FINAL

PHASE III
REMEDIAL INVESTIGATION REPORT

FOR THE

WINKLEPECK BURNING GROUNDS
AT THE
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

Prepared for

US Army Corps of Engineers®

U.S. Army Corps of Engineers, Louisville District
Contract No. DACA62-00-D-0001
Delivery Order CY08

March 2005

SAIC®

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

contributed to the preparation of this document and should not be considered an eligible contractor for its review.

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Prepared by

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CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Science Applications International Corporation (SAIC) has completed the Final Report for the Phase III Remedial Investigation of the Winklepeck Burning Grounds at the Ravenna Army Ammunition Plant, Ravenna, Ohio. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of data quality objectives; technical assumptions; methods, procedures, and materials to be used; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing Corps policy.

W. Kevin Jago — 3/1/05

Kevin Jago — Date
Study/Design Team Leader

Sarah Vaughn — 3/1/05

Sarah Vaughn — Date
Independent Technical Reviewer

Significant concerns and the explanation of the resolution are as follows:

> Internal SAIC Independent Technical Review comments are recorded on a Document Review Record per SAIC quality assurance procedure QAAP 3.1. This Document Review Record is maintained in the project file. Changes to the report addressing the comments have been verified by the Study/Design Team Leader.

As noted above, all concerns resulting from independent technical review of the project have been considered.

William P Key — 3/3/05

Principal w/ A-E firm — Date

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ACRONYMS

AA	atomic absorption
amsl	above mean sea level
AOC	area of concern
AT123D	Analytical Transient 1-, 2-, 3-Dimensional (model)
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMCOC	contaminant migration contaminant of concern
CMCOPC	contaminant migration contaminant of potential concern
COC	contaminant of concern
COPC	chemical of potential concern
COPEC	contaminant of potential concern
CSM	conceptual site model
DAF	dilution attenuation factor
DDT	dichlorodiphenyl-trichloroethane
DLA	Defense Logistics Agency
DNB	dinitrobenzene
DNT	dinitrotoluene
DQA	data quality assessment
DQO	data quality objective
EPA	U. S. Environmental Protection Agency
EU	exposure unit
FS	feasibility study
GSSL	generic soil screening level
HELP	Hydrologic Evaluation of Landfill Performance
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
ICP	inductively coupled plasma
IDW	investigation-derived waste
IRP	Installation Restoration Program
JMC	Joint Munitions Command
MCL	maximum contaminant level
MKM	MKM Engineers
MOA	memorandum of agreement
NGB	National Guard Bureau
NIST	National Institute of Standards and Testing
OBG	Open Burning Ground
OE	ordnance and explosive
OHARNG	Ohio Air National Guard
Ohio EPA	Ohio Environmental Protection Agency
OVA	organic vapor analyzer
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
ppb	part per billion
ppm	part per million
PRG	preliminary remediation goal
PVC	polyvinyl chloride
QA	quality assurance

QC	quality control
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RGO	remedial goal option
RI	remedial investigation
RRSE	relative risk site evaluation
RVAAP	Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
SAP	sampling and analysis plan
SESOIL	Seasonal Soil Compartment (model)
SOP	standard operating procedure
SRC	site-related contaminant
SSL	soil screening level
STL	Severn Trent Laboratories, Inc.
SVOC	semivolatile organic compound
TAL	target analyte list
TCE	trichloroethylene
TNB	trinitrobenzene
TNT	trinitrotoluene
TOC	total organic carbon
UCL	upper confidence limit
USACE	U.S. Army Corps of Engineers
USCS	Unified Soil Classification System
UXO	unexploded ordnance
VOC	volatile organic compound
WBG	Winklepeck Burning Grounds
XRF	X-ray fluorescence

EXECUTIVE SUMMARY

This Phase III Remedial Investigation (RI) Report characterizes the nature and extent of contamination, and evaluates the fate and transport of contaminants resulting from former operations at Winklepeck Burning Grounds (WBG) at the Ravenna Army Ammunition Plant in Ravenna, Ohio. Historical operations at WBG, which consists of approximately 200 acres, included melting explosives out of heavy artillery projectiles using open burning. In some instances, high-energy material such as black powder and explosives were also laid out in a string along a road and burned (USATHAMA 1978). Prior to 1980, burning was carried out in four burn pits, on burn pads, and sometimes on the roads. The burn pits consisted of areas bermed on three sides, approximately 50 to 75 ft in width and length. After 1980, thermal treatment of munitions and explosives was conducted only in a 1-acre Resource Conservation and Recovery Act (RCRA) area at Burning Pad 37. The burn trays were decontaminated and removed from Burning Pad 37 in 1998, and the site was closed under RCRA.

The Phase III RI was performed to fill additional data needs regarding the extent of contamination in affected media (e.g., soils, sediments, and groundwater) that remained following the Phase II investigation (USACE 2001a). Data from the Phase III RI will support the subsequent feasibility study (FS). In the FS, data acquired in the Phase III RI will be screened against human health remedial goal options (RGOs) developed for the future WBG land use scenario that has been agreed upon by RVAAP stakeholders (Section 1.2.2). These data will be considered during the screening and evaluation of remedial alternatives in the FS to determine the areas and volumes of soils exceeding applicable RGOs. Evaluation of ecological risks will also be presented in the subsequent FS and incorporate the Ecological Field Effects Study (USACE 2003a), as well as considerations for suitable habitat under the future land use, to develop ecological goals for remediation as applicable.

PREVIOUS INVESTIGATIONS

Previous characterization efforts at WBG include two historical soil sampling efforts, a Phase I RI in 1996 (USACE 1998), and a Phase II RI in 1998 (USACE 2001a). The purpose of the investigations was to confirm the presence and nature and extent of contamination in surface and subsurface soils, sediment, surface water, and groundwater. Previous investigations are described in detail in the Phase I and II RI reports.

An Ecological Field Effects Study (USACE 2003a) was completed to evaluate impacts to the flora and fauna that populate WBG through direct observations and analysis as compared to calculated hazard quotients. The ecological field effects investigation was designed to refine the screening ecological risk assessment performed in the Phase II RI and included evaluation of all three RI phases of data in addition to environmental analyses conducted exclusively for the study.

PHASE III REMEDIAL INVESTIGATION INVESTIGATIVE APPROACH

The findings and data gaps identified during previous investigations guided the specific objectives and sampling design of the Phase III RI at WBG. As detailed in *the Sampling and Analysis Plan Addendum No. 1 for the WBG Feasibility Study* (USACE 2000), the Phase III RI sampling objectives, by medium, included the following:

- **Soil.** Further horizontal characterization of areas of known soil contamination was performed to define contaminant nature and extent and to provide sufficient data for remedial alternatives analysis. Vertical characterization was performed for the same reasons and to determine if leaching processes

may be contributing to groundwater contamination. Random grid sampling was performed to determine whether soil contamination is present outside of and between former burn areas.

- **Sediment.** Operational data suggest that the ditches and tributaries in the vicinity of the former burn areas represent the most likely locations for contaminants that may have accumulated through erosional transport and redeposition. Considering the available data and the CSM, an uncharacterized ditchline draining two highly contaminated pads was targeted for biased sampling.

- **Surface Water.** Phase II RI characterization, surface water fate and transport modeling, and risk analysis were deemed adequate to characterize potential contaminant transport; therefore, additional surface water characterization was not an element of the Phase III RI.

- **Groundwater.** Analytical evidence for groundwater contamination at WBG remained somewhat limited at the conclusion of the Phase II RI; thus, the occurrence and extent of groundwater contamination required further evaluation. Additional monitoring wells were installed immediately downgradient of pads having residual contamination and in locations to monitor for potential migration of contamination off of the AOC. Soil leaching modeling and groundwater transport modeling were included in the scope of Phase III data evaluation efforts.

AVAILABLE DATA

The environmental database for WBG includes data from Phase I, II, and III RIs. Site-related contaminants (SRCs) for surface soil (including sediments from intermittent drainage conveyances) and subsurface soil were identified by screening Phase III RI against frequency of detection, essential human nutrient, and facility-wide background criteria. Groundwater SRCs were screened using data from the combined Phase I, II, and III data sets; however, the Phase III RI data are evaluated in the nature and extent assessment of this report because it represents current conditions within the AOC. The data collected under this Phase III RI include the following:

- 96 surface soil samples,
- 54 subsurface soil samples,
- 2 sediment samples, and
- 18 groundwater samples.

SRCs identified from Phase III RI data were compared against those determined during the Phase II RI. Newly identified SRCs from Phase III RI data will require additional evaluation in the human health risk evaluation and remedial goal development in the subsequent FS.

Geological characterization was achieved through the collection of undisturbed and disturbed geotechnical samples from soil sampling stations and monitoring well borings.

NATURE AND EXTENT OF CONTAMINATION

The Phase III RI evaluated the nature and extent of contamination in four media as follows: surface soil [from 0 to 1 ft below ground surface (bgs)], subsurface soil (from 2 to a maximum of 10 ft bgs), sediment, and groundwater. The surface and subsurface soil were further divided into lateral aggregates based on individual burning pads or former buildings, and random grid samples. Sediment and groundwater were considered on an area of concern (AOC)-wide basis. The results of this evaluation are summarized by medium.

Surface Soil

A total of 66 biased surface soil and 2 dry sediment stations were sampled for the purpose of completing the nature and extent of surface soil contamination at the 12 former burning pads of interest. As noted above, a total of 30 random grid surface soil samples were also collected. Chemical evaluation of the surface soils included analyses of explosives, propellants, target analyte list (TAL) metals, hexavalent chromium, cyanide, and organic compounds. All surface soil and dry sediment samples were analyzed in the field for trinitrotoluene (TNT) and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX). Explosives were not evaluated in samples from Pad 32, as this site was sampled to verify whether concentrations of metals were present (e.g., aluminum) at sufficient levels to potentially produce ecological effects.

Explosives

- The majority of the soil samples analyzed in the field for TNT and RDX had no detectable quantities of these explosives. A total of 21 surface soil samples were submitted for analyses in the fixed-base laboratory for explosives. Samples from 9 of the 12 pads sampled contained low, detectable concentrations of one or more explosive compounds at concentrations less than 1 mg/kg.

- Three pads had occurrences of explosives in excess of 1 mg/kg:

  – Pad 60 (station WBG-211) results indicated high concentrations of 2,4,6-TNT (680 mg/kg), as well as degradation products 2-amino-4,6-dinitrotoluene (14J mg/kg) and 2, 4-dinitrotoluene (DNT) (1.5 mg/kg). The maximum detected values were on the berm located south of the pad.

  – At Pad 66 (station WBG-247), 2,4,6-TNT was detected at 1.5 mg/kg.

  – At Pad 67, high concentrations of 1,3,5-trinitrobenzene (TNB) (34 mg/kg); 2,4,6-TNT (430 mg/kg); RDX (470 mg/kg); and octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) (100 mg/kg) were identified. Concentrations of 2,4,6-TNT above 10 mg/kg extended to the drainage ditch located about 100 ft south of the pad. This was the only pad sampled during the Phase III RI with detectable quantities of HMX and RDX in surface soils. A small area of the pad was observed to have stained soil, and a small amount of possible residual product was observed on the ground surface. This material was collected (about 21 g) and analyzed for TNT in the field laboratory only. The TNT content was approximated at 97%. Analysis of filter residues for metals did not indicate any substantially elevated inorganics in this material.

- There were no occurrences of explosives or propellants in random grid samples, Pad 37, or Building 4301.

Inorganics

- Hexavalent chromium was present at generally low estimated concentrations at the 10 pads where samples were collected. Concentrations ranged from non-detects to a maximum of 12.2 J mg/kg at Pad 61 (station WBG-217).

- Cyanide was generally absent in surface soil; low, estimated concentrations were observed only at Pad 60 (0.88 J mg/kg) and at Building 4301 (1.8 J mg/kg).

- Phase III RI data indicated metals concentrations (primarily antimony, cadmium, chromium, barium, lead, zinc, and occasionally mercury) substantially higher than background values at the following sites:

  – Pad 37 (surface soil on the pad),
  – Pad 38 (surface soil on the pad),

- Pad 45 (north and east of the Deactivation Furnace Area),
- Pad 58 (on the berms and south and east of the berms),
- Pad 59 (western berm and western half of the pad),
- Pad 60 (berms and west of the western berm),
- Pad 61 (surface soil on the pad),
- Pad 62 (center and to the west of the pad),
- Pad 66 (south and west of the pad),
- Pad 67 (western half of the pad and south to the drainage ditch), and
- Pad 68 (areas adjacent to the pad).

- Occurrences of metals above background are common in the random grid samples. Barium, cadmium, cobalt, and zinc were the most commonly detected metals.

- Samples from the Building 4301 vicinity contained antimony, barium, cadmium, and mercury at concentrations many times above the background criteria.

Organic Compounds

- Organic compounds were analyzed in a total of nine samples collected at Pads 37, 38, 45, 61, 62, 66, and 67 and at Building 4301.

- Pesticides [4,4'-dichlorodiphenyl-trichloroethane (DDT), dieldrin, and heptachlor epoxide] or polychlorinated biphenyls (PCBs) were detected at very low concentrations at Pads 37, 38, 61, and 66.

- Semivolatile organic compounds (SVOCs), primarily polycyclic aromatic hydrocarbons (PAHs) presumed to result from open burning on the pads, were found at Pad 61 and at Building 4301. These compounds were present at low concentrations, generally below 0.7 mg/kg.

- One volatile organic compound (VOC), [trichloroethylene (TCE)] was detected at Building 4301 at a low estimated concentration.

Subsurface Soil

Fifty-four subsurface soil samples were collected from 25 borings at 10 burning pads as part of the Phase III RI. Chemical evaluation of the soils included analyses of explosives, TAL metals, hexavalent chromium, cyanide, and organic compounds. Based on field analyses for TNT and RDX in surface soil, subsurface soils were collected from 2 to 4 ft. Successive depths were generally sampled based on the results of the field explosives analyses. All Geoprobe borings were sampled to a depth of 10 ft and samples submitted for fixed-base laboratory analyses of explosives regardless of field laboratory results. Concentrations of both explosives and metals decrease with depth; however, in several cases, the deepest interval still reveals concentrations of these analytes to be elevated above installation background.

Explosives and Propellants

- Occurrences of explosives at concentrations greater than 1 mg/kg were identified at Pads 58, 59, 61, and 67 as follows:

  - At Pad 58, explosives contamination was evident to a depth of 6 ft bgs. Concentrations of 1,3,5-TNB; TNT; 2,4-DNT; and other compounds were 5 to 100 times higher in the subsurface soils at station

WBG-199 than in the surface soil sample, suggesting some reworking of soils during the active use of this pad.

– At Pad 59, explosives contamination was evident to a depth of 6 ft bgs in WBG-205. Samples from station WBG-210 contained no detectable explosives below the 2- to 4-ft interval. The maximum concentration of explosives was 17 mg/kg of 2,4,6-TNT at station WBG-205 (4- to 6-ft interval); most other occurrences were less than 1 mg/kg.

– At Pad 61, RDX and TNT occurred at concentrations slightly greater than 1 mg/kg in the 2- to 4- and 4- to 6-ft intervals.

– Pad 67 exhibited the highest concentrations of several explosives encountered in WBG subsurface soils, including 2,4,6-TNT and RDX. At station WBG-252, 2,4,6-TNT was present at high concentrations at all depth intervals sampled, with a maximum value of 5,200 mg/kg in the 4- to 6-ft interval. HMX; RDX; 1,3,5-TNB; and 2,4-DNT were also present in subsurface soils at Pad 67. The vertical extent of explosives contamination may not have been determined at Pad 67, as 10 ft was the maximum depth sampled.

Inorganics

- Hexavalent chromium was analyzed in 12 samples collected from Pads 38, 45, and 58. This constituent was detected at low, estimated concentrations only in two subsurface samples from station WBG-237: 2.8 J mg/kg in the 4- to 6-ft interval and 1.4 J mg/kg in the 8- to 10-ft interval.

- Cyanide was detected only once (Pad 61) out of four samples (4.6 mg/kg, station WBG-217, 2- to 4-ft interval). Pad 61 subsurface soil also had the highest frequency of metals detected above their respective background criteria and a number of metals were detected at Phase III maximum concentrations (antimony, barium, chromium, copper, lead, mercury, nickel, selenium, silver, vanadium, and zinc).

- At Pads 37, 38, 58, and 59, antimony, arsenic, barium, cadmium, copper, lead, silver, and zinc all exceeded subsurface soil background criteria at various depths.

Organic Compounds

- Organic compounds were evaluated at one boring at Pads 58, 59, 61, and 68. Each sample was evaluated for VOCs, SVOCs, and pesticides/PCBs. Occurrences of organic compounds in subsurface soils are sporadic and at generally low concentrations.

- Toluene, dimethylbenzene, and ethylbenzene were identified at Pad 59. TCE was present at Pad 61 and acetone and methylene chloride were present at Pad 68, each at concentrations less than 0.01 mg/kg. All detections of VOCs were from the 2- to 4-ft sample interval at these pads.

- SVOCs were detected Pad 58 in the 4- to 6-ft interval and at Pads 59 and 61 in the 2- to 4-ft interval. Detected SVOCs consist mainly of a number of PAHs presumed to be associated with open burning at the pads. Pad 61 had the maximum concentration of all PAHs detected in the Phase III subsurface soil. At Pad 58, 10 PAHs were detected. At Pad 59, eight PAHs were detected at concentrations ranging from 0.05 to 3.2 mg/kg.

- Two pesticides, endrin ketone and heptachlor epoxide, were each detected on one occasion at low concentrations less than 0.05 mg/kg.

Phase III Remedial Investigation Dry Sediment Samples

- The two sediment samples collected from the drainage ditch flowing beneath Road E did not contain detectable TNT or RDX exceeding 1 ppm; therefore, samples were not sent to the fixed-base laboratory. Nitroguanidine was detected at a low estimated concentration in the sample from WBG-294.

- Inorganic SRCs detected above background criteria included antimony, beryllium, cadmium, and lead. Chromium, copper, nickel, selenium, and vanadium were detected above background values in WBG-295 only. Concentrations were generally less than twice the background criteria for analytes having background values.

- Low, estimated concentration of one VOC (TCE), PCB-1260, and two SVOCs (di-n-butylphthalate and n-nitrosodiphenylamine) were detected in one or both samples.

Groundwater

Groundwater samples were collected from 17 existing and newly installed Phase III RI monitoring wells. Samples were analyzed for dissolved (filtered) metals, explosives, propellants, cyanide, VOCs, SVOCs, and pesticides/PCBs.

Explosives

- Every monitoring well, with the exception of OBG-2 and WBGmw-013, was found to have low concentrations of one or more explosives. Concentrations ranged from 0.05 µg/L (2,4-DNT) in WBGmw-005 to a maximum concentration of 52 µg/L (RDX) in WBGmw-006. Results for only five individual compounds exceeded 1 µg/L: two compounds in WBGmw-006, two in WBGmw-015, and one in WBGmw-010.

- The well at the eastern AOC boundary, WBGmw-016, contained low concentrations of 2- and 4-nitrotoluene.

- Concentrations of explosives in WBG groundwater appear to have changed very little since the Phase II RI.

Inorganics

- Inorganics did not exceed background in wells OBG-1 and -2, and WBGmw-006, -008, -011, -012, -013, and -017.

- Eight metals were detected above background in Phase III groundwater samples: aluminum, arsenic, barium, cadmium, cobalt, manganese, nickel, and zinc. The largest exceedance of background criteria was for zinc in WBGmw-015 (500 µg/L; about eight times the background value). Copper, mercury, and cyanide were identified as SRCs in Phase II samples, but these three constituents were not detected in Phase III samples.

- The occurrences of inorganics above background values were generally limited to three or fewer per monitoring well. Inorganics were detected at concentrations exceeding secondary maximum contaminant levels (MCLs), but no inorganics exceeded primary MCLs.

- Concentrations of metals are similar to those observed during the Phase II RI.

Organic Compounds

- Low levels of bis(2-ethylhexyl)phthalate were the only SVOC detected during the Phase III RI (WBGmw-007, -010, and -013). The pesticide 4,4'-DDT was detected in WBGmw-006 (0.058 J µg/L) and heptachlor epoxide was detected in WBGmw-10 at a concentration of 0.056 J µg/L. PCBs and PAHs were not detected.

- Chloroform was the only VOC detected in WBGmw-010.

FATE AND TRANSPORT ANALYSIS

Contaminant fate and transport modeling performed as part of the Phase III RI included leachate modeling [Seasonal Soil Compartment (SESOIL)] at selected source areas demonstrating the highest levels of process-related contaminants. Where leaching was predicted to occur, groundwater modeling [Analytical Transient 1-, 2-, 3-Dimensional (AT123D)] was conducted from the source to selected receptors or exit points from the AOC. The receptor and exit points selected for groundwater transport modeling included the AOC boundary, Sand Creek, and stream north of WBG (Pads 58, 60, 61, and 62 only) at their closest points downgradient of each source area.

Antimony, arsenic, and RDX were identified at multiple pads as exceeding MCLs or risk-based concentrations (RBCs) in the leaching model. These constituents were identified as contaminant migration constituents of potential concern (CMCOPCs). The following compounds were identified as CMCOPCs at only one source pad: 1,3-dinitrobenzene and 2,6-DNT (Pad 66); 1,3,5-TNB (Pad 67); barium (Pad 68); cadmium (Pad 38); carbazole (Pad 61); and chromium (Pad 58). The timeframe for explosive compounds to reach predicted peak concentrations ranged from 2 to 12 years, which suggests that maximum concentrations have already occurred relative to the cessation of operations at WBG. Predicted timeframes for peak concentrations of inorganics ranged from 311 to the model maximum of 1,000 years. Although the leaching modeling is conservative, the presence of arsenic; barium; cadmium; 2,6-DNT; 1,3,5-TNB; and RDX in groundwater indicate leaching processes are ongoing near some of the source pads.

Modeling of contaminant transport in shallow groundwater was conducted for identified CMCOPCs from the source pads to the three endpoints noted above. No metals were predicted to reach any receptor points at concentrations greater than MCLs or RBCs within the 1,000-year modeling period. RDX and carbazole were the only compounds predicted to reach one or more of the selected receptor locations at concentrations exceeding their respective RBCs. RDX from Pad 37 was the only CMCOPC predicted to reach Sand Creek above its RBC (peak concentration estimated at 10 years). Peak RDX concentrations were predicted to occur at the AOC boundary from 6 to 11 years depending on pad location. For Pads 60, 61, and 62, RDX was also predicted to exceed its RBC at the stream north of WBG with peak concentrations occurring from 6 to 11 years. Concentrations of carbazole were also predicted to exceed its RBC at the AOC boundary and the stream north of WBG; however, the timeframe to achieve peak concentrations was the model maximum of 1,000 years and this compound was not detected in groundwater during the Phase III RI.

CONCEPTUAL SITE MODEL

The conceptual site model (CSM) for WBG was initially developed during the Phase II RI and was revised based on new Phase III RI data. Elements of the CSM include the following:

- primary contaminant source areas and release mechanisms,

- contaminant migration pathways and exit points, and
- data gaps and uncertainties.

Source-Term and Release Mechanisms

Results of the Phase III RI soil sampling indicate that Pads 58, 59, 60, 61, 66, and 67 generally contain the greatest numbers and concentrations of contaminants. Metals and explosives are the primary contaminants present in these areas at concentrations greater than background. Soil contamination by explosives is present to the maximum depths sampled (6 to 10 ft) at Pads 58, 59, 61, and 67. Metals SRCs substantially above background also were observed at Pads 37, 38, 45, 62, and 68. Samples from the Building 4301 vicinity also showed concentrations of inorganics well above background values.

Two primary mechanisms for release of contaminants from the source areas are identified: (1) erosional and/or dissolved phase transport of contaminants from soil sources with transport into drainage ditches and Sand Creek, and (2) leaching of constituents to groundwater via infiltration of rainwater through surface and subsurface soils. Evaluation of these release mechanisms was done through sampling of ditches and monitoring wells installed downgradient of the burn pads, and numerical modeling of soil leaching processes. Airborne dispersion of contaminants was not quantified or modeled. The chemical characteristics of the SRCs present, high annual precipitation levels, and heavy vegetation cover at WBG likely preclude any substantial dispersion of contaminants via air dispersion pathways.

Contaminant Migration Pathways and Exit Points

Surface Water Pathways

Migration of contaminants from soil sources via surface water occurs primarily by: (1) movement of particle-bound (e.g., clays or colloids) contaminants in surface water runoff, and (2) transport of dissolved constituents in surface water. Surface runoff is directed to drainage ditches and tributaries to the Sand Creek, and to a ditch that drains the northwest portion of WBG and exits the AOC between Pads 58 through 61 to a surface drainage conveyance north of WBG.

Upon reaching quiescent portions of surface water conveyances, flow velocities decrease and particle-bound contaminants are expected to settle out as sediment accumulation. Sediment-bound contaminants may be re-mobilized during storm events. Sediment-bound contaminants may also partition to surface water and be transported in dissolved phase. Previous sampling of sediment and surface water was deemed adequate to characterize potential contaminant transport along conveyances to Sand Creek. Modeling of surface water transport pathways in the Phase II RI indicated that erosional transport mechanisms are not expected to contribute substantial flux of contaminants to Sand Creek. Biased sampling of sediment in the ditch flowing north out of WBG indicates that the drainage is not an exit point for contaminants.

Leaching and Groundwater Pathways

Evaluation of leaching potential for soil source areas (Section 6.2) indicates that explosives, metals, and carbazole may be expected to leach from the contaminated surface soil into the groundwater and reach concentrations exceeding groundwater MCLs or RBCs. The presence of some of these constituents in groundwater near source areas suggests that leaching processes are ongoing near the source areas. Timeframes for leaching of the explosive compounds are relatively short (2 to 12 years), indicating that peak concentrations in groundwater beneath the source areas may have already passed. Timeframes to attain predicted peak concentrations for metals are much longer (approximately 300 to 1,000 years), indicating that concentrations may increase in the future.

Shallow groundwater flow follows stream drainage and topographic patterns with flow east-southeast across the AOC. Evidence exists that the AOC acts as a recharge area with shallow groundwater flow to the stream northeast of WBG and to Sand Creek. Modeling of contaminant transport in shallow groundwater showed that no metals CMCOPCs were predicted to reach any receptor points at concentrations greater than MCLs or RBCs within the modeling period. RDX can be expected to reach certain receptor locations, depending on the source area modeled, at concentrations exceeding its RBC. However, as with the leaching results, the predicted timeframes to attain peak concentrations (6 to 11 years) suggest that most migration has already occurred.

Uncertainties

The CSM is developed based on available site characterization and chemical data. Uncertainties are inherent in the CSM where selected data do not exist or are sparse. The uncertainties within the CSM for WBG include the following.

- Leachate and transport modeling is limited by uncertainties in the behavior and movement of contaminants in the presence of multiple solutes. In addition, heterogeneity, anisotropy, and spatial distributions of more permeable zones could not be fully characterized during the field investigation nor addressed in the modeling. Therefore, effects of these features on contaminant transport at WBG are uncertain and modeling results are considered as conservative representations.

- The exact source(s) of some inorganics in soil and sediment in the AOC is unknown. Data evaluated in the nature and extent and risk evaluations address all constituents measured within the burning grounds whether from natural or anthropogenic sources. Results of the evaluations may reflect, in part, contributions from sources other than WBG operations (e.g., slag or pre-RVAAP activities).

CONCLUSIONS

The conclusions presented below, by medium, combine the findings of the contaminant nature and extent evaluation and fate and transport modeling. The results of the Phase III investigation do not change the overall conclusions presented in the Phase II RI. It is noted that analyses for additional compounds in the Phase III RI, relative to the Phase I and II RIs, resulted in some additional chemicals that were identified as SRCs. These additional SRCs will require further screening in context of the human health risk evaluation in the pending FS.

Surface Soil

With the possible exception of Pad 67, the lateral extent of explosives in surface soil has largely been defined down to a concentration of 1 mg/kg. At the 12 pads investigated during the Phase III RI, explosive compounds appear to be limited to relatively close proximity to the source pads. Antimony, cadmium, chromium, barium, lead, zinc, and mercury were frequently detected above background in surface soils within a number of pads. The Phase III RI demonstrated that concentrations of some metals (e.g., lead and cadmium) 5 to 20 times background criteria extend well beyond pad boundaries. Hexavalent chromium, pesticides, PCBs, SVOCs, and VOCs were detected only sporadically and usually at low, estimated concentrations. Additional SRCs identified from Phase III RI data are shown in the summary below.

2-Amino-4,6-dinitrotoluene	4,4'-DDT
4-Amino-2,6-dinitrotoluene	Dieldrin
Nitroguanidine	Heptachlor Epoxide
Hexavalent Chromium	PCB-1254
Manganese	PCB-1260
Vanadium	

Subsurface Soil

Subsurface soil sampling during the Phase III RI showed the presence of detectable explosive compounds and inorganics above facility-wide background criteria at several pads. Concentrations of explosives decreased with depth; the greatest overall frequency of detection occurred at depths of 4 ft or less. Explosive compounds above 1 mg/kg were detected at four pads to depths of 6 ft or greater at four pads (58, 59, 61, and 67). However, even at these locations, maximum observed concentrations were observed at depths of 6 ft or less. Pad 67 contained the highest concentrations of explosives in subsurface soil and concentrations up to 860 mg/kg (2,4,6-TNT) continued to be observed to the maximum sampling depth of 10 ft.

Pads 37, 38, 58, 59, and 61 exhibited the greater numbers and concentrations of inorganic SRCs in subsurface soil (antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, vanadium, and zinc). Distinct vertical concentration gradients were not clearly evident for most metals; background exceedances occurred at various depths depending on the location. Hexavalent chromium and cyanide were infrequently detected and occurred primarily at low, estimated values. Occurrences of organic compounds in subsurface soils were also sporadic and at generally low, estimated concentrations.

Additional SRCs identified from Phase III RI subsurface soil data are shown in the summary below.

2-Amino-4,6-dinitrotoluene	Endrin Ketone
4-Amino-2,6-dinitrotoluene	Heptachlor Epoxide
Aluminum	Acenaphthylene
Arsenic	Dibenzofuran
Chromium	Fluorene
Hexavalent Chromium	Naphthalene
Cyanide	Dimethylbenzene
Nickel	Ethylbenzene
Selenium	Methylene Chloride
Vanadium	TCE

Phase III Remedial Investigation Dry Sediment

Sediment samples collected from the drainage ditch flowing north beneath Road E did not contain detectable TNT or RDX exceeding 1 mg/kg in field analyses. Nitroguanidine was detected at a low estimated concentration in the sample from WBG-294. Inorganic SRCs detected above background criteria included antimony, beryllium, cadmium, and lead. Chromium, copper, nickel, selenium, and vanadium were detected above background values in WBG-295 only. Concentrations were generally less than twice the background criteria for analytes having background values. The Phase III RI data indicate that substantial contamination is not migrating from the AOC via this pathway. Four additional SRCs were identified from Phase III RI data

- nitroguanidine,
- hexavalent chromium,
- selenium, and

- PCB-1260.

Groundwater

Shallow groundwater at WBG near former source pads contains low concentrations (generally less than 1 μg/L) of explosives. Based on available data, groundwater contamination by inorganics and organics other than explosives is minimal at WBG. Trace levels of only two degradation products (2- and 4-nitrotoluene) were observed in well WBGmw-016, located furthest downgradient (east) at WBG, which indicates minimal migration of contaminants beyond the AOC boundary. In those wells sampled during both the Phase II and III investigations, concentrations of explosives and metals have changed very little over time indicating that leaching processes are at steady state. Modeling results compared to WBG operational history suggest that peak leaching of explosive compounds has already occurred. RDX was the only contaminant currently detected in groundwater that may potentially migrate to receptor points at concentrations greater than RBCs.

Additional SRCs identified from Phase III RI groundwater data include those listed below.

1,3,5-TNB	Aluminum
2,4,6-TNT	Arsenic
2,6-DNT	Cadmium
2-Amino-4,6-dinitrotoluene	Cobalt
2-Nitrotoluene	Zinc
4-Amino-2,6-dinitrotoluene	4,4'-DDT
4-Nitrotoluene	Heptachlor Epoxide
Tetryl	

RECOMMENDATIONS

It is recommended that WBG proceed to the FS phase under the RVAAP Comprehensive Environmental Response, Compensation, and Liability Act process. It is recommended that the FS phase employ a streamlined remedial alternatives evaluation process based on the most likely land use. The intent of this strategy is to accelerate the evaluation of site-specific remedies by focusing the FS efforts to appropriate alternatives that have been evaluated at other sites with operational histories similar to WBG.

The future land uses and controls envisioned for WBG should be finalized prior to selection of the path forward for the site. Establishment of the most likely land use scenario (e.g., Mark 19 grenade practice range) will allow decision makers the initial information necessary to determine the correct remedial action, such as source removal, land use controls, and/or continued monitoring, to achieve requisite protection of human health and the environment. The envisioned future use of the AOC, or portions of the AOC, is an important consideration in determining the extent of remediation necessary to achieve the required degree of protectiveness. Establishment of land use will also allow for streamlined evaluation of remedies and will be necessary for a future record of decision and attendant land use controls implementation plan (or equivalent documentation).

Areas having the same projected land use within WBG will incorporate the same RGOs into remedial alternative development. Also, the FS should consider potential future separate actions related to surface water systems and the facility-wide groundwater monitoring program. The FS should apply results of the previous ecological field effects evaluation at WBG (pending agreement by the Ohio Environmental Protection Agency) to remedial goal development to the extent practicable.

Key data uncertainties have been identified in the RI to help guide future remedial planning efforts. Details of additional nature and extent assessment, if needed to fill any remaining data gaps to evaluate

remedial alternatives, are deferred to the FS stage. It is noted that a substantial amount of data has been collected at WBG and these data are sufficient to progress to the FS stage. However, because of the nature of historical site operations and physical and chemical nature of the SRCs identified, the nature and extent of contamination cannot be defined with complete certainty. The following components may be necessary for a thorough FS evaluation or may be considered under a separate RI/FS process for integrator media, such as surface water or groundwater:

- Quantification or additional evaluation of risks related to constituents identified as new SRCs from the Phase III RI.

- Refinement of exposure unit (EU) boundaries based on the most likely future land use, if remedial decisions by EU are considered most feasible by decision makers. Such a delineation would allow:

  – prioritization of EUs or areas, as needed, from highest potential risk to lowest potential risk;

  – selection of cleanup actions and exit strategies per EU and/or per buildings in each EU, (e.g., certain areas may remediated by soil removal, whereas remediation of other areas may require an alternate approach); and

  – potential elimination of all or portions of certain EUs from further action, thus reducing the footprint of that portion of the AOC requiring remediation.

- Assessment of shallow groundwater at WBG indicated some contamination related to historical process operations. Although definitive evidence of vertical migration of contaminants does not exist, assessment of deep groundwater at the site has not been performed and may be necessary at some point to support future resource use decisions.

1.0 INTRODUCTION

This report documents the results of the Phase III Remedial Investigation (RI) of Winklepeck Burning Grounds (WBG) at the U.S. Army Joint Munitions Command (JMC) Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio (Figures 1-1 and 1-2). The Phase III RI was conducted under the U.S. Department of Defense Installation Restoration Program (IRP) by Science Applications International Corporation (SAIC) and their subcontractors, under contract number DACA62-00-D-0001, Delivery Order No. CY08, with the U.S. Army Corps of Engineers (USACE), Louisville District. The Phase III RI was conducted in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 following work plans reviewed and commented on by the Ohio Environmental Protection Agency (Ohio EPA).

This document summarizes the results of the Phase III RI field activities conducted in October and November 2000 at WBG. The environmental setting, data quality objectives (DQOs), field implementation, nature and extent of contamination, and fate and transport of chemical constituents are discussed. These additional data will be used to complete the remaining elements of human health and ecological risk evaluations and to develop remedial alternatives in a subsequent feasibility study (FS).

1.1 PURPOSE AND SCOPE

Figure 1-3 presents the approach to implementing the CERCLA process under the guidance of the IRP. Priorities for environmental restoration at areas of concern (AOCs) at RVAAP are based on their relative potential threat to human health and the environment, derived from relative risk site evaluations (RRSEs). Thirty-eight AOCs were identified in the *Facility-wide Preliminary Assessment (PA) for the Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 1996). Thirteen new AOCs were identified in 1998 as a result of additional records searches and site walkovers. These were ranked by the U.S. Army Center for Health Promotion and Preventive Medicine and entered into the JMC database. Those AOCs ranked as high-priority sites (i.e., those with high RRSE scores) are targeted first for Phase I RIs. Medium- and low-priority sites will be characterized in Phase I RIs following completion of the RIs for high-priority AOCs. Investigations and remedial actions under the CERCLA process are implemented at the AOCs in order of priority as funding is available or unless other priorities surface, such as land use needs.

The scope of the Phase III RI at WBG is to fill additional data needs regarding the extent of contamination in affected media (e.g., soils, sediments, and groundwater) that remained following the Phase II investigation (USACE 2001a). The primary objectives of the Phase III RI are as follows:

- Further define vertical and lateral extent of contamination at selected burning pads where available data indicate that contamination extends beyond the areas sampled during the Phase II RI.
- Perform random grid sampling in areas that were not likely to have been impacted by former operations to verify absence of contamination.
- Further characterize groundwater quality within the AOC to ascertain flow patterns and levels of contaminants.
- Obtain necessary data to evaluate the potential for natural attenuation using quantitative measures where possible.
- Obtain necessary data to evaluate contaminant fate and transport using quantitative measures where possible.

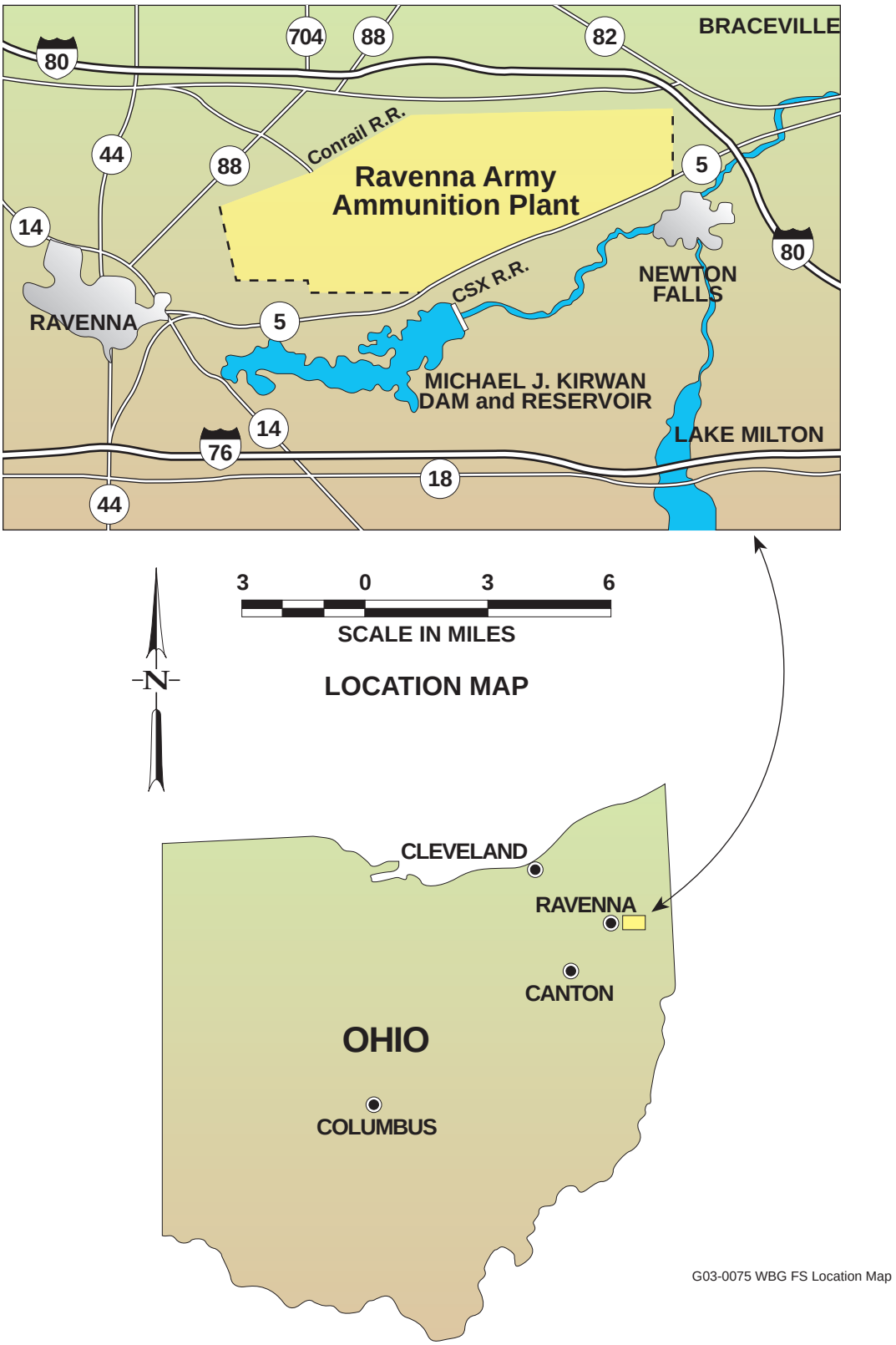
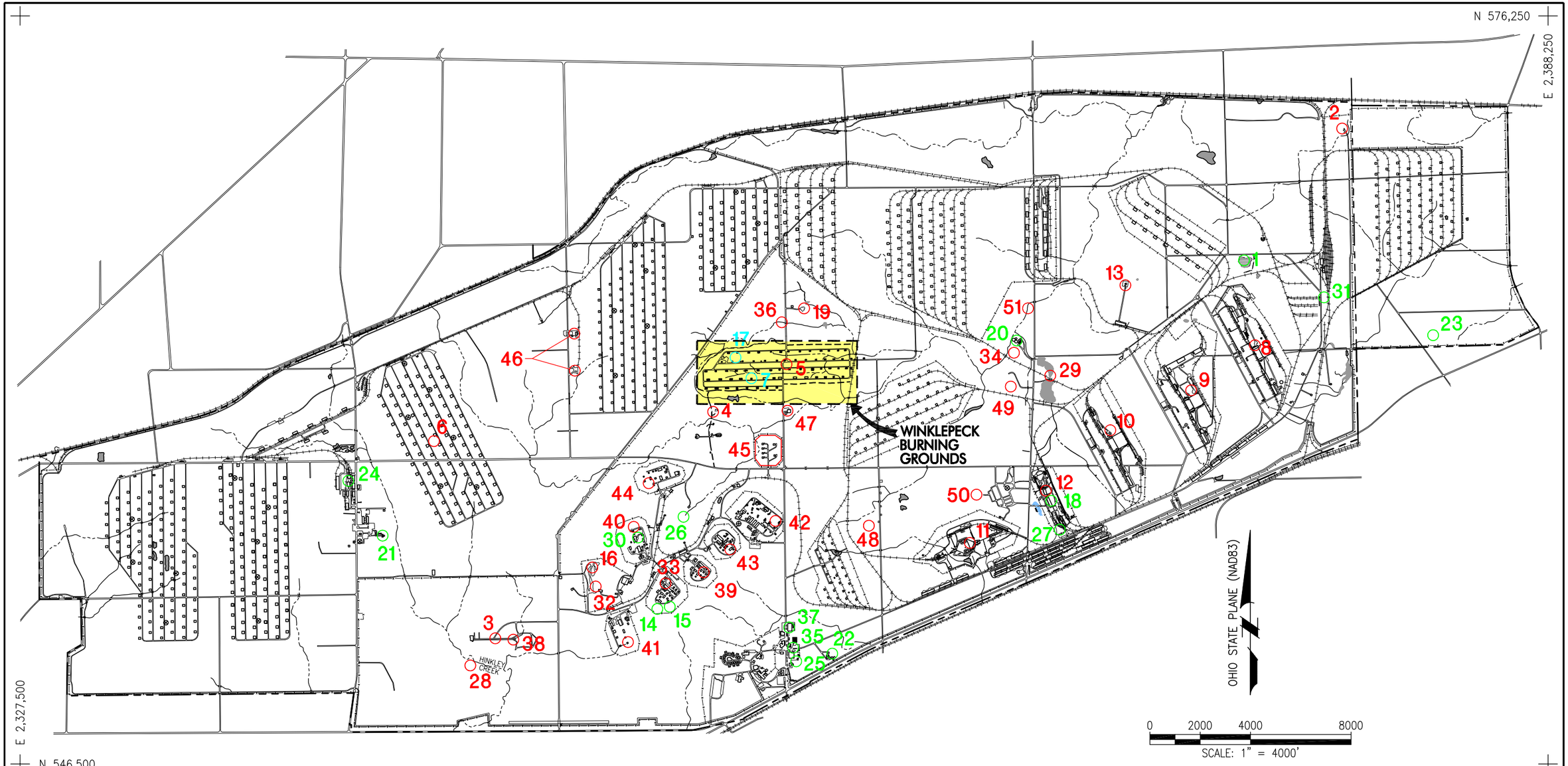


Figure 1-1. General Location and Orientation of RVAAP



LEGEND:

1 RAMSDELL QUARRY LANDFILL
2 ERIE BURNING GROUNDS
3 DEMOLITION AREA #1
4 DEMOLITION AREA #2
5 WINKLEPECK BURNING GROUNDS
6 C BLOCK QUARRY
7 BUILDING 1601 HAZARDOUS WASTE STORAGE
8 LOAD LINE 1 AND DILUTION/SETTLING POND
9 LOAD LINE 2 AND DILUTION/SETTLING POND
10 LOAD LINE 3 AND DILUTION/SETTLING POND
11 LOAD LINE 4 AND DILUTION/SETTLING POND
12 LOAD LINE 12 AND DILUTION/SETTLING POND
13 BUILDING 1200 AND DILUTION/SETTLING POND
14 LOAD LINE 6, EVAPORATION UNIT
15 LOAD LINE 6, TREATMENT PLANT
16 QUARRY LANDFILL/FORMER FUZE & BOOSTER BURNING PITS
17 DEACTIVATION FURNACE
18 LOAD LINE 12 PINK WASTEWATER TREATMENT
19 LANDFILL NORTH OF WINKLEPECK BURNING GROUND
20 SAND CREEK SEWAGE TREATMENT PLANT
21 DEPOT SEWAGE TREATMENT PLANT
22 GEORGE ROAD SEWAGE TREATMENT PLANT
23 UNIT TRAINING SITE WASTE OIL TANK
24 RESERVE UNIT MAINTENANCE AREA WASTE OIL TANK
25 BUILDING 1034 MOTOR POOL WASTE OIL TANK
26 FUZE BOOSTER AREA SETTLING TANKS
27 BUILDING 854–PCB STORAGE
28 MUSTARD AGENT BURIAL SITE
29 UPPER AND LOWER COBB'S POND COMPLEX
30 LOAD LINE 7 PINK WASTEWATER TREATMENT PLANT
31 ORE PILE RETENTION POND
32 40– AND 60–MM FIRING RANGE
33 FIRESTONE TEST FACILITY
34 SAND CREEK DISPOSAL ROAD LANDFILL
35 1037 BUILDING–LAUNDRY WASTEWATER SUMP
36 PISTOL RANGE
37 PESTICIDE STORAGE BUILDING T–4452
38 NACA TEST AREA
39 LOAD LINE 5/FUZE LINE 1
40 LOAD LINE 7/BOOSTER LINE 1
41 LOAD LINE 8/BOOSTER LINE 2
42 LOAD LINE 9/DETONATOR LINE
43 LOAD LINE 10/PERCUSSION ELEMENT
44 LOAD LINE 11/ARTILLERY PRIMER
45 WET STORAGE AREA
46 BUILDINGS F–15 AND F–16
47 BUILDING T–5301 DECONTAMINATION
48 ANCHOR TEST AREA
49 CENTRAL BURN PITS
50 ATLAS SCRAP YARD
51 DUMP ALONG PARIS–WINDHAM ROAD

CERCLA
RCRA
OTHER REGULATORY
RAILROAD TRACKS
FENCELINE
PROPERTY BOUNDARY
STREAM OR CREEK

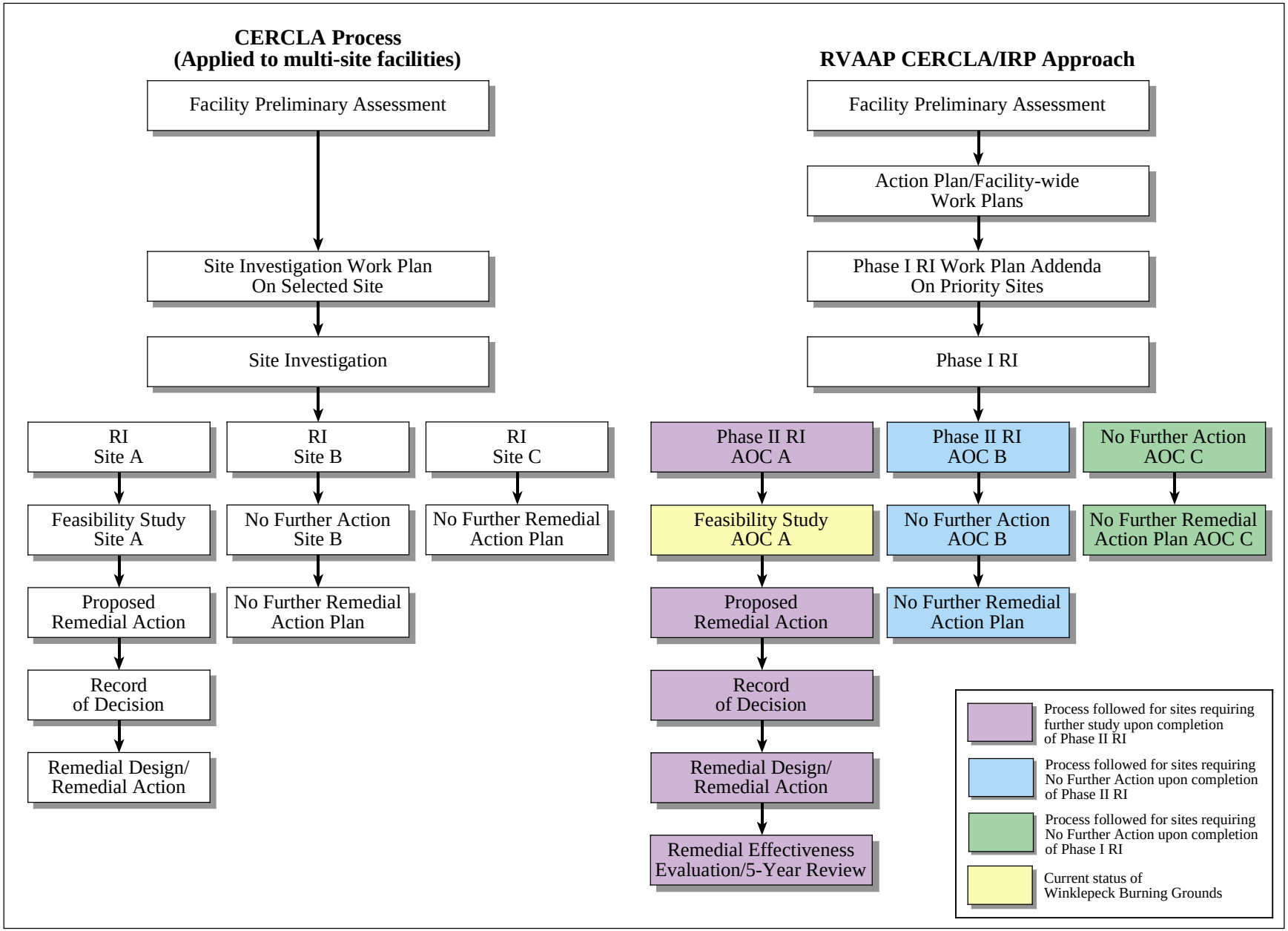
US Army Corps of Engineers Louisville District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE:
R. BEELER	A / 01–19–04	/03046/DWGS/T55LOC01

Figure 1-2. RVAAP Facility Map



G03-0267 WBG FS

Figure 1-3. CERCLA Approach at RVAAP

A revision of the human health risk assessment (HHRA) performed in the Phase II RI was determined not to be an objective of the Phase III RI. However, as part of a subsequent FS for WBG, data acquired in the Phase III RI will be screened against human health remedial goal options (RGOs) developed for the future WBG land use scenario that has been agreed upon by RVAAP stakeholders (Section 1.2.2). These data will be considered during the screening and evaluation of remedial alternatives in the FS to determine the areas and volumes of soils exceeding applicable RGOs. Evaluation of ecological risks was identified as an objective of the Phase III RI. Ecological risks for WBG have been extensively studied as part of an Ecological Field Effects Study (USACE 2003a), which included direct measurements, as well as Phase III RI data in recalculation of hazard quotients (HQs). Results from this study will be presented in the subsequent FS, along with considerations for suitable habitat under the future land use, to develop ecological goals for remediation, if applicable.

To meet the primary project objectives, investigation-specific DQOs were developed using the approach presented in the Facility-wide Sampling and Analysis Plan (SAP) (USACE 2001b). The DQOs specific to the WBG Phase III RI are discussed in Section 1.4.

The investigation approach for the Phase III RI involved a combination of field and laboratory activities to characterize the AOC. Field investigation techniques included soil boring and sampling as well as sampling of groundwater and sediment. Colorimetric analyses of soils and sediments for trinitrotoluene (TNT) and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) were conducted in the field to support the determination of extent of explosives contamination. X-ray fluorescence (XRF) spectrometry for metals in soil and sediment was performed in the field (in situ) and in a field laboratory setting (ex situ). The field program was conducted in accordance with the Facility-wide SAP (USACE 2001b) and the *Sampling and Analysis Plan Addendum No. 1 for the Winklepeck Burning Grounds Feasibility Study* (USACE 2000).

1.2 GENERAL FACILITY DESCRIPTION

1.2.1 Historical Mission and Current Status

RVAAP is a government-owned, contractor-operated facility, located in northeastern Ohio within east-central Portage County and southwestern Trumbull County. The facility is located approximately 37 km (23 miles) east of the city of Akron, 4.8 km (3 miles) east-northeast of the city of Ravenna, and approximately 1.6 km (1 mile) northwest of the town of Newton Falls. The installation consists of 8,668.3 ha (21,419 acres) contained in a 17.7-km (11-miles)-long, 5.6-km (3.5-miles)-wide tract, bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad on the south; Garretsville and Berry Roads on the west; and the CONRAIL Railroad on the north (see Figures 1-1 and 1-2). The installation is surrounded by several less populous communities: Windham directly to the north; Garretsville 9.6 km (6 miles) to the northwest; Charlestown directly to the southwest; and Wayland 4.8 km (3 miles) to the southeast.

RVAAP was constructed in 1940 and 1941 with the primary missions of depot storage and ammunition loading during World War II. Industrial operations at RVAAP consisted of 12 munitions-assembly facilities referred to as “load lines.” Load Lines 1 through 4 were used to melt and load TNT and Composition B into large-caliber shells and bombs. The operations on the load lines produced explosive dust, spills, and vapors that collected on the floors and walls of each building. Periodically, the floors and walls would be cleaned with water and steam. The liquid containing TNT and Composition B was known as “pink water” for its characteristic pink color. Pink water was collected in concrete holding tanks, filtered, and pumped into unlined ditches for transport to earthen settling ponds. Load Lines 5 through 11 were used to manufacture fuzes, primers, and boosters. Potential contaminants in these load lines include

lead compounds, mercury compounds, and explosives. From 1946 to 1949, Load Line 12 was used to produce ammonium nitrate for explosives and fertilizers.

In 1950, the facility was placed on standby status and operations were limited to renovation, demilitarization, and normal maintenance of equipment, along with storage of munitions. Production activities were resumed during the Korean Conflict (July 1954 to October 1957) and again during the Vietnam Conflict (May 1968 to August 1972). In addition to production missions, various demilitarization activities were conducted at facilities constructed at Load Lines 1, 2, 3, and 12. Demilitarization activities included disassembly of munitions and explosives melt-out and recovery operations using hot water and steam processes. Periodic demilitarization of various munitions continued through 1992.

In addition to production and demilitarization activities at the load lines, other facilities at RVAAP include sites that were used for the burning, demolition, and testing of munitions. These burning and demolition grounds consist of large parcels of open space or abandoned quarries. Potential contaminants at these AOCs include explosives, propellants, metals, waste oils, and sanitary waste. Other types of AOCs present at RVAAP include landfills, an aircraft fuel tank testing facility, and various general industrial support and maintenance facilities. Additionally, beginning in the late 1940s, the Defense Logistics Agency (DLA) initiated a strategic materials storage mission at RVAAP. The storage mission included storage of bulk materials in outdoor locations, dry storage within above-grade steel tanks, and warehouse storage. The major materials stored included silica carbide, antimony sulfide, asbestos, magnesium silicate, magnesium alloy ingots, kyanite, talc, fluorospar, and heavy mineral sands. Stockpile storage included partially processed manganese, chrome, and ferrochrome materials.

In 1992, the status of RVAAP changed from inactive-maintained to modified-caretaker. The only activities still being carried out from the wartime era are the storage of bulk explosives and propellants and the infrequent demolition of unexploded ordnance (UXO) found at the installation. The bulk explosives storage mission at RVAAP is being phased out; transfer of materiel from RVAAP to other facilities is expected to be completed in 2004. Similarly, the DLA mission at RVAAP is being phased out; the only remaining activity related to this mission is completing removal of the outdoor strategic material stockpiles. The Army is also overseeing the reclamation of railroad tracks, telephone lines, and steel for re-use or recycling. The Army has completed the demolition of excess buildings at Load Lines 1 and 12, and is currently conducting demolition activities at Load Lines 2, 3, and 4, which includes the removal of friable asbestos. RVAAP's operations and mission-related activities are directed by Operations Support Command. Environmental restoration activities at RVAAP are conducted under the auspices of the IRP. As of January 2003, oversight and funding responsibilities for the IRP were transferred from OSC to the U.S. Army Environmental Center.

RVAAP used several areas for the burning, demolition, and testing of munitions. These burning grounds consist of large parcels of open space or abandoned quarries. Potential contaminants at these AOCs include explosives, propellants, metals, and semivolatile organic compounds (SVOCs).

RVAAP has been inactive since 1992. The only activities still being carried out from the wartime era are the storage of bulk explosives and the infrequent demolition of UXO found at the installation. The Army is also overseeing the reclamation of railroad track, telephone line, and steel for reuse or recycling. Transfer of the bulk explosives storage mission to other installations is scheduled to be completed in December 2004. The Army has completed the demolition of excess buildings at Load Lines 1 and 12 and is currently conducting demolition activities at Load Lines 2, 3, and 4.

1.2.2 Demography and Land Use

RVAAP consists of 21,419 acres and is located in northeastern Ohio, approximately 23 miles east-northeast of Akron and 30 miles west-northwest of Youngstown. RVAAP occupies east-central Portage County and southwestern Trumbull County. The 2000 Census figures state the total populations of Portage and Trumbull Counties at 152,061 and 225,116, respectively. Population centers closest to RVAAP are Ravenna, with a population of 11,771, and Newton Falls, with a population of 5,002.

The RVAAP facility is located in a rural area and is not close to any major industrial or developed areas. Approximately 55% of Portage County, in which the majority of RVAAP is located, consists of either woodland or farmland acreage. The Michael J. Kirwan Reservoir (also known as West Branch Reservoir) is the closest major recreational area and is located adjacent to the western half of RVAAP south of State Route 5.

Until May 1999, about 900 acres of land and some existing facilities at RVAAP were used by the National Guard Bureau (NGB) for training purposes administered by the Ohio Army National Guard (OHARNG). Training and related activities, managed under the Ravenna Training and Logistics Site, include field operations and bivouac training, convoy training, equipment maintenance, and storage of heavy equipment. In a Memorandum of Agreement (MOA) dated December 1998, 16,164 acres of land were transferred from the Army JMC to NGB, effective May 1999, for expanded training missions. On May 13, 2002, an additional 3,774 acres of land was transferred from JMC to NGB via an amendment to the MOA. Approximately 1,481 acres of property remain under the control of RVAAP; this acreage includes AOCs and active mission areas (Figure 1-4). As AOCs are remediated, transfer of the remaining acreage to NGB will occur. OHARNG has prepared a comprehensive Environmental Assessment and an Integrated Natural Resources Management Plan, which addresses future uses of the property (OHARNG 2001). These uses include hand grenade practice and qualification ranges, a light demolition range, and armored vehicle maneuver areas. Additional field support and cantonment facilities will be constructed to support future training.

OHARNG plans to construct a Mark 19 Range in WBG. This construction activity is being performed as part of the Army's military mission. The details of the construction and land use have been incorporated into the focused FS for completeness of the environmental evaluation of the defined land use. The evaluation of applicable and relevant or appropriate requirements (ARARs), alternatives, and possible remedial actions concerning areas that exceeded RGOs, for the defined land use scenario, are presented in conjunction with the defined military mission at WBG. The Mark 19 target practice grenade will be fired on this range. The target practice round carries a small bursting charge to allow a visual determination of the impact point. The range will have four fixed firing points, located to the west of Pads 43 and 58 orientated to fire eastward. The Mark 19 Grenade Machine gun will fire 40-mm target practice grenades into a series of five target arrays located 400; 600; 800; 1,100; and 1,500 m east of the firing points. Targets will be a combination of computerized pop-up silhouette-type targets or hard targets. Hard targets are fixed, inoperable, obsolete armored vehicles and tanks. These vehicles will have their engines removed, as well as all petroleum products and lubricants removed. The computerized pop-up targets are remotely operated and display a specific silhouette for a programmed time for target acquisition and engagement. Details regarding the future land use are presented in the FS and are used to develop a range maintenance worker exposure scenario for development of RGOs specific to the land use.

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N 576,250

E 2,388,250

EAGLE CREEK

SAND CREEK

SAND CREEK

HINKLEY CREEK

HINKLEY CREEK

WINKLEPECK BURNING GROUNDS

E 2,327,500

N 546,500

LEGEND:

- BUILDING
- AREAS OF CONCERN UNDER IRP/JMC USE AREAS
- ASPHALT ROAD
- GRAVEL ROAD
- RAILROAD TRACKS
- FENCE LINE
- PROPERTY BOUNDARY
- STREAM OR CREEK
- WATER BODIES
- 49 AREAS OF CONCERN (See Figure 1-2)
- XX CERCLA
- XX RCRA
- XX OTHER REGULATORY

OHIO STATE PLANE (NAD83)

0 2000 4000 8000

SCALE: 1" = 4000'

US Army Corps of Engineers Louisville District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE:
R. BEELER	A / 01-19-04	/03046/DWGS/T55LUSE01

Figure 1-4. Current Land Use at RVAAP

1.3 WINKLEPECK BURNING GROUNDS SITE DESCRIPTION

A detailed history of process operations and waste processes for each AOC at RVAAP, including WBG, is presented in the *Preliminary Assessment for the Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 1996). Operational history, contaminant distribution and extent, and identified contaminants of concern for WBG are described in detail in the Phase II RI report (USACE 2001a). The following is a summary of the history and related contaminants at WBG.

1.3.1 Operational History

WBG, designated as AOC RVAAP-05, encompasses approximately 200 acres in the central portion of RVAAP (Figure 1-2). A site map for WBG is shown on Figure 1-5. Historical operations at WBG included melting explosives out of heavy artillery projectiles using open burning. In some instances, high-energy material such as black powder and explosives were also laid out in a string along a road and burned (USATHAMA 1978). Burning is also known to have occurred along Road D. Prior to 1980, wastes disposed by burning included RDX, antimony sulfide, Composition B, lead oxide, lead thiocyanate, 2,4,6-TNT, propellant, black powder, sludge and sawdust from load lines, and domestic wastes. Also, small amounts of laboratory chemicals were routinely disposed of during production periods. Shrapnel and other metallic munitions fragments were allowed to remain on the site after detonation, as were possible residual explosives. Waste oil (hydraulic oil from machines and lubrication oil from vehicles) was disposed in the northeast corner of WBG until 1973.

Prior to 1980, burning was carried out in four burn pits, on burn pads, and sometimes on the roads. The burn pits consisted of areas bermed on three sides, approximately 50 to 75 ft in width and length. It is suspected (USACE 2001a), but not presently confirmed, that the four burn pits correspond to Pads 58, 59, 60, and 61 as follows, specifically, Pit 1 is believed to correspond to Pad 58 (Figure 1-5). Of the four burn pits, Pit 1 was used most frequently. The burn pads generally consisted of level areas without berms 20 to 40 ft in width and length. It is not known exactly how many pads were contained within the AOC. Currently, 70 burning pads have been identified from historical drawings and aerial photographs. Burning was conducted on bare ground. Ash from these areas was not collected (Jacobs Engineering 1989). Scrap metal was reclaimed and taken to the landfill north of Winklepeck (RVAAP-19).

After 1980, thermal treatment of munitions and explosives was conducted only in a 1-acre Resource Conservation and Recovery Act (RCRA) area at Burning Pad 37. Burning was conducted in metal, refractory-lined trays set on top of a bed of crushed slag in an area approximately 100 x 100 ft in size. Ash residues were drummed and stored in Building 1601 on the west side of WBG pending proper disposition. The burn trays were decontaminated and removed from Burning Pad 37 in 1998, and the site was closed under RCRA.

Two additional closed RCRA-regulated units besides Burning Pad 37 are located within WBG (Figure 1-5). These two units are the Deactivation Furnace Area and Building 1601. Building 1601 was certified closed by the Ohio EPA in 1999. Closure activities at Building 1601 included sampling through the floor and outside the doors of Building 1601 with subsequent decontamination of the structure. The Deactivation Furnace is being transferred to the CERCLA program because of the unique technical and programmatic considerations created by its location within a CERCLA AOC. Previous closure activities at the Deactivation Furnace included removal of structures and sampling and analysis of the subsurface soils.

1.3.2 Previous Investigations at Winklepeck Burning Grounds

WBG was the subject of a Phase I RI in 1996 (USACE 1998), a Phase II RI in 1998 (USACE 2001a), and an Ecological Field Effects Study (USACE 2003a). The purpose of the investigations was to confirm whether

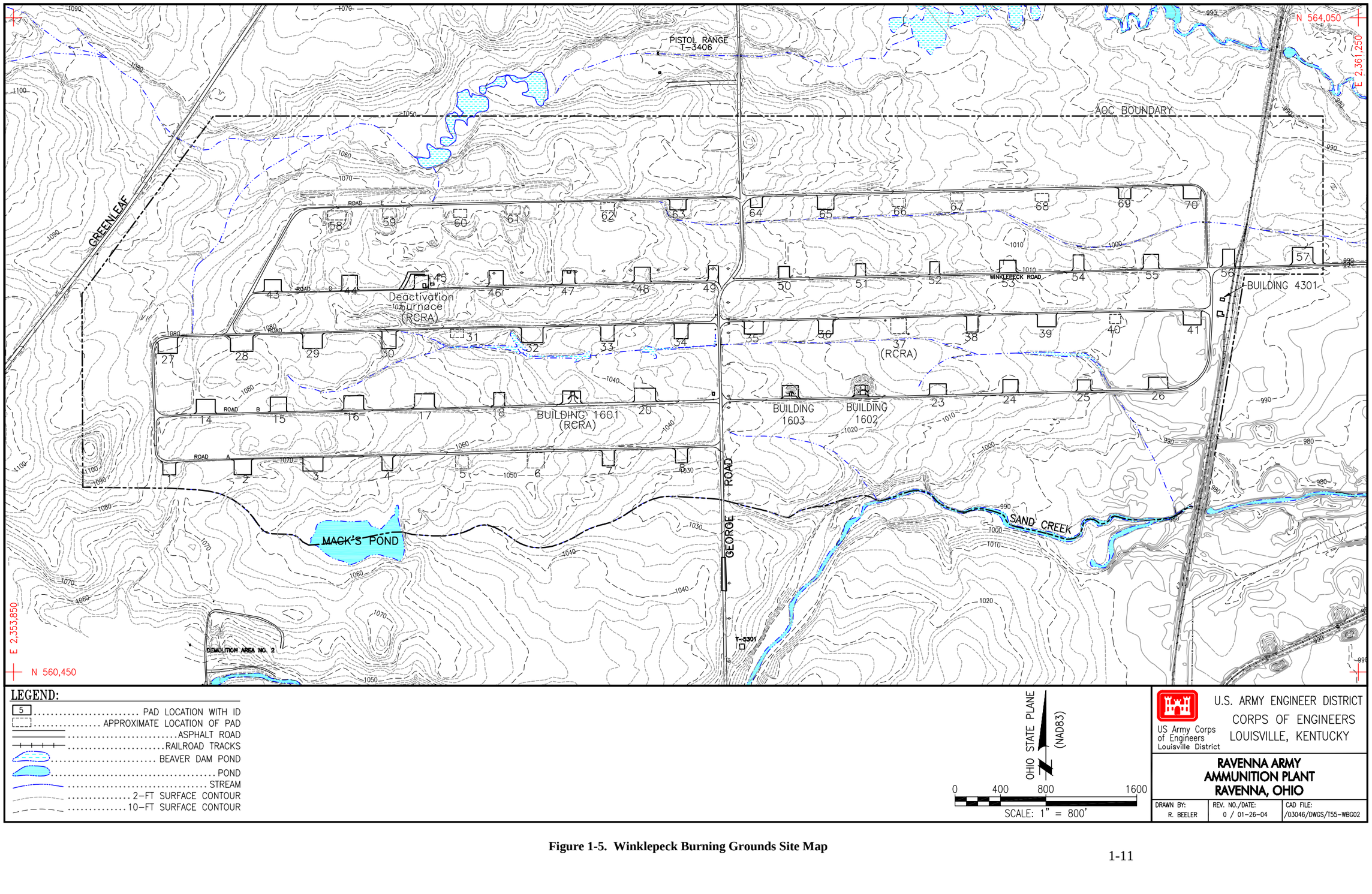


Figure 1-5. Winklepeck Burning Grounds Site Map

contamination was present at the site, and to determine the nature and extent of chemicals of potential concern (COPCs). The Phase I RI investigated surface soils only. During the Phase II RI, surface and subsurface soils, sediment, surface water, and groundwater were characterized at the burning pads and features that exhibited the highest contaminant levels in the Phase I RI. Phase I and II RI data are presented in their entirety in the respective RI reports and are not repeated here. Phase I and II data are included on figures in this report, where appropriate, and are incorporated into the Phase III nature and extent discussion.

The Ecological Field Effects Study evaluated impacts to the flora and fauna that populate WBG through direct observations and analysis as compared to calculated HQs. The ecological field effects investigation was designed to refine the screening ecological risk assessment performed in the Phase II RI and included evaluation of all three RI phases of data in addition to environmental analyses conducted exclusively for the study.

In addition, two historical investigations have been conducted at WBG: (1) *Hazardous Waste Management Study No. 37-26-0442-84 Phase II of AMC Open-Burning/Open-Detonation Grounds Evaluation, Ravenna Army Ammunition Plant* (USAEHA 1983); and (2) *Soil Sample Analysis, Winklepeck Burning Grounds* (USACE 1997). A comprehensive overview of all locations previously sampled within WBG is contained in the Phase II RI Report (USACE 2001a).

1.3.3 Chemicals of Potential Concern

Table 1-1 presents summary data for those constituents identified as COPCs in the HHRA conducted as part of the Phase II RI. COPCs were identified by comparing detected values against RVAAP facility-wide background criteria and 1/10 of the U.S. Environmental Protection Agency (EPA) Region 9 Tap Water or Residential Soil preliminary remediation goals (PRGs). Metals were the most commonly identified COPCs, and surface soil was the most affected media. No COPCs were identified in surface water. Few COPCs were identified in groundwater. From the COPCs identified, a subset of chemicals of concern (COCs) was identified through quantitative risk models for one or more of eight selected exposure receptors (e.g., residential farmer adult and child, National Guard Trainee, etc.). These human health COCs are indicated on Table 1-1 and are presented in detail in Chapter 6.0 of the Phase II RI Report (USACE 2001a). Constituents of potential ecological concern (COPECs) were also identified in the Phase II RI through a quantitative screening process and are presented in Chapter 7.0 of the Phase II RI Report.

The COPCs and COPECs identified from the previous phases of investigation were taken into consideration during development of DQOs for the Phase III RI (e.g., types of analyses to be conducted and focused areas for additional sampling). An HHRA, to be presented in the FS, will evaluate data with respect to the currently identified land use for WBG (Section 1.2.2), which was not in effect at the time of the Phase II RI. Phase III RI data will be screened and compared to the COPC list developed as part of the Phase II RI to identify if any new chemicals emerge as COPCs as a result of the additional characterization effort. Risk-based RGOs will be developed for all identified COPCs (Phase II and III) based on the currently identified land use. Phase III RI data were included in the Ecological Field Effects Study for WBG; results from this study and the newly identified future land use will also be evaluated in the FS.

1.4 SUPPLEMENTAL REMEDIAL INVESTIGATION DATA QUALITY OBJECTIVES

Process knowledge and archived records were used to develop the Phase III RI sampling design using the DQO approach presented in the Facility-wide SAP (USACE 2001b). The DQOs for the Phase III RI at

Table 1-1. Phase II Remedial Investigation Summary Data for Identified Human Health Constituents of Potential Concern at Winklepeck Burning Grounds

Chemical of Potential Concern	Maximum Detect in Surface Soil[a]	Maximum Detect in Subsurface Soil[a]	Maximum Detect in Groundwater[b]	Maximum Detect in Sediment[a]
Inorganics				
Aluminum	50,100	NA	NA	17,900
Antimony	27.9[c]	NA	NA	NA
Arsenic	35.8[c]	NA	NA	NA
Barium	10,400[c]	NA	NA	528
Cadmium	877[c]	11.9[c]	NA	NA
Chromium	189[c]	NA	NA	21.3
Copper	16,800	NA	NA	NA
Lead	2,200	105	3.1	40.1
Manganese	NA	NA	2,920[c]	NA
Thallium	3.1	NA	NA	1.8
Zinc	24,900[c]	NA	NA	NA
Explosives				
1,3,5-TNB	490[c]	NA	NA	NA
2,4,6-TNT	3,800[c]	27[c]	NA	NA
HMX	1,700[c]	NA	NA	NA
Nitrocellulose as N	315	88.4	NA	NA
Nitroglycerin	12	NA	NA	NA
RDX	9,500[c]	82[c]	32[c]	NA
Semivolatile and Volatile Organics				
2-Methylnaphthalene	0.15	0.06	NA	NA
Benzo(*a*)pyrene	0.8[c]	0.5[c]	NA	0.39[c]
Benzo(*a*)anthracene	1.0[c]	0.48	NA	0.56[c]
Benzo(*b*)fluoranthene	1.1[c]	0.7	NA	0.56[c]
Benzo(*g,h,i*)perylene	0.39	0.31	NA	0.13
Bis(2-ethylhexyl)phthalate	NA	NA	4.5	NA
Dibenzo(*a,h*)anthracene	0.11[c]	0.08[c]	NA	NA
Indeno(1,2,3-*cd*)pyrene	0.48[c]	0.37	NA	0.17
Phenanthrene	2.4	0.53	NA	0.64
Chloroform	NA	NA	1.7[c]	NA

NOTE: Surface water contained no chemicals of potential concern.
[a]Results are in mg/kg.
[b]Results are in µg/L.
[c]Identified as a human health constituent of concern.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
NA = Not applicable.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
TNB = Trinitrobenzene.
TNT = Trinitrotoluene.

WBG were presented in detail in the SAP Addendum No. 1 for the WBG FS (USACE 2000). A summary of DQOs follows.

- **Soil.** Previous sampling data at WBG indicated that contamination is present in soils in former burn areas. Based on characterization data to date, the conceptual site model (CSM) considers contaminated soils within and adjacent to the former burning pits and pad as potential secondary sources of contamination to sediment, surface water, and groundwater. Further horizontal characterization of areas of known soil contamination was performed to define contaminant nature and extent and to provide sufficient data for remedial alternatives analysis. Vertical characterization was performed for the same

reasons and to determine if leaching processes may be contributing to groundwater contamination. Random grid sampling was performed to determine whether soil contamination is present outside of and between former burn areas.

- **Sediment.** Operational data suggest that the ditches and tributaries in the vicinity of the former burn areas represent the most likely locations for contaminants that may have accumulated through erosional transport and redeposition. Considering the available data and the CSM, a previously uncharacterized ditchline draining two highly contaminated pads was targeted for biased sampling.

- **Surface Water.** Sampling of surface water from conveyances within and adjacent to WBG was conducted only at Mack's Pond during the Phase II RI. No human health or ecological COPCs were identified and modeling indicated that potential migration of contaminants off the AOC is not expected to be a future problem. Data from the Phase II RI was deemed adequate to characterize potential contaminant transport; therefore, additional surface water characterization was not an element of the Phase III RI and no further surface water sampling at WBG was conducted.

- **Groundwater.** Analytical evidence for groundwater contamination at WBG remained somewhat limited at the conclusion of the Phase II RI. Because of the limited available data, contaminant migration from source areas to groundwater (via leaching or surface water infiltration) was identified as a data gap in the conceptual model. Considering the uncertainties associated with the CSM, the presence of groundwater contamination required further evaluation. Groundwater characterization efforts included installation of monitoring wells immediately downgradient of pads having residual contamination and in AOC perimeter locations to monitor for potential migration of contamination off of the AOC. Soil leaching modeling and groundwater transport modeling was included in the scope of Phase III data evaluation efforts.

1.5 REPORT ORGANIZATION

This Phase III RI Report is organized to meet Ohio EPA requirements in accordance with EPA CERCLA and USACE guidance. The report consists of an Executive Summary, Chapters 1.0 through 7.0, and supporting appendices. Chapter 1.0 describes the purpose, objectives, and organization of this report and provides a description and history of WBG. Chapter 2.0 describes the environmental setting at RVAAP and WBG, including the geology, hydrogeology, climate, population, and ecological resources. Chapter 3.0 describes the specific Phase III RI methods used for field data collection and the approach to analytical data management and laboratory programs. Chapter 4.0 presents the data generated during the Phase III RI and discusses the nature and extent of contamination at WBG. Chapter 5.0 discusses contaminant fate and transport evaluation. Chapter 6.0 provides the results and conclusions of this study. Chapter 7.0 provides a list of referenced documents used to support this Phase III RI.

Appendices (A through O) to the Phase III RI Report for WBG contain supporting data collected in the Phase III RI. These appendices consist of sampling logs, analytical data tables, project quality assurance (QA) summary, a data quality assessment (DQA), topographic survey data, and other detailed information used to make the interpretations presented herein.

2.0 ENVIRONMENTAL SETTING

This chapter describes the physical characteristics of RVAAP and WBG and the surrounding environment that are factors in understanding the potential contaminant transport pathways, receptors, and exposure scenarios for human health and ecological risks. The geology, hydrology, climate, and ecological characteristics of RVAAP were originally presented in Chapter 3.0 of the *Phase I Remedial Investigation Report for High-Priority Areas of Concern at RVAAP* (USACE 1998). Site-specific data from this Phase III RI, as well as local and regional information, are used to refine the CSM for WBG and are presented at the end of this section.

2.1 RAVENNA ARMY AMMUNITION PLANT PHYSIOGRAPHIC SETTING

RVAAP is located within the Southern New York Section of the Appalachian Plateaus physiographic province (USGS 1968). This province is characterized by elevated uplands underlain primarily by Mississippian- and Pennsylvanian-age bedrock units that are horizontal or gently dipping. The province is further characterized by its rolling topography with incised streams having dendritic drainage patterns. The Southern New York Section has been modified by glaciation, which rounded ridges, filled major valleys, and blanketed many areas with glacially derived unconsolidated deposits (e.g., sand, gravel, and finer grained outwash deposits). As a result of glacial activity in this section, old stream drainage patterns were disrupted in many locales, and extensive wetland areas developed.

2.2 SURFACE FEATURES AND SITE TOPOGRAPHY

WBG is situated in the center of the RVAAP facility, as shown in Figure 1-2. The AOC is characterized by moderately subdued topography on a reworked glacial surface. It is surrounded by woodland and is 2 miles from the installation's northern and southern boundaries.

The topography at WBG is characterized by gently undulating contours that decrease in elevation from west to east. Elevations at WBG vary from 1084.9 to 993.2 ft above mean sea level (amsl) across the site. The highest elevations are at the extreme western end of the WBG, in the vicinity of Pads 28 and 43 (see Figure 1-5). Figure 2-1 illustrates site conditions in the former burning area at the time of the Phase III RI sampling effort in October and November 2000.

Cultural features at WBG consist of Buildings 1601, 1602, and 1603, remnants of the foundation of the Deactivation Furnace, intact gravel or dirt roadways, and man-made drainage features (see Figure 1-5). The former Building T-5301 at the south entrance to the burning ground has been demolished. Building 4301 is still present near the eastern boundary of the AOC. George Road bisects the site from north to south. Although rails and rail ties have been removed, the rail beds (consisting of industrial slag ballast) of the two main tracks that traverse the eastern edge of the AOC are still present.

2.3 SOILS AND GEOLOGY

2.3.1 Regional Geology

The regional geology at RVAAP consists of horizontal to gently dipping bedrock strata of Mississippian- and Pennsylvanian-age overlain by varying thicknesses of unconsolidated glacial deposits. The bedrock and unconsolidated geology at RVAAP and geology specific to WBG are presented in the following subsections.



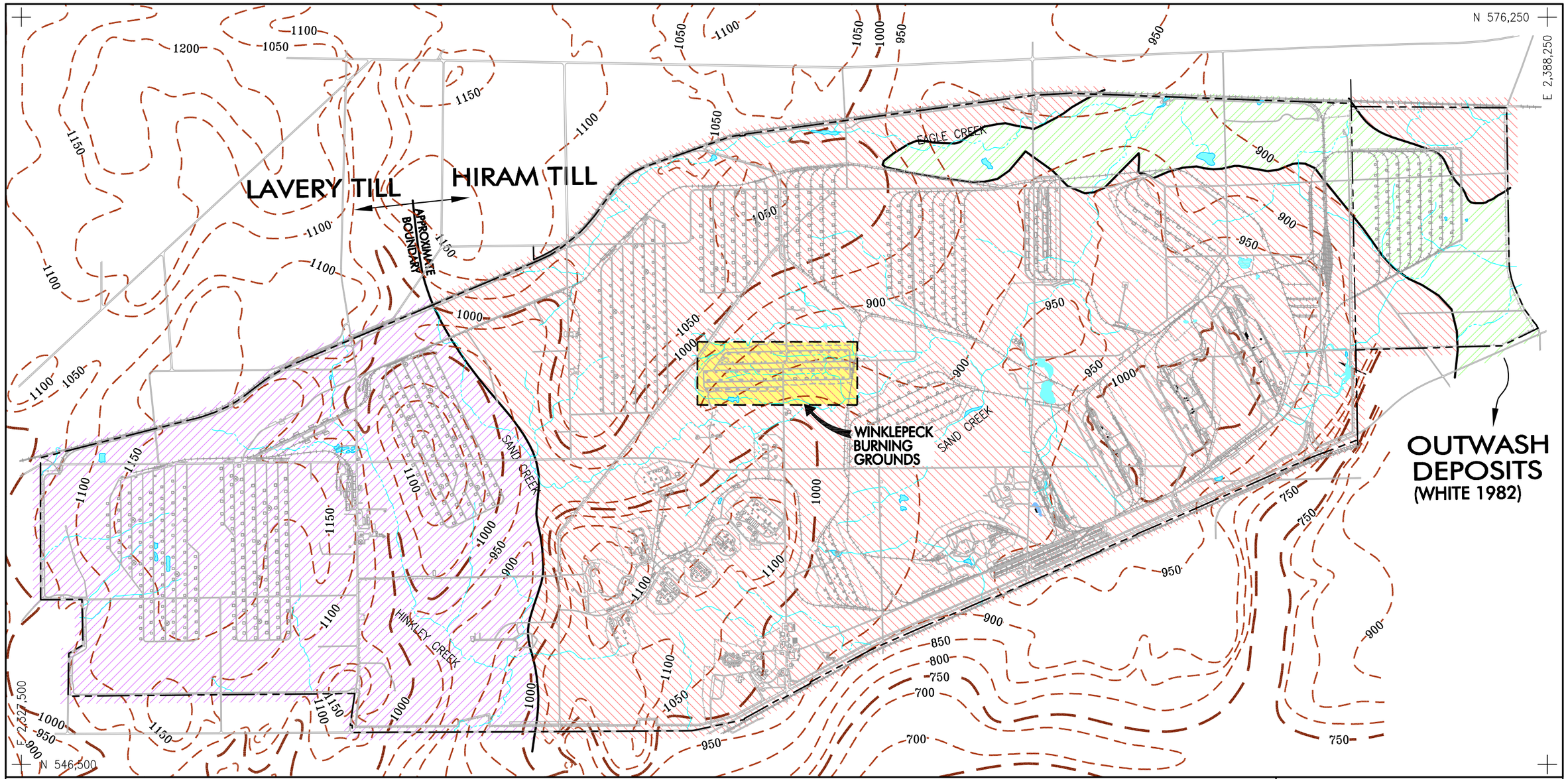
Figure 2-1. Site Conditions at Winklepeck Burning Grounds during the Phase III Remedial Investigation, Fall 2000

2.3.1.1 Soils and glacial deposits

Bedrock at RVAAP is overlain by deposits of the Wisconsin-aged Lavery Till in the western portion of the facility and the younger Hiram Till and associated outwash deposits in the eastern portion (Figure 2-2) (ODNR 1982). Unconsolidated glacial deposits vary considerably in their character and thickness across RVAAP, from zero in some of the eastern portion of the facility to an estimated 150 ft in the south-central portion.

Thin coverings of glacial materials have been completely removed as a consequence of human activities at locations such as Ramsdell Quarry, and bedrock is exposed at or near the ground surface in many locations such as Load Lines 1 and 2. Where glacial materials are still present, their distribution and character indicate their origin in ground moraine. These tills consist of laterally discontinuous assemblages of yellow-brown, brown, and gray silty clays to clayey silts with sand and rock fragments. Deposits from bodies of glacial-age standing water may also have been encountered in the form of deposits of uniform light gray silt up to 50 ft thick.

Soils at RVAAP are generally derived from the Wisconsin-age silty clay glacial till. Distributions of soil types are discussed and mapped in the Soil Survey of Portage County, Ohio (USDA 1978). Much of the native soil at RVAAP was reworked or removed during construction activities in operational areas of the installation. According to the Portage County soil survey, the major soil types found in the high-priority AOCs are silt or clay loams with permeabilities ranging from 6.0×10^{-7} to 1.4×10^{-3} cm/sec.



LEGEND:

- PROPERTY BOUNDARY
- LOAD LINE 1 BOUNDARY
- STREAM OR CREEK
- POND
- BEDROCK SURFACE CONTOUR (50-FT INTERVAL)
- BEDROCK SURFACE CONTOUR (250-FT INTERVAL)
- LAVERY TILL
- HIRAM TILL
- OUTWASH DEPOSITS
- WINKLEPECK BURNING GROUNDS

DATA SOURCE:

1.) SLUCHER, 1996: BEDROCK TOPOGRAPHY OF THE WINDHAM AND RAVENNA, OH, QUADRANGLES (ELEVATION ABOVE SEA LEVEL OF BEDROCK SURFACE) CONTOUR INTERVAL = 50 FT.

OHIO STATE PLANE (NAD83)

0 2000 4000 8000

SCALE: 1" = 4000'

US Army Corps of Engineers Louisville District

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RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE:
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Figure 2-2. Geologic Map of Unconsolidated Deposits on RVAAP

2.3.1.2 Bedrock stratigraphy

The Sharon Member of the Pennsylvanian Pottsville Formation unconformably overlies the eroded Mississippian Cuyahoga Group throughout the eastern half of RVAAP. The Sharon Member consists of two units: a sandstone and a shale. The Sharon Sandstone unit of the Sharon Member is highly porous, permeable, cross-bedded, and frequently fractured and weathered. It is present beneath the glacial cover at many locations at RVAAP, including the Ramsdell Quarry Landfill, WBG, and Load Line 1. The Sharon Shale unit is a light to dark-gray fissile shale, which has been eroded in many locations. It has not been encountered in investigations of AOCs near WBG.

2.3.2 Geologic Setting of the Winklepeck Burning Grounds

Depth to bedrock at WBG was inferred from the four monitoring well borings drilled in 1992 for the Open Burning Ground (OBG) RCRA unit at Pad 37. These wells were completed in unconsolidated material at the top of bedrock, at depths ranging from 18 to 23 ft below ground surface (bgs). Bedrock was not encountered in any of the monitoring well borings installed in the Phase II or III RIs.

2.3.2.1 Soils

Distributions of major soil types at RVAAP are discussed in detail in the Soil Survey of Portage County, Ohio (USDA 1978). At WBG, soils of the Mahoning series are the dominant type. This series is typified by poorly drained soil formed in silty clay loam or clay loam glacial till where bedrock is generally greater than 6 ft. Runoff is typically medium to rapid, and the soil is seasonally wet. Permeabilities range from 0.6 to 2.0 in. per hour. Additional geotechnical data collected during the Phase III RI can be found in the geotechnical report (Appendix L).

At WBG, glacial materials encountered in Phase II and III RI monitoring well borings consist of clays and silts interbedded with fine- to medium-grained sand. The shallow water-bearing zones consist of sands with silts and gravels, and vary in thickness from 0.6 ft to > 5 ft. Determination of the thickness of glacial cover at WBG has not been a specific objective of environmental investigations to date. However, it is suspected that glacial material across WBG may be many tens of feet thick.

2.3.2.2 Bedrock geology

Bedrock has not been encountered at the ground surface or in the shallow subsurface at WBG. Monitoring wells drilled for the Phase II and III RIs did not encounter bedrock.

2.4 HYDROLOGY

2.4.1 Regional Hydrogeology

Sand and gravel aquifers are present in the buried-valley and outwash deposits in Portage County, as described in the *Phase I Remedial Investigation Report for High-Priority Areas of Concern at RVAAP* (USACE 1998). Generally these saturated zones are too thin and localized to provide large quantities of water for industrial or public water supplies; however, yields are sufficient for residential water supplies. Lateral continuity of these aquifers is not known. Recharge of these units comes from surface water infiltration of precipitation and surface streams. Specific groundwater recharge and discharge areas at RVAAP have not been delineated.

2.4.1.1 Unconsolidated sediment

The thickness of the unconsolidated interval at RVAAP ranges from thin to absent in the southeastern portion of RVAAP to an estimated 150 ft in the central portion of the installation. The groundwater table occurs within the unconsolidated zone in many areas of the installation. Because of the very heterogeneous nature of the unconsolidated glacial materials, groundwater flow patterns are difficult to determine with a high degree of accuracy. Vertical recharge from precipitation likely occurs via infiltration along root zones and desiccation cracks and partings within the soil column. Laterally, most groundwater flow likely occurs along preferential pathways (e.g., sand seams, channel deposits, or other stratigraphic discontinuities) having higher permeabilities than surrounding clay or silt-rich materials. Moderately high horizontal hydraulic conductivities from 3.87×10^{-2} to 5.65×10^{-4} cm/sec have been measured in sandy unconsolidated materials in the central portion of RVAAP (e.g., WBG). At Load Line 1, slug tests performed at three unconsolidated wells (USACE 1998) revealed conductivities of 6.5×10^{-5} to 1.7×10^{-3} cm/sec. Unconsolidated zone hydraulic conductivities at Load Lines 4 and 12 reflect the occurrence of much finer-grained materials (clays and silts) in this portion of RVAAP, with slug test results ranging from 2.32×10^{-3} to 2.35×10^{-6} cm/sec.

2.4.1.2 Bedrock hydrogeology

The sandstone facies of the Sharon Member, and in particular the Sharon Conglomerate, were the primary sources of groundwater during RVAAP's active phase, although some wells were completed in the Sharon Shale. Past studies of the Sharon Sandstone indicate that the highest yields come from the quartizite pebble conglomerate facies and from jointed and fractured zones. Where it is present, the overlying Sharon Shale acts as a relatively impermeable confining layer for the sandstone. No WBG wells were completed in the Sharon Member, but wells in other areas of RVAAP completed in the Sharon Shale generally exhibit much lower hydraulic conductivities than those in the sandstone.

2.4.1.3 Groundwater flow directions

A facility-wide water table map was constructed from data collected on August 27 and 28, 2001, as part of a facility-wide water-level measurement and well inspection effort conducted under a separate project (USACE 2003b). Figure 2-3 illustrates the potentiometric surface across the eastern portion of RVAAP. Monitoring wells from which data were obtained are all screened within the uppermost groundwater interval at RVAAP, either at the water table or immediately below it. Both unconsolidated and bedrock zone wells are represented in the water level data set; thus, the potentiometric map presents a generalized representation of the water table surface. Perennial streams and ponds present at RVAAP were considered as expressions of the water table surface. To augment water level data in areas that did not have adequate well coverage, elevations of perennial streams and ponds, estimated from topographic base map files, were used to infer water table elevations. Topographic surface controls from base map files were also used to guide placement of water table isopleths.

The facility-wide potentiometric map shows that the water table surface is a subdued representation of the topography of the region. The predominant groundwater flow direction is to the east, with water table elevations decreasing from a high of about 1,136 ft amsl in the northwest portion of the facility to a low of about 928 ft amsl southeast of Load Line 1 (well LL1mw-065). A significant potentiometric high, centered around Load Line 2, is indicated in the southeastern portion of RVAAP. This potentiometric high results in localized radial flow vectors in this portion of the facility. A groundwater divide (not shown on Figure 2-3) is also inferred in the western portion of the facility based on surface stream and topographic elevations, although little potentiometric data exist in this region to confirm its presence.

At the watershed scale (i.e., Sand Creek, Hinkley Creek, and South Fork of Eagle Creek), groundwater flow generally mirrors surface drainage patterns. Regional drainage patterns along Sand Creek in the northeast

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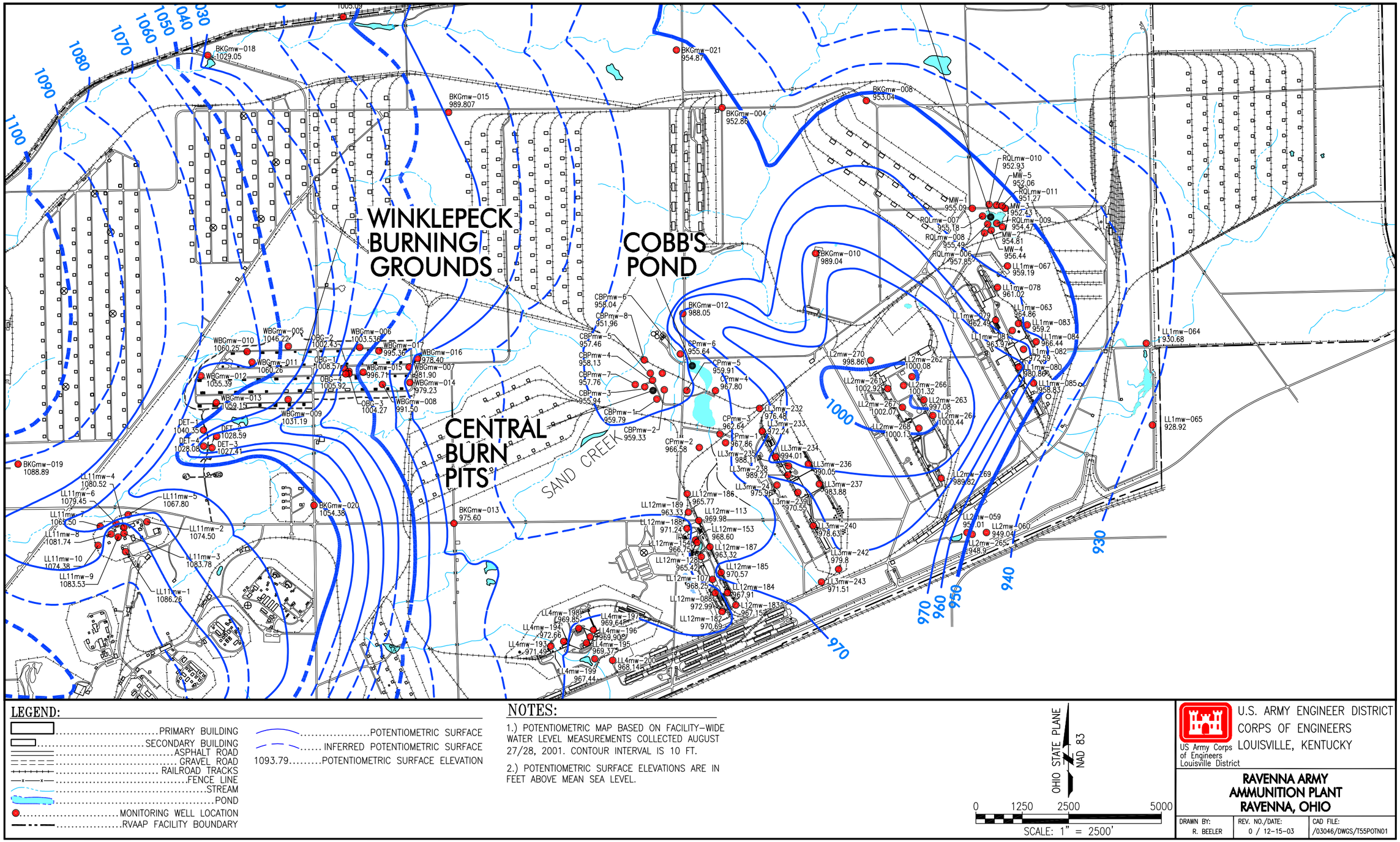

LEGEND:

- PRIMARY BUILDING
- SECONDARY BUILDING
- ASPHALT ROAD
- GRAVEL ROAD
- RAILROAD TRACKS
- FENCE LINE
- STREAM
- POND
- MONITORING WELL LOCATION
- RVAAP FACILITY BOUNDARY
- POTENTIOMETRIC SURFACE
- INFERRED POTENTIOMETRIC SURFACE
- 1093.79 POTENTIOMETRIC SURFACE ELEVATION

NOTES:

1.) POTENTIOMETRIC MAP BASED ON FACILITY-WIDE WATER LEVEL MEASUREMENTS COLLECTED AUGUST 27/28, 2001. CONTOUR INTERVAL IS 10 FT.

2.) POTENTIOMETRIC SURFACE ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL.

OHIO STATE PLANE NAD 83

0 1250 2500 5000

SCALE: 1" = 2500'

US Army Corps of Engineers Louisville District

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS LOUISVILLE, KENTUCKY

RAVENNA ARMY AMMUNITION PLANT RAVENNA, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE:
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Figure 2-3. Facility-wide Potentiometric Map, August 2001

portion of RVAAP result in a localized variation in the overall flow direction to the north-northeast (Figure 2-3). In several locations along the southern boundary of RVAAP, south-southeast variations in the overall observed groundwater flow patterns are observed as follows:

- a localized south-southeasterly flow component from the potentiometric high area centered around Load Lines 1, 2, and 3 toward the facility boundary;

- a localized southerly flow component toward the facility boundary from the southernmost portion of Load Line 12;

- a localized southerly flow component toward the facility boundary from Load Line 4, which mirrors the direction of surface water flow in the unnamed tributary that drains this load line; and

- groundwater flow to the south in association with Hinkley Creek (not shown on Figure 2-3) in the southwest portion of the site (i.e., NACA Test Area and Demolition Area 1 vicinity; see Figure 1-4).

The potentiometric surface may be interpreted with a higher degree of confidence in the southeastern portion of RVAAP than in many other areas of the facility because of the density of monitoring wells present (i.e., vicinity of Cobb's Pond, Ramsdell Quarry, and Load Lines 1 through 4). The potentiometric surface and water table gradients in the vicinity of Cobb's Pond, Load Line 12, and Load Line 4 are subdued when compared to other portions of RVAAP, and they appear to be influenced by the abundant large surface water features and wetlands present in these areas (Figure 2-3).

Greater uncertainty in interpretation of groundwater flow directions exists in the vicinity of Load Line 12 and Demolition Area 2. Potential subsurface geologic heterogeneities in the vicinity of Load Line 12 create a complex potentiometric surface that is difficult to interpret with existing data. An apparent narrow potentiometric low oriented in a north-south direction extends along the central portion of Load Line 12 from South Service Road towards Cobb's Pond. This potentiometric low was also evident from water table data collected during 2000 and may be a representation of some type of subsurface anisotropy.

In the vicinity of Demolition Area 2, steep potentiometric gradients are inferred based on data from wells that existed in the area as of August 2001. Additional monitoring wells were installed at this AOC in the fall of 2002 as part of a Phase II RI. Data from the new Demolition Area 2 wells need to be included in any subsequent assessment of facility-wide potentiometric elevations and may alter the interpretation of gradients in this area.

2.4.1.4 Surface water system

The entire RVAAP facility is situated within the Ohio River Basin, with the West Branch of the Mahoning River representing the major surface stream in the area. This stream flows adjacent to the western end of the facility, generally from north to south, before flowing into the Michael J. Kirwan Reservoir that is located to the south of State Route 5. The West Branch flows out of the reservoir along the southern facility boundary before joining the Mahoning River east of RVAAP.

The western and northern portions of RVAAP display low hills and dendritic surface drainage. The eastern and southern portions are characterized by an undulating to moderately level surface, with less dissection by surface drainage. The facility is marked with marshy areas and flowing and intermittent streams, with headwaters located in the higher regions of the site. Three primary watercourses drain RVAAP: the South Fork of Eagle Creek, Sand Creek, and Hinkley Creek.

Sand Creek, with a drainage area of 13.9 miles^2, flows generally northeast to its confluence with the South Fork of Eagle Creek. In turn, the South Fork of Eagle Creek then continues in a northerly direction for 2.7 miles to its confluence with Eagle Creek. The drainage area of the South Fork of Eagle Creek is 26.2 miles^2, including the area drained by Sand Creek. Hinkley Creek, with a drainage area of 11.0 miles^2, flows in a southerly direction through the installation to its confluence with the West Branch of the Mahoning River south of the facility.

Approximately 50 ponds are scattered throughout the installation. Many were built within natural drainageways to function as settling ponds or basins for process effluent and runoff. Others are natural glacial depressions or result from beaver activity. All water bodies at RVAAP support an abundance of aquatic vegetation and are well stocked with fish. None of the ponds within the installation are used as water supply sources.

Storm water runoff is controlled primarily by natural drainage, except in facility operations areas where extensive storm sewer networks and surface ditches help to direct runoff to drainage ditches and settling ponds. In addition, the storm sewer and drainage ditch systems were one of the primary drainage mechanisms for process effluent during the period that production facilities were in operation.

2.4.2 Winklepeck Burning Grounds Hydrologic/Hydrogeologic Setting

The general groundwater flow pattern at WBG mimics the site topography and surface water drainage patterns, which indicate an overall flow gradient to the east across the AOC. WBG is elevated from 10 to 30 ft relative to surface water streams to the north and south, which suggests that the AOC is a recharge area. Some northeast and southeast components of shallow groundwater flow towards the surface water features are likely. Phase II and III RI drilling data show that groundwater occurs under unconfined conditions in sandy interbeds within glacial till deposits at the site, which are presumed to be many tens of feet thick. Because of the heterogeneous nature of the unconsolidated glacial deposits beneath the site, these sandy units are likely discontinuous. Localized variants in the overall flow patterns and preferred migration pathways (i.e., gravel or sand stringers) likely exist at the site. A generalized potentiometric surface map for WBG, compiled from water level data collected in October 2000 prior to the Phase III RI groundwater sampling, is presented in Figure 2-4. The water level data indicate a regional east-southeast flow direction. Steeper gradients are observed in the northeast quadrant of the AOC; however, the sparse distribution of monitoring wells over the large area of WBG allows only general interpretations to be made. Local variations in the flow direction and gradient are likely.

Results of slug tests performed at the 13 WBG monitoring wells during the Phase II and III RIs reveal moderate to high hydraulic conductivities in the geologic material. Hydraulic conductivity ranged from 3.89×10^{-5} to 2.7×10^{-2} cm/sec, with an average of 6.66×10^{-3} cm/sec (Table 2-1). Hydraulic conductivity tests were also conducted in the laboratory on 2-ft Shelby tube samples collected within the screened interval at each well (Table 2-1). Specifically, the Shelby Tube analysis was performed on a representative 6-in. interval of the total Shelby tube sample (see Appendix L for Phase III geotechnical result details). Results ranged from 3.39×10^{-8} to 3.2×10^{-7} cm/sec, with an average result of 1.15×10^{-7} cm/sec, approximately four orders of magnitude less than the slug test results. Shelby Tube results are representative of the specific 2-ft interval sampled. Therefore, any local heterogeneities that affect hydraulic conductivity within the screened interval, such as sand lenses, may not be present in the Shelby tube samples.

Surface water flows from west to east across WBG via three small intermittent streams (all tributaries to Sand Creek) and northward in a stream that drains Pads 58 through 61. Mack's Pond is located in the southwest quadrant of WBG. The southernmost surface water channel, which drains the western end of WBG, discharges to Mack's Pond. The pond drains eastward to an unnamed stream that joins Sand Creek east of

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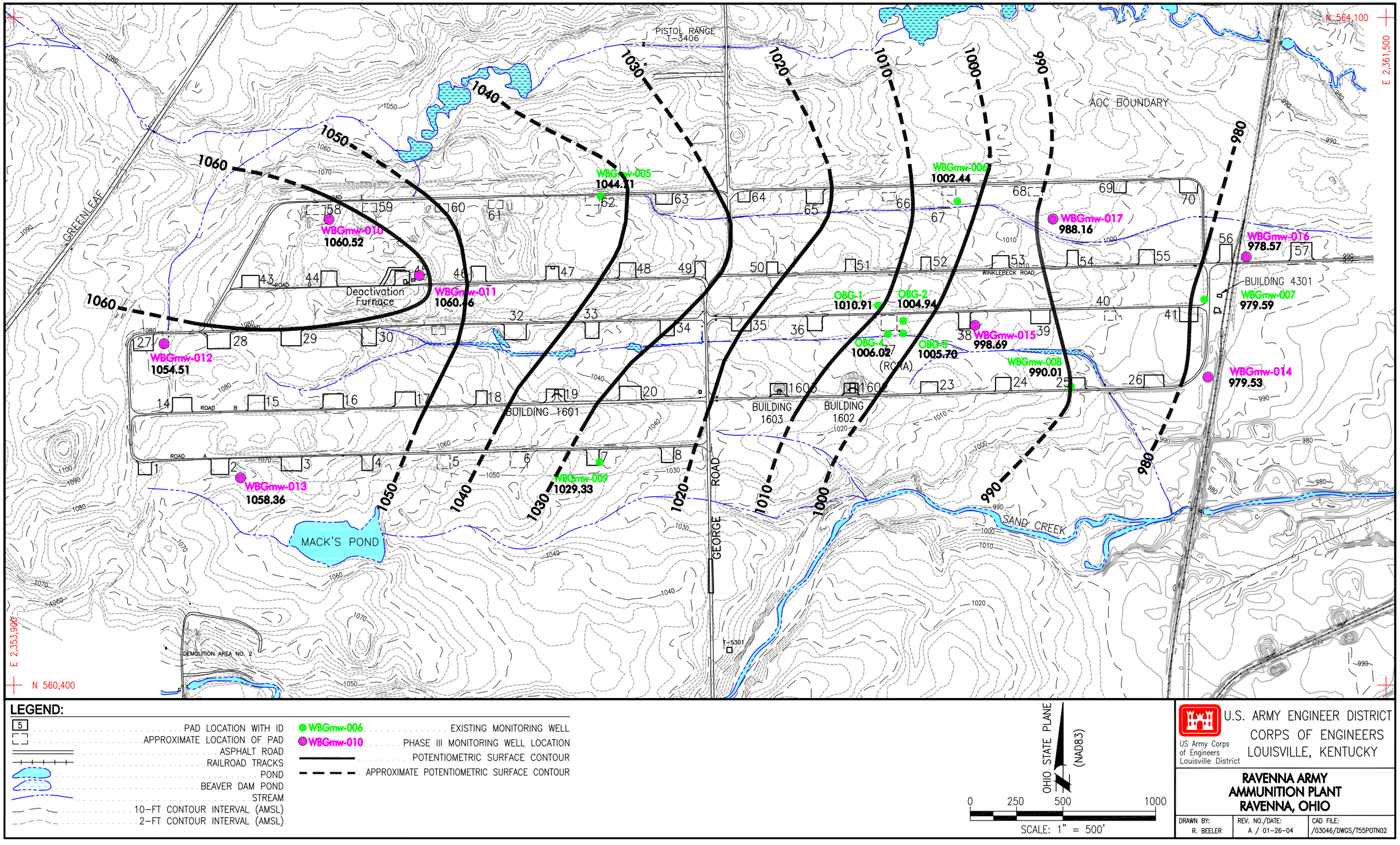

LEGEND:

- 5 — PAD LOCATION WITH ID
- APPROXIMATE LOCATION OF PAD
- ASPHALT ROAD
- RAILROAD TRACKS
- POND
- BEAVER DAM POND
- STREAM
- 10-FT CONTOUR INTERVAL (AMSL)
- 2-FT CONTOUR INTERVAL (AMSL)
- WBGmw-006 — EXISTING MONITORING WELL
- WBGmw-010 — PHASE III MONITORING WELL LOCATION
- POTENTIOMETRIC SURFACE CONTOUR
- APPROXIMATE POTENTIOMETRIC SURFACE CONTOUR

OHIO STATE PLANE (NAD83)

0 250 500 1000

SCALE: 1" = 500'

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US Army Corps of Engineers Louisville District

RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE:
R. BEELER	A / 01-26-04	/03046/DWGS/T55POTN02

Figure 2-4. Potentiometric Surface Map of Winklepeck Burning Grounds, October 2000

Table 2-1. Horizontal Hydraulic Conductivities in Phase II and Phase III Remedial Investigation Monitoring Wells

Monitoring Well ID	Screened Interval (depth bgs, ft)	Total Depth (bgs, ft)	Geologic Material Adjacent to Screen	Slug Test-Determined Hydraulic Conductivity (cm/s)	Laboratory-Determined Hydraulic Conductivity (cm/s)	Depth Ranges of Laboratory Permeability Sample (ft)
WBGmw-005	8.3 to 18.3	19	Clay with sand	3.89×10^{-5}	1.19×10^{-7}	14 to 15.5
WBGmw-006	7.6 to 17.6	19	Silty sand with sand	2.46×10^{-3}	9.16×10^{-8}	9 to 10.8
WBGmw-007	13.4 to 23.4	24	Silty clay with sand	2.12×10^{-2}	3.39×10^{-8}	9 to 10.5
WBGmw-008	8.1 to 18.1	18.5	Sand	8.85×10^{-3}	4.50×10^{-8}	12 to 13.5
WBGmw-009	11.4 to 21.4	24	Silty sand	5.65×10^{-4}	4.45×10^{-8}	9 to 11
WBGmw-010	10.5 to 20.5	20.8	Sand with silt	2.63×10^{-3}	6.9×10^{-8}	1 to 3
WBGmw-011	7 to 17	21.3	Sand with silt and gravel	7.84×10^{-3}	NA	NA
WBGmw-012	19 to 29	24.3	Sand with silt	1.52×10^{-3}	9.2×10^{-8}	1 to 3
WBGmw-013	11 to 21	21.3	Sand with silt	4.38×10^{-3}	NA	NA
WBGmw-014	12 to 22	22.3	Sand with silt and gravel	7.38×10^{-3}	2.2×10^{-7}	1 to 3
WBGmw-015	9 to 19	19.3	Sand with silt and gravel	2.24×10^{-3}	3.2×10^{-7}	1 to 3
WBGmw-016	13 to 23	24	Sand with silt and gravel	5.1×10^{-4}	NA	NA
WBGmw-017	11 to 21	21.3	Sand with fine silt	2.7×10^{-2}	NA	NA

bgs = Below ground surface.
ID = Identification.
NA = Not analyzed; no permeability sample collected.

George Road. The stream north of Pallet Road B runs south of Pads 29 through 39, in the center of WBG. The northernmost stream exits the AOC east of Pad 63. Beaver ponds are also present in low areas in the southeast quadrant of WBG. These drainage channels are shown on Figure 2-4 and further delineated on Figure 4-2 in Chapter 4.0.

2.5 CLIMATE

RVAAP has a humid continental climate characterized by warm, humid summers and cold winters. Precipitation varies widely throughout the year. The average driest month is February, and the wettest month is July. Data from the National Weather Service compiled over the past 47 years indicate that the average rainfall for the area is 38.72 in. annually. The average snowfall is 42.4 in. annually. Severe weather, in the form of thunder, hail, or snowstorms, is common during the summer and winter. Tornadoes are infrequent in Portage County. The Phase III RI was conducted during the historically dry portion of the year (autumn), but overall, climate conditions for the year were normal.

2.6 POTENTIAL RECEPTORS

2.6.1 Human Receptors

The RVAAP facility is located in a rural area, is not accessible to the general public, and is not near any major industrial or developed areas. The facility is completely fenced and patrolled by security personnel. Army and full-time operating contractor staff (i.e., security, grounds, and maintenance workers) are located on-site. Additional subcontractor staff are on-site for varying periods of time, ranging from several weeks to more than 12 months to complete specific demolition/decommissioning projects. Training activities under OHARNG involve an average of 4,500 personnel during the course of a month, who are on-site for periods of 3 d (inactive duty or weekend training) to 2 weeks (annual training).

WBG is located in the center of RVAAP and is not currently used for OHARNG training activities. Industrial workers do not frequent the area. Groundskeeping activities are limited to infrequent mowing and brush clearing. The area is not used for deer hunts. Security activities consist of gate checks and surveillance along George Road. As described in Section 1.2.2, WBG is to be developed as a grenade practice range. A detailed analysis of a range maintenance soldier receptor scenario is planned as part of the FS.

2.6.2 Ecological Receptors

The dominant vegetative cover types at RVAAP, including WBG's immediate surroundings, are forests and old fields of various ages. More than 80% of RVAAP is now in forest. Most of the old field cover is the result of earlier agricultural practices that left these sites with poor topsoil, which limits forest regeneration. Several thousand acres of agricultural fields were planted in trees during the 1950s and 1960s, but these plantings were not successful in areas with poor topsoil. Some fields, leased for cattle grazing during the same time period, were delayed in their reversion of forest. A few fields have been periodically mowed, maintaining them as old field, and 90 acres are leased as hay fields (Morgan 2003a).

From one-half to two-thirds (10,000 to 15,000 acres) of RVAAP's land area meets the regulatory definition of jurisdictional wetland. Wetland areas at RVAAP include seasonally saturated wetlands, wet fields, and forested wetlands. Most of these wetlands exist because of poorly drained and hydric soils. Beaver impoundments contribute to wetland diversification on the site.

The flora and fauna present at RVAAP are varied and widespread. No federal threatened or endangered or candidate threatened or endangered species have been observed on RVAAP. A listing of state endangered, state threatened or potentially threatened, and state special interest species confirmed to be on RVAAP is provided on Table 2-2 (Morgan 2003b). Additionally, five rare plant communities/significant natural areas have been identified on RVAAP, including the northern woods, Wadsworth Glen, Group 3 woods, B&O Wye Road area, and South Patrol Road swamp forest.

Restricted land use and sound forest management practices have preserved and enabled large forest tracts to mature. Habitat conversion at RVAAP, unlike most other habitat conversions occurring nationwide, has been toward restoration of the forests that covered the area prior to its being cleared for agriculture. The reversion of these agricultural fields to mature forest provides a diverse habitat from old field through several successional stages. Overall, the trend toward forest cover enhances the area for use by both plant and animal forest species. Future IRP activities will require consideration of these species to ensure that detrimental effects on threatened or endangered RVAAP flora and fauna do not occur. There are no federal, state, or local parks or protected areas on RVAAP facility property.

2.7 PRELIMINARY CONCEPTUAL SITE MODEL

The most current version of the CSM for WBG, which includes operational information, hydrogeologic and contaminant fate and transport data, analytical data collected through the Phase II RI, and human health and ecological risk assessment information, was developed and presented in the Phase II RI Report (USACE 2001a). Those elements of the CSM specific to the Phase III RI are as follows.

2.7.1 Soils

Based on characterization data through the Phase II RI, contaminated soils within and adjacent to the former burning pits and pads are potential secondary sources of contamination to sediment, surface water, and groundwater. Contaminants may be released from soil and migrate in storm runoff either in dissolved phase or adsorbed to particulates and/or colloids. Contaminants may also leach from soils through the vadose zone to groundwater and, subsequently, migrate along flowpaths until discharging to surface streams near the AOC.

Table 2-2. RVAAP Rare Species List as of 2003

A. State Endangered
   1. Northern harrier, *Circus cyaneus*
   2. Common barn owl, *Tyto alba*
   3. Yellow-bellied sapsucker, *Sphyrapicus varius*
   4. Mountain brook lamprey, *Ichthyomyzon greeleyi*
   5. Graceful underwing, *Catocala gracilis*
   6. Ovate spikerush, *Eleocharis ovata* (Blunt spike-rush)
   7. Lurking leskea, *Plagiothecium latebricola*
   8. Little blue heron, *Egretta caerulea* (suspected)
   9. American bittern, *Botaurus lentiginosu* (migrant)
   10. Canada warbler, *Wilsonia canadensis* (migrant)
   11. Osprey, *Junco hyemalis* (migrant)
   12. Trumpeter swan, *Cygnus buccinator* (migrant)
   13. Little blue heron, *Egretta caerulea* (migrant)

B. State Threatened
   1. Simple willow-herb, *Epilobium strictum*

C. State Potentially Threatened
   1. Gray birch, *Betula populifolia*
   2. Round-leaved sundew, *Drosera rotundifolia*
   3. Closed gentian, *Gentiana clausa*
   4. Butternut, *Juglans cinerea*
   5. Blunt mountain-mint, *Pycnanthemum muticum*
   6. Northern rose azalea, *Rhododendron nudiflorum* var. *roseum*
   7. Large cranberry, *Vaccinium macrocarpon*
   8. Hobblebush, *Viburnum alnifolium*
   9. Long beech fern, *Phegopteris connectilis*
   10. Woodland horsetail, *Equisetum sylvaticum*
   11. Weak sedge, *Carex debilis* var. *debilis*
   12. Straw sedge, *Carex straminea*
   13. Water avens, *Geum rivale*
   14. Tall St. John's wort, *Hypercium majus*
   15. Swamp oats, *Sphenopholis pensylvanica*
   16. Shining ladies'-tresses, *Spiranthes lucida*

D. State Special Interest
   1. Sora, *Porzana carolina*
   2. Virginia rail, *Rallus limicola*
   3. Four-toed salamander, *Hemidactylium scutatum*
   4. Smooth green snake, *Opheodrys vernalis*
   5. Woodland jumping mouse, *Napaeozapus insignis*
   6. Sharp-shinned hawk, *Accipiter striatus*
   7. Solitary vireo, *Vireo solitarius*
   8. Pygmy shrew, *Sorex hoyi*
   9. Star-nosed mole, *Condylura cristata*
   10. Red-shouldered hawk, *Buteo lineatus*
   11. Henslow's sparrow, *Ammodramus henslowii*
   12. Cerulean warbler, *Dendroica cerulea*
   13. Common moorhen, *Gallinula chloropus*
   14. Eastern box turtle, *Carolina carolina*
   15. *Capperia evansi* (moth)
   16. *Zanclognatha martha* (moth)
   17. *Oligia bridghami* (moth)
   18. *Chaetaglaea sericea* (moth)
   19. *Sutyna privata* (moth)
   20. *Homorthodes frufurata* (moth)

Source: Morgan (2003b).

Previous sampling data at WBG indicated explosives (primarily 2,4,6-TNT and its degradation products) in excess of 1 mg/kg in surface soil at Pads 5, 6, 37, 38, 59, 60, 62, 66, 67, 68, and 69. Inorganics were detected at nearly all pads above background levels. Prevalent inorganic site-related contaminants (SRCs) include barium, cadmium, chromium, copper, lead, mercury, and zinc. The principal human health COCs identified in the baseline HHRA in the Phase II RI include cadmium, 2,4,6-TNT, and RDX with Pads 38, 45, 58, 60, 61, 66, and 67 exhibiting the highest risk factors (risk > 10^{-4} and/or HQ >3). The principal ecological COCs include aluminum, cadmium, and lead with Pads 32, 37, 38, 58, 59, 60, and 66 exhibiting the highest ecological risk (HQ approximately or >1,000).

Explosives in subsurface soil were identified in the Phase II RI at concentrations in excess of 1 mg/kg to depths of at least 4 ft at Pads 60, 62, 66, 67, and 68. Phase II RI analytical data showed explosives in excess of 1 mg/kg to depths of at least 6 ft at Pads 67 and 68. Lead values in excess of 100 mg/kg occurred at depths of 4 ft at Pad 60, and cadmium was present at elevated levels at Pads 60 and 61. Human health COCs for subsurface soil include cadmium and 2,4,6-TNT.

2.7.2 Sediment

Sediment within ditches and tributaries represents a receptor medium for contaminants eroded or leached from soils in source areas and transported by storm runoff. In addition, sediment may function as a transport mechanism considering that contaminants adsorbed to particulates may be mobilized by surface water flow. Operational data suggest that the ditches in the vicinity of former burn areas represent likely locations where contaminants may have accumulated through erosion and redeposition.

Site data collected to date show that explosives were not present in sediment in concentrations above 1 mg/kg. Inorganics above facility-wide background were observed in two samples, with the highest levels concentrated in a sample collected at the east end of the AOC. One sample collected near Mack's Pond contained low levels of 11 SVOCs [primarily polycyclic aromatic hydrocarbons (PAHs)], all at concentrations less than 1 mg/kg. No human health COCs for sediment exceeding risk values of 10^{-4} or hazard index (HI) > 1 were identified in the Phase II RI. Ecological COCs identified for sediment include arsenic, copper, manganese, nickel, and zinc with HIs of 1 to 3. Low ecological risks (HIs of 1 to 2) were associated with the SVOCs identified near Mack's Pond.

2.7.3 Surface Water

Surface water conveyances within WBG are intermittent; therefore, sediment sampling in the Phase II RI was deemed adequate to characterize any potential contaminant transport along these conveyances. Sampling of surface water from conveyances within and adjacent to WBG was conducted only at Mack's Pond during the Phase II RI. Explosives were not detected in this sample and inorganics were less than background levels. The Phase II RI identified no human health or ecological COCs. Modeling of potential surface water transport was conducted in the Phase II RI using the EPA Storm Water Management Model. This modeling indicated that potential contaminant migration off of the AOC is not expected to be a future problem.

2.7.4 Groundwater

The general groundwater flow patterns mimic the site topography and surface water drainage patterns, which indicate an overall flow gradient to the east-southeast across the AOC. There is evidence that the AOC is a recharge area with some northeast and southeast components of shallow groundwater flow towards surface water features.

Phase II RI groundwater sampling showed the presence of explosives in excess of 1 µg/L in two wells. A number of inorganics were detected in groundwater at concentrations above facility-wide background criteria, but below Ohio maximum contaminant levels (MCLs) for drinking water. The only human health COC identified for groundwater was manganese, which had an HQ between 1 and 2; however, the facility-wide background value for this inorganic is six times the risk-based screening criterion. Contaminant migration from source areas to groundwater via leaching or surface water infiltration has not been verified as a major release mechanism in the CSM at present. However, characterization data show that the contaminants identified to date have low mobility in groundwater and would be expected to degrade or adsorb within the soil column.

2.7.5 Current Site Conditions

The current potential for human exposure to potential contaminants migrating from the site is mitigated by inactivity at the site, the absence of permanent residents, and low population density on adjacent private properties. The RVAAP facility is located in a rural area and is not accessible to the general public. WBG is located in a remote area in the interior of RVAAP, 2 miles from the northern and southern boundaries. The entire facility is surrounded by a fence and is patrolled by security personnel.

3.0 STUDY AREA INVESTIGATION

The Phase III RI field effort conducted in October and November 2000 at WBG included sampling surface soil, subsurface soil, and sediment; installing eight new monitoring wells; and sampling all 17 existing and new monitoring wells. Surface water sampling was not included in the scope of field activities. In addition, analyses for TNT and RDX, using a colorimetric method, were performed in a field-based laboratory to provide an indication of contamination nature and extent and to help guide the sampling efforts. Analyses of metals were conducted using XRF instruments as part of an evaluation of potential innovative analytical methods that may be applied to environmental investigations to reduce costs. The XRF analyses were conducted by using both a field-based laboratory (bench-top unit) and by taking direct measurements of soil at each sampling point in the AOC using hand-held instruments (in situ measurements).

This chapter presents information on locations of and rationale for samples collected during the field effort and provides a synopsis of the sampling methods employed during the investigation. Specific notation is made where site conditions required a departure from planned activities in the SAP Addendum No. 1 for the WBG FS (USACE 2000). Information regarding standard field decontamination procedures, sample container types, preservation techniques, sample labeling, chain-of-custody, and packaging and shipping requirements implemented during the field investigation may be found in the Facility-wide SAP (USACE 2001b) and SAP Addendum No. 1 for the WBG FS.

Proposed Phase III RI sample locations were reviewed by representatives of RVAAP, Ohio EPA, and USACE, based on the results of the Phase II RI and new information collected after the Phase II RI on potential source areas. The rationales for each component of the field program are described in the following sections.

3.1 SOIL AND VADOSE ZONE CHARACTERIZATION

Phase III RI soil samples were collected from a total of 66 biased soil sampling stations located in and adjacent to 12 former burning pads and from 30 random grid stations located in areas believed not to have been impacted by AOC operations. Additionally, dry sediment samples were collected at two stations in intermittent drainage conveyances and are considered as soil samples for the purpose of the RI/FS. Figures 3-1, 3-2, and 3-3 illustrate locations of soil and dry sediment sampling collected during the Phase III RI, as well as the previous two phases of investigation. Table 3-1 provides details on locations, rationales, sample depths, and other field information for all soil and sediment sample collection activities during the Phase III RI. Surface soil samples within and adjacent to burning pads were pre-planned in part; however, flexibility in the investigation program was provided through the use of contingency samples and the application of field analyses for explosives. Several planned samples were not collected at the direction of USACE so that the analytical capacity could be applied to contingency samples, especially north of Pads 58 and 59. This is documented on Table 3-1. Random grid sampling locations were all pre-planned. Subsurface soil sampling was preplanned for some locations, but was also dictated by the results of the field analyses for explosives, as discussed in Section 3.1.1.

The collection of subsurface soils at WBG was intended to define the vertical extent of contamination resulting from dispersal of explosives and to study transport pathways of any such contamination. Subsurface soils were collected using both hand augers and a Geoprobe hydraulic-push sampling device.

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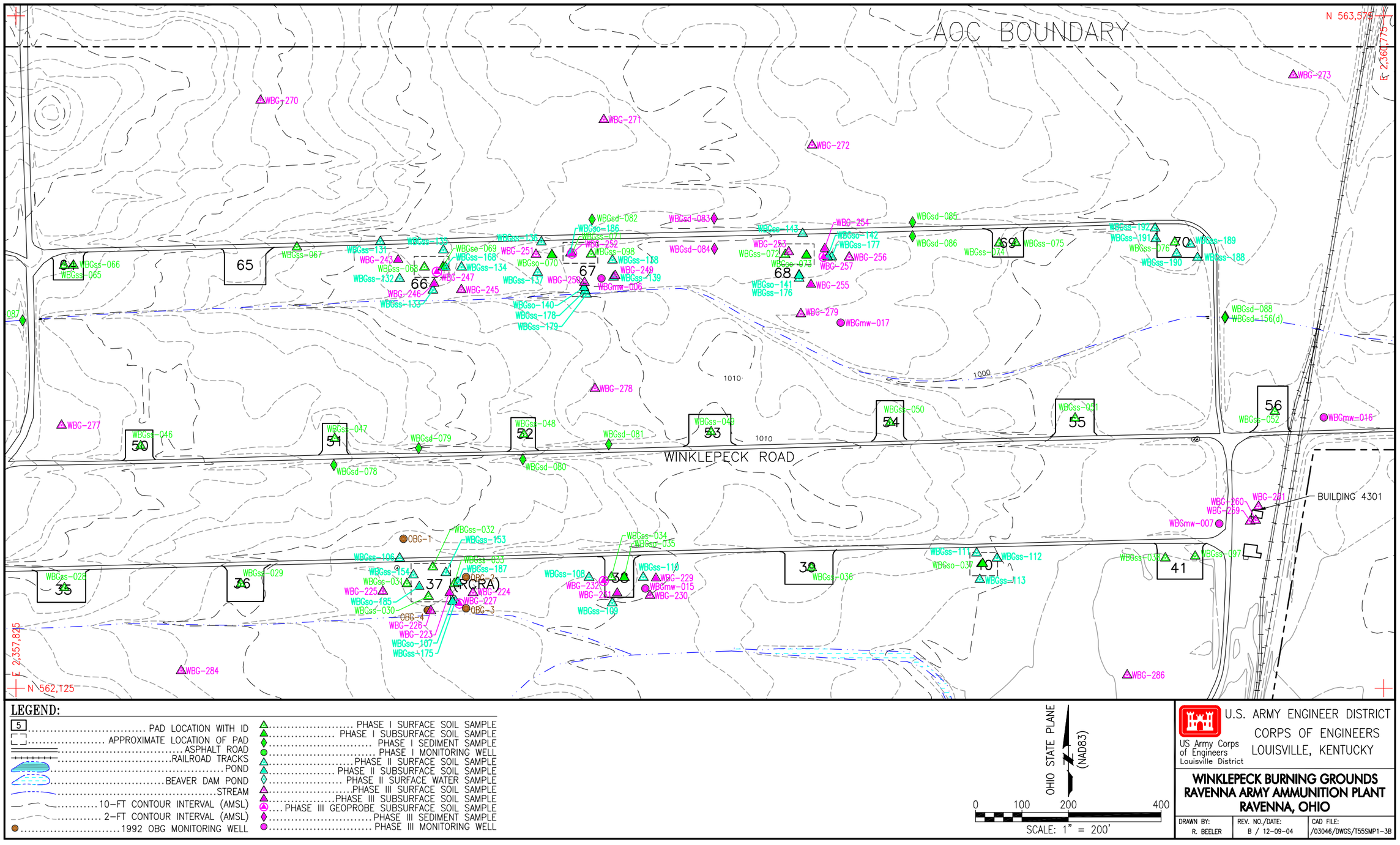
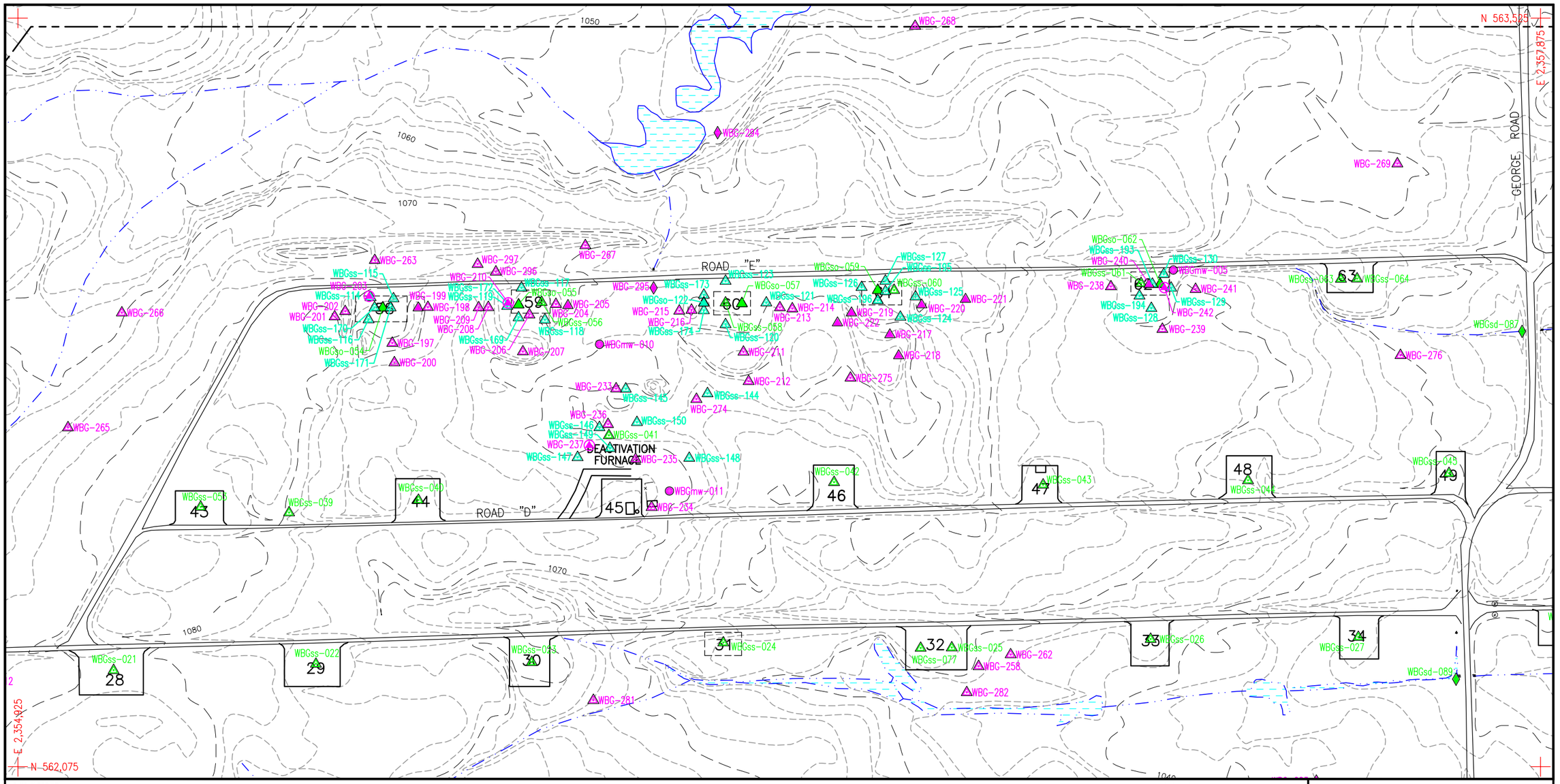


Figure 3-1. Phase I, II, and III Remedial Investigation Soil Sampling Locations for Pads 37, 38, 66, 67, and 68



LEGEND:

- 5 ..... PAD LOCATION WITH ID
- ..... APPROXIMATE LOCATION OF PAD
- ..... ASPHALT ROAD
- ..... RAILROAD TRACKS
- ..... POND
- ..... BEAVER DAM POND
- ..... STREAM
- ..... 10-FT CONTOUR INTERVAL (AMSL)
- ..... 2-FT CONTOUR INTERVAL (AMSL)
- ..... PHASE I SURFACE SOIL SAMPLE
- ..... PHASE I SUBSURFACE SOIL SAMPLE
- ..... PHASE I SEDIMENT SAMPLE
- ..... PHASE I MONITORING WELL
- ..... PHASE II SURFACE SOIL SAMPLE
- ..... PHASE II SUBSURFACE SOIL SAMPLE
- ..... PHASE II SURFACE WATER SAMPLE
- ..... PHASE III SURFACE SOIL SAMPLE
- ..... PHASE III SUBSURFACE SOIL SAMPLE
- ..... PHASE III GEOPROBE SUBSURFACE SOIL SAMPLE
- ..... PHASE III SEDIMENT SAMPLE
- ..... PHASE III MONITORING WELL

OHIO STATE PLANE (NAD83)

0 100 200 400

SCALE: 1" = 200'

US Army Corps of Engineers Louisville District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

WINKLEPECK BURNING GROUNDS
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE:
R. BEELER	A / 01-19-04	/03046/DWGS/T55SMP1-3A

Figure 3-2. Phase I, II, and III Remedial Investigation Soil Sampling Locations for Pads 32, 45, 58, 59, 60, 61, and 62

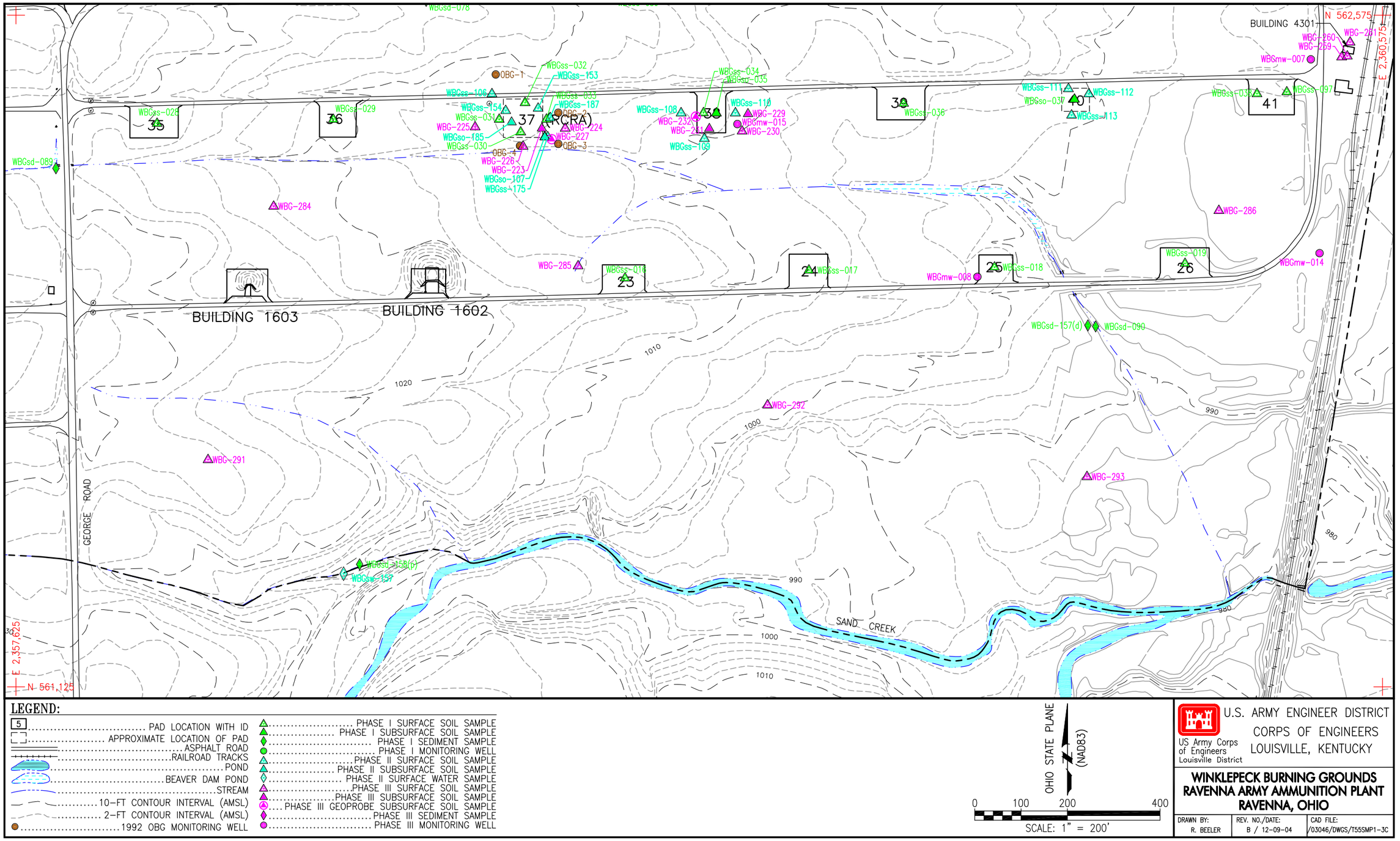


Figure 3-3. Phase I, II, and III Remedial Investigation Soil Sampling Locations for Pads 37, 38, and 40

Table 3-1. Soil and Dry Sediment Sample List and Rationales, Winklepeck Burning Grounds Phase III Remedial Investigation

Functional Area	No. of Sample Stations	Sample Station ID	Location Description	Sample Station Rationale	Sample ID	Depth (ft)	Sample Collected (Yes/No)	Comments
Pad 58 – Area 1/3	7	WBG-197	South of Pad 58, in berm	Source area characterization	WBGss-197-4000-SO	0 to 1	Yes	
					WBGso-197-4001-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil ample
					WBGso-197-4002-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-198	East of Pad 58	Source area characterization	WBGss-198-4003-SO	0 to 1	Yes	
					WBGso-198-4004-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-198-4005-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-199	East of Pad 58, in berm	Source area characterization	WBGss-199-4006-SO	0 to 1	Yes	
				Source area characterization	WBGso-199-4007-SO	2 to 4	Yes	
				Source area characterization	WBGso-199-4008-SO	4 to 6	Yes	
				Source area characterization	WBGso-199-4314-SO	6 to 8	Yes	Contingency
		WBG-200	South of Pad 58	Source area characterization	WBGss-200-4009-SO	0 to 1	Yes	
					WBGso-200-4010-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-200-4011-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-201	West of Pad 58	Source area characterization	WBGss-201-4012-SO	0 to 1	Yes	
					WBGss-201-4268-SO	0 to 1	Yes	Duplicate of WBG-4012
					WBGso-201-4013-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-201-4014-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-202	West of Pad 58, in berm	Source area characterization	WBGss-202-4015-SO	0 to 1	Yes	
					WBGso-202-4016-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-202-4017-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-203	North of center of Pad 58	Source area characterization	WBGss-203-4018-SO	0 to 1	Yes	Geoprobe
				Source area characterization	WBGss-203-4019-SO	2 to 4	Yes	Geoprobe
				Source area characterization	WBGss-203-4020-SO	4 to 6	Yes	Geoprobe
				Source area characterization	WBGso-203-4021-SO	6 to 8	Yes	Geoprobe
				Source area characterization	WBGso-203-4022-SO	8 to 10	Yes	Geoprobe
Pad 59 – Area 1/3	7	WBG-204	East of Pad 59, in berm	Source area characterization	WBGss-204-4023-SO	0 to 1	Yes	
					WBGso-204-4024-SO	2 to 4	No	
					WBGso-204-4025-SO	4 to 6	No	

Table 3-1. Soil and Dry Sediment Sample List and Rationales, Winklepeck Burning Grounds Phase III Remedial Investigation (continued)

Functional Area	No. of Sample Stations	Sample Station ID	Location Description	Sample Station Rationale	Sample ID	Depth (ft)	Sample Collected (Yes/No)	Comments
Pad 59 – Area 1/3 (cont.)	7	WBG-205	East of Pad 59	Source area characterization	WBGss-205-4026-SO	0 to 1	Yes	
				Source area characterization	WBGso-205-4027-SO	2 to 4	Yes	
				Source area characterization	WBGso-205-4028-SO	4 to 6	Yes	
				Source area characterization	WBGso-205-4313-SO	6 to 8	Yes	Contingency
		WBG-206	East-central part of Pad 59	Source area characterization	WBGss-206-4029-SO	0 to 1	Yes	
					WBGso-206-4030-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-206-4031-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-207	South of Pad 59	Source area characterization	WBGss-207-4032-SO	0 to 1	Yes	
					WBGso-207-4033-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-207-4034-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-208	West of Pad 59, in berm	Source area characterization	WBGss-208-4035-SO	0 to 1	Yes	
					WBGso-208-4036-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-208-4037-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-209	West of Pad 59	Source area characterization	WBGss-209-4038-SO	0 to 1	Yes	
					WBGso-209-4039-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-209-4040-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-210	West-central part of Pad 59	Source area characterization	WBGss-210-4041-SO	0 to 1	Yes	Geoprobe
					WBGss-210-4277-SO	0 to 1	Yes	Duplicate of WBG-4041 Geoprobe
				Source area characterization	WBGso-210-4042-SO	2 to 4	Yes	Geoprobe
				Source area characterization	WBGso-210-4043-SO	4 to 6	Yes	Geoprobe
					WBGso-210-4278-SO	4 to 6	Yes	Duplicate of WBG-4043 Geoprobe
				Source area characterization	WBGso-210-4044-SO	6 to 8	Yes	Geoprobe
				Source area characterization	WBGso-210-4045-SO	8 to 10	Yes	Geoprobe
		WBG-296	Northwest of Pad 59	Extent of contamination based on field laboratory results	WBGss-296-4315-SO	0 to 1	Yes	Contingency
		WBG-297	Northwest of Pad 59	Extent of contamination based on field laboratory results	WBGss-297-4316-SO	0 to 1	Yes	Contingency

Table 3-1. Soil and Dry Sediment Sample List and Rationales, Winklepeck Burning Grounds Phase III Remedial Investigation (continued)

Functional Area	No. of Sample Stations	Sample Station ID	Location Description	Sample Station Rationale	Sample ID	Depth (ft)	Sample Collected (Yes/No)	Comments
Pad 60 – Area 1	6	WBG-211	South of Pad 60, in berm	Source area characterization	WBGss-211-4046-SO	0 to 1	Yes	
					WBGso-211-4047-SO	2 to 4	No	Hole was abandoned because of UXO concerns
					WBGso-211-4048-SO	4 to 6	No	Hole was abandoned because of UXO concerns
		WBG-212	South of Pad 60	Source area characterization	WBGss-212-4049-SO	0 to 1	Yes	
					WBGss-212-4269-SO	0 to 1	Yes	Duplicate of WBG-4049
					WBGso-212-4050-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-212-4051-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-213	East of Pad 60, in berm	Source area characterization	WBGss-213-4052-SO	0 to 1	Yes	
					WBGso-213-4053-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-213-4054-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-214	East of Pad 60	Source area characterization	WBGss-214-4055-SO	0 to 1	Yes	
					WBGso-214-4056-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-214-4057-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-215	West of Pad 60	Source area characterization	WBGss-215-4058-SO	0 to 1	Yes	
					WBGso-215-4059-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-215-4060-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-216	West of Pad 60, in berm	Source area characterization	WBGss-216-4061-SO	0 to 1	Yes	
					WBGso-216-4062-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-216-4063-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
Pad 61 – Area 1	6	WBG-217	South of Pad 61, in berm	Source area characterization	WBGss-217-4064-SO	0 to 1	Yes	
				Source area characterization	WBGso-217-4065-SO	2 to 4	Yes	
					WBGso-217-4066-SO	4 to 6	No	TNT and RDX field laboratory results BD in 2- to 4-ft soil sample
		WBG-218	South of Pad 61, in berm	Source area characterization	WBGss-218-4067-SO	0 to 1	Yes	
				Source area characterization	WBGso-218-4068-SO	2 to 4	Yes	
					WBGso-218-4069-SO	4 to 6	No	

Table 3-1. Soil and Dry Sediment Sample List and Rationales, Winklepeck Burning Grounds Phase III Remedial Investigation (continued)

Functional Area	No. of Sample Stations	Sample Station ID	Location Description	Sample Station Rationale	Sample ID	Depth (ft)	Sample Collected (Yes/No)	Comments
Pad 61 – Area 1 (cont.)	6	WBG-219	West of Pad 61, in berm	Source area characterization	WBGss-219-4070-SO	0 to 1	Yes	
				Source area characterization	WBGso-219-4071-SO	2 to 4	Yes	
				Source area characterization	WBGso-219-4072-SO	4 to 6	Yes	
		WBG-220	East of Pad 61, in berm	Source area characterization	WBGss-220-4073-SO	0 to 1	Yes	
				Source area characterization	WBGso-220-4074-SO	2 to 4	Yes	
					WBGso-220-4272-SO	2 to 4	Yes	Duplicate of WBG-4074
					WBGso-220-4075-SO	4 to 6	No	Reassigned to WBG-221 (4- to 6-ft depth)
		WBG-221	East of Pad 61	Source area characterization	WBGss-221-4076-SO	0 to 1	Yes	
					WBGso-221-4077-SO	2 to 4	No	
				Source area characterization	WBGso-221-4075-SO	4 to 6	Yes	Sampling team used the WBG-4075 label set at station WBG-221
		WBG-222	West of Pad 61	Source area characterization	WBGss-222-4079-SO	0 to 1	Yes	
				Source area characterization	WBGso-222-4080-SO	2 to 4	Yes	
					WBGso-222-4081-SO	4 to 6	No	TNT and RDX field laboratory results BD in 2- to 4-ft soil sample
Pad 37 – Area 2/3	5	WBG-223	Southeast quadrant of Pad 37	Source area characterization	WBGss-223-4082-SO	0 to 1	Yes	
				Source area characterization	WBGso-223-4083-SO	2 to 4	Yes	
					WBGso-223-4084-SO	4 to 6	No	TNT and RDX field laboratory results BD in 2- to 4-ft soil sample
		WBG-224	East of Pad 37	Source area characterization	WBGss-224-4085-SO	0 to 1	Yes	
					WBGso-224-4086-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-224-4087-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-225	West of Pad 37	Source area characterization	WBGss-225-4088-SO	0 to 1	Yes	
					WBGso-225-4089-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-225-4090-SO	4 to 6	No	TNT and RDX field lab results BD in surface soil sample
		WBG-226	South-central part of Pad 37, near metal covering	Source area characterization	WBGss-226-4091-SO	0 to 1	Yes	
					WBGso-226-4092-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-226-4093-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample

Table 3-1. Soil and Dry Sediment Sample List and Rationales, Winklepeck Burning Grounds Phase III Remedial Investigation (continued)

Functional Area	No. of Sample Stations	Sample Station ID	Location Description	Sample Station Rationale	Sample ID	Depth (ft)	Sample Collected (Yes/No)	Comments
Pad 37 – Area 2/3 (cont.)	5	WBG-227	Southwest of Pad 37	Source area characterization	WBGss-227-4094-SO	0 to 1	Yes	Geoprobe
				Source area characterization	WBGso-227-4095-SO	2 to 4	Yes	Geoprobe
				Source area characterization	WBGso-227-4096-SO	4 to 6	Yes	Geoprobe
				Source area characterization	WBGso-227-4097-SO	6 to 8	Yes	Geoprobe
				Source area characterization	WBGso-228-4098-SO	8 to 10	Yes	Geoprobe
Pad 38 – Area 2/3	5	WBG-228			WBGss-228-4099-SO	0 to 1	No	Client instructed field team to not collect this sample[a]
					WBGso-228-4100-SO	2 to 4	No	
					WBGso-228-4101-SO	4 to 6	No	
		WBG-229	East of Pad 38	Source area characterization	WBGss-229-4102-SO	0 to 1	Yes	
				Source area characterization	WBGso-229-4103-SO	2 to 4	Yes	
					WBGso-229-4104-SO	4 to 6	No	TNT and RDX field laboratory results BD in 2- to 4-ft soil sample
		WBG-230	Southeast of Pad 38	Source area characterization	WBGss-230-4105-SO	0 to 1	Yes	
					WBGso-230-4106-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-230-4107-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-231	North-central part of Pad 38	Source area characterization	WBGss-231-4108-SO	0 to 1	Yes	
				Source area characterization	WBGso-231-4109-SO	2 to 4	Yes	
					WBGso-231-4110-SO	4 to 6	No	TNT and RDX field laboratory results BD in 2- to 4-ft soil sample
		WBG-232	Southwest quadrant of Pad 35	Source area characterization	WBGss-232-4111-SO	0 to 1	Yes	Geoprobe
				Source area characterization	WBGso-232-4112-SO	2 to 4	Yes	Geoprobe
				Source area characterization	WBGso-232-4113-SO	4 to 6	Yes	Geoprobe
				Source area characterization	WBGso-232-4114-SO	6 to 8	Yes	Geoprobe
				Source area characterization	WBGso-232-4115-SO	8 to 10	Yes	Geoprobe
Pad 45 – Area 2/3	5	WBG-233	North of Pad 45	Source area characterization	WBGss-233-4116-SO	0 to 1	Yes	
					WBGso-233-4117-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-233-4118-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-234	East of Pad 45	Source area characterization	WBGss-234-4119-SO	0 to 1	Yes	
					WBGso-234-4120-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-234-4121-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample

Table 3-1. Soil and Dry Sediment Sample List and Rationales, Winklepeck Burning Grounds Phase III Remedial Investigation (continued)

Functional Area	No. of Sample Stations	Sample Station ID	Location Description	Sample Station Rationale	Sample ID	Depth (ft)	Sample Collected (Yes/No)	Comments
Pad 45 – Area 2/3 (cont.)	5	WBG-235	Northeast of Pad 45	Source area characterization	WBGss-235-4122-SO	0 to 1	Yes	
					WBGso-235-4123-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-235-4124-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-236	Northwest of Pad 45	Source area characterization	WBGss-236-4125-SO	0 to 1	Yes	
					WBGss-236-4270-SO	0 to 1	Yes	Duplicate of WBG-4125
					WBGso-236-4126-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-236-4127-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-237	Northwest of Pad 45	Source area characterization	WBGss-237-4128-SO	0 to 1	Yes	Geoprobe
				Source area characterization	WBGso-237-4129-SO	2 to 4	Yes	Geoprobe
				Source area characterization	WBGso-237-4130-SO	4 to 6	Yes	Geoprobe
				Source area characterization	WBGso-237-4131-SO	6 to 8	Yes	Geoprobe
				Source area characterization	WBGso-237-4132-SO	8 to 10	Yes	Geoprobe
Pad 62 – Area 2/3	5	WBG-238	West of Pad 62	Source area characterization	WBGss-238-4133-SO	0 to 1	Yes	
					WBGso-238-4134-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-238-4135-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-239	South of Pad 62	Source area characterization	WBGss-239-4136-SO	0 to 1	Yes	
					WBGso-239-4137-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-239-4138-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-240	North-central part of Pad 62	Source area characterization	WBGss-240-4139-SO	0 to 1	Yes	
				Source area characterization	WBGso-240-4140-SO	2 to 4	Yes	
					WBGso-240-4141-SO	4 to 6	No	TNT and RDX field laboratory results BD in 2–4 ft soil sample
		WBG-241	East of Pad 62	Source area characterization	WBGss-241-4142-SO	0 to 1	Yes	
					WBGss-241-4271-SO	0 to 1	Yes	Duplicate of WBG-4142
					WBGso-241-4143-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-241-4144-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample

Table 3-1. Soil and Dry Sediment Sample List and Rationales, Winklepeck Burning Grounds Phase III Remedial Investigation (continued)

Functional Area	No. of Sample Stations	Sample Station ID	Location Description	Sample Station Rationale	Sample ID	Depth (ft)	Sample Collected (Yes/No)	Comments
Pad 62 – Area 2/3 (cont.)	5	WBG-242	Southeast quadrant of Pad 62	Source area characterization	WBGss-242-4145-SO	0 to 1	Yes	Geoprobe
				Source area characterization	WBGso-242-4146-SO	2 to 4	Yes	Geoprobe
				Source area characterization	WBGso-242-4147-SO	4 to 6	Yes	Geoprobe
				Source area characterization	WBGso-242-4148-SO	6 to 8	Yes	Geoprobe
				Source area characterization	WBGso-242-4149-SO	8 to 10	Yes	Geoprobe
Pad 66 – Area 2/3	5	WBG-243	West of Pad 66	Source area characterization	WBGss-243-4150-SO	0 to 1	Yes	
				Source area characterization	WBGso-243-4151-SO	2 to 3.8	Yes	
					WBGso-243-4273-SO	2 to 3.8	Yes	Duplicate of WBG-4151
					WBGso-243-4152-SO	4 to 6	No	Refusal at 3.8 ft
		WBG-244			WBGss-244-4153-SO	0 to 1	No	Client instructed field team to not collect this sample[a]
					WBGso-244-4154-SO	2 to 4	No	
					WBGso-244-4155-SO	4 to 6	No	
		WBG-245	Southeast of Pad 66, near stream	Source area characterization	WBGss-245-4156-SO	0 to 1	Yes	
					WBGso-245-4157-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-245-4158-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-246	South of Pad 66, near stream	Source area characterization	WBGss-246-4159-SO	0 to 1	Yes	
				Source area characterization	WBGso-246-4160-SO	2 to 4	Yes	
					WBGso-246-4161-SO	4 to 6	No	TNT and RDX field lab results BD in 2- to 4-ft soil sample
		WBG-247	Southeast quadrant of Pad 66	Source area characterization	WBGss-247-4162-SO	0 to 1	Yes	Geoprobe
				Source area characterization	WBGso-247-4163-SO	2 to 4	Yes	Geoprobe
					WBGso-247-4164-SO	4 to 6	No	Remaining Geoprobe sample intervals were not collected because groundwater was encountered in the borehole Geoprobe
					WBGso-247-4165-SO	6 to 8	No	Geoprobe
					WBGso-247-4166-SO	8 to 10	No	Geoprobe
Pad 67 – Area 2/3	5	WBG-248			WBGss-248-4167-SO	0 to 1	No	
					WBGso-248-4168-SO	2 to 4	No	
					WBGso-248-4169-SO	4 to 6	No	
		WBG-249	East of Pad 67	Source area characterization	WBGss-249-4170-SO	0 to 1	Yes	
					WBGso-249-4171-SO	2 to 4	No	
					WBGso-249-4172-SO	4 to 6	No	

Table 3-1. Soil and Dry Sediment Sample List and Rationales, Winklepeck Burning Grounds Phase III Remedial Investigation (continued)

Functional Area	No. of Sample Stations	Sample Station ID	Location Description	Sample Station Rationale	Sample ID	Depth (ft)	Sample Collected (Yes/No)	Comments
Pad 67 – Area 2/3 (cont.)	5	WBG-250	South of Pad 67	Source area characterization	WBGss-250-4173-SO	0 to 1	Yes	
					WBGso-250-4174-SO	2 to 4	No	
					WBGso-250-4175-SO	4 to 6	No	
		WBG-251	West of Pad 67	Source area characterization	WBGss-251-4176-SO	0 to 1	Yes	
					WBGso251-4177-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-251-4178-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-252	Southwest quadrant of Pad 67	Source area characterization	WBGss-252-4179-SO	0 to 1	Yes	Geoprobe
				Source area characterization	WBGso-252-4180-SO	2 to 4	Yes	Geoprobe
				Source area characterization	WBGso-252-4181-SO	4 to 6	Yes	Geoprobe
				Source area characterization	WBGso-252-4182-SO	6 to 8	Yes	Geoprobe
				Source area characterization	WBGso-252-4183-SO	8 to 10	Yes	Geoprobe
Pad 68 – Area 2/3	5	WBG-253	West of Pad 68	Source area characterization	WBGss-253-4184-SO	0 to 1	Yes	
					WBGso-253-4185-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-253-4186-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-254	Northeast quadrant of Pad 68	Source area characterization	WBGss-254-4187-SO	0 to 1	Yes	
				Source area characterization	WBGso-254-4188-SO	2 to 4	Yes	
					WBGso-254-4189-SO	4 to 6	No	TNT and RDX field laboratory results BD in 2- to 4-ft soil sample
		WBG-255	South of Pad 68	Source area characterization	WBGss-255-4190-SO	0 to 1	Yes	
				Source area characterization	WBGso-255-4191-SO	2 to 4	Yes	
					WBGso-255-4192-SO	4 to 6	No	TNT and RDX field laboratory results BD in 2- to 4-ft soil sample
		WBG-256	East of Pad 68	Source area characterization	WBGss-256-4193-SO	0 to 1	Yes	
					WBGso-256-4194-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-256-4195-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-257	Southeast quadrant of Pad 68	Source area characterization	WBGss-257-4196-SO	0 to 1	Yes	Because of UXO concerns this location was moved 28 ft west of the original designated location Geoprobe
					WBGss-257-4275-SO	0 to 1	Yes	Duplicate of WBG-4196 Geoprobe

Table 3-1. Soil and Dry Sediment Sample List and Rationales, Winklepeck Burning Grounds Phase III Remedial Investigation (continued)

Functional Area	No. of Sample Stations	Sample Station ID	Location Description	Sample Station Rationale	Sample ID	Depth (ft)	Sample Collected (Yes/No)	Comments
Pad 68 – Area 2/3 (cont.)	5	WBG-257 (cont.)		Source area characterization	WBGso-257-4197-SO	2 to 4	Yes	Geoprobe
				Source area characterization	WBGso-257-4198-SO	4 to 6	Yes	Geoprobe
				Source area characterization	WBGso-257-4199-SO	6 to 8	Yes	Geoprobe
					WBGso-257-4276-SO	6 to 8	Yes	Duplicate of WBG-4199 Geoprobe
				Source area characterization	WBGso-257-4200-SO	8 to 10	Yes	Geoprobe
Pad 32	1	WBG-258	Adjacent to southeast corner of Pad 32	Source area characterization	WBGss-258-4201-SO	0 to 1	Yes	
					WBGso-258-4202-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-258-4203-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
Area 5 – Contingency		WBG-259	In "D" sample area south of southwest corner of Building 4301	Potential source area confirmation	WBGss-259-4204-SO	0 to 1	Yes	
					WBGso-259-4205-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-259-4206-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-260	In "D" sample area south of Building 4301	Potential source area confirmation	WBGss-260-4207-SO	0 to 1	Yes	
					WBGso-260-4208-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-260-4209-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-261	In "D" sample area north of Building 4301	Potential source area confirmation	WBGss-261-4210-SO	0 to 1	Yes	
					WBGso-261-4211-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-261-4212-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
		WBG-262	East of Pad 32 in low-lying area	Potential source area confirmation	WBGss-262-4213-SO	0 to 1	Yes	
					WBGso-262-4214-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-262-4215-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample

Table 3-1. Soil and Dry Sediment Sample List and Rationales, Winklepeck Burning Grounds Phase III Remedial Investigation (continued)

Functional Area	No. of Sample Stations	Sample Station ID	Location Description	Sample Station Rationale	Sample ID	Depth (ft)	Sample Collected (Yes/No)	Comments
Area 5 – Contingency (cont.)		WBG-263	North of Pad 58	Potential source area confirmation	WBGss-263-4216-SO	0 to 1	Yes	
					WBGso-263-4217-SO	2 to 4	No	TNT and RDX field laboratory results BD in surface soil sample
					WBGso-263-4218-SO	4 to 6	No	TNT and RDX field laboratory results BD in surface soil sample
Area 4 – Random Grid	30	WBG-264	South-southwest of Pad 27, adjacent to firebreak	Confirmation of absence of contamination	WBGss-264-4219-SO	0 to 1	Yes	
		WBG-265	South-southwest of Pad 58, across road and adjacent to firebreak	Confirmation of absence of contamination	WBGss-265-4220-SO	0 to 1	Yes	
		WBG-266	Southwest of Pad 5, 140 ft west across firebreak	Confirmation of absence of contamination	WBGss-266-4221-SO	0 to 1	Yes	
					WBGss-266-4279-SO	0 to 1	Yes	Duplicate of WBG-4221
		WBG-267	55 ft north of road and Pad 59, in berm	Confirmation of absence of contamination	WBGss-267-4222-SO	0 to 1	Yes	
		WBG-268		Confirmation of absence of contamination	WBGss-268-4223-SO	0 to 1	Yes	
					WBGss-268-4281-SO	0 to 1	Yes	Duplicate of WBG-4223
		WBG-269	North of Pad 6, 25 ft south of firebreak	Confirmation of absence of contamination	WBGss-269-4224-SO	0 to 1	Yes	
		WBG-270	North of Pad 64, 180 ft north of firebreak, east of George Rd	Confirmation of absence of contamination	WBGss-270-4225-SO	0 to 1	Yes	
		WBG-271	North of Pads 66 & 67, north of firebreak, east of George Rd	Confirmation of absence of contamination	WBGss-271-4226-SO	0 to 1	Yes	
		WBG-272	North of Pad 68, 25 ft north of firebreak, east of George Rd	Confirmation of absence of contamination	WBGss-272-4227-SO	0 to 1	Yes	
		WBG-273	Northeast of Pad 70, 150 ft northeast of firebreak, 60 ft from abandoned railroad bed	Confirmation of absence of contamination	WBGss-273-4228-SO	0 to 1	Yes	
		WBG-274	Northeast of Pad 45, near creek	Confirmation of absence of contamination	WBGss-274-4229-SO	0 to 1	Yes	
		WBG-275	North of Pad 46, 150 ft off Road D-West on other side of berm	Confirmation of absence of contamination	WBGss-275-4230-SO	0 to 1	Yes	

Table 3-1. Soil and Dry Sediment Sample List and Rationales, Winklepeck Burning Grounds Phase III Remedial Investigation (continued)

Functional Area	No. of Sample Stations	Sample Station ID	Location Description	Sample Station Rationale	Sample ID	Depth (ft)	Sample Collected (Yes/No)	Comments
Area 4 – Random Grid (cont.)	30	WBG-276	South of Pad 63, across ditch, approximately 200 ft south of gravel road	Confirmation of absence of contamination	WBGss-276-4231-SO	0 to 1	Yes	
		WBG-277	Northwest of Pad 50, 50 ft east of George Rd	Confirmation of absence of contamination	WBGss-277-4232-SO	0 to 1	Yes	
		WBG-278	Between Pads 52 and 53, approximately 125 ft north of Winklepeck Road	Confirmation of absence of contamination	WBGss-278-4233-SO	0 to 1	Yes	
		WBG-279	Northeast of Pad 68, 45 ft west of well WBG-17	Confirmation of absence of contamination	WBGss-279-4234-SO	0 to 1	Yes	
		WBG-280	Northeast of Pad 18, 70 ft north of road	Confirmation of absence of contamination	WBGss-280-4235-SO	0 to 1	Yes	
		WBG-281	Southeast of Pad 30 in trees, 120 ft south of C-West Road	Confirmation of absence of contamination	WBGss-281-4236-SO	0 to 1	Yes	
					WBGss-281-4272-SO	0 to 1	Yes	Duplicate
		WBG-282	Approximately 100 ft south of Pad 32	Confirmation of absence of contamination	WBGss-282-4237-SO	0 to 1	Yes	
		WBG-283	Northeast of Pad 20 in trees	Confirmation of absence of contamination	WBGss-283-4238-SO	0 to 1	Yes	
		WBG-284	North of Building 1603, 100 ft north of road	Confirmation of absence of contamination	WBGss-284-4239-SO	0 to 1	Yes	
		WBG-285	175 ft east of Building 1602, 35 ft north of road near ditch	Confirmation of absence of contamination	WBGss-285-4240-SO	0 to 1	Yes	
		WBG-286	West of Building S-1403, southeast of 90-degree bend in road	Confirmation of absence of contamination	WBGss-286-4241-SO	0 to 1	Yes	
		WBG-287	South of MW-113, across firebreak, west of George Rd	Confirmation of absence of contamination	WBGss-287-4242-SO	0 to 1	Yes	
		WBG-288	55 ft south of firebreak, west of George Rd, 50 ft west of Mack's Pond	Confirmation of absence of contamination	WBGss-288-4243-SO	0 to 1	Yes	
		WBG-289	150 ft south of firebreak across berm	Confirmation of absence of contamination	WBGss-289-4244-SO	0 to 1	Yes	
		WBG-290	40 ft south of gravel road, southwest of concrete bunker	Confirmation of absence of contamination	WBGss-290-4245-SO	0 to 1	Yes	
		WBG-291	70 ft south of firebreak, off George Rd, south of Building 1603	Confirmation of absence of contamination	WBGss-291-4246-SO	0 to 1	Yes	

Table 3-1. Soil and Dry Sediment Sample List and Rationales, Winklepeck Burning Grounds Phase III Remedial Investigation (continued)

Functional Area	No. of Sample Stations	Sample Station ID	Location Description	Sample Station Rationale	Sample ID	Depth (ft)	Sample Collected (Yes/No)	Comments
Area 4 – Random Grid (cont.)	30	WBG-292-	South of Pad 24, 35 ft south of firebreak	Confirmation of absence of contamination	WBGss-292-4247-SO	0 to 1	Yes	
					WBGss-292-4280-SO	0 to 1	Yes	Duplicate of WBG-4247
		WBG-293	300 ft south of firebreak, off George Rd, west of stream	Confirmation of absence of contamination	WBGss-293-4248-SO	0-1	Yes	
Area 6 – Sediment		WBG-294	From continuation of ditch beginning between Pads 59 and 60, north of "E" Rd and firebreak, near pond		WBGsd-294-4249-SO	0 to 0.5	Yes	
		WBG-295	From ditch (in line with 12-in. culvert under road) between Pads 59 and 60, north of "E" Road		WBGsd-295-4250-SO	0 to 0.5	Yes	

[a]Samples WBG-228 and WBG-244, planned for Pads 38 and 66, respectively, were not collected per instructions from the client. In both cases, it was deemed the analytical capacity could better be applied to contingency samples (especially north of Pads 58 and 59). Sufficient samples were determined to have been collected from Pads 38 and 66 based on field explosives anaysis, and the elimination of these stations did not affect the Phase III characterization at these two pads.

BD = Bedrock.
ID = Identification.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
TNT = Trinitrotoluene.
UXO = Unexploded ordnance.

3.1.1 Rationale

Soil samples were collected during the WBG Phase III RI to (1) define contaminant nature and extent in known areas of soil contamination, (2) provide sufficient data for remedial alternatives analysis, (3) determine if leaching processes may be contributing to groundwater contamination, as described in the DQOs.

Included in the sampling strategy for soils at WBG was the use of color spectrophotometry, or colorimetry, to analyze TNT and RDX in the field (see Section 3.4.1). The rationale for employing the field method was to identify the presence of explosive compounds at a specific sample location on a "real-time" basis to guide sampling efforts for lateral and vertical characterization of explosive compounds. At stations where these compounds were identified at concentrations greater than 1 mg/kg in the surface soil interval, field teams collected a subsurface soil sample to characterize vertical distribution of contamination. Figure 3-4 illustrates application of field explosives field analysis in guiding the Phase III RI sampling efforts. On the basis of the field colorimetric results for TNT and RDX, all samples that had detectable levels of these compounds in the field method were sent to the fixed-base laboratory for explosives and propellant analysis. In addition, 15% of the samples having no detected TNT or RDX using the field methods were submitted to the fixed-base laboratory for analysis for QA purposes. As discussed further in Section 3.4.1, an error in the field explosives procedure resulted in some samples with TNT or RDX greater than 1 mg/kg not being sent to the fixed-based laboratory.

3.1.1.1 Surface soil and dry sediment

As presented in Table 3-1, soil sampling locations were categorized by geographic location and sample type. The categories include: (1) source area characterization, (2) contingency samples, and (3) random grid samples in non-production areas. The rationales for collection of these categories of samples are summarized below.

Source Area Characterization

Surface soil samples and dry sediments in ditches (0 to 1 ft) were collected using hand augers to complete assessment of the horizontal extent of contamination and evaluate likely contaminant accumulation points. The rationale for this biased surface soil and sediment sampling strategy was to fully characterize the pads and areas that pose the greatest threat to the environment based on the results of the Phase II RI (note that in the Phase I RI, surface soil samples were collected from 0 to 2 ft bgs). The exact locations of the samples were finalized in the field based on observations (e.g., staining, vegetative stress, drainage, etc.).

Biased surface soil samples were collected from the following source areas:

1. Pad 58
2. Pad 59
3. Pad 60
4. Pad 61
5. Pad 37
6. Pad 38
7. Pad 45
8. Pad 62
9. Pad 66
10. Pad 67
11. Pad 68
12. Pad 32

Pad 32 was added to the original list of source areas identified in the SAP Addendum No. 1 for the WBG FS based on the results of the Ecological Field Effects Study (USACE 2003a).

The sampling locations are shown on Figures 3-1, 3-2, and 3-3. The number of samples identified for each area, as well as the required chemical analyses, was outlined in Table 5-1 of the SAP Addendum No. 1

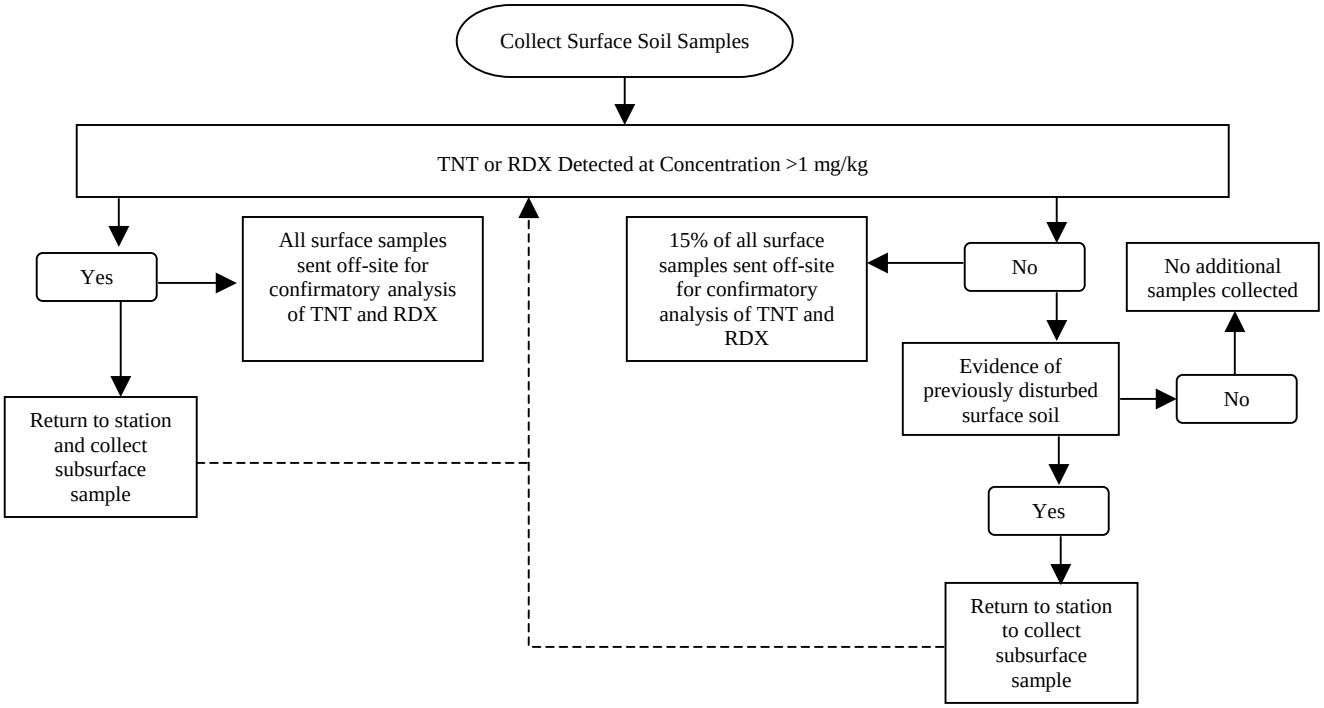


Figure 3-4. Field Explosives Screening Rationale

for the WBG FS (USACE 2000). Table 3-1 details where departures from the SAP Addendum occurred due to field conditions and evaluation of field analytical results. Appendices A and B contain logs for surface soil and dry sediment samples, respectively.

The results of the Phase II RI at WBG indicated that the release of explosive residues, metals, and other chemicals onto surface soils occurred at several of the pads. The assemblage of possible contaminants was found to vary with the historical functions or uses of the pads. Operational information indicates that some of the largest berms (especially those at Pads 58 through 60) may be at least partially constructed of scrap metal, ash, and other materials pushed off the burning pads. Thus, the berms surrounding Pads 59 and 60 and areas on the north side of Pallet Road E West were evaluated for the first time as potential source areas.

Dry sediment samples were collected from only two locations during the WBG Phase III RI (stations WBG-294 and WBG-295). The samples were collected from the 0- to 0.5-ft interval from a drainage ditch exiting the WBG to the north through a culvert between Pads 59 and 60 (Figure 3-2). The first sample was collected adjacent to the north side of Road E and the second at the confluence of the ditch with a small, unnamed pond and wetland area north of WBG.

Contingency Samples

Seven biased contingency surface soil samples were used to characterize any additional identified areas exhibiting obvious visual evidence of contamination (Table 3-1). The rationale for locating contingency surface soil samples was to target areas of obvious staining or discoloration, evidence of ordnance and explosives (OE), or areas in which additional sampling was deemed necessary based on field observations. If field analyses indicated no explosives were present, no further sampling was performed in that area. However, if colorimetric analyses showed TNT or RDX ≥ 1 parts per million (ppm), then additional

samples were collected to map horizontal extent and subsurface soil sampling was performed, as needed, to determine vertical extent. As noted on Table 3-1, one biased surface soil contingency sample was collected in the area of the vegetation measurements at Pad 32, which indicated a high ecological HQ value due to aluminum. Three samples were collected from Building 4301, which had not been previously characterized. An additional sample was collected north of Pad 59 in a suspected former burn pit. Two samples were collected northwest of Pad 58 based on field laboratory results.

Random Grid Samples

In addition to the biased surface soil sampling within the areas described above, 30 random grid samples were collected at WBG following Section 3.2.9.2 of the Facility-wide SAP (USACE 2001b; Figure 3-5). The objective of random grid sampling is to characterize areas between the pads and burn pits that were identified as contaminated in the Phase II RI, as well as areas outside the functional area of the AOC. This sampling approach was used to confirm that no contamination in soils associated with WBG has been overlooked in the RI. Random sample points were assigned to 30 exposure units constituting WBG. These samples were analyzed for XRF and TAL metals and field explosives only.

3.1.1.2 Subsurface soil

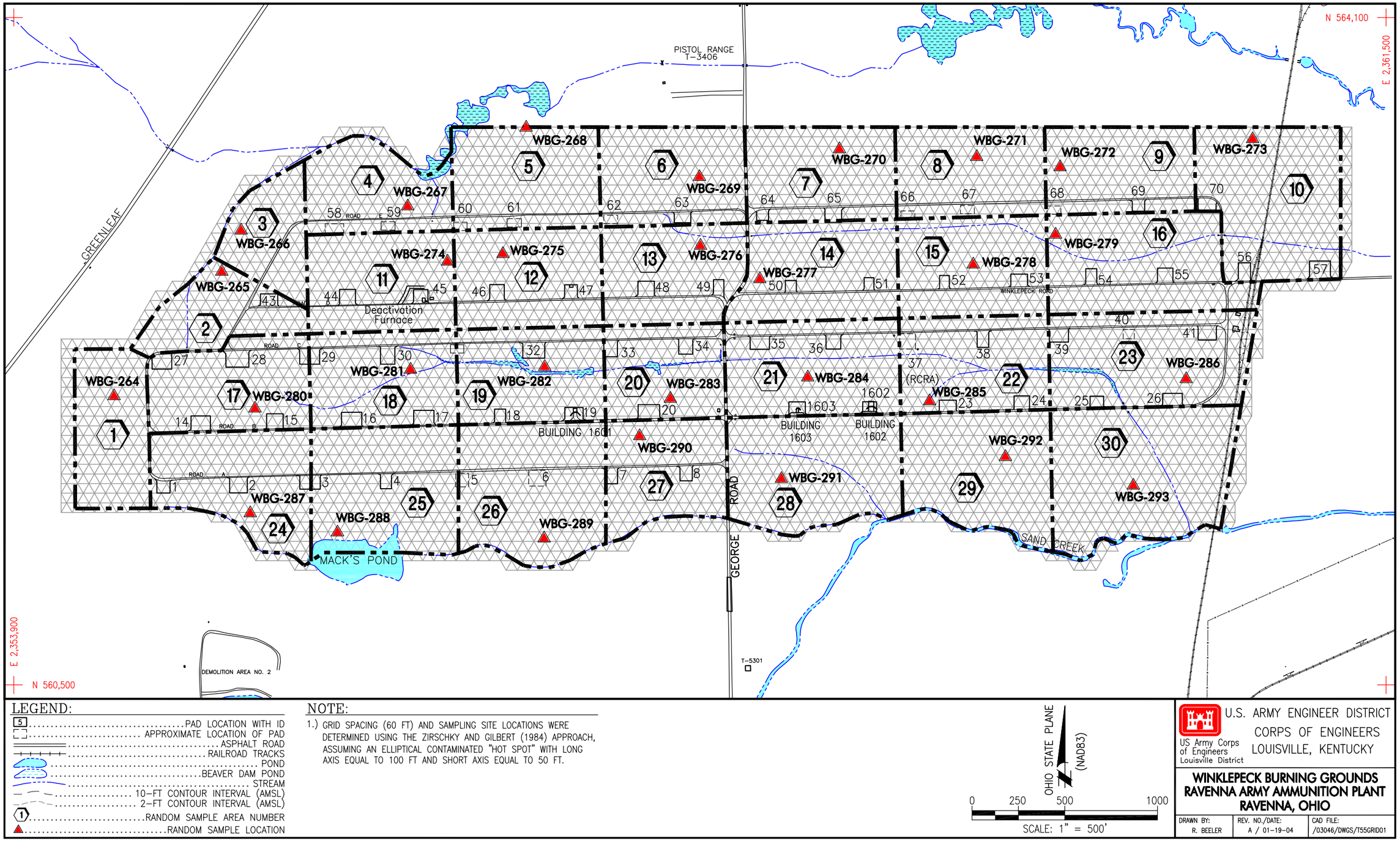
A total of 54 subsurface soil samples were collected from 16 biased hand auger borings where field colorimetric results indicated explosives contamination in the overlying surface soil sample and 9 Geoprobe borings (Table 3-1, Figures 3-1, 3-2, and 3-3). Subsurface soil samples were collected at a total of 10 former burning pads

1. Pad 37
2. Pad 38
3. Pad 45
4. Pad 58
5. Pad 59
6. Pad 61
7. Pad 62
8. Pad 66
9. Pad 67
10. Pad 68

Sampling at these locations was conducted using hand auger equipment. Fifteen samples were from 2- to 4-ft intervals; four samples were collected from 4- to 6-ft intervals. Two samples were collected from 6- to 8-ft intervals. In a few cases, the full sample interval could not be collected, either because of evidence of OE or because of the presence of groundwater in the soil boring.

To provide data regarding vertical distribution of contamination, subsurface soils samples were also collected at nine predetermined locations to depths of 10 ft using Geoprobe equipment. These locations were at Phase I or II RI sample stations that exhibited the highest concentrations of contamination (explosives or metals in absence of explosives contamination). Table 3-2 lists the rationales for selection of the Geoprobe locations along with their corresponding Phase I or II RI sample station. All locations were sampled to a depth of 10 ft bgs, with the exception of station WBG-247, where groundwater was encountered at 4 ft bgs.

Undisturbed subsurface soil samples were collected using a thin-walled (Shelby) tube sampler from two of the eight monitoring wells installed as part of the WBG Phase III investigation. Samples were collected using this device as part of hollow-stem auger drilling of boreholes for the monitoring wells. Both Shelby tube samples were collected from depths of 1 to 3 ft, per Section 4.4.2.4.1 of the Facility-wide SAP. All samples were analyzed for dry unit weight, grain size distribution, moisture content, Atterberg limits, Unified Soil Classification System (USCS), total organic carbon, hydraulic conductivity, specific gravity, redox potential, and pH.



LEGEND:

- [5] ..... PAD LOCATION WITH ID
- [ ] ..... APPROXIMATE LOCATION OF PAD
- ..... ASPHALT ROAD
- ..... RAILROAD TRACKS
- ..... POND
- ..... BEAVER DAM POND
- ..... STREAM
- ..... 10-FT CONTOUR INTERVAL (AMSL)
- ..... 2-FT CONTOUR INTERVAL (AMSL)
- (1) ..... RANDOM SAMPLE AREA NUMBER
- ▲ ..... RANDOM SAMPLE LOCATION

NOTE:

1.) GRID SPACING (60 FT) AND SAMPLING SITE LOCATIONS WERE DETERMINED USING THE ZIRSCHKY AND GILBERT (1984) APPROACH, ASSUMING AN ELLIPTICAL CONTAMINATED "HOT SPOT" WITH LONG AXIS EQUAL TO 100 FT AND SHORT AXIS EQUAL TO 50 FT.

OHIO STATE PLANE (NAD83)

0 250 500 1000

SCALE: 1" = 500'

US Army Corps of Engineers Louisville District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

WINKLEPECK BURNING GROUNDS
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE:
R. BEELER	A / 01-19-04	/03046/DWGS/T55GRID01

Figure 3-5. Winklepeck Burining Grounds Phase III Remedial Investigation Random Grid Soil Sampling Locations

Table 3-2. Rationale for Selection of Winklepeck Burning Grounds Feasibility Study Geoprobe Locations

Pad No.	Phase III RI Geoprobe Station	Corresponding Phase I or Phase II RI Sampling Station	Rationale
58	WBG-203	WBGss-114	Maximum observed metals: lead at 1,020 mg/kg, mercury at 0.3 mg/kg, and cadmium at 80 mg/kg
59	WBG-210	WBGso-055	Maximum observed explosives (TNT at 33 mg/kg) and lead at 916 mg/kg
37	WBG-227	WBGss-107	Maximum observed lead (1,490 mg/kg), detected HMX, RDX, and TNT
38	WBG-232	WBGss-034	Maximum observed lead (504 mg/kg) and cadmium (877 mg/kg). Trace levels of DNT
45	WBG-237	WBGss-146	Maximum observed lead (2,200 mg/kg), zinc (24,900 mg/kg), mercury (0.34 mg/kg), and cadmium (234 mg/kg)
62	WBG-242	WBGso-062	Maximum observed TNT (36 mg/kg), RDX (270 mg/kg), and HMX (38 mg/kg)
66	WBG-247	WBGss-069	Maximum observed TNT (3,800 mg/kg) and TNB (76 mg/kg)
67	WBG-252	WBGss-071	Subsurface maximum observed HMX (14 mg/kg), RDX (82 mg/kg), TNT (26 mg/kg), and TNB (6.9 mg/kg)
68	WBG-257	WBGss-142	Maximum observed TNT (17 mg/kg) and mercury (1.2 mg/kg)

DNT = Dinitrotoluene.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
RI = Remedial investigation.
TNB = Trinitrobenzene.
TNT = Trinitrotoluene.

3.1.2 Surface and Subsurface Soil Field Sampling Methods

3.1.2.1 Surface soil and dry sediment

All surface soil and dry sediment samples collected in the Phase III RI at WBG were collected using hand augers, as described in the SAP Addendum No. 1 for the WBG FS (USACE 2000). A decontaminated stainless steel bucket hand auger was used to collect surface soil samples at each station. The target depth interval for surface soil samples was 0 to 1 ft. The 0- to 1-ft interval was sampled using the bucket hand auger and the sample was submitted for field analysis of explosives as well as fixed-base laboratory analysis of explosives and metals. Field descriptions and classification of the soils was performed and the results recorded in the project logbooks in accordance with Section 4.4.2.3 of the Facility-wide SAP, as specified in the SAP Addendum No. 1 for the WBG FS, with the following exception. Headspace gases were not screened in the field for organic vapors. Organic vapor measurements were made in the breathing zone during sampling and at the top of the boring and recorded in the field logbooks. Where analyses for explosives and propellant compounds were specified, composite samples were collected. Because of the physical characteristics of these explosives and propellant compounds (e.g., flakes, particles, and pellets) and the nature of process operations, the distribution of these types of compounds can be erratic and highly variable. Composite sampling has been shown to reduce statistical sampling error in surface soil data at sites with a history of explosives contamination in surface soils (Jenkins et al. 1996) and to increase the likelihood of capturing detectable levels of explosive compounds over a given area. Composite sampling data are considered acceptable to EPA (RAGS, Part A) to assess the presence or absence of contamination in soil, sediment, groundwater, or surface water; however, they may be used in risk assessment only to represent average concentrations over the area or time frame sampled (EPA 1989).

To collect composite samples for surface soil and dry sediment, three borings were hand augered in an equilateral triangle pattern measuring about 3 ft on a side. Equal portions of soil from the three subsamples were placed into a large, decontaminated stainless steel bowl, homogenized, and then samples for explosive

and propellant compounds analyses were placed into appropriate containers. A portion of the sample was extracted from the sample container for field colorimetric analysis of TNT and RDX.

Samples for analyses of other contaminants [e.g., inorganics, SVOCs, volatile organic compounds (VOCs), etc.] were collected from a boring placed in the approximate center of the triangle formed by the three subsamples. The material from the center boring was placed into a decontaminated stainless steel bowl and samples for VOC analyses were immediately placed into the appropriate sample containers. The remaining soil was mixed thoroughly and samples for non-volatile constituents were placed into the appropriate sample containers.

Dry sediment samples were collected from a discrete point from 0 to 0.5 ft in the drainage conveyance using a decontaminated hand bucket auger or stainless steel scoop or trowel. The sample material was placed into a decontaminated stainless steel bowl and samples for VOC analyses were immediately placed into the appropriate sample containers. The remaining soil was mixed thoroughly and samples for non-volatile constituents placed into the appropriate sample containers.

Field descriptions and classifications for the soil samples were performed and the results recorded in the project logbooks in accordance with Section 4.4.2.3 of the Facility-wide SAP, as specified in the SAP Addendum No. 1 for the WBG FS, with the following exception. Headspace gases were not screened in the field for organic vapors. Organic vapor measurements were made in the breathing zone during sampling and the results recorded in the field logbooks.

Following collections of the sample, excess soil was designated as investigation-derived waste (IDW) and placed in lined, labeled 55-gal drums that were sealed after use and staged at the designated Field Staging Area within the load line. IDW practices for all media are discussed in Appendix O. Hand auger borings were backfilled to the ground surface with dry bentonite chips following collection of all necessary surface and subsurface soil samples.

3.1.2.2 Subsurface soil

Hand Auger Borings

Subsurface soil samples were collected using a hand auger at each location where surface soil samples exhibited evidence of explosives contamination (i.e., TNT and/or RDX greater than or equal to 1 ppm by field colorimetric analysis). The 2- to 4-ft subsurface interval was initially sampled. If the sample tested positive for either TNT or RDX at 1 ppm or greater in the field laboratory, sample collection from the 4- to 6-ft interval was performed. This process continued until field explosives values were less than 1 ppm or the boring could not be deepened any more using this sampling method.

To collect subsurface samples for chemical analyses, a decontaminated auger bucket was used to deepen the surface soil boring over the required depth interval. At locations where composite sampling was performed for explosive and propellant compound analysis, the subsurface sample was obtained by deepening the surface soil boring located in the center of the equilateral triangle. If refusal occurs in the center boring, the subsurface samples are collected by deepening one of three equilateral subsampling points. Where possible, subsurface soil borings were advanced using only the hand auger; however, where necessary, a power auger was used to advance the boring to the top of the sample interval and then bucket augers were used to collect the sample from the interval of interest.

Soil from the subsurface interval was placed into a decontaminated stainless steel bowl, mixed using a decontaminated stainless steel spoon or trowel, and representative aliquots were placed into the appropriate sample containers. All VOC samples were collected as discrete aliquots from the middle of the interval

without homogenization. As with surface soil samples, a portion of the sample designated for explosives and propellant compound analyses was extracted from the sample container for field colorimetric analysis of TNT and RDX. As required by field method results or for confirmation purposes, the remaining portion was submitted to the fixed-base laboratory for explosives and propellant analysis, as applicable.

Following collections of the sample, excess soil was designated as IDW and placed in lined, labeled 55-gal drums that were sealed after use and staged at the designated Field Staging Area within the load line. IDW practices for all media are discussed in Appendix O. Hand auger borings were backfilled to the ground surface with dry bentonite chips.

Subsurface Soil Sampling Using Geoprobe Equipment

The Geoprobe equipment used for subsurface sample collection was a 2-in. outside-diameter macro-core sampling device, advanced using 1-in.-diameter steel rods attached to the hydraulic device and used in accordance with Section 4.4.2.1.5 of the Facility-wide SAP. The hydraulic device was used to retrieve continuous samples at the nine locations described above, from the ground surface through depths to 10 ft bgs, in 2-ft intervals. Core retrieval was accomplished by inserting a clear acetate liner into the macro-core sampler, attaching the core barrel to the hydraulic-push device, and advancing the sampler through the unconsolidated material. Successive depth intervals were reached by attaching additional steel rods of approximately 3 ft in length. Upon retrieval of the sampler, the acetate liner was removed, marked, and split open for collection of discrete soil samples. Soil was removed from the liner and placed in sample containers using stainless-steel spoons and scoops in accordance with Section 4.2.2 of the SAP Addendum No. 1 for the WBG FS. Aliquots of soil from these samples were subjected to field colorimetric analyses for explosives. However, all Geoprobe soil samples were analyzed in the fixed-base laboratory for explosives regardless of field colorimetric result.

Organic vapors were monitored in the subsurface soil borings using hand-held organic vapor analyzers (OVAs). No headspace samples were collected. Breathing zone gas concentrations were recorded in the project logbooks.

Following collection of the sample, the subsurface soil lithologies and/or general soil characteristics were recorded in the project logbooks. Each borehole was plugged with bentonite hole plug and water. Excess soil from the boreholes was placed in lined, labeled 55-gal drums that were sealed after each use and staged at Building 1036. IDW practices for all media are discussed in Appendix O.

All soil and dry sediment samples were also screened in the field for metals using a portable XRF spectrometer. In situ measurements of the concentrations of 24 metals were collected at each surface soil/sediment sampling location, using each of the four surface boreholes as a measurement point. In addition, an aliquot of each homogenized soil/sediment sample was subjected to ex situ analyses in an on-site laboratory. Both the in situ and ex situ measurements were made using Niton® instruments. Unlike the explosives field screening, the XRF method was not used to select samples for fixed-base laboratory analysis. Rather, all soils samples were sent to the laboratory for analysis with the standard SW-846 technique regardless of the field results. A discussion of the XRF methodology is presented in Section 3.4.2. All surface soil samples collected at WBG during the Phase III RI were analyzed for target analyte list (TAL) metals and cyanide. VOCs, SVOCs, and polychlorinated biphenyls (PCBs) were analyzed at random in 10% of the surface soil or sediment samples. Hexavalent chromium was evaluated in 40 samples.

3.2 GROUNDWATER CHARACTERIZATION

3.2.1 Rationale

Groundwater characterization was performed in order to conduct a more accurate assessment of flow patterns and contamination. Accordingly, the existing monitoring wells were sampled and additional monitoring wells were installed as part of the WBG Phase III RI to further assess groundwater contamination and potential migration pathways. Groundwater characterization efforts included installation of monitoring wells immediately downgradient of pads identified as having residual soil contamination and along the eastern boundary of WBG to determine whether groundwater and potential contaminant transport is occurring off of the AOC (Figure 3-6). The rationale for the placement of these wells is presented in Table 3-3.

Table 3-3. Rationale for Placement of Monitoring Wells at Winklepeck Burning Grounds

Well ID	Location	Rationale
WBGmw-010	South of Pad 58	Close to potential source area
WBGmw-011	Southeast of Pad 45	Immediately downgradient of Deactivation Furnace Area (former RCRA unit)
WBGmw-012	Southeast of Pad 27	West end of WBG – furthest west well inside AOC boundary, presumed upgradient
WBGmw-013	Southeast corner of Pad 2	Upgradient of Mack's Pond and WBGmw-009
WBGmw-014	Southeast of Pad 26 on east end of WBG	Potential interception point for contaminants from the west end of WBG
WBGmw-015	Southeast of Pad 38	Downgradient of former RCRA unit (OBG) and contaminated surface soils
WBGmw-016	East end of WBG between Pads 56 and 57	Downgradient of all known WBG source areas at AOC boundary
WBgmw-017	Northeast corner of WBG near Pad 68	Downgradient of potential source area and WBGmw-006

AOC = Area of concern.
OBG = Open Burning Ground.
RCRA = Resource Conservation and Recovery Act.
WBG = Winklepeck Burning Grounds.

3.2.2 Monitoring Well Installation Methods

Monitoring well installation was conducted in accordance with Section 4.3.2 of the Facility-Wide SAP, as referenced by the SAP Addendum No. 1 for the WBG FS. Monitoring wells were installed using hollow-stem auger drilling methods under the direct supervision of a qualified geologist. A 4.25-in. inside diameter, hollow-stem auger was used to advance the borehole through unconsolidated materials. Soil samples were collected continuously from the surface to bedrock refusal or planned borehole termination using a split-barrel sampler. Soil sampling was conducted during well drilling for description of soil stratigraphy in accordance with the USCS using standard Munsell soil color charts (Munsell 1988). Geotechnical samples only were collected from two monitoring well borings in the unconsolidated zone (WBGmw-014 and WBGmw-015). A borehole log, including lithologic information, was entered in the project logbooks for each monitoring well boring. The monitoring well boring logs are provided in Appendix C.

Organic vapors were monitored from soil cuttings at each borehole using a hand-held OVA. The breathing zone was continuously monitored for evidence of organic chemicals. Samples for headspace readings were not collected. All readings are recorded in the project logbooks.

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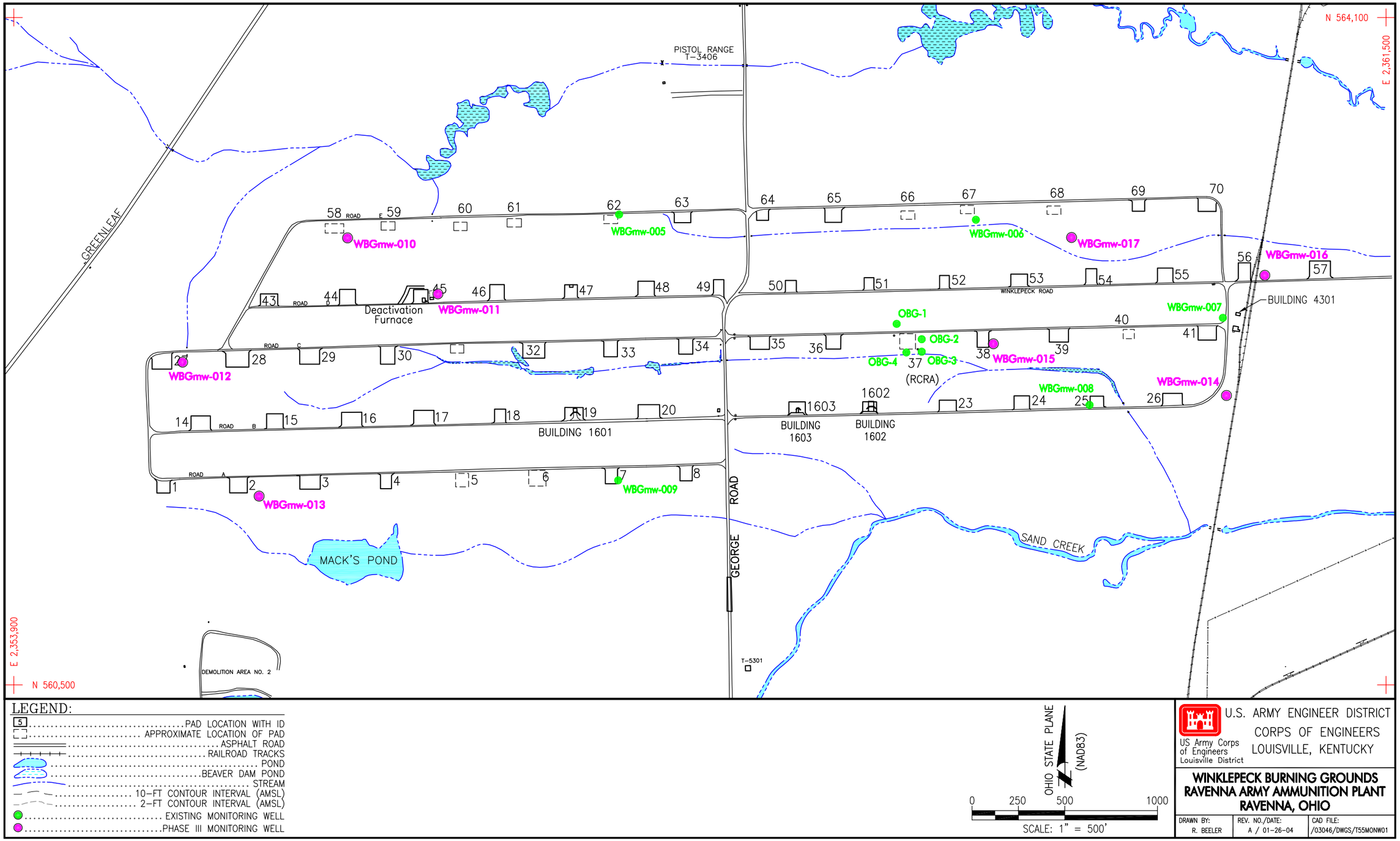

LEGEND:

- 5 ..... PAD LOCATION WITH ID
- ..... APPROXIMATE LOCATION OF PAD
- ..... ASPHALT ROAD
- ..... RAILROAD TRACKS
- ..... POND
- ..... BEAVER DAM POND
- ..... STREAM
- ..... 10-FT CONTOUR INTERVAL (AMSL)
- ..... 2-FT CONTOUR INTERVAL (AMSL)
- ..... EXISTING MONITORING WELL
- ..... PHASE III MONITORING WELL

OHIO STATE PLANE (NAD83)

0 250 500 1000

SCALE: 1" = 500'

US Army Corps of Engineers Louisville District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

WINKLEPECK BURNING GROUNDS
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE:
R. BEELER	A / 01-26-04	/03046/DWGS/T55MONW01

Figure 3-6. Winklepeck Burning Grounds Phase I, II, and III Monitoring Well Locations

Upon reaching the approximate target depth for each boring, drilling operations were halted for approximately 1 hr to determine the amount of groundwater recharge. The objective for this step was to ensure that at least one-half of the screened interval for each well was below the water table. If sufficient groundwater recovery occurred, the field crew proceeded with reaming of the borehole to the proper diameter and construction of the monitoring well. If a sufficient water column was not present, the boring was advanced further.

Following drilling of monitoring well boreholes to the appropriate depths, monitoring wells were constructed from pre-cleaned 2.0-in. schedule 40 polyvinyl chloride (PVC) pipe. Well screens were commercially fabricated with slot widths of 0.005 or 0.01 in. The monitoring wells were constructed using 3-m (10-ft) screens. The well casing and screen were assembled and lowered into the open borehole. Following placement of the well casing and screen, a pre-washed filter pack, consisting of Global Supply No. 7 sand, was tremied in place from the bottom of the borehole to approximately 2 ft above the top of the well screen in each well. A 2- or 3-ft bentonite pellet annular seal was then poured into the borehole on top of the filter pack.

For monitoring well completion, a grout mixture consisting of Type I Portland cement and 5% bentonite was then tremied from the top of the annular seal to the ground surface, followed by the placement of a protective steel surface casing and construction of a mortar collar and cement pad. Three steel posts were installed around each well, painted, and labeled. Monitoring well installation procedures are provided in Section 4.3.2 of the Facility-wide SAP. Note that two wells, WBGmw-015 and WBGmw-017, were determined during completion to be too shallow to accommodate the necessary thickness of bentonite seal and cement backfill material. These wells were plugged and abandoned according to the Facility-wide SAP, and re-drilled at locations close to the original borings. Monitoring wells were then installed to Facility-wide SAP specifications. Construction diagrams, provided in Appendix C, summarize the construction details for the monitoring wells installed during the Phase III RI at WBG, including depths, screened intervals, and groundwater elevations. This information is summarized in Table 3-4.

Table 3-4. Summary of Winklepeck Burning Grounds Monitoring Well Construction Data

Well ID	Total Depth (ft)	Elevation (GL)	Elevation (TOC)	Screened Interval (ft below TOC)	Lithology in Screened Interval	Year Installed
OBG-1	18	1,016.92	1,017.42	13 to 18	Clayey silt with sand	1992
OBG-2	19	1,013.37	1,013.67	14 to 19	Clayey silt	1992
OBG-3	19	1,012.41	1,012.91	14 to 19	Clayey silt with sand	1992
OBG-4	18.2	1,013.13	1,013.33	13 to 18	Fine sand with clay	1992
WBGmw-005	19	1,049.7	1,052.20	8.3 to 18.3	Clay with sand	1998
WBGmw-006	19	1,009.66	1,012.16	7.6 to 17.6	Sandy silty clay	1998
WBGmw-007	24	995.59	998.09	13.4 to 23.4	Clay and sand	1998
WBGmw-008	18.5	1,003.21	1,005.71	8.1 to 18.1	Sand	1998
WBGmw-009	24	1,042.53	1,045.03	11.4 to 21.4	Silty Sand	1998
WBGmw-010	20.8	1,067.1	1,069.85	10.5 to 20.5	Sand with silt	2000
WBGmw-011	21.3	1,069.7	1,072.38	7 to 17	Sand with silt and gravel	2000
WBGmw-012	24.3	1,076.5	1,079.11	19 to 29	Sand with silt	2000
WBGmw-013	21.3	1,069.1	1,071.1	11 to 21	Sand with silt	2000
WBGmw-014	22.3	994.1	996.78	12 to 22	Sand with silt and gravel	2000
WBGmw-015	19.3	1,009.1	1,011.6	9 to 19	Sand with silt and gravel	2000
WBGmw-016	24	994.9	997.03	13 to 23	Sand with silt and gravel	2000
WBGmw-017	21.3	1,004.0	1,006.62	11 to 21	Sand with fine silt	2000

GL = Ground level.
ID = Identification.
TOC = Top of casing.

3.2.3 Well Development Methods

At least 48 hr after completion, each monitoring well was developed so that representative groundwater samples could be collected. Well development was accomplished by purging at least five well volumes of groundwater, using a submersible pump or a bailer, until the development water was visually clear and sediment thickness in the well was less than 0.1 ft. Well development records were included in the project logbooks and are provided in Appendix D.

3.2.4 Groundwater Field Sampling Methods

Following development of the new wells, groundwater samples were collected at the monitoring wells installed during the Phase II and III RIs, and at the four OBG monitoring wells in the former RCRA unit at Pad 37. The procedure for sampling groundwater is described in Sections 4.3.4 and 4.3.5 of the Facility-wide SAP. Before sampling, the monitoring wells were purged until readings of pH, conductivity, dissolved oxygen, and water temperature reached equilibrium. Groundwater samples were collected using a bladder pump following low-flow sampling procedures where there was sufficient water. General groundwater quality indicator parameters (e.g., pH, specific conductance, dissolved oxygen, temperature, and turbidity) were monitored during the sampling procedure using a flow-through cell.

All groundwater samples from WBG were analyzed for dissolved TAL metals (filtered only), explosives, propellants, cyanide, VOCs, SVOCs, and pesticides/PCBs. Groundwater samples analyzed for dissolved metals were filtered during sample collection using a pre-sterilized, in-line, barrel filter with 0.45-um pores. The results of groundwater sampling at WBG are discussed in detail in Section 4.6, and presented in their entirety in Appendix H.

3.2.5 In Situ Permeability Testing

Slug tests were performed at newly installed wells to determine the hydraulic conductivity of the geologic materials surrounding each well screen. Slug tests followed the provisions of the SAP Addendum No. 1 for the WBG FS. These analyses calculate horizontal hydraulic conductivities in the screened interval of each well. Rising head slug test were conducted in all wells. The rising head test was performed by inserting a PVC cylinder into the well, allowing the water level to stabilize, removing the slug, and monitoring the rise in the water level. The tests were performed after each well had fully recovered from groundwater sampling. The slug employed for all tests was designed to displace 1 ft of water.

Pressure transducers and data loggers were used for automated data collection during slug tests. Water level measurements were recorded using a pre-programmed logarithmic time interval. Water levels were monitored for a period of 6 hr or until the well re-equilibrated to 90% of the pretest water level. The data were evaluated using AqteSolve™ software and hydraulic conductivity values were derived using the updated Bouwer and Rice method (Bouwer 1989; Butler 1998). Compensation for water levels within the screened interval is included in this evaluation method. The results of the slug tests are presented in Appendix E and are discussed in Chapter 2.0.

3.2.6 Groundwater Level Measurements

In order to determine the hydraulic gradient and flow directions across WBG, a complete round of water level measurements was obtained from all monitoring wells at the AOC independent of sampling activities. Water level measurements were obtained over a 1 day period and reflected base flow conditions. Measurements were obtained using an electric water level indicator and measured to the nearest 0.01 ft. Potentiometric data for WBG are discussed in Chapter 2.0.

3.3 CIVIL SURVEY

A civil survey was performed by a surveying subcontractor at the conclusion of the Phase III RI field investigation. All plane and vertical surveys were conducted under the supervision of an Ohio-registered land surveyor. Final coordinates were converted to a state plane coordinate system and both North American Datum 1927 and 1983 coordinates reported. All horizontal locations were surveyed to the nearest 0.1 ft, and all elevations to the nearest 0.01 ft. Sample locations inside of buildings were not surveyed. Field activities included the following:

- Surveying soil, sediment, and surface water sampling locations.
- Establishing final locations, ground surface elevations, and top-of-casing elevations for all new monitoring wells.

3.4 ANALYTICAL PROGRAM OVERVIEW

3.4.1 Field Analysis for Explosives Compounds

All surface soil and sediment samples were field analyzed with colorimetric methods for TNT and RDX. The purpose of the analysis was to define the extent of surface soil contamination with respect to these explosive compounds. Field colorimetry was also used as a screening method to reduce the number of samples that required fixed-base laboratory analysis for explosives. Figure 3-4 illustrates the application of field analysis for explosives during the Phase III RI. The colorimetric data are considered as bulk values for TNT and RDX, as discussed below (e.g., other explosive compounds may also be present and inflate the apparent TNT concentration). The methods may be used as a screening tool and to help map contaminant nature and extent. However, the method cannot be used in human health or ecological risk assessments because the quantitative risk calculations require that each compound must be evaluated individually.

The procedure for measuring 2,4,6-TNT concentrations in soils involves a liquid extraction of the explosives from the soil matrix with acetone, and formation of a color complex with sodium sulfite and potassium hydroxide. Absorbance is measured at a wavelength of 540 nm. For RDX, all nitrate must be removed from the extract by passing through an ion exchange column, then glacial acetic acid and zinc powder are added. A color-producing agent is added to the sample, and absorbance is measured at 507 nm. In both methods, percent absorbance is correlated to concentration. A full discussion of the field screening and laboratory results for TNT and RDX is presented in Section 4.8 of this report.

During the Phase III RI, calculations to determine the concentration of TNT and RDX using the field colorimetric analytical method were determined to be incorrect by a factor of 100 because the acetone extract volume was omitted from an equation contained in the standard operating procedure (SOP) to calculate concentration values in the extract. This calculation error resulted in a noncompliance with work plan requirements that all samples yielding results greater than 1 ppm TNT or RDX would be sent for laboratory analysis. As a result of the calculation error, a total of 16 samples with detected TNT values greater than 1 ppm were not submitted for laboratory confirmation analyses. As discussed in Appendix F, the field analysis SOP and all field laboratory TNT and RDX results were corrected. A corrective action assessment was completed to identify the impact to the project and is maintained in the project files at SAIC. Project impact was mitigated by the fact that at most of the 16 stations, a duplicate sample or a sample at greater depth was pre-planned and analyzed by either field screening or the analytical laboratory. Table 3-5 provides a summary of the 16 samples having field explosives greater than 1 ppm where corresponding fixed-base laboratory samples were not submitted. The table also illustrates where pre-planned samples were collected and the extent of vertical characterization performed at each station.

The corrective action evaluation concluded that vertical delineation of explosives was achieved down to comparatively low concentrations (e.g., 6.5 ppm or less) at all stations except WBG-217 (Table 3-5). Considering that additional sampling would be done as part of remedial actions at WBG, re-sampling of the affected stations was determined not to be necessary.

Table 3-5. Summary of Affected Sample Stations as a Result of Field TNT and RDX Calculation Error

Sample Depth	0 to 1 ft		2 to 4 ft		4 to 6 ft		6 to 8 ft	
Station	Field Result ppm	Lab Result ppm	Field Result ppm	Lab Result ppm	Field Result ppm	Lab Result ppm	Field Result ppm	Lab Result ppm
WBG-199	**34**	NA	138	190	17	10	**6.5**	NA
WBG-205	**13**	NA	**32**	NA	28	17	**4**	NA
WBG-217	**44**	NA	NC	NC	NC	NC	NC	NC
WBG-218	**23**	NA	**2.7**	NA	NC	NC	NC	NC
WBG-219	**21**	NA	**1.7**	NA	1 U	0.63[a]	NC	NC
WBG-220	**1**	NA	2.3	1.8	NC	NC	NC	NC
WBG-231	**2**	NA	1 U	NA	NC	NC	NC	NC
WBG-240	**4**	NA	1 U	NA	NC	NC	NC	NC
WBG-243	**1.1**	NA	1 U	11[a]	NC	NC	NC	NC
WBG-246	**15**	NA	1 U	NA	NC	NC	NC	NC
WBG-249	**1.5**	NA	NC	NC	NC	NC	NC	NC

[a]Sample submitted for fixed-base laboratory analyses as part of 15% non-detect sample verification.
Bold values indicate samples that exceeded 1 ppm (corrected value) for field analysis of TNT and/or RDX that were not submitted for fixed-based laboratory analyses.
NA = Not submitted for analysis.
NC = Not collected.
ppm = Parts per million.
RDX = Hexahydro-1,3,5,-trinitro-1,3,5-triazine.
TNT = Trinitrotoluene.

3.4.2 X-Ray Fluorescence Field Analyses for Metals

Field measurements of metals concentrations were made using XRF spectrometry. Both in situ and ex situ analyses of soils were performed using a Niton 700 series spectrometer. This instrumentation has the ability to be employed as either a hand-held instrument or a bench top piece of equipment. These analytical methods can rapidly provide on-site information relative to metal concentrations, and can be useful in facilitating real time decisions.

In situ analysis of soils involved taking measurements in-place. Measurement locations were based on the triangular sampling scheme followed for the collection of samples for explosives and metals, as described in Section 3.2.2. Each sample station was identified and cleared of vegetation and debris by the SAIC sampling team. Subcontract [MKM Engineers (MKM)] personnel used the Niton XRF instrument to collect data from the three vertices of the triangle. A fourth in situ measurement was collected from the center of the triangle, consistent with the location of the metals soil sample collection point. The instrument was calibrated daily using the internal calibration procedure designated by the manufacturer for in situ measurements. For in situ measurements, soils are not processed prior to data collection and results are, therefore, subject to higher variability and less precision.

Ex situ analyses involved processing (drying and homogenizing) soil samples in the MKM base facility in accordance with EPA Method 6200. Analyses were performed on split samples provided by the SAIC sampling team to the MKM field laboratory. Method QA/quality control (QC) procedures were implemented during analysis. Calibration verification checks were conducted using National Institute of

Standards and Technology (NIST) standards provided by the instrument manufacturer. Ten percent of the sample analyses were duplicated and an NIST blank sample was analyzed periodically to ensure the instrument probe window had not become contaminated.

The Niton 700 series XRF instrument is a dual-detector system containing both cadmium and americium excitation sources. The cadmium source allows detection of arsenic, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, rubidium, selenium, strontium, titanium, zinc, and zirconium. The americium source allows detection of antimony, barium, cadmium, indium, iodine, palladium, silver, and tin. Results from the in situ and ex situ analyses have been provided in Appendix J. In situ, ex situ, and laboratory result comparisons are discussed in Section 4.6.

3.4.3 Geotechnical Analyses

Shelby tube samples were collected from the 1- to 3-ft interval in four of the monitoring well soil borings. The two sediment samples were also analyzed for geotechnical properties according to the SAP Addendum No. 1. All samples were analyzed for dry unit weight, grain size distribution (sieve method), moisture content, Atterberg limits, unified soil classification, total organic carbon, hydraulic conductivity, specific gravity, redox potential, and pH. Shelby tube samples were additionally analyzed for bulk density and porosity. The results of the geotechnical evaluation can be found in Appendix L.

3.4.4 Laboratory Analyses

All analytical procedures were completed in accordance with applicable professional standards, EPA requirements, government regulations and guidelines, USACE, Louisville District analytical QA guidelines, and specific project goals and requirements. The sampling and analysis program conducted during the Phase III RI for WBG involved the collection and analysis of surface soil, subsurface soil, sediment, and groundwater. Field screening for organic vapors was conducted at each sampling location using an OVA. All samples were analyzed by an independent laboratory under contract with the USACE, Louisville District.

Samples collected during the investigation were analyzed by Severn Trent Laboratories, Inc. (STL), North Canton, Ohio, a USACE Center of Excellence-certified laboratory. QA samples collected for soil, sediment, and groundwater were analyzed by USACE's contracted QA laboratory, Envirodata Group, located in Lexington, Kentucky. Laboratories supporting this work have statements of qualifications including organizational structures, QA manuals, and SOPs, which are available upon request.

Samples were collected and analyzed according to the Facility-wide SAP and the SAP Addendum No. 1 for the WBG FS. Prepared in accordance with USACE and EPA guidance, the Facility-wide SAP outlines the organization, objectives, intended data uses, and QA/QC activities to achieve the desired DQOs and maintain the defensibility of the data. Project DQOs were established in accordance with EPA Region 5 guidance. Requirements for sample collection, handling, analysis criteria, target analytes, laboratory criteria, and data validation criteria for the Phase III RI are consistent with EPA requirements for National Priorities List sites. DQOs for this project included analytical precision, accuracy, representativeness, completeness, comparability, and sensitivity for the measurement data. Appendix G presents an assessment of those objectives as they apply to the analytical program.

Strict adherence to the requirements set forth in the Facility-wide SAP and project addenda was required of the analytical laboratory so that conditions adverse to quality would not arise. The laboratory was required to perform all analyses in compliance with EPA SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Analytical Protocols* (EPA 1990). SW-846 chemical analytical procedures were followed for the analyses of metals, VOCs, SVOCs, pesticides, PCBs, explosives, propellants (except nitrocellulose and nitroguanidine), and cyanide. Laboratories were required to comply with all methods as

written; recommendations were considered requirements. Analytical procedures for nitrocellulose and nitroguanidine are proprietary laboratory methods.

QA/QC samples for this project included field blanks, trip blanks, QA field duplicates, QC split samples, laboratory method blanks, laboratory control samples, laboratory duplicates, and matrix spike/matrix spike duplicate samples. Field blanks, consisting of potable water used in the decontamination process, equipment rinsate blanks, and trip blanks were submitted for analysis, along with field duplicate samples, to provide a means to assess the quality of the data resulting from the field sampling program. Table 3-6 presents a summary of QA/QC samples utilized during the Phase III RI. Evaluation of these QA/QC samples and their contribution to documenting the project data quality is provided in the Data Quality Control Summary Report (QCSR) in Appendix G.

Table 3-6. Summary of Quality Assurance/Quality Control Samples, Load Line 2 Phase II Remedial Investigation

Sample Type	Rationale
Field Blank	Analyzed to determine procedural contamination at the site that may contribute to sample contamination
Trip Blank	Analyzed to assess the potential for contamination of samples due to contaminant interference during sample shipment and storage
Field Duplicate	Analyzed to determine sample heterogeneity and sampling methodology reproducibility
Equipment Rinsate	Analyzed to assess the adequacy of the equipment decontamination processes for soil and groundwater
Laboratory Method Blanks	Analyzed to determine the accuracy and precision of the analytical method as implemented by the laboratory
Laboratory Duplicate Samples	Analyzed to assist in determining the analytical reproducibility and precision of the analysis for the samples of interest and provide information about the effect of the sample matrix on the measurement methodology
Matrix Spike/Matrix Spike Duplicate	
Quality Control Split	Analyzed to provide independent verification of the accuracy and precision of the principal analytical laboratory

SAIC is the custodian of the project file and will maintain the contents of the files for this investigation, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports, correspondence, and chain-of-custody forms. These files will remain in a secure area under the custody of the SAIC project manager, until they are transferred to USACE, Louisville District and RVAAP. Analytical data reports from STL have been forwarded to the USACE, Louisville District laboratory data validation contractor (Lee A. Knuppel and Associates) for validation review and QA comparison. STL will retain all original raw data (both hardcopy and electronic) in a secure area under the custody of the laboratory project manager.

3.4.5 Data Review, Validation, and Quality Assessment

Samples were properly packaged for shipment and dispatched to STL for analysis. A separate signed custody record with sample numbers and locations listed was enclosed with each shipment. When transferring the possession of samples, the individuals relinquishing and receiving signed, dated, and noted the time on the record. All shipments were in compliance with applicable Department of Transportation regulations for environmental samples.

Data were produced, reviewed, and reported by the laboratory in accordance with specifications outlined in the Facility-wide SAP, the SAP Addendum No.1 for the WBG FS, the Louisville District analytical QA guidelines, and the laboratory's QA manual. Laboratory reports included documentation verifying analytical holding time compliance.

STL performed in-house analytical data reduction under the direction of the laboratory project manager and QA officer. These individuals were responsible for assessing data quality and informing SAIC and USACE of any data that are considered "unacceptable" or required caution on the part of the data user in terms of its reliability. Data were reduced, reviewed, and reported as described in the laboratory QA manual and SOPs. Data reduction, review, and reporting by the laboratory were conducted as follows:

- Raw data produced by the analyst were turned over to the respective area supervisor.
- The area supervisor reviewed the data for attainment of QC criteria, as outlined in the established methods and for overall reasonableness.
- Upon acceptance of the raw data by the area supervisor, a report was generated and sent to the laboratory project manager.
- The laboratory project manager completed a thorough review of all reports.
- Final reports were generated by the laboratory project manager.

Data were then delivered to SAIC for data verification. STL prepared and retained full analytical and QC documentation for the project in both paper copy and electronic storage media (e.g., compact disk) as directed by the analytical methodologies employed. STL provided the following information to SAIC in each analytical data package submitted:

- cover sheets listing the samples included in the report and narrative comments describing problems encountered in analysis;
- tabulated results of inorganic and organic compounds identified and quantified; and
- analytical results for QC sample spikes, sample duplicates, initial and continuing calibration verifications of standards and blanks, method blanks, and LCS information.

A systematic process for data verification was performed by SAIC to ensure that the precision and accuracy of the analytical data were adequate for their intended use. This verification also attempted to minimize the potential of using false-positive or false-negative results in the decision-making process (i.e., to ensure accurate identification of detected versus non-detected compounds). This approach was consistent with the DQOs for the project and with the analytical methods, and was appropriate for determining contaminants of concern and calculating risk. Samples were identified through implementation of "definitive" analytical methods. "Definitive Data" were reported consistent with the deliverables identified in the project SAP. These definitive data were then verified through the review process outlined in the project SAP and are presented in Appendix G. Following data verification, all data packages were forwarded to the USACE independent data validation contractor.

Independent data validation was performed by Lee A. Knuppel and Associates under a separate task with USACE, Louisville District. This review constituted comprehensive validation of 10% of the primary data set; comprehensive validation of the QA split sample data set; and a comparison of primary sample, field duplicate sample, and field QA split sample information.

3.5 ORDNANCE AND EXPLOSIVES AVOIDANCE AND FIELD RECONNAISSANCE

A qualified UXO subcontractor approved by the USACE Huntsville OE Mandatory Center of Excellence provided OE avoidance support during all field activities, except groundwater sampling and in situ hydraulic conductivity testing (slug testing). The OE Team Leader led an initial safety briefing on OE avoidance to train all field personnel to recognize and stay away from propellants and OE. Daily tailgate safety briefings included reminders regarding OE avoidance. Site visitors were briefed on OE avoidance prior to allowing them access into the AOC.

The OE avoidance technicians used Schonstedt Models GA-52 and GA-72 (or equivalent) magnetic locators for surface anomaly surveys, and a Schonstedt Model MG-220 magnetic gradiometer (or equivalent) for all downhole surveys. Prior to beginning sampling activities, access routes into areas from which samples were to be collected were assessed for potential OE using visual surveys and hand-held magnetometers. The OE Team leader, USACE technical representative, and SAIC technical manager located each proposed soil, sediment, and groundwater monitoring well location within the AOC using a steel pin flag with the sample station identification number. The pin flag was placed at a point approved by the OE technician.

An OE technician remained with the sampling crews as work progressed. At stations where subsurface soil samples were to be collected below 1 ft bgs, a magnetometer was lowered into the borehole to screen for subsurface magnetic anomalies at the top of the subsurface interval. Where circumstances dictated that the borehole be deepened beyond 3 ft bgs, a magnetometer reading was taken at the top of each subsequent 2-ft interval prior to augering.

For monitoring well borings, OE technicians screened the locations by hand augering to a minimum depth of at least 3 or 2 ft below original undisturbed soil, whichever was more, and performed downhole magnetomer readings at 2 ft intervals. The OE technician remained on-site as drilling was performed to visually examine drill cuttings for any unusual materials indicative of potential OE. The OE reconnaissance results at WBG are presented in Appendix N in their entirety.

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4.0 NATURE AND EXTENT OF CONTAMINATION

This chapter presents results of the evaluation of the WBG Phase III RI data to further evaluate the nature and extent of contamination at WBG and to fill key data gaps remaining from the Phase II RI. Chemicals that are deemed to be related to AOC operations are classified as SRCs. The previous Phase I and Phase II RI investigations separately identified SRCs based on screening of analytical data using a statistical protocol. In this report, the Phase III soil data were separately screened to identify whether any chemicals may be considered as SRCs in addition to those identified in the Phase I and II RIs. Surface soil and subsurface soil from all three RI phases are evaluated on a pad-by-pad basis at the 12 pads that were the focus of this investigation. For sediment and groundwater, analytical results from the Phase III RI were combined with those from the previous phases of investigation and screened to identify whether any chemicals may be considered as SRCs in addition to those identified in the Phase I and II RIs. Section 4.1 presents the statistical methods and screening criteria used to reduce and display data and to distinguish naturally occurring constituents from SRCs indicative of impacts from historical site operations. Sections 4.2 through 4.5 present the nature and extent of identified SRCs for each of the data aggregates established for the purposes of this Phase III RI report that were defined by environmental media (surface soil, subsurface soil, sediment, and groundwater) and site operational history and physical characteristics (spatial aggregates). No additional surface water samples were collected during the Phase III RI; therefore, no additional evaluation of contaminant nature and extent is conducted for this media. The reader is referred to the final Phase II RI report (USACE 2001a) for a full discussion of surface water investigation. A summary of the results of the OE avoidance activities is presented in Section 4.6. Field measurements of metals and explosives are compared with their respective laboratory measurements in Section 4.7. Section 4.8 provides a summary of the results of the Phase III contaminant nature and extent evaluation.

4.1 DATA EVALUATION METHODS

The processes used to evaluate the WBG Phase III RI analytical data for each environmental media involve four general steps: (1) defining background concentrations, (2) defining data aggregates, (3) data reduction and screening, and (4) data presentation. Data derived from the field analysis of TNT and RDX and the analysis of metals using XRF were not subjected to the screening and evaluation process used for laboratory data. However, these field data were used qualitatively in the contaminant nature and extent evaluation and for a statistical comparison of laboratory results to field method results (Section 4.7).

4.1.1 Site Chemical Background

Chemicals occur naturally in soils, sediments, surface water, and groundwater. The natural levels of chemicals—called background levels—must be known in order to determine whether the concentrations measured at WBG are higher than would be expected if AOC operations had not occurred. Development of facility-wide background values for inorganic constituents in soil, sediment, surface water, and groundwater was conducted as part of the Phase II RI at WBG (USACE 2001a). Although some organic compounds also occur under ambient conditions (i.e., some PAHs), the organic compounds of primary concern (e.g., explosives) are man-made and, therefore, any detected concentration of these compounds is considered as being above background.

In the background investigation, a background level was calculated for each inorganic constituent detected for each environmental medium of interest. The background level for a specific constituent is the lower of the maximum detected value in the background data set (for non-normally distributed data) or the 95% upper tolerance limit of the 95th percentile of the distribution of background concentrations for normally distributed or log-normally distributed data. For all inorganics detected in the background data set, the

background criteria selected were maximum detected values (e.g., all data were non-normally distributed). If a measured concentration is above the background criteria, it is likely that it comes from an area with concentrations elevated above background levels.

The background criteria were set to zero for inorganics that were not detected in the background samples. For those metals that were not detected in the background samples, any detected result from WBG would be considered above background. RVAAP facility-wide background criteria for each medium are listed in Table 4-1.

4.1.2 Definition of Aggregates

Data from all three CERCLA investigations at WBG were grouped (aggregated) in two ways for additional evaluation of contaminant nature and extent: environmental media aggregates and spatial aggregates. The basis for aggregating data is derived from that used in the Phase II RI. Data aggregates based on environmental media (i.e., soil, sediment, and groundwater) are used to facilitate evaluation of contaminant nature and extent. Soil data were further aggregated on the basis of depth for consistency with the Phase II RI baseline HHRA and EPA and RVAAP risk assessment guidance. The surface soil aggregate is defined as the interval from ground surface to 1.0 ft and the subsurface soil aggregate is defined as all soil greater than a depth of 1.0 ft.

In this report, the nature and extent evaluation incorporates or references data collected from previous phases of the RI investigation of WBG. In the Phase I RI, surface soil samples were collected from the 0- to 2-ft depth interval rather than a 0- to 1-ft interval. For evaluation of these samples, the data were assigned to the surface soil aggregate as a conservative measure, wherein the assumption is made that the exposure potential to contaminants in the shallow subsurface soil is the same as that at the ground surface.

For each aggregate based on environmental media, spatial aggregates were developed, as necessary, based on site characteristics, historical operations, ecological habitat, and potential future remedial strategy and land use. As in the Phase II RI, soil data were evaluated on a pad-by-pad basis. Figures 3-1, 3-2, and 3-3 illustrate the soil sampling stations associated with the various individual burning pads. In the Phase III RI, two new areas were investigated outside of the vicinity of individual burning pads and additional spatial aggregates for soils were created for data generated from these samples:

- Building 4301 aggregate, including three surface and subsurface soil samples (stations WBG-259, WBG-260, and WBG-261) that were collected in the vicinity of this former service building (Figure 3-1).

- Random grid samples, including 30 surface soil samples collected between the burning pads in areas that were not suspected of being contaminated (Figure 3-4).

Sediment data were evaluated on an AOC-wide basis with no spatial or geographic distinctions since it is a transient media. Dry sediment samples were collected from ditches at two locations in the northern portion of the AOC; these two samples were included in the sediment data set generated from previous CERCLA investigations and evaluated. As previously noted, no additional surface water samples were collected from streams or drainage ditches at WBG during the Phase III RI.

Groundwater media were also not subdivided into spatial aggregates for the purposes of the Phase III RI. All of the monitoring wells installed at the AOC monitor the water table interval and are screened within the unconsolidated zone. Because groundwater is a transient media, no technical basis exists for aggregation of sample data at this point in the CERCLA process. Therefore, groundwater analytical data from all previous CERCLA investigations were combined and screened to identify any new SRCs.

Table 4-1. RVAAP Facility-Wide Background Criteria

Media Units Analyte	Surface Soil (mg/kg)	Subsurface Soil (mg/kg)	Sediment (mg/kg)	Surface Water (µg/L)	Groundwater Bedrock Zone Filtered (µg/L)	Groundwater Bedrock Zone Unfiltered (µg/L)	Groundwater Unconsolidated Zone Filtered (µg/L)	Groundwater Unconsolidated Zone Unfiltered (µg/L)
Cyanide	0	0	0	0	0	0	0	0
Aluminum	17,700	19,500	13,900	3,370	0	9,410	0	48,000
Antimony	0.96	0.96	0	0	0	0	0	4.3
Arsenic	15.4	19.8	19.5	3.2	0	19.1	11.7	215
Barium	88.4	124	123	47.5	256	241	82.1	327
Beryllium	0.88	0.88	0.38	0	0	0	0	0
Cadmium	0	0	0	0	0	0	0	0
Calcium	15,800	35,500	5,510	41,400	53,100	48,200	115,000	194,000
Chromium	17.4	27.2	18.1	0	0	19.5	7.3	85.20
Cobalt	10.4	23.2	9.1	0	0	0	0	46.3
Copper	17.7	32.3	27.6	7.9	0	17	0	289
Iron	23,100	35,200	28,200	2,560	1,430	21,500	279	195,000
Lead	26.1	19.1	27.4	0	0	23	0	183
Magnesium	3,030	8,790	2,760	10,800	15,000	13,700	43,300	58,400
Manganese	1,450	3,030	1,950	391	1,340	1,260	1,020	2,860
Mercury	0.036	0.044	0.059	0	0	0	0	0.25
Nickel	21.1	60.7	17.7	0	83.4	85.3	0	117
Potassium	927	3,350	1,950	3,170	5,770	6,060	2,890	7,480
Selenium	1.4	1.5	1.7	0	0	0	0	5.7
Silver	0	0	0	0	0	0	0	0
Sodium	123	145	112	21,300	51,400	49,700	45,700	44,700
Thallium	0	0.91	0.89	0	0	0	0	2.4
Vanadium	31.1	37.6	26.1	0	0	15.5	0	98.1
Zinc	61.8	93.3	532	42	52.3	193	60.9	888

RVAAP = Ravenna Army Ammunition Plant.

4.1.3 Data Reduction and Screening

4.1.3.1 Data reduction

In the Phase III RI, 185 environmental soil, sediment, surface water, and field QC samples were collected with approximately 10,800 discrete analyses (i.e., analytes) being obtained, reviewed, and integrated into the WBG database. These totals do not include field measurements and field descriptions. Analytical results were reported by the laboratory in electronic format and loaded into a database. As discussed in Section 3.6, verification of data was performed to ensure all requested data were received and complete. Data use qualifiers were assigned to each result based on the laboratory QA review and verification criteria. Results were qualified as follows:

"U" Not detected.
"UJ" Not detected, detection limit estimated.
"J" Estimated concentration less than method reporting limits.
"R" Rejected result.
"=" Analyte present and concentration accurate.

In addition to assigning qualifiers, the verification process also selected the appropriate result to use when re-analyses or dilutions were performed. Where laboratory surrogate recovery data or laboratory QC samples were outside of analytical method specifications, a determination was made regarding whether laboratory re-analysis should be used in place of an original reported result. If results were reported for both diluted and undiluted samples, results from the diluted sample were used only for those analytes that exceeded the calibration range of the undiluted sample. A complete discussion of the results of the verification process is contained in the DQA (Appendix G). Independent validation of 10% of the Phase III RI data and 100% of the USACE QA laboratory data are performed by a third-party subcontractor to the USACE, Louisville District. Additional qualification of the Phase III RI data may be required based on the results of the validation process.

The data reduction process employed to identify SRCs in the Phase III RI data set involved first calculating data summary statistics. Site data were extracted from the database such that QC splits and field duplicates were excluded from the screening data sets. Rejected results were excluded from the screening process. Analytes having at least one detected value were included in the data reduction process. The SRC summary statistics for the combined Phase I and II data sets for surface soil and subsurface soil, respectively, are shown in Tables 4-2 and 4-3. Summary statistics calculated for Phase III surface soil and subsurface soil are shown in Tables 4-4 and 4-5. (Refer to Section 4.1.5 for the rationale for aggregating soil data in this manner.) For sediment and groundwater, summary statistics were run on the combined (Phase I, II, and III) data sets, as shown in Tables 4-6 and 4-7, respectively. The summary statistics tables include the minimum, maximum, and average (mean) detected values and the proportion of detected results to the total number of samples collected. Non-detected results meeting contract-required detection limits were set to one-half of the reported detection limit during calculation of the mean result for each compound. Non-detected results with elevated detection limits (e.g., more than five times the contract-required detection limit) were excluded from the summary statistics in order not to skew the calculation of mean values.

Following data reduction, the data were screened to identify SRCs using the processes outlined in the following sections. Only those constituents identified as SRCs for the entire AOC are discussed in detail in the following sections. Additionally, subsequent evaluation of the SRCs was conducted (refer to Chapter 5.0) to identify constituents of potential migration concern in the fate and transport evaluation.

Table 4-2. Determination of SRCs in Surface Soils – Phase I and II

Analyte	Result > Detection Limit	Minimum Detect	Maximum Detect	Average Result[a]	Site Background Criteria	Detect > Site Background Criteria	SRC?
Explosives (mg/kg)							
1,3,5-Trinitrobenzene	15/99	0.055	490	6.28	NB	NA	Yes
1,3-Dinitrobenzene	1/99	0.084	0.084	0.65	NB	NA	Yes
2,4,6-Trinitrotoluene	29/99	0.03	3,800	79.50	NB	NA	Yes
2,4-Dinitrotoluene	8/99	0.065	0.55	0.20	NB	NA	Yes
2,6-Dinitrotoluene	3/99	0.075	0.62	0.20	NB	NA	Yes
2-Nitrotoluene	3/99	0.074	0.17	0.65	NB	NA	Yes
3-Nitrotoluene	3/99	0.091	21	0.55	NB	NA	Yes
4-Nitrotoluene	2/99	0.13	0.19	0.65	NB	NA	Yes
HMX	14/99	0.11	1,700	19.60	NB	NA	Yes
Nitrobenzene	2/99	0.035	0.054	0.66	NB	NA	Yes
Nitrocellulose as N	7/20	2.5	315	28.07	NB	NA	Yes
Nitroglycerin	2/21	5.5	12	2.03	NB	NA	Yes
RDX	10/99	0.18	9,500	100.60	NB	NA	Yes
Tetryl	5/99	0.088	0.48	1.69	NB	NA	Yes
Metals (mg/kg)							
Aluminum	149/149	1,410	50,100	12,400	17,700.00	12/149	Yes
Antimony[b]	38/77	0.48	27.9	3.36	0.96	34/ 77	Yes
Arsenic	149/149	2.5	35.8	13.2	15.40	31/149	Yes
Barium	148/149	11.7	10,400	384.1	88.40	69/149	Yes
Beryllium[b]	21/76	0.23	3.4	0.4205	0.88	8/ 76	Yes
Cadmium	102/148	0.06	877	11.26	0.0	102/148	Yes
Calcium	77/77	805	111,000	10,180	15,800.00	11/ 77	No
Chromium	149/149	5.4	189	19.15	17.40	54/149	Yes
Cobalt	76/77	1.2	12.7	7.872	10.40	5/ 77	Yes
Copper	77/77	9.3	16,800	416.5	17.70	63/ 77	Yes
Cyanide	7/76	0.064	1.2	0.3293	0.0	7/ 76	Yes
Iron	77/77	9,450	39,100	22,440	23,100.00	36/ 77	No
Lead	149/149	10.2	2,200	168.4	26.10	76/149	Yes
Magnesium	77/77	1,410	16,700	3194	3,030.00	24/ 77	No
Manganese	149/149	65.4	3,910	559.6	1,450.00	7/149	No
Mercury	77/149	0.025	1.2	0.07459	0.04	63/149	Yes
Nickel	77/77	7.4	133	20.76	21.10	25/ 77	Yes
Potassium	77/77	400	3,050	1,212	927.00	57/ 77	No
Selenium	100/149	0.34	5	0.8633	1.40	17/149	Yes
Silver	25/149	0.22	33.2	0.8942	0.0	25/149	Yes
Sodium	42/76	43.5	1,080	128.7	123.00	23/ 76	No
Thallium	7/77	1.4	3.1	0.4866	0.0	7/ 77	Yes
Vanadium	77/77	11.2	34	20.99	31.10	3/ 77	No
Zinc	149/149	28.6	24,900	424.2	61.80	97/149	Yes
SVOCs (mg/kg)							
2-Methylnaphthalene	3/14	0.047	0.15	0.16	NB	NA	Yes
Acenaphthene	2/14	0.14	0.15	0.19	NB	NA	Yes
Anthracene	2/14	0.44	0.48	0.23	NB	NA	Yes
Benzo(*a*)anthracene	4/14	0.043	1	0.27	NB	NA	Yes
Benzo(*a*)pyrene	4/14	0.06	0.8	0.25	NB	NA	Yes
Benzo(*b*)fluoranthene	4/14	0.093	1.1	0.29	NB	NA	Yes
Benzo(*g,h,i*)perylene	3/14	0.11	0.39	0.20	NB	NA	Yes
Benzo(*k*)fluoranthene	3/14	0.091	0.5	0.22	NB	NA	Yes

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Table 4-2. Determination of SRCs in Surface Soils – Phase I and II (continued)

Analyte	Result > Detection Limit	Minimum Detect	Maximum Detect	Average Result[a]	Site Background Criteria	Detect > Site Background Criteria	SRC?
Bis(2-ethylhexyl)phthalate	1/14	0.034	0.034	0.19	NB	NA	Yes
Carbazole	2/14	0.2	0.27	0.20	NB	NA	Yes
Chrysene	4/14	0.05	1	0.27	NB	NA	Yes
Di-*n*-butyl Phthalate	1/14	0.053	0.053	0.19	NB	NA	Yes
Dibenzo(*a*,*h*)anthracene	2/14	0.054	0.11	0.18	NB	NA	Yes
Dibenzofuran	2/14	0.11	0.16	0.19	NB	NA	Yes
Fluoranthene	5/14	0.04	2.7	0.50	NB	NA	Yes
Fluorene	2/14	0.18	0.24	0.20	NB	NA	Yes
Indeno(1,2,3-*cd*)pyrene	3/14	0.13	0.48	0.21	NB	NA	Yes
Naphthalene	1/14	0.076	0.076	0.18	NB	NA	Yes
Phenanthrene	5/14	0.07	2.4	0.41	NB	NA	Yes
Pyrene	5/14	0.036	2.1	0.40	NB	NA	Yes
VOCs (mg/kg)							
Chloroform	1/10	0.002	0.002	0.00	NB	NA	Yes
Methylene Chloride	1/10	0.012	0.012	0.00	NB	NA	Yes
Toluene	8/10	0.00079	0.17	0.03	NB	NA	Yes

[a]Non-detects were set to one-half the reporting limit to calculate the average. In cases when detects were estimated below the reporting limit but above the method detection limit, the average may be larger than the maximum detect.
[b]Subsurface criteria used.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
NA = Not applicable.
NB = No background criterion available.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

Table 4-3. Determination of SRCs in Subsurface Soils – Phase I and II

Analyte	Result > Detection Limit	Minimum Detect	Maximum Detect	Average Result[a]	Site Background Criteria	Detect > Site Background Criteria	SRC?
Explosives (mg/kg)							
1,3,5-Trinitrobenzene	17/31	0.03	6.90	0.53	NB	NA	Yes
1,3-Dinitrobenzene	1/31	0.26	0.26	0.40	NB	NA	Yes
2,4,6-Trinitrotoluene	20/31	0.04	27.00	3.06	NB	NA	Yes
2,4-Dinitrotoluene	8/31	0.03	0.11	0.11	NB	NA	Yes
2,6-Dinitrotoluene	3/31	0.07	0.22	0.13	NB	NA	Yes
2-Nitrotoluene	2/31	0.08	4.80	0.39	NB	NA	Yes
3-Nitrotoluene	4/31	0.07	0.12	0.43	NB	NA	Yes
4-Nitrotoluene	3/31	0.08	0.11	0.43	NB	NA	Yes
HMX	18/31	0.10	14.00	0.93	NB	NA	Yes
Nitrobenzene	4/31	0.03	0.36	0.40	NB	NA	Yes
Nitrocellulose as N	3/6	3.20	88.40	16.87	NB	NA	Yes
Nitroglycerin	1/31	7.40	7.40	1.45	NB	NA	Yes
RDX	13/31	0.14	82.00	3.96	NB	NA	Yes
Tetryl	7/31	0.05	0.24	1.09	NB	NA	Yes
Metals (mg/kg)							
Aluminum	31/31	6,330.00	17,500.00	12,480.00	19,500.00	0/ 31	No
Antimony	13/31	0.34	2.40	0.50	0.96	3/ 31	Yes
Arsenic	31/31	5.80	20.50	13.69	19.80	1/ 31	No
Barium	31/31	31.10	400.00	115.60	124.00	8/ 31	Yes
Beryllium	10/31	0.23	1.30	0.36	0.88	1/ 31	No
Cadmium	4/31	0.62	11.90	0.92	0.0	4/ 31	Yes
Calcium	30/31	333.00	20,500.00	3,853.00	35,500.00	0/ 31	No
Chromium	31/31	9.40	23.30	16.74	27.20	0/ 31	No
Cobalt	31/31	5.40	25.40	10.68	23.20	1/ 31	No
Copper	31/31	8.30	46.90	21.52	32.30	2/ 31	Yes
Iron	31/31	13,300.00	37,100.00	24,640.00	35,200.00	2/ 31	No
Lead	31/31	9.90	105.00	20.16	19.10	9/ 31	Yes
Magnesium	31/31	1,430.00	6,520.00	3,200.00	8,790.00	0/ 31	No
Manganese	31/31	211.00	3,470.00	545.60	3,030.00	1/ 31	No
Mercury	5/31	0.03	0.07	0.04	0.04	2/ 31	Yes
Nickel	31/31	11.40	46.80	22.23	60.70	0/ 31	No
Potassium	31/31	725.00	3,490.00	1,515.00	3,350.00	1/ 31	No
Selenium	2/31	0.81	0.98	0.34	1.50	0/ 31	No
Silver	1/31	1.50	1.50	0.64	0.0	1/ 31	Yes
Sodium	12/24	18.90	227.00	71.84	145.00	4/ 24	No
Thallium	3/31	0.76	1.10	0.36	0.91	1/ 31	No
Vanadium	31/31	11.70	40.50	21.90	37.60	1/ 31	No
Zinc	31/31	37.60	184.00	72.68	93.30	3/ 31	Yes
SVOCs (mg/kg)							
2-Methylnaphthalene	1/9	0.06	0.06	0.18	NB	NA	Yes
Anthracene	1/9	0.10	0.10	0.19	NB	NA	Yes
Benzo(*a*)anthracene	2/9	0.05	0.48	0.21	NB	NA	Yes
Benzo(*a*)pyrene	2/9	0.06	0.50	0.22	NB	NA	Yes
Benzo(*b*)fluoranthene	2/9	0.08	0.70	0.24	NB	NA	Yes
Benzo(*g,h,i*)perylene	1/9	0.31	0.31	0.21	NB	NA	Yes
Benzo(*k*)fluoranthene	1/9	0.29	0.29	0.21	NB	NA	Yes
Carbazole	1/9	0.09	0.09	0.19	NB	NA	Yes
Chrysene	2/9	0.06	0.56	0.22	NB	NA	Yes

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Table 4-3. Determination of SRCs in Subsurface Soils – Phase I and II (continued)

Analyte	Result > Detection Limit	Minimum Detect	Maximum Detect	Average Result[a]	Site Background Criteria	Detect > Site Background Criteria	SRC?
Dibenzo(*a*,*h*)anthracene	1/9	0.08	0.08	0.18	NB	NA	Yes
Fluoranthene	2/9	0.11	1.20	0.30	NB	NA	Yes
Indeno(1,2,3-*cd*)pyrene	1/9	0.37	0.37	0.22	NB	NA	Yes
Phenanthrene	2/9	0.09	0.53	0.22	NB	NA	Yes
Pyrene	2/9	0.08	0.91	0.26	NB	NA	Yes
VOCs (mg/kg)							
Acetone	1/5	0.05	0.05	0.02	NB	NA	Yes
Toluene	4/5	0.00	0.00	0.00	NB	NA	Yes

[a]Non-detects were set to one-half the reporting limit to calculate the average. In cases when detects were estimated below the reporting limit but above the method detection limit, the average may be larger than the maximum detect.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
NA = Not applicable.
NB = No background criterion available.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

Table 4-4. Summary Statistics and Determination of SRCs in Surface Soil – Phase III

Analyte	Results > Detection Limit	Min. Detect	Max. Detect	Avg. Result[a]	Site Bkg. Criteria	SRC?[b]	Justification
Explosives (concentration units = mg/kg)							
1,3,5-Trinitrobenzene	3/18	0.37	34	2.40		Yes	No background data available
1,3-Dinitrobenzene	4/18	0.04	0.09	0.11		Yes	No background data available
2,4,6-Trinitrotoluene	10/18	0.07	680	61.93		Yes	No background data available
2,4-Dinitrotoluene	4/18	0.06	1.50	0.22		Yes	No background data available
2,6-Dinitrotoluene	2/18	0.09	0.09	0.22		Yes	No background data available
2-Amino-4,6-dinitrotoluene	6/18	0.10	14	1.11		Yes	No background data available
4-Amino-2,6-dinitrotoluene	7/18	0.10	0.93	3.94		Yes	No background data available
HMX	3/18	0.19	100	5.81		Yes	No background data available
Nitrobenzene	1/18	0.12	0.12	0.12		Yes	No background data available
Nitroguanidine	1/5	0.09	0.09	0.12		Yes	No background data available
RDX	3/18	0.61	470	26.50		Yes	No background data available
Metals (concentration units = mg/kg)							
Aluminum	95/95	4,790	19,300	12,890	17,700	Yes	Above Background
Antimony	58/96	0.65	236	7.72	0.96	Yes	Above Background
Arsenic	96/96	6.90	33.50	12.55	15.40	Yes	Above Background
Barium	95/95	28.20	7,160	384.20	88.40	Yes	Above Background
Beryllium	84/95	0.14	1.80	0.47	0.88	Yes	Above background
Cadmium	74/95	0.06	43.60	2.31		Yes	No background data available
Calcium	89/95	126	75,500	5,645	15,800	No	Essential element
Chromium	95/95	9.50	69.50	19.86	17.40	Yes	Above background
Chromium, hexavalent	18/43	2	12.20	2.83		Yes	No background data available
Cobalt	95/95	1.60	18.20	9.03	10.40	Yes	Above background
Copper	95/95	5.80	1830	113.60	17.70	Yes	Above background
Cyanide	2/7	0.88	1.80	0.61		Yes	No background data available
Iron	95/95	12,800	90,700	25,710	23,100	No	Essential element
Lead	96/96	11	936	103.60	26.10	Yes	Above background
Magnesium	95/95	941	10,000	2,827	3,030	No	Essential element
Manganese	95/95	98.30	3,170	733	1,450	Yes	Above background
Mercury	94/96	0.02	1.40	0.09	0.04	Yes	Above background
Nickel	95/95	7	66	19.50	21.10	Yes	Above background
Potassium	95/95	223	3,090	1,198	927	No	Essential element
Selenium	71/96	0.48	2.70	0.93	1.40	Yes	Above background
Silver	22/95	0.20	26.70	1.31		Yes	No background data available
Sodium	30/95	62.20	1120	250.90	123	No	Essential element
Thallium	96/96	0.17	0.81	0.49		Yes	No background data available
Vanadium	95/95	7.10	37.80	22.87	31.10	Yes	Above background
Zinc	95/95	30.60	4,520	318.70	61.80	Yes	Above background
Organics-Pesticide/PCB (concentration units = mg/kg)							
4,4'-DDT	1/9	0.1300	0.1300	0.0323		Yes	No background data available
Dieldrin	2/9	0.0024	0.0054	0.0196		Yes	No background data available
Heptachlor Epoxide	2/9	0.0510	0.0810	0.0306		Yes	No background data available
PCB-1254	1/9	0.1400	0.1400	0.0442		Yes	No background data available
PCB-1260	2/9	0.1700	0.4600	0.0863		Yes	No background data available
Organics-Semivolatile (concentration units = mg/kg)							
2-Methylnaphthalene	2/9	0.08	0.10	0.18		Yes	No background data available

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1 **Table 4-4. Summary Statistics and Determination of SRCs in Surface Soil – Phase III (continued)**

Analyte	Results > Detection Limit	Min. Detect	Max. Detect	Avg. Result[a]	Site Bkg. Criteria	SRC?[b]	Justification
Anthracene	3/9	0.05	0.08	0.16		Yes	No background data available
Benz(*a*)anthracene	3/9	0.34	0.36	0.26		Yes	No background data available
Benzo(*a*)pyrene	3/9	0.33	0.41	0.26		Yes	No background data available
Benzo(*b*)fluoranthene	3/9	0.45	0.49	0.30		Yes	No background data available
Benzo(*g,h,i*)perylene	3/9	0.21	0.27	0.22		Yes	No background data available
Benzo(*k*)fluoranthene	3/9	0.12	0.17	0.19		Yes	No background data available
Carbazole	1/9	0.06	0.06	0.19		Yes	No background data available
Chrysene	3/9	0.31	0.43	0.26		Yes	No background data available
Dibenz(*a,h*)anthracene	3/9	0.06	0.07	0.16		Yes	No background data available
Fluoranthene	3/9	0.57	0.60	0.34		Yes	No background data available
Indeno(1,2,3-*cd*)pyrene	3/9	0.22	0.29	0.22		Yes	No background data available
Naphthalene	2/9	0.06	0.07	0.18		Yes	No background data available
Phenanthrene	3/9	0.31	0.48	0.27		Yes	No background data available
Pyrene	3/9	0.42	0.77	0.33		Yes	No background data available
Organics-Volatile (concentration units = mg/kg)							
Trichloroethene	1/9	0.0012	0.0012	0.0030		Yes	No background data available

[a]Values less than the detection limit were set to one-half of the reporting limit in calculation of the average.
[b]Calcium, iron, magnesium, potassium, and sodium were eliminated as SRCs based on the essential human nutrient screen.
DDT = Dichlorodiphenyl-trichloroethane.
HMX = Octoahydro-1,3,5,6-tetranitro-1,3,5,7-tetrazocine.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.

Table 4-5. Summary Statistics and Determination of SRCs in Subsurface Soil – Phase III

Analyte	Results > Detection Limit	Min. Detect	Max. Detect	Avg. Result[a]	Site Bkg. Criteria	SRC?[b]	Justification
Explosives (concentration units = mg/kg)							
1,3,5-Trinitrobenzene	4/37	0.31	8.70	5.55		Yes	No background data available
1,3-Dinitrobenzene	1/37	0.05	0.05	0.13		Yes	No background data available
2,4,6-Trinitrotoluene	16/37	0.06	5,200	272.20		Yes	No background data available
2,4-Dinitrotoluene	5/37	0.07	2.80	0.30		Yes	No background data available
2,6-Dinitrotoluene	1/37	0.15	0.15	3.65		Yes	No background data available
2-Amino-4,6-dinitrotoluene	4/37	0.15	7.50	5.45		Yes	No background data available
4-Amino-2,6-dinitrotoluene	3/37	0.09	0.24	19.30		Yes	No background data available
4-Nitrotoluene	1/37	0.16	0.16	0.16		Yes	No background data available
HMX	5/37	0.24	27	11.31		Yes	No background data available
Nitrobenzene	2/37	0.07	0.08	0.13		Yes	No background data available
RDX	6/37	0.23	260	20		Yes	No background data available
Metals (concentration units = mg/kg)							
Aluminum	54/54	3,580	20,000	11,350	19,500	Yes	Above background
Antimony	33/54	0.61	32.50	3.30	0.96	Yes	Above background
Arsenic	54/54	7.30	38.40	16.01	19.80	Yes	Above background
Barium	54/54	20.20	1,040	125.30	124	Yes	Above background
Beryllium	43/54	0.27	0.88	0.42	0.88	No	Below background
Cadmium	32/54	0.08	201	6.16		Yes	No background data available
Calcium	54/54	432	35,700	8171	35,500	No	Essential element
Chromium	54/54	7.60	80.90	20.66	27.20	Yes	Above background
Chromium, hexavalent	2/12	1.40	2.80	0.83		Yes	No background data available
Cobalt	54/54	3.70	18.20	10.92	23.20	No	Below background
Copper	54/54	11.00	601	62.50	32.30	Yes	Above background
Cyanide	1/4	4.60	4.60	1.37		Yes	No background data available
Iron	54/54	12,300	163,000	31,540	35,200	No	Essential element
Lead	54/54	7.20	1,130	99.82	19.10	Yes	Above background
Magnesium	54/54	1,010	11,100	3,859	8,790	No	Essential element
Manganese	54/54	154	1,400	471.50	3,030	No	Below background
Mercury	45/54	0.01	0.07	0.03	0.04	Yes	Above background
Nickel	54/54	8.80	92.70	27.15	60.70	Yes	Above background
Potassium	54/54	690	2,880	1542	3,350	No	Essential element
Selenium	22/54	0.42	4.60	0.77	1.50	Yes	Above background
Silver	8/54	0.25	5.70	0.78		Yes	No background data available
Sodium	14/54	60.10	1780	210.30	145	No	Essential element
Thallium	48/54	0.27	0.81	0.47	0.91	No	Below background
Vanadium	53/54	7.40	44.80	19.78	37.60	Yes	Above background
Zinc	53/53	31.20	2,420	269.90	93.30	Yes	Above background
Organics-Pesticide/PCB (concentration units = mg/kg)							
Endrin Ketone	1/4	0.0043	0.0043	0.0039		Yes	No background data available
Heptachlor Epoxide	1/4	0.05	0.05	0.01		Yes	No background data available
Organics-Semivolatile (concentration units = mg/kg)							
2-Methylnaphthalene	1/4	17	17	34.34		Yes	No background data available
Acenaphthene	2/4	0.44	65	16.45		Yes	No background data available
Anthracene	2/4	0.16	400	100.10		Yes	No background data available
Benz(*a*)anthracene	2/4	0.20	570	142.60		Yes	No background data available

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Table 4-5. Summary Statistics and Determination of SRCs in Subsurface Soil – Phase III (continued)

Analyte	Results > Detection Limit	Min. Detect	Max. Detect	Avg. Result[a]	Site Bkg. Criteria	SRC?[b]	Justification
Benzo(*a*)pyrene	2/4	0.22	510	127.70		Yes	No background data available
Benzo(*b*)fluoranthene	2/4	0.29	620	155.20		Yes	No background data available
Benzo(*g,h,i*)perylene	2/4	0.11	280	70.12		Yes	No background data available
Benzo(*k*)fluoranthene	2/4	0.13	280	70.13		Yes	No background data available
Carbazole	1/4	190	190	47.64		Yes	No background data available
Chrysene	2/4	0.20	540	135.10		Yes	No background data available
Dibenz(*a,h*)anthracene	1/4	59	59	14.89		Yes	No background data available
Dibenzofuran	1/4	110	110	27.64		Yes	No background data available
Fluoranthene	3/4	0.05	1,500	375.20		Yes	No background data available
Fluorene	2/4	0.93	130	32.83		Yes	No background data available
Indeno(1,2,3-*cd*)pyrene	2/4	0.13	320	80.13		Yes	No background data available
Naphthalene	2/4	1.60	62	15.99		Yes	No background data available
Phenanthrene	3/4	0.14	1,300	325.90		Yes	No background data available
Pyrene	3/4	0.13	1,100	275.20		Yes	No background data available
Organics-Volatile (concentration units = mg/kg)							
Acetone	1/4	0.0049	0.0049	0.0065		Yes	No background data available
Dimethylbenzene	1/4	0.0260	0.0260	0.0086		Yes	No background data available
Ethylbenzene	1/4	0.0210	0.0210	0.0074		Yes	No background data available
Methylene Chloride	1/4	0.0066	0.0066	0.0038		Yes	No background data available
Toluene	1/4	0.0110	0.0110	0.0049		Yes	No background data available
Trichloroethene	1/4	0.0011	0.0011	0.0024		Yes	No background data available

[a]Values less than the detection limit were set to one-half of the reporting limit in calculation of the average.
[b]Calcium, iron, magnesium, potassium, and sodium were eliminated as SRCs based on the essential human nutrient screen.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.

Table 4-6. Summary Statistics and Determination of SRCs in Sediment – Phase I, II, and III

Analyte	Results > Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?[b]
Explosives (concentration units = mg/kg)						
1,3,5-Trinitrobenzene	4/17	0.12	0.07	0.15	NB	Yes
1,3-Dinitrobenzene	1/17	0.12	0.04	0.04	NB	Yes
2,4,6-Trinitrotoluene	4/17	0.20	0.09	0.97	NB	Yes
2,4-Dinitrotoluene	1/17	0.12	0.04	0.04	NB	Yes
HMX	1/17	0.82	0.12	0.12	NB	Yes
Nitrobenzene	1/17	0.13	0.07	0.07	NB	Yes
Nitroguanidine	1/2	0.08	0.04	0.04	NB	Yes
Metals (concentration units = mg/kg)						
Chromium, hexavalent	1/1	5.00	5.00	5.00	NB	Yes
Aluminum	19/19	11,040.00	4,740.00	17,900.00	13,900.00	Yes
Antimony	3/8	0.80	0.32	2.00	0.00	Yes
Arsenic	19/19	12.30	7.70	18.10	19.50	No
Barium	19/19	126.20	36.80	528.00	123.00	Yes
Beryllium	4/8	0.36	0.42	0.60	0.38	Yes
Cadmium	8/19	0.26	0.06	0.73	0.00	Yes
Calcium	8/8	1,775.00	975.00	3,910.00	5,510.00	No
Chromium	19/19	13.51	7.20	21.30	18.10	Yes
Cobalt	8/8	8.09	5.70	10.40	9.10	Yes
Copper	8/8	21.01	7.80	49.10	27.60	Yes
Cyanide	1/8	0.38	0.11	0.11	0.00	Yes
Iron	8/8	18,790.00	13,900.00	25,400.00	28,200.00	No
Lead	19/19	19.94	10.20	44.60	27.40	Yes
Magnesium	8/8	2,156.00	1,180.00	3,280.00	2,760.00	No
Manganese	19/19	479.80	183.00	1,050.00	1,950.00	No
Mercury	5/19	0.04	0.02	0.16	0.06	Yes
Nickel	8/8	17.38	10.10	28.30	17.70	Yes
Potassium	8/8	1,075.00	665.00	1,970.00	1,950.00	No
Selenium	8/19	0.63	0.37	3.60	1.70	Yes
Sodium	6/8	155.70	25.90	161.00	112.00	No
Thallium	4/8	0.82	0.47	1.80	0.89	Yes
Vanadium	8/8	18.80	13.00	29.20	26.10	Yes
Zinc	19/19	94.93	38.30	328.00	532.00	No
Organics-Pesticide/PCB (concentration units = mg/kg)						
PCB-1260	1/4	0.03	0.03	0.03	NB	Yes
Anthracene	1/5	0.18	0.15	0.15	NB	Yes
Benz(*a*)anthracene	1/5	0.26	0.56	0.56	NB	Yes
Benzo(*a*)pyrene	1/5	0.23	0.39	0.39	NB	Yes
Benzo(*b*)fluoranthene	1/5	0.26	0.56	0.56	NB	Yes
Benzo(*g,h,i*)perylene	1/5	0.18	0.13	0.13	NB	Yes
Benzo(*k*)fluoranthene	1/5	0.19	0.19	0.19	NB	Yes
Chrysene	1/5	0.25	0.51	0.51	NB	Yes
Di-n-butyl phthalate	1/5	0.34	0.87	0.87	NB	Yes
Fluoranthene	1/5	0.45	1.50	1.50	NB	Yes
Indeno(1,2,3-*cd*)pyrene	1/5	0.19	0.17	0.17	NB	Yes
N-Nitrosodiphenylamine	1/5	0.18	0.09	0.09	NB	Yes
Phenanthrene	1/5	0.28	0.64	0.64	NB	Yes
Pyrene	1/5	0.34	0.94	0.94	NB	Yes

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1 **Table 4-6. Summary Statistics and Determination of SRCs in Sediment – Phase I, II, and III (continued)**

Analyte	Results > Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?[b]
Organics-Volatile (concentration units = mg/kg)						
Acetone	1/4	0.01	0.02	0.02	NB	Yes
Chloroform	1/5	0.003	0.002	0.002	NB	Yes
Toluene	1/5	0.01	0.03	0.03	NB	Yes
Trichloroethene	1/5	0.003	0.001	0.001	NB	Yes

[a]Values less than the detection limit were set to one-half of the reporting limit in calculation of the average.
[b]Calcium, iron, magnesium, potassium, and sodium were eliminated as SRCs based on the essential human nutrient screen.
AOC = Area of Concern.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
NB = Analyte not screened against facility-wide background criteria; analytes exceeding a frequency of detection of 5% or weight of evidence criteria were considered as SRCs.
PCB = Polychlorinated biphenyl.
SRC = Site-related contaminant.

Table 4-7. Summary Statistics and Determination of SRCs in Groundwater – Phase I, II, and III

Analyte	Results > Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?[b]
Explosives (concentration units = µg/L)						
1,3,5-Trinitrobenzene	3/25	0.16	0.11	1.30	NB	Yes
1,3-Dinitrobenzene	1/25	0.10	0.03	0.03	NB	Yes
2,4,6-Trinitrotoluene	4/25	0.19	0.32	0.94	NB	Yes
2,4-Dinitrotoluene	14/25	0.13	0.03	0.95	NB	Yes
2,6-Dinitrotoluene	4/25	0.09	0.10	0.25	NB	Yes
2-Amino-4,6-dinitrotoluene	2/17	0.18	0.33	1.30	NB	Yes
2-Nitrotoluene	7/25	0.25	0.19	2.60	NB	Yes
3-Nitrotoluene	3/25	0.11	0.08	0.31	NB	Yes
4-Amino-2,6-dinitrotoluene	1/17	0.13	0.54	0.54	NB	Yes
4-Nitrotoluene	7/25	0.17	0.16	0.85	NB	Yes
HMX	3/26	0.98	0.74	11.00	NB	Yes
Nitrobenzene	1/25	0.10	0.06	0.06	NB	Yes
RDX	6/26	3.69	0.25	52.00	NB	Yes
Tetryl	4/25	0.16	0.10	0.92	NB	Yes
Filtered Metals (concentration units = µg/L)						
Aluminum	2/17	343.50	32.00	4,700.00	0.00	Yes
Arsenic	4/26	4.32	8.00	24.00	11.70	Yes
Barium	23/26	38.36	7.60	110.00	82.10	Yes
Cadmium	1/26	2.42	0.30	0.30	0.00	Yes
Calcium	26/26	74,680.00	31,900.00	145,000.00	115,000.00	No
Chromium	2/26	3.99	1.40	1.70	7.30	No
Cobalt	2/26	23.32	1.80	4.50	0.00	Yes
Copper	2/24	12.00	3.30	9.80	0.00	Yes
Cyanide	1/9	6.56	19.00	19.00	0.00	Yes
Iron	9/26	472.10	155.00	7,300.00	279.00	No
Lead	1/26	1.56	3.10	3.10	0.00	Yes
Magnesium	26/26	20,940.00	9,300.00	43,900.00	43,300.00	No
Manganese	24/26	374.50	32.00	2,920.00	1,020.00	Yes
Mercury	1/26	0.10	0.08	0.08	0.00	Yes
Nickel	5/26	16.78	2.20	6.20	0.00	Yes
Potassium	26/26	1,446.00	560.00	3,800.00	2,890.00	No
Sodium	25/26	8,934.00	3,060.00	35,800.00	45,700.00	No
Zinc	10/26	35.38	13.00	500.00	60.90	Yes
Organics-Pesticide/PCB (concentration units = µg/L)						
4,4'-DDT	1/17	0.03	0.06	0.06	NB	Yes
Heptachlor Epoxide	1/17	0.03	0.06	0.06	NB	Yes
Bis(2-ethylhexyl)phthalate	4/25	6.63	3.40	49.00	NB	Yes
Chloroform	4/26	2.30	0.64	1.70	NB	Yes

[a]Values less than the detection limit were set to one-half of the reporting limit in calculation of the average.
[b]Calcium, iron, magnesium, potassium, and sodium were eliminated as SRCs based on the essential human nutrient screen.
AOC = Area of Concern.
DDT = Dichlorodiphenyl-trichloroethane.
HMX = Octahyrdo-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
NB = Analyte not screened against facility-wide background criteria; analytes exceeding a frequency of detection of 5% or weight of evidence criteria were considered as SRCs.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.

4.1.3.2 Frequency of detection screen

For sample aggregates containing more than 20 samples, a frequency of detection criterion was applied to identify SRCs. Inorganic constituents, VOCs, SVOCs, pesticides, and PCBs having a frequency of detection greater than or equal to 5% (e.g., 1 in 20 samples) were identified as potential SRCs and passed through to the next screening step. If the frequency of detection for one of these classes of analytes was less than 5%, a weight of evidence approach was used to determine if the chemical was a potential SRC. The weight of evidence approach involved examining the magnitude and locations of the detected results. If no clustering within a particular area was noted and concentrations were not substantially elevated relative to the detection limits, the detected results were considered spurious, and the compound was eliminated as a potential SRC. For sample populations comprised of less than 20 samples, all detected constituents were carried forward to the facility-wide background and essential human nutrient screening steps.

All detected explosives and propellants were considered to be SRCs regardless of the frequency of detection. However, appropriate qualification is made in the assessment of occurrence and distribution for those explosives and propellants having a frequency of detection less than 5%.

4.1.3.3 Facility-wide background screen

For each inorganic constituent passing the frequency of detection screen, concentrations were compared against facility-wide background values developed as part of the Phase II RI for WBG (USACE 2001a). For inorganic constituents, if the maximum detected concentration of an analyte exceeded its respective background criterion, it was considered to be a SRC. In the event a constituent was not detected in the background data set, the background value was set to zero, and any detected result for that constituent was considered above background. This conservative process ensured that detected constituents were not eliminated as SRCs simply because they were not detected in the background data set. All detected organic compounds were considered to be above background, because these classes of compounds do not occur naturally.

4.1.3.4 Essential nutrients screen

Chemicals that are considered to be essential nutrients (calcium, chloride, iodine, iron, magnesium, potassium, phosphorus, and sodium) are an integral part of the food supply and are often added to foods as supplements. Thus, these constituents are not generally addressed as SRCs in the contaminant nature and extent evaluation unless they are grossly elevated relative to background values (EPA 1989 and 1996). For the WBG Phase III RI, analyses were conducted for calcium, iron, magnesium, potassium, and sodium. These five constituents were eliminated as SRCs in all environmental media based on comparison to background values.

4.1.4 Data Presentation

Data summary statistics and screening results for SRCs in each data aggregate are presented in Tables 4-4 through 4-7. In the sections addressing the nature and extent of contamination for each media, analytical results for selected SRCs are presented on maps to depict spatial distribution. The figures show the spatial distribution of contaminants from the Phase I and II RIs as well as the current Phase III investigation. Phase III analytical results for classes of SRCs (e.g., explosive compounds, inorganics, or VOCs) are presented in data summary tables for each media and spatial aggregate whenever a sufficient number of detected values occurred to merit such tables. Where few detected values for a class of SRCs occurred within an aggregate, the values are addressed in the text of the chapter. Complete analytical results including all non-detected results, are contained in Appendix H. Each table in Appendix H presents the results for each sampling station for a specific medium aggregate (e.g., surface soil, subsurface soil, sediment, and groundwater) and class of analytes. Complete results for the samples taken during the

Phase I and II RIs are listed in the reports addressing those specific phases of investigation (USACE 1998 and 2001a).

4.1.5 Comparison of Phase I and II Site-related Contaminants and Phase III Site-related Contaminants

Surface soil and subsurface soil SRCs for the Phase III RI were calculated using Phase III data only. Sediment and groundwater SRCs were calculated using the combined Phase I, II, and III data sets. The rationale for this was that the Phase III RI focused on only a few pads with identified high levels of contamination, and was weighted to subsurface soil characterization. The Phase I and II RIs emphasized surface soil characterization and included all pads at WBG, many of which were determined to have little or no contamination. Combining the previous investigations with the Phase III RI in the calculation of summary statistics would have skewed the results of SRC determination in the Phase III RI data. The results of the Phase I and II SRCs (as presented in USACE 1998 and 2001a) and the Phase III SRCs were compared to see if any new SRCs had been identified, or any previously identified SRCs eliminated, as a result of additional environmental data collected. The comparison is summarized below.

4.1.5.1 Surface soil

Twelve new SRCs were identified based on screening of Phase III surface soil data. These include

- 2-amino-4,6-dinitrotoluene
- 4-amino-2,6-dinitrotoluene
- nitroguanidine
- hexavalent chromium
- manganese
- vanadium
- 4,4'-dichlorodiphenyl-trichloroethane (DDT)
- dieldrin
- heptachlor epoxide
- PCB-1254
- PCB-1260

The following Phase I and II SRCs were not identified as SRCs in the Phase III data set:

- 2-nitrotoluene
- 3-nitrotoluene
- 4-nitrotoluene
- nitrocellulose
- nitroglycerine
- tetryl

4.1.5.2 Subsurface soil

Twenty new SRCs were identified based on screening of the Phase III subsurface soil data. These compounds were not SRCs in the Phase I and II data:

- 2-amino-4,6-dinitrotoluene
- 4-amino-2,6-dinitrotoluene
- aluminum
- arsenic

- chromium
- hexavalent chromium
- cyanide
- nickel
- selenium
- vanadium
- endrin ketone
- heptachlor epoxide
- acenaphthylene
- dibenzofuran
- fluorene
- naphthalene
- dimethylbenzene
- ethylbenzene
- methylene chloride
- trichloroethylene (TCE)

The following subsurface soil SRCs from the Phase I and II RIs were not identified in the Phase III subsurface soil data screening:

- 2-nitrotoluene
- 3-nitrotoluene
- nitrocellulose
- nitroglycerine
- tetryl

4.1.5.3 Sediment

Screening of the combined Phase I, II, and III sediment data sets identified the following new SRCs:

- nitroguanidine
- hexavalent chromium
- selenium
- PCB-1260

4.1.6 Groundwater

When the Phase III data were combined with the Phase I and II groundwater data and screened for SRCs, the following new compounds were identified as groundwater SRCs at WBG:

- 1,3,5-trinitrobenzene (TNB)
- 2,4,6-TNT
- 2,6-dinitrotoluene (DNT)
- 2-amino-4,6-dinitrotoluene
- 2-nitrotoluene
- 4-amino-2,6-dinitrotoluene
- 4-nitrotoluene
- tetryl
- aluminum

- arsenic
- cadmium
- cobalt
- zinc
- 4,4'-DDT
- heptachlor epoxide

4.2 SURFACE SOILS

A total of 96 surface soil (0- to 1-ft) samples were collected during the Phase III RI field effort. Fifty-nine samples came from originally planned locations within the process area of WBG. Thirty samples were collected from the random grid sampling locations located throughout the AOC. Seven contingency samples were collected. Hand-augered surface soils samples were collected at each of the 12 burning pads sampled. The surface soil interval was also collected from an additional nine locations on burning pads using a Geoprobe hydraulic push device. Surface soil samples collected from the Phase I RI were from 0 to 2 ft bgs, so data exist representing the 1- to 2-ft bgs depth interval at the burning pad locations.

The surface soil sampling is biased toward those areas that are known or suspected to have the greatest surface soil contamination based on the results of the Phase II RI. This included 11 pads (37, 38, 45, 58, 59, 60, 61, 62, 66, 67, and 68). Two samples were also collected from Pad 32, based on observations during the Field Effects Study (USACE 2003a). Three samples were collected in the vicinity of the former service Building 4301. Random grid sampling investigated areas believed to be uncontaminated outside of former burn pads. Figures 3-1 and 3-2 illustrate the distribution of surface soil samples in the process area of WBG in the Phase III RI. The random grid sampling locations are shown in Figure 3-3. All surface soil samples are designated "WBGss-XXX" to distinguish them from the subsurface soil sample (if any) at the same location.

All sample collection and analysis for the Phase III RI was conducted in accordance with the SAP Addendum No.1 for WBG FS (USACE 2000), as described in Chapter 3.0 of this report. All surface soil samples were analyzed for field explosives, field metals, and TAL metals (inorganics). Samples that tested positive for the explosives TNT or RDX in the field laboratory were to be sent to the fixed-base laboratory for explosives analysis if the field lab result was > 1.0 ppm; however, an inadvertent error in the work plan resulted in the field laboratory results being under-reported by two orders of magnitude (i.e. results reported as 0.01 ppm should have been reported as 1.0 ppm) and several samples that should have been sent for fixed-base laboratory analysis were not. This is explained further in the explosives subsection of this section. Propellants analyses were limited to five samples. VOCs, SVOCs, pesticides, PCBs, and cyanide were analyzed in 10% of the samples, as described in Chapter 3.0. Hexavalent chromium was analyzed in all surface soil samples taken at Pads 32, 58, 67, and 68; three samples each at Pads 60, 61, 38, 45, and 66; four samples at Pad 62; one sample at Building 4301; and in all of the Geoprobe samples.

The analytical results for SRCs identified in surface soil samples collected at WBG are summarized by sample station and by analyte in Tables 4-8 through 4-21 and analytical data are provided in their entirety in Appendix H. Only constituents determined to be SRCs across the AOC (Table 4-4) are included for discussion in this report. The following sections describe the distribution of explosives, propellants, inorganics, and organic constituents for surface soils at each of the pads. For each constituent class discussed, figures are presented (as appropriate) that illustrate the distribution of site-related contamination identified in the Phase I, II, and III investigations. The analytes presented in the figures represent those that occur with the greatest frequency, or those that represent the distribution of chemicals known to be significant human health or ecological risk drivers based on previous investigations at WBG.

Table 4-8. Concentrations of Site-related Inorganics in Surface Soil – Random Grid[a]

Location		Random Grid	Random Grid	Random Grid	Random Grid	Random Grid	Random Grid	Random Grid
Station		WBG-264	WBG-265	WBG-266	WBG-266	WBG-267	WBG-268	WBG-268
Sample ID		WBGss-264-4219-SO	WBGss-265-4220-SO	WBGss-266-4221-SO	WBGss-266-4279-SO	WBGss-267-4222-SO	WBGss-268-4223-SO	WBGss-268-4281-SO
Date		10/30/2000	10/30/2000	10/30/2000	10/30/2000	10/24/2000	11/01/2000	11/01/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Field Duplicate	Grab	Grab	Field Duplicate
Analyte	Units							
Metals								
Cyanide	mg/kg	NA	NA	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	NA	NA	NA	NA	NA	NA	NA
Aluminum	mg/kg	13,500 =	11,700 =	13,800 =	12,500 =	14,300 =	16,600 J	14,600 J
Antimony	mg/kg	ND	ND	ND	ND	7.1 J *	ND	ND
Arsenic	mg/kg	12.8 =	9.7 =	11.1 =	13.1 =	9.6 =	13.7 J	13.8 J
Barium	mg/kg	129 = *	57 =	84.5 =	77.3 =	72.9 =	100 = *	96.1 = *
Beryllium	mg/kg	0.65 =	0.37 J	0.74 =	0.68 =	0.43 J	0.67 J	0.65 J
Cadmium	mg/kg	0.21 J *	0.17 J *	0.25 J *	0.22 J *	0.34 J *	0.089 J *	ND
Chromium	mg/kg	17.1 J	14.5 J	16.7 J	15.4 J	17.6 J *	19.9 = *	17.6 = *
Cobalt	mg/kg	12.6 = *	11.1 = *	12.2 = *	13.9 = *	10.8 = *	10.6 J *	10.9 J *
Copper	mg/kg	11 J	9.7 J	11.4 J	9.6 J	16.3 =	16.4 J	13.4 J
Lead	mg/kg	23.6 =	16.5 =	20.8 =	20.8 =	36.4 J *	24.4 =	21 =
Manganese	mg/kg	1,640 J *	753 J	1,830 J *	1,930 J *	821 J	1,180 =	1,310 =
Mercury	mg/kg	0.047 J *	0.051 J *	0.072 J *	0.069 J *	0.064 J *	0.066 J *	0.058 J *
Nickel	mg/kg	14.4 J	13.3 J	18 J	16.7 J	15.2 =	23.1 J *	19.4 J
Selenium	mg/kg	0.9 =	0.75 =	0.97 =	0.97 =	1.1 =	1 =	0.83 =
Silver	mg/kg	ND	ND	ND	ND	ND	ND	ND
Thallium	mg/kg	0.37 J *	0.29 J *	0.47 J *	0.37 J *	0.49 J *	0.39 J *	0.33 J *
Vanadium	mg/kg	30.5 J	22.4 J	25.3 J	24.9 J	26.4 =	28 =	26 =
Zinc	mg/kg	66.5 J *	55.4 J	64.2 J *	58.2 J	96.7 J *	84.4 J *	74.9 J *

Table 4-8. Concentrations of Site-related Inorganics in Surface Soil – Random Grid[a] (continued)

Location		Random Grid	Random Grid	Random Grid	Random Grid	Random Grid	Random Grid	Random Grid
Station		WBG-269	WBG-270	WBG-271	WBG-272	WBG-273	WBG-274	WBG-275
Sample ID		WBGss-269-4224-SO	WBGss-270-4225-SO	WBGss-271-4226-SO	WBGss-272-4227-SO	WBGss-273-4228-SO	WBGss-274-4229-SO	WBGss-275-4230-SO
Date		10/24/2000	11/01/2000	11/01/2000	11/01/2000	11/01/2000	10/24/2000	10/24/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	Units							
Metals								
Cyanide	mg/kg	NA	NA	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	NA	NA	NA	NA	NA	NA	NA
Aluminum	mg/kg	12,900 =	10,900 J	11,400 J	11,700 J	12,700 J	14,200 =	17,600 =
Antimony	mg/kg	ND	ND	ND	ND	ND	ND	ND
Arsenic	mg/kg	9.7 =	9.7 J	9.6 J	10.2 J	10.8 J	10.9 =	12.7 =
Barium	mg/kg	67.5 =	139 = *	500 = *	162 = *	147 = *	72.3 =	64.8 =
Beryllium	mg/kg	ND	0.41 J	0.36 J	0.46 J	0.59 J	ND	0.45 J
Cadmium	mg/kg	ND	ND	0.09 J *	ND	0.2 J *	0.35 J *	ND
Chromium	mg/kg	16.1 J	13.7 =	13.7 =	14.1 =	14.9 =	18.4 J *	22.7 J *
Cobalt	mg/kg	12.8 = *	10.8 J *	8.1 J	9.2 J	11.7 J *	8.1 =	7.5 =
Copper	mg/kg	10 =	13.5 J	12.1 J	12.2 J	9.4 J	19.4 = *	17.7 =
Lead	mg/kg	25.6 J	20.9 =	20.8 =	18.1 =	25 =	25.3 J	16.1 J
Manganese	mg/kg	858 J	1,020 =	508 =	901 =	3,170 = *	393 J	273 J
Mercury	mg/kg	0.045 J *	0.055 J *	0.05 J *	0.044 J *	0.074 J *	0.04 J *	0.042 J *
Nickel	mg/kg	13.1 =	15.5 J	13 J	12.5 J	18.3 J	15.6 =	20.2 =
Selenium	mg/kg	0.8 =	0.88 =	0.68 =	0.6 J	0.48 J	0.85 =	1.3 =
Silver	mg/kg	ND	ND	ND	ND	ND	ND	ND
Thallium	mg/kg	0.46 J *	0.29 J *	0.26 J *	0.27 J *	0.39 J *	0.61 J *	0.62 J *
Vanadium	mg/kg	26.2 =	21.4 =	21.8 =	22.2 =	24 =	27.3 =	31.2 = *
Zinc	mg/kg	57.9 J	57.5 J	65.7 J *	60.6 J	88 J *	90.1 J *	63 J *

Table 4-8. Concentrations of Site-related Inorganics in Surface Soil – Random Grid[a] (continued)

Location		Random Grid	Random Grid	Random Grid	Random Grid	Random Grid	Random Grid	Random Grid
Station		WBG-276	WBG-277	WBG-278	WBG-279	WBG-280	WBG-281	WBG-281
Sample ID		WBGss-276-4231-SO	WBGss-277-4232-SO	WBGss-278-4233-SO	WBGss-279-4234-SO	WBGss-280-4235-SO	WBGss-281-4236-SO	WBGss-281-4274-SO
Date		10/24/2000	10/24/2000	10/24/2000	10/31/2000	10/30/2000	10/24/2000	10/24/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab	Grab	Grab	Field Duplicate
Analyte	Units							
Metals								
Cyanide	mg/kg	NA	NA	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	NA	NA	NA	NA	NA	NA	NA
Aluminum	mg/kg	13,000 J	10,200 =	14,700 =	10,500 =	9,070 =	11,000 =	10,000 =
Antimony	mg/kg	0.76 J	ND	ND	ND	ND	ND	ND
Arsenic	mg/kg	15.1 =	9.9 =	13.3 =	7.2 J	6.9 =	13 =	14.4 =
Barium	mg/kg	104 = *	66.9 =	104 = *	115 = *	80.4 =	43.8 =	40.5 =
Beryllium	mg/kg	0.57 J	ND	0.47 J	0.34 J	ND	ND	ND
Cadmium	mg/kg	0.11 J *	0.14 J *	0.16 J *	0.063 J *	0.14 J *	ND	0.069 J *
Chromium	mg/kg	16.6 =	13.1 J	18.4 J *	10.7 =	10.7 J	14.1 J	13.3 J
Cobalt	mg/kg	11.9 = *	8 =	10 =	5.7 J	10.3 =	8.6 =	8 =
Copper	mg/kg	10.3 =	10.3 =	17.4 =	19 J *	6.9 J	19.5 = *	18.5 = *
Lead	mg/kg	23.2 =	20.8 J	21.1 J	12.5 =	15.9 =	15.4 J	15 J
Manganese	mg/kg	1,410 J	699 J	1,000 J	328 =	916 J	463 J	389 J
Mercury	mg/kg	0.042 J *	0.04 J *	0.047 J *	0.041 J *	0.051 J *	0.023 J	0.02 J
Nickel	mg/kg	15.6 =	12.9 =	15.3 =	11.9 J	10.4 J	17 =	16.7 =
Selenium	mg/kg	1.2 =	0.9 =	1.2 =	ND	ND	0.77 =	0.72 =
Silver	mg/kg	ND	ND	ND	ND	ND	ND	ND
Thallium	mg/kg	0.81 = *	0.43 J *	0.53 J *	0.24 J *	0.29 J *	0.41 J *	0.5 J *
Vanadium	mg/kg	27 =	20.2 =	31 =	18.7 =	17.1 J	19.9 =	18.3 =
Zinc	mg/kg	63.9 = *	52 J	67.9 J *	59.5 J	42.9 J	67.5 J *	63.6 J *

Table 4-8. Concentrations of Site-related Inorganics in Surface Soil – Random Grid[a] (continued)

Location		Random Grid	Random Grid	Random Grid	Random Grid	Random Grid	Random Grid	Random Grid
Station		WBG-282	WBG-283	WBG-284	WBG-285	WBG-286	WBG-287	WBG-288
Sample ID		WBGss-282-4237-SO	WBGss-283-4238-SO	WBGss-284-4239-SO	WBGss-285-4240-SO	WBGss-286-4241-SO	WBGss-287-4242-SO	WBGss-288-4243-SO
Date		10/31/2000	10/31/2000	10/31/2000	10/31/2000	10/31/2000	10/31/2000	10/31/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	Units							
Metals								
Cyanide	mg/kg	NA	NA	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	NA	NA	NA	NA	NA	NA	NA
Aluminum	mg/kg	12,500 =	12,900 =	10,200 =	12,500 J	9,760 =	12,000 =	11,200 =
Antimony	mg/kg	0.73 J	ND	ND	ND	ND	ND	ND
Arsenic	mg/kg	13.1 J	13.9 J	11.1 J	18.4 J *	12.1 J	11.2 J	19.1 J *
Barium	mg/kg	75.7 =	110 = *	99 = *	50.2 =	55.2 =	64.5 =	77.4 =
Beryllium	mg/kg	0.55 J	0.87 =	0.49 J	0.34 J	0.46 J	0.45 J	0.48 J
Cadmium	mg/kg	0.27 J *	ND	ND	ND	ND	ND	0.16 J *
Chromium	mg/kg	17.9 = *	19.4 = *	13.5 =	17.4 =	11.2 =	15.5 =	13.8 =
Cobalt	mg/kg	11.8 J *	15.3 J *	8.3 J	7.1 J	10 J	11.2 J *	9.8 J
Copper	mg/kg	20.3 J *	23.6 J *	10.9 J	16.4 J	8.9 J	18.4 J *	16.4 J
Lead	mg/kg	24.1 =	13.7 =	16.7 =	19 =	20.4 =	20.8 =	20.3 =
Manganese	mg/kg	544 =	327 =	690 =	392 =	981 =	749 =	561 =
Mercury	mg/kg	0.039 J *	0.027 J	0.046 J *	0.044 J *	0.04 J *	0.051 J *	0.05 J *
Nickel	mg/kg	21 J	37.1 J *	17.9 J	15.6 J	9.4 J	17.7 J	17.7 J
Selenium	mg/kg	0.99 =	0.51 J	0.75 =	1.3 =	0.69 =	0.63 J	0.81 =
Silver	mg/kg	ND	ND	ND	ND	ND	ND	ND
Thallium	mg/kg	0.17 J *	0.34 J *	0.34 J *	0.29 J *	0.21 J *	0.31 J *	0.26 J *
Vanadium	mg/kg	24.1 =	21.6 =	19.2 =	25 =	25.2 =	21.1 =	18.2 =
Zinc	mg/kg	80.3 J *	67.3 J *	59.7 J	49.1 J	42.3 J	62.3 J *	76.9 J *

Table 4-8. Concentrations of Site-related Inorganics in Surface Soil – Random Grid[a] (continued)

Location		Random Grid	Random Grid	Random Grid	Random Grid	Random Grid	Random Grid
Station		WBG-289	WBG-290	WBG-291	WBG-292	WBG-292	WBG-293
Sample ID		WBGss-289-4244-SO	WBGss-290-4245-SO	WBGss-291-4246-SO	WBGss-292-4247-SO	WBGss-292-4280-SO	WBGss-293-4248-SO
Date		10/31/2000	10/31/2000	10/31/2000	10/31/2000	10/31/2000	10/31/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab	Field Duplicate	Grab
Analyte	Units						
Metals							
Cyanide	mg/kg	NA	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	NA	NA	NA	NA	NA	NA
Aluminum	mg/kg	9,100 =	10,300 =	9,920 =	11,400 =	9,850 =	5,350 =
Antimony	mg/kg	ND	ND	ND	ND	ND	ND
Arsenic	mg/kg	8.7 J	7.1 J	8.9 =	9.7 J	9.3 J	8.8 J
Barium	mg/kg	29 =	66.1 =	35.1 =	102 = *	105 = *	28.2 =
Beryllium	mg/kg	ND	0.32 J	ND	0.39 J	0.32 J	ND
Cadmium	mg/kg	ND	ND	0.081 J *	0.098 J *	0.11 J *	ND
Chromium	mg/kg	9.5 =	12.9 =	13 J	13.1 =	11.8 =	9.6 =
Cobalt	mg/kg	5.9 J	6.4 J	8.3 =	8.5 J	8.5 J	5.1 J
Copper	mg/kg	9.8 J	8.9 J	8.6 J	10.8 J	9.5 J	5.8 J
Lead	mg/kg	11.5 =	14.8 =	24.7 =	25.1 =	24.9 =	11 =
Manganese	mg/kg	145 =	348 =	434 J	1,250 =	1,350 =	98.3 =
Mercury	mg/kg	0.033 J	0.052 J *	0.044 J *	0.083 J *	0.084 J *	0.035 J
Nickel	mg/kg	11.2 J	11.3 J	11.3 J	14.6 J	13.3 J	7.8 J
Selenium	mg/kg	0.65 =	0.66 =	0.98 =	0.77 =	0.81 =	0.76 =
Silver	mg/kg	ND	ND	ND	ND	ND	ND
Thallium	mg/kg	0.22 J *	0.25 J *	0.31 J *	0.39 J *	0.28 J *	0.24 J *
Vanadium	mg/kg	16.3 =	18.2 =	20.8 J	21.5 =	19.1 =	10.3 =
Zinc	mg/kg	48.7 J	45.7 J	40.1 J	70 J *	61.4 J	30.6 J

[a] Random grid samples were not submitted for laboratory analysis of explosives based on field screening.
ID = Identification.
NA = Not analyzed.
ND = Non detect.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-9. Concentrations of SRCs in Surface Soil at Building 4301

Station		WBG-259	WBG-260	WBG-261
Sample ID		WBGss-259-4204-SO	WBGss-260-4207-SO	WBGss-261-4210-SO
Date		10/23/2000	10/23/2000	10/23/2000
Depth (ft)		0 - 1	0 - 1	0 - 1
Field Type		Grab	Grab	Grab
Analyte	Units			
Explosives				
1,3,5-Trinitrobenzene	mg/kg	NA	NA	NA
1,3-Dinitrobenzene	mg/kg	NA	NA	NA
2,4,6-Trinitrotoluene	mg/kg	NA	NA	NA
2,4-Dinitrotoluene	mg/kg	NA	NA	NA
2,6-Dinitrotoluene	mg/kg	NA	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	NA	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	NA	NA	NA
HMX	mg/kg	NA	NA	NA
Nitrobenzene	mg/kg	NA	NA	NA
Nitroguanidine	mg/kg	ND	ND	ND
RDX	mg/kg	NA	NA	NA
Metals				
Cyanide	mg/kg	NA	NA	1.8 J *
Chromium, hexavalent	mg/kg	NA	ND	NA
Aluminum	mg/kg	4,790 =	13,300 =	10,500 =
Antimony	mg/kg	5.8 J *	17.5 J *	21 J *
Arsenic	mg/kg	20.1 = *	8.6 =	10.5 =
Barium	mg/kg	58.3 =	207 = *	192 = *
Beryllium	mg/kg	0.36 J	1.4 = *	1.1 = *
Cadmium	mg/kg	0.58 = *	1.2 = *	2.6 = *
Chromium	mg/kg	12.2 J	24.4 J *	29.1 J *
Cobalt	mg/kg	3.1 J	4.7 J	4.3 J
Copper	mg/kg	79.1 = *	184 = *	106 = *
Lead	mg/kg	64.7 J *	88.3 J *	125 J *
Manganese	mg/kg	440 J	2,240 J *	1,630 J *
Mercury	mg/kg	ND	0.016 J	ND
Nickel	mg/kg	7.8 =	9.9 =	11.6 =
Selenium	mg/kg	0.68 =	0.7 =	1.1 =
Silver	mg/kg	ND	ND	ND
Thallium	mg/kg	0.57 J *	0.52 J *	0.66 = *
Vanadium	mg/kg	8.3 =	9.5 =	7.1 =
Zinc	mg/kg	89.5 J *	163 J *	140 J *
Organics-Pesticide/PCB				
4,4'-DDT	mg/kg	NA	NA	ND
Dieldrin	mg/kg	NA	NA	ND
Heptachlor Epoxide	mg/kg	NA	NA	ND
PCB-1254	mg/kg	NA	NA	0.14 =
PCB-1260	mg/kg	NA	NA	ND
Organics-Semivolatile				
2-Methylnaphthalene	mg/kg	NA	NA	0.082 J
Anthracene	mg/kg	NA	NA	0.057 J
Benz(*a*)anthracene	mg/kg	NA	NA	0.36 J
Benzo(*a*)pyrene	mg/kg	NA	NA	0.35 J
Benzo(*b*)fluoranthene	mg/kg	NA	NA	0.45 =

Table 4-9. Concentrations of SRCs in Surface Soil at Building 4301 (continued)

Station		WBG-259	WBG-260	WBG-261
Sample ID		WBGss-259-4204-SO	WBGss-260-4207-SO	WBGss-261-4210-SO
Date		10/23/2000	10/23/2000	10/23/2000
Depth (ft)		0 - 1	0 - 1	0 - 1
Field Type		Grab	Grab	Grab
Analyte	Units			
Benzo(*g*,*h*,*i*)perylene	mg/kg	NA	NA	0.21 J
Benzo(*k*)fluoranthene	mg/kg	NA	NA	0.12 J
Carbazole	mg/kg	NA	NA	ND
Chrysene	mg/kg	NA	NA	0.43 =
Dibenz(*a*,*h*)anthracene	mg/kg	NA	NA	0.062 J
Fluoranthene	mg/kg	NA	NA	0.6 =
Indeno(1,2,3-*cd*)pyrene	mg/kg	NA	NA	0.22 J
Naphthalene	mg/kg	NA	NA	0.061 J
Phenanthrene	mg/kg	NA	NA	0.48 =
Pyrene	mg/kg	NA	NA	0.77 =
Organics-Volatile				
Trichloroethene	mg/kg	NA	NA	0.0012 J

DDT = Dichlorodiphenyl-trichloroethane.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non detect
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-10. Concentrations of SRCs in Surface Soil at Pad 32[a]

Station		WBG-258	WBG-262
Sample ID		WBGss-258-4201-SO	WBGss-262-4213-SO
Date		11/01/2000	11/01/2000
Depth (ft)		0–1	0–1
Field Type		Grab	Grab
Analyte	Units		
Metals			
Cyanide	mg/kg	NA	NA
Chromium, hexavalent	mg/kg	ND	NA
Aluminum	mg/kg	13,700 =	14,300 J
Antimony	mg/kg	0.91 J	ND
Arsenic	mg/kg	12.5 =	10.3 J
Barium	mg/kg	95.6 = *	85.3 =
Beryllium	mg/kg	0.59 J	0.55 J
Cadmium	mg/kg	0.74 = *	ND
Chromium	mg/kg	18.8 = *	21.5 = *
Cobalt	mg/kg	11.1 = *	11.4 J *
Copper	mg/kg	28.9 = *	21.4 J *
Lead	mg/kg	19 =	12.7 =
Manganese	mg/kg	513 =	362 =
Mercury	mg/kg	0.03 J	0.021 J
Nickel	mg/kg	26.1 = *	29.7 J *
Selenium	mg/kg	0.63 =	ND
Silver	mg/kg	ND	ND
Thallium	mg/kg	0.58 J *	0.31 J *
Vanadium	mg/kg	23.8 =	25.3 =
Zinc	mg/kg	79.2 = *	63.2 J *

[a] Exposives were not detected in surface soil at Pad 32.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-11. Concentrations of SRCs in Surface Soil at Pad 37

Station		WBG-223	WBG-224	WBG-225	WBG-226	WBG-227
Sample ID		WBGss-223-4082-SO	WBGss-224-4085-SO	WBGss-225-4088-SO	WBGss-226-4091-SO	WBGss-227-4094-SO
Date		10/20/2000	10/20/2000	10/20/2000	10/20/2000	10/22/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	Units					
Explosives						
1,3,5-Trinitrobenzene	mg/kg	NA	NA	NA	NA	ND
1,3-Dinitrobenzene	mg/kg	NA	NA	NA	NA	ND
2,4,6-Trinitrotoluene	mg/kg	NA	NA	NA	NA	ND
2,4-Dinitrotoluene	mg/kg	NA	NA	NA	NA	ND
2,6-Dinitrotoluene	mg/kg	NA	NA	NA	NA	ND
2-Amino-4,6-dinitrotoluene	mg/kg	NA	NA	NA	NA	ND
4-Amino-2,6-dinitrotoluene	mg/kg	NA	NA	NA	NA	ND
HMX	mg/kg	NA	NA	NA	NA	ND
Nitrobenzene	mg/kg	NA	NA	NA	NA	ND
Nitroguanidine	mg/kg	NA	NA	NA	NA	NA
RDX	mg/kg	NA	NA	NA	NA	ND
Metals						
Cyanide	mg/kg	NA	NA	ND	NA	NA
Chromium, hexavalent	mg/kg	ND	ND	2 J	8.8 J	NA
Aluminum	mg/kg	17,700 J	12,300 J	9,750 J	17,100 J	16,800 J
Antimony	mg/kg	ND	0.69 J	ND	2.8 J *	0.93 J
Arsenic	mg/kg	10.3 =	13.2 =	9.4 =	25.6 = *	13 =
Barium	mg/kg	267 J *	71.8 J	72.3 J	101 J *	96.7 J *
Beryllium	mg/kg	1.8 = *	0.55 J	0.44 J	0.41 J	0.49 J
Cadmium	mg/kg	6.9 J *	0.29 J *	0.073 J *	0.74 J *	0.17 J *
Chromium	mg/kg	30.2 J *	15.6 J	12.1 J	30.8 J *	21.9 J *
Cobalt	mg/kg	6.9 =	11.5 = *	7.7 =	8.8 =	10 =
Copper	mg/kg	16.2 =	14.7 =	7.8 =	39.7 = *	19.9 = *
Lead	mg/kg	28.4 = *	29.8 = *	18.7 =	452 = *	44.9 = *
Manganese	mg/kg	1,020 =	1,140 =	705 J	485 =	823 =
Mercury	mg/kg	0.017 J	0.041 J *	0.046 J *	0.037 J *	0.043 J *
Nickel	mg/kg	12 =	15 =	11.2 =	22.2 = *	18 =
Selenium	mg/kg	1.4 =	1.3 =	1.2 =	1.2 =	0.97 =
Silver	mg/kg	0.51 J *	ND	ND	ND	ND
Thallium	mg/kg	0.26 J *	0.38 J *	0.49 J *	0.46 J *	0.47 J *
Vanadium	mg/kg	24 =	26.3 =	20.3 =	31 =	30.9 =
Zinc	mg/kg	128 J *	86.4 J *	51.9 J	221 J *	102 J *
Organics-Pesticide/PCB						
4,4'-DDT	mg/kg	NA	NA	ND	NA	NA
Dieldrin	mg/kg	NA	NA	0.0054 =	NA	NA
Heptachlor Epoxide	mg/kg	NA	NA	ND	NA	NA
PCB-1254	mg/kg	NA	NA	ND	NA	NA
PCB-1260	mg/kg	NA	NA	ND	NA	NA
Organics-Semivolatile						
2-Methylnaphthalene	mg/kg	NA	NA	ND	NA	NA
Anthracene	mg/kg	NA	NA	ND	NA	NA
Benz(*a*)anthracene	mg/kg	NA	NA	ND	NA	NA
Benzo(*a*)pyrene	mg/kg	NA	NA	ND	NA	NA

Table 4-11. Concentrations of SRCs in Surface Soil at Pad 37 (continued)

Station		WBG-223	WBG-224	WBG-225	WBG-226	WBG-227
Sample ID		WBGss-223-4082-SO	WBGss-224-4085-SO	WBGss-225-4088-SO	WBGss-226-4091-SO	WBGss-227-4094-SO
Date		10/20/2000	10/20/2000	10/20/2000	10/20/2000	10/22/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	Units					
Benzo(*b*)fluoranthene	mg/kg	NA	NA	ND	NA	NA
Benzo(*g*,*h*,*i*)perylene	mg/kg	NA	NA	ND	NA	NA
Benzo(*k*)fluoranthene	mg/kg	NA	NA	ND	NA	NA
Carbazole	mg/kg	NA	NA	ND	NA	NA
Chrysene	mg/kg	NA	NA	ND	NA	NA
Dibenz(*a*,*h*)anthracene	mg/kg	NA	NA	ND	NA	NA
Fluoranthene	mg/kg	NA	NA	ND	NA	NA
Indeno(1,2,3-*cd*)pyrene	mg/kg	NA	NA	ND	NA	NA
Naphthalene	mg/kg	NA	NA	ND	NA	NA
Phenanthrene	mg/kg	NA	NA	ND	NA	NA
Pyrene	mg/kg	NA	NA	ND	NA	NA
Organics-Volatile						
Trichloroethene	mg/kg	NA	NA	ND	NA	NA

DDT = Dichlorodiphenyl-trichloroethane.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-12. Concentrations of SRCs in Surface Soil at Pad 38

Station		WBG-229	WBG-230	WBG-231	WBG-232
Sample ID		WBGss-229-4102-SO	WBGss-230-4105-SO	WBGss-231-4108-SO	WBGss-232-4111-SO
Date		10/21/2000	10/20/2000	10/21/2000	10/22/2000
Depth (ft)		0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab
Analyte	Units				
Explosives					
1,3,5-Trinitrobenzene	mg/kg	NA	NA	NA	ND
1,3-Dinitrobenzene	mg/kg	NA	NA	NA	ND
2,4,6-Trinitrotoluene	mg/kg	NA	NA	NA	0.066 J
2,4-Dinitrotoluene	mg/kg	NA	NA	NA	0.15 J
2,6-Dinitrotoluene	mg/kg	NA	NA	NA	ND
2-Amino-4,6-dinitrotoluene	mg/kg	NA	NA	NA	ND
4-Amino-2,6-dinitrotoluene	mg/kg	NA	NA	NA	ND
HMX	mg/kg	NA	NA	NA	ND
Nitrobenzene	mg/kg	NA	NA	NA	ND
Nitroguanidine	mg/kg	NA	NA	NA	NA
RDX	mg/kg	NA	NA	NA	ND
Metals					
Cyanide	mg/kg	NA	NA	ND	NA
Chromium, hexavalent	mg/kg	ND	2.9 J	ND	5.8 J
Aluminum	mg/kg	11,300 J	15,200 J	13,300 J	11,500 =
Antimony	mg/kg	0.65 J	ND	2.2 J *	ND
Arsenic	mg/kg	16.1 = *	13.7 =	17.8 = *	12.6 =
Barium	mg/kg	54.8 J	63 J	203 J *	112 = *
Beryllium	mg/kg	0.26 J	0.5 J	0.31 J	0.67 =
Cadmium	mg/kg	0.5 J *	ND	43.6 J *	31.6 = *
Chromium	mg/kg	13.9 J	18.7 J *	26.3 J *	14.4 =
Cobalt	mg/kg	7.3 =	9.4 =	10.1 =	7.9 J
Copper	mg/kg	11.1 =	17.9 = *	29.7 = *	18.9 = *
Lead	mg/kg	16.9 =	18.5 =	223 = *	37.4 = *
Manganese	mg/kg	363 =	507 =	467 =	829 =
Mercury	mg/kg	0.038 J *	0.027 J	0.023 J	0.027 J
Nickel	mg/kg	13.7 =	15.8 =	22.1 = *	18.3 =
Selenium	mg/kg	0.98 =	1.1 =	2.5 = *	ND
Silver	mg/kg	ND	ND	ND	ND
Thallium	mg/kg	0.34 J *	0.37 J *	0.43 J *	0.43 J *
Vanadium	mg/kg	20.2 =	29.6 =	25.6 =	16.3 =
Zinc	mg/kg	58 J	66.4 J *	287 J *	73.1 J *
Organics-Pesticide/PCB					
4,4'-DDT	mg/kg	NA	NA	ND	NA
Dieldrin	mg/kg	NA	NA	ND	NA
Heptachlor Epoxide	mg/kg	NA	NA	0.081 J	NA
PCB-1254	mg/kg	NA	NA	ND	NA
PCB-1260	mg/kg	NA	NA	ND	NA
Organics-Semivolatile					
2-Methylnaphthalene	mg/kg	NA	NA	ND	NA
Anthracene	mg/kg	NA	NA	ND	NA
Benz(*a*)anthracene	mg/kg	NA	NA	ND	NA
Benzo(*a*)pyrene	mg/kg	NA	NA	ND	NA

Table 4-12. Concentrations of SRCs in Surface Soil at Pad 38 (continued)

Station		WBG-229	WBG-230	WBG-231	WBG-232
Sample ID		WBGss-229-4102-SO	WBGss-230-4105-SO	WBGss-231-4108-SO	WBGss-232-4111-SO
Date		10/21/2000	10/20/2000	10/21/2000	10/22/2000
Depth (ft)		0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab
Analyte	Units				
Benzo(*b*)fluoranthene	mg/kg	NA	NA	ND	NA
Benzo(g,h,i)perylene	mg/kg	NA	NA	ND	NA
Benzo(*k*)fluoranthene	mg/kg	NA	NA	ND	NA
Carbazole	mg/kg	NA	NA	ND	NA
Chrysene	mg/kg	NA	NA	ND	NA
Dibenz(*a*,*h*)anthracene	mg/kg	NA	NA	ND	NA
Fluoranthene	mg/kg	NA	NA	ND	NA
Indeno(1,2,3-*cd*)pyrene	mg/kg	NA	NA	ND	NA
Naphthalene	mg/kg	NA	NA	ND	NA
Phenanthrene	mg/kg	NA	NA	ND	NA
Pyrene	mg/kg	NA	NA	ND	NA
Organics-Volatile					
Trichloroethene	mg/kg	NA	NA	ND	NA

DDT = Dichlorodiphenyl-trichloroethane.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-13. Concentrations of SRCs in Surface Soil at Pad 45

Station		WBG-233	WBG-234	WBG-235	WBG-236	WBG-236	WBG-237
Sample ID		WBGss-233-4116-SO	WBGss-234-4119-SO	WBGss-235-4122-SO	WBGss-236-4125-SO	WBGss-236-4270-SO	WBGss-237-4128-SO
Date		10/20/2000	10/19/2000	10/19/2000	10/20/2000	10/20/2000	10/22/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab	Field Duplicate	Grab
Analyte	Units						
Explosives							
1,3,5-Trinitrobenzene	mg/kg	NA	ND	NA	ND	ND	ND
1,3-Dinitrobenzene	mg/kg	NA	ND	NA	ND	ND	ND
2,4,6-Trinitrotoluene	mg/kg	NA	0.13 J	NA	ND	ND	ND
2,4-Dinitrotoluene	mg/kg	NA	ND	NA	ND	ND	ND
2,6-Dinitrotoluene	mg/kg	NA	ND	NA	ND	ND	ND
2-Amino-4,6-dinitrotoluene	mg/kg	NA	ND	NA	ND	ND	ND
4-Amino-2,6-dinitrotoluene	mg/kg	NA	ND	NA	ND	ND	ND
HMX	mg/kg	NA	ND	NA	ND	ND	ND
Nitrobenzene	mg/kg	NA	ND	NA	ND	ND	ND
Nitroguanidine	mg/kg	NA	NA	NA	0.091 J	ND	NA
RDX	mg/kg	NA	ND	NA	ND	ND	ND
Metals							
Cyanide	mg/kg	NA	NA	NA	ND	ND	NA
Chromium, hexavalent	mg/kg	ND	ND	ND	5.2 J	1.5 J	3.5 J
Aluminum	mg/kg	13,400 J	15,100 =	15,100 =	NA	13,900 J	12,100 J
Antimony	mg/kg	0.76 J	ND	0.85 J	ND	ND	1.7 J *
Arsenic	mg/kg	10 =	8.6 =	8.1 =	10.6 =	13.5 =	11.3 =
Barium	mg/kg	46.2 =	140 = *	90.8 = *	NA	71.1 =	71.5 =
Beryllium	mg/kg	ND	1.7 = *	1.1 = *	NA	0.6 J	0.49 J
Cadmium	mg/kg	ND	3.5 = *	2.8 = *	NA	ND	ND
Chromium	mg/kg	16.8 =	10.1 J	10.6 J	NA	18.1 = *	16 =
Cobalt	mg/kg	6.5 =	4.6 J	4.4 J	NA	11.2 = *	10.3 =
Copper	mg/kg	13.3 =	416 J *	219 J *	NA	26.7 = *	17.6 =
Lead	mg/kg	15.4 =	81.9 J *	98.8 J *	18.5 =	23.4 =	28.9 = *
Manganese	mg/kg	211 J	1320 =	587 =	NA	411 J	593 =
Mercury	mg/kg	0.019 J	0.041 J *	0.041 J *	0.021 J	0.024 J	0.033 J
Nickel	mg/kg	16.6 =	7 =	11.5 =	NA	25.9 = *	19.2 =
Selenium	mg/kg	1.4 =	ND	ND	1.2 =	1.8 = *	ND
Silver	mg/kg	ND	ND	0.2 J *	NA	ND	ND
Thallium	mg/kg	0.66 J *	0.36 J *	0.4 J *	0.56 J *	0.71 J *	0.62 J *
Vanadium	mg/kg	23.1 =	11.6 =	12.7 =	NA	23.3 =	21.3 =
Zinc	mg/kg	62.2 = *	360 J *	538 J *	NA	110 = *	83.3 = *

Table 4-13. Concentrations of SRCs in Surface Soil at Pad 45 (continued)

Station		WBG-233	WBG-234	WBG-235	WBG-236	WBG-236	WBG-237
Sample ID		WBGss-233-4116-SO	WBGss-234-4119-SO	WBGss-235-4122-SO	WBGss-236-4125-SO	WBGss-236-4270-SO	WBGss-237-4128-SO
Date		10/20/2000	10/19/2000	10/19/2000	10/20/2000	10/20/2000	10/22/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab	Field Duplicate	Grab
Analyte	Units						
Organics-Pesticide/PCB							
4,4'-DDT	mg/kg	NA	NA	NA	ND	ND	NA
Dieldrin	mg/kg	NA	NA	NA	ND	ND	NA
Heptachlor Epoxide	mg/kg	NA	NA	NA	ND	ND	NA
PCB-1254	mg/kg	NA	NA	NA	ND	ND	NA
PCB-1260	mg/kg	NA	NA	NA	ND	ND	NA
Organics-Semivolatile							
2-Methylnaphthalene	mg/kg	NA	NA	NA	ND	ND	NA
Anthracene	mg/kg	NA	NA	NA	ND	ND	NA
Benz(*a*)anthracene	mg/kg	NA	NA	NA	ND	ND	NA
Benzo(*a*)pyrene	mg/kg	NA	NA	NA	ND	ND	NA
Benzo(*b*)fluoranthene	mg/kg	NA	NA	NA	ND	ND	NA
Benzo(*g,h,i*)perylene	mg/kg	NA	NA	NA	ND	ND	NA
Benzo(*k*)fluoranthene	mg/kg	NA	NA	NA	ND	ND	NA
Carbazole	mg/kg	NA	NA	NA	ND	ND	NA
Chrysene	mg/kg	NA	NA	NA	ND	ND	NA
Dibenz(*a,h*)anthracene	mg/kg	NA	NA	NA	ND	ND	NA
Fluoranthene	mg/kg	NA	NA	NA	ND	ND	NA
Indeno(1,2,3-*cd*)pyrene	mg/kg	NA	NA	NA	ND	ND	NA
Naphthalene	mg/kg	NA	NA	NA	ND	ND	NA
Phenanthrene	mg/kg	NA	NA	NA	ND	ND	NA
Pyrene	mg/kg	NA	NA	NA	ND	ND	NA
Organics-Volatile							
Trichloroethene	mg/kg	NA	NA	NA	ND	ND	NA

DDT = Dichlorodiphenyl-trichloroethane.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-14. Concentrations of SRCs in Surface Soil at Pad 58

Station		WBG-197	WBG-198	WBG-199	WBG-200	WBG-201	WBG-201	WBG-202	WBG-203
Sample ID		WBGss-197-4000-SO	WBGss-198-4003-SO	WBGss-199-4006-SO	WBGss-200-4009-SO	WBGss-201-4012-SO	WBGss-201-4268-SO	WBGss-202-4015-SO	WBGss-203-4018-SO
Date		10/17/2000	10/17/2000	10/17/2000	10/17/2000	10/17/2000	10/17/2000	10/17/2000	10/22/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab	Grab	Field Duplicate	Grab	Grab
Analyte	Units								
Explosives									
1,3,5-Trinitrobenzene	mg/kg	ND	NA	NA	NA	ND	ND	NA	ND
1,3-Dinitrobenzene	mg/kg	ND	NA	NA	NA	ND	ND	NA	ND
2,4,6-Trinitrotoluene	mg/kg	ND	NA	NA	NA	ND	ND	NA	ND
2,4-Dinitrotoluene	mg/kg	ND	NA	NA	NA	ND	ND	NA	ND
2,6-Dinitrotoluene	mg/kg	ND	NA	NA	NA	ND	ND	NA	ND
2-Amino-4,6-dinitrotoluene	mg/kg	ND	NA	NA	NA	0.11 J	ND	NA	ND
4-Amino-2,6-dinitrotoluene	mg/kg	ND	NA	NA	NA	0.12 J	ND	NA	ND
HMX	mg/kg	ND	NA	NA	NA	ND	ND	NA	ND
Nitrobenzene	mg/kg	ND	NA	NA	NA	ND	ND	NA	ND
Nitroguanidine	mg/kg	NA	NA	ND	NA	NA	ND	NA	NA
RDX	mg/kg	ND	NA	NA	NA	ND	ND	NA	ND
Metals									
Cyanide	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	ND	NA	2.5 J	4 J	NA	NA	4.7 J	ND
Aluminum	mg/kg	15,200 =	10,700 =	16,100 =	13,400 =	10,600 =	13,400 =	13,600 =	12,800 =
Antimony	mg/kg	13 J *	0.7 J	49.8 J *	9.5 J *	ND	ND	0.75 J	0.74 J
Arsenic	mg/kg	33.5 = *	7.5 =	13.9 =	14.3 =	10.5 =	13.9 =	10.3 =	11.9 =
Barium	mg/kg	152 = *	53.9 =	386 = *	134 = *	106 = *	116 = *	74.1 =	109 = *
Beryllium	mg/kg	0.75 =	0.27 J	0.48 J	0.42 J	0.42 J	0.48 J	0.44 J	0.71 =
Cadmium	mg/kg	1.2 = *	ND	1.7 = *	0.83 = *	0.11 J *	ND	ND	0.75 = *
Chromium	mg/kg	27.5 = *	12.3 =	47.7 = *	28.3 = *	15.4 =	18.2 = *	16.4 =	19 = *
Cobalt	mg/kg	11.1 = *	6.9 =	13.9 = *	9.8 =	9.2 =	10.4 =	8.8 =	11.4 J *
Copper	mg/kg	375 = *	13.5 =	469 = *	146 = *	27.8 = *	24.1 = *	17.3 =	28.3 = *
Lead	mg/kg	202 = *	24.7 =	922 = *	256 = *	22.5 =	15.9 =	26.6 = *	16 =
Manganese	mg/kg	816 J	569 J	1,370 J	437 J	371 J	237 J	481 J	366 =
Mercury	mg/kg	0.35 = *	0.066 J *	0.14 = *	0.12 = *	1 = *	0.72 = *	1.4 = *	0.04 J *
Nickel	mg/kg	31.1 = *	13.3 =	38.9 = *	29.2 = *	21.5 = *	27 = *	16.6 =	35.9 = *
Selenium	mg/kg	2.4 = *	1.4 =	2.1 = *	1.9 = *	1.3 =	1.7 = *	1.4 =	ND

Table 4-14. Concentrations of SRCs in Surface Soil at Pad 58 (continued)

Station		WBG-197	WBG-198	WBG-199	WBG-200	WBG-201	WBG-201	WBG-202	WBG-203
Sample ID		WBGss-197-4000-SO	WBGss-198-4003-SO	WBGss-199-4006-SO	WBGss-200-4009-SO	WBGss-201-4012-SO	WBGss-201-4268-SO	WBGss-202-4015-SO	WBGss-203-4018-SO
Date		10/17/2000	10/17/2000	10/17/2000	10/17/2000	10/17/2000	10/17/2000	10/17/2000	10/22/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab	Grab	Field Duplicate	Grab	Grab
Analyte	Units								
Silver	mg/kg	4.6 = *	0.7 J *	9.5 = *	1.4 = *	ND	ND	ND	ND
Thallium	mg/kg	0.59 = *	0.5 J *	0.7 J *	0.63 J *	0.62 J *	0.67 J *	0.56 J *	0.53 J *
Vanadium	mg/kg	20.9 =	19.1 =	27.2 =	22 =	17.9 =	21 =	22.8 =	21.7 =
Zinc	mg/kg	463 J *	73.2 J *	4,520 J *	608 J *	73.6 J *	79.5 J *	88.1 J *	88.6 J *

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" Analyte present and concentration accurate.

Table 4-15. Concentrations of SRCs in Surface Soil at Pad 59

Station		WBG-204	WBG-205	WBG-206	WBG-207	WBG-208	WBG-209	WBG-210	WBG-210
Sample ID		WBGss-204-4023-SO	WBGss-205-4026-SO	WBGss-206-4029-SO	WBGss-207-4032-SO	WBGss-208-4035-SO	WBGss-209-4038-SO	WBGss-210-4041-SO	WBGss-210-4277-SO
Date		10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/30/2000	10/30/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab	Field Duplicate
Analyte	Units								
Explosives									
1,3,5-Trinitrobenzene	mg/kg	NA	NA	NA	NA	NA	NA	ND	NA
1,3-Dinitrobenzene	mg/kg	NA	NA	NA	NA	NA	NA	ND	NA
2,4,6-Trinitrotoluene	mg/kg	NA	NA	NA	NA	NA	NA	ND	NA
2,4-Dinitrotoluene	mg/kg	NA	NA	NA	NA	NA	NA	ND	NA
2,6-Dinitrotoluene	mg/kg	NA	NA	NA	NA	NA	NA	ND	NA
2-Amino-4,6-dinitrotoluene	mg/kg	NA	NA	NA	NA	NA	NA	ND	NA
4-Amino-2,6-dinitrotoluene	mg/kg	NA	NA	NA	NA	NA	NA	ND	NA
HMX	mg/kg	NA	NA	NA	NA	NA	NA	ND	NA
Nitrobenzene	mg/kg	NA	NA	NA	NA	NA	NA	ND	NA
Nitroguanidine	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
RDX	mg/kg	NA	NA	NA	NA	NA	NA	ND	NA
Metals									
Cyanide	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	7.8 J	3.8 J	ND	10.1 J	NA	NA	NA	NA
Aluminum	mg/kg	14,500 =	10,000 =	16,000 =	16,400 =	12,700 =	14,100 =	13,500 =	14,000 =
Antimony	mg/kg	1.7 J *	ND	6 J *	157 J *	1.9 J *	4.9 J *	4 J *	6.4 J *
Arsenic	mg/kg	12.7 =	14.8 =	11.4 =	15.1 =	9.6 =	11.7 =	16.3 = *	12.6 =
Barium	mg/kg	84.7 =	67.7 =	57.2 =	629 = *	113 = *	110 = *	53.7 =	58.1 =
Beryllium	mg/kg	0.6 J	0.52 J	0.42 J	0.28 J	0.35 J	0.37 J	0.44 J	0.42 J
Cadmium	mg/kg	0.5 J *	0.55 J *	0.22 J *	7.5 = *	0.7 = *	1.4 = *	0.2 J *	0.27 J *
Chromium	mg/kg	17.1 J	15.1 J	19.3 J *	50.6 J *	18.9 J *	25.7 J *	17.4 J	18.1 J *
Cobalt	mg/kg	12.5 = *	7.9 =	10.8 = *	10.8 = *	8.9 =	9 =	10.1 =	10 =
Copper	mg/kg	22.6 J *	31.6 J *	41.9 J *	344 J *	68.7 J *	177 J *	52.4 J *	62.6 J *
Lead	mg/kg	38.2 J *	38.9 J *	71.8 J *	835 J *	92 J *	127 J *	41.7 = *	51.8 = *
Manganese	mg/kg	1,630 = *	241 =	393 =	776 =	508 =	298 =	310 J	415 J
Mercury	mg/kg	0.072 J *	0.11 J *	0.055 J *	0.098 J *	0.28 = *	0.08 J *	0.036 J	0.043 J *
Nickel	mg/kg	14.1 =	21.4 = *	21.6 = *	50.7 = *	19.2 =	28.1 = *	25.2 J *	21 J
Selenium	mg/kg	ND	ND	ND	ND	ND	ND	0.98 =	0.88 =

Table 4-15. Concentrations of SRCs in Surface Soil at Pad 59 (continued)

Station		WBG-204	WBG-205	WBG-206	WBG-207	WBG-208	WBG-209	WBG-210	WBG-210
Sample ID		WBGss-204-4023-SO	WBGss-205-4026-SO	WBGss-206-4029-SO	WBGss-207-4032-SO	WBGss-208-4035-SO	WBGss-209-4038-SO	WBGss-210-4041-SO	WBGss-210-4277-SO
Date		10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/30/2000	10/30/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab	Field Duplicate
Analyte	Units								
Silver	mg/kg	ND	ND	0.22 J *	22.5 = *	0.32 J *	0.43 J *	ND	ND
Thallium	mg/kg	0.64 = *	0.62 = *	0.48 J *	0.52 J *	0.58 J *	0.71 = *	0.35 J *	0.53 J *
Vanadium	mg/kg	30.2 =	16.3 =	26.7 =	28.3 =	21.5 =	35.6 = *	23.6 J	25.6 J
Zinc	mg/kg	101 J *	120 J *	93.7 J *	3,330 J *	325 J *	556 J *	176 J *	165 J *

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-16. Concentrations of SRCs in Surface Soil at Pad 60

Station		WBG-211	WBG-212	WBG-212	WBG-213	WBG-214	WBG-215	WBG-216	WBG-217
Sample ID		WBGss-211-4046-SO	WBGss-212-4049-SO	WBGss-212-4269-SO	WBGss-213-4052-SO	WBGss-214-4055-SO	WBGss-215-4058-SO	WBGss-216-4061-SO	WBGss-217-4064-SO
Date		10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/19/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Field Duplicate	Grab	Grab	Grab	Grab	Grab
Analyte	Units								
Explosives									
1,3,5-Trinitrobenzene	mg/kg	6.9 =	ND	ND	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	mg/kg	0.091 J	ND	ND	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	mg/kg	680 =	ND	ND	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	mg/kg	1.5 =	ND	ND	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	mg/kg	ND	ND	ND	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	14 J	ND	ND	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	ND	ND	ND	NA	NA	NA	NA	NA
HMX	mg/kg	ND	ND	ND	NA	NA	NA	NA	NA
Nitrobenzene	mg/kg	ND	ND	ND	NA	NA	NA	NA	NA
Nitroguanidine	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
RDX	mg/kg	2.6 =	ND	ND	NA	NA	NA	NA	NA
Metals									
Cyanide	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	NA	ND	7.4 J	ND	ND	NA	NA	12.2 J
Aluminum	mg/kg	19,300 = *	8,830 =	9,560 =	13,100 =	16,500 =	16,000 =	14,600 =	9,510 J
Antimony	mg/kg	236 J *	1.3 J *	1.6 J *	3 J *	ND	4.9 J *	3.1 J *	9.9 J *
Arsenic	mg/kg	24.9 = *	8.8 =	8.7 =	15.8 = *	7.2 =	17.1 = *	11.7 =	18 = *
Barium	mg/kg	1,450 = *	95.1 = *	108 = *	128 = *	59.9 =	165 = *	131 = *	232 = *
Beryllium	mg/kg	ND	0.32 J	0.35 J	0.32 J	0.3 J	0.51 J	0.48 J	0.5 J
Cadmium	mg/kg	24.9 = *	2.9 = *	3.4 = *	2.9 = *	0.22 J *	1.5 = *	1 = *	4.1 = *
Chromium	mg/kg	69.5 J *	12.9 J	14.3 J	22.8 J *	20.3 J *	26.7 J *	24.2 J *	37.2 = *
Cobalt	mg/kg	15.7 = *	8.9 =	9.2 =	8.4 =	6.3 J	10.2 =	11.7 = *	8.1 =
Copper	mg/kg	1,830 J *	52.5 J *	82 J *	479 J *	22 J *	112 J *	39.7 J *	292 = *
Lead	mg/kg	936 J *	84.1 J *	123 J *	176 J *	20.3 J	281 J *	203 J *	328 = *
Manganese	mg/kg	857 =	579 =	594 =	278 =	134 =	333 =	1,480 = *	609 J
Mercury	mg/kg	0.3 = *	0.059 J *	0.095 J *	0.052 J *	0.065 J *	0.11 J *	0.084 J *	0.058 J *
Nickel	mg/kg	66 = *	15.3 =	16.3 =	23.3 = *	16.8 =	28.6 = *	15.5 =	29.2 = *
Selenium	mg/kg	ND	ND	ND	ND	ND	ND	ND	2.4 = *

Table 4-16. Concentrations of SRCs in Surface Soil at Pad 60 (continued)

Station		WBG-211	WBG-212	WBG-212	WBG-213	WBG-214	WBG-215	WBG-216	WBG-217
Sample ID		WBGss-211-4046-SO	WBGss-212-4049-SO	WBGss-212-4269-SO	WBGss-213-4052-SO	WBGss-214-4055-SO	WBGss-215-4058-SO	WBGss-216-4061-SO	WBGss-217-4064-SO
Date		10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/19/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Field Duplicate	Grab	Grab	Grab	Grab	Grab
Analyte	Units								
Silver	mg/kg	26.7 = *	0.85 J *	1.1 J *	2.5 = *	ND	0.56 J *	0.26 J *	0.96 J *
Thallium	mg/kg	0.68 = *	0.53 J *	0.58 J *	0.68 = *	0.64 J *	0.68 = *	0.63 = *	0.62 J *
Vanadium	mg/kg	37.8 = *	16.5 =	17.8 =	23.9 =	28.5 =	26.4 =	28.9 =	16.9 =
Zinc	mg/kg	2,600 J *	171 J *	239 J *	353 J *	79.4 J *	420 J *	330 J *	885 = *

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-17. Concentrations of SRCs in Surface Soil at Pad 61

Station		WBG-218	WBG-219	WBG-220	WBG-221	WBG-222
Sample ID		WBGss-218-4067-SO	WBGss-219-4070-SO	WBGss-220-4073-SO	WBGss-221-4076-SO	WBGss-222-4079-SO
Date		10/19/2000	10/18/2000	10/19/2000	10/19/2000	10/18/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	Units					
Explosives						
1,3,5-Trinitrobenzene	mg/kg	NA	NA	NA	NA	ND
1,3-Dinitrobenzene	mg/kg	NA	NA	NA	NA	0.036 J
2,4,6-Trinitrotoluene	mg/kg	NA	NA	NA	NA	0.51 =
2,4-Dinitrotoluene	mg/kg	NA	NA	NA	NA	0.063 J
2,6-Dinitrotoluene	mg/kg	NA	NA	NA	NA	0.092 J
2-Amino-4,6-dinitrotoluene	mg/kg	NA	NA	NA	NA	0.37 =
4-Amino-2,6-dinitrotoluene	mg/kg	NA	NA	NA	NA	0.46 =
HMX	mg/kg	NA	NA	NA	NA	ND
Nitrobenzene	mg/kg	NA	NA	NA	NA	0.12 J
Nitroguanidine	mg/kg	NA	NA	NA	NA	NA
RDX	mg/kg	NA	NA	NA	NA	ND
Metals						
Cyanide	mg/kg	0.88 J *	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	11.8 J	NA	ND	7.4 J	NA
Aluminum	mg/kg	16,500 J	16,400 =	8,990 J	16,400 J	14,300 =
Antimony	mg/kg	7.9 J *	17.6 J *	12.4 J *	1.2 J *	0.89 J
Arsenic	mg/kg	14.5 =	16.2 = *	11.8 =	13.9 =	11.3 =
Barium	mg/kg	511 = *	476 = *	299 = *	130 = *	69.7 =
Beryllium	mg/kg	0.49 J	0.35 J	0.39 J	0.47 J	0.51 J
Cadmium	mg/kg	2.4 = *	2.8 = *	3.2 = *	0.27 J *	0.27 J *
Chromium	mg/kg	41 = *	61.3 J *	26.1 = *	20.8 = *	24.6 J *
Cobalt	mg/kg	13.8 = *	13.8 = *	8.7 =	7.5 =	7.5 =
Copper	mg/kg	280 = *	280 J *	96.4 = *	25.1 = *	27.6 J *
Lead	mg/kg	497 = *	754 J *	206 = *	60.9 = *	30.7 J *
Manganese	mg/kg	954 J	708 =	494 J	606 J	187 =
Mercury	mg/kg	0.046 J *	0.089 J *	0.029 J	0.037 J *	0.058 J *
Nickel	mg/kg	57 = *	50.1 = *	26.7 = *	19.6 =	20.4 =
Selenium	mg/kg	2.7 = *	ND	1.7 = *	1.5 = *	ND
Silver	mg/kg	1.5 = *	3.2 = *	0.71 J *	ND	ND
Thallium	mg/kg	0.8 J *	0.52 J *	0.58 J *	0.61 J *	0.66 = *
Vanadium	mg/kg	28.6 =	31.3 = *	15.8 =	26.2 =	24.6 =
Zinc	mg/kg	1,170 = *	1,240 J *	557 = *	127 = *	89.7 J *
Organics-Pesticide/PCB						
4,4'-DDT	mg/kg	0.13 =	NA	ND	NA	NA
Dieldrin	mg/kg	ND	NA	ND	NA	NA
Heptachlor Epoxide	mg/kg	ND	NA	0.051 =	NA	NA
PCB-1254	mg/kg	ND	NA	ND	NA	NA
PCB-1260	mg/kg	0.46 =	NA	0.17 =	NA	NA
Organics-Semivolatile						
2-Methylnaphthalene	mg/kg	0.098 J	NA	ND	NA	NA
Anthracene	mg/kg	0.083 J	NA	0.054 J	NA	NA
Benz(*a*)anthracene	mg/kg	0.34 J	NA	0.36 J	NA	NA
Benzo(*a*)pyrene	mg/kg	0.33 J	NA	0.41 J	NA	NA

Table 4-17. Concentrations of SRCs in Surface Soil at Pad 61 (continued)

Station		WBG-218	WBG-219	WBG-220	WBG-221	WBG-222
Sample ID		WBGss-218-4067-SO	WBGss-219-4070-SO	WBGss-220-4073-SO	WBGss-221-4076-SO	WBGss-222-4079-SO
Date		10/19/2000	10/18/2000	10/19/2000	10/19/2000	10/18/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	Units					
Benzo(*b*)fluoranthene	mg/kg	0.49 =	NA	0.47 =	NA	NA
Benzo(*g*,*h*,*i*)perylene	mg/kg	0.23 J	NA	0.27 J	NA	NA
Benzo(*k*)fluoranthene	mg/kg	0.14 J	NA	0.17 J	NA	NA
Carbazole	mg/kg	0.057 J	NA	ND	NA	NA
Chrysene	mg/kg	0.31 J	NA	0.31 J	NA	NA
Dibenz(*a*,*h*)anthracene	mg/kg	0.073 J	NA	0.07 J	NA	NA
Fluoranthene	mg/kg	0.6 =	NA	0.57 =	NA	NA
Indeno(1,2,3-*cd*)pyrene	mg/kg	0.24 J	NA	0.29 J	NA	NA
Naphthalene	mg/kg	0.066 J	NA	ND	NA	NA
Phenanthrene	mg/kg	0.35 J	NA	0.31 J	NA	NA
Pyrene	mg/kg	0.48 =	NA	0.42 J	NA	NA
Organics-Volatile						
Trichloroethene	mg/kg	ND	NA	ND	NA	NA

DDT = Dichlorodiphenyl-trichloroethane.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-18. Concentrations of SRCs in Surface Soil at Pad 62

Station		WBG-238	WBG-239	WBG-240	WBG-241	WBG-241	WBG-242
Sample ID		WBGss-238-4133-SO	WBGss-239-4136-SO	WBGss-240-4139-SO	WBGss-241-4142-SO	WBGss-241-4271-SO	WBGss-242-4145-SO
Date		10/21/2000	10/21/2000	10/21/2000	10/21/2000	10/21/2000	10/22/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab	Field Duplicate	Grab
Analyte	Units						
Explosives							
1,3,5-Trinitrobenzene	mg/kg	NA	NA	NA	NA	ND	ND
1,3-Dinitrobenzene	mg/kg	NA	NA	NA	NA	ND	ND
2,4,6-Trinitrotoluene	mg/kg	NA	NA	NA	NA	ND	0.28 =
2,4-Dinitrotoluene	mg/kg	NA	NA	NA	NA	ND	ND
2,6-Dinitrotoluene	mg/kg	NA	NA	NA	NA	ND	ND
2-Amino-4,6-dinitrotoluene	mg/kg	NA	NA	NA	NA	ND	0.099 J
4-Amino-2,6-dinitrotoluene	mg/kg	NA	NA	NA	NA	ND	0.17 J
HMX	mg/kg	NA	NA	NA	NA	ND	0.19 J
Nitrobenzene	mg/kg	NA	NA	NA	NA	ND	ND
Nitroguanidine	mg/kg	NA	NA	NA	NA	NA	NA
RDX	mg/kg	NA	NA	NA	NA	ND	ND
Metals							
Cyanide	mg/kg	NA	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	ND	ND	ND	ND	2.7 J	NA
Aluminum	mg/kg	14,300 J	15,100 J	16,200 J	12,600 J	11,600 J	15,300 J
Antimony	mg/kg	0.96 J	1.5 J *	1.9 J *	ND	ND	1.1 J *
Arsenic	mg/kg	13.6 =	14.7 =	12.6 =	16.4 = *	16.5 = *	13 =
Barium	mg/kg	98.1 J *	48.2 J	332 J *	39.9 J	36.9 J	125 = *
Beryllium	mg/kg	0.5 J	0.31 J	0.44 J	0.44 J	0.41 J	0.6 J
Cadmium	mg/kg	0.35 J *	ND	7.6 J *	ND	ND	1.7 = *
Chromium	mg/kg	18.1 J *	21 J *	25 J *	16.5 J	15.5 J	19.3 = *
Cobalt	mg/kg	15.7 = *	5.7 J	9.6 =	11.6 = *	9.2 =	12.5 = *
Copper	mg/kg	12.6 =	17 =	97.7 = *	23.7 = *	22.5 = *	26.5 = *
Lead	mg/kg	34.3 = *	13.6 =	107 = *	15.4 =	14.8 =	72.2 = *
Manganese	mg/kg	2,100 = *	179 =	607 =	294 =	224 =	1,190 =
Mercury	mg/kg	0.054 J *	0.024 J	0.015 J	0.018 J	0.019 J	0.045 J *
Nickel	mg/kg	16.5 =	16.1 =	24.7 = *	19.4 =	18.8 =	18.1 =
Selenium	mg/kg	1.2 =	0.84 =	1.1 =	1.1 =	1.1 =	ND
Silver	mg/kg	ND	ND	0.26 J *	ND	ND	ND
Thallium	mg/kg	0.47 J *	0.42 J *	0.38 J *	0.35 J *	0.41 J *	0.57 J *
Vanadium	mg/kg	30.8 =	29 =	30.9 =	20.8 =	19.4 =	30.2 =
Zinc	mg/kg	75.1 J *	47.1 J	877 J *	63.2 J *	59.6 J	173 = *
Organics-Pesticide/PCB							
4,4'-DDT	mg/kg	NA	NA	ND	NA	NA	NA
Dieldrin	mg/kg	NA	NA	ND	NA	NA	NA
Heptachlor Epoxide	mg/kg	NA	NA	ND	NA	NA	NA
PCB-1254	mg/kg	NA	NA	ND	NA	NA	NA
PCB-1260	mg/kg	NA	NA	ND	NA	NA	NA
Organics-Semivolatile							
2-Methylnaphthalene	mg/kg	NA	NA	ND	NA	NA	NA
Anthracene	mg/kg	NA	NA	ND	NA	NA	NA
Benz(*a*)anthracene	mg/kg	NA	NA	ND	NA	NA	NA
Benzo(*a*)pyrene	mg/kg	NA	NA	ND	NA	NA	NA
Benzo(*b*)fluoranthene	mg/kg	NA	NA	ND	NA	NA	NA
Benzo(*g,h,i*)perylene	mg/kg	NA	NA	ND	NA	NA	NA
Benzo(*k*)fluoranthene	mg/kg	NA	NA	ND	NA	NA	NA
Carbazole	mg/kg	NA	NA	ND	NA	NA	NA
Chrysene	mg/kg	NA	NA	ND	NA	NA	NA

Table 4-18. Concentrations of SRCs in Surface Soil at Pad 62 (continued)

Station		WBG-238	WBG-239	WBG-240	WBG-241	WBG-241	WBG-242
Sample ID		WBGss-238-4133-SO	WBGss-239-4136-SO	WBGss-240-4139-SO	WBGss-241-4142-SO	WBGss-241-4271-SO	WBGss-242-4145-SO
Date		10/21/2000	10/21/2000	10/21/2000	10/21/2000	10/21/2000	10/22/2000
Depth (ft)		0–1	0–1	0—1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab	Field Duplicate	Grab
Analyte	Units						
Dibenz(*a,h*)anthracene	mg/kg	NA	NA	ND	NA	NA	NA
Fluoranthene	mg/kg	NA	NA	ND	NA	NA	NA
Indeno(1,2,3-*cd*)pyrene	mg/kg	NA	NA	ND	NA	NA	NA
Naphthalene	mg/kg	NA	NA	ND	NA	NA	NA
Phenanthrene	mg/kg	NA	NA	ND	NA	NA	NA
Pyrene	mg/kg	NA	NA	ND	NA	NA	NA
Organics-Volatile							
Trichloroethene	mg/kg	NA	NA	ND	NA	NA	NA

DDT = Dichlorodiphenyl-trichloroethane.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-19. Concentrations of SRCs in Surface Soil at Pad 66

Station		WBG-243	WBG-245	WBG-246	WBG-247
Sample ID		WBGss-243-4150-SO	WBGss-245-4156-SO	WBGss-246-4159-SO	WBGss-247-4162-SO
Date		10/21/2000	10/23/2000	10/23/2000	10/22/2000
Depth (ft)		0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab
Analyte	Units				
Explosives					
1,3,5-Trinitrobenzene	mg/kg	NA	NA	NA	0.37 =
1,3-Dinitrobenzene	mg/kg	NA	NA	NA	0.037 J
2,4,6-Trinitrotoluene	mg/kg	NA	NA	NA	1.5 =
2,4-Dinitrotoluene	mg/kg	NA	NA	NA	0.18 J
2,6-Dinitrotoluene	mg/kg	NA	NA	NA	ND
2-Amino-4,6-dinitrotoluene	mg/kg	NA	NA	NA	0.97 =
4-Amino-2,6-dinitrotoluene	mg/kg	NA	NA	NA	0.93 =
HMX	mg/kg	NA	NA	NA	0.69 =
Nitrobenzene	mg/kg	NA	NA	NA	ND
Nitroguanidine	mg/kg	NA	NA	NA	NA
RDX	mg/kg	NA	NA	NA	0.61 =
Metals					
Cyanide	mg/kg	NA	ND	NA	NA
Chromium, hexavalent	mg/kg	ND	1.2 R	1.2 R	NA
Aluminum	mg/kg	16,300 J	15,800 =	18,100 = *	13,900 =
Antimony	mg/kg	3.4 J *	1.8 J *	6.3 J *	45.1 J *
Arsenic	mg/kg	14.5 =	17.9 = *	13.6 =	13 =
Barium	mg/kg	331 J *	3,500 = *	7,160 = *	1,320 = *
Beryllium	mg/kg	0.32 J	0.62 =	0.49 J	0.46 J
Cadmium	mg/kg	0.087 J *	1.5 = *	15.7 = *	8.3 = *
Chromium	mg/kg	20.6 J *	18.9 J *	18.5 J *	24 = *
Cobalt	mg/kg	9.4 =	12.6 = *	1.6 J	6.4 J
Copper	mg/kg	52 = *	137 = *	926 = *	876 = *
Lead	mg/kg	52.4 = *	37 J *	208 J *	336 = *
Manganese	mg/kg	429 =	1,800 J *	953 J	635 =
Mercury	mg/kg	0.064 J *	0.14 = *	0.53 = *	0.12 J *
Nickel	mg/kg	15.2 =	19.9 =	18.3 =	17.3 =
Selenium	mg/kg	1.8 = *	1.3 =	1.1 =	ND
Silver	mg/kg	ND	ND	ND	0.21 J *
Thallium	mg/kg	0.41 J *	0.71 J *	0.67 J *	0.55 J *
Vanadium	mg/kg	33.1 = *	28.9 =	21.3 =	22.6 =
Zinc	mg/kg	175 J *	303 J *	1,590 J *	1,410 J *
Organics-Pesticide/PCB					
4,4'-DDT	mg/kg	NA	ND	NA	NA
Dieldrin	mg/kg	NA	0.0024 =	NA	NA
Heptachlor Epoxide	mg/kg	NA	ND	NA	NA
PCB-1254	mg/kg	NA	ND	NA	NA
PCB-1260	mg/kg	NA	ND	NA	NA
Organics-Semivolatile					
2-Methylnaphthalene	mg/kg	NA	ND	NA	NA
Anthracene	mg/kg	NA	ND	NA	NA
Benz(*a*)anthracene	mg/kg	NA	ND	NA	NA
Benzo(*a*)pyrene	mg/kg	NA	ND	NA	NA

Table 4-19. Concentrations of SRCs in Surface Soil at Pad 66 (continued)

Station		WBG-243	WBG-245	WBG-246	WBG-247
Sample ID		WBGss-243-4150-SO	WBGss-245-4156-SO	WBGss-246-4159-SO	WBGss-247-4162-SO
Date		10/21/2000	10/23/2000	10/23/2000	10/22/2000
Depth (ft)		0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab
Analyte	Units				
Benzo(*b*)fluoranthene	mg/kg	NA	ND	NA	NA
Benzo(*g*,*h*,*i*)perylene	mg/kg	NA	ND	NA	NA
Benzo(*k*)fluoranthene	mg/kg	NA	ND	NA	NA
Carbazole	mg/kg	NA	ND	NA	NA
Chrysene	mg/kg	NA	ND	NA	NA
Dibenz(*a*,*h*)anthracene	mg/kg	NA	ND	NA	NA
Fluoranthene	mg/kg	NA	ND	NA	NA
Indeno(1,2,3-*cd*)pyrene	mg/kg	NA	ND	NA	NA
Naphthalene	mg/kg	NA	ND	NA	NA
Phenanthrene	mg/kg	NA	ND	NA	NA
Pyrene	mg/kg	NA	ND	NA	NA
Organics-Volatile					
Trichloroethene	mg/kg	NA	ND	NA	NA

DDT = Dichlorodiphenyl-trichloroethane.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-20. Concentrations of SRCs in Surface Soil at Pad 67

Station		WBG-249	WBG-250	WBG-251	WBG-252
Sample ID		WBGss-249-4170-SO	WBGss-250-4173-SO	WBGss-251-4176-SO	WBGss-252-4179-SO
Date		10/23/2000	10/23/2000	10/23/2000	10/22/2000
Depth (ft)		0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab
Analyte	Units				
Explosives					
1,3,5-Trinitrobenzene	mg/kg	NA	NA	NA	34 =
1,3-Dinitrobenzene	mg/kg	NA	NA	NA	0.056 J
2,4,6-Trinitrotoluene	mg/kg	NA	NA	NA	430 =
2,4-Dinitrotoluene	mg/kg	NA	NA	NA	ND
2,6-Dinitrotoluene	mg/kg	NA	NA	NA	ND
2-Amino-4,6-dinitrotoluene	mg/kg	NA	NA	NA	ND
4-Amino-2,6-dinitrotoluene	mg/kg	NA	NA	NA	ND
HMX	mg/kg	NA	NA	NA	100 =
Nitrobenzene	mg/kg	NA	NA	NA	ND
Nitroguanidine	mg/kg	NA	NA	ND	NA
RDX	mg/kg	NA	NA	NA	470 =
Metals					
Cyanide	mg/kg	NA	NA	ND	NA
Chromium, hexavalent	mg/kg	6.3 J	4.9 J	ND	NA
Aluminum	mg/kg	9,460 =	14,700 =	14,700 =	7,700 J
Antimony	mg/kg	1.7 J *	2.1 J *	0.67 J	14.6 J *
Arsenic	mg/kg	10.6 =	14.5 =	14.2 =	10.2 =
Barium	mg/kg	1,400 = *	2,190 = *	180 = *	783 = *
Beryllium	mg/kg	0.28 J	0.57 J	0.69 =	0.46 J
Cadmium	mg/kg	10 = *	0.94 = *	0.077 J *	0.86 = *
Chromium	mg/kg	11.1 J	25.1 J *	19.4 J *	16.3 =
Cobalt	mg/kg	5 J	7.7 =	18.2 = *	7 =
Copper	mg/kg	94 = *	161 = *	16.5 =	168 = *
Lead	mg/kg	37.7 J *	36.4 J *	31.1 J *	147 = *
Manganese	mg/kg	279 J	817 J	2020 J *	762 =
Mercury	mg/kg	0.084 J *	0.16 = *	0.051 J *	0.038 J *
Nickel	mg/kg	13.8 =	33.1 = *	17.6 =	12.7 =
Selenium	mg/kg	0.98 =	1.4 =	0.78 =	ND
Silver	mg/kg	ND	ND	ND	ND
Thallium	mg/kg	0.48 J *	0.66 J *	0.7 = *	0.57 J *
Vanadium	mg/kg	17.6 =	25.2 =	31.5 = *	14.7 =
Zinc	mg/kg	296 J *	244 J *	76.5 J *	209 = *
Organics-Pesticide/PCB					
4,4'-DDT	mg/kg	NA	NA	ND	NA
Dieldrin	mg/kg	NA	NA	ND	NA
Heptachlor Epoxide	mg/kg	NA	NA	ND	NA
PCB-1254	mg/kg	NA	NA	ND	NA
PCB-1260	mg/kg	NA	NA	ND	NA
Organics-Semivolatile					
2-Methylnaphthalene	mg/kg	NA	NA	ND	NA
Anthracene	mg/kg	NA	NA	ND	NA
Benz(*a*)anthracene	mg/kg	NA	NA	ND	NA
Benzo(*a*)pyrene	mg/kg	NA	NA	ND	NA

Table 4-20. Concentrations of SRCs in Surface Soil at Pad 67 (continued)

Station		WBG-249	WBG-250	WBG-251	WBG-252
Sample ID		WBGss-249-4170-SO	WBGss-250-4173-SO	WBGss-251-4176-SO	WBGss-252-4179-SO
Date		10/23/2000	10/23/2000	10/23/2000	10/22/2000
Depth (ft)		0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab
Analyte	Units				
Benzo(*b*)fluoranthene	mg/kg	NA	NA	ND	NA
Benzo(*g*,*h*,*i*)perylene	mg/kg	NA	NA	ND	NA
Benzo(*k*)fluoranthene	mg/kg	NA	NA	ND	NA
Carbazole	mg/kg	NA	NA	ND	NA
Chrysene	mg/kg	NA	NA	ND	NA
Dibenz(*a*,*h*)anthracene	mg/kg	NA	NA	ND	NA
Fluoranthene	mg/kg	NA	NA	ND	NA
Indeno(1,2,3-*cd*)pyrene	mg/kg	NA	NA	ND	NA
Naphthalene	mg/kg	NA	NA	ND	NA
Phenanthrene	mg/kg	NA	NA	ND	NA
Pyrene	mg/kg	NA	NA	ND	NA
Organics-Volatile					
Trichloroethene	mg/kg	NA	NA	ND	NA

DDT = Dichlorodiphenyl-trichloroethane.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-21. Concentrations of SRCs in Surface Soil at Pad 68

Station		WBG-253	WBG-254	WBG-255	WBG-256	WBG-257	WBG-257
Sample ID		WBGss-253-4184-SO	WBGss-254-4187-SO	WBGss-255-4190-SO	WBGss-256-4193-SO	WBGss-257-4196-SO	WBGss-257-4275-SO
Date		10/17/2000	10/16/2000	10/17/2000	10/17/2000	10/30/2000	10/30/2000
Depth (ft)		0–1	0–1	0–1	0–1	0–1	0–1
Field Type		Grab	Grab	Grab	Grab	Grab	Field Duplicate
Analyte	Units						
Explosives							
1,3,5-Trinitrobenzene	mg/kg	NA	ND	ND	NA	ND	NA
1,3-Dinitrobenzene	mg/kg	NA	ND	ND	NA	ND	NA
2,4,6-Trinitrotoluene	mg/kg	NA	0.16 J	0.98 =	NA	0.069 J	NA
2,4-Dinitrotoluene	mg/kg	NA	ND	ND	NA	ND	NA
2,6-Dinitrotoluene	mg/kg	NA	ND	0.094 J	NA	ND	NA
2-Amino-4,6-dinitrotoluene	mg/kg	NA	ND	0.22 J	NA	ND	NA
4-Amino-2,6-dinitrotoluene	mg/kg	NA	0.12 J	0.47 =	NA	0.097 J	NA
HMX	mg/kg	NA	ND	ND	NA	ND	NA
Nitrobenzene	mg/kg	NA	ND	ND	NA	ND	NA
Nitroguanidine	mg/kg	NA	NA	NA	NA	NA	NA
RDX	mg/kg	NA	ND	ND	NA	ND	NA
Metals							
Cyanide	mg/kg	NA	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	ND	ND	ND	2.8 J	NA	NA
Aluminum	mg/kg	12,100 =	9,960 =	10,200 =	11,600 =	10,100 =	10,300 =
Antimony	mg/kg	1.4 J *	3.1 J *	8.3 J *	0.72 J	6.1 J *	2.9 J *
Arsenic	mg/kg	8.5 =	7.9 =	9.1 =	8.6 =	9.2 =	9.4 =
Barium	mg/kg	380 = *	2,170 = *	1,870 = *	2,490 = *	1,080 = *	336 = *
Beryllium	mg/kg	0.25 J	0.35 J	0.27 J	0.31 J	ND	ND
Cadmium	mg/kg	0.1 J *	1.1 = *	0.57 J *	0.28 J *	1.1 = *	0.44 J *
Chromium	mg/kg	13.8 =	15.3 =	12.1 =	12.5 =	19.8 J *	14.3 J
Cobalt	mg/kg	6.4 =	3.1 J	3.2 J	3.1 J	5.8 =	6.9 =
Copper	mg/kg	50.9 = *	57.6 = *	675 = *	19.4 = *	252 J *	27.1 J *
Lead	mg/kg	25.5 =	97.2 = *	88.7 = *	29.1 = *	150 = *	47.1 = *
Manganese	mg/kg	310 J	479 J	327 J	439 J	379 J	505 J
Mercury	mg/kg	0.063 J *	0.1 J *	0.12 = *	0.044 J *	0.094 J *	0.056 J *
Nickel	mg/kg	14.2 =	12.4 =	12.3 =	12.4 =	14.3 J	14 J
Selenium	mg/kg	1.3 =	1.3 =	1.6 = *	1.1 =	0.76 =	0.81 =
Silver	mg/kg	ND	ND	ND	ND	ND	ND
Thallium	mg/kg	0.51 J *	0.51 J *	0.49 J *	0.46 J *	0.42 J *	0.38 J *
Vanadium	mg/kg	20.6 =	14.4 =	15.3 =	18.1 =	17.7 J	21.3 J
Zinc	mg/kg	84.3 J *	327 J *	537 J *	120 J *	261 J *	92 J *

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

4.2.1 Explosives and Propellants

All surface soil samples were screened in the field for TNT and RDX. A total of 18 samples were submitted to the fixed-base laboratory for confirmation sampling. Ten explosives and one propellant (nitroguanididine) were detected in at least one sample. Figures 4-1 through 4-4 show the distribution of four selected explosives in surface soil at WBG. 2,4,6-TNT was the most commonly detected explosive compound, with detectible concentrations in 10 surface soil samples. Explosives 2-amino-4,6-dinitrotoluene and 4-amino-2,6-dinitrotoluene were detected in six and seven samples, respectively. Other explosives were detected in two to four samples, with a single detection of nitrobenzene and nitroguanidine. Concentrations of explosive and propellant compounds ranged from 0.09 to 680 mg/kg (Table 4-4). Laboratory analysis indicates that at 10 Phase III locations, explosives were not detected (random grid samples, Building 4301, and Pads 32, 37, 45 and 59) or detected at low concentrations (less than 1 mg/kg) (Pads 38, 58, 62, and 69). Pads 60, 61, 66, and 67 showed the greatest number and highest concentration of explosive compounds in surface soil.

4.2.1.1 Random grid

Field explosives analysis did not detect TNT or RDX at any random grid locations, thus no regular random grid samples were submitted for laboratory analysis of explosives and propellants. The field duplicate sample from station WBG-281 was analyzed for explosives; there were none detected (Table 4-8).

4.2.1.2 Building 4301

Two of the three samples from this area were submitted for analysis of propellants (nitrocellulose and nitroguanidine). There were no detections (Table 4-9).

4.2.1.3 Pad 32

The two samples collected from this area were not submitted for laboratory analysis of explosives (Table 4-10).

4.2.1.4 Pad 37

The field analysis identified a concentration (corrected) of 3.4 mg/kg RDX at station WBG-223. The sample was not submitted for fixed-base laboratory analysis; however, the 2- to 4-ft bgs sample was submitted for laboratory analysis and indicated non-detect for all explosive compounds (see Section 4.3.2). All other field screening showed non-detects for explosives. The sample from station WBG-227 was submitted for laboratory analysis; there were no detections of explosives or propellants. Note that WBG-227 is co-located with the Phase II RI sample WBG-107, in which RDX was found (Table 4-11).

4.2.1.5 Pad 38

Field analysis indicated concentrations (corrected) of 1.3 mg/kg TNT at station WBG-229 and 2.0 mg/kg TNT at station WBG-231. Neither of these samples was submitted to the fixed-base laboratory. Station WBG-232 showed a field concentration of 1.8 mg/kg TNT, and confirmation analysis from the laboratory indicated a concentration of 0.006 mg/kg 2,4,6-TNT and 0.15 mg/kg 2,4-DNT (Table 4-12).

4.2.1.6 Pad 45

Explosive field analysis indicated a detection of RDX at station WBG-234, but confirmatory analysis from the laboratory detected 2,4,6-TNT (0.13 mg/kg) and no RDX. The single detection of nitroguanidine

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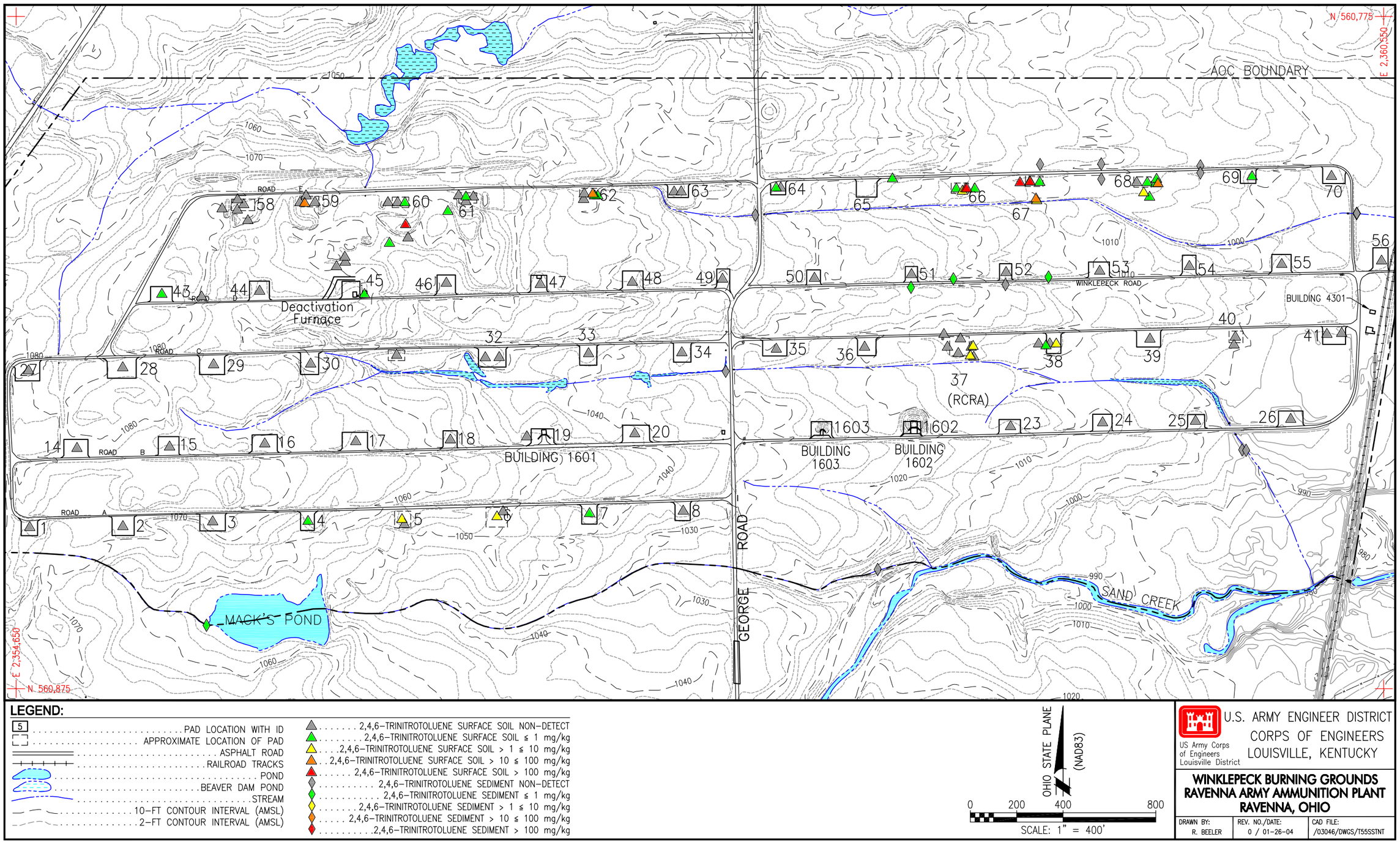

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- 5 . . . . . PAD LOCATION WITH ID
- . . . . . APPROXIMATE LOCATION OF PAD
- . . . . . ASPHALT ROAD
- . . . . . RAILROAD TRACKS
- . . . . . POND
- . . . . . BEAVER DAM POND
- . . . . . STREAM
- . . . . . 10–FT CONTOUR INTERVAL (AMSL)
- . . . . . 2–FT CONTOUR INTERVAL (AMSL)

- . . . . . 2,4,6–TRINITROTOLUENE SURFACE SOIL NON–DETECT
- . . . . . 2,4,6–TRINITROTOLUENE SURFACE SOIL ≤ 1 mg/kg
- . . . . 2,4,6–TRINITROTOLUENE SURFACE SOIL > 1 ≤ 10 mg/kg
- . . 2,4,6–TRINITROTOLUENE SURFACE SOIL > 10 ≤ 100 mg/kg
- . . . . . 2,4,6–TRINITROTOLUENE SURFACE SOIL > 100 mg/kg
- . . . . . 2,4,6–TRINITROTOLUENE SEDIMENT NON–DETECT
- . . . . . 2,4,6–TRINITROTOLUENE SEDIMENT ≤ 1 mg/kg
- . . . . . 2,4,6–TRINITROTOLUENE SEDIMENT > 1 ≤ 10 mg/kg
- . . . . . 2,4,6–TRINITROTOLUENE SEDIMENT > 10 ≤ 100 mg/kg
- . . . . . 2,4,6–TRINITROTOLUENE SEDIMENT > 100 mg/kg

OHIO STATE PLANE (NAD83)

0 200 400 800

SCALE: 1" = 400'

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US Army Corps of Engineers Louisville District

WINKLEPECK BURNING GROUNDS
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

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R. BEELER	0 / 01–26–04	/03046/DWGS/T55SSTNT

Figure 4-1. 2,4,6-Trinitrotoluene in Surface Soil and Sediment at Winklepeck Burning Grounds (Phase I, II, and III data shown)

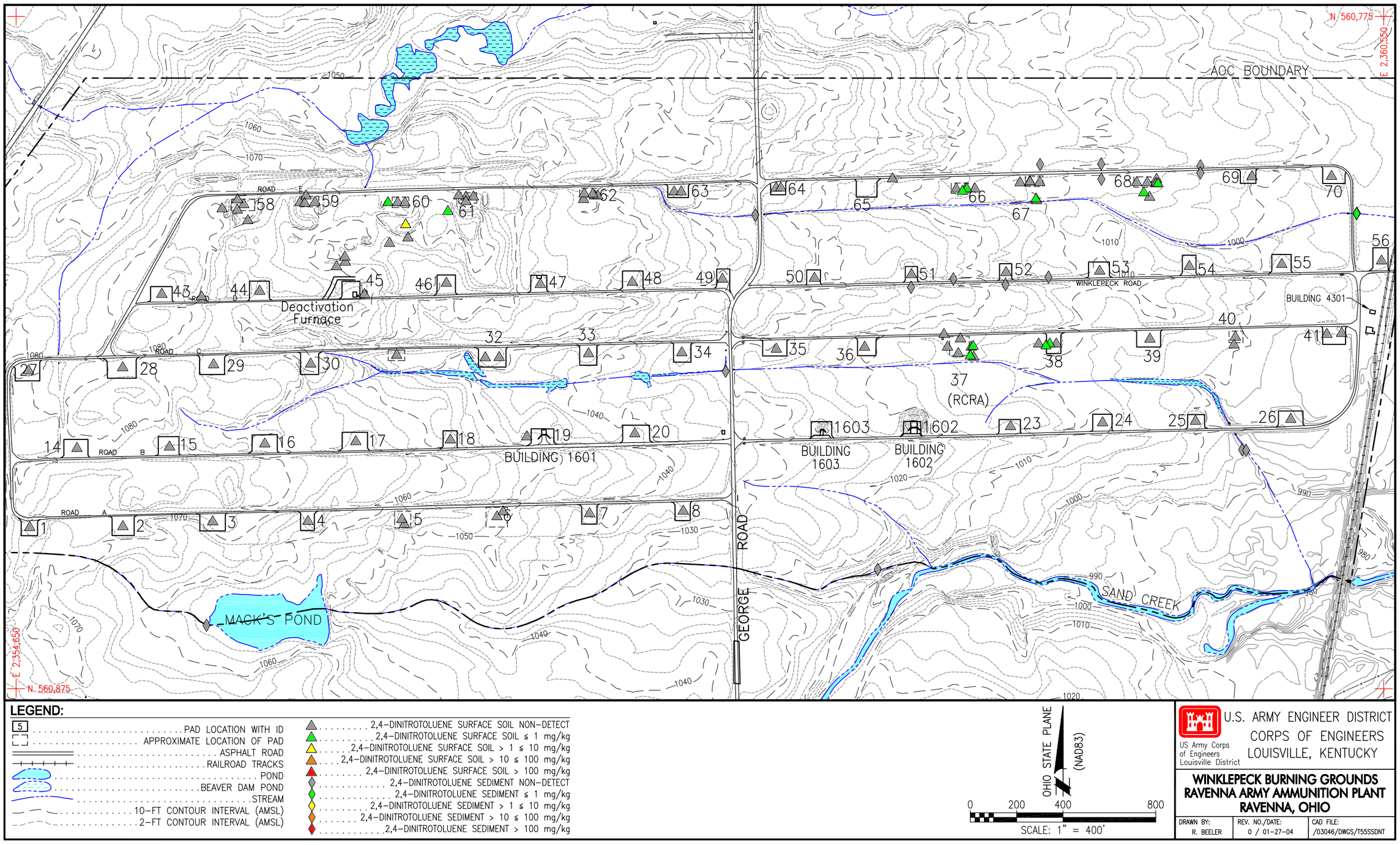

Figure 4-2. 2,4-Dinitrotoluene in Surface Soil and Sediment at Winklepeck Burning Grounds (Phase I, II, and III data shown)

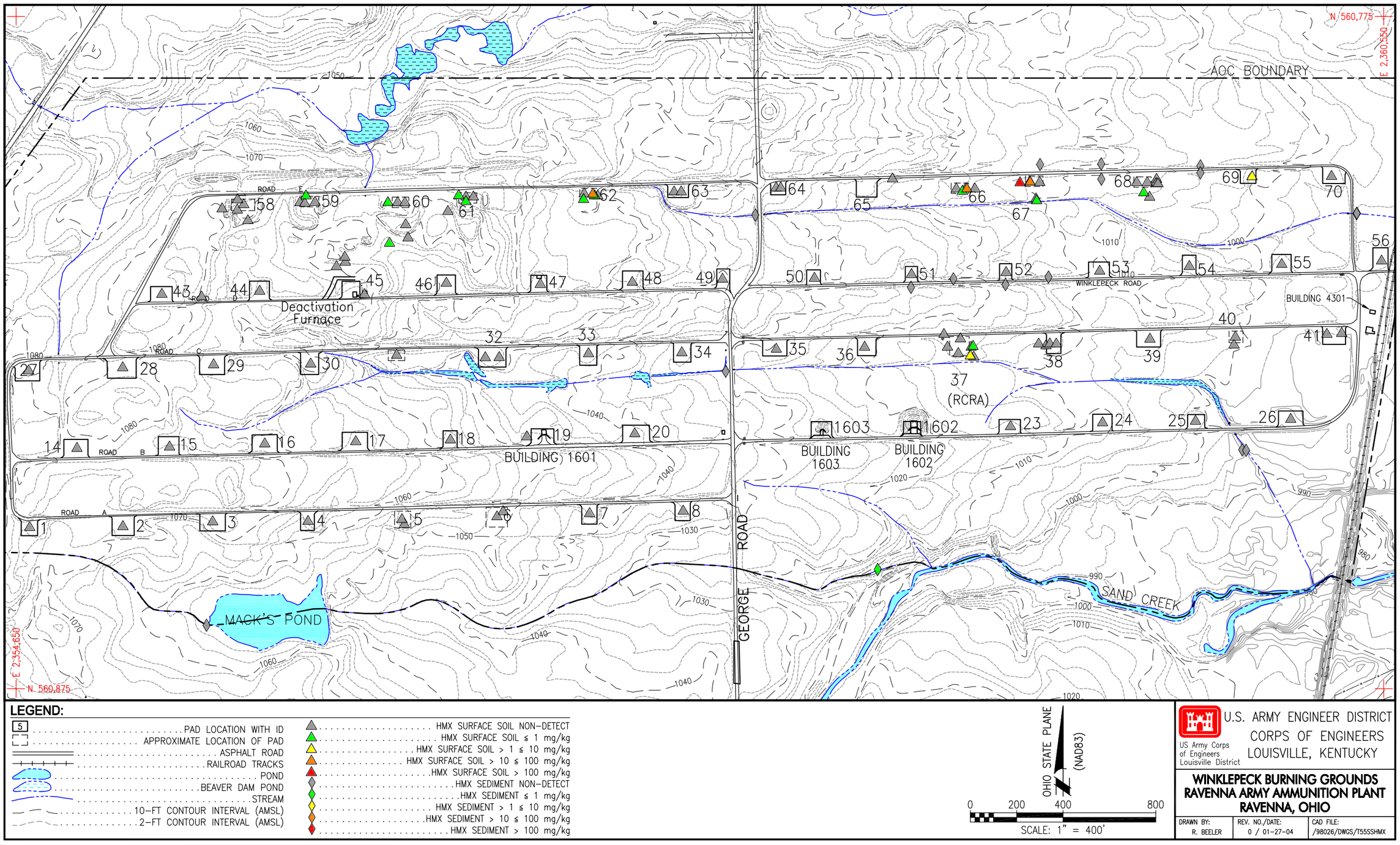

Figure 4-3. HMX in Surface Soil and Sediment at Winklepeck Burning Grounds (Phase I, II, and III data shown)

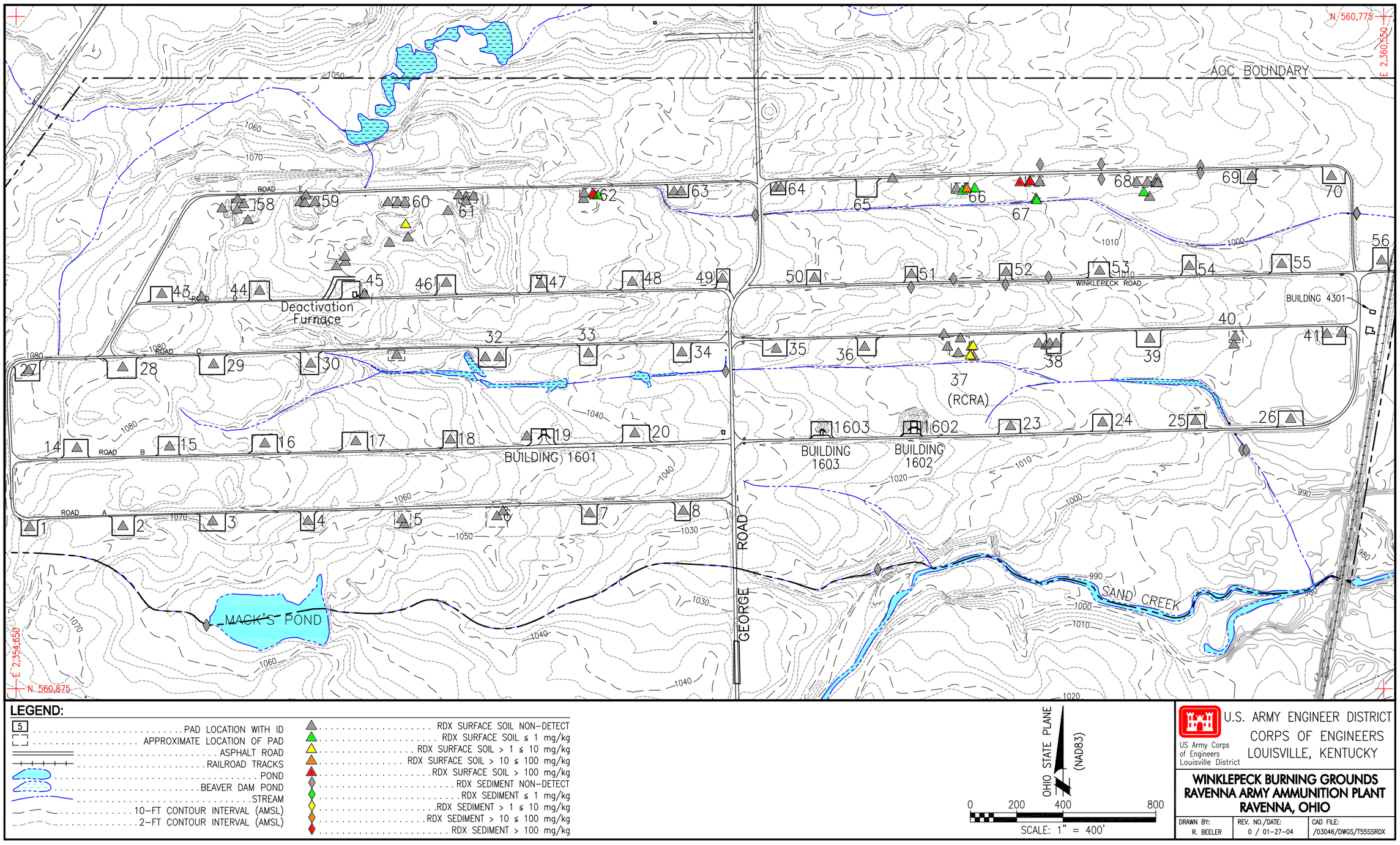

Figure 4-4. RDX in Surface Soil and Sediment at Winklepeck Burning Grounds (Phase I, II, and III data shown)

occurred at station WBG-236, at a concentration of 0.091 mg/kg. This sample is located immediately east of the Deactivation Furnace Area. There were no other explosives or propellants detected in samples from Pad 45 (Table 4-13). These results are comparable with the Phase II RI data for WBG-144.

4.2.1.7 Pad 58

Field analysis of the sample from station WBG-199 indicated TNT at a corrected concentration of 34 mg/kg. This sample was not submitted for laboratory analysis. However, samples were also collected from the 2- to 4-, 4- to 6-, and 6- to 8-ft intervals, and the 2- to 4- and 4- to 6-ft intervals were submitted for laboratory analysis (see Section 4.3.1). Three samples were submitted to the fixed-base laboratory for analysis; samples from stations WBG-197 and -203 were non-detect for explosives and propellants, and 2-amino-4,6-dinitrotoluene (0.11 mg/kg) and 4-amino-2,6-dinitrotoluene (0.12 mg/kg) were detected in the sample from station WBG-201 (Table 4-14). These data are consistent with the Phase II RI finding of few explosives at this pad.

4.2.1.8 Pad 59

Field analysis for explosives indicated a concentration (corrected) of 13 mg/kg TNT at station WBG-205. This sample was not sent to the fix-based laboratory; however, deeper samples were collected and the 4- to 6-ft bgs sample was sent for laboratory analysis (see Section 4.3.1). The sample from station WBG-210 was submitted to the laboratory; there were no detections of explosives or propellants (Table 4-15). Note that WBG-055, sampled in the Phase I RI, contained 33 mg/kg TNT in surface soil.

4.2.1.9 Pad 60

Field analysis indicated the presence of TNT at a concentration (corrected) of 223 mg/kg in the sample from station WBG-221. Laboratory analysis of this sample indicated 1,3,5-TNB; 1,3-dinitrobenzene (DNB); 2,4,6-TNT; 2,4-DNT; 2-amino-4,6-dinitrotoluene, and RDX. The maximum concentrations in surface soil for 1,3-DNB; 2,4,6-TNT; 2,4-DNT; and 2-amino-4,6-dinitrotoluene occurred in this sample. The high-observed concentration of TNT in this sample is likely caused by the presence of solid masses of TNT in the original soil sample. With the exception of this detection, concentrations of explosives in the sample are similar to those observed in surface soil west of the pad in the Phase II RI at WBG-122. Laboratory analysis of the sample from WBG-212 indicated all non-detects (Table 4-16).

4.2.1.10 Pad 61

Field analysis detected TNT at or above 1 ppm in four of five surface soil samples from Pad 61. Field concentrations ranged from 1 mg/kg at station WBG-220 to 318 mg/kg at station WBG-222. Only the sample from station WBG-222 was submitted for laboratory analysis. Samples WBG-218, -219, and -220 were not sent to the laboratory due to the field explosives correction error. Deeper samples from WBG-219 and -220 were sent for laboratory analysis as part of the 15% confirmation of non-detects analysis requirement (see Section 4.3.1). Surface soil at station WBG-222 contained seven explosive compounds (1,3-DNB; 2,4,6-TNT; 2,4-DNT; 2,6-DNT; 2-amino-4,6-DNT; 4-amino-2,6-DNT; and nitrobenzene. The maximum concentrations of two explosives, 2,6-DNT (0.092 mg/kg) and nitrobenzene (0.12 mg/kg), were found in this sample (Table 4-17). These results are consistent with concentrations measured in the Phase II RI samples at this pad.

4.2.1.11 Pad 62

Field analysis indicated 4 mg/kg of TNT at station WBG-240. This sample was not submitted for laboratory analysis due to the field explosives correction error. Field screening of deeper intervals at this

station were non-detect. Samples from stations WBG-241 and -242 were sent to the fixed-base laboratory. WBG-241 showed all non-detects for explosives/propellants, while low concentrations of several explosives (2,4,6-TNT; 2-amino-4,6-DNT; 4-amino-2,6-DNT; and HMX) were reported in the sample from station WBG-242 (Table 4-18). These results are consistent with concentrations measured in Phase II RI samples from this pad.

4.2.1.12 Pad 66

Field analysis for explosives indicated concentrations from 1.1 to 15 mg/kg TNT in three of four surface soil samples from this pad, and RDX at 5.3 mg/kg at station WBG-243. Station WBG-245 was non-detect for field explosives. The sample from station WBG-247 was submitted to the fixed-base laboratory for analysis. Samples WBG-243 and -246 were not sent for laboratory analyses due to the field explosives correction error. Eight explosive compounds were detected in this sample, including the maximum concentration for 4-amino-2,6-DNT (0.93 mg/kg) (Table 4-19). 2,4,6-TNT was the only compound that was present at a concentration greater than 1 ppm.

4.2.1.13 Pad 67

Field analysis for explosives identified TNT in three of four surface soil samples. No explosives were identified at WBG-251. Concentrations were low (1 to 1.5 mg/kg) at WBG-249 and -250. Field screening indicated a concentration of 1,780 mg/kg 2,4,6-TNT at station WBG-252. Laboratory analysis confirmed the presence of 2,4,6-TNT (430 mg/kg), as well as the presence of four other explosive compounds. The maximum concentration of 1,3,5-TNB, HMX, and RDX were found in this sample (Table 4-20). Note that surface soil from Phase I RI sample WBG-070, located west of the pad, also had high concentrations of TNT, TNB, RDX, and HMX. A small area of the pad was observed to have stained soil and a small amount of residual, weathered product on the ground surface. This material was collected (about 21 g) by OE technicians and analyzed for TNT in the field laboratory. The TNT content was approximated at 97%.

4.2.1.14 Pad 68

Field analysis for explosives detected TNT in two of five surface soil samples from Pad 68 (WBG-254 and -255). RDX was also identified in WBG-254. Both of these samples, and also WBG-257, were submitted for laboratory analysis. The explosives 2,4,6-TNT and 4-amino-2,6-DNT were detected in all three samples, at fairly low (less than 1 mg/kg) concentrations (Table 4-21).

4.2.2 Inorganic Constituents

All samples were field screened for XRF metals (in situ and bench top units). Barium, iron, lead, rubidium, strontium, zinc, and zirconium were detected in nearly all samples. Antimony, copper, and molybdenum were also detected frequently. Appendix H includes the field XRF metals data for each station. Screening of fixed-base laboratory analytical data indicates that 20 inorganic constituents were determined to be SRCs in surface soil for the Phase III investigation at WBG (Table 4-4). Five elements, calcium, iron, magnesium, potassium, and sodium, were screened out because they are essential nutrients (see Section 4.1). The remaining 20 elements were detected above background in at least 5% of all samples, or, in the case of cadmium, hexavalent chromium, cyanide, silver, and thallium, were retained because no background value exists. Eleven of the 20 inorganic SRCs were detected in every sample analyzed (Table 4-4), but many of these infrequently exceeded background. For example, aluminum was present in 95 of 96 samples analyzed, but occurred above the background criteria in only 3 samples, and the maximum detection of aluminum is less than twice the background criteria. Other analytes with high detection rates, but low background exceedance rates, include beryllium (exceeded background in 5 of 95 samples), manganese (exceeded background in 10 of 96 samples), and vanadium (exceeded background in 4 of 95 samples). The

maximum detected concentration of cobalt, selenium, and vanadium, in addition to aluminum mentioned above, is less than twice the background criteria. Figures 4-5 through 4-8 show the distribution of selected metals in random grid samples, and Figures 4-9 through 4-12 show the distribution of selected metals in biased surface soil samples. Metals were chosen to be shown on figures based on high frequency of detection and/or concentrations significantly exceeding background criteria. A detailed discussion of the distribution of inorganics by area follows below.

4.2.2.1 Random grid

Fourteen of the surface soil SRCs were detected above background in at least 1 of the 30 random grid samples. Thallium was detected at low concentrations (0.17 to 0.81 mg/kg) in every random grid sample, and has no background criteria. Cadmium (0.06 to 0.35 mg/kg) was detected in 17 samples, and also has no background. Metals frequently detected above the background criteria in random grid samples include cobalt (13 samples, 5.10 to 15.3 mg/kg); mercury (22 samples, 0.02 to 0.08 mg/kg); zinc (16 samples, 30.6 to 96.7 mg/kg); chromium (8 samples, 9.5 to 22.7 mg/kg); and barium (10 samples, 28.2 to 500 mg/kg). For the most part, maximum detections are less than twice the background criteria, indicating pervasive but low levels of contamination across the WBG site. Exceptions include antimony and barium, which are present at concentrations six or seven times greater than the background criteria. The maximum detection of manganese, which is only slightly greater than twice background, occurred at station WBG-273 (Table 4-8).

4.2.2.2 Building 4301

Eleven of the surface soil SRCs were detected above background in the three samples collected in the vicinity of Building 4301. Cadmium and thallium do not have background criteria. The maximum concentration of cyanide in surface soil occurred in the sample from WBG-261 in this area. Antimony, cadmium, copper, lead, thallium, and zinc were each detected above background in all three samples. Antimony, copper, and lead exceeded the background criteria 21, 9, and 5 times, respectively. Maximum arsenic and zinc concentrations were just slightly more than twice the background criteria. Stations WBG-260 and -261 had somewhat higher concentrations of inorganic SRCs than WBG-259 (Table 4-9).

4.2.2.3 Pad 32

Eight surface soil SRCs exceeded the background criteria in the two samples collected from this pad. Cadmium and thallium do not have background criteria. All concentrations detected were only slightly above the RVAAP background criteria, and none of the detected concentrations were more than twice the background criteria (Table 4-10).

4.2.2.4 Pad 37

Fifteen of the 20 surface soil SRCs were detected above background at Pad 37. Cadmium, lead, and thallium were detected above background in all five samples from this area; cadmium and thallium do not have background criteria. Beryllium was detected at station WBG-223 at 1.8 mg/kg, the maximum concentration for beryllium detected in Phase III samples. WBG-226 had the greatest variety of SRCs (10), as well as the maximum values for lead, antimony, arsenic, barium, cadmium, chromium, copper, magnesium, and zinc at Pad 37. WBG-223 and -227 each had eight of the SRCs above background, and also relatively higher concentrations. WBG-224 and -225 had between four and six SRCs, at concentrations generally slightly greater than background, indicating that metals contamination extends beyond the pad itself to the west and east (Table 4-11).

1

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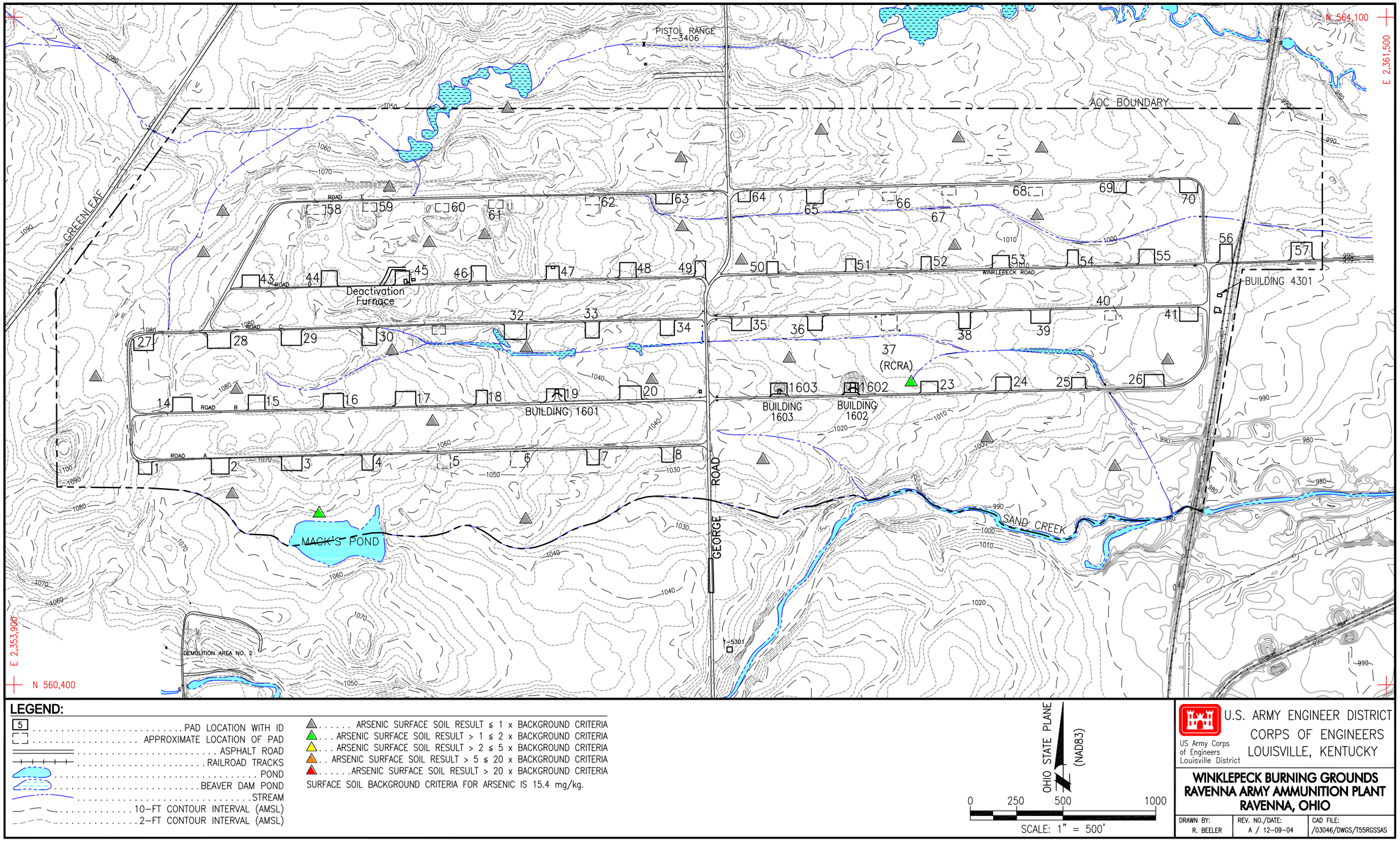
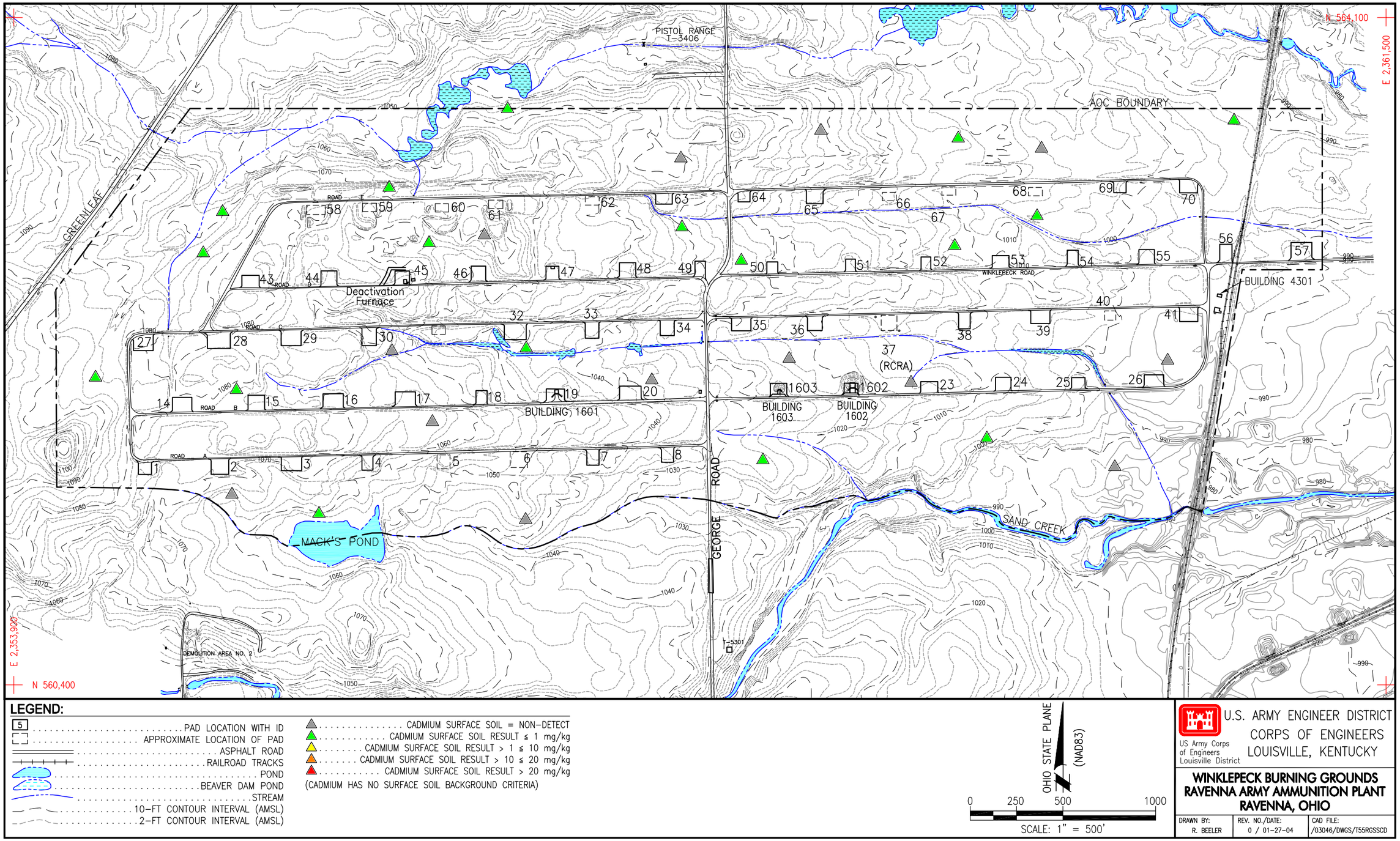


Figure 4-5. Arsenic in Phase III Random Grid Surface Soil Samples at Winklepeck Burning Grounds



LEGEND:

- 5 . . . . . PAD LOCATION WITH ID
- . . . . . APPROXIMATE LOCATION OF PAD
- . . . . . ASPHALT ROAD
- . . . . . RAILROAD TRACKS
- . . . . . POND
- . . . . . BEAVER DAM POND
- . . . . . STREAM
- . . . . . 10-FT CONTOUR INTERVAL (AMSL)
- . . . . . 2-FT CONTOUR INTERVAL (AMSL)

- . . . . . CADMIUM SURFACE SOIL = NON-DETECT
- . . . . . CADMIUM SURFACE SOIL RESULT ≤ 1 mg/kg
- . . . . . CADMIUM SURFACE SOIL RESULT > 1 ≤ 10 mg/kg
- . . . . . CADMIUM SURFACE SOIL RESULT > 10 ≤ 20 mg/kg
- . . . . . CADMIUM SURFACE SOIL RESULT > 20 mg/kg

(CADMIUM HAS NO SURFACE SOIL BACKGROUND CRITERIA)

OHIO STATE PLANE (NAD83)

0 250 500 1000

SCALE: 1" = 500'

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WINKLEPECK BURNING GROUNDS
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

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R. BEELER	0 / 01-27-04	/03046/DWGS/T55RGSSCD

Figure 4-6. Cadmium in Phase III Random Grid Surface Soil Samples at Winklepeck Burning Grounds

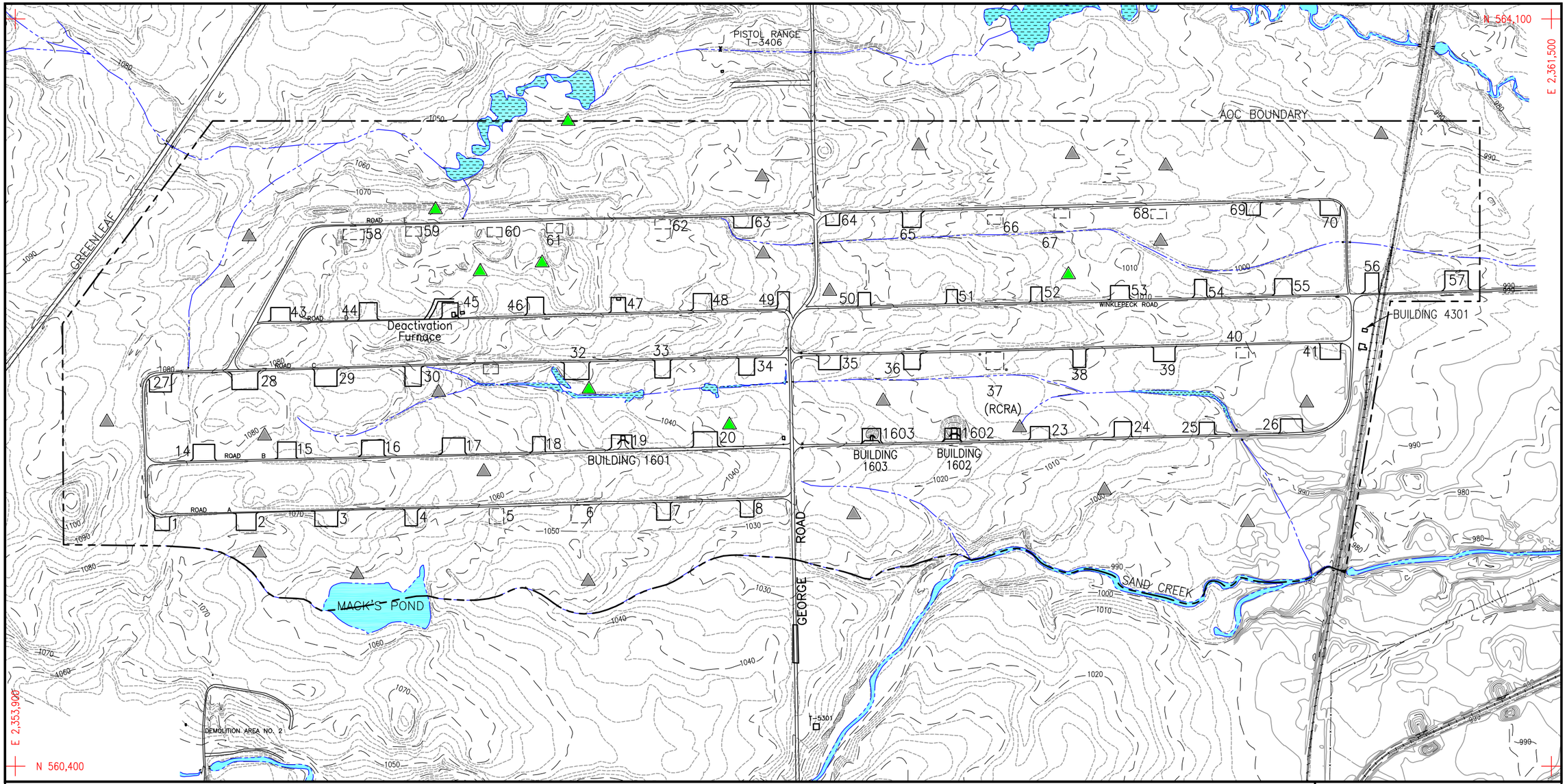


Figure 4-7. Chromium in Phase III Random Grid Surface Soil Samples at Winklepeck Burning Grounds

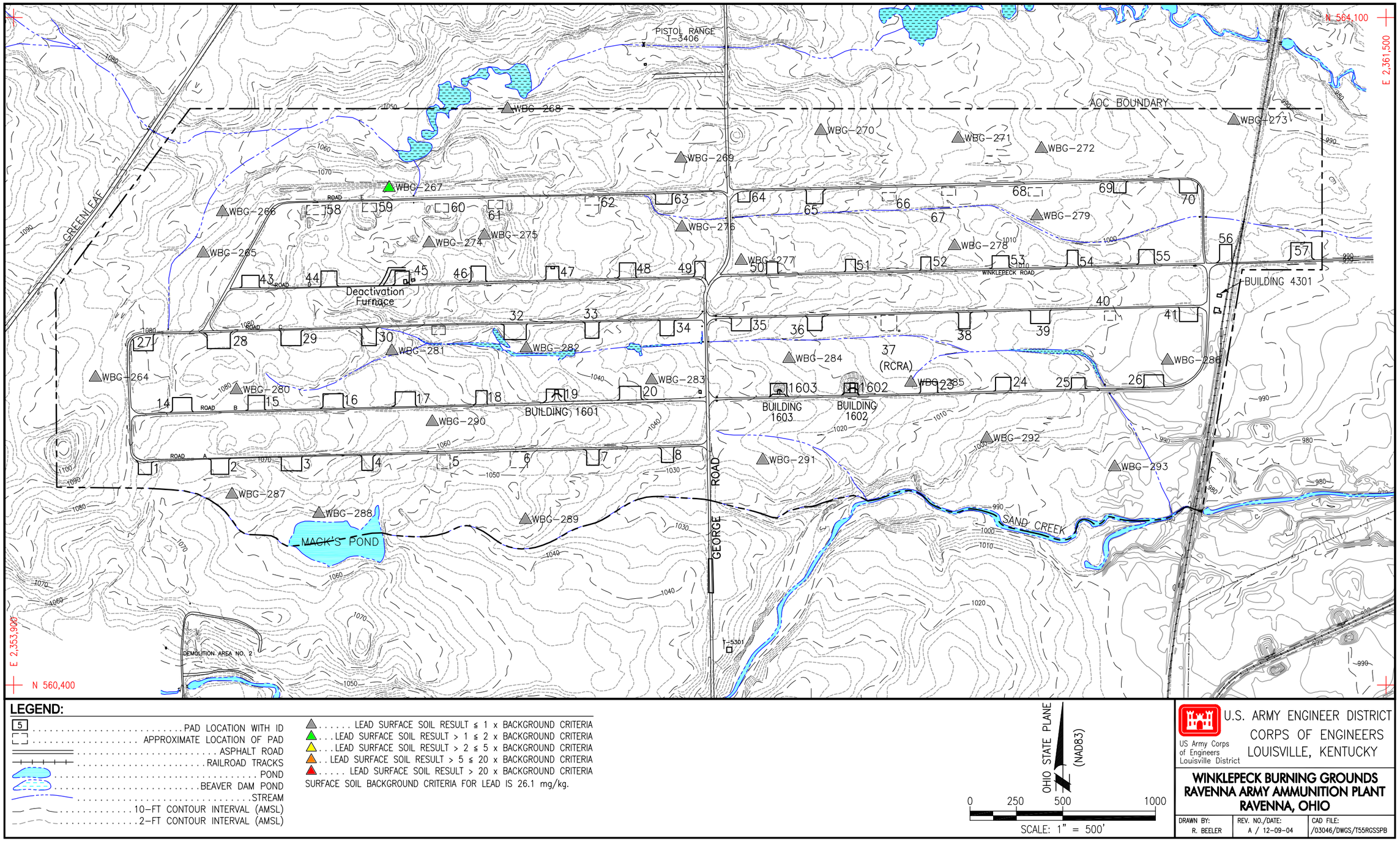


Figure 4-8. Lead in Phase III Random Grid Surface Soil Samples at Winklepeck Burning Grounds

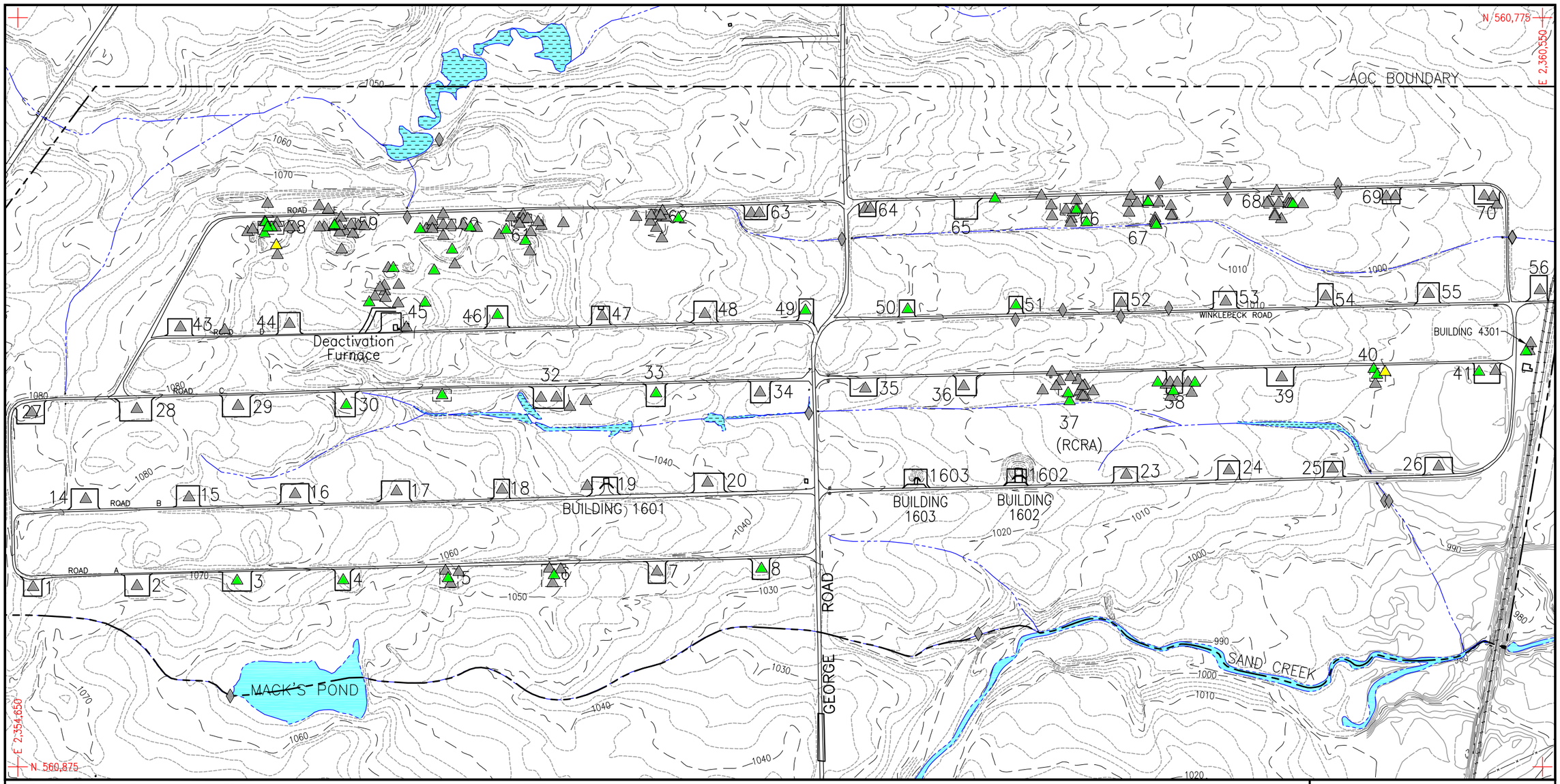
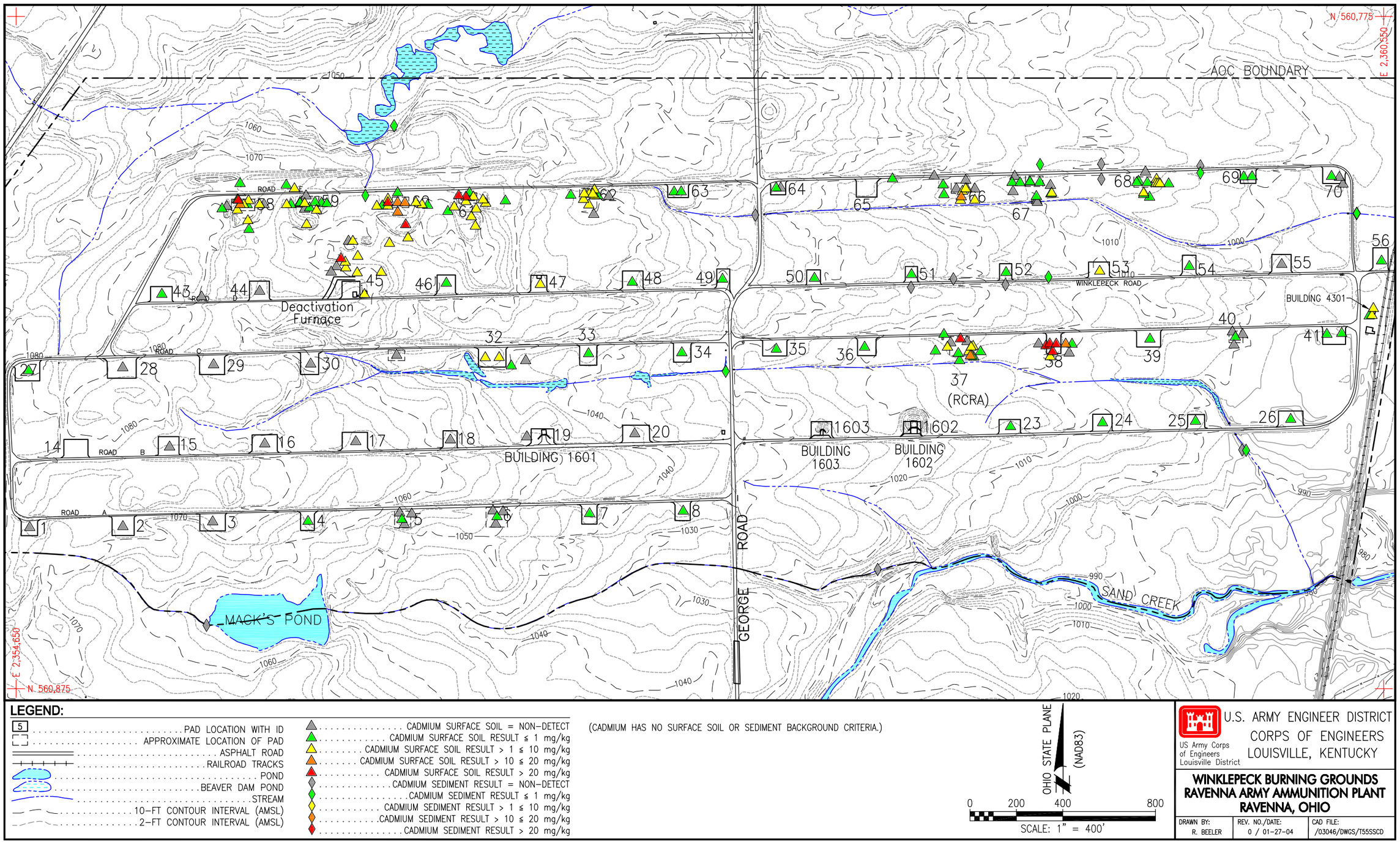


Figure 4-9. Arsenic in Surface Soil and Sediment at Winklepeck Burning Grounds (Phase I, II, and III results shown)



LEGEND:

- 5 ..... PAD LOCATION WITH ID
- ..... APPROXIMATE LOCATION OF PAD
- ..... ASPHALT ROAD
- ..... RAILROAD TRACKS
- ..... POND
- ..... BEAVER DAM POND
- ..... STREAM
- ..... 10–FT CONTOUR INTERVAL (AMSL)
- ..... 2–FT CONTOUR INTERVAL (AMSL)

- ..... CADMIUM SURFACE SOIL = NON–DETECT
- ..... CADMIUM SURFACE SOIL RESULT ≤ 1 mg/kg
- ..... CADMIUM SURFACE SOIL RESULT > 1 ≤ 10 mg/kg
- ..... CADMIUM SURFACE SOIL RESULT > 10 ≤ 20 mg/kg
- ..... CADMIUM SURFACE SOIL RESULT > 20 mg/kg
- ..... CADMIUM SEDIMENT RESULT = NON–DETECT
- ..... CADMIUM SEDIMENT RESULT ≤ 1 mg/kg
- ..... CADMIUM SEDIMENT RESULT > 1 ≤ 10 mg/kg
- ..... CADMIUM SEDIMENT RESULT > 10 ≤ 20 mg/kg
- ..... CADMIUM SEDIMENT RESULT > 20 mg/kg

(CADMIUM HAS NO SURFACE SOIL OR SEDIMENT BACKGROUND CRITERIA.)

OHIO STATE PLANE (NAD83)

0 200 400 800

SCALE: 1" = 400'

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WINKLEPECK BURNING GROUNDS
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

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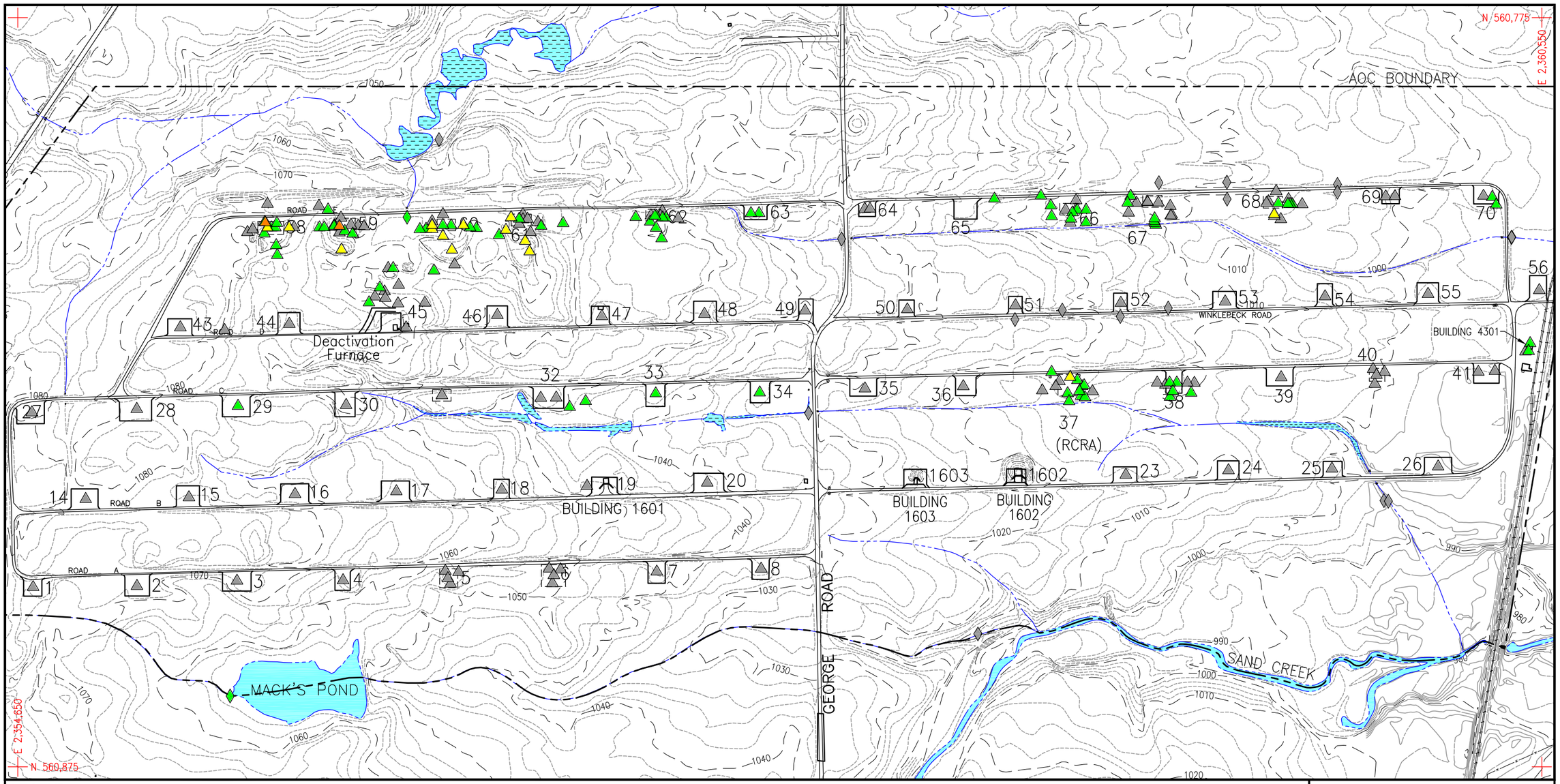
Figure 4-10. Cadmium in Surface Soil and Sediment at Winklepeck Burning Grounds (Phase I, II, and III data shown)



LEGEND:

- PAD LOCATION WITH ID
- APPROXIMATE LOCATION OF PAD
- ASPHALT ROAD
- RAILROAD TRACKS
- POND
- BEAVER DAM POND
- STREAM
- 10–FT CONTOUR INTERVAL (AMSL)
- 2–FT CONTOUR INTERVAL (AMSL)
- CHROMIUM SURFACE SOIL RESULT ≤ 1 x BACKGROUND CRITERIA
- CHROMIUM SURFACE SOIL RESULT > 1 ≤ 2 x BACKGROUND CRITERIA
- CHROMIUM SURFACE SOIL RESULT > 2 ≤ 5 x BACKGROUND CRITERIA
- CHROMIUM SURFACE SOIL RESULT > 5 ≤ 20 x BACKGROUND CRITERIA
- CHROMIUM SURFACE SOIL RESULT > 20 x BACKGROUND CRITERIA
- CHROMIUM SEDIMENT RESULT ≤ 1 x BACKGROUND CRITERIA
- CHROMIUM SEDIMENT RESULT > 1 ≤ 2 x BACKGROUND CRITERIA
- CHROMIUM SEDIMENT RESULT > 2 ≤ 5 x BACKGROUND CRITERIA
- CHROMIUM SEDIMENT RESULT > 5 ≤ 20 x BACKGROUND CRITERIA
- CHROMIUM SEDIMENT RESULT > 20 x BACKGROUND CRITERIA

SURFACE SOIL BACKGROUND CRITERIA FOR CHROMIUM IS 17.4 mg/kg.
SEDIMENT BACKGROUND CRITERIA FOR CHROMIUM IS 18.1 mg/kg.

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WINKLEPECK BURNING GROUNDS
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RAVENNA, OHIO

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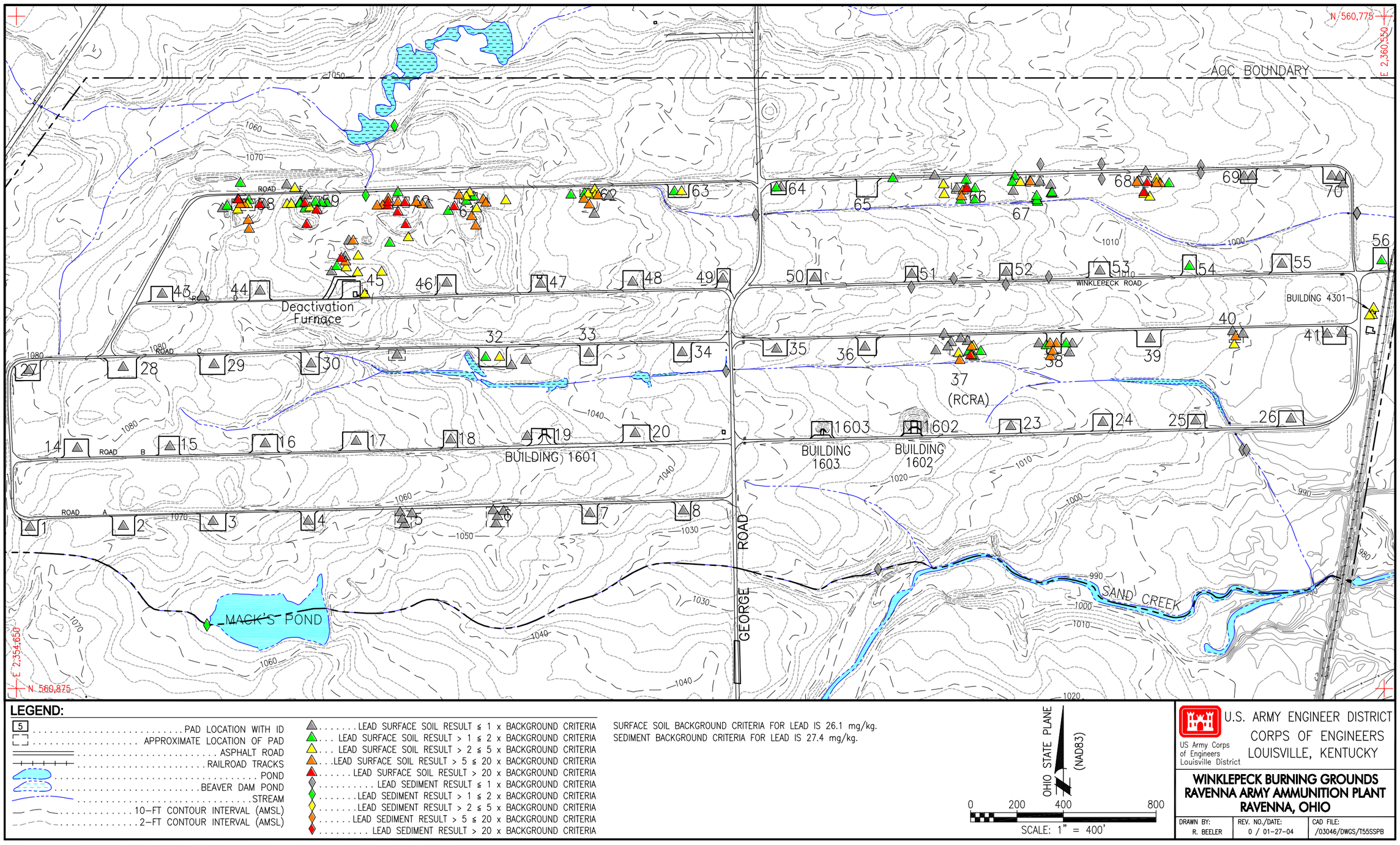
R. BEELER	A / 12-09-04	/03046/DWGS/T55SSCR

Figure 4-11. Chromium in Surface Soil and Sediment at Winklepeck Burning Grounds (Phase I, II, and III data shown)



LEGEND:

- 5 ..... PAD LOCATION WITH ID
- [ ] ..... APPROXIMATE LOCATION OF PAD
- ..... ASPHALT ROAD
- ..... RAILROAD TRACKS
- ..... POND
- ..... BEAVER DAM POND
- ..... STREAM
- ..... 10-FT CONTOUR INTERVAL (AMSL)
- ..... 2-FT CONTOUR INTERVAL (AMSL)

- ..... LEAD SURFACE SOIL RESULT ≤ 1 x BACKGROUND CRITERIA
- ..... LEAD SURFACE SOIL RESULT > 1 ≤ 2 x BACKGROUND CRITERIA
- ..... LEAD SURFACE SOIL RESULT > 2 ≤ 5 x BACKGROUND CRITERIA
- ..... LEAD SURFACE SOIL RESULT > 5 ≤ 20 x BACKGROUND CRITERIA
- ..... LEAD SURFACE SOIL RESULT > 20 x BACKGROUND CRITERIA
- ..... LEAD SEDIMENT RESULT ≤ 1 x BACKGROUND CRITERIA
- ..... LEAD SEDIMENT RESULT > 1 ≤ 2 x BACKGROUND CRITERIA
- ..... LEAD SEDIMENT RESULT > 2 ≤ 5 x BACKGROUND CRITERIA
- ..... LEAD SEDIMENT RESULT > 5 ≤ 20 x BACKGROUND CRITERIA
- ..... LEAD SEDIMENT RESULT > 20 x BACKGROUND CRITERIA

SURFACE SOIL BACKGROUND CRITERIA FOR LEAD IS 26.1 mg/kg.
SEDIMENT BACKGROUND CRITERIA FOR LEAD IS 27.4 mg/kg.

OHIO STATE PLANE (NAD83)

0 200 400 800

SCALE: 1" = 400'

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RAVENNA, OHIO

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R. BEELER	0 / 01-27-04	/03046/DWGS/T55SSPB

Figure 4-12. Lead in Surface Soil and Sediment at Winklepeck Burning Grounds

4.2.2.5 Pad 38

Four surface soil samples were collected from Pad 38, and 12 SRCs were detected above background in those samples. Thallium and cadmium, which have no background values, were detected in four and three samples, respectively. Hexavalent chromium was detected in two samples. The maximum Phase III surface soil concentration for cadmium (43.6 mg/kg) occurred at station WBG-231. This station, located in the southeastern portion of the pad, has the highest concentrations and greatest variety of SRCs of any station sampled at this pad during the current investigation (Table 4-12).

4.2.2.6 Pad 45

Eleven surface soil SRCs were identified in the five samples collected from Pad 45. Thallium was detected in all samples, but has no background value against which to screen. Cadmium and hexavalent chromium were detected in two samples, and silver in one sample. Of the metals with background criteria, concentrations of copper, lead, and zinc were more than twice the background criteria at WBG-234 and -235. WBG-234 is located immediately east of the former Deactivation Furnace. Concentrations of all other SRCs, and these metals at the other Pad 45 stations, were generally detected at concentrations less than twice the background criteria (Table 4-13).

4.2.2.7 Pad 58

All the surface soil SRCs, with the exception of beryllium and manganese, were detected in the eight samples collected at Pad 58. Maximum surface soil concentrations of several metals occurred in these samples, including arsenic (33.5 mg/kg, at WBG-197); zinc (4520 mg/kg, at WBG-199); and mercury (1.4 mg/kg at WBG-202). WBG-197, -199, and -200 had the greatest variety of surface soil SRCs, with between 12 and 14 metals present above the background criteria at each of these stations. WBGss-199, located on the berm east of the pad, is the locus of the maximum concentrations of six of the metals – antimony, barium, chromium, copper, lead, and zinc. WBG-198, -201, -202, -203, and -263 showed the least amount of contamination, with between four and eight SRCs present above the background criteria, and concentrations of those elements with background values less than twice the background criteria (with the exception of mercury in station WBG-202, which was detected at a concentration significantly above the background criteria of 0 04 mg/kg) (Table 4-14).

4.2.2.8 Pad 59

Nine surface soil samples were collected from Pad 59 during the Phase III RI, and 16 of the 20 surface soil SRCs were present in these samples at concentrations exceeding the background criteria. Aluminum, beryllium, selenium, and cyanide were not detected in soils from this area. As at Pad 58, the most heavily contaminated soils come from the berm area, notably WBG-207 south of the pad and WBG-209 to the west of the pad. The most heavily contaminated stations, both in terms of number of SRCs and concentrations detected, were WBG-207, and -209, with particularly high concentrations of antimony, barium, lead, silver, and zinc at station WBG-207. Thirteen SRCs were detected at concentrations above the background criteria at this station. In contrast, the results of analysis from station WBG-297 show only cadmium and thallium as SRCs, and these chemicals have no background criteria against which to compare (Table 4-15).

4.2.2.9 Pad 60

A total of 16 surface soil inorganic SRCs were detected at Pad 60. Of the six surface soil samples collected from this pad during the Phase III RI, the sample from WBG-211 shows the highest contamination. Maximum concentrations were detected for eight of the inorganic SRCs, including aluminum, antimony, chromium, copper, lead, nickel, silver, and vanadium (Table 4-4). Fourteen of the 20 surface soil SRCs were present in this sample, most at concentrations well above the background criteria. Four of the six samples

showed 10 or more surface soil SRCs at concentrations exceeding the background levels (Table 4-16). The greatest numbers and concentrations of metals above background are generally found on the west berm of Pad 60, with lower concentrations and fewer constituents to the south and east of the pad.

4.2.2.10 Pad 61

Sixteen surface soil SRCs, including cyanide and hexavalent chromium, were detected in the six Pad 61 samples. The maximum concentration of hexavalent chromium was detected at station WBG-217, and the maximum selenium concentration was detected at station WBG-218 (Table 4-4). These two stations contain the greatest variety (14 and 15 SRCs, respectively) but, in general, the highest concentrations occurred at station WBG-219, which had 13 SRCs present at concentrations exceeding the background criteria (Table 4-17). WBG-217, -218, -219, and -220 are located on the berm or on the raised area south of Pad 61 and generally have high concentrations of metals above background. The fact that WBG-217 and -218 are 60 to 100 ft south of the pad area indicates a greater horizontal extent of contamination than was previously suspected.

4.2.2.11 Pad 62

Seven surface soil samples were collected in the vicinity of Pad 62, with analysis showing that 15 surface soil SRCs were present in this area at concentrations exceeding their background criteria. For the most part, inorganics are pervasive but detected in low concentrations, with few detections more than twice the background criteria for those elements having background values. At station WBG-240, located in the center of Pad 62, 10 inorganic surface soils SRCs were detected above their background criteria, and eight of these were at concentrations more than twice the background criteria, or there was no criteria (e.g., cadmium, silver, thallium). At station WBG-242, on the eastern half of the pad, 10 SRCs were present above the background criteria, but only lead and zinc were detected at concentrations more than twice the background criteria (Table 4-18). WBG-239 and -241, located south and east of the pad, respectively, each had three SRCs only slightly greater than background values. To the west of the pad, WBG-238 exhibits nine metals at concentrations all less than twice the background criteria in surface soil.

4.2.2.12 Pad 66

Each of the four surface soil samples from Pad 66 had between 10 and 12 surface soil SRCs detected at concentrations exceeding the background criteria. The maximum concentration for barium was detected at station WBG-246, located south of the pad, and barium was significantly elevated (more than four times the background value) in all samples from this pad. In general, station WBG-246 also had the highest concentrations within the pad of other SRCs as well (Table 4-19). Thus, it appears contamination extends well beyond the pad itself.

4.2.2.13 Pad 67

Fourteen surface soil SRCs were detected at concentrations exceeding the background criteria in the four samples collected from Pad 67. The maximum concentrations for cobalt (18.2 mg/kg) occurred at station WBG-251, located to the west of Pad 67; however, this concentration is less than twice the background criteria. Station WBG-250, situated about 60 ft south of Pad 67, had the highest concentration of five of the SRCs within the pad. Station WBG-252, located on the western half of the pad, also had some of the maximum Pad 67 concentrations (Table 4-20). It is apparent that metals contamination is dispersed beyond the pad itself into adjacent areas.

4.2.2.14 Pad 68

Ten surface soil SRCs were detected in the five samples collected from Pad 58 at concentrations above the background criteria. Barium, cadmium, copper, mercury, thallium, and zinc were detected above background in all samples from this pad, with antimony and lead detected above background in four samples each, and scattered detections of chromium and selenium. Concentrations were similar in all samples throughout the pad, with sample WBG-253 located on the pad, showing somewhat lower concentrations of most SRCs than the other samples collected off the pad to the east (Table 4-21).

4.2.3 Semivolatile Organic Compounds, Volatile Organic Compounds, and Polychlorinated Biphenyls

Nine surface soil samples were submitted for pesticide/PCB, SVOC, and VOC analysis. A total of 21 organic compounds were detected, and thus determined to be SRCs in surface soil. Samples were collected from the former Building 4301 area and Pads 37, 38, 45, 61 (2 samples), 62, 66, and 67. Organic compounds were not detected at Pad 45 (station WBG-236), 62 (station WBG-240), or 67 (station WBG-251). A single detection of pesticide occurred at the following pad/stations: Pad 37, station WBG-225 (dieldrin); Pad 38, station WBG-231 (heptachlor epoxide); and Pad 66, station WBG-245 (dieldrin). The remaining three stations (one from Building 4301, and two from Pad 61) had a fairly diverse suite of organic compounds detected, including PCBs, pesticides, SVOCs, and VOCs. Concentrations among the three samples were similar, with most being estimated values at or below the contract detection limit. These samples are discussed in more detail below.

4.2.3.1 Building 4301

As shown in Table 4-9, the sample from station WBG-261 contained detections of PCB-1254, 14 SVOCs (all PAHs), and TCE. This was the only detection of TCE, which has an estimated value of 1.2 µg/kg.

4.2.3.2 Pad 61

Table 4-17 gives the results of organic analysis for samples WBG-218 and -220. Both samples contained PCB-1260, with single detections of 4,4'-DDT (WBG-218) and heptachlor epoxide (WBG-220). All values were flagged "=" above the contract detection limits. Seventeen SVOCs were detected in WBG-218 and 14 SVOCs were detected in WBG-220. Most chemicals detected are PAHs, with the exception of 2,4-DNT and 2,6-DNT detected in WBG-218, and most concentrations were detected as estimated values at or below the contract detection limit. VOCs were not detected in either sample.

4.2.4 Geotechnical Results

Geotechnical analyses were not conducted on Phase III surface soil samples.

4.2.5 Surface Soil Summary

Ninety-seven surface soil samples from 12 burning pads, Building 4301, and random grid locations were collected as part of this Phase III RI in order to determine nature and extent of contamination. Chemical evaluation of the surface soils included analyses of explosives, propellants, TAL metals, hexavalent chromium, cyanide, and organic compounds.

4.2.5.1 Explosives

- The majority of soil samples analyzed in the field for TNT and RDX had no detectable concentrations of these explosives. A total of 21 surface soil samples were analyzed in the fixed-base laboratory for explosives and/or propellants.

- Nine of the 12 pads have low detectable concentrations of one or more explosive compounds. Explosives were not evaluated in samples from Pad 32. Of these, only three pads (60, 66, and 67) had occurrences of explosives in excess of 1 ppm.

- At Pad 60 (WBG-211), the maximum concentration of TNT (680 mg/kg); 2-amino-4,6-DNT (14 J mg/kg); and 2, 4-DNT (1.5 mg/kg) were observed. This sample is located on the berm south of the pad.

- At Pad 66, WBG-247, 2,4,5-TNT was detected at 1.5 mg/kg. This sample is located on the southern edge of the pad.

- At Pad 67, high concentrations of 1,3,5-TNB (34 mg/kg), TNT (430 mg/kg), RDX (470 mg/kg), and HMX (100 mg/kg) were identified in WBG-252. This was the only location with detectable quantities of HMX and RDX in surface soils.

- Based on limited Phase III laboratory analytical data, explosives contamination extends well beyond the actual pad boundary at Pads 45 (former deactivation furnace), 60, 61, and, to a lesser extent (e.g., at lower concentrations), at Pads 58 and 68.

- Phase III laboratory results confirm the findings of the Phase I and II RI on the lateral extent of contamination at Pads 37, 38, 59, 62, 66, and 67. However, field explosives were detected beyond the edge of the pad in samples that were inadvertently not submitted to the fixed-base analytical laboratory.

4.2.5.2 Inorganics

Inorganics were evaluated in all surface soil samples.

- Occurrences of metals above background are common in the random grid samples, although concentrations only slightly exceed the background criteria. Barium, cadmium, cobalt, and zinc were the most commonly detected metals. Maximum levels of cobalt and zinc were found south of Pads 33 and 34 near Building 1604, a location at which contamination had not been observed in the Phase I RI. Highest barium concentrations occur mainly in the northern half of the site; lead was also identified above background north of Pad 59.

- At Building 4301, antimony, copper, and lead occur in concentrations well above the background criteria.

- Inorganics were found at concentrations exceeding background criteria in all pads. The results of the Phase III investigation indicate metals contamination (primarily antimony, cadmium, chromium, barium, lead, zinc, and occasionally mercury) is substantially higher than background values at the following sites:

  - Pad 37 (surface soil on the pad),
  - Pad 38 (surface soil on the pad),
  - Pad 45 (north and east of the Deactivation Furnace Area),
  - Pad 58 (on the berms and south and east of the berms),

- Pad 59 (western berm and western half of the pad),
- Pad 60 (berms and west of the western berm),
- Pad 61 (surface soil on the pad),
- Pad 62 (center and to the west of the pad),
- Pad 66 (south and west of the pad),
- Pad 67 (western half of the pad and south to the drainage ditch), and
- Pad 68 (areas adjacent to the pad).

4.2.5.3 Organic compounds

- Organic compounds were evaluated in a total of nine samples collected at Pads 37, 38, 45, 61, 62, 66, and 67, and Building 4301. No samples were analyzed for organic compounds at Pads 32, 58, 59, 60, and 68, or in the random grid areas. A total of nine samples received organics analyses.

- Pesticides or PCBs were found in very low concentrations at Pads 37, 38, 61, and 66. 4,4'-DDT occurred once at Pad 61; dieldrin was detected once each at Pads 37 and 66. Heptachlor epoxide was detected at Pads 38 and 61.

- SVOCs, primarily PAHS presumed to result from open burning on the pads, were found at Pad 61 (both samples) and at Building 4301. These compounds were present at low concentrations, generally below 0.7 mg/kg.

- The occurrence of VOCs was limited to one detection of TCE at Building 4301 (0.0012J mg/kg). The source of this compound is unknown.

4.3 SUBSURFACE SOILS

Subsurface (2 to 4, 4 to 6, and 6 to 8 ft) soil samples were collected in the Phase III RI. At a minimum, one 2- to 4-ft sample was collected at Pads 37, 38, 45, 58, 59, 61, 62, 66, 67, and 68 for a determination of vertical extent of contamination. The surface soil field screening results were used to determine the placement of additional samples. These borings reached a maximum depth of 10 ft, and were advanced to the target depth regardless of the field explosives determination in the preceding depth interval. A total of 54 subsurface samples were collected.

The subsurface sampling is biased toward those areas that are known or suspected to have the greatest surface soil contamination. Subsurface soil samples were not collected from random grid locations, Pad 32, or Building 4301. Figures 3-1 and 3-2 illustrate the distribution of subsurface soil samples in the Phase III RI. All subsurface soil samples are designated "WBGso-XXX" to distinguish them from the surface soil sample at the same location.

All sample collection and analysis for the Phase III RI was conducted in accordance with the SAP Addendum No.1 (USACE 2000), as described in Chapter 3.0 of this report. Subsurface soil samples were analyzed for field explosives, field metals, explosives, and TAL metals (inorganics). Samples that tested positive for the explosives TNT or RDX in the field laboratory were to be sent to the fixed-base laboratory for explosives analysis if the field laboratory result was > 1.0 ppm; however, an inadvertent error in the work plan resulted in the field laboratory results being under-reported by two orders of magnitude (i.e., results reported as 0.01 ppm should have been reported as 1.0 ppm) and several samples that should have been sent for fixed-base laboratory analysis were not. This is explained further in the explosives subsection of this section. VOCs, SVOCs, pesticides/PCBs, and cyanide, were analyzed in

four of the subsurface samples, as described in Chapter 3.0. Hexavalent chromium was analyzed in 12 of the subsurface soil samples.

The analytical results for soil samples collected at WBG are summarized by sample station and by analyte in Tables 4-22 through 4-31, and are provided in their entirety in Appendix H. Only constituents determined to be subsurface soil SRCs across the AOC (Table 4-5) are included for discussion in this section. The following subsections describe the distribution of explosives, propellants, inorganics, and organic constituents for subsurface soils at each of the pads. For each constituent class discussed, figures are presented (as appropriate) that illustrate the distribution of site-related contamination identified in the Phase I, II, and III investigations. The analytes presented in the figures represent those that occur with the greatest frequency, or those that represent the distribution of chemicals known to be significant human health or ecological risk drivers based on previous investigations at WBG.

4.3.1 Explosives and Propellants

All 54 subsurface soil samples were analyzed in the field for TNT and RDX. A total of 37 regular subsurface samples were submitted to the fixed-base laboratory for confirmation sampling. Eleven explosives were detected in at least one sample (Table 4-5). Propellants were not detected in the samples analyzed in the fixed-base laboratory. 2,4,6-TNT was the most commonly detected explosive compound, with detectible concentrations in 16 subsurface soil samples. RDX was detected in six samples, and 2,4-DNT and HMX were each detected in five samples. 1,3,5-TNB was detected in four samples. Explosives 2-amino-4,6-DNT and 4-amino-2,6-DNT were detected in four and three samples, respectively. Other explosives were detected in one or two samples, as Table 4-5 shows. Concentrations of explosive compounds ranged from 0.05 to 5,200 mg/kg (Table 4-5). Laboratory analysis indicates that explosives were not detected or detected at low concentrations (less than 1 mg/kg) in the subsurface at Pads 37, 38, 45, 62, and 68. Pads 58, 59, 61, 66, and 67 showed the greatest number and highest concentration of explosive compounds in subsurface soil, with each of these pads displaying the maximum concentration for at least one explosive compound, and Pad 67 having the maximum concentrations of six explosive compounds. Figures 4-13 through 4-16 show the relative concentration of 2,4,6-TNT; 2,4-DNT, HMX, and RDX, respectively, in the 2- to 4-ft subsurface soil interval. This depth interval was chosen for illustration because, in general, there were more detections and at higher concentrations in the 2- to 4-ft subsurface soil interval than in deeper intervals.

4.3.1.1 Pad 37

Explosives were not detected in WBG-223. Field analysis of samples from WBG-227 identified a concentration of 1.9 mg/kg (corrected) of TNT in the 6- to 8-ft sample. Fixed-base laboratory analysis of this sample did not identify any detectible concentrations of explosives or propellants at this depth, but 2,4,6-TNT was detected at low estimated concentrations in the 2- to 4- and 4- to 6-ft intervals. RDX was also detected in the 4- to 6-ft interval (Table 4-22).

4.3.1.2 Pad 38

Field analysis detected explosives in two of the six subsurface soil samples collected at Pad 38. Both the 4- to 6- and 6- to 8-ft interval of WBG-232 tested positive for TNT at concentrations of 1.2 and 1.1 mg/kg, respectively. Laboratory analysis confirmed the presence of this explosive compound (Table 4-23). Field analysis of the 2- to 4-ft interval did not indicate the presence of explosives; however, laboratory analysis of this sample identified 2,4,6-TNT; 2,4-DNT; and 4-amino-2,6-DNT at low estimated concentrations less than 1 mg/kg (Table 4-23). Note that the surface soil collected from this boring contained comparable concentrations of two explosives.

Table 4-22. Concentrations of SRCs in Subsurface Soil at Pad 37

Station		WBG-223	WBG-227	WBG-227	WBG-227	WBG-227
Sample ID		WBGso-223-4083-SO	WBGso-227-4095-SO	WBGso-227-4096-SO	WBGso-227-4097-SO	WBGso-227-4098-SO
Date		10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000
Depth (ft)		2–4	2–4	4–6	6–8	8–10
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	Units					
Explosives						
1,3,5-Trinitrobenzene	mg/kg	NA	ND	ND	ND	ND
1,3-Dinitrobenzene	mg/kg	NA	ND	ND	ND	ND
2,4,6-Trinitrotoluene	mg/kg	NA	0.17 J	0.12 J	ND	ND
2,4-Dinitrotoluene	mg/kg	NA	ND	ND	ND	ND
2,6-Dinitrotoluene	mg/kg	NA	ND	ND	ND	ND
2-Amino-4,6-dinitrotoluene	mg/kg	NA	ND	ND	ND	ND
4-Amino-2,6-dinitrotoluene	mg/kg	NA	ND	ND	ND	ND
4-Nitrotoluene	mg/kg	NA	ND	ND	ND	ND
HMX	mg/kg	NA	ND	ND	ND	ND
Nitrobenzene	mg/kg	NA	ND	ND	ND	ND
RDX	mg/kg	NA	ND	0.23 J	ND	ND
Metals						
Cyanide	mg/kg	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	NA	NA	NA	NA	NA
Aluminum	mg/kg	13,000 J	10,700 J	10,900 J	9,730 J	8,380 J
Antimony	mg/kg	ND	0.97 J *	ND	0.65 J	0.67 J
Arsenic	mg/kg	15.9 =	38.4 = *	20.7 = *	21 = *	17.7 =
Barium	mg/kg	54.9 =	62.8 J	47.5 J	49.8 J	39.3 =
Cadmium	mg/kg	ND	ND	ND	ND	ND
Chromium	mg/kg	16.7 =	14 J	16.4 J	15 J	14.4 =
Copper	mg/kg	20.2 =	22.3 =	20.4 =	20.7 =	20.5 =
Lead	mg/kg	17.4 =	34.9 = *	17.5 =	22.1 = *	14.1 =
Mercury	mg/kg	0.019 J	0.029 J	ND	0.019 J	0.011 J
Nickel	mg/kg	19.1 =	23.5 =	24.2 =	19.7 =	22.6 =
Selenium	mg/kg	ND	0.78 =	0.42 J	0.63 =	ND
Silver	mg/kg	ND	ND	ND	ND	ND
Vanadium	mg/kg	22.5 =	19.7 =	18.3 =	18.7 =	14.3 =
Zinc	mg/kg	62.3 =	78.2 J	73.8 J	70.8 J	ND

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-23. Concentrations of SRCs in Subsurface Soil at Pad 38

Station		WBG-229	WBG-231	WBG-232	WBG-232	WBG-232	WBG-232
Sample ID		WBGso-229-4103-SO	WBGso-231-4109-SO	WBGso-232-4112-SO	WBGso-232-4113-SO	WBGso-232-4114-SO	WBGso-232-4115-SO
Date		10/25/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000
Depth (ft)		2–4	2–4	2–4	4–6	6–8	8–10
Field Type		Grab	Grab	Grab	Grab	Grab	Grab
Analyte	Units						
Explosives							
1,3,5-Trinitrobenzene	mg/kg	NA	NA	ND	ND	ND	ND
1,3-Dinitrobenzene	mg/kg	NA	NA	ND	ND	ND	ND
2,4,6-Trinitrotoluene	mg/kg	NA	NA	0.13 J	0.17 J	0.061 J	ND
2,4-Dinitrotoluene	mg/kg	NA	NA	0.066 J	ND	ND	ND
2,6-Dinitrotoluene	mg/kg	NA	NA	ND	ND	ND	ND
2-Amino-4,6-dinitrotoluene	mg/kg	NA	NA	ND	ND	ND	ND
4-Amino-2,6-dinitrotoluene	mg/kg	NA	NA	0.092 J	ND	ND	ND
4-Nitrotoluene	mg/kg	NA	NA	ND	ND	ND	ND
HMX	mg/kg	NA	NA	ND	ND	ND	ND
Nitrobenzene	mg/kg	NA	NA	ND	ND	ND	ND
RDX	mg/kg	NA	NA	ND	ND	ND	ND
Metals							
Cyanide	mg/kg	NA	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	NA	NA	ND	ND	ND	ND
Aluminum	mg/kg	11,800 =	12,200 J	12,700 =	12,000 =	8,450 =	8,300 =
Antimony	mg/kg	0.61 J	0.73 J	ND	ND	0.66 J	ND
Arsenic	mg/kg	15.8 =	13.8 =	12.9 =	11.8 =	18.4 =	15.9 =
Barium	mg/kg	67 J	66.7 =	189 = *	152 = *	87.4 =	38.2 =
Cadmium	mg/kg	ND	0.12 J *	201 = *	69.1 = *	28 = *	1.2 = *
Chromium	mg/kg	16.9 J	14.8 =	20.8 =	16.9 =	13.4 =	12.9 =
Copper	mg/kg	23 J	12.3 =	20.8 =	18.3 =	17.7 =	18.5 =
Lead	mg/kg	12.8 =	16.8 =	190 = *	83.6 = *	38.6 = *	11.7 =
Mercury	mg/kg	ND	0.041 J	0.015 J	0.015 J	0.012 J	ND
Nickel	mg/kg	28.4 =	13.5 =	31.7 =	29.3 =	20.6 =	26.6 =
Selenium	mg/kg	1 =	ND	ND	ND	ND	ND
Silver	mg/kg	ND	ND	ND	ND	ND	ND
Vanadium	mg/kg	19 =	24.8 =	15.3 =	15.3 =	13.4 =	13 =
Zinc	mg/kg	74.4 =	48.6 =	136 J *	85 J	63.6 J	62.2 J

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5-7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates value exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-24. Concentrations of SRCs in Subsurface Soil at Pad 45

Station		WBG-237	WBG-237	WBG-237	WBG-237
Sample ID		WBGso-237-4129-SO	WBGso-237-4130-SO	WBGso-237-4131-SO	WBGso-237-4132-SO
Date		10/22/2000	10/22/2000	10/22/2000	10/22/2000
Depth (ft)		2–4	4–6	6–8	8–10
Field Type		Grab	Grab	Grab	Grab
Analyte	Units				
Explosives					
1,3,5-Trinitrobenzene	mg/kg	ND	ND	ND	ND
1,3-Dinitrobenzene	mg/kg	ND	ND	ND	ND
2,4,6-Trinitrotoluene	mg/kg	0.057 J	ND	ND	ND
2,4-Dinitrotoluene	mg/kg	ND	ND	ND	ND
2,6-Dinitrotoluene	mg/kg	ND	ND	ND	ND
2-Amino-4,6-dinitrotoluene	mg/kg	ND	ND	ND	ND
4-Amino-2,6-dinitrotoluene	mg/kg	ND	ND	ND	ND
4-Nitrotoluene	mg/kg	ND	ND	ND	ND
HMX	mg/kg	ND	ND	ND	ND
Nitrobenzene	mg/kg	ND	ND	ND	ND
RDX	mg/kg	ND	ND	ND	ND
Metals					
Cyanide	mg/kg	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	ND	2.8 J	ND	1.4 J
Aluminum	mg/kg	15,700 J	13,800 =	11,300 =	13,200 =
Antimony	mg/kg	0.91 J	0.68 J	0.86 J	ND
Arsenic	mg/kg	15.2 =	15.7 =	16.2 =	9.9 =
Barium	mg/kg	60.4 =	73.4 =	75.6 =	63.3 =
Cadmium	mg/kg	ND	0.2 J *	0.27 J *	0.15 J *
Chromium	mg/kg	19.2 =	19.9 =	16.3 =	18.4 =
Copper	mg/kg	18.7 =	24.2 =	24.9 =	17.9 =
Lead	mg/kg	16 =	16.1 =	15.9 =	9.3 =
Mercury	mg/kg	0.038 J	0.023 J	0.025 J	0.018 J
Nickel	mg/kg	16.8 =	25.8 =	23.8 =	19.6 =
Selenium	mg/kg	ND	0.89 J	ND	ND
Silver	mg/kg	ND	ND	ND	ND
Vanadium	mg/kg	30.6 =	28 =	26.1 =	25.1 =
Zinc	mg/kg	50.8 =	61.9 J	63.6 J	49.3 J

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-25. Concentrations of Subsurface Soils at Pad 58

Station		WBG-199	WBG-199	WBG-199	WBG-203	WBG-203	WBG-203	WBG-203
Sample ID		WBGso-199-4007-SO	WBGso-199-4008-SO	WBGso-199-4314-SO	WBGso-203-4019-SO	WBGso-203-4020-SO	WBGso-203-4021-SO	WBGso-203-4022-SO
Date		10/20/2000	10/21/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000
Depth (ft)		2–4	4–6	6–8	2–4	4–6	6–8	8–10
Field Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	Units							
Explosives								
1,3,5-Trinitrobenzene	mg/kg	1.9 =	ND	NA	ND	ND	ND	ND
1,3-Dinitrobenzene	mg/kg	ND	ND	NA	ND	ND	ND	ND
2,4,6-Trinitrotoluene	mg/kg	190 =	10 =	NA	ND	ND	ND	ND
2,4-Dinitrotoluene	mg/kg	0.56 =	ND	NA	ND	ND	ND	ND
2,6-Dinitrotoluene	mg/kg	ND	ND	NA	ND	ND	ND	ND
2-Amino-4,6-dinitrotoluene	mg/kg	7.5 =	0.45 J	NA	ND	ND	ND	ND
4-Amino-2,6-dinitrotoluene	mg/kg	ND	ND	NA	ND	ND	ND	ND
4-Nitrotoluene	mg/kg	ND	ND	NA	ND	ND	ND	ND
HMX	mg/kg	ND	ND	NA	ND	ND	ND	ND
Nitrobenzene	mg/kg	ND	ND	NA	ND	ND	ND	ND
RDX	mg/kg	ND	ND	NA	ND	ND	ND	ND
Metals								
Cyanide	mg/kg	NA	ND	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	NA	NA	NA	ND	ND	ND	ND
Aluminum	mg/kg	13,200 J	14,900 J	13,200 =	10,100 =	10,100 =	9,330 =	3,580 =
Antimony	mg/kg	27.6 J *	3.4 J *	5.6 J *	0.72 J	0.72 J	0.67 J	ND
Arsenic	mg/kg	12.1 =	11.3 =	12.4 =	11.4 =	21.1 = *	28.8 = *	9.9 =
Barium	mg/kg	314 = *	82.3 J	146 = *	57.8 =	53.5 =	42.4 =	24.6 =
Cadmium	mg/kg	0.93 = *	ND	0.68 = *	5 = *	0.42 J *	0.31 J *	0.26 J *
Chromium	mg/kg	41 = *	20.3 J	23.3 =	15.6 =	16.3 =	14.8 =	9.6 =
Copper	mg/kg	205 = *	38 = *	55.2 = *	62.4 = *	21.5 =	20.8 =	13.9 =
Lead	mg/kg	649 = *	72 = *	101 = *	15.6 =	15.8 =	14.9 =	7.6 =
Mercury	mg/kg	0.042 J	0.031 J	0.029 J	0.029 J	0.023 J	0.0097 J	ND
Nickel	mg/kg	39.3 =	22.9 =	33.5 =	25.8 =	26.3 =	23.6 =	13 =
Selenium	mg/kg	2.1 = *	0.92 =	ND	ND	ND	ND	ND
Silver	mg/kg	2.7 = *	0.25 J *	0.28 J *	ND	ND	ND	ND
Vanadium	mg/kg	22.7 =	24.9 =	22.2 =	16.9 =	18.2 =	15.3 =	7.4 =
Zinc	mg/kg	2,390 = *	381 J *	493 J *	110 J *	64.3 J	64.7 J	47.4 J
Organics – Pesticide/PCB								
Endrin Ketone	mg/kg	NA	ND	NA	NA	NA	NA	NA
Heptachlor Epoxide	mg/kg	NA	0.05 J	NA	NA	NA	NA	NA

Table 4-25. Concentrations of Subsurface Soils at Pad 58 (continued)

Station		WBG-199	WBG-199	WBG-199	WBG-203	WBG-203	WBG-203	WBG-203
Sample ID		WBGso-199-4007-SO	WBGso-199-4008-SO	WBGso-199-4314-SO	WBGso-203-4019-SO	WBGso-203-4020-SO	WBGso-203-4021-SO	WBGso-203-4022-SO
Date		10/20/2000	10/21/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000
Depth (ft)		2–4	4–6	6–8	2–4	4–6	6–8	8–10
Field Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	Units							
Organics – Semivolatile								
2-Methylnaphthalene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Acenaphthene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Anthracene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Benz(*a*)anthracene	mg/kg	NA	0.2 J	NA	NA	NA	NA	NA
Benzo(*a*)pyrene	mg/kg	NA	0.22 J	NA	NA	NA	NA	NA
Benzo(*b*)fluoranthene	mg/kg	NA	0.29 J	NA	NA	NA	NA	NA
Benzo(*g,h,i*)perylene	mg/kg	NA	0.11 J	NA	NA	NA	NA	NA
Benzo(*k*)fluoranthene	mg/kg	NA	0.13 J	NA	NA	NA	NA	NA
Carbazole	mg/kg	NA	ND	NA	NA	NA	NA	NA
Chrysene	mg/kg	NA	0.2 J	NA	NA	NA	NA	NA
Dibenz(*a,h*)anthracene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Dibenzofuran	mg/kg	NA	ND	NA	NA	NA	NA	NA
Fluoranthene	mg/kg	NA	0.41 =	NA	NA	NA	NA	NA
Fluorene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Indeno(1,2,3-*cd*)pyrene	mg/kg	NA	0.13 J	NA	NA	NA	NA	NA
Naphthalene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Phenanthrene	mg/kg	NA	0.14 J	NA	NA	NA	NA	NA
Pyrene	mg/kg	NA	0.47 =	NA	NA	NA	NA	NA
Organics – Volatile								
Acetone	mg/kg	NA	ND	NA	NA	NA	NA	NA
Dimethylbenzene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Ethylbenzene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Methylene Chloride	mg/kg	NA	ND	NA	NA	NA	NA	NA
Toluene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Trichloroethene	mg/kg	NA	ND	NA	NA	NA	NA	NA

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-26. Concentrations of SRCs in Subsurface Soil at Pad 59

Station		WBG-205	WBG-205	WBG-205	WBG-210	WBG-210	WBG-210	WBG-210	WBG-210
Sample ID		WBGso-205-4027-SO	WBGso-205-4028-SO	WBGso-205-4313-SO	WBGso-210-4042-SO	WBGso-210-4043-SO	WBGso-210-4278-SO	WBGso-210-4044-SO	WBGso-210-4045-SO
Date		10/20/2000	10/21/2000	10/22/2000	10/30/2000	10/30/2000	10/30/2000	10/30/2000	10/30/2000
Depth (ft)		2–4	4–6	6–8	2–4	4–6	4–6	6–8	8–10
Field Type		Grab	Grab	Grab	Grab	Grab	Field Duplicate	Grab	Grab
Analyte	Units								
Explosives									
1,3,5-Trinitrobenzene	mg/kg	NA	0.31 J	NA	ND	ND	NA	ND	ND
1,3-Dinitrobenzene	mg/kg	NA	ND	NA	ND	ND	NA	ND	ND
2,4,6-Trinitrotoluene	mg/kg	NA	17 =	NA	0.067 J	ND	NA	ND	ND
2,4-Dinitrotoluene	mg/kg	NA	ND	NA	ND	ND	NA	ND	ND
2,6-Dinitrotoluene	mg/kg	NA	ND	NA	ND	ND	NA	ND	ND
2-Amino-4,6-dinitrotoluene	mg/kg	NA	1.4 =	NA	0.15 J	ND	NA	ND	ND
4-Amino-2,6-dinitrotoluene	mg/kg	NA	ND	NA	ND	ND	NA	ND	ND
4-Nitrotoluene	mg/kg	NA	ND	NA	ND	ND	NA	ND	ND
HMX	mg/kg	NA	ND	NA	0.24 J	ND	NA	ND	ND
Nitrobenzene	mg/kg	NA	ND	NA	0.081 J	ND	NA	ND	ND
RDX	mg/kg	NA	ND	NA	ND	ND	NA	ND	ND
Metals									
Cyanide	mg/kg	NA	NA	NA	ND	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	mg/kg	12,900 J	10,500 J	9,360 =	11,900 =	13,100 =	4,200 =	9,560 =	9,740 =
Antimony	mg/kg	0.62 J	0.61 J	0.62 J	1.2 J *	ND	ND	ND	ND
Arsenic	mg/kg	11.4 =	13 =	11 =	13.3 =	16.4 =	4.5 =	22.9 = *	19.6 =
Barium	mg/kg	44.1 =	72.6 J	58.4 =	77.5 =	73.4 =	22.4 J	43.5 =	44.6 =
Cadmium	mg/kg	ND	ND	0.29 J *	1.9 = *	0.26 J *	ND	0.23 J *	0.27 J *
Chromium	mg/kg	16.3 =	16.9 J	15.3 =	22.4 J	20.9 J	6.4 J	15.6 J	15.9 J
Copper	mg/kg	19.6 =	21.7 =	18.7 =	38.8 J *	24.9 J	6.4 J	23.6 J	24.8 J
Lead	mg/kg	13 =	12.6 =	10 =	134 = *	13.6 =	4 =	16.7 =	19.5 = *
Mercury	mg/kg	0.033 J	ND	ND	0.017 J	0.012 J	0.017 J	0.015 J	0.013 J
Nickel	mg/kg	17.1 =	28.8 =	27.3 =	30.8 J	32.8 J	10 J	26.7 J	27.6 J
Selenium	mg/kg	1.5 =	0.56 J	ND	0.76 =	ND	ND	0.66 =	0.69 =
Silver	mg/kg	ND	ND	ND	ND	ND	ND	ND	D
Vanadium	mg/kg	23.8 =	17.6 =	16.2 =	19.6 J	22.2 J	7.5 J	15.5 J	15.8 J
Zinc	mg/kg	47.6 =	68.8 J	59.1 J	211 J *	73.8 J	19.9 J	75.4 J	86.1 J
Organics – Pesticide/PCB									
Endrin Ketone	mg/kg	NA	NA	NA	0.0043 =	NA	NA	NA	NA
Heptachlor Epoxide	mg/kg	NA	NA	NA	ND	NA	NA	NA	NA

Table 4-26. Concentrations of SRCs in Subsurface Soil at Pad 59 (continued)

Station		WBG-205	WBG-205	WBG-205	WBG-210	WBG-210	WBG-210	WBG-210	WBG-210
Sample ID		WBGso-205-4027-SO	WBGso-205-4028-SO	WBGso-205-4313-SO	WBGso-210-4042-SO	WBGso-210-4043-SO	WBGso-210-4278-SO	WBGso-210-4044-SO	WBGso-210-4045-SO
Date		10/20/2000	10/21/2000	10/22/2000	10/30/2000	10/30/2000	10/30/2000	10/30/2000	10/30/2000
Depth (ft)		2–4	4–6	6–8	2–4	4–6	4–6	6–8	8–10
Field Type		Grab	Grab	Grab	Grab	Grab	Field Duplicate	Grab	Grab
Analyte	Units								
Organics – Semivolatile									
2-Methylnaphthalene	mg/kg	NA	NA	NA	17 =	NA	NA	NA	NA
Acenaphthene	mg/kg	NA	NA	NA	0.44 =	NA	NA	NA	NA
Anthracene	mg/kg	NA	NA	NA	0.16 J	NA	NA	NA	NA
Benz(*a*)anthracene	mg/kg	NA	NA	NA	ND	NA	NA	NA	NA
Benzo(*a*)pyrene	mg/kg	NA	NA	NA	ND	NA	NA	NA	NA
Benzo(*b*)fluoranthene	mg/kg	NA	NA	NA	ND	NA	NA	NA	NA
Benzo(*g,h,i*)perylene	mg/kg	NA	NA	NA	ND	NA	NA	NA	NA
Benzo(*k*)fluoranthene	mg/kg	NA	NA	NA	ND	NA	NA	NA	NA
Carbazole	mg/kg	NA	NA	NA	ND	NA	NA	NA	NA
Chrysene	mg/kg	NA	NA	NA	ND	NA	NA	NA	NA
Dibenz(*a,h*)anthracene	mg/kg	NA	NA	NA	ND	NA	NA	NA	NA
Dibenzofuran	mg/kg	NA	NA	NA	ND	NA	NA	NA	NA
Fluoranthene	mg/kg	NA	NA	NA	0.05 J	NA	NA	NA	NA
Fluorene	mg/kg	NA	NA	NA	0.93 =	NA	NA	NA	NA
Indeno(1,2,3-*cd*)pyrene	mg/kg	NA	NA	NA	ND	NA	NA	NA	NA
Naphthalene	mg/kg	NA	NA	NA	1.6 =	NA	NA	NA	NA
Phenanthrene	mg/kg	NA	NA	NA	3.2 =	NA	NA	NA	NA
Pyrene	mg/kg	NA	NA	NA	0.13 J	NA	NA	NA	NA
Organics – Volatile									
Acetone	mg/kg	NA	NA	NA	ND	NA	NA	NA	NA
Dimethylbenzene	mg/kg	NA	NA	NA	0.026 J	NA	NA	NA	NA
Ethylbenzene	mg/kg	NA	NA	NA	0.021 J	NA	NA	NA	NA
Methylene Chloride	mg/kg	NA	NA	NA	ND	NA	NA	NA	NA
Toluene	mg/kg	NA	NA	NA	0.011 =	NA	NA	NA	NA
Trichloroethene	mg/kg	NA	NA	NA	ND	NA	NA	NA	NA

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-27. Concentrations of SRCs in Subsurface Soil at Pad 61

Station		WBG-217	WBG-218	WBG-219	WBG-219	WBG-220	WBG-220	WBG-221	WBG-222
Sample ID		WBGso-217-4065-SO	WBGso-218-4068-SO	WBGso-219-4071-SO	WBGso-219-4072-SO	WBGso-220-4074-SO	WBGso-220-4272-SO	WBGso-221-4075-SO	WBGso-222-4080-SO
Date		10/22/2000	10/22/2000	10/22/2000	10/25/2000	10/22/2000	10/22/2000	10/25/2000	10/25/2000
Depth (ft)		2–4	2–4	2–4	4–6	2–4	2–4	4–6	2–4
Field Type		Grab	Grab	Grab	Grab	Grab	Field Duplicate	Grab	Grab
Analyte	Units								
Explosives									
1,3,5-Trinitrobenzene	mg/kg	NA	NA	NA	ND	NA	0.42 =	NA	NA
1,3-Dinitrobenzene	mg/kg	NA	NA	NA	ND	NA	0.063 J	NA	NA
2,4,6-Trinitrotoluene	mg/kg	NA	NA	NA	0.63 =	NA	1.8 =	NA	NA
2,4-Dinitrotoluene	mg/kg	NA	NA	NA	ND	NA	0.086 J	NA	NA
2,6-Dinitrotoluene	mg/kg	NA	NA	NA	ND	NA	ND	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	NA	NA	NA	ND	NA	0.41 =	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	NA	NA	NA	0.24 J	NA	ND	NA	NA
4-Nitrotoluene	mg/kg	NA	NA	NA	ND	NA	ND	NA	NA
HMX	mg/kg	NA	NA	NA	0.38 J	NA	0.29 J	NA	NA
Nitrobenzene	mg/kg	NA	NA	NA	ND	NA	0.093 J	NA	NA
RDX	mg/kg	NA	NA	NA	1.2 =	NA	1.3 =	NA	NA
Metals									
Cyanide	mg/kg	4.6 = *	NA	NA	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	mg/kg	14,200 J	17,200 J	20,000 J *	14,800 =	13,100 J	16,300 J	12,300 =	13,100 =
Antimony	mg/kg	9.1 J *	13.8 J *	27.4 J *	5.9 J *	32.5 J *	14.2 J *	ND	ND
Arsenic	mg/kg	18.5 =	29.8 = *	24 = *	16.1 =	16.2 =	18.1 =	18.8 =	14.4 =
Barium	mg/kg	250 = *	406 = *	1040 = *	185 J *	403 = *	491 = *	52.4 J	86 J
Cadmium	mg/kg	8.3 = *	ND	0.88 J *	0.36 J *	2.2 = *	2.2 = *	ND	ND
Chromium	mg/kg	57 = *	67.6 = *	80.9 = *	28.8 J *	55.2 = *	55.3 = *	17.5 J	19.6 J
Copper	mg/kg	601 = *	428 = *	366 = *	104 J *	177 = *	596 = *	22.8 J	23.2 J
Lead	mg/kg	326 = *	293 = *	1130 = *	173 = *	1050 = *	715 = *	12.2 =	12 =
Mercury	mg/kg	0.073 J *	0.014 J	0.028 J	0.02 J	0.056 J *	0.045 J *	ND	ND
Nickel	mg/kg	52.8 =	92.7 = *	76.3 = *	36.3 =	52 =	61.3 = *	27.8 =	34.9 =
Selenium	mg/kg	3.6 = *	4.2 = *	4.6 = *	1.9 = *	ND	ND	0.92 =	1.1 =
Silver	mg/kg	0.71 J *	2.6 = *	5.7 = *	0.78 J *	1.8 = *	1.8 = *	ND	ND
Vanadium	mg/kg	ND	30.6 =	44.8 = *	24.7 =	23.6 =	29 =	20.8 =	21.3 =
Zinc	mg/kg	2,420 = *	471 = *	2,100 = *	890 = *	1,300 = *	1,040 = *	72.5 =	78.5 =
Organics – Pesticide/PCB									
Endrin Ketone	mg/kg	ND	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	mg/kg	ND	NA	NA	NA	NA	NA	NA	NA

Table 4-27. Concentrations of SRCs in Subsurface Soil at Pad 61 (continued)

Station		WBG-217	WBG-218	WBG-219	WBG-219	WBG-220	WBG-220	WBG-221	WBG-222
Sample ID		WBGso-217-4065-SO	WBGso-218-4068-SO	WBGso-219-4071-SO	WBGso-219-4072-SO	WBGso-220-4074-SO	WBGso-220-4272-SO	WBGso-221-4075-SO	WBGso-222-4080-SO
Date		10/22/2000	10/22/2000	10/22/2000	10/25/2000	10/22/2000	10/22/2000	10/25/2000	10/25/2000
Depth (ft)		2–4	2–4	2–4	4–6	2–4	2–4	4–6	2–4
Field Type		Grab	Grab	Grab	Grab	Grab	Field Duplicate	Grab	Grab
Analyte	Units								
Organics – Semivolatile									
2-Methylnaphthalene	mg/kg	ND	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	mg/kg	65 J	NA	NA	NA	NA	NA	NA	NA
Anthracene	mg/kg	400 =	NA	NA	NA	NA	NA	NA	NA
Benz(*a*)anthracene	mg/kg	570 =	NA	NA	NA	NA	NA	NA	NA
Benzo(*a*)pyrene	mg/kg	510 =	NA	NA	NA	NA	NA	NA	NA
Benzo(*b*)fluoranthene	mg/kg	620 =	NA	NA	NA	NA	NA	NA	NA
Benzo(*g,h,i*)perylene	mg/kg	280 =	NA	NA	NA	NA	NA	NA	NA
Benzo(*k*)fluoranthene	mg/kg	280 =	NA	NA	NA	NA	NA	NA	NA
Carbazole	mg/kg	190 J	NA	NA	NA	NA	NA	NA	NA
Chrysene	mg/kg	540 =	NA	NA	NA	NA	NA	NA	NA
Dibenz(*a,h*)anthracene	mg/kg	59 J	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	mg/kg	110 J	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	mg/kg	1,500 =	NA	NA	NA	NA	NA	NA	NA
Fluorene	mg/kg	130 J	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-*cd*)pyrene	mg/kg	320 =	NA	NA	NA	NA	NA	NA	NA
Naphthalene	mg/kg	62 J	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	mg/kg	1,300 =	NA	NA	NA	NA	NA	NA	NA
Pyrene	mg/kg	1,100 =	NA	NA	NA	NA	NA	NA	NA
Organics – Volatile									
Acetone	mg/kg	ND	NA	NA	NA	NA	NA	NA	NA
Dimethylbenzene	mg/kg	ND	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	mg/kg	ND	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	mg/kg	ND	NA	NA	NA	NA	NA	NA	NA
Toluene	mg/kg	ND	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	mg/kg	0.0011 J	NA	NA	NA	NA	NA	NA	NA

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-28. Concentrations of SRCs in Subsurface Soil at Pad 62

Station		WBG-240	WBG-242	WBG-242	WBG-242	WBG-242
Sample ID		WBGso-240-4140-SO	WBGso-242-4146-SO	WBGso-242-4147-SO	WBGso-242-4148-SO	WBGso-242-4149-SO
Date		10/25/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000
Depth (ft)		2–4	2–4	4–6	6–8	8–10
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	Units					
Explosives						
1,3,5-Trinitrobenzene	mg/kg	NA	ND	ND	ND	ND
1,3-Dinitrobenzene	mg/kg	NA	ND	ND	ND	ND
2,4,6-Trinitrotoluene	mg/kg	NA	ND	ND	ND	ND
2,4-Dinitrotoluene	mg/kg	NA	ND	ND	ND	ND
2,6-Dinitrotoluene	mg/kg	NA	ND	ND	ND	ND
2-Amino-4,6-dinitrotoluene	mg/kg	NA	ND	ND	ND	ND
4-Amino-2,6-dinitrotoluene	mg/kg	NA	ND	ND	ND	ND
4-Nitrotoluene	mg/kg	NA	ND	ND	ND	ND
HMX	mg/kg	NA	0.25 J	ND	ND	ND
Nitrobenzene	mg/kg	NA	ND	ND	ND	ND
RDX	mg/kg	NA	ND	ND	ND	ND
Metals						
Cyanide	mg/kg	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	NA	NA	NA	NA	NA
Aluminum	mg/kg	12,300 =	9,540 J	7,030 J	5,810 J	3,990 J
Antimony	mg/kg	0.89 J	ND	ND	ND	ND
Arsenic	mg/kg	14.5 =	13.5 =	12 =	11.4 =	10.6 =
Barium	mg/kg	59.9 J	43.7 =	34.6 =	47.3 =	20.2 J
Cadmium	mg/kg	ND	ND	ND	ND	ND
Chromium	mg/kg	15.6 J	12.6 =	10.1 =	11.2 =	7.6 =
Copper	mg/kg	19.5 J	16.6 =	18.3 =	17.3 =	12.3 =
Lead	mg/kg	13.4 =	11.8 =	10.2 =	9.5 =	8.5 =
Mercury	mg/kg	0.013 J	0.015 J	0.017 J	0.014 J	ND
Nickel	mg/kg	16.8 =	12.2 =	14 =	14.2 =	10.4 =
Selenium	mg/kg	1.3 =	ND	ND	ND	ND
Silver	mg/kg	ND	ND	ND	ND	ND
Vanadium	mg/kg	23.5 =	18.5 =	13.1 =	10.6 =	8.7 =
Zinc	mg/kg	62.1 =	45.7 =	54.6 =	45.7 =	42.1 =

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
"=" = Analyte present and concentration accurate.

Table 4-29. Concentrations of SRCs in Subsurface Soil at Pad 66

Station		WBG-243	WBG-243	WBG-246	WBG-247
Sample ID		WBGso-243-4151-SO	WBGso-243-4273-SO	WBGso-246-4160-SO	WBGso-247-4163-SO
Date		10/23/2000	10/23/2000	10/25/2000	10/22/2000
Depth (ft)		2–4	2–4	2–4	2–4
Field Type		Grab	Field Duplicate	Grab	Grab
Analyte	Units				
Explosives					
1,3,5-Trinitrobenzene	mg/kg	NA	ND	NA	ND
1,3-Dinitrobenzene	mg/kg	NA	ND	NA	ND
2,4,6-Trinitrotoluene	mg/kg	NA	11 =	NA	0.19 J
2,4-Dinitrotoluene	mg/kg	NA	ND	NA	ND
2,6-Dinitrotoluene	mg/kg	NA	ND	NA	0.15 J
2-Amino-4,6-dinitrotoluene	mg/kg	NA	ND	NA	ND
4-Amino-2,6-dinitrotoluene	mg/kg	NA	ND	NA	ND
4-Nitrotoluene	mg/kg	NA	ND	NA	0.16 J
HMX	mg/kg	NA	ND	NA	ND
Nitrobenzene	mg/kg	NA	ND	NA	0.068 J
RDX	mg/kg	NA	0.2 J	NA	ND
Metals					
Cyanide	mg/kg	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	NA	NA	NA	NA
Aluminum	mg/kg	14,500 =	12,700 =	14,100 =	12,100 =
Antimony	mg/kg	ND	ND	0.87 J	9.1 J *
Arsenic	mg/kg	20.7 = *	14.4 =	14.5 =	20.2 = *
Barium	mg/kg	106 =	117 =	220 J *	303 = *
Cadmium	mg/kg	ND	ND	0.4 J *	1 = *
Chromium	mg/kg	20.8 J	18.7 J	17.2 J	26.6 =
Copper	mg/kg	22.7 =	22.1 =	39.3 J *	160 = *
Lead	mg/kg	18.9 J	14 J	17.9 =	338 = *
Mercury	mg/kg	0.014 J	0.015 J	0.029 J	0.024 J
Nickel	mg/kg	39.8 =	38.4 =	14.4 =	18.1 =
Selenium	mg/kg	0.47 J	0.44 J	1.7 = *	ND
Silver	mg/kg	ND	ND	ND	ND
Vanadium	mg/kg	23.6 =	20.9 =	28.4 =	20.4 =
Zinc	mg/kg	76.9 J	79.3 J	101 = *	594 J *

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-30. Concentrations of SRCs in Subsurface Soil at Pad 67

Station		WBG-252	WBG-252	WBG-252	WBG-252
Sample ID		WBGso-252-4180-SO	WBGso-252-4181-SO	WBGso-252-4182-SO	WBGso-252-4183-SO
Date		10/22/2000	10/22/2000	10/22/2000	10/22/2000
Depth (ft)		2–4	4–6	6–8	8–10
Field Type		Grab	Grab	Grab	Grab
Analyte	Units				
Explosives					
1,3,5-Trinitrobenzene	mg/kg	5.3 =	ND	ND	8.7 =
1,3-Dinitrobenzene	mg/kg	ND	0.045 J	ND	ND
2,4,6-Trinitrotoluene	mg/kg	490 =	5,200 =	3,300 =	860 =
2,4-Dinitrotoluene	mg/kg	0.54 =	ND	2.8 =	0.58 =
2,6-Dinitrotoluene	mg/kg	ND	ND	ND	ND
2-Amino-4,6-dinitrotoluene	mg/kg	ND	ND	ND	ND
4-Amino-2,6-dinitrotoluene	mg/kg	ND	ND	ND	ND
4-Nitrotoluene	mg/kg	ND	ND	ND	ND
HMX	mg/kg	27 J	ND	ND	7.1 =
Nitrobenzene	mg/kg	ND	ND	ND	ND
RDX	mg/kg	100 =	260 J	240 J	130 =
Metals					
Cyanide	mg/kg	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	NA	NA	NA	NA
Aluminum	mg/kg	11,600 J	13,200 J	11,100 J	13,000 J
Antimony	mg/kg	2.3 J *	9.4 J *	2.4 J *	1.9 J *
Arsenic	mg/kg	13.1 =	13.1 =	14.7 =	16.2 =
Barium	mg/kg	149 = *	344 = *	172 = *	201 = *
Cadmium	mg/kg	ND	0.17 J *	0.081 J *	ND
Chromium	mg/kg	17 =	22 =	18.5 =	19.7 =
Copper	mg/kg	50.1 = *	220 = *	35.5 = *	32.1 =
Lead	mg/kg	34.8 = *	72.7 = *	146 = *	23.9 = *
Mercury	mg/kg	0.021 J	0.015 J	0.017 J	0.014 J
Nickel	mg/kg	25.6 =	26 =	26.3 =	27.2 =
Selenium	mg/kg	ND	ND	ND	ND
Silver	mg/kg	ND	ND	ND	ND
Vanadium	mg/kg	18.6 =	22.5 =	18.1 =	20.2 =
Zinc	mg/kg	87.7 =	154 = *	88.2 =	84.4 =

HMX = Octahydro-1,3,5,7-tetrazocine-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-31. Concentrations of SRCs in Subsurface Soil at Pad 68

Station		WBG-254	WBG-255	WBG-257	WBG-257	WBG-257	WBG-257	WBG-257
Sample ID		WBGso-254-4188-SO	WBGso-255-4191-SO	WBGso-257-4197-SO	WBGso-257-4198-SO	WBGso-257-4199-SO	WBGso-257-4276-SO	WBGso-257-4200-SO
Date		10/19/2000	10/19/2000	10/30/2000	10/30/2000	10/30/2000	10/30/2000	10/30/2000
Depth (ft)		2–4	2–4	2–4	4–6	6–8	6–8	8–9
Field Type		Grab	Grab	Grab	Grab	Grab	Field Duplicate	Grab
Analyte	Units							
Explosives								
1,3,5-Trinitrobenzene	mg/kg	NA	NA	ND	ND	ND	NA	ND
1,3-Dinitrobenzene	mg/kg	NA	NA	ND	ND	ND	NA	ND
2,4,6-Trinitrotoluene	mg/kg	NA	NA	ND	ND	ND	NA	ND
2,4-Dinitrotoluene	mg/kg	NA	NA	ND	ND	ND	NA	ND
2,6-Dinitrotoluene	mg/kg	NA	NA	ND	ND	ND	NA	ND
2-Amino-4,6-dinitrotoluene	mg/kg	NA	NA	ND	ND	ND	NA	ND
4-Amino-2,6-dinitrotoluene	mg/kg	NA	NA	ND	ND	ND	NA	ND
4-Nitrotoluene	mg/kg	NA	NA	ND	ND	ND	NA	ND
HMX	mg/kg	NA	NA	ND	ND	ND	NA	ND
Nitrobenzene	mg/kg	NA	NA	ND	ND	ND	NA	ND
RDX	mg/kg	NA	NA	ND	ND	ND	NA	ND
Metals								
Cyanide	mg/kg	NA	ND	NA	NA	NA	NA	NA
Chromium, hexavalent	mg/kg	NA	NA	NA	NA	NA	NA	NA
Aluminum	mg/kg	8,340 =	9,940 =	7,300 =	10,900 =	9,960 =	11,000 =	9,610 =
Antimony	mg/kg	ND	0.75 J	ND	0.71 J	ND	ND	ND
Arsenic	mg/kg	7.3 =	21.1 = *	7.6 =	17.1 =	14.8 =	12.3 =	10.7 =
Barium	mg/kg	48.5 =	80 =	65.4 =	92.2 =	54.6 =	50.8 =	39.1 =
Cadmium	mg/kg	ND	0.29 J *	0.084 J *	0.24 J *	0.18 J *	0.16 J *	0.15 J *
Chromium	mg/kg	9.3 J	14.4 J	8.7 J	16.3 J	16 J	16.6 J	15.3 J
Copper	mg/kg	11 J	28.4 J	16.2 J	24.2 J	21.4 J	18.1 J	18.6 J
Lead	mg/kg	7.2 J	18.1 J	8 =	20.3 = *	12.9 =	11.7 =	10.1 =
Mercury	mg/kg	0.039 J	0.018 J	0.031 J	0.034 J	0.021 J	0.012 J	0.017 J
Nickel	mg/kg	8.8 =	24.9 =	15 J	27.8 J	26.7 J	23.3 J	24.2 J
Selenium	mg/kg	ND	ND	ND	ND	0.44 J	0.49 J	ND
Silver	mg/kg	ND	ND	ND	ND	ND	ND	ND
Vanadium	mg/kg	15 =	18.1 =	12.4 J	24.7 J	16.8 J	19.1 J	16.1 J
Zinc	mg/kg	31.2 J	96.2 J *	40.8 J	89.9 J	67.2 J	58.7 J	55.7 J
Organics – Pesticide/PCB								
Endrin Ketone	mg/kg	NA	ND	NA	NA	NA	NA	NA
Heptachlor Epoxide	mg/kg	NA	ND	NA	NA	NA	NA	NA

Table 4-31. Concentrations of SRCs in Subsurface Soil at Pad 68 (continued)

Station		WBG-254	WBG-255	WBG-257	WBG-257	WBG-257	WBG-257	WBG-257
Sample ID		WBGso-254-4188-SO	WBGso-255-4191-SO	WBGso-257-4197-SO	WBGso-257-4198-SO	WBGso-257-4199-SO	WBGso-257-4276-SO	WBGso-257-4200-SO
Date		10/19/2000	10/19/2000	10/30/2000	10/30/2000	10/30/2000	10/30/2000	10/30/2000
Depth (ft)		2–4	2–4	2–4	4–6	6–8	6–8	8–9
Field Type		Grab	Grab	Grab	Grab	Grab	Field Duplicate	Grab
Analyte	Units							
Organics – Semivolatile								
2-Methylnaphthalene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Acenaphthene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Anthracene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Benz(*a*)anthracene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Benzo(*a*)pyrene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Benzo(*b*)fluoranthene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Benzo(*g,h,i*)perylene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Benzo(*k*)fluoranthene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Carbazole	mg/kg	NA	ND	NA	NA	NA	NA	NA
Chrysene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Dibenz(*a,h*)anthracene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Dibenzofuran	mg/kg	NA	ND	NA	NA	NA	NA	NA
Fluoranthene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Fluorene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Indeno(1,2,3-*cd*)pyrene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Naphthalene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Phenanthrene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Pyrene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Organics – Volatile								
Acetone	mg/kg	NA	0.0049 J	NA	NA	NA	NA	NA
Dimethylbenzene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Ethylbenzene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Methylene Chloride	mg/kg	NA	0.0066 =	NA	NA	NA	NA	NA
Toluene	mg/kg	NA	ND	NA	NA	NA	NA	NA
Trichloroethene	mg/kg	NA	ND	NA	NA	NA	NA	NA

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
NA = Not analyzed.
ND = Non-detect.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

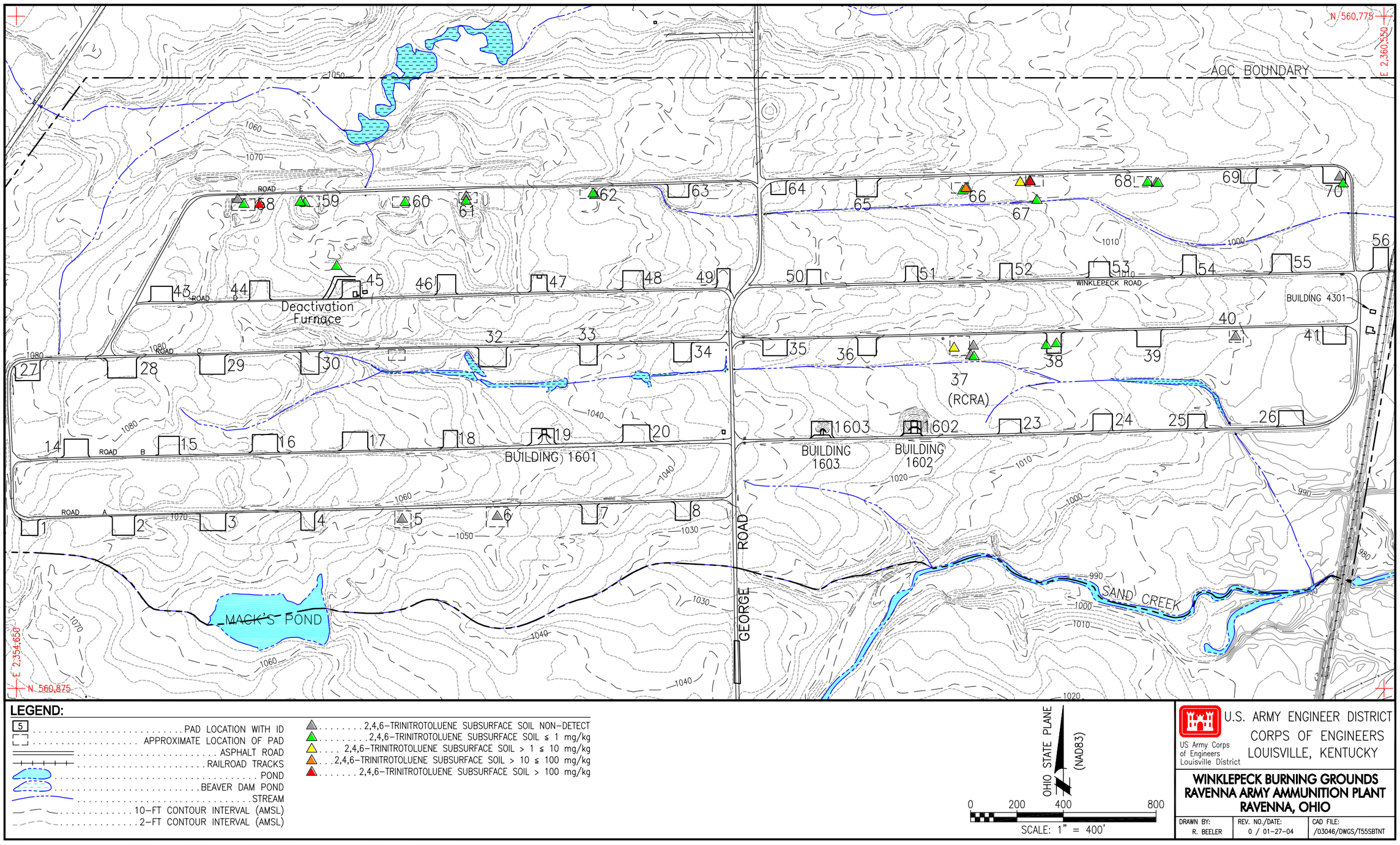


Figure 4-13. 2,4,6-Trinitrotoluene in 2- to 4-ft Interval Subsurface Soil at Winklepeck Burning Grounds (Phase II and III data)

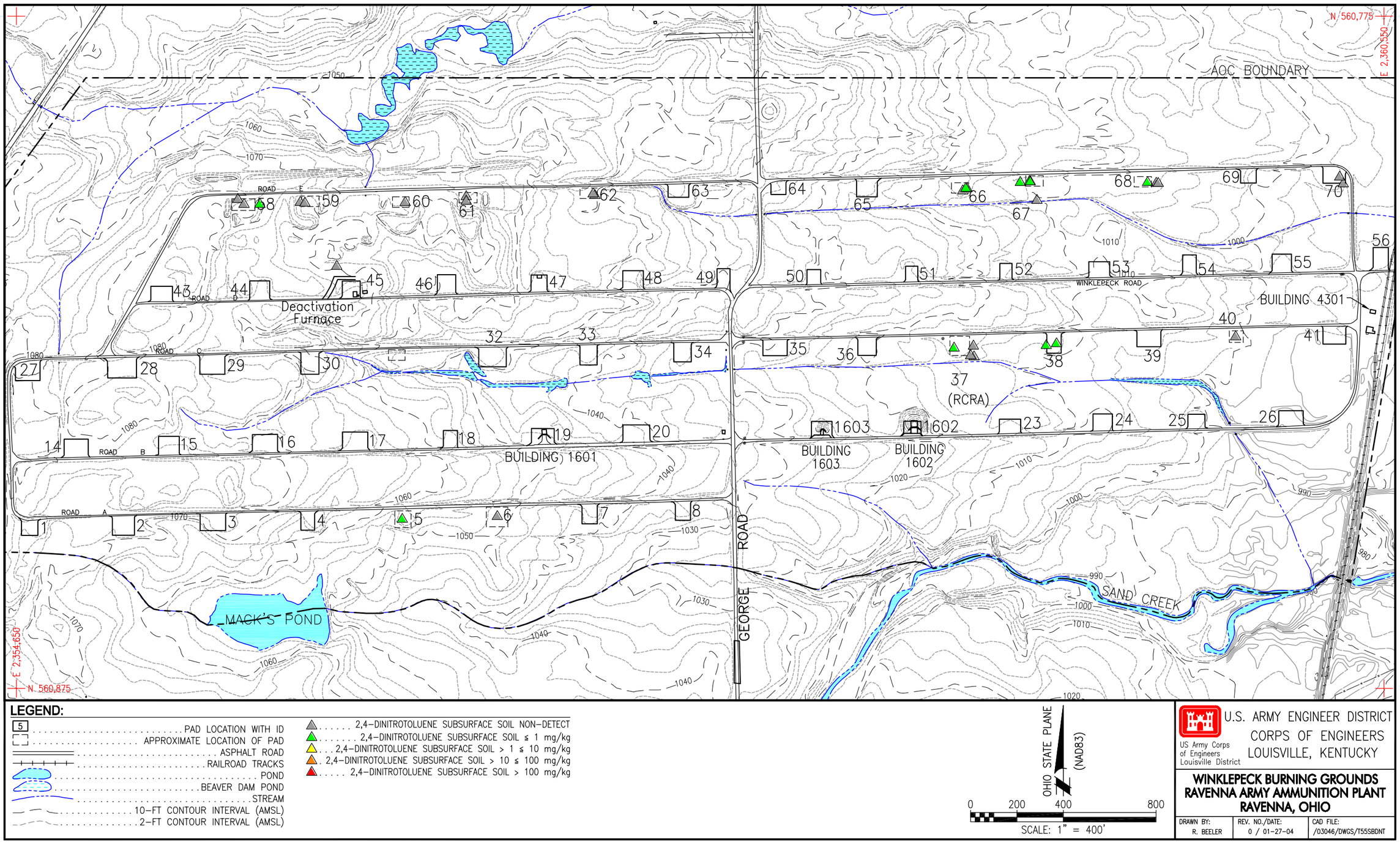


Figure 4-14. 2,4-Dinitrotoluene in 2- to 4-ft Interval Subsurface Soil at Winklepeck Burning Grounds (Phase II and III data)

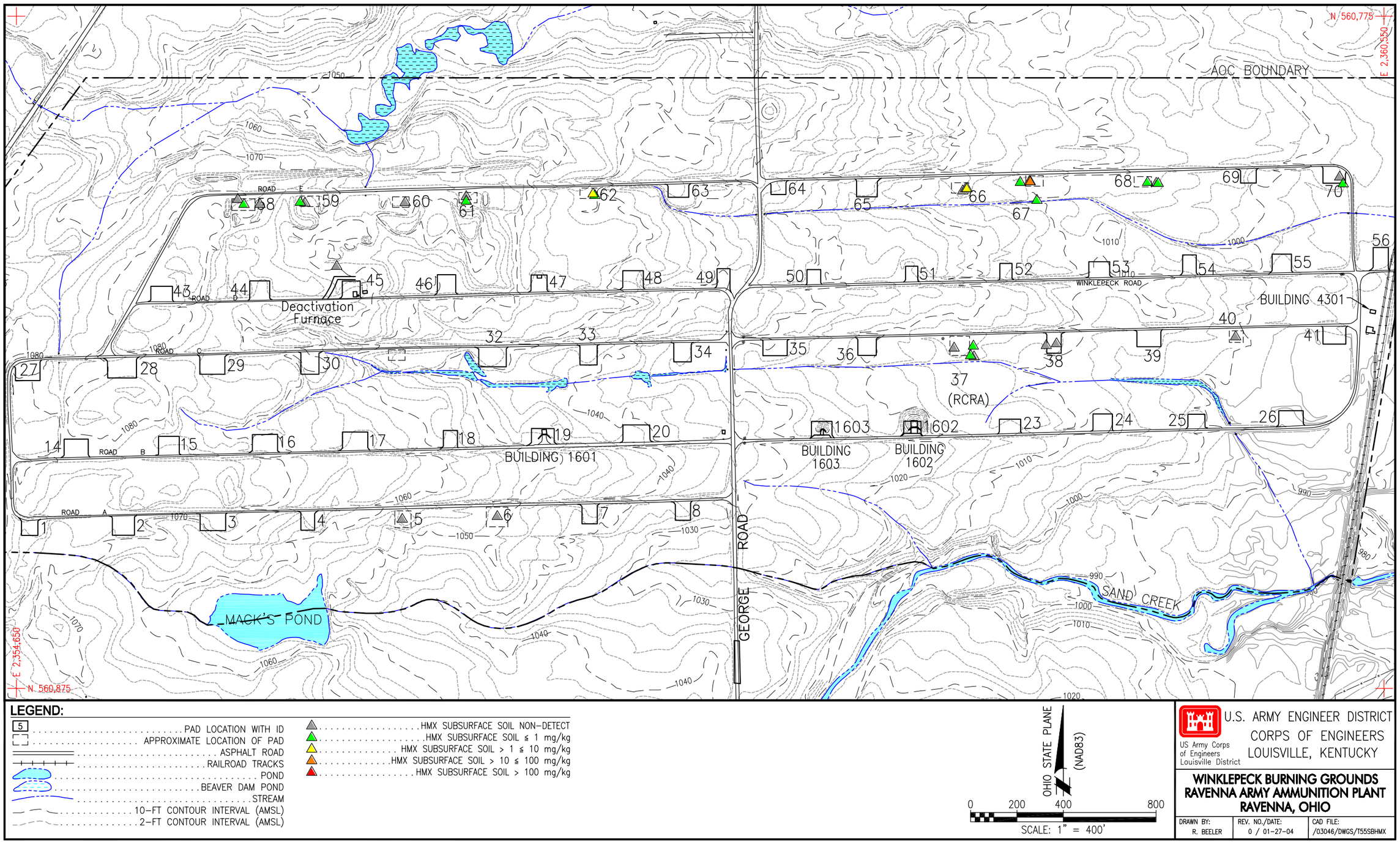


Figure 4-15. HMX in 2- to 4-ft Interval Subsurface Soil at Winklepeck Burning Grounds (Phase II and III data)

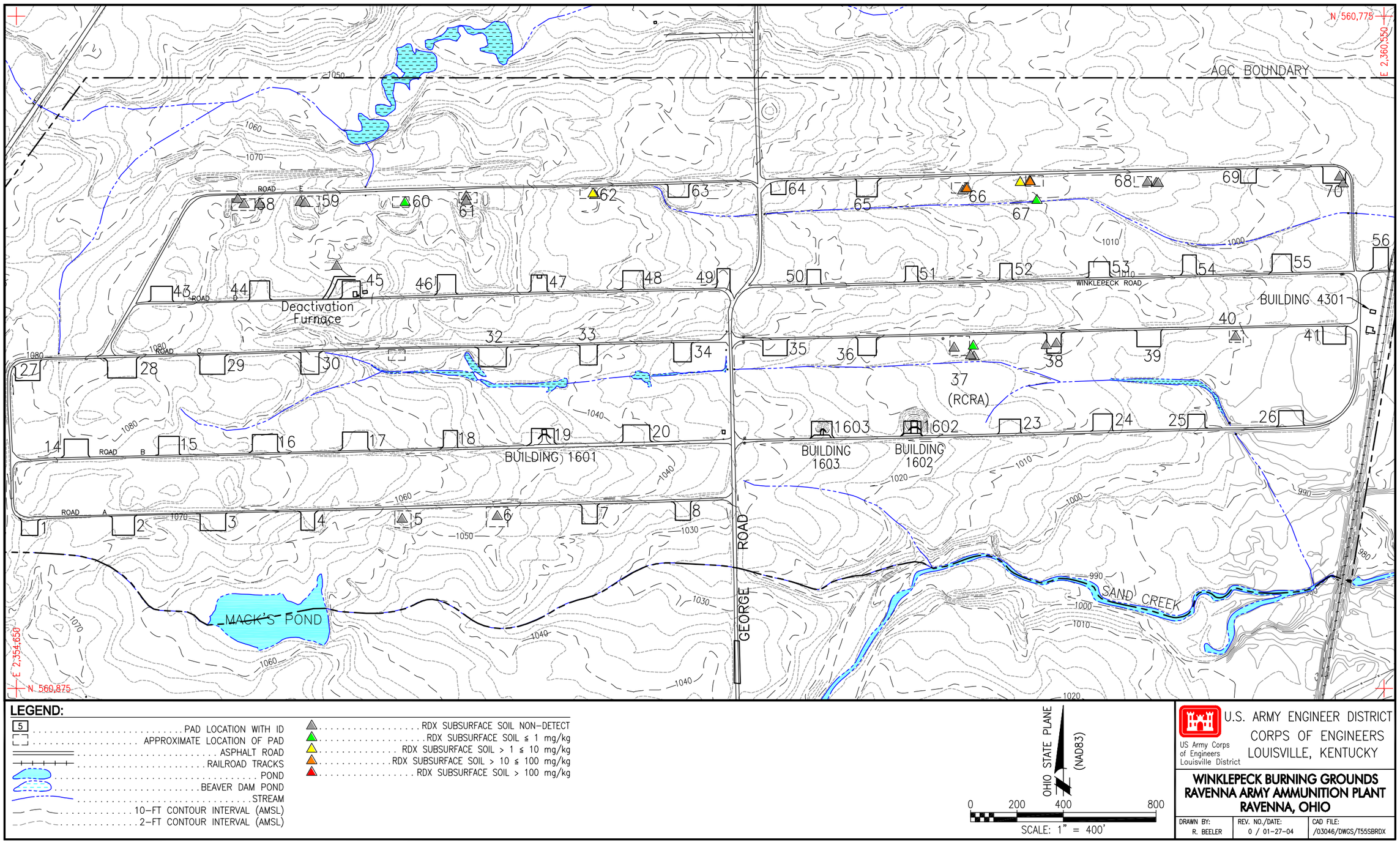


Figure 4-16. RDX in 2- to 4-ft Interval Subsurface Soil at Winklepeck Burning Grounds (Phase II and III data)

4.3.1.3 Pad 45

Subsurface soil was collected from one station at this pad, WBG-237. Field analyses for explosives were below 1 part per billion (ppb). Laboratory analysis identified a single detectible concentration of 2,4,6-TNT in the 2- to 4-ft interval, at a low estimated concentration of 0.057 mg/kg (Table 4-24).

4.3.1.4 Pad 58

Seven subsurface soil samples were collected from two stations (WBG-199 and WBG-203) and analyzed for field explosives. TNT was detected in the three sampled intervals from WBG-199, and no explosives were detected in the four depth intervals from WBG-203. Fixed-base laboratory analysis confirmed the occurrence of explosives in the two samples analyzed from WBG-199 (Table 4-25). Four explosive compounds were detected in the 2- to 4-ft interval, with the maximum detection of 2-amino-4,6-TNT in Phase III subsurface soil occurring in this sample. Two compounds were detected in the 4- to 6-ft sample, at lower concentrations than in the 2- to 4-ft interval. Concentrations in these subsurface intervals were 5 to 100 times higher than those encountered in the surface soil from WBG-201 nearby, suggesting some reworking of soils during the creation of the berm where WBG-199 is located. All four samples from WBG-203 were submitted for laboratory analysis; there were no explosives or propellants detected.

4.3.1.5 Pad 59

Seven samples and one field duplicate sample were collected from WBG-205 and -210 (Table 4-26). The three samples from WBG-205 tested positive for TNT, while the four samples from WBG-210 indicated concentrations less than 1 ppm for field explosives. Only the 4- to 6-ft sample from WBG-205 was sent for laboratory analysis, which confirmed the presence of several explosives (Table 4-26). All four samples from WBG-210 were submitted to the laboratory, with detections only in the 2- to 4-ft depth interval. A total of five explosive compounds were detected, including the maximum Phase III subsurface soil concentration for nitrobenzene (Tables 4-5 and 4-26). There were no detectable concentrations of these compounds in the surface soil sample at WBG-210. The above results indicate some reworking of soils has occurred to allow explosives to be present in discrete subsurface zones.

4.3.1.6 Pad 61

Seven subsurface samples and one field duplicate were collected from six stations in the vicinity of Pad 61 (Table 4-27). Field analyses of six of the samples indicated four occurrences of TNT above 1 ppm. Four explosive compounds were detected in the one regular sample from the 4- to 6-ft interval at WBG-219, including the maximum Phase III subsurface soil concentration of 4-amino-2,6-DNT (Table 4-27). The field duplicate sample from the 2- to 4-ft interval at WBG-220 contained mostly low, estimated concentrations of eight different explosive compounds, with only 2,4,6-TNT and RDX present at concentrations over 1 mg/kg.

4.3.1.7 Pad 62

Field analyses of subsurface soil samples from Pad 62 indicated all non-detects. All four depth samples from WBG-242 were sent for laboratory analysis; the only detected explosive compound was HMX at a low estimated concentration in the 2- to 4-ft depth interval (Table 4-28).

4.3.1.8 Pad 66

Three 2- to 4-ft samples were collected from three stations at Pad 66. Field analyses of all three samples indicated explosives were not present above 1 ppb. The regular sample from WBG-247 was submitted for

laboratory analysis, with four explosive compounds detected at low (less than 1 mg/kg) estimated values (Table 4-29). The field duplicate sample form WBG-243 also identified 2,4,6-TNT at 11 mg/kg, and RDX at a low estimated concentration (Table 4-29).

4.3.1.9 Pad 67

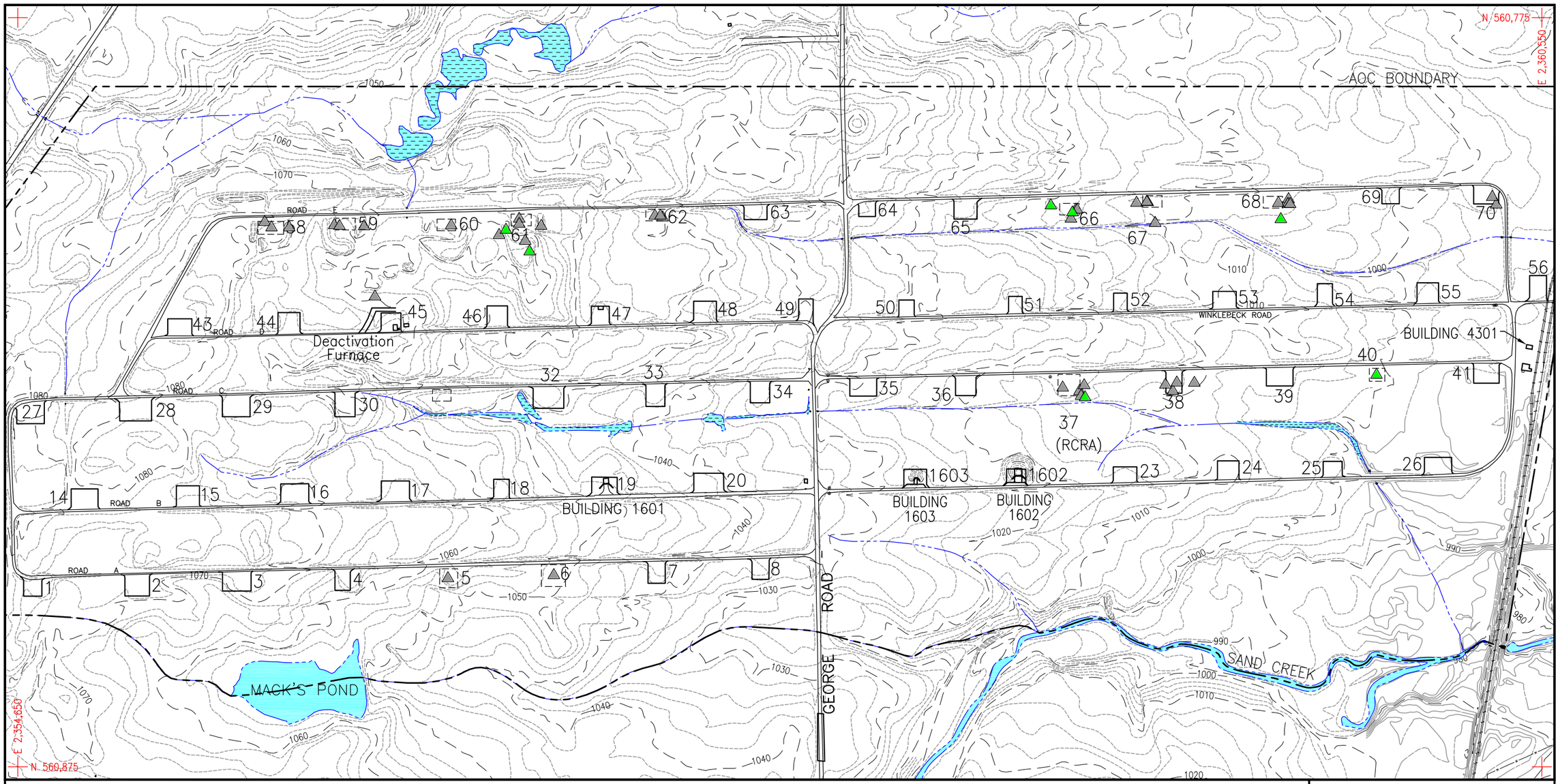
The highest subsurface soil concentration of explosives occurred in samples from station WBG-252 in the vicinity of Pad 67. Some detections were higher than those seen in surface soil from the same location (Section 4.2). Samples were collected from all four depth intervals at this station (Table 4-30). Field analyses detected TNT at concentrations ranging from 1670 mg/kg in the 2- to 4-ft interval to 475 mg/kg in the 8- to 10-ft sample. Laboratory analysis confirmed concentrations of 2,4,6-TNT as high as 5,200 mg/kg, with concentrations in all subsurface intervals being higher than those seen in surface soil at this location, and the three deepest intervals had higher concentrations than the maximum surface soil concentration seen at Pad 60 (680 mg/kg). The 2- to 4- and 8- to 10-ft intervals each had five explosive compounds detected, while the 4- to 6 and 6- to 8-ft intervals had three compounds each. Those three compounds tended to have higher concentrations than either the 2- to 4- or 8- to 10-ft intervals (Table 4-30). Concentrations between these values in the deeper intervals suggest that soil reworking occurred over the active life of the burning pad. If the contamination had simply been dispersed across the ground surface and left undisturbed, concentrations would be expected to decrease with increasing depth. Samples below 10 ft bgs were not collected as this was the maximum scoped depth for collection of direct-push samples.

4.3.1.10 Pad 68

Neither field analyses nor fixed-base laboratory analysis identified the presence of explosive compounds at detectible concentrations (Table 4-31).

4.3.2 Inorganic Constituents

All samples were field screened for XRF metals (in situ and bench top units). Barium, iron, lead, rubidium, strontium, zinc, and zirconium were detected in nearly all samples. Antimony, copper, and molybdenum were also detected frequently. Appendix H includes the field XRF metals data from each station. Screening of fixed-base laboratory analytical data indicates that 16 inorganic constituents were determined to be SRCs in subsurface soil for the Phase III investigation at WBG (Table 4-5). Five elements, calcium, iron, magnesium, potassium, and sodium, were screened out because they are essential nutrients (see Section 4.1). The remaining 16 elements were detected above background in at least 5% of all samples, or, in the case of cadmium, hexavalent chromium, cyanide, and silver, were retained because no background value exists. Eight of the 16 inorganic SRCs were detected in every sample analyzed (Table 4-5) but many of these were detected above the background criteria far less. For example, aluminum was present in 54 of 54 samples analyzed, but occurred above the background criteria in only 1 sample, and the maximum detection of aluminum only very slightly above the background criteria. Other analytes with high detection rates but low background exceedance rates include chromium (exceeded background in 6 of 54 samples), mercury (3 of 54 samples above background), nickel (2 of 54 samples above background), and vanadium (2 of 54 samples exceeding background). The maximum detected concentration of arsenic, mercury, nickel, and vanadium, in addition to aluminum mentioned above, is less than twice the background criteria. Figures 4-17 through 4-20 show the relative concentrations of arsenic, cadmium, chromium, and lead in the 2- to 4-ft subsurface soil interval. These metals were selected based on high frequency of detection and/or concentrations significantly exceeding background criteria. The 2- to 4-ft bgs interval had, in general, more detections, at higher concentrations, than deeper intervals, so it was chosen for illustration on the figures. A detailed discussion of the distribution of inorganics by area follows below.



LEGEND:

- 5 . . . . . PAD LOCATION WITH ID
- . . . . . APPROXIMATE LOCATION OF PAD
- . . . . . ASPHALT ROAD
- . . . . . RAILROAD TRACKS
- . . . . . POND
- . . . . . BEAVER DAM POND
- . . . . . STREAM
- . . . . . 10-FT CONTOUR INTERVAL (AMSL)
- . . . . . 2-FT CONTOUR INTERVAL (AMSL)

- . . . . . ARSENIC SUBSURFACE SOIL RESULT ≤ 1 x BACKGROUND CRITERIA
- . . . . ARSENIC SUBSURFACE SOIL RESULT > 1 ≤ 2 x BACKGROUND CRITERIA
- . . . . ARSENIC SUBSURFACE SOIL RESULT > 2 ≤ 5 x BACKGROUND CRITERIA
- . . . ARSENIC SUBSURFACE SOIL RESULT > 5 ≤ 20 x BACKGROUND CRITERIA
- . . . . . ARSENIC SUBSURFACE SOIL RESULT > 20 x BACKGROUND CRITERIA

SUBSURFACE SOIL BACKGROUND CRITERIA FOR ARSENIC IS 19.8 mg/kg.

OHIO STATE PLANE (NAD83)

0 200 400 800

SCALE: 1" = 400'

US Army Corps of Engineers Louisville District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

WINKLEPECK BURNING GROUNDS
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE:
R. BEELER	0 / 12-09-04	/03046/DWGS/T55SBAS

Figure 4-17. Arsenic in 2- to 4-ft Interval Subsurface Soil at Winklepeck Burning Grounds (Phase II and III data)

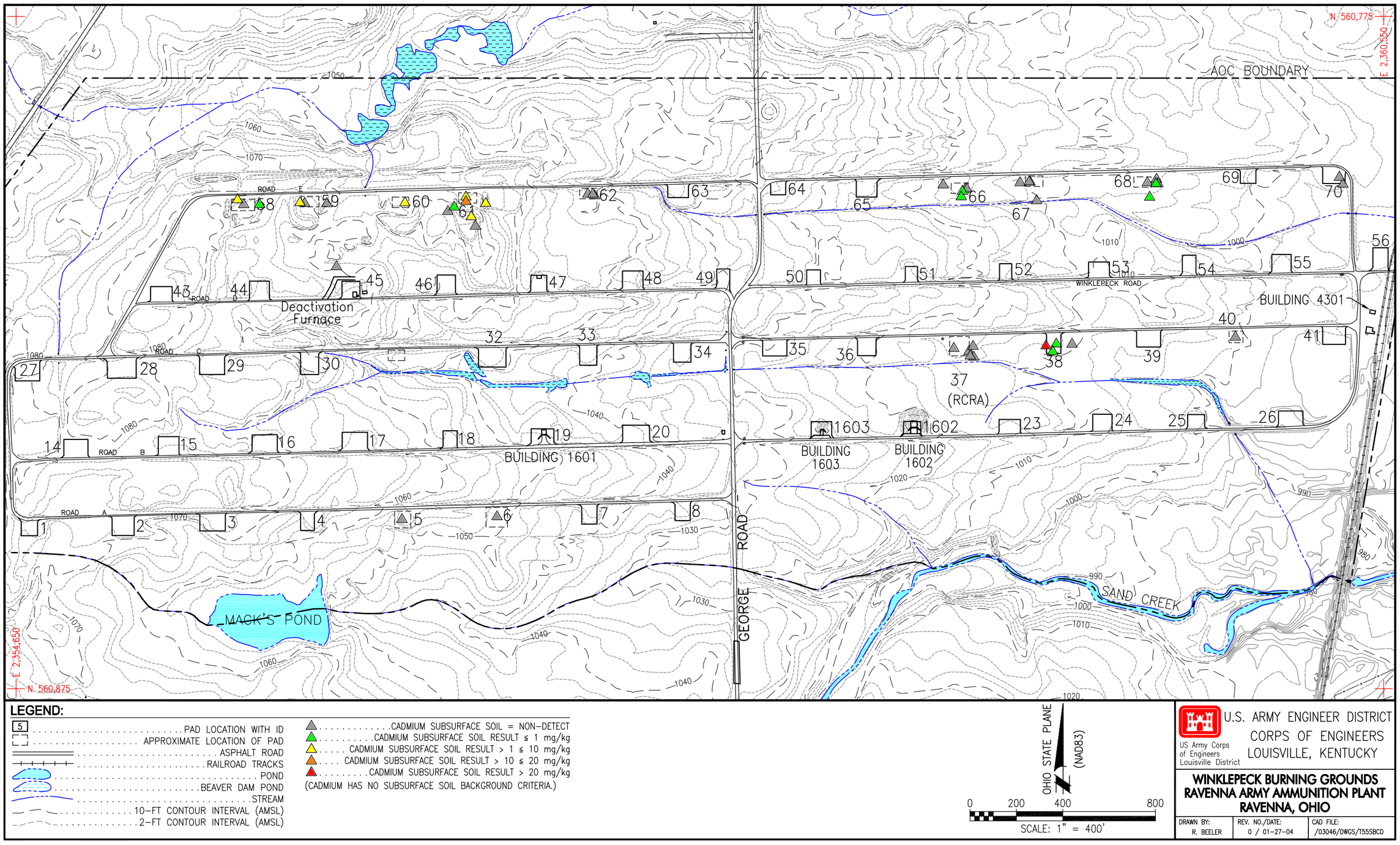


Figure 4-18. Cadmium in 2- to 4-ft Interval Subsurface Soil at Winklepeck Burning Grounds (Phase II and III data)

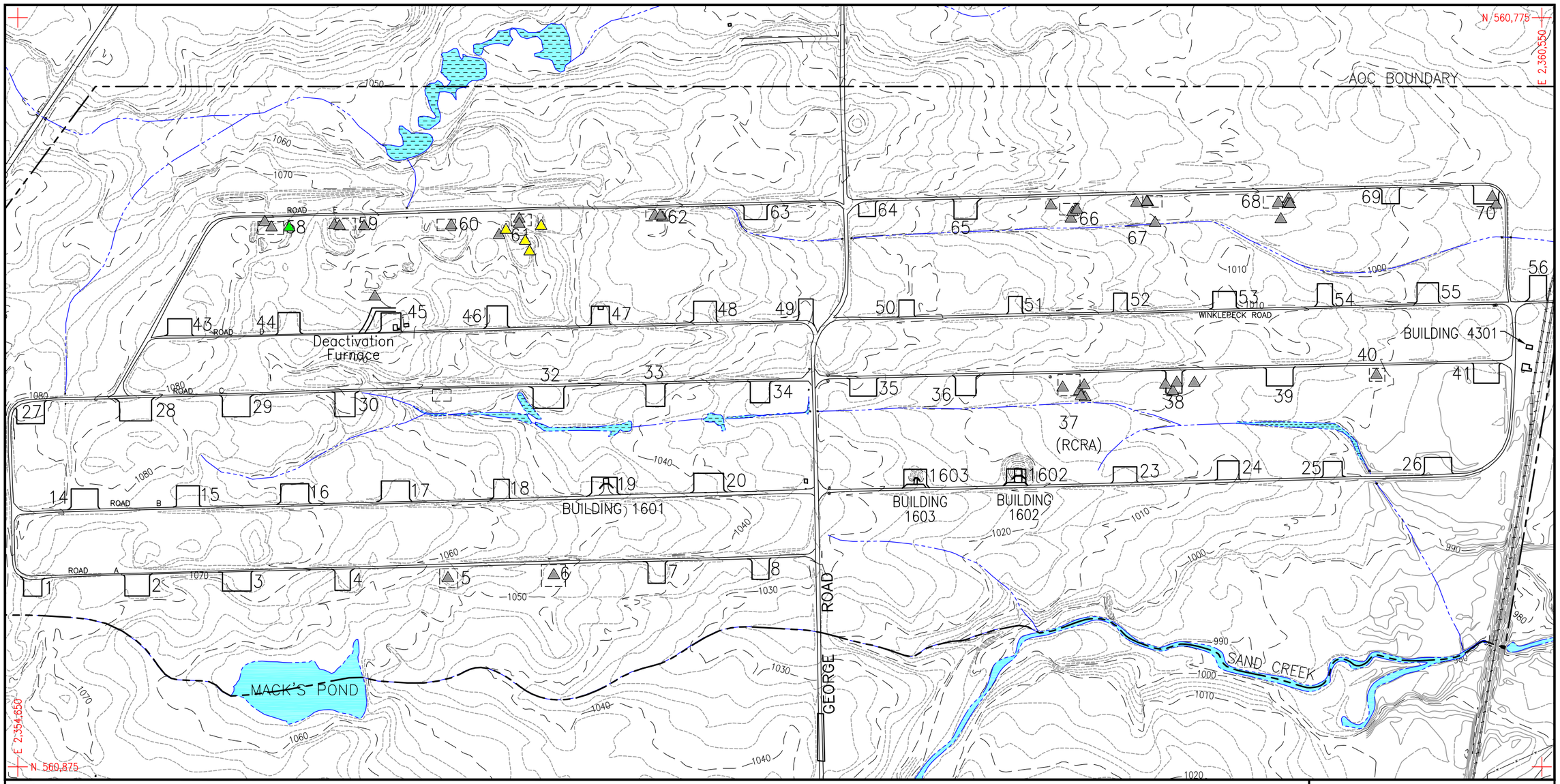


Figure 4-19. Chromium in 2- to 4-ft Interval Subsurface Soil at Winklepeck Burning Grounds (Phase II and III data)

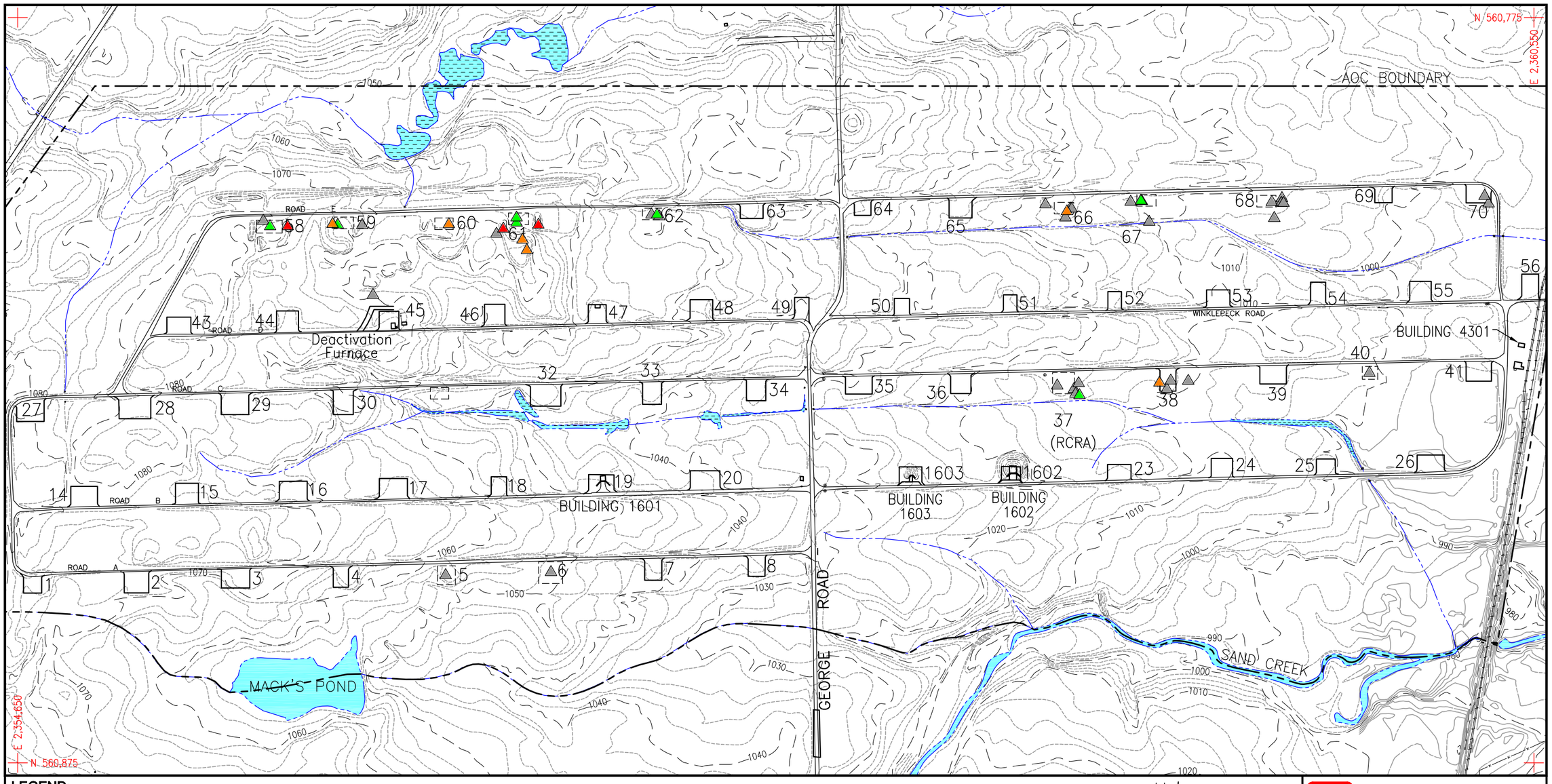


Figure 4-20. Lead in 2- to 4-ft Interval Subsurface Soil at Winklepeck Burning Grounds (Phase II and III data)

4.3.2.1 Pad 37

Five samples from two stations indicated a scattering of inorganics detected above the background criteria (Table 4-22). WBG-223 shows no detections exceeding background criteria. Antimony, arsenic, and lead occur at concentrations just slightly above the background criteria in the 2-to 4-, 4- to 6-, and 6- to 8-ft intervals of WBG-227. The maximum concentration of arsenic in Phase III subsurface soil was detected in the 2- to 4-ft interval at this station. Concentrations appear to diminish with depth, as no SRCs were detected above background in the 8- to 10-ft interval (Table 4-22).

4.3.2.2 Pad 38

Barium, cadmium, lead, mercury, and zinc were detected above background in samples from Pad 38. Four samples were collected from WBG-232. The 2- to 4-ft interval contains all five of these metals, while both the number of SRCs above background and concentrations diminish with depth. The maximum Phase III subsurface soil concentration of cadmium was detected in the 2- to 4-ft interval of this station. Station WBG-229 has no SRCs exceeding background, and WBG-231 shows a low estimated detection of cadmium (Table 4-23).

4.3.2.3 Pad 45

Hexavalent chromium and cadmium were detected in the bottom three intervals of WBG-237. Neither of these SRCs have background criteria; all concentrations were low, estimated values. The only two Phase III detections of hexavalent chromium occurred at this station, with the maximum Phase III subsurface soil concentration for this metal detected in the 4- to 6-ft interval. The 2- to 4-ft interval did not contain SRCs above the background criteria (Table 4-24).

4.3.2.4 Pad 58

This pad shows more inorganic contamination than those described previously. The 2- to 4-ft interval contains 10 SRCs greater than background, with 6 SRCs above background in the 4- to 6-ft interval, 8 SRCs above background in the 6- to 8-ft interval, and 1 SRC (cadmium) in the 8- to 10-ft interval. Concentrations are generally higher in the samples from WBG-199 than in -203, and concentrations are, in general, higher in the 2- to 4- and 6- to 8-ft intervals than in the 4- to 6-ft interval (Table 4-25).

4.3.2.5 Pad 59

A single detection of cadmium occurred in the 6- to 8-ft interval of WBG-205. Antimony, cadmium, copper, lead, and zinc were detected above the background criteria in the 2- to 4-ft samples from WBG-210. Only zinc occurred at a concentration more than twice the background criteria. Cadmium was detected in all deeper samples as well, and arsenic and lead were each detected once above background in the 6- to 8- and 8- to 10-ft sample, respectively (Table 4-26).

4.3.2.6 Pad 61

Only samples from the 2- to 4- and 4- to 6-ft intervals were submitted for laboratory analysis. Fifteen of 16 subsurface soil SRCs were detected in samples from 2 to 4 ft bgs. Hexavalent chromium was not analyzed for in any sample from this pad. The maximum concentrations of 12 of the subsurface soil SRCs were detected in the 2- to 4-ft bgs interval of samples from this pad, with WBG-219 showing maximum concentrations for barium, chromium, lead, selenium, silver, and vanadium. The maximum concentrations for cyanide, copper, mercury, and zinc were found in WBG-217. The maximum nickel concentration

occurred in WBG-218, and the maximum subsurface concentration of antimony was detected in WBG-220 (Table 4-27). Nine SRCs occurred above the background criteria in the 4- to 6-ft interval of WBG-219, but in all cases concentrations were lower than in the overlying interval. No SRCs occurred above the background criteria in the 2- to 4-ft interval of WBG-222 or the 4- to 6-ft interval of WBG-221.

4.3.2.7 Pad 62

In all subsurface soil samples from this pad, inorganic compounds were either not detected, or detected at concentrations below the facility-wide background criteria (Table 4-28).

4.3.2.8 Pad 66

Samples from the 2- to 4-ft bgs interval from three stations were analyzed. Antimony, arsenic, barium, cadmium, copper, lead, selenium, and zinc were each detected above background in one or two samples (Table 4-29). Only concentrations in WBG-247 were significantly elevated relative to background criteria (e.g., more than twice the background criteria).

4.3.2.9 Pad 67

Four depth intervals from WBG-252 were analyzed. Antimony, barium, and lead were detected above background in all depth intervals. Copper, cadmium, and zinc were also detected above background at some depth intervals (Table 4-30). The 4- to 6-ft interval contains the highest concentration of most of these metals, the exception being lead, which was highest in the 6- to 8-ft interval. Concentrations in the 8- to 10-ft interval are generally less than twice the background criteria.

4.3.2.10 Pad 68

Arsenic, cadmium, lead, and zinc were detected above the background criteria in samples from this pad, and concentrations of arsenic, lead, and zinc were only slightly above the background criteria (Table 4-31).

4.3.3 Semivolatile Organic Compounds, Volatile Organic Compounds, and Polychlorinated Biphenyls

Four subsurface soil samples were submitted for pesticide/PCB, SVOC, and VOC analyses. Samples were collected from Pads 58, 59, 61, and 68, from either the 2- to 4-ft interval (Pads 59, 61, and 69) or the 4- to 6- ft interval (Pad 58). A total of 26 organic compounds were detected, and thus determined to be SRCs in subsurface soil. Two pesticides, 18 PAH compounds, and 6 VOCs comprise the organic compounds detected. Pesticides and VOCs were all detected once each, while PAH compounds were detected in between one and three samples. These samples are discussed in more detail below.

4.3.3.1 Pad 58

The 4- to 6-ft interval of station WBG-199 was submitted for analysis of organic compounds. The pesticide heptachlor epoxide was detected at a low estimated value (0.05 mg/kg). A total of 10 SVOCs (PAH compounds) were detected in this sample at concentrations ranging from an estimated value of 0.11 mg/kg for benzo(*g*,*h*,*i*)perylene to 0.47 mg/kg for pyrene (Table 4-25). All detected concentrations were less than 0.5 mg/kg, and all but two were flagged “J” (estimated value). VOCs were not detected in this interval from this station.

4.3.3.2 Pad 59

The 2- to 4-ft interval of station WBG-210 was analyzed for organic compounds. The pesticide endrin ketone was detected at a concentration of 0.0043 mg/kg. Eight SVOCs (PAH compounds) were detected in this sample, at concentrations from 0.05 J mg/kg (fluoranthene) to 3.2 mg/kg (phenanthrene). The VOCs dimethylbenzene, ethylbenzene, and toluene were all detected at concentrations less than 0.1 mg/kg (Table 4-26).

4.3.3.3 Pad 61

The 2- to 4-ft interval of station WBG-217 was submitted for organic analysis. Pesticides were not detected in this sample. Seventeen of the 18 detected PAH compounds occurred at their maximum concentration in this sample, with concentrations as high as 1,100 mg/kg (pyrene), 1,300 mg/kg (phenanthrene), and 1,500 mg/kg (fluoranthene). The lowest detected concentration in this sample was dibenz(*a*,*h*)anthracene at an estimated concentration of 59 mg/kg (Table 4-27). TCE was identified at a very low estimated value (0.0011 J mg/kg) in this sample. The source of this compound is unknown.

4.3.3.4 Pad 68

The 2- to 4-ft sample of station WBG-255 was analyzed for pesticides, SVOCs, and VOCs. Pesticides and SVOCs were not detected in this sample. Two VOCs, acetone and methylene chloride, were detected at low estimated concentrations less than 0.01 mg/kg (Table 4-31). These compounds are frequently seen as common laboratory contaminants, and may represent an artifact of the laboratory procedures more than contamination in subsurface soils at WBG.

4.3.4 Geotechnical Results

Four Shelby tube samples were collected during monitoring well installation in the Phase III RI and submitted for geotechnical analysis. Analyses included moisture content, Atterberg limits, grain size analysis, dry bulk density determination, hydraulic conductivity, pH, specific gravity, porosity, redox potential, and USCS classification. Table 4-32 presents a summary of the geotechnical results; the complete geotechnical report is contained in Appendix L.

4.3.5 Subsurface Soil Summary

Fifty-four subsurface soil samples from 24 borings on 10 burning pads were collected as part of this Phase III RI to determine nature and extent of contamination. Chemical evaluation of the soils included analyses of explosives, propellants, TAL metals, hexavalent chromium, cyanide, and organic compounds. Figure 4-21 shows the vertical profile for four constituents (TNT, HMX, lead, and zinc) from Geoprobe boring at Pads 58, 59, 67, and 68.

4.3.5.1 Explosives

- Occurrences of explosives in concentrations greater than 1 mg/kg were identified at Pads 58, 59, 61, and 67.

  – At Pad 58, explosives contamination was evident to a depth of 6 ft bgs. Concentrations of 1,3,5-TNB; TNT; 2,4-DNT; and other compounds were 5 to 100 times higher in the subsurface soils at WBG-199 than in the nearest surface soil sample, suggesting some reworking of soils during the active use of this pad.

Table 4-32. Phase III Subsurface Soil Geotechnical Data Summary

Station ID	Depth (ft)	Moisture Content (%)	Atterberg Limits		Grain Size			Dry Bulk Density (lb/ft^3)
			LL	PI	Gravel (%)	Sand (%)	Silt and Clay (%)	
WBGmw-010	1 to 3	16.4	33	14	6.3	30.8	62.9	112.7
WBGmw-012	2 to 3	16.3	38	18	10.2	29.1	60.7	114.2
WBGmw-014	3 to 3	17.3	31	13	0.4	18	81.6	111.6
WBGmw-015	4 to 3	23.3	37	16	11	25.6	63.4	100.5

Station ID	Hydraulic Conductivity (cm/sec)	pH	Specific Gravity	Porosity	Redox Potential (mV)	USCS
WBGmw-010	6.9×10^{-8}	5.3	2.640	0.316	+420	Sandy lean clay (CL)
WBGmw-012	9.2×10^{-8}	5.1	2.629	0.304	+430	Sandy lean clay (CL)
WBGmw-014	2.2×10^{-7}	5.3	2.658	0.327	+460	Lean clay w/ sand (CL)
WBGmw-015	3.2×10^{-7}	5.9	2.656	0.393	+440	Sandy lean clay (CL)

ID = Identification.
USCS = Unified Soil Classification System.

  - At Pad 59, explosives contamination was evident to a depth of 6 ft bgs in WBG-205. However, station WBG-210 at this pad showed no explosives contamination below the 2- to 4-ft interval. The maximum concentration of explosives was 17 mg/kg TNT at WBG-205 (4- to 6-ft); most other occurrences were less than 1 mg/kg.

  - At Pad 61, RDX and TNT occurred at concentrations slightly greater than 1 mg/kg in the 2- to 4- and 4- to 6-ft intervals.

  - Pad 67 exhibits the highest concentrations of several explosives encountered in WBG subsurface soils, including TNT and RDX. At WBG-252, TNT was present in high concentrations in all depth intervals sampled, with the maximum of 5,200 mg/kg in the 4- to 6-ft interval. The vertical extent of explosives contamination may not have been determined at Pad 67. HMX; RDX; 1,3,5-TNB; and 2,4-DNT were also present in subsurface soils at Pad 67.

- Concentrations of explosives below 1 mg/kg were observed at Pads 37, 38, 45, 62, and 66. Some explosives are present in the 6- to 8-ft interval at Pad 38; however, most contaminants were identified in the 2- to 4-ft interval. The vertical extent of explosives contamination may not have been determined at all burning pads.

- Pad 68 had no detectable quantities of explosives in the subsurface soils.

4.3.5.2 Inorganics

- Results of the Phase III analytical results indicate that inorganic contamination extends beyond the pad boundary in subsurface soils at Pads 37, 38, 45, 58, 59, 61, 66, and 67.

- In general, contamination decreases with depth, but in some cases, contamination is greater in the 6- to 8-ft interval than in the 4- to 6-ft interval, particularly in samples taken from berm areas surrounding the pads. In these cases, the vertical extent of metals contamination may not have been determined. An example of this is occurs at Pads 45, 58, and 67.

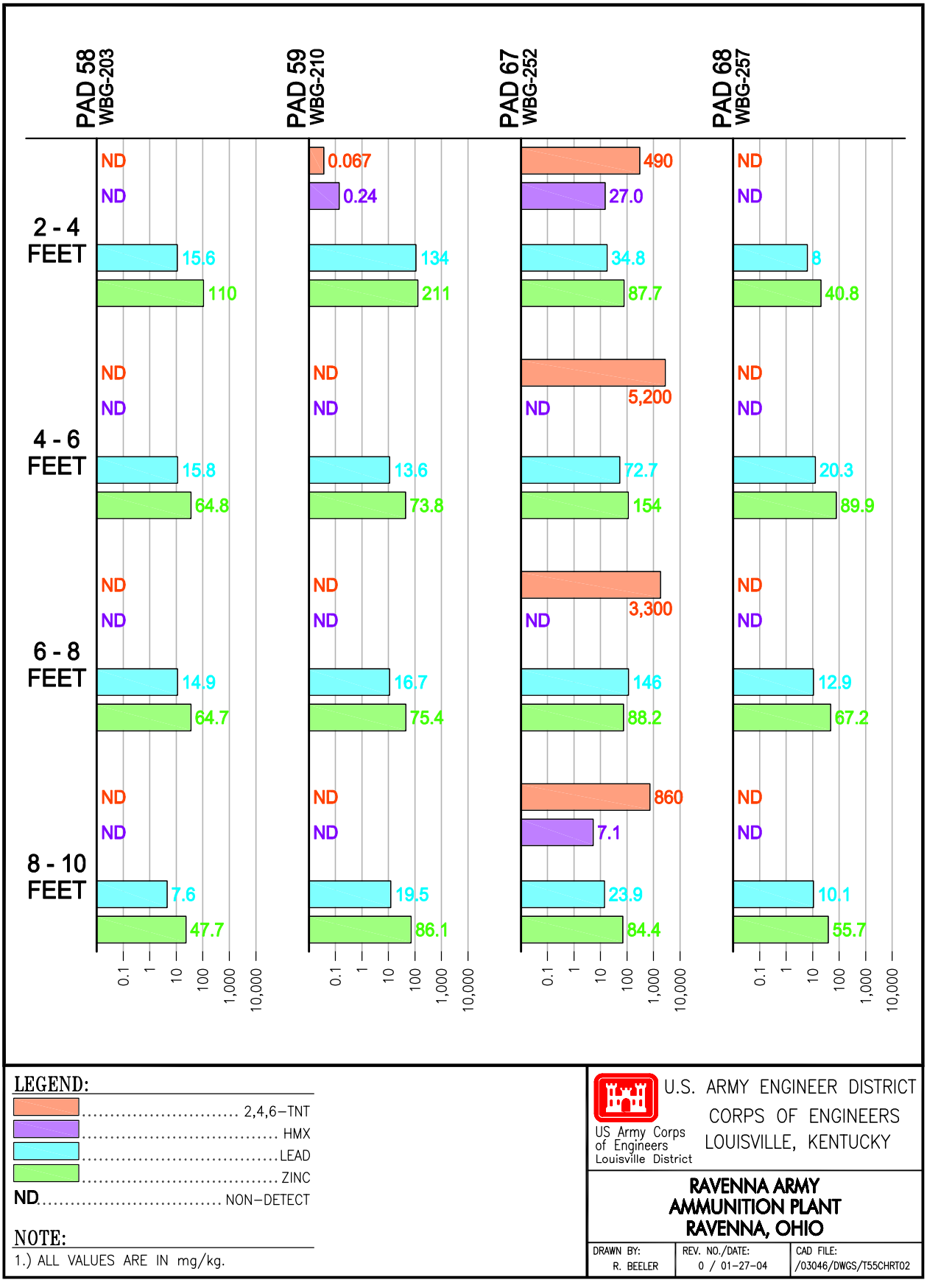


Figure 4-21. Vertical Profiles from Geoprobe Borings at Selected Pads at Winklepeck Burning Grounds

- Hexavalent chromium was analyzed in 12 samples collected from Pads 38, 45, and 58. This constituent was detected at low, estimated concentrations only in two subsurface samples from station WBG-237: 2.8J mg/kg in the 4- to 6-ft interval and 1.4J mg/kg in the 8- to 10-ft interval.

- No metals exceeded background values at Pad 62.

- Cyanide was detected only once (Pad 61) out of four samples (4.6 mg/kg, station WBG-217, 2- to 4-ft interval). Pad 61 subsurface soil also had the highest frequency of metals detected above their respective background criteria and a number of metals were detected at Phase III maximum concentrations (antimony, barium, chromium, copper, lead, mercury, nickel, selenium, silver, vanadium, and zinc).

- At Pads 37, 38, 58, and 59, antimony, arsenic, barium, cadmium, copper, lead, silver, and zinc all exceeded subsurface soil background criteria at various depths.

4.3.5.3 Organic compounds

- Organic compounds were evaluated at one boring on each of the four burning pads: Pads 58, 59, 61, and 68. Each sample was evaluated for VOCs, SVOCs, and pesticides/PCBs.

- Occurrences of organic compounds in subsurface soils are sporadic and generally low concentrations.

- VOCs toluene, dimethylbenzene, and ethylbenzene were identified at Pad 59 in concentrations less than 0.03 mg/kg. TCE was detected at Pad 61, and acetone and methylene chloride were present at Pad 68, each at concentrations less than 0.01 mg/kg. All detections of VOCs came from the 2- to 4-ft sample interval at these pads. The sources of these compounds are unknown.

- SVOCs were detected at three Pads [58 (4- to 6-), 59 (2- to 4-), and 61 (2- to 4- ft)]. These consist mainly of a number of PAHs presumed to be associated with open burning at the pads. Pad 61 had the maximum concentration of all PAHs detected in the Phase III subsurface soil. At Pad 58, the maximum concentration among the 10 PAHs detected was 0.47 mg/kg. At Pad 59, the PAHs detected varied in concentration from 0.05 to 3.2 mg/kg.

- Two pesticides, endrin ketone and heptachlor epoxide, were detected once each in the subsurface soils at low concentrations less than 0.05 mg/kg.

4.4 SEDIMENTS

Two dry sediment samples were collected from the drainage ditch north of Road E, between Pads 59 and 60. Samples were collected from stations WBG-294 and -295, from 0 to 0.5 ft. Sampling along this ditch was intended to characterize sediment transport off the AOC from two of the most heavily used burning pads in the northwest quadrant of WBG. These samples were analyzed for field explosives, field metals, propellants, TAL metals (inorganics), hexavalent chromium, VOCs, SVOCs, pesticides/PCBs, and cyanide. Because both samples tested negative in the field laboratory for explosives, they were not analyzed for explosives by the fixed-base laboratory. Both sediment samples also received analyses for total organic carbon (TOC) and geotechnical properties (Atterberg limits, moisture content, USCS classification, bulk density, porosity, hydraulic conductivity, specific gravity, pH, redox potential, grain size, and dry weight).

The sediment samples were collected using bucket hand augers and stainless steel scoops according to the SAP Addendum No. 1 for the WBG FS (USACE 2000). The results of the analyses of the two sediment samples are discussed below. The analytical results for sediment samples collected at WBG are summarized

by sample station and by analyte in Table 4-33 and are provided in their entirety in Appendix H. Only constituents determined to be SRCs across the AOC (Table 4-6) are included for discussion in this section.

4.4.1 Explosives and Propellants

Field analysis for explosives did not detect concentrations exceeding 1 ppm, so samples were not sent to the fixed-base laboratory. The sediment samples were analyzed for the propellants nitrocellulose and nitroguanidine only. Nitroguanidine was detected at a low estimated concentration of 0.035 mg/kg in the sample from WBG-294. Neither propellant was detected in the sample from WBG-295.

4.4.2 Inorganics

Both samples were field screened for XRF metals (in situ and bench top units). Barium, iron, lead, rubidium, strontium, zinc, and zirconium were detected in both samples. Arsenic and molybdenum were also detected. Appendix H includes the field XRF metals data for each station. Screening of fixed-base laboratory analytical data from Phase I, II, and III indicates that 15 metals are determined to be sediment SRCs for the entire WBG AOC. Sediment SRCs detected above background criteria in both Phase III sediment samples included antimony, beryllium, cadmium, and lead. Chromium, copper, nickel, selenium, and vanadium were detected above background values at WBG-295 only. Generally, the highest concentrations of metals were observed at WBG-295; however, with the exception of selenium, concentrations noted in this sample are less than twice the background criteria for analytes having background values (Table 4-33). Both samples were analyzed for hexavalent chromium, which was detected at an estimated concentration of 5 mg/kg at station WBG-294. Cyanide was not detected in either sample. Figures 4-5 through 4-8 show the relative concentrations of inorganics (i.e., arsenic, cadmium, chromium, and lead) in surface soil and sediment at WBG.

4.4.3 Organic Compounds

PCBs and SVOCs were not detected in the sample from WBG-295. This sample did contain a very low estimated detection of TCE (Table 4-33). PCB-1260 was detected at a low estimated concentration at WBG-294. Two semivolatile compounds were detected from this sample: di-n-butyl phthalate and n-nitrosodiphenylamine (Table 4-33). The source of these two compounds in not known. VOCs were not detected in the sample from WBG-294.

4.4.4 Total Organic Carbon and Geotechnical Investigation

Both samples were analyzed for TOC by the fixed-base analytical laboratory. TOC concentrations for the two sediment samples were 16,000 and 2,700 mg/kg at WBG-294 and -295, respectively. The samples were also submitted for disturbed sample grain size analysis (% passing) and content (gravel/sand/silt and clay). Table 4-34 summarizes the geotechnical data. The complete geotechnical report is included at Appendix L.

4.5 GROUNDWATER

The eight newly installed wells (WBGmw-010 through -017) and the nine previously existing monitoring wells at WBG were sampled November 1 through 5, 2000. The locations of all wells sampled during the Phase III RI are shown on Figure 3-5. The nine previously existing wells were not re-developed prior to sampling. The rationale for not re-developing existing wells was that they had been either re-developed or installed and sampled within the 18 months prior to the Phase III RI. No intervening disturbance of the

Table 4-33. Concentrations of SRCs in Sediment

Station		WBG-294	WBG-295
Sample ID		WBGsd-294-4249-SD	WBGsd-295-4250-SD
Date		10/24/2000	10/24/2000
Depth (ft)		0 to 0.5	0 to 0.5
Field Type		Grab	Grab
Analyte	Units		
Explosives			
Nitrocellulose	mg/kg	ND	ND
Nitroguanidine	mg/kg	0.035 J	ND
Metals			
Cyanide	mg/kg	ND	ND
Chromium, hexavalent	mg/kg	5 J	1.3 R
Aluminum	mg/kg	9,940 =	14,900 = *
Antimony	mg/kg	2 J *	1.7 J *
Barium	mg/kg	67.3 =	76.7 =
Beryllium	mg/kg	0.42 J *	0.47 J *
Cadmium	mg/kg	0.59 J *	0.73 = *
Chromium	mg/kg	14.7 J	20.1 J *
Cobalt	mg/kg	9.1 =	7.9 =
Copper	mg/kg	19.3 =	30.9 = *
Lead	mg/kg	34.7 J *	44.6 J *
Mercury	mg/kg	0.04 J	0.024 J
Nickel	mg/kg	16.4 =	19.6 = *
Selenium	mg/kg	0.79 =	3.6 = *
Thallium	mg/kg	0.47 J	0.53 J
Vanadium	mg/kg	19.8 =	26.8 = *
Organics – Pesticide/PCB			
PCB-1260	mg/kg	0.032 J	ND
Organics – Semivolatile			
Anthracene	mg/kg	ND	ND
Benz(*a*)anthracene	mg/kg	ND	ND
Benzo(*a*)pyrene	mg/kg	ND	ND
Benzo(*b*)fluoranthene	mg/kg	ND	ND
Benzo(*g,h,i*)perylene	mg/kg	ND	ND
Benzo(*k*)fluoranthene	mg/kg	ND	ND
Chrysene	mg/kg	ND	ND
Di-n-butyl phthalate	mg/kg	0.87 =	ND
Fluoranthene	mg/kg	ND	ND
Indeno(1,2,3-*cd*)pyrene	mg/kg	ND	ND
N-Nitrosodiphenylamine	mg/kg	0.085 J	ND
Phenanthrene	mg/kg	ND	ND
Pyrene	mg/kg	ND	ND
Organics – Volatile			
Acetone	mg/kg	ND	ND
Chloroform	mg/kg	ND	ND
Toluene	mg/kg	ND	ND
Trichloroethene	mg/kg	ND	0.0012 J

ID = Identification.
ND = Non-detect.
PCB = Polychlorinated biphenyl.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

Table 4-34. Phase III Sediment Geotechnical Data Summary

Station ID	WBG-294	WBG-295
TOC (mg/kg)	16,000	2,700
Classification		
Disturbed Sample Grain Size Analysis (% passing)		
3 to 3/4 in.	100	100
3/8 in.	100	95.1
4	96.8	91.9
10	93.7	88.4
20	90.4	85.1
40	84.1	80.2
60	72.7	73.2
140	57.1	64.3
200	54	61.8
Content		
% Gravel	3.2	8.1
% Sand	42.8	30.1
% Silt and Clay	54	61.8

ID = Identification.
TOC = Total organic carbon.

wells had occurred. Additionally, the 2001 Facility-wide well inspections were consulted, and the following degree of siltation was reported based on field measurements of total depth versus reported construction depths:

OBG-1 = 0.9 ft
OBG-2 = 0 ft
OBG-3 = 0 ft
WBGmw-005 = 0.25 ft
WBGmw-006 = 1.25 ft
WBGmw-007 = 0 ft
WBGmw-008 = 0.05 ft
WBGmw-009 = 2.1 ft

The 2001 inspection data show that only WBGmw-006 and -009 had sufficient siltation (e.g., > 10% of the screened interval) to merit re-development prior to any future sampling event.

Groundwater sampling was conducted using low-flow sampling techniques and equipment, as described in Section 4.3.4.2 of the Facility-wide SAP (USACE 2001b). All groundwater samples were analyzed for total and dissolved TAL metals (inorganics), cyanide, explosives, propellants, VOCs, SVOCs, and PCBs. Inorganic results for unfiltered groundwater samples are not discussed in this section due to the high turbidity in the unfiltered samples. However, all results are reported in Appendix H.

Prior to the start of groundwater sampling activities, water levels were measured from the top of casing at all WBG monitoring wells, and were used to create the potentiometric surface map shown in Figure 2-2. Because of the considerable horizontal space between the individual wells in this large area, the potentiometric surface map is generalized, assumes that all the wells are in hydraulic communication with one another, and, as such, probably does not completely depict the complex flow system beneath the burning ground.

The determination of SRCs in groundwater samples collected from Phase I, II, and III RIs at WBG are summarized in Table 4-7. The detected concentrations of SRCs from the Phase III data set are

summarized by sample station and by analyte in Table 4-35 and analytical data from the Phase III sampling event are provided in their entirety in Appendix H. Only constituents determined to be SRCs across the AOC (Table 4-7) are included for discussion in this section. The following sections describe the distribution of explosives, propellants, inorganics, and organic constituents in Phase III groundwater at each of the pads. For each constituent class discussed, figures are presented (as appropriate) that illustrate the distribution of site-related contamination. The analytes presented in the figures represent those that occur with the greatest frequency, or those that represent the distribution of chemicals known to be significant human health or ecological risk drivers based on previous investigations at WBG.

4.5.1 Explosives and Propellants

Twelve explosive compounds were detected at least once in regular Phase III samples from monitoring wells at WBG. Nitrobenzene was detected in the field duplicate sample from WBGmw-010. The explosive 1,3-DNB, which was detected during the Phase I and II sampling, was not detected in any wells during the Phase III sampling event. Propellants were not detected in groundwater. 2,4-DNT was the most frequently detected explosive, occurring in 11 of the 17 groundwater samples. 2-Nitrotoluene and 4-nitrotoluene were the second most common compounds, each detected in seven of the samples (Table 4-35).

Explosive compounds were detected in all monitoring wells, with the exception of OBG-2 and WBGmw-013. Detected concentrations range from 0.05 µg/L (2,4-DNT at WBGmw-005) to a maximum detected concentration of 52 µg/L RDX at WBGmw-006. Figure 4-22 shows the distribution of explosive compounds in WBG monitoring wells. WBGmw-006 exhibited the largest number of explosive compounds (eight). Concentrations in groundwater at this well varied from 0.11 µg/L 1,3,5-TNB to the maximum observed value of 52 µg/L RDX. OBG-3, WBGmw-007, and WBGmw-012 each had one explosive compound at detectable concentrations. Concentrations greater than 1 µg/L are as follows:

- 11 µg/L HMX (WBGmw-006)
- 52 µg/L RDX (WBGmw-006)
- 1.3 µg/L 2-amino-4,6-dinitrotoluene (WBGmw-010)
- 1.3 µg/L 1,3,5-TNB (WBGmw-015)
- 2.6 µg/L 2-nitrotoluene (WBGmw-015)

The Phase III RI results for explosives correlate in some respects with those from the Phase II RI. Both events revealed generally low concentrations of explosives in the monitoring wells, and WBGmw-006 contained the highest concentrations of explosives in both events. HMX and RDX concentrations at WBGmw-006 are consistent with those measured in Phase II. Overall, contaminant concentrations in wells sampled in both the Phase II and III events do not appear to have changed. However, some explosive compounds present in the Phase II samples were not detected at all in the Phase III RI, and vice versa. Some wells (e.g., WBGmw-008 and OBG-3) that were previously unaffected by explosives were found to have low concentrations of some compounds in the Phase III RI.

A qualitative analysis of the results reveals no evidence of a trend in explosives concentrations associated with the presumed groundwater flow direction. Instead, detectable quantities of explosives present in groundwater appear to be related generally to the source areas (e.g., Pads 37, 59, and 67) or to preferential flow pathways that have yet to be determined (e.g., occurrences of 2,4-DNT in OBG wells, but not in WBGmw-015 immediately downgradient).

Table 4-35. Concentration of SRCs in Groundwater

Station		OBG-1	OBG-2	OBG-3	OBG-4	WBGmw-005	WBGmw-006	WBGmw-007
Sample ID		WBGmw-164-4251-GF	WBGmw-165-4252-GF	WBGmw-166-4253-GF	WBGmw-167-4254-GF	WBGmw-005-4255-GF	WBGmw-006-4256-GF	WBGmw-007-4257-GF
Date		11/05/2000	11/05/2000	11/05/2000	11/05/2000	11/04/2000	11/03/2000	11/03/2000
Depth (ft)		Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved
Field Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	Units							
Explosives								
1,3,5-Trinitrobenzene	µg/L	ND	ND	ND	ND	ND	0.11 J	ND
1,3-Dinitrobenzene	µg/L	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trinitrotoluene	µg/L	ND	ND	ND	ND	ND	0.52 =	ND
2,4-Dinitrotoluene	µg/L	0.44 =	ND	0.091 J	0.061 J	0.053 J	0.95 =	0.081 J
2,6-Dinitrotoluene	µg/L	0.12 J	ND	ND	ND	ND	0.25 =	ND
2-Amino-4,6-dinitrotoluene	µg/L	ND	ND	ND	ND	ND	ND	ND
2-Nitrotoluene	µg/L	0.19 J	ND	ND	ND	ND	0.31 =	ND
3-Nitrotoluene	µg/L	ND	ND	ND	0.15 J	ND	ND	ND
4-Amino-2,6-dinitrotoluene	µg/L	ND	ND	ND	ND	ND	ND	ND
4-Nitrotoluene	µg/L	0.2 =	ND	ND	ND	0.16 J	0.38 =	ND
HMX	µg/L	ND	ND	ND	ND	ND	11 =	ND
Nitrobenzene	µg/L	ND	ND	ND	ND	ND	ND	ND
RDX	µg/L	ND	ND	ND	ND	ND	52 =	ND
Tetryl	µg/L	ND	ND	ND	0.098 J	ND	ND	ND
Metals								
Cyanide	µg/L	ND	ND	ND	ND	ND	ND	ND
Aluminum	µg/L	ND	ND	32 J *	ND	ND	ND	ND
Arsenic	µg/L	ND	ND	9.9 =	15 = *	24 = *	ND	ND
Barium	µg/L	8.8 J	42 J	110 J *	64 J	60 J	26 J	38 J
Cadmium	µg/L	ND	ND	ND	ND	ND	ND	0.3 J *
Cobalt	µg/L	ND	ND	ND	ND	1.8 J *	ND	ND
Copper	µg/L	ND	ND	ND	ND	ND	ND	ND
Lead	µg/L	ND	ND	ND	ND	ND	ND	ND
Manganese	µg/L	ND	250 =	130 =	680 =	1,300 = *	63 =	120 =
Mercury	µg/L	ND	ND	ND	ND	ND	ND	ND
Nickel	µg/L	ND	ND	2.8 J *	ND	ND	ND	ND
Zinc	µg/L	ND	14 J	14 J	13 J	ND	ND	ND

Table 4-35. Concentration of SRCs in Groundwater (continued)

Station		OBG-1	OBG-2	OBG-3	OBG-4	WBGmw-005	WBGmw-006	WBGmw-007
Sample ID		WBGmw-164-4251-GF	WBGmw-165-4252-GF	WBGmw-166-4253-GF	WBGmw-167-4254-GF	WBGmw-005-4255-GF	WBGmw-006-4256-GF	WBGmw-007-4257-GF
Date		11/05/2000	11/05/2000	11/05/2000	11/05/2000	11/04/2000	11/03/2000	11/03/2000
Depth (ft)		Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved
Field Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	Units							
Organics – Pesticide/PCB								
4,4'-DDT	µg/L	ND	ND	ND	ND	ND	0.058 J	ND
Heptachlor Epoxide	µg/L	ND	ND	ND	ND	ND	ND	ND
Organics – Semivolatile								
Bis(2-ethylhexyl)phthalate	µg/L	ND	ND	ND	ND	ND	ND	49 =
Organics – Volatile								
Chloroform	µg/L	ND	ND	ND	ND	ND	ND	ND

Table 4-35. Concentration of SRCs in Groundwater (continued)

Station		WBGmw-008	WBGmw-009	WBGmw-010	WBGmw-010	WBGmw-011	WBGmw-011
Sample ID		WBGmw-008-4258-GF	WBGmw-009-4259-GF	WBGmw-010-4260-GF	WBGmw-010-4285-GF	WBGmw-011-4261-GF	WBGmw-011-4284-GF
Date		11/03/2000	11/04/2000	11/02/2000	11/02/2000	11/02/2000	11/02/2000
Depth (ft)		Dissolved	Dissolved	Total	Total	Total	Total
Field Type		Grab	Grab	Grab	Field Duplicate	Grab	Field Duplicate
Analyte	Units						
Explosives							
1,3,5-Trinitrobenzene	µg/L	ND	ND	ND	0.11 J	ND	ND
1,3-Dinitrobenzene	µg/L	ND	ND	ND	ND	ND	ND
2,4,6-Trinitrotoluene	µg/L	0.85 =	ND	ND	0.23 =	ND	ND
2,4-Dinitrotoluene	µg/L	0.073 J	ND	0.28 =	0.17 =	0.093 J	0.16 =
2,6-Dinitrotoluene	µg/L	ND	ND	ND	ND	0.1 J	0.1 J
2-Amino-4,6-dinitrotoluene	µg/L	ND	ND	1.3 =	1.2 =	ND	ND
2-Nitrotoluene	µg/L	ND	ND	0.2 =	ND	0.33 =	0.29 =
3-Nitrotoluene	µg/L	ND	ND	ND	ND	ND	ND
4-Amino-2,6-dinitrotoluene	µg/L	ND	ND	0.54 =	0.55 =	ND	ND
4-Nitrotoluene	µg/L	ND	ND	0.31 =	ND	ND	0.1 J
HMX	µg/L	ND	0.74 =	ND	ND	ND	ND
Nitrobenzene	µg/L	ND	ND	ND	0.067 J	ND	ND
RDX	µg/L	ND	5.3 =	ND	ND	ND	ND
Tetryl	µg/L	ND	0.36 =	ND	0.7 =	ND	0.077 J
Metals							
Cyanide	µg/L	ND	ND	ND	ND	ND	ND
Aluminum	µg/L	ND	ND	ND	ND	ND	ND
Arsenic	µg/L	8 =	ND	ND	ND	ND	ND
Barium	µg/L	40 J	10 J	14 J	14 J	29 J	31 J
Cadmium	µg/L	ND	ND	ND	ND	ND	ND
Cobalt	µg/L	ND	4.5 J *	ND	ND	ND	ND
Copper	µg/L	ND	ND	ND	ND	ND	ND
Lead	µg/L	ND	ND	ND	ND	ND	ND
Manganese	µg/L	530 =	180 =	32 =	35 =	45 =	48 =
Mercury	µg/L	ND	ND	ND	ND	ND	ND
Nickel	µg/L	ND	6.2 J *	2.8 J *	59 = *	ND	ND
Zinc	µg/L	ND	13 J	48 =	43 =	ND	ND

Table 4-35. Concentration of SRCs in Groundwater (continued)

Station		WBGmw-008	WBGmw-009	WBGmw-010	WBGmw-010	WBGmw-011	WBGmw-011
Sample ID		WBGmw-008-4258-GF	WBGmw-009-4259-GF	WBGmw-010-4260-GF	WBGmw-010-4285-GF	WBGmw-011-4261-GF	WBGmw-011-4284-GF
Date		11/03/2000	11/04/2000	11/02/2000	11/02/2000	11/02/2000	11/02/2000
Depth (ft)		Dissolved	Dissolved	Total	Total	Total	Total
Field Type		Grab	Grab	Grab	Field Duplicate	Grab	Field Duplicate
Analyte	Units						
Organics – Pesticide/PCB							
4,4'-DDT	µg/L	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	µg/L	ND	ND	0.056 J	ND	ND	ND
Organics – Semivolatile							
Bis(2-ethylhexyl)phthalate	µg/L	ND	ND	3.9 J	5.2 J	ND	ND
Organics – Volatile							
Chloroform	µg/L	ND	ND	1.4 J	1.5 J	ND	ND

Table 4-35. Concentration of SRCs in Groundwater (continued)

Station		WBGmw-012	WBGmw-013	WBGmw-014	WBGmw-015	WBGmw-016	WBGmw-017
Sample ID		WBGmw-012-4262-GF	WBGmw-013-4263-GF	WBGmw-014-4264-GF	WBGmw-015-4265-GF	WBGmw-016-4266-GF	WBGmw-017-4267-GF
Date		11/04/2000	11/02/2000	11/04/2000	11/01/2000	11/03/2000	11/01/2000
Depth (ft)		Total	Total	Total	Total	Total	Total
Field Type		Grab	Grab	Grab	Grab	Grab	Grab
Analyte	Units						
Explosives							
1,3,5-Trinitrobenzene	µg/L	ND	ND	ND	1.3 =	ND	0.3 =
1,3-Dinitrobenzene	µg/L	ND	ND	ND	ND	ND	ND
2,4,6-Trinitrotoluene	µg/L	ND	ND	ND	0.94 =	ND	0.32 =
2,4-Dinitrotoluene	µg/L	0.08 J	ND	ND	ND	0.068 J	ND
2,6-Dinitrotoluene	µg/L	ND	ND	0.11 J	ND	ND	ND
2-Amino-4,6-dinitrotoluene	µg/L	ND	ND	ND	0.33 =	ND	ND
2-Nitrotoluene	µg/L	ND	ND	0.49 =	2.6 =	0.22 =	ND
3-Nitrotoluene	µg/L	ND	ND	ND	0.31 =	ND	ND
4-Amino-2,6-dinitrotoluene	µg/L	ND	ND	ND	ND	ND	ND
4-Nitrotoluene	µg/L	ND	ND	0.35 =	0.85 =	0.17 J	ND
HMX	µg/L	ND	ND	ND	ND	ND	ND
Nitrobenzene	µg/L	ND	ND	ND	ND	ND	ND
RDX	µg/L	ND	ND	0.27 J	ND	0.25 J	ND
Tetryl	µg/L	ND	ND	ND	0.92 =	ND	0.59 =
Metals							
Cyanide	µg/L	ND	ND	ND	ND	ND	ND
Aluminum	µg/L	ND	ND	4,700 = *	ND	ND	ND
Arsenic	µg/L	ND	ND	ND	ND	ND	ND
Barium	µg/L	13 J	19 J	19 J	73 J	47 J	53 J
Cadmium	µg/L	ND	ND	ND	ND	ND	ND
Cobalt	µg/L	ND	ND	ND	ND	ND	ND
Copper	µg/L	ND	ND	ND	ND	ND	ND
Lead	µg/L	ND	ND	ND	ND	ND	ND
Manganese	µg/L	74 =	81 =	280 =	230 =	540 =	250 =
Mercury	µg/L	ND	ND	ND	ND	ND	ND
Nickel	µg/L	ND	ND	ND	2.3 J *	2.2 J *	ND
Zinc	µg/L	14 J	ND	ND	500 = *	19 J	19 J

Table 4-35. Concentration of SRCs in Groundwater (continued)

Station		WBGmw-012	WBGmw-013	WBGmw-014	WBGmw-015	WBGmw-016	WBGmw-017
Sample ID		WBGmw-012-4262-GF	WBGmw-013-4263-GF	WBGmw-014-4264-GF	WBGmw-015-4265-GF	WBGmw-016-4266-GF	WBGmw-017-4267-GF
Date		11/04/2000	11/02/2000	11/04/2000	11/01/2000	11/03/2000	11/01/2000
Depth (ft)		Total	Total	Total	Total	Total	Total
Field Type		Grab	Grab	Grab	Grab	Grab	Grab
Analyte	Units						
Organics – Pesticide/PCB							
4,4'-DDT	µg/L	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	µg/L	ND	ND	ND	ND	ND	ND
Organics – Semivolatile							
Bis(2-ethylhexyl)phthalate	µg/L	ND	3.4 J	ND	ND	ND	ND
Organics – Volatile							
Chloroform	µg/L	ND	ND	ND	ND	ND	ND

DDT = Dichlorodiphenyl-trichloroethane.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identification.
ND = Non-detect.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.
Qualifiers:
J = Estimated value less than reporting limits.
* = Indicates result exceeds facility-wide background level.
"=" = Analyte present and concentration accurate.

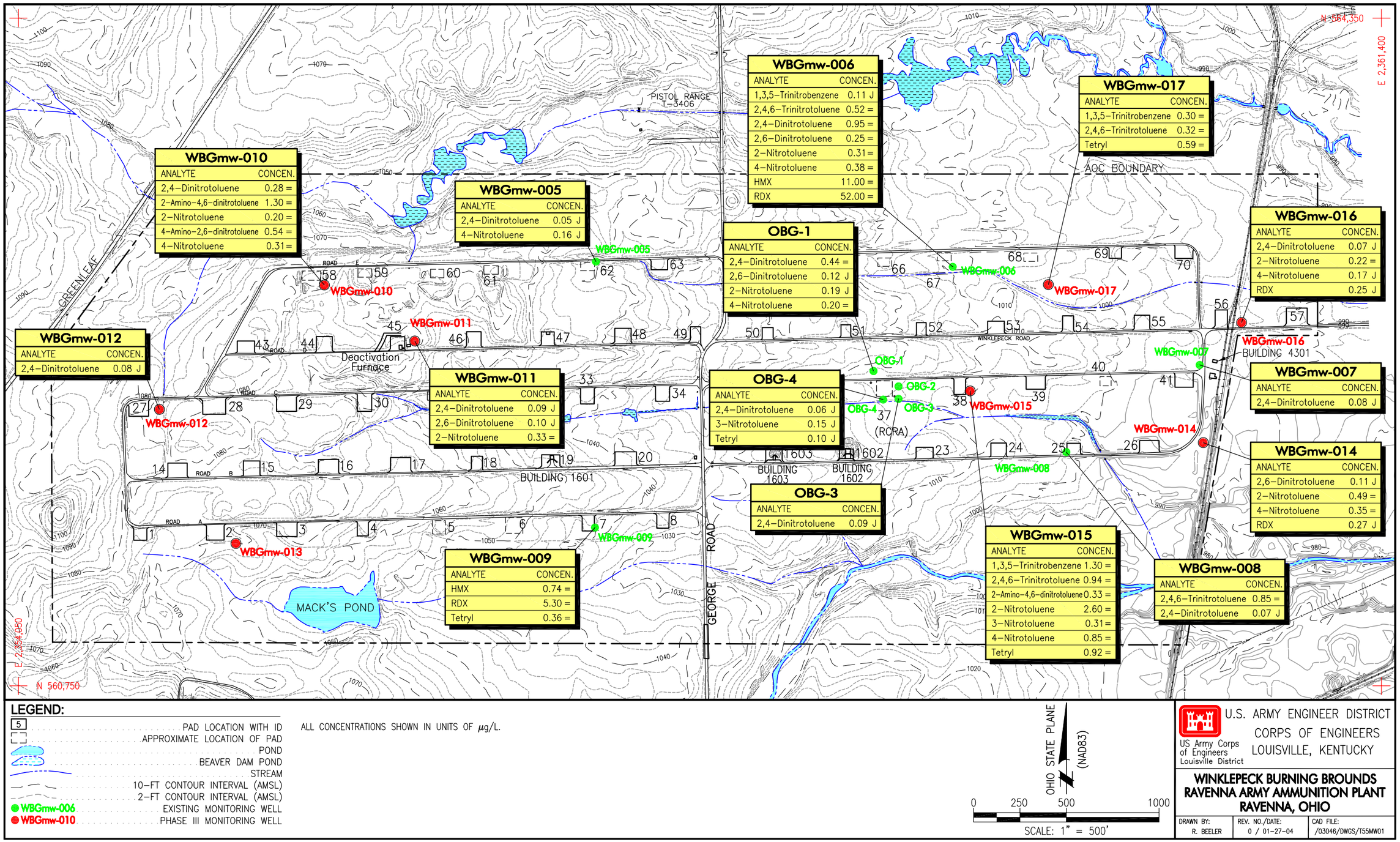


Figure 4-22. Explosives in Groundwater at Winklepeck Burning Grounds (Phase III data only)

4.5.2 Inorganics

The Phase I, II, and III analytical results for the 23 TAL metals were compared to the facility-wide background criteria for filtered groundwater in unconsolidated material (Table 4-7). Of the metals detected, calcium, iron, magnesium, potassium, and sodium are not considered to be site-related because they are essential nutrients, and are eliminated from further discussion. Chromium was detected, but the maximum concentration (1.7J µg/L) is below the site background criteria (7.3 µg/L) (see Table 4-7). Eleven metals and cyanide were determined to be SRCs in groundwater at WBG. These include aluminum, arsenic, barium, cadmium, cobalt, copper, lead, manganese, mercury, nickel, and zinc, in addition to cyanide. Copper and mercury were not detected in Phase III groundwater samples. Cyanide was also not detected in Phase III groundwater. In the Phase II RI, it was detected in WBGmw-009. Table 4-35 gives the detected concentrations of all inorganic SRCs in groundwater from the Phase III sampling event. Figure 4-23 shows the distribution of metals exceeding background in WBG monitoring wells. The results above background are summarized below.

- Aluminum was detected twice, in OBG-2 (32 µg/L) and WBGmw-014 (4,700 µg/L). Aluminum was not detected in the background data set, so the background value for aluminum was set to zero. The latter occurrence exceeds the secondary MCL for drinking water (200 µg/L).

- Arsenic was detected in four wells and was present twice above the background criteria (OBG-4 and WBGmw-005).

- Barium was detected in every well, but exceeded the background criterion of 82.1 µg/L only in OBG-3 at a concentration of 110 µg/L, less than twice the background value.

- Cadmium was detected once, at 0.30 µg/L, in WBGmw-007. Cadmium was not detected in the background data set, so the background value for cadmium was set to zero.

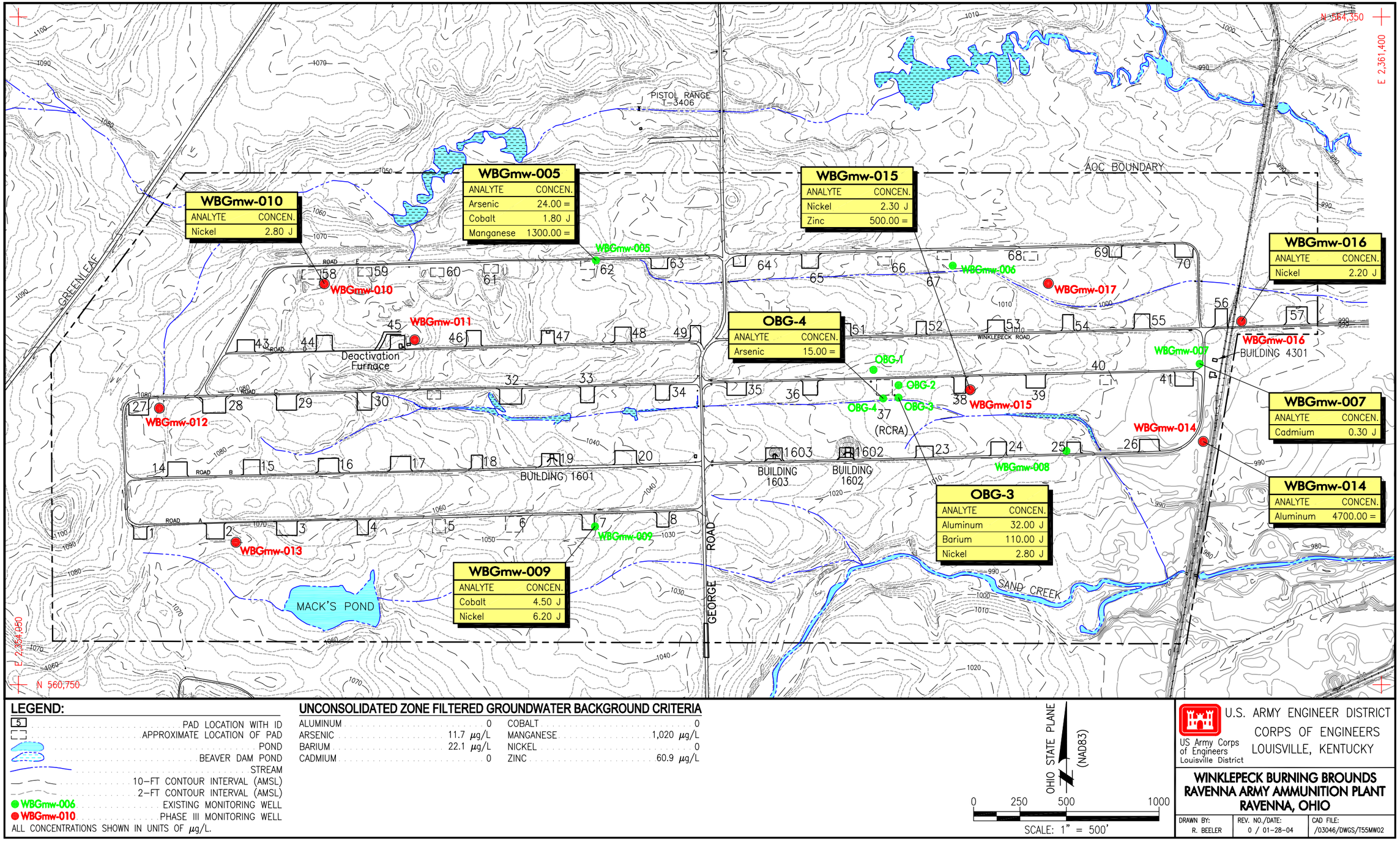
- Cobalt was detected twice, 1.8 µg/L in WBGmw-005 and 4.5 µg/L in WBGmw-009. Cobalt was also not detected in the background data set, so the cobalt background criteria was set to zero.

- Manganese was detected in nearly every well but only exceeded background in WBGmw-005, at a concentration of 1,300 µg/L. While less than twice the background criterion, this concentration exceeds the secondary MCL for drinking water (50 µg/L).

- Nickel, which was not detected in the background data set, was present in five samples. Concentrations ranged from 2.2 µg/L at WBGmw-016 to 6.2 µg/L at WBGmw-009.

- Zinc was detected in nine of the groundwater samples, but occurred above background in only one sample. A concentration of 500 µg/L zinc was reported in WBGmw-015. This result is more than eight times the background value, and is the largest exceedance of background for groundwater samples at WBG.

There were no occurrences of metals above background criteria in 8 of the 17 wells: OBG-1 and –2 and WBGmw-006, -008, -011, -012, -013, and -017. The following wells had only one metal detected above background (or above detection levels if no background value was available): OBG-4 and WBGmw-007, -010, -014, and -016. The remaining wells (OBG-3 and WBGmw-005, -009, and -015) had either two or three metals above background criteria.



LEGEND:

- 5 — PAD LOCATION WITH ID
- APPROXIMATE LOCATION OF PAD
- POND
- BEAVER DAM POND
- STREAM
- 10-FT CONTOUR INTERVAL (AMSL)
- 2-FT CONTOUR INTERVAL (AMSL)
- WBGmw-006 — EXISTING MONITORING WELL
- WBGmw-010 — PHASE III MONITORING WELL

ALL CONCENTRATIONS SHOWN IN UNITS OF µg/L.

UNCONSOLIDATED ZONE FILTERED GROUNDWATER BACKGROUND CRITERIA

ALUMINUM	0	COBALT	0
ARSENIC	11.7 µg/L	MANGANESE	1,020 µg/L
BARIUM	22.1 µg/L	NICKEL	0
CADMIUM	0	ZINC	60.9 µg/L

OHIO STATE PLANE (NAD83)

0 250 500 1000

SCALE: 1" = 500'

US Army Corps of Engineers Louisville District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

WINKLEPECK BURNING BROUNDS
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE:
R. BEELER	0 / 01-28-04	/03046/DWGS/T55MW02

Figure 4-23. Metals Exceeding Background in Groundwater at Winklepeck Burning Grounds (Phase III data only)

The analytical results for metals in groundwater are consistent in some respects with the Phase II RI results – there are very few metals present above background, and each well has three or fewer metals that are present above background. The barium result for OBG-3, (110 μg/L) is similar to that measured in the Phase II RI (98.1 μg/L). However, other occurrences of metals in groundwater do not correlate with results from the Phase II; constituents that occurred above background criteria in the Phase II RI in one well are now present in other wells, and no longer above background in the original wells.

4.5.3 Volatile Organic Compounds, Semivolatile Organic Compounds, and Polychlorinated Biphenyls

All Phase III groundwater samples were analyzed for organic compounds, including pesticides/PCBs, SVOCs, and VOCs. A total of four compounds were detected, these are the pesticides, 4-4'-DDT and heptachlor epoxide; the SVOC, bis(2-ethylhexyl)phthalate; and the VOC, chloroform. These compounds occurred in a total of four wells, as shown in Table 4-35. WBGmw-006 contained 4-4'-DDT, and WBGmw-007 contained bis(2-ethylhexyl)phthalate. This SVOC was the most commonly detected organic compound, also being detected in WBGmw-010 and -013. Heptachlor epoxide and chloroform were also detected in WBGmw-010.

As in the Phase II RI, the compounds detected in groundwater are not known to be specifically related to burning ground activities and are distributed sporadically among the monitoring wells. Their sources are unknown. There were no detectable concentrations of PCBs, PAHs, or other organic compounds in the monitoring wells.

4.5.4 Groundwater Summary

4.5.4.1 Explosives

- Every monitoring well, with the exception of OBG-2 and WBGmw-013, was found to have low concentrations of one or more explosives. Concentrations ranged from 0.05 μg/L (2,4-DNT) in WBGmw-005 to a maximum concentration of 52 μg/L (RDX) in WBGmw-006.

- There were five occurrences of explosives in concentrations greater than 1 μg/L. Two of these are in WBGmw-006, two are in WBGmw-015, and one is in WBGmw-010. WBGmw-006 contains the highest concentrations of explosives in WBG groundwater.

- Propellants were not detected in groundwater.

- The well at the eastern AOC boundary, WBGmw-016, contained low concentrations of 2- and 4-nitrotoluene.

- Although the spatial distributions of specific compounds have changed over time, concentrations of explosives in WBG groundwater appear to have changed very little since the Phase II RI.

4.5.4.2 Metals

- Eight metals were detected above background in Phase III groundwater samples: aluminum, arsenic, barium, cadmium, cobalt, manganese, nickel, and zinc. Copper, mercury, and cyanide were previously identified as SRCs in Phase II samples, but these three constituents were not detected in Phase III samples.

- OBG-1 and -2 and WBGmw-006, -008, -011, -012, -013, and -017 had no occurrences of metals above background criteria.

- The largest exceedance of background criteria was 500 μg/L zinc at WBGmw-015 (over eight times the background value).

- The occurrences of metals above background values are generally limited to three or fewer per monitoring well. Metals occur at concentrations exceeding secondary MCLs, but there are no occurrences of metals at concentrations above primary MCLs.

- Concentrations of metals are similar to those observed during the Phase II RI, although distributions have shifted.

4.5.4.3 Organic compounds

- Low levels of bis-2(ethylhexyl)phthalate were the only SVOC detected during the Phase III RI (WBGmw-007, WBGmw-010, and WBGmw-013). The pesticide 4,4'-DDT was detected in WBGmw-006 (0.058J μg/L) and heptachlor epoxide was detected in WBGmw-010 at a concentration of 0.056J ug/L. PCBs and PAHs were not detected.

- Chloroform was the only VOC detected in WBGmw-010.

4.6 ORDNANCE AND EXPLOSIVES AVOIDANCE SURVEY SUMMARY

Inert fuzes, projectile flash tubes, a fuze adapter, a tail assembly of a 90-mm mortar, a 155-mm shell fragment, a 40-mm cartridge with no projectile, and numerous cartridge-actuated devices were observed during visual field reconnaissance and magnetometer surveys of access routes and proposed sample points. Most of the observed OE and ordnance-related debris were associated with bare soil areas near Pad 45 (Deactivation Furnace), Pads 58 through 61, and in the firebreak adjacent to Pad 7. Areas that contained surface and subsurface magnetic anomalies were marked appropriately as part of OE avoidance. During sampling activities, subsurface soil borings were screened at 2-ft intervals to ensure that no metallic anomalies were encountered. Proposed locations for monitoring wells were hand augered to 4 ft and cleared with a magnetometer before the drill crew was allowed to proceed. On several occasions, proposed soil sample or monitoring well locations had to be moved slightly due to the detection of surface and subsurface anomalies. A detailed report of OE avoidance activities is provided in Appendix N.

4.7 COMPARATIVE EVALUATION OF FIELD AND LABORATORY ANALYSES FOR EXPLOSIVES AND METALS

4.7.1 Explosives

This section presents a comparison of the TNT and RDX field screening analyses to values determined by the off-site analytical laboratory.

4.7.1.1 Field sampling and analysis protocol

Samples were collected from surface and subsurface soil locations in and around WBG sites. All surface soil (0- to 1-ft depth) samples were composite samples from three individual sampling locations positioned in a 3-ft equilateral triangle pattern in the sampling area. Subsurface samples were collected at discrete locations, but were composited over the associated depth interval.

Field determinations of TNT and RDX in soil samples were performed through implementation of colorimetric analyses developed by the USACE Cold Regions Research & Engineering Laboratory.

The procedure for measuring TNT concentrations in soils involves a liquid extraction of the explosives from the soil matrix with acetone, and formation of a color complex with sodium sulfite and potassium hydroxide. Absorbance is measured at a wavelength of 540 nm. For RDX, all nitrate must be removed from the extract, then glacial acetic acid and zinc powder are added. A complexing agent (NitriVer3) is added to the sample, and absorbance is measured at 507 nm. In both methods, percent absorbance is correlated to concentration.

Off-site laboratory determinations for TNT and RDX were performed through solvent extraction and analysis by liquid chromatographic techniques (SW846-8330).

All surface soil and subsurface soil samples were field analyzed with colorimetric methods for TNT and RDX. The purpose of the analysis was to define the extent of surface soil contamination with respect to these explosive compounds. Field colorimetry was also used as a screening method to reduce the number of samples that required fixed-base laboratory analysis for explosives. The strategy can be summarized as follows:

- If the field method indicated TNT was present at ≥ 1 mg/kg, the sample was sent to the off-site laboratory for analysis of explosives and propellants;
- If the concentration of TNT was < 1 mg/kg, the analysis for RDX was performed;
- If RDX was present at a concentration ≥ 1 mg/kg, the sample was sent to the off-site laboratory for analysis of explosives and propellants; and
- In addition, 15% of the samples showing non-detects of TNT or RDX were sent to the off-site laboratory for analysis of explosives.

As noted in Section 3.4, an error in the field explosives calculation formula resulted in some samples with TNT or RDX above 1 mg/kg (corrected) not being sent to the fixed-base laboratory.

4.7.1.2 TNT comparison

TNT field screening and laboratory results are presented in Table 4-36. Starting with the premise that the laboratory results are accurate relative to the presence or absence of TNT in the sample, the field screening values provide 2% false-negative information and 10% false-positive information. Consideration of values less than 2 mg/kg as equivalent reduces the false-positive rate to 2%. Comparison of positive TNT data where both laboratory and field screening values were greater than 1 mg/kg provided a correlation coefficient of 0.257 (Figure 4-24).

Review of laboratory results for associated explosive compounds (i.e., TNB, DNTs, nitrotoluenes, nitrocellulose, etc.) indicates there were not any impacts on the field screening determinations from these compounds. Elevated levels of nitrocellulose did not appear to influence the TNT screening value. The low levels of other nitro-compounds observed in these samples did not exhibit any impact on the TNT screening levels.

Table 4-36. TNT Lab/Field Comparison

Station	Sample ID	Lab Results	Field Results[a]	Units	Station	Sample ID	Lab Results	Field Results[a]	Units
WBG-254	WBG4187	0.16 J	1.1	mg/kg	WBG-242	WBG4149	0.25 U	1 U	mg/kg
WBG-255	WBG4190	0.98	5	mg/kg	WBG-247	WBG4163	0.19 J	1 U	mg/kg
WBG-201	WBG4012	0.25 U	1 U	mg/kg	WBG-252	WBG4180	490	1,670	mg/kg
WBG-197	WBG4000	0.25 U	1 U	mg/kg	WBG-252	WBG4181	5,200	1,200	mg/kg
WBG-211	WBG4046	680	223	mg/kg	WBG-252	WBG4182	3,300	1,360	mg/kg
WBG-212	WBG4049	0.25 U	1 U	mg/kg	WBG-252	WBG4183	860	475	mg/kg
WBG-222	WBG4079	0.51	318	mg/kg	WBG-232	WBG4112	0.13 J	1 U	mg/kg
WBG-234	WBG4119	0.13 J	1 U	mg/kg	WBG-232	WBG4113	0.17 J	1.2	mg/kg
WBG-236	WBG4125	0.25 U	1 U	mg/kg	WBG-232	WBG4114	0.06 J	1.1	mg/kg
WBG-241	WBG4142	0.25 U	1 U	mg/kg	WBG-232	WBG4115	0.25 U	1 U	mg/kg
WBG-203	WBG4018	0.25 U	1 U	mg/kg	WBG-227	WBG4095	0.17 J	3.5	mg/kg
WBG-242	WBG4145	0.28	1 U	mg/kg	WBG-227	WBG4096	0.12 J	1 U	mg/kg
WBG-247	WBG4162	1.5	4.5	mg/kg	WBG-227	WBG4097	0.25 U	1.9	mg/kg
WBG-252	WBG4179	430	1,780	mg/kg	WBG-227	WBG4098	0.25 U	1 U	mg/kg
WBG-232	WBG4111	0.07 J	1.8	mg/kg	WBG-237	WBG4129	0.06 J	1 U	mg/kg
WBG-227	WBG4094	0.25 U	1 U	mg/kg	WBG-237	WBG4130	0.25 U	1 U	mg/kg
WBG-237	WBG4128	0.25 U	1 U	mg/kg	WBG-237	WBG4131	0.25 U	1 U	mg/kg
WBG-281	WBG4236	0.25 U	1 U	mg/kg	WBG-237	WBG4132	0.25 U	1 U	mg/kg
WBG-257	WBG4196	0.07 J	1 U	mg/kg	WBG-220	WBG4074	1.8	2.3	mg/kg
WBG-210	WBG4041	0.25 U	1 U	mg/kg	WBG-243	WBG4151	11	1 U	mg/kg
WBG-205	WBG4028	17	28	mg/kg	WBG-219	WBG4072	0.06 J	1 U	mg/kg
WBG-199	WBG4008	10	17	mg/kg	WBG-257	WBG4197	0.25 U	1 U	mg/kg
WBG-199	WBG4007	190	138	mg/kg	WBG-257	WBG4198	0.25 U	1 U	mg/kg
WBG-203	WBG4019	0.25 U	1 U	mg/kg	WBG-257	WBG4199	0.25 U	1 U	mg/kg
WBG-203	WBG4020	0.25 U	1 U	mg/kg	WBG-257	WBG4200	0.25 U	1 U	mg/kg
WBG-203	WBG4021	0.25 U	1 U	mg/kg	WBG-210	WBG4042	0.07 J	1 U	mg/kg
WBG-203	WBG4022	0.25 U	1 U	mg/kg	WBG-210	WBG4043	0.25 U	1 U	mg/kg
WBG-242	WBG4146	0.25 U	1 U	mg/kg	WBG-210	WBG4044	0.25 U	1 U	mg/kg
WBG-242	WBG4147	0.25 U	1 U	mg/kg	WBG-210	WBG4045	0.25 U	1 U	mg/kg
WBG-242	WBG4148	0.25 U	1 U	mg/kg					

[a]Field results presented are corrected values (see Section 3.4.1).
TNT = Trinitrotoluene.

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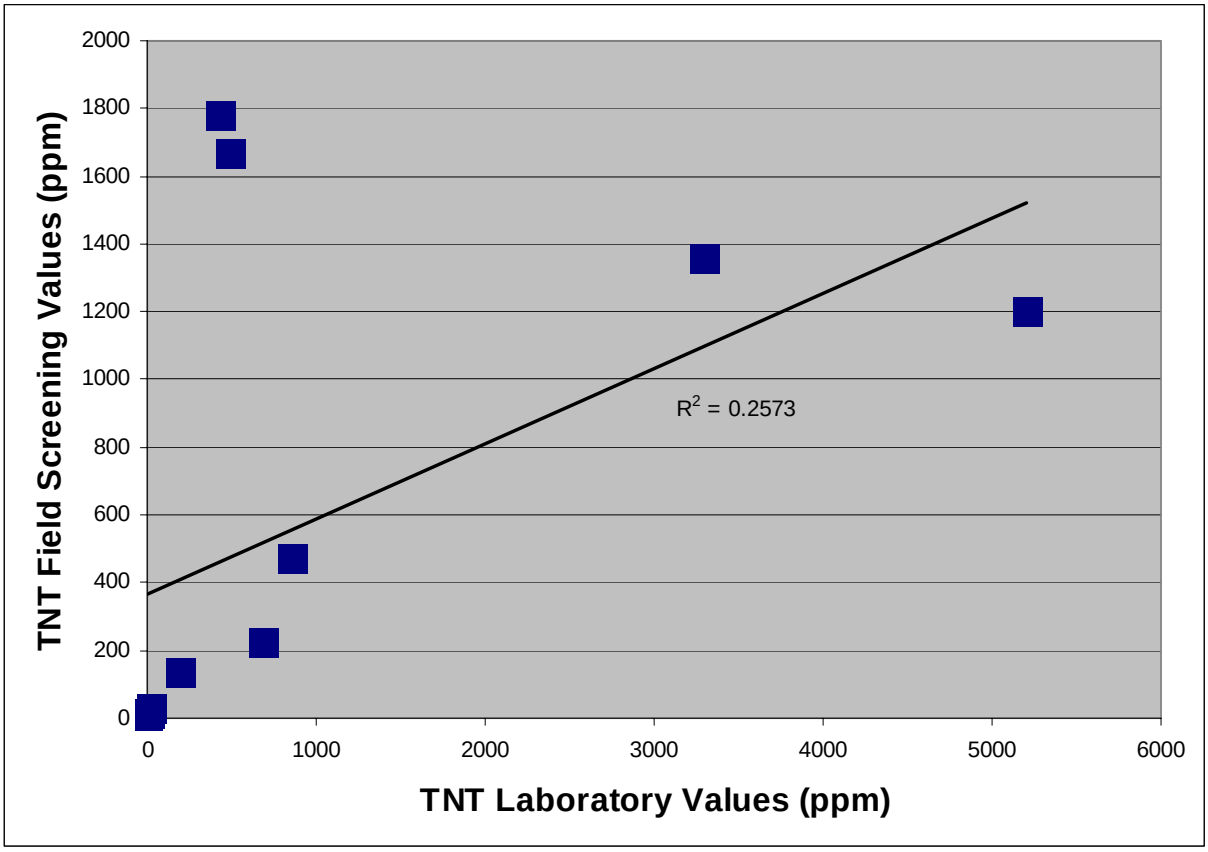

Figure 4-24. Field Screening/Laboratory Data Comparison

Figure 4-24 plots field screening data versus laboratory data. The limited data available for comparison provides a correlation coefficient of 0.257. It is believed the field screening has provided a valid representation of the presence or absence of TNT above 1 to 2 mg/kg; however, quantified results indicate a high degree of heterogeneity in the sample matrices. Sample composite procedures, combined with field and laboratory analytical sample sizes, plus contaminant particle size, make it difficult for the sampling and analytical process to consistently quantify comparative results.

4.7.1.3 RDX comparison

RDX field screening and laboratory results are presented in Table 4-37. Starting with the premise that the laboratory results are accurate relative to the presence or absence of RDX in the sample, the field method produced 0% false-negative information and 5% false-positive information. However, there are limited comparison data for RDX as a result of the screening process protocol. Samples containing TNT in excess of 1 ppm that also have a high potential for elevated RDX concentrations were not field screened for RDX. Therefore, the number of positive results for comparison does not exist. Due to the limited positive RDX data available, correlation coefficient information was not feasible. It is believed the field screening has provided a valid representation of the presence or absence of RDX above 1 mg/kg; however, these few comparisons do not provide confidence in the field screening quantified results.

Table 4-37. RDX Lab/Field Comparison

Station	Sample ID	Lab Results	Field Results[a]	Units	Station	Sample ID	Lab Results	Field Results[a]	Units
WBG-254	WBG4187	0.5 U	4.1	mg/kg	WBG-242	WBG4149	0.5 U	1 U	mg/kg
WBG-201	WBG4012	0.5 U	1 U	mg/kg	WBG-247	WBG4163	0.5 U	1 U	mg/kg
WBG-197	WBG4000	0.5 U	1 U	mg/kg	WBG-232	WBG4112	0.5 U	1 U	mg/kg
WBG-212	WBG4049	0.5 U	1 U	mg/kg	WBG-232	WBG4115	0.5 U	1 U	mg/kg
WBG-234	WBG4119	0.5 U	2	mg/kg	WBG-227	WBG4095	0.5 U	1 U	mg/kg
WBG-236	WBG4125	0.5 U	1 U	mg/kg	WBG-227	WBG4096	0.23 J	1 U	mg/kg
WBG-241	WBG4142	0.5 U	1 U	mg/kg	WBG-227	WBG4098	0.5 U	1 U	mg/kg
WBG-203	WBG4018	0.5 U	1 U	mg/kg	WBG-237	WBG4129	0.5 U	1 U	mg/kg
WBG-242	WBG4145	0.5 U	1 U	mg/kg	WBG-237	WBG4130	0.5 U	1 U	mg/kg
WBG-227	WBG4094	0.5 U	1 U	mg/kg	WBG-237	WBG4131	0.5 U	1 U	mg/kg
WBG-281	WBG4236	0.5 U	1 U	mg/kg	WBG-237	WBG4132	0.5 U	1 U	mg/kg
WBG-257	WBG4196	0.5 U	1 U	mg/kg	WBG-243	WBG4151	0.2 J	1 U	mg/kg
WBG-210	WBG4041	0.5 U	1 U	mg/kg	WBG-219	WBG4072	1.2	1.5	mg/kg
WBG-205	WBG4028	0.5 U	1 U	mg/kg	WBG-257	WBG4197	0.5 U	1 U	mg/kg
WBG-203	WBG4019	0.5 U	1 U	mg/kg	WBG-257	WBG4198	0.5 U	1 U	mg/kg
WBG-203	WBG4020	0.5 U	1 U	mg/kg	WBG-257	WBG4199	0.5 U	1 U	mg/kg
WBG-203	WBG4021	0.5 U	1 U	mg/kg	WBG-257	WBG4200	0.5 U	1 U	mg/kg
WBG-203	WBG4022	0.5 U	1 U	mg/kg	WBG-210	WBG4042	0.5 U	1 U	mg/kg
WBG-242	WBG4146	0.5 U	1 U	mg/kg	WBG-210	WBG4043	0.5 U	1 U	mg/kg
WBG-242	WBG4147	0.5 U	1 U	mg/kg	WBG-210	WBG4044	0.5 U	1 U	mg/kg
WBG-242	WBG4148	0.5 U	1 U	mg/kg	WBG-210	WBG4045	0.5 U	1 U	mg/kg

[a]Field results presented are corrected values (see Section 3.4.1).
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

Review of laboratory results for associated explosive compounds (i.e., HMX, nitrocellulose, nitroquanidine, etc.) does not indicate any obvious impacts on the field screening determinations from these compounds. Elevated levels of nitrocellulose did not appear to influence the RDX screening value. Low levels of HMX and nitroquanidine observed in these samples did not exhibit an impact on the RDX screening levels.

4.7.2 Field Metals Analysis by X-Ray Fluorescence

Two types of field XRF measurements were made at WBG: in situ and ex situ. In situ measurements were made at each of the surface soil sampling locations. The center and the vertices of an equilateral triangle with 3-ft sides were cleared of vegetation and surface debris at each sampling location. A Niton 700 Series XRF instrument was used in the field to record metal concentrations at the center and the vertices of the triangle. Thus, there were four in situ XRF measurements made at each surface soil sampling location.

Ex situ XRF measurements were made in a field laboratory by EPA method SW846 6200 on a split of each sample that was sent to the laboratory for analysis by inductively couple plasma (ICP) (SW846 6010) or atomic absorption (AA) methods (SW846 7471). Surface and subsurface soil and dry ditch sediment samples were hand augered from the center of the sampling location to a depth of 1 ft. Each sample was placed in a stainless-steel bowl and thoroughly homogenized. Aliquots for the ex situ XRF and the usual laboratory analyses were extracted from the homogenized mixture.

The XRF measurements were made to see if this technique would produce results comparable to the usual laboratory methods. If the XRF and usual laboratory methods produce comparable results, the more rapid and less expensive XRF method could be used in the future to define the extent of contamination. The ex situ measurements should be directly comparable to the laboratory measurements. The ex situ and laboratory samples were splits from the same homogenized source material. Differences between the

ex situ XRF and laboratory results should primarily reflect differences in the two methods used on the same material.

The in situ XRF measurements were made at four points on and near the location from which the laboratory and ex situ XRF samples were taken. Differences among these four in situ XRF results represent spatial variability in the surface concentrations of the metals, as well as variability of the XRF instrument. The in situ results may be compared to the ex situ results to compare the variability of metal concentrations on the soil surface to the concentration from a homogenized soil interval based on the XRF method. Results from the in situ method may be compared to the usual laboratory results to see how characterization by field XRF would compare to the conclusions drawn from the usual laboratory results. All in situ and ex situ XRF results are listed in Appendix J.

4.7.2.1 Ex situ XRF results compared to ICP and AA laboratory results

Results for all metals reported by the ex situ XRF method are summarized in Table 4-38. Nine analytes measured by XRF were not included in the target analyte list for the laboratory analyses. Five of these nine—cesium, lanthanum, palladium, tellurium, and tin—were infrequently detected. Of the other four, rubidium, strontium, and zirconium were detected in all of the samples and molybdenum in more than 70% of the samples. It is not possible, however, to assess the accuracy of these nine metals because the actual concentrations are unknown. The nine metals that were not included on the laboratory target analyte list are not discussed further.

Fifteen of the metals measured by XRF were also measured by the usual ICP and AA methods. Summary statistics for samples analyzed by laboratory ICP and AA methods are presented in Table 4-39. The average detection limits for the XRF analyses are higher than the average detection limits for the usual laboratory analyses, in some cases as much as 100 times higher (compare Tables 4-38 and 4-39). The higher detection limits for the XRF method reduce the effectiveness of the method to measure certain metals in a field setting, such as at WBG. Mercury, selenium, and silver were not further compared to the laboratory results because they were not detected in any of the ex situ XRF samples.

The results for the remaining 12 analytes that were measured by both techniques are plotted in Figures 4-25 through 4-30. These figures show three scatter plots for each analyte. The plot at the top of the page shows the in situ versus ex situ results. The middle plot shows the in situ results versus the results for the usual laboratory method. The plot at the bottom shows the results for the ex situ method versus the usual laboratory method. Only results that were considered detects for both methods are plotted. For the in situ measurements, a line connects the minimum and maximum detect from the same sampling location, and a crossbar on the line indicates the average value. If both methods were measuring the same concentration, all of the points should fall on a line with a slope of 1.0. A reference line with a slope of 1 is drawn on each plot.

A linear regression model was fit to the data in each plot. The laboratory data were modeled as the independent variable and the ex situ measurements as the dependent variable. Statistics for each regression model are reported in Table 4-40. The correlation coefficient (r^2 value) is a measure of how well the measurements from the two methods are related to each other. An r^2 value of 1.0 indicates perfect agreement. An r^2 value close to zero indicates no relationship between the measurements. The intercept is the modeled value of the ex situ measurement when the laboratory measurement was zero. If both methods were equally sensitive at low concentrations, the intercept should be close to zero. The slope is the modeled ratio of the ex situ to the laboratory measurements. If the methods were measuring exactly the same concentrations, then the slope would be close to 1.0. The probability is another measure of how well the measurements are correlated. A low probability (close to zero) indicates that the observed correlation is “real” and not the chance result of random measurements.

Table 4-38. Summary of Ex Situ XRF Metal Analyses[a]

Metal	Number Detects/ Number Samples	Average Detect	Std. Dev. for Detects	Minimum Detect	Maximum Detect	Average Detection Limit	Minimum Non-detect	Maximum Non-detect
Antimony	13/ 166	320	462	78.7	1,729.6	57.9	37.8	79.95
Arsenic	40/ 166	25	21	15.2	149.3	17.1	11.25	65.4
Barium	166/ 166	634	820	218.2	8,396.8	93.1	AD	AD
Cadmium	4/ 166	117	79.5	45.4	216.2	42.5	28.05	64.35
Cesium	0/ 166	ND	ND	ND	ND	65.3	41.55	165
Chromium	18/ 166	422	213	227.2	956	235	165	405
Cobalt	10/ 166	459	58.1	327.8	529.6	370	225	870
Copper	30/ 166	361	280	77.5	951.2	71.4	53.1	98.1
Iron	166/ 166	29,800	13,300	13,299.2	11,9910.4	676	AD	AD
Lanthanum	12/ 166	65.8	9.64	53.7	91.6	52.6	36.15	90.45
Lead	134/ 166	166	350	17	2,699.2	18	13.95	19.35
Manganese	20/ 166	880	434	394	2,148.8	550	345	1,334.4
Mercury	0/ 166	ND	ND	ND	ND	11.9	8.4	28.5
Molybdenum	118/ 166	12.2	2.61	8.4	21.9	6.8	8.25	9.9
Nickel	7/ 166	156	17	130.6	179.2	130	87.75	285
Palladium	0/ 166	ND	ND	ND	ND	38.1	24.75	51.45
Rubidium	166/ 166	120	21.3	68.1	172.2	11	AD	AD
Selenium	0/ 166	ND	ND	ND	ND	9.04	6.9	17.4
Silver	0/ 166	ND	ND	ND	ND	199	133.65	240
Strontium	166/ 166	81.9	33.2	45.9	292	8.49	AD	AD
Tellurium	0/ 166	ND	ND	ND	ND	73.8	50.1	102.45
Tin	6/ 166	393	446	179.3	1,300	155	108	195
Zinc	166/ 166	396	921	42.6	7,616	39.5	AD	AD
Zirconium	166/ 166	293	58.8	121.2	528	12.2	AD	AD

[a]All results in mg/kg.
AD = All detects; therefore, no minimum or maximum non-detect.
ND = No detects; therefore, no average, standard deviation, minimum, or maximum detect.
XRF = X-ray fluorescence.

Table 4-39. Summary of Laboratory ICP and AA Metal Analyses[a]

Metal	Number Detects/ Number Samples	Average Detect	Std. Dev. for Detects	Minimum Detect	Maximum Detect	Average Detection Limit	Minimum Non-detect	Maximum Non-detect
Aluminum	165/165	12,300	2,930	3,580	20,000	24.5	AD	AD
Antimony	97/166	9.39	29.2	0.61	236	1.32	1.1	1.4
Arsenic	166/166	13.7	4.84	4.5	38.4	0.658	AD	AD
Barium	165/165	274	712	20.2	7,160	25.7	AD	AD
Beryllium	140/165	0.505	0.229	0.14	1.8	0.612	0.11	0.65
Cadmium	116/165	4.71	20.4	0.063	201	0.659	0.56	3
Calcium	157/165	6,500	10,900	126	75,500	616	157	6,630
Chromium	165/165	19.9	11.4	6.4	80.9	1.32	AD	AD
Cobalt	165/165	9.75	3.32	1.6	18.2	6.12	AD	AD
Copper	165/165	91.9	203	5.8	1,830	3.06	AD	AD
Iron	165/165	27,500	16,100	8,310	163,000	13.2	AD	AD
Lead	166/166	99.5	197	4	1,130	0.395	AD	AD
Magnesium	165/165	3,210	1,900	941	12,400	612	AD	AD
Manganese	165/165	633	470	98.3	3,170	1.98	AD	AD
Mercury	155/166	0.0718	0.154	0.0097	1.4	0.122	0.11	0.12
Nickel	165/165	22.3	12.4	7	92.7	4.93	AD	AD
Potassium	165/165	1,330	561	223	3,130	616	AD	AD
Selenium	106/166	1.2	0.73	0.42	4.6	0.658	0.41	1.3
Silver	32/165	3.02	6.01	0.2	26.7	1.22	1.1	1.4
Sodium	52/165	257	353	60.1	1,780	612	64.4	679
Thallium	160/166	0.487	0.142	0.17	0.82	0.612	0.75	0.82
Vanadium	164/165	21.8	6.13	7.1	44.8	6.59	21.1	21.1
Zinc	164/165	288	598	19.9	4,520	2.89	66.9	66.9

[a]All results in mg/kg.
AA = Atomic absorption.
AD = All detects; therefore, no minimum or maximum non-detect.
ICP = Inductively coupled plasma.

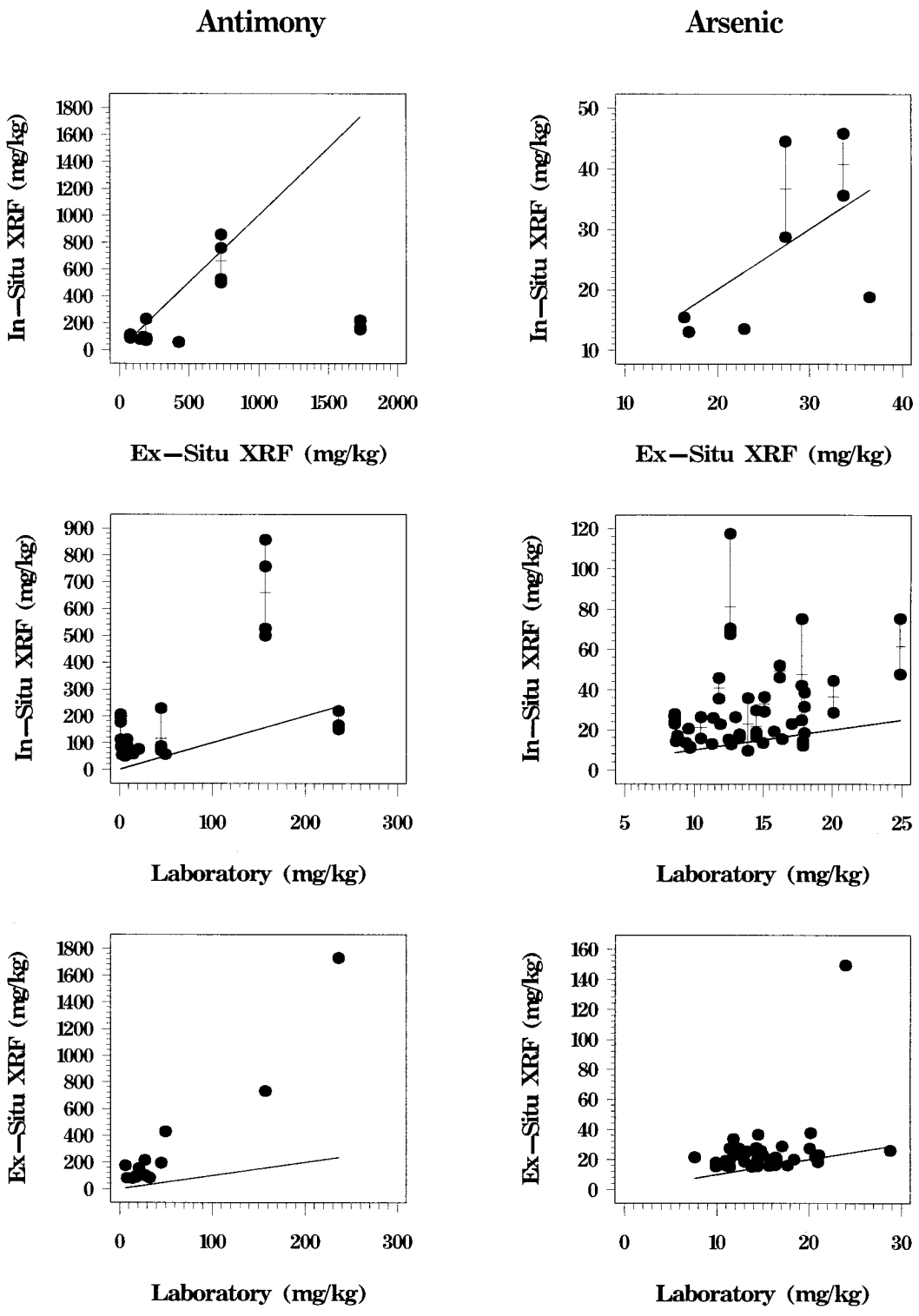

Figure 4-25. Comparison of XRF and Laboratory Measurements of Antimony and Arsenic

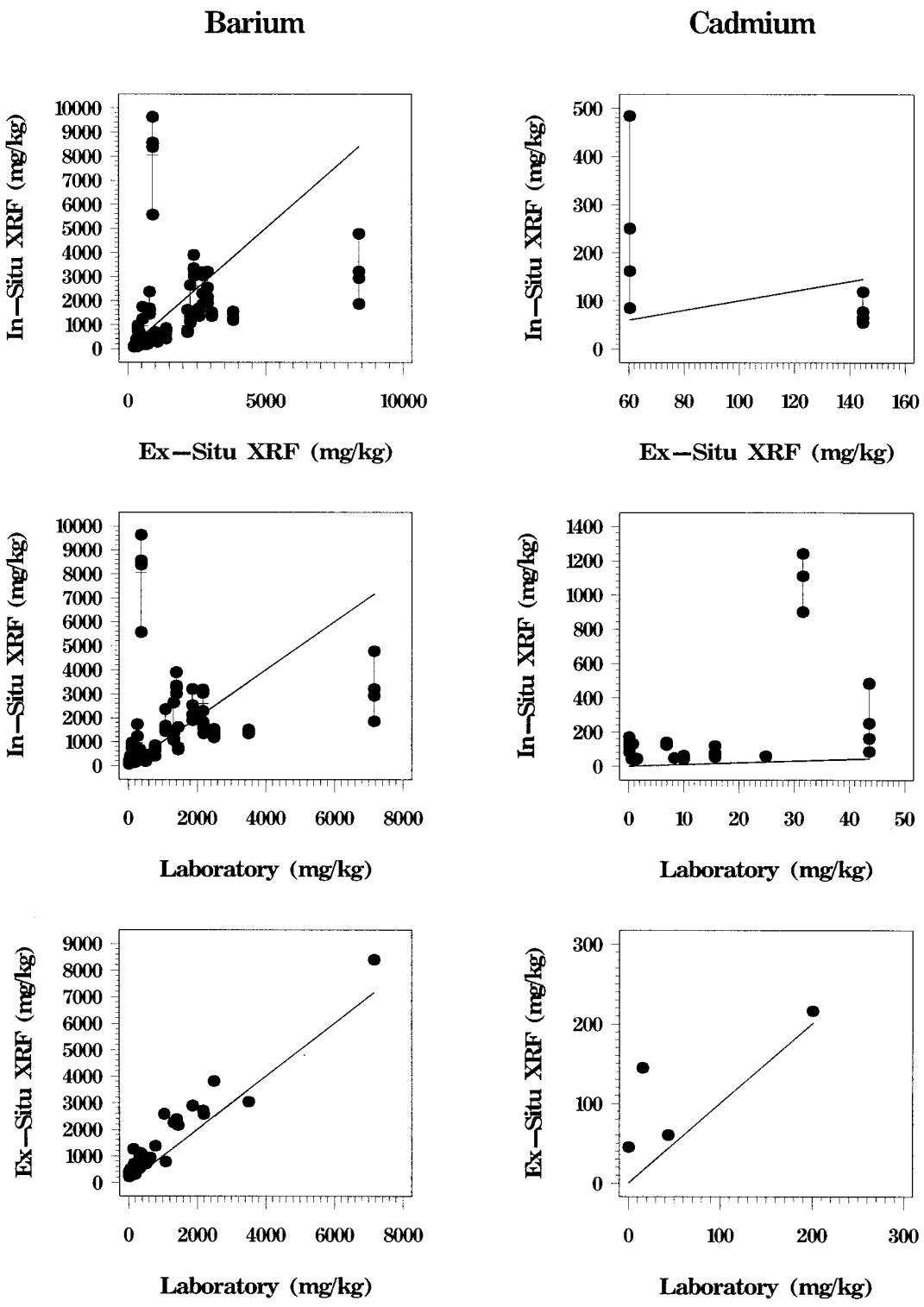

Figure 4-26. Comparison of XRF and Laboratory Measurements of Barium and Cadmium

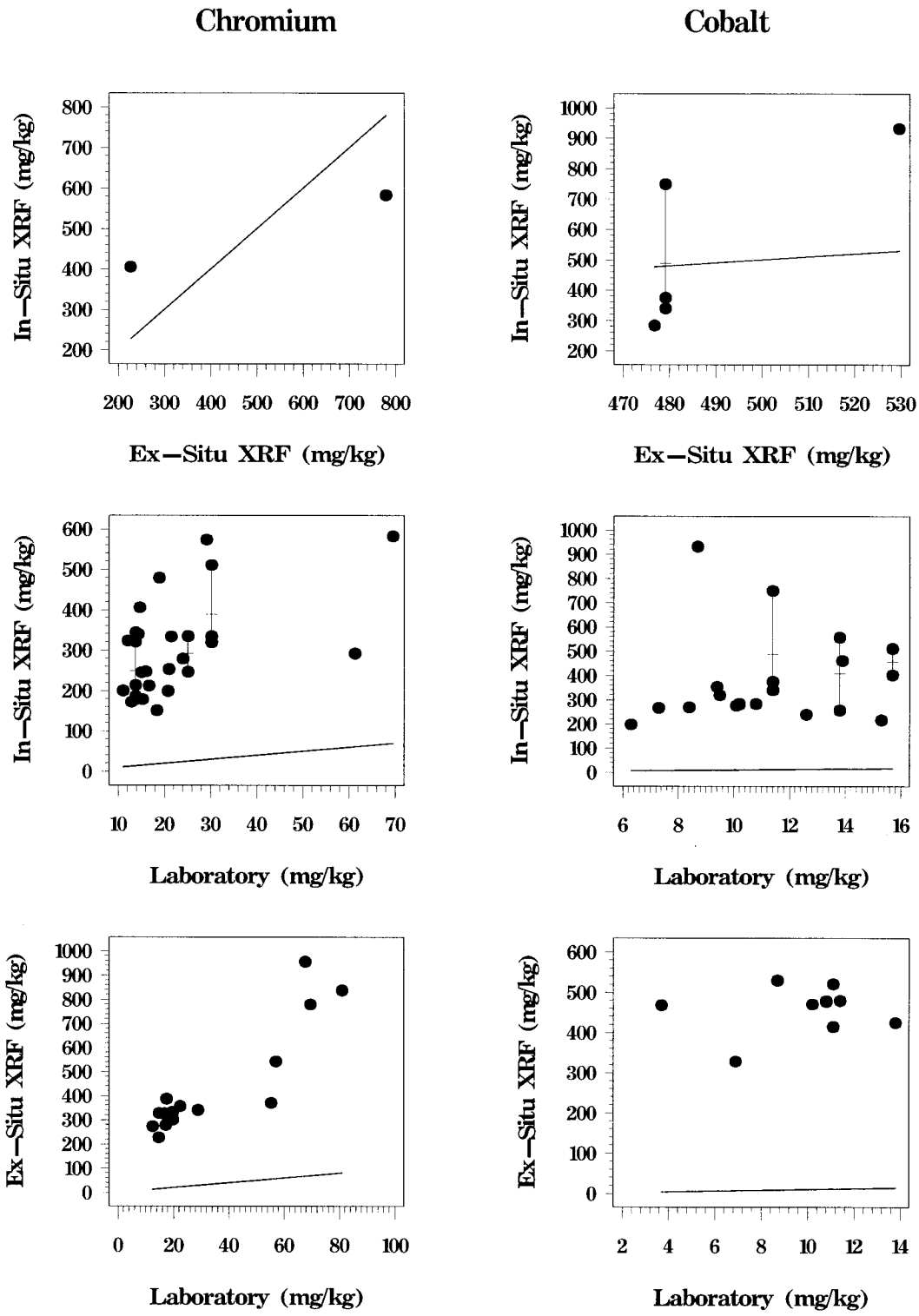

Figure 4-27. Comparison of XRF and Laboratory Measurements of Chromium and Cobalt

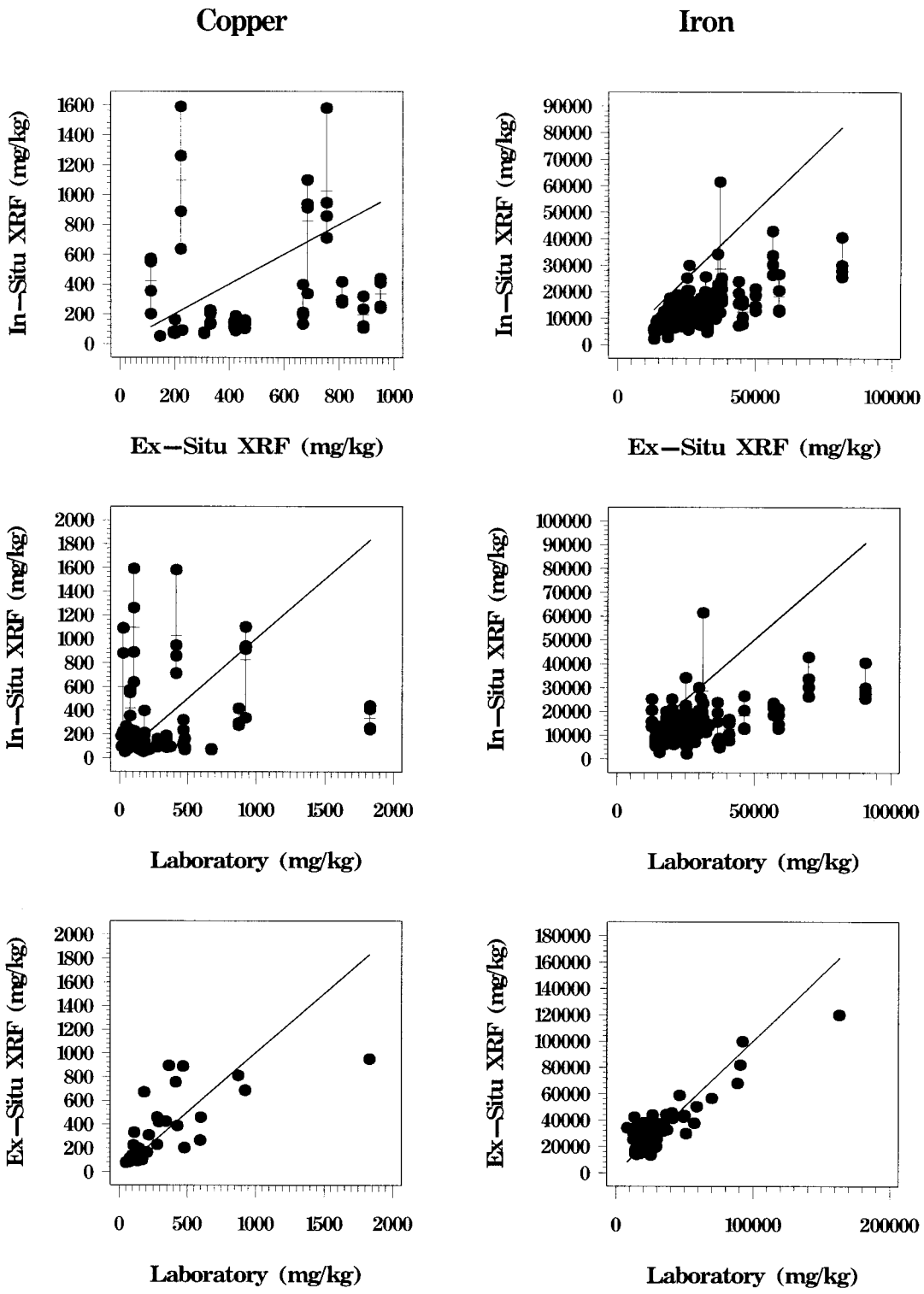

Figure 4-28. Comparison of XRF and Laboratory Measurements of Copper and Iron

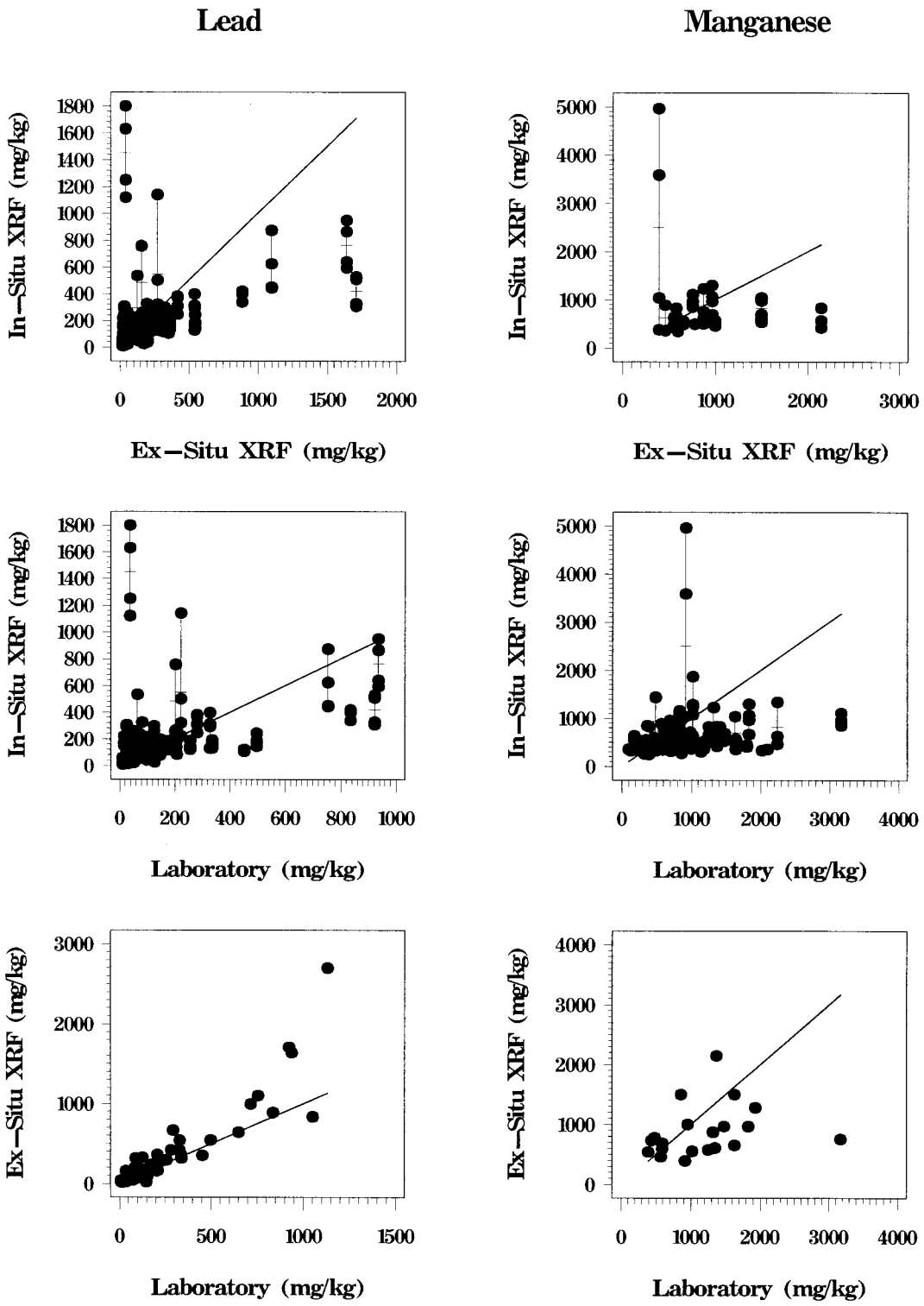

Figure 4-29. Comparison of XRF and Laboratory Measurements of Lead and Manganese

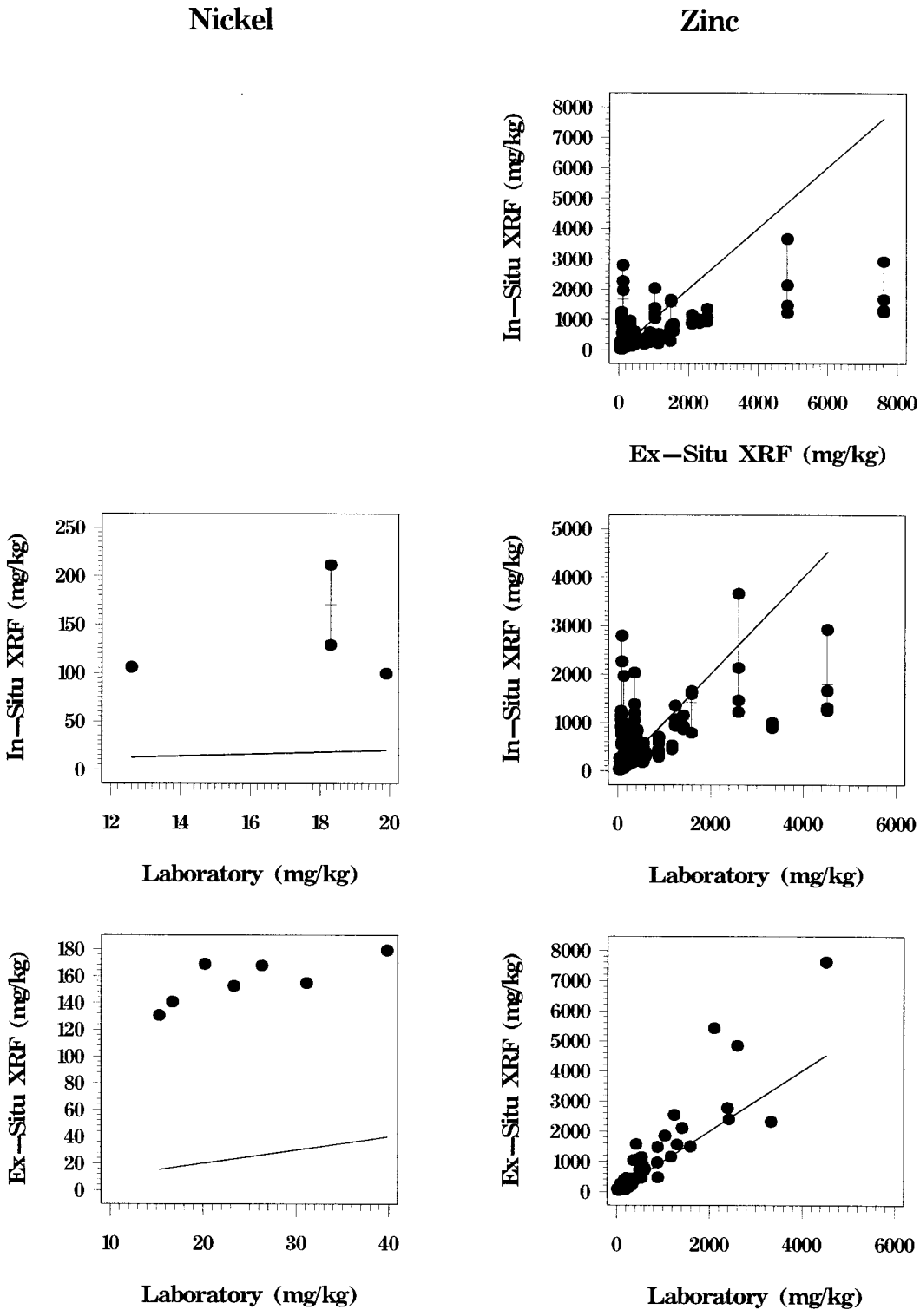

Figure 4-30. Comparison of XRF and Laboratory Measurements of Nickel and Zinc

Table 4-40. Linear Regression Model Statistics for Ex Situ XRF versus Laboratory Metal Analyses

Chemical	r^2	Intercept	Slope	Probability
Antimony	0.9278	-13.323	6.56266	0.0001
Arsenic	0.1451	-3.98671	1.9008	0.0153
Barium	0.9456	328.62487	1.12213	0.0001
Cadmium	0.6663	70.93319	0.70254	0.1837
Chromium	0.8118	155.45239	8.41273	0.0001
Cobalt	0.02	430.17472	2.93252	0.6964
Copper	0.4785	175.43173	0.53813	0.0001
Iron	0.7208	10490	0.70309	0.0001
Lead	0.8488	-12.8659	1.50054	0.0001
Manganese	0.0665	681.08099	0.16708	0.2722
Nickel	0.5802	119.22129	1.50232	0.0466
Zinc	0.8524	-12.39173	1.42967	0.0001

r^2 = correlation coefficient.
XRF = X-ray fluorescence.

The bottom plot in each column of Figures 4-25 through 4-30 shows the ex situ results relative to the laboratory results. Table 4-40 shows the regression statistics for a linear model though these points. For antimony, most points fell above the 1:1 reference line, indicating that the ex situ XRF tends to overestimate the metal concentrations compared to the laboratory measurements (Figure 4-25). This is confirmed by the regression model, which has a slope greater than 6. The measurements of arsenic are poorly correlated as seen in the plot and the regression r^2 value of 0.15. The plot for barium indicates a strong correlation between the laboratory and ex situ measurements (Figure 4-26). Both the r^2 value and slope of the regression model are close to 1.0 (Table 4-40), indicating that the XRF and laboratory methods are reporting comparable results. There were only four ex situ detects for cadmium so it is difficult to assess how well the methods correlate. For chromium, higher ex situ results appear to correspond with higher laboratory results (r^2 value of 0.81) but the ex situ results are nearly 10 times higher than the laboratory results (regression slope of 8.4). The much higher ex situ results suggest a calibration or interference problem for this analyte. For cobalt (Figure 4-27), the ex situ XRF measurements appeared uncorrelated with the laboratory measurements and generally higher by a factor of 10 or more. If the laboratory measurements are accurate, the plot indicates that the XRF method is not sensitive to the cobalt concentration. For copper, the ex situ measurements appeared to be correlated with the laboratory measurements with increasing scatter as concentrations increased (Figure 4-28). This pattern could indicate interference in the XRF method. This scatter results in an r^2 value of 0.48 for the regression model. The regression slope of 0.54 is influenced by one large outlier point. The results for the two methods appear to be correlated for iron with an r^2 value of 0.72 and slope of 0.7 (Figure 4-28 and Table 4-40). The methods also appear to be fairly well correlated for lead with an r^2 value of 0.85 and slope of 1.5 (Figure 4-29 and Table 4-40), although there is some scatter at the higher concentrations. Results for the two methods appeared to be poorly correlated for manganese (Figure 4-29). Nickel was detected in only 7 of 166 samples by the ex situ XRF method. While there appeared to be some correlation between the ex situ and laboratory measurements (r^2 value of 0.58), the ex situ measurements were more than five times greater than the laboratory values (Figure 4-30). This could result from a calibration or interference problem. Results for zinc appeared to be highly correlated, with increasing scatter at the higher concentrations (with an r^2 value of 0.85 and slope of 1.4).

4.7.2.2 In situ XRF analyses compared to ex situ XRF analyses

Results for all metals reported by the in situ XRF method are summarized in Table 4-41. The following discussion focuses on the 15 metals that were measured by both XRF and the usual ICP and AA methods. Summary statistics for samples analyzed by the ex situ method are presented in Table 4-38. The average

detection limits for the in situ and ex situ XRF analyses were generally similar (compare Tables 4-38 and 4-41). Mercury, nickel, selenium, and silver were not further compared because they were so infrequently detected.

Table 4-41. Summary of In Situ XRF Metal Analyses[a]

Metal	Number Detects/ Number Samples	Average Detect	Std. Dev. for Detects	Minimum Detect	Maximum Detect	Average Detection Limit	Minimum Non-detect	Maximum Non-detect
Antimony	31/ 384	181	202	49.7	856.8	46.4	31.05	93
Arsenic	51/ 382	31.1	21.5	9.6	117.5	14.8	7.8	42.6
Barium	384/ 384	531	1,010	71.2	9,625.6	67.9	AD	AD
Cadmium	30/ 384	237	354	35	1,240	34.6	21.15	53.1
Cesium	0/ 384	ND	ND	ND	ND	53.5	34.35	180
Chromium	28/ 382	302	118	151.4	582.8	174	94.05	390
Cobalt	21/ 382	376	182	197.7	931.2	226	84.9	435
Copper	89/ 382	296	341	51.7	1,589.6	58.9	37.95	110.55
Iron	382/ 382	12,400	5,790	2,169.6	61,388.8	383	AD	AD
Lanthanum	35/ 382	57.9	16	40.4	103.9	39.9	23.1	91.95
Lead	343/ 382	126	211	9.8	1,800	14.9	9.6	19.2
Manganese	148/ 382	646	515	248.2	4,960	319	165	975
Mercury	0/ 382	ND	ND	ND	ND	9.94	5.85	19.8
Molybdenum	311/ 382	10.7	3.17	4.1	23.2	4.9	3.9	8.4
Nickel	4/ 382	136	51.6	99.4	211.4	93.6	50.4	210
Palladium	1/ 384	41.1	NA	41.1	41.1	30.3	22.8	43.95
Rubidium	382/ 382	52.4	14.7	11.1	92.3	7.11	AD	AD
Selenium	1/ 382	17.2	NA	17.2	17.2	7.84	4.8	13.8
Silver	1/ 384	489	NA	489.2	489.2	161	124.35	240
Strontium	366/ 382	42.1	87.7	6.1	1,200	6.35	4.65	9
Tellurium	0/ 384	ND	ND	ND	ND	61.3	46.35	97.65
Tin	6/ 384	1,300	1,730	148.6	3,609.6	128	96	195
Zinc	352/ 382	299	467	27.6	3,657.6	33.6	24	52.05
Zirconium	382/ 382	119	35.8	19.4	265	7.68	AD	AD

[a]All results in mg/kg.
AD = All detects; therefore, no minimum or maximum non-detect.
ND = No detects; therefore, no average, standard deviation, minimum, or maximum detect.
NA = Not applicable; only one detect, so a standard deviation cannot be calculated.
XRF = X-ray fluorescence.

The in situ results are plotted versus the ex situ for 11 metals in Figures 4-25 through 4-30 (top plot in each column). A linear regression model was calculated for each analyte using the mean of the detected in situ results for each location (Table 4-42). The variation among the four in situ measurements taken at each sampling location was quite large in some cases. The variation of in situ measurements at some locations was nearly as large as the entire range of the ex situ measurements over all of the locations. This variability may represent heterogeneous concentrations in the surface soils or may result from measurement interference from other metals.

The strongest correlations between the in situ and ex situ measurements were for barium, iron, lead, and zinc. None of the other regression models were statistically significant at the 0.05 probability level (Table 4-42).

4.7.2.3 In situ XRF analyses ICP and AA laboratory results

The results for the in situ and laboratory measurements were plotted against each other in Figures 4-25 through 4-30 (middle plot in column) for the same 12 metals that were compared for the ex situ analyses. A linear regression model was calculated for each analyte using the mean of the detected in situ results for

Table 4-42. Linear Regression Model Statistics for Ex Situ XRF versus In Situ XRF Metal Analyses

Chemical	r^2	Intercept	Slope	Probability
Antimony	0.0951	124.89938	0.11262	0.5011
Arsenic	0.342	1.01991	0.85748	0.2228
Barium	0.2721	165.95188	0.4952	0.0001
Cadmium	1	364.23246	-1.97156	.
Chromium	1	332.71832	0.32078	.
Cobalt	0.9272	-4732.5363	10.70221	0.174
Copper	0.0614	181.52215	0.29851	0.3378
Iron	0.5622	3319.0469	0.35054	0.0001
Lead	0.2755	71.48379	0.35848	0.0001
Manganese	0.0436	992.29623	-0.22159	0.4551
Zinc	0.5556	146.25777	0.30804	0.0001

r^2 = correlation coefficient.
XRF = X-ray fluorescence.

each location (Table 4-43). The in situ results for antimony and arsenic generally appeared to be higher than the laboratory results (above the 1:1 line in Figure 4-25). The results for barium showed strong correlation but there were two distinct outlier points (Figure 4-26). Cadmium results were not well correlated. Chromium results showed some correlation but the in situ results were much higher than the laboratory results (Figure 4-27). Cobalt results were not correlated. Copper results showed a great deal of scatter (Figure 4-28). Iron results were correlated but the in situ measurements tended to be lower that the laboratory measurements. Given the good agreement between ex situ and laboratory iron measurements, the lower in situ measurements may reflect actual lower iron concentrations in the surface soil resulting from leaching compared concentrations in the samples taken from 1 ft depth that were analyzed in the laboratory. There appeared to be some correlation for lead and zinc between the in situ and laboratory measurements (Figures 4-29 and 4-30). The higher values for the laboratory measurements tended to correspond with the higher values of the in situ XRF measurements with considerable scatter.

Table 4-43. Linear Regression Model Statistics for In Situ XRF versus Laboratory XRF Metal Analyses

Chemical	r^2	Intercept	Slope	Probability
Antimony	0.3499	78.59052	1.33098	0.0259
Arsenic	0.1654	2.82533	1.70263	0.0188
Barium	0.2468	328.89636	0.53578	0.0001
Cadmium	0.2971	39.38788	11.08768	0.0541
Chromium	0.2739	204.92646	4.25691	0.0124
Cobalt	0.004	320.373	4.08427	0.8166
Copper	0.0451	196.98896	0.15501	0.2516
Iron	0.4464	4818.48072	0.29734	0.0001
Lead	0.2885	58.2722	0.5669	0.0001
Manganese	0.0566	464.47377	0.12981	0.0604
Nickel	0.0533	85.22485	2.35188	0.8517
Zinc	0.5083	139.67112	0.44807	0.0001

r^2 = correlation coefficient.
XRF = X-ray fluorescence.

4.7.2.4 Assessment of XRF use

XRF detection limits for mercury, selenium, and silver were too high to reliably detect metals at the concentrations found in soils and sediment at WBG. XRF results for chromium, cobalt, and nickel were 5 to 10 times the corresponding laboratory values, indicating a problem with these measurements. Although there was some scatter and bias, the ex situ XRF results did appear to correlate with the laboratory measurements for barium, copper, iron, lead, and zinc. These analytes also had strong correlations between the laboratory and the in situ XRF results.

5.0 CONTAMINANT FATE AND TRANSPORT

5.1 INTRODUCTION

This chapter describes the potential migration pathways and mechanisms for transport of chemical substances found in surface and subsurface soils, surface water, and groundwater at WBG. Computer-based contaminant fate and transport modeling analyses were performed to predict rate of contaminant migration in the identified primary media and to project likely future contaminant concentrations at receptor locations through these media. The ultimate objectives of these analyses are to evaluate potential future impacts to human health and the environment and to provide a basis for evaluating the effectiveness of the proposed remedial alternative in the FS.

Previously, fate and transport modeling was used to simulate contaminant distribution in the WBG surface water system (overland flow from source areas to the drainage ditches and tributaries). Surface water and sediment transport modeling was performed to predict future contaminant concentrations in the tributaries flowing west to east across WBG and entering Sand Creek. Surface water concentrations in Sand Creek due to contaminant loading from WBG were also simulated. Neither groundwater nor air quality modeling was performed for the Phase II RI because these media were not considered as primary pathways of contaminant transport at WBG. Based on Phase II RI DQOs, soil leaching and groundwater migration have been evaluated and presented in this report.

A summary of the principles of contaminant fate and transport is presented in this chapter, along with the results of the groundwater fate and transport modeling activities. Section 5.2 presents a CSM for contaminant fate and transport that considers site topography, hydrogeology, contaminant sources and distribution in various environmental media, and release mechanisms through transport media. Section 5.3 presents the persistence of contaminants in the environment and the physical and chemical properties of the SRCs (including metals, organic compounds, and explosives found at the WBG). Section 5.4 presents a soil leachability analysis to identify contaminant migration contaminants of potential concern (CMCOPCs). Section 5.5 describes the groundwater transport modeling, including modeling approach and the results. The summary and conclusions of the fate and transport analysis are presented in Section 5.6.

5.2 CONCEPTUAL SITE MODEL FOR FATE AND TRANSPORT

The CSM for fate and transport serves as the framework for quantitative modeling. Site conditions described by the CSM include waste source information, the surrounding geologic and hydrologic conditions, and the SRCs and their current spatial distribution. This information is combined to identify chemical migration pathways at WBG. The predictive function of the CSM, of primary importance to contaminant fate and transport analysis, relies on known information and informed assumptions about the site. The better the information and the greater the accuracy of the assumptions, the more accurately the CSM describes the AOC and, therefore, the more reliable the predictions.

The CSM for fate and transport and the conclusions of the quantitative modeling are incorporated into Chapter 6.0 of this report. A summary of the salient fate and transport model elements follows.

5.2.1 Contaminant Sources

Based on historical records and the findings of sampling and analysis at WBG, the following contaminant sources have been identified:

- individual burning pads and roadside ditches that were used periodically to destroy explosives and other materials by burning;
- surrounding surface soils that appear to act as a source of surface runoff;
- surrounding subsurface soils, specifically near the contaminated pads; and
- the crushed slag that was used throughout WBG for roads, pads, and driveways.

5.2.2 Hydrogeology

A complete description of the site geology and hydrology is provided in Chapter 3.0 and can be summarized as follows:

- The topography consists of gently undulating slopes and level areas decreasing from west to east across WBG.
- In general, WBG is covered by low-permeability soils and glacial sediments, except where the natural material has been either eroded, removed, reworked, or covered during RVAAP operations.
- Most surface water flows from west to east and north to southeast across WBG in three small streams, eventually entering Sand Creek. Mack's Pond, located in the southwest quadrant of WBG, is fed by a surface water channel draining the western portion of WBG. The extreme northwest corner of WBG (Pads 58-61) drains northeastward toward the pistol range.
- Groundwater is present in the sandy interbeds found in glacial materials that occur within approximately 25 ft of the ground surface. The glacial material present at WBG is presumed to be tens of feet thick. The water-bearing units behave as unconfined systems. Based on topography of the site and potentiometric surface data, groundwater is presumed to flow from west to east and southeast with an average velocity varying between 2.12×10^{-2} to 5.65×10^{-4} cm/s (see Chapter 3.0).

5.2.3 Water Balance

The potential for contaminant transport begins with precipitation. The actual amount of rainwater available for flow is highly variable and dependent upon soil type and climatic conditions. A water balance calculation can be used as a tool to quantitatively account for all the components of the hydrologic cycle at WBG. The components of a simple steady-state water balance model include precipitation (P), evapotranspiration (ET), surface runoff (Sr), and groundwater recharge or percolation (Gr), and are defined as follows:

$$P = ET + Sr + Gr,$$

or

$$\text{Rainwater available for flow} = Sr + Gr = P - ET.$$

A relatively moderate amount of runoff occurs from the site. It is expected that there will be loss of runoff water in the form of evaporation. The remaining water after runoff is infiltration, which includes loss to

the atmosphere by evapotranspiration. The annual average water balance estimates for WBG indicate an evapotranspiration of 64% (23.7 in.) of total precipitation (37.1 in.). The remaining 36% (13.4 in.) of total precipitation is available for flow. Of this 36% (13.4 in.), groundwater recharge (percolation) accounts for 11% (4.2 in.), and surface runoff accounts for the remaining 25% (9.2 in.). The water balance estimations were developed based on the Hydrologic Evaluation of Landfill Performance (HELP) model (Schroeder et al. 1994) calculations for WBG site conditions using precipitation and temperature data for the 100-year period generated synthetically using coefficients for Cleveland, Ohio.

5.2.4 Site-related Chemicals

The SRCs for WBG are identified in Chapter 4.0. The SRCs represent a comparison of detected maximum concentrations of the chemicals against their respective background criteria. The SRCs are summarized in Appendix K.

5.2.5 Contaminant Distribution in the Environment

Based on the findings presented in Chapter 4.0, the following conclusions can be made about the distribution of contaminants in WBG sources and the surrounding environmental media.

- Explosives, metals, and PAHs contamination in surface soils is generally found on the pads. Concentrations of explosives are greatest at Pads 66 and 67. However, in 55 of 70 pads sampled in the Phase I RI, the residual levels of explosives were less than 1 mg/kg.

- Metals contamination in surface soil appears to be distributed around some burning pads as well as on the pads. At some locations, metals contamination has migrated off the pads. The residual levels of lead were less than 100 mg/kg. At some locations, metal contamination has migrated off the pads.

- Subsurface soils explosive contamination >1 mg/kg occurs at Pads 58, 59, 61, and 67 (see Section 4.3.1). Cadmium, lead, and zinc are the only metals frequently detected in subsurface soils above their background criteria. Concentrations of both explosives and metals decrease with depth; however, in several cases, the deepest depth interval still shows concentrations of these analytes to be elevated above installation background levels.

- Several PAHs were detected in one sediment sample from the upstream end of Mack's Pond. Metals above background criteria were observed in the sediment from the eastern end of WBG.

- Acetone is the only SRC in surface water, which may be attributed to probable laboratory contamination.

- Migration of chemicals to groundwater is limited with minor detection of explosives and one of nine detections above background for manganese. Manganese appears to be naturally occurring as the background for manganese in groundwater is significantly high (i.e., greater than EPA Region 9 PRGs) in this site.

5.2.6 Contaminant Release Mechanisms and Migration Pathways

Based on the information presented above, the following contaminant release and migration pathways have been identified.

- Contaminants in surface soils are released to the surrounding environment through dissolution by rainwater and mass movement by soil erosion. These contaminants enter the drainage ditches/streams and are transported in surface water as either particulate-bound or dissolved chemical species. Sediment

deposition, scour, suspension, and transport in the surface water system may be a potential pathway for migration of contaminants.

- Water infiltrating through contaminated surface and subsurface soils may leach contaminants into the groundwater. The factors that affect leaching rate include a contaminant's solubility, K_d, and the amount of infiltration. Whether it is a contaminant's partitioning coefficient or solubility that controls leaching depends on whether leaching is solubility-controlled or sorption-controlled. Insoluble compounds will precipitate out of solution in the subsurface or remain in their insoluble forms with little leaching. For the contaminants detected at WBG, generally sorption processes and the K_d will have the greatest effect on leaching. Metals detected at WBG have high K_ds and are not expected to leach to groundwater at any significant rate. This point is supported by the fact that metals concentrations found in groundwater are below background with limited exception, despite the presence of high concentrations of metals in subsurface soils in some parts of the site. Another factor that affects whether a contaminant will reach the water table through infiltration of rainwater is the contaminant's rate of decay. Most of the organic compounds decay at characteristic rates that are described by the substance's half-life. For a given percolation rate, those contaminants with long half-lives have a greater potential for contaminating groundwater than those with shorter half-lives. However, at WBG, the chemicals with longer half-lives (PAHs) have high K_ds, thereby limiting their migration potential to groundwater.

Release by gaseous emissions and airborne particulates is not significant at WBG. VOCs were not found in surface soils as they have already volatized over the last 40 to 50 years; therefore, there is likely little to no gaseous emissions. Thus, contaminant levels in the air pathway are minor to nonexistent. Particulate matter from contaminated surface soil can become airborne as a result of wind erosion. At WBG, however, this process is moderated by the wet climate and the presence of vegetative cover throughout a large portion of the AOC.

5.3 PHYSICAL AND CHEMICAL PROPERTIES OF SITE-RELATED CHEMICALS

The migration of chemical constituents through various media is governed by the physical and chemical properties of the detected chemicals and the surface and subsurface media through which the chemicals are transferred. In a general way, chemical constituents and structures with similar physical and chemical characteristics will show similar patterns of transformation, transport, or attenuation in the environment. Solubility, vapor pressure data, chemical partitioning coefficients, degradation rates, and Henry's Law constant, provide information that can be used to evaluate contaminant mobility in the environment. Partitioning coefficients are used to assess the relative affinities of compounds for solution or solid phase adsorption. However, the synergistic effects of multiple migrating compounds and the complexity of soil/water interactions, including pH and oxidation-reduction potential (Eh), grain size, and clay mineral variability, are typically unknown.

The physical properties of the chemical constituents that were detected in the environmental media at WBG are summarized in Appendix K (Tables K-1, K-2, and K-3). The properties are used to assess the anticipated behavior of each compound under environmental conditions.

The water solubility of a compound is a measure of the saturated concentration of the compound in water at a given temperature and pressure. The tendency for a compound to be transported by groundwater is directly related to its solubility and inversely related to both its tendencies to adsorb to soil and to volatilize from water (OGE 1988). Compounds with high water solubilities tend to desorb from soils and sediments, are less likely to volatilize from water, and are susceptible to biodegradation. The water solubility of a compound varies with temperature, pH, and the presence of other dissolved constituents (including organic carbon and humic acids).

The octanol-water partition coefficient (K_{ow}) is a laboratory-determined ratio of the concentration of a chemical in the n-octanol phase of a two-phase system to the concentration in the water phase. The octanol-water partition coefficient can be used to estimate the tendency for a chemical to partition between environmental phases of different polarity. Compounds with log K_{ow} values less than 1 are highly hydrophilic, while compounds with log K_{ow} values greater than 4 will partition to soil particles (Lyman, Reehl, and Rosenblatt 1990).

The water/organic carbon partition coefficient (K_{oc}) is a measure of the tendency of a compound to partition between soil and water. The K_{oc} is defined as the ratio of the absorbed compound per unit weight of organic carbon to the aqueous solute concentration. This coefficient can be used to estimate the degree to which a compound will adsorb to soil and thus not migrate with groundwater. The higher the K_{oc} value, the greater the tendency of the compound to partition into soil (OGE 1988). The sorption coefficient (K_d) is calculated from the K_{oc} coefficient by multiplying the K_{oc} value by the fraction of organic carbon in the soil.

Vapor pressure is a measure of the pressure at which a compound and its vapor are in equilibrium. The value can be used to determine the extent to which a compound would travel in air, as well as the rate of volatilization from soils and solution (OGE 1988). In general, compounds with vapor pressures lower than 10^{-7} mm mercury will not be present in the atmosphere or soil air in significant amounts, while compounds with vapor pressures higher than 10^{-2} mm mercury will exist primarily in the air (Dragun 1988). In general, VOCs will exist primarily in the atmosphere and soil air, while pesticides and other SVOCs will exist in both the air and the soil.

The Henry's Law constant value (K_H) for a compound is a measure of the ratio of the compound's vapor pressure to its aqueous solubility. The K_H value can be used to make general predictions about the compound's tendency to volatilize from water. Substances with K_H values less than 10^{-7} atm-m^3/mol will generally volatilize slowly while compounds with K_H greater than 10^{-3} atm-m^3/mol will volatilize rapidly (Lyman, Reehl, and Rosenblatt 1990).

Organic chemicals with differing chemical structures will biodegrade at different rates. Primary biodegradation consists of any biologically induced structural change in an organic chemical while complete biodegradation is the biologically mediated degradation of an organic compound into carbon dioxide, water, oxygen, and other metabolic inorganic products (Dragun 1988). The biodegradation rate of an organic chemical is proportional to the concentration:

$$-dC/dt = kC^n ,$$

where

- C = concentration,
- k = biodegradation rate constant = $(2.303/t') \log (a/x)$,
- t = time,
- a = initial concentration at time $t = 0$,
- n = reaction order,
- x = concentration at time $t = t'$.

The half-life ($t_{1/2} = 0.693/k$) is the time necessary for half of the chemical concentration to react. The biodegradation rate of an organic chemical is generally dependent on the presence and population size of soil microorganisms, capable of degrading the chemical.

Inorganic and organic constituents in soil, sediment, and groundwater are in continuous chemical and physical interaction with ambient surface and subsurface environmental conditions. The observed distributions of chemical concentrations in the environment are affected by these interactions and determine the chemical

fate of these materials in the various media. Chemicals released into the environment are susceptible to several degradation pathways including hydrolysis, oxidation, reduction, isomerization, photolysis, photooxidation, biotransformation, and biodegradation. Transformation products resulting from these processes will behave distinctively in the environment.

5.3.1 Metals

Inorganic constituents detected in soil and sediment samples at WBG are associated with both the aqueous phase (unbound pore water) and with leachable metal ions on soil particles. The transport of these materials from unsaturated soils to the underlying groundwater is controlled by the physical processes of precipitation infiltration, chemical interaction with the soil, and downward transport of removed metal ions by continued infiltration. The additional physical mechanism of erosive transport is important for surface soil and sediment dispersal. The chemistry of inorganic interaction with percolating precipitation and varying soil conditions is complex and includes numerous chemical transformations that may result in altered oxidation states, ion exchange, adsorption, precipitation, or complexation. The chemical reactions, which are affected by environmental conditions including pH; oxidation/reduction conditions; and the type and amount of organic matter, clay, and the presence of hydrous oxides, may act to enhance or reduce the mobility and toxicity of the metal ions. In general, these reactions are reversible and add to the variability commonly observed in inorganics distributions in soil and sediment.

Inorganic chemical form impacts the solubility and mobility in the environment; however, chemical speciation is complex and difficult to delineate in routine laboratory analysis. Metals in soil and sediment are commonly found in several forms (Shuman 1991), including dissolved concentrations in soil pore water; metal ions occupying exchange sites on inorganic soil constituents, specifically adsorbed metal ions on inorganic soil constituents; metal ions associated with insoluble organic matter; precipitated inorganic compounds as pure or mixed solids; and metal ions present in the structure of primary or secondary minerals.

In situations where metal ions have been introduced to the environment by human activities, they are attributed to non-mineralogic occurrences. The dissolved (aqueous) fraction and its equilibrium fraction are of primary importance when considering the migration potential of metals associated with soil and sediment. Of the inorganic compounds that are likely to form, chlorides, nitrates, and nitrites are commonly the most soluble. Sulfate, carbonate, and hydroxides generally have low to moderate solubility. Soluble compounds are transported in aqueous form subject to attenuation, whereas less soluble compounds remain as a precipitate and limit the overall dissolution of the metal ions. The solubility of the metal ions also is regulated by ambient chemical conditions, including pH and oxidation/reduction.

The attenuation of metal ions in the environment can be estimated numerically using the retardation factor (R_d). The extent to which the velocity of the contaminant is slowed and is largely derived from the soil/water partitioning coefficient (K_d) is expressed by the following relation:

$$R_d = 1 + (K_d \rho_b)/\phi_w ,$$

where

ρ_b = the soil bulk dry density, (g/cm^3),
ϕ_w = soil moisture content, (dimensionless).

Table K-1 provides a range of K_d values (as well as calculated R_d values) for metal ions concentrations in various soil types. Because of variability in the media and in the methods of measurement, the reported K_d values for metal ions vary over orders of magnitude and may similarly vary between samples. The K_d values (as well as the R_d values) presented in this table represent loam–type soil and are conservative

because the site soil is more clay and silt than loam. Metal ion concentrations in the environment do not attenuate by natural or biological degradation because of low volatility and solubility of the ions. Metals concentrations may be biotransformed or bioconcentrated through microbial activity.

5.3.2 Organic Compounds

The predominant organic chemical compounds detected in WBG soils include explosives-related compounds and SVOCs (primarily PAHs). These compounds may be transformed or degraded in the environment by various processes, including hydrolysis, oxidation/reduction, photolysis, volatilization, biodegradation, or biotransformation. The half-life (time required to naturally reduce chemical concentration by one-half) of organic compounds in various media can vary from minutes to years depending on environmental conditions and the chemical structures of the compounds. Organic degradation may either enhance (through the production of more toxic byproducts) or reduce (through concentration reduction) the toxicity of a chemical in the environment. Biodegradation rates (Howard et al. 1991) for the detected organic compounds at WBG are shown in Appendix K (Table K-2).

5.3.3 Explosives-related Compounds

Explosives-related (nitroaromatic) compounds detected at WBG include 2,4,6-TNT; 2,4-DNT; 2,6-DNT; 1,3-DNT; *o*-nitrotoluene; HMX; and RDX. The source and nature and extent of the ammunition related constituents are discussed in Chapter 4.0.

The surface runoff process is predominantly an advective transport process that allows spatial and temporal variations of contaminants through washoff. Microbiological and photochemical transformations are two additional principal processes affecting the fate and distribution of munitions-related constituents in the environment. For example, based on the results of culture studies involving the removal of TNT by activated sludge microorganisms, it has been concluded that TNT undergoes biotransformation, but not biodegradation (Burrows et al. 1989). It has been found (Funk et al. 1993) that the anaerobic metabolism occurs in two stages. The first stage is the reductive stage in which TNT is reduced to its amino derivatives. In the second stage, degradation to non-aromatic products begins after the reduction of the third nitro group.

The biotransformation pathway for TNT in simulated composting systems is shown on Figure 5-1 (Kaplan and Kaplan 1990). The biotransformation of 2,4-DNT has been systematically studied in laboratory cell cultures. The pathway proposal for this biotransformation is shown in Figure 5-2. The reduction products include the amino and azoxy derivatives as observed with TNT biotransformation. As with TNT and DNT, the principal mode of microbial transformation of the nitroaromatic compounds TNB and 1,3-dinitrobenzene is reduction of nitro groups to form amino groups.

Limited information exists regarding biotransformation or biodegradation of RDX. Studies indicate biodegradation of RDX occurs most rapidly in anaerobic environments in the presence of other nutrients. Aerobic degradation has also been observed in bench-scale tests in the presence of a TOC source (stream sediment), although rates were slower. Photolytic degradation of RDX is reported as a major transformation process (Card and Autenrieth 1998). End products of the anaerobic pathway include formaldehyde and nitramine (Roberts and Kotharu 2004). The end products of the photolytic pathway include nitrate, nitrite, and formaldehyde (Card and Autenrieth 1998). One pilot study being conducted by USACE (USACE 2004) that evaluates treatment of pink water wastes using an anaerobic fluidized-bed granular activated carbon bioreactor indicated RDX biodegradation in the presence of ethanol. Such data may be useful for evaluating the potential use of enhanced bioremediation as a remedial option.

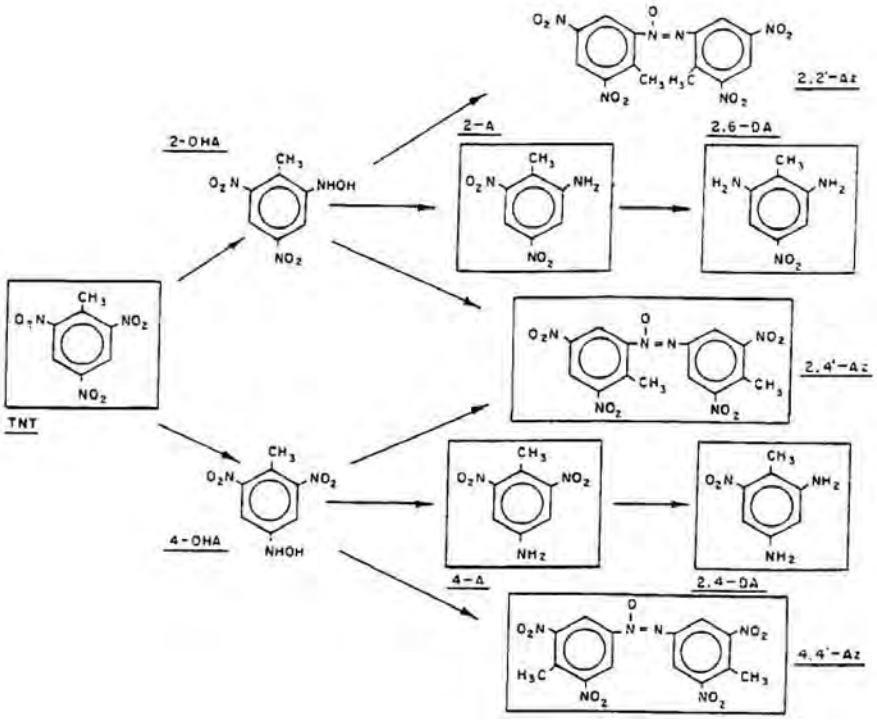

Figure 5-1. 2,4,6-TNT Biotransformation Pathway

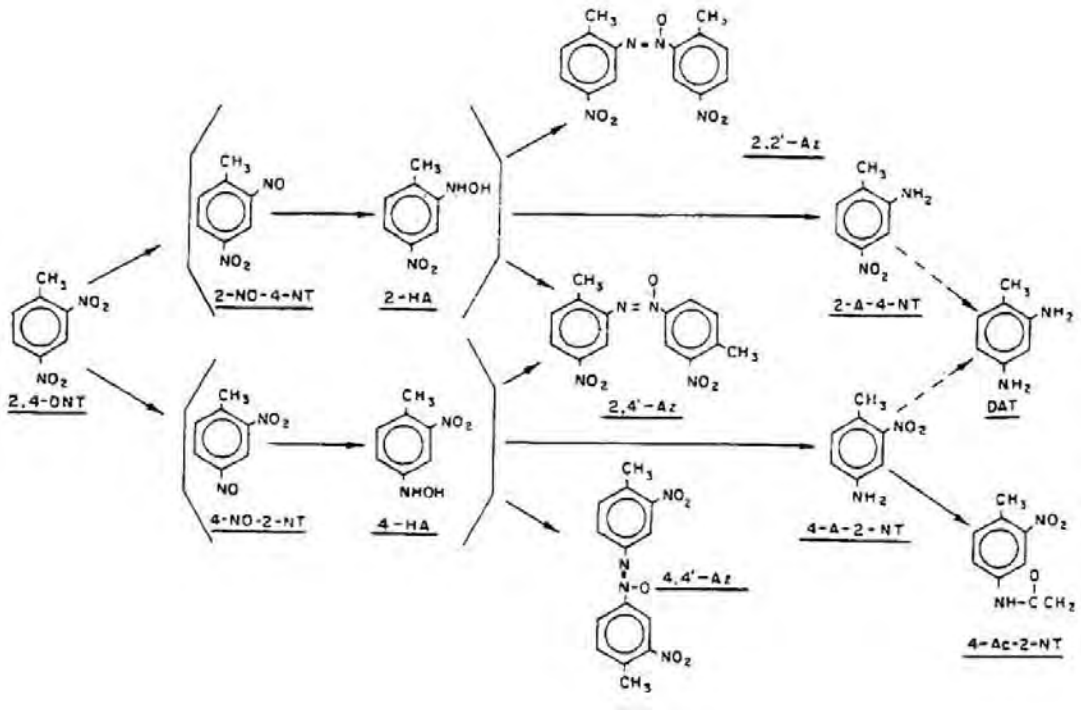

Figure 5-2. 2,4-DNT Biotransformation Pathway

5.4 SOIL LEACHABILITY ANALYSIS

Contaminant fate and transport analyses at this site involve a series of screening steps to define the CMCOPCs at WBG. The CMCOPCs are defined as the constituents that may pose the greatest problem if they are migrating from the site sources.

Once initial CMCOPCs were developed through the screening process, they were further evaluated using a vadose zone contaminant transport model, Seasonal Soil Compartment (SESOIL), for vertical migration, and a saturated zone contaminant transport model, Analytical Transient 1-, 2-, 3-Dimensional (AT123D), for lateral migration to the receptor locations. The screening steps are discussed in this section and the modeling procedures are discussed in the following section.

5.4.1 Comparison of the Unit-Specific Conceptual Site Model to the Soil Screening Level

The first step of the screening process is the development of the SRCs. The chemical data in surface and subsurface soil from Phase II and Phase III were combined and summarized by individual pads or source areas (e.g., buildings, etc.). The SRCs were selected by comparing the maximum detected concentrations of all the analytes measured in surface and subsurface soils with their respective background concentrations. If the maximum concentration of an analyte in the soil exceeds its background concentration, then that analyte is selected as an SRC for the unit. To reduce the volume of modeling, only the pads or source areas having the highest levels of contamination were selected for this analysis. These include Building 4301 and Pads 37, 38, 58, 60, 61, 62, 66, 67, 68, and 70.

After completion of the first screening, the results were examined to check the consistency of the SRCs with respect to the knowledge of contamination at the site. Essential nutrients, calcium, magnesium, potassium, and sodium, were eliminated from the list of SRCs for further quantitative modeling.

The third step of the screening process involves developing the source area-specific soil exposure concentrations. The soil exposure concentration of a contaminant in a source area represents either the 95% upper confidence limit (UCL) developed using results of all the soil samples within the source unit, or the maximum value if the UCL exceeds the maximum.

The fourth step of the screening process involves comparing the maximum detected concentrations of all the SRCs with EPA generic soil screening levels (GSSLs). The GSSLs are set for Superfund Sites for the migration to the groundwater pathway (EPA 1996). A default dilution attenuation factor (DAF) of 20 was applied to the GSSLs. A DAF of 20 is appropriate for source areas where the depth to water table is greater than 10 ft and the area of the source is less than 0.5 acre, which is consistent with individual pads at WBG. The GSSL is defined as the concentration of a contaminant in soil that represents a level of contamination below which there is no concern under CERCLA, provided conditions associated with soil screening levels (SSLs) are met. Generally, if contaminant concentrations in soil fall below the GSSL, and there are no significant ecological receptors of concern, then no further study or action is warranted for that area. However, it should be noted here that the purpose of this screen is not to identify the contaminants that may pose risk at downgradient locations, but to target those contaminants that may pose the greatest problem if they are migrating from the site. When the GSSL for an SRC was not available from EPA (1996), a GSSL was developed using the following equation (EPA 1996):

$$C_s = C_w \left(K_d + \frac{\theta_w + \theta_a + K_H}{\rho_b} \right)$$

where

C_w = target soil leachate concentration (mg/L),
C_s = GSSL (mg/kg),
K_d = soil adsorption coefficient (L/Kg),
K_H = Henry's Law constant (unitless),
ρ_b = dry soil bulk density (kg/L),
θ_w = water-filled soil porosity (volume percent),
θ_a = air-filled soil porosity (volume percent).

Default values, as used by EPA (1996) to develop the GSSLs, were used in the calculations. Non-zero MCLs or risk-based concentrations for groundwater (if MCL is not available) were used for target groundwater concentrations. Based on this screening, only those constituents which exceeded the appropriate GSSL (or calculated GSSL if GSSLs were not available) multiplied by the default DAF were identified as the initial CMCOPCs, based on leaching to groundwater, and were selected for SESOIL modeling.

5.4.2 Limitations and Assumptions of Soil Screening Analysis

It is important to recognize that acceptable soil concentrations for individual chemicals are highly site-specific. The GSSLs used in this screening are based on a number of default assumptions chosen to be protective of human health for most site conditions (EPA 1996). These GSSLs are expected to be generally more conservative than site-specific screening levels based on site conditions. The conservative assumptions included in this analysis are: (1) no adsorption in the unsaturated zone or in the aquifer, (2) no biological or chemical degradation in the soil or in the aquifer, and (3) contamination is evenly distributed throughout the source. However, the GSSL does not incorporate the existence of contamination already present in the aquifer. In any case, to evaluate the contaminant migration potential from the source areas, an SSL screen can be used as an effective tool.

5.5 FATE AND TRANSPORT MODELING

Contaminant fate and transport modeling is based on the site conditions for WBG discussed in Section 5.2. As mentioned earlier, air is not considered an important pathway for contaminant transport from WBG, and analysis of the surface water pathway had already be performed and presented in the Phase II RI; therefore, only vadose zone leaching and groundwater modeling were performed and are presented in this section.

5.5.1 Modeling Approach

As discussed earlier, contaminant transport in the vadose zone includes the movement of water and dissolved materials from source areas at WBG to groundwater in the sandy interbeds found in glacial materials. This occurs as rainwater infiltrates from the surface and percolates through the source of contamination, and its surrounding soil and bedrock, into the saturated zone. Downward movement of water, driven by gravitational potential, capillary pressure, and other components of total fluid potential, mobilize the contaminants and carry them through the vadose zone. Lateral transport is controlled by the regional groundwater gradient. Vertical transport down through the vadose zone to the water table and the horizontal transport through the sandy interbeds to the downgradient locations are illustrated in Figure 5-3.

A combination of small-scale analytical groundwater transport models and simple estimates of contaminant attenuation/dilution along specific pathways are combined in the framework of the conceptual model for fate and transport analysis. The combination of methods is site-specific and is discussed in detail later in this section.

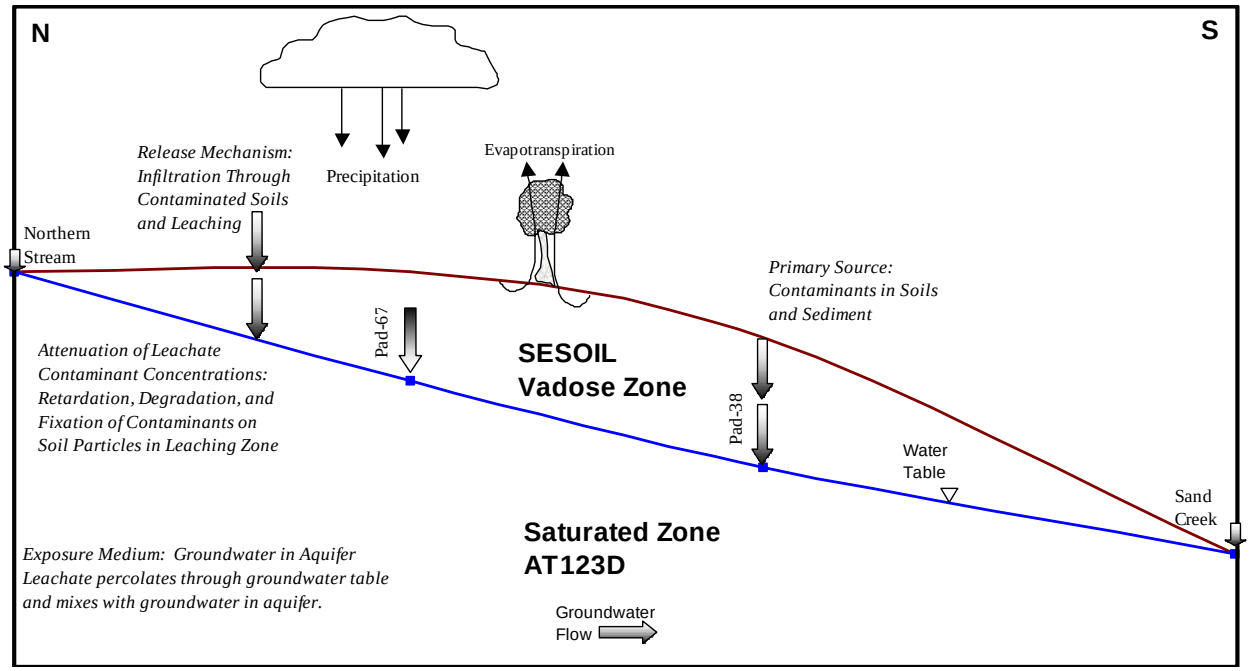

Figure 5-3. Contaminant Migration Conceptual Model at Winklepeck Burning Grounds

The output of the contaminant fate and transport modeling is presented as the expected maximum concentration of modeled contaminants at the receptor locations. These data will allow prediction of the approximate locations of future maximum concentrations resulting from the integration of the contributions from multiple sources and different pathways. This analysis includes the most important pads that were selected based on leachability analysis with data from both Phase II and Phase III. Figure 5-3 shows the conceptual approach for fate and transport analysis. The quantitative modeling accounted for the following:

- contents of the source area,
- identifiable geologic strata beneath the source area,
- contaminated soil layer,
- thickness of each layer in the vadose zone,
- vertical permeability of the unsaturated soils,
- water table fluctuations, and
- receptor locations.

Initial CMCOPCs for the individual pad source areas are based on soil concentrations within the source areas. Analytical equations were used to determine whether a constituent from a source area would be expected to reach the groundwater table within 1,000 years. If not, the constituent was eliminated from the list of CMCOPCs. Leachate modeling on all the remaining CMCOPCs from each source area was performed. Once the leachate modeling for all the source areas was completed, the predicted maximum groundwater concentrations beneath the source areas were determined using the AT123D groundwater model and the concentrations were compared against the existing groundwater concentrations in the groundwater downgradient of the source area. If the predicted groundwater concentration exceeded the measured concentration in the groundwater, then the predicted concentration was compared against their respective groundwater MCLs or risk-based concentrations (RBCs) (if an MCL was not available for the constituent). If the predicted and measured maximum groundwater concentrations were below the

groundwater MCL or RBC, the contaminant was eliminated from the list of CMCOPCs and no further evaluations were performed.

5.5.2 Model Applications

As discussed in the previous section, modeling of contaminant migration from the sources to Sharon Sandstone groundwater was accomplished using eight separate sources.

SESOIL Modeling. The SESOIL model used for leachate modeling, when applicable, estimates pollutant concentrations in the soil profile following introduction via direct application and/or interaction with other media. The model defines the soil compartment as a soil column extending from the ground surface through the unsaturated zone and to the upper level of the saturated soil zone. Processes simulated in SESOIL are categorized in three cycles—hydrologic, sediment, and pollutant. Each cycle is a separate submodule in the SESOIL code. The hydrologic cycle includes rainfall, surface runoff, infiltration, soil-water content, evapotranspiration, and groundwater recharge. The pollutant cycle includes convective transport, volatilization, adsorption/desorption, and degradation/decay. A contaminant in SESOIL can partition in up to four phases (liquid, adsorbed, air, and pure).

Data requirements for SESOIL are not extensive, utilizing a minimum of soil and chemical parameters and monthly or seasonal meteorological values as input. Output of the SESOIL model includes pollutant concentrations at various soil depths and pollutant loss from the unsaturated soil zone in terms of surface runoff, percolation to groundwater, volatilization, and degradation.

The mathematical representations used generally consider the rate at which the modeled processes occur, the interaction of different processes with each other, and the initial conditions of both the waste area and the surrounding geohydrologic formations.

The simulations using SESOIL were continued until the maximum concentration in leachate beneath the source was attained. However, due to the voluminous amount of output per run and the large computing time it takes to complete a long-term simulation, the model was run for 1,000 years. The travel times to the water table for each initial CMCOPC from the eight source areas were estimated using simple analytical equations:

$$T_t = \frac{T_h \times R_f}{V_p},$$

where

T_t = leachate travel time (year),
T_h = thickness of attenuation zone (ft),
R_f = retardation factor (dimensionless) (Section 5.3.1),
V_p = porewater velocity (ft/year).

and

$$V_p = \frac{I}{\theta},$$

where

I = infiltration rate (ft/year),
θ = fraction of total porosity that is filled by water.

If the source depth for a constituent is equal to the thickness of the vadose zone, the constituent is determined to have a travel time equal to zero using the above equation (i.e., no leaching zone). The estimated travel

time is then compared to a screening value. If the travel time for a constituent from a source area exceeded 1,000 years, then the constituent was eliminated from the list of CMCOPCs (see Appendix K).

The constituents from each source area/pad selected for SESOIL modeling are listed in Table 5-1. The reasonable maximum exposure soil concentrations, SESOIL-predicted maximum leachate concentrations, and the corresponding time are presented in this table. The maximum predicted leachate concentrations were input into the AT123D model to predict the maximum groundwater concentration beneath the source, which is also presented in Table 5-1. A constituent is defined as the final CMCOPC and was selected for lateral migration modeling using AT123D only, if the predicted groundwater concentration or the downgradient measured groundwater concentration exceeded its MCL or RBC.

Table 5-1. Summary of Leachate Modeling Results for Winklepeck Burning Grounds

CMCOPCs	RME (mg/kg)	Predicted $C_{leachate,max}$ Beneath the Source (µg/L)	Predicted T_{max} (years)	Predicted $C_{gw,max}$ at the Source[a] (µg/L)	Observed $C_{gw,max}$ in Groundwater (µg/L)	MCL/RBC (µg/L)	Final CMCOPC[b]
PAD 37							
2,4-Dinitrotoluene	0.16	164.70	16	1.99	0.95	73.00	No
RDX	1.77	18,835.80	4	162.00	52.00	0.61	Yes
Arsenic	16.53	1,751.70	470	80.20	24.00	10.00	Yes
PAD 38							
2,4-Dinitrotoluene	0.18	301.40	16	3.13	0.95	73.00	No
Arsenic	15.02	1,140.70	421	46.30	24.00	10.00	Yes
Cadmium	877.00	3,121.90	1000	91.60	0.30	5.00	Yes
PAD 58							
2,4-Dinitrotoluene	0.24	611.58	15	5.19	0.95	73.00	No
Arsenic	17.90	1,315.92	363	42.50	24.00	10.00	Yes
Antimony	20.10	650.70	870	22.40	NA	4.00	Yes
Cadmium	11.49	81.28	1,000	2.02	0.30	5.00	No
Chromium	44.08	3,149.17	331	104.00	1.70	100.00	Yes
PAD 60							
1,3-Dinitrobenzene	0.09	137.80	7	0.82	0.03	3.70	No
2,4-Dinitrotoluene	0.62	914.20	16	7.87	0.95	73.00	No
2,6-Dinitrotoluene	0.20	269.40	12	2.18	0.25	37.00	No
RDX	1.15	7,579.10	4	34.00	52.00	0.61	Yes
Arsenic	15.01	974.10	527	31.60	24.00	10.00	Yes
PAD 61							
1,3-Dinitrobenzene	0.04	60.00	7	0.36	0.03	3.70	No
2,4-Dinitrotoluene	0.06	30.74	19	0.26	0.95	73.00	No
2,6-Dinitrotoluene	0.09	62.70	15	0.50	0.25	37.00	No
RDX	0.65	5,856.50	3	24.90	52.00	0.61	Yes
Carbazole	190.00	6.60	452	203.00	NA	3.30	Yes
Dibenzofuran	110.00	0.00	0	0.00	NA		No
Arsenic	16.81	1,314.80	516	85.90	24.00	10.00	Yes
Antimony	10.36	0.47	804	15.60	NA	4.00	Yes
PAD 62							
RDX	69.78	60.00	4	321.00	52.00	0.61	Yes
Arsenic	13.52	0.76	594	24.20	24.00	10.00	Yes
PAD 66							
1,3,5-Trinitrobenzene	28.06	172,400.00	4	959.00	1.30	1,100.00	No
1,3-Dinitrobenzene	0.26	863.60	6	5.16	0.03	3.70	Yes
2,4-Dinitrotoluene	0.55	372.90	16	3.20	0.95	73.00	No
2,6-Dinitrotoluene	0.62	665.70	12	127.00	0.25	37.00	Yes
RDX	80.00	60,000.00	4	321.00	52.00	0.61	Yes
Arsenic	16.01	1,170.20	522	37.90	24.00	10.00	Yes
Barium	4,820.00	110,142.00	842	3,730.00	110.00	2,000.00	Yes

Table 5-1. Summary of Leachate Modeling Results for Winklepeck Burning Grounds (continued)

CM COPCs	RME (mg/kg)	Predicted $C_{leachate,max}$ Beneath the Source (µg/L)	Predicted T_{max} (years)	Predicted $C_{gw,max}$ at the Source[a] (µg/L)	Observed $C_{gw,max}$ in Groundwater (µg/L)	MCL/RBC (µg/L)	Final CMCOPC[b]
PAD 67							
1,3,5-Trinitrobenzene	100.30	350,000.00	5	2,090.00	1.30	1,100.00	Yes
1,3-Dinitrobenzene	0.06	219.20	5	1.30	0.03	3.70	No
2,4-Dinitrotoluene	0.88	3,130.00	9	27.50	0.95	73.00	No
2,4,6-Trinitrotoluene	5,200.00	0.00	0	0.00	0.94	2.20	No
RDX	9,500.00	60,000.00	2	321.00	52.00	0.61	Yes
Arsenic	14.07	1,179.20	428	40.70	24.00	10.00	Yes
PAD 68							
1,3-Dinitrobenzene	0.08	122.00	7	0.72	0.03	3.70	No
2,4-Dinitrotoluene	0.17	199.00	16	1.47	0.95	73.00	No
2,6-Dinitrotoluene	0.09	62.70	15	0.50	0.25	37.00	No
RDX	0.34	1,340.00	4	6.66	52.00	0.61	Yes
Antimony	6.88	163.00	940	5.51	NA	4.00	Yes
Arsenic	12.82	1,190.00	460	40.60	24.00	10.00	Yes
Barium	10,400.00	69,100.00	900	2,360.00	110.00	2,000.00	Yes
Building 4301							
Arsenic	20.10	0.00E+00	0.00	0.00	24.00	10.00	No

[a]The predicted maximum concentration in groundwater ($C_{gw,max}$) at the source was calculated using the AT123D model based on contaminant loading predicted by SESOIL.
[b]A constituent is a final CMCOPC if it reaches the water table within 1,000 years and its predicted concentration in groundwater exceeds its MCL or RBC.
AT123D = Analytical Transient 1-, 2-, 3-Dimensional (model).
CMCOPC = Contaminant migration contaminant of potential concern.
MCL = Maximum contaminant level.
RBC = Risk-based concentration.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
RME = Reasonable maximum exposure.
SESOIL = Seasonal Soil Compartment (model).

The SESOIL model was calibrated against the percolation rate by varying the hydraulic conductivity and the disconnectedness index and keeping all other site-specific geotechnical parameters fixed. The final parameter values used in this modeling are shown in Table 5-2. The disconnectedness index and the intrinsic permeability were derived during calibration of the model to a percolation rate of 0.11 m/year. The percolation rate was derived by performing water balance simulation for the site using the HELP model. The SESOIL model was set up using four layers extending from the ground surface to the average water table surface. Details of the model layers are presented in Appendix K (Table K-4).

The chemical-specific parameters are presented in Appendix K (Tables K-1 through K-3). The distribution coefficients (K_ds) for metals were obtained from EPA's Soil Screening Guidance Document (EPA 1996b), unless stated otherwise. The K_ds for organic compounds were estimated from organic carbon-based water partition coefficients (K_{oc}) usning the relationship $Kd = (f_{oc})(K_{oc})$, where F_{oc} = soil organic carbon content as mass fraction obtained from site-specific measurements and K_{oc} values were obtained from EPA's Soil Screening Guidance Document (EPA 1996b), unless stated otherwise. Biodegradation rates ware not applicable for the inorganic CMCOPCs. Most conservative values found in the literature (Howard et al 1991) were used for organic CMCOPCs; however, biodegradation values could not be found in literature for RDX; 1,3,5-TNB; and carbazole among the selected CMCOPCs for SESOIL modeling. The consitituents selected for SESOIL modeling are listed in Table 5-1.

Table 5-2. Hydrogeological Parameters Used for SESOIL Modeling, Winklepeck Burning Grounds

Parameter Type	Parameter Value	Source
Soil Type	Silty clay	Site specific
Bulk Density (gm/cm^3)	1.85	Laboratory analysis (geotechnical sample data)
Percolation Rate (cm/year)	10.8	From HELP model
Intrinsic Permeability (cm^2)	0.99E-10	Calibrated
Disconnectedness Index	9	Calibrated
Porosity	0.31	Laboratory analysis (geotechnical sample data)
Depth to Water Table (ft)	10.5	Site specific
Organic Carbon Content (%)	0.66	Laboratory analysis (geotechnical sample data)
Frendlich Equation Exponent	1	SESOIL default value
Leaching Depth (m)	Site specific, Chemical specific	Estimated from soil contamination depth (see Appendix K)
Area of Source (m^2)	Site specific	Estimated from soil contamination area (see Appendix K)

HELP = Hydrologic Evaluation of Landfill Performance (model).
SESOIL = Seasonal Soil Compartment (model).

AT123D Modeling in the Sandy Interbeds. AT123D is an analytical groundwater pollutant fate and transport model. It computes the spatial-temporal concentration distribution of wastes in the aquifer system and predicts the transient spread of a contaminant plume through a groundwater aquifer. The fate and transport processes accounted for in AT123D are: advection, dispersion, adsorption/retardation, and decay. This model can be used as a tool for estimating the dissolved concentration of a chemical in three dimensions in the groundwater resulting from a mass release over a source area (point, line, area, or volume source). The model can handle instantaneous, as well as continuous, source loadings of chemicals of interest at the site. AT123D is frequently used by the scientific and technical community to perform quick and conservative estimates of groundwater plume movement in space and time. In RISKPRO, SESOIL and AT123D are linked so that mass loading to the groundwater predicted by SESOIL can be directly transferred to AT123D. Therefore, AT123D was chosen to predict the future receptor concentrations for the contaminants.

Five metals and six explosive-related compounds were selected for AT123D modeling in the sandy interbed based on source loading predicted by SESOIL or on measured groundwater concentrations downgradient of the sources. No VOCs or SVOCs were selected for modeling. Three receptor points were selected for groundwater transport modeling: the AOC boundary, Sand Creek, and the drainage conveyance/stream located north of WBG. The shortest downgradient distance from the source area to each receptor was incorporated into the model. The northern stream receptor applied only to Pads 58, 60, 61, and 62 based on known potentiometric flow directions at WBG (Chapter 2.0). The remaining sources were considered to be downgradient of the northern stream. Hydrogeological model input parameters are summarized in Table 5-3. The chemical-specific parameters are presented in Appendix K (Tables K-1 thorugh K-3). As discussed under SESOIL modeling, biodegration rates are literature-based (Howard et al 1991) most conservative values, if available.

Table 5-3. Key Hydrogeological Parameters Used for AT123D Modeling, Winklepeck Burning Grounds

Parameter Type	Parameter Value	Source
Bulk Density (kg/m^3)	1,850	Laboratory analysis (geotechnical sample data)
Effective Porosity	0.2	Mills et al. (1985) for sandy clay type
Hydraulic Conductivity (m/h)	4.10E-02	Site specific
Hydraulic Gradient	0.026	Site specific
Dispersivity (m) Longitudinal Transverse Vertical	 10 3 1	Assumed plume length, Lp=100 m Calculated $\alpha_L = 0.1 \times Lp$ Calculated $\alpha_T = 0.3 \times \alpha_L$ Calculated $\alpha_V = 0.1 \times \alpha_L$
Density of Water (kg/m^3)	1,000	Default
Fraction of Organic Carbon (unitless)	0.0066	Laboratory analysis (geotechnical sample data)
Distance to Receptor (ft)	Site specific	See Appendix K
Source Area Length (m)	Site specific	See Appendix K
Source Area Width (m)	Site specific	See Appendix K

AT123D = Analytical Transient 1-, 2-, 3-Dimensional (model).

5.5.3 Modeling Results

The results of the contaminant fate and transport analysis for individual source areas are summarized in Tables 5-1 and 5-4.

Presented in Table 5-1 are the predicted peak leachate and groundwater concentrations beneath the source, and the corresponding time for peak concentrations. In addition, this table presents for comparison the currently observed maximum concentrations in the groundwater downgradient of the source and drinking water MCLs or RBCs (if MCL is not available). As can be seen from these tables, 2,6-DNT; RDX; 1,3,5-TNB; 1,3-DNB; and carbazole among the organics were predicted to reach concentrations exceeding groundwater MCLs or RBCs beneath the source areas. Therefore, these organics were identified as the final CMCOPCs to be modeled using AT123D. Among the metals, antimony, arsenic, barium, and chromium were identified as the final CMCOPCs, as these metals were predicted to reach the water table exceeding their respective groundwater MCL or RBC.

Table 5-4 presents the results of the AT123D modeling of the constituents identified above. Other than RDX, none of the modeled constituents are predicted to reach the WBG site boundary at concentrations exceeding their respective MCLs or RBCs.

5.5.4 Limitations/Assumptions

Based upon the data available, a conservative approach was used, which may overestimate the contaminant concentration in the leachate for migration from observed or back-calculated soil concentrations. Listed below are important assumptions used in this analysis.

- The use of K_d and R_d to describe the reaction term of the transport equation assumes that an equilibrium relationship exists between the solid- and solution-phase concentrations and that the relationship is linear and reversible.

- The K_d values used in this analysis for all the CMCOPCs represent literature or calculated values and may not accurately represent the site conditions.

Table 5-4. Summary of AT123D Modeling Results for Winklepeck Burning Grounds

CMCOPCs	Predicted Maximum Groundwater Concentration at Receptors[a]							Observed $C_{gw,max}$ in Groundwater (µg/L)	MCL/RBC (µg/L)	CMCOC Based on Concentration at	
	At Source (µg/L)	Property Boundary		Northern Stream		Sand Creek					
		Conc. (µg/L)	Time[b] (years)	Conc. (µg/L)	Time[b] (years)	Conc. (µg/L)	Time[b] (years)			Source	Receptor[c]
PAD 37											
RDX	162.00	0.20		NA		1.73	11	52.00	0.61	Yes	Yes
Arsenic	80.20	0.002		NA		1.50		24.00	10.00	Yes	No
PAD 38											
Arsenic	46.30	0.01		NA		0.22		24.00	10.00	Yes	No
Cadmium	91.60	0.00		NA		0.00		0.30	5.00	Yes	No
PAD 58											
Arsenic	42.50	4.92		5.68		0.00		24.00	10.00	Yes	No
Antimony	22.40	0.10		0.18		0.00		NA	4.00	Yes	No
Chromium	104.00	15.30		16.10		0.00		1.70	100.00	Yes	No
PAD 60											
RDX	34.00	2.38	7	11.9	6	0.00		52.00	0.61	Yes	Yes
Arsenic	31.60	2.32		7.83		0.00		24.00	10.00	Yes	No
PAD 61											
RDX	24.90	1.84	6	2.3	6	0.00		52.00	0.61	Yes	Yes
Carbazole	203.00	27	1,000	29.4	1000	0.00		NA	3.30	Yes	Yes
Arsenic	85.90	6.35		7.97		0.00		24.00	10.00	Yes	No
Antimony	15.60	0.01		0.02		0.00		NA	4.00	Yes	No
PAD 62											
RDX	321.00	45.8	10	18.4	11	0.01		52.00	0.61	Yes	Yes
Arsenic	24.20	1.97		0.35		0.00		24.00	10.00	Yes	No
PAD 66											
1,3-Dinitrobenzene	5.16	0.08		NA		0.00		0.03	3.70	Yes	No
2,6-Dinitrotoluene	127.00	0.00		NA		0.00		0.25	37.00	Yes	No
RDX	321.00	38.1	11	NA		0.08		52.00	0.61	Yes	Yes
Arsenic	37.90	3.51		NA		0.00		24.00	10.00	Yes	No
Barium	3,730.00	15.80		NA		0.00		110.00	2,000.00	Yes	No
PAD 67											
1,3,5-Trinitrobenzene	2,090.00	193.00		NA		0.03		1.30	1,100.00	Yes	No
RDX	321.00	54.8	10	NA		0.04		52.00	0.61	Yes	Yes
Arsenic	40.70	8.26		NA		0.00		24.00	10.00	Yes	No

Table 5-4. Summary of AT123D Modeling Results for Winklepeck Burning Grounds (continued)

CMCOPCs	Predicted Maximum Groundwater Concentration at Receptors[a]							Observed $C_{gw,max}$ in Groundwater (µg/L)	MCL/RBC (µg/L)	CMCOC Based on Concentration at	
	At Source (µg/L)	Property Boundary		Northern Stream		Sand Creek					
		Conc. (µg/L)	Time[b] (years)	Conc. (µg/L)	Time[b] (years)	Conc. (µg/L)	Time[b] (years)			Source	Receptor[c]
PAD 68											
RDX	6.66	0.89	6	NA		0.00		52.00	0.61	Yes	Yes
Antimony	5.51	0.02		NA		0.00		NA	4.00	Yes	No
Arsenic	40.60	7.96		NA		0.00		24.00	10.00	Yes	No
Barium	2,360.00	51.90		NA		0.00		110.00	2,000.00	Yes	No

[a]The predicted maximum concentration in groundwater ($C_{gw,max}$) at the source was calculated using the AT123D model based on contaminant loading predicted by SESOIL.
[b]If the concentration of a CMCOPC in groundwater at the receptor location exceeds its MCL or RBC, then the time required to reach the peak concentration is reported in the table.
[c]A constituent is a final CMCOC if the AT123D-predicted maximum concentration in groundwater at any of the three receptor locations exceeds its MCL or RBC.
NA = Indicates that the Northern Stream is not an applicable receptor for the listed pad.
AT123D = Analytical Transient 1-, 2-, 3-Dimensional (model).
CMCOC = Contaminant migration contaminant of concern.
CMCOPC = Contaminant migration contaminant of potential concern.
MCL = Maximum contaminant level.
RBC = Risk-based concentration.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SESOIL = Seasonal Soil Compartment (model).

- Migration in the vadose zone is one-dimensional (i.e., only in the vertical direction).
- Initial condition is disregarded in the vadose zone modeling.
- Flow and transport are not affected by density variations.
- Areal distribution of soil contamination is not considered.

The inherent uncertainties associated with using these assumptions must be recognized. K_d values are highly sensitive to changes in the major chemistry of the solution phase. Therefore, it is important that the values be measured or estimated under conditions that will represent as closely as possible those of the contaminant plume. It is also important to note that the contaminant plume will change over time and be affected by multiple solutes that are present at the site. Projected organic concentrations in the aquifer are uncertain because of the lack of site-specific data on constituent decay in the vadose zone, as well as in the water table. Use of literature values (particularly K_d values) may produce either over- or underestimation of constituents' concentrations in the aquifer. Deviations from assumed literature values may significantly affect contaminant fate predictions.

The effects of heterogeneity, anisotropy, and spatial distribution of fractures are not addressed in these simulations. The present modeling study using SESOIL and AT123D does not address the effects of flow and contaminant transport across interfaces in a sharply varying heterogeneous media.

Conceptually, an average water-table depth of 10 ft bgs (SESOIL modeling depth) was assumed. Therefore, the saturated groundwater flow was assumed to occur below this depth in the sandy interbeds. Because of AT123D limitation, the hydraulic conductivity field for the saturated zone was assumed to be homogeneous, and its geometric mean value of 1.14E-3 cm/sec based on the slug-test results was used in this modeling. Noting the hydraulic conductivity to range from 1.55E-04 to 8.14E-02 cm/sec, the predicted concentrations appear to represent a mean condition within a range of expected concentrations. The range appears to be orders of magnitude, suggesting the associated uncertainty to be significant.

For AT123D modeling, the key input parameters are hydraulic conductivity (K_s), hydraulic gradient (I_s), effective porosity (n_e), and K_d. The K_s, I_s, and n_e work as a lumped parameter controlling the seepage velocity $V_s = K_s*I_s/n_e$. The impact (sensitivity) of K_d is discussed above. They hydraulic gradient is noted to vary over a relatively narrow range below the facility. Therefore, the impact of hydraulic gradient is expected to be relatively less than that of K_s. The impact of n_e can be significant given the presence of fractures in the Sharon Group (Section 2.3.1.2).

5.6 SUMMARY AND CONCLUSIONS

Based on site characterization and monitoring data, metals and organics compounds exist in the surface and subsurface soils at WBG. Some organic compounds and metals are also found in the groundwater. Fate and transport modeling indicates that some of these contaminants may have been leaching from contaminated soils into the groundwater beneath the source areas. Migration of many of the constituents, however, has been attenuated because of moderate to high retardation factors. The findings of the groundwater modeling are summarized below.

- Several explosive-related compounds (e.g., 2,6-DNT; RDX; 1,3,5-TNB; 1,3-DNB; and carbazole) are expected to continue leaching to the water table with concentrations exceeding their respective MCL or RBC.

- Some of the metals detected at this site (e.g., antimony, arsenic, barium, and chromium) are expected to continue leaching to the water table with concentrations exceeding their respective MCL or RBC.

- Lateral migration modeling using the AT123D model indicates that none of the metals or organics except RDX and carbazole are expected to reach the WBG site boundary or any of the receptor locations at concentrations exceeding their respective MCLs or RBCs.

- RDX from Pads 60, 61, 62, 66, 67, and 68 was the only CMCOPC modeled to reach the AOC boundary at concentrations above its RBC in less than 1,000 years. The estimated time to attain peak concentrations is 11 years or less, which suggests peak concentrations have already passed relative to the cessation of WBG operations.

- RDX from Pad 37 was the only constituent modeled to reach Sand Creek at concentrations greater than MCLs or RBCs. Peak concentrations of 1.73 μg/L were predicted to occur at 10 years.

6.0 SUMMARY AND CONCLUSIONS

The WBG Phase III RI Report presents a detailed analysis of the environmental data collected during the Phase III RI field effort. The following sections present an overview of the major findings of the investigation and modeling of contaminant fate and transport. A revised CSM is presented to integrate results of previous investigations with those of the Phase III RI. The CSM denotes, based on available data, where source areas occur, the mechanisms for contaminant migration from source areas to receptor media (e.g., streams and groundwater), and exit pathways from the AOC.

6.1 SUMMARY OF CONTAMINANT NATURE AND EXTENT

The Phase III RI evaluated the nature and extent of contamination in surface soil from 0 to 1 ft bgs, subsurface soil below 2 ft bgs, sediment, and groundwater. Phase III RI biased soil sampling activities were limited to 12 pads where previous investigations indicated the need for additional characterization of lateral and/or vertical extent of contamination. Surface soil samples were also collected in the Building 4301 vicinity, which had not been previously characterized. In order to confirm the absence of contamination, surface soil samples were collected using random grid techniques from areas that were not believed to have been impacted by AOC operations between the former burning pads. Biased subsurface soil samples were collected using hand bucket auger and Geoprobe methods to depths of up to 10 ft. Two dry sediment samples were collected from a previously uncharacterized drainage conveyance exiting the AOC to the north. Eight new monitoring wells were installed and all existing and newly installed wells were sampled.

Data were aggregated by environmental media and depth as follows: surface soil 0 to 1 ft bgs, subsurface soil below 2 to 10 ft bgs, sediment (both samples), and groundwater (all wells). Summary statistics for data within each media aggregate were calculated for the purposes of identifying SRCs. SRCs were identified by screening data against frequency of detection and weight of evidence criteria, essential human nutrient criteria, and RVAAP facility-wide background values for inorganics.

Phase III RI data screening results were compared to those from the Phase II RI to identify if any new chemicals emerged as SRCs or instances where previously identified SRCs were not confirmed by the Phase III RI. These differences are described in the report for future reference in risk evaluations to be included in the subsequent FS report. The nature and extent evaluation in this report focused on lateral and horizontal extent of those constituents identified as SRCs in both the Phase II and III investigations, as well as those new SRCs identified in only the Phase III RI. The occurrence of SRCs at each individual pad or building vicinity sampled was evaluated. For random grid surface soil sampling, 30 geographic exposure units (EUs) were delineated and one sample station was identified within each EU. The occurrence of SRCs within each random grid EU was evaluated. Sediment SRCs were evaluated in the previously uncharacterized drainage ditch to the north. Groundwater was evaluated on an AOC-wide basis.

6.1.1 Surface Soil

A total of 66 biased surface soil stations were sampled for the purpose of completing the nature and extent of surface soil contamination at the 12 former burning pads of interest. As noted above, a total of 30 random grid surface soil samples were also collected. Chemical evaluation of the surface soils included analyses of explosives, propellants, TAL metals, hexavalent chromium, cyanide, and organic compounds. All surface soil samples were analyzed in the field for TNT and RDX. Explosives were not evaluated in samples from Pad 32, as this site was sampled to verify whether concentrations of metals (e.g., aluminum) were present at sufficient levels to potentially produce ecological effects.

6.1.1.1 Explosives

- The majority of the soil samples analyzed in the field for TNT and RDX had no detectable quantities of these explosives (based on corrected calculations). A total of 21 surface soil samples were submitted for analyses in the fixed-base laboratory for explosives.

- Samples from 9 of the 12 pads sampled contained low, detectable concentrations of one or more explosive compounds at concentrations less than 1 mg/kg.

- Three pads had occurrences of explosives in excess of 1 ppm:

  – Pad 60 (station WBG-211) results indicated high concentrations of 2,4,6-TNT (680 mg/kg), as well as degradation products 2-amino-4,6-dintrotoluene (14J mg/kg) and 2, 4-DNT (1.5 mg/kg). The maximum detected values were on the berm located south of the pad.

  – At Pad 66 (station WBG-247), 2,4,6-TNT was detected at 1.5 mg/kg.

  – At Pad 67, high concentrations of 1,3,5-TNB (34 mg/kg), 2,4,6-TNT (430 mg/kg), RDX (470 mg/kg), and HMX (100 mg/kg) were identified. Concentrations of 2,4,6-TNT above 10 mg/kg extended to the drainage ditch located about 100 ft south of the pad. This was the only pad sampled during the Phase III RI with detectable quantities of HMX and RDX in surface soils. A small area of the pad was observed to have stained soil and a small amount of possible residual product was observed on the ground surface. This material was collected (about 21 g) and analyzed for TNT in the field laboratory only. The TNT content was approximated at 97%. Analysis of filter residues for metals did not indicate any substantially elevated inorganics in this material.

- There were no occurrences of explosives or propellants in random grid samples or at Pad 37.

- Results of the field TNT and RDX screening indicate that the Building 4301 vicinity is not contaminated with explosive compounds. Two samples from this site were submitted for propellants analyses; no propellants were detected.

6.1.1.2 Inorganics

- Hexavalent chromium was present at generally low estimated concentrations at the 10 pads where samples were collected. Concentrations ranged from non-detects to a maximum of 12.2J mg/kg at Pad 61 (station WBG-217).

- Cyanide was generally absent in surface soil; low, estimated concentrations were observed only at Pad 60 (0.88J mg/kg) and at Building 4301 (1.8J mg/kg).

- Phase III RI data indicated metals concentrations (primarily antimony, cadmium, chromium, barium, lead, zinc, and occasionally mercury) substantially higher than background values at the following sites:

  – Pad 37 (surface soil on the pad),
  – Pad 38 (surface soil on the pad),
  – Pad 45 (north and east of the Deactivation Furnace Area),
  – Pad 58 (on the berms and south and east of the berms),
  – Pad 59 (western berm and western half of the pad),
  – Pad 60 (berms and west of the western berm),

- Pad 61 (surface soil on the pad),
- Pad 62 (center and to the west of the pad),
- Pad 66 (south and west of the pad),
- Pad 67 (western half of the pad and south to the drainage ditch), and
- Pad 68 (areas adjacent to the pad).

- Occurrences of metals above background are common in the random grid samples. Barium, cadmium, cobalt, and zinc were the most commonly detected metals. Maximum levels of cobalt and zinc were found south of Pads 33 and 34, near Building 1604, a location at which contamination had not been observed in the Phase II RI. Lead was also identified above background north of Pad 59. Higher barium concentrations generally occur in the northern half of WBG, as compared to the southern half of the site.

- Samples from the Building 4301 vicinity contained antimony, barium, cadmium, and mercury at concentrations many times above the background criteria.

6.1.1.3 Organic compounds

- Organic compounds were analyzed in a total of nine samples collected at Pads 37, 38, 45, 61, 62, 66, 67, and at Building 4301. No samples were analyzed for organic compounds at Pads 32, 58, 59, 60, and 68, or in the random grid areas.

- Pesticides (4,4'-DDT, dieldrin, and heptachlor epoxide) or PCBs were detected at very low concentrations at Pads 37, 38, 61, and 66.

- SVOCs, primarily PAHs presumed to result from open burning on the pads, were found at Pad 61 and at Building 4301. These compounds were present at low concentrations, generally below 0.7 mg/kg.

- One VOC (TCE) was detected at Building 4301 at a low estimated concentration of 0.0012J mg/kg.

6.1.2 Subsurface Soil

Fifty-four subsurface soil samples were collected from 25 borings at 10 burning pads as part of the Phase III RI. Subsurface soil was not sampled at Pads 32 or 60 based on Phase III RI field screening for explosives in surface soil and previous (Phase II) investigation findings. Chemical evaluation of the soils included analyses of explosives, TAL metals, hexavalent chromium, cyanide, and organic compounds. Based on field analyses for TNT and RDX in surface soil, subsurface soils were collected from the 2- to 4-ft intervals from borings excavated with hand bucket augers, with the exception of stations WBG-217 and -249 (see Section 3.4.1). Successive depths were sampled based on the results of the field explosives analyses, except at stations WBG-281 and -220. All Geoprobe borings were sampled to a depth of 10 ft and samples submitted for fixed-base laboratory analyses of explosives regardless of field laboratory results. A total of 37 samples from 13 soil borings were analyzed in the fixed-base laboratory for explosives.

6.1.2.1 Explosives and propellants

- Pad 68 had no detectable quantities of explosives in the subsurface soils.

- Concentrations of explosives below 1 mg/kg were observed at Pads 37, 38, 45, 62, and 66. Some detectable explosives were present in the 6- to 8-ft interval at Pad 38; however, most contaminants were identified in the 2- to 4-ft interval.

- Occurrences of explosives at concentrations greater than 1 mg/kg were identified at Pads 58, 59, 61, and 67 as follows. As the maximum scoped sample depth was 10 ft bgs, the vertical extent of contamination may not have been defined at all pads.

  – At Pad 58, explosives contamination was evident to a depth of 6 ft bgs. Concentrations of 1,3,5-TNB; TNT; 2,4-DNT; and other compounds were 5 to 100 times higher in the subsurface soils at station WBG-199 than in the surface soil sample, suggesting some reworking of soils during the active use of this pad.

  – At Pad 59, explosives contamination was evident to a depth of 6 ft bgs in WBG-205. Samples from station WBG-210 contained no detectable explosives below the 2- to 4-ft interval. The maximum concentration of explosives was 17 mg/kg of 2,4,6-TNT at station WBG-205 (4- to 6-ft interval); most other occurrences were less than 1 mg/kg.

  – At Pad 61, RDX and TNT occurred at concentrations slightly greater than 1 mg/kg in the 2- to 4- and 4- to 6-ft intervals.

  – Pad 67 exhibited the highest concentrations of several explosives encountered in WBG subsurface soils, including 2,4,6-TNT and RDX. At station WBG-252, 2,4,6-TNT was present at high concentrations at all depth intervals sampled, with a maximum value of 5,200 mg/kg in the 4- to 6-ft interval. HMX; RDX; 1,3,5-TNB; and 2,4-DNT were also present in subsurface soils at Pad 67.

6.1.2.2 Inorganics

- Hexavalent chromium was analyzed in 12 samples collected from Pads 38, 45, and 58. This constituent was detected at low, estimated concentrations only in two subsurface samples from station WBG-237: 2.8J mg/kg in the 4- to 6-ft interval and 1.4J mg/kg in the 8- to 10-ft interval.

- No metals exceeded background values at Pad 62.

- Cyanide was detected only once (Pad 61) out of four samples (4.6 mg/kg, station WBG-217, 2- to 4-ft interval). Pad 61 subsurface soil also had the highest frequency of metals detected above their respective background criteria and a number of metals were detected at Phase III maximum concentrations (antimony, barium, chromium, copper, lead, mercury, nickel, selenium, silver, vanadium, and zinc).

- At Pads 37, 38, 58, and 59, antimony, arsenic, barium, cadmium, copper, lead, silver, and zinc all exceeded subsurface soil background criteria at various depths. Since the maximum scoped depth of sampling was 10 ft bgs, in some cases, the vertical extent of contamination may not have been defined.

6.1.2.3 Organic compounds

- Organic compounds were evaluated at one boring at Pads 58, 59, 61, and 68. Each sample was evaluated for VOCs, SVOCs, and pesticides/PCBs. Occurrences of organic compounds in subsurface soils are sporadic and at generally low concentrations.

- Toluene, dimethylbenzene, and ethylbenzene were identified at Pad 59 at concentrations less than 0.03 mg/kg. TCE was present at Pad 61 at 0.0011 J mg/kg and acetone and methylene chloride were present at Pad 68, at concentrations less than 0.01 mg/kg. All detections of VOCs were from the 2- to 4-ft sample interval at these pads.

- SVOCs were detected Pad 58 in the 4- to 6-ft interval and at Pads 59 and 61 in the 2- to 4-ft interval. Detected SVOCs consist mainly of a number of PAHs presumed to be associated with open burning at the pads. Pad 61 had the maximum concentration of all PAHs detected in the Phase III subsurface soil. At Pad 58, 10 PAHs were detected, with a maximum observed concentration of 0.47 mg/kg for pyrene. At Pad 59, eight PAHs were detected at concentrations ranging from 0.05 to 3.2 mg/kg.

- Two pesticides, endrin ketone and heptachlor epoxide, were each detected on one occasion at low concentrations less than 0.05 mg/kg.

6.1.3 Phase III Remedial Investigation Dry Sediment Samples

- The two sediment samples collected from the drainage ditch flowing beneath Road E, did not contain detectable TNT or RDX exceeding 1 mg/kg; therefore, samples were not sent to the fixed-base laboratory. Nitroguanidine was detected at a low estimated concentration in the sample from WBG-294.

- Inorganic SRCs detected above background criteria included antimony, beryllium, cadmium, and lead. Chromium, copper, nickel, selenium, and vanadium were detected above background values in WBG-295 only. Concentrations were generally less than twice the background criteria for analytes having background values.

- The sample from station WBG-295 contained a low, estimated concentration of one VOC (TCE). PCB-1260 was detected at a low, estimated concentration at WBG-294. Two SVOCs, di-n-butylphthalate and n-nitrosodiphenylamine, were also detected at low estimated concentrations at station WBG-294.

6.1.4 Groundwater

Groundwater samples were collected from 17 existing and newly installed Phase III RI monitoring wells. Samples were analyzed for dissolved (filtered) metals, explosives, propellants, cyanide, VOCs, SVOCs, and pesticides/PCBs.

6.1.4.1 Explosives

- Propellants were not detected in groundwater.

- Every monitoring well, with the exception of OBG-2 and WBGmw-013, was found to have low concentrations of one or more explosives. Concentrations ranged from 0.05 μg/L (2,4-DNT) in WBGmw-005 to a maximum concentration of 52 μg/L (RDX) in WBGmw-006. Results for only five individual compounds exceeded 1 μg/L: two compounds in WBGmw-006, two in WBGmw-015, and one in WBGmw-010.

- The well at the eastern AOC boundary, WBGmw-016, contained low concentrations of 2-nitrotoluene and 4-nitrotoluene.

- Concentrations of explosives in WBG groundwater appear to have changed very little since the Phase II RI.

6.1.4.2 Inorganics

- Eight metals were detected above background in Phase III groundwater samples: aluminum, arsenic, barium, cadmium, cobalt, manganese, nickel, and zinc. Copper, mercury, and cyanide were identified as SRCs in Phase II samples, but these three constituents were not detected in Phase III samples.

- Inorganics did not exceed background in wells OBG-1 and OBG-2 and WBGmw-006, -008, -011, -012, -013, and -017.

- The largest exceedance of background criteria was for zinc in WBGmw-015 (500 ug/L; about eight times the background value).

- The occurrences of inorganics above background values were generally limited to three or fewer per monitoring well. Inorganics were detected at concentrations exceeding secondary MCLs, but no inorganics exceeded primary MCLs.

- Concentrations of metals are similar to those observed during the Phase II RI.

6.1.4.3 Organic compounds

- Low levels of bis(2-ethylhexyl)phthalate were the only SVOC detected during the Phase III RI (WBGmw-007, -010, and -013). Low estimated concentrations of the pesticide 4,4'-DDT were detected in WBGmw-006 and heptachlor epoxide in WBGmw-010. PCBs and PAHs were not detected.

- Chloroform was the only VOC detected (WBGmw-010).

6.2 CONTAMINANT FATE AND TRANSPORT

Contaminant fate and transport modeling performed as part of the Phase III RI included leachate modeling (SESOIL) at selected source areas within WBG demonstrating the highest levels of process-related contaminants (Pads 37, 38, 58, 60, 61, 62, 66, 67, and 68 and Building 4301). Combined Phase I, II, and III RI data were used to conduct source area modeling evaluations. At those source areas where constituents were predicted to leach from surface soil to groundwater at concentrations exceeding MCLs or RBCs (e.g., CMCOPCs), groundwater modeling (AT123D) was conducted for the CMCOPCs from the source to selected receptors or exit points from the AOC. The receptor and exit points selected for groundwater transport modeling included the AOC boundary, Sand Creek, and stream north of WBG (Pads 58, 60, 61, and 62 only) at their closest points downgradient of each source area. Those constituents predicted to reach the receptor locations at concentrations exceeding risk-based criteria were identified as contaminant migration contaminant of concern (CMCOCs).

6.2.1 SESOIL Modeling

Antimony, arsenic, and RDX were identified at multiple pads as CMCOPCs based on the leachability analysis of the source. The following compounds were identified as CMCOPCs at only one source pad: 1,3-DNB and 2,6-DNT (Pad 66); 1,3,5-TNB (Pad 67); barium (Pad 68); cadmium (Pad 38); carbazole (Pad 61); and chromium (Pad 58). The timeframe for explosive compounds to reach predicted peak concentrations ranged from 2 to 12 years, which suggests that maximum concentrations have already occurred relative to the cessation of operations at WBG. The predicted timeframes for peak concentrations of inorganic CMCOPCs ranged from 311 to the model maximum of 1,000 years. The leaching modeling is conservative and migration of these constituents may be attenuated because of moderate to high retardation factors for these constituents. For example, 1,3-TNB and carbazole were not detected in Phase III RI groundwater samples. However, the presence of arsenic; barium; cadmium; 2,6-DNT; 1,3,5-TNB; and RDX in groundwater indicate leaching processes are ongoing near some of the source pads.

6.2.2 AT123D Modeling

Modeling of contaminant transport in shallow groundwater was conducted for the identified CMCOPCs from the source pads to the three endpoints noted above. None of the metals were predicted to reach any receptor points at concentrations greater than MCLs or RBCs within the 1,000-year modeling period; thus, they were eliminated as CMCOCs. RDX from Pads 37, 60, 61, 62, 66, 67, and 68 was predicted to reach one or more of the selected receptor locations at concentrations exceeding its RBC. Pad 37 was the only source location where a CMCOC was predicted to reach Sand Creek above it RBC (RDX with a peak concentration at 10 years). Peak RDX concentrations were predicted to occur at the AOC boundary from 6 to 11 years depending on pad location. For Pads 60, 61, and 62, RDX was also predicted to exceed its RBC at the stream north of WBG with peak concentrations occurring from 6 to 11 years. Concentrations of carbazole were also predicted to exceed its RBC at the AOC boundary and the stream north of WBG; thus, it may technically be considered as a CMCOC. However, the timeframe to achieve peak concentrations was the model maximum of 1,000 years and, as noted above, this compound was not detected in groundwater during the Phase III RI.

6.3 CONCEPTUAL SITE MODEL

The preliminary CSM for WBG, developed as part of the FS SAP Addendum No. 1, was summarized in Chapter 2.0. A revised CSM is presented in this section that incorporates Phase III RI data and the results of contaminant fate and transport modeling and risk evaluations. Elements of the CSM include

- primary contaminant source areas and release mechanisms,
- contaminant migration pathways and exit points, and
- data gaps and uncertainties.

An illustrated version of the revised CSM is provided in Figure 6-1 to assist in visualizing the concepts discussed below.

6.3.1 Source-Term and Release Mechanisms

Results of the Phase III RI soil sampling indicate that Pads 58, 59, 60, 61, 66, and 67 generally contain the greatest numbers and concentrations of contaminants. Metals and explosives are the primary contaminants present in these areas at concentrations greater than background. Soil contamination by explosives is present to the maximum depths sampled (6 to 10 ft) at Pads 58, 59, 61, and 67. Metals SRCs substantially above background also were observed at Pads 37, 38, 45, 62, and 68. Samples from the Building 4301 vicinity also showed concentrations of inorganics well above background values.

Two primary mechanisms for release of contaminants from the source areas are identified: (1) erosional and/or dissolved phase transport of contaminants from soil sources with transport into drainage ditches and Sand Creek, and (2) leaching of constituents to groundwater via infiltration of rainwater through surface and subsurface soils. Evaluation of these release mechanisms was done through sampling of ditches and monitoring wells installed downgradient of the burn pads, and numerical modeling of soil leaching processes. Discussion of the results of evaluation of data for preferred contaminant migration pathways and exit points is presented below. Airborne dispersion of contaminants was not quantified or modeled. The chemical characteristics of the SRCs present, high annual precipitation levels, and heavy vegetation cover at WBG likely preclude any substantial dispersion of contaminants via air dispersion pathways.

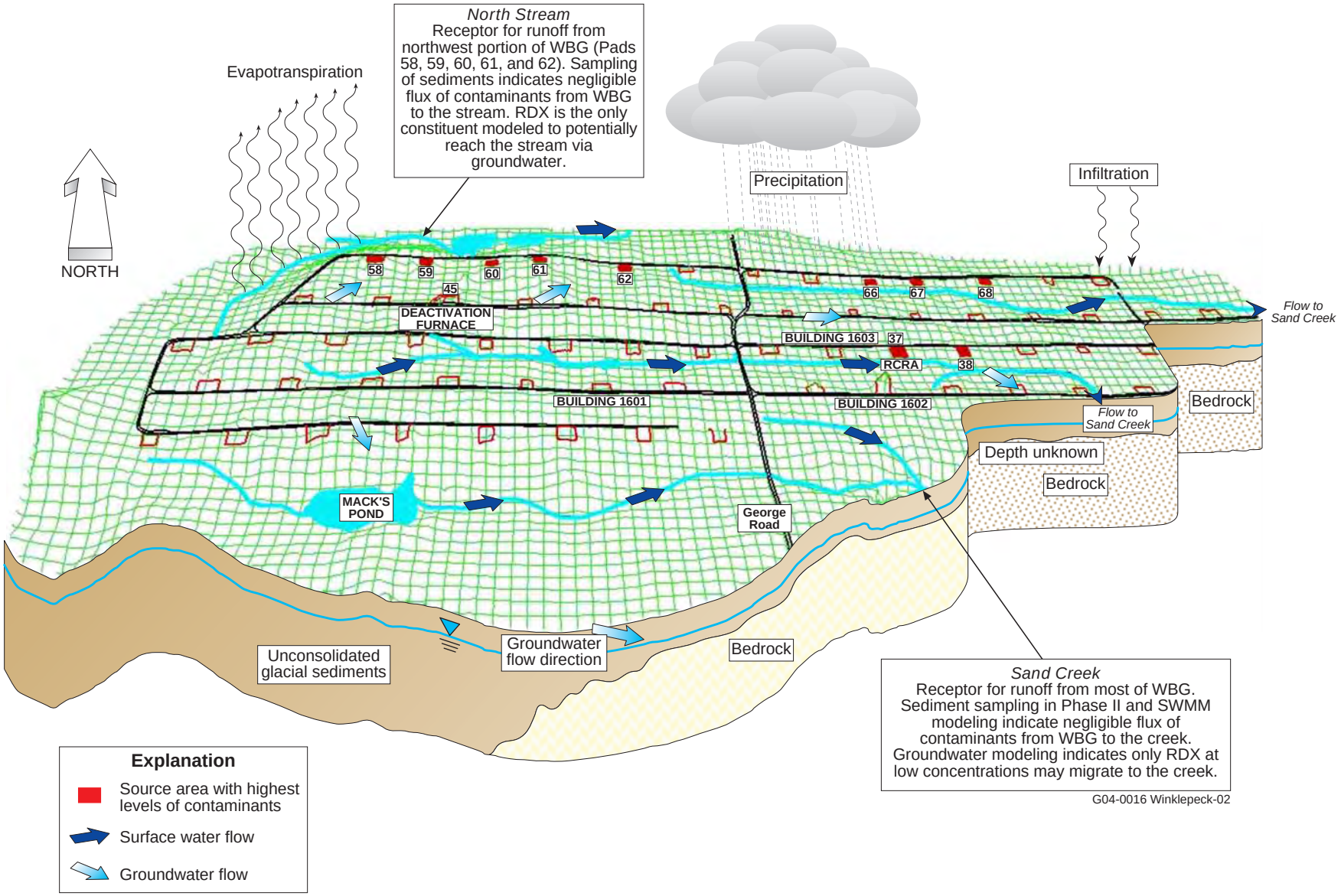

Figure 6-1. Conceptual Site Model for Winklepeck Burning Grounds

6.3.2 Contaminant Migration Pathways and Exit Points

6.3.2.1 Surface water pathways

Migration of contaminants from soil sources via surface water occurs primarily by: (1) movement of particle-bound (e.g., clays or colloids) contaminants in surface water runoff, and (2) transport of dissolved constituents in surface water. Surface runoff is directed to drainage ditches and tributaries to the Sand Creek, and to a ditch that drains the northwest portion of WBG and exits the AOC between Pads 58 through 61 to a surface drainage conveyance north of WBG.

Upon reaching quiescent portions of surface water conveyances, flow velocities decrease and particle-bound contaminants are expected to settle out as sediment accumulation. Sediment-bound contaminants may be re-mobilized during storm events. Sediment-bound contaminants may also partition to surface water and be transported in dissolved phase. Previous sampling of sediment and surface water was deemed adequate to characterize potential contaminant transport along conveyances to Sand Creek. Modeling of surface water transport pathways in the Phase II RI indicated that erosional transport mechanisms are not expected to contribute substantial flux of contaminants to Sand Creek.

Biased sampling of sediment in the ditch flowing north out of WBG indicates that the drainage is not an exit point for contaminants. Inorganic contaminants were typically detected at concentrations less than twice background criteria, except antimony and selenium, which were detected at just over twice the background level. Cadmium (which has no background criterion) was also detected. Detects for one PCB compound, two SVOCs, and one VOC were all less than 1 mg/kg.

6.3.2.2 Leaching and groundwater pathways

Evaluation of leaching potential for soil source areas (Section 6.2) indicates that explosives, metals, and carbazole may be expected to leach from the contaminated surface soil into the groundwater and reach concentrations exceeding groundwater MCLs or RBCs. The presence of some of these constituents in groundwater near source areas suggests that leaching processes are ongoing near the source areas. Timeframes for leaching of the explosive compounds are relatively short (2 to 12 years), indicating that peak concentrations in groundwater beneath the source areas may have already passed. Timeframes to attain predicted peak concentrations for metals are much longer (approximately 300 to 1,000 years), indicating that concentrations may increase in the future.

Shallow groundwater flow follows stream drainage and topographic patterns with flow east-southeast across the AOC. Evidence exists that the AOC acts as a recharge area with shallow groundwater flow to the northeast and southeast surface water features. Modeling of contaminant transport in shallow groundwater was conducted for CMCOPCs identified from the leaching model to selected receptor locations. Results show that none of the metals were predicted to reach any receptor points at concentrations greater than MCLs or RBCs within the modeling period. RDX can be expected to reach certain receptor locations, depending on the source area modeled, at concentrations exceeding its RBC. However, as with the leaching results, the predicted timeframes to attain peak concentrations (6 to 11 years) suggest that most migration has already occurred.

6.3.3 Uncertainties

The CSM is developed based on available site characterization and chemical data. Uncertainties are inherent in the CSM where selected data do not exist or are sparse. The uncertainties within the CSM for WBG include the following.

- Leachate and transport modeling is limited by uncertainties in the behavior and movement of contaminants in the presence of multiple solutes. In addition, heterogeneity, anisotropy, and spatial distributions of more permeable zones (e.g., fractures) could not be fully characterized during the field investigation nor addressed in the modeling. Therefore, effects of these features on contaminant transport at WBG are uncertain and modeling results are considered as conservative representations.

- The exact source(s) of some inorganics in soil and sediment in the AOC is unknown. Data evaluated in the nature and extent and risk evaluations address all constituents measured within the burning grounds whether from natural or anthropogenic sources. Results of the evaluations may reflect, in part, contributions from sources other than WBG operations (e.g., slag or pre-RVAAP activities).

6.4 CONCLUSIONS

The conclusions presented below, by medium, combine the findings of the contaminant nature and extent evaluation and fate and transport modeling. The results of the Phase III investigation do not change the overall conclusions presented in the Phase II RI. It is noted that analyses for additional compounds in the Phase III RI, relative to the Phase I and II RIs, resulted in some additional chemicals that were identified as SRCs. These additional SRCs will require further screening in context of the human health risk evaluation in the pending FS.

6.4.1 Surface Soil

With the possible exception of Pad 67, the lateral extent of explosives in surface soil has largely been defined down to a concentration of 1 ppm. At the 12 pads investigated during the Phase III RI, explosive compounds appear to be limited to relatively close proximity to the source pads. Antimony, cadmium, chromium, barium, lead, zinc, and mercury were frequently detected above background in surface soils within a number of pads. The Phase III RI demonstrated that concentrations of some metals (e.g., lead and cadmium) 5 to 20 times background criteria extend well beyond pad boundaries. Hexavalent chromium, pesticides, PCBs, SVOCs, and VOCs were detected only sporadically and usually at low, estimated concentrations. Additional SRCs identified from Phase III RI data include the following:

- 2-amino-4,6-dinitrotoluene
- 4-amino-2,6-dinitrotoluene
- nitroguanidine
- hexavalent chromium
- manganese
- vanadium
- 4,4'-DDT
- dieldrin
- heptachlor epoxide
- PCB-1254
- PCB-1260

6.4.2 Subsurface Soil

Subsurface soil sampling during the Phase III RI showed the presence of detectable explosive compounds and inorganics above facility-wide background criteria at several pads. Concentrations of explosives decreased with depth; the greatest overall frequency of detection occurred at depths of 4 ft or less. Explosive compounds above 1 mg/kg were detected to depths of 6 ft or greater at four pads (58, 59, 61,

and 67). However, even at these locations, maximum observed concentrations were observed at depths of 6 ft or less. Pad 67 contained the highest concentrations of explosives in subsurface soil and concentrations up to 860 mg/kg (2,4,6-TNT) continued to be observed to the maximum sampling depth of 10 ft.

Pads 37, 38, 58, 59, and 61 exhibited the greater numbers and concentrations of inorganic SRCs in subsurface soil (antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, vanadium, and zinc). Distinct vertical concentration gradients were not clearly evident for most metals; background exceedances occurred at various depths depending on the location. Hexavalent chromium and cyanide were infrequently detected and occurred primarily at low, estimated values. Occurrences of organic compounds in subsurface soils were also sporadic and at generally low, estimated concentrations.

Additional SRCs identified from Phase III RI subsurface soil data include the following:

- 2-amino-4,6-dinitrotoluene
- 4-amino-2,6-dinitrotoluene
- aluminum
- arsenic
- chromium
- hexavalent chromium
- cyanide
- nickel
- selenium
- vanadium
- endrin ketone
- heptachlor epoxide
- acenaphthylene
- dibenzofuran
- fluorene
- naphthalene
- dimethylbenzene
- ethylbenzene
- methylene chloride
- TCE

6.4.3 Phase III Remedial Investigation Dry Sediment

Sediment samples collected from the drainage ditch flowing north beneath Road E did not contain detectable TNT or RDX exceeding 1 mg/kg in field analyses. Nitroguanidine was detected at a low estimated concentration in the sample from WBG-294. Inorganic SRCs detected above background criteria included antimony, beryllium, cadmium, and lead. Chromium, copper, nickel, selenium, and vanadium were detected above background values in WBG-295 only. Concentrations were generally less than twice the background criteria for analytes having background values. The Phase III RI data indicate that substantial contamination is not migrating from the AOC via this pathway. Four additional SRCs were identified from Phase III RI data

- nitroguanidine,
- hexavalent chromium,
- selenium, and
- PCB-1260.

6.4.4 Groundwater

Shallow groundwater at WBG near former source pads contains low concentrations (generally less than 1 μg/L) of explosives. Based on available data, groundwater contamination by inorganics and organics other than explosives is minimal at WBG. Trace levels of only two degradation products (2- and 4-nitrotoluene) were observed in well WBGmw-016, located furthest downgradient (east) at WBG, which indicates minimal migration of contaminants beyond the AOC boundary. In those wells sampled during both the Phase II and III investigations, concentrations of explosives and metals have changed very little over time indicating that leaching processes are at steady state. Modeling results compared to WBG operational history suggest that peak leaching of explosive compounds has already occurred. RDX was the only contaminant currently detected in groundwater that may potentially migrate to receptor points at concentrations greater than RBCs.

Additional SRCs identified from Phase III RI groundwater data include the following:

- 1,3,5-TNB
- 2,4,6-TNT
- 2,6-DNT
- 2-amino-4,6-dinitrotoluene
- 2-nitrotoluene
- 4-amino-2,6-dinitrotoluene
- 4-nitrotoluene
- tetryl
- aluminum
- arsenic
- cadmium
- cobalt
- zinc
- 4,4'-DDT
- heptachlor epoxide

7.0 RECOMMENDATIONS

It is recommended that WBG proceed to the FS phase under the RVAAP CERCLA process. It is recommended that the FS phase employ a streamlined remedial alternatives evaluation process based on the most likely land use. The intent of this strategy is to accelerate the evaluation of site-specific remedies by focusing the FS efforts to appropriate alternatives that have been evaluated at other sites with operational histories similar to WBG.

The future land uses and controls envisioned for WBG should be finalized prior to selection of the path forward for the site. Establishment of the most likely land use scenario (e.g., Mark 19 grenade practice range) will allow decision makers the initial information necessary to determine the correct remedial action, such as source removal, land use controls, and/or continued monitoring, to achieve requisite protection of human health and the environment. The envisioned future use of the AOC, or portions of the AOC, is an important consideration in determining the extent of remediation necessary to achieve the required degree of protectiveness. Establishment of land use will also allow for streamlined evaluation of remedies and will be necessary for a future record of decision and attendant land use controls implementation plan (or equivalent documentation).

Areas having the same projected land use within WBG will incorporate the same RGOs into remedial alternative development. Also, the FS should consider potential future separate actions related to surface water systems and the facility-wide groundwater monitoring program. The FS should apply results of the previous ecological field effects evaluation at WBG (pending agreement by Ohio EPA) to remedial goal development to the extent practicable.

Key data uncertainties have been identified in the RI to help guide future remedial planning efforts. Details of additional nature and extent assessment, if needed to fill any remaining data gaps to evaluate remedial alternatives, are deferred to the FS stage. It is noted that a substantial amount of data has been collected at WBG and these data are sufficient to progress to the FS stage. However, because of the nature of historical site operations and physical and chemical nature of the SRCs identified, the nature and extent of contamination cannot be defined with complete certainty. The following components may be necessary for a thorough FS evaluation or may be considered under a separate RI/FS process for integrator media, such as surface water or groundwater:

- Quantification or additional evaluation of risks related to constituents identified as new SRCs from the Phase III RI.

- Refinement of EU boundaries based on the most likely future land use, if remedial decisions by EU are considered most feasible by decision makers. Such a delineation would allow

  - prioritization of EUs or areas, as needed, from highest potential risk to lowest potential risk;

  - selection of cleanup actions and exit strategies per EU and/or per buildings in each EU, (e.g., certain areas may be remediated by soil removal, whereas remediation of other areas may require an alternate approach); and

  - potential elimination of all or portions of certain EUs from further action, thus reducing the footprint of that portion of the AOC requiring remediation.

- Assessment of shallow groundwater at WBG indicated some contamination related to historical process operations. Although definitive evidence of vertical migration of contaminants does not exist, assessment of deep groundwater at the site has not been performed and may be necessary at some point to support future resource use decisions.

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APPENDIX A

SOIL SAMPLING LOGS

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Appendix A
Soil Sample Logs Locator Sheet

Sampling Site Number	Page Number	Sampling Site Number	Page Number	Sampling Site Number	Page Number
WBG-197	A-5	WBG-230	A-69	WBG-264	A-133
WBG-198	A-7	WBG-231	A-71	WBG-265	A-135
WBG-199	A-9	WBG-232	A-73	WBG-266	A-137
WBG-200	A-11	WBG-233	A-75	WBG-267	A-139
WBG-201	A-13	WBG-234	A-77	WBG-268	A-141
WBG-202	A-15	WBG-235	A-79	WBG-269	A-143
WBG-203	A-17	WBG-236	A-81	WBG-270	A-145
WBG-204	A-19	WBG-237	A-83	WBG-271	A-147
WBG-205	A-21	WBG-238	A-85	WBG-272	A-149
WBG-206	A-23	WBG-239	A-87	WBG-273	A-151
WBG-207	A-25	WBG-240	A-89	WBG-274	A-153
WBG-208	A-27	WBG-241	A-91	WBG-275	A-155
WBG-209	A-29	WBG-242	A-93	WBG-276	A-157
WBG-210	A-31	WBG-243	A-95	WBG-277	A-159
WBG-211	A-33	WBG-245	A-97	WBG-278	A-161
WBG-212	A-35	WBG-246	A-99	WBG-279	A-163
WBG-213	A-37	WBG-247	A-101	WBG-280	A-165
WBG-214	A-39	WBG-249	A-103	WBG-281	A-167
WBG-215	A-41	WBG-250	A-105	WBG-282	A-169
WBG-216	A-43	WBG-251	A-107	WBG-283	A-171
WBG-217	A-45	WBG-252	A-109	WBG-284	A-173
WBG-218	A-47	WBG-253	A-111	WBG-285	A-175
WBG-219	A-49	WBG-254	A-113	WBG-286	A-177
WBG-220	A-51	WBG-255	A-115	WBG-287	A-179
WBG-221	A-53	WBG-256	A-117	WBG-288	A-181
WBG-222	A-55	WBG-257	A-119	WBG-289	A-183
WBG-223	A-57	WBG-258	A-121	WBG-290	A-185
WBG-224	A-59	WBG-259	A-123	WBG-291	A-187
WBG-225	A-61	WBG-260	A-125	WBG-292	A-189
WBG-226	A-63	WBG-261	A-127	WBG-293	A-191
WBG-227	A-65	WBG-262	A-129	WBG-296	A-193
WBG-229	A-67	WBG-263	A-131	WBG-297	A-195

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HTRW DRILLING LOG

DISTRICT: LOUISVILLE	HOLE NUMBER: WBG-197	
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WINKLEPECK BURNING GROUNDS	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS SPOON; SS BOWL; SS 3" AUGER W/ EXTENTION	8. HOLE LOCATION: PAD 58 N 562895.96 E 2355650.34	
	9. SURFACE ELEVATION: ~~N/A~~ 1079.41 SRA 4/27/01	
	10. DATE STARTED: 17 OCT 00	11. DATE COMPLETED: 10-17-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER IN HOLE	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A	N/A	TAL XRF	EXPLOSIVES	PROPELLANTS	10-14 ~~N/A~~ Cr	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	B. Williams

LOCATION SKETCH/COMMENTS

SCALE: NOT TO SCALE

SEE PAGE 33 OF "WINKLEPECK BURNING GROUNDS FS SOIL SAMPLING LOGBOOK 1" HOLE WBG-202

PROJECT	HOLE NO.
RVAAP WBG FS	WBG-197

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	B. W. H. →	SHEET	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	10 YR 4/3 BROWN CL-LEAN CLAY WITH SAND, LOW PLASTICITY, DAMP, SOFT, POORLY SORTED FINE SAND	0.0 PPM	N/A	WBG-[illegible]	METAL, WIRE, GLASS, WOOD AND BURN WASTE IN SAMPLE
	1.0					
		148 ft CC				

HTRW DRILLING LOG

DISTRICT: LOUISVILLE		HOLE NUMBER: WBG-198
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2

3. PROJECT: RVAAP WBG FS	4. LOCATION: WINKLEPECK BURNING GROUND
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS SPOON; SS BOWL; SS 3" AUGER W/ EXTENTION	8. HOLE LOCATION: PAD SE; N 562965.38, E 2355719.38
	9. SURFACE ELEVATION: ~~N/A~~ 1076.98 SRA 4/27/01
	10. DATE STARTED: 17 OCT 00
	11. DATE COMPLETED: 18-17-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: 0-1.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER IN HOLE

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	N/A	TAL XRF	EXPLOSIVES	PROPELLANTS	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	B. Will

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE

SEE PAGE 38 OF "WINKLEPECK BURNING GROUNDS FS SOIL SAMPLING LOGBOOK" HOLE WBG-202 Pad 58

PROJECT	HOLE NO
RVAAP WBG FS	WBG-198

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	B. Will	2 OF 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.0	10YR 4/3 BROWN CL-LEAN CLAY WITH SAND LOW PLASTICITY, DAMP, SOFT, POORLY SORTED SAND (FINE)	0.0 PPM	N/A	WB36-0003	
	0.5	10YR 5/6 YELLOWISH BROWN MOTTLED WITH 10YR 4/3 BROWN CL-LEAN CLAY WITH SAND, LOW PLASTICITY, DAMP, SOFT, POORLY	0.0 PPM			0.5
	1.0	SORTED FINE SAND				1.0
		CC 10-20-00 discard sample			CC 10-20-00 WB36	CC 10-20-00
	2.0					
		- Incorrect - 1-4 not sampled 10-20-00 CC				
	3.0					
	4.0					CC 10-20-00

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HTRW DRILLING LOG

DISTRICT: LOUISVILLE		HOLE NUMBER: WBG-199
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 of 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WINKLEPECK BURNING GROUND	
5. NAME OF DRILLER: N/A	6. MANUFACTURER'S DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS SPOON; SS BOWL; SS 3" AUGER w/ EXTENTION	8. HOLE LOCATION: PAD SB — N 562964.97, E 2355700.64	
	9. SURFACE ELEVATION: ~~N/A~~ 1081.73 SRA 4/27/01	
	10. DATE STARTED: 17 OCT 00	11. DATE COMPLETED: 18-22 OCT 00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: (0-22.0 ft) 0-8.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER IN HOLE	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	~~N/A~~	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	(0-2' bgs) ~~N/A~~ SVOC	TAL XRFC	EXPLOSIVES	PROPELLANTS	PCBs ~~& Pesticides~~ N/A	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	bentonite	N/A	N/A	B. W. Williams

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE

SEE PAGE 33 OF "WINKLEPECK BURNING GROUNDS FS SOIL SAMPLING WORKBOOK" HOLE WBG-222 Pg 158

PROJECT	HOLE NO
RVAAP WBG FS	WBG-199

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DIGGING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	B. Will...	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	10 YR 4/3 BROWN CL-LEAN CLAY WITH SAND, LOW PLASTICITY, DAMP, SOFT, POORLY SORTED FINE SAND	0.0 PPM	N/A	WBG-4006	METAL, WIRE, GLASS, BURN WASTE IN SAMPLE (WOOD)
	1.0	Discard layer		N/A	CC 10-20-00 ~~WBG-4007~~	
	2.0	10YR 5/4 Yellowish brown, CL-lean clay with sand, fine poorly sorted, gravel subangular from 2to flat angular cobble 80mm dry, no plasticity, loose	13.0 ppm	N/A	WBG-4007	glass, nails
	3.0					
	4.0	2.5Y 7/4 pale yellow, CL-Lean Clay ~~w/~~ Silt, subangular to subround gravel up to 50mm, dry, no plasticity, loose, very hard	0.0 ppm	N/A	WBG-4008	N/A
	5.0					
	6.0	2.5Y 7/4 pale yellow, CL-Lean Clay w/Silt, subangular to subrounded gravel up to 50 mm, very hard, loose, no plasticity, dry	0.0 ppm	N/A	WBG-~~4009~~ 4314	nails, metal ~~N/A~~ CC 10-22-00
	7.0					
			hit refusal		vjb 1/2/01	
	8.0					

11-8-00

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HTRW DRILLING LOG

DISTRICT: LOUISVILLE	HOLE NUMBER: WBG-244	
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WINKLEPECK BURNING GROUND	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS SPOON; SS BOWL; 3" SS AUGER W/ EXTENSION	8. HOLE LOCATION: PAD 58 N 56258.09 E 2355654.58	
	9. SURFACE ELEVATION: ~~N/A~~ 1073.41 SRA 4/27/01	
	10. DATE STARTED: 17 OCT 00	11. DATE COMPLETED: 10-17-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): BW 10-17-00 ~~N/A~~ NO WATER IN HOLE	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A	N/A	XRF, TAL	EXPLOSIVES	PROPELLANTS	~~N/A~~	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	B. Williams

LOCATION SKETCH/COMMENTS

SCALE: NOT TO SCALE

SEE PAGE 33 OF "WINKLEPECK BURNING GROUNDS FS SOIL SAMPLING LOGBOOK 1" HOLE WBG 244, Pad 58

PROJECT	HOLE NO.
RVAAP WBG FS	WBG-244

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	B. Williams	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		7.5YR 5/1 VERY DARK GRAY MOTTLED WITH 7.5YR 4/3 BROWN WITH				METAL, WIRE, GLASS, YELLOW/OLIVE PONTOCIE IN SAMPLE - THROUGHOUT
	Ø.25	BLACK & BROWN BURN MAT'L.	N/A	NA	NBG-4[illegible]	
	Ø.5	CL-LEAN CLAY WITH SAND GRAVEL UP TO 2 INCHES (FLAT) COBBLE LOW PLASTICITY, SOFT				
	1.Ø	Ø.25-> 1.Ø DESCRIPTION: 75% 7.5YR 5/6 STRONG BROWN 25% 7.5YR 7/1 LIGHT GRAY CL-LEAN CLAY WITH SAND ; GRAVEL UP TO 2 MM LOW PLASTICITY, FIRM				

Ø.25
Ø.5
1.Ø

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HTRW DRILLING LOG

DISTRICT: LOUISVILLE		HOLE NUMBER: WBG-2Ø1
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: WINKLEPECK BURNING GROUNDS	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3S BOWL; 3S SPOON; 3S 3" AUGER W/ EXTENTION	8. HOLE LOCATION: PAD 58 N562947.04 E2355538.79	
	9. SURFACE ELEVATION: ~~N/A~~ 1078.18 SRA 4/27/01	
	10. DATE STARTED: 17 OCT ØØ	11. DATE COMPLETED: 18-17-ØØ
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: Ø-1ØØ FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	~~VOC~~	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	N/A	XRF TAL	EXPLOSIVES	PROPELLANTS	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	~~MONITORING WELL~~	~~OTHER (SPECIFY)~~	23. SIGNATURE OF INSPECTOR
N/A	BENTONITE	N/A	N/A	B. W. Ill.

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE

SEE PAGE 33 OF "WINKLEPECK BURNING GROUNDS FS SOIL SAMPLING LOGBOOK 1" HOLE WBG-2Ø2 FOR MAP OF PAD 58 AND SAMPLE LOCATIONS IN RELATION TO EACH OTHER.

PROJECT	HOLE NO
RVAAP WBG FS	WBG-2Ø1

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DIGGING LOG

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PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	B. Williams	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5 1.0	2.5Y 5/4 LIGHT OLIVE BROWN MOTTLED WITH 2.5Y 6/6 OLIVE YELLOW CL-LEAN CLAY W/ SAND (FINE) WITH OCCASIONAL 30MM GRAVEL (SUB ANGULAR) LOW PLASTICITY, SOFT	BW 10-17-94 ~~N/A~~ 0.0 PPM	N/A	WBG-4012	

11-8-94 CC

PROJECT RVAAP WBG FS

HOLE NO WBG-201

HTRW DRILLING LOG

	DISTRICT: LOUISVILLE	HOLE NUMBER: WB6-202
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2

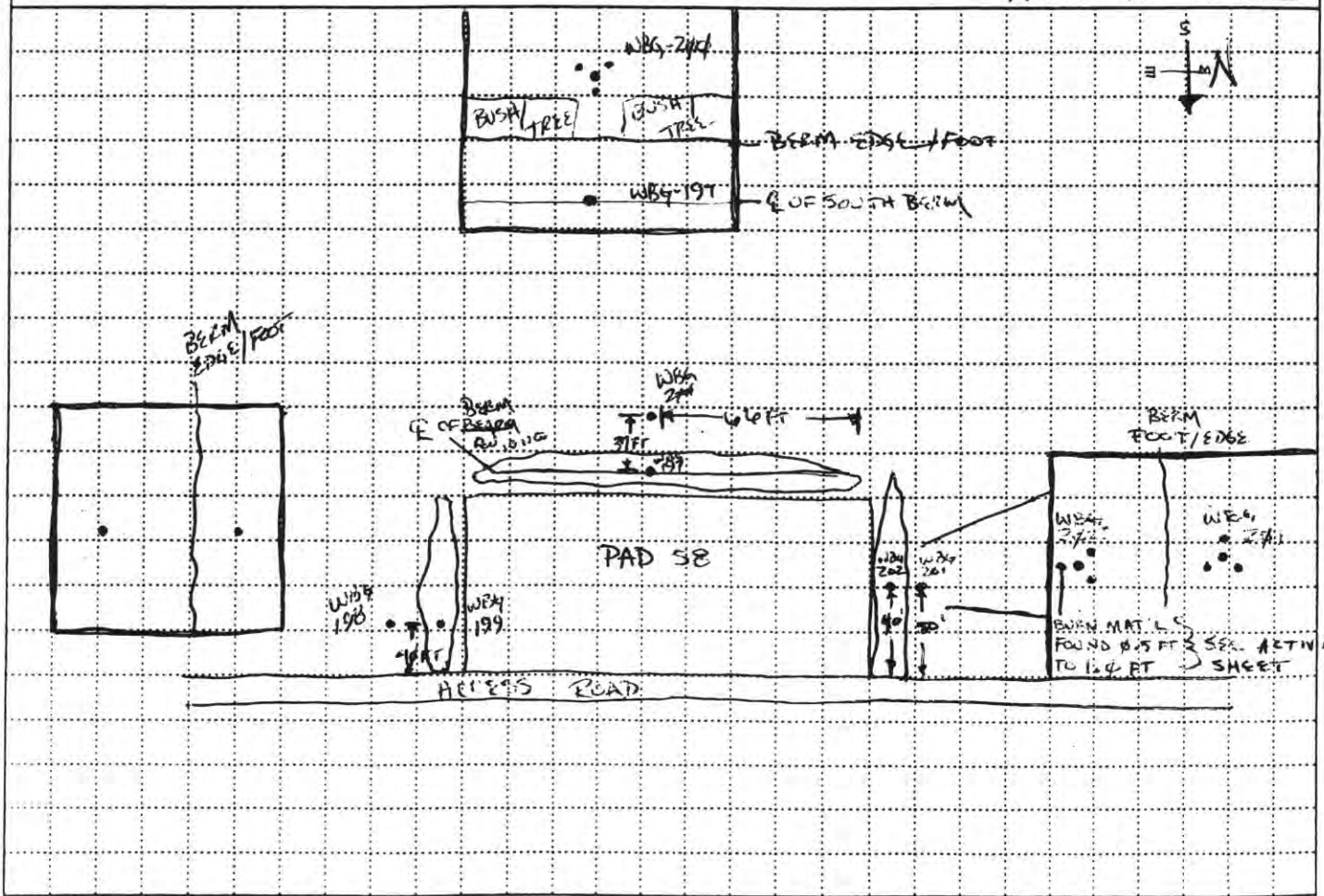
3. PROJECT: RVAAP WB6 FS	4. LOCATION: WINKLEPECK BURNING GROUNDS
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS SPOON; SS BOWL; 3 1/4" AUGER W/ EXTENSIONS	8. HOLE LOCATION: PAD 58 N 562957.39 E 2355559.22 SRA 4/27/01
	9. SURFACE ELEVATION: ~~N/A~~ 1084.36 SRA 4/27/01
	10. DATE STARTED: 17/OCT/00 — 11. DATE COMPLETED: 10-17-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: 0.1 - 1.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER IN HOLE

18. GEOTECHNICAL SAMPLES	~~DISTURBED~~	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	~~VOC~~	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	~~OTHER (SPECIFY)~~	21. TOTAL CORE RECOVERY %
N/A	N/A	TAL XRF	EXPLOSIVES	PROPELLANTS	Cr6+ by IC	N/A

22. DISPOSITION OF HOLE	BACKFILLED	~~MONITORING WELL~~	~~OTHER (SPECIFY)~~	23. SIGNATURE OF INSPECTOR
N/A	bentonite	N/A	N/A	B. W. Williams

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO
RVAAP WB6 FS	WB6-202

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DIGGING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	B. Williams	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 4/4 OLIVE BROWN CL-LEAN CLAY WITH SAND FINE SUBANGULAR TO SUB-ROUNDED SAND WITH TRACE GRAVEL (ANGULAR TO SUB-ANGULAR) UP TO 10MM. (SP) VERY SOFT LOW TO MED.	N/A PID error	N/A	WBG-4015	
	1.0	PLASTICITY				
BW 10.17.00	1.0					

0.5

1.0

11-8-04 CC

PROJECT RVAAP WBG FS

HOLE NO WBG-202

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: TOLTEST, INC.	DISTRICT: LOUISVILLE COE
		HOLE NUMBER: WBG-203
		SHEET / SHEETS: OF
3. PROJECT: RVAAP: WBG/FS	4. LOCATION: WBG-203 (PAD 58, AREA 1/3)	
5. NAME OF DRILLER: NEAL WIKTOR	6. MANUFACTURERS DESIGNATION OF DRILL: CME	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2' SPLIT SPOONS W/ACETATE LINERS	8. HOLE LOCATION: N562986.31 E2355605.54 WBG-203 (PAD 58, AREA 1/3)	
	9. SURFACE ELEVATION: 1076.47 SRA 4/27/01	
	10. DATE STARTED: 10/22/00	11. DATE COMPLETED: 10/22/00
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: NA	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 10.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

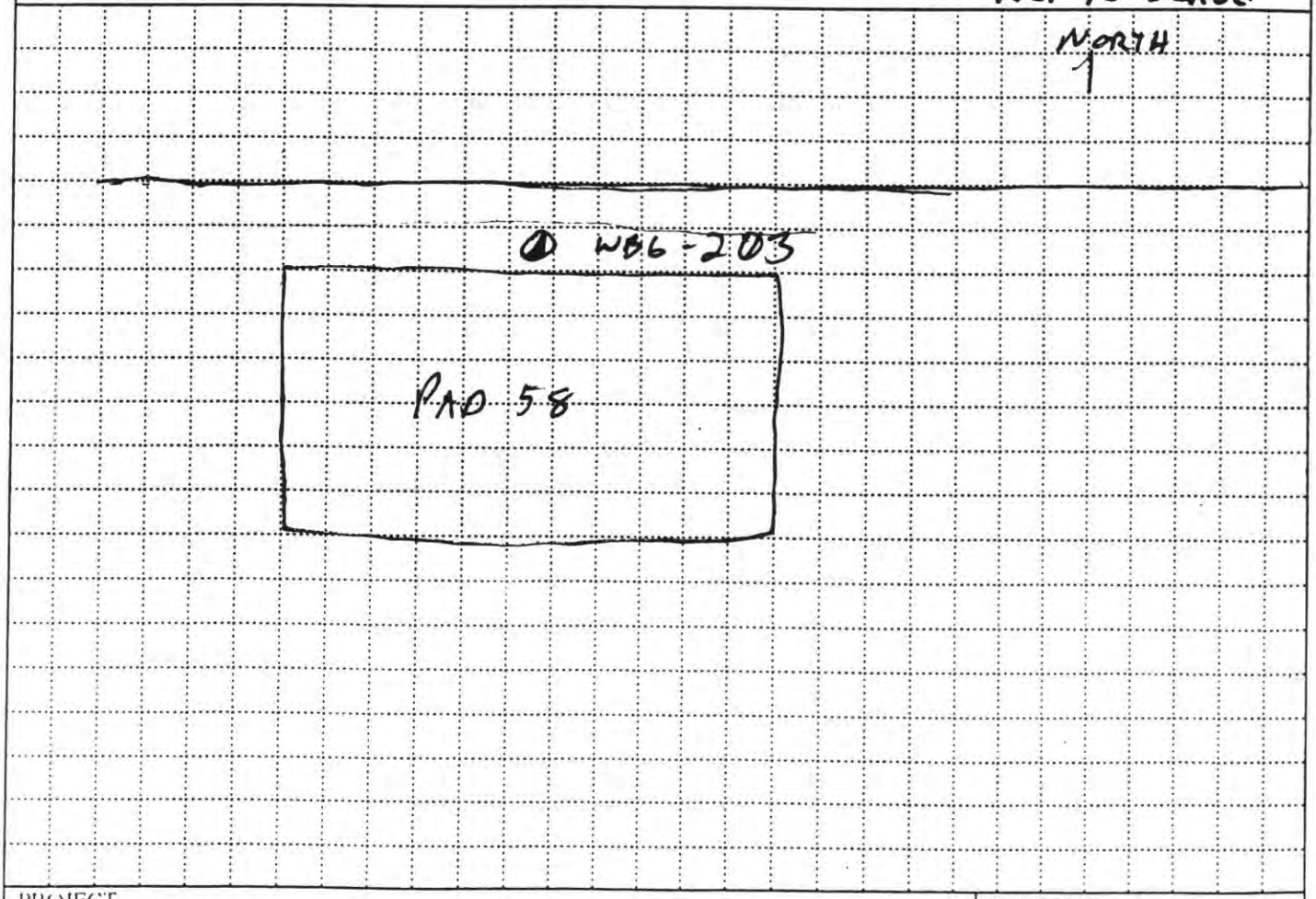
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	BENTONITE	NA		

LOCATION SKETCH/COMMENTS

SCALE: NOT TO SCALE.



PROJECT	HOLE NO
RVAAP: WBG/FS	WBG-203

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

DIGGING LOG

WBG - 203

6

PROJECT	RVAAP: WBG /FS	INSPECTOR	BG ABELN	SHEET

ELEV (A)	DEPTH (FT)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		MH - ELASTIC SILT W/FINE SAND, TRACE CLAY -DRY YELLOWISH BROWN (10YR 5/4)	PID-DR		0-1': WBG4018 0915	0'-2' RECOVERY = 1.6'/2.0 PENETROMETER > 4.5 RGY 10/22/00
	2.0				2-4': WBG4019 0920	2'-4' RECOVERY 1.9/2.0
	4.0	ML SILT W/FINE SAND -DRY YELLOWISH BROWN (10 YR 5/4)			4'-6': WBG4020 0923	4'-6' RECOVERY = 2.0/2.0
	6.0	MH ELASTIC SILT W/FINE SAND -DRY YELLOWISH BROWN (10YR 5/4)			6'-8': WBG4021 0925	6'-8 RECOVERY ~~2.0/2.0~~ 2.0'/2.0' BLA 10/22/00
	8.0					
		SRSM			8'-10': WBG4022 0930	8'-10 RECOVERY = .9/2.0
	10.0					

PROJECT RVAAP: WBG/FS

HOLE NO WBG - 203

75

HTRW DRILLING LOG

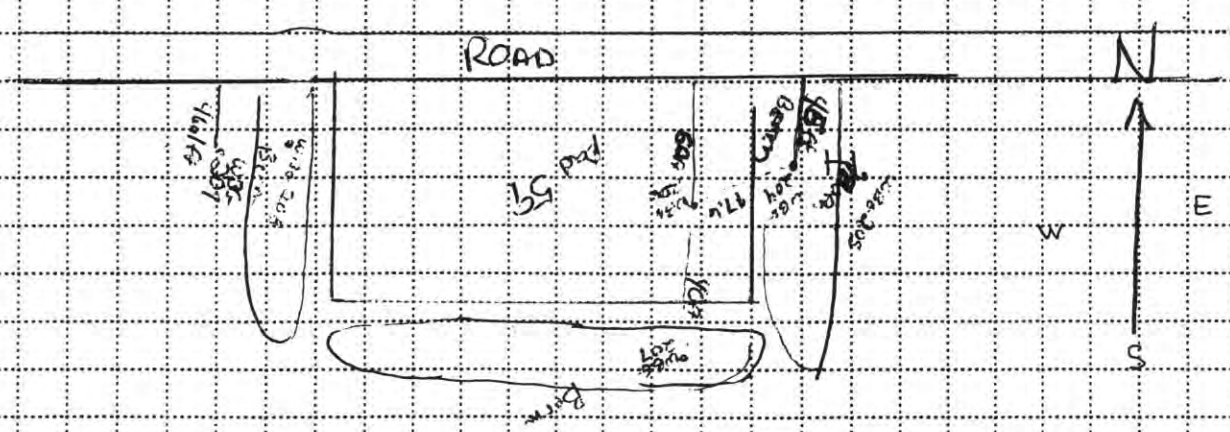
DISTRICT: Louisville		HOLE NUMBER: WBG-204
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: Winklepeck Burning Grounds	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS Spoon; SS Bowl; SS 3" Auger w/extention	8. HOLE LOCATION: Pad 59 N 562971.18 E 2355967.52	
	9. SURFACE ELEVATION: ~~N/A~~ 1074.60 SRA 4/27/01	
	10. DATE STARTED: 18 Oct 00	11. DATE COMPLETED: 10-18-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no WATER in Hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	N/A	TAL-XRF	Explosives	Propellants	~~N/A~~ [illegible]	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	Chantelle Carroll

LOCATION SKETCH/COMMENTS SCALE:



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-204

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

DRILLING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	C. Carroll	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 5/4 Olive brown Q-L dam Clay, Non plastic, Dry, loose, soft Sub-rounded gravel upto 2mm rootlets throughout	~~0.0 PP~~ not working properly	N/A	WBG-4023	
	1.0					

11-8-00 CC

82

HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG-205
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: Winklepeck Burning Grounds	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" auger w/extention	8. HOLE LOCATION: PaD 59 N 562969.56 E 2355990.64	
	9. SURFACE ELEVATION: ~~N/A~~ 1069.05 SRA 4/27/01	
	10. DATE STARTED: 18/Oct/00	11. DATE COMPLETED: 10-22-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 10-22-00 ~~0-1.0 ft~~ 0-8.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

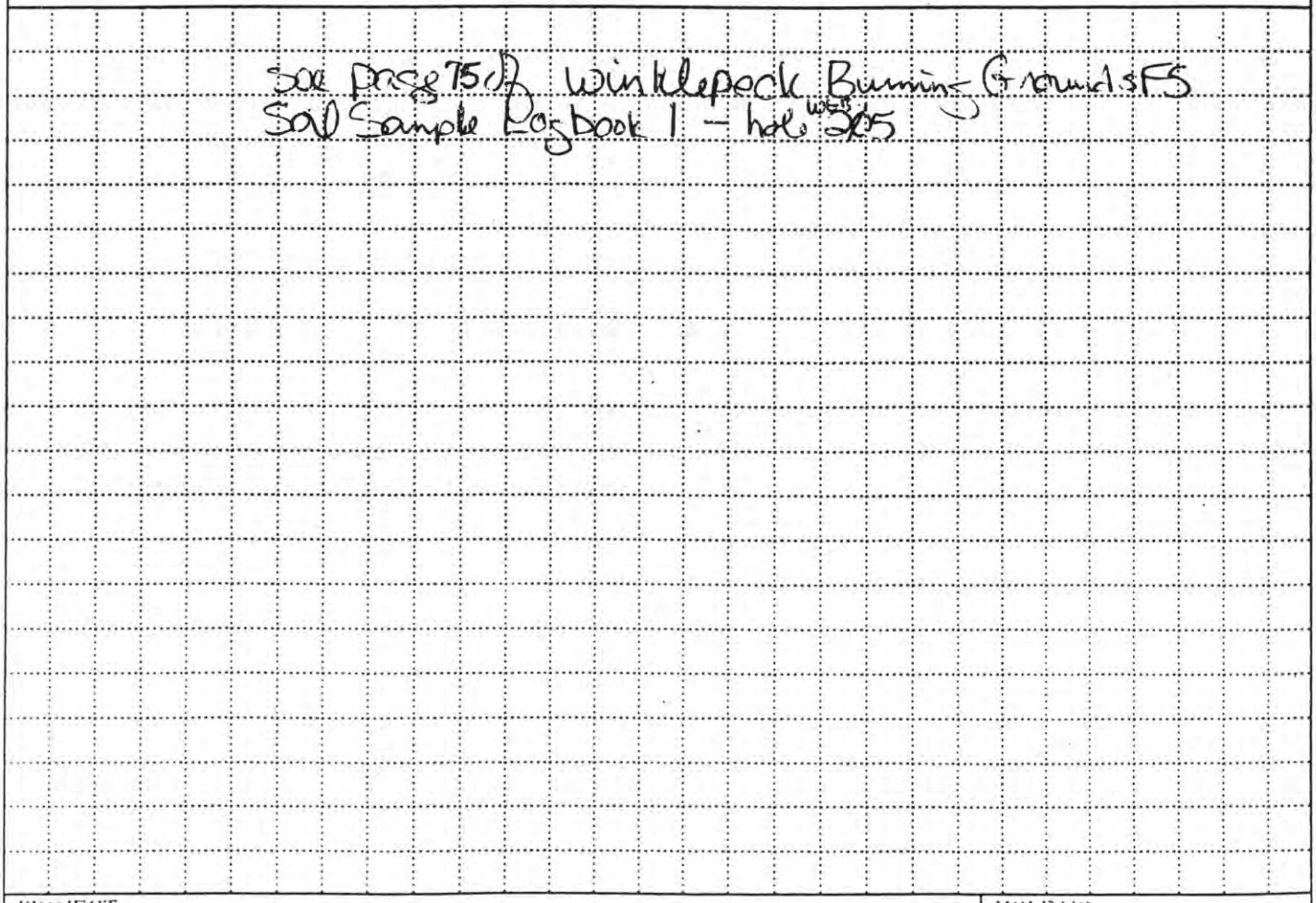
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	N/A	TAL, YREF	Explos.	Propel.	~~N/A~~ Cr	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	C. Canale

LOCATION SKETCH/COMMENTS SCALE:

See page 75 of Winklepeck Burning Grounds FS Soil Sample Logbook 1 - hole WBG 205



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-205

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

DIGGING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

83

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5 – 1.0	2.5Y 4/3 olive brown CL Lean with Sand, Poorly sorted, fine grained sand w/gravel up to 6mm low plasticity, damp to moist gravel sub-rounded, ~~orga~~ rootlets, organics throughout	PID not working properly	N/A	WBG-4026	
	1.0 – 2.0	discard layer				
	2.0 – 4.0	7.5YR 5/8 strong brown, mottled w/7.5YR 7/2 pinkish gray, CL-Lean Clay ~~to~~ ML silt, med plasticity, soft, moist, gravel up to 55mm	0.0 ppm	N/A	WBG-4027	
	4.0 – 5.0	2.5Y 5/4 light olive brown mottled w/ 10YR 5/8 yellowish brown to 5YR 5/8 yellowish red, CL-Lean Clay to a ML-silt, firm, damp, ~~sub~~ angular to subangular up to 55 mm, low plasticity		N/A	WBG-4028	~~few metal pieces~~ CC incorrect 10-21-00 conclusion
	5.0 – 6.0	2.5Y 5/4 light olive brown, CL-Lean Clay, ~~fine~~ firm, damp, low plasticity angular to subangular stones, up to 55mm	0.0 ppm	N/A	WBG-4028	
	6.0 – 7.0	2.5Y 5/4 light olive brown, CL-Lean Clay, hard, damp, low to no plasticity cobbles up to 85 mm sub angular to subrounded	0.0 ppm	N/A	WBG-~~4028~~	
	7.0 – 8.0	2.5Y 6/8 olive yellow, fine, poor sorted sand layer				
	8.0	2.5Y 5/4 light olive brown, CL-Lean Clay, hard, damp, low to no plasticity angular stones up to 20mm	0.0 ppm	N/A	4313	vjb 1/2/01

PROJECT RVAAP WBG FS A-22 HOLE NO WBG-205

89

HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG 206
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR:	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: Pad 59 - Winkle Peck Burning Ground	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl, SS spoon, SS 3" auger w/extention	8. HOLE LOCATION: PAD 59 N 562950.87 E 2355915.99	
	9. SURFACE ELEVATION: ~~N/A~~ 1069.10 SRA 4/27/01	
	10. DATE STARTED: 18/Oct/2000	11. DATE COMPLETED: 10-18-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A		TAL-XRF	Explosive	Propellant	~~N/A~~	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	N/A	N/A	C Carroll

LOCATION SKETCH/COMMENTS SCALE:

See page 75 of WBG FS Soil Sample Log Book / Hole WBG-206

PROJECT	HOLE NO.
RVAAP WBS FS	WBG 206

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

DIGGING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

90

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		10YR 4/2 dark grayish brown, mottled w/ 10YR 4/4 brownish yellow, CL Lean Clay w/ Sand				
	05	Fine poorsorted sand, w/sub angular gravel up to 20mm, damp, low plastic, soft				
		10YR 5/4 yellowish brown, dry, CL Lean Clay w/Sand, Poorsort sand w/sub angul. gravel up to 50mm, loose, non plastic	0.0 ppm	N/A	WBG-4029	small pieces of metal
	10					

11-8-[illegible] CC

PROJECT RVAAP WBG FS A-24 HOLE NO WBG 206

96

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	DISTRICT: Louisville; HOLE NUMBER: 207; SHEET: 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: Winklepeck Burning Ground	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS Spoon; SS Bowl; SS 3" Auger w/ Extention	8. HOLE LOCATION: Pad 59; N 562879.33, E 2355903.29	
	9. SURFACE ELEVATION: N/A; 1075.64 SRA 4/27/01	
	10. DATE STARTED: 10-18-00	11. DATE COMPLETED: 10-18-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 00.10ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS		METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	XXX	TAL-XRF	Propellants	Explosives	Cr+6	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	C. Canall

LOCATION SKETCH/COMMENTS — SCALE:

See Page 75 of the Soil Sampling Logbook #1, hole WBG-207, Pad 59

PROJECT	HOLE NO.
RVAAP WBG FS	WBG-207

DIGGING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Candel	SHEET	2 of 2

97

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0E 1.0A	10YR 3/2 very dark grayish brown CL-Lean clay w/sand, fine pea or sorted sand w/gravel ~~[illegible]~~ 3mm to cobble angular to subrounded, low plasticity, damp, soft	0.0 ppm	n/A	WBG-4032	lots of metal, glass

11-8-00 CC

103

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	DISTRICT: Louisville; HOLE NUMBER: 208; SHEET 1 OF 5
3. PROJECT: RVAAP WBG FS	4. LOCATION: Winklepeck Burning Grounds	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 5S Spoon; 5S Bowl; 5S 3" Auger w/ extention	8. HOLE LOCATION: Pad 59 N 562965.21 E 2355836.28	
	9. SURFACE ELEVATION: N/A 1077.800 SRA 4/27/01	
	10. DATE STARTED: 10-18-00	11. DATE COMPLETED: 10-18-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0.0 - 10 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A	N/A	TAL XRF	Propellant	Explosive	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	C. Canard

LOCATION SKETCH/COMMENTS — SCALE:

See page 75 of the Soil Sampling Logbook #1, for WBG-208 Pad 59

PROJECT	HOLE NO
RVAAP WBG FS	WBG-207

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	C. Carroll	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5ft 1.0ft	2.5Y 5/4 light olive brown, CL-Lean clay w/sand, fine poor sorted, sub angular grain, gravel up to 30 mm, low plasticity, damp soft	0.0 ppm	n/A	WBG-4035	pieces of glass, metals

PROJECT RVAAP WBG FS

HOLE NO WBG-208

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	DISTRICT: Louisville	HOLE NUMBER: WBG-209-1
	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 5 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: Winklepeck Burning Grounds	
5. NAME OF DRILLER: N/A	6. MANUFACTURER'S DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS Spoon; SS Bowl; SS 3" Auger W/Extention	8. HOLE LOCATION: Pad 59 N 562964.67 E 2355817.79	
	9. SURFACE ELEVATION: ~~N/A~~ 1071.55 SRA 4/27/01	
	10. DATE STARTED: 10-18-00	11. DATE COMPLETED: 10-18-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0. - 1.0A	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A	N/A	TAL-XRF	Propellant	Explosives	N/A	N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	C Carroll

LOCATION SKETCH/COMMENTS — SCALE:

See page 75 of the Soil Sampling Logbook #1 for WBG-209

PROJECT	HOLE NO
RVAAP WBG FS	WBG-209

DRILLING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	C. Carroll	2 of 2

6

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	2 inch	10YR 3/3 dark brown, CL-Lean sand, poor sorted subangular, up to 5mm, low plasticity, moist, soft				~~(3/4 of a 155 ug)~~
	0.5	10YR 4/6 dark yellowish brown, CL-Lean w/sand, fine, poor sorted, gravel up to 5mm subangular, damp, low plasticity, soft	0.0 ppm	n/A	WBG-4038	metals, plastics pieces
	1.0 ft	(has mottling) 10YR 5/8 yellowish brown				

11-4-00

PROJECT: RVAAP WBG FS

A-30

HOLE NO: WBG-209

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	DISTRICT: LOUISVILLE; HOLE NUMBER: WBG-210; SHEET 1 OF 2

3. PROJECT: RVAAP WBG FS	4. LOCATION: WINKLEPECK BURNING GROUNDS
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS BOWL; SS SCREEN; 3" SS AUGER W/ EXTENTION	8. HOLE LOCATION: PAD 59; N 562973.44 E 2355875.06
	9. SURFACE ELEVATION: ~~N/A~~ 1070.89 SRA 4/27/01
	10. DATE STARTED: 3 OCT 00; 11. DATE COMPLETED: 3 OCT 00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: 0 - 10 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): at 4.5 ft, water in hole

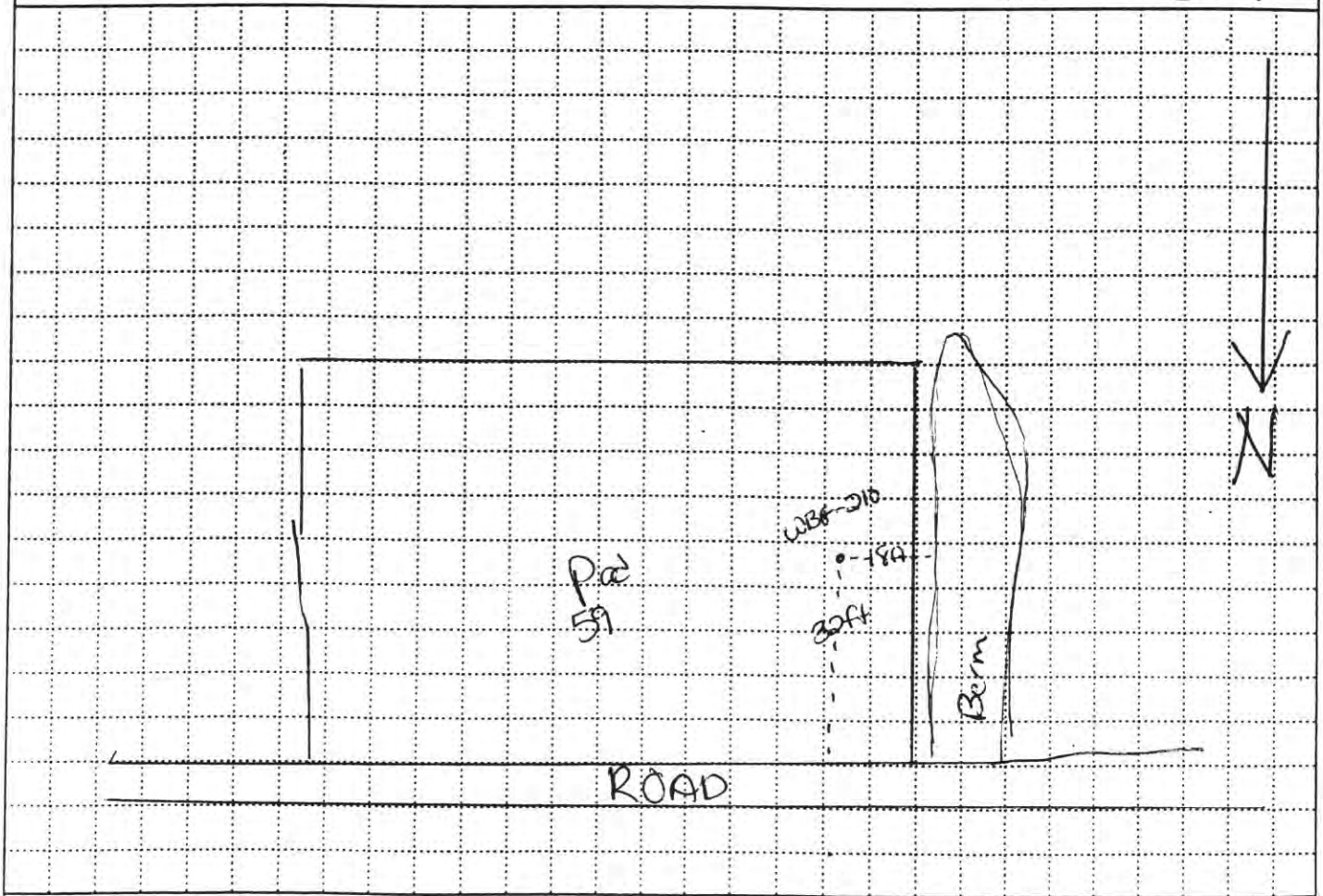
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	N/A	TAL, XRF	EXPLOSIVES	PROPELLANTS	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	bentonite	N/A	N/A	B. Will

LOCATION SKETCH/COMMENTS

SCALE: NOT TO SCALE



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-210

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DIGGING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

27

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	10YR 5/6 yellowish brown CL-Lean Clay with Silt, fine to med. poor sorted sands, subrounded to angular gravel 2-25mm in size, firm, dry, low to no plasticity	0.0ppm		WBG-4041	earthworms, roothets throughout, few larger roots (≈ 10cm diameter)
	1.0					
	1.5	INTERVAL NOT SAMPLED		DISCARDED		
	2.0	7.5YR 2.5/1 black patches in the sample - organic burned chips, silty loose, non plastic found within 10YR 4/6 brownish yellow mottled with chips of brown red metal flakes CL-Lean Clay with silt, fine poor sorted sands, firm to soft, med plasticity, moist, angular to subangular gravel up to 40mm	12.0ppm ~~0.0ppm~~ 10-30-00 [PID still read 0.0 even over the diesel smell]		WBG-4042	oil or diesel smell, very dark patches gravel, slag? pieces metal
	2.5					
	3.0					
	3.5					
	4.0	10YR 5/3 brown CL-Lean Clay, with fine poor sorted sands, gravel angular to sub-angular up to 50 mm, firm to hard, damp to dry, low to no plasticity				slag pieces water in hole appeared
	4.5					
	5.0		0.0ppm		WBG-4043	
	5.5					
	6.0	10YR 6/4 light yellowish brown CL-Lean Clay, with fine poor sorted sands, soft to firm, damp, low to med. plasticity, few flakes of oxidized metal? gravel up to 10mm				
	6.5					
	7.0		0.0ppm		WBG-4044	
	7.5					
	8.0	10YR 6/4 light yellowish brown CL-Lean Clay with fine to med. poor sorted sands, firm to hard, damp, gravel up to 15mm, low to no plasticity				
	8.5		0.0ppm		WBG-4045	
	9.0					
	9.5					
	10.0					

PROJECT: RVAAP WBG FS

HOLE NO: WBG-C10

40

HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG 211
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: Winklepeck Burning Ground	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon, SS bowl, SS 3" auger w/ extention	8. HOLE LOCATION: Pad 60 N 562878.67 E 2356330.66	
	9. SURFACE ELEVATION: ~~n/A~~ 1073.09 SRA 4/27/01	
	10. DATE STARTED: 10-18-00	11. DATE COMPLETED: 10-22-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: ~~0-1.0 ft~~ ~~0-4 ft~~ 10-22-00 0-1.2 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	SVOC ~~n/A~~ Pesticides	TAL-XRF	Propellant	Explosive	~~n/A~~ Cr+6	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	bentonite	n/A	n/A	C. Canall

LOCATION SKETCH/COMMENTS

SCALE:

See page 12 for reference location in Soil Sampling Logbook #2 hole WBG-211, Pad 60

PROJECT	HOLE NO.
RVAAP WBG FS	WBG - 211

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR C. McCarrell	SHEET 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5ft	10YR 2/1 black, OL/OH, w/sand (organic soil) fine medgravy Poor sorted, w/gravel up to 30mm, soft, loose, damp rootlets throughout	PID not working	N/A	WBG-40016	burned wood, cloth, metal, glass, tree roots
	1.0	Stop due to UXO ordinance				nails, metal tree roots
		~~Discard cuttings~~		~~N/A~~		
	2.0				~~WBG-40017~~	This sample not collected 1/21/01
			D - 2200 CC			
	3.0		00 ppm	N/A		
	4.0					

PROJECT RVAAP WBG FS A-34

HOLE NO WBG-211

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	DISTRICT: Louisville
3. PROJECT: RVAAP WBG FS	4. LOCATION: Winklepeck Burning Grounds	HOLE NUMBER: WBG 212
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	SHEET 1 OF 2
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" auger extension	8. HOLE LOCATION: Pad 60 — N 562821.84, E 2356340.67	
	9. SURFACE ELEVATION: ~~N/A~~ 1066.29 SRA 4/27/01	
	10. DATE STARTED: 10-18-00	11. DATE COMPLETED: 10-18-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole.	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A	N/A	TAL-RCRA	Propellants	Explosives	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	bentonite	N/A	N/A	C. Canada

LOCATION SKETCH/COMMENTS — SCALE:

See Page 12 for reference location in Soil Sampling Logbook #2

Hole WBG-212, Pad 60

PROJECT	HOLE NO.
RVAAP WBG FS	WBG-212

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR C. Carroll	SHEET 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5ft	10YR 3/2 very dark grayish brown, CL-Lean clay w/sand, fine, poorly sorted, burnt chips, gravel up to 5mm rounded, low plasticity, soft, damp	0.0 ppm	N/A	WBG-40849	
	1.0					

11-4-00 CC

PROJECT RVAAP WBG FSA-36

HOLE NO WBG-212

48

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville; HOLE NUMBER: WBG 213; SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: Winklepeck Burning Grounds	
5. NAME OF DRILLER: n/A	6. MANUFACTURER'S DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" auger w/extension	8. HOLE LOCATION: Pad 60 N 562964.76 E 2356401.19	
	9. SURFACE ELEVATION: ~~n/A~~ 1072.29 SRA 4/27/01	
	10. DATE STARTED: 10-18-00	11. DATE COMPLETED: 10-18-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0.10 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-XRF	Explosive	Propellant	n/A (5 ft)	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS — SCALE:

See page 12 for reference location of WBG-213 hole in Soil Sampling Logbook #2, Pad 60

PROJECT	HOLE NO
RVAAP WBG FS	WBG 213

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canall	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5 feet	10YR 3/2 very dark grayish brown CL - Lean clay, poorly sorted fine sand burned charred pieces up to 40mm, flat angular cobble up to 60mm, low plasticity, damp, SOFT	PID not working properly	N/A	WBG-4052	burnt wood, charred material.
	1.0 feet	10YR 5/6 yellowish brown, CL Lean clay w/fine poorly sorted sand, burn pieces up to 10mm, sub-rounded gravel to 4mm, low plasticity, damp, SOFT				
						11-4-00 CC

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HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG 214
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: Winklepeck Burning Grounds	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon, SS bowl, SS 3" auger w/extention	8. HOLE LOCATION: Pad 60 N 562962.55 E 2356425.45	
	9. SURFACE ELEVATION: ~~n/A~~ 1069.58 SRA 4/27/01	
	10. DATE STARTED: 10-18-00	11. DATE COMPLETED: 10-18-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-XRF	Propellants	Explosives	10-18-00 CC ~~n/A~~ (Ft)	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
CC ~~n/A~~ n/A	Bentonite	n/A	n/A	C. Canall

LOCATION SKETCH/COMMENTS

SCALE:

See page 12 for reference of location in Soil Sampling Logbook #2

hole WBG-214, Pad 60

PROJECT	HOLE NO.
RVAAP WBG FS	WBG 214

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canall	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	2 inch	organic layer				roots, grasses, tight packed
	0.5	2.5Y 5/6 light olive brown, mottled w/ 10YR 5/8 yellowish brown, CL- Lean Clay w/ sand, fine poor sorted, gravel up to 5mm, sub-rounded, moist, med. plasticity, soft	PID not working properly	n/A	WBG-4055	
	1.0 ft					
						1440 CC

PROJECT: RVAAP WBG FS A-40

HOLE NO: WBG 214

HTRW DRILLING LOG

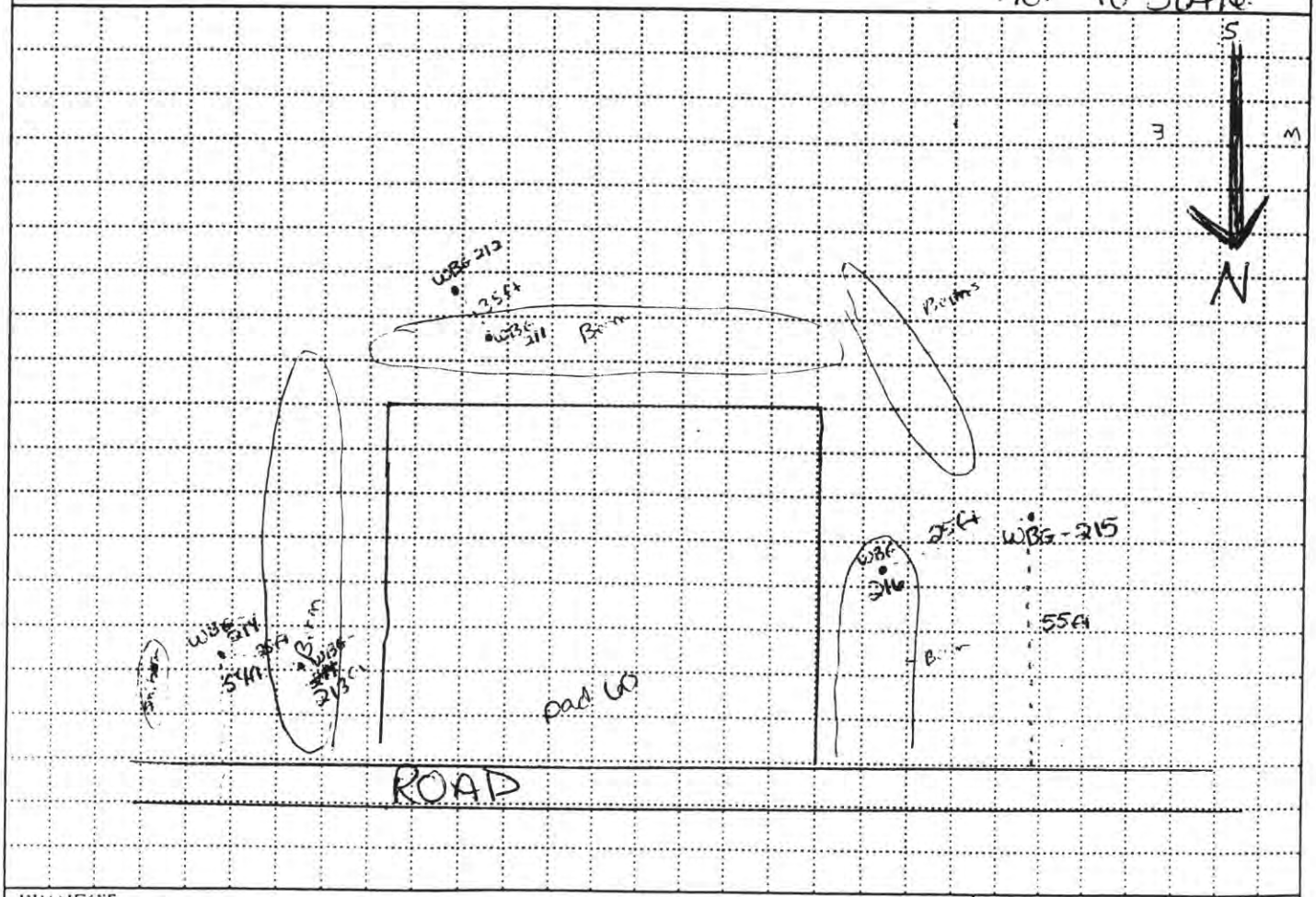
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	HOLE NUMBER: ~~WBG 258~~ WBG 215 (12)
3. PROJECT: RVAAAP WBG FS	4. LOCATION: Winklepeck Burning Grounds	SHEET 1 OF 2 SHEETS
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" auger w/extention	8. HOLE LOCATION: Pad 10 N562958.27 E 2356206.48	
	9. SURFACE ELEVATION: ~~DTM~~ 1065.64 SRA 4/27/01	
	10. DATE STARTED: 10-18-00	11. DATE COMPLETED: 10-18-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0 - 1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A	N/A	TAL-XRF	Propellants	Explosives	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	C. Canall

LOCATION SKETCH/COMMENTS — SCALE: not to scale



PROJECT	HOLE NO
RVAAAP WBG FS	WBG 215

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

DIGGING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.3	2.5Y 4/3 olive brown, CL-Lean Clay w/sand, fine poor sorted, w/grains up to 3mm moist, soft, rootlets,				nails, max. metals ~~[illegible]~~ burned wood chips
	0.3 1.0ft	2.5Y 7/1 light gray, mottled w/ 10YR 5/8 yellowish brown, CL-Lean Clay w/sand, fine poor sorted, firm w/pebbles up to 3mm	not working properly	N/A	WBG-40/5Y	

11-4-00 CC

HTRW DRILLING LOG	DISTRICT Louisville	HOLE NUMBER WBG 216
1. COMPANY NAME SAIC	2. DRILL SUBCONTRACTOR N/A	SHEET 1 OF 2 SHEETS

3. PROJECT RVAAP WBG FS	4. LOCATION Winklepeck Burning Grounds
5. NAME OF DRILLER N/A	6. MANUFACTURER'S DESIGNATION OF DRILL N/A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS 3 spoon; SS bowl; SS 3" auger w/ extention	8. HOLE LOCATION Pad 60 N 562959.83 E 2356230.02
	9. SURFACE ELEVATION N/A 1071.15 SRA 4/27/01
	10. DATE STARTED 10-18-00 / 11. DATE COMPLETED 10-18-00
12. OVERBURDEN THICKNESS N/A	15. DEPTH GROUNDWATER ENCOUNTERED N/A
13. DEPTH DRILLED INTO ROCK N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED N/A
14. TOTAL DEPTH OF HOLE 0-10ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) No water in hole

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A	N/A	TAL-XRF	Explosive	Propellant	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	bentonite	N/A	N/A	C Canall

LOCATION SKETCH/COMMENTS — SCALE:

See page reference dg 12 in the Soil Sampling Logbook #2
Hole WBG-216

PROJECT	HOLE NO.
RVAAP WBG FS	WBG-216

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C Canall	SHEET	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 5/4 light olive brown, CL-Lean clay w/sand, ~~pebbles~~ gravel up to 5mm fine, poor sorted, dry, nonplastic loose, (rootlets in top 2in.)	PID not working properly	N/A	WBG-4061	
	1.0 ft					
				11-4-00 CC		

PROJECT RVAAP WBG FS

HOLE NO WBG-214

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HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG-217
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF SHEETS 2
3. PROJECT: ~~n/A~~ 10-19-00 RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl, SS spoon, SS 3" auger w/extention	8. HOLE LOCATION: Pad 61 N 562912.94 E 2356614.32	
	9. SURFACE ELEVATION: ~~n/A~~ 1071.69 SRA 4/27/01	
	10. DATE STARTED: 10-19-00	11. DATE COMPLETED: 10-22-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: ~~0-1.0ft~~ 10-22-00 0-40 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
n/A	SVOC, PCB's	XRF-TAL	Explosives	Cr+6	Pesticides	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS

SCALE:

See page 54 for location reference hole WBG-217, Pad 61 in the Soil Sampling Logbook #2

PROJECT	HOLE NO.
RVAAP WBG FS	WBG-217

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Cavitt	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 2.5/1 black, burned by-product w/ clay and sand, sand fine, poorly sorted, lots of ash, burned wood, loose, damp, no plasticity	8.5 ppm	N/A	WBG-4864	trash, metal, brick, burned wood,
	1.0	discard auger				
	2.0	10YR 4/4 dark yellowish brown, predominantly silty sand, loose, dry, non plastic, full of tar pieces, burned	0.4 ppm		WBG-4865	tar globs, metal, burned wood chips
	3.0	10YR 4/3 very pale brown, CL-Lean clay with silt/sand, fine poorly sorted sands, dry, loose, hard, non plastic, some gravel up to 10 mm	0.4 ppm		WBG-4866	tar globs
	4.0					
						11-5-04 CC

PROJECT	RVAAP WBG FS A-46	HOLE NO	WBG-217

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	HOLE NUMBER: WBG-218
	DISTRICT: Louisville	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS Spoon; SS bowl; SS 3" auger w/extention	8. HOLE LOCATION: Pad 61 N 562872.33 E 2356631.32	
	9. SURFACE ELEVATION: ~~n/A~~ 1074.95 SRA 4/27/01	
	10. DATE STARTED: 19 Oct 2000	11. DATE COMPLETED: 19-22-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: ~~0-2.0ft~~ 0-1.0ft cc 0-4.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
n/A	SVOC, PCBs,	TAL-XRF-CN	explosives	TOC	Pesticides	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	bentonite	n/A	n/A	C. Canall

LOCATION SKETCH/COMMENTS — SCALE:

See page 54 for location reference
hole WBG-218, Pad 61
in Soil Sampling Logbook #2

PROJECT	HOLE NO
RVAAP WBG FS	WBG-218

DRILLING LOG

PROJECT	RVAAP WBG	INSPECTOR	C Canall	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.0	2.5Y 2/1 black, CL-clay with sand, poorly sorted, cobbles up to 80mm, moist, loose	PID not functioning properly	n/A	WBG-42867	glass, metals, nails, burnt wood, brick construction; rope/twine
	1.0					
	1.5	NOT SAMPLED/ DISCARDED				
	2.0					2.0
	2.5	10YR 4/3 BROWN, CL-LEAN CLAY WITH SILT, GRAVEL (FLAT TO ANGULAR + SUB ANGULAR FROM 2MM UP TO 70 MM COBBLE) SOFT, LOOSE, MOIST, LOW PLASTICITY	0.0 PPM	N/A	WBG-42868	METAL, WHITE PIECES, 2.0-3.0 FT WAS MOIST TO WET; 3.0-4.0 FT LESS MOISTURE (MOIST) 2.5
	3.0					3.0
	3.5					3.5
	4.0					4.0
					11 5-00 CC	

PROJECT: RVAAP WBG FS

HOLE NO: WBG-217

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	HOLE NUMBER: WBG 219
	DISTRICT: Louisville	SHEET 1 OF 2 SHEETS

S4

3. PROJECT: RVAAP WBG	4. LOCATION: Wumkiepeck Burning Ground
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS SPOON; SS BOWL; SS 3" Auger w/extention	8. HOLE LOCATION: Pad 61 N 562955.25 E 2356539.88
	9. SURFACE ELEVATION: ~~N/A~~ 1073.63 SRA 4/27/01
	10. DATE STARTED: 10-19-00 / 11. DATE COMPLETED: 10-25-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: ~~D-1.0ft~~ 10-4-00 Ø-16.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole.

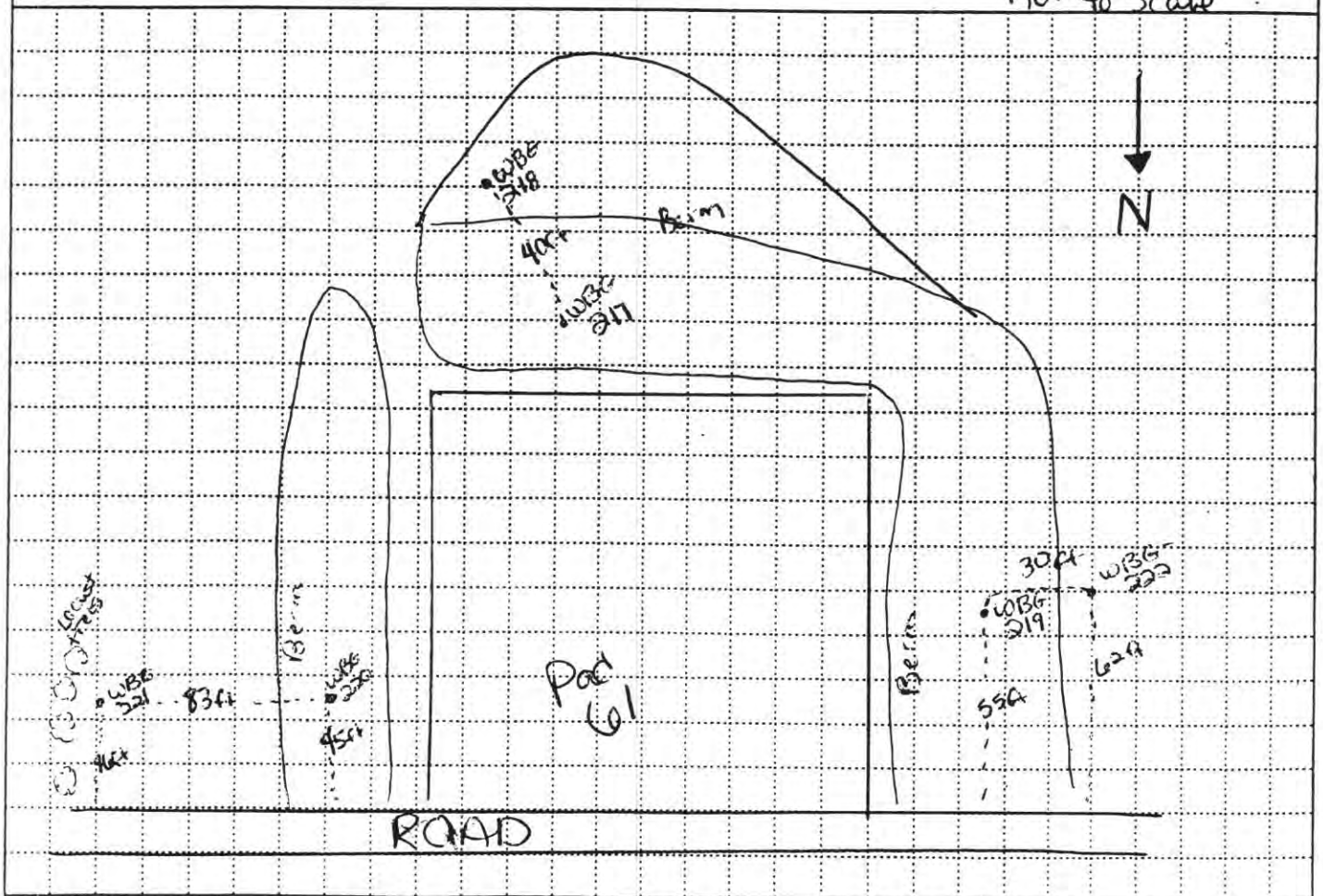
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	N/A	TAL-XRF	Propellants	explosive	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	C. Canell

LOCATION SKETCH/COMMENTS — SCALE: not to scale

not to scale



PROJECT	HOLE NO
RVAAP WBG FS	WBG 219

DRILLING LOG

PROJECT	RVAAP WBG F5	INSPECTOR	C Condit	SHEET	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE INTX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	10YR 3/3 very dark brown, CL-lean clay w/sand, tiny poorly sorted, flat angular up to 40mm in size, loose non plastic, damp (one hole - explosive - bottom 4" - 10YR 5/6 yellowish brown, mottled w/10YR	0.0 ppm	n/A	WBG-4070	Burned flakes, metal, glass (appears very organic) worms - slugs
	1.0	3/1 white, CL-Lean Clay w/sand, fine Poorly sorted angular up to 3mm size, low plasticity, firm, damp Discard the 1-2ft layer				
	2.0	Silty/Sandy, gravel Burned materials, white ~~tar~~ color ~~ashes~~ in the sample, predominant color of soil is brown, flaked with oranges, metals, nails, very loose, no plasticity, dry 10YR 4/2 dark grayish brown	0.0 ppm	n/A	WBG-4071	metal, gray white material, slight odor to hole, nails, burned flakes,
	3.0					
	4.0	10YR 6/6 brownish yellow, CL-Lean Clay fine, poorly sorted, dry, no plasticity, firm				
	4.5	10YR 5/4 YELLOWISH BROWN MOTTLED WITH 10YR 6/8 BROWNISH YELLOW, CL-LEAN CLAY W/ FINE POORLY SORTED SAND, ANGULAR GRAVEL UP TO 60MM, FIRM, DRY, NO PLASTICITY	HIGH HUMIDITY PID NOT OPERATING CORRECTLY	N/A	WBG-4072	METAL, GLASS, NAILS, BURN, CLOTH
	5.0					
	5.5					
	6.0			11-4-00 CC		

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	DISTRICT: Louisville	HOLE NUMBER: WBG-220
2. DRILL SUBCONTRACTOR: n/A		SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" auger retention	8. HOLE LOCATION: Pad 61 N 562970.66 E 2356676.03	
	9. SURFACE ELEVATION: n/A 1071.06 SRA 4/27/01	
	10. DATE STARTED: 10-19-00	11. DATE COMPLETED:
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTRICT: n/A	UNDISTURBED: n/A	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS: n/A	(VOC): SVOC, PCB,	(METALS): TAL-XRF-Cr6	(OTHER (SPECIFY)): Explosives	(OTHER (SPECIFY)): Pesticides	(OTHER (SPECIFY)): TOC	21. TOTAL CORE RECOVERY: n/A
22. DISPOSITION OF HOLE: n/A	BACKFILLED: Bentonite	MONITORING WELL: n/A	OTHER (SPECIFY): n/A	23. SIGNATURE OF INSPECTOR: C. Crandall		

LOCATION SKETCH/COMMENTS

SCALE:

See page 54 for location reference for hole WBG-220, Pad 61 in Soil Sampling Logbook #2

PROJECT	HOLE NO
RVAAP WBG FS	WBG-220

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5 ft 1.0 ft	2.5Y 2/3 black, CL Lean clay w/ sand, fine, poor sorted, up to 30 mm, soft subangular, low to med placity, damp 2.5Y 4/4 olive brown, CL-Lean clay w/ sand, poor sorted, subangular to sub rounded up to 10 mm, low placity, damp firm	PID not functioning properly	N/A	WBG-4073	Glass, metal, burned wood, etc throughout (Top is organic, rootlets throughout
	1.5 FT	~~10YR 5/3 BROWN, CL-LEAN CLAY~~ BW 10-22-00				
	2.0 FT	10 YR 5/3 BROWN, CL-LEAN CLAY WITH FINE POORLY SORTED SAND, FIRM,				METAL, GLASS, CLOTH, AND AUGERED TIRE PIECES, BURN PIECES
	2.5	TIRE REGION				
	3.0 3.5	GRAVEL (SUBANGULAR) UP TO 30 MM, DAMP, LOW-NO PLACTICITY. RED STAINING FROM METALS. (SAME MATERIAL FROM 2-4 FT.)	0.0 PPM	N/A	WBG-4074 WBG-4272 WBG-4290	
	4.0					

1.0
1.5
2.0
2.5
3.0
3.5
4.0

PROJECT RVAAP WBG FS A-52

HOLE NO WBG-220

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HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG 221
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" auger w/extention	8. HOLE LOCATION: Pad 61 N 562981.38 E 2356760.91	
	9. SURFACE ELEVATION: ~~n/A~~ 1064.72 SRA 4/27/01	
	10. DATE STARTED: 10-19-00	11. DATE COMPLETED:
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0.10 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole.	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	

20. SAMPLES FOR CHEMICAL ANALYSIS	~~VOC~~	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	~~OTHER (SPECIFY)~~	21. TOTAL CORE RECOVERY %
n/A		TAL-XRF	explosives	Cr+6	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	n/A	n/A	n/A	C. Cundell

LOCATION SKETCH/COMMENTS — SCALE:

See page 54 for location reference for hole WBG-221, Pad 61 in Soil Sampling Logbook #2

PROJECT	HOLE NO
RVAAP WBG FS	WBG 221

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DIGGING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canall	SHEET	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		2.5Y 3/2 very dark grayish brown, OL-OH organic w/sand, soft, moist, fine, poor sorted sand	error-PID not working	N/A	WBG-4076	rootlets throughout
	0.5	2.5Y 5/4 light olive brown, mottled w/10YR 5/8 yellowish brown, CL-Lean clay w/sand poor sorted, fine, pebbles up to 5mm, subangular to rounded, damp, firm				
	1.0A					
	1.5					
	2.0	10YR 7/2 LIGHT GRAY MOTTLED WITH 10YR 5/8 YELLOWISH BROWN CL-LEAN CLAY WITH FINE POORLY SORTED SAND, GRAVEL (ANGULAR TO SUBANGULAR) UP TO 30 MM, FIRM, DAMP, LOW PLASTICITY	0.0 PPM	N/A	WBG-4077	SMALL BURN CHIPS
	2.5					
	3.0					
	3.5					
	4.0	2.5Y 5/6 LIGHT OLIVE BROWN CL-LEAN CLAY W/ FINE POORLY SORTED SAND, SUBANGULAR TO SUBROUNDED GRAVEL UP TO 50MM, SOFT, DRY TO DAMP, LOOSE, LOW TO NO PLASTICITY	0.0 PPM	N/A	WBG-4075	
	4.5					
	5.0					
	5.5					
	6.0					

PROJECT RVAAP WBG FS

A-54

HOLE NO WBG 221

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville
		HOLE NUMBER: WBG 222
		SHEET 1 OF 2 SHEETS

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3. PROJECT: RVAAP WBG FS	4. LOCATION: Winklepeck Burning Grounds
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" auger w/ extention	8. HOLE LOCATION: Part 61 N 562935.72 E 2356512.88
	9. SURFACE ELEVATION: ~~n/A~~ 1070.54 SRA 4/27/01
	10. DATE STARTED: 10-18-00 / 11. DATE COMPLETED: 10-25-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A
14. TOTAL DEPTH OF HOLE: ~~0-4.0 ft~~ 11-5.0 cc 0-4.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/a	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/a	n/A	TAL-XRF	Propellants	Explosives	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/a	bentonite	n/a	n/A	C. Canada

LOCATION SKETCH/COMMENTS — SCALE:

See page 54 for location reference for hole WBG-222 in Soil Sampling Logbook #2

PROJECT	HOLE NO
RVAAP WBG FS	WBG 222

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DIGGING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5 ft 1.0 ft	10YR 3/2 very dark grayish brown mottled w/ 5YR 5/1 yellowish red, CL-Lean Clay w/ sand, fine poor sorted low to med placity, moist, firm angular to sub angular cobble up to 70 mm.	Ø.Ø ppm	n/A	WBG-4Ø79	glass bits, earthworms, an
	1.5 ft	Discard layer				
	2.Ø ft 2.5 ft 3.Ø ft 3.5 ft 4.Ø ft	2.5Y 4/4 OLIVE BROWN CL-LEAN CLAY W/ FINE POORLY SORTED SANDS DAMP, FIRM, LOW PLASTICITY	PID NOT OPERATING CORRECTLY DC/E TO HIGH HUMIDITY	N/A	WBG-4Ø8Ø	

Ø.5 1.Ø 1.5 2.Ø 2.5 3.Ø 3.5 4.Ø

11-5-ØØ CC

PROJECT RVAAP WBG FS

A-56

HOLE NO WBG 222

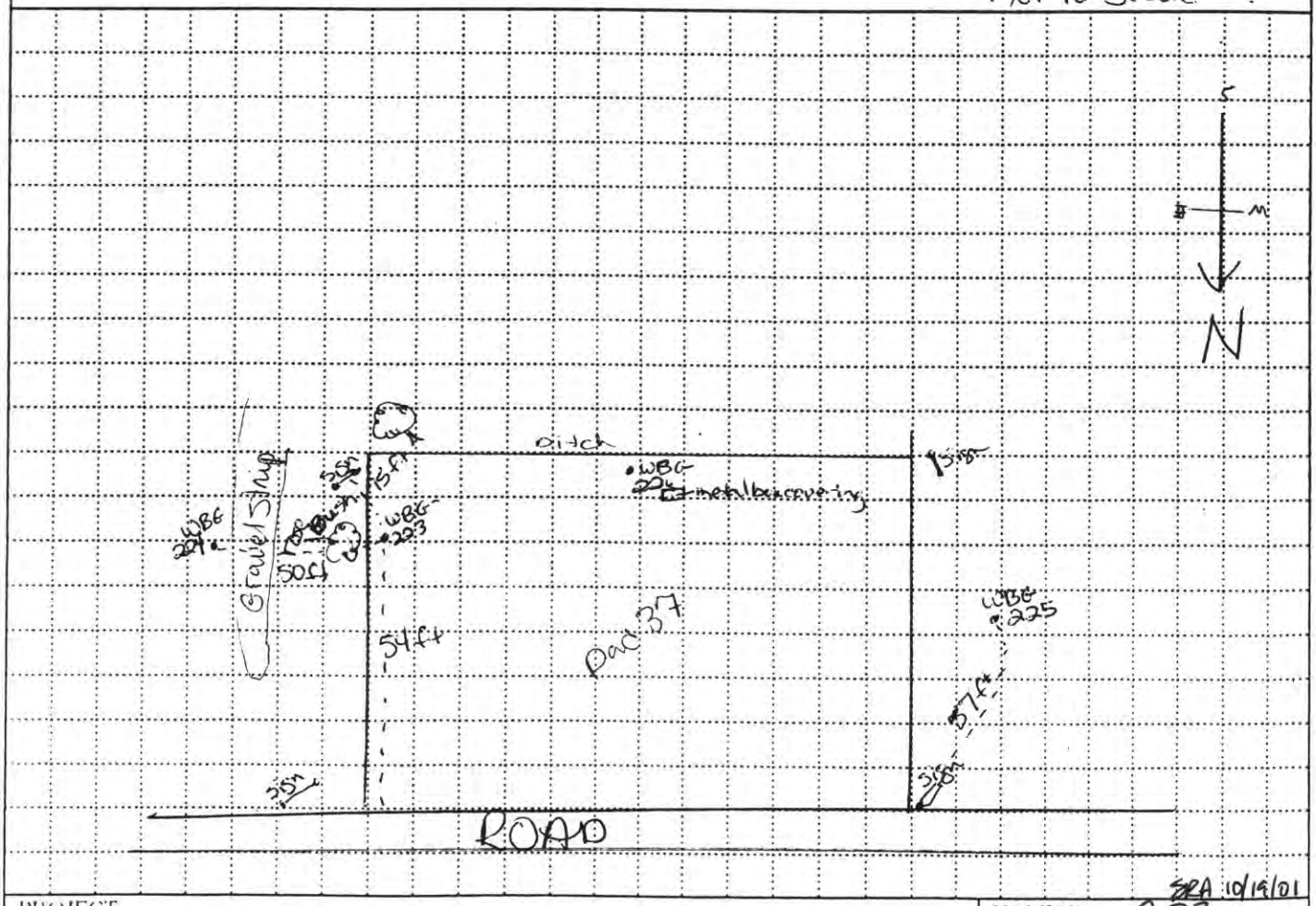
19

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville
3. PROJECT: RVAAP WBG FS	4. LOCATION: Pad 37 WBG	HOLE NUMBER: WBG 223
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	SHEET 1 OF 2 SHEETS
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 5S bowl; 5S spoon; 5S 3" auger w/extention	8. HOLE LOCATION: Pad 37 N 562331.69 E 2358760.29	
	9. SURFACE ELEVATION: ~~n/A~~ 1015.16 SRA 4/27/01	
	10. DATE STARTED: 10-20-00	11. DATE COMPLETED: 10-22-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: ~~0-10 ft bgs~~ 0-4.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no WATER in hole.	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
n/A	n/A	n/A	n/A			
20. SAMPLES FOR CHEMICAL ANALYSIS	**VOC**	**METALS**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**21. TOTAL CORE RECOVERY**
n/A	n/A	XRF-TAL-Cr	explosives	n/A	n/A	n/A
22. DISPOSITION OF HOLE	**BACKFILLED**	**MONITORING WELL**	**OTHER (SPECIFY)**	**23. SIGNATURE OF INSPECTOR**		
n/A	bentonite	n/A	n/A	C. Canall		

LOCATION SKETCH/COMMENTS — SCALE: not to scale



SRA 10/19/01

PROJECT	HOLE NO
RVAAP WBG FS	WBG-~~223~~ 223

BORING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canall	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (F)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 4/4 olive brown, CL-Lean Clay w/Silt, angular to subangular gravel up to 10mm, soft, low plasticity, damp	0.0 ppm	N/A	CC 10-20 ~~WBG-223~~ WBG-4080	@ 1st 2" is slag then this layer
	1.0	2.5Y 4/4 olive brown, CL-Lean Clay w/Silt, angular to subangular gravel up to 20 mm, firm, low plasticity, damp				
		Discard layer				
	2.0					
		2.5Y 7/1 LIGHT GRAY MOTTLED W/ 2.5Y ~~5/6 LIGHT OLIVE~~ BROWN 10 YR 22-44 6/8 OLIVE YELLOW, CL-LEAN CLAY W/ FINE POORLY SORTED SAND SOFT TO FIRM, LOW TO MED. PLASTICITY, MOIST.	0.0 PPM	N/A	WBG-1105-CC ~~4082~~ -4083	
	3.0					
	4.0					

PROJECT RVAAP WBG FS A-58

HOLE NO WBG-223

20

HTRW DRILLING LOG	DISTRICT: Louisville	HOLE NUMBER: WBG-204
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" auger/extention	8. HOLE LOCATION: Pad 37 N 562330.94 E 2358810.65	
	9. SURFACE ELEVATION: ~~n/A~~ 1013.44 SRA 4/27/01	
	10. DATE STARTED: 10-20-00	11. DATE COMPLETED: 10-20-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A		n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-XRF-CN	explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	bentonite	n/A	n/A	C. Canall

LOCATION SKETCH/COMMENTS — SCALE:

See page 19 for reference location of hole WBG-204, Pad 37 in the Soil Sampling Logbook #3

PROJECT	HOLE NO
RVAAP WBG FS	WBG-204

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	05	2.5Y 4/3 Olive brown, CL-Lean Clay, Fine poorly sorted sand, some silt, moist, soft, low plasticity, angular to subangular gravel up to 20mm	00 ppm	n/A	WBG-4085	
	10					
					11-5.00 CC	

PROJECT RVAAP WBG FS A-60

HOLE NO WBG-224

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville; HOLE NUMBER: WBG 225; SHEET 1 OF 3
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURER'S DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS Spoon; SS bowl; SS 3" auger w/extention	8. HOLE LOCATION: Pad 37 N 562334.04 E 2358616.05	
	9. SURFACE ELEVATION: ~~n/A~~ 1015.12 SRA 4/27/01	
	10. DATE STARTED: 10-20-00	11. DATE COMPLETED: 10-20-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
n/A	SVOC-PCB's	XRF-TAL-Cr+6	Pesticides	SP n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	bentonite	n/A	n/A	C. Canall

LOCATION SKETCH/COMMENTS — SCALE:

See page 19 for reference location of hole WBG-225, Pad 37 in the Soil Sampling Logbook #3

PROJECT	HOLE NO.
RVAAP WBG FS	WBG-225

DRILLING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	C Canall	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	10YR 4/3 brown, mottled w/ 7.5YR 5/8 strong brown CL-Lean Clay Fine poorly sorted sands, low plasticity, Soft, damp	0.0 ppm	n/A	WBG-4088	
	1.0					
						11-5-08 CC

PROJECT: RVAAP WBG FSA-62

HOLE NO: WBG-225

HTRW DRILLING LOG	DISTRICT Louisville	HOLE NUMBER WBG-226
1. COMPANY NAME SAIC	2. DRILL SUBCONTRACTOR n/A	SHEET 1 OF 2 SHEETS

3. PROJECT RVAAP WBG FS	4. LOCATION WBG
5. NAME OF DRILLER n/A	6. MANUFACTURERS DESIGNATION OF DRILL n/A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT SS bowl; SS spoon; SS 3" auger w/extension	8. HOLE LOCATION Pad 37 N 562292.17 E 2358719.96
	9. SURFACE ELEVATION n/A 1015.33 SRA 4/27/01
	10. DATE STARTED 10/20/00 — 11. DATE COMPLETED 10-20-00
12. OVERBURDEN THICKNESS n/A	15. DEPTH GROUNDWATER ENCOUNTERED n/A
13. DEPTH DRILLED INTO ROCK n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED n/A
14. TOTAL DEPTH OF HOLE 0-1.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) no water in hole

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
n/A	n/A	TAL-XRF-Cr6	explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	bentonite	n/A	n/A	C. Canall

LOCATION SKETCH/COMMENTS — SCALE:

See Page 19 for reference location of hole WBG-226, Pad 37 in the Soil Sampling logbook #3

PROJECT	HOLE NO
RVAAP WBG FS	WBG-224

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canali	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 4/4 olive brown mottled w/ 10.YR 5/8 yellowish brown, CL-Loam clay fine poor sorted sand, damp, low plasticity, soft, angular gravel up to 40mm	0.0 ppm	N/A	WBG-4091	metal, worms, nails slug of glass, burned chips, wire
	1.0					
						11.5 @ TC

PROJECT RVAAP WBG FS A-64

HOLE NO WBG-226

34

HTRW DRILLING LOG

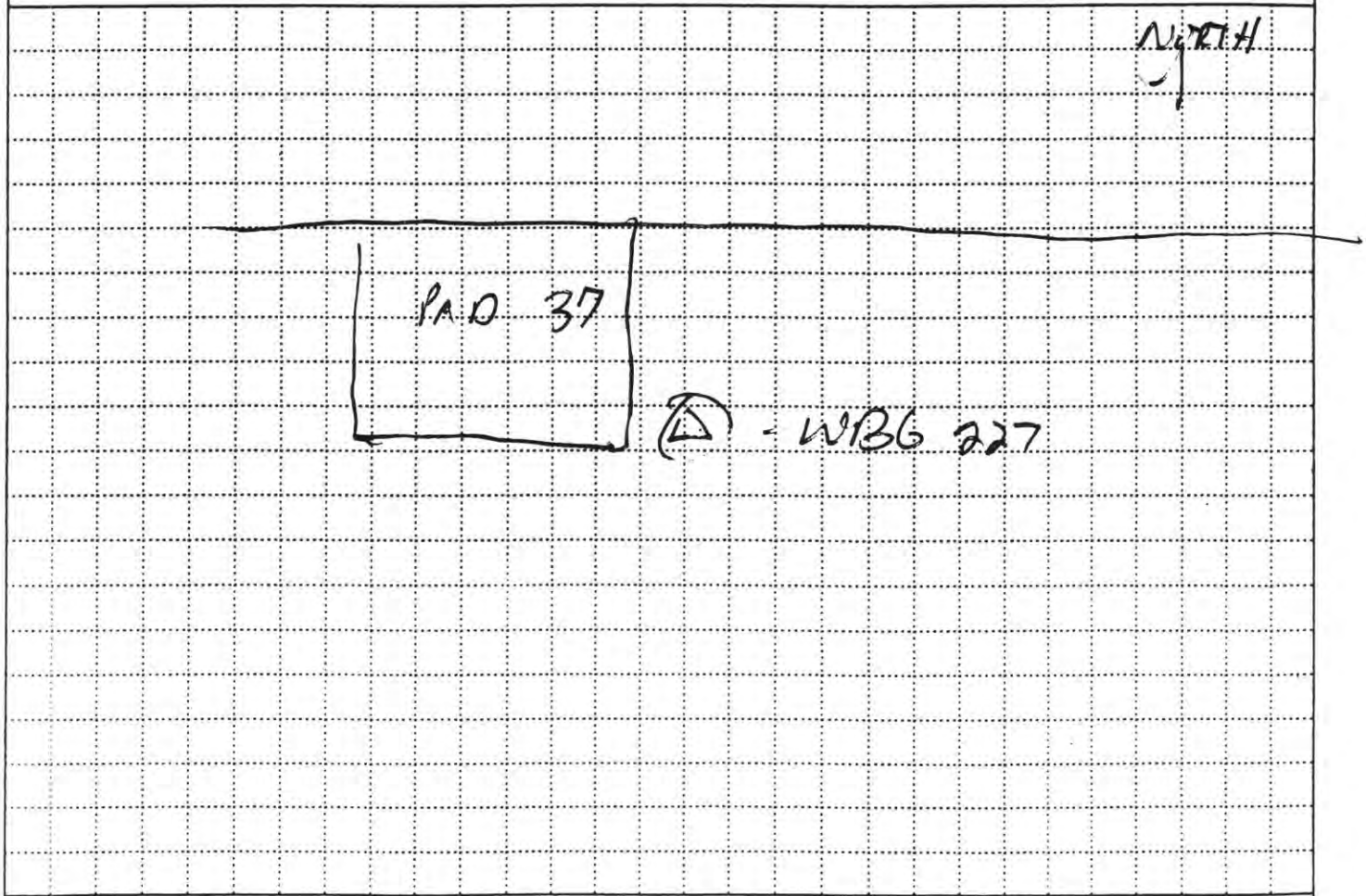
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: TOLTEST	DISTRICT: LOUISVILLE COE; HOLE NUMBER: WBG-227; SHEET ___ SHEETS ___ OF
3. PROJECT: RVAAP - WBG / FS	4. LOCATION: WBG	
5. NAME OF DRILLER: NEAL WIKTOR	6. MANUFACTURERS DESIGNATION OF DRILL: CME	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2' SPLIT SPOONS; ACETATE LINERS	8. HOLE LOCATION: WBG 227 — N 562307.48, E 2358781.43	
	9. SURFACE ELEVATION: NA 1013.88 SRA 4/27/01	
	10. DATE STARTED: 10/22/00	11. DATE COMPLETED: 10/22/00
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: NA	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 10'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA		NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	-	XRF	CYANIDE	PCB/PEST	EXPLOSIVES	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	BENTONITE	NA	NA	[signature]

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO.
RVAAP - WBG / FS	WBG 227

DRILLING LOG

PROJECT	INSPECTOR	SHEET
RVAAP: WBG IES	BG & BELIN	41

ELEV (A)	DEPTH (B) FT	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		MH ELASTIC SILT W/SAND - DRY YELLOWISH BROWN (10 YR 5/4)	PID: 0ppm		0-1': WBG4014 1420	0-2' RECOVERY:
	2.0	SP-SC POORLY GRADED FINE SAND W/CLAY - MOIST GRAYISH BROWN (10YR 5/2)	PID = 0ppm			2'-4' RECOVERY: 1.9/2.0
		SP-SM POORLY GRADED FINE SAND W/SILT - DRY DARK YELLOWISH BROWN (10YR 4/4)	PID=0ppm		2'-4': WBG4095 1425	
	4.0				4-6': WBG4096 1425	4-6' RECOVERY = 2.0/2.0
		MH ELASTIC SILT W/FINE SAND - DRY YELLOWISH BROWN (10YR 5/4) WITH GRAY (10YR 6/1) MOTTLES			6-8': WBG4097 1430	6-8' RECOVERY = 2.0/2.0
	8.0				8-10 WBG4098 1435	8-10 RECOVERY = 2.0/2.0
	10.0					

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville; HOLE NUMBER: WBG-229; SHEET 1 OF 3
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 55 bowl; 55 spoon; 55 3" auger extention	8. HOLE LOCATION: Pad 38 N 562363.07 E 2359205.22	
	9. SURFACE ELEVATION: ~~n/A~~ 1009.75 SRA 4/27/01	
	10. DATE STARTED: 10-21-00	11. DATE COMPLETED: 10-25-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: ~~Ø-10ft~~ 11.5ft bgs Ø-4.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
n/A	n/A	n/A	n/A			
20. SAMPLES FOR CHEMICAL ANALYSIS	**VOC**	**METALS**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**21. TOTAL CORE RECOVERY**
n/A	n/A	XRF-TALC*	Explosives	n/A	n/A	n/A
22. DISPOSITION OF HOLE	**BACKFILLED**	**MONITORING WELL**	**OTHER (SPECIFY)**	**23. SIGNATURE OF INSPECTOR**		
n/A	Bentonite	n/A	n/A	C. Canall		

LOCATION SKETCH/COMMENTS — SCALE:

See page 47 for reference
Location of hole WBG-229, Pad 38
in the Soil Sampling Logbook #3

PROJECT	HOLE NO.
RVAAP WBG FS	WBG 229

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canall	SHEET	2 of 2

SS

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		Organic layer				roottets,
	0.5	10YR 5/4 yellowish brown, mottled w/ 10YR 5/8 yellowish brown, CL-Lean Clay w/ fine poor sorted sandy angular to subangular gravel up to 20 mm, soft, low plasticity, damp	00 ppm	n/A	WBG-4102	
	1.0					
	1.5	INTERVAL NOT SAMPLED				
	2.0	10YR 4/6 DARK YELLOWISH BROWN, BROWN SILTY CLAY W/ FINE TO MED POORLY SORTED SANDS, SUBANGULAR GRAVEL UP TO 50MM, DAMP, SOFT, LOOSE, LOW TO NO PLASTICITY	1.0 PPM	N/A	WBG-4103	
	2.5					
	3.0					
	3.5					
	4.0					
						1.5-00 CC

PROJECT	RVAAP WBG FS A-68	HOLE NO	WBG-209

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HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG-230
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" auger w/extention	8. HOLE LOCATION: Pad 38 N 562324.99 E 2359192.62	
	9. SURFACE ELEVATION: ~~n/A~~ 1008.15 SRA 4/27/01	
	10. DATE STARTED: 10-20-00	11. DATE COMPLETED: 10-20-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

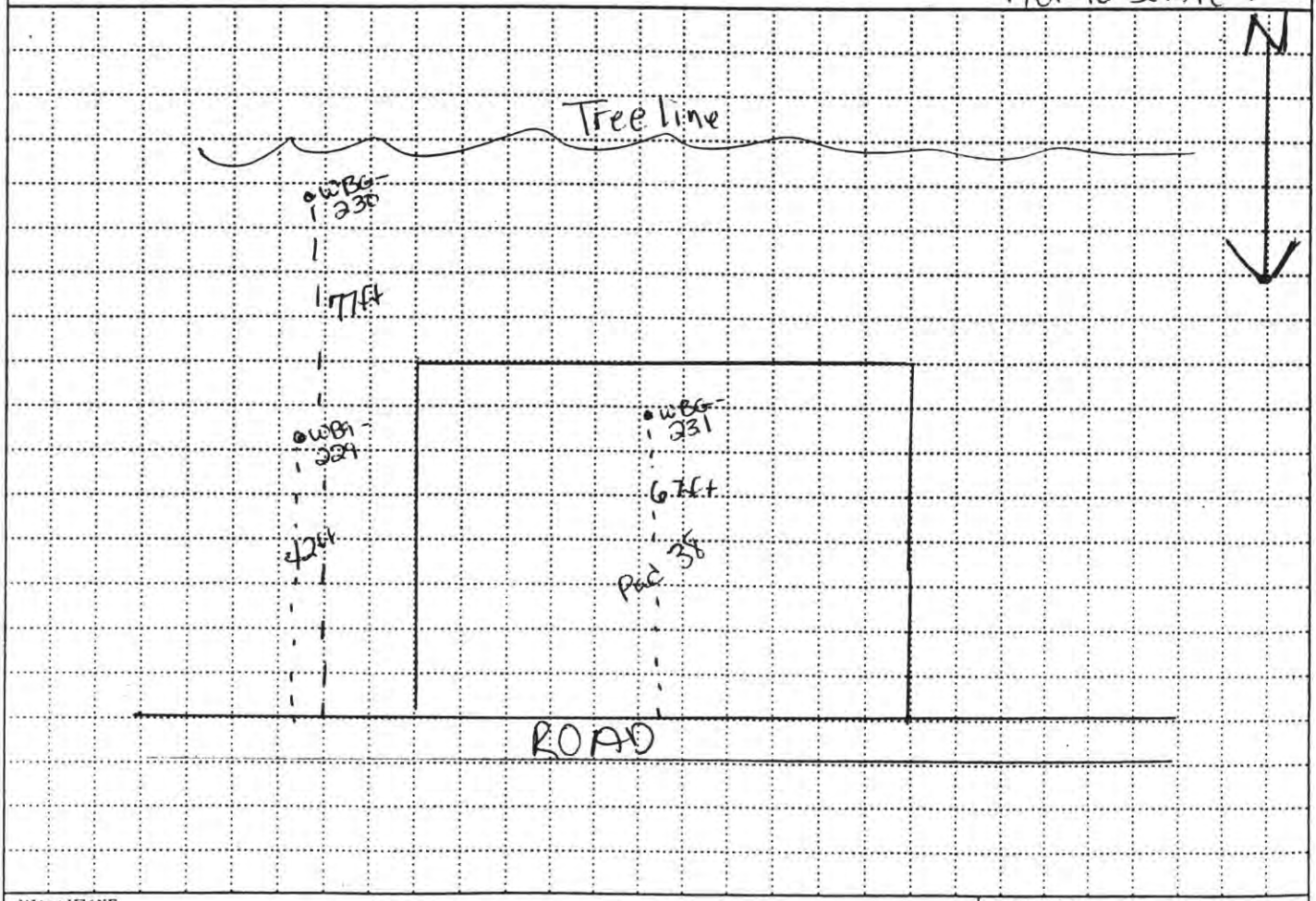
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	XRF-TAL-Cr+	explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS

SCALE: not to scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-230

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBGFS	INSPECTOR	C. Canall	SHEET	2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	10YR 4/2 dark grayish brown, CL - Lean Clay, fine poor sorted sand, low to med plasticity, soft, ~~dry~~ moist, Subangular up to 8mm	0.0 ppm	n/a	WBG-4105	Rootlets throughout
	1.0					
		12.5.00 CC				

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville; HOLE NUMBER: WBG-231; SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 55 spoon; 55 bowl; 55 3" auger w/extention	8. HOLE LOCATION: Pad 38 N 562331.20 E 2359121.69	
	9. SURFACE ELEVATION: ~~n/A~~ 1011.40 SRA 4/27/01	
	10. DATE STARTED: 10/21/00	11. DATE COMPLETED: 10-22-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-10 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): n/A (no WATER in hole)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	~~n/A~~

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
n/A	SVOC, PCB's	TAL-XRF-Cr6	Explosives	Pesticides	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS — SCALE:

See page 47 for reference location of hole WBG-231, Pad 38 in the Soil Sampling Logbook #3

PROJECT	HOLE NO.
RVAAP WBG FS	WBG-231

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canall	SHEET	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		10YR 3/3 dark brown, silty clay, fine to med sand, poor sorted, angular to sub-angular gravel up to 20mm, soft, damp, low plasticity				nails, metal, frag, slag rootlets, burned chips
	0.5	10YR 5/4 yellowish brown, Cl-Lean Clay poorly sorted sand, fine, sub-angular to sub-rounded gravel up to 20mm, firm, damp, low plasticity	0.0 ppm	N/A	WBG-4108	
	1.0					
	1.5	DISCARD SAMPLE INTERVAL				
	2.0	10YR 5/8 YELLOWISH BROWN, SILTY SAND, FINE TO MED SAND WITH GRAVEL (ANGULAR TO SUB-ANGULAR) UP TO 30MM. SOFT, LOW PLASTICITY, MOIST.	0.0 PPM	N/A	WBG-4109	
	2.5					
	3.0	2.5Y 3/3 DARK OLIVE BROWN, SILTY CLAY, W/FINE POORLY SORTED SAND GRAVEL (ROUNDED) UP TO 20 MM, VERY SOFT, MOIST, MED PLASTICITY	0.0 PPM	N/A		
	3.5	10YR 7/1 LIGHT GRAY MOTTLED W/ 10YR 5/8 YELLOWISH BROWN SILTY CLAY WITH FINE-MEDIUM POORLY SORTED SAND, MOIST, VERY SOFT, MED PLASTICITY	0.0 PPM	N/A		
	4.0	ROUNDED TO SUBROUNDED GRAVEL UP TO 20 MM				

11-5-00
CC

PROJECT RVAAP WBG FS A-72

HOLE NO WBG-231

HTRW DRILLING LOG

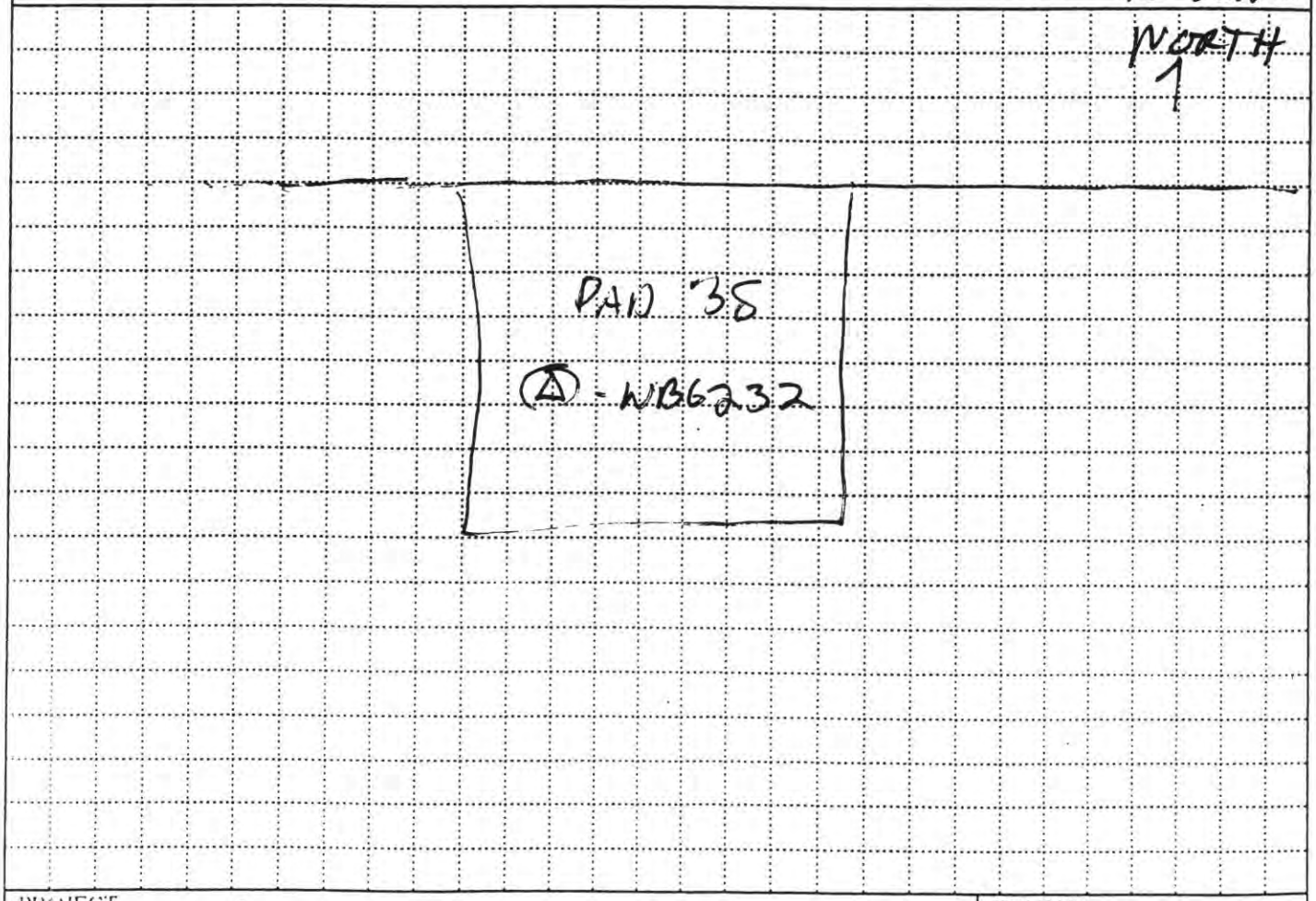
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: TOTEST	DISTRICT: LOUISVILLE COE; HOLE NUMBER: WBG 232; SHEET / SHEETS: OF
3. PROJECT: RVAAP: WBG/FS	4. LOCATION: WBG	
5. NAME OF DRILLER: NEAL WIKTOR	6. MANUFACTURERS DESIGNATION OF DRILL: CME 75	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" SPLIT SPOONS; ACE DATE LINERS	8. HOLE LOCATION: WBG 232 N 562356.21 E 2359092.82	
	9. SURFACE ELEVATION: ~~NAT~~ 1011.99 SRA 4/27/01	
	10. DATE STARTED: 10/22/00	11. DATE COMPLETED: 10/22/00
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: NA	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 10'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	✓	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	CYANIDE	XRF	PEST / PCBS	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	BENTONITE	NA	NA	B Schuch

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO
R-VAAP: WBG/FS	WBG 232

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DIGGING LOG

PROJECT	INSPECTOR	SHEET
RVAAP: WBG / FS	BLAKELEN	34

ELEV (A)	DEPTH (ft)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		MH. ELASTIC SILT W/FINE SAND -DRY YELLOWISH BROWN (10 YR 5/6) WITH GRAY (10YR 6/1) MOTTLES	PID = 0ppm		0-1': WBG 4111 1330	0-2' RECOVERY = 1.8'/2.0
	2.0				2-4: WBG 4112 1335	2-4' RECOVERY = 1.5'/2.0'
	4.0				4-6': WBG 4113 1340	4-6' RECOVERY = 1.9'/2.0'
	6.0				6-8': WBG 4114 1345	6-8' RECOVERY = 1.8'/2.0
	8.0	SP-SM POORLY GRADED FINE SAND W/SILT -DRY DARK YELLOWISH BROWN (10YR 4/4)	PID = 0ppm		8-10' WBG 4115 1350	8-10' RECOVERY = 2.0'/2.0
	10.0	SP-SM POORLY GRADED FINE SAND W/SILT -MOIST BROWN (10YR 4/3)	PID = 0ppm			

PROJECT

HOLE NO WBG-232

HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG-233
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" auger w/ extention	8. HOLE LOCATION: Pad 45 — N 562807.59, E 2356083.91	
	9. SURFACE ELEVATION: N/A 1068.36 MSA 4/27/01	
	10. DATE STARTED: 10-26-00	11. DATE COMPLETED: 10-26-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no WATER in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	N/A	XRF-TAL-Cr-Hg	Explosives	N/A	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	bentonite	N/A	N/A	C. Carroll

LOCATION SKETCH/COMMENTS — SCALE:

See Page 96 for reference location of hole WBG-233, Pad 45 in the Soil Sampling Logbook #3

PROJECT	HOLE NO
RVAAP WBG FS	WBG 233

DIGGING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canall	SHEET	2 of 2

13

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		10YR 4/3 brown, CL Lean clay, poor sorted fine sand, damp, gravel sub angul. to subround up to 20mm, soft, low plasticity				rootlets throughout
	0.5	2.5Y 7/2 light grey mottled w/ 10YR 5/4 yellowish brown, CL-Lean Clay, poor sorted fine sand, subangular gravel up to 40mm, damp, firm, low plasticity	0.0 ppm	N/A	WBG-4116	
	10					

11-5-00 CC

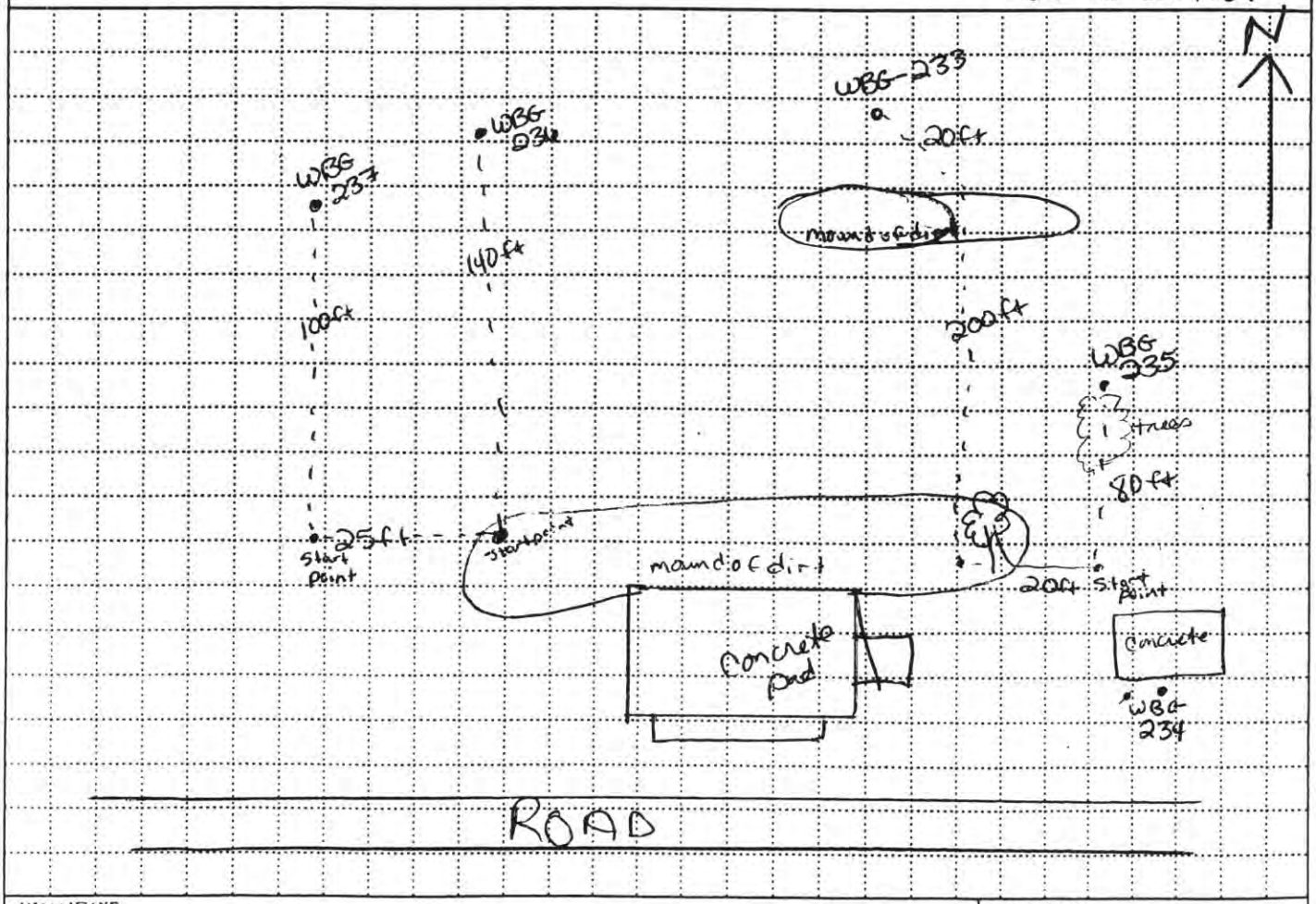
PROJECT RVAAP WBG FS A-76 HOLE NO WBG 233

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/a	DISTRICT: Louisville
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	HOLE NUMBER: WBG 234
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	SHEET 1 OF 2 SHEETS
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3" Spoon, 3" Bowl, 3" auger with extension	8. HOLE LOCATION: Pad 45	N 562577.88 E 2356152.85
	9. SURFACE ELEVATION: NA	1070.25 SRA 4/27/01
	10. DATE STARTED: 10-19-00	11. DATE COMPLETED: 10-19-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no WATER in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
n/A	n/A	n/A				
20. SAMPLES FOR CHEMICAL ANALYSIS	**VOC**	**METALS**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**21. TOTAL CORE RECOVERY %**
n/A	n/A	TAL-XRF-Cr6	explosives	n/A	n/A	n/A
22. DISPOSITION OF HOLE	**BACKFILLED**	**MONITORING WELL**	**OTHER (SPECIFY)**	**23. SIGNATURE OF INSPECTOR**		
n/A	Bentonite	n/A	n/A	C. Carroll		

LOCATION SKETCH/COMMENTS — SCALE: not to scale.



PROJECT	HOLE NO.
RVAAP WBG FS	WBG 234

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canall	SHEET	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		10YR 4/3 brown, CL-Lean Clay poor sorted fine sand, damp, soft low-tomed plasticity, 1% gravel (round)				
	5	10YR 6/2 light brownish gray mottled w/ 10YR 5/8 yellowish brown CL-Lean Clay, poor fine sorted sand, damp, hard, low plasticity, gravel, subangular to subrounded up to 2mm	0.0 ppm	n/A	WBG 4119	
	10					

11-5-96 CC

PROJECT	RVAAP WBG FS A-78	HOLE NO	WBG 234

HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG 235
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURER'S DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" auger w/extention	8. HOLE LOCATION: Pad 45 N 562671.01 E 2356121.60	
	9. SURFACE ELEVATION: ~~N/A~~ 1068.27 SRA 4/27/01	
	10. DATE STARTED: 10-19-00	11. DATE COMPLETED: 10-19-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER in hole.	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A			n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
n/A	n/A	XRF Cr, TAL explosives		n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Canall

LOCATION SKETCH/COMMENTS — SCALE:

See page 96 for reference location of hole WBG 235, Pad 45 in the Soil Sampling logbook #2

PROJECT	HOLE NO.
RVAAP WBG FS	WBG 235

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5 1.0	10YR 4/4 dark yellowish brown CL-Lean Clay, poor sorted fine sands gravel to cobble size up to 80 mm, damp, soft to firm, low to no plasticity	0.0 ppm	N/A	WBG-4122	

11-5-00 CC

PROJECT RVAAP WBG FS A-80

HOLE NO WBG 235

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HTRW DRILLING LOG

DISTRICT: Louisville	HOLE NUMBER: WBG 236	
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS; SS; SS 3" auger extention	8. HOLE LOCATION: WBG Pad 45 N 562738.60 E 2356068.40	
	9. SURFACE ELEVATION: ~~n/A~~ 1066.72 SRA 4/27/01	
	10. DATE STARTED: 10-20-00	11. DATE COMPLETED: 10-20-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0 - 10ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER IN HOLE	
18. GEOTECHNICAL SAMPLES: n/A	DISTURBED: n/A; UNDISTURBED: n/A	19. TOTAL NUMBER OF CORE BOXES: n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	(VOC)	(METALS)	(OTHER (SPECIFY))	(OTHER (SPECIFY))	(OTHER (SPECIFY))	21. TOTAL CORE RECOVERY
n/A	SVOC-PCBs	TAL-XRF-Cr6	Explosives	Propellants	Pesticides	n/A
22. DISPOSITION OF HOLE	**BACKFILLED**	**MONITORING WELL**	**OTHER (SPECIFY)**	**23. SIGNATURE OF INSPECTOR**		
n/A	bentonite	n/A	n/A	C Canall		

LOCATION SKETCH/COMMENTS — SCALE:

See page 96 for reference location of hole WBG-236, Pad 45 in the Soil Sampling logbook #2

PROJECT	HOLE NO.
RVAAP WBG FS	WBG 236

ENG FORM 5056-R, AUG 94 — (Proponent CECW-EG)

DIGGING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		10YR 3/2 very dark grayish brown CL-Lean clay w/poorly sorted fine sand, moist, med to low plasticity, soft				rootlets, worms
	0.5	10YR 4/3 brown, CL-Lean clay mottled w/7.5YR 5/8 strong brown, poorly sorted fine sand, subangular gravel up to 20mm moist, ~~soft~~ firm, low plasticity	0.0 ppm	N/A	WBG -4125 -4288-split -4270-dup	
	1.0					

11-5-00
CC

HTRW DRILLING LOG

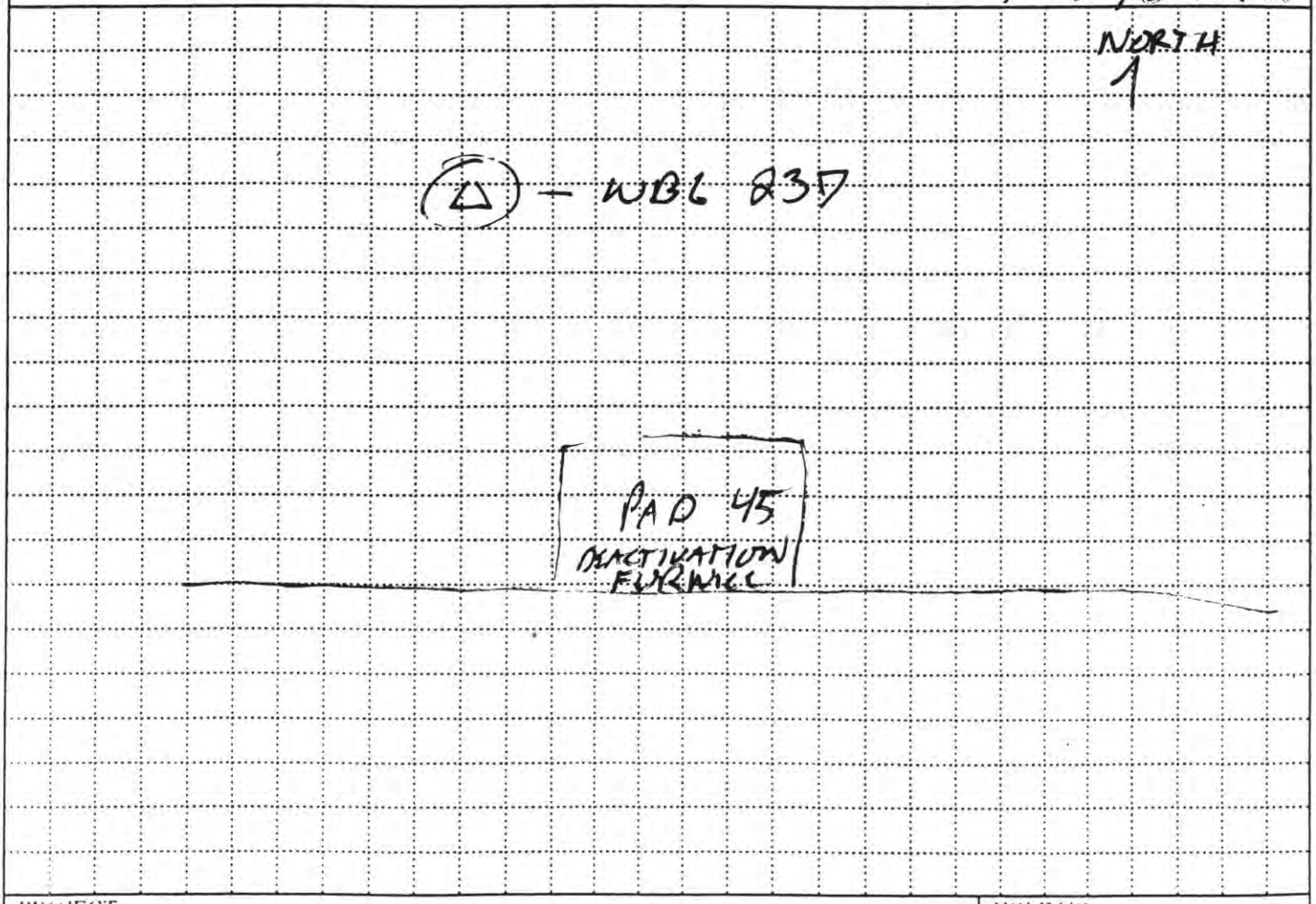
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: TOLTEST	HOLE NUMBER: WBG-237
3. PROJECT: RVAAP: WBG/FS	4. LOCATION: WBG	SHEET / SHEETS: OF
5. NAME OF DRILLER: NEAL WICKTOR	6. MANUFACTURERS DESIGNATION OF DRILL: CME 75	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2' SPLIT SPOON; ACETATE LINERS	8. HOLE LOCATION: WBG 237 N 562697.49 E 2351032.10	
	9. SURFACE ELEVATION: NA 1067.26 SRA 4/27/01	
	10. DATE STARTED: 10/22/00	11. DATE COMPLETED: 10/22/00
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: NA	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: NA	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	✓	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	8RCRA	CHEMOD	EXPLOSIVES	PCB/PEST	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	BENTONITE	NA	NA	

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO.
RVAAP: WBG/FS	WBG 237

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG/FS	D.C. ABELN	4P

ELEV (A)	DEPTH (FT) (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.0	MH ELASTIC SILT WITH FINE SAND - MOIST BROWN (10YR 4/3) WITH GRAY (10YR 5/1) MOTTLES	PID: 0 ppm		0-1': WBG4123 1515	0-2' RECOVERY = 2.0/2.0'
	2.0				2-4': WBG4124 1520	2-4' RECOVERY = 1.6/2.0'
	4.0				4-6': WBG4130 1523	4-6' RECOVERY = 2.0/2.0'
	6.0				6-8' WBG4131 1525	6-8' RECOVERY = 2.0/2.0'
	8.0	SP-SC POORLY GRADED FINE SAND W/CLAY - MOIST DARK YELLOWISH BROWN (10YR 4/4)				
		MH ELASTIC SILT W/FINE SAND - MOIST BROWN (10YR 4/3) W/GRAY (10YR 5/1) MOTTLES			8-10': WBG4132 1528	8-10 RECOVERY = 2.0/2.0
		SP-SM POORLY GRADED FINE SAND W/SILT DARK YELLOWISH BROWN (10YR 4/4)				
	10.0					

PROJECT

HOLE NO

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville; HOLE NUMBER: WBG-238; SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURER'S DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" auger w/extention	8. HOLE LOCATION: Pad 60 — N 563005.31, E 2357042.45	
	9. SURFACE ELEVATION: ~~n/A~~ 1050.700 SRA 4/27/01	
	10. DATE STARTED: 10/21/00	11. DATE COMPLETED: 10/21/00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no WATER in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	XRF-TAL-CA explosives		n/A	n/A	n/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Canell

LOCATION SKETCH/COMMENTS — SCALE:

See page 68 for reference
location of hole WBG-238, Pad 60
in the Soil Sampling Logbook #3

PROJECT	HOLE NO
RVAAP WBG FS	WBG-238

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR C. Canall	SHEET 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0 0.5 1.0	10YR 4/3 BROWN CL-LEAN CLAY W/ FINE POORLY SORTED SAND (AND SILT), SOFT, MOIST, LOW - MED PLASTICITY GRAVEL - SUB-ANGULAR TO SUBROUNDED UP TO 20 MM	Battery died for PID	n/A	WBG-4133	SMALL BURN CHIPS ROOTLETS THROUGHOUT

11-5 ΦΦ CC

PROJECT RVAAP WBG FS A-86

HOLE NO WBG-23

90

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville
		HOLE NUMBER: WBG239
		SHEET 1 OF 2

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3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3S bowl; 3S spoon; 3S 3" auger w/ extension	8. HOLE LOCATION: Pad 62 N 562922.97 E 2357142.22
	9. SURFACE ELEVATION: ~~n/A~~ 1050.12 SRA 4/27/01
	10. DATE STARTED: 10/21/00 — 11. DATE COMPLETED: 10/21/00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A
14. TOTAL DEPTH OF HOLE: 0-10 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no WATER in hole

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	XRF-TAL-CR6	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Canada

LOCATION SKETCH/COMMENTS — SCALE:

See Page 68 for reference location of hole WBG-239, Pad 62 in the Soil Sampling Logbook #3

PROJECT	HOLE NO.
RVAAP WBG FS	WBG-239

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Cancell	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 7/2 light gray mottled w/ 7.5YR 5/8 strong brown, CL clay with trace poorly sorted sands, flat angular to subangular gravel up to 30 mm, soft, low to med plasticity, moist	0.0 ppm	N/A	WBG-4136	rootlets
	1.0					
	11.5			11.5-0.0 CC		

PROJECT RVAAP WBG FS A-88

HOLE NO. WBG-239

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	DISTRICT: Louisville
		HOLE NUMBER: WBG ~~241~~ 240
		SHEET 1 OF 2

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3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" auger extention	8. HOLE LOCATION: Pad 62 N 563010.20 E 2357116.48
	9. SURFACE ELEVATION: ~~DTA~~ 1050.06 SRA 4/27/01
	10. DATE STARTED: 10/21/00 — 11. DATE COMPLETED: 10-25-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: ~~0-10ft~~ 11-5-00 0-4.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): now water in hole.

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	SVOC, PCBs	TAL-XRF-Cr+6	Explosives	Pesticides	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	C. Canall

LOCATION SKETCH/COMMENTS — SCALE:

See page 68 for reference
location of hole WBG-241, Pad 62
in the Soil Sampling Logbook #3

PROJECT	HOLE NO
RVAAP WBG FS	WBG-~~241~~ 240

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR C. Canall	SHEET 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 3/2 very dark grayish brown, CL-Lean Clay towards a ML-Silty w/sand, poor sorted fine sands, angular to subangular gravel upto 30 mm soft, low to med plasticity, moist	0.0 ppm	n/a	WBG-4139	nails, metal roottets throughout
	1.0	2.5Y 5/4 light olive brown, CL-Lean Clay w/fine sands, gravel to 5 mm Subangular fine, low plasticity, damp				roottets throughout cm. burned chips
	1.5	INTERVAL NOT SAMPLED				
	2.0	5Y 7/1 LIGHT GRAY MOTTLED WITH 10YR 5/6 YELLOWISH BROWN CL-LEAN CLAY W/ FINE POORLY SORTED SAND W/ SUBANGULAR GRAVEL UP TO 40 MM, SOFT, DAMP, LOW PLASTICITY	0.0 PPM	N/A	WBG-4140	
	2.5					
	3.0					
	3.5					
	4.0					

11.5-0.0 CC

PROJECT	HOLE NO
RVAAP WBG FS A-90	WBG-241

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville / HOLE NUMBER: WBG-241 / SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/a	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" auger w/extention	8. HOLE LOCATION: Pad 62 N 563000.25 E 2357206.46	
	9. SURFACE ELEVATION: n/A 1048.76 SRA 4/27/01	
	10. DATE STARTED: 10/21/00	11. DATE COMPLETED: 10/21/00
12. OVERBURDEN THICKNESS: n/a	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/a	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

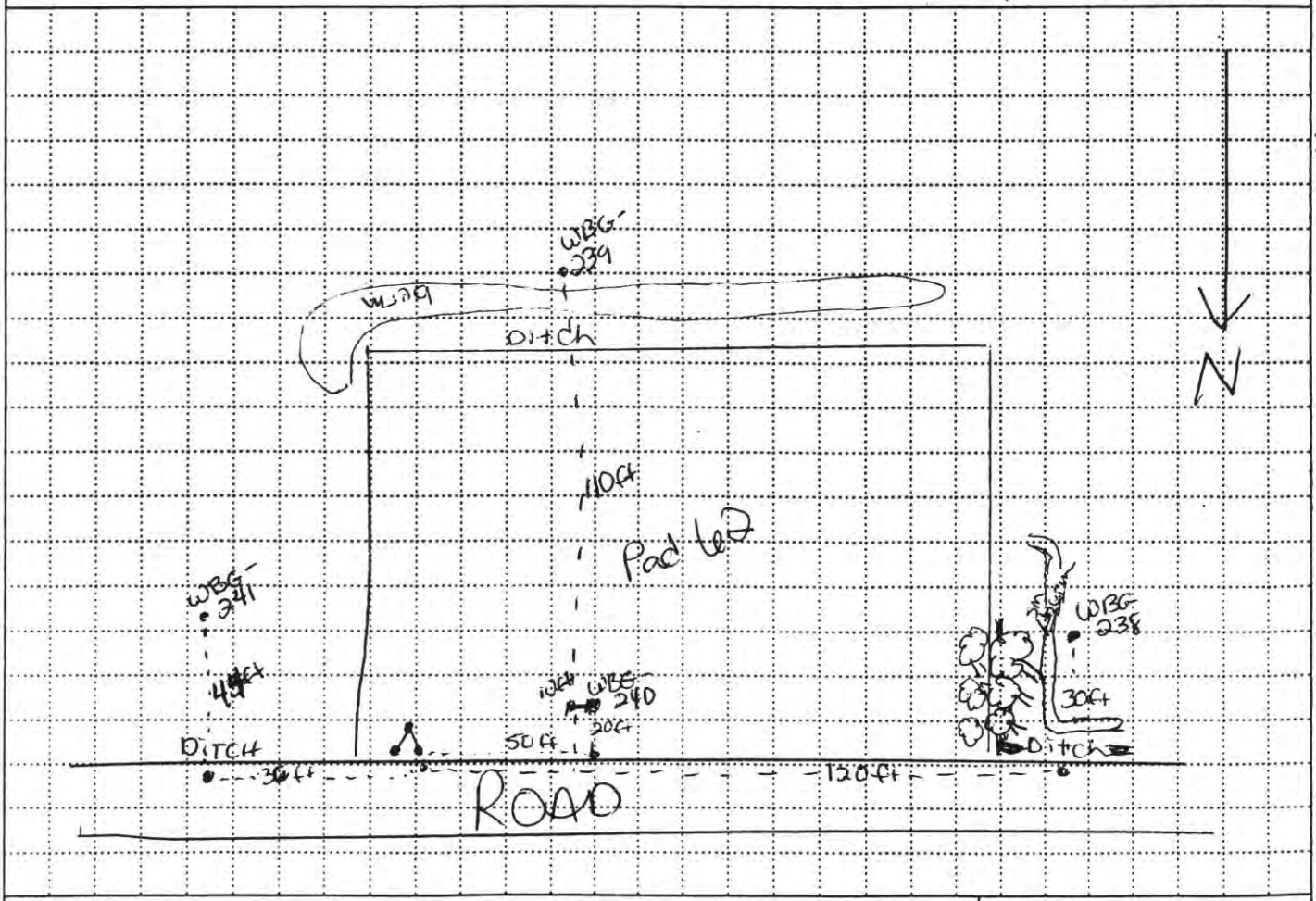
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	XRF-Metals	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	bentonite	n/A	n/A	C. Canada

LOCATION SKETCH/COMMENTS — SCALE: not to scale.

not to scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-241

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C Canall	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		10YR 5/4 yellowish brown, CL-Lean Clay w/sand; Gravel up to 10mm, moist, soft, low plasticity				
	0.5	10YR 4/2 light brownish gray mottled with 10YR 5/8 yellowish brown, CL-Lean Clay fine poorly sorted sandy, Sub angular to subrounded gravel up to 30mm, firm, damp, low plasticity	0 0 ppm	n/a	WBG-4142 4271 (Dup) 4289 (Split)	
	1.0					
						11-5 0 CC

PROJECT: RVAAP WBG FS A-92

HOLE NO: WBG-241

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: TOLTEST	HOLE NUMBER: WBG-242
	DISTRICT: LOUISVILLE COE	SHEET / SHEETS OF

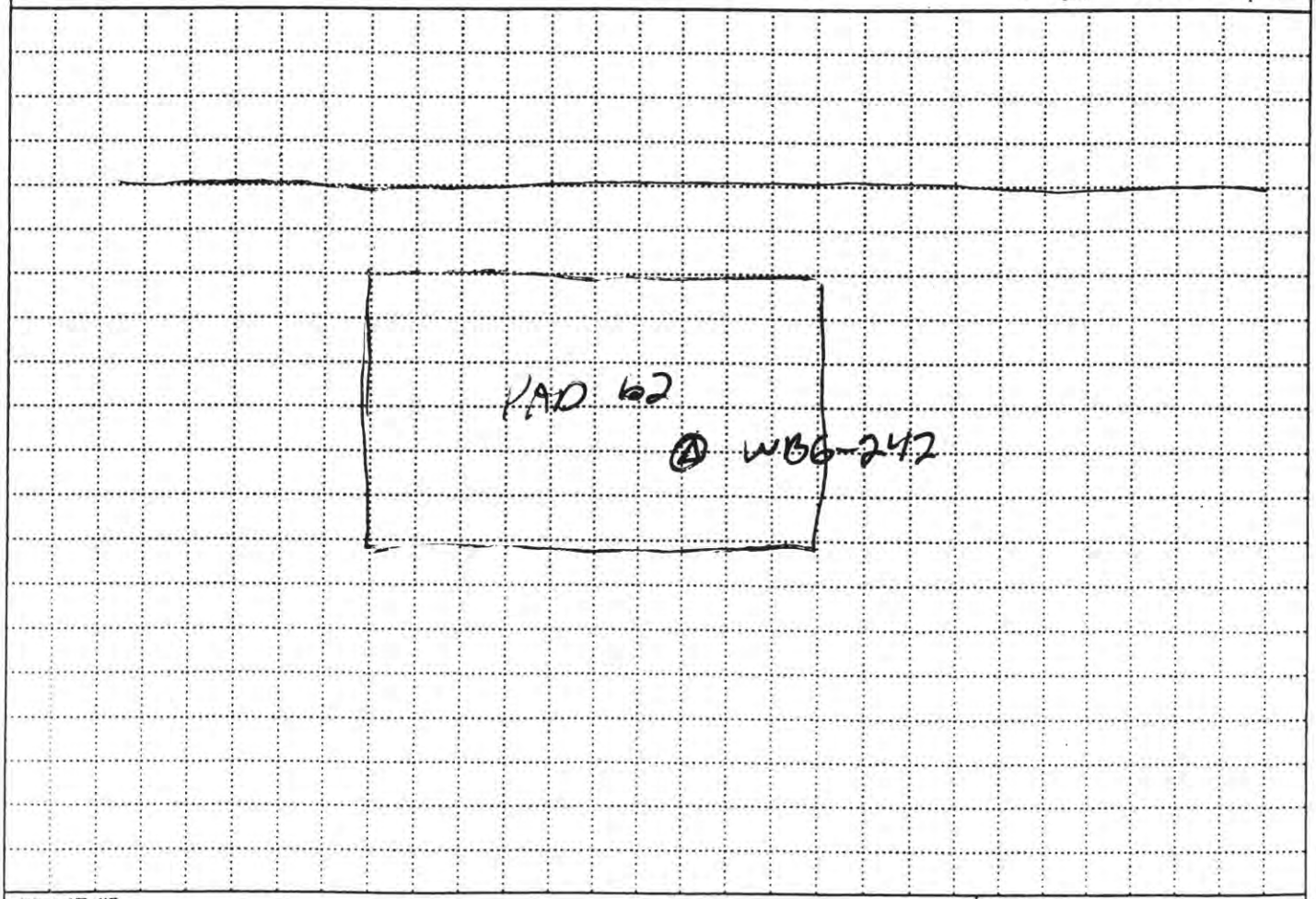
3. PROJECT: RVAAP: WBG/FS	4. LOCATION: WBG
5. NAME OF DRILLER: NEAL WIKTOR	6. MANUFACTURERS DESIGNATION OF DRILL: CME 75
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2' SPLIT SPOONS, ACETATE LINERS	8. HOLE LOCATION: WBG 242 N 563003.28 E 2357146.22
	9. SURFACE ELEVATION: DAF 1049.38 SRA 4/27/01
	10. DATE STARTED: 10/22/00 — 11. DATE COMPLETED: 10/22/00
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: NA
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA
14. TOTAL DEPTH OF HOLE: 10'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	-	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	10	NA	NA	NA	NA	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	HEADSPACE	NA	NA	[signature]

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO
RVAAP: WBG/FS	WBG 242

DRILLING LOG

WB6-242

PROJECT	INSPECTOR	SHEET
RVAAP: WB6/FS	B. GIBELIN	

ELEV (A)	DEPTH (FT) (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.0	MH ELASTIC SILT W/FINE SAND - MOIST - YELLOWISH BROWN (10YR 4/4)	PID: 0 ppm		0-1': WB64145 1020	0-2' RECOVERY: 1.5/2.0 PENETROMETER: 1.75
	2.0	SP-SM POORLY GRADED FINE SAND W/SILT - MOIST LIGHT YELLOWISH BROWN (10YR 6/4)			2-4': WB64146 1025	2-4' RECOVERY: 1.5/2.0
	4.0	SP-SM POORLY GRADED FINE SAND W/SILT - MOIST DARK YELLOWISH BROWN (10YR 3/6)			4-6': WB64147 1030	4-6 RECOVERY: 2.0/2.0
	6.0				6-8': WB64148 1035	6-8' RECOVERY: 2.0/2.0
	8.0				8-10': WB64149	8-10' RECOVERY: 2.0/2.0
	10.0	MH SILT W/FINE SAND - MOIST GRAY (10YR 5/1)				

PROJECT: RVAAP: WB6/FS

HOLE NO: WB6-242

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville; HOLE NUMBER: WBG 243; SHEET 1 OF 5
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; 3 1/4" auger w/extention	8. HOLE LOCATION: Pad 66 N 563049.93 E 2358649.30	
	9. SURFACE ELEVATION: ~~n/A~~ 1016.60 SRA 4/27/01	
	10. DATE STARTED: 10/21/00	11. DATE COMPLETED: 10-23-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: CC 10-23-00 D-1.0ft Ø-4.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER IN hole	

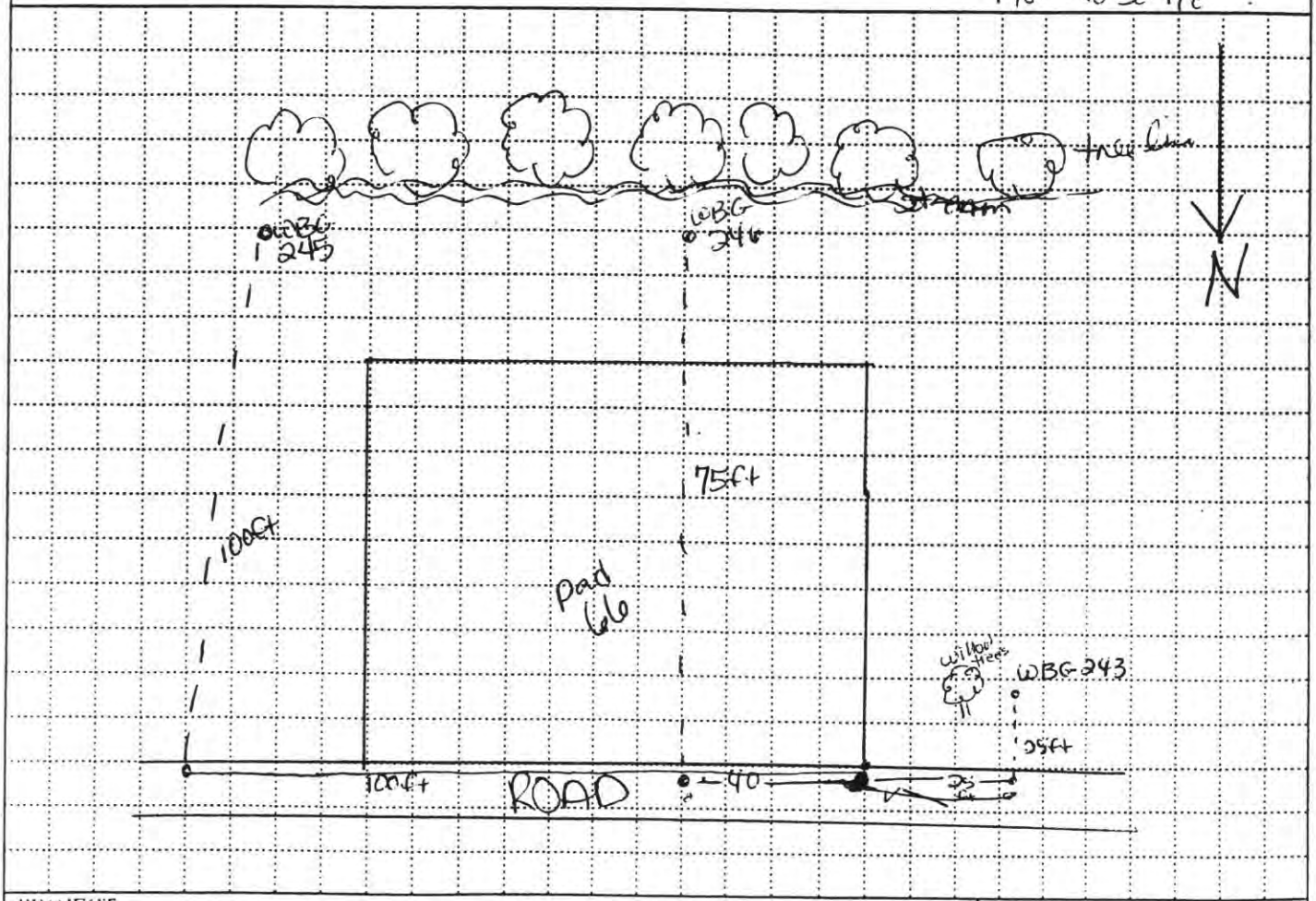
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-XRF-Cr6+	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	n/A	n/A	n/A	C. Canall

LOCATION SKETCH/COMMENTS — SCALE: Not to scale

not to scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG 243

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canall	SHEET	2 of 2

97

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		2.5YR 4/3 olive brown, CL-Lean Clay w/ fine poor-sorted sands, some silt, soft, damp low to med plasticity subangular pebbles up to 15mm				lots of rootlets
	0.5	2.5Y 4/3 light yellowish brown, mottled w/10YR 5/8 yellowish brown, CL-Lean clay with silt, low plasticity, firm, damp subangular pebbles up to 15mm	dead battery on PID	N/A	WBG-4150	
	1.0	Discard layer				
	2.0	2.5Y 5/4 light olive brown, CL-Lean Clay, fine to med. poor-sorted sands, cobbles angular to subangular 3 to 60mm, moist, firm, low plasticity	0.0ppm	N/A	WBG-4151	
	3.0				WBG-4273 (Dup)	
					WBG-4291 (split)	Refusal at 3.8"
	4.0					
				11.5-0.0 CC		

PROJECT RVAAP WBG FS A-96

HOLE NO WBG 243

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	DISTRICT: Louisville; HOLE NUMBER: WBG-245; SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS Spoon; SS bowl; SS 3in auger w/extention	8. HOLE LOCATION: Pad L66 N 562984.44 E 2358785.56	
	9. SURFACE ELEVATION: ~~N/A~~ 1014.25 SRA 4/27/01	
	10. DATE STARTED: 10-23-00	11. DATE COMPLETED: 10-23-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-10 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER in hole.	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	(0)	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A	SVOC, PCBs	TAL-XRF-Cr6	EXPLOSIVES	Pesticides	N/A	N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	C. Canaldo

LOCATION SKETCH/COMMENTS — SCALE:

See page 96 for Reference Location of hole WBG-245, Pad L66 in the Soil Sampling Logbook #3

PROJECT	HOLE NO.
RVAAP WBG FS	WBG-245

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR C. Conrath	SHEET 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	2.5Y 4/3 olive brown, CL- Lean Clay, w/ silt, firm, moist, no to low plasticity, fine to poorly sorted, strong HCl reaction,	0.0 ppm	n/A	WBG-4156	Plastic, metal, Rootlets
	10					

11-5-00 CC

PROJECT RVAAP WBG-FS A-98 HOLE NO WBG-345

104

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	DISTRICT: Louisville	HOLE NUMBER: WBG-246
2. DRILL SUBCONTRACTOR: n/a		SHEET 1 OF 2

3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG
5. NAME OF DRILLER: n/a	6. MANUFACTURERS DESIGNATION OF DRILL: n/a
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" auger extention	8. HOLE LOCATION: Pad WB N 562998.60 E 2358727.03
	9. SURFACE ELEVATION: ~~n/a~~ 1015.83 SRA 4/27/01
	10. DATE STARTED: 10/23/00 — 11. DATE COMPLETED: 10/25/00
12. OVERBURDEN THICKNESS: n/a	13. DEPTH GROUNDWATER ENCOUNTERED: n/a
13. DEPTH DRILLED INTO ROCK: n/a	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/a
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/a	n/a		n/a

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/a	n/a	XRF-Cr+6-TAL	Explosives	n/a	n/a	n/a

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/a	~~n/a~~ Bentonite	n/a	n/a	Carroll

LOCATION SKETCH/COMMENTS — SCALE:

See page 96 for reference
Location of hole WBG-246
Pad WB, in the Soil
Sampling Logbook #3

PROJECT	HOLE NO
RVAAP WBG FS	WBG-246

BIGELING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canall	SHEET	2 of 2

6

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.3	2.5Y 3/2 very dark gray ish brown, CL-OH organic w/sand, fine poorly sorted sands, gravel angular to rounded up to 50mm, loose, moist, non plastic	0.0 ppm		WBG-4159	rootlets
	0.5	2.5Y 4/6 olive yellow, red staining from metals, black char, CL-Lean Clay with silt, with fine to med poorly sorted sands, subangular gravel up to 40mm, soft, moist, low plasticity	0.0	N/A	WBG-4159	metals rootlets burned chips; metals
	1.0					
	1.5	INTERVAL NOT SAMPLED / DISCARDED				
	2.0	2.5Y 4/4 OLIVE BROWN w/ 10YR 4/6 DARK YELLOWISH BROWN SPECKLING, SILTY CLAY w/ FINE TO MED POORLY SORTED SAND, MOIST, VERY SOFT, LOW-MED PLASTICITY	0.0 PPM	N/A	WBG-4160	
	3.0	2.5Y 5/1 GRAY MOTTLED w/ 10YR 4/6 DARK YELLOWISH BROWN, CL-LEAN CLAY w/ FINE POORLY SORTED SAND, SUBANGULAR TO SUB ROUNDED GRAVEL UP TO 30MM, SOFT,				
	4.0	MED - HIGH PLASTICITY, MOIST.				

PROJECT RVAAP WBG FS A-100 HOLE NO WBG-246

19

HTRW DRILLING LOG

DISTRICT: LOUISVILLE COE		HOLE NUMBER: WBG-247
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: TOLTEST	SHEET ___ OF ___ SHEETS
3. PROJECT: RVAAP: WBG/FS	4. LOCATION: WBG	
5. NAME OF DRILLER: NEAL WIKTOR	6. MANUFACTURERS DESIGNATION OF DRILL: CME 75	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2' SPLIT SPOONS, ACETATE LINERS	8. HOLE LOCATION: WBG 247 N 563023.07 E 2358732.77	
	9. SURFACE ELEVATION: ~~NA~~ 1016.42 SRA 4/27/01	
	10. DATE STARTED: 10/22/00	11. DATE COMPLETED: 10/22/00
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 1.5	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 4'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

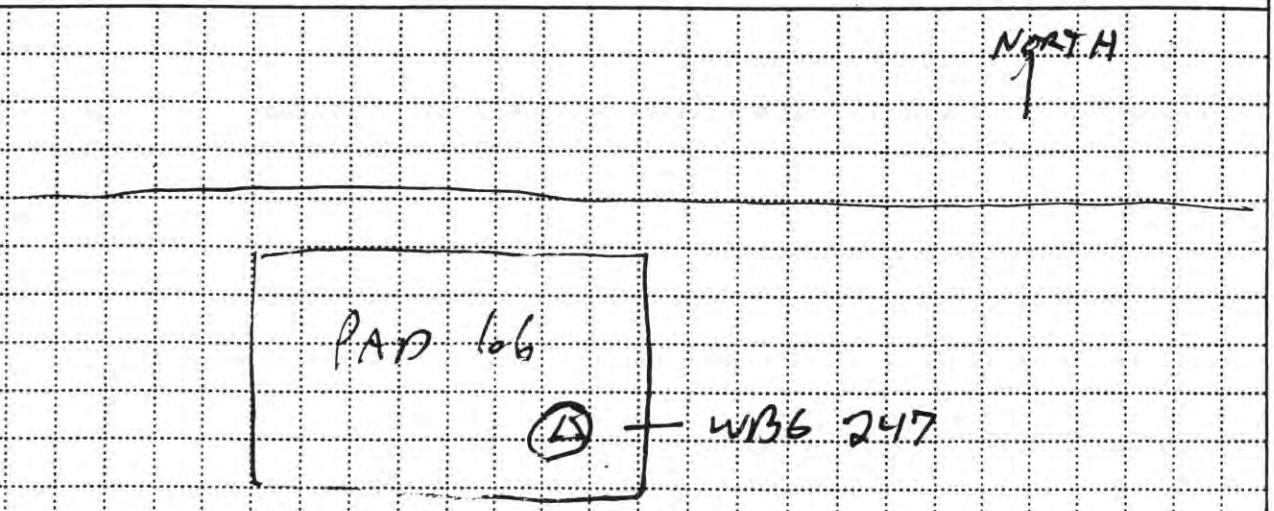
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
		✓	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	Ø	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	BENTONITE	NA	NA	B Sdlach

LOCATION SKETCH/COMMENTS

SCALE: NOT TO SCALE



PROJECT	HOLE NO.
RVAAP: WBG/FS	WBG 247

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

DRILLING LOG

PROJECT	INSPECTOR	SHEET

20

ELEV (A)	DEPTH (ft)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		MH ELASTIC SILT W/FINE SAND -DRY BROWN (10YR 4/3)	PID=0ppm		0-1: WBG4162 1110	0-2' RECOVERY = 1.3'/2.0
	2.0	SP-SM POORLY GRADED FINE SAND W/SILT - WOOD CHIPS - BLACK (10YR 2/1) WITH DARK REDDISH BROWN (5YR 3/4) STAINING - WET	PID=0ppm		2-4 2-4': WBG4163 1115	2-4' RECOVERY 1.0'/2.0'
	4.0	MH ELASTIC SILT W/FINE SAND BROWN (10YR 4/3)	PID=0ppm			
	6.0					
	8.0					
	10.0					

PROJECT

HOLE NO WBG-247

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	HOLE NUMBER: WBG-249
		SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 9S Spoon; 5S bowl; 5S 3" auger extention	8. HOLE LOCATION: Pad 67 N 563014.77 E 2359117.34	
	9. SURFACE ELEVATION: ~~N/A~~ 1009.71 SRA 4/27/01	
	10. DATE STARTED: 10/23/00	11. DATE COMPLETED: 10/23/00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER in hole.	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A	1/17	XRF-TAL-CrHg	Explosives	N/A	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
1/17	Bentonite	N/A	N/A	C Canada

LOCATION SKETCH/COMMENTS — SCALE:

See page 12 for reference location of hole WBG-249, Pad 67, in the Soil Sampling Logbook #4

PROJECT	HOLE NO
RVAAP WBG FS	WBG-249

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DIGGING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	C. Carroll	2 of 2

27

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	Ø.5 1.Ø	10YR 4/8 brownish yellow, sandy silt w/ some clay, fine to med fine poor sorted sands, subangular to subrounded up to 30mm, damp, soft, loose, low plasticity	Ø.Ø ppm	N/A	WBG-4170	nails, burned chips metals, roof tests

11-8-10 CC

PROJECT RVAAP WBG FS A-104 HOLE NO WBG-249

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	DISTRICT: Louisville; HOLE NUMBER: WBG-230; SHEET 1 OF 1
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" auger w/extention	8. HOLE LOCATION: Pad 107 N 563000.08 E 2359051.31	
	9. SURFACE ELEVATION: ~~N/A~~ 1009.66 SRA 4/27/01	
	10. DATE STARTED: 10/23/00	11. DATE COMPLETED: 10-23-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no WATER in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
N/A	N/A	N/A				

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A	N/A	XRF-Fe-Tal	explosives	N/A	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	C. Canada

LOCATION SKETCH/COMMENTS — SCALE:

See page 12/ for reference location of hole WBG-230, Pad 107 in the Soil Sampling Logbook #4/

PROJECT	HOLE NO.
RVAAP WBG FS	WBG 230

DIGGING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canall	SHEET	2 of 2

20

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 5/4 LIGHT OLIVE BROWN, CL-LEAN CLAY WITH SILT AND POORLY SORTED SAND (FINE), GRAVEL (ANGULAR TO SUBANGULAR) UP TO 4mm, FIRM, DAMP, LOW PLASTICITY	Ø.ØPPM	N/A	WBG-4173	METAL, WHITE MATERIAL
	1Ø	2.5Y 7/1 LIGHT GRAY MOTTLED W/ 10YR 6/8 BROWNISH YELLOW - CL-LEAN CLAY W/ FINE POORLY SORTED SANDS, MOIST, LOW PLASTICITY, SOFT	Ø.ØPPM	N/A		

11 [illegible] CL

12

HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG-251
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" auger w/extention	8. HOLE LOCATION: Pad 67 N 563060.64 E 2358946.66	
	9. SURFACE ELEVATION: ~~n/A~~ 1011.71 SRA 4/27/01	
	10. DATE STARTED: 10/23/00	11. DATE COMPLETED: 10/23/00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER in	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

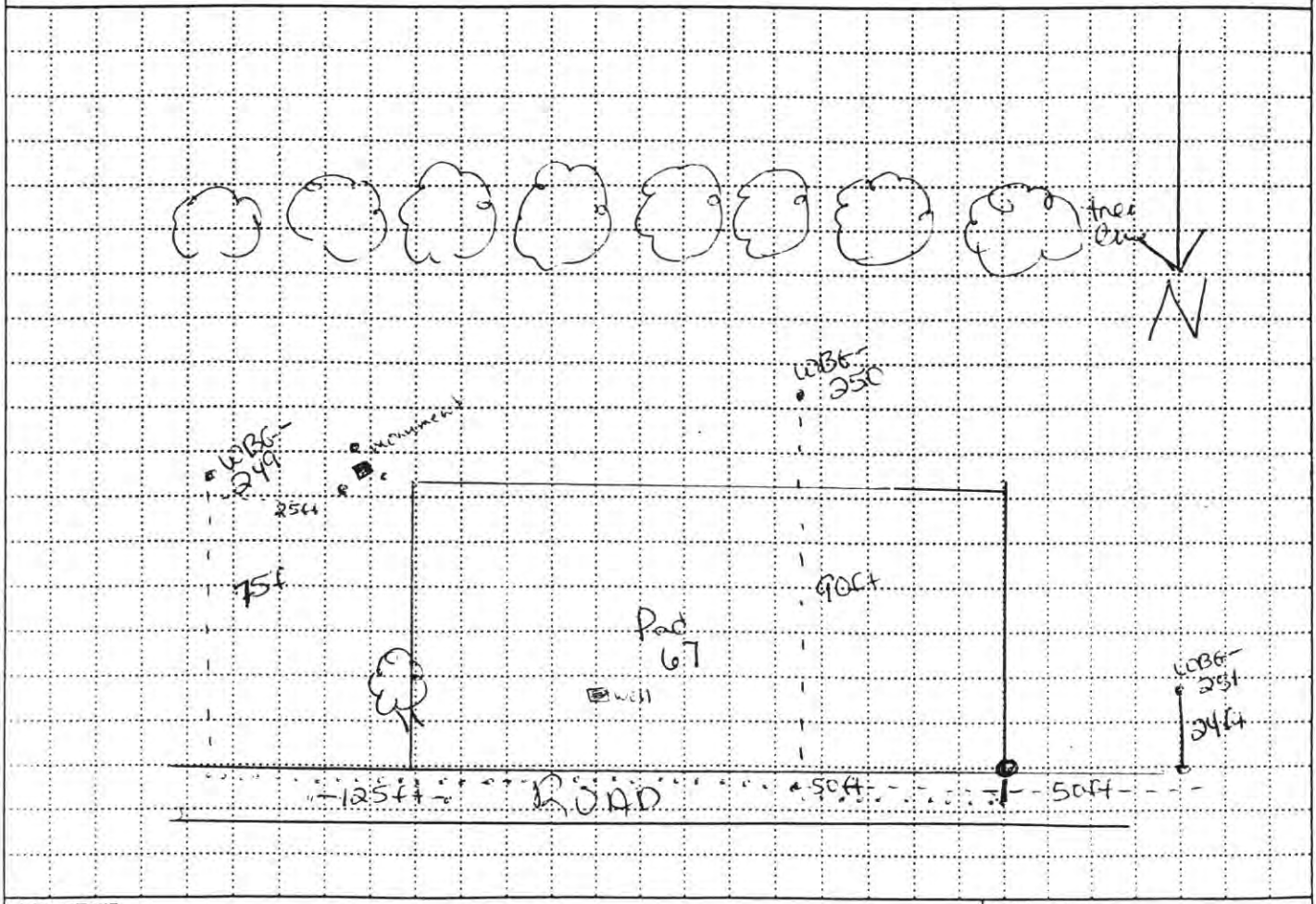
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	SVOC-VOC PCB	XRF-Crtc TAL	Propellants	Explosives	Pesticides	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	~~n/A~~ Bentonite	n/A	n/A	C. Cavall

LOCATION SKETCH/COMMENTS

SCALE:

not to scale



PROJECT	HOLE NO
RVAAP WBG FS	WBG-251

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canall	SHEET	2 of 2

13

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5 1.0	2.5Y 4/3 olive brown, CL-Lean Clay to ML-silt, w/fine poor sorted sands, moist, soft, low plasticity	0.0 ppm	n/A	WBG-4176	

11-8-00 CL

PROJECT RVAAP WBG FS A-108

HOLE NO WBG-251

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: TOLTEST	HOLE NUMBER: WBG 252
	DISTRICT: LOUISVILLE COE	SHEET / SHEETS: OF

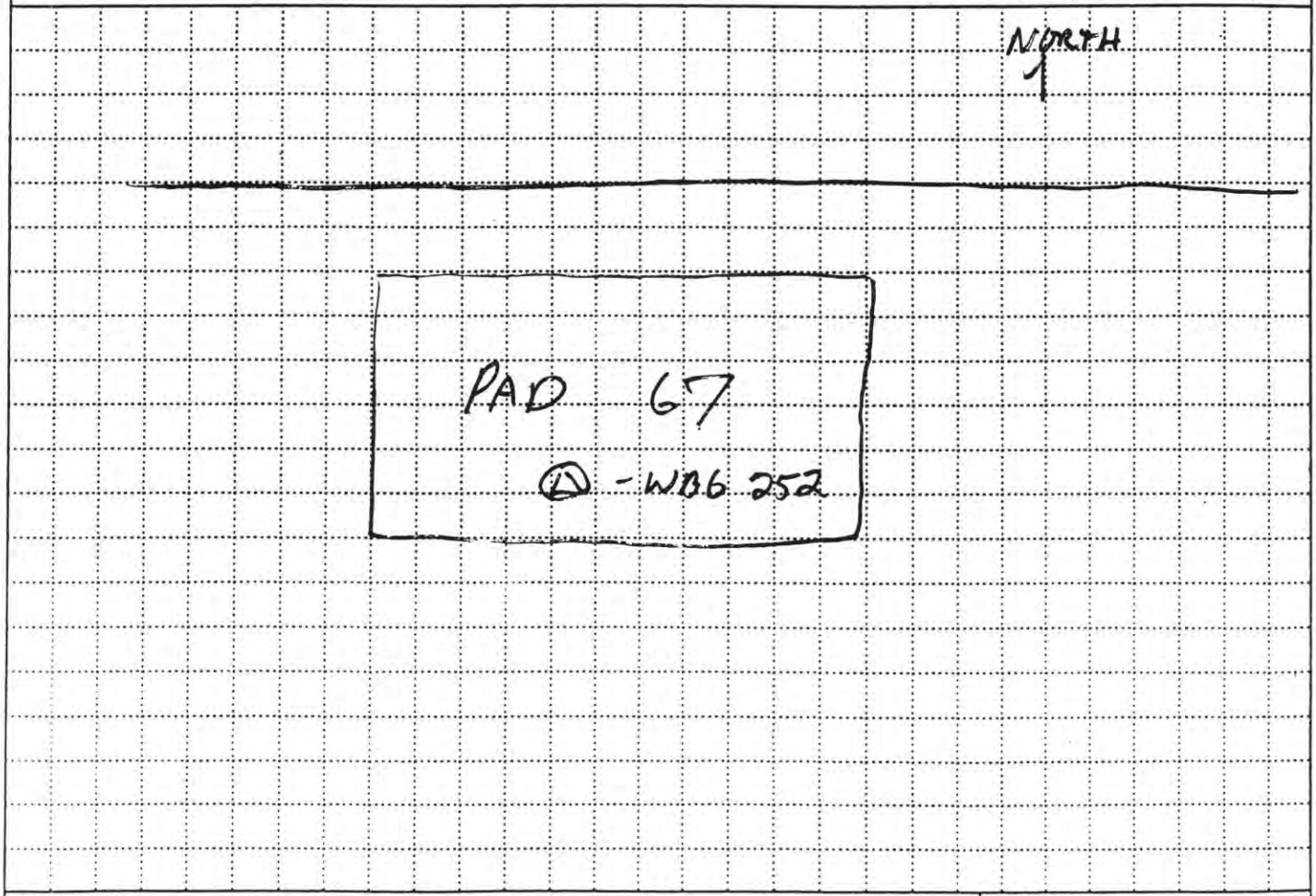
3. PROJECT: RVAAP: WBG /ES	4. LOCATION: WBG
5. NAME OF DRILLER: NEAL WINTON	6. MANUFACTURERS DESIGNATION OF DRILL: CME 75
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2' SPLIT SPOONS ACETATE LINERS	8. HOLE LOCATION: WBG 252 N 563062.47 E 2359024.20
	9. SURFACE ELEVATION: NA 1010.45 SRA 4/27/01
	10. DATE STARTED: 10/22/00 / 11. DATE COMPLETED: 10/22/00
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: NA
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA
14. TOTAL DEPTH OF HOLE: 10.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	-	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	-	-	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	CEMENTED	NA	NA	B. Schuck

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO.
RVAAP: WBG /ES	WBG 252

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT | INSPECTOR BG ABELIN | SHEET 27

ELEV (A)	DEPTH (FT) (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		MH ELASTIC SILT W/FINE SAND -DRY DARK REDDISH BROWN (10YR 3/4)	PID=0ppm		0-1': WB64179 1150	0-2' RECOVERY = 2.0/2.0
	2.0	MH ELASTIC SILT W/FINE SAND -DRY BROWN (10YR 4/3) WITH GRAY (10YR 6/1) MOTTLES	PID=0ppm		2-4' WB64180 1200	2-4' RECOVERY = 2.0/2.0
		SP-SM POORLY GRADED FINE SAND W/SILT -DRY VERY DARK BROWN (10YR 2/2)	PID=0ppm			
	4.0	MH ELASTIC SILT W/FINE SAND -DRY (BROWN (10YR 4/3)	PID=0ppm		4-6': WB64181 1203	4-6' RECOVERY = 2.0/2.0
	6.0	SP-SM POORLY GRADED FINE SAND W/SILT -DRY -VERY DARK BROWN (10YR 2/2)			6-8': WB64182 1205	6-8' RECOVERY = 2.0/2.0
	8.0	MH ELASTIC SILT W/FINE SAND -DRY (BROWN (10YR 4/3)			8-10': WB64183 1210	8-10' RECOVERY = 2.0/2.0

PROJECT | HOLE NO

HTRW DRILLING LOG

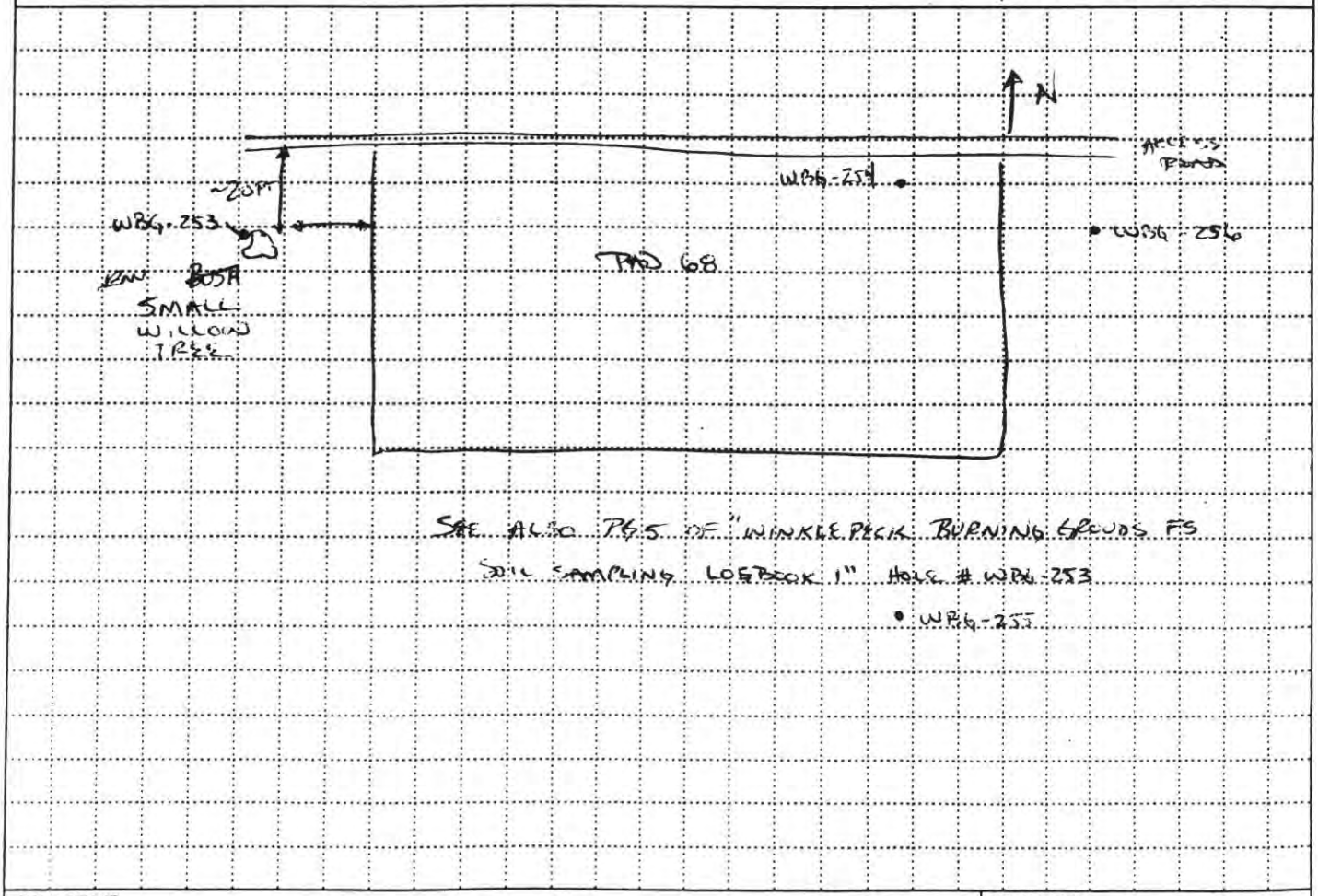
	DISTRICT: LOUISVILLE	HOLE NUMBER: WBG-253
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: WINKLEPECK BURNING GROUNDS	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS SCREEN; SS BOWL; SS 3" AUGER W/ EXTENTION	8. HOLE LOCATION: PAD 68 N 5630666.27 E 2359491.75	
	9. SURFACE ELEVATION: ~~N/A~~ 1007.49 SRA 4/27/01	
	10. DATE STARTED: 17 OCT 00	11. DATE COMPLETED: 18-17-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0.0 - 1.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER IN HOLES	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	N/A	XRF TAL	EXPLOSIVES	PROPELLANTS	~~N/A~~	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	B. Will

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



SEE ALSO PG 5 OF "WINKLEPECK BURNING GROUNDS FS SOIL SAMPLING LOGBOOK 1" HOLE # WBG-253 • WBG-255

PROJECT	HOLE NO.
RVAAP WBG FS	WBG-253

DRILLING LOG

PROJECT: RVAAP WB4 FS | INSPECTOR: B. Williams | SHEET: 2 OF 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		2.5Y 3/1 VERY DARK GRAY CLAYEY SAND FINE TO MEDIUM	N/A PID acting erroneously	N/A	WB4-4184	AW
	.5 AW 10-17-06	SUB ANGULAR SAND WITH ~~GRAVEL~~ UP TO 4 INCHES COBBLE NON PLASTIC, MOIST, LOOSE → Ø - Ø.3 FT DESCRIPTION A				Ø.5
	1.Ø					1.Ø
	10-17-06	2.5Y 4/4 OLIVE BROWN ~~CLAYEY SAND~~ SANDY CLAY FINE SAND WITH SUBROUNDED GRAVEL UP TO 5MM SOFT, PLASTIC, DAMP				
						11-8-06 CC

PROJECT: RVAAP WB4 FS | A-112 | HOLE NO: WB4-253

HTRW DRILLING LOG

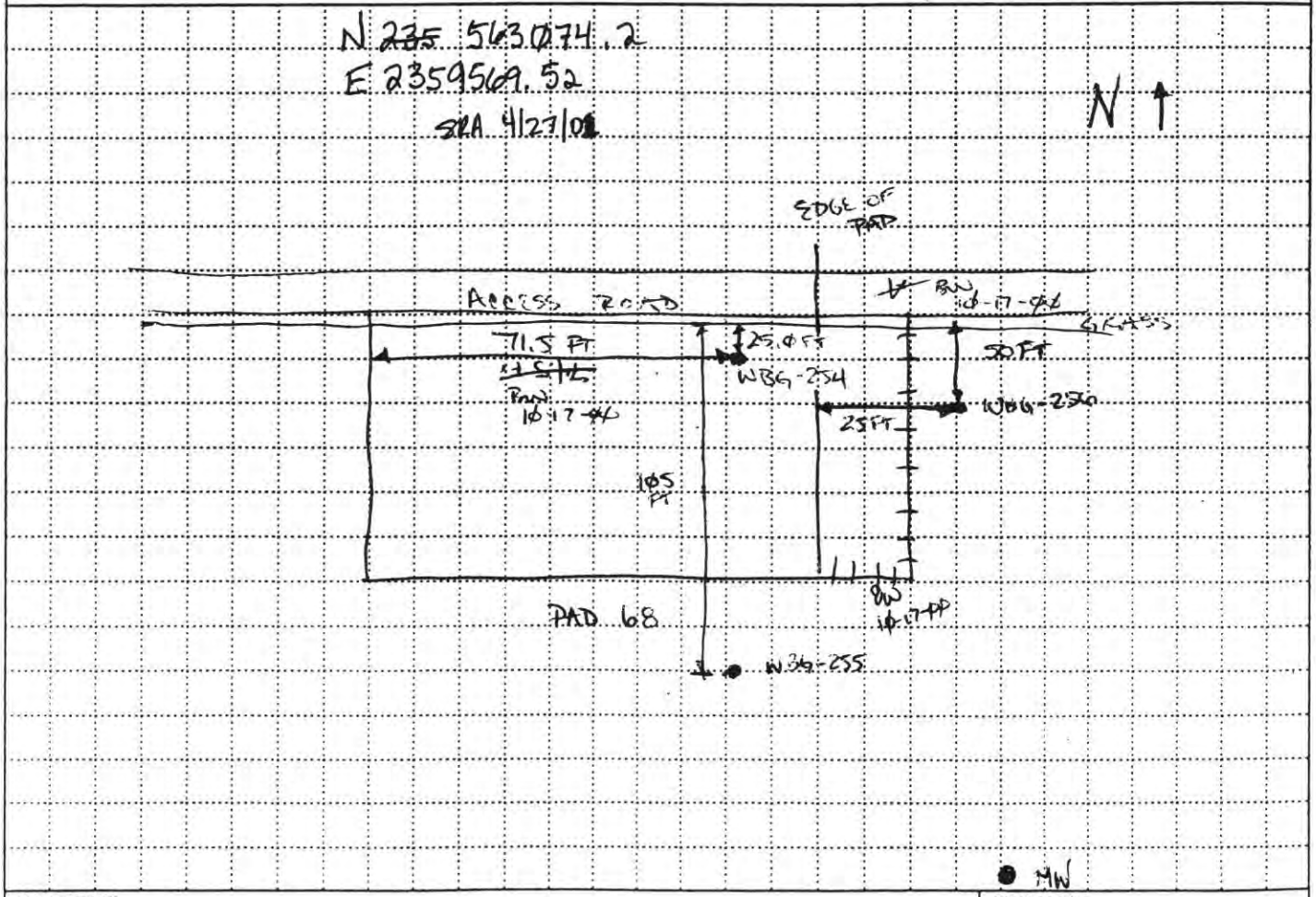
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	DISTRICT: LOUISVILLE; HOLE NUMBER: WBG-254; SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: WINKLEPECK BURNING GROUNDS	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS BOWL; SS SPOON; ~~BW~~ 3" AUGER W/ EXTENTION	8. HOLE LOCATION: PAD-68 N 563074.2 E 2359569.52 SRA 4/27/01	
	9. SURFACE ELEVATION: N/A 1007.33 SRA 4-27-01	
	10. DATE STARTED: 16 OCT 00	11. DATE COMPLETED: 19-OCT-00 ~~16 OCT 00~~
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 10-19-00 CC ~~0-1.0 FT~~ 0-41.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 10-19-00 CC ~~NO WATER IN HOLES~~ 2 in. to water depth	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	~~X~~	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	EXPLOSIVES	TAL RXF	PROPELLANTS	~~HERBICIDES~~	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	B. Williams

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO
RVAAP WBG FS	WBG-254

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DIGGING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	B. Williams	2 of 2

6

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	10YR 3/1 very dark gray SANDY CLAY, SUB-ANGULAR TO SUB-ROUNDED SAND WITH ROUNDED (SUB) TO 25 mm (PEBBLE), DAMP, ~~NO~~ AW 10-16-00	0 ppm	N/A	WBG-254-487-SO	
	1.0	PLASTICITY (MEDIUM) not sampled	CC 10-19-00 ~~0.0~~ ppm			
	2.0	10YR 7/2 light grey mottled w/ 10YR 5/8 yellowish brown ML-Sandy Silt, med. grain sand, angular, med. plasticity, moist to wet, gravel up to 10 mm, ~~coarse~~ cc ~~[illegible]~~ quartz	0.0 ppm	N/A	WBG-4188	
	2.5	10YR 7/1 light gray, ML-Sandy Silt med. angular sand, loose, moist to wet [illegible]				
	3.0	10YR 5/4 yellowish brown, Silty-Sand, med, angular to subangular poor sorted, loose, wet, no plasticity	0.0 ppm	N/A	WBG-4188	
	3.5					
	4.0					

PROJECT: RVAAP WBG FS

HOLE NO: WBG-254

19

HTRW DRILLING LOG

DISTRICT: LOUISVILLE	HOLE NUMBER: WBG-255	
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WINKLEPECK BURNING GROUNDS	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS SPOON; SS BOWL; 3" SS AUGER W/ EXTENTION	8. HOLE LOCATION: PAD 68 N 562996.79 E 2359539.8 SRA 4/27/01	
	9. SURFACE ELEVATION: ~~N/A~~ 1005.62 SRA 4/27/01	
	10. DATE STARTED: 17 OCT 00	11. DATE COMPLETED: 10-19-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 10-19-00 CC ~~0-10 FT~~ 0-4 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER IN HOLE	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	10-19-00 CC ~~N/A~~ TOC	TAL, XRF	EXPLOSIVES	PROPELLANTS	Cr+6 ~~N/A~~ 10-19-00 CC	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	bentonite	N/A	N/A	B. Will

LOCATION SKETCH/COMMENTS → SVOC, PCBs, Pesticides

SCALE: NOT TO SCALE

PLEASE REFERENCE PAGE 5 OF "WINKLEPECK BURNING GROUNDS FS, SOIL SAMPLING LOG BOOK 1", HOLE # WBG-254

PROJECT	HOLE NO
RVAAP WBG FS	WBG-255

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WB6 FS	B. Williams	2 of 2

30

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		2.5Y 4/3 OLIVE BROWN, SUB-ANGULAR CLAYEY SAND, LOOSE. NON PLASTIC, DAMP, GRAVEL UP TO	3 mm, PEBBLES			
	0.5	2.5Y 4/3 OLIVE BROWN MOTTLED WITH 2.5Y 5/6 LIGHT OLIVE BROWN, SUB-ANGULAR CLAYEY SAND LOOSE, NON PLASTIC, DAMP,	0.0	N/A	WB6-4190	
	1.0	GRAVEL UP TO 3MM.				
		Discard Auger				
	2.0	[illegible]	0.0 ppm			
		10YR 4/4 dark yellowish brown, CL-Lean clay, w/ fine poorsorted sand subangular to subrounded up to 30mm dry to damp, firm, low to no plasticity	0.0 ppm	N/A	WB6-4191	
	3.0	10YR 4/4 dark yellowish brown mottled w/ 10YR 6/1 gray, CL-Lean clay w/ fine poorsorted sand, subangular to subrounded gravel up to 30 mm low to no plasticity, dry to damp firm				
	4.0					

11-8-00 CC

12

HTRW DRILLING LOG

DISTRICT: LOUISVILLE	HOLE NUMBER: WBG-256	
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WINKLEPECK BURNING GROUNDS	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS BOWL, SS SPOON, 3" AUGER W/ EXTENTION	8. HOLE LOCATION: PAD 68 N 563054.9 E 2359622.08 SRA 4/27/01	
	9. SURFACE ELEVATION: ~~N/A~~ 1005.91 SRA 4/27/01	
	10. DATE STARTED: 17 OCT 00	11. DATE COMPLETED: 10-17-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER IN HOLE	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	N/A	XRF ETAL	EXPLOSIVES	PROPELLANTS	10-FT CONTACT	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	bentonite	N/A	N/A	B. Will

LOCATION SKETCH/COMMENTS

SCALE: NOT TO SCALE

REFERENCE PAGE 5 OF "WINKLEPECK BURNING GROUNDS FS, SOIL SAMPLING LOGBOOK 1" HOLE NUMBER WBG-254

PROJECT	HOLE NO.
RVAAP WBG FS	WBG-256

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT RVAAP WB6 FS	INSPECTOR B. Williams	SHEET 2 of 2

13

UTLY (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		10YR 3/3 DARK BROWN FINE, POORLY SORTED SANDY CLAY WITH SUBANGULAR F. SAND. DAMP, PLASTIC	0.0 PPM	N/A	WB6-4187	
	0.5	10YR 6/4 LIGHT YELLOWISH BROWN MOTTLED WITH 10YR 6/8				
	1.0	BROWNISH YELLOW FINE, POORLY SORTED, SUBANGULAR SANDY CLAY. STIFF, NON PLASTIC DAMP				
		11-8-00 CC				

HTRW DRILLING LOG

DISTRICT: LOUISVILLE		HOLE NUMBER: WB6-257
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2 SHEETS

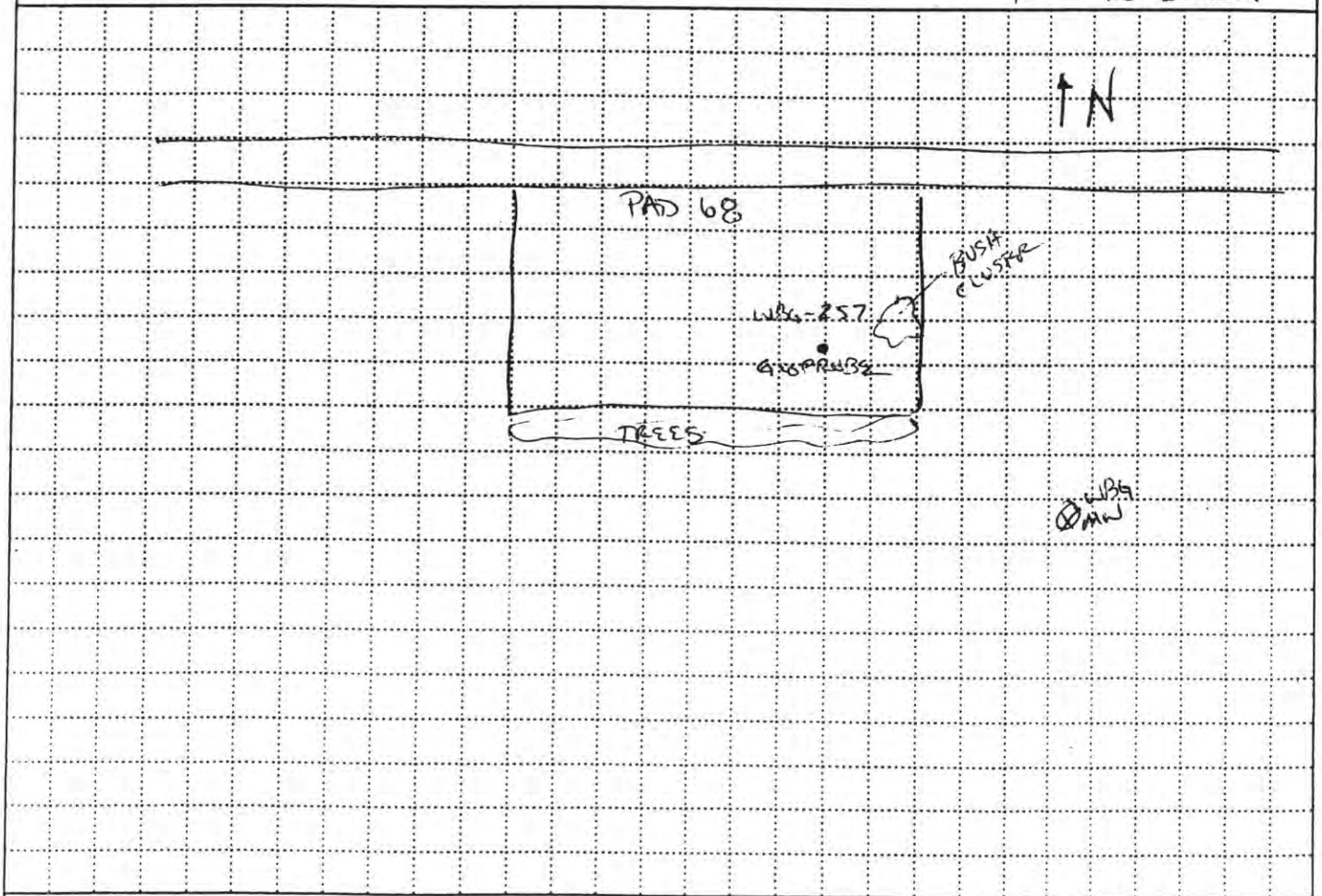
3. PROJECT: RVAAP WB6 FS	4. LOCATION: WINKLEPECK BURNING GROUNDS
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS SPOON; SS BOWL; 3" SS AUGER W/ EXTENTION	8. HOLE LOCATION: N 563055.41 E 2359566.98; PAD 68
	9. SURFACE ELEVATION: ~~N/A~~ 1006.98 SRA 4/27/01
	10. DATE STARTED: 30 OCT 00 — 11. DATE COMPLETED: 30 OCT 00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: 0 - 9.1 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 3.5 FT TO WATER

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	N/A	TAL + XRF	EXPLOSIVES	PROPELLANTS	N/A	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	BENTONITE	N/A	N/A	B.W.H.

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO.
RVAAP WB6 FS	WB6-257

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DIGGING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	B. Williams	SHEET	2 of 2

20

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 6/4 LIGHT YELLOWISH BROWN, CL-LEAN CLAY WITH SILT AND FINE POORLY SORTED SAND, GRAVEL UP TO 40MM (ANGULAR TO SUBANGULAR) SOFT, LOOSE, MOIST, NONPLASTIC	~~0.0~~ BW 10-30-00 0.0 PPM	N/A	WBG-4196 WBG-4275 D WBG-4293 S	
	1.0					
	1.5	INTERVAL NOT SAMPLED - DISCARDED -				
	2.0	10YR 4/4 DARK YELLOWISH BROWN, MEDIUM GRAINED, SUBROUNDED SAND WITH TRACE CLAY. MOIST TO WET, LOOSE, NONPLASTIC	0.0 PPM	N/A	WBG-4197	
	2.5					
	3.0					
	3.5					WATER IN HOLE
	4.0		0.0 PPM	N/A	WBG-4198	
	4.5	10YR 5/4 YELLOWISH BROWN WITH 20% 2.5Y 7/1 LIGHT GRAY, CL-Lean Clay with fine to medium poor sorted sands, angular gravel up to 40 mm, firm, wet, low to med plasticity	~~0.0 PPM~~ BW 10-30-00	~~N/A~~ BW 10-30-00		
	5.0					
	5.5					
	6.0	2.5Y 6/3 light yellowish brown, CL-Lean clay, fine to med poorly sorted sands, subangular up to 30mm, soft to very soft, wet, low to med plasticity	0.0 PPM	N/A	WBG-4199	
	6.5					
	7.0					
	7.5					
	8.0	2.5Y 6/3 light-yellowish brown, CL-Lean Clay, fine to med poorly sorted sands, sub angular up to 10mm, soft to firm, wet, low to medium plasticity	0.0 PPM	N/A	WBG-4200	
	8.5					
	9.0					
	9.5	REFUSAL				
	10.0					

PROJECT: RVAAP WBG FS

HOLE NO: WBG-257

33

HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG-258
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" auger w/extention	8. HOLE LOCATION: Pad 32 N 562269.75 E 2356786.16	
	9. SURFACE ELEVATION: ~~n/A~~ 1048.20 SRA 4/27/01	
	10. DATE STARTED: 11-1-00	11. DATE COMPLETED: 11-1-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in Hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

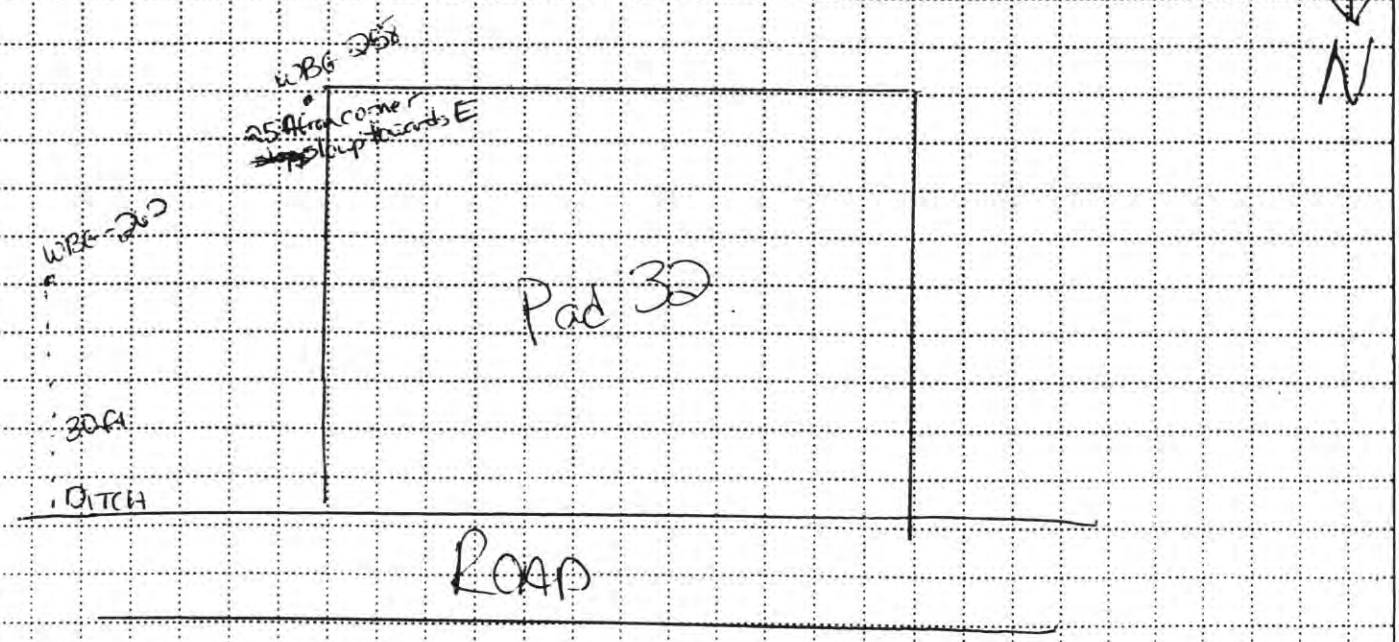
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-Cr+6 XRF	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS

SCALE: not to scale

SEE ALSO PG 26 of "WINKLEPECK BURNING GROUNDS SOIL SAMPLING LOGBOOK 7" GW 11-5-00



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-258

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carron	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	05	10YR 4/3 brown, CL-Lean Clay, fine to med. poor sorted sands, angular to subrounded gravel up to 40mm, firm, damp, low to no plasticity	0.0	n/a	WBG-4201	root bits
	10					

11-4-10 CC

PROJECT RVAAP WBG FS A-122

HOLE NO WBG-258

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	DISTRICT: Louisville; HOLE NUMBER: WBG 259; SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 55 bowl; 55 spoon; 55 3" auger extention	8. HOLE LOCATION: Bld. S-4301, Area 5 "D" Mill; N 562485 E 2360487	
	9. SURFACE ELEVATION: N/A	
	10. DATE STARTED: 10/23/00	11. DATE COMPLETED: 10/23/00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER in hole	

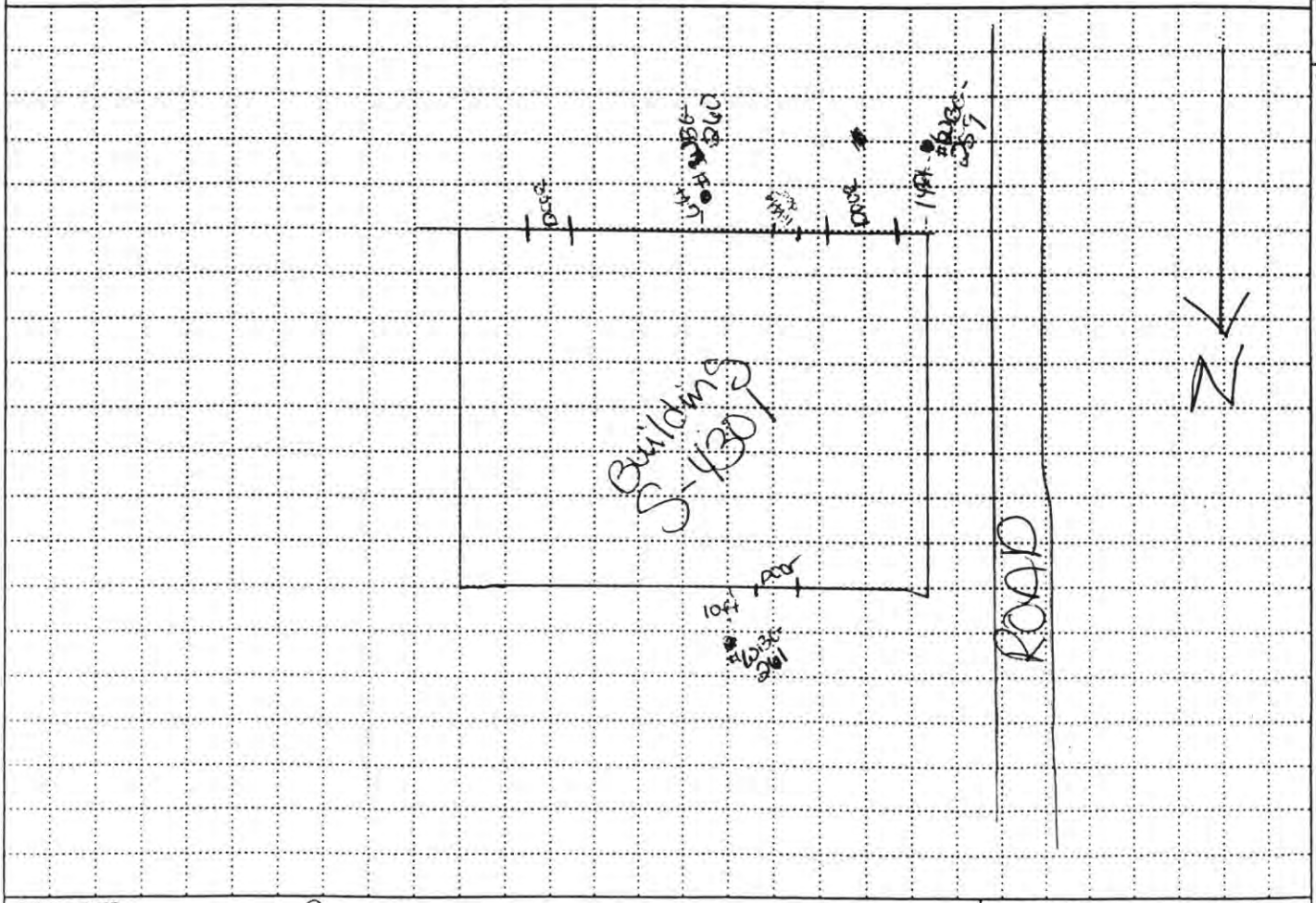
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A		XRF-TAL-CP	Explosives	Propellants	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	C. Canall

LOCATION SKETCH/COMMENTS — SCALE:

not to scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-259

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canall	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		tar and ~~stain~~ organics	0.0			rootlets, has tar smell
	0.5	10YR 5/8 yellowish brown silty-sand, loose, moist, gravel 2mm to 90mm, sub-angular to angular nonplasticity	0.0 ppm	n/A	WBG-4204	rocks, slag ≈ 50%
	1.0					

11-8-00

PROJECT RVAAP WBG FS A-124

HOLE NO WBG 259

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	DISTRICT: Louisville
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	HOLE NUMBER: WBG-260
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	SHEET 1 OF 2 SHEETS
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" auger extention	8. HOLE LOCATION: Bldg. S-4301, Area 5, N 562487 E 2360499	
	9. SURFACE ELEVATION: n/A	
	10. DATE STARTED: 10/23/00	11. DATE COMPLETED: 10/23/00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): n/A (no water in hole)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
n/A	n/A					
20. SAMPLES FOR CHEMICAL ANALYSIS	**VOC**	**METALS**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**21. TOTAL CORE RECOVERY**
n/a	n/a	XRF-TAL-CPM	Explosives	Propellants	n/a	n/A
22. DISPOSITION OF HOLE	**BACKFILLED**	**MONITORING WELL**	**OTHER (SPECIFY)**	**23. SIGNATURE OF INSPECTOR**		
n/a	Bentonite	n/a	n/A	C Carnall		

LOCATION SKETCH/COMMENTS — SCALE:

See Page 33 for Reference Location of hole WBG-260 Bldg S-4301, "D" area for Soil Sampling Logbook #4

PROJECT	HOLE NO
RVAAP WBG FS	WBG-260

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		Organic - bar - rootlets				gravel stas - 60%
	0.5	10YR 5/8 yellowish brown, silty-sand loose, moist gravel 2 to 100 mm, subangular, nonplastic	0.0 ppm	N/A	WBG-4297	rocks, stas, ≈ 75%
	1.0					

11-8-00 CC

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville; HOLE NUMBER: WBG-261; SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" auger extention	8. HOLE LOCATION: Bldg. S-4301, Area 5, N 562517 E 2360505	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 10/23/00	11. DATE COMPLETED: 10/23/00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-10ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER IN HOLE	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	SVOC, VOC, PCB,	XRF-TAL	Explosives	Pesticides	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Carnall

LOCATION SKETCH/COMMENTS — SCALE:

See page 33 for reference location of hole WBG-261 Bld S-4301, "D" area in the Soil Sampling Logbook #1

PROJECT	HOLE NO
RVAAP WBG FS	WBG-261

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carron	SHEET	2 of 2

48

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		10YR 3/1 black organic-tan-slag with some silt, moist, nonplastic	0.0 ppm	N/A	WBG-	60% rock slag
	0.5	10YR 5/8 yellowish brown, silty-sand, loose, moist, gravel 3mm to 120mm (slag?) subangular to subrounded non plastic	0.0 ppm	N/A	4210	50% rock, slag
	10					

11-8-04
CC

PROJECT RVAAP WBG FS A-128

HOLE NO WBG-261

96

HTRW DRILLING LOG

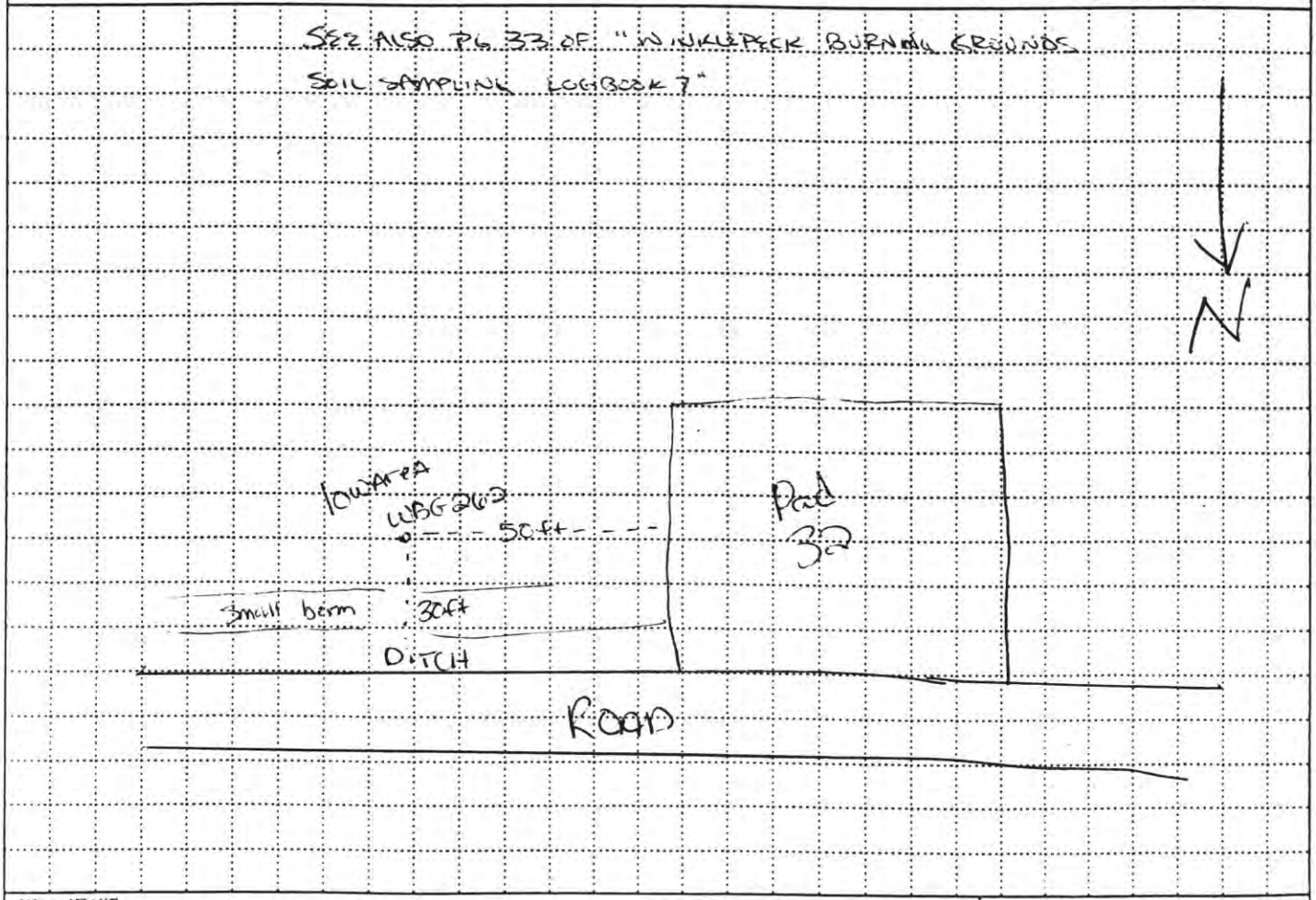
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville; HOLE NUMBER: WBG-26D; SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	N 562292.46 E 2352848.44
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" auger extention	8. HOLE LOCATION: Pad 32, Cutting Location	
	9. SURFACE ELEVATION: n/A	1045.82 SRA 4/27/01
	10. DATE STARTED: 11-1-00	11. DATE COMPLETED: 11-1-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL XRF	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE.



PROJECT	HOLE NO
RVAAP WBG FS	WBG-26D

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBGFS	INSPECTOR	C. Carroll	SHEET	2 of 2

97

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	10YR 5/4 yellowish brown, CL-lean Clay, gravel subangular-to Angular up to 2mm, damp, firm, low plasticity	0.0ppm	n/A	WBG-4213	
	1.0					
						11-4-00 CC

40

HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG-263
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" auger w/extension	8. HOLE LOCATION: Contrng. Sample N 563056.33 E 2355616.49	
	9. SURFACE ELEVATION: ~~n/A~~ 1073.87 SRA 4/27/01	
	10. DATE STARTED: 11-1-00	11. DATE COMPLETED: 11-1-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no WATER in HOLE.	

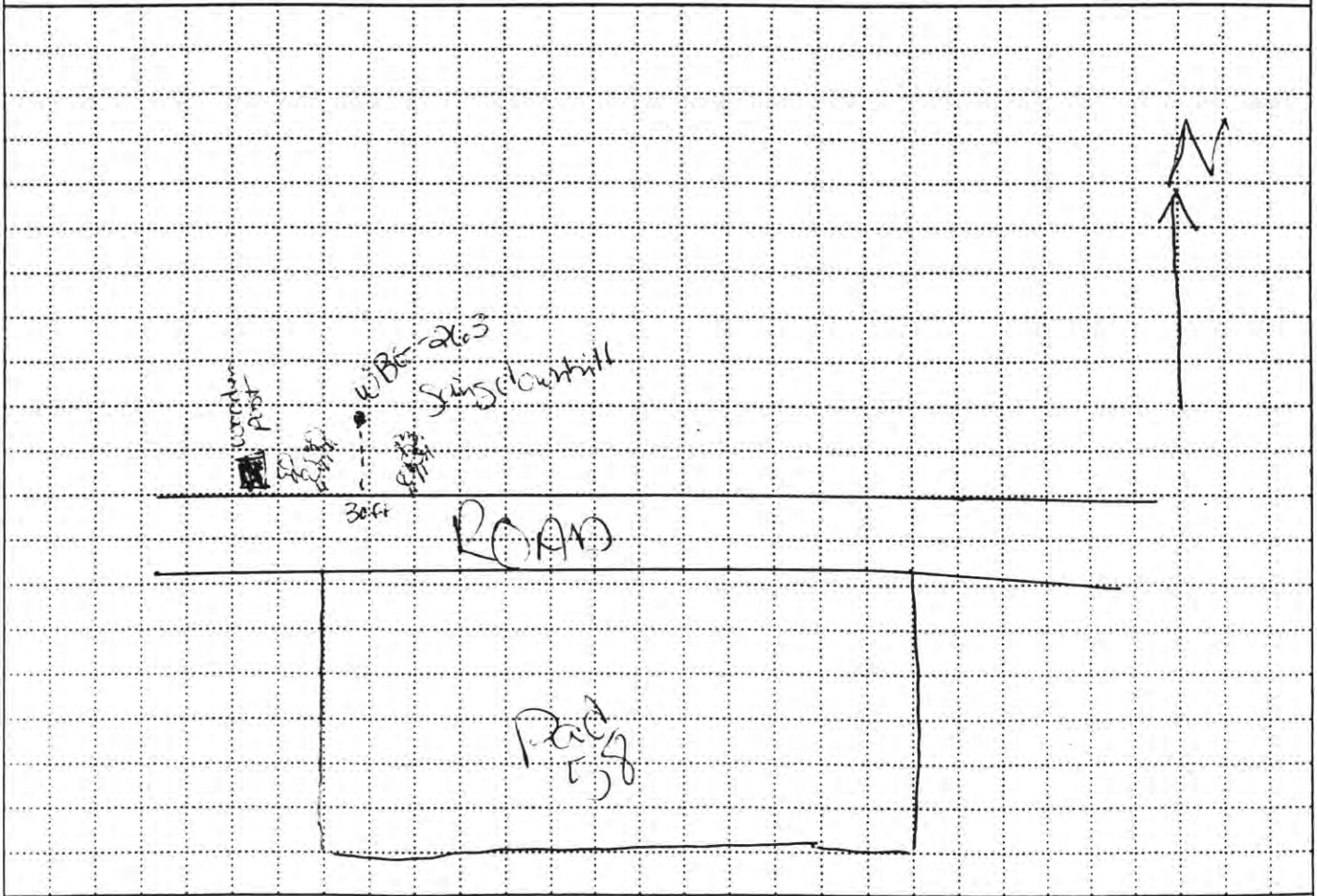
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	XRF TAL	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS

SCALE: not to scale.



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-263

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

SIGELING LOG

PROJECT	RVAAP WBG	INSPECTOR	C Carroll	SHEET	2 of 2

41

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	Ø5	2.5Y 5/4 light olive brown, ~~black~~ 11-21-00 10YR 5/8 yellow on brown (black-brown speckles) Cl-Lean clay w/ Silt, fine poor sorted sands, moist, soft, low plastic	Ø.Ø ppm	n/A	WBG-4216	burned chips, slag, nails, burned throughout
	1.Ø	burned material - black - sandy crushed, brittle burned slag/objects wet, loose, piece sup to 50 mm				metal shot?, small balls

11-4-ØØ
CC

PROJECT RVAAP WBG FS A-132

HOLE NO WBG - 263

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/a	DISTRICT: Louisville
		HOLE NUMBER: WBG 264
		SHEET 1 OF 3

47

3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG N 562061.58 E 2354441.06
5. NAME OF DRILLER: n/a	6. MANUFACTURER'S DESIGNATION OF DRILL: n/a
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" cutter w/ extention	8. HOLE LOCATION: Random sample grid
	9. SURFACE ELEVATION: ~~n/a~~ 1082.700 SRA 4/27/01
	10. DATE STARTED: 10-30-00 — 11. DATE COMPLETED: 10-30-00
12. OVERBURDEN THICKNESS: n/a	15. DEPTH GROUNDWATER ENCOUNTERED: n/a
13. DEPTH DRILLED INTO ROCK: n/a	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/a
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER in hole

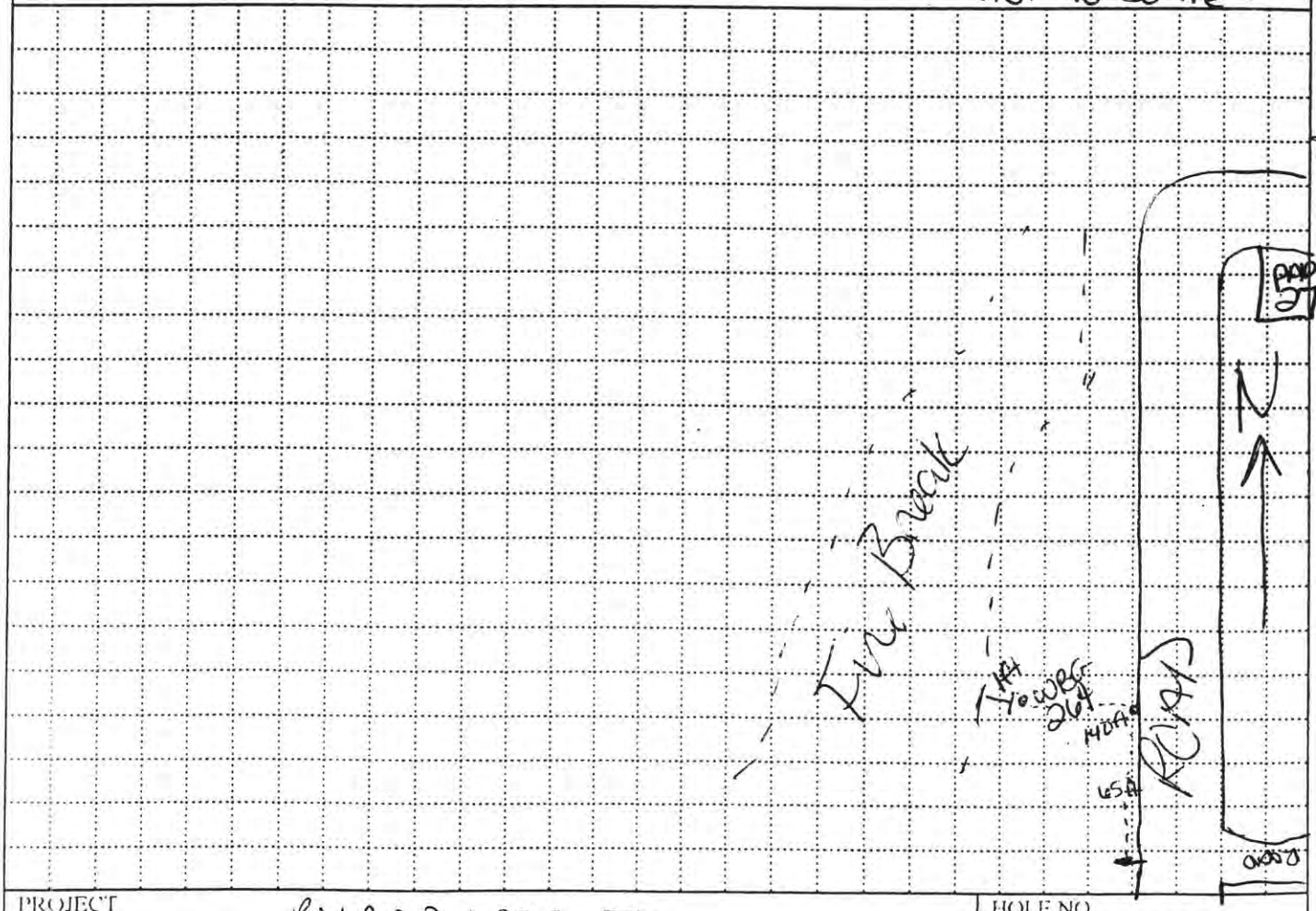
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/a	n/a	n/a	n/a

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
n/a	n/a	TAL-RF	Explosives	n/a	n/a	n/a

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/a	Bentonite	n/a	n/a	C Canall

LOCATION SKETCH/COMMENTS — SCALE: not to scale

not to scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-264

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG	INSPECTOR C. Canall	SHEET 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5 1.0	2.5Y 4/4 olive brown, CL-Lean Clay w/Silt, moist to wet, fine poorly sorted sand, gravel sub angular to sub-rounded up to 50mm, very soft, low plasticity	0.0 ppm	n/a	WBG-4219	rootlets, worms

PROJECT RVAAP WBG FS A-134

HOLE NO WBG 264

40

HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG-265
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: 10-30-00 CG ~~Sediment~~ - WBG N 562732.26 E 2355022.12	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" auger/extension	8. HOLE LOCATION: 10-30-00 ~~Sediment~~ Random Grid Locations	
	9. SURFACE ELEVATION: ~~n/A~~ 1072.98 SRA 4/27/01	
	10. DATE STARTED: 10-30-00	11. DATE COMPLETED: 10-30-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER in hole	

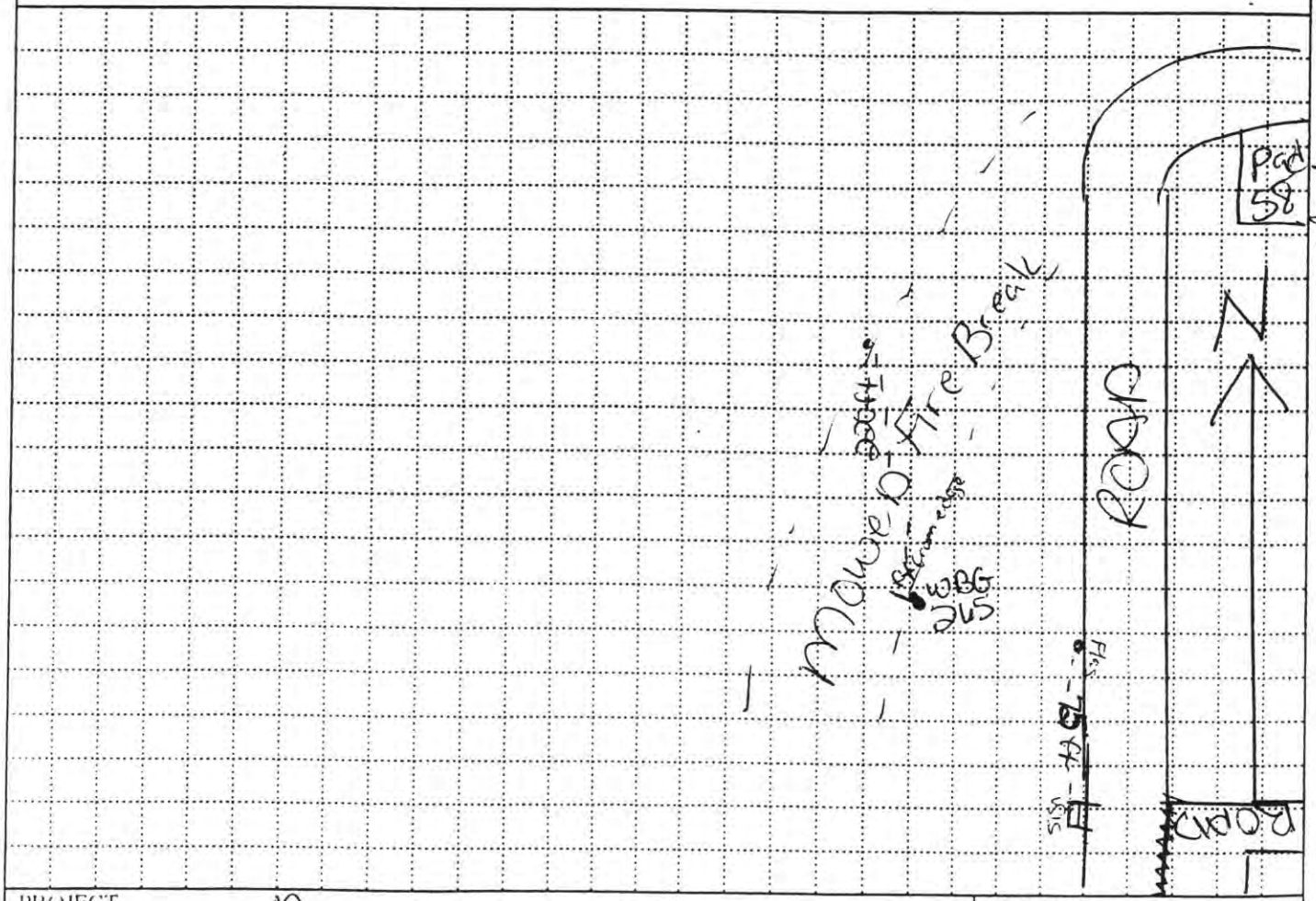
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-XRF	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Canall

LOCATION SKETCH/COMMENTS

SCALE:



PROJECT	HOLE NO.
RVAAP WBG FS	WBG 265

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP	INSPECTOR	C. Carnn	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 6/4 light brownish yellow CL Lean clay w/SILT, soft to firm, moist, no to low plasticity, cobbles subangular to sub rounded 40mm	0.0 ppm		WBG-4220	rootlets throughout
	1.0	10YR 6/4 light yellowish brown CL-Lean Clay, poorly sorted-sand, moist, soft low to no plasticity, gravel up to 15mm, sub rounded				

PROJECT: RVAAP WBG FS A-136

HOLE NO: WBG 265

33

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	HOLE NUMBER: WBG-266
		SHEET 1 OF 2

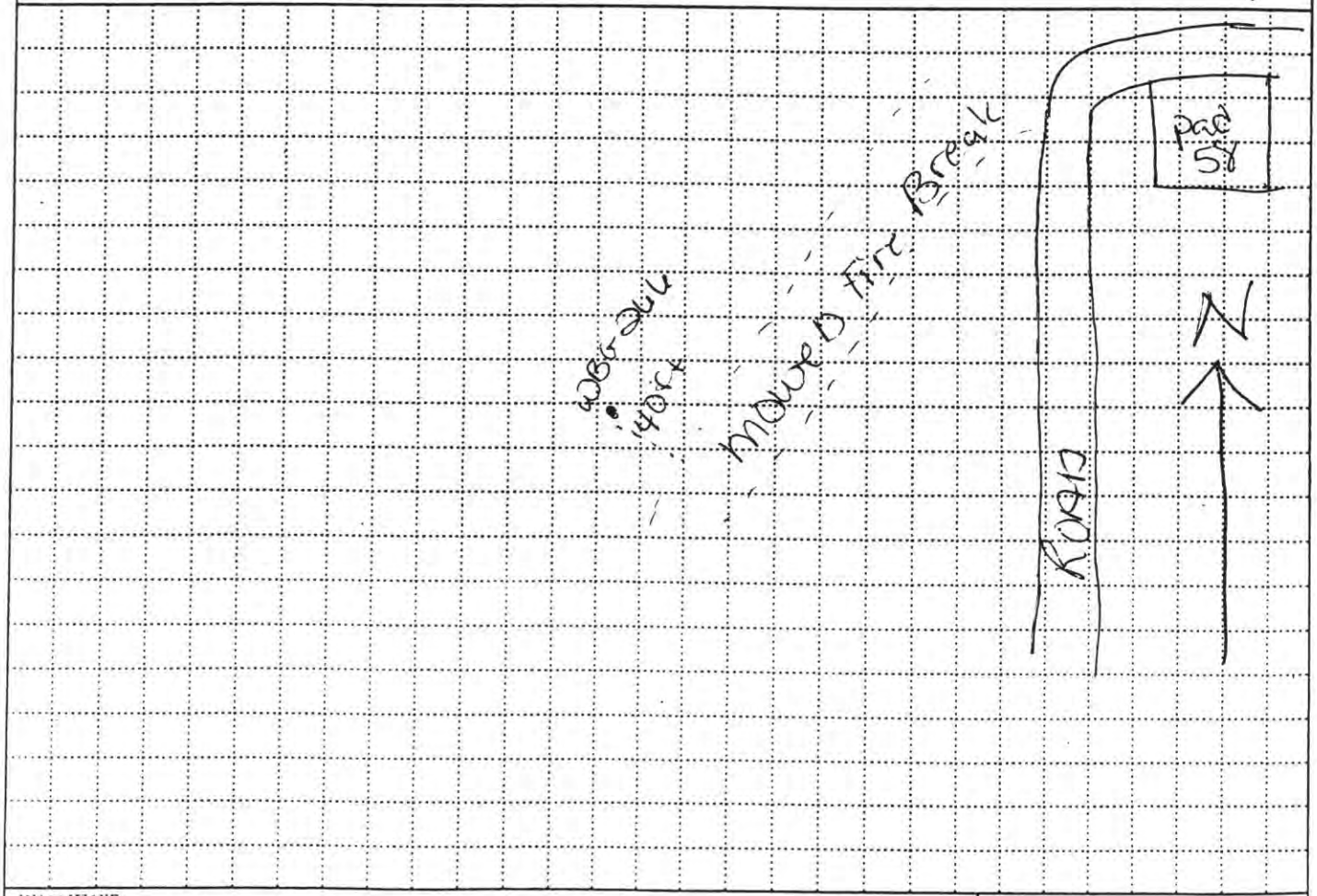
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG — N 562954.68, E 2355126.52
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" auger w/ extention	8. HOLE LOCATION: ~~Sediment~~ Random Grid Location
	9. SURFACE ELEVATION: ~~n/A~~ 1067.41 SRA 4/27/01
	10. DATE STARTED: 10-30-00 — 11. DATE COMPLETED: 10-30-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER in Hole

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
n/A	n/A	XRFTAL	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C Carroll

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO
RVAAP WBG FS	WBG-266

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canall	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		10YR 4/3 brown, CL Lean Clay with silt soft, moist, low to no plasticity				root hairs throughout some up to .6mm diameter
	0.5			N/A	WBG-4221	
	1.0	10YR 5/8 yellowish brown mottled w/ 10YR 7/2 light grey, CL-Lean Clay w/ fine poorly sorted sands, gravel angular to subangular up to 45mm, soft, loose, moist, low to no plasticity				

11-9 @ CC

HTRW DRILLING LOG

1 COMPANY NAME: SAIC	2 DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville; HOLE NUMBER: WBG 267; SHEET 1 OF 2
3 PROJECT: RVAAP WBG FS	4 LOCATION: WBG — N 563085.09, E 2356024.25	
5 NAME OF DRILLER: n/A	6 MANUFACTURERS DESIGNATION OF DRILL: n/A	
7 SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" auger bit extention	8 HOLE LOCATION: Random Grid Location	
	9 SURFACE ELEVATION: ~~n/A~~ 1070.39 SRA 4/27/01	
	10 DATE STARTED: 10/24/00	11 DATE COMPLETED: 10/24/00
12 OVERBURDEN THICKNESS: n/A	15 DEPTH GROUNDWATER ENCOUNTERED: n/A	
13 DEPTH DRILLED INTO ROCK: n/A	16 DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14 TOTAL DEPTH OF HOLE: 0-1.0 ft	17 OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER in hole	

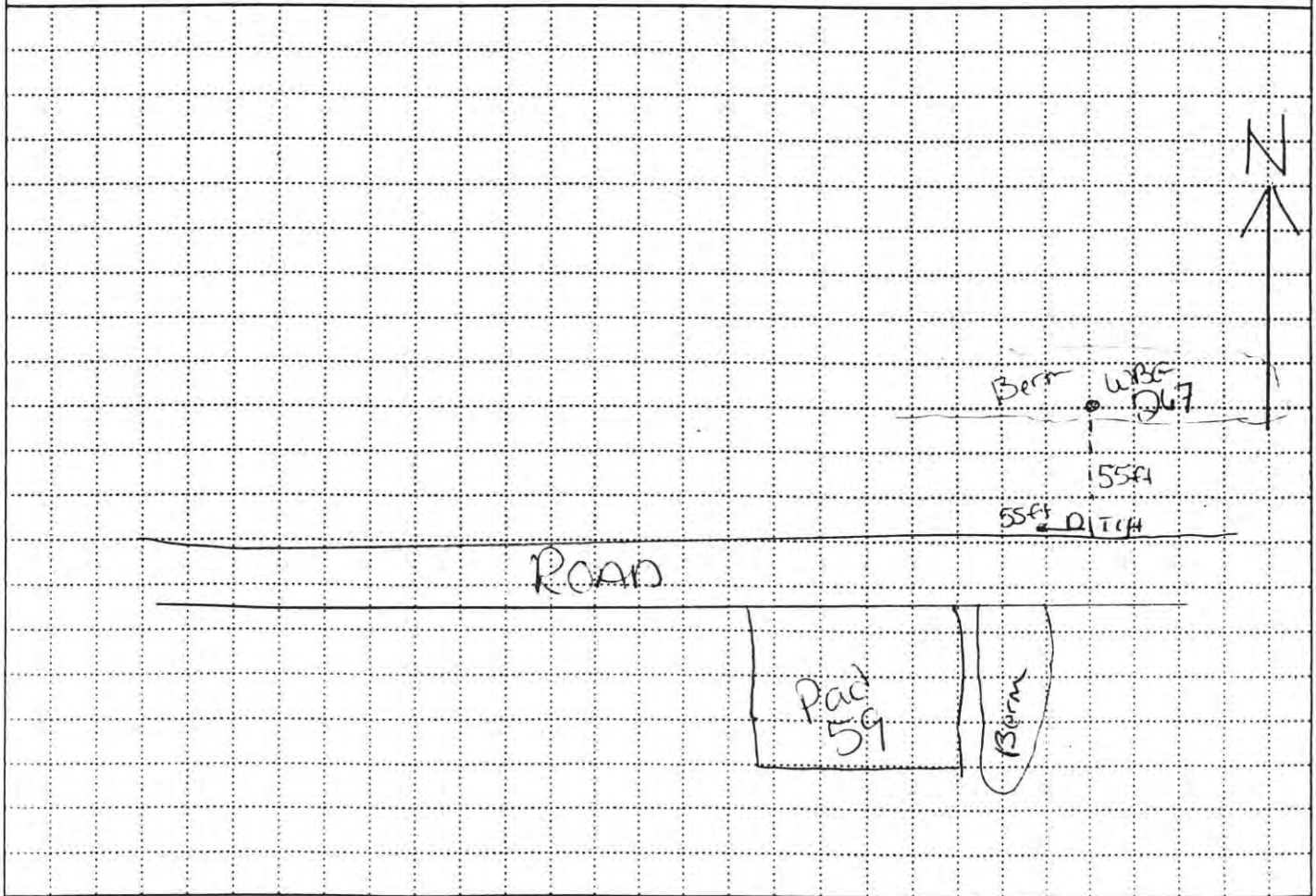
18 GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19 TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20 SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21 TOTAL CORE RECOVERY
n/A	n/A	XRF-TAL	Explosives	n/A	n/A	n/A

22 DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23 SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Canall

LOCATION SKETCH/COMMENTS — SCALE:

not to scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-267

DIGGING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	Ø5	2.5Y 4/3 olive brown, CL-Lean Clay with silt, cobbles up to 60mm, loose, firm, no plasticity, damp	PID not working properly -heavy rain	n/A	WBG-4222	
	1Ø					

11-8-ØØ CC

PROJECT RVAAP WBG FS A-140

HOLE NO WBG-267

HTRW DRILLING LOG

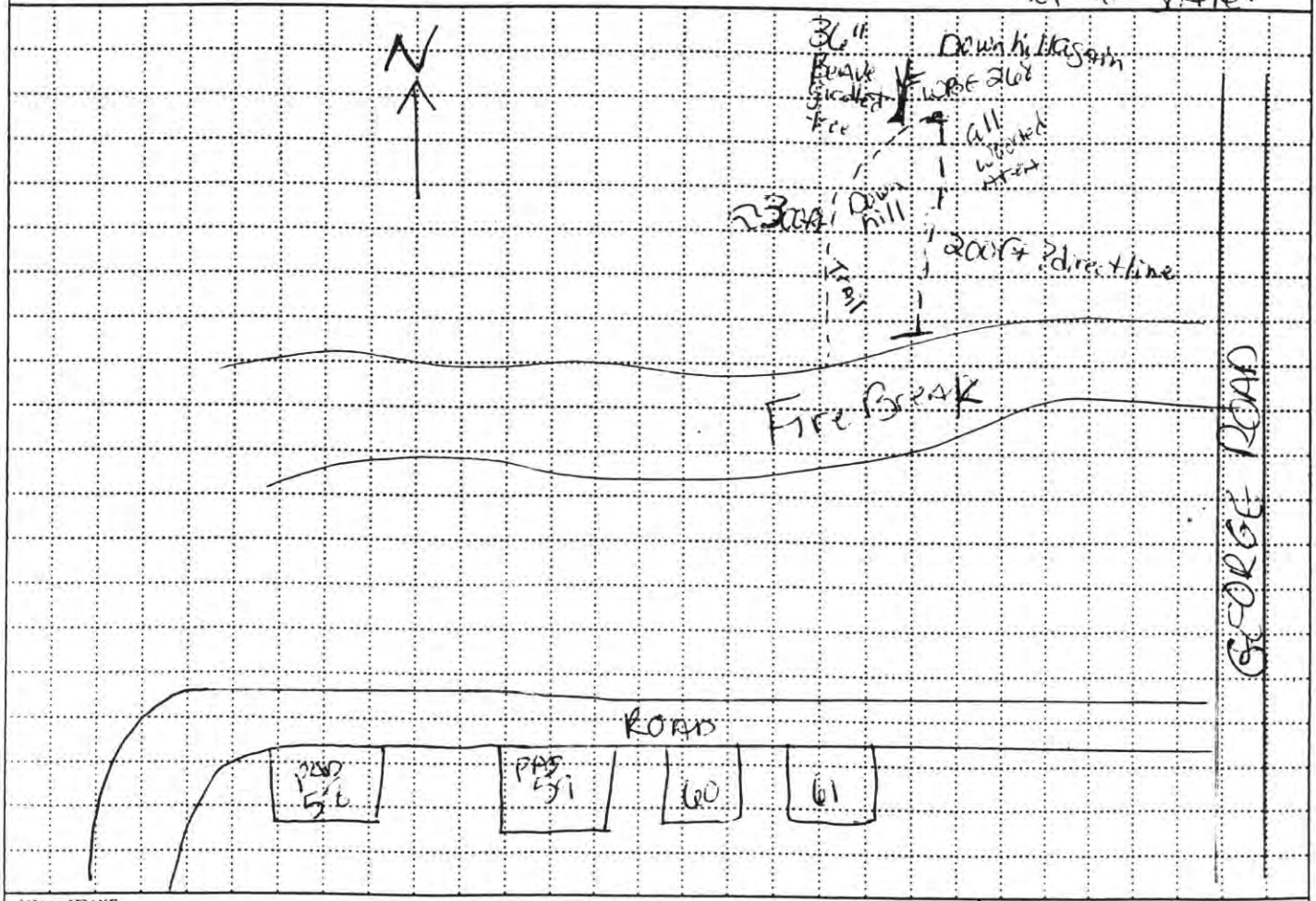
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville; HOLE NUMBER: WBG-268; SHEET 1 OF 2
3. PROJECT: RVAAP WBG-FS	4. LOCATION: Random Grid Location-WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" auger extention	8. HOLE LOCATION: Random Grid Location N 563509.88 E 2356663.14	
	9. SURFACE ELEVATION: n/A 1044.78 SRA 4/27/01	
	10. DATE STARTED: 11-1-00	11. DATE COMPLETED: 11-1-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-XRF	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS — SCALE: not to scale.



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-268

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C Carroll	SHEET	2 of 2

2Ø

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	Ø.5 1.Ø	2.5Y 4/4 olive brown, silty Lean Clay fine poorly sorted sands, moist very soft, low to no plasticity	Ø.Øppm	n/A	WBG-4299 (Sp) WBG-4281 (Dup) WBG-4223	root lets throughout
				11.4-ØØ cc		

PROJECT RVAAP WBG FS

A-142

HOLE NO WBG-268

HTRW DRILLING LOG

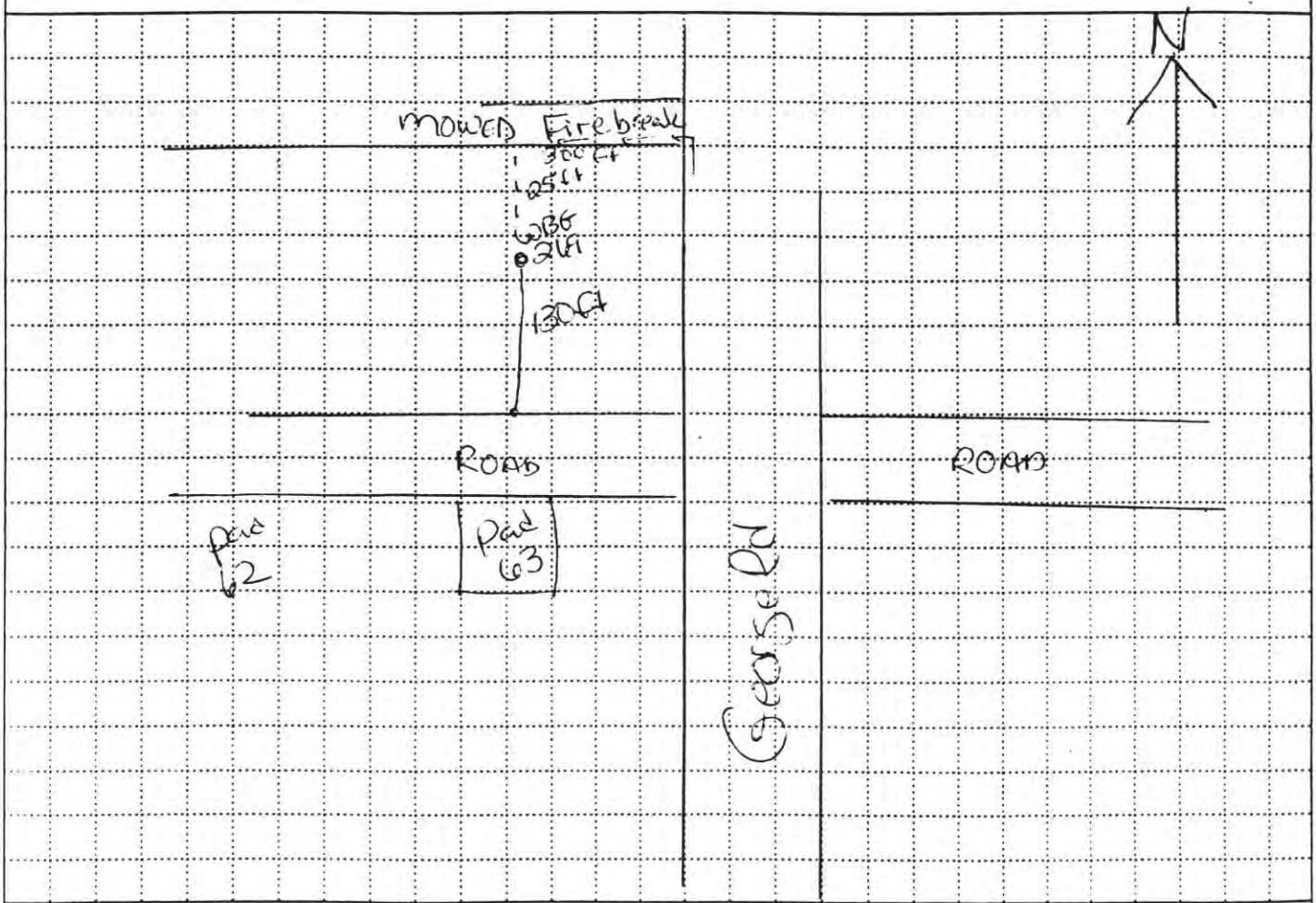
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/a	DISTRICT: Louisville
3. PROJECT: RVAAP WBG-FS	4. LOCATION: WBG	HOLE NUMBER: WBG-269
5. NAME OF DRILLER: n/a	6. MANUFACTURERS DESIGNATION OF DRILL: n/a	SHEET 1 OF 2 SHEETS
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl, SS spoon, 3" auger w/extention	8. HOLE LOCATION: Random Grid location	N 563243.46, E 2357597.66
	9. SURFACE ELEVATION: n/a 1049.00 SRA 4/27/01	
	10. DATE STARTED: 10-24-00	11. DATE COMPLETED: 10-24-00
12. OVERBURDEN THICKNESS: n/a	15. DEPTH GROUNDWATER ENCOUNTERED: n/a	
13. DEPTH DRILLED INTO ROCK: n/a	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/a	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/a	n/a	n/a	n/a

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/a		XRF-TAL	Explosives	n/a	n/a	n/a

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/a	Bentonite	n/a	n/a	C Canall

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO
RVAAP WBG-FS	WBG-269

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

55

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 5/4 light olive brown CL-lean Clay w/ Silt and sands, fine-to med poorly sorted sand, 2-40 mm angular, moist, soft, low to med plasticity	0.0 ppm	n/A	WBG-4224	
	10					

11-8-24 CC

PROJECT RVAAP WBG FS A-144

HOLE NO WBG-269

HTRW DRILLING LOG

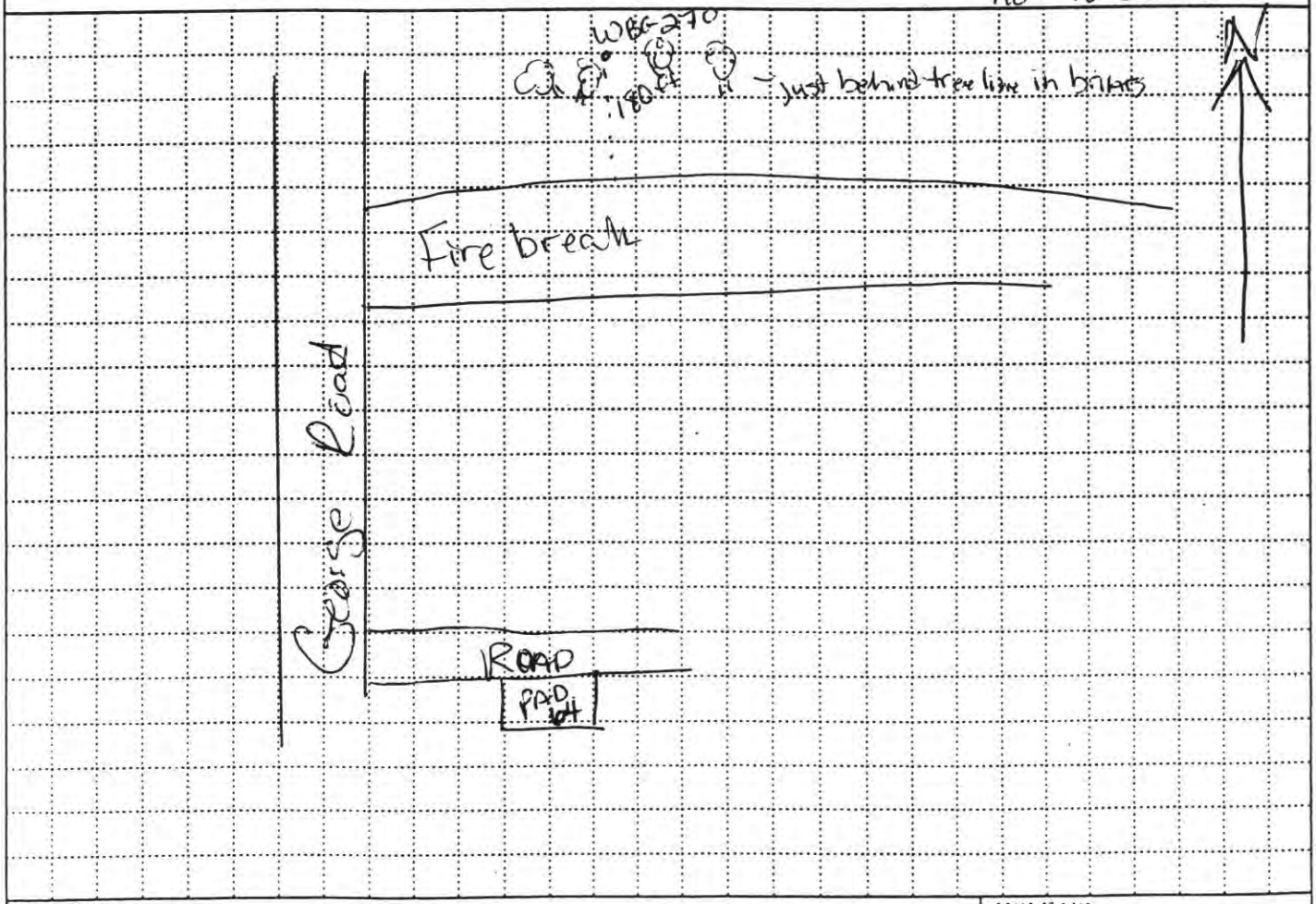
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	HOLE NUMBER: WBG-270 (96)
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG N 563392.91	SHEET 1 OF 2
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	E 2358352.59
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" Auger extention	8. HOLE LOCATION: Random Grid Location	
	9. SURFACE ELEVATION: ~~N/A~~ 1030.39 SRA 4/27/01	
	10. DATE STARTED: 11-1-00	11. DATE COMPLETED: 11-1-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): No water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	N/A	XRF-TAL	Explosives	N/A	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	bentonite	N/A	N/A	C. Carroll

LOCATION SKETCH/COMMENTS — SCALE: not to scale



PROJECT	HOLE NO
RVAAP WBG FS	WBG-270

DRILLING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	C. Carroll	2 of 3

97

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 5/6 light olive brown, lean Silty Clay, fine poorly sorted sands, moist, very soft, low to no plasticity	0.0 ppm	N/A	WBG 4235	rootlets throughout
	1.5					
						11-3 CC

PROJECT RVAAP WBG FS A-146

HOLE NO WBG 390

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	DISTRICT: Louisville
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	HOLE NUMBER: WBG 271
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	SHEET 1 OF 2 SHEETS
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3" bowl; 3" spoon; 3" auger w/ extention	8. HOLE LOCATION: Random Grid Location	N 563351.38 E 2359092.77
	9. SURFACE ELEVATION: N/A 1012.79 SRA 4/27/01	
	10. DATE STARTED: 11-1-00	11. DATE COMPLETED: 11-1-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

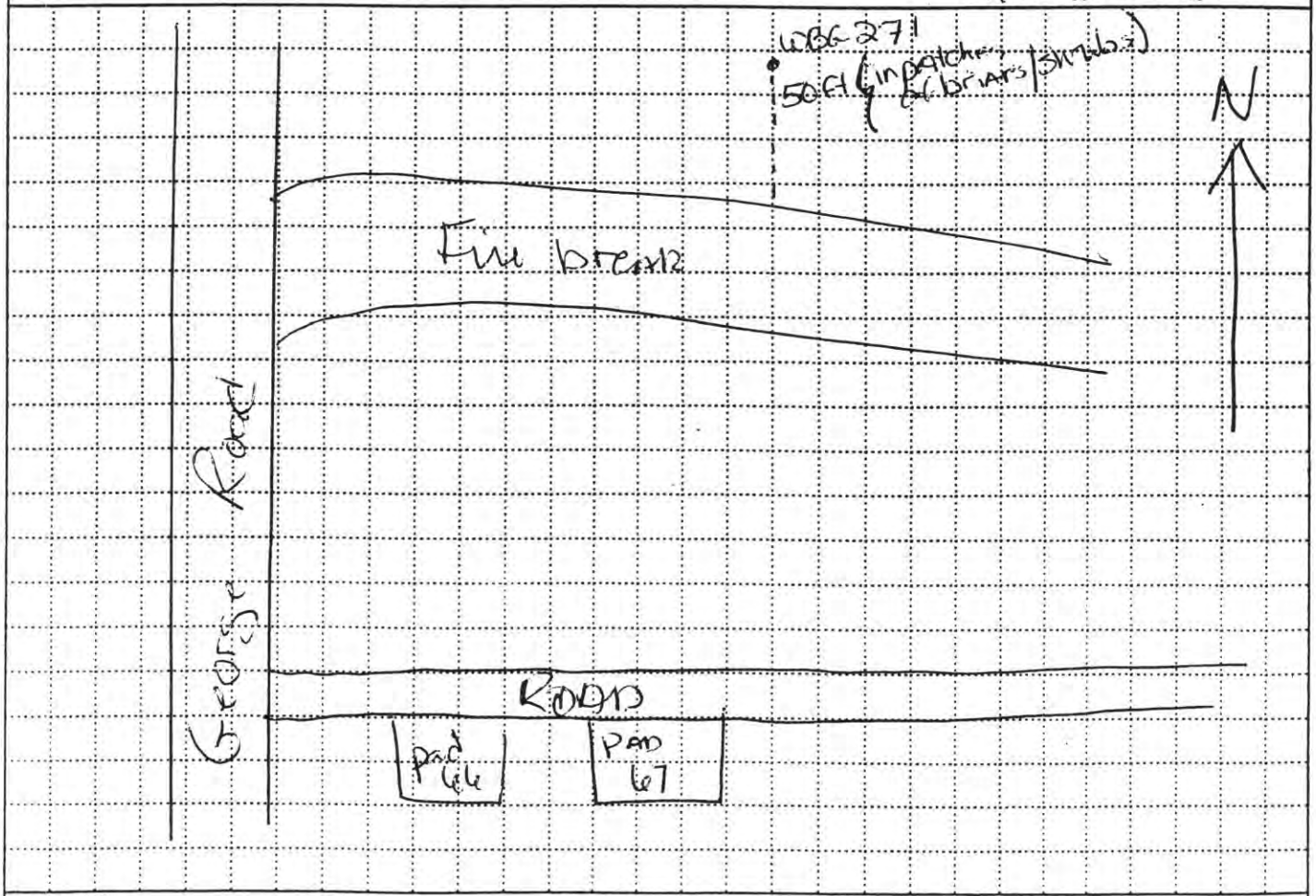
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	N/A	TAL-XRF	Explosives	N/A	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	C. Carroll

LOCATION SKETCH/COMMENTS

SCALE: not to scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-271

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carron	SHEET	2 of 5

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0 5 1	2.5Y 4/4 olive brown, lean-silty clay, w/fine poorly sorted sands, subangular gravels up to 60mm moist, very soft, loose, low to no plasticity	0.0 ppm	N/A	WBG 4226	rootlets throughout
		11-3-00 CC				

PROJECT RVAAP WBG FS A-148

HOLE NO WBG-271

104

5

HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG 272
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl, SS spoon, SS 3" auger w/extention	8. HOLE LOCATION: Random Grid Location N 563296.32 E 2359542.02	
	9. SURFACE ELEVATION: n/A 1005.30 SRA 4/27/01	
	10. DATE STARTED: 11-1-00	11. DATE COMPLETED: 11-1-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

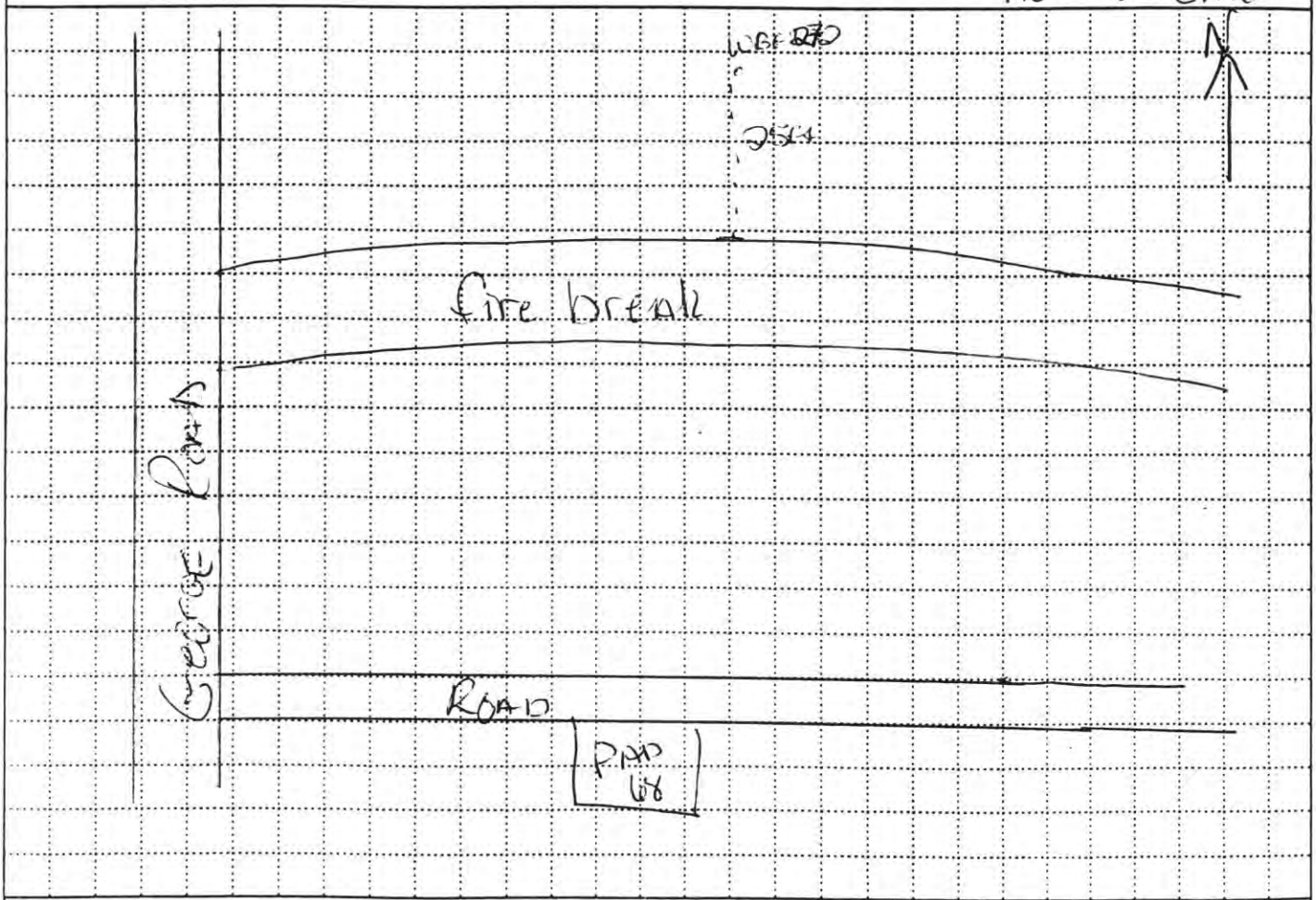
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-XRF	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS

SCALE: not to scale



PROJECT	HOLE NO
RVAAP WBG FS	WBG 272

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG	INSPECTOR	C. Carroll	SHEET	2 of 2

6

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 5/6 light olive brown, Lean silty clay, fine poorly sorted sands, moist, very soft, low plasticity		n/A	WBG	rootlets, some very large roots.
	1.0	2.5Y 4/2 pale yellow mottled w/ 10YR 6/8 brownish yellow, CL-Lean Clay, fine poor sorted sands, some silt, damp, soft, low to no plasticity			4227	

113-00 CC

PROJECT RVAAP WBG FS A-150

HOLE NO WBG-272

HTRW DRILLING LOG

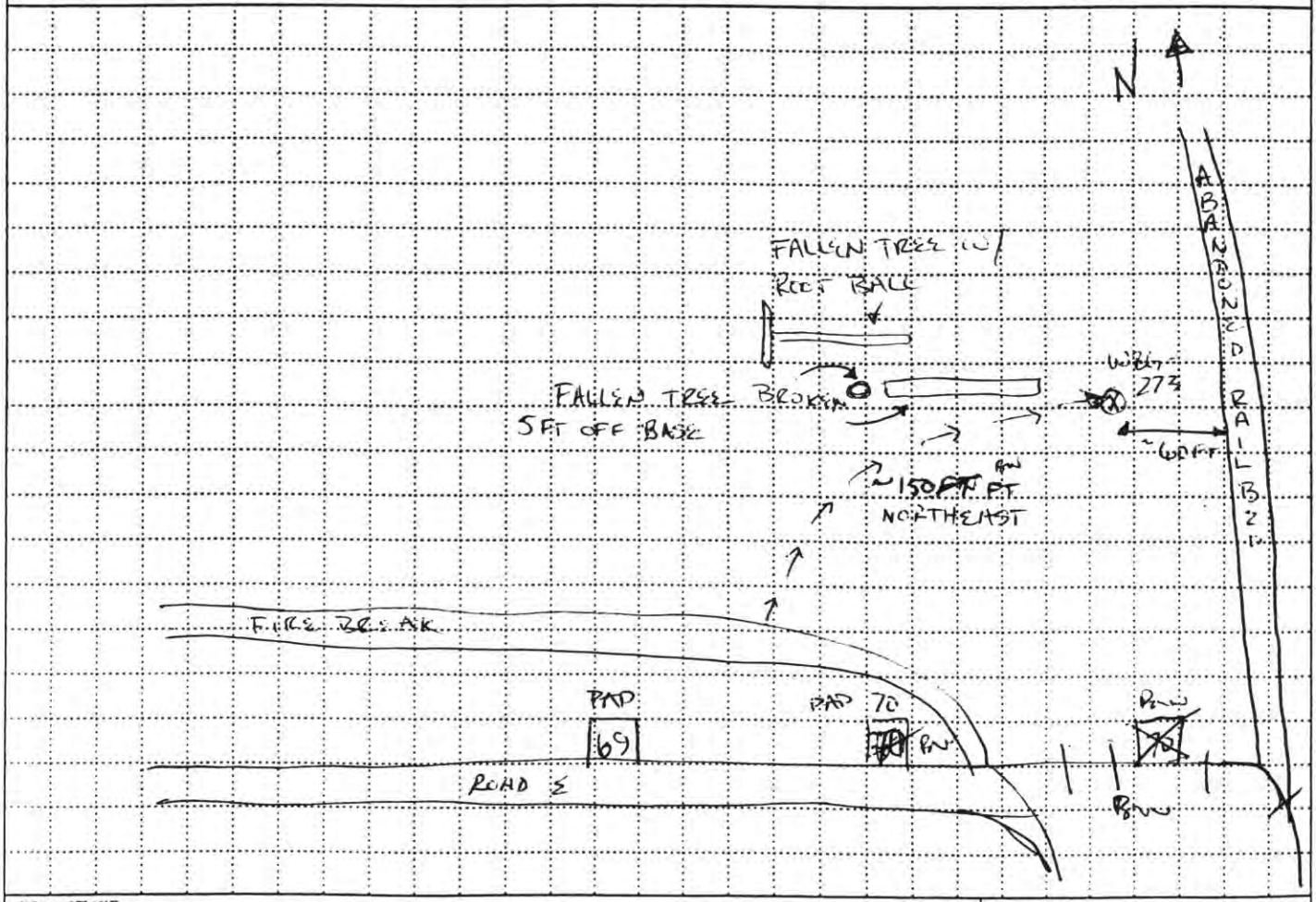
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	HOLE NUMBER: WBG-273
3. PROJECT: RVAAP WBGFS	4. LOCATION: WBG N 563447.69 E 2360580.21	SHEET 1 OF 2 SHEETS
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" auger extention	8. HOLE LOCATION: Random Grid Locations	
	9. SURFACE ELEVATION: ~~N/A~~ 992.38 BGA 4/27/01	
	10. DATE STARTED: 11-1-00	11. DATE COMPLETED: 11-1-00
12. OVERBURDEN THICKNESS: N/A	13. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A	N/A	TAL-XRF	Explosives	N/A	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	C. Carroll

LOCATION SKETCH/COMMENTS — SCALE: Not to Scale



PROJECT	HOLE NO
RVAAP WBGFS	WBG-273

DRILLING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG-FS	C. Carroll	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 3/2 very dark grayish brown, SiH w/ clay, very soft, moist, non plastic	0.0 ppm	n/a	WBG-	rootlets
	1.0	10YR 4/4 light yellowish brown mottled w/ 10YR 5/8 yellowish brown, lean silty clay, w/ fine to med. poorly sorted sands	0.0 ppm		4208	rootlets
		SOFT, moist, but no plasticity				
						11-4-04 CC

PROJECT RVAAP WBG FS A-152

HOLE NO WBG-273

HTRW DRILLING LOG

	DISTRICT: LOUISVILLE	HOLE NUMBER: WBG-274
1 COMPANY NAME: SAIC	2 DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2
3 PROJECT: RVAAP WBG FS	4 LOCATION: WINKLEPECK BURNING GROUNDS	
5 NAME OF DRILLER: N/A	6 MANUFACTURERS DESIGNATION OF DRILL: N/A	N 562787.2 E 2356239.52
7 SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS SPOON; SS BOWL; 3" SS AUGER W/ EXTENTION	8 HOLE LOCATION: RANDOM GRID LOCATION	
	9 SURFACE ELEVATION: NA 1065.43 SRA 4/27/01	
	10 DATE STARTED: 10-24-00	11 DATE COMPLETED: 10/24/00
12 OVERBURDEN THICKNESS: N/A	15 DEPTH GROUNDWATER ENCOUNTERED: N/A	
13 DEPTH DRILLED INTO ROCK: N/A	16 DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14 TOTAL DEPTH OF HOLE: 0-9.0 FT	17 OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER IN HOLE	

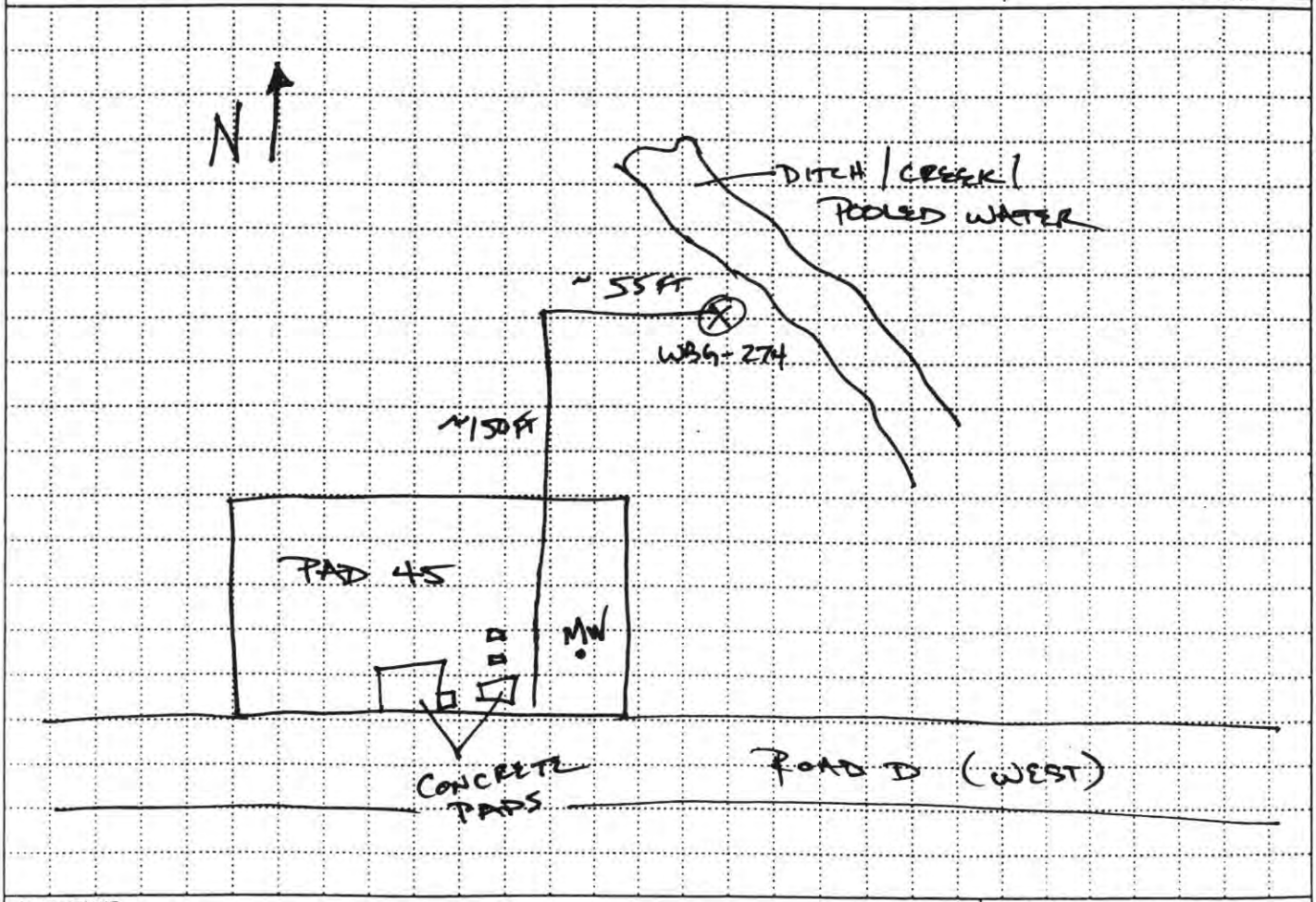
18 GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19 TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20 SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21 TOTAL CORE RECOVERY
N/A	N/A	TAL, XRF	EXPLOSIVES	N/A	N/A	N/A

22 DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23 SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	B. Williams

LOCATION SKETCH/COMMENTS

SCALE: NOT TO SCALE



PROJECT	HOLE NO
RVAAP WBG FS	WBG-274

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DIGGING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	B. Williams	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 4/3 OLIVE BROWN, CL-LEAN CLAY W/ SILT AND POORLY SORTED FINE SANDS, GRAVEL (SUBANGULAR) UP TO 40MM, SOFT, MOIST, LOW-MED PLASTICITY	PID NOT WORKING DUE TO HIGH HUMIDITY	N/A	WBG-4229	ROOTLETS
	1.0	0.5-1.0 FT DESCRIPTION: 2.5Y 7/2 LIGHT GRAY MOTTLED W/ 10YR 6/8 BROWNISH YELLOW, CL-LEAN CLAY W/ FINE POORLY SORTED SAND, DAMP, SOFT, LOW-PLASTICITY, GRAVEL UP TO 15MM (SUB-ANGULAR)				

11-8-00 CC

HTRW DRILLING LOG

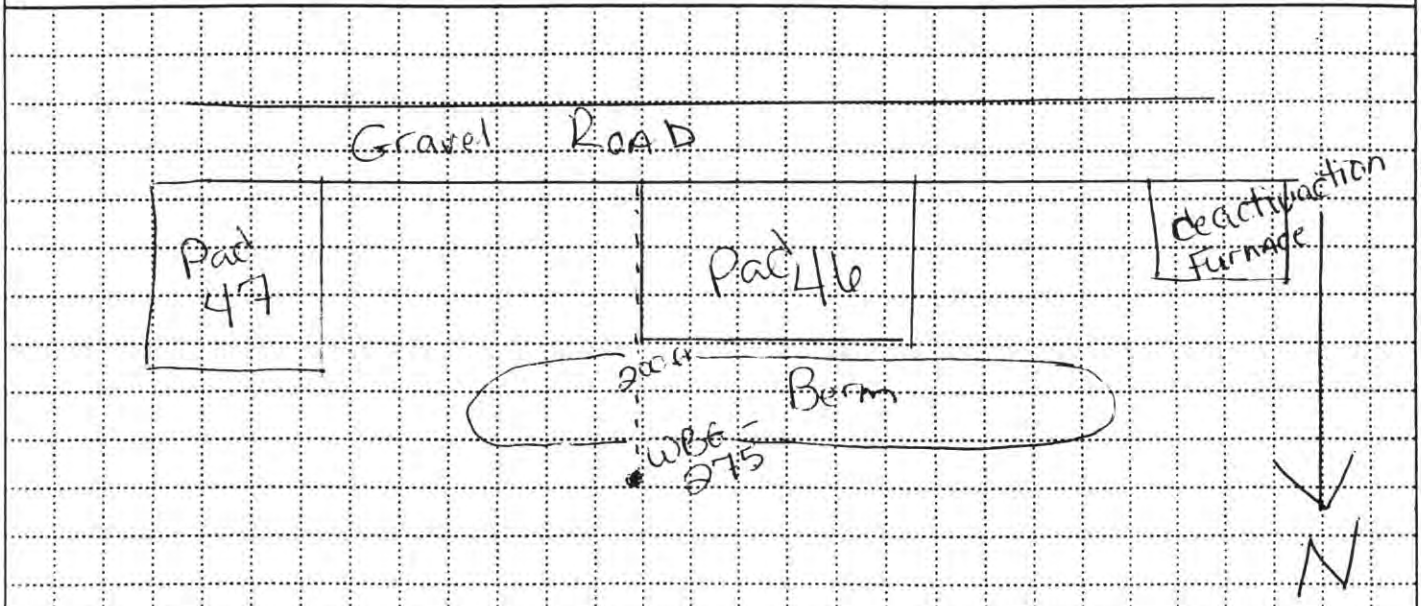
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	HOLE NUMBER: WBG 275
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	SHEET 1 OF 2 SHEETS
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	N 562828.39 E 2356537.84
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3" auger extention	8. HOLE LOCATION: Random Grid location	
	9. SURFACE ELEVATION: ~~n/A~~ 1067.86 SRA 4/27/01	
	10. DATE STARTED: 10/24/00	11. DATE COMPLETED: 10/24/00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 01-1.0A	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): No water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/a	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	XRF TAL	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/a	Bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS — SCALE:



not to scale

PROJECT	HOLE NO
RVAAP WBG FS	WBG - 275

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

83

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		2.5Y 4/3 olive brown, CL-Lean Clay w/silt fine poor sorted sands, moist, low plasticity, soft to firm, angular to sub angular pebbles to 10mm				rootlets
	0.5	2.5Y 7/3 pale yellow mottled w/ 2.5Y 6/8 olive yellow, CL-Lean Clay w/ fine poor sorted sands, sub angular to sub rounded cobbles up to 60mm, damp low to med. plasticity, soft to firm	1.6ppm	n/A	WBG-4230	
	1.0					

11-8-04

PROJECT RVAAP WBG FS A-156

HOLE NO WBG 275

B8

HTRW DRILLING LOG

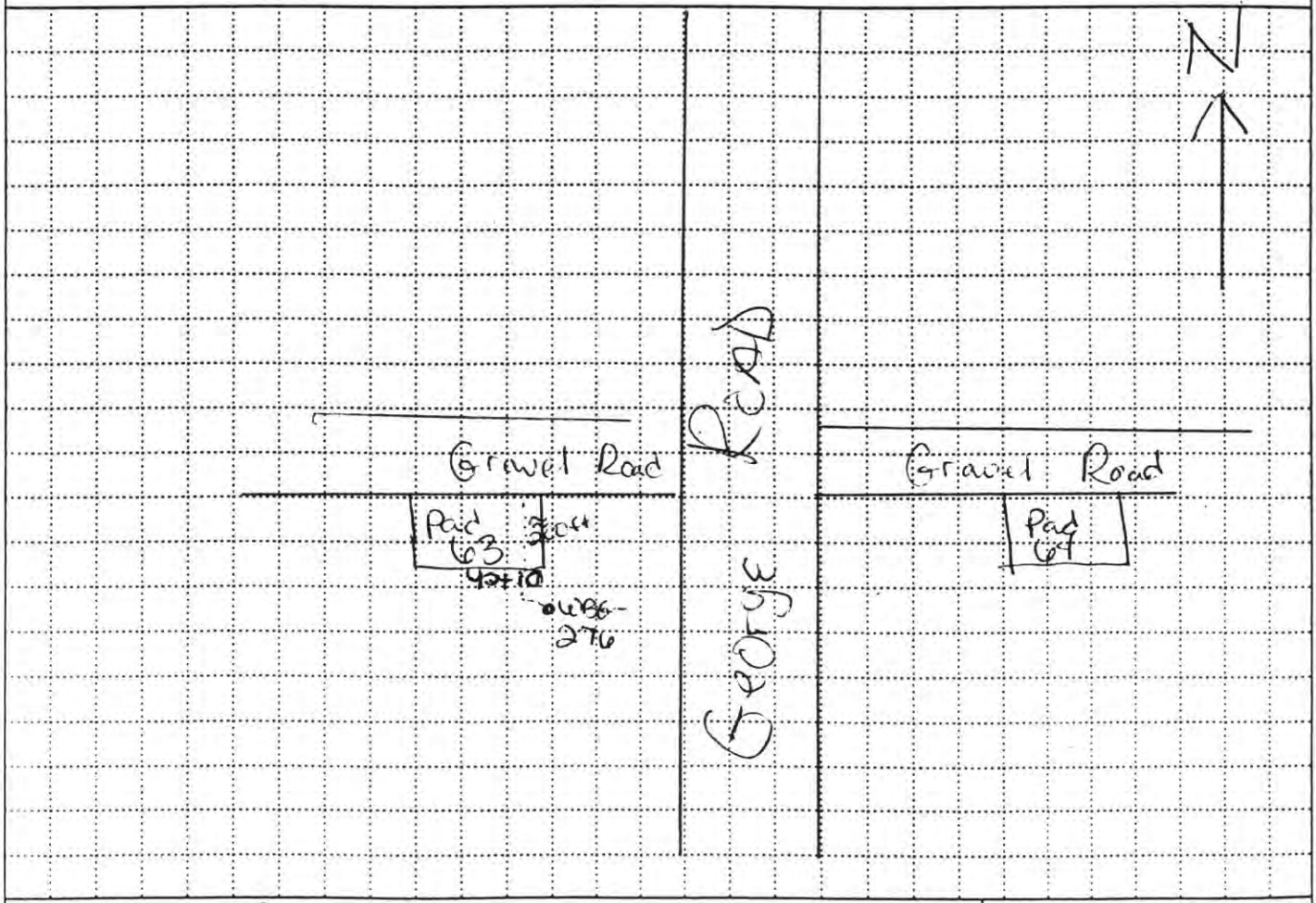
DISTRICT: Louisville		HOLE NUMBER: WBG-276
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/a	SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	N 562872.26 E 2357603.53
5. NAME OF DRILLER: n/a	6. MANUFACTURERS DESIGNATION OF DRILL: n/a	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 5" bowl, 5" spoon, 5" 3" auger w/ extention	8. HOLE LOCATION: Random Grid Location	
	9. SURFACE ELEVATION: ~~n/a~~ 1038.42 SRA 4/27/01	
	10. DATE STARTED: 10/24/00	11. DATE COMPLETED: 10/24/00
12. OVERBURDEN THICKNESS: n/a	15. DEPTH GROUNDWATER ENCOUNTERED: n/a	
13. DEPTH DRILLED INTO ROCK: n/a	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/a	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/a	n/a		n/a

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/a	n/a	XRF-TAL	Explosives	n/a	n/a	n/a

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/a	Bentonite	n/a	n/a	C. Canall

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO
RVAAP WBG FS	WBG-276

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG	INSPECTOR	C. Canall	SHEET	2 of 2

69

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5 1.0	2.5Y 5/4 LIGHT OLIVE BROWN, CL-LEAN CLAY WITH SILT AND SAND (FINE POORLY SORTED), GRAVEL SUBANGULAR TO ROUNDED UP TO 60MM, SOFT, DAMP, LOW TO MED PLASTICITY	PID not functioning properly - raining hard	N/A	WBG-4231	

11-8-00 CC

PROJECT RVAAP WBG FS A-158

HOLE NO WBG 276

61

HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG 277
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: ~~FAA~~ WBG	N 562692.2 E 2357923.12
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon, SS bowl, SS 3" auger w/extention	8. HOLE LOCATION: random Grid Location	
	9. SURFACE ELEVATION: ~~n/A~~ 1034.55 SRA 4/27/01	
	10. DATE STARTED: 10/24/00	11. DATE COMPLETED: 10-24-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER in hole	

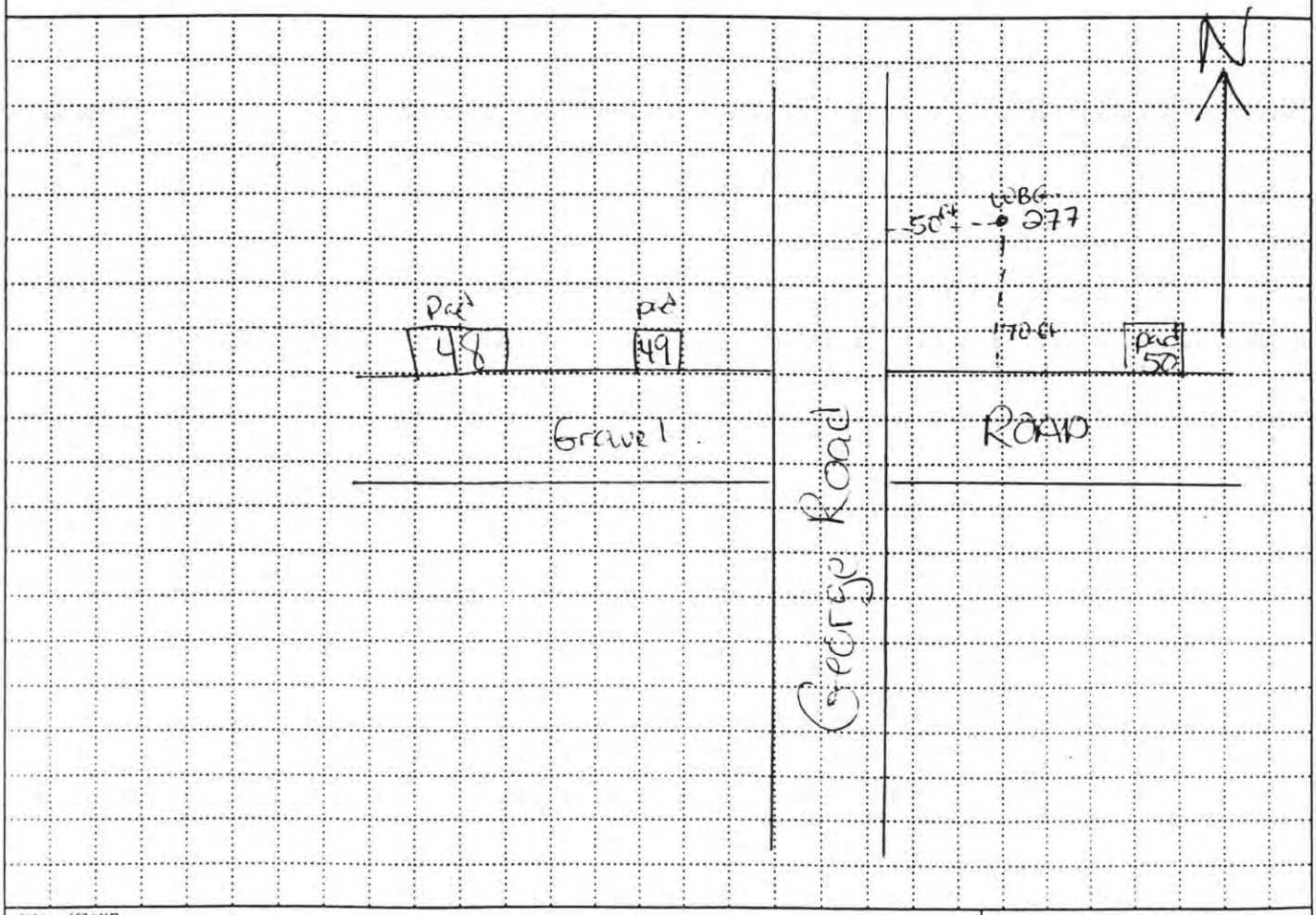
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	XRF-TAL	Explosives			n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Canale

LOCATION SKETCH/COMMENTS

SCALE:



PROJECT	HOLE NO.
RVAAP WBG FS	WBG 277

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

62

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 4/3 olive brown, CL-Lean Clay w/ Silt, moist, low to no plasticity, soft to firm, gravel subangular 2-40mm	0.0 ppm	n/A	WBG-4232	
	1.0	10YR 6/6 brownish yellow, CL-Lean Clay w/ Silt, moist, no plasticity, firm				

11-08-00
CC

193

HTRW DRILLING LOG

DISTRICT: LOUISVILLE		HOLE NUMBER: WBG-278
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WINKLEPECK BURNING GROUNDS	
5. NAME OF DRILLER: N/A	6. MANUFACTURER'S DESIGNATION OF DRILL: N/A	N 562771.47
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS SPOON; SS BOWL; 3" SS AUGER W/ EXTENTION	8. HOLE LOCATION: RANDOM GRID LOCATION	E 2359073.86
	9. SURFACE ELEVATION: N/A 1011.14 SRA 4/27/01	
	10. DATE STARTED: 10-24-00	11. DATE COMPLETED: 10-24-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER IN HOLES	

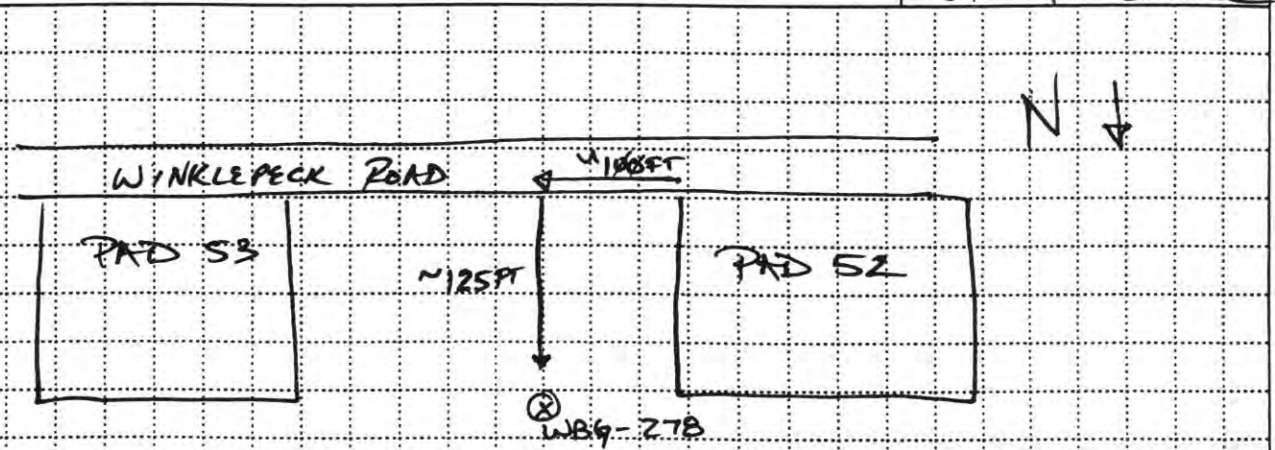
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/a	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOA	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/a	N/A	TAL XRF	EXPLOSIVES	N/A	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/a	Bentonite	N/A	N/A	B.W.Ll:

LOCATION SKETCH/COMMENTS

SCALE: NOT TO SCALE



PROJECT	HOLE NO
RVAAP WBG FS	WBG-278

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	B. Williams	SHEET	2 OF 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		2.5Y 4/4 OLIVE BROWN - CL LEAN CLAY W/ SILT, GRAVEL SUBANGULAR UP TO 6MM, SOFT, MOIST, LOW PLASTICITY	Ø.ØPPM	N/A	WBG-4238	ROOTLETS
	Ø.5					Ø.5
		2.5Y 7/2 LIGHT GRAY MOTTLED	Ø.ØPPM			ROOTLETS
	1.Ø	WITH 10YR 6/8 BROWNISH YELLOW, CL-LEAN CLAY W/ SILT AND FINE POORLY SORTED SAND, DAMP, SOFT, LOW PLASTICITY				1.Ø
				11-5 ØØ CC		

1 Ø4

96

HTRW DRILLING LOG

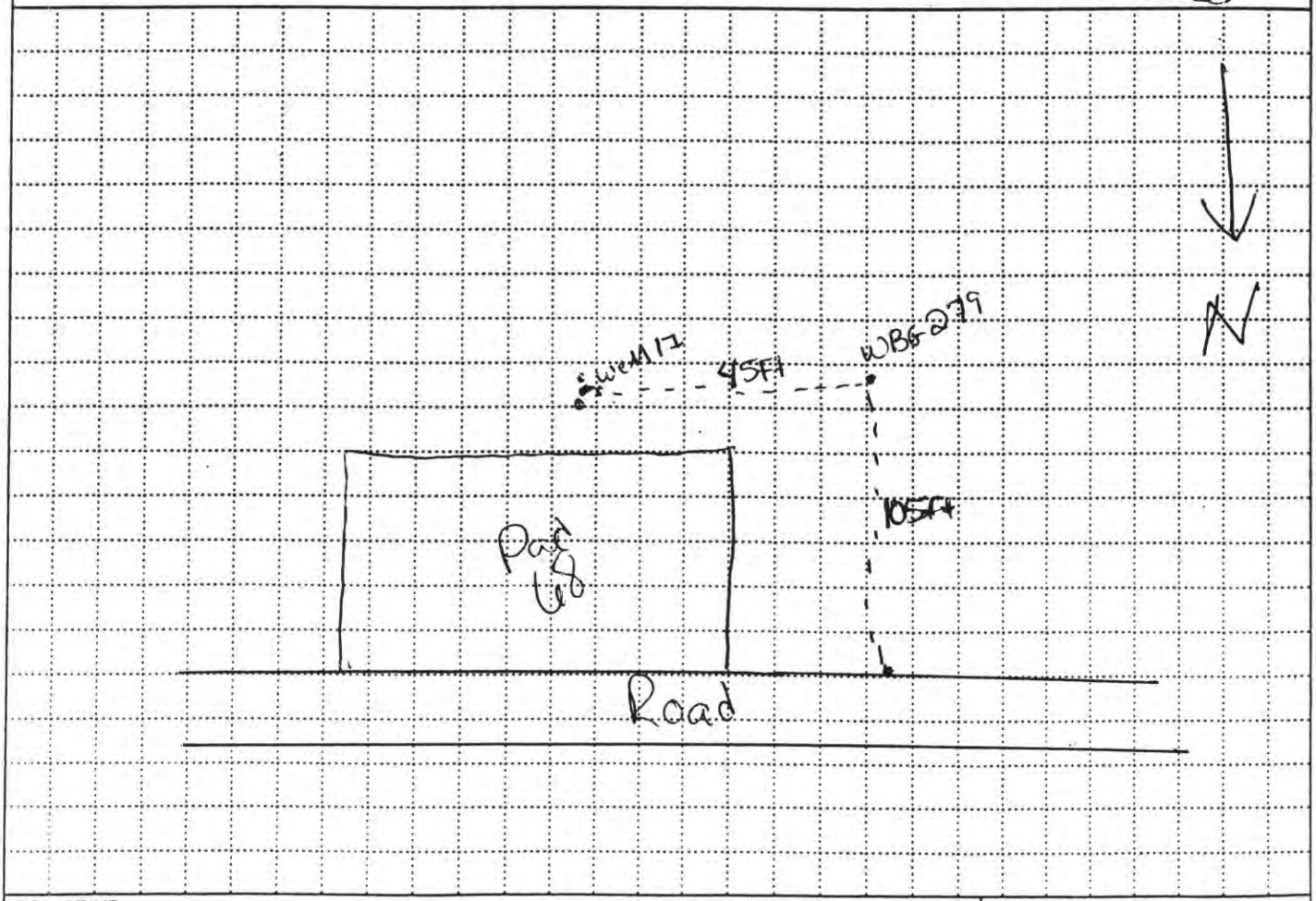
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2
DISTRICT: Louisville		HOLE NUMBER: WBG-279
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG- N562932.47 E2359517.82	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl, SS spoon, 3" auger extention	8. HOLE LOCATION: Random Grid location	
	9. SURFACE ELEVATION: n/A 1004.45 SRA 4/27/01	
	10. DATE STARTED: 10/31/00	11. DATE COMPLETED: 10/31/00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/n	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole.	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-XRF	explosives	n/A	n/A	n/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/a	n/A	C. Carroll

LOCATION SKETCH/COMMENTS — SCALE: not to scale.



PROJECT	HOLE NO
RVAAP WBG FS	WBG-279

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DIGGING LOG

PROJECT	RVAAP WBGFS	INSPECTOR	C. Canall	SHEET	2 of 2

97

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5 1.0	to 31-00 to 2.5Y 4/4 olive brown, Cl-lean to a silt, fine poorly sorted to med. sands, pebbles up to 10mm, subangular, very soft, moist, low plasticity loose	00 ppm	n/A	WBG-4234	rootlets, worms

11-8 00 CC

PROJECT RVAAP WBG FS A-164

HOLE NO WBG-279

54

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	HOLE NUMBER: WBG-280
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	SHEET 1 OF 2 SHEETS
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl, SS spoon, SS 3" auger w/extention	8. HOLE LOCATION: Random Grid location	N 561994.50 E 2355201.05
	9. SURFACE ELEVATION: 1077.07 SRA 4/27/01	
	10. DATE STARTED: 10-30-00	11. DATE COMPLETED: 10-30-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no WATER in hole	

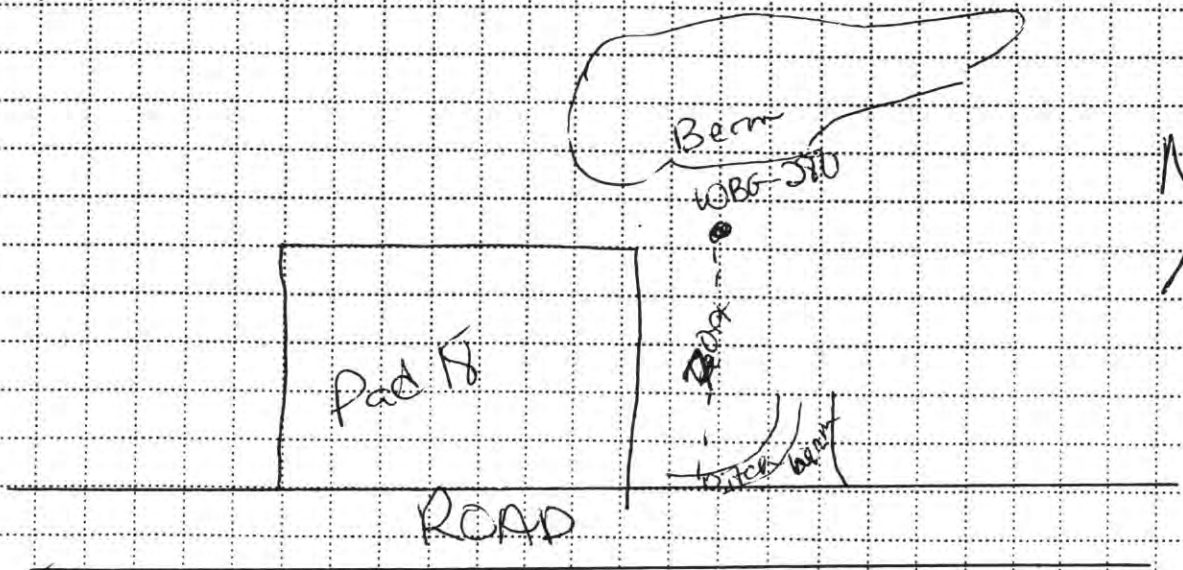
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TOTAL	EXPLOSIVES	n/A	n/A	n/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	bentonite	n/A	n/A	C. Canall

LOCATION SKETCH/COMMENTS — SCALE: not to scale.

not-to-scale



PROJECT	HOLE NO
RVAAP WBG FS	WBG 280

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DIGGING LOG

PROJECT	RVAAP WBG F5	INSPECTOR	C. Carroll	SHEET	2 of 2

55

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	05	2.5Y 4/4 olive brown, Sty. Clay w/ fine poorly sorted sands, gravel subrounded up to 20mm, very soft, moist, low to no plasticity	0.0 ppm	n/A	WBG-4235	
	10					

11.5 ft CC

PROJECT RVAAP WBG F5 A-166

HOLE NO WBG-280

HTRW DRILLING LOG

DISTRICT: LOUISVILLE		HOLE NUMBER: WBG-281
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: WINKLEPECK BURNING GROUNDS	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	N 562204.07
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS BOWL, SS SPOON, 3" SS AUGER W/EXTENTION	8. HOLE LOCATION: RANDOM GRID LOCATION	E 2356039.88
	9. SURFACE ELEVATION: ~~N/A~~ 1063.56 SRA 4/27/01	
	10. DATE STARTED: 10-24-00	11. DATE COMPLETED: 10/24/00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0 - 1.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER IN HOLES	

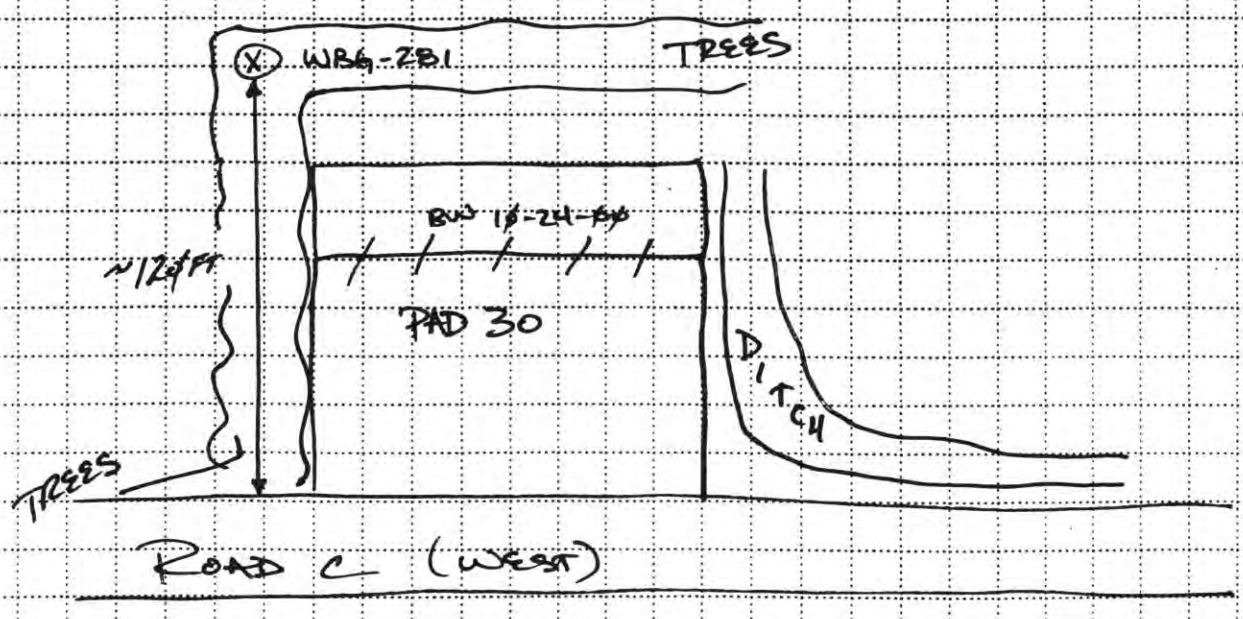
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	~~VOC~~	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A	N/A	TAL XRF	EXPLOSIVES	N/A	N/A	N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	N/A	N/A	B. Williams

LOCATION SKETCH/COMMENTS

SCALE: NOT TO SCALE



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-281

DIGGING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	B. Williams	2 of 2

47

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		2.5Y 4/3 OLIVE BROWN, SILTY CLAY, SUB-ROUNDED GRAVEL UP TO 60 MM, MOIST, VERY SOFT, LOW-MED PLASTICITY	PID NOT WORKING CORRECTLY DUE TO HIGH HUMIDITY	N/A	WBG-4236 WBG-	BURN CHIPS (WOOD) ROOTLETS
	0.5	2.5Y 5/6 LIGHT OLIVE BROWN, SILTY CLAY W/ FINE POORLY SORTED SANDS, SUB-ROUNDED			WBG-	
	1.0	GRAVEL UP TO 60MM, MOIST, SOFT, LOW-NO PLASTICITY				

0.5

1.0

11.8 ft
CC

PROJECT: RVAAP WBG FS

HOLE NO: WBG-281

HTRW DRILLING LOG

DISTRICT: Louisville	HOLE NUMBER: WBG-~~282~~ 289 CC 10-31-00	
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG N 562219.22 E 2356763.44	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon, SS bowl, SS 3" auger w/extention	8. HOLE LOCATION: Pad 32 - Random Grid Location	
	9. SURFACE ELEVATION: ~~n/A~~ 1045.59 SRA 4/27/01	
	10. DATE STARTED: 10/31/00	11. DATE COMPLETED: 10/31/00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

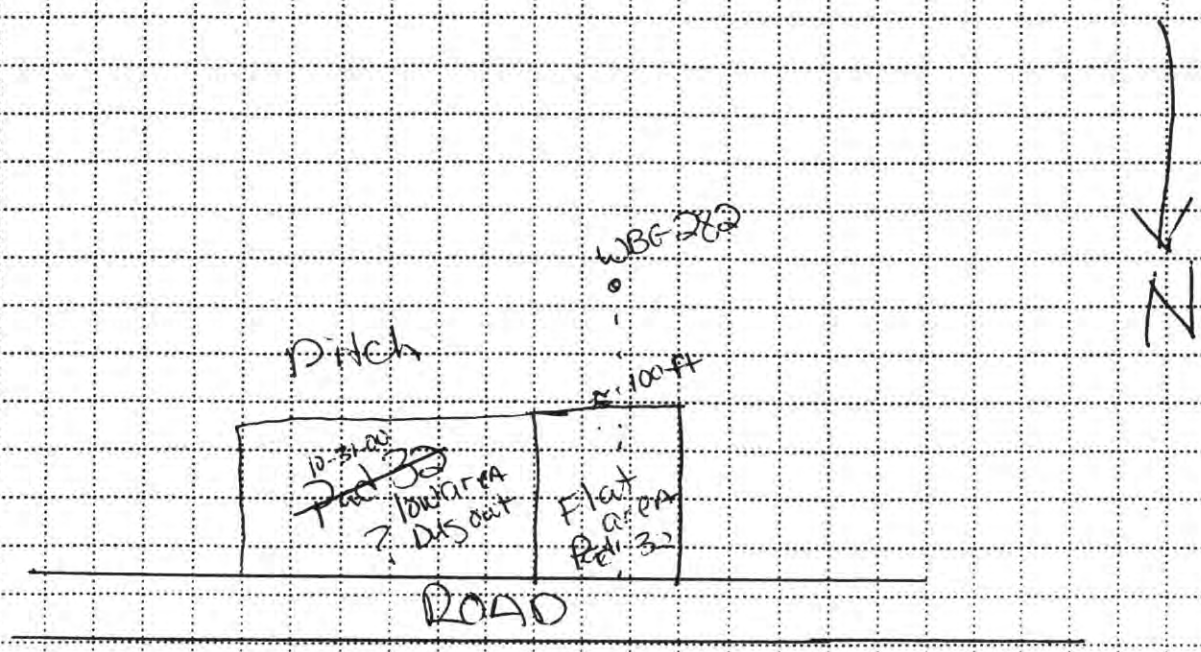
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
n/A	n/A	XRF-TAL-CM 10-31-00	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS

SCALE: not to scale.



PROJECT	HOLE NO.
RVAAP WBG	WBG 282

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG-FS	INSPECTOR C. Canell	SHEET 2 OF 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y5/4 light olive brown, CL lean Clay with silt, fine poor sorted sands, pebbles subrounded to subangular up to 20mm, moist, soft, med plasticity	0.0 ppm	N/A	WBG-4237	
	1.0					

11-3-00 CC

PROJECT	HOLE NO
RVAAP WBG FS A-170	WBG-202

68

HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG-283
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 3 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	N 562047.54 E 2357440.67
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl, SS spoon, SS 3" auger w/extention	8. HOLE LOCATION: Random Grid Location	
	9. SURFACE ELEVATION: ~~n/A~~ 1037.84 SRA 4/27/01	
	10. DATE STARTED: 10/31/00	11. DATE COMPLETED: 10-31-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): n/A	

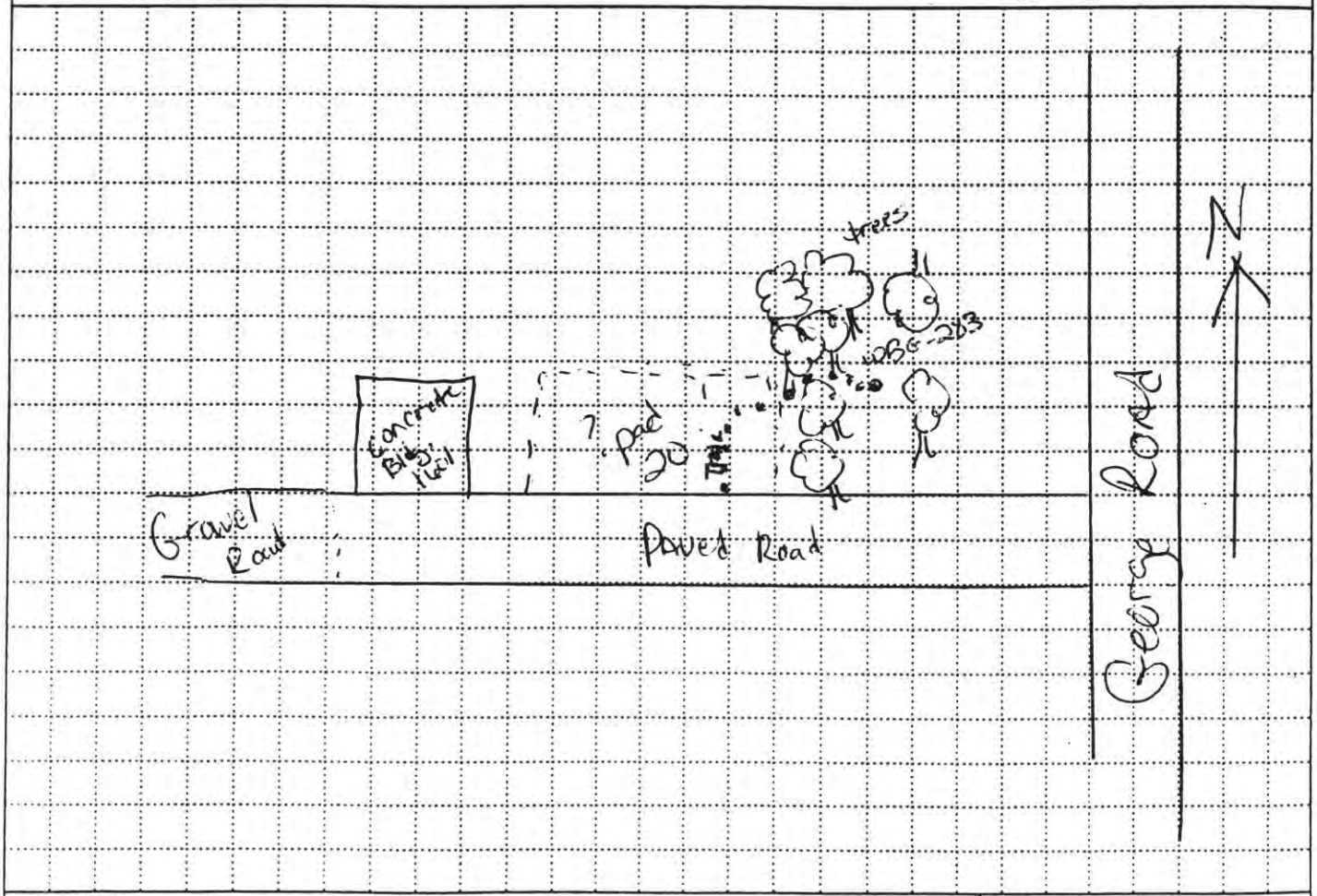
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-XRF	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	~~cc n/A~~ Bentonite	n/A	n/A	C. Canall

LOCATION SKETCH/COMMENTS

SCALE: not to scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG 283

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

69

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		2.5Y 3/3 dark brown, Chy. silt, soft, moist low plasticity				rootlets
	0.5	2.5Y 5/4 yellowish brown, Cl. Lean Clay fine, poorly sorted sands, subangular to subrounded gravel up to 20mm, firm, damp, no to low plasticity	0.7 ppm (poss. error reading)	N/A	WBG-4238	throughout
	1.0					

11-5-00 CC

PROJECT RVAAP WBG FS A-172

HOLE NO WBG-283

95

HTRW DRILLING LOG

DISTRICT: Louisville	HOLE NUMBER: WBG284	
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	N 562162.70 E 2358181.29
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon, SS bowl, SS 3" auger extention	8. HOLE LOCATION: Random Grid Location	
	9. SURFACE ELEVATION: ~~n/A~~ 1021.31 SRA 4/27/01	
	10. DATE STARTED: 10/31/00	11. DATE COMPLETED: 10/31/00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

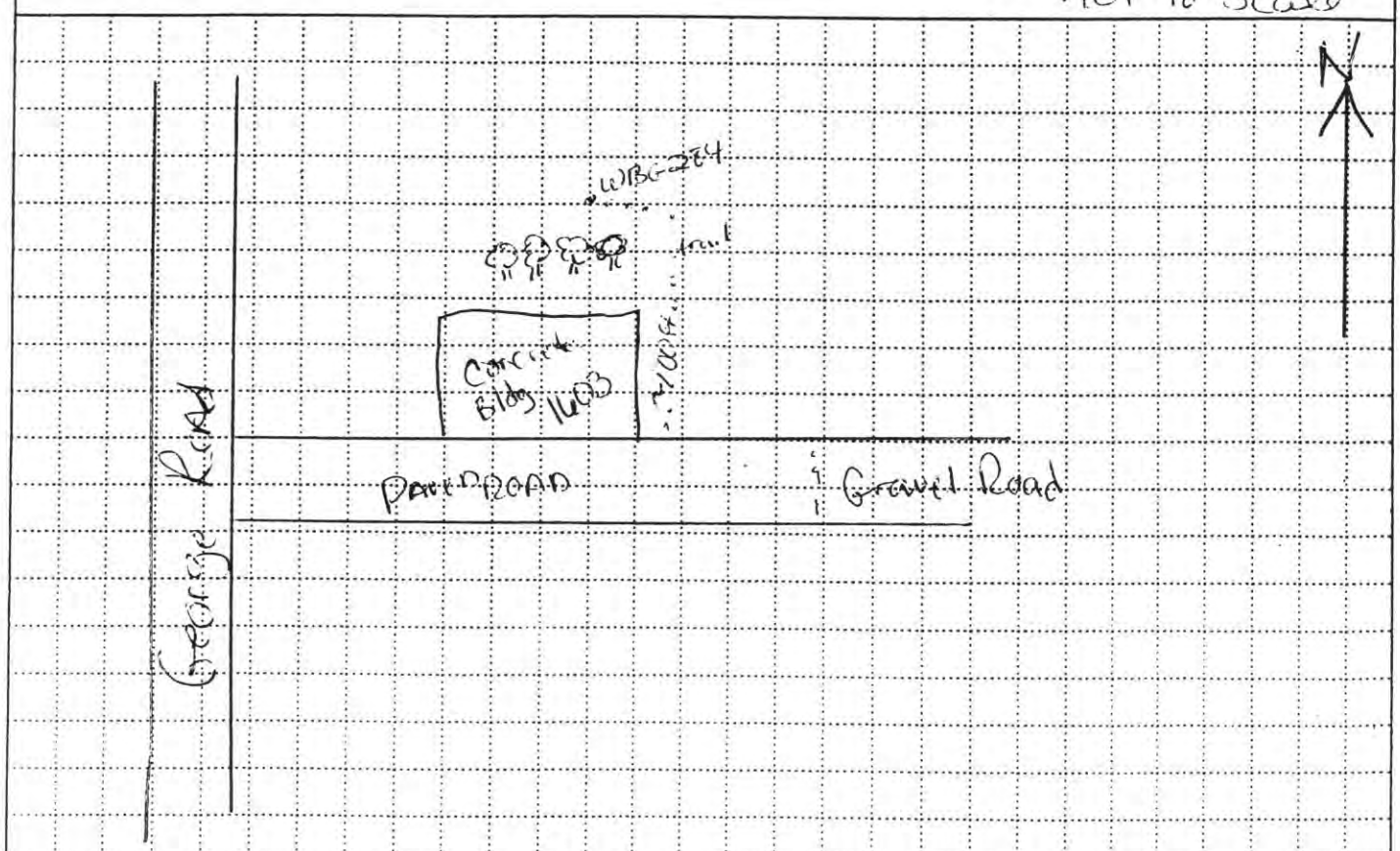
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-XRF	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS

SCALE: not to scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-284

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

7/6

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5 1.0	10YR 5/2 light brownish gray mottled w/ 10YR 7/8 yellow (poss. metal?), CL-lean Clay w/ SH, fine sand, poorly sorted in patches, moist, low plasticity, soft to firm	0.4 ppm	n/a	WBG-4239	lots of rootlets earthworms, bugs

PROJECT RVAAP WBG FS A-174

HOLE NO WBG-284

82

HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG-285
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	N562034.01
5. NAME OF DRILLER: n/A	6. MANUFACTURER'S DESIGNATION OF DRILL: n/A	E 2358838.55
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl, SS spoon, SS 3" auger w/extention	8. HOLE LOCATION: Random Grid Locations	
	9. SURFACE ELEVATION: ~~n/A~~ 1016.39 SRA 4/27/01	
	10. DATE STARTED: 10/31/00	11. DATE COMPLETED: 10/31/00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

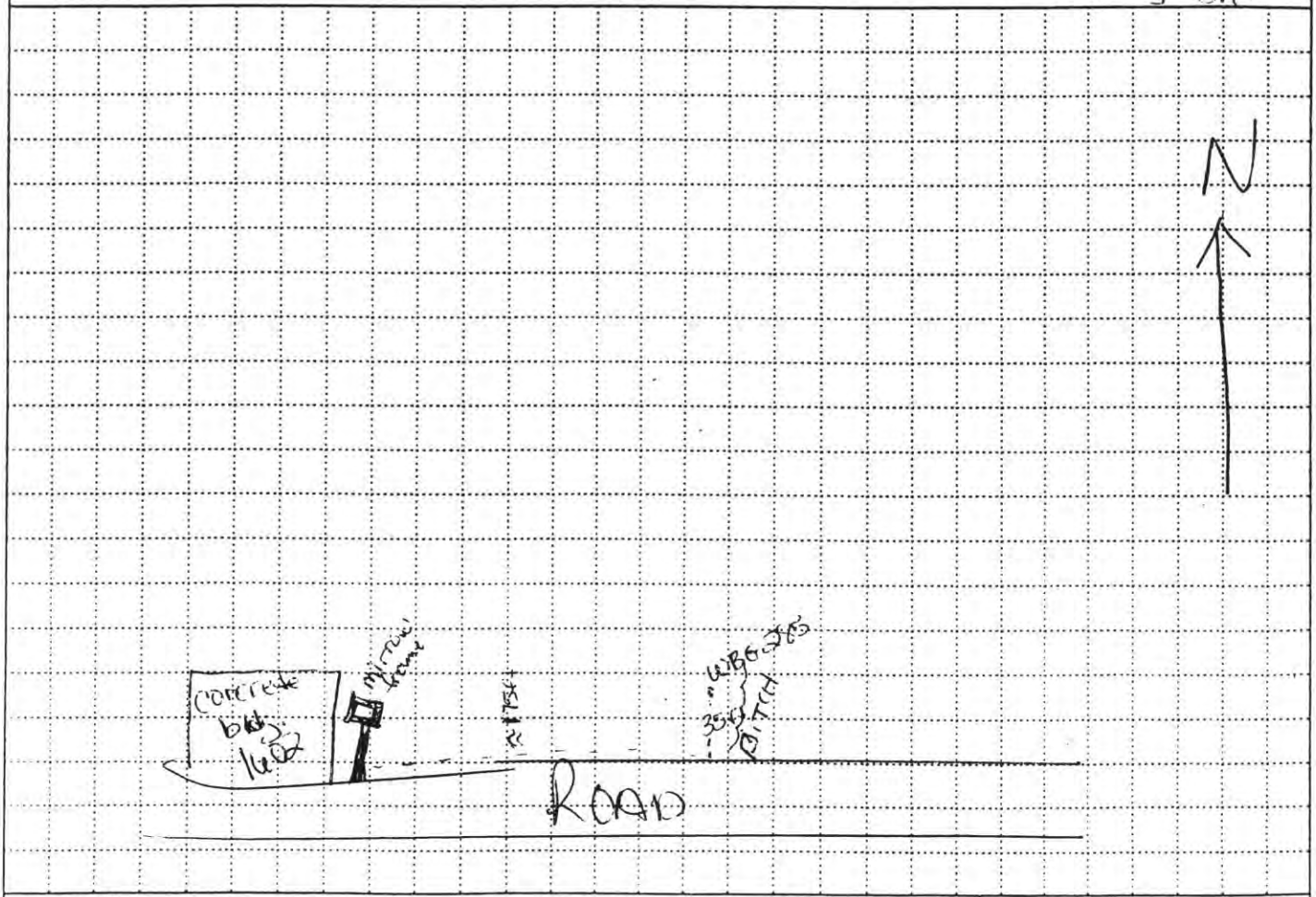
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-XRF	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS

SCALE: not to scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-285

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

83

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	Ø5 1.Ø	2.5Y 5/3 light olive brown Cl-lean clay-STH, gravel subangular to angular up to 45mm, moist, low to no plasticity	Ø.3 (pid not working properly?)	n/A	WBG-424Ø	rootlets

11-[illegible] cl

89

HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG 286
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG N 562153.41	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A E 2360221.82	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" auger extention	8. HOLE LOCATION: Random Grid locations	
	9. SURFACE ELEVATION: ~~n/A~~ 996.44 SRA 4/27/01	
	10. DATE STARTED: 10/31/00	11. DATE COMPLETED: 10/31/00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

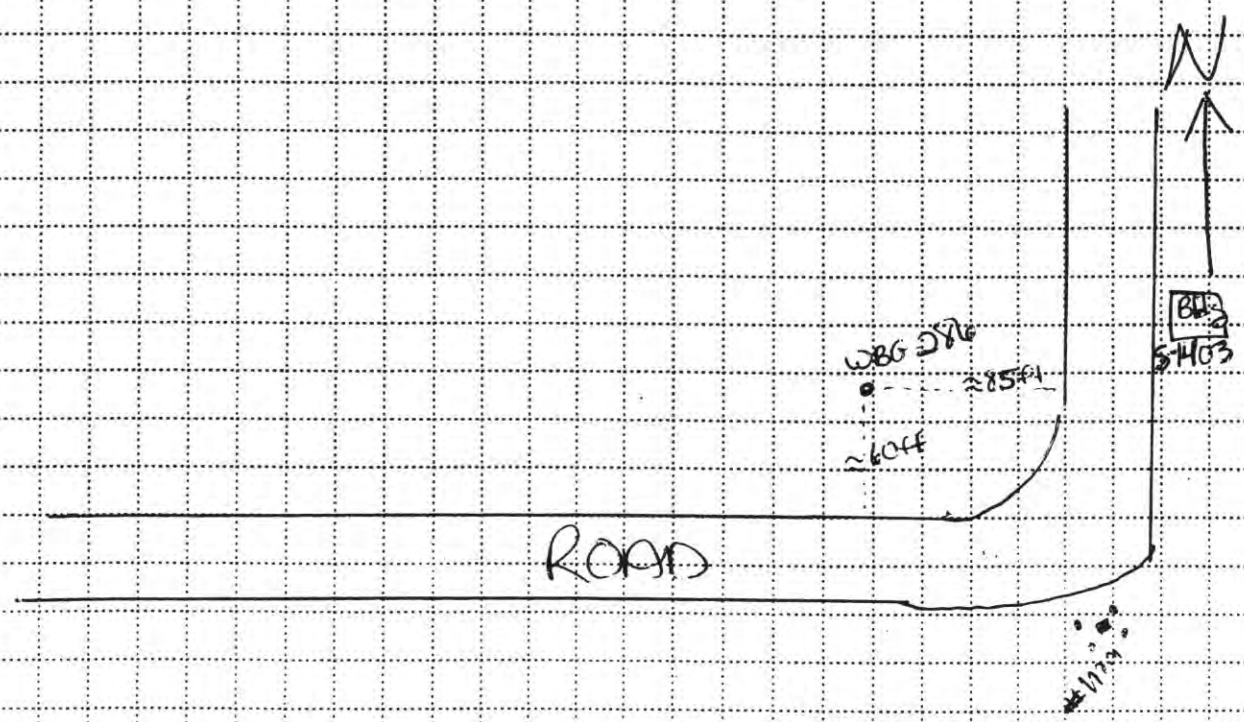
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
n/A	n/A	TAL-XRF	explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	cc ~~n/A~~ Bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS

SCALE: not to scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG 286

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carnall	SHEET	2 of 2

90

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5 1.0	10YR5/3 brown, CL-Lean Clay-Silt, fine, poor sorted sand, gravel subrounded to subangular up to 70mm, moist, soft, low plasticity	0.0 ppm	n/A	WBG-4241	rootlets

11-8-00 CC

PROJECT RVAAP WBG FS

HOLE NO WBG-286

HTRW DRILLING LOG

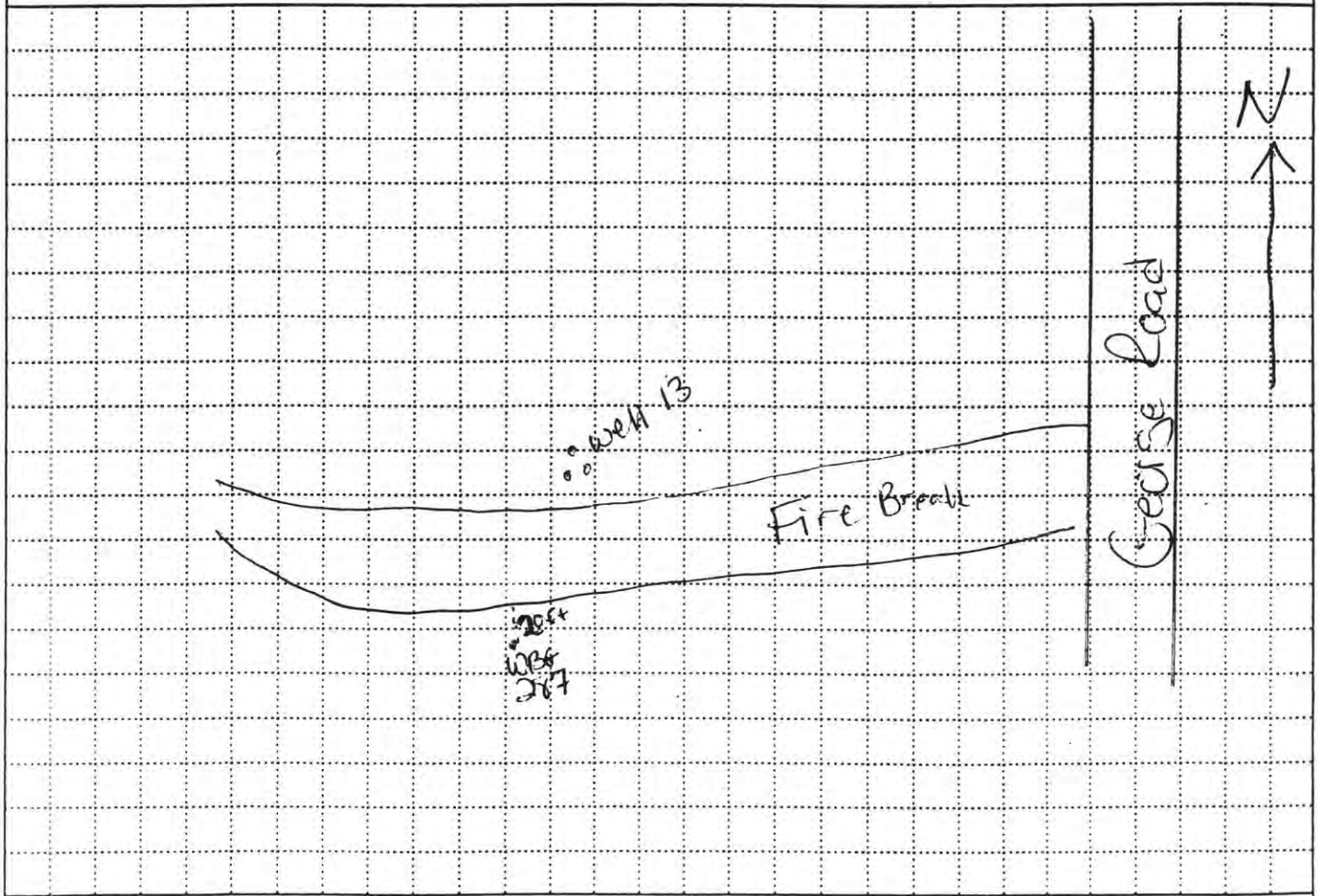
DISTRICT: Louisville		HOLE NUMBER: WBG-287
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/a	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG- N 561430.78 E 2355176.73	
5. NAME OF DRILLER: n/a	6. MANUFACTURERS DESIGNATION OF DRILL: n/a	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3.5 Spoon, 3.5 Bowl, 3.5 3" w/auger extention	8. HOLE LOCATION: Random Grid Locations	
	9. SURFACE ELEVATION: ~~n/a~~ 1064.68 SRA 4/27/01	
	10. DATE STARTED: 10/31/00	11. DATE COMPLETED: 10/31/00
12. OVERBURDEN THICKNESS: n/a	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: n/a	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/a	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): hotwater in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/a	n/a	n/a	n/a

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
n/a	n/a	TAL-XRF	EXPLOSIVES	n/a	n/a	n/a

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/a	bentonite	n/a	n/a	C. Carroll

LOCATION SKETCH/COMMENTS — SCALE: not to Scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG 287

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Canall	SHEET	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5 10	2.5Y 5/4 light olive brown mottled w/2.5Y 5/1 gray, CL Lean clay, fine poor sorted sands, subrounded gravel up to 30mm, firm to soft, no plasticity, loose, damp	0.0ppm	n/A	WBG 4242	rootlets throughout

11-3-00
CC

PROJECT: RVAAP WBG FS A-180

HOLE NO: WBG-287

HTRW DRILLING LOG

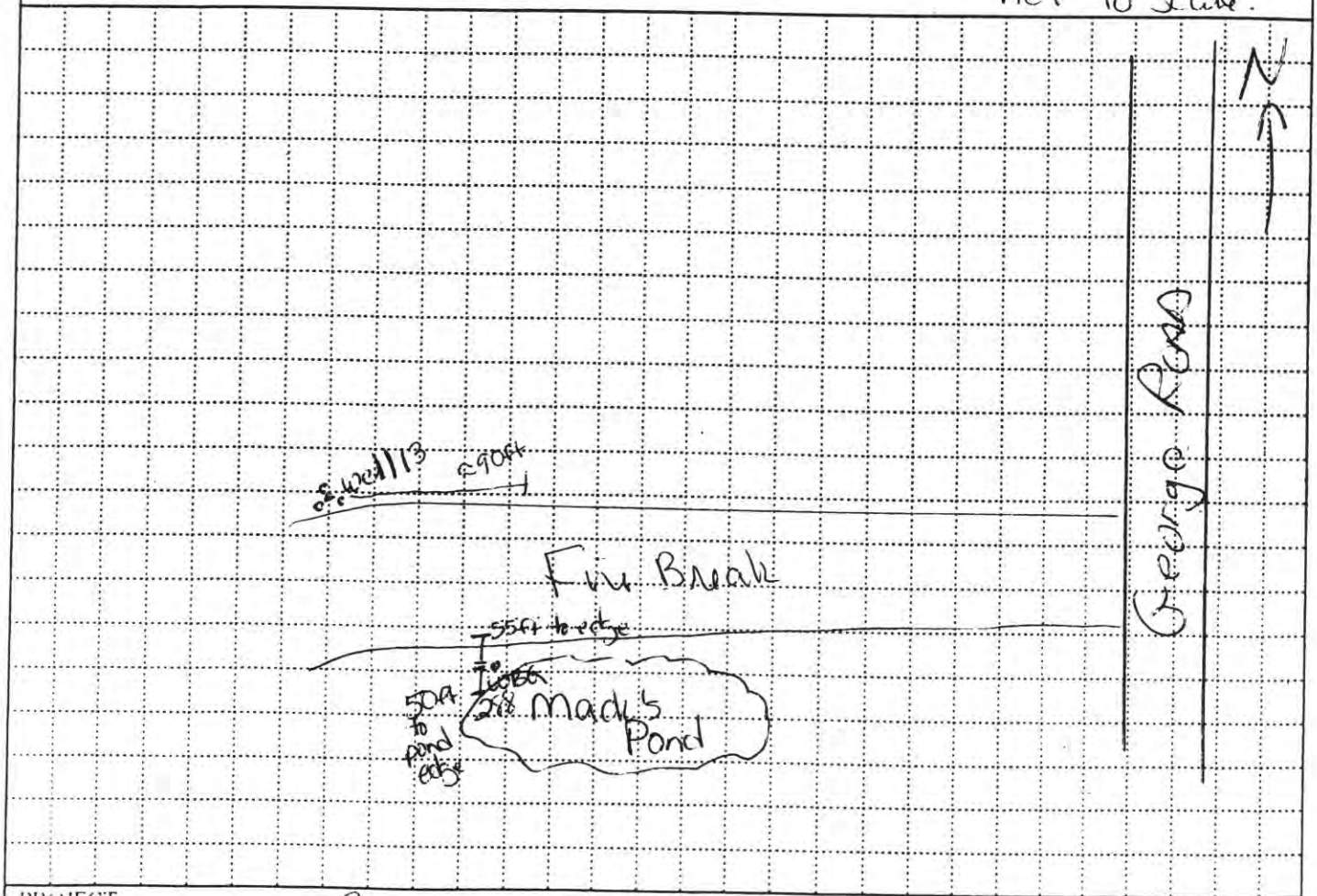
1. COMPANY NAME: SAIC	DISTRICT: Louisville	HOLE NUMBER: WBG-28
	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl; SS spoon; SS 3' auger extention	8. HOLE LOCATION: Random Grid locations N 561326.45 E 2355645.94	
	9. SURFACE ELEVATION: N/A 1058.07 SRA 4/27/01	
	10. DATE STARTED: 10-31-00	11. DATE COMPLETED: 10-31-00
12. OVERBURDEN THICKNESS: n/a	15. DEPTH GROUNDWATER ENCOUNTERED: n/a	
13. DEPTH DRILLED INTO ROCK: n/a	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/a	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/a	n/a	n/a	n/a

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/a	n/a	TAL-XRF	EXPLOSIVES	n/a	N/A	n/a

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/a	Bentonite	n/a	n/a	C. Carson

LOCATION SKETCH/COMMENTS — SCALE: not to scale.



PROJECT	HOLE NO.
RVAAP WBG FS	WBG 28

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

76

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 5/3 light olive brown, CL-Lean Clay to a silt, fine poorly sorted sands, soft, moist to damp, low to no plasticity	0.0 ppm		WBG-4243	root lets throughout
	1.0					
				12-3-00 CC		

PROJECT RVAAP WBG FSA-182

HOLE NO WBG-288

HTRW DRILLING LOG

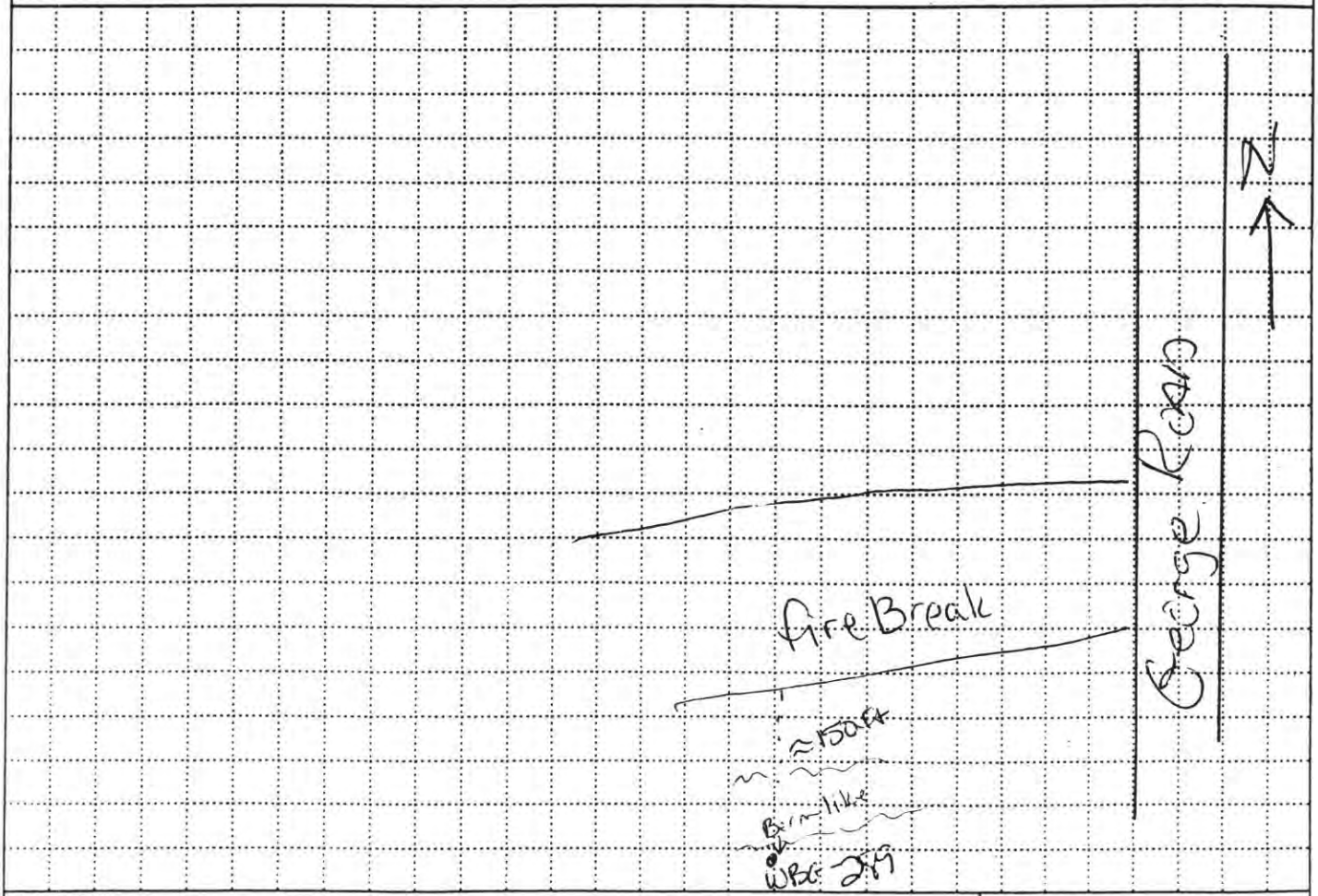
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	HOLE NUMBER: WBG-289
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	SHEET 1 OF 2
5. NAME OF DRILLER: n/A	6. MANUFACTURER'S DESIGNATION OF DRILL: n/A	N 561294.29 E 2356760.00
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" auger extention	8. HOLE LOCATION: Random Grid Locations	
	9. SURFACE ELEVATION: ~~n/A~~ 1055.27 SRA 4/27/01	
	10. DATE STARTED: 10/31/00	11. DATE COMPLETED: 10-31-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
n/A	n/A	TAL-XRF	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS — SCALE: not to scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-289

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carron	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		10YR 3/3 brown CL-Lean Clay- trace silt, fine poor sorted sands, moist, loose, no plasticity soft, ~~	ØØ ppm			rootlets throughout
	0.5	10YR 5/6 brownish yellow, Silty-Clay, loose, cobbles, Subangular to Subrounded up to 55mm, moist, loose, no plasticity soft	Ø.Ø ppm	N/A	WBG-4244	
	1Ø					

11-3-04 CE

PROJECT RVAAP WBG FSA-184

HOLE NO WBG-289

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HTRW DRILLING LOG

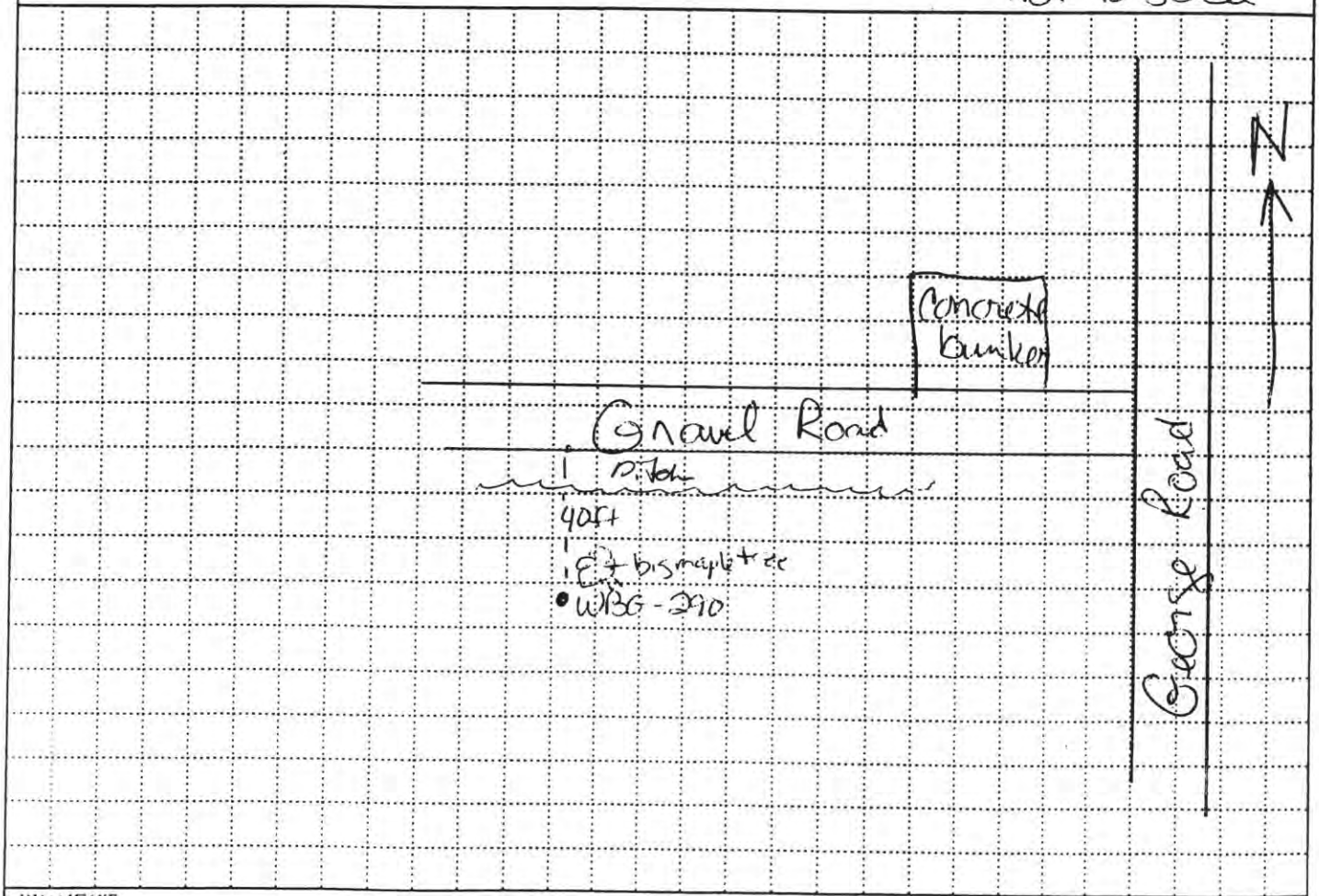
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville; HOLE NUMBER: WBG-390; SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	N 561822.60, E 2356257.46
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3" bowl; 3" auger; 3" auger extention	8. HOLE LOCATION: Random Grid location	
	9. SURFACE ELEVATION: n/A 1065.89 SRA 4/27/01	
	10. DATE STARTED: 10/31/00	11. DATE COMPLETED: 10-31-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no WATER in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-XRF	explosives	n/A	n/A	n/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS — SCALE: not to scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-390

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG-FS	INSPECTOR	C. Canall	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	05	2.5Y 3/3 dark olive brown, Clay-Silt, moist, very soft, low to none plasticity	0.0ppm		WBG-4245	rootlets throughout
	10	2.5Y 7/6 yellow, Clay-Silt, damp, soft, loose, non-plastic				

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PROJECT RVAAP WBG FS A-186

HOLE NO WBG-290

HTRW DRILLING LOG

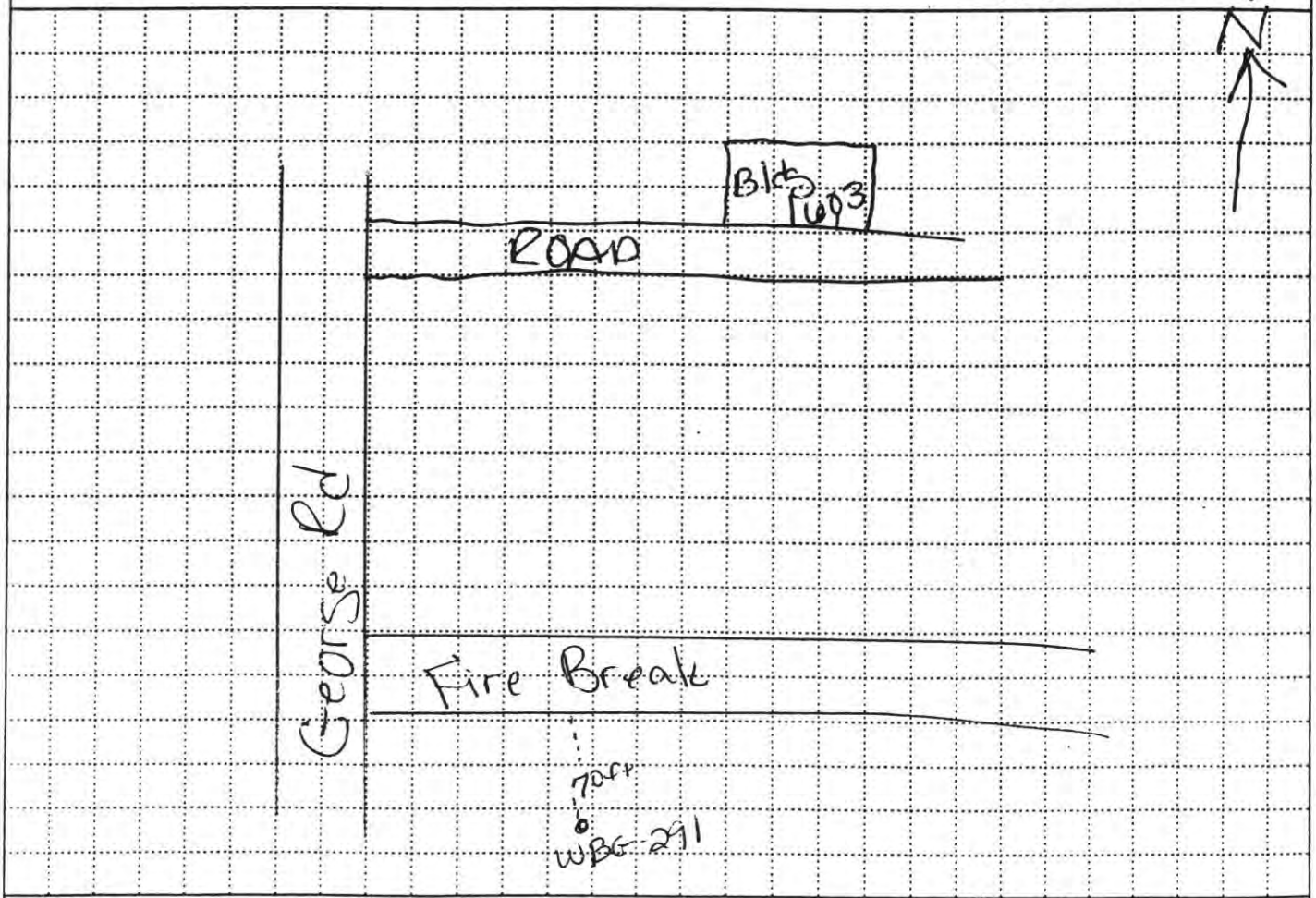
DISTRICT: Louisville	HOLE NUMBER: WBG-291	
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/a	SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG N 561615.57	
5. NAME OF DRILLER: n/a	6. MANUFACTURERS DESIGNATION OF DRILL: n/a E 2358039.61	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3" spoon; 3" bowl; 3" auger extention	8. HOLE LOCATION: Random Grid Location	
	9. SURFACE ELEVATION: n/a 1028.98 SRA 4/27/01	
	10. DATE STARTED: 10-31-00	11. DATE COMPLETED: 10-31-00
12. OVERBURDEN THICKNESS: n/a	15. DEPTH GROUNDWATER ENCOUNTERED: n/a	
13. DEPTH DRILLED INTO ROCK: n/a	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/a	
14. TOTAL DEPTH OF HOLE: 0-1.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/a	n/a	n/a	n/a

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/a	n/a	TAL-VEH	Explosives	n/a	n/a	n/a %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/a	~~CUTTINGS~~ Bentonite	n/a	n/a	C. Arnold

LOCATION SKETCH/COMMENTS — SCALE: not to scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-291

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C Carron	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		10YR 4/3 brown, silty clay, moist to damp, loose, soft to very soft, low to no plasticity				rootlets throughout
	0.5 1.0	10YR 4/3 pale brown, mottled with 10YR 8/8 yellow, CL-Lean clay. Fine poorly sorted sands, soft to firm, low to no plasticity, damp	0.0 ppm	N/A	WBG-4246	

11-8 CC

PROJECT	RVAAP WBG FS A-188	HOLE NO	WBG-291

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HTRW DRILLING LOG

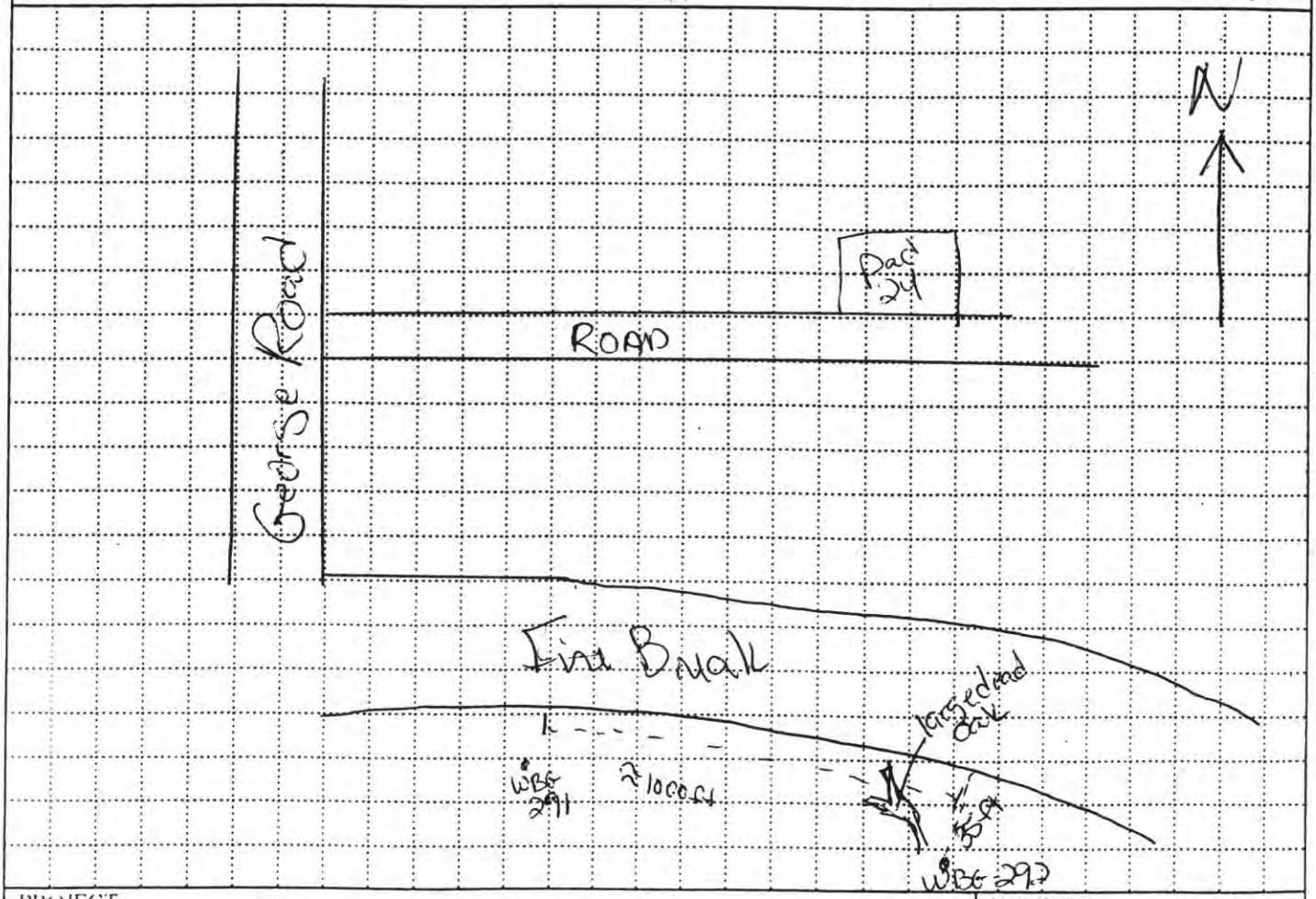
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville / HOLE NUMBER: WBG-292 / SHEET 1 OF 2
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	N 561733.53 E 2359247.44
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3" bowl, 3" spoon, 3" auger extention	8. HOLE LOCATION: Random Grid location	
	9. SURFACE ELEVATION: ~~n/A~~ 1001.63 SRA 4/27/01	
	10. DATE STARTED: 10-31-00	11. DATE COMPLETED: 10-31-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/a

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-XRF	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C Carroll

LOCATION SKETCH/COMMENTS — SCALE: not to scale



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-292

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	2.5Y 4/3 olive brown, CL-lean clay to a silt, pebbles up to 5mm, gravel subangular to sub rounded up to 55mm, soft damp, low plasticity	0.0 ppm	N/A	WBG-4247 (soil) 4298 (split) 4280 (Dup)	rootlets throughout earthworm, bugs
	1.0					

11-3.0Ø CC

PROJECT RVAAP WBS FS A-190

HOLE NO WBG-292

61

HTRW DRILLING LOG

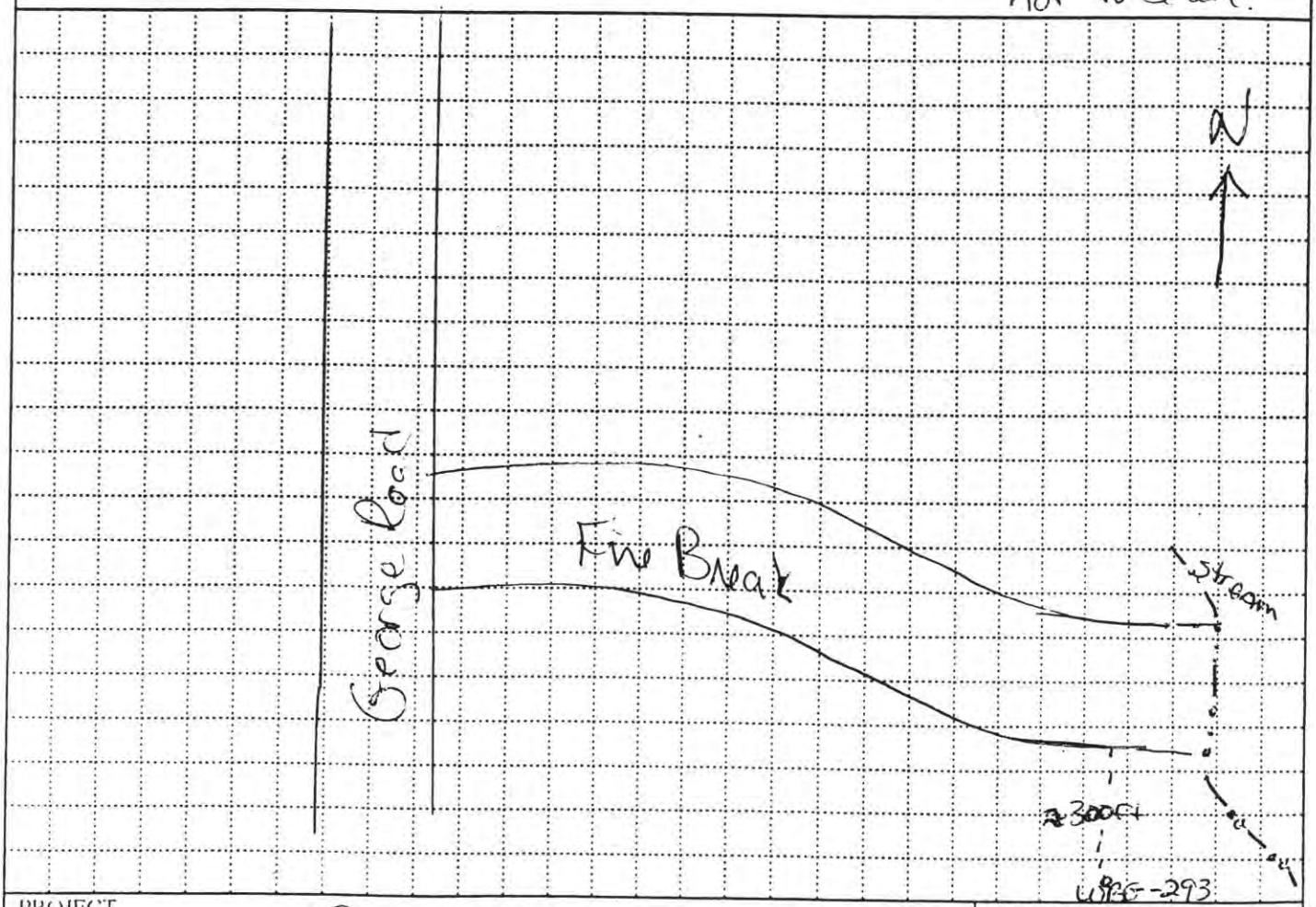
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	HOLE NUMBER: WBG-293
5. NAME OF DRILLER: N/A	6. MANUFACTURER'S DESIGNATION OF DRILL: n/A	SHEET 1 OF 2
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3" Spoon; 3" Bowl; 3" Auger extention	8. HOLE LOCATION: Random Grid Location	N 561578.85 E 2359937.23
	9. SURFACE ELEVATION: n/A	986.42 SRA 4/27/01
	10. DATE STARTED: 10/31/00	11. DATE COMPLETED: 10-31-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0.-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-XRF	explosives	n/A	n/A	0/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS — SCALE: not to scale.



PROJECT	HOLE NO
RVAAP WBG FS	WBG 293

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C. Carroll	SHEET	2 of 2

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	10YR 3/2 very dark grayish brown CL Lean Clay to ~~Silt~~, moist, soft low to med plasticity	0.0		WBG-	rootlets through
	1.0	10YR 7/6 yellow silty-clay, moist, soft, loose, no plasticity	0.0ppm		4048	
						11-3-00 CC

47

HTRW DRILLING LOG

DISTRICT: Louisville		HOLE NUMBER: WBG-296
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG	
5. NAME OF DRILLER: n/A	6. MANUFACTURERS DESIGNATION OF DRILL: n/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS bowl, SS spoon, SS 3" auger w/ extention	8. HOLE LOCATION: contig. location N 563033.91 E 2355851.02	
	9. SURFACE ELEVATION: ~~n/A~~ 1071.63 SRA 4/27/01	
	10. DATE STARTED: 11-2-00	11. DATE COMPLETED: 11-2-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A	
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A	
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

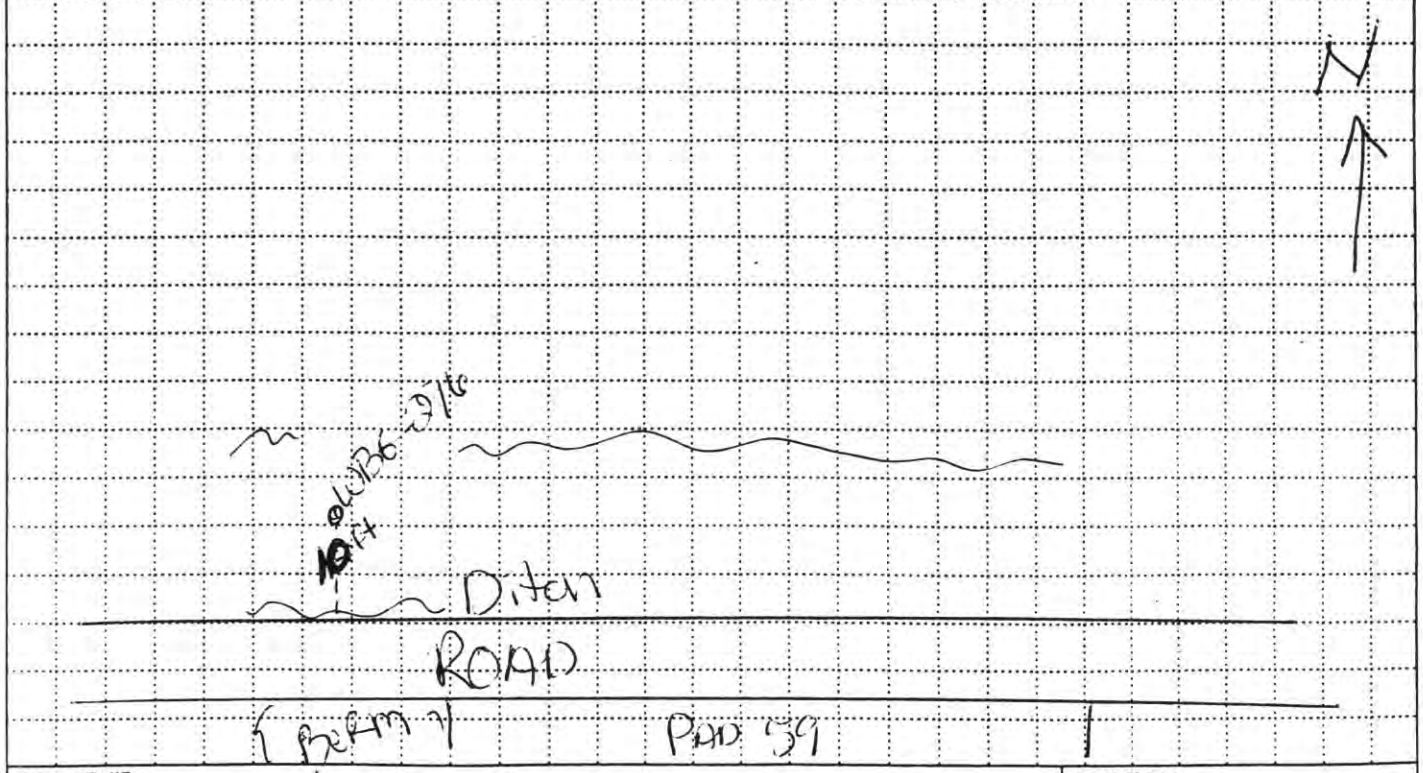
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
n/A	n/A	TAL-XRF	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	bentonite	n/A	n/A	C. Carnall

LOCATION SKETCH/COMMENTS

SCALE: not to scale

~~SEE~~ BN 11-5-00 SEE ALSO PG 54 OF "WINKLEPECK BURNING GROUNDS SOIL SAMPLING LOGBOOK 7" BN 11-5-00



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-296

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

BORING LOG

PROJECT	RVAAP WBG FS	INSPECTOR	C Carnall	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	10YR 4/3 brown, CL-lean clay, silt, soft, moist, low plasticity			WBG-	earthworms, rootlets
	1.0	10YR 6/1 gray mottled w/ 10YR 7/8 yellow CL-Lean Clay, fine poor sorted sand, gravel up to 3mm, soft to firm, low plasticity, damp, sub rounded gravel up to 20mm	0.0 ppm	N/A	4315	~~earth~~

11-4-04 CC

PROJECT: RVAAP WBG FS A-194

HOLE NO: WBG 2916

54

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: n/A	DISTRICT: Louisville
		HOLE NUMBER: WBG-297
		SHEET 1 OF 5

3. PROJECT: RVAAP WBG FS	4. LOCATION: WBG
5. NAME OF DRILLER: n/A	6. MANUFACTURER'S DESIGNATION OF DRILL: n/A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS spoon; SS bowl; SS 3" Auger extention	8. HOLE LOCATION: Contis. location N 563048.91 E 2355815.77
	9. SURFACE ELEVATION: ~~n/A~~ 1073.16 SRA 4/27/01
	10. DATE STARTED: 11-2-00 — 11. DATE COMPLETED: 11-2-00
12. OVERBURDEN THICKNESS: n/A	15. DEPTH GROUNDWATER ENCOUNTERED: n/A
13. DEPTH DRILLED INTO ROCK: n/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: n/A
14. TOTAL DEPTH OF HOLE: 0-1.0ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): no water in hole

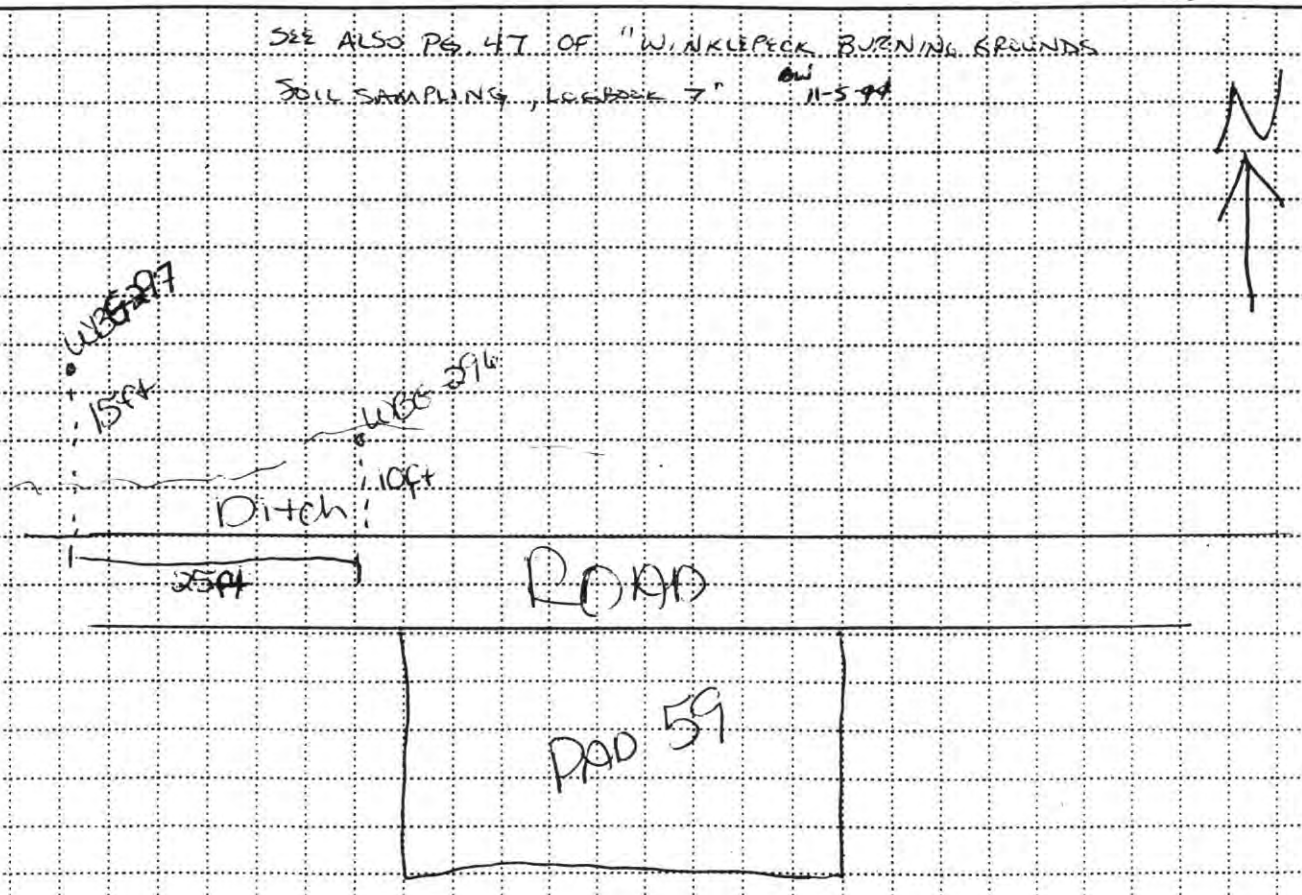
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
n/A	n/A	n/A	n/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
n/A	n/A	XRF-TAL	Explosives	n/A	n/A	n/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
n/A	Bentonite	n/A	n/A	C. Carroll

LOCATION SKETCH/COMMENTS — SCALE: not to scale

See also pg. 47 of "Winklepeck Burning Grounds Soil Sampling, Logbook 7" dw 11-5-99



PROJECT	HOLE NO.
RVAAP WBG FS	WBG-297

DRILLING LOG

PROJECT	RVAAP WB6 T5	INSPECTOR	C. Carroll	SHEET	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.5	10YR 4/3 brown, CL-Lean to sandy, very soft, subrounded gravel 1 mm to 15 mm to a subangular, low plasticity, moist	0.4 ppm		WB6-4316	
	1.0	10YR 7/2 light gray mottled w/ 10YR 7/8 yellow CL-Lean clay fine poorly sorted Sands, Gravel subangular to subrounded up to 35 mm, moist, med plasticity soft	0.4 ppm			

11-4-96 CC

PROJECT RVAAP WB6 T5 A-196

HOLE NO WB6-297

53

APPENDIX B

SEDIMENT SAMPLING LOGS

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Appendix B
Sediment Sampling Logs Locator Sheet

Sampling Site Number	Page Number
WBG-294	B-5
WBG-295	B-7

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	DISTRICT: LOUISVILLE
		HOLE NUMBER: WBG-294
		SHEET 1 OF SHEETS 2

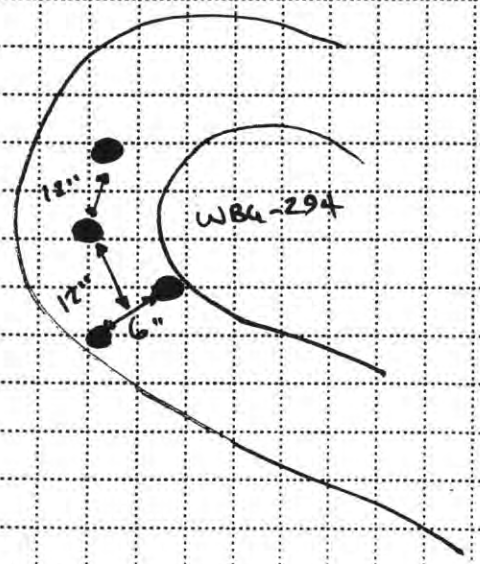
3. PROJECT: RVAAP WBG FS	4. LOCATION: ~~SWMU-24-DP~~ WBG-294 WINKLEPECK BURNING GROUNDS
5. NAME OF DRILLER:	6. MANUFACTURERS DESIGNATION OF DRILL: N/A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS BOWL; SS SPOON; 3" SS AUGER W/ EXTENTION	8. HOLE LOCATION: SEDIMENT N 5633303.27 E 2356280.64
	9. SURFACE ELEVATION: ~~N/A~~ 1047.53 SRA 4/27/01
	10. DATE STARTED: 10-24-00 / 11. DATE COMPLETED: 10-24-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: 0-0.5 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NO WATER IN HOLES

18. GEOTECHNICAL SAMPLES: N/A	(X) DISTURBED: GRAIN SIZE	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: N/A			
20. SAMPLES FOR CHEMICAL ANALYSIS: N/A	VOC	METALS: TAL, XRF	OTHER (SPECIFY): SVOC, PCB	OTHER (SPECIFY): EXPLOSIVES, PROPELLANTS, CN	OTHER (SPECIFY): PESTICIDES	21. TOTAL CORE RECOVERY: N/A %
22. DISPOSITION OF HOLE: N/A	BACKFILLED: Bentonite	MONITORING WELL: N/A	OTHER (SPECIFY): N/A	23. SIGNATURE OF INSPECTOR: B. Williams		

LOCATION SKETCH/COMMENTS

SCALE: NOT TO SCALE

SEE ALSO PAGE 5 OF "WINKLEPECK BURNING GROUNDS FS SOIL SAMPLING LOGBOOK" FOR ADDITIONAL REFERENCE



PROJECT: RVAAP WBG FS	HOLE NO: WBG-294

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DIGGING LOG

13

PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	B. Williams	2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.25 0.5	2.5Y 4/3 OLIVE BROWN SAND/SILT WITH CLAY FINE TO MED. GRAIN SAND VERY SOFT, WET, MED TO HIGH PLASTICITY	PID NOT WORKING CORRECTLY DUE TO HIGH HUMIDITY	N/A	WBG-4249	

11-8 ~~00~~ CC

PROJECT: RVAAP WBG FS

HOLE NO: WBG-294

HTRW DRILLING LOG

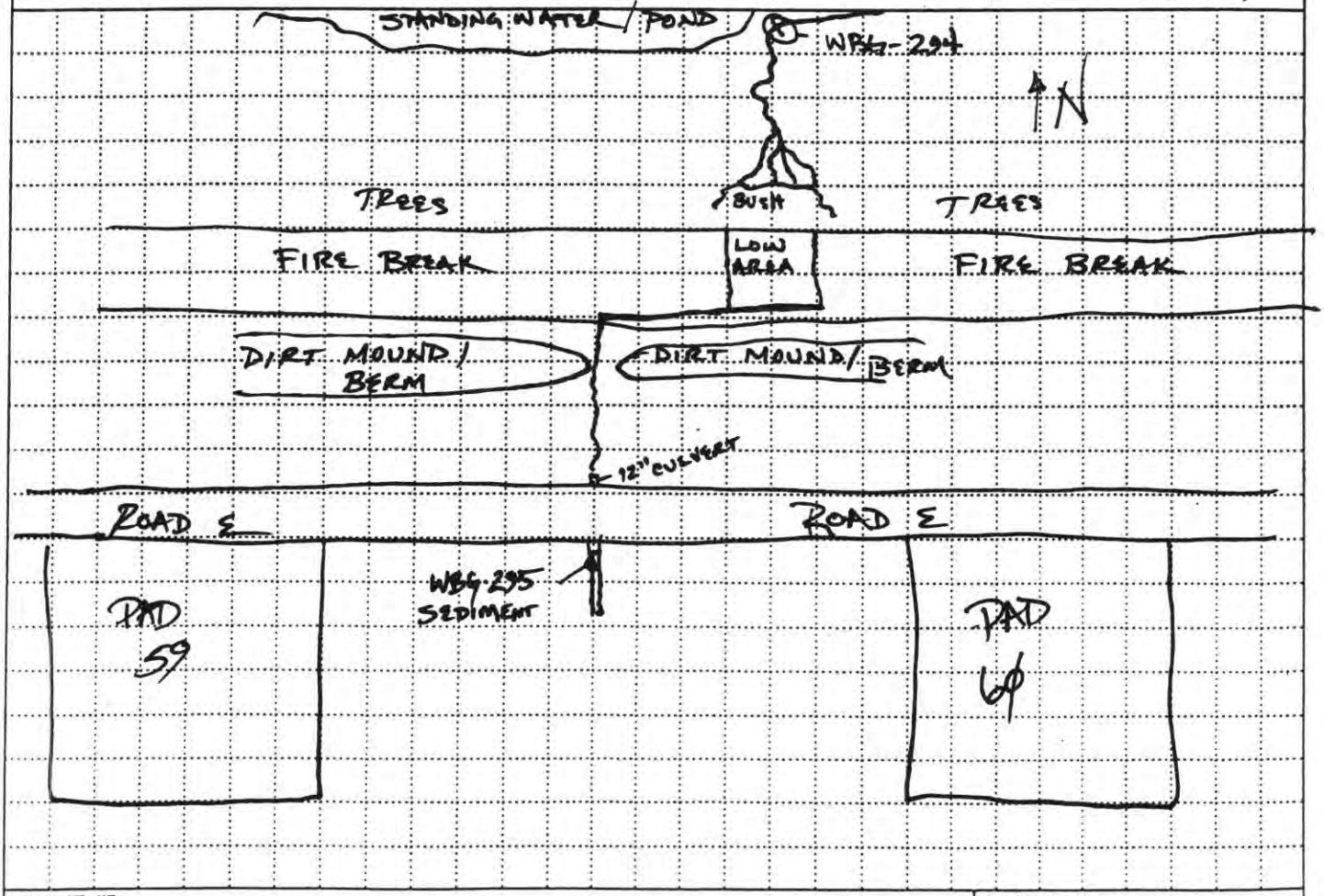
DISTRICT: LOUISVILLE		HOLE NUMBER: WBG-295
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2 SHEETS
3. PROJECT: RVAAP WBG FS	4. LOCATION: WINKLEPEEK BURNING GROUNDS	
5. NAME OF DRILLER: N/A	6. MANUFACTURERS DESIGNATION OF DRILL: N/A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: SS SPOON; SS BOWL; 3" SS AUGER W/ EXTENTION	8. HOLE LOCATION: SEDIMENT N 563002.64 E 2356156.81	
	9. SURFACE ELEVATION: NAE 1063.79 SRA 4/23/01	
	10. DATE STARTED: 10-24-00	11. DATE COMPLETED: 10-24-00
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 0-0.5 FT, AW 10-24-00	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 5 INCHES OF WATER (DEPTH)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	GRAIN SIZE N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
TOC, Cr+6, SVOC, PCB		BW METALS, XRF, EXPLOSIVES		PROPELLANTS, GC, PESTICIDE		N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
N/A	Bentonite	X N/A	X N/A	B. Williams

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO
RVAAP WBG FS	WBG-295

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	INSPECTOR	SHEET
RVAAP WBG FS	B. Williams	2 OF 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		2.5Y 7/1 LIGHT GRAY MOTTLED WITH 10YR 6/8 BROWNISH YELLOW - CL- LEAN CLAY W/SILT AND FINE POORLY SORTED SANDS, WET, SOFT, MED TO HIGH PLASTICITY	PID NOT WORKING CORRECTLY DUE TO HIGH HUMIDITY	N/A	WBG-425Φ	
	Φ.25					Φ.25
	Φ.5	GRAVEL - SUBROUNDED UP TO 2ΦMM				Φ.5
						11-8 ΦCC

APPENDIX C

MONITORING WELL INSTALLATION LOGS

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Appendix C
Monitoring Well Installation Logs Locator Sheet

Sampling Site Number	Page Number
WBGMW-010	C-7
WBGMW-011	C-13
WBGMW-012	C-19
WBGMW-013	C-25
WBGMW-014	C-31
WBGMW-015	C-37
WBGMW-016	C-43
WBGMW-017	C-49

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COMPREHENSIVE WATER LEVEL MEASUREMENTS

PROJECT NAME: Winklepeck Burning Grounds — DELIVERY ORDER NO: CY08

WELL NUMBER	DATE	TIME	DEPTH TO WATER *	INSTRUMENT	SERIAL NO.	REMARKS
OBG-1	10.30.00	1449	6.51'	SOLINST 6896		TD = 17.41'
OBG-2	10.30.00	1438	8.73'	"	6896	TD = 20.05'
OBG-3	10.30.00	1400	7.21'	"	"	TD = 19.90'
OBG-4	10.30.00	1422	7.31'	"	"	TD = 18.90'
WBGmw-005	10.30.00	1100	7.48'	"	3435	TD = 196'
WBGmw-006	10 30.00	1112	9.72'	"	3435	TD = 17.88'
WBGmw-007	10.30.00	1124	18.50'	"	3435	TD = 23 80'
WBGmw-008	10 30.00	1136	15.70'	"	3435	TD = 1854'
WBGmw-009	" " "	1148	15.70'	"	3435	TD = 21.50'
WBGmw-010	10.30 00	1536	9.33'	"	"	
WBGmw-011	" " "	1530	11.92	"	"	
WBGmw-012	10.30.00	1525	24.6'	"	"	
WBGmw-013	" " "	1522	12.74'	"	"	
WBGmw-014	" " "	1542	17.25			
WBGmw-015	" "	1547	12.91'			
WBGmw-016			18.46'			TD = 24.24'

* All measurements from V-notch top of casing (OR NORTH SIDE OF MANHOLE FOR FLUSH-MOUNTS W/O NOTCH

RECORDED BY: KL Dimmick 10.30.00
(Signature and Date)

QA CHECK BY: Julie Brumbach 10-8-01
(Signature and Date)

COMPREHENSIVE WATER LEVEL MEASUREMENTS

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: CY08

WELL NUMBER	DATE	TIME	DEPTH TO WATER *	INSTRUMENT	SERIAL NO.	REMARKS
WBG,mw-017	10.30.00	1415	18.46'	SOLINST	3435	TD - 23.84'

vjb 10-8-01

C-6

* All measurements from V-notch top of casing

RECORDED BY: Kathy Dominic 10/30/00 by vjb
(Signature and Date)

QA CHECK BY: Vicki Borumbaha 10-8-01
(Signature and Date)

HTRW DRILLING LOG

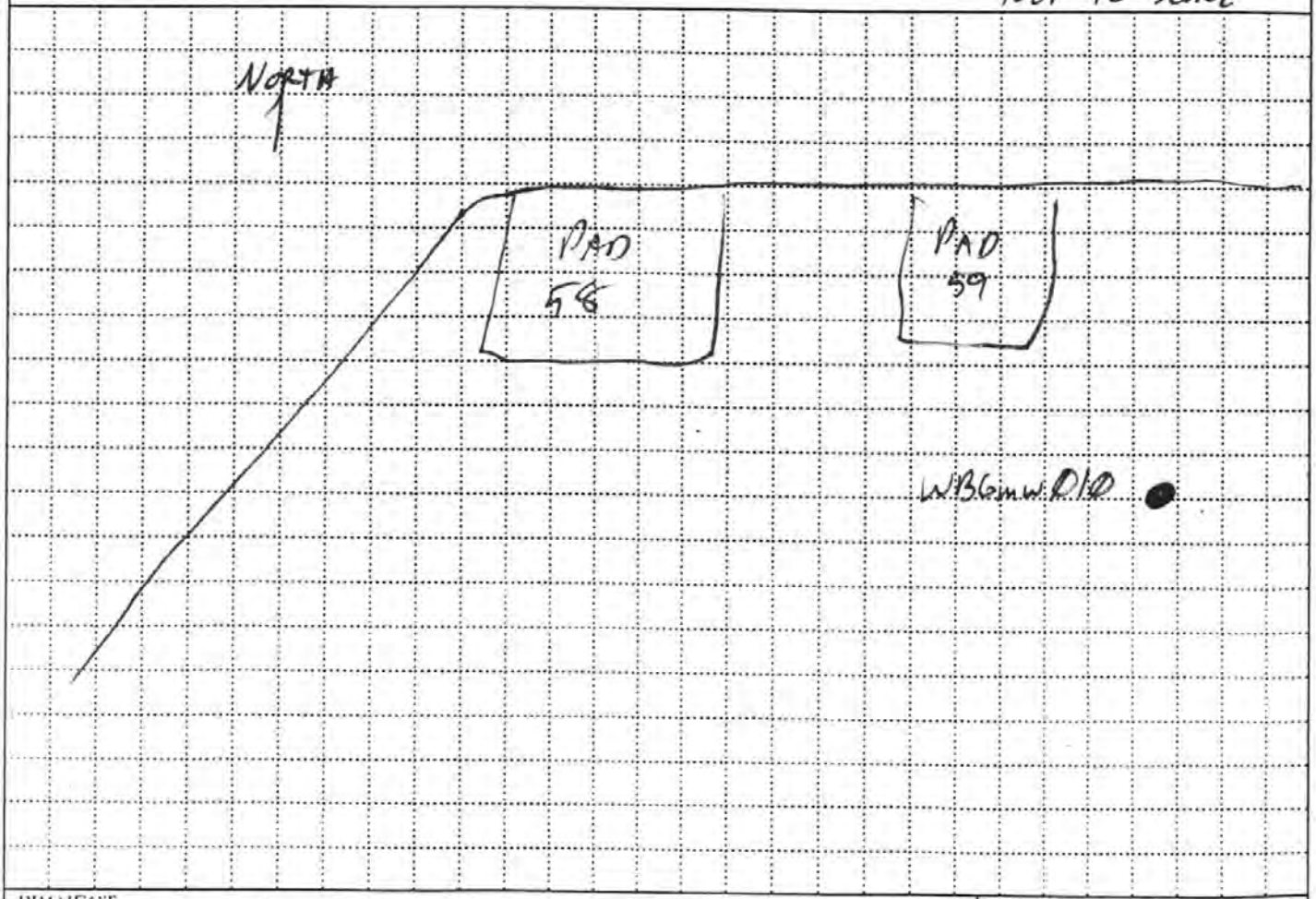
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: TOLTEST, INC.	HOLE NUMBER: WBG mw 010 83
		SHEET 1 OF 1 SHEETS
3. PROJECT: RVAAP: WBG/FS	4. LOCATION: WBG	
5. NAME OF DRILLER: NEAL WIKTOR	6. MANUFACTURERS DESIGNATION OF DRILL: CME 75 HSA	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" HSA'S, 2' SPLIT SPOONS	8. HOLE LOCATION: WBG mw 010 N 562893.20 E 2356051.96	
	9. SURFACE ELEVATION: 1067.1 SRA 4/27/01	
	10. DATE STARTED: 10/20/00	11. DATE COMPLETED:
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: ~~NA 11/7/00 10.9'~~ 16.24'	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: ~~NA~~ 11.62	
14. TOTAL DEPTH OF HOLE: 21'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	0	NA	NA	NA	NA	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	✓	NA	

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO.
RVAAP: WBG/FS	WBG mw 010

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	RVAAP: WB6 /FS	INSPECTOR	BOABELN	HOLE NO.	WB6 MW 010
				SHEET	1 of 3

ELEV (A)	DEPTH (Ft) (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	MH ELASTIC SILT W/SAND - FINE SAND . MOTTLES YELLOWISH BROWN (10YR 5/6) WITH GRAY (10YR 6/1) MOTTLES - DRY	PID = 0ppm	1-3' SHELBY TUBE		0-2' RECOVERY = 1.1/2.0' PENETROMETER = 4.0
	2.0					2.0-4.0' RECOVERY 1.3/2.0
	4.0					4.0-6.0' RECOVERY = 1.7/2.0
	6.0					6.0-8.0' RECOVERY = 1.7/2.0'
	8.0					8-10' RECOVERY = 2.0/2.0'
	10.0	CL LEAN CLAY W/SILT AND SOME FINE SAND - DRY GRAYISH BROWN (10YR 5/2)	PID = 0ppm			PENETROMETER > 4.5

PROJECT RVAAP: WB6 /FS

HOLE NO WB6 MW 010

DRILLING LOG

PROJECT: RVAAP: WB6/FS | INSPECTOR: B.G. ABELIN | HOLE NO: WB6MW010 | SHEET: 2 of 3

ELEV (A)	DEPTH (FT)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		D				10-12 RECOVERY = .65/2.0'
		ML SILT W/FINE SAND - WET GRAYISH BROWN (10YR 5/2)	P.I.D = 0ppm			PENETROMETER = 1.0
	12.0					12'-14' RECOVERY = 1.6'/2.0
		SP-SM POORLY GRADED MED. SAND W/SILT - WET DARK YELLOWISH BROWN (10YR 4/4)	P.I.D = 0ppm			PENETROMETER = NA
	14.0					14'-16' RECOVERY 1.6'/2.0
				BGA 10/20/00		
	16.0	~~ML SILT W/FINE SAND~~ ~~WET~~ ~~DARK GRAY~~ BGA 10/20/00 ~~(10YR 4/1)~~				~~PENETROMETER = 1.5~~ 16'-18' RECOVERY 1.9'/2.0
		ML SILT W/FINE SAND - WET DARK GRAY (10YR 4/1)	P.I.D = 0ppm			18'-20' RECOVERY = 1.7'/2.0 PENETROMETER = 1.5
	18.0					
	20.0					

PROJECT: RVAAP: WB6/FS | HOLE NO: WB6 MW 010

DRILLING LOG

PROJECT	RVAAP: WBG/FS	INSPECTOR	BG ABELN	HOLE NUMBER	WBG MW 010
				SHEET	3 of 3

8 to

ELEV (A)	DEPTH (FT)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
						20-21' RECOVERY 1/1
		BOTTOM OF BOREHOLE				
	22.0					
	24.0					
	26.0					
	28.0					
	30.0					

PROJECT: RVAAP: WBG/FS

HOLE NO: WBG mw 010

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MONITORING WELL INSTALLATION LOG

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER: CY08**

MONITORING WELL ID: WB6 MW 010

INSTALLATION START: DATE: 10/20/00 TIME: 0830

INSTALLATION FINISH: DATE: _____ TIME: _____

ANNULAR SPACE MATERIALS INVENTORY:

GRANULAR FILTER PACK: TYPE: GLOBAL #7 SAND QUANTITY: ~~6~~ 5/50 LB BAGS SET 10/20/00

BENTONITE SEAL: TYPE: ~~VOLCLAY/PORTGOLD 3/8"~~ BG4 10/20/00 CETCO 1/4" COATED TABLETS QUANTITY: 1 GALS / VOLCLAY/PORTGOLD .5 GAL DSI SHUR-PLL 3/8" GAL

GROUT: TYPE: _____ QUANTITY: _____

DESCRIPTION OF WELL SCREEN:

SLOT SIZE (inches): .01 SLOT CONFIGURATION: HORIZONTAL

TOTAL OPEN AREA PER FOOT OF SCREEN: _____

OUTSIDE DIAMETER: 2.3" NOMINAL INSIDE DIAMETER: 2.0"

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

TYPE OF MATERIAL BETWEEN BOTTOM OF BORING AND SCREEN: GLOBAL #7 SAND

DESCRIPTION OF WELL CASING:

OUTSIDE DIAMETER: 2.3' NOMINAL INSIDE DIAMETER: 2.0"

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

JOINT DESIGN AND COMPOSITION: MANUFACTURED FLUSH THREADED

CENTRALIZERS DESIGN AND COMPOSITION: NA.

DESCRIPTION OF PROTECTIVE CASING:

NOMINAL INSIDE DIAMETER: 8.0' COMPOSITION: STEEL

SPECIAL PROBLEMS ENCOUNTERED DURING WELL CONSTRUCTION AND THEIR RESOLUTION:

_____

Was all well screen and casing material used for construction free of foreign matter (e.g., adhesive tape, labels, soil, grease, etc.)? YES [✓] NO [ ]

Was all well screen and casing material used for construction free of unsecured couplings, ruptures, and other physical breakage and/or defects? YES [✓] NO [ ]

Is deformation or bending of the installed well screen and casing minimized to the point of allowing the insertion and retrieval of a 1.0-inch bailer throughout the entire length of the completed well? YES [✓] NO [ ]

QUANTITY OF APPROVED WATER USED FOR FILTER PACK ENPLACEMENT: _____

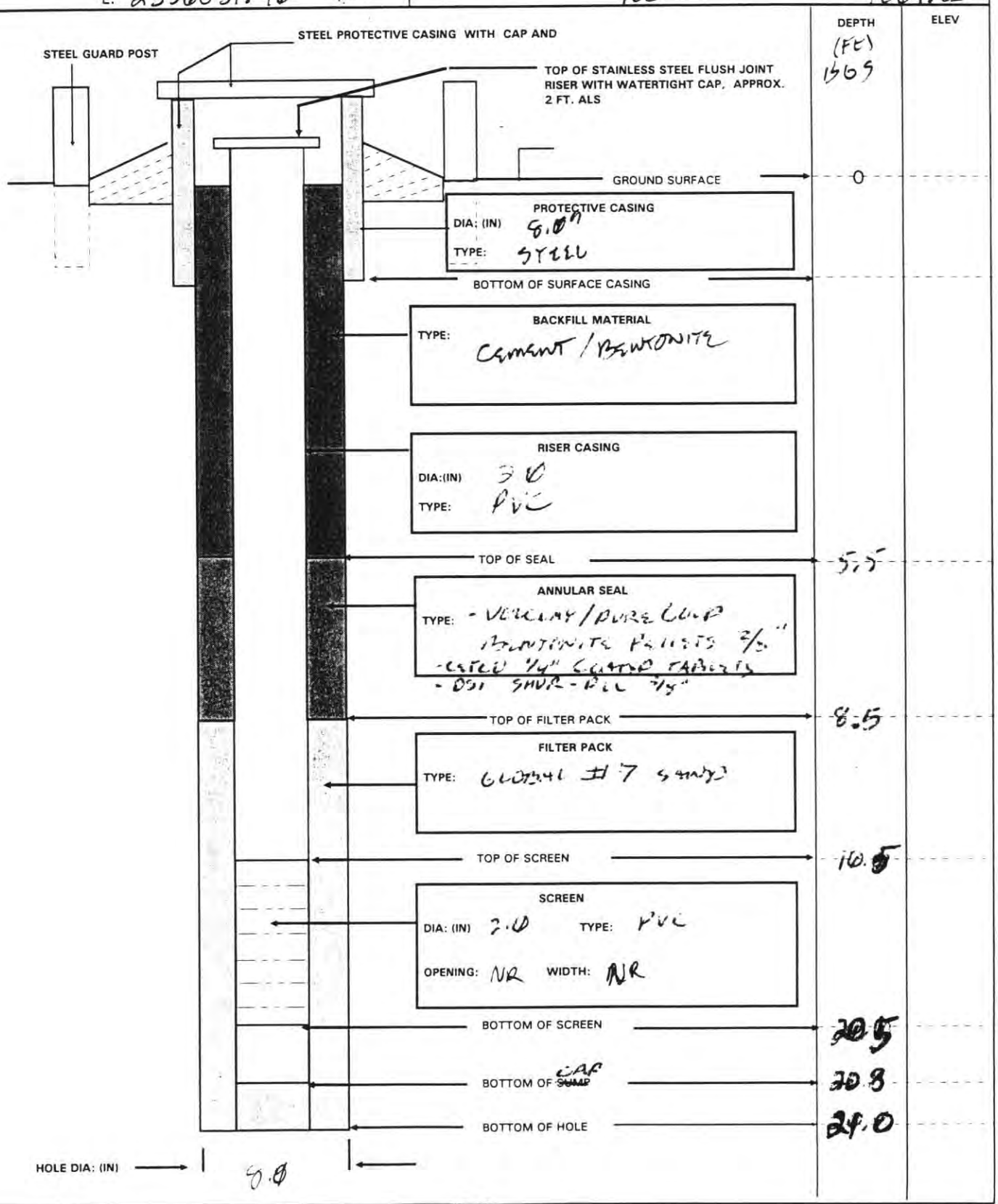
RECORDED BY: Brooks Abelin 10-20-00 (Signature & Date) vjb

QA CHECK BY: [signature] 10-9-01 (Signature & Date)

MONITORING WELL

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO:** CY08

WELL NUMBER: WBG mw-01C	**BEGIN:** 10/20/00 0530	**END:**
COORDINATES: N: 562893.20 E: 2356051.96 SRA 4/27/01	**REFERENCE POINT:** ground surface TOC	**ELEVATION:** 1067.1 / 1069.85



HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: TOLTEST, INC	HOLE NUMBER: WBG mw 011
		SHEET 1 OF 1

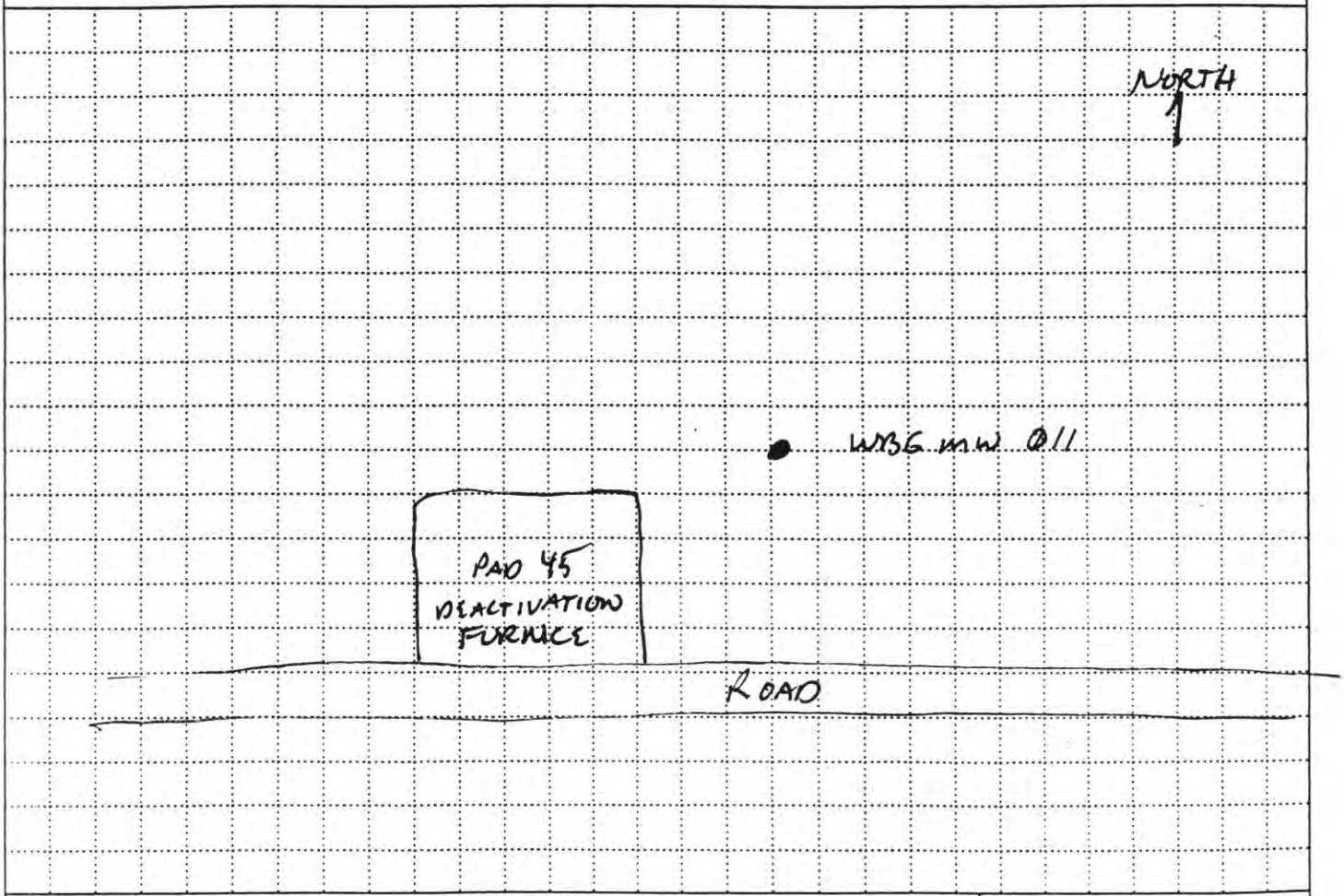
3. PROJECT: RVAAP: WBG/FS	4. LOCATION: WB6
5. NAME OF DRILLER: NEAL WIKTOR	6. MANUFACTURERS DESIGNATION OF DRILL: CME 75 HSA
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 1/4" HSA's, 2" SPLIT SPOON	8. HOLE LOCATION: WB6 mw 011 N 562609.18 E 2356187.29
	9. SURFACE ELEVATION: ~~AAE~~ 1069.7 SRA 4/27/01
	10. DATE STARTED: 10/19/00 — 11. DATE COMPLETED: 10/25/00
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 17.32
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA
14. TOTAL DEPTH OF HOLE: 18.04'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	✓		Bob Clark

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO
RVAAP: WBG/FS	WBG mw 011

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET
RVAAP: WBG / FS	B G ABELN	MW 011	1 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.0	MH ELASTIC SILT w/ FINE SAND -DRY -YELLOWISH BROWN (10YR 5/6) w/LIGHT GRAY (10YR 7/1) MOTTLES	PID=0			0-2 RECOVERY = 2/2'
	2.0					2-4 RECOVERY = 1.2/2'
	4.0					4-6 RECOVERY = 1.85/2.0
	6.0					6-8' RECOVERY = 1.6/2.0
	8.0'	SP-SM POORLY GRADED MED. SAND W/SILT AND FINE SUB-ROUNDED GRAVEL BROWN (10YR 4/3) -DRY				8-10 RECOVERY = 2/2'
	10.0	▽				

DRILLING LOG

HOLE NUMBER MW011

PROJECT RVAAP: WBG/FS | INSPECTOR BG ABELN | SHEET 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		WET	PID=0			12-12' Recovery - 1.3/2
	12.0	SP-SM POORLY GRADED MED SAND W/SILT AND FINE ROUNDED GRAVEL - WET DARK YELLOWISH BROWN (10 YR 4/0)	PID=0			12-14 Recovery = 2/2
	14.0	SP-SM POORLY GRADED MED SAND W/SILT GRAY (10YR 5/1)	PID=0			14/16' Recovery = 1.5/2.0
	16.0	SP-SM POORLY GRADED MED SAND W/SILT YELLOWISH BROWN (10 YR 5/4)	PID=0			16-18 Recovery = 2/2.
	18.0					
		ML SILT W/FINE SAND - WET DARK GRAY (10YR 4/1)	PID=0			18-20 Recovery = 2/2
	20.0					

PROJECT RVAAP: WBG/FS C-15 HOLE NO WBG MW 011 (NEW WELL)

DRILLING LOG

PROJECT	INSPECTION	HOLE NUMBER	SHEET
RVAAP: WBG/FS	BGABELN	MW 011	3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
						20-22 RECOVERY = 2/2
	22'	BOTTOM OF BOREHOLE				

PROJECT: RVAAP: WBG/FS

HOLE NO: WBG MW 011 (NEW WELL)

MONITORING WELL INSTALLATION LOG

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER:** CY08

MONITORING WELL ID: WBG mw 011

INSTALLATION START: DATE: 10/19/00 TIME: 0930

INSTALLATION FINISH: DATE: 10/21/00 TIME: NOT

ANNULAR SPACE MATERIALS INVENTORY:

GRANULAR FILTER PACK: TYPE: GLOBAL #7 SAND QUANTITY: 4/50 LB BAGS

BENTONITE SEAL: TYPE: VOLCLAY/PURE GOLD 3/8" QUANTITY: 1.5 GAL

GROUT: TYPE: I PORTLAND - CANTON QUANTITY: NA

DESCRIPTION OF WELL SCREEN:

SLOT SIZE (inches): .01 SLOT CONFIGURATION: HORIZONTAL

TOTAL OPEN AREA PER FOOT OF SCREEN: NR

OUTSIDE DIAMETER: 2.3" NOMINAL INSIDE DIAMETER: 2.0"

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

TYPE OF MATERIAL BETWEEN BOTTOM OF BORING AND SCREEN: GLOBAL #7

DESCRIPTION OF WELL CASING:

OUTSIDE DIAMETER: 2.3" NOMINAL INSIDE DIAMETER: 2.0"

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

JOINT DESIGN AND COMPOSITION: MANUFACTURED THREADED FLUSH

CENTRALIZERS DESIGN AND COMPOSITION: NA

DESCRIPTION OF PROTECTIVE CASING:

NOMINAL INSIDE DIAMETER: 8.0 COMPOSITION: STEEL

SPECIAL PROBLEMS ENCOUNTERED DURING WELL CONSTRUCTION AND THEIR RESOLUTION:

NA

Was all well screen and casing material used for construction free of foreign matter (e.g., adhesive tape, labels, soil, grease, etc.)? YES [✓] NO [ ]

Was all well screen and casing material used for construction free of unsecured couplings, ruptures, and other physical breakage and/or defects? YES [✓] NO [ ]

Is deformation or bending of the installed well screen and casing minimized to the point of allowing the insertion and retrieval of a 1.0-inch bailer throughout the entire length of the completed well? YES [✓] NO [ ]

QUANTITY OF APPROVED WATER USED FOR FILTER PACK ENPLACEMENT: NA

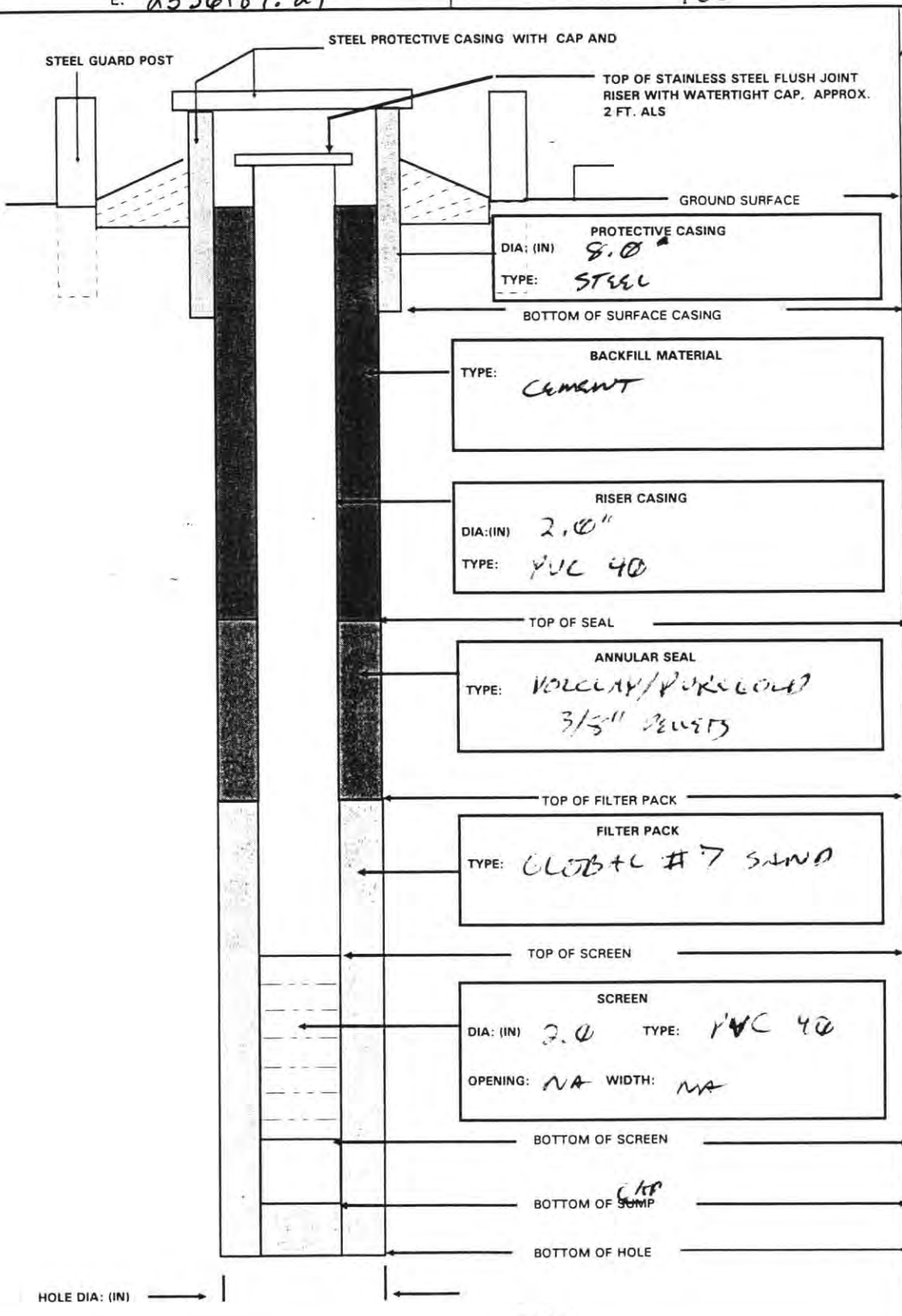
RECORDED BY: [signature] 11/08/00 (Signature & Date)

QA CHECK BY: KD 11.08.00 (Signature & Date)

MONITORING WELL

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: CY08

WELL NUMBER: WBG mw - 011	BEGIN: 10/19/00	END: 10/21/00	
COORDINATES: N: 562~~787.20~~609.18 E: 2356187.29	REFERENCE POINT: ground sfc TOC	ELEVATION: 1069.7 1072.38	



~~DEPTH~~ ABANDONED WELL (FT)	ELEV NEW WELL (FT) (MSL)
0	0
	5
.7'	5.7'
3.7'	8.9'
7.0'	11.0'
17.0'	21.0'
	21.3'
15.04'	22.0'

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: TOLTEST	HOLE NUMBER: WBG-MW-012
	DISTRICT: LOUISVILLE COE	SHEET 1 OF 1

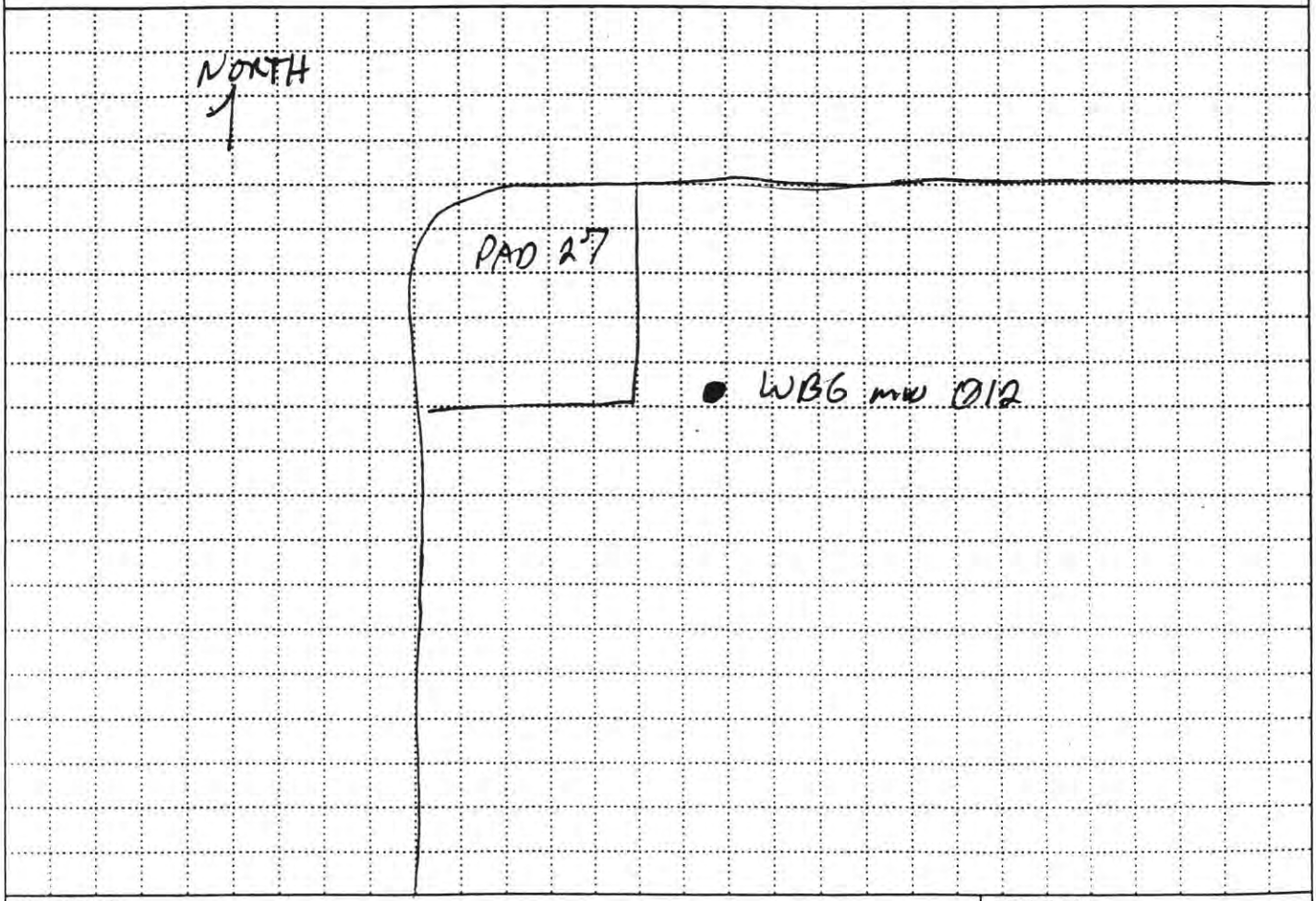
3. PROJECT: RVAAP: WBG/FS	4. LOCATION
5. NAME OF DRILLER: NEAL WIKTOR	6. MANUFACTURERS DESIGNATION OF DRILL: CME 75 HSA
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2' SPLIT SPOONS, 4"1/4" AUGERS	8. HOLE LOCATION: WBG N 562240.90 E 2354810.65
	9. SURFACE ELEVATION: 1076.5 SRA 4/27/01
	10. DATE STARTED: 10/19/00 — 11. DATE COMPLETED: 10/23/00
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 29.7
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 27.8
14. TOTAL DEPTH OF HOLE: 30'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A	0 ppm	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
NA	NA	—	NA	B. Wikter

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO
RVAAP: WBG/FS	WBG MW-012

DRILLING LOG

PROJECT	INSPECTOR	SHEET
RVAAP: WBG/FS	BG-ABELN	1 of 3

WBG MW 012

7R

ELEV (A)	DEPTH (B) (FT)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	2.0	MH ELASTIC SILT W/CLAY MOTTLES DRY YELLOWISH BROWN (10YR 5/4) WITH GRAY (10YR 4/1) MOTTLES	PID: 0 ppm			0-2' RECOVERY = 1.3/2.0 PENETROMETER = 2.75
	4.0	SP-SM POORLY GRADED FINE SAND W/SILT - DRY YELLOWISH BROWN (10YR 5/4)	PID: 0 ppm			2-4' RECOVERY, 1.7/2.0 PENETROMETER = 2.5
	6.0	MH ELASTIC SILT W/SAND - FINE SAND - DRY - SOME SUB-ROUNDED FINE GRAVEL BROWN (10YR 4/3)	PID - 0 ppm			4'-6 RECOVERY = 1.6/2.0 PENETROMETER > 4.5
	8.0					6-8' RECOVERY 1.6/2.0
	10.0					8-10' RECOVERY = 1.8/2.0

PROJECT: RVAAP: WBG/FS

HOLE NO: WBG MW 012

DRILLING LOG

BOREHOLE 012

PROJECT RVAAP: WBG/FS | INSPECTOR B. ABELL | SHEET 2 of 3

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ELEV (A)	DEPTH (FT) (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
						10'-12' RECOVERY = 1.5'/2.0
	12.0					12-14' RECOVERY 1.45'/2.0
	14.0					14-16' RECOVERY 1.7'/2.0
		SP POORLY GRADED MED SAND W/GRAVEL - DRY - LIGHT YELLOWISH BROWN	PID = 0ppm			
	16.0	MH ELASTIC SILT W/SAND (FINE) AND FINE SUB ROUNDED GRAVEL -DRY YELLOWISH BROWN (10YR 5/4)	PID: 0ppm			PENETROMETER > 4.5
		SP-SM POORLY GRADED MED. SAND WITH SILT AND SOME FINE SUB-ROUNDED GRAVEL -MOIST - DARK YELLOWISH BROWN (10YR 4/4)	PID: 0ppm			16-18' RECOVERY 1.3'/2.0
	18.0					
		SP-SM POORLY GRADED FINE SAND W/SILT AND SOME CLAY -DARK YELLOWISH BROWN (10YR 4/4)	PID: 0ppm			PENETROMETER > 4.5
	20.0					

PROJECT RVAAP: WBG/FS

BOREHOLE NO WBG0012

DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER MW 012
		SHEET 3 of 3

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	20.0	BGA 10/14/00		BGA 10/14/00		20-22 Recovery 2/2 BGA 10/14/00
		MH ELASTIC SILT w/Fine SAND - DRY	P.I.D-0ppm			
	22.0					22-24' Recovery = 1.5'/2.0 Penetrometer 4.5
	24.0	SP-SM POORLY GRADED MED SAND w/ SILT - MOIST DARK YELLOWISH BROWN (10YR 4/6)	P.I.D-0ppm			Penetrometer = 1.0 24-26' Recovery.
	26.0	MH ELASTIC SILT DARK GRAY (2.5Y 4/1) - DRY	P.I.D-0ppm			Penetrometer > 4.5 26'-28' Recovery = 2.0/2.0
	28.0	SP-SM POORLY GRADED MED. SAND w/SILT - MOIST DARK YELLOWISH BROWN (10YR 4/6)	P.I.D=0ppm			28'-30' Recovery = 1.6/2.0
	30.0					

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MONITORING WELL INSTALLATION LOG

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER: CY08**

MONITORING WELL ID: WBGMW 012

INSTALLATION START: DATE: 10/19/00 TIME: 1400

INSTALLATION FINISH: DATE: 10/25/00 TIME: 1200

ANNULAR SPACE MATERIALS INVENTORY:

GRANULAR FILTER PACK: TYPE: GLOBAL #7 SAND QUANTITY: 11 / BAGS

BENTONITE SEAL: TYPE: VOLCLAY / PURE GOLD QUANTITY: 2 GAL

GROUT: TYPE: Cement - bentonite QUANTITY: NA SRA 12/10/04

DESCRIPTION OF WELL SCREEN:

SLOT SIZE (inches): .01 SLOT CONFIGURATION: HORIZONTAL

TOTAL OPEN AREA PER FOOT OF SCREEN: NR

OUTSIDE DIAMETER: 2.3" NOMINAL INSIDE DIAMETER: 2.0"

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

TYPE OF MATERIAL BETWEEN BOTTOM OF BORING AND SCREEN: GLOBAL #7 SAND

DESCRIPTION OF WELL CASING:

OUTSIDE DIAMETER: 2.3" NOMINAL INSIDE DIAMETER: 2.0"

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

JOINT DESIGN AND COMPOSITION: MANUFACTURED FLUSH THREADED

CENTRALIZERS DESIGN AND COMPOSITION: NA

DESCRIPTION OF PROTECTIVE CASING:

NOMINAL INSIDE DIAMETER: 8.0' COMPOSITION: STEEL

SPECIAL PROBLEMS ENCOUNTERED DURING WELL CONSTRUCTION AND THEIR RESOLUTION:

BGA 11/8/00

Was all well screen and casing material used for construction free of foreign matter (e.g., adhesive tape, labels, soil, grease, etc.)? YES [✓] NO [ ]

Was all well screen and casing material used for construction free of unsecured couplings, ruptures, and other physical breakage and/or defects? YES [✓] NO [ ]

Is deformation or bending of the installed well screen and casing minimized to the point of allowing the insertion and retrieval of a 1.0-inch bailer throughout the entire length of the completed well? YES [✓] NO [ ]

QUANTITY OF APPROVED WATER USED FOR FILTER PACK ENPLACEMENT: NA

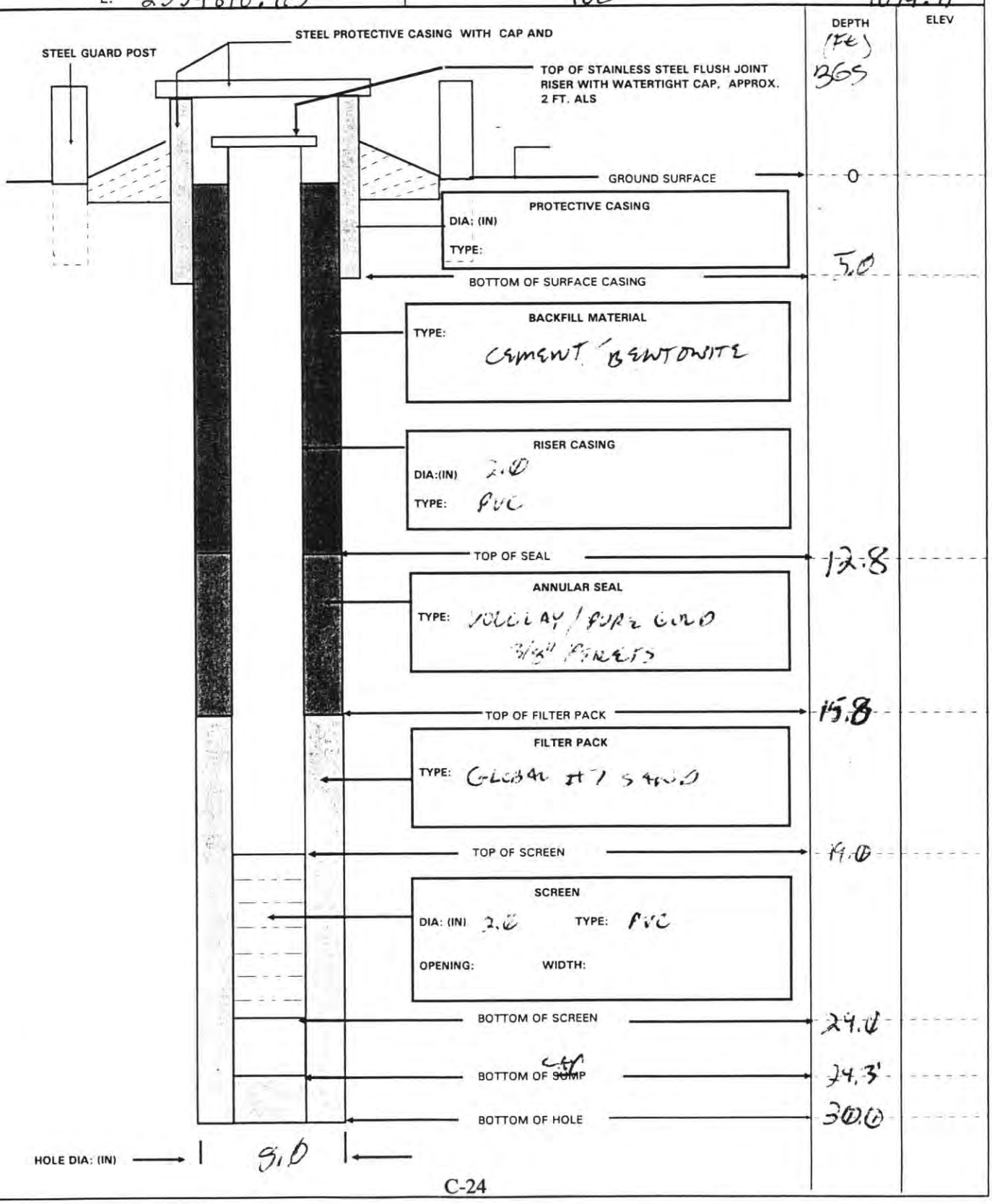
RECORDED BY: [signature] 11/8/00 (Signature & Date)

QA CHECK BY: [signature] 10-9-01 (Signature & Date)

MONITORING WELL

PROJECT NAME: Winkelpeck Burning Grounds DELIVERY ORDER NO: CY08

WELL NUMBER: WB6 mw 012	BEGIN: 10/19/00	END: 10/25/00	
COORDINATES: N: 563240.90 E: 2354810.65	REFERENCE POINT: ground surface TOC	ELEVATION: 1076.5 1079.11	



HTRW DRILLING LOG

DISTRICT: LOUISVILLE COE		HOLE NUMBER: WBG-MW-013
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: TOLTEST	SHEET 1 OF 1

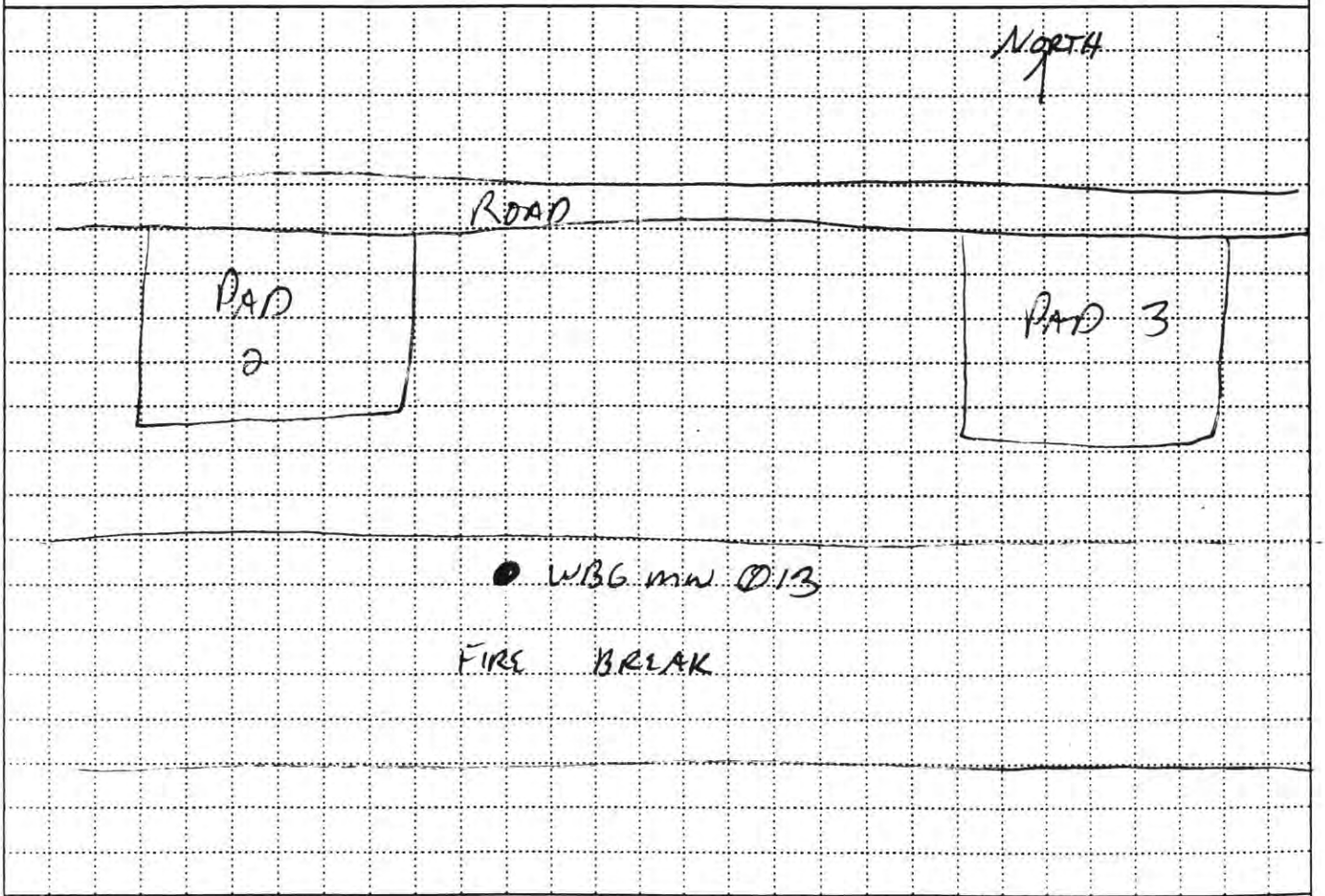
3. PROJECT: RVAAP: WBG/FS	4. LOCATION: WBG
5. NAME OF DRILLER: NEAL WIKTOR	6. MANUFACTURERS DESIGNATION OF DRILL: CME 75 HSA
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2' SPLIT SPOON, 4 1/4' AUGER	8. HOLE LOCATION: WBG MW 013 N 561518.27 E 2355223.25
	9. SURFACE ELEVATION: NA 1069.1 SRA 4/27/01
	10. DATE STARTED: 10/20/00 — 11. DATE COMPLETED: 10/25/00
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 8.5'
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 8.0'
14. TOTAL DEPTH OF HOLE: 22'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	0	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	✓	NA	B A [illegible]

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO
RVAAP: WBG/FS	WBG MW 013

DRILLING LOG

PROJECT: RVAAP: WB6/ES | INSPECTOR: [illegible] | SHEET: 1 of 3

ELEV (A)	DEPTH (B) (FT)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		SP-SM POORLY GRADED FINE SAND W/SILT AND CLAY BROWN (10YR 4/4) -DRY	PID=0ppm			0'-2' RECOVERY= 1.6/2.0 PENETROMETER>4.5
	2.0					2'-4' RECOVERY= 1.3/3.0
	4.0					4'-6' RECOVERY= 2.0/2.0
	6.0					6'-8' RECOVERY= 1.3/2.0
	8.0					8'-10' RECOVERY= 1.5'/2.0
		SP-SM POORLY GRADED MED SAND W/SILT -WET BROWN (10YR 4/4)	PID=0			PENETROMETER=NA
	12.0					

PROJECT: RVAAP: WB6/ES

HOLE NO: WB6MW013

DRILLING LOG

PROJECT	RVAAP: WBG/FS	INSPECTOR	BG ABELN	HOLE NUMBER	WBGMW013
				SHEET	2 of 3

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ELEV (A)	DEPTH (FT)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
						10-12' RECOVERY = 1.65'/2.0
		SP-SM POORLY GRADED FINE SAND W/SILT AND CLAY - MOIST BROWN (10YR 4/4)	PID = 0ppm			PENETROMETER = 4.25
	12.0	SP-SM POORLY GRADED MED. SAND W/SILT - WET - BROWN (10YR 4/4)	PID = 0ppm			12-14' RECOVERY 2.0/2.0 PENETROMETER = NA
	14.0					14-16' RECOVERY 2.0/2.0
	16.0					16-18' RECOVERY = 2.0/2.0
	18.0					18-20 RECOVERY 2.0/2.0

PROJECT RVAAP: WBG/FS

HOLE NO WBGMW-013

DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET
RVAAP: WBG/FS	BGARZON	WBG-MW-013	3 of 3

ELEV (A)	DEPTH (Ft)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
						20'-22' RECOVERY: 20/20
	22.0'	BOTTOM OF BOREHOLE				

MONITORING WELL INSTALLATION LOG

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER:** CY08

MONITORING WELL ID: WBG MW 013

INSTALLATION START: DATE: 10/20/00 TIME: 1330

INSTALLATION FINISH: DATE: 10/25/00 TIME: 1400

ANNULAR SPACE MATERIALS INVENTORY:

GRANULAR FILTER PACK: TYPE: GLOBAL #7 QUANTITY: NR

BENTONITE SEAL: TYPE: VOLCLAY/PURE GOLD QUANTITY: NR

GROUT: TYPE: CEMENT / BENTONITE I PORTLAND QUANTITY: NR

DESCRIPTION OF WELL SCREEN:

SLOT SIZE (inches): .01 SLOT CONFIGURATION: HORIZONTAL

TOTAL OPEN AREA PER FOOT OF SCREEN: NR

OUTSIDE DIAMETER: 2.3" NOMINAL INSIDE DIAMETER: 2.0"

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

TYPE OF MATERIAL BETWEEN BOTTOM OF BORING AND SCREEN: GLOBAL #7

DESCRIPTION OF WELL CASING:

OUTSIDE DIAMETER: 2.3" NOMINAL INSIDE DIAMETER: 2.0"

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

JOINT DESIGN AND COMPOSITION: MANUFACTURED FLUSH THREADED

CENTRALIZERS DESIGN AND COMPOSITION: NA

DESCRIPTION OF PROTECTIVE CASING:

NOMINAL INSIDE DIAMETER: 8.0 COMPOSITION: STEEL

SPECIAL PROBLEMS ENCOUNTERED DURING WELL CONSTRUCTION AND THEIR RESOLUTION:

BGA 11/8/00

Was all well screen and casing material used for construction free of foreign matter (e.g., adhesive tape, labels, soil, grease, etc.)? YES [✓] NO [ ]

Was all well screen and casing material used for construction free of unsecured couplings, ruptures, and other physical breakage and/or defects? YES [✓] NO [ ]

Is deformation or bending of the installed well screen and casing minimized to the point of allowing the insertion and retrieval of a 1.0-inch bailer throughout the entire length of the completed well? YES [✓] NO [ ]

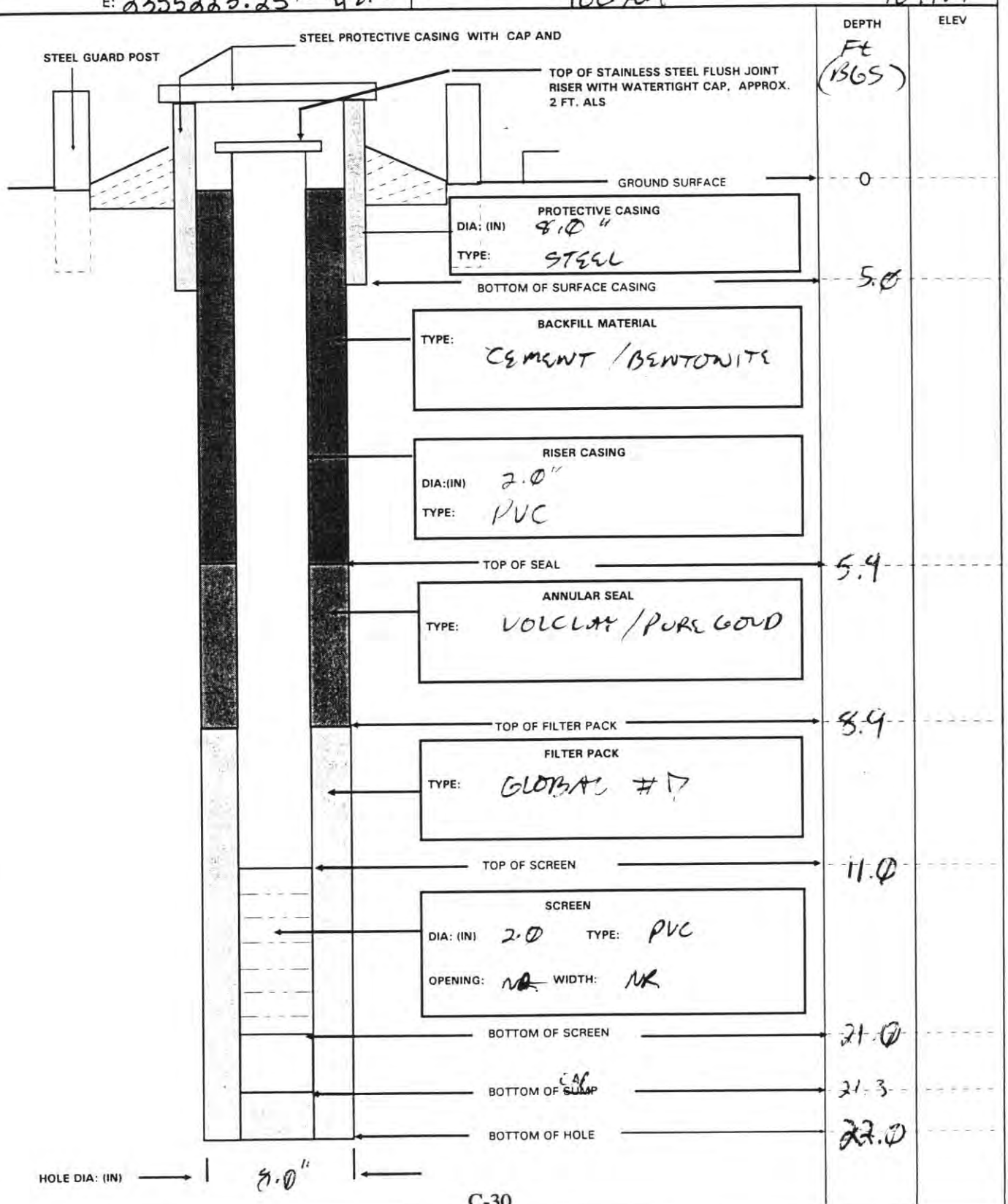
QUANTITY OF APPROVED WATER USED FOR FILTER PACK ENPLACEMENT: BG GAL

RECORDED BY: [signature] 11/8/00 (Signature & Date) QA CHECK BY: [signature] 10-9-01 (Signature & Date)

MONITORING WELL

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO.:** CY08

WELL NUMBER: WBG mw 013	**BEGIN:** 10/20/00	**END:** 10/25/00	
COORDINATES: N: 561518.27 E: 2355223.25 ~~H~~ SDA 4-27-01	**REFERENCE POINT:** ground sfc ~~TOC~~	**ELEVATION:** 1069.1 1071.7	



HTRW DRILLING LOG

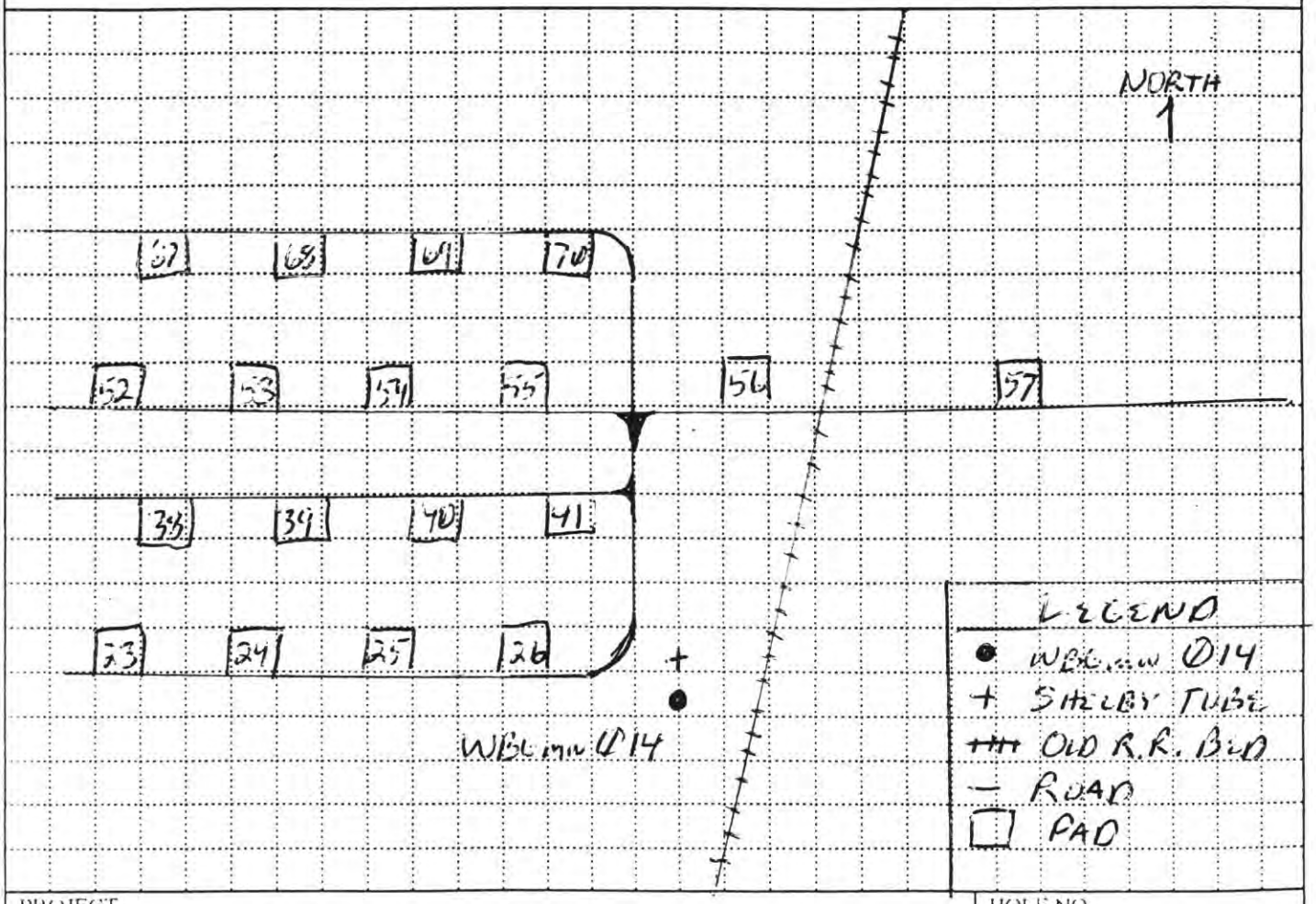
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: TOLTEST, INC.	DISTRICT: LOUISVILLE COE
3. PROJECT: RVAAP: WBG / FS	4. LOCATION: WBG	HOLE NUMBER: WBG mw 014
5. NAME OF DRILLER: NEAL WIKTOR	6. MANUFACTURER'S DESIGNATION OF DRILL: CME 75 HSA	SHEET 1 OF 1 SHEETS
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: CME 75 HSA, 4 1/4" AUGERS; 2" SPLIT SPOONS	8. HOLE LOCATION: WBG mw 014 N 562061.26 E 2360439.22	
	9. SURFACE ELEVATION: NA 994.1 SRA 4/27/01	
	10. DATE STARTED: 10/14/00	11. DATE COMPLETED: 10/25/00
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 14.35' @ 0935	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 14.32' @ 1005	
14. TOTAL DEPTH OF HOLE: 23.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	SHELBY	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	0 each	No	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	—	NA	Bob Allen

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO
RVAAP WBG / FS	WBG mw-014

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

PROJECT	INSPECTOR	HOLE NO.	SHEET
RVAAP: WBG/FS	BG ABELN	WBG MW 014	1 of 3

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ELEV (A)	DEPTH (FT) (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	0-1.5' MH ELASTIC SILT W/SAND AND GRAVEL - DAMP BROWN (10YR 4/3)	PID=0ppm	SHELBY TUBE 1'-3'		0'-2' RECOVERY = 1'3/2.0' PENTROMETER = 1.0
	2.0	1.5' CL - LEAN CLAY W/CLAY MOTTLES YELLOWISH BROWN (10YR 5/4) LIGHT BLUISH GRAY (CLEY 5B 7/1 MOTTLES - DAMP	PID=0ppm			PENTROMETER = 2.0 2'-4' RECOVERY = 1'4/2.0'
	4.0					4'-6' RECOVERY = 2.0/2.0'
		CL LEAN CLAY - MOIST - SATURATED LIGHT OLIVE BROWN (2.5Y 5/4)	PID=0ppm			PENTROMETER = 3.25
	6.0					6'-8' RECOVERY 1.6/2.0
		CL - LEAN CLAY LIGHT OLIVE BROWN (2.5Y 5/4) WITH YELLOWISH BROWN (10YR 5/6) MOTTLES - DAMP	PID=0ppm			PENTROMETER = 3.0
	8.0					8'-10' RECOVERY = 1/2'
	10.0					

DRILLING LOG

PROJECT	RVAAP: WBG/FS	INSPECTOR	BCABELN	HOLE NO.	WBGMW 014
				SHEET	2 of 3

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ELEV (A)	DEPTH (ft)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
			PID = 0ppm			10'-12' RECOVERY = 1.2'/2.0'
	12.0	SP-SM POORLY GRADED SAND W/SILT AND GRAVEL BROWN (10YR 5/3) WITH YELLOWISH BROWN (10YR 5/8) SANDY NODULES	PID = 0ppm			12'-14' RECOVERY = 1.6'/2.0' PENTROMETER = 1.5
	14.0					14'-16' RECOVERY = 1.1'/2.0'
	16.0	SW-SM WELL GRADED SAND W/SILT AND GRAVEL AND TRACE CLAY GRAY (2.5Y 6/1) - SATURATED	PID = 0ppm			16'-18' RECOVERY = 1.3'/2.0' PENTROMETER = 2.75
	18.0					18'-20' RECOVERY = .9'/2.0'
	20.0					

PROJECT RVAAP: WBG/FS

HOLE NO. WBGMW 014

DRILLING LOG

PROJECT	RVAAP: WBG/FS	INSPECTOR	BG ABELN	HOLE NUMBER	WBGMW014
				SHEET	3 of 3

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ELEV (A)	DEPTH (ft)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
						20-22' RECOVERY = 9/2.0
	22.0	SP-SC POORLY GRADED MEDIUM SAND W/CLAY ~~AND GRAVEL~~ BGA 10/18/00 ~~GRAY~~ YELLOWISH BROWN (10YR 5/4) SANDS WITH GRAY (10YR 5/1) CLAY - DAMP	PID = 0 ppm			PENTROMETER = 3.5
						22-23 RECOVERY = 1.7/1.0
			PID = 0 ppm			PENTROMETER > 4.5
	27.0	CL LEAN CLAY - SLIGHTLY CONSOLIDATED - MODERATE CEMENTATION GLEY 1 ~~BLACK~~ BGA 10/18/00 VERY DARK GRAY (GLEY1 3/N)				
		BOTTOM OF BOREHOLE				

MONITORING WELL INSTALLATION LOG

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER: CY08**

MONITORING WELL ID: WBG M4 014

INSTALLATION START: DATE: 10/18/00 TIME: 1030

INSTALLATION FINISH: DATE: 10/21/00 TIME: 1200

ANNULAR SPACE MATERIALS INVENTORY:

GRANULAR FILTER PACK: TYPE: DSI #1 SAND (EQUIV TO GLOBAL #7) QUANTITY: 8 /50 LB BAGS

BENTONITE SEAL: TYPE: DELCLAY/PURE GOLD 3/8 QUANTITY: 2.75 GAL

GROUT: TYPE: 1 PORTLAND QUANTITY: NR

DESCRIPTION OF WELL SCREEN:

SLOT SIZE (inches): 1.5" SLOT CONFIGURATION: HORIZONTAL

TOTAL OPEN AREA PER FOOT OF SCREEN: NR

OUTSIDE DIAMETER: 2.3" NOMINAL INSIDE DIAMETER: 2.0"

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

TYPE OF MATERIAL BETWEEN BOTTOM OF BORING AND SCREEN: DSI #1 SAND (EQUIV TO GLOBAL #7)

DESCRIPTION OF WELL CASING:

OUTSIDE DIAMETER: 2.3" NOMINAL INSIDE DIAMETER: 2.0"

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

JOINT DESIGN AND COMPOSITION: MANUFACTURED FLUSH THREADED

CENTRALIZERS DESIGN AND COMPOSITION: NA

DESCRIPTION OF PROTECTIVE CASING:

NOMINAL INSIDE DIAMETER: 8.0' COMPOSITION: STEEL

SPECIAL PROBLEMS ENCOUNTERED DURING WELL CONSTRUCTION AND THEIR RESOLUTION:

SAND BRIDGED BETWEEN WELL CASING AND INSIDE AUGER WHEN TREMIED.

Was all well screen and casing material used for construction free of foreign matter (e.g., adhesive tape, labels, soil, grease, etc.)? YES [✓] NO [ ]

Was all well screen and casing material used for construction free of unsecured couplings, ruptures, and other physical breakage and/or defects? YES [✓] NO [ ]

Is deformation or bending of the installed well screen and casing minimized to the point of allowing the insertion and retrieval of a 1.0-inch bailer throughout the entire length of the completed well? YES [✓] NO [ ]

QUANTITY OF APPROVED WATER USED FOR FILTER PACK ENPLACEMENT: 25 GAL

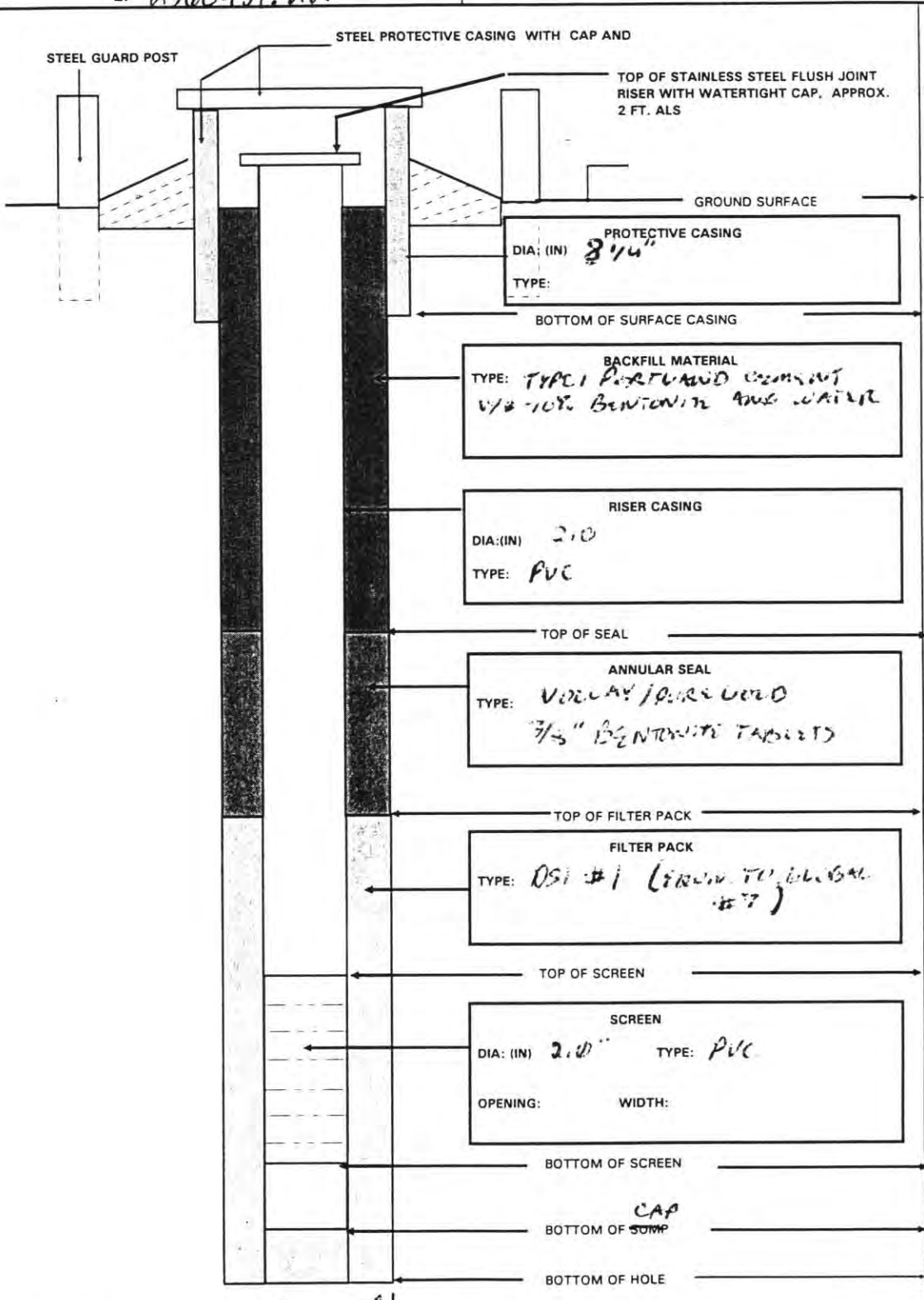
RECORDED BY: B Adbeck (Signature & Date)

QA CHECK BY: [signature] 11.05.00 (Signature & Date)

MONITORING WELL

PROJECT NAME: Winkiepeck Burning Grounds DELIVERY ORDER NO: CY08

WELL NUMBER: ~~WBG~~ mw 017	BEGIN: 10/15/00 0510	END: 10/21/00 1200 KD
COORDINATES: N: 562061.26 E: 2360439.22	REFERENCE POINT: ground s/e TOC	ELEVATION: 994.1 996.78



HTRW DRILLING LOG

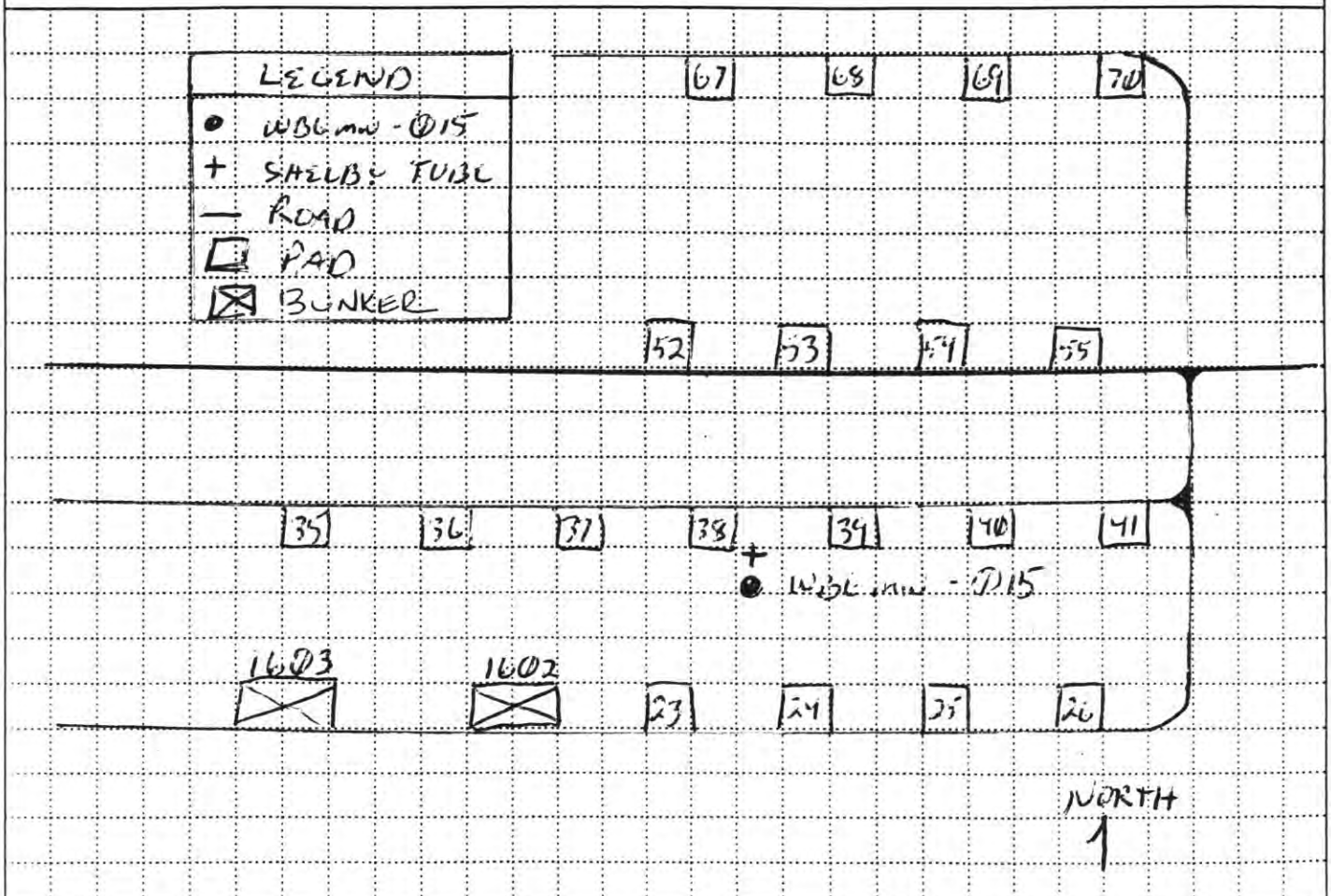
	DISTRICT: LOUISVILLE COE	HOLE NUMBER: WBG mw 015
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: TOLTEST, INC	SHEET 1 OF 1 SHEETS
3. PROJECT: RVAAP: WBG/FS	4. LOCATION: WBG	
5. NAME OF DRILLER: MR. WIKTOR	6. MANUFACTURERS DESIGNATION OF DRILL: CME 75 HSA	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" HSAS, 2" SPLIT SPOONS	8. HOLE LOCATION: WBG mw 015 — N 562340.12, E 2359182.41	
	9. SURFACE ELEVATION: ~~AAA~~ 1009.1 SRA 4/27/01	
	10. DATE STARTED: 10/18/00 — 11. DATE COMPLETED: 10/25/00	
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 17.38 @ 1510	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 20.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	SHELBY	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		✓		

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO
RVAAP: WBG/FS	WBG mw - 015

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

HOLE NUMBER MW-015

PROJECT RVAAP: WBG/FS | INSPECTOR B GABELAW | SHEET 1 of 3

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ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.0	MH ELASTIC SILT W/FINE SAND - DRY YELLOWISH BROWN (10YR 5/4)	PID=0			0-2' Recovery 2½'.
	2.0					2'-4' Recovery = 9½'.
	4.0					4'-6' Recovery 1½'.
	6.0					6'-8' Recovery 2½'.
	8.0					8'-10' Recovery 2½'.
	10.0					

PROJECT RVAAP: WBG/FS

HOLE NO WBG MW 015 (NSW WELL)

DRILLING LOG

HOLE NUMBER MW-015

PROJECT RVAAP - WBG / FS | INSPECTOR B GABELN | SHEET 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
						10-12 RECOVERY = 1.6/2.0
		MH ELASTIC SILT -DRY GRAY (10YR 5/1)	PID = 0			
	12.0					12-14 RECOVERY = 1.5/2
		SP-SM POORLY GRADED MED SILT AND FINE SUB-ROUNDED GRAVEL YELLOWISH BROWN (10YR 5/6) DRY	PID = 0			
	14.0					14-16' RECOVERY = 1.6/2.
	16.0	MH ELASTIC SILT -MOIST GRAY (10YR 5/1)	PID = 0			16-18' RECOVERY = 1.5/2
		SP-SM POORLY GRADED FINE SAND W/ SILT -WET GRAY (10YR 6/1)	PID = 0			
	18.0					18-20 RECOVERY = 2/2
	20.0					

PROJECT RVAAP: WBG / FS

HOLE NO WBG MW 015 / (NEW WELL)

DRILLING LOG

HOLE NUMBER MW-015

PROJECT RVAAP: WBG/FS | INSPECTOR BG ABELW | SHEET 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		MH ELASTIC SILT W/SAND FINE (MOIST) GRAY (10YR 5/1)	PID=0			20-22 RECOVERY = 2/2
		ML SILT W/FINE SAND - DRY BROWN (10YR 4/3)	PID=0			
	22.0	BOTTOM OF BOREHOLE				

PROJECT RVAAP: WBG/FS

HOLE NO WBG MW 015 (NEW WELL)

5C

MONITORING WELL INSTALLATION LOG

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER: CY08**

MONITORING WELL ID: WBG MW 015

INSTALLATION START: DATE: 10/18/00 TIME: 1630

INSTALLATION FINISH: DATE: 10/21/00 TIME: 1200

ANNULAR SPACE MATERIALS INVENTORY:

GRANULAR FILTER PACK: TYPE: GLOBAL #7 SAND QUANTITY: 8 (50LB BAGS

BENTONITE SEAL: TYPE: VOLCLAY/PUREGOLD 1/8" QUANTITY: 2 BAG

GROUT: TYPE: 1 PORTLAND QUANTITY: NR

DESCRIPTION OF WELL SCREEN:

SLOT SIZE (inches): 1.5 SLOT CONFIGURATION: HORIZONTAL

TOTAL OPEN AREA PER FOOT OF SCREEN: NR

OUTSIDE DIAMETER: 2.3" NOMINAL INSIDE DIAMETER: 2.0

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

TYPE OF MATERIAL BETWEEN BOTTOM OF BORING AND SCREEN: GLOBA #7 SAND

DESCRIPTION OF WELL CASING:

OUTSIDE DIAMETER: 2.3" NOMINAL INSIDE DIAMETER: 2.0"

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

JOINT DESIGN AND COMPOSITION: MANUFACTURED FLUSH THREADED

CENTRALIZERS DESIGN AND COMPOSITION: NA

DESCRIPTION OF PROTECTIVE CASING:

NOMINAL INSIDE DIAMETER: 8.0" COMPOSITION: STEEL

SPECIAL PROBLEMS ENCOUNTERED DURING WELL CONSTRUCTION AND THEIR RESOLUTION:

NA

Was all well screen and casing material used for construction free of foreign matter (e.g., adhesive tape, labels, soil, grease, etc.)? YES [✓] NO [ ]

Was all well screen and casing material used for construction free of unsecured couplings, ruptures, and other physical breakage and/or defects? YES [✓] NO [ ]

Is deformation or bending of the installed well screen and casing minimized to the point of allowing the insertion and retrieval of a 1.0-inch bailer throughout the entire length of the completed well? YES [✓] NO [ ]

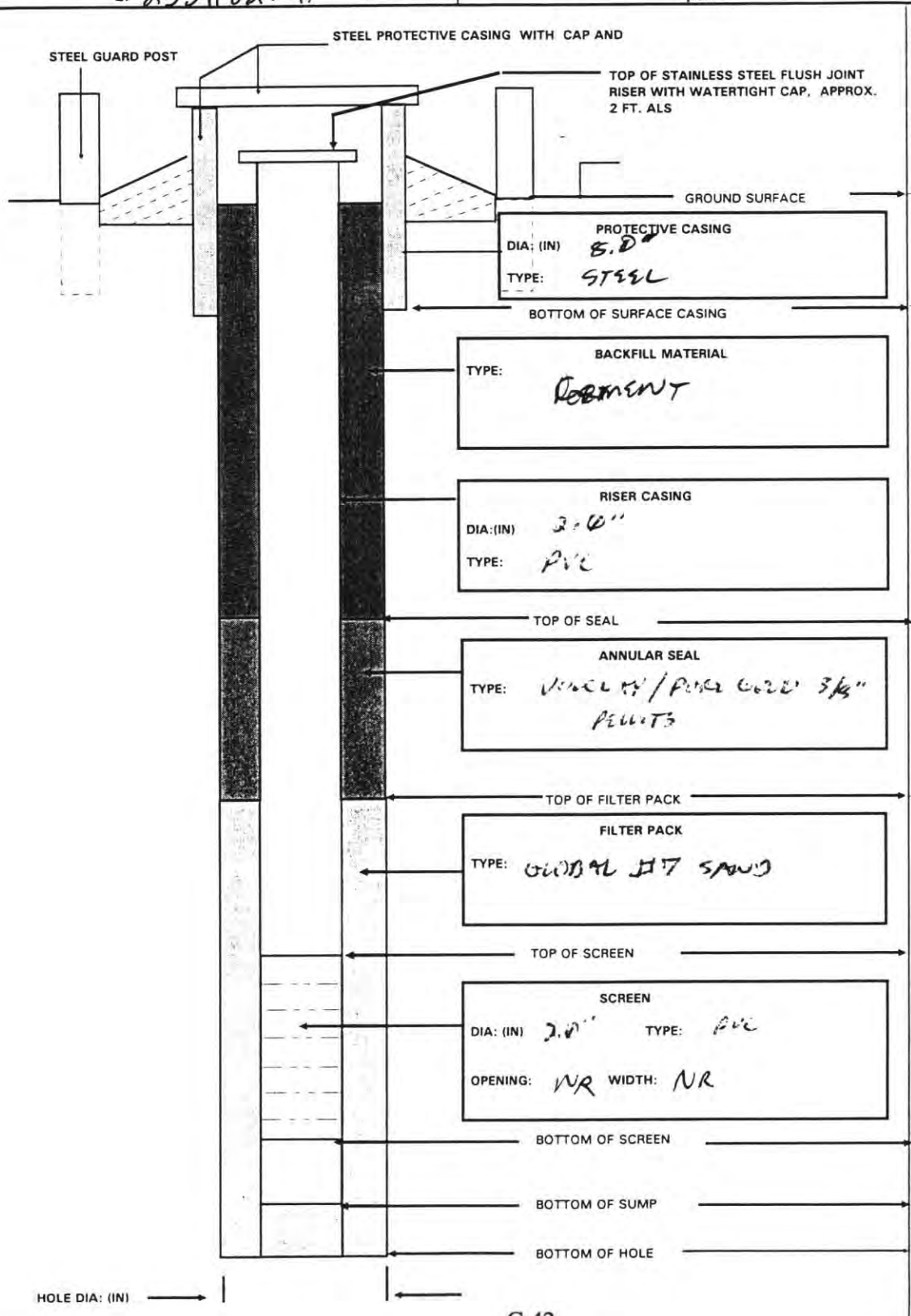
QUANTITY OF APPROVED WATER USED FOR FILTER PACK ENPLACEMENT: NA

RECORDED BY: [signature] 11/07/00 (Signature & Date) QA CHECK BY: KD 11.08.00 (Signature & Date)

MONITORING WELL

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO.** CY08

WELL NUMBER: WBGMW 015	**BEGIN:** 10/15/00 1420	**END:** 10/25/00
COORDINATES: N: 562340.12 E: 2359182.41 SRA 4-27-01	**REFERENCE POINT:** ground surface TOC	**ELEVATION:** 1009.1 1011.6



	DEPTH OLD WELL (FT) (ABANDONED)	ELEV. NEW WELL (FT) (BGS)
GROUND SURFACE	0	0
BOTTOM OF SURFACE CASING	5.0	5.0
TOP OF SEAL	2.9'	5.9'
TOP OF FILTER PACK	6.9'	8.9'
TOP OF SCREEN	9.0'	11.0'
BOTTOM OF SCREEN	19.0'	21.0'
BOTTOM OF SUMP	19.3'	21.3'
BOTTOM OF HOLE	20.0'	22.0'

HTRW DRILLING LOG

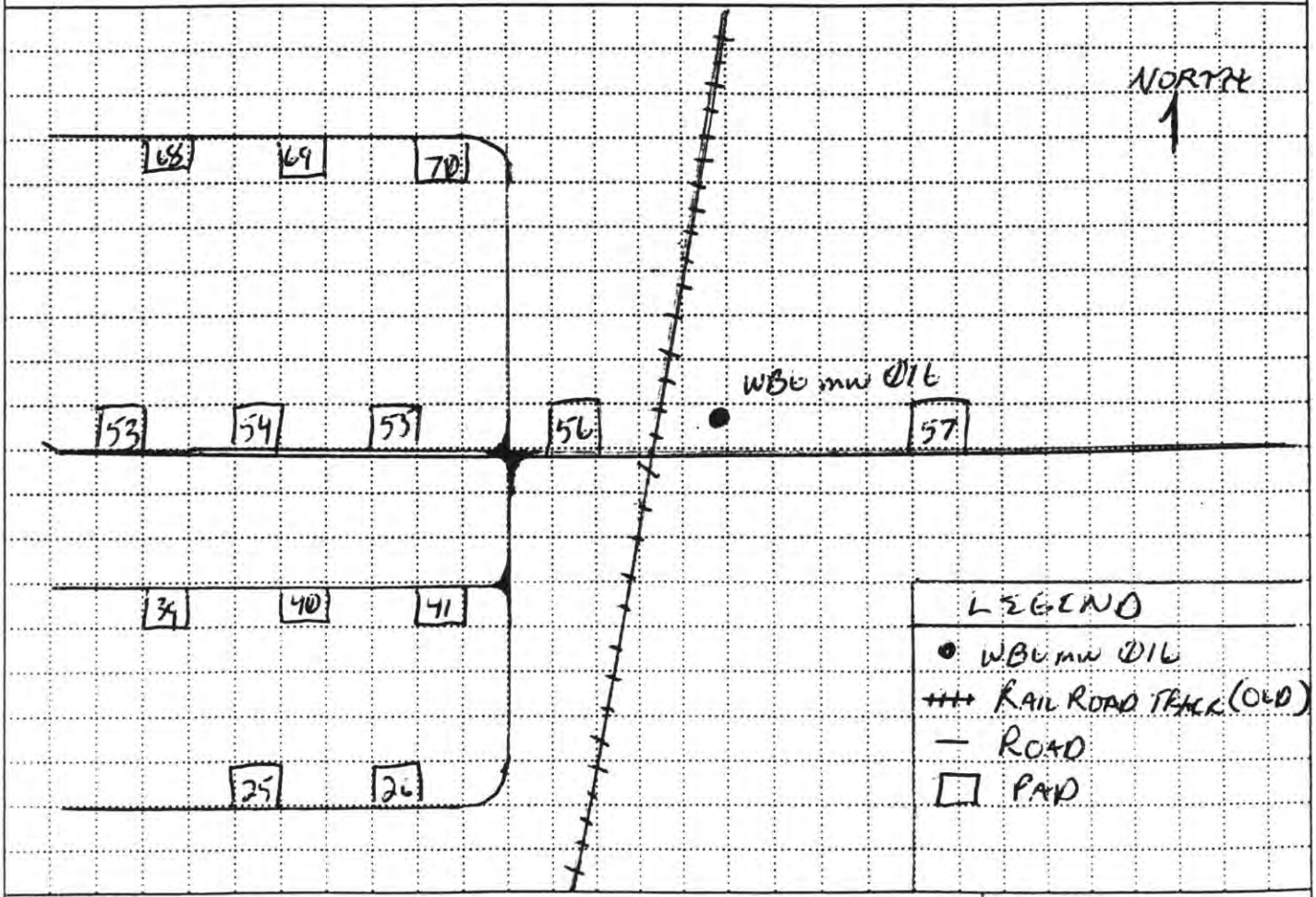
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: TOLTEST, INC	DISTRICT: LOUISVILLE COE; HOLE NUMBER: WBG mw 016; SHEET 1 OF 1
3. PROJECT: RVAAP: WBG / FS	4. LOCATION: WBG mw 016	
5. NAME OF DRILLER: NEAL WIKTOR	6. MANUFACTURERS DESIGNATION OF DRILL: CME 75 HSA	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 1/4" HSA's, 2' SPLIT SPOONS	8. HOLE LOCATION: WBG mw 016 N 562709.13 E 2360645.88	
	9. SURFACE ELEVATION: 994.9 SRA 4/27/01	
	10. DATE STARTED: 10/17/00	11. DATE COMPLETED:
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 17.66' @ 1530	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 17.34' @ 1600	
14. TOTAL DEPTH OF HOLE: 24'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	✓	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	1	NA	BDC Clark

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO
RVAAP: WBG/FS	WBG mw 016

ENG FORM 5056-R, AUG 94 — (Proponent CECW-EG)

DRILLING LOG

WBG mw 016

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PROJECT	INSPECTOR	SHEET
RVAAP: WBG/FS	B GABELN	1 of 3

ELEV (A)	DEPTH (B) ft	DESCRIPTION OF MATERIALS (C) BOX 1/17/00	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	2.0	SP-SM POORLY ~~WELL~~ GRADED SAND W/SILT - FINE SAND - DAMP DARK GRAYISH BROWN (10YR 4/2)	PID=0ppm			RECOVERY = .5/2' PENTROMETER = 2.0
		SP-SM POORLY GRADED SAND W/SILT - FINE GRAIN SAND - DAMP YELLOWISH BROWN (10YR 5/6)	PID=0ppm			RECOVERY 1/2' PENTROMETER = .5
	4.0	SP-SM POORLY GRADED SAND W/SILT - FINE SAND - DAMP STRONG BROWN (7.5YR 4/6)	PID=0ppm			4'-6' RECOVERY = 1.5/2.0 PENTROMETER >4.5
	6.0	CL LEAN CLAY - DAMP YELLOWISH BROWN (10YR 5/6)	PID=0ppm			6-8' RECOVERY = 2/2' PENTROMETER > 4.5
	8.0					8-10 RECOVERY 1.2/2
	10.0	SW-SM WELL GRADED SAND W/SILT AND GRAVEL - DAMP YELLOWISH BROWN (10YR 5/4)	PID=0ppm			PENTROMETER .5

PROJECT RVAAP: WBG/FS C-44 HOLE NO WBG mw 016

DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET
RVAAP: WBG/FS	BG ABELN	WBGMW 016	2 of 3

ELEV (A)	DEPTH (FT) (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	12.0					10-12' RECOVERY = 1.3/2 12-14' RECOVERY = .2' (ROCK WAS CAUGHT IN CUTTING SHOE)
	14.0	SW-SM WELL GRADED SAND W/SILT AND GRAVEL - MOIST VERY DARK BROWN (10 YR 2/2	PID = 0ppm			14-16 RECOVERY = .8/2'
	16.0	YELLOWISH BROWN (10 YR 4/3)				16-18 RECOVERY = .8/2' PENETROMETER = .5
	18.0	SW-SM WELL GRADED SAND W/SILT AND GRAVEL - SATURATED YELLOWISH BROWN (10 YR 4/4)	PID = 0ppm			18-20' RECOVERY = .8/2' PENETROMETER = 2.5
	20.0					

DRILLING LOG

PROJECT	INSPECTOR	HOLE NO.	SHEET
RVAAP: WBG/FS	BEABELN	WBGmw016	3 of 3

ELEV (A)	DEPTH (ft) (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	20	SP-SM POORLY GRADED SAND W/SILT - FINE SAND - SATURATED DARK YELLOWISH BROWN (10YR 4/4)	PID=0ppm			20-22 RECOVERY=1.1/2
	22.0	SW-SM WELL GRADED SAND W/GRAVEL - SATURATED DARK YELLOWISH BROWN (10YR 4/4)	PID=0ppm			22'-24' RECOVERY=1/2 PENETROMETER=0
	24.0					BOTTOM OF BOREHOLE
	26.0			10/30/00 BEA		

MONITORING WELL INSTALLATION LOG

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER:** CY08

MONITORING WELL ID: WBG mw 016

INSTALLATION START: DATE: 10/17/00 TIME: 1425

INSTALLATION FINISH: DATE: 10/15/00 TIME: 1200

ANNULAR SPACE MATERIALS INVENTORY:

GRANULAR FILTER PACK: TYPE: OS #1 SAND (EQUIV TO LONESTAR #7) QUANTITY: 6 /50 LB BAGS

BENTONITE SEAL: TYPE: VOLCLAY/PURE GOLD 3/8" QUANTITY: 15 GAL

GROUT: TYPE: PORTLAND TYPE IW/BENTONITE CHIPS QUANTITY: ~ 5 GAL

DESCRIPTION OF WELL SCREEN:

SLOT SIZE (inches): 1.5" X SLOT CONFIGURATION: HORIZONTAL

TOTAL OPEN AREA PER FOOT OF SCREEN: _____

OUTSIDE DIAMETER: 2.3" NOMINAL INSIDE DIAMETER: 2.0"

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

TYPE OF MATERIAL BETWEEN BOTTOM OF BORING AND SCREEN: OS #1 SAND (EQUIV TO LONESTAR #7)

DESCRIPTION OF WELL CASING:

OUTSIDE DIAMETER: 2.3" NOMINAL INSIDE DIAMETER: 2.0"

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

JOINT DESIGN AND COMPOSITION: MANUFACTURED FLUSH THREADED

CENTRALIZERS DESIGN AND COMPOSITION: NA

DESCRIPTION OF PROTECTIVE CASING:

NOMINAL INSIDE DIAMETER: 8.0" COMPOSITION: STEEL

SPECIAL PROBLEMS ENCOUNTERED DURING WELL CONSTRUCTION AND THEIR RESOLUTION:

NA

Was all well screen and casing material used for construction free of foreign matter (e.g., adhesive tape, labels, soil, grease, etc.)? YES [✓] NO [ ]

Was all well screen and casing material used for construction free of unsecured couplings, ruptures, and other physical breakage and/or defects? YES [✓] NO [ ]

Is deformation or bending of the installed well screen and casing minimized to the point of allowing the insertion and retrieval of a 1.0-inch bailer throughout the entire length of the completed well? YES [✓] NO [ ]

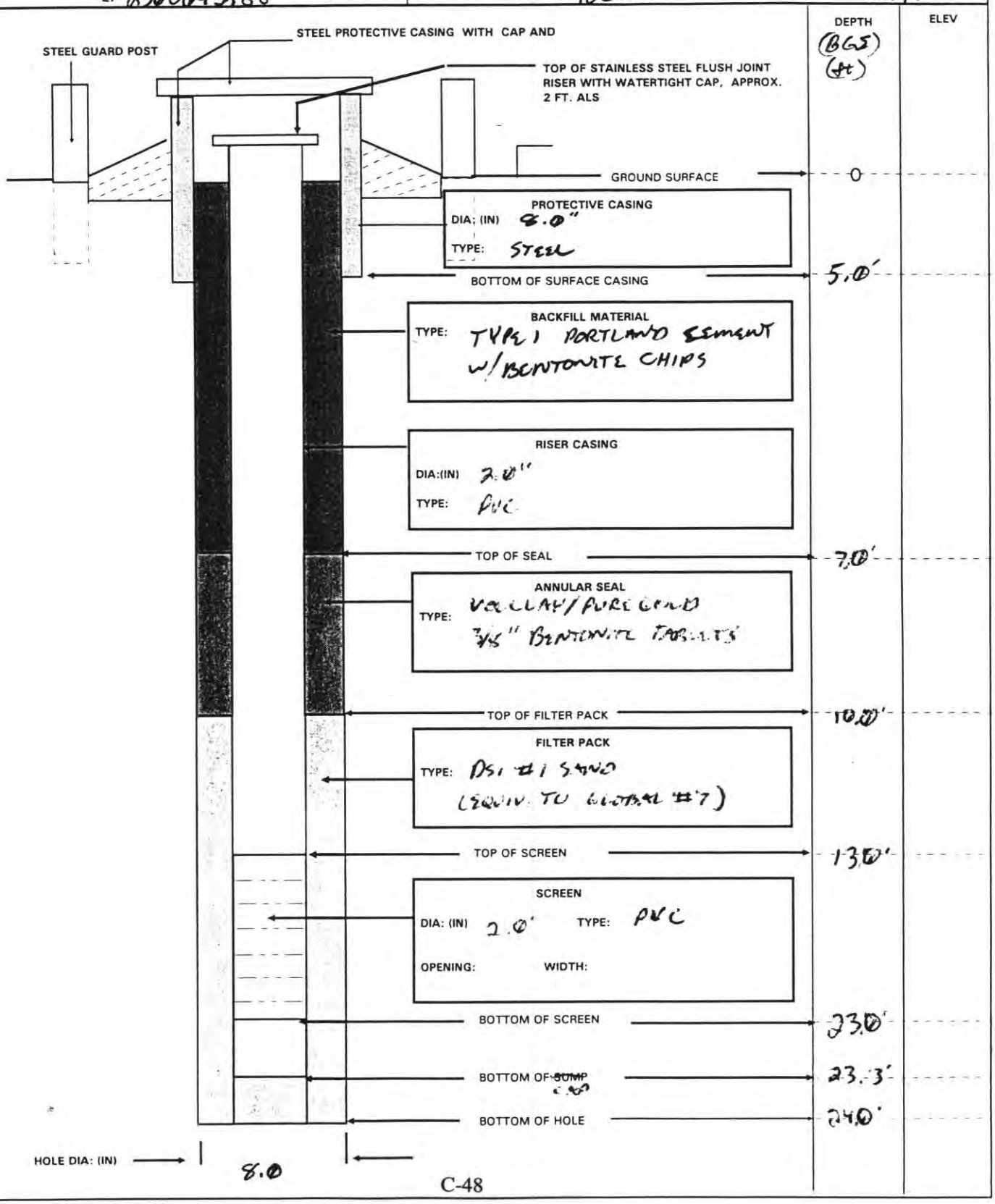
QUANTITY OF APPROVED WATER USED FOR FILTER PACK ENPLACEMENT: Ø

RECORDED BY: BAClark 10/30/00 (Signature & Date) QA CHECK BY: KDD (Signature & Date)

MONITORING WELL

PROJECT NAME: Winkelpeck Burning Grounds **DELIVERY ORDER NO.:** CY08

WELL NUMBER: WBG MW 01C	**BEGIN:** 10/17/00 1610	**END:** 10/25/00
COORDINATES: N: 562709.13 E: 2360645.88 SRA 4-27-01	**REFERENCE POINT:** ground surface TOC	**ELEVATION:** 994.9 997.03



HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: TOLTEST, INC	DISTRICT: LOUISVILLE COE — HOLE NUMBER: WBG-MW-017
		SHEET 1 OF 1 SHEETS

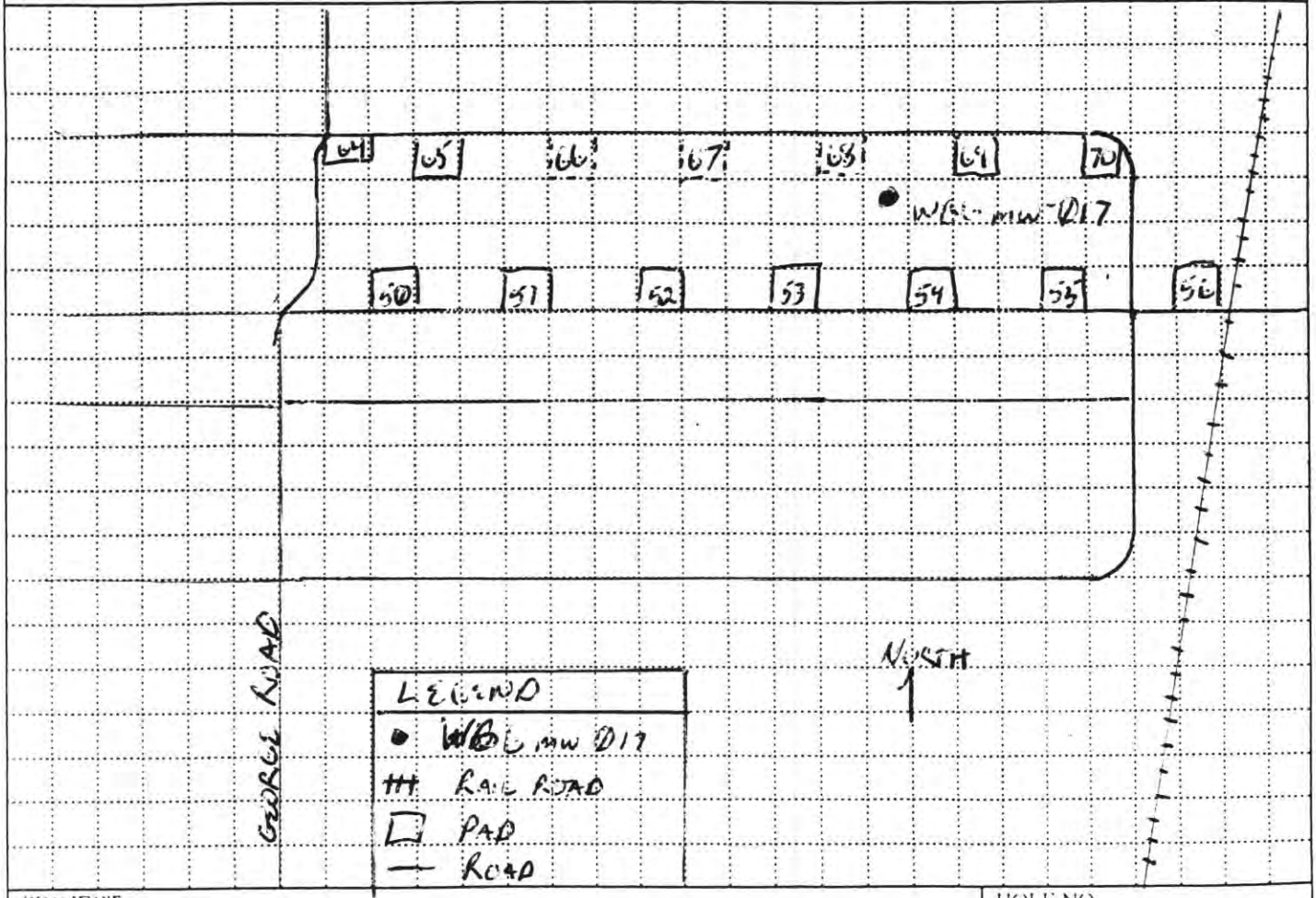
3. PROJECT: RVAAP: WBG	4. LOCATION: WBG MW-017
5. NAME OF DRILLER: NEAL WIKTOR (TOLTEST, INC.)	6. MANUFACTURERS DESIGNATION OF DRILL: CME 75 HSA
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" Hollow stem AUGERS, 2" split spoons	8. HOLE LOCATION: WBG MW 017 N 562913.24 E 2359603.84
	9. SURFACE ELEVATION: ground 1004.0 TOC 1006.62 SRA 4/27/01
BGA 10/18/00	10. DATE STARTED: 10/17/00 — 11. DATE COMPLETED: 10/22/00
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: ~~13.8'~~ 12.9' @ 1030
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 12.9' @ 1210
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA				

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
				B S Abel

LOCATION SKETCH/COMMENTS — SCALE: NOT TO SCALE



PROJECT	HOLE NO
RVAAP: WBG/FS	WBG MW 017

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

DRILLING LOG

HOLE NUMBER MW 017

PROJECT: RVAAP: WBG mw - 017 | INSPECTOR: B GABELN | SHEET: 1 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		SP-SM POORLY GRADED FINE SAND W/SILT -MOIST DARK YELLOWISH BROWN (10YR 4/4)	PID = 0			0-2' RECOVERY = 1.85'/2.0
	2.0	SPSM POORLY GRADED FINE-MED SAND -MOIST YELLOWISH BROWN (10YR 5/6)	PID = 0			2'-4' RECOVERY = 1.7/2.0
	4.0	MH ELASTIC SILT W/ FINE SAND OLIVE BROWN (2.5 Y4/3)	PID = 0			4'-6' RECOVERY = 2.0/2.0
	6.0	SP-SM POORLY GRADED FINE SAND W/SILT -WET YELLOWISH BROWN (10YR 5/6)	PID = 0			6'-8' RECOVERY = 1.2'/2.0'
	8.0	CL - LEAN CLAY (2.5 Y 4/3) OLIVE BROWN	PID = 0			8'-10' RECOVERY = 1.4'/2.0
	10.0					

C-50

PROJECT: RVAAP: WBG mw 017 (NEW WELL)

HOLE NO: WBG mw 017

DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET
RVAAP: WBG/FS	BGABELN	MW-017	2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
						10-12' Recovery = 2.0/2.0
		SP-SM Poorly Graded Fine Sand w/Silt & Fine Sub-Rounded Gravel	PID = 0			
	2.0	-Wet -Light Olive Brown (2.5Y 5/4)				12'-14' Recovery = 2.0/2.0
		SW-SM Well Graded Sand w/Silt & Fine Rounded Gravel -Wet	PID = 0			
	14.0	Very Dark Gray (2.5Y 3/1)				14'-16' Recovery = 2.0/2.0
	16.0					
		MH - Elastic Silt w/Fine Sand				16'-18' Recovery = 1.8'/2.0
		Dark Gray (2.5Y 4/1)	PID = 0			
	18.0					
	20.0					

PROJECT: RVAAP: WBG/FS

HOLE NO: WBG MW-017 (MW WELL)

DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET
RVAAP: WBG/FS	BG ABELN	MW017	3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
						20-22 = 2½'
	22.0	BOTTOM OF BOREHOLE				

12a

MONITORING WELL INSTALLATION LOG

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER: CY08**

MONITORING WELL ID: NBG MW 017

INSTALLATION START: DATE: 10/22/00 TIME: 0900

INSTALLATION FINISH: DATE: 10/22/00 TIME: 1300

ANNULAR SPACE MATERIALS INVENTORY:

GRANULAR FILTER PACK: TYPE: GLOBAL #7 QUANTITY: 7 50 LB BAGS

BENTONITE SEAL: TYPE: VOLCLAY / PURE GOLD QUANTITY: 1 5 GAL

GROUT: TYPE: I. PORTLAND QUANTITY: NR

DESCRIPTION OF WELL SCREEN:

SLOT SIZE (inches): .1 SLOT CONFIGURATION: HORIZONTAL

TOTAL OPEN AREA PER FOOT OF SCREEN: NR

OUTSIDE DIAMETER: 2.3" NOMINAL INSIDE DIAMETER: 2.0"

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

TYPE OF MATERIAL BETWEEN BOTTOM OF BORING AND SCREEN: GLOBAL #7

DESCRIPTION OF WELL CASING:

OUTSIDE DIAMETER: 2.3" NOMINAL INSIDE DIAMETER: 2.0"

SCHEDULE/THICKNESS: 40 COMPOSITION: PVC

MANUFACTURER: JOHNSON

JOINT DESIGN AND COMPOSITION: MANUFACTURED FLUSH THREAD

CENTRALIZERS DESIGN AND COMPOSITION: NA

DESCRIPTION OF PROTECTIVE CASING:

NOMINAL INSIDE DIAMETER: 8.0" COMPOSITION: STEEL

SPECIAL PROBLEMS ENCOUNTERED DURING WELL CONSTRUCTION AND THEIR RESOLUTION:

NA

Was all well screen and casing material used for construction free of foreign matter (e.g., adhesive tape, labels, soil, grease, etc.)? YES [✓] NO [ ]

Was all well screen and casing material used for construction free of unsecured couplings, ruptures, and other physical breakage and/or defects? YES [✓] NO [ ]

Is deformation or bending of the installed well screen and casing minimized to the point of allowing the insertion and retrieval of a 1.0-inch bailer throughout the entire length of the completed well? YES [✓] NO [ ]

QUANTITY OF APPROVED WATER USED FOR FILTER PACK ENPLACEMENT: 0

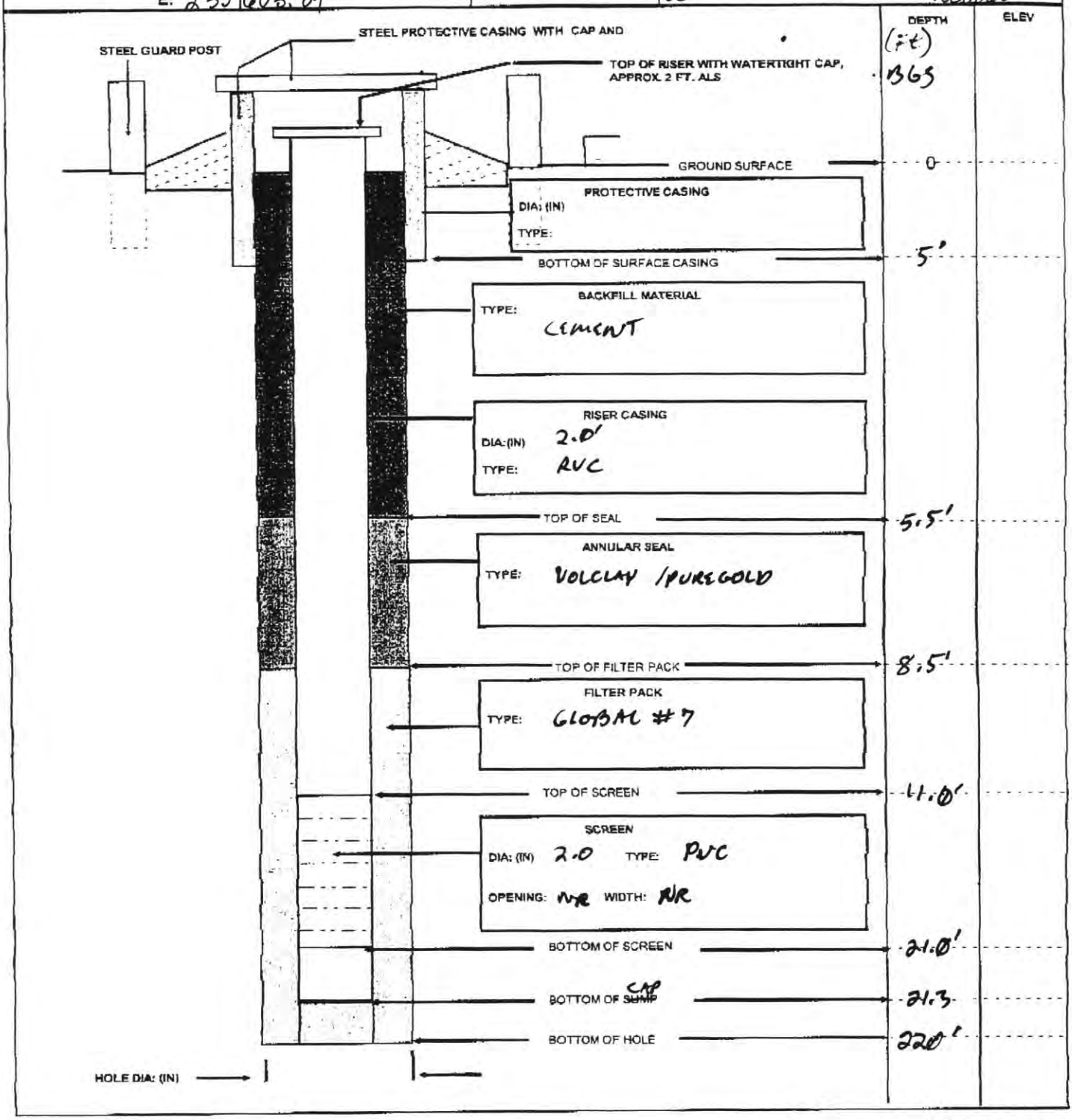
RECORDED BY: [signature] 11/02/00
(Signature & Date)

QA CHECK BY: KLD 11.08.00
(Signature & Date)

13 a

[redacted]

WELL NUMBER: WB6mw017	**BEGIN:** 10/21/00	**END:** 10/23/00
COORDINATES: N: 562913.24 E: 2359603.84	**REFERENCE POINT:** GL / TOC	**ELEVATION:** 1004.6 / 1006.62 MSL



TOTAL P.03

APPENDIX D

GROUNDWATER MONITORING WELL DEVELOPMENT AND SAMPLING LOGS

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Appendix D
Groundwater Monitoring Well Development and Sampling Logs Locator Sheet

Sampling Site Number	Page Number
WBGMW-005	D-5
WBGMW-006	D-7
WBGMW-008	D-9
WBGMW-009	D-11
WBGMW-010	D-13
WBGMW-011	D-17
WBGMW-012	D-22
WBGMW-013	D-27
WBGMW-014	D-32
WBGMW-015	D-37
WBGMW-016	D-43
WBGMW-017	D-48
OBG-1	D-53
OBG-2	D-55
OBG-3	D-57

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GROUND WATER PURGE SHEET

PROJECT NAME: Winkelpeck Burning Grounds DELIVERY ORDER NO: CY08

DATE (mm/dd/yy): 11.4.09 TIME: 10 : 12

WELL ID NUMBER: WBG-MW-005 WELL LOCATION: WBG-1

DEPTH OF SCREENED INTERVAL(toc notch): _____ ft. to _____ ft.

INNER CASING: TYPE: _____ ID: _____ inches

WELL VOLUME CALCULATION $Vc = 3.142 \times (di/2)^2 \times (TD-H)$ N/A

$VF = 3.142 \times [(dH/2)^2 - (do/2)^2] (TD - S \text{ or } H) (P)$ Microjetted

NOTE: If S > H use S, if S < H use H

$Vt = (Vc + Vf) (7.48)$

WHERE:

Vc = Volume of water in well casing, cu.ft.
Vt = Total volume, gal
Vf = Volume of water in filter pack, cu.ft.
do = outside of diameter of well casing, ft.
di = inside diameter of well casing, ft.
P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a range of 30 to 35%)

dH = diameter of borehole, ft.
TD = total depth of well from top of well casing, ft.
H = depth of water, ft., from top of well casing
S = depth to base of seal, ft., from top of well casing

PURGE METHOD: [ ] Bailer [ ] Bladder Pump [ ] Pump Type QED

MINIMUM PURGE VOLUME = Vt x 3 PURGE VOLUME: N/A GAL.

SAMPLE METHOD: [ ] Bailer [ ] Bladder Pump [ ] Other (specify) _____

SITE CONDITIONS DURING PURGING: Microjetting

NOTE: IF WELL HAS A DEDICATED PUMP, IT IS TO BE USED.

FIELD OBSERVATIONS: _____

S&A PLAN SAMPLING PROCEDURE FOLLOWED: [X] YES [ ] NO IF NO, WHY WAS A DEVIATION NECESSARY: _____

RECORDED BY: KL Dimmick (Signature) QA CHECKED BY: Vicki Brumbach (Signature)

WELL PURGE RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: CY08

WELL NUMBER AND LOCATION: WBG mw 05

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	DO	COMMENTS WATER LEVEL (FT)
11.4.00	10:12	0	—	—	—	—	0	N/A	—	7.59
	1045	2	13.2	.519	6.52	1	2	NA	10.66	9.50
	1055	.25	13.3	.525	6.58	75	2.25	NA	10.8	9.6
	1100	.1	13.3	.512	6.61	2	2.35	NA	3.92	9.6
	1110	.25	12.9	.536	6.72	1	2.60	NA	3.15	9.6
	1120	.25					2.85	NA		9.8
KD	~~1130~~ 1125	.25	12.8	0.552	6.70	1	3.10	NA	2.28	9.8
	1130	.25	11.7	0.544	6.76	1	3.35	NA	3.27	
	1140	.25	13.6	0.563	6.85	1	3.60	NA	3.49	
	1250		15.2	0.594	6.98	1	4.60	NA	2.44	10.68

RECORDED BY: Kathy Dominic 11-4-00 kmd/yb
(Signature and Date)

QA CHECK BY: Vicki Brumbach 10-8-01
(Signature and Date)

70

GROUND WATER PURGE SHEET

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO:** CY08

DATE (mm/dd/yy): 11/03/00 TIME: 12 : 30 2/3

WELL ID NUMBER: WBG - MW - 006 WELL LOCATION: WBG Box PAP, OP

DEPTH OF SCREENED INTERVAL(toc notch): 10.5 ft. to 20.5 ft.

INNER CASING: TYPE: PVC ID: 2 inches

WELL VOLUME CALCULATION $Vc = 3.142 \times (di/2)^2 \times (TD-H)$ NA

$VF = 3.142 \times [\ (dH/2)^2 - (do/2)^2\ ]\ (TD - S \text{ or } H)\ (P)$ NA

NOTE: If S > H use S, if S < H use H

$Vt = (Vc + Vf)\ (7.48)$ NA

WHERE:

- Vc = Volume of water in well casing, cu.ft.
- Vt = Total volume, gal
- Vf = Volume of water in filter pack, cu.ft.
- do = outside of diameter of well casing, ft.
- di = inside diameter of well casing, ft.
- P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a range of 30 to 35%)
- dH = diameter of borehole, ft.
- TD = total depth of well from top of well casing, ft.
- H = depth of water, ft., from top of well casing
- S = depth to base of seal, ft., from top of well casing

PURGE METHOD: [ ] Bailer [X] Bladder Pump [ ] Pump Type _____

MINIMUM PURGE VOLUME = Vt x 3 PURGE VOLUME: 4 GAL.

SAMPLE METHOD: [ ] Bailer [X] Bladder Pump [ ] Other (specify) _____

SITE CONDITIONS DURING PURGING: Van was carrying to run pump

NOTE: IF WELL HAS A DEDICATED PUMP, IT IS TO BE USED.

FIELD OBSERVATIONS: Mostly cloudy calm Humid 65°F. Battery died whilst purging switched to van battery. Parameters were stable.

S&A PLAN SAMPLING PROCEDURE FOLLOWED: [X] YES [ ] NO IF NO, WHY WAS A DEVIATION NECESSARY: _____

RECORDED BY: [signature] (Signature) QA CHECKED BY: Vicki Brumbach (Signature)

WELL PURGE RECORD

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO:** CY08

PAGE 3 OF 3

WELL NUMBER AND LOCATION: mw 006

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (~~µMHOS~~/CM) mS/cm	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	mg/L D.O.	COMMENTS WL
11/3/00	1325	Ø	14.Ø	Ø.534	7.46	11	Ø	Ø	Ø.78	10.75
	1335	1	13.7	Ø.535	7.42	12	1	NA	Ø.46	10.75
	1345	~~2~~ 1.5	13.6	Ø.534	7.42	7	2.5		1.06	10.75
	1355	1.5	13.5	Ø.535	7.41	1	4		3.44	10.66
	1400	start	temp leg	WAG	4256		—			
	1426	last read	14.1	Ø.527	7.48	3	—		2.78	10.65

RECORDED BY: [signature] 11/3/00 vjb
(Signature and Date)

QA CHECK BY: Vicki Brumbah 10-8-01
(Signature and Date)

PROJECT NAME: Winkelpeck Burning Grounds

DELIVERY ORDER NO. -

DATE (mm/dd/yy): 11-3-00

TIME: 14:35

WELL ID NUMBER: WBG-MW-00B

WELL LOCATION: WINKELPECK BURNING GROUNDS - SE SIDE

DEPTH OF SCREENED INTERVAL(toc notch): 10.76 ft. to 20.76 ft.

INNER CASING: TYPE: BW 11.3.00 2 INCH PVC ID: 2 INCH inches

WELL VOLUME CALCULATION Vc = 3.142 x (di/2)^2 x (TD-H) NA- micropurging

VF = 3.142 x [(dH/2)^2 - (do/2)^2] (TD - S or H) (P)

NOTE: If S > H use S, if S < H use H

Vt = (Vc + Vf) (7.48)

WHERE:

Vc = Volume of water in well casing, cu.ft.

Vt = Total volume, gal

Vf = Volume of water in filter pack, cu.ft.

do = outside of diameter of well casing, ft.

di = inside diameter of well casing, ft.

dH = diameter of borehole, ft.

TD = total depth of well from top of well casing, ft.

H = depth of water, ft., from top of well casing

S = depth to base of seal, ft., from top of well casing

P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a range of 30 to 35%)

D-9

PURGE METHOD: [ ] Bailer [X] Bladder Pump [ ] Pump Type _____

MINIMUM PURGE VOLUME = Vt x 3 PURGE VOLUME: _____ GAL.

SAMPLE METHOD: [ ] Bailer [X] Bladder Pump [ ] Other (specify) _____

SITE CONDITIONS DURING PURGING: MOSTLY SUNNY, 1-5MPH BREEZE, 55°F

NOTE: IF WELL HAS A DEDICATED PUMP, IT IS TO BE USED.

FIELD OBSERVATIONS: WATER LEVEL 15.71 FT, PUMP INTAKE AT 19.0 FT, CALCULATED INTAKE WOULD BE AT 15.76 FT, 19 FT. WILL ALLOW ~1 FT OVER THE PUMP HEAD FOR WATER LEVEL MEASUREMENTS.

S&A PLAN SAMPLING PROCEDURE FOLLOWED: [X] YES [ ] NO IF NO, WHY WAS A DEVIATION NECESSARY: _____

RECORDED BY: B. Williams (Signature)

QA CHECKED BY: Vicki Brumbach (Signature)

WELL PURGE RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO.: 6708

PAGE 1 OF 1

3 of 4 VJB

WELL NUMBER AND LOCATION: NBG-MW-08 - SOUTHEAST END OF WINKLEPECK BURNING GROUNDS

DATE	TIME	GALLONS REMOVED		TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY	D.O.	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS	PID
11-3-00	1435	0.0		14.12	0.545	8.27	1.79	40	0.0	0.0	DEPTH TO WATER 15.70 INITIAL	0.0
11-3-00	1445	0.5		13.72	0.537	8.27	1.83	9	0.5		16.00 ~~15.00~~ ON 11-3-00	0.0
11-3-00	1455	1.0	0.5	13.72	0.538	8.26	1.81	3	1.0		16.00	0.0
11-3-00	1505	1.25	0.25	13.63	0.540	8.26	1.51	4	1.25		16.00	0.0
11-3-00	1515	1.50	0.25	13.62	0.542	8.24	1.98	8	1.50		16.00	0.0
11-3-00	1525	1.75	0.25	13.56	0.542	8.26	2.02	9	1.75		16.00 SAMPLE	0.0
11-3-00	1654		2.5	13.10	0.549	8.21	2.43	10	4.50		16.00 FINAL	0.0

VJB 11-8-00

D-10

RECORDED BY: B. Williams 11-3-00
(Signature and Date)

QA CHECK BY: Vicki Brumbach 11-8-00
(Signature and Date)

5

PROJECT NAME: Winkelpeck Burning Grounds

DATE (mm/dd/yy): 11-4-00 TIME: 15:00 page 2 of 4

WELL ID NUMBER: WBG-MW-003 WELL LOCATION: WINKLEPECK BURNING GROUNDS.

DEPTH OF SCREENED INTERVAL(toc notch): 14.28 ft. to 24.28 ft.

INNER CASING: TYPE: PVC ID: 2 INCH inches

WELL VOLUME CALCULATION $Vc = 3.142 \times (di/2)^2 \times (TD-H)$ NA- micrpurging

$VF = 3.142 \times [(dH/2)^2 - (do/2)^2] (TD - S \text{ or } H) (P)$ ↓

NOTE: If S > H use S, if S < H use H

$Vt = (Vc + Vf) (7.48)$

WHERE:

- Vc = Volume of water in well casing, cu.ft.
- Vt = Total volume, gal
- Vf = Volume of water in filter pack, cu.ft.
- do = outside of diameter of well casing, ft.
- di = inside diameter of well casing, ft.
- dH = diameter of borehole, ft.
- TD = total depth of well from top of well casing, ft.
- H = depth of water, ft., from top of well casing
- S = depth to base of seal, ft., from top of well casing
- P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a range of 30 to 35%)

D-11

PURGE METHOD: [ ] Bailer [X] Bladder Pump [ ] Pump Type _____

MINIMUM PURGE VOLUME = Vt x 3 PURGE VOLUME: _____ GAL.

SAMPLE METHOD: [ ] Bailer [X] Bladder Pump [ ] Other (specify) _____

SITE CONDITIONS DURING PURGING: MOSTLY SUNNY, 1-4 MPH BREEZE, 50°F

NOTE: IF WELL HAS A DEDICATED PUMP, IT IS TO BE USED.

FIELD OBSERVATIONS: _____

S&A PLAN SAMPLING PROCEDURE FOLLOWED: [X] YES [ ] NO IF NO, WHY WAS A DEVIATION NECESSARY: _____

RECORDED BY: B. Williams (Signature) QA CHECKED BY: Vicki Brownlock (Signature)

WELL PURGE RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO. CY10R

WELL NUMBER AND LOCATION: WB6-MW-009 - WINKLEPECK BURNING GROUNDS

DATE	TIME	GALLONS REMOVED		TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY / DO.		TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS DEPTH TO WATER	PID
11-4-00 BW 11-4-00	1500 ~~1400~~	0.0		13.19	0.326	6.59	3.00	10	0.0		15.68 INITIAL	0.0 PPM
11-4-00 BW	1500 ~~1410~~	0.1		13.10	0.327	6.50	3.23	7	0.1		16.00	0.0 PPM
11-4-00 BW	1520 ~~1420~~	0.2	0.1	12.99	0.318	6.44	3.24	4	0.2		16.00	0.0 PPM
11-4-00 BW	1530 ~~1430~~	0.3	0.1	12.68	0.314	6.42	3.11	1	0.3		16.00	00 PPM
11-4-00 PW	1540 1440	0.5	0.2	12.40 12.06	0.311	6.40	3.00	6	0.5		16.00 SAMPLE	0.0 PPM
11.4.00	1800	2.5		~~11.25~~ 800 11-4-00	0.301	6.37	1.99	2	3.0		16.00 FINAL	0.0 PPM
						BW 11.4.00						

D-12

RECORDED BY: B. Williams 11-4-00
(Signature and Date)

QA CHECK BY: Vicki Brumbach 11-8-00
(Signature and Date)

75

14

Well volume calculation sheet

Date 10/31/00 Time 1345
Well ID Num MW01D
Well Location WB6

Total depth of well (ft BTOC) 23.14
Depth to water (ft BTOC) 9.16
Height of water column (ft) (Hc) 13.98

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc .280 cu. ft.

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)
**note ** use length of screen if Hc > length of screen
= 1.35 cu. ft.

Vt = (Vc+Vf)*(7.48 gal/cu ft)
= 12.19 gal.

Where:
Vc = Volume of casing (ft^3)
Vf = Volume of filter pack (ft^3)
Vt = Total volume
Ro = outside radius of casing .095 (ft)
Hc = height of water column 9.16 (ft)
Rf = radius of filter pack .335 (ft)
Rc = radius of inside casing .08 (ft)

WELL DEVELOPMENT RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO.: CY08

WELL NUMBER AND LOCATION: WBG mw-010

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	D.O.	COMMENTS
~~10/31/00~~ BLA 10/31/00	1345	—	—	—	—	—	—	—	—	
	1400	15	13.7	.683	7.30	999	~~+400~~ 15	1	3.08	
	1413	13	13.1	.684	7.43	999	28	2	3.56	
	1426	13	13.2	.722	7.39	174	41	3	3.72	
	1439	13	13.1	.734	7.37	59	54	4	3.61	
	1452	13	12.9	.723	7.35	42	67	5	3.65	

RECORDED BY: Brooke Abeln 10-31-01 by vjb
(Signature and Date)

QA CHECK BY: Vicki Brumback 10-08-01
(Signature and Date)

GROUND WATER PURGE SHEET

PROJECT NAME: Winkelpeck Burning Grounds DELIVERY ORDER NO.: CY08

DATE (mm/dd/yy): 11/02/00 TIME: 14:00

WELL ID NUMBER: WBG mw 010 WELL LOCATION: WBG

DEPTH OF SCREENED INTERVAL(toc notch): _____ ft. to _____ ft.

INNER CASING: TYPE: PVC ID: 2 inches

WELL VOLUME CALCULATION $Vc = 3.142 \times (di/2)^2 \times (TD-H)$ NA micropurging

$VF = 3.142 \times [(dH/2)^2 - (do/2)^2] (TD - S \text{ or } H) (P)$

NOTE: If S > H use S, if S < H use H

$Vt = (Vc + Vf) (7.48)$

WHERE:

Vc = Volume of water in well casing, cu.ft.
Vt = Total volume, gal
Vf = Volume of water in filter pack, cu.ft.
do = outside of diameter of well casing, ft.
di = inside diameter of well casing, ft.
dH = diameter of borehole, ft.
TD = total depth of well from top of well casing, ft.
H = depth of water, ft., from top of well casing
S = depth to base of seal, ft., from top of well casing
P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a range of 30 to 35%)

PURGE METHOD: [ ] Bailer [X] Bladder Pump [ ] Pump Type _____

MINIMUM PURGE VOLUME = Vt x 3 PURGE VOLUME: _____ GAL.

SAMPLE METHOD: [ ] Bailer [X] Bladder Pump [ ] Other (specify) _____

SITE CONDITIONS DURING PURGING: _____

NOTE: IF WELL HAS A DEDICATED PUMP, IT IS TO BE USED.

FIELD OBSERVATIONS: _____

S&A PLAN SAMPLING PROCEDURE FOLLOWED: [X] YES [ ] NO IF NO, WHY WAS A DEVIATION NECESSARY: _____

RECORDED BY: Brooks Ahelm (vjb) QA CHECKED BY: Vicki Brumbach

(Signature) (Signature)

WELL PURGE RECORD

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO:** CY08

PAGE 1 OF 1

WELL NUMBER AND LOCATION: WBGmw 010

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (μMHOS/CM)	pH (Standard Units)	TURBIDITY	DO	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS WL (Ft)
11/02/00	1400	0	—	—	—	—	—	0	NA	WL = 9.35
	1410	2	13.5	.718	7.32	999	2.29	2	NA	9.95
	1420	2	13.4	.716	7.35	253	1.42	4	NA	9.95
	1430	2	13.4	.725	7.30	86	1.36	6	NA	9.95
	1440	2	13.1	.732	7.29	72	1.15	8	NA	9.95
	1450	2	13.0	.743	7.29	39	1.12	10	NA	9.95

BGA 11/02/00

RECORDED BY: B. Sabelin 11/02/00
(Signature and Date)

QA CHECK BY: Vicki Brumbak 10-8-01
(Signature and Date)

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Well volume calculation sheet

Date 10:31.00 Time _____
Well ID Num WBG.mw-011
Well Location WBG pad 45

Total depth of well (ft BTOC) 24.1'
Depth to water (ft BTOC) 11.78
Height of water column (ft) (Hc) 12.32

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc 0.2477 cu. ft.

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)
**note ** use length of screen if Hc > length of screen
= 1.1982 cu. ft.

Vt = (Vc+Vf)*(7.48 gal/cu ft)
= 54.1 gal.

Where:
Vc = Volume of casing (ft^3)
Vf = Volume of filter pack (ft^3)
Vt = Total volume
Ro = outside radius of casing .045 (ft)
Hc = height of water column 12.32 (ft)
Rf = radius of filter pack .335 (ft)
Rc = radius of inside casing .08 (ft)

7

WELL DEVELOPMENT FORM

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO. CY08

page 3 of 4

Date: 10/31/00 Time: 1430

Well Number and Location: LUBGmw - Ø11

Development Crew: K. DOMINIC J. McGEE (TOT-Test)

V. BRUMBACK

Driller (if applicable): NA

Water Levels / Time: Initial: 11.92' / 1429 Pumping: ± 1g / min

Final: 12.09 / 1531

Total Well Depth: Initial: 23.75' FT BTOC Final: 24.1' FT BTOC

Date and Time: Begin: 10.31.00 / 1433 Completed: 10.31.00 / 1531

Development Method(S): Whale pump

Total Quantity of Water Removed: 45 gals

FIELD MEASUREMENT	TIME 1445	SERIAL NUMBER 1457		DATE OF LAST CALIBRATION 10.31.00
Temperature	13.83	14.29	HORIBA 709039	
Specific Conductivity	0.363	0.341		
pH	6.43	6.75		
Turbidity				
D.O.	1.55 mg/L	2.79		

WELL DEVELOPMENT RECORD

PROJECT NAME Winklepeck Burning Grounds DELIVERY ORDER NO. [illegible]

WELL NUMBER AND LOCATION: WBG-611

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS
10.31.00	1445	11	13.83	0.363	6.43		11	1	GOOD RECHARGE!
	1457	11	14.29	0.341	6.75		22	2	D+S??
	1505	10	13.94	0.343	6.76		32	~3	
	1515	8	14.40	0.358	6.52		40		D.O= 2.22
	1525	5	14.42	.342	6.84		45	4	" 3.03
	1530		13.92	0.343	6.83	56			=3.44

vjb 11-8-00

RECORDED BY: Kathy Dominic 10-31-00 vjb
(Signature and Date)

QA CHECK BY: Vicki Brumbach 11-8-00
(Signature and Date)

PROJECT NAME: Winklepeck Burning Grounds

DATE (mm/dd/yy): 11-2-00 TIME: 13:00 page 2 of 4

WELL ID NUMBER: WBG-MW-011 WELL LOCATION: WINKLEPECK BURNING GROUNDS NEAR PAD 45 (DEACTIVATION FURNACE)

DEPTH OF SCREENED INTERVAL(toc notch): 13.92 ft. to 23.92 ft.

INNER CASING: TYPE: PVC ID: 2 INCH inches

WELL VOLUME CALCULATION $Vc = 3.142 \times (di/2)^2 \times (TD-H)$ NA | micropurging

$VF = 3.142 \times [(dH/2)^2 - (do/2)^2] (TD - S \text{ or } H) (P)$

NOTE: If S > H use S, if S < H use H

$Vt = (Vc + Vf) (7.48)$

WHERE:

Vc = Volume of water in well casing, cu.ft.
Vt = Total volume, gal
Vf = Volume of water in filter pack, cu.ft.
do = outside of diameter of well casing, ft.
di = inside diameter of well casing, ft.
P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a range of 30 to 35%)
dH = diameter of borehole, ft.
TD = total depth of well from top of well casing, ft.
H = depth of water, ft., from top of well casing
S = depth to base of seal, ft., from top of well casing

PURGE METHOD: [ ] Bailer [X] Bladder Pump [ ] Pump Type _____

MINIMUM PURGE VOLUME = Vt x 3 PURGE VOLUME: _____ GAL.

SAMPLE METHOD: [ ] Bailer [X] Bladder Pump [ ] Other (specify) _____

SITE CONDITIONS DURING PURGING: PARTLY CLOUDY, 60°F, 1-2 MPH BREEZE, MOSTLY SUNNY

NOTE: IF WELL HAS A DEDICATED PUMP, IT IS TO BE USED.

FIELD OBSERVATIONS: _____

S&A PLAN SAMPLING PROCEDURE FOLLOWED: [ ] YES [ ] NO IF NO, WHY WAS A DEVIATION NECESSARY: _____

RECORDED BY: B. Williams (Signature) QA CHECKED BY: Vicki Brumbach (Signature)

WELL PURGE RECORD

PROJECT NAME: Winkelpeck Burning Grounds DELIVERY ORDER NO. 6708

WELL NUMBER AND LOCATION: WBG-MW-011 NEAR PAD 45 (DEACTIVATION FURNACE)

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY		TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS	
						DO.				DEPTH TO WATER	PID
11-2-00	1305	0.25	14.17	0.323	6.68	1.21	999			11.92 CLOUDY	0.4 PPM
11-2-00	1315	3.0	13.96	0.332	6.69	1.19	812			11.94 CLOUDY	0.4 PPM
11-2-00	1325	4.5	13.96	0.334	6.75	0.84	230			11.94 CLOUDY	0.4 PPM
11-2-00	1335	7.0	14.01	0.335	6.81	1.59	81			11.94	0.4 PPM
11-2-00	1345	9.0	14.00	0.335	6.78	1.32	44			11.94	0.4 PPM
11-2-00	1355	11.0	13.94	0.335	6.79	1.54	22			11.94 SAMPLE	0.4 PPM
11-2-00	1440		13.92	0.337	6.89	1.62	3			11.94 FINAL	0.4 PPM

VB 11-8-00

RECORDED BY: B. Williams 11-2-00
(Signature and Date)

QA CHECK BY: Debi Brumbach 11-8-00
(Signature and Date)

Well volume calculation sheet

Date WBGmw 012 Time _____
Well ID Num 11.1.00
Well Location WBG

Total depth of well (ft BTOC) 315
Depth to water (ft BTOC) 258'
Height of water column (ft) (Hc) 77'

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc 0.1547 cu. ft.

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)
**note ** use length of screen if Hc > length of screen
= 0.748 cu. ft.

Vt = (Vc+Vf)*(7.48 gal/cu ft)
= 33.78 gal.

Where:
Vc = Volume of casing (ft^3)
Vf = Volume of filter pack (ft^3)
Vt = Total volume
Ro = outside radius of casing 0.095 (ft)
Hc = height of water column 77 (ft)
Rf = radius of filter pack 0.122 (ft)
Rc = radius of inside casing 0.08 (ft)

WELL DEVELOPMENT FORM

PROJECT NAME: Whitehead Burning Grounds DELIVERY ORDER NO: CY08

Date: 11/01/00 Time: 1220

Well Number and Location: WBGmw-012

Development Crew: KDominic

V. Brumback / J. Alvarado

Driller (if applicable): NA

Water Levels / Time: Initial: 24.65' / 1222 Pumping: ~1g / min

Final: 29.00 / 1154 11.3.00

Total Well Depth: Initial: 30.62 FT BTOC Final: 30.92 FT BTOC

Date and Time: Begin: 11.2.00 / 0935 Completed: 11.3.00 / 11.3.00

Development Method(S): whale pump; surged repeatedly w/Teflon surge block over 2 days

Total Quantity of Water Removed: 53 gals

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature	HORIBA U-10 709039	11.2.00 11.3.00
Specific Conductivity		
pH		
Turbidity		

WELL DEVELOPMENT RECORD

PROJECT NAME Winklepeck Burning Grounds DELIVERY ORDER NO. [illegible]

WELL NUMBER AND LOCATION: W13Gmw-012

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY D.O	TURBIDITY Turb	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS
11.01.00	1231	7g	12.56	0.401	7.18	4.90	off scale	9g	1	
~~11.03.00~~	~~0937~~	3	KD				"			
11.03.00	1048	6	13.0	0.424	7.49	6.92	"	33	4.5	
	1128	4	13.1	0.403	7.79	7.9	"	36	5.0	
	1136		12.9	~~0.396~~ 0.402 KD	~~7.63~~ KD	7.85	"	~~40~~ 38 KD	~5.0	
	1144		13.5	0.398	7.63 KD	7.85	"	40g	~5.	
	1150		13.1	0.403	7.32	7.30	845	53	~5	

vjb 11-8-00

RECORDED BY: Kathy Dominic ~~10-8~~ 11-03-00 vjb
(Signature and Date)

QA CHECK BY: Vicki Brumbach 11-8-00
(Signature and Date)

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GROUND WATER PURGE SHEET

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: CY08

DATE (mm/dd/yy): 11.4.00 TIME: 15 : 15

WELL ID NUMBER: WBG MW-012 WELL LOCATION: WBG

DEPTH OF SCREENED INTERVAL(toc notch): _____ ft. to _____ ft.

INNER CASING: TYPE: _____ ID: _____ inches

WELL VOLUME CALCULATION $Vc = 3.142 \times (di/2)^2 \times (TD-H)$ NA

$VF = 3.142 \times [\ (dH/2)^2 - (do/2)^2\ ]\ (TD - S \text{ or } H)\ (P)$ micropurged

NOTE: If S > H use S, if S < H use H

$Vt = (Vc + Vf)\ (7.48)$

WHERE:

- Vc = Volume of water in well casing, cu.ft.
- Vt = Total volume, gal
- Vf = Volume of water in filter pack, cu.ft.
- do = outside of diameter of well casing, ft.
- di = inside diameter of well casing, ft.
- dH = diameter of borehole, ft.
- TD = total depth of well from top of well casing, ft.
- H = depth of water, ft., from top of well casing
- S = depth to base of seal, ft., from top of well casing
- P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a range of 30 to 35%)

PURGE METHOD: [ ] Bailer [✓] Bladder Pump [ ] Pump Type QED

MINIMUM PURGE VOLUME = Vt x 3 PURGE VOLUME: See p 79 GAL.

SAMPLE METHOD: [ ] Bailer [ ] Bladder Pump [ ] Other (specify) _____

SITE CONDITIONS DURING PURGING: Micropurged

NOTE: IF WELL HAS A DEDICATED PUMP, IT IS TO BE USED.

FIELD OBSERVATIONS: WATER TURBID THROUGHT DEVELOPMENT

S&A PLAN SAMPLING PROCEDURE FOLLOWED: [✓] YES [ ] NO IF NO, WHY WAS A DEVIATION NECESSARY: _____

RECORDED BY: [signature] 11.4.00 (Signature) QA CHECKED BY: [signature] (Signature)

WELL PURGE RECORD

PROJECT NAME: Winkelpeck Burning Grounds **DELIVERY ORDER NO:** CY08

PAGE 1 OF 1

WELL NUMBER AND LOCATION: MW36mw - Ø12

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS D.O.
11.4.00	1530	~1	12.2	0.533	7.03	999	~1		5.02 WL unknown
	1545	Ø.5	11.9	0.523	7.07	322	1.5		5.60 top of pump above W.L.
	1555	0.5	11.8	0.519	7.12	172	2.0		4.86
	1605	0.5	11.7	0.516	7.12	58	2.5		4.88
	1745		11.2	.489	7.30	16			7.54 final WL 7.05

RECORDED BY: Kathy Dennis 11-4-00 vjb
(Signature and Date)

QA CHECK BY: Vicki Brumbaugh 10-8-01
(Signature and Date)

18

Well volume calculation sheet

Date 11/01/00 Time 0830
Well ID Num MW 013
Well Location WBG

Total depth of well (ft BTOC) 23.6
Depth to water (ft BTOC) 12.8
Height of water column (ft) (Hc) 10.8

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc .217 cu. ft.

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)
**note ** use length of screen if Hc > length of screen
= 1.05 cu. ft.

Vt = (Vc+Vf)*(7.48 gal/cu ft)
= 9.48 gal.

Where:
Vc = Volume of casing (ft^3)
Vf = Volume of filter pack (ft^3)
Vt = Total volume
Ro = outside radius of casing .095 (ft)
Hc = height of water column 10.8 (ft)
Rf = radius of filter pack .385 (ft)
Rc = radius of inside casing .08 (ft)

WELL DEVELOPMENT FORM

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: CY08

Date: 11/01/00 Time: 0830

Well Number and Location: WBG MW-013

Development Crew: BROOKS ABELN (SAIC), JIM McGEE (TOLTEST)

Driller (if applicable): NA

Water Levels / Time: Initial: 12.8 / 0830 Pumping: 19.4 / 0935

Final: /

Total Well Depth: Initial: 23.6 FT BTOC Final: FT BTOC

Date and Time: Begin: / Completed: /

Development Method(S): WHALE PUMP

Total Quantity of Water Removed: 115.6 gals

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature	13861	11/01/00
Specific Conductivity	13861	11/01/00
pH	13861	11/01/00
Turbidity	13861	11/01/00
DO	13861	11/01/00

WELL DEVELOPMENT RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NO: CY08

WELL NUMBER AND LOCATION: WBG mw-013

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	DO	COMMENTS
11/01/00	0835	—	—	—	—	—	—	—	—	
	0843	11.5	12.3	.487	6.44	999	11.5	1	4.51	
	0851	11.5	12.6	.417	6.41	240	23.0	2	12.73	
	0859	11.5	12.3	.336	6.34	~~336~~ 32	34.5	3	13.04	
	0907	11.5	12.4	.294	6.29	60	46.0	4	12.46	
	0915	11.5	12.3	.271	6.28	23	57.5	5	12.40	
	0960	103.5	12.5	.256	6.22	8	115.0	10	5.98	

RECORDED BY: Brooke Abeln 11-01-00 by vjb
(Signature and Date)

QA CHECK BY: Vicki Brumbach 10-08-01
(Signature and Date)

GROUND WATER PURGE SHEET

PROJECT NAME: Winkelpeck Burning Grounds DELIVERY ORDER NO: CY08

DATE (mm/dd/yy): 11/02/000 BGA 11/02/00 TIME: 10 : 00

WELL ID NUMBER: WBG mw ~~010~~ 013 WELL LOCATION: WBG

DEPTH OF SCREENED INTERVAL(toc notch): 14.5 ft. to 24.5 ft.

INNER CASING: TYPE: PVC ID: 2 inches

WELL VOLUME CALCULATION $Vc = 3.142 \times (di/2)^2 \times (TD-H)$ NA micropurging

$VF = 3.142 \times [(dH/2)^2 - (do/2)^2] (TD - S \text{ or } H) (P)$

NOTE: If S > H use S, if S < H use H

$Vt = (Vc + Vf) (7.48)$

WHERE:

Vc = Volume of water in well casing, cu.ft.
Vt = Total volume, gal
Vf = Volume of water in filter pack, cu.ft.
do = outside of diameter of well casing, ft.
di = inside diameter of well casing, ft.
dH = diameter of borehole, ft.
TD = total depth of well from top of well casing, ft.
H = depth of water, ft., from top of well casing
S = depth to base of seal, ft., from top of well casing
P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a range of 30 to 35%)

PURGE METHOD: [ ] Bailer [✓] Bladder Pump [ ] Pump Type

MINIMUM PURGE VOLUME = Vt x 3 PURGE VOLUME: 8.0 GAL.

SAMPLE METHOD: [ ] Bailer [✓] Bladder Pump [ ] Other (specify)

SITE CONDITIONS DURING PURGING:

NOTE: IF WELL HAS A DEDICATED PUMP, IT IS TO BE USED.

FIELD OBSERVATIONS:

S&A PLAN SAMPLING PROCEDURE FOLLOWED: [X] YES [ ] NO IF NO, WHY WAS A DEVIATION NECESSARY:

RECORDED BY: (Signature) QA CHECKED BY: Vicki Brumback (Signature)

WELL PURGE RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: CY08

BGA 11/02/00

PAGE 1 OF 1

WELL NUMBER AND LOCATION: WBG mw- ~~010~~ 013

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (μMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	DO	COMMENTS
BGA 11/02/00 ~~11/02/00~~	~~1020~~	~~2~~		~~.252~~	~~6.35~~					
11/02/00	1015	0	—	—	—	—	0	NA		
	1020	2	13.2	.252	6.35	4.32	2	NA	5.35	
	1030	BGA 11/02/00 ~~4~~ 2	13.1	.285	6.45	232	4	NA	4.91	
	1040	~~6~~ 2	13.0	.286	6.43	116	6	NA	4.40	
	1050	2	13.0	.281	6.39	56	8	NA	4.12	

BGA 11/02/00

RECORDED BY: B S Dlbch 11/02/00
(Signature and Date)

QA CHECK BY: Vicki Brumbah 10-8-01
(Signature and Date)

59

Well volume calculation sheet

Date 11.1.00 Time 9:00a
Well ID Num WBG mw-014
Well Location WBG SE CORNER

Total depth of well (ft BTOC) 23.44
Depth to water (ft BTOC) 17.08
Height of water column (ft) (Hc) 6.36

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc 0.12 cu. ft.

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)
**note ** use length of screen if Hc > length of screen
= 0.68 cu. ft.

Vt = (Vc+Vf)*(7.48 gal/cu ft)
= ~~28.34~~ 27.60 gal. KD plus ~27 gal added during drilling & development

Where:
Vc = Volume of casing (ft^3)
Vf = Volume of filter pack (ft^3)
Vt = Total volume
Ro = outside radius of casing .095 (ft)
Hc = height of water column 6.36 (ft)
Rf = radius of filter pack .335 (ft)
Rc = radius of inside casing .08 (ft)

WELL DEVELOPMENT FORM

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO. CY08

page 3 of 4

Date: 10/31/00 Time: 11:04a

Well Number and Location: WBGMW-Ø14

Development Crew: K. Dominic

J. McGee (Tol-Test)

Driller (if applicable): NA

Water Levels / Time: Initial: 16.95' / 1108 Pumping: ~~15~~ 1.0 kg / min

Final: 16.88 / 1520

Total Well Depth: Initial: 23.50' 11.1.00 FT BTOC Final: 24.46 FT BTOC

Date and Time: Begin: 10.31.00 / 11:08 Completed: ~~142~~ 11.2.00 / 1430

Development Method(S): Deconned whale pump

Total Quantity of Water Removed: 64 gals

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature	Horiba U-10 709039	11.2.00
Specific Conductivity		
pH		
Turbidity		

WELL DEVELOPMENT RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO.: [illegible]

PAGE 4 OF 4

WELL NUMBER AND LOCATION: WBGmw - Ø14

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (μMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS
11.2.00	1030	19	12.9	0.419	7.62	(off scale)	19		D.O. 3.69
	1120	8	13.1	0.399	7.72	(off scale)	27		D.O. 3.41
	1346	5	14.0	0.404	7.42	" "	32		D.O. 12.25
	1353	7	~~13~~ ~~14.0~~ Stet	0.401	~~7.74~~ 7.46	~~102~~ 265	39		D.O. 13.73
	1400	7	14.4	0.401	7.74	102	46		D.O. 13.20
	1407	6	14.3	.406	7.69	143	52		D.O. 13.08
	1414	7	14.6	0.401	7.71	27	59		D.O. ~~13.08~~ KB 12.79
	1420	5	14.3	0.400	7.61	~~8~~ 17	64		

vjb 11-8-00

RECORDED BY: Kathy Dominic 11-2-00 vjb
(Signature and Date)

QA CHECK BY: [illegible] Brumback 11-8-00
(Signature and Date)

PROJECT NAME: Winkelpeck Burning Grounds DELIVERY ORDER NO.:

DATE (mm/dd/yy): 11-4-00 TIME: 09:05 page 2 of 4

WELL ID NUMBER: WBG-MW-014 WELL LOCATION: SOUTHEAST END OF WINKELPECK BURNING GROUNDS

DEPTH OF SCREENED INTERVAL(toc notch): 14.92 ft. to 24.92 ft.

INNER CASING: TYPE: ~~11-4-00~~ 2" PVC ID: 2 INCH inches

WELL VOLUME CALCULATION Vc = 3.142 x (di/2)^2 x (TD-H) NA - Micropurging

VF = 3.142 x [(dH/2)^2 - (do/2)^2] (TD - S or H) (P)

NOTE: If S > H use S, if S < H use H

Vt = (Vc + Vf) (7.48)

WHERE:

Vc = Volume of water in well casing, cu.ft.
Vt = Total volume, gal
Vf = Volume of water in filter pack, cu.ft.
do = outside of diameter of well casing, ft.
di = inside diameter of well casing, ft.
dH = diameter of borehole, ft.
TD = total depth of well from top of well casing, ft.
H = depth of water, ft., from top of well casing
S = depth to base of seal, ft., from top of well casing
P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a range of 30 to 35%)

D-35

PURGE METHOD: [ ] Bailer [X] Bladder Pump [ ] Pump Type _____

MINIMUM PURGE VOLUME = Vt x 3 PURGE VOLUME: _____ GAL.

SAMPLE METHOD: [ ] Bailer [X] Bladder Pump [ ] Other (specify) _____ BW 11-4-00

SITE CONDITIONS DURING PURGING: PARTLY CLOUDY W/ SUN, 1-2 MPH BREEZE, ~~50~~ 48°F

NOTE: IF WELL HAS A DEDICATED PUMP, IT IS TO BE USED.

FIELD OBSERVATIONS: _____

S&A PLAN SAMPLING PROCEDURE FOLLOWED: [X] YES [ ] NO IF NO, WHY WAS A DEVIATION NECESSARY: _____

RECORDED BY: B. Williams (Signature) QA CHECKED BY: Vicki Brumbach (Signature)

WELL PURGE RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: 6708

WELL NUMBER AND LOCATION: WBG-MW-014

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY / D.O.		TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS DEPTH TO WATER	PID
11-4-00	0905	0.0	11.38	0.450	7.29	2.79	41	0.0		17.14 INITAL	0.0 PPM
11-4-00	0915	0.5	11.84	0.452	7.38	0.80	272	0.5		17.14 GRAY CLOUDY	0.0 PPM
11-4-00	0925	0.8	11.98	0.454	7.42	0.56	91	1.3		17.14 GRAY CLOUDY	0.0 PPM
11-4-00	0935	0.7	12.15	0.454	7.42	0.49	33	2.0		17.14	0.0 PPM
11-4-00	0945	1.0	12.18	0.454	7.42	0.40	22	3.0		17.14	0.0 PPM
11-7-00	0955	0.75	12.28	0.453	7.45	0.38	19	3.75		17.14	0.0 PPM
11-4-00	1005	1.0	12.32	0.452	7.47	0.41	13	4.75		17.14 SAMPLE	0.0 PPM
11-4-00	1033	4.25	1250	0.451	7.50	0.51	23	9.0		17.14 FINAL	0.0 PPM
				BW							
				11-4-00							

RECORDED BY: B. Williams (Signature and Date)

QA CHECK BY: Vicki Brumbaugh 11-8-00 (Signature and Date)

Well volume calculation sheet

Date 10/31/00 Time 0845
Well ID Num mw 005
Well Location WB6

Total depth of well (ft BTOC) 23.45
Depth to water (ft BTOC) 12.72
Height of water column (ft) (Hc) 10.73

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc .216 cu. ft.

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)
**note ** use length of screen if Hc > length of screen
= 1.04 cu. ft.

Vt = (Vc+Vf)*(7.48 gal/cu ft)
= 9.47 gal.

Where:
Vc = Volume of casing (ft^3)
Vf = Volume of filter pack (ft^3)
Vt = Total volume
Ro = outside radius of casing .095 (ft)
Hc = height of water column 10.73 (ft)
Rf = radius of filter pack .335 (ft)
Rc = radius of inside casing .08 (ft)

WELL DEVELOPMENT FORM

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: GY08

Date: 10/31/00 Time: 1345

Well Number and Location: WBG mw 015

Development Crew: Brooks Abelin (SAIC), Jim McGee (Toltest)

Driller (if applicable): NA

Water Levels / Time: Initial: ~~22.95~~ 9.28 / 1340 Pumping: 29.3 / 1426

Final: 9.31 / 1500

Total Well Depth: Initial: 22.95 FT BTOC Final: 23.40 FT BTOC

Date and Time: Begin: 10/31/00 / 1345 Completed: ____ / ____

Development Method(S): Whale Pump

Total Quantity of Water Removed: 67 gals

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature	13861	10/31/00
Specific Conductivity	13861	10/31/00
pH	13861	10/31/00
Turbidity	13861	10/31/00
DO	13861	10/31/00

WELL DEVELOPMENT FORM

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: CY08

Date: 10/31/00 Time: 0830

Well Number and Location: WBG mw 0015

Development Crew: BROOKS ABELN (SAIC), JIM MCGEE

Driller (if applicable): NA

Water Levels / Time: Initial: 12.81 / 0855 Pumping: /

Final: 13.10 / 1145

Total Well Depth: Initial: 23.6 FT BTOC Final: 23.6 FT BTOC

Date and Time: Begin: 10/31/00 / 0845 Completed: /

Development Method(S): WHALE PUMP

Total Quantity of Water Removed: 50 gals

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature	13861	10/31/00
Specific Conductivity	13861	10/31/00
pH	13861	10/31/00
Turbidity	13861	10/31/00
00	13861	10/31/00

WELL DEVELOPMENT RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: CY08

WELL NUMBER AND LOCATION: WB6 mw 015

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	DO	COMMENTS
10/31/00	0925	—	—	—	—	—	—	—		
10/31/00	0935	~~20~~ 10	13.0	.826	6.85	999	~~20~~ 10	~~2~~ 1	1.50	
10/31/00	0955	10	13.3	.771	7.12	999	20	2	1.82	
10/31/00	1025	10	13.4	.834	7.15	999	30	3	1.70	
10/31/00	1055	10	14.0	.850	7.19	999	40	4	1.40	
10/31/00	1125	10	14.2	.759	7.17	934	50	5	1.12	

RECORDED BY: Brooke Abeln 10/31/00 (Signature and Date) bja 11/6

QA CHECK BY: Vicki Brumback 10-08-01 (Signature and Date)

PROJECT NAME: Winklepeck Burning Grounds

DATE (mm/dd/yy): 11-1-00 TIME: 15 : 10

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WELL ID NUMBER: WBG-MW-015 WELL LOCATION: WINKLEPECK BURNING GROUNDS NEAR PAD 69

DEPTH OF SCREENED INTERVAL(toc notch): _____ ft. to _____ ft.

INNER CASING: TYPE: PVC ID: 2 INCH inches

WELL VOLUME CALCULATION $Vc = 3.142 \times (di/2)^2 \times (TD-H)$ NA micropurging

$VF = 3.142 \times [(dH/2)^2 - (do/2)^2] (TD - S \text{ or } H) (P)$

NOTE: If S > H use S, if S < H use H

$Vt = (Vc + Vf) (7.48)$

WHERE:

Vc = Volume of water in well casing, cu.ft.
Vt = Total volume, gal
Vf = Volume of water in filter pack, cu.ft.
do = outside of diameter of well casing, ft.
di = inside diameter of well casing, ft.
dH = diameter of borehole, ft.
TD = total depth of well from top of well casing, ft.
H = depth of water, ft., from top of well casing
S = depth to base of seal, ft., from top of well casing
P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a range of 30 to 35%)

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PURGE METHOD: [ ] Bailer [X] Bladder Pump [ ] Pump Type _____

MINIMUM PURGE VOLUME = Vt x 3 PURGE VOLUME: _____ GAL.

SAMPLE METHOD: [ ] Bailer [X] Bladder Pump [ ] Other (specify) _____

SITE CONDITIONS DURING PURGING: CLEAR, SUNNY, 1-3 MPH BREEZE, 60°F

NOTE: IF WELL HAS A DEDICATED PUMP, IT IS TO BE USED.

FIELD OBSERVATIONS: _____

S&A PLAN SAMPLING PROCEDURE FOLLOWED: [ ] YES [ ] NO IF NO, WHY WAS A DEVIATION NECESSARY: _____

RECORDED BY: B. Williams (Signature) QA CHECKED BY: Heidi Brumbaugh (Signature)

WELL PURGE RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO. CY08

PAGE 3 OF 4

WELL NUMBER AND LOCATION: WBG-MW-Ø15 NEAR PAD 68

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (μMHOS/CM)	pH (Standard Units)	TURBIDITY Do.		TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS
11-1-ØØ	151Ø	Ø.Ø	15.61	Ø.733	7.35					INITIAL WATERLEVEL 12.80 FT PID Ø.3 PPM
11-1-ØØ	152Ø	Ø.25	13.8Ø	Ø.734	7.28					CLOUDY 12.80 Ø.3 PPM
11-1-ØØ	153Ø	1.Ø	13.84	Ø.727	7.27					CLOUDY 12.88 Ø.4 PPM
11-1-ØØ	154Ø	1.8	13.79	Ø.725	7.30					CLOUDY 12.88 Ø.4 PPM
11-1-ØØ	155Ø	2.75	13.71	Ø.727	7.28	3.13				CLOUDY 12.88 Ø.4 PPM
11-1-ØØ	16ØØ	3.4Ø	13.65	Ø.73Ø	7.26	2.99				CLOUDY 12.88 Ø.4 PPM
11-1-ØØ	161Ø	4.ØØ	13.61	Ø.733	7.27	3.Ø4	61			CLOUDY 12.88 Ø.4 PPM
11-1-ØØ	162Ø	~~4.8Ø~~ 4.80 BW 11-1-00	13.60	Ø.734	7.26	2.99	298			SAMPLE CLOUDY 12.88 Ø.4 PPM
11-1-ØØ	172Ø		12.88	Ø.735	7.24	3.53	4Ø			FINAL 12.88 Ø.4 PPM

vjb 11-8-00

RECORDED BY: B. Williams 11-1-ØØ
(Signature and Date)

QA CHECK BY: Vicki Brumbach 11-8-00
(Signature and Date)

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Well volume calculation sheet

Date 10/30/00 Time 1415
Well ID Num MW 016
Well Location WBC

Total depth of well (ft BTOC) 24.46
Depth to water (ft BTOC) 18.4
Height of water column (ft) (Hc) 6.06

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc 0.122 cu. ft.

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)
**note ** use length of screen if Hc > length of screen
= 0.589 cu. ft.

Vt = (Vc+Vf)*(7.48 gal/cu ft)
= 5.3 gal.

Where:
Vc = Volume of casing (ft^3)
Vf = Volume of filter pack (ft^3)
Vt = Total volume
Ro = outside radius of casing .095 (ft)
Hc = height of water column 6.06 (ft)
Rf = radius of filter pack .335 (ft)
Rc = radius of inside casing .08 (ft)

WELL DEVELOPMENT FORM

PROJECT NAME: Winkiepeck Burning Grounds DELIVERY ORDER NO: CY08

Date: 10/30/00 Time: 1415

Well Number and Location: WBGmw-016

Development Crew: BROOKS ABELN, VICKI BRUMBACK,

Driller (if applicable): NA

Water Levels / Time: Initial: 18.46 / 1415 Pumping: 19.1 / 1610

Final: 21.36 / 1745

Total Well Depth: Initial: 24.24 FT BTOC Final: 25.35 FT BTOC

Date and Time: Begin: 10/30/00 1415 Completed: /

Development Method(S): WHALE Pump

Total Quantity of Water Removed: 30 gals

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature	13861	10/30/00
Specific Conductivity	13861	10/30/00
pH	13861	10/30/00
Turbidity	13861	10/30/00
DO	13861	10/30/00

WELL DEVELOPMENT RECORD

PROJECT NAME Winklepeck Burning Grounds DELIVERY ORDER NO. CY08

PAGE 1 OF 1

WELL NUMBER AND LOCATION: WB6 mw 016

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (μMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	D.O.	COMMENTS
10/30/00	1415	—	—	—	—	—	—	—	—	
	1515	6.0	13.9	.624	7.99	63	6.0	1	12.94	
	1550	6.0	12.7	.571	7.80	523	12.0	2	1.87	
	1630	6.0	12.3	.608	7.92	141	18.0	3	2.84	
	1705	6.0	12.1	.591	7.87	596	24.0	4	2.18	
	1735	6.0	11.9	.589	7.87	104	30.0	5	1.37	

RECORDED BY: B S Clark 10-30-00
(Signature and Date)

QA CHECK BY: Vicki Pommback 10-8-01
(Signature and Date)

GROUND WATER PURGE SHEET

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO. [illegible]

DATE (mm/dd/yy): 11/03/00 TIME: 10 : 10 page 2 of 4

WELL ID NUMBER: WBG-MW-016 WELL LOCATION: Winklepeck Burning Grounds - NAVE of DeMill bldg.

DEPTH OF SCREENED INTERVAL(toc notch): 15.16 ft. to 25.16 ft.

INNER CASING: TYPE: PVC ID: 2" inches

WELL VOLUME CALCULATION $Vc = 3.142 \times (di/2)^2 \times (TD-H)$ NA micropurging

$VF = 3.142 \times [\ (dH/2)^2 - (do/2)^2\ ]\ (TD - S \text{ or } H)\ (P)$

NOTE: If S > H use S, if S < H use H

$Vt = (Vc + Vf)\ (7.48)$

WHERE:

- Vc = Volume of water in well casing, cu.ft.
- Vt = Total volume, gal
- Vf = Volume of water in filter pack, cu.ft.
- do = outside of diameter of well casing, ft.
- di = inside diameter of well casing, ft.
- P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a range of 30 to 35%)
- dH = diameter of borehole, ft.
- TD = total depth of well from top of well casing, ft.
- H = depth of water, ft., from top of well casing
- S = depth to base of seal, ft., from top of well casing

PURGE METHOD: [ ] Bailer [X] Bladder Pump [ ] Pump Type _____

MINIMUM PURGE VOLUME = Vt x 3 PURGE VOLUME: _____ GAL.

SAMPLE METHOD: [ ] Bailer [X] Bladder Pump [ ] Other (specify) _____

SITE CONDITIONS DURING PURGING: Partly Cloudy, Early morning fog, calm, 55-57°F

NOTE: IF WELL HAS A DEDICATED PUMP, IT IS TO BE USED.

FIELD OBSERVATIONS: _____

S&A PLAN SAMPLING PROCEDURE FOLLOWED: [X] YES [ ] NO IF NO, WHY WAS A DEVIATION NECESSARY: _____

RECORDED BY: _____ (Signature)

QA CHECKED BY: Vicki Brumbach (Signature)

WELL PURGE RECORD

PROJECT NAME Winklepeck Burning Grounds DELIVERY ORDER NO. (CY00)

WELL NUMBER AND LOCATION: WBG-MW-016 N/NE of DeMill Bldg.

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY / D.O.		TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS	PID
11/3/00	10:10	0.0	13.65	0.544	8.06	1.63	93	0.	0.	~~initial~~ initial	11-3-00 0.3
11/3/00	10:20	0.25	12.82	0.545	8.08	.92	999	0.25		• brown cloudy	0.0
11-3-00	10:30	1.0	12.68	0.542	8.10	.53	999	1.25		cloudy	0.0
11-3-00	10:40	1.20	12.63	0.541	8.10	.42	999	2.45		cloudy	0.0
11-3-00	10:50	1.85	12.77	0.542	8.12	.41	999	4.30		cloudy	0.0
11-3-00	11:00	2.25	12.88	0.541	8.12	.35	775	6.55		less but cloudy	0.0
11-3-00	11:10	3.0	12.93	0.542	8.14	.35	582	9.55		sample less but cloudy	0.0
11-3-00	12:10	6-0	13.66	0.541	8.18	.62	347	15.55		FINAL less cloudy	0.0
								Vjb (see "gallons removed" column for "total gallons removed")			
					cc 11/3/00						

RECORDED BY: C. Canard 11-3-00
(Signature and Date)

QA CHECK BY: Wade Brumbach 11-8-00
(Signature and Date)

Well volume calculation sheet

Date 10/30/00 Time 1230
Well ID Num MW 017
Well Location WBG

Total depth of well (ft BTOC) 23.17
Depth to water (ft BTOC) 10.19
Height of water column (ft) (Hc) 12.98

Well Volume Calculation

Vc = 3.142(Rc^2)*Hc .2610 cu. ft.

Vf = 3.142[(Rf^2)-(Ro^2)]*(Hc or length of screen)*(0.30)
**note ** use length of screen if Hc > length of screen
= 1.262 cu. ft.

Vt = (Vc+Vf)*(7.48 gal/cu ft)
= 11.39 gal.

Where:
Vc = Volume of casing (ft^3)
Vf = Volume of filter pack (ft^3)
Vt = Total volume
Ro = outside radius of casing .095 (ft) BGA 10/30/00
Hc = height of water column ~~.08~~ (ft) 12.98 ft
Rf = radius of filter pack .335 (ft)
Rc = radius of inside casing .08 (ft)

WELL DEVELOPMENT FORM

PROJECT NAME: Winkelpeck Burning Grounds DELIVERY ORDER NO: CY08

Date: 10/30/00 Time: 10:15

Well Number and Location: WBG mw-017

Development Crew: Brooks Abeln, Vicki Brumback, Kathy Dominic

BGA 10/30/00

Driller (if applicable): NA

BGA 10/30/00

Water Levels / Time: Initial: 10.21' / 1250 Pumping: 10.86 / 1325

Final: 10.4' / 1335

Total Well Depth: Initial: 22.7 FT BTOC Final: 23.84 FT BTOC

Date and Time: Begin: 10/30/00 1300 Completed: 10/30/00 / 1335

Development Method(S): Whale Pump

Total Quantity of Water Removed: 58 gals

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature	13861	10/30/00
Specific Conductivity	13861	10/30/00
pH	13861	10/30/00
Turbidity	13861	10/30/00
DO	13861	10/30/00

WELL DEVELOPMENT RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO.: CY08

PAGE 1 OF 1

WELL NUMBER AND LOCATION: WB6 mw 017

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (μMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	DO	COMMENTS
10/30/00	1300	—	—	—	—	—	—	—		
10/30/00	1312	12	13.0	.542	7.53	999	12	1	1.01	
10/30/00	1320	10/13/00 BGA ~~25~~ 13	13.6	.521	7.50	1.60	25	2	1.09	
10/30/00	1328	15	13.0	.524	7.58	53	40	3	1.25	
10/30/00	1333	18	13.3	.520	7.64	32	58	4	1.99	

RECORDED BY: Brooks Abeln
(Signature and Date)

QA CHECK BY: Vicki Brumbach 10-8-01
(Signature and Date)

GROUND WATER PURGE SHEET

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: CY08

DATE (mm/dd/yy): 11/01/00 TIME: 16:00

WELL ID NUMBER: WBG MW 017 WELL LOCATION: WBG

DEPTH OF SCREENED INTERVAL(toc notch): 138 ft. to 738 ft.

INNER CASING: TYPE: PVC ID: 2 inches

WELL VOLUME CALCULATION $Vc = 3.142 \times (di/2)^2 \times (TD-H)$ NA - micropurge

$VF = 3.142 \times [(dH/2)^2 - (do/2)^2] (TD - S \text{ or } H) (P)$

NOTE: If S > H use S, if S < H use H

$Vt = (Vc + Vf) (7.48)$

WHERE:

Vc = Volume of water in well casing, cu.ft.
Vt = Total volume, gal
Vf = Volume of water in filter pack, cu.ft.
do = outside of diameter of well casing, ft.
di = inside diameter of well casing, ft.
dH = diameter of borehole, ft.
TD = total depth of well from top of well casing, ft.
H = depth of water, ft., from top of well casing
S = depth to base of seal, ft., from top of well casing
P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a range of 30 to 35%)

PURGE METHOD: [ ] Bailer [✓] Bladder Pump [ ] Pump Type _____

MINIMUM PURGE VOLUME = Vt x 3 PURGE VOLUME: _____ GAL.

SAMPLE METHOD: [ ] Bailer [✓] Bladder Pump [ ] Other (specify) _____

SITE CONDITIONS DURING PURGING: _____

NOTE: IF WELL HAS A DEDICATED PUMP, IT IS TO BE USED.

FIELD OBSERVATIONS: _____

S&A PLAN SAMPLING PROCEDURE FOLLOWED: [✓] YES [ ] NO IF NO, WHY WAS A DEVIATION NECESSARY: _____

RECORDED BY: Brooks Abeln 11-01-00 (Signature) QA CHECKED BY: Vicki Brumbach (Signature)

WELL PURGE RECORD

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO:** CY08

PAGE 1 OF 1

WELL NUMBER AND LOCATION: WBGmw-017

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (μMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	DO	COMMENTS
11/01/00	1605	—	—	—	—	—	—	NA	—	
11/01/00	1610	1.5	12.8	.540	7.13	3.58	1.5		0.55	
11/01/00	1620	~~1.5~~ 1.5	12.4	.539	7.27	2.03	3.0		0.37	
11/01/00	1630	1.5	12.3	.540	7.26	1.83	4.5		0.83	

BGA 11/01/00

RECORDED BY: B S Olbeck 11/01/00
(Signature and Date)

QA CHECK BY: Vicki Brumbach 10-8-01
(Signature and Date)

PROJECT NAME: Middlepeak Burning

DATE (mm/dd/yy): 11.05.00 TIME: 14 :

WELL ID NUMBER: OBG-1 WELL LOCATION: NBG

DEPTH OF SCREENED INTERVAL(toc notch): 7.4 ft. to 17.4 ft.

INNER CASING: TYPE: PVC ID: 2 inches

WELL VOLUME CALCULATION Vc = 3.142 x (di/2)^2 x (TD-H) NA (micropurged)

VF = 3.142 x [(dH/2)^2 - (do/2)^2] (TD - S or H) (P)

NOTE: If S > H use S, if S < H use H

Vt = (Vc + Vf) (7.48)

WHERE:

Vc = Volume of water in well casing, cu.ft.
Vt = Total volume, gal
Vf = Volume of water in filter pack, cu.ft.
do = outside of diameter of well casing, ft.
di = inside diameter of well casing, ft.
dH = diameter of borehole, ft.
TD = total depth of well from top of well casing, ft.
H = depth of water, ft., from top of well casing
S = depth to base of seal, ft., from top of well casing
P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a range of 30 to 35%)

PURGE METHOD: [ ] Bailer [✓] Bladder Pump [ ] Pump Type

MINIMUM PURGE VOLUME = Vt x 3 PURGE VOLUME: see p. 67 GAL.

SAMPLE METHOD: [ ] Bailer [✓] Bladder Pump [ ] Other (specify)

SITE CONDITIONS DURING PURGING: Standing water inside flush mount prior to purging

NOTE: IF WELL HAS A DEDICATED PUMP, IT IS TO BE USED.

FIELD OBSERVATIONS:

S&A PLAN SAMPLING PROCEDURE FOLLOWED: [✓] YES [ ] NO IF NO, WHY WAS A DEVIATION NECESSARY:

RECORDED BY: (Signature) QA CHECKED BY: Vicki Brumbach (Signature)

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WELL PURGE RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NO.: CY08

PAGE 3 OF 4

WELL NUMBER AND LOCATION: OBG-1

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (μMHOS/CM)	pH (Standard Units)	TURBIDITY	TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS D.O.
11/5/00	1432	Ø	14.4	0.446	7.43	45	Ø		1.74
	1442	1.5	14.4	0.432	7.43	15	1.5		1.16
	1452	0.5	13.9	0.427	7.43	7	2.0		1.11
	1532	0.6	13.5	0.452	7.40	2	2.6		2.35

Vjb 11-8-00

RECORDED BY: K L Dominic 11.5.00
(Signature and Date)

QA CHECK BY: Vidin Brumbach 11-8-00
(Signature and Date)

PROJECT NAME: Winkelpeck Burning Grounds

DELIVERY ORDER NO.:

DATE (mm/dd/yy): 11-5-00

TIME: 15 : 00 page 2 of 4

WELL ID NUMBER: OBG-2

WELL LOCATION: WINKLEPECK BURNING GROUNDS - PAD 37

DEPTH OF SCREENED INTERVAL(toc notch): _____ ft. to _____ ft.

INNER CASING: TYPE: PVC ID: 2 INCH inches

WELL VOLUME CALCULATION $Vc = 3.142 \times (di/2)^2 \times (TD-H)$ NA- micropurging

$VF = 3.142 \times [(dH/2)^2 - (do/2)^2] (TD - S \text{ or } H) (P)$

NOTE: If S > H use S, if S < H use H

$Vt = (Vc + Vf) (7.48)$

WHERE:

Vc = Volume of water in well casing, cu.ft.
Vt = Total volume, gal
Vf = Volume of water in filter pack, cu.ft.
do = outside of diameter of well casing, ft.
di = inside diameter of well casing, ft.
dH = diameter of borehole, ft.
TD = total depth of well from top of well casing, ft.
H = depth of water, ft., from top of well casing
S = depth to base of seal, ft., from top of well casing
P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a range of 30 to 35%)

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PURGE METHOD: [ ] Bailer [X] Bladder Pump [ ] Pump Type _____

MINIMUM PURGE VOLUME = Vt x 3 PURGE VOLUME: _____ GAL.

SAMPLE METHOD: [ ] Bailer [X] Bladder Pump [ ] Other (specify) _____

SITE CONDITIONS DURING PURGING: CLEAR, 1-5 MPH BREEZE, 54°F EVENING- 42°F, CLEAR, CALM

NOTE: IF WELL HAS A DEDICATED PUMP, IT IS TO BE USED.

FIELD OBSERVATIONS: _____

S&A PLAN SAMPLING PROCEDURE FOLLOWED: [X] YES [ ] NO IF NO, WHY WAS A DEVIATION NECESSARY: _____

RECORDED BY: Beau Williams (vjb) (Signature)

QA CHECKED BY: Vicki Brumbach (Signature)

WELL PURGE RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO. LY08

PAGE 3 OF 4

WELL NUMBER AND LOCATION: OBG-2 WINKLEPECK BURNING GROUNDS - PAD 37

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (μMHOS/CM)	pH (Standard Units)	TURBIDITY D.O.		TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	DEPTH TO WATER	COMMENTS PID
11-5-00	1500	0.0	13.89	0.828	7.15	3.12	2	0.0	0.0	8.60	0.0 PPM
11-5-00	1510	0.1	13.40	0.858	7.09	2.62	34	0.1		8.60	0.0 PPM
11-5-00	1520	0.1	13.29	0.836	7.08	1.20	110	0.2		8.60	0.0 PPM
11-5-00	1530	0.2	13.28	0.792	7.09	0.82	174	0.4		8.60	0.0 PPM
11-5-00	1540	0.35	13.31	0.737	7.10	0.63	211	0.75		8.60	MILKY ~~MILKY~~ 0.0 PPM
11-5-00	1550	0.25	13.31	0.705	7.11	0.62	207	1.0		8.60	MILKY ~~MILKY~~ 0.0 PPM
11-5-00	1600	0.2	13.25	0.676	7.12	1.12	219	1.2		8.60	MILKY 0.0 PPM
11-5-00	1610	0.15	13.12	0.664	7.11	0.63	238	1.35		8.60	SAMPLE MILKY 0.0 PPM
11-5-00	1810	2.5	BW 11-5-00 ~~11.70~~ 11.70	0.583	7.14	0.70	135	3.85		8.60	FINAL 0.0 PPM
					BW						
					11-5-00						

RECORDED BY: B. Williams 11.5.00
(Signature and Date)

QA CHECK BY: Vicki Brumbach 11-8-00
(Signature and Date)

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GROUND WATER PURGE SHEET

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO. [illegible]

DATE (mm/dd/yy): 11-5-00 TIME: ____:____ page 2 of 4

WELL ID NUMBER: OB6-3 WELL LOCATION: WINKLEPECK BURNING GROUNDS - PAD 37

DEPTH OF SCREENED INTERVAL(toc notch): 9.58 ft. to 19.58 ft.

INNER CASING: TYPE: BW 11.5-ph 2 PVC ID: 2 INCH inches

WELL VOLUME CALCULATION $Vc = 3.142 \times (di/2)^2 \times (TD-H)$ NA- micropurging

$VF = 3.142 \times [\ (dH/2)^2 - (do/2)^2\ ]\ (TD - S \text{ or } H)\ (P)$

NOTE: If S > H use S, if S < H use H

$Vt = (Vc + Vf)\ (7.48)$

WHERE:

Vc = Volume of water in well casing, cu.ft.
Vt = Total volume, gal
Vf = Volume of water in filter pack, cu.ft.
do = outside of diameter of well casing, ft.
di = inside diameter of well casing, ft.
P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a range of 30 to 35%)

dH = diameter of borehole, ft.
TD = total depth of well from top of well casing, ft.
H = depth of water, ft., from top of well casing
S = depth to base of seal, ft., from top of well casing

PURGE METHOD: [ ] Bailer [X] Bladder Pump [ ] Pump Type _____

MINIMUM PURGE VOLUME = Vt x 3 PURGE VOLUME: _____ GAL.

SAMPLE METHOD: [ ] Bailer [X] Bladder Pump [ ] Other (specify) _____

SITE CONDITIONS DURING PURGING: SUNNY, CLEAR, 1-5 MPH BREEZE, 48°F

NOTE: IF WELL HAS A DEDICATED PUMP, IT IS TO BE USED.

FIELD OBSERVATIONS: _____

S&A PLAN SAMPLING PROCEDURE FOLLOWED: [X] YES [ ] NO IF NO, WHY WAS A DEVIATION NECESSARY: _____

RECORDED BY: B. Williams (Signature) QA CHECKED BY: Vicki Brumbaker (Signature)

WELL PURGE RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO. CTO08

WELL NUMBER AND LOCATION: OBG-3 WINKLEPECK BURNING GROUNDS - PAD 37

DATE	TIME	GALLONS REMOVED	TEMP(C)	SPECIFIC CONDUCTIVITY (µMHOS/CM)	pH (Standard Units)	TURBIDITY / D.O.		TOTAL GALLONS REMOVED	WELL VOLUMES REMOVED	COMMENTS: DEPTH TO WATER LEVEL	PID
11500	1005	0.0	13.52	0.431	7.24	3.09	0	0.0	0.0	6.70 INITIAL	0.0 PPM
11.5-00	1015	0.1	13.55	0.434	7.24	3.01	35	0.1		6.71	0.0 PPM
11.5-00	1025	0.2	13.56	0.434	7.26	3.03	55	0.3		6.73	0.0 PPM
11.5-00	1035	0.4	13.54	0.434	7.25	1.86	78	0.7		6.74	0.0 PPM
11.5-00	1045	0.3	13.37	0.433	7.23	1.39	98	1.0		6.75	0.0 PPM
11.5-00	1055	0.2	13.31	0.433	7.24	1.40	69	1.2		6.75	0.0 PPM
11-5-00	1105	0.2	13.39	0.434	7.23	1.15	49	1.4		6.76	0.0 PPM
11.5-00	1115	0.2	13.45	0.436	7.23	1.14	36	1.6		6.76	0.0 PPM
11.5-00	1125	0.2	13.56	0.436	7.24	1.11	34	1.8		6.76 SAMPLE	0.0 PPM
11.5-00	1305	2.5	15.16	0.434	7.24	1.15	22	4.3		6.76 FINAL	0.0 PPM
				BW 11.5-00							

RECORDED BY: B. Williams 11-5-00
(Signature and Date)

QA CHECK BY: Vicki Brumbach 11-8-00
(Signature and Date)

APPENDIX E

SLUG TESTS LOGS

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SLUG TEST RECORD

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO:** CY08

WELL NO: WBG mw 010	DATE STARTED: 11/07/00	DATE COMPLETED: 11/07/00
LOCATION: WBG	RECORDED BY: Brooks Abeln	

EQUIPMENT INFORMATION SUMMARY

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NO.	RANGE (PSI)	LAST CALIB.
DATA LOGGER	IN-SITU ~~HERMIT~~ TROLL	~~1000 C~~ 40000	11285	15	NA
TRANSDUCER	IN SITU NA	PXD-260 NA	NA	NA	N'A
WATER LEVEL					

PRETEST DATA

REFERENCE POINT	REFERENCE POINT ELEVATION	RISER CASING I.D. (IN.) 2.0
SCREEN OR OPEN HOLE I.D.(IN.) 2.0	DIAMETER OF BOREHOLE (IF SCREENED)	

	FT BRP	MSL		FT BRP	MSL
TOTAL WELL DEPTH	22.95		TOP OF FILTER PACK	11.0	
DEPTH TO WATER	9.18		TOP OF SCREEN OR OPEN HOLE	13.0	
HEIGHT OF WATER COLUMN	15.87		SCREEN LENGTH	10'	
TEST INTERVAL TYPE					

TEST METHODS SUMMARY

TEST METHOD — SLUG IN (FALLING HEAD) ☐ — SLUG OUT (RISING HEAD) ☑

SLUG DIMENSIONS	SLUG VOL(GAL)	SLUG DEPTH(FT)
3.4' x 1.375"		

DATA LOGGER RECORDS

DATA LOGGER TEST NO.	FILE NAME	DATE (MM/DD/YY) BEGIN	DATE (MM/DD/YY) END	DATE (HH:MM:SS) BEGIN	DATE (HH:MM:SS) END	DEPTH TO TRANSDUCER (FT BRP)	DEPTH TO WATER (FT BRP) BEGIN	DEPTH TO WATER (FT BRP) END	HEIGHT OF WATER COLUMN (FT) BEGIN	HEIGHT OF WATER COLUMN (FT) END
	WPbg mw 010 ST 002 a	11/7/00	11/7/00	9:09:19	9:17:13					
					BGA 11/8/00					

STORAGE LOCATION OF DATA: 1) Computer 2) Disc

FILE STRUCTURES	DATA TYPE	FORMAT (1)	UNITS	TEST TIME INTERVAL LOG SCALE	TEST TIME INTERVAL ARITH. SCALE	COMMENTS
COLUMN A						
COLUMN B						
COLUMN C						

(1) CK - 24 HR CLOCK TIME; ET - ELASPED TIME; H - HEIGHT OF WATER ABOVE TRANSDUCER; FT BRP - DEPTH TO WATER; E - WATER LEVEL ELEVATION; P - PRESSURE; O - OTHER (EXPLAIN IN REMARKS)

DATA CHECK RESULTS:

REMARKS: WHITE SLUG SIZE SLUG TEST DATA (PRINT OUT / DISC FILE)

DATA RECORDED BY	DATE	QA CHECK BY	DATE
Brooks Abeln	11/7/00	Vicki Brumbach	10-8-01

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SLUG TEST RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: CY08

WELL NO: WBG MW 010	DATE STARTED: 11/7/00	DATE COMPLETED: 11/7/00
LOCATION: WBG	RECORDED BY: BROOKS ABELN	

MANUAL RECORDS SUMMARY

TEST DATE INTERVAL		TEST TIME INTERVAL		DEPTH TO WATER	
BEGIN	END	BEGIN (to)	END	BEGIN (to)	END

WATER LEVEL RECOVERY

MEAS.	ELAPSED TIME		DTW	MEAS.	ELAPSED TIME		DTW	MEAS.	ELAPSED TIME		DTW
	MIN.	SEC.			MIN.	SEC.			MIN.	SEC.	
1				16				31			
2				17				32			
3				18				33			
4				19				34			
5				20				35			
6				21				36			
7				22				37			
8				23				38			
9				24				39			
10				25				40			
11				26				41			
12				27				42			
13				28				43			
14				29				44			
15				30				45			

BGA 11/8/00

REMARKS: SEE SLUG TEST DATA (PRINTOUT / DISC FILE)

DATA RECORDED BY	DATE	QA CHECK BY	DATE
B Abeln	11/8/00	Vicki Brumbach	10-8-01

SLUG TEST RECORD

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO: CY08**

WELL NO: MW-011	DATE STARTED: 11/01/00	DATE COMPLETED: 11/7/00
LOCATION: ~ MW36	RECORDED BY: B GABELN	

EQUIPMENT INFORMATION SUMMARY

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NO.	RANGE (PSI)	LAST CALIB.
DATA LOGGER	IN-SITU ~~HERMIT~~ TROLL	~~1000C~~ 4000	11282	15	NA
TRANSDUCER	IN SITU NA	PXD-260	NA	NA	NA
WATER LEVEL					

PRETEST DATA

REFERENCE POINT	REFERENCE POINT ELEVATION	RISER CASING I.D. (IN.)

SCREEN OR OPEN HOLE I.D.(IN.)	DIAMETER OF BOREHOLE (IF SCREENED)

	FT BRP	MSL		FT BRP	MSL
TOTAL WELL DEPTH	23.3		TOP OF FILTER PACK	11.5	
DEPTH TO WATER	11.705		TOP OF SCREEN OR OPEN HOLE	9.6	
HEIGHT OF WATER COLUMN	11.695		SCREEN LENGTH	10'	
TEST INTERVAL TYPE					

TEST METHODS SUMMARY

TEST METHOD	SLUG IN (FALLING HEAD) ☐	SLUG OUT (RISING HEAD) ☑	
SLUG DIMENSIONS	3.15' x 1.25"	SLUG VOL(GAL)	SLUG DEPTH(FT)

DATA LOGGER RECORDS

DATA LOGGER TEST NO.	FILE NAME	DATE (MM/DD/YY) BEGIN	DATE (MM/DD/YY) END	DATE (HH:MM:SS) BEGIN	DATE (HH:MM:SS) END	DEPTH TO TRANSDUCER (FT BRP)	DEPTH TO WATER (FT BRP) BEGIN	DEPTH TO WATER (FT BRP) END	HEIGHT OF WATER COLUMN (FT) BEGIN	HEIGHT OF WATER COLUMN (FT) END
				B6A						
					11/8/00					

STORAGE LOCATION OF DATA: 1) 2)

FILE STRUCTURES	DATA TYPE	FORMAT (1)	UNITS	TEST TIME INTERVAL LOG SCALE	TEST TIME INTERVAL ARITH. SCALE	COMMENTS
COLUMN A						
COLUMN B						
COLUMN C						

(1) CK - 24 HR CLOCK TIME; ET - ELASPED TIME; H - HEIGHT OF WATER ABOVE TRANSDUCER; FT BRP - DEPTH TO WATER; E - WATER LEVEL ELEVATION; P - PRESSURE; O - OTHER (EXPLAIN IN REMARKS)

DATA CHECK RESULTS:

REMARKS: SEE SLUG TEST DATA (PRINTOUT / DISC FILE)

DATA RECORDED BY	DATE	QA CHECK BY	DATE
B Gabeln	11/8/00	Vicki Baumbach	10-8-01

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SLUG TEST RECORD

PROJECT NAME: Winkelpeck Burning Grounds DELIVERY ORDER NO: CY08

WELL NO: WB6 mw 011	DATE STARTED: 11/7/00	DATE COMPLETED: 11/7/00
LOCATION: WB6	RECORDED BY:	

MANUAL RECORDS SUMMARY

TEST DATE INTERVAL		TEST TIME INTERVAL		DEPTH TO WATER	
BEGIN	END	BEGIN (to)	END	BEGIN (to)	END

WATER LEVEL RECOVERY

MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW	MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW	MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW
1				16				31			
2				17				32			
3				18				33			
4				19				34			
5				20				35			
6				21	11/8/00			36			
7				22				37			
8				23				38			
9				24				39			
10				25				40			
11				26				41			
12				27				42			
13				28				43			
14				29				44			
15				30				45			

REMARKS: SEE SLUG TEST DATA (PRINTOUT / DISC FILE)

DATA RECORDED BY	DATE	QA CHECK BY	DATE
	11/8/00	Vicki Brumbaugh	10-8-01

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SLUG TEST RECORD

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO:** CY08

WELL NO: WBG-MN-012	DATE STARTED: 11/07/00	DATE COMPLETED: 11/7/00
LOCATION: WBG	RECORDED BY: B.S. Albach	

EQUIPMENT INFORMATION SUMMARY

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NO.	RANGE (PSI)	LAST CALIB.
DATA LOGGER	IN-SITU ~~HERMIT~~ TROLL	~~1000 C~~ 4000	11286	15	NA
TRANSDUCER	IN SITU NA	PXD-260 NA	NA	NA	NA
WATER LEVEL					

PRETEST DATA

REFERENCE POINT NA	REFERENCE POINT ELEVATION NA	RISER CASING I.D. (IN.) 8.0
SCREEN OR OPEN HOLE I.D.(IN.) 2.0"	DIAMETER OF BOREHOLE (IF SCREENED) NA	

	FT BRP	MSL		FT BRP	MSL
TOTAL WELL DEPTH	30.94		TOP OF FILTER PACK	18.5	
DEPTH TO WATER	24.62		TOP OF SCREEN OR OPEN HOLE	21.7	
HEIGHT OF WATER COLUMN	6.32		SCREEN LENGTH	10.0'	
TEST INTERVAL TYPE					

TEST METHODS SUMMARY

TEST METHOD	SLUG IN (FALLING HEAD) ☑	SLUG OUT (RISING HEAD) ☑	
SLUG DIMENSIONS	3.15' x 1.25"	SLUG VOL(GAL)	SLUG DEPTH(FT)

DATA LOGGER RECORDS

DATA LOGGER TEST NO.	FILE NAME	DATE (MM/DD/YY)		DATE (HH:MM:SS)		DEPTH TO TRANSDUCER (FT BRP)	DEPTH TO WATER (FT BRP)		HEIGHT OF WATER COLUMN (FT)	
		BEGIN	END	BEGIN	END		BEGIN	END	BEGIN	END

BGA 11/8/00

STORAGE LOCATION OF DATA:	1)	2)

FILE STRUCTURES	DATA TYPE	FORMAT (1)	UNITS	TEST TIME INTERVAL		COMMENTS
				LOG SCALE	ARITH. SCALE	
COLUMN A						
COLUMN B						
COLUMN C						

(1) CK - 24 HR CLOCK TIME; ET - ELASPED TIME; H - HEIGHT OF WATER ABOVE TRANSDUCER; FT BRP - DEPTH TO WATER; E - WATER LEVEL ELEVATION; P - PRESSURE; O - OTHER (EXPLAIN IN REMARKS)

DATA CHECK RESULTS:

REMARKS: SEE SLUG TEST DATA (PRINTOUT / DISC FILE)

DATA RECORDED BY	DATE	QA CHECK BY	DATE
B.S. Albach	11/8/00	Vicki Brumbach	10-08-01

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SLUG TEST RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: CY08

WELL NO: WB6 mw 012	DATE STARTED: 11/7/00	DATE COMPLETED: 11/7/00
LOCATION: WB6	RECORDED BY: BAdlock	

MANUAL RECORDS SUMMARY

TEST DATE INTERVAL		TEST TIME INTERVAL		DEPTH TO WATER	
BEGIN	END	BEGIN (to)	END	BEGIN (to)	END
11/8/00	11/7/00	1010	1013	24.62	24.62

WATER LEVEL RECOVERY

MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW	MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW	MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW
1				16				31			
2				17				32			
3				18				33			
4				19				34			
5				20				35			
6				21				36			
7				22				37			
8				23				38			
9				24				39			
10				25				40			
11				26				41			
12				27				42			
13				28				43			
14				29				44			
15				30				45			

REMARKS: SEE SLUG TEST DATA (ATTACHED PRINTOUT / DISC FILE)
WPbg mw 012 STOUT

DATA RECORDED BY	DATE	QA CHECK BY	DATE
BAdlock	11/8/00	Vicki Brumbach	10-8-01

SLUG TEST RECORD

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO.:** CY08

WELL NO: WBGmw013	DATE STARTED: 11/07/00	DATE COMPLETED: 11/7/00	
LOCATION: WBG	RECORDED BY: B&Clark		

EQUIPMENT INFORMATION SUMMARY

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NO.	RANGE (PSI)	LAST CALIB.
DATA LOGGER	IN-SITU ~~HERMIT~~ TROLL	~~1000 C~~ 4000	11282	15	NC
TRANSDUCER	IN SITU NA	PXD-260 NA	NA	NA	NA
WATER LEVEL					

PRETEST DATA

REFERENCE POINT: NA	REFERENCE POINT ELEVATION: NA	RISER CASING I.D. (IN.): 2"
SCREEN OR OPEN HOLE I.D.(IN.): 2.0"	DIAMETER OF BOREHOLE (IF SCREENED):	

	FT BRP	MSL		FT BRP	MSL
TOTAL WELL DEPTH	23.70		TOP OF FILTER PACK	11.55	
DEPTH TO WATER	12.53		TOP OF SCREEN OR OPEN HOLE	13.65	
HEIGHT OF WATER COLUMN	11.17		SCREEN LENGTH	10.0'	
TEST INTERVAL TYPE					

TEST METHODS SUMMARY

TEST METHOD: SLUG IN (FALLING HEAD) ☐ SLUG OUT (RISING HEAD) ☑

SLUG DIMENSIONS	SLUG VOL(GAL)	SLUG DEPTH(FT)
3.15" x 1.25"		

DATA LOGGER RECORDS

DATA LOGGER TEST NO.	FILE NAME	DATE (MM/DD/YY) BEGIN	DATE (MM/DD/YY) END	DATE (HH:MM:SS) BEGIN	DATE (HH:MM:SS) END	DEPTH TO TRANSDUCER (FT BRP)	DEPTH TO WATER (FT BRP) BEGIN	DEPTH TO WATER (FT BRP) END	HEIGHT OF WATER COLUMN (FT) BEGIN	HEIGHT OF WATER COLUMN (FT) END
					BGA					
						11/8/00				

STORAGE LOCATION OF DATA: 1) 2)

FILE STRUCTURES	DATA TYPE	FORMAT (1)	UNITS	TEST TIME INTERVAL LOG SCALE	TEST TIME INTERVAL ARITH. SCALE	COMMENTS
COLUMN A						
COLUMN B						
COLUMN C						

(1) CK - 24 HR CLOCK TIME; ET - ELASPED TIME; H - HEIGHT OF WATER ABOVE TRANSDUCER; FT BRP - DEPTH TO WATER; E - WATER LEVEL ELEVATION; P - PRESSURE; O - OTHER (EXPLAIN IN REMARKS)

DATA CHECK RESULTS:

REMARKS: SEE SLUG TEST DATA (ATTACHED PRINTOUT / DISK FILE: wpbg mw 013 STOUT)

DATA RECORDED BY	DATE	QA CHECK BY	DATE
B&Clark	11/8/00	Vicki Brumbaugh	10-8-01

40

SLUG TEST RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: CY08

WELL NO: WB6mw 013	DATE STARTED: 11/7/00	DATE COMPLETED: 11/7/00
LOCATION: WB6	RECORDED BY: B Sdlach	

MANUAL RECORDS SUMMARY

TEST DATE INTERVAL		TEST TIME INTERVAL		DEPTH TO WATER	
BEGIN	END	BEGIN (to)	END	BEGIN (to)	END
11/7/00	11/7/00	1009	1013	2.53	12.53

WATER LEVEL RECOVERY

MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW	MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW	MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW
1				16				31			
2				17				32			
3				18				33			
4				19 BGA				34			
5				20				35			
6				21		11/8/00		36			
7				22				37			
8				23				38			
9				24				39			
10				25				40			
11				26				41			
12				27				42			
13				28				43			
14				29				44			
15				30				45			

REMARKS: SEE SLUG TEST DATA ON ATTACHED PRINTOUT OR DISC FILE: wphg mw 013 STOUT

DATA RECORDED BY	DATE	QA CHECK BY	DATE
B Sdlach	11/8/00	Vicki Brumbach	10-8-01

SLUG TEST RECORD

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO:** CY08

WELL NO: WBG mw 014	DATE STARTED: 11/07/00	DATE COMPLETED: 11/7/00
LOCATION: WBG	RECORDED BY: B&S Church	

EQUIPMENT INFORMATION SUMMARY

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NO.	RANGE (PSI)	LAST CALIB.
DATA LOGGER	IN-SITU HERMIT	~~1000 C~~ 4000	11262	15	NR
TRANSDUCER	IN SITU NA	PXD-260 NA	NA	NA	NA
WATER LEVEL					

PRETEST DATA

REFERENCE POINT NA	REFERENCE POINT ELEVATION NA	RISER CASING I.D. (IN.) 2.0"
SCREEN OR OPEN HOLE I.D.(IN.) 2.0"	DIAMETER OF BOREHOLE (IF SCREENED) NA	

	FT BRP	MSL		FT BRP	MSL
TOTAL WELL DEPTH	24.48		TOP OF FILTER PACK	11.3	
DEPTH TO WATER	16.85		TOP OF SCREEN OR OPEN HOLE	14.8	
HEIGHT OF WATER COLUMN	8.63		SCREEN LENGTH	10.0	
TEST INTERVAL TYPE					

TEST METHODS SUMMARY

TEST METHOD — SLUG IN (FALLING HEAD) ☐ — SLUG OUT (RISING HEAD) ☑

SLUG DIMENSIONS	3.4" x 1.375"	SLUG VOL(GAL)	SLUG DEPTH(FT)

DATA LOGGER RECORDS

DATA LOGGER TEST NO.	FILE NAME	DATE (MM/DD/YY)		DATE (HH:MM:SS)		DEPTH TO TRANSDUCER (FT BRP)	DEPTH TO WATER (FT BRP)		HEIGHT OF WATER COLUMN (FT)	
		BEGIN	END	BEGIN	END		BEGIN	END	BEGIN	END
				B&A						

STORAGE LOCATION OF DATA: 1) 2)

4/5/00

FILE STRUCTURES	DATA TYPE	FORMAT (1)	UNITS	TEST TIME INTERVAL		COMMENTS
				LOG SCALE	ARITH. SCALE	
COLUMN A						
COLUMN B						
COLUMN C						

(1) CK - 24 HR CLOCK TIME; ET - ELASPED TIME; H - HEIGHT OF WATER ABOVE TRANSDUCER; FT BRP - DEPTH TO WATER; E - WATER LEVEL ELEVATION; P - PRESSURE; O - OTHER (EXPLAIN IN REMARKS)

DATA CHECK RESULTS:

REMARKS: SEE SLUG TEST DATA CON ATTACHED PRINTOUT OR DISC FILE: WPBG MW 014 S.T OUT

DATA RECORDED BY	DATE	QA CHECK BY	DATE
B&S Church	11/8/00	Vicki Brumbach	10-8-01

44

SLUG TEST RECORD

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO.** CY08

WELL NO: WBG mw 014	DATE STARTED: 11/7/00	DATE COMPLETED: 11/7/00
LOCATION: WBG	RECORDED BY: B Sdlbch	

MANUAL RECORDS SUMMARY

TEST DATE INTERVAL		TEST TIME INTERVAL		DEPTH TO WATER	
BEGIN	END	BEGIN (to)	END	BEGIN (to)	END
11/7/00	11/7/00	1119	1123	16.85	16.85

WATER LEVEL RECOVERY

MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW	MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW	MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW
1				16				31			
2				17				32			
3				18				33			
4				19				34			
5				20				35			
6				21	BGA			36			
7				22				37			
8				23		11/8/00		38			
9				24				39			
10				25				40			
11				26				41			
12				27				42			
13				28				43			
14				29				44			
15				30				45			

REMARKS: SEE SLUG TEST DATA ON ATTACHED PRINTOUT OR DISC FILE: WPBG mw 014 ST OUT

DATA RECORDED BY	DATE	QA CHECK BY	DATE
B Sdlbch	11/8/00	Vicki Brumbach	10-8-01

SLUG TEST RECORD

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO: CY08**

WELL NO: WBG MW 015	DATE STARTED: 11/07/00	DATE COMPLETED: 11/07/00
LOCATION: WBG	RECORDED BY: B.A. Clark	

EQUIPMENT INFORMATION SUMMARY

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NO.	RANGE (PSI)	LAST CALIB.
DATA LOGGER	IN-SITU ~~HERMIT~~ TROLL	~~1000 C~~ 40000	11286	15	NA
TRANSDUCER	IN SITU NA	PXD-260 NA	NA	NA	NA
WATER LEVEL					

PRETEST DATA

REFERENCE POINT	NA	REFERENCE POINT ELEVATION	NA	RISER CASING I.D. (IN.)	2.0"
SCREEN OR OPEN HOLE I.D.(IN.)	2.0"	DIAMETER OF BOREHOLE (IF SCREENED)	NA		

	FT BRP	MSL		FT BRP	MSL
TOTAL WELL DEPTH	23.20		TOP OF FILTER PACK	11.7	
DEPTH TO WATER	12.66		TOP OF SCREEN OR OPEN HOLE	13.8	
HEIGHT OF WATER COLUMN	10.64		SCREEN LENGTH	10.0	
TEST INTERVAL TYPE					

TEST METHODS SUMMARY

TEST METHOD	SLUG IN (FALLING HEAD) ☐	SLUG OUT (RISING HEAD) ☑	
SLUG DIMENSIONS	3.15' X 1.25"	SLUG VOL(GAL)	SLUG DEPTH(FT)

DATA LOGGER RECORDS

DATA LOGGER TEST NO.	FILE NAME	DATE (MM/DD/YY) BEGIN	DATE (MM/DD/YY) END	DATE (HH:MM:SS) BEGIN	DATE (HH:MM:SS) END	DEPTH TO TRANSDUCER (FT BRP)	DEPTH TO WATER (FT BRP) BEGIN	DEPTH TO WATER (FT BRP) END	HEIGHT OF WATER COLUMN (FT) BEGIN	HEIGHT OF WATER COLUMN (FT) END
				13:04						

STORAGE LOCATION OF DATA: 1) 11/8/00 2)

FILE STRUCTURES	DATA TYPE	FORMAT (1)	UNITS	TEST TIME INTERVAL LOG SCALE	TEST TIME INTERVAL ARITH. SCALE	COMMENTS
COLUMN A						
COLUMN B						
COLUMN C						

(1) CK - 24 HR CLOCK TIME; ET - ELASPED TIME; H - HEIGHT OF WATER ABOVE TRANSDUCER; FT BRP - DEPTH TO WATER; E - WATER LEVEL ELEVATION; P - PRESSURE; O - OTHER (EXPLAIN IN REMARKS)

DATA CHECK RESULTS:

REMARKS: SEE SLUG TEST DATA ON ATTACHED PRINTOUT OR DISC FILE: WPBG MW 015 ST OUT

DATA RECORDED BY	DATE	QA CHECK BY	DATE
B.A. Clark	11/8/00	Vicki Brumbach	10-8-01

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SLUG TEST RECORD

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO:** CY08

WELL NO: WBG MW 014	DATE STARTED: 11/7/00	DATE COMPLETED: 11/7/00
LOCATION: WBG 015 vjb 10-8-01	RECORDED BY: BJ Abbott	

MANUAL RECORDS SUMMARY

TEST DATE INTERVAL		TEST TIME INTERVAL		DEPTH TO WATER	
BEGIN	END	BEGIN (to)	END	BEGIN (to)	END
11/7/00	11/7/00	1119	1123	12.66	12.61

WATER LEVEL RECOVERY

MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW	MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW	MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW
1				16				31			
2				17				32			
3				18				33			
4				BG97				34			
5				20				35			
6				21	11/8/00			36			
7				22				37			
8				23				38			
9				24				39			
10				25				40			
11				26				41			
12				27				42			
13				28				43			
14				29				44			
15				30				45			

REMARKS: SEE SLUG TEST DATA ON ATTACHED PRINTOUT OR DISC FILE: wpbg mw 015 ST OUT

DATA RECORDED BY	DATE	QA CHECK BY	DATE
BJ Abbott	11/8/00	Vicki Brumbach	10-8-01

SLUG TEST RECORD

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PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: CY08

WELL NO: WBGmw 016	DATE STARTED: 11/07/00	DATE COMPLETED: 11/7/00	
LOCATION: WBG	RECORDED BY: B S Clark		

EQUIPMENT INFORMATION SUMMARY

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NO.	RANGE (PSI)	LAST CALIB.
DATA LOGGER	IN-SITU ~~HERMIT~~ TROLL	~~1000 C~~ 4000	11285	15	NR
TRANSDUCER	IN SITU NA	PXD-260 NA	NA	NA	NA
WATER LEVEL					

PRETEST DATA

REFERENCE POINT NA	REFERENCE POINT ELEVATION NA	RISER CASING I.D. (IN.) 2.0"	
SCREEN OR OPEN HOLE I.D.(IN.) 2.0"	DIAMETER OF BOREHOLE (IF SCREENED) NA		

	FT BRP	MSL		FT BRP	MSL
TOTAL WELL DEPTH	24.68		TOP OF FILTER PACK	12.5	
DEPTH TO WATER	18.14		TOP OF SCREEN OR OPEN HOLE	15.5	
HEIGHT OF WATER COLUMN	6.54		SCREEN LENGTH	10.0	
TEST INTERVAL TYPE					

TEST METHODS SUMMARY

TEST METHOD	SLUG IN (FALLING HEAD) ☐	SLUG OUT (RISING HEAD) ☑	
SLUG DIMENSIONS	3.15' x 1.25"	SLUG VOL(GAL)	SLUG DEPTH(FT)

DATA LOGGER RECORDS

DATA LOGGER TEST NO.	FILE NAME	DATE (MM/DD/YY)		DATE (HH:MM:SS)		DEPTH TO TRANSDUCER (FT BRP)	DEPTH TO WATER (FT BRP)		HEIGHT OF WATER COLUMN (FT)	
		BEGIN	END	BEGIN	END		BEGIN	END	BEGIN	END

BGR 11/8/00

STORAGE LOCATION OF DATA:	1)	2)

FILE STRUCTURES	DATA TYPE	FORMAT (1)	UNITS	TEST TIME INTERVAL		COMMENTS
				LOG SCALE	ARITH. SCALE	
COLUMN A						
COLUMN B						
COLUMN C						

(1) CK - 24 HR CLOCK TIME; ET - ELASPED TIME; H - HEIGHT OF WATER ABOVE TRANSDUCER; FT BRP - DEPTH TO WATER; E - WATER LEVEL ELEVATION; P - PRESSURE; O - OTHER (EXPLAIN IN REMARKS)

DATA CHECK RESULTS:

REMARKS: WHITE SLUG. SEE SLUG TEST DATA ON ATTACHED PRINTOUT OR DISC FILE: WPBGmw016 ST OUT

DATA RECORDED BY	DATE	QA CHECK BY	DATE
B S Clark	11/8/00	Vicki Brumbach	10-8-01

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SLUG TEST RECORD

PROJECT NAME: Winklepeck Burning Grounds DELIVERY ORDER NO: CY08

WELL NO: WBGmw 016	DATE STARTED: 11/8/00	DATE COMPLETED: 11/9/00
LOCATION: WBG	RECORDED BY: BA Clark	

MANUAL RECORDS SUMMARY

TEST DATE INTERVAL		TEST TIME INTERVAL		DEPTH TO WATER	
BEGIN	END	BEGIN (to)	END	BEGIN (to)	END
11/7/00	11/7/00	1136	1135	18.14	18.14

WATER LEVEL RECOVERY

MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW	MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW	MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW
1				16				31			
2				17				32			
3				18				33			
4				19				34			
5				20				35			
6				21 BCA				36			
7				22				37			
8				23		11/8/00		38			
9				24				39			
10				25				40			
11				26				41			
12				27				42			
13				28				43			
14				29				44			
15				30				45			

REMARKS: SEE SLUG TEST DATA ON ATTACHED PRINTOUT OR DISC FILE: WPBGmw 016 ST OUT

DATA RECORDED BY	DATE	QA CHECK BY	DATE
BA Clark	11/8/00	Vicki Brumbach	10-8-01

SLUG TEST RECORD

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO.:** CY08

WELL NO: WBG MW-017	DATE STARTED: 11/07/00	DATE COMPLETED: 11/7/00
LOCATION: WBG	RECORDED BY: [illegible]	

EQUIPMENT INFORMATION SUMMARY

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NO.	RANGE (PSI)	LAST CALIB.
DATA LOGGER	IN-SITU ~~HERMIT~~ TROLL	1000 C 4000	11280	15	NA
TRANSDUCER	IN SITU NA	PXD-260 NA	NA	NA	NA
WATER LEVEL					

PRETEST DATA

REFERENCE POINT NA	REFERENCE POINT ELEVATION NA	RISER CASING I.D. (IN.) 2.0"
SCREEN OR OPEN HOLE I.D.(IN.) 2.0"	DIAMETER OF BOREHOLE (IF SCREENED) NA	

	FT BRP	MSL		FT BRP	MSL
TOTAL WELL DEPTH	23.22		TOP OF FILTER PACK	11.1	
DEPTH TO WATER	10.19		TOP OF SCREEN OR OPEN HOLE	13.6	
HEIGHT OF WATER COLUMN	13.03		SCREEN LENGTH	10.0	
TEST INTERVAL TYPE					

TEST METHODS SUMMARY

TEST METHOD — SLUG IN (FALLING HEAD) ☐ — SLUG OUT (RISING HEAD) ☑

SLUG DIMENSIONS	SLUG VOL(GAL)	SLUG DEPTH(FT)
3.15' x 1.25"		

DATA LOGGER RECORDS

DATA LOGGER TEST NO.	FILE NAME	DATE (MM/DD/YY)		DATE (HH:MM:SS)		DEPTH TO TRANSDUCER (FT BRP)	DEPTH TO WATER (FT BRP)		HEIGHT OF WATER COLUMN (FT)	
		BEGIN	END	BEGIN	END		BEGIN	END	BEGIN	END
				BGA						
					11/8/00					

STORAGE LOCATION OF DATA: 1) 2)

FILE STRUCTURES	DATA TYPE	FORMAT (1)	UNITS	TEST TIME INTERVAL		COMMENTS
				LOG SCALE	ARITH. SCALE	
COLUMN A						
COLUMN B						
COLUMN C						

(1) CK - 24 HR CLOCK TIME; ET - ELASPED TIME; H - HEIGHT OF WATER ABOVE TRANSDUCER; FT BRP - DEPTH TO WATER; E - WATER LEVEL ELEVATION; P - PRESSURE; O - OTHER (EXPLAIN IN REMARKS)

DATA CHECK RESULTS:

REMARKS: SEE SLUG TEST DATA ON ATTACHED PRINTOUT
OR DISC FILE WPBGMW017 ST OUT

DATA RECORDED BY	DATE	QA CHECK BY	DATE
[signature]	11/8/00	Vicki Brumbach	10-8-01

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SLUG TEST RECORD

PROJECT NAME: Winklepeck Burning Grounds **DELIVERY ORDER NO.:** CY08

WELL NO: WBG MW 017	DATE STARTED: 11/7/00	DATE COMPLETED: 11/7/00
LOCATION: WBG	RECORDED BY: BSA	

MANUAL RECORDS SUMMARY

TEST DATE INTERVAL		TEST TIME INTERVAL		DEPTH TO WATER	
BEGIN	END	BEGIN (to)	END	BEGIN (to)	END
11/7/00	11/7/00	1144	1146	1019	1019

WATER LEVEL RECOVERY

MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW	MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW	MEAS.	ELAPSED TIME MIN.	ELAPSED TIME SEC.	DTW
1				16				31			
2				17				32			
3				18				33			
4				19				34			
5				20				35			
6				21 BGS				36			
7				22				37			
8				23			11/8/00	38			
9				24				39			
10				25				40			
11				26				41			
12				27				42			
13				28				43			
14				29				44			
15				30				45			

REMARKS: SEE SLUG TEST DATA ON ATTACHED PRINTOUT OR DISC FILE: WPBGMW017 ST OUT

DATA RECORDED BY	DATE	QA CHECK BY	DATE
BSA	11/8/00	Vicki Brumbaugh	10-8-01

IN_SITU INC.	Troll		
Report generated:	12/23/2003	9:17:39	
Report from file:	C:\WINSITU\DATA\WP0051~1.BIN		
DataMgr Version	2.12		
Serial number:	11285		
Firmware Version	6.24		
Unit name:	SP4000		
Test name:		wpbgmw010stout2	
Test defined on:	11/7/2000	9:09:19	
Test started on:	11/7/2000	9:15:58	
Test stopped on:	N/A	N/A	
Test extracted on:	11/7/2000	9:17:13	
Data gathered using Logarithmic testing			
Maximum time between data points: 1.00	Minutes.		
Number of data samples:	96		
TOTAL DATA SAMPLES	96		
Channel number [2]			
Measurement type:	Pressure/Level		
Channel name:			
Sensor Range:	15 PSI.		
Specific gravity:	1		
Mode:	TOC		
User-defined reference:	9.18	Feet H2O	
Referenced on:	channel definition.		
Pressure head at reference:	10.514	Feet H2O	
			Chan[2]
Date	Time	ET (min)	Feet H2O
---	---	---	---
11/7/2000	9:15:58	0	9.175
11/7/2000	9:15:58	0.005	9.175
11/7/2000	9:15:58	0.01	9.175
11/7/2000	9:15:58	0.015	9.175
11/7/2000	9:15:59	0.02	9.175
11/7/2000	9:15:59	0.025	9.175
11/7/2000	9:15:59	0.03	9.175
11/7/2000	9:16:00	0.035	9.175
11/7/2000	9:16:00	0.04	9.177
11/7/2000	9:16:00	0.045	9.177
11/7/2000	9:16:01	0.05	9.175

11/7/2000	9:16:01	0.055	9.175
11/7/2000	9:16:01	0.06	9.175
11/7/2000	9:16:01	0.065	9.177
11/7/2000	9:16:02	0.07	9.175
11/7/2000	9:16:02	0.075	9.18
11/7/2000	9:16:02	0.08	9.18
11/7/2000	9:16:03	0.085	9.175
11/7/2000	9:16:03	0.09	9.177
11/7/2000	9:16:03	0.095	9.177
11/7/2000	9:16:04	0.1	9.177
11/7/2000	9:16:04	0.1058	9.514
11/7/2000	9:16:04	0.112	12.121
11/7/2000	9:16:05	0.1185	14.63
11/7/2000	9:16:05	0.1255	12.121
11/7/2000	9:16:05	0.1328	9.872
11/7/2000	9:16:06	0.1407	10.142
11/7/2000	9:16:06	0.149	9.95
11/7/2000	9:16:07	0.1578	9.996
11/7/2000	9:16:08	0.1672	9.976
11/7/2000	9:16:08	0.177	10.01
11/7/2000	9:16:09	0.1875	9.98
11/7/2000	9:16:09	0.1985	9.957
11/7/2000	9:16:10	0.2102	9.936
11/7/2000	9:16:11	0.2227	9.916
11/7/2000	9:16:12	0.2358	9.899
11/7/2000	9:16:12	0.2498	9.883
11/7/2000	9:16:13	0.2647	9.863
11/7/2000	9:16:14	0.2803	9.849
11/7/2000	9:16:15	0.297	9.83
11/7/2000	9:16:16	0.3147	9.814
11/7/2000	9:16:18	0.3333	9.796
11/7/2000	9:16:19	0.3532	9.78
11/7/2000	9:16:20	0.3742	9.763
11/7/2000	9:16:21	0.3963	9.745
11/7/2000	9:16:23	0.4198	9.726
11/7/2000	9:16:24	0.4447	9.708
11/7/2000	9:16:26	0.4697	9.69
11/7/2000	9:16:27	0.4963	9.673
11/7/2000	9:16:29	0.5247	9.655
11/7/2000	9:16:31	0.5547	9.637
11/7/2000	9:16:33	0.5863	9.62
11/7/2000	9:16:35	0.6213	9.6
11/7/2000	9:16:37	0.658	9.583
11/7/2000	9:16:39	0.6963	9.565
11/7/2000	9:16:42	0.738	9.547
11/7/2000	9:16:44	0.7813	9.528
11/7/2000	9:16:47	0.828	9.512
11/7/2000	9:16:50	0.8763	9.494
11/7/2000	9:16:53	0.928	9.477

11/7/2000	9:16:56	0.983	9.461
11/7/2000	9:17:00	1.0413	9.445
11/7/2000	9:17:04	1.103	9.431
11/7/2000	9:17:08	1.168	9.415
11/7/2000	9:17:12	1.238	9.404
11/7/2000	9:17:16	1.3113	9.392
11/7/2000	9:17:21	1.3897	9.378
11/7/2000	9:17:26	1.473	9.364
11/7/2000	9:17:31	1.5613	9.353
11/7/2000	9:17:37	1.6547	9.344
11/7/2000	9:17:43	1.753	9.332
11/7/2000	9:17:49	1.858	9.325
11/7/2000	9:17:56	1.968	9.316
11/7/2000	9:18:03	2.0847	9.309
11/7/2000	9:18:10	2.2097	9.302
11/7/2000	9:18:18	2.3413	9.295
11/7/2000	9:18:26	2.4813	9.288
11/7/2000	9:18:35	2.6297	9.284
11/7/2000	9:18:45	2.7863	9.279
11/7/2000	9:18:55	2.953	9.274
11/7/2000	9:19:05	3.1297	9.27
11/7/2000	9:19:16	3.3163	9.265
11/7/2000	9:19:28	3.5147	9.265
11/7/2000	9:19:41	3.7247	9.258
11/7/2000	9:19:54	3.9463	9.256
11/7/2000	9:20:08	4.1813	9.256
11/7/2000	9:20:23	4.4297	9.254
11/7/2000	9:20:39	4.693	9.251
11/7/2000	9:20:56	4.973	9.251
11/7/2000	9:21:14	5.2697	9.249
11/7/2000	9:21:32	5.583	9.249
11/7/2000	9:21:52	5.9147	9.247
11/7/2000	9:22:13	6.2663	9.189
11/7/2000	9:22:36	6.6397	9.244
11/7/2000	9:23:00	7.0347	9.244
11/7/2000	9:23:25	7.453	9.242

IN_SITU INC.	Troll		
Report generated:	12/23/2003	9:35:00	
Report from file:	C:\WINSITU\DATA\WPBGMW~2.BIN		
DataMgr Version	2.12		
Serial number:	11282		
Firmware Version	6.24		
Unit name:	SP4000		
Test name:		wpbgmw011 stout	
Test defined on:	11/7/2000	9:31:16	
Test started on:	11/7/2000	9:31:54	
Test stopped on:	N/A	N/A	
Test extracted on:	11/7/2000	9:33:19	
Data gathered using Logarithmic testing			
Maximum time between data points: 1.0000	Minutes.		
Number of data samples:	100		
TOTAL DATA SAMPLES	100		
Channel number [2]			
Measurement type:	Pressure/Level		
Channel name:	OnBoard Pressure		
Sensor Range:	15 PSI.		
Specific gravity:	1		
Mode:	TOC		
User-defined reference:	11.71	Feet H2O	
Referenced on:	channel definition.		
Pressure head at reference:	7.147	Feet H2O	
			Chan[2]
Date	Time	ET (min)	Feet H2O
--------	--------	----------	----------
11/7/2000	9:31:54	0	11.72
11/7/2000	9:31:54	0.005	11.72
11/7/2000	9:31:54	0.01	11.72
11/7/2000	9:31:54	0.015	11.72
11/7/2000	9:31:55	0.02	11.722
11/7/2000	9:31:55	0.025	11.722
11/7/2000	9:31:55	0.03	11.72
11/7/2000	9:31:56	0.035	11.72
11/7/2000	9:31:56	0.04	11.722
11/7/2000	9:31:56	0.045	11.72
11/7/2000	9:31:57	0.05	11.722

11/7/2000	9:31:57	0.055	11.722
11/7/2000	9:31:57	0.06	11.722
11/7/2000	9:31:57	0.065	11.722
11/7/2000	9:31:58	0.07	11.722
11/7/2000	9:31:58	0.075	11.722
11/7/2000	9:31:58	0.08	11.722
11/7/2000	9:31:59	0.085	11.722
11/7/2000	9:31:59	0.09	11.722
11/7/2000	9:31:59	0.095	11.722
11/7/2000	9:32:00	0.1	11.722
11/7/2000	9:32:00	0.1058	11.722
11/7/2000	9:32:00	0.112	14.661
11/7/2000	9:32:01	0.1185	11.992
11/7/2000	9:32:01	0.1255	12.859
11/7/2000	9:32:01	0.1328	12.638
11/7/2000	9:32:02	0.1407	12.575
11/7/2000	9:32:02	0.149	12.539
11/7/2000	9:32:03	0.1578	12.467
11/7/2000	9:32:04	0.1672	12.446
11/7/2000	9:32:04	0.177	12.456
11/7/2000	9:32:05	0.1875	12.412
11/7/2000	9:32:05	0.1985	12.37
11/7/2000	9:32:06	0.2102	12.336
11/7/2000	9:32:07	0.2227	12.296
11/7/2000	9:32:08	0.2358	12.262
11/7/2000	9:32:08	0.2498	12.229
11/7/2000	9:32:09	0.2647	12.197
11/7/2000	9:32:10	0.2803	12.165
11/7/2000	9:32:11	0.297	12.135
11/7/2000	9:32:12	0.3147	12.107
11/7/2000	9:32:14	0.3333	12.08
11/7/2000	9:32:15	0.3532	12.056
11/7/2000	9:32:16	0.3742	12.033
11/7/2000	9:32:17	0.3963	12.008
11/7/2000	9:32:19	0.4198	11.987
11/7/2000	9:32:20	0.4447	11.967
11/7/2000	9:32:22	0.4697	11.95
11/7/2000	9:32:23	0.4963	11.934
11/7/2000	9:32:25	0.5247	11.918
11/7/2000	9:32:27	0.5547	11.904
11/7/2000	9:32:29	0.5863	11.89
11/7/2000	9:32:31	0.6213	11.877
11/7/2000	9:32:33	0.658	11.865
11/7/2000	9:32:35	0.6963	11.853
11/7/2000	9:32:38	0.738	11.849
11/7/2000	9:32:40	0.7813	11.84
11/7/2000	9:32:43	0.828	11.833
11/7/2000	9:32:46	0.8763	11.826
11/7/2000	9:32:49	0.928	11.819

11/7/2000	9:32:52	0.983	11.814
11/7/2000	9:32:56	1.0413	11.807
11/7/2000	9:33:00	1.103	11.805
11/7/2000	9:33:04	1.168	11.803
11/7/2000	9:33:08	1.238	11.798
11/7/2000	9:33:12	1.3113	11.796
11/7/2000	9:33:17	1.3897	11.794
11/7/2000	9:33:22	1.473	11.794
11/7/2000	9:33:27	1.5613	11.789
11/7/2000	9:33:33	1.6547	11.787
11/7/2000	9:33:39	1.753	11.787
11/7/2000	9:33:45	1.858	11.784
11/7/2000	9:33:52	1.968	11.784
11/7/2000	9:33:59	2.0847	11.782
11/7/2000	9:34:06	2.2097	11.78
11/7/2000	9:34:14	2.3413	11.78
11/7/2000	9:34:22	2.4813	11.777
11/7/2000	9:34:31	2.6297	11.777
11/7/2000	9:34:41	2.7863	11.775
11/7/2000	9:34:51	2.953	11.775
11/7/2000	9:35:01	3.1297	11.775
11/7/2000	9:35:12	3.3163	11.773
11/7/2000	9:35:24	3.5147	11.773
11/7/2000	9:35:37	3.7247	11.773
11/7/2000	9:35:50	3.9463	11.773
11/7/2000	9:36:04	4.1813	11.77
11/7/2000	9:36:19	4.4297	11.77
11/7/2000	9:36:35	4.693	11.768
11/7/2000	9:36:52	4.973	11.768
11/7/2000	9:37:10	5.2697	11.766
11/7/2000	9:37:28	5.583	11.766
11/7/2000	9:37:48	5.9147	11.766
11/7/2000	9:38:09	6.2663	11.764
11/7/2000	9:38:32	6.6397	11.764
11/7/2000	9:38:56	7.0347	11.766
11/7/2000	9:39:21	7.453	11.764
11/7/2000	9:39:47	7.8963	11.764
11/7/2000	9:40:15	8.3663	11.761
11/7/2000	9:40:45	8.8647	11.761
11/7/2000	9:41:17	9.3913	11.761

IN_SITU INC.		Troll		
Report generated:		12/23/2003	9:35:21	
Report from file:		C:\WINSITU\DATA\WPBGMW~3.BIN		
DataMgr Version		2.12		
Serial number:		11286		
Firmware Version		6.24		
Unit name:		SP4000		
Test name:			wpbgmw012 stout	
Test defined on:		11/7/2000	9:50:45	
Test started on:		11/7/2000	9:51:38	
Test stopped on:		N/A	N/A	
Test extracted on:		11/7/2000	9:52:57	
Data gathered using Logarithmic testing				
Maximum time between data points:	1.0000	Minutes.		
Number of data samples:		140		
TOTAL DATA SAMPLES		140		
Channel number [2]				
Measurement type:		Pressure/Level		
Channel name:		OnBoard Pressure		
Sensor Range:		15 PSI.		
Specific gravity:		1		
Mode:		TOC		
User-defined reference:		24.48	Feet H2O	
Referenced on:		channel definition.		
Pressure head at reference:		6.46	Feet H2O	
				Chan[2]
Date		Time	ET (min)	Feet H2O
--------		--------	----------	----------
11/7/2000		9:51:38	0	24.479
11/7/2000		9:51:38	0.005	24.482
11/7/2000		9:51:38	0.01	24.482
11/7/2000		9:51:38	0.015	24.479
11/7/2000		9:51:39	0.02	24.482
11/7/2000		9:51:39	0.025	24.479
11/7/2000		9:51:39	0.03	24.482
11/7/2000		9:51:40	0.035	24.482
11/7/2000		9:51:40	0.04	24.482
11/7/2000		9:51:40	0.045	24.482
11/7/2000		9:51:41	0.05	24.482

11/7/2000	9:51:41	0.055	24.482
11/7/2000	9:51:41	0.06	24.482
11/7/2000	9:51:41	0.065	24.482
11/7/2000	9:51:42	0.07	24.482
11/7/2000	9:51:42	0.075	24.482
11/7/2000	9:51:42	0.08	24.482
11/7/2000	9:51:43	0.085	24.482
11/7/2000	9:51:43	0.09	24.482
11/7/2000	9:51:43	0.095	24.482
11/7/2000	9:51:44	0.1	24.482
11/7/2000	9:51:44	0.1058	24.482
11/7/2000	9:51:44	0.112	24.482
11/7/2000	9:51:45	0.1185	27.109
11/7/2000	9:51:45	0.1255	23.358
11/7/2000	9:51:45	0.1328	25.257
11/7/2000	9:51:46	0.1407	25.614
11/7/2000	9:51:46	0.149	25.658
11/7/2000	9:51:47	0.1578	25.646
11/7/2000	9:51:48	0.1672	25.642
11/7/2000	9:51:48	0.177	25.686
11/7/2000	9:51:49	0.1875	25.676
11/7/2000	9:51:49	0.1985	25.653
11/7/2000	9:51:50	0.2102	25.635
11/7/2000	9:51:51	0.2227	25.614
11/7/2000	9:51:52	0.2358	25.593
11/7/2000	9:51:52	0.2498	25.566
11/7/2000	9:51:53	0.2647	25.543
11/7/2000	9:51:54	0.2803	25.517
11/7/2000	9:51:55	0.297	25.492
11/7/2000	9:51:56	0.3147	25.464
11/7/2000	9:51:58	0.3333	25.436
11/7/2000	9:51:59	0.3532	25.409
11/7/2000	9:52:00	0.3742	25.379
11/7/2000	9:52:01	0.3963	25.347
11/7/2000	9:52:03	0.4198	25.314
11/7/2000	9:52:04	0.4447	25.282
11/7/2000	9:52:06	0.4697	25.25
11/7/2000	9:52:07	0.4963	25.217
11/7/2000	9:52:09	0.5247	25.185
11/7/2000	9:52:11	0.5547	25.153
11/7/2000	9:52:13	0.5863	25.118
11/7/2000	9:52:15	0.6213	25.086
11/7/2000	9:52:17	0.658	25.054
11/7/2000	9:52:19	0.6963	25.024
11/7/2000	9:52:22	0.738	24.996
11/7/2000	9:52:24	0.7813	24.971
11/7/2000	9:52:27	0.828	24.947
11/7/2000	9:52:30	0.8763	24.924
11/7/2000	9:52:33	0.928	24.906

11/7/2000	9:52:36	0.983	24.89
11/7/2000	9:52:40	1.0413	24.876
11/7/2000	9:52:44	1.103	24.862
11/7/2000	9:52:48	1.168	24.851
11/7/2000	9:52:52	1.238	24.841
11/7/2000	9:52:56	1.3113	24.834
11/7/2000	9:53:01	1.3897	24.825
11/7/2000	9:53:06	1.473	24.816
11/7/2000	9:53:11	1.5613	24.809
11/7/2000	9:53:17	1.6547	24.802
11/7/2000	9:53:23	1.753	24.795
11/7/2000	9:53:29	1.858	24.793
11/7/2000	9:53:36	1.968	24.786
11/7/2000	9:53:43	2.0847	24.781
11/7/2000	9:53:50	2.2097	24.777
11/7/2000	9:53:58	2.3413	24.772
11/7/2000	9:54:06	2.4813	24.765
11/7/2000	9:54:15	2.6297	24.761
11/7/2000	9:54:25	2.7863	24.758
11/7/2000	9:54:35	2.953	24.754
11/7/2000	9:54:45	3.1297	24.749
11/7/2000	9:54:56	3.3163	24.747
11/7/2000	9:55:08	3.5147	24.74
11/7/2000	9:55:21	3.7247	24.738
11/7/2000	9:55:34	3.9463	24.735
11/7/2000	9:55:48	4.1813	24.731
11/7/2000	9:56:03	4.4297	24.726
11/7/2000	9:56:19	4.693	24.724
11/7/2000	9:56:36	4.973	24.721
11/7/2000	9:56:54	5.2697	24.717
11/7/2000	9:57:12	5.583	24.715
11/7/2000	9:57:32	5.9147	24.71
11/7/2000	9:57:53	6.2663	24.705
11/7/2000	9:58:16	6.6397	24.701
11/7/2000	9:58:40	7.0347	24.698
11/7/2000	9:59:05	7.453	24.694
11/7/2000	9:59:31	7.8963	24.689
11/7/2000	9:59:59	8.3663	24.685
11/7/2000	10:00:29	8.8647	24.682
11/7/2000	10:01:01	9.3913	24.68
11/7/2000	10:01:34	9.9497	24.675
11/7/2000	10:02:10	10.5413	24.671
11/7/2000	10:02:48	11.168	24.668
11/7/2000	10:03:27	11.8313	24.664
11/7/2000	10:04:10	12.5347	24.661
11/7/2000	10:04:54	13.2797	24.659
11/7/2000	10:05:42	14.0697	24.657
11/7/2000	10:06:32	14.9063	24.652
11/7/2000	10:07:25	15.7913	24.65

11/7/2000	10:08:21	16.7297	24.648
11/7/2000	10:09:21	17.723	24.645
11/7/2000	10:10:21	18.723	24.643
11/7/2000	10:11:21	19.723	24.638
11/7/2000	10:12:21	20.723	24.638
11/7/2000	10:13:21	21.723	24.636
11/7/2000	10:14:21	22.723	24.634
11/7/2000	10:15:21	23.723	24.631
11/7/2000	10:16:21	24.723	24.631
11/7/2000	10:17:21	25.723	24.629
11/7/2000	10:18:21	26.723	24.629
11/7/2000	10:19:21	27.723	24.627
11/7/2000	10:20:21	28.723	24.627
11/7/2000	10:21:21	29.723	24.627
11/7/2000	10:22:21	30.723	24.625
11/7/2000	10:23:21	31.723	24.625
11/7/2000	10:24:21	32.723	24.622
11/7/2000	10:25:21	33.723	24.622
11/7/2000	10:26:21	34.723	24.622
11/7/2000	10:27:21	35.723	24.62
11/7/2000	10:28:21	36.723	24.62
11/7/2000	10:29:21	37.723	24.618
11/7/2000	10:30:21	38.723	24.62
11/7/2000	10:31:21	39.723	24.618
11/7/2000	10:32:21	40.723	24.615
11/7/2000	10:33:21	41.723	24.615
11/7/2000	10:34:21	42.723	24.615
11/7/2000	10:35:21	43.723	24.613
11/7/2000	10:36:21	44.723	24.613
11/7/2000	10:37:21	45.723	24.613
11/7/2000	10:38:21	46.723	24.611

IN_SITU INC.	Troll		
Report generated:	12/23/2003	9:35:40	
Report from file:	C:\WINSITU\DATA\WPBGMW~4.BIN		
DataMgr Version	2.12		
Serial number:	11282		
Firmware Version	6.24		
Unit name:	SP4000		
Test name:		wpbgmw013 stout	
Test defined on:	11/7/2000	10:09:45	
Test started on:	11/7/2000	10:10:20	
Test stopped on:	N/A	N/A	
Test extracted on:	11/7/2000	10:13:23	
Data gathered using Logarithmic testing			
Maximum time between data points: 1.0000	Minutes.		
Number of data samples:	99		
TOTAL DATA SAMPLES	99		
Channel number [2]			
Measurement type:	Pressure/Level		
Channel name:	OnBoard Pressure		
Sensor Range:	15 PSI.		
Specific gravity:	1		
Mode:	TOC		
User-defined reference:	12.53	Feet H2O	
Referenced on:	channel definition.		
Pressure head at reference:	7.407	Feet H2O	
			Chan[2]
Date	Time	ET (min)	Feet H2O
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11/7/2000	10:10:20	0	12.53
11/7/2000	10:10:20	0.005	12.532
11/7/2000	10:10:20	0.01	12.53
11/7/2000	10:10:20	0.015	12.532
11/7/2000	10:10:21	0.02	12.53
11/7/2000	10:10:21	0.025	12.53
11/7/2000	10:10:21	0.03	12.53
11/7/2000	10:10:22	0.035	12.532
11/7/2000	10:10:22	0.04	12.532
11/7/2000	10:10:22	0.045	12.534
11/7/2000	10:10:23	0.05	12.532

11/7/2000	10:10:23	0.055	12.534
11/7/2000	10:10:23	0.06	12.534
11/7/2000	10:10:23	0.065	12.534
11/7/2000	10:10:24	0.07	12.534
11/7/2000	10:10:24	0.075	12.532
11/7/2000	10:10:24	0.08	12.534
11/7/2000	10:10:25	0.085	12.53
11/7/2000	10:10:25	0.09	13.127
11/7/2000	10:10:25	0.095	14.32
11/7/2000	10:10:26	0.1	13.734
11/7/2000	10:10:26	0.1058	13.346
11/7/2000	10:10:26	0.112	13.566
11/7/2000	10:10:27	0.1185	13.57
11/7/2000	10:10:27	0.1255	13.538
11/7/2000	10:10:27	0.1328	13.515
11/7/2000	10:10:28	0.1407	13.478
11/7/2000	10:10:28	0.149	13.485
11/7/2000	10:10:29	0.1578	13.383
11/7/2000	10:10:30	0.1672	13.399
11/7/2000	10:10:30	0.177	13.443
11/7/2000	10:10:31	0.1875	13.413
11/7/2000	10:10:31	0.1985	13.39
11/7/2000	10:10:32	0.2102	13.36
11/7/2000	10:10:33	0.2227	13.337
11/7/2000	10:10:34	0.2358	13.312
11/7/2000	10:10:34	0.2498	13.282
11/7/2000	10:10:35	0.2647	13.254
11/7/2000	10:10:36	0.2803	13.226
11/7/2000	10:10:37	0.297	13.201
11/7/2000	10:10:38	0.3147	13.173
11/7/2000	10:10:40	0.3333	13.146
11/7/2000	10:10:41	0.3532	13.12
11/7/2000	10:10:42	0.3742	13.093
11/7/2000	10:10:43	0.3963	13.065
11/7/2000	10:10:45	0.4198	13.037
11/7/2000	10:10:46	0.4447	13.012
11/7/2000	10:10:48	0.4697	12.987
11/7/2000	10:10:49	0.4963	12.961
11/7/2000	10:10:51	0.5247	12.938
11/7/2000	10:10:53	0.5547	12.917
11/7/2000	10:10:55	0.5863	12.89
11/7/2000	10:10:57	0.6213	12.867
11/7/2000	10:10:59	0.658	12.846
11/7/2000	10:11:01	0.6963	12.823
11/7/2000	10:11:04	0.738	12.8
11/7/2000	10:11:06	0.7813	12.781
11/7/2000	10:11:09	0.828	12.761
11/7/2000	10:11:12	0.8763	12.742
11/7/2000	10:11:15	0.928	12.726

11/7/2000	10:11:18	0.983	12.712
11/7/2000	10:11:22	1.0413	12.643
11/7/2000	10:11:26	1.103	12.634
11/7/2000	10:11:30	1.168	12.673
11/7/2000	10:11:34	1.238	12.661
11/7/2000	10:11:38	1.3113	12.65
11/7/2000	10:11:43	1.3897	12.641
11/7/2000	10:11:48	1.473	12.634
11/7/2000	10:11:53	1.5613	12.627
11/7/2000	10:11:59	1.6547	12.617
11/7/2000	10:12:05	1.753	12.613
11/7/2000	10:12:11	1.858	12.608
11/7/2000	10:12:18	1.968	12.606
11/7/2000	10:12:25	2.0847	12.604
11/7/2000	10:12:32	2.2097	12.601
11/7/2000	10:12:40	2.3413	12.599
11/7/2000	10:12:48	2.4813	12.597
11/7/2000	10:12:57	2.6297	12.594
11/7/2000	10:13:07	2.7863	12.544
11/7/2000	10:13:17	2.953	12.592
11/7/2000	10:13:27	3.1297	12.594
11/7/2000	10:13:38	3.3163	12.592
11/7/2000	10:13:50	3.5147	12.592
11/7/2000	10:14:03	3.7247	12.59
11/7/2000	10:14:16	3.9463	12.592
11/7/2000	10:14:30	4.1813	12.59
11/7/2000	10:14:45	4.4297	12.59
11/7/2000	10:15:01	4.693	12.541
11/7/2000	10:15:18	4.973	12.592
11/7/2000	10:15:36	5.2697	12.59
11/7/2000	10:15:54	5.583	12.59
11/7/2000	10:16:14	5.9147	12.59
11/7/2000	10:16:35	6.2663	12.59
11/7/2000	10:16:58	6.6397	12.59
11/7/2000	10:17:22	7.0347	12.541
11/7/2000	10:17:47	7.453	12.59
11/7/2000	10:18:13	7.8963	12.59
11/7/2000	10:18:41	8.3663	12.59
11/7/2000	10:19:11	8.8647	12.59

IN_SITU INC.	Troll		
Report generated:	12/23/2003	9:33:26	
Report from file:	C:\WINSITU\DATA\WP0251~1.BIN		
DataMgr Version	2.12		
Serial number:	11282		
Firmware Version	6.24		
Unit name:	SP4000		
Test name:		wpbgmw014 stout	
Test defined on:	11/7/2000	11:19:31	
Test started on:	11/7/2000	11:19:53	
Test stopped on:	11/7/2000	11:23:20	
Test extracted on:	11/7/2000	11:23:27	
Data gathered using Logarithmic testing			
Maximum time between data points: 1.0000	Minutes.		
Number of data samples:	82		
TOTAL DATA SAMPLES	82		
Channel number [2]			
Measurement type:	Pressure/Level		
Channel name:	OnBoard Pressure		
Sensor Range:	15 PSI.		
Specific gravity:	1		
Mode:	TOC		
User-defined reference:	16.84	Feet H2O	
Referenced on:	channel definition.		
Pressure head at reference:	6.717	Feet H2O	
			Chan[2]
Date	Time	ET (min)	Feet H2O
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11/7/2000	11:19:53	0	16.843
11/7/2000	11:19:53	0.005	16.84
11/7/2000	11:19:53	0.01	16.843
11/7/2000	11:19:53	0.015	16.845
11/7/2000	11:19:54	0.02	16.845
11/7/2000	11:19:54	0.025	16.845
11/7/2000	11:19:54	0.03	16.843
11/7/2000	11:19:55	0.035	16.843
11/7/2000	11:19:55	0.04	16.845
11/7/2000	11:19:55	0.045	16.845
11/7/2000	11:19:56	0.05	16.845

11/7/2000	11:19:56	0.055	16.845
11/7/2000	11:19:56	0.06	16.845
11/7/2000	11:19:56	0.065	16.847
11/7/2000	11:19:57	0.07	16.845
11/7/2000	11:19:57	0.075	16.845
11/7/2000	11:19:57	0.08	16.845
11/7/2000	11:19:58	0.085	16.845
11/7/2000	11:19:58	0.09	16.847
11/7/2000	11:19:58	0.095	17.846
11/7/2000	11:19:59	0.1	19.657
11/7/2000	11:19:59	0.1058	17.784
11/7/2000	11:19:59	0.112	17.86
11/7/2000	11:20:00	0.1185	17.823
11/7/2000	11:20:00	0.1255	17.825
11/7/2000	11:20:00	0.1328	17.842
11/7/2000	11:20:01	0.1407	17.768
11/7/2000	11:20:01	0.149	17.735
11/7/2000	11:20:02	0.1578	17.71
11/7/2000	11:20:03	0.1672	17.809
11/7/2000	11:20:03	0.177	17.782
11/7/2000	11:20:04	0.1875	17.666
11/7/2000	11:20:04	0.1985	17.604
11/7/2000	11:20:05	0.2102	17.59
11/7/2000	11:20:06	0.2227	17.556
11/7/2000	11:20:07	0.2358	17.516
11/7/2000	11:20:07	0.2498	17.479
11/7/2000	11:20:08	0.2647	17.442
11/7/2000	11:20:09	0.2803	17.408
11/7/2000	11:20:10	0.297	17.371
11/7/2000	11:20:11	0.3147	17.336
11/7/2000	11:20:13	0.3333	17.299
11/7/2000	11:20:14	0.3532	17.265
11/7/2000	11:20:15	0.3742	17.175
11/7/2000	11:20:16	0.3963	17.203
11/7/2000	11:20:18	0.4198	17.17
11/7/2000	11:20:19	0.4447	17.145
11/7/2000	11:20:21	0.4697	17.06
11/7/2000	11:20:22	0.4963	17.096
11/7/2000	11:20:24	0.5247	17.076
11/7/2000	11:20:26	0.5547	17.055
11/7/2000	11:20:28	0.5863	17.037
11/7/2000	11:20:30	0.6213	17.02
11/7/2000	11:20:32	0.658	17.004
11/7/2000	11:20:34	0.6963	16.993
11/7/2000	11:20:37	0.738	16.983
11/7/2000	11:20:39	0.7813	16.974
11/7/2000	11:20:42	0.828	16.963
11/7/2000	11:20:45	0.8763	16.958
11/7/2000	11:20:48	0.928	16.891

11/7/2000	11:20:51	0.983	16.947
11/7/2000	11:20:55	1.0413	16.942
11/7/2000	11:20:59	1.103	16.937
11/7/2000	11:21:03	1.168	16.933
11/7/2000	11:21:07	1.238	16.928
11/7/2000	11:21:11	1.3113	16.923
11/7/2000	11:21:16	1.3897	16.923
11/7/2000	11:21:21	1.473	16.921
11/7/2000	11:21:26	1.5613	16.917
11/7/2000	11:21:32	1.6547	16.917
11/7/2000	11:21:38	1.753	16.914
11/7/2000	11:21:44	1.858	16.912
11/7/2000	11:21:51	1.968	16.91
11/7/2000	11:21:58	2.0847	16.912
11/7/2000	11:22:05	2.2097	16.907
11/7/2000	11:22:13	2.3413	16.907
11/7/2000	11:22:21	2.4813	16.907
11/7/2000	11:22:30	2.6297	16.905
11/7/2000	11:22:40	2.7863	16.905
11/7/2000	11:22:50	2.953	16.905
11/7/2000	11:23:00	3.1297	16.903
11/7/2000	11:23:11	3.3163	16.903

IN_SITU INC.	Troll		
Report generated:	12/23/2003	9:34:24	
Report from file:	C:\WINSITU\DATA\WP8251~1.BIN		
DataMgr Version	2.12		
Serial number:	11286		
Firmware Version	6.24		
Unit name:	SP4000		
Test name:		wpbgmw015 stout	
Test defined on:	11/7/2000	11:08:24	
Test started on:	11/7/2000	11:08:49	
Test stopped on:	N/A	N/A	
Test extracted on:	11/7/2000	11:10:26	
Data gathered using Logarithmic testing			
Maximum time between data points: 1.0000	Minutes.		
Number of data samples:	90		
TOTAL DATA SAMPLES	90		
Channel number [2]			
Measurement type:	Pressure/Level		
Channel name:	OnBoard Pressure		
Sensor Range:	15 PSI.		
Specific gravity:	1		
Mode:	TOC		
User-defined reference:	12.63	Feet H2O	
Referenced on:	channel definition.		
Pressure head at reference:	6.858	Feet H2O	
			Chan[2]
Date	Time	ET (min)	Feet H2O
--------	--------	----------	----------
11/7/2000	11:08:49	0	12.628
11/7/2000	11:08:49	0.005	12.628
11/7/2000	11:08:49	0.01	12.626
11/7/2000	11:08:49	0.015	12.628
11/7/2000	11:08:50	0.02	12.63
11/7/2000	11:08:50	0.025	12.628
11/7/2000	11:08:50	0.03	12.63
11/7/2000	11:08:51	0.035	12.628
11/7/2000	11:08:51	0.04	12.628
11/7/2000	11:08:51	0.045	12.628
11/7/2000	11:08:52	0.05	12.628

11/7/2000	11:08:52	0.055	12.628
11/7/2000	11:08:52	0.06	12.628
11/7/2000	11:08:52	0.065	12.63
11/7/2000	11:08:53	0.07	12.628
11/7/2000	11:08:53	0.075	12.63
11/7/2000	11:08:53	0.08	12.628
11/7/2000	11:08:54	0.085	12.628
11/7/2000	11:08:54	0.09	12.626
11/7/2000	11:08:54	0.095	15.613
11/7/2000	11:08:55	0.1	13.262
11/7/2000	11:08:55	0.1058	13.133
11/7/2000	11:08:55	0.112	13.597
11/7/2000	11:08:56	0.1185	13.481
11/7/2000	11:08:56	0.1255	13.392
11/7/2000	11:08:56	0.1328	13.364
11/7/2000	11:08:57	0.1407	13.341
11/7/2000	11:08:57	0.149	13.322
11/7/2000	11:08:58	0.1578	13.308
11/7/2000	11:08:59	0.1672	13.299
11/7/2000	11:08:59	0.177	13.352
11/7/2000	11:09:00	0.1875	13.334
11/7/2000	11:09:00	0.1985	13.325
11/7/2000	11:09:01	0.2102	13.311
11/7/2000	11:09:02	0.2227	13.297
11/7/2000	11:09:03	0.2358	13.283
11/7/2000	11:09:03	0.2498	13.272
11/7/2000	11:09:04	0.2647	13.26
11/7/2000	11:09:05	0.2803	13.244
11/7/2000	11:09:06	0.297	13.23
11/7/2000	11:09:07	0.3147	13.216
11/7/2000	11:09:09	0.3333	13.2
11/7/2000	11:09:10	0.3532	13.186
11/7/2000	11:09:11	0.3742	13.172
11/7/2000	11:09:12	0.3963	13.159
11/7/2000	11:09:14	0.4198	13.145
11/7/2000	11:09:15	0.4447	13.126
11/7/2000	11:09:17	0.4697	13.112
11/7/2000	11:09:18	0.4963	13.094
11/7/2000	11:09:20	0.5247	13.08
11/7/2000	11:09:22	0.5547	13.064
11/7/2000	11:09:24	0.5863	13.048
11/7/2000	11:09:26	0.6213	13.034
11/7/2000	11:09:28	0.658	13.018
11/7/2000	11:09:30	0.6963	13.004
11/7/2000	11:09:33	0.738	12.983
11/7/2000	11:09:35	0.7813	12.967
11/7/2000	11:09:38	0.828	12.951
11/7/2000	11:09:41	0.8763	12.932
11/7/2000	11:09:44	0.928	12.916

11/7/2000	11:09:47	0.983	12.903
11/7/2000	11:09:51	1.0413	12.889
11/7/2000	11:09:55	1.103	12.873
11/7/2000	11:09:59	1.168	12.861
11/7/2000	11:10:03	1.238	12.845
11/7/2000	11:10:07	1.3113	12.833
11/7/2000	11:10:12	1.3897	12.822
11/7/2000	11:10:17	1.473	12.808
11/7/2000	11:10:22	1.5613	12.801
11/7/2000	11:10:28	1.6547	12.794
11/7/2000	11:10:34	1.753	12.78
11/7/2000	11:10:40	1.858	12.771
11/7/2000	11:10:47	1.968	12.764
11/7/2000	11:10:54	2.0847	12.755
11/7/2000	11:11:01	2.2097	12.748
11/7/2000	11:11:09	2.3413	12.741
11/7/2000	11:11:17	2.4813	12.736
11/7/2000	11:11:26	2.6297	12.73
11/7/2000	11:11:36	2.7863	12.725
11/7/2000	11:11:46	2.953	12.723
11/7/2000	11:11:56	3.1297	12.718
11/7/2000	11:12:07	3.3163	12.713
11/7/2000	11:12:19	3.5147	12.709
11/7/2000	11:12:32	3.7247	12.709
11/7/2000	11:12:45	3.9463	12.704
11/7/2000	11:12:59	4.1813	12.702
11/7/2000	11:13:14	4.4297	12.7
11/7/2000	11:13:30	4.693	12.697
11/7/2000	11:13:47	4.973	12.697
11/7/2000	11:14:05	5.2697	12.695

IN_SITU INC.	Troll		
Report generated:	12/23/2003	9:34:05	
Report from file:	C:\WINSITU\DATA\WP0351~1.BIN		
DataMgr Version	2.12		
Serial number:	11285		
Firmware Version	6.24		
Unit name:	SP4000		
Test name:		wpbgmw016 stout	
Test defined on:	11/7/2000	11:36:56	
Test started on:	11/7/2000	11:37:14	
Test stopped on:	N/A	N/A	
Test extracted on:	11/7/2000	11:38:46	
Data gathered using Logarithmic testing			
Maximum time between data points: 1.0000	Minutes.		
Number of data samples:	108		
TOTAL DATA SAMPLES	108		
Channel number [2]			
Measurement type:	Pressure/Level		
Channel name:			
Sensor Range:	15 PSI.		
Specific gravity:	1		
Mode:	TOC		
User-defined reference:	18.13	Feet H2O	
Referenced on:	channel definition.		
Pressure head at reference:	6.564	Feet H2O	
			Chan[2]
Date	Time	ET (min)	Feet H2O
---	---	---	---
11/7/2000	11:37:14	0	18.129
11/7/2000	11:37:14	0.005	18.129
11/7/2000	11:37:14	0.01	18.129
11/7/2000	11:37:14	0.015	18.129
11/7/2000	11:37:15	0.02	18.129
11/7/2000	11:37:15	0.025	18.129
11/7/2000	11:37:15	0.03	18.129
11/7/2000	11:37:16	0.035	18.127
11/7/2000	11:37:16	0.04	18.129
11/7/2000	11:37:16	0.045	18.129
11/7/2000	11:37:17	0.05	18.129

11/7/2000	11:37:17	0.055	18.129
11/7/2000	11:37:17	0.06	18.129
11/7/2000	11:37:17	0.065	18.129
11/7/2000	11:37:18	0.07	18.129
11/7/2000	11:37:18	0.075	18.129
11/7/2000	11:37:18	0.08	18.129
11/7/2000	11:37:19	0.085	18.129
11/7/2000	11:37:19	0.09	18.129
11/7/2000	11:37:19	0.095	18.129
11/7/2000	11:37:20	0.1	18.129
11/7/2000	11:37:20	0.1058	18.129
11/7/2000	11:37:20	0.112	18.129
11/7/2000	11:37:21	0.1185	18.129
11/7/2000	11:37:21	0.1255	18.129
11/7/2000	11:37:21	0.1328	18.129
11/7/2000	11:37:22	0.1407	18.48
11/7/2000	11:37:22	0.149	19.88
11/7/2000	11:37:23	0.1578	19.504
11/7/2000	11:37:24	0.1672	19.456
11/7/2000	11:37:24	0.177	19.495
11/7/2000	11:37:25	0.1875	19.405
11/7/2000	11:37:25	0.1985	19.315
11/7/2000	11:37:26	0.2102	19.456
11/7/2000	11:37:27	0.2227	19.444
11/7/2000	11:37:28	0.2358	19.437
11/7/2000	11:37:28	0.2498	19.426
11/7/2000	11:37:29	0.2647	19.416
11/7/2000	11:37:30	0.2803	19.41
11/7/2000	11:37:31	0.297	19.4
11/7/2000	11:37:32	0.3147	19.391
11/7/2000	11:37:34	0.3333	19.382
11/7/2000	11:37:35	0.3532	19.373
11/7/2000	11:37:36	0.3742	19.361
11/7/2000	11:37:37	0.3963	19.352
11/7/2000	11:37:39	0.4198	19.343
11/7/2000	11:37:40	0.4447	19.331
11/7/2000	11:37:42	0.4697	19.322
11/7/2000	11:37:43	0.4963	19.31
11/7/2000	11:37:45	0.5247	19.299
11/7/2000	11:37:47	0.5547	19.287
11/7/2000	11:37:49	0.5863	19.278
11/7/2000	11:37:51	0.6213	19.264
11/7/2000	11:37:53	0.658	19.253
11/7/2000	11:37:55	0.6963	19.241
11/7/2000	11:37:58	0.738	19.225
11/7/2000	11:38:00	0.7813	19.211
11/7/2000	11:38:03	0.828	19.195
11/7/2000	11:38:06	0.8763	19.181
11/7/2000	11:38:09	0.928	19.165

11/7/2000	11:38:12	0.983	19.149
11/7/2000	11:38:16	1.0413	19.13
11/7/2000	11:38:20	1.103	19.114
11/7/2000	11:38:24	1.168	19.096
11/7/2000	11:38:28	1.238	19.008
11/7/2000	11:38:32	1.3113	19.061
11/7/2000	11:38:37	1.3897	19.043
11/7/2000	11:38:42	1.473	19.024
11/7/2000	11:38:47	1.5613	19.004
11/7/2000	11:38:53	1.6547	18.98
11/7/2000	11:38:59	1.753	18.957
11/7/2000	11:39:05	1.858	18.937
11/7/2000	11:39:12	1.968	18.914
11/7/2000	11:39:19	2.0847	18.891
11/7/2000	11:39:26	2.2097	18.865
11/7/2000	11:39:34	2.3413	18.844
11/7/2000	11:39:42	2.4813	18.819
11/7/2000	11:39:51	2.6297	18.794
11/7/2000	11:40:01	2.7863	18.766
11/7/2000	11:40:11	2.953	18.736
11/7/2000	11:40:21	3.1297	18.711
11/7/2000	11:40:32	3.3163	18.681
11/7/2000	11:40:44	3.5147	18.653
11/7/2000	11:40:57	3.7247	18.628
11/7/2000	11:41:10	3.9463	18.6
11/7/2000	11:41:24	4.1813	18.57
11/7/2000	11:41:39	4.4297	18.545
11/7/2000	11:41:55	4.693	18.517
11/7/2000	11:42:12	4.973	18.491
11/7/2000	11:42:30	5.2697	18.464
11/7/2000	11:42:48	5.583	18.441
11/7/2000	11:43:08	5.9147	18.415
11/7/2000	11:43:29	6.2663	18.395
11/7/2000	11:43:52	6.6397	18.369
11/7/2000	11:44:16	7.0347	18.351
11/7/2000	11:44:41	7.453	18.33
11/7/2000	11:45:07	7.8963	18.314
11/7/2000	11:45:35	8.3663	18.295
11/7/2000	11:46:05	8.8647	18.279
11/7/2000	11:46:37	9.3913	18.268
11/7/2000	11:47:10	9.9497	18.254
11/7/2000	11:47:46	10.5413	18.245
11/7/2000	11:48:24	11.168	18.235
11/7/2000	11:49:03	11.8313	18.226
11/7/2000	11:49:46	12.5347	18.222
11/7/2000	11:50:30	13.2797	18.217
11/7/2000	11:51:18	14.0697	18.21
11/7/2000	11:52:08	14.9063	18.208

IN_SITU INC.	Troll		
Report generated:	12/23/2003	9:34:46	
Report from file:	C:\WINSITU\DATA\WPBGMW~1.BIN		
DataMgr Version	2.12		
Serial number:	11280		
Firmware Version	6.24		
Unit name:	SP4000		
Test name:		wpbgmw017 stout	
Test defined on:	11/7/2000	11:44:32	
Test started on:	11/7/2000	11:44:46	
Test stopped on:	N/A	N/A	
Test extracted on:	11/7/2000	11:46:17	
Data gathered using Logarithmic testing			
Maximum time between data points: 1.0000	Minutes.		
Number of data samples:	76		
TOTAL DATA SAMPLES	76		
Channel number [2]			
Measurement type:	Pressure/Level		
Channel name:	OnBoard Pressure		
Sensor Range:	15 PSI.		
Specific gravity:	1		
Mode:	TOC		
User-defined reference:	10.19	Feet H2O	
Referenced on:	channel definition.		
Pressure head at reference:	9.451	Feet H2O	
			Chan[2]
Date	Time	ET (min)	Feet H2O
---	---	---	---
11/7/2000	11:44:46	0	10.19
11/7/2000	11:44:46	0.005	10.19
11/7/2000	11:44:46	0.01	10.19
11/7/2000	11:44:46	0.015	10.193
11/7/2000	11:44:47	0.02	10.19
11/7/2000	11:44:47	0.025	10.19
11/7/2000	11:44:47	0.03	10.193
11/7/2000	11:44:48	0.035	10.193
11/7/2000	11:44:48	0.04	10.193
11/7/2000	11:44:48	0.045	10.193
11/7/2000	11:44:49	0.05	10.193

11/7/2000	11:44:49	0.055	10.193
11/7/2000	11:44:49	0.06	10.193
11/7/2000	11:44:49	0.065	10.193
11/7/2000	11:44:50	0.07	10.193
11/7/2000	11:44:50	0.075	10.193
11/7/2000	11:44:50	0.08	10.193
11/7/2000	11:44:51	0.085	10.19
11/7/2000	11:44:51	0.09	10.193
11/7/2000	11:44:51	0.095	10.193
11/7/2000	11:44:52	0.1	10.193
11/7/2000	11:44:52	0.1058	10.195
11/7/2000	11:44:52	0.112	10.22
11/7/2000	11:44:53	0.1185	10.188
11/7/2000	11:44:53	0.1255	10.167
11/7/2000	11:44:53	0.1328	10.19
11/7/2000	11:44:54	0.1407	10.195
11/7/2000	11:44:54	0.149	10.606
11/7/2000	11:44:55	0.1578	11.847
11/7/2000	11:44:56	0.1672	10.758
11/7/2000	11:44:56	0.177	10.626
11/7/2000	11:44:57	0.1875	10.523
11/7/2000	11:44:57	0.1985	10.453
11/7/2000	11:44:58	0.2102	10.396
11/7/2000	11:44:59	0.2227	10.354
11/7/2000	11:45:00	0.2358	10.327
11/7/2000	11:45:00	0.2498	10.306
11/7/2000	11:45:01	0.2647	10.29
11/7/2000	11:45:02	0.2803	10.278
11/7/2000	11:45:03	0.297	10.271
11/7/2000	11:45:04	0.3147	10.267
11/7/2000	11:45:06	0.3333	10.262
11/7/2000	11:45:07	0.3532	10.26
11/7/2000	11:45:08	0.3742	10.26
11/7/2000	11:45:09	0.3963	10.257
11/7/2000	11:45:11	0.4198	10.255
11/7/2000	11:45:12	0.4447	10.255
11/7/2000	11:45:14	0.4697	10.255
11/7/2000	11:45:15	0.4963	10.253
11/7/2000	11:45:17	0.5247	10.255
11/7/2000	11:45:19	0.5547	10.255
11/7/2000	11:45:21	0.5863	10.255
11/7/2000	11:45:23	0.6213	10.255
11/7/2000	11:45:25	0.658	10.253
11/7/2000	11:45:27	0.6963	10.253
11/7/2000	11:45:30	0.738	10.255
11/7/2000	11:45:32	0.7813	10.253
11/7/2000	11:45:35	0.828	10.253
11/7/2000	11:45:38	0.8763	10.253
11/7/2000	11:45:41	0.928	10.253

11/7/2000	11:45:44	0.983	10.253
11/7/2000	11:45:48	1.0413	10.253
11/7/2000	11:45:52	1.103	10.253
11/7/2000	11:45:56	1.168	10.253
11/7/2000	11:46:00	1.238	10.253
11/7/2000	11:46:04	1.3113	10.253
11/7/2000	11:46:09	1.3897	10.253
11/7/2000	11:46:14	1.473	10.253
11/7/2000	11:46:19	1.5613	10.255
11/7/2000	11:46:25	1.6547	10.253
11/7/2000	11:46:31	1.753	10.25
11/7/2000	11:46:37	1.858	10.25
11/7/2000	11:46:44	1.968	10.25
11/7/2000	11:46:51	2.0847	10.25
11/7/2000	11:46:58	2.2097	10.25
11/7/2000	11:47:06	2.3413	10.25

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APPENDIX F

PROJECT QUALITY ASSURANCE SUMMARY

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PROJECT QUALITY ASSURANCE SUMMARY AT WINKLEPECK BURNING GROUNDS AT THE RAVENNA ARMY AMMUNITION PLANT, RAVENNA, OHIO

January 2004

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ACRONYMS

CAR	corrective action report
CQC	contractor quality control
EPA	U.S. Environmental Protection Agency
FCO	field change order
FS	feasibility study
M&TE	materials and testing equipment
NCR	non-conformance report
ppm	parts per million
QA	quality assurance
QC	quality control
RI	remedial investigation
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SOP	standard operating procedure
SOW	Statement of Work
STL	Severn Trent Laboratories Inc.
TNT	trinitrotoluene
USACE	U.S. Army Corps of Engineers
WBG	Winklepeck Burning Grounds
XRF	x-ray fluorescence

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F1.0 PROJECT QUALITY ASSURANCE SUMMARY

F1.1 INTRODUCTION

This appendix presents the actions and methodologies undertaken to meet the quality assurance/quality control (QA/QC) goals for a Phase III remedial investigation (RI) conducted as part of the feasibility study (FS) for the Winklepeck Burning Grounds (WBG). These goals were established in the *Facility-wide Sampling and Analysis Plan (SAP) for the Ravenna Army Ammunition Plant* (RVAAP) (USACE 2001) and the *SAP Addendum No. 1 for the Winklepeck Burning Grounds Feasibility Study* (USACE 2000). These were implemented through project-specific procedures and requirements, the Science Applications International Corporation (SAIC) QA Program, and the U.S. Army Corps of Engineers (USACE), Louisville District QA requirements. A large portion of project QA was focused on field and analytical laboratory activities and project administration.

F1.2 FIELD QUALITY ASSURANCE

F1.2.1 Readiness Review

Field QA was initiated for the Phase III RI in a readiness review held at the SAIC Oak Ridge offices on October 11, 2000. The purpose of the readiness review was to ensure that (1) all project documents and procedures were approved, controlled, and properly distributed; (2) all assigned personnel were trained or a schedule was established to conduct training; (3) the mobilization and site logistics were established; (4) the laboratories were ready to accept samples; (5) all other subcontractors were ready to begin work; and (6) the QA system was implemented. All elements of the readiness review were completed prior to initiating field activities and were approved by the SAIC QA/QC Officer. Readiness review and project kickoff checklists provide documentation of this QA element and are maintained in the project file.

F1.2.2 Procedures

Standard operating methods for field activities performed during the Phase III RI are incorporated into the governing documents for the project. The Facility-wide Sampling and Analysis Plan (SAP) (USACE 2001) describes the overall approach and methodologies to be used for projects at the Ravenna Army Ammunition Plant, and the SAP Addendum No. 1 (USACE 2000) details project-specific requirements for field implementation. These documents were reviewed and approved by the Army, the USACE, Louisville District, and the Ohio Environmental Protection Agency (EPA) prior to implementation. Clarifications and/or planned deviations from these methods were documented as field change orders (FCOs), and variances were documented as non-conformance reports (NCRs). Copies of the FCOs are attached to this appendix.

F1.2.3 Training

Field team personnel were trained in all procedures applicable to their assigned tasks. Training was accomplished by combinations of classroom lectures, reading assignments, and on-the-job training. Surveillance performed by the project SAIC contractor quality control (CQC) representative provided assessments of worker proficiency and training effectiveness.

Training was documented by the completion of training records. Performance documentation was completed in the field by the CQC representative after observing successful implementation of a procedure by a field team member. Copies of training records and surveillance reports were maintained in the project file. Copies of training records required for the Occupational Safety and Health Administration and U.S. Department of Transportation compliance also were maintained in the field.

F1.2.4 Equipment Calibration

Various types of measuring and testing equipment (M&TE) were used during the field investigation. All M&TE was categorized, assigned unique identifiers, and listed in an inventory in the M&TE logbook. Last and next calibration recall dates were also recorded. As appropriate, instruments were calibrated or calibrations were checked on a daily basis according to the manufacturer's instructions. Only equipment and standards having verifiable traceability to nationally recognized standards were used for calibration and calibration checks. Daily calibration activities and results were recorded in the M&TE logbook, as well as source information for all calibration standards and reagents.

F1.2.5 Quality Control Samples

Field QC samples collected included trip blanks, equipment rinsate blanks, source water, and field duplicates. Field QA splits pertaining to contractor chemical QC were collected as specified in the SAP Addendum No. 1 (USACE 2000). Implementation of the Contractor Chemical QC Program in the field was done by the SAIC CQC representative. Field QC data and analyses of QC samples are presented in Appendix H.

F1.2.6 Field Records

Field data, observations, activities, and information were recorded in pre-formatted, bound field logbooks. The use of structured logbooks ensured that all necessary data were entered consistently. Logbook entries were checked for accuracy and completeness by independent reviewers. Critical and/or contract-required original records (e.g., sampling forms) were recorded in duplicate using carbonless paper. Other field records, which were collected and likewise maintained, included equipment/material certifications, boring logs, and air-bill forms.

F1.2.7 Surveillance and Audits

Surveillance of field operations during the Phase III RI was conducted by SAIC. This surveillance assessed technical and quality-related activities including surface and subsurface soil sampling, sediment sampling, well development and installation, groundwater sampling, equipment decontamination, training and health and safety practices, and field records review.

F1.3 ANALYTICAL LABORATORY QUALITY ASSURANCE

SAIC subcontracted Severn Trent Laboratories Inc. (STL) to perform chemical analysis for samples collected during the Phase III RI. The selected laboratory is certified by the USACE Missouri River Division Mandatory Center of Expertise in Omaha, Nebraska. In addition, this laboratory was technically audited by SAIC prior to contract award.

F1.3.1 Readiness Review

Laboratory QA activities were initiated during the readiness review. The readiness review ensured that (1) governing documents and approved analytical methods were controlled and properly distributed, (2) the laboratory was scheduled and ready to conduct the analysis, (3) logistical coordination was established between the laboratory and the field team, and (4) laboratory QA programs were consistent and compatible with the project requirements.

F1.3.2 Procedures

Prior to initiation of analytical support for the Phase III RI, STL and SAIC reviewed and negotiated a contract based on a comprehensive Statement of Work (laboratory SOW). The laboratory SOW represented and referenced project-specific requirements, including the parameters to be measured, the analytical methods to implement, adherence to EPA SW-846 protocols, project quantitation goals (sensitivity), and data deliverables required. All laboratory comments and questions were resolved before analytical work began.

F1.3.3 Laboratory Quality Control

To document laboratory data quality and to measure the quality of the analytical process, laboratory QC samples and data verification/validation were employed. The results of laboratory QC are discussed in the project Data QC Summary Report (Appendix G). Analytical results for laboratory QC samples are included in the project file and form the basis of the data validation and verification process.

F1.3.4 Laboratory Documentation

The laboratory maintains comprehensive information regarding the entire analytical process. The laboratory delivered summary data packages and electronic deliverables consistent with those identified in the EPA SW-846 protocol to SAIC for validation and verification. Laboratory QC sample analyses were cross-referenced to the appropriate environmental field sample analyses in the laboratory deliverables.

F1.3.5 Data Verification/Validation

Analytical data generated during this project were subjected to a rigorous process of data validation and verification. Criteria were established against which the analytical results were compared and from which a judgment was rendered regarding the acceptability and qualification of the data (Appendix G). Upon receipt of data packages from each laboratory, the information was subjected to a systematic examination following standardized checklists and procedures to ensure content, presentation, administrative validity, and technical validity. Routine data changes were documented through data change forms. Data deficiencies or formal laboratory-related nonconformances were documented through an NCR process, as required.

F1.4 QUALITY ASSURANCE DOCUMENTATION

Primary methods for documenting QA during the Phase III RI include the completion of FCOs and NCRs. Copies of FCOs completed during the investigation are included in this appendix. Copies of NCRs are on record in the WBG FS project file maintained at SAIC.

F1.4.1 Field Change Control

The FCOs were completed during the RI to document the rationale and approval for any departures from protocols specified in the approved Facility-wide SAP (USACE 2001) and SAP Addendum No. 1 (USACE 2000) for the WBG FS. Field changes provide clarification to scope or refinement in the procedural approach to a specific field activity. All FCOs were reviewed and approved by designated technical representatives of the USACE, Louisville District prior to implementation. None of the FCOs resulted in an adverse impact to project quality, schedule, or scope. Copies of the approved FCOs are included in this appendix.

FCO No. 001 assigned propellants analyses to samples at five specific locations rather than to samples with the five highest trinitrotoluene (TNT) or hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) detections

determined in the field laboratory. This FCO was required because the field analysis of samples and identification of those having the highest concentrations of TNT or RDX would not be known until after the holding time had expired for propellants analysis.

FCO No. 002 documented the use of a hand auger to sample subsurface soil instead of a Geoprobe™ direct-push sampler. The sampling method change applied to locations where the known or suspected presence of ordnance and explosives presented safety concerns with respect to use of a drilling rig and where suspected sample recovery would be poor using the direct-push sampler.

FCO No. 003 reassigned the locations of three soil samples to characterize the Building S-4301 vicinity, which had not previously been investigated.

FCO No. 004 documented the addition of Target Analyte List metals laboratory analysis on 30 soil samples. These analyses were added to provide data for comparative evaluations of fixed-base laboratory results to field analyses of metals using portable x-ray fluorescence (XRF) equipment. This comparison was performed as part of a study of the potential use of XRF as a rapid, cost-effective method to characterize nature and extent of selected metals contaminants.

F1.4.2 Nonconformance Reports

To identify and correct conditions adverse to quality, as described in the field and laboratory QA plans, NCRs and associated corrective action reports (CARs) were completed, as necessary. Between project initiation and May 2001, two NCRs were issued.

A summary of the actions or items that warranted the initiation of the two NCRs included

- Soil sample number WBGss-236-4125-SO was not analyzed for standard inductively coupled plasma (ICP) metals as planned in the SAP addendum and as requested on the sample chain-of-custody. This error resulted in an incomplete data set for metals. As part of the corrective action, laboratory personnel were informed of the discrepancy and instructed to be more diligent in the tracking and execution of analysis, including sample digest completion. The CAR for the nonconformance concluded that the lack of metals data is not deemed a significant data gap and that the corrective actions taken with laboratory personnel are satisfactory. This NCR has been closed.

- Calculations to determine the concentration of TNT and RDX using the field colorimetric analytical method were determined to be incorrect by a factor of 100 because the acetone extract volume was omitted from an equation contained in the standard operating procedure (SOP) to calculate concentration values in the extract. This calculation error resulted in a noncompliance with work plan requirements that samples yielding results greater than 1 part per million (ppm) TNT or RDX would be sent for laboratory analysis. As a result of the calculation error, a total of 16 samples with detected TNT values greater than 1 ppm were not submitted for laboratory confirmation analyses. The field analysis SOP and all field laboratory TNT and RDX results were corrected. A corrective action assessment was completed to identify the impact to the project and is maintained in the project files at SAIC. Project impact was mitigated by the fact that at most of the 16 stations, a duplicate sample or a sample at greater depth was pre-planned and analyzed by either field screening or the analytical laboratory. The corrective action evaluation concluded that the potential exists for unidentified contamination below the surface interval of 0 to 0.3 m (0 to 1 ft) at only four stations. Considering that additional sampling would be done as part of remedial actions at WBG, re-sampling of the four identified stations was determined not to be necessary. This NCR has been closed.

F1.5 REFERENCES

USACE (U.S. Army Corps of Engineers) 2000. *SAP Addendum No. 1 for the Winklepeck Burning Grounds Feasibility Study.*

USACE 2001. *Facility-wide Sampling and Analysis Plan (SAP) for the Ravenna Army Ammunition Plant* (RVAAP).

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ATTACHMENT

FIELD CHANGE ORDERS

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Field Change Order (FCO)

FCO NO 01

MODIFICATION NO. _____ DATE 10.21.00 WORK AUTHORIZATION _____

TYPE OF CHANGE CLARIFICATION PRIORITY O EMERGENCY O URGENT O ROUTINE

ADS NO. - CYWP NO. _____ CWBS NO. _____ O MINOR O MAJOR O OTHER

REQUESTER IDENTIFICATION

NAME KATHRYN DOMINIC ORGANIZATION SAIC PHONE 918·625·7614

TITLE Field Manager SIGNATURE Kathryn L Dominic

BASELINE IDENTIFICATION

BASELINE(S) AFFECTED O COST O SCOPE O MILESTONES ✓ METHOD OF ACCOMPLISHMENT

PROGRAM SERVICE ORDER NO. _____ REVISION NO. _____ CAM SIGNATURE _____

DESCRIPTION OF CHANGE SECTIONS 4.2.2.4 & 4.3.14, TABLE 5.1 - A TOTAL OF 5 SOIL SAMPLES WILL BE SENT TO THE LABORATORY FOR PROPELLANTS ANALYSIS. BASED ON THE 5 HIGHEST FIELD EXPLOSIVES HITS. INSTEAD THESE ANALYSES WILL BE ASSIGNED TO THE FOLLOWING: 3 LOCATIONS ON THE BERM AT PAD #5B, AND 2 CONTINGENCY LOCATIONS ASSIGNED TO THE DEMIL BLDG AT WBG. PHONE _____

JUSTIFICATION IT IS IMPOSSIBLE TO KNOW UNTIL THE SAMPLING PROGRAM IS COMPLETED WHICH WILL BE THE 5 HIGHEST EXPLOSIVES HITS, AND BY THAT TIME THE HOLDING TIMES FOR ANALYSES OF THESE COMPOUNDS WILL BE EXCEEDED.

IMPACT OF NOT IMPLEMENTING REQUEST EXCEEDING PROPELLANT HOLDING TIMES

PARTICIPANTS AFFECTED BY IMPLEMENTING REQUEST SOIL SAMPLING TEAM; SAMPLE MANAGER.

COST ESTIMATE $ _____ ESTIMATOR SIGNATURE _____

PHONE _____ DATE _____

PREVIOUS FC AFFECTED O YES ✓ NO

APPROVAL CLIENT

PROJECT MANAGER SIGNATURE _____ DATE _____

QAS REVIEW _____ DATE _____

TIME FROM INITIATION TO ACTION Immed.

Field Change Order (FCO)

FCO NO 02

MODIFICATION NO. _____ DATE 10.21.00 WORK AUTHORIZATION _____

TYPE OF CHANGE MODIFICATION PRIORITY O EMERGENCY O URGENT O ROUTINE

ADS NO. - CYWP NO. _____ CWBS NO. _____ O MINOR O MAJOR O OTHER

REQUESTER IDENTIFICATION

NAME K. DOMINIC ORGANIZATION SAIC PHONE _____

TITLE FIELD MANAGER SIGNATURE /

BASELINE IDENTIFICATION

BASELINE(S) AFFECTED O COST O SCOPE O MILESTONES ✓ METHOD OF ACCOMPLISHMENT

PROGRAM SERVICE ORDER NO. _____ REVISION NO. _____ CAM SIGNATURE _____

DESCRIPTION OF CHANGE SECTION 4.2.1.3 SPECIFIES GEOPROBE PHONE _____
OR EQUIVALENT METHOD WILL BE USED AT NINE LOCATIONS TO COLLECT SOILS TO A DEPTH OF 10 ft, in 2-ft INTERVALS. TWO LOCATIONS (AT PAD #58 & #68) WILL BE SAMPLED USING HAND AUGERS INSTEAD. IN ADDITION, AT LOCATIONS WHERE THE 2"-dia. SAMPLER CANNOT RECOVER ENOUGH VOLUME FROM THE SURFACE INTERVAL FOR A SAMPLE, A HAND AUGER WILL BE USED TO RETRIEVE THE REQUIRED SOIL.

JUSTIFICATION UXO/OE MAKE USE OF DRILL/PROBE RIG IMPOSSIBLE AT PADS 58 + 68. FURTHER, UXO, OE, AND ROCKS IN THE UPPER 3-4' OF SOILS AT ALL NINE PADS OBSTRUCT THE SAMPLER, WHICH IS 2" IN DIAMETER, AND PREVENT SAMPLE RECOVERY.

IMPACT OF NOT IMPLEMENTING REQUEST NO RECOVERY OF REPRESENTATIVE SOILS FROM NINE PLANNED SAMPLING LOCATIONS.

PARTICIPANTS AFFECTED BY IMPLEMENTING REQUEST SAMPLE TEAMS, SAMPLE MANAGER

COST ESTIMATE $ NA ESTIMATOR SIGNATURE _____

PHONE _____ DATE _____

PREVIOUS FC AFFECTED O YES ✓ NO

APPROVAL CLIENT PROJECT MANAGER SIGNATURE _____ DATE _____

QAS REVIEW _____ DATE _____

TIME FROM INITIATION TO ACTION immed.

Field Change Order (FCO)

FCO NO 03

MODIFICATION NO. _____ DATE 11.1.00 WORK AUTHORIZATION _____

TYPE OF CHANGE _____ PRIORITY O EMERGENCY ✓ URGENT O ROUTINE

ADS NO. _____ CYWP NO. _____ CWBS NO. _____ O MINOR O MAJOR O OTHER

REQUESTER IDENTIFICATION

NAME KDOMINIC ORGANIZATION SAIC PHONE 918-625-7614

TITLE Field Mgr. SIGNATURE Kelly L Dominic

BASELINE IDENTIFICATION

BASELINE(S) AFFECTED ✓ COST ✓ SCOPE O MILESTONES ✓ METHOD OF ACCOMPLISHMENT

PROGRAM SERVICE ORDER NO. _____ REVISION NO. _____ CAM SIGNATURE _____

DESCRIPTION OF CHANGE Section 4.3, Figs 4-2 & 4-3 show PHONE _____
soil sample locations WB4-228, -248, -244 at Pads 38, 66, & 67 respectively.
Tech. Mgr. Dent would like to delete these locations and apply the unused analytical capacity to contingency sampling north of Pads 58 & 59.

JUSTIFICATION Added characterization north of these two pads is desirable. Deletion of the three locations will not impact characterization of those pads.

IMPACT OF NOT IMPLEMENTING REQUEST No characterization of presumed "hot spots" missed in earlier investigations

PARTICIPANTS AFFECTED BY IMPLEMENTING REQUEST Field teams
Sample manager

COST ESTIMATE $ ~ ESTIMATOR SIGNATURE _____

PHONE _____ DATE _____

PREVIOUS FC AFFECTED O YES ✓ NO

APPROVAL CLIENT
PROJECT MANAGER SIGNATURE _____ DATE _____

QAS REVIEW _____ DATE _____

TIME FROM INITIATION TO ACTION _____

Field Change Order (FCO)

FCO NO 04

MODIFICATION NO. _____ DATE 11.1.00 WORK AUTHORIZATION _____

TYPE OF CHANGE ADDITION PRIORITY O EMERGENCY ✓ URGENT O ROUTINE

ADS NO. _____ CYWP NO. _____ CWBS NO. _____ O MINOR O MAJOR O OTHER

REQUESTER IDENTIFICATION

NAME K DOMINIC ORGANIZATION SAIC PHONE 918-625-7614

TITLE Field Mgr. SIGNATURE K Dominic

BASELINE IDENTIFICATION

BASELINE(S) AFFECTED ✓ COST ✓ SCOPE O MILESTONES ✓ METHOD OF ACCOMPLISHMENT

PROGRAM SERVICE ORDER NO. _____ REVISION NO. _____ CAM SIGNATURE _____

DESCRIPTION OF CHANGE John Jent requested analyses of 30 soil samples for TAL metals by STL. These soils are to be those of the 10 highest, 10 lowest, and 10 other representative "ex-situ" soils on which XRF determinations have been run by MKM. SAIC will provide containers (2-oz glass) for MKM to place the pulverized soils in + ship to STL for ICP analysis of TAL metals. PHONE _____

JUSTIFICATION Provides Quality Assurance check on the XRF Niton method for comparison purposes

IMPACT OF NOT IMPLEMENTING REQUEST No means of quality-check XRF ex-situ data

PARTICIPANTS AFFECTED BY IMPLEMENTING REQUEST Sample manager
MKM
Project manager (cost)

COST ESTIMATE $ _____ ESTIMATOR SIGNATURE _____

PHONE _____ DATE _____

PREVIOUS FC AFFECTED O YES ✓ NO

APPROVAL CLIENT
PROJECT MANAGER SIGNATURE _____ DATE _____

QAS REVIEW _____ DATE _____

TIME FROM INITIATION TO ACTION _____

APPENDIX G

QUALITY CONTROL SUMMARY REPORT

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DRAFT

QUALITY CONTROL SUMMARY REPORT
AT
WINKLEPECK BURNING GROUNDS
AT THE
RAVENNA ARMY AMMUNITION PLANT,
RAVENNA, OHIO

January 2004

Prepared for

U.S. Army Corps of Engineers
Louisville District
Contract No. DACA62-00-D-0001
Delivery Order CY08

Prepared by

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ACRONYMS

BHC	benzene hexachloride
DQCR	Daily Quality Control Report
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
FS	feasibility study
LCS	laboratory control standard
MPR	Monthly Progress Report
MS	matrix spike
MSD	matrix spike duplicate
PM	project manager
QA	quality assurance
QAPP	Quality Assurance Program Plan
QC	quality control
QCSR	Quality Control Summary Report
RI	remedial investigation
RPD	relative percent difference
RVAAP	Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
STL	Severn Trent Laboratories Inc.
SVOC	semivolatile organic compound
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound
WBG	Winklepeck Burning Grounds

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G1.0 PURPOSE

Environmental data must always be interpreted relative to its known limitations and its intended use. As can be expected in environmental media of the type investigated during the Phase III remedial investigation (RI) for Winklepeck Burning Grounds (WBG), there are areas and data points where the user needs to be cautioned relative to the quality of the project information presented. The analytical data review process and this Data Quality Summary Report (QCSR) are intended to provide current and future data users assistance throughout the interpretation of this data.

The purpose of this QCSR is (1) to describe the quality control (QC) procedures followed to ensure data generated by Science Applications International Corporation (SAIC) during the Phase III RI for WBG at the Ravenna Army Ammunition Plant (RVVAP) would meet project requirements, (2) to describe the quality of the data collected, and (3) to describe any problems encountered during the course of the study and their solutions. A separate Chemical Quality Assessment Report will be completed by the U.S. Army Corps of Engineers (USACE) quality assurance (QA) representative covering data generated from QA split samples remanded to their custody.

This report provides an assessment of the quality of the analytical information gathered during the course of the Phase III RI for WBG performed during 2000. The Phase III RI was completed as a component of a feasibility study (FS), which evaluates remedial alternatives for WBG. The report documents that the quality of the data employed for the RI report and evaluation met project objectives. Evaluation of field and laboratory QC measures will constitute the majority of this assessment; however, references will also be directed toward those QA procedures that establish data credibility. The primary intent of this assessment is to illustrate that data generated for these investigations can withstand scientific scrutiny, are appropriate for their intended purpose, are technically defensible, and are of known and acceptable sensitivity, precision, and accuracy.

Multiple activities were performed to achieve the desired data quality in this project. As discussed in the previous report text, decisions were made during the initial scoping of the Phase III RI to define the quality and quantity of data required. Data quality objectives (DQOs) were established to guide the implementation of the field sampling and laboratory analysis [refer to the WBG FS Sampling and Analysis Plan (SAP) Addendum No. 1 (USACE 2000)]. A QA program was established to standardize procedures and to document activities as part of the RVAAP Facility-wide Quality Assurance Program Plan (QAPP), as revised (USACE 2001), and the WBG FS SAP Addendum No. 1. This program provided a means to detect and correct any deficiencies in the process. Upon receipt by the project team, data were subjected to verification and review, which identified and qualified problems related to the analysis. This QCSR assesses whether the data generated during the investigation met project objectives and recommends if data should be used.

G2.0 QUALITY ASSURANCE PROGRAM

The Facility-wide QAPP (USACE 2001) and the Phase III RI SAP Addendum No. 1 (USACE 2000) were developed to guide the investigation. The purpose of these documents was to enumerate the quantity and type of samples to be taken to investigate the Area of Concern, and to define the quantity and type of QA/QC samples to be used to evaluate the quality of the data obtained.

The QAPP established requirements for both field and laboratory QC procedures. In general, field QC duplicates and QA split samples were required for each environmental sample matrix (collected at a frequency of 10%, with the exception of general chemistry samples of soils that were collected at a 5% frequency). Volatile organic compound (VOC) trip blanks were to accompany each cooler containing

water samples for VOC determinations. Analytical laboratory QC duplicates, matrix spikes (MSs), laboratory control samples (LCSs), and method blanks were required for every 20 samples or less of each matrix and analyte.

A primary goal of the RVAAP QA program is to ensure that the quality of results for all environmental measurements is appropriate for the intended use of the data. To this end, the QAPP-standardized field procedures were compiled to guide the investigation. Through the process of readiness review, training, equipment calibration, QC implementation, and detailed documentation, the project has successfully accomplished the goals set by the QA program.

G2.1 MONTHLY PROGRESS REPORTS

A Monthly Progress Report (MPR) was completed by the SAIC project manager (PM) for every month during project field implementation. The MPRs contained the following information: work completed, problems encountered, corrective actions/solutions, summary of findings, and upcoming work. These reports were issued to the USACE, Louisville PM and may be obtained through that office.

G2.2 DAILY QUALITY CONTROL REPORTS

The Field Team Leader produced all Daily Quality Control Reports (DQCRs). These reports include information such as, but not limited to, sub-tier contractors on-site, equipment on-site, work performed summaries, QC activities, health and safety activities, problems encountered, and corrective actions. The DQCRs were submitted to the USACE, Louisville District PM and may obtained through that office.

G2.3 LABORATORY "DEFINITIVE" LEVEL DATA REPORTING

The QAPP for this project identified requirements for laboratory data reporting and identified Severn Trent Laboratories Inc. (STL), North Canton, Ohio, as the laboratory for the project. During the execution of the project, the North Canton facility took the lead and performed the majority of the analyses, while STL, Knoxville, Tennessee, performed explosives by High-Pressure Liquid Chromatography and STL, Sacramento, California, performed nitroguanidine and nitrocellulose determinations. U.S. Environmental Protection Agency (EPA) “definitive” data have been reported, including the following basic information:

- laboratory case narratives
- sample results (soil/sediment reported per dry weight)
- laboratory method blank results
- LCS results
- laboratory sample MS recoveries
- laboratory duplicate results
- surrogate recoveries [VOCs, semivolatile organic compounds (SVOCs), polychlorinated biphenyls, and explosives]

- sample extraction dates
- sample analysis dates

This information from the laboratory, along with field information, provides the basis for subsequent data evaluation relative to sensitivity, precision, accuracy, representativeness, and completeness. These have been presented in Section G.4. All laboratory analytical data have been summarized (with data qualifiers) and presented in Appendix H. These data are also maintained electronically in an environmental database for RVAAP.

G3.0 DATA VERIFICATION

The objective when evaluating the quality of the project data is to determine its usability. The evaluation is based on the interpretation of laboratory QC measures, field QC measures, and the project DQOs. This project implemented checklists to facilitate laboratory data review. These checklists were completed by the project-designated verification staff and were reviewed by the project laboratory coordinator. Data verification checklists for each laboratory sample delivery group have been retained with laboratory data deliverables in the project files. Copies of all data verification checklists are provided to the USACE, Louisville District Project Chemist.

G3.1 FIELD DATA VERIFICATION

DQCRs were completed by the Field Team Leader. The DQCRs and other field-generated documents such as sampling logs, boring logs, daily health and safety summaries, daily safety inspections, equipment calibration and maintenance logs, and sample management logs were peer reviewed on-site. These logs and all associated field information have been delivered to the USACE, Louisville District PM and can be obtained through that office.

G3.2 LABORATORY DATA VERIFICATION

Analytical data generated for this project have been subjected to a process of data verification and review. The following describes this systematic process and the evaluation activities performed. Several criteria have been established against which the data are compared and from which a judgment is rendered regarding the acceptance and qualification of the data. Because it is beyond the scope of this report to cite those criteria, the reader is directed to the following documents for specific detail:

- SAIC Technical Support Contractor QA Technical Procedure (TP-DM-300-7) Data Verification and Validation;
- EPA National Functional Guidelines for Inorganic Data Review, EPA-540/R-94/013, February 1994;
- EPA National Functional Guidelines for Organic Data Review, EPA-540/R-99/008, October 1999;
- USACE Shell for Analytical Chemistry Requirements, Appendix I, EM 200-1-3, revised February 2001; and
- SAP Addendum No. 1 for the WBG FS (USACE 2000).

Upon receipt of field and analytical data, verification staff performed a systematic examination of the reports, following standardized data package checklists, to ensure the content, presentation, and administrative validity of the data. Discrepancies identified during this process were recorded and documented utilizing the checklists. As part of the data verification, standardized laboratory electronic data deliverables were subjected to review. This technical evaluation ensured that all contract-specified requirements had been met and that electronic information conformed to reported hardcopy data. QA program Nonconformance Reports and corrective action systems were implemented as part of the QAPP.

During the verification phase of the review and evaluation process, data were subjected to a systematic technical review by examining all field and analytical QC results and laboratory documentation, following appropriate EPA functional guidelines and SAIC internal procedures for laboratory data review. These data review guidelines define the technical criteria, methods for evaluation of the criteria, and actions to be taken resulting from the review of these criteria. The primary objective of this phase was to assess and summarize the quality and reliability of the data for the intended use and to document factors that may affect the usability of the data. This process did not include in-depth review of raw data instrument out-put or recalculation of results from primary instrument out-put. The verification and review process included, but was not necessarily limited to, the following parameters:

- data completeness
- holding times
- calibration (initial and continuing)
- method blanks
- sample results verification
- surrogate recovery
- LCS analysis
- internal standard performance
- MS recovery
- duplicate analysis comparison
- reported detection limits
- compound, element, and isotope quantification
- reported detection levels
- secondary dilutions

As an end result of this phase of the review, the data were qualified based on the technical assessment of the review criteria. Qualifiers were applied to each field and analytical result to indicate the usability of the data for its intended purpose.

G3.3 DEFINITION OF DATA QUALIFIERS (FLAGS)

During the review process, all laboratory data were assigned appropriate data qualification flags and reason codes. Flags are defined as follows:

"U" Indicates the analyte was analyzed for, but not detected above, the level of the associated value.

"J" Indicates the analyte was positively identified; however, the associated numerical value is an approximate concentration of the analyte in the sample.

"UJ" Indicates the analyte was analyzed for, but not detected above, the associated value; however, the reported value is an estimate and demonstrates a decreased knowledge of its accuracy or precision.

"R" Indicates the analyte value reported is unusable. The integrity of the analyte's identification, accuracy, precision, or sensitivity has raised significant questions as to the reality of the information presented.

"=" Indicates the analyte has been reviewed, the analyte has been positively identified, and the associated concentration value is accurate.

SAIC qualification reason codes have been provided in Attachment G-1, while copies of review checklists and qualified data forms are in the file with the analytical laboratory deliverable.

G3.4 DATA ACCEPTABILITY

A total of 185 environmental soil, sediment, and groundwater samples, plus field QC samples, were collected with approximately 10,800 discrete analyses (i.e., analytes) being obtained, reviewed, and integrated into the assessment (these totals do not include field measurements and field descriptions). The project produced acceptable results for over 99% of the sample analyses performed.

Table G-1 presents a summary of the number of collected investigation samples and analytical groups and also tallies the collection of appropriate field QC and QA split samples. Table G-2 identifies a cross reference for duplicate and QA split sample pair numbers. Table G-3 provides a summary of rejected analyses grouped by media and analyte category. Unacceptable data constitutes less than 1% of the total analytical data generated. The majority of estimated values were based on concentrations observed between the laboratory method detection levels and the project reporting levels. Values determined in this region have an inherently higher variability and need to be considered estimated, at best.

G4.0 DATA EVALUATION

Through data verification and review processes, analytical accuracy, precision, selectivity, and sensitivity have been evaluated. The following paragraphs summarize this review by analyte group.

G4.1 METALS ANALYSES

G4.1.1 Sediment, Groundwater, Quality Control, and Investigation-derived Waste Samples

- For several groundwater samples, aluminum and chromium were qualified as non-detectable due to method blank contamination, and thallium was often qualified as estimated non-detectable as a result of MS recoveries.

- Investigation-derived waste data for antimony, calcium, chromium, copper, lead, and sodium were qualified as estimated because of blank contamination or MS recoveries. Zinc was qualified as estimated due to continuing calibration recovery above the upper control limit.

- The two field blanks were qualified as estimated non-detectable for manganese as a result of method blanks and thallium; one field blank sample was qualified as estimated because the post-digestion spike recovery was outside the control limit.

Table G-1. Winklepeck Burning Grounds Phase III Remedial Investigation Sample Summary

Media	Analyte Group	Environmental Samples	Field Duplicates
Soil	Metals	150	14
	Cyanide	11	1
	Field Explosives	149	0
	Explosives	59	7
	Pesticides and PCBs	13	1
	Semivolatile	13	1
	Volatile Organics	13	1
	Hexavalent Chromium	57	3
Sediment	Metals	2	0
	Cyanide	2	0
	Field Explosives	2	0
	Explosives	2	0
	Pesticides and PCBs	2	0
	Semivolatile	2	0
	Volatile Organics	2	0
	Hexavalent Chromium	2	0
	Total Organic Carbon	2	0
Groundwater	Metals	17	2
	Cyanide	17	2
	Explosives	17	2
	Pesticides and PCBs	17	2
	Semivolatile	17	2
	Volatile Organics	17	2
Field Blank	Metals	2	0
	Cyanide	2	0
	Explosives	2	0
	Pesticides and PCBs	2	0
	Semivolatile	2	0
	Volatile Organics	2	0
Trip Blank	Volatile Organics	3	0
	Environmental Samples	**169**	**16**

PCB = Polychlorinated biphenyl.

Table G-2. Winklepeck Burning Grounds Phase III Remedial Investigation
Primary, Duplicate, and Split Sample Correlation

Media	Station #	Sample #/ Duplicate #	SDG # Metals, etc.	SDG # Explosives	SDG # Propellants	Split #
Surface Soil	WBG-201	WBG4012	AOJ190108	AOJ210109	None	WBG4286
		WBG4268	AOJ190108	AOJ190108	AOJ190134	
Surface Soil	WBG236	WBG4125	AOJ210113	AOJ210113	AOJ210119	WBG4288
		WBG4270	AOJ210113	AOJ210113	AOJ210119	
Surface Soil	WBG212	WBG4049	AOJ210109	AOJ210109	None	WBG4287
		WBG4269	AOJ210109	AOJ210109	None	
Surface Soil	WBG241	WBG4142	AOJ240125	None	None	WBG4289
		WBG4271	AOJ240125	AOJ240125	None	
Subsurface Soil	WBG220	WBG4074	AOJ240141	None	None	WBG4290
		WBG4272	AOJ240141	AOJ240141	None	
Subsurface Soil	WBG243	WBG4151	AOJ260152	None	None	WBG4291
		WBG4273	AOJ260152	AOJ260152	None	
Surface Soil	WBG281	WBG4236	AOJ260152	None	None	WBG4292
		WBG4274	AOJ260152	AOJ260152	None	
Subsurface Soil	WBG257	WBG4199	AOK020144	AOK020144	None	WBG4294
		WBG4276	AOK020144	None	None	
Surface Soil	WBG257	WBG4196	AOK020144	AOK020144	None	WBG4293
		WBG4275	AOK020144	None	None	
Subsurface Soil	WBG210	WBG4043	AOK020144	AOK020144	None	WBG4296
		WBG4278	AOK020144	None	None	
Surface Soil	WBG266	WBG4221	AOK020144	None	None	WBG4297
		WBG4279	AOK020144	None	None	
Surface Soil	WBG210	WBG4041	AOK020144	AOK020144	None	WBG4295
		WBG4277	AOK020144	None	None	
Surface Soil	WBG268	WBG4223	AOK020183	None	None	WBG4299
		WBG4281	AOK020183	None	None	
Surface Soil	WBG292	WBG4247	AOK020183	None	None	WBG4298
		WBG4280	AOK020183	None	None	
Groundwater	WBGmw-010	WBG4260	AOK040107	AOK040107	Aok040108	WBG4303
		WBG4285	AOK040107	AOK040107	Aok040108	
Groundwater	WBGmw-011	WBG4261	AOK040107	AOK040107	Aok040108	WBG4302
		WBG4284	AOK040107	AOK040107	Aok040108	

SDG = Sample delivery group.

Table G-3. Winklepeck Burning Grounds Phase III Remedial Investigation Summary of Rejected Laboratory Analytes

Media	Analyte Group	Rejected/Total	Percent Rejected
Soil	Metals	0 / 3,755	0.0
	Cyanide	0 / 12	0.0
	Explosives	0 / 944	0.0
	Pesticides and PCBs	2 / 392	0.5
	Semivolatile	6 / 896	0.7
	Volatile Organics	0 / 490	0.0
	Hexavalent Chromium	2 / 60	3.3
Sediment	Metals	0 / 46	0.0
	Cyanide	0 / 2	0.0
	Explosives	0 / 4	0.0
	Pesticides and PCBs	0 / 56	0.0
	Semivolatile	0 / 128	0.0
	Volatile Organics	0 / 70	0.0
	Hexavalent Chromium	1 / 2	50.0
	Total Organic Carbon	0 / 2	0.0
	SOIL/SEDIMENT SUBTOTAL	**10 / 7,131**	**0.1**
Groundwater	Metals	0 / 437	0.0
	Cyanide	0 / 19	0.0
	Explosives	0 / 323	0.0
	Pesticides and PCBs	0 / 532	0.0
	Semivolatile	19 / 1,216	1.6
	Volatile Organics	0 / 665	0.0
	GROUNDWATER SUBTOTAL	**19 / 3,192**	**0.6**
Waste Material	Inorganics	0 / 22	0.0
	WASTE MATERIAL SUBTOTAL	**0 / 22**	**0.0**
Quality Control	Metals	0 / 46	0.0
	Cyanide	0 / 2	0.0
	Explosives	0 / 34	0.0
	Pesticides and PCBs	0 / 56	0.0
	Semivolatile	2 / 128	1.6
	Volatile Organics	0 / 175	0.0
	QUALITY CONTROL SUBTOTAL	**2 / 441**	**0.5**
PROJECT TOTAL		**31 / 10,786**	**0.3**

PCB = Polychlorinated biphenyl.
RI = Remedial investigation.

- For both sediment samples, antimony, chromium, lead, manganese, and zinc were qualified as estimated due to MS recoveries. Thallium, for both samples, was qualified as estimated because the post-digestion spike recovery was outside the control limit.

- Hexavalent chromium data were rejected in sediment sample WBG4250 because the extraction time was exceeded and the MS/matrix spike duplicate (MSD) recovery was less than 10%.

- In general, hexavalent chromium was qualified as estimated or estimated non-detectable because extraction times were exceeded.

- With the exception of the single hexavalent chromium value, all data are considered acceptable for use.

G4.1.2 Soil Samples

- Beryllium was qualified as non-detectable in many instances due to blank contamination.

- Mercury was often qualified as estimated due to LCS recovery being above the upper control limit.

- Thallium was estimated because the post-digestion spike recovery was outside the control limit.

- In general, aluminum, arsenic, barium, calcium, cadmium, cobalt, copper, magnesium, nickel, sodium, and zinc were qualified as estimated due to MS recoveries. Occasionally, thallium, vanadium, potassium, and lead were also qualified in this manner.

- Additionally, aluminum, magnesium, calcium, and sodium were qualified because the blank had a negative value greater than 2 times the detection limit for the instrument. Calcium was further qualified due to method blank contamination or failure to meet serial dilution criteria. Other analytes that were qualified due to blank contamination include both selenium and sodium.

- In general, zinc was either qualified as described above or because of failure to meet serial dilution criteria.

- Hexavalent chromium data were rejected for soil samples WBG4156 and WBG4159 because the extraction times were exceeded and the MS/MSD recovery was less than 10%.

- In general, hexavalent chromium was qualified as estimated or estimated non-detectable because extraction times were exceeded.

- With the exception of two hexavalent chromium values, all data are considered acceptable for use.

G4.2 EXPLOSIVES ANALYSES

G4.2.1 Soil, Sediment, and Groundwater Samples

- Nitrocellulose and nitroguanidine data were qualified as estimated non-detect due to exceeding extraction times.

- Explosive compounds were also qualified as estimated non-detects as a result of observed minor method blank levels.

- All explosive results are considered acceptable for use by the project.

G4.3 CYANIDE ANALYSES

G4.3.1 Soil, Sediment, and Quality Control Samples

- Data were qualified as estimated or estimated non-detect due to exceedance of analysis holding times or continuing calibration recoveries being slightly outside criteria.

- All cyanide results are considered acceptable for use by the project.

G4.4 PESTICIDES AND POLYCHLORIDE BIPHENYL ANALYSES

G4.4.1 Groundwater Samples

- WBG4256, WBG4260, WGB4261, WBG4284, and WBG4285 were qualified as estimated or estimated non-detectable for several different analytes because initial/continual calibration relative percent difference (RPD) criteria were not met.

- All data are considered acceptable for use.

G4.4.2 Soil and Sediment Samples

- Endrin ketone and beta-benzene hexachloride (-BHC) for samples WBG4249 and WBG4250 were qualified as estimated non-detect due to LCS recoveries being slightly outside criteria.

- Non-detect results for delta-BHC data were rejected in samples WBG4088 and WBG4108 based on poor compound response data.

- Delta-BHC was qualified as estimated non-detect in one sample because the initial calibration relative standard deviation was greater than 30%.

- In several samples, methoxychlor and heptachlor were qualified as estimated due to secondary column checks being greater than 25% RPD or because the LCSs were determined to be above the upper control limit.

- All data, with the exception of the two delta-BHC values, are considered acceptable for use.

G4.5 SEMIVOLATILE ORGANIC ANALYSES

G4.5.1 Groundwater and Field Quality Control Samples

- 3-Nitrobenzenamine was qualified as estimated due to LCS recoveries being outside criteria.

- All groundwater 4-chlorobenzenamine was rejected due to extremely poor laboratory control performance.

- In sample WBG4067, bis(2-chloroethyl)ether was qualified as estimated because the LCS recovery was above the upper control limit.

- In field blank samples, hexachlorocyclopentadiene data were rejected based on extremely poor laboratory control performance.

- All compound analyses are considered useable for the project, with the exception of 4-chlorobenzenamine.

G4.5.2 Soil and Sediment Samples

- In sample WBG4073, 3,3'-dichlorobenzidine, bis(2-chloroethyl) ether, and hexachlorocyclopentadiene were rejected because MS/MSD recovery was less than 10% or estimated non-detectable.

- In sample WBG4156, 3,3'-dichlorobenzidine was rejected because MS/MSD recovery was less than 10%.

- In sample WBG4270, bis(2-chloroethyl)ether was qualified as estimated non-detectable due to LCS recovery.

- For WBG4139, most SVOCs were qualified as estimated non-detectable due to area counts being outside the control limits.

- Sample WBG4139 pentachlorophenol, hexachlorocyclopentadiene, and 3,3'-dichlorobenzidine data were rejected because the MS/MSD recoveries were less than 10%.

- All SVOC analyses are considered useable for the project, with the exception of those 4-chlorobenzenamine, pentachlorophenol, hexachlorocyclopentadiene, and 3,3'-dichlorobenzidine values cited above.

G4.6 VOLATILE ORGANIC ANALYSES

G4.6.1 Soil, Sediment, and Groundwater Samples

- 2-Butanone, 2-hexanone, 4-methyl-2-pentanone, acetone, and chloroethane results were qualified as estimated or estimated non-detectable due to LCS recoveries.

- Acetone and methylene chloride values were qualified as non-detectable as a result of similar concentrations being observed in the method blank.

- Data were qualified as estimated non-detectable because area counts were outside acceptable limits in sample WBG4067.

- Dimethylbenzene and ethylbenzene were qualified as estimated because MS/MSD pairs exceeded the RPD criteria for sample WBG4042.

- All compound analyses are considered useable for the project.

G4.7 FIELD PRECISION

Field duplicate samples were collected to ascertain the contribution to variability (i.e., precision) due to the combination of environmental media, sampling consistency, and analytical precision. Field duplicate samples were collected from the same spatial and temporal conditions as the primary environmental sample. For soil and sediment samples, all analytes except VOCs were collected after homogenization from the same sampling device used for primary sampling.

Table G-4 provides a summary of surface soil, subsurface soil, and groundwater field duplicate comparisons by analyte. The table presents both absolute difference and RPD evaluations for field duplicate measurements. RPD was calculated only when both samples were >5 times the analyte reporting level. When one or both sample values were between the quantitation level and 5 times the analyte reporting level, the absolute difference was evaluated. If both samples were not detected for a given analyte, precision was considered acceptable. All field duplicate pairs are represented in the tabulation.

In order to review information, this data quality assessment has implemented general criteria for comparison of absolute difference measurements and RPDs. RPD criteria are identified in Table G-5. Absolute difference criteria were set at three 3 times the analyte reporting level.

Soil field duplicate RPDs are considered good, with the majority having RPDs <50% or being below reporting levels with absolute differences being within 3 times the analyte reporting level criteria. Soil duplicate pair WBG4196/WBG4275 exhibited a poor comparison for barium, copper, lead, and zinc. Soil duplicate pairs WBG4125/WBG4270 and WBG4049/WBG4269 returned unacceptable results for hexavalent chromium. Duplicates WBG4043/WBG4278 exhibited a poor comparison for aluminum, arsenic, calcium, chromium, iron, lead, manganese, and zinc, while the data for copper, magnesium, and nickel were determined to be unacceptable. For duplicates WBG4074/WBG4272, antimony is determined to be a fair comparison (78.4%), but copper showed a poor comparison between samples (108.4%). All other duplicate comparisons of soil samples are determined to be good (RPD <50%). Both groundwater duplicates were determined to have a good comparison, with RPDs ≤ 8%.

G4.8 SENSITIVITY

Determination of minimum detectable values allows the investigation to assess the relative confidence that can be placed in a value relative to the magnitude or level of analyte concentration observed. The closer a measured value comes to the minimum detectable concentration, the less confidence and more variation the measurement will have. Project sensitivity goals were expressed as quantitation level goals in the QAPP. These levels were achieved or exceeded throughout the analytical process. Actual laboratory method detection levels achieved during this investigation are presented in Table G-6 along with original project quantitation level goals. There were individual exceptions that have generated qualification of the data or elevation of detection levels when the original goal was not achieved. Variations observed were caused by fluctuations in moisture content, the need to dilute samples due to matrix interference, or high levels of specific analytes. Variations in observed detection levels have not impacted the usability of the data for the project. Moisture content and blank levels did not impact data usability.

Method blank determinations were performed with each analytical sample batch for each analyte under investigation. These blanks were evaluated during data review to determine their potential impact on individual data points, if any. Review action levels are set at 5 times the reporting level for all analytes, except those designated as common laboratory contaminants (methylene chloride, acetone, toluene, 2-butanone, and phthalate compounds) with action levels set at 10 times the reporting levels. During data review, reported sample concentrations are assessed against method blank action levels and the following qualifications are made when reportable quantities of analytes were observed in the associated method blank.

- When the analyte sample concentration is above 5 or 10 times the action level, it is not qualified and is considered a positive value. These results receive a reason code of “F01, F08.”

- When the analyte sample concentration is determined to be below 5 or 10 times the action level, but above the reporting level, it is considered impacted by the method blank and the value reported is qualified as non-detected at the analyte value reported. The result is then qualified as “U” with a reason code of “F01, F07.”

Table G-4. Winklepeck Burning Grounds Phase III Remedial Investigation
Field Duplicate Comparison

Sample Numbers	WBG4012 and WBG4268	WBG4125 and WBG4270	WBG4049 and WBG4269	WBG4142 and WBG4271	WBG4236 and WBG4274
Analysis	**Surface Soil RPD**	**Surface Soil RPD**	**Surface Soil RPD**	**Surface Soil RPD**	**Surface Soil RPD**
Inorganics					
Aluminum	23.3	NA	7.9	8.3	9.5
Antimony	*	*	*	*	*
Arsenic	27.9	24.1	1.1	0.6	10.2
Barium	*	NA	*	*	*
Beryllium	*	NA	*	*	*
Cadmium	*	NA	*	*	*
Calcium	*	NA	*	*	*
Chromium	16.7	NA	10.3	6.3	5.8
Cobalt	*	NA	*	*	*
Copper	14.3	NA	43.9	5.2	5.3
Iron	19.4	NA	4.7	7.2	3.3
Lead	34.4	23.4	37.6	4.0	2.6
Magnesium	12.7	NA	*	*	*
Manganese	44.1	NA	2.6	27.0	17.4
Mercury	32.6	*	*	*	*
Nickel	22.7	NA	*	*	*
Potassium	*	NA	*	*	*
Selenium	*	*	*	*	*
Silver	*	NA	*	*	*
Sodium	*	NA	*	*	*
Thallium	*	*	*	*	*
Vanadium	*	NA	*	*	*
Zinc	7.7	NA	33.2	5.9	5.9
Chromium, hexavalent	NA	UNAC	UNAC	*	NA
Explosives					
All compounds	*	*	*	NA	NA
Pesticides and PCBs					
All compounds	NA	*	NA	NA	NA
SVOCs					
All compounds	NA	*	NA	NA	NA
VOCs					
All compounds	NA	*	NA	NA	NA

* At least one value was <5 times the analyte reporting level with absolute differences being within 3 times the reporting level.
HMX = Octoahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
NA = Not applicable.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
RPD = Relative percent difference.
SVOC = Semivolatile organic compound.
UNAC = At least one value was <5 times the analyte reporting level; however, the absolute difference between values was >3 times the analyte reporting level.
VOC = Volatile organic compound.

Table G-4. Winklepeck Burning Grounds Phase III Remedial Investigation
Field Duplicate Comparison (continued)

Sample Numbers	WBG4196 and WBG4275	WBG4221 and WBG4279	WBG4041 and WBG4277	WBG4223 and WBG4281	WBG4247 and WBG4280
Analysis	**Surface Soil RPD**	**Surface Soil RPD**	**Surface Soil RPD**	**Surface Soil RPD**	**Surface Soil RPD**
Inorganics					
Aluminum	2.0	9.9	3.6	12.8	14.6
Antimony	*	*	46.2	*	*
Arsenic	2.2	16.5	25.6	0.7	4.2
Barium	105.1	*	*	*	*
Beryllium	*	*	*	*	*
Cadmium	*	*	*	*	*
Calcium	*	*	*	*	*
Chromium	32.3	8.1	3.9	12.3	10.4
Cobalt	*	*	*	*	*
Copper	161.2	*	17.7	*	*
Iron	6.3	11.4	5.1	5.8	9.8
Lead	104.4	*	21.6	15.0	0.8
Magnesium	*	*	*	*	*
Manganese	28.5	5.3	29.0	10.4	7.7
Mercury	*	*	*	*	*
Nickel	*	*	*	*	*
Potassium	*	*	*	*	*
Selenium	*	*	*	*	*
Silver	*	*	*	*	*
Sodium	*	*	*	*	*
Thallium	*	*	*	*	*
Vanadium	*	*	*	*	*
Zinc	95.8	9.8	6.5	11.9	13.1
Chromium, hexavalent	NA	NA	NA	NA	NA
Explosives					
All compounds	NA	NA	NA	NA	NA
Pesticides and PCBs					
All compounds	NA	NA	NA	NA	NA
SVOCs					
All compounds	NA	NA	NA	NA	NA
VOCs					
All compounds	NA	NA	NA	NA	NA

* At least one value was <5 times the analyte reporting level with absolute differences being within 3 times the reporting level.
HMX = Octoahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
NA = Not applicable.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
RPD = Relative percent difference.
SVOC = Semivolatile organic compound.
UNAC = At least one value was <5 times the analyte reporting level; however, the absolute difference between values was >3 times the analyte reporting level.
VOC = Volatile organic compound.

Table G-4. Winklepeck Burning Grounds Phase III Remedial Investigation
Field Duplicate Comparison (continued)

Sample Numbers Analysis	WBG4043 and WBG4278 Subsurface Soil RPD	WBG4199 and WBG4276 Subsurface Soil RPD	WBG4151 and WBG4273 Subsurface Soil RPD	WBG4074 and WBG4272 Subsurface Soil RPD
		Inorganics		
Aluminum	102.9	9.9	13.2	21.8
Antimony	*	*	*	78.4
Arsenic	113.9	18.5	35.9	11.1
Barium	*	*	9.9	19.7
Beryllium	*	*	*	*
Cadmium	*	*	*	*
Calcium	132.7	17.7	29.9	25.0
Chromium	106.2	3.7	10.6	0.2
Cobalt	*	*	*	*
Copper	UNAC	16.7	2.7	108.4
Iron	113.7	12.8	7.6	1.2
Lead	109.1	9.8	29.8	38.0
Magnesium	UNAC	0.6	8.7	12.9
Manganese	126.4	34.7	8.3	11.4
Mercury	*	*	*	*
Nickel	UNAC	*	3.6	16.4
Potassium	*	*	*	*
Selenium	*	*	*	*
Silver	*	*	*	*
Sodium	*	*	*	*
Thallium	*	*	*	*
Vanadium	*	*	*	*
Zinc	115	13.5	3.1	22.2

* At least one value was <5 times the analyte reporting level with absolute differences being within 3 times the reporting level.
HMX = Octoahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
NA = Not applicable.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
RPD = Relative percent difference.
SVOC = Semivolatile organic compound.
UNAC = At least one value was <5 times the analyte reporting level; however, the absolute difference between values was >3 times the analyte reporting level.
VOC = Volatile organic compound.

Table G-4. Winklepeck Burning Grounds Phase III Remedial Investigation
Field Duplicate Comparison (continued)

Sample Numbers	WBG4260 and WBG4285	WBG4261 and WBG4284
Analysis	**Groundwater RPD**	**Groundwater RPD**
Inorganics		
Aluminum	*	*
Antimony	*	*
Arsenic	*	*
Barium	*	*
Beryllium	*	*
Cadmium	*	*
Calcium	2.5	4.7
Chromium	*	*
Cobalt	*	*
Copper	*	*
Iron	*	*
Lead	*	*
Magnesium	*	*
Manganese	*	*
Mercury	*	*
Nickel	*	*
Potassium	*	*
Selenium	*	*
Silver	*	*
Sodium	*	*
Thallium	*	*
Vanadium	*	*
Zinc	*	*
Cyanide	*	*
Explosives		
1,3,5-Trinitrobenzene	*	*
1,3-Dinitrobenzene	*	*
2,4,6-Trinitrotoluene	*	*
2,4-Dinitrotoluene	*	*
2,6-Dinitrotoluene	*	*
2-Amino-4,6-dinitrotoluene	8.0	*
2-Nitrotoluene	*	*
3-Nitrotoluene	*	*
4-Amino-2,6-dinitrotoluene	*	*
4-Nitrotoluene	*	*
HMX	*	*
Nitrobenzene	*	*
Nitrocellulose	*	*
Nitroglycerin	*	*
Nitroguanidine	*	*
RDX	*	*
Tetryl	*	*

Table G-4. Winklepeck Burning Grounds Phase III Remedial Investigation
Field Duplicate Comparison (continued)

Sample Numbers	**WBG4260 and WBG4285**	**WBG4261 and WBG4284**
Analysis	**Groundwater RPD**	**Groundwater RPD**
Pesticides and PCBs		
All compounds	*	*
SVOCs		
All compounds	*	*
VOCs		
All compounds	*	*

* At least one value was <5 times the analyte reporting level with absolute differences being within 3 times the reporting level.
HMX = Octoahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
NA = Not applicable.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
RPD = Relative percent difference.
SVOC = Semivolatile organic compound.
UNAC = At least one value was <5 times the analyte reporting level; however, the absolute difference between values was >3 times the analyte reporting level.
VOC = Volatile organic compound.

Table G-5. RPD Evaluation Categories

Matrix	Good	Fair	Poor	Unacceptable
Soil	<50%	<90%	<150%	>150%
Groundwater	<35%	<70%	<100%	>100%

RPD = Relative percent difference.

Table G-6. Project Quantitation Limit Goals and Achieved Method Detection Levels for the Winklepeck Burning Grounds Phase III Remedial Investigation

	Water		Soil/Sediment	
Parameters/Methods	**Project Quantitation Goal**	**Achieved Method Detection Level**	**Project Quantitation Goal**	**Achieved Method Detection Level**
2-Hexanone	10	8.6	10	1.2
Tetrachloroethene	5	1.3	5	074
Toluene	5	0.45	5	0.75
1,1,2,2-Tetrachloroethane	5	0.57	5	0.7
Chlorobenzene	5	0.43	5	0.72
Ethylbenzene	5	0.41	5	0.84
Styrene	5	0.43	5	0.65
Xylenes (total)	5	1.4	5	0.2
SVOCs SW 846-8270C	**(µg/L)**	**(µg/L)**	**(µg/kg)**	**(µg/kg)**
Phenol	10	1.3	330	35
bis(2-Chloroethyl) ether	10	2.1	330	33
2-Chlorophenol	10	1.6	330	28
1,3-Dichlorobenzene	10	1	330	32
1,4-Dichlorobenzene	10	0.9	330	36
1,2-Dichlorobenzene	10	0.9	330	29
2-Methylphenol	10	1.1	330	37
2,2'- oxybis(1-Chloropropane)	10	1.3	330	93
4-Methylphenol	10	1.7	330	27
N-nitroso-di-n-dipropylamine	10	1	330	31
Hexachloroethane	10	2.3	330	40
Nitrobenzene	10	2.6	330	32
Isophorone	10	2.7	330	32
2-Nitrophenol	10	1	330	44
2,4-Dimethylphenol	10	1.1	330	57
bis(2-chloroethoxy) methane	10	2.6	330	21
2,4-Dichlorophenol	10	1	330	45
1,2,4-Trichlorobenzene	10	2.5	330	38
Naphthalene	10	0.7	330	35
4-Chloroaniline	10	2.8	330	33
Hexachlorobutadiene	10	1.2	330	31
4-chloro-3-methylphenol	10	1.2	330	31
2-Methylnaphthalene	10	0.9	330	33
Hexachlorocyclopentadiene	10	3.4	330	150
2,4,6-Trichlorophenol	10	1.3	330	57
2,4,5-Trichlorophenol	25	1.1	800	69
2-Chloronaphthalene	10	2.5	330	32
2-Nitroaniline	25	1.4	800	33
Dimethylphthalate	10	3.7	330	36
Acenaphthylene	10	2.7	330	35
2,6-Dinitrotoluene	10	2.8	330	30

Table G-6. Project Quantitation Limit Goals and Achieved Method Detection Levels for the Winklepeck Burning Grounds Phase III Remedial Investigation (continued)

Parameters/Methods	Water		Soil/Sediment	
	Project Quantitation Goal	Achieved Method Detection Level	Project Quantitation Goal	Achieved Method Detection Level
3-Nitroaniline	25	2	800	33
Acenaphthene	10	2.7	330	35
2,4-Dinitrophenol	25	13	800	150
4-Nitrophenol	25	4.8	800	350
Dibenzofuran	10	2.8	330	36
2,4-Dinitrotoluene	10	0.8	330	41
Diethylphthalate	10	3.2	330	38
4-Chlorophenyl-phenyl ether	10	1.3	330	36
Fluorene	10	2.9	330	29
4-Nitroaniline	25	1.2	800	47
4,6-Dinitro-2-methylphenol	25	7.5	800	180
N-nitrosodiphenylamine	10	0.9	330	37
4-bromophenyl-phenylether	10	1	300	35
Hexachlorobenzene	10	1.8	330	41
Pentachlorophenol	25	0.6	800	34
Phenanthrene	10	2.4	330	43
Anthracene	10	0.9	330	37
Carbazole	10	1.1	330	42
Di-n-butylphthalate	10	1.1	330	59
Fluoranthene	10	0.9	330	38
Pyrene	10	1.4	330	57
Butylbenzylphthalate	10	1.9	330	44
3,3'-Dichlorobenzidine	10	1.1	330	140
Benzo(*a*)anthracene	10	2.8	330	35
Chrysene	10	0.9	330	50
bis(2-Ethylhexyl)phthalate	10	2.1	330	65
Di-n-octylphthalate	10	2	330	50
Benzo(*b*)fluoranthene	10	2.6	330	35
Benzo(*k*)fluoranthene	10	1.2	330	41
Benzo(*a*)pyrene	10	3	330	33
Indeno(1,2,3-*cd*)pyrene	10	1.2	330	42
Dibenzo(*a,h*)anthracene	10	1.2	330	38
Benzo(*g,h,i*)perylene	10	3.3	330	45
PCBs SW 846-8082	**(µg/L)**	**(µg/L)**	**(µg/kg)**	**(µg/kg)**
Arochlor-1016	1.0	0.02	33	5.3
Arochlor-1221	2.0	0.09	67	19
Arochlor-1232	1.0	0.16	33	11
Arochlor-1242	1.0	0.3	33	18
Arochlor-1248	1.0	0.22	33	4.6
Arochlor-1254	1.0	0.10	33	20
Arochlor-1260	1.0	0.07	33	7.4
Explosive Compounds SW 846-8330	**(µg/L)**	**(µg/L)**	**(µg/kg)**	**(µg/kg)**
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	20	0.09	2	0.18
Hexahydro-1,3,5-trinitro-1,3,5-triazine (cyclonite)	20	0.09	2	0.17
1,3,5-Trinitrobenzene	2	0.09	1	0.09
1,3-Dinitrobenzene	3	0.04	1	0.03
Tetryl	50	0.06	5	0.38
Nitrobenzene	10	0.06	1	0.05

Table G-6. Project Quantitation Limit Goals and Achieved Method Detection Levels for the Winklepeck Burning Grounds Phase III Remedial Investigation (continued)

Parameters/Methods	Water		Soil/Sediment	
	Project Quantitation Goal	Achieved Method Detection Level	Project Quantitation Goal	Achieved Method Detection Level
2,4,6-Trinitrotoluene	3	0.05	1	0.05
2,4-Dinitrotoluene	0.1	0.05	1	0.05
2,6-Dinitrotoluene	0.1	0.09	1	0.09
4-Amino-2,6-dinitrotoluene	0.1	0.09	1	0.09
4-Amino-2,6-dinitrotoluene	0.1	0.09	1	0.09
o-Nitrotoluene	10	0.14	1	0.14
m-Nitrotoluene	10	0.14	1	0.14
p-Nitrotoluene	10	0.10	1	0.09
Additional Explosive Compounds				
Nitroglycerin	10	0.3	1	0.12
Nitroquanidine	10	0.96	1	0.023
Nitrocellulose	10	0.36	1	0.28
Metals (Target Analyte List) SW 846-6010B/6020 or 7000	**(µg/L)**	**(µg/L)**	**(mg/Kg)**	**(mg/Kg)**
Aluminum	200	28	20	1.1
Antimony	5	2.2	0.5	0.49
Arsenic	5	4.1	0.5	0.3
Barium	200	3	20	0.13
Beryllium	4	0.54	0.5	0.046
Cadmium	5	0.28	0.5	0.04
Calcium	5,000	250	500	37
Chromium	10	1.4	1	0.38
Cobalt	50	1.3	15	0.15
Copper	25	4.2	2.5	0.27
Iron	100	88	10	6.6
Lead	3	2.5	0.3	0249
Magnesium	5,000	30	500	12
Manganese	15	0.9	1.5	0.15
Mercury (CVAA) SW 846-7470A/7471A	0.2	0.13	0.1	0.008
Nickel	40	2.2	4	0.27
Potassium	5,000	41	500	5.1
Selenium	5	4.5	0.5	0319
Silver	10	1.5	1	0152
Sodium	5,000	630	500	50
Thallium	2	5	0.5	0.5
Vanadium	50	0.82	5	0.13
Zinc	20	12	2	1.2

PCB = Polychlorinated biphenyl.
SVOC = Semivolatile organic compound.

- When the analyte sample concentration is determined to be below 5 or 10 times the action level and below the reporting level, the result is considered impacted by the method blank and the value reported is qualified as a non-detect at the reporting level. The result is then qualified as "U" with a reason code of "F01, F06."

No data were rejected as a result of method blank contamination; however, various analytes are qualified as non-detect "U" according to the above reason codes.

Evaluation of overall project sensitivity can be gained through review of field blank information. These actual sample analyses provide a comprehensive look at the combined sampling and analysis sensitivity attained by the project. Field QC blanks obtained during sampling activities included samples of the final equipment decontamination rinse water. Field blanks observed minor amounts of magnesium, calcium, sodium, potassium, 1,3,5-trinitrobenzene, 2,4,6-trinitrotoluene, tetryl, and a few VOCs. However, these observances were not considered detrimental to the solids determination. It can, therefore, be concluded that the procedures and precautions employed were effective in preserving the integrity of the sample analytical sensitivity.

G4.9 REPRESENTATIVENESS AND COMPARABILITY

Representativeness expresses the degree to which data accurately reflect the analyte or parameter of interest for the environmental site and is the qualitative term most concerned with the proper design of the sampling program. Factors that affect the representativeness of analytical data include proper preservation, holding times, use of standard sampling and analytical methods, and determination of matrix or analyte interferences. Only three soil/sediment hexavalent chromium data points were rejected due to exceedance of holding times. Twenty-eight explosives analyses and 34 hexavalent chromium analyses were qualified as estimated or as estimated non-detectable due to extended holding/extraction times. Estimated values qualified as being outside of the holding time were utilized with the requisite precautions in some of the report interpretations. Use of these data might result in some additional uncertainty in specific interpretations where the values were incorporated, but are not believed to have detracted from achieving the overall project DQOs. Sample preservation, analytical methodologies, and sampling methodologies were documented to be adequate and consistently applied. Soil, sediment, and groundwater sampling methods were effectively applied for this study.

Comparability, like representativeness, is a qualitative term relative to a project dataset as an individual. The Phase III RI employed appropriate sampling methodologies, site surveillance, use of standard sampling devices, uniform training, documentation of sampling, standard analytical protocols/procedures, QC checks with standard control limits, and universally accepted data reporting units to ensure comparability to other datasets. Through the proper implementation and documentation of these standard practices, the project has established the confidence that the data will be comparable to other project and programmatic information. Table G-7 presents the standardized parameter groups, analytical methods, sample containers, preservation techniques, and associated holding times.

G4.10 COMPLETENESS

Usable data are defined as those data that pass individual scrutiny during the verification and review process and are accepted for unrestricted application to the human health risk assessment evaluation or equivalent type applications. It has been determined that estimated data are acceptable for RVAAP project objectives.

Objectives for this RVAAP WBG RI have been achieved. The project produced valid results for over 99% of the sample analyses performed.

Table G-7. Container Requirements for Soil and Sediment Samples at Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte Group	Container	Minimum Sample Size	Preservative	Holding Time
VOCs 5030/8260B	One 2-oz glass jar with Teflon®-lined cap (no headspace)	20 g	Cool, 4 °C	14 d
SVOCs 3540/8270C	One 8-oz glass jar with Teflon®-lined cap	60 g	Cool, 4 °C	14 d (extraction) 40 d (analysis)
Pesticide Compounds 3540/8081A	Include in SVOC container	60 g	Cool, 4 °C	14 d (extraction) 40 d (analysis)
PCBs 3540/8082	Include in SVOC container	60 g	Cool, 4 °C	14 d (extraction) 40 d (analysis)
Explosive Compounds 8330	One 4-oz glass jar with Teflon®-lined cap	60 g	Cool, 4 °C	14 d (extraction) 40 d (analysis)
Propellant Compounds 8330, 353.2, and UV-HPLC	One 4-oz glass jar with Teflon®-lined cap	60 g	Cool, 4 °C	14 d (extraction) 40 d (analysis)
Metals 6010B and 7471	One 4-oz glass jar with Teflon®-lined cap	50 g	Cool, 4 °C	180 d; Hg @ 28 d
Cyanide 9012A	Include in metals container	25 g	Cool, 4 °C	14 d
Hexavalent Chromium 7196A	Include in metals container	25 g	Cool, 4 °C	24 h
VOCs 5030/8260B	Three 40-mL glass vials with Teflon®-lined septum (no headspace)	80 mL	HCl to pH <2 Cool, 4 °C	14 d
SVOCs 3520/8270C	Two 1-L amber glass bottle with Teflon®-lined lid	1,000 mL	Cool, 4 °C	7 d (extraction) 40 d (analysis)
Pesticide Compounds 3520/8081A	One 1-L amber glass bottle with Teflon®-lined lid	1,000 mL	Cool, 4 °C	7 d (extraction) 40 d (analysis)
PCBs 3520/8082	One 1-L amber glass bottle with Teflon®-lined lid	1,000 mL	Cool, 4 °C	7 d (extraction) 40 d (analysis)
Explosive Compounds 8330	One 1-L amber glass bottle with Teflon®-lined lid	1,000 mL	Cool, 4 °C	7 d (extraction) 40 d (analysis)
Propellant Compounds 8330, 353.2, and UV-HPLC	One 1-L amber glass bottle with Teflon®-lined lid	1,000 mL	Cool, 4 °C	7 d (extraction) 40 d (analysis)
Metals 6010A and 7470	One 1-L polybottle	500 mL	HNO_3 to pH <2 Cool, 4 °C	180 d; Hg @ 28 d
Cyanide 9012A	500-mL polybottle	500 mL	NaOH to pH >12 Cool, 4 °C	14 d

Table G-7. Container Requirements for Soil and Sediment Samples at Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte Group	Container	Minimum Sample Size	Preservative	Holding Time
Anions (Br, Cl, F, SO4) 300.0	250-mL polybottle	250 mL	Cool, 4 °C	28 d
Nitrate-Nitrite 353.2	250-mL polybottle	100 mL	H_2SO_4 to pH <2 Cool, 4 °C	28 d
TSS/TDS 160.2 and 160.1	500-mL polybottle	100 mL ea.	Cool, 4 °C	28 d

PCB = Polychlorinated biphenyl.
SVOC = Semivolatile organic compound.
TDS = Total dissolved solid.
TSS = Total suspended solid.
VOC = Volatile organic compound.

G5.0 DATA QUALITY ASSESSMENT SUMMARY

The overall quality of WBG Phase III RI data and associated information meets or exceeds the established project objectives. Through proper implementation of the project data verification and assessment process, project information has been determined to be acceptable for use. Data, as presented, have been qualified as usable, estimated when necessary, or rejected as appropriate. Data that have been estimated provide indications of accuracy, precision, or sensitivity being less than desired but adequate for interpretation. Data that are not acceptable for use have been rejected. Qualifiers have been applied to data when necessary.

Data produced for these investigations demonstrate that it can withstand scientific scrutiny, are appropriate for its intended purpose, are technically defensible, and are of known and acceptable sensitivity, precision, and accuracy. Data integrity has been documented through proper implementation of QA and QC measures. The environmental information presented has an established confidence, which allows utilization for the project objectives and provides data for future needs.

G6.0 REFERENCES

USACE (U.S. Army Corps of Engineers) 2000. *Sampling and Analysis Plan Addendum No. 1 for the Winklepeck Burning Grounds Feasibility Study, Ravenna Army Ammunition Plant, Ravenna, Ohio,* DACA62-00-D-0001, DO CY08, October.

USACE 2001. *Facility-wide Sampling and Analysis Plan for the Ravenna Army Ammunition Plant, Ravenna, Ohio,* DACA62-00-D-0001, DO CY02, March.

ATTACHMENT

SAIC QUALIFICATION REASON CODES

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DATA QUALIFICATION REASON CODES

Organic, Inorganic, and Radiological Analytical Data

Holding Times

A01 Extraction holding times were exceeded.
A02 Extraction holding times were grossly exceeded.
A03 Analysis holding times were exceeded.
A04 Analysis holding times were grossly exceeded.
A05 Samples were not preserved properly.
A06 Professional judgment was used to qualify the data.

GC/MS Tuning

B01 Mass calibration was in error, even after applying expanded criteria.
B02 Mass calibration was not performed every 12 h.
B03 Mass calibration did not meet ion-abundance criteria.
B04 Professional judgment was used to qualify the data.

Initial/Continuing Calibration – Organics

C01 Initial calibration RRF was < 0.05.
C02 Initial calibration RDS was > 30%.
C03 Initial calibration sequence was not followed as required.
C04 Continuing calibration RRF was < 0.05.
C05 Continuing calibration %D was > 25%.
C06 Continuing calibration was not performed at the required frequency.
C07 Resolution criteria were not met.
C08 RPD criteria were not met.
C09 RDS criteria were not met.
C10 Retention time of compounds was outside windows.
C11 Compounds were not adequately resolved.
C12 Breakdown of endrin or DDT was > 30%.
C13 Combined breakdown of endrin/DDT was > 30%.
C14 Professional judgment was used to qualify the data.

Initial/Continuing Calibration – Inorganics

D01 ICV or CCV were not performed for every analyte.
D02 ICV recovery was above the upper control limit.
D03 ICV recovery was below the lower control limit.
D04 CCV recovery was above the upper control limit.
D05 CCV recovery was below the lower control limit.
D06 Standard curve was not established with the minimum number of standards.
D07 Instrument was not calibrated daily or each time the instrument was set up.
D08 Correlation coefficient was <0.995.
D09 Mid-range cyanide standard was not distilled.
D10 Professional judgment was used to qualify the data.

ICP and Furnace Requirements

E01 Interference check sample recovery was outside the control limit.
E02 Duplicate injections were outside the control limit.
E03 Post-digestion spike recovery was outside the control limit.
E04 MSA was required but not performed.
E05 MSA correlation coefficient was <0.995.
E06 MSA spikes were not at the correct concentration.
E07 Serial dilution criteria were not met.
E08 Professional judgment was used to qualify the data.

Blanks

F01 Sample data were qualified as a result of the method blank.
F02 Sample data were qualified as a result of the field blank.
F03 Sample data were qualified as a result of the equipment rinsate.
F04 Sample data were qualified as a result of the trip blank.
F05 Gross contamination exists.
F06 Concentration of the contaminant was detected at a level below the CRQL.
F07 Concentration of the contaminant was detected at a level less than the action limit, but greater than the CRQL.
F08 Concentration of the contaminant was detected at a level that exceeds the action level.
F09 No laboratory blanks were analyzed.
F10 Blank had a negative value >2 times the IDL.
F11 Blanks were not analyzed at required frequency.
F12 Professional judgment was used to qualify the data.

Surrogate/Radiological Chemical Recovery

G01 Surrogate/radiological chemical recovery was above the upper control limit.
G02 Surrogate/radiological chemical recovery was below the lower control limit.
G03 Surrogate recovery was <10%.
G04 Surrogate recovery was zero.
G05 Surrogate/radiological chemical recovery data was not present.
G06 Professional judgment was used to qualify the data.
G07 Radiological chemical recovery was <20%.
G08 Radiological chemical recovery was >150%.

Matrix Spike/Matrix Spike Duplicate (MS/MSD)

H01 MS/MSD recovery was above the upper control limit.
H02 MS/MSD recovery was below the lower control limit.
H03 MD/MSD recovery was <10%.
H04 MS/MSD pairs exceed the RPD limit.
H05 No action was taken on MS/MSD limit.
H06 Professional judgment was used to qualify the data.
H07 Radiological MS/MSD recovery was <20%.
H08 Radiological MS/MSD recovery was >160%.
H09 Radiological MS/MSD samples were not analyzed at the required frequency.

Matrix Spike

I01 MS recovery was above the upper control limit.
I02 MS recovery was below the lower control limit.
I03 MS recovery was <30%.
I04 No action was taken on MS data.
I05 Professional judgment was used to qualify the data.

Laboratory Duplicate

J01 Duplicate RPD/radiological DER was outside the control limit.
J02 Duplicate sample results were >5 times the CRDL.
J03 Duplicate sample results were <5 times the CRDL.
J04 Professional judgment was used to qualify the data.
J05 Duplicate was not analyzed at the required frequency.

Internal Area Summary

K01 Area counts were outside the control limits.
K02 Extremely low area counts or performance was exhibited by a major drop off.
K03 IS retention time varied by more than 30 sec.
K04 Professional judgment was used to qualify the data.

Pesticide Cleanup Checks

L01 10% recovery was obtained during either check.
L02 Recoveries during either check were >120%.
L03 GPC cleanup recoveries were outside the control limits.
L04 Florisil cartridge cleanup recoveries were outside the control limits.
L05 Professional judgment was used to qualify the data.

Target Compound Identification

M01 Incorrect identifications were made.
M02 Qualitative criteria were not met.
M03 Cross contamination occurred.
M04 Confirmatory analysis was not performed.
M05 No results were provided.
M06 Analysis occurred outside 12-h GC/MS window.
M07 Professional judgment was used to qualify the data.
M08 The %D between the two pesticide/PCB column checks was >25%.

Compound Quantitation and Reported CRQLs

N01 Quantitation limits were affected by large off-scale peaks.
N02 MDLs reported by the laboratory exceeded corresponding CRQLs.
N03 Professional judgment was used to qualify the data.

Tentatively Identified Compounds (TICs)

O01 Compound was suspected laboratory contaminant and was not detected in the blank.
O02 TIC result was not above 10 times the level found in the blank.
O03 Professional judgment was used to qualify analytical data.

Laboratory Control Samples (LCSs)

P01 LCS recovery was above upper control limit.
P02 LCS recovery was below lower control limit.
P03 LCS recovery was <50%.
P04 No action was taken on the LCS data.
P05 LCS was not analyzed at required frequency.
P06 Radiological LCS recovery was <50% for aqueous samples; <40% for solid samples.
P07 Radiological LCS recovery was >150% for aqueous samples; >160% for solid samples.
P08 Professional judgment was used to qualify the data.

Field Duplicate

Q01 Field duplicate RPDs were >30% for waters and/or >50% for soils.
Q02 Radiological field DER was outside the control limit.
Q03 Duplicate sample results were >5 times the CRDL.
Q04 Duplicate sample results were <5 times the CRDL.

Radiological Calibration

R01 Efficiency calibration criteria were not met.
R02 Energy calibration criteria were not met.
R03 Resolution calibration criteria were not met.
R04 Background determination criteria were not met.
R05 Quench curve criteria were not met.
R06 Absorption curve criteria were not met.
R07 Plateau curve criteria were not met.
R08 Professional judgment was used to qualify the data.

Radiological Calibration Verification

S01 Efficiency verification criteria were not met.
S02 Energy verification criteria were not met.
S03 Resolution verification criteria were not met.
S04 Background verification criteria were not met.
S05 Cross-talk verification criteria were not met.
S06 Professional judgment was used to qualify the data.

APPENDIX H

LABORATORY ANALYTICAL RESULTS

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Appendix H
Laboratory Analytical Results Locator Sheet

Sampling Description	Parameter Group	Table Number	Page Number
Surface Soil	Explosives/Propellants	H-1	H-5
	Inorganics	H-2	H-9
	Semivolatile Organic Constituents	H-3	H-21
	Volatile Organic Compounds	H-4	H-25
	Pesticides/PCBs	H-5	H-27
Subsurface Soil	Explosives/Propellants	H-6	H-29
	Inorganics	H-7	H-34
	Semivolatile Organic Constituents	H-8	H-40
	Volatile Organic Compounds	H-9	H-42
	Pesticides/PCBs	H-10	H-43
Sediment	Explosives/Propellants	H-11	H-44
	Inorganics	H-12	H-45
	Total Organic Carbon	H-13	H-46
	Semivolatile Organic Constituents	H-14	H-47
	Volatile Organic Compounds	H-15	H-49
	Pesticides/PCBs	H-16	H-50
Groundwater	Explosives/Propellants	H-17	H-51
	Inorganics	H-18	H-54
	Semivolatile Organic Constituents	H-19	H-57
	Volatile Organic Compounds	H-20	H-65
	Pesticides/PCBs	H-21	H-69
Quality Control Samples	Inorganics	H-22	H-73
	Explosives/Propellants	H-23	H-74
	Semivolatile Organics	H-24	H-75
	Volatile Organics	H-25	H-77
	Pesticides/PCBs	H-26	H-78

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Table H-1. Winklepeck Burning Grounds
Surface Soil - Explosives and Propellants

Location		Pad 58	Pad 58	Pad 58	Pad 58	Pad 58	Pad 59	Pad 60
Station		WBG-197	WBG-199	WBG-201	WBG-201	WBG-203	WBG-210	WBG-211
Sample ID		WBGss-197-4000-SO	WBGss-199-4006-SO	WBGss-201-4012-SO	WBGss-201-4268-SO	WBGss-203-4018-SO	WBGss-210-4041-SO	WBGss-211-4046-SO
Date		10/17/2000	10/17/2000	10/17/2000	10/17/2000	10/22/2000	10/30/2000	10/18/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Grab	Grab	Grab	Field Duplicate	Grab	Grab	Grab
Analyte	Units							
1,3,5-Trinitrobenzene	mg/kg	0.25 U		0.25 U	0.25 U	0.25 U	0.25 U	6.9 =
1,3-Dinitrobenzene	mg/kg	0.25 U		0.25 U	0.25 U	0.25 U	0.25 U	0.091 J
2,4,6-Trinitrotoluene	mg/kg	0.25 U		0.25 U	0.25 U	0.25 U	0.25 U	680 =
2,4-Dinitrotoluene	mg/kg	0.25 U		0.25 U	0.25 U	0.25 U	0.25 U	1.5 =
2,6-Dinitrotoluene	mg/kg	0.25 U		0.25 U	0.25 U	0.25 U	0.25 U	2.3 U
2-Amino-4,6-dinitrotoluene	mg/kg	0.25 U		0.11 J	0.25 U	0.25 U	0.25 U	14 J
2-Nitrotoluene	mg/kg	0.25 U		0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-Nitrotoluene	mg/kg	0.25 U		0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-Amino-2,6-dinitrotoluene	mg/kg	0.25 U		0.12 J	0.25 U	0.25 U	0.25 U	25 U
4-Nitrotoluene	mg/kg	0.25 U		0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
HMX	mg/kg	0.5 U		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Nitrobenzene	mg/kg	0.25 U		0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Nitrocellulose	mg/kg		2 U		2 UJ			
Nitroglycerin	mg/kg	2.5 U		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Nitroguanidine	mg/kg		0.25 U		0.25 U			
RDX	mg/kg	0.5 U		0.5 U	0.5 U	0.5 U	0.5 U	2.6 =
Tetryl	mg/kg	0.65 U		0.65 U	0.65 U	0.65 U	0.65 U	0.65 U

HMX = Octahydro-1,3,5,7-tetranitro-
1,3,5,7-tetrazocine.
RDX = Hexahydro-1,3,-trinitro-
1,3,5-triazine.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-1. Winklepeck Burning Grounds
Surface Soil - Explosives and Propellants

Location		Pad 60	Pad 60	Pad 61	Pad 37	Pad 38	Pad 45	Pad 45
Station		WBG-212	WBG-212	WBG-222	WBG-227	WBG-232	WBG-234	WBG-236
Sample ID		WBGss-212-4049-SO	WBGss-212-4269-SO	WBGss-222-4079-SO	WBGss-227-4094-SO	WBGss-232-4111-SO	WBGss-234-4119-SO	WBGss-236-4125-SO
Date		10/18/2000	10/18/2000	10/18/2000	10/22/2000	10/22/2000	10/19/2000	10/20/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Grab	Field Duplicate	Grab	Grab	Grab	Grab	Grab
Analyte	Units							
1,3,5-Trinitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,3-Dinitrobenzene	mg/kg	0.25 U	0.25 U	0.036 J	0.25 U	0.25 U	0.25 U	0.25 U
2,4,6-Trinitrotoluene	mg/kg	0.25 U	0.25 U	0.51 =	0.25 U	0.066 J	0.13 J	0.25 U
2,4-Dinitrotoluene	mg/kg	0.25 U	0.25 U	0.063 J	0.25 U	0.15 J	0.25 U	0.25 U
2,6-Dinitrotoluene	mg/kg	0.25 U	0.25 U	0.092 J	0.25 U	0.25 U	0.25 U	0.25 U
2-Amino-4,6-dinitrotoluene	mg/kg	0.25 U	0.25 U	0.37 =	0.25 U	0.25 U	0.25 U	0.25 U
2-Nitrotoluene	mg/kg	0.84 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-Amino-2,6-dinitrotoluene	mg/kg	0.25 U	0.25 U	0.46 =	0.25 U	0.25 U	0.25 U	0.25 U
4-Nitrotoluene	mg/kg	0.41 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
HMX	mg/kg	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Nitrobenzene	mg/kg	0.25 U	0.25 U	0.12 J	0.25 U	0.25 U	0.25 U	0.25 U
Nitrocellulose	mg/kg							2 UJ
Nitroglycerin	mg/kg	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Nitroguanidine	mg/kg							0.091 J
RDX	mg/kg	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetryl	mg/kg	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U

HMX = Octahydro-1,3,5,7-tetranitro-
1,3,5,7-tetrazocine.
RDX = Hexahydro-1,3,-trinitro-
1,3,5-triazine.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-1. Winklepeck Burning Grounds
Surface Soil - Explosives and Propellants

Location		Pad 45	Pad 45	Pad 62	Pad 62	Pad 66	Pad 67	Pad 67
Station		WBG-236	WBG-237	WBG-241	WBG-242	WBG-247	WBG-251	WBG-252
Sample ID		WBGss-236-4270-SO	WBGss-237-4128-SO	WBGss-241-4271-SO	WBGss-242-4145-SO	WBGss-247-4162-SO	WBGss-251-4176-SO	WBGss-252-4179-SO
Date		10/20/2000	10/22/2000	10/21/2000	10/22/2000	10/22/2000	10/23/2000	10/22/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Field Duplicate	Grab	Field Duplicate	Grab	Grab	Grab	Grab
Analyte	**Units**							
1,3,5-Trinitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.37 =		34 =
1,3-Dinitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.037 J		0.056 J
2,4,6-Trinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.28 =	1.5 =		430 =
2,4-Dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.18 J		0.76 U
2,6-Dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U		1.8 U
2-Amino-4,6-dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.099 J	0.97 =		5.7 U
2-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U		0.25 U
3-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U		0.25 U
4-Amino-2,6-dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.17 J	0.93 =		110 U
4-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U		0.25 U
HMX	mg/kg	0.5 U	0.5 U	0.5 U	0.19 J	0.69 =		100 =
Nitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U		0.25 U
Nitrocellulose	mg/kg	2 UJ					2 UJ	
Nitroglycerin	mg/kg	2.5 U	2.5 U	2.5 U	2.5 U	2.7 U		11 U
Nitroguanidine	mg/kg	0.25 U					0.25 U	
RDX	mg/kg	0.5 U	0.5 U	0.5 U	0.5 U	0.61 =		470 =
Tetryl	mg/kg	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U		0.65 U

HMX = Octahydro-1,3,5,7-tetranitro-
1,3,5,7-tetrazocine.
RDX = Hexahydro-1,3,-trinitro-
1,3,5-triazine.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-1. Winklepeck Burning Grounds
Surface Soil - Explosives and Propellants

Location		Pad 68	Pad 68	Pad 68	Building S-4301	Building S-4301	Random Grid
Station		WBG-254	WBG-255	WBG-257	WBG-259	WBG-260	WBG-281
Sample ID		WBGss-254-4187-SO	WBGss-255-4190-SO	WBGss-257-4196-SO	WBGss-259-4204-SO	WBGss-260-4207-SO	WBGss-281-4274-SO
Date		10/16/2000	10/17/2000	10/30/2000	10/23/2000	10/23/2000	10/24/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Grab	Grab	Grab	Grab	Grab	Field Duplicate
Analyte	Units						
1,3,5-Trinitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U			0.25 U
1,3-Dinitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U			0.25 U
2,4,6-Trinitrotoluene	mg/kg	0.16 J	0.98 =	0.069 J			0.25 U
2,4-Dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U			0.25 U
2,6-Dinitrotoluene	mg/kg	0.25 U	0.094 J	0.25 U			0.25 U
2-Amino-4,6-dinitrotoluene	mg/kg	0.25 U	0.22 J	0.25 U			0.25 U
2-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U			0.25 U
3-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U			0.25 U
4-Amino-2,6-dinitrotoluene	mg/kg	0.12 J	0.47 =	0.097 J			0.25 U
4-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U			0.25 U
HMX	mg/kg	0.5 U	0.5 U	0.5 U			0.5 U
Nitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U			0.25 U
Nitrocellulose	mg/kg				2 UJ	2 UJ	
Nitroglycerin	mg/kg	2.5 U	2.5 U	2.5 U			2.5 U
Nitroguanidine	mg/kg				0.25 U	0.25 U	
RDX	mg/kg	0.5 U	0.5 U	0.5 U			0.5 U
Tetryl	mg/kg	0.65 U	0.65 U	0.65 U			0.65 U

HMX = Octahydro-1,3,5,7-tetranitro-
1,3,5,7-tetrazocine.
RDX = Hexahydro-1,3,-trinitro-
1,3,5-triazine.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-2. Winklepeck Burning Grounds
Surface Soil - Inorganics

Location Station Sample ID Date Depth (ft) Field Type		Pad 58 WBG-197 WBGss-197-4000-SO 10/17/2000 0 - 1 Grab	Pad 58 WBG-198 WBGss-198-4003-SO 10/17/2000 0 - 1 Grab	Pad 58 WBG-199 WBGss-199-4006-SO 10/17/2000 0 - 1 Grab	Pad 58 WBG-200 WBGss-200-4009-SO 10/17/2000 0 - 1 Grab	Pad 58 WBG-201 WBGss-201-4012-SO 10/17/2000 0 - 1 Grab	Pad 58 WBG-201 WBGss-201-4268-SO 10/17/2000 0 - 1 Field Duplicate	Pad 58 WBG-202 WBGss-202-4015-SO 10/17/2000 0 - 1 Grab	Pad 58 WBG-203 WBGss-203-4018-SO 10/22/2000 0 - 1 Grab	Pad 59 WBG-204 WBGss-204-4023-SO 10/18/2000 0 - 1 Grab
Analyte	**Units**									
Cyanide	mg/kg									
Chromium, hexavalent	mg/kg	1.2 UJ		2.5 J	4 J			4.7 J	1.2 UJ	7.8 J
Aluminum	mg/kg	15,200 =	10,700 =	16,100 =	13,400 =	10,600 =	13,400 =	13,600 =	12,800 =	14,500 =
Antimony	mg/kg	13 J *	0.7 J	49.8 J *	9.5 J *	1.2 UJ	1.2 UJ	0.75 J	0.74 J	1.7 J *
Arsenic	mg/kg	33.5 = *	7.5 =	13.9 =	14.3 =	10.5 =	13.9 =	10.3 =	11.9 =	12.7 =
Barium	mg/kg	152 = *	53.9 =	386 = *	134 = *	106 = *	116 = *	74.1 =	109 = *	84.7 =
Beryllium	mg/kg	0.75 =	0.27 J	0.48 J	0.42 J	0.42 J	0.48 J	0.44 J	0.71 =	0.6 J
Cadmium	mg/kg	1.2 = *	0.61 U	1.7 = *	0.83 = *	0.11 J *	0.61 U	0.61 U	0.75 = *	0.5 J *
Calcium	mg/kg	14,500 =	509 J	7,410 =	2,700 =	1,720 =	2,600 =	640 =	2,480 =	530 J
Chromium	mg/kg	27.5 = *	12.3 =	47.7 = *	28.3 = *	15.4 =	18.2 = *	16.4 =	19 = *	17.1 J
Cobalt	mg/kg	11.1 = *	6.9 =	13.9 = *	9.8 =	9.2 =	10.4 =	8.8 =	11.4 J *	12.5 = *
Copper	mg/kg	375 = *	13.5 =	469 = *	146 = *	27.8 = *	24.1 = *	17.3 =	28.3 = *	22.6 J *
Iron	mg/kg	30,200 = *	17,600 =	46,400 = *	33,400 = *	24,200 = *	29,400 = *	22,000 =	25,100 = *	26,800 = *
Lead	mg/kg	202 = *	24.7 =	922 = *	256 = *	22.5 =	15.9 =	26.6 = *	16 =	38.2 J *
Magnesium	mg/kg	5,440 = *	1,900 =	3,570 = *	3,010 =	3,180 = *	3,610 = *	2,350 =	3,650 = *	2,000 =
Manganese	mg/kg	816 J	569 J	1,370 J	437 J	371 J	237 J	481 J	366 =	1,630 = *
Mercury	mg/kg	0.35 = *	0.066 J *	0.14 = *	0.12 = *	1 = *	0.72 = *	1.4 = *	0.04 J *	0.072 J *
Nickel	mg/kg	31.1 = *	13.3 =	38.9 = *	29.2 = *	21.5 = *	27 = *	16.6 =	35.9 = *	14.1 =
Potassium	mg/kg	2,130 = *	556 J	1,930 = *	1,570 = *	1,260 = *	1,330 = *	1,510 = *	2,300 = *	1,060 = *
Selenium	mg/kg	2.4 = *	1.4 =	2.1 = *	1.9 = *	1.3 =	1.7 = *	1.4 =	0.58 U	0.61 U
Silver	mg/kg	4.6 = *	0.7 J *	9.5 = *	1.4 = *	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Sodium	mg/kg	168 J *	607 U	494 J *	620 UJ	609 UJ	608 UJ	608 UJ	80.6 U	611 UJ
Thallium	mg/kg	0.59 = *	0.5 J *	0.7 J *	0.63 J *	0.62 J *	0.67 J *	0.56 J *	0.53 J *	0.64 = *
Vanadium	mg/kg	20.9 =	19.1 =	27.2 =	22 =	17.9 =	21 =	22.8 =	21.7 =	30.2 =
Zinc	mg/kg	463 J *	73.2 J *	4,520 J *	608 J *	73.6 J *	79.5 J *	88.1 J *	88.6 J *	101 J *

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-2. Winklepeck Burning Grounds
Surface Soil - Inorganics

Location Station Sample ID Date Depth (ft) Field Type		Pad 59 WBG-205 WBGss-205-4026-SO 10/18/2000 0 - 1 Grab	Pad 59 WBG-206 WBGss-206-4029-SO 10/18/2000 0 - 1 Grab	Pad 59 WBG-207 WBGss-207-4032-SO 10/18/2000 0 - 1 Grab	Pad 59 WBG-208 WBGss-208-4035-SO 10/18/2000 0 - 1 Grab	Pad 59 WBG-209 WBGss-209-4038-SO 10/18/2000 0 - 1 Grab	Pad 59 WBG-210 WBGss-210-4041-SO 10/30/2000 0 - 1 Grab	Pad 59 WBG-210 WBGss-210-4277-SO 10/30/2000 0 - 1 Field Duplicate	Pad 60 WBG-211 WBGss-211-4046-SO 10/18/2000 0 - 1 Grab	Pad 60 WBG-212 WBGss-212-4049-SO 10/18/2000 0 - 1 Grab
Analyte	**Units**									
Cyanide	mg/kg									
Chromium, hexavalent	mg/kg	3.8 J	1.2 UJ	10.1 J						1.2 UJ
Aluminum	mg/kg	10,000 =	16,000 =	16,400 =	12,700 =	14,100 =	13,500 =	14,000 =	19,300 = *	8,830 =
Antimony	mg/kg	1.2 UJ	6 J *	157 J *	1.9 J *	4.9 J *	4 J *	6.4 J *	236 J *	1.3 J *
Arsenic	mg/kg	14.8 =	11.4 =	15.1 =	9.6 =	11.7 =	16.3 = *	12.6 =	24.9 = *	8.8 =
Barium	mg/kg	67.7 =	57.2 =	629 = *	113 = *	110 = *	53.7 =	58.1 =	1,450 = *	95.1 = *
Beryllium	mg/kg	0.52 J	0.42 J	0.28 J	0.35 J	0.37 J	0.44 J	0.42 J	0.65 U	0.32 J
Cadmium	mg/kg	0.55 J *	0.22 J *	7.5 = *	0.7 = *	1.4 = *	0.2 J *	0.27 J *	24.9 = *	2.9 = *
Calcium	mg/kg	2,510 J	1,060 J	9,190 J	2,100 J	2,500 J	866 J	989 J	9,120 J	1,780 J
Chromium	mg/kg	15.1 J	19.3 J *	50.6 J *	18.9 J *	25.7 J *	17.4 J	18.1 J *	69.5 J *	12.9 J
Cobalt	mg/kg	7.9 =	10.8 = *	10.8 = *	8.9 =	9 =	10.1 =	10 =	15.7 = *	8.9 =
Copper	mg/kg	31.6 J *	41.9 J *	344 J *	68.7 J *	177 J *	52.4 J *	62.6 J *	1,830 J *	52.5 J *
Iron	mg/kg	23,900 = *	25,400 = *	57,100 = *	22,300 =	37,400 = *	25,900 = *	24,600 = *	90,700 = *	18,700 =
Lead	mg/kg	38.9 J *	71.8 J *	835 J *	92 J *	127 J *	41.7 = *	51.8 = *	936 J *	84.1 J *
Magnesium	mg/kg	2,180 =	2,930 =	4,110 = *	2,270 =	2,620 =	2,450 J	2,490 J	3,500 = *	1,850 =
Manganese	mg/kg	241 =	393 =	776 =	508 =	298 =	310 J	415 J	857 =	579 =
Mercury	mg/kg	0.11 J *	0.055 J *	0.098 J *	0.28 = *	0.08 J *	0.036 J	0.043 J *	0.3 = *	0.059 J *
Nickel	mg/kg	21.4 = *	21.6 = *	50.7 = *	19.2 =	28.1 = *	25.2 J *	21 J	66 = *	15.3 =
Potassium	mg/kg	1,160 = *	1,650 = *	2,040 = *	1,040 = *	1,400 = *	1,040 J *	1,160 J *	2,190 = *	731 =
Selenium	mg/kg	0.62 U	0.59 U	0.64 U	0.62 U	0.67 U	0.98 =	0.88 =	1.3 U	0.6 U
Silver	mg/kg	1.2 U	0.22 J *	22.5 = *	0.32 J *	0.43 J *	1.2 U	1.2 U	26.7 = *	0.85 J *
Sodium	mg/kg	615 UJ	110 J	638 J *	158 J *	98.9 J	587 U	70.6 J	1,120 J *	62.2 J
Thallium	mg/kg	0.62 = *	0.48 J *	0.52 J *	0.58 J *	0.71 = *	0.35 J *	0.53 J *	0.68 = *	0.53 J *
Vanadium	mg/kg	16.3 =	26.7 =	28.3 =	21.5 =	35.6 = *	23.6 J	25.6 J	37.8 = *	16.5 =
Zinc	mg/kg	120 J *	93.7 J *	3,330 J *	325 J *	556 J *	176 J *	165 J *	2,600 J *	171 J *

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-2. Winklepeck Burning Grounds
Surface Soil - Inorganics

Location		Pad 60	Pad 60	Pad 60	Pad 60	Pad 60	Pad 60	Pad 61	Pad 61	Pad 61
Station		WBG-212	WBG-213	WBG-214	WBG-215	WBG-216	WBG-217	WBG-218	WBG-219	WBG-220
Sample ID		WBGss-212-4269-SO	WBGss-213-4052-SO	WBGss-214-4055-SO	WBGss-215-4058-SO	WBGss-216-4061-SO	WBGss-217-4064-SO	WBGss-218-4067-SO	WBGss-219-4070-SO	WBGss-220-4073-SO
Date		10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/18/2000	10/19/2000	10/19/2000	10/18/2000	10/19/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Field Duplicate	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	**Units**									
Cyanide	mg/kg							0.88 J *		
Chromium, hexavalent	mg/kg	7.4 J	1.3 UJ	1.3 UJ			12.2 J	11.8 J		1.3 UJ
Aluminum	mg/kg	9,560 =	13,100 =	16,500 =	16,000 =	14,600 =	9,510 J	16,500 J	16,400 =	8,990 J
Antimony	mg/kg	1.6 J *	3 J *	1.3 UJ	4.9 J *	3.1 J *	9.9 J *	7.9 J *	17.6 J *	12.4 J *
Arsenic	mg/kg	8.7 =	15.8 = *	7.2 =	17.1 = *	11.7 =	18 = *	14.5 =	16.2 = *	11.8 =
Barium	mg/kg	108 = *	128 = *	59.9 =	165 = *	131 = *	232 = *	511 = *	476 = *	299 = *
Beryllium	mg/kg	0.35 J	0.32 J	0.3 J	0.51 J	0.48 J	0.5 J	0.49 J	0.35 J	0.39 J
Cadmium	mg/kg	3.4 = *	2.9 = *	0.22 J *	1.5 = *	1 = *	4.1 = *	2.4 = *	2.8 = *	3.2 = *
Calcium	mg/kg	1,910 J	2,370 J	988 J	2,450 J	1,480 J	6,920 =	9,680 =	6,720 J	12,300 =
Chromium	mg/kg	14.3 J	22.8 J *	20.3 J *	26.7 J *	24.2 J *	37.2 = *	41 = *	61.3 J *	26.1 = *
Cobalt	mg/kg	9.2 =	8.4 =	6.3 J	10.2 =	11.7 = *	8.1 =	13.8 = *	13.8 = *	8.7 =
Copper	mg/kg	82 J *	479 J *	22 J *	112 J *	39.7 J *	292 = *	280 = *	280 J *	96.4 = *
Iron	mg/kg	19,600 =	31,100 = *	21,800 =	40,900 = *	25,800 = *	36,700 = *	58,900 = *	69,900 = *	31,400 = *
Lead	mg/kg	123 J *	176 J *	20.3 J	281 J *	203 J *	328 = *	497 = *	754 J *	206 = *
Magnesium	mg/kg	1,950 =	2,830 =	2,510 =	35,30 = *	2,080 =	2,250 =	3,550 = *	3,000 =	3,560 = *
Manganese	mg/kg	594 =	278 =	134 =	333 =	1,480 = *	609 J	954 J	708 =	494 J
Mercury	mg/kg	0.095 J *	0.052 J *	0.065 J *	0.11 J *	0.084 J *	0.058 J *	0.046 J *	0.089 J *	0.029 J
Nickel	mg/kg	16.3 =	23.3 = *	16.8 =	28.6 = *	15.5 =	29.2 = *	57 = *	50.1 = *	26.7 = *
Potassium	mg/kg	786 =	1,490 = *	1390 = *	1,760 = *	1,400 = *	1,220 = *	2,280 = *	1,790 = *	1,660 = *
Selenium	mg/kg	0.61 U	0.63 U	0.66 U	0.66 U	0.59 U	2.4 = *	2.7 = *	0.63 U	1.7 = *
Silver	mg/kg	1.1 J *	2.5 = *	1.3 U	0.56 J *	0.26 J *	0.96 J *	1.5 = *	3.2 = *	0.71 J *
Sodium	mg/kg	88.6 J	110 J	662 UJ	104 J	593 UJ	146 J *	335 J *	518 J *	142 J *
Thallium	mg/kg	0.58 J *	0.68 = *	0.64 J *	0.68 = *	0.63 = *	0.62 J *	0.8 J *	0.52 J *	0.58 J *
Vanadium	mg/kg	17.8 =	23.9 =	28.5 =	26.4 =	28.9 =	16.9 =	28.6 =	31.3 = *	15.8 =
Zinc	mg/kg	239 J *	353 J *	79.4 J *	420 J *	330 J *	885 = *	1,170 = *	1,240 J *	557 = *

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-2. Winklepeck Burning Grounds
Surface Soil - Inorganics

Location Station Sample ID Date Depth (ft) Field Type		Pad 61 WBG-221 WBGss-221-4076-SO 10/19/2000 0 - 1 Grab	Pad 61 WBG-222 WBGss-222-4079-SO 10/18/2000 0 - 1 Grab	Pad 37 WBG-223 WBGss-223-4082-SO 10/20/2000 0 - 1 Grab	Pad 37 WBG-224 WBGss-224-4085-SO 10/20/2000 0 - 1 Grab	Pad 37 WBG-225 WBGss-225-4088-SO 10/20/2000 0 - 1 Grab	Pad 37 WBG-226 WBGss-226-4091-SO 10/20/2000 0 - 1 Grab	Pad 37 WBG-227 WBGss-227-4094-SO 10/22/2000 0 - 1 Grab	Pad 38 WBG-229 WBGss-229-4102-SO 10/21/2000 0 - 1 Grab	Pad 38 WBG-230 WBGss-230-4105-SO 10/20/2000 0 - 1 Grab
Analyte	**Units**									
Cyanide	mg/kg					0.66 U				
Chromium, hexavalent	mg/kg	7.4 J		1.2 UJ	1.3 UJ	2 J	8.8 J		1.3 UJ	2.9 J
Aluminum	mg/kg	16,400 J	14,300 =	17,700 J	12,300 J	9,750 J	17,100 J	16,800 J	11,300 J	15,200 J
Antimony	mg/kg	1.2 J *	0.89 J	1.2 UJ	0.69 J	1.3 UJ	2.8 J *	0.93 J	0.65 J	1.3 UJ
Arsenic	mg/kg	13.9 =	11.3 =	10.3 =	13.2 =	9.4 =	25.6 = *	13 =	16.1 = *	13.7 =
Barium	mg/kg	130 = *	69.7 =	267 J *	71.8 J	72.3 J	101 J *	96.7 J *	54.8 J	63 J
Beryllium	mg/kg	0.47 J	0.51 J	1.8 = *	0.55 J	0.44 J	0.41 J	0.49 J	0.26 J	0.5 J
Cadmium	mg/kg	0.27 J *	0.27 J *	6.9 J *	0.29 J *	0.073 J *	0.74 J *	0.17 J *	0.5 J *	0.64 UJ
Calcium	mg/kg	7,460 =	2,420 J	39,000 J *	2,060 J	637 J	5,830 J	11,000 J	637 UJ	1,050 J
Chromium	mg/kg	20.8 = *	24.6 J *	30.2 J *	15.6 J	12.1 J	30.8 J *	21.9 J *	13.9 J	18.7 J *
Cobalt	mg/kg	7.5 =	7.5 =	6.9 =	11.5 = *	7.7 =	8.8 =	10 =	7.3 =	9.4 =
Copper	mg/kg	25.1 = *	27.6 J *	16.2 =	14.7 =	7.8 =	39.7 = *	19.9 = *	11.1 =	17.9 = *
Iron	mg/kg	28,900 = *	25,200 = *	20,000 =	27,900 = *	19,800 =	30,600 = *	26,700 = *	19,200 =	28,600 = *
Lead	mg/kg	60.9 = *	30.7 J *	28.4 = *	29.8 = *	18.7 =	452 = *	44.9 = *	16.9 =	18.5 =
Magnesium	mg/kg	3,990 = *	2,590 =	10,000 J *	2,060 J	1,520 J	3,410 J *	2,980 J	2,040 J	2,520 J
Manganese	mg/kg	606 J	187 =	1,020 =	1,140 =	705 J	485 =	823 =	363 =	507 =
Mercury	mg/kg	0.037 J *	0.058 J *	0.017 J	0.041 J *	0.046 J *	0.037 J *	0.043 J *	0.038 J *	0.027 J
Nickel	mg/kg	19.6 =	20.4 =	12 =	15 =	11.2 =	22.2 = *	18 =	13.7 =	15.8 =
Potassium	mg/kg	1,890 = *	1,390 = *	1,580 = *	927 =	606 =	2,230 = *	1,780 = *	812 =	1,150 = *
Selenium	mg/kg	1.5 = *	0.64 U	1.4 =	1.3 =	1.2 =	1.2 =	0.97 =	0.98 =	1.1 =
Silver	mg/kg	1.3 U	1.3 U	0.51 J *	1.3 U	1.3 U	1.2 U	1.3 U	1.3 U	1.3 U
Sodium	mg/kg	68.7 J	66.3 J	366 U	647 U	67.7 U	91.6 U	104 U	637 U	78.3 U
Thallium	mg/kg	0.61 J *	0.66 = *	0.26 J *	0.38 J *	0.49 J *	0.46 J *	0.47 J *	0.34 J *	0.37 J *
Vanadium	mg/kg	26.2 =	24.6 =	24 =	26.3 =	20.3 =	31 =	30.9 =	20.2 =	29.6 =
Zinc	mg/kg	127 = *	89.7 J *	128 J *	86.4 J *	51.9 J	221 J *	102 J *	58 J	66.4 J *

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-2. Winklepeck Burning Grounds
Surface Soil - Inorganics

Location Station Sample ID Date Depth (ft) Field Type		Pad 38 WBG-231 WBGss-231-4108-SO 10/21/2000 0 - 1 Grab	Pad 38 WBG-232 WBGss-232-4111-SO 10/22/2000 0 - 1 Grab	Pad 45 WBG-233 WBGss-233-4116-SO 10/20/2000 0 - 1 Grab	Pad 45 WBG-234 WBGss-234-4119-SO 10/19/2000 0 - 1 Grab	Pad 45 WBG-235 WBGss-235-4122-SO 10/19/2000 0 - 1 Grab	Pad 45 WBG-236 WBGss-236-4125-SO 10/20/2000 0 - 1 Grab	Pad 45 WBG-236 WBGss-236-4270-SO 10/20/2000 0 - 1 Field Duplicate	Pad 45 WBG-237 WBGss-237-4128-SO 10/22/2000 0 - 1 Grab	Pad 62 WBG-238 WBGss-238-4133-SO 10/21/2000 0 - 1 Grab
Analyte	**Units**									
Cyanide	mg/kg	0.66 U					0.6 U	0.62 U		
Chromium, hexavalent	mg/kg	1.3 UJ	5.8 J	1.2 UJ	1.2 UJ	1.2 UJ	5.2 J	1.5 J	3.5 J	1.3 UJ
Aluminum	mg/kg	13,300 J	11,500 =	13,400 J	15,100 =	15,100 =		13,900 J	12,100 J	14,300 J
Antimony	mg/kg	2.2 J *	1.2 UJ	0.76 J	1.2 UJ	0.85 J	1.2 UJ	1.2 UJ	1.7 J *	0.96 J
Arsenic	mg/kg	17.8 = *	12.6 =	10 =	8.6 =	8.1 =	10.6 =	13.5 =	11.3 =	13.6 =
Barium	mg/kg	203 J *	112 = *	46.2 =	140 = *	90.8 = *		71.1 =	71.5 =	98.1 J *
Beryllium	mg/kg	0.31 J	0.67 =	0.23 U	1.7 = *	1.1 = *		0.6 J	0.49 J	0.5 J
Cadmium	mg/kg	43.6 J *	31.6 = *	0.61 U	3.5 = *	2.8 = *		0.62 U	0.62 U	0.35 J *
Calcium	mg/kg	3,810 J	17,000 = *	909 =	54,500 J *	34,200 J *		1,130 =	1,060 J	1,080 J
Chromium	mg/kg	26.3 J *	14.4 =	16.8 =	10.1 J	10.6 J		18.1 = *	16 =	18.1 J *
Cobalt	mg/kg	10.1 =	7.9 J	6.5 =	4.6 J	4.4 J		11.2 = *	10.3 =	15.7 = *
Copper	mg/kg	29.7 = *	18.9 = *	13.3 =	416 J *	219 J *		26.7 = *	17.6 =	12.6 =
Iron	mg/kg	28,700 = *	21,900 =	23,800 = *	12,800 =	14,100 =		28,900 = *	23,400 = *	26,300 = *
Lead	mg/kg	223 = *	37.4 = *	15.4 =	81.9 J *	98.8 J *	18.5 =	23.4 =	28.9 = *	34.3 = *
Magnesium	mg/kg	2,650 J	4,000 = *	2,810 =	8,630 = *	5,890 = *		3,310 = *	2,680 J	2,210 J
Manganese	mg/kg	467 =	829 =	211 J	1,320 =	587 =		411 J	593 =	2,100 = *
Mercury	mg/kg	0.023 J	0.027 J	0.019 J	0.041 J *	0.041 J *	0.021 J	0.024 J	0.033 J	0.054 J *
Nickel	mg/kg	22.1 = *	18.3 =	16.6 =	7 =	11.5 =		25.9 = *	19.2 =	16.5 =
Potassium	mg/kg	951 = *	928 = *	1,130 = *	914 =	1,140 = *		1,730 = *	1,170 = *	1,070 = *
Selenium	mg/kg	2.5 = *	0.58 U	1.4 =	0.58 U	0.61 U	1.2 =	1.8 = *	1.2 U	1.2 =
Silver	mg/kg	1.3 U	1.2 U	1.2 U	1.2 U	0.2 J *		1.2 U	1.2 U	1.3 U
Sodium	mg/kg	127 U	184 U	613 U	548 J *	242 J *		616 U	621 U	652 U
Thallium	mg/kg	0.43 J *	0.43 J *	0.66 J *	0.36 J *	0.4 J *	0.56 J *	0.71 J *	0.62 J *	0.47 J *
Vanadium	mg/kg	25.6 =	16.3 =	23.1 =	11.6 =	12.7 =		23.3 =	21.3 =	30.8 =
Zinc	mg/kg	287 J *	73.1 J *	62.2 = *	360 J *	538 J *		110 = *	83.3 = *	75.1 J *

Qualifiers:
= - detected.
J - estimated.
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U - not detected.
* - exceeds site-wide background criteria.

Table H-2. Winklepeck Burning Grounds
Surface Soil - Inorganics

Location		Pad 62	Pad 62	Pad 62	Pad 62	Pad 62	Pad 66	Pad 66	Pad 66	Pad 66
Station		WBG-239	WBG-240	WBG-241	WBG-241	WBG-242	WBG-243	WBG-245	WBG-246	WBG-247
Sample ID		WBGss-239-4136-SO	WBGss-240-4139-SO	WBGss-241-4142-SO	WBGss-241-4271-SO	WBGss-242-4145-SO	WBGss-243-4150-SO	WBGss-245-4156-SO	WBGss-246-4159-SO	WBGss-247-4162-SO
Date		10/21/2000	10/21/2000	10/21/2000	10/21/2000	10/22/2000	10/21/2000	10/23/2000	10/23/2000	10/22/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Grab	Grab	Grab	Field Duplicate	Grab	Grab	Grab	Grab	Grab
Analyte	**Units**									
Cyanide	mg/kg							0.62 UJ		
Chromium, hexavalent	mg/kg	1.2 UJ	1.2 UJ	1.2 UJ	2.7 J		1.2 UJ	1.2 R	1.2 R	
Aluminum	mg/kg	15,100 J	16,200 J	12,600 J	11,600 J	15,300 J	16,300 J	15,800 =	18,100 = *	13,900 =
Antimony	mg/kg	1.5 J *	1.9 J *	1.2 UJ	1.2 UJ	1.1 J *	3.4 J *	1.8 J *	6.3 J *	45.1 J *
Arsenic	mg/kg	14.7 =	12.6 =	16.4 = *	16.5 = *	13 =	14.5 =	17.9 = *	13.6 =	13 =
Barium	mg/kg	48.2 J	332 J *	39.9 J	36.9 J	125 = *	331 J *	3,500 = *	7,160 = *	1,320 = *
Beryllium	mg/kg	0.31 J	0.44 J	0.44 J	0.41 J	0.6 J	0.32 J	0.62 =	0.49 J	0.46 J
Cadmium	mg/kg	0.62 UJ	7.6 J *	0.6 UJ	0.59 UJ	1.7 = *	0.087 J *	1.5 = *	15.7 = *	8.3 = *
Calcium	mg/kg	395 UJ	7,980 J	596 UJ	592 UJ	3,470 J	1,870 J	2,130 =	2,540 =	3,350 =
Chromium	mg/kg	21 J *	25 J *	16.5 J	15.5 J	19.3 = *	20.6 J *	18.9 J *	18.5 J *	24 = *
Cobalt	mg/kg	5.7 J	9.6 =	11.6 = *	9.2 =	12.5 = *	9.4 =	12.6 = *	1.6 J	6.4 J
Copper	mg/kg	17 =	97.7 = *	23.7 = *	22.5 = *	26.5 = *	52 = *	137 = *	926 = *	876 = *
Iron	mg/kg	32,500 = *	30,100 = *	28,800 = *	26,800 = *	28,500 = *	29,900 = *	29,900 = *	25,200 = *	23,400 = *
Lead	mg/kg	13.6 =	107 = *	15.4 =	14.8 =	72.2 = *	52.4 = *	37 J *	208 J *	336 = *
Magnesium	mg/kg	2790 J	3,650 J *	2,540 J	2440 J	2,710 J	2,590 J	2,580 =	3,190 = *	2,200 =
Manganese	mg/kg	179 =	607 =	294 =	224 =	1,190 =	429 =	1,800 J *	953 J	635 =
Mercury	mg/kg	0.024 J	0.015 J	0.018 J	0.019 J	0.045 J *	0.064 J *	0.14 = *	0.53 = *	0.12 J *
Nickel	mg/kg	16.1 =	24.7 = *	19.4 =	18.8 =	18.1 =	15.2 =	19.9 =	18.3 =	17.3 =
Potassium	mg/kg	1,540 = *	1,720 = *	1,480 = *	1,210 = *	1,320 = *	1,230 = *	1,510 = *	1,630 = *	1,980 = *
Selenium	mg/kg	0.84 =	1.1 =	1.1 =	1.1 =	0.86 U	1.8 = *	1.3 =	1.1 =	0.73 U
Silver	mg/kg	1.2 U	0.26 J *	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	0.21 J *
Sodium	mg/kg	616 U	187 U	596 U	592 U	77.7 U	79.7 U	84.3 J	161 J *	256 U
Thallium	mg/kg	0.42 J *	0.38 J *	0.35 J *	0.41 J *	0.57 J *	0.41 J *	0.71 J *	0.67 J *	0.55 J *
Vanadium	mg/kg	29 =	30.9 =	20.8 =	19.4 =	30.2 =	33.1 = *	28.9 =	21.3 =	22.6 =
Zinc	mg/kg	47.1 J	877 J *	63.2 J *	59.6 J	173 = *	175 J *	303 J *	1,590 J *	1,410 J *

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-2. Winklepeck Burning Grounds
Surface Soil - Inorganics

Location Station Sample ID Date Depth (ft) Field Type		Pad 67 WBG-249 WBGss-249-4170-SO 10/23/2000 0 - 1 Grab	Pad 67 WBG-250 WBGss-250-4173-SO 10/23/2000 0 - 1 Grab	Pad 67 WBG-251 WBGss-251-4176-SO 10/23/2000 0 - 1 Grab	Pad 67 WBG-252 WBGss-252-4179-SO 10/22/2000 0 - 1 Grab	Pad 68 WBG-253 WBGss-253-4184-SO 10/17/2000 0 - 1 Grab	Pad 68 WBG-254 WBGss-254-4187-SO 10/16/2000 0 - 1 Grab	Pad 68 WBG-255 WBGss-255-4190-SO 10/17/2000 0 - 1 Grab	Pad 68 WBG-256 WBGss-256-4193-SO 10/17/2000 0 - 1 Grab	Pad 68 WBG-257 WBGss-257-4196-SO 10/30/2000 0 - 1 Grab
Analyte	**Units**									
Cyanide	mg/kg			0.65 UJ						
Chromium, hexavalent	mg/kg	6.3 J	4.9 J	1.3 UJ		1.2 UJ	1.2 UJ	1.2 UJ	2.8 J	
Aluminum	mg/kg	9,460 =	14,700 =	14,700 =	7,700 J	12,100 =	9,960 =	10,200 =	11,600 =	10,100 =
Antimony	mg/kg	1.7 J *	2.1 J *	0.67 J	14.6 J *	1.4 J *	3.1 J *	8.3 J *	0.72 J	6.1 J *
Arsenic	mg/kg	10.6 =	14.5 =	14.2 =	10.2 =	8.5 =	7.9 =	9.1 =	8.6 =	9.2 =
Barium	mg/kg	1,400 = *	2,190 = *	180 = *	783 = *	380 = *	2,170 = *	1,870 = *	2,490 = *	1,080 = *
Beryllium	mg/kg	0.28 J	0.57 J	0.69 =	0.46 J	0.25 J	0.35 J	0.27 J	0.31 J	0.34 U
Cadmium	mg/kg	10 = *	0.94 = *	0.077 J *	0.86 = *	0.1 J *	1.1 = *	0.57 J *	0.28 J *	1.1 = *
Calcium	mg/kg	713 =	1,490 =	1,980 =	11,700 J	1,530 =	6,100 =	1,760 =	854 =	2,230 J
Chromium	mg/kg	11.1 J	25.1 J *	19.4 J *	16.3 =	13.8 =	15.3 =	12.1 =	12.5 =	19.8 J *
Cobalt	mg/kg	5 J	7.7 =	18.2 = *	7 =	6.4 =	3.1 J	3.2 J	3.1 J	5.8 =
Copper	mg/kg	94 = *	161 = *	16.5 =	168 = *	50.9 = *	57.6 = *	675 = *	19.4 = *	252 J *
Iron	mg/kg	18,300 =	29,400 = *	26,000 = *	20,700 =	18,000 =	18,200 =	18,600 =	17,600 =	19,500 =
Lead	mg/kg	37.7 J *	36.4 J *	31.1 J *	147 = *	25.5 =	97.2 = *	88.7 = *	29.1 = *	150 = *
Magnesium	mg/kg	2,000 =	2,480 =	2,150 =	2,750 =	2,040 =	2,330 =	1,600 =	2,120 =	1,830 J
Manganese	mg/kg	279 J	817 J	2,020 J *	762 =	310 J	479 J	327 J	439 J	379 J
Mercury	mg/kg	0.084 J *	0.16 = *	0.051 J *	0.038 J *	0.063 J *	0.1 J *	0.12 = *	0.044 J *	0.094 J *
Nickel	mg/kg	13.8 =	33.1 = *	17.6 =	12.7 =	14.2 =	12.4 =	12.3 =	12.4 =	14.3 J
Potassium	mg/kg	759 =	1,340 = *	1,130 = *	944 = *	795 =	553 J	545 J	661 =	579 J
Selenium	mg/kg	0.98 =	1.4 =	0.78 =	1 U	1.3 =	1.3 =	1.6 = *	1.1 =	0.76 =
Silver	mg/kg	1.1 U	1.2 U	1.3 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Sodium	mg/kg	73.8 J	83.4 J	646 U	236 U	593 UJ	595 UJ	74.7 J	610 UJ	62.6 J
Thallium	mg/kg	0.48 J *	0.66 J *	0.7 = *	0.57 J *	0.51 J *	0.51 J *	0.49 J *	0.46 J *	0.42 J *
Vanadium	mg/kg	17.6 =	25.2 =	31.5 = *	14.7 =	20.6 =	14.4 =	15.3 =	18.1 =	17.7 J
Zinc	mg/kg	296 J *	244 J *	76.5 J *	209 = *	84.3 J *	327 J *	537 J *	120 J *	261 J *

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-2. Winklepeck Burning Grounds
Surface Soil - Inorganics

Location Station Sample ID Date Depth (ft) Field Type		Pad 68 WBG-257 WBGss-257-4275-SO 10/30/2000 0 - 1 Field Duplicate	Pad 32 WBG-258 WBGss-258-4201-SO 11/01/2000 0 - 1 Grab	Building S-4301 WBG-259 WBGss-259-4204-SO 10/23/2000 0 - 1 Grab	Building S-4301 WBG-260 WBGss-260-4207-SO 10/23/2000 0 - 1 Grab	Building S-4301 WBG-261 WBGss-261-4210-SO 10/23/2000 0 - 1 Grab	Pad 32 WBG-262 WBGss-262-4213-SO 11/01/2000 0 - 1 Grab	Pad 58 WBG-263 WBGss-263-4216-SO 11/01/2000 0 - 1 Grab	Random Grid WBG-264 WBGss-264-4219-SO 10/30/2000 0 - 1 Grab
Analyte	**Units**								
Cyanide	mg/kg					1.8 J *			
Chromium, hexavalent	mg/kg		1.2 UJ		1.1 UJ				
Aluminum	mg/kg	10,300 =	13,700 =	4,790 =	13,300 =	10,500 =	14,300 J	9,840 =	13,500 =
Antimony	mg/kg	2.9 J *	0.91 J	5.8 J *	17.5 J *	21 J *	1.2 UJ	0.98 J *	1.3 UJ
Arsenic	mg/kg	9.4 =	12.5 =	20.1 = *	8.6 =	10.5 =	10.3 J	15 =	12.8 =
Barium	mg/kg	336 = *	95.6 = *	58.3 =	207 = *	192 = *	85.3 =	64.5 =	129 = *
Beryllium	mg/kg	0.32 U	0.59 J	0.36 J	1.4 = *	1.1 = *	0.55 J	0.47 J	0.65 =
Cadmium	mg/kg	0.44 J *	0.74 = *	0.58 = *	1.2 = *	2.6 = *	0.6 U	0.48 J *	0.21 J *
Calcium	mg/kg	1,200 J	4,450 =	13,100 =	75,500 = *	50,100 = *	32,500 J *	2,950 =	226 UJ
Chromium	mg/kg	14.3 J	18.8 = *	12.2 J	24.4 J *	29.1 J *	21.5 = *	14.8 =	17.1 J
Cobalt	mg/kg	6.9 =	11.1 = *	3.1 J	4.7 J	4.3 J	11.4 J *	8 =	12.6 = *
Copper	mg/kg	27.1 J *	28.9 = *	79.1 = *	184 = *	106 = *	21.4 J *	27.2 = *	11 J
Iron	mg/kg	18,300 =	26,200 = *	18,000 =	15,700 =	20,100 =	25,500 = *	26,500 = *	26,100 = *
Lead	mg/kg	47.1 = *	19 =	64.7 J *	88.3 J *	125 J *	12.7 =	28.7 = *	23.6 =
Magnesium	mg/kg	1,740 J	3,530 = *	1,770 =	9,980 = *	5,950 = *	7,610 = *	1,980 =	1,930 J
Manganese	mg/kg	505 J	513 =	440 J	2,240 J *	1,630 J *	362 =	457 =	1,640 J *
Mercury	mg/kg	0.056 J *	0.03 J	0.11 U	0.016 J	0.12 U	0.021 J	0.062 J *	0.047 J *
Nickel	mg/kg	14 J	26.1 = *	7.8 =	9.9 =	11.6 =	29.7 J *	17.9 =	14.4 J
Potassium	mg/kg	649 J	1,750 = *	813 =	890 =	958 = *	3,090 = *	862 =	1,010 J *
Selenium	mg/kg	0.81 =	0.63 =	0.68 =	0.7 =	1.1 =	0.6 U	1.2 =	0.9 =
Silver	mg/kg	1.2 U	1.2 U	1.1 U	1.1 U	1.2 U	1.2 U	1.3 U	1.3 U
Sodium	mg/kg	582 U	620 U	122 J	331 J *	253 J *	85.2 J	626 U	641 U
Thallium	mg/kg	0.38 J *	0.58 J *	0.57 J *	0.52 J *	0.66 = *	0.31 J *	0.8 J *	0.37 J *
Vanadium	mg/kg	21.3 J	23.8 =	8.3 =	9.5 =	7.1 =	25.3 =	19.6 =	30.5 J
Zinc	mg/kg	92 J *	79.2 = *	89.5 J *	163 J *	140 J *	63.2 J *	64 = *	66.5 J *

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-2. Winklepeck Burning Grounds
Surface Soil - Inorganics

Location		Random Grid	Random Grid	Random Grid	Random Grid	Random Grid	Random Grid	Random Grid	Random Grid	Random Grid
Station		WBG-265	WBG-266	WBG-266	WBG-267	WBG-268	WBG-268	WBG-269	WBG-270	WBG-271
Sample ID		WBGss-265-4220-SO	WBGss-266-4221-SO	WBGss-266-4279-SO	WBGss-267-4222-SO	WBGss-268-4223-SO	WBGss-268-4281-SO	WBGss-269-4224-SO	WBGss-270-4225-SO	WBGss-271-4226-SO
Date		10/30/2000	10/30/2000	10/30/2000	10/24/2000	11/01/2000	11/01/2000	10/24/2000	11/01/2000	11/01/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Grab	Grab	Field Duplicate	Grab	Grab	Field Duplicate	Grab	Grab	Grab
Analyte	**Units**									
Cyanide	mg/kg									
Chromium, hexavalent	mg/kg									
Aluminum	mg/kg	11,700 =	13,800 =	12,500 =	14,300 =	16,600 J	14,600 J	12,900 =	10,900 J	11,400 J
Antimony	mg/kg	1.2 UJ	1.3 UJ	1.3 UJ	7.1 J *	1.4 UJ	1.3 UJ	1.3 UJ	1.3 UJ	1.3 UJ
Arsenic	mg/kg	9.7 =	11.1 =	13.1 =	9.6 =	13.7 J	13.8 J	9.7 =	9.7 J	9.6 J
Barium	mg/kg	57 =	84.5 =	77.3 =	72.9 =	100 = *	96.1 = *	67.5 =	139 = *	500 = *
Beryllium	mg/kg	0.37 J	0.74 =	0.68 =	0.43 J	0.67 J	0.65 J	0.35 U	0.41 J	0.36 J
Cadmium	mg/kg	0.17 J *	0.25 J *	0.22 J *	0.34 J *	0.089 J *	0.67 U	0.63 U	0.63 U	0.09 J *
Calcium	mg/kg	387 J	370 J	308 J	664 =	873 J	622 J	326 J	408 J	517 J
Chromium	mg/kg	14.5 J	16.7 J	15.4 J	17.6 J *	19.9 = *	17.6 = *	16.1 J	13.7 =	13.7 =
Cobalt	mg/kg	11.1 = *	12.2 = *	13.9 = *	10.8 = *	10.6 J *	10.9 J *	12.8 = *	10.8 J *	8.1 J
Copper	mg/kg	9.7 J	11.4 J	9.6 J	16.3 =	16.4 J	13.4 J	10 =	13.5 J	12.1 J
Iron	mg/kg	19,200 =	22,300 =	25,000 = *	18,900 =	24,900 = *	23,500 = *	18,700 =	19,600 =	17,700 =
Lead	mg/kg	16.5 =	20.8 =	20.8 =	36.4 J *	24.4 =	21 =	25.6 J	20.9 =	20.8 =
Magnesium	mg/kg	1,950 J	2,130 J	1,990 J	2,160 =	2,810 =	2,270 =	1,980 =	1,830 =	1,670 =
Manganese	mg/kg	753 J	1,830 J *	1,930 J *	821 J	1,180 =	1,310 =	858 J	1,020 =	508 =
Mercury	mg/kg	0.051 J *	0.072 J *	0.069 J *	0.064 J *	0.066 J *	0.058 J *	0.045 J *	0.055 J *	0.05 J *
Nickel	mg/kg	13.3 J	18 J	16.7 J	15.2 =	23.1 J *	19.4 J	13.1 =	15.5 J	13 J
Potassium	mg/kg	957 J *	887 J	783 J	1,200 = *	1,580 = *	1,170 = *	1,150 = *	748 =	736 =
Selenium	mg/kg	0.75 =	0.97 =	0.97 =	1.1 =	1 =	0.83 =	0.8 =	0.88 =	0.68 =
Silver	mg/kg	1.2 U	1.3 U	1.3 U	1.2 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	mg/kg	612 U	640 U	631 U	63.1 J	679 U	670 U	634 U	633 U	658 U
Thallium	mg/kg	0.29 J *	0.47 J *	0.37 J *	0.49 J *	0.39 J *	0.33 J *	0.46 J *	0.29 J *	0.26 J *
Vanadium	mg/kg	22.4 J	25.3 J	24.9 J	26.4 =	28 =	26 =	26.2 =	21.4 =	21.8 =
Zinc	mg/kg	55.4 J	64.2 J *	58.2 J	96.7 J *	84.4 J *	74.9 J *	57.9 J	57.5 J	65.7 J *

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-2. Winklepeck Burning Grounds
Surface Soil - Inorganics

Location Station Sample ID Date Depth (ft) Field Type		Random Grid WBG-272 WBGss-272-4227-SO 11/01/2000 0 - 1 Grab	Random Grid WBG-273 WBGss-273-4228-SO 11/01/2000 0 - 1 Grab	Random Grid WBG-274 WBGss-274-4229-SO 10/24/2000 0 - 1 Grab	Random Grid WBG-275 WBGss-275-4230-SO 10/24/2000 0 - 1 Grab	Random Grid WBG-276 WBGss-276-4231-SO 10/24/2000 0 - 1 Grab	Random Grid WBG-277 WBGss-277-4232-SO 10/24/2000 0 - 1 Grab	Random Grid WBG-278 WBGss-278-4233-SO 10/24/2000 0 - 1 Grab	Random Grid WBG-279 WBGss-279-4234-SO 10/31/2000 0 - 1 Grab	Random Grid WBG-280 WBGss-280-4235-SO 10/30/2000 0 - 1 Grab
Analyte	**Units**									
Cyanide	mg/kg									
Chromium, hexavalent	mg/kg									
Aluminum	mg/kg	11,700 J	12,700 J	14,200 =	17,600 =	13,000 J	10,200 =	14,700 =	10,500 =	9,070 =
Antimony	mg/kg	1.2 UJ	1.4 UJ	1.3 UJ	1.3 UJ	0.76 J	1.3 UJ	1.3 UJ	1.3 UJ	1.3 UJ
Arsenic	mg/kg	10.2 J	10.8 J	10.9 =	12.7 =	15.1 =	9.9 =	13.3 =	7.2 J	6.9 =
Barium	mg/kg	162 = *	147 = *	72.3 =	64.8 =	104 = *	66.9 =	104 = *	115 = *	80.4 =
Beryllium	mg/kg	0.46 J	0.59 J	0.36 U	0.45 J	0.57 J	0.42 U	0.47 J	0.34 J	0.32 U
Cadmium	mg/kg	0.61 U	0.2 J *	0.35 J *	0.63 U	0.11 J *	0.14 J *	0.16 J *	0.063 J *	0.14 J *
Calcium	mg/kg	544 J	777 J	852 =	831 =	530 J	839 =	932 =	638 J	172 UJ
Chromium	mg/kg	14.1 =	14.9 =	18.4 J *	22.7 J *	16.6 =	13.1 J	18.4 J *	10.7 =	10.7 J
Cobalt	mg/kg	9.2 J	11.7 J *	8.1 =	7.5 =	11.9 = *	8 =	10 =	5.7 J	10.3 =
Copper	mg/kg	12.2 J	9.4 J	19.4 = *	17.7 =	10.3 =	10.3 =	17.4 =	19 J *	6.9 J
Iron	mg/kg	19,700 =	20,800 =	22,300 =	28,200 = *	24,400 = *	19,600 =	25,400 = *	14,400 =	14,200 =
Lead	mg/kg	18.1 =	25 =	25.3 J	16.1 J	23.2 =	20.8 J	21.1 J	12.5 =	15.9 =
Magnesium	mg/kg	1,650 =	1,830 =	2,670 =	3,220 = *	2,010 =	1,870 =	2,330 =	1,680 =	1,340 J
Manganese	mg/kg	901 =	3,170 = *	393 J	273 J	1,410 J	699 J	1,000 J	328 =	916 J
Mercury	mg/kg	0.044 J *	0.074 J *	0.04 J *	0.042 J *	0.042 J *	0.04 J *	0.047 J *	0.041 J *	0.051 J *
Nickel	mg/kg	12.5 J	18.3 J	15.6 =	20.2 =	15.6 =	12.9 =	15.3 =	11.9 J	10.4 J
Potassium	mg/kg	966 = *	705 =	1,450 = *	2,120 = *	1,080 = *	584 J	1,300 = *	660 =	441 J
Selenium	mg/kg	0.6 J	0.48 J	0.85 =	1.3 =	1.2 =	0.9 =	1.2 =	0.63 U	0.63 U
Silver	mg/kg	1.2 U	1.4 U	1.3 U	1.3 U	1.2 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	mg/kg	611 U	677 U	65.2 J	629 U	608 U	628 U	651 U	634 U	628 U
Thallium	mg/kg	0.27 J *	0.39 J *	0.61 J *	0.62 J *	0.81 = *	0.43 J *	0.53 J *	0.24 J *	0.29 J *
Vanadium	mg/kg	22.2 =	24 =	27.3 =	31.2 = *	27 =	20.2 =	31 =	18.7 =	17.1 J
Zinc	mg/kg	60.6 J	88 J *	90.1 J *	63 J *	63.9 = *	52 J	67.9 J *	59.5 J	42.9 J

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-2. Winklepeck Burning Grounds
Surface Soil - Inorganics

Location Station Sample ID Date Depth (ft) Field Type		Random Grid WBG-281 WBGss-281-4236-SO 10/24/2000 0 - 1 Grab	Random Grid WBG-281 WBGss-281-4274-SO 10/24/2000 0 - 1 Field Duplicate	Random Grid WBG-282 WBGss-282-4237-SO 10/31/2000 0 - 1 Grab	Random Grid WBG-283 WBGss-283-4238-SO 10/31/2000 0 - 1 Grab	Random Grid WBG-284 WBGss-284-4239-SO 10/31/2000 0 - 1 Grab	Random Grid WBG-285 WBGss-285-4240-SO 10/31/2000 0 - 1 Grab	Random Grid WBG-286 WBGss-286-4241-SO 10/31/2000 0 - 1 Grab	Random Grid WBG-287 WBGss-287-4242-SO 10/31/2000 0 - 1 Grab	Random Grid WBG-288 WBGss-288-4243-SO 10/31/2000 0 - 1 Grab
Analyte	**Units**									
Cyanide	mg/kg									
Chromium, hexavalent	mg/kg									
Aluminum	mg/kg	11,000 =	10,000 =	12,500 =	12,900 =	10,200 =	12,500 J	9,760 =	12,000 =	11,200 =
Antimony	mg/kg	1.2 UJ	1.2 UJ	0.73 J	1.2 UJ	1.3 UJ	1.2 UJ	1.3 UJ	1.3 UJ	1.3 UJ
Arsenic	mg/kg	13 =	14.4 =	13.1 J	13.9 J	11.1 J	18.4 J *	12.1 J	11.2 J	19.1 J *
Barium	mg/kg	43.8 =	40.5 =	75.7 =	110 = *	99 = *	50.2 =	55.2 =	64.5 =	77.4 =
Beryllium	mg/kg	0.36 U	0.38 U	0.55 J	0.87 =	0.49 J	0.34 J	0.46 J	0.45 J	0.48 J
Cadmium	mg/kg	0.6 U	0.069 J *	0.27 J *	0.62 U	0.65 U	0.62 U	0.63 U	0.65 U	0.16 J *
Calcium	mg/kg	738 =	764 =	2,390 J	1,900 J	630 J	189 J	144 J	211 J	1,700 J
Chromium	mg/kg	14.1 J	13.3 J	17.9 = *	19.4 = *	13.5 =	17.4 =	11.2 =	15.5 =	13.8 =
Cobalt	mg/kg	8.6 =	8 =	11.8 J *	15.3 J *	8.3 J	7.1 J	10 J	11.2 J *	9.8 J
Copper	mg/kg	19.5 = *	18.5 = *	20.3 J *	23.6 J *	10.9 J	16.4 J	8.9 J	18.4 J *	16.4 J
Iron	mg/kg	21,100 =	21,800 =	24,100 = *	28,400 = *	21,500 =	25,400 = *	25,500 = *	22,000 =	19,800 =
Lead	mg/kg	15.4 J	15 J	24.1 =	13.7 =	16.7 =	19 =	20.4 =	20.8 =	20.3 =
Magnesium	mg/kg	2,150 =	2,000 =	2,780 =	3,620 = *	2,040 =	2,070 =	1,420 =	2,370 =	2,430 =
Manganese	mg/kg	463 J	389 J	544 =	327 =	690 =	392 =	981 =	749 =	561 =
Mercury	mg/kg	0.023 J	0.02 J	0.039 J *	0.027 J	0.046 J *	0.044 J *	0.04 J *	0.051 J *	0.05 J *
Nickel	mg/kg	17 =	16.7 =	21 J	37.1 J *	17.9 J	15.6 J	9.4 J	17.7 J	17.7 J
Potassium	mg/kg	1,280 = *	1,000 = *	1,550 = *	1,340 = *	697 =	699 =	334 J	985 = *	1,050 = *
Selenium	mg/kg	0.77 =	0.72 =	0.99 =	0.51 J	0.75 =	1.3 =	0.69 =	0.63 J	0.81 =
Silver	mg/kg	1.2 U	1.2 U	1.2 U	1.2 U	1.3 U	1.2 U	1.3 U	1.3 U	1.3 U
Sodium	mg/kg	600 U	73 J	623 U	624 U	654 U	621 U	626 U	650 U	656 U
Thallium	mg/kg	0.41 J *	0.5 J *	0.17 J *	0.34 J *	0.34 J *	0.29 J *	0.21 J *	0.31 J *	0.26 J *
Vanadium	mg/kg	19.9 =	18.3 =	24.1 =	21.6 =	19.2 =	25 =	25.2 =	21.1 =	18.2 =
Zinc	mg/kg	67.5 J *	63.6 J *	80.3 J *	67.3 J *	59.7 J	49.1 J	42.3 J	62.3 J *	76.9 J *

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-2. Winklepeck Burning Grounds
Surface Soil - Inorganics

Location Station Sample ID Date Depth (ft) Field Type		Random Grid WBG-289 WBGss-289-4244-SO 10/31/2000 0 - 1 Grab	Random Grid WBG-290 WBGss-290-4245-SO 10/31/2000 0 - 1 Grab	Random Grid WBG-291 WBGss-291-4246-SO 10/31/2000 0 - 1 Grab	Random Grid WBG-292 WBGss-292-4247-SO 10/31/2000 0 - 1 Grab	Random Grid WBG-292 WBGss-292-4280-SO 10/31/2000 0 - 1 Field Duplicate	Random Grid WBG-293 WBGss-293-4248-SO 10/31/2000 0 - 1 Grab	Pad 59 WBG-296 WBGss-296-4315-SO 11/02/2000 0 - 1 Grab	Pad 59 WBG-297 WBGss-297-4316-SO 11/02/2000 0 - 1 Grab
Analyte	**Units**								
Cyanide	mg/kg								
Chromium, hexavalent	mg/kg								
Aluminum	mg/kg	9,100 =	10,300 =	99,20 =	11,400 =	9,850 =	5,350 =	11,800 =	10,900 =
Antimony	mg/kg	1.2 UJ	1.3 UJ	1.2 UJ	1.3 UJ	1.3 UJ	1.3 UJ	1.8 J *	0.74 J
Arsenic	mg/kg	8.7 J	7.1 J	8.9 =	9.7 J	9.3 J	8.8 J	13.3 =	9.4 =
Barium	mg/kg	29 =	66.1 =	35.1 =	102 = *	105 = *	28.2 =	85 =	46.2 =
Beryllium	mg/kg	0.24 U	0.32 J	0.27 U	0.39 J	0.32 J	0.22 U	0.45 J	0.14 J
Cadmium	mg/kg	0.61 U	0.64 U	0.081 J *	0.098 J *	0.11 J *	0.63 U	1.5 = *	0.13 J *
Calcium	mg/kg	126 J	469 J	157 UJ	419 J	441 J	503 J	2,920 =	506 J
Chromium	mg/kg	9.5 =	12.9 =	13 J	13.1 =	11.8 =	9.6 =	18.5 = *	14.7 =
Cobalt	mg/kg	5.9 J	6.4 J	8.3 =	8.5 J	8.5 J	5.1 J	9.5 =	6.5 =
Copper	mg/kg	9.8 J	8.9 J	8.6 J	10.8 J	9.5 J	5.8 J	78.9 = *	11.3 =
Iron	mg/kg	14,400 =	15,300 =	18,700 =	17,100 =	15,500 =	15,600 =	26,700 = *	22,100 =
Lead	mg/kg	11.5 =	14.8 =	24.7 =	25.1 =	24.9 =	11 =	65.6 = *	13.8 =
Magnesium	mg/kg	1,120 =	1,630 =	1,650 J	1,640 =	1,400 =	941 =	2,980 =	1,950 =
Manganese	mg/kg	145 =	348 =	434 J	1,250 =	1,350 =	98.3 =	289 =	190 =
Mercury	mg/kg	0.033 J	0.052 J *	0.044 J *	0.083 J *	0.084 J *	0.035 J	0.07 J *	0.035 J
Nickel	mg/kg	11.2 J	11.3 J	11.3 J	14.6 J	13.3 J	7.8 J	22.8 = *	12.6 =
Potassium	mg/kg	363 J	561 J	673 J	685 =	548 J	223 J	929 = *	573 J
Selenium	mg/kg	0.65 =	0.66 =	0.98 =	0.77 =	0.81 =	0.76 =	1.1 =	0.64 =
Silver	mg/kg	1.2 U	1.3 U	1.2 U	1.3 U	1.3 U	1.3 U	0.92 J *	1.2 U
Sodium	mg/kg	614 U	635 U	582 U	666 U	668 U	632 U	617 U	617 U
Thallium	mg/kg	0.22 J *	0.25 J *	0.31 J *	0.39 J *	0.28 J *	0.24 J *	0.59 J *	0.63 J *
Vanadium	mg/kg	16.3 =	18.2 =	20.8 J	21.5 =	19.1 =	10.3 =	20.5 =	21.2 =
Zinc	mg/kg	48.7 J	45.7 J	40.1 J	70 J *	61.4 J	30.6 J	139 = *	41.6 =

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-3. Winklepeck Burning Grounds
Surface Soil - Semivolatile Organic Compounds

Location		Pad 61	Pad 61	Pad 37	Pad 38	Pad 45
Station		WBG-218	WBG-220	WBG-225	WBG-231	WBG-236
Sample ID		WBGss-218-4067-SO	WBGss-220-4073-SO	WBGss-225-4088-SO	WBGss-231-4108-SO	WBGss-236-4125-SO
Date		10/19/2000	10/19/2000	10/20/2000	10/21/2000	10/20/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	**Units**					
1,2,4-Trichlorobenzene	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
1,2-Dichlorobenzene	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
1,3-Dichlorobenzene	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
1,4-Dichlorobenzene	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
2,4,5-Trichlorophenol	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
2,4,6-Trichlorophenol	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
2,4-Dichlorophenol	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
2,4-Dimethylphenol	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
2,4-Dinitrophenol	mg/kg	1.1 U	1.1 U	1.1 U	1.1 U	0.97 U
2,4-Dinitrotoluene	mg/kg	0.21 J	0.44 U	0.44 U	0.43 U	0.4 U
2,6-Dinitrotoluene	mg/kg	0.22 J	0.44 U	0.44 U	0.43 U	0.4 U
2-Chloronaphthalene	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
2-Chlorophenol	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
2-Methyl-4,6-dinitrophenol	mg/kg	1.1 U	1.1 U	1.1 U	1.1 U	0.97 U
2-Methylnaphthalene	mg/kg	0.098 J	0.44 U	0.44 U	0.43 U	0.4 U
2-Methylphenol	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
2-Nitrobenzenamine	mg/kg	1.1 U	1.1 U	1.1 U	1.1 U	0.97 U
2-Nitrophenol	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
3,3'-Dichlorobenzidine	mg/kg	0.44 U	0.44 R	0.44 U	0.43 U	0.4 U
3-Nitrobenzenamine	mg/kg	1.1 U	1.1 U	1.1 U	1.1 U	0.97 U
4-Bromophenyl phenyl ether	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
4-Chloro-3-methylphenol	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
4-Chlorobenzenamine	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
4-Chlorophenyl phenyl ether	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
4-Methylphenol	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
4-Nitrobenzenamine	mg/kg	1.1 U	1.1 U	1.1 U	1.1 U	0.97 U
4-Nitrophenol	mg/kg	1.1 U	1.1 U	1.1 U	1.1 U	0.97 U
Acenaphthene	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Acenaphthylene	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Anthracene	mg/kg	0.083 J	0.054 J	0.44 U	0.43 U	0.4 U
Benz(*a*)anthracene	mg/kg	0.34 J	0.36 J	0.44 U	0.43 U	0.4 U
Benzo(*a*)pyrene	mg/kg	0.33 J	0.41 J	0.44 U	0.43 U	0.4 U
Benzo(*b*)fluoranthene	mg/kg	0.49 =	0.47 =	0.44 U	0.43 U	0.4 U
Benzo(*g,h,i*)perylene	mg/kg	0.23 J	0.27 J	0.44 U	0.43 U	0.4 U
Benzo(*k*)fluoranthene	mg/kg	0.14 J	0.17 J	0.44 U	0.43 U	0.4 U
Bis(2-chloroethoxy)methane	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Bis(2-chloroethyl)ether	mg/kg	0.44 UJ	0.44 UJ	0.44 U	0.43 U	0.4 U
Bis(2-chloroisopropyl)ether	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Bis(2-ethylhexyl)phthalate	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Butyl benzyl phthalate	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Carbazole	mg/kg	0.057 J	0.44 U	0.44 U	0.43 U	0.4 U

Table H-3. Winklepeck Burning Grounds
Surface Soil - Semivolatile Organic Compounds

Location		Pad 61	Pad 61	Pad 37	Pad 38	Pad 45
Station		WBG-218	WBG-220	WBG-225	WBG-231	WBG-236
Sample ID		WBGss-218-4067-SO	WBGss-220-4073-SO	WBGss-225-4088-SO	WBGss-231-4108-SO	WBGss-236-4125-SO
Date		10/19/2000	10/19/2000	10/20/2000	10/21/2000	10/20/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	**Units**					
Chrysene	mg/kg	0.31 J	0.31 J	0.44 U	0.43 U	0.4 U
Di-n-butyl phthalate	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Di-n-octylphthalate	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Dibenz(*a*,*h*)anthracene	mg/kg	0.073 J	0.07 J	0.44 U	0.43 U	0.4 U
Dibenzofuran	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Diethyl phthalate	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Dimethyl phthalate	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Fluoranthene	mg/kg	0.6 =	0.57 =	0.44 U	0.43 U	0.4 U
Fluorene	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Hexachlorobenzene	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Hexachlorobutadiene	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Hexachlorocyclopentadiene	mg/kg	0.44 U	0.44 R	0.44 U	0.43 U	0.4 U
Hexachloroethane	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Indeno(*1,2,3-cd*)pyrene	mg/kg	0.24 J	0.29 J	0.44 U	0.43 U	0.4 U
Isophorone	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
N-Nitroso-di-n-propylamine	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
N-Nitrosodiphenylamine	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Naphthalene	mg/kg	0.066 J	0.44 U	0.44 U	0.43 U	0.4 U
Nitrobenzene	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Pentachlorophenol	mg/kg	1.1 U	1.1 U	1.1 U	1.1 U	0.97 U
Phenanthrene	mg/kg	0.35 J	0.31 J	0.44 U	0.43 U	0.4 U
Phenol	mg/kg	0.44 U	0.44 U	0.44 U	0.43 U	0.4 U
Pyrene	mg/kg	0.48 =	0.42 J	0.44 U	0.43 U	0.4 U

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-3. Winklepeck Burning Grounds
Surface Soil - Semivolatile Organic Compounds

Location		Pad 45	Pad 62	Pad 66	Pad 67	Bldg. S-4301
Station		WBG-236	WBG-240	WBG-245	WBG-251	WBG-261
Sample ID		WBGss-236-4270-SO	WBGss-240-4139-SO	WBGss-245-4156-SO	WBGss-251-4176-SO	WBGss-261-4210-SO
Date		10/20/2000	10/21/2000	10/23/2000	10/23/2000	10/23/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Field Duplicate	Grab	Grab	Grab	Grab
Analyte	Units					
1,2,4-Trichlorobenzene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
1,2-Dichlorobenzene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
1,3-Dichlorobenzene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
1,4-Dichlorobenzene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
2,4,5-Trichlorophenol	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
2,4,6-Trichlorophenol	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
2,4-Dichlorophenol	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
2,4-Dimethylphenol	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
2,4-Dinitrophenol	mg/kg	0.99 U	0.98 U	0.99 U	1 U	1 U
2,4-Dinitrotoluene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
2,6-Dinitrotoluene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
2-Chloronaphthalene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
2-Chlorophenol	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
2-Methyl-4,6-dinitrophenol	mg/kg	0.99 U	0.98 U	0.99 U	1 U	1 U
2-Methylnaphthalene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.082 J
2-Methylphenol	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
2-Nitrobenzenamine	mg/kg	0.99 U	0.98 U	0.99 U	1 U	1 U
2-Nitrophenol	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
3,3'-Dichlorobenzidine	mg/kg	0.41 U	0.41 R	0.41 R	0.43 U	0.41 U
3-Nitrobenzenamine	mg/kg	0.99 U	0.98 U	0.99 U	1 U	1 U
4-Bromophenyl phenyl ether	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
4-Chloro-3-methylphenol	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
4-Chlorobenzenamine	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
4-Chlorophenyl phenyl ether	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
4-Methylphenol	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
4-Nitrobenzenamine	mg/kg	0.99 U	0.98 U	0.99 U	1 U	1 U
4-Nitrophenol	mg/kg	0.99 U	0.98 U	0.99 U	1 U	1 U
Acenaphthene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Acenaphthylene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Anthracene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.057 J
Benz(*a*)anthracene	mg/kg	0.41 U	0.41 UJ	0.41 U	0.43 U	0.36 J
Benzo(*a*)pyrene	mg/kg	0.41 U	0.41 UJ	0.41 U	0.43 U	0.35 J
Benzo(*b*)fluoranthene	mg/kg	0.41 U	0.41 UJ	0.41 U	0.43 U	0.45 =
Benzo(*g,h,i*)perylene	mg/kg	0.41 U	0.41 UJ	0.41 U	0.43 U	0.21 J
Benzo(*k*)fluoranthene	mg/kg	0.41 U	0.41 UJ	0.41 U	0.43 U	0.12 J
Bis(2-chloroethoxy)methane	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Bis(2-chloroethyl)ether	mg/kg	0.41 UJ	0.41 U	0.41 U	0.43 U	0.41 U
Bis(2-chloroisopropyl)ether	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Bis(2-ethylhexyl)phthalate	mg/kg	0.41 U	0.41 UJ	0.41 U	0.43 U	0.41 U
Butyl benzyl phthalate	mg/kg	0.41 U	0.41 UJ	0.41 U	0.43 U	0.41 U
Carbazole	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U

Table H-3. Winklepeck Burning Grounds
Surface Soil - Semivolatile Organic Compounds

Location		Pad 45	Pad 62	Pad 66	Pad 67	Bldg. S-4301
Station		WBG-236	WBG-240	WBG-245	WBG-251	WBG-261
Sample ID		WBGss-236-4270-SO	WBGss-240-4139-SO	WBGss-245-4156-SO	WBGss-251-4176-SO	WBGss-261-4210-SO
Date		10/20/2000	10/21/2000	10/23/2000	10/23/2000	10/23/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Field Duplicate	Grab	Grab	Grab	Grab
Analyte	**Units**					
Chrysene	mg/kg	0.41 U	0.41 UJ	0.41 U	0.43 U	0.43 =
Di-n-butyl phthalate	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Di-n-octylphthalate	mg/kg	0.41 U	0.41 UJ	0.41 U	0.43 U	0.41 U
Dibenz(*a,h*)anthracene	mg/kg	0.41 U	0.41 UJ	0.41 U	0.43 U	0.062 J
Dibenzofuran	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Diethyl phthalate	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Dimethyl phthalate	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Fluoranthene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.6 =
Fluorene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Hexachlorobenzene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Hexachlorobutadiene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Hexachlorocyclopentadiene	mg/kg	0.41 U	0.41 R	0.41 U	0.43 U	0.41 U
Hexachloroethane	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Indeno(*1,2,3-cd*)pyrene	mg/kg	0.41 U	0.41 UJ	0.41 U	0.43 U	0.22 J
Isophorone	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
N-Nitroso-di-n-propylamine	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
N-Nitrosodiphenylamine	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Naphthalene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.061 J
Nitrobenzene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Pentachlorophenol	mg/kg	0.99 U	0.98 R	0.99 U	1 U	1 U
Phenanthrene	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.48 =
Phenol	mg/kg	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Pyrene	mg/kg	0.41 U	0.41 UJ	0.41 U	0.43 U	0.77 =

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-4. Winklepeck Burning Grounds
Surface Soil - Volatile Organic Compounds

Location		Pad 61	Pad 61	Pad 37	Pad 38	Pad 45
Station		WBG-218	WBG-220	WBG-225	WBG-231	WBG-236
Sample ID		WBGss-218-4067-SO	WBGss-220-4073-SO	WBGss-225-4088-SO	WBGss-231-4108-SO	WBGss-236-4125-SO
Date		10/19/2000	10/19/2000	10/20/2000	10/21/2000	10/20/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	**Units**					
1,1,1-Trichloroethane	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
1,1,2,2-Tetrachloroethane	mg/kg	0.0066 UJ	0.0067 U	0.0066 U	0.0066 U	0.006 U
1,1,2-Trichloroethane	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
1,1-Dichloroethane	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
1,1-Dichloroethene	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
1,2-Dibromoethane	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
1,2-Dichloroethane	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
1,2-Dichloroethene	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
1,2-Dichloropropane	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
2-Butanone	mg/kg	0.013 UJ	0.013 UJ	0.013 U	0.013 U	0.012 UJ
2-Hexanone	mg/kg	0.013 UJ	0.013 UJ	0.013 UJ	0.013 UJ	0.012 UJ
4-Methyl-2-pentanone	mg/kg	0.013 UJ	0.013 UJ	0.013 U	0.013 U	0.012 UJ
Acetone	mg/kg	0.013 UJ	0.013 UJ	0.013 UJ	0.013 UJ	0.012 UJ
Benzene	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
Bromochloromethane	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
Bromodichloromethane	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
Bromoform	mg/kg	0.0066 UJ	0.0067 U	0.0066 U	0.0066 U	0.006 U
Bromomethane	mg/kg	0.013 U	0.013 U	0.013 U	0.013 U	0.012 U
Carbon Disulfide	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
Carbon Tetrachloride	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
Chlorobenzene	mg/kg	0.0066 UJ	0.0067 U	0.0066 U	0.0066 U	0.006 U
Chloroethane	mg/kg	0.013 U	0.013 U	0.013 U	0.013 U	0.012 U
Chloroform	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
Chloromethane	mg/kg	0.013 U	0.013 U	0.013 U	0.013 U	0.012 U
Dibromochloromethane	mg/kg	0.0066 UJ	0.0067 U	0.0066 U	0.0066 U	0.006 U
Dimethylbenzene	mg/kg	0.0066 UJ	0.0067 U	0.0066 U	0.0066 U	0.006 U
Ethylbenzene	mg/kg	0.0066 UJ	0.0067 U	0.0066 U	0.0066 U	0.006 U
Methylene Chloride	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
Styrene	mg/kg	0.0066 UJ	0.0067 U	0.0066 U	0.0066 U	0.006 U
Tetrachloroethene	mg/kg	0.0066 UJ	0.0067 U	0.0066 U	0.0066 U	0.006 U
Toluene	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
Trichloroethene	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
Vinyl Chloride	mg/kg	0.013 U	0.013 U	0.013 U	0.013 U	0.012 U
cis -1,3-Dichloropropene	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U
trans -1,3-Dichloropropene	mg/kg	0.0066 U	0.0067 U	0.0066 U	0.0066 U	0.006 U

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-4. Winklepeck Burning Grounds
Surface Soil - Volatile Organic Compounds

Location		Pad 45	Pad 62	Pad 66	Pad 67	Bldg. S-4301
Station		WBG-236	WBG-240	WBG-245	WBG-251	WBG-261
Sample ID		WBGss-236-4270-SO	WBGss-240-4139-SO	WBGss-245-4156-SO	WBGss-251-4176-SO	WBGss-261-4210-SO
Date		10/20/2000	10/21/2000	10/23/2000	10/23/2000	10/23/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Field Duplicate	Grab	Grab	Grab	Grab
Analyte	**Units**					
1,1,1-Trichloroethane	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
1,1,2,2-Tetrachloroethane	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
1,1,2-Trichloroethane	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
1,1-Dichloroethane	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
1,1-Dichloroethene	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
1,2-Dibromoethane	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
1,2-Dichloroethane	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
1,2-Dichloroethene	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
1,2-Dichloropropane	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
2-Butanone	mg/kg	0.012 UJ	0.012 U	0.012 U	0.013 U	0.012 U
2-Hexanone	mg/kg	0.012 UJ	0.012 UJ	0.012 UJ	0.013 UJ	0.012 UJ
4-Methyl-2-pentanone	mg/kg	0.012 UJ	0.012 U	0.012 U	0.013 U	0.012 U
Acetone	mg/kg	0.012 UJ	0.012 UJ	0.012 UJ	0.013 UJ	0.012 UJ
Benzene	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
Bromochloromethane	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
Bromodichloromethane	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
Bromoform	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
Bromomethane	mg/kg	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U
Carbon Disulfide	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
Carbon Tetrachloride	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
Chlorobenzene	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
Chloroethane	mg/kg	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U
Chloroform	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
Chloromethane	mg/kg	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U
Dibromochloromethane	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
Dimethylbenzene	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
Ethylbenzene	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
Methylene Chloride	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
Styrene	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
Tetrachloroethene	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
Toluene	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
Trichloroethene	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0012 J
Vinyl Chloride	mg/kg	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U
cis -1,3-Dichloropropene	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U
trans -1,3-Dichloropropene	mg/kg	0.0062 U	0.0061 U	0.0062 U	0.0065 U	0.0062 U

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-5. Winklepeck Burning Grounds
Surface Soil - Pesticides and PCBs

Location		Pad 61	Pad 61	Pad 37	Pad 38	Pad 45
Station		WBG-218	WBG-220	WBG-225	WBG-231	WBG-236
Sample ID		WBGss-218-4067-SO	WBGss-220-4073-SO	WBGss-225-4088-SO	WBGss-231-4108-SO	WBGss-236-4125-SO
Date		10/19/2000	10/19/2000	10/20/2000	10/21/2000	10/20/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	**Units**					
4,4'-DDD	mg/kg	0.023 U	0.046 U	0.0045 U	0.011 U	0.0041 U
4,4'-DDE	mg/kg	0.023 U	0.046 U	0.0045 U	0.011 U	0.0041 U
4,4'-DDT	mg/kg	0.13 =	0.046 U	0.0045 U	0.011 U	0.0041 U
Aldrin	mg/kg	0.023 U	0.046 U	0.0045 U	0.011 U	0.0041 U
Dieldrin	mg/kg	0.023 U	0.046 U	0.0054 =	0.011 U	0.0041 U
Endosulfan I	mg/kg	0.023 U	0.046 U	0.0045 U	0.011 U	0.0041 U
Endosulfan II	mg/kg	0.023 U	0.046 U	0.0045 U	0.011 U	0.0041 U
Endosulfan Sulfate	mg/kg	0.023 U	0.046 U	0.0045 U	0.011 U	0.0041 U
Endrin	mg/kg	0.023 U	0.046 U	0.0045 U	0.011 U	0.0041 U
Endrin Aldehyde	mg/kg	0.023 U	0.046 U	0.0045 U	0.011 U	0.0041 U
Endrin Ketone	mg/kg	0.023 U	0.046 U	0.0045 U	0.011 U	0.0041 U
Heptachlor	mg/kg	0.023 U	0.046 U	0.0045 U	0.011 U	0.0041 U
Heptachlor Epoxide	mg/kg	0.023 U	0.051 =	0.0045 U	0.081 J	0.0041 U
Lindane	mg/kg	0.023 U	0.046 U	0.0045 U	0.011 U	0.0041 U
Methoxychlor	mg/kg	0.044 UJ	0.088 UJ	0.0087 U	0.022 U	0.008 U
PCB-1016	mg/kg	0.22 U	0.044 U	0.044 U	0.043 U	0.04 U
PCB-1221	mg/kg	0.22 U	0.044 U	0.044 U	0.043 U	0.04 U
PCB-1232	mg/kg	0.22 U	0.044 U	0.044 U	0.043 U	0.04 U
PCB-1242	mg/kg	0.22 U	0.044 U	0.044 U	0.043 U	0.04 U
PCB-1248	mg/kg	0.22 U	0.044 U	0.044 U	0.043 U	0.04 U
PCB-1254	mg/kg	0.22 U	0.044 U	0.044 U	0.043 U	0.04 U
PCB-1260	mg/kg	0.46 =	0.17 =	0.044 U	0.043 U	0.04 U
Toxaphene	mg/kg	0.89 U	1.8 U	0.18 U	0.44 U	0.16 U
alpha-BHC	mg/kg	0.023 U	0.046 U	0.0045 U	0.011 U	0.0041 U
alpha-Chlordane	mg/kg	0.023 U	0.046 U	0.0045 U	0.011 U	0.0041 U
beta-BHC	mg/kg	0.023 U	0.046 U	0.0045 U	0.011 U	0.0041 U
delta-BHC	mg/kg	0.023 U	0.046 U	0.0045 R	0.011 R	0.0041 U
gamma-Chlordane	mg/kg	0.023 U	0.046 U	0.0045 U	0.011 U	0.0041 U

BHC = Benzene hexachloride.
DDD = Dichlorodiphenyl-dichloroethane.
DDE = Dichlorodiphenyl-dichloroethylene.
DDT = Dichlorodiphenyl-trichloroethane.
PCB = Polychlorinated biphenyl.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-5. Winklepeck Burning Grounds
Surface Soil - Pesticides and PCBs

Location		Pad 45	Pad 62	Pad 66	Pad 67	Building S-4301
Station		WBG-236	WBG-240	WBG-245	WBG-251	WBG-261
Sample ID		WBGss-236-4270-SO	WBGss-240-4139-SO	WBGss-245-4156-SO	WBGss-251-4176-SO	WBGss-261-4210-SO
Date		10/20/2000	10/21/2000	10/23/2000	10/23/2000	10/23/2000
Depth (ft)		0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Field Type		Field Duplicate	Grab	Grab	Grab	Grab
Analyte	**Units**					
4,4'-DDD	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
4,4'-DDE	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
4,4'-DDT	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
Aldrin	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
Dieldrin	mg/kg	0.021 U	0.021 U	0.0024 =	0.022 U	0.21 U
Endosulfan I	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
Endosulfan II	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
Endosulfan Sulfate	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
Endrin	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
Endrin Aldehyde	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
Endrin Ketone	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
Heptachlor	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
Heptachlor Epoxide	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
Lindane	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
Methoxychlor	mg/kg	0.041 UJ	0.041 U	0.0041 U	0.043 U	0.41 U
PCB-1016	mg/kg	0.041 U	0.041 U	0.041 U	0.043 U	0.041 U
PCB-1221	mg/kg	0.041 U	0.041 U	0.041 U	0.043 U	0.041 U
PCB-1232	mg/kg	0.041 U	0.041 U	0.041 U	0.043 U	0.041 U
PCB-1242	mg/kg	0.041 U	0.041 U	0.041 U	0.043 U	0.041 U
PCB-1248	mg/kg	0.041 U	0.041 U	0.041 U	0.043 U	0.041 U
PCB-1254	mg/kg	0.041 U	0.041 U	0.041 U	0.043 U	0.14 =
PCB-1260	mg/kg	0.041 U	0.041 U	0.041 U	0.043 U	0.041 U
Toxaphene	mg/kg	0.83 U	0.82 U	0.083 U	0.87 U	8.3 U
alpha-BHC	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
alpha-Chlordane	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
beta-BHC	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
delta-BHC	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U
gamma-Chlordane	mg/kg	0.021 U	0.021 U	0.0021 U	0.022 U	0.21 U

BHC = Benzene hexachloride.
DDD = Dichlorodiphenyl-dichloroethane.
DDE = Dichlorodiphenyl-dichloroethylene.
DDT = Dichlorodiphenyl-trichloroethane.
PCB = Polychlorinated biphenyl.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-6. Winklepeck Burning Grounds
Subsurface Soil - Explosives and Propellants

Location		Pad 58	Pad 58	Pad 58	Pad 58	Pad 58	Pad 58	Pad 59	Pad 59
Station		WBG-199	WBG-199	WBG-203	WBG-203	WBG-203	WBG-203	WBG-205	WBG-210
Sample ID		WBGso-199-4007-SO	WBGso-199-4008-SO	WBGso-203-4019-SO	WBGso-203-4020-SO	WBGso-203-4021-SO	WBGso-203-4022-SO	WBGso-205-4028-SO	WBGso-210-4042-SO
Date		10/20/2000	10/21/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/21/2000	10/30/2000
Depth (ft)		2 - 4	4 - 6	2 - 4	4 - 6	6 - 8	8 - 10	4 - 6	2 - 4
Field Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	Units								
1,3,5-Trinitrobenzene	mg/kg	1.9 =	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.31 J	0.25 U
1,3-Dinitrobenzene	mg/kg	0.25 U	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.75 U	0.25 U
2,4,6-Trinitrotoluene	mg/kg	190 =	10 =	0.25 U	0.25 U	0.25 U	0.25 U	17 =	0.067 J
2,4-Dinitrotoluene	mg/kg	0.56 =	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.75 U	0.25 U
2,6-Dinitrotoluene	mg/kg	1.3 U	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.75 U	0.25 U
2-Amino-4,6-dinitrotoluene	mg/kg	7.5 =	0.45 J	0.25 U	0.25 U	0.25 U	0.25 U	1.4 =	0.15 J
2-Nitrotoluene	mg/kg	1.1 U	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.75 U	0.47 U
3-Nitrotoluene	mg/kg	0.25 U	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.75 U	0.25 U
4-Amino-2,6-dinitrotoluene	mg/kg	51 U	3.6 U	0.25 U	0.25 U	0.25 U	0.25 U	6.2 U	0.14 J
4-Nitrotoluene	mg/kg	1.7 U	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.75 U	0.25 U
HMX	mg/kg	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	1.5 U	0.24 J
Nitrobenzene	mg/kg	0.25 U	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.75 U	0.081 J
Nitroglycerin	mg/kg	2.5 U	5 U	2.5 U	2.5 U	2.5 U	2.5 U	7.5 U	2.5 U
RDX	mg/kg	0.62 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	1.5 U	0.5 U
Tetryl	mg/kg	0.65 U	1.3 U	0.65 U	0.65 U	0.65 U	0.65 U	2 U	0.65 U

HMX = Octoahydro-1,3,5,7-tetranitro-
1,3,5,7-tetrazocine.
RDX = Hexahydro-1,3,5-trinitro-
1,3,5-triazine.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-6. Winklepeck Burning Grounds
Subsurface Soil - Explosives and Propellants

Location		Pad 59	Pad 59	Pad 59	Pad 61	Pad 61	Pad 37	Pad 37	Pad 37
Station		WBG-210	WBG-210	WBG-210	WBG-219	WBG-220	WBG-227	WBG-227	WBG-227
Sample ID		WBGso-210-4043-SO	WBGso-210-4044-SO	WBGso-210-4045-SO	WBGso-219-4072-SO	WBGso-220-4272-SO	WBGso-227-4095-SO	WBGso-227-4096-SO	WBGso-227-4097-SO
Date		10/30/2000	10/30/2000	10/30/2000	10/25/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000
Depth (ft)		4 - 6	6 - 8	8 - 10	4 - 6	2 - 4	2 - 4	4 - 6	6 - 8
Field Type		Grab	Grab	Grab	Grab	Field Duplicate	Grab	Grab	Grab
Analyte	**Units**								
1,3,5-Trinitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.42 =	0.25 U	0.25 U	0.25 U
1,3-Dinitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.063 J	0.25 U	0.25 U	0.25 U
2,4,6-Trinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.63 =	1.8 =	0.17 J	0.12 J	0.25 U
2,4-Dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.086 J	0.25 U	0.25 U	0.25 U
2,6-Dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-Amino-4,6-dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.41 =	0.25 U	0.25 U	0.25 U
2-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.23 J	0.25 U	0.25 U	0.25 U
3-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-Amino-2,6-dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.24 J	0.75 U	0.25 U	0.25 U	0.25 U
4-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
HMX	mg/kg	0.5 U	0.5 U	0.5 U	0.38 J	0.29 J	0.5 U	0.5 U	0.5 U
Nitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.093 J	0.25 U	0.25 U	0.25 U
Nitroglycerin	mg/kg	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
RDX	mg/kg	0.5 U	0.5 U	0.5 U	1.2 =	1.3 =	0.5 U	0.23 J	0.5 U
Tetryl	mg/kg	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U

HMX = Octoahydro-1,3,5,7-tetranitro-
1,3,5,7-tetrazocine.
RDX = Hexahydro-1,3,5-trinitro-
1,3,5-triazine.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-6. Winklepeck Burning Grounds
Subsurface Soil - Explosives and Propellants

Location		Pad 37	Pad 38	Pad 38	Pad 38	Pad 38	Pad 45	Pad 45	Pad 45
Station		WBG-227	WBG-232	WBG-232	WBG-232	WBG-232	WBG-237	WBG-237	WBG-237
Sample ID		WBGso-227-4098-SO	WBGso-232-4112-SO	WBGso-232-4113-SO	WBGso-232-4114-SO	WBGso-232-4115-SO	WBGso-237-4129-SO	WBGso-237-4130-SO	WBGso-237-4131-SO
Date		10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000
Depth (ft)		8 - 10	2 - 4	4 - 6	6 - 8	8 - 10	2 - 4	4 - 6	6 - 8
Field Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	Units								
1,3,5-Trinitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,3-Dinitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4,6-Trinitrotoluene	mg/kg	0.25 U	0.13 J	0.17 J	0.061 J	0.25 U	0.057 J	0.25 U	0.25 U
2,4-Dinitrotoluene	mg/kg	0.25 U	0.066 J	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,6-Dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-Amino-4,6-dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-Amino-2,6-dinitrotoluene	mg/kg	0.25 U	0.092 J	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
HMX	mg/kg	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Nitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Nitroglycerin	mg/kg	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
RDX	mg/kg	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetryl	mg/kg	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U

HMX = Octoahydro-1,3,5,7-tetranitro-
1,3,5,7-tetrazocine.
RDX = Hexahydro-1,3,5-trinitro-
1,3,5-triazine.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-6. Winklepeck Burning Grounds
Subsurface Soil - Explosives and Propellants

Location		Pad 45	Pad 62	Pad 62	Pad 62	Pad 62	Pad 66	Pad 66	Pad 67
Station		WBG-237	WBG-242	WBG-242	WBG-242	WBG-242	WBG-243	WBG-247	WBG-252
Sample ID		WBGso-237-4132-SO	WBGso-242-4146-SO	WBGso-242-4147-SO	WBGso-242-4148-SO	WBGso-242-4149-SO	WBGso-243-4273-SO	WBGso-247-4163-SO	WBGso-252-4180-SO
Date		10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/23/2000	10/22/2000	10/22/2000
Depth (ft)		8 - 10	2 - 4	4 - 6	6 - 8	8 - 10	2 - 4	2 - 4	2 - 4
Field Type		Grab	Grab	Grab	Grab	Grab	Field Duplicate	Grab	Grab
Analyte	**Units**								
1,3,5-Trinitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	5.3 =
1,3-Dinitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4,6-Trinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	11 =	0.19 J	490 =
2,4-Dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.54 =
2,6-Dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.15 J	1.6 U
2-Amino-4,6-dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	2.7 U
2-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-Amino-2,6-dinitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	110 U
4-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.16 J	0.25 U
HMX	mg/kg	0.5 U	0.25 J	0.5 U	0.5 U	0.5 U	0.5 U	0.74 U	27 J
Nitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.068 J	0.25 U
Nitroglycerin	mg/kg	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
RDX	mg/kg	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.2 J	0.5 U	100 =
Tetryl	mg/kg	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U

HMX = Octoahydro-1,3,5,7-tetranitro-
1,3,5,7-tetrazocine.
RDX = Hexahydro-1,3,5-trinitro-
1,3,5-triazine.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-6. Winklepeck Burning Grounds
Subsurface Soil - Explosives and Propellants

Location		Pad 67	Pad 67	Pad 67	Pad 68	Pad 68	Pad 68	Pad 68
Station		WBG-252	WBG-252	WBG-252	WBG-257	WBG-257	WBG-257	WBG-257
Sample ID		WBGso-252-4181-SO	WBGso-252-4182-SO	WBGso-252-4183-SO	WBGso-257-4197-SO	WBGso-257-4198-SO	WBGso-257-4199-SO	WBGso-257-4200-SO
Date		10/22/2000	10/22/2000	10/22/2000	10/30/2000	10/30/2000	10/30/2000	10/30/2000
Depth (ft)		4 - 6	6 - 8	8 - 10	2 - 4	4 - 6	6 - 8	8 - 9
Field Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	**Units**							
1,3,5-Trinitrobenzene	mg/kg	250 U	120 U	8.7 =	0.25 U	0.25 U	0.25 U	0.25 U
1,3-Dinitrobenzene	mg/kg	0.045 J	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
2,4,6-Trinitrotoluene	mg/kg	5200 =	3300 =	860 =	0.25 U	0.25 U	0.25 U	0.25 U
2,4-Dinitrotoluene	mg/kg	4.9 U	2.8 =	0.58 =	0.25 U	0.25 U	0.25 U	0.25 U
2,6-Dinitrotoluene	mg/kg	250 U	6.6 U	1.7 U	0.25 U	0.25 U	0.25 U	0.25 U
2-Amino-4,6-dinitrotoluene	mg/kg	250 U	120 U	4 U	0.25 U	0.25 U	0.25 U	0.25 U
2-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
3-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
4-Amino-2,6-dinitrotoluene	mg/kg	600 U	500 U	150 U	0.25 U	0.25 U	0.25 U	0.25 U
4-Nitrotoluene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
HMX	mg/kg	500 U	250 U	7.1 =	0.5 U	0.5 U	0.5 U	0.5 U
Nitrobenzene	mg/kg	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Nitroglycerin	mg/kg	6.7 U	5.8 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
RDX	mg/kg	260 J	240 J	130 =	0.5 U	0.5 U	0.5 U	0.5 U
Tetryl	mg/kg	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U

HMX = Octoahydro-1,3,5,7-tetranitro-
1,3,5,7-tetrazocine.
RDX = Hexahydro-1,3,5-trinitro-
1,3,5-triazine.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-7. Winklepeck Burning Grounds
Subsurface Soil - Inorganics

Location		Pad 58	Pad 58	Pad 58	Pad 58	Pad 58	Pad 58	Pad 58	Pad 59	Pad 59	Pad 59
Station		WBG-199	WBG-199	WBG-199	WBG-203	WBG-203	WBG-203	WBG-203	WBG-205	WBG-205	WBG-205
Sample ID		WBGso-199-4007-SO	WBGso-199-4008-SO	WBGso-199-4314-SO	WBGso-203-4019-SO	WBGso-203-4020-SO	WBGso-203-4021-SO	WBGso-203-4022-SO	WBGso-205-4027-SO	WBGso-205-4028-SO	WBGso-205-4313-SO
Date		10/20/2000	10/21/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/20/2000	10/21/2000	10/22/2000
Depth (ft)		2 - 4	4 - 6	6 - 8	2 - 4	4 - 6	6 - 8	8 - 10	2 - 4	4 - 6	6 - 8
Field Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	Units										
Cyanide	mg/kg		0.56 U								
Chromium, hexavalent	mg/kg				1.1 UJ	1.1 UJ	1.1 UJ	1.1 UJ			
Aluminum	mg/kg	13,200 J	14,900 J	13,200 =	10,100 =	10,100 =	9,330 =	3,580 =	12,900 J	10,500 J	9,360 =
Antimony	mg/kg	27.6 J *	3.4 J *	5.6 J *	0.72 J	0.72 J	0.67 J	1.1 UJ	0.62 J	0.61 J	0.62 J
Arsenic	mg/kg	12.1 =	11.3 =	12.4 =	11.4 =	21.1 = *	28.8 = *	9.9 =	11.4 =	13 =	11 =
Barium	mg/kg	314 = *	82.3 J	146 = *	57.8 =	53.5 =	42.4 =	24.6 =	44.1 =	72.6 J	58.4 =
Beryllium	mg/kg	0.38 J	0.44 J	0.63 =	0.38 J	0.43 J	0.43 J	0.14 U	0.24 U	0.41 J	0.27 J
Cadmium	mg/kg	0.93 = *	0.56 UJ	0.68 = *	5 = *	0.42 J *	0.31 J *	0.26 J *	0.62 U	0.57 UJ	0.29 J *
Calcium	mg/kg	5,590 =	1,660 J	1,880 =	28,800 =	14,000 =	7,940 =	35,700 = *	591 J	4,460 J	21,000 =
Chromium	mg/kg	41 = *	20.3 J	23.3 =	15.6 =	16.3 =	14.8 =	9.6 =	16.3 =	16.9 J	15.3 =
Cobalt	mg/kg	13.3 =	9.6 =	14.2 J	10.1 J	10 J	9.4 J	4 J	6.8 =	11.4 =	11.7 J
Copper	mg/kg	205 = *	38 = *	55.2 = *	62.4 = *	21.5 =	20.8 =	13.9 =	19.6 =	21.7 =	18.7 =
Iron	mg/kg	51,200 = *	25,100 =	35,200 =	23,100 =	29,800 =	26,000 =	13,400 =	26,000 =	26,800 =	23,800 =
Lead	mg/kg	649 = *	72 = *	101 = *	15.6 =	15.8 =	14.9 =	7.6 =	13 =	12.6 =	10 =
Magnesium	mg/kg	3,160 =	3,390 J	3,380 =	5,580 =	4,690 =	4,510 =	11,100 = *	2,490 =	4,710 J	5,590 =
Manganese	mg/kg	1,400 J	423 =	481 =	364 =	423 =	365 =	477 =	154 J	339 =	404 =
Mercury	mg/kg	0.042 J	0.031 J	0.029 J	0.029 J	0.023 J	0.0097 J	0.11 U	0.033 J	0.11 U	0.11 U
Nickel	mg/kg	39.3 =	22.9 =	33.5 =	25.8 =	26.3 =	23.6 =	13 =	17.1 =	28.8 =	27.3 =
Potassium	mg/kg	1,130 =	1,490 =	1,960 =	1,620 =	2,270 =	1,920 =	783 =	926 =	1,580 =	1,590 =
Selenium	mg/kg	2.1 = *	0.92 =	0.57 U	0.57 U	0.56 U	0.57 U	0.56 U	1.5 =	0.56 J	0.57 U
Silver	mg/kg	2.7 = *	0.25 J *	0.28 J *	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U	1.1 U
Sodium	mg/kg	366 J *	142 U	182 U	100 U	104 U	109 U	119 U	619 U	77.2 U	71.6 U
Thallium	mg/kg	0.61 J	0.42 J	0.51 J	0.52 J	0.51 J	0.49 J	0.38 J	0.73 J	0.42 J	0.5 J
Vanadium	mg/kg	22.7 =	24.9 =	22.2 =	16.9 =	18.2 =	15.3 =	7.4 =	23.8 =	17.6 =	16.2 =
Zinc	mg/kg	2,390 = *	381 J *	493 J *	110 J *	64.3 J	64.7 J	47.4 J	47.6 =	68.8 J	59.1 J

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-7. Winklepeck Burning Grounds
Subsurface Soil - Inorganics

Location		Pad 59	Pad 59	Pad 59	Pad 59	Pad 59	Pad 61	Pad 61	Pad 61	Pad 61	Pad 61
Station		WBG-210	WBG-210	WBG-210	WBG-210	WBG-210	WBG-217	WBG-218	WBG-219	WBG-219	WBG-220
Sample ID		WBGso-210-4042-SO	WBGso-210-4043-SO	WBGso-210-4278-SO	WBGso-210-4044-SO	WBGso-210-4045-SO	WBGso-217-4065-SO	WBGso-218-4068-SO	WBGso-219-4071-SO	WBGso-219-4072-SO	WBGso-220-4074-SO
Date		10/30/2000	10/30/2000	10/30/2000	10/30/2000	10/30/2000	10/22/2000	10/22/2000	10/22/2000	10/25/2000	10/22/2000
Depth (ft)		2 - 4	4 - 6	4 - 6	6 - 8	8 - 10	2 - 4	2 - 4	2 - 4	4 - 6	2 - 4
Field Type		Grab	Grab	Field Duplicate	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	**Units**										
Cyanide	mg/kg	0.58 U					4.6 = *				
Chromium, hexavalent	mg/kg										
Aluminum	mg/kg	11,900 =	13,100 =	4,200 =	9,560 =	9,740 =	14,200 J	17,200 J	20,000 J *	14,800 =	13,100 J
Antimony	mg/kg	1.2 J *	1.2 UJ	1.2 UJ	1.2 UJ	1.2 UJ	9.1 J *	13.8 J *	27.4 J *	5.9 J *	32.5 J *
Arsenic	mg/kg	13.3 =	16.4 =	4.5 =	22.9 = *	19.6 =	18.5 =	29.8 = *	24 = *	16.1 =	16.2 =
Barium	mg/kg	77.5 =	73.4 =	22.4 J	43.5 =	44.6 =	250 = *	406 = *	1,040 = *	185 J *	403 = *
Beryllium	mg/kg	0.51 J	0.56 J	0.16 U	0.44 J	0.45 J	0.43 J	0.61 U	0.59 U	0.35 U	0.38 J
Cadmium	mg/kg	1.9 = *	0.26 J *	0.59 U	0.23 J *	0.27 J *	8.3 = *	3 U	0.88 J *	0.36 J *	2.2 = *
Calcium	mg/kg	8,480 J	32,800 J	6,630 UJ	8,120 J	6,260 J	6,350 J	11,100 J	17,300 J	4,340 J	11,900 J
Chromium	mg/kg	22.4 J	20.9 J	6.4 J	15.6 J	15.9 J	57 = *	67.6 = *	80.9 = *	28.8 J *	55.2 = *
Cobalt	mg/kg	12 =	13.3 =	4.1 J	11.9 =	11.6 =	14 =	18.2 =	16.2 =	11.1 =	13.2 =
Copper	mg/kg	38.8 J *	24.9 J	6.4 J	23.6 J	24.8 J	601 = *	428 = *	366 = *	104 J *	177 = *
Iron	mg/kg	26,900 =	30,200 =	8,310 =	29,300 =	28,700 =	88,600 = *	163,000 = *	92,200 = *	41,400 = *	49,500 = *
Lead	mg/kg	134 = *	13.6 =	4 =	16.7 =	19.5 = *	326 = *	293 = *	1,130 = *	173 = *	1,050 = *
Magnesium	mg/kg	5,260 J	7,250 J	1,920 J	5,020 J	4,720 J	2,270 =	3,040 =	3,080 J	3,120 =	10,900 = *
Manganese	mg/kg	474 J	457 J	103 J	301 J	363 J	947 =	1,050 =	835 =	300 =	530 =
Mercury	mg/kg	0.017 J	0.012 J	0.017 J	0.015 J	0.013 J	0.073 J *	0.014 J	0.028 J	0.02 J	0.056 J *
Nickel	mg/kg	30.8 J	32.8 J	10 J	26.7 J	27.6 J	52.8 =	92.7 = *	76.3 = *	36.3 =	52 =
Potassium	mg/kg	2,000 J	2,420 J	1,070 J	1,630 J	1,620 J	2,260 =	1,810 =	1,550 =	940 =	2,340 =
Selenium	mg/kg	0.76 =	0.62 U	0.59 U	0.66 =	0.69 =	3.6 = *	4.2 = *	4.6 = *	1.9 = *	1.1 U
Silver	mg/kg	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	0.71 J *	2.6 = *	5.7 = *	0.78 J *	1.8 = *
Sodium	mg/kg	137 J	122 J	65.3 J	90.5 J	88.2 J	291 U	1,520 = *	1,780 = *	389 J *	559 J *
Thallium	mg/kg	0.51 J	0.44 J	0.38 J	0.27 J	0.35 J	0.65 =	0.38 J	0.81 =	0.82 U	0.35 J
Vanadium	mg/kg	19.6 J	22.2 J	7.5 J	15.5 J	15.8 J	21.1 U	30.6 =	44.8 = *	24.7 =	23.6 =
Zinc	mg/kg	211 J *	73.8 J	19.9 J	75.4 J	86.1 J	2,420 = *	471 = *	2,100 = *	890 = *	1,300 = *

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-7. Winklepeck Burning Grounds
Subsurface Soil - Inorganics

Location		Pad 61	Pad 61	Pad 61	Pad 37	Pad 37	Pad 37	Pad 37	Pad 37	Pad 38	Pad 38
Station		WBG-220	WBG-221	WBG-222	WBG-223	WBG-227	WBG-227	WBG-227	WBG-227	WBG-229	WBG-231
Sample ID		WBGso-220-4272-SO	WBGso-221-4075-SO	WBGso-222-4080-SO	WBGso-223-4083-SO	WBGso-227-4095-SO	WBGso-227-4096-SO	WBGso-227-4097-SO	WBGso-227-4098-SO	WBGso-229-4103-SO	WBGso-231-4109-SO
Date		10/22/2000	10/25/2000	10/25/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/25/2000	10/22/2000
Depth (ft)		2 - 4	4 - 6	2 - 4	2 - 4	2 - 4	4 - 6	6 - 8	8 - 10	2 - 4	2 - 4
Field Type		Field Duplicate	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	**Units**										
Cyanide	mg/kg										
Chromium, hexavalent	mg/kg										
Aluminum	mg/kg	16,300 J	12,300 =	13,100 =	13,000 J	10,700 J	10,900 J	9,730 J	8,380 J	11,800 =	12,200 J
Antimony	mg/kg	14.2 J *	1.1 UJ	1.2 UJ	1.2 UJ	0.97 J *	1.2 UJ	0.65 J	0.67 J	0.61 J	0.73 J
Arsenic	mg/kg	18.1 =	18.8 =	14.4 =	15.9 =	38.4 = *	20.7 = *	21 = *	17.7 =	15.8 =	13.8 =
Barium	mg/kg	491 = *	52.4 J	86 J	54.9 =	62.8 J	47.5 J	49.8 J	39.3 =	67 J	66.7 =
Beryllium	mg/kg	0.36 J	0.57 J	0.58 =	0.45 J	0.51 J	0.5 J	0.44 J	0.31 J	0.62 =	0.36 J
Cadmium	mg/kg	2.2 = *	0.57 UJ	0.58 UJ	0.59 U	0.59 UJ	0.58 UJ	0.59 UJ	0.59 U	0.57 UJ	0.12 J *
Calcium	mg/kg	15,300 J	1,390 J	6,030 J	940 J	1,050 J	1,340 J	946 J	1,570 J	1,320 J	1,560 J
Chromium	mg/kg	55.3 = *	17.5 J	19.6 J	16.7 =	14 J	16.4 J	15 J	14.4 =	16.9 J	14.8 =
Cobalt	mg/kg	15.8 =	11.3 =	12.8 =	14.1 =	13.8 =	10.9 =	9.1 =	10.2 =	12.5 =	7.5 =
Copper	mg/kg	596 = *	22.8 J	23.2 J	20.2 =	22.3 =	20.4 =	20.7 =	20.5 =	23 J	12.3 =
Iron	mg/kg	50,100 = *	29,200 =	29,600 =	23,500 =	34,800 =	28,700 =	29,000 =	26,200 =	26,100 =	28,700 =
Lead	mg/kg	715 = *	12.2 =	12 =	17.4 =	34.9 = *	17.5 =	22.1 = *	14.1 =	12.8 =	16.8 =
Magnesium	mg/kg	12,400 J *	3,650 =	4,570 =	2,580 =	2,250 J	3,140 J	2,340 J	2,920 =	3,200 =	1,870 =
Manganese	mg/kg	594 =	374 =	357 =	419 =	502 =	508 =	401 =	368 =	343 =	487 =
Mercury	mg/kg	0.045 J *	0.11 U	0.12 U	0.019 J	0.029 J	0.12 U	0.019 J	0.011 J	0.11 U	0.041 J
Nickel	mg/kg	61.3 = *	27.8 =	34.9 =	19.1 =	23.5 =	24.2 =	19.7 =	22.6 =	28.4 =	13.5 =
Potassium	mg/kg	3,130 =	2,020 =	1,750 =	1,420 =	1,050 =	1,820 =	1,240 =	1,050 =	1,490 =	935 =
Selenium	mg/kg	0.94 U	0.92 =	1.1 =	0.59 U	0.78 =	0.42 J	0.63 =	0.74 U	1 =	0.99 U
Silver	mg/kg	1.8 = *	1.1 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.1 U	1.3 U
Sodium	mg/kg	712 = *	85.4 J	577 U	70.9 U	64.4 U	64.5 U	594 U	69.3 U	575 U	65.4 U
Thallium	mg/kg	0.82 =	0.75 U	0.76 U	0.49 J	0.33 J	0.37 J	0.33 J	0.36 J	0.8 U	0.46 J
Vanadium	mg/kg	29 =	20.8 =	21.3 =	22.5 =	19.7 =	18.3 =	18.7 =	14.3 =	19 =	24.8 =
Zinc	mg/kg	1,040 = *	72.5 =	78.5 =	62.3 =	78.2 J	73.8 J	70.8 J	66.9 U	74.4 =	48.6 =

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-7. Winklepeck Burning Grounds
Subsurface Soil - Inorganics

Location		Pad 38	Pad 38	Pad 38	Pad 38	Pad 45	Pad 45	Pad 45	Pad 45	Pad 62	Pad 62
Station		WBG-232	WBG-232	WBG-232	WBG-232	WBG-237	WBG-237	WBG-237	WBG-237	WBG-240	WBG-242
Sample ID		WBGso-232-4112-SO	WBGso-232-4113-SO	WBGso-232-4114-SO	WBGso-232-4115-SO	WBGso-237-4129-SO	WBGso-237-4130-SO	WBGso-237-4131-SO	WBGso-237-4132-SO	WBGso-240-4140-SO	WBGso-242-4146-SO
Date		10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000	10/25/2000	10/22/2000
Depth (ft)		2 - 4	4 - 6	6 - 8	8 - 10	2 - 4	4 - 6	6 - 8	8 - 10	2 - 4	2 - 4
Field Type		Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Analyte	**Units**										
Cyanide	mg/kg										
Chromium, hexavalent	mg/kg	1.2 UJ	1.2 UJ	1.1 UJ	1.2 UJ	1.2 UJ	2.8 J	1.2 UJ	1.4 J		
Aluminum	mg/kg	12,700 =	120,00 =	8,450 =	8,300 =	15,700 J	13,800 =	11,300 =	13,200 =	12,300 =	9,540 J
Antimony	mg/kg	1.2 UJ	1.2 UJ	0.66 J	1.2 UJ	0.91 J	0.68 J	0.86 J	1.2 UJ	0.89 J	1.2 UJ
Arsenic	mg/kg	12.9 =	11.8 =	18.4 =	15.9 =	15.2 =	15.7 =	16.2 =	9.9 =	14.5 =	13.5 =
Barium	mg/kg	189 = *	152 = *	87.4 =	38.2 =	60.4 =	73.4 =	75.6 =	63.3 =	59.9 J	43.7 =
Beryllium	mg/kg	0.83 =	0.88 =	0.47 J	0.37 J	0.44 J	0.58 J	0.53 J	0.34 J	0.37 U	0.32 J
Cadmium	mg/kg	201 = *	69.1 = *	28 = *	1.2 = *	0.62 U	0.2 J *	0.27 J *	0.15 J *	0.58 UJ	0.61 U
Calcium	mg/kg	21,900 =	20,600 =	28,000 =	13,000 =	582 J	661 =	768 =	750 =	681 J	605 J
Chromium	mg/kg	20.8 =	16.9 =	13.4 =	12.9 =	19.2 =	19.9 =	16.3 =	18.4 =	15.6 J	12.6 =
Cobalt	mg/kg	7.8 J	14.7 J	10.4 J	10.9 J	8.2 =	17.7 J	18.2 J	5.9 J	11.4 =	6.4 =
Copper	mg/kg	20.8 =	18.3 =	17.7 =	18.5 =	18.7 =	24.2 =	24.9 =	17.9 =	19.5 J	16.6 =
Iron	mg/kg	22,600 =	21,600 =	22,600 =	25,100 =	31,300 =	31,000 =	30,800 =	23,400 =	23,800 =	20,400 =
Lead	mg/kg	190 = *	83.6 = *	38.6 = *	11.7 =	16 =	16.1 =	15.9 =	9.3 =	13.4 =	11.8 =
Magnesium	mg/kg	5,300 =	5,460 =	5,110 =	4,200 =	2,880 J	3,260 =	2,920 =	2,710 =	2,160 =	1,650 J
Manganese	mg/kg	675 =	622 =	689 =	351 =	369 =	480 =	590 =	162 =	371 =	348 =
Mercury	mg/kg	0.015 J	0.015 J	0.012 J	0.12 U	0.038 J	0.023 J	0.025 J	0.018 J	0.013 J	0.015 J
Nickel	mg/kg	31.7 =	29.3 =	20.6 =	26.6 =	16.8 =	25.8 =	23.8 =	19.6 =	16.8 =	12.2 =
Potassium	mg/kg	1,260 =	1,400 =	1,210 =	1,340 =	1,200 =	1,280 =	1,150 =	1420 =	1,170 =	1,070 =
Selenium	mg/kg	0.75 U	0.43 U	0.86 U	0.58 U	1.2 U	0.89 J	0.5 U	0.46 U	1.3 =	0.66 U
Silver	mg/kg	1.2 U	1.2 U	1.1 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Sodium	mg/kg	229 U	212 U	152 U	99 U	620 U	109 U	624 U	66.7 U	583 U	606 U
Thallium	mg/kg	0.43 J	0.47 J	0.49 J	0.42 J	0.69 =	0.63 J	0.6 J	0.46 J	0.75 U	0.47 J
Vanadium	mg/kg	15.3 =	15.3 =	13.4 =	13 =	30.6 =	28 =	26.1 =	25.1 =	23.5 =	18.5 =
Zinc	mg/kg	136 J *	85 J	63.6 J	62.2 J	50.8 =	61.9 J	63.6 J	49.3 J	62.1 =	45.7 =

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-7. Winklepeck Burning Grounds
Subsurface Soil - Inorganics

Location		Pad 62	Pad 62	Pad 62	Pad 66	Pad 66	Pad 66	Pad 66	Pad 67	Pad 67	Pad 67
Station		WBG-242	WBG-242	WBG-242	WBG-243	WBG-243	WBG-246	WBG-247	WBG-252	WBG-252	WBG-252
Sample ID		WBGso-242-4147-SO	WBGso-242-4148-SO	WBGso-242-4149-SO	WBGso-243-4151-SO	WBGso-243-4273-SO	WBGso-246-4160-SO	WBGso-247-4163-SO	WBGso-252-4180-SO	WBGso-252-4181-SO	WBGso-252-4182-SO
Date		10/22/2000	10/22/2000	10/22/2000	10/23/2000	10/23/2000	10/25/2000	10/22/2000	10/22/2000	10/22/2000	10/22/2000
Depth (ft)		4 - 6	6 - 8	8 - 10	2 - 4	2 - 4	2 - 4	2 - 4	2 - 4	4 - 6	6 - 8
Field Type		Grab	Grab	Grab	Grab	Field Duplicate	Grab	Grab	Grab	Grab	Grab
Analyte	**Units**										
Cyanide	mg/kg										
Chromium, hexavalent	mg/kg										
Aluminum	mg/kg	7,030 J	5,810 J	3,990 J	14,500 =	12,700 =	14,100 =	12,100 =	11,600 J	13,200 J	11,100 J
Antimony	mg/kg	1.2 UJ	1.3 UJ	1.2 UJ	1.2 UJ	1.2 UJ	0.87 J	9.1 J *	2.3 J *	9.4 J *	2.4 J *
Arsenic	mg/kg	12 =	11.4 =	10.6 =	20.7 = *	14.4 =	14.5 =	20.2 = *	13.1 =	13.1 =	14.7 =
Barium	mg/kg	34.6 =	47.3 =	20.2 J	106 =	117 =	220 J *	303 = *	149 = *	344 = *	172 = *
Beryllium	mg/kg	0.23 U	0.23 U	0.12 U	0.84 =	0.9 = *	0.55 J	0.52 J	0.64 =	0.65 =	0.43 J
Cadmium	mg/kg	0.59 U	0.64 U	0.6 U	0.58 U	0.58 U	0.4 J *	1 = *	0.59 U	0.17 J *	0.081 J *
Calcium	mg/kg	432 J	22,700 J	594 J	3,350 =	4,530 =	1,050 J	9,710 =	5,170 J	14,300 J	10,500 J
Chromium	mg/kg	10.1 =	11.2 =	7.6 =	20.8 J	18.7 J	17.2 J	26.6 =	17 =	22 =	18.5 =
Cobalt	mg/kg	7.6 =	6.6 =	4.2 J	16.1 =	16.1 =	7.4 =	6.8 J	14.6 =	15.5 =	11.4 =
Copper	mg/kg	18.3 =	17.3 =	12.3 =	22.7 =	22.1 =	39.3 J *	160 = *	50.1 = *	220 = *	35.5 = *
Iron	mg/kg	17,900 =	17,700 =	13,700 =	30,100 =	27,900 =	25,500 =	22,300 =	27,100 =	26,700 =	26,900 =
Lead	mg/kg	10.2 =	9.5 =	8.5 =	18.9 J	14 J	17.9 =	338 = *	34.8 = *	72.7 = *	146 = *
Magnesium	mg/kg	1,470 J	1,600 J	1,010 J	4,570 =	4,190 =	2,580 =	2,890 =	3,630 =	5210 J	5,110 =
Manganese	mg/kg	589 =	434 =	171 =	533 J	579 J	581 =	449 =	463 =	1,270 =	374 =
Mercury	mg/kg	0.017 J	0.014 J	0.12 U	0.014 J	0.015 J	0.029 J	0.024 J	0.021 J	0.015 J	0.017 J
Nickel	mg/kg	14 =	14.2 =	10.4 =	39.8 =	38.4 =	14.4 =	18.1 =	25.6 =	26 =	26.3 =
Potassium	mg/kg	998 =	880 =	760 =	2,410 =	1,770 =	1,250 =	2,380 =	1340 =	2,300 =	1,780 =
Selenium	mg/kg	0.75 U	0.69 U	0.69 U	0.47 J	0.44 J	1.7 = *	0.67 U	0.67 U	0.41 U	0.83 U
Silver	mg/kg	1.2 U	1.3 U	1.2 U	1.2 U	1.2 U	1.2 U	1.3 U	1.2 U	1.2 U	1.2 U
Sodium	mg/kg	592 U	83.2 U	602 U	60.1 J	64.1 J	615 U	341 U	137 U	239 U	114 U
Thallium	mg/kg	0.44 J	0.41 J	0.34 J	0.59 J	0.57 J	0.79 U	0.58 J	0.57 J	0.65 =	0.58 J
Vanadium	mg/kg	13.1 =	10.6 =	8.7 =	23.6 =	20.9 =	28.4 =	20.4 =	18.6 =	22.5 =	18.1 =
Zinc	mg/kg	54.6 =	45.7 =	42.1 =	76.9 J	79.3 J	101 = *	594 J *	87.7 =	154 = *	88.2 =

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-7. Winklepeck Burning Grounds
Subsurface Soil - Inorganics

Location		Pad 67	Pad 68	Pad 68	Pad 68	Pad 68	Pad 68	Pad 68	Pad 68
Station		WBG-252	WBG-254	WBG-255	WBG-257	WBG-257	WBG-257	WBG-257	WBG-257
Sample ID		WBGso-252-4183-SO	WBGso-254-4188-SO	WBGso-255-4191-SO	WBGso-257-4197-SO	WBGso-257-4198-SO	WBGso-257-4199-SO	WBGso-257-4276-SO	WBGso-257-4200-SO
Date		10/22/2000	10/19/2000	10/19/2000	10/30/2000	10/30/2000	10/30/2000	10/30/2000	10/30/2000
Depth (ft)		8 - 10	2 - 4	2 - 4	2 - 4	4 - 6	6 - 8	6 - 8	8 - 9
Field Type		Grab	Grab	Grab	Grab	Grab	Grab	Field Duplicate	Grab
Analyte	**Units**								
Cyanide	mg/kg			0.58 UJ					
Chromium, hexavalent	mg/kg								
Aluminum	mg/kg	13,000 J	8,340 =	9,940 =	7,300 =	10,900 =	9,960 =	11,000 =	9,610 =
Antimony	mg/kg	1.9 J *	1.2 UJ	0.75 J	1.2 UJ	0.71 J	1.3 UJ	1.3 UJ	1.2 UJ
Arsenic	mg/kg	16.2 =	7.3 =	21.1 = *	7.6 =	17.1 =	14.8 =	12.3 =	10.7 =
Barium	mg/kg	201 = *	48.5 =	80 =	65.4 =	92.2 =	54.6 =	50.8 =	39.1 =
Beryllium	mg/kg	0.6 =	0.11 U	0.42 J	0.31 U	0.4 J	0.41 J	0.46 J	0.4 J
Cadmium	mg/kg	0.58 U	0.6 U	0.29 J *	0.084 J *	0.24 J *	0.18 J *	0.16 J *	0.15 J *
Calcium	mg/kg	10,100 J	560 J	1,390 J	529 J	1,690 J	13,500 J	11,300 J	13,700 =
Chromium	mg/kg	19.7 =	9.3 J	14.4 J	8.7 J	16.3 J	16 J	16.6 J	15.3 J
Cobalt	mg/kg	11.2 =	3.7 J	9.9 =	6.7 =	11.5 =	10.8 J	9.3 =	9.7 =
Copper	mg/kg	32.1 =	11 J	28.4 J	16.2 J	24.2 J	21.4 J	18.1 J	18.6 J
Iron	mg/kg	28,900 =	12,300 =	25,300 =	13,600 =	26,800 =	25,800 =	22,700 =	23,700 =
Lead	mg/kg	23.9 = *	7.2 J	18.1 J	8 =	20.3 = *	12.9 =	11.7 =	10.1 =
Magnesium	mg/kg	5,110 =	1,240 =	2,850 =	1,540 J	3,310 J	5,320 J	5,350 J	5,520 J
Manganese	mg/kg	361 =	154 =	352 =	240 J	333 J	386 J	272 J	268 J
Mercury	mg/kg	0.014 J	0.039 J	0.018 J	0.031 J	0.034 J	0.021 J	0.012 J	0.017 J
Nickel	mg/kg	27.2 =	8.8 =	24.9 =	15 J	27.8 J	26.7 J	23.3 J	24.2 J
Potassium	mg/kg	2,880 =	690 =	1,500 =	864 J	2,080 J	1,940 J	2,560 J	2,100 J
Selenium	mg/kg	0.48 U	0.6 U	0.58 U	0.59 U	0.62 U	0.44 J	0.49 J	0.61 U
Silver	mg/kg	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.3 U	1.3 U	1.2 U
Sodium	mg/kg	106 U	601 UJ	583 UJ	588 U	80.9 J	84.7 J	92.5 J	93.7 J
Thallium	mg/kg	0.65 =	0.32 J	0.48 J	0.33 J	0.44 J	0.42 J	0.49 J	0.38 J
Vanadium	mg/kg	20.2 =	15 =	18.1 =	12.4 J	24.7 J	16.8 J	19.1 J	16.1 J
Zinc	mg/kg	84.4 =	31.2 J	96.2 J *	40.8 J	89.9 J	67.2 J	58.7 J	55.7 J

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-8. Winklepeck Burning Grounds
Subsurface Soil - Semivolatile Organic Constituents

Location		Pad 58	Pad 59	Pad 61	Pad 68
Station		WBG-199	WBG-210	WBG-217	WBG-255
Sample ID		WBGso-199-4008-SO	WBGso-210-4042-SO	WBGso-217-4065-SO	WBGso-255-4191-SO
Date		10/21/2000	10/30/2000	10/22/2000	10/19/2000
Depth (ft)		4 - 6	2 - 4	2 - 4	2 - 4
Field Type		Grab	Grab	Grab	Grab
Analyte	**Units**				
1,2,4-Trichlorobenzene	mg/kg	0.37 U	0.38 U	240 U	0.38 U
1,2-Dichlorobenzene	mg/kg	0.37 U	0.38 U	240 U	0.38 U
1,3-Dichlorobenzene	mg/kg	0.37 U	0.38 U	240 U	0.38 U
1,4-Dichlorobenzene	mg/kg	0.37 U	0.38 U	240 U	0.38 U
2,4,5-Trichlorophenol	mg/kg	0.37 U	0.38 U	240 U	0.38 U
2,4,6-Trichlorophenol	mg/kg	0.37 U	0.38 U	240 U	0.38 U
2,4-Dichlorophenol	mg/kg	0.37 U	0.38 U	240 U	0.38 U
2,4-Dimethylphenol	mg/kg	0.37 U	0.38 U	240 U	0.38 U
2,4-Dinitrophenol	mg/kg	0.89 U	0.93 U	570 U	0.93 U
2,4-Dinitrotoluene	mg/kg	0.37 U	0.38 U	240 U	0.38 U
2,6-Dinitrotoluene	mg/kg	0.37 U	0.38 U	240 U	0.38 U
2-Chloronaphthalene	mg/kg	0.37 U	0.38 U	240 U	0.38 U
2-Chlorophenol	mg/kg	0.37 U	0.38 U	240 U	0.38 U
2-Methyl-4,6-dinitrophenol	mg/kg	0.89 U	0.93 U	570 U	0.93 U
2-Methylnaphthalene	mg/kg	0.37 U	17 =	240 U	0.38 U
2-Methylphenol	mg/kg	0.37 U	0.38 U	240 U	0.38 U
2-Nitrobenzenamine	mg/kg	0.89 U	0.93 U	570 U	0.93 U
2-Nitrophenol	mg/kg	0.37 U	0.38 U	240 U	0.38 U
3,3'-Dichlorobenzidine	mg/kg	0.37 U	0.38 U	240 U	0.38 U
3-Nitrobenzenamine	mg/kg	0.89 U	0.93 U	570 U	0.93 U
4-Bromophenyl phenyl ether	mg/kg	0.37 U	0.38 U	240 U	0.38 U
4-Chloro-3-methylphenol	mg/kg	0.37 U	0.38 U	240 U	0.38 U
4-Chlorobenzenamine	mg/kg	0.37 U	0.38 U	240 U	0.38 U
4-Chlorophenyl phenyl ether	mg/kg	0.37 U	0.38 U	240 U	0.38 U
4-Methylphenol	mg/kg	0.37 U	0.38 U	240 U	0.38 U
4-Nitrobenzenamine	mg/kg	0.89 U	0.93 U	570 U	0.93 U
4-Nitrophenol	mg/kg	0.89 U	0.93 U	570 U	0.93 U
Acenaphthene	mg/kg	0.37 U	0.44 =	65 J	0.38 U
Acenaphthylene	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Anthracene	mg/kg	0.37 U	0.16 J	400 =	0.38 U
Benz(*a*)anthracene	mg/kg	0.2 J	0.38 U	570 =	0.38 U
Benzo(*a*)pyrene	mg/kg	0.22 J	0.38 U	510 =	0.38 U
Benzo(*b*)fluoranthene	mg/kg	0.29 J	0.38 U	620 =	0.38 U
Benzo(*g,h,i*)perylene	mg/kg	0.11 J	0.38 U	280 =	0.38 U
Benzo(*k*)fluoranthene	mg/kg	0.13 J	0.38 U	280 =	0.38 U
Bis(2-chloroethoxy)methane	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Bis(2-chloroethyl)ether	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Bis(2-chloroisopropyl)ether	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Bis(2-ethylhexyl)phthalate	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Butyl benzyl phthalate	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Carbazole	mg/kg	0.37 U	0.38 U	190 J	0.38 U
Chrysene	mg/kg	0.2 J	0.38 U	540 =	0.38 U

Table H-8. Winklepeck Burning Grounds
Subsurface Soil - Semivolatile Organic Constituents

Location		Pad 58	Pad 59	Pad 61	Pad 68
Station		WBG-199	WBG-210	WBG-217	WBG-255
Sample ID		WBGso-199-4008-SO	WBGso-210-4042-SO	WBGso-217-4065-SO	WBGso-255-4191-SO
Date		10/21/2000	10/30/2000	10/22/2000	10/19/2000
Depth (ft)		4 - 6	2 - 4	2 - 4	2 - 4
Field Type		Grab	Grab	Grab	Grab
Analyte	**Units**				
Di-n-butyl phthalate	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Di-n-octylphthalate	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Dibenz(*a,h*)anthracene	mg/kg	0.37 U	0.38 U	59 J	0.38 U
Dibenzofuran	mg/kg	0.37 U	0.38 U	110 J	0.38 U
Diethyl phthalate	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Dimethyl phthalate	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Fluoranthene	mg/kg	0.41 =	0.05 J	1500 =	0.38 U
Fluorene	mg/kg	0.37 U	0.93 =	130 J	0.38 U
Hexachlorobenzene	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Hexachlorobutadiene	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Hexachlorocyclopentadiene	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Hexachloroethane	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Indeno(*1,2,3-cd*)pyrene	mg/kg	0.13 J	0.38 U	320 =	0.38 U
Isophorone	mg/kg	0.37 U	0.38 U	240 U	0.38 U
N-Nitroso-di-n-propylamine	mg/kg	0.37 U	0.38 U	240 U	0.38 U
N-Nitrosodiphenylamine	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Naphthalene	mg/kg	0.37 U	1.6 =	62 J	0.38 U
Nitrobenzene	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Pentachlorophenol	mg/kg	0.89 U	0.93 U	570 U	0.93 U
Phenanthrene	mg/kg	0.14 J	3.2 =	1300 =	0.38 U
Phenol	mg/kg	0.37 U	0.38 U	240 U	0.38 U
Pyrene	mg/kg	0.47 =	0.13 J	1100 =	0.38 U

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-9. Winklepeck Burning Grounds
Subsurface Soil - Volatile Organic Compounds

Location		Pad 58	Pad 59	Pad 61	Pad 68
Station		WBG-199	WBG-210	WBG-217	WBG-255
Sample ID		WBGso-199-4008-SO	WBGso-210-4042-SO	WBGso-217-4065-SO	WBGso-255-4191-SO
Date		10/21/2000	10/30/2000	10/22/2000	10/19/2000
Depth (ft)		4 - 6	2 - 4	2 - 4	2 - 4
Field Type		Grab	Grab	Grab	Grab
Analyte	**Units**				
1,1,1-Trichloroethane	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
1,1,2,2-Tetrachloroethane	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
1,1,2-Trichloroethane	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
1,1-Dichloroethane	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
1,1-Dichloroethene	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
1,2-Dibromoethane	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
1,2-Dichloroethane	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
1,2-Dichloroethene	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
1,2-Dichloropropane	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
2-Butanone	mg/kg	0.011 U	0.012 UJ	0.011 U	0.012 U
2-Hexanone	mg/kg	0.011 UJ	0.012 UJ	0.011 UJ	0.012 UJ
4-Methyl-2-pentanone	mg/kg	0.011 U	0.012 U	0.011 U	0.012 U
Acetone	mg/kg	0.011 UJ	0.02 UJ	0.011 UJ	0.0049 J
Benzene	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
Bromochloromethane	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
Bromodichloromethane	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
Bromoform	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
Bromomethane	mg/kg	0.011 U	0.012 U	0.011 U	0.012 U
Carbon Disulfide	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
Carbon Tetrachloride	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
Chlorobenzene	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
Chloroethane	mg/kg	0.011 U	0.012 U	0.011 U	0.012 U
Chloroform	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
Chloromethane	mg/kg	0.011 U	0.012 U	0.011 U	0.012 U
Dibromochloromethane	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
Dimethylbenzene	mg/kg	0.0056 U	0.026 J	0.0057 U	0.0058 U
Ethylbenzene	mg/kg	0.0056 U	0.021 J	0.0057 U	0.0058 U
Methylene Chloride	mg/kg	0.0056 U	0.0058 UJ	0.0057 U	0.0066 =
Styrene	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
Tetrachloroethene	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
Toluene	mg/kg	0.0056 U	0.011 =	0.0057 U	0.0058 U
Trichloroethene	mg/kg	0.0056 U	0.0058 U	0.0011 J	0.0058 U
Vinyl Chloride	mg/kg	0.011 U	0.012 U	0.011 U	0.012 U
cis -1,3-Dichloropropene	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U
trans -1,3-Dichloropropene	mg/kg	0.0056 U	0.0058 U	0.0057 U	0.0058 U

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-10. Winklepeck Burning Grounds
Subsurface Soil - Pesticides and PCBs

Location		Pad 58	Pad 59	Pad 61	Pad 68
Station		WBG-199	WBG-210	WBG-217	WBG-255
Sample ID		WBGso-199-4008-SO	WBGso-210-4042-SO	WBGso-217-4065-SO	WBGso-255-4191-SO
Date		10/21/2000	10/30/2000	10/22/2000	10/19/2000
Depth (ft)		4 - 6	2 - 4	2 - 4	2 - 4
Field Type		Grab	Grab	Grab	Grab
Analyte	Units				
4,4'-DDD	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U
4,4'-DDE	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U
4,4'-DDT	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U
Aldrin	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U
Dieldrin	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U
Endosulfan I	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U
Endosulfan II	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U
Endosulfan Sulfate	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U
Endrin	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U
Endrin Aldehyde	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U
Endrin Ketone	mg/kg	0.019 U	0.0043 =	0.0019 U	0.002 U
Heptachlor	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U
Heptachlor Epoxide	mg/kg	0.05 J	0.004 U	0.0019 U	0.002 U
Lindane	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U
Methoxychlor	mg/kg	0.037 U	0.0077 UJ	0.0038 U	0.0038 U
PCB-1016	mg/kg	0.037 U	0.038 U	0.038 U	0.038 U
PCB-1221	mg/kg	0.037 U	0.038 U	0.038 U	0.038 U
PCB-1232	mg/kg	0.037 U	0.038 U	0.038 U	0.038 U
PCB-1242	mg/kg	0.037 U	0.038 U	0.038 U	0.038 U
PCB-1248	mg/kg	0.037 U	0.038 U	0.038 U	0.038 U
PCB-1254	mg/kg	0.037 U	0.038 U	0.038 U	0.038 U
PCB-1260	mg/kg	0.037 U	0.038 U	0.038 U	0.038 U
Toxaphene	mg/kg	0.74 U	0.16 U	0.076 U	0.078 U
alpha-BHC	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U
alpha-Chlordane	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U
beta-BHC	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U
delta-BHC	mg/kg	0.019 U	0.004 UJ	0.0019 U	0.002 U
gamma-Chlordane	mg/kg	0.019 U	0.004 U	0.0019 U	0.002 U

BHC = Benzene hexachloride.
DDD = Dichlorodiphenyldichloroethane.
DDE = Dichlorodiphenyldichloroethylene.
DDT = Dichlorodiphenyl-trichloroethane.
PCB = Polychlorinated biphenyl.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-11. Winklepeck Burning Grounds
Sediment - Explosive and Propellants

Location		Ditch Between Pad 59/60, North of Road E	Ditch Between Pad 59/60, North of Road E
Station		WBG-294	WBG-295
Sample ID		WBGsd-294-4249-SD	WBGsd-295-4250-SD
Date		10/24/2000	10/24/2000
Depth (ft)		0 - 1	0 - 1
Field Type		Grab	Grab
Analyte	**Units**		
Nitrocellulose	mg/kg	2.6 U	2 U
Nitroguanidine	mg/kg	0.035 J	0.25 U

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-12. Winklepeck Burning Grounds
Sediment - Inorganics

Location		Ditch Between Pad 59/60, North of Road E	Ditch Between Pad 59/60, North of Road E
Station		WBG-294	WBG-295
Sample ID		WBGsd-294-4249-SD	WBGsd-295-4250-SD
Date		10/24/2000	10/24/2000
Depth (ft)		0 - 1	0 - 1
Field Type		Grab	Grab
Analyte	**Units**		
Cyanide	mg/kg	0.63 UJ	0.65 UJ
Chromium, hexavalent	mg/kg	5 J	1.3 R
Aluminum	mg/kg	9,940 =	14,900 = *
Antimony	mg/kg	2 J *	1.7 J *
Arsenic	mg/kg	11 =	13.7 =
Barium	mg/kg	67.3 =	76.7 =
Beryllium	mg/kg	0.42 J *	0.47 J *
Cadmium	mg/kg	0.59 J *	0.73 = *
Calcium	mg/kg	1,420 =	2,220 =
Chromium	mg/kg	14.7 J	20.1 J *
Cobalt	mg/kg	9.1 =	7.9 =
Copper	mg/kg	19.3 =	30.9 = *
Iron	mg/kg	19,200 =	25,400 =
Lead	mg/kg	34.7 J *	44.6 J *
Magnesium	mg/kg	2,130 =	3,050 = *
Manganese	mg/kg	302 J	207 J
Mercury	mg/kg	0.04 J	0.024 J
Nickel	mg/kg	16.4 =	19.6 = *
Potassium	mg/kg	1,140 =	1,970 = *
Selenium	mg/kg	0.79 =	3.6 = *
Silver	mg/kg	1.3 U	1.3 U
Sodium	mg/kg	632 U	161 J *
Thallium	mg/kg	0.47 J	0.53 J
Vanadium	mg/kg	19.8 =	26.8 = *
Zinc	mg/kg	101 J	328 J
Total Organic Carbon	mg/kg	16,000 =	2,700 =

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-13. Winklepeck Burning Grounds
Sediment - Total Organic Carbon

Location		**Ditch Between Pad 59/60, North of Road E**	**Ditch Between Pad 59/60, North of Road E**
Station		**WBG-294**	**WBG-295**
Sample ID		**WBGsd-294-4249-SD**	**WBGsd-295-4250-SD**
Date		**10/24/2000**	**10/24/2000**
Depth (ft)		**0 - 1**	**0 - 1**
Field Type		**Grab**	**Grab**
Analyte	**Units**		
Total Organic Carbon	mg/kg	16,000=	2,700=

Qualifier:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-14. Winklepeck Burning Grounds
Sediment - Semivolatile Organic Constituents

Location		Ditch Between Pad 59/60, North of Road E	Ditch Between Pad 59/60, North of Road E
Station		WBG-294	WBG-295
Sample ID		WBG4249	WBG4250
Customer ID		WBGsd-294-4249-SD	WBGsd-295-4250-SD
Date		10/24/2000	10/24/2000
Depth (ft)		0 - 1	0 - 1
Field Type		Grab	Grab
Analyte	**Units**		
1,2,4-Trichlorobenzene	mg/kg	0.42 U	0.43 U
1,2-Dichlorobenzene	mg/kg	0.42 U	0.43 U
1,3-Dichlorobenzene	mg/kg	0.42 U	0.43 U
1,4-Dichlorobenzene	mg/kg	0.42 U	0.43 U
2,4,5-Trichlorophenol	mg/kg	0.42 U	0.43 U
2,4,6-Trichlorophenol	mg/kg	0.42 U	0.43 U
2,4-Dichlorophenol	mg/kg	0.42 U	0.43 U
2,4-Dimethylphenol	mg/kg	0.42 U	0.43 U
2,4-Dinitrophenol	mg/kg	1 U	1 U
2,4-Dinitrotoluene	mg/kg	0.42 U	0.43 U
2,6-Dinitrotoluene	mg/kg	0.42 U	0.43 U
2-Chloronaphthalene	mg/kg	0.42 U	0.43 U
2-Chlorophenol	mg/kg	0.42 U	0.43 U
2-Methyl-4,6-dinitrophenol	mg/kg	1 U	1 U
2-Methylnaphthalene	mg/kg	0.42 U	0.43 U
2-Methylphenol	mg/kg	0.42 U	0.43 U
2-Nitrobenzenamine	mg/kg	1 U	1 U
2-Nitrophenol	mg/kg	0.42 U	0.43 U
3,3'-Dichlorobenzidine	mg/kg	0.42 U	0.43 U
3-Nitrobenzenamine	mg/kg	1 U	1 U
4-Bromophenyl phenyl ether	mg/kg	0.42 U	0.43 U
4-Chloro-3-methylphenol	mg/kg	0.42 U	0.43 U
4-Chlorobenzenamine	mg/kg	0.42 U	0.43 U
4-Chlorophenyl phenyl ether	mg/kg	0.42 U	0.43 U
4-Methylphenol	mg/kg	0.42 U	0.43 U
4-Nitrobenzenamine	mg/kg	1 U	1 U
4-Nitrophenol	mg/kg	1 U	1 U
Acenaphthene	mg/kg	0.42 U	0.43 U
Acenaphthylene	mg/kg	0.42 U	0.43 U
Anthracene	mg/kg	0.42 U	0.43 U
Benz(*a*)anthracene	mg/kg	0.42 U	0.43 U
Benzo(*a*)pyrene	mg/kg	0.42 U	0.43 U
Benzo(*b*)fluoranthene	mg/kg	0.42 U	0.43 U
Benzo(*g,h,i*)perylene	mg/kg	0.42 U	0.43 U
Benzo(*k*)fluoranthene	mg/kg	0.42 U	0.43 U
Bis(2-chloroethoxy)methane	mg/kg	0.42 U	0.43 U
Bis(2-chloroethyl) ether	mg/kg	0.42 U	0.43 U
Bis(2-chloroisopropyl) ether	mg/kg	0.42 U	0.43 U
Bis(2-ethylhexyl)phthalate	mg/kg	0.42 U	0.43 U
Butyl benzyl phthalate	mg/kg	0.42 U	0.43 U
Carbazole	mg/kg	0.42 U	0.43 U

Table H-14. Winklepeck Burning Grounds
Sediment - Semivolatile Organic Constituents

Location		Ditch Between Pad 59/60, North of Road E	Ditch Between Pad 59/60, North of Road E
Station		WBG-294	WBG-295
Sample ID		WBG4249	WBG4250
Customer ID		WBGsd-294-4249-SD	WBGsd-295-4250-SD
Date		10/24/2000	10/24/2000
Depth (ft)		0 - 1	0 - 1
Field Type		Grab	Grab
Analyte	**Units**		
Chrysene	mg/kg	0.42 U	0.43 U
Di-n-butyl phthalate	mg/kg	0.87 =	0.43 U
Di-n-octylphthalate	mg/kg	0.42 U	0.43 U
Dibenz(*a,h*)anthracene	mg/kg	0.42 U	0.43 U
Dibenzofuran	mg/kg	0.42 U	0.43 U
Diethyl phthalate	mg/kg	0.42 U	0.43 U
Dimethyl phthalate	mg/kg	0.42 U	0.43 U
Fluoranthene	mg/kg	0.42 U	0.43 U
Fluorene	mg/kg	0.42 U	0.43 U
Hexachlorobenzene	mg/kg	0.42 U	0.43 U
Hexachlorobutadiene	mg/kg	0.42 U	0.43 U
Hexachlorocyclopentadiene	mg/kg	0.42 U	0.43 U
Hexachloroethane	mg/kg	0.42 U	0.43 U
Indeno(*1,2,3-cd*)pyrene	mg/kg	0.42 U	0.43 U
Isophorone	mg/kg	0.42 U	0.43 U
N-Nitroso-di-n-propylamine	mg/kg	0.42 U	0.43 U
N-Nitrosodiphenylamine	mg/kg	0.085 J	0.43 U
Naphthalene	mg/kg	0.42 U	0.43 U
Nitrobenzene	mg/kg	0.42 U	0.43 U
Pentachlorophenol	mg/kg	1 U	1 U
Phenanthrene	mg/kg	0.42 U	0.43 U
Phenol	mg/kg	0.42 U	0.43 U
Pyrene	mg/kg	0.42 U	0.43 U

Qualifier:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-15. Winklepeck Burning Grounds
Sediment - Volatile Organic Compounds

Location		Ditch Between Pad 59/60, North of Road E	Ditch Between Pad 59/60, North of Road E
Station		WBG-294	WBG-295
Sample ID		WBGsd-294-4249-SD	WBGsd-295-4250-SD
Date		10/24/2000	10/24/2000
Depth (ft)		0 - 1	0 - 1
Field Type		Grab	Grab
Analyte	**Units**		
1,1,1-Trichloroethane	mg/kg	0.0063 U	0.0065 U
1,1,2,2-Tetrachloroethane	mg/kg	0.0063 U	0.0065 U
1,1,2-Trichloroethane	mg/kg	0.0063 U	0.0065 U
1,1-Dichloroethane	mg/kg	0.0063 U	0.0065 U
1,1-Dichloroethene	mg/kg	0.0063 U	0.0065 U
1,2-Dibromoethane	mg/kg	0.0063 U	0.0065 U
1,2-Dichloroethane	mg/kg	0.0063 U	0.0065 U
1,2-Dichloroethene	mg/kg	0.0063 U	0.0065 U
1,2-Dichloropropane	mg/kg	0.0063 U	0.0065 U
2-Butanone	mg/kg	0.013 U	0.013 U
2-Hexanone	mg/kg	0.013 UJ	0.013 UJ
4-Methyl-2-pentanone	mg/kg	0.013 U	0.013 U
Acetone	mg/kg	0.013 UJ	0.013 UJ
Benzene	mg/kg	0.0063 U	0.0065 U
Bromochloromethane	mg/kg	0.0063 U	0.0065 U
Bromodichloromethane	mg/kg	0.0063 U	0.0065 U
Bromoform	mg/kg	0.0063 U	0.0065 U
Bromomethane	mg/kg	0.013 U	0.013 U
Carbon Disulfide	mg/kg	0.0063 U	0.0065 U
Carbon Tetrachloride	mg/kg	0.0063 U	0.0065 U
Chlorobenzene	mg/kg	0.0063 U	0.0065 U
Chloroethane	mg/kg	0.013 U	0.013 U
Chloroform	mg/kg	0.0063 U	0.0065 U
Chloromethane	mg/kg	0.013 U	0.013 U
Dibromochloromethane	mg/kg	0.0063 U	0.0065 U
Dimethylbenzene	mg/kg	0.0063 U	0.0065 U
Ethylbenzene	mg/kg	0.0063 U	0.0065 U
Methylene Chloride	mg/kg	0.0063 U	0.0065 U
Styrene	mg/kg	0.0063 U	0.0065 U
Tetrachloroethene	mg/kg	0.0063 U	0.0065 U
Toluene	mg/kg	0.0063 U	0.0065 U
Trichloroethene	mg/kg	0.0063 U	0.0012 J
Vinyl Chloride	mg/kg	0.013 U	0.013 U
cis -1,3-Dichloropropene	mg/kg	0.0063 U	0.0065 U
trans -1,3-Dichloropropene	mg/kg	0.0063 U	0.0065 U

Qualifier:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-16. Winklepeck Burning Grounds
Sediment - Pesticides and PCBs

Location Station Sample ID Date Depth (ft) Field Type Analyte	Units	Ditch Between Pad 59/60, North of Road E WBG-294 WBGsd-294-4249-SD 10/24/2000 0 - 1 Grab	Ditch Between Pad 59/60, North of Road E WBG-295 WBGsd-295-4250-SD 10/24/2000 0 - 1 Grab
4,4'-DDD	mg/kg	0.0021 U	0.0022 U
4,4'-DDE	mg/kg	0.0021 U	0.0022 U
4,4'-DDT	mg/kg	0.0021 U	0.0022 U
Aldrin	mg/kg	0.0021 U	0.0022 U
Dieldrin	mg/kg	0.0021 U	0.0022 U
Endosulfan I	mg/kg	0.0021 U	0.0022 U
Endosulfan II	mg/kg	0.0021 U	0.0022 U
Endosulfan Sulfate	mg/kg	0.0021 U	0.0022 U
Endrin	mg/kg	0.0021 U	0.0022 U
Endrin Aldehyde	mg/kg	0.0021 U	0.0022 U
Endrin Ketone	mg/kg	0.0021 UJ	0.0022 UJ
Heptachlor	mg/kg	0.0021 U	0.0022 U
Heptachlor Epoxide	mg/kg	0.0021 U	0.0022 U
Lindane	mg/kg	0.0021 U	0.0022 U
Methoxychlor	mg/kg	0.0042 U	0.0043 U
PCB-1016	mg/kg	0.042 U	0.043 U
PCB-1221	mg/kg	0.042 U	0.043 U
PCB-1232	mg/kg	0.042 U	0.043 U
PCB-1242	mg/kg	0.042 U	0.043 U
PCB-1248	mg/kg	0.042 U	0.043 U
PCB-1254	mg/kg	0.042 U	0.043 U
PCB-1260	mg/kg	0.032 J	0.043 U
Toxaphene	mg/kg	0.085 U	0.087 U
alpha-BHC	mg/kg	0.0021 U	0.0022 U
alpha-Chlordane	mg/kg	0.0021 U	0.0022 U
beta-BHC	mg/kg	0.0021 UJ	0.0022 UJ
delta-BHC	mg/kg	0.0021 U	0.0022 U
gamma-Chlordane	mg/kg	0.0021 U	0.0022 U

BHC = Benzene hexachloride.
DDD = Dichlorodiphenyldichloroethane.
DDE = Dichlorodiphenyldichloroethylene.
DDT = Dichlorodiphenyl-trichloroethane.
PCB = Polychlorinated biphenyl.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-17. Winklepeck Burning Grounds
Groundwater - Explosives and Propellants

Location Station / Sample ID / Date / Filtered / Field Type		Existing Monitoring Wells OBG-1 WBGmw-164-4251-GF 11/05/2000 Total Grab	Existing Monitoring Wells OBG-2 WBGmw-165-4252-GF 11/05/2000 Total Grab	Existing Monitoring Wells OBG-3 WBGmw-166-4253-GF 11/05/2000 Total Grab	Existing Monitoring Wells OBG-4 WBGmw-167-4254-GF 11/05/2000 Total Grab	Existing Monitoring Wells WBGmw-005 WBGmw-005-4255-GF 11/04/2000 Total Grab	Existing Monitoring Wells WBGmw-006 WBGmw-006-4256-GF 11/03/2000 Total Grab	Existing Monitoring Wells WBGmw-007 WBGmw-007-4257-GF 11/03/2000 Total Grab
Analyte	**Units**							
1,3,5-Trinitrobenzene	µg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.11 J	0.2 U
1,3-Dinitrobenzene	µg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2,4,6-Trinitrotoluene	µg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.52 =	0.2 U
2,4-Dinitrotoluene	µg/L	0.44 =	0.13 U	0.091 J	0.061 J	0.053 J	0.95 =	0.081 J
2,6-Dinitrotoluene	µg/L	0.12 J	0.13 U	0.13 U	0.13 U	0.13 U	0.25 =	0.13 U
2-Amino-4,6-dinitrotoluene	µg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Nitrotoluene	µg/L	0.19 J	0.2 U	0.2 U	0.2 U	0.2 U	0.31 =	0.2 U
3-Nitrotoluene	µg/L	0.2 U	0.2 U	0.2 U	0.15 J	0.2 U	0.2 U	0.2 U
4-Amino-2,6-dinitrotoluene	µg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
4-Nitrotoluene	µg/L	0.2 =	0.2 U	0.2 U	0.2 U	0.16 J	0.38 =	0.2 U
HMX	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	11 =	0.5 U
Nitrobenzene	µg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nitrocellulose	µg/L	500 U	500 U	500 U	500 U	500 U	500 U	500 U
Nitroglycerin	µg/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Nitroguanidine	µg/L	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ
RDX	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	52 =	0.5 U
Tetryl	µg/L	0.2 U	0.2 U	0.2 U	0.098 J	0.2 U	0.2 U	0.2 U

HMX = Octahydro-1,3,5,7-tetranitro-
1,3,5,7-tetrazocine.
RDX = Hexahydro-1,3,5-trinitro-
1,3,5-triazine.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-17. Winklepeck Burning Grounds
Groundwater - Explosives and Propellants

Location Station / Sample ID / Date / Filtered / Field Type		Existing Monitoring Wells WBGmw-008 WBGmw-008-4258-GF 11/03/2000 Total Grab	Existing Monitoring Wells WBGmw-009 WBGmw-009-4259-GF 11/04/2000 Total Grab	New Monitoring Wells WBGmw-010 WBGmw-010-4260-GF 11/02/2000 Total Grab	New Monitoring Wells WBGmw-010 WBGmw-010-4285-GF 11/02/2000 Total Field Duplicate	New Monitoring Wells WBGmw-011 WBGmw-011-4261-GF 11/02/2000 Total Grab	New Monitoring Wells WBGmw-011 WBGmw-011-4284-GF 11/02/2000 Total Field Duplicate
Analyte	**Units**						
1,3,5-Trinitrobenzene	µg/L	0.2 U	0.2 U	0.2 U	0.11 J	0.2 U	0.2 U
1,3-Dinitrobenzene	µg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2,4,6-Trinitrotoluene	µg/L	0.85 =	0.2 U	0.2 U	0.23 =	0.2 U	0.2 U
2,4-Dinitrotoluene	µg/L	0.073 J	0.13 U	0.28 =	0.17 =	0.093 J	0.16 =
2,6-Dinitrotoluene	µg/L	0.13 U	0.13 U	0.28 U	0.19 U	0.1 J	0.1 J
2-Amino-4,6-dinitrotoluene	µg/L	0.2 U	0.2 U	1.3 =	1.2 =	0.2 U	0.2 U
2-Nitrotoluene	µg/L	0.2 U	0.2 U	0.2 =	0.2 U	0.33 =	0.29 =
3-Nitrotoluene	µg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
4-Amino-2,6-dinitrotoluene	µg/L	0.2 U	0.2 U	0.54 =	0.55 =	0.2 U	0.2 U
4-Nitrotoluene	µg/L	0.2 U	0.2 U	0.31 =	0.2 U	0.2 U	0.1 J
HMX	µg/L	0.5 U	0.74 =	0.5 U	0.5 U	0.5 U	0.5 U
Nitrobenzene	µg/L	0.2 U	0.2 U	0.2 U	0.067 J	0.2 U	0.2 U
Nitrocellulose	µg/L	500 U	500 U	500 UJ	500 UJ	500 UJ	500 UJ
Nitroglycerin	µg/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Nitroguanidine	µg/L	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ
RDX	µg/L	0.5 U	5.3 =	0.5 U	0.5 U	0.5 U	0.5 U
Tetryl	µg/L	0.2 U	0.36 =	0.2 U	0.7 =	0.2 U	0.077 J

HMX = Octahydro-1,3,5,7-tetranitro-
1,3,5,7-tetrazocine.
RDX = Hexahydro-1,3,5-trinitro-
1,3,5-triazine.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-17. Winklepeck Burning Grounds
Groundwater - Explosives and Propellants

Location Station Sample ID Date Filtered Field Type		New Monitoring Wells WBGmw-012 WBGmw-012-4262-GF 11/04/2000 Total Grab	New Monitoring Wells WBGmw-013 WBGmw-013-4263-GF 11/02/2000 Total Grab	New Monitoring Wells WBGmw-014 WBGmw-014-4264-GF 11/04/2000 Total Grab	New Monitoring Wells WBGmw-015 WBGmw-015-4265-GF 11/01/2000 Total Grab	New Monitoring Wells WBGmw-016 WBGmw-016-4266-GF 11/03/2000 Total Grab	New Monitoring Wells WBGmw-017 WBGmw-017-4267-GF 11/01/2000 Total Grab
Analyte	**Units**						
1,3,5-Trinitrobenzene	µg/L	0.2 U	0.2 U	0.2 U	1.3 =	0.2 U	0.3 =
1,3-Dinitrobenzene	µg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2,4,6-Trinitrotoluene	µg/L	0.2 U	0.2 U	0.2 U	0.94 =	0.2 U	0.32 =
2,4-Dinitrotoluene	µg/L	0.08 J	0.13 U	0.13 U	0.32 U	0.068 J	0.13 U
2,6-Dinitrotoluene	µg/L	0.13 U	0.13 U	0.11 J	0.36 U	0.13 U	0.13 U
2-Amino-4,6-dinitrotoluene	µg/L	0.2 U	0.2 U	0.2 U	0.33 =	0.2 U	0.2 U
2-Nitrotoluene	µg/L	0.2 U	0.2 U	0.49 =	2.6 =	0.22 =	0.2 U
3-Nitrotoluene	µg/L	0.2 U	0.2 U	0.2 U	0.31 =	0.2 U	0.2 U
4-Amino-2,6-dinitrotoluene	µg/L	0.2 U	0.2 U	0.2 U	0.23 U	0.2 U	0.2 U
4-Nitrotoluene	µg/L	0.2 U	0.2 U	0.35 =	0.85 =	0.17 J	0.2 U
HMX	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Nitrobenzene	µg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nitrocellulose	µg/L	500 U	500 UJ	500 U	500 UJ	500 U	500 UJ
Nitroglycerin	µg/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Nitroguanidine	µg/L	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ
RDX	µg/L	0.5 U	0.5 U	0.27 J	0.77 U	0.25 J	0.5 U
Tetryl	µg/L	0.2 U	0.2 U	0.2 U	0.92 =	0.2 U	0.59 =

HMX = Octahydro-1,3,5,7-tetranitro-
1,3,5,7-tetrazocine.
RDX = Hexahydro-1,3,5-trinitro-
1,3,5-triazine.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-18. Winklepeck Burning Grounds
Groundwater - Inorganics

Location Station / Sample ID / Date / Filtered / Field Type		Existing Monitoring Wells OBG-1 WBGmw-164-4251-GF 11/05/2000 Dissolved Grab	Existing Monitoring Wells OBG-2 WBGmw-165-4252-GF 11/05/2000 Dissolved Grab	Existing Monitoring Wells OBG-3 WBGmw-166-4253-GF 11/05/2000 Dissolved Grab	Existing Monitoring Wells OBG-4 WBGmw-167-4254-GF 11/05/2000 Dissolved Grab	Existing Monitoring Wells WBGmw-005 WBGmw-005-4255-GF 11/04/2000 Dissolved Grab	Existing Monitoring Wells WBGmw-006 WBGmw-006-4256-GF 11/03/2000 Dissolved Grab	Existing Monitoring Wells WBGmw-007 WBGmw-007-4257-GF 11/03/2000 Dissolved Grab
Analyte	**Units**							
Cyanide	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Aluminum	µg/L	200 U	200 U	32 J *	200 U	200 U	200 U	200 U
Antimony	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Arsenic	µg/L	5 U	5 U	9.9 =	15 = *	24 = *	5 U	5 U
Barium	µg/L	8.8 J	42 J	110 J *	64 J	60 J	26 J	38 J
Beryllium	µg/L	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Cadmium	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	0.3 J *
Calcium	µg/L	61,000 =	89,800 =	68,000 =	145,000 = *	75,200 =	68,500 =	67,900 =
Chromium	µg/L	10 U	10 U	3.5 U	10 U	10 U	3.2 U	1.7 U
Cobalt	µg/L	50 U	50 U	50 U	50 U	1.8 J *	50 U	50 U
Copper	µg/L	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Iron	µg/L	100 U	290 = *	520 = *	1,200 = *	7,300 = *	100 U	210 =
Lead	µg/L	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Magnesium	µg/L	18,700 =	24,900 =	18,500 =	43,900 = *	18,600 =	22,400 =	17,500 =
Manganese	µg/L	15 U	250 =	130 =	680 =	1,300 = *	63 =	120 =
Mercury	µg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	µg/L	40 U	40 U	2.8 J *	40 U	40 U	40 U	40 U
Potassium	µg/L	800 J	1,100 J	930 J	1,300 J	1,300 J	910 J	1,300 J
Selenium	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Silver	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Sodium	µg/L	5,200 =	8,000 =	7,300 =	18,100 =	18,300 =	6,200 =	4,800 J
Thallium	µg/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
Vanadium	µg/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Zinc	µg/L	20 U	14 J	14 J	13 J	20 U	20 U	20 U

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-18. Winklepeck Burning Grounds
Groundwater - Inorganics

Location Station Sample ID Date Filtered Field Type		Existing Monitoring Wells WBGmw-008 WBGmw-008-4258-GF 11/03/2000 Dissolved Grab	Existing Monitoring Wells WBGmw-009 WBGmw-009-4259-GF 11/04/2000 Dissolved Grab	New Monitoring Wells WBGmw-010 WBGmw-010-4260-GF 11/02/2000 Dissolved Grab	New Monitoring Wells WBGmw-010 WBGmw-010-4285-GF 11/02/2000 Dissolved Field Duplicate	New Monitoring Wells WBGmw-011 WBGmw-011-4261-GF 11/02/2000 Dissolved Grab	New Monitoring Wells WBGmw-011 WBGmw-011-4284-GF 11/02/2000 Dissolved Field Duplicate	New Monitoring Wells WBGmw-012 WBGmw-012-4262-GF 11/04/2000 Dissolved Grab
Analyte	**Units**							
Cyanide	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Aluminum	µg/L	200 U	200 U	34 U	35 U	65 U	74 U	200 U
Antimony	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Arsenic	µg/L	8 =	5 U	5 U	5 U	5 U	5 U	5 U
Barium	µg/L	40 J	10 J	14 J	14 J	29 J	31 J	13 J
Beryllium	µg/L	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Cadmium	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Calcium	µg/L	80,900 =	43,600 =	31,900 =	32,700 =	51,600 =	54,100 =	71,000 =
Chromium	µg/L	10 U	1.5 U	1.7 J	2 J	10 U	10 U	1.5 U
Cobalt	µg/L	50 U	4.5 J *	50 U	50 U	50 U	50 U	50 U
Copper	µg/L	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Iron	µg/L	1,000 = *	290 = *	100 U	100 U	100 U	100 U	100 U
Lead	µg/L	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Magnesium	µg/L	20,800 =	13,300 =	9,300 =	9,500 =	10,500 =	11,100 =	19,200 =
Manganese	µg/L	530 =	180 =	32 =	35 =	45 =	48 =	74 =
Mercury	µg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	µg/L	40 U	6.2 J *	2.8 J *	59 = *	40 U	40 U	40 U
Potassium	µg/L	1,200 J	560 J	1,100 J	1,100 J	3,800 J *	4,000 J *	1,100 J
Selenium	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Silver	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Sodium	µg/L	7,900 =	5,300 =	3,500 J	3,500 J	3,400 J	3,700 J	3,800 J
Thallium	µg/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
Vanadium	µg/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Zinc	µg/L	20 U	13 J	48 =	43 =	20 U	20 U	14 J

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-18. Winklepeck Burning Grounds
Groundwater - Inorganics

Location		New Monitoring Wells	New Monitoring Wells	New Monitoring Wells	New Monitoring Wells	New Monitoring Wells
Station		WBGmw-013	WBGmw-014	WBGmw-015	WBGmw-016	WBGmw-017
Sample ID		WBGmw-013-4263-GF	WBGmw-014-4264-GF	WBGmw-015-4265-GF	WBGmw-016-4266-GF	WBGmw-017-4267-GF
Date		11/02/2000	11/04/2000	11/01/2000	11/03/2000	11/01/2000
Filtered		Dissolved	Dissolved	Dissolved	Dissolved	Dissolved
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	**Units**					
Cyanide	µg/L	10 U	10 U	10 U	10 U	10 U
Aluminum	µg/L	32 U	4,700 = *	49 U	200 U	34 U
Antimony	µg/L	5 U	5 U	5 U	5 U	5 U
Arsenic	µg/L	5 U	5 U	5 U	5 U	5 U
Barium	µg/L	19 J	19 J	73 J	47 J	53 J
Beryllium	µg/L	4 U	4 U	4 U	4 U	4 U
Cadmium	µg/L	5 U	5 U	5 U	5 U	5 U
Calcium	µg/L	90,400 =	72,400 =	107,000 =	81,400 =	71,600 =
Chromium	µg/L	10 U	10 U	1.4 J	10 U	10 U
Cobalt	µg/L	50 U	50 U	50 U	50 U	50 U
Copper	µg/L	25 U	25 U	25 U	25 U	25 U
Iron	µg/L	100 U	100 U	100 U	100 U	430 = *
Lead	µg/L	3 U	3 U	3 U	3 U	3 U
Magnesium	µg/L	33,300 =	17,700 =	33,700 =	20,600 =	18,100 =
Manganese	µg/L	81 =	280 =	230 =	540 =	250 =
Mercury	µg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	µg/L	40 U	40 U	2.3 J *	2.2 J *	40 U
Potassium	µg/L	840 J	1,600 J	2,300 J	1,700 J	1,400 J
Selenium	µg/L	5 U	5 U	5 U	5 U	5 U
Silver	µg/L	10 U	10 U	10 U	10 U	10 U
Sodium	µg/L	14,100 =	5,100 =	13,700 =	5,000 =	5,200 =
Thallium	µg/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
Vanadium	µg/L	50 U	50 U	50 U	50 U	50 U
Zinc	µg/L	20 U	20 U	500 = *	19 J	19 J

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.
* - exceeds site-wide background criteria.

Table H-19. Winklepeck Burning Grounds
Groundwater - Semivolatile Organic Constituents

Location		Existing Monitoring Wells	Existing Monitoring Wells	Existing Monitoring Wells	Existing Monitoring Wells	Existing Monitoring Wells
Station		OBG-1	OBG-2	OBG-3	OBG-4	WBGmw-005
Sample ID		WBGmw-164-4251-GF	WBGmw-165-4252-GF	WBGmw-166-4253-GF	WBGmw-167-4254-GF	WBGmw-005-4255-GF
Date		11/05/2000	11/05/2000	11/05/2000	11/05/2000	11/04/2000
Filtered		Total	Total	Total	Total	Total
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	**Units**					
1,2,4-Trichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	µg/L	10 U	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	µg/L	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	µg/L	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	µg/L	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	µg/L	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	µg/L	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	µg/L	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	µg/L	10 U	10 U	10 U	10 U	10 U
2-Methyl-4,6-dinitrophenol	µg/L	25 U	25 U	25 U	25 U	25 U
2-Methylnaphthalene	µg/L	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
2-Nitrobenzenamine	µg/L	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	µg/L	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	µg/L	10 U	10 U	10 U	10 U	10 U
3-Nitrobenzenamine	µg/L	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ
4-Bromophenyl phenyl ether	µg/L	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
4-Chlorobenzenamine	µg/L	10 R	10 R	10 R	10 R	10 R
4-Chlorophenyl phenyl ether	µg/L	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
4-Nitrobenzenamine	µg/L	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	µg/L	25 U	25 U	25 U	25 U	25 U
Acenaphthene	µg/L	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	µg/L	10 U	10 U	10 U	10 U	10 U
Anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Benz(*a*)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(*a*)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(*b*)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(*g,h,i*)perylene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(*k*)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U
Bis(2-chloroethoxy)methane	µg/L	10 U	10 U	10 U	10 U	10 U
Bis(2-chloroethyl) ether	µg/L	10 U	10 U	10 U	10 U	10 U
Bis(2-chloroisopropyl) ether	µg/L	10 U	10 U	10 U	10 U	10 U

Table H-19. Winklepeck Burning Grounds
Groundwater - Semivolatile Organic Constituents

Location		Existing Monitoring Wells	Existing Monitoring Wells	Existing Monitoring Wells	Existing Monitoring Wells	Existing Monitoring Wells
Station		OBG-1	OBG-2	OBG-3	OBG-4	WBGmw-005
Sample ID		WBGmw-164-4251-GF	WBGmw-165-4252-GF	WBGmw-166-4253-GF	WBGmw-167-4254-GF	WBGmw-005-4255-GF
Date		11/05/2000	11/05/2000	11/05/2000	11/05/2000	11/04/2000
Filtered		Total	Total	Total	Total	Total
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	**Units**					
Bis(2-ethylhexyl)phthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Butyl benzyl phthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Carbazole	µg/L	10 U	10 U	10 U	10 U	10 U
Chrysene	µg/L	10 U	10 U	10 U	10 U	10 U
Di-n-butyl phthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Dibenz(*a,h*)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	µg/L	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Dimethyl phthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U
Fluorene	µg/L	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	µg/L	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	µg/L	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	µg/L	10 U	10 U	10 U	10 U	10 U
Indeno(*1,2,3-cd*)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U
Isophorone	µg/L	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	µg/L	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	µg/L	10 U	10 U	10 U	10 U	10 U
Naphthalene	µg/L	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	µg/L	25 U	25 U	25 U	25 U	25 U
Phenanthrene	µg/L	10 U	10 U	10 U	10 U	10 U
Phenol	µg/L	10 U	10 U	10 U	10 U	10 U
Pyrene	µg/L	10 U	10 U	10 U	10 U	10 U

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-19. Winklepeck Burning Grounds
Groundwater - Semivolatile Organic Constituents

Location		Existing Monitoring Wells	Existing Monitoring Wells	Existing Monitoring Wells	Existing Monitoring Wells	New Monitoring Wells
Station		WBGmw-006	WBGmw-007	WBGmw-008	WBGmw-009	WBGmw-010
Sample ID		WBGmw-006-4256-GF	WBGmw-007-4257-GF	WBGmw-008-4258-GF	WBGmw-009-4259-GF	WBGmw-010-4260-GF
Date		11/03/2000	11/03/2000	11/03/2000	11/04/2000	11/02/2000
Filtered		Total	Total	Total	Total	Total
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	**Units**					
1,2,4-Trichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	µg/L	10 U	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	µg/L	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	µg/L	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	µg/L	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	µg/L	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	µg/L	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	µg/L	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	µg/L	10 U	10 U	10 U	10 U	10 U
2-Methyl-4,6-dinitrophenol	µg/L	25 U	25 U	25 U	25 U	25 U
2-Methylnaphthalene	µg/L	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
2-Nitrobenzenamine	µg/L	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	µg/L	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	µg/L	10 U	10 U	10 U	10 U	10 U
3-Nitrobenzenamine	µg/L	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ
4-Bromophenyl phenyl ether	µg/L	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
4-Chlorobenzenamine	µg/L	10 R	10 R	10 R	10 R	10 R
4-Chlorophenyl phenyl ether	µg/L	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
4-Nitrobenzenamine	µg/L	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	µg/L	25 U	25 U	25 U	25 U	25 U
Acenaphthene	µg/L	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	µg/L	10 U	10 U	10 U	10 U	10 U
Anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Benz(*a*)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(*a*)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(*b*)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(*g,h,i*)perylene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(*k*)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U
Bis(2-chloroethoxy)methane	µg/L	10 U	10 U	10 U	10 U	10 U
Bis(2-chloroethyl) ether	µg/L	10 U	10 U	10 U	10 U	10 U
Bis(2-chloroisopropyl) ether	µg/L	10 U	10 U	10 U	10 U	10 U

Table H-19. Winklepeck Burning Grounds
Groundwater - Semivolatile Organic Constituents

Location Station Sample ID Date Filtered Field Type		Existing Monitoring Wells WBGmw-006 WBGmw-006-4256-GF 11/03/2000 Total Grab	Existing Monitoring Wells WBGmw-007 WBGmw-007-4257-GF 11/03/2000 Total Grab	Existing Monitoring Wells WBGmw-008 WBGmw-008-4258-GF 11/03/2000 Total Grab	Existing Monitoring Wells WBGmw-009 WBGmw-009-4259-GF 11/04/2000 Total Grab	New Monitoring Wells WBGmw-010 WBGmw-010-4260-GF 11/02/2000 Total Grab
Analyte	**Units**					
Bis(2-ethylhexyl)phthalate	µg/L	10 U	49 =	10 U	10 U	3.9 J
Butyl benzyl phthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Carbazole	µg/L	10 U	10 U	10 U	10 U	10 U
Chrysene	µg/L	10 U	10 U	10 U	10 U	10 U
Di-n-butyl phthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Dibenz(*a,h*)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	µg/L	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Dimethyl phthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U
Fluorene	µg/L	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	µg/L	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	µg/L	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	µg/L	10 U	10 U	10 U	10 U	10 U
Indeno(*1,2,3-cd*)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U
Isophorone	µg/L	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	µg/L	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	µg/L	10 U	10 U	10 U	10 U	10 U
Naphthalene	µg/L	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	µg/L	25 U	25 U	25 U	25 U	25 U
Phenanthrene	µg/L	10 U	10 U	10 U	10 U	10 U
Phenol	µg/L	10 U	10 U	10 U	10 U	10 U
Pyrene	µg/L	10 U	10 U	10 U	10 U	10 U

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-19. Winklepeck Burning Grounds
Groundwater - Semivolatile Organic Constituents

Location		New Monitoring Wells	New Monitoring Wells	New Monitoring Wells	New Monitoring Wells	New Monitoring Wells
Station		WBGmw-010	WBGmw-011	WBGmw-011	WBGmw-012	WBGmw-013
Sample ID		WBGmw-010-4285-GF	WBGmw-011-4261-GF	WBGmw-011-4284-GF	WBGmw-012-4262-GF	WBGmw-013-4263-GF
Date		11/02/2000	11/02/2000	11/02/2000	11/04/2000	11/02/2000
Filtered		Total	Total	Total	Total	Total
Field Type		Field Duplicate	Grab	Field Duplicate	Grab	Grab
Analyte	**Units**					
1,2,4-Trichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	µg/L	10 U	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	µg/L	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	µg/L	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	µg/L	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	µg/L	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	µg/L	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	µg/L	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	µg/L	10 U	10 U	10 U	10 U	10 U
2-Methyl-4,6-dinitrophenol	µg/L	25 U	25 U	25 U	25 U	25 U
2-Methylnaphthalene	µg/L	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
2-Nitrobenzenamine	µg/L	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	µg/L	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	µg/L	10 U	10 U	10 U	10 U	10 U
3-Nitrobenzenamine	µg/L	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ
4-Bromophenyl phenyl ether	µg/L	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
4-Chlorobenzenamine	µg/L	10 R	10 R	10 R	10 R	10 R
4-Chlorophenyl phenyl ether	µg/L	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	µg/L	10 U	10 U	10 U	10 U	10 U
4-Nitrobenzenamine	µg/L	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	µg/L	25 U	25 U	25 U	25 U	25 U
Acenaphthene	µg/L	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	µg/L	10 U	10 U	10 U	10 U	10 U
Anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Benz(*a*)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(*a*)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(*b*)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(*g,h,i*)perylene	µg/L	10 U	10 U	10 U	10 U	10 U
Benzo(*k*)fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U
Bis(2-chloroethoxy)methane	µg/L	10 U	10 U	10 U	10 U	10 U
Bis(2-chloroethyl) ether	µg/L	10 U	10 U	10 U	10 U	10 U
Bis(2-chloroisopropyl) ether	µg/L	10 U	10 U	10 U	10 U	10 U

Table H-19. Winklepeck Burning Grounds
Groundwater - Semivolatile Organic Constituents

Location		New Monitoring Wells	New Monitoring Wells	New Monitoring Wells	New Monitoring Wells	New Monitoring Wells
Station		WBGmw-010	WBGmw-011	WBGmw-011	WBGmw-012	WBGmw-013
Sample ID		WBGmw-010-4285-GF	WBGmw-011-4261-GF	WBGmw-011-4284-GF	WBGmw-012-4262-GF	WBGmw-013-4263-GF
Date		11/02/2000	11/02/2000	11/02/2000	11/04/2000	11/02/2000
Filtered		Total	Total	Total	Total	Total
Field Type		Field Duplicate	Grab	Field Duplicate	Grab	Grab
Analyte	**Units**					
Bis(2-ethylhexyl)phthalate	µg/L	5.2 J	10 U	10 U	10 U	3.4 J
Butyl benzyl phthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Carbazole	µg/L	10 U	10 U	10 U	10 U	10 U
Chrysene	µg/L	10 U	10 U	10 U	10 U	10 U
Di-n-butyl phthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Dibenz(*a,h*)anthracene	µg/L	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	µg/L	10 U	10 U	10 U	10 U	10 U
Diethyl phthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Dimethyl phthalate	µg/L	10 U	10 U	10 U	10 U	10 U
Fluoranthene	µg/L	10 U	10 U	10 U	10 U	10 U
Fluorene	µg/L	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	µg/L	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	µg/L	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	µg/L	10 U	10 U	10 U	10 U	10 U
Indeno(*1,2,3-cd*)pyrene	µg/L	10 U	10 U	10 U	10 U	10 U
Isophorone	µg/L	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	µg/L	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	µg/L	10 U	10 U	10 U	10 U	10 U
Naphthalene	µg/L	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	µg/L	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	µg/L	25 U	25 U	25 U	25 U	25 U
Phenanthrene	µg/L	10 U	10 U	10 U	10 U	10 U
Phenol	µg/L	10 U	10 U	10 U	10 U	10 U
Pyrene	µg/L	10 U	10 U	10 U	10 U	10 U

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-19. Winklepeck Burning Grounds
Groundwater - Semivolatile Organic Constituents

Location		New Monitoring Wells	New Monitoring Wells	New Monitoring Wells	New Monitoring Wells
Station		WBGmw-014	WBGmw-015	WBGmw-016	WBGmw-017
Sample ID		WBGmw-014-4264-GF	WBGmw-015-4265-GF	WBGmw-016-4266-GF	WBGmw-017-4267-GF
Date		11/04/2000	11/01/2000	11/03/2000	11/01/2000
Filtered		Total	Total	Total	Total
Field Type		Grab	Grab	Grab	Grab
Analyte	**Units**				
1,2,4-Trichlorobenzene	µg/L	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	µg/L	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	µg/L	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	µg/L	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	µg/L	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	µg/L	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	µg/L	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	µg/L	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	µg/L	10 U	10 U	10 U	10 U
2-Chloronaphthalene	µg/L	10 U	10 U	10 U	10 U
2-Chlorophenol	µg/L	10 U	10 U	10 U	10 U
2-Methyl-4,6-dinitrophenol	µg/L	25 U	25 U	25 U	25 U
2-Methylnaphthalene	µg/L	10 U	10 U	10 U	10 U
2-Methylphenol	µg/L	10 U	10 U	10 U	10 U
2-Nitrobenzenamine	µg/L	25 U	25 U	25 U	25 U
2-Nitrophenol	µg/L	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	µg/L	10 U	10 U	10 U	10 U
3-Nitrobenzenamine	µg/L	25 UJ	25 UJ	25 UJ	25 UJ
4-Bromophenyl phenyl ether	µg/L	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	µg/L	10 U	10 U	10 U	10 U
4-Chlorobenzenamine	µg/L	10 R	10 R	10 R	10 R
4-Chlorophenyl phenyl ether	µg/L	10 U	10 U	10 U	10 U
4-Methylphenol	µg/L	10 U	10 U	10 U	10 U
4-Nitrobenzenamine	µg/L	25 U	25 U	25 U	25 U
4-Nitrophenol	µg/L	25 U	25 U	25 U	25 U
Acenaphthene	µg/L	10 U	10 U	10 U	10 U
Acenaphthylene	µg/L	10 U	10 U	10 U	10 U
Anthracene	µg/L	10 U	10 U	10 U	10 U
Benz(*a*)anthracene	µg/L	10 U	10 U	10 U	10 U
Benzo(*a*)pyrene	µg/L	10 U	10 U	10 U	10 U
Benzo(*b*)fluoranthene	µg/L	10 U	10 U	10 U	10 U
Benzo(*g,h,i*)perylene	µg/L	10 U	10 U	10 U	10 U
Benzo(*k*)fluoranthene	µg/L	10 U	10 U	10 U	10 U
Bis(2-chloroethoxy)methane	µg/L	10 U	10 U	10 U	10 U
Bis(2-chloroethyl) ether	µg/L	10 U	10 U	10 U	10 U
Bis(2-chloroisopropyl) ether	µg/L	10 U	10 U	10 U	10 U

Table H-19. Winklepeck Burning Grounds
Groundwater - Semivolatile Organic Constituents

Location Station Sample ID Date Filtered Field Type		New Monitoring Wells WBGmw-014 WBGmw-014-4264-GF 11/04/2000 Total Grab	New Monitoring Wells WBGmw-015 WBGmw-015-4265-GF 11/01/2000 Total Grab	New Monitoring Wells WBGmw-016 WBGmw-016-4266-GF 11/03/2000 Total Grab	New Monitoring Wells WBGmw-017 WBGmw-017-4267-GF 11/01/2000 Total Grab
Analyte	**Units**				
Bis(2-ethylhexyl)phthalate	µg/L	10 U	10 U	10 U	10 U
Butyl benzyl phthalate	µg/L	10 U	10 U	10 U	10 U
Carbazole	µg/L	10 U	10 U	10 U	10 U
Chrysene	µg/L	10 U	10 U	10 U	10 U
Di-n-butyl phthalate	µg/L	10 U	10 U	10 U	10 U
Di-n-octylphthalate	µg/L	10 U	10 U	10 U	10 U
Dibenz(*a,h*)anthracene	µg/L	10 U	10 U	10 U	10 U
Dibenzofuran	µg/L	10 U	10 U	10 U	10 U
Diethyl phthalate	µg/L	10 U	10 U	10 U	10 U
Dimethyl phthalate	µg/L	10 U	10 U	10 U	10 U
Fluoranthene	µg/L	10 U	10 U	10 U	10 U
Fluorene	µg/L	10 U	10 U	10 U	10 U
Hexachlorobenzene	µg/L	10 U	10 U	10 U	10 U
Hexachlorobutadiene	µg/L	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	µg/L	10 U	10 U	10 U	10 U
Hexachloroethane	µg/L	10 U	10 U	10 U	10 U
Indeno(*1,2,3-cd*)pyrene	µg/L	10 U	10 U	10 U	10 U
Isophorone	µg/L	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	µg/L	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	µg/L	10 U	10 U	10 U	10 U
Naphthalene	µg/L	10 U	10 U	10 U	10 U
Nitrobenzene	µg/L	10 U	10 U	10 U	10 U
Pentachlorophenol	µg/L	25 U	25 U	25 U	25 U
Phenanthrene	µg/L	10 U	10 U	10 U	10 U
Phenol	µg/L	10 U	10 U	10 U	10 U
Pyrene	µg/L	10 U	10 U	10 U	10 U

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-20. Winklepeck Burning Grounds
Groundwater - Volatile Organic Compounds

Location		Existing Monitoring Wells	Existing Monitoring Wells	Existing Monitoring Wells	Existing Monitoring Wells	Existing Monitoring Wells
Station		OBG-1	OBG-2	OBG-3	OBG-4	WBGmw-005
Sample ID		WBGmw-164-4251-GF	WBGmw-165-4252-GF	WBGmw-166-4253-GF	WBGmw-167-4254-GF	WBGmw-005-4255-GF
Date		11/05/2000	11/05/2000	11/05/2000	11/05/2000	11/04/2000
Filtered		Total	Total	Total	Total	Total
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	**Units**					
1,1,1-Trichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dibromoethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	µg/L	5 U	5 U	5 U	5 U	5 U
2-Butanone	µg/L	10 U	10 U	10 U	10 U	10 U
2-Hexanone	µg/L	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	µg/L	10 U	10 U	10 U	10 U	10 U
Acetone	µg/L	10 U	10 U	10 U	10 U	10 U
Benzene	µg/L	5 U	5 U	5 U	5 U	5 U
Bromochloromethane	µg/L	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	µg/L	5 U	5 U	5 U	5 U	5 U
Bromoform	µg/L	5 U	5 U	5 U	5 U	5 U
Bromomethane	µg/L	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	µg/L	5 UJ	5 U	5 U	5 U	5 U
Carbon Tetrachloride	µg/L	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Chloroethane	µg/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Chloroform	µg/L	5 U	5 U	5 U	5 U	5 U
Chloromethane	µg/L	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	µg/L	5 U	5 U	5 U	5 U	5 U
Dimethylbenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Methylene Chloride	µg/L	5 U	5 U	5 U	5 U	5 U
Styrene	µg/L	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
Toluene	µg/L	5 U	5 U	5 U	5 U	5 U
Trichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
Vinyl Chloride	µg/L	10 U	10 U	10 U	10 U	10 U
cis -1,3-Dichloropropene	µg/L	5 U	5 U	5 U	5 U	5 U
trans -1,3-Dichloropropene	µg/L	5 U	5 U	5 U	5 U	5 U

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-20. Winklepeck Burning Grounds
Groundwater - Volatile Organic Compounds

Location		Existing Monitoring Wells	Existing Monitoring Wells	Existing Monitoring Wells	Existing Monitoring Wells	New Monitoring Wells
Station		WBGmw-006	WBGmw-007	WBGmw-008	WBGmw-009	WBGmw-010
Sample ID		WBGmw-006-4256-GF	WBGmw-007-4257-GF	WBGmw-008-4258-GF	WBGmw-009-4259-GF	WBGmw-010-4260-GF
Date		11/03/2000	11/03/2000	11/03/2000	11/04/2000	11/02/2000
Filtered		Total	Total	Total	Total	Total
Field Type		Grab	Grab	Grab	Grab	Grab
Analyte	**Units**					
1,1,1-Trichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dibromoethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	µg/L	5 U	5 U	5 U	5 U	5 U
2-Butanone	µg/L	10 U	10 U	10 U	10 U	10 U
2-Hexanone	µg/L	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	µg/L	10 U	10 U	10 U	10 U	10 U
Acetone	µg/L	10 U	10 U	10 U	10 U	10 U
Benzene	µg/L	5 U	5 U	5 U	5 U	5 U
Bromochloromethane	µg/L	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	µg/L	5 U	5 U	5 U	5 U	5 U
Bromoform	µg/L	5 U	5 U	5 U	5 U	5 U
Bromomethane	µg/L	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	µg/L	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	µg/L	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Chloroethane	µg/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Chloroform	µg/L	5 U	5 U	5 U	5 U	1.4 J
Chloromethane	µg/L	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	µg/L	5 U	5 U	5 U	5 U	5 U
Dimethylbenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Methylene Chloride	µg/L	5 U	5 U	5 U	5 U	5 U
Styrene	µg/L	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
Toluene	µg/L	5 U	5 U	5 U	5 U	5 U
Trichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
Vinyl Chloride	µg/L	10 U	10 U	10 U	10 U	10 U
cis -1,3-Dichloropropene	µg/L	5 U	5 U	5 U	5 U	5 U
trans -1,3-Dichloropropene	µg/L	5 U	5 U	5 U	5 U	5 U

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-20. Winklepeck Burning Grounds
Groundwater - Volatile Organic Compounds

Location		New Monitoring Wells	New Monitoring Wells	New Monitoring Wells	New Monitoring Wells	New Monitoring Wells
Station		WBGmw-010	WBGmw-011	WBGmw-011	WBGmw-012	WBGmw-013
Sample ID		WBGmw-010-4285-GF	WBGmw-011-4261-GF	WBGmw-011-4284-GF	WBGmw-012-4262-GF	WBGmw-013-4263-GF
Date		11/02/2000	11/02/2000	11/02/2000	11/04/2000	11/02/2000
Filtered		Total	Total	Total	Total	Total
Field Type		Field Duplicate	Grab	Field Duplicate	Grab	Grab
Analyte	**Units**					
1,1,1-Trichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dibromoethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	µg/L	5 U	5 U	5 U	5 U	5 U
2-Butanone	µg/L	10 U	10 U	10 U	10 U	10 U
2-Hexanone	µg/L	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	µg/L	10 U	10 U	10 U	10 U	10 U
Acetone	µg/L	10 U	10 U	10 U	10 U	10 U
Benzene	µg/L	5 U	5 U	5 U	5 U	5 U
Bromochloromethane	µg/L	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	µg/L	5 U	5 U	5 U	5 U	5 U
Bromoform	µg/L	5 U	5 U	5 U	5 U	5 U
Bromomethane	µg/L	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	µg/L	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	µg/L	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Chloroethane	µg/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Chloroform	µg/L	1.5 J	5 U	5 U	5 U	5 U
Chloromethane	µg/L	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	µg/L	5 U	5 U	5 U	5 U	5 U
Dimethylbenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Methylene Chloride	µg/L	5 U	5 U	5 U	5 U	5 U
Styrene	µg/L	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
Toluene	µg/L	5 U	5 U	5 U	5 U	5 U
Trichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
Vinyl Chloride	µg/L	10 U	10 U	10 U	10 U	10 U
cis -1,3-Dichloropropene	µg/L	5 U	5 U	5 U	5 U	5 U
trans -1,3-Dichloropropene	µg/L	5 U	5 U	5 U	5 U	5 U

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-20. Winklepeck Burning Grounds
Groundwater - Volatile Organic Compounds

Location		New Monitoring Wells	New Monitoring Wells	New Monitoring Wells	New Monitoring Wells
Station		WBGmw-014	WBGmw-015	WBGmw-016	WBGmw-017
Sample ID		WBGmw-014-4264-GF	WBGmw-015-4265-GF	WBGmw-016-4266-GF	WBGmw-017-4267-GF
Date		11/04/2000	11/01/2000	11/03/2000	11/01/2000
Filtered		Total	Total	Total	Total
Field Type		Grab	Grab	Grab	Grab
Analyte	**Units**				
1,1,1-Trichloroethane	µg/L	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	µg/L	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	µg/L	5 U	5 U	5 U	5 U
1,1-Dichloroethane	µg/L	5 U	5 U	5 U	5 U
1,1-Dichloroethene	µg/L	5 U	5 U	5 U	5 U
1,2-Dibromoethane	µg/L	5 U	5 U	5 U	5 U
1,2-Dichloroethane	µg/L	5 U	5 U	5 U	5 U
1,2-Dichloroethene	µg/L	5 U	5 U	5 U	5 U
1,2-Dichloropropane	µg/L	5 U	5 U	5 U	5 U
2-Butanone	µg/L	10 U	10 U	10 U	10 U
2-Hexanone	µg/L	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	µg/L	10 U	10 U	10 U	10 U
Acetone	µg/L	10 U	10 U	10 U	10 U
Benzene	µg/L	5 U	5 U	5 U	5 U
Bromochloromethane	µg/L	5 U	5 U	5 U	5 U
Bromodichloromethane	µg/L	5 U	5 U	5 U	5 U
Bromoform	µg/L	5 U	5 U	5 U	5 U
Bromomethane	µg/L	10 U	10 U	10 U	10 U
Carbon Disulfide	µg/L	5 U	5 U	5 U	5 U
Carbon Tetrachloride	µg/L	5 U	5 U	5 U	5 U
Chlorobenzene	µg/L	5 U	5 U	5 U	5 U
Chloroethane	µg/L	10 UJ	10 UJ	10 UJ	10 UJ
Chloroform	µg/L	5 U	5 U	5 U	5 U
Chloromethane	µg/L	10 U	10 U	10 U	10 U
Dibromochloromethane	µg/L	5 U	5 U	5 U	5 U
Dimethylbenzene	µg/L	5 U	5 U	5 U	5 U
Ethylbenzene	µg/L	5 U	5 U	5 U	5 U
Methylene Chloride	µg/L	5 U	5 U	5 U	5 U
Styrene	µg/L	5 U	5 U	5 U	5 U
Tetrachloroethene	µg/L	5 U	5 U	5 U	5 U
Toluene	µg/L	5 U	5 U	5 U	5 U
Trichloroethene	µg/L	5 U	5 U	5 U	5 U
Vinyl Chloride	µg/L	10 U	10 U	10 U	10 U
cis -1,3-Dichloropropene	µg/L	5 U	5 U	5 U	5 U
trans -1,3-Dichloropropene	µg/L	5 U	5 U	5 U	5 U

Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-21. Winklepeck Burning Grounds
Groundwater - Pesticides and PCBs

Location Station Sample ID Date Filtered Field Type		Existing Monitoring Wells OBG-1 WBGmw-164-4251-GF 11/05/2000 Total Grab	Existing Monitoring Wells OBG-2 WBGmw-165-4252-GF 11/05/2000 Total Grab	Existing Monitoring Wells OBG-3 WBGmw-166-4253-GF 11/05/2000 Total Grab	Existing Monitoring Wells OBG-4 WBGmw-167-4254-GF 11/05/2000 Total Grab	Existing Monitoring Wells WBGmw-005 WBGmw-005-4255-GF 11/04/2000 Total Grab
Analyte	**Units**					
4,4'-DDD	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
4,4'-DDE	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
4,4'-DDT	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Aldrin	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Dieldrin	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan I	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan II	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan Sulfate	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endrin	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endrin Aldehyde	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endrin Ketone	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor Epoxide	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Lindane	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Methoxychlor	µg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
PCB-1016	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1221	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1232	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1242	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1248	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1254	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1260	µg/L	1 U	1 U	1 U	1 U	1 U
Toxaphene	µg/L	2 U	2 U	2 U	2 U	2 U
alpha-BHC	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
alpha-Chlordane	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
beta-BHC	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
delta-BHC	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
gamma-Chlordane	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U

BHC = Benzene hexachloride.
DDD = Dichlorodiphenyl-dichloroethane.
DDE = Dichlorodiphenyl-dichloroethylene.
DDT = Dichlorodiphenyl-trichloroethane.
PCB = Polychloride biphenyl.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-21. Winklepeck Burning Grounds
Groundwater - Pesticides and PCBs

Location Station Sample ID Date Filtered Field Type		Existing Monitoring Wells WBGmw-006 WBGmw-006-4256-GF 11/03/2000 Total Grab	Existing Monitoring Wells WBGmw-007 WBGmw-007-4257-GF 11/03/2000 Total Grab	Existing Monitoring Wells WBGmw-008 WBGmw-008-4258-GF 11/03/2000 Total Grab	Existing Monitoring Wells WBGmw-009 WBGmw-009-4259-GF 11/04/2000 Total Grab	New Monitoring Wells WBGmw-010 WBGmw-010-4260-GF 11/02/2000 Total Grab
Analyte	**Units**					
4,4'-DDD	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
4,4'-DDE	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
4,4'-DDT	µg/L	0.058 J	0.05 U	0.05 U	0.05 U	0.05 U
Aldrin	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Dieldrin	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan I	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan II	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan Sulfate	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endrin	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endrin Aldehyde	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endrin Ketone	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor Epoxide	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.056 J
Lindane	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Methoxychlor	µg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
PCB-1016	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1221	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1232	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1242	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1248	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1254	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1260	µg/L	1 U	1 U	1 U	1 U	1 U
Toxaphene	µg/L	2 U	2 U	2 U	2 U	2 U
alpha-BHC	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
alpha-Chlordane	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
beta-BHC	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
delta-BHC	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
gamma-Chlordane	µg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U

BHC = Benzene hexachloride.
DDD = Dichlorodiphenyl-dichloroethane.
DDE = Dichlorodiphenyl-dichloroethylene.
DDT = Dichlorodiphenyl-trichloroethane.
PCB = Polychloride biphenyl.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-21. Winklepeck Burning Grounds
Groundwater - Pesticides and PCBs

Location		New Monitoring Wells	New Monitoring Wells	New Monitoring Wells	New Monitoring Wells
Station		WBGmw-010	WBGmw-011	WBGmw-011	WBGmw-012
Sample ID		WBGmw-010-4285-GF	WBGmw-011-4261-GF	WBGmw-011-4284-GF	WBGmw-012-4262-GF
Date		11/02/2000	11/02/2000	11/02/2000	11/04/2000
Filtered		Total	Total	Total	Total
Field Type		Field Duplicate	Grab	Field Duplicate	Grab
Analyte	Units				
4,4'-DDD	µg/L	0.05 UJ	0.05 UJ	0.05 UJ	0.05 U
4,4'-DDE	µg/L	0.05 U	0.05 U	0.05 U	0.05 U
4,4'-DDT	µg/L	0.05 UJ	0.05 UJ	0.05 UJ	0.05 U
Aldrin	µg/L	0.05 U	0.05 U	0.05 U	0.05 U
Dieldrin	µg/L	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan I	µg/L	0.05 UJ	0.05 UJ	0.05 UJ	0.05 U
Endosulfan II	µg/L	0.05 UJ	0.05 UJ	0.05 UJ	0.05 U
Endosulfan Sulfate	µg/L	0.05 UJ	0.05 UJ	0.05 UJ	0.05 U
Endrin	µg/L	0.05 UJ	0.05 UJ	0.05 UJ	0.05 U
Endrin Aldehyde	µg/L	0.05 UJ	0.05 UJ	0.05 UJ	0.05 U
Endrin Ketone	µg/L	0.05 UJ	0.05 UJ	0.05 UJ	0.05 U
Heptachlor	µg/L	0.05 UJ	0.05 UJ	0.05 UJ	0.05 U
Heptachlor Epoxide	µg/L	0.05 UJ	0.05 UJ	0.05 UJ	0.05 U
Lindane	µg/L	0.05 UJ	0.05 UJ	0.05 UJ	0.05 U
Methoxychlor	µg/L	0.1 UJ	0.1 UJ	0.1 UJ	0.1 U
PCB-1016	µg/L	1 U	1 U	1 U	1 U
PCB-1221	µg/L	1 U	1 U	1 U	1 U
PCB-1232	µg/L	1 U	1 U	1 U	1 U
PCB-1242	µg/L	1 U	1 U	1 U	1 U
PCB-1248	µg/L	1 U	1 U	1 U	1 U
PCB-1254	µg/L	1 U	1 U	1 U	1 U
PCB-1260	µg/L	1 U	1 U	1 U	1 U
Toxaphene	µg/L	2 U	2 U	2 U	2 U
alpha-BHC	µg/L	0.05 U	0.05 U	0.05 U	0.05 U
alpha-Chlordane	µg/L	0.05 U	0.05 U	0.05 U	0.05 U
beta-BHC	µg/L	0.05 UJ	0.05 UJ	0.05 UJ	0.05 U
delta-BHC	µg/L	0.05 UJ	0.05 UJ	0.05 UJ	0.05 U
gamma-Chlordane	µg/L	0.05 UJ	0.05 UJ	0.05 UJ	0.05 U

BHC = Benzene hexachloride.
DDD = Dichlorodiphenyl-dichloroethane.
DDE = Dichlorodiphenyl-dichloroethylene.
DDT = Dichlorodiphenyl-trichloroethane.
PCB = Polychloride biphenyl.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-21. Winklepeck Burning Grounds
Groundwater - Pesticides and PCBs

Location Station Sample ID Date Filtered Field Type		New Monitoring Wells WBGmw-013 WBGmw-013-4263-GF 11/02/2000 Total Grab	New Monitoring Wells WBGmw-014 WBGmw-014-4264-GF 11/04/2000 Total Grab	New Monitoring Wells WBGmw-015 WBGmw-015-4265-GF 11/01/2000 Total Grab	New Monitoring Wells WBGmw-016 WBGmw-016-4266-GF 11/03/2000 Total Grab	New Monitoring Wells WBGmw-017 WBGmw-017-4267-GF 11/01/2000 Total Grab
Analyte	**Units**					
4,4'-DDD	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
4,4'-DDE	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
4,4'-DDT	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
Aldrin	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
Dieldrin	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
Endosulfan I	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
Endosulfan II	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
Endosulfan Sulfate	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
Endrin	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
Endrin Aldehyde	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
Endrin Ketone	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
Heptachlor	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
Heptachlor Epoxide	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
Lindane	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
Methoxychlor	µg/L	0.1 U	0.1 U	0.2 U	0.1 U	0.1 U
PCB-1016	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1221	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1232	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1242	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1248	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1254	µg/L	1 U	1 U	1 U	1 U	1 U
PCB-1260	µg/L	1 U	1 U	1 U	1 U	1 U
Toxaphene	µg/L	2 U	2 U	4 U	2 U	2 U
alpha-BHC	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
alpha-Chlordane	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
beta-BHC	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
delta-BHC	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U
gamma-Chlordane	µg/L	0.05 U	0.05 U	0.1 U	0.05 U	0.05 U

BHC = Benzene hexachloride.
DDD = Dichlorodiphenyl-dichloroethane.
DDE = Dichlorodiphenyl-dichloroethylene.
DDT = Dichlorodiphenyl-trichloroethane.
PCB = Polychloride biphenyl.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-22. Winklepeck Burning Grounds
Quality Control Samples - Inorganics

Station Sample ID Date Field Type		QC WBG4310 10/20/2000 DI Water Field Blank	QC WBG4311 10/20/2000 Potable Water Field Blank
Analyte	**Units**		
Cyanide	µg/L	10 UJ	10 UJ
Aluminum	µg/L	200 U	170 J
Antimony	µg/L	5 U	5 U
Arsenic	µg/L	5 U	5 U
Barium	µg/L	200 U	34 J
Beryllium	µg/L	4 U	4 U
Cadmium	µg/L	5 U	5 U
Calcium	µg/L	5,000 U	43,000 =
Chromium	µg/L	10 U	10 U
Cobalt	µg/L	50 U	50 U
Copper	µg/L	25 U	27 =
Iron	µg/L	100 U	100 U
Lead	µg/L	3 U	3 U
Magnesium	µg/L	5,000 U	12,500 =
Manganese	µg/L	1.1 U	3.7 U
Mercury	µg/L	0.2 U	0.2 U
Nickel	µg/L	40 U	40 U
Potassium	µg/L	5,000 U	5,600 =
Selenium	µg/L	5 U	5 U
Silver	µg/L	10 U	10 U
Sodium	µg/L	5,000 U	41,200 =
Thallium	µg/L	2 U	2 UJ
Vanadium	µg/L	50 U	50 U
Zinc	µg/L	20 U	270 =

QC = Quality control.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-23. Winklepeck Burning Grounds
Quality Control Samples - Explosives and Propellants

Station Sample ID Date Field Type		QC WBG4310 10/20/2000 DI Water Field Blank	QC WBG4311 10/20/2000 Potable Water Field Blank
Analyte	**Units**		
1,3,5-Trinitrobenzene	µg/L	1.4 =	0.44 =
1,3-Dinitrobenzene	µg/L	0.2 U	0.2 U
2,4,6-Trinitrotoluene	µg/L	1.1 =	0.53 =
2,4-Dinitrotoluene	µg/L	0.13 U	0.13 U
2,6-Dinitrotoluene	µg/L	0.13 U	0.13 U
2-Amino-4,6-dinitrotoluene	µg/L	0.2 U	0.2 U
2-Nitrotoluene	µg/L	0.2 U	0.37 =
3-Nitrotoluene	µg/L	0.2 U	0.2 U
4-Amino-2,6-dinitrotoluene	µg/L	0.2 U	0.2 U
4-Nitrotoluene	µg/L	0.2 U	0.38 =
HMX	µg/L	0.11 J	0.5 U
Nitrobenzene	µg/L	0.2 U	0.2 U
Nitrocellulose	µg/L	500 U	500 U
Nitroglycerin	µg/L	2.5 U	2.5 U
Nitroguanidine	µg/L	20 U	20 U
RDX	µg/L	0.5 U	0.5 U
Tetryl	µg/L	3.6 =	1.1 =

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
QC = Quality control.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-24. Winklepeck Burning Grounds
Quality Control Samples - Semivolatile Organics

Station		QC	QC
Sample ID		WBG4310	WBG4311
Date		10/20/2000	10/20/2000
Field Type		DI Water Field Blank	Potable Water Field Blank
Analyte	Units		
1,2,4-Trichlorobenzene	µg/L	10 U	10 U
1,2-Dichlorobenzene	µg/L	10 U	10 U
1,3-Dichlorobenzene	µg/L	10 U	10 U
1,4-Dichlorobenzene	µg/L	10 U	10 U
2,4,5-Trichlorophenol	µg/L	10 U	10 U
2,4,6-Trichlorophenol	µg/L	10 U	10 U
2,4-Dichlorophenol	µg/L	10 U	10 U
2,4-Dimethylphenol	µg/L	10 U	10 U
2,4-Dinitrophenol	µg/L	25 U	25 U
2,4-Dinitrotoluene	µg/L	10 U	10 U
2,6-Dinitrotoluene	µg/L	10 U	10 U
2-Chloronaphthalene	µg/L	10 U	10 U
2-Chlorophenol	µg/L	10 U	10 U
2-Methyl-4,6-dinitrophenol	µg/L	25 U	25 U
2-Methylnaphthalene	µg/L	10 U	10 U
2-Methylphenol	µg/L	10 U	10 U
2-Nitrobenzenamine	µg/L	25 U	25 U
2-Nitrophenol	µg/L	10 U	10 U
3,3'-Dichlorobenzidine	µg/L	10 UJ	10 UJ
3-Nitrobenzenamine	µg/L	25 U	25 U
4-Bromophenyl phenyl ether	µg/L	10 U	10 U
4-Chloro-3-methylphenol	µg/L	10 U	10 U
4-Chlorobenzenamine	µg/L	10 U	10 U
4-Chlorophenyl phenyl ether	µg/L	10 U	10 U
4-Methylphenol	µg/L	10 U	10 U
4-Nitrobenzenamine	µg/L	25 U	25 U
4-Nitrophenol	µg/L	25 U	25 U
Acenaphthene	µg/L	10 U	10 U
Acenaphthylene	µg/L	10 U	10 U
Anthracene	µg/L	10 U	10 U
Benz(*a*)anthracene	µg/L	10 U	10 U
Benzo(*a*)pyrene	µg/L	10 U	10 U
Benzo(*b*)fluoranthene	µg/L	10 U	10 U
Benzo(*g,h,i*)perylene	µg/L	10 U	10 U
Benzo(*k*)fluoranthene	µg/L	10 U	10 U
Bis(2-chloroethoxy)methane	µg/L	10 U	10 U
Bis(2-chloroethyl)ether	µg/L	10 U	10 U
Bis(2-chloroisopropyl)ether	µg/L	10 U	10 U
Bis(2-ethylhexyl)phthalate	µg/L	10 U	10 U
Butyl benzyl phthalate	µg/L	10 U	10 U
Carbazole	µg/L	10 U	10 U
Chrysene	µg/L	10 U	10 U
Di-n-butyl phthalate	µg/L	10 U	10 U
Di-n-octylphthalate	µg/L	10 U	10 U

Table H-24. Winklepeck Burning Grounds
Quality Control Samples - Semivolatile Organics

Station Sample ID Date Field Type		QC WBG4310 10/20/2000 DI Water Field Blank	QC WBG4311 10/20/2000 Potable Water Field Blank
Analyte	**Units**		
Dibenz(*a,h*)anthracene	µg/L	10 U	10 U
Dibenzofuran	µg/L	10 U	10 U
Diethyl phthalate	µg/L	10 U	10 U
Dimethyl phthalate	µg/L	10 U	10 U
Fluoranthene	µg/L	10 U	10 U
Fluorene	µg/L	10 U	10 U
Hexachlorobenzene	µg/L	10 U	10 U
Hexachlorobutadiene	µg/L	10 U	10 U
Hexachlorocyclopentadiene	µg/L	10 R	10 R
Hexachloroethane	µg/L	10 U	10 U
Indeno(*1,2,3-cd*)pyrene	µg/L	10 U	10 U
Isophorone	µg/L	10 U	10 U
N-Nitroso-di-n-propylamine	µg/L	10 U	10 U
N-Nitrosodiphenylamine	µg/L	10 U	10 U
Naphthalene	µg/L	10 U	10 U
Nitrobenzene	µg/L	10 U	10 U
Pentachlorophenol	µg/L	25 U	25 U
Phenanthrene	µg/L	10 U	10 U
Phenol	µg/L	10 U	10 U
Pyrene	µg/L	10 U	10 U

QC = Quality control.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-25. Winklepeck Burning Grounds
Quality Control Samples - Volatile Organics

Station Sample ID Date Field Type		QC WBG4304 10/20/2000 Trip Blank	QC WBG4305 11/01/2000 Trip Blank	QC WBG4306 11/03/2000 Trip Blank	QC WBG4310 10/20/2000 DI Water Field Blank	QC WBG4311 10/20/2000 Potable Water Field Blank
Analyte	**Units**					
1,1,1-Trichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dibromoethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	µg/L	5 U	5 U	5 U	5 U	5 U
2-Butanone	µg/L	10 U	10 U	10 U	10 U	10 U
2-Hexanone	µg/L	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	µg/L	10 U	10 U	10 U	10 U	10 U
Acetone	µg/L	22 U	28 U	23 U	17 U	25 U
Benzene	µg/L	5 U	5 U	5 U	5 U	5 U
Bromochloromethane	µg/L	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	µg/L	5 U	5 U	5 U	5 U	15 =
Bromoform	µg/L	5 U	5 U	5 U	5 U	5 U
Bromomethane	µg/L	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	µg/L	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	µg/L	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	µg/L	5 U	5 U	5 U	1 J	5 U
Chloroethane	µg/L	10 U	10 UJ	10 UJ	10 U	10 U
Chloroform	µg/L	5 U	5 U	5 U	5 U	44 =
Chloromethane	µg/L	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	µg/L	5 U	5 U	5 U	5 U	2.7 J
Dimethylbenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	µg/L	5 U	5 U	5 U	5 U	5 U
Methylene Chloride	µg/L	5 U	5 U	5 U	5 U	5 U
Styrene	µg/L	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
Toluene	µg/L	5 U	5 U	5 U	5 U	5 U
Trichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U
Vinyl Chloride	µg/L	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	µg/L	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	µg/L	5 U	5 U	5 U	5 U	5 U

QC = Quality control.
Qualifiers:
= - detected.
J - estimated.
R - rejected.
U - not detected.

Table H-26. Winklepeck Burning Grounds
Quality Control Samples - Pesticides and PCBs

Station Sample ID Date Field Type		QC WBG4310 10/20/2000 DI Water Field Blank	QC WBG4311 10/20/2000 Potable Water Field Blank
Analyte	**Units**		
4,4'-DDD	µg/L	0.05 U	0.05 U
4,4'-DDE	µg/L	0.05 U	0.05 U
4,4'-DDT	µg/L	0.05 U	0.05 U
Aldrin	µg/L	0.05 U	0.05 U
Dieldrin	µg/L	0.05 U	0.05 U
Endosulfan I	µg/L	0.05 U	0.05 U
Endosulfan II	µg/L	0.05 U	0.05 U
Endosulfan Sulfate	µg/L	0.05 U	0.05 U
Endrin	µg/L	0.05 U	0.05 U
Endrin Aldehyde	µg/L	0.05 U	0.05 U
Endrin Ketone	µg/L	0.05 U	0.05 U
Heptachlor	µg/L	0.05 U	0.05 U
Heptachlor Epoxide	µg/L	0.05 U	0.05 U
Lindane	µg/L	0.05 U	0.05 U
Methoxychlor	µg/L	0.1 U	0.1 U
PCB-1016	µg/L	1 U	1 U
PCB-1221	µg/L	1 U	1 U
PCB-1232	µg/L	1 U	1 U
PCB-1242	µg/L	1 U	1 U
PCB-1248	µg/L	1 U	1 U
PCB-1254	µg/L	1 U	1 U
PCB-1260	µg/L	1 U	1 U
Toxaphene	µg/L	2 U	2 U
alpha-BHC	µg/L	0.05 U	0.05 U
alpha-Chlordane	µg/L	0.05 U	0.05 U
beta-BHC	µg/L	0.05 U	0.05 U
delta-BHC	µg/L	0.05 U	0.05 U
gamma-Chlordane	µg/L	0.05 U	0.05 U

BHC = Benzene hexachloride.
DDD = Dichlorodiphenyldichloroethane.
DDE = Dichlorodiphenyldichloroethylene.
DDT = Dichlorodiphenyl-trichloroethane.
PCB = Polychlorinated biphenyl.
QC = Quality control.
Qualifier:
= - detected.
J - estimated.
R - rejected.
U - not detected.

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Science Applications International Corporation
806 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

COC NO.: WBGSNT - 1
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CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SOIL: SVOCs b1	SOIL: Pesticides/PCBs e1	SOIL: Explosives f1	SOIL: Propellants f1	SOIL: TAL Metals c1	SOIL: CN d1	SOIL: TAL Metals c1, CN d1	SOIL: TOC	WATER: VOCs n1,2	WATER: SVOCs j1	WATER: Pesticides/PCBs k1	WATER: Metals - filtered l1,3	WATER: Metals - total l1,3	WATER: CN h1,4	WATER: Explosives m1	WATER: Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4190*	10-17-00	1010	soil				1		1												2	
WBG 4003		1626							1												1	
WBG 4184		1053							1												1	
WBG 4006		1611							1												1	
WBG 4187*	10-16-00	1627					1		1												2	
WBG 4000	10-17-00	1543							1												1	
WBG 4193		0902							1												1	
WBG 4009		1502							1												1	
WBG 4015		1315							1												1	
WBG 4012		1338							1												1	
WBG 4268		1338					1	1	2												4	RUN MS/MSD (extra vol. sent)

vjb 10/18/00

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Vicki Brumback	10/18/00	Al Haidit	10-18-00
COMPANY NAME: SAIC	1450	COMPANY NAME:	1450
RECEIVED BY:	Date/Time	RELINQUISHED BY: Al Haidit	Date/Time 10-18-00
COMPANY NAME:		COMPANY NAME:	1715
RELINQUISHED BY:	Date/Time	RECEIVED BY: Terry Burns	Date/Time 10-18-00
COMPANY NAME:		COMPANY NAME: STL	1715

TOTAL NUMBER OF 16

Cooler Temperature: 4°C

Cooler ID: H154

FEDEX NUMBER: NA- Courier pickup

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

* This sample had detection in field explosives lab.

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

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CHAIN OF CUSTODY RECORD

COC NO.: WBGSNT - 2
page 1 of 3

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1	TOC	TAL Metals + CN	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4049	10-18-00	1536	soil				1						1									2	Station 212
WBG 4012	10-17-00	1338	soil				1															1	201
WBG 4035	10-18-00	1050	soil						1													1	208
WBG 4023	10-18-00	0855	soil										1									1	204
WBG 4058	10-18-00	1315	soil						1													1	215
WBG 4269	10-18-00	1536	soil				1						1									2	212
WBG 4046	10-18-00	1516	soil				1		1													2	211
WBG 4038	10-18-00	1103	soil						1													1	209
WBG 4055	10-18-00	1420	soil										1									1	214
WBG 4061	10-18-00	1350	soil						1													1	216
WBG 4079	10-18-00	1716	soil				1		1													2	222
WBG 4052	10-18-00	1443	soil										1									1	213
WBG 4026	10-18-00	0926	soil										1									1	(17) 205

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF Sep p. 3/3	Cooler Temperature: 4°C
Vicki Brumback	10/20/00	[illegible]	10-20-00	Cooler ID: J805	FEDEX NUMBER:
COMPANY NAME: SAIC	1430	COMPANY NAME:	1430	K69	NA - Conner pickup
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

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CHAIN OF CUSTODY RECORD

COC NO.: WBGSNT - 2
page 2 of 3

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1/Pesticides/PCBs e1	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1	TOC	TAL Metals + Cr^{+6}	WATER: TAL Metals/Cr^{+6}/CN	VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4029	10-18-00	0947	soil										1										1	Station 206
WBG 4070	10-18-00	1635	soil						1														1	219
WBG 4032	10-18-00	1012	soil										1										1	207
WBG 4191	10-19-00	1431	soil	1	1						1												3	2-4 FT ~~225~~ 255
WBG 4122	10-19-00	1648	soil										1										1	235
WBG 4119	10-19-00	1611	soil				1						1										2	234
WBG 4188	10-19-00	1341	soil						1														1	2-4 FT 254
WBG 4064	10-19-00	1106	soil										1										1	217
WBG 4073	10-19-00	0940	soil	1	1								1										3	220
WBG 4067	10-19-00	1019	soil	1	1									1									3	218
WBG 4076	10-19-00	0905	soil										1										1	221
WBG 4310	10-20-00	0845	water												3	2	2	1		1	2	2	13	DI water source
WBG 4311	10-20-00	0915	water												3	2	2	1		1	2	2	13	(FB) Potable water source

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Vicki Brumback	10/20/00	[illegible]	10-20-00 1430
COMPANY NAME: SAIC		COMPANY NAME:	
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF: See p. 3 of 3

Cooler Temperature: 4°C

Cooler ID: J805 K69

FEDEX NUMBER: NA - Courier pickup

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool, 4C 2 HCL, pH < 2 3 HNO3, pH < 2 4 NaOH, pH > 12 5 H2SO4, pH < 2

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Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

COC NO.: WBGSNT - 2
page 3 of 3

CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature) Vicki Brumback **(Printed Name)** Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1/Pest/PCBs	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1 + Cr^{+6}	TOC	TAL Metals + Cr^{+6}	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4304	10-20-00	0840	water											3								3	TRIP BLANK
WBG 4006	10-17-00	1611	soil					1														1	STA. 199
WBG 4000	10-17-00	1543	soil				1															1	197
WBG 4125	10-20-00	0800	soil	1	1		1	1			1											5	236
WBG 4007	10-20-00	0956	soil						1													1	(2-4 FT) 199
WBG 4027	10-20-00	1039	soil						1													1	(2-4 FT) 205
WBG 4116	10-20-00	0857	soil										1									1	233
WBG 4270	10-20-00	0800	soil	1	1		1	1			1											5	dup 236

10-20-00 vjb

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Vicki Brumback	10/20/00 1430	[signature]	10-20-00 1430
COMPANY NAME: SAIC		COMPANY NAME:	
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF

Cooler ID: J805 K69

Cooler Temperature: 4°C

FEDEX NUMBER: NA- Courier pickup

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

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CHAIN OF CUSTODY RECORD

COC NO.: WBGSNT - 3
page 1 of 5

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature) Vicki Brumback **(Printed Name)** Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1/Pest/PCBs	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1 + Cr+6	CN d1	TAL Metals c1, CN d1 + Cr+6	TOC	TAL Metals + CN	WATER: TAL Metals	VOCs n1.2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1.4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4082	10-20-00	1438	soil						1														1	Sta 223
WBG 4088	10-20-00	1619	soil	1	1						1												3	225
WBG 4085	10-20-00	1518	soil						1														1	224
WBG 4105	10-20-00	1739	soil						1														1	230
WBG 4091	10-20-00	1551	soil						1														1	226
WBG 4007	10-20-00	0956	soil				1																1	2-4 199
WBG 4271	10-21-00	1422	soil				1		1														2	dup 241
WBG 4150	10-21-00	1707	soil						1														1	243
WBG 4142	10-21-00	1422	soil						1														1	241
WBG 4139	10-21-00	1508	soil	1	1				1														3	240
WBG 4008	10-21-00	1222	soil	1	1		1						1										3	4 vib 199 4-6'
WBG 4028	10-21-00	1141	soil				1							1									2	205 4-6'
WBG 4108	10-21-00	1047	soil	1	1						1			1 vib									3	23 24 231

RELINQUISHED BY: Vicki Brumback	Date/Time 10-23-00 1400	RECEIVED BY: [illegible]	Date/Time 10-23-00 1400	TOTAL NUMBER OF CONTAINERS See p. 5/5	Cooler Temperature: 4°C
COMPANY NAME: SAIC		COMPANY NAME:		Cooler ID: J807	FEDEX NUMBER: NA Courier pickup
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool, 4C 2 HCL, pH < 2 3 HNO3, pH < 2 4 NaOH, pH > 12 5 H2SO4, pH < 2

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CHAIN OF CUSTODY RECORD

COC NO.: WBGSNT - 3
page 2 of 5

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback **(Printed Name):** Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1 / Pest IPCBs	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1+Cr+6	CN d1	TAL Metals c1, CN d1	TOC	TAL Metals	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4102	10-21-00	1023	soil						1													1	Sta 229
WBG 4136	10-21-00	1555	soil						1													1	239
WBG 4133	10-21-00	1629	soil						1													1	238
WBG 4094	10-22-00	1420	soil										1									1	227
4095	"	1425	"										1									1	
4096	"	1428	"										1									1	
4097	"	1430	"										1									1	
4098	"	1435	"										1									1	
WBG 4083	10-22-00	1652	soil										1									1	223 2-4'
WBG 4109	10-22-00	1715	soil										1									1	231 2-4
WBG 4074	10-22-00	1536	soil										1									1	220 2-4
WBG 4065	10-22-00	1421	soil	1	1						1		1									3	217 2-4
WBG 4068	10-22-00	1457	soil										1									1	218 2-4

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF Sa p. 5/5	Cooler Temperature: 4°C
Vicki Brumback	10-23-00	M Winslet	10-23-00	Cooler ID: J807	FEDEX NUMBER: NA - Courier pickup
COMPANY NAME: SAIC	1400	COMPANY NAME:	1400		
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

SAIC An Employee-Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

CHAIN OF CUSTODY RECORD

COC NO.: WBGSNT - 3
page 3 of 5

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature) Vicki Brumback **(Printed Name)** Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1/Pest/PCBs	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1	TOC	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG-4180	10-22-00	1200	soil						1												1	Sta 252
WBG-4179	"	1150	"						1												1	
WBG-4182	"	1205	"						1												1	
WBG-4183	"	1210	"						1												1	
WBG-4181	"	1203	"						1												1	
WBG-4145	10-22-00	1020	soil						1												1	242
4146	"	1025	"						1												1	
4147	"	1030	"						1												1	
4148	"	1035	"						1												1	
4149	"	1040	"						1												1	
WBG-4071	10-22-00	1149	soil						1												1	2-4 219
~~WBG-4065~~	~~10-22-00~~	~~1421~~	~~soil~~	1	1																	

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF SC p.5/5	Cooler Temperature: 4°C
Vicki Brumback	10-23-00 1400	Al Wright	10-23-00 1400	Cooler ID: J807	FEDEX NUMBER: NA- Courier pickup
COMPANY NAME: SAIC		COMPANY NAME:			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

SAIC An Employee-Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

CHAIN OF CUSTODY RECORD

COC NO.: WBGSNT - 3
page 4 of 5

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature) Vicki Brumback **(Printed Name)** Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1	TOC	TAL Metals + Cr+6	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4272	10-22-00	1536	soil				1		1													2	dup 220 Start 2-4
WBG 4128	10-22-00	1515	soil										1									1	237
4129		1520											1									1	
4130		1523											1									1	
4131		1525											1									1	
4132		1528											1									1	
WBG 4111	10-22-00	1330	soil										1									1	Start 232
4112	"	1335											1									1	
4113		1340											1									1	
4114		1345											1									1	
4115	vib	1350											1									1	199 6-8'
WBG (4312)4	10-22-00	0956	soil						1													1	* NOTE- please change label on jar to WBG 4314
WBG 4313	10-22-00	1035	soil						1													1	205 6-8'

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF	Cooler Temperature:
Vicki Brumback	10-23-00 1400	[signature]	10-23-00 1400	Sup 5/5	4°C
COMPANY NAME: SAIC		COMPANY NAME:		Cooler ID: J807	FEDEX NUMBER: NA- Courier pickup
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

SAIC An Employee-Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

CHAIN OF CUSTODY RECORD

COC NO.: WBGSNT - 3
page 5 of 5

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1 + Cr+6	CN d1	TAL Metals ~~e1, CN d1~~ vjb	TOC	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4018	10-22-00	0915	soil						1												1	203
4019		0920							1												1	
4020		0923							1												1	
4021		0925							1												1	
4022		0930							1												1	
WBG 4162	10-22-00	1110	soil								1										1	247
4163		1115									1										1	247 2-4

vjb 10-23-00

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Vicki Brumback	10-23-00	[signature]	10-23-00
COMPANY NAME: SAIC	1400	COMPANY NAME:	1400
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF 71

Cooler Temperature: 4°C

Cooler ID: J807

FEDEX NUMBER: NA- Courier pickup

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

SAIC An Employee-Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

CHAIN OF CUSTODY RECORD

COC NO.: WBGSNT - 4
page 1 of 5

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1 / Pest / PCBs	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1 + Cr+6	TOC	TAL Metals + Cr+6	WATER: TAL Metals + CN	VOCs n1.2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1.3	Metals - total i1.3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG4204	10-23-00	1357	soil					1	1														2	SCA 259
WBG4207	10-23-00	1437	soil					1					1										2	260
WBG4159	10-23-00	0950	soil										1										1	RUN MS/MSD 246
WBG 4176	10-23-00	1024	soil	1	1			1			1												4	RUN 251 MS/MSD on TAL metals, CN + Cr+6
WBG4210	10-23-00	1527	soil	1	1									1									3	261
WBG 4173	10-23-00	1055	soil										1										1	RUN MS/MSD 250 v,b
WBG 4156	10-23-00	0915	soil	1	1						1												3	RUN MS/MSD ~~on TAL metals + Cr+6~~ 245
WBG 4170	10-23-00	1124	soil										1										1	249
WBG 4151	10-23-00	1656	soil						1														1	243 2-3.8
WBG 4273	10-23-00	1656	soil				1		1														2	dup 243
WBG 4249	10-24-00	1700	sediment	1	1			1			1	1											5	294
WBG 4230	10-24-00	1035	soil						1														1	275
WBG 4222	10-24-00	1015	soil						1														1	267

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF See p 5/5	Cooler Temperature: 4°C
Vicki Brumback	10-25-00	[illegible]	10-25-00	Cooler ID: J912, J478	FEDEX NUMBER: NA- Courier pickup
COMPANY NAME: SAIC	1535	COMPANY NAME:	1535		
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

H-88

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Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

COC NO.: WBGSNT - 4
page 2 of 5

CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature) Vicki Brumback **(Printed Name)** Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1/Pest/PCBs	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1 + Cr+6	TOC	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4224	10-24-00	0835	soil						1												1	Sta 269
WBG 4250	10-24-00	1607	sediment	1	1			1			1	1									5	RUN MS/MSD on 295 TAL metals + Cr+6
WBG 4236	10-24-00	1355	soil						1												1	281
WBG 4274	10-24-00	1355	soil				1		1												2	281 dup
WBG 4229	10-24-00	1320	soil						1												1	274
WBG 4233	10-24-00	1440	soil						1												1	278
WBG 4232	10-24-00	0905	soil						1												1	277
WBG 4231	10-24-00	0940	soil						1												1	276
WBG 4128	10-22-00	1515	soil				1														1	RUN MS/MSD
4129		1520					1														1	
4130		1523					1														1	
4131		1525					1														1	
4132		1528					1														1	

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF See p.5/5	Cooler Temperature: 4°C
Vicki Brumback	10-25-00 1535	Al Haidet	10-25-00 1535	Cooler ID: J912, J478	FEDEX NUMBER: NA Courier pickup
COMPANY NAME: SAIC		COMPANY NAME:			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

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Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

CHAIN OF CUSTODY RECORD

COC NO.: WBGSNT - 4
page 3 of 5

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Urbin Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1	TOC	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4145	10-27-00	1020	soil				1														1	
4146	"	1025	"				1														1	
4147	"	1030	"				1														1	
4148	"	1035	"				1														1	
4149	"	1040	"				1														1	
WBG 4162	"	1110	"				1														1	
4163	"	1115	"				1														1	
WBG 4111	"	1330	"				1														1	
4112	"	1335	"				1														1	
4113	"	1340	"				1														1	
4114	"	1345	"				1														1	
4115	"	1350	"				1														1	

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Urbin Brumback	10-25-00	Al Waddell	10-25-00
COMPANY NAME: SAIC	1535	COMPANY NAME:	1535
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF See p 5/5
Cooler Temperature: 4°C
Cooler ID: J912, J478
FEDEX NUMBER: NA- courier pickup

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

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Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

CHAIN OF CUSTODY RECORD

COC NO.: WBGSNT - 4
page 4 of 5

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1	TOC	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4094	10-22-00	1420	soil				1														1	
4095		1425					1														1	
4096		1430					1														1	
4097		1428					1														1	RUN MS/MSD
4098		1435					1														1	
WBG 4018		0915					1														1	
4019		0920					1														1	
4020		0923					1														1	
4021		0925					1														1	
4022		0930					1														1	
WBG 4179		1150					1														1	
4180		1200					1														1	
4181		1203					1														1	

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Vicki Brumback	10-25-00 1535	Al Haskett	10-25-00 1535
COMPANY NAME: SAIC		COMPANY NAME:	
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF Sea p5/5

Cooler Temperature: 4°C

Cooler ID: J912, J478

FEDEX NUMBER: NA - Courier pickup

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

SAIC An Employee-Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

CHAIN OF CUSTODY RECORD

COC NO.: WBGSNT - 4
page 5 of 5

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1	TOC	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4182	10-22-00	1205	soil				1		1												1	
4183		1210					1		1												1	
WBG 4160	10-25-00	1047							1												1	246 2-4
4075		0947							1												1	
4103		1120							1												1	
4072		0935					1		1												1	
4140		1017							1												1	
4080		0900							1												1	

Vib 10-25-00

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Vicki Brumback	10-25-00	Al Waidet	10-25-00
COMPANY NAME: SAIC	1535	COMPANY NAME:	1535
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF Cooler ID: J912, J478

Cooler Temperature: 4°C

FEDEX NUMBER: NA - Courier pickup

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

H-92

SAIC An Employee-Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

CHAIN OF CUSTODY RECORD

COC NO.: WBGSNT - 5
page 1 of 4

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature) Urzli Brumback **(Printed Name)** Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1 / Pest/PCBs	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1	TOC	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4276	10-30-00	0915	soil				e		2 vjb												2	do not run explosives analysis RUN MS/MSD (use extra jar for extra volume)
WBG 4042	10-30-00	1057	soil	1	1		1		1		1										4	geoprobe
WBG 4277	10-30-00	1047	soil				e		2 vjb												2	do not run explosives analysis
WBG 4198	10-30-00	0902	soil				1		1												2	geoprobe
WBG 4275	10-30-00	0847	soil				e		2 vjb												2	do not run explosives analysis
WBG 4197	10-30-00	0855	soil				1		1												2	geoprobe
WBG 4200	10-30-00	0927	soil				1		1												2	↓
WBG 4196	10-30-00	0847	soil				1		1												2	↓
WBG 4199	10-30-00	0915	soil				1		1												2	↓
WBG 4044	10-30-00	1132	soil				1		1												2	↓
WBG 4278	10-30-00	1107	soil				e		2 vjb												2	do not run explosives analysis RUN MS/MSD (use extra jar for extra volume)
WBG 4045	10-30-00	1202	soil				1		1												2	geoprobe
WBG 4043	10-30-00	1107	soil				1		1												2	↓ RUN MS/MSD for EXPLOSIVES

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Urzli Brumback	11-1-00	Al Waidt	11-01-00
COMPANY NAME: SAIC	1530	COMPANY NAME:	1530
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF See p.4 of 4

Cooler Temperature: 4°C

Cooler ID: K65

FEDEX NUMBER: NA- Courier pickup

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

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Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

CHAIN OF CUSTODY RECORD

COC NO.: WBGSNT - 5
page 2 of 4

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature) Vicki Brumback **(Printed Name)** Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1	TOC	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4219	10-30-00	1446	soil				1		1												2	do not run explosives analysis
WBG 4220	10-30-00	1533	soil						1												1	
WBG 4221	10-30-00	1446	soil						1												1	
WBG 4041	10-30-00	1047	soil				1		1												2	geoprobe
WBG 4219	10-30-00	1646	soil						1												1	
WBG 4235	10-30-00	1706	soil						1												1	
WBG 4246	10-31-00	1324	soil						1												1	
WBG 4238	10-31-00	0843	soil						1												1	
WBG 4237	10-31-00	1701	soil						1												1	
WBG 4248	10-31-00	1451	soil						1												1	
WBG 4245	10-31-00	0891 (0819?)	soil						1												1	
WBG 4247	10-31-00	1523	soil						1												1	
WBG 4243	10-31-00	~~1523~~ 1604	soil						1												1	

RELINQUISHED BY: Vicki Brumback	Date/Time 11-1-00 1530	RECEIVED BY: [illegible]	Date/Time 11-01-00 1530	TOTAL NUMBER OF See p. 4/4	Cooler Temperature: 4°C
COMPANY NAME: SAIC		COMPANY NAME:		Cooler ID: K65	FEDEX NUMBER: NA - Courier pickup
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

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Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

COC NO.: WBGSNT - 5
page 3 of 4

CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature) Vicki Brumback **(Printed Name)** Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SOIL: SVOCs b1	SOIL: Pesticides/PCBs e1	SOIL: Explosives f1	SOIL: Propellants f1	SOIL: TAL Metals c1	SOIL: CN d1	SOIL: TAL Metals c1, CN d1	SOIL: TOC	WATER: VOCs n1,2	WATER: SVOCs j1	WATER: Pesticides/PCBs k1	WATER: Metals - filtered i1,3	WATER: Metals - total i1,3	WATER: CN h1,4	WATER: Explosives m1	WATER: Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4280	10-31-00	1400	soil						1												1	
WBG 4242	10-31-00	1638	soil						1												1	
WBG 4241	10-31-00	1046	soil						1												1	
WBG 4247	10-31-00	1400	soil						1												1	
WBG 4239	10-31-00	0934	soil						1												1	
WBG 4234	10-31-00	1130	soil						1												1	
WBG 4240	10-31-00	1009	soil						1												1	
WBG 4225	11-01-00	0827	soil						1												1	
WBG 4226	11-01-00	0843	soil						1												1	
WBG 4227	11-01-00	0903	soil						1												1	
WBG 4228	11-1-00	0916	soil						1												1	
WBG 4223	11-1-00	0950	soil						1												1	
WBG 4281	11-1-00	0950	soil						1												1	

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Vicki Brumback	11-1-00	Al Haidet	11-01-00
COMPANY NAME: SAIC	1530	COMPANY NAME:	1530
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF see p 4 of 4

Cooler Temperature: 4°C

Cooler ID: K65

FEDEX NUMBER: NA - Courier pickup

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

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800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

COC NO.: WBGSNT - 5
page 4 of 4

CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature) Vicki Brumback **(Printed Name)** Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1	TOC	TAL Metals Cr+6	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4213	11-01-00	1022	soil						1													1	
WBG 4201	11-01-00	1039	soil										1									1	
WBG 4216	11-01-00	1107	soil						1													1	

Vjb 11-1-00

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF 59	Cooler Temperature: 4°C
Vicki Brumback	11-1-00	Al Haiat	11-01-00		
COMPANY NAME: SAIC	1530	COMPANY NAME:	1530	Cooler ID: K65	FEDEX NUMBER: NA - Courier pickup
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

H-96

To: Becki Strait (fax: 330-497-0772)

From: Vicki Brumbach

11-4-00

Corrected COC # WBGSNT-6

SAIC An Employee-Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

CHAIN OF CUSTODY RECORD

original
COC NO.: WBGSNT - 6
page 1 of 1

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature) Vicki Brumback **(Printed Name)** Vicki Brumback

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1	TOC	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG4265	11-1-00	1622	water										3	2	2	1	+	1	2	2	13	WBG-mw-015
WBG 4267	11-1-00	1635	water										3	2	2	1	+	1	2	2	13	WBG mw-017
WBG 4315	11-2-00	0838	soil						1								Vjb				1	
WBG 4316	11-2-00	0902	soil						1												1	
WBG 4305	11-1-00	—	water										2								2	TRIP BLANK
WBG 4268	11-2-00	1110	water										3	2	2	1		1	2	2	13	WBG-mw-013
↓ MS/MSD	↓	↓	↓										6	4	4	2		2	4	4	26	MS/MSD for WBG 4268
WBG 4263	11-2-00	1455	water										3	2	2	1		1	2	2	13	WBG-mw-010
WBG 4285	11-2-00	1110	water										3	2	2	1		1	2	2	13	
~~WBG 4288~~																						
WBG 4289							Vjb		11-3-00													
WBG 4261																						WBG mw 011

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Vicki Brumback	11/3/00 3:01 pm	Rebecca Strait	11/3/00 3:01 p
COMPANY NAME: SAIC		COMPANY NAME: STL North Canton	
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF 95

Cooler Temperature: 4°C

Cooler ID:

FEDEX NUMBER: NA - SAIC lab delivery

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

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REPLACEMENT
COC NO.: WBGSNT - 6
page 1 of 1

CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1	TOC	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4265	11-1-00	1622	water										3	2	2	1		1	2	2	13	WBG mw-015
WBG 4267	11-1-00	1635	water										3	2	2	1		1	2	2	13	WBG mw-017
WBG 4315	11-2-00	0838	soil						1												1	
WBG 4316	11-2-00	0902	soil						1												1	
WBG 4305	11-1-00	—	water										2								2	TRIP BLANK
WBG 4260	11-2-00	1110	water										3	2	2	1		1	2	2	13	WBG mw-013
↓ MS/MSD	↓	↓	↓										6	4	4	2		2	4	4	26	MS/MSD for WBG 4260
WBG 4263	11-2-00	1455	water										3	2	2	1		1	2	2	13	WBG mw-010
WBG 4285	11-2-00	1110	water										3	2	2	1		1	2	2	13	
WBG 4284	11-2-00	1355	water										3	2	2	1		1	2	2	13	
WBG 4261	11-2-00	1355	water										3	2	2	1		1	2	2	13	WBG mw-011

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF 121	Cooler Temperature: 4°C
COMPANY NAME: See original for signatures		COC # WBGSNT-6 COMPANY NAME:		Cooler ID:	FEDEX NUMBER: NA - SAIC delivery
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

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800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

CHAIN OF CUSTODY RECORD

COC NO.: WBGSNT - 7
page 1 of 1

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature) Vicki Brumbeck **(Printed Name)** Vicki Brumbeck

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	SOIL: VOCs a1	SVOCs b1	Pesticides/PCBs e1	Explosives f1	Propellants f1	TAL Metals c1	CN d1	TAL Metals c1, CN d1	TOC	WATER: VOCs n1,2	SVOCs j1	Pesticides/PCBs k1	Metals - filtered i1,3	Metals - total i1,3	CN h1,4	Explosives m1	Propellants m1	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4253	11-5-00	1125	water										3	2	2	1		1	2	2	13	
WBG 4266	11-3-00	1115	water										3	2	2	1		1	2	2	13	
WBG 4256	11-3-00	1400	water										3	2	2	1		1	2	2	13	
WBG 4262	11-4-00	1615	water										3	2	2	1		1	2	2	13	
WBG 4264	11-4-00	1007	water										3	2	2	1		1	2	2	13	
WBG 4255	11-4-00	1145	water										3	2	2	1		1	2	2	13	
WBG 4259	11-4-00	1545	water										3	2	2	1		1	2	2	13	
WBG 4254	11-5-00	1100	water										3	2	2	1		1	2	2	13	
WBG 4258	11-3-00	1528	water										3	2	2	1		1	2	2	13	
WBG 4257	11-3-00	1630	water										3	2	2	1		1	2	2	13	
WBG 4252	11-5-00	1612	water										3	2	2	1		1	2	2	13	
WBG 4251	11-5-00	1500	water										3	2	2	1		1	2	2	13	
WBG 4306	11-3-00	—	water										3								3	TRIP BLANK

LABORATORY NAME: Severn Trent Laboratories, Inc.

LABORATORY ADDRESS: 4101 Shuffel Drive NW, North Canton, Ohio 44720, Attn: Becky Strait

PHONE NO: 330-497-9396

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Vicki Brumbeck	11-6-00 1125		
COMPANY NAME: SAIC		COMPANY NAME: STL	
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF 159

Cooler ID: J807, 11C J51, J166 + 5 more

Cooler Temperature: 4°C

FEDEX NUMBER: NA - Courier pickup

SOIL/SEDIMENT METHODS
a SW-846, 5035/8260B
b SW-846, 8270C
c SW-846, 6010B/7471
d SW-846, 9011/9010
e SW-846, 8082
f SW-846, 8330
g SW-846, 9060
p EPA 350.2

WATER METHODS
h SW-846, 9010
i SW-846, 6010A/7470
j SW-846, 8270C
k SW-846, 8082
m SW-846, 8330
n SW-846, 8260B
q EPA 350.2

1 Cool,4C 2 HCL, pH<2 3 HNO3, pH<2 4 NaOH, pH>12 5 H2SO4, pH<2

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800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423) 481-4600

COC NO.: WBGS&ME - 1
page 1 of 1

CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NO: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: S&ME, Inc.

LABORATORY ADDRESS: 1413 Topside Road Louisville, TN 37777

PHONE NO: 423-970-2299 865

Sample ID	Date Collected	Time Collected	Matrix	Grain Size	Moisture	Atterberg Limits	USCS Classification	Bulk Density	Porosity	Hydraulic Conductivity	Specific Gravity	pH	Hydrometer	Redox Potential	Grain Size (sieve only)	Dry Weight	No. of Bottles/ Vials:	OBSERVATIONS, COMMENTS,
WBG 4249	10-24-00	1700	sediment	✓	✓	✓	✓										1	WBG-294
WBG 4250	10-24-00	1607	sediment	✓	✓	✓	✓										1	WBG-295
WBG 4266	10-18-00	1630	Soil		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	1	1-3 FT MW-15
WBG 4264	10-18-00	1305	Soil		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	1	1-3 FT MW-14
WBG 4262	10-19-00	1105	soil		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	1	1-3 FT MW-12
WBG 4260	10-26-00	0835	soil	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	1	1-3 FT MW 10
				VB														
							VB		10/31/00									

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF CONTAINERS: 6	Cooler Temperature: NA
Vicki Brumback	11/1/00			Cooler ID: NA	FEDEX NUMBER: Airbill # 822527889172
COMPANY NAME: SAIC	1700	COMPANY NAME:			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

H-101

Soil

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APPENDIX I

EXPLOSIVES FIELD ANALYTICAL RESULTS

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Table I-1. Explosives Field Analytical Results[a]

Station	Sample ID	Field Sample Type	Date Collected	2,4,6-TNT (mg/kg)	RDX (mg/kg)
Sediment					
WBG-294	WBG4249	Grab	10/24/00	< 1	< 1
WBG-295	WBG4250	Grab	10/24/00	< 1	< 1
Surface Soil					
WBG-197	WBG4000	Grab	10/17/00	< 1	< 1
WBG-198	WBG4003	Grab	10/17/00	< 1	< 1
WBG-199	WBG4006	Grab	10/17/00	34	NA
WBG-200	WBG4009	Grab	10/17/00	< 1	< 1
WBG-201	WBG4012	Grab	10/17/00	< 1	< 1
WBG-202	WBG4015	Grab	10/17/00	< 1	< 1
WBG-203	WBG4018	Grab	10/22/00	< 1	< 1
WBG-204	WBG4023	Grab	10/18/00	< 1	< 1
WBG-205	WBG4026	Grab	10/18/00	13	NA
WBG-206	WBG4029	Grab	10/18/00	< 1	< 1
WBG-207	WBG4032	Grab	10/18/00	< 1	< 1
WBG-208	WBG4035	Grab	10/18/00	< 1	< 1
WBG-209	WBG4038	Grab	10/18/00	< 1	< 1
WBG-210	WBG4041	Grab	10/30/00	< 1	< 1
WBG-211	WBG4046	Grab	10/18/00	223	NA
WBG-212	WBG4049	Grab	10/18/00	< 1	< 1
WBG-213	WBG4052	Grab	10/18/00	< 1	< 1
WBG-214	WBG4055	Grab	10/18/00	< 1	< 1
WBG-215	WBG4058	Grab	10/18/00	< 1	< 1
WBG-216	WBG4061	Grab	10/18/00	< 1	< 1
WBG-217	WBG4064	Grab	10/19/00	44	NA
WBG-218	WBG4067	Grab	10/19/00	23	NA
WBG-219	WBG4070	Grab	10/18/00	21	< 1
WBG-220	WBG4073	Grab	10/19/00	1	< 1
WBG-221	WBG4076	Grab	10/19/00	< 1	< 1
WBG-222	WBG4079	Grab	10/18/00	318	NA
WBG-223	WBG4082	Grab	10/20/00	< 1	3.4
WBG-224	WBG4085	Grab	10/20/00	< 1	< 1
WBG-225	WBG4088	Grab	10/20/00	< 1	< 1
WBG-226	WBG4091	Grab	10/20/00	< 1	< 1
WBG-227	WBG4094	Grab	10/22/00	< 1	< 1
WBG-229	WBG4102	Grab	10/21/00	1.3	< 1
WBG-230	WBG4105	Grab	10/20/00	< 1	< 1
WBG-231	WBG4108	Grab	10/21/00	2	< 1
WBG-232	WBG4111	Grab	10/22/00	1.8	NA
WBG-233	WBG4116	Grab	10/20/00	< 1	< 1
WBG-234	WBG4119	Grab	10/19/00	< 1	2
WBG-235	WBG4122	Grab	10/19/00	< 1	< 1
WBG-236	WBG4125	Grab	10/20/00	< 1	< 1
WBG-237	WBG4128	Grab	10/22/00	< 1	NA
WBG-238	WBG4133	Grab	10/21/00	< 1	< 1
WBG-239	WBG4136	Grab	10/21/00	< 1	< 1
WBG-240	WBG4139	Grab	10/21/00	4	NA
WBG-241	WBG4142	Grab	10/21/00	< 1	< 1
WBG-242	WBG4145	Grab	10/22/00	< 1	< 1
WBG-243	WBG4150	Grab	10/21/00	1.1	5.3

Table I-1. Explosives Field Analytical Results (continued)[a]

Station	Sample ID	Field Sample Type	Date Collected	2,4,6-TNT (mg/kg)	RDX (mg/kg)
WBG-245	WBG4156	Grab	10/23/00	< 1	< 1
WBG-246	WBG4159	Grab	10/23/00	15	NA
WBG-247	WBG4162	Grab	10/22/00	4.5	NA
WBG-249	WBG4170	Grab	10/23/00	1.5	NA
WBG-250	WBG4173	Grab	10/23/00	1	NA
WBG-251	WBG4176	Grab	10/23/00	< 1	< 1
WBG-252	WBG4179	Grab	10/22/00	1,780	NA
WBG-253	WBG4184	Grab	10/17/00	< 1	< 1
WBG-254	WBG4187	Grab	10/16/00	1.1	4.1
WBG-255	WBG4190	Grab	10/17/00	5	NA
WBG-256	WBG4193	Grab	10/17/00	< 1	< 1
WBG-257	WBG4196	Grab	10/30/00	< 1	< 1
WBG-258	WBG4201	Grab	11/01/00	< 1	< 1
WBG-259	WBG4204	Grab	10/23/00	< 1	< 1
WBG-260	WBG4207	Grab	10/23/00	< 1	< 1
WBG-261	WBG4210	Grab	10/23/00	< 1	< 1
WBG-262	WBG4213	Grab	11/01/00	< 1	< 1
WBG-263	WBG4216	Grab	11/01/00	< 1	< 1
WBG-264	WBG4219	Grab	10/30/00	< 1	< 1
WBG-265	WBG4220	Grab	10/30/00	< 1	< 1
WBG-266	WBG4221	Grab	10/30/00	< 1	< 1
WBG-267	WBG4222	Grab	10/24/00	< 1	< 1
WBG-268	WBG4223	Grab	11/01/00	< 1	< 1
WBG-269	WBG4224	Grab	10/24/00	< 1	< 1
WBG-270	WBG4225	Grab	11/01/00	< 1	< 1
WBG-271	WBG4226	Grab	11/01/00	< 1	< 1
WBG-272	WBG4227	Grab	11/01/00	< 1	< 1
WBG-273	WBG4228	Grab	11/01/00	< 1	< 1
WBG-274	WBG4229	Grab	10/24/00	< 1	< 1
WBG-275	WBG4230	Grab	10/24/00	< 1	< 1
WBG-276	WBG4231	Grab	10/24/00	< 1	< 1
WBG-277	WBG4232	Grab	10/24/00	< 1	< 1
WBG-278	WBG4233	Grab	10/24/00	< 1	< 1
WBG-279	WBG4234	Grab	10/31/00	< 1	< 1
WBG-280	WBG4235	Grab	10/30/00	< 1	< 1
WBG-281	WBG4236	Grab	10/24/00	< 1	< 1
WBG-282	WBG4237	Grab	10/31/00	< 1	< 1
WBG-283	WBG4238	Grab	10/31/00	< 1	< 1
WBG-284	WBG4239	Grab	10/31/00	< 1	< 1
WBG-285	WBG4240	Grab	10/31/00	< 1	< 1
WBG-286	WBG4241	Grab	10/31/00	< 1	< 1
WBG-287	WBG4242	Grab	10/31/00	< 1	< 1
WBG-288	WBG4243	Grab	10/31/00	< 1	< 1
WBG-289	WBG4244	Grab	10/31/00	< 1	< 1
WBG-290	WBG4245	Grab	10/31/00	< 1	< 1
WBG-291	WBG4246	Grab	10/31/00	< 1	< 1
WBG-292	WBG4247	Grab	10/31/00	< 1	< 1
WBG-293	WBG4248	Grab	10/31/00	< 1	< 1
WBG-296	WBG4315	Grab	11/02/00	< 1	< 1
WBG-297	WBG4316	Grab	11/02/00	< 1	< 1

Table I-1. Explosives Field Analytical Results (continued)[a]

Station	Sample ID	Field Sample Type	Date Collected	2,4,6-TNT (mg/kg)	RDX (mg/kg)
Subsurface Soil					
WBG-199	WBG4007	Grab	10/20/00	138	NA
WBG-199	WBG4008	Grab	10/21/00	17	NA
WBG-199	WBG4314	Grab	10/22/00	6.5	NA
WBG-203	WBG4019	Grab	10/22/00	< 1	< 1
WBG-203	WBG4020	Grab	10/22/00	< 1	< 1
WBG-203	WBG4021	Grab	10/22/00	< 1	< 1
WBG-203	WBG4022	Grab	10/22/00	< 1	< 1
WBG-205	WBG4027	Grab	10/20/00	32	NA
WBG-205	WBG4028	Grab	10/21/00	28	< 1
WBG-205	WBG4313	Grab	10/22/00	4	NA
WBG-210	WBG4042	Grab	10/30/00	< 1	< 1
WBG-210	WBG4043	Grab	10/30/00	< 1	< 1
WBG-210	WBG4044	Grab	10/30/00	< 1	< 1
WBG-210	WBG4045	Grab	10/30/00	< 1	< 1
WBG-218	WBG4068	Grab	10/22/00	2.7	NA
WBG-219	WBG4071	Grab	10/22/00	1.7	NA
WBG-219	WBG4072	Grab	10/25/00	< 1	1.5
WBG-220	WBG4074	Grab	10/22/00	2.3	NA
WBG-221	WBG4075	Grab	10/25/00	< 1	< 1
WBG-222	WBG4080	Grab	10/25/00	< 1	< 1
WBG-223	WBG4083	Grab	10/22/00	< 1	< 1
WBG-227	WBG4095	Grab	10/22/00	< 1	< 1
WBG-227	WBG4096	Grab	10/22/00	< 1	< 1
WBG-227	WBG4097	Grab	10/22/00	1.9	NA
WBG-227	WBG4098	Grab	10/22/00	< 1	< 1
WBG-229	WBG4103	Grab	10/25/00	< 1	< 1
WBG-231	WBG4109	Grab	10/22/00	< 1	< 1
WBG-232	WBG4112	Grab	10/22/00	< 1	< 1
WBG-232	WBG4113	Grab	10/22/00	1.2	NA
WBG-232	WBG4114	Grab	10/22/00	1.1	NA
WBG-232	WBG4115	Grab	10/22/00	< 1	< 1
WBG-237	WBG4129	Grab	10/22/00	< 1	< 1
WBG-237	WBG4130	Grab	10/22/00	< 1	< 1
WBG-237	WBG4131	Grab	10/22/00	< 1	< 1
WBG-237	WBG4132	Grab	10/22/00	< 1	< 1
WBG-240	WBG4140	Grab	10/25/00	< 1	< 1
WBG-242	WBG4146	Grab	10/22/00	< 1	< 1
WBG-242	WBG4147	Grab	10/22/00	< 1	< 1
WBG-242	WBG4148	Grab	10/22/00	< 1	< 1
WBG-242	WBG4149	Grab	10/22/00	< 1	< 1
WBG-243	WBG4151	Grab	10/23/00	< 1	< 1
WBG-246	WBG4160	Grab	10/25/00	< 1	< 1
WBG-247	WBG4163	Grab	10/22/00	< 1	< 1
WBG-252	WBG4180	Grab	10/22/00	1,670	NA
WBG-252	WBG4181	Grab	10/22/00	1,200	NA
WBG-252	WBG4182	Grab	10/22/00	1,360	NA
WBG-252	WBG4183	Grab	10/22/00	475	NA
WBG-254	WBG4188	Grab	10/19/00	< 1	< 1
WBG-255	WBG4191	Grab	10/19/00	< 1	< 1

Table I-1. Explosives Field Analytical Results (continued)[a]

Station	Sample ID	Field Sample Type	Date Collected	2,4,6-TNT (mg/kg)	RDX (mg/kg)
WBG-257	WBG4197	Grab	10/30/00	< 1	< 1
WBG-257	WBG4198	Grab	10/30/00	< 1	< 1
WBG-257	WBG4199	Grab	10/30/00	< 1	< 1
WBG-257	WBG4200	Grab	10/30/00	< 1	< 1

[a] Results presented for TNT and RDX represent corrected results.
NA = Not available.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
TNT = Trinitrotoluene.

APPENDIX J

X-RAY FLUORESCENCE ANALYTICAL RESULTS

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FINAL REPORT FOR THE X-RAY FLUORESCENCE ANALYSIS FOR METALS AT WINKLEPECK BURNING GROUNDS

RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO 44266

Prepared for

[redacted]

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
800 OAKRIDGE TURNPIKE
OAKRIDGE, TN 37831

Prepared by



MKM ENGINEERS, INC
4153 BLUEBONNET DRIVE
STAFFORD, TEXAS 77477

JANUARY 2001

MKM

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2. Case Narrative

3. In-Situ Analysis Results

4. Ex-Situ Analysis Results

5. Quality Assurance/Quality Control Information

6. Calibration Data

7. Chain of Custody Sheets

1. INTRODUCTION

INTRODUCTION

Project Authorization: MKM Engineers, Inc. provided services to conduct X-Ray Fluorescence (XRF) Analysis for detection of Metals during the Remedial Investigation at Winklepeck Burning Grounds by Science Applications International Corporation (SAIC). This project started on September 12, 2000.

Purpose and Scope: The purpose of this project was to use XRF Technology to detect metals in soils and sediments during the Remedial Investigation of Winklepeck Burning Grounds. Specifically, the major tasks involved in completing this contract were:

1. Provide all necessary materials and labor to detect metals in-situ.
2. Provide all necessary materials and labor to analyze metals ex-situ in accordance with the EPA Method 6200 on samples provided by SAIC.
3. Provide final report describing results of all work completed.

X-Ray Fluorescence Spectrometry:

Analytical methods that can rapidly provide on-site information on contaminant concentrations can be very useful in facilitating the making of real time decisions regarding sampling, exposure assessment, risk assessment and risk management. XRF instruments for measuring concentrations of metals in soils is gaining acceptance because of its obvious advantages. Analysis of metals in soils and sediments can be made either in-situ or ex-situ.

In-situ analysis of soils involves measuring concentrations in-place. Since the soils are not processed prior to analysis, such data may not be very accurate compared to results from a traditional laboratory extraction procedure. Ex-situ analysis involves processing of the soil samples in a laboratory in accordance with the EPA 6200 method. Previous studies have shown that the ex-situ data is comparable to the traditional laboratory data. However, comprehensive correlation studies have not been conducted to compare the in-situ and ex-situ analysis data.

Niton 700 Series XRF Instrument is a dual-detector system containing Cadmium and Americium detectors. Cadmium detects Arsenic, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Rubidium, Selenium, Strontium, Titanium, Zinc and Zirconium. Americium detects Antimony, Barium, Cadmium, Indium, Iodine, Palladium, Silver and Tin.

The current report is a compilation of results from the in-situ and ex-situ analyses of soil samples from Winklepeck Burning Grounds at the Ravenna Army Ammunition Plant. The Niton XRF Instrument reports results with an error margin of 3-Standard Deviations. The results from the in-situ and ex-situ analyses have been provided in

separate sections. Ex-situ results can be used for comparisons to the laboratory analytical data.

In-Situ Analysis for Metals:

Based on the triangulation sampling scheme followed for the collection of samples for analysis of explosives and metals, each sample station identified and cleared by the SAIC sampling team was analyzed using the Niton XRF Instrument at the 3 vertices of the triangle. A fourth location at the center of the triangle (which was used for collection of sample for metals analysis by the SAIC sampling team) was also analyzed using the Niton XRF Instrument. The instrument was calibrated thrice every day using the internal calibration procedure for the in-situ measurements.

Ex-Situ Analysis for Metals:

Samples (splits of samples that were sent to the laboratory for analysis using the traditional extraction procedures) provided by the SAIC Sampling Team were analyzed at the MKM Field Laboratory using the EPA Method 6200. Appropriate QA/QC procedures were implemented during the analysis. Calibration verification checks were conducted using the NIST standards provided by the instrument manufacturer. Ten percent of the samples analyzed in a day were duplicated to ensure data accuracy. NIST Blank sample (instrument blank) was analyzed periodically to ensure that the spectrometer or the probe window is not contaminated.

2. CASE NARRATIVE

CASE NARRATIVE

Samples were received from the SAIC Sampling Manager immediately after collection and were at ambient temperature. All samples were refrigerated at 4 degrees C immediately upon arrival at the MKM Field Laboratory.

No anomalies were associated with this project. Necessary laboratory QA/QC measures were implemented during the project.

3. IN-SITU ANALYSIS DATA

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
197-1	<LOD	38.4	250.6	48.8	<LOD	48.75	<LOD	60.75	<LOD	51.3	<LOD	116.55
197-2	<LOD	38.85	284.4	53.7	<LOD	47.4	<LOD	61.2	<LOD	51.75	<LOD	123.9
197-3	<LOD	34.95	303.6	57.7	<LOD	47.85	<LOD	64.65	<LOD	55.35	<LOD	131.4
197-4	<LOD	44.1	296.2	59.1	<LOD	54.15	<LOD	63.75	<LOD	57.45	<LOD	136.35
198-1	<LOD	32.1	166.4	44	<LOD	43.8	<LOD	64.65	<LOD	48.6	<LOD	124.05
198-2	<LOD	37.05	268.2	49.8	<LOD	43.35	<LOD	56.85	<LOD	40.5	<LOD	116.85
198-3	<LOD	33	249	48.2	<LOD	45.9	<LOD	59.4	<LOD	43.8	<LOD	116.55
198-4	<LOD	45.75	304.6	62.2	<LOD	51.45	<LOD	67.05	<LOD	55.05	<LOD	140.4
199-1	<LOD	32.85	282.6	48	<LOD	40.8	<LOD	53.1	56.5	33.1	<LOD	112.5
199-2	<LOD	33.3	272.8	45.1	<LOD	42	<LOD	49.35	<LOD	44.7	<LOD	107.4
199-3	<LOD	49.8	390.4	70	<LOD	58.65	<LOD	69.15	<LOD	60.6	<LOD	144.15
199-4	<LOD	45.75	390.6	67.4	<LOD	54.3	<LOD	57.15	<LOD	55.5	<LOD	136.5
200-1	<LOD	39	252.8	52.2	<LOD	52.35	<LOD	60.3	<LOD	55.5	<LOD	124.2
200-2	<LOD	41.85	241.6	52.3	<LOD	46.05	<LOD	60.75	<LOD	46.2	<LOD	130.65
200-3	<LOD	35.4	249.6	53	<LOD	47.1	<LOD	59.85	<LOD	46.2	<LOD	131.4
200-4	<LOD	33.9	297.4	49.6	<LOD	46.65	<LOD	54	<LOD	38.7	<LOD	112.5
201-1	<LOD	37.95	218.2	45.1	<LOD	40.95	<LOD	60.3	<LOD	41.25	<LOD	118.65
201-2	<LOD	44.85	269.6	53.5	<LOD	50.55	<LOD	60.45	<LOD	46.8	<LOD	120
201-3	<LOD	43.2	271.8	55.2	<LOD	49.65	<LOD	61.5	<LOD	43.65	<LOD	127.05
201-4	<LOD	32.55	211.6	48.1	<LOD	47.85	<LOD	63.6	<LOD	48.75	<LOD	127.2
202-1	62.8	29.2	225.8	44.1	<LOD	43.8	<LOD	57.15	<LOD	34.8	<LOD	111.3

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
202-2	44.2	26.6	234	45.3	<LOD	39.6	<LOD	53.4	<LOD	40.05	<LOD	109.35
202-3	<LOD	48.6	222.4	53.7	<LOD	49.05	<LOD	69.45	<LOD	48.9	<LOD	136.8
202-4	<LOD	39.45	204.2	45.8	<LOD	47.4	<LOD	54.15	<LOD	38.4	<LOD	114.75
203-1	<LOD	43.2	206.4	49.2	<LOD	47.55	<LOD	65.55	<LOD	47.55	<LOD	136.5
203-2	<LOD	43.95	285	62.8	<LOD	53.85	<LOD	68.85	<LOD	61.05	<LOD	145.8
203-3	<LOD	39.75	250.4	57.1	<LOD	49.2	<LOD	65.55	<LOD	51.9	<LOD	137.85
203-4	<LOD	44.1	342.2	66.4	<LOD	52.2	<LOD	64.95	<LOD	48.3	<LOD	138.15
204-1	<LOD	33.45	258.6	47.8	<LOD	42	<LOD	55.8	<LOD	38.4	<LOD	116.7
204-2	<LOD	36.75	192.1	44.5	<LOD	45.45	<LOD	62.85	<LOD	40.05	<LOD	121.05
204-3	<LOD	40.65	234	47.1	<LOD	44.55	<LOD	52.5	<LOD	46.35	<LOD	119.55
204-4	<LOD	39	289.4	51.4	<LOD	40.95	<LOD	58.5	<LOD	42.75	<LOD	116.85
205-1	<LOD	37.8	226.2	43.8	<LOD	40.8	<LOD	54.45	<LOD	40.8	<LOD	113.7
205-2	60.3	28.1	217.6	42.2	<LOD	39.9	<LOD	53.25	<LOD	36.15	<LOD	109.2
205-3	<LOD	33.75	240.2	46.9	<LOD	41.1	<LOD	48.6	<LOD	42.6	<LOD	120.15
205-4	<LOD	34.5	197.3	39.7	<LOD	41.7	<LOD	50.55	<LOD	34.95	<LOD	109.35
206-1	<LOD	38.7	192.4	45.5	<LOD	49.95	<LOD	59.25	<LOD	51.3	<LOD	122.7
206-2	<LOD	32.25	168.5	38.4	<LOD	42.15	<LOD	56.25	<LOD	50.25	<LOD	115.5
206-3	<LOD	31.8	186	40.7	<LOD	42	<LOD	52.05	54.5	33.8	<LOD	117.75
206-4	<LOD	32.55	177.4	39.5	<LOD	41.25	<LOD	52.2	67.9	34.8	<LOD	111.9
207-1	<LOD	38.7	445.2	69.7	<LOD	66.6	<LOD	62.4	525.2	80	<LOD	135.45
207-2	<LOD	37.8	398.6	67.4	<LOD	81.75	<LOD	69.75	856.8	100	<LOD	139.65
207-3	<LOD	42.9	473.2	71.6	<LOD	71.85	<LOD	62.7	757.2	94.7	<LOD	140.4

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
207-4	<LOD	40.95	470.8	77.1	<LOD	69.45	<LOD	71.1	498.8	85.6	<LOD	146.4
208-1	<LOD	38.1	302.6	53.2	<LOD	44.1	<LOD	53.85	<LOD	39	<LOD	119.55
208-2	43.3	28.1	253.8	48.8	<LOD	42	<LOD	55.35	<LOD	45	<LOD	117.3
208-3	<LOD	37.05	256.8	54.7	<LOD	46.65	<LOD	60.9	<LOD	43.35	<LOD	136.5
208-4	<LOD	39.6	279.2	51.3	<LOD	49.05	<LOD	54.45	<LOD	43.35	<LOD	116.85
209-1	<LOD	33.15	174.3	38	<LOD	42.75	<LOD	53.7	<LOD	40.65	<LOD	110.7
209-2	<LOD	30.15	139.9	32.6	<LOD	34.35	<LOD	48.75	<LOD	34.5	<LOD	102.75
209-3	<LOD	32.25	193.5	37.1	<LOD	40.65	<LOD	52.65	<LOD	38.7	<LOD	106.2
209-4	<LOD	30	124.8	30	<LOD	38.4	<LOD	47.25	<LOD	31.05	<LOD	98.85
210-1	<LOD	31.5	179.8	44.9	<LOD	50.25	<LOD	62.25	87.4	41.4	<LOD	128.85
210-2	<LOD	46.35	158.7	53.3	<LOD	59.4	<LOD	76.95	106.3	54.5	<LOD	150
210-3	<LOD	44.55	173.3	47.6	<LOD	49.8	<LOD	64.8	<LOD	51.45	<LOD	133.65
210-4	45	28.9	199.8	46.3	<LOD	48	<LOD	55.2	<LOD	51.9	<LOD	120.15
211-1	<LOD	53.85	1609.6	160	<LOD	81.9	<LOD	70.35	165.9	57.3	165.6	110
211-2	<LOD	35.4	674.4	89.2	<LOD	65.25	<LOD	63.6	162.5	52.9	<LOD	142.5
211-3	<LOD	41.25	755.6	92.9	<LOD	70.95	<LOD	66.6	150.1	50.9	<LOD	146.7
211-4	<LOD	40.05	710.4	100	<LOD	74.25	<LOD	73.5	219.2	66.6	<LOD	150
212-1	<LOD	38.4	197.7	43.3	<LOD	43.95	<LOD	50.7	<LOD	44.1	<LOD	116.85
212-2	<LOD	31.95	280.8	48	<LOD	43.35	<LOD	51.6	<LOD	42.9	<LOD	114.75
212-3	<LOD	34.35	243	48.4	<LOD	46.05	<LOD	58.8	<LOD	41.85	<LOD	117
212-4	<LOD	42.45	271	53.6	<LOD	44.85	<LOD	58.8	<LOD	43.65	<LOD	119.55
213-1	<LOD	32.25	280	48.4	<LOD	43.95	<LOD	52.35	<LOD	42	<LOD	116.4

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
213-2	<LOD	39.9	291	58.1	<LOD	53.1	<LOD	61.8	<LOD	54	<LOD	140.25
213-3	<LOD	35.55	210.2	44.6	<LOD	46.2	<LOD	55.95	<LOD	48.45	<LOD	116.4
213-4	<LOD	33	214.2	45.7	<LOD	41.7	<LOD	54	<LOD	51.3	<LOD	121.95
214-1	<LOD	30.45	203.7	41.1	<LOD	41.7	<LOD	54.15	<LOD	39.6	<LOD	106.65
214-2	<LOD	34.05	237.6	42.8	<LOD	40.95	<LOD	47.25	<LOD	34.05	<LOD	109.95
214-3	<LOD	38.1	170.3	40	<LOD	48.6	<LOD	55.8	<LOD	37.8	<LOD	116.55
214-4	46.4	27.4	217	44.2	<LOD	45.6	<LOD	48	<LOD	41.85	<LOD	118.2
215-1	<LOD	36.9	355.4	55.1	<LOD	44.85	<LOD	59.4	<LOD	49.8	<LOD	114.45
215-2	<LOD	23.1	349.8	52.6	<LOD	44.4	<LOD	53.4	<LOD	47.25	<LOD	114.45
215-3	<LOD	32.85	257.8	46.6	<LOD	46.2	<LOD	51.75	<LOD	41.7	<LOD	108.9
215-4	<LOD	34.65	391.8	57.1	<LOD	47.4	<LOD	53.55	<LOD	49.65	<LOD	115.2
216-1	<LOD	49.5	337.2	63.9	<LOD	48.6	<LOD	59.85	<LOD	49.8	<LOD	134.85
216-2	<LOD	43.05	290.6	61.6	<LOD	56.85	<LOD	64.8	<LOD	44.7	<LOD	135.15
216-3	<LOD	46.5	294.8	63.6	<LOD	60.15	<LOD	68.1	<LOD	53.85	<LOD	141.3
216-4	<LOD	45.45	321.4	71.5	<LOD	68.7	<LOD	71.1	<LOD	58.65	<LOD	150
217-1	<LOD	37.5	280.4	55.4	<LOD	51.6	<LOD	60.45	<LOD	44.7	<LOD	128.55
217-2	<LOD	28.8	303.2	62.7	<LOD	57.3	<LOD	66.9	<LOD	51.15	<LOD	137.55
217-3	<LOD	35.4	299.2	58	<LOD	53.4	<LOD	68.85	<LOD	51.6	<LOD	127.65
217-4	<LOD	36.75	168.3	42.2	<LOD	39.9	<LOD	58.35	<LOD	46.65	<LOD	125.55
218-1	<LOD	37.2	277.8	52.5	<LOD	45.3	<LOD	62.4	<LOD	45.75	<LOD	122.85
218-2	<LOD	37.5	250.8	52.7	<LOD	47.1	<LOD	48.45	<LOD	40.2	<LOD	128.85
218-3	<LOD	36.9	185	43.5	<LOD	42.3	<LOD	51.3	<LOD	42.9	<LOD	119.1

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
218-4	<LOD	37.35	277.4	57.3	<LOD	52.5	<LOD	63.75	<LOD	46.8	<LOD	131.1
219-1	<LOD	41.85	428.4	72.1	<LOD	51.6	<LOD	66.3	<LOD	56.4	<LOD	145.35
219-2	<LOD	43.5	421.6	74.3	<LOD	59.1	<LOD	65.55	<LOD	55.65	<LOD	148.65
219-3	NA	37.95	420	65	<LOD	47.7	<LOD	57.15	<LOD	44.1	<LOD	126.3
219-4	NA	36.15	442.4	66.3	<LOD	50.7	<LOD	62.85	<LOD	53.1	<LOD	129.75
220-1	<LOD	46.05	248.6	65.6	<LOD	60.45	<LOD	85.35	<LOD	66.75	<LOD	150
220-2	<LOD	39.3	303.2	60.9	<LOD	52.8	<LOD	59.7	<LOD	49.8	<LOD	135.6
220-3	<LOD	38.85	290.6	59.6	<LOD	46.5	<LOD	61.2	<LOD	47.85	<LOD	136.65
220-4	<LOD	40.5	386.8	67.8	<LOD	50.25	<LOD	62.4	<LOD	48.15	<LOD	133.95
221-1	<LOD	34.95	313.4	54.5	<LOD	46.8	<LOD	51.45	<LOD	38.55	<LOD	124.05
221-2	<LOD	33	300.2	47.9	<LOD	41.85	<LOD	53.25	<LOD	39.6	<LOD	109.05
221-3	<LOD	40.8	233.2	48.1	<LOD	47.55	<LOD	55.35	<LOD	46.5	<LOD	126
221-4	53.1	31.3	292	55.2	<LOD	47.25	<LOD	56.85	<LOD	47.1	<LOD	122.7
222-1	<LOD	39.3	184.4	48.1	<LOD	54	<LOD	62.85	<LOD	44.1	<LOD	135.15
222-2	<LOD	39.9	181.6	42.1	<LOD	45.9	<LOD	58.65	<LOD	39.15	<LOD	119.25
222-3	<LOD	34.5	206.2	39.6	<LOD	37.5	<LOD	48	<LOD	36.9	<LOD	106.05
222-4	<LOD	32.85	250.8	44.3	<LOD	37.8	<LOD	53.7	<LOD	40.05	<LOD	110.1
223-1	<LOD	45.15	478.8	81.5	<LOD	54	<LOD	77.55	<LOD	56.7	3459.2	260
223-2	<LOD	40.05	1229.6	110	<LOD	62.55	<LOD	64.65	<LOD	38.85	270.6	100
223-3	<LOD	46.65	314.6	69.8	<LOD	50.55	<LOD	67.5	<LOD	49.95	<LOD	150
223-4	<LOD	60	1729.6	170	<LOD	86.25	<LOD	88.8	<LOD	71.4	3609.6	280
224-1	44.1	27.8	166.1	42.4	<LOD	42.9	<LOD	52.95	<LOD	43.35	<LOD	116.1

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
224-2	<LOD	37.5	185.2	46.3	<LOD	45.3	<LOD	59.25	<LOD	40.65	<LOD	127.35
224-3	<LOD	44.7	237.2	54.8	<LOD	53.4	<LOD	63.45	<LOD	43.65	<LOD	140.55
224-4	<LOD	36	198.5	44	<LOD	45.3	<LOD	53.1	<LOD	40.2	<LOD	118.65
225-1	65.9	37.1	203.2	53.4	<LOD	52.35	<LOD	69.9	<LOD	44.25	<LOD	143.1
225-2	<LOD	35.85	219.6	49.8	<LOD	47.4	<LOD	62.1	<LOD	42.15	<LOD	125.1
225-3	<LOD	36.6	207.4	50.1	<LOD	46.2	<LOD	60.75	<LOD	42.9	<LOD	128.85
225-4	<LOD	47.25	172	47.7	<LOD	49.65	<LOD	67.8	<LOD	43.95	<LOD	137.55
226-1	<LOD	45.15	225	53.3	<LOD	49.95	<LOD	62.7	<LOD	48.15	148.6	98
226-2	55.2	32.6	288.2	57.7	<LOD	47.7	<LOD	64.65	<LOD	44.4	<LOD	134.4
226-3	<LOD	40.2	279.2	55	<LOD	48.6	<LOD	64.5	<LOD	41.1	<LOD	125.25
226-4	<LOD	42.45	191.5	55.6	<LOD	52.05	<LOD	67.2	<LOD	53.55	<LOD	150
227-1	<LOD	50.25	295.6	63.7	<LOD	59.85	<LOD	70.5	<LOD	51.15	<LOD	142.05
227-2	<LOD	65.85	200.7	65.1	<LOD	62.7	<LOD	75.45	<LOD	64.8	<LOD	165
227-3	<LOD	38.4	288.8	55.1	<LOD	45.9	<LOD	55.8	<LOD	47.1	<LOD	128.7
227-4	<LOD	43.2	235.4	54	<LOD	52.35	<LOD	64.8	<LOD	41.85	<LOD	132.6
229-1	<LOD	48.15	213.4	54.7	<LOD	52.8	<LOD	64.35	<LOD	47.4	<LOD	136.95
229-2	<LOD	29.25	180	42.7	<LOD	45.9	<LOD	57.3	<LOD	42	<LOD	122.55
229-3	<LOD	34.05	162.9	45	<LOD	50.85	<LOD	52.8	<LOD	42.75	<LOD	138.6
229-4	54.9	31.7	160.8	43.2	<LOD	47.7	<LOD	60.6	<LOD	43.5	<LOD	121.35
230-1	<LOD	37.95	183.3	41.7	<LOD	43.8	<LOD	57.45	<LOD	44.4	<LOD	113.85
230-2	<LOD	37.2	173.9	39.4	<LOD	36	<LOD	46.35	<LOD	37.95	<LOD	111.45
230-3	<LOD	27.75	190.7	39.9	<LOD	42.15	<LOD	52.8	<LOD	37.35	<LOD	111.6

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
230-4	43.3	26.4	187.5	41.4	<LOD	46.35	<LOD	50.4	<LOD	33.75	<LOD	114.3
231-1	<LOD	30	216	50.6	<LOD	47.25	<LOD	57.6	<LOD	57.3	<LOD	130.65
231-2	<LOD	32.55	364.2	64.5	<LOD	50.25	<LOD	63.75	<LOD	58.65	<LOD	145.05
231-3	<LOD	43.8	526.4	75.8	<LOD	51.75	<LOD	65.55	<LOD	54.3	167.9	95.1
231-4	<LOD	42.75	661.2	91.1	<LOD	70.2	<LOD	65.25	<LOD	69.3	<LOD	146.7
232-1	<LOD	58.2	878.4	100	<LOD	63	<LOD	67.95	<LOD	83.7	<LOD	138.75
232-2	103.9	46.5	703.2	97.6	<LOD	63.6	<LOD	65.7	<LOD	93	<LOD	139.05
232-3	88.5	43.6	800.4	100	<LOD	67.95	<LOD	69.6	<LOD	77.55	<LOD	139.05
232-4	<LOD	52.5	959.2	100	<LOD	62.85	<LOD	59.1	<LOD	85.05	<LOD	131.25
233-1	<LOD	42.45	213.4	49.8	<LOD	49.35	<LOD	62.1	<LOD	37.2	<LOD	122.85
233-2	<LOD	38.4	192.2	43.1	<LOD	38.85	<LOD	52.8	<LOD	39.3	<LOD	117.6
233-3	<LOD	32.4	174	38.2	<LOD	41.1	<LOD	49.35	<LOD	38.25	<LOD	114.9
233-4	<LOD	35.4	226.4	42.6	<LOD	42.3	<LOD	52.8	<LOD	35.55	<LOD	106.35
234-1	64.9	31	326	54.1	<LOD	45.3	<LOD	56.25	<LOD	42.9	<LOD	118.2
234-2	<LOD	42.3	358	59.8	<LOD	48.3	<LOD	61.35	<LOD	45.9	<LOD	123
234-3	82.8	37.8	249.6	55.7	<LOD	48.9	<LOD	55.8	<LOD	44.7	<LOD	131.1
234-4	48.2	27.6	257.8	48.1	<LOD	46.65	<LOD	59.55	<LOD	41.85	<LOD	112.35
235-1	<LOD	34.35	153.4	42.5	<LOD	44.7	<LOD	57.15	<LOD	40.8	<LOD	125.4
235-2	<LOD	32.25	161.4	42.9	<LOD	46.05	<LOD	52.05	<LOD	41.1	<LOD	116.4
235-3	<LOD	35.4	139.4	37	<LOD	40.8	<LOD	55.35	<LOD	38.25	<LOD	113.55
235-4	<LOD	39.75	132.2	38.5	<LOD	48.6	<LOD	61.05	<LOD	41.25	<LOD	129.45
236-1	<LOD	35.55	179	47	<LOD	50.7	<LOD	59.7	<LOD	45.75	<LOD	136.95

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
236-2	<LOD	43.5	177.9	44.7	<LOD	49.5	<LOD	65.55	<LOD	46.5	<LOD	121.35
236-3	<LOD	34.05	201.1	45.5	<LOD	47.7	<LOD	54.6	<LOD	41.7	<LOD	124.65
236-4	<LOD	43.95	136.7	44.3	<LOD	48.9	<LOD	71.25	<LOD	52.05	<LOD	135.45
237-1	<LOD	36.9	240.8	47.3	<LOD	45.3	<LOD	55.2	<LOD	34.35	<LOD	119.4
237-2	<LOD	43.5	225	50.9	<LOD	46.65	<LOD	62.7	<LOD	48.6	<LOD	124.95
237-3	<LOD	39	263.2	54.2	<LOD	43.65	<LOD	66.15	<LOD	43.35	<LOD	130.2
237-4	<LOD	44.4	193	48.4	<LOD	42.75	<LOD	58.05	<LOD	44.55	<LOD	130.5
238-1	<LOD	32.55	271.8	44.4	<LOD	40.2	<LOD	52.35	<LOD	36	<LOD	103.05
238-2	<LOD	34.5	234	43.6	<LOD	37.95	<LOD	53.4	<LOD	41.55	<LOD	113.55
238-3	<LOD	36.45	246.4	45.2	<LOD	42.9	<LOD	52.95	<LOD	36.15	<LOD	111
238-4	<LOD	32.25	231.2	45.8	<LOD	43.05	<LOD	55.5	<LOD	40.05	<LOD	117.15
239-1	<LOD	33.45	212.2	49.5	<LOD	46.2	<LOD	64.5	<LOD	47.1	<LOD	126.3
239-2	<LOD	30.3	217	44	<LOD	39.6	<LOD	55.65	<LOD	37.8	<LOD	116.4
239-3	<LOD	35.85	233	47.8	<LOD	46.05	<LOD	54	<LOD	42.3	<LOD	116.55
239-4	<LOD	41.4	158.6	42.1	<LOD	42.45	<LOD	55.5	<LOD	46.65	<LOD	119.55
240-1	<LOD	40.5	274.2	54	<LOD	48.45	<LOD	61.05	<LOD	50.7	<LOD	125.4
240-2	<LOD	36.3	308.2	55.2	<LOD	43.8	<LOD	57.3	<LOD	43.2	<LOD	121.95
240-3	<LOD	35.55	393	57.8	<LOD	48.3	<LOD	55.5	<LOD	39.9	<LOD	117.6
240-4	<LOD	41.25	307.6	57.1	<LOD	49.35	<LOD	55.95	<LOD	42	<LOD	125.55
241-1	<LOD	38.4	138.6	36.9	<LOD	39.6	<LOD	54.6	<LOD	41.25	<LOD	111.6
241-2	<LOD	38.85	186	45.1	<LOD	43.35	<LOD	51.45	<LOD	42.75	<LOD	124.35
241-3	<LOD	35.55	161.9	37.8	<LOD	36.45	<LOD	51.75	<LOD	36.75	<LOD	110.4

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
241-4	40.4	24.6	219.4	41.5	<LOD	39.3	<LOD	54.45	<LOD	37.65	<LOD	110.1
242-1	<LOD	37.05	256	47.9	<LOD	48	<LOD	56.4	<LOD	47.7	<LOD	113.7
242-2	<LOD	42.9	227.8	55.1	<LOD	55.35	<LOD	66.9	<LOD	52.95	<LOD	136.05
242-3	<LOD	39	291.6	51.5	<LOD	43.95	<LOD	54.45	<LOD	37.65	<LOD	118.8
242-4	<LOD	41.4	241.8	49.1	<LOD	44.85	<LOD	60.75	<LOD	44.85	<LOD	120
243-1	<LOD	34.95	589.2	79.1	<LOD	53.85	<LOD	61.65	<LOD	44.55	<LOD	125.25
243-2	<LOD	35.85	402.2	57.7	<LOD	49.65	<LOD	58.95	<LOD	37.8	<LOD	111.3
243-3	<LOD	38.1	686	71.3	<LOD	52.95	<LOD	51.9	<LOD	36	<LOD	101.85
243-4	<LOD	41.85	444.8	66.6	<LOD	49.65	<LOD	61.5	<LOD	44.7	<LOD	124.95
245-1	<LOD	46.95	1400	120	<LOD	68.7	<LOD	60.75	<LOD	46.95	<LOD	116.7
245-2	<LOD	40.5	1349.6	110	<LOD	66.15	<LOD	56.55	<LOD	39.15	<LOD	121.8
245-3	<LOD	36.15	1400	110	<LOD	64.65	<LOD	57.45	<LOD	39.6	<LOD	112.5
245-4	<LOD	44.7	1509.6	130	<LOD	80.1	<LOD	58.2	<LOD	43.5	<LOD	124.8
246-1	<LOD	69.45	4777.6	320	<LOD	140.25	<LOD	95.25	95.9	47.6	<LOD	165
246-2	<LOD	80.4	3209.6	290	<LOD	140.25	<LOD	97.65	<LOD	80.4	<LOD	195
246-3	<LOD	49.8	1859.2	180	<LOD	89.55	<LOD	76.65	<LOD	67.35	<LOD	165
246-4	<LOD	50.25	2929.6	210	<LOD	97.35	<LOD	70.35	77.7	41	<LOD	149.55
247-1	<LOD	48.15	1160	110	<LOD	74.55	<LOD	66	74.8	39.8	<LOD	135.75
247-2	<LOD	46.35	1069.6	110	<LOD	63.75	<LOD	63.75	86.8	42	<LOD	138.45
247-3	<LOD	55.8	2640	200	<LOD	101.1	<LOD	77.1	228.6	59.6	<LOD	147.6
247-4	<LOD	35.85	1329.6	120	<LOD	72.45	<LOD	59.55	70.5	38	<LOD	133.05
249-1	<LOD	54.75	3268.8	220	<LOD	102.75	<LOD	70.5	<LOD	52.05	<LOD	134.85

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
249-2	<LOD	53.55	3019.2	220	<LOD	109.65	<LOD	76.65	<LOD	57.6	<LOD	165
249-3	<LOD	44.55	3347.2	230	<LOD	112.35	<LOD	74.7	<LOD	54.6	<LOD	147
249-4	<LOD	61.95	3897.6	250	<LOD	114.75	<LOD	78.9	84.6	40.4	<LOD	146.1
250-1	<LOD	44.55	1560	120	<LOD	72	<LOD	59.55	<LOD	49.35	<LOD	124.5
250-2	<LOD	50.7	1609.6	130	<LOD	78.15	<LOD	69.75	<LOD	49.65	<LOD	129.15
250-3	<LOD	56.55	1349.6	130	<LOD	77.4	<LOD	69.6	<LOD	50.1	<LOD	136.65
250-4	<LOD	52.8	1680	150	<LOD	87.9	<LOD	68.1	<LOD	48.9	<LOD	142.5
251-1	<LOD	36.9	280.6	61.2	<LOD	51.6	<LOD	71.25	<LOD	45.6	<LOD	141.6
251-2	41.2	25.8	329	50.5	<LOD	39.3	<LOD	50.25	<LOD	38.4	<LOD	108
251-3	<LOD	31.05	295.6	51	<LOD	43.05	<LOD	54.6	<LOD	43.65	<LOD	110.7
251-4	<LOD	36.3	327.8	52.2	<LOD	48	<LOD	55.95	<LOD	38.55	<LOD	112.65
252-1	<LOD	29.1	411.2	55.1	<LOD	46.65	<LOD	51.45	<LOD	39	<LOD	104.85
252-2	<LOD	43.95	843.2	93.2	<LOD	61.35	<LOD	55.95	<LOD	53.85	<LOD	127.5
252-3	<LOD	43.95	650.8	78.4	<LOD	53.85	<LOD	60.3	<LOD	53.1	<LOD	120.9
252-4	<LOD	44.4	790.4	91.7	<LOD	61.95	<LOD	63.75	57.5	37.7	<LOD	130.35
253-1	<LOD	67.65	5568	320	<LOD	134.1	<LOD	81.9	110.9	42	<LOD	143.1
253-2	<LOD	80.25	9625.6	470	<LOD	180	<LOD	86.1	205.8	48.2	<LOD	165
253-3	<LOD	91.95	8377.6	450	<LOD	180	<LOD	89.4	177	48.9	<LOD	165
253-4	<LOD	90.3	8556.8	470	<LOD	180	<LOD	97.2	195.7	53.8	<LOD	180
254-1	<LOD	38.25	1840	130	<LOD	71.7	<LOD	63	<LOD	37.95	<LOD	115.2
254-2	<LOD	54.6	3179.2	230	<LOD	113.7	<LOD	80.4	<LOD	51.6	<LOD	150
254-3	<LOD	48.75	3040	180	<LOD	100.5	<LOD	63.75	54.4	32.2	<LOD	127.65

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
254-4	<LOD	46.2	2289.6	150	<LOD	81.9	<LOD	60.75	<LOD	45.9	<LOD	118.5
255-1	<LOD	46.8	2129.6	160	<LOD	81.75	<LOD	66.45	<LOD	51.3	<LOD	130.05
255-2	<LOD	44.55	1899.2	150	<LOD	92.55	<LOD	69.45	<LOD	55.2	<LOD	141
255-3	<LOD	54.75	3200	210	<LOD	106.95	<LOD	70.65	87.4	39.4	<LOD	138.6
255-4	<LOD	51.15	2529.6	180	<LOD	96.3	<LOD	67.95	112.1	43.2	<LOD	138.45
256-1	<LOD	50.7	1540	120	<LOD	74.25	<LOD	63.6	<LOD	44.7	<LOD	120.9
256-2	<LOD	41.1	1180	100	<LOD	65.7	<LOD	57	<LOD	37.95	<LOD	119.7
256-3	<LOD	38.25	1249.6	110	<LOD	69.3	<LOD	57.9	<LOD	43.95	<LOD	113.7
256-4	<LOD	51.9	1460	130	<LOD	77.25	<LOD	63	<LOD	52.5	<LOD	132.3
257-1	<LOD	44.7	1609.6	120	<LOD	72.9	<LOD	60.6	49.7	33	<LOD	115.5
257-2	<LOD	49.65	2360	180	<LOD	96.9	<LOD	77.85	<LOD	59.85	<LOD	145.35
257-3	<LOD	43.5	1668.8	130	<LOD	75.45	<LOD	61.5	<LOD	43.2	<LOD	124.05
257-4	<LOD	41.25	1440	120	<LOD	70.8	<LOD	54.75	52.9	34	<LOD	119.7
258-1	<LOD	36.9	261.4	46.2	<LOD	39.45	<LOD	47.7	<LOD	40.05	<LOD	107.85
258-2	<LOD	32.7	245.8	49.8	<LOD	44.55	<LOD	60.6	<LOD	43.35	<LOD	118.65
258-3	<LOD	35.25	249	49.1	<LOD	45.75	<LOD	55.35	<LOD	34.95	<LOD	118.95
258-4	<LOD	39.6	200.7	46.8	<LOD	46.35	<LOD	55.05	<LOD	42.75	<LOD	116.1
259-1	<LOD	51.3	288.4	72.4	<LOD	69	<LOD	74.4	<LOD	52.95	<LOD	165
259-2	<LOD	45.3	240.2	55	<LOD	52.05	<LOD	58.95	<LOD	51	<LOD	136.05
259-3	95.8	41.6	393	68.9	<LOD	60.15	<LOD	67.8	<LOD	59.85	<LOD	139.65
259-4	<LOD	46.2	346.6	63.4	<LOD	57.3	<LOD	65.55	<LOD	54.3	<LOD	134.55
260-1	80.2	42.3	339.6	70.9	<LOD	60.75	<LOD	62.85	<LOD	54.15	<LOD	145.35

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
260-2	<LOD	57.3	250	65.8	<LOD	62.1	<LOD	72.15	<LOD	63.75	<LOD	150
260-3	43.3	28.5	142.7	40.8	<LOD	37.5	<LOD	59.4	<LOD	45.6	<LOD	119.4
260-4	66.9	34.6	261.2	55.5	<LOD	50.25	<LOD	63.15	<LOD	56.1	<LOD	130.2
261-1	<LOD	37.35	224	51.8	<LOD	47.25	<LOD	58.35	75.8	41.7	<LOD	129
261-2	<LOD	55.5	201.5	65.3	<LOD	66.15	<LOD	82.8	<LOD	72.75	<LOD	150
261-3	<LOD	37.2	206.2	54.9	<LOD	50.4	<LOD	62.4	<LOD	64.35	<LOD	139.05
261-4	<LOD	38.7	268.8	67.5	<LOD	59.1	<LOD	70.95	<LOD	64.5	<LOD	150
262-1	<LOD	44.7	213	61.2	<LOD	53.7	<LOD	70.65	<LOD	50.4	<LOD	144.6
262-2	<LOD	48.45	253.4	58.1	<LOD	52.8	<LOD	58.95	<LOD	47.55	<LOD	140.25
262-3	<LOD	38.4	184.7	48.8	<LOD	43.8	<LOD	64.95	<LOD	40.5	<LOD	124.2
262-4	66.6	31.6	235.8	48.8	<LOD	43.8	<LOD	57	<LOD	43.65	<LOD	115.05
263-1	<LOD	39.45	217.6	48.2	<LOD	44.25	<LOD	51	<LOD	47.25	<LOD	124.05
263-2	46.4	27.8	249.4	48.7	<LOD	44.1	<LOD	57.15	<LOD	41.4	<LOD	116.7
263-3	<LOD	41.85	249.2	51.9	<LOD	42.15	<LOD	54.3	<LOD	42	<LOD	120.3
263-4	<LOD	45.9	188.6	50.5	<LOD	50.85	<LOD	59.1	<LOD	40.95	<LOD	131.7
264-1	<LOD	43.2	220.6	52	<LOD	46.8	<LOD	65.7	<LOD	38.25	<LOD	144
264-2	<LOD	35.25	252.8	56	<LOD	48.15	<LOD	72.75	<LOD	51.45	<LOD	136.65
264-3	<LOD	35.1	266.4	46.9	<LOD	40.05	<LOD	52.8	<LOD	37.35	<LOD	110.25
264-4	<LOD	41.1	237.2	49.2	<LOD	50.85	<LOD	58.05	<LOD	41.55	<LOD	119.7
265-1	<LOD	39.3	207.2	45.5	<LOD	39.9	<LOD	52.2	<LOD	39.6	<LOD	117.6
265-2	<LOD	40.5	272	53.3	<LOD	45	<LOD	58.65	<LOD	43.95	<LOD	125.85
265-3	<LOD	31.2	246.6	54.3	<LOD	54.45	<LOD	65.4	<LOD	41.55	<LOD	131.4

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
265-4	<LOD	27.9	233.4	40	<LOD	36.75	<LOD	47.4	<LOD	34.05	<LOD	96
266-1	<LOD	34.65	179.8	43.2	<LOD	45.15	<LOD	57.3	<LOD	40.2	<LOD	121.05
266-2	<LOD	35.1	232.8	46.9	<LOD	49.05	<LOD	57.15	<LOD	38.7	<LOD	117.15
266-3	<LOD	46.35	195.6	50.8	<LOD	50.55	<LOD	66.3	<LOD	44.1	<LOD	137.55
266-4	51	31	200.7	47.4	<LOD	43.95	<LOD	61.95	<LOD	46.5	<LOD	123.45
267-1	<LOD	39.3	236.6	54.1	<LOD	54.45	<LOD	60.3	<LOD	49.65	<LOD	132.15
267-2	<LOD	41.85	227.2	51.8	<LOD	51.15	<LOD	58.2	<LOD	53.1	<LOD	130.35
267-3	<LOD	49.2	258.2	60.2	<LOD	51.3	<LOD	72.6	<LOD	47.25	<LOD	147.45
267-4	<LOD	43.35	282.4	65.4	<LOD	52.2	<LOD	74.25	<LOD	56.25	<LOD	145.5
268-1	<LOD	38.25	299.2	51.1	<LOD	44.55	<LOD	59.1	<LOD	36.9	<LOD	116.1
268-2	51.8	32.5	264	55.6	<LOD	54	<LOD	65.55	<LOD	40.95	<LOD	127.8
268-3	<LOD	34.2	290.2	48.8	<LOD	39.45	<LOD	51.45	<LOD	38.25	<LOD	109.35
268-4	<LOD	34.5	270.2	56.3	<LOD	48.15	<LOD	63.75	<LOD	45.9	<LOD	127.05
269-1	<LOD	37.65	187.6	46.2	<LOD	45.15	<LOD	61.95	<LOD	45.75	<LOD	127.95
269-2	<LOD	36.75	189	47.3	<LOD	45.9	<LOD	69.45	<LOD	43.95	<LOD	127.8
269-3	<LOD	35.7	205	47.2	<LOD	42.9	<LOD	54.3	<LOD	41.7	<LOD	120.75
269-4	<LOD	31.65	220.2	44.9	<LOD	43.5	<LOD	54.15	<LOD	43.5	<LOD	113.85
270-1	<LOD	43.95	318.6	58.1	<LOD	47.85	<LOD	53.7	<LOD	39.45	<LOD	125.7
270-2	<LOD	36.9	326.2	60.8	<LOD	49.2	<LOD	70.65	<LOD	45	<LOD	132.6
270-3	<LOD	48.9	291	64.6	<LOD	49.05	<LOD	65.25	<LOD	42.75	<LOD	147.6
270-4	<LOD	39.9	269.4	57.3	<LOD	56.55	<LOD	62.25	<LOD	41.85	<LOD	138.75
271-1	<LOD	37.5	379.6	62.5	<LOD	48.15	<LOD	55.2	<LOD	44.55	<LOD	126.9

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
271-2	<LOD	58.35	400	83.2	<LOD	58.2	<LOD	79.8	<LOD	65.25	<LOD	165
271-3	<LOD	38.85	362.4	62.2	<LOD	53.25	<LOD	65.55	<LOD	45.3	<LOD	124.95
271-4	<LOD	39.45	432.4	74.6	<LOD	57.3	<LOD	64.2	<LOD	53.7	<LOD	137.55
272-1	<LOD	34.95	260.6	47.3	<LOD	38.7	<LOD	48	<LOD	44.7	<LOD	117
272-2	<LOD	48.6	267.4	62.3	<LOD	56.4	<LOD	75.6	<LOD	54.3	<LOD	148.8
272-3	<LOD	39.75	274.4	53.1	<LOD	46.65	<LOD	57.3	<LOD	44.4	<LOD	125.25
272-4	<LOD	46.5	318	62.4	<LOD	49.95	<LOD	71.7	<LOD	51.15	<LOD	133.5
273-1	<LOD	41.4	295	54.6	<LOD	45	<LOD	60	<LOD	41.55	<LOD	121.35
273-2	<LOD	28.5	271.6	50.7	<LOD	42.9	<LOD	51.3	<LOD	44.4	<LOD	115.2
273-3	<LOD	38.85	245.2	57.2	<LOD	53.4	<LOD	68.85	<LOD	45.3	<LOD	134.4
273-4	<LOD	38.55	260.8	51.2	<LOD	46.65	<LOD	61.95	<LOD	31.2	<LOD	113.7
274-1	<LOD	38.55	260.8	51.2	<LOD	46.65	<LOD	61.95	<LOD	31.2	<LOD	113.7
274-2	<LOD	30.3	146.7	38.1	<LOD	41.25	<LOD	57.3	<LOD	34.05	<LOD	113.1
274-3	57.5	32.8	204	48.9	<LOD	47.7	<LOD	57.75	<LOD	39.75	<LOD	126.6
274-4	<LOD	38.55	175.6	42.2	<LOD	43.2	<LOD	57.3	<LOD	43.35	<LOD	119.7
275-1	<LOD	33.75	246.6	45.4	<LOD	37.35	<LOD	55.05	<LOD	35.7	<LOD	111.75
275-2	<LOD	39.6	163.6	47.7	<LOD	52.35	<LOD	65.85	<LOD	46.65	<LOD	141.15
275-3	<LOD	43.05	242	51.6	<LOD	44.7	<LOD	62.55	<LOD	47.55	<LOD	124.5
275-4	<LOD	44.55	244.2	51.8	<LOD	49.8	<LOD	61.2	<LOD	45.6	<LOD	134.4
276-1	<LOD	35.1	274.6	51.4	<LOD	46.8	<LOD	54.45	<LOD	45.15	<LOD	120.45
276-2	<LOD	48.3	312.4	66.8	<LOD	57.9	<LOD	65.85	<LOD	53.4	<LOD	149.25
276-3	<LOD	41.25	269.4	57.9	<LOD	55.35	<LOD	66.9	<LOD	41.55	<LOD	138.75

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
276-4	<LOD	46.2	255.6	56.5	<LOD	53.1	<LOD	67.05	<LOD	43.95	<LOD	134.25
277-1	<LOD	37.35	236.6	45	<LOD	42	<LOD	51.3	<LOD	34.8	<LOD	106.5
277-2	<LOD	40.8	180.6	47.5	<LOD	42.9	<LOD	60.45	<LOD	40.5	<LOD	130.5
277-3	<LOD	41.4	230.8	51.4	<LOD	49.95	<LOD	57.9	<LOD	43.65	<LOD	130.35
277-4	<LOD	32.55	216.4	45.7	<LOD	47.4	<LOD	58.8	<LOD	45.15	<LOD	120.6
278-1	<LOD	33.3	233.4	56.2	<LOD	54.75	<LOD	61.95	<LOD	46.95	<LOD	139.95
278-2	<LOD	30.15	242.6	56.9	<LOD	49.5	<LOD	69.3	<LOD	43.5	<LOD	129.3
278-3	<LOD	31.5	274.4	47.6	<LOD	41.85	<LOD	54	<LOD	37.05	<LOD	106.2
278-4	<LOD	42.6	272.6	63.2	<LOD	55.35	<LOD	67.95	<LOD	48.15	<LOD	146.25
279-1	<LOD	42	356.8	58.7	<LOD	49.5	<LOD	60.6	<LOD	45.15	<LOD	118.95
279-2	<LOD	48.9	327.6	63.1	<LOD	51.6	<LOD	60.3	<LOD	54	<LOD	140.55
279-3	<LOD	33.75	380.8	58.7	<LOD	46.2	<LOD	48.9	<LOD	41.85	<LOD	116.4
279-4	50	31.1	379.2	61.8	<LOD	49.2	<LOD	50.4	<LOD	39.3	<LOD	125.85
280-1	<LOD	32.25	258.2	49.2	<LOD	42.15	<LOD	54.9	<LOD	42.75	<LOD	117.6
280-2	<LOD	32.25	225.6	45.1	<LOD	39.75	<LOD	54.9	<LOD	39.15	<LOD	116.25
280-3	<LOD	48.45	185.2	53.6	<LOD	51.45	<LOD	73.95	<LOD	55.95	<LOD	139.2
280-4	<LOD	34.8	218.4	48.5	<LOD	43.8	<LOD	59.25	<LOD	44.85	<LOD	113.25
281-1	<LOD	40.65	198.1	46.4	<LOD	45.3	<LOD	57.45	<LOD	45.15	<LOD	128.85
281-2	<LOD	38.25	184.9	43.7	<LOD	45	<LOD	56.25	<LOD	43.35	<LOD	120.3
281-3	<LOD	39.15	141.3	39.4	<LOD	45.6	<LOD	60.3	<LOD	36.6	<LOD	124.35
281-4	<LOD	49.95	171	53.2	<LOD	50.1	<LOD	68.85	<LOD	53.4	<LOD	147
282-1	<LOD	38.55	217.8	48.1	<LOD	50.25	<LOD	61.35	<LOD	37.05	<LOD	126.15

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
282-2	<LOD	42.15	274.4	60.3	<LOD	50.85	<LOD	63.15	<LOD	43.35	<LOD	144.9
282-3	<LOD	31.2	231.6	44.2	<LOD	37.95	<LOD	56.85	<LOD	36.9	<LOD	112.5
282-4	54	34.6	211.4	52.9	<LOD	55.05	<LOD	70.5	<LOD	53.4	<LOD	141.15
283-1	<LOD	39.3	190.5	44.8	<LOD	44.7	<LOD	56.4	<LOD	43.05	<LOD	116.55
283-2	<LOD	40.05	163.3	54.1	<LOD	44.4	<LOD	66.6	<LOD	55.05	<LOD	144.15
283-3	<LOD	37.65	210	44.5	<LOD	39.9	<LOD	56.4	<LOD	46.35	<LOD	110.55
283-4	68.8	30.7	200.2	44.3	<LOD	42.45	<LOD	54.45	<LOD	35.1	<LOD	116.1
284-1	<LOD	42.15	261.2	59.2	<LOD	50.4	<LOD	62.7	<LOD	48.9	<LOD	140.25
284-2	<LOD	37.2	324.4	56	<LOD	52.35	<LOD	64.2	<LOD	41.25	<LOD	124.65
284-3	<LOD	37.5	335.8	53.5	<LOD	47.7	<LOD	56.55	<LOD	48	<LOD	112.95
284-4	<LOD	39.15	246.4	50.5	<LOD	48.6	<LOD	57.15	<LOD	41.25	<LOD	120.15
285-1	<LOD	41.1	205.4	48.3	<LOD	51.9	<LOD	61.35	<LOD	47.7	<LOD	126.6
285-2	<LOD	35.4	157.2	43.5	<LOD	46.2	<LOD	53.7	<LOD	48.9	<LOD	127.5
285-3	<LOD	35.7	211.8	46.4	<LOD	38.7	<LOD	51.75	<LOD	44.1	<LOD	118.35
285-4	<LOD	40.95	191.6	44.1	<LOD	43.65	<LOD	54.15	<LOD	40.8	<LOD	119.55
286-1	<LOD	28.8	125.1	35.7	<LOD	34.65	<LOD	50.55	<LOD	31.35	<LOD	115.65
286-2	<LOD	27	179.3	40.5	<LOD	38.4	<LOD	49.05	<LOD	43.2	<LOD	109.35
286-3	<LOD	33.9	161.8	40.3	<LOD	42.6	<LOD	54.75	<LOD	42.45	<LOD	115.2
286-4	<LOD	40.95	165.6	45.3	<LOD	47.55	<LOD	61.2	<LOD	45	<LOD	127.95
287-1	<LOD	37.95	209.2	50.9	<LOD	49.65	<LOD	58.2	<LOD	40.35	<LOD	130.35
287-2	<LOD	36.9	209.6	46.4	<LOD	47.7	<LOD	57	<LOD	39.3	<LOD	117.45
287-3	<LOD	37.35	239.4	48.8	<LOD	43.8	<LOD	58.05	<LOD	42	<LOD	118.5

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
287-4	<LOD	41.85	164	50.8	<LOD	48.45	<LOD	63.45	<LOD	48.15	<LOD	139.65
288-1	<LOD	42.15	145.6	51.1	<LOD	55.95	<LOD	64.2	<LOD	52.8	<LOD	142.05
288-2	<LOD	42	216.2	49.3	<LOD	47.25	<LOD	54.3	<LOD	44.1	<LOD	129.75
288-3	<LOD	39.6	238.4	53.1	<LOD	49.2	<LOD	57	<LOD	43.05	<LOD	127.2
288-4	<LOD	47.4	191.9	61.1	<LOD	58.35	<LOD	88.05	<LOD	53.7	<LOD	147.45
289-1	<LOD	38.7	181.2	53.1	<LOD	45.15	<LOD	66.75	<LOD	54.6	<LOD	138.75
289-2	<LOD	32.55	146.1	45.6	<LOD	46.35	<LOD	63	<LOD	47.85	<LOD	128.25
289-3	<LOD	48.15	76.9	47.3	<LOD	62.4	<LOD	73.65	<LOD	58.35	<LOD	165
289-4	<LOD	34.5	128.4	38.3	<LOD	40.05	<LOD	60.9	<LOD	39.3	<LOD	122.85
290-1	<LOD	46.95	230.8	56.3	<LOD	50.4	<LOD	63	<LOD	55.65	<LOD	135.9
290-2	<LOD	45.75	198.3	52.2	<LOD	51.75	<LOD	68.4	<LOD	42.9	<LOD	139.05
290-3	<LOD	50.1	211.8	57.6	<LOD	59.55	<LOD	76.65	<LOD	54	<LOD	150
290-4	48.3	30.4	201.9	47.7	<LOD	44.25	<LOD	67.95	<LOD	46.05	<LOD	131.55
291-1	<LOD	37.35	178.7	41.5	<LOD	40.35	<LOD	57.75	<LOD	45.45	<LOD	114.75
291-2	<LOD	37.2	181.3	44.5	<LOD	45.9	<LOD	54.75	<LOD	43.65	<LOD	125.1
291-3	<LOD	35.1	200.2	46.1	<LOD	48.45	<LOD	51.75	<LOD	40.05	<LOD	122.7
291-4	59.3	33.2	190	47.9	<LOD	50.25	<LOD	68.4	<LOD	41.55	<LOD	126.3
292-1	<LOD	42.15	218	48.8	<LOD	46.95	<LOD	63.45	<LOD	46.35	<LOD	120
292-2	<LOD	38.85	263.8	51.9	<LOD	40.35	<LOD	55.2	<LOD	43.35	<LOD	125.85
292-3	<LOD	36.9	249.6	51	<LOD	43.2	<LOD	61.05	<LOD	41.4	<LOD	122.55
292-4	<LOD	26.7	242.2	43.1	<LOD	38.7	<LOD	48.6	<LOD	33.45	<LOD	101.25
293-1	<LOD	36.9	71.2	38.2	<LOD	43.8	<LOD	65.85	<LOD	43.05	<LOD	135.45

Station #	La	+/- 3SD	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD
293-2	<LOD	49.2	97.9	42	<LOD	52.2	<LOD	66.15	<LOD	49.65	<LOD	144.6
293-3	42.1	27.8	90.4	34.1	<LOD	41.4	<LOD	65.7	<LOD	43.05	<LOD	124.2
293-4	57.6	31.1	104.1	37.2	<LOD	39.3	<LOD	58.35	<LOD	42.45	<LOD	123.15
296-1	<LOD	41.7	245.2	55.1	<LOD	51.9	<LOD	66	<LOD	43.2	<LOD	130.8
296-2	<LOD	34.05	271	51.8	<LOD	40.95	<LOD	55.05	<LOD	45.9	<LOD	123.15
296-3	<LOD	49.65	257	60.5	<LOD	52.2	<LOD	65.85	<LOD	56.25	<LOD	140.1
296-4	<LOD	45.6	254	53.6	<LOD	47.7	<LOD	59.25	<LOD	52.2	<LOD	133.8
297-1	<LOD	40.5	234.8	50.8	<LOD	44.7	<LOD	61.2	<LOD	44.85	<LOD	123.75
297-2	<LOD	46.2	219.8	51.6	<LOD	47.1	<LOD	62.1	<LOD	45.45	<LOD	132.6
297-3	<LOD	39.45	192	48	<LOD	52.5	<LOD	67.2	<LOD	42.3	<LOD	124.35
297-4	<LOD	41.4	181.3	49.6	<LOD	45.45	<LOD	63.15	<LOD	46.35	<LOD	131.4

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
197-1	<LOD	33.9	<LOD	145.2	<LOD	30.15	7.1	4.6	110.5	7.8	27.3	6.3
197-2	<LOD	31.95	<LOD	150	<LOD	30.3	8.1	4.7	107.1	7.9	34.8	6.6
197-3	<LOD	38.1	<LOD	165	<LOD	28.8	12.7	4.9	99.6	7.9	33.9	6.7
197-4	<LOD	34.8	<LOD	165	<LOD	32.4	10.2	5.1	115.9	8.8	33.8	7.2
198-1	<LOD	39	<LOD	165	<LOD	34.8	<LOD	6	88.4	6.4	7.5	4.9
198-2	<LOD	31.95	<LOD	150	<LOD	27.15	<LOD	6.75	155.6	8	21.8	5.6
198-3	<LOD	33	<LOD	150	<LOD	30.6	11.4	4.5	155.8	7.8	19.2	5.3
198-4	<LOD	30.9	<LOD	165	<LOD	31.35	12	5.3	173.3	9.3	26.2	6.4
199-1	<LOD	27.9	<LOD	140.1	<LOD	25.95	7.3	3.8	84.6	6	17.8	5
199-2	<LOD	31.95	<LOD	131.25	<LOD	24.45	<LOD	5.55	73.6	5.9	23.5	5.2
199-3	<LOD	44.7	<LOD	180	<LOD	30.3	8.4	4.8	89.8	8.2	56.4	7.7
199-4	<LOD	39.9	<LOD	165	<LOD	31.95	7.4	4.4	96.5	7.4	39.5	6.6
200-1	<LOD	30.9	<LOD	165	<LOD	32.1	11.8	4.8	135.6	8.1	23.2	6
200-2	<LOD	33.9	<LOD	165	<LOD	29.7	8.8	4.6	109.3	7.8	18.4	6
200-3	<LOD	35.85	<LOD	165	<LOD	30.15	11.1	4.4	90.6	7.1	25	5.9
200-4	<LOD	21.15	<LOD	138.15	<LOD	25.5	7.3	4.4	122.9	7.4	28	5.8
201-1	<LOD	33.75	<LOD	142.8	<LOD	24.75	9.8	4.5	96.9	7.4	62.4	7
201-2	<LOD	30.3	<LOD	150	<LOD	31.35	<LOD	6.6	112	7.5	39.5	6.3
201-3	<LOD	39.3	<LOD	165	<LOD	28.95	6.8	4.1	93.4	6.6	44.7	6
201-4	<LOD	35.7	<LOD	165	<LOD	27.9	<LOD	5.85	82.2	6.4	57.2	6.2
202-1	<LOD	28.05	<LOD	139.5	<LOD	28.5	9.5	4.7	177.2	8.5	27.2	5.8

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
202-2	<LOD	28.2	<LOD	139.65	<LOD	25.95	11	4.8	154.9	8.4	23.7	5.9
202-3	<LOD	35.55	<LOD	180	<LOD	33	13.1	4.9	163.6	8.7	30.7	6.2
202-4	<LOD	27.3	<LOD	150	<LOD	29.85	11	5	156.5	8.8	33.2	6.4
203-1	<LOD	41.55	<LOD	165	<LOD	32.1	6.6	3.4	41.4	5.2	64.7	5.9
203-2	130.1	46.2	<LOD	180	<LOD	32.4	13.6	5.6	112.8	9.5	43.5	8.2
203-3	<LOD	41.7	<LOD	180	<LOD	28.8	10.5	4.8	75	7.3	36.9	6.9
203-4	<LOD	37.2	<LOD	165	<LOD	27	11.3	4.7	83.5	7.7	41.7	6.9
204-1	<LOD	27	<LOD	140.25	<LOD	26.55	13.2	4.9	160.7	8.5	27.5	6
204-2	<LOD	33	<LOD	165	<LOD	27.75	9.5	4.7	164.4	8.3	20.2	5.6
204-3	<LOD	29.55	<LOD	150	<LOD	27.75	11.4	4.8	158.8	8.4	29.9	6
204-4	<LOD	30.15	<LOD	141.3	41.1	21.8	12.4	5.1	177.6	9.1	33.1	6.4
205-1	<LOD	33.9	<LOD	144.45	<LOD	25.5	8.6	4	130.3	7	28.9	5.3
205-2	<LOD	22.05	<LOD	137.55	<LOD	27.45	<LOD	6.15	135.4	7.3	28.6	5.4
205-3	<LOD	32.4	<LOD	150	<LOD	26.7	8.3	4.3	119.2	7.3	23.1	5.5
205-4	<LOD	30.9	<LOD	135.75	<LOD	27.3	<LOD	5.7	127.6	6.6	18.9	4.8
206-1	<LOD	32.1	<LOD	165	<LOD	27.45	11.4	4.4	124.9	7.2	11.9	5.2
206-2	<LOD	28.35	<LOD	144.75	<LOD	26.25	<LOD	4.95	59.3	4.9	6.4	4.2
206-3	<LOD	28.8	<LOD	148.2	<LOD	24.75	<LOD	6	99.2	6.8	22.8	5.5
206-4	<LOD	28.2	<LOD	139.8	<LOD	29.1	<LOD	5.7	106.3	6.4	17.9	4.9
207-1	<LOD	43.35	<LOD	165	<LOD	26.85	8.5	4.6	83.6	7.7	44	7
207-2	<LOD	38.85	<LOD	165	<LOD	32.1	9.8	4.3	88.4	6.9	38.3	6.2
207-3	<LOD	40.2	<LOD	165	<LOD	26.25	7.8	4.5	107.9	7.8	52	6.9

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
207-4	<LOD	41.55	<LOD	180	<LOD	29.1	8.6	4.8	118	8.2	41.4	6.9
208-1	<LOD	34.8	<LOD	148.35	<LOD	27.15	11.3	4.4	125.9	7.6	30.3	5.8
208-2	<LOD	27.9	<LOD	148.65	<LOD	24.9	<LOD	6.15	120.9	7.2	23.4	5.5
208-3	<LOD	32.1	<LOD	150	<LOD	31.35	15.8	5.1	128.5	8.5	30	6.6
208-4	<LOD	32.1	<LOD	149.4	<LOD	29.55	6.9	4.4	146.6	7.8	31.8	5.8
209-1	<LOD	28.2	<LOD	134.7	<LOD	23.7	<LOD	4.8	47.2	4.7	<LOD	6.15
209-2	<LOD	29.25	<LOD	131.25	<LOD	22.95	4.1	2.7	24.6	3.4	<LOD	4.95
209-3	<LOD	27.9	<LOD	131.85	<LOD	26.4	<LOD	4.35	52.4	4.2	<LOD	5.4
209-4	<LOD	24.6	<LOD	128.25	<LOD	23.1	<LOD	3.9	19.4	3.2	<LOD	4.65
210-1	<LOD	29.55	<LOD	165	<LOD	28.35	<LOD	5.1	67.2	5.3	7	4.4
210-2	<LOD	42.6	<LOD	195	<LOD	36.15	9.1	4.5	97.6	7.3	11.2	5.6
210-3	<LOD	33.3	<LOD	165	<LOD	35.7	<LOD	5.85	76.7	6.2	13.6	5.2
210-4	<LOD	31.5	<LOD	165	<LOD	28.05	<LOD	6	101.4	6.5	15.2	5
211-1	59	35.3	<LOD	195	<LOD	39	<LOD	7.35	98.9	8.9	65.5	8.4
211-2	<LOD	43.8	<LOD	180	<LOD	29.7	7.3	4.3	54.2	6.9	42.6	6.9
211-3	<LOD	44.4	<LOD	165	<LOD	31.35	<LOD	6.9	122.6	8.3	49.1	7.2
211-4	<LOD	53.1	<LOD	195	<LOD	40.8	11.5	4.9	64	7.8	35	7.5
212-1	<LOD	30.6	<LOD	148.95	<LOD	27.3	11.9	4.6	133.9	7.9	31.7	6
212-2	<LOD	29.85	<LOD	139.35	<LOD	27.3	7.9	4.3	147	7.6	34.4	5.7
212-3	<LOD	34.2	<LOD	149.55	<LOD	23.4	<LOD	6	101	6.7	25.4	5.4
212-4	<LOD	33.6	<LOD	150	<LOD	27.6	10.7	3.9	76.5	5.8	18.4	4.9
213-1	<LOD	30.75	<LOD	140.4	<LOD	25.35	<LOD	6.15	121.7	7.3	25.2	5.6

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
213-2	<LOD	31.95	<LOD	165	<LOD	33.45	10.5	5.5	107.5	9.2	30.6	7.5
213-3	<LOD	25.8	<LOD	146.7	<LOD	25.5	<LOD	5.85	82.7	6.3	21	5.3
213-4	<LOD	33.6	<LOD	150	<LOD	26.4	8.5	4	78.1	6.2	13	5.1
214-1	<LOD	23.55	<LOD	136.8	<LOD	28.05	6.5	3.8	113.3	6.4	17.3	4.8
214-2	<LOD	25.35	<LOD	135	<LOD	28.2	6.5	3.8	123.7	6.5	21	4.8
214-3	<LOD	31.8	<LOD	147.6	<LOD	27.6	9.3	3.9	116.8	6.5	17	4.8
214-4	<LOD	30.6	<LOD	144.15	<LOD	29.4	7.7	3.8	98.4	6.1	16.1	4.8
215-1	<LOD	35.25	<LOD	142.95	<LOD	28.2	9.3	4.4	108.2	7.7	38	6.4
215-2	<LOD	33.15	<LOD	140.25	<LOD	26.4	<LOD	4.65	36	4.5	13.6	4.4
215-3	<LOD	32.4	<LOD	142.35	<LOD	24.45	5.7	3.4	59.2	5.3	22.3	4.9
215-4	<LOD	32.25	<LOD	142.8	<LOD	27.75	<LOD	5.7	87.4	6.5	27.1	5.6
216-1	<LOD	34.05	<LOD	180	<LOD	30.75	17.3	6.1	220.4	11.3	47.1	7.8
216-2	<LOD	35.25	<LOD	180	<LOD	35.1	NA		NA		NA	
216-3	<LOD	28.05	<LOD	180	<LOD	37.8	NA		NA		NA	
216-4	<LOD	46.95	<LOD	195	<LOD	35.55	17.8	5.7	143.6	9.7	30.2	7.5
217-1	<LOD	35.85	<LOD	165	<LOD	30.75	10.5	4.6	104.3	7.7	42.8	6.7
217-2	<LOD	30.9	<LOD	180	<LOD	33	7.2	4.7	104.7	8	41.5	6.9
217-3	<LOD	39.3	<LOD	165	<LOD	30.15	7.2	4.2	96.1	7	35.8	6.1
217-4	<LOD	35.4	<LOD	165	<LOD	29.55	6.5	3.4	40.9	4.8	11.8	4.6
218-1	<LOD	35.4	<LOD	150	<LOD	29.1	13.3	4.4	77.6	6.6	21.5	5.8
218-2	<LOD	35.4	<LOD	165	<LOD	28.35	11.4	4.5	72.4	6.8	27.3	6.2
218-3	<LOD	30.75	<LOD	150	<LOD	25.65	11.7	4.4	80.9	7	31	6.2

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
218-4	<LOD	35.55	<LOD	165	<LOD	25.65	6.8	4.3	81.6	6.9	19.4	5.8
219-1	<LOD	37.05	<LOD	165	<LOD	33.6	9.8	4.7	92	8	58	7.7
219-2	<LOD	43.35	<LOD	180	<LOD	28.2	11	5.2	96	8.8	39.2	7.7
219-3	<LOD	39.9	<LOD	150	<LOD	27.6	8.5	4.9	119.7	8.5	38.6	7.2
219-4	<LOD	31.35	<LOD	165	<LOD	28.8	7.8	5.2	121.2	9.3	48.2	7.9
220-1	<LOD	46.95	<LOD	210	<LOD	36.6	20.3	6.5	116.3	11.1	65.7	10.1
220-2	<LOD	40.2	<LOD	165	<LOD	34.5	13	5.4	98.3	8.9	38.3	7.7
220-3	<LOD	36.15	<LOD	165	<LOD	30.3	7.1	4.7	70.3	7.3	26.8	6.6
220-4	<LOD	31.65	<LOD	165	<LOD	32.25	16.7	5.6	112.8	9.2	43.8	7.8
221-1	<LOD	37.65	<LOD	147	<LOD	29.1	12.4	4.5	118.7	7.4	34.2	6
221-2	<LOD	26.25	<LOD	138.3	<LOD	26.25	<LOD	5.85	108.2	6.7	33.9	5.5
221-3	<LOD	24	<LOD	148.5	<LOD	25.95	<LOD	6.3	110.5	7	27.4	5.6
221-4	<LOD	38.25	<LOD	150	<LOD	27.3	9.5	4.6	113.4	7.6	33.9	6.2
222-1	<LOD	40.8	<LOD	180	<LOD	34.65	11	4.7	77.9	7	<LOD	8.4
222-2	<LOD	30.75	<LOD	147.3	<LOD	27.6	7.6	3.9	80.5	6	9.8	4.8
222-3	<LOD	27.45	<LOD	132.6	<LOD	25.65	<LOD	6.15	100.9	6.8	15.5	5.2
222-4	<LOD	22.8	<LOD	138	<LOD	23.4	<LOD	5.4	97.1	6	18.3	4.7
223-1	138.7	52.6	<LOD	195	<LOD	34.35	10.7	5.8	125	11.5	596	18.9
223-2	<LOD	40.05	<LOD	165	<LOD	28.5	10	6.3	126.1	13	857.6	24.8
223-3	<LOD	34.35	<LOD	180	<LOD	35.25	13.7	7.6	94.9	14	508.4	22.9
223-4	124.4	53.5	<LOD	210	<LOD	37.8	11.9	6.8	130.7	15.1	1200	31.5
224-1	<LOD	27.15	<LOD	150	<LOD	30.9	11.1	4.8	116.4	7.9	26.4	6.2

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
224-2	<LOD	30.6	<LOD	165	<LOD	29.55	7.6	3.9	115.3	6.5	24.3	5
224-3	<LOD	36.45	<LOD	180	<LOD	34.2	11.6	4.7	122.3	7.7	22.6	5.8
224-4	<LOD	30.75	<LOD	150	<LOD	28.35	12.7	4.5	130.9	7.5	27.5	5.7
225-1	<LOD	40.05	<LOD	180	<LOD	35.25	8.3	3.6	91.6	5.8	14.6	4.5
225-2	<LOD	31.95	<LOD	165	<LOD	31.95	6.5	3.9	102.6	6.2	15.2	4.8
225-3	<LOD	39.3	<LOD	165	<LOD	28.2	8.3	4	134.4	7	22.7	5
225-4	<LOD	33.75	<LOD	180	<LOD	33.6	11	4	104.7	6.4	14.2	4.8
226-1	<LOD	33.75	<LOD	165	<LOD	33	9.5	5	147.4	8.9	37.9	6.8
226-2	<LOD	28.95	<LOD	165	<LOD	29.7	10.1	5.1	172.5	9.4	45.5	7
226-3	<LOD	31.8	<LOD	165	<LOD	30.6	11.6	4.6	151.3	8	41.8	6.2
226-4	<LOD	39.9	<LOD	180	<LOD	38.7	14.7	6.1	149.4	10.9	60.3	9
227-1	<LOD	41.25	<LOD	180	<LOD	36.15	11.5	4.8	116.1	7.8	45.8	6.7
227-2	<LOD	45	<LOD	210	<LOD	36.45	19	6.4	109.3	10.4	60.7	9.4
227-3	<LOD	32.7	<LOD	165	<LOD	28.05	7.7	4.5	119.8	7.7	58.2	6.8
227-4	<LOD	32.85	<LOD	165	<LOD	34.5	7.8	4.5	114.4	7.7	58.8	6.8
229-1	<LOD	42.75	<LOD	180	<LOD	33	17.7	5.7	151.7	9.7	23	6.9
229-2	<LOD	31.2	<LOD	150	<LOD	25.2	11.1	5.1	163.1	9	25.7	6.3
229-3	<LOD	28.65	<LOD	165	<LOD	29.4	13.1	5.2	168.9	9	16.9	5.9
229-4	<LOD	30.3	<LOD	165	<LOD	28.2	9.1	4.9	165.3	8.6	14.8	5.7
230-1	<LOD	30.6	<LOD	147	<LOD	26.55	12.1	4.2	118.9	6.9	19.9	5.2
230-2	<LOD	28.5	<LOD	146.85	<LOD	29.25	<LOD	5.55	104.7	6.3	11.3	4.7
230-3	<LOD	24.6	<LOD	138.45	<LOD	27.15	6.1	3.5	120.3	6	12.9	4.3

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
230-4	<LOD	29.55	<LOD	138.3	<LOD	26.85	<LOD	6.15	134.2	7.1	16.7	5
231-1	84.7	37.2	<LOD	165	<LOD	35.4	<LOD	6.15	108	6.9	32.5	5.7
231-2	161.7	46.3	<LOD	165	<LOD	29.4	8.1	4.3	106.7	7.1	37	6.1
231-3	250.2	53.4	<LOD	165	<LOD	29.55	11.5	5	149.5	9.1	69.6	7.7
231-4	484	77	<LOD	180	<LOD	35.1	13.2	5.4	138.4	9.5	49.2	7.9
232-1	1109.6	110	<LOD	180	<LOD	37.65	12.1	5.3	66	10	166.2	11.6
232-2	1240	130	<LOD	195	<LOD	36.75	<LOD	6.15	25.8	7.5	107.5	8.9
232-3	900	100	<LOD	180	<LOD	40.65	9.6	5.1	99.5	9.5	125.4	9.9
232-4	1109.6	110	<LOD	165	<LOD	33.15	10.4	5	86.3	9.6	175.9	10.9
233-1	<LOD	34.65	<LOD	165	<LOD	30.15	18.4	6	165.2	10.2	16.3	6.9
233-2	<LOD	29.55	<LOD	146.7	<LOD	27.75	12.7	4.7	176.3	8.4	20.2	5.5
233-3	<LOD	28.8	<LOD	138.45	<LOD	27	8	4.5	150.5	7.8	15.7	5.3
233-4	<LOD	27.75	<LOD	136.05	<LOD	25.2	9	4.6	184.2	8.3	16.3	5.3
234-1	<LOD	34.5	<LOD	145.2	<LOD	28.05	13.2	5.6	155	10.3	120.4	9.7
234-2	<LOD	35.4	<LOD	165	<LOD	28.95	13.2	5.8	117.7	10	132.1	10.5
234-3	<LOD	34.5	<LOD	180	<LOD	34.05	14.9	5.7	122.1	9.7	96.1	9.2
234-4	<LOD	36.6	<LOD	143.4	<LOD	23.85	8.1	5.4	112.3	9.3	107.3	9.5
235-1	<LOD	35.1	<LOD	165	<LOD	29.25	7.4	4.2	94.8	6.7	17.9	5.4
235-2	<LOD	35.4	<LOD	150	<LOD	26.85	13	4.3	97.3	6.7	20	5.4
235-3	<LOD	32.85	<LOD	143.7	<LOD	25.5	<LOD	5.1	62.6	5.3	6.9	4.4
235-4	<LOD	35.7	<LOD	165	<LOD	31.5	8.9	3.9	74.3	5.9	13.2	4.8
236-1	<LOD	39.9	<LOD	165	<LOD	33.75	18.5	5.4	96.5	8.4	18.5	6.7

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
236-2	<LOD	37.2	<LOD	150	<LOD	28.8	15.4	5.2	135.8	8.6	25.7	6.4
236-3	<LOD	33.6	<LOD	150	<LOD	27	9.9	4.5	122.9	7.4	21.6	5.6
236-4	<LOD	34.65	<LOD	180	<LOD	30.6	16.1	5.4	114.3	8.6	18.2	6.5
237-1	<LOD	28.8	<LOD	150	<LOD	32.25	11.7	4.7	140	7.9	24	5.8
237-2	<LOD	38.25	<LOD	165	<LOD	27.9	<LOD	6.15	117.1	7	19.2	5.3
237-3	<LOD	38.4	<LOD	165	<LOD	31.35	11.7	4.5	116.4	7.5	22	5.7
237-4	<LOD	26.7	<LOD	165	<LOD	29.55	15.9	5.4	118	8.7	26.3	6.8
238-1	<LOD	24.9	<LOD	129.15	<LOD	22.8	<LOD	6.45	140.8	7.5	19.8	5.3
238-2	<LOD	28.95	<LOD	136.65	<LOD	23.85	8.4	4.2	119.1	6.8	18.1	5.1
238-3	<LOD	27.15	<LOD	138.75	<LOD	26.7	<LOD	5.55	107.7	6.2	18.3	4.8
238-4	<LOD	28.5	<LOD	147	<LOD	27	7.3	4.1	115	7	18.5	5.2
239-1	<LOD	28.35	<LOD	165	<LOD	28.05	11.5	4.8	127.2	7.8	9.8	5.5
239-2	<LOD	30.45	<LOD	145.65	<LOD	30	7.6	4.4	178.5	8.2	21.4	5.4
239-3	<LOD	32.25	<LOD	149.7	<LOD	25.5	10.4	5	171.8	9	13.6	5.8
239-4	<LOD	34.65	<LOD	149.7	<LOD	32.25	10	4.8	160.6	8.4	21	5.8
240-1	<LOD	34.65	<LOD	150	<LOD	28.35	7.7	4.6	86.8	7.4	26.2	6.3
240-2	<LOD	33.6	<LOD	150	<LOD	27.9	15.2	4.6	106.2	7.3	29.9	6
240-3	<LOD	28.2	<LOD	145.65	<LOD	26.85	<LOD	6.45	125.9	7.8	40.3	6.2
240-4	<LOD	29.4	<LOD	165	<LOD	28.65	9.2	4.4	113.6	7.5	33.8	6.1
241-1	<LOD	26.7	<LOD	145.8	<LOD	25.2	<LOD	6	144.7	7	6.9	4.6
241-2	<LOD	32.25	<LOD	150	<LOD	34.2	10.9	4.9	168.8	8.7	13.9	5.7
241-3	<LOD	26.4	<LOD	139.8	<LOD	25.35	10.5	4.7	224.4	8.8	19.6	5.3

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
241-4	<LOD	30	<LOD	136.8	<LOD	25.05	11.6	5.2	237.4	9.9	29.8	6.1
242-1	<LOD	32.7	<LOD	146.7	<LOD	25.8	11.4	4.7	126.2	8	35.4	6.3
242-2	<LOD	38.25	<LOD	180	<LOD	33.6	15.3	5.3	98.9	8.4	30.1	6.9
242-3	<LOD	28.8	<LOD	150	<LOD	27.3	9.4	4.7	143.5	8.1	31	6.1
242-4	<LOD	31.65	<LOD	150	<LOD	26.7	<LOD	6.75	132.2	7.8	35.9	6.1
243-1	<LOD	32.85	<LOD	165	<LOD	29.25	13	5.2	151.7	9.1	35.5	6.8
243-2	<LOD	26.55	<LOD	143.1	<LOD	29.25	9	5	129.5	8.7	32.4	6.8
243-3	<LOD	26.1	<LOD	133.8	<LOD	24.3	7	4.4	153.4	7.8	33.7	5.8
243-4	<LOD	31.2	<LOD	150	<LOD	30	11.8	5.4	135.4	9.3	46.4	7.6
245-1	43.3	26	<LOD	150	<LOD	30.3	9.9	4.5	132.4	7.8	45.8	6.3
245-2	<LOD	31.5	<LOD	145.2	<LOD	26.85	10.2	4.3	118.8	7.2	43.6	6
245-3	<LOD	28.95	<LOD	135.75	<LOD	26.1	9.4	4.3	127.4	7.5	44.4	6.1
245-4	<LOD	31.65	<LOD	165	<LOD	31.5	8.7	4.6	99.5	7.6	43.3	6.6
246-1	118.6	39.2	<LOD	210	<LOD	43.95	11	5.5	125.7	9.8	84.7	9
246-2	77.2	40.9	<LOD	240	<LOD	42.75	17.1	7	112.6	12	86.8	11.4
246-3	64.4	35.8	<LOD	195	<LOD	34.5	<LOD	4.95	28.8	4.8	87.4	6.3
246-4	54.8	28.7	<LOD	195	<LOD	33.15	10.4	5.4	165.3	9.9	86.2	8.5
247-1	<LOD	34.05	<LOD	165	<LOD	33	<LOD	7.65	176	9.7	99.4	8.5
247-2	<LOD	35.25	<LOD	165	<LOD	31.35	11.8	5.1	129.4	9.1	144.4	9.5
247-3	48	28.3	<LOD	180	<LOD	32.25	17.6	6	128.1	10.3	144.5	10.8
247-4	<LOD	37.95	<LOD	165	<LOD	28.8	8.6	4.6	108.7	8	138.7	8.8
249-1	60.6	27.6	<LOD	180	<LOD	29.85	9.4	5.1	119.7	9.1	84.4	8.3

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
249-2	43.2	27.4	<LOD	195	<LOD	35.25	8.4	4.5	98.8	7.7	59.4	7
249-3	55	26.6	<LOD	180	<LOD	34.95	10.6	4.8	125.5	8.7	75.1	7.7
249-4	62	27.1	<LOD	180	<LOD	34.5	9.2	4.2	90.1	7	75.4	6.8
250-1	36.4	24.2	<LOD	150	<LOD	31.65	<LOD	6.75	144.2	7.9	39.3	6.1
250-2	<LOD	35.4	<LOD	165	<LOD	28.2	9.1	4.7	135.9	8.1	34.3	6.3
250-3	<LOD	34.65	<LOD	165	<LOD	35.25	14.3	5.2	134.5	8.5	36.4	6.7
250-4	<LOD	41.55	<LOD	180	<LOD	31.5	16.7	5.6	167.5	9.7	42.2	7.3
251-1	<LOD	33.45	<LOD	180	<LOD	32.4	20.1	5.8	126.2	9.1	17.5	6.8
251-2	<LOD	24.15	<LOD	141.6	<LOD	26.25	<LOD	5.85	132.5	6.7	19.5	4.9
251-3	<LOD	31.35	<LOD	146.4	<LOD	28.95	6.2	4.1	133.1	7.1	25.4	5.3
251-4	<LOD	29.1	<LOD	141.45	<LOD	24.3	9.5	4.5	143.3	7.7	29.5	5.7
252-1	<LOD	27.45	<LOD	135.3	<LOD	25.35	10.9	5.6	242	10.8	69.7	7.7
252-2	<LOD	32.25	<LOD	165	<LOD	30.15	17.7	5.9	199.3	10.5	65.7	8
252-3	<LOD	30.45	<LOD	150	<LOD	23.85	<LOD	8.4	252.8	11	60.1	7.5
252-4	<LOD	28.65	<LOD	165	<LOD	27.3	15.7	6.1	265	11.7	52.3	7.6
253-1	85.1	27.7	<LOD	180	<LOD	32.85	11.1	4.9	109.6	8.7	99.8	8.4
253-2	169.6	32.7	<LOD	180	<LOD	35.1	<LOD	5.25	59.5	5.9	52.8	5.9
253-3	119.9	29.3	<LOD	195	<LOD	41.7	10.8	4.2	50.3	6.9	85	7.5
253-4	157.4	36.5	<LOD	195	<LOD	36.9	<LOD	6.3	73.1	7	61.4	6.8
254-1	<LOD	25.35	<LOD	143.1	<LOD	25.35	10.8	4.9	103.9	8.1	25.4	6.5
254-2	<LOD	31.05	<LOD	180	<LOD	35.4	12.7	5.1	140	9	43.1	7
254-3	35	20.8	<LOD	150	<LOD	28.05	8.7	4.3	113.5	7.3	32.8	5.9

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
254-4	<LOD	31.2	<LOD	150	<LOD	28.8	<LOD	6.6	140	8.1	39.5	6.3
255-1	<LOD	33.15	<LOD	165	<LOD	30.9	11	4.8	101	7.8	37.2	6.6
255-2	<LOD	37.05	<LOD	165	<LOD	32.25	10.2	4.4	92.6	6.9	26	5.7
255-3	47	24.8	<LOD	165	<LOD	32.7	7.7	4.4	96.7	7.2	30.9	6
255-4	43.3	25.9	<LOD	165	<LOD	32.7	10.1	4.7	94.6	7.7	34.8	6.5
256-1	<LOD	30.75	<LOD	150	<LOD	27.6	9.7	4.3	116.5	7.1	21.5	5.4
256-2	<LOD	28.05	<LOD	146.25	<LOD	26.1	10.8	4	108.6	6.7	28.9	5.3
256-3	<LOD	29.85	<LOD	145.8	<LOD	32.4	8.4	3.6	92.9	5.8	20.1	4.6
256-4	<LOD	37.95	<LOD	165	<LOD	30	10	4.4	97.5	7.1	23	5.7
257-1	<LOD	33.15	<LOD	146.55	<LOD	28.35	<LOD	6.15	111.9	6.9	27.3	5.5
257-2	<LOD	42.3	<LOD	180	<LOD	36.9	8.3	4.3	91.7	7	29.1	5.9
257-3	<LOD	31.35	<LOD	165	<LOD	28.95	7.6	3.9	108.6	6.6	25.1	5.2
257-4	<LOD	32.1	<LOD	150	<LOD	30.6	<LOD	5.4	100.5	6.1	34.6	5.1
258-1	<LOD	27.45	<LOD	135.6	<LOD	27.6	<LOD	6.3	118.9	7.2	26.9	5.6
258-2	<LOD	37.35	<LOD	150	<LOD	28.65	10.4	4.6	123.7	7.9	38.5	6.4
258-3	<LOD	30.6	<LOD	150	<LOD	28.8	5.9	3.6	109.2	6.2	26.9	4.9
258-4	<LOD	33	<LOD	150	<LOD	29.1	12.3	4.4	109.9	7.1	28.2	5.7
259-1	<LOD	33.9	<LOD	210	<LOD	36.9	9.3	4.7	67.3	7.5	95.6	8.5
259-2	<LOD	39.6	<LOD	165	<LOD	32.1	5.8	3.7	50.5	5.6	60.2	6.3
259-3	<LOD	39.15	<LOD	180	<LOD	37.8	8	4.2	76.4	6.9	113.4	7.9
259-4	<LOD	35.1	<LOD	165	<LOD	33.3	7.4	4.1	86	7	104	7.6
260-1	<LOD	36.15	<LOD	180	<LOD	40.05	16.1	6.7	99.4	11.3	161.6	13

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
260-2	<LOD	39.6	<LOD	195	<LOD	39	12.5	5	91.6	8	64.3	7.7
260-3	<LOD	31.35	<LOD	165	<LOD	32.55	6.5	4	52.1	6.1	37	5.9
260-4	<LOD	36.75	<LOD	165	<LOD	31.8	8.2	4.5	88.2	7.3	60.1	7
261-1	<LOD	36.6	<LOD	165	<LOD	33	11.1	4.6	106.2	7.6	73.1	7.3
261-2	<LOD	50.85	<LOD	210	<LOD	39.15	14.7	5.6	72.2	8.6	44	8.2
261-3	<LOD	36.75	<LOD	180	<LOD	36.15	12.6	4.2	68.4	6.4	45.2	6.3
261-4	<LOD	30.45	<LOD	180	<LOD	37.05	11.5	5.8	92.6	9.6	73.2	9.3
262-1	<LOD	42.6	<LOD	195	<LOD	32.4	16.7	6.7	157.9	11.5	54.7	9.2
262-2	<LOD	37.8	<LOD	180	<LOD	35.55	17.6	6.2	192.2	11.2	66.1	8.6
262-3	<LOD	32.25	<LOD	165	<LOD	29.7	15.5	5.5	185.4	9.9	57.8	7.5
262-4	<LOD	33.3	<LOD	150	<LOD	26.85	23.2	6	196.3	10.7	71.3	8.2
263-1	<LOD	37.2	<LOD	150	<LOD	30.15	7.9	4.3	116.7	7.2	33.4	5.8
263-2	<LOD	30.75	<LOD	150	<LOD	28.2	7.2	4.3	144.5	7.6	35.6	5.8
263-3	<LOD	32.25	<LOD	165	<LOD	30.3	<LOD	6.3	114.7	7.2	26.8	5.7
263-4	<LOD	31.2	<LOD	165	<LOD	32.7	<LOD	6.6	106.9	7.4	22.7	5.9
264-1	<LOD	37.5	<LOD	165	<LOD	32.4	14.3	5.2	161.1	9.2	29.3	6.5
264-2	<LOD	36.6	<LOD	180	<LOD	32.85	12.5	5.3	164.9	9.2	25.1	6.5
264-3	<LOD	28.05	<LOD	138.75	<LOD	26.25	<LOD	6.75	169.2	8.2	27.3	5.7
264-4	<LOD	27.45	<LOD	150	<LOD	28.35	8.3	4.5	172.7	8.2	24.9	5.6
265-1	<LOD	31.2	<LOD	147	<LOD	28.8	12.2	5	147.8	8.6	24.7	6.2
265-2	<LOD	31.8	<LOD	150	<LOD	34.35	9.1	4.7	149	8.2	24.7	5.9
265-3	<LOD	33.3	<LOD	165	<LOD	34.35	9.6	4.3	164	7.6	26.5	5.3

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
265-4	<LOD	26.55	<LOD	124.35	<LOD	25.65	9.6	4.5	143.5	7.9	25	5.6
266-1	<LOD	32.4	<LOD	150	<LOD	29.4	8.6	4.2	137.5	7.2	20.4	5.1
266-2	<LOD	24.75	<LOD	148.2	<LOD	28.65	<LOD	5.55	117	6.3	16.4	4.6
266-3	<LOD	33.75	<LOD	165	<LOD	28.35	13.8	5.2	130.4	8.5	17.7	6.2
266-4	<LOD	32.25	<LOD	165	<LOD	25.95	12.8	4.6	133.1	7.7	19.1	5.6
267-1	<LOD	31.35	<LOD	165	<LOD	36.45	11.5	4.8	150.5	8.5	24.3	6
267-2	<LOD	35.1	<LOD	165	<LOD	29.55	9.7	4.9	151.2	8.6	23.4	6.1
267-3	<LOD	34.8	<LOD	195	<LOD	34.8	10.5	5.2	172.5	9.4	33.6	6.6
267-4	<LOD	39.15	<LOD	180	<LOD	34.05	16.9	5.6	173.8	9.7	28.5	6.7
268-1	<LOD	30.45	<LOD	143.4	<LOD	27.9	<LOD	5.7	82.5	6.4	25.6	5.4
268-2	<LOD	34.35	<LOD	165	<LOD	28.8	<LOD	5.55	78.6	6	13.1	4.9
268-3	<LOD	26.1	<LOD	136.95	<LOD	25.95	7.4	4.2	88.1	6.9	23.9	5.8
268-4	<LOD	32.1	<LOD	165	<LOD	25.2	6.8	4	68.6	6.4	22	5.6
269-1	<LOD	34.8	<LOD	150	<LOD	32.55	6.8	4	130.5	6.8	15	4.8
269-2	<LOD	34.5	<LOD	165	<LOD	33.6	<LOD	4.95	104.4	5.5	8.2	4
269-3	<LOD	33.45	<LOD	150	<LOD	28.65	10.9	4.6	139.7	7.9	17.6	5.6
269-4	<LOD	30.6	<LOD	147.6	<LOD	30.9	9.9	5	161.6	8.8	25.2	6.2
270-1	<LOD	36.75	<LOD	165	<LOD	33.45	<LOD	6.45	159.2	7.7	23.5	5.3
270-2	<LOD	31.65	<LOD	165	<LOD	34.5	<LOD	6.45	159.2	7.7	23.5	5.3
270-3	<LOD	41.85	<LOD	195	<LOD	33	17.4	5.6	195.6	10.1	28.5	6.7
270-4	<LOD	29.7	<LOD	180	<LOD	31.8	12.2	4.6	194.6	8.4	30.8	5.6
271-1	<LOD	31.05	<LOD	150	<LOD	29.7	7.3	4.3	142.4	7.6	19.2	5.4

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
271-2	<LOD	45.6	<LOD	210	<LOD	37.2	12.2	5.9	117.8	9.8	13.7	7.2
271-3	<LOD	36.6	<LOD	165	<LOD	28.35	12.2	4.6	137.4	7.8	22.1	5.6
271-4	<LOD	39.3	<LOD	180	<LOD	33.3	12.2	5	132.3	8.5	23.8	6.3
272-1	<LOD	32.1	<LOD	144	<LOD	27.9	9.8	4.4	117.7	7.3	21.5	5.5
272-2	<LOD	31.2	<LOD	180	<LOD	35.25	11.3	5.2	116.9	8.8	24.8	6.8
272-3	<LOD	30.15	<LOD	150	<LOD	28.5	7.1	4.2	140.3	7.5	27.6	5.5
272-4	<LOD	33.75	<LOD	165	<LOD	27.3	13.6	4.7	113.9	7.7	22.8	5.9
273-1	<LOD	30.6	<LOD	150	<LOD	29.25	6.8	3.8	80.5	5.8	8.9	4.7
273-2	<LOD	32.25	<LOD	150	<LOD	29.1	6.9	3.6	94.1	5.7	12.4	4.4
273-3	<LOD	34.05	<LOD	180	<LOD	35.25	9.9	4.4	107	7.1	17	5.4
273-4	<LOD	33.9	<LOD	150	<LOD	25.2	9.4	4.2	90.7	6.6	11	5.2
274-1	<LOD	33.9	<LOD	150	<LOD	25.2	11.5	4.6	142.5	7.9	16.9	5.5
274-2	<LOD	31.8	<LOD	144.9	<LOD	26.7	7.8	4	137.6	6.9	12.5	4.7
274-3	<LOD	33.3	<LOD	165	<LOD	32.1	10.2	4.2	115.4	6.9	11.3	5
274-4	<LOD	28.2	<LOD	147.75	<LOD	28.2	7	4	140.9	7	16.1	4.8
275-1	<LOD	32.1	<LOD	138.6	<LOD	23.7	7.4	4.6	125.7	7.8	18.3	5.7
275-2	<LOD	37.95	<LOD	180	<LOD	30.6	11.3	4.6	130.8	7.7	18.8	5.6
275-3	<LOD	32.85	<LOD	165	<LOD	30.15	<LOD	6	138.6	7.1	16.4	4.9
275-4	<LOD	34.35	<LOD	165	<LOD	35.55	7	4.2	114.4	7	13.9	5.1
276-1	<LOD	33.15	<LOD	150	<LOD	25.8	8.8	4.7	142.8	8.2	26.3	6
276-2	<LOD	42.3	<LOD	195	<LOD	38.55	18.5	5.6	154.5	9.5	34.3	7
276-3	<LOD	45.6	<LOD	180	<LOD	34.65	9.2	4.8	162.7	8.6	29	6.1

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
276-4	<LOD	33.9	<LOD	165	<LOD	31.5	12.5	4.6	162.8	8.2	31	5.8
277-1	<LOD	26.85	<LOD	136.5	<LOD	25.5	11.4	4.3	149.5	7.4	16.8	5.1
277-2	<LOD	37.05	<LOD	165	<LOD	27	9.7	4.1	135.3	7.1	18.8	5
277-3	<LOD	36	<LOD	165	<LOD	30.6	7.4	4.2	135.2	7.3	19	5.2
277-4	<LOD	31.35	<LOD	150	<LOD	27.3	<LOD	5.85	158.8	7.1	20.3	4.8
278-1	<LOD	41.25	<LOD	180	<LOD	28.95	14.8	4.9	159.6	8.5	26.8	6
278-2	<LOD	36.9	<LOD	165	<LOD	34.8	8.8	4.4	133.9	7.3	20.7	5.3
278-3	<LOD	29.25	<LOD	141.3	<LOD	28.95	9.4	4	131.9	6.8	22.5	5
278-4	<LOD	39	<LOD	180	<LOD	38.85	15.4	5.9	123.1	9.6	24.4	7.4
279-1	<LOD	35.4	<LOD	150	<LOD	30	7.8	3.9	111.5	6.5	16.7	4.8
279-2	<LOD	36.6	<LOD	180	<LOD	33.6	11.1	4.2	105.9	6.8	18.6	5.2
279-3	<LOD	32.4	<LOD	150	<LOD	31.2	8.2	4.2	124.6	7.1	18.8	5.2
279-4	<LOD	33.6	<LOD	150	<LOD	27	<LOD	5.85	114.9	6.6	18	4.9
280-1	<LOD	31.95	<LOD	148.2	<LOD	25.65	8.6	4	104.7	6.6	18	5.1
280-2	<LOD	32.85	<LOD	146.7	<LOD	32.1	15.9	4.5	180.4	7.9	28	5.3
280-3	<LOD	43.2	<LOD	180	<LOD	30.9	5.8	3.6	74.5	5.6	10.9	4.6
280-4	<LOD	36.75	<LOD	150	<LOD	29.7	10.4	4.1	92.9	6.6	22.9	5.4
281-1	<LOD	31.8	<LOD	150	<LOD	28.65	<LOD	6.15	121.8	7.1	22.1	5.3
281-2	<LOD	32.1	<LOD	145.65	<LOD	30.3	7.9	4	105.1	6.7	16.1	5
281-3	<LOD	30.6	<LOD	150	<LOD	28.35	9.2	4	109.8	6.5	13	4.8
281-4	<LOD	41.7	<LOD	195	<LOD	37.05	13	4.8	99	7.6	12.2	5.8
282-1	<LOD	30.9	<LOD	150	<LOD	29.4	7.2	4.3	139.5	7.5	22	5.4

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
282-2	<LOD	39.9	489.2	140	<LOD	40.65	13.8	4.3	121.4	7.2	27	5.5
282-3	<LOD	31.95	<LOD	136.95	<LOD	27.3	9.6	4.4	121.1	7.3	24.7	5.6
282-4	<LOD	42.15	<LOD	180	<LOD	33.75	8.9	5	116.3	8.5	26.4	6.6
283-1	<LOD	33.9	<LOD	148.8	<LOD	26.25	7.7	4	109.9	6.6	16.5	5
283-2	<LOD	38.7	<LOD	180	<LOD	35.4	12.4	4.2	54	5.8	<LOD	7.5
283-3	<LOD	31.5	<LOD	145.95	<LOD	28.35	<LOD	5.1	88.2	5.5	17	4.4
283-4	<LOD	30.9	<LOD	144.9	<LOD	28.05	<LOD	6.15	150.7	7.3	28.5	5.3
284-1	<LOD	38.25	<LOD	180	<LOD	33.6	5.6	3.7	48.3	5.3	10	4.8
284-2	<LOD	29.85	<LOD	150	<LOD	29.25	12.6	4.6	94.6	7.3	23.5	6
284-3	<LOD	33.45	<LOD	146.4	<LOD	24.45	<LOD	6	105.5	6.8	25.1	5.4
284-4	<LOD	34.65	<LOD	150	<LOD	26.85	8.2	4	74	6	11.3	5
285-1	<LOD	35.85	<LOD	150	<LOD	31.05	<LOD	6.15	147.1	7.3	21.6	5.2
285-2	<LOD	35.25	<LOD	150	<LOD	28.5	6.9	3.8	80.2	5.8	<LOD	6.75
285-3	<LOD	34.5	<LOD	150	<LOD	29.25	12.2	4.4	140.2	7.3	11.1	5
285-4	<LOD	34.8	<LOD	150	<LOD	31.35	<LOD	4.65	88.5	5.1	6.1	3.8
286-1	<LOD	30.45	<LOD	150	<LOD	26.1	<LOD	4.35	40.5	3.9	<LOD	4.8
286-2	<LOD	29.1	<LOD	140.55	<LOD	25.5	7.7	3.7	113.4	6.1	9.3	4.3
286-3	<LOD	32.25	<LOD	144.75	<LOD	27.3	8.8	3.7	107.9	5.8	<LOD	6
286-4	<LOD	37.05	<LOD	165	<LOD	31.8	9	3.6	117.9	5.9	<LOD	6
287-1	<LOD	33.75	<LOD	165	<LOD	31.95	16.9	5.6	131.3	9.6	33.3	7.4
287-2	<LOD	25.35	<LOD	150	<LOD	30.15	10.1	4.3	121.6	7.3	25.1	5.6
287-3	<LOD	29.4	<LOD	148.95	<LOD	26.4	16.4	5	141.5	8.5	30.5	6.3

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
287-4	<LOD	42.45	<LOD	180	<LOD	33.45	16.5	5.6	133.7	9.2	24.3	6.9
288-1	<LOD	44.55	<LOD	180	<LOD	37.8	8	4.3	72.7	6.5	<LOD	7.95
288-2	<LOD	33.6	<LOD	165	<LOD	30.3	9.9	4.4	132.6	7.5	21.5	5.5
288-3	<LOD	31.8	<LOD	165	<LOD	26.55	12	4.8	128.9	8.2	24.5	6.1
288-4	<LOD	45.6	<LOD	195	<LOD	36.3	16.5	5.7	121.4	9.3	22.4	7.1
289-1	<LOD	37.65	<LOD	180	<LOD	32.1	16.6	4.7	122.7	7.6	14.4	5.5
289-2	<LOD	35.25	<LOD	165	<LOD	30.15	11	4.7	161	8.4	25.8	5.8
289-3	<LOD	46.2	<LOD	210	<LOD	36.45	17.2	5.3	117.2	8.3	<LOD	9
289-4	<LOD	31.8	<LOD	149.7	<LOD	27.15	6.2	3.7	124.3	6.2	13	4.4
290-1	<LOD	32.4	<LOD	180	<LOD	29.1	10.8	4.4	115.3	7.2	15.4	5.3
290-2	<LOD	34.05	<LOD	180	<LOD	35.85	9.1	4.5	110.1	7.3	9.5	5.3
290-3	<LOD	40.95	<LOD	195	<LOD	43.95	16.8	5.4	125.6	8.5	16.3	6.2
290-4	<LOD	35.85	<LOD	165	<LOD	30.15	7	4.1	120.3	6.8	16	5
291-1	<LOD	30	<LOD	146.7	<LOD	30.45	8.5	3.9	127	6.7	15.2	4.7
291-2	<LOD	28.35	<LOD	150	<LOD	29.1	9.5	4.4	147.4	7.6	16	5.2
291-3	<LOD	33.45	<LOD	150	<LOD	30.9	12.5	4.2	125.4	7	17.4	5.1
291-4	<LOD	28.5	<LOD	165	<LOD	30.75	12.6	4.7	136.6	7.8	14.2	5.4
292-1	<LOD	29.85	<LOD	165	<LOD	25.35	10	4.2	114.5	6.8	19.7	5.2
292-2	<LOD	33.45	<LOD	150	<LOD	28.2	10.3	4.2	159	7.4	22	5
292-3	<LOD	30	<LOD	150	<LOD	27.15	7.5	3.9	121.3	6.6	16.3	4.8
292-4	<LOD	25.35	<LOD	131.4	<LOD	25.5	8.7	3.9	127.2	6.6	19.3	4.8
293-1	<LOD	37.8	<LOD	180	<LOD	34.65	9.5	4.3	110.7	6.9	<LOD	6.75

Station #	Cd	+/- 3SD	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD
293-2	<LOD	42.15	<LOD	180	<LOD	34.5	9.6	3.9	63.5	5.4	<LOD	5.85
293-3	<LOD	31.2	<LOD	165	<LOD	29.4	5.8	3.1	70.6	4.5	<LOD	4.8
293-4	<LOD	31.5	<LOD	165	<LOD	28.5	<LOD	5.85	117.3	6.6	<LOD	6.6
296-1	<LOD	31.5	<LOD	165	<LOD	28.65	11.7	4.7	74.6	7.2	21	6.3
296-2	<LOD	35.7	<LOD	150	<LOD	29.25	8.7	3.8	98.6	6.2	27.6	5.1
296-3	<LOD	40.65	<LOD	180	<LOD	32.1	10.4	4.6	88.2	7.5	32.1	6.5
296-4	<LOD	32.1	<LOD	165	<LOD	28.35	<LOD	6.45	83.9	7	31.2	6.1
297-1	<LOD	33.45	<LOD	165	<LOD	29.25	8.1	4.5	149.8	7.8	17.2	5.4
297-2	<LOD	30.45	<LOD	180	<LOD	34.65	12.9	4.7	129.5	7.7	16	5.5
297-3	<LOD	37.35	<LOD	165	<LOD	37.05	10.2	4.3	127.3	7.2	16.9	5.2
297-4	<LOD	35.25	<LOD	165	<LOD	31.8	11.9	4.8	140.4	8.3	23	6

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
197-1	54	7.4	259.2	22.1	<LOD	8.4	<LOD	23.25	<LOD	11.55	598.4	46.4
197-2	64.4	8.1	144.9	18	<LOD	8.55	<LOD	19.65	<LOD	10.95	417.2	41.3
197-3	61.9	8.2	187.5	20.2	<LOD	8.85	<LOD	21.6	<LOD	11.1	518.4	45.8
197-4	59.2	8.4	216.6	22.5	<LOD	10.05	<LOD	23.4	<LOD	11.85	592.4	50.5
198-1	28.8	5.4	22.2	9.6	<LOD	7.35	<LOD	10.5	<LOD	8.25	92.7	24.9
198-2	49.1	6.8	41.9	11.3	<LOD	7.5	<LOD	12.75	<LOD	8.85	72.1	24.5
198-3	54.4	6.8	102.5	14.2	<LOD	7.65	<LOD	15	<LOD	9.45	113.4	25.6
198-4	54.2	7.8	40.1	12.6	<LOD	8.25	<LOD	14.7	<LOD	11.1	87.3	29.3
199-1	46.7	6.1	307.6	20.6	<LOD	7.2	<LOD	20.85	<LOD	9.6	1249.6	54.7
199-2	43.9	6	327.2	21.3	<LOD	7.2	<LOD	21.6	<LOD	10.05	1309.6	56
199-3	56	8.1	508.8	31.5	<LOD	9.75	<LOD	32.55	<LOD	15	2920	100
199-4	51.3	7.2	528.4	29.7	<LOD	8.55	35.9	20.4	<LOD	13.35	1659.2	70.3
200-1	58.2	7.6	126.3	16.6	<LOD	8.1	<LOD	18	<LOD	10.65	332.6	37.5
200-2	51.8	7.3	121.6	16.5	<LOD	7.95	<LOD	17.85	<LOD	10.95	318	37.2
200-3	55.2	7.2	186.5	18.6	<LOD	8.25	<LOD	19.5	<LOD	10.5	375.4	37.7
200-4	52.2	6.9	141.6	16.5	<LOD	8.1	<LOD	17.4	<LOD	10.05	310.2	34.8
201-1	67.4	8	22.6	10.7	<LOD	8.25	<LOD	13.05	<LOD	10.2	67	25.6
201-2	68	8	16.9	10.2	<LOD	7.8	15.7	8.5	<LOD	9.6	54.1	24.9
201-3	65.4	7.5	18	9.5	<LOD	7.05	<LOD	11.25	<LOD	8.55	54.9	23.4
201-4	59.8	7.1	18.9	9.3	<LOD	6.9	<LOD	10.95	<LOD	8.85	58.7	22.9
202-1	67.3	7.6	18.8	10	<LOD	7.8	<LOD	12.15	<LOD	9.9	49.4	23.4

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
202-2	57.9	7.4	31.9	11.2	<LOD	7.65	<LOD	12.75	<LOD	9.6	78	26.1
202-3	67.1	7.9	29.8	11	<LOD	7.35	<LOD	13.2	<LOD	9.9	59.5	25.4
202-4	77.8	8.6	19.5	10.8	<LOD	8.1	<LOD	13.05	<LOD	10.05	41	24.9
203-1	41.5	5.6	171.8	15.4	<LOD	6.6	22.9	11.1	<LOD	9.6	2259.2	70.6
203-2	71.5	9.6	219	24.1	<LOD	10.35	<LOD	25.65	<LOD	15.3	2788.8	110
203-3	64.5	8.5	151.8	19	<LOD	8.7	<LOD	20.25	<LOD	11.85	748.8	54.4
203-4	74.2	8.7	167.5	19.1	<LOD	8.1	<LOD	20.55	<LOD	11.85	795.2	53.7
204-1	68.9	8	41.3	11.9	<LOD	7.8	<LOD	13.5	<LOD	9.9	76.5	26.4
204-2	66.2	7.6	43.6	11.6	<LOD	7.8	<LOD	13.05	<LOD	9.3	85.7	25.5
204-3	69.5	8	39.7	11.6	<LOD	7.5	<LOD	13.5	<LOD	9.15	86.7	26.3
204-4	76.1	8.5	45.5	12.4	<LOD	7.8	<LOD	13.8	<LOD	9.9	119	29.5
205-1	63.5	6.8	19.1	9	<LOD	6.9	<LOD	10.95	<LOD	8.7	<LOD	30.45
205-2	59.8	6.8	33.5	10.1	<LOD	6.75	<LOD	11.1	<LOD	8.4	51.7	21.9
205-3	60.5	7.2	28.8	10.3	<LOD	6.9	<LOD	11.55	<LOD	9.6	52.8	23.1
205-4	52.8	6.2	29.2	9.3	<LOD	6.75	<LOD	10.35	<LOD	7.95	50.7	20.6
206-1	35.5	6	123.7	15.4	<LOD	7.35	<LOD	16.95	<LOD	9.75	108.8	26.4
206-2	32.2	5	124.5	13.3	<LOD	6.3	<LOD	14.4	<LOD	7.8	113.5	22.5
206-3	39.8	6.1	236.2	19.4	<LOD	7.5	26	13.9	<LOD	9.9	167.1	28.6
206-4	41.4	5.7	209	17.2	<LOD	6.75	<LOD	17.85	<LOD	9	132.9	24.9
207-1	48.1	7.3	339	25.3	<LOD	9.15	<LOD	26.4	<LOD	11.55	889.6	55.2
207-2	50.6	6.9	418.4	25.7	<LOD	8.1	29.2	17.7	<LOD	11.4	963.2	53
207-3	54.8	7.4	399.2	26.1	<LOD	8.25	36.4	18.3	<LOD	12.45	1000	56.2

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
207-4	53.3	7.6	400.4	27.1	<LOD	8.55	<LOD	27.75	<LOD	12.3	964	57.6
208-1	50.2	6.6	97.1	14	<LOD	7.35	<LOD	15.45	<LOD	9.3	407.4	37.3
208-2	54.2	6.9	122.8	15.2	<LOD	7.05	<LOD	15.9	<LOD	9.15	377	36.3
208-3	66.1	8.4	126.9	17.4	<LOD	8.7	20.6	12.9	<LOD	10.8	428	42.8
208-4	66.2	7.4	96.9	14.1	<LOD	7.65	<LOD	15.3	<LOD	9.15	321	34.2
209-1	37.2	5.2	48.3	9.9	<LOD	6.45	<LOD	11.1	<LOD	7.65	273.6	28
209-2	28.5	4.1	69.2	9.3	<LOD	5.1	<LOD	9.6	<LOD	6.3	305.8	24.9
209-3	36	4.6	44.4	8.7	<LOD	5.7	<LOD	9.9	<LOD	6.9	258.4	24.9
209-4	24.8	3.8	26.8	7	<LOD	4.8	<LOD	7.8	<LOD	5.85	194	21.2
210-1	30.2	4.9	193.3	16	<LOD	6.3	<LOD	16.5	<LOD	8.1	253.4	28.2
210-2	36.3	6.4	209.2	20.1	<LOD	7.65	<LOD	20.4	<LOD	10.35	462.8	42.2
210-3	27.1	5.3	185.3	17.5	<LOD	7.35	<LOD	18.45	<LOD	9.6	575.2	41.7
210-4	35.1	5.7	143.2	15.5	<LOD	7.2	<LOD	16.65	<LOD	8.85	240.6	30.6
211-1	51.7	8	948.8	42.7	<LOD	10.35	<LOD	42.6	<LOD	15.75	2129.6	86.7
211-2	35.6	6.5	594	32.1	<LOD	9.3	47.8	22.2	<LOD	13.65	1460	68.7
211-3	52	7.6	864.8	38.6	<LOD	9.75	75.3	26.5	<LOD	16.05	3657.6	110
211-4	33.9	7.1	640.4	36.5	<LOD	9.9	<LOD	37.05	<LOD	14.7	1220	69.1
212-1	60.3	7.4	102.3	14.8	<LOD	7.65	<LOD	16.2	<LOD	9.45	205.4	31.2
212-2	61.5	7	147	15.8	<LOD	7.5	<LOD	16.5	<LOD	9.3	311.2	32.9
212-3	55	6.8	78.7	12.8	<LOD	7.05	17.1	9.7	<LOD	8.55	183	28.5
212-4	38.5	5.7	70.8	11.8	<LOD	6.9	<LOD	13.05	<LOD	7.95	158.9	26
213-1	68.2	7.5	180.2	17.4	<LOD	7.35	19.3	12.5	<LOD	9.6	430.8	37.6

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
213-2	62.2	9.1	183	22.3	<LOD	9.3	<LOD	23.85	<LOD	13.35	437.2	49.2
213-3	43.5	6.1	118.3	14.4	<LOD	6.9	<LOD	15.45	<LOD	9	324	33.2
213-4	43.9	6.2	139.4	15.6	<LOD	7.05	<LOD	16.35	<LOD	9.15	273.8	32
214-1	54.5	6.3	27.6	9.3	<LOD	6.75	<LOD	10.65	<LOD	7.95	48.6	20.8
214-2	60.1	6.4	23.3	8.7	<LOD	6.15	<LOD	10.05	<LOD	7.65	55.9	20.7
214-3	59.5	6.5	20.6	8.8	<LOD	6.75	<LOD	10.2	<LOD	7.95	50.8	20.8
214-4	46.9	5.9	21.1	8.7	<LOD	6.3	<LOD	10.2	<LOD	7.65	36.4	20.2
215-1	71	8	369.8	24.8	<LOD	8.55	<LOD	25.65	<LOD	11.85	850.4	51.2
215-2	34.2	5	246.2	17.1	<LOD	5.85	<LOD	17.85	<LOD	8.1	614.8	37.7
215-3	44.6	5.7	309.4	19.7	<LOD	6.75	23.1	13.7	<LOD	9.15	640.4	39.2
215-4	68.1	7.3	381	23.4	<LOD	7.5	<LOD	24	<LOD	10.65	820.8	47.4
216-1	75.8	9.7	208.4	23	<LOD	9.9	<LOD	24.3	<LOD	12.15	351	43.8
216-2	NA		NA		NA		NA		NA		NA	
216-3	NA		NA		NA		NA		NA		NA	
216-4	53.4	8.6	757.2	41	<LOD	9.9	<LOD	40.2	<LOD	14.55	449.2	47.9
217-1	54.8	7.4	397.8	26.1	<LOD	7.95	38.7	18.3	<LOD	11.85	704.4	48.8
217-2	59.2	8	313	24.7	<LOD	8.7	31.6	17.4	<LOD	11.55	655.6	50
217-3	45.3	6.6	291.6	22	<LOD	7.8	<LOD	22.8	<LOD	10.65	573.6	43.3
217-4	27.7	4.9	129.2	14	<LOD	6.6	18.5	10.3	<LOD	8.25	289.6	29.7
218-1	45.8	6.8	173.4	18.2	<LOD	8.1	<LOD	19.05	<LOD	9.75	468	41.1
218-2	43.7	6.9	242	21.3	<LOD	7.8	<LOD	22.2	<LOD	11.1	506	43.2
218-3	38.8	6.4	186	18.8	<LOD	8.1	<LOD	19.65	<LOD	10.65	524	42.8

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
218-4	50.4	7.1	143.6	17	<LOD	7.5	18.8	12.4	<LOD	10.05	450.4	40.9
219-1	51.6	7.7	872.8	39.1	<LOD	10.05	<LOD	39	<LOD	14.7	1349.6	66.5
219-2	53.1	8.3	450	31.5	<LOD	9.75	<LOD	32.4	<LOD	13.95	932.8	62.3
219-3	68.6	8.6	444.4	29.3	<LOD	9	46.1	20.5	<LOD	12.45	981.6	59.4
219-4	70.4	9.2	624	36.1	<LOD	10.95	52	24.9	<LOD	14.55	1069.6	64.9
220-1	77.3	11.1	269	29.4	<LOD	12	45.8	21.4	<LOD	15.75	579.6	59.9
220-2	67.8	9.3	208.8	23.2	<LOD	9.6	<LOD	24.75	<LOD	12.3	351.2	44.6
220-3	47.4	7.6	140.1	18.5	<LOD	8.7	<LOD	20.25	<LOD	11.7	259.6	37.5
220-4	73.2	9.6	202.1	22.8	<LOD	9.15	35.6	16.9	<LOD	13.2	470.4	48.8
221-1	64.5	7.5	91.9	14.2	<LOD	7.8	<LOD	15.45	<LOD	9.15	136.4	27.6
221-2	57.2	6.7	76.5	12.4	<LOD	7.05	<LOD	13.5	<LOD	8.7	124.6	24.7
221-3	60.4	7.2	71.2	12.8	<LOD	7.35	<LOD	13.95	<LOD	9.3	120.4	26.2
221-4	66.2	7.9	96.6	15	<LOD	8.1	<LOD	16.35	<LOD	9.6	135.7	28.8
222-1	43.1	7.2	16.3	10.5	<LOD	8.1	<LOD	12.15	<LOD	9.6	<LOD	37.8
222-2	40.7	5.9	19	8.9	<LOD	6.6	<LOD	10.5	<LOD	7.8	47.9	21.4
222-3	46.4	6.4	25.6	10	<LOD	7.65	<LOD	11.55	<LOD	8.4	36.3	22
222-4	51.1	6.1	18	8.5	<LOD	6.45	13	7	<LOD	8.1	52.2	20.5
223-1	45.4	10	248.2	25.6	<LOD	11.25	<LOD	26.85	<LOD	15.45	1960	89.6
223-2	48.5	11.8	74.1	18.7	<LOD	11.4	<LOD	20.1	<LOD	14.55	340.8	49.1
223-3	28.4	11.6	52.8	20.8	<LOD	13.8	<LOD	23.55	<LOD	18.75	135.4	49.3
223-4	48.5	13.4	200.7	27.1	<LOD	12.3	<LOD	28.5	<LOD	15.6	660.8	64.4
224-1	53.3	7.5	25	11.1	<LOD	8.4	<LOD	13.2	<LOD	9.9	54.2	26.2

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
224-2	47.2	6	23.1	9.1	<LOD	6.75	<LOD	10.5	<LOD	8.4	58.4	21.3
224-3	48.7	7	22	10.3	<LOD	7.35	<LOD	11.85	<LOD	9.3	54.4	24.6
224-4	57.9	7.1	42.5	11.2	<LOD	7.35	<LOD	12.45	<LOD	8.85	87.3	24.8
225-1	44.7	5.5	13.2	7.7	<LOD	6.15	<LOD	9.15	<LOD	7.65	35.3	18.9
225-2	47.9	6.1	<LOD	12.6	<LOD	7.05	<LOD	9.9	<LOD	8.25	41.6	20.8
225-3	57.7	6.4	20.1	8.7	<LOD	6.3	<LOD	10.05	<LOD	7.8	59.1	21.1
225-4	53.7	6.3	<LOD	12.3	<LOD	6.9	<LOD	9.9	<LOD	7.8	42.7	20.5
226-1	63.7	8.2	106.4	16.5	<LOD	9.15	<LOD	18.15	<LOD	10.35	144	31.4
226-2	82.8	9	120.9	17	<LOD	8.85	<LOD	18.75	<LOD	10.35	198.2	33.5
226-3	82.7	8.2	112.9	15	<LOD	7.5	<LOD	16.2	<LOD	9.6	209.8	30.6
226-4	74.1	10.2	113.6	19.8	<LOD	10.5	<LOD	22.2	<LOD	13.95	192.5	40
227-1	73.7	8.5	52.7	12.9	<LOD	7.95	<LOD	13.95	<LOD	9.6	111.6	28.9
227-2	65.7	10.4	54.4	17.1	<LOD	11.4	<LOD	19.8	<LOD	13.35	133.8	40
227-3	66.4	7.8	69.9	13.3	<LOD	7.65	<LOD	14.4	<LOD	9.75	121.8	27.8
227-4	64.4	7.9	51.6	12.4	<LOD	7.65	<LOD	13.65	<LOD	9.75	74.7	26.3
229-1	61.7	8.7	30.1	12.8	<LOD	9.15	<LOD	15.15	<LOD	11.1	45.8	29.3
229-2	55.7	7.7	32.6	11.8	<LOD	8.4	<LOD	13.5	<LOD	10.95	50.5	25.7
229-3	52.3	7.5	24	11.2	<LOD	8.25	<LOD	13.35	<LOD	10.35	<LOD	37.95
229-4	54.3	7.4	21.2	10.8	<LOD	8.25	<LOD	12.45	<LOD	9.45	48.3	25.2
230-1	55.2	6.6	22.4	9.3	<LOD	6.9	<LOD	11.1	<LOD	8.7	53.7	22.3
230-2	49.8	6.1	15.6	8.4	<LOD	6.3	<LOD	10.2	<LOD	7.8	34.4	20
230-3	54.4	5.8	18.5	7.9	<LOD	6	<LOD	9.45	<LOD	7.5	30.5	18.3

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
230-4	55.2	6.7	22.2	9.5	<LOD	7.2	<LOD	11.1	<LOD	8.85	68.1	23
231-1	39	6.1	222.8	19	<LOD	7.95	<LOD	20.25	<LOD	10.05	952	51
231-2	45.7	6.7	320.6	23.1	<LOD	8.25	24.9	16.1	<LOD	10.2	718	47
231-3	50.6	7.6	501.2	30.5	<LOD	9.9	42.1	21.2	<LOD	13.8	849.6	54.6
231-4	59	8.6	1140	48.1	<LOD	11.55	75.1	32.2	<LOD	15.6	833.6	57.8
232-1	37.8	8.1	1800	63.3	<LOD	12.9	117.5	41.7	<LOD	19.8	1240	71.7
232-2	28.4	6.4	1120	44.7	<LOD	10.65	67.4	29.9	<LOD	15.6	1060	59.8
232-3	44.4	8	1249.6	50.5	17.2	8.4	70.4	33.5	<LOD	16.65	916.8	60.2
232-4	42	7.9	1629.6	56.3	<LOD	12.15	68.6	36.7	<LOD	17.85	1149.6	64.7
233-1	52.1	8.4	<LOD	17.55	<LOD	9.3	<LOD	14.55	<LOD	12	46.6	30.1
233-2	56.8	7.1	19.7	9.9	<LOD	7.65	<LOD	11.4	<LOD	9	52.2	23.5
233-3	50	6.7	22.3	9.9	<LOD	7.2	<LOD	11.7	<LOD	9	36.5	22.9
233-4	56.3	7	19.8	9.8	<LOD	7.35	<LOD	10.95	<LOD	9	58	23.4
234-1	58	8.8	324.4	27.1	<LOD	10.65	<LOD	27.9	<LOD	14.4	2028.8	91.5
234-2	47.4	8.7	213	24.2	<LOD	11.25	28	17.6	<LOD	14.4	1189.6	75.4
234-3	33.9	7.5	169.6	21.5	<LOD	10.35	24.7	15.7	<LOD	12.9	1040	69
234-4	35.8	7.8	202.3	23.1	<LOD	10.2	26.4	16.8	<LOD	14.4	1380	78.8
235-1	44.1	6.4	43.2	11.1	<LOD	7.05	<LOD	12.9	<LOD	8.7	251	32.3
235-2	40.3	6.2	53.6	11.8	<LOD	7.35	<LOD	12.9	<LOD	9.3	257.6	32.3
235-3	28.3	4.9	40	9.6	<LOD	6.15	<LOD	10.95	<LOD	7.8	222	27.5
235-4	34.6	5.5	57.6	11.2	<LOD	6.6	<LOD	12.15	<LOD	7.95	371.8	34
236-1	45.8	7.8	<LOD	17.25	<LOD	9.15	<LOD	13.8	<LOD	11.25	66.8	29.6

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
236-2	65.8	8.4	20.8	11.2	<LOD	8.25	<LOD	13.2	<LOD	10.2	76.1	28.3
236-3	56.8	7.2	15.4	9.5	<LOD	7.2	<LOD	11.4	<LOD	8.55	49.9	23.8
236-4	51.9	8.2	<LOD	16.65	<LOD	9	<LOD	13.35	<LOD	10.65	<LOD	41.4
237-1	66.5	7.7	18.4	10	<LOD	7.5	<LOD	12.15	<LOD	9.45	56.8	24.3
237-2	70.5	7.5	<LOD	13.65	<LOD	7.35	<LOD	10.8	<LOD	8.7	53.8	22.6
237-3	60.3	7.4	24.5	10.3	<LOD	7.05	<LOD	11.85	<LOD	9.15	57.8	24.6
237-4	65.2	8.9	22.2	11.9	<LOD	8.55	<LOD	14.4	<LOD	10.8	79	30
238-1	63.6	7.3	30.6	10.4	<LOD	7.2	<LOD	12.3	<LOD	9.15	73.2	24
238-2	50	6.5	22.5	9.6	<LOD	7.05	<LOD	11.4	<LOD	8.7	47.8	22.2
238-3	51.6	6.1	28.9	9.1	<LOD	6.15	<LOD	10.35	<LOD	7.65	56.3	20.5
238-4	53.9	6.7	40.5	10.6	<LOD	6.75	<LOD	12	<LOD	8.7	63.3	23.1
239-1	45.3	6.9	22.9	10.7	<LOD	7.95	<LOD	12.6	<LOD	9.45	37.9	24.6
239-2	54.9	6.7	32.8	10.3	<LOD	7.2	<LOD	12.15	<LOD	8.85	40.7	22.2
239-3	61.7	7.8	16	10.3	<LOD	7.8	<LOD	12.45	<LOD	9.75	<LOD	36.3
239-4	48	6.9	28.3	10.9	<LOD	7.8	<LOD	12.15	<LOD	9.45	<LOD	35.7
240-1	49.4	7.4	73.6	14.4	<LOD	8.25	<LOD	15.6	<LOD	10.5	354.2	39.4
240-2	58.4	7.5	89.1	14.3	<LOD	7.35	<LOD	15.3	<LOD	9.45	394.2	38.4
240-3	70.6	7.8	79.6	13.6	<LOD	7.35	<LOD	15	<LOD	9.9	438	38.8
240-4	52	6.9	90.4	14	<LOD	7.2	<LOD	15	<LOD	9.3	384.4	37.2
241-1	33.4	5.3	22.9	8.9	<LOD	6.45	<LOD	10.65	<LOD	8.25	34.2	20.1
241-2	37.6	6.4	29.2	10.9	<LOD	7.05	<LOD	12.45	<LOD	9.75	<LOD	36
241-3	46.1	6.3	<LOD	13.65	<LOD	7.35	15.4	7.7	<LOD	9.3	<LOD	31.95

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
241-4	60.4	7.6	25.7	10.9	<LOD	7.65	<LOD	12.75	<LOD	9.45	45.7	24.8
242-1	60.9	7.6	72.5	13.7	<LOD	7.8	<LOD	14.55	<LOD	10.2	175.3	30.6
242-2	55.7	8.2	72	15.3	<LOD	9	<LOD	16.65	<LOD	10.35	171.4	34.3
242-3	62	7.6	102.4	15.1	<LOD	8.25	<LOD	16.2	<LOD	9.6	164.6	30
242-4	64.2	7.6	72.3	13.3	<LOD	7.5	<LOD	14.4	<LOD	9.15	154.7	28.9
243-1	61	8.2	96.2	16.1	<LOD	8.85	<LOD	17.25	<LOD	11.25	184.7	33.7
243-2	88.2	9.4	22.9	11.9	<LOD	9.15	16.5	9.7	<LOD	10.65	89.8	28.9
243-3	65.8	7.3	70.5	12.5	<LOD	7.05	<LOD	13.95	<LOD	9.15	185.5	29.1
243-4	77.2	9.5	260.6	24.5	<LOD	9.6	29.8	17.6	<LOD	13.05	936	61.8
245-1	68.7	7.7	36.4	11.1	<LOD	7.65	<LOD	12.45	<LOD	9.3	180.4	29.5
245-2	62.5	7.2	22.5	9.9	<LOD	7.8	12.1	7.9	<LOD	8.85	194.7	29
245-3	68.6	7.5	21.9	9.7	<LOD	6.75	14.5	8	<LOD	9.15	172.3	28.4
245-4	54.1	7.5	39.2	11.9	<LOD	7.95	<LOD	13.35	<LOD	9.9	160.4	31.1
246-1	59.4	8.8	231	23.7	<LOD	9.75	<LOD	25.35	<LOD	13.65	1649.6	83.9
246-2	49.8	10.4	192.1	27.7	<LOD	12.45	<LOD	29.4	<LOD	16.65	1649.6	100
246-3	19.9	4.7	84.4	12	<LOD	6.45	<LOD	13.2	<LOD	8.55	786	44.3
246-4	70.3	9	259.6	23.8	<LOD	9.45	<LOD	25.2	<LOD	12.45	1589.6	78
247-1	78.5	9.1	163.2	19.1	<LOD	8.1	<LOD	20.1	<LOD	12	860	56.6
247-2	67.2	8.8	191	20.5	<LOD	8.4	<LOD	22.05	<LOD	11.1	926.4	58.9
247-3	69.3	10	171.3	22.2	<LOD	9.9	<LOD	24.3	<LOD	13.8	1149.6	73.3
247-4	60.2	8	132.3	16.8	<LOD	7.8	26.4	12.5	<LOD	10.65	904	54.8
249-1	55.3	8.1	51.2	13.7	<LOD	8.85	<LOD	15.15	<LOD	10.95	369	42.1

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
249-2	37.8	6.5	47.3	12.2	<LOD	7.95	<LOD	13.8	<LOD	10.05	283	36
249-3	38.2	6.7	55.1	13.1	<LOD	8.25	<LOD	14.85	<LOD	10.5	421.6	42
249-4	33.8	5.8	64.2	12.1	<LOD	7.05	<LOD	13.95	<LOD	9.45	421.6	37.4
250-1	58.2	7.3	32.3	10.9	<LOD	7.5	<LOD	12.9	<LOD	9.75	160.8	29.4
250-2	61	7.7	44	12.1	<LOD	8.1	<LOD	14.1	<LOD	10.05	169.9	30.9
250-3	56.3	8	43.6	12.8	<LOD	8.25	<LOD	14.7	<LOD	10.65	155.8	32.4
250-4	62.7	8.6	48.8	13.7	<LOD	8.4	<LOD	15.9	<LOD	11.4	184.3	35.5
251-1	39.1	7.7	<LOD	17.25	<LOD	9	<LOD	14.7	<LOD	12.15	51.3	30.5
251-2	56.4	6.4	29.8	9.3	<LOD	6.3	<LOD	10.95	<LOD	8.1	33.7	20
251-3	59.8	6.8	30.8	9.9	<LOD	6.9	<LOD	11.4	<LOD	8.25	51.4	22
251-4	55.6	7	23	9.8	<LOD	6.75	<LOD	11.85	<LOD	9.15	67.7	24.2
252-1	44.8	7.4	120.4	17.2	<LOD	8.7	<LOD	18.6	<LOD	11.85	163.6	33.3
252-2	44	7.8	113.2	17.9	<LOD	9.45	<LOD	19.2	<LOD	11.85	185.8	36
252-3	47.2	7.6	78.9	15.3	<LOD	9	<LOD	16.95	<LOD	11.7	113.3	30.8
252-4	49.6	8.1	117.6	18	<LOD	9	<LOD	18.9	<LOD	12	142.6	33.8
253-1	40.5	7.1	299.6	24.2	<LOD	9.45	<LOD	24.75	<LOD	12.15	576.8	46.9
253-2	24.2	4.9	178.2	16.1	<LOD	6.75	<LOD	16.95	<LOD	9.15	547.6	38
253-3	25.6	5.6	306.2	22.6	<LOD	8.1	<LOD	23.1	<LOD	10.05	579.2	44.2
253-4	25.9	5.6	287.4	21.8	<LOD	7.5	<LOD	22.35	<LOD	9.9	546.8	42.4
254-1	38	6.8	109.6	16.5	<LOD	8.1	<LOD	18	<LOD	11.7	167.6	32.5
254-2	38.8	6.9	180.8	19.9	<LOD	9.15	<LOD	21.15	<LOD	11.1	324.8	38.6
254-3	40.1	6.2	144.6	16.3	<LOD	7.95	<LOD	17.4	<LOD	9.9	318.2	34.4

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
254-4	45.2	6.6	135.2	16.3	<LOD	8.1	<LOD	17.7	<LOD	9.75	248.4	32.8
255-1	35.4	6.6	181.9	19.7	<LOD	9	<LOD	21	<LOD	10.95	174.9	32.2
255-2	36.1	6.1	112.5	15.1	<LOD	7.2	<LOD	16.35	<LOD	9.45	214.4	31.3
255-3	39.7	6.4	174.4	18.1	<LOD	7.8	<LOD	19.05	<LOD	9.9	269	34.1
255-4	36.7	6.5	217.4	20.6	<LOD	8.1	<LOD	21.45	<LOD	10.8	218.8	33.7
256-1	37.3	5.9	23.1	9.8	<LOD	7.5	<LOD	11.4	<LOD	8.7	96.4	24.9
256-2	38.2	5.6	14.5	8.5	<LOD	6.6	<LOD	10.2	<LOD	7.95	71.4	22
256-3	32	4.9	21	8.2	<LOD	5.7	<LOD	9.75	<LOD	7.5	66.2	20.1
256-4	32.5	5.9	15.3	9.6	<LOD	7.8	<LOD	11.55	<LOD	8.7	82.1	25.2
257-1	37	5.9	141.8	15.7	<LOD	7.5	<LOD	16.8	<LOD	9.75	202.3	29.3
257-2	38.1	6.2	195.3	18.6	<LOD	7.8	<LOD	19.65	<LOD	9.9	246.6	32.1
257-3	38.9	5.7	187.1	16.8	<LOD	7.2	<LOD	17.7	<LOD	9	188.8	27.4
257-4	40.3	5.5	175.2	15.3	<LOD	6.3	<LOD	16.35	<LOD	8.4	210.8	26.6
258-1	77.1	7.9	24.1	10.1	<LOD	7.5	<LOD	11.85	<LOD	8.85	63.4	24.1
258-2	81.1	8.5	20.8	10.5	<LOD	7.95	<LOD	12.6	<LOD	9.45	47.7	24.8
258-3	62.7	6.3	18.6	8.4	<LOD	6.6	<LOD	9.9	<LOD	7.8	69.8	20.8
258-4	75.2	7.9	<LOD	14.25	<LOD	7.65	15.2	8	<LOD	9.45	61.4	24
259-1	26.7	6.5	204.5	21.4	<LOD	9	28.7	15.5	<LOD	10.8	188.6	36.8
259-2	25.3	5.3	204.3	18	<LOD	7.5	<LOD	18.9	<LOD	9.3	169.6	28.8
259-3	31.1	6.1	224	19.6	<LOD	7.95	<LOD	20.7	<LOD	9.75	223	34.7
259-4	30.7	6	534.4	28.4	<LOD	8.7	44.5	19.7	<LOD	11.4	253.4	35.4
260-1	21.8	8.3	176.9	26	<LOD	12.3	<LOD	28.5	<LOD	16.35	257.6	52.4

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Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
260-2	19.8	6	116.9	17.6	<LOD	9.45	<LOD	19.5	<LOD	11.85	122.2	33.6
260-3	21.4	5.1	117.2	14.9	<LOD	7.2	<LOD	16.05	<LOD	9.3	129.1	27.6
260-4	21.3	5.7	138.9	17.3	<LOD	8.55	23.1	12.8	<LOD	10.8	175.5	32.7
261-1	25.4	5.9	297.2	22.8	<LOD	8.4	26.4	16.1	<LOD	11.85	514	48.6
261-2	20.5	6.6	163.2	22	<LOD	9.3	<LOD	24.15	<LOD	12.75	383.2	58.1
261-3	17.8	5	195.6	18.5	<LOD	7.8	<LOD	19.65	<LOD	9.9	390	40.6
261-4	17	6.7	256.4	27	<LOD	11.1	<LOD	27.6	<LOD	14.4	376.4	54.5
262-1	73.7	10.9	25.9	14.9	<LOD	10.95	<LOD	17.7	<LOD	13.95	<LOD	52.05
262-2	82.1	10.4	26.6	13.6	<LOD	9.9	<LOD	15	<LOD	12.75	47.5	31.5
262-3	73.8	8.9	23.5	12	<LOD	9.3	<LOD	13.95	<LOD	10.8	67.7	28.7
262-4	78.4	9.4	26.2	12.5	<LOD	9	<LOD	14.4	<LOD	10.8	63.4	29.5
263-1	62.1	7.3	22.2	10	<LOD	7.35	13.5	8.1	<LOD	9	47.7	23.3
263-2	65.5	7.3	32.8	10.3	<LOD	6.6	<LOD	11.4	<LOD	8.25	62.4	23.3
263-3	68.3	7.6	24.8	10.2	<LOD	7.5	<LOD	11.85	<LOD	9.3	71	24.4
263-4	53.8	7.3	20.2	10.5	<LOD	8.25	<LOD	12.3	<LOD	9.45	51.6	24.6
264-1	69.4	8.5	26.1	11.6	<LOD	8.7	<LOD	12.9	<LOD	9.9	71.8	27.6
264-2	73.2	8.9	<LOD	16.65	<LOD	8.55	<LOD	13.2	<LOD	10.35	<LOD	39.15
264-3	64.2	7.5	18.3	9.9	<LOD	7.8	<LOD	11.25	<LOD	9.45	<LOD	33.45
264-4	65.3	7.3	21.6	9.8	<LOD	7.2	<LOD	11.4	<LOD	8.85	66.8	23.9
265-1	55.4	7.7	<LOD	15.75	<LOD	8.25	<LOD	12.75	<LOD	9.9	53	26.3
265-2	58.7	7.4	24.4	10.5	<LOD	7.5	<LOD	12.3	<LOD	9.75	82.9	26.2
265-3	58.1	6.6	16.1	9	<LOD	7.2	<LOD	10.65	<LOD	8.4	50.3	21.8

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
265-4	53.7	6.8	15.8	9.3	<LOD	7.05	<LOD	11.25	<LOD	8.7	47.2	22.8
266-1	60.8	6.8	22.6	9.4	<LOD	6.9	<LOD	11.1	<LOD	8.7	66.7	22.5
266-2	51.1	6	21.6	8.6	<LOD	6.3	<LOD	9.75	<LOD	7.8	45.6	19.7
266-3	54.5	8	21.3	11.4	<LOD	8.25	<LOD	12.75	<LOD	10.8	45.1	27.2
266-4	61.9	7.4	21.4	9.9	<LOD	7.2	<LOD	11.55	<LOD	8.85	42.1	23.1
267-1	53.6	7.3	29.3	11.1	<LOD	7.8	<LOD	12.75	<LOD	9.6	60.9	25.4
267-2	55.9	7.5	30.7	11.4	<LOD	8.1	<LOD	13.35	<LOD	9.75	69.5	26.3
267-3	66.9	8.3	31.2	11.7	<LOD	8.1	<LOD	13.95	<LOD	9.45	80.8	28.1
267-4	63.4	8.5	44.6	13.3	<LOD	9	<LOD	15	<LOD	10.35	75.3	29
268-1	88.1	8	21.9	9.4	<LOD	6.75	<LOD	11.1	<LOD	8.7	48.4	21.9
268-2	60.4	6.8	21.1	9.2	<LOD	6.9	<LOD	10.5	<LOD	8.4	54.8	22
268-3	85.9	8.4	23.6	10.3	<LOD	7.35	<LOD	12	<LOD	9.45	56.6	24
268-4	61.3	7.2	22.1	9.8	<LOD	7.2	<LOD	11.4	<LOD	8.85	43	22.8
269-1	53.4	6.4	30.3	9.5	<LOD	6.6	<LOD	10.8	<LOD	8.1	33.6	20.4
269-2	38.5	4.9	24.8	8	<LOD	5.85	<LOD	9.3	<LOD	6.6	51.1	18.4
269-3	52.7	7	36.9	11.2	<LOD	7.35	<LOD	12.15	<LOD	9.15	<LOD	34.8
269-4	56.7	7.6	39.6	12	<LOD	7.95	<LOD	13.2	<LOD	10.2	40.4	25.2
270-1	58	6.8	19.4	9.3	<LOD	6.9	<LOD	11.25	<LOD	8.7	43.1	21.6
270-2	58	6.8	19.4	9.3	<LOD	6.9	<LOD	11.25	<LOD	8.7	43.1	21.6
270-3	61.9	8.3	21.5	11.4	<LOD	8.55	<LOD	13.65	<LOD	10.5	57.6	27.7
270-4	73.8	7.6	25.7	9.9	<LOD	6.9	<LOD	11.4	<LOD	8.7	43.7	22.4
271-1	50.2	6.6	<LOD	13.65	<LOD	7.2	<LOD	10.95	<LOD	9.3	41.8	22.6

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
271-2	38.9	8	20.5	12.7	<LOD	9	<LOD	15	<LOD	11.7	<LOD	46.65
271-3	51.2	6.9	<LOD	13.8	<LOD	7.35	<LOD	11.25	<LOD	9.15	36.7	23.1
271-4	48.5	7.4	<LOD	15.3	<LOD	7.95	<LOD	12	<LOD	10.05	<LOD	38.25
272-1	56.4	7	<LOD	13.65	<LOD	7.2	<LOD	11.1	<LOD	8.85	50	23.3
272-2	56.5	8.3	25.2	12.2	<LOD	9.15	<LOD	13.95	<LOD	10.8	<LOD	40.95
272-3	64.9	7.1	21.1	9.6	<LOD	7.2	<LOD	11.25	<LOD	8.55	60	22.7
272-4	56.2	7.3	<LOD	14.25	<LOD	7.65	<LOD	11.1	<LOD	9.3	62.8	25.3
273-1	31.9	5.4	<LOD	12.6	<LOD	6.9	<LOD	10.35	<LOD	7.65	58.8	21.8
273-2	50.8	5.9	13	7.7	<LOD	5.85	<LOD	8.85	<LOD	7.35	66.6	20.3
273-3	49.5	6.8	21.8	9.9	<LOD	7.35	<LOD	11.1	<LOD	8.85	83.7	25.3
273-4	45.7	6.5	23.2	9.8	<LOD	7.2	<LOD	10.95	<LOD	8.1	57.5	23.8
274-1	41.8	6.4	18.3	9.8	<LOD	7.35	<LOD	11.85	<LOD	9.3	66.1	24.6
274-2	46.1	6	17	8.6	<LOD	6.45	<LOD	10.05	<LOD	7.95	65.4	21.9
274-3	40.3	6	19.8	9.3	<LOD	6.9	<LOD	10.35	<LOD	8.1	73.6	23.3
274-4	44.5	5.9	13.4	8.3	<LOD	6.3	<LOD	10.05	<LOD	8.25	89.2	22.8
275-1	58.8	7.5	16.2	9.9	<LOD	7.8	12.8	8.2	<LOD	9.15	57.2	25
275-2	60.7	7.4	<LOD	13.95	<LOD	7.35	<LOD	10.95	<LOD	8.85	35.8	23.2
275-3	59.8	6.7	20.6	9.1	<LOD	6.9	<LOD	10.35	<LOD	8.55	42.3	21.1
275-4	49.8	6.5	24.6	9.7	<LOD	7.05	<LOD	11.1	<LOD	8.55	47.3	22.6
276-1	60.1	7.5	20.5	10.3	<LOD	7.95	<LOD	12.3	<LOD	9.15	79.9	25.9
276-2	58.6	8.3	22.5	11.8	<LOD	8.7	<LOD	13.5	<LOD	10.65	61.1	28.3
276-3	64.4	7.8	24.9	10.7	<LOD	7.8	<LOD	12.45	<LOD	9	54.2	25

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
276-4	65.9	7.4	21.3	9.9	<LOD	7.5	<LOD	11.1	<LOD	8.7	56.8	23.5
277-1	54.7	6.6	16.8	8.9	<LOD	6.45	<LOD	10.65	<LOD	8.55	37.9	21.9
277-2	55.6	6.4	<LOD	12.6	<LOD	6.6	<LOD	10.05	<LOD	8.1	36.6	20.2
277-3	44.9	6.2	15.8	9	<LOD	6.75	<LOD	10.35	<LOD	8.55	36.7	21.8
277-4	51.7	6.1	14.9	8.4	<LOD	6.9	<LOD	9.9	<LOD	7.65	56.2	20.7
278-1	58.9	7.4	<LOD	13.8	<LOD	6.9	<LOD	11.25	<LOD	8.7	57.2	25.1
278-2	53.1	6.8	<LOD	13.05	<LOD	7.05	<LOD	10.65	<LOD	8.55	40.7	22.6
278-3	54.6	6.2	13	8.3	<LOD	6.6	<LOD	10.05	<LOD	8.55	68.9	21.5
278-4	49.1	8.6	<LOD	19.2	<LOD	10.35	<LOD	15.3	<LOD	12.75	66.9	32.6
279-1	36.8	5.5	<LOD	12.3	<LOD	6.6	<LOD	10.05	<LOD	8.1	51	21.2
279-2	36.1	5.8	21.3	9.3	<LOD	6.6	<LOD	10.2	<LOD	7.95	36.9	21.7
279-3	43.4	6.1	16.6	9	<LOD	6.6	<LOD	10.95	<LOD	8.7	59	22.6
279-4	44	5.9	<LOD	12.6	<LOD	6.75	<LOD	10.05	<LOD	8.25	<LOD	29.7
280-1	36.5	5.7	44.4	10.6	<LOD	7.05	<LOD	12.45	<LOD	8.7	202	28.4
280-2	55	6.6	53.3	11.2	<LOD	7.05	<LOD	12.6	<LOD	8.85	49.2	22
280-3	28.9	4.9	55.7	10.4	<LOD	6	<LOD	11.4	<LOD	7.5	73.1	21.2
280-4	34.7	5.8	61.6	12	<LOD	7.2	<LOD	12.75	<LOD	8.4	268.6	31.9
281-1	55	6.7	15.2	9	<LOD	6.9	<LOD	10.95	<LOD	8.7	46	22.1
281-2	40.5	5.8	<LOD	12.6	<LOD	6.45	<LOD	9.9	<LOD	7.65	31.5	20.7
281-3	44.8	6	15.5	8.6	<LOD	6.6	<LOD	10.35	<LOD	7.95	43.3	21.1
281-4	39.2	6.7	19.8	10.6	<LOD	8.25	<LOD	12.15	<LOD	9.3	<LOD	37.35
282-1	58.2	7	14.8	9.2	<LOD	7.05	<LOD	10.8	<LOD	9	69.9	23.5

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
282-2	60.8	6.9	16.4	9.3	<LOD	7.35	<LOD	10.8	<LOD	8.4	50.6	23
282-3	59.4	7.2	21.8	9.9	<LOD	7.35	<LOD	11.4	<LOD	9.15	51.8	23.5
282-4	55.6	8.1	20.8	11.4	<LOD	8.4	<LOD	13.5	<LOD	10.95	<LOD	40.65
283-1	55.8	6.7	18.7	9	<LOD	6.45	<LOD	10.5	<LOD	7.95	37.9	21.3
283-2	34.3	6	<LOD	13.35	<LOD	7.65	<LOD	10.8	<LOD	8.7	38.6	23.1
283-3	52.6	5.8	<LOD	10.95	<LOD	6.45	9.6	6.1	<LOD	7.65	31.1	18.2
283-4	64.1	6.8	16.3	8.9	<LOD	7.05	<LOD	10.65	<LOD	8.4	44.2	21.4
284-1	44	6.1	22.5	9.2	<LOD	6.75	<LOD	10.5	<LOD	7.65	48.4	21.7
284-2	67.8	8	<LOD	14.25	<LOD	8.1	<LOD	12	<LOD	9.75	44.9	24.3
284-3	92.3	8.2	21.1	9.7	<LOD	7.5	<LOD	11.55	<LOD	9.15	49.9	22.1
284-4	57.1	6.8	<LOD	12.9	<LOD	7.05	<LOD	10.65	<LOD	8.55	<LOD	32.1
285-1	58.3	6.7	21.4	9.3	<LOD	6.9	<LOD	10.8	<LOD	8.25	44.7	21.5
285-2	36.6	5.6	34.4	9.7	<LOD	6.6	<LOD	10.65	<LOD	7.8	<LOD	30.45
285-3	53.4	6.6	22.9	9.6	<LOD	7.05	<LOD	10.95	<LOD	8.55	42.1	21.9
285-4	36.7	4.7	22.8	7.5	<LOD	5.4	<LOD	8.55	<LOD	6.3	35.8	16.9
286-1	19.7	3.8	<LOD	9.6	<LOD	5.4	<LOD	7.8	<LOD	6.9	52.4	17.6
286-2	27.3	4.8	30.1	8.9	<LOD	6.3	<LOD	10.05	<LOD	7.65	45.5	19.7
286-3	30.6	4.8	40.8	9.3	<LOD	6	<LOD	10.2	<LOD	6.9	39.5	18.8
286-4	34.2	4.9	32.9	8.8	<LOD	6	<LOD	10.2	<LOD	7.65	27.6	18.3
287-1	84.4	9.9	28.7	12.8	<LOD	9	<LOD	14.1	<LOD	10.95	59.2	29.9
287-2	64.8	7.3	22.7	10	<LOD	7.65	<LOD	11.55	<LOD	8.85	48.2	22.8
287-3	80.6	8.7	17.3	10.6	<LOD	8.4	<LOD	12.75	<LOD	9.6	47.3	25.2

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Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
287-4	67.5	9.1	<LOD	17.55	<LOD	9.15	<LOD	14.1	<LOD	12.3	<LOD	42.9
288-1	46.9	6.8	<LOD	14.25	<LOD	7.5	<LOD	11.4	<LOD	9.3	46.9	24.1
288-2	66.2	7.4	<LOD	13.65	<LOD	7.65	<LOD	10.95	<LOD	9.15	82	24.4
288-3	65.2	8	23.2	10.9	<LOD	8.1	<LOD	12.45	<LOD	9.45	71.3	26.4
288-4	72.2	9.6	<LOD	17.55	<LOD	9.15	<LOD	13.95	<LOD	11.4	65.3	30.8
289-1	42.4	6.5	59	12.5	<LOD	7.65	<LOD	13.65	<LOD	9	46.6	23.7
289-2	44.1	6.5	16.2	9.6	<LOD	7.2	14.3	8.1	<LOD	9.15	46.8	23.5
289-3	40.9	7.2	23	11.6	<LOD	8.55	<LOD	13.95	<LOD	10.95	54.3	28.1
289-4	38.4	5.3	21.1	8.3	<LOD	6	<LOD	9.75	<LOD	7.8	<LOD	28.35
290-1	49.3	6.7	<LOD	13.5	<LOD	7.35	<LOD	10.8	<LOD	9.15	44.6	23.1
290-2	36.9	6.2	15.5	9.7	<LOD	7.65	<LOD	11.4	<LOD	8.7	<LOD	34.65
290-3	43.6	7.4	<LOD	16.65	<LOD	9.15	<LOD	12.9	<LOD	9.45	<LOD	39.6
290-4	50.2	6.4	16.1	8.9	<LOD	7.2	<LOD	10.35	<LOD	7.95	43.1	21.4
291-1	44.4	5.7	35.3	9.6	<LOD	6.6	<LOD	10.95	<LOD	7.95	32.7	19.6
291-2	52.4	6.6	26.5	10	<LOD	7.5	<LOD	11.25	<LOD	8.4	<LOD	31.65
291-3	63.1	6.9	37.3	10.2	<LOD	6.75	<LOD	11.25	<LOD	8.55	45.6	21.4
291-4	58.1	7.3	29.5	10.7	<LOD	7.5	<LOD	12.45	<LOD	9.6	37	23.6
292-1	43.9	6.1	15.1	8.8	<LOD	6.9	11.7	7.3	<LOD	8.25	66.6	22.7
292-2	55	6.4	21.7	9	<LOD	6.6	<LOD	10.35	<LOD	7.8	52.3	21.2
292-3	46	5.9	17.1	8.6	<LOD	6.6	11	7	<LOD	7.95	54.4	21.2
292-4	50.5	6.1	26.5	9.1	<LOD	6.45	<LOD	10.5	<LOD	7.8	47.5	20.5
293-1	27.2	5.4	20.8	9.7	<LOD	7.65	<LOD	11.1	<LOD	8.55	40.7	22.5

Station #	Rb	+/- 3SD	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD
293-2	11.1	4	<LOD	10.65	<LOD	7.2	<LOD	9.3	<LOD	7.95	<LOD	28.5
293-3	17.6	3.6	9.8	6.5	<LOD	5.4	<LOD	7.8	<LOD	6.3	<LOD	24
293-4	22.1	4.7	<LOD	11.85	<LOD	6.6	<LOD	9.6	<LOD	7.95	<LOD	29.55
296-1	70.3	8.6	49.6	13.1	<LOD	8.25	<LOD	15.3	<LOD	10.5	103.7	29.6
296-2	91.1	7.6	61.2	11.1	<LOD	6.75	17.8	8.6	<LOD	8.4	159.3	25.5
296-3	79.6	8.7	76.8	14.3	<LOD	7.95	<LOD	15.75	<LOD	10.35	112.2	28.8
296-4	85.9	8.7	62.7	13.1	<LOD	7.95	16.4	10.1	<LOD	10.2	148.8	29.4
297-1	67.7	7.6	28.6	10.4	<LOD	7.05	<LOD	11.55	<LOD	9.45	55.4	23.8
297-2	48.9	6.9	<LOD	13.95	<LOD	7.5	13.6	7.9	<LOD	9.15	<LOD	35.1
297-3	53.4	6.7	21.7	9.6	<LOD	7.05	<LOD	11.25	<LOD	8.55	50.8	22.3
297-4	58.5	7.4	22.3	10.5	<LOD	7.95	<LOD	12.3	<LOD	9.15	<LOD	35.7

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
197-1	95.8	52	<LOD	105.3	<LOD	270	16294.4	460	452.4	290	<LOD	195
197-2	<LOD	71.7	<LOD	109.2	<LOD	285	17600	490	<LOD	435	<LOD	195
197-3	<LOD	78.75	<LOD	114.3	<LOD	300	18188.8	510	<LOD	465	<LOD	210
197-4	94.4	56.8	<LOD	115.65	<LOD	300	18393.6	530	741.6	340	<LOD	225
198-1	<LOD	54.3	<LOD	76.8	<LOD	165	6067.2	260	359.8	180	<LOD	149.1
198-2	<LOD	53.4	<LOD	83.55	<LOD	210	9465.6	330	<LOD	315	<LOD	150
198-3	<LOD	53.55	<LOD	78.3	<LOD	195	9254.4	310	<LOD	315	<LOD	150
198-4	<LOD	66.6	<LOD	100.2	<LOD	240	10195.2	380	885.6	270	<LOD	210
199-1	106.1	51.6	<LOD	87.75	<LOD	210	12499.2	350	419.6	220	<LOD	165
199-2	121.5	52.6	<LOD	87.6	<LOD	225	12998.4	360	<LOD	345	<LOD	150
199-3	319.8	87	<LOD	133.65	460.4	250	26496	630	828	380	<LOD	255
199-4	234	66.9	<LOD	112.35	<LOD	300	20390.4	500	564.4	310	<LOD	210
200-1	<LOD	70.05	<LOD	100.2	<LOD	255	14489.6	430	<LOD	390	<LOD	195
200-2	<LOD	68.55	<LOD	100.95	<LOD	255	13888	420	<LOD	375	<LOD	180
200-3	82.3	46	<LOD	96	<LOD	240	13798.4	400	<LOD	375	<LOD	180
200-4	72.5	44.1	<LOD	95.1	<LOD	240	14592	410	<LOD	390	<LOD	180
201-1	<LOD	58.2	<LOD	93.9	<LOD	240	12595.2	390	<LOD	360	<LOD	165
201-2	<LOD	58.05	<LOD	96.3	<LOD	255	15091.2	430	<LOD	390	<LOD	180
201-3	<LOD	54.9	<LOD	89.55	<LOD	225	13299.2	380	<LOD	345	<LOD	165
201-4	<LOD	52.5	<LOD	84.6	<LOD	225	12396.8	360	<LOD	345	<LOD	150
202-1	<LOD	53.7	<LOD	88.65	<LOD	225	11699.2	360	<LOD	345	<LOD	165

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
202-2	<LOD	59.1	<LOD	99.45	<LOD	270	16588.8	450	457.2	280	<LOD	195
202-3	<LOD	58.95	<LOD	95.25	<LOD	240	12998.4	400	<LOD	375	<LOD	180
202-4	<LOD	58.95	<LOD	100.35	<LOD	255	14092.8	420	<LOD	405	<LOD	180
203-1	879.2	74.3	<LOD	99.6	<LOD	225	17088	390	<LOD	360	<LOD	150
203-2	1089.6	120	<LOD	180	748.8	310	34176	800	846.4	460	<LOD	300
203-3	218.8	62.8	<LOD	124.5	339.2	220	21798.4	570	<LOD	510	<LOD	225
203-4	200	60.6	<LOD	121.95	374.2	220	22592	560	<LOD	495	<LOD	210
204-1	<LOD	60.6	<LOD	94.95	<LOD	255	13696	410	557.6	270	<LOD	195
204-2	<LOD	55.2	<LOD	84.45	<LOD	225	11897.6	370	<LOD	360	<LOD	180
204-3	<LOD	57.3	<LOD	94.35	<LOD	225	12294.4	380	497.6	250	<LOD	180
204-4	100.2	45.1	<LOD	98.1	<LOD	255	14400	430	490.8	270	<LOD	195
205-1	<LOD	49.35	<LOD	81.45	<LOD	195	11596.8	330	<LOD	300	245	100
205-2	<LOD	50.55	<LOD	82.95	<LOD	195	10796.8	330	<LOD	315	<LOD	148.65
205-3	<LOD	52.8	<LOD	87.3	<LOD	210	11398.4	350	<LOD	330	<LOD	165
205-4	<LOD	48	<LOD	74.25	<LOD	180	9894.4	300	<LOD	285	<LOD	139.95
206-1	<LOD	57.3	<LOD	86.7	<LOD	195	9126.4	320	362.2	210	<LOD	165
206-2	51.7	32.5	<LOD	67.8	<LOD	165	7475.2	250	<LOD	255	<LOD	128.1
206-3	102.5	41.1	<LOD	86.4	<LOD	225	12697.6	370	<LOD	345	<LOD	165
206-4	62.9	35.6	<LOD	75.15	<LOD	180	9824	300	<LOD	285	<LOD	147.15
207-1	89.2	56.6	<LOD	117.75	<LOD	330	23488	570	<LOD	495	<LOD	225
207-2	116.5	54.2	<LOD	104.4	283	180	18393.6	460	<LOD	420	<LOD	195
207-3	187.4	59.1	<LOD	112.8	<LOD	300	21593.6	520	467.2	310	<LOD	210

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
207-4	149	60.6	<LOD	120.6	<LOD	315	22400	550	<LOD	495	<LOD	210
208-1	116.2	45.5	<LOD	88.65	<LOD	225	12396.8	370	<LOD	345	<LOD	165
208-2	<LOD	65.1	<LOD	90.6	<LOD	225	11795.2	360	<LOD	330	<LOD	150
208-3	79.6	51.3	<LOD	107.1	<LOD	285	15193.6	460	<LOD	420	<LOD	195
208-4	<LOD	63.75	<LOD	93	<LOD	240	13491.2	380	<LOD	360	<LOD	165
209-1	<LOD	51.3	<LOD	69.75	<LOD	165	8684.8	270	<LOD	240	<LOD	118.8
209-2	<LOD	43.05	<LOD	55.35	<LOD	122.55	6048	200	<LOD	195	<LOD	94.8
209-3	51.7	30.7	<LOD	60.15	<LOD	135.6	7046.4	220	<LOD	210	<LOD	101.7
209-4	<LOD	40.35	<LOD	53.1	<LOD	109.2	4758.4	170	<LOD	180	<LOD	97.95
210-1	83	36.9	<LOD	77.85	<LOD	195	11494.4	310	<LOD	300	<LOD	139.5
210-2	80.7	48.9	<LOD	96.9	<LOD	240	12294.4	400	<LOD	375	<LOD	180
210-3	116.8	47.2	<LOD	92.85	276.4	160	13593.6	380	<LOD	360	<LOD	165
210-4	107.6	41.4	<LOD	84.3	<LOD	210	11200	340	<LOD	315	<LOD	150
211-1	439.6	85.5	<LOD	165	510.4	300	40499.2	810	978.4	460	<LOD	285
211-2	411.2	72.6	<LOD	132.75	<LOD	360	29977.6	640	692	380	<LOD	225
211-3	253	87.2	<LOD	128.7	401.8	230	25497.6	590	<LOD	525	<LOD	225
211-4	241.2	72.2	<LOD	142.05	<LOD	390	27776	680	612	400	582.8	200
212-1	<LOD	63.15	<LOD	90	<LOD	225	10995.2	360	<LOD	345	<LOD	165
212-2	79.9	41.6	<LOD	87.15	<LOD	225	13196.8	370	<LOD	345	<LOD	165
212-3	<LOD	58.2	<LOD	85.05	<LOD	210	10899.2	340	<LOD	315	<LOD	150
212-4	<LOD	52.5	<LOD	72.9	<LOD	165	7385.6	270	<LOD	255	<LOD	140.25
213-1	85.9	45.1	<LOD	96.3	<LOD	255	15590.4	410	<LOD	375	<LOD	180

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
213-2	161.6	62.5	<LOD	130.8	<LOD	345	19788.8	590	<LOD	525	<LOD	240
213-3	86.4	41.3	<LOD	83.7	<LOD	210	11596.8	340	<LOD	330	<LOD	150
213-4	69.3	41.3	<LOD	88.65	268.8	150	11897.6	350	<LOD	330	<LOD	150
214-1	<LOD	49.5	<LOD	75	<LOD	180	8646.4	280	<LOD	270	<LOD	134.4
214-2	<LOD	48.6	<LOD	72.75	197.7	120	8524.8	270	<LOD	255	<LOD	130.35
214-3	<LOD	47.85	<LOD	73.05	<LOD	165	8889.6	280	<LOD	270	<LOD	135.6
214-4	<LOD	49.05	<LOD	73.2	<LOD	180	8595.2	280	323.6	190	<LOD	131.55
215-1	140.6	54.3	<LOD	102.75	280.8	180	16588.8	440	<LOD	405	<LOD	180
215-2	224.8	43.8	<LOD	72.45	<LOD	165	7648	250	<LOD	240	<LOD	125.25
215-3	132.7	42.7	<LOD	75	<LOD	180	10297.6	300	<LOD	285	<LOD	140.4
215-4	205.8	52.3	<LOD	96.3	283.4	160	14988.8	390	380	250	<LOD	165
216-1	<LOD	79.35	<LOD	114.75	<LOD	300	14796.8	490	689.2	320	<LOD	225
216-2	NA		NA		NA		NA		NA		NA	
216-3	NA		NA		NA		NA		NA		NA	
216-4	<LOD	80.85	<LOD	113.4	<LOD	285	12800	460	530.8	300	<LOD	225
217-1	148.7	55.2	<LOD	117.75	<LOD	330	23795.2	550	<LOD	495	<LOD	225
217-2	142.6	56.9	<LOD	116.85	<LOD	300	19392	520	751.6	330	<LOD	225
217-3	110.9	49.2	<LOD	99.45	<LOD	255	15488	420	592	270	<LOD	195
217-4	<LOD	52.65	<LOD	69.3	<LOD	165	7129.6	260	<LOD	255	<LOD	126.45
218-1	<LOD	70.95	<LOD	98.25	257	170	14592	420	458.4	270	<LOD	180
218-2	<LOD	73.95	<LOD	110.4	<LOD	315	21094.4	520	<LOD	465	<LOD	195
218-3	91.1	49.4	<LOD	106.95	<LOD	285	18598.4	480	<LOD	435	<LOD	195

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
218-4	<LOD	70.35	<LOD	94.35	<LOD	240	12697.6	400	563.2	260	<LOD	180
219-1	159.6	67.1	<LOD	147.9	<LOD	435	42777.6	800	<LOD	645	<LOD	270
219-2	133.1	65.5	<LOD	134.25	<LOD	390	26291.2	660	<LOD	570	292	170
219-3	102.8	61.3	<LOD	135.3	556.4	270	33689.6	720	<LOD	615	<LOD	255
219-4	145.8	67.7	<LOD	143.7	<LOD	405	30182.4	700	<LOD	600	<LOD	255
220-1	<LOD	106.5	<LOD	210	931.2	440	61388.8	1300	<LOD	975	<LOD	390
220-2	<LOD	83.1	<LOD	123.45	<LOD	315	17292.8	540	<LOD	495	<LOD	225
220-3	<LOD	71.25	<LOD	106.05	<LOD	255	12096	420	<LOD	405	<LOD	195
220-4	<LOD	86.4	<LOD	134.1	<LOD	375	23398.4	640	<LOD	555	<LOD	255
221-1	<LOD	57.45	<LOD	94.95	<LOD	255	15296	420	<LOD	390	199.1	120
221-2	<LOD	50.55	<LOD	81.15	<LOD	210	12697.6	350	360.6	220	<LOD	150
221-3	<LOD	54.3	<LOD	86.55	<LOD	240	13491.2	390	<LOD	360	<LOD	165
221-4	<LOD	60.3	<LOD	99.45	<LOD	255	14988.8	430	<LOD	405	<LOD	180
222-1	<LOD	58.2	<LOD	94.35	<LOD	225	8928	360	<LOD	330	<LOD	165
222-2	<LOD	48.15	<LOD	74.1	<LOD	180	8236.8	290	<LOD	270	<LOD	135.6
222-3	<LOD	52.2	<LOD	84.75	<LOD	195	9657.6	320	<LOD	315	<LOD	150
222-4	<LOD	46.65	<LOD	73.05	<LOD	180	9766.4	300	<LOD	285	<LOD	142.2
223-1	184.1	82.5	<LOD	128.25	<LOD	300	15590.4	510	1249.6	360	510.8	200
223-2	<LOD	94.5	<LOD	121.5	<LOD	285	12096	490	1080	350	334.2	200
223-3	<LOD	110.55	<LOD	150	<LOD	285	6739.2	450	1868.8	400	<LOD	345
223-4	<LOD	105.9	<LOD	138.15	<LOD	315	12499.2	520	1289.6	380	319.4	210
224-1	<LOD	62.1	<LOD	94.05	<LOD	225	9868.8	360	403.2	240	<LOD	195

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
224-2	<LOD	48.6	<LOD	73.35	<LOD	180	8659.2	280	303.8	190	<LOD	139.05
224-3	<LOD	55.2	<LOD	86.25	<LOD	210	8697.6	330	<LOD	315	<LOD	150
224-4	<LOD	53.85	<LOD	82.65	<LOD	210	10694.4	340	<LOD	330	<LOD	165
225-1	<LOD	44.1	<LOD	65.55	<LOD	150	7168	240	332.4	170	<LOD	131.1
225-2	<LOD	48.75	<LOD	71.7	<LOD	165	7756.8	270	313.4	180	<LOD	145.95
225-3	<LOD	47.55	<LOD	73.05	<LOD	180	8569.6	280	358	190	<LOD	142.95
225-4	<LOD	46.8	<LOD	73.8	<LOD	165	7808	270	343.4	190	<LOD	140.7
226-1	<LOD	66	<LOD	106.5	<LOD	285	16588.8	480	<LOD	435	<LOD	210
226-2	<LOD	68.4	<LOD	111.6	<LOD	300	19097.6	510	<LOD	450	<LOD	210
226-3	<LOD	61.5	<LOD	99.15	<LOD	270	19200	460	423.6	280	<LOD	180
226-4	<LOD	84.15	<LOD	145.95	<LOD	405	25600	710	1440	450	<LOD	315
227-1	<LOD	63.3	<LOD	102	<LOD	270	15488	450	<LOD	405	<LOD	195
227-2	<LOD	88.35	<LOD	135.6	<LOD	330	14489.6	550	<LOD	525	<LOD	255
227-3	<LOD	60.15	<LOD	95.4	<LOD	240	13593.6	400	409.4	260	<LOD	180
227-4	<LOD	60.9	<LOD	95.85	<LOD	255	14400	420	<LOD	390	<LOD	180
229-1	<LOD	68.4	<LOD	103.35	<LOD	240	10899.2	410	<LOD	405	<LOD	195
229-2	<LOD	58.05	<LOD	98.85	266.4	160	11494.4	390	<LOD	375	<LOD	180
229-3	<LOD	59.85	<LOD	92.7	<LOD	225	10195.2	370	<LOD	345	<LOD	180
229-4	<LOD	58.05	<LOD	96.3	<LOD	225	10796.8	370	<LOD	345	<LOD	165
230-1	<LOD	53.1	<LOD	78.9	<LOD	195	10598.4	320	440.4	220	<LOD	165
230-2	<LOD	47.4	<LOD	71.85	<LOD	180	9344	290	<LOD	285	<LOD	142.65
230-3	<LOD	44.1	<LOD	70.35	<LOD	165	9964.8	280	333.4	180	<LOD	133.95

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Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
230-4	<LOD	52.5	<LOD	82.8	<LOD	210	11200	340	<LOD	315	<LOD	150
231-1	<LOD	73.65	<LOD	89.4	<LOD	225	11494.4	350	350	230	<LOD	165
231-2	<LOD	69.3	<LOD	90.6	<LOD	225	10694.4	350	502	240	<LOD	165
231-3	<LOD	82.05	<LOD	104.55	<LOD	255	13798.4	430	601.2	280	<LOD	210
231-4	<LOD	86.25	<LOD	110.7	<LOD	285	14899.2	470	<LOD	450	<LOD	225
232-1	<LOD	103.5	128.7	82.7	<LOD	285	13888	470	1060	330	<LOD	270
232-2	96.5	58.7	211.4	69.5	<LOD	195	7865.6	320	658	230	<LOD	195
232-3	<LOD	89.55	<LOD	114.9	<LOD	270	12499.2	430	1160	310	340	170
232-4	<LOD	93	<LOD	111.75	<LOD	255	12800	430	1120	300	<LOD	240
233-1	<LOD	69	<LOD	105.6	<LOD	240	9625.6	400	<LOD	375	<LOD	195
233-2	<LOD	53.1	<LOD	83.7	<LOD	195	8640	310	339.2	210	<LOD	150
233-3	<LOD	55.2	<LOD	83.4	<LOD	210	9644.8	330	<LOD	315	<LOD	165
233-4	<LOD	52.5	<LOD	82.05	<LOD	210	10297.6	330	<LOD	315	<LOD	150
234-1	1580	120	<LOD	150	<LOD	330	20492.8	570	1229.6	370	<LOD	270
234-2	857.6	96.2	<LOD	150	<LOD	390	25190.4	680	759.6	410	<LOD	285
234-3	712.4	87.5	<LOD	127.65	<LOD	285	13593.6	470	502.4	310	<LOD	225
234-4	946.4	98.1	<LOD	136.05	<LOD	315	15692.8	510	624.4	330	<LOD	240
235-1	70.1	41.9	<LOD	84.15	<LOD	195	8998.4	320	<LOD	300	<LOD	150
235-2	76.9	42.1	<LOD	84.3	<LOD	195	8729.6	310	<LOD	285	<LOD	147.3
235-3	75.8	35.9	<LOD	67.5	<LOD	148.8	6598.4	240	<LOD	240	<LOD	122.85
235-4	70.4	40.4	<LOD	76.65	<LOD	180	7635.2	270	346	190	<LOD	141
236-1	<LOD	66.6	<LOD	99.3	<LOD	240	9184	380	<LOD	375	<LOD	210

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
236-2	<LOD	64.8	<LOD	103.05	<LOD	270	13888	440	<LOD	420	<LOD	210
236-3	<LOD	56.25	<LOD	88.8	<LOD	210	10796.8	350	<LOD	345	<LOD	165
236-4	<LOD	66.3	<LOD	99.45	327	160	8659.2	370	<LOD	375	<LOD	195
237-1	<LOD	55.5	<LOD	92.7	<LOD	240	12998.4	390	<LOD	360	<LOD	180
237-2	<LOD	51.15	<LOD	86.4	<LOD	225	12595.2	370	<LOD	345	<LOD	150
237-3	<LOD	57.15	<LOD	88.8	<LOD	225	11897.6	370	<LOD	345	<LOD	165
237-4	<LOD	65.85	<LOD	109.35	<LOD	285	14592	480	<LOD	450	247.4	150
238-1	<LOD	52.2	<LOD	83.25	<LOD	210	10995.2	340	<LOD	330	<LOD	165
238-2	<LOD	52.05	<LOD	82.5	<LOD	210	10995.2	340	357.8	220	<LOD	150
238-3	<LOD	46.05	<LOD	69.75	<LOD	180	9004.8	280	<LOD	270	<LOD	139.2
238-4	<LOD	52.5	<LOD	82.65	<LOD	195	9139.2	310	<LOD	300	<LOD	150
239-1	<LOD	57.75	<LOD	94.35	<LOD	240	11296	380	<LOD	360	<LOD	195
239-2	<LOD	53.25	<LOD	86.55	<LOD	225	12499.2	360	634.8	240	<LOD	180
239-3	<LOD	59.1	<LOD	97.2	<LOD	240	11398.4	380	542	260	253	140
239-4	<LOD	57.45	<LOD	93	<LOD	225	11296	370	<LOD	360	<LOD	165
240-1	<LOD	69	<LOD	92.25	<LOD	240	11795.2	400	<LOD	375	<LOD	180
240-2	<LOD	67.05	<LOD	92.85	<LOD	240	13696	410	<LOD	360	<LOD	180
240-3	<LOD	66.75	<LOD	96.3	<LOD	240	14092.8	400	<LOD	375	<LOD	180
240-4	<LOD	65.4	<LOD	94.8	<LOD	240	12896	380	<LOD	360	<LOD	165
241-1	<LOD	46.95	<LOD	77.85	<LOD	195	9996.8	310	325.8	200	<LOD	145.35
241-2	<LOD	57	<LOD	91.05	<LOD	225	10995.2	370	<LOD	330	<LOD	165
241-3	<LOD	52.35	<LOD	82.35	<LOD	225	12697.6	360	<LOD	330	<LOD	165

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Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
241-4	<LOD	58.35	<LOD	99.45	<LOD	255	15488	440	<LOD	390	<LOD	180
242-1	<LOD	62.55	<LOD	95.55	<LOD	240	13299.2	400	<LOD	375	<LOD	180
242-2	<LOD	68.25	<LOD	103.35	<LOD	255	11097.6	410	<LOD	405	<LOD	210
242-3	<LOD	63	<LOD	93.15	<LOD	240	13196.8	400	<LOD	375	<LOD	180
242-4	<LOD	59.1	<LOD	93.75	<LOD	240	13696	400	<LOD	375	<LOD	180
243-1	<LOD	68.1	<LOD	107.4	<LOD	270	13388.8	430	<LOD	405	<LOD	195
243-2	<LOD	66.45	<LOD	128.4	<LOD	375	29977.6	670	<LOD	555	<LOD	225
243-3	<LOD	61.05	<LOD	94.35	<LOD	240	15296	400	<LOD	375	<LOD	165
243-4	164.4	66.2	<LOD	127.5	352.8	230	20390.4	570	<LOD	525	<LOD	240
245-1	<LOD	59.4	<LOD	92.25	<LOD	240	13299.2	390	445.6	250	<LOD	165
245-2	<LOD	58.05	<LOD	90.3	238.8	150	12595.2	360	<LOD	345	<LOD	165
245-3	<LOD	58.5	99.4	62.1	<LOD	225	13196.8	380	409	240	<LOD	165
245-4	<LOD	66.15	<LOD	101.7	<LOD	240	12896	410	<LOD	375	479.2	140
246-1	1100	100	<LOD	138.75	<LOD	300	16089.6	510	514	320	<LOD	240
246-2	938.4	120	<LOD	165	<LOD	375	16294.4	640	<LOD	600	<LOD	315
246-3	337.2	51.3	<LOD	74.4	<LOD	146.85	5648	230	<LOD	240	<LOD	129.6
246-4	913.6	92.6	<LOD	131.4	<LOD	300	17190.4	500	486	310	<LOD	225
247-1	288.6	64.5	<LOD	111.9	<LOD	285	16896	480	<LOD	450	<LOD	210
247-2	276.2	65.9	<LOD	117.15	<LOD	300	17600	500	<LOD	450	<LOD	210
247-3	417.2	82.7	<LOD	135.75	<LOD	345	17190.4	550	<LOD	525	279	180
247-4	294.2	61.9	<LOD	106.2	<LOD	255	14592	430	485.6	270	<LOD	195
249-1	149.5	54.4	<LOD	105	<LOD	255	11596.8	410	424.4	270	<LOD	195

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
249-2	153.9	49.2	<LOD	94.95	<LOD	210	9177.6	340	<LOD	330	<LOD	165
249-3	231.8	54.9	<LOD	97.35	<LOD	225	10099.2	360	<LOD	345	<LOD	195
249-4	142.7	45.7	<LOD	82.8	<LOD	195	9164.8	310	<LOD	300	200	110
250-1	<LOD	62.25	<LOD	92.25	<LOD	210	10400	350	<LOD	345	<LOD	165
250-2	<LOD	63.15	<LOD	92.85	<LOD	225	10899.2	370	<LOD	360	<LOD	180
250-3	<LOD	67.8	<LOD	104.25	<LOD	240	11699.2	400	<LOD	390	334.6	140
250-4	<LOD	75.45	<LOD	111.6	<LOD	270	13094.4	440	<LOD	420	246.6	150
251-1	<LOD	70.8	<LOD	108.75	<LOD	240	8608	380	<LOD	375	<LOD	195
251-2	<LOD	46.35	<LOD	72.15	<LOD	180	8640	280	<LOD	285	<LOD	142.35
251-3	<LOD	51.75	<LOD	78	<LOD	195	9849.6	310	332.6	200	<LOD	146.4
251-4	<LOD	55.35	<LOD	84.75	<LOD	210	9798.4	330	<LOD	315	<LOD	165
252-1	<LOD	72.6	<LOD	108	<LOD	255	13388.8	430	760	290	<LOD	210
252-2	<LOD	75.75	<LOD	108.15	<LOD	270	12396.8	430	460	280	<LOD	210
252-3	<LOD	67.95	<LOD	101.85	<LOD	240	10899.2	390	416.4	260	<LOD	195
252-4	<LOD	71.1	<LOD	104.7	<LOD	255	10796.8	410	<LOD	405	<LOD	210
253-1	<LOD	78.15	<LOD	102.45	<LOD	240	11596.8	390	474	260	320.4	150
253-2	116.9	42.4	<LOD	70.95	<LOD	150	6387.2	240	286.6	170	178.7	99.3
253-3	266	53.7	<LOD	85.35	<LOD	195	7974.4	300	<LOD	300	343.8	120
253-4	88.4	47.4	<LOD	84.75	<LOD	195	7667.2	300	<LOD	300	186.7	120
254-1	<LOD	67.35	<LOD	98.4	<LOD	240	11494.4	400	<LOD	375	<LOD	180
254-2	<LOD	69.3	<LOD	100.5	<LOD	240	12294.4	410	<LOD	390	<LOD	195
254-3	71.2	43	<LOD	87.75	<LOD	210	10995.2	350	<LOD	330	178.8	110

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
254-4	<LOD	65.4	<LOD	100.2	<LOD	270	17600	450	496.4	280	<LOD	195
255-1	<LOD	64.35	<LOD	88.2	<LOD	210	8179.2	330	<LOD	330	<LOD	180
255-2	<LOD	61.05	<LOD	82.65	<LOD	180	7104	290	<LOD	285	<LOD	150
255-3	76.1	44	<LOD	85.2	<LOD	180	8307.2	310	<LOD	300	<LOD	165
255-4	68.2	45.2	<LOD	90.45	<LOD	195	8416	330	<LOD	315	323.4	130
256-1	<LOD	53.4	<LOD	79.65	<LOD	180	8505.6	300	<LOD	285	<LOD	146.4
256-2	<LOD	48.45	<LOD	76.2	<LOD	180	8435.2	280	<LOD	270	<LOD	140.25
256-3	<LOD	43.65	<LOD	66.9	<LOD	150	7136	240	<LOD	240	<LOD	123
256-4	<LOD	55.2	<LOD	79.95	<LOD	180	7648	300	<LOD	300	<LOD	150
257-1	<LOD	57.75	<LOD	82.95	<LOD	195	9804.8	320	<LOD	300	<LOD	150
257-2	<LOD	59.7	<LOD	82.2	<LOD	195	8428.8	310	<LOD	285	<LOD	150
257-3	<LOD	55.35	<LOD	78.45	<LOD	180	9024	290	<LOD	285	<LOD	142.65
257-4	<LOD	52.65	<LOD	73.2	<LOD	165	8448	270	<LOD	270	<LOD	136.95
258-1	<LOD	57.6	<LOD	92.25	<LOD	240	14796.8	400	<LOD	375	<LOD	180
258-2	<LOD	59.7	<LOD	102.15	<LOD	270	16294.4	450	<LOD	420	<LOD	180
258-3	<LOD	47.55	<LOD	78.75	<LOD	210	13888	340	<LOD	315	<LOD	147.3
258-4	<LOD	55.95	<LOD	92.1	<LOD	255	15795.2	420	<LOD	375	<LOD	165
259-1	354	60.5	<LOD	113.25	<LOD	285	15398.4	480	<LOD	450	<LOD	210
259-2	200.7	44.4	<LOD	89.55	<LOD	225	13491.2	370	<LOD	345	<LOD	165
259-3	572.4	60.6	<LOD	106.95	<LOD	270	17292.8	450	503.2	280	<LOD	195
259-4	549.2	59.5	<LOD	107.7	<LOD	270	19993.6	480	522.4	290	<LOD	195
260-1	397.8	83.5	<LOD	149.55	<LOD	345	13696	570	1340	410	<LOD	315

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
260-2	210.6	55.1	<LOD	107.85	<LOD	255	11494.4	410	625.6	280	<LOD	210
260-3	133.5	42.8	<LOD	87.45	<LOD	195	9798.4	320	462.8	220	<LOD	150
260-4	197.8	50.2	<LOD	97.8	<LOD	240	11296	380	<LOD	375	<LOD	180
261-1	1260	84.5	<LOD	131.55	<LOD	330	25190.4	560	1040	350	<LOD	225
261-2	1589.6	110	<LOD	165	<LOD	315	16089.6	550	<LOD	525	<LOD	255
261-3	636.4	64.8	<LOD	112.2	<LOD	270	17600	450	535.6	290	573.6	150
261-4	888	93.8	<LOD	150	<LOD	375	20992	640	1040	410	<LOD	270
262-1	<LOD	84.9	<LOD	134.55	<LOD	330	15398.4	570	<LOD	540	<LOD	255
262-2	<LOD	77.7	<LOD	125.25	<LOD	330	17689.6	550	<LOD	510	<LOD	240
262-3	<LOD	67.95	<LOD	107.7	<LOD	285	15897.6	470	<LOD	435	<LOD	210
262-4	<LOD	70.05	<LOD	119.85	<LOD	315	17497.6	520	<LOD	465	333.6	160
263-1	<LOD	55.5	<LOD	92.25	<LOD	255	15488	410	<LOD	390	<LOD	165
263-2	<LOD	54	<LOD	93.6	<LOD	240	16000	410	<LOD	375	<LOD	165
263-3	<LOD	55.95	<LOD	94.35	<LOD	255	15897.6	420	<LOD	390	<LOD	180
263-4	<LOD	56.25	<LOD	94.2	<LOD	255	13888	420	<LOD	375	<LOD	180
264-1	<LOD	62.85	<LOD	100.8	<LOD	255	13094.4	420	<LOD	405	<LOD	195
264-2	<LOD	63	<LOD	103.5	<LOD	255	12198.4	420	564.4	280	<LOD	210
264-3	<LOD	52.35	<LOD	85.95	<LOD	210	10899.2	350	357.2	230	<LOD	165
264-4	<LOD	54.3	<LOD	86.4	<LOD	210	11097.6	340	463.2	230	<LOD	165
265-1	<LOD	61.2	<LOD	95.7	<LOD	225	10899.2	380	441.2	250	<LOD	195
265-2	<LOD	58.8	<LOD	88.95	<LOD	225	11296	370	451.2	240	<LOD	180
265-3	<LOD	50.4	<LOD	82.65	<LOD	210	12096	340	583.2	230	<LOD	165

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Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
265-4	<LOD	52.65	<LOD	80.4	<LOD	195	9798.4	330	455.6	220	<LOD	165
266-1	<LOD	50.4	<LOD	80.55	<LOD	195	10796.8	330	1060	240	<LOD	165
266-2	<LOD	44.4	<LOD	71.55	<LOD	165	8819.2	280	1300	220	<LOD	165
266-3	<LOD	63.45	<LOD	99	<LOD	240	10694.4	400	967.2	280	<LOD	210
266-4	<LOD	53.4	<LOD	84.45	<LOD	210	10099.2	340	665.6	240	212.4	130
267-1	<LOD	57.15	<LOD	89.7	<LOD	225	10099.2	350	553.6	240	<LOD	180
267-2	<LOD	58.5	<LOD	90.9	<LOD	240	11596.8	390	712.4	260	<LOD	195
267-3	<LOD	63.6	<LOD	96.75	<LOD	240	12096	410	608	270	<LOD	195
267-4	<LOD	65.7	<LOD	100.2	<LOD	240	10496	390	814.4	280	<LOD	195
268-1	<LOD	51.9	<LOD	88.05	<LOD	240	16089.6	410	434	250	<LOD	165
268-2	<LOD	51.15	<LOD	81.3	<LOD	195	10598.4	320	378	210	<LOD	165
268-3	<LOD	56.1	<LOD	96.15	<LOD	270	16896	440	520	280	<LOD	195
268-4	<LOD	54.45	<LOD	89.4	<LOD	225	12697.6	370	364	240	<LOD	165
269-1	<LOD	47.55	<LOD	73.5	<LOD	180	7936	280	272	180	<LOD	134.1
269-2	<LOD	42.75	<LOD	62.1	<LOD	146.25	7187.2	230	341	160	<LOD	119.25
269-3	<LOD	54.45	<LOD	85.65	<LOD	210	9888	340	<LOD	330	<LOD	165
269-4	<LOD	60	<LOD	91.8	<LOD	225	10297.6	360	430.4	240	<LOD	180
270-1	<LOD	49.05	<LOD	78.75	<LOD	195	9798.4	320	611.2	220	<LOD	165
270-2	<LOD	49.05	<LOD	78.75	<LOD	195	9798.4	320	611.2	220	<LOD	165
270-3	<LOD	64.35	<LOD	100.5	<LOD	255	12499.2	420	490.4	280	<LOD	195
270-4	<LOD	52.5	<LOD	84.15	<LOD	210	11596.8	350	634.4	240	<LOD	180
271-1	<LOD	52.2	<LOD	82.65	<LOD	195	8985.6	310	<LOD	300	<LOD	165

Winklepeck Burning Grounds in-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
271-2	<LOD	74.4	<LOD	109.65	<LOD	225	6956.8	360	<LOD	360	<LOD	225
271-3	<LOD	54.75	<LOD	84.15	<LOD	195	8448	310	<LOD	315	<LOD	150
271-4	<LOD	60.15	<LOD	89.7	<LOD	210	8249.6	340	<LOD	330	<LOD	180
272-1	<LOD	54.3	<LOD	80.7	<LOD	195	9734.4	330	<LOD	315	<LOD	150
272-2	<LOD	68.25	<LOD	107.85	<LOD	270	12499.2	440	516.4	290	<LOD	210
272-3	<LOD	51.6	<LOD	83.4	<LOD	195	10195.2	320	<LOD	315	<LOD	165
272-4	<LOD	58.95	<LOD	89.7	<LOD	210	9414.4	340	414	230	<LOD	165
273-1	<LOD	47.85	<LOD	71.7	<LOD	150	6048	250	851.2	200	<LOD	165
273-2	<LOD	45	<LOD	67.65	<LOD	150	7200	250	959.2	190	<LOD	143.7
273-3	<LOD	55.2	<LOD	79.35	<LOD	180	7756.8	300	1109.6	240	<LOD	180
273-4	<LOD	54.45	<LOD	78.45	<LOD	180	6995.2	280	877.6	220	<LOD	180
274-1	<LOD	54.75	<LOD	81	<LOD	195	8000	300	<LOD	300	<LOD	150
274-2	<LOD	49.35	<LOD	75.45	<LOD	180	7724.8	270	<LOD	270	<LOD	132.6
274-3	<LOD	50.25	<LOD	75.45	<LOD	180	7680	290	<LOD	285	<LOD	146.85
274-4	<LOD	50.4	<LOD	71.7	<LOD	165	7174.4	260	<LOD	255	<LOD	133.2
275-1	<LOD	58.2	<LOD	90.75	<LOD	225	10694.4	360	534.4	240	<LOD	165
275-2	<LOD	55.2	<LOD	86.55	<LOD	210	10195.2	350	<LOD	330	<LOD	165
275-3	<LOD	49.35	<LOD	79.65	<LOD	195	10400	320	<LOD	315	<LOD	150
275-4	<LOD	52.8	<LOD	80.85	<LOD	195	8915.2	310	<LOD	300	<LOD	150
276-1	<LOD	57.9	<LOD	90.3	<LOD	225	11795.2	380	590	250	<LOD	165
276-2	<LOD	63.45	<LOD	104.7	<LOD	270	12896	440	825.6	300	<LOD	225
276-3	<LOD	58.5	<LOD	96.15	<LOD	255	13696	410	651.6	270	<LOD	195

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
276-4	<LOD	54.15	<LOD	84.75	<LOD	225	11795.2	360	566.4	240	<LOD	180
277-1	<LOD	52.95	<LOD	77.85	<LOD	180	8896	300	330.6	200	<LOD	150
277-2	<LOD	45.6	<LOD	75	<LOD	165	8224	280	<LOD	270	<LOD	140.25
277-3	<LOD	52.05	<LOD	78.15	<LOD	180	7686.4	280	561.6	200	<LOD	150
277-4	<LOD	47.85	<LOD	70.8	<LOD	165	8544	270	<LOD	270	<LOD	133.35
278-1	<LOD	58.5	<LOD	89.4	<LOD	225	10099.2	350	<LOD	345	<LOD	165
278-2	<LOD	54.15	<LOD	80.7	<LOD	210	9644.8	330	460.8	220	<LOD	165
278-3	<LOD	47.85	<LOD	73.95	<LOD	180	10195.2	300	366.6	200	151.4	100
278-4	<LOD	75	<LOD	108.3	<LOD	255	9664	420	566.8	290	<LOD	210
279-1	<LOD	48.9	<LOD	71.7	<LOD	150	6448	250	255.6	170	<LOD	136.35
279-2	<LOD	51.15	<LOD	76.35	<LOD	165	7148.8	270	290.6	190	<LOD	150
279-3	<LOD	50.7	<LOD	76.65	<LOD	180	8224	290	346.2	200	<LOD	147.15
279-4	<LOD	48	<LOD	74.1	<LOD	165	7168	260	319.6	180	<LOD	138.15
280-1	<LOD	54.9	<LOD	70.2	<LOD	147	5318.4	240	3587.2	280	<LOD	225
280-2	<LOD	51.75	<LOD	79.65	<LOD	195	9267.2	300	378.8	200	<LOD	148.35
280-3	<LOD	45.6	<LOD	67.35	<LOD	150	6726.4	250	1040	200	<LOD	147.45
280-4	<LOD	58.05	<LOD	78	<LOD	165	6969.6	290	4960	340	<LOD	255
281-1	<LOD	52.2	<LOD	82.5	<LOD	210	10195.2	320	321	210	<LOD	150
281-2	<LOD	49.05	<LOD	77.7	<LOD	180	8979.2	300	344.4	200	<LOD	144.6
281-3	<LOD	50.55	<LOD	77.1	<LOD	180	9548.8	300	<LOD	300	<LOD	142.05
281-4	<LOD	60.3	<LOD	87.9	<LOD	210	7955.2	330	<LOD	330	<LOD	165
282-1	<LOD	51.6	<LOD	82.5	<LOD	210	10195.2	330	<LOD	330	<LOD	165

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
282-2	<LOD	55.65	<LOD	85.65	<LOD	225	12896	360	<LOD	345	<LOD	165
282-3	<LOD	54.9	<LOD	89.7	<LOD	225	12800	380	<LOD	360	<LOD	180
282-4	<LOD	64.8	<LOD	102.75	<LOD	255	11699.2	410	<LOD	390	<LOD	180
283-1	<LOD	50.1	<LOD	80.55	216.4	140	10995.2	330	<LOD	315	<LOD	150
283-2	<LOD	54.45	<LOD	78.15	<LOD	180	7014.4	290	<LOD	285	<LOD	150
283-3	<LOD	43.35	<LOD	72.15	<LOD	180	10099.2	290	<LOD	270	<LOD	126.9
283-4	<LOD	51.45	<LOD	81	<LOD	210	11596.8	330	<LOD	315	<LOD	150
284-1	<LOD	50.25	<LOD	76.8	<LOD	180	8115.2	290	744	210	<LOD	165
284-2	<LOD	56.4	<LOD	95.55	<LOD	240	12998.4	400	429.2	260	<LOD	195
284-3	<LOD	52.05	<LOD	94.5	<LOD	255	18790.4	440	<LOD	405	<LOD	180
284-4	<LOD	51.45	<LOD	80.1	<LOD	195	9798.4	320	959.2	230	<LOD	180
285-1	<LOD	49.35	<LOD	76.5	<LOD	180	8819.2	290	369.2	200	<LOD	146.7
285-2	<LOD	49.65	<LOD	71.55	<LOD	150	6118.4	250	829.6	190	<LOD	150
285-3	<LOD	50.55	<LOD	75.75	<LOD	180	8320	290	<LOD	285	<LOD	150
285-4	<LOD	39.6	<LOD	61.5	<LOD	139.65	7078.4	220	248.2	150	<LOD	117
286-1	<LOD	38.85	<LOD	50.4	<LOD	84.9	2169.6	130	713.2	130	<LOD	114
286-2	<LOD	45.9	<LOD	66	<LOD	131.85	5059.2	210	<LOD	225	<LOD	122.7
286-3	<LOD	43.35	<LOD	63.15	<LOD	138.3	5507.2	220	<LOD	225	<LOD	115.35
286-4	<LOD	43.5	<LOD	62.7	<LOD	136.8	6048	220	<LOD	225	<LOD	119.1
287-1	<LOD	70.35	<LOD	108	<LOD	285	13888	470	<LOD	450	<LOD	210
287-2	<LOD	52.95	<LOD	83.85	<LOD	210	10400	330	353.6	220	<LOD	165
287-3	<LOD	59.1	<LOD	96.15	<LOD	240	13094.4	410	<LOD	390	<LOD	195

Winklepeck Burning Grounds In-Situ XRF Analysis for Metals

Station #	Cu	+/- 3SD	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
287-4	<LOD	69.15	<LOD	122.7	<LOD	315	17792	540	645.6	340	<LOD	240
288-1	<LOD	55.35	<LOD	86.25	<LOD	195	8076.8	310	<LOD	315	<LOD	150
288-2	<LOD	53.1	<LOD	82.05	<LOD	210	10995.2	350	<LOD	330	<LOD	150
288-3	<LOD	59.85	<LOD	94.8	<LOD	240	12499.2	400	<LOD	375	213.6	130
288-4	<LOD	69.9	<LOD	110.7	<LOD	255	10796.8	430	<LOD	420	<LOD	210
289-1	<LOD	54.15	<LOD	85.35	<LOD	210	9734.4	340	<LOD	315	<LOD	150
289-2	<LOD	54	<LOD	82.35	<LOD	210	10400	350	<LOD	330	<LOD	150
289-3	<LOD	65.4	<LOD	96	<LOD	225	9689.6	380	<LOD	360	<LOD	165
289-4	<LOD	46.2	<LOD	66.75	<LOD	150	7244.8	250	<LOD	240	<LOD	120.45
290-1	<LOD	53.7	<LOD	75.15	<LOD	165	6624	270	552.8	200	<LOD	165
290-2	<LOD	54.15	<LOD	79.5	<LOD	165	5929.6	270	424.4	200	<LOD	165
290-3	<LOD	61.8	<LOD	93.15	<LOD	210	7424	330	<LOD	330	<LOD	165
290-4	<LOD	50.4	<LOD	76.2	<LOD	180	8384	290	469.6	200	172.5	110
291-1	<LOD	46.8	<LOD	74.7	<LOD	165	8537.6	280	<LOD	270	<LOD	128.4
291-2	<LOD	51.3	<LOD	79.95	<LOD	180	8915.2	300	<LOD	285	<LOD	136.05
291-3	<LOD	50.1	<LOD	78.15	<LOD	180	9004.8	300	<LOD	285	<LOD	143.7
291-4	<LOD	56.7	<LOD	86.4	<LOD	195	9356.8	330	<LOD	300	<LOD	150
292-1	<LOD	51	<LOD	76.2	<LOD	180	7974.4	290	650.8	210	<LOD	165
292-2	<LOD	48.75	<LOD	75.45	<LOD	180	9280	290	662.8	210	<LOD	150
292-3	<LOD	48.45	<LOD	72.15	<LOD	165	7334.4	260	825.6	200	<LOD	146.55
292-4	<LOD	46.65	<LOD	73.2	<LOD	165	8588.8	280	654.8	200	<LOD	148.95
293-1	<LOD	51	<LOD	71.85	<LOD	144.9	4528	230	356.2	170	<LOD	140.85

4. EX-SITU ANALYSIS DATA

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station	Sample ID	Result Type	Date Collected	Field Sample Type	Media description	Start Depth (ft)	End Depth (ft)	Station #	La	+/- 3SD
WBG-197	WBG4000	REG	10/17/2000	Grab	Surface Soil	0	1	**197**	<LOD	55.05
WBG-198	WBG4003	REG	10/17/2000	Grab	Surface Soil	0	1	**198**	<LOD	43.65
WBG-199	WBG4006	REG	10/17/2000	Grab	Surface Soil	0	1	**199**	<LOD	56.25
WBG-199	WBG4006	DUP	10/17/2000	Grab	Surface Soil	0	1	**199**	<LOD	57.75
WBG-199	WBG4007	REG	10/20/2000	Grab	Subsurface soil	2	4	**199**	<LOD	52.5
WBG-199	WBG4008	REG	10/21/2000	Grab	Subsurface soil	4	6	**199**	67.4	41.6
WBG-199	WBG4314	REG	10/22/2000	Grab	Subsurface soil	6	8	**199**	57.8	34.7
WBG-200	WBG4009	REG	10/17/2000	Grab	Surface Soil	0	1	**200**	<LOD	60
WBG-201	WBG4268	REG	10/17/2000	Field Duplicate	Surface Soil	0	1	**201**	<LOD	53.25
WBG-201	WBG4012	REG	10/17/2000	Grab	Surface Soil	0	1	**201**	<LOD	55.05
WBG-202	WBG4015	REG	10/17/2000	Grab	Surface Soil	0	1	**202**	<LOD	49.65
WBG-203	WBG4018	REG	10/22/2000	Grab	Surface Soil	0	1	**203**	<LOD	44.4
WBG-203	WBG4019	REG	10/22/2000	Grab	Subsurface soil	2	4	**203**	<LOD	61.95
WBG-203	WBG4020	REG	10/22/2000	Grab	Subsurface soil	4	6	**203**	<LOD	48.6
WBG-203	WBG4021	REG	10/22/2000	Grab	Subsurface soil	6	8	**203**	<LOD	46.95
WBG-203	WBG4022	REG	10/22/2000	Grab	Subsurface soil	8	10	**203**	<LOD	46.95
WBG-204	WBG4023	REG	10/18/2000	Grab	Surface Soil	0	1	**204**	<LOD	44.7
WBG-205	WBG4026	REG	10/18/2000	Grab	Surface Soil	0	1	**205**	<LOD	46.5
WBG-205	WBG4027	REG	10/20/2000	Grab	Subsurface soil	2	4	**205**	<LOD	58.65
WBG-205	WBG4028	REG	10/21/2000	Grab	Subsurface soil	4	6	**205**	<LOD	70.65
WBG-205	WBG4027	DUP	10/20/2000	Grab	Subsurface soil	2	4	**205**	<LOD	52.35
WBG-205	WBG4313	REG	10/22/2000	Grab	Subsurface soil	6	8	**205**	<LOD	46.05

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD	Cd	+/- 3SD
197	487.6	82.8	<LOD	57	<LOD	64.95	<LOD	63.15	<LOD	165	<LOD	44.7
198	430.8	75.9	<LOD	58.65	<LOD	62.4	<LOD	55.5	<LOD	147.6	<LOD	35.25
199	1069.6	130	<LOD	89.7	<LOD	74.1	429.2	85.6	<LOD	180	<LOD	51.3
199	1049.6	150	<LOD	94.2	<LOD	96.9	399.4	99.8	<LOD	195	<LOD	50.25
199	582.4	92	<LOD	65.4	<LOD	73.2	101.1	51.2	<LOD	165	<LOD	46.5
199	396.2	77.9	<LOD	58.5	<LOD	70.8	<LOD	57	<LOD	150	<LOD	35.25
199	532.8	75.9	<LOD	55.5	<LOD	60.45	<LOD	54	<LOD	129.9	<LOD	34.65
200	451.6	82.1	<LOD	64.95	<LOD	81.75	<LOD	63.45	<LOD	165	<LOD	42.9
201	485.6	85.2	<LOD	60.9	<LOD	78.45	<LOD	63	<LOD	150	<LOD	39.75
201	490.8	83	<LOD	67.8	<LOD	75.6	<LOD	53.7	<LOD	150	<LOD	41.85
202	356.2	74.8	<LOD	59.85	<LOD	72.3	<LOD	45.3	<LOD	165	<LOD	46.05
203	464.8	75.9	<LOD	57.15	<LOD	57.45	<LOD	51	<LOD	142.2	<LOD	39.75
203	420.8	88.2	<LOD	66.45	<LOD	81.45	<LOD	65.4	<LOD	165	<LOD	42.75
203	326.4	63	<LOD	55.5	<LOD	64.8	<LOD	45.75	<LOD	137.55	<LOD	37.2
203	334.8	75.8	<LOD	61.65	<LOD	74.1	<LOD	54.15	<LOD	165	<LOD	42
203	266	60.4	<LOD	45	<LOD	64.5	<LOD	47.4	<LOD	134.1	<LOD	32.85
204	371.6	76.3	<LOD	57.15	<LOD	76.5	<LOD	52.65	<LOD	150	<LOD	40.35
205	411.2	67.8	<LOD	54.15	<LOD	66.9	<LOD	46.5	<LOD	135.9	<LOD	28.35
205	416.8	81.4	<LOD	58.65	<LOD	76.8	<LOD	53.7	179.3	110	<LOD	45.45
205	359.6	84.9	<LOD	74.25	<LOD	86.85	<LOD	72.6	<LOD	165	<LOD	50.85
205	383.2	74.7	<LOD	57.3	<LOD	67.95	<LOD	54.15	<LOD	149.4	<LOD	43.05
205	407.6	94.8	<LOD	74.1	<LOD	80.85	<LOD	71.4	<LOD	180	<LOD	51

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD	Rb	+/- 3SD
197	<LOD	195	<LOD	38.4	<LOD	8.4	237.8	11.4	79.3	8.5	145.4	12
198	<LOD	180	<LOD	38.55	11.8	6.1	365.4	12.7	63.4	7.6	94.4	9.6
199	<LOD	210	<LOD	39.15	<LOD	9.6	191.2	13.2	117.2	11.7	98.9	12
199	<LOD	255	<LOD	55.05	13.5	6.5	193.6	13.3	125.3	11.7	114.6	12.4
199	<LOD	195	<LOD	40.2	15.3	6.4	331.4	13	76.7	8.7	107.4	10.9
199	<LOD	195	<LOD	35.7	11.9	5.9	327.8	12.2	68.5	7.8	112.6	10.3
199	<LOD	165	<LOD	33.3	9.3	5.8	249.4	11.8	81.2	8.7	141.5	12
200	<LOD	195	<LOD	40.2	9.2	5.8	249.8	11.7	75.2	8.6	124.2	11.4
201	<LOD	195	<LOD	34.95	<LOD	8.55	235.4	11.7	109.4	9.4	146.3	12.5
201	<LOD	195	<LOD	32.85	<LOD	8.7	238.2	11.7	110.1	9.4	155.1	12.7
202	<LOD	195	<LOD	37.5	9	5.7	311.8	12	68	7.8	109.1	10.1
203	<LOD	180	<LOD	30.9	12.3	6.1	222.4	11.9	94.8	9.4	172.2	13.6
203	<LOD	210	<LOD	35.55	<LOD	9	210.2	11.7	104.8	9.8	148.7	13.2
203	<LOD	180	<LOD	34.65	<LOD	9	253	12	79.5	8.8	135.9	12.1
203	<LOD	210	<LOD	39.9	10.5	6.2	291.2	12.6	69.7	8.5	134.4	12
203	<LOD	180	<LOD	35.7	9.6	6	294.6	12.1	70.8	8.2	84.7	9.7
204	<LOD	195	<LOD	39.6	9.1	5.7	306	11.6	56.4	7.3	105.9	10
205	<LOD	180	<LOD	32.1	8.6	5.7	268.2	11.3	69.2	7.9	115.7	10.6
205	<LOD	195	<LOD	42.45	15.1	6.3	302.4	12.9	78.9	8.8	115.1	11.2
205	<LOD	225	<LOD	42.45	13.9	6	222.6	11.7	82.6	9	164.1	13.3
205	<LOD	195	<LOD	37.8	14.2	6.3	311.8	12.7	76.4	8.5	101.9	10.5
205	<LOD	240	<LOD	44.85	<LOD	9	222.6	11.8	105.8	9.6	168.6	13.7

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD	Cu	+/- 3SD
197	225.2	22.6	<LOD	9.6	<LOD	23.7	<LOD	12.15	462	45.5	<LOD	82.95
198	21.7	11.5	<LOD	8.25	<LOD	13.35	<LOD	10.65	80.3	28.4	<LOD	64.65
199	1708.8	65.9	<LOD	13.35	<LOD	62.7	<LOD	23.4	7616	190	888.8	150
199	1620	62.8	<LOD	12.9	<LOD	60.3	<LOD	22.95	7584	190	734	150
199	643.6	36.3	<LOD	10.2	<LOD	36.45	<LOD	15.15	2769.6	100	162.3	85.1
199	75.9	14.9	<LOD	8.55	<LOD	16.2	<LOD	10.95	381	40.6	<LOD	73.05
199	181.8	21	<LOD	9.3	27.4	15.4	<LOD	13.05	728	54.2	<LOD	90
200	296	25.5	<LOD	9.6	27.9	18	<LOD	12.9	754.8	55.8	196.7	65
201	25.3	13.2	<LOD	9.6	<LOD	15.9	<LOD	12	100.5	31.8	<LOD	71.1
201	21.3	12.8	<LOD	9.3	<LOD	15.3	<LOD	11.85	117.8	32.6	<LOD	73.8
202	29.6	12.1	<LOD	8.55	<LOD	14.1	<LOD	10.95	95.7	28.9	<LOD	64.95
203	23.3	13.3	<LOD	9.3	<LOD	16.2	<LOD	12.9	124.8	34.1	<LOD	77.1
203	<LOD	19.05	<LOD	9.75	19.7	10.8	<LOD	12.9	118.4	34.4	<LOD	74.7
203	26.1	13.5	<LOD	9.6	<LOD	16.35	<LOD	12.9	100.3	32.9	<LOD	76.35
203	<LOD	18.6	<LOD	9.3	26.1	10.6	<LOD	11.25	86.4	31.4	<LOD	72.6
203	24.4	12.5	<LOD	8.85	15.4	10.2	<LOD	11.55	88.5	30.7	<LOD	68.85
204	26.5	11.7	<LOD	8.25	<LOD	14.1	<LOD	10.65	101.4	29	<LOD	63.6
205	36.5	12.7	<LOD	8.1	25.8	10.6	<LOD	11.25	147.9	32.4	<LOD	70.95
205	<LOD	18.3	<LOD	9	15.2	10	<LOD	11.7	74.8	30.8	<LOD	73.05
205	23.6	13.2	<LOD	9.3	18.6	10.7	<LOD	11.7	91.1	31.9	<LOD	72.6
205	20.7	12.5	<LOD	9	22.7	10.5	<LOD	11.4	86.3	31.1	<LOD	72.75
205	<LOD	18.9	<LOD	8.85	16	10.3	<LOD	11.85	82.7	31.9	<LOD	72.45

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
197	154.7	95.9	414.8	270	33484.8	730	<LOD	615	<LOD	270
198	<LOD	103.5	327.8	190	16192	470	461.2	290	<LOD	210
199	<LOD	210	<LOD	600	58777.6	1200	2148.8	640	<LOD	405
199	<LOD	210	<LOD	600	58982.4	1200	2169.6	630	<LOD	405
199	<LOD	140.1	<LOD	390	29798.4	690	<LOD	600	<LOD	270
199	<LOD	119.4	<LOD	315	22195.2	550	<LOD	495	<LOD	210
199	<LOD	144.45	<LOD	420	35481.6	760	<LOD	645	<LOD	270
200	<LOD	144	<LOD	420	35379.2	760	<LOD	645	<LOD	255
201	<LOD	142.5	<LOD	420	34380.8	760	<LOD	645	<LOD	270
201	<LOD	144.6	<LOD	420	34892.8	760	<LOD	630	<LOD	270
202	<LOD	114.45	<LOD	315	21798.4	540	<LOD	480	<LOD	225
203	<LOD	150	479.2	300	36480	810	<LOD	660	<LOD	270
203	<LOD	149.1	<LOD	450	34688	800	<LOD	660	<LOD	270
203	167.7	99.3	<LOD	435	36275.2	790	<LOD	660	<LOD	270
203	<LOD	138.75	<LOD	420	33075.2	750	<LOD	615	<LOD	255
203	<LOD	127.8	<LOD	360	26982.4	650	<LOD	570	<LOD	240
204	<LOD	108.45	<LOD	300	19200	510	654.8	320	<LOD	210
205	<LOD	124.95	<LOD	360	27084.8	630	<LOD	555	<LOD	240
205	<LOD	143.55	<LOD	420	33382.4	750	<LOD	615	<LOD	255
205	<LOD	149.55	<LOD	435	35379.2	790	<LOD	660	<LOD	270
205	<LOD	139.8	<LOD	420	33382.4	740	<LOD	615	<LOD	255
205	<LOD	145.5	<LOD	435	34176	780	<LOD	660	<LOD	270

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station	Sample ID	Result Type	Date Collected	Field Sample Type	Media description	Start Depth (ft)	End Depth (ft)	Station #	La	+/- 3SD
WBG-206	WBG4029	REG	10/18/2000	Grab	Surface Soil	0	1	**206**	<LOD	36.15
WBG-207	WBG4032	REG	10/18/2000	Grab	Surface Soil	0	1	**207**	<LOD	59.25
WBG-208	WBG4035	REG	10/18/2000	Grab	Surface Soil	0	1	**208**	<LOD	53.4
WBG-209	WBG4038	REG	10/18/2000	Grab	Surface Soil	0	1	**209**	<LOD	56.7
WBG-209	WBG4038	DUP	10/18/2000	Grab	Surface Soil	0	1	**209**	<LOD	49.35
WBG-210	WBG4041	REG	10/30/2000	Grab	Surface Soil	0	1	**210**	<LOD	46.35
WBG-210	WBG4277	REG	10/30/2000	Field Duplicate	Surface Soil	0	1	**210**	<LOD	54.75
WBG-210	WBG4042	REG	10/30/2000	Grab	Subsurface soil	2	4	**210**	<LOD	56.7
WBG-210	WBG4043	REG	10/30/2000	Grab	Subsurface soil	4	6	**210**	<LOD	41.7
WBG-210	WBG4278	REG	10/30/2000	Field Duplicate	Subsurface soil	4	6	**210**	<LOD	67.35
WBG-210	WBG4044	REG	10/30/2000	Grab	Subsurface soil	6	8	**210**	64.3	41.6
WBG-210	WBG4045	REG	10/30/2000	Grab	Subsurface soil	8	10	**210**	69.2	46.1
WBG-211	WBG4046	REG	10/18/2000	Grab	Surface Soil	0	1	**211**	<LOD	58.5
WBG-212	WBG4049	REG	10/18/2000	Grab	Surface Soil	0	1	**212**	<LOD	51.3
WBG-212	WBG4269	REG	10/18/2000	Field Duplicate	Surface Soil	0	1	**212**	<LOD	56.7
WBG-213	WBG4052	REG	10/18/2000	Grab	Surface Soil	0	1	**213**	60.4	40
WBG-214	WBG4055	REG	10/18/2000	Grab	Surface Soil	0	1	**214**	<LOD	49.5
WBG-215	WBG4058	REG	10/18/2000	Grab	Surface Soil	0	1	**215**	<LOD	59.25
WBG-216	WBG4061	REG	10/18/2000	Grab	Surface Soil	0	1	**216**	<LOD	45.9
WBG-217	WBG4064	REG	10/19/2000	Grab	Surface Soil	0	1	**217**	<LOD	60.45
WBG-217	WBG4065	REG	10/22/2000	Grab	Subsurface soil	2	4	**217**	<LOD	47.25
WBG-218	WBG4067	REG	10/19/2000	Grab	Surface Soil	0	1	**218**	<LOD	58.5

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD	Cd	+/- 3SD
206	368	60.1	<LOD	51.9	<LOD	60.75	<LOD	49.2	<LOD	125.85	<LOD	30.45
207	943.2	120	<LOD	90.9	<LOD	75.9	731.2	110	<LOD	180	<LOD	52.95
208	412.4	83.1	<LOD	64.05	<LOD	75	<LOD	56.1	<LOD	165	<LOD	37.5
209	380.2	82.8	<LOD	57.9	<LOD	84.15	<LOD	56.85	<LOD	165	<LOD	46.8
209	453.2	81.6	<LOD	64.65	<LOD	78.3	<LOD	56.85	<LOD	150	<LOD	33.75
210	464.4	80.7	<LOD	60.45	<LOD	66.45	<LOD	64.65	<LOD	143.85	<LOD	40.8
210	428.4	77	<LOD	57.6	<LOD	71.4	<LOD	52.05	<LOD	147	<LOD	38.55
210	468	91.1	<LOD	68.25	<LOD	91.65	<LOD	53.1	<LOD	165	<LOD	41.85
210	425.6	78.8	<LOD	63.6	<LOD	70.35	<LOD	58.35	<LOD	148.5	<LOD	42.3
210	376	87.7	<LOD	74.85	<LOD	80.25	<LOD	56.85	<LOD	180	<LOD	46.65
210	457.2	82.8	<LOD	61.5	<LOD	72.9	<LOD	57.15	<LOD	150	<LOD	38.4
210	281.6	75.9	<LOD	57.45	<LOD	82.65	<LOD	57.6	<LOD	180	<LOD	41.85
211	2160	190	<LOD	132.45	<LOD	88.8	1729.6	170	<LOD	180	<LOD	57.3
212	372	71.1	<LOD	57.75	<LOD	70.2	<LOD	59.4	<LOD	148.5	<LOD	39.3
212	399	75.6	<LOD	59.7	<LOD	63.3	<LOD	53.25	<LOD	150	<LOD	42.3
213	416	78.7	<LOD	57.9	<LOD	77.55	<LOD	60.15	<LOD	165	<LOD	39.15
214	344.2	70.4	<LOD	58.8	<LOD	71.4	<LOD	51.3	<LOD	147.9	<LOD	38.25
215	700.4	110	<LOD	70.35	<LOD	66.3	<LOD	73.95	<LOD	165	<LOD	45
216	423.6	78.5	<LOD	59.85	<LOD	65.85	<LOD	45.15	<LOD	145.65	<LOD	44.4
217	579.6	100	<LOD	71.7	<LOD	76.65	<LOD	62.7	181	120	<LOD	42.9
217	547.6	93.5	<LOD	61.05	<LOD	81.75	<LOD	70.2	<LOD	165	<LOD	45.45
218	709.6	110	<LOD	73.05	<LOD	81.3	<LOD	66.15	<LOD	165	<LOD	42.6

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD	Rb	+/- 3SD
206	<LOD	150	<LOD	28.95	14.7	5.9	278.4	11.7	69.8	8.1	132.8	11.4
207	<LOD	210	<LOD	34.2	14.7	5.7	228	11.1	97.4	9	105.7	10.4
208	<LOD	210	<LOD	34.35	<LOD	8.85	310.4	12.1	60.1	7.7	120.9	11
209	<LOD	210	<LOD	39.9	<LOD	8.7	249	11.7	71.9	8.4	130	11.6
209	<LOD	195	<LOD	42.75	10.7	6	236.8	11.8	74.1	8.7	130.1	11.9
210	<LOD	195	<LOD	38.4	10.6	5.4	346.2	11.3	60.5	6.9	109.5	9.4
210	<LOD	180	<LOD	34.2	<LOD	8.85	341	12.6	65.2	7.9	116.6	10.7
210	<LOD	225	<LOD	39.15	10.6	6	228	11.8	88.4	9.2	164	13.4
210	<LOD	195	<LOD	36.75	<LOD	8.4	199.8	11.1	104.5	9.3	152.5	12.7
210	<LOD	225	<LOD	44.4	<LOD	8.7	203.6	11.6	105.4	9.7	155.6	13.2
210	<LOD	195	<LOD	38.85	<LOD	9.15	279.2	12.4	76.5	8.7	144.2	12.4
210	<LOD	225	<LOD	45.15	<LOD	9.3	297.2	12.8	67.8	8.6	130.5	12.1
211	<LOD	210	<LOD	47.55	<LOD	9.9	164.5	13.7	171.1	13.6	85.1	12
212	<LOD	195	<LOD	37.5	11.4	5.7	343.6	11.8	70	7.4	93.7	9.2
212	<LOD	195	<LOD	35.55	13	5.9	339.8	12.1	70.9	7.7	105.6	9.9
213	<LOD	195	<LOD	34.8	11.5	5.7	258	11.4	77.4	8.3	133	11.2
214	<LOD	180	<LOD	32.55	9.5	5.6	285.4	11.4	63.2	7.5	114.6	10.2
215	<LOD	210	<LOD	45.3	<LOD	8.55	235	11.8	88.7	9.1	144.3	12.1
216	<LOD	195	<LOD	38.4	10.7	5.9	328.6	12.2	68.3	7.7	118	10.5
217	<LOD	210	<LOD	41.1	10.1	5.8	226.2	11.7	118.7	9.9	94.8	10.5
217	<LOD	210	<LOD	39.75	<LOD	9.9	261	13.6	103.5	10.7	97.1	11.6
218	<LOD	210	<LOD	41.1	12.2	6.1	234.2	12	92.5	9.5	119.7	11.6

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD	Cu	+/- 3SD
206	69.9	15.2	<LOD	9	<LOD	16.95	<LOD	11.55	129.6	31.6	<LOD	67.35
207	888	40.5	<LOD	10.2	<LOD	40.2	<LOD	15.75	2320	88.3	424.8	84.8
208	96.2	16.6	<LOD	9.6	<LOD	18.3	<LOD	11.4	318	39.7	<LOD	75.75
209	173.2	20.6	<LOD	9	<LOD	22.05	<LOD	12.75	738.4	55.1	147.4	63
209	160	20.7	<LOD	9.6	<LOD	21.9	<LOD	12.75	732	56.3	141	64
210	57.2	12.8	<LOD	8.1	<LOD	14.25	<LOD	10.5	206.2	31.8	<LOD	67.65
210	106.7	16.9	<LOD	8.7	<LOD	18.15	<LOD	11.7	226.2	36.4	85.5	51.5
210	159.7	21.1	<LOD	10.2	25.4	15.5	<LOD	12.9	446.8	47.4	<LOD	85.5
210	<LOD	18.6	<LOD	9.45	21.5	10.5	<LOD	12	68.7	30.3	<LOD	71.1
210	<LOD	19.35	<LOD	9.3	<LOD	15.15	<LOD	12.3	84.3	32.4	<LOD	75.3
210	28.2	13.3	<LOD	8.85	<LOD	15.45	<LOD	11.55	96	32.3	<LOD	74.85
210	<LOD	19.35	<LOD	9.15	<LOD	15.75	<LOD	12.3	70.5	31.5	<LOD	74.85
211	1640	67.4	<LOD	14.4	<LOD	65.4	<LOD	23.1	4848	160	951.2	140
212	140.4	17.4	<LOD	8.55	<LOD	18	<LOD	10.5	252.6	34.7	<LOD	68.7
212	113.6	16.6	<LOD	8.7	<LOD	17.85	<LOD	10.65	264.8	36.3	84.9	48.7
213	228.6	22	<LOD	8.85	<LOD	23.55	<LOD	12	442	44.6	201.9	59.6
214	26.2	11.7	<LOD	8.4	<LOD	13.35	<LOD	10.35	100	28.5	<LOD	62.25
215	419.6	29.6	<LOD	9.6	<LOD	30.6	<LOD	14.1	1569.6	76.1	331.6	79.1
216	158.6	18.8	<LOD	8.85	<LOD	20.1	<LOD	10.95	299.2	37.7	<LOD	70.65
217	542.4	34	<LOD	10.65	<LOD	34.2	<LOD	15.75	1480	76	419.6	81.8
217	421.6	33.3	<LOD	11.7	<LOD	34.5	<LOD	17.4	2400	100	458.4	100
218	546.4	34.4	<LOD	10.5	36.5	23.5	<LOD	14.55	1160	68.6	228.4	74

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
206	<LOD	130.5	<LOD	375	29977.6	670	<LOD	570	<LOD	240
207	<LOD	148.5	476.8	280	37683.2	760	<LOD	645	<LOD	270
208	<LOD	118.5	<LOD	345	23590.4	590	<LOD	525	<LOD	240
209	<LOD	141.9	<LOD	405	32588.8	730	<LOD	615	<LOD	255
209	<LOD	142.8	<LOD	420	33382.4	750	<LOD	630	<LOD	270
210	<LOD	111.75	<LOD	300	24089.6	530	<LOD	450	319.6	140
210	<LOD	124.8	<LOD	345	24396.8	590	<LOD	525	<LOD	225
210	<LOD	147.75	<LOD	435	35481.6	790	<LOD	645	356.6	190
210	<LOD	140.7	<LOD	420	32998.4	740	<LOD	615	<LOD	255
210	<LOD	148.2	<LOD	435	34099.2	780	<LOD	645	<LOD	270
210	<LOD	141.6	<LOD	420	32793.6	750	<LOD	615	<LOD	255
210	<LOD	142.95	<LOD	420	33894.4	770	<LOD	645	<LOD	255
211	<LOD	240	<LOD	735	81766.4	1500	1500	760	779.6	320
212	<LOD	108.3	<LOD	300	19494.4	490	<LOD	450	<LOD	195
212	<LOD	108.15	<LOD	300	19289.6	500	<LOD	450	<LOD	210
213	152.4	94.3	<LOD	405	35276.8	730	<LOD	600	<LOD	240
214	<LOD	108.75	<LOD	300	20288	520	<LOD	450	<LOD	195
215	<LOD	165	<LOD	480	45491.2	880	<LOD	720	<LOD	300
216	<LOD	108.9	<LOD	285	18598.4	500	968.8	330	<LOD	240
217	<LOD	165	<LOD	465	44083.2	889.6	<LOD	735	<LOD	300
217	<LOD	210	<LOD	630	67788.8	1300	<LOD	945	542.8	260
218	<LOD	165	<LOD	510	50176	969.6	1000	530	<LOD	315

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station	Sample ID	Result Type	Date Collected	Field Sample Type	Media description	Start Depth (ft)	End Depth (ft)	Station #	La	+/- 3SD
WBG-218	WBG4068	REG	10/22/2000	Grab	Subsurface soil	2	4	**218**	<LOD	45.15
WBG-219	WBG4070	REG	10/18/2000	Grab	Surface Soil	0	1	**219**	<LOD	52.35
WBG-219	WBG4071	REG	10/22/2000	Grab	Subsurface soil	2	4	**219**	<LOD	76.5
WBG-219	WBG4072	REG	10/25/2000	Grab	Subsurface soil	4	6	**219**	<LOD	60.6
WBG-219	WBG4072	DUP	10/25/2000	Grab	Subsurface soil	4	6	**219**	<LOD	52.5
WBG-220	WBG4073	REG	10/19/2000	Grab	Surface Soil	0	1	**220**	<LOD	44.7
WBG-220	WBG4272	REG	10/22/2000	Field Duplicate	Subsurface soil	2	4	**220**	<LOD	68.55
WBG-220	WBG4074	REG	10/22/2000	Grab	Subsurface soil	2	4	**220**	<LOD	63.15
WBG-221	WBG4075	REG	10/25/2000	Grab	Subsurface soil	4	6	**221**	<LOD	49.2
WBG-221	WBG4076	REG	10/19/2000	Grab	Surface Soil	0	1	**221**	<LOD	53.55
WBG-222	WBG4079	REG	10/18/2000	Grab	Surface Soil	0	1	**222**	<LOD	57.15
WBG-222	WBG4080	REG	10/25/2000	Grab	Subsurface soil	2	4	**222**	<LOD	62.85
WBG-223	WBG4082	REG	10/20/2000	Grab	Surface Soil	0	1	**223**	<LOD	51.15
WBG-223	WBG4083	REG	10/22/2000	Grab	Subsurface soil	2	4	**223**	<LOD	45.45
WBG-224	WBG4085	REG	10/20/2000	Grab	Surface Soil	0	1	**224**	<LOD	49.35
WBG-225	WBG4088	REG	10/20/2000	Grab	Surface Soil	0	1	**225**	<LOD	50.7
WBG-226	WBG4091	REG	10/20/2000	Grab	Surface Soil	0	1	**226**	<LOD	51.75
WBG-227	WBG4094	REG	10/22/2000	Grab	Surface Soil	0	1	**227**	<LOD	46.2
WBG-227	WBG4095	REG	10/22/2000	Grab	Subsurface soil	2	4	**227**	<LOD	46.65
WBG-227	WBG4096	REG	10/22/2000	Grab	Subsurface soil	4	6	**227**	<LOD	52.8
WBG-227	WBG4097	REG	10/22/2000	Grab	Subsurface soil	6	8	**227**	53.7	26.6
WBG-227	WBG4098	REG	10/22/2000	Grab	Subsurface soil	8	10	**227**	<LOD	46.65

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD	Cd	+/- 3SD
218	854.4	120	<LOD	72.75	<LOD	82.35	78.7	52	1300	180	<LOD	49.65
219	934.4	130	<LOD	79.8	<LOD	91.35	88.7	53.2	<LOD	180	<LOD	38.1
219	2579.2	260	<LOD	125.4	<LOD	102.45	214.8	76.7	294.4	150	<LOD	54.75
219	604.8	100	<LOD	67.95	<LOD	86.85	<LOD	58.5	<LOD	165	<LOD	45.6
219	475.2	87.6	<LOD	70.65	<LOD	74.55	<LOD	52.2	<LOD	165	<LOD	41.1
220	522.8	79.6	<LOD	60.45	<LOD	68.4	<LOD	57.3	<LOD	142.95	<LOD	45.3
220	816.4	120	<LOD	75.15	<LOD	77.4	<LOD	75.45	<LOD	180	<LOD	54.45
220	882.4	120	<LOD	80.25	<LOD	79.8	83.7	50.7	206.2	120	<LOD	49.2
221	325.4	68.4	<LOD	57	<LOD	70.05	<LOD	46.5	<LOD	143.7	<LOD	43.95
221	438.4	76.3	<LOD	59.85	<LOD	77.85	<LOD	51.9	<LOD	144.45	<LOD	46.2
222	389.8	79.2	<LOD	63.75	<LOD	71.1	<LOD	52.95	<LOD	165	<LOD	41.1
222	450.8	84.7	<LOD	68.4	<LOD	73.65	<LOD	58.2	<LOD	165	<LOD	44.4
223	536.4	91.1	<LOD	72.9	<LOD	81	<LOD	62.7	199.5	120	<LOD	49.05
223	349.4	69	<LOD	58.5	<LOD	68.55	<LOD	49.35	<LOD	139.8	<LOD	39
224	473.2	87.1	<LOD	58.8	<LOD	74.25	<LOD	49.35	<LOD	150	<LOD	41.25
225	396.4	73.3	<LOD	58.35	<LOD	67.5	<LOD	51.45	<LOD	148.5	<LOD	46.8
226	442.4	81.4	<LOD	57	<LOD	68.55	<LOD	51	<LOD	165	<LOD	48.75
227	472	83.4	<LOD	60.75	<LOD	66.9	<LOD	54.45	<LOD	165	<LOD	37.65
227	354.6	62.7	<LOD	49.95	<LOD	67.95	<LOD	48.15	<LOD	132.6	<LOD	35.4
227	378.6	76.5	<LOD	60.45	<LOD	72.9	<LOD	66.15	<LOD	150	<LOD	48.3
227	333.8	50.3	<LOD	41.55	<LOD	50.1	<LOD	37.8	<LOD	108	<LOD	28.05
227	313.8	65.4	<LOD	47.25	<LOD	76.05	<LOD	55.8	<LOD	144.6	<LOD	36.9

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD	Rb	+/- 3SD
218	<LOD	210	<LOD	40.35	12.2	6.3	150.1	13	292	15.1	98	12
219	<LOD	210	<LOD	45.3	15.4	6.6	217	12.9	113.6	11	106.6	12.1
219	<LOD	240	<LOD	51.45	21.9	7.5	121.2	15	289.4	17.8	73.4	12.9
219	<LOD	225	<LOD	38.1	8.4	5.5	236.6	11.1	86.6	8.5	133.7	11.1
219	<LOD	210	<LOD	40.05	9.2	6.1	251.6	12.4	90.5	9.4	128.3	11.9
220	<LOD	180	<LOD	34.35	<LOD	8.85	229.8	11.9	110.8	9.7	110.1	11.2
220	<LOD	210	<LOD	47.85	<LOD	9.3	227.6	12.8	129.1	11	115.9	12.2
220	<LOD	195	<LOD	40.95	11.1	6.1	227.8	12.3	128	10.5	100.4	11.1
221	<LOD	180	<LOD	37.95	9.7	6.2	299.6	12.6	67.3	8.4	132.8	11.9
221	<LOD	195	<LOD	36.75	<LOD	8.85	273.6	12.2	78.4	8.6	135.2	11.9
222	<LOD	210	<LOD	39.75	9.4	5.9	263.8	11.9	68.1	8.3	124.4	11.4
222	<LOD	210	<LOD	40.2	<LOD	8.55	215	11.3	91.9	9	163.4	12.9
223	<LOD	195	<LOD	38.4	10.8	6.1	307	12.6	156.2	10.1	128.1	11.5
223	<LOD	180	<LOD	39	<LOD	9.6	382.8	13.8	64.6	8.2	122.7	11.4
224	<LOD	195	<LOD	40.05	9	5.6	310.6	11.5	70.2	7.5	109.9	9.9
225	<LOD	195	<LOD	32.4	10.2	5.7	312.6	11.8	65.3	7.5	127.1	10.7
226	<LOD	195	<LOD	36	12	6.2	280.2	12.5	82	8.9	146.4	12.5
227	<LOD	195	<LOD	39.75	12.4	5.9	286.4	12	74.9	8.2	141	11.7
227	<LOD	165	<LOD	36.15	12.4	6.2	346.2	12.8	63.3	8	116.2	10.8
227	<LOD	195	<LOD	36.3	9	5.7	295.6	11.8	74.8	8	136.5	11.1
227	<LOD	133.65	<LOD	24.75	9.7	6.3	352.4	13.2	61.2	8.1	104.5	10.6
227	<LOD	195	<LOD	38.55	19.2	6.4	301.8	12.8	68.5	8.5	119.9	11.4

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD	Cu	+/- 3SD
218	667.6	40.9	<LOD	12.15	<LOD	41.4	<LOD	17.85	1089.6	73.8	387.6	90.7
219	1100	51.6	<LOD	12.15	<LOD	50.7	<LOD	19.2	2539.2	110	458	100
219	2699.2	95	<LOD	17.4	149.3	60.3	<LOD	28.5	5427.2	180	893.6	160
219	236.8	22.2	<LOD	9.15	<LOD	23.25	<LOD	12.15	471.2	44	<LOD	80.85
219	239	24.2	<LOD	9.9	<LOD	25.95	<LOD	13.8	513.6	49.4	<LOD	89.55
220	362.6	28.6	<LOD	9.9	33.7	20.1	<LOD	14.1	902.4	61.1	<LOD	98.1
220	995.2	48	<LOD	10.95	<LOD	47.4	<LOD	17.4	1849.6	88.9	266	86.3
220	835.2	42.6	<LOD	11.25	<LOD	42.75	<LOD	15.9	1560	79	160.7	77.1
221	21.9	12.8	<LOD	9.3	<LOD	15.15	<LOD	11.1	106.8	32.2	<LOD	72.9
221	60.6	15	<LOD	8.7	<LOD	16.05	<LOD	11.4	120.1	32.5	<LOD	72.15
222	37	13.4	<LOD	8.55	16.9	10.6	<LOD	11.25	89.6	31	<LOD	71.55
222	19.7	12.5	<LOD	8.7	15.4	10.1	<LOD	11.7	75	30.3	<LOD	70.5
223	33.5	13.2	<LOD	9.15	<LOD	14.7	<LOD	11.4	131	32.3	<LOD	70.05
223	<LOD	18.6	<LOD	9.3	18.8	10.3	<LOD	12	82.7	31	<LOD	71.55
224	30.9	11.9	<LOD	8.25	<LOD	13.95	<LOD	10.95	80.5	27.8	<LOD	63.9
225	17.3	11	<LOD	8.25	<LOD	12.9	<LOD	10.8	81.9	27.8	<LOD	62.85
226	353.6	28.1	<LOD	9.75	<LOD	29.25	<LOD	12.45	237.8	38.5	<LOD	75.9
227	60.4	14.4	<LOD	8.25	<LOD	16.05	<LOD	10.8	127.3	31.8	<LOD	70.8
227	43.5	13.6	<LOD	8.55	<LOD	15.6	<LOD	10.95	68.6	29.6	<LOD	71.1
227	21.6	11.9	<LOD	8.7	21.7	9.9	<LOD	11.1	76.3	28.7	<LOD	67.65
227	<LOD	18	<LOD	9.75	18.4	10.1	<LOD	11.85	74.8	30.2	<LOD	69.45
227	<LOD	18.9	<LOD	9.6	16.1	10.3	<LOD	11.55	103.2	32.3	<LOD	74.1

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
218	<LOD	255	<LOD	825	119910.4	1899.2	<LOD	1244.4	956	330
219	<LOD	195	<LOD	585	56473.6	1100	<LOD	885	<LOD	360
219	<LOD	285	<LOD	870	99686.4	1899.2	<LOD	1334.4	837.6	370
219	<LOD	143.55	520.4	290	41395.2	790	<LOD	630	340.8	180
219	<LOD	165	524.4	320	41984	869.6	<LOD	690	<LOD	285
220	<LOD	150	529.6	300	37299.2	810	<LOD	675	<LOD	285
220	<LOD	165	<LOD	495	43596.8	929.6	<LOD	750	370.2	210
220	<LOD	165	<LOD	480	42291.2	880	<LOD	720	<LOD	300
221	<LOD	140.4	<LOD	420	32588.8	740	<LOD	600	386.8	180
221	<LOD	136.65	<LOD	390	30694.4	700	<LOD	585	<LOD	240
222	<LOD	136.8	<LOD	390	30284.8	700	<LOD	600	<LOD	255
222	<LOD	144.75	<LOD	435	36992	790	<LOD	630	332.8	180
223	<LOD	126.45	<LOD	345	23692.8	600	<LOD	525	<LOD	240
223	<LOD	136.05	<LOD	390	30284.8	700	<LOD	585	<LOD	240
224	<LOD	108.15	<LOD	285	19097.6	490	<LOD	450	<LOD	210
225	<LOD	103.8	<LOD	270	16793.6	460	<LOD	420	<LOD	195
226	<LOD	140.4	<LOD	405	32076.8	730	<LOD	615	<LOD	255
227	<LOD	120.9	<LOD	360	26188.8	620	<LOD	540	<LOD	225
227	<LOD	135.3	424.8	270	31897.6	700	<LOD	600	<LOD	255
227	<LOD	128.55	<LOD	390	33996.8	700	<LOD	570	<LOD	240
227	<LOD	128.25	<LOD	375	29286.4	680	<LOD	585	<LOD	240
227	<LOD	139.65	470.4	280	32384	740	<LOD	615	<LOD	270

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station	Sample ID	Result Type	Date Collected	Field Sample Type	Media description	Start Depth (ft)	End Depth (ft)	Station #	La	+/- 3SD
WBG-229	WBG4102	REG	10/21/2000	Grab	Surface Soil	0	1	**229**	<LOD	47.25
WBG-229	WBG4103	REG	10/25/2000	Grab	Subsurface soil	2	4	**229**	66	38.7
WBG-230	WBG4105	REG	10/20/2000	Grab	Surface Soil	0	1	**230**	<LOD	55.2
WBG-231	WBG4108	REG	10/21/2000	Grab	Surface Soil	0	1	**231**	<LOD	41.55
WBG-231	WBG4109	REG	10/22/2000	Grab	Subsurface soil	2	4	**231**	<LOD	46.05
WBG-232	WBG4111	DUP	10/22/2000	Grab	Surface Soil	0	1	**232**	<LOD	57.45
WBG-232	WBG4111	REG	10/22/2000	Grab	Surface Soil	0	1	**232**	<LOD	45
WBG-232	WBG4112	REG	10/22/2000	Grab	Subsurface soil	2	4	**232**	<LOD	51.6
WBG-232	WBG4113	REG	10/22/2000	Grab	Subsurface soil	4	6	**232**	<LOD	55.05
WBG-232	WBG4114	REG	10/22/2000	Grab	Subsurface soil	6	8	**232**	<LOD	52.05
WBG-232	WBG4115	REG	10/22/2000	Grab	Subsurface soil	8	10	**232**	<LOD	59.25
WBG-233	WBG4116	REG	10/20/2000	Grab	Surface Soil	0	1	**233**	<LOD	54
WBG-234	WBG4119	REG	10/19/2000	Grab	Surface Soil	0	1	**234**	59.8	35.9
WBG-235	WBG4122	REG	10/19/2000	Grab	Surface Soil	0	1	**235**	<LOD	52.2
WBG-236	WBG4125	REG	10/20/2000	Grab	Surface Soil	0	1	**236**	<LOD	54.15
WBG-236	WBG4270	REG	10/20/2000	Field Duplicate	Surface Soil	0	1	**236**	<LOD	66.6
WBG-237	WBG4128	REG	10/22/2000	Grab	Surface Soil	0	1	**237**	<LOD	61.65
WBG-237	WBG4129	REG	10/22/2000	Grab	Subsurface soil	2	4	**237**	<LOD	54
WBG-237	WBG4130	REG	10/22/2000	Grab	Subsurface soil	4	6	**237**	<LOD	57.45
WBG-237	WBG4131	REG	10/22/2000	Grab	Subsurface soil	6	8	**237**	<LOD	48.6
WBG-237	WBG4132	REG	10/22/2000	Grab	Subsurface soil	8	10	**237**	<LOD	49.95
WBG-238	WBG4133	REG	10/21/2000	Grab	Surface Soil	0	1	**238**	<LOD	58.5

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD	Cd	+/- 3SD
229	365.4	69	<LOD	49.35	<LOD	66.9	<LOD	51.6	<LOD	143.25	<LOD	39
229	363	71	<LOD	55.2	<LOD	74.4	<LOD	48.3	<LOD	144.6	<LOD	37.8
230	316.2	73.4	<LOD	64.95	<LOD	77.7	<LOD	56.7	<LOD	165	<LOD	44.4
231	422	77.3	<LOD	58.35	<LOD	79.35	<LOD	62.25	<LOD	150	60.4	37.7
231	418	77.1	<LOD	68.85	<LOD	66.45	<LOD	56.25	<LOD	144.6	<LOD	39.45
232	309.8	76.4	<LOD	69.9	<LOD	87.3	<LOD	63	<LOD	165	92.1	47.7
232	368.8	73.9	<LOD	57.15	<LOD	68.4	<LOD	54.9	<LOD	150	<LOD	52.65
232	482.4	86.4	<LOD	67.95	<LOD	60.9	<LOD	69.3	<LOD	165	216.2	59.4
232	498	84.4	<LOD	60.75	<LOD	76.2	<LOD	54.15	<LOD	150	<LOD	48.9
232	421.6	81.1	<LOD	57.6	<LOD	68.55	<LOD	58.2	<LOD	165	<LOD	55.65
232	334.6	83.2	<LOD	66.9	<LOD	89.1	<LOD	69.15	<LOD	180	<LOD	51.15
233	380.8	82.7	<LOD	67.05	<LOD	74.4	<LOD	66.6	<LOD	165	<LOD	51.45
234	451.6	73.2	<LOD	52.35	<LOD	62.4	<LOD	51.9	<LOD	131.25	<LOD	41.1
235	424.4	82.6	<LOD	68.85	<LOD	76.35	<LOD	68.25	<LOD	180	<LOD	52.35
236	348	74.4	<LOD	61.65	<LOD	84.6	<LOD	61.95	<LOD	150	<LOD	47.4
236	442.4	92.9	<LOD	78.6	<LOD	86.55	<LOD	71.1	<LOD	165	<LOD	55.05
237	367.2	82.5	<LOD	69.3	<LOD	76.35	<LOD	63.75	<LOD	165	<LOD	42.9
237	444	81.4	<LOD	64.65	<LOD	71.4	<LOD	50.85	<LOD	150	<LOD	42.75
237	373.2	78.1	<LOD	73.8	<LOD	73.5	<LOD	56.25	<LOD	150	<LOD	44.7
237	429.2	78.7	<LOD	56.85	<LOD	72.3	<LOD	54.45	<LOD	146.1	<LOD	40.05
237	462.8	79	<LOD	61.5	<LOD	68.55	<LOD	56.1	<LOD	142.2	<LOD	39.15
238	433.6	82.6	<LOD	66.3	<LOD	63.75	<LOD	60.9	<LOD	165	<LOD	41.7

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD	Rb	+/- 3SD
229	<LOD	180	<LOD	29.85	<LOD	8.55	342.6	12	59.2	7.3	104.3	9.8
229	<LOD	195	<LOD	36.6	<LOD	9	273.8	12.2	71.6	8.5	143.1	12.3
230	<LOD	210	<LOD	34.65	13.4	6	338.4	12.3	60.4	7.5	123.2	10.8
231	<LOD	195	<LOD	37.5	9.2	6.1	334	12.7	75.7	8.3	85	9.6
231	<LOD	195	<LOD	35.4	10.4	6.1	318.8	12.7	73.7	8.3	119	11
232	<LOD	225	<LOD	37.8	14	5.9	280.8	11.8	70.4	8.1	111.8	10.6
232	<LOD	195	<LOD	42.9	10	6.2	304	12.8	76.1	8.6	97.6	10.4
232	<LOD	195	<LOD	39.3	<LOD	8.85	272.6	12.2	74.3	8.6	147.3	12.3
232	<LOD	195	<LOD	37.95	<LOD	8.55	229.4	11.4	87.8	8.8	152.9	12.3
232	<LOD	195	<LOD	33.45	<LOD	9.3	289	12.8	102	9.4	144.3	12.5
232	<LOD	225	<LOD	42.6	<LOD	8.7	273.6	11.7	75	8.3	140.6	11.9
233	<LOD	225	<LOD	40.8	12.8	6.2	312.4	12.8	64.5	8.3	133.5	11.8
234	<LOD	165	<LOD	32.7	<LOD	9.3	285.4	13	114.8	9.9	119.9	11.8
235	<LOD	210	<LOD	39	16.4	6.2	299.8	12.4	78	8.5	111.2	10.8
236	<LOD	210	<LOD	34.5	11.5	6	283.8	12.1	73.5	8.3	129.7	11.4
236	<LOD	240	<LOD	44.85	<LOD	8.25	269.4	11.3	66.5	7.8	133.2	11.1
237	<LOD	210	<LOD	41.1	11.1	5.9	306.8	12.1	66.1	7.8	125.6	11
237	<LOD	195	<LOD	40.05	10.8	5.6	281.4	11.4	64.3	7.7	121.9	10.6
237	<LOD	210	<LOD	38.1	14.3	6.1	238	11.8	74.6	8.7	124.6	11.7
237	<LOD	195	<LOD	38.25	11.6	5.9	236.4	11.5	73.4	8.5	122.9	11.5
237	<LOD	195	<LOD	37.65	8.6	5.5	264.2	11	82.9	8	102	9.8
238	<LOD	195	<LOD	39.6	<LOD	8.7	300	11.9	63.1	7.7	123.4	11

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD	Cu	+/- 3SD
229	24.2	11.3	<LOD	7.65	<LOD	13.2	<LOD	10.8	78.5	27.5	<LOD	61.95
229	19.6	12.7	<LOD	9.15	16.3	10.3	<LOD	11.7	103	32.1	<LOD	72.15
230	24.5	11.9	<LOD	8.7	<LOD	13.5	<LOD	11.1	74.2	28.3	<LOD	63.75
231	275	24.2	<LOD	9.15	<LOD	24.6	<LOD	12.45	333.4	40.5	<LOD	74.55
231	<LOD	17.7	<LOD	9.15	15.2	9.8	<LOD	11.4	86.5	30	<LOD	67.95
232	42.1	13.5	<LOD	9.15	<LOD	15.75	<LOD	11.1	108.8	31.1	<LOD	70.8
232	43.3	14.2	<LOD	9.45	<LOD	15.75	<LOD	11.7	85.9	31.2	<LOD	72.75
232	173	20.8	<LOD	9.45	<LOD	22.2	<LOD	12	140.8	33.8	<LOD	74.4
232	57	14.6	<LOD	8.25	<LOD	16.35	<LOD	11.4	89.1	30.8	<LOD	71.7
232	60.8	15.6	<LOD	9.6	20	12	<LOD	11.4	96.7	32.2	<LOD	72.45
232	<LOD	17.55	<LOD	8.1	20.1	10	<LOD	12.15	90.6	30.5	<LOD	68.25
233	23.8	12.5	<LOD	8.55	<LOD	15	<LOD	11.7	90.6	31.1	<LOD	71.4
234	195.6	22.6	<LOD	9.9	<LOD	24.15	<LOD	13.65	1040	68.7	755.6	89.1
235	201.2	21.7	<LOD	9.3	<LOD	22.65	<LOD	13.35	1140	65.8	309.2	72
236	24.3	12.4	<LOD	8.4	<LOD	14.85	<LOD	11.7	96.2	30.7	<LOD	69.3
236	25.2	12	<LOD	8.55	<LOD	14.25	<LOD	10.8	128	30.8	<LOD	67.05
237	<LOD	16.95	<LOD	8.4	<LOD	13.8	<LOD	10.8	86.4	29.4	<LOD	67.65
237	34.6	12.4	<LOD	7.8	<LOD	13.65	<LOD	11.1	71	28.2	<LOD	66.15
237	<LOD	18.6	<LOD	9.3	15.7	10.2	<LOD	11.7	79.6	31.4	<LOD	73.35
237	<LOD	18.9	<LOD	9.6	<LOD	14.7	<LOD	10.8	67.7	30.2	<LOD	71.1
237	<LOD	15.6	<LOD	8.4	18.1	9	<LOD	10.8	78.9	28	<LOD	64.65
238	31	12.6	<LOD	9	<LOD	14.7	<LOD	11.4	77.2	29.3	<LOD	67.95

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
229	<LOD	106.95	<LOD	285	18688	490	<LOD	420	<LOD	195
229	<LOD	142.5	<LOD	435	35686.4	780	<LOD	630	327.2	180
230	<LOD	109.05	<LOD	300	19097.6	510	<LOD	450	<LOD	210
231	<LOD	126.9	<LOD	345	24396.8	600	<LOD	525	<LOD	225
231	<LOD	126.9	<LOD	360	26496	640	<LOD	555	<LOD	240
232	<LOD	129.45	<LOD	375	29184	660	<LOD	570	<LOD	240
232	<LOD	136.65	<LOD	390	29696	700	<LOD	600	<LOD	255
232	<LOD	144.9	<LOD	435	36198.4	770	<LOD	645	<LOD	270
232	<LOD	140.4	<LOD	405	34176	740	<LOD	615	<LOD	255
232	<LOD	147.3	<LOD	420	34688	770	<LOD	645	<LOD	270
232	<LOD	134.25	<LOD	405	33280	730	<LOD	600	<LOD	255
233	<LOD	129.6	<LOD	375	27187.2	660	<LOD	555	<LOD	240
234	<LOD	146.4	<LOD	375	25292.8	660	874.4	400	<LOD	270
235	<LOD	133.35	<LOD	360	25792	630	594.4	370	<LOD	240
236	<LOD	131.25	<LOD	375	29184	670	<LOD	570	<LOD	240
236	<LOD	125.85	<LOD	360	28979.2	640	<LOD	540	<LOD	225
237	<LOD	117.15	<LOD	330	23897.6	590	<LOD	510	<LOD	225
237	<LOD	129.6	<LOD	375	32076.8	680	<LOD	555	<LOD	225
237	<LOD	139.05	<LOD	420	33382.4	760	<LOD	630	<LOD	255
237	<LOD	139.5	<LOD	420	33484.8	750	<LOD	630	<LOD	255
237	<LOD	124.05	<LOD	345	27596.8	610	<LOD	525	<LOD	210
238	<LOD	116.85	<LOD	315	21299.2	550	<LOD	495	<LOD	225

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station	Sample ID	Result Type	Date Collected	Field Sample Type	Media description	Start Depth (ft)	End Depth (ft)	Station #	La	+/- 3SD
WBG-239	WBG4136	REG	10/21/2000	Grab	Surface Soil	0	1	**239**	<LOD	65.1
WBG-240	WBG4139	REG	10/21/2000	Grab	Surface Soil	0	1	**240**	<LOD	63.3
WBG-240	WBG4140	REG	10/25/2000	Grab	Subsurface soil	2	4	**240**	<LOD	54
WBG-241	WBG4142	REG	10/21/2000	Grab	Surface Soil	0	1	**241**	<LOD	54.3
WBG-241	WBG4271	REG	10/21/2000	Field Duplicate	Surface Soil	0	1	**241**	<LOD	52.8
WBG-242	WBG4145	REG	10/22/2000	Grab	Surface Soil	0	1	**242**	<LOD	41.85
WBG-242	WBG4146	REG	10/22/2000	Grab	Subsurface soil	2	4	**242**	<LOD	43.8
WBG-242	WBG4147	REG	10/22/2000	Grab	Subsurface soil	4	6	**242**	<LOD	46.8
WBG-242	WBG4148	REG	10/22/2000	Grab	Subsurface soil	6	8	**242**	<LOD	49.95
WBG-242	WBG4149	REG	10/22/2000	Grab	Subsurface soil	8	10	**242**	<LOD	50.7
WBG-243	WBG4150	REG	10/21/2000	Grab	Surface Soil	0	1	**243**	<LOD	59.1
WBG-243	WBG4151	REG	10/23/2000	Grab	Subsurface soil	2	3.8	**243**	<LOD	49.65
WBG-243	WBG4273	REG	10/23/2000	Field Duplicate	Subsurface soil	2	3.8	**243**	<LOD	51.75
WBG-245	WBG4156	REG	10/23/2000	Grab	Surface Soil	0	1	**245**	<LOD	63
WBG-246	WBG4159	REG	10/23/2000	Grab	Surface Soil	0	1	**246**	<LOD	90.45
WBG-246	WBG4160	REG	10/25/2000	Grab	Subsurface soil	2	4	**246**	<LOD	54.75
WBG-247	WBG4162	REG	10/22/2000	Grab	Surface Soil	0	1	**247**	<LOD	60.45
WBG-247	WBG4163	REG	10/22/2000	Grab	Subsurface soil	2	4	**247**	<LOD	54.3
WBG-249	WBG4170	REG	10/23/2000	Grab	Surface Soil	0	1	**249**	<LOD	58.65
WBG-250	WBG4173	REG	10/23/2000	Grab	Surface Soil	0	1	**250**	<LOD	60.6
WBG-251	WBG4176	REG	10/23/2000	Grab	Surface Soil	0	1	**251**	91.6	56.7
WBG-251	WBG4176	DUP	10/23/2000	Grab	Surface Soil	0	1	**251**	<LOD	47.25

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD	Cd	+/- 3SD
239	324	78.5	<LOD	63.3	<LOD	73.05	<LOD	60	<LOD	165	<LOD	46.95
240	686	110	<LOD	66.9	<LOD	85.65	<LOD	62.55	<LOD	165	<LOD	51
240	400.8	80.3	<LOD	55.8	<LOD	71.85	<LOD	58.35	<LOD	150	<LOD	36.15
241	306.2	69.8	<LOD	56.1	<LOD	64.8	<LOD	48.45	<LOD	165	<LOD	45.75
241	304.6	76.4	<LOD	58.5	<LOD	81.75	<LOD	62.25	<LOD	180	<LOD	41.4
242	405.2	72.4	<LOD	52.65	<LOD	65.1	<LOD	52.2	<LOD	145.65	<LOD	36.45
242	360.8	64.2	<LOD	50.4	<LOD	55.05	<LOD	43.65	<LOD	132	<LOD	35.85
242	332.8	63.1	<LOD	50.1	<LOD	66	<LOD	46.65	<LOD	133.8	<LOD	36.6
242	356	65.7	<LOD	53.25	<LOD	62.4	<LOD	51.6	<LOD	137.85	<LOD	39.45
242	295	66.1	<LOD	58.35	<LOD	70.5	<LOD	52.35	<LOD	150	<LOD	34.35
243	986.4	110	<LOD	63.3	<LOD	78.3	<LOD	50.25	<LOD	150	<LOD	43.5
243	393.2	71.7	<LOD	54.6	<LOD	69.3	<LOD	56.1	<LOD	150	<LOD	31.95
243	459.6	77.4	<LOD	56.55	<LOD	66.75	<LOD	46.5	<LOD	138.6	<LOD	35.85
245	3040	230	<LOD	106.8	<LOD	81.3	<LOD	61.35	<LOD	165	<LOD	44.7
246	8396.8	500	<LOD	165	<LOD	100.5	175.2	55.6	<LOD	195	144.8	39.8
246	460.8	86.3	<LOD	65.4	<LOD	74.1	<LOD	42.6	<LOD	150	<LOD	46.65
247	2259.2	210	<LOD	104.55	<LOD	82.95	194.7	65.7	<LOD	180	<LOD	51.9
247	698.8	110	<LOD	66.15	<LOD	78.15	<LOD	62.1	<LOD	150	<LOD	47.4
249	2388.8	210	<LOD	100.8	<LOD	91.05	<LOD	66.6	<LOD	180	<LOD	47.4
250	2579.2	220	<LOD	101.85	<LOD	79.2	<LOD	68.4	<LOD	165	<LOD	42.15
251	423.2	99.5	<LOD	69.15	<LOD	94.95	<LOD	79.95	<LOD	195	<LOD	64.35
251	480.8	93.3	<LOD	59.55	<LOD	77.55	<LOD	64.8	<LOD	165	<LOD	37.2

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD	Rb	+/- 3SD
239	<LOD	210	<LOD	43.8	13.2	6.3	311.4	12.9	65.8	8.4	138.1	12.1
240	<LOD	225	<LOD	36.9	13.1	5.7	245	11.3	84.5	8.5	131.8	11.3
240	<LOD	195	<LOD	35.7	<LOD	9.3	355.8	13.5	69.1	8.4	118.5	11.1
241	<LOD	195	<LOD	32.55	13.3	6.5	386.6	13.8	59.2	8.1	119.8	11.2
241	<LOD	210	<LOD	38.85	17.2	6.2	352.2	12.8	63.9	7.9	120.3	10.7
242	<LOD	180	<LOD	34.35	14.1	5.9	335	12.2	75.6	7.9	102.4	9.9
242	<LOD	165	<LOD	29.1	<LOD	8.7	374	12.6	74.6	7.8	116	10.1
242	<LOD	165	<LOD	31.8	14.3	6.9	443.6	15	70.7	8.6	103.3	10.7
242	<LOD	180	<LOD	39.9	15.1	6.6	403	14	67.9	8.2	92.5	10
242	<LOD	180	<LOD	36.3	19	7	461.6	15.1	66.4	8.4	102.5	10.6
243	<LOD	195	<LOD	36.75	10.8	6.2	323.6	12.9	71.8	8.3	121.8	11.2
243	<LOD	180	<LOD	34.2	13.5	6.2	236.6	12.1	78.1	9	154	13.1
243	<LOD	195	<LOD	36	14.8	6	232	11.7	85.2	9	149.6	12.6
245	<LOD	210	<LOD	39.6	13.4	6	280.2	12.1	92.1	8.7	121.7	11.1
246	<LOD	240	<LOD	47.25	15.2	6.4	291.8	13.2	142.5	10.4	118.3	11.5
246	<LOD	210	<LOD	43.2	9.8	5.8	310	12	77.4	8	121.9	10.8
247	<LOD	210	<LOD	38.4	<LOD	9.3	290.2	13.5	251.4	12.8	122	12.1
247	<LOD	210	<LOD	36.3	<LOD	9.3	271.6	12.8	98.5	9.6	137.9	12.6
249	<LOD	210	<LOD	44.1	11	6.1	360.2	12.9	87.7	8.3	85.6	9.3
250	<LOD	210	<LOD	33.75	12.4	5.7	281.4	11.6	83.8	8.2	130.8	11
251	<LOD	240	<LOD	48.75	12.9	5.9	297.2	11.9	69	7.8	119.8	10.8
251	<LOD	210	<LOD	44.7	13.1	5.8	300.6	11.7	69.4	7.7	128.5	10.9

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Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD	Cu	+/- 3SD
239	<LOD	17.85	<LOD	9.6	<LOD	14.7	<LOD	11.55	52.5	29.5	<LOD	70.95
240	129.7	18	<LOD	8.55	<LOD	19.2	<LOD	12.15	964.8	59.2	137.6	63.3
240	<LOD	18.75	<LOD	9.45	21.8	10.6	<LOD	12.3	71.9	30.2	<LOD	70.2
241	19.1	12.4	<LOD	9	16.4	10.1	<LOD	11.55	68.4	30	<LOD	69.6
241	23.3	12.1	<LOD	8.7	20.5	10	<LOD	10.65	68.3	28.8	<LOD	68.4
242	<LOD	16.8	<LOD	8.7	<LOD	13.8	<LOD	11.25	57.7	27.5	<LOD	64.65
242	<LOD	16.65	<LOD	8.1	<LOD	13.5	<LOD	10.8	66.5	27.1	<LOD	61.95
242	<LOD	18.45	<LOD	9.6	23.2	10.7	<LOD	12.45	106.4	32.7	<LOD	74.1
242	<LOD	17.25	<LOD	9.45	27.4	10.2	<LOD	11.25	97	31.1	<LOD	69.9
242	30.2	13.5	<LOD	9.45	<LOD	15.9	<LOD	12.3	93.5	32.2	<LOD	74.1
243	55.2	14.5	<LOD	9	<LOD	16.5	<LOD	11.55	131.7	32.8	<LOD	72.45
243	<LOD	19.2	<LOD	9.15	<LOD	15.3	<LOD	11.85	72.3	32	<LOD	76.95
243	<LOD	19.2	<LOD	9.9	19.9	10.6	<LOD	11.85	74	31.3	<LOD	76.35
245	28.5	12.6	<LOD	8.55	<LOD	15.15	<LOD	11.4	262	38.4	90.6	53.3
246	163.7	20.7	<LOD	9.45	<LOD	21.75	<LOD	12.75	1500	77.4	686.4	89.1
246	<LOD	17.1	<LOD	8.4	<LOD	13.5	<LOD	11.25	99.3	29.7	<LOD	66.3
247	362.6	28.9	<LOD	9.9	<LOD	29.85	<LOD	15.3	2108.8	91.9	811.2	99.5
247	318.8	27.7	<LOD	10.05	37.6	19.7	<LOD	13.2	704.4	56.5	<LOD	93.15
249	137.8	17.9	<LOD	8.1	<LOD	19.05	<LOD	11.55	328	39.3	<LOD	75.6
250	54.1	13.7	<LOD	8.4	<LOD	15.15	<LOD	11.25	309.8	38.6	107.3	51.6
251	31.9	12.2	<LOD	7.65	<LOD	13.65	<LOD	10.65	110.4	30	<LOD	63.15
251	23.5	11.6	<LOD	8.4	<LOD	13.35	<LOD	10.05	91.5	28.7	<LOD	63.75

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
239	<LOD	138.3	<LOD	405	31590.4	730	<LOD	600	<LOD	255
240	<LOD	136.8	<LOD	390	31180.8	680	<LOD	570	<LOD	240
240	<LOD	142.2	<LOD	420	35379.2	760	<LOD	645	<LOD	255
241	<LOD	133.05	<LOD	390	31078.4	700	<LOD	570	<LOD	240
241	<LOD	134.25	<LOD	390	33894.4	710	<LOD	570	<LOD	240
242	<LOD	124.05	<LOD	345	27084.8	610	<LOD	525	<LOD	225
242	<LOD	124.5	<LOD	360	30284.8	640	<LOD	540	<LOD	225
242	<LOD	138.6	<LOD	420	32076.8	730	687.2	420	<LOD	285
242	<LOD	132.75	<LOD	390	31180.8	700	735.2	410	<LOD	270
242	<LOD	143.1	<LOD	420	33382.4	750	<LOD	615	<LOD	255
243	<LOD	125.4	<LOD	360	26099.2	630	<LOD	525	<LOD	225
243	179.2	100	<LOD	450	36889.6	820	<LOD	675	<LOD	270
243	<LOD	149.1	<LOD	435	35993.6	780	<LOD	645	<LOD	285
245	<LOD	129.45	<LOD	345	25497.6	620	<LOD	555	<LOD	255
246	<LOD	145.2	<LOD	375	25792	650	<LOD	570	<LOD	270
246	<LOD	121.2	<LOD	345	26188.8	610	<LOD	540	278.2	160
247	<LOD	150	<LOD	405	30284.8	720	<LOD	600	<LOD	270
247	<LOD	150	<LOD	435	35891.2	810	<LOD	660	<LOD	270
249	<LOD	115.35	<LOD	315	19891.2	520	<LOD	465	<LOD	210
250	<LOD	115.65	<LOD	300	19891.2	520	<LOD	480	<LOD	225
251	<LOD	107.85	<LOD	300	18598.4	510	<LOD	480	<LOD	210
251	<LOD	109.8	<LOD	285	18496	500	491.2	310	<LOD	210

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station	Sample ID	Result Type	Date Collected	Field Sample Type	Media description	Start Depth (ft)	End Depth (ft)	Station #	La	+/- 3SD
WBG-252	WBG4179	REG	10/22/2000	Grab	Surface Soil	0	1	**252**	<LOD	66
WBG-252	WBG4180	REG	10/22/2000	Grab	Subsurface soil	2	4	**252**	<LOD	58.05
WBG-252	WBG4181	REG	10/22/2000	Grab	Subsurface soil	4	6	**252**	<LOD	56.25
WBG-252	WBG4182	REG	10/22/2000	Grab	Subsurface soil	6	8	**252**	<LOD	50.55
WBG-252	WBG4183	REG	10/22/2000	Grab	Subsurface soil	8	10	**252**	<LOD	46.2
WBG-252	WBG4179	DUP	10/22/2000	Grab	Surface Soil	0	1	**252**	<LOD	65.7
WBG-253	WBG4184	REG	10/17/2000	Grab	Surface Soil	0	1	**253**	<LOD	63.15
WBG-254	WBG4187	REG	10/16/2000	Grab	Surface Soil	0	1	**254**	<LOD	75.6
WBG-254	WBG4188	REG	10/19/2000	Grab	Subsurface soil	2	4	**254**	<LOD	52.2
WBG-255	WBG4190	REG	10/17/2000	Grab	Surface Soil	0	1	**255**	<LOD	76.2
WBG-255	WBG4191	REG	10/19/2000	Grab	Subsurface soil	2	4	**255**	<LOD	63.45
WBG-256	WBG4193	REG	10/17/2000	Grab	Surface Soil	0	1	**256**	<LOD	61.35
WBG-257	WBG4196	REG	10/30/2000	Grab	Surface Soil	0	1	**257**	<LOD	48.3
WBG-257	WBG4275	REG	10/30/2000	Field Duplicate	Surface Soil	0	1	**257**	<LOD	51.75
WBG-257	WBG4197	REG	10/30/2000	Grab	Subsurface soil	2	4	**257**	<LOD	55.95
WBG-257	WBG4198	REG	10/30/2000	Grab	Subsurface soil	4	6	**257**	<LOD	53.4
WBG-257	WBG4199	REG	10/30/2000	Grab	Subsurface soil	6	8	**257**	<LOD	56.4
WBG-257	WBG4276	REG	10/30/2000	Field Duplicate	Subsurface soil	6	8	**257**	63.1	39.5
WBG-257	WBG4200	REG	10/30/2000	Grab	Subsurface soil	8	9.1	**257**	<LOD	53.1
WBG-258	WBG4201	REG	11/01/2000	Grab	Surface Soil	0	1	**258**	72.9	43.4
WBG-259	WBG4204	REG	10/23/2000	Grab	Surface Soil	0	1	**259**	63.1	37.4
WBG-260	WBG4207	REG	10/23/2000	Grab	Surface Soil	0	1	**260**	<LOD	58.5

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD	Cd	+/- 3SD
252	1380	150	<LOD	85.5	<LOD	93.15	<LOD	71.25	<LOD	165	<LOD	51
252	1260	160	<LOD	81.15	<LOD	82.05	<LOD	78.75	<LOD	180	<LOD	40.95
252	570	92.1	<LOD	65.4	<LOD	78.45	<LOD	57.3	<LOD	150	<LOD	42.75
252	428.8	80.4	<LOD	55.95	<LOD	66.75	<LOD	54.15	<LOD	150	<LOD	46.05
252	554	85.9	<LOD	62.55	<LOD	73.65	<LOD	55.8	<LOD	150	<LOD	43.05
252	402.2	84.7	<LOD	67.5	<LOD	75	<LOD	63	<LOD	165	<LOD	40.8
253	903.2	110	<LOD	68.1	<LOD	61.05	<LOD	47.7	<LOD	150	<LOD	43.8
254	2708.8	210	<LOD	99.6	<LOD	81.3	<LOD	58.35	<LOD	165	<LOD	41.7
254	424.8	80.9	<LOD	64.05	<LOD	79.5	<LOD	54.6	<LOD	150	<LOD	39.15
255	2889.6	240	<LOD	111.15	<LOD	90.9	81.1	48.4	<LOD	180	<LOD	39.9
255	477.6	90.5	<LOD	58.2	<LOD	78.15	<LOD	55.2	<LOD	165	<LOD	40.65
256	3817.6	250	<LOD	110.7	<LOD	81.75	<LOD	52.5	<LOD	150	45.4	26.6
257	786.8	100	<LOD	68.7	<LOD	64.95	<LOD	54.75	<LOD	142.35	<LOD	35.4
257	1120	120	<LOD	79.5	<LOD	69.3	<LOD	60.3	<LOD	145.35	<LOD	40.8
257	504.8	88	<LOD	63.9	<LOD	80.1	<LOD	57.9	<LOD	165	<LOD	39.75
257	438	83.1	<LOD	59.25	<LOD	74.85	<LOD	61.65	<LOD	165	<LOD	41.25
257	377	78.3	<LOD	52.8	<LOD	75.45	<LOD	51.9	<LOD	165	<LOD	40.35
257	380	73.8	<LOD	58.5	<LOD	64.8	<LOD	49.35	<LOD	148.35	<LOD	37.05
257	393.8	80.3	<LOD	56.7	<LOD	76.8	<LOD	63.9	<LOD	150	<LOD	35.25
258	383.6	78	<LOD	60.15	<LOD	68.25	<LOD	57	<LOD	165	<LOD	42.75
259	316.4	65.5	<LOD	56.4	<LOD	71.85	<LOD	61.8	<LOD	149.4	<LOD	31.65
260	320.6	75.8	<LOD	61.8	<LOD	77.7	95	55.4	<LOD	165	<LOD	57.9

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD	Rb	+/- 3SD
252	<LOD	225	<LOD	46.2	11.2	5.5	298	11.3	102.3	8.2	105.8	9.7
252	<LOD	240	<LOD	46.65	11.6	5.8	285.4	11.9	92.9	8.5	95.3	9.9
252	<LOD	195	<LOD	39	<LOD	8.55	246	11.6	84.1	8.6	148.8	12.1
252	<LOD	195	<LOD	35.7	<LOD	8.85	224.4	11.9	97.1	9.4	150.7	12.9
252	<LOD	195	<LOD	37.2	11.3	6.1	237	12.1	86.2	9.2	143.2	12.6
252	<LOD	210	<LOD	41.85	<LOD	8.85	252.6	12.1	86.2	8.9	160.4	12.8
253	<LOD	195	<LOD	33.75	10.8	5.8	334.2	12.1	71.7	7.7	91.8	9.3
254	<LOD	195	<LOD	35.4	<LOD	8.85	346	12.3	74	7.8	80	9
254	<LOD	195	<LOD	37.65	10.6	6.3	307	12.9	72.4	8.6	115.9	11.3
255	<LOD	210	<LOD	42.45	14.6	6	319.2	12.5	86.7	8.4	90	9.6
255	<LOD	225	<LOD	42	<LOD	9.9	381	14.1	75.9	8.8	139.1	12.3
256	<LOD	195	<LOD	35.25	14	5.6	303.6	11.5	78.8	7.7	112.3	9.7
257	<LOD	195	<LOD	36	11.4	5.8	351.4	12	66	7.3	88.9	9
257	<LOD	195	<LOD	35.1	11	5.8	348	12	73.4	7.6	94.5	9.4
257	<LOD	195	<LOD	37.2	<LOD	8.55	216.6	11.3	72.9	8.6	154.9	12.6
257	<LOD	195	<LOD	38.1	10.5	6.2	261.2	12.6	82.5	9.2	145	12.8
257	<LOD	210	<LOD	40.35	<LOD	8.55	229.2	11.4	86.6	8.8	152.9	12.5
257	<LOD	195	<LOD	35.55	<LOD	8.55	215.4	11.2	87.1	8.8	156.3	12.6
257	<LOD	195	<LOD	41.4	<LOD	8.85	226	11.8	94.1	9.3	153.4	12.9
258	<LOD	210	<LOD	43.2	<LOD	8.4	243.4	11.3	77.3	8.3	135	11.5
259	<LOD	180	<LOD	32.25	13.4	6.3	367.6	13.2	83.5	8.5	101.7	10.1
260	<LOD	210	<LOD	43.65	20.5	7.2	528	15.9	92.6	9	80.2	9.7

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD	Cu	+/- 3SD
252	180.6	18.9	<LOD	8.55	<LOD	19.65	<LOD	10.95	272.2	35.7	100.3	48.6
252	157.7	19.1	<LOD	8.85	<LOD	20.4	<LOD	11.85	254	37	77.5	50.2
252	42.3	13.8	<LOD	8.85	<LOD	15.9	<LOD	11.1	142.4	33.2	<LOD	73.5
252	23.1	13.3	<LOD	9.6	<LOD	15.9	<LOD	12.6	98.8	32.4	<LOD	72.15
252	43	14.7	<LOD	9.6	<LOD	17.25	<LOD	12.9	122.7	34	<LOD	75.9
252	33.1	13.3	<LOD	8.1	22.1	10.8	<LOD	11.55	106.6	31.7	<LOD	70.5
253	32.9	12.2	<LOD	8.55	<LOD	14.4	<LOD	10.05	104.4	29.1	<LOD	65.25
254	112.9	16.7	<LOD	8.4	<LOD	18.15	<LOD	11.4	246.6	36.1	<LOD	72.6
254	21.7	12.9	<LOD	9.6	<LOD	15.45	<LOD	11.85	55.8	29.9	<LOD	71.7
255	113.8	17.1	<LOD	9	<LOD	18.6	<LOD	11.55	459.6	43.7	<LOD	75.6
255	27	13.6	<LOD	9.9	23	11.2	<LOD	12	126.6	34.1	<LOD	76.05
256	26.5	11.3	<LOD	7.95	<LOD	13.8	<LOD	10.8	154.3	29.9	<LOD	62.25
257	87.2	15	<LOD	8.85	<LOD	16.65	<LOD	10.8	145.6	30.4	<LOD	65.4
257	132.8	17.2	<LOD	8.4	<LOD	18.15	<LOD	11.1	161.2	31.7	<LOD	68.85
257	39.7	14.1	<LOD	9.45	21.5	11.3	<LOD	11.85	97.6	31.9	<LOD	74.55
257	31.9	14.3	<LOD	9.9	28.8	12	<LOD	13.5	126.3	34.9	<LOD	78.9
257	20.7	12.7	<LOD	9.15	<LOD	14.85	<LOD	11.55	73.2	30.3	<LOD	72
257	22.9	12.8	<LOD	9	<LOD	15.15	<LOD	11.85	107.3	32	<LOD	73.05
257	25.9	13.2	<LOD	8.85	<LOD	15.3	<LOD	12.45	94.3	32.1	<LOD	73.5
258	26.9	12.5	<LOD	8.7	<LOD	14.85	<LOD	10.95	100.8	30.7	<LOD	70.5
259	127.3	18.1	<LOD	9.3	27.4	13.6	<LOD	11.25	171.4	34.8	113.8	52.8
260	317.2	26.5	<LOD	9.3	<LOD	27.45	<LOD	13.5	377.6	47.9	669.6	77.9

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
252	<LOD	111	<LOD	285	20697.6	510	<LOD	465	<LOD	210
252	<LOD	116.4	<LOD	315	20992	540	<LOD	480	<LOD	225
252	<LOD	137.85	<LOD	405	34278.4	740	<LOD	630	<LOD	255
252	<LOD	144.6	<LOD	435	34995.2	780	<LOD	660	<LOD	270
252	<LOD	144	<LOD	420	32793.6	760	<LOD	630	300	190
252	<LOD	140.25	<LOD	420	35584	770	<LOD	630	296	180
253	<LOD	112.35	<LOD	300	20889.6	520	<LOD	450	<LOD	195
254	<LOD	111	<LOD	300	19097.6	510	779.6	320	<LOD	210
254	<LOD	139.2	468	280	31385.6	730	<LOD	630	<LOD	255
255	<LOD	108.75	<LOD	285	17395.2	490	<LOD	435	<LOD	210
255	<LOD	150	<LOD	450	38886.4	829.6	<LOD	675	<LOD	270
256	<LOD	104.55	<LOD	285	18496	470	<LOD	435	273	140
257	<LOD	103.8	<LOD	285	17600	470	<LOD	435	<LOD	195
257	<LOD	107.55	<LOD	285	18598.4	490	<LOD	435	<LOD	210
257	<LOD	150	<LOD	465	42086.4	849.6	<LOD	690	<LOD	285
257	<LOD	165	<LOD	495	43699.2	909.6	<LOD	720	<LOD	300
257	<LOD	143.1	478.8	280	33996.8	750	<LOD	615	<LOD	270
257	<LOD	141.75	<LOD	420	33382.4	740	<LOD	615	<LOD	255
257	<LOD	145.5	<LOD	435	34483.2	770	<LOD	630	<LOD	255
258	<LOD	132.45	<LOD	375	30080	680	<LOD	555	325.8	160
259	<LOD	134.25	<LOD	390	31897.6	690	<LOD	585	<LOD	240
260	<LOD	150	<LOD	420	35686.4	770	<LOD	660	<LOD	270

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station	Sample ID	Result Type	Date Collected	Field Sample Type	Media description	Start Depth (ft)	End Depth (ft)	Station #	La	+/- 3SD
WBG-261	WBG4210	REG	10/23/2000	Grab	Surface Soil	0	1	**261**	<LOD	59.25
WBG-262	WBG4213	REG	11/01/2000	Grab	Surface Soil	0	1	**262**	<LOD	53.85
WBG-263	WBG4216	REG	11/01/2000	Grab	Surface Soil	0	1	**263**	<LOD	50.55
WBG-264	WBG4219	REG	10/30/2000	Grab	Surface Soil	0	1	**264**	<LOD	53.25
WBG-264	WBG4219	DUP	10/30/2000	Grab	Surface Soil	0	1	**264**	<LOD	57.6
WBG-265	WBG4220	REG	10/30/2000	Grab	Surface Soil	0	1	**265**	<LOD	43.8
WBG-266	WBG4221	REG	10/30/2000	Grab	Surface Soil	0	1	**266**	<LOD	49.35
WBG-266	WBG4279	REG	10/30/2000	Field Duplicate	Surface Soil	0	1	**266**	<LOD	49.8
WBG-267	WBG4222	REG	10/24/2000	Grab	Surface Soil	0	1	**267**	<LOD	48.75
WBG-268	WBG4223	REG	11/01/2000	Grab	Surface Soil	0	1	**268**	<LOD	55.2
WBG-268	WBG4281	REG	11/01/2000	Field Duplicate	Surface Soil	0	1	**268**	<LOD	57.75
WBG-269	WBG4224	REG	10/24/2000	Grab	Surface Soil	0	1	**269**	<LOD	58.8
WBG-270	WBG4225	REG	11/01/2000	Grab	Surface Soil	0	1	**270**	<LOD	51.75
WBG-271	WBG4226	REG	11/01/2000	Grab	Surface Soil	0	1	**271**	<LOD	46.8
WBG-272	WBG4227	REG	11/01/2000	Grab	Surface Soil	0	1	**272**	<LOD	43.2
WBG-273	WBG4228	REG	11/01/2000	Grab	Surface Soil	0	1	**273**	<LOD	53.85
WBG-273	WBG4228	DUP	11/01/2000	Grab	Surface Soil	0	1	**273**	<LOD	43.2
WBG-274	WBG4229	REG	10/24/2000	Grab	Surface Soil	0	1	**274**	<LOD	54.15
WBG-275	WBG4230	REG	10/24/2000	Grab	Surface Soil	0	1	**275**	<LOD	47.4
WBG-276	WBG4231	REG	10/24/2000	Grab	Surface Soil	0	1	**276**	<LOD	58.65
WBG-277	WBG4232	REG	10/24/2000	Grab	Surface Soil	0	1	**277**	<LOD	45.15
WBG-278	WBG4233	REG	10/24/2000	Grab	Surface Soil	0	1	**278**	<LOD	48.75

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD	Cd	+/- 3SD
261	513.2	100	<LOD	73.95	<LOD	79.95	154.5	66.2	<LOD	180	<LOD	42.45
262	407	85.1	<LOD	69.45	<LOD	79.05	<LOD	69.45	<LOD	165	<LOD	42
263	367.8	67.2	<LOD	55.65	<LOD	58.2	<LOD	47.7	<LOD	139.95	<LOD	36.9
264	446.8	81.4	<LOD	59.85	<LOD	68.55	<LOD	58.95	<LOD	149.55	<LOD	45.75
264	388.2	82.6	<LOD	66.9	<LOD	79.5	<LOD	51.75	<LOD	165	<LOD	40.5
265	371.2	68.8	<LOD	56.7	<LOD	67.65	<LOD	43.95	<LOD	145.8	<LOD	36.3
266	415.2	71.4	<LOD	52.5	<LOD	61.2	<LOD	41.1	<LOD	139.2	<LOD	40.05
266	521.2	90.1	<LOD	60.15	<LOD	66.45	<LOD	60.75	<LOD	165	<LOD	37.2
267	380.4	68.4	<LOD	55.2	<LOD	64.05	<LOD	57.15	<LOD	139.65	<LOD	38.25
268	365.6	79.8	<LOD	71.55	<LOD	65.4	<LOD	50.4	<LOD	165	<LOD	46.65
268	428.8	79.7	<LOD	62.1	<LOD	72.15	<LOD	51.15	<LOD	147.75	<LOD	38.4
269	337	76	<LOD	62.85	<LOD	79.8	<LOD	55.65	<LOD	165	<LOD	42.9
270	418.4	76.2	<LOD	54.9	<LOD	70.35	<LOD	56.55	<LOD	142.95	<LOD	43.35
271	795.2	120	<LOD	70.35	<LOD	76.95	<LOD	55.95	<LOD	165	<LOD	47.1
272	538.8	87.8	<LOD	65.85	<LOD	76.65	<LOD	53.55	<LOD	150	<LOD	48
273	384.8	86.3	<LOD	72.6	<LOD	85.8	<LOD	65.55	<LOD	165	<LOD	43.05
273	356.4	80.2	<LOD	63	<LOD	84.3	<LOD	57.9	<LOD	165	<LOD	49.05
274	328.2	71.2	<LOD	63.3	<LOD	69.3	<LOD	60.75	<LOD	165	<LOD	44.7
275	347	73.5	<LOD	63.3	<LOD	73.05	<LOD	52.2	<LOD	165	<LOD	39.15
276	495.2	86.2	<LOD	58.95	<LOD	70.5	<LOD	49.05	<LOD	150	<LOD	45.45
277	365.6	70.1	<LOD	59.4	<LOD	67.8	<LOD	54.75	<LOD	141	<LOD	42.75
278	380.4	68.4	<LOD	55.2	<LOD	64.05	<LOD	57.15	<LOD	139.65	<LOD	38.25

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD	Rb	+/- 3SD
261	<LOD	240	<LOD	45.9	15.7	6.8	365	14.4	145.2	10.7	68.1	9.7
262	<LOD	210	<LOD	37.05	<LOD	8.7	208.4	11.6	111	9.7	145.5	12.7
263	<LOD	180	<LOD	34.35	<LOD	8.55	258.6	11.9	92.1	8.8	127.6	11.4
264	<LOD	195	<LOD	37.95	11.8	5.8	314	11.9	71.9	7.8	116.9	10.4
264	<LOD	210	<LOD	39.45	13.4	5.5	319.8	11.2	64.6	7.1	122.3	10
265	<LOD	180	<LOD	39.9	11.7	6	352	12.5	66.4	7.6	108.7	10.2
266	<LOD	180	<LOD	35.85	15.8	6	306.6	12	66.2	7.8	125.1	11
266	<LOD	195	<LOD	40.65	12.4	5.4	319.8	11.1	59	6.9	127.8	10.1
267	<LOD	180	<LOD	32.85	11.4	5.7	302.2	11.5	61.4	7.4	103.7	9.8
268	<LOD	210	<LOD	41.25	14.2	5.7	253.2	11.1	55.7	7.5	116.3	10.6
268	<LOD	195	<LOD	31.8	8.8	5.5	250.6	11	65.2	7.6	126.3	10.7
269	<LOD	210	<LOD	40.65	10.5	5.8	349.6	12.1	62	7.3	95.1	9.4
270	<LOD	195	<LOD	33.75	11.3	5.7	338.2	11.9	60.4	7.2	102.4	9.6
271	<LOD	210	<LOD	48.6	14.1	5.6	303.2	11.4	68.1	7.4	89.8	9.1
272	<LOD	195	<LOD	36.15	9.5	5.6	327.8	11.6	59.6	7.1	111.3	9.8
273	<LOD	225	<LOD	45	11.2	5.6	311.8	11.4	55.7	7.1	105.4	9.7
273	<LOD	210	<LOD	42.9	8.8	5.5	304.4	11.1	49.2	6.8	98.3	9.4
274	<LOD	195	<LOD	37.05	<LOD	8.85	360.4	12.6	69.5	7.7	110.7	10.2
275	<LOD	195	<LOD	35.55	9.8	6.1	296.2	12.3	62.5	8.1	134.7	11.9
276	<LOD	195	<LOD	33.15	17	6	338	12.2	67.9	7.6	110.2	10.2
277	<LOD	180	<LOD	38.4	8.8	5.7	339.8	12	61.1	7.3	98.3	9.5
278	<LOD	180	<LOD	32.85	13.7	6	315.6	12.2	66.3	7.8	107.9	10.4

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD	Cu	+/- 3SD
261	328	28.1	<LOD	9.75	<LOD	29.1	<LOD	13.8	256	42.6	224.2	63.9
262	<LOD	19.05	<LOD	9.15	<LOD	15	<LOD	11.7	76.8	31.4	<LOD	72.75
263	36.9	13.3	<LOD	8.55	22.9	10.8	<LOD	11.25	115	31.5	<LOD	70.05
264	21.7	11.4	<LOD	8.4	<LOD	13.65	<LOD	10.35	68.1	27.4	<LOD	63.3
264	26.3	11	<LOD	7.95	<LOD	12.75	<LOD	9.3	69	25.7	<LOD	58.35
265	<LOD	16.8	<LOD	8.7	<LOD	13.2	<LOD	11.25	93.1	28.8	<LOD	62.55
266	17.7	11.7	<LOD	9	<LOD	14.1	<LOD	11.25	76.9	29	<LOD	67.65
266	21.3	10.7	<LOD	7.65	<LOD	12.15	<LOD	9.45	93.7	26.9	<LOD	60
267	40.5	12.5	<LOD	8.25	<LOD	14.1	<LOD	10.5	128.3	29.9	<LOD	63.15
268	21.9	11.7	<LOD	8.4	<LOD	13.8	<LOD	10.65	87	29	<LOD	65.55
268	18.7	11.5	<LOD	9.15	<LOD	13.5	<LOD	10.35	101.7	28.8	<LOD	63.45
269	31	11.7	<LOD	7.8	<LOD	13.05	<LOD	10.05	53	26.3	<LOD	61.95
270	<LOD	15.75	<LOD	7.95	<LOD	12.9	<LOD	9.75	42.6	25.6	<LOD	61.65
271	17.6	10.6	<LOD	8.1	<LOD	12.3	<LOD	9.75	75.1	26.9	<LOD	61.8
272	25.9	11.2	<LOD	7.65	<LOD	12.9	<LOD	9.9	69.8	26.3	<LOD	59.4
273	<LOD	15.3	<LOD	8.55	<LOD	12.45	<LOD	10.8	103.5	28.3	<LOD	61.8
273	19.5	10.9	<LOD	8.4	<LOD	12.45	<LOD	10.2	79.8	26.8	<LOD	60.3
274	24	11.6	<LOD	8.25	<LOD	13.5	<LOD	10.8	102.4	29.2	<LOD	63.9
275	23.9	12.6	<LOD	8.7	<LOD	14.55	<LOD	11.25	72.7	30.2	<LOD	70.5
276	20.8	11.4	<LOD	8.4	<LOD	13.35	<LOD	10.95	52.2	26.9	<LOD	63.9
277	29.7	11.8	<LOD	8.4	<LOD	13.2	<LOD	10.5	54.7	26.2	<LOD	60.75
278	25.7	12.1	<LOD	8.4	<LOD	13.8	<LOD	10.8	69.7	28.6	<LOD	66.15

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
261	<LOD	150	<LOD	465	37888	840	1500	490	<LOD	315
262	<LOD	138.9	<LOD	405	30796.8	720	<LOD	600	<LOD	255
263	<LOD	139.35	<LOD	420	35481.6	750	<LOD	615	327.6	180
264	<LOD	109.05	<LOD	300	19289.6	510	<LOD	465	<LOD	210
264	<LOD	102.9	<LOD	285	19596.8	480	<LOD	435	<LOD	195
265	<LOD	109.95	<LOD	285	18291.2	500	<LOD	465	<LOD	210
266	<LOD	114.9	<LOD	315	21196.8	550	967.2	350	<LOD	240
266	<LOD	106.05	<LOD	300	21798.4	510	1280	330	<LOD	210
267	<LOD	104.85	<LOD	285	16793.6	470	<LOD	420	<LOD	210
268	<LOD	118.35	<LOD	315	21491.2	550	<LOD	495	<LOD	210
268	<LOD	114.75	<LOD	315	21798.4	540	<LOD	465	<LOD	210
269	<LOD	103.95	<LOD	270	15897.6	450	<LOD	420	<LOD	180
270	<LOD	104.4	<LOD	270	16896	460	555.6	290	<LOD	195
271	<LOD	99.9	<LOD	255	14592	430	<LOD	375	<LOD	180
272	<LOD	104.4	<LOD	270	17689.6	470	<LOD	435	<LOD	195
273	<LOD	103.35	<LOD	270	16896	460	756.4	300	<LOD	210
273	<LOD	100.05	<LOD	270	16588.8	450	627.6	290	<LOD	210
274	<LOD	109.5	<LOD	300	19200	510	<LOD	465	<LOD	195
275	168.8	94.4	<LOD	405	30387.2	700	<LOD	600	<LOD	240
276	<LOD	108.6	<LOD	300	19097.6	510	<LOD	465	<LOD	210
277	<LOD	104.4	<LOD	270	16998.4	460	<LOD	420	<LOD	195
278	130.6	79.9	<LOD	315	20595.2	540	<LOD	480	<LOD	210

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station	Sample ID	Result Type	Date Collected	Field Sample Type	Media description	Start Depth (ft)	End Depth (ft)	Station #	La	+/- 3SD
WBG-279	WBG4234	REG	10/31/2000	Grab	Surface Soil	0	1	**279**	<LOD	36.15
WBG-280	WBG4235	REG	10/30/2000	Grab	Surface Soil	0	1	**280**	<LOD	55.8
WBG-281	WBG4236	REG	10/24/2000	Grab	Surface Soil	0	1	**281**	<LOD	54.15
WBG-281	WBG4274	REG	10/24/2000	Field Duplicate	Surface Soil	0	1	**281**	<LOD	45.15
WBG-282	WBG4237	REG	10/31/2000	Grab	Surface Soil	0	1	**282**	<LOD	53.1
WBG-283	WBG4238	REG	10/31/2000	Grab	Surface Soil	0	1	**283**	<LOD	52.8
WBG-284	WBG4239	REG	10/31/2000	Grab	Surface Soil	0	1	**284**	<LOD	51.9
WBG-284	WBG4239	DUP	10/31/2000	Grab	Surface Soil	0	1	**284**	<LOD	47.1
WBG-285	WBG4240	REG	10/31/2000	Grab	Surface Soil	0	1	**285**	<LOD	41.55
WBG-286	WBG4241	REG	10/31/2000	Grab	Surface Soil	0	1	**286**	<LOD	56.1
WBG-287	WBG4242	REG	10/31/2000	Grab	Surface Soil	0	1	**287**	<LOD	48.15
WBG-288	WBG4243	REG	10/31/2000	Grab	Surface Soil	0	1	**288**	<LOD	47.1
WBG-289	WBG4244	REG	10/31/2000	Grab	Surface Soil	0	1	**289**	<LOD	54.75
WBG-290	WBG4245	REG	10/31/2000	Grab	Surface Soil	0	1	**290**	<LOD	53.25
WBG-291	WBG4246	REG	10/31/2000	Grab	Surface Soil	0	1	**291**	<LOD	60.45
WBG-292	WBG4247	REG	10/31/2000	Grab	Surface Soil	0	1	**292**	<LOD	47.55
WBG-292	WBG4280	REG	10/31/2000	Field Duplicate	Surface Soil	0	1	**292**	<LOD	49.65
WBG-293	WBG4248	REG	10/31/2000	Grab	Surface Soil	0	1	**293**	<LOD	50.25
WBG-294	WBG4249	REG	10/24/2000	Grab	Sediment	0	0.5	**294**	<LOD	49.35
WBG-295	WBG4250	REG	10/24/2000	Grab	Sediment	0	0.5	**295**	<LOD	54.45
WBG-296	WBG4315	REG	11/02/2000	Grab	Surface Soil	0	1	**296**	<LOD	49.35
WBG-297	WBG4316	REG	11/02/2000	Grab	Surface Soil	0	1	**297**	<LOD	45

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ba	+/- 3SD	Cs	+/- 3SD	Te	+/- 3SD	Sb	+/- 3SD	Sn	+/- 3SD	Cd	+/- 3SD
279	472.8	80.1	<LOD	52.35	<LOD	69	<LOD	48.75	<LOD	138.75	<LOD	38.4
280	435.2	84.1	<LOD	58.95	<LOD	77.1	<LOD	53.55	<LOD	150	<LOD	43.35
281	302.8	68.6	<LOD	57.9	<LOD	66.9	<LOD	56.85	<LOD	150	<LOD	43.5
281	362.6	68.7	<LOD	58.5	<LOD	64.35	<LOD	56.1	<LOD	143.25	<LOD	32.1
282	375	75.1	<LOD	63.3	<LOD	78.15	<LOD	53.4	<LOD	150	<LOD	34.2
283	426	78.5	<LOD	59.85	<LOD	66.75	<LOD	51.6	<LOD	149.1	<LOD	36.45
284	377	82.3	<LOD	56.25	<LOD	73.95	<LOD	56.25	<LOD	165	<LOD	47.55
284	322.6	89.1	<LOD	55.8	<LOD	97.95	<LOD	79.2	<LOD	195	<LOD	61.65
285	345.4	67.7	<LOD	54.9	<LOD	71.25	<LOD	50.25	<LOD	142.35	<LOD	35.1
286	377	74.3	<LOD	58.65	<LOD	69.75	<LOD	55.8	<LOD	150	<LOD	37.8
287	412.4	80.8	<LOD	52.8	<LOD	67.65	<LOD	59.85	<LOD	165	<LOD	45.3
288	347	70.8	<LOD	62.7	<LOD	69	<LOD	56.25	<LOD	148.8	<LOD	35.7
289	324	67.1	<LOD	56.1	<LOD	66.6	<LOD	53.7	<LOD	144.15	<LOD	39.9
290	386.8	73.9	<LOD	63	<LOD	73.2	<LOD	52.95	<LOD	148.65	<LOD	39
291	438.8	86.3	<LOD	55.8	<LOD	81.45	<LOD	55.65	<LOD	165	<LOD	43.8
292	459.6	84.7	<LOD	63.45	<LOD	69.9	<LOD	65.4	<LOD	150	<LOD	46.8
292	543.2	88.7	<LOD	56.55	<LOD	66.9	<LOD	53.7	<LOD	165	<LOD	40.8
293	218.2	62.7	<LOD	51	<LOD	75.6	<LOD	53.4	<LOD	150	<LOD	40.2
294	386.8	78.3	<LOD	58.8	<LOD	85.35	<LOD	52.35	<LOD	149.25	<LOD	33.75
295	392.2	82.7	<LOD	66.75	<LOD	79.95	<LOD	64.8	<LOD	165	<LOD	43.2
296	469.6	83	<LOD	68.4	<LOD	73.35	<LOD	57.75	<LOD	149.1	<LOD	42.45
297	349.4	70.6	<LOD	65.4	<LOD	73.8	<LOD	55.35	<LOD	150	<LOD	39.9

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ag	+/- 3SD	Pd	+/- 3SD	Mo	+/- 3SD	Zr	+/- 3SD	Sr	+/- 3SD	Rb	+/- 3SD
279	<LOD	195	<LOD	39.6	11.4	5.6	312.6	11.4	61.8	7.2	104.2	9.7
280	<LOD	210	<LOD	37.05	12.7	5.1	365.2	10.8	63.8	6.4	99.9	8.3
281	<LOD	195	<LOD	42.3	13.2	6.4	371.4	13.4	62	8	99.5	10.2
281	<LOD	180	<LOD	32.85	9.1	6	353.6	12.4	61	7.5	100	9.9
282	<LOD	195	<LOD	36.3	15.3	5.9	256.8	11.5	71.7	8.1	137.1	11.6
283	<LOD	180	<LOD	39.6	12.2	5.9	224.6	11.2	69.7	8.3	134.9	11.9
284	<LOD	210	<LOD	38.4	10.5	5.7	324.6	11.7	55.1	7.2	126.7	10.7
284	<LOD	255	<LOD	55.65	10.1	6	312.8	12.3	61.6	7.8	127.4	11.3
285	<LOD	180	<LOD	35.55	15.5	5.7	319.8	11.6	61.6	7.2	103.7	9.6
286	<LOD	180	<LOD	36.3	14.3	5.5	384.8	11.5	59.1	6.6	90.4	8.4
287	<LOD	195	<LOD	39.45	8.7	5.7	269.6	11.7	63.3	7.9	122.4	11
288	<LOD	195	<LOD	35.4	9.2	5.4	267	10.8	57.9	7.2	118.5	10.2
289	<LOD	195	<LOD	37.8	13.5	5.9	382.2	12.3	45.9	6.8	89.9	9
290	<LOD	195	<LOD	36.3	12.3	5.6	350.8	11.7	60.5	7	109	9.6
291	<LOD	225	<LOD	37.5	11.4	5.8	316.4	11.9	63.7	7.5	122.6	10.6
292	<LOD	210	<LOD	33	10.3	5.6	333	11.6	62.4	7.2	101.7	9.5
292	<LOD	195	<LOD	34.95	9.2	5.7	316.8	11.7	66	7.4	113.9	10.2
293	<LOD	195	<LOD	35.25	15.5	5.6	439.6	12	46.6	6.3	72.7	7.5
294	<LOD	210	<LOD	33.75	11.5	5.4	339.4	11.3	69.1	7.2	107.9	9.3
295	<LOD	225	<LOD	40.05	<LOD	8.7	253.2	11.9	78	8.6	145.5	12.3
296	<LOD	195	<LOD	36.15	8.8	5.6	250.8	11.3	78.3	8.2	139.4	11.5
297	<LOD	195	<LOD	41.1	13	5.8	297.2	11.8	65	7.7	134.1	11.2

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Pb	+/- 3SD	Se	+/- 3SD	As	+/- 3SD	Hg	+/- 3SD	Zn	+/- 3SD	Cu	+/- 3SD
279	21.5	11	<LOD	8.25	<LOD	13.35	<LOD	9.9	98.1	28.2	<LOD	63.45
280	28.5	10	<LOD	6.9	<LOD	11.25	<LOD	8.4	54.5	22.8	<LOD	53.1
281	23.3	12.1	<LOD	8.25	<LOD	14.25	<LOD	11.1	95.7	30.7	<LOD	70.35
281	17.5	11.4	<LOD	7.95	17.6	9.4	<LOD	10.65	74.1	28.8	<LOD	67.8
282	31.5	12.5	<LOD	8.1	<LOD	14.55	<LOD	11.4	115	31	<LOD	69.15
283	32.1	13.4	<LOD	9.15	<LOD	15.3	<LOD	10.95	95.7	31.5	<LOD	72.75
284	22.7	11.5	<LOD	8.25	<LOD	13.65	<LOD	10.5	79.1	27.9	<LOD	63.45
284	17.7	11.7	<LOD	8.7	<LOD	14.4	<LOD	11.4	74.3	29.1	<LOD	66
285	<LOD	14.85	<LOD	7.65	<LOD	12	<LOD	10.2	90.4	27.7	<LOD	61.95
286	<LOD	13.95	<LOD	7.5	<LOD	11.55	<LOD	9.45	71.7	24.6	<LOD	55.65
287	40.4	13.2	<LOD	8.55	<LOD	14.4	<LOD	11.1	77.9	29	<LOD	66.45
288	30.8	11.7	<LOD	8.1	<LOD	13.2	<LOD	10.05	88.6	27.6	<LOD	62.55
289	17	10.6	<LOD	7.65	<LOD	12.6	<LOD	9.9	88.8	27.4	<LOD	60.3
290	21	10.7	<LOD	7.65	<LOD	12.6	<LOD	10.2	69	26.1	<LOD	59.7
291	36.6	12.4	<LOD	8.25	<LOD	14.1	<LOD	10.8	60	27.2	<LOD	64.05
292	22.3	10.8	<LOD	7.5	<LOD	12.9	<LOD	10.35	88.4	27.3	<LOD	61.2
292	24.1	11.5	<LOD	8.7	<LOD	13.2	<LOD	10.35	107.4	28.6	<LOD	60.9
293	21	10	<LOD	7.5	<LOD	11.7	<LOD	9	50.6	23.6	<LOD	56.4
294	58	12.8	<LOD	7.95	19.3	10	<LOD	10.05	116.3	27.7	<LOD	60
295	31.4	13.5	<LOD	9.6	<LOD	15.75	<LOD	11.4	215	36.8	<LOD	74.85
296	62.3	14.5	<LOD	8.25	<LOD	16.2	<LOD	11.25	164.2	33.2	<LOD	72.75
297	<LOD	16.65	<LOD	8.55	<LOD	13.2	<LOD	10.8	60	27.4	<LOD	63.9

Winklepeck Burning Grounds Ex-Situ XRF Analysis for Metals

Station #	Ni	+/- 3SD	Co	+/- 3SD	Fe	+/- 3SD	Mn	+/- 3SD	Cr	+/- 3SD
279	<LOD	103.35	<LOD	270	16089.6	450	<LOD	405	<LOD	180
280	<LOD	87.75	<LOD	225	14489.6	370	394	240	<LOD	165
281	<LOD	127.05	<LOD	360	25600	620	<LOD	540	<LOD	240
281	140.6	84	<LOD	345	25600	600	544	360	<LOD	225
282	<LOD	118.5	<LOD	345	24588.8	600	<LOD	525	<LOD	225
283	<LOD	138.9	<LOD	405	32076.8	720	<LOD	585	311.6	170
284	<LOD	111.6	<LOD	315	21888	540	<LOD	480	<LOD	210
284	<LOD	119.85	<LOD	330	22297.6	580	<LOD	510	<LOD	225
285	<LOD	102.6	<LOD	270	17190.4	460	<LOD	420	<LOD	180
286	<LOD	90.9	<LOD	225	13299.2	370	<LOD	345	<LOD	165
287	<LOD	118.8	<LOD	330	21888	560	<LOD	495	<LOD	225
288	<LOD	109.95	<LOD	300	19289.6	490	<LOD	435	<LOD	195
289	<LOD	104.85	<LOD	285	17689.6	470	<LOD	405	<LOD	180
290	<LOD	96.75	<LOD	240	14092.8	410	<LOD	390	<LOD	180
291	<LOD	110.1	<LOD	285	17689.6	480	<LOD	420	<LOD	195
292	<LOD	100.8	<LOD	270	16396.8	450	578	280	<LOD	195
292	<LOD	103.5	<LOD	270	16588.8	460	610.8	290	<LOD	210
293	<LOD	93.45	<LOD	255	18291.2	430	<LOD	375	<LOD	165
294	<LOD	114.9	<LOD	330	26675.2	560	<LOD	495	<LOD	210
295	<LOD	143.85	<LOD	450	37683.2	800	<LOD	645	<LOD	270
296	<LOD	135.75	<LOD	390	33484.8	710	<LOD	570	<LOD	240
297	<LOD	114.3	<LOD	330	22899.2	560	<LOD	480	227.2	150

5. QA/QC INFORMATION

WBG-COC#1-1

MKM

MKM ENGINEERS INC.

DATE: 30 OCTOBER 2000
JOB# C00121

EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS

Collection Dates: 17 OCTOBER 2000

Page #: 1 OF 1 PAGE

XRF SURVEY - WINKLEPECK BURNING GROUNDS (WBG)

Cup No. C #	COC #	Sample # WBG - NUMBER	Station # WBG - No.	Weight grams	Oven Time In / Out	Sieved/Mounted Date	Analysis Cd / Am Reading # / Date	Comments
C 01	001	WBG - 4015	202	50-55gm	1102 10-30-00 / 1502	S 10-31-00 MS M 11-03-00 JWS	327 / 328	11-07-00 JWS ~~[illegible]~~
C 02	001	WBG - 4187	254	50-55gm	1102 / 1502	S 10-31-00 M 11-03-00 JWS	329 / 330	CALIBRATION INTERNAL CHECK #323
C 03	001	WBG - 4190	255	50-55gm	1102 / 1502	S 10-31-00 M 11-03-00	331 / 332	#324Cd/~~325~~ NIST [illegible] 325Cd/326 AM BLANK
C 04	001	WBG - 4193	256	50-55gm	1102 / 1502	S 10-31-00 M 11-03-00	333 / 334	
C 05	001	WBG - 4009	200	50-55gm	1102 / 1502	S 10-31-00 M 11-03-00	335 / 336	
C 06	001	WBG - 4003	198	50-55gm	1102 / 1502	S 10-31-00 M 11-03-00	337 / 338	
C 07	001	WBG - 4268	201	50-55gm	1102 / 1502	S 10-31-00 M 11-03-00	339 / 340	
C 08	001	WBG - 4012	201	50-55gm	1102 / 1502	S 10-31-00 M 11-03-00	341 / 342	
C 09	001	WBG - 4184	253	50-55gm	1102 / 1502	S 10-31-00 M 11-03-00	343 / 344	
C 10	001	WBG - 4006	199	50-55gm	1102 / 1502	S 10-31-00 M 11-03-00	345 / 346	DUPLICATE IN CUP-C12D
C 11	001	WBG - 4000	197	50-55gm	1102 / 1502	S 11-1-00 M 11-03-00	347 / 348	
C 12D	001	WBG - 4006	199	DUPLICATE OF C 10	1102 10-30-00 / 1502	S 11-1-00 M 11-03-00	349 / 350	DUPLICATE OF CUP C 10
		PROCESSING DATES - COC#1 -						
		Sieved 10-31-00 MS	MOUNTED 11-03-00	WEIGHED 10-30-00 MS				
		ANALYZED 11-07-00 JWS		DRIED 10-30-00 MS				

Analyzed By: John W. Simhonin 07 NOVEMBER 2000

QA/QC/Project Manager: [signature]

WBG-COC #2-1/2

MKM

MKM ENGINEERS INC.

DATE: 30 OCTOBER 2000
JOB # C00121

EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS

Collection Dates: 18 & 19 OCTOBER 2000

XRF SURVEY - LIVERMORE BURNING GROUNDS (WBG)

Cup No. C #	COC #	Sample # WBG-NUMBER	Station # WBG-NUMBER	Weight grams	Oven Time In / Out	Sieved/Mounted Date	Analysis Reading # / Date Cd / Am	Comments
C13	002	4269	212	50-55 gms	1102 10-30-00 / 1502	S 11-1-00 MS; M 11-3-00 gms	351 11-7-00 / 352	MOUNTED ALL SAMPLES 11-3-00 gms
C14	002	4076	205	50-55 gms	1102 / 1502	S 11-1-00; M 11-3-00	353 / 354	Analyzed 11-7-00 gms
C15	002	4032	207	50-55 gms	1102 / 1502	S 11-1-00; M 11-3-00	355 / 356	
C16	002	4049	212	50-55 gms	1102 / 1502	S 11-1-00; M 11-3-00	357 / 358	
C17	002	4055	214	50-55	1102 / 1502	S 11-1-00; M 11-3-00	359 / 360	
C18	002	4061	216	50-55	1102 / 1502	S 11-1-00; M 11-3-00	361 11-7-00 / 362	
C19	002	4035	208	50-55	1102 / 1502	S 11-1-00; M 11-3-00	363 / 364	
C20	002	4046	211	50-55	1102 10-30-00 / 1502	S 11-1-00; M 11-3-00	365 / 366	
C21	002	4029	206	50-55	1102 / 1502	S 11-1-00 MS; M 11-3-00 gms	367 / 368	
C22	002	4070	219	50-55	1102 / 1502	S 11-1-00; M 11-3-00	376 376 377 / 379	CANCEL READING NOS 369-375
C23	002	4038	209	50-55	1102 / 1502	S 11-2-00; M 11-3-00	378 / 379	DUPLICATE IN CUP - C35D
C24	002	4023	204	50-55	1102 / 1502	S 11-2-00; M 11-3-00	380 / 381	
C25	002	4058	215	50-55	1102 / 1502	S 11-2-00; M 11-3-00	382 / 383	130/
C26	002	4079	222	50-55	1102 / 1502	S 11-2-00; M 11-3-00	384 / 385	
C27	002	4052	213	50-55	1102 10-30-00 / 1502	S 11-2-00 MS; M 11-3-00 gms	386 11-7-00 / 387	137/144

Analyzed By: John W. Sinhonic 07 NOV 2000

QA/QC/Project Manager:

WBG - COC #2-2/2

DATE: 30 OCTOBER 2000

JOB # C00121

MKM

MKM ENGINEERS INC.

EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS

Collection Dates: 18 & 19 OCTOBER 2000

Page #: 2 OF 2 PAGES

XRF SURVEY - WINKLEPECK BURNING GROUNDS (WBG)

Cup No.	COC #	Sample #	Station #	Weight	Oven Time	Sieved/Mounted	Analysis	Comments
C #		WBG - NUMBER	WBG - NUMBER	grams	In / Out	Date	Reading # / Date	
C28	002	4064	217	50-55 grms	1102 10-30-00 / 1502	S 11-2-00 MS M 11-3-00 JWS	388 11-7-00 / 389	124/123
C29	002	4067	218	50-55	1102 10-30-00 / 1502	S 11-2-00 M 11-3-00	390 / 391	132/121
C30	002	4073	220	50-55	1102 / 1502	S 11-2-00 M 11-3-00	392 / 393	120/175
C31	002	4122	235	50-55	1102 / 1502	S 11-2-00 M 11-03-00	394 11-7-00 / 395	124/121
C32	002	4119	234	50-55	1102 / 1502	S 11-2-00 M 11-03-00	396 / 397	121/171
C33	002	4191	255	50-55	1102 / 1502	S 11-2-00 M 11-03-00	399 ~~398~~ / 400 ~~399~~	~~140~~ 125/131/140 - Cancel #348 398=400
C34	002	4188	254	50-55	1102 10-30-00 / 1502	S 11-2-00 M 11-03-00	401 / 402	120/123
C35D	002	4035	209	DUPLICATE OF C23	1102 / 1502	S 11-2-00 MS M 11-03-00 JWS	403 11-7-00 / 404	DUPLICATE OF CUP - C23
								120/131
			Processing	DATES -				
		WBG -	Samples COC # 2 -	WEIGHED 10/30/00 MS				
				DRIED 10/30/00 MS				
				SIEVED 10/2/00 MS				
				MOUNTED 11-03-00 JWS				
				ANALYZED				

Analyzed By: John W. Sinfaine 07 NOVEMBER 2000

QA/QC/Project Manager: [signature]

WBG - COC 3 - 1/2

DATE: 30 OCTOBER 2000

Job #: C00121

MKM ENGINEERS INC.

EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS

Collection Dates: 19-20-21 OCTOBER 2000

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XRF SURVEY - WILKLEPECK BURNING GROUNDS (WBG)

	Cup No. C #	COC #	Sample # WBG-NUMBER	Station # WBG-NUMBER	Weight grams	Oven Time In / Out	Sieved/Mounted Date	Cd Analysis Am Reading # / Date	Comments
1.	C 36	003	4116	233	50-55 gms	1304 / 1604	S 11-2-00 M 11-3-00	469 / 470	MOUNTED 11-3-00 JWS
	C 37	003	4076	221	50-55	1304 / 1604	S 11-2-00 M 11-3-00	471 / 472	Calibration Readings
	C 38	003	4125	236	50-55	1304 / 1604	S 11-2-00 M 11-3-00	473 / 474	#465 - Internal ##466 Cd NIST
	C 39	003	4270	236	50-55	1304 / 1604	S 11-2-00 M 11-3-00	475 / 476	Medium 467 Cd → BLANK
5.	C 40	003	4007	199	50-55	1304 / 1604	S 11-2-00 M 11-3-00	477 / 478	468 Am → BLANK
	C 41	003	4027	205	50-55	1304 / 1604	S 11-2-00 M 11-3-00	479 / 480	DUPLICATE in Cup C 57D
J-127	C 42	003	4105	230	50-55	1304 / 1604	S 11-2-00 M 11-3-00	481 / 482	
	C 43	003	4091	226	50-55	1304 / 1604	S 11-2-00 M 11-3-00	483 / 484	
	C 44	003	4088	225	50-55	1304 / 1604	S 11-2-00 M 11-3-00	485 / 486	CANCEL 487 487 = 488
10.	C 45	003	4085	224	50-55	1304 / 1604	S 11-2-00 M 11-3-00	488 / 489	#488/489
	C 46	003	4082	223	50-55	1304 / 1604	S 11-2-00 M 11-3-00	490 / 491	#490/491
	C 47	003	4271	241	50-55	1304 / 1604	S 11-2-00 M 11-3-00	492 / 493	
	C 48	003	4008	199	50-55	1304 / 1604	S 11-2-00 M 11-3-00	494 / 495	
	C 49	003	4028	205	50-55	1304 / 1604	S 11-2-00 M 11-3-00	496 / 497	
15	C 50	003	4150	243	50-55 gms	1304 / 1604	S 11-2-00 M 11-3-00	498 / 499	

Analyzed By: 11-8-00

QA/QC/Project Manager:

WBG - COC 3 - 2/2

DATE: 30 OCTOBER 2000

Job # C001121

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MKM ENGINEERS INC.

EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS

Collection Dates: 19-20-21 OCTOBER 2000

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XRF SURVEY - WINKLEPECK BURNING GROUNDS (WBG)

	Cup No. C #	COC #	Sample # WBG - Number	Station # WBG - Number	Weight grams	Oven Time In / Out	Sieved/Mounted Date	Cd Analysis Am Reading # / Date	Comments
16.	C51	003	4108	231	50-55	1304 / 1604	S 11-2-00 M 11-3-00	500 / 501	analyzed 11-8-00 jws
17.	C52	003	4102	229	50-55	1304 / 1604	S 11-2-00 M 11-3-00	502 / 503	
18.	C53	003	4139	240	50-55	1304 / 1604	S 11-2-00 M 11-3-00	504 / 505	
19.	C54	003	4133	238	50-55	1304 / 1604	S 11-2-00 M 11-3-00	506 / 507	
20.	C55	003	4142	241	50-55	1304 / 1604	S 11-2-00 M 11-3-00	508 / 509	
21.	C56	003	4136	239	50-55	1304 / 1604	S 11-2-00 M 11-3-00	510 / 511	
22	C57D	003	4027	205	DUPLICATE OF C41	1304 / 1604	S 11-2-00 M 11-3-00	512 / 513	DUPLICATE OF CUP - C41
		- COC #	- PROCESSING DATES						
				WEIGHED 10/30/00 MS					
				DRIED 10/30/00 MS					
				SIEVED 11-2-00 MS					
				MOUNTED 11-3-00 jws					
				ANALYZED 11-8-00 jws					

J-128

Analyzed By: John W. Sinkevic 11-8-00

QA/QC/Project Manager:

WBG-COC #4 - 1/3

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MKM ENGINEERS INC.

DATE: 07 NOVEMBER 2000 WBG

EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS JOB # C00121

Collection Dates: 22 OCTOBER 2000

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Cup No. C #	COC #	Sample # WBG-NUMBER	Station # WBG-NUMBER	Weight grams	Oven Time In / Out	Sieved/Mounted Date	Analysis (Cd / Am) Reading # / Date	Comments
C 58	04	WBG - 4162	WBG - 247	50-55 gm.	0951 / 1436	S 3 NOV 2000 M 7 NOV 2000	515 / 516 11-8-00	- WEIGHED 31 OCT 2000 - DRIED - 31 OCT 2000
C 59	04	4163	WBG - 242		0951 / 1436	S 3 NOV 2000 M 11-7-00	517 / 518	514Cd - NIST MEDIUM CALIBRATION
C 60	04	4018	WBG - 203/0		0951 / 1436	S 3 NOV 2000 M 11-7-00	519 / 520	Reading @ 15:52 11-8-00
C 61	04	4019	WBG - 203/2		0951 / 1436	S 3 NOV 2000 M 11-7-00	521 11-8-00 / 522	analyzed 11/8/00
C 62	04	4020	WBG - 203/4		0951 / 1436	S 3 NOV 2000 M 11-7-00	05 11-13-00 / 06	- 11/13/00 AM - CALIBRATION Reading
C 63	04	4021	WBG - 203/6		0951 / 1436	S 3 NOV 2000 M 11-7-00	07 / 08	01 - Internal Check 02 NIST - Medium
C 64	04	4022	WBG - 203/8	50 - 55 gm	0951 / 1436	S 3 NOV 2000 M 11-7-00	09 / 10	03 Cd 04 Am Blank Check
C 65	04	WBG - 4111	WBG - 232/0		0951 / 1436	S 3 NOV 2000 M 11-7-00	11 / 12	*Duplicate in CUP C99
C 66	04	4112	WBG - 232/2		0951 / 1436	S 3 NOV 2000 M 11-7-00	13 / 14	
C 67	04	4113	WBG - 232/4		0951 / 1436	S 3 NOV 2000 M 11-7-00	15 11-13-00 / 16	
C 68	04	4114	WBG 232/6		0951 / 1436	S 3 NOV 2000 M 11-7-00	17 / 18	
C 69	04	4115	WBG - 232/8		0951 / 1436	S 3 NOV 2000 M 11-7-00	19 / 20	
C 70	04	4314	WBG - 199		0951 / 1436	S 3 NOV 2000 M 11-7-00	21 / 22	
C 71	04	4128	WBG - 237		0951 / 1436	S 3 NOV 2000 M 11-7-00	23 / 24	
C 72	04	WBG - 4129	WBG - 237/8	50-55 gm	0951 / 1436	S 3 NOV 2000 M 11-7-00	25 11-13-00 / 26	

J-129

Analyzed By: John Wm. Sinkanas 13 NOVEMBER 2000 – QA/QC/Project Manager:

WBG-COC#4 - 2/3

DATE: 07 NOVEMBER 2000

Job # C00121

WBG

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EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS

Collection Dates: 22 OCTOBER 2000

Page #: 2 OF 3 PAGES

Cup No. C#	COC #	Sample # WBG-NUMBER	Station # WBG-NUMBER	Weight grams	Oven Time In / Out	Sieved/Mounted Date	Analysis Cd / Am Reading # / Date	Comments
C73	04	WBG-4130	WBG-237/4	50-55gms	0951 10-31-00 / 1436	S 3 NOV 2000 M 11-7-00	27 11-13-00 / 28	
C74	04	4131	237/6		0951 / 1436	S 3 NOV 2000 M 11-7-00	29 / 30	
C75	04	4132	237/8		0951 / 1436	S 3 NOV 2000 M 11-7-00	31 / 32	
C76	04	4145	242		0951 / 1436	S 3 NOV 2000 M 11-7-00	33 / 34	DUPLICATE Readings 35/36
C77	04	4146	242/2		0951 / 1436	S 3 NOV 2000 M 11-7-00	37 / 38	
C78	04	4147	242/4		0951 / 1436	S 3 NOV 2000 M 11-7-00	39 / 40	
C79	04	4148	242/6		0951 / 1436	S 3 NOV 2000 M 11-7-00	41 11-13-00 / 42	
C80	04	WBG-4149	WBG-242/8	50-55gm	0951 10-31-00 / 1436	S 3 NOV 2000 M 11-7-00	43 / 44	
C81	04	4313	205		0951 / 1436	S 3 NOV 2000 M 11-7-00	45 / 46	
C82	04	4222	220		0951 / 1436	S 3 NOV 2000 M 11-7-00	47 / 48	CALIBRATION CHECK READING No. 49 MST-MECHAM
C83	04	4068	218		0951 / 1436	S 3 NOV 2000 M 11-7-00	50 / 51	
C84	04	4094	227		0951 / 1436	S 3 NOV 2000 M 11-7-00	52 / 53	
C85	04	4095	227/2		0951 / 1436	S 3 NOV 2000 M 11-7-00	54 / 55	
C86	04	4096	227/4		0951 / 1436	S 3 NOV 2000 M 11-7-00	56 / 57	
C87	04	WBG-4097	WBG-227/6	50-55gm	0951 10-31-00 / 1436	S 3 NOV 2000 M 11-7-00	58 11-13-00 / 59	

Analyzed By: John W. Simmons 13 NOVEMBER 2000 QA/QC/Project Manager:

J-130

WBG-COC#4-3/3

DATE: 07 November 2000
JOB #C00121
WBG

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EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS

Collection Dates: 22 OCTOBER 2000

Page #: 3 OF 3 PAGES

Cup No. C #	COC #	Sample # WBG - NUMBER	Station # WBG - NUMBER	Weight grams	Oven Time In / Out	Sieved/Mounted Date	Analysis Cd / Am Reading # / Date	Comments
C 88	04	WBG - 4098	WBG - 227/8	50-55gm	0951 10-31-00 / 1436	S 3 NOV 2000 M 11-7-00	60 11-13-00 / 61	
C 89	04	4179	252		0951 / 1436	S 3 NOV 2000 M 11-7-00	62 / 63	DUPLICATE ON CUP - C/00
C 90	04	4180	252/2		0951 / 1436	S 3 NOV 2000 M 11-7-00	64 / 65	
C 91	04	4181	252/4		0951 / 1436	S 3 NOV 2000 M 11-7-00	66 / 67	
C 92	04	4182	252/6		0951 / 1436	S 3 NOV 2000 M 11-7-00	68 / 69	
C 93	04	4183	252/8		0951 / 1436	S 3 NOV 2000 M 11-7-00	70 11-13-00 / 71	
C 94	04	WBG - 4109	WBG - 231	50-55gm	0951 10-31-00 / 1436	S 3 NOV 2000 M 11-7-00	72 / 73	
C 95	04	4083	223		0951 / 1436	S 3 NOV 2000 M 11-7-00	74 / 75	
C 96	04	4065	217		0951 / 1436	S 3 NOV 2000 M 11-7-00	76 / 77	
C 97	04	4071	219		0951 / 1436	S 3 NOV 2000 M 11-7-00	78 11-13-00 / 79	
C 98	04	WBG - 4074	WBG - 220	50-55gm	0951 10-31-00 / 1436	S 3 NOV 2000 M 11-7-00	80 / 81	
C99D	04	WBG - 4111	WBG - 232	DUPLICATE OF C 65	0951 10-31-00 / 1436	S 3 NOV 2000 M 7 NOV 2000	82 / 83	DUPLICATE OF CUP - C 65
C100D	04	WBG - 4179	WBG - 252	DUPLICATE OF C 89	0951 10-31-00 / 1436	S 3 NOV 2000 M 11-7-00	84 11-13-00 / 85	DUPLICATE OF CUP - C 89
						COC #4 Completed		13 NOV 2000

Analyzed By: John W. Sinhorn 13 NOVEMBER 2000 - QA/QC/Project Manager: [signature]

WBG-COC #5-1

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MKM ENGINEERS INC.

DATE: 07 NOVEMBER 2000 JOB # WBG-000121

EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS

Collection Dates: 23 OCTOBER 2000

Page #: 1 OF 1 PAGE

Cup No. C #	COC #	Sample # WBG-NUMBER	Station # WBG-NUMBER	Weight grams	Oven Time In / Out	Sieved/Mounted Date	Analysis Reading # / Date (Cd / Am)	Comments
C101	05	WBG-4159	WBG-246	50-55gm	1122 10-31-00 / 1608	S 11-6-00 M 11-8-00	86 11-13-00 / 87	ANALYZE CUP NOS C101 THRU C111 D-1
C102	05	4170	WBG-249	50-55gm	1122 / 1608	S 11-6-00 M 11-8-00	88 / 89	13 NOVEMBER 2000 113° START - 121° COMPLETE
C103	05	4173	WBG-250	50-55gm	1122 10-31-00 / 1608	S 11-6-00 M 11-8-00	90 / 91	ANALYZED 13 NOVEMBER
C104	05	4210	WBG-261	50-55gm	1122 10-31-00 / 1608	S 11-6-00 M 11-8-00	92 / 93	
C105	05	4157	WBG-243	50-55gm	1122 10-31-00 / 1608	S 11-6-00 M 11-8-00	94 / 95	
C106	05	WBG-4207	WBG-260	50-55gm	1122 10-31-00 / 1608	S 11-6-00 M 11-8-00	96 / 97	
C107	05	4273	WBG-243/2	50-55gm	1122 10-31-00 / 1608	S 11-6-00 M 11-8-00	98 / 99	
C108	05	4156	WBG-245	50-55gm	1122 10-31-00 / 1608	S 11-6-00 M 11-8-00	101 / 102	CALIBRATION CHECK READING NO. 100
C109	05	4176	WBG-251	50-55gm	1122 10-31-00 / 1608	S 11-6-00 M 11-8-00	103 / 104	DUPLICATE OF IN C111-D
C110	05	WBG-4204	WBG-254	50-55gm	1122 10-31-00 / 1608	S 11-6-00 M 11-8-00	105 / 106	
C111D	05	WBG-4176	WBG-251	DUPLICATE OF C109	1122 10-31-00 / 1608	S 11-6-00 M 11-8-00	107 / 108	DUPLICATE OF CUP-C109
		COC #5 - all mounted - Analyzed -				Completed	13 NOVEMBER 2000	

Analyzed By: [signature] 13 Nov 2000

QA/QC/Project Manager: [signature]

WBG-COC #6-1/2

MKM

MKM ENGINEERS INC.

DATE: 07 November 2000

WBG JOB #C00121

EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS

Collection Dates: 24-25 OCTOBER 2000

Page #: 1 of 2 Pages

Cup No. C #	COC #	Sample #	Station #	Weight grams	Oven Time In / Out	Sieved/Mounted Date	Analysis (Cd / Am) Reading # / Date	Comments
C112	06	WBG-4249	WBG-294	50-55gm	1122 10-31-00 / 1608	S 11-6-00 M 11-8-00	109 11-13-00 / 110	Analyzed-13 NOVEMBER
C113	06	WBG-4224	WBG-269		1122 / 1608	S 11-6-00 M 11-8-00	111 / 112	1311-1419
C114	06	WBG-4222	WBG-267		1122 / 1608	S 11-6-00 M 11-8-00	113 / 114	
C115	06	WBG-4233	WBG-278		1122 / 1608	S 11-6-00 M 11-8-00	115 / 116	
C116	06	WBG-4229	WBG-274	50-55gm	1122 / 1608	S 11-6-00 M 11-8-00	117 11-13-00 / 118	
C117	06	WBG-4230	WBG-275		1122 / 1608	S 11-6-00 M 11-8-00	119 / 120	
C118	06	WBG-4250	WBG-295		1122 / 1608	S 11-6-00 M 11-8-00	121 / 122	
C119	06	WBG-4231	WBG-276	50-55gm	1122 10-31-00 / 1608	S 11-6-00 M 11-8-00	123 / 124	
C120	06	WBG-4232	WBG-277		1122 / 1608	S 11-6-00 M 11-8-00	125 11-13-00 / 126	
C121	06	WBG-4236	WBG-281		1122 / 1608	S 11-6-00 M 11-8-00	127 / 128	
C122	06	WBG-4274	WBG-281/2		1122 / 1608	S 11-6-00 M 11-8-00	129 / 130	
C123	06	WBG-4072	WBG-219	50-55gm	1122 / 1608	S 11-6-00 M 11-8-00	131 / 132	DUPLICATE IN CUP-C129
C124	06	WBG-4080	WBG-222		1122 / 1608	S 11-6-00 M 11-8-00	134 / 135	CALIBRATION CHECK Reading No. 133
C125	06	WBG-4075	WBG-220		1122 / 1608	S 11-6-00 M 11-8-00	136 / 137	
C126	06	WBG-4103	WBG-229	50-55gm	1122 10-31-00 / 1608	S 11-6-00 M 11-8-00	138 11-13-00 / 139	

Analyzed By: John W. Sinkovec 13 November, 2000

QA/QC/Project Manager:

WBG-COC#6-2/2

DATE: 07 NOVEMBER 2000

WBG.

JOB # C00121

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EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS

Collection Dates: 24-25 OCTOBER 2000

Page #: 2 of 2 Pages

Cup No. C #	COC #	Sample #	Station #	Weight grams	Oven Time In / Out	Sieved/Mounted Date	Analysis (Cd / Am) Reading # / Date	Comments
C127	06	WBG-4160	WBG-246	50-55gm	1122 10-31-00 1608	S 11-6-00 M 11-8-00	140 11-13-00 / 141	
C128	06	WBG-4140	WBG-240	50-55gm	1122 10-31-00 1608	S 11-6-00 M 11-8-00	142 11-13-00 / 143	
C129-D	06	WBG-4072	WBG-219	DUPLICATE OF C123	1122 / 1608	S 11-6-00 M 11-8-00	144 11-13-00 / 145	DUPLICATE OF CUP-C123
		COC#6 - Completed Analysis 13 NOVEMBER 2000 JWS						

Analyzed By: John Wm Swihart III 13NOV2000

QA/QC/Project Manager:

WBG-COC #7-1/2

DATE: 07 November 2000
WBG
JOB # C00121

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EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS

Collection Dates: 30 OCTOBER 2000

Page # : 1 of 2 pages

Cup No. C #	COC #	Sample #	Station #	Weight grams	Oven Time In / Out	Sieved/Mounted Date	Analysis Cd / Am Reading # / Date	Comments
C130	07	WBG-4041	WBG-210	50-55gm	0828 11-7-00 / 1238	S 11-7-00 M 11-8-00	146 11-13-00 / 147	Analyzed 13 Nov 2000 JWS
C131	07	WBG-4277	WBG-210/1	50-55gm	828 / 1238	S 11-7-00 M 11-8-00	148 / 149	1419-1539
C132	07	WBG-4042	WBG-210/2	50-55gm	828 / 1238	S 11-7-00 M 11/8/00	150 / 151	
C133	07	WBG-4043	WBG-210/4	50-55gm	828 / 1238	S 11-7-00 M 11/8/00	152 / 153	
C134	07	WBG-4278	WBG-210/42	50-55gm	828 / 1238	S 11-7-00 M 11/8/00	154 / 155	
C135	07	WBG-4044	WBG-210/6	50-55gm	828 / 1238	S 11-7-00 M 11/8/00	156 / 157	
C136	07	WBG-4045	WBG-210/8	50-55gm	828 / 1238	S 11-7-00 M 11/8/00	158 11-13-00 / 159	
C137	07	WBG-4220	WBG-265	50-55gm	0828 11-7-00 / 1238	S 11-7-00 M 11/8/00	160 / 161	
C138	07	WBG-4219	WBG-264	50-55gm	828 / 1238	S 11-7-00 M 11/8/00	162 / 163	Duplicate in Cup-C149
C139	07	WBG-4235	WBG-280	50-55gm	828 / 1238	S 11-7-00 M 11/8/00	164 / 165	
C140	07	WBG-4221	WBG-266	50-55gm	828 / 1238	S 11-7-00 M 11/8/00	166 / 167	
C141	07	WBG-4279	WBG-266/1	50-55gm	828 / 1238	S 11-7-00 M 11/8/00	168 / 169	
C142	07	WBG-4196	WBG-257	50-55gm	828 / 1238	S 11-7-00 M 11/8/00	170 / 171	
C143	07	WBG-4275	WBG-257/1	50-55gm	828 / 1238	S 11-7-00 M 11/8/00	172 / 173	
C144	07	WBG-4197	WBG-257/2	50-55gm	0828 11-7-00 / 1238	S 11-7-00 M 11-8-00	174 11-13-00 / 175	

Analyzed By: John W. Simkowski 13 November 2000 QA/QC/Project Manager: [signature]

WBG. COC # 7-2/2

DATE: 07 November 2000

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MKM ENGINEERS INC.

EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS

WBG JOB # C00121

Collection Dates: 30 OCTOBER 2000

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Cup No. C #	COC #	Sample #	Station #	Weight grams	Oven Time In / Out	Sieved/Mounted Date	Analysis (Cd / Am) Reading # / Date	Comments
C145	07	WBG-4198	WBG-257/4	50-55gm	0828-00 11-7-00 / 1238	S 11-7-00 M 11-8-00	176 NOV 13 2000 / 177	Analyzed 13 November 2000
C146	07	WBG-4199	WBG-257/6	50-55gm	0828 11-7-00 / 1238	S 11-7-00 M 11-8-00	178 11-13-2000 / 179	1419-1539 gws
C147	07	WBG-4276	WBG-257/62	50-55gm	0828 11-7-00 / 1288	S 11-7-00 M 11-8-00	180 11-13-2000 / 181	
C148	07	WBG-4200	WBG-257/8	50-55gm	0828-00 11-7-00 / 1238	S 11-7-00 M 11-8-00	182 11-13-2000 / 183	
C149D	07	WBG-4219	WBG-264	DUPLICATE OF C138	0828-00 11-7-00 / 1238	S 11-7-00 M 11-8-00	184 NOV 13 2000 / 185	DUPLICATE OF CUP-C138
								* CALIBRATION CHECK - READING No. 186
		* COC #7 - Completed Analysis of all Samples 13 NOVEMBER 2000 - gws						

Analyzed By: John W. Sinfronia 13 NOV 2000

QA/QC/Project Manager:

J-136

WBG - COC # 8

MKM

MKM ENGINEERS INC.

DATE: 07 NOVEMBER 2000 WBG

EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS

JOB # C00121

Collection Dates: 31 OCTOBER 2000

Page # : 1 OF 1 PAGE

Cup No. C #	COC #	Sample #	Station #	Weight grams	Oven Time In / Out	Sieved/Mounted Date	Analysis (Cd / Am) Reading # / Date	Comments
C150	08	WBG - 4241	WBG - 286	50-55gm	1035 11-7-00 / 1434	S 11-8-00 M 11-8-00	187 11-13-00 / 188	Analyzed 11-13-00 ~ QWS
C151	08	WBG - 4247	WBG - 292	50-55	1035 / 1434	S 11-8-00 M 11-8-00	189 / 190	1541 - 1631 - 15 SAMPLES
C152	08	WBG - 4239	WBG - 284	50-55	1035 / 1434	S 11-8-00 M 11-8-00	191 / 192	DUPLICATE IN CUP-C164
C153	08	WBG - 4240	WBG - 285	50-55	1035 / 1434	S 11-8-00 M 11-8-00	193 / 194	
C154	08	WBG - 4234	WBG - 279	50-55	1035 / 1434	S 11-8-00 M 11-8-00	195 11-13-00 / 196	
C155	08	WBG - 4238	WBG - 283	50-55	1035 / 1434	S 11-8-00 M 11-8-00	197 / 198	
C156	08	WBG - 4248	WBG - 293	50-55	1035 / 1434	S 11-8-00 M 11-8-00	199 / 200	
C157	08	WBG - 4243	WBG - 288	50-55gm	1035 11-7-00 / 1434	S 11-8-00 M 11-8-00	201 11-13-00 / 202	
C158	08	WBG - 4237	WBG - 282	50-55	1035 / 1434	S 11-8-00 M 11-8-00	203 / 204	
C159	08	WBG - 4246	WBG - 291	50-55	1035 / 1434	S 11-8-00 M 11-8-00	205 / 206	
C160	08	WBG - 4245	WBG - 290	50-55	1035 / 1434	S 11-8-00 M 11-8-00	207 / 208	
C161	08	WBG - 4244	WBG - 289	50-55	1035 / 1434	S 11-8-00 M 11-8-00	209 11-13-00 / 210	
C162	08	WBG - 4280	WBG - 292	50-55gm	1035 / 1434	S 11-8-00 M 11-8-00	211 / 212	
C163	08	WBG - 4242	WBG - 287	50-55gm	1035 11-7-00 / 1434	S 11-8-00 M 11-8-00	213 / 214	
C164-D	08	WBG - 4239	WBG - 284	DUPLICATE IN C152	1035 11-7-00 / 1434	S 11-8-00 M 11-8-00	215 11-13-00 / 216	DUPLICATE OF CUP - C152

Analyzed By: John Wm. Sinkovec 13 November 2000 ~ QA/QC/Project Manager:

J-137

WBG-COC #9-

MKM

MKM ENGINEERS INC.

DATE: 07 November 2000 WBG

EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS

JOB #C00121

Collection Dates: 01 November 2000

Page # : 1 OF 1 PAGE

	Cup No. C#	COC #	Sample #	Station #	Weight grams	Oven Time In / Out	Sieved/Mounted Date	Analysis Reading # / Date (Cd / Am)	Comments
1	C165	09	WBG-4225	WBG-270	50-55gm	1035 / 1434	S 11-8-00 M 11-8-00	217 11-13-00 / 218	Analyzed 11-13-00 JWS
2	C166	09	WBG-4223	WBG-268	50-55	1035 / 1434	S 11-8-00 M 11-8-00	219 11-13-00 / 220	1633-1704
3	C167	09	WBG-4226	WBG-271	50-55	1035 / 1434	S 11-8-00 M 11-8-00	221 11-13-00 / 222	
4	C168	09	WBG-4227	WBG-272	50-55	1035 / 1434	S 11-8-00 M 11-8-00	223 11-13-00 / 224	
5	C169	09	WBG-426	WBG-263	50-55 gm	1035 / 1434	S 11-8-00 M 11-8-00	225 11-13-00 / 226	
6	C170	09	WBG-4228	WBG-273	50-56	1035 11-7-00 / 1434	S 11-8-00 M 11-8-00	227 11-13-00 / 228	* NOTE DUPLICATE IN CUP - C174
7	C171	09	WBG-4213	WBG-262	50-56	1035 / 1434	S 11-8-00 M 11-8-00	229 11-13-00 / 230	
8	C172	09	WBG-4201	WBG-258	50-55	1035 / 1434	S 11-8-00 M 11-8-00	231 11-13-00 / 232	
9	C173	09	WBG-4281	WBG-268/2	50-55gm	1035 / 1434	S 11-8-00 M 11-8-00	233 11-13-00 / 234	* NOTE
10	C174	09	WBG-4228	WBG-273	*DUPLICATE OF C170	1035 11-7-00 / 1434	S 11-8-00 M 11-8-00	235 11-13-00 / 236	DUPLICATE OF CUP - C170
									*Cancel Reading #236
			*COC #9 - Analyzed 13 NOVEMBER 2000 JWS						

Analyzed By: John Wm. Sinkevich 13 November 2000

QA/QC/Project Manager:

WBG - COC #10-1

MKM

MKM ENGINEERS INC.

DATE: 07 November 2000

WBG JOB # C00121

EX-SITU SAMPLE PREPARATION AND ANALYSIS FORM FOR XRF ANALYSIS FOR METALS

Collection Dates: 02 November 2000

Page # : 1 OF 1 PAGE

	Cup No. C #	COC #	Sample #	Station #	Weight grams	Oven Time In / Out	Sieved/Mounted Date	Analysis (Cd / Am) Reading # / Date	Comments
1.	C175	10	WBG-4315	WBG-296	50-55 gm	1035 11-7-00 / 1434	S 11-8-00 M 11-8-00	238 11-13-00 / 239	Analyzed JWS 11-8-00
2.	C176	10	WBG-4316	WBG-297	50-55 gm	1035 11-7-00 / 1434	S 11-8-00 M 11-8-00	240 11-13-00 / 241	17 05 17
									mounted JWS sieved MS
									* Calibration Check Reading No. 242
			* COC #10 - Analysis Completed 13 November 2000 - JWS						

J-139

Analyzed By: John W. Sinkovec 13 November 2000 QA/QC/Project Manager:

6. CALIBRATION DATA

NITON XRF - XL 700 SERIES INSTRUMENT CALIBRATION LOG

THURSDAY

INSTRUMENT SERIAL NUMBER : U 2056

DATE: 02 NOVEMBER 2000

LOCATION: Ravenna Army Ammunition Plant, Ravenna, OH

WINKLEPECK BURNING GROUNDS

JOB NUMBER: C00121 - WBG

TIME	READING #	STANDARD UTILIZED	ELEMENT	ACTUAL READINGS	CALIBRATION RANGE	PASS/RESET	OPERATOR INITIALS	COMMENTS
0840	02 -	NIST-MEDIUM	Lead - Pb	1070/65.0	1162/31.0	✓ P	Jws	Calibration Check Prior
		STANDARD	Zinc - Zn	269/57.0	350.4/4.8	✓ P	Jws	To Insitu Sampling at
	01 -	Internal	Copper - Cu	<120	114/2.0	✓ P	Jws	Winklepeck B.G.
		Cal Check	Arsenic - As	105/45.0	105/8.0	✓ P	Jws	848 - Press Reset Button
			BLANK					850 SHUT Turn Instrument
0850	#03Cd	BLANK	Lead - Pb					OFF & Recalibrate —
	#04Am	BLANK	Zinc - Zn				#01	-Resolution 300 eV
			Copper - Cu					Sri Strength 8 mCi
			Arsenic - As	All elements < limit of Detection w/04Am				61 Seconds - Reading
	#03/04	NIST —	BLANK	Sr 44.5/8.0 all others < limit w/03Cd				#02
1727	142Cd	NIST	Lead - Pb	1110/65	1162/31	✓ P	Jws	66 Seconds -
		Medium	Zinc - Zn	320/58	350.4/4.8	✓ P	Jws	end of day -
		Standard	Copper - Cu	<110	114/2.0	✓ P	Jws	Readings to No 141Am
			Arsenic - As	83.2/44.0	105/8.0	✓ P	Jws	are Insitu from WBG
			BLANK					
			Lead - Pb					
			Zinc - Zn					
			Copper - Cu					
			Arsenic - As					
			BLANK					
			Lead - Pb					
			Zinc - Zn					
			Copper - Cu					
			Arsenic - As					
			BLANK					

NITON XRF - XL 700 SERIES INSTRUMENT CALIBRATION LOG

INSTRUMENT SERIAL NUMBER : U 2056 DATE: 06 NOVEMBER 2000

LOCATION: Ravenna Army Ammunition Plant, Ravenna, OH JOB NUMBER: COC121

TIME	READING #	STANDARD UTILIZED	ELEMENT	ACTUAL READINGS	CALIBRATION RANGE	PASS/RESET	OPERATOR INITIALS	COMMENTS
0742	1440	NIST -	Lead - Pb	1170/69.0	1162/31.0	P ✓	JWS	- Resolution 301 eV
		MEDIUM	Zinc - Zn	321/60.0	350.4/4.8	P ✓	JWS	- Src Strength 8 mCi
			Copper - Cu	< 120	114/2.0	P ✓	JWS	
	# 143Cd -	INTERNAL CALIBRATION	Arsenic - As	94.3/47.0	105/8.0	P ✓	JWS	61 seconds/60 seconds -
	145Cd &	CHECK -	BLANK	Sr-37.6/7.6	ALL OTHERS < LI	MIT OF	DETECTION	/ ALL Elements < Limit of Detection
1750	#3220	NIST-	Lead - Pb	1150/68	1162/31	✓ P	JWS	60 seconds
		MEDIUM	Zinc - Zn	310/60	350.4/4.8	✓ P	JWS	
			Copper - Cu	< 120	114/2.0	✓ P	JWS	
			Arsenic - As	105/47	105/8.0	✓ P	JWS	
			BLANK					
			Lead - Pb					
			Zinc - Zn					
			Copper - Cu					
			Arsenic - As					
			BLANK					
			Lead - Pb					
			Zinc - Zn					
			Copper - Cu					
			Arsenic - As					
			BLANK					
			Lead - Pb					
			Zinc - Zn					
			Copper - Cu					
			Arsenic - As					
			BLANK					

NITON XRF - XL 700 SERIES INSTRUMENT CALIBRATION LOG

INSTRUMENT SERIAL NUMBER : U 2056 DATE: 07 NOVEMBER 2000

LOCATION: Ravenna Army Ammunition Plant, Ravenna, OH JOB NUMBER: C00121/LUBG

TIME	READING #	STANDARD UTILIZED	ELEMENT	ACTUAL READINGS	CALIBRATION RANGE	PASS/RESET	OPERATOR INITIALS	COMMENTS
855	323	External Cal Check	Lead - Pb	1100/66.0	1162/31	✓ P	JWS	Resolution 300 eV ✓
	324 Cd	/ NIST-Med	Zinc - Zn	275/58.0	350.4/4.8	✓ P	JWS	Src Strength 8 mCi.
		(62 seconds)	Copper - Cu	128/8.0	114/2.0	✓ P	JWS	
	325 Cd	BLANK	Arsenic - As	82.1/45.0	105/8.0	✓ P	JWS	
	326 Am	BLANK	BLANK	325Cd - Sr 44.9/8.0/all other elements < Limit of Detection w/Cd & Am				
1226	#405 Cd	NIST	Lead - Pb	1160/68.0	1162/31	✓ P	JWS	62 Seconds
		Medium	Zinc - Zn	344/62.0	350.4/4.8	✓ P	JWS	
			Copper - Cu	< 110	114/2.0	✓ P	JWS	
			Arsenic - As	110/47.0	105/8.0	✓ P	JWS	
			BLANK					
1627	#464 Cd	NIST	Lead - Pb	1130/68	1162/31.0	✓ P	JWS	62 Seconds
		MEDIUM	Zinc - Zn	319/61	350.4/4.8	✓ P	JWS	
			Copper - Cu	139/82	114/2.0	✓ P	JWS	
			Arsenic - As	107/46	105/8.0	✓ P	JWS	
			BLANK					
			Lead - Pb					
			Zinc - Zn					
			Copper - Cu					
			Arsenic - As					
			BLANK					
			Lead - Pb					
			Zinc - Zn					
			Copper - Cu					
			Arsenic - As					
			BLANK					

NITON XRF - XL 700 SERIES INSTRUMENT CALIBRATION LOG

INSTRUMENT SERIAL NUMBER : U 2056 DATE: 08 November 2000

LOCATION: Ravenna Army Ammunition Plant, Ravenna, OH WINKLEPECK B.G. JOB NUMBER: C00121 / WBG

TIME	READING #	STANDARD UTILIZED	ELEMENT	ACTUAL READINGS	CALIBRATION RANGE	PASS/RESET	OPERATOR INITIALS	COMMENTS
1258	466Cd	NIST-	Lead - Pb	1180/69.0	1162/31.0	✓P	JWS	Resolution 304 eV
		MEDIUM	Zinc - Zn	320/60.0	350.4/4.8	✓P	JWS	Src Strength 8 mCi
1253	#465Cd	Internal	Copper - Cu	<120	114/2.0	✓P	JWS	
1330	467Cd	Calibration	Arsenic - As	85.8/46.0	105/8.0	✓P	JWS	62 SECONDS
1331	468Am	BLANK	BLANK	Sr 41.3/7.5	Cd/Am all other elements < limit of detection			
1532	514Cd	NIST-	Lead - Pb	1190/68.0	1162/31.0	✓P	JWS	66 Seconds
	~~515Am~~	MEDIUM	Zinc - Zn	358/61.0	350.4/4.8	✓P	JWS	
			Copper - Cu	<120	114/2.0	✓P	JWS	
			Arsenic - As	86.7/46.0	105/8.0	✓P	JWS	
			BLANK					
1600	523Cd	BLANK	Lead - Pb					
	524Am	BLANK	Zinc - Zn					
1603	OFF-		Copper - Cu					
			Arsenic - As	524AM - Blank - All elements < limit of detection				
		523Cd -	BLANK	Sr 44.2/7.9 all other elements < less than < limit of detection				
			Lead - Pb					
			Zinc - Zn					
			Copper - Cu					
			Arsenic - As					
			BLANK					
			Lead - Pb					
			Zinc - Zn					
			Copper - Cu					
			Arsenic - As					
			BLANK					

NITON XRF - XL 700 SERIES INSTRUMENT CALIBRATION LOG

INSTRUMENT SERIAL NUMBER : U 2056 DATE: 13 November 2000

LOCATION: Ravenna Army Ammunition Plant, Ravenna, OH WINKLEPECK BURNING Grounds JOB NUMBER: C00121, WBG

TIME	READING #	STANDARD UTILIZED	ELEMENT	ACTUAL READINGS	CALIBRATION RANGE	PASS/RESET	OPERATOR INITIALS	COMMENTS
0745	01Cd	Internal Calibration	Lead - Pb	1130/67.0	1162/31.0	P	gws	01 - Resolution 365 eV
	02Cd	NIST Medium	Zinc - Zn	309/59.0	350.4/4.8	P	gws	Src Strength 8 mCi
	03Cd	Blank	Copper - Cu	<110	114/2.0	P	gws	02 - NIST-Medium 62secs.
	04Am	Blank	Arsenic - As	106/46.0	105/8.0	P	gws	03/04 61 Seconds
		03Cd BLANK =	Sr 42.1/7.7	all other elements	< limit of detection -			
0952	49Cd	NIST -	Lead - Pb	1100/65.0	1162/31.0	P	gws	2 hour - Calibration
		MEDIUM	Zinc - Zn	307/58.0	350.4/4.8	P	gws	Check - 61 Seconds
			Copper - Cu	<120	114/2.0	P	gws	
			Arsenic - As	92.5/44.0	105/8.0	P	gws	
			BLANK					
1200	100Cd	NIST-Medium	Lead - Pb	1150/49.0	1162/31.0	P	gws	Calibration Check
			Zinc - Zn	316/430	350.4/4.8	P	gws	62 Seconds
			Copper - Cu	102/58.0	114/2.0	P	gws	
			Arsenic - As	103/33.0	105/8.0	P	gws	
			BLANK					
1355	133Cd	NIST -	Lead - Pb	1180/52.0	1162/31.0	P	gws	Calibration Check —
		MEDIUM	Zinc - Zn	307/45.0	350.4/4.8	P	gws	107 Seconds
			Copper - Cu	<89.0	114/2.0	P	gws	
			Arsenic - As	79.4/35	105/8.0	P	gws	
			BLANK					
1534	186Cd	NIST -	Lead - Pb	1170/68.0		P	gws	62 Seconds -
		MEDIUM	Zinc - Zn	278.0/58.0		P	gws	2 hr. Calibration Check
			Copper - Cu	142/80.0		P	gws	
			Arsenic - As	93.4/46.0		P	gws	
			BLANK					

NITON XRF - XL 700 SERIES INSTRUMENT CALIBRATION LOG

INSTRUMENT SERIAL NUMBER : U 2056

DATE: 13 NOVEMBER 2000

LOCATION: Ravenna Army Ammunition Plant, Ravenna, OH

JOB NUMBER: C00121

TIME	READING #	STANDARD UTILIZED	ELEMENT	ACTUAL READINGS	CALIBRATION RANGE	PASS/RESET	OPERATOR INITIALS	COMMENTS
1712	242 Cd	NIST-MEDIUM	Lead - Pb	1210/68	1162/31.0	✓ P	JWS	FINAL XRF CALIBRATION
			Zinc - Zn	305/58	350.4/4.8	✓ P	JWS	FOR 13 NOV 2000
			Copper - Cu	<110	114/2.0	✓ P	JWS	62 - SECONDS
			Arsenic - As	96.9/460	105/8.0	✓ P	JWS	
			BLANK					
			Lead - Pb					
			Zinc - Zn					
			Copper - Cu					
			Arsenic - As					
			BLANK					
			Lead - Pb					
			Zinc - Zn					
			Copper - Cu					
			Arsenic - As					
			BLANK					
			Lead - Pb					
			Zinc - Zn					
			Copper - Cu					
			Arsenic - As					
			BLANK					
			Lead - Pb					
			Zinc - Zn					
			Copper - Cu					
			Arsenic - As					
			BLANK					

7. CHAIN OF CUSTODY

SAIC. An Employee Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

COC #1
WBG

COC NO.: MKM (XRF M's) - 1
page 1 of 1

SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

Sample ID	Date Collected	Time Collected	Matrix	REQUESTED PARAMETERS: XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS: STATION # / CUP #
WBG 4015	10-17-00	1315	Soil	1	1	WBG 202
WBG 4187	10-16-00	1627		1	1	WBG 254
WBG 4190	10-17-00	1010		1	1	WBG 255
WBG 4193	10-17-00	0902		1	1	WBG 256
WBG 4009	10-17-00	1502		1	1	WBG 200
WBG 4003	10-17-00	1626		1	1	WBG 198
WBG 4268	10-17-00	1338		1	1	WBG 201 (duplicate)
WBG 4012	10-17-00	1338		1	1	WBG 201
WBG 4189	10-17-00	1053		1	1	WBG 253
WBG 4006	10-17-00	1611		1	1	WBG 199
WBG 4008	10-17-00	1543		1	1	WBG 197

J-148

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF: 11 (ELEVEN)	Cooler Temperature:
Vicki Brumback		[signature]	18 OCT 2000 0954	Cooler ID:	FEDEX NUMBER:
COMPANY NAME: SAIC		COMPANY NAME: MKM Engineers			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time	WINKLEPECK BURNING GROUNDS – 11 (ELEVEN) Samples.	
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

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Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

COC #2-1 WBG

COC NO.: MKM (XRF Me 1 - 2
page 1 of 2

JWS COPY

SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

Sample ID	Date Collected	Time Collected	Matrix	REQUESTED PARAMETERS: XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4269	10/18/00	1536	soil	1		WBG-212 (duplicate)
WBG 4026		0926		1		WBG-205
WBG 4032		1012		1		WBG-207
WBG 4049		1536		1	1	WBG-212
WBG 4055		1420		1		WBG-214
WBG 4061		1350		1		WBG-216
WBG 4035		1050		1		WBG-208
WBG 4046		1516		1		WBG 211
WBG 4029		0947		1		WBG 206
WBG 4070		1635		1		WBG 219
WBG 4038		1103		1		WBG 209
WBG 4023		0855		1		WBG 204
WBG 4058	↓	1315	↓	1		WBG 215

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF	Cooler Temperature:
Vicki Brumback	20OCT2000	[signature]		Cooler ID:	FEDEX NUMBER:
COMPANY NAME: SAIC	0733	COMPANY NAME: MKM Engineers			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

COC #2-2
WBG

COC NO.: MKM (XRF Me) - 2

page 2 of 2

JWS COPY

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800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

REQUESTED PARAMETERS

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4079	10/18/00	1716	soil	1		WBG-222
WBG 4052	↓	1443		1		WBG-213
WBG 4064	10/19/00	1106		1		WBG-217
WBG 4067		1019		1		WBG-218
WBG 4073		0940		1		WBG-220
WBG 4122		1648		1		WBG-235
WBG 4119		1611		1		WBG-234
WBG 4191		1431		1		WBG-255
WBG 4188	↓	1341	↓	1		WBG-254

Vjh 10-20-00

J-150

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF 22	Cooler Temperature:
Vicki Brumback	10/20/00	John W. Simcoe		Cooler ID:	FEDEX NUMBER:
COMPANY NAME: SAIC	0733	COMPANY NAME: MKM Engineers			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

SAIC An Employee-Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

COC#3-1 WBG

COC NO.: MKM (XRF Me) - 3
page 1 of 2

SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumbach (Printed Name): Vicki Brumbach

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4116	10-20-00	0857	Soil	1		WBG-233
WBG 4076	10-19-00	0905	Soil	1		WBG-221
WBG 4125	10-20-00	0800	Soil	1		WBG-236
WBG 4270	10-20-00	0800	Soil	1		WBG-236 (duplicate)
WBG 4007	10-20-00	0956	Soil	1		WBG-199 (2-4 FT)
WBG 4027	10-20-00	1039	Soil	1		WBG-205 (2-4 FT)
WBG 4105	10-20-00	1739	Soil	1		WBG 230
WBG 4091	10-20-00	1551	Soil	1		WBG 226
WBG 4088	10-20-00	1619	Soil	1		WBG 225
WBG 4085	10-20-00	1518	Soil	1		WBG-224
WBG 4082	10-20-00	1438	Soil	1		WBG-223
WBG 4271	10-21-00	1422	Soil	1		WBG-241 (duplicate)
WBG 4008	10-21-00	1222	Soil	1		WBG 199 (4-6 FT)

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Vicki Brumbach	23 OCT 2000	John Wm. Sinkovic	
COMPANY NAME: SAIC	0727	COMPANY NAME: MKM Engineers	
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF

Cooler Temperature:

Cooler ID:

FEDEX NUMBER:

WINKLEPECK BURNING GROUNDS
21 (Twenty-one) Samples -

SAIC An Employee-Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

COC #3-2 WBG

COC NO.: MKM (XRF M) - 3
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SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4028	10-21-00	1141	Soil	1		WBG-205
WBG 4150	10-21-00	1707	Soil	1		WBG-243
WBG 4108	10-21-00	1047	Soil	1		WBG-231
WBG 4102	10-21-00	1023	Soil	1		WBG-229
WBG 4139	10-21-00	1508	Soil	1		WBG-240
WBG 4133	10-21-00	1629	Soil	1		WBG-238
WBG 4142	10-21-00	1422	Soil	1		WBG-241
WBG 4136	10-21-00	1555	Soil	1		WBG-239

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RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF 21	Cooler Temperature:
Vicki Brumback	23OCT2000	[illegible]		Cooler ID:	FEDEX NUMBER:
COMPANY NAME: SAIC	0727	COMPANY NAME: MKM Engineers			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

COC4-1 COC NO.: MKM (XRF Me 1-4
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SAIC An Employee Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

REQUESTED PARAMETERS

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS SPECIAL INSTRUCTIONS
WBG-4162	10-22-00	1110	Soil	1		WBG-247 0-1 FT
WBG-4163	10-22-00	1115	soil	1		2-4 FT
WBG-4018	10-22-00	0915	soil	1		WBG-203 0-1 FT
WBG-4019		0920		1		2-4 FT
WBG-4020		0923		1		4-6 FT
WBG-4021		0925		1		6-8 FT
WBG-4022		0930		1		8-10 FT
WBG-4111	10-22-00	1330	soil	1		WBG-232 0-1 FT
WBG-4112		1335		1		2-4 FT
WBG-4113		1340		1		4-6 FT
WBG-4114		1345		1		6-8 FT
WBG-4115 vb		1350		1		8-10 FT
WBG-4314	10-22-00	0956	soil	1		WBG-199 6-8 FT

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF	Cooler Temperature:
Vicki Brumback	0734 10/24/00	John Wm. Sullivan	10/24/00 734	Cooler ID:	FEDEX NUMBER:
COMPANY NAME: SAIC		COMPANY NAME: MKM Engineers			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

WINKLEPECK BURNING GROUNDS
41 (FORTY-ONE) SAMPLES

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COC4-2 COC NO.: MKM (XRF Me[illegible]) - 4
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SAIC An Employee-Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumbak (Printed Name): Vicki Brumbak

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4128	10-22-00	1515	soil	1		WBG-237 0-1 FT
WBG 4129	↓	1520	↓	1		2-4 FT
WBG 4130		1523		1		4-6 FT
WBG 4131		1525		1		6-8 FT
WBG 4132		1528		1		8-10 FT
WBG 4145	10-22-00	1020	soil	1		WBG-242 0-1 FT
WBG 4146	↓	1025	↓	1		2-4 FT
WBG 4147		1030		1		4-6 FT
WBG 4148		1035		1		6-8 FT
WBG 4149		1040		1		8-10 FT
WBG 4313	10-22-00	1035	soil	1		WBG-205 6-8 FT
WBG 4272	10-22-00	1536	soil	1		WBG-220 (2-4 FT) (duplicat
WBG 4068	10-22-00	1457	soil	1		WBG-218

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Vicki Brumbak	24 OCTOBER 2000 0734	John W. [illegible]	10/24/00 734
COMPANY NAME: SAIC		COMPANY NAME: MKM Engineers	
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF

Cooler ID:

Cooler Temperature:

FEDEX NUMBER:

COC4-3 COC NO.: MKM (XRF Me) - 4

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SAIC An Employee Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

REQUESTED PARAMETERS

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4094	10-22-00	1420	Soil	1		WBG-227 0-1 FT
WBG 4095	"	1425	"	1		2-4 FT
WBG 4096	"	1430	"	1		4-6 FT
WBG 4097	"	1428	"	1		6-8 FT
WBG 4098	"	1435	"	1		8-10 FT
WBG 4179	10-22-00	1150	Soil	1		WBG-252 0-1 FT
WBG 4180	"	1200	"	1		2-4 FT
WBG 4181	"	1203	"	1		4-6 FT
WBG 4182	"	1205	"	1		6-8 FT
WBG 4183	"	1210	"	1		8-10 FT
WBG 4109	10-22-00	1715	Soil	1		WBG-231 2-4 FT
WBG 4083	10-22-00	1652	Soil	1		WBG-223 2-4 FT
WBG 4065	10-22-00	1421	Soil	1		WBG-217 2-4 FT

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF	Cooler Temperature:
Vicki Brumback	24 OCTOBER 2000 0734	John W. Simkins	10/24/00 734	Cooler ID:	FEDEX NUMBER:
COMPANY NAME: SAIC		COMPANY NAME: MKM Engineers			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

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COC 4-4

COC NO.: MKM (XRF Me' 's) - 4
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SAIC An Employee Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4071	10-22-00	1149	soil	1		WBG-219 2-4 FT
WBG 4074	10-22-00	1536	soil	1		WBG-220 2-4 FT

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF 41	Cooler Temperature:
Vicki Brumback	0734 24 OCTOBER 2000	Joseph W. Sinkovic	10/24/00 734	Cooler ID:	FEDEX NUMBER:
COMPANY NAME: SAIC		COMPANY NAME: MKM Engineers			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

COC #5

COC NO.: MKM (XRF Met - 5

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Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

REQUESTED PARAMETERS

LABORATORY NAME: MKM

LABORATORY ADDRESS

PHONE NO:

Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4159	10-23-00	0950	Soil	1		WBG-246
WBG 4170		1124		1		WBG-249
WBG 4173		1055		1		WBG-250
WBG 4210		1527		1		WBG-261
WBG 4151		1656		1		WBG-243 (2-4 FT)
WBG 4207		1437		1		WBG-266
WBG 4273		1656		1		WBG-243 (2-4 FT) COMPLIED
WBG 4156		0915		1		WBG-245
WBG 4176		1024		1		WBG-251
WBG 4204		1357		1		WBG-259

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RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF 10	Cooler Temperature:
Vicki Brumback			25 OCTOBER 2000 0716	Cooler ID:	FEDEX NUMBER:
COMPANY NAME: SAIC		COMPANY NAME: MKM Engineers			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time	WINKLEPECK BURNING GROUNDS	
COMPANY NAME:		COMPANY NAME:		COC #5 10 (Ten) Samples	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

COC6-1

COC NO.: MKM (XRF Me) - 6
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SAIC An Employee Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

REQUESTED PARAMETERS

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4249	10-24-00	1700	sediment	1		WBG-294
WBG 4224		0835	soil	1		WBG-269
WBG 4222		1015		1		WBG-267
WBG 4233		1440		1		WBG-278
WBG 4229		1320		1		WBG 274
WBG 4230		1035		1		WBG-275
WBG 4250		1617	sediment	1		WBG-295
WBG 4231		0940	soil	1		WBG-276
WBG 4232		0905		1		WBG-277
WBG 4236		1355		1		WBG-281
WBG 4274		1355		1		WBG-281 (duplicate)
WBG 4072	10-25-00	0935	soil	1		WBG-219
WBG 4080		0960		1		WBG-222

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF	Cooler Temperature:
Vicki Brumback	10-25-00 1310	[illegible]	10/25/00 13:10	Cooler ID:	FEDEX NUMBER:
COMPANY NAME: SAIC		COMPANY NAME: MKM			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

COC6-2

COC NO.: MKM (XRF Me[illegible]) - 6

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SAIC An Employee-Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4075	10-25-00	0947	Soil	1		WBG-220
WBG 4103	↓	1120	↓	1		WBG-229
WBG 4160	↓	1047	↓	1		WBG-246
WBG 4140	↓	1017	↓	1		WBG-240

WB 10-25-00

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF	Cooler Temperature:
Vicki Brumback	10-25-00 1310	[signature]	10/25/00 1310	Cooler ID:	FEDEX NUMBER:
COMPANY NAME: SAIC		COMPANY NAME: MKM			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

COC 7-1 COC NO.: MKM (XRF M[illegible]) - 7

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SAIC An Employee-Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

REQUESTED PARAMETERS

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

	Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
1	WBG 4041	10-30-00	1047	soil	1		WBG 210 0-1 FT
2	4277		1047		1		0-1 FT (d)
3	4042		1057		1		2-4 FT
4	4043		1107		1		4-6 FT
5	4278		1107		1		4-6 FT (d)
6	4044		1132		1		6-8 FT
7	4045		1202		1		8-10 FT
8	WBG 4220		1533		1		WBG-265 0-1 FT
9	WBG 4219		1646		1		WBG-264 0-1 FT
10	WBG 4235		1706		1		WBG-280 0-1 FT
11	WBG 4221		1446		1		WBG-266 0-1 FT
12	WBG 4279		1446		1		0-1 FT (d)

RELINQUISHED BY: Vicki Brumback	Date/Time	RECEIVED BY: John Wm Sinkenge	Date/Time: 31 OCTOBER 2000 1303	TOTAL NUMBER OF Cooler ID: WBG-COC	Cooler Temperature: FEDEX NUMBER: #7-RECEIVED 31OCT00
COMPANY NAME: SAIC		COMPANY NAME: MKM Engineers			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time	WEIGHED – DRIED – SIEVED = Mounted – Analyzed –	
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

COC7-2 COC NO.: MKM (XRF Me' 1-7

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SAIC. An Employee Owned Company

Science Applications International Corporation

800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

	Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS SPECIAL INSTRUCTIONS
13	WBG-4196	10-30-00	0847	soil	1		WBG 257-1 0-1FT
14	4275		0847		1		257-2 0-1FT (dup)
15	4197		0855		1		257-3 2-4 FT
16	4198		0902		1		257-4 4-6 FT
17	4199		0915		1		257-5 6-8 FT
18	4276		0915		1		257-6 6-8 FT (dup)
19	4200		0927		1		257-7 8-10 FT

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REQUESTED PARAMETERS

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Vicki Brumback		John W. Sinkovich	31 OCTOBER 2000
COMPANY NAME: SAIC		COMPANY NAME: MKM Engineers	1303
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF (19) Cooler Temperature:

Cooler ID: NINETEEN FEDEX NUMBER:

WBG-COC #7

RECEIVED 31 OCTOBER 2000

WEIGHED -

DRIED -

SIEVED -

MOUNTED -

ANALYZED -

WBG · COC 8-1

COC NO.: MKM (XRF M) 8
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SAIC An Employee Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

REQUESTED PARAMETERS

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

	Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
1.	WBG 4241	10-31-00	1046	Soil	1		WBG-286
2.	WBG 4247		1400		1		WBG-292
3.	WBG 4239		0934		1		WBG-284
4.	WBG 4240		1009		1		WBG 285
5.	WBG 4234		1130		1		WBG-279
6.	WBG 4238		0843		1		WBG 283
7.	WBG 4248		1451		1		WBG-293
8.	WBG 4243		~~1523~~	vsh 1604	1		WBG-288
9.	WBG 4237		1701		1		WBG-282
10.	WBG 4246		1324		1		WBG-291
11.	WBG 4245		0819		1		WBG-290
12.	WBG 4244		1523		1		WBG-289
13.	WBG 4280		1400		1		WBG-292 (duplicate)

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Vicki Brumback		John Wm. Sunkoin	01 NOV 2000
COMPANY NAME: SAIC		COMPANY NAME: MKM Engineers	1450 Gwy
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF

Cooler ID:

Cooler Temperature:

FEDEX NUMBER:

SAIC An Employee Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

WBG - COC 8-2

COC NO.: MKM (XRF Me[illegible]) - 8
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SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

REQUESTED PARAMETERS

	Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
14.	WBG 4242	10-31-00	1638	soil	1		WBG 287

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF 14	Cooler Temperature:
Vicki Brumback		John Wm. Sinkovic	01 NOV 2000 1450 hrs	Cooler ID: FOURTEEN	FEDEX NUMBER:
COMPANY NAME: SAIC		COMPANY NAME: MKM Engineers			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME		COMPANY NAME:			
RELINQUISHED BY	Date/Time	RECEIVED BY	Date/Time		
COMPANY NAME		COMPANY NAME:			

SAIC An Employee Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

WE 3-COC 9

COC NO.: MKM (XRF Me[illegible]) - 9
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SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vidn Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

REQUESTED PARAMETERS

	Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS COMMENTS SPECIAL INSTRUCTIONS
1	WBG 4225	11-1-00	0827	Soil	1		WBG-270
2	WBG 4223	↓	0956	↓	1		WBG-268
3	WBG 4226		0843		1		WBG-271
4	WBG 4227		0903		1		WBG-272
5	WBG 4216		1107		1		WBG-~~273~~ 263 N. OF PAD 58
6	WBG 4228		0916		1		WBG-273
7	WBG 4213		1022		1		WBG-262 - Pad 32
8	WBG 4201		1039		1		WBG-258
9	WBG 4281	↓	0950	↓	1		WBG-268 (duplicate)

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Vidn Brumback		John L. Sinkovic	02 NOV 2000
COMPANY NAME: SAIC		COMPANY NAME: MKM Engineers	0731
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF 9

Cooler ID: NINE

Cooler Temperature:

FEDEX NUMBER:

COC #9 - WINKLEPECK BURNING GROUNDS

SAIC An Employee-Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423)

COC #10

COC NO.: MKM (XRF Me) - 10
page 1 of 1

SAMPLE TRACKING FORM/CHAIN OF CUSTODY RECORD

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NUMBER: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature) (Printed Name)

LABORATORY NAME: MKM

LABORATORY ADDRESS:

PHONE NO:

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	XRF Metals	No. of Containers	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
WBG 4315	11-2-00	0838	Soil	1	1	WBG-296
WBG-4316	11-2-00	0902	Soil	1	1	WBG-297

Vib 11-2-00

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF 2	Cooler Temperature:
Vicki Brumbak		John Wm. Sukonic	03 NOVEMBER 2000 0737	Cooler ID: (TWO)	FEDEX NUMBER:
COMPANY NAME: SAIC		COMPANY NAME: MKM Engineers			
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time	WINKLEPECK BURNING GROUNDS	
COMPANY NAME:		COMPANY NAME:		WEIGHED -	
				DRIED -	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	Sieved -	
COMPANY NAME:		COMPANY NAME:		MOUNTED -	
				Analyzed -	

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APPENDIX K

CONTAMINANT FATE AND TRANSPORT

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APPENDIX K

CONTAMINANT FATE AND TRANSPORT

This appendix presents a summary of the results generated by key computational steps performed for contaminant fate and transport modeling. In particular, the appendix summarizes the following:

- Chemical and physical properties of the site-related contaminants (SRCs) (Tables K-1 through K-3).
- Screening of the SRCs in soil to identify the preliminary contaminant migration contaminants of potential concern (CMCOPCs) (Table K-4).
- Development of final CMCOPCs based on leach depth for 1,000-year period for SESOIL modeling (Table K-5).
- Climatic data used in SESOIL modeling (Table K-6).
- Source/receptor description used for SESOIL/AT123D modeling (Table K-7).
- SESOIL application data (Tables K-8 through K-16).

Table K-1. List of Distribution Coefficients (K_ds) for Inorganic SRCs at WBG

Site-Related Chemicals (SRCs)	Distribution coefficient (K_d) (L/kg)	Ref	Calculated Retardation Factor (Rd)
Aluminum	1,500	*b*	11,409
Antimony	45	*a*	343
Arsenic	29	*a*	222
Barium	41	*a*	313
Beryllium	790	*a*	6,009
Cadmium	75	*a*	571
Chromium	19	*a*	146
Cobalt	1,300	*c*	9,888
Copper	35	*b*	267
Cyanide	10	*a*	76
Lead	16,000	*c*	121,691
Manganese	750	*c*	5,705
Mercury	52	*a*	396
Nickel	65	*a*	495
Selenium	5	*a*	39
Silver	8	*a*	64
Thallium	71	*a*	541
Vanadium	1,000	*a*	7,607
Zinc	62	*a*	473

[a]EPA Soil Screening Guidance: Technical Background Document, May 1996.
[b]Baes and Sharp 1983.
[c]Sheppard and Thibault 1990.
SRC = Site-related contaminant.
WBG = Winklepeck Burning Grounds.

Table K-2. Physical and Chemical Properties of Organic SRCs at WBG[a]

Constituents	Mol. Wt.	Solubility S_w (mg/L)	S_w @ Temp. (°C)	K_{OW} K_{OW} (ml/ml)	Vapor Pressure (tor @ °C)	Henry's Constant (K_h) ($atm.m^3/mol$)	K_h @ Temp. (°C)	Air Diff. Coeff. (cm^2/s)	K_{OC} (ml/g)	Biodegradation Rate (λ) (1/day)	Log (K_{OW})
Volatile Organics											
Acetone	58.1	1.00E+06		5.75E-01	270 @ 30	5.14E-07	25#	0.110 s	3.63E-01	2.48E-02	-0.24
Benzene	78.1	1.75E+03		1.35E+02		5.55E-03		0.088	6.20E+01 m	9.60E-04	2.13
Chloroform	119.4	9.30E+03	25	9.33E+01	160 @ 20	3.39E-03	25	0.091 s	5.30E+01 m	3.85E-04	1.92
Dimethylbenzene	106.2	1.61E+02		5.89E+02		7.34E-03		0.070	1.96E+02	1.93E-03	3.20
Ethylbenzene	106.2	1.69E+02		1.41E+03		7.88E-03		0.075	2.04E+02 m	3.04E-03	3.14
Methylene chloride	84.9	1.67E+04	25	1.78E+01	429 @ 25	3.19E-03	25	0.104 s	1.00E+01 m	6.19E-03	1.25
Styrene	104.1	3.10E+02	20	1.45E+03		2.75E-03		0.071	9.12E+02	3.30E-03	2.94
Toluene	92.1	5.15E+02	20	4.90E+02	28 @ 25	5.92E-03	25	0.087	1.40E+02 m	3.30E-03	2.75
Trichloroethene	131.4	1.10E+03		3.39E+02		1.03E-02		0.079	9.40E+01 m	4.20E-04	2.71
Semivolatile Organics											
2-Methylnaphthalene	142.2	2.60E+01	25	7.24E+03	10 @ 105	2.20E-02		0.056	4.56E+03		3.86
Acenaphthene	154.2	3.42E+00	25	8.32E+03		2.41E-04	25	0.062	5.24E+03	1.70E-03	3.92
Anthracene	178.2	1.29E+00	25	2.82E+04	1.95E-4 L	8.60E-05	25	0.042	2.35E+04 m	3.77E-04	4.45
Benzo(*a*)anthracene	228.3	1.00E-02	24	4.07E+05	5E-9 @ 20	2.94E-08	25#	0.051	3.58E+05 m	2.55E-04	5.61
Benzo(*a*)pyrene	252.3	3.80E-03	25	9.55E+05	5E-9 @ 21	4.90E-07	25	0.043	9.69E+05 m	3.27E-04	5.98
Benzo(*b*)fluoranthene	252.3	1.00E-03	#	3.72E+06	5E-7 L	2.94E-07	25#	0.044 #	2.34E+06	2.84E-04	6.57
Benzo(*g,h,i*)perylene	276.3	2.60E-04	25	1.70E+07	1E-10 @ 20	1.40E-07		0.042	1.07E+07	2.67E-04	7.23
Benzo(*k*)fluoranthene	252.3	3.00E-04	#	6.92E+06	1E-11 @ 20	2.54E-05	25#	0.044	4.36E+06	8.10E-05	6.84
Bis-(2-Ethylhexyl)phthalate	390.6	1.30E+00	25	2.00E+05	1.2 @ 200	3.00E-07	20	0.032 s	1.11E+05 m	1.78E-03	5.30
Carbazole		7.48E+00				1.53E-08			3.39E+03		3.59
Chrysene	228.3	6.00E-03	25	4.07E+05	6.3E-9 @25	1.05E-06	25	0.046	2.57E+05	1.73E-04	5.61
Dibenzo(*a,h*)anthracene	278.4	5.00E-04	25	9.33E+05	1E-10 L	7.30E-08	25	0.042	1.79E+06 m	1.84E-04	5.97
Dibenzofuran	168.2	1.00E+01		1.32E+04				0.068	8.31E+03	6.19E-03	4.12
Di-n-butylphthalate	278.4	4.00E+02	25	1.58E+05	0.1 @ 115	2.80E-07	25	0.042	1.57E+03 m	3.01E-02	5.20
Fluoranthene	202.3	2.65E-01	25	2.14E+05	5E-6 L	6.50E-06	25	0.069 s	4.91E+04 m	3.94E-04	5.33
Fluorene	166.2	1.90E+00	25	1.51E+04		1.17E-04	25	0.055	9.54E+03	2.89E-03	4.18
Indeno(1,2,3-*cd*)pyrene	276.3	1.40E-04		4.57E+07	1E-10 L	6.95E-08	25	0.044	2.88E+07	2.37E-04	7.66
Naphthalene	128.2	3.00E+01	25	2.34E+03	0.082 @ 25	4.83E-04	25	0.059	1.19E+03 m	2.69E-03	3.37
Phenanthrene	178.2	8.16E-01	21	2.88E+04	1 @ 118	3.93E-05	25	0.054	1.82E+04	8.66E-04	4.46
Pyrene	202.3	1.60E-01	26	1.51E+05	2.5 @ 200	5.10E-06	25	0.051	6.80E+04 m	9.12E-05	5.18

[a]Solubilities, Henry's Law Constant and Log (Kow) have been taken from EPA Risk Reduction Engineering Laboratory Treatability Database (EPA 1994), except otherwise indicated.
Biodegrdation half-lives are taken from Hand Book of Environmental Degradation Rates (Howard et. al. 1991), except otherwise indicated.
Air diffusion coefficients are obtained from EPA 1987, except otherwise indicated.
[s] source = Shen, et al. 1993; [#] Source = EPA 1991; m = measured Koc (EPA 1996); [L] source = EPA 1995.
EPA = U.S. Environmental Protection Agency.
SRC = Site-related contaminant.
WBG = Winklepeck Burning Grounds.

Table K-3. Physical and Chemical Properties of Explosive-Related Compounds at WBG[a]

Constituents	Mol. Wt.	Solubility S_w (mg/L)	S_w @ Temp. (°C)	K_{OW} K_{OW} (ml/ml)	Vapor Pressure (tor @ °C)	Henry's Constant (K_h) ($atm.m^3/mol$)	K_h @ Temp. (°C)	Air Diff. Coeff. (cm^2/s)	K_{OC} (ml/g)	Biodegradation Rate (λ) (1/day)	Log (K_{OW})
1,3,5-Trinitrobenzene	213.1	3.50E+02		1.58E+01	2E-5 C	1.60E-08	C	2.49E-01 #	9.98E+00	NF	1.20
1,3-Dinitrobenzene	168.1	4.69E+02	15	3.09E+01	9E-4 C	2.30E-07	C	2.80E-01	1.95E+01	1.90E-03	1.49
2,4,6-Trinitrotoluene	227.1	1.00E+02	25	3.39E+05	.046 @ 82	2.00E-07		1.79E-01 #	2.13E+05	1.90E-03	5.53
2,4-Drinitrotoluene	182.1	2.70E+02		1.02E+02	.0013 @ 59	9.26E-08		2.00E-01	9.55E+01 x	1.90E-03	2.01
2,6-Drinitrotoluene	182.1	1.82E+02		7.41E+01	6 @ 150	7.47E-07		2.00E-01 #	6.92E+01 x	1.90E-03	1.87
2-Nitrotoluene[b]	137.1	4.42E+02	30	2.34E+02	0.1 @ 20	4.10E-05	20	2.30E-01 #	1.48E+02	NF	2.37
3-Nitrotoluene[b]	137.1	4.42E+02	30	2.34E+02	0.1 @ 20	4.10E-05	20	2.30E-01 #	1.48E+02	NF	2.37
4-Nitrotoluene	137.1	4.42E+02	30	2.34E+02	0.1 @ 20	4.10E-05	20	2.30E-01 #	1.48E+02	NF	2.37
HMX	296.2	NF		NF	NF	NF		NF	NF	NF	NF
Nitrobenzene	123.1	1.90E+03	20	6.92E+01	0.15 @ 20	2.38E-05	25	7.60E-02	1.19E+02 m	1.80E-03	1.84
Nitrocellulose as N	504.3	NF		NF	NF	NF		NF	NF	NF	NF
Nitroglycerin	227.1	1.80E+03		NF	2.6E-4 @ 20	NF		NF	NF	NF	NF
RDX	222.3	6.00E+01	23	7.41E+00	NF	NF		NF	4.67E+00	NF	0.87
Tetryl	287.2	Insoluble		NF	NF	NF		NF	NF	NF	NF

[a] Solubilities, Henry's Law Constant and Log (Kow) have been taken from EPA Risk Reduction Engineering Laboratory Treatability Data Base (EPA 1994) except otherwise indicated.
Biodegrdation half-lives are taken from Hand Book of Environmental Degradation Rates (Howard et. al. 1991) except otherwise indicated.
Air diffusion coefficients are obtained from EPA 1987, except otherwise indicated.
[#] Source = EPA 1991; m = measured Koc (EPA 1996); [C] source = SCDM (EPA 1997)
* Properties are based on 4-nitrotoluene; NF = Not found
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
WBG = Winklepeck Burning Grounds.

Table K-4. Development of Preliminary CMCOPCs (Developed Comparing Exposure Concentration with GSSL of SRCs; used GSSLs with DAF of 20)

Media	Group	Analysis Type	Analyte	Units	Exposure Concen-tration	GSSL*20	Preliminary CMCOPC?
All Soil	Building 4301	Metals	Antimony	mg/kg	21.00	6.00	Yes
All Soil	Building 4301	Metals	Arsenic	mg/kg	20.10	5.84	Yes
All Soil	Building 4301	Metals	Barium	mg/kg	207.00	1,640.00	
All Soil	Building 4301	Metals	Beryllium	mg/kg	1.40	60.00	
All Soil	Building 4301	Metals	Cadmium	mg/kg	2.60	8.00	
All Soil	Building 4301	Metals	Chromium	mg/kg	29.10	40.00	
All Soil	Building 4301	Metals	Copper	mg/kg	184.00	11,200.00	
All Soil	Building 4301	Metals	Cyanide	mg/kg	1.80	40.00	
All Soil	Building 4301	Metals	Lead	mg/kg	125.00	8,000.00	
All Soil	Building 4301	Metals	Manganese	mg/kg	2,240.00	2,200.00	Yes
All Soil	Building 4301	Metals	Thallium	mg/kg	0.66	0.80	
All Soil	Building 4301	Metals	Zinc	mg/kg	163.00	12,400.00	
All Soil	Building 4301	Organics-Pesticide/PCB	PCB-1254	mg/kg	0.14	0.53	
All Soil	Building 4301	Organics-Semivolatile	2-Methylnaphthalene	mg/kg	0.08	206.00	
All Soil	Building 4301	Organics-Semivolatile	Anthracene	mg/kg	0.06	11,800.00	
All Soil	Building 4301	Organics-Semivolatile	Benz(*a*)anthracene	mg/kg	0.36	1.60	
All Soil	Building 4301	Organics-Semivolatile	Benzo(*a*)pyrene	mg/kg	0.35	8.00	
All Soil	Building 4301	Organics-Semivolatile	Benzo(*b*)fluoranthene	mg/kg	0.45	4.00	
All Soil	Building 4301	Organics-Semivolatile	Benzo(*g,h,i*)perylene	mg/kg	0.21	3,940,000.00	
All Soil	Building 4301	Organics-Semivolatile	Benzo(*k*)fluoranthene	mg/kg	0.12	40.00	
All Soil	Building 4301	Organics-Semivolatile	Chrysene	mg/kg	0.43	160.00	
All Soil	Building 4301	Organics-Semivolatile	Dibenz(*a,h*)anthracene	mg/kg	0.06	1.60	
All Soil	Building 4301	Organics-Semivolatile	Fluoranthene	mg/kg	0.60	4,200.00	
All Soil	Building 4301	Organics-Semivolatile	Indeno(1,2,3-*cd*)pyrene	mg/kg	0.22	14.00	
All Soil	Building 4301	Organics-Semivolatile	Naphthalene	mg/kg	0.06	80.00	
All Soil	Building 4301	Organics-Semivolatile	Phenanthrene	mg/kg	0.48	804.00	
All Soil	Building 4301	Organics-Semivolatile	Pyrene	mg/kg	0.77	4,200.00	
All Soil	Building 4301	Organics-Volatile	Trichloroethene	mg/kg	0.00	0.06	
All Soil	PAD-37	Explosives	1,3,5-Trinitrobenzene	mg/kg	0.13	5.00	
All Soil	PAD-37	Explosives	2,4,6-Trinitrotoluene	mg/kg	1.01	0.01	Yes
All Soil	PAD-37	Explosives	2,4-Dinitrotoluene	mg/kg	0.16	0.00	Yes
All Soil	PAD-37	Explosives	3-Nitrotoluene	mg/kg	0.12	3.62	
All Soil	PAD-37	Explosives	4-Nitrotoluene	mg/kg	0.14	3.62	
All Soil	PAD-37	Explosives	HMX	mg/kg	0.70	0.00	Yes
All Soil	PAD-37	Explosives	Nitrobenzene	mg/kg	0.05	0.14	
All Soil	PAD-37	Explosives	Nitrocellulose	mg/kg	315.00	0.00	Yes
All Soil	PAD-37	Explosives	Nitroglycerin	mg/kg	4.45	0.00	Yes
All Soil	PAD-37	Explosives	RDX	mg/kg	1.77	0.00	Yes
All Soil	PAD-37	Explosives	Tetryl	mg/kg	0.05	0.00	Yes
All Soil	PAD-37	General	Chromium, hexavalent	mg/kg	8.80	40.00	
All Soil	PAD-37	Metals	Aluminum	mg/kg	18,120.00	111,000.00	
All Soil	PAD-37	Metals	Antimony	mg/kg	1.38	6.00	
All Soil	PAD-37	Metals	Arsenic	mg/kg	16.53	5.84	Yes
All Soil	PAD-37	Metals	Barium	mg/kg	199.70	1,640.00	
All Soil	PAD-37	Metals	Beryllium	mg/kg	2.74	60.00	
All Soil	PAD-37	Metals	Cadmium	mg/kg	5.69	8.00	
All Soil	PAD-37	Metals	Chromium	mg/kg	21.29	40.00	
All Soil	PAD-37	Metals	Cobalt	mg/kg	9.57	57,200.00	
All Soil	PAD-37	Metals	Copper	mg/kg	28.09	11,200.00	
All Soil	PAD-37	Metals	Cyanide	mg/kg	0.23	40.00	
All Soil	PAD-37	Metals	Lead	mg/kg	245.60	8,000.00	
All Soil	PAD-37	Metals	Manganese	mg/kg	1,394.00	2,200.00	
All Soil	PAD-37	Metals	Mercury	mg/kg	0.04	2.00	

Table K-4. Development of Preliminary CMCOPCs (Developed Comparing Exposure Concentration with GSSL of SRCs; used GSSLs with DAF of 20) (continued)

Media	Group	Analysis Type	Analyte	Units	Exposure Concen-tration	GSSL*20	Preliminary CMCOPC?
All Soil	PAD-37	Metals	Nickel	mg/kg	18.86	140.00	
All Soil	PAD-37	Metals	Selenium	mg/kg	1.06	6.00	
All Soil	PAD-37	Metals	Silver	mg/kg	0.68	40.00	
All Soil	PAD-37	Metals	Thallium	mg/kg	0.68	0.80	
All Soil	PAD-37	Metals	Zinc	mg/kg	137.40	12,400.00	
All Soil	PAD-37	Organics-Pesticide/PCB	Dieldrin	mg/kg	0.01	0.00	Yes
All Soil	PAD-37	Organics-Semivolatile	Bis(2-ethylhexyl)phthalate	mg/kg	0.03	3,600.00	
All Soil	PAD-37	Organics-Semivolatile	Di-n-butyl phthalate	mg/kg	0.05	5,400.00	
All Soil	PAD-37	Organics-Volatile	Chloroform	mg/kg	0.00	0.60	
All Soil	PAD-37	Organics-Volatile	Toluene	mg/kg	0.02	12.00	
All Soil	PAD-38	Explosives	1,3,5-Trinitrobenzene	mg/kg	0.06	5.00	
All Soil	PAD-38	Explosives	2,4,6-Trinitrotoluene	mg/kg	0.96	0.01	Yes
All Soil	PAD-38	Explosives	2,4-Dinitrotoluene	mg/kg	0.18	0.00	Yes
All Soil	PAD-38	Explosives	4-Amino-2,6-dinitrotoluene	mg/kg	0.09	0.00	Yes
All Soil	PAD-38	General	Chromium, hexavalent	mg/kg	2.82	40.00	
All Soil	PAD-38	Metals	Aluminum	mg/kg	15,120.00	111,000.00	
All Soil	PAD-38	Metals	Antimony	mg/kg	0.98	6.00	
All Soil	PAD-38	Metals	Arsenic	mg/kg	15.02	5.84	Yes
All Soil	PAD-38	Metals	Barium	mg/kg	211.10	1,640.00	
All Soil	PAD-38	Metals	Beryllium	mg/kg	0.78	60.00	
All Soil	PAD-38	Metals	Cadmium	mg/kg	877.00	8.00	Yes
All Soil	PAD-38	Metals	Chromium	mg/kg	20.75	40.00	
All Soil	PAD-38	Metals	Cobalt	mg/kg	11.64	57,200.00	
All Soil	PAD-38	Metals	Copper	mg/kg	31.44	11,200.00	
All Soil	PAD-38	Metals	Lead	mg/kg	172.80	8,000.00	
All Soil	PAD-38	Metals	Manganese	mg/kg	987.30	2,200.00	
All Soil	PAD-38	Metals	Mercury	mg/kg	0.04	2.00	
All Soil	PAD-38	Metals	Nickel	mg/kg	25.77	140.00	
All Soil	PAD-38	Metals	Selenium	mg/kg	1.52	6.00	
All Soil	PAD-38	Metals	Thallium	mg/kg	0.42	0.80	
All Soil	PAD-38	Metals	Zinc	mg/kg	261.90	12,400.00	
All Soil	PAD-38	Organics-Pesticide/PCB	Heptachlor Epoxide	mg/kg	0.08	0.60	
All Soil	PAD-58	Explosives	1,3,5-Trinitrobenzene	mg/kg	0.55	5.00	
All Soil	PAD-58	Explosives	2,4,6-Trinitrotoluene	mg/kg	45.09	0.01	Yes
All Soil	PAD-58	Explosives	2,4-Dinitrotoluene	mg/kg	0.24	0.00	Yes
All Soil	PAD-58	Explosives	2-Amino-4,6-dinitrotoluene	mg/kg	2.50	0.00	Yes
All Soil	PAD-58	Explosives	3-Nitrotoluene	mg/kg	0.09	3.62	
All Soil	PAD-58	Explosives	4-Amino-2,6-dinitrotoluene	mg/kg	0.12	0.00	Yes
All Soil	PAD-58	Explosives	4-Nitrotoluene	mg/kg	0.08	3.62	
All Soil	PAD-58	Explosives	HMX	mg/kg	0.11	0.00	Yes
All Soil	PAD-58	General	Chromium, hexavalent	mg/kg	2.66	40.00	
All Soil	PAD-58	Metals	Antimony	mg/kg	20.10	6.00	Yes
All Soil	PAD-58	Metals	Arsenic	mg/kg	17.90	5.84	Yes
All Soil	PAD-58	Metals	Barium	mg/kg	169.50	1,640.00	
All Soil	PAD-58	Metals	Cadmium	mg/kg	11.49	8.00	Yes
All Soil	PAD-58	Metals	Chromium	mg/kg	44.08	40.00	Yes
All Soil	PAD-58	Metals	Cobalt	mg/kg	10.84	57,200.00	
All Soil	PAD-58	Metals	Copper	mg/kg	293.30	11,200.00	
All Soil	PAD-58	Metals	Cyanide	mg/kg	0.06	40.00	
All Soil	PAD-58	Metals	Lead	mg/kg	602.70	8,000.00	
All Soil	PAD-58	Metals	Mercury	mg/kg	0.72	2.00	
All Soil	PAD-58	Metals	Nickel	mg/kg	29.42	140.00	
All Soil	PAD-58	Metals	Selenium	mg/kg	1.16	6.00	

Table K-4. Development of Preliminary CMCOPCs (Developed Comparing Exposure Concentration with GSSL of SRCs; used GSSLs with DAF of 20) (continued)

Media	Group	Analysis Type	Analyte	Units	Exposure Concen-tration	GSSL*20	Preliminary CMCOPC?
All Soil	PAD-58	Metals	Silver	mg/kg	2.91	40.00	
All Soil	PAD-58	Metals	Thallium	mg/kg	0.55	0.80	
All Soil	PAD-58	Metals	Zinc	mg/kg	965.70	12,400.00	
All Soil	PAD-58	Organics-Pesticide/PCB	Heptachlor epoxide	mg/kg	0.05	0.60	
All Soil	PAD-58	Organics-Semivolatile	Benz(*a*)anthracene	mg/kg	0.20	1.60	
All Soil	PAD-58	Organics-Semivolatile	Benzo(*a*)pyrene	mg/kg	0.22	8.00	
All Soil	PAD-58	Organics-Semivolatile	Benzo(*b*)fluoranthene	mg/kg	0.29	4.00	
All Soil	PAD-58	Organics-Semivolatile	Benzo(*g,h,i*)perylene	mg/kg	0.11	3,940,000.00	
All Soil	PAD-58	Organics-Semivolatile	Benzo(*k*)fluoranthene	mg/kg	0.13	40.00	
All Soil	PAD-58	Organics-Semivolatile	Chrysene	mg/kg	0.20	160.00	
All Soil	PAD-58	Organics-Semivolatile	Fluoranthene	mg/kg	0.41	4,200.00	
All Soil	PAD-58	Organics-Semivolatile	Indeno(1,2,3-*cd*)pyrene	mg/kg	0.13	14.00	
All Soil	PAD-58	Organics-Semivolatile	Phenanthrene	mg/kg	0.14	804.00	
All Soil	PAD-58	Organics-Semivolatile	Pyrene	mg/kg	0.47	4,200.00	
All Soil	PAD-60	Explosives	1,3,5-Trinitrobenzene	mg/kg	2.57	5.00	
All Soil	PAD-60	Explosives	1,3-Dinitrobenzene	mg/kg	0.09	0.02	Yes
All Soil	PAD-60	Explosives	2,4,6-Trinitrotoluene	mg/kg	246.20	0.01	Yes
All Soil	PAD-60	Explosives	2,4-Dinitrotoluene	mg/kg	0.62	0.00	Yes
All Soil	PAD-60	Explosives	2,6-Dinitrotoluene	mg/kg	0.20	0.00	Yes
All Soil	PAD-60	Explosives	2-Amino-4,6-dinitrotoluene	mg/kg	14.00	0.00	Yes
All Soil	PAD-60	Explosives	2-Nitrotoluene	mg/kg	0.17	3.62	
All Soil	PAD-60	Explosives	3-Nitrotoluene	mg/kg	0.12	3.62	
All Soil	PAD-60	Explosives	HMX	mg/kg	0.24	0.00	Yes
All Soil	PAD-60	Explosives	Nitrobenzene	mg/kg	0.08	0.14	
All Soil	PAD-60	Explosives	Nitrocellulose	mg/kg	5.80	0.00	Yes
All Soil	PAD-60	Explosives	Nitroglycerin	mg/kg	4.34	0.00	Yes
All Soil	PAD-60	Explosives	RDX	mg/kg	1.15	0.00	Yes
All Soil	PAD-60	Explosives	Tetryl	mg/kg	0.38	0.00	Yes
All Soil	PAD-60	Metals	Aluminum	mg/kg	20,610.00	111,000.00	
All Soil	PAD-60	Metals	Antimony	mg/kg	152.70	6.00	Yes
All Soil	PAD-60	Metals	Arsenic	mg/kg	15.01	5.84	Yes
All Soil	PAD-60	Metals	Barium	mg/kg	358.40	1,640.00	
All Soil	PAD-60	Metals	Cadmium	mg/kg	42.80	8.00	Yes
All Soil	PAD-60	Metals	Chromium	mg/kg	37.56	40.00	
All Soil	PAD-60	Metals	Cobalt	mg/kg	11.83	57,200.00	
All Soil	PAD-60	Metals	Copper	mg/kg	3,832.00	11,200.00	
All Soil	PAD-60	Metals	Lead	mg/kg	2,150.00	8,000.00	
All Soil	PAD-60	Metals	Manganese	mg/kg	684.60	2,200.00	
All Soil	PAD-60	Metals	Mercury	mg/kg	0.11	2.00	
All Soil	PAD-60	Metals	Nickel	mg/kg	36.30	140.00	
All Soil	PAD-60	Metals	Selenium	mg/kg	1.14	6.00	
All Soil	PAD-60	Metals	Silver	mg/kg	9.17	40.00	
All Soil	PAD-60	Metals	Thallium	mg/kg	0.56	0.80	
All Soil	PAD-60	Metals	Vanadium	mg/kg	28.34	6,000.00	
All Soil	PAD-60	Metals	Zinc	mg/kg	1,791.00	12,400.00	
All Soil	PAD-60	Organics-Semivolatile	2-Methylnaphthalene	mg/kg	0.15	206.00	
All Soil	PAD-60	Organics-Semivolatile	Benz(*a*)anthracene	mg/kg	0.04	1.60	
All Soil	PAD-60	Organics-Semivolatile	Benzo(*a*)pyrene	mg/kg	0.06	8.00	
All Soil	PAD-60	Organics-Semivolatile	Benzo(*b*)fluoranthene	mg/kg	0.09	4.00	
All Soil	PAD-60	Organics-Semivolatile	Chrysene	mg/kg	0.05	160.00	
All Soil	PAD-60	Organics-Semivolatile	Fluoranthene	mg/kg	0.09	4,200.00	
All Soil	PAD-60	Organics-Semivolatile	Phenanthrene	mg/kg	0.14	804.00	
All Soil	PAD-60	Organics-Semivolatile	Pyrene	mg/kg	0.11	4,200.00	

Table K-4. Development of Preliminary CMCOPCs (Developed Comparing Exposure Concentration with GSSL of SRCs; used GSSLs with DAF of 20) (continued)

Media	Group	Analysis Type	Analyte	Units	Exposure Concen-tration	GSSL*20	Preliminary CMCOPC?
All Soil	PAD-60	Organics-Volatile	1,2-Dimethylbenzene	mg/kg	0.02	122.20	
All Soil	PAD-60	Organics-Volatile	Benzene	mg/kg	0.03	0.04	
All Soil	PAD-60	Organics-Volatile	Chloroform	mg/kg	0.02	0.60	
All Soil	PAD-60	Organics-Volatile	Dimethylbenzene	mg/kg	0.02	122.20	
All Soil	PAD-60	Organics-Volatile	Ethylbenzene	mg/kg	0.16	14.00	
All Soil	PAD-60	Organics-Volatile	Styrene	mg/kg	0.04	4.00	
All Soil	PAD-60	Organics-Volatile	Toluene	mg/kg	0.19	12.00	
All Soil	PAD-61	Explosives	1,3,5-Trinitrobenzene	mg/kg	0.10	5.00	
All Soil	PAD-61	Explosives	1,3-Dinitrobenzene	mg/kg	0.04	0.02	Yes
All Soil	PAD-61	Explosives	2,4,6-Trinitrotoluene	mg/kg	0.63	0.01	Yes
All Soil	PAD-61	Explosives	2,4-Dinitrotoluene	mg/kg	0.06	0.00	Yes
All Soil	PAD-61	Explosives	2,6-Dinitrotoluene	mg/kg	0.09	0.00	Yes
All Soil	PAD-61	Explosives	2-Amino-4,6-dinitrotoluene	mg/kg	0.37	0.00	Yes
All Soil	PAD-61	Explosives	2-Nitrotoluene	mg/kg	0.12	3.62	
All Soil	PAD-61	Explosives	4-Amino-2,6-dinitrotoluene	mg/kg	0.46	0.00	Yes
All Soil	PAD-61	Explosives	HMX	mg/kg	0.38	0.00	Yes
All Soil	PAD-61	Explosives	Nitrobenzene	mg/kg	0.12	0.14	
All Soil	PAD-61	Explosives	RDX	mg/kg	0.65	0.00	Yes
All Soil	PAD-61	General	Chromium, hexavalent	mg/kg	12.20	40.00	
All Soil	PAD-61	Metals	Aluminum	mg/kg	14,140.00	111,000.00	
All Soil	PAD-61	Metals	Antimony	mg/kg	10.36	6.00	Yes
All Soil	PAD-61	Metals	Arsenic	mg/kg	16.81	5.84	Yes
All Soil	PAD-61	Metals	Barium	mg/kg	359.30	1,640.00	
All Soil	PAD-61	Metals	Cadmium	mg/kg	15.35	8.00	Yes
All Soil	PAD-61	Metals	Chromium	mg/kg	39.37	40.00	
All Soil	PAD-61	Metals	Cobalt	mg/kg	12.46	57,200.00	
All Soil	PAD-61	Metals	Copper	mg/kg	240.00	11,200.00	
All Soil	PAD-61	Metals	Cyanide	mg/kg	1.73	40.00	
All Soil	PAD-61	Metals	Lead	mg/kg	816.30	8,000.00	
All Soil	PAD-61	Metals	Mercury	mg/kg	0.06	2.00	
All Soil	PAD-61	Metals	Nickel	mg/kg	54.30	140.00	
All Soil	PAD-61	Metals	Selenium	mg/kg	2.83	6.00	
All Soil	PAD-61	Metals	Silver	mg/kg	1.58	40.00	
All Soil	PAD-61	Metals	Thallium	mg/kg	0.58	0.80	
All Soil	PAD-61	Metals	Vanadium	mg/kg	25.71	6,000.00	
All Soil	PAD-61	Metals	Zinc	mg/kg	917.50	12,400.00	
All Soil	PAD-61	Organics-Pesticide/PCB	4,4'-DDT	mg/kg	0.13	40.00	
All Soil	PAD-61	Organics-Pesticide/PCB	Heptachlor epoxide	mg/kg	0.05	0.60	
All Soil	PAD-61	Organics-Pesticide/PCB	PCB-1260	mg/kg	0.46	6.18	
All Soil	PAD-61	Organics-Semivolatile	2-Methylnaphthalene	mg/kg	0.10	206.00	
All Soil	PAD-61	Organics-Semivolatile	Acenaphthene	mg/kg	65.00	580.00	
All Soil	PAD-61	Organics-Semivolatile	Anthracene	mg/kg	400.00	11,800.00	
All Soil	PAD-61	Organics-Semivolatile	Benz(*a*)anthracene	mg/kg	570.00	1.60	Yes
All Soil	PAD-61	Organics-Semivolatile	Benzo(*a*)pyrene	mg/kg	510.00	8.00	Yes
All Soil	PAD-61	Organics-Semivolatile	Benzo(*b*)fluoranthene	mg/kg	620.00	4.00	Yes
All Soil	PAD-61	Organics-Semivolatile	Benzo(*g,h,i*)perylene	mg/kg	280.00	3,940,000.00	
All Soil	PAD-61	Organics-Semivolatile	Benzo(*k*)fluoranthene	mg/kg	280.00	40.00	Yes
All Soil	PAD-61	Organics-Semivolatile	Carbazole	mg/kg	190.00	0.60	Yes
All Soil	PAD-61	Organics-Semivolatile	Chrysene	mg/kg	540.00	160.00	Yes
All Soil	PAD-61	Organics-Semivolatile	Dibenz(*a,h*)anthracene	mg/kg	59.00	1.60	Yes
All Soil	PAD-61	Organics-Semivolatile	Dibenzofuran	mg/kg	110.00	48.00	Yes
All Soil	PAD-61	Organics-Semivolatile	Fluoranthene	mg/kg	1,500.00	4,200.00	
All Soil	PAD-61	Organics-Semivolatile	Fluorene	mg/kg	130.00	560.00	

Table K-4. Development of Preliminary CMCOPCs (Developed Comparing Exposure Concentration with GSSL of SRCs; used GSSLs with DAF of 20) (continued)

Media	Group	Analysis Type	Analyte	Units	Exposure Concen-tration	GSSL*20	Preliminary CMCOPC?
All Soil	PAD-61	Organics-Semivolatile	Indeno(1,2,3-*cd*)pyrene	mg/kg	320.00	14.00	Yes
All Soil	PAD-61	Organics-Semivolatile	Naphthalene	mg/kg	62.00	80.00	
All Soil	PAD-61	Organics-Semivolatile	Phenanthrene	mg/kg	1,300.00	804.00	Yes
All Soil	PAD-61	Organics-Semivolatile	Pyrene	mg/kg	1,100.00	4,200.00	
All Soil	PAD-61	Organics-Volatile	Trichloroethene	mg/kg	0.00	0.06	
All Soil	PAD-62	Explosives	1,3,5-Trinitrobenzene	mg/kg	0.23	5.00	
All Soil	PAD-62	Explosives	2,4,6-Trinitrotoluene	mg/kg	9.35	0.01	Yes
All Soil	PAD-62	Explosives	2-Amino-4,6-dinitrotoluene	mg/kg	0.10	0.00	Yes
All Soil	PAD-62	Explosives	4-Amino-2,6-dinitrotoluene	mg/kg	0.15	0.00	Yes
All Soil	PAD-62	Explosives	HMX	mg/kg	10.04	0.00	Yes
All Soil	PAD-62	Explosives	RDX	mg/kg	69.78	0.00	Yes
All Soil	PAD-62	Explosives	Tetryl	mg/kg	0.23	0.00	Yes
All Soil	PAD-62	Metals	Antimony	mg/kg	1.08	6.00	
All Soil	PAD-62	Metals	Arsenic	mg/kg	13.52	5.84	Yes
All Soil	PAD-62	Metals	Barium	mg/kg	232.50	1,640.00	
All Soil	PAD-62	Metals	Beryllium	mg/kg	0.66	60.00	
All Soil	PAD-62	Metals	Cadmium	mg/kg	2.91	8.00	
All Soil	PAD-62	Metals	Chromium	mg/kg	18.75	40.00	
All Soil	PAD-62	Metals	Cobalt	mg/kg	11.98	57,200.00	
All Soil	PAD-62	Metals	Copper	mg/kg	53.49	11,200.00	
All Soil	PAD-62	Metals	Lead	mg/kg	295.50	8,000.00	
All Soil	PAD-62	Metals	Manganese	mg/kg	1,227.00	2,200.00	
All Soil	PAD-62	Metals	Mercury	mg/kg	0.06	2.00	
All Soil	PAD-62	Metals	Nickel	mg/kg	18.86	140.00	
All Soil	PAD-62	Metals	Silver	mg/kg	0.58	40.00	
All Soil	PAD-62	Metals	Thallium	mg/kg	0.41	0.80	
All Soil	PAD-62	Metals	Vanadium	mg/kg	26.48	6,000.00	
All Soil	PAD-62	Metals	Zinc	mg/kg	388.80	12,400.00	
All Soil	PAD-66	Explosives	1,3,5-Trinitrobenzene	mg/kg	28.06	5.00	Yes
All Soil	PAD-66	Explosives	1,3-Dinitrobenzene	mg/kg	0.26	0.02	Yes
All Soil	PAD-66	Explosives	2,4,6-Trinitrotoluene	mg/kg	3,800.00	0.01	Yes
All Soil	PAD-66	Explosives	2,4-Dinitrotoluene	mg/kg	0.55	0.00	Yes
All Soil	PAD-66	Explosives	2,6-Dinitrotoluene	mg/kg	0.62	0.00	Yes
All Soil	PAD-66	Explosives	2-Amino-4,6-dinitrotoluene	mg/kg	0.97	0.00	Yes
All Soil	PAD-66	Explosives	3-Nitrotoluene	mg/kg	7.76	3.62	Yes
All Soil	PAD-66	Explosives	4-Amino-2,6-dinitrotoluene	mg/kg	0.93	0.00	Yes
All Soil	PAD-66	Explosives	4-Nitrotoluene	mg/kg	0.16	3.62	
All Soil	PAD-66	Explosives	HMX	mg/kg	23.15	0.00	Yes
All Soil	PAD-66	Explosives	Nitrobenzene	mg/kg	0.36	0.14	Yes
All Soil	PAD-66	Explosives	Nitrocellulose	mg/kg	21.44	0.00	Yes
All Soil	PAD-66	Explosives	RDX	mg/kg	80.00	0.00	Yes
All Soil	PAD-66	Explosives	Tetryl	mg/kg	0.16	0.00	Yes
All Soil	PAD-66	Metals	Aluminum	mg/kg	14,840.00	111,000.00	
All Soil	PAD-66	Metals	Antimony	mg/kg	28.33	6.00	Yes
All Soil	PAD-66	Metals	Arsenic	mg/kg	16.01	5.84	Yes
All Soil	PAD-66	Metals	Barium	mg/kg	4,820.00	1,640.00	Yes
All Soil	PAD-66	Metals	Cadmium	mg/kg	9.98	8.00	Yes
All Soil	PAD-66	Metals	Chromium	mg/kg	21.06	40.00	
All Soil	PAD-66	Metals	Cobalt	mg/kg	9.50	57,200.00	
All Soil	PAD-66	Metals	Copper	mg/kg	512.70	11,200.00	
All Soil	PAD-66	Metals	Cyanide	mg/kg	0.45	40.00	
All Soil	PAD-66	Metals	Lead	mg/kg	244.90	8,000.00	
All Soil	PAD-66	Metals	Manganese	mg/kg	752.50	2,200.00	

Table K-4. Development of Preliminary CMCOPCs (Developed Comparing Exposure Concentration with GSSL of SRCs; used GSSLs with DAF of 20) (continued)

Media	Group	Analysis Type	Analyte	Units	Exposure Concen-tration	GSSL*20	Preliminary CMCOPC?
All Soil	PAD-66	Metals	Mercury	mg/kg	0.20	2.00	
All Soil	PAD-66	Metals	Nickel	mg/kg	22.91	140.00	
All Soil	PAD-66	Metals	Selenium	mg/kg	1.01	6.00	
All Soil	PAD-66	Metals	Silver	mg/kg	0.75	40.00	
All Soil	PAD-66	Metals	Thallium	mg/kg	0.51	0.80	
All Soil	PAD-66	Metals	Vanadium	mg/kg	26.31	6,000.00	
All Soil	PAD-66	Metals	Zinc	mg/kg	601.30	12,400.00	
All Soil	PAD-66	Organics-Pesticide/PCB	Dieldrin	mg/kg	0.00	0.00	
All Soil	PAD-66	Organics-Semivolatile	Acenaphthene	mg/kg	0.14	580.00	
All Soil	PAD-66	Organics-Semivolatile	Anthracene	mg/kg	0.44	11,800.00	
All Soil	PAD-66	Organics-Semivolatile	Benz(*a*)anthracene	mg/kg	0.63	1.60	
All Soil	PAD-66	Organics-Semivolatile	Benzo(*a*)pyrene	mg/kg	0.53	8.00	
All Soil	PAD-66	Organics-Semivolatile	Benzo(*b*)fluoranthene	mg/kg	0.69	4.00	
All Soil	PAD-66	Organics-Semivolatile	Benzo(*g*,*h*,*i*)perylene	mg/kg	0.17	3,940,000.00	
All Soil	PAD-66	Organics-Semivolatile	Benzo(*k*)fluoranthene	mg/kg	0.35	40.00	
All Soil	PAD-66	Organics-Semivolatile	Carbazole	mg/kg	0.20	0.60	
All Soil	PAD-66	Organics-Semivolatile	Chrysene	mg/kg	0.62	160.00	
All Soil	PAD-66	Organics-Semivolatile	Dibenz(*a*,*h*)anthracene	mg/kg	0.05	1.60	
All Soil	PAD-66	Organics-Semivolatile	Dibenzofuran	mg/kg	0.11	48.00	
All Soil	PAD-66	Organics-Semivolatile	Fluoranthene	mg/kg	2.00	4,200.00	
All Soil	PAD-66	Organics-Semivolatile	Fluorene	mg/kg	0.18	560.00	
All Soil	PAD-66	Organics-Semivolatile	Indeno(1,2,3-*cd*)pyrene	mg/kg	0.21	14.00	
All Soil	PAD-66	Organics-Semivolatile	Phenanthrene	mg/kg	1.40	804.00	
All Soil	PAD-66	Organics-Semivolatile	Pyrene	mg/kg	1.30	4,200.00	
All Soil	PAD-67	Explosives	1,3,5-Trinitrobenzene	mg/kg	100.30	5.00	Yes
All Soil	PAD-67	Explosives	1,3-Dinitrobenzene	mg/kg	0.06	0.02	Yes
All Soil	PAD-67	Explosives	2,4,6-Trinitrotoluene	mg/kg	5,200.00	0.01	Yes
All Soil	PAD-67	Explosives	2,4-Dinitrotoluene	mg/kg	0.88	0.00	Yes
All Soil	PAD-67	Explosives	2-Nitrotoluene	mg/kg	2.61	3.62	
All Soil	PAD-67	Explosives	4-Nitrotoluene	mg/kg	0.09	3.62	
All Soil	PAD-67	Explosives	HMX	mg/kg	1,700.00	0.00	Yes
All Soil	PAD-67	Explosives	Nitrobenzene	mg/kg	0.04	0.14	
All Soil	PAD-67	Explosives	Nitrocellulose	mg/kg	88.40	0.00	Yes
All Soil	PAD-67	Explosives	RDX	mg/kg	9,500.00	0.00	Yes
All Soil	PAD-67	Explosives	Tetryl	mg/kg	0.13	0.00	Yes
All Soil	PAD-67	General	Chromium, hexavalent	mg/kg	6.30	40.00	
All Soil	PAD-67	Metals	Antimony	mg/kg	3.46	6.00	
All Soil	PAD-67	Metals	Arsenic	mg/kg	14.07	5.84	Yes
All Soil	PAD-67	Metals	Barium	mg/kg	1,149.00	1,640.00	
All Soil	PAD-67	Metals	Cadmium	mg/kg	1.44	8.00	
All Soil	PAD-67	Metals	Chromium	mg/kg	17.64	40.00	
All Soil	PAD-67	Metals	Cobalt	mg/kg	12.16	57,200.00	
All Soil	PAD-67	Metals	Copper	mg/kg	79.23	11,200.00	
All Soil	PAD-67	Metals	Lead	mg/kg	51.21	8,000.00	
All Soil	PAD-67	Metals	Manganese	mg/kg	827.20	2,200.00	
All Soil	PAD-67	Metals	Mercury	mg/kg	0.10	2.00	
All Soil	PAD-67	Metals	Nickel	mg/kg	24.42	140.00	
All Soil	PAD-67	Metals	Selenium	mg/kg	0.72	6.00	
All Soil	PAD-67	Metals	Thallium	mg/kg	0.51	0.80	
All Soil	PAD-67	Metals	Vanadium	mg/kg	23.97	6,000.00	
All Soil	PAD-67	Metals	Zinc	mg/kg	144.10	12,400.00	
All Soil	PAD-68	Explosives	1,3,5-Trinitrobenzene	mg/kg	0.88	5.00	
All Soil	PAD-68	Explosives	1,3-Dinitrobenzene	mg/kg	0.08	0.02	Yes

Table K-4. Development of Preliminary CMCOPCs (Developed Comparing Exposure Concentration with GSSL of SRCs; used GSSLs with DAF of 20) (continued)

Media	Group	Analysis Type	Analyte	Units	Exposure Concen-tration	GSSL*20	Preliminary CMCOPC?
All Soil	PAD-68	Explosives	2,4,6-Trinitrotoluene	mg/kg	3.67	0.01	Yes
All Soil	PAD-68	Explosives	2,4-Dinitrotoluene	mg/kg	0.17	0.00	Yes
All Soil	PAD-68	Explosives	2,6-Dinitrotoluene	mg/kg	0.09	0.00	Yes
All Soil	PAD-68	Explosives	2-Amino-4,6-dinitrotoluene	mg/kg	0.16	0.00	Yes
All Soil	PAD-68	Explosives	4-Amino-2,6-dinitrotoluene	mg/kg	0.27	0.00	Yes
All Soil	PAD-68	Explosives	4-Nitrotoluene	mg/kg	0.13	3.62	
All Soil	PAD-68	Explosives	HMX	mg/kg	0.24	0.00	Yes
All Soil	PAD-68	Explosives	Nitrocellulose	mg/kg	11.00	0.00	Yes
All Soil	PAD-68	Explosives	RDX	mg/kg	0.34	0.00	Yes
All Soil	PAD-68	Explosives	Tetryl	mg/kg	0.15	0.00	Yes
All Soil	PAD-68	General	Chromium, hexavalent	mg/kg	2.44	40.00	
All Soil	PAD-68	Metals	Antimony	mg/kg	6.88	6.00	Yes
All Soil	PAD-68	Metals	Arsenic	mg/kg	12.82	5.84	Yes
All Soil	PAD-68	Metals	Barium	mg/kg	10,400.00	1,640.00	Yes
All Soil	PAD-68	Metals	Beryllium	mg/kg	0.51	60.00	
All Soil	PAD-68	Metals	Cadmium	mg/kg	1.45	8.00	
All Soil	PAD-68	Metals	Chromium	mg/kg	17.99	40.00	
All Soil	PAD-68	Metals	Cobalt	mg/kg	7.54	57,200.00	
All Soil	PAD-68	Metals	Copper	mg/kg	144.50	11,200.00	
All Soil	PAD-68	Metals	Cyanide	mg/kg	0.59	40.00	
All Soil	PAD-68	Metals	Lead	mg/kg	307.40	8,000.00	
All Soil	PAD-68	Metals	Mercury	mg/kg	0.28	2.00	
All Soil	PAD-68	Metals	Nickel	mg/kg	17.62	140.00	
All Soil	PAD-68	Metals	Selenium	mg/kg	0.80	6.00	
All Soil	PAD-68	Metals	Thallium	mg/kg	0.59	0.80	
All Soil	PAD-68	Metals	Zinc	mg/kg	376.40	12,400.00	
All Soil	PAD-68	Organics-Volatile	Acetone	mg/kg	0.00	16.00	
All Soil	PAD-68	Organics-Volatile	Methylene Chloride	mg/kg	0.01	0.02	
All Soil	PAD-68	Organics-Volatile	Toluene	mg/kg	0.08	12.00	
All Soil	PAD-70	Explosives	1,3,5-Trinitrobenzene	mg/kg	0.04	5.00	
All Soil	PAD-70	Explosives	2,4,6-Trinitrotoluene	mg/kg	0.73	0.01	Yes
All Soil	PAD-70	Explosives	HMX	mg/kg	0.14	0.00	Yes
All Soil	PAD-70	Metals	Cadmium	mg/kg	0.10	8.00	
All Soil	PAD-70	Metals	Chromium	mg/kg	19.83	40.00	
All Soil	PAD-70	Metals	Copper	mg/kg	19.90	11,200.00	
All Soil	PAD-70	Metals	Nickel	mg/kg	23.60	140.00	
All Soil	PAD-70	Metals	Thallium	mg/kg	1.31	0.80	Yes
All Soil	PAD-70	Metals	Zinc	mg/kg	82.47	12,400.00	
All Soil	PAD-70	Organics-Semivolatile	2-Methylnaphthalene	mg/kg	0.05	206.00	
All Soil	PAD-70	Organics-Semivolatile	Acenaphthene	mg/kg	0.15	580.00	
All Soil	PAD-70	Organics-Semivolatile	Anthracene	mg/kg	0.28	11,800.00	
All Soil	PAD-70	Organics-Semivolatile	Benz(*a*)anthracene	mg/kg	0.47	1.60	
All Soil	PAD-70	Organics-Semivolatile	Benzo(*a*)pyrene	mg/kg	0.42	8.00	
All Soil	PAD-70	Organics-Semivolatile	Benzo(*b*)fluoranthene	mg/kg	0.55	4.00	
All Soil	PAD-70	Organics-Semivolatile	Benzo(*g,h,i*)perylene	mg/kg	0.27	3,940,000.00	
All Soil	PAD-70	Organics-Semivolatile	Benzo(*k*)fluoranthene	mg/kg	0.30	40.00	
All Soil	PAD-70	Organics-Semivolatile	Carbazole	mg/kg	0.22	0.60	
All Soil	PAD-70	Organics-Semivolatile	Chrysene	mg/kg	0.49	160.00	
All Soil	PAD-70	Organics-Semivolatile	Dibenz(*a,h*)anthracene	mg/kg	0.11	1.60	
All Soil	PAD-70	Organics-Semivolatile	Dibenzofuran	mg/kg	0.16	48.00	
All Soil	PAD-70	Organics-Semivolatile	Fluoranthene	mg/kg	1.13	4,200.00	
All Soil	PAD-70	Organics-Semivolatile	Fluorene	mg/kg	0.21	560.00	
All Soil	PAD-70	Organics-Semivolatile	Indeno(1,2,3-*cd*)pyrene	mg/kg	0.31	14.00	

Table K-4. Development of Preliminary CMCOPCs (Developed Comparing Exposure Concentration with GSSL of SRCs; used GSSLs with DAF of 20) (continued)

Media	Group	Analysis Type	Analyte	Units	Exposure Concen-tration	GSSL*20	Preliminary CMCOPC?
All Soil	PAD-70	Organics-Semivolatile	Phenanthrene	mg/kg	0.93	804.00	
All Soil	PAD-70	Organics-Semivolatile	Pyrene	mg/kg	0.89	4,200.00	
All Soil	PAD-70	Organics-Volatile	Acetone	mg/kg	0.02	16.00	
All Soil	PAD-70	Organics-Volatile	Chloroform	mg/kg	0.00	0.60	
All Soil	PAD-70	Organics-Volatile	Toluene	mg/kg	0.06	12.00	

CMCOPC = Contaminant migration contaminant of potential concern.
DAF = Dilution attentuation factor.
DDT = Dichlorodiphenyl-trichloroethane.
GSSL = Generic soil screening level.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC = Site-related contaminant.

Table K-5. Development of Final CMCOPCs Based on Leach Depth for 1,000-year Period

Area	Media	Group	Analysis Type	Analyte	Unit	Leaching Depth	Screening Depth[a]	Final CMCOPC?
WBG	All Soil	Building 4301	Metals	Antimony	ft	9.00	4.10	
WBG	All Soil	Building 4301	Metals	Arsenic	ft	9.00	6.36	
WBG	All Soil	Building 4301	Metals	Manganese	ft	9.00	0.25	
WBG	All Soil	PAD-37	Explosives	2,4,6-Trinitrotoluene	ft	4.00	0.19	
WBG	All Soil	PAD-37	Explosives	2,4-Dinitrotoluene	ft	6.00	324.00	Yes
WBG	All Soil	PAD-37	Explosives	HMX	ft	6.00		
WBG	All Soil	PAD-37	Explosives	Nitrocellulose	ft	9.00		
WBG	All Soil	PAD-37	Explosives	Nitroglycerin	ft	9.00		
WBG	All Soil	PAD-37	Explosives	RDX	ft	4.00	1,210.00	Yes
WBG	All Soil	PAD-37	Explosives	Tetryl	ft	6.00	0.40	
WBG	All Soil	PAD-37	Metals	Arsenic	ft	0.00	6.36	Yes
WBG	All Soil	PAD-37	Organics-Pesticide/PCB	Dieldrin	ft	9.00	1.57	
WBG	All Soil	PAD-38	Explosives	2,4,6-Trinitrotoluene	ft	2.00	0.19	
WBG	All Soil	PAD-38	Explosives	2,4-Dinitrotoluene	ft	6.00	324.00	Yes
WBG	All Soil	PAD-38	Explosives	4-Amino-2,6-dinitrotoluene	ft	6.00		
WBG	All Soil	PAD-38	Metals	Arsenic	ft	0.00	6.36	Yes
WBG	All Soil	PAD-38	Metals	Cadmium	ft	0.00	2.46	Yes
WBG	All Soil	PAD-58	Explosives	2,4,6-Trinitrotoluene	ft	4.00	0.19	
WBG	All Soil	PAD-58	Explosives	2,4-Dinitrotoluene	ft	6.00	324.00	Yes
WBG	All Soil	PAD-58	Explosives	2-Amino-4,6-dinitrotoluene	ft	4.00		
WBG	All Soil	PAD-58	Explosives	HMX	ft	6.00		
WBG	All Soil	PAD-58	Metals	Antimony	ft	2.00	4.10	Yes
WBG	All Soil	PAD-58	Metals	Arsenic	ft	0.00	6.36	Yes
WBG	All Soil	PAD-58	Metals	Cadmium	ft	0.00	2.46	Yes
WBG	All Soil	PAD-58	Metals	Chromium	ft	0.00	9.68	Yes
WBG	All Soil	PAD-60	Explosives	1,3-Dinitrobenzene	ft	9.00	1,320.00	Yes
WBG	All Soil	PAD-60	Explosives	2,4,6-Trinitrotoluene	ft	6.00	0.19	
WBG	All Soil	PAD-60	Explosives	2,4-Dinitrotoluene	ft	9.00	324.00	Yes
WBG	All Soil	PAD-60	Explosives	2,6-Dinitrotoluene	ft	6.00	324.00	Yes
WBG	All Soil	PAD-60	Explosives	2-Amino-4,6-dinitrotoluene	ft	9.00		
WBG	All Soil	PAD-60	Explosives	HMX	ft	4.00		
WBG	All Soil	PAD-60	Explosives	Nitrocellulose	ft	9.00		
WBG	All Soil	PAD-60	Explosives	Nitroglycerin	ft	6.00		
WBG	All Soil	PAD-60	Explosives	RDX	ft	6.00	1,210.00	Yes
WBG	All Soil	PAD-60	Explosives	Tetryl	ft	4.00	0.40	
WBG	All Soil	PAD-60	Metals	Antimony	ft	4.00	4.10	Yes
WBG	All Soil	PAD-60	Metals	Arsenic	ft	4.00	6.36	Yes
WBG	All Soil	PAD-60	Metals	Cadmium	ft	6.00	2.46	
WBG	All Soil	PAD-61	Explosives	1,3-Dinitrobenzene	ft	9.00	1,320.00	Yes
WBG	All Soil	PAD-61	Explosives	2,4,6-Trinitrotoluene	ft	4.00	0.19	
WBG	All Soil	PAD-61	Explosives	2,4-Dinitrotoluene	ft	9.00	324.00	Yes
WBG	All Soil	PAD-61	Explosives	2,6-Dinitrotoluene	ft	9.00	324.00	Yes
WBG	All Soil	PAD-61	Explosives	2-Amino-4,6-dinitrotoluene	ft	9.00		
WBG	All Soil	PAD-61	Explosives	4-Amino-2,6-dinitrotoluene	ft	4.00		
WBG	All Soil	PAD-61	Explosives	HMX	ft	4.00		
WBG	All Soil	PAD-61	Explosives	RDX	ft	4.00	1,210.00	Yes
WBG	All Soil	PAD-61	Metals	Antimony	ft	4.00	4.10	Yes
WBG	All Soil	PAD-61	Metals	Arsenic	ft	4.00	6.36	Yes
WBG	All Soil	PAD-61	Metals	Cadmium	ft	4.00	2.46	
WBG	All Soil	PAD-61	Organics-Semivolatile	Benz(*a*)anthracene	ft	6.00		
WBG	All Soil	PAD-61	Organics-Semivolatile	Benzo(*a*)pyrene	ft	6.00	0.04	
WBG	All Soil	PAD-61	Organics-Semivolatile	Benzo(*b*)fluoranthene	ft	6.00	0.03	
WBG	All Soil	PAD-61	Organics-Semivolatile	Benzo(*k*)fluoranthene	ft	6.00	0.03	
WBG	All Soil	PAD-61	Organics-Semivolatile	Carbazole	ft	6.00	19.50	Yes
WBG	All Soil	PAD-61	Organics-Semivolatile	Chrysene	ft	6.00	0.10	
WBG	All Soil	PAD-61	Organics-Semivolatile	Dibenz(*a*,*h*)anthracene	ft	6.00	0.02	
WBG	All Soil	PAD-61	Organics-Semivolatile	Dibenzofuran	ft	6.00	3.09	

Table K-5. Development of Final CMCOPCs Based on Leach Depth for 1,000-year Period (continued)

Area	Media	Group	Analysis Type	Analyte	Unit	Leaching Depth	Screening Depth[a]	Final CMCOPC?
WBG	All Soil	PAD-61	Organics-Semivolatile	Indeno(1,2,3-*cd*)pyrene	ft	6.00		
WBG	All Soil	PAD-61	Organics-Semivolatile	Phenanthrene	ft	6.00	2.21	
WBG	All Soil	PAD-62	Explosives	2,4,6-Trinitrotoluene	ft	4.00	0.19	
WBG	All Soil	PAD-62	Explosives	2-Amino-4,6-dinitrotoluene	ft	9.00		
WBG	All Soil	PAD-62	Explosives	4-Amino-2,6-dinitrotoluene	ft	9.00		
WBG	All Soil	PAD-62	Explosives	HMX	ft	6.00		
WBG	All Soil	PAD-62	Explosives	RDX	ft	4.00	1,210.00	Yes
WBG	All Soil	PAD-62	Explosives	Tetryl	ft	9.00	0.40	
WBG	All Soil	PAD-62	Metals	Arsenic	ft	0.00	6.36	Yes
WBG	All Soil	PAD-66	Explosives	1,3,5-Trinitrobenzene	ft	4.00	1,040.00	Yes
WBG	All Soil	PAD-66	Explosives	1,3-Dinitrobenzene	ft	6.00	1,320.00	Yes
WBG	All Soil	PAD-66	Explosives	2,4,6-Trinitrotoluene	ft	4.00	0.19	
WBG	All Soil	PAD-66	Explosives	2,4-Dinitrotoluene	ft	6.00	324.00	Yes
WBG	All Soil	PAD-66	Explosives	2,6-Dinitrotoluene	ft	4.00	324.00	Yes
WBG	All Soil	PAD-66	Explosives	2-Amino-4,6-dinitrotoluene	ft	9.00		
WBG	All Soil	PAD-66	Explosives	3-Nitrotoluene	ft	4.00	228.00	Yes
WBG	All Soil	PAD-66	Explosives	4-Amino-2,6-dinitrotoluene	ft	9.00		
WBG	All Soil	PAD-66	Explosives	HMX	ft	4.00		
WBG	All Soil	PAD-66	Explosives	Nitrobenzene	ft	6.00	273.00	Yes
WBG	All Soil	PAD-66	Explosives	Nitrocellulose	ft	6.00		
WBG	All Soil	PAD-66	Explosives	RDX	ft	4.00	1,210.00	Yes
WBG	All Soil	PAD-66	Explosives	Tetryl	ft	4.00	0.40	
WBG	All Soil	PAD-66	Metals	Antimony	ft	6.00	4.10	
WBG	All Soil	PAD-66	Metals	Arsenic	ft	4.00	6.36	Yes
WBG	All Soil	PAD-66	Metals	Barium	ft	4.00	4.50	Yes
WBG	All Soil	PAD-66	Metals	Cadmium	ft	6.00	2.46	
WBG	All Soil	PAD-67	Explosives	1,3,5-Trinitrobenzene	ft	0.00	1,040.00	Yes
WBG	All Soil	PAD-67	Explosives	1,3-Dinitrobenzene	ft	4.00	1,320.00	Yes
WBG	All Soil	PAD-67	Explosives	2,4,6-Trinitrotoluene	ft	0.00	0.19	Yes
WBG	All Soil	PAD-67	Explosives	2,4-Dinitrotoluene	ft	0.00	324.00	Yes
WBG	All Soil	PAD-67	Explosives	HMX	ft	0.00		
WBG	All Soil	PAD-67	Explosives	Nitrocellulose	ft	4.00		
WBG	All Soil	PAD-67	Explosives	RDX	ft	0.00	1,210.00	Yes
WBG	All Soil	PAD-67	Explosives	Tetryl	ft	4.00	0.40	
WBG	All Soil	PAD-67	Metals	Arsenic	ft	0.00	6.36	Yes
WBG	All Soil	PAD-68	Explosives	1,3-Dinitrobenzene	ft	9.00	1,320.00	Yes
WBG	All Soil	PAD-68	Explosives	2,4,6-Trinitrotoluene	ft	4.00	0.19	
WBG	All Soil	PAD-68	Explosives	2,4-Dinitrotoluene	ft	6.00	324.00	Yes
WBG	All Soil	PAD-68	Explosives	2,6-Dinitrotoluene	ft	9.00	324.00	Yes
WBG	All Soil	PAD-68	Explosives	2-Amino-4,6-dinitrotoluene	ft	9.00		
WBG	All Soil	PAD-68	Explosives	4-Amino-2,6-dinitrotoluene	ft	9.00		
WBG	All Soil	PAD-68	Explosives	HMX	ft	4.00		
WBG	All Soil	PAD-68	Explosives	Nitrocellulose	ft	9.00		
WBG	All Soil	PAD-68	Explosives	RDX	ft	4.00	1,210.00	Yes
WBG	All Soil	PAD-68	Explosives	Tetryl	ft	4.00	0.40	
WBG	All Soil	PAD-68	Metals	Antimony	ft	4.00	4.10	Yes
WBG	All Soil	PAD-68	Metals	Arsenic	ft	0.00	6.36	Yes
WBG	All Soil	PAD-68	Metals	Barium	ft	0.00	4.50	Yes
WBG	All Soil	PAD-70	Explosives	2,4,6-Trinitrotoluene	ft	6.00	0.19	
WBG	All Soil	PAD-70	Explosives	HMX	ft	6.00		
WBG	All Soil	PAD-70	Metals	Thallium	ft	8.00	2.60	

[a]Screening depth for a constituent is calculated based on contaminant leaching for 1,000-year period. If a screening depth is greater than the leaching depth, then the constituent is expected to migrate to the water table within 1000 years.
CMCOPC = Contaminant migration contaminant of potential concern.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
PCB = Polychlorinated biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
WBG = Winklepeck Burning Grounds.

Table K-6. Climatic Data Used in SESOIL Model for WBG, Ravenna (Station: Youngstown WSO AP, Ohio)[a]

Month	Air Temp (°C)	Cloud Cover	Humidity	ALBEDO	Evapotranspiration[b] (cm/d)	Precipitation (cm)	Duration (days)	Storms per Month	Model Days in Month
October	12	0.60	0.70	0.17	0	6.46	0.42	5.33	30.4
November	5.22	0.70	0.75	0.24	0	7.4	0.53	6.67	30.4
December	-1.06	0.80	0.75	0.31	0	7.06	0.57	6.14	30.4
January	-2.94	0.80	0.80	0.3	0	7.06	0.61	5.69	30.4
February	-2.33	0.70	0.75	0.32	0	5.76	0.53	5.09	30.4
March	2.33	0.70	0.70	0.29	0	8.26	0.55	7.14	30.4
April	9.11	0.70	0.70	0.19	0	8.83	0.48	7.4	30.4
May	14.61	0.60	0.70	0.16	0	8.46	0.45	7.15	30.4
June	19.89	0.60	0.70	0.16	0	9.07	0.36	6.57	30.4
July	21.89	0.50	0.70	0.16	0	9.8	0.3	6.06	30.4
August	21.11	0.55	0.70	0.16	0	8.14	0.3	6.06	30.4
September	17.67	0.55	0.70	0.16	0	7.85	0.4	5.44	30.4

[a]1996 data from Youngstown, Ohio, Weather Service Office - Airport Station.
[b]Data calculated in SESOIL model; 0.00 indicates evapotranspiration is calculated from other climatic data.
WBG = Winklepeck Burning Grounds.

Table K-7. Source/Receptor Description Used for SESOIL/AT123D Modeling

Source	Source-to-Receptor Distance			Source Description		
	Property Boundary (m)	Northern Stream (m)	Sand Creek (m)	Length (m)	Width (m)	Area (m^2)
Pad-37	266.77	457.32	266.77	26.68	26.68	711.65
Pad-38	381.10	457.32	304.88	19.05	26.68	508.32
Pad-58	161.89	152.44	990.85	22.87	15.24	348.56
Pad-60	161.59	85.37	838.41	22.87	15.24	348.56
Pad-61	161.59	152.44	762.20	22.87	15.24	348.56
Pad-62	142.99	190.55	647.87	22.87	15.24	348.56
Pad-66	152.44	266.77	495.43	22.87	15.24	348.56
Pad-67	134.15	266.77	533.54	22.87	15.24	348.56
Pad-68	134.15	304.88	571.65	22.87	15.24	348.56

Table K-8. SESOIL Application Data, Pad 37

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
Arsenic	4	1	2	2	1	13.73
					2	17.68
		2	4	4	1	38.38
					2	38.38
					3	20.7
					4	20.7
		3	4	4	1	20.97
					2	20.97
					3	17.68
					4	17.68
		4	0.5	1	1	0.00
2,4-Dinitrotoluene	4	1	2	2	1	0.24
					2	0.00
		2	4	4	1	0.05
					2	0.05
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
RDX					1	2.24
					2	6.49
					1	0.14
					2	0.14
					3	0.23
					4	0.23
					1	0.00
					2	0.00
					3	0.00
					4	0.00
					1	0.00

CMCOPC = Contaminant migration contaminant of potential concern.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

Table K-9. SESOIL Application Data, Pad 38

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
Arsenic	4	1	2	2	1	16.16
					2	10.49
		2	4	4	1	15.78
					2	15.78
					3	11.78
					4	11.78
		3	4	4	1	18.38
					2	18.38
					3	15.89
					4	15.89
		4	0.5	1	1	0.00
Cadmium	4	1	2	2	1	43.62
					2	875.68
		2	4	4	1	201.08
					2	201.08
					3	69.19
					4	69.19
		3	4	4	1	28.00
					2	28.00
					3	1.20
					4	1.20
		4	0.5	1	1	0.00
2,4-Dinitrotoluene					1	0.15
					2	0.31
					1	0.07
					2	0.07
					3	0.00
					4	0.00
					1	0.00
					2	0.00
					3	0.00
					4	0.00
					1	0.00

CMCOPC = Contaminant migration contaminant of potential concern.

Table K-10. SESOIL Application Data, Pad 58

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
Antimony	4	1	2	2	1	41.24
					2	0.00
		2	4	4	1	27.62
					2	27.62
					3	3.40
					4	3.40
		3	4	4	1	5.62
					2	5.62
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
Arsenic	4	1	2	2	1	19.35
					2	0.00
		2	4	4	1	0.00
					2	0.00
					3	21.08
					4	21.08
		3	4	4	1	28.81
					2	28.81
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
Cadmium	4	1	2	2	1	41.14
					2	0.00
		2	4	4	1	5.00
					2	5.00
					3	0.42
					4	0.42
		3	4	4	1	0.68
					2	0.68
					3	0.26
					4	0.26
		4	0.5	1	1	0.00
Chromium	4	1	2	2	1	58.38
					2	0.00
		2	4	4	1	40.97
					2	40.97
					3	20.32
					4	20.32
		3	4	4	1	23.30
					2	23.30
					3	0.00
					4	0.00
		4	0.5	1	1	0.00

Table K-10. SESOIL Application Data, Pad 58 (continued)

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
2,4-Dinitrotoluene	4	1	2	2	1	0.00
					2	0.00
		2	4	4	1	0.56
					2	0.56
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00

CMCOPC = Contaminant migration contaminant of potential concern.

Table K-11. SESOIL Application Data, Pad 60

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
Arsenic	4	1	2	2	1	16.38
					2	11.62
		2	4	4	1	14.11
					2	14.11
					3	13.78
					4	13.78
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
1,3-Dinitrobenzene	4	1	2	2	1	0.09
					2	0.00
		2	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
2,4-Dinitrotoluene	4	1	2	2	1	1.50
					2	0.00
		2	4	4	1	0.20
					2	0.20
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
2,6-Dinitrotoluene	4	1	2	2	1	0.00
					2	0.00
		2	4	4	1	0.20
					2	0.20
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00

Table K-11. SESOIL Application Data, Pad 60 (continued)

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
RDX	4	1	2	2	1	2.60
					2	0.00
		2	4	4	1	0.26
					2	0.26
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00

CMCOPC = Contaminant migration contaminant of potential concern.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

Table K-12. SESOIL Application Data, Pad 61

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
Antimony	4	1	2	2	1	7.51
					2	0.00
		2	4	4	1	21.84
					2	21.84
					3	5.89
					4	5.89
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
Arsenic	4	1	2	2	1	14.76
					2	11.51
		2	4	4	1	24.92
					2	24.92
					3	18.81
					4	18.81
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
Carbazole	4	1	2	2	1	0.06
					2	0.00
		2	4	4	1	190.27
					2	190.27
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
Dibenzofuran	4	1	2	2	1	0.00
					2	0.00
		2	4	4	1	110.27
					2	110.27
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00

Table K-12. SESOIL Application Data, Pad 61 (continued)

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
1,3-Dinitrobenzene	4	1	2	2	1	0.04
					2	0.00
		2	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
2,4-Dinitrotoluene	4	1	2	2	1	0.06
					2	0.00
		2	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
2,6-Dinitrotoluene	4	1	2	2	1	0.09
					2	0.00
		2	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
RDX	4	1	2	2	1	0.00
					2	0.00
		2	4	4	1	0.00
					2	0.00
					3	1.20
					4	1.20
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00

Table K-12. SESOIL Application Data, Pad 61 (continued)

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
1,3,5-Trinitrobenzene	4	1	2	2	1	0.09
					2	0.00
		2	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00

CMCOPC = Contaminant migration contaminant of potential concern.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

Table K-13. SESOIL Application Data, Pad 62

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
Arsenic	4	1	2	2	1	13.84
					2	12.11
		2	4	4	1	16.92
					2	16.92
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
RDX	4	1	2	2	1	0.29
					2	270.27
		2	4	4	1	6.97
					2	6.97
					3	0.55
					4	0.55
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00

CMCOPC = Contaminant migration contaminant of potential concern.
RDX = Hexahyro-1,3,5-trinitro-1,3,5-triazine.

Table K-14. SESOIL Application Data, Pad 66

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
Arsenic	4	1	2	2	1	14.76
					2	15.62
		2	4	4	1	20.43
					2	20.43
					3	15.62
					4	15.62
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
Barium	4	1	2	2	1	7,135.14
					2	7,783.78
		2	4	4	1	280.00
					2	280.00
					3	136.76
					4	136.76
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
1,3-Dinitrobenzene	4	1	2	2	1	0.04
					2	0.00
		2	4	4	1	0.26
					2	0.26
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
2,4-Dinitrotoluene	4	1	2	2	1	0.55
					2	0.00
		2	4	4	1	0.11
					2	0.11
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00

Table K-14. SESOIL Application Data, Pad 66 (continued)

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
2,6-Dinitrotoluene	4	1	2	2	1	0.62
					2	0.00
		2	4	4	1	0.22
					2	0.22
					3	0.07
					4	0.07
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
RDX	4	1	2	2	1	80.00
					2	0.00
		2	4	4	1	14.00
					2	14.00
					3	0.46
					4	0.46
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
1,3,5-Trinitrobenzene	4	1	2	2	1	28.00
					2	76.22
		2	4	4	1	2.50
					2	2.50
					3	0.13
					4	0.13
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00

CMCOPC = Contaminant migration contaminant of potential concern.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

Table K-15. SESOIL Application Data, Pad 67

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
Arsenic	4	1	2	2	1	13.68
					2	10.70
		2	4	4	1	16.22
					2	16.22
					3	17.51
					4	17.51
		3	4	4	1	14.70
					2	14.70
					3	16.22
					4	16.22
		4	0.5	1	1	0.00
1,3-Dinitrobenzene	4	1	2	2	1	0.06
					2	0.00
		2	4	4	1	0.00
					2	0.00
					3	0.05
					4	0.05
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
2,4-Dinitrotoluene	4	1	2	2	1	0.22
					2	0.00
		2	4	4	1	0.54
					2	0.54
					3	0.00
					4	0.00
		3	4	4	1	2.80
					2	2.80
					3	0.58
					4	0.58
		4	0.5	1	1	0.00
RDX	4	1	2	2	1	470.27
					2	9,513.51
		2	4	4	1	100.00
					2	100.00
					3	260.00
					4	260.00
		3	4	4	1	240.00
					2	240.00
					3	130.27
					4	130.27
		4	0.5	1	1	0.00

Table K-15. SESOIL Application Data, Pad-67 (continued)

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
1,3,5-Trinitrobenzene	4	1	2	2	1	30.49
					2	490.27
		2	4	4	1	6.92
					2	6.92
					3	0.27
					4	0.27
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
2,4,6-Trinitrotoluene	4	1	2	2	1	430.27
					2	3,400.00
		2	4	4	1	490.27
					2	490.27
					3	5,200.00
					4	5,200.00
		3	4	4	1	3,297.30
					2	3,297.30
					3	859.46
					4	859.46
		4	0.5	1	1	0.00

CMCOPC = Contaminant migration contaminant of potential concern.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

Table K-16. SESOIL Application Data, Pad 68

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
Antimony	4	1	2	2	1	22.32
					2	2.60
		2	4	4	1	0.70
					2	0.70
					3	0.71
					4	0.71
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
Arsenic	4	1	2	2	1	13.41
					2	9.30
		2	4	4	1	21.08
					2	21.08
					3	17.08
					4	17.08
		3	4	4	1	14.81
					2	14.81
					3	10.70
					4	10.70
		4	0.5	1	1	0.00
Barium	4	1	2	2	1	9,135.13
					2	918.92
		2	4	4	1	274.05
					2	274.05
					3	158.92
					4	158.92
		3	4	4	1	54.59
					2	54.59
					3	39.08
					4	39.08
		4	0.5	1	1	0.00
1,3-Dinitrobenzene	4	1	2	2	1	0.08
					2	0.00
		2	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00

Table K-16. SESOIL Application Data, Pad-68 (continued)

CMCOPCs	No. of Layers	Layer No.	Thickness of Layer (ft)	No. of Sublayers	Sublayer No.	Concentration (mg/kg)
2,4-Dinitrotoluene	4	1	2	2	1	0.27
					2	0.00
		2	4	4	1	0.06
					2	0.06
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
2,6-Dinitrotoluene	4	1	2	2	1	0.09
					2	0.00
		2	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00
RDX	4	1	2	2	1	0.34
					2	0.00
		2	4	4	1	0.00
					2	0.00
					3	0.17
					4	0.17
		3	4	4	1	0.00
					2	0.00
					3	0.00
					4	0.00
		4	0.5	1	1	0.00

CMCOPC = Contaminant migration contaminant of potential concern.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

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APPENDIX L

GEOTECHNICAL ANALYTICAL RESULTS

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S&ME

December 1 , 2000

Science Applications International Corporation
800 Oak Ridge Turnpike
Oak Ridge, Tennessee 37831

ATTENTION: Mr. Kevin Jago

REFERENCE: **GEOTECHNICAL/PHYSICAL SOIL ANALYSIS**
Winklepeck Burning Grounds Feasibility Study
Ravenna Army Ammunition Plant
Ravenna, Ohio
Purchase Order 4400032404
S&ME Project No. 1439-00-554

Dear Mr. Jago:

S&ME, Inc. has completed laboratory testing for the subject project. This testing program was conducted in general accordance with Purchase Order No. 4400032404. The purpose of the testing program was to determine the requested properties of the soil samples received. The following report presents the activities and results of the testing program.

RECEIPT INSPECTION

A total of two (2) grab samples and four (4) Shelby tube samples were received on November 2, 2000 for the Winklepeck Burning Grounds Feasibility Study. Receipt Inspection Reports and copies of the Chain of Custody records are enclosed in Appendix A.

SCOPE AND PROCEDURES

The testing program consisted of moisture content, grain size, Atterberg limits, USCS classification, hydraulic conductivity, specific gravity, pH, redox potential, bulk density, and

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porosity on selected samples. The tests assigned were performed in general accordance with American Society for Testing and Materials (ASTM) Methods D2216 for moisture content, D422 for grain size, D4318 for Atterberg limits, D2487 for classification, D5084 for hydraulic conductivity, D854 for specific gravity, D4972 for pH, D1498 for redox potential, and Corps of Engineers procedure EM-1110-2-1906 for bulk density and porosity.

RESULTS

A summary of test results and test data sheets are included in the attachments.

S&ME, Inc., appreciates the opportunity to be of service in this project. If you have questions or require additional information, please contact us at your convenience.

Sincerely,

S&ME, Inc.

John B. Pearson, P.E.
Laboratory Manager

JBP/trb

Attachments

TEST DATA SUMMARY
Winklepeck Burning Grounds Feasibility Study
Ravenna Army Ammunition Plant
Ravenna, Ohio
S&ME Project No. 1439-00-554

Specimen I.D.	Moist. Cont. %	Att. Limits		Grain Size			Dry Blk. Density lb/ft^3	Hyd. Cond. cm/sec	pH	Spec. grav.	Porosity ft^3/ft^3	Redox Pot. MV	Classification
		LL	PI	%grav.	%sand	% silt & clay							
WBG4249	29.8	32	11	3.2	42.8	54.0	-	-	-	-	-	-	Sandy lean clay (CL)
WBG4250	40.1	38	18	8.1	30.1	61.8	-	-	-	-	-	-	Sandy lean clay (CL)
WBG4266	23.3	37	16	11.0	25.6	63.4	100.5	$3.2x10^{-7}$	5.9	2.656	0.393	+440	Sandy lean clay (CL)
WBG4264	17.3	31	13	0.4	18.0	81.6	111.6	$2.2x10^{-7}$	5.3	2.658	0.327	+460	Lean clay w/sand (CL)
WBG4262	16.3	38	18	10.2	29.1	60.7	114.2	$9.2x10^{-8}$	5.1	2.629	0.304	+430	Sandy lean clay (CL)
WBG4260	16.4	33	14	6.3	30.8	62.9	112.7	$6.9x10^{-8}$	5.3	2.640	0.316	+420	Sandy lean clay (CL)

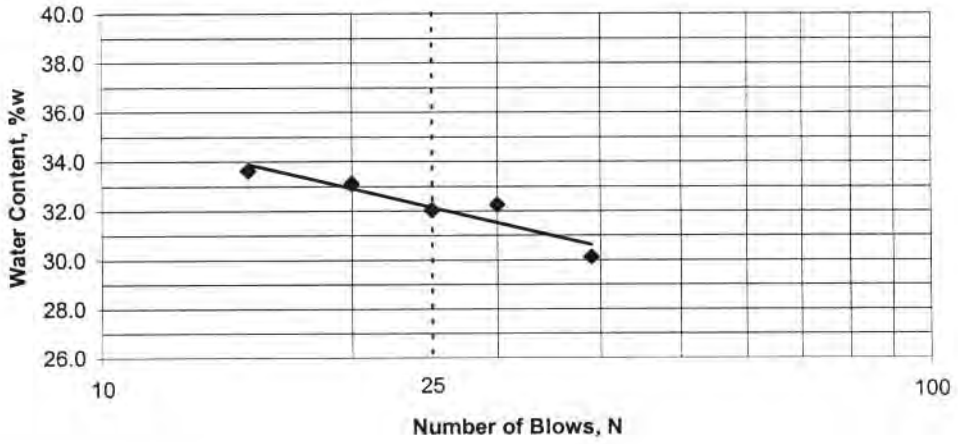
S&ME

ATTERBERG LIMITS

Job No:	1439-00-554	**ASTM D:**	4318
Job Name:	Winklepeck Burning Grounds	**Operator:**	DB
Sample No:	WBG 4249	**Date:**	11/10/00

LIQUID LIMIT DETERMINATION

Tare No.	A20	50	1d	E	11
Soil & Tare Wet Wt.	17.33	17.05	17.23	17.49	15.90
Soil & Tare Dry Wt.	13.96	13.77	14.04	14.22	13.17
Tare Wt.	3.94	3.86	4.08	4.08	4.11
Moisture Content; %	33.6	33.1	32.0	32.3	30.1
No. of Blows; N	15	20	25	30	39



PLASTIC LIMIT DETERMINATION

Tare No.	16		26		57
Soil & Tare Wet Wt.	25.09		24.29		22.66
Soil & Tare Dry Wt.	21.51		20.66		19.61
Tare Wt.	4.13		3.87		3.87
Moisture Content; %	20.6		21.6		19.4

LL= 32 **PL = 21** **PI = 11**

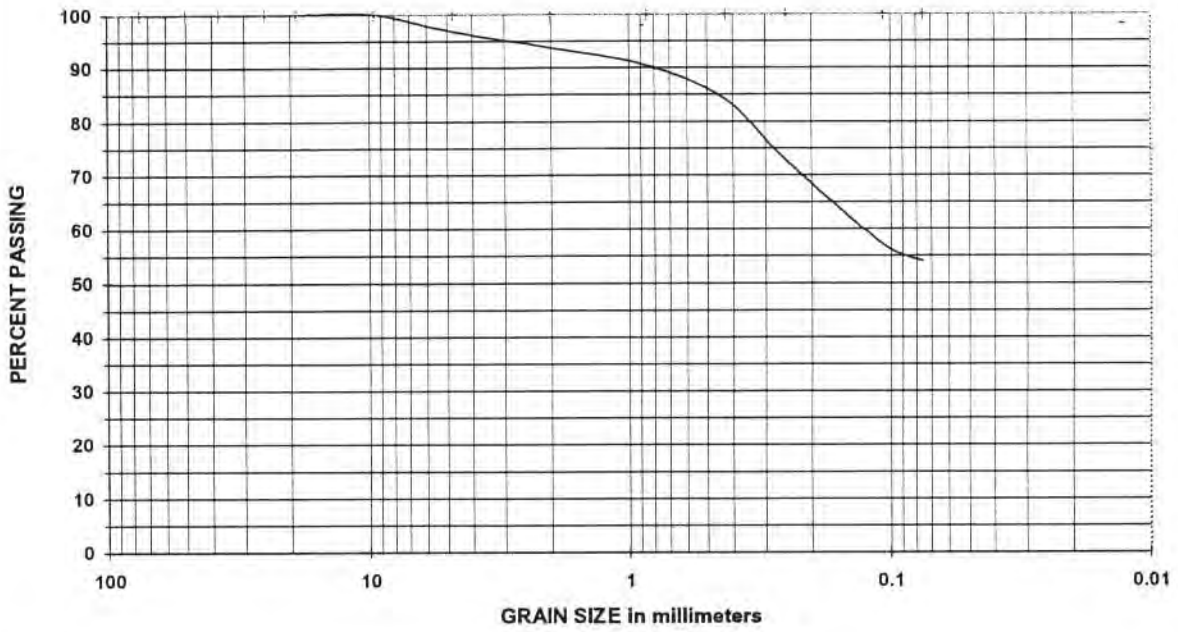
S&ME

GRAIN SIZE DATA SHEET

Job Name: Winklepeck Burning Grounds
Job Number: 1439-00-554

ASTM: D 422
Date: 11/10/00

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	< 0.005 mm

Sample No.: WBG 4249

Elevation (ft): ND

Soil Description: Dark Brown Sandy Lean Clay (CL)

GRAIN SIZE DATA	
% Gravel	3.2
% Sand	42.8
% Fines	54.0

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Mechanical Sieve Analysis

Job No: 1439-00-554 **ASTM:** D 422

Job Name: Winklepeck Burning Grounds **Operator:** DB

Specimen ID: WBG 4249 **Date:** 11/10/00

Specimen Description: Dark Brown

Initial Specimen Weight:

Dry wt, (g) 200.28

Stand. Sieve	Opening Size (mm)	Cum. Wt. Ret. (g)	Cum. % Ret. (%)	% Passing (%)	Req. % Pass. (%)
3 in	75	0.00	0.0	100.0	
2 in	50	0.00	0.0	100.0	
1.5 in	37.5	0.00	0.0	100.0	
1 in	25	0.00	0.0	100.0	
.75 in	19	0.00	0.0	100.0	
0.375	9.5	0.00	0.0	100.0	
4	4.75	6.41	3.2	96.8	
10	2	12.71	6.3	93.7	
20	0.85	19.24	9.6	90.4	
40	0.425	31.85	15.9	84.1	
60	0.25	54.68	27.3	72.7	
140	0.106	85.93	42.9	57.1	
200	0.075	92.20	46.0	54.0	

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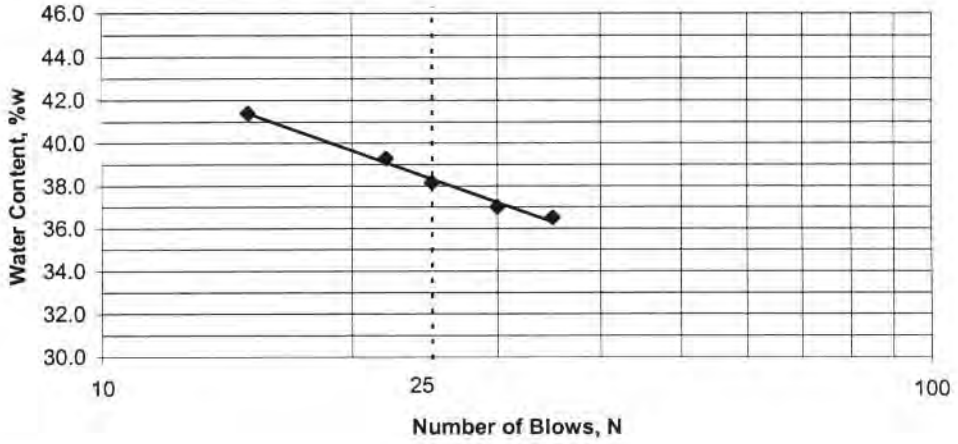
ATTERBERG LIMITS

Job No:	1439-00-554	**ASTM D:**	4318
Job Name:	Winklepeck Burning Grounds	**Operator:**	DB
Sample No:	WBG 4250	**Date:**	11/10/00

LIQUID LIMIT DETERMINATION

Tare No.	I	9	28	13	46
Soil & Tare Wet Wt.	17.50	17.82	15.27	17.74	18.92
Soil & Tare Dry Wt.	13.60	13.99	12.11	14.05	14.92
Tare Wt.	4.18	4.24	3.83	4.08	3.96
Moisture Content; %	41.4	39.3	38.2	37.0	36.5
No. of Blows; N	15	22	25	30	35



PLASTIC LIMIT DETERMINATION

Tare No.	A15		FO		A5
Soil & Tare Wet Wt.	19.04		18.84		17.26
Soil & Tare Dry Wt.	16.46		16.32		15.06
Tare Wt.	3.98		4.07		3.94
Moisture Content; %	20.7		20.6		19.8

LL= 38 **PL = 20** **PI = 18**

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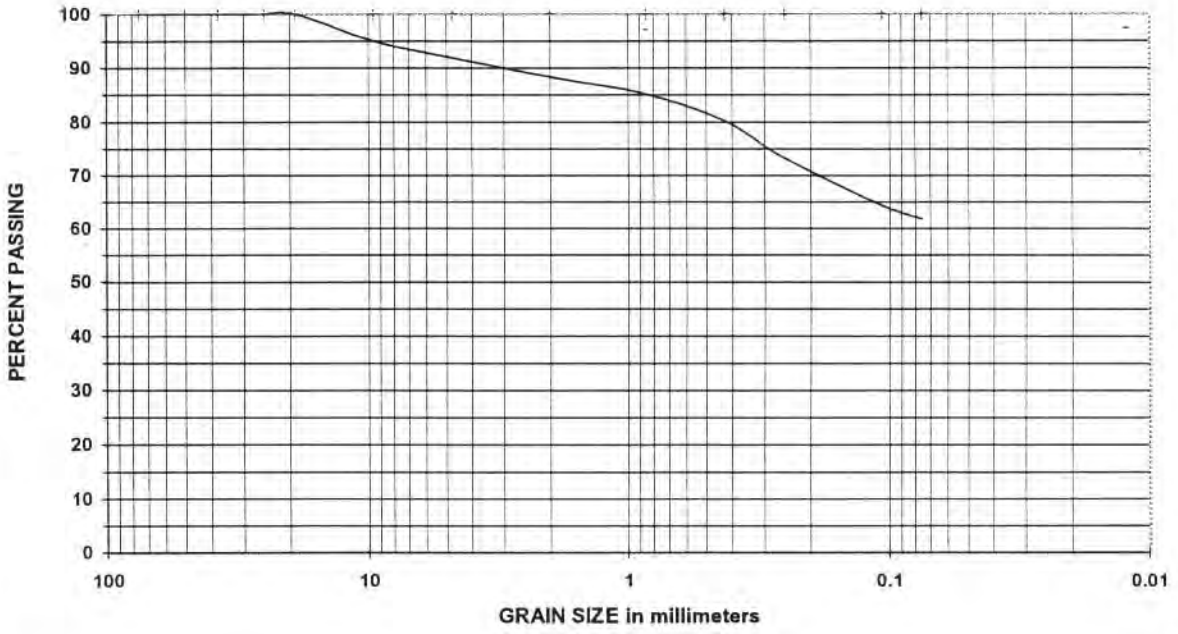
GRAIN SIZE DATA SHEET

Job Name: Winklepeck Burning Grounds
Job Number: 1439-00-554

ASTM: D 422
Date: 11/10/00

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	< 0.005 mm

Sample No.: WBG 4250

Elevation (ft): ND

Soil Description: Gray & Brown Sandy Lean Clay (CL)

GRAIN SIZE DATA	
% Gravel	8.1
% Sand	30.1
% Fines	61.8

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Mechanical Sieve Analysis

Job No:	1439-00-554	**ASTM:**	D 422
Job Name:	Winklepeck Burning Grounds	**Operator:**	DB
Specimen ID:	WBG 4250	**Date:**	11/10/00

Specimen Description: Gray & Brown

Initial Specimen Weight:

Dry wt, (g) 255.51

Stand. Sieve	Opening Size (mm)	Cum. Wt. Ret. (g)	Cum. % Ret. (%)	% Passing (%)	Req. % Pass. (%)
3 in	75	0.00	0.0	100.0	
2 in	50	0.00	0.0	100.0	
1.5 in	37.5	0.00	0.0	100.0	
1 in	25	0.00	0.0	100.0	
.75 in	19	0.00	0.0	100.0	
0.375	9.5	12.64	4.9	95.1	
4	4.75	20.67	8.1	91.9	
10	2	29.76	11.6	88.4	
20	0.85	38.03	14.9	85.1	
40	0.425	50.54	19.8	80.2	
60	0.25	68.40	26.8	73.2	
140	0.106	91.28	35.7	64.3	
200	0.075	97.51	38.2	61.8	

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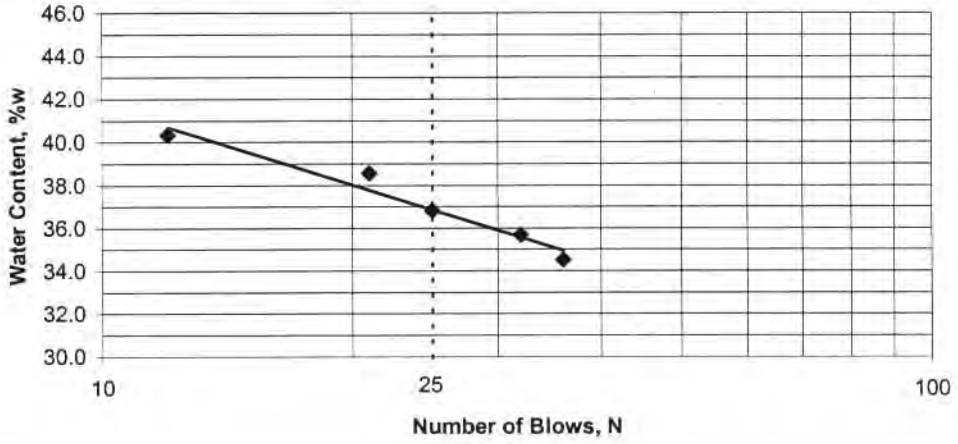
ATTERBERG LIMITS

Job No:	1439-00-554	**ASTM D:**	4318
Job Name:	Winklepeck Burning Grounds	**Operator:**	DB
Sample No:	WBG 4266	**Date:**	11/10/00

LIQUID LIMIT DETERMINATION

Tare No.	12	35	A8	4	1C
Soil & Tare Wet Wt.	17.27	17.03	17.51	17.31	17.88
Soil & Tare Dry Wt.	13.52	13.39	13.85	13.80	14.36
Tare Wt.	4.22	3.95	3.91	3.96	4.16
Moisture Content; %	40.3	38.6	36.8	35.7	34.5
No. of Blows; N	12	21	25	32	36



PLASTIC LIMIT DETERMINATION

Tare No.	Q		Z		D
Soil & Tare Wet Wt.	21.23		20.44		21.21
Soil & Tare Dry Wt.	18.28		17.53		18.21
Tare Wt.	4.17		4.09		4.02
Moisture Content; %	20.9		21.7		21.1

LL= 37 **PL = 21** **PI = 16**

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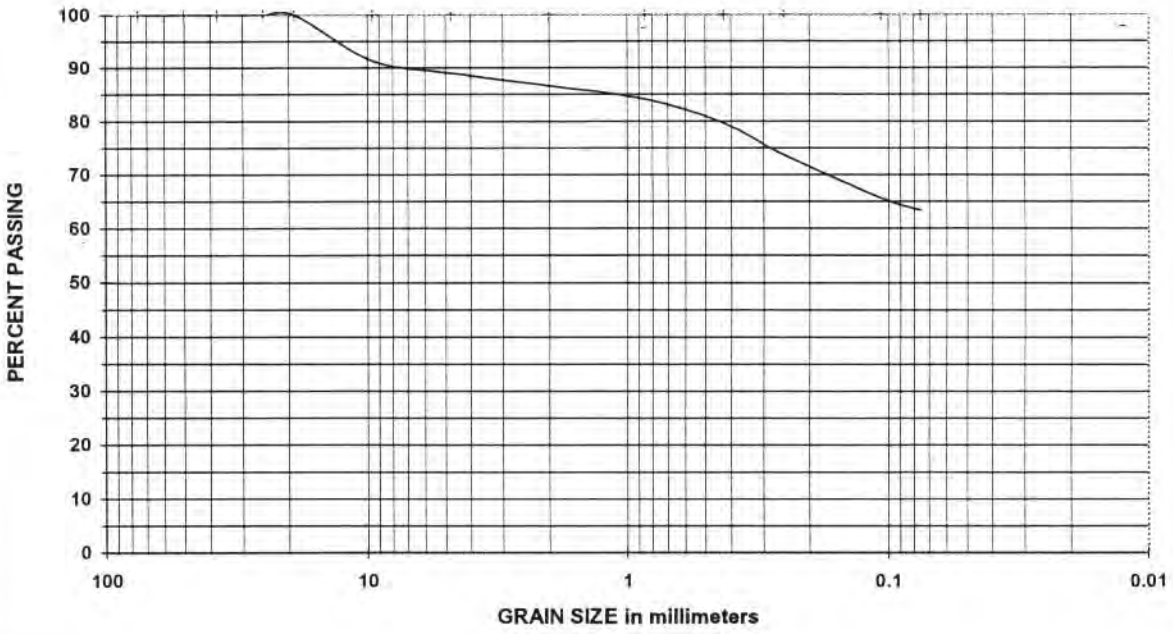
GRAIN SIZE DATA SHEET

Job Name: Winklepeck Burning Grounds
Job Number: 1439-00-554

ASTM: D 422
Date: 11/10/00

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	< 0.005 mm

Sample No.: **WBG 4266**

Elevation (ft): **1.0-3.0**

Soil Description: **Brown w/ Gray Mottling Sandy Lean Clay (CL)**

GRAIN SIZE DATA	
% Gravel	**11.0**
% Sand	**25.6**
% Fines	**63.4**

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Mechanical Sieve Analysis

Job No: 1439-00-554 **ASTM:** D 422

Job Name: Winklepeck Burning Grounds **Operator:** DB

Specimen ID: WBG 4266 **Date:** 11/10/00

Specimen Description: Brown w/ Gray Mottling

Initial Specimen Weight:

Dry wt, (g) 197.82

Stand. Sieve	Opening Size (mm)	Cum. Wt. Ret. (g)	Cum. % Ret. (%)	% Passing (%)	Req. % Pass. (%)
3 in	75	0.00	0.0	100.0	
2 in	50	0.00	0.0	100.0	
1.5 in	37.5	0.00	0.0	100.0	
1 in	25	0.00	0.0	100.0	
.75 in	19	0.00	0.0	100.0	
0.375	9.5	17.23	8.7	91.3	
4	4.75	21.72	11.0	89.0	
10	2	26.44	13.4	86.6	
20	0.85	31.55	15.9	84.1	
40	0.425	40.30	20.4	79.6	
60	0.25	52.07	26.3	73.7	
140	0.106	68.13	34.4	65.6	
200	0.075	72.42	36.6	63.4	

Hydraulic Conductivity

Job No: 1439-00-554 **Spec ID:** WBG4266 **ASTM:** D5084

Job Name: Winklepeck Burning Grounds **Depth:** 1.0'-3.0' **Operator:** JWA

Description: Brown w/ Gray Mottling **Date Rec:** 11/3/00 **Date Comp:**

Ave. Hydraulic Conductivity: 3.2E-07 cm/s

Ave. Sample Height:	3.152 in	**Ave. Confining Pressure:**	4.0 psi
Ave. Sample Height:	8.005 cm	**Ave. Differential Pressure:**	1.0 psi
Ave. Sample Diameter:	2.833 in	**Pipette Area:**	0.3030 cm^2
Ave. Sample Diameter:	7.196 cm	**Wet Density:**	123.9 pcf
Sample Area:	6.304 in^2	**Moisture Content:**	23.3 %
Sample Area:	40.668 cm^2	**Dry Density:**	100.5 pcf
Sample Volume:	325.56 cc	**Specific Gravity:**	2.656
Initial Sample Weight:	646.67 gms	**Porosity:**	0.393

Headwater (Influent)				Tailwater (Effluent)				Elapsed	Int. H	Final H	Conductivity
P (psi)	Vol. (mL)	L (cm)	head (cm)	P (psi)	Vol. (mL)	L (cm)	head (cm)	time (s)	Diff. (cm)	Diff. (cm)	K (cm/s)
81.0	15.4	50.9	121.2	80.0	7.4	24.5	24.5	51540.0	96.7	55.1	3.25E-07
81.0	9.2	30.3	100.6	80.0	13.8	45.5	45.5				
81.0	9.2	30.3	100.6	80.0	13.8	45.5	45.5	13380.0	55.1	47.2	3.45E-07
81.0	8.0	26.3	96.6	80.0	15.0	49.4	49.4				
81.0	19.7	64.9	135.2	80.0	2.6	8.6	8.6	12600.0	126.6	111.0	3.11E-07
81.0	17.4	57.3	127.6	80.0	5.0	16.6	16.6				
81.0	17.4	57.3	127.6	80.0	5.0	16.6	16.6	49260.0	111.0	66.4	3.11E-07
81.0	10.7	35.3	105.6	80.0	11.9	39.2	39.2				

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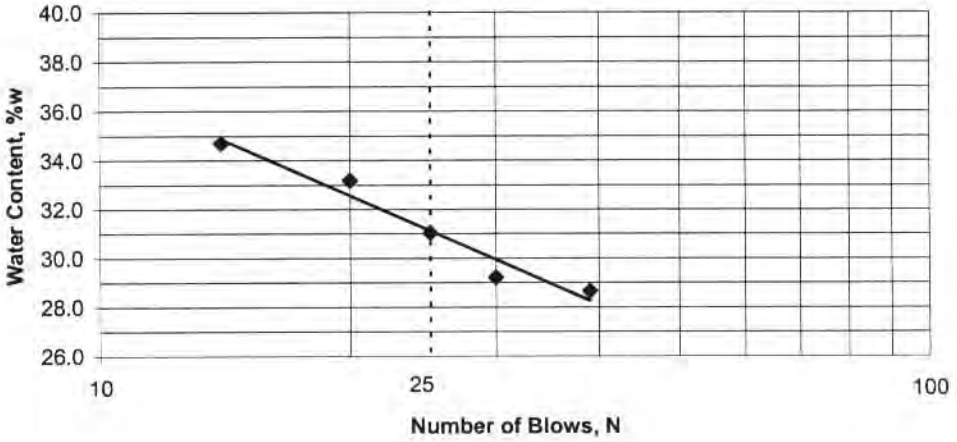
ATTERBERG LIMITS

Job No:	1439-00-554	**ASTM D:**	4318
Job Name:	Winklepeck Burning Grounds	**Operator:**	DB
Sample No:	WBG 4264	**Date:**	11/10/00

LIQUID LIMIT DETERMINATION

Tare No.	10	C	1	B-1	14
Soil & Tare Wet Wt.	16.48	18.19	17.67	17.84	18.81
Soil & Tare Dry Wt.	13.27	14.67	14.46	14.67	15.54
Tare Wt.	4.02	4.06	4.12	3.82	4.13
Moisture Content; %	34.7	33.2	31.0	29.2	28.7
No. of Blows; N	14	20	25	30	39



PLASTIC LIMIT DETERMINATION

Tare No.	31		311		Y
Soil & Tare Wet Wt.	22.41		22.93		21.95
Soil & Tare Dry Wt.	19.72		20.03		19.31
Tare Wt.	3.87		4.04		4.18
Moisture Content; %	17.0		18.1		17.5

LL= 31 **PL = 18** **PI = 13**

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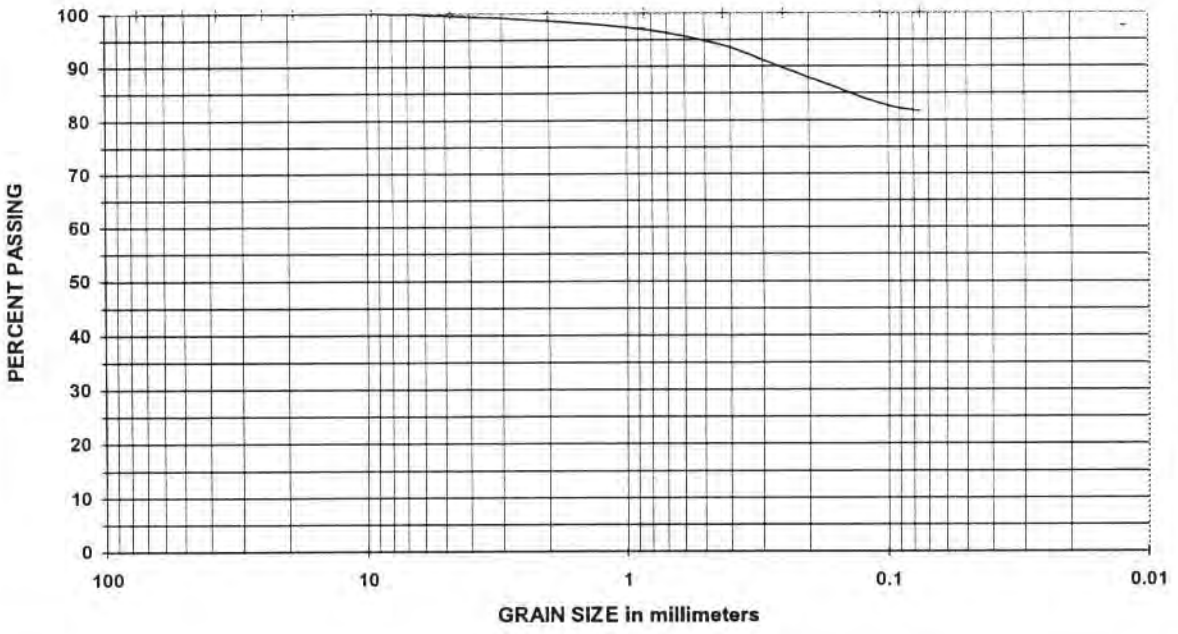
GRAIN SIZE DATA SHEET

Job Name: Winklepeck Burning Grounds
Job Number: 1439-00-554

ASTM: D 422
Date: 11/10/00

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	< 0.005 mm

Sample No.: **WBG 4264**

Elevation (ft): **1.0-3.0**

Soil Description: **Brown w/ Gray Mottling Lean Clay w/ Sand (CL)**

GRAIN SIZE DATA	
% Gravel	0.4
% Sand	18.0
% Fines	81.6

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Mechanical Sieve Analysis

Job No: 1439-00-554 **ASTM:** D 422

Job Name: Winklepeck Burning Grounds **Operator:** DB

Specimen ID: WBG 4264 **Date:** 11/10/00

Specimen Description: Brown w/ Gray Mottling

Initial Specimen Weight:

Dry wt, (g) 196.87

Stand. Sieve	Opening Size (mm)	Cum. Wt. Ret. (g)	Cum. % Ret. (%)	% Passing (%)	Req. % Pass. (%)
3 in	75	0.00	0.0	100.0	
2 in	50	0.00	0.0	100.0	
1.5 in	37.5	0.00	0.0	100.0	
1 in	25	0.00	0.0	100.0	
.75 in	19	0.00	0.0	100.0	
0.375	9.5	0.00	0.0	100.0	
4	4.75	0.88	0.4	99.6	
10	2	2.69	1.4	98.6	
20	0.85	6.14	3.1	96.9	
40	0.425	11.86	6.0	94.0	
60	0.25	20.35	10.3	89.7	
140	0.106	33.34	16.9	83.1	
200	0.075	36.24	18.4	81.6	

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Hydraulic Conductivity

Job No: 1439-00-554 Spec ID: WBG4264 ASTM: D5084

Job Name: Winklepeck Burning Grounds Depth: 1.0'-3.0' Operator: JWA

Description: Brown w/ Gray Mottling Date Rec: 11/3/00 Date Comp:

Ave. Hydraulic Conductivity: 2.2E-07 cm/s

Ave. Sample Height:	3.129 in	Ave. Confining Pressure:	4.0 psi
Ave. Sample Height:	7.947 cm	Ave. Differential Pressure:	2.0 psi
Ave. Sample Diameter:	2.845 in	Pipette Area:	0.3030 cm^2
Ave. Sample Diameter:	7.227 cm	Wet Density:	130.8 pcf
Sample Area:	6.359 in^2	Moisture Content:	17.3 %
Sample Area:	41.023 cm^2	Dry Density:	111.6 pcf
Sample Volume:	326.00 cc	Specific Gravity:	2.658
Initial Sample Weight:	683.54 gms	Porosity:	0.327

Headwater (Influent)				Tailwater (Effluent)				Elapsed	Int. H	Final H	Conductivity
P (psi)	Vol. (mL)	L (cm)	head (cm)	P (psi)	Vol. (mL)	L (cm)	head (cm)	time (s)	Diff. (cm)	Diff. (cm)	K (cm/s)
82.0	14.7	48.5	189.1	80.0	9.4	31.0	31.0	51540.0	158.1	110.5	2.04E-07
82.0	7.6	25.0	165.6	80.0	16.7	55.1	55.1				
82.0	7.6	25.0	165.6	80.0	16.7	55.1	55.1	13380.0	110.5	100.3	2.12E-07
82.0	6.1	20.0	160.6	80.0	18.3	60.3	60.3				
82.0	6.1	20.0	160.6	80.0	18.3	60.3	60.3	7500.0	100.3	95.3	2.00E-07
82.0	5.4	17.7	158.3	80.0	19.1	63.0	63.0				
82.0	14.3	47.2	187.8	80.0	8.0	26.3	26.3	49260.0	161.5	102.7	2.70E-07
82.0	5.4	17.9	158.5	80.0	16.9	55.8	55.8				

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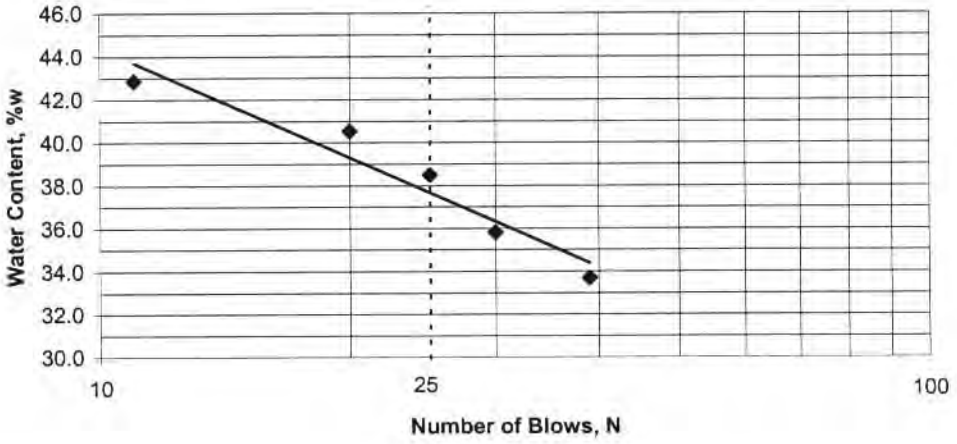
ATTERBERG LIMITS

Job No:	1439-00-554	**ASTM D:**	4318
Job Name:	Winklepeck Burning Grounds	**Operator:**	DB
Sample No:	WBG 4262	**Date:**	11/10/00

LIQUID LIMIT DETERMINATION

Tare No.	1b	39	40	15	A19
Soil & Tare Wet Wt.	16.22	15.75	15.98	17.93	18.40
Soil & Tare Dry Wt.	12.58	12.30	12.60	14.27	14.75
Tare Wt.	4.09	3.79	3.82	4.05	3.92
Moisture Content; %	42.9	40.5	38.5	35.8	33.7
No. of Blows; N	11	20	25	30	39



PLASTIC LIMIT DETERMINATION

Tare No.	20		B10		T
Soil & Tare Wet Wt.	20.91		23.88		19.13
Soil & Tare Dry Wt.	18.09		20.56		16.61
Tare Wt.	3.98		3.93		4.05
Moisture Content; %	20.0		20.0		20.1

LL= 38 **PL = 20** **PI = 18**

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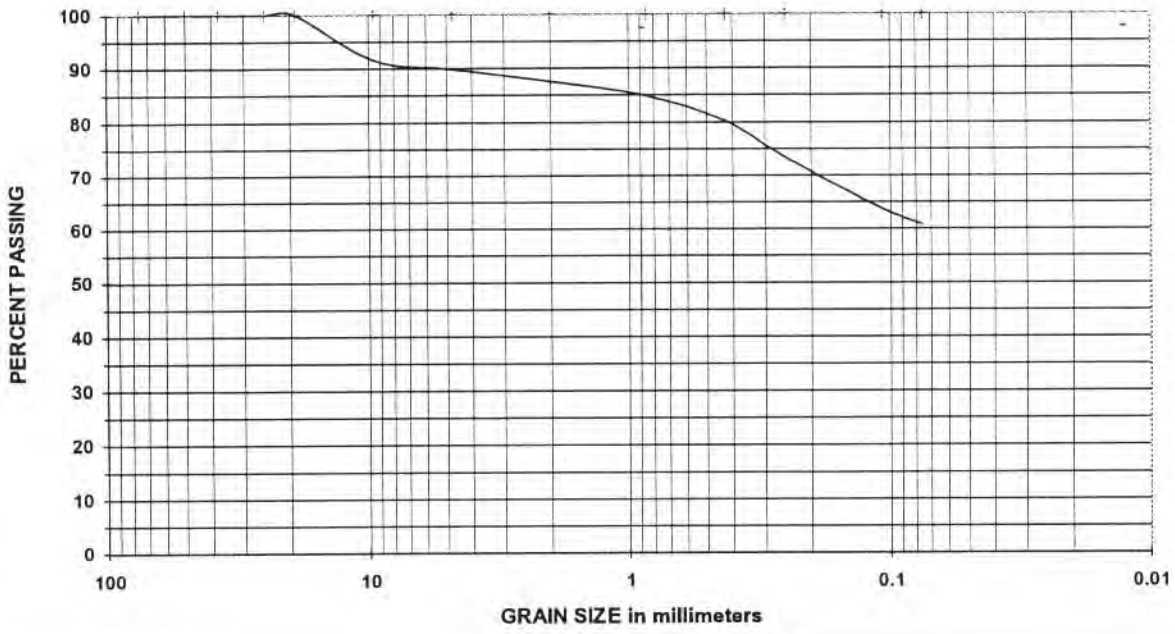
GRAIN SIZE DATA SHEET

Job Name: Winklepeck Burning Grounds
Job Number: 1439-00-554

ASTM: D 422
Date: 11/10/00

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	< 0.005 mm

Sample No.: **WBG 4262**

Elevation (ft): **1.0-3.0**

Soil Description: **Brown w/ Gray Mottling Sandy Lean Clay (CL)**

GRAIN SIZE DATA	
% Gravel	**10.2**
% Sand	**29.1**
% Fines	**60.7**

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Mechanical Sieve Analysis

Job No: 1439-00-554 **ASTM:** D 422

Job Name: Winklepeck Burning Grounds **Operator:** DB

Specimen ID: WBG 4262 **Date:** 11/10/00

Specimen Description: Brown w/ Gray Mottling

Initial Specimen Weight:

Dry wt, (g) 176.19

Stand. Sieve	Opening Size (mm)	Cum. Wt. Ret. (g)	Cum. % Ret. (%)	% Passing (%)	Req. % Pass. (%)
3 in	75	0.00	0.0	100.0	
2 in	50	0.00	0.0	100.0	
1.5 in	37.5	0.00	0.0	100.0	
1 in	25	0.00	0.0	100.0	
.75 in	19	0.00	0.0	100.0	
0.375	9.5	14.94	8.5	91.5	
4	4.75	17.93	10.2	89.8	
10	2	21.91	12.4	87.6	
20	0.85	26.65	15.1	84.9	
40	0.425	34.92	19.8	80.2	
60	0.25	46.94	26.6	73.4	
140	0.106	64.18	36.4	63.6	
200	0.075	69.25	39.3	60.7	

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Hydraulic Conductivity

Job No: 1439-00-554 Spec ID: WBG4262 ASTM: D5084

Job Name: Winklepeck Burning Grounds Depth: 1.0'-3.0' Operator: JWA

Description: Brown w/ Gray Mottling Date Rec: 11/3/00 Date Comp:

Ave. Hydraulic Conductivity: 9.2E-08 cm/s

Ave. Sample Height:	3.183 in	Ave. Confining Pressure:	4.0 psi
Ave. Sample Height:	8.085 cm	Ave. Differential Pressure:	2.0 psi
Ave. Sample Diameter:	2.862 in	Pipette Area:	0.3030 cm^2
Ave. Sample Diameter:	7.269 cm	Wet Density:	132.8 pcf
Sample Area:	6.433 in^2	Moisture Content:	16.3 %
Sample Area:	41.505 cm^2	Dry Density:	114.2 pcf
Sample Volume:	335.56 cc	Specific Gravity:	2.629
Initial Sample Weight:	713.91 gms	Porosity:	0.304

Headwater (Influent)				Tailwater (Effluent)				Elapsed	Int. H	Final H	Conductivity
P (psi)	Vol. (mL)	L (cm)	head (cm)	P (psi)	Vol. (mL)	L (cm)	head (cm)	time (s)	Diff. (cm)	Diff. (cm)	K (cm/s)
82.0	17.5	57.7	198.3	80.0	6.6	21.7	21.7	51540.0	176.6	150.0	9.35E-08
82.0	13.5	44.5	185.1	80.0	10.6	35.1	35.1				
82.0	13.5	44.5	185.1	80.0	10.6	35.1	35.1	13380.0	150.0	143.7	9.46E-08
82.0	12.5	41.4	182.0	80.0	11.6	38.3	38.3				
82.0	20.7	68.4	209.0	80.0	3.6	12.0	12.0	12600.0	197.0	189.0	9.71E-08
82.0	19.5	64.5	205.1	80.0	4.9	16.1	16.1				
82.0	19.5	64.5	205.1	80.0	4.9	16.1	16.1	49260.0	189.0	164.4	8.35E-08
82.0	15.8	52.2	192.8	80.0	8.6	28.4	28.4				

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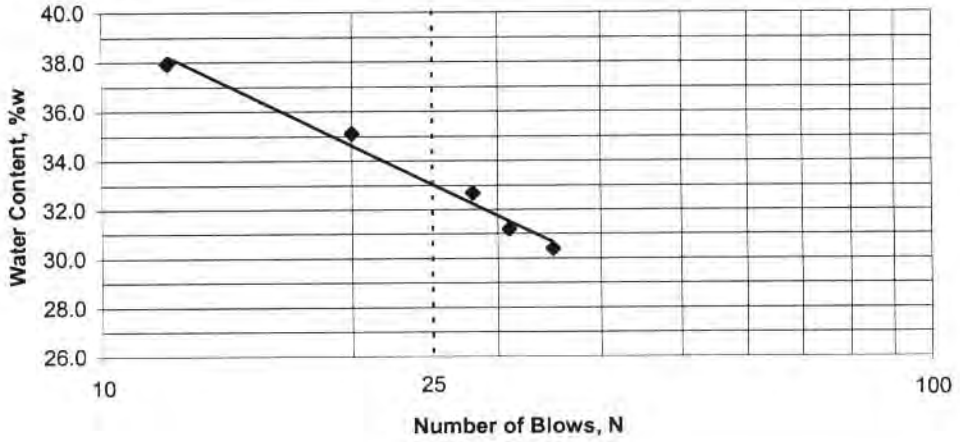
ATTERBERG LIMITS

Job No:	1439-00-554	**ASTM D:**	4318
Job Name:	Winklepeck Burning Grounds	**Operator:**	DB
Sample No:	WBG 4260	**Date:**	11/10/00

LIQUID LIMIT DETERMINATION

Tare No.	45	7	A	36	21
Soil & Tare Wet Wt.	15.85	18.10	17.03	17.95	18.25
Soil & Tare Dry Wt.	12.52	14.48	13.85	14.59	14.94
Tare Wt.	3.74	4.17	4.12	3.82	4.05
Moisture Content; %	37.9	35.1	32.7	31.2	30.4
No. of Blows; N	12	20	28	31	35



PLASTIC LIMIT DETERMINATION

Tare No.	N		18		A4
Soil & Tare Wet Wt.	21.58		21.42		20.73
Soil & Tare Dry Wt.	18.71		18.59		18.10
Tare Wt.	4.01		4.08		3.93
Moisture Content; %	19.5		19.5		18.6

LL= 33 **PL = 19** **PI = 14**

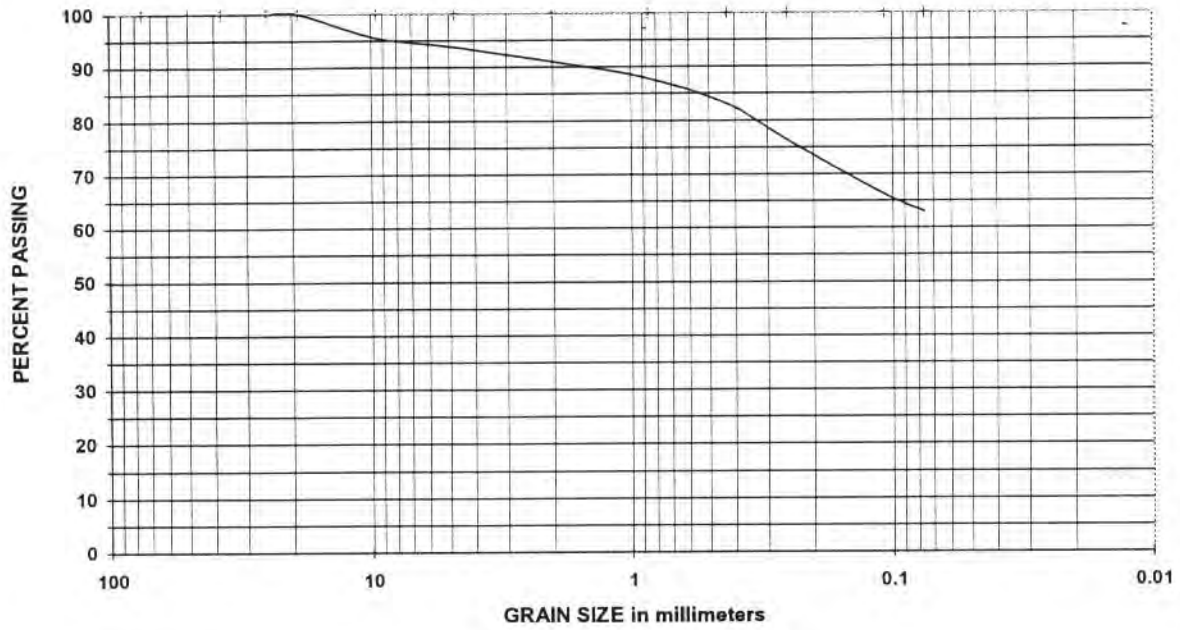
S&ME

GRAIN SIZE DATA SHEET

Job Name: Winklepeck Burning Grounds
Job Number: 1439-00-554

ASTM: D 422
Date: 11/10/00

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	< 0.005 mm

Sample No.: **WBG 4260**

Elevation (ft): **1.0-3.0**

Soil Description: **Brown w/ Gray Mottling Sandy Lean Clay (CL)**

GRAIN SIZE DATA	
% Gravel	**6.3**
% Sand	**30.8**
% Fines	**62.9**

S&ME, Inc., 1413 Topside Road, Louisville, Tennessee 37777, (423) 970-0003, Fax (423) 970-0004

S&ME

Mechanical Sieve Analysis

Job No: 1439-00-554 **ASTM:** D 422

Job Name: Winklepeck Burning Grounds **Operator:** DB

Specimen ID: WBG 4260 **Date:** 11/10/00

Specimen Description: Brown w/ Gray Mottling

Initial Specimen Weight:

Dry wt, (g) 166.41

Stand. Sieve	Opening Size (mm)	Cum. Wt. Ret. (g)	Cum. % Ret. (%)	% Passing (%)	Req. % Pass. (%)
3 in	75	0.00	0.0	100.0	
2 in	50	0.00	0.0	100.0	
1.5 in	37.5	0.00	0.0	100.0	
1 in	25	0.00	0.0	100.0	
.75 in	19	0.00	0.0	100.0	
0.375	9.5	7.48	4.5	95.5	
4	4.75	10.49	6.3	93.7	
10	2	14.92	9.0	91.0	
20	0.85	20.26	12.2	87.8	
40	0.425	28.29	17.0	83.0	
60	0.25	39.55	23.8	76.2	
140	0.106	56.45	33.9	66.1	
200	0.075	61.74	37.1	62.9	

S&ME

Hydraulic Conductivity

Job No: 1439-00-554 Spec ID: WBG4260 ASTM: D5084

Job Name: Winklepeck Burning Grounds Depth: 1.0'-3.0' Operator: JWA

Description: Brown w/ Gray Mottling Date Rec: 11/3/00 Date Comp:

Ave. Hydraulic Conductivity: 6.9E-08 cm/s

Ave. Sample Height:	3.104 in	Ave. Confining Pressure:	4.0 psi
Ave. Sample Height:	7.885 cm	Ave. Differential Pressure:	2.0 psi
Ave. Sample Diameter:	2.852 in	Pipette Area:	0.3030 cm^2
Ave. Sample Diameter:	7.245 cm	Wet Density:	131.2 pcf
Sample Area:	6.390 in^2	Moisture Content:	16.4 %
Sample Area:	41.225 cm^2	Dry Density:	112.7 pcf
Sample Volume:	325.06 cc	Specific Gravity:	2.64
Initial Sample Weight:	683.29 gms	Porosity:	0.316

Headwater (Influent)				Tailwater (Effluent)				Elapsed time	Int. H Diff.	Final H Diff.	Conductivity K
P (psi)	Vol. (mL)	L (cm)	head (cm)	P (psi)	Vol. (mL)	L (cm)	head (cm)	(s)	(cm)	(cm)	(cm/s)
82.0	16.8	55.4	196.0	80.0	6.8	22.6	22.6	51540.0	173.4	150.0	8.15E-08
82.0	13.2	43.5	184.1	80.0	10.3	34.1	34.1				
82.0	13.2	43.5	184.1	80.0	10.3	34.1	34.1	13380.0	150.0	144.9	7.49E-08
82.0	12.4	41.0	181.6	80.0	11.1	36.7	36.7				
82.0	20.4	67.2	207.8	80.0	3.3	10.8	10.8	12600.0	197.0	191.5	6.51E-08
82.0	19.5	64.5	205.1	80.0	4.1	13.6	13.6				
82.0	19.5	64.5	205.1	80.0	4.1	13.6	13.6	49260.0	191.5	174.1	5.60E-08
82.0	16.9	55.7	196.3	80.0	6.7	22.2	22.2				

APPENDIX A

Receipt Inspection Reports
and
Chain-of-Custody Records

Inspection Report

DATE: 11/2/00

REPORT No.: QA-INSP-00- 128

☑ RECEIVING ☐ SHIPPING

PROJECT No.: 1439-00-554

INSPECTOR: IRBEST

RECEIVED FROM/SHIPPED TO: SAIC

S&ME P.O. No.: N/A

CLIENT P.O. No.: 4400032404

PROJECT MANAGER/ENGINEER: JB PEARSON

RELEASE/CO/REV No.: N/A

ITEM No.	QTY	PART No.	IDENTIFICATION No.	DESCRIPTION	ACCEPTABLE YES	ACCEPTABLE NO*
1	1	N/A	WBG 4249	SOIL, GRAB SAMPLE	✓	
2	1	N/A	WBG 4250	" " "	✓	
3	1	N/A	WBG 4266	SOIL, SHELBY TUBE	✓	
4	1	N/A	WBG 4264	" " "	✓	
5	1	N/A	WBG 4262	" " "	✓	
6	1	N/A	WBG 4260	" " "	✓	

PACKAGING: ☐ CRATE ☑ METAL/PLASTIC CONTAINER ☐ CARDBOARD ☐ DOUBLE PACKED ☑ SINGLE PACKED

DOCUMENTATION: ☐ MATERIAL CERTIFICATION ☐ CERTIFICATE OF CONFORMANCE ☐ CERTIFICATE OF CALIBRATION ☐ OTHER (specify)

*1. NOTICE OF ANOMALY IS REQUIRED PER QAP 15.1
☐ YES ☑ NO

2. WORK CLASSIFICATION: ☐ NUCLEAR
☑ SAFETY-RELATED ☑ NON-NUCLEAR

COMMENTS/DESCRIPTION OF DESCREPANCIES (continue on reverse):

IRBest 11/2/00
Inspector Signature Date

Form 10.1-1 Revision 2

SAIC An Employee-Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423) 481-4600

COC NO.: WBGS&ME - 1
page 1 of 1

CHAIN OF CUSTODY RECORD

RECEIVED NOV 03 2000

PROJECT NAME: Winklepeck Burning Grounds

DELIVERY ORDER NO: CY08

PROJECT MANAGER: Kevin Jago 865-481-4614

Sampler (Signature): Vicki Brumback (Printed Name): Vicki Brumback

LABORATORY NAME: S&ME, Inc.

LABORATORY ADDRESS: 1413 Topside Road Louisville, TN 37777

PHONE NO: ~~423~~ 865-970-2299

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	Grain Size	Moisture	Atterberg Limits	USCS Classification	Bulk Density	Porosity	Hydraulic Conductivity	Specific Gravity	pH	Hydrometer	Redox Potential	Grain Size (sieve only)	Dry Weight	No. of Bottles/ Vials:	OBSERVATIONS, COMMENTS
WBG 4249	10-24-00	1700	sediment	✓	✓	✓	✓										1	WBG-294
WBG4250	10-24-00	1607	sediment	✓	✓	✓	✓										1	WBG-295
WBG4266	10-18-00	1630	Soil		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	1	1-3 FT MW-15
WBG4264	10-18-00	1305	Soil		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	1	1-3 FT MW-14
WBG-4262	10-19-00	1105	Soil		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	1	1-3 FT MW-12
WBG4260	10-26-00	0835	Soil	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	1	1-3 FT MW 10
				~~✓~~														

VB 10/31/00

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Vicki Brumback	11/1 0800		11/2/00
COMPANY NAME: SAIC	1700	COMPANY NAME: S&ME	10:30 AM
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF CONTAINERS: 6

Cooler ID: NA

Cooler Temperature: NA

FEDEX NUMBER: Airbill # 822527889172

APPENDIX M

TOPOGRAPHIC SURVEY REPORT

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TOPOGRAPHIC SURVEY

for

Winklepeck Burning Grounds Feasibility Study

at

RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

Prepared For:

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

November, 2000

Prepared By:

ADAMS ARCHITECTS
CRAFT ENGINEERS
HERZ PLANNERS
WALKER SURVEYORS

OAK RIDGE, TENNESSEE

ACHW PROJECT NO. 00742.0

TABLE OF CONTENTS

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GPS LOOP CLOSURES

GPS NETWORK ADJUSTMENT

FIELD NOTES

DRAWINGS

NARRATIVE

NARRATIVE

Adams Craft Herz Walker, Inc. (ACHW) mobilized to Ravenna, Ohio on Wednesday, November 8, 2000 in support of **Science Applications International Corporation** (SAIC) for a Winklepeck Burning Grounds Feasibility Study. Work under this mobilization was completed and ACHW demobilized on Friday, November 10, 2000. Some of the location work at Winklepeck Burning Ground was done on Thursday, November 2, 2000 after completion of work at Load Line 12.

ACHW's crew located 8 monitoring wells, 98 sample locations, and 30 random sample locations at Winklepeck Burning Grounds. The 30 random sample locations and two of the monitoring wells were located directly with GPS.

Horizontal and vertical control were established for the sites using GPS and tied to existing control points RAV 1, RAV 2, and RAV 10. The coordinates and elevation of RAV 1, RAV 2, and RAV 10 were provided by the US Army Corps of Engineers. Horizontal data is based on the North American Datum of 1983 (NAD 83) State Plane Coordinate System, Ohio North Zone. Vertical datum for the survey is relative to North American Vertical Datum of 1988 (NAVD88).

The field location of data was obtained using a three Trimble 4600LS GPS receivers and a Topcon 303DPG total station. Elevations for monitoring wells were confirmed using a Topcon AT-F1 automatic level.

A copy of the points lists, raw-data files, GPS data, field traverse, and drawings TS-1, TS-2, and TS-3 are attached.

Sam Bruner, RLS
Ohio Reg. No. 7781

POINTS LIST

ACHW Project #00742.0
JOB: 7420ALL.CR5 TIME: 11:16 DATE: 11-19-2000
Ravenna, Ohio Winklepeck

Point	Northing	Easting	Elevation	Note
200	562962.550000	2356425.450000	1069.580	WBG-214
201	562964.760000	2356401.190000	1072.290	WBG-213
202	562878.670000	2356330.660000	1073.090	WBG-211
203	562959.830000	2356230.020000	1071.150	WBG-216
204	562958.270000	2356206.480000	1065.640	WBG-215
205	563002.640000	2356156.810000	1063.790	WBG-295
206	562935.720000	2356512.880000	1070.540	WBG-222
207	562955.250000	2356539.880000	1073.630	WBG-219
208	562912.940000	2356614.320000	1071.690	WBG-217
209	562872.330000	2356631.320000	1074.950	WBG-218
210	562970.660000	2356676.030000	1071.060	WBG-220
211	562981.380000	2356760.910000	1064.720	WBG-221
212	563003.280000	2357146.220000	1049.380	WBG-242
213	563010.200000	2357116.480000	1050.060	WBG-240
214	562922.970000	2357142.220000	1050.120	WBG-239
215	563000.250000	2357206.460000	1048.760	WBG-241
216	563005.310000	2357042.450000	1050.700	WBG-238
217	562821.840000	2356340.670000	1066.290	WBG-212
218	563085.090000	2356024.250000	1070.390	WBG-267
219	562893.200000	2356051.960000	1069.850	WBGMW-010
220	562971.180000	2355967.520000	1074.600	WBG-204
221	562969.560000	2355990.640000	1069.050	WBG-205
222	562950.870000	2355915.990000	1069.100	WBG-206
223	562879.330000	2355903.290000	1075.640	WBG-207
224	562973.440000	2355875.060000	1070.890	WBG-210
225	562964.670000	2355817.790000	1071.550	WBG-209
226	562965.210000	2355836.280000	1077.800	WBG-208
227	563033.910000	2355851.020000	1071.630	WBG-296CONT
228	563048.910000	2355815.770000	1073.160	WBG-297CONT
229	562965.380000	2355719.380000	1076.980	WBG-198
230	562964.970000	2355700.640000	1081.730	WBG-199
231	562895.960000	2355650.340000	1079.410	WBG-197
232	562858.090000	2355654.580000	1073.410	WBG-200
233	562947.040000	2355538.790000	1078.180	WBG-201
234	562957.390000	2355559.220000	1084.360	WBG-202
235	563056.330000	2355616.490000	1073.870	WBG-263CONT
236	562986.310000	2355605.560000	1076.470	WBG-203
237	562061.260000	2360439.220000	996.780	WBGMW-014
238	562709.130000	2360645.880000	997.030	WBGMW-016
239	562444.710000	2360492.220000	995.480	WBG-1CONT
240	562396.490000	2360466.150000	995.190	WBG-2CONT
241	562401.810000	2360489.650000	995.250	WBG-3CONT
300	562577.880000	2356152.850000	1070.250	WBG-234
301	562609.180000	2356187.290000	1072.380	WBGMW-011
302	562787.200000	2356239.520000	1065.430	WBG-274
303	562671.010000	2356121.600000	1068.270	WBG-235
304	562697.490000	2356032.100000	1067.260	WBG-237
305	562738.600000	2356068.400000	1066.720	WBG-236
306	562807.590000	2356083.910000	1068.360	WBG-233

ACHW Project #00742.0
JOB: 7420ALL.CR5 TIME: 11:16 DATE: 11-19-2000
Ravenna, Ohio Winklepeck

Point	Northing	Easting	Elevation	Note
32	562386.310000	2358723.830000	1016.680	P32
35	562364.200000	2359137.060000	1012.370	P35
37	562393.950000	2359910.170000	1002.020	P37.CMON
45	562563.860000	2356144.690000	1070.700	IPCF45
46	562576.360000	2356504.260000	1061.360	IPCS46
47	562337.810000	2355960.560000	1068.210	NCH47S
48	562338.430000	2356725.690000	1051.170	NCH48S
54	562964.580000	2355631.810000	1075.790	P54.CMON
55	562970.420000	2355895.280000	1070.390	P55.CMON
58	562974.030000	2356296.030000	1066.720	P58.CMON
59	562998.540000	2356590.620000	1065.110	P59.CMON
68	563033.210000	2358705.950000	1016.790	P-68
71	563063.890000	2359023.220000	1010.600	P-71
73	563059.250000	2359530.040000	1007.610	P-73
75	563038.270000	2356442.860000	1067.580	NCH75S
76	563047.150000	2356851.810000	1060.150	NCH76S
77	563010.520000	2357138.100000	1049.810	P62.CMONF.CKIN
78	563024.630000	2356008.230000	1069.410	NCH78S
79	563024.100000	2355781.580000	1075.270	NCH79S
80	562479.840000	2360420.410000	998.090	WBGMW-7
101	562330.940000	2358810.650000	1013.440	WBG-224
102	562307.480000	2358781.430000	1013.880	WBG-227
103	562292.170000	2358719.960000	1015.330	WBG-226
104	562334.040000	2358616.050000	1015.120	WBG-225
105	562331.690000	2358760.290000	1015.160	WBG-223
106	562034.010000	2358838.550000	1016.390	WBG-285
107	562356.210000	2359092.820000	1011.990	WBG-232
108	562331.200000	2359121.690000	1011.400	WBG-231
109	562324.990000	2359192.620000	1008.150	WBG-230
110	562363.070000	2359205.220000	1009.750	WBG-229
111	562340.120000	2359182.410000	1011.600	MW-015
112	563066.270000	2359491.750000	1007.490	WBG-253
113	563055.410000	2359566.980000	1006.980	WBG-257
114	563074.200000	2359569.520000	1007.330	WBG-254
115	563054.900000	2359622.080000	1005.910	WBG-256
116	562996.790000	2359539.800000	1005.620	WBG-255
117	562932.470000	2359517.820000	1004.450	WBG-279
118	562913.240000	2359603.840000	1006.620	WBGMW-017
119	563296.320000	2359542.020000	1005.300	WBG-272
120	563060.640000	2358946.660000	1011.710	WBG-251
121	563062.470000	2359024.200000	1010.450	WBG-252
122	563000.080000	2359051.310000	1009.660	WBG-250
123	563014.770000	2359117.340000	1009.710	WBG-249
124	563351.380000	2359092.770000	1012.790	WBG-271
125	562771.470000	2359073.860000	1011.140	WBG-278
126	563023.070000	2358732.770000	1016.420	WBG-247
127	562998.600000	2358727.030000	1015.830	WBG-246
128	562984.440000	2358785.560000	1014.250	WBG-245
129	563049.930000	2358649.300000	1016.600	WBG-243

ACHW Project #00742.0
JOB: 7420ALL.CR5 TIME: 11:16 DATE: 11-19-2000
Ravenna, Ohio Winklepeck

Point	Northing	Easting	Elevation	Note
307	562828.390000	2356537.840000	1067.860	WBG-275
308	562292.460000	2356848.440000	1045.820	WBG-262CONT
309	562269.750000	2356786.160000	1048.200	WBG-258
310	562219.220000	2356763.440000	1045.590	WBG-282
311	562204.070000	2356039.880000	1063.560	WBG-281
401	561518.270000	2355223.250000	1071.700	WBG-MW-013
402	562240.900000	2354810.650000	1079.110	WBG-MW-012
403	563243.460000	2357597.660000	1049.000	WBG-269
404	563392.910000	2358352.590000	1030.390	WBG-270
405	563447.690000	2360580.210000	992.380	WBG-273
406	562692.200000	2357923.120000	1034.550	WBG-277
407	562162.700000	2358181.290000	1021.310	WBG-284
408	562153.410000	2360221.820000	996.440	WBG-286
409	561430.780000	2355176.730000	1064.680	WBG-287
410	561326.450000	2355645.940000	1058.070	WBG-288
411	561294.290000	2356760.000000	1055.270	WBG-289
412	561615.570000	2358039.610000	1028.980	WBG-291
413	561733.530000	2359247.440000	1001.630	WBG-292
414	561578.850000	2359937.230000	986.420	WBG-293
415	562061.580000	2354441.060000	1082.700	WBG-264
416	562732.260000	2355022.120000	1072.980	WBG-265
417	562954.680000	2355126.520000	1067.410	WBG-266
418	563509.880000	2356663.140000	1044.780	WBG-268
419	562872.260000	2357603.530000	1038.420	WBG-276
420	561994.500000	2355201.050000	1077.070	WBG-280
421	562047.540000	2357440.670000	1037.840	WBG-283
422	561822.600000	2356257.460000	1065.890	WBG-290
423	563303.220000	2356280.640000	1047.530	WBG-294
424	562576.350000	2356504.140000	1061.410	P 45
425	562563.860000	2356144.690000	1070.700	P 46

RAW-DATA FILES

ACHW Project #00742.0
JOB: 7420LOC1 TIME: 08:29 DATE: 11-17-2000
Ravenna, Ohio Winklepeck
JOB: Name 7420LOC1,Date 11-1-2000,Time 14:42:49.96
Mode Setup: North Azimuth,Dist feet,Scale 1.0000,Earth crv OFF
Store: Pt 32,N 562386.3060,E 2358723.8300,Elv 1016.6800,START
Store: Pt 35,N 562364.2000,E 2359137.8300,Elv 1012.3700,P35
Store: Pt 32,N 562386.3060,E 2358723.8300,Elv 1016.6800,P32
Occupy: Occ 32,N 562386.3060,E 2358723.8300,Elv 1016.6800,P32
Backsight: Occ 32,BS Pt 35,BS azm 93.0323,Back circle 0.0000
HI / HR : Inst H 5.2100,Rod H 5.4500
Note: BS point check:32-35
Side Shot: 32-101,Ang-Rt 29.5655,Zenith 91.3800,Slp Dst 100.5350,WBG-2224
Store: Pt 101,N 562331.5655,E 2358808.1066,Elv 1013.5744,WBG-224
Side Shot: 32-102,Ang-Rt 50.4325,Zenith 91.3110,Slp Dst 97.6950,WBG-227
Side Shot: 32-103,Ang-Rt 89.3310,Zenith 90.4135,Slp Dst 93.7950,WBG-226
Side Shot: 32-104,Ang-Rt 150.5750,Zenith 90.3825,Slp Dst 119.2500,WBG-225
Store: Pt 35,N 562364.2000,E 2359137.0580,Elv 1012.3700,P35
Backsight: Occ 32,BS Pt 35,BS azm 93.0344,Back circle 0.0000
Note: BS point check:32-35
Side Shot: 32-101,Ang-Rt 29.2755,Zenith 91.4015,Slp Dst 103.0150,WBG-224
Side Shot: 32-102,Ang-Rt 50.4700,Zenith 91.3010,Slp Dst 97.6600,WBG-227
Side Shot: 32-103,Ang-Rt 89.1740,Zenith 90.4035,Slp Dst 94.2200,WBG-226
Side Shot: 32-104,Ang-Rt 151.0410,Zenith 90.3755,Slp Dst 119.7950,WBG-225
Side Shot: 32-105,Ang-Rt 53.1245,Zenith 91.0650,Slp Dst 65.6750,WBG-223
HI / HR : Inst H 5.2100,Rod H 8.9000
Side Shot: 32-106,Ang-Rt 68.5400,Zenith 89.2825,Slp Dst 370.5200,WBG-285
Occupy: Occ 35,N 562364.2000,E 2359137.0580,Elv 1012.3700,P35
Backsight: Occ 35,BS Pt 32,BS azm 273.0344,Back circle 0.0000
Backsight: Occ 35,BS Pt 32,BS azm 273.0344,Back circle 0.0000
HI / HR : Inst H 5.0900,Rod H 5.4500
Note: BS point check:35-32
Side Shot: 35-107,Ang-Rt 346.4145,Zenith 90.0130,Slp Dst 44.9500,WBG-232
Side Shot: 35-108,Ang-Rt 291.5435,Zenith 90.5805,Slp Dst 36.4050,WBG-231
Side Shot: 35-109,Ang-Rt 212.0835,Zenith 93.1500,Slp Dst 68.1150,WBG-230
HI / HR : Inst H 5.0900,Rod H 8.9000
Side Shot: 35-110,Ang-Rt 177.5315,Zenith 89.0005,Slp Dst 68.1800,WBG-229
HI / HR : Inst H 5.0900,Rod H 5.4500
Side Shot: 35-111,Ang-Rt 204.5400,Zenith 90.2545,Slp Dst 51.3500,MW-015
Store: Pt 71,N 563063.8860,E 2359023.2220,Elv 1010.6000,P-71
Store: Pt 73,N 563059.2510,E 2359530.0360,Elv 1007.6100,P-73
Occupy: Occ 73,N 563059.2510,E 2359530.0360,Elv 1007.6100,P-73
Backsight: Occ 73,BS Pt 71,BS azm 270.3126,Back circle 0.0000
HI / HR : Inst H 5.1200,Rod H 15.0500
Note: BS point check:73-71
HI / HR : Inst H 5.1200,Rod H 5.4500
Side Shot: 73-112,Ang-Rt 9.5155,Zenith 89.4135,Slp Dst 38.9200,WBG-253
Side Shot: 73-113,Ang-Rt 185.2500,Zenith 90.2810,Slp Dst 37.1400,WBG-257
Side Shot: 73-114,Ang-Rt 158.4435,Zenith 89.5615,Slp Dst 42.2200,WBG-254
Side Shot: 73-115,Ang-Rt 182.1100,Zenith 90.5110,Slp Dst 92.1600,WBG-256
Side Shot: 73-116,Ang-Rt 260.3515,Zenith 91.3030,Slp Dst 63.2400,WBG-255
Side Shot: 73-117,Ang-Rt 274.5840,Zenith 91.1630,Slp Dst 127.4000,WBG-279
Side Shot: 73-118,Ang-Rt 242.3940,Zenith 90.1145,Slp Dst 163.6000,WBGMW-017
HI / HR : Inst H 5.1200,Rod H 8.9000
Side Shot: 73-119,Ang-Rt 92.2210,Zenith 89.3845,Slp Dst 237.3800,WBG-272

ACHW Project #00742.0
JOB: 7420LOC1 TIME: 08:29 DATE: 11-17-2000
Ravenna, Ohio Winklepeck
Store: Pt 68,N 563033.2140,E 2358705.9460,Elv 1016.7900,P-68
Occupy: Occ 71,N 563063.8860,E 2359023.2220,Elv 1010.6000,P-71
Backsight: Occ 71,BS Pt 68,BS azm 264.2842,Back circle 0.0000
HI / HR : Inst H 5.2600,Rod H 5.4500
Note: BS point check:71-68
Side Shot: 71-120,Ang-Rt 3.0540,Zenith 89.0155,Slp Dst 76.6400,WBG-251
Side Shot: 71-121,Ang-Rt 240.5450,Zenith 88.3115,Slp Dst 1.7200,WBG-252
Side Shot: 71-122,Ang-Rt 251.4555,Zenith 90.3715,Slp Dst 69.7200,WBG-250
Side Shot: 71-123,Ang-Rt 213.0445,Zenith 90.2250,Slp Dst 106.1600,WBG-249
HI / HR : Inst H 5.2600,Rod H 8.9000
Side Shot: 71-124,Ang-Rt 109.0715,Zenith 88.5215,Slp Dst 295.8400,WBG-271
Side Shot: 71-125,Ang-Rt 265.4150,Zenith 89.1135,Slp Dst 296.8000,WBG-278
Occupy: Occ 68,N 563033.2140,E 2358705.9460,Elv 1016.7900,P-68
Backsight: Occ 68,BS Pt 71,BS azm 84.2842,Back circle 0.0000
HI / HR : Inst H 5.3900,Rod H 5.4500
Note: BS point check:68-71
Side Shot: 68-126,Ang-Rt 26.1355,Zenith 90.3700,Slp Dst 28.6800,WBG-247
Side Shot: 68-127,Ang-Rt 64.1045,Zenith 91.1640,Slp Dst 40.5400,WBG-246
Side Shot: 68-128,Ang-Rt 37.0045,Zenith 91.3125,Slp Dst 93.4000,WBG-245
Side Shot: 68-129,Ang-Rt 201.5745,Zenith 90.0750,Slp Dst 59.0600,WBG-243
Store: Pt 33,N 555004.3600,E 2367417.8300,Elv 983.8400,RAV10

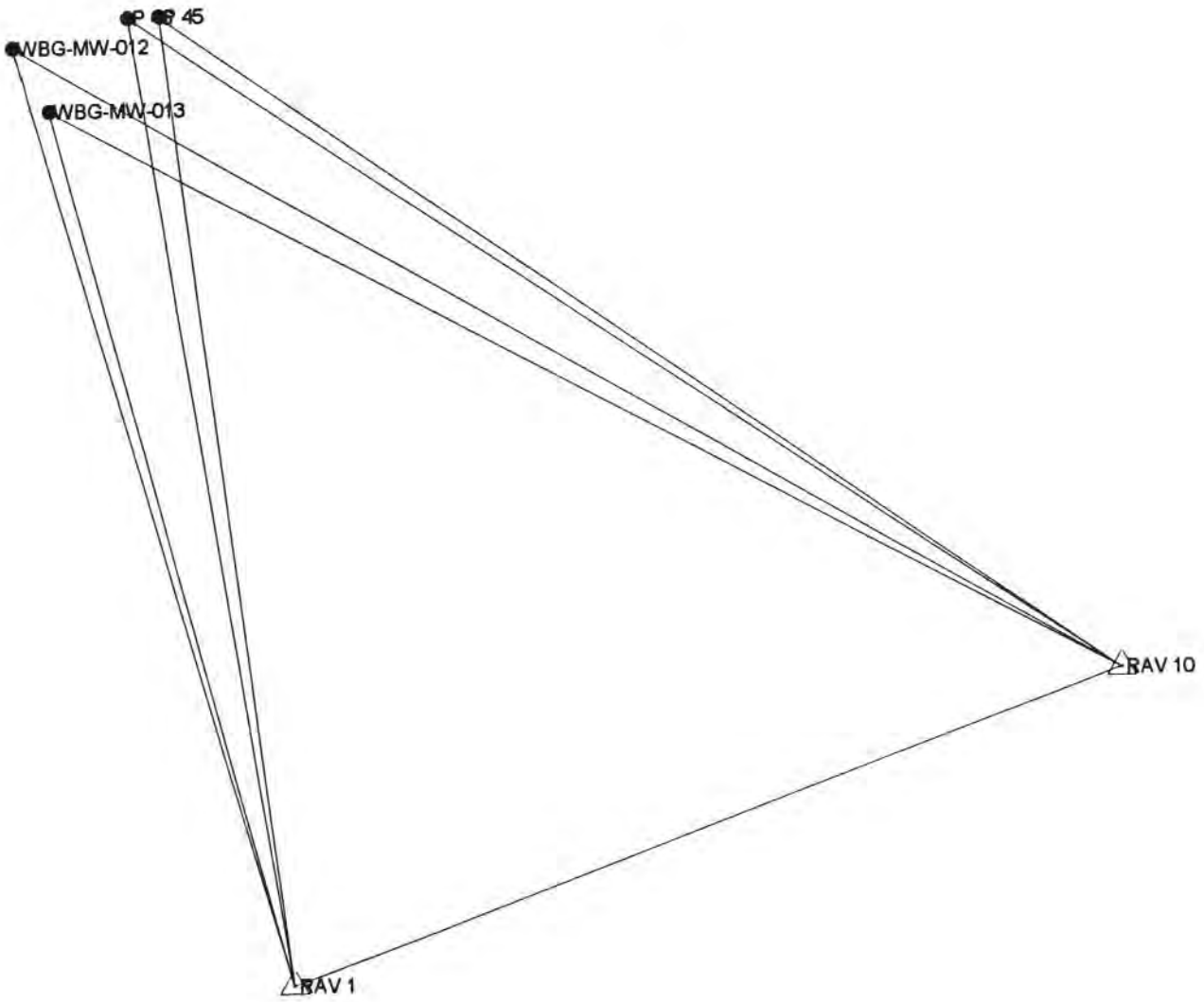
ACHW Project #00742.0
JOB: 7420LOC2 TIME: 11:21 DATE: 11-17-2000
Ravenna, Ohio Winklepeck
JOB: Name 7420LOC2,Date 11-8-2000,Time 08:12:56.89
Mode Setup: North Azimuth,Dist feet,Scale 1.0000,Earth crv OFF
Store: Pt 32,N 562386.3060,E 2358723.8300,Elv 1016.6800,START
Store: Pt 32,N 562386.3060,E 2358723.8300,Elv 1016.6800,MNOP32
Store: Pt 59,N 562998.5420,E 2356590.6190,Elv 1065.1100,P59 CMON
Store: Pt 32,N 562386.3060,E 2358723.8300,Elv 1016.6800,P32 CMON
Store: Pt 58,N 562974.0340,E 2356296.0260,Elv 1066.7200,P58 CMON
Resection: Pt 58,Circl 0.0000,Zenith 90.0650,Slp Dst 160.3200
HI / HR : Inst H 4.9400,Rod H 5.4500
Resection: Pt 59,Circl 218.4030,Zenith 90.4430,Slp Dst 153.0600
Note: Resection
Store: Pt 75,N 563038.2669,E 2356442.8639,Elv 1067.5750,NCH75S
Occupy: Occ 75,N 563038.2669,E 2356442.8639,Elv 1067.5750,NCH75S
Backsight: Occ 75,BS Pt 58,BS azm 246.2225,Back circle 0.0000
Note: BS point check:75-58
Side Shot: 75-100,Ang-Rt 306.3450,Zenith 88.0845,Slp Dst 77.7400,WBG-214
Side Shot: 75-101,Ang-Rt 323.1025,Zenith 86.2750,Slp Dst 84.6600,WBG-213
HI / HR : Inst H 4.9400,Rod H 8.9000
Side Shot: 75-102,Ang-Rt 328.4410,Zenith 87.1310,Slp Dst 195.3200,WBG-211
Side Shot: 75-103,Ang-Rt 3.2345,Zenith 88.0550,Slp Dst 226.9600,WBG-216
Side Shot: 75-104,Ang-Rt 4.5550,Zenith 89.3210,Slp Dst 249.5600,WBG-215
Side Shot: 75-105,Ang-Rt 16.3140,Zenith 89.5755,Slp Dst 288.2600,WBG-295
HI / HR : Inst H 4.9400,Rod H 5.4500
Side Shot: 75-106,Ang-Rt 259.1815,Zenith 88.2345,Slp Dst 124.2200,WBG-222
Side Shot: 75-107,Ang-Rt 244.1050,Zenith 87.0325,Slp Dst 127.8600,WBG-219
HI / HR : Inst H 4.9400,Rod H 6.0000
Side Shot: 75-108,Ang-Rt 239.4730,Zenith 88.3615,Slp Dst 212.4400,WBG-217
HI / HR : Inst H 4.9400,Rod H 6.5000
Side Shot: 75-109,Ang-Rt 244.5930,Zenith 87.5745,Slp Dst 251.2600,WBG-218
Side Shot: 75-110,Ang-Rt 219.4745,Zenith 88.4835,Slp Dst 242.8200,WBG-220
HI / HR : Inst H 4.9400,Rod H 15.0500
Side Shot: 75-111,Ang-Rt 213.4605,Zenith 88.4250,Slp Dst 323.1800,WBG-221
HI / HR : Inst H 4.9400,Rod H 5.4500
Side Shot: 75-76,Ang-Rt 202.2255,Zenith 90.5805,Slp Dst 409.1000,NCH76S
Occupy: Occ 76,N 563047.1514,E 2356851.8091,Elv 1060.1530,NCH76S
Backsight: Occ 76,BS Pt 75,BS azm 268.4520,Back circle 0.0000
HI / HR : Inst H 5.1200,Rod H 4.8900
Note: BS point check:76-75
HI / HR : Inst H 5.1200,Rod H 5.4500
Side Shot: 76-77,Ang-Rt 188.3210,Zenith 91.5910,Slp Dst 288.8000,P62 CMONF CKI
Side Shot: 76-112,Ang-Rt 189.4310,Zenith 92.0035,Slp Dst 297.8400,WBG-242
Side Shot: 76-113,Ang-Rt 189.1135,Zenith 92.0535,Slp Dst 267.4200,WBG-240
HI / HR : Inst H 5.1200,Rod H 12.4000
Side Shot: 76-114,Ang-Rt 204.2345,Zenith 90.3000,Slp Dst 315.8600,WBG-239
Side Shot: 76-115,Ang-Rt 188.4640,Zenith 90.3930,Slp Dst 357.7600,WBG-241
HI / HR : Inst H 5.1200,Rod H 8.9000
Side Shot: 76-116,Ang-Rt 193.3725,Zenith 91.3955,Slp Dst 195.2600,WBG-238
Occupy: Occ 58,N 562974.0340,E 2356296.0260,Elv 1066.7200,P58 CMON
Backsight: Occ 58,BS Pt 75,BS azm 66.2225,Back circle 0.0000
HI / HR : Inst H 4.8800,Rod H 4.8900
Note: BS point check:58-75
HI / HR : Inst H 4.8800,Rod H 13.5500

ACHW Project #00742.0
JOB: 7420LOC2 TIME: 11:21 DATE: 11-17-2000
Ravenna, Ohio Winklepeck
Side Shot: 58-117,Ang-Rt 97.1635,Zenith 87.0140,Slp Dst 158.8200,WBG-212
Store: Pt 55,N 562970.4190,E 2355895.2830,Elv 1070.3900,P55 CMON
Store: Pt 54,N 562964.5820,E 2355631.8050,Elv 1075.7900,P54 CMON
Resection: Pt 55,Circl 0.0000,Zenith 88.2100,Slp Dst 125.4200
HI / HR : Inst H 4.9100,Rod H 7.6000
Resection: Pt 58,Circl 215.3640,Zenith 90.0725,Slp Dst 292.4000
HI / HR : Inst H 4.9100,Rod H 6.9000
Note: Resection
Store: Pt 78,N 563024.6316,E 2356008.2323,Elv 1069.4047,NCH78S
Occupy: Occ 78,N 563024.6316,E 2356008.2323,Elv 1069.4050,NCH78S
Backsight: Occ 78,BS Pt 55,BS azm 244.2137,Back circle 0.0000
HI / HR : Inst H 4.9100,Rod H 5.4500
Side Shot: 78-118,Ang-Rt 130.2830,Zenith 88.3615,Slp Dst 62.5600,WBG-267
Side Shot: 78-119,Ang-Rt 277.1415,Zenith 89.3405,Slp Dst 138.5200,WBGMW-010
Occupy: Occ 55,N 562970.4190,E 2355895.2830,Elv 1070.3900,P55 CMON
Backsight: Occ 55,BS Pt 78,BS azm 64.2137,Back circle 0.0000
HI / HR : Inst H 4.8100,Rod H 7.0000
Note: BS point check:55-78
HI / HR : Inst H 4.8100,Rod H 5.4500
Side Shot: 55-120,Ang-Rt 25.0210,Zenith 86.0935,Slp Dst 72.4000,WBG-204
Note: HA offset
Off Center Shot: Ang-Rt 26.1315,Zenith 88.2100,Slp Dst 95.4000
HI / HR : Inst H 4.8100,Rod H 8.9000
Side Shot: 55-121,Ang-Rt 26.0930,Zenith 88.2100,Slp Dst 95.4000,WBG-205
HI / HR : Inst H 4.8100,Rod H 5.4500
Side Shot: 55-122,Ang-Rt 68.5920,Zenith 91.1850,Slp Dst 28.4800,WBG-206
HI / HR : Inst H 4.8100,Rod H 7.0000
Side Shot: 55-123,Ang-Rt 110.3650,Zenith 85.2105,Slp Dst 91.7400,WBG-207
HI / HR : Inst H 4.8100,Rod H 5.4500
Side Shot: 55-124,Ang-Rt 214.0840,Zenith 86.4815,Slp Dst 20.4800,WBG-210
HI / HR : Inst H 4.8100,Rod H 12.4000
Side Shot: 55-125,Ang-Rt 201.2355,Zenith 83.3445,Slp Dst 78.2000,WBG-209
HI / HR : Inst H 4.8100,Rod H 5.4500
Side Shot: 55-126,Ang-Rt 200.3535,Zenith 82.1530,Slp Dst 59.7800,WBG-208
Side Shot: 55-127,Ang-Rt 260.4530,Zenith 88.3630,Slp Dst 77.4200,WBG-296CONT
Side Shot: 55-128,Ang-Rt 250.1600,Zenith 88.1515,Slp Dst 111.7800,WBG-297CONT
Resection: Pt 54,Circl 0.0000,Zenith 90.2155,Slp Dst 125.7600
HI / HR : Inst H 4.7800,Rod H 8.9000
Resection: Pt 54,Circl 0.0000,Zenith 90.2135,Slp Dst 125.7600
Resection: Pt 54,Circl 133.0255,Zenith 89.3320,Slp Dst 161.2400
HI / HR : Inst H 4.7800,Rod H 5.4500
Note: Resection
Resection: Pt 54,Circl 0.0000,Zenith 89.3345,Slp Dst 161.2400
Resection: Pt 55,Circl 226.5630,Zenith 90.2150,Slp Dst 125.8000
HI / HR : Inst H 4.7800,Rod H 8.9000
Note: Resection
Store: Pt 79,N 563024.0962,E 2355781.5756,Elv 1075.2689,NCH79S
Occupy: Occ 54,N 562964.5820,E 2355631.8050,Elv 1075.7900,P54 CMON
Backsight: Occ 54,BS Pt 79,BS azm 68.1943,Back circle 0.0000
HI / HR : Inst H 4.6250,Rod H 5.4500
Note: BS point check:54-79
HI / HR : Inst H 4.6250,Rod H 6.0000

ACHW Project #00742.0
JOB: 7420LOC2 TIME: 11:21 DATE: 11-17-2000
Ravenna, Ohio Winklepeck
Side Shot: 54-129,Ang-Rt 21.0855,Zenith 88.1920,Slp Dst 87.6200,WBG-198
Side Shot: 54-130,Ang-Rt 21.2050,Zenith 83.5550,Slp Dst 69.2200,WBG-199
Side Shot: 54-131,Ang-Rt 96.3315,Zenith 85.5905,Slp Dst 71.2600,WBG-197
HI / HR : Inst H 4.6250,Rod H 15.0500
Side Shot: 54-132,Ang-Rt 99.3600,Zenith 85.4635,Slp Dst 109.2000,WBG-200
Side Shot: 54-133,Ang-Rt 190.5940,Zenith 82.1725,Slp Dst 95.5200,WBG-201
HI / HR : Inst H 4.6250,Rod H 5.4500
Side Shot: 54-134,Ang-Rt 196.0045,Zenith 82.3935,Slp Dst 73.5400,WBG-202
Side Shot: 54-135,Ang-Rt 282.1135,Zenith 90.4020,Slp Dst 93.0200,WBG-263CONT
Backsight: Occ 54,BS Pt 79,BS azm 68.1943,Back circle 0.0000
HI / HR : Inst H 4.6600,Rod H 5.4500
Note: BS point check:54-79
Side Shot: 54-136,Ang-Rt 241.1720,Zenith 87.3130,Slp Dst 34.1000,WBG-203
Store: Pt 37,N 562393.9500,E 2359910.1660,Elv 1002.0200,P37 CMON
Store: Pt 80,N 562479.8390,E 2360420.4110,Elv 998.0900,WBGMW-7
Occupy: Occ 80,N 562479.8390,E 2360420.4110,Elv 998.0900,WBGMW-7
Backsight: Occ 80,BS Pt 37,BS azm 260.2642,Back circle 0.0000
HI / HR : Inst H 2.6500,Rod H 8.4000
Note: BS point check:80-37
HI / HR : Inst H 2.6500,Rod H 5.4500
Side Shot: 80-137,Ang-Rt 276.5855,Zenith 89.4740,Slp Dst 419.0000,WBGMW-014
Side Shot: 80-138,Ang-Rt 144.0420,Zenith 89.4120,Slp Dst 321.5800,WBGMW-016
Side Shot: 80-139,Ang-Rt 215.3720,Zenith 89.5155,Slp Dst 79.9400,WBG-1CONT
Side Shot: 80-140,Ang-Rt 250.4750,Zenith 90.0330,Slp Dst 95.0800,WBG-2CONT
HI / HR : Inst H 2.6500,Rod H 21.9100
Side Shot: 80-141,Ang-Rt 237.5810,Zenith 81.0315,Slp Dst 105.6000,WBG-3CONT

ACHW Project #00742.0
JOB: 7420LOC3 TIME: 11:21 DATE: 11-17-2000
Ravenna, Ohio Winklepeck
JOB: Name 7420LOC3,Date 11-8-2000,Time 13:20:13.48
Mode Setup: North Azimuth,Dist feet,Scale 1.0000,Earth crv OFF
Store: Pt 45,N 5000.0000,E 5000.0000,Elv 100.0000,START
Store: Pt 45,N 5000.0000,E 5000.0000,Elv 100.0000,IPCF45
Occupy: Occ 45,N 5000.0000,E 5000.0000,Elv 100.0000,IPCF45
Backsight: Occ 45,BS Pt 45,BS azm 0.0000,Back circle 0.0000
HI / HR : Inst H 4.7900,Rod H 5.4500
Side Shot: 45-46,Ang-Rt 0.0000,Zenith 91.2255,Slp Dst 359.9000,IPCS46
Backsight: Occ 45,BS Pt 46,BS azm 0.0000,Back circle 0.0000
Backsight: Occ 45,BS Pt 46,BS azm 0.0000,Back circle 0.0000
Note: BS point check:45-46
Side Shot: 45-100,Ang-Rt 302.1200,Zenith 89.1435,Slp Dst 16.2200,WBG-234
Side Shot: 45-101,Ang-Rt 315.1330,Zenith 87.5100,Slp Dst 62.2400,WBGMW-011
Side Shot: 45-102,Ang-Rt 294.5950,Zenith 91.0515,Slp Dst 242.6800,WBG-274
Side Shot: 45-103,Ang-Rt 259.4955,Zenith 90.5535,Slp Dst 109.6200,WBG-235
Note: HA offset
Off Center Shot: Ang-Rt 231.4235,Zenith 88.3800,Slp Dst 174.7800
HI / HR : Inst H 4.7900,Rod H 12.4000
Side Shot: 45-104,Ang-Rt 231.5225,Zenith 88.3800,Slp Dst 174.7790,WBG-237
Side Shot: 45-105,Ang-Rt 248.2415,Zenith 89.5735,Slp Dst 190.6600,WBG-236
HI / HR : Inst H 4.7900,Rod H 8.9000
Side Shot: 45-105,Ang-Rt 248.2415,Zenith 89.5735,Slp Dst 190.6600,WBG-236
HI / HR : Inst H 4.7900,Rod H 15.0500
Side Shot: 45-106,Ang-Rt 257.5915,Zenith 88.1140,Slp Dst 251.3200,WBG-233
HI / HR : Inst H 4.7900,Rod H 5.4500
Side Shot: 45-47,Ang-Rt 131.0910,Zenith 90.2135,Slp Dst 291.5600,NCH47S
Occupy: Occ 46,N 5359.7953,E 5000.0000,Elv 90.6600,IPCS46
Backsight: Occ 46,BS Pt 45,BS azm 180.0000,Back circle 0.0000
HI / HR : Inst H 5.0500,Rod H 5.4500
Note: BS point check:46-45
HI / HR : Inst H 5.0500,Rod H 12.4000
Side Shot: 46-107,Ang-Rt 99.3440,Zenith 86.5255,Slp Dst 254.6400,WBG-275
HI / HR : Inst H 5.0500,Rod H 8.9000
Side Shot: 46-48,Ang-Rt 229.0250,Zenith 91.0700,Slp Dst 325.0800,NCH48S
Occupy: Occ 48,N 5572.8242,E 5245.4701,Elv 80.4750,NCH48S
Backsight: Occ 48,BS Pt 46,BS azm 229.0250,Back circle 0.0000
HI / HR : Inst H 4.8800,Rod H 7.5000
Note: BS point check:48-46
HI / HR : Inst H 4.8800,Rod H 5.4500
Side Shot: 48-108,Ang-Rt 153.2825,Zenith 92.0530,Slp Dst 131.1600,WBG-262CONT
Side Shot: 48-109,Ang-Rt 181.3455,Zenith 91.3020,Slp Dst 91.5400,WBG-258
HI / HR : Inst H 4.8800,Rod H 8.9000
Side Shot: 48-110,Ang-Rt 205.2220,Zenith 90.4305,Slp Dst 125.0600,WBG-282
Occupy: Occ 47,N 4808.1372,E 5219.5280,Elv 97.5100,NCH47S
Backsight: Occ 47,BS Pt 45,BS azm 311.0910,Back circle 0.0000
HI / HR : Inst H 4.9700,Rod H 7.0000
Note: BS point check:47-45
HI / HR : Inst H 4.9700,Rod H 5.4500
Side Shot: 47-111,Ang-Rt 110.0955,Zenith 91.3215,Slp Dst 155.5400,WBG-281

GPS CONTROL DATA



M-19

Field surveyor:

Computer operator:

Reference:

Scale 1" to 2083 ft
0 3500 sft
US survey feet

0°00'00"

Plot Scale: 1" to 2083 ft
Printed on 11/17/00, at 3:58:34 PM

Printed from Trimble Geomatics Office

Site: Not selected, System: US State Plane 1983
Zone: Ohio North 3401, Datum: NAD 1983 (Conus)

Project: 007420
US Feet

GPS SURVEY FIELD LOG **ACHW**

Job No.	Date	Julian Day	GPS Receiver	Operator(s)	Project Description		
0042	11-1-00	306	7515	Bryan & Heishel	Winkelpeck Burning Ground		
Occ.#	**Station**	**Start Time**	**Stop Time**	**Antenna Height**	**PDOP**	**# SV's**	**Point Description & Notes**
0	RAV2	12:38	17:22	1.638 (m) / 5.37 (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
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				(m) / (ft)			
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				(m) / (ft)			
				/			
				(m) / (ft)			
				/			

Receiver S/N _____ Antenna S/N _____ Page ____ of ____

GPS SURVEY FIELD LOG

ACHW

Job No.	Date	Julian Day	GPS Receiver	Operator(s)	Project Description		
00742	11-1-00	306	3871	Bryan & Hershel	Winklepeck Burning Ground		
Occ.#	**Station**	**Start Time**	**Stop Time**	**Antenna Height**	**PDOB**	**# SV's**	**Point Description & Notes**
0	WBG-289	12:50	13:25	1.611 (m) / 5.285 (ft)			
				/			
1	WBG-287	13:34	14:05	1.610 (m) / 5.28 (ft)			
				/			
2	WBG-292	14:16	14:46	1.622 (m) / 5.32 (ft)			
				/			
3	WBG-273	15:00	15:35	1.716 (m) / 5.63 (ft)			
				/			
4	WBG-286	15:55	16:25	1.623 (m) / 5.325 (ft)			
				/			
5	WBG-284	16:30	17:06	1.618 (m) / 5.305 (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			

Receiver S/N _____ Antenna S/N _____ Page ____ of ____

GPS SURVEY FIELD LOG ACHW

Job No.	Date	Julian Day	GPS Receiver	Operator(s)	Project Description		
00742	11-1-60	306	3874	Bryan S. Hershel	Winkle peak Burning Ground		
Occ.#	**Station**	**Start Time**	**Stop Time**	**Antenna Height**	**PDOP**	**# SVs**	**Point Description & Notes #**
0	WBG-288	12:52	13:29	1.604 (m) / 5.26 (ft)			
				/			
1	WBG-291	13:39	14:19	1.746 (m) / 5.77 (ft)			
				/			
2	WBG-293	14:26	15:08	1.733 (m) / 5.69 (ft)			
				/			
3	WBG-270	15:21	16:03	1.670 (m) / 5.475 (ft)			
				/			
4	WBG-269	16:11	16:41	1.619 (m) / 5.31 (ft)			
				/			
5	WBG-277	16:47	17:17	1.716 (m) / 5.625 (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
:				(m) / (ft)			
:				/			

Receiver S/N _____ Antenna S/N _____ Page ____ of ____

GPS SURVEY FIELD LOG **ACHW**

Job No.	Date	Julian Day	GPS Receiver	Operator(s)	Project Description		
00742	11-2-00	307	3874	Bryan & Herschel	Winklepeck Burning Ground		
Occ.#	**Station**	**Start Time**	**Stop Time**	**Antenna Height**	**PDOP**	**# SVs**	**Point Description & Notes**
0	RAVI	7:00		1.604 (m) / 5.26 (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			

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Receiver S/N _____ Antenna S/N _____ Page ____ of ____

GPS SURVEY FIELD LOG ACHW

Job No.	Date	Julian Day	GPS Receiver	Operator(s)	Project Description		
00742	11-2-00	307	7515	Bryan & Hershel	Winklepeck Burning Ground		
Occ.#	**Station**	**Start Time**	**Stop Time**	**Antenna Height**	**PDOP**	**# SV's**	**Point Description & Notes**
0	WBGMW-012	7:14	8:12	0.877 (m) / 2.875 (ft)			1.479 (4.85) Conc.
				(PVC) /			-0.6' Gr.
1	WBGMW-013	8:21	8:52	0.891 (m) / 2.92 (ft)			1.554 (5.10) Conc.
				(PVC) /			-0.4' Gr.
2	P45	8:57	9:30	1.673 (m) / 5.485 (ft)			IPCS (PLASTIC CAP)
				/			
3	P46	9:33	10:03	1.689 (m) / 5.54 (ft)			IPCS
				/			
4	WBG-264	10:12	10:47	1.651 (m) / 5.41 (ft)			
				/			
5	WBG-266	10:50	11:40	1.654 (m) / 5.42 (ft)			*
				/			
6	WBG-268	11:47	12:40	1.776 (m) / 5.825 (ft)			*
				/			
7	WBG-290	12:47	13:25	1.724 (m) / 5.65 (ft)			*
				/			
8	WBG-276	13:32	14:15	1.690 (m) / 5.545 (ft)			*
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
:				(m) / (ft)			
:				/			

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Receiver S/N _____ Antenna S/N _____

* TROUBLE LOCKING DOWN.

GPS SURVEY FIELD LOG ACHW

Job No.	Date	Julian Day	GPS Receiver	Operator(s)	Project Description		
00742	11-2-00	307	3871	Bryan & Heistad	Winklepeck Burning Ground		
Occ.#	**Station**	**Start Time**	**Stop Time**	**Antenna Height**	**PDOP**	**# SVs**	**Point Description & Notes**
0	RAV10	7:07	10:19	1.609 (m) / 5.275 (ft)			
				/			
1	WBG-265	10:34	11:15	1.682 (m) / 5.52 (ft)			
				/			
2	WBG-294	11:22	12:15	1.904 (m) / 6.245 (ft)			*
				/			
3	WBG-280	12:25	12:55	1.738 (m) / 5.70 (ft)			
				/			
4	WBG-283	12:59	13:43	1.708 (m) / 5.60 (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
				(m) / (ft)			
				/			
:				(m) / (ft)			
:				/			

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Receiver S/N _____ Antenna S/N _____

*TROUBLE COUNTING DOWN.

GPS LOOP CLOSURES

Loop Closure Report

Project 007420

Project name	007420		
Coordinate Units	US survey feet		
Distance Units	US survey feet		
Height Units	US survey feet		
Date printed	11/17/00 3:57:54 PM		
Coordinate System	US State Plane 1983	**Zone**	Ohio North 3401
Datum	NAD 1983 (Conus)	**Geoid model**	GEOID99 (Conus)

Contents

Summary

Passed Loops

Passed Loop Details

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Summary

Legs in loop:	3
Number of Loops:	4
Number Passed:	4
Number Failed:	0

	Length	dHoriz	dVert	ppm
Pass/Fail Criteria		0.098sft	0.164sft	
Best		0.006sft	0.007sft	0.267
Worst		0.014sft	0.124sft	3.551
Average Loop	34948.642sft	0.009sft	0.046sft	1.393
Standard Deviation	575.712sft	0.003sft	0.046sft	1.285

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Passed Loops

GPS Loop 1:
RAV 10: WBG-MW-013: RAV 1: RAV 10

Observations:

Baseline ID	Solution ID	From	To	Solution Type	Start Time
B2	S1	RAV 10	WBG-MW-013	L1 fixed	08:21:02 2 Nov 2000
B1	S4	RAV 1	WBG-MW-013	L1 fixed	08:21:02 2 Nov 2000
B4	S3	RAV 10	RAV 1	L1 fixed	07:06:47 2 Nov 2000

Passed combinations for loop 1:

	Length	dHoriz	dVert	Ppm
S1 - S4 - S3	34361.969sft	0.008sft	0.039sft	1.154

GPS Loop 2:
RAV 10: WBG-MW-012: RAV 1: RAV 10

Observations:

Baseline ID	Solution ID	From	To	Solution Type	Start Time
B5	S2	RAV 10	WBG-MW-012	L1 fixed	07:41:02 2 Nov 2000
B3	S5	RAV 1	WBG-MW-012	L1 fixed	07:41:02 2 Nov 2000
B4	S3	RAV 10	RAV 1	L1 fixed	07:06:47 2 Nov 2000

Passed combinations for loop 2:

	Length	dHoriz	dVert	Ppm
S2 - S5 - S3	35880.297sft	0.006sft	0.007sft	0.267

GPS Loop 3:
RAV 10: RAV 1: P 45: RAV 10

Observations:

Baseline ID	Solution ID	From	To	Solution Type	Start Time
B4	S3	RAV 10	RAV 1	L1 fixed	07:06:47 2 Nov 2000
B6	S20	RAV 1	P 45	L1 fixed	09:33:02 2 Nov 2000
B8	S15	RAV 10	P 45	L1 fixed	09:33:02 2 Nov 2000

Passed combinations for loop 3:

	Length	dHoriz	dVert	Ppm
S3 - S20 - S15	34611.675sft	0.014sft	0.015sft	0.600

GPS Loop 4:
RAV 10: RAV 1: P 46: RAV 10

Observations:

Baseline ID	Solution ID	From	To	Solution Type	Start Time
B4	S3	RAV 10	RAV 1	L1 fixed	07:06:47 2 Nov 2000
B7	S21	RAV 1	P 46	L1 fixed	08:57:32 2 Nov 2000
B9	S18	RAV 10	P 46	L1 fixed	08:57:32 2 Nov 2000

Passed combinations for loop 4:

	Length	dHoriz	dVert	Ppm
S3 - S21 - S18	34940.629sft	0.008sft	0.124sft	3.551

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Passed Loop Details

Loop S1 - S4 - S3:

From: RAV 10

To: WBG-MW-013		L1 fixed	08:21:02 2 Nov 2000
	Slope:	13827.069sft	561518.281sft
	Total:	13827.069sft	2355223.168sft
			1071.682sft
To: RAV 1		L1 fixed	08:21:02 2 Nov 2000
	Slope:	10403.583sft	551472.424sft
	Total:	24230.652sft	2357923.274sft
			1023.900sft
To: RAV 10		L1 fixed	07:06:47 2 Nov 2000
	Slope:	10131.317sft	555004.362sft
	Total:	34361.969sft	2367417.825sft
			983.879sft

Precision:	1.154ppm			
Errors	Horiz:	0.008sft	Vert:	0.039sft

Loop S2 - S5 - S3:

From:	RAV 10			
To:	WBG-MW-012		L1 fixed	07:41:02 2 Nov 2000
		Slope:	14538.338sft	562240.915sft
		Total:	14538.338sft	2354810.567sft
				1079.081sft
To:	RAV 1		L1 fixed	07:41:02 2 Nov 2000
		Slope:	11210.643sft	551472.426sft
		Total:	25748.980sft	2357923.288sft
				1023.868sft
To:	RAV 10		L1 fixed	07:06:47 2 Nov 2000
		Slope:	10131.317sft	555004.364sft
		Total:	35880.297sft	2367417.839sft
				983.847sft

Precision:	0.267ppm			
Errors	Horiz:	0.006sft	Vert:	0.007sft

Loop S3 - S20 - S15:

From:	RAV 10			
To:	RAV 1		L1 fixed	07:06:47 2 Nov 2000
		Slope:	10131.317sft	551472.425sft
		Total:	10131.317sft	2357923.282sft
				1023.861sft
To:	P 45		L1 fixed	09:33:02 2 Nov 2000
		Slope:	11195.489sft	562576.367sft
		Total:	21326.806sft	2356504.074sft
				1061.381sft
To:	RAV 10		L1 fixed	09:33:02 2 Nov 2000
		Slope:	13284.869sft	555004.351sft
		Total:	34611.675sft	2367417.840sft
				983.856sft

Precision:	0.600ppm			
Errors	Horiz:	0.014sft	Vert:	0.015sft

Loop S3 - S21 - S18:

From:	RAV 10			
To:	RAV 1		L1 fixed	07:06:47 2 Nov 2000
		Slope:	10131.317sft	551472.425sft
		Total:	10131.317sft	2357923.282sft
				1023.861sft
To:	P 46		L1 fixed	08:57:32 2 Nov 2000
		Slope:	11234.435sft	562563.888sft
		Total:	21365.752sft	2356144.616sft
				1070.689sft
To:	RAV 10		L1 fixed	08:57:32 2 Nov 2000
		Slope:	13574.877sft	555004.361sft
		Total:	34940.629sft	2367417.841sft
				983.964sft

Precision:	3.551ppm			
Errors	Horiz:	0.008sft	Vert:	0.124sft

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GPS NETWORK ADJUSTMENT

Network Adjustment Report

Project 007420

Project name	007420		
Coordinate Units	US survey feet		
Distance Units	US survey feet		
Height Units	US survey feet		
Date printed	11/17/00 3:54:00 PM		
Coordinate System	US State Plane 1983	**Zone**	Ohio North 3401
Datum	NAD 1983 (Conus)	**Geoid model**	GEOID99 (Conus)

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  - Individual GPS Observation Statistics
- Adjusted Coordinates
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  - Geodetic Coordinates
  - Coordinate Deltas
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- Point Error Ellipses
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Statistical Summary

Number of Iterations

Successful Adjustment in 1 iteration(s)

Global Statistics

Network Reference Factor : 1.18

Chi Square Test (α=95%) : PASS

Degrees of Freedom : 13.00

GPS Observation Statistics

Reference Factor : 1.18

Redundancy Number (r) : 12.03

Geoid Model Statistics

Reference Factor : 1.11

Redundancy Number (r) : 0.97

Weighting Strategies

GPS Observations

User-Defined Scalar Set Applied to All Observations

Scalar : 1.87

Geoid Observations

Default Scalar Set Applied to All Observations

Scalar : 1.00

Set-up Errors

Error in Height of Antenna : 0.003sft

Centering Error : 0.001sft

Individual GPS Observation Statistics

Observation ID	Reference Factor	Redundancy Number
B1	1.14	1.25
B2	1.14	1.44
B3	0.81	1.15
B4	0.49	1.15
B5	0.81	1.42
B6	0.75	1.38
B7	1.95	0.92
B8	0.76	1.39
B9	1.81	1.94

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Adjusted Coordinates

Adjustment performed in NAD 1983 (Conus)

Number of Points : 6
Number of Constrained Points : 2
Horizontal and Elevation Only : 2

Adjusted Grid Coordinates

Errors are reported using 1.96σ.

Point Name	Northing	N error	Easting	E error	Elevation	e error	Fix
RAV 1	551472.462sft	0.000sft	2357923.326sft	0.000sft	1023.920sft	0.000sft	N E e
WBG-MW-013	561518.269sft	0.011sft	2355223.250sft	0.008sft	1071.696sft	0.099sft	
RAV 10	555004.363sft	0.000sft	2367417.833sft	0.000sft	983.840sft	0.000sft	N E e
WBG-MW-012	562240.898sft	0.010sft	2354810.645sft	0.008sft	1079.113sft	0.096sft	
P 45	562576.352sft	0.013sft	2356504.144sft	0.012sft	1061.408sft	0.099sft	
P 46	562563.863sft	0.011sft	2356144.686sft	0.008sft	1070.699sft	0.100sft	

Adjusted Geodetic Coordinates

Errors are reported using 1.96σ.

Point Name	Latitude	N error	Longitude	E error	Height	h error	Fix
RAV 1	41°10'18.06583"N	0.000sft	81°05'07.42132"W	0.000sft	913.346sft	0.055sft	Lat Long e
WBG-MW-013	41°11'57.74565"N	0.011sft	81°05'40.60796"W	0.008sft	961.128sft	0.062sft	
RAV 10	41°10'51.41927"N	0.000sft	81°03'02.51459"W	0.000sft	873.212sft	0.055sft	Lat Long e
WBG-MW-012	41°12'04.95058"N	0.010sft	81°05'45.85285"W	0.008sft	968.545sft	0.057sft	
P 45	41°12'07.99477"N	0.013sft	81°05'23.62951"W	0.012sft	950.822sft	0.062sft	
P 46	41°12'07.92878"N	0.011sft	81°05'28.33422"W	0.008sft	960.116sft	0.064sft	

Coordinate Deltas

Point Name	ΔNorthing	ΔEasting	ΔElevation	ΔHeight	ΔGeoid Separation
RAV 1	0.000sft	0.000sft	0.000sft	-0.003sft	0.003sft
WBG-MW-013	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
RAV 10	0.000sft	0.000sft	0.000sft	0.003sft	-0.003sft
WBG-MW-012	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
P 45	0.005sft	0.000sft	-0.014sft	-0.014sft	0.000sft
P 46	0.000sft	0.000sft	-0.031sft	-0.031sft	0.000sft

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Adjusted Observations

Adjustment performed in NAD 1983 (Conus)

GPS Observations

GPS Transformation Group: <GPS Default>

Azimuth Rotation : -0°00'00.3803" **(1.96σ)** : 0°00'00.0947"

Network Scale : 1.00000544 **(1.96σ)** : 0.00000039

Number of Observations : 9

Number of Outliers : 0

Observation Adjustment (Critical Tau = 2.75). Any outliers are in red.

Observation ID	From Point	To Point		Observations	A-posteriori Error (1.96σ)	Residual	Std. Residua
B1	RAV 1	WBG-MW-013	Az.	345°53'06.0543"	0°00'00.1407"	-0°00'00.0662"	-1.0
			ΔHt.	47.777sft	0.031sft	0.015sft	1.0
			Dist.	10403.006sft	0.010sft	0.000sft	0.0
B2	RAV 10	WBG-MW-013	Az.	299°03'41.6562"	0°00'00.1534"	0°00'00.0384"	0.4
			ΔHt.	87.911sft	0.032sft	-0.017sft	-1.0
			Dist.	13826.181sft	0.007sft	-0.003sft	-0.7
B3	RAV 1	WBG-MW-012	Az.	344°48'25.1011"	0°00'00.1195"	0°00'00.0554"	1.1
			ΔHt.	55.193sft	0.020sft	0.000sft	0.0

			Dist.	11210.001sft	0.009sft	-0.001sft	-0.1
B4	RAV 10	RAV 1	Az.	250°32'49.6762"	0°00'00.0947"	0°00'00.0159"	0.5
			ΔHt.	40.129sft	0.018sft	0.002sft	0.2
			Dist.	10130.806sft	0.004sft	0.001sft	0.4
B5	RAV 10	WBG-MW-012	Az.	300°48'28.4589"	0°00'00.1168"	-0°00'00.0320"	-0.5
			ΔHt.	95.327sft	0.021sft	0.000sft	0.0
			Dist.	14537.389sft	0.007sft	0.003sft	0.8
B6	RAV 1	P 45	Az.	353°38'44.7660"	0°00'00.2043"	-0°00'00.0440"	-0.4
			ΔHt.	37.471sft	0.031sft	-0.011sft	-0.7
			Dist.	11194.933sft	0.012sft	0.006sft	0.9
B7	RAV 1	P 46	Az.	351°49'07.3949"	0°00'00.1212"	-0°00'00.1000"	-1.9
			ΔHt.	46.765sft	0.034sft	-0.029sft	-2.6
			Dist.	11233.829sft	0.010sft	-0.004sft	-0.9
B8	RAV 10	P 45	Az.	305°42'18.7545"	0°00'00.1627"	-0°00'00.0452"	-0.5
			ΔHt.	77.605sft	0.031sft	0.012sft	0.8
			Dist.	13284.058sft	0.013sft	-0.006sft	-0.9
B9	RAV 10	P 46	Az.	304°47'48.8247"	0°00'00.1416"	-0°00'00.0578"	-0.3
			ΔHt.	86.899sft	0.037sft	0.103sft	1.8
			Dist.	13573.999sft	0.008sft	-0.006sft	-1.0

Geoid Observations

Number of Observations : 6

Number of Outliers : 0

Observation Adjustment (Critical Tau = 2.75). Any outliers are in red.

Observation ID	Point Name	Separation	A-posteriori Error (1.96σ)	Residual	Std. Residual
G5	RAV 1	-110.574sft	0.055sft	-0.026sft	-0.94
G6	WBG-MW-013	-110.568sft	0.077sft	0.000sft	0.00
G7	RAV 10	-110.628sft	0.055sft	0.026sft	0.94
G8	WBG-MW-012	-110.568sft	0.077sft	0.000sft	0.00
G9	P 45	-110.587sft	0.077sft	0.000sft	0.00
G10	P 46	-110.583sft	0.077sft	0.000sft	0.00

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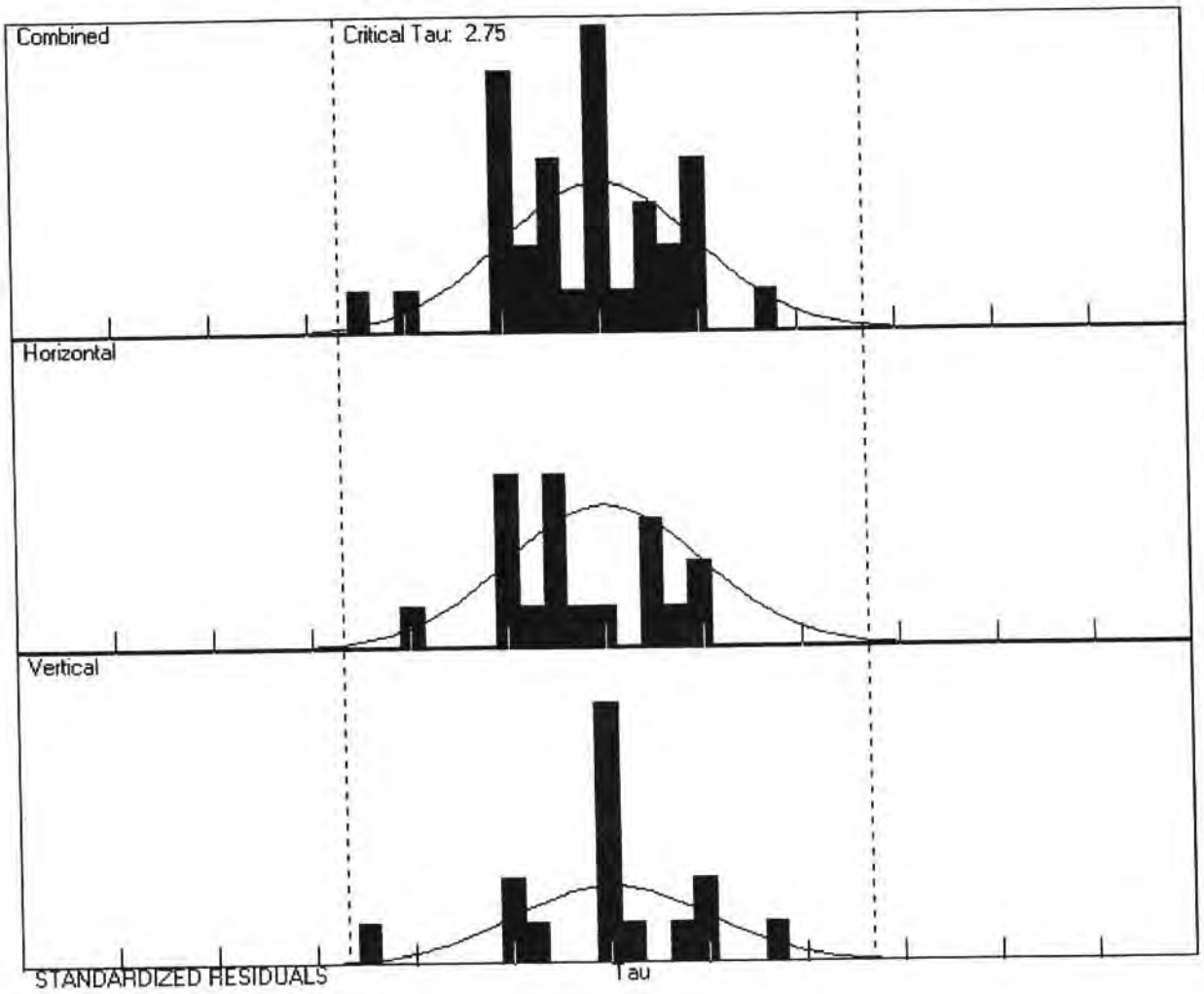
Histograms of Standardized Residuals



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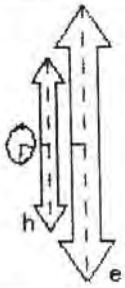
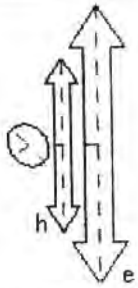
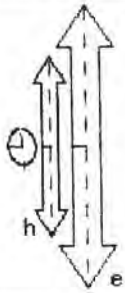
Point Error Ellipses

RAV 1	WBG-MW-013	RAV 10
 0°	 82°	 0°
Tick Size: 0.0100sft Horizontal Bivariate Scalar: 2.45σ Vertical Univariate Scalar: 1.96σ		
WBG-MW-012	**P 45**	**P 46**
 86°	 -47°	 -83°
Tick Size: 0.0100sft Horizontal Bivariate Scalar: 2.45σ Vertical Univariate Scalar: 1.96σ		

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Covariant Terms

Adjustment performed in NAD 1983 (Conus)

From Point	To Point		Components	A-posteriori Error (1.96σ)	Horiz. Precision (Ratio)	3D Precision (Ratio)
RAV 1	WBG-MW-013	Az.	345°53'06.4346"	0°00'00.1704"	1:949565	1:949565
		ΔHt.	47.782sft	0.031sft		
		Dist.	10402.949sft	0.011sft		
RAV 1	RAV 10	Az.	70°31'27.8206"	0°00'00.0000"	1:0	1:0
		ΔHt.	-40.134sft	0.018sft		
		Dist.	10130.751sft	0.000sft		
RAV 1	WBG-MW-012	Az.	344°48'25.4814"	0°00'00.1537"	1:1186323	1:1186323
		ΔHt.	55.199sft	0.020sft		
		Dist.	11209.940sft	0.009sft		
RAV 1	P 45	Az.	353°38'45.1464"	0°00'00.2236"	1:866848	1:866848
		ΔHt.	37.476sft	0.031sft		
		Dist.	11194.872sft	0.013sft		
RAV 1	P 46	Az.	351°49'07.7752"	0°00'00.1502"	1:1007108	1:1007108
		ΔHt.	46.770sft	0.034sft		
		Dist.	11233.768sft	0.011sft		
WBG-MW-013	RAV 10	Az.	119°01'57.9226"	0°00'00.1645"	1:1625896	1:1625896
		ΔHt.	-87.916sft	0.032sft		
		Dist.	13826.106sft	0.009sft		
RAV 10	WBG-MW-012	Az.	300°48'28.8392"	0°00'00.1322"	1:1710565	1:1710565
		ΔHt.	95.333sft	0.021sft		
		Dist.	14537.310sft	0.008sft		
RAV 10	P 45	Az.	305°42'19.1348"	0°00'00.1754"	1:972875	1:972875
		ΔHt.	77.610sft	0.031sft		
		Dist.	13283.986sft	0.014sft		
RAV 10	P 46	Az.	304°47'49.2050"	0°00'00.1512"	1:1412125	1:1412125
		ΔHt.	86.904sft	0.037sft		
		Dist.	13573.925sft	0.010sft		

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M-42

SAIC REVENNA ARMY AMUNITION PLANT, OHIO 00742.?

WINKEPECK BURNING GROUNDS — MONITORING WELL ELEVATIONS 11-01-00 LEVEL LOOPS

	BS	HI	IFS	FS	ELEV.			
Bm #45 Top 2" PVC w/ 6" HTC CASING	5.01					ACHW IPSCAP (S) WBG MW-011	PT# 101 D.C. JOB FILE: 7420 LOC 3. CRS/RWS	⊼ LGW ϕ HHC Top AT-F1
conc	3.[illegible]			27				
GRND			5.71					
Bm #45 IPSCAP (S)				5.01				
				3				
BM P-58 conc mon Top 2" PVC w/ 6" HTC CASING	6.66	1073.38			1066.72	Arm. IPSCAP ALUMPS WBG MW-010	PT# 119 D.C. JOB FILE: 7420 LOC 2. CRS/RWS	⊼ HHW ϕ LGW Top GTS 3.31
	3.43	1073.28		3.51	1069.85			
conc			5.59		1067.69			
GRND			6.22		1067.06			
BM P-58 ACHW IPSCAP ALUM FS conc mon				6.56	1066.72			
Bm WBG-MW 7 Top 2" PVC w/ 6" HTC CASING	2.44	1000.53			998.09	Top 2" PVC WBG MW-016	PT# 138 D.C. JOB FILE: 7420 LOC 2. CRS/RWS	⊼ LGW ϕ HHC Top GTS 3.30
	3.47	1000.50		3.50	997.03			
conc			5.08		995.42			
GRND			5.63		994.87			
Bm WBG-MW 7 Top 2" PVC				2.42	998.08			
Bm WBG MW-7 Top 2" PVC w/ 6" HTC CASING	2.36	1000.45			998.09	Top 2" PVC WBG MW-014	PT# 137 D.C. JOB FILE: 7420 LOC 2. CRS/RWS	⊼ LGW ϕ HHC Top GTS 3.30
	3.61	1000.39		3.67	996.78			
conc			5.89		994.50			
GRND			6.27		994.12			
Bm WBG MW-7				2.30	998.09			

VOID

SEE PAGE 33

		BS	HI	IFS	FS	ELEV.		
Bm P-35	conc mon	4.28	1016.65			1012.37	Acmw IPS CAP (F) Alum WBM	
Top 2" PVC w/ 6" MTL CASING		5.02	1016.62		5.05	1011.60	MW-015	
		9.30						
conc				7.12		1009.50		
GRND				7.54		1009.08		
Bm P-35	conc mon Acmw IPS CAP Alum				4.24	1012.38		
					9.79			
Bm P-73	conc mon (F)	4.42	1012.03			1007.61	Acmw IPS CAP (F) Alum WBM	
Top 2" PVC w/ 6" MTL CASING		5.34	1011.96		5.41	1006.62	MW-017	
		9.76						
conc				7.58		1004.38		
GRND				7.95		1004.01		
Bm P-73	conc mon Acmw IPS CAP Alum				4.36	1007.60		
Bm GPS #6		5.52	1076.22			1070.70	Acmw IPS CAP (F) WBG	
Top 2" PVC w/ 6" MTL CASING		3.65	1076.03		3.84	1072.38	MW-011	
conc				5.82		1070.21		
GRND				6.33		1069.70		
Bm GPS #46	Acmw IPS CAP (F)				5.32	1070.71		
Bm GPS-0022		5.22	982.18			982.18	Acmw IPS CAP (F) Alum	
Top 2" PVC w/ mon 6" MTL CASING WELL		2.94	987.36		2.98	984.42	L12-182 (P-1 OLD)	
		8.16						
conc				5.15		982.21		
GRND				5.49		981.87		
Bm GPS-0022	Acmw IPS CAP Alum (F)				5.18	982.18		
					5.16			

SAIC REVENNA Army Ammunition Plant, OHIO — 00742.9 THURS 11-09-00

WINKLEPECK BURNING GROUNDS MONITORING WELL REV. LEVEL LOOPS

PT # 11 DC JOB FILE: 7420 LOC 1.CRS/RW5 — 1012.37 / 4.29 / 1016.65 / 5.05 / 1011.60 — π LGW, φ HHL, Topcon GTS-3031

PT # 118 DC JOB FILE: 7420 LOC 1.CRS/RW5 — 00742.9 — π LGW, φ HHL, Topcon GTS-3031

PT # 101 DC JOB FILE: 7420 LOC 3.CRS/RW5 — 00742.9 — π HHL, φ LGW, Topcon GTS-3031

SAIC REVENNA Army Ammunition Plant, OHIO — 00730.9 THURS 11-09-00

CK π Topcon (see pg. 28) AT-F1 LOADLINE 12 MONITORING WELL LEVEL LOOP CK-ELEV. — 987.90 / 984.42 / 1.21 / 987.36 / 2.65 — π LGW, φ HHL, Topcon GTS-3031

DRAWINGS

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APPENDIX N

ORDNANCE AND EXPLOSIVES AVOIDANCE SURVEY

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FINAL REPORT

Unexploded Ordnance Support Services
Winklepeck Burning Grounds
Ravenna Army Ammunition Plant
Ravenna, Ohio

FINAL REPORT
RAVENNA ARMY AMMUNITION PLANT
WINKLEPECK BURNING GROUNDS
RAVENNA, OHIO

1.0 INTRODUCTION

1.1 Project Authorization

Explosive Ordnance Technologies Incorporated (EOTI), was contracted by Science Applications International Corporation (SAIC), to provide standard Ordnance Avoidance and Site Safety services for the Winklepeck Burning Grounds (WBG) Feasibility Study. The project commenced with mobilization of personnel on October 16th, 2000. The following report contains a brief description of operational procedures used during the project.

1.2 Objectives

The purpose of the project was to provide Ordnance and Explosive Safety support for SAIC and subcontractors during well drilling and soil sampling efforts. Specifically, the following tasks were to be completed:

1. Provide daily ordnance/explosive safety briefings for all site personnel.

2. Visually verify the extent of surface ordnance and explosive waste.

3. Use magnetometers/gradiometers to verify subsurface soil sample and well drilling locations to be free of anomalies.

4. Prepare final report.

2.0 DAILY OPERATIONS

15 October, 2000 - Wayne Lewallen, EOTI Senior UXO Supervisor and Glen Harbaugh, UXO Technician mobilize to Ravenna, Ohio.

16 October, 2000 - EOTI personnel arrive for Site Safety meeting.

Mr. Kevin Jago (SAIC Project Manager), briefs site history, work assignments and objectives of the WBG Feasibility Study.

Wayne Lewallen (Senior UXO Supervisor) provides a detailed UXO Safety Briefing to include examples of ordnance previously located at Ravenna. All personnel signed the Site Work Plan and Health and Safety log during this meeting.

EOTI personnel depart to commence UXO Avoidance operations with soil sampling and well drilling crews. All monitoring well locations are pre-screened to a depth of 4 feet with hand auger by EOTI personnel.

Wayne Lewallen and Kevin Jago (SAIC Project Manager) identify preliminary locations for installation of Monitoring Wells. Well drilling team arrives to begin drilling well #017.

Glen Harbaugh assists monitoring well crews by performing magnetometer sweeps prior to soil sampling throughout the day.

Team departs Ravenna at 1800.

17 October, 2000 - Arrive at site for 0700 Safety Briefing.

At 0730 Glen Harbaugh escorts Soil Sample crew to begin collecting soil samples. Wayne Lewallen escorts Well Drilling crew to continue with installation of wells.

Team conducts surface sweeps and down-hole magnetometer checks throughout the day.

The following sites were cleared for soil sampling: WBG 197, 199, 200, 201, 202, 253, 256.

The following sites were cleared for Monitoring Well installation: WBGMW 016,014

Team departs Ravenna at 1800.

18 October, 2000 - Arrive at site for 0700 Safety Briefing.

Arrive at WBG at 0730.

UXO team rotates between the Well Drilling Team, the Soil Sampling Team throughout the day.

Soil Sample locations 198, 204, 205, 206, 207, 208, 209, 211, 212, 213, 214, 215, 216, 219, and 222 were cleared. Monitoring Well sites WBGMW 015 and 010 were cleared.

Team departs Ravenna at 1800.

19 October, 2000 - Arrive at site for 0700 Safety Briefing.

Arrive at WBG at 0730.

Begin magnetometer check and hand auger 4' test hole for well drilling crew. Continue with magnetometer checks for soil sample team and well drilling crews. Soil Sample locations and approach paths for point 217, 218, 220, 221, 234, and 235 cleared.

Team departs Ravenna at 1805.

20 October, 2000 - Arrive at site for 0700 Safety Briefing.

Arrive at WBG at 0730.

Wayne Lewallen begins hand auger operation for monitoring well checks.

Glen Harbaugh assists soil sample team with magnetometer checks. The following sample points were cleared: 224, 225, 226, 230, 232, 233, 236.

Team departs Ravenna at 1800.

21 October, 2000 - Glen Harbaugh arrives at site for 0700 Safety Brief. Wayne Lewallen demobilizes site as stipulated by contract.

Arrive at WBG at 0740.

Begin magnetometer checks for well drilling crews and then rotates to soil sampling crews.

The following soil sample locations were cleared: 229, 231, 238, 239, 240, 241, 243.

Team departs Ravenna at 1800.

22 October, 2000 - Arrive at site for 0800 Safety Brief.

Arrive at WBG at 0900.

Glen Harbaugh assists soil sample crew by returning to previously excavated soil sample locations to take samples at deeper depths.

Depart Ravenna at 1800.

23 October, 2000 - Arrive at site for 0700 Safety Brief.

Arrive at WBG at 0730.

Provide magnetometer checks for soil sample and well drilling crews. The following sample locations were cleared: 245, 246, 249, 250, 251, 259, 260, 261.

Departs Ravenna at 1800.

24 October, 2000 - Arrive at site for 0700 Safety Brief

Arrive at WBG at 0730

Soil sample crews arrive. Perform magnetometer checks for the following soil sample locations: 267, 269, 274, 275, 276, 277, 278, 281, 294, 295.

Depart Ravenna at 1800.

25 October, 2000 - Arrive at site for 0700 Safety Briefing

Arrive at WBG at 0800

Accompany soil sample team to take deeper samples on 12 sites where TNT hits were located.

Depart Ravenna at 1800. (Demobilize for scheduled home leave).

30 October, 2000 - Arrive at site for 0700 Safety Briefing

All personnel returned safely from home leave. Extensive Safety Briefing conducted to refresh all site personnel with UXO hazards and safety precautions.

Arrive at WBG at 0730.

Complete magnetometer checks for Soil Sample crews. The following soil sample locations were cleared: 210, 257, 264, 265, 266, and 280.

Depart Ravenna at 1800.

31 October, 2000 - Arrive at site for 0700 Safety Brief.

Arrive at WBG at 0800.

Begin magnetometer checks for Soil Sampling crews. The following soil sample locations were cleared: 279, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, and 293.

Depart Ravenna at 1800.

1 November, 2000 - Arrive at site for 0700 Safety Brief.

Arrive at WBG at 0800.

Begin day with magnetometer checks for soil sample team. The following points were cleared for sample team: 268-273.

At 1330 begin escorting survey crew to clear approach paths for survey effort.

Depart Ravenna at 1800.

2 November, 2000 - Arrive at site for 0700 Safety Brief.

Arrive at WBG at 0730.

Begin providing magnetometer checks for soil sample crews. Rotate between soil sample crews and survey crew throughout the day. The following locations were cleared prior samples being taken: 258, 262, 263, 296, 297.

Depart Ravenna at 1800.

Team departs Ravenna at 1800.

3.0 EQUIPMENT

EOTI personnel conducted UXO Survey sweeps with GA52CX Shonstedt Magnetometers for all soil sample locations and approach paths. Monitoring Wells and Geoprobe locations were surveyed with GA52CX Shonstedt Magnetometers and MG230 (downhole) gradiometers.

4.0 ORDNANCE/EXPLOSIVES

The following ordnance and explosives related components were identified during this portion of the WBG Feasibility Study:

TYPE	QTY	LOCATION
90mm Mortar (Tail Assembly)	1	Pad 61
Point Detonating Fuze (See Photo #2)	2	Pad 59
40mm Cartridge (no projectile)	1	Pad 59
Projectile Flash Tubes (See Photo #1)	3	Pad 45
Point Detonating Fuze (See Photo #2)	1	Pad 45
Mechanical Time Fuze (See Photo #3)	1	Pad 58
Fuze Adapter (See Photo #4)	1 (Found in firebreak adjacent to Pad 7	
155mm Frag (30lbs) (See Photo #5)	1 (Found in firebreak adjacent to Pad 7	

Cartridge Actuated Devices (See Photo #6) Note: Pad 58 through 61 contain a large amount of surface/subsurface ordnance related debris from previous burn operations.

EOTI personnel conducted magnetometer/gradiometer check for all Monitoring Well/Geoprobe and Soil Sample locations. On many occasions sub-surface anomalies were detected in the proposed Monitoring Well or Soil Sample location requiring the selection of another location.

All work was conducted safely with no injuries to personnel.

Wayne Lewallen,
Project Manager, EOTI



Photo #1. Projectile Flash Tubes



Photo #2. Point Detonating Fuze (Center of Photo)



Photo #3. Mechanical Time Fuze



Photo #4. Fuze Adapter



Photo #5. 155 mm Projectile Fragment



Photo #6. Cartridge Actuated Devices



Photo #7. Prescreening of Monitoring Well Location

MKM Engineers, Inc.

4153 Bluebonnet Drive Stafford, Texas 77477
Phone: 281-277-5100 Fax: 281-277-5205

To: Don Johnson	From: Khodi Irani
Company: SAIC	Date: 6/15/00
Fax Number: 865-481-4601	Total Pages + Cover: 3
Phone Number:	Sender's Reference #:
Re:	Your Reference #:

☐ Urgent ☐ For Review ☐ For Comment ☐ For Reply ☐ For Recycle

MESSAGE:

Proposal for Winklepeck

APPENDIX O

INVESTIGATION-DERIVED WASTE MANAGEMENT REPORTS

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CY08 File 08

Science Applications International Corporation
An Employee-Owned Company

February 26, 2001

Mr. Walter Perro
U.S. Army Corps of Engineers
Louisville District
ATTN: CEORL-ED-GE
600 Martin Luther King, Jr. Place
Louisville, KY 40201-0059

SUBJECT: **Contract No. DACA62-00-D-0001, Delivery Order CY08, Feasibility Study Field Investigation at Winklepeck Burning Ground, Ravenna Army Ammunition Plant, Ravenna, Ohio**

RE: **Deliverable – Investigation-Derived Waste Characterization and Disposal Report**

Dear Mr. Perro:

Investigative activities conducted during the Feasibility Study (FS) Field Investigation at Winklepeck Burning Ground (WBG), at the Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio, resulted in the generation of investigation-derived waste (IDW) consisting of soil, water, and field laboratory reagents. The IDW was generated in the course of sampling of soils and groundwater, field analysis of explosives, and decontamination of sampling equipment. The purpose of this letter report is to characterize and classify liquid IDW, consisting of potable wash/rinse decontamination water and monitoring well development and purge water, for disposal. A previous letter, dated December 6, 2000, documents the characterization and disposal recommendation for the liquid IDW generated in the field laboratory. The characterization and classification of the remaining soil containers will be completed in a separate letter report to be submitted at a later date pending verification of the environmental sampling data needed for characterization.

This report includes a summary of liquid IDW generated and its origin (Table 1), comparisons of characterization sampling results to regulatory criteria (Table 2), and classification of the liquid IDW and recommendations for disposal (Table 3). This document follows guidance established by the Facility-Wide Sampling and Analysis Plan (USACE 1996), the Sampling and Analysis Plan Addendum No. 1 for WBG (USACE 2000), and the Ohio EPA (November 1997) regarding IDW disposition at RVAAP.

Table 1. Summary of WBG FS IDW

DRUM NUMBER	CONTAINER TYPE AND SIZE	CONTENTS AND VOLUME	GENERATION DATE(S)
WBG DECON-01	55-gallon closed-top	potable wash/rinse water; full	10/17 to 10/31/00
WBG-06	55-gallon closed-top	potable wash/rinse water; full	10/31 to 11/8/00
TANK-1	800-gallon poly tank	decon pad wash/rinse water; approx. 10 gal.	10/16 to 10/30/00
Decon water from Tank-1, Drum 1 of 2	55-gallon closed-top	decon pad wash/rinse water transfered to drums as a freeze protection measure; full	10/16 to 10/30/00
Decon water from Tank-1, Drum 2 of 2	55-gallon closed-top	decon pad wash/rinse water transfered to drums as a freeze protection measure; full	10/16 to 10/30/00
WBG-05	55-gallon closed-top	purge water from 1998 wells and OBG-1 through –4; full	11/3 to 11/7/00
WBGmw-010-3	55-gallon open-top	development/purge water; full	10/31/00
WBGmw-010-4	55-gallon open-top	development/purge water; full	10/31/00
WBGmw-011-5	55-gallon open-top	development/purge water; full	10/31/00
WBGmw-011-6	55-gallon open-top	development/purge water; 2/3 full	10/31/00
WBGmw-012-4	55-gallon open-top	development water; full	11/1 to 11/2/00
WBGmw-012-5	55-gallon closed-top	development/purge water; ½ full	11/2 to 11/3/00
WBGmw-013-3	55-gallon open-top	development/purge water; full	11/1/00
WBGmw-013-4	55-gallon open-top	development/purge water; full	11/1/00
WBGmw-013-5	55-gallon closed-top	development/purge water; 1/3 full	11/1/00
WBGmw-014-3	55-gallon open-top	development/purge water; ¾ full	10/31/ to 11/2/00
WBGmw-014-4	55-gallon open-top	development/purge water; 2/3 full	11/2/00
WBGmw-015-5	55-gallon closed-top	development/purge water; full	10/31/00
WBGmw-015-6	55-gallon closed-top	development/purge water; ½ full	10/31/00
WBGmw-016-3	55-gallon open-top	development/purge water; ½ full	10/30 to 10/31/00
WBGmw-017-5	55-gallon open-top	development/purge water; full	10/30/00
IDWW01	55-gallon closed-top	Decontamination wash/rinse; full	8/12/00

For the characterization of decontamination IDW as hazardous or non-hazardous, waste characterization samples were collected from the containers. A composite sample was collected from drums WBG DECON-01 and WBG-06 because they were from the same waste stream, and a discrete sample was collected from both the polyethylene tank (TANK-1) and IDWW01. Note that as a freeze protection measure, about 100 gallons of the contents of the poly tank were transferred to two 55-gallon drums on December 8, 2000 and moved into Building 1036 along the with remaining small volume within the tank. The samples were analyzed for TCLP metals, pH, and ignitability. IDWW01 was additionally analyzed for TCLP VOCs and SVOCs, pesticides, and PCBs, as part of the biological measurements study at WBG. The analytical results above detection limits for the samples are compared directly to the Resource Conservation and Recovery Act (RCRA) toxicity characteristic regulatory limits set by 40 CFR 261.24 to determine a waste characterization, as shown in Table 2. The TCLP results are attached to this letter.

Table 2. Comparison of TCLP Waste Characterization Results for WBG to TCLP Criteria

Drum I.D.	Chemical	TCLP Result (mg/L)	TCLP Criterion (mg/L)	TCLP Pass/Fail
WBG DECON-01 and WBG-06 (composite)	Barium	0.53	100	P
	Cadmium	0.052	1	P
	Chromium	0.037	5	P
TANK-1 and associated Drum 1 and Drum 2	Barium	1.1	100	P
	Chromium	0.046	5	P
WBG-05	Arsenic	0.024	5	P
	Barium	0.11	100	P
	Cadmium	0.0003	1	P
	Chromium	0.0035	1	P
	2,4-Dinitrotoluene	0.00095	0.13	P
WBGmw-010-3 and –4	Barium	0.014	100	P
	Chromium	0.0017	5	P
	2,4-Dinitrotoluene	0.00028	0.13	P
	Chloroform	0.0014	6	P
WBGmw-011-5 and-6	Barium	0.029	100	P
	2,4-Dinitrotoluene	0.000093	0.13	P
WBGmw-012-4 and –5	Barium	0.013	100	P
	Chromium	0.0015	5	P

Drum I.D.	Chemical	TCLP Result (mg/L)	TCLP Criterion (mg/L)	TCLP Pass/Fail
	2,4-Dinitrotoluene	0.00008	0.13	P
WBGmw-013-3 through -5	Barium	0.019	100	P
WBGmw-014-3 and –4	Barium	0.019	100	P
WBGmw-015-5 and –6	Barium	0.073	100	P
	Chromium	0.0014	5	P
WBGmw-016-3	Barium	0.047	100	P
	2,4-Dinitrotoluene	0.000068	0.13	P
WBGmw-017-5	Barium	0.053	100	P
IDWW01	Heptachlor epoxide	0.014	0.008	**F**

With the exception of IDWW01, the drums and tank containing decontamination fluids are classified as non-hazardous, contaminated waste based upon TCLP metals analyses of the liquid, as shown in Table 3. The decontamination fluid IDW also contains trace amounts of barium, chromium, and cadmium. These containers are recommended for off-site disposal at a licensed disposal facility. IDWW01 exceeds the TCLP criterion for heptachlor epoxide and is classified as a hazardous waste; it is noted that this constituent was not used in any of the sampling or decontamination procedures employed for any of the studies at WBG.

For the characterization of monitoring well development and purge water as hazardous or non-hazardous with respect to metals, explosives, and organic compounds, the RCRA toxicity characteristic regulatory limits are compared to the mean and maximum contaminant levels in the filtered groundwater samples, as presented in Attachment 1. Table 7-1 of the Facility-Wide SAP shows the maximum concentrations of contaminants for the RCRA toxicity characteristic for hazardous wastes per 40 CFR 261.24. Maximum detected analytical results for the correlative filtered groundwater samples are compared with these criteria to determine whether any wastes are potentially hazardous.

Attachment 1 shows that the maximum detects of all explosives, inorganics, volatile organic compounds, semi-volatile organic compounds, and pesticides/PCBs in groundwater were below the TCLP criteria.

The well development and purge water is classified as non-hazardous contaminated waste based upon TCLP comparisons with the analytical data for explosives, inorganics, and other compounds, as shown in Table 3 and Attachment 1. The liquid IDW contains trace amounts of metals and explosives, as well as organic compounds. These containers are recommended for off-site disposal at a licensed disposal facility.

Table 3. Summary of Final Waste Classification and Recommended Disposal Options

Non-Hazardous, Contaminated Waste			
Container Number	**Medium**	**Waste Criterion**	**Disposal Recommendation**
WBG DECON-01	Water	Metals	Permitted Facility
WBG-06	Water	Metals	Permitted Facility
TANK-1 and associated Drum 1 and Drum 2	Water	Metals	Permitted Facility
WBGmw-010-3 and -4	Water	Metals, explosives, and organics	Permitted Facility
WBGmw-011-5 and-6	Water	Metals	Permitted Facility
WBGmw-012-4 and –5	Water	Metals and explosives	Permitted Facility
WBGmw-013-3 through –5	Water	Metals	Permitted Facility
WBGmw-014-3 and -4	Water	Metals	Permitted Facility
WBGmw-015-5 and -6	Water	Metals	Permitted Facility
WBGmw-016-3	Water	Metals and explosives	Permitted Facility
WBGmw-017-5	Water	Metals	Permitted Facility
Hazardous Waste			
IDWW01	Water	Heptachlor epoxide	Permitted Facility

Please note that this WBG IDW has been characterized using TCLP results and direct analysis for those parameters identified in the Winklepeck Burning Grounds Feasibility Study Sampling and Analysis Plan Addendum No. 1 as the basis for comparison. Unless RVAAP has additional information that would result in the IDW meeting, or containing materials that meet, the definition of a listed hazardous waste as defined in 40 CFR Part 261 Subpart D, it is recommended that the IDW (with the exception of drum number IDWW01), as presently characterized under provisions of the Facility-Wide Sampling and Analysis Plan and Winklepeck Burning Grounds Feasibility Study Sampling and Analysis Plan Addendum No. 1, be disposed as non-hazardous, contaminated solid waste (e.g., wastewater). It is recommended that drum number IDWW01 be disposed of as hazardous solid waste.

Since RVAAP, under RCRA, is the generator of this material, SAIC requests concurrence or direction on the waste classification prior to disposal to ensure that the materials are properly disposed. Following your direction and immediate approval, we will

proceed with the appropriate waste disposal. Disposal will be scheduled for early March, 2001.

If you have any questions or require additional information, please do not hesitate to contact me at 918-625-7614.

Sincerely,

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Kathy Dominic
Environmental Projects Manager

CC: John Jent, USACE
Eileen Mohr, Ohio EPA
Mark Patterson, RVAAP
Kevin Jago, SAIC
Steve Selecman, SAIC

Attachment 1. WBG FS IDW Summary For Groundwater

Drum ID	Max > TCLP	Analysis Type	Chemical	Units	Proportion Detected	Mean	Max Detect	ID of Max Concentration	TCLP Criteria (mg/L)	Proportion >TCLP
WBG-05		Inorganics	Aluminum	MG/L	1/ 9	0.181	0.032	WBGmw-009-4259-GF		
WBG-05	N	Inorganics	Arsenic	MG/L	4/ 9	0.0091	0.024	WBGmw-005-4255-GF	5	0/ 9
WBG-05	N	Inorganics	Barium	MG/L	9/ 9	0.0443	0.11	WBGmw-166-4253-GF	100	0/ 9
WBG-05	N	Inorganics	Cadmium	MG/L	1/ 9	0.00448	0.0003	WBGmw-165-4252-GF	1	0/ 9
WBG-05		Inorganics	Calcium	MG/L	9/ 9	77.8	145	WBGmw-167-4254-GF		
WBG-05	N	Inorganics	Chromium	MG/L	4/ 9	0.00666	0.0035	WBGmw-167-4254-GF	5	0/ 9
WBG-05		Inorganics	Cobalt	MG/L	2/ 9	0.0396	0.0045	WBGmw-007-4257-GF		
WBG-05		Inorganics	Iron	MG/L	7/ 9	1.22	7.3	WBGmw-005-4255-GF		
WBG-05		Inorganics	Magnesium	MG/L	9/ 9	22.1	43.9	WBGmw-167-4254-GF		
WBG-05		Inorganics	Manganese	MG/L	8/ 9	0.363	1.3	WBGmw-005-4255-GF		
WBG-05		Inorganics	Nickel	MG/L	2/ 9	0.0321	0.0062	WBGmw-006-4256-GF		
WBG-05		Inorganics	Potassium	MG/L	9/ 9	1.04	1.3	WBGmw-005-4255-GF		
WBG-05		Inorganics	Sodium	MG/L	9/ 9	9.01	18.3	WBGmw-005-4255-GF		
WBG-05		Inorganics	Zinc	MG/L	4/ 9	0.0171	0.014	WBGmw-164-4251-GF		
WBG-05		Explosives	1,3,5-Trinitrobenzene	MG/L	1/ 9	0.00019	0.00011	WBGmw-165-4252-GF		
WBG-05		Explosives	2,4,6-Trinitrotoluene	MG/L	4/ 9	0.000319	0.00085	WBGmw-008-4258-GF		
WBG-05	N	Explosives	2,4-Dinitrotoluene	MG/L	7/ 9	0.000223	0.00095	WBGmw-006-4256-GF	0.13	0/ 9
WBG-05		Explosives	2,6-Dinitrotoluene	MG/L	2/ 9	0.000142	0.00025	WBGmw-006-4256-GF		
WBG-05		Explosives	2-Nitrotoluene	MG/L	2/ 9	0.000211	0.00031	WBGmw-006-4256-GF		
WBG-05		Explosives	3-Nitrotoluene	MG/L	1/ 9	0.000194	0.00015	WBGmw-164-4251-GF		
WBG-05		Explosives	4-Nitrotoluene	MG/L	3/ 9	0.000216	0.00038	WBGmw-006-4256-GF		
WBG-05		Explosives	HMX	MG/L	2/ 9	0.00169	0.011	WBGmw-006-4256-GF		
WBG-05		Explosives	RDX	MG/L	2/ 9	0.00676	0.052	WBGmw-006-4256-GF		
WBG-05		Explosives	Tetryl	MG/L	2/ 9	0.000206	0.00036	WBGmw-009-4259-GF		
WBG-05		Pesticides and PCBs	4,4'-DDT	MG/L	1/ 9	0.0000509	0.000058	WBGmw-006-4256-GF		
WBG-05		Semi-Volatile Organics	Bis(2-ethylhexyl)phthalate	MG/L	1/ 9	0.0143	0.049	WBGmw-007-4257-GF		
WBG-05		Volatile Organics	Acetone	MG/L	9/ 9	0.00629	0.0078	WBGmw-166-4253-GF		
WBG-05		Volatile Organics	Methylene chloride	MG/L	8/ 9	0.00226	0.0022	WBGmw-164-4251-GF		
WBGmw-010-3		Inorganics	Aluminum	MG/L	1/ 1	0.034	0.034	WBGmw-010-4260-GF		
WBGmw-010-3	N	Inorganics	Barium	MG/L	1/ 1	0.014	0.014	WBGmw-010-4260-GF	100	0/ 1
WBGmw-010-3		Inorganics	Calcium	MG/L	1/ 1	31.9	31.9	WBGmw-010-4260-GF		
WBGmw-010-3	N	Inorganics	Chromium	MG/L	1/ 1	0.0017	0.0017	WBGmw-010-4260-GF	5	0/ 1
WBGmw-010-3		Inorganics	Magnesium	MG/L	1/ 1	9.3	9.3	WBGmw-010-4260-GF		
WBGmw-010-3		Inorganics	Manganese	MG/L	1/ 1	0.032	0.032	WBGmw-010-4260-GF		
WBGmw-010-3		Inorganics	Nickel	MG/L	1/ 1	0.0028	0.0028	WBGmw-010-4260-GF		
WBGmw-010-3		Inorganics	Potassium	MG/L	1/ 1	1.1	1.1	WBGmw-010-4260-GF		
WBGmw-010-3		Inorganics	Sodium	MG/L	1/ 1	3.5	3.5	WBGmw-010-4260-GF		

Attachment 1. WBG FS IDW Summary For Groundwater

Drum ID	Max > TCLP	Analysis Type	Chemical	Units	Proportion Detected	Mean	Max Detect	ID of Max Concentration	TCLP Criteria (mg/L)	Proportion >TCLP
WBGmw-010-3		Inorganics	Zinc	MG/L	1/ 1	0.048	0.048	WBGmw-010-4260-GF		
WBGmw-010-3	N	Explosives	2,4-Dinitrotoluene	MG/L	1/ 1	0.00028	0.00028	WBGmw-010-4260-GF	0.13	0/ 1
WBGmw-010-3		Explosives	2-Amino-4,6-Dinitrotoluene	MG/L	1/ 1	0.0013	0.0013	WBGmw-010-4260-GF		
WBGmw-010-3		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.0002	0.0002	WBGmw-010-4260-GF		
WBGmw-010-3		Explosives	4-Amino-2,6-Dinitrotoluene	MG/L	1/ 1	0.00054	0.00054	WBGmw-010-4260-GF		
WBGmw-010-3		Explosives	4-Nitrotoluene	MG/L	1/ 1	0.00031	0.00031	WBGmw-010-4260-GF		
WBGmw-010-3		Pesticides and PCBs	Heptachlor epoxide	MG/L	1/ 1	0.000056	0.000056	WBGmw-010-4260-GF		
WBGmw-010-3		Semi-Volatile Organics	Bis(2-ethylhexyl)phthalate	MG/L	1/ 2	0.00695	0.0039	WBGmw-010-4260-GF		
WBGmw-010-3		Volatile Organics	Acetone	MG/L	1/ 1	0.0077	0.0077	WBGmw-010-4260-GF		
WBGmw-010-3	N	Volatile Organics	Chloroform	MG/L	1/ 1	0.0014	0.0014	WBGmw-010-4260-GF	6	0/ 1
WBGmw-010-3		Volatile Organics	Methylene chloride	MG/L	1/ 1	0.0018	0.0018	WBGmw-010-4260-GF		
WBGmw-010-4		Inorganics	Aluminum	MG/L	1/ 1	0.034	0.034	WBGmw-010-4260-GF		
WBGmw-010-4	N	Inorganics	Barium	MG/L	1/ 1	0.014	0.014	WBGmw-010-4260-GF	100	0/ 1
WBGmw-010-4		Inorganics	Calcium	MG/L	1/ 1	31.9	31.9	WBGmw-010-4260-GF		
WBGmw-010-4	N	Inorganics	Chromium	MG/L	1/ 1	0.0017	0.0017	WBGmw-010-4260-GF	5	0/ 1
WBGmw-010-4		Inorganics	Magnesium	MG/L	1/ 1	9.3	9.3	WBGmw-010-4260-GF		
WBGmw-010-4		Inorganics	Manganese	MG/L	1/ 1	0.032	0.032	WBGmw-010-4260-GF		
WBGmw-010-4		Inorganics	Nickel	MG/L	1/ 1	0.0028	0.0028	WBGmw-010-4260-GF		
WBGmw-010-4		Inorganics	Potassium	MG/L	1/ 1	1.1	1.1	WBGmw-010-4260-GF		
WBGmw-010-4		Inorganics	Sodium	MG/L	1/ 1	3.5	3.5	WBGmw-010-4260-GF		
WBGmw-010-4		Inorganics	Zinc	MG/L	1/ 1	0.048	0.048	WBGmw-010-4260-GF		
WBGmw-010-4	N	Explosives	2,4-Dinitrotoluene	MG/L	1/ 1	0.00028	0.00028	WBGmw-010-4260-GF	0.13	0/ 1
WBGmw-010-4		Explosives	2-Amino-4,6-Dinitrotoluene	MG/L	1/ 1	0.0013	0.0013	WBGmw-010-4260-GF		
WBGmw-010-4		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.0002	0.0002	WBGmw-010-4260-GF		
WBGmw-010-4		Explosives	4-Amino-2,6-Dinitrotoluene	MG/L	1/ 1	0.00054	0.00054	WBGmw-010-4260-GF		
WBGmw-010-4		Explosives	4-Nitrotoluene	MG/L	1/ 1	0.00031	0.00031	WBGmw-010-4260-GF		
WBGmw-010-4		Pesticides and PCBs	Heptachlor epoxide	MG/L	1/ 1	0.000056	0.000056	WBGmw-010-4260-GF		
WBGmw-010-4		Semi-Volatile Organics	Bis(2-ethylhexyl)phthalate	MG/L	1/ 2	0.00695	0.0039	WBGmw-010-4260-GF		
WBGmw-010-4		Volatile Organics	Acetone	MG/L	1/ 1	0.0077	0.0077	WBGmw-010-4260-GF		
WBGmw-010-4	N	Volatile Organics	Chloroform	MG/L	1/ 1	0.0014	0.0014	WBGmw-010-4260-GF	6	0/ 1
WBGmw-010-4		Volatile Organics	Methylene chloride	MG/L	1/ 1	0.0018	0.0018	WBGmw-010-4260-GF		
WBGmw-011-5		Inorganics	Aluminum	MG/L	1/ 1	0.065	0.065	WBGmw-011-4261-GF		
WBGmw-011-5	N	Inorganics	Barium	MG/L	1/ 1	0.029	0.029	WBGmw-011-4261-GF	100	0/ 1
WBGmw-011-5		Inorganics	Calcium	MG/L	1/ 1	51.6	51.6	WBGmw-011-4261-GF		
WBGmw-011-5		Inorganics	Magnesium	MG/L	1/ 1	10.5	10.5	WBGmw-011-4261-GF		
WBGmw-011-5		Inorganics	Manganese	MG/L	1/ 1	0.045	0.045	WBGmw-011-4261-GF		
WBGmw-011-5		Inorganics	Potassium	MG/L	1/ 1	3.8	3.8	WBGmw-011-4261-GF		

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Drum ID	Max > TCLP	Analysis Type	Chemical	Units	Proportion Detected	Mean	Max Detect	ID of Max Concentration	TCLP Criteria (mg/L)	Proportion >TCLP
WBGmw-011-5		Inorganics	Sodium	MG/L	1/ 1	3.4	3.4	WBGmw-011-4261-GF		
WBGmw-011-5	N	Explosives	2,4-Dinitrotoluene	MG/L	1/ 1	0.000093	0.000093	WBGmw-011-4261-GF	0.13	0/ 1
WBGmw-011-5		Explosives	2,6-Dinitrotoluene	MG/L	1/ 1	0.0001	0.0001	WBGmw-011-4261-GF		
WBGmw-011-5		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.00033	0.00033	WBGmw-011-4261-GF		
WBGmw-011-5		Volatile Organics	Acetone	MG/L	1/ 1	0.0088	0.0088	WBGmw-011-4261-GF		
WBGmw-011-5		Volatile Organics	Methylene chloride	MG/L	1/ 1	0.0018	0.0018	WBGmw-011-4261-GF		
WBGmw-011-6		Inorganics	Aluminum	MG/L	1/ 1	0.065	0.065	WBGmw-011-4261-GF		
WBGmw-011-6	N	Inorganics	Barium	MG/L	1/ 1	0.029	0.029	WBGmw-011-4261-GF	100	0/ 1
WBGmw-011-6		Inorganics	Calcium	MG/L	1/ 1	51.6	51.6	WBGmw-011-4261-GF		
WBGmw-011-6		Inorganics	Magnesium	MG/L	1/ 1	10.5	10.5	WBGmw-011-4261-GF		
WBGmw-011-6		Inorganics	Manganese	MG/L	1/ 1	0.045	0.045	WBGmw-011-4261-GF		
WBGmw-011-6		Inorganics	Potassium	MG/L	1/ 1	3.8	3.8	WBGmw-011-4261-GF		
WBGmw-011-6		Inorganics	Sodium	MG/L	1/ 1	3.4	3.4	WBGmw-011-4261-GF		
WBGmw-011-6	N	Explosives	2,4-Dinitrotoluene	MG/L	1/ 1	0.000093	0.000093	WBGmw-011-4261-GF	0.13	0/ 1
WBGmw-011-6		Explosives	2,6-Dinitrotoluene	MG/L	1/ 1	0.0001	0.0001	WBGmw-011-4261-GF		
WBGmw-011-6		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.00033	0.00033	WBGmw-011-4261-GF		
WBGmw-011-6		Volatile Organics	Acetone	MG/L	1/ 1	0.0088	0.0088	WBGmw-011-4261-GF		
WBGmw-011-6		Volatile Organics	Methylene chloride	MG/L	1/ 1	0.0018	0.0018	WBGmw-011-4261-GF		
WBGmw-012-4	N	Inorganics	Barium	MG/L	1/ 1	0.013	0.013	WBGmw-012-4262-GF	100	0/ 1
WBGmw-012-4		Inorganics	Calcium	MG/L	1/ 1	71	71	WBGmw-012-4262-GF		
WBGmw-012-4	N	Inorganics	Chromium	MG/L	1/ 1	0.0015	0.0015	WBGmw-012-4262-GF	5	0/ 1
WBGmw-012-4		Inorganics	Magnesium	MG/L	1/ 1	19.2	19.2	WBGmw-012-4262-GF		
WBGmw-012-4		Inorganics	Manganese	MG/L	1/ 1	0.074	0.074	WBGmw-012-4262-GF		
WBGmw-012-4		Inorganics	Potassium	MG/L	1/ 1	1.1	1.1	WBGmw-012-4262-GF		
WBGmw-012-4		Inorganics	Sodium	MG/L	1/ 1	3.8	3.8	WBGmw-012-4262-GF		
WBGmw-012-4		Inorganics	Zinc	MG/L	1/ 1	0.014	0.014	WBGmw-012-4262-GF		
WBGmw-012-4	N	Explosives	2,4-Dinitrotoluene	MG/L	1/ 1	0.00008	0.00008	WBGmw-012-4262-GF	0.13	0/ 1
WBGmw-012-4		Volatile Organics	Acetone	MG/L	1/ 1	0.0079	0.0079	WBGmw-012-4262-GF		
WBGmw-012-4		Volatile Organics	Methylene chloride	MG/L	1/ 1	0.0024	0.0024	WBGmw-012-4262-GF		
WBGmw-012-5	N	Inorganics	Barium	MG/L	1/ 1	0.013	0.013	WBGmw-012-4262-GF	100	0/ 1
WBGmw-012-5		Inorganics	Calcium	MG/L	1/ 1	71	71	WBGmw-012-4262-GF		
WBGmw-012-5	N	Inorganics	Chromium	MG/L	1/ 1	0.0015	0.0015	WBGmw-012-4262-GF	5	0/ 1
WBGmw-012-5		Inorganics	Magnesium	MG/L	1/ 1	19.2	19.2	WBGmw-012-4262-GF		
WBGmw-012-5		Inorganics	Manganese	MG/L	1/ 1	0.074	0.074	WBGmw-012-4262-GF		
WBGmw-012-5		Inorganics	Potassium	MG/L	1/ 1	1.1	1.1	WBGmw-012-4262-GF		
WBGmw-012-5		Inorganics	Sodium	MG/L	1/ 1	3.8	3.8	WBGmw-012-4262-GF		
WBGmw-012-5		Inorganics	Zinc	MG/L	1/ 1	0.014	0.014	WBGmw-012-4262-GF		

Drum ID	Max > TCLP	Analysis Type	Chemical	Units	Proportion Detected	Mean	Max Detect	ID of Max Concentration	TCLP Criteria (mg/L)	Proportion >TCLP
WBGmw-012-5	N	Explosives	2,4-Dinitrotoluene	MG/L	1/ 1	0.00008	0.00008	WBGmw-012-4262-GF	0.13	0/ 1
WBGmw-012-5		Volatile Organics	Acetone	MG/L	1/ 1	0.0079	0.0079	WBGmw-012-4262-GF		
WBGmw-012-5		Volatile Organics	Methylene chloride	MG/L	1/ 1	0.0024	0.0024	WBGmw-012-4262-GF		
WBGmw-013-3		Inorganics	Aluminum	MG/L	1/ 1	0.032	0.032	WBGmw-013-4263-GF		
WBGmw-013-3	N	Inorganics	Barium	MG/L	1/ 1	0.019	0.019	WBGmw-013-4263-GF	100	0/ 1
WBGmw-013-3		Inorganics	Calcium	MG/L	1/ 1	90.4	90.4	WBGmw-013-4263-GF		
WBGmw-013-3		Inorganics	Magnesium	MG/L	1/ 1	33.3	33.3	WBGmw-013-4263-GF		
WBGmw-013-3		Inorganics	Manganese	MG/L	1/ 1	0.081	0.081	WBGmw-013-4263-GF		
WBGmw-013-3		Inorganics	Potassium	MG/L	1/ 1	0.84	0.84	WBGmw-013-4263-GF		
WBGmw-013-3		Inorganics	Sodium	MG/L	1/ 1	14.1	14.1	WBGmw-013-4263-GF		
WBGmw-013-3		Semi-Volatile Organics	Bis(2-ethylhexyl)phthalate	MG/L	2/ 2	0.0032	0.0034	WBGmw-013-4263-GF		
WBGmw-013-3		Volatile Organics	Acetone	MG/L	1/ 1	0.006	0.006	WBGmw-013-4263-GF		
WBGmw-013-3		Volatile Organics	Methylene chloride	MG/L	1/ 1	0.0016	0.0016	WBGmw-013-4263-GF		
WBGmw-013-4		Inorganics	Aluminum	MG/L	1/ 1	0.032	0.032	WBGmw-013-4263-GF		
WBGmw-013-4	N	Inorganics	Barium	MG/L	1/ 1	0.019	0.019	WBGmw-013-4263-GF	100	0/ 1
WBGmw-013-4		Inorganics	Calcium	MG/L	1/ 1	90.4	90.4	WBGmw-013-4263-GF		
WBGmw-013-4		Inorganics	Magnesium	MG/L	1/ 1	33.3	33.3	WBGmw-013-4263-GF		
WBGmw-013-4		Inorganics	Manganese	MG/L	1/ 1	0.081	0.081	WBGmw-013-4263-GF		
WBGmw-013-4		Inorganics	Potassium	MG/L	1/ 1	0.84	0.84	WBGmw-013-4263-GF		
WBGmw-013-4		Inorganics	Sodium	MG/L	1/ 1	14.1	14.1	WBGmw-013-4263-GF		
WBGmw-013-4		Semi-Volatile Organics	Bis(2-ethylhexyl)phthalate	MG/L	2/ 2	0.0032	0.0034	WBGmw-013-4263-GF		
WBGmw-013-4		Volatile Organics	Acetone	MG/L	1/ 1	0.006	0.006	WBGmw-013-4263-GF		
WBGmw-013-4		Volatile Organics	Methylene chloride	MG/L	1/ 1	0.0016	0.0016	WBGmw-013-4263-GF		
WBGmw-013-5		Inorganics	Aluminum	MG/L	1/ 1	0.032	0.032	WBGmw-013-4263-GF		
WBGmw-013-5	N	Inorganics	Barium	MG/L	1/ 1	0.019	0.019	WBGmw-013-4263-GF	100	0/ 1
WBGmw-013-5		Inorganics	Calcium	MG/L	1/ 1	90.4	90.4	WBGmw-013-4263-GF		
WBGmw-013-5		Inorganics	Magnesium	MG/L	1/ 1	33.3	33.3	WBGmw-013-4263-GF		
WBGmw-013-5		Inorganics	Manganese	MG/L	1/ 1	0.081	0.081	WBGmw-013-4263-GF		
WBGmw-013-5		Inorganics	Potassium	MG/L	1/ 1	0.84	0.84	WBGmw-013-4263-GF		
WBGmw-013-5		Inorganics	Sodium	MG/L	1/ 1	14.1	14.1	WBGmw-013-4263-GF		
WBGmw-013-5		Semi-Volatile Organics	Bis(2-ethylhexyl)phthalate	MG/L	2/ 2	0.0032	0.0034	WBGmw-013-4263-GF		
WBGmw-013-5		Volatile Organics	Acetone	MG/L	1/ 1	0.006	0.006	WBGmw-013-4263-GF		
WBGmw-013-5		Volatile Organics	Methylene chloride	MG/L	1/ 1	0.0016	0.0016	WBGmw-013-4263-GF		
WBGmw-014-3		Inorganics	Aluminum	MG/L	1/ 1	4.7	4.7	WBGmw-014-4264-GF		
WBGmw-014-3	N	Inorganics	Barium	MG/L	1/ 1	0.019	0.019	WBGmw-014-4264-GF	100	0/ 1
WBGmw-014-3		Inorganics	Calcium	MG/L	1/ 1	72.4	72.4	WBGmw-014-4264-GF		
WBGmw-014-3		Inorganics	Magnesium	MG/L	1/ 1	17.7	17.7	WBGmw-014-4264-GF		

Attachment 1. WBG FS IDW Summary For Groundwater

Drum ID	Max > TCLP	Analysis Type	Chemical	Units	Proportion Detected	Mean	Max Detect	ID of Max Concentration	TCLP Criteria (mg/L)	Proportion >TCLP
WBGmw-014-3		Inorganics	Manganese	MG/L	1/ 1	0.28	0.28	WBGmw-014-4264-GF		
WBGmw-014-3		Inorganics	Potassium	MG/L	1/ 1	1.6	1.6	WBGmw-014-4264-GF		
WBGmw-014-3		Inorganics	Sodium	MG/L	1/ 1	5.1	5.1	WBGmw-014-4264-GF		
WBGmw-014-3		Explosives	2,6-Dinitrotoluene	MG/L	1/ 1	0.00011	0.00011	WBGmw-014-4264-GF		
WBGmw-014-3		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.00049	0.00049	WBGmw-014-4264-GF		
WBGmw-014-3		Explosives	4-Nitrotoluene	MG/L	1/ 1	0.00035	0.00035	WBGmw-014-4264-GF		
WBGmw-014-3		Explosives	RDX	MG/L	1/ 1	0.00027	0.00027	WBGmw-014-4264-GF		
WBGmw-014-3		Volatile Organics	Acetone	MG/L	1/ 1	0.0061	0.0061	WBGmw-014-4264-GF		
WBGmw-014-3		Volatile Organics	Methylene chloride	MG/L	1/ 1	0.0016	0.0016	WBGmw-014-4264-GF		
WBGmw-014-4		Inorganics	Aluminum	MG/L	1/ 1	4.7	4.7	WBGmw-014-4264-GF		
WBGmw-014-4	N	Inorganics	Barium	MG/L	1/ 1	0.019	0.019	WBGmw-014-4264-GF	100	0/ 1
WBGmw-014-4		Inorganics	Calcium	MG/L	1/ 1	72.4	72.4	WBGmw-014-4264-GF		
WBGmw-014-4		Inorganics	Magnesium	MG/L	1/ 1	17.7	17.7	WBGmw-014-4264-GF		
WBGmw-014-4		Inorganics	Manganese	MG/L	1/ 1	0.28	0.28	WBGmw-014-4264-GF		
WBGmw-014-4		Inorganics	Potassium	MG/L	1/ 1	1.6	1.6	WBGmw-014-4264-GF		
WBGmw-014-4		Inorganics	Sodium	MG/L	1/ 1	5.1	5.1	WBGmw-014-4264-GF		
WBGmw-014-4		Explosives	2,6-Dinitrotoluene	MG/L	1/ 1	0.00011	0.00011	WBGmw-014-4264-GF		
WBGmw-014-4		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.00049	0.00049	WBGmw-014-4264-GF		
WBGmw-014-4		Explosives	4-Nitrotoluene	MG/L	1/ 1	0.00035	0.00035	WBGmw-014-4264-GF		
WBGmw-014-4		Explosives	RDX	MG/L	1/ 1	0.00027	0.00027	WBGmw-014-4264-GF		
WBGmw-014-4		Volatile Organics	Acetone	MG/L	1/ 1	0.0061	0.0061	WBGmw-014-4264-GF		
WBGmw-014-4		Volatile Organics	Methylene chloride	MG/L	1/ 1	0.0016	0.0016	WBGmw-014-4264-GF		
WBGmw-015-5		Inorganics	Aluminum	MG/L	1/ 1	0.049	0.049	WBGmw-015-4265-GF		
WBGmw-015-5	N	Inorganics	Barium	MG/L	1/ 1	0.073	0.073	WBGmw-015-4265-GF	100	0/ 1
WBGmw-015-5		Inorganics	Calcium	MG/L	1/ 1	107	107	WBGmw-015-4265-GF		
WBGmw-015-5	N	Inorganics	Chromium	MG/L	1/ 1	0.0014	0.0014	WBGmw-015-4265-GF	5	0/ 1
WBGmw-015-5		Inorganics	Magnesium	MG/L	1/ 1	33.7	33.7	WBGmw-015-4265-GF		
WBGmw-015-5		Inorganics	Manganese	MG/L	1/ 1	0.23	0.23	WBGmw-015-4265-GF		
WBGmw-015-5		Inorganics	Nickel	MG/L	1/ 1	0.0023	0.0023	WBGmw-015-4265-GF		
WBGmw-015-5		Inorganics	Potassium	MG/L	1/ 1	2.3	2.3	WBGmw-015-4265-GF		
WBGmw-015-5		Inorganics	Sodium	MG/L	1/ 1	13.7	13.7	WBGmw-015-4265-GF		
WBGmw-015-5		Inorganics	Zinc	MG/L	1/ 1	0.5	0.5	WBGmw-015-4265-GF		
WBGmw-015-5		Explosives	1,3,5-Trinitrobenzene	MG/L	1/ 1	0.0013	0.0013	WBGmw-015-4265-GF		
WBGmw-015-5		Explosives	2,4,6-Trinitrotoluene	MG/L	1/ 1	0.00094	0.00094	WBGmw-015-4265-GF		
WBGmw-015-5		Explosives	2-Amino-4,6-Dinitrotoluene	MG/L	1/ 1	0.00033	0.00033	WBGmw-015-4265-GF		
WBGmw-015-5		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.0026	0.0026	WBGmw-015-4265-GF		
WBGmw-015-5		Explosives	3-Nitrotoluene	MG/L	1/ 1	0.00031	0.00031	WBGmw-015-4265-GF		

Drum ID	Max > TCLP	Analysis Type	Chemical	Units	Proportion Detected	Mean	Max Detect	ID of Max Concentration	TCLP Criteria (mg/L)	Proportion >TCLP
WBGmw-015-5		Explosives	4-Nitrotoluene	MG/L	1/ 1	0.00085	0.00085	WBGmw-015-4265-GF		
WBGmw-015-5		Explosives	Tetryl	MG/L	1/ 1	0.00092	0.00092	WBGmw-015-4265-GF		
WBGmw-015-5		Volatile Organics	Acetone	MG/L	1/ 1	0.0095	0.0095	WBGmw-015-4265-GF		
WBGmw-015-5		Volatile Organics	Methylene chloride	MG/L	1/ 1	0.0027	0.0027	WBGmw-015-4265-GF		
WBGmw-015-6		Inorganics	Aluminum	MG/L	1/ 1	0.049	0.049	WBGmw-015-4265-GF		
WBGmw-015-6	N	Inorganics	Barium	MG/L	1/ 1	0.073	0.073	WBGmw-015-4265-GF	100	0/ 1
WBGmw-015-6		Inorganics	Calcium	MG/L	1/ 1	107	107	WBGmw-015-4265-GF		
WBGmw-015-6	N	Inorganics	Chromium	MG/L	1/ 1	0.0014	0.0014	WBGmw-015-4265-GF	5	0/ 1
WBGmw-015-6		Inorganics	Magnesium	MG/L	1/ 1	33.7	33.7	WBGmw-015-4265-GF		
WBGmw-015-6		Inorganics	Manganese	MG/L	1/ 1	0.23	0.23	WBGmw-015-4265-GF		
WBGmw-015-6		Inorganics	Nickel	MG/L	1/ 1	0.0023	0.0023	WBGmw-015-4265-GF		
WBGmw-015-6		Inorganics	Potassium	MG/L	1/ 1	2.3	2.3	WBGmw-015-4265-GF		
WBGmw-015-6		Inorganics	Sodium	MG/L	1/ 1	13.7	13.7	WBGmw-015-4265-GF		
WBGmw-015-6		Inorganics	Zinc	MG/L	1/ 1	0.5	0.5	WBGmw-015-4265-GF		
WBGmw-015-6		Explosives	1,3,5-Trinitrobenzene	MG/L	1/ 1	0.0013	0.0013	WBGmw-015-4265-GF		
WBGmw-015-6		Explosives	2,4,6-Trinitrotoluene	MG/L	1/ 1	0.00094	0.00094	WBGmw-015-4265-GF		
WBGmw-015-6		Explosives	2-Amino-4,6-Dinitrotoluene	MG/L	1/ 1	0.00033	0.00033	WBGmw-015-4265-GF		
WBGmw-015-6		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.0026	0.0026	WBGmw-015-4265-GF		
WBGmw-015-6		Explosives	3-Nitrotoluene	MG/L	1/ 1	0.00031	0.00031	WBGmw-015-4265-GF		
WBGmw-015-6		Explosives	4-Nitrotoluene	MG/L	1/ 1	0.00085	0.00085	WBGmw-015-4265-GF		
WBGmw-015-6		Explosives	Tetryl	MG/L	1/ 1	0.00092	0.00092	WBGmw-015-4265-GF		
WBGmw-015-6		Volatile Organics	Acetone	MG/L	1/ 1	0.0095	0.0095	WBGmw-015-4265-GF		
WBGmw-015-6		Volatile Organics	Methylene chloride	MG/L	1/ 1	0.0027	0.0027	WBGmw-015-4265-GF		
WBGmw-016-3	N	Inorganics	Barium	MG/L	1/ 1	0.047	0.047	WBGmw-016-4266-GF	100	0/ 1
WBGmw-016-3		Inorganics	Calcium	MG/L	1/ 1	81.4	81.4	WBGmw-016-4266-GF		
WBGmw-016-3		Inorganics	Magnesium	MG/L	1/ 1	20.6	20.6	WBGmw-016-4266-GF		
WBGmw-016-3		Inorganics	Manganese	MG/L	1/ 1	0.54	0.54	WBGmw-016-4266-GF		
WBGmw-016-3		Inorganics	Nickel	MG/L	1/ 1	0.0022	0.0022	WBGmw-016-4266-GF		
WBGmw-016-3		Inorganics	Potassium	MG/L	1/ 1	1.7	1.7	WBGmw-016-4266-GF		
WBGmw-016-3		Inorganics	Sodium	MG/L	1/ 1	5	5	WBGmw-016-4266-GF		
WBGmw-016-3		Inorganics	Zinc	MG/L	1/ 1	0.019	0.019	WBGmw-016-4266-GF		
WBGmw-016-3	N	Explosives	2,4-Dinitrotoluene	MG/L	1/ 1	0.000068	0.000068	WBGmw-016-4266-GF	0.13	0/ 1
WBGmw-016-3		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.00022	0.00022	WBGmw-016-4266-GF		
WBGmw-016-3		Explosives	4-Nitrotoluene	MG/L	1/ 1	0.00017	0.00017	WBGmw-016-4266-GF		
WBGmw-016-3		Explosives	RDX	MG/L	1/ 1	0.00025	0.00025	WBGmw-016-4266-GF		
WBGmw-016-3		Volatile Organics	Acetone	MG/L	1/ 1	0.0063	0.0063	WBGmw-016-4266-GF		
WBGmw-017-5		Inorganics	Aluminum	MG/L	1/ 1	0.034	0.034	WBGmw-017-4267-GF		

Attachment 1. WBG FS IDW Summary For Groundwater

Drum ID	Max > TCLP	Analysis Type	Chemical	Units	Proportion Detected	Mean	Max Detect	ID of Max Concentration	TCLP Criteria (mg/L)	Proportion >TCLP
WBGmw-017-5	N	Inorganics	Barium	MG/L	1/ 1	0.053	0.053	WBGmw-017-4267-GF	100	0/ 1
WBGmw-017-5		Inorganics	Calcium	MG/L	1/ 1	71.6	71.6	WBGmw-017-4267-GF		
WBGmw-017-5		Inorganics	Iron	MG/L	1/ 1	0.43	0.43	WBGmw-017-4267-GF		
WBGmw-017-5		Inorganics	Magnesium	MG/L	1/ 1	18.1	18.1	WBGmw-017-4267-GF		
WBGmw-017-5		Inorganics	Manganese	MG/L	1/ 1	0.25	0.25	WBGmw-017-4267-GF		
WBGmw-017-5		Inorganics	Potassium	MG/L	1/ 1	1.4	1.4	WBGmw-017-4267-GF		
WBGmw-017-5		Inorganics	Sodium	MG/L	1/ 1	5.2	5.2	WBGmw-017-4267-GF		
WBGmw-017-5		Inorganics	Zinc	MG/L	1/ 1	0.019	0.019	WBGmw-017-4267-GF		
WBGmw-017-5		Explosives	1,3,5-Trinitrobenzene	MG/L	1/ 1	0.0003	0.0003	WBGmw-017-4267-GF		
WBGmw-017-5		Explosives	2,4,6-Trinitrotoluene	MG/L	1/ 1	0.00032	0.00032	WBGmw-017-4267-GF		
WBGmw-017-5		Explosives	Tetryl	MG/L	1/ 1	0.00059	0.00059	WBGmw-017-4267-GF		
WBGmw-017-5		Volatile Organics	Acetone	MG/L	1/ 1	0.0079	0.0079	WBGmw-017-4267-GF		
WBGmw-017-5		Volatile Organics	Methylene chloride	MG/L	1/ 1	0.0022	0.0022	WBGmw-017-4267-GF		

Attachment 2. WBG Ecological Study IDW Summary for Decontamination Rinsate

Drum ID	Max > TCLP	Analysis Type	Chemical	Units	Proportion Detected	Mean	Max Detect	ID of Max Concentration	TCLP Criteria (mg/L)	Proportion >TCLP	Mean Adj. for TCLP (mg/L)	Max Detect Adj. for TCLP (mg/L)
Decon Water	N	TCLP Metals	Barium	MG/L	1/ 1	0.039	0.039	IDWW01	100	0/ 1	0.039	0.039
Decon Water	N	TCLP Metals	Cadmium	MG/L	1/ 1	0.0087	0.0087	IDWW01	1	0/ 1	0.0087	0.0087
Decon Water	N	TCLP Metals	Chromium	MG/L	1/ 1	0.008	0.008	IDWW01	5	0/ 1	0.008	0.008
Decon Water	N	TCLP Metals	Lead	MG/L	1/ 1	0.01	0.01	IDWW01	5	0/ 1	0.01	0.01
Decon Water	Y	TCLP Pesticides and/or PCBs	Heptachlor epoxide	MG/L	1/ 1	0.014	0.014	IDWW01	0.008	1/ 1	0.014	0.014
Decon Water	N	TCLP Volatiles	Chloroform	MG/L	1/ 1	0.003	0.003	IDWW01	6	0/ 1	0.003	0.003

ENVIRONMENTAL CONTROL LABORATORIES INC.

Amos Wieneke
Onyx Environmental
12480B Debartolo Drive
North Jackson, OH 44451

E. C. Lab #: 0011-13005
Received Date: 11/13/00
Report Date: 11/21/00

Purchase Order #:

Subject: RVAAP/SAIC

Sample No: 002
Client I.D. WBG Decon Water
Sample Date: 11/08/2000
Matrix: Liquid

Analyte	Method	Detection Limit	Results	Units	Analysis Date
pH	9045C		5.0	S.U.	11/21/00
Flash Point	1010		> 200	DEG F	11/20/00

Note: BDL (Below Detection Limit)

ØØ2 = WBG DECON - Ø1 & WBG - Ø6

ENVIRONMENTAL CONTROL LABORATORIES INC.

Amos Wieneke
Onyx Environmental
12480B Debartolo Drive
North Jackson, OH 44451

E. C. Lab #: 0011-13005
Received Date: 11/13/00
Report Date: 11/21/00

Purchase Order #:

Subject: RVAAP/SAIC

Sample No: 006
Client I.D. WBG Decon Tank
Sample Date: 11/08/2000
Matrix: Liquid

TCLP Extract*: 11/15/2000

Analyte	Method	Detection Limit	Results	Units	Analysis Date
TCLP METALS*					11/17/00
Arsenic	6010B	0.20	BDL	mg/L	11/17/00
Barium	6010B	0.020	1.1	mg/L	11/17/00
Cadmium	6010B	0.020	BDL	mg/L	11/17/00
Chromium	6010B	0.010	0.046	mg/L	11/17/00
Lead	6010B	0.050	BDL	mg/L	11/17/00
Mercury	7470A	0.0002	BDL	mg/L	11/16/00
Selenium	6010B	0.20	BDL	mg/L	11/17/00
Silver	6010B	0.010	BDL	mg/L	11/17/00

*Extraction Method: SW 846 1311

Note: BDL (Below Detection Limit)

006 = TANK-1

21337 Drake Road Strongsville, Ohio 44149
(440) 238-6100 FAX: (440) 238-6294

ENVIRONMENTAL CONTROL LABORATORIES INC.

Amos Wieneke
Onyx Environmental
12480B Debartolo Drive
North Jackson, OH 44451

E. C. Lab #: 0011-13005
Received Date: 11/13/00
Report Date: 11/21/00

Purchase Order #:

Subject: RVAAP/SAIC

Sample No: 006
Client I.D. WEG Decon Tank
Sample Date: 11/08/2000
Matrix: Liquid

Analyte	Method	Detection Limit	Results	Units	Analysis Date
pH	9045C		8.0	S.U.	11/21/00
Flash Point	1010		> 200	DEG F	11/20/00

Note:BDL(Below Detection Limit)

CY08 File
08

Science Applications International Corporation
An Employee-Owned Company

April 11, 2001

Mr. Walter Perro
U.S. Army Corps of Engineers
Louisville District
ATTN: CEORL-ED-GE
600 Martin Luther King, Jr. Place
Louisville, KY 40201-0059

SUBJECT: Contract No. DACA62-00-D-0001, Delivery Order CY08, Feasibility Study Field Investigation at Winklepeck Burning Ground, Ravenna Army Ammunition Plant, Ravenna, Ohio

RE: Deliverable -- Investigation-Derived Waste Characterization and Disposal Report

Dear Mr. Perro:

Investigative activities conducted during the Feasibility Study (FS) Field Investigation at Winklepeck Burning Ground (WBG), at the Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio, resulted in the generation of investigation-derived waste (IDW) consisting of soil, water, and field laboratory reagents. The IDW was generated in the course of sampling of soils and groundwater, field analysis of explosives, and decontamination of sampling equipment. The purpose of this letter report is to characterize and classify solid IDW, consisting of saturated and unsaturated soil cuttings, for disposal. Previous letters, dated December 6, 2000, and February 26, 2001, document the characterization and disposal recommendation for the liquid IDW generated in the field laboratory and groundwater sampling effort.

This report includes a summary of solid IDW generated and its origin (Table 1), comparisons of characterization sampling results to regulatory criteria (Table 2), and classification of the IDW and recommendations for disposal (Table 3). This document follows guidance established by the Facility-Wide Sampling and Analysis Plan (USACE 2000), the Sampling and Analysis Plan Addendum No. 1 for WBG (USACE 2000), and the Ohio EPA (November 1997) regarding IDW disposition at RVAAP.

Table 1. Summary of WBG FS IDW

DRUM NUMBER	CONTAINER TYPE AND SIZE	CONTENTS AND VOLUME	GENERATION DATE(S)
WBG-01	55-gallon open-top	Unsaturated soil cuttings; full	10/16 to 10/20/00
WBG-02	55-gallon open-top	Unsaturated soil cuttings; full	10//20 to 10/22/00
WBG-03	55-gallon open-top	Unsaturated soil cuttings; full	10/22 to 10/25/00
WBG-04	55-gallon open-top	Unsaturated soil cuttings; full	10/25 to 11/3/00
WBGmw-010-1	55-gallon open-top	saturated soil cuttings; full	10/20/00
WBGmw-010-2	55-gallon open-top	saturated soil cuttings; full	10/20/00
WBGmw-011-1	55-gallon open-top	saturated soil cuttings; full	10/19/00
WBGmw-011-2	55-gallon open-top	saturated soil cuttings; full	10/19/00
WBGmw-011-3	55-gallon open-top	saturated soil cuttings; full	10/22/00
WBGmw-011-4	55-gallon open-top	saturated soil cuttings; full	10/22/00
WBGmw-012-1	55-gallon open-top	Unsaturated soil cuttings; full	10/19/00
WBGmw-012-2	55-gallon open-top	Unsaturated soil cuttings; full	10/19/00
WBGmw-012-3	55-gallon open-top	saturated soil cuttings; full	10/19/00
WBGmw-013-1	55-gallon open-top	Unsaturated soil cuttings; full	10/20/00
WBGmw-013-2	55-gallon open-top	saturated soil cuttings; full	10/20/00
WBGmw-014-01	55-gallon open-top	Unsaturated soil cuttings; full	10/18/00
WBGmw-014-02	55-gallon open-top	Unsaturated soil cuttings; 2/3 full	10/18/00
WBGmw-015-1	55-gallon open-top	Unsaturated soil cuttings; full	10/18/00
WBGmw-015-2	55-gallon open-top	Unsaturated soil cuttings; full	10/18/00
WBGmw-015-3	55-gallon open-top	saturated soil cuttings; full	10/23/00
WBGmw-015-4	55-gallon open-top	saturated soil cuttings; full	10/23/00
WBGmw-016-1	55-gallon open-top	Unsaturated soil cuttings; full	10/17/00
WBGmw-016-2	55-gallon open-top	saturated soil cuttings; ½ full	10/17/00
WBGmw-017-1	55-gallon open-top	Unsaturated soil cuttings; full	10/17/00
WBGmw-017-2	55-gallon open-top	Unsaturated soil cuttings; full	10/21/00
WBGmw-017-3	55-gallon open-top	Unsaturated soil cuttings; full	10/23/00
WBGmw-017-4	55-gallon open-top	Unsaturated soil cuttings; full	10/23/00

Per Section 7 of the Facility-Wide SAP (USACE 2000), the analytical results from environmental samples collected during the FS investigation are used, where possible, to characterize IDW for each sampling medium. The analytical results from the sampling of shallow soil borings are used to characterize the drums containing correlative soil IDW for waste characterization (drums WBG01 – WBG04). For soils and rock cuttings from monitoring wells, groundwater samples are used to characterize the cuttings from monitoring well boreholes, because leaching to groundwater yields adequate characterization results. Analytical results used to characterize waste containers are shown in Attachment 1.

All soil samples collected during the WBG FS were assigned to a drum by collection date. If a date was associated with more than one drum, all of the samples associated with that date were assigned to both drums.

Attachment 1 presents the frequency of detects, minimum and maximum detected concentrations, and average concentrations for each analyte. Note that the average value is calculated from all reported values, using either the detected concentration or, if the analyte was not detected, the quantitation limit for that sample. For analyses that include non-detects, the average represents an upper bound on the true average. Because quantitation limits vary between samples, the calculated average may exceed the maximum detect in cases where a high percentage of non-detects are included. Because surface soil drums contain IDW from several sampling locations within Winklepeck Burning Grounds, minimum, maximum, and mean concentrations from all samples contained in each drum are presented for the characterization of wastes in each container.

For the characterization of wastes as hazardous or non-hazardous, the Resource Conservation and Recovery Act (RCRA) regulatory limits are compared to the maximum contaminant levels as presented in Attachment 1. Table 7-1 of the Facility-Wide SAP shows the maximum concentration of contaminants for the toxicity characteristic for hazardous wastes per 40 CFR 261.24. Analytical results for the correlative IDW are compared with these criteria to determine whether any wastes are potentially hazardous. Results from total analysis in mg/kg for analytes having corresponding TCLP criteria were divided by 20 to estimate the extractable concentration in mg/L assuming all of the chemical were leached (due to the 20-fold dilution factor inherent in the TCLP method). These estimated concentrations were compared to the TCLP criteria. If a given analyte is found to exceed 20 times the regulatory limit, it is conservatively considered to be RCRA-hazardous waste. All containers of soil IDW that were considered to be RCRA hazardous were conservatively managed as such until the time of disposal, without TCLP testing.

Table 2. Comparison of Waste Characterization Results for WBG to TCLP Criteria

Drum I.D.	Chemical	Max. Assumed Leachate Conc. (mg/L)	TCLP Criterion (mg/L)	TCLP Pass/Fail
WBG-01	Barium	125	100	F
	Cadmium	1.25	1	F
	Lead	46.8	5	F
WBG-02	Cadmium	10.1	1	F
	Lead	56.5	5	F
	2,4-DNT	0.14	0.13	F
WBG-03	Barium	358	100	F
	Cadmium	10.1	1	F
	Lead	56.5	5	F
	2,4-DNT	0.14	0.13	F
WBG-04	Lead	8.65	5	F

The soils shown in Table 2 are classified as hazardous contaminated waste based upon TCLP comparisons with the analytical data for explosives, inorganics, and other compounds, as shown in Table 3 and Attachment 1. The solid IDW contains potentially hazardous amounts of metals and explosives. These containers are recommended for off-site disposal at a licensed disposal facility.

The remaining drums containing monitoring well soil cuttings are classified as non-hazardous, contaminated waste based upon TCLP comparisons with groundwater analytical results, as shown in Attachment 1 and Table 3. Attachment 1 shows that the maximum detects of explosives, inorganics, volatile organic compounds, semi-volatile organic compounds, and pesticides/PCBs in the groundwater were below the TCLP criteria. These containers are recommended for off-site disposal at a licensed solid waste disposal facility.

Table 3. Summary of Final Waste Classification and Recommended Disposal Options

Non-Hazardous, Contaminated Waste			
WBGmw-010-1	soil	inorganics	Permitted Solid Waste Facility
WBGmw-010-2	soil	inorganics	Permitted Solid Waste Facility
WBGmw-011-1	soil	inorganics	Permitted Solid Waste Facility
WBGmw-011-2	soil	inorganics	Permitted Solid Waste Facility
WBGmw-011-3	soil	inorganics	Permitted Solid Waste Facility
WBGmw-011-4	soil	inorganics	Permitted Solid Waste Facility
WBGmw-012-1	soil	inorganics	Permitted Solid Waste Facility
WBGmw-012-2	soil	inorganics	Permitted Solid Waste Facility
WBGmw-012-3	soil	inorganics	Permitted Solid Waste Facility
WBGmw-013-1	soil	inorganics	Permitted Solid Waste Facility
WBGmw-013-2	soil	inorganics	Permitted Solid Waste Facility
WBGmw-014-01	soil	inorganics	Permitted Solid Waste Facility

WBGmw-014-02	soil	inorganics	Permitted Solid Waste Facility
WBGmw-015-1	soil	inorganics	Permitted Solid Waste Facility
WBGmw-015-2	soil	inorganics	Permitted Solid Waste Facility
WBGmw-015-3	soil	inorganics	Permitted Solid Waste Facility
WBGmw-015-4	soil	inorganics	Permitted Solid Waste Facility
WBGmw-016-1	soil	inorganics	Permitted Solid Waste Facility
WBGmw-016-2	soil	inorganics	Permitted Solid Waste Facility
WBGmw-017-1	soil	inorganics	Permitted Solid Waste Facility
WBGmw-017-2	soil	inorganics	Permitted Solid Waste Facility
WBGmw-017-3	soil	inorganics	Permitted Solid Waste Facility
WBGmw-017-4	soil	inorganics	Permitted Solid Waste Facility
Hazardous Waste			
Container Number	**Medium**	**Waste Criterion**	**Disposal Recommendation**
WBG-01	soil	Inorganics	Permitted Solid Waste Facility
WBG-02	soil	Inorganics, explosives	Permitted Solid Waste Facility
WBG-03	soil	Inorganics, explosives	Permitted Solid Waste Facility
WBG-04	soil	inorganics	Permitted Solid Waste Facility

Please note that this WBG IDW has been characterized using comparisons of direct analysis to TCLP criteria for those parameters identified in the Winklepeck Burning Grounds Feasibility Study Sampling and Analysis Plan Addendum No. 1. Unless RVAAP has additional information that would result in the IDW meeting, or containing materials that meet, the definition of a listed hazardous waste as defined in 40 CFR Part 261 Subpart D, it is recommended that the IDW as presently characterized under provisions of the Facility-Wide Sampling and Analysis Plan and Winklepeck Burning Grounds Feasibility Study Sampling

and Analysis Plan Addendum No. 1, be disposed as non-hazardous, contaminated solid waste, except drums WBG-01 through WBG-04, which are recommended to be disposed as hazardous solid waste.

Since RVAAP, under RCRA, is the generator of this material, SAIC requests concurrence or direction on the waste classification prior to disposal to ensure that the materials are properly disposed. Following your direction and immediate approval, we will proceed with the appropriate waste disposal. Disposal will be scheduled for April, 2001.

If you have any questions or require additional information, please do not hesitate to contact me at 918-625-7614.

Sincerely,

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Kathy Dominic
Environmental Projects Manager

CC: John Jent, USACE
Eileen Mohr, Ohio EPA
Mark Patterson, RVAAP
Kevin Jago, SAIC
Steve Selecman, SAIC
CRF

Drum ID	Max > TCLP	Analysis Type	Chemical	Units	Proportion Detected	Mean	Max Detect	ID of Max Concentration	TCLP Criteria (mg/L)	Proportion >TCLP	Mean Adj. for TCLP (mg/L)	Max Detect Adj. for TCLP (mg/L)
WBG-01		General Chemistry	Chromium, hexavalent	MG/KG	16/ 30	3.74	12.2	WBGss-217-4084-SO				
WBG-01		Cyanide	Cyanide	MG/KG	1/ 5	0.668	0.88	WBGss-218-4067-SO				
WBG-01		Inorganics	Aluminum	MG/KG	43/ 43	13400	19300	WBGss-211-4046-SO				
WBG-01		Inorganics	Antimony	MG/KG	33/ 44	13.8	236	WBGss-211-4046-SO				
WBG-01	N	Inorganics	Arsenic	MG/KG	44/ 44	12.9	33.5	WBGss-197-4000-SO	5	0/ 44	0.646	1.68
WBG-01	Y	Inorganics	Barium	MG/KG	43/ 43	332	2490	WBGss-256-4193-SO	100	2/ 43	16.6	125
WBG-01		Inorganics	Beryllium	MG/KG	39/ 43	0.491	1.8	WBGss-223-4082-SO				
WBG-01	Y	Inorganics	Cadmium	MG/KG	35/ 43	2.02	24.9	WBGss-211-4046-SO	1	1/ 43	0.101	1.25
WBG-01		Inorganics	Calcium	MG/KG	43/ 43	6310	54500	WBGss-234-4119-SO				
WBG-01	N	Inorganics	Chromium	MG/KG	43/ 43	23.5	69.5	WBGss-211-4046-SO	5	0/ 43	1.18	3.48
WBG-01		Inorganics	Cobalt	MG/KG	43/ 43	8.84	15.7	WBGss-211-4046-SO				
WBG-01		Inorganics	Copper	MG/KG	43/ 43	168	1830	WBGss-211-4046-SO				
WBG-01		Inorganics	Iron	MG/KG	43/ 43	30000	90700	WBGss-211-4046-SO				
WBG-01	Y	Inorganics	Lead	MG/KG	44/ 44	184	936	WBGss-211-4046-SO	5	16/ 44	9.19	46.8
WBG-01		Inorganics	Magnesium	MG/KG	43/ 43	3120	10000	WBGss-223-4082-SO				
WBG-01		Inorganics	Manganese	MG/KG	43/ 43	603	1630	WBGss-204-4023-SO				
WBG-01	N	Inorganics	Mercury	MG/KG	44/ 44	0.144	1.4	WBGss-202-4015-SO	0.2	0/ 44	0.00721	0.07
WBG-01		Inorganics	Nickel	MG/KG	43/ 43	23.2	66	WBGss-211-4046-SO				
WBG-01		Inorganics	Potassium	MG/KG	42/ 43	1320	2280	WBGss-218-4067-SO				
WBG-01	N	Inorganics	Selenium	MG/KG	25/ 44	1.19	2.7	WBGss-218-4067-SO	1	0/ 44	0.0596	0.135
WBG-01	N	Inorganics	Silver	MG/KG	21/ 43	2.52	26.7	WBGss-211-4046-SO	5	0/ 43	0.126	1.34
WBG-01		Inorganics	Sodium	MG/KG	21/ 43	402	1120	WBGss-211-4046-SO				
WBG-01		Inorganics	Thallium	MG/KG	44/ 44	0.563	0.8	WBGss-218-4067-SO				
WBG-01		Inorganics	Vanadium	MG/KG	43/ 43	22.9	37.8	WBGss-211-4046-SO				
WBG-01		Inorganics	Zinc	MG/KG	43/ 43	557	4520	WBGss-199-4006-SO				
WBG-01		Explosives	1,3,5-Trinitrobenzene	MG/KG	2/ 13	0.888	6.9	WBGss-211-4046-SO				
WBG-01		Explosives	1,3-Dinitrobenzene	MG/KG	2/ 13	0.221	0.091	WBGss-212-4049-SO				
WBG-01		Explosives	2,4,6-Trinitrotoluene	MG/KG	6/ 13	67.2	680	WBGss-211-4046-SO				
WBG-01	N	Explosives	2,4-Dinitrotoluene	MG/KG	3/ 13	0.356	1.5	WBGss-211-4046-SO	0.13	0/ 13	0.0178	0.075
WBG-01		Explosives	2,6-Dinitrotoluene	MG/KG	2/ 13	0.464	0.094	WBGss-211-4046-SO				
WBG-01		Explosives	2-Amino-4,6-dinitrotoluene	MG/KG	5/ 13	1.86	14	WBGss-211-4046-SO				
WBG-01		Explosives	4-Amino-2,6-dinitrotoluene	MG/KG	4/ 13	6.07	0.47	WBGso-199-4007-SO				
WBG-01	N	Explosives	Nitrobenzene	MG/KG	1/ 13	0.24	0.12	WBGss-197-4000-SO	2	0/ 13	0.012	0.006
WBG-01		Explosives	Nitroguanidine	MG/KG	1/ 4	0.21	0.091	WBGss-236-4270-SO				
WBG-01		Explosives	RDX	MG/KG	1/ 13	0.671	2.6	WBGss-211-4046-SO				
WBG-01		Pesticides and PCBs	4,4'-DDT	MG/KG	1/ 6	0.0346	0.13	WBGss-218-4067-SO				
WBG-01		Pesticides and PCBs	Dieldrin	MG/KG	1/ 6	0.0169	0.0054	WBGss-220-4073-SO				
WBG-01		Pesticides and PCBs	Heptachlor epoxide	MG/KG	1/ 6	0.0176	0.051	WBGss-220-4073-SO				
WBG-01		Pesticides and PCBs	PCB-1260	MG/KG	2/ 6	0.132	0.46	WBGss-218-4067-SO				
WBG-01	N	Semi-Volatile Organics	2,4-Dinitrotoluene	MG/KG	1/ 6	0.38	0.21	WBGss-225-4088-SO	0.13	0/ 6	0.019	0.0105
WBG-01		Semi-Volatile Organics	2,6-Dinitrotoluene	MG/KG	1/ 6	0.382	0.22	WBGss-220-4073-SO				
WBG-01		Semi-Volatile Organics	2-Methylnaphthalene	MG/KG	1/ 6	0.361	0.098	WBGss-225-4088-SO				
WBG-01		Semi-Volatile Organics	Anthracene	MG/KG	2/ 6	0.295	0.083	WBGss-225-4088-SO				

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WBG-01		Semi-Volatile Organics	Benz(a)anthracene	MG/KG	2/ 6	0.388	0.36	WBGss-225-4088-SO				
WBG-01		Semi-Volatile Organics	Benzo(a)pyrene	MG/KG	2/ 6	0.395	0.41	WBGss-225-4088-SO				
WBG-01		Semi-Volatile Organics	Benzo(b)fluoranthene	MG/KG	2/ 6	0.432	0.49	WBGss-218-4067-SO				
WBG-01		Semi-Volatile Organics	Benzo(ghi)perylene	MG/KG	2/ 6	0.355	0.27	WBGss-225-4088-SO				
WBG-01		Semi-Volatile Organics	Benzo(k)fluoranthene	MG/KG	2/ 6	0.323	0.17	WBGss-225-4088-SO				
WBG-01		Semi-Volatile Organics	Carbazole	MG/KG	1/ 6	0.355	0.057	WBGss-225-4088-SO				
WBG-01		Semi-Volatile Organics	Chrysene	MG/KG	2/ 6	0.375	0.31	WBGss-225-4088-SO				
WBG-01		Semi-Volatile Organics	Dibenz(a,h)anthracene	MG/KG	2/ 6	0.296	0.073	WBGss-225-4088-SO				
WBG-01		Semi-Volatile Organics	Fluoranthene	MG/KG	2/ 6	0.467	0.6	WBGss-218-4067-SO				
WBG-01		Semi-Volatile Organics	Indeno(1,2,3-cd)pyrene	MG/KG	2/ 6	0.36	0.29	WBGss-225-4088-SO				
WBG-01		Semi-Volatile Organics	Naphthalene	MG/KG	1/ 6	0.356	0.066	WBGss-225-4088-SO				
WBG-01		Semi-Volatile Organics	Phenanthrene	MG/KG	2/ 6	0.382	0.35	WBGss-225-4088-SO				
WBG-01		Semi-Volatile Organics	Pyrene	MG/KG	2/ 6	0.422	0.48	WBGss-218-4067-SO				
WBG-01		Volatile Organics	Acetone	MG/KG	1/ 7	0.0116	0.0049	WBGss-225-4088-SO				
WBG-01		Volatile Organics	Methylene chloride	MG/KG	2/ 7	0.00641	0.0066	WBGss-220-4073-SO				
WBG-02		General Chemistry	Chromium, hexavalent	MG/KG	10/ 31	1.99	8.8	WBGss-226-4091-SO				
WBG-02		Cyanide	Cyanide	MG/KG	1/ 6	1.28	4.6	WBGso-217-4065-SO				
WBG-02		Inorganics	Aluminum	MG/KG	60/ 60	12300	20000	WBGso-219-4071-SO				
WBG-02		Inorganics	Antimony	MG/KG	42/ 61	4.44	45.1	WBGss-247-4162-SO				
WBG-02	N	Inorganics	Arsenic	MG/KG	61/ 61	15.3	38.4	WBGso-227-4095-SO	5	0/ 61	0.763	1.92
WBG-02	N	Inorganics	Barium	MG/KG	60/ 60	172	1320	WBGss-247-4162-SO	100	0/ 60	8.6	66
WBG-02		Inorganics	Beryllium	MG/KG	52/ 60	0.471	1.8	WBGss-223-4082-SO				
WBG-02	Y	Inorganics	Cadmium	MG/KG	37/ 60	7.38	201	WBGso-232-4112-SO	1	5/ 60	0.369	10.1
WBG-02		Inorganics	Calcium	MG/KG	56/ 60	7800	39000	WBGss-223-4082-SO				
WBG-02	N	Inorganics	Chromium	MG/KG	60/ 60	21.8	80.9	WBGso-219-4071-SO	5	0/ 60	1.09	4.05
WBG-02		Inorganics	Cobalt	MG/KG	60/ 60	10.5	18.2	WBGso-237-4131-SO				
WBG-02		Inorganics	Copper	MG/KG	60/ 60	84	876	WBGss-247-4162-SO				
WBG-02		Inorganics	Iron	MG/KG	60/ 60	31300	163000	WBGso-218-4068-SO				
WBG-02	Y	Inorganics	Lead	MG/KG	61/ 61	120	1130	WBGso-219-4071-SO	5	15/ 61	6.02	56.5
WBG-02		Inorganics	Magnesium	MG/KG	60/ 60	3710	12400	WBGso-220-4272-SO				
WBG-02		Inorganics	Manganese	MG/KG	60/ 60	570	2100	WBGss-238-4133-SO				
WBG-02	N	Inorganics	Mercury	MG/KG	54/ 61	0.0383	0.12	WBGso-227-4096-SO	0.2	0/ 61	0.00192	0.006
WBG-02		Inorganics	Nickel	MG/KG	60/ 60	24.8	92.7	WBGso-218-4068-SO				
WBG-02		Inorganics	Potassium	MG/KG	59/ 60	1470	3130	WBGso-220-4272-SO				
WBG-02	N	Inorganics	Selenium	MG/KG	28/ 61	1.08	4.6	WBGso-219-4071-SO	1	0/ 61	0.0539	0.23
WBG-02	N	Inorganics	Silver	MG/KG	11/ 60	1.27	5.7	WBGso-219-4071-SO	5	0/ 60	0.0633	0.285
WBG-02		Inorganics	Sodium	MG/KG	5/ 60	336	1780	WBGso-219-4071-SO				
WBG-02		Inorganics	Thallium	MG/KG	61/ 61	0.494	0.82	WBGso-220-4272-SO				
WBG-02		Inorganics	Vanadium	MG/KG	59/ 60	21.9	44.8	WBGso-219-4071-SO				
WBG-02		Inorganics	Zinc	MG/KG	59/ 60	296	2420	WBGso-217-4065-SO				
WBG-02		Explosives	1,3,5-Trinitrobenzene	MG/KG	7/ 39	11	34	WBGso-252-4181-SO				
WBG-02		Explosives	1,3-Dinitrobenzene	MG/KG	4/ 39	0.249	0.063	WBGso-205-4028-SO				
WBG-02		Explosives	2,4,6-Trinitrotoluene	MG/KG	19/ 39	269	5200	WBGso-252-4181-SO				

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WBG-02	Y	Explosives	2,4-Dinitrotoluene	MG/KG	8/ 39	0.477	2.8	WBGso-252-4181-SO	0.13	1/ 39	0.0239	0.14
WBG-02		Explosives	2,6-Dinitrotoluene	MG/KG	1/ 39	6.97	0.15	WBGso-252-4181-SO				
WBG-02		Explosives	2-Amino-4,6-dinitrotoluene	MG/KG	6/ 39	10.3	7.5	WBGso-252-4181-SO				
WBG-02		Explosives	2-Nitrotoluene	MG/KG	1/ 39	0.291	0.23	WBGso-199-4007-SO				
WBG-02		Explosives	4-Amino-2,6-dinitrotoluene	MG/KG	3/ 39	39.5	0.93	WBGso-252-4181-SO				
WBG-02		Explosives	4-Nitrotoluene	MG/KG	1/ 39	0.304	0.16	WBGso-199-4007-SO				
WBG-02		Explosives	HMX	MG/KG	7/ 39	23.1	100	WBGso-252-4181-SO				
WBG-02	N	Explosives	Nitrobenzene	MG/KG	2/ 39	0.261	0.093	WBGso-205-4028-SO	2	0/ 39	0.013	0.00465
WBG-02		Explosives	Nitroguanidine	MG/KG	1/ 2	0.171	0.091	WBGss-236-4270-SO				
WBG-02		Explosives	RDX	MG/KG	8/ 39	31.3	470	WBGss-252-4179-SO				
WBG-02		Pesticides and PCBs	Dieldrin	MG/KG	1/ 7	0.0119	0.0054	WBGss-240-4139-SO				
WBG-02		Pesticides and PCBs	Heptachlor epoxide	MG/KG	2/ 7	0.0262	0.081	WBGss-231-4108-SO				
WBG-02		Semi-Volatile Organics	Acenaphthene	MG/KG	1/ 7	9.64	65	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Anthracene	MG/KG	1/ 7	57.5	400	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Benz(a)anthracene	MG/KG	2/ 7	81.8	570	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Benzo(a)pyrene	MG/KG	2/ 7	73.2	510	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Benzo(b)fluoranthene	MG/KG	2/ 7	88.9	620	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Benzo(ghi)perylene	MG/KG	2/ 7	40.3	280	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Benzo(k)fluoranthene	MG/KG	2/ 7	40.3	280	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Carbazole	MG/KG	1/ 7	27.5	190	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Chrysene	MG/KG	2/ 7	77.5	540	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Dibenz(a,h)anthracene	MG/KG	1/ 7	8.78	59	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Dibenzofuran	MG/KG	1/ 7	16.1	110	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Fluoranthene	MG/KG	2/ 7	215	1500	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Fluorene	MG/KG	1/ 7	18.9	130	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Indeno(1,2,3-cd)pyrene	MG/KG	2/ 7	46	320	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Naphthalene	MG/KG	1/ 7	9.21	62	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Phenanthrene	MG/KG	2/ 7	186	1300	WBGso-217-4065-SO				
WBG-02		Semi-Volatile Organics	Pyrene	MG/KG	2/ 7	158	1100	WBGso-217-4065-SO				
WBG-02	N	Volatile Organics	Trichloroethene	MG/KG	1/ 7	0.00546	0.0011	WBGss-231-4108-SO	0.5	0/ 7	0.000273	0.000055
WBG-03		General Chemistry	Chromium, hexavalent	MG/KG	6/ 19	2.09	6.3	WBGss-249-4170-SO				
WBG-03		Cyanide	Cyanide	MG/KG	2/ 4	1.92	4.6	WBGso-217-4065-SO				
WBG-03		Inorganics	Aluminum	MG/KG	66/ 66	12100	20000	WBGso-219-4071-SO				
WBG-03		Inorganics	Antimony	MG/KG	43/ 66	4.57	45.1	WBGss-247-4162-SO				
WBG-03	N	Inorganics	Arsenic	MG/KG	66/ 66	15.2	38.4	WBGso-227-4095-SO	5	0/ 66	0.759	1.92
WBG-03	Y	Inorganics	Barium	MG/KG	66/ 66	369	7160	WBGss-246-4159-SO	100	3/ 66	18.5	358
WBG-03		Inorganics	Beryllium	MG/KG	53/ 66	0.505	1.4	WBGss-260-4207-SO				
WBG-03	Y	Inorganics	Cadmium	MG/KG	43/ 66	6.3	201	WBGso-232-4112-SO	1	4/ 66	0.315	10.1
WBG-03		Inorganics	Calcium	MG/KG	66/ 66	8570	75500	WBGss-260-4207-SO				
WBG-03	N	Inorganics	Chromium	MG/KG	66/ 66	20.9	80.9	WBGso-219-4071-SO	5	0/ 66	1.05	4.05
WBG-03		Inorganics	Cobalt	MG/KG	66/ 66	10.4	18.2	WBGso-237-4131-SO				
WBG-03		Inorganics	Copper	MG/KG	66/ 66	98.1	926	WBGss-246-4159-SO				
WBG-03		Inorganics	Iron	MG/KG	66/ 66	29700	163000	WBGso-218-4068-SO				

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WBG-03	Y	Inorganics	Lead	MG/KG	66/ 66	100	1130	WBGso-219-4071-SO	5	14/ 66	5.02	56.5
WBG-03		Inorganics	Magnesium	MG/KG	66/ 66	3650	12400	WBGso-220-4272-SO				
WBG-03		Inorganics	Manganese	MG/KG	66/ 66	647	2240	WBGss-260-4207-SO				
WBG-03	N	Inorganics	Mercury	MG/KG	55/ 66	0.0551	0.53	WBGss-246-4159-SO	0.2	0/ 66	0.00276	0.0265
WBG-03		Inorganics	Nickel	MG/KG	66/ 66	24.6	92.7	WBGso-218-4068-SO				
WBG-03		Inorganics	Potassium	MG/KG	66/ 66	1470	3130	WBGso-220-4272-SO				
WBG-03	N	Inorganics	Selenium	MG/KG	33/ 66	0.987	4.6	WBGso-219-4071-SO	1	0/ 66	0.0493	0.23
WBG-03	N	Inorganics	Silver	MG/KG	8/ 66	1.26	5.7	WBGso-219-4071-SO	5	0/ 66	0.0632	0.285
WBG-03		Inorganics	Sodium	MG/KG	18/ 66	328	1780	WBGso-219-4071-SO				
WBG-03		Inorganics	Thallium	MG/KG	60/ 66	0.554	0.82	WBGso-219-4072-SO				
WBG-03		Inorganics	Vanadium	MG/KG	65/ 66	21.2	44.8	WBGso-219-4071-SO				
WBG-03		Inorganics	Zinc	MG/KG	65/ 66	264	2420	WBGso-217-4065-SO				
WBG-03		Explosives	1,3,5-Trinitrobenzene	MG/KG	5/ 36	11.8	34	WBGso-252-4181-SO				
WBG-03		Explosives	1,3-Dinitrobenzene	MG/KG	4/ 36	0.228	0.063	WBGso-243-4273-SO				
WBG-03		Explosives	2,4,6-Trinitrotoluene	MG/KG	18/ 36	286	5200	WBGso-252-4181-SO				
WBG-03	Y	Explosives	2,4-Dinitrotoluene	MG/KG	7/ 36	0.467	2.8	WBGso-252-4181-SO	0.13	1/ 36	0.0234	0.14
WBG-03		Explosives	2,6-Dinitrotoluene	MG/KG	1/ 36	7.48	0.15	WBGso-252-4181-SO				
WBG-03		Explosives	2-Amino-4,6-dinitrotoluene	MG/KG	3/ 36	10.9	0.97	WBGso-252-4181-SO				
WBG-03		Explosives	2-Nitrotoluene	MG/KG	1/ 36	0.249	0.23	WBGss-281-4274-SO				
WBG-03		Explosives	4-Amino-2,6-dinitrotoluene	MG/KG	4/ 36	41.1	0.93	WBGso-252-4181-SO				
WBG-03		Explosives	4-Nitrotoluene	MG/KG	1/ 36	0.248	0.16	WBGso-203-4022-SO				
WBG-03		Explosives	HMX	MG/KG	8/ 36	25	100	WBGso-252-4181-SO				
WBG-03	N	Explosives	Nitrobenzene	MG/KG	2/ 36	0.241	0.093	WBGso-237-4130-SO	2	0/ 36	0.012	0.00465
WBG-03		Explosives	RDX	MG/KG	10/ 36	33.8	470	WBGss-252-4179-SO				
WBG-03		Pesticides and PCBs	Dieldrin	MG/KG	1/ 4	0.0591	0.0024	WBGss-261-4210-SO				
WBG-03		Pesticides and PCBs	PCB-1254	MG/KG	1/ 4	0.0655	0.14	WBGss-261-4210-SO				
WBG-03		Semi-Volatile Organics	2-Methylnaphthalene	MG/KG	1/ 4	60.2	0.082	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Acenaphthene	MG/KG	1/ 4	16.6	65	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Anthracene	MG/KG	2/ 4	100	400	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Benz(a)anthracene	MG/KG	2/ 4	143	570	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Benzo(a)pyrene	MG/KG	2/ 4	128	510	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Benzo(b)fluoranthene	MG/KG	2/ 4	155	620	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Benzo(ghi)perylene	MG/KG	2/ 4	70.3	280	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Benzo(k)fluoranthene	MG/KG	2/ 4	70.2	280	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Carbazole	MG/KG	1/ 4	47.8	190	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Chrysene	MG/KG	2/ 4	135	540	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Dibenz(a,h)anthracene	MG/KG	2/ 4	15	59	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Dibenzofuran	MG/KG	1/ 4	27.8	110	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Fluoranthene	MG/KG	2/ 4	375	1500	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Fluorene	MG/KG	1/ 4	32.8	130	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Indeno(1,2,3-cd)pyrene	MG/KG	2/ 4	80.3	320	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Naphthalene	MG/KG	2/ 4	15.7	62	WBGso-217-4065-SO				
WBG-03		Semi-Volatile Organics	Phenanthrene	MG/KG	2/ 4	325	1300	WBGso-217-4065-SO				

Drum ID	Max > TCLP	Analysis Type	Chemical	Units	Proportion Detected	Mean	Max Detect	ID of Max Concentration	TCLP Criteria (mg/L)	Proportion >TCLP	Mean Adj. for TCLP (mg/L)	Max Detect Adj. for TCLP (mg/L)
WBG-03		Semi-Volatile Organics	Pyrene	MG/KG	2/ 4	275	1100	WBGso-217-4065-SO				
WBG-03	N	Volatile Organics	Trichloroethene	MG/KG	2/ 4	0.00375	0.0012	WBGss-251-4176-SO	0.5	0/ 4	0.000188	0.00006
WBG-04		Inorganics	Aluminum	MG/KG	50/ 50	11400	16600	WBGss-268-4223-SO				
WBG-04		Inorganics	Antimony	MG/KG	15/ 50	1.58	6.4	WBGss-210-4277-SO				
WBG-04	N	Inorganics	Arsenic	MG/KG	50/ 50	12.4	22.9	WBGso-210-4044-SO	5	0/ 50	0.621	1.15
WBG-04	N	Inorganics	Barium	MG/KG	50/ 50	114	1080	WBGss-257-4196-SO	100	0/ 50	5.72	54
WBG-04		Inorganics	Beryllium	MG/KG	40/ 50	0.45	0.87	WBGss-283-4238-SO				
WBG-04	N	Inorganics	Cadmium	MG/KG	33/ 50	0.434	1.9	WBGso-210-4042-SO	1	0/ 50	0.0217	0.095
WBG-04		Inorganics	Calcium	MG/KG	46/ 50	3630	32800	WBGso-210-4043-SO				
WBG-04	N	Inorganics	Chromium	MG/KG	50/ 50	15.7	28.8	WBGso-219-4072-SO	5	0/ 50	0.785	1.44
WBG-04		Inorganics	Cobalt	MG/KG	50/ 50	9.8	15.3	WBGss-283-4238-SO				
WBG-04		Inorganics	Copper	MG/KG	50/ 50	26.5	252	WBGss-257-4196-SO				
WBG-04		Inorganics	Iron	MG/KG	50/ 50	22800	41400	WBGso-219-4072-SO				
WBG-04	Y	Inorganics	Lead	MG/KG	50/ 50	28.2	173	WBGso-219-4072-SO	5	3/ 50	1.41	8.65
WBG-04		Inorganics	Magnesium	MG/KG	50/ 50	2780	7610	WBGss-262-4213-SO				
WBG-04		Inorganics	Manganese	MG/KG	50/ 50	646	3170	WBGss-273-4228-SO				
WBG-04	N	Inorganics	Mercury	MG/KG	47/ 50	0.0469	0.094	WBGso-222-4080-SO	0.2	0/ 50	0.00234	0.0047
WBG-04		Inorganics	Nickel	MG/KG	50/ 50	19.6	37.1	WBGss-283-4238-SO				
WBG-04		Inorganics	Potassium	MG/KG	50/ 50	1160	3090	WBGss-262-4213-SO				
WBG-04	N	Inorganics	Selenium	MG/KG	42/ 50	0.824	1.9	WBGso-219-4072-SO	1	0/ 50	0.0412	0.095
WBG-04	N	Inorganics	Silver	MG/KG	2/ 50	1.23	0.92	WBGss-273-4228-SO	5	0/ 50	0.0614	0.046
WBG-04		Inorganics	Sodium	MG/KG	14/ 50	482	389	WBGss-268-4223-SO				
WBG-04		Inorganics	Thallium	MG/KG	44/ 50	0.417	0.8	WBGso-219-4072-SO				
WBG-04		Inorganics	Vanadium	MG/KG	50/ 50	21	30.5	WBGss-264-4219-SO				
WBG-04		Inorganics	Zinc	MG/KG	50/ 50	93	890	WBGso-219-4072-SO				
WBG-04		Explosives	2,4,6-Trinitrotoluene	MG/KG	3/ 11	0.251	0.63	WBGso-219-4072-SO				
WBG-04		Explosives	2-Amino-4,6-dinitrotoluene	MG/KG	1/ 11	0.241	0.15	WBGss-210-4041-SO				
WBG-04		Explosives	4-Amino-2,6-dinitrotoluene	MG/KG	3/ 11	0.225	0.24	WBGso-257-4199-SO				
WBG-04		Explosives	HMX	MG/KG	2/ 11	0.465	0.38	WBGso-257-4197-SO				
WBG-04	N	Explosives	Nitrobenzene	MG/KG	1/ 11	0.235	0.081	WBGso-219-4072-SO	2	0/ 11	0.0117	0.00405
WBG-04		Explosives	RDX	MG/KG	1/ 11	0.564	1.2	WBGso-219-4072-SO				
WBG-04		Pesticides and PCBs	Endrin ketone	MG/KG	1/ 1	0.0043	0.0043	WBGso-210-4042-SO				
WBG-04		Semi-Volatile Organics	2-Methylnaphthalene	MG/KG	1/ 1	17	17	WBGso-210-4042-SO				
WBG-04		Semi-Volatile Organics	Acenaphthene	MG/KG	1/ 1	0.44	0.44	WBGso-210-4042-SO				
WBG-04		Semi-Volatile Organics	Anthracene	MG/KG	1/ 1	0.16	0.16	WBGso-210-4042-SO				
WBG-04		Semi-Volatile Organics	Fluoranthene	MG/KG	1/ 1	0.05	0.05	WBGso-210-4042-SO				
WBG-04		Semi-Volatile Organics	Fluorene	MG/KG	1/ 1	0.93	0.93	WBGso-210-4042-SO				
WBG-04		Semi-Volatile Organics	Naphthalene	MG/KG	1/ 1	1.6	1.6	WBGso-210-4042-SO				
WBG-04		Semi-Volatile Organics	Phenanthrene	MG/KG	1/ 1	3.2	3.2	WBGso-210-4042-SO				
WBG-04		Semi-Volatile Organics	Pyrene	MG/KG	1/ 1	0.13	0.13	WBGso-210-4042-SO				
WBG-04		Volatile Organics	Dimethylbenzene	MG/KG	1/ 1	0.026	0.026	WBGso-210-4042-SO				
WBG-04		Volatile Organics	Ethylbenzene	MG/KG	1/ 1	0.021	0.021	WBGso-210-4042-SO				
WBG-04		Volatile Organics	Toluene	MG/KG	1/ 1	0.011	0.011	WBGso-210-4042-SO				

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WBGmw-010-1	N	Inorganics	Barium	MG/L	2/ 2	0.014	0.014	WBGmw-010-4260-GF	100	0/ 2	0.014	0.014
WBGmw-010-1		Inorganics	Calcium	MG/L	2/ 2	32.3	32.7	WBGmw-010-4285-GF				
WBGmw-010-1	N	Inorganics	Chromium	MG/L	2/ 2	0.00185	0.002	WBGmw-010-4285-GF	5	0/ 2	0.00185	0.002
WBGmw-010-1		Inorganics	Magnesium	MG/L	2/ 2	9.4	9.5	WBGmw-010-4285-GF				
WBGmw-010-1		Inorganics	Manganese	MG/L	2/ 2	0.0335	0.035	WBGmw-010-4285-GF				
WBGmw-010-1		Inorganics	Nickel	MG/L	2/ 2	0.0309	0.059	WBGmw-010-4285-GF				
WBGmw-010-1		Inorganics	Potassium	MG/L	2/ 2	1.1	1.1	WBGmw-010-4260-GF				
WBGmw-010-1		Inorganics	Sodium	MG/L	2/ 2	3.5	3.5	WBGmw-010-4260-GF				
WBGmw-010-1		Inorganics	Zinc	MG/L	2/ 2	0.0455	0.048	WBGmw-010-4260-GF				
WBGmw-010-1		Explosives	1,3,5-Trinitrobenzene	MG/L	1/ 2	0.000155	0.00011	WBGmw-010-4260-GF				
WBGmw-010-1		Explosives	2,4,6-Trinitrotoluene	MG/L	1/ 2	0.000215	0.00023	WBGmw-010-4285-GF				
WBGmw-010-1	N	Explosives	2,4-Dinitrotoluene	MG/L	2/ 2	0.000225	0.00028	WBGmw-010-4260-GF	0.13	0/ 2	0.000225	0.00028
WBGmw-010-1		Explosives	2-Amino-4,6-dinitrotoluene	MG/L	2/ 2	0.00125	0.0013	WBGmw-010-4260-GF				
WBGmw-010-1		Explosives	2-Nitrotoluene	MG/L	1/ 2	0.0002	0.0002	WBGmw-010-4285-GF				
WBGmw-010-1		Explosives	4-Amino-2,6-dinitrotoluene	MG/L	2/ 2	0.000545	0.00055	WBGmw-010-4285-GF				
WBGmw-010-1		Explosives	4-Nitrotoluene	MG/L	1/ 2	0.000255	0.00031	WBGmw-010-4260-GF				
WBGmw-010-1	N	Explosives	Nitrobenzene	MG/L	1/ 2	0.000134	0.000067	WBGmw-010-4260-GF	2	0/ 2	0.000134	0.000067
WBGmw-010-1		Explosives	Tetryl	MG/L	1/ 2	0.00045	0.0007	WBGmw-010-4285-GF				
WBGmw-010-1		Pesticides and PCBs	Heptachlor epoxide	MG/L	1/ 2	0.000053	0.000056	WBGmw-010-4260-GF				
WBGmw-010-1		Semi-Volatile Organics	Bis(2-ethylhexyl)phthalate	MG/L	3/ 4	0.00563	0.0052	WBGmw-010-4260-GF				
WBGmw-010-1	N	Volatile Organics	Chloroform	MG/L	2/ 2	0.00145	0.0015	WBGmw-010-4285-GF	6	0/ 2	0.00145	0.0015
WBGmw-010-2	N	Inorganics	Barium	MG/L	2/ 2	0.014	0.014	WBGmw-010-4260-GF	100	0/ 2	0.014	0.014
WBGmw-010-2		Inorganics	Calcium	MG/L	2/ 2	32.3	32.7	WBGmw-010-4285-GF				
WBGmw-010-2	N	Inorganics	Chromium	MG/L	2/ 2	0.00185	0.002	WBGmw-010-4285-GF	5	0/ 2	0.00185	0.002
WBGmw-010-2		Inorganics	Magnesium	MG/L	2/ 2	9.4	9.5	WBGmw-010-4285-GF				
WBGmw-010-2		Inorganics	Manganese	MG/L	2/ 2	0.0335	0.035	WBGmw-010-4285-GF				
WBGmw-010-2		Inorganics	Nickel	MG/L	2/ 2	0.0309	0.059	WBGmw-010-4285-GF				
WBGmw-010-2		Inorganics	Potassium	MG/L	2/ 2	1.1	1.1	WBGmw-010-4260-GF				
WBGmw-010-2		Inorganics	Sodium	MG/L	2/ 2	3.5	3.5	WBGmw-010-4260-GF				
WBGmw-010-2		Inorganics	Zinc	MG/L	2/ 2	0.0455	0.048	WBGmw-010-4260-GF				
WBGmw-010-2		Explosives	1,3,5-Trinitrobenzene	MG/L	1/ 2	0.000155	0.00011	WBGmw-010-4260-GF				
WBGmw-010-2		Explosives	2,4,6-Trinitrotoluene	MG/L	1/ 2	0.000215	0.00023	WBGmw-010-4285-GF				
WBGmw-010-2	N	Explosives	2,4-Dinitrotoluene	MG/L	2/ 2	0.000225	0.00028	WBGmw-010-4260-GF	0.13	0/ 2	0.000225	0.00028
WBGmw-010-2		Explosives	2-Amino-4,6-dinitrotoluene	MG/L	2/ 2	0.00125	0.0013	WBGmw-010-4260-GF				
WBGmw-010-2		Explosives	2-Nitrotoluene	MG/L	1/ 2	0.0002	0.0002	WBGmw-010-4285-GF				
WBGmw-010-2		Explosives	4-Amino-2,6-dinitrotoluene	MG/L	2/ 2	0.000545	0.00055	WBGmw-010-4285-GF				
WBGmw-010-2		Explosives	4-Nitrotoluene	MG/L	1/ 2	0.000255	0.00031	WBGmw-010-4260-GF				
WBGmw-010-2	N	Explosives	Nitrobenzene	MG/L	1/ 2	0.000134	0.000067	WBGmw-010-4260-GF	2	0/ 2	0.000134	0.000067
WBGmw-010-2		Explosives	Tetryl	MG/L	1/ 2	0.00045	0.0007	WBGmw-010-4285-GF				
WBGmw-010-2		Pesticides and PCBs	Heptachlor epoxide	MG/L	1/ 2	0.000053	0.000056	WBGmw-010-4260-GF				
WBGmw-010-2		Semi-Volatile Organics	Bis(2-ethylhexyl)phthalate	MG/L	3/ 4	0.00563	0.0052	WBGmw-010-4260-GF				
WBGmw-010-2	N	Volatile Organics	Chloroform	MG/L	2/ 2	0.00145	0.0015	WBGmw-010-4285-GF	6	0/ 2	0.00145	0.0015
WBGmw-011-1	N	Inorganics	Barium	MG/L	1/ 2	0.03	0.029	WBGmw-011-4284-GF	100	0/ 2	0.03	0.029

Drum ID	Max > TCLP	Analysis Type	Chemical	Units	Proportion Detected	Mean	Max Detect	ID of Max Concentration	TCLP Criteria (mg/L)	Proportion >TCLP	Mean Adj. for TCLP (mg/L)	Max Detect Adj. for TCLP (mg/L)
WBGmw-011-1		Inorganics	Calcium	MG/L	2/ 2	52.9	54.1	WBGmw-011-4284-GF				
WBGmw-011-1		Inorganics	Magnesium	MG/L	2/ 2	10.8	11.1	WBGmw-011-4284-GF				
WBGmw-011-1		Inorganics	Manganese	MG/L	2/ 2	0.0465	0.048	WBGmw-011-4284-GF				
WBGmw-011-1		Inorganics	Potassium	MG/L	2/ 2	3.9	4	WBGmw-011-4284-GF				
WBGmw-011-1		Inorganics	Sodium	MG/L	2/ 2	3.55	3.7	WBGmw-011-4284-GF				
WBGmw-011-1	N	Explosives	2,4-Dinitrotoluene	MG/L	2/ 2	0.000127	0.00016	WBGmw-011-4284-GF	0.13	0/ 2	0.000127	0.00016
WBGmw-011-1		Explosives	2,6-Dinitrotoluene	MG/L	2/ 2	0.0001	0.0001	WBGmw-011-4261-GF				
WBGmw-011-1		Explosives	2-Nitrotoluene	MG/L	2/ 2	0.00031	0.00033	WBGmw-011-4261-GF				
WBGmw-011-1		Explosives	4-Nitrotoluene	MG/L	1/ 2	0.00015	0.0001	WBGmw-011-4261-GF				
WBGmw-011-1		Explosives	Tetryl	MG/L	1/ 2	0.000139	0.000077	WBGmw-011-4261-GF				
WBGmw-011-1	N	Semi-Volatile Organics	2-Methylphenol	MG/L	1/ 4	0.00823	0.0029	WBGmw-011-4284-GF	200	0/ 4	0.00823	0.0029
WBGmw-011-2	N	Inorganics	Barium	MG/L	1/ 2	0.03	0.029	WBGmw-011-4284-GF	100	0/ 2	0.03	0.029
WBGmw-011-2		Inorganics	Calcium	MG/L	2/ 2	52.9	54.1	WBGmw-011-4284-GF				
WBGmw-011-2		Inorganics	Magnesium	MG/L	2/ 2	10.8	11.1	WBGmw-011-4284-GF				
WBGmw-011-2		Inorganics	Manganese	MG/L	2/ 2	0.0465	0.048	WBGmw-011-4284-GF				
WBGmw-011-2		Inorganics	Potassium	MG/L	2/ 2	3.9	4	WBGmw-011-4284-GF				
WBGmw-011-2		Inorganics	Sodium	MG/L	2/ 2	3.55	3.7	WBGmw-011-4284-GF				
WBGmw-011-2	N	Explosives	2,4-Dinitrotoluene	MG/L	2/ 2	0.000127	0.00016	WBGmw-011-4284-GF	0.13	0/ 2	0.000127	0.00016
WBGmw-011-2		Explosives	2,6-Dinitrotoluene	MG/L	2/ 2	0.0001	0.0001	WBGmw-011-4261-GF				
WBGmw-011-2		Explosives	2-Nitrotoluene	MG/L	2/ 2	0.00031	0.00033	WBGmw-011-4261-GF				
WBGmw-011-2		Explosives	4-Nitrotoluene	MG/L	1/ 2	0.00015	0.0001	WBGmw-011-4261-GF				
WBGmw-011-2		Explosives	Tetryl	MG/L	1/ 2	0.000139	0.000077	WBGmw-011-4261-GF				
WBGmw-011-2	N	Semi-Volatile Organics	2-Methylphenol	MG/L	1/ 4	0.00823	0.0029	WBGmw-011-4284-GF	200	0/ 4	0.00823	0.0029
WBGmw-011-3	N	Inorganics	Barium	MG/L	1/ 2	0.03	0.029	WBGmw-011-4284-GF	100	0/ 2	0.03	0.029
WBGmw-011-3		Inorganics	Calcium	MG/L	2/ 2	52.9	54.1	WBGmw-011-4284-GF				
WBGmw-011-3		Inorganics	Magnesium	MG/L	2/ 2	10.8	11.1	WBGmw-011-4284-GF				
WBGmw-011-3		Inorganics	Manganese	MG/L	2/ 2	0.0465	0.048	WBGmw-011-4284-GF				
WBGmw-011-3		Inorganics	Potassium	MG/L	2/ 2	3.9	4	WBGmw-011-4284-GF				
WBGmw-011-3		Inorganics	Sodium	MG/L	2/ 2	3.55	3.7	WBGmw-011-4284-GF				
WBGmw-011-3	N	Explosives	2,4-Dinitrotoluene	MG/L	2/ 2	0.000127	0.00016	WBGmw-011-4284-GF	0.13	0/ 2	0.000127	0.00016
WBGmw-011-3		Explosives	2,6-Dinitrotoluene	MG/L	2/ 2	0.0001	0.0001	WBGmw-011-4261-GF				
WBGmw-011-3		Explosives	2-Nitrotoluene	MG/L	2/ 2	0.00031	0.00033	WBGmw-011-4261-GF				
WBGmw-011-3		Explosives	4-Nitrotoluene	MG/L	1/ 2	0.00015	0.0001	WBGmw-011-4261-GF				
WBGmw-011-3		Explosives	Tetryl	MG/L	1/ 2	0.000139	0.000077	WBGmw-011-4261-GF				
WBGmw-011-3	N	Semi-Volatile Organics	2-Methylphenol	MG/L	1/ 4	0.00823	0.0029	WBGmw-011-4284-GF	200	0/ 4	0.00823	0.0029
WBGmw-011-4	N	Inorganics	Barium	MG/L	1/ 2	0.03	0.029	WBGmw-011-4284-GF	100	0/ 2	0.03	0.029
WBGmw-011-4		Inorganics	Calcium	MG/L	2/ 2	52.9	54.1	WBGmw-011-4284-GF				
WBGmw-011-4		Inorganics	Magnesium	MG/L	2/ 2	10.8	11.1	WBGmw-011-4284-GF				
WBGmw-011-4		Inorganics	Manganese	MG/L	2/ 2	0.0465	0.048	WBGmw-011-4284-GF				
WBGmw-011-4		Inorganics	Potassium	MG/L	2/ 2	3.9	4	WBGmw-011-4284-GF				
WBGmw-011-4		Inorganics	Sodium	MG/L	2/ 2	3.55	3.7	WBGmw-011-4284-GF				
WBGmw-011-4	N	Explosives	2,4-Dinitrotoluene	MG/L	2/ 2	0.000127	0.00016	WBGmw-011-4284-GF	0.13	0/ 2	0.000127	0.00016
WBGmw-011-4		Explosives	2,6-Dinitrotoluene	MG/L	2/ 2	0.0001	0.0001	WBGmw-011-4261-GF				

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WBGmw-011-4		Explosives	2-Nitrotoluene	MG/L	2/ 2	0.00031	0.00033	WBGmw-011-4261-GF				
WBGmw-011-4		Explosives	4-Nitrotoluene	MG/L	1/ 2	0.00015	0.0001	WBGmw-011-4261-GF				
WBGmw-011-4		Explosives	Tetryl	MG/L	1/ 2	0.000139	0.000077	WBGmw-011-4261-GF				
WBGmw-011-4	N	Semi-Volatile Organics	2-Methylphenol	MG/L	1/ 4	0.00823	0.0029	WBGmw-011-4284-GF	200	0/ 4	0.00823	0.0029
WBGmw-012-1	N	Inorganics	Barium	MG/L	1/ 1	0.013	0.013	WBGmw-012-4262-GF	100	0/ 1	0.013	0.013
WBGmw-012-1		Inorganics	Calcium	MG/L	1/ 1	71	71	WBGmw-012-4262-GF				
WBGmw-012-1		Inorganics	Magnesium	MG/L	1/ 1	19.2	19.2	WBGmw-012-4262-GF				
WBGmw-012-1		Inorganics	Manganese	MG/L	1/ 1	0.074	0.074	WBGmw-012-4262-GF				
WBGmw-012-1		Inorganics	Potassium	MG/L	1/ 1	1.1	1.1	WBGmw-012-4262-GF				
WBGmw-012-1		Inorganics	Sodium	MG/L	1/ 1	3.8	3.8	WBGmw-012-4262-GF				
WBGmw-012-1		Inorganics	Zinc	MG/L	1/ 1	0.014	0.014	WBGmw-012-4262-GF				
WBGmw-012-1	N	Explosives	2,4-Dinitrotoluene	MG/L	1/ 1	0.00008	0.00008	WBGmw-012-4262-GF	0.13	0/ 1	0.00008	0.00008
WBGmw-012-2	N	Inorganics	Barium	MG/L	1/ 1	0.013	0.013	WBGmw-012-4262-GF	100	0/ 1	0.013	0.013
WBGmw-012-2		Inorganics	Calcium	MG/L	1/ 1	71	71	WBGmw-012-4262-GF				
WBGmw-012-2		Inorganics	Magnesium	MG/L	1/ 1	19.2	19.2	WBGmw-012-4262-GF				
WBGmw-012-2		Inorganics	Manganese	MG/L	1/ 1	0.074	0.074	WBGmw-012-4262-GF				
WBGmw-012-2		Inorganics	Potassium	MG/L	1/ 1	1.1	1.1	WBGmw-012-4262-GF				
WBGmw-012-2		Inorganics	Sodium	MG/L	1/ 1	3.8	3.8	WBGmw-012-4262-GF				
WBGmw-012-2		Inorganics	Zinc	MG/L	1/ 1	0.014	0.014	WBGmw-012-4262-GF				
WBGmw-012-2	N	Explosives	2,4-Dinitrotoluene	MG/L	1/ 1	0.00008	0.00008	WBGmw-012-4262-GF	0.13	0/ 1	0.00008	0.00008
WBGmw-012-3	N	Inorganics	Barium	MG/L	1/ 1	0.013	0.013	WBGmw-012-4262-GF	100	0/ 1	0.013	0.013
WBGmw-012-3		Inorganics	Calcium	MG/L	1/ 1	71	71	WBGmw-012-4262-GF				
WBGmw-012-3		Inorganics	Magnesium	MG/L	1/ 1	19.2	19.2	WBGmw-012-4262-GF				
WBGmw-012-3		Inorganics	Manganese	MG/L	1/ 1	0.074	0.074	WBGmw-012-4262-GF				
WBGmw-012-3		Inorganics	Potassium	MG/L	1/ 1	1.1	1.1	WBGmw-012-4262-GF				
WBGmw-012-3		Inorganics	Sodium	MG/L	1/ 1	3.8	3.8	WBGmw-012-4262-GF				
WBGmw-012-3		Inorganics	Zinc	MG/L	1/ 1	0.014	0.014	WBGmw-012-4262-GF				
WBGmw-012-3	N	Explosives	2,4-Dinitrotoluene	MG/L	1/ 1	0.00008	0.00008	WBGmw-012-4262-GF	0.13	0/ 1	0.00008	0.00008
WBGmw-013-1	N	Inorganics	Barium	MG/L	1/ 1	0.019	0.019	WBGmw-013-4263-GF	100	0/ 1	0.019	0.019
WBGmw-013-1		Inorganics	Calcium	MG/L	1/ 1	90.4	90.4	WBGmw-013-4263-GF				
WBGmw-013-1		Inorganics	Magnesium	MG/L	1/ 1	33.3	33.3	WBGmw-013-4263-GF				
WBGmw-013-1		Inorganics	Manganese	MG/L	1/ 1	0.081	0.081	WBGmw-013-4263-GF				
WBGmw-013-1		Inorganics	Potassium	MG/L	1/ 1	0.84	0.84	WBGmw-013-4263-GF				
WBGmw-013-1		Inorganics	Sodium	MG/L	1/ 1	14.1	14.1	WBGmw-013-4263-GF				
WBGmw-013-1		Semi-Volatile Organics	Bis(2-ethylhexyl)phthalate	MG/L	2/ 2	0.0032	0.0034	WBGmw-013-4263-GF				
WBGmw-013-2	N	Inorganics	Barium	MG/L	1/ 1	0.019	0.019	WBGmw-013-4263-GF	100	0/ 1	0.019	0.019
WBGmw-013-2		Inorganics	Calcium	MG/L	1/ 1	90.4	90.4	WBGmw-013-4263-GF				
WBGmw-013-2		Inorganics	Magnesium	MG/L	1/ 1	33.3	33.3	WBGmw-013-4263-GF				
WBGmw-013-2		Inorganics	Manganese	MG/L	1/ 1	0.081	0.081	WBGmw-013-4263-GF				
WBGmw-013-2		Inorganics	Potassium	MG/L	1/ 1	0.84	0.84	WBGmw-013-4263-GF				
WBGmw-013-2		Inorganics	Sodium	MG/L	1/ 1	14.1	14.1	WBGmw-013-4263-GF				
WBGmw-013-2		Semi-Volatile Organics	Bis(2-ethylhexyl)phthalate	MG/L	2/ 2	0.0032	0.0034	WBGmw-013-4263-GF				
WBGmw-014-01		Inorganics	Aluminum	MG/L	1/ 1	4.7	4.7	WBGmw-014-4264-GF				

Drum ID	Max > TCLP	Analysis Type	Chemical	Units	Proportion Detected	Mean	Max Detect	ID of Max Concentration	TCLP Criteria (mg/L)	Proportion >TCLP	Mean Adj. for TCLP (mg/L)	Max Detect Adj. for TCLP (mg/L)
WBGmw-014-01	N	Inorganics	Barium	MG/L	1/ 1	0.019	0.019	WBGmw-014-4264-GF	100	0/ 1	0.019	0.019
WBGmw-014-01		Inorganics	Calcium	MG/L	1/ 1	72.4	72.4	WBGmw-014-4264-GF				
WBGmw-014-01		Inorganics	Magnesium	MG/L	1/ 1	17.7	17.7	WBGmw-014-4264-GF				
WBGmw-014-01		Inorganics	Manganese	MG/L	1/ 1	0.28	0.28	WBGmw-014-4264-GF				
WBGmw-014-01		Inorganics	Potassium	MG/L	1/ 1	1.6	1.6	WBGmw-014-4264-GF				
WBGmw-014-01		Inorganics	Sodium	MG/L	1/ 1	5.1	5.1	WBGmw-014-4264-GF				
WBGmw-014-01		Explosives	2,6-Dinitrotoluene	MG/L	1/ 1	0.00011	0.00011	WBGmw-014-4264-GF				
WBGmw-014-01		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.00049	0.00049	WBGmw-014-4264-GF				
WBGmw-014-01		Explosives	4-Nitrotoluene	MG/L	1/ 1	0.00035	0.00035	WBGmw-014-4264-GF				
WBGmw-014-01		Explosives	RDX	MG/L	1/ 1	0.00027	0.00027	WBGmw-014-4264-GF				
WBGmw-014-02		Inorganics	Aluminum	MG/L	1/ 1	4.7	4.7	WBGmw-014-4264-GF				
WBGmw-014-02	N	Inorganics	Barium	MG/L	1/ 1	0.019	0.019	WBGmw-014-4264-GF	100	0/ 1	0.019	0.019
WBGmw-014-02		Inorganics	Calcium	MG/L	1/ 1	72.4	72.4	WBGmw-014-4264-GF				
WBGmw-014-02		Inorganics	Magnesium	MG/L	1/ 1	17.7	17.7	WBGmw-014-4264-GF				
WBGmw-014-02		Inorganics	Manganese	MG/L	1/ 1	0.28	0.28	WBGmw-014-4264-GF				
WBGmw-014-02		Inorganics	Potassium	MG/L	1/ 1	1.6	1.6	WBGmw-014-4264-GF				
WBGmw-014-02		Inorganics	Sodium	MG/L	1/ 1	5.1	5.1	WBGmw-014-4264-GF				
WBGmw-014-02		Explosives	2,6-Dinitrotoluene	MG/L	1/ 1	0.00011	0.00011	WBGmw-014-4264-GF				
WBGmw-014-02		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.00049	0.00049	WBGmw-014-4264-GF				
WBGmw-014-02		Explosives	4-Nitrotoluene	MG/L	1/ 1	0.00035	0.00035	WBGmw-014-4264-GF				
WBGmw-014-02		Explosives	RDX	MG/L	1/ 1	0.00027	0.00027	WBGmw-014-4264-GF				
WBGmw-015-1	N	Inorganics	Barium	MG/L	1/ 1	0.073	0.073	WBGmw-015-4265-GF	100	0/ 1	0.073	0.073
WBGmw-015-1		Inorganics	Calcium	MG/L	1/ 1	107	107	WBGmw-015-4265-GF				
WBGmw-015-1	N	Inorganics	Chromium	MG/L	1/ 1	0.0014	0.0014	WBGmw-015-4265-GF	5	0/ 1	0.0014	0.0014
WBGmw-015-1		Inorganics	Magnesium	MG/L	1/ 1	33.7	33.7	WBGmw-015-4265-GF				
WBGmw-015-1		Inorganics	Manganese	MG/L	1/ 1	0.23	0.23	WBGmw-015-4265-GF				
WBGmw-015-1		Inorganics	Nickel	MG/L	1/ 1	0.0023	0.0023	WBGmw-015-4265-GF				
WBGmw-015-1		Inorganics	Potassium	MG/L	1/ 1	2.3	2.3	WBGmw-015-4265-GF				
WBGmw-015-1		Inorganics	Sodium	MG/L	1/ 1	13.7	13.7	WBGmw-015-4265-GF				
WBGmw-015-1		Inorganics	Zinc	MG/L	1/ 1	0.5	0.5	WBGmw-015-4265-GF				
WBGmw-015-1		Explosives	1,3,5-Trinitrobenzene	MG/L	1/ 1	0.0013	0.0013	WBGmw-015-4265-GF				
WBGmw-015-1		Explosives	2,4,6-Trinitrotoluene	MG/L	1/ 1	0.00094	0.00094	WBGmw-015-4265-GF				
WBGmw-015-1		Explosives	2-Amino-4,6-dinitrotoluene	MG/L	1/ 1	0.00033	0.00033	WBGmw-015-4265-GF				
WBGmw-015-1		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.0026	0.0026	WBGmw-015-4265-GF				
WBGmw-015-1		Explosives	3-Nitrotoluene	MG/L	1/ 1	0.00031	0.00031	WBGmw-015-4265-GF				
WBGmw-015-1		Explosives	4-Nitrotoluene	MG/L	1/ 1	0.00085	0.00085	WBGmw-015-4265-GF				
WBGmw-015-1		Explosives	Tetryl	MG/L	1/ 1	0.00092	0.00092	WBGmw-015-4265-GF				
WBGmw-015-2	N	Inorganics	Barium	MG/L	1/ 1	0.073	0.073	WBGmw-015-4265-GF	100	0/ 1	0.073	0.073
WBGmw-015-2		Inorganics	Calcium	MG/L	1/ 1	107	107	WBGmw-015-4265-GF				
WBGmw-015-2	N	Inorganics	Chromium	MG/L	1/ 1	0.0014	0.0014	WBGmw-015-4265-GF	5	0/ 1	0.0014	0.0014
WBGmw-015-2		Inorganics	Magnesium	MG/L	1/ 1	33.7	33.7	WBGmw-015-4265-GF				
WBGmw-015-2		Inorganics	Manganese	MG/L	1/ 1	0.23	0.23	WBGmw-015-4265-GF				
WBGmw-015-2		Inorganics	Nickel	MG/L	1/ 1	0.0023	0.0023	WBGmw-015-4265-GF				

Drum ID	Max > TCLP	Analysis Type	Chemical	Units	Proportion Detected	Mean	Max Detect	ID of Max Concentration	TCLP Criteria (mg/L)	Proportion >TCLP	Mean Adj. for TCLP (mg/L)	Max Detect Adj. for TCLP (mg/L)
WBGmw-015-2		Inorganics	Potassium	MG/L	1/ 1	2.3	2.3	WBGmw-015-4265-GF				
WBGmw-015-2		Inorganics	Sodium	MG/L	1/ 1	13.7	13.7	WBGmw-015-4265-GF				
WBGmw-015-2		Inorganics	Zinc	MG/L	1/ 1	0.5	0.5	WBGmw-015-4265-GF				
WBGmw-015-2		Explosives	1,3,5-Trinitrobenzene	MG/L	1/ 1	0.0013	0.0013	WBGmw-015-4265-GF				
WBGmw-015-2		Explosives	2,4,6-Trinitrotoluene	MG/L	1/ 1	0.00094	0.00094	WBGmw-015-4265-GF				
WBGmw-015-2		Explosives	2-Amino-4,6-dinitrotoluene	MG/L	1/ 1	0.00033	0.00033	WBGmw-015-4265-GF				
WBGmw-015-2		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.0026	0.0026	WBGmw-015-4265-GF				
WBGmw-015-2		Explosives	3-Nitrotoluene	MG/L	1/ 1	0.00031	0.00031	WBGmw-015-4265-GF				
WBGmw-015-2		Explosives	4-Nitrotoluene	MG/L	1/ 1	0.00085	0.00085	WBGmw-015-4265-GF				
WBGmw-015-2		Explosives	Tetryl	MG/L	1/ 1	0.00092	0.00092	WBGmw-015-4265-GF				
WBGmw-015-3	N	Inorganics	Barium	MG/L	1/ 1	0.073	0.073	WBGmw-015-4265-GF	100	0/ 1	0.073	0.073
WBGmw-015-3		Inorganics	Calcium	MG/L	1/ 1	107	107	WBGmw-015-4265-GF				
WBGmw-015-3	N	Inorganics	Chromium	MG/L	1/ 1	0.0014	0.0014	WBGmw-015-4265-GF	5	0/ 1	0.0014	0.0014
WBGmw-015-3		Inorganics	Magnesium	MG/L	1/ 1	33.7	33.7	WBGmw-015-4265-GF				
WBGmw-015-3		Inorganics	Manganese	MG/L	1/ 1	0.23	0.23	WBGmw-015-4265-GF				
WBGmw-015-3		Inorganics	Nickel	MG/L	1/ 1	0.0023	0.0023	WBGmw-015-4265-GF				
WBGmw-015-3		Inorganics	Potassium	MG/L	1/ 1	2.3	2.3	WBGmw-015-4265-GF				
WBGmw-015-3		Inorganics	Sodium	MG/L	1/ 1	13.7	13.7	WBGmw-015-4265-GF				
WBGmw-015-3		Inorganics	Zinc	MG/L	1/ 1	0.5	0.5	WBGmw-015-4265-GF				
WBGmw-015-3		Explosives	1,3,5-Trinitrobenzene	MG/L	1/ 1	0.0013	0.0013	WBGmw-015-4265-GF				
WBGmw-015-3		Explosives	2,4,6-Trinitrotoluene	MG/L	1/ 1	0.00094	0.00094	WBGmw-015-4265-GF				
WBGmw-015-3		Explosives	2-Amino-4,6-dinitrotoluene	MG/L	1/ 1	0.00033	0.00033	WBGmw-015-4265-GF				
WBGmw-015-3		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.0026	0.0026	WBGmw-015-4265-GF				
WBGmw-015-3		Explosives	3-Nitrotoluene	MG/L	1/ 1	0.00031	0.00031	WBGmw-015-4265-GF				
WBGmw-015-3		Explosives	4-Nitrotoluene	MG/L	1/ 1	0.00085	0.00085	WBGmw-015-4265-GF				
WBGmw-015-3		Explosives	Tetryl	MG/L	1/ 1	0.00092	0.00092	WBGmw-015-4265-GF				
WBGmw-016-1	N	Inorganics	Barium	MG/L	1/ 1	0.047	0.047	WBGmw-016-4266-GF	100	0/ 1	0.047	0.047
WBGmw-016-1		Inorganics	Calcium	MG/L	1/ 1	81.4	81.4	WBGmw-016-4266-GF				
WBGmw-016-1		Inorganics	Magnesium	MG/L	1/ 1	20.6	20.6	WBGmw-016-4266-GF				
WBGmw-016-1		Inorganics	Manganese	MG/L	1/ 1	0.54	0.54	WBGmw-016-4266-GF				
WBGmw-016-1		Inorganics	Nickel	MG/L	1/ 1	0.0022	0.0022	WBGmw-016-4266-GF				
WBGmw-016-1		Inorganics	Potassium	MG/L	1/ 1	1.7	1.7	WBGmw-016-4266-GF				
WBGmw-016-1		Inorganics	Sodium	MG/L	1/ 1	5	5	WBGmw-016-4266-GF				
WBGmw-016-1		Inorganics	Zinc	MG/L	1/ 1	0.019	0.019	WBGmw-016-4266-GF				
WBGmw-016-1	N	Explosives	2,4-Dinitrotoluene	MG/L	1/ 1	0.000068	0.000068	WBGmw-016-4266-GF	0.13	0/ 1	0.000068	0.000068
WBGmw-016-1		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.00022	0.00022	WBGmw-016-4266-GF				
WBGmw-016-1		Explosives	4-Nitrotoluene	MG/L	1/ 1	0.00017	0.00017	WBGmw-016-4266-GF				
WBGmw-016-1		Explosives	RDX	MG/L	1/ 1	0.00025	0.00025	WBGmw-016-4266-GF				
WBGmw-016-2	N	Inorganics	Barium	MG/L	1/ 1	0.047	0.047	WBGmw-016-4266-GF	100	0/ 1	0.047	0.047
WBGmw-016-2		Inorganics	Calcium	MG/L	1/ 1	81.4	81.4	WBGmw-016-4266-GF				
WBGmw-016-2		Inorganics	Magnesium	MG/L	1/ 1	20.6	20.6	WBGmw-016-4266-GF				
WBGmw-016-2		Inorganics	Manganese	MG/L	1/ 1	0.54	0.54	WBGmw-016-4266-GF				
WBGmw-016-2		Inorganics	Nickel	MG/L	1/ 1	0.0022	0.0022	WBGmw-016-4266-GF				

Drum ID	Max > TCLP	Analysis Type	Chemical	Units	Proportion Detected	Mean	Max Detect	ID of Max Concentration	TCLP Criteria (mg/L)	Proportion >TCLP	Mean Adj. for TCLP (mg/L)	Max Detect Adj. for TCLP (mg/L)
WBGmw-016-2		Inorganics	Potassium	MG/L	1/ 1	1.7	1.7	WBGmw-016-4266-GF				
WBGmw-016-2		Inorganics	Sodium	MG/L	1/ 1	5	5	WBGmw-016-4266-GF				
WBGmw-016-2		Inorganics	Zinc	MG/L	1/ 1	0.019	0.019	WBGmw-016-4266-GF				
WBGmw-016-2	N	Explosives	2,4-Dinitrotoluene	MG/L	1/ 1	0.000068	0.000068	WBGmw-016-4266-GF	0.13	0/ 1	0.000068	0.000068
WBGmw-016-2		Explosives	2-Nitrotoluene	MG/L	1/ 1	0.00022	0.00022	WBGmw-016-4266-GF				
WBGmw-016-2		Explosives	4-Nitrotoluene	MG/L	1/ 1	0.00017	0.00017	WBGmw-016-4266-GF				
WBGmw-016-2		Explosives	RDX	MG/L	1/ 1	0.00025	0.00025	WBGmw-016-4266-GF				
WBGmw-017-1	N	Inorganics	Barium	MG/L	1/ 1	0.053	0.053	WBGmw-017-4267-GF	100	0/ 1	0.053	0.053
WBGmw-017-1		Inorganics	Calcium	MG/L	1/ 1	71.6	71.6	WBGmw-017-4267-GF				
WBGmw-017-1		Inorganics	Iron	MG/L	1/ 1	0.43	0.43	WBGmw-017-4267-GF				
WBGmw-017-1		Inorganics	Magnesium	MG/L	1/ 1	18.1	18.1	WBGmw-017-4267-GF				
WBGmw-017-1		Inorganics	Manganese	MG/L	1/ 1	0.25	0.25	WBGmw-017-4267-GF				
WBGmw-017-1		Inorganics	Potassium	MG/L	1/ 1	1.4	1.4	WBGmw-017-4267-GF				
WBGmw-017-1		Inorganics	Sodium	MG/L	1/ 1	5.2	5.2	WBGmw-017-4267-GF				
WBGmw-017-1		Inorganics	Zinc	MG/L	1/ 1	0.019	0.019	WBGmw-017-4267-GF				
WBGmw-017-1		Explosives	1,3,5-Trinitrobenzene	MG/L	1/ 1	0.0003	0.0003	WBGmw-017-4267-GF				
WBGmw-017-1		Explosives	2,4,6-Trinitrotoluene	MG/L	1/ 1	0.00032	0.00032	WBGmw-017-4267-GF				
WBGmw-017-1		Explosives	Tetryl	MG/L	1/ 1	0.00059	0.00059	WBGmw-017-4267-GF				
WBGmw-017-2	N	Inorganics	Barium	MG/L	1/ 1	0.053	0.053	WBGmw-017-4267-GF	100	0/ 1	0.053	0.053
WBGmw-017-2		Inorganics	Calcium	MG/L	1/ 1	71.6	71.6	WBGmw-017-4267-GF				
WBGmw-017-2		Inorganics	Iron	MG/L	1/ 1	0.43	0.43	WBGmw-017-4267-GF				
WBGmw-017-2		Inorganics	Magnesium	MG/L	1/ 1	18.1	18.1	WBGmw-017-4267-GF				
WBGmw-017-2		Inorganics	Manganese	MG/L	1/ 1	0.25	0.25	WBGmw-017-4267-GF				
WBGmw-017-2		Inorganics	Potassium	MG/L	1/ 1	1.4	1.4	WBGmw-017-4267-GF				
WBGmw-017-2		Inorganics	Sodium	MG/L	1/ 1	5.2	5.2	WBGmw-017-4267-GF				
WBGmw-017-2		Inorganics	Zinc	MG/L	1/ 1	0.019	0.019	WBGmw-017-4267-GF				
WBGmw-017-2		Explosives	1,3,5-Trinitrobenzene	MG/L	1/ 1	0.0003	0.0003	WBGmw-017-4267-GF				
WBGmw-017-2		Explosives	2,4,6-Trinitrotoluene	MG/L	1/ 1	0.00032	0.00032	WBGmw-017-4267-GF				
WBGmw-017-2		Explosives	Tetryl	MG/L	1/ 1	0.00059	0.00059	WBGmw-017-4267-GF				
WBGmw-017-3	N	Inorganics	Barium	MG/L	1/ 1	0.053	0.053	WBGmw-017-4267-GF	100	0/ 1	0.053	0.053
WBGmw-017-3		Inorganics	Calcium	MG/L	1/ 1	71.6	71.6	WBGmw-017-4267-GF				
WBGmw-017-3		Inorganics	Iron	MG/L	1/ 1	0.43	0.43	WBGmw-017-4267-GF				
WBGmw-017-3		Inorganics	Magnesium	MG/L	1/ 1	18.1	18.1	WBGmw-017-4267-GF				
WBGmw-017-3		Inorganics	Manganese	MG/L	1/ 1	0.25	0.25	WBGmw-017-4267-GF				
WBGmw-017-3		Inorganics	Potassium	MG/L	1/ 1	1.4	1.4	WBGmw-017-4267-GF				
WBGmw-017-3		Inorganics	Sodium	MG/L	1/ 1	5.2	5.2	WBGmw-017-4267-GF				
WBGmw-017-3		Inorganics	Zinc	MG/L	1/ 1	0.019	0.019	WBGmw-017-4267-GF				
WBGmw-017-3		Explosives	1,3,5-Trinitrobenzene	MG/L	1/ 1	0.0003	0.0003	WBGmw-017-4267-GF				
WBGmw-017-3		Explosives	2,4,6-Trinitrotoluene	MG/L	1/ 1	0.00032	0.00032	WBGmw-017-4267-GF				
WBGmw-017-3		Explosives	Tetryl	MG/L	1/ 1	0.00059	0.00059	WBGmw-017-4267-GF				
WBGmw-017-4	N	Inorganics	Barium	MG/L	1/ 1	0.053	0.053	WBGmw-017-4267-GF	100	0/ 1	0.053	0.053
WBGmw-017-4		Inorganics	Calcium	MG/L	1/ 1	71.6	71.6	WBGmw-017-4267-GF				
WBGmw-017-4		Inorganics	Iron	MG/L	1/ 1	0.43	0.43	WBGmw-017-4267-GF				

Drum ID	Max > TCLP	Analysis Type	Chemical	Units	Proportion Detected	Mean	Max Detect	ID of Max Concentration	TCLP Criteria (mg/L)	Proportion >TCLP	Mean Adj. for TCLP (mg/L)	Max Detect Adj. for TCLP (mg/L)
WBGmw-017-4		Inorganics	Magnesium	MG/L	1/ 1	18.1	18.1	WBGmw-017-4267-GF				
WBGmw-017-4		Inorganics	Manganese	MG/L	1/ 1	0.25	0.25	WBGmw-017-4267-GF				
WBGmw-017-4		Inorganics	Potassium	MG/L	1/ 1	1.4	1.4	WBGmw-017-4267-GF				
WBGmw-017-4		Inorganics	Sodium	MG/L	1/ 1	5.2	5.2	WBGmw-017-4267-GF				
WBGmw-017-4		Inorganics	Zinc	MG/L	1/ 1	0.019	0.019	WBGmw-017-4267-GF				
WBGmw-017-4		Explosives	1,3,5-Trinitrobenzene	MG/L	1/ 1	0.0003	0.0003	WBGmw-017-4267-GF				
WBGmw-017-4		Explosives	2,4,6-Trinitrotoluene	MG/L	1/ 1	0.00032	0.00032	WBGmw-017-4267-GF				
WBGmw-017-4		Explosives	Tetryl	MG/L	1/ 1	0.00059	0.00059	WBGmw-017-4267-GF				

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Comment Responses for Draft
Phase III Remedial Investigation (RI) for the Winklepeck Burning Grounds (WBS) at the
Ravenna Army Ammunition Plant, Ravenna, Ohio
Comment Response Table
Rev. 02/28/05

Comment Number	Page or Sheet	Comment	Recommendation	Response
Ohio EPA NEDO, DERR and DDAGW				
1.	General	Please be advised that Ohio EPA has not yet received a revision to the executive summary (ES) of the ecological field truthing document. (Ohio EPA comment #4 on the preliminary-draft).	Please submit the revised ES as soon as possible.	Clarification. USACE has the lead for issuing the final revision of the field truthing document. Per the 10/20/04 comment resolution meeting on the preliminary draft Phase III RI, USACE has the action item to provide revisions to the Executive Summary of the field truthing report. No changes required to the Final Phase III RI Report.
2.	Figures 4-5, 4-7, and 4-8	Figures 4-5, 4-7, and 4-8 were not revised as requested. (Ohio EPA comment #34 on the preliminary-draft).	Please provide revised figures.	Agree. Figures have been revised as requested.
3.	Table 4-33	Please clarify on Table 4-33 why the heading still indicates that the sediment sample depth was at the 0-1 foot interval, and a footnote added that states 0.-0.5 feet. (Ohio EPA comment #49 on the preliminary-draft).	The header should be changed to 0 – 0.5 foot.	Agree. Depth intervals have been changed as requested.
4.	Page 4-105, line 13	In the revised document, please remove the term “possible” with respect to re-developing both WBGmw-006 and WBGmw-009. (Ohio EPA comment #50 on the preliminary draft).	Both wells will need to be re-developed, as greater than 10% of the screen is silted in.	Agree. The word “possible” has been removed from the text in the Final Phase III RI report.