

**FINAL
COMPREHENSIVE RANGE EVALUATION
PRELIMINARY SCREENING SYNOPSIS
DECISION POINT TWO REPORT (UPDATE)**

**NAVAL WEAPONS SYSTEMS TRAINING FACILITY
BOARDMAN, OREGON**

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ACRONYMS

bgs	below ground surface
BMcD	Burns & McDonnell Engineering Company, Inc.
cm	centimeter
CRE	Comprehensive Range Evaluation
CRREL	Cold Regions Research and Engineering Laboratory
CSM	Conceptual Site Model
DoD	Department of Defense
DP	Decision Point
DU	Decision Unit
ft	feet
FUDS	Formerly Used Defense Site
GPS	Global Positioning System
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
IDW	Investigation Derived Waste
MCs	munitions constituents
MDL	method detection limit
MEC	munitions and explosives of concern
µg /L	micrograms per Liter
mg/kg	milligrams per kilogram
mg/L	milligrams per Liter
MIS	Multi-Incremental Sampling
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NASWI	Naval Air Station Whidbey Island
NAVFAC	Naval Facilities
NFEC	Naval Facilities Engineering Command
NWSTF	Naval Weapons Systems Training Facility
OB/OD	Open Burn/Open Detonation
ODEQ	Oregon Department of Environmental Quality
ORSM	Operational Range Site Model
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
PSS	Preliminary Screening Synopsis
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCA	Range Condition Assessment
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RSEPA	Range Sustainability Environmental Program Assessment
RSL	Regional Screening Levels
SIM	selected ion monitoring
TPH	total petroleum hydrocarbons
USEPA	United States Environmental Protection Agency
USN	United States Navy
UXO	Unexploded Ordnance

1 INTRODUCTION

In accordance with the United States Navy's Range Sustainability Environmental Program Assessment Policy (RSEPA), the Naval Facilities (NAVFAC) Northwest initiated the Range Condition Assessment (RCA) 5-Year Review at the Naval Weapons Systems Training Facility (NWSTF) in Boardman, Oregon. The initial RCA (Naval Facilities Engineering Command [NFEC], 2004) was to ensure the protection of human health and the environment, and in support of the sustainment of range operations and access. The primary objectives of the 5-year RCA review are to:

- Evaluate changes from the previous RCA;
- Determine if further steps are necessary to maintain compliance;
- Evaluate the status and effectiveness of protective measures; and
- Evaluate revisions to the RSEPA Policy Implementation Manual (reference).

The RSEPA Technical Team for the Naval Air Station Whidbey Island (NASWI) Complex conducted the initial phase of this RCA 5-year review for NWSTF Boardman and determined that the following additional field work was necessary to obtain data to complete the 5-year review and assessment of the potential risk for an off-range release of munitions constituents (MCs) of potential concern:

- Surface soil sampling at four locations for MCs (explosives and nitroguanidine), perchlorate, and nitrite/nitrate using multi-incremental sampling (MIS) methods;
- Evaluation of the existing wells at NWSTF Boardman to determine their suitability for inclusion in groundwater monitoring to be conducted as part of the RCA 5-year review (this evaluation was completed as part of a site visit conducted on June 2 and 3, 2009);
- Installation of two additional monitoring wells near the northern boundary at NWSTF Boardman; and
- Sampling and analysis of groundwater from the nine existing (including all wells evaluated and determined to be suitable for sampling during previous field evaluation described above) and the two newly installed monitoring wells at NWSTF Boardman.

ECC, the prime contractor selected by NAVFAC NW managed these elements of the RCA from their Lakewood, Colorado office. ECC teamed with the Burns & McDonnell Engineering Company, Inc. (BMcD) to provide personnel to support the field activities at the NWSTF Boardman site and to produce the updated Decision Point Two (DP2) Report.

1.1 Project History and Site Description

1.1.1 Site History

NWSTF Boardman is located approximately three miles south of Boardman, Oregon in northern Morrow County, and encompasses approximately 47,432 acres (Figure 1-1). The site is part of the Northwest Range Training Complex managed by NASWI, Oak Harbor, Washington. Since 1941, the range has been used as a military training area by the U.S. Army, the U.S. Air Force,

and the U.S. Navy (USN). Currently NWSTF Boardman is an active and operational range operated by the USN for operational training. Originally, the range encompassed 95,986 acres; however, in 1960, the range was split into two sections. Ownership of the western section was transferred to the State of Oregon Department of Veteran Affairs and is listed as a Formerly Used Defense Site (FUDS). The eastern section of the property was transferred to the USN for use as an aerial bombing practice range.

The western section was leased to the Boeing Company, which operated the Boardman Space Age Industrial Park (a test location for jet and rocket engines). Boeing Agri-Industries assumed management of the lease in 1971 and used the area to produce crops. In 1975, Boeing leased 35,000 acres to P. J. Taggares Farms. In 1986, Boeing developed 4,000 acres as the Boardman Antenna Test Range. In 2000, Three-Mile Canyon Farms purchased the original Boeing lease and the property from the Oregon Department of Veteran Affairs, and currently maintains ownership.

Once the site was split in 1960, the USN used the eastern area as an aerial bombing range for aircraft located out of NASWI. NWSTF Boardman was used by NASWI for air-to-ground inert weapons delivery training for the Grumman A-6 Intruder aircraft until May 1996, when the A-6 was phased out.

In one case, documented use of a specific area within the range for open detonation of munitions has occurred (OB/OD Area of Figure 2-1). Other areas of the range appear to have been used for undocumented open detonation of munitions prior to USN assuming ownership of the range in 1960. With the exception of emergency responses conducted by NASWI Det or operational range clearance, munitions treatment no longer occurs on the range. The area is currently used for operational training by the USN. In the future, operational range uses may include the Oregon National Guard, as well as other Department of Defense (DoD) agencies.

1.1.2 Migration Pathways/Potential Off-Range Receptors

1.1.2.1 Groundwater

Basalt units of the Columbia River Basalt Group underlie the range at depths ranging from 8 feet below ground surface (bgs) at BW-2 to 93 feet bgs at the Demolition Area Well. Figure 1-2 shows the surface geology across the range and a geologic cross-section close to the range. The total basalt thickness is estimated to be 10,000 feet (ft) or more. These basalt units contain groundwater zones varying from a few ft thick to 300 ft thick. Sediments composed of eolian silt and sands, fluvial and or glaciofluvial sands and gravels were deposited during of the intervals between eruptive events. These extensive deposits of sediments also provide an important source of groundwater for the region. Across the range, groundwater occurs in fractured zones within the uppermost 10 to 30 ft of basalt at approximately 50 to 100 ft bgs. The upper 5 to 10 ft of the basalt is comprised of a low permeability basalt unit or a highly weathered clayey basalt unit. This results in confined groundwater conditions at depth.

In the northern portion of the range (Sections 25, 26, and 27 of Township 4 North, Range 25 East), shallow unconfined groundwater occurs in unconsolidated deposits above the uppermost basalt unit. The occurrence of this shallow system is due to infiltration of precipitation and surface water through the unconsolidated sediments until the water encounters the relatively

impermeable uppermost basalt unit. At BW-5 the depth to water was 59 ft bgs and the top of the weathered basalt was encountered at 61 ft bgs. At BW-4 the depth to water was 9 ft and the top of the weathered basalt was encountered at 15.5 ft bgs. BW-4 is located in Juniper Canyon. The shallow groundwater flows to the north northwest toward the Columbia River at a gradient of approximately 50 ft per mile.

1.1.2.2 Surface Water

Year round surface water bodies are not present at NWSTF Boardman. The site has two ephemeral ponds that were man made and intended for livestock. Grazing and livestock use no longer occurs on the range. These ponds capture seasonal rainwater and provide seasonal water for wildlife. A seasonal pond fed from onsite water wells is also present, but only contains water for approximately six to eight weeks in the spring depending on temporal conditions. Runoff from seasonal rainfall and/or snowmelt is the only natural surface water that occurs on the site. The closest permanent surface water bodies are the Carty Reservoir and the Columbia River, approximately two miles to the west and three miles north of the site, respectively.

1.1.2.3 Potential Receptors

Potential exposure routes could include direct contact with surface and subsurface soil, surface water, and/or ingestion of surface water and groundwater. Potential receptors include any industrial or construction workers, Navy personnel, researchers, and terrestrial wildlife. Other potential receptors could include any recreational users or hunters, which have gained access to the site illegally and may come in contact with contaminated media. Data collected during the Comprehensive Range Evaluation (CRE) Phase I indicated that on-range source areas were unlikely to contribute to an off-range release. Furthermore, based on the initial RCA (NFEC, 2004) and the CRE Phase 1 assessment (NFEC, 2006), there currently is no evidence that an off-range release has occurred. Data gathered from media sampling (surface and subsurface soil sampling and groundwater sampling) at potential source areas showed no concentrations exceeding established risk based screening concentrations for any of the full suite of compounds included in CRE Phase 1 assessment. On-range source areas that have been identified are located well within the NWSTF Boardman site and away from the range boundary.

1.2 Scope of Work

1.2.1 Monitoring Well Installation

Two new monitoring wells, Border Well 4 (BW-4) and Border Well 5 (BW-5), were installed at the NWSTF Boardman. Both monitoring wells were placed adjacent to the northern boundary of the site. These additional wells were installed to provide more complete groundwater data at the northern boundary of the range to better assess local groundwater flow regimes in this area. The installation process included monitoring well development and surveying. Additional details are presented in Section 2.1.1 of this report.

1.2.2 Groundwater Sampling

Eleven monitoring and supply wells were planned for groundwater sampling at NWSTF Boardman. This included the two new monitoring wells, plus seven monitoring wells installed in 2005 as part of the CRE, and two historical wells at the site. One of these historical wells was not sampled due to insufficient water for sample collection. Water samples were analyzed for explosive compounds, nitroguanidine, perchlorate, nitrate, nitrite, chloride, sulfate, and bicarbonate alkalinity. Additional details are presented in Section 2.1.2 of this report.

1.2.3 Soil Sampling

Surface soil samples were collected from the following four decision units (DUs) located within the operational range (see Figure 2-2):

- A former range munitions and scrap consolidation area (DU 4);
- A Potential Fuse Demolition Area (DU 8), where visual evidence of detonation craters and fragments from kick-out associated with detonation suggested past use of this area for open detonation of munitions, including fuse components;
- An area west of the current administrative compound (DU 9), that exhibited visual evidence consistent with past undocumented use of this area for open detonation of munitions (i.e. detonation craters and fragments of munitions items); and
- The former North Target Area (DU 11), which had been used as an historic range target area.

Samples were collected using MIS procedures, as described in Worksheet #11 of the project Quality Assurance Project Plan (QAPP) (ECC/BMcD, 2010), and were analyzed for explosive compounds, perchlorate, nitrate, and nitrite. Additional details are presented in Section 2.1.3 of this report.

2 FIELD INVESTIGATION

This section of the DP2 Report (Update) will address the field investigation activities conducted, including the monitoring well installation and development, groundwater sampling, and surface soil sampling. This section will also address decontamination procedures, analytical procedures, the data quality evaluation, and a discussion of the sampling results.

2.1 Field Investigation Tasks

Section 2.1 describes the field activities performed during June 2010 as part of the Five-Year Review RCA event. These activities included:

- The collection of surface soil samples, using MIS methodology, from DU 4, DU 8, DU 9, and DU 11;
- Installation and development of monitoring wells BW-4 and BW-5;
- Collection of groundwater samples from ten of eleven planned wells; and
- Survey of newly installed monitoring wells BW-4 and BW-5 locations.

All procedures for the MIS of surface soil, the installation and development of the new monitoring wells, and the collection of groundwater samples followed those outlined in Worksheet #11 of the project QAPP (ECC/BMcD, 2010). The QAPP is included with the Quality Control Summary Report in Appendix D. Any deviations from Worksheet #11, such as the development of BW-5, are discussed in the appropriate section of this report.

Figure 2-1 presents the location of all wells planned for groundwater sampling, including the locations of the two newly installed monitoring wells (BW-4 and BW-5). Figure 2-2 presents the location of the four DUs where surface soil samples were collected.

2.1.1 Monitoring Well Installation

Between June 1 and June 4, 2010, ECC and BMcD provided oversight for the drilling and installation of two monitoring wells on the northern boundary of the range as part of the RCA. Both monitoring wells were installed by Environmental West Exploration, a licensed driller from Spokane, Washington, in accordance with the Oregon Department of Environmental Quality (ODEQ) Administrative Rule 690-240. Prior to commencing the field work and drilling activities, a safety briefing and awareness training session for unexploded ordnance (UXO) and munitions and explosives of concern (MEC) was conducted at the administration building by USN personnel onsite. Prior to the drilling rig setting up on location, the ECC UXO technician surveyed the site and during drilling surveyed the first 5 feet (ft) of the wellbore.

The borings for monitoring wells BW-4 and BW-5 were advanced using a Schramm 300 air rotary drilling rig equipped with a Tubex XL Type 165/Odex system and a peripheral Ingersoll Rand air compressor. The Tubex/Odex system advanced 7.7-inch outside diameter steel outer casing by using a 6.5-inch diameter air hammer. Both boreholes were logged continuously by an Oregon registered geologist from drill cuttings from ground surface to total depth.

Monitoring well BW-4 was drilled first in a drainage feature in the vicinity of an area of suspected shallow groundwater based on past observation of surface water in a shallow trench (Figure 2-1). The borehole was advanced to a total depth of approximately 20 ft below ground surface (bgs). The upper 13 ft of the borehole consisted of silty sand. A layer of caliche gravel (approximately 0.2 ft thick) was detected at 13 ft bgs that was underlain by a 2.3 ft sand layer. The weathered basalt was encountered at roughly 15.5 ft bgs. Approximately 4.5 ft of weathered and fresh basalt was penetrated prior to reaching the total depth of the borehole. Water was observed at approximately 10 ft bgs during drilling as measured by the driller when encountered.

Following completion of the BW-4 drilling, the monitor well was installed. The well materials consisted of a 2-inch diameter, schedule 40 polyvinyl chloride (PVC) bottom plug; 10 ft of 0.010-inch machine-slotted, schedule 40 PVC screen; and 10 ft of schedule 40 PVC riser pipe. The bottom of the well was set at approximately 17.4 ft bgs. The annular space between well screen and the borehole wall was backfilled with 10-20 Colorado silica sand filter pack to approximately 5.5 ft bgs. Approximately 3.5 ft of hydrated bentonite chips were placed above the filter pack to within 2 ft of the ground surface. An above ground completion with a steel protective cover, concrete pad, and four bollards were installed.

Monitor well BW-5 was drilled on the crest of a hill or dune (Figure 2-1), following the same UXO clearance procedures. The borehole was drilled to a total depth of approximately 64 ft bgs. The upper 57.5 ft of the borehole consisted of silty sand. A layer of nodular caliche (approximately 3.5 ft thick) was detected at 57.5 ft. bgs. This caliche layer forms a local unconformity with the weathered basalt below the layer. Approximately 3 ft of weathered and fresh basalt was penetrated prior to reaching the total depth of the borehole.

Droplets of water were observed in the unconsolidated material during logging of the borehole, but no moisture was noted in the basalt. Since no measureable water was observed during or directly following drilling, a decision was made to pull the casing up approximately 10 ft and let the borehole set open overnight. The following morning approximately 3 ft of free water was measured in the borehole.

Monitor well BW-5 was design to collect the maximum saturated thickness of the water bearing zone. The monitor well was installed following discussions between NAVFAC Northwest, ODEQ, ECC, and BMcD to determine the placement depth for the screen. The well materials consisted of a 2-inch diameter, schedule 40 PVC bottom plug; 10 ft of 0.010-inch machine slotted, schedule 40 PVC screen; and 55.45 ft of schedule 40 PVC riser pipe. The bottom of the well was set at approximately 63 ft bgs. The annular space between well screen and the borehole wall was backfilled with 10-20 Colorado silica sand filter pack to approximately 51 ft bgs. Approximately 10 ft of hydrated bentonite chips were placed above the filter pack. Due to the depth of the well, approximately 39 ft of high solids bentonite grout was placed above the bentonite seal to within 2 ft of the ground surface. A steel protective cover, concrete pad, and four bollards were installed to complete the monitoring well.

The wells were developed by Environmental West Exploration and BMcD personnel. A minimum of 24 hours was allowed following completion of the monitoring wells for the proper curing of materials used in well construction before commencing development. Development was a two-stage process, with initial development performed using a bailer to surge the well and

remove sediment from the monitoring well, followed by the use of a submersible pump to complete development. Monitoring well BW-4 was developed by surging the screened interval and removing sediments with a weighted bailer. A twelve-volt pump was then used to pump the monitoring well and complete development. Stabilization readings were also collected during this phase of the well development process. Monitoring well BW-5 had insufficient water to use the two-stage development process. Following consultation with the ECC project manager, monitoring well BW-5 was surged and bailed dry twice on June 4th, removing a total of 5 well volumes. Monitoring well BW-5 was then bailed dry on June 6th and was allowed to recharge prior to sampling.

Soil cuttings from these two borings were spread on the ground on the NWSTF Boardman site. Well development water was containerized in 55-gallon steel drums and staged on-site.

All field documentation related to monitoring well installation and development (drilling logs, well construction diagrams, and well development forms) is provided in Appendix A of this report.

2.1.2 Groundwater Sampling

Nine of ten planned monitoring wells were sampled using low-flow sampling procedures from June 5th through June 8th, 2010. These included monitoring wells BW-1, BW-2, BW-3, BW-4, BW-5, OB/OD-1, OB/OD-2, OB/OD-3, and the Demo Area Well. In addition, Navy Well #2 at the Administration Area was sampled from a spigot. There was not sufficient water present to collect a sample from Navy Well #7. Monitoring well locations are depicted on Figure 2-1. Water samples were analyzed for explosive compounds, nitroguanidine, perchlorate, nitrate, nitrite, chloride, sulfate, and bicarbonate alkalinity. Detailed procedures for monitoring well sampling are presented in Worksheet #11 of the project QAPP (ECC/BMcD, 2010). Appendix B contains individual well sampling documents and this section describes which QAPP procedure was used for each well and any deviations from Worksheet #11 that occurred.

Monitoring wells were sampled using low-flow purging procedures and a non-dedicated bladder pump. Decontamination of the pump assembly is discussed in Section 2.2. The collection of groundwater samples using the low-flow purging method was ideally accomplished in four general steps:

- Determine the sustainable purge flow rate for the well;
- Obtain a stabilized water level in the well;
- Obtain stabilized water quality parameters; and
- Collect groundwater samples.

Stabilization parameters were collected with the use of a multi-probe meter and a flow-through cell. This facilitated the collection of temperature, pH, specific conductance, salinity, oxidation-reduction potential, and dissolved oxygen data from each monitoring well sampled with a bladder pump. In addition, turbidity was also measured. During purging and sampling of each well, field parameters and water levels were recorded every five minutes on the field groundwater sampling report form along with the date, time, and other pertinent sampling information. All data was recorded on both the field groundwater sampling report form and in the field logbook. Once field parameters stabilize over at least three consecutive readings while

a stabilized water elevation is maintained, the final set of field parameters were recorded, the flow-through cell was disconnected and samples for the lab were collected at a pump rate at or below the rate where water elevation stability was obtained. A final water level after completion of sampling was also recorded.

Monitoring wells BW-1, BW-2, BW-3, BW-4, OB/OD-3, and the Demo Area Well were all sampled using the above procedures for sustainable recovery wells. There was sufficient recharge that these six monitoring wells could be pumped at a constant flow rate, and both the water level and the field parameters could be stabilized.

Monitoring wells BW-5, OB/OD-1, and OB/OD-2 required the use of low-recovery well procedures. These three wells yielded insufficient recharge to stabilize the water level above the pump intake and to stabilize the field parameters, as required when using sustainable recovery well procedures. Therefore, the low-recovery well procedures specified in Worksheet #11 of the QAPP were used to complete monitoring well purging. For monitoring wells OB/OD-1 and OB/OD-2, all required field water quality parameters stabilized prior to sampling; however, the water level did not stabilize in the case of either monitoring well. All required samples were collected from both of these wells. Due to the limited amount of water present in monitoring well BW-5 during development, the ECC project manager directed the field sampling crew to purge only 1.25 gallons from the well, not stabilize parameters, and then collect samples for analysis. All required samples were collected from monitoring well BW-5.

Navy Well #7 could not be sampled due to insufficient water in the well. During purging, the water level did not stabilize. In addition, the field crew noted that the water had a gray color, foul odor, and dissolved oxygen was below normal site conditions (0.03 milligrams per liter [mg/L] compared to 3 to 10 mg/L). The ECC and NAVFAC project managers made a decision to suspend pumping, use a bailer to purge the well dry, and then check for recharge the next day. The purging of Navy Well #7 was performed on June 7th. The well was checked the next day and there was no recharge to the well.

Navy Well #2 was sampled from a tap at the Administration Area. Water was run from the spigot for approximately five minutes, during which time the well pump turned on. Approximately three gallons of water was purged during this process. Water samples were collected in a graduated cylinder for the determination of field parameters. It was not possible to take measurements of water levels or total depth, due to the physical configuration of the well.

Quality control samples, including field duplicates and matrix spike/matrix spike duplicate (MS/MSD) samples, were collected during the groundwater sampling. Rinsate blanks were also collected from non-dedicated bladder pumps by pumping deionized water through the pump. These rinsate blanks were sent to the laboratory and analyzed for the same suite of analytes collected from the monitoring wells. Temperature blanks were placed in each cooler shipped to the analytical laboratory

Investigative derived waste (IDW) consisting of approximately 25 gallons of purged groundwater was stored in labeled DOT approved drums on-site along with 55 gallons removed during well development. All field documentation related to the groundwater sampling (monitoring well sampling reports, logbook notes, and calibration forms) are provided in Appendix B of this report.

2.1.3 Soil Sampling

Surface soil samples were collected from the four DU grids (DU 4, DU 8, DU 9, and DU 11). The locations are shown on Figure 2-2. All soil samples were collected on June 4, 2010 using MIS procedures described in Worksheet #11 of the project QAPP (ECC/BMcD, 2010). Following UXO clearance, the four DU grids were laid out by ECC and NAVFAC personnel. The four corner stakes of each DU were then surveyed by ECC personnel using a hand-held Global Positioning System (GPS) to accurately delineate grid boundaries. A minimum of one-hundred sample locations were then marked and individually cleared for UXO within each DU grid. DU 8 and DU 9 were staked out as 100 ft squares, while DU 4 and DU 11 were staked as 69 by 159 ft rectangles. Figures 2.2a and 2.2b outline the shape of the units.

Soil samples were collected using a Cold Regions Research and Engineering Laboratory (CRREL) MIS tool. The MIS tool was assembled with a sample head of five centimeters (cm) in length and 1.75 cm in diameter. Crew members sampled using an alternating sample path covering all flagged sample locations within a DU for each location. The samples were composited into clean Ziploc storage bags and placed onto ice immediately after collection. These samples were shipped to the analytical laboratory, where they were analyzed for explosives, perchlorate, nitrate, and nitrite.

A field duplicate sample was collected at DU 9 to determine the precision and reproducibility of sample collection and analytical results. The primary sample from each location within the grid was collected as well as the duplicate sample at each of the same locations within the grid. The duplicate sample was collected in the same manner and placed in a separate container. This sample volume was sent to the laboratory and analyzed for the same parameters as the original sample. To provide information on any matrix interferences encountered during sample preparation and/or analysis, a MS/MSD was analyzed. The analytical laboratory prepared the MS/MSD sample by splitting one of the primary composite samples into three aliquots from a selected DU; therefore, a separate MS/MSD sample was not collected in the field in a separate sample container.

Field documentation related to the soil sampling is provided in Appendix C of this report.

2.2 Decontamination Procedures

All non-dedicated drilling and sampling equipment was decontaminated before drilling each new boring and prior to leaving the site. Hot, pressurized water was used to remove all visible soil and contamination from equipment, augmented by use of a stiff-bristled brush as necessary. Wastewater resulting from decontamination procedures was containerized, characterized, and disposed of in accordance with USN protocols.

The non-dedicated bladder pump used for groundwater sampling was decontaminated by pumping a mixture of deionized water and non-phosphate laboratory-grade detergent through the pump. The pump was then rinsed by pumping several liters of deionized water through the pump.

Because all soil samples collected within any DU were composited, there was no requirement to decontaminate the CRREL MIS tool between increments. However, the CRREL MIS tool was decontaminated between each of the four DUs. The cleaning process involved first removing all

adhering soil, then rinsing the sampling head with clean water, and finally rinsing the head with acetone.

A more detailed discussion of the decontamination procedures is found in Worksheet #11 of the project QAPP (ECC/BMcD, 2010).

2.3 Analytical Procedures

Per the project-specific QAPP, samples were collected and analyzed for the following:

- 8330B (nitroaromatics/nitramines),
- 8330Modified (M) (nitroguanidine),
- 6850 (perchlorate), and
- General chemistry methods (bicarbonate alkalinity, chloride, nitrate-nitrite, sulfate).

The scope of the project originally included total and dissolved RCRA metals. The February 2006 CRE Decision Point 2 document (NFEC, 2006) did not include RCRA metals when sampling the wells. Since the update to the Decision Point document was designed to only update the prior analytical, metals were removed from the scope of the sampling.

Analyses were performed by Test America – Sacramento. Locations of sample collection, corresponding sample identifications, and the required analyses are listed in Table 1-1 of the Quality Control Summary Report (QCSR), which is provided as Appendix D.

2.4 Data Quality Evaluation

Results for nitroguanidine and nitrobenzene in sample DU08-060410-001 were rejected (R) due to low MS/MSD recoveries. The nitroguanidine results for samples BW05-060710-001, BW04-060710-001, DAW-060810-001 and rinsate blank RB02-060710-001 were rejected (R) due to extraction holding times being exceeded. The impact to project objectives is believed to be minimal because these compounds were not detected in any other project samples. All other data are valid for use as qualified. No analytes were detected above the project screening values. Validation activities are detailed in the QCSR (Appendix D).

2.5 Sampling Results

2.5.1 Groundwater Sampling Results

Groundwater samples collected from wells at the site were evaluated for perchlorate, explosive compounds, and selected anions (bicarbonate alkalinity, chloride, nitrate-nitrite, and sulfate). The analytical results for the ten wells sampled are presented in Table 2-1. Table 2-2 presents positive detections only, which are summarized in the following bullets:

- Perchlorate was detected in all monitoring wells, except for BW-3, OB/OD-1, and the Demo Area Well. Concentrations ranged from 0.68 micrograms per liter ($\mu\text{g/L}$) at OB/OD-2 to 4.4 $\mu\text{g/L}$ at BW-5. All detected concentrations for perchlorate were below the screening concentration value of 15 $\mu\text{g/L}$.

- Explosive compounds were detected at monitoring well BW-5. Nitroglycerin was detected at a concentration of 0.690 µg/L (method detection limit [MDL] - 0.15 µg/L) and octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) was detected at a concentration of 0.059 µg/L (MDL - 0.027 µg/L). BW-5 is in the northeast corner of the range and distant from all range related activities.
- All four anions were detected at virtually all the monitoring wells. The only exception was that nitrate-nitrite was not detected at monitoring well BW-3. At the nine monitoring wells where nitrate-nitrite was detected, the concentrations ranged from 0.065 mg/L at OB/OD-1 to 54.20 mg/L at BW-4.

2.5.2 Soil Sampling Results

Surface soil samples collected from the four DUs at the site were evaluated for perchlorate, explosives, and nitrate-nitrite. The analytical results for the DUs are presented in Table 2-3. Table 2-4 presents positive detections only, which are summarized in the following bullets:

- Perchlorate was not detected in surface soil at any of the DUs.
- The explosive compounds hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) and/or tetryl were detected in soil samples collected at DU 8 and DU 9. RDX was detected at DU 9 at a concentration of 0.041 milligrams per kilogram (mg/kg). The concentration of RDX in the duplicate soil sample collected at DU 9 was 0.044 mg/kg. RDX was not detected at DU 8. Tetryl was detected at both DU 8 and DU 9 at concentrations of 1.40 mg/kg and 0.41 mg/kg, respectively. The concentration of tetryl in the duplicate sample collected at DU 9 was 2.40 mg/kg.
- Nitrate-nitrite was detected at all four DUs. Concentrations ranged from 2.8 mg/kg at DU 8 to 10.7 mg/kg at DU 11.

3 PRELIMINARY SCREENING

This updated preliminary screening synopsis (PSS) has been prepared to aid in the determination of potential MC migration off site. The following sections present a comparison of the analytical results with RSEPA target compound screening levels.

3.1 Comparison of Sampling Results to Screening Values

RSEPA target compound screening levels for groundwater are presented in Table 3-1 and RSEPA target compound screening levels for soil are presented in Table 3-2. These screening levels are based on United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs) and the USEPA interim drinking water health advisory for perchlorate (USEPA, 2010 and 2008).

3.1.1 Comparison of Groundwater Sampling Results to RSEPA Screening Values

Groundwater sampling results were compared to RSEPA target analyte screening values in accordance with RSEPA policy. HMX and nitroglycerin were detected in the groundwater sample collected from one monitoring well (BW-5). Perchlorate was detected in groundwater samples collected from most of the monitoring wells at the range. None of these detections exceeded screening levels for tap water (Tables 2-2 and 3-1).

3.1.2 Comparison of Soil Sampling Results to RSEPA Screening Values

Soil sampling results were compared to RSEPA target analyte screening values in accordance with RSEPA policy. RDX and tetryl were detected in surface soil collected at two of the four DUs sampled at the site. None of these detections exceeded screening levels for either residential or industrial soil (Tables 2-4 and 3-2).

4 OPERATIONAL RANGE SITE MODEL

4.1 Review and Update of Existing Operational Range Site Model

An Operational Range Site Model (ORSM) was developed for NWSTF Boardman in the original RCA (NFEC, 2004). The ORSM is analogous to a Conceptual Site Model (CSM) and aids in the following:

- Identifies types and locations of known or suspected sources of contamination;
- Identifies pathways for release, migration, or potential exposure to contaminants or hazards; and
- Identifies receptors and the associated exposure routes by which the receptors may come into contact with the contaminants or hazards.

The original ORSM for NWSTF Boardman included two primary historical and current munitions-related activities (weapons training and historical munitions treatment). Weapons training and munitions treatment are the primary activities. Within the weapons training activity, two primary source types are present, impact/target areas and aerial bombing ranges. The primary sources included in the munitions treatment activity include munitions consolidation areas MEC and documented and undocumented open detonation areas. The weapons training activity is both historical and current in nature, while the munitions treatment is primarily historical with limited open detonation operations currently conducted to support operational range clearance and emergency responses.

Primary release mechanisms for impact/target area include firing and the associated incomplete detonation, dud-fired and complete detonation elements. The aerial bombing release mechanisms also include incomplete detonation, dud-fired, and complete detonation elements linked with dropping the munitions. Kick-outs/incomplete detonation and burning are the mechanisms associated with the OB/OD areas. Expected munitions contamination includes MEC and MEC components, frag, unfired munitions, incompletely treated munitions, and MC. Secondary sources included surface soil, subsurface soil, and MC.

Transport and migration mechanisms include human activities, run-off (in the form of precipitation and snow melt), erosion, and percolation. Exposure media include the ground surface, subsurface soil/sediment, inland surface water and associated sediment, and groundwater. Exposure routes include direct contact with surface and subsurface soil, and surface water. Ingestion of surface water and groundwater are additional exposure routes.

Receptors include workers (both industrial and construction), Navy personnel, researchers, and terrestrial wildlife. Other potential receptors, such as recreational users and hunters are restricted from the area, but could be subject to contaminated media if they access the area illegally.

As part of the ORSM review conducted in conjunction with the original PSS, the ORSM was updated with the recommendation that all the receptor blocks for dermal exposure and ingestion of inland surface water and ingestion of groundwater be removed. This was the result of a lack of any MC compounds in groundwater at any source area well, as well as the fact that no surface water exists at any of these locations, nor does groundwater use occur at any of these locations.

The revised ORSM was included as Figure 4-2 in the 2006 DP2 Report (NFEC, 2006). This figure is included in Appendix E of this document.

4.2 Operational Range Site Model Review

In support of this updated DP2/PSS, the NWSTF Boardman ORSM was reviewed. The ORSM continues to accurately reflect site conditions regarding known or suspected sources of contamination, pathways for the release, migration, and potential exposure to contaminants, and the identification of receptors and associated exposure routes. A minor revision to the ORSM document was necessary to reflect the lack of landfill or munitions burial areas on the range based on current data.

5 DECISION POINT TWO (UPDATED)

The ultimate purpose of the DP2 of the RSEPA process for NWSTF Boardman is to answer the question: *Is there likely to be an off-range release that poses a potential risk to human health and the environment?* The following subsections examine the data collected during this updated DP2 investigation and answer this question.

5.1 Is There Likely to be an Off-Range Release That Poses a Potential Risk to Human Health and the Environment?

The soil and groundwater data collected during this updated DP2 investigation indicate that NWSTF Boardman potential source areas are not likely to contribute to an off-range release of MC at concentrations which exceed RSEPA screening levels. RDX and/or tetryl were detected in soil samples collected at DU-8 and DU-9. In the case of RDX, the concentrations were below the RSEPA screening levels (there is no screening level for tetryl). Both of these DUs are located inside the NWSTF Boardman boundary and several thousand feet away from the northern range boundary. Migration of contaminants to underlying water bearing deposits would be extremely unlikely given site conditions. Only one boundary well had detections of MC in groundwater; HMX and nitroglycerin were detected at monitoring well BW-5. These concentrations were both below the RSEPA screening levels.

5.2 Is Further Analysis Required to Assess Risk of Potential Off-Range Release?

Analytical data for soil and groundwater samples collected as part of this updated DP2 indicate there is no potential for off-range releases at NWSTF Boardman at concentrations which exceed the RSEPA screening levels. Further analysis to assess risk of potential off-range release at this time is not warranted.

5.3 Decision Point 2 Update Recommendations

Based upon the results of both soil and groundwater sampling conducted in conjunction with this DP2 update, no additional sampling is necessary. The RSEPA policy requirement for a RCA 5-year review should be completed in 2010. The results of this DP2 update should be incorporated into the RCA.

5.4 Protective Measures

The RSEPA Technical Team generated a table of recommended protective measures that enhance range sustainment and provide for a more secure operational environment in compliance with Navy and DoD policy. These protective measures were included in Table 5.1 of the 2006 DP2 Report (NFEC, 2006). Table 5.1 is included in Appendix E of this report.

Additional protective measures are only implemented when evidence of an off-range release has occurred or there is a substantial threat of an off-range release. Since soil and groundwater analytical results presented in this report indicate that there is neither evidence of, nor a significant threat of an off-range release, additional protective measures beyond those recommended in Table 5.1 are not required.

6 REFERENCES

- ECC/Burns & McDonnell Engineering Company, Inc., 2010. *Draft Final Range-Specific Quality Assurance Project Plan for Five-Year Review / Range Condition Assessment, Naval Weapons Systems Training Facility at Boardman, Oregon*. May.
- Naval Facilities Engineering Command (NFEC), 2004. *Range Condition Assessment Whidbey Island Complex, Phase II/Phase III*.
- NFEC, 2006. *Comprehensive Range Evaluation NWSWF Boardman Preliminary Screening Synopsis Decision Point Two Report*. February.
- United States Environmental Protection Agency (USEPA), 2008. *Interim Drinking Water Health Advisory for Perchlorate*, EPA 822-R-08-025, Office of Water, Washington, D.C.
- USEPA, 2010. Regional Screening Level Table (accessed at http://www.epa.gov/reg3hwmd/risk/human_rb-concentration_table/Generic_Tables/pdf/master_sl_table_bwrun_MAY2010.pdf)

TABLES

**Table 2-1
Analytical Results - Water
Updated Decision Point Two Report
NWSTF Boardman, Oregon**

Sample ID:	RB01-060410-001	BW01-060510-001	BW01-060510-001D	BW03-060510-01	BW02-060510-001	OB/OD03-060610-001	OB/OD01-060610-001	OB/OD02-060610-001					
Laboratory ID:	Rinsate Blank G0F080568-001	G0F080568-002	Field Duplicate G0F080568-003	G0F080568-004	G0F080568-005	G0F080568-006	G0F080568-007	G0F080568-008					
Sample Date:	6/4/2010	6/5/2010	6/5/2010	6/5/2010	6/5/2010	6/6/2010	6/6/2010	6/6/2010					
SDG:	G0F080568	G0F080568	G0F080568	G0F080568	G0F080568	G0F080568	G0F080568	G0F080568					
Compound	Units												
Perchlorate													
Perchlorate	ug/L	0.50	U	2.3	2.4	0.50	U	3.5	1.5	0.50	U	0.68	
Explosives													
Nitroguanidine	ug/L	20	U	20	U	20	U	20	U	20	U	20	U
4-Amino-2,6-dinitrotoluene	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
2-Amino-4,6-dinitrotoluene	ug/L	0.29	U	0.29	U	0.29	U	0.30	U	0.29	U	0.29	U
1,3-Dinitrobenzene	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
2,4-Dinitrotoluene	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
2,6-Dinitrotoluene	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
HMX	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
Nitrobenzene	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
Nitroglycerin	ug/L	0.97	U	0.98	U	0.98	U	0.99	U	0.97	U	0.96	U
4-Nitrotoluene	ug/L	0.97	U	0.98	U	0.98	U	0.99	U	0.97	U	0.96	U
2-Nitrotoluene	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
3-Nitrotoluene	ug/L	0.48	U	0.49	U	0.49	U	0.50	U	0.48	U	0.49	U
RDX	ug/L	0.24	U	0.24	U	0.24	U	0.25	U	0.24	U	0.24	U
Tetryl	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
1,3,5-Trinitrobenzene	ug/L	0.097	U	0.098	U	0.098	U	0.099	U	0.097	U	0.096	U
2,4,6-Trinitrotoluene	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
Anions													
Bicarbonate Alkalinity	mg/L			189	188	131	147	175	167	183			
Chloride	mg/L			53.9	53.8	62.4	53.5	19.6	45.8	9.4			
Nitrate-Nitrite	mg/L	0.050	U	9.3	9.5	0.050	U	33.4	6.1	3.7			
Sulfate	mg/L			108	108	187	62.8	54.3	121	40.2			

Notes:

Reportable detections are in BOLD font.

ID = Identification

J = Estimated

MDL = Method Detection Limit

J = Estimated

SDG = Sample Delivery Group

U = Not detected.

ug/L = Micrograms per Liter

mg/L = Milligrams per Liter

Table 2-1
Analytical Results - Water
Updated Decision Point Two Report
NWSTF Boardman, Oregon

Sample ID:		NV02-060610-001	BW05-060710-001	BW04-060710-001	RB02-060710-001	DAW-060810-001
Laboratory ID:		G0F080568-009	G0F090497-001	G0F090497-002	Rinsate Blank G0F090497-003	DEMO ATLAS WELL G0F100530-001
Sample Date:		6/6/2010	6/7/2010	6/7/2010	6/7/2010	6/8/2010
SDG:		G0F080568	G0F090497	G0F090497	G0F090497	G0F100530
Compound	Units					
Perchlorate						
Perchlorate	ug/L	2.60	4.4	2.5	0.50 U	0.50 U
Explosives						
Nitroguanidine	ug/L	20 U	20 UJ	20 UJ	20 UJ	20 UJ
4-Amino-2,6-dinitrotoluene	ug/L	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
2-Amino-4,6-dinitrotoluene	ug/L	0.30 U	0.30 U	0.30 U	0.29 U	0.31 U
1,3-Dinitrobenzene	ug/L	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
2,4-Dinitrotoluene	ug/L	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
2,6-Dinitrotoluene	ug/L	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
HMX	ug/L	0.15 U	0.059 J	0.15 U	0.15 U	0.15 U
Nitrobenzene	ug/L	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Nitroglycerin	ug/L	1.00 U	0.690 J	1.00 U	0.97 U	1.00 U
4-Nitrotoluene	ug/L	1.00 U	1.00 U	1.00 U	0.97 U	1.00 U
2-Nitrotoluene	ug/L	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
3-Nitrotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.48 U	0.51 U
RDX	ug/L	0.25 U	0.25 U	0.25 U	0.24 U	0.26 U
Tetryl	ug/L	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
1,3,5-Trinitrobenzene	ug/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
2,4,6-Trinitrotoluene	ug/L	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Anions						
Bicarbonate Alkalinity	mg/L	148	133	156	5.0 U	191
Chloride	mg/L	30.9	94.9	62.7	1.0 U	30.2
Nitrate-Nitrite	mg/L	17.4	41.50	54.20	0.050 U	0.12
Sulfate	mg/L	44.0	88	101	1.0 U	109

Notes:

Reportable detections are in BOLD font.

ID = Identification

J = Estimated

MDL = Method Detection Limit

J = Estimated

SDG = Sample Delivery Group

U = Not detected.

ug/L = Micrograms per Liter

mg/L = Milligrams per Liter

**Table 2-2
Detections - Water
Updated Decision Point Two Report
NWSTF Boardman, Oregon**

		Sample ID:	BW01-060510-001	BW01-060510-001D Field Duplicate	BW03-060510-01	BW02-060510-001	OB/OD03-060610-001	OB/OD01-060610-001	OB/OD02-060610-001							
		Laboratory ID:	G0F080568-002	G0F080568-003	G0F080568-004	G0F080568-005	G0F080568-006	G0F080568-007	G0F080568-008							
		Sample Date:	6/5/2010	6/5/2010	6/5/2010	6/5/2010	6/6/2010	6/6/2010	6/6/2010							
		SDG:	G0F080568	G0F080568	G0F080568-004	G0F080568	G0F080568	G0F080568	G0F080568							
Compound	Units Screening Values															
Perchlorate																
Perchlorate	ug/L	15	2.3	2.4	0.50	U	3.5	1.5	0.50	U	0.68					
Explosives																
HMX	ug/L	1,800	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U	0.15	U		
Nitroglycerin	ug/L	3.7	0.98	U	0.98	U	0.99	U	0.97	U	0.98	U	0.96	U	1.00	U
Anions																
Bicarbonate Alkalinity	mg/L	N/A	189	188	131		147	175	167		183					
Chloride	mg/L	N/A	53.9	53.8	62.4		53.5	19.6	45.8		9.4					
Nitrate-Nitrite	mg/L	58,000 / 3,700	9.3	9.5	0.050	U	33.4	6.1	0.065		3.7					
Sulfate	mg/L	N/A	108	108	187		62.8	54.3	121		40.2					

Notes:

Reportable detections are in BOLD font.

ID = Identification

J = Estimated

MDL = Method Detection Limit

N/A = Not Applicable

SDG = Sample Delivery Group

U = Not detected.

ug/L = Micrograms per Liter

mg/L = Milligrams per Liter

**Table 2-2
 Detections - Water
 Updated Decision Point Two Report
 NWSTF Boardman, Oregon**

		Sample ID:	NV02-060610-001	BW05-060710-001	BW04-060710-001	DEMO ATLAS WELL DAW-060810-001
		Laboratory ID:	G0F080568-009	G0F090497-001	G0F090497-002	G0F100530-001
		Sample Date:	6/6/2010	6/7/2010	6/7/2010	6/8/2010
		SDG:	G0F080568	G0F090497	G0F090497	G0F100530
Compound	Units	Screening Values				
Perchlorate						
Perchlorate	ug/L	15	2.60	4.4	2.5	0.50 U
Explosives						
HMX	ug/L	1,800	0.15 U	0.059 J	0.15 U	0.15 U
Nitroglycerin	ug/L	3.7	1.00 U	0.690 J	1.00 U	1.00 U
Anions						
Bicarbonate Alkalinity	mg/L	N/A	148	133	156	191
Chloride	mg/L	N/A	30.9	94.9	62.7	30.2
Nitrate-Nitrite	mg/L	58,000 / 3,700	17.4	41.50	54.20	0.12
Sulfate	mg/L	N/A	44.0	88	101	109

Notes:

Reportable detections are in BOLD font.

ID = Identification

J = Estimated

MDL = Method Detection Limit

N/A = Not Applicable

SDG = Sample Delivery Group

U = Not detected.

ug/L = Micrograms per Liter

mg/L = Milligrams per Liter

Table 2-3
Analytical Results - Soil
Updated Decision Point Two Report
NWSTF Boardman, Oregon

Sample ID:		DU09-060410-001	DU09-060410-001D	DU08-060410-011	DU04-060410-001	DU11-060410-001					
Laboratory ID:		G0F080568-010	Field Duplicate G0F080568-011	G0F080568-012	G0F080568-013	G0F080568-014					
Sample Date:		6/4/2010	6/4/2010	6/4/2010	6/4/2010	6/4/2010					
SDG:		G0F080568	G0F080568	G0F080568	G0F080568	G0F080568					
Compound	Units										
Perchlorate											
Perchlorate	ug/kg	6.2	U	5.6	U	5.8	U	5.4	U	5.4	U
Explosives											
Nitroguanidine	mg/kg	0.2500	U	0.25	U	0.25	UR	0.25	U	0.25	U
4-Amino-2,6-dinitrotoluene	mg/kg	0.25	UJ	0.25	UJ	0.24	UJ	0.25	UJ	0.24	UJ
2-Amino-4,6-dinitrotoluene	mg/kg	0.25	UJ	0.25	U	0.24	UJ	0.25	U	0.24	U
1,3-Dinitrobenzene	mg/kg	0.25	U	0.25	U	0.24	UJ	0.25	U	0.24	U
2,4-Dinitrotoluene	mg/kg	0.25	U	0.25	U	0.24	UJ	0.25	U	0.24	U
2,6-Dinitrotoluene	mg/kg	0.25	U	0.25	U	0.24	UJ	0.25	U	0.24	U
HMX	mg/kg	0.25	U	0.25	U	0.24	UJ	0.25	U	0.24	U
Nitrobenzene	mg/kg	0.25	U	0.25	U	0.24	UR	0.25	U	0.24	U
Nitroglycerin	mg/kg	0.50	U	0.50	U	0.48	UJ	0.50	U	0.48	U
2-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.24	UJ	0.25	U	0.24	U
3-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.24	UJ	0.25	U	0.24	U
4-Nitrotoluene	mg/kg	0.50	U	0.50	U	0.48	UJ	0.50	U	0.48	U
RDX	mg/kg	0.041	J	0.044	J	0.24	UJ	0.25	U	0.24	U
Tetryl	mg/kg	0.41	J	2.40	J	1.40	J	0.25	U	0.24	U
1,3,5-Trinitrobenzene	mg/kg	0.25	U	0.25	U	0.24	UJ	0.25	U	0.24	U
2,4,6-Trinitrotoluene	mg/kg	0.25	U	0.25	U	0.24	UJ	0.25	U	0.24	U
Anions											
Nitrate-Nitrite	mg/kg	3.5		5.7		2.8		3.5		10.7	

Notes:

Reportable detections are in BOLD font.

ID = Identification

J = Estimated

MDL = Method Detection Limit

J = Estimated

R = Rejected

SDG = Sample Delivery Group

U = Not detected.

ug/kg = micrograms per kilogram

mg/kg = milligrams per kilogram

**Table 2-4
 Detections - Soil
 Updated Decision Point Two Report
 NWSTF Boardman, Oregon**

			Sample ID:	DU09-060410-001	DU09-060410-001D Field Duplicate	DU08-060410-011	DU04-060410-001	DU11-060410-001				
			Laboratory ID:	G0F080568-010	G0F080568-011	G0F080568-012	G0F080568-013	G0F080568-014				
			Sample Date:	6/4/2010	6/4/2010	6/4/2010	6/4/2010	6/4/2010				
			SDG:	G0F080568	G0F080568	G0F080568	G0F080568	G0F080568				
Compound	Units	Screening Values										
Explosives												
RDX	mg/kg	5.5	0.041	J	0.044	J	0.24	UJ	0.25	U	0.24	U
Tetryl	mg/kg	N/A	0.41	J	2.40	J	1.40	J	0.25	U	0.24	U
Anions												
Nitrate-Nitrite	mg/kg	130,000 / 7,800	3.5		5.7		2.8		3.5		10.7	

Notes:

Reportable detections are in BOLD font.

ID = Identification

J = Estimated

MDL = Method Detection Limit

J = Estimated

SDG = Sample Delivery Group

U = Not detected.

ug/kg = micrograms per kilogram

mg/kg = milligrams per kilogram

Table 3-1
Screening for MCs in Groundwater Samples
Updated Decision Point Two Report
NWSTF Boardman, Oregon

Munitions Constituent	Tap Water (ug/L)	Exceeds Screening Value (Yes/No)	List Locations of Exceedances
HMX	1,800 (Note 1)	No	N/A
Nitroglycerin	3.7 (Note 1)	No	N/A
Perchlorate	15 (Note 2)	No	N/A

N/A - Not applicable

1. Value from USEPA Regional Screening Level Table (May 2010)
2. Value from USEPA Interim Drinking Water Health Advisory for Perchlorate, EPA 822-R-08-025, Office of Water, Washington, D.C. (December 2008)

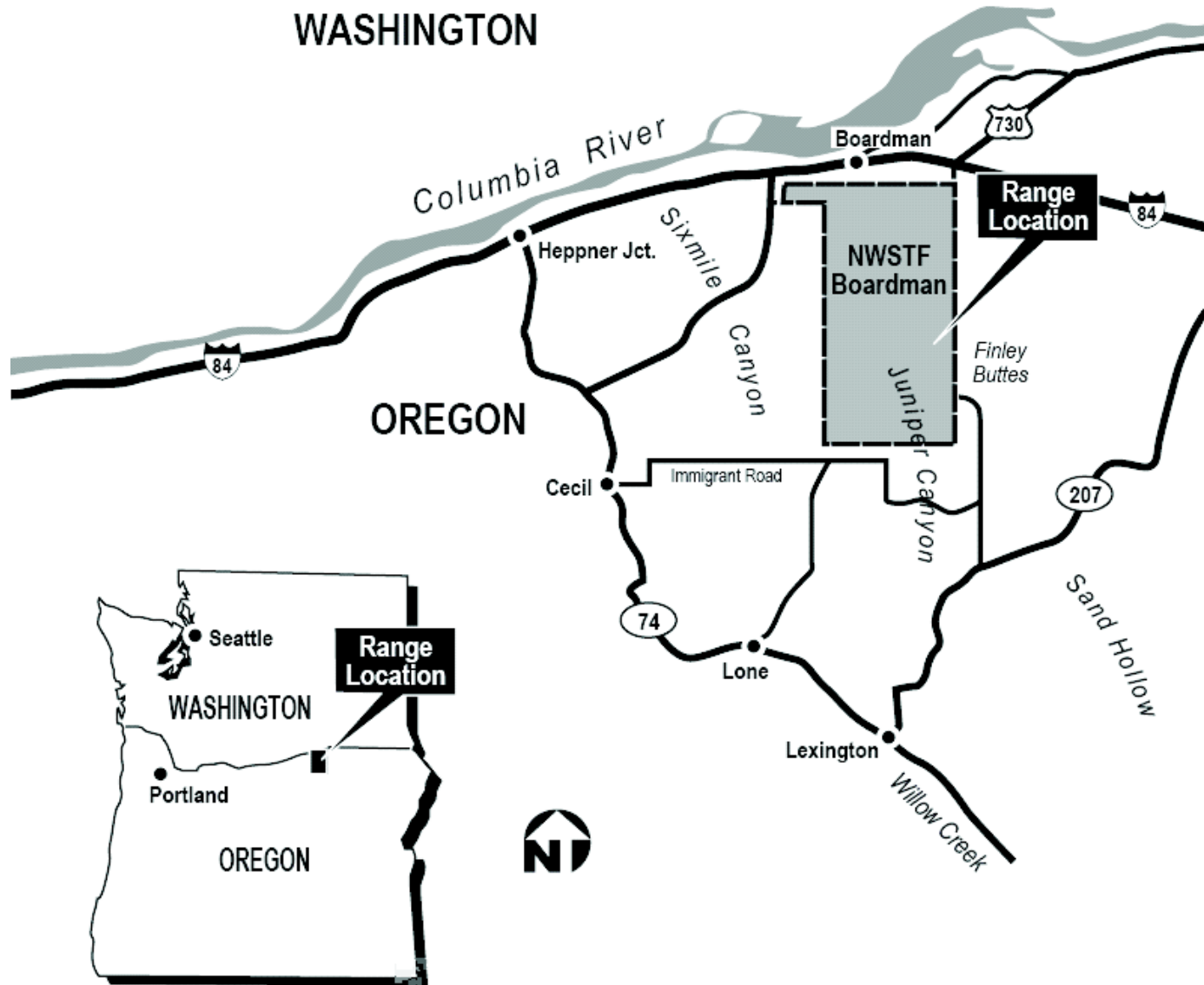
Table 3-2
Screening for MCs in Surface Soil Samples
Updated Decision Point Two Report
NWSTF Boardman, Oregon

Munitions Constituent	Soil Residential (mg/kg)	Soil Industrial (mg/kg)	Exceeds Screening Value (Yes/No)	List Locations of Exceedances
RDX	5.5	24	No, Residential No, Industrial	N/A
Tetryl	240	2,500	No, Residential No, Industrial	N/A

N/A - Not applicable

1. Residential and industrial soil screening levels taken from USEPA Regional Screening Level Table (May 2010)

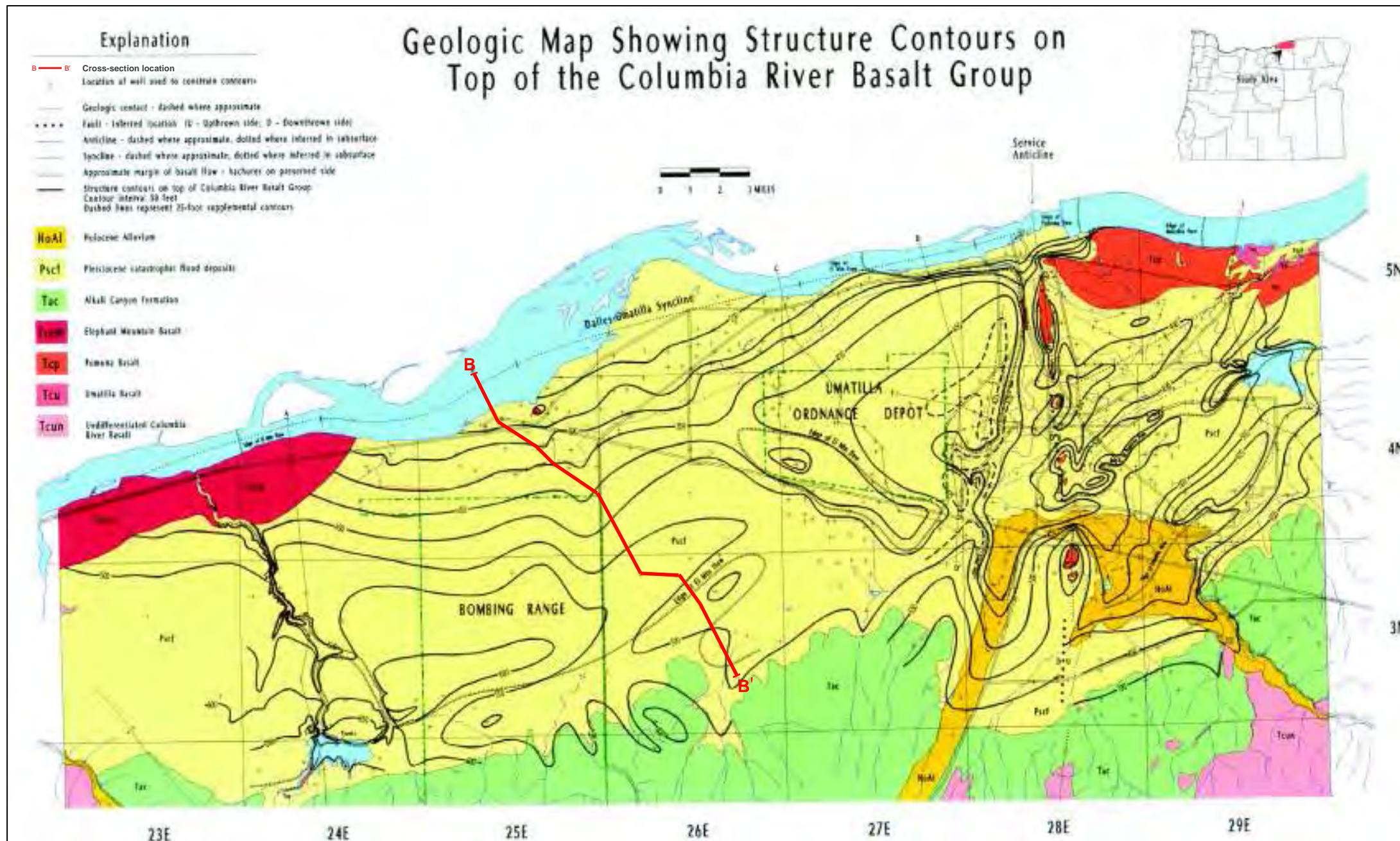
FIGURES



Note:
 Figure from the Comprehensive Range
 Evaluation, NWSTF Boardman Preliminary
 Screening Synopsis, Decision Point Two Report,
 US Navy, February, 2006.



Figure 1-1
Site Location Map
Updated Decision Point Two Report
NWSTF Boardman



Source: Lower Umatilla Groundwater Technical Report (1995)

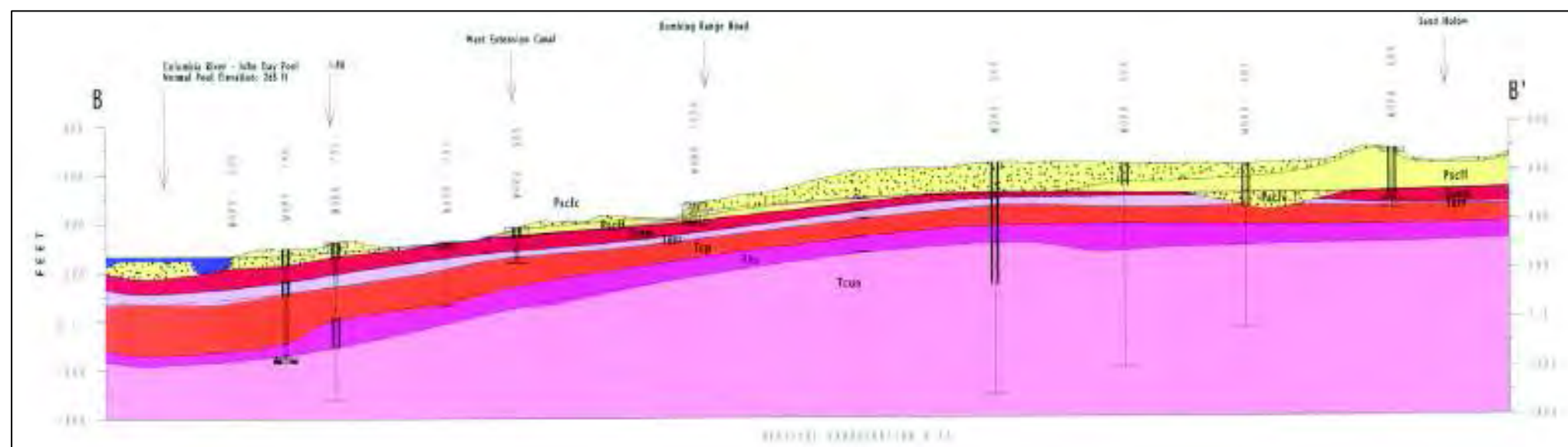
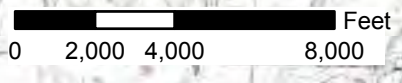
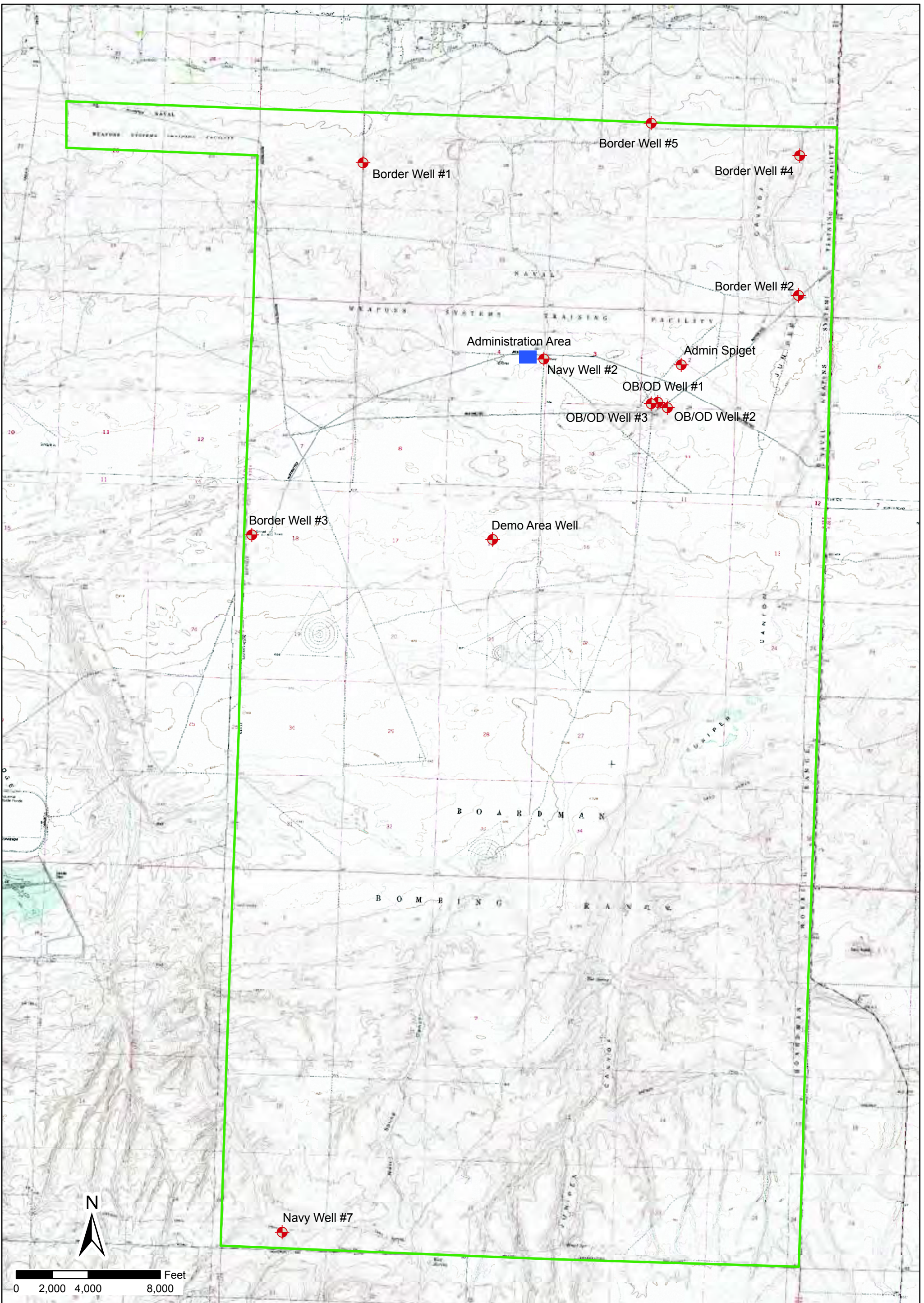






Figure 1-2
Geologic Map and Geologic Cross-Section
Updated Decision Point Two Report
NWSTF Boardman



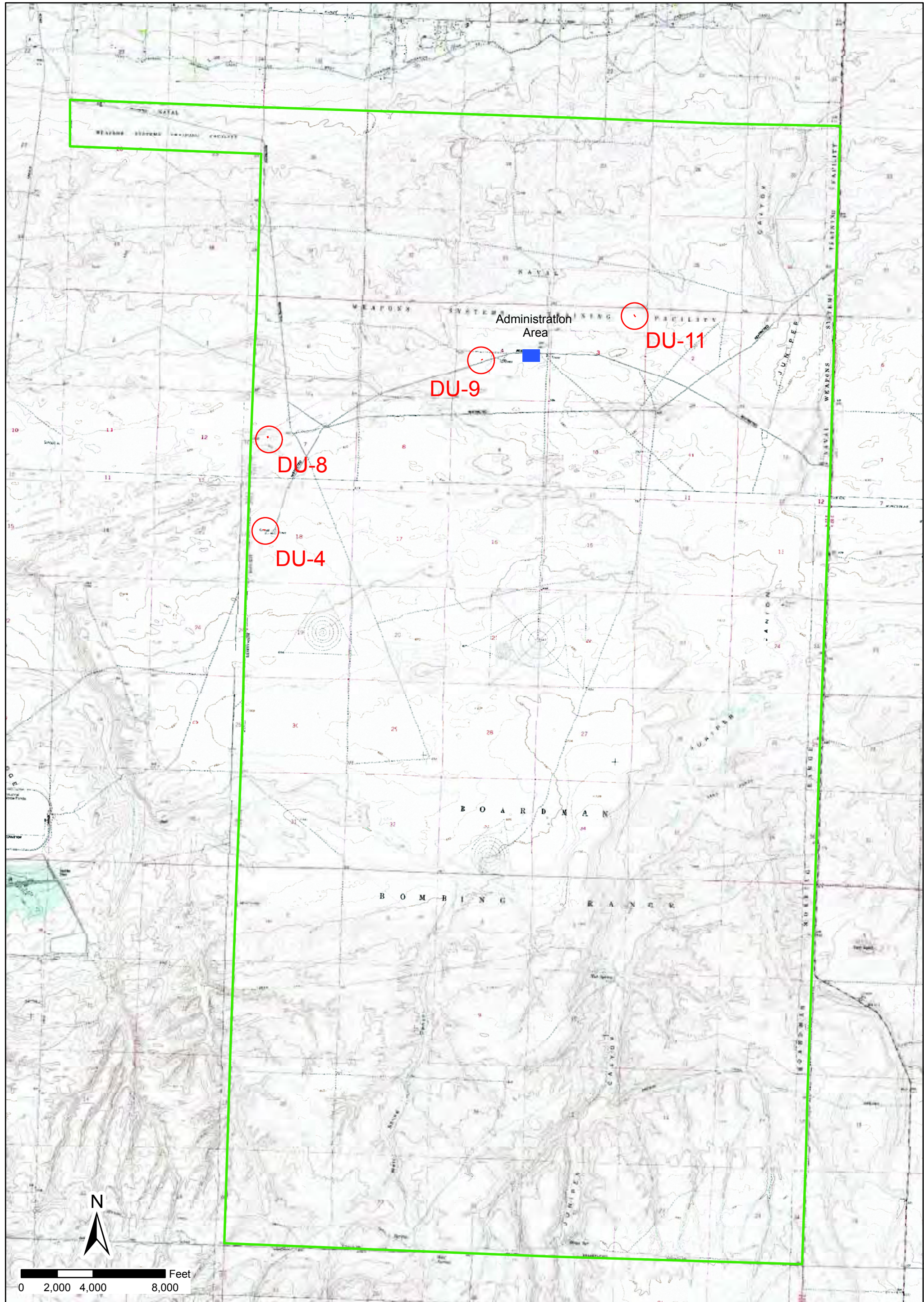
	Monitoring Well
	Administration Area
	NWSTF Boardman Boundary






DO47
Naval Weapons Systems
Training Facility Boardman


Comprehensive Range Evaluation

Figure 2-1
Groundwater Sampling Locations
Updated Decision Point Two Report
NWSTF Boardman



Legend

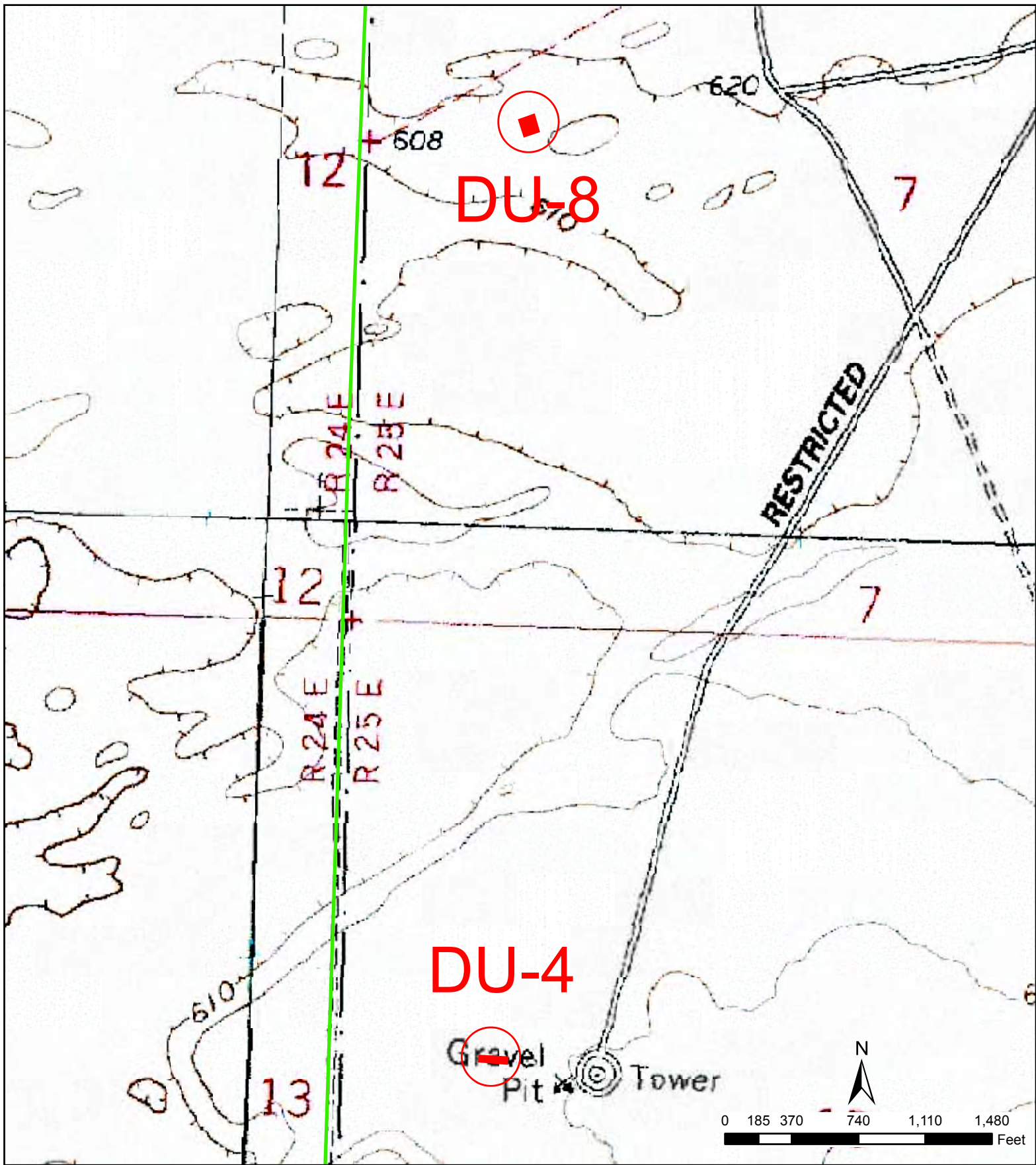
-  Decision Unit
-  Administration Area
-  NWSTF Boardman Boundary






DO47
Naval Weapons Systems
Training Facility Boardman

Comprehensive Range Evaluation

Figure 2-2
Soil Sample Locations
Updated Decision Point Two Report
NWSTF Boardman



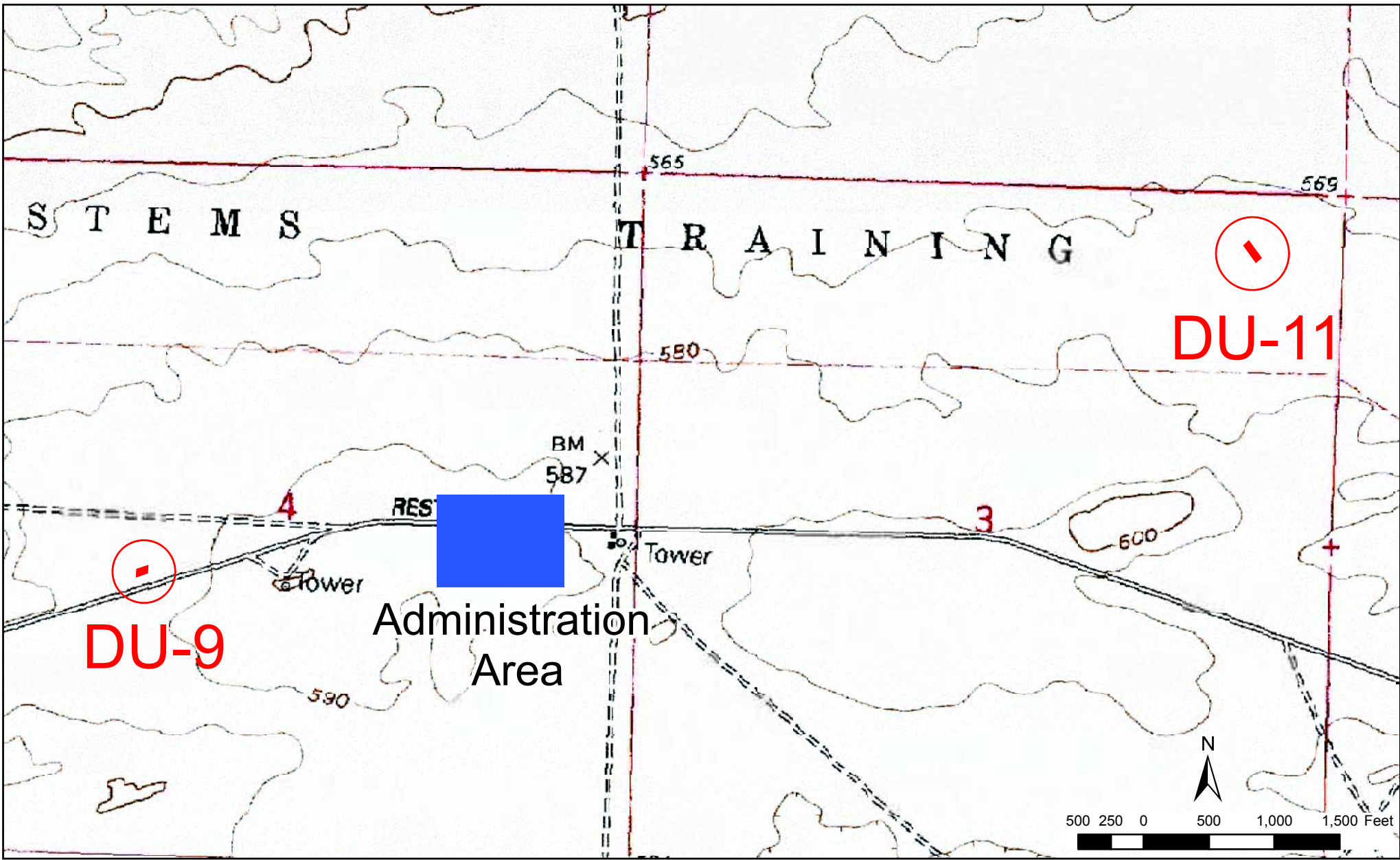
Legend

-  Decision Unit
-  Administration Area
-  NWSTF Boardman Boundary







DO47
 Naval Weapons Systems
 Training Facility Boardman
 Comprehensive Range Evaluation

Figure 2-2a
Soil Sample Locations
DU4 and DU8
Updated Decision Point Two Report
NWSTF Boardman



Legend

-  Decision Unit
-  Administration Area
-  NWSTF Boardman Boundary



DO47
Naval Weapons Systems
Training Facility Boardman

Comprehensive Range Evaluation

Figure 2-2b
Soil Sample Locations
DU9 and DU11
Updated Decision Point Two Report
NWSTF Boardman

APPENDIX A

MONITORING WELL INSTALLATION AND

DEVELOPMENT DOCUMENTATION

HTW DRILLING LOG

HOLE NO. AREA #12 MW

1. COMPANY NAME BURNS & MCDONNELL		2. DRILLING SUBCONTRACTOR ENVIRONMENTAL WEST EXPLORATION		SHEET 1 OF 3 SHEETS		
3. PROJECT BOARDMAN NWSTE		4. LOCATION (GPS) 45°48'07.3"N 119°37'52.6" W				
5. NAME OF DRILLER TIM SMITH		6. MANUFACTURER'S DESIGNATION OF DRILL SCHRAM T-300				
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	6.5" TUBEX AIR ROTARY		8. HOLE LOCATION 779695.600N 8423653.168E OREGON STATE PLANE			
	TUBEX XL TYPE 165		9. SURFACE ELEVATION 450.93			
			10. DATE STARTED 6/2/10		11. DATE COMPLETED 6/2/10	
12. OVERBURDEN THICKNESS 15.5 ft		15. DEPTH GROUNDWATER ENCOUNTERED 9.95 ft bgs				
13. DEPTH DRILLED INTO ROCK 4.5 ft		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 8.77 ft bgs ≈ 25 HRS				
14. TOTAL DEPTH OF HOLE 20 ft		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)				
18. GEOTECHNICAL SAMPLES		DISTURBED NA	UNDISTURBED NA	19. TOTAL NUMBER OF CORE BOXES NA		
20. SAMPLES FOR CHEMICAL ANALYSIS		VOC NA	METALS NA	OTHER (SPECIFY) NA	OTHER (SPECIFY) NA	OTHER (SPECIFY) NA
						21. TOTAL CORE RECOVERY NA %
22. DISPOSITION OF HOLE		BACKFILLED	MONITORING WELL X	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR <i>[Signature]</i>	

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO.	BLOW COUNTS g	REMARKS h
	1	<p>SAND, SILTY, MODERATE BROWN (5 YR 3/1), FINE GRAINED, POORLY GRADED, 'DAMP, LOOSE' TO MEDIUM DENSITY</p>	NA	NA	NA	NA	<p>STARTED 1135 LOGGED FROM CHIPS</p>
	2						
	3						
	4						
	5						

HTW DRILLING LOG

HOLE NO. **BW-4**

PROJECT **BOARDMAN NWSTF**

INSPECTOR

SHEET **2**
OF **3** SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SAND, SILTY, MODERATE BROWN (5YR 3/4), FINE GRAINED, POORLY GRADED, LOOSE TO MEDIUM DENSITY, MOIST					UXO CLEARANCE
	6		N/A	N/A	N/A	N/A	
	7						
	8						
	9						
	10	COLOR CHANGE TO DUSKY BROWN (5YR 2/2) MOIST TO WET					Wet/ Brit Damp @ 10 ft 1145 Driller Measured ✓ WL @ 9.95' bgs
	11		N/A	N/A	N/A	N/A	
	12						
	13	Caliche gravel, WET					
	14	SAND, SILTY, DUSKY BROWN (5YR 2/2), FINE GRAINED, POORLY GRADED, LOOSE TO MEDIUM DENSITY WET					



051601
Form MRK-55-2

PROJECT **53170**

HOLE NO. **AREA #12 M12**
BW-4

HTW DRILLING LOG

HOLE NO. AREA #12 MW
SHEET # 3 OF 3 SHEETS

PROJECT			INSPECTOR				REMARKS
ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND, SILTY, DUSKY BROWN (5YR2/2), FINE GRAINED, POORLY GRADED, WET, LOOSE TO MEDIUM DENSITY	NA	NA	NA	NA	
	15		NA	NA	NA	NA	
	16	BASALT WEATHERED, BROWNISH GRAY (5YR4/1) TO BROWNISH BLACK (5YR7/1), WET TO MOIST, CaCO ₃ NOTED ON SOME SURFACES OF CHIPS.					
	17						
	18						
S	19	BASALT, FRESH, GRAYISH BLACK (2N2) & DARK GREENISH GRAY (5GY4/1), DAMP, MASSIVE, DRY ₇₀					Measured TD 19.1ft logs
	20	TD = 20ft					TD reached 1210 6-2-10
	21						
	22						
	23						

BW-5

HTW DRILLING LOG

HOLE NO. **BORDER WELL # 45**

1. COMPANY NAME BURNS & McDONNELL		2. DRILLING SUBCONTRACTOR ENVIRONMENTAL WEST EXPLORATION		SHEET 1 OF 8 SHEETS	
3. PROJECT BOARDMAN NWSTF		(GPS)		4. LOCATION N 45° 48' 22.3" W 119° 39' 50.0"	
5. NAME OF DRILLER TIM SMITH		6. MANUFACTURER'S DESIGNATION OF DRILL SCHRAM T-300			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT		COR TUBEX AIR ROTARY		8. HOLE LOCATION 781134.069N 8415319.254E OREGON	
		TUBEX XL TYPE 165		779695.6 N 8423653.160E STATE PLANE	
				9. SURFACE ELEVATION 472.42	
12. OVERBURDEN THICKNESS 61ft		15. DEPTH GROUNDWATER ENCOUNTERED NO FREE H2O During Drilling			
13. DEPTH DRILLED INTO ROCK 3ft		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 59.2 ft bgs 18hr 45 mins			
14. TOTAL DEPTH OF HOLE 64 ft		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) 60.7ft bgs 15h 50 mins			
18. GEOTECHNICAL SAMPLES		DISTURBED NA	UNDISTURBED NA	19. TOTAL NUMBER OF CORE BOXES NA	
20. SAMPLES FOR CHEMICAL ANALYSIS		VOC NA	METALS NA	OTHER (SPECIFY) NA	OTHER (SPECIFY) NA
21. TOTAL CORE RECOVERY NA%		OTHER (SPECIFY) NA	OTHER (SPECIFY) NA	OTHER (SPECIFY) NA	OTHER (SPECIFY) NA
22. DISPOSITION OF HOLE		BACKFILLED	MONITORING WELL X	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR <i>[Signature]</i>

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	1	SAND, SILTY, DARK YELLOWISH BROWN (10YR 4/12) TO BROWNISH BLACK (5YR 2/1), FINE GRAINED, POORLY GRADED, DAMP, LOOSE TO MEDIUM DENSITY, TRACE FINE GRAVEL					STARTED 1509 LOGGED FROM CUTTINGS
	2						
	3						
	4						
	5						

HTW DRILLING LOG

HOLE NO. **BW-5**

PROJECT **53170**

INSPECTOR **Jeff Binder**

SHEET OF **2** SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SAND, SILTY, DARK YELLOW/BROWN (10YR 4/2), FINE GRAINED, POORLY GRADED, DAMP TO DRY, LOOSE TO MEDIUM DENSITY	NA	NA	NA	NA	checked for MEC/UXO @ bottom
	6						
	7						
	8		NA	NA	NA	NA	
	9						
	10						
	11						
	12						
	13		NA	NA	NA	NA	
	14						

HTW DRILLING LOG

HOLE NO. **BW-5**

PROJECT

53170

INSPECTOR

Jeff Bindy

SHEET **3**
OF **8** SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND, SILTY, DARK YELLOWISH BROWN (10 YR 4/2), FINE GRAINED, POORLY GRAINED, DRY, LOOSE TO MEDIUM DENSITY	NA	NA	NA	NA	
	15						
	16						
	17						
	18		NA	NA	NA	NA	31534
	19						
	20						
	21						
	22						
	23						

PROJECT

53170

HOLE NO.

BW-5

HTW DRILLING LOG

HOLE NO. **BW-5**

PROJECT **53170**

INSPECTOR **Jeff Bindy**

SHEET **14**
OF **8** SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	23	SAND, SILTY, DARK YELLOWISH BROWN (10YR 4/2), FINE GRAINED, POORLY GRADED, DRY, LOOSE TO MEDIUM DENSITY	NA	NA	NA	NA	
	24						
	25						
	26						
	27						
	28	Same as above with some finer sand & mica flakes	NA	NA	NA	NA	
	29						
	30						
	31						
	32						

HTW DRILLING LOG

 HOLE NO. **BW-5**

 PROJECT **53170**

 INSPECTOR **Jeff Binder**

 SHEET OF **5** SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	32	SAND, SILTY, DARK YELLOWISH BROWN (10 YR 4/2) FINE GRAINED, POORLY GRADED, DRY, LOOSE TO MEDIUM DENSITY					
	33		NA	NA	NA	NA	
	34						
35	35 36						
	36						
	37 38						
	38		NA	NA	NA	NA	
	39 40						
	41						

HTW DRILLING LOG

HOLE NO. **BW-5**

PROJECT **53170**

INSPECTOR **Jeff Binder**

SHEET **10**
OF **8** SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	41	SAND, SILTY, DARK YELLOWISH BROWN (10YR 4/2), FINE GRAINED, POORLY GRADED, DRY, LOOSE TO MEDIUM DENSITY					
	42						
	43		NA	NA	NA	NA	
	44						
	45						
	46						
	47						
	48		NA	NA	NA	NA	
	49						
	50						



051601
Form MRK-55-2

PROJECT **53170**

HOLE NO. **BW-5**

HTW DRILLING LOG

HOLE NO. *BW-5*

PROJECT *53170*

INSPECTOR *Jeff Binder*

SHEET OF *7* SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	<i>50</i>	<i>SAND SILTY, DARK YELLOWISH BROWN (10YR 4/2) FINE GRAINED, POORLY GRADED, DRY, LOOSE TO MEDIUM DENSITY</i>	<i>NA</i>	<i>NA</i>	<i>NA</i>	<i>NA</i>	
	<i>51</i>						
	<i>52</i>						
	<i>53</i>		<i>NA</i>	<i>NA</i>	<i>NA</i>	<i>NA</i>	
	<i>54</i>						
	<i>55</i>	<i>Sand becoming moist to wet</i>					
	<i>56</i>						
	<i>57</i>						
	<i>58</i>	<i>CALICHE, NODULAR, PINKISH GRAY (5YR 8/1) TO MODERATE YELLOWISH BROWN (10YR 5/4) WITH FINE SILTY SAND & SANDY CLAY, MEDIUM TO DENSE, CALCAREOUS, MOIST</i>	<i>NA</i>	<i>NA</i>	<i>NA</i>	<i>NA</i>	
	<i>59</i>						



HTW DRILLING LOG

HOLE NO. **BW-5**

PROJECT **53170**

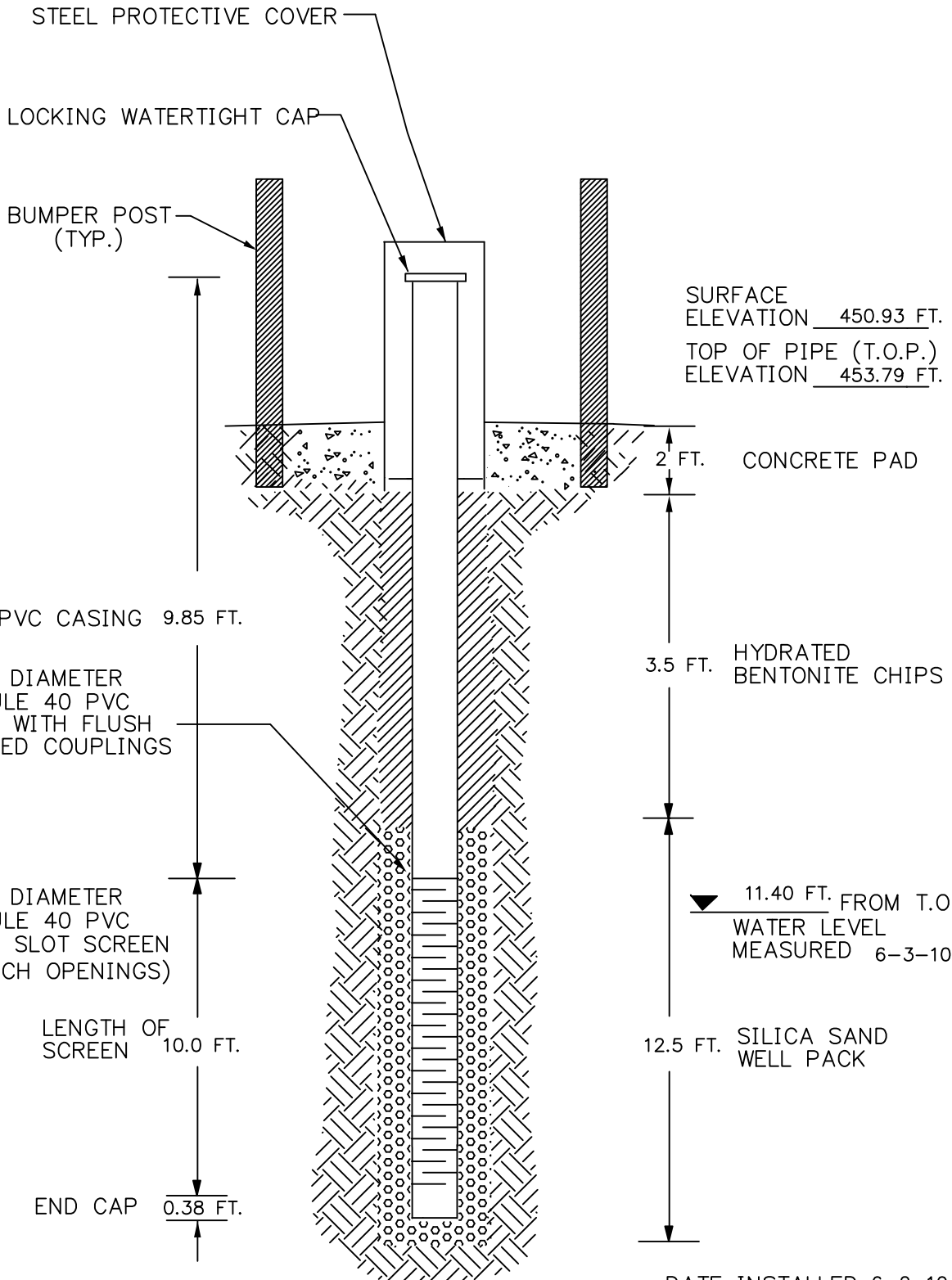
INSPECTOR **Jeff Bindy**

SHEET **18**
OF **8** SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	59	CALICHE, NODULAR, PINKISH GRAY (5YR 8/1) TO MODERATE YELLOW BROWN (10YR 2.5/4), WITH FINE SILTY SAND & SANDY CLAY, MEDIUM TO DENSE, CALCAREOUS, MOIST	NA	NA	NA	NA	
	60						
	61	BASALT, WEATHERED BROWNISH GRAY (5YR 4/1) TO BROWNISH BLACK (5YR 2/1), DAMP TO DRY, CaCO ₃ NOTED ON SURFACES OF CHIPS					Water Level 6/3/10 ∇ 0810 60.7' ft h ₂ O
	62						
	63	BASALT, FRESH, GRAYISH BLACK (2.5Y 2) & DARK GREENISH GRAY (5GY 4/1), DRY, MASSIVE	NA	NA	NA		
	64	TD = 64 ft 6/2/10					6-2-10 1620 STOPPED @ 64 FT BGS TO ALLOW WATER TO FLOW INTO BOREHOLE OVERNIGHT
	65						6/3/10 TD = 63.4 ft 1655
	66						
	67						
	68						



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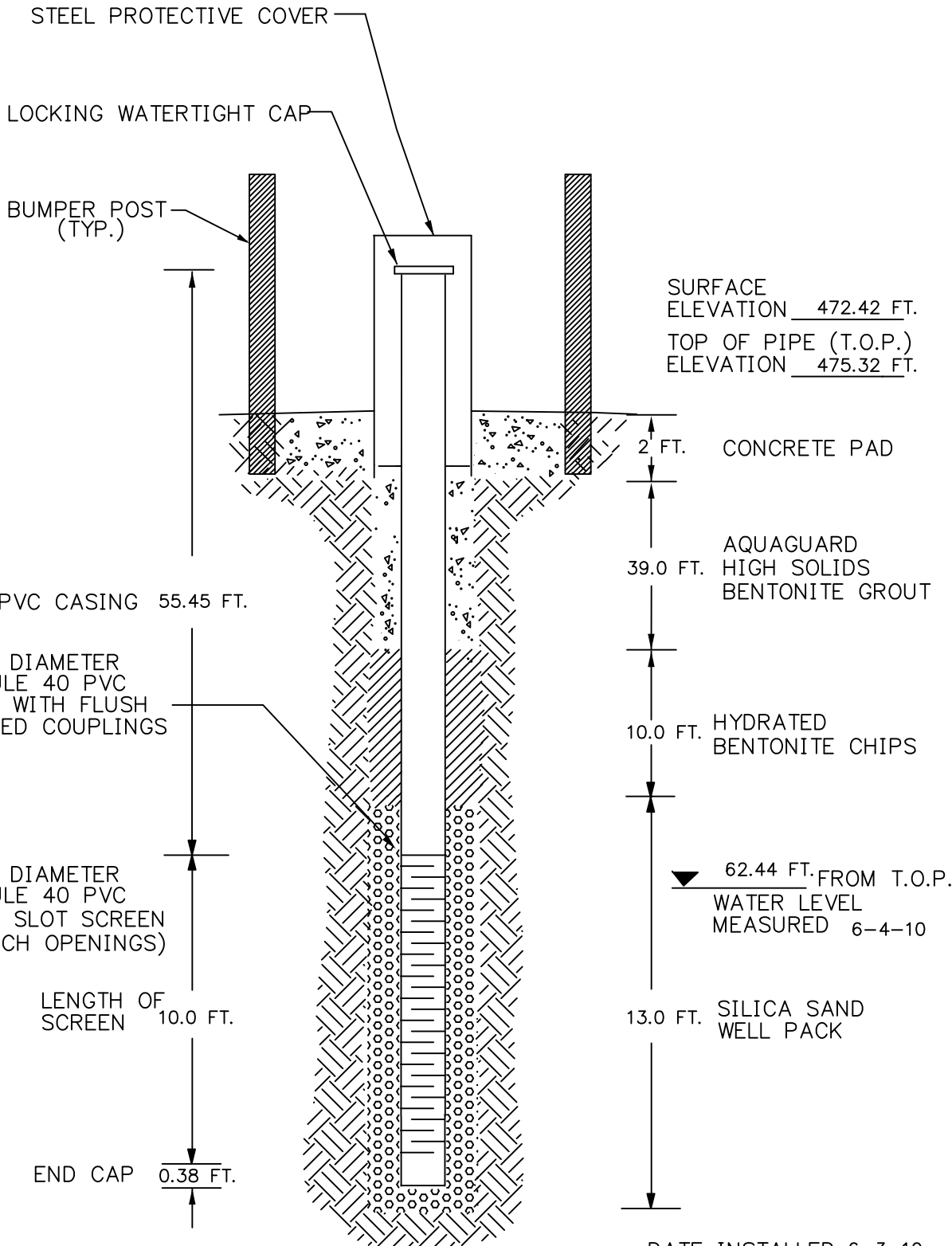


BOTTOM OF WELL 17.37 FT. BELOW MEASURED SURFACE ELEVATION

NOT TO SCALE



Figure 1
 BW-4
 WELL CONSTRUCTION
 DIAGRAM
 BOARDMAN NWSTF
 BOARDMAN, OREGON



BOTTOM OF WELL 62.93 FT. BELOW MEASURED SURFACE ELEVATION

NOT TO SCALE



Figure 2
 BW-5
 WELL CONSTRUCTION
 DIAGRAM
 BOARDMAN NWSTF
 BOARDMAN, OREGON

THURSDAY JUNE 3, 2010

C. MATHENGA
L. TURNER

WEATHER: MOSTLY CLOUDY 60-75°F WIND S-15 S

TASK: DEVELOPE WELL INSTALLED.

PERSONNEL: LEWIS TURNER, CHERYL MATHENGA.

0656 DEPART HOTEL

0716 AT SITE ADMIN BLDG

0730 HAVE SAFETY MEETING/RANGE BRIEF ABOUT UXO
SIGN IN TO BOTH.

0739 SWITCH VEHICLES w/ JEFF BINDER.

0742 COMPLETE SWITCHING EQUIPMENT TO YUKON 4X4.

0800 WATER AT 60.7' DRIVE OUT TO DRILL RIG - SRT WELL.

0824 CALIBRATE EACH 2100 TURBIDITY BUMP TEST
6.78 / 7.0 62.3 / 60 484 / 4500839 CALIBRATE YSI 516 mps
pH: 7.00 / 7.00 4.01 / 4.00 9.90 / 10.0
COND: 1.850 / 1.795 mS/cm SAL: 1.09
ORP: 220 / 220.

DO: ALLOW WARM UP OF 10 MIN. 97.7%.

0902 COMPLETE CALIBRATION WAITING FOR DRILLER

0905 WAIT TO INSTALL SECOND WELL TO GET PUMP TO DEVELOP.

0950 DRILLERS INSTALLED SECOND WELL TOWER DOWN.

1000 BW-4 WL= 11.41 TD= 18.03 10' SCREEN.
BW-5 WL: 61.70 TD= 65.83

1040 DRILLERS FINISH AT WELL POURING PAD.

1140 MOB OUT OF AREA.

1149 FOLLOW DRILLER TO BW-4 TO DEVELOP.

C. MATHENGA.³
L. TURNER

6/3/10

1208 SETUP AT BW-4 TO DEVELOP WL: 11.40 TD: 20.16

1212 BEGIN PUMPING AT BW-4 TO REMOVE SEDIMENT

1221 FIVE GALLONS REMOVED.

1234 10 GALLONS REMOVED

1239 SWITCH TO 12 VOLT PUMP CLEAN BOTTOM OF
WELL IF ANY SED MOVE TO MSD SCREEN ROUGHLY
3' FROM BOTTOM.

1242 BEGIN PUMPING AND COLLECTING READINGS.

1317 COMPLETE DEVELOPMENT OF BW-4 38 GALLONS
REMOVED. FINAL WL= 11.63 TD= 20.16 * TO C

FINAL PARAMETERS

TEMP	pH	S.C	TURB	SAL	DO	ORP
15.51	7.90	1.148	3.50	0.57	9.70	19.0

1330 DRILLER PUTS WELL PLATE ID ON WELL COVER

1345 DEPART BACK TO ADMIN BLDG.

1405 AT BLDG

1449 GO TO GET SAMPLER BOTTLES AT HOTEL

1520 AT HOTEL NO COOLERS? CALL PAUL

1529 GO BACK TO SITE.

1545 BACK AT SITE CALL: PAUL ON WAY BACK TO SITE.
WAIT AT ADMIN BLDG.

1607 GO TO MARK.

1646 COMPLETE MARKING LOCATION.

1650 OFF TO HOTEL

FRIDAY, JUNE 4, 2010

C. MATHANZA
L. TURNER

WEATHER: OVERCAST + LT. RAIN

TASK: DEVELOPE LAST NEW WELL.

PERSONNEL: L. TURNER C. MATHANZA

0635 DEPART HOTEL

0700 AT SITE - NAVY UNLOCKS GATE.

0715 CAL TURBIDITY HACH 2100

6.74/7.0 63.7/60 486/450

0717 CALIBRATE YSI 556 mps.

PH: 7.00/7.0 3.95/4.0 10.00/10.0

COND: 1.794/1.795 ORP: 220/220

SAL: 1.06/1.00 D.O: 97.6%

0735 COMPLETE CALIBRATION. HAD MORNING SAFETY (ACC)
MEETING W/ DRAUER AND WKO.

0754 AT BW-5 WL: 62.44 TD: 65.81

S WELL VOLUMES: 2.74 GAL.

0805 BEGIN BAILING SEDIMENT TAKE READING IN
CUP DUE TO POTENTIAL LOW VOLUME.

0819 BAILED DRY AT 2.3 GALLONS. ALLOW RECHARGE.

0836 WL: 64.88 BAIL LAST AMT OUT.

0842 COMPLETE BAILING. 2.80 GALLONS S VOLUMES
HAVE BEEN REMOVED. DID NOT PRODUCE ENOUGH
FOR A VOLT PUMP USE. WELL CONSIDERED DEVELOPED
AS PER QAPP S VOLUMES REMOVED.

0845 LOAD UP EQUIPMENT

0852 DRIVE TO A DISSEMIN UNIT (DU)

C. MATHANZA
L. TURNER

6/4/10

0909 ARRIVE AT AREA 9 DU. PREPARE TO SAMPLE

0916 WKO CLEARS EACH SAMPLE LOCATION (START.

0923 ASSEMBLE MIS TOOL + INITIAL DECON

0940 COMPLETE DECON W/ ACTIONS WIPER DOWN AND RINSF.

0945 DELETE LABEL METHOD DU09-060410-001

0950 BEGIN SAMPLE PATH. COMBINE INTO ONE

COMPOSITE SAMPLER WILL HAVE 100 LOCATIONS.

5cm X 1.75cm MEASUREMENTS.

1011 COMPLETE BOTH SAMPLE PASSES. 1.3 kg estimate
COLLECTED BASED OFF OF MEASUREMENTS, PER SAMPLER

1015 DECON MIS TOOL. 100 LOCATIONS SAMPLED.

1020 COLLECTED DU09-060410-001 FOR EXPLOSIVES,
NITROGUANIDINE, NITRATE/NITRITE, AND PERCHLORATE.1030 COLLECT DU09-060410-001 D FOR EXPLOSIVES
NITROGUANIDINE, NITRATE/NITRITE AND PERCHLORATE

1036 LOADING EQUIPMENT.

1045 DRIVE TO NEXT DU. AREA 8

1104 WKO CLEARS ALL 100 POINTS SWAMPY + 20 mhd wind

1120 COMPLETE CLEARANCE BEGIN SAMPLER LABS. NS/EW
COMBINE INTO ONE CLEAN ZEPLOC BAG.
5cm X 1.75 DIA SAMPLER.1143 COMPLETE BOTH SAMPLE PASSES ROUGHLY 1.5 kg
COMPOSITE (100 LOCATIONS).1145 COLLECTED DU08-060410-001 FOR EXPLOSIVES.
NITROGUANIDINE, NITRATE/NITRITE, AND PERCHLORATE.

Well Development Form

Project Number: 53170				Well Number: BW-4							
Project Information				Elevation of Well							
Facility Name: Boardman				Ground Surface Elevation (GS):							
Location: N		E		Top of Casing Elevation (TOC):							
Well Information				Well Volume Calculation $WL = 11.40$ $TD = 20.16$							
Date Well Installed: 6/2/10				5 WELL VOLUMES = 7.15 gal.							
Total Depth of Well: 20.16		feet from TOC		$= 8.76 \times 0.0408 \times 4 = 1.43 \text{ GALLONS}$							
Depth to Top of Screen: 10.16		feet from TOC		1 well volume (gallons) = initial height of water column (ft) x 0.0408 x (casing diameter (in)) ²							
Length of Casing Screened: 10.0		feet									
Type of Formation Screened: SAND / FEW FEET OF WEATHERED BASALT											
Well Development Method											
Equipment:			Method Description: Begin by bailing and surging with 3' weighted bailer. Continue								
Surge		Bail	3' Bailer	to bail until a majority of sediments were removed. A 12 volt pump was then used to collect water quality parameters until stable or five well volumes were removed.							
Airlift		Pump	12 volt								
Observations During Well Development											
Date	Time	Depth to Water* (ft)	Total Depth* (ft)	Fluid Removed		Temp. (degrees F)	pH (units)	S.C. (S/cm)	Turbidity (NTU)	Fluid Appearance and Remarks (color, odor, etc.)	
				Gallons	Total						
↓	1212	11.40	20.16	2	0	—	—	—	—	Begin bailing to remove sediments.	
	1221	—	—	5	5	—	—	—	—	Less suspended sediments	
	1234	—	—	5	10	—	—	—	—	Majority of sediment removed.	
	1239	—	—	—	—	—	—	—	—	Prepare and begin 12 volt pumping.	
	1242	12.50	—	—	1	10	15.60	7.94	1.148	382	Sal: 0.57 ppt D.O.: 9.84 ORP: 60.7
	1247	12.65	—	—	4	14	15.58	7.86	1.148	82.1	Sal: 0.57 ppt D.O.: 8.50 ORP: 40.5
	1252	12.65	—	—	4	18	15.57	7.85	1.147	21.6	Sal: 0.57 ppt D.O.: 7.79 ORP: 27.7
	1257	12.65	—	—	4	22	15.55	7.88	1.147	16.5	Sal: 0.57 ppt D.O.: 7.79 ORP: 21.9
	1302	12.68	—	—	4	26	15.54	7.90	1.147	11.2	Sal: 0.57 ppt D.O.: 7.80 ORP: 19.1
	1307	12.66	—	—	4	30	15.52	7.91	1.148	12.2	Sal: 0.57 ppt D.O.: 7.81 ORP: 19.5
1312	12.66	—	—	4	34	15.51	7.92	1.148	5.76	Sal: 0.57 ppt D.O.: 7.77 ORP: 19.3	
1317	12.66	—	—	4	38	15.51	7.90	1.148	3.50	Sal: 0.57 ppt D.O.: 7.78 ORP: 19.0	
6/3/10	1320	11.63	20.16	—	—	—	—	—	—	Final water level and total depth	

* From TOC unless otherwise noted in Remarks



Well Development Form

Project Number: 53170				Well Number: BW-5							
Project Information				Elevation of Well							
Facility Name: Boardman				Ground Surface Elevation (GS):							
Location: N		E		Top of Casing Elevation (TOC):							
Well Information				Well Volume Calculation							
Date Well Installed: 6/3/10				WL = 62.44 TD = 65.81							
Total Depth of Well: 65.81		feet from TOC		5 well volumes = 2.74 gal							
Depth to Top of Screen: 55.81		feet from TOC		= 3.37 x 0.0408 x 4 = 0.55 gal.							
Length of Casing Screened: 10.0		feet		1 well volume (gallons) = initial height of water column (ft) x 0.0408 x (casing diameter (in)) ²							
Type of Formation Screened:											
Well Development Method											
Equipment:				Method Description: *Due to low volume of water 12 volt pump could not be used.							
Surge		Bail	3' Bailor	measurements were taken from bailed water in an open container.							
Airlift		Pump									
Observations During Well Development											
Date	Time	Depth to Water* (ft)	Total Depth* (ft)	Fluid Removed		Temp. (degrees F)	pH (units)	S.C. (S/cm)	Turbidity (NTU)	Fluid Appearance and Remarks (color, odor, etc.)	
				Gallons	Total						
↓	6/4/10	0805	62.44	65.81	I	0	16.51	6.29	1.098	OR	Bailing Sal=0.55 ppt D.O.=7.05 ORP=164.5
		0810	-	-	1.7	1.7	16.70	6.58	1.084	OR	Sal=0.54 ppt D.O.=7.30 ORP=112.4
		0819	65.58	65.81	0.6	2.3	-	-	-	-	Bailed Dry allow time recharge.
		0836	64.88	65.81	-	2.3	-	-	-	-	Resume bailing
	6/4/10	0842	65.51	65.81	0.5	2.8	16.72	6.60	1.084	OR	Sal=0.54 ppt D.O.=7.25 ORP=113.0
											Bailed Dry. Have removed 5 well volumes as per O&P. Paul agrees.
	6/6/10	1540	62.53	65.80	I	0	16.79	6.70	1.102	OR	Begin bailing dry.
		↓			2.0	2.0	16.90	6.72	1.098	OR	Sal=0.54 D.O.=7.21 ORP=110.4
	6/6/10	1555	65.55	65.81	-	-	-	-	-	-	Bailed Dry at 2.0 gallons complete development activities. Take final water and total depths.

* From TOC unless otherwise noted in Remarks

OR = over range of instrument.



EXHIBIT MAP
ECC
NAVAL WEAPONS SYSTEM TRAINING CENTER
BOARDMAN, MORROW COUNTY, OREGON

OREGON STATE PLANE COORDINATES NORTH ZONE

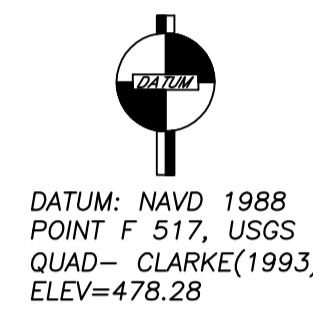
Point	Northing*	Eastng*	Elev.	Description	Latitude	Longitude	Convergence-Angle	Scale-Factor
1101	781361.802	8425469.163	484.31	PM-15 CON	45°48'23.4715"	119°37'26.7097"	0°37'16.2694"	0.999956564220
1102	781361.755	8425468.653	487.00	PM-15 TOP	45°48'23.4711"	119°37'26.7169"	0°37'16.2643"	0.999956564198
1103	781360.737	8425463.489	487.63	PM-15-S TOP	45°48'23.4595"	119°37'26.5076"	0°37'16.4122"	0.999956563569
1104	781360.818	8425483.314	484.72	PM-15-S TOP	45°48'23.4603"	119°37'26.5101"	0°37'16.4109"	0.999956563613
1109	781263.245	8418566.182	467.47	PM-16-S CON	45°48'23.2260"	119°39'04.1659"	0°36'07.1548"	0.999956550939
1110	781263.328	8418566.317	470.42	PM-16-S TOP	45°48'23.2268"	119°39'04.1640"	0°36'07.1561"	0.999956550983
1111	781258.077	8418554.298	469.65	PM-16 TOP	45°48'23.1762"	119°39'04.3350"	0°36'07.0349"	0.999956548946
1112	781258.182	8418554.255	467.64	PM-16 CON	45°48'23.1575"	119°39'04.3353"	0°36'07.0346"	0.999956547235
1116	781183.343	8412713.267	445.95	PM-17 CON	45°48'23.0361"	119°40'26.7966"	0°35'08.5543"	0.999956540668
1117	781183.340	8412713.595	448.41	PM-17 TOP	45°48'23.0360"	119°40'26.7920"	0°35'08.5376"	0.999956540664
1118	781182.424	8412689.049	449.10	PM-17-S TOP	45°48'23.0294"	119°40'27.1386"	0°35'08.3119"	0.999956540309
1119	781182.380	8412688.897	446.23	PM-17-S CON	45°48'23.0290"	119°40'27.1407"	0°35'08.3102"	0.999956540286

* COORDINATES ARE INTERNATIONAL FEET

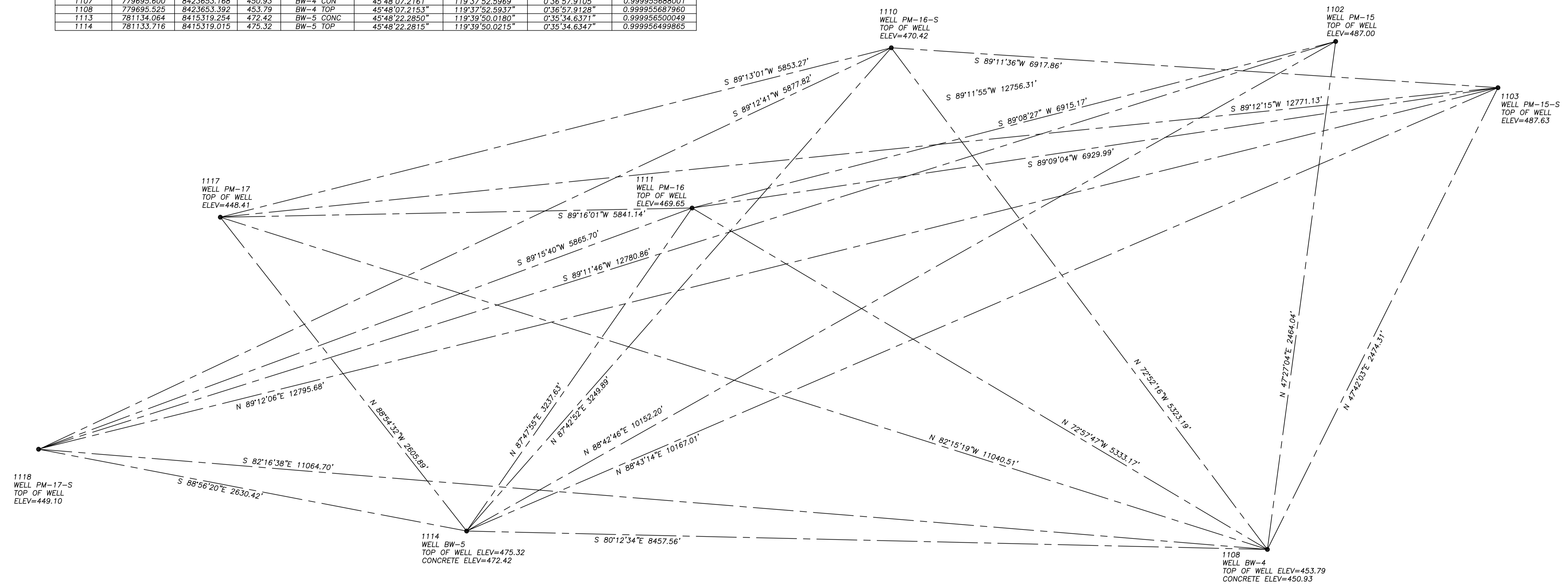
Point	Northing	Eastng	Elev.	Description	Latitude	Longitude	Convergence-Angle	Scale-Factor
1107	779695.600	8423653.168	450.93	BW-4 CON	45°48'07.2161"	119°37'52.5969"	0°36'57.9105"	0.9999565688001
1108	779695.525	8423653.392	453.79	BW-4 TOP	45°48'07.2153"	119°37'52.5937"	0°36'57.9128"	0.9999565687960
1113	781134.064	8415319.254	472.42	BW-5 CONC	45°48'22.2850"	119°39'50.0180"	0°35'34.6371"	0.999956500049
1114	781133.716	8415319.015	475.32	BW-5 TOP	45°48'22.2815"	119°39'50.0215"	0°35'34.6347"	0.999956499865



NOT TO SCALE



DATUM: NAVD 1988
POINT F 517, USGS
QUAD- CLARK(1993)
ELEV=478.28



WORLEY SURVEYING SERVICE, INC., P.S.
P.O. BOX 6132
121 S. ELY STREET
KENNEWICK, WASHINGTON 99336
509-582-6716

APPENDIX B

WELL SAMPLING DOCUMENTATION

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FIELD GROUND-WATER SAMPLING REPORT

DATE: 6/5/10 SITE: NWSTF Boardman PID READING at WELL HEAD (ppm): N/A

PROJECT NUMBER: 53170 WEATHER: Partly cloudy 78F wind 5-20 W

WELL NUMBER _____ DEPTH TO WATER (ft): 28.67

BW-02

TOTAL DEPTH (ft): 60.07 WELL DIAMETER (inches): 2.0

PURGING

CASING VOLUME CALCULATION: _____ ft of water in casing X _____ gallons/foot = _____ total gallons/casing volume

Equipment Used: Dedicated Bladder Pump **Nondedicated Bladder Pump** Bailer Other _____

Time (24 hr)	Amount Purged (gals)	Flow Rate (ml/min)	pH	Temp (C)	Conductivity (mmhos/cm)	Salinity (ppt)	Turbidity (NTUs)	ORP (mV)	D.O. (mg/L)	Depth to Water (ft TOC)
1624	1	400	6.87	17.15	0.741	0.42	58.6	4.2	11.13	28.73
1629	0.53	400	6.67	17.01	0.787	0.42	25.4	13.3	10.01	28.73
1634	1.06	400	6.54	16.98	0.815	0.42	12.4	18.4	9.77	28.73
1639	1.59	400	6.44	16.96	0.844	0.42	12.8	22.2	7.69	28.73
1644	2.12	400	6.43	16.98	0.847	0.42	7.86	22.4	6.47	28.73
1649	2.65	400	6.40	16.90	0.849	0.42	4.52	23.5	6.35	28.73
1654	3.18	400	6.37	16.89	0.850	0.42	4.61	25.2	6.29	28.73
1659	3.71	400	6.35	16.87	0.852	0.42	3.38	25.0	6.27	28.73

Continued on back (circle one) yes / no

SAMPLING Equipment Used: Same as above Other _____

Sample Time (24 hr)	Total Purged (gals)	pH	Temp (C)	Cond. (mmhos/cm)	Salinity (ppt)	Turbidity (NTUs)	ORP (mV)	D.O. (mg/L)	Depth to Water (ft TOC)	Obs.
1710	3.71	6.35	16.87	0.852	0.42	3.38	25.0	9.27	28.73	clear

FERROUS IRON (mg/L): N/A ALKALINITY (mg/L): N/A IDW TOTAL: 3.71

FINAL DEPTH TO WATER (ft TOC): 28.68 TIME FINAL DEPTH TAKEN: 1730

SAMPLE ID: BW02-060510-001 SAMPLE ID FOR QC: BW02-060510-001MS/MSD

PARAMETERS REQUESTED FOR ANALYSIS: Explosives, Nitroguanidine, Perchlorate, Nitrate, Nitrite, Chloride, Sulfate, Bicarbonate, and Alkalinity

DO METER MODEL No.: YSI 556 MPS ORP METER MODEL No.: YSI 556 MPS FLOW CELL TYPE.: 500 mL
DO CHECK IN AIR: Before: 99.7 After: 99.9

CHECKED FLOW THROUGH CELL FOR LEAKS: COMMENTS: N/A

PREPARED: Lewis Turner SIGNATURE: _____ DATE: 6/5/10
REVIEWED: _____

FIELD GROUND-WATER SAMPLING REPORT

DATE: 6/5/10 SITE: NWSTF Boardman PID READING at WELL HEAD (ppm): N/A

PROJECT NUMBER: 53170 WEATHER: Partly cloudy 75-80F wind 5-20 W

WELL NUMBER _____ DEPTH TO WATER (ft): 136.36

BW-03

TOTAL DEPTH (ft): 153.90 WELL DIAMETER (inches): 2.0

PURGING

CASING VOLUME CALCULATION: _____ ft of water in casing X _____ gallons/foot = _____ total gallons/casing volume

Equipment Used: Dedicated Bladder Pump Nondedicated Bladder Pump Bailer Other _____

Time (24 hr)	Amount Purged (gals)	Flow Rate (ml/min)	pH	Temp (C)	Conductivity (mmhos/cm)	Salinity (ppt)	Turbidity (NTUs)	ORP (mV)	D.O. (mg/L)	Depth to Water (ft TOC)
1350	1	150	7.22	19.05	0.828	0.41	10.7	-4.1	5.34	137.02
1355	0.13	100	7.16	19.04	0.830	0.41	13.6	-4.3	5.15	137.02
1400	0.26	100	6.99	18.94	0.844	0.41	14.4	87.5	4.59	137.03
1405	0.39	100	6.64	19.39	0.854	0.42	9.43	65.9	4.93	137.03
1410	0.52	100	6.85	18.96	0.850	0.42	10.7	52.9	4.53	137.03
1415	0.65	100	6.75	18.78	0.850	0.42	10.8	51.3	4.13	137.03
1420	0.78	100	6.70	18.72	0.850	0.42	9.66	35.3	3.55	137.05
1425	0.91	100	6.66	18.55	0.850	0.42	10.30	25.7	3.33	137.05
1430	1.04	100	6.62	18.65	0.849	0.42	8.12	20.5	3.08	137.06
1435	1.17	100	6.61	18.68	0.848	0.42	6.52	16.1	2.94	137.06
1440	1.30	100	6.59	18.66	0.848	0.42	6.28	14.1	2.85	137.06

Continued on back (circle one) yes / no

SAMPLING Equipment Used: Same as above Other _____

Sample Time (24 hr)	Total Purged (gals)	pH	Temp (C)	Cond. (mmhos/cm)	Salinity (ppt)	Turbidity (NTUs)	ORP (mV)	D.O. (mg/L)	Depth to Water (ft TOC)	Obs.
1450	1.30	6.59	18.66	0.848	0.42	6.28	14.1	2.85	137.06	clear

FERROUS IRON (mg/L): N/A ALKALINITY (mg/L): N/A IDW TOTAL: 1.30

FINAL DEPTH TO WATER (ft TOC): 136.19 TIME FINAL DEPTH TAKEN: 1533

SAMPLE ID: BW03-060510-001 SAMPLE ID FOR QC: N/A

PARAMETERS REQUESTED FOR ANALYSIS: Explosives, Nitroguanidine, Perchlorate, Nitrate, Nitrite, Chloride, Sulfate, Bicarbonate, and Alkalinity

DO METER MODEL No.: YSI 556 MPS ORP METER MODEL No.: YSI 556 MPS FLOW CELL TYPE.: 500 mL
 DO CHECK IN AIR: Before: 100.3 After: 99.8

CHECKED FLOW THROUGH CELL FOR LEAKS: COMMENTS: N/A

PREPARED: _____ REVIEWED: _____	NAME: <u>Lewis Turner</u> SIGNATURE: _____	DATE: <u>6/5/10</u>
------------------------------------	---	---------------------

FIELD GROUND-WATER SAMPLING REPORT

DATE: 6/6/10 SITE: NWSTF Boardman PID READING at WELL HEAD (ppm): N/A

PROJECT NUMBER: 53170 WEATHER: Partly Cloudy 75F wind 5-20 W

WELL NUMBER _____ DEPTH TO WATER (ft): 118.50

OB/OD - 01

TOTAL DEPTH (ft): 200.46 WELL DIAMETER (inches): 2.0

PURGING

CASING VOLUME CALCULATION: _____ ft of water in casing X _____ gallons/foot = _____ total gallons/casing volume

Equipment Used: Dedicated Bladder Pump Nondedicated Bladder Pump Bailer Other _____

Time (24 hr)	Amount Purged (gals)	Flow Rate (ml/min)	pH	Temp (C)	Conductivity (mmhos/cm)	Salinity (ppt)	Turbidity (NTUs)	ORP (mV)	D.O. (mg/L)	Depth to Water (ft TOC)
1110	1	200	7.78	17.19	0.709	0.35	>1000	13.7	5.03	117.65
1115	0.26	200	7.67	17.25	0.711	0.35	>1000	14.7	2.48	118.97
1120	0.43	100	7.54	17.44	0.713	0.35	752	12.5	2.17	120.28
1125	0.60	100	7.57	17.84	0.713	0.35	878	10.5	2.30	122.28
1130	0.77	100	7.54	17.65	0.712	0.35	544	9.6	2.30	123.98
1135	0.94	100	7.51	17.65	0.711	0.35	314	9.8	2.35	124.78
1140	Switch to low-recovery sampling method, and take reading every 500 mL.									
1154	0.94	200	7.47	17.37	0.711	0.35	182	9.9	2.45	127.18
1156.5	1.07	200	7.41	17.39	0.711	0.35	130	10.0	2.50	128.01
1159	1.20	200	7.42	17.35	0.710	0.35	89.1	10.1	2.58	128.65
1201.5	1.33	200	7.45	17.40	0.711	0.35	64.6	10.4	3.01	129.50
1204	1.46	200	7.41	17.41	0.710	0.35	44.6	10.3	2.98	129.98
1206.5	1.59	200	7.41	17.39	0.710	0.35	40.9	10.0	2.95	130.70
1209	1.72	200	7.40	17.35	0.710	0.35	35.9	9.9	2.92	131.01

Continued on back (circle one) yes / no

SAMPLING

Equipment Used: Same as above Other _____

Sample Time (24 hr)	Total Purged (gals)	pH	Temp (C)	Cond. (mmhos/cm)	Salinity (ppt)	Turbidity (NTUs)	ORP (mV)	D.O. (mg/L)	Depth to Water (ft TOC)	Obs.
1230	2.40	7.43	17.42	0.709	0.35	25.1	7.9	2.86	136.78	murky

FERROUS IRON (mg/L): N/A ALKALINITY (mg/L): N/A IDW TOTAL: 2.40

FINAL DEPTH TO WATER (ft TOC): 144.98 TIME FINAL DEPTH TAKEN: 1235

SAMPLE ID: OB/OD01-060610-001 SAMPLE ID FOR QC: N/A

PARAMETERS REQUESTED FOR ANALYSIS: Explosives, Nitroguanidine, Perchlorate, Nitrate, Nitrite, Chloride, Sulfate, Bicarbonate, and Alkalinity

DO METER MODEL No.: YSI 556 MPS ORP METER MODEL No.: YSI 556 MPS FLOW CELL TYPE.: 500 mL

DO CHECK IN AIR: Before: 100.7 After: 101.1

CHECKED FLOW THROUGH CELL FOR LEAKS: COMMENTS: N/A

PREPARED: _____ NAME Lewis Turner SIGNATURE _____ DATE 6/6/10
 REVIEWED: _____

FIELD GROUND-WATER SAMPLING REPORT

DATE: 6/6/10 SITE: NWSTF Boardman PID READING at WELL HEAD (ppm): N/A

PROJECT NUMBER: 53170 WEATHER: Partly Cloudy 75F wind 5-20 W

WELL NUMBER _____ DEPTH TO WATER (ft): 101.08

OB/OD - 02

TOTAL DEPTH (ft): 168.00 WELL DIAMETER (inches): 2.0

PURGING

CASING VOLUME CALCULATION: _____ ft of water in casing X _____ gallons/foot = _____ total gallons/casing volume

Equipment Used: Dedicated Bladder Pump Nondedicated Bladder Pump Bailer Other _____

Time (24 hr)	Amount Purged (gals)	Flow Rate (ml/min)	pH	Temp (C)	Conductivity (mmhos/cm)	Salinity (ppt)	Turbidity (NTUs)	ORP (mV)	D.O. (mg/L)	Depth to Water (ft TOC)
1325	1	125	8.24	18.51	0.479	0.23	287	-6.8	6.60	100.90
1330	0.16	125	8.08	18.25	0.479	0.23	195	0.6	5.66	102.07
1335	0.29	100	7.84	18.44	0.478	0.23	72.2	4.7	5.06	102.57
1340	0.42	100	7.72	18.36	0.477	0.23	45.4	6.8	5.01	102.92
1345	0.55	100	7.69	18.90	0.476	0.23	27.0	6.8	4.58	102.94
1350	0.68	100	7.68	18.95	0.477	0.23	23.7	8.1	4.69	102.97
1355	Switch to low-recovery sampling method, and take reading every 500 mL.									
1400	0.68	250	7.54	17.52	0.476	0.23	12.7	11.3	4.88	104.63
1402	0.81	250	7.50	17.41	0.475	0.23	10.8	12.0	4.78	104.79
1404	0.94	250	7.51	17.59	0.474	0.23	10.0	9.8	4.78	104.98
1406	1.07	250	7.48	17.50	0.476	0.23	11.1	10.4	4.78	105.15
1408	1.2	250	7.48	17.45	0.475	0.23	9.56	12.5	4.69	105.42
1410	1.33	250	7.47	17.48	0.478	0.23	9.01	13.4	4.65	105.61
1412	1.46	250	7.47	17.49	0.475	0.23	8.52	14.0	4.62	105.84

Continued on back (circle one) yes / no

SAMPLING Equipment Used: Same as above Other _____

Sample Time (24 hr)	Total Purged (gals)	pH	Temp (C)	Cond. (mmhos/cm)	Salinity (ppt)	Turbidity (NTUs)	ORP (mV)	D.O. (mg/L)	Depth to Water (ft TOC)	Obs.
1425	2.00	7.48	17.45	0.475	0.23	9.24	12.5	4.69	106.56	clear

FERROUS IRON (mg/L): N/A ALKALINITY (mg/L): N/A IDW TOTAL: 2.00

FINAL DEPTH TO WATER (ft TOC): 108.48 TIME FINAL DEPTH TAKEN: 1430

SAMPLE ID: OB/OD02-060610-001 SAMPLE ID FOR QC: N/A

PARAMETERS REQUESTED FOR ANALYSIS: Explosives, Nitroguanidine, Perchlorate, Nitrate, Nitrite, Chloride, Sulfate, Bicarbonate, and Alkalinity

DO METER MODEL No.: YSI 556 MPS ORP METER MODEL No.: YSI 556 MPS FLOW CELL TYPE: 500 mL

DO CHECK IN AIR: Before: 99.2 After: 97.6

CHECKED FLOW THROUGH CELL FOR LEAKS: COMMENTS: N/A

PREPARED: Lewis Turner SIGNATURE: _____ DATE: 6/6/10
 REVIEWED: _____

FIELD GROUND-WATER SAMPLING REPORT

DATE: 6/6/10 SITE: NWSTF Boardman PID READING at WELL HEAD (ppm): N/A

PROJECT NUMBER: 53170 WEATHER: Overcast 70F wind 5-15 W

WELL NUMBER _____ DEPTH TO WATER (ft): 94.25

OB/OD-03

TOTAL DEPTH (ft): 144.94 WELL DIAMETER (inches): 2.0

PURGING

CASING VOLUME CALCULATION: _____ ft of water in casing X _____ gallons/foot = _____ total gallons/casing volume

Equipment Used: Dedicated Bladder Pump Nondedicated Bladder Pump Bailer Other _____

Time (24 hr)	Amount Purged (gals)	Flow Rate (ml/min)	pH	Temp (C)	Conductivity (mmhos/cm)	Salinity (ppt)	Turbidity (NTUs)	ORP (mV)	D.O. (mg/L)	Depth to Water (ft TOC)
0935	1	400	7.28	17.36	0.556	0.27	58.3	137.2	9.92	94.31
0940	0.40	300	7.19	17.21	0.547	0.27	50.1	105.1	9.77	94.29
0945	0.80	300	7.13	17.05	0.546	0.27	51.3	85.4	7.10	94.29
0950	1.20	300	7.11	17.10	0.544	0.27	30.4	68.7	6.85	94.29
0955	1.60	300	7.13	17.15	0.543	0.27	28.5	61.8	4.99	94.30
1000	2.00	300	7.12	17.13	0.543	0.28	23.6	57.3	4.78	94.30
1005	2.40	300	7.11	17.18	0.545	0.27	24.6	53.6	4.75	94.30
1010	2.80	300	7.13	17.16	0.546	0.27	20.0	50.4	4.70	94.30

Continued on back (circle one) yes / no

SAMPLING Equipment Used: Same as above Other _____

Sample Time (24 hr)	Total Purged (gals)	pH	Temp (C)	Cond. (mmhos/cm)	Salinity (ppt)	Turbidity (NTUs)	ORP (mV)	D.O. (mg/L)	Depth to Water (ft TOC)	Obs.
1010	2.80	7.13	17.16	0.546	0.27	20.0	50.4	8.70	94.30	clear

FERROUS IRON (mg/L): N/A ALKALINITY (mg/L): N/A IDW TOTAL: 2.80

FINAL DEPTH TO WATER (ft TOC): 94.28 TIME FINAL DEPTH TAKEN: 1025

SAMPLE ID: OB/OD03-060610-001 SAMPLE ID FOR QC: N/A

PARAMETERS REQUESTED FOR ANALYSIS: Explosives, Nitroguanidine, Perchlorate, Nitrate, Nitrite, Chloride, Sulfate, Bicarbonate, and Alkalinity

DO METER MODEL No.: YSI 556 MPS ORP METER MODEL No.: YSI 556 MPS FLOW CELL TYPE.: 500 mL
 DO CHECK IN AIR: Before: 100.5 After: 100.1

CHECKED FLOW THROUGH CELL FOR LEAKS: COMMENTS: N/A

PREPARED: _____ REVIEWED: _____	NAME: <u>Lewis Turner</u> SIGNATURE: _____	DATE: <u>6/6/10</u>
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FIELD GROUND-WATER SAMPLING REPORT

DATE: 6/8/10 SITE: NWSTF Boardman PID READING at WELL HEAD (ppm): N/A

PROJECT NUMBER: 53170 WEATHER: Mostly clear 80F wind 5-20 NW

WELL NUMBER _____ DEPTH TO WATER (ft): 180.72

DEMO AREA WELL

TOTAL DEPTH (ft): 247.50 WELL DIAMETER (inches): 2.0

PURGING

CASING VOLUME CALCULATION: _____ ft of water in casing X _____ gallons/foot = _____ total gallons/casing volume

Equipment Used: Dedicated Bladder Pump Nondedicated Bladder Pump Bailer Other _____

Time (24 hr)	Amount Purged (gals)	Flow Rate (ml/min)	pH	Temp (C)	Conductivity (mmhos/cm)	Salinity (ppt)	Turbidity (NTUs)	ORP (mV)	D.O. (mg/L)	Depth to Water (ft TOC)
0900	1	130	7.43	19.81	0.618	0.30	171	32.1	6.22	181.45
0905	0.13	100	7.53	19.30	0.651	0.32	203	-73.2	2.24	181.49
0910	0.26	100	7.52	19.54	0.655	0.32	173	-91.8	1.34	181.45
0915	0.39	100	7.52	19.47	0.656	0.32	116	-99.2	1.03	181.45
0920	0.52	100	7.53	19.42	0.655	0.32	96.9	-97.7	0.96	181.45
0925	0.65	100	7.54	19.52	0.653	0.32	61.2	-91.1	0.90	181.44
0930	0.78	100	7.55	19.70	0.650	0.32	40.8	-75.7	0.93	181.44
0935	0.91	100	7.56	19.75	0.646	0.31	22.9	-74.3	0.93	181.44
0940	1.04	100	7.60	19.80	0.647	0.31	19.8	-70.5	0.94	181.44
0945	1.17	100	7.61	19.82	0.649	0.32	16.7	-71.3	0.95	181.44

Continued on back (circle one) yes / no

SAMPLING

Equipment Used: Same as above Other _____

Sample Time (24 hr)	Total Purged (gals)	pH	Temp (C)	Cond. (mmhos/cm)	Salinity (ppt)	Turbidity (NTUs)	ORP (mV)	D.O. (mg/L)	Depth to Water (ftTOC)	Obs.
1000	1.17	7.61	19.82	0.649	0.32	16.7	-71.3	0.95	181.44	clear

FERROUS IRON (mg/L): N/A ALKALINITY (mg/L): N/A IDW TOTAL: 1.17

FINAL DEPTH TO WATER (ft TOC): 181.44 TIME FINAL DEPTH TAKEN: 1020

SAMPLE ID: DAW-060810-001 SAMPLE ID FOR QC: N/A

PARAMETERS REQUESTED FOR ANALYSIS: Explosives, Nitroguanidine, Perchlorate, Nitrate, Nitrite, Chloride, Sulfate, Bicarbonate, and Alkalinity

DO METER MODEL No.: YSI 556 MPS ORP METER MODEL No.: YSI 556 MPS FLOW CELL TYPE.: 500 mL

DO CHECK IN AIR: Before: 100.6 After: 100.3

CHECKED FLOW THROUGH CELL FOR LEAKS: COMMENTS: N/A

PREPARED: _____ REVIEWED: _____	NAME: <u>Lewis Turner</u> SIGNATURE: _____	DATE: <u>6/8/10</u>
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Daily Calibration Log

Project Number: 53170
 Project Name: NUSTF Bumpman
 Field Site Manager: Lewis Turner

Date	Time	DO	DO	pH	Conductivity	PID	Turbidity	Iron	ORP	Salinity	Notes
		%	mg/L				NTU			ppm	
Standards:		100	10	7/7/10	1.795	100	7/60/459	1.0	200-275	1.0	
6/3/10	0824	97.7	-	4.01, 7.00, 9.90	1.850	NA	6.78, 62.3, 484	NA	220.0	1.09	Initial Cal.
6/3/10	1730	98.1	-	4.00, 7.00, 9.95	1.842	NA	6.74, 61.4, 471	NA	220.4	1.01	End of Day Bump Test = Pass
6/4/10	0715	97.6	-	3.95, 7.00, 10.00	1.794	NA	6.74, 62.7, 486	NA	220.0	1.06	Initial Cal
6/4/10	0745	97.1	-	4.00, 7.00, 10.01	1.800	NA	6.75, 61.8, 465	NA	220.9	1.04	End of Day Bump Test = Pass
6/5/10	0938	99.7	-	4.00, 7.00, 9.99	1.799	NA	6.96, 63.3, 487	NA	223.0	1.03	Initial Cal.
6/5/10	1848	98.7	-	4.01, 7.00, 10.00	1.803	NA	6.98, 62.5, 457	NA	220.7	1.01	End of Day Bump Test = Pass
6/6/10	0844	100.0	-	4.01, 7.00, 9.95	1.765	NA	6.92, 64.5, 485	NA	223.0	1.00	Initial Cal.
6/6/10	1800	99.6	-	4.00, 7.00, 9.91	1.801	NA	6.90, 62.8, 461	NA	223.4	1.05	End of Day Bump Test = Pass
6/7/10	0848	100.6	-	4.00, 7.00, 9.97	1.927	NA	6.97, 63.6, 489	NA	223.0	1.00	Initial Cal
6/7/10	1819	100.2	-	4.03, 7.11, 9.95	1.821	NA	6.99, 63.7, 470	NA	221.7	1.04	End of Day Bump Test = Pass.
6/8/10	0823	100.5	-	3.99, 7.00, 10.05	1.924	NA	7.09, 63.5, 474	NA	223.0	0.98	Initial Cal
6/8/10	1105	95.0	-	4.08, 7.00, 9.89	1.780	NA	6.90, 63.9, 478	NA	221.0	1.00	End of Day Bump Test = Pass

ORP=Oxidation Reduction Potential
 NTU= Nephelometric Units

DO=Dissolved oxygen
 %=Percent
 Temp=ambient air temperature at time of calibration

Photoionization Detector
 ppm=Parts per million

NWSTF



"Rite in the Rain"

ALL-WEATHER

JOURNAL

No. 390NF

BOARDMAN

Burns & McDonnell

2

NWSTF
C. MATHENEA
L. TURNER
THURSDAY JUNE 3, 2010 BOARDMAN

WEATHER: MOSTLY CLOUDY 60-75°F WIND S-15 S

TASK: DEVELOPE WELL INSTALLED.

PERSONNEL: LEWIS TURNER, CHERYL MATHENEA.

0656 DEPART HOTEL

0716 AT SITE ADMIN BLDG

0730 HAVE SAFETY MEETING/RANGE BRIEF ABOUT UXO

SIGN IN TO ROTN.

0739

~~0829~~ SWITCH VEHICLES. V/ JEFF BINDER.

~~0742~~ 0742

~~0840~~ COMPLETE SWITCHING EQUIPMENT TO YUKON 4X4.

0800 WATER AT 60.7' DRIVE OUT TO DRILL RIG - SET WELL (JEFF)

0824 CALIBRATE HACH AND TURBIDITY BUMP TEST

6.78 / 7.0 62.3 / 60 484 / 450 PASS

0839 CALIBRATE YSI 516mps PASS

pH: 7.00 / 7.00 4.01 / 4.00 9.90 / 10.0

COND: 1.850 / 1.795 ns/cm SAL: 1.09

ORP: 220 / 220.

DO: ALLOW WARM UP OF 10 MIN. 97.7%.

0902 COMPLETE CALIBRATION WAITING FOR DRILLER

0905 WANT TO INSTALL SECOND WELL TO GET PUMP TO DEVELOP.

0950 DRILLERS INSTALLED SECOND WELL TOWER DOWN.

1000 BW-4 WL= 11.41 TD= 18.03 10' SCREEN.

BW-5 WL: 61.70 TD= 65.83 10' SCREEN

1040 DRILLERS FINISH AT WELL POURING PAD.

1140 MOB OUT OF AREA.

1149 FOLLOW DRILLER TO BW-4 TO DEVELOP

NWSTF

C. MATHENEA. 3

6/3/10

BOARDMAN

L. TURNER

1208 SETUP AT BW-4 TO DEVELOP. WL: 11.40 TD: 20.16

1212 BEGIN PAILING AT BW-4 TO REMOVE SEDIMENT.

1221 FIVE GALLONS REMOVED.

1234 10 GALLONS REMOVED

1239 SWITCH TO 12 VOLT PUMP CLEAN BOTTOM OF WELL IF ANY SED MOVE TO MSD SCREEN ROUGHLY 3' FROM BOTTOM.

1242 BEGIN PUMPING AND COLLECTING READINGS.

1317 COMPLETE DEVELOPMENT OF BW-4 38 GALLONS REMOVED. FINAL WL= 11.63 TD= 20.16 *TDC

FINAL PARAMETERS

TEMP	pH	S.C.	TURB	SAL	RD	ORP
15.51	7.90	1.148	350	0.57	9.70	19.0

1330 DRILLER PUTS WELL PLATE ID ON WELL COVER

1345 DEPART BACK TO ADMIN BLDG.

1405 AT BLDG

1459 GO TO GET SAMPLE BOTTLES AT HOTEL.

1520 AT HOTEL NO COOLERS? CALL PAUL SAID ARRIVAL TOMORROW

1529 GO BACK TO SITE.

1545 BACK AT SITE. CALL: PAUL ON WAY BACK TO SITE.

WAIT AT ADMIN BLDG.

1607 GO TO MARK. DM. LOCATION (LAST UP 4).

1646 COMPLETE MARKING LOCATION.

1650 OFF TO HOTEL

1730 Bump TEST YSI = PASS SEE CAL LOG.

1730

4

NWJTF

C. MATHANZA

FRIDAY, JUNE 4, 2010

BOARDMAN

L. TURNER

WEATHER: OVERCAST + LT. RAIN 70'S WIND S-30 W

TASK: DEVELOPE LAST NEW WELL.

PERSONNEL: L. TURNER C. MATHANZA

0635 DEPART HOTEL

0700 AT SITE - NAVY UNLOCKS GATE.

0715 CAL TURBIDITY WITH 2100

6.74/7.0 63.7/60 486/450

0717 CALIBRATE YSI 556 mps.

PH: 7.00/7.0 3.95/4.0 10.00/10.0

COND: 1.794/1.795 ORP: 220/220

SAL: 1.06/1.00 D.O: 97.6%

0735 COMPLETE CALIBRATION. HAD MORNING SAFETY (PCC)
MEETING W/ DRILLER AND UXO.

0754 AT BW-5 WL: 62.44 TD: 65.81

5 WELL VOLUMES: 2.74 GAL.

0805 BEGIN BAILING SEDIMENT TAKE READING IN
CUP DUE TO POTENTIAL LOW VOLUME.

0819 BAILED DRY AT 2.3 GALLONS. ALLOW RECHARGE.

0836 WL: 64.88 BAIL LAST AMT OUT.

0842 COMPLETE BAILING. 2.80 GALLONS 5 VOLUMES
HAVE BEEN REMOVED. DID NOT PRODUCE ENOUGH
FOR 2 VOLT PUMP USE. WELL CONSIDERED DRY
AS PER QAPP 5 VOLUMES REMOVED. (WELL VOLUMES).

0845 LOAD UP EQUIPMENT

0852 DRIVE TO A DISSEMIN WET (DU)

NWJTF

C. MATHANZA

6/4/10

BOARDMAN.

L. TURNER

0909 ARRIVE AT AREA 9 DU. PREPARE TO SAMPLE

0916 UXO CLEARS EACH SAMPLE LOCATION (START.)

0923 ASSEMBLE MISC TOOL + INITIAL DECON

0940 COMPLETE DECON W/ ACETONE WIPES DOWN AND RINSE

0945 DECIDE LABEL METHOD DU09-060410-001

0950 BEGIN SAMPLE PATH. COMBINE INTO ONE
COMPOSITE SAMPLE. WILL HAVE 100 LOCATIONS.
5 CM X 1.75 CM MEASUREMENTS SAMPLER1011 COMPLETE BOTH SAMPLE PAGES. 1.3 kg estimate
COLLECTED BASED OFF OF MEASUREMENTS, PER SAMPLE

1015 DECON MISC TOOL. 100 LOCATIONS SAMPLED.

1020 COLLECTED DU09-060410-001 FOR EXPLOSIVES,
NITROGUANIDINE, NITRATE/NITRITE, AND PERCHLORATE.1030 COLLECT DU09-060410-001D FOR EXPLOSIVES
NITROGUANIDINE, NITRATE/NITRITE AND PERCHLORATE.

1036. LOADING EQUIPMENT.

1045 DRIVE TO NEXT DU. AREA B

1104 UXO CLEARS ALL 100 POINTS SUNNY + 20 mph WIND

1120 COMPLETE CLEARANCE BEGIN SAMPLE LAPS. 45/EW
COMBINE INTO ONE CLEAN ZIPLOC BAG.
5 CM X 1.75 DIA SAMPLER.1143 COMPLETE BOTH SAMPLE PAGES ROUGHLY 1.5 kg
COMPOSITE (100 LOCATIONS).1145 COLLECTED DU08-060410-001 FOR EXPLOSIVES:
NITROGUANIDINE, NITRATE/NITRITE, AND PERCHLORATE.

6/4/10

NWSTF
BOARDMAN

L. TURNER

- 1150 DECON MIS TOOL LIQUINOX + ACETONE + RINSE
- 1155 DRIVE TO NEXT DU. AREA 4 69 X 159 FEET (EST).
- 1205 AT AREA 4 DU UXO CLEARS 100 GRID LOCATIONS
- 1223 AREA CLEARED BEGIN 100 SAMPLE PATHS
COMBINE INTO ONE COMPLETE SAMPLE
- 1245 COMPLETE SAMPLE PASSES 1.5 KG estimate
- 1247 COLLECTED DU04-060410-001 FOR EXPLOSIVES,
NITROGUANIDINE, NITRATE/NITRITE, PERCHLORATE
- 1250 DECON MIS TOOL LIQUINOX + ACETONE + RINSE
- 1257 HEAD BACK TO ADMIN BLDG. TO GET ESCORT TO NEXT
DU. AREA 11.
- 1306 AT ADMIN CHECK ESCORT SCHEDULE
- 1315 NAVY CHIEF SAID OIC AS LONG AS UXO IS
OIC W/ IT PROCEED FORWARD.
- 1324 AT DU AREA 11, CONTAINS WHITE PHOSPHORUS AND
THERMITE ROUNDS IN AREA, BRING EXTRA CASQUEL
- 1329 BEGIN UXO CLEARANCE w/ DETECTOR OF ALL
LOCATIONS
- 1352 CLEARED LOCATIONS. 7 X 16 = 112 LOCATIONS
- 1400 BEGIN SAMPLE PATH FOR MIS COMPLETE AREA 11
- 1423 COMPLETE SAMPLE FOR DU-AREA 11. 1.5 KG
- 1425 COLLECTED DU11-060410-001 FOR EXPLOSIVES
NITROGUANIDINE, NITRATE/NITRITE, PERCHLORATE.
- 1430 DECON MIS TOOL LIQUINOX + ACETONE + RINSE.
- 1435 LOAD EQUIPMENT STORE SAMPLE CORER IN

BOARDMAN.

L. TURNER

6/4/10

- PLASTIC ZIPLOC TO DO REWIATE LATER. COOLERS HAVE
FINALLY ARRIVED AT HOTEL.
- 1442 UNWIND EDW BUCKETS (2) AND LABEL DRUMS
- 1450 FINISH UNWINDING EDW 2 FULL DRUMS FROM
DECON (DRIVING) AND DEVELOPMENT. (LABELED)
- 1455 TALK NAVY CREW ABOUT SAMPLING TOWARD
- 1505 OFF TO HOTEL TO LOAD COOLERS
- 1505 AT HOTEL LOAD COOLERS WILL TAKE REWIATE
OF MIS SAMPLER HEAD STORED IN PLASTIC
AFTER DECON TO FUTURE CLEAN.
- 1530 DO BOTTLE CHECK, BUMP TEST YSI = PASS SERIAL LAB.
- 1536 PREPARE TO COLLECT REWIATE OF MIS.
- 1545 COLLECT RB01-060410-001 (REWIATE) FOR EXPLOSIVES
NITROGUANIDINE, NITRATE/NITRITE, PERCHLORATE
- 1555 FILL LABELS AND CHAINS FOR REWIATE
- 1615 OFFSET. DECON PUMP IN HOTEL ROOM w/
LIQUINOX AND HAND BRUSH. DISASSEMBLE THEN
RINSE STORED ALL WATER USED TO DECON.
- 1751 PLACE INTO ZIPLOC BAG AFTER DRYING, FOR STORAGE
- JTS 6/4/10

NWSTF C. MATHENIA
BOARDMAN L. TURNER

SATURDAY, JUNE 5, 2010

WEATHER: OVERCAST, 70's, WIND S-15 W

TASK: BEGIN LOW-FLOW SAMPLING.

PERSONNEL: LEWIS TURNER, CHERYL MATHENIA.

0800 DEPART HOTEL

0815 GET ICG FOR SAMPLE COOLERS.

0830 AT SITE CONDUCT SAFETY MEETING.

0840 AS PER DISCUSSION THIS MORNING FILTERED METALS WILL NOT BE REQUIRED AS THEY WANT TO REPEAT THE 2006 EVENT. PAUL (ECC) REQUEST.

0855 DEPART TO FIRST WELL BORDER WELL #1

0915 AT WELL SETUP EQUIPMENT. ECC GOES TO GET KEY

0920 INSTALL BLADDER W/ COLLAR ONTO PUMP.

0938 CALIBRATE EQUIPMENT.

HACH 2100 TURBIDITY
0.96/7.0 63.3/60.0 487 / 450

YSI 556 mps
PH: 7.00/7.00 4.00/4.00 9.99/10.00

COND: 1.799/1.795 SAL: 1.07

ORP: 223/220 DO: 8.52 mg/L

0948 BW-1 WL: 52.29 TD: 105.58 99.7%

1005 CUT LOCK. NO KEY WILL RE-LOCK LATER.

1010 RUN PUMP W/ TUBING TO 101' FOR TOP OF PUMP.

1035 COMPLETE RE-CAL - PASS CONDUCTIVITY OFF.

1045 BLOW FIVE IN SEPARATE LIGHTER. Hook CONTROLLER TO BATTERY ONLY.

NWSTF C. MATHENIA
BOARDMAN L. TURNER

6/5/10

1045 BEGIN LOW FLOW PURGING AT BW-1 WL/STABLE AT 300 ml/min. WATER LEVEL STABLE.

TIME	GAL	FR	PR	TEMP	COND	SAL	I	ORP	DO
1050	1	300	6.95	17.53	0.806	0.40	65.7	20.7	4.65
1055	0.40	300	6.76	17.51	0.806	0.40	59.4	21.0	3.95
1100	0.80	300	6.64	17.05	0.803	0.40	76.7	21.3	3.78
1105	1.20	300	6.58	17.09	0.802	0.40	22.8	21.1	3.19
1110	1.60	300	6.90	17.05	0.804	0.40	22.8	21.0	3.16
1115	2.00	300	6.47	17.09	0.805	0.40	9.24	31.0	3.22
1120	2.40	300	6.45	17.17	0.806	0.40	8.19	20.8	3.25
1125	2.80	300	6.44	17.11	0.807	0.40	8.37	27.5	3.20

1135 COLLECT BW01-060510-001 AND DUP SAMPLE

1135 COLLECT BW-01-060510-0010 (DUPLICATE) FOR EXPLOSIVES, NITROGUANIDINE, PERCHLORATE, NITRATE, NITRITE, CHLORIDE, SULFATE, BICARB, ALKALINITY.

1145 COMPLETE SAMPLING W/AD UP EQUIPMENT. PLACE PUMP IN DOWN TUBE WELL DECON AT NEXT LOCATION.

1210 HEAD TO ADMIN DUMP TRASH, REST ROOM, EAT LUNCH AT ADMIN. AT ADMIN 1219

1240 DEPART TO BW-3 FROM ADMIN BLDG

1255 AT WELL WL: 136.36 TD: 153.90

1317 DECON PUMP

1330 LOWER PUMP W/ NEW TUBING INTO BW-3.

1350 BEGIN LOW FLOW PURGING AT BW-3 UNABLE

NWSTF

L. TURNER

6/5/10

BOARDMAN

TO GET A FLOW OF OVER 100 ml/min.

1440 FINAL READINGS

TIME	GAL	FR	PH	TEMP	COND	SAL	TURB	ORP	DO
1440	1.30	100	6.59	16.66	0.848	0.42	6.28	14.1	2.81

1450 COLLECT BW03-060510-001 FOR EXPLOSIVES, AND SUITE.

1537 FINAL WL = 136.19

1540 PULL AND DECON PUMP

1549 COMPLETE DECON.

1552 GO TO ADMIN OXARC DELIVERED 4 X 150 cu.

NITROGEN CYL. (ALREADY USED ONE UP).

1557 LOAD ONE CYL TO VEHICLE.

1600 DEPART TO BORDER WALL #2

1609 AT BW-2 WL = 28.67 TD = 60.07

1612 SETUP AT BW-2 INSTALL NEW TUBING w/ 2"

SS BLADDER PUMP.

1624 BEGIN LOW-FLOW PURGING ENDED AT 400 ml/min

FLOW RATE. VERY SMALL BUBBLES IN CRCL PASSING

CAUSING HIGH D.O., SIMILAR D.O. w/ NEW WELL

OBSERVED DURING DEVELOPMENT.

1659 FINAL READINGS BEFORE SAMPLING.

TIME	GAL	FR	PH	TEMP	COND	SAL	TURB	ORP	DO
1610	3.71	400	6.35	16.87	0.852	0.42	3.38	25.0	6.27

1710 COLLECT BW02-060510-001 AND ODIMS + 001 MSD FOR

EXPLOSIVES, NITROGUANIDINE, PERCHLORATE, NITRATE, NITRITE,

CHLORIDE, SULFATE, BICARBONATE, AND ALKALINITY.

NWSTF

L. TURNER

6/5/10

BOARDMAN

1730 FINAL WL = 28.68

1735 PULL PUMP AND DECON. w/ LEAKAGE MEX.

1744 LOAD EQUIPMENT.

1805 OFF TO HOTEL IN BOARDMAN.

1825 AT HOTEL

1848 PERFORM CHECK ON VSI = PASS SEE CAL LOG.

6/5/10

J A

SUNDAY, JUNE 6, 2010

NWSTF
BOARDMANC. MATHENIA
L. TURNER

WEATHER: OVERCAST 60-70°F

TASK: CONTINUE GW SAMPLING.

PERSONNEL: LEWIS TURNER, CHERYL MATHENIA.

0740 DEPART HOTEL.

0750 GET FUEL, AND ICE AT GAS STATION.

0755 CONTINUE TO SETA.

0809 AT ADMIN BLDG UNLOAD IOWA WATER TO DRUMS.

0815 FINISH UNLOADING WATER

0825 EC DAILY SAFETY MEETING

0830 DRIVE TO 0800-3 WL: 94.25 TD: 144.94

0840 AT 0800-3 SET UP EQUIPMENT.

0842 CAL. YSI AND BUMP TEST TURBIDITY

0844 TURBIDITY HACH 8100P METER = PASS
6.92/7.0 64.5/60.0 485/450

0850 YSI 556 MPS ALLOW 15 MIN D.O. SENSOR WARM UP.

PH: 7.00/7.00 4.01/4.00 9.95/10.00

COND: 1.765/1.795 SAL = 1.00

ORP: 223/220 DO: 100.0% 89.9%

0927 COMPLETE CAL BEGIN PURGING 0800-3 FLOW

RATE OF 400 mL/min CAUSED SLIGHT DRAW DOWN

LOWER TO 300 mL/min.

0935 FLOW ACCOMPLISHED.

1010 FINAL READINGS

TIME	GAL	FR	PH	TEMP	COND	SAL	TURB	ORP	D.O.
1010	280	300	7.13	17.16	0.546	0.97	80.0	58.4	4.70 (4.70)

NWSTF

C. MATHENIA 13

6/6/10

BOARDMAN

L. TURNER

1015 COLLECT 08/00-03 - 060610 - 001 FOR EXPLOSIVES + SWIRL

1025 FINAL WL = 94.28

1030 PULL PUMP AND DECON IN TUBE

1041 COMPLETE DECON LOADED EQUIPMENT.

1043 DRIVE TO 08/00-1 WELL

1044 AT 08/00-1 WL = 118.50 TD = 200.46

1050 SET UP EQUIPMENT.

1105 BEGIN LOW-FLOW PURGING AT 08/00-1

1110 FLOW ACCOMPLISHED. 200 BACK DOWN TO 125 mL/min

1125 LOWEST POSSIBLE TO STILL GET FLOW. CAUSING

DRAW DOWN. CALCULATE BORE SATURATED

VOLUME SWITCHING TO LOW RECOVERY WELL METHOD.

CASING VOL = 13.7

FILTERPACK VOL = 5.1 TOTAL = 18.8 gal

SYSTEM VOL = 0.97 gal = 1.2 SYS VOL

1140 SWITCHED TO LOW RECOVERY METHOD WELL

COLLECT READINGS AT 500 ML INTERVALS

UNTIL A TOTAL OF 2.4 GALLONS (2 SYSTEM VOL)

HAVE BEEN REMOVED. THEN WELL WILL BE

SAMPLED.

1220 2.4 GALLONS HAVE BEEN PURGED BEGIN COLLECTING SAMPLES.

1220 FINAL READINGS ALL STABLE EXCEPT WATER LEVEL

TIME	GAL	FR	PH	TEMP	COND	SAL	TURB	ORP	D.O.
1220	2.4	200	7.43	17.48	0.709	0.35	25.1	7.9	2.86

12 14		NWSTF		C. MATHENIA		NWSTF		C. MATHENIA 15						
S 6/6/10		BOARDMAN		L. TURNER		BOARDMAN		L. TURNER						
6	1230	COLLECT OB/0001-060610-001		FOR EXPLOSIVES, SUITE		1459	AT ADMIN PUT MORE NITROGEN IN VEHICLE,							
7	1235	FINAL WATER LEVEL = 144.98					UNLOAD EMPTIES							
8	1240	PULL AND DECON PUMP + LOAD EQUIPMENT.				1520	DEPART TO BW-5							
07	1300	DRIVE TO NEXT LOCATION				1524	AT BW-5 WL = 62.53 TD = 65.80							
07	1304	AT OB/00-02 WL = 101.08 TD = 168.00					VOLUME ABOVE PUMP INTAKE: 1.25 GAL.							
07	1310	SETUP EQUIPMENT PUMP 3' OFF OF BOTTOM.					TOTAL BORE HOLE WL = 1.75 GAL							
08	1322	BEGIN LOW-FLOW PURGING AT OB/00-02					VOL NEEDED FOR SAMPLES = 1.0 GAL SYSTEM = 0.30							
08	1325	FLOW ACCOMPLISHED 125 DOWN TO 100 STILL				1535	PAUL DECIDES TO BAIL DRY ONE LAST TIME							
08		CAUTION DRAW DOWN SWITCH TO LOW RECOVERY.					BECAUSE WE WILL NOT HAVE THE VOLUME TO							
08	1350	SWITCH METHODS, LOW RECOVERY					LOW-FLOW PURGE SYSTEM VOLUMES.							
08		CASING = 10.9 gal				1540	BEGIN BAILING.							
08		FILTER = 5.09				1557	BAILED DRY AT 2.0 GALLONS. WL = 65.55 TD = 65.01							
08		SYSTEM VOL = 0.90 X 2 = 1.80 GAL TOTAL				1557	STARTS RAINING.							
	1400	PURGE TWO SYSTEM VOLUMES (1.80 GAL)				1600	HEAD BACK TO ADMIN TO SAMPLE NAVY WELL #2							
08	1420	COMPLETE PURGING VOLUMES. BEGIN COLLECTING				1617	DISCUSS W/ PAUL ABOUT SPIGOT SAMPLE. HE							
		SAMPLES (2.00 REMOVED).					AGREES TO TAKING READINGS OUT OF CWP W/ YEE							
	1420	FINAL READINGS ALL STABLE EXCEPT WL.					WELL IS USED FOR WATER SYSTEMS AROUND BASE							
		TIME	GAL	pH	TEMP	COND	SAL	TURB	ORP	D.O.				
0	1420	2.02	7.48	17.45	0.425	0.37	9.24	12.5	4.69					
	1425	COLLECT OB/0002-060610-001		FOR EXPLOSIVES AND SHEET.		1619	WILL SET STEADY FLOW FROM SPIGOT THEN COLLECT							
	1441	FINAL WATER LEVEL = 108.48					READINGS. DO WILL BE AFFECTED.							
01	1445	PULL AND DECON PUMP. + LOAD UP.				1125	COMPLETE PURGING							
11	1450	HAVE USED 3.5 FULL 150 GALLON TANKS TOTAL FOR				1125	FINAL READINGS.							
11		ALL WELLS SAMPLED SO FAR				TEMP	GAL	pH	TEMP	COND	SAL	TURB	ORP	D.O.
11	1455	DEPART TO ADMIN				1650	3.16	7.90	18.40	0.614	0.30	7.57	29.0	6.02

12 16
S 6/6/10

NWSTF
BOARDMAN

C. MATHENZA
L. TURNER

NWSTF
BOARDMAN

C. MATHENZA
L. TURNER

MONDAY, JUNE 7, 2010

L 1650 COLLECT NVO2-060610-001 FOR EXPLOSIVES + SITE

WEATHER: MOSTLY CLEAR 70-75°P WIND S-20

- 1710 DEPART SITE NAVY LOCKS GATE

TASK: CONTINUE GW SAMPLING

P 1735 AT HOTEL

PERSONNEL: LEWIS TURNER, CHERYL MATHENZA.

07 1800 PERFORM RUMP CHECK ON YSE SEE CALIBRATION LOG.

0745 PACK UP COOLERS TO SHIP.

= PASSED.

0750 CHAINS WERE COMPLETED YESTERDAY - RE-ICE COOLERS
FOUR TOTAL.

0818 CHERYL AND LEWIS ASSIST ECC IN PACKING COOLERS
4 ARE READY TO SHIP, FEDEX WILL COME PICK UP.

0820 COMPLETE, GO TO DEPART HOTEL.

0826 STOP FOR DRINKING WATER CALL OXARC ORDER

PICK UP OF NITROGEN BOTTLES AND MORE DELIVERED.
3 NEW BOTTLES.

0848 AT ADMIN BLDG. LOAD UP MORE EQUIPMENT
ROPE AND TUBING.

CALIBRATE INSTRUMENTS

TURBIDITY HACH 2100 P.

6.97/7.0 - 63.6/60 484/450

YSE 556 mps

PH: 7.00/7.00 4.00/4.00 9.97/10.00

COND: 1.987/2.000 SAL: 0.98/1.00

ORP: 223/220 DR. 100.6/100% 8.90 mg/L

0924 COMPLETE CALIBRATION. CALL SHARON ABOUT
BW-5 VOLUME. SURVEYS GO TO 2 NEW WELLS

0940 SETUP AT BW-5 WL= 62.60 TO 65.80

WL CLOSE TO PREVIOUS DAY WILL USE SAME CALCULATIONS

ST

12 18 NWSTP C. MATHENZA
5 6/7/10 BOARDMAN L. TURNER

6 0950 BW-5 CALCULATIONS. WANT TO NOTIFY AD. LINDERMAN
VOLUME ABOVE PUMP INTAKE WHEN PUMP RESTS AT
BOTTOM = 1' OFF OF BOTTOM. = 1.25 GALLONS
TOTAL BARR HOLE + RESER. VOL = 1.25 GAL.
SYSTEM VOL. NO FLOW THROUGH = 1.38 GAL. - INCLUDES
VOL FOR REG. SAMPLES = 1.0 GAL.

0 1003 BEGIN COLLECTING SAMPLE NO VOL TO PURGE BEFORE
WAS BARR DRY YESTERDAY.

08 1015 63.75 WL 1 LITER LEFT TO COLLECT.
NOTE NO PARAMETERS COLLECTED AND
WATER LEVEL NOT STABLE. 100 ^{ml}/min (AHEAD) DRAWDOWN

08 1019 FINAL WL. = 64.39 ROUGHLY 0.40' OF
WATER ON TOP OF PUMP COLLECT FLOW
RATE W/ REMAINING WATER. FR = 150 ^{ml}/min

01 TIME GAL FR PH TEMP COND SAL ORP D.O.
1025 1.25 150 7.64 19.29 0.581 0.49 43.8 ~~11.05~~ ^{4.06} ^{10.7}

1025 COLLECTED BW05-060710-001 FOR EXPLOSIVES + OTHER ANALYSIS
PULL PUMP TO DECON W/ LEADENOR

1049 COMPLETE DECON

1105 DEPART TO NV-7

1130 ARRIVE AT NV-7 WL = 26.77 TD = 73.60

1150 RUN TUBING W/ PUMP 3' FROM BOTTOM

1151 NITROGEN ARRIVED AT ADMIN.

1200 BEGIN PURGING NV-7 AT 100 ml/min (AHEAD).
DRAW DOWN CALCULATE MEASUREMENTS.

NWSTP C. MATHENZA 19
6/7/10 BOARDMAN L. TURNER

CASING VOL = 7.64 GAL
TURNING = 0.77 F-CALL = 0.65 BLADDER = 0.13
1 SYSTEM VOL = 1.15 GALLONS.

1230 WILL PURGE 2 SYSTEM VOLUMES. PAUL CALLING.
AS LATER APPEARS STAGNANT.

1335 PAUL CALLED MARK MURPHY. SAID TO BARR DRY
THEN CHECK FOR RECHARGE. 2.47 GAL PURGED.

1345 PAUSED PUMP AND BEGIN BAILING.

1420 COMPLETE BAILING. 10 GALLONS TOTAL.

1422 WL = 73.40 WILL CHECK TOMORROW FOR RECHARGE.

1425 DECON PUMP + CELL.

1437 DEPART TO ADMIN.

1500 AT DRUMS STORE IDW PURGE WATER.

1505 WAA NEW NITROGEN TANK.

1540 ORDER PACK OF BLADDER.

1544 AT BW-4 SETUP WL = 11.43 TD = 20.16

1550 SETUP INSTALL PUMP W/ NEW TUBING.

1555 BEGIN PURGING BW-4 AT 800 ml/min

1628 FLOW AT 850 WL STABLE

TIME GAL FR PH TEMP COND SAL ORP D.O.
1650 2.62 250 7.21 16.87 1.040 0.42 24.5 6.90

1650 COLLECT BW04-060710-001 FOR EXPLOSIVES, METRO
PERMANGANATE, NITRATE, NITRITE, CHLORIDE, SULFATE, BICARBONATE
ALLANISYD

1654 PULL AND DECON PUMP. SAMPLE RINSE.

1700 FINAL WL WAS = 4.51

6/7/10

BOARDMAN

L. TURNER

TUESDAY, JUNE 8, 2010

L. TURNER

1710 COLLECT R802-060710-001 F.R. EXPLOSIVES, NITRO,
PERCHLORATE, NITRATE, NITRITE, CHLORIDE, SULFATE, ALK, BICARB.

1737 DEPART TO HOTEL

1745 NAVY LOCK GATE

1755 AT HOTEL

1819 Bump TEST YSI = PASS SEE CAL LOG.

6/7/10

WEATHER MOSTLY CLEAR, 70'S WIND S-30 W.

TASK: COMPLETE SAMPLING.

PERSONNEL: L. TURNER, C. MATHENIA

0740 PAUL SHIP'S OWE LOGS FROM YESTERDAY

0743 DEPART HOTEL.

0801 AT ADMIN LOADUP NITROGEN SAFETY MEETING

0820 DEM AREA WELL WL = 180.72 TD = 247.50

0823 CALIBRATE EQUIPMENT. INSTALL TUBING + PUMP.

TURBIDITY HACH 2100P

7.09/7.0 63.5/60.0 474/450

YSI 556 MP1

PH 7.04/7.00 3.99/4.00 10.05/10.00

COND: 1.924/2.000 @ 25°C SAL 0.98

ORP: 223/220.0 D.O. 100.5% 8.45 mg/l

0850 COMPLETE CAL AND WELL EQUIPMENT SETUP.

0855 BEGIN LOW-FLOW PURGING AT DEM AREA WELL

0900 FLOW ACCOMPLISHED AT 100 ml/min WILL LEAVE

AT THIS FLOW AS TO NOT DAMAGE BLADDER

RED STATES PUMP MAY DEPTH IS 250' BGS.

MINOR ADJUSTMENT DO NOT SEEM TO AFFECT

PUMP RATE, WILL ERROR ON SAFE SIDE AND KEEP

SAME RATE.

0945 COMPLETE PURGING BEGIN SAMPLING.

TIME	GAL	PH	TEMP	COND	SAL	TURB	ORP	D.O.
0945	1.17	7.61	19.82	0.649	0.72	16.7	-71.3	0.95

22

C. MATHENIA.

NWSTF

BOARDMAN

L. TURNER

5/8/10

1000 COLLECT DAW-060810-001 FOR EXPLOSIVES + OTHERS.

1025 PULL AND DECON PUMP, LOAN EQUIPMENT.

1043 COMPLETE DECON OF EQUIPMENT: PAUL AND TERRY

WENT TO CHECK WATER LEVEL IN NAVY WELL 7.

1058 PAUL AND TERRY CALL SAID NO NEW WATER IN

NAVY WELL #7 THEY ARE COMING BACK, WL=73.43

WATER PURGED YESTERDAY WAS FOULED W/ HAIR/ANIMAL

REMNANTS - WILL NOT SAMPLE PER PAUL'S INSTRUCTION.

1105 END OF DAY CAL TURBIDITY T YSI = PASSED.

HACH 2100 COLORIMETER

6.90 / 7.0 63.9 / 62.2 478 / 450

YSI 556 MDS.

PH 7.08 / 7.00 4.08 / 4.00 9.89 / 10.00

COND 1.780 / 1.745 SAL = 1.00

ORP 221 / 220 DO: 8.65 mg/L 95%

1115 PACK UP EQUIPMENT.

1140 DEPART TO HOTEL

1200 AT HOTEL HEAR PAUL W/ COOPER, FINISH

BOXING UP EQUIPMENT.

1226 OFF TO PARKS FEDEX OXARC PICKING UP

5 X 150 CU. FT. NITROGEN TODAY OR

TOMORROW.

1327 AT FEDEX IN PARKS VA.

1354 SHIP ALL EQUIPMENT 1 TO GROTRICH 5 TO

BMCD KC 1 TO BMCD STL.

C. MATHENIA.

NWSTF
BOARDMAN

L. TURNER

23

5/8/10

1400 FINISH PACKAGING AND SHIPPING EQUIPMENT BACK

TO KC OFFICE

1420 TO HOTEL IN PARKS WILL FLY OUT TOMORROW.

S

5/8/10

WEDNESDAY, JUNE 9, 2010 BOARDMAN

WEATHER: OVERCAST, 70°F

TASK: TRAVEL TO KANAWA CITY.

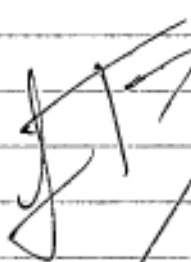
PERSONNEL: CHERYL MATHENZA, LEWIS TURNER.

0600 DEPART HOTEL TO AIRPORT. RETURN RENTAL SUV.

0700 BOARD FLIGHT TO KCI AIRPORT

0235 AT KCI AIRPORT

0330 DEPART TO HOUSE FROM ECONOMY PARKING.



6/9/10

APPENDIX C

SOIL SAMPLING DOCUMENTATION

**GPS Survey Data
Decision Units 4, 8, 9, and 11
NWSTF Boardman, Oregon**

Area	NW	NE	SW	SE	Size (M)
Area 4 DU	45.74192 119.74617	45.74191 119.74552	45.74187 119.74618	45.74174 119.74550	48x21
Area 8 DU	45.75594 119.74552	45.75612 119.74601	45.75587 119.74953	45.75622 119.74565	30x30
Area 9 DU	45.76403 119.70002	45.76911 119.69951	45.76883 119.69988	45.76893 119.69952	30x30
Area 11 DU	45.77658 119.66706	45.77670 119.66689	45.77611 119.66667	45.77633 119.66648	48x21

Notes

1. Survey conducted with hand-held GPS.
2. Survey coordinates presented as latitude and longitude.

DU - decision unit

M - meters

NE - northeast

NW - northwest

SE - southeast

SW - southwest

APPENDIX D

QUALITY CONTROL SUMMARY REPORT

QUALITY CONTROL SUMMARY REPORT

DECISION POINT TWO REPORT (UPDATE)

NAVAL WEAPONS SYSTEMS TRAINING FACILITY

BOARDMAN, OREGON

Prepared for

Naval Facilities Northwest

Contract No. N62742-03-D-1843

September 2010

Prepared by:

ECC
1746 Cole Blvd
Building 21, Suite 350
Lakewood, Colorado 80401

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LIST OF ATTACHMENTS

Attachment A Analytical Data

LIST OF ABBREVIATIONS AND ACRONYMS

COC	Chain-of-Custody Record
CRM	certified reference material
%C	degrees Celsius
%D	percent difference
EPA	United States Environmental Protection Agency
ID	identifier/identification
J	estimated
LCS	laboratory control sample
M	modified
MDL	method detection limit
ug/L	micrograms per liter
mg/kg	milligrams per kilogram
MS/MSD	matrix spike/matrix spike duplicate
NAVFAC	Naval Facilities Engineering Command
PACDIV	Pacific Division
QAPP	Quality Assurance Project Plan
QC	quality control
QCSR	Quality Control Summary Report
R	rejected
%REC	percent recovery
RPD	relative percent difference
SDG	sample delivery group
U	not detected - analyte is not present at greater than the MDL
UJ	not detected, estimated
UR	notdetected, rejected

1.0 INTRODUCTION

Sampling was conducted by ECC as contracted by the, Naval Facilities Engineering Command (NAVFAC) Pacific Division (PACDIV), from June 4, 2010 through June 8, 2010 as part of the Five Year Range Condition Assessment Review at Boardman, Oregon. All sampling activities were performed in accordance with the project-specific Quality Assurance Project Plan (QAPP). This report is the Quality Control Summary Report (QCSR), which presents a summary of the chemical data quality review for this project.

Per the project-specific QAPP, samples were collected and analyzed for the following:

- 8330B (Nitroaromatics/Nitramines)
- 8330Modified (M) (Nitroguanidine)
- 6850 (Perchlorate)
- General Chemistry methods (Bicarbonate Alkalinity, Chloride, Nitrate-Nitrite, Sulfate)

For the purposes of this QCSR, parameters measured by Method 8330B and/or 8330M are referred to as “explosives.”

Analyses were performed by Test America - Sacramento under the following sample delivery groups (SDGs):

G0F080568
G0F090497
G0F100530

Table 1-1 lists locations planned for sample collection, the corresponding sample identifications (IDs), and the required analyses. Table 1-1 also provides the following sample collection information:

- A cross-reference between laboratory sample IDs and field sample IDs;
- Matrix spike/matrix spike duplicate (MS/MSD) information;
- SDG numbers;
- Chain of Custody (COC) numbers;
- Dates of sample collection and sample receipt by the laboratory; and
- Requested analyses

The laboratory data packages are included as Attachment A of this report.

2.0 FIELD SAMPLING ACTIVITIES

Samples were collected from June 4 through June 8, 2010. Sample IDs and analyses are listed in Table 1-1, as noted in the previous section.

Field duplicates were collected as indicated on Table 1-1. MS/MSD pairs were analyzed as indicated by field personnel on the COC or at the laboratory’s discretion. The field quality control (QC) goals for field duplicates and MS/MSD pairs were satisfied.

Water samples were collected from 10 of the 11 planned wells (Navy Well 7 was dry). Soil samples were collected for each of the four decision units.

3.0 ANALYTICAL RESULTS

Analytical results for water and soils are presented in Table 3-1 and Table 3-3, respectively. Detections for water and soils are presented in Table 3-2 and Table 3-4, respectively.

4.0 QUALITY CONTROL SUMMARY

The following subsections present the results of the data quality evaluation. This evaluation was performed in accordance with the project specific QAPP. Data quality evaluation results are summarized in Table 4-1 according to field sample ID. QC outliers are summarized in Table 4-2. Field duplicate results are reported in Table 4-3.

4.1 Sample Receipt at the Laboratory

Two of three coolers associated with samples reported in SDG G0F080568 were received at the laboratory at temperatures of 8 degrees Celsius ($^{\circ}\text{C}$) and 9°C . The cooler associated with SDG G0F090497 was received at the laboratory at a temperature of 13°C . Based upon laboratory notation, inadequate ice was used for packing these cooler. Because of the non-volatile nature of the analytes for this project, no qualifiers were assigned for temperature at receipt for the samples received at 8°C and 9°C . The samples in SDG G0F090497 were qualified for temperature at receipt due to the discrepancies in the sample condition being large enough to possibly affect the data. Therefore, results for samples BW05-060710-001, BW04-060710-001 and rinsate blank RB02-060710-001 were qualified as estimated, "J/UJ" for explosives (except nitroguanidine), perchlorate and general chemistry methods. The Nitroguanidine non-detects for samples BW05-060710-001, BW04-060710-001 and rinsate blank RB02-060710-001 were rejected (UR) as unusable due to the temperature exceedance and seven day extraction holding time exceeded by more than two times as noted in Section 4.2. All remaining samples were received at the laboratory intact, properly preserved, on ice, and within $4 \pm 2^{\circ}\text{C}$.

The laboratory noted discrepancies between sample collection times on the bottles and sample collection times on the COCs for samples received in SDG G0F080568. Communication with field personnel indicated that the times were recorded on the sample containers in the field; therefore, the sample times on the bottles were correct. There was no confusion regarding sample identification, and no qualifications were required.

One cooler was noted by the laboratory as "not relinquished by an appropriate agent". Conversation with field personnel confirmed that one COC was submitted to the shipping agent without obtaining the signature. Coolers were either in the control of field personnel, the shipping agent, or the laboratory, and sample integrity was not compromised. No qualifications were required.

4.2 Holding Times

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. The extraction holding time was exceeded for nitroguanidine for water samples BW05-060710-001, BW04-060710-001, DAW-060810-001 (DEMO ATLAS WELL), and rinsate blank RB02-060701-001. The seven day extraction holding time was exceeded by eight to nine days for the samples. Due to the holding time being exceeded by more than two times, the non-detect results for nitroguanidine were rejected as unusable (UR) for these samples as noted in Table 4-1. All other samples were extracted and analyzed within required holding times.

4.3 Calibration

Initial calibrations are analyzed to ensure that an instrument is capable of producing a linear calibration curve so that target analytes are accurately quantified. During validation, individual target compounds in associated samples are qualified as estimated (J/UJ) if that compound does not meet initial calibration criteria.

All initial calibration results were acceptable and no sample qualifications were required.

Continuing calibrations are analyzed to ensure that instrument performance is satisfactory prior to sample analysis. Percent difference (% D) control limits and individual method requirements are applied. Detected and non-detected sample results are qualified as estimated (J/UJ) whether the associated continuing calibration %D demonstrates a high bias or a low bias.

All continuing calibration results were acceptable and no sample qualifications were required.

4.4 Blanks

A laboratory method blank is an analyte-free matrix that is carried through the entire preparation and analysis sequence for the purpose of identifying potential contamination introduced during preparation and analysis. Detections are qualified as non-detected (U) if the concentration in the sample is less than five times the concentration in the associated laboratory method blank (10x for common laboratory contaminants).

No detections were reported for the method blanks, and no qualifications were required in association with method blank results.

Rinsate blanks were collected in association with water and soil samples, and results for both rinsate blanks were non-detect for all analytes. No qualifications were required.

4.5 Surrogates

Surrogates are compounds not normally found in the environment that are added (spiked) into samples prior to extraction (for extractable methods) or prior to analysis (for non-extractable methods). The percent recovery (%REC) of each surrogate is used to assess the success of the sample preparation process for an individual sample.

Surrogates were spiked for analysis of explosives and all surrogate %RECs were acceptable, except for the surrogate %REC for sample DU08-060410-001. Per the laboratory case narrative, SDG G0F080568, the matrix effect was confirmed by visible chromatographic interferences. MS/MSD analyses were performed on this sample and low surrogate recoveries were observed in these QC samples, also. Results for this sample were qualified as noted in Table 4-1.

4.6 Laboratory Control Samples

A laboratory control sample (LCS) consists of a matrix similar to that of the field sample that is spiked with known concentrations of analytes. The LCS %REC is a measure of method accuracy. The LCS %RECs for the milled certified reference material (CRM) were low for 4-amino-2,6-dinitrotoluene and nitrobenzene at 61% and 73%, respectively. The results for 4-amino-2,6-dinitrotoluene and nitrobenzene (all non-detects) were qualified as estimated (UJ) for all soil samples as noted in Table 4-1. The nitrobenzene non-detect for sample DU08-060410-001 was subsequently rejected (UR) due to 0%

nitrobenzene recoveries for the MS/MSD analyses performed on this sample. All other LCS %RECs were acceptable. No further qualifications were required.

4.7 Matrix Spike / Matrix Spike Duplicate

A field sample is split into three portions (original, MS, and MSD) and known amounts of analytes are added (spiked) into the MS and MSD. The results for the MS and MSD are assessed for reproducibility using the relative percent difference (RPD). These results are also compared to the un-spiked portion of the sample for % REC of the spiked analytes.

MS/MSD %RECs and RPDS were acceptable for all analyses, except for the explosives analyses of sample DU08-060410-001. Results for this sample were qualified as noted in Table 4-1. Because the MS/MSD %RECs for nitrobenzene and nitroguanidine were less than 10%, non-detect results for nitrobenzene and nitroguanidine were rejected (UR) for sample DU08-060410-001.

4.8 Other Laboratory QC

Analytes detected below the reporting limit, but above the lowest level for reporting are quantified and results are qualified as estimated (J) by the laboratory. These qualifiers are carried over as “J” by the validator but are not considered as validation qualifiers for purposes of data completeness calculations.

Explosives

The RDX detection (0.041 J milligrams per kilogram [mg/kg]) at below the reporting limit for sample DU09-060410-001 was flagged by the laboratory for having a %D of > 40% between the original and confirmation column detects.

The HMX detection (0.059 J micrograms per liter [ug/L]) at below the reporting limit for sample BW05-060710-001 was flagged by the laboratory for having a %D of > 40% between the original and confirmation column detects.

The RDX and HMX detections were estimated due to being below reporting limit, and no further qualification was required for the %D between the original and confirmation column results.

4.9 Field Duplicates

Field duplicates provide information regarding the reproducibility of analytical results and account for error introduced from handling, shipping, preparing, and analyzing field samples. One field duplicate pair was collected for water and one was collected for soils. Field duplicate results are presented in Table 4-3.

The field duplicate pair for water was BW01-060510-001/ BW01-060510-001D. The field duplicate pair for soils was DU09-060410-001/ DU09-060410-001D. All field duplicate results met acceptance criteria except for the tetryl detections for the soil field duplicate pair. Tetryl was qualified as estimated (J) for both samples as note in Table 4-1. No other qualifications were required due to field duplicate results.

4.10 Dilutions and Reanalyses

General Chemistry

Several general chemistry results, for each of the three SDGs, have detections qualified by the laboratory for being reported from dilutions. These dilutions were made due to high levels of the reported analytes. The dilutions brought the detections to within the calibration range of the instrument; therefore, no sample qualifications were required due to the sample dilutions.

All other results were reported from undiluted analyses and no qualifications were required.

4.11 Overall Assessment

The following subsections present the field completeness, analytical completeness, and project completeness determinations.

Field completeness for sample collection was assessed by comparing the number of samples properly collected to the number of samples planned for collection. All samples were collected as outlined in the QAPP. Soil samples were collected from each of the four decision units. Water samples were collected from 10 of 11 planned wells. Field completeness was 94%. The field completeness results are reported in Table 4-4.

Analytical completeness is calculated as both acceptable data completeness and quality data completeness. Acceptable data includes data that has not been rejected or qualified as estimated (J/UJ). Data points for which the required corrective actions were taken do not count against the acceptable data completeness goal calculation. The acceptable data completeness percentage is a measure of laboratory contract compliance. Acceptable data completeness was 79%.

Quality data is defined as all data except rejected data points. Rejected data points that have acceptable replacement data points are not counted against the quality data completeness goal. The quality data completeness was 98%. The analytical completeness calculations are shown in Table 4-5.

All samples were analyzed using the appropriate method as outlined in the QAPP. All analytical results are usable as qualified, with the following exceptions: the non-detect results for nitroguanidine and nitrobenzene in sample DU08-060410-001, were rejected (R) due to low (<10%) MS/MSD %RECs, and the nitroguanidine non-detects for samples BW05-060710-001, BW04-060710-001, DAW-060810-001 and rinsate blank RB02-060710-001 were rejected (R) due to extraction holding times being exceeded by >2x the seven day holding time.

5.0 CONCLUSIONS

Results for nitroguanidine and nitrobenzene in sample DU08-060410-001 were rejected (R) due to low (<10%) MS/MSD %RECs with no acceptable replacement data points. Nitroguanidine results for samples BW05-060710-001, BW04-060710-001, DAW-060810-001 and rinsate blank RB02-060710-001 were rejected (R) due to extraction holding times being exceeded by >2x the seven day holding time with no acceptable replacement data points. Impact to project objectives is minimal because these compounds were not detected in any project samples.

All other data are valid for use as qualified. No analytes were detected above the project screening values.

6.0 REFERENCES

ECC, 2010, Draft Final Range-Specific Quality Assurance Project Plan for Five-Year Review / Range Condition Assessment Naval Weapons Systems Training Facility at Boardman, Oregon. May.

EPA Office of Env. Information, 2002, Guidance on Environmental Data Verification and Data Validation, EPA QA/G-8 Final. November.

TABLES

**Table 1-1
Sample Collection Summary
Five Year Range Condition Assessment Review
Boardman, Oregon**

Field ID	Matrix	Field Duplicate Samples	MS/MSD	Date Sampled	Date Received by Laboratory	COC ID	Laboratory ID	SDG	Analyses														
									Perchlorate EPA Method 6850	Nitroguanidine EPA Method 8330V Modified	Explosives EPA Method 8330B	Bicarbonate Alkalinity EPA Method 2320B	Chloride EPA Method 300.0A	Nitrate - Nitrite EPA Method 353.2	Sulfate EPA Method 300.0A								
Field Samples																							
BW01-060510-001	Water			6/5/2010	6/8/2010	139611	G0F080568-002	G0F080568	*	*	*	*	*	*	*	*							
	Water	BW01-060510-001D		6/5/2010	6/8/2010	139611	G0F080568-003	G0F080568	*	*	*	*	*	*	*	*							
BW03-060510-01	Water			6/5/2010	6/8/2010	139611	G0F080568-004	G0F080568	*	*	*	*	*	*	*	*							
BW02-060510-001	Water		MS/MSD - All Analyses	6/5/2010	6/8/2010	139611	G0F080568-005	G0F080568	*	*	*	*	*	*	*	*							
OB/OD03-060610-001	Water			6/6/2010	6/8/2010	139618	G0F080568-006	G0F080568	*	*	*	*	*	*	*	*							
OB/OD01-060610-001	Water			6/6/2010	6/8/2010	139618	G0F080568-007	G0F080568	*	*	*	*	*	*	*	*							
OB/OD02-060610-001	Water			6/6/2010	6/8/2010	139618	G0F080568-008	G0F080568	*	*	*	*	*	*	*	*							
NV02-060610-001	Water			6/6/2010	6/8/2010	139618	G0F080568-009	G0F080568	*	*	*	*	*	*	*	*							
BW05-060710-001	Water			6/7/2010	6/9/2010	139619	G0F090497-001	G0F090497	*	*	*	*	*	*	*	*							
BW04-060710-001	Water			6/7/2010	6/9/2010	139619	G0F090497-002	G0F090497	*	*	*	*	*	*	*	*							
DEMO ATLAS WELL DAW-060810-001	Water			6/8/2010	6/10/2010	139612	G0F100530-001	G0F100530	*	*	*	*	*	*	*	*							
NAVY WELL 07 ¹	Water																						
DU09-060410-001	Soil		N/N MS/MSD	6/4/2010	6/8/2010	139617	G0F080568-010	G0F080568	*	*	*				*								
	Soil	DU09-060410-001D		6/4/2010	6/8/2010	139617	G0F080568-011	G0F080568	*	*	*				*								
DU08-060410-011	Soil		All Except N/N	6/4/2010	6/8/2010	139617	G0F080568-012	G0F080568	*	*	*				*								
DU04-060410-001	Soil			6/4/2010	6/8/2010	139617	G0F080568-013	G0F080568	*	*	*				*								
DU11-060410-001	Soil			6/4/2010	6/8/2010	139617	G0F080568-014	G0F080568	*	*	*				*								
Rinsate Blanks																							
RB01-060410-001	Water			6/4/2010	6/8/2010	139611	G0F080568-001	G0F080568	*	*	*				*								
RB02-060710-001	Water			6/7/2010	6/8/2010	139619	G0F090497-003	G0F090497	*	*	*	*	*	*	*	*							

¹ = Sampling for NAVY WELL 07 was planned for 6/08/2010 but the well was dry and no sample was collected per COC 139612.

Notes:

- * = Requested for the indicated analyses.
- COC = Chain of Custody Record
- EPA = United States Environmental Protection Agency
- ID = Identification

- MS/MSD = Matrix Spike / Matrix Spike Duplicate
- SDG = Sample Delivery Group
- N/N = Nitrate-Nitrite

**Table 3-1
Analytical Results - Water
Five Year Range Condition Assessment Review
Boardman, Oregon**

Sample ID:	RB01-060410-001	Val Qual	BW01-060510-001	Val Qual	BW01-060510-001D	Val Qual	BW03-060510-01	Val Qual	BW02-060510-001	Val Qual	OB/OD03-060610-001	Val Qual	OB/OD01-060610-001	Val Qual	
Laboratory ID:	Rinsate Blank				Field Duplicate										
Sample Date:	G0F080568-001		G0F080568-002		G0F080568-003		G0F080568-004		G0F080568-005		G0F080568-006		G0F080568-007		
SDG:	6/4/2010		6/5/2010		6/5/2010		6/5/2010		6/5/2010		6/6/2010		6/6/2010		
SDG:	G0F080568		G0F080568		G0F080568		G0F080568		G0F080568		G0F080568		G0F080568		
Compound	Units														
Perchlorate															
Perchlorate	ug/L	0.50	2.3		2.4		0.50	U	3.5		1.5		0.50	U	
Explosives															
Nitroguanidine	ug/L	20	U	20	U	20	U	20	U	20	U	20	U	20	U
4-Amino-2,6-dinitrotoluene	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
2-Amino-4,6-dinitrotoluene	ug/L	0.29	U	0.29	U	0.29	U	0.30	U	0.29	U	0.29	U	0.29	U
1,3-Dinitrobenzene	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
2,4-Dinitrotoluene	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
2,6-Dinitrotoluene	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
HMX	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
Nitrobenzene	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
Nitroglycerin	ug/L	0.97	U	0.98	U	0.98	U	0.99	U	0.97	U	0.98	U	0.96	U
4-Nitrotoluene	ug/L	0.97	U	0.98	U	0.98	U	0.99	U	0.97	U	0.98	U	0.96	U
2-Nitrotoluene	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
3-Nitrotoluene	ug/L	0.48	U	0.49	U	0.49	U	0.50	U	0.48	U	0.49	U	0.49	U
RDX	ug/L	0.24	U	0.24	U	0.24	U	0.25	U	0.24	U	0.24	U	0.24	U
Tetryl	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
1,3,5-Trinitrobenzene	ug/L	0.097	U	0.098	U	0.098	U	0.099	U	0.097	U	0.098	U	0.096	U
2,4,6-Trinitrotoluene	ug/L	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
Anions															
Bicarbonate Alkalinity	mg/L	N/A		189		188		131		147		175		167	
Chloride	mg/L	N/A		53.9		53.8		62.4		53.5		19.6		45.8	
Nitrate-Nitrite	mg/L	0.050	U	9.3		9.5		0.050	U	33.4		6.1		0.065	
Sulfate	mg/L	N/A		108		108		187		62.8		54.3		121	

Notes:

Reportable detections are in BOLD font.

ID = Identification

ug/L = Micrograms per Liter

J = Estimated

mg/L = Milligrams per Liter

N/A = Not Analyzed

SDG = Sample Delivery Group

U = Not Detected.

UJ = Not Detected, Estimated

UR = Not Detected, Rejected

**Table 3-1
Analytical Results - Water
Five Year Range Condition Assessment Review
Boardman, Oregon**

Sample ID:	OB/OD02-060610-001		NV02-060610-001		BW05-060710-001		BW04-060710-001		RB02-060710-001 Rinsate Blank		DAW-060810-001 DEMO ATLAS WELL	
Laboratory ID:	G0F080568-008		G0F080568-009		G0F090497-001		G0F090497-002		G0F090497-003		G0F100530-001	
Sample Date:	6/6/2010		6/6/2010		6/7/2010		6/7/2010		6/7/2010		6/8/2010	
SDG:	G0F080568	Val Qual	G0F080568	Val Qual	G0F090497	Val Qual	G0F090497	Val Qual	G0F090497	Val Qual	G0F100530	Val Qual
Compound	Units											
Perchlorate												
Perchlorate	ug/L	0.68	2.60		4.4	J	2.5	J	0.50	UJ	0.50	U
Explosives												
Nitroguanidine	ug/L	20	20	U	20	UR	20	UR	20	UR	20	UR
4-Amino-2,6-dinitrotoluene	ug/L	0.15	0.15	U	0.15	UJ	0.15	UJ	0.15	UJ	0.15	U
2-Amino-4,6-dinitrotoluene	ug/L	0.30	0.30	U	0.30	UJ	0.30	UJ	0.29	UJ	0.31	U
1,3-Dinitrobenzene	ug/L	0.15	0.15	U	0.15	UJ	0.15	UJ	0.15	UJ	0.15	U
2,4-Dinitrotoluene	ug/L	0.15	0.15	U	0.15	UJ	0.15	UJ	0.15	UJ	0.15	U
2,6-Dinitrotoluene	ug/L	0.15	0.15	U	0.15	UJ	0.15	UJ	0.15	UJ	0.15	U
HMX	ug/L	0.15	0.15	U	0.059	J	0.15	UJ	0.15	UJ	0.15	U
Nitrobenzene	ug/L	0.15	0.15	U	0.15	UJ	0.15	UJ	0.15	UJ	0.15	U
Nitroglycerin	ug/L	1.00	1.00	U	0.690	J	1.00	UJ	0.97	UJ	1.00	U
4-Nitrotoluene	ug/L	1.00	1.00	U	1.00	UJ	1.00	UJ	0.97	UJ	1.00	U
2-Nitrotoluene	ug/L	0.15	0.15	U	0.15	UJ	0.15	UJ	0.15	UJ	0.15	U
3-Nitrotoluene	ug/L	0.50	0.50	U	0.50	UJ	0.50	UJ	0.48	UJ	0.51	U
RDX	ug/L	0.25	0.25	U	0.25	UJ	0.25	UJ	0.24	UJ	0.26	U
Tetryl	ug/L	0.15	0.15	U	0.15	UJ	0.15	UJ	0.15	UJ	0.15	U
1,3,5-Trinitrobenzene	ug/L	0.10	0.10	U	0.10	UJ	0.10	UJ	0.10	UJ	0.10	U
2,4,6-Trinitrotoluene	ug/L	0.15	0.15	U	0.15	UJ	0.15	UJ	0.15	UJ	0.15	U
Anions												
Bicarbonate Alkalinity	mg/L	183	148		133	J	156	J	5.0	UJ	191	
Chloride	mg/L	9.4	30.9		94.9	J	62.7	J	1.0	UJ	30.2	
Nitrate-Nitrite	mg/L	3.7	17.4		41.50	J	54.20	J	0.050	UJ	0.12	
Sulfate	mg/L	40.2	44.0		88	J	101	J	1.0	UJ	109	

Notes:

Reportable detections are in BOLD font.

ID = Identification

J = Estimated

N/A = Not Analyzed

SDG = Sample Delivery Group

U = Not Detected.

UJ = Not Detected, Estimated

UR = Not Detected, Rejected

**Table 3-2
 Detections - Water
 Five Year Range Condition Assessment Review
 Boardman, Oregon**

		Sample ID:	BW01-060510-001		BW01-060510-001D Field Duplicate		BW03-060510-01		BW02-060510-001		OB/OD03-060610-001		OB/OD01-060610-001	
		Laboratory ID:	G0F080568-002		G0F080568-003		G0F080568-004		G0F080568-005		G0F080568-006		G0F080568-007	
		Sample Date:	6/5/2010		6/5/2010		6/5/2010		6/5/2010		6/6/2010		6/6/2010	
		SDG:	G0F080568		G0F080568		G0F080568-004		G0F080568		G0F080568		G0F080568	
			Val Qual		Val Qual		Val Qual		Val Qual		Val Qual		Val Qual	
Compound	Units	Screening Values ¹												
Perchlorate														
Perchlorate	ug/L	15	2.3		2.4		0.50	U	3.5		1.5		0.50	U
Explosives														
HMX	ug/L	1,800	0.15	U	0.15	U	0.15	U	0.15	U	0.15	U	0.14	U
Nitroglycerin	ug/L	3.7	0.98	U	0.98	U	0.99	U	0.97	U	0.98	U	0.96	U
Anions														
Bicarbonate Alkalinity	mg/L	N/A	189		188		131		147		175		167	
Chloride	mg/L	N/A	53.9		53.8		62.4		53.5		19.6		45.8	
Nitrate-Nitrite	mg/L	58,000 / 3,700	9.3		9.5		0.050	U	33.4		6.1		0.065	
Sulfate	mg/L	N/A	108		108		187		62.8		54.3		121	

¹ = EPA Region 9 Regional Screening Levels (RSLs), April 2009. Worksheet #9 of the Range-Specific QAPP NWSTF Boardman, Boardman, Oregon

Notes:

Detections exceeding the screening values are highlighted in blue

Reportable detections are in BOLD font.

ID = Identification

J = Estimated

N/A = Not Applicable

SDG = Sample Delivery Group

U = Not Detected.

UJ = Not Detected, Estimated

ug/L = Micrograms per Liter

mg/L = Milligrams per Liter

**Table 3-2
 Detections - Water
 Five Year Range Condition Assessment Review
 Boardman, Oregon**

		Sample ID:	OB/OD02-060610-001		NV02-060610-001		BW05-060710-001		BW04-060710-001		DEMO ATLAS WELL DAW-060810-001	
		Laboratory ID:	G0F080568-008		G0F080568-009		G0F090497-001		G0F090497-002		G0F100530-001	
		Sample Date:	6/6/2010		6/6/2010		6/7/2010		6/7/2010		6/8/2010	
		SDG:	G0F080568	Val Qual	G0F080568	Val Qual	G0F090497	Val Qual	G0F090497	Val Qual	G0F100530	Val Qual
Compound	Units	Screening Values ¹										
Perchlorate												
Perchlorate	ug/L	15	0.68		2.60		4.4	J	2.5	J	0.50	U
Explosives												
HMX	ug/L	1,800	0.15	U	0.15	U	0.059	J	0.15	UJ	0.15	U
Nitroglycerin	ug/L	3.7	1.00	U	1.00	U	0.690	J	1.00	UJ	1.00	U
Anions												
Bicarbonate Alkalinity	mg/L	N/A	183		148		133	J	156	J	191	
Chloride	mg/L	N/A	9.4		30.9		94.9	J	62.7	J	30.2	
Nitrate-Nitrite	mg/L	58,000 / 3,700	3.7		17.4		41.50	J	54.20	J	0.12	
Sulfate	mg/L	N/A	40.2		44.0		88	J	101	J	109	

¹ = EPA Region 9 Regional Screening Levels (RSLs), April 2009. Worksheet #9 of the Range-Specific QAPP NWSTF Boardman, Boardman, Oregon

Notes:

Detections exceeding the screening values are highlighted in blue

Reportable detections are in BOLD font.

ID = Identification

J = Estimated

N/A = Not Applicable

SDG = Sample Delivery Group

U = Not Detected.

UJ = Not Detected, Estimated

ug/L = Micrograms per Liter

mg/L = Milligrams per Liter

Table 3-4
Detections - Soil
Five Year Range Condition Assessment Review
Boardman, Oregon

			Sample ID:	DU09-060410-001	Val Qual	DU09-060410-001D Field Duplicate	Val Qual	DU08-060410-011	Val Qual	DU04-060410-001	Val Qual	DU11-060410-001	Val Qual
			Laboratory ID:	G0F080568-010		G0F080568-011		G0F080568-012		G0F080568-013		G0F080568-014	
			Sample Date:	6/4/2010		6/4/2010		6/4/2010		6/4/2010		6/4/2010	
			SDG:	G0F080568		G0F080568		G0F080568		G0F080568		G0F080568	
Compound	Units	Screening Values ¹											
Explosives													
RDX	mg/kg	5.5	0.041	J	0.044	J	0.24	UJ	0.25	U	0.24	U	
Tetryl	mg/kg	N/A	0.41	J	2.40	J	1.40	J	0.25	U	0.24	U	
Anions													
Nitrate-Nitrite	mg/kg	130,000 / 7,800	3.5		5.7		2.8		3.5		10.7		

¹ = EPA Region 9 Regional Screening Levels (RSLs), April 2009. Worksheet #9 of the Range-Specific QAPP NWSTF Boardman, Boardman, Oregon

Notes:

Detections exceeding the screening values are highlighted in blue

Reportable detections are in BOLD font.

ID = Identification

J = Estimated

SDG = Sample Delivery Group

U = Not Detected.

UJ = Not Detected, Estimated

mg/kg = Milligrams per Kilogram

**Table 4-1
Data Quality Evaluation Results
Five Year Range Condition Assessment Review
Boardman, Oregon**

Sample ID	Date Sampled	SDG	Lab Number	Analysis	Parameter	Units	Laboratory Result		Data Review Qualifier	Hold Times	Temp. at receipt	Surrogate/Internal Standard	MS/MSD or DUP	LCS/LCSD	Comments	Final Result	
DU09-060410-001	6/4/2010	G0F080568	G0F080568-010	Explosives	4-Amino-2,6-dinitrotoluene	mg/kg	0.25	U	UJ					X	Low LCS %REC for the milled certified reference material (CRM)	0.25 UJ	
					Nitrobenzene	mg/kg	0.25	U	UJ					X	Low LCS %REC for the milled certified reference material (CRM)	0.25 UJ	
					Tetryl	mg/kg	0.41		J				X		Field Duplicate RPD	0.41 J	
DU09-060410-001D	6/4/2010	G0F080568	G0F080568-011	Explosives	4-Amino-2,6-dinitrotoluene	mg/kg	0.25	U	UJ					X	Low LCS %REC for the milled certified reference material (CRM)	0.25 UJ	
					Nitrobenzene	mg/kg	0.25	U	UJ					X	Low LCS %REC for the milled certified reference material (CRM)	0.25 UJ	
					Tetryl	mg/kg	2.40		J			X		Field Duplicate RPD	2.40 J		
DU08-060410-001	6/4/2010	G0F080568	G0F080568-012	Explosives	4-Amino-2,6-dinitrotoluene	mg/kg	0.24	U	UJ					X	Low LCS %REC for the milled certified reference material (CRM)	0.24 UJ	
					All Explosives (except Nitrobenzene and Nitroguanidine)	mg/kg	various		J / UJ				X		Low surrogate recovery	various UJ / J	
					Nitrobenzene	mg/kg	0.24	U	R				X	X	0% MS/MSD recovery Low surrogate recovery Low LCS %REC for the milled certified reference material (CRM)	0.24 UR	
					1,3-Dinitrobenzene	mg/kg	0.24	U	UJ				X		Low MS/MSD %REC	0.24 UJ	
					2,4-Dinitrotoluene	mg/kg	0.24	U	UJ				X		Low MS/MSD %REC	0.24 UJ	
					2,6-Dinitrotoluene	mg/kg	0.24	U	UJ				X		Low MS/MSD %REC	0.24 UJ	
					Tetryl	mg/kg	1.4		J			X		High MS/MSD %REC	1.4 J		
					1,3,5-Trinitrobenzene	mg/kg	0.24	U	UJ				X		Low MS/MSD %REC	0.24 UJ	
					2,4,6-Trinitrotoluene	mg/kg	0.24	U	UJ				X		Low MS/MSD %REC	0.24 UJ	
DU04-060410-001	6/4/2010	G0F080568	G0F080568-013	Explosives	4-Amino-2,6-dinitrotoluene	mg/kg	0.25	U	UJ					X	Low LCS %REC for the milled certified reference material (CRM)	0.25 UJ	
					Nitrobenzene	mg/kg	0.25	U	UJ					X	Low LCS %REC for the milled certified reference material (CRM)	0.25 UJ	
DU11-060410-001	6/4/2010	G0F080568	G0F080568-014	Explosives	4-Amino-2,6-dinitrotoluene	mg/kg	0.24	U	UJ					X	Low LCS %REC for the milled certified reference material (CRM)	0.24 UJ	
					Nitrobenzene	mg/kg	0.24	U	UJ					X	Low LCS %REC for the milled certified reference material (CRM)	0.24 UJ	
BW05-060710-001	6/7/2010	G0F090497	G0F090497-001	Explosives	Nitroguanidine	ug/L	20	U	UR	X	X				extraction HT was exceeded by >2X Sample received at 13 °C	20 UR	
				Explosives	All Explosives (except Nitroguanidine)	ug/L	various		J / UJ			X				Sample received at 13 °C	various UJ / J
				Perchlorate	Perchlorate	ug/L	4.4		J			X				Sample received at 13 °C	4.4 J
					Bicarbonate Alkalinity	mg/L	133		J			X				Sample received at 13 °C	133 J
				General Chemistry	Chloride	mg/L	94.9		J			X				Sample received at 13 °C	94.9 J
					Nitrate-Nitrite	mg/L	41.5		J			X				Sample received at 13 °C	41.5 J
Sulfate	mg/L	87.6		J			X					Sample received at 13 °C	87.6 J				

**Table 4-1
Data Quality Evaluation Results
Five Year Range Condition Assessment Review
Boardman, Oregon**

Sample ID	Date Sampled	SDG	Lab Number	Analysis	Parameter	Units	Laboratory Result		Data Review Qualifier	Hold Times	Temp. at receipt	Surrogate/Internal Standard	MS/MSD or DUP	LCS/LCSD	Comments	Final Result		
BW04-060710-001	6/7/2010	G0F090497	G0F090497-002	Explosives	Nitroguanidine	ug/L	20	U	UR	X	X				extraction HT was exceeded by >2X Sample received at 13 °C	20 UR		
				Explosives	All Explosives (except Nitroguanidine)	ug/L	various		UJ			X				Sample received at 13 °C	various UJ	
				Perchlorate	Perchlorate	ug/L	2.5		J			X				Sample received at 13 °C	2.5 J	
				General Chemistry	Bicarbonate Alkalinity	mg/L	156		J			X					Sample received at 13 °C	156 J
					Chloride	mg/L	62.7		J			X					Sample received at 13 °C	62.7 J
					Nitrate-Nitrite	mg/L	54.2		J			X					Sample received at 13 °C	54.2 J
	Sulfate	mg/L	101		J			X					Sample received at 13 °C	101 J				
DAW-060810-001 Demo Atlas Well	6/8/2010	G0F100530	G0F100530-001	Explosives	Nitroguanidine	ug/L	20	U	UR	X				extraction HT was exceeded by >2X	20 UR			
RB02-060710-001 (rinsate blank)	6/7/2010	G0F090497	G0F090497-003	Explosives	Nitroguanidine	ug/L	20	U	UR	X	X				extraction HT was exceeded by >2X Sample received at 13 °C	20 UR		
				Explosives	All Explosives (except Nitroguanidine)	ug/L	various		UJ			X				Sample received at 13 °C	various UJ	
				Perchlorate	Perchlorate	ug/L	0.50	U	UJ			X				Sample received at 13 °C	0.50 UJ	
				General Chemistry	Bicarbonate Alkalinity	mg/L	5.0	U	UJ			X					Sample received at 13 °C	5.0 UJ
					Chloride	mg/L	1.0	U	UJ			X					Sample received at 13 °C	1.0 UJ
					Nitrate-Nitrite	mg/L	0.050	U	UJ			X					Sample received at 13 °C	0.050 UJ
	Sulfate	mg/L	1.0	U	UJ			X					Sample received at 13 °C	1.0 UJ				

Notes:

DUP = Laboratory Duplicate
HT = Holding Time
ID = Identification
J = Estimated
LCS = Laboratory Control Sample
MS = Matrix Spike
MSD = Matrix Spike Duplicate

R = Rejected
RPD = Relative Percent Difference
SDG = Sample Delivery Group
U = Not Detected
ug/L = Micrograms per Liter
mg/kg = Milligrams per Kilogram
mg/L = Milligrams per Liter
%REC = Percent Recovery
°C = degrees Celsius

Table 4-2
Quality Control Outliers
Five Year Range Condition Assessment Review
Boardman, Oregon

Field Sample ID(s) Requiring Qualification	SDG	Analyte	QC Outlier	QC Parameter Control Limit	QC Result
Holding Time					
BW05-060710-001 BW04-060710-001 RB02-060710-001	G0F090497	Nitroguanidine	Extraction HT	Within 7 days of sample collection	Extraction performed 16 days after sample collection
DAW-060810-001 (Demo Atlas Well)	G0F100530	Nitroguanidine	Extraction HT	Within 7 days of sample collection	Extraction performed 15 days after sample collection
MS/MSD % Recovery					
DU08-060410-001	G0F080568	Explosives: Nitrobenzene 1,3-Dinitrobenzene 2,4-Dinitrotoluene 2,6-Dinitrotoluene Tetryl 1,3,5-Trinitrobenzene 2,4,6-Trinitrotoluene	MS and MSD %REC was not met for the samples	75 - 125 %REC 80 - 125 %REC 80 - 125 %REC 80 - 120 %REC 70 - 130 %REC 75 - 125 %REC 70 - 130 %REC	0 %RECs 47 %RECs 57 % RECs 79 %RECs 293% / 291 %REC 48% / 33 %REC 41 %RECs
DU08-060410-001	G0F080568	Nitroguanidine	MS and MSD %REC was not met for the samples	72 - 121 %REC	5.8% / 9.1 %REC
Field Duplicates					
DU09-060410-001 DU09-060410-001D	G0F080568	Explosives: Tetryl	High Field Duplicate RDP	Difference in the two values is less than 2x the PQL value: 2X PQL = 0.50 mg/kg	The difference in the two values is 1.99 mg/kg
LCS % Recovery (milled Certified Reference Material)					
DU09-060410-001 DU09-060410-001D DU08-060410-001 DU04-060410-001 DU11-060410-001	G0F080568	Explosives: 4-Amino-2,6-dinitrotoluene Nitrobenzene	LCS %REC was not met for the samples.	80 - 125 %REC 75 - 125 %REC	61 %REC 73 %REC
Surrogate Recoveries					
DU08-060410-001	G0F080568	All explosives except Nitroguanidine	Low surrogate recovery	81 - 127 %REC	49 %REC

Table 4-2
Quality Control Outliers
Five Year Range Condition Assessment Review
Boardman, Oregon

Field Sample ID(s) Requiring Qualification	SDG	Analyte	QC Outlier	QC Parameter Control Limit	QC Result
Sample Temperature at Receipt					
BW05-060710-001 BW04-060710-001 RB02-060710-001	G0F090497	All explosives (including Nitroguanidine)	Sample receipt temperature was high	4 ± 2°C	13°C
BW05-060710-001 BW04-060710-001 RB02-060710-001	G0F090497	Perchlorate	Sample receipt temperature was high	4 ± 2°C	13°C
BW05-060710-001 BW04-060710-001 RB02-060710-001	G0F090497	General Chemistry: Bicarbonate Alkalinity Chloride Nitrate-Nitrite Sulfate	Sample receipt temperature was high	4 ± 2°C	13°C

Notes:

HT = Holding Time

ID = Identification

QC = Quality Control

% REC = Percent Recovery

RPD = Relative Percent Difference

SDG = Sample Delivery Group

LCS = Laboratory Control Sample

MS/MSD = Matrix Spike / Matrix Spike Duplicate

PQL = Practical Quantitation Limit

Table 4-3
Field Duplicate Results
Five Year Range Condition Assessment Review
Boardman, Oregon

		Sample ID:	BW01-060510-001		BW01-060510-001D		QC Criteria	
		Laboratory ID:	G0F080568-002	Val Qual	Field Duplicate G0F080568-003	Val Qual		
		Sample Date:	6/5/2010		6/5/2010			
		SDG:	G0F080568		G0F080568			
Compound	Units	Water		Water		RPDs	Sensitivity	
Perchlorate								
Perchlorate	ug/L	2.3		2.4				± 0.50 ug/L
Explosives								
Nitroguanidine	ug/L	20	U	20	U	0.0		
4-Amino-2,6-dinitrotoluene	ug/L	0.15	U	0.15	U	0.0		
2-Amino-4,6-dinitrotoluene	ug/L	0.29	U	0.29	U	0.0		
1,3-Dinitrobenzene	ug/L	0.15	U	0.15	U	0.0		
2,4-Dinitrotoluene	ug/L	0.15	U	0.15	U	0.0		
2,6-Dinitrotoluene	ug/L	0.15	U	0.15	U	0.0		
HMX	ug/L	0.15	U	0.15	U	0.0		
Nitrobenzene	ug/L	0.15	U	0.15	U	0.0		
Nitroglycerin	ug/L	0.98	U	0.98	U	0.0		
4-Nitrotoluene	ug/L	0.98	U	0.98	U	0.0		
2-Nitrotoluene	ug/L	0.15	U	0.15	U	0.0		
3-Nitrotoluene	ug/L	0.49	U	0.49	U	0.0		
RDX	ug/L	0.24	U	0.24	U	0.0		
Tetryl	ug/L	0.15	U	0.15	U	0.0		
1,3,5-Trinitrobenzene	ug/L	0.098	U	0.098	U	0.0		
2,4,6-Trinitrotoluene	ug/L	0.15	U	0.15	U	0.0		
Anions								
Bicarbonate Alkalinity	mg/L	189		188		0.5		
Chloride	mg/L	53.9		53.8		0.2		
Nitrate-Nitrite	mg/L	9.3		9.5		-2.1		
Sulfate	mg/L	108		108		0.0		

Water QC Criteria = RPD < 30% when detections are > 5x PQL in both samples or a difference in the two values of < the PQL value if the detections are < 5x PQL in one/both samples

Notes:

Reportable detections are in BOLD font.

ID = Identification

N/A = Not Applicable

PQL = Practical Quantitation Limit

RPD = Relative Percent Difference

SDG = Sample Delivery Group

QC = Quality Control

U = Not detected.

ug/L = Micrograms per Liter

mg/L = Milligrams per Liter

**Table 4-3
Field Duplicate Results
Five Year Range Condition Assessment Review
Boardman, Oregon**

		Sample ID:	DU09-060410-001		DU09-060410-001D			
		Laboratory ID:	G0F080568-010	Val Qual	Field Duplicate G0F080568-011	Val Qual		
		Sample Date:	6/4/2010		6/4/2010			
		SDG:	G0F080568		G0F080568			
		QC Criteria						
Compound	Units	Soil		Soil		RPDs	Sensitivity	
Perchlorate								
Perchlorate	ug/kg	6.2	U	5.6	U	0.0		
Explosives								
Nitroguanidine	mg/kg	0.25	U	0.25	U	0.0		
4-Amino-2,6-dinitrotoluene	mg/kg	0.25	UJ	0.25	UJ	0.0		
2-Amino-4,6-dinitrotoluene	mg/kg	0.25	UJ	0.25	U	0.0		
1,3-Dinitrobenzene	mg/kg	0.25	U	0.25	U	0.0		
2,4-Dinitrotoluene	mg/kg	0.25	U	0.25	U	0.0		
2,6-Dinitrotoluene	mg/kg	0.25	U	0.25	U	0.0		
HMX	mg/kg	0.25	U	0.25	U	0.0		
Nitrobenzene	mg/kg	0.25	U	0.25	U	0.0		
Nitroglycerin	mg/kg	0.50	U	0.50	U	0.0		
4-Nitrotoluene	mg/kg	0.50	U	0.50	U	0.0		
2-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.0		
3-Nitrotoluene	mg/kg	0.25	U	0.25	U	0.0		
RDX	mg/kg	0.041	J	0.044	J	-7.1		
Tetryl	mg/kg	0.41	J	2.40	J		± 0.50 mg/kg	
1,3,5-Trinitrobenzene	mg/kg	0.25	U	0.25	U	0.0		
2,4,6-Trinitrotoluene	mg/kg	0.25	U	0.25	U	0.0		
Anions								
Bicarbonate Alkalinity	N/A	N/A		N/A				
Chloride	N/A	N/A		N/A				
Nitrate-Nitrite	mg/kg	3.5		5.7		-47.8		
Sulfate	N/A	N/A		N/A				

Soil QC Criteria = RPD < 50% when detections are > 5x PQL in both samples or a difference in the two values of < 2x the PQL value if the detections are < 5x PQL in one/both samples

Notes:

Reportable detections are in BOLD font.

ID = Identification

J = Estimated

N/A = Not Applicable

PQL = Practical Quantitation Limit

RPD = Relative Percent Difference

SDG = Sample Delivery Group

QC = Quality Control

U = Not detected.

ug/kg = Micrograms per Kilogram

mg/kg = Milligrams per Kilogram

Table 4-4
Field Completeness
Five Year Range Condition Assessment Review
Boardman, Oregon

Analysis	Number of Samples Planned¹	Number of Samples Collected	Field Completeness
Water	12	11	92%
Soil	5	5	100%
	17	16	94%
Field Completeness Goal			100%

Notes:

¹ = Number of samples includes field samples and duplicates. Rinsates are not included.

**Table 4-5
Analytical Completeness
Five Year Range Condition Assessment Review
Boardman, Oregon**

Parameter	Total Number of Parameters¹	Acceptable Data²	Acceptable Data Completeness	Quality Data³	Quality Data Completeness
Water					
Perchlorate	11	9	82%	11	100%
Explosives	176	143	81%	172	98%
Bicarbonate Alkalinity	11	9	82%	11	100%
Chloride	11	9	82%	11	100%
Nitrate-Nitrite	11	9	82%	11	100%
Sulfate	11	9	82%	11	100%
Water Totals	231	188	81%	227	98%
Soil					
Perchlorate	5	5	100%	5	100%
Explosives	80	54	68%	78	98%
Nitrate-Nitrite	5	5	100%	5	100%
Soil Totals	90	64	71%	88	98%
Totals	321	252	79%	315	98%
Completeness Goals			95%	95%	

Notes:

- ¹ = Total number of parameters includes field samples (includes data points from dilutions and/or reanalyses to be used in place of original data) and duplicates (does not include field blanks)
- ² = Acceptable data includes data that has not been rejected or qualified as estimated (J/UJ). Data points for which the required corrective actions were taken do not count against the acceptable data completeness goal calculation (i.e., results exceeding the calibration range that were reanalyzed at dilutions within the calibration range).
- ³ = Quality data is defined as all non-rejected data.

ATTACHMENT A

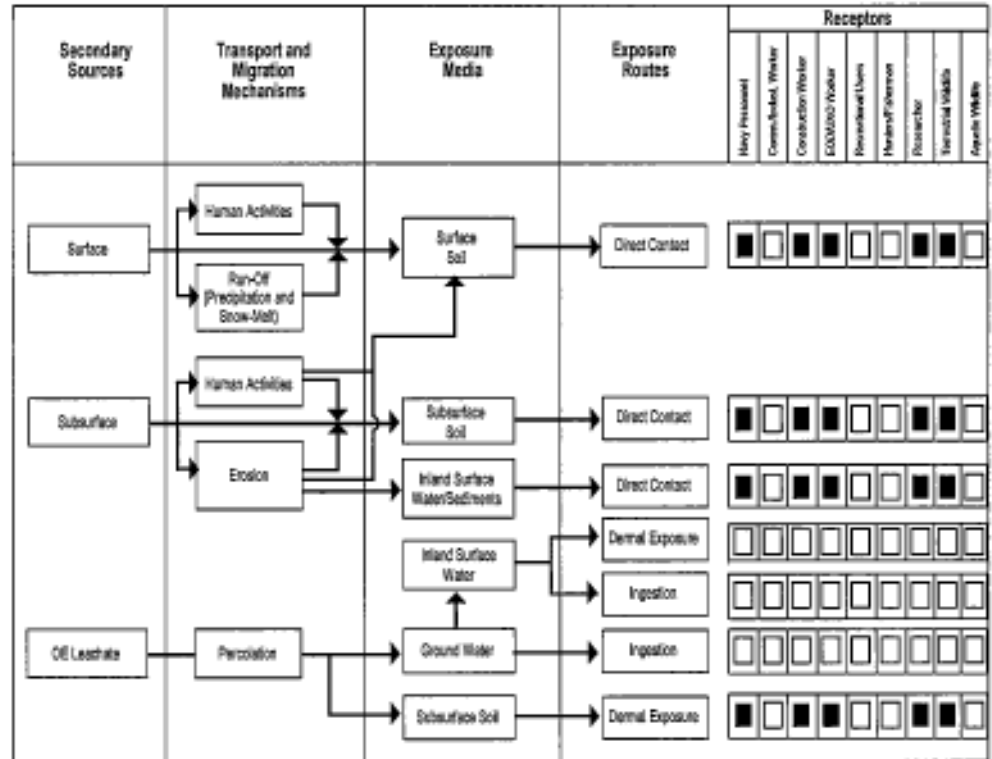
Analytical Data Packages

APPENDIX E

**REVISED CONCEPTUAL MODEL AND
RANGE PROTECTIVE MEASURES MATRIX**

Munitions Related Activity	Primary Source	Primary Release Mechanism	Expected MEC Contamination	Secondary Source
Weapons Training	Impact/Target Areas	Firing - Incomplete Detonation	Frag, Pieces of MEC, MC	Surface Subsurface Munitions Constituents
		Firing - Dud Fired	MEC, MEC Components, MC	Surface Subsurface Munitions Constituents
		Firing - Complete Detonation	Frag, MC	Subsurface Munitions Constituents
	Aerial Bombing Range	Dropping - Incomplete Detonation	Frag, Pieces of MC	Surface Subsurface Munitions Constituents
		Dropping - Dud Fired	MEC, MEC Components, MC	Surface Subsurface Munitions Constituents
		Dropping - Complete Detonation	Frag, MC	Surface Subsurface Munitions Constituents
Munitions Treatment	Range and Munitions Debris Clearance Consolidation Areas	Degradation	Unfired (fuzed or unfuzed) MEC, Possible retrograde MEC	Subsurface Munitions Constituents
	Open Burn/ Open Detonation (OB/OD)	Kick-Out/incomplete Detonation (OD)	MEC, MEC Components	Surface Subsurface Munitions Constituents
		Burning/Detonation	Incompletely tested MEC, MC Contaminated Scrap, MC Residue	Surface Subsurface Munitions Constituents

Operational Range Site Model



Conceptual Model of Exposure Pathways

**Table 5-1
 Range Protective Measures Matrix**

Protective Measure	Reference(s)	Considerations
Conduct a hazard assessment before any range maintenance or clearance operation.	Department of Defense Directive (DoDD) 4715.11 (Environmental and Explosives Safety Management on DoD Active and Inactive Ranges within the US); OPNAVINST 3500.39A, "Operational Risk Management".	Hazard assessment must be conducted in accordance with OPNAVINST 3500.39A, "Operational Risk Management".
Develop a safe and practical method for recycling or disposing of UXO and range scrap/debris, including a secure yard or laydown area.	DoDD 4715.11	Inspect all legacy UXO and range scrap/debris to ensure it is inert and/or free of explosives or related material. Segregate all UXO and range scrap/debris generated from base or range operations prior to recycling.
Remove all hazardous materials (petroleum, oil, lubricants, radium dials, batteries, etc.) from potential targets before they are placed on range.	DoDD 4715.11	Provide appropriate personnel with applicable hazardous waste training / knowledge / personal protective equipment to handle suspect hazardous wastes.
Provide (and document) initial and yearly ground and explosives safety briefings to personnel assigned to the range.	DoDD 4715.11	Include as element of Range Complex Management Plan (to be developed). Develop briefing templates and forms to be used by range personnel.
Prevent unauthorized access to the range through establishment of access controls, including fencing, lockable gates, physical barriers, etc.	DoDD 4715.11, OPNAVINST 5530.14C (Navy Physical Security Manual)	Ensure boundary signs include appropriate terms as detailed in the Navy Physical Security Manual. Post bilingual warning signs where significant numbers of local residents are non-English speaking.
Provide appropriate explosives safety training to individuals authorized access to the range.	DoDD 4715.11	Identify authorized personnel and develop notification and training SOPs.

Table 5-1 (Continued)
Range Protective Measures Matrix

Protective Measure	Reference(s)	Considerations
Maintain permanent records of munitions expended, including estimated dud rates; type, quantity, and location of expended munitions; using organizations; all UXO and range scrap/debris clearance operations; all EOD mishaps attributed to UXO and range scrap/debris that occur on or off range.	DoD Military Munitions Rule Implementation Policy (MRIP)	Include recommendations for range managers (parties responsible for document control).
Maintain a community outreach program that provides public notifications of potential explosives hazards; provides appropriate information to local officials regarding the compatible uses of non-DoD property located near the range; addresses in a local forum issues that have a potential to affect the surrounding communities; and educates citizens living near the range on explosives hazards associated with MEC and trespassing on the range.	DoDD 4715.11	Develop guidelines for public notification. Identify appropriate public relations officers or specialists.
Conduct appropriate range clearance operations consistent with the proposed use of the area before changing range use.	DoDD 4715.11	Implement relevant protective measures including segregation of UXO and range scrap/debris, hazardous material removal and recycling.
Prohibit controlled burning of vegetation as a method of UXO and range scrap/debris clearance.	DoDD 4715.11	Maintain fire prevention measures including personnel and vehicle access restrictions, and open burning prohibitions.
Prohibit burying munitions on range or transporting them off range for treatment.	MRIP	Follow policy regarding burial and treatment. Identify potential historical burial areas.

APPENDIX F
PROJECT PHOTOS

Appendix F - Photos

June 2, 2010



Appendix F - Photos



Appendix F - Photos

Area 4 - June 3, 2010	
	
	
	
	

Appendix F - Photos



Appendix F - Photos



Appendix F - Photos

	
	
	
Area 8 - June 3, 2010	
	

Appendix F - Photos



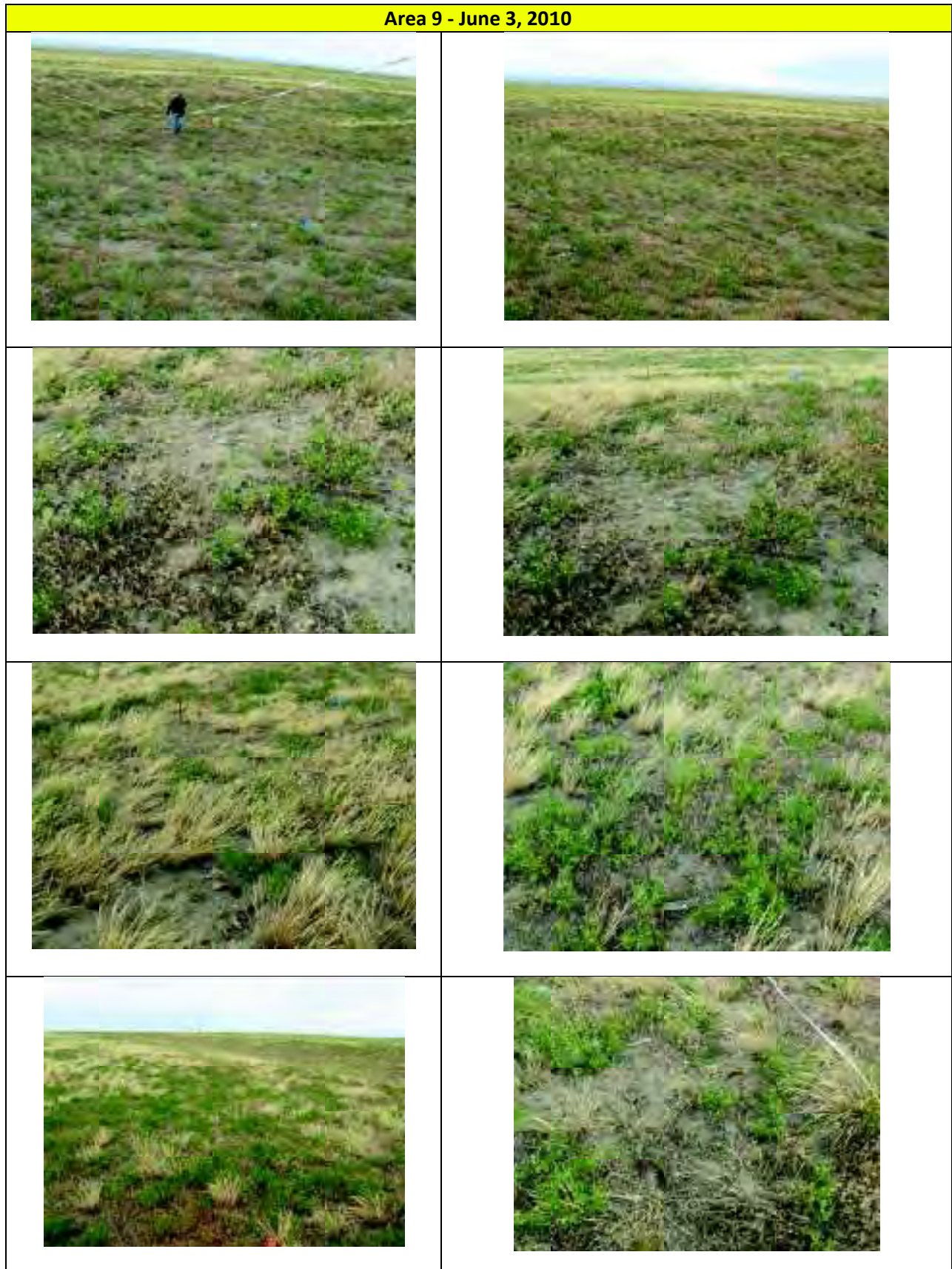
Appendix F - Photos



Appendix F - Photos



Appendix F - Photos

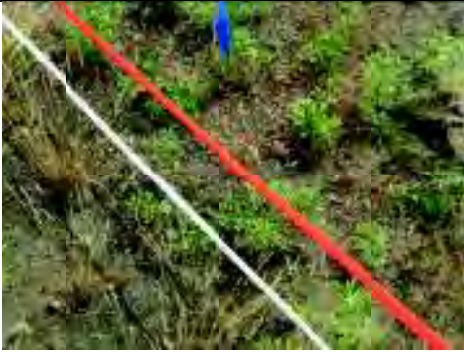


Appendix F - Photos



Appendix F - Photos

Area 11 - June 3, 2010



Appendix F - Photos

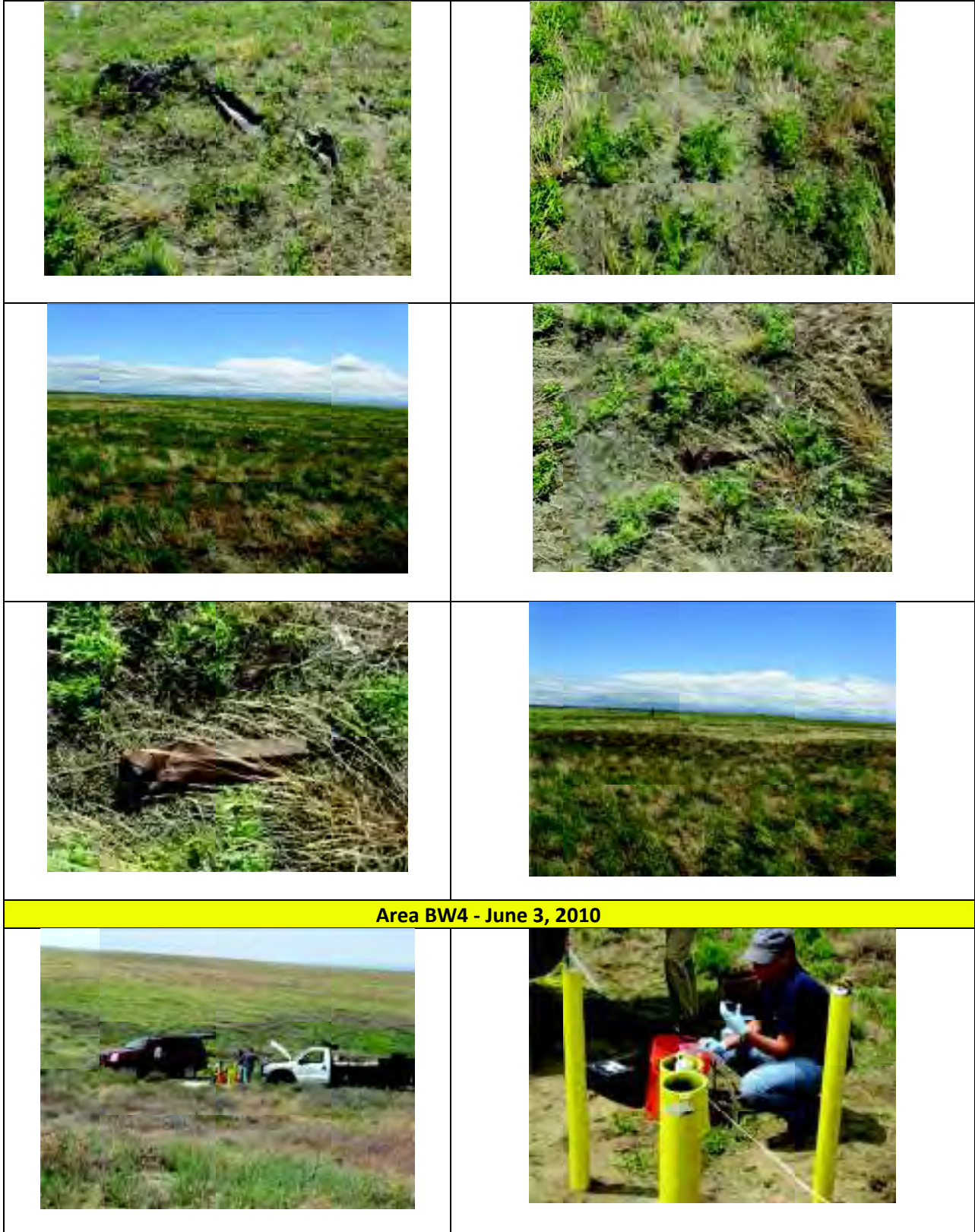


Appendix F - Photos

Area 11 - June 4, 2010



Appendix F - Photos



Appendix F - Photos



Area BW5- June 4, 2010



Appendix F - Photos



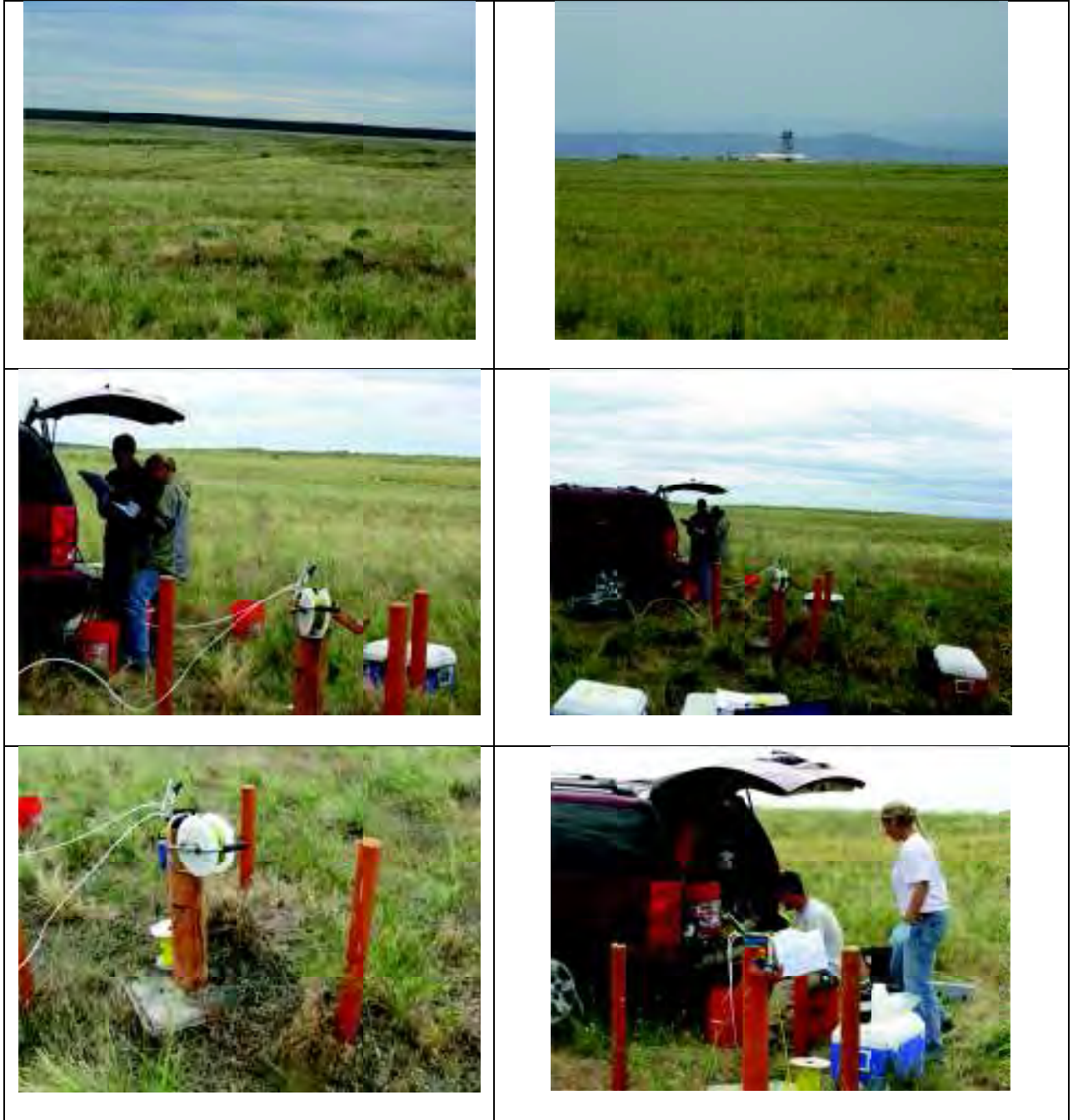
Appendix F - Photos



Appendix F - Photos



Appendix F - Photos



Appendix F - Photos



June 7, 2010



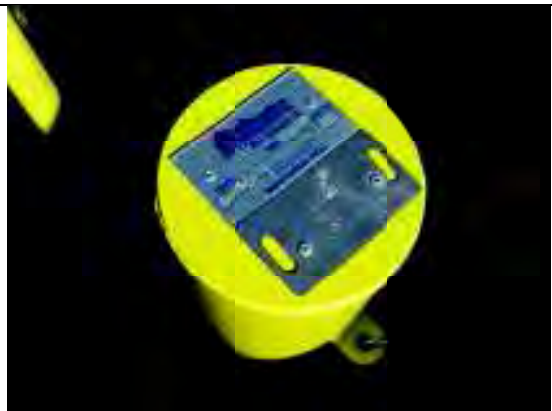
Appendix F - Photos



Appendix F - Photos



Appendix F - Photos



Appendix F - Photos

June 8, 2010



June 9, 2010

