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CORRECTIVE MEASURES IMPLEMENTATION PLAN FOR MAIN TREATMENT AREA PORTION OF SOLID WASTE MANAGEMENT UNIT 3 AMMUNITION BURNING GROUNDS OLD JEEP TRAIL NSA CRANE IN

6/1/2011

TETRA TECH NUS

Corrective Measures Implementation Plan
for
Main Treatment Area Portion of SWMU 3 - Ammunition Burning Grounds / Old Jeep Trail

NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

Naval Facilities Engineering Command Midwest
Contract Number N62467-04-D-0055
Contract Task Order 21

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RESOURCE CONSERVATION AND RECOVERY ACT CORRECTIVE MEASURES IMPLEMENTATION PLAN/ QUALITY ASSURANCE PROJECT PLAN FOR SWMU 3 – AMMUNITION BURNING GROUNDS

NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
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Submitted by:
Tetra Tech NUS, Inc.
234 Mall Boulevard, Suite 260
King of Prussia, Pennsylvania 19406

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PREPARED UNDER THE DIRECTION OF:

RALPH BASINSKI
PROJECT MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

APPROVED FOR SUBMITTAL BY:

DR. TOM JOHNSTON
CLEAN QUALITY ASSURANCE MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

HOWARD HICKEY
REMEDIAL PROJECT MANAGER
NAVFAC MIDWEST

TOM BRENT
ENVIRONMENTAL SITE MANAGER
NSA CRANE

_____

DOUG GRIFFIN
CORRECTIVE ACTION PROJECT MANAGER
IDEM OFFICE OF LAND QUALITY

_____

CRAIG PENDER
QUALITY ASSURANCE COORDINATOR
IDEM OFFICE OF LAND QUALITY

_____

DARREN SIPES
SAIC
PROJECT MANAGER

_____

KIM HUGHES
SAIC
QUALITY ASSURANCE MANAGER

_____

LESLIE DIMOND
LABORATORY QUALITY ASSURANCE OFFICER
KATAHDIN ANALYTICAL SERVICES

_____

KATE ZALESKI
PROJECT MANAGER
KATAHDIN ANALYTICAL SERVICES

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ACRONYMS

1,1,2,2,-PCA	1,1,2,2-Tetrachloroethane
2A-DNT	2-Amino-4,6-dinitrotoluene
4A-DNT	4-Amino-2,6-dinitrotoluene
ABG	Ammunition Burning Grounds
BC/BC	Big Clifty Sandstone/Beech Creek Limestone
bgs	Below ground surface
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
CMI	Corrective Measures Implementation
CMIP	Corrective Measures Implementation Plan
CMP	Corrective Measures Proposal
COC	Chemical of concern
COPC	Chemical of potential concern
CTO	Contract Task Order
DQO	Data quality objective
NELAP	Environmental Laboratory Accreditation Program
EPD	Environmental Protection Department
ESM	Environmental Site Manager
FOL	Field Operations Leader
FSP	Field Sampling Plan
FTMR	Field task modification request
G-H	Golconda-Haney
GDM	Geographic data management
GWMP	Groundwater monitoring plan
GIS	Geographic information system
HASP	Health and Safety Plan
HSM	Health and Safety Manager
HMX	Cyclotetramethylenetetranitramine
IDEM	Indiana Department of Environmental Management
LSC	Little Sulphur Creek
LTM	Long-term monitoring
LUC	Land use control
LUCIP	LUC Implementation Plan

MCS	Media Cleanup Standard
msl	Mean sea level
MTA	Main Treatment Area
NAVFAC	Naval Facilities Engineering Command
NSA	Naval Support Activity
NSWC	Naval Surface Warfare Center
OJT	Old Jeep Trail
OSHA	Occupational Health and Safety Administration
PCA	Tetrachloroethane
PM	Project Manager
QA	Quality assurance
QAC	Quality Assurance Coordinator
QAM	Quality Assurance Manager
QAPP	Quality Assurance Project Plan
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RFI	RCRA Facility Investigation
RPM	Remedial Project Manager
SB	Statement of Basis
SOP	Standard operating procedure
SOW	Statement of work
SSO	Site Safety Officer
SWMU	Solid Waste Management Unit
TCA	Trichloroethane
TCE	Trichloroethene
TNT	Trinitrotoluene
USACE	United States Army Corps of Engineers
US EPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
WES	Waterways Experiment Station
WQC	Water quality criteria

1.0 INTRODUCTION

This Corrective Measures Implementation Plan (CMIP)/Quality Assurance Project Plan (QAPP) was prepared for Solid Waste Management Unit (SWMU) 3 – Ammunition Burning Grounds (ABG) at the Naval Support Activity (NSA) facility located in Crane, Indiana. SWMU 3 comprises the Main Treatment Area (MTA), Old Jeep Trail (OJT), and portions of Little Sulphur Creek (LSC). The CMIP/QAPP was prepared for the Naval Facilities Engineering Command (NAVFAC) Midwest under Contract Task Order (CTO) 21 of Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62467-04-D-0055. For the purposes of this plan, SWMU 3 consists of the Main Treatment Area (MTA), the Old Jeep Trail (OJT), and Little Sulphur Creek (LSC). LSC is a separate entity that is included in this CMIP because it is impacted by contamination at the MTA and OJT.

NSA Crane is located in a rural, sparsely populated region of south-central Indiana, approximately 75 miles southwest of Indianapolis and 71 miles northwest of Louisville, Kentucky (Figure 1-1), immediately east of Crane Village and Burns City. Most of the facility is located in Martin County, and a small portion is distributed among Greene, Daviess, and Lawrence Counties. The NSA facility is active, and general public access is restricted. SWMU 3 is located in the eastern portion of NSA Crane along LSC (Figure 1-2).

The MTA is permitted under the Resource Conservation and Recovery Act (RCRA) by the Indiana Department of Environmental Management (IDEM) as an active treatment facility for hazardous waste munitions, explosives, and pyrotechnics and is subject to the groundwater monitoring and corrective action requirements of 40 Code of Federal Regulations (CFR) 264, Subpart F. A RCRA groundwater monitoring plan (GWMP) has been prepared (Navy, 2007). Current land use as a RCRA-permitted OB/OD unit prohibits recreational and residential uses as well as other industrial uses. Additionally, all RCRA-permitted facilities are subject to RCRA closure requirements; therefore, at the end of the active life of the MTA, the site is required to either be clean closed or closed as a RCRA landfill.

RCRA Facility Investigation (RFI) studies at the MTA have been conducted by the United States Army Corps of Engineers (USACE) for soil, groundwater, and surface water. These studies recommended that corrective measures be considered for these media to address contamination by explosives, chlorinated solvents, and metals (Murphy, 1994; Albertson, et al., 1998).

The OJT portion of SWMU 3 is currently not being used for ordnance treatment. The RFI report for the OJT and LSC recommended that a Corrective Measures Proposal (CMP) be conducted to address soil

and groundwater at the OJT contaminated with explosives, chlorinated solvents, and metals (Tetra Tech, 2005a).

A CMP followed the RFI studies to evaluate potential remedies for soil and groundwater contamination (Tetra Tech, 2010a). The preferred corrective measures alternative was then proposed in a Statement of Basis (SB) prepared in 2010. Although contaminated groundwater beneath the MTA and OJT discharges to LSC through springs, there are no current risks to human health or the environment from exposure to LSC surface water. The preferred alternative for OJT and LSC includes groundwater and surface water long-term monitoring (LTM) to determine whether groundwater contaminants are naturally attenuating and ensure that there are no future unacceptable risks to human health and the environment from exposure to LSC surface water. The SB also recommended that land use controls (LUCs) be established to prevent groundwater use and exposure to contaminated soil and groundwater that could result in unacceptable risks to human health. The SB has undergone public review and was recently approved by IDEM.

This CMIP/QAPP describes the design of the LTM program and LUC Implementation Plan (LUCIP) for SWMU 3. This document outlines the requirements and describes the procedures for performing sample collection and analysis activities, and for using the data to render decisions concerning the effectiveness of LTM and LUCs at controlling current and potential future risks associated with exposure of select human receptors to soil, groundwater, and surface water. The existing RCRA GWMP, associated field sampling plan (FSP), and QAPP will be used to implement the LTM component of the corrective measures for SWMU 3. The LUCIP is presented in Section 6.0.

1.1 SITE DESCRIPTION

1.1.1 Physical Description and Operational History

1.1.1.1 Surface Water Hydrology, Geology, and Hydrogeology

LSC flows through the MTA and along the west side of the OJT (Figure 1-3). Above Spring C (03-SPR-C on Figure 1-3), the creek is a losing and generally dry stream; however, below Spring C, the creek becomes a perennial stream. LSC flows off the NSA Crane boundary and into Sulphur Creek, which flows into Indian Creek, which flows into the East Fork of the White River. A public water supply intake is located on the East Fork of the White River at Shoals, Indiana, approximately 12 miles south of SWMU 3.

The MTA is located near the headwaters of LSC, and the OJT is located in the valley of LSC, approximately $^1/_2$ mile south-southeast of the MTA (Figure 1-3). The LSC watershed is characterized by

rugged relief, with ground surface elevations ranging from approximately 600 to 800 feet above mean sea level (msl) in the headwaters. At the OJT, ground surface elevations range from approximately 550 to 600 feet above msl. The surface elevation is approximately 500 feet above msl where LSC exits the southern border of the installation. Most of the LSC valley is surrounded by wooded areas along the hillsides to the east and west, with miscellaneous natural ground vegetation under the tree canopy and along the creek banks.

Bedrock underlying the NSA Crane facility consists of sedimentary rocks from the Lower Pennsylvanian age Mansfield Formation (Raccoon Creek Group) and the Upper Mississippian age Stephensport and West Baden Groups. Due to erosion and moderate relief in the area, the Lower Pennsylvanian and Upper Mississippian rock units crop out on ridge tops and along stream valleys.

Groundwater in the nonglaciated southwestern portion of Indiana is generally contained in fractures and joint openings of limestone and sandstone aquifers. Aquifers are generally isolated from one another vertically by less permeable shale and siltstone units. Groundwater enters the aquifers as infiltration in outcrop areas and flows by gravity down the dip of the strata or locally in directions controlled by the potentiometric gradients, which are in most cases influenced by topography and locations of stream channels (i.e., groundwater discharge areas). The MTA and OJT are underlain by two separate karst systems. Groundwater underlying the MTA flows toward a karst conduit that subsequently discharges to LSC at Spring A (03-SPR-A on Figure 1-3). Groundwater underlying the OJT flows through a separate karst conduit and discharges to LSC at Spring C.

The following primary aquifers in the LSC watershed have been identified in the Pennsylvanian and Upper Mississippian strata:

- Pennsylvanian sandstones
- Haney Limestone, which is also referred to as the Golconda-Haney (G-H) aquifer
- Big Clifty Sandstone/Beech Creek Limestone (BC/BC) aquifer
- Beaver Bend Limestone

Contaminated groundwater from the BC/BC aquifer at the MTA and OJT is not currently, and not anticipated to be used in the future as a potable water source. The ABG Break Room drinking water source is the Beaver Bend aquifer. This drinking water source is 190 feet below ground surface (bgs) and hydraulically isolated from the contaminated BC/BC aquifer (i.e., the BC/BC and Beaver Bend

aquifers are not connected). The Break Room drinking water is tested quarterly for drinking water parameters.

The RCRA Part B operating permit for the ABG requires monitoring of upgradient and downgradient wells in the BC/BC and Beaver Bend aquifers.

1.1.1.2 Main Treatment Area

The MTA (Figure 1-4) is relatively flat. The site was formerly kept devoid of vegetation to minimize the potential for fires during treatment using open burning. Since the early 1990s, areas along LSC within SWMU 3 have been seeded with grass to minimize soil erosion into LSC.

The MTA is used extensively to destroy unwanted materials contaminated with explosives and related materials. Several separate treatment units are located within the site.

Prior to the construction and use of clay-lined steel burn pans for open burning operations, explosives, propellants, and materials contaminated with these substances were spread and ignited on unlined pads or in pits. Many of these burn pads and pits were located in the area now occupied by clay-lined steel burn pans (Unit No. 3 on Figure 1-4); however, others were located throughout the MTA.

Three unlined surface impoundments were used to remove liquid from otherwise combustible sludge. In 1982, each impoundment was modified to include a liner and leachate collection system. The impoundments have been replaced by dewatering units (Unit Nos. 10 and 11 on Figure 1-4). The impoundments are now empty and no longer in use, and further action will be required at RCRA closure of the MTA. Underground storage tanks (USTs) were used to store runoff and leachate from the impoundments. The USTs were removed in 1994. The USTs were partially closed, and further action will be required at RCRA closure of the MTA.

The ash pile area was the site of a former stockpile of burn residue. The pile was removed between July 1986 and February 1987, pursuant to a RCRA closure plan. However, this was not a “clean closure,” and further action will be required at RCRA closure of the MTA.

Pink water sludge was placed and burned in an unlined pit at the location of the pink water tanks (Unit No. 14 on Figure 1-4). This treatment process was relocated to the burn pans around 1985. The pit area will require further action at RCRA closure of the MTA.

The former primer burn box was used for thermal treatment of ammunition components and pyrotechnic munitions. The burn box has been decommissioned, and these activities are now performed at the primer pits and the incendiary cage (Unit Nos. 12 and 13 on Figure 1-4).

No treatment operations have taken place on the ground surface since the 1980s; all current operations take place in containment facilities. The following operations currently occur at the MTA (see Figure 1-4 for unit locations):

- Solid bulk propellant and explosives are open burned in 18 clay-lined steel pans (Unit No. 3).

- The primer pit operation (Unit No. 12) involves treatment of small explosive components such as hand grenade fuses and cartridge primers.

- Solvents contaminated with propellants, explosives, and pyrotechnics are burned in an unlined steel pan (Unit No. 5).

- Waste scrap pyrotechnics that have been desensitized with No. 2 fuel oil are burned in an unlined steel pan (Unit No. 7).

- Scrap black powder desensitized with water is burned in a steel pan (Unit No. 8).

- Two sets of four pans each are used for treatment of a waste mixture containing red phosphorus and No. 2 fuel oil (Unit No. 6).

- The incendiary cage (Unit No. 13) is set up primarily to allow the open burning of pyrotechnic devices and components.

- The flashing and thermal treatment of suspected explosives-contaminated material is carried out at three concrete-lined burn pads (Unit No. 9).

- Sludge contaminated with explosives and pyrotechnics is treated at three sludge burning pans (Unit Nos. 10 and 11)

The MTA was granted RCRA interim status by the United States Environmental Protection Agency (US EPA) Region 5 in November 1980. Interim status was terminated in December 1989 when the RCRA

operating permit went into effect. The RCRA permit (IN5170023498) was renewed by IDEM and went into effect on October 18, 2001. The RCRA operating permit includes the following:

- Strict operating conditions including the requirement that treatment only take place in containment.
- Procedural requirements for inspection of the surrounding area and removal of any material generated during open burning operations.
- Strict groundwater monitoring requirements.
- MTA must undergo RCRA closure upon suspension of operations (clean closure or closure in place).

1.1.1.3 Old Jeep Trail

The OJT site (Figure 1-5) is located in a gravel-covered area on the western side of a gravel access road (Jeep Trail 25) where the road widens to greater than 50 feet. The OJT is adjacent to LSC and is surrounded by wooded areas with miscellaneous natural ground vegetation.

The OJT is an inactive area. Former operations were directly associated with MTA operations. The OJT was used to burn out bombs and to flash powder from the mid-1970s through 1983. The area was also used to flash the residue from bombs and projectiles after the bulk of the explosives had been removed. Materials were treated at two separate areas referred to as the burn area and burn pit. The burn area was used for flashing bomb casings to complete the demilitarization process. The burn pit was used to flash powder and burn explosives-contaminated material. Small munitions items and components were also reportedly treated in the burn pit.

The area was filled with clean material and revegetated in approximately 1983. The area is now overgrown with brush, trees, and grasses. Although inactive as a treatment area, the OJT is still used as a vehicle route and for temporary storage of inert materials.

1.1.2 Previous Investigations and Remediations

Several investigations have been conducted for the MTA, OJT, and LSC. No remedial actions have occurred.

1.1.2.1 Main Treatment Area

A Phase III RFI characterization for groundwater was conducted by the USACE Waterways Experiment Station (WES) (Murphy, 1994). Over 70 monitoring wells were sampled quarterly starting in 1987.

Springs were also sampled. The RFI concluded that several wells were contaminated with volatile organic compounds (VOCs), explosives, and metals and recommended that a risk assessment be conducted to establish action levels followed by a CMP.

A Phase III RFI characterization of soil was conducted by the USACE WES in 1993 (Albertson et al., 1998). Surface and subsurface samples were collected. VOCs were only present in a few locations. Explosives were detected in surface and subsurface soil.

The Current Contamination Conditions Risk Assessment included a field investigation and screening-level human health and environmental risk assessments (Tetra Tech, 1999). Soil, groundwater, and sediment samples were collected. No unacceptable ecological risks from exposure to soil were identified. Zinc in soil was identified as a potential human health chemical of concern (COC). Potential groundwater human health COCs included VOCs, explosives, and metals. There were no unacceptable human health or ecological risks associated with exposure to sediment. Because this was a screening-level evaluation, further investigation was required to refine the potential risks to human and ecological receptors.

As part of previous RCRA quarterly monitoring in the early 2000s, selected monitoring wells, a spring (Spring A), and LSC have been sampled. Explosives, primarily hexhydro-1,3,5-trinitro-1,3,5-triazine (RDX), have been detected in samples from downgradient wells, Spring A, and LSC. The CMP included data and conclusions from monitoring reports for calendar years 2000 through 2003 (SAIC 2002a, 2002b, 2003, and 2004). Barium was the primary metal detected in groundwater and springs. VOCs, primarily trichloroethene (TCE) and its degradation products, have been consistently observed in several downgradient wells.

A field investigation was conducted in 2004 to fill data gaps identified during the early stage of CMP development (Tetra Tech, 2005b). More than 200 soil samples were collected. The most frequently detected explosives in soil were cyclotetramethylenetetranitramine (HMX), RDX, and trinitrotoluene (TNT). The most frequently detected VOC in soil was TCE. Barium was the primary metal of concern for soil. Groundwater samples were collected from 26 monitoring wells. The most frequently detected explosives in groundwater were HMX and RDX. TCE was detected in 14 groundwater samples. Despite the extensive soil and groundwater investigations a large uncertainty persists regarding the amount of TCE found in soil versus the sandstone aquifer. This uncertainty leads to uncertainty regarding how effective a soil remediation could be in reducing the migration of TCE from soil to groundwater. Although some isolated soil locations have TCE concentrations that exceed IDEM screening levels for migration from soil to groundwater, it is believed that the source of groundwater TCE contamination is well

dispersed in the soil column and trapped within bedrock fractures. Hence, soil remediation is not likely to be effective at reducing groundwater contamination significantly.

Risk for exposure to lead in soils was found to be unacceptable for construction workers in the southeastern quadrant of the MTA near soil borings 03SB116 and 03SB120. The mean lead concentration (681 milligrams per kilogram (mg/kg)) in this area exceeds the calculated maximum allowed site-specific screening value of 550 mg/kg for the construction worker. However, the 681 mg/kg mean lead concentration at the MTA is less than the IDEM Risk Integrated System of Closure screening value of 970 mg/kg for the construction worker.

1.1.2.2 Old Jeep Trail

The USACE installed 17 monitoring wells in the OJT area between 1981 and 1983 (Murphy, 1996). TCE was detected at concentrations of concern in groundwater. In 1994, TCE, cis-1,2-dichloroethene, and RDX were detected at concentrations of concern.

During the 2001 RFI, more than 100 soil samples were collected, and the monitoring wells installed by USACE were resampled (Tetra Tech, 2005a). The burn pit was identified as a potential source of groundwater contaminated with RDX and TCE. The RDX and TCE concentrations had decreased significantly compared to the concentrations detected in 1994.

A field investigation was conducted in 2004 to fill data gaps identified during the early stage of CMP development (Tetra Tech, 2005b). Soil and groundwater samples were collected. HMX and TNT were the only two explosives detected in surface soil. Explosives were not detected in subsurface soil. Several explosives, including HMX and TNT, were detected in groundwater.

1.1.3 Current SWMU 3 Status

1.1.3.1 Main Treatment Area

The following conditions exist at the MTA:

- The MTA is an active, operating, RCRA-permitted hazardous waste treatment facility that will be in use at least until the year 2050. At the end of the active life, the MTA will either be clean closed or closed as a landfill in accordance with RCRA regulations. Therefore, human receptors and pathways

of exposure evaluated for the CMP were limited to the current land use scenario because future land use scenarios (e.g., residential use) will be addressed in the RCRA closure plan.

- Explosives, VOCs, and metals have been detected at potentially unacceptable concentrations in surface and subsurface soil.

- There are no unacceptable cancer risks from exposure to surface or subsurface soil for current human receptors.

- The only unacceptable non-cancer risks are associated with exposure to lead in surface and subsurface soil by a construction worker. The associated area of concern for lead is a sub-area of the southeastern quadrant of the MTA (i.e., the area near soil borings 03SB116 and 03SB120). By preventing construction in this area, the potential for exposure is eliminated; therefore, there is no unacceptable level of construction worker non-cancer risk from exposure to lead in soil.

- Groundwater that is contaminated with explosives, VOCs, and metals is not currently used for drinking water or any other purpose and therefore poses no unacceptable risks to current receptors. All groundwater from the MTA, however, discharges to springs along LSC, and risks from use of these springs were evaluated. TCE in MTA groundwater was concluded to volatilize during transport within karst geologic conduits connecting MTA groundwater to the springs via tortuous pathways. Whereas, the presence of TCE in the groundwater is undesirable, natural attenuation through volatilization and other mechanisms mitigates its presence. The tortuous karst transport also complicates the potential for remediating groundwater directly. Natural degradation of TCE produces chemicals that may be equally as toxic as TCE, or even more so, but these chemicals are more volatile than TCE and more readily volatilize from groundwater along with the TCE. TCE and its degradation products have not been detected at unacceptable concentrations in LSC surface water to which the MTA groundwater discharges. The impracticability of remediating soil and groundwater directly to decrease observed groundwater TCE concentrations, and natural attenuation of VOCs during transport through the complicated karst system, were indications that land use controls to prevent exposure to groundwater are a cost-effective (and preferred) way to protect human health. These controls, which would prevent the use of MTA groundwater for any purpose, would also prevent exposure to RDX and metals in the groundwater. RDX and metals are not volatile species and although RDX degrades via biotic activity in groundwater, metals do not degrade. RDX and metal concentrations in MTA groundwater discharge to LSC are significantly less than IDEM water quality ecological and human health criteria. Because the groundwater criteria take into account

dilution of the groundwater after discharge to LSC, there can be no unacceptable risks to human health from exposure to LSC surface water.

- There are no adverse risks to ecological receptors because the MTA is not a suitable habitat for ecological receptors due to the RCRA-permitted treatment activities.

1.1.3.2 Old Jeep Trail

- The corrective measures for the contamination (lead, TNT, and RDX) at the OJT is addressed in a separate implementation plan.

1.1.3.3 Little Sulphur Creek

The following conditions exist in LSC:

- LSC flows into Sulphur Creek, Sulphur Creek flows into Indian Creek, and Indian Creek flows into the East Fork of the White River.

- There are no current unacceptable risks to off-site human receptors or adverse risks to ecological receptors.

1.2 CONCEPTUAL SITE MODEL

1.2.1 Main Treatment Area

Contaminants were released into surface and subsurface soil and migrated toward downgradient locations from those releases to deeper soil, groundwater, springs, and LSC. The following is a summary of the Conceptual Site Model for the MTA based on all information currently available:

- Groundwater underlying the MTA is contaminated with 1,1,2,2-tetrachloroethane (PCA), TCA, TCE, RDX, TNT, and degradation products of TNT and TCE in excess of risk-based concentrations. The presence of degradation products indicates that natural attenuation is occurring.

- The distribution of RDX and TCE contamination sources in the overburden soil, bedrock, and karst system appears to be heterogeneous in nature.

- Current practices (open burning in containment structures) have eliminated any current and future releases of contaminants to soil and groundwater; therefore, the contaminant source is being depleted through attenuation.

- Groundwater discharges through the karst system into LSC through Springs A and A'.

- Groundwater contamination at the MTA and OJT will be mitigated through the implementation of Land Use Controls (LUCs) in a separate document.

- TCE and its degradation products are volatilized in the karst system and are not present in LSC surface water.

- RDX concentrations in surface water originating from Spring A discharges do not result in off-site exceedances of IDEM water quality criteria (WQC) for public water supplies and for incidental contact with surface water. WQC were developed for RDX, which did not have state or federal standards. The development of the RDX WQC is presented as part of the Corrective Measures Proposal in Appendix D.

- The existing use is military/industrial. Receptors associated with the existing use include the site worker, construction worker, and trespasser.

- Contaminated groundwater in the BC/BC aquifer is not used and does not present a risk under the industrial use scenario.

- Excess risk for existing use is present only for the construction worker resulting from exposure to lead in soil.

- Excess risk for future use is present for future residents ingesting groundwater from the BC/BC aquifer. Reasonable future use does not include residential housing.

- The industrial nature of the MTA (open burning operations, paved areas, etc.) eliminates ecological habitat; therefore, ecological uses are not viable.

1.2.2 Old Jeep Trail

Contaminants were released into surface and subsurface soil and migrated toward downgradient locations from those releases to deeper soil, groundwater, springs, and LSC. Mitigation of potential human health risks from exposure to contamination in soil is being addressed in separate documents. No adverse risk to ecological receptors at the OJT has been identified.

The contamination and geology of the OJT is similar to that of the MTA and is addressed in a separate CMIP.

1.3 CURRENT LAND USE

NSA Crane is situated in a rural area of south-central Indiana. The surrounding communities that form the region are in a period of transition from an economic base of agriculture, mining, and quarrying to an economy built on manufacturing and service industries. The patterns of settlement, population statistics, and median income are similar throughout the region.

There is no state or local planning within the vicinity of NSA Crane. The only zoning and land use regulations are found in the municipalities within the region. None of these municipalities are close enough to have an impact on NSA Crane. None of the areas adjacent to NSA Crane are zoned, and zoning is not anticipated in the future. The MTA of SWMU 3 is approximately 1 mile west of the nearest NSA Crane property boundary. There are no known current or likely future land use or community actions under consideration or proposed at this time for the off-base land in the vicinity of SWMU 3. SWMU 3 is contained completely within NSA Crane, and likely future land use at areas surrounding the SWMU is expected to be limited to industrial uses. However, because LSC flows off base contamination could be transported off base via LSC.

1.4 CORRECTIVE MEASURE GOALS

The corrective measure goals for MTA and LSC portions of SWMU 3 are as follows:

- Monitoring to ensure that chemical concentrations in LSC continue to attain Media Cleanup Standards (MCSs) identified in the SB and to determine whether chemical concentrations in groundwater are naturally attenuating.
- Prevent human exposure to contaminated soil, groundwater, and surface water.

To achieve these goals, LTM and LUCs will be implemented.

1.4.1 Long-Term Monitoring Objectives

The objectives of LTM are as follows:

- Determine whether RDX and TCE in MTA groundwater are naturally attenuating and to warn of potential contamination migration.

- Verify that the concentrations of RDX and other contaminant concentrations in LSC surface water are less than MCSs.

LTM will be conducted in accordance with the RCRA GWMP that is part of the RCRA operating permit for the ABG (Navy, 2007). RCRA monitoring at the ABG includes sampling of groundwater, springs, and LSC.

The monitoring points, units monitored, monitoring frequency, and monitoring point objectives are presented in the RCRA GWMP. The analytes to be monitored at each monitoring point, the groundwater protection standards, and the surface water protection standards are presented in the RCRA GWMP. For convenience, the monitoring points from the RCRA GWMP are shown on Figures 1-4 (MTA), 1-5 (OJT), and 1-6 (LSC).

1.4.2 Land Use Control Objectives

The objectives of LUCs are as follows:

- Prevent access to and use of contaminated soil or groundwater within the MTA; and access to and use of contaminated groundwater within the OJT until MCSs are achieved throughout those areas.

- Maintain the integrity of any current or future remedial or monitoring system (e.g., monitoring wells).

- Prohibit the development and use of the MTA properties for residential or other unrestricted use.

LUCs will be used to ensure that exposure of humans to contaminated soil and groundwater does not occur. This requires periodic evaluations of the integrity of the monitoring network and physical controls

that are in place to prevent exposure to contaminated soil and groundwater. Ensuring that controls remain effective will require the following:

- Management of existing LUCs.
- Periodic review of existing LUCs and additional LUCs, if implemented, to ensure that they remain effective.

The LUC boundary is the same as the SWMU 3 boundary and is shown on Figure 1-3. The LUCIP is included in Section 6.0 of this CMIP/QAPP.

1.5 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are presented here in a format that parallels the Guidance for Data Quality Objectives (USEPA, 2006). The previous sections of this document constitute the DQO problem statements for LTM and LUCs. An additional consideration is that the party that will implement the LTM program (i.e., collect and analyze samples, interpret the data, and generate reports) on behalf of the Navy may change in the future. Therefore, controls are included in this document to ensure that the implementing parties will meet the following criteria:

- Satisfy all IDEM requirements for sample collection and management.
- Satisfy IDEM requirements for data review and management.
- Collect samples and generate data in a manner that is comparable in quality to past activities at the site.
- Interpret data in a technically sound and defensible manner.

Standard operating procedures (SOPs) for sampling and laboratory analysis that have been approved by USEPA and IDEM are included in the GWMP that is part of the RCRA operating permit for the ABG (Navy, 2007). The SOPs are referenced in the RCRA GWMP to provide the level of control required to ensure that the above objectives are satisfied. References to these SOPs and other controls are included throughout the RCRA GWMP. The RCRA GWMP and SOPs have been adopted, as written, for implementing the LTM plan described in this CMIP/QAPP. It may be necessary to change some of the information (e.g., organizational structure) if there are changes in the implementing parties. In that case, the changes must be approved by IDEM.

1.5.1 Decision Statements

Decision statements were incorporated directly into the decision rules that are presented in Section 1.5.4.

1.5.2 Inputs to the Decision

The analytes listed for groundwater and surface water are presented as part of the RCRA GWMP.

Groundwater elevations must be determined during every sampling round to update groundwater flow direction information. Well stabilization parameters (e.g., pH, turbidity) must be measured to ensure that samples collected are representative of the water-bearing zones associated with the wells. Groundwater elevations and well stabilization parameters will be measured as specified in the RCRA GWMP.

Low-flow sampling of groundwater must be used to ensure comparability with previously collected data and to ensure that the samples are representative of groundwater conditions. Surface water sampling will be performed by direct filling of sample bottles. Groundwater and surface water samples will be collected as specified in the RCRA GWMP.

Quality control (QC) samples must be collected to help estimate precision, accuracy, representativeness, comparability, completeness, and sensitivity of samples and analyses, as appropriate. QC samples will be collected and analytical results will be evaluated as specified in the RCRA GWMP.

Monitoring in accordance with the RCRA GWMP must continue during active operation of the ABG until it is closed in accordance with RCRA. Evaluation of groundwater and surface water data will involve comparisons of chemical concentrations to the groundwater and surface water protection standards presented in RCRA GWMP. The data will be evaluated as specified in the RCRA GWMP.

In addition to the above, periodic assessment of LUCs must be made. Section 6.0 if this CMIP/QAPP is the LUCIP that was developed separately from the LTM plan to describe LUC requirements. Periodic evaluation of site conditions (e.g., well integrity, lack of groundwater use) will be necessary to ensure that LUCs remain effective at preventing human exposure to contaminated media.

1.5.3 Study Boundaries

The groundwater, spring, and surface water sampling locations specified in the RCRA GWMP are shown on Figures 1-3, 1-4, and 1-5. Groundwater and surface water potentially contaminated from site

operations are the populations of interest. Figure 1-3 also shows the LUC boundaries. The LUC boundaries may be altered, with IDEM approval, based on the LTM results.

The intent is to conduct monitoring in accordance with the RCRA GWMP. This will satisfy the LTM requirements for the SWMU 3 corrective measures. Previous investigations and RCRA monitoring at the ABG have indicated that the concentrations of groundwater COCs are decreasing as a result of natural attenuation processes. Contaminated groundwater from the MTA and OJT discharges to LSC via springs. The CMP concluded that there are no unacceptable risks to human health from exposure to downstream surface water beyond the facility boundary. Surface water monitoring will ensure that groundwater discharges do not cause surface water concentrations to exceed the applicable surface water protection standards.

If detected concentrations of applicable chemicals decrease to less than groundwater and surface water protection standards, they may be eliminated from the LTM program, with IDEM approval, in accordance with the RCRA GWMP. The optimization will be consistent with the current Navy groundwater monitoring optimization guidance.

1.5.4 Decision Rules

Based on the above characterizations, decision rules were developed to govern the decision making for this project. Evaluation of these rules depends heavily on qualitative considerations because there are many interacting variables involved in some of the decisions. In addition, there is significant overlap between the monitoring program to comply with RCRA permit requirements for the ABG and the LTM program for SWMU 3 corrective measures.

Decision Rule 1

Modifications to the monitoring program will be in accordance with the RCRA GWMP and the RCRA operating permit for the ABG. This includes, but is not limited to, selection of or changes in monitoring locations, monitoring frequency, and analytical parameters. In general, monitoring shall continue until attainment of MCSs has been demonstrated and contaminant concentrations do not pose a threat of increasing to values greater than MCSs in the monitored groundwater or surface water, as applicable. Monitoring network optimization will be conducted in accordance with the most current version of the "Guide to Optimal Groundwater Monitoring" (DON, 2008).

Decision Rule 2

If the land use at SWMU 3 changes in a manner that will cause increased potential for exposure of humans or the environment to SWMU 3 soil, groundwater, or surface water, re-evaluate LUCs and/or re-evaluate the remedy to ensure that they are protective of human health and the environment. Further detail is provided in Section 6.0.

Decision Rule 3

If LUCs are determined to be ineffective at preventing human exposure to contaminated soil, groundwater, or surface water, improve the effectiveness of the LUCs by adding more LUCs or changing existing LUCs. If changes in LUCs will not prevent this human exposure, alter the remedy to be more protective of human health and the environment. Further detail is provided in Section 6.0.

1.5.5 Establish Decision Error Tolerances

The decision error tolerances are the same as for the RCRA GWMP.

1.5.6 Optimize the Design

The RCRA GWMP for the ABG was recently updated to address the LTM portion of the SWMU 3 corrective measures as well as RCRA permit requirements. Any changes in the sampling plan will be in accordance with the RCRA GWMP and RCRA permit for the ABG.

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\GENERAL_LOCATION.MXD 05/17/11 SS

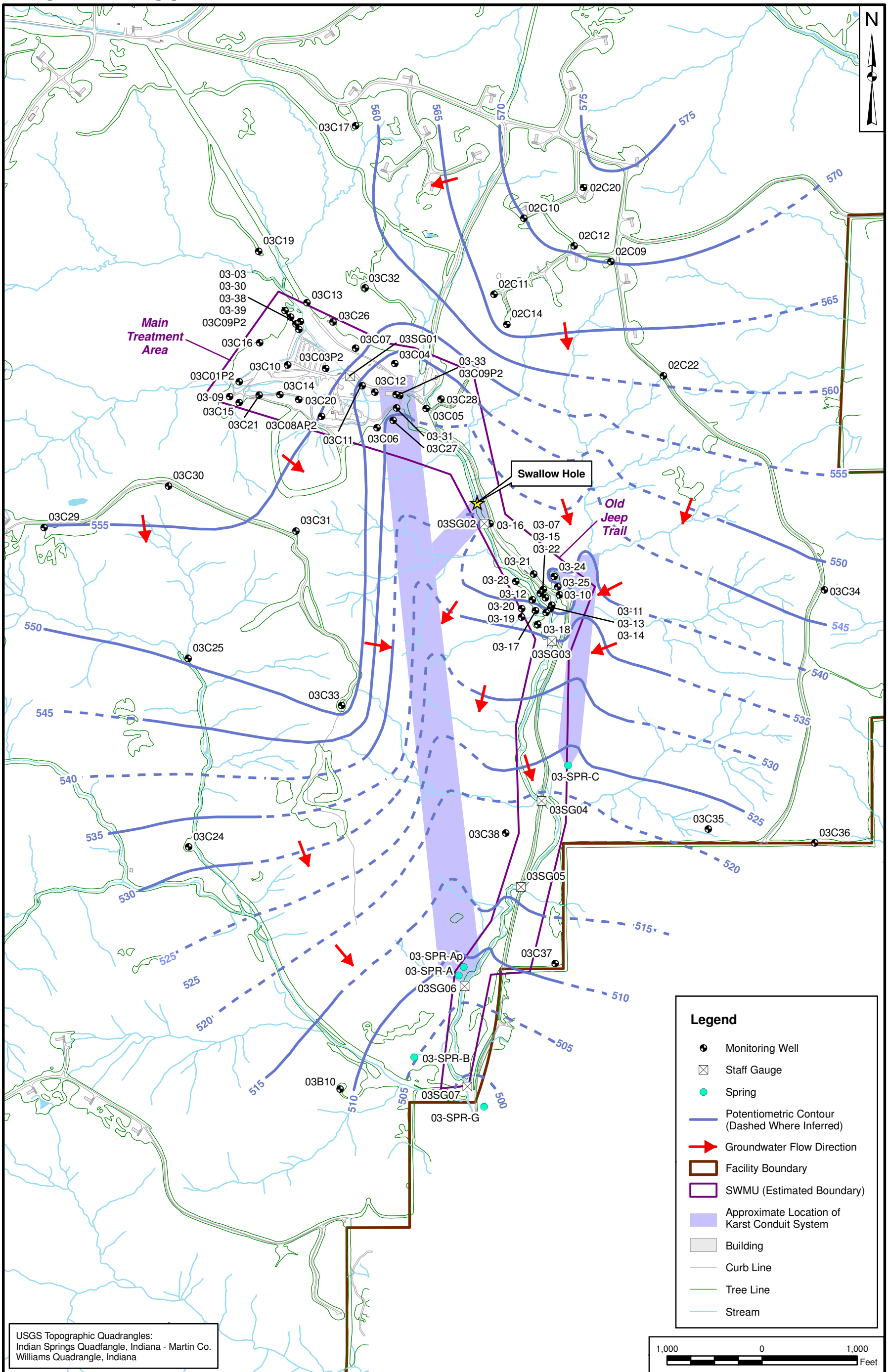
DRAWN BY J. ENGLISH	DATE 03/10/11		GENERAL LOCATION MAP SWMU 3 CMIP NAVAL SUPPORT ACTIVITY CRANE, INDIANA	CONTRACT NUMBER CTO 0021	CTO NUMBER ___
CHECKED BY T. JOHNSTON	DATE 05/17/11			APPROVED BY ___	DATE ___
REVISED BY	DATE			APPROVED BY ___	DATE ___
SCALE AS NOTED				FIGURE NO. FIGURE 1-1	REV 0

P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU03_DRAINAGE.MXD 04/14/11 TW

Source: "Initial Assessment of Study of Naval Weapons Support Center Crane, Indiana." Naval Energy and Environmental Support Activity, May 1983.

DRAWN BY T. WHEATON	DATE 04/14/11	SWMU 03 LOCATION SWMU 3 CMIP NAVAL SUPPORT ACTIVITY CRANE CRANE, INDIANA	CONTRACT NUMBER CTO 0021
CHECKED BY T. JOHNSTON	DATE 05/17/11		OWNER NUMBER —
REVISED BY —	DATE —		APPROVED BY — DATE —
SCALE AS NOTED			FIGURE NO. FIGURE 1-2 REV 0

P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU03_GW_CONTOURS.MXD 06/03/11 SS



DRAWN BY J. ENGLISH	DATE 06/08/10	MTA OJT LSC SITE LAYOUT SWMU 3 CMIP NAVAL SUPPORT ACTIVITY CRANE CRANE, INDIANA	CONTRACT NUMBER CTO 0021
CHECKED BY V. PLACHY	DATE 06/03/11		APPROVED BY ___ DATE ___
REVISED BY ___	DATE ___		APPROVED BY ___ DATE ___
SCALE AS NOTED			FIGURE NO. FIGURE 1-3 REV 0

P:\GIS\NSWC_CRANE\APR\7651.APR ABG - CROSS SECTION LAYOUT 5/17/10 KM

N

03C13
03-30
03-01
03-39
03-38
03C26
FORMER SURFACE IMPOUNDMENT
03C09P2
03C09
ORDNANCE BURNING AREA
03C16
10
11
11
03C07
3
3
3
3
3
3
PILE
6
03SB103
03C04
03C23
12
3
3
03C10
PILE
9
03C03P2
03C03
9
STORAGE
2908
PILE
FORMER SURFACE IMPOUNDMENTS
03C01P2
03C01
03C01P3
STORAGE
03C22
ASH INSPECTION PAN
03SB061
03SB120
14
03C11
H-462
2011
03C18
03-29
STORAGE
03-27
STORAGE
4
03SB116
5
7
10
8
03C12
03C02P2
03C02
03-37
03-33
03C28
03-02
03-09
03C21
03C21P2
03C14
03C15P3
03C15
03C20
ASH PILE (removed)
03-35
03-34
03-32
03-03
03-04
03-06
03-31
03C09
13
03-28
03C08P2
03C08P3
03C08
03C08A
6
STORAGE
03-36
03C27
03C06
ORDNANCE BURNING AREA

Wells sampled during April 2004 Investigation
Wells currently sampled for RCRA Monitoring Program
Wells not completed in Big Clifty/Beech Creek aquifer; not sampled during CMS Investigation
Treatment Unit
Road
Stream
Vegetation
Building

TREATMENT UNIT LEGEND

3. Main Burn Pan Grid
4. Burn Pans
5. Burn Pan
6. Red Phosphorus Burn Pans
7. East End Burn Pan #1
8. East End Burn Pan #2
9. Flash Pits
10. Dewatering Units #1
11. Dewatering Units #2, #3
12. Primer Pits
13. Incendiary Cage
14. Approximate Location of Former Pink Water Tanks

200 0 200 Feet

CONTRACT NO. CTO 0021
APPROVED BY ___ DATE ___
APPROVED BY ___ DATE ___
DRAWING NO. FIGURE 1 - 4
REV 0

MAIN TREATMENT AREA
SWMU 3 CMIP
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY A. JANOCHA DATE 3/03/04
CHECKED BY K. TURNBULL DATE 9/18/08
COST/SCHED-AREA
SCALE AS NOTED

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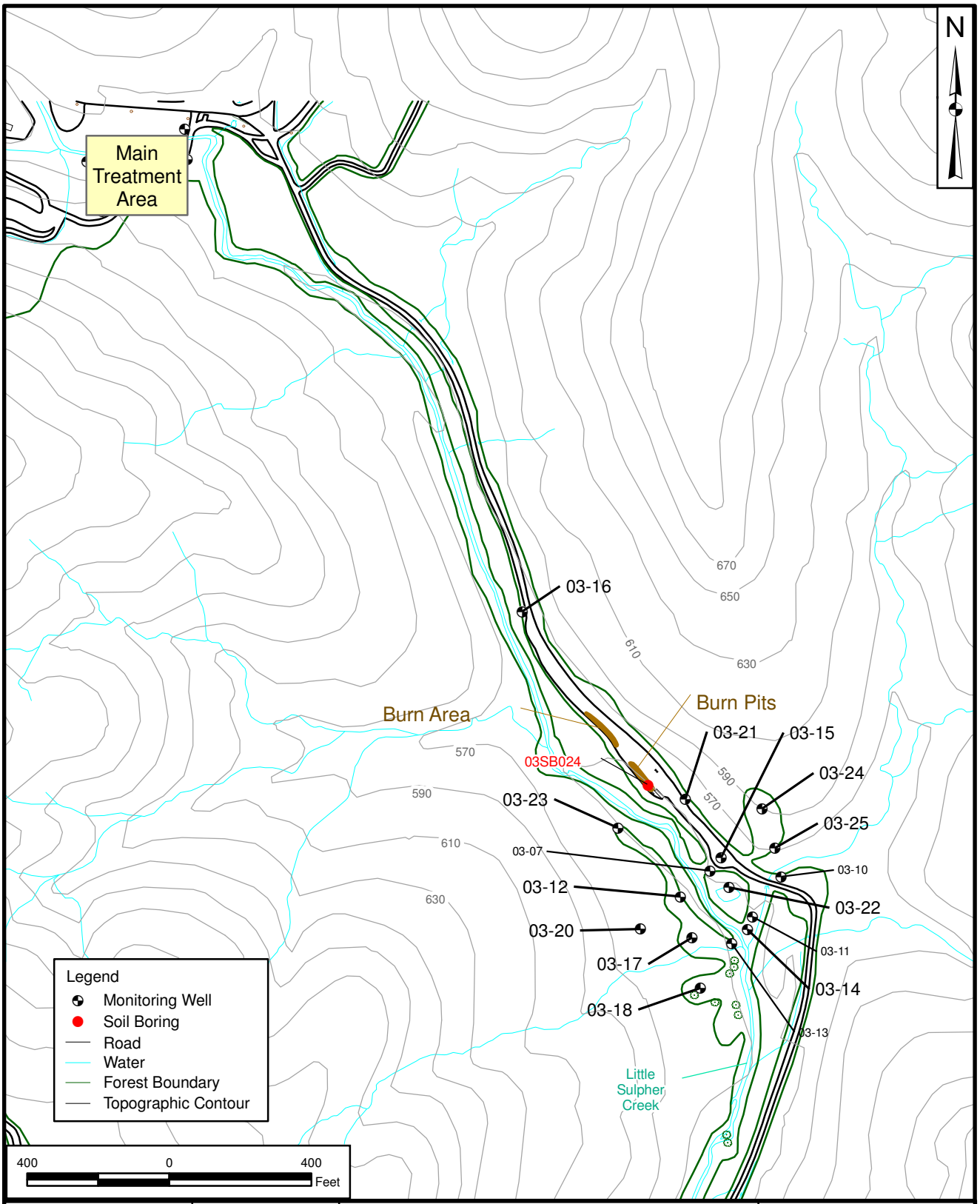
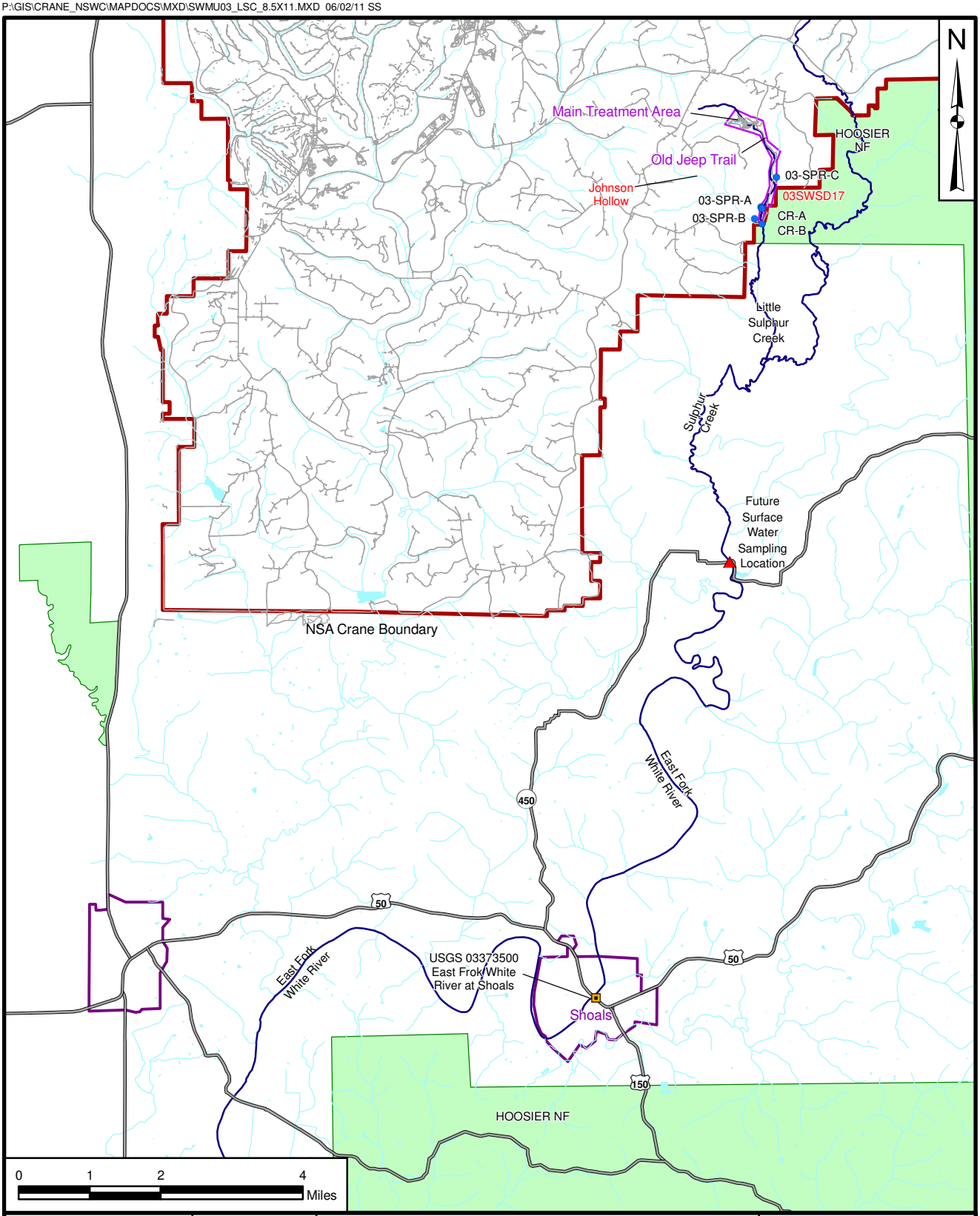


DRAWN BY S.STROZ	DATE 06/04/10	OLD JEEP TRAIL WITH BURN AREA AND BURN PIT SWMU 3 CMIP NAVAL SUPPORT ACTIVITY CRANE CRANE, INDIANA	CONTRACT NUMBER CTO 0021
CHECKED BY T. JOHNSTON	DATE 05/17/11		APPROVED BY ___ DATE ___
REVISED BY ___	DATE ___		APPROVED BY ___ DATE ___
SCALE AS NOTED			FIGURE NO. FIGURE 1-5 / REV 0

P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU03_LSC_8.5X11.MXD 06/02/11 SS



DRAWN BY S. STROZ	DATE 06/07/10	LITTLE SULFUR CREEK SWMU 3 CMIP NAVAL SUPPORT ACTIVITY CRANE CRANE, INDIANA	CONTRACT NUMBER CTO 0021
CHECKED BY V. PLACHY	DATE 06/02/11		APPROVED BY ___ DATE ___
REVISED BY S. STROZ	DATE 06/02/11		APPROVED BY ___ DATE ___
SCALE AS NOTED			FIGURE NO. FIGURE 1-6 REV 0

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section presents the proposed project management and organization for Corrective Measures Implementation (CMI) at the ABG at NSA Crane. Table 2-1 lists key project personnel by function.

The field work outlined in this plan will be conducted under the health and safety rules set forth in a Health and Safety Plan (HASP) written specifically by the Prime Contractor.

2.1 MANAGEMENT

The Prime Contractor, on behalf of the Navy, is responsible for overall management, implementation of contract field activities, and preparation of reports as designated in this CMIP/QAPP and RCRA permit. Personnel from the Navy will be actively involved and will coordinate with Prime Contractor personnel in a number of areas. The authorities and organizational relationships of key personnel are depicted on Figure 2-1. Responsibilities for program management, project management, field operations, and laboratory operations are discussed in the following sections. It is intended that the individuals named will perform the designated responsibilities to the extent that the specific person is available to perform the stated activities.

2.1.1 Indiana Department of Environmental Management

The IDEM Corrective Action Project Manager, Doug Griffin, or other IDEM-designated staff member(s), will oversee and manage the CMI. They represent IDEM interests and will provide input from this perspective.

2.1.2 Navy Project Managers

The Navy Remedial Project Manager (RPM), Howard Hickey, acts as representative for the Navy, providing management, technical direction, and oversight for all NSA Crane project activities performed by contractors and their subcontractors. In matters such as facilitation of site access and oversight, the Navy RPM is assisted by the NSA Crane Environmental Site Manager (ESM), Tom Brent. Additional responsibilities of the RPM are as follows:

- Define project objectives and develop a detailed schedule.

- Establish project policy and procedures to address the specific needs of the project as a whole and the objectives of each task.

- Acquire and apply technical resources (e.g., contractors) as needed to ensure performance within budget and schedule constraints.

- Review the work performed on each task to ensure its quality, responsiveness, and timeliness.

- Review and analyze overall task performance with respect to planned requirements and authorizations.

- Approve all reports (deliverables) before their submittal to IDEM.

- Ultimately be responsible for the preparation and quality of interim and final reports.

- Represent the project team at meetings and public hearings.

- With respect to LUCs, ensure that the controls are implemented in accordance with Section 6.0 of this CMIP/QAPP.

2.1.3 Prime Contractor Management

2.1.3.1 Project Manager

The Prime Contractor Project Manager (PM) has the overall responsibility for ensuring that the project meets IDEM objectives and Navy and Prime Contractor quality standards. The PM is responsible for distribution of the CMIP/QAPP and for development of any additional documents required to implement the plan. This may include, for example, updated personnel contact lists. The PM will take direction from the Navy RPM. The PM will ensure that all parties implementing the CMI will obtain copies of this CMIP/QAPP and any additional documents required to implement the CMIP/QAPP. The PM will report to the Navy RPM and is responsible for technical QC and project oversight. Additional responsibilities of the PM are as follows:

- Ensuring timely resolution of project-related technical, quality, safety, and waste management issues.

- Functioning as the primary interface with the Navy RPM and NSA Crane ESM, field and office personnel, and subcontractor points of contact.

- Ensuring that health and safety issues related to this project are communicated effectively to all personnel.

- Monitoring and evaluating subcontractor laboratory performance.

- Coordinating and overseeing work performed by field and office technical staff, including data validation, statistical evaluations, and report preparation.

- Coordinating and overseeing maintenance of all project records.

- Coordinating and overseeing review of project deliverables.

- Preparing and issuing final deliverables to the Navy.

- Approving the implementation of corrective actions.

2.1.3.2 Project Geologist

The services of this individual will be required only if new wells are installed or other intrusive activities occur that require the expertise of a geologist. This individual has the responsibility for ensuring that field activities related to geology are implemented in a safe and technically sound manner. The Project Geologist, or designee, will perform lithologic logging and soil classification of all borings drilled for well installation.

2.1.3.3 Project Chemist

The Prime Contractor Project Chemist has the overall responsibility for ensuring that the project meets objectives from the standpoint of laboratory performance. The Project Chemist is responsible for the technical preparation of laboratory statements of work (SOWs) and work releases. The subcontractor laboratory PM will report to the Project Chemist. The Project Chemist will report to the Prime Contractor PM. Additional responsibilities of the Project Chemist are as follows:

- Providing technical advice to the project team on matters of project chemistry.
- Monitoring and evaluating subcontractor laboratory performance.
- Ensuring timely resolution of laboratory-related technical, quality, or other issues affecting project goals.
- Functioning as the primary interface with the subcontracted laboratory and the Prime Contractor PM.
- Coordinating and overseeing work performed by the subcontracted laboratory.
- Coordinating and overseeing review of laboratory deliverables.
- Recommending appropriate laboratory corrective actions.

2.1.3.4 Health and Safety Manager

The Prime Contractor Health and Safety Manager (HSM) is responsible for the following:

- Providing technical advice to the Prime Contractor PM on matters of health and safety.
- Overseeing the development and review of the HASP specifically designed for LTM.
- Implementing the HASP.
- Assigning the Site Safety Officer (SSO) and supervising his/her performance.
- Conducting health and safety audits.
- Preparing health and safety reports for management.

2.2 QUALITY ASSURANCE

This section identifies the quality assurance (QA) responsibilities of IDEM, the Prime Contractor, and the analytical laboratory.

2.2.1 IDEM Quality Assurance Coordinator

The IDEM Quality Assurance Coordinator (QAC) is responsible for reviewing and approving the CMIP/QAPP and provides overall QA support and review.

2.2.2 Prime Contractor Quality Assurance Responsibilities

2.2.2.1 Quality Assurance Manager

The Prime Contractor QA Manager (QAM) is responsible for overall QA for the project and reports directly to the Prime Contractor PM. The QAM acts on behalf of the Navy for project QA and is responsible for the following:

- Developing, maintaining, and monitoring QA policies and procedures.
- Providing training to Prime Contractor staff in QA/QC policies and procedures.
- Conducting systems and performance audits to monitor compliance with environmental regulations, contractual requirements, CMIP/QAPP requirements, and corporate policies and procedures.
- Auditing project records.
- Monitoring subcontractor QC and records.
- Assisting in the development of corrective action plans.
- Ensuring correction of nonconformances reported in internal or external audits.
- Overseeing implementation of CMI documents.
- Overseeing and reviewing the development and revision of CMI documents.
- Overseeing the responsibilities of the Prime Contractor Site QA/QC Advisor (see Section 2.3.2).
- Preparing QA reports for Prime Contractor management.
- Ensuring that chemistry and other quality concerns are resolved in a manner that preserves data integrity.

2.2.2.2 Data Validation Manager

The Prime Contractor Data Validation Manager is responsible for all data validation and data review activities. The Data Validation Manager is responsible for ensuring that analytical laboratory data are reviewed and validated in accordance with analytical project objectives outlined in this CMIP/QAPP. The following items summarize principal areas or responsibility for the Data Validation Manager:

- Reviewing compliance of the analytical laboratory with methods and analytical requirements as outlined in this CMIP/QAPP and laboratory specifications.
- Ensuring completeness of analytical laboratory deliverables in both electronic and hardcopy formats.
- Ensuring data validation qualification is conducted in accordance with IDEM and/or USEPA regional requirements.
- Performing a QA review of all data validation reports and validated analytical data.
- Reviewing and approving all data validation qualifications entered into the electronic database.
- Conducting verification and accounting for all samples, analyte fractions, and analytical parameters.
- Approving the final qualified analytical database.

2.2.3 Laboratory Responsibilities

The subcontracted laboratory is responsible for analyzing all samples in accordance with the analytical methods and additional requirements specified in this document. The analytical laboratory will also be responsible for properly disposing of unused sample aliquots in accordance with applicable regulations.

The laboratory PM will report directly to the Prime Contractor Project Chemist and will be responsible for the following:

- Ensuring that method and project-specific requirements are properly communicated and understood by laboratory personnel.
- Ensuring that all laboratory resources are available on an as-required basis.

- Monitoring analytical and project QA requirements.

- Reviewing analytical data packages for completeness, clarity, and compliance with project requirements.

- Informing the Prime Contractor PM or designee of project status on a weekly basis and of any sample receipt or analytical problems as they occur.

- Ensuring timeliness of deliverables as specified in contract documents.

2.3 FIELD INVESTIGATION

The Prime Contractor will be responsible for all field activities related to the CMI. The Prime Contractor field team will be organized according to the activities planned. Field team members will be selected based on the type and extent of effort required. All team members will be appropriately skilled and trained for the tasks assigned to them. The team will consist of a combination of the following personnel:

- Field Operations Leader (FOL)
- Site QA/QC Advisor
- SSO
- Field technical staff.

More than one activity may be performed by the same person.

2.3.1 Field Operations Leader

The FOL is responsible for coordinating all on-site personnel and providing technical assistance when required. The FOL, or designee, will coordinate and lead all sampling activities and ensure the availability and maintenance of sampling materials and equipment. The FOL is responsible for completing all sampling, field, and chain of custody documentation, will assume custody of all samples, and will ensure proper handling and shipping of samples. The FOL will report directly to the Prime Contractor PM. Specific FOL requirements include the following:

- Ensuring that all health and safety requirements are implemented.

- Functioning as the communications link between field staff members, SSO, NSA Crane ESM, and PM.

- Overseeing the mobilization and demobilization of all field equipment and subcontractors.

- Coordinating and managing field technical staff.

- Adhering to work schedules provided by the PM.

- Ensuring proper maintenance of the site logbook, the field logbook, and field recordkeeping.

- Initiating field task modification requests (FTMRs) when necessary.

- Identifying and resolving problems in the field, resolving difficulties via consultation with the NSA Crane ESM, implementing and documenting corrective action procedures, and providing communication between the field team and project management.

2.3.2 Site Quality Assurance/Quality Control Advisor

The FOL, or designee, will act as the site QA/QC Advisor and will be responsible for ensuring adherence to all QA/QC requirements as defined in this CMIP/QAPP. Strict adherence to these procedures is essential for collection of acceptable and representative data. The following is a summary of the Site QA/QC Advisor responsibilities:

- Ensuring that field QC samples are collected at the proper frequency.

- Ensuring that additional volumes of sample are supplied to the analytical laboratory with the proper frequency to accommodate laboratory QA/QC analyses.

- Ensuring that measuring and testing equipment are calibrated, used, and maintained in accordance with applicable procedures and technical standards.

- Acting as the liaison between site personnel, laboratory personnel, and the QAM.

- Managing bottleware shipments and overseeing field preservation.

2.3.3 Site Safety Officer

The duties of the SSO will be detailed in the HASP that is specific to the Prime Contractor. The SSO has stop-work authority, which can be executed upon the identification of an imminent safety hazard.

2.3.4 Field Technical Staff

All field team members will be experienced professionals who possess the degree of specialization and technical competence required to effectively and efficiently perform the required work.

Field team members are responsible for complying with field-related requirements as presented in this CMIP/QAPP and the HASP.

2.4 SPECIAL TRAINING REQUIREMENTS AND CERTIFICATIONS

Each site worker performing sampling of hazardous materials will be required to have completed appropriate Hazardous Waste Operations for Emergency Response (HAZWOPER) training specified in Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations 1910.120(e). Safety requirements are addressed in greater detail in the site-specific HASP.

The analytical laboratory must have successfully completed the laboratory evaluation process required as part of the DoD Environmental Laboratory Accreditation Program (ELAP).

TABLE 2-1

KEY PROJECT PERSONNEL NAMES, PHONE NUMBERS, AND ADDRESSES
SWMU 10 – ROCKEYE
NSA CRANE, CRANE, INDIANA

PERSON / TITLE / ORGANIZATION	ADDRESS	TELEPHONE
Doug Griffin Office of Land Quality Hazardous Waste Permits IDEM	OLQ Permits Branch Mail Code 64-45 IGCN 1101 100 N. Senate Avenue Indianapolis, IN 46204	Tel: (317) 233-2710
Craig Pender Quality Assurance Office of Land Quality IDEM	OLQ Permits Branch 100 N. Senate Avenue Indianapolis, IN 46204	Tel: (313) 234-0941
Howard Hickey Remedial Project Manager U.S. Navy NAVFAC MW	Department of Navy NAVFAC MW 201 Decatur Avenue Building 1A, Floor B, Room 18 Great Lakes, Illinois 60088	Tel: (847) 688-2600
Tom Brent Environmental Restoration Site Manager NAVFAC Crane	NSA Crane Code PRC2 Building 3245 300 Highway 361 Crane, Indiana 47522-5009	Tel: (812) 854-6160 FAX: (812) 854-4177
Peter Ramanauskas U.S. EPA Region 5	U.S. EPA Region 5 77 West Jackson Blvd. Chicago, Illinois 60604	Tel: (312) 886-7890 FAX: (312) 353-4788
Alan Debus Quality Assurance U.S. EPA Region 5	U.S. EPA Region 5 77 West Jackson Blvd. Chicago, Illinois 60604	Tel: (312) 886-6186
Darren Sipes Program Manager SAIC	SAIC 14064 E. Westgate Court Crane, IN 47522	Tel: (812) 863-3197 FAX: (812) 863-2537
Bryce York Health and Safety Manager SAIC	SAIC 14064 E. Westgate Court Crane, IN 47522	Tel: (812) 863-3286 FAX: (812) 863-2537
Kim Hughes Project Manager SAIC	SAIC 14064 E. Westgate Court Crane, IN 47522	Tel: (812) 863-3238 FAX: (812) 863-2537
Kim Hughes Field Operations Leader/Site QA SAIC	SAIC 14064 E. Westgate Court Crane, IN 47522	Tel: (812) 863-3238 FAX: (812) 863-2537
Kim Hughes Data Validation Manager/QA Manager SAIC	SAIC 14064 E. Westgate Court Crane, IN 47522	Tel: (812) 863-3238 FAX: (812) 863-2537

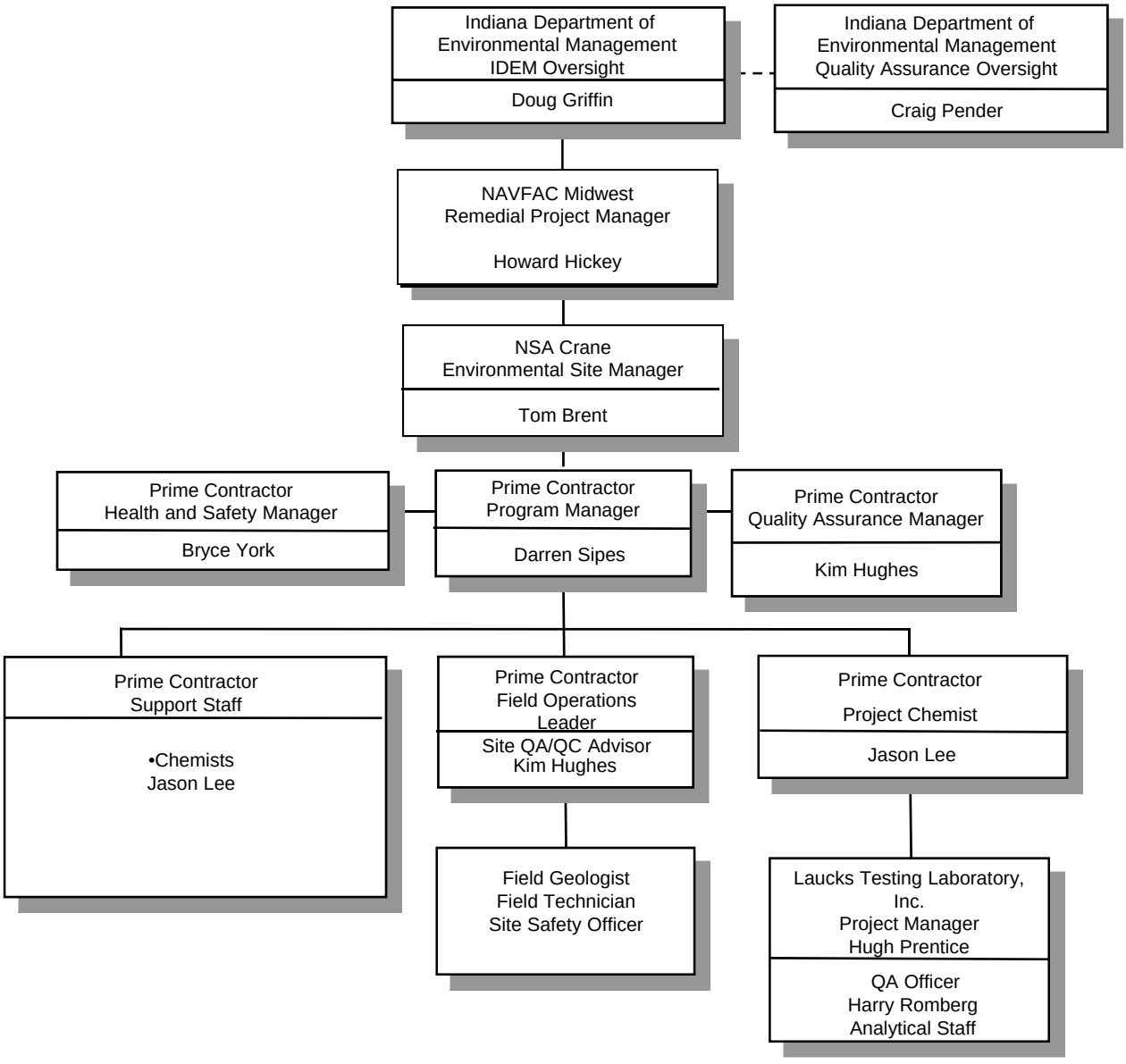
TABLE 2-1

KEY PROJECT PERSONNEL NAMES, PHONE NUMBERS, AND ADDRESSES
SWMU 10 – ROCKEYE
NSA CRANE, CRANE, INDIANA
PAGE 2 OF 2

PERSON / TITLE / ORGANIZATION	ADDRESS	TELEPHONE
Kim Hughes Project Geologist SAIC	SAIC 14064 E. Westgate Court Crane, IN 47522	Tel: (812) 863-3238 FAX: (812) 863-2537
TBD Project Chemist SAIC	SAIC 14064 E. Westgate Court Crane, IN 47522	Tel: (812) 863-3236 FAX: (812) 863-2537
Kelly Perkins Project Manager Katahdin Analytical Services	Katahdin Analytical Services 600 Technology Way Scarborough, ME 04074	Tel: (207) 874-2400 FAX: (207) 775-4029
Leslie Dimond QA Manager Katahdin Analytical Services	Katahdin Analytical Services 600 Technology Way Scarborough, ME 04074	Tel: (207) 874-2400 FAX: (207) 775-4029

FIGURE 2-1

PROJECT ORGANIZATION CHART
SWMU 3 - AMMUNITION BURNING GROUNDS CORRECTIVE MEASURES IMPLEMENTATION PLAN
NAVAL SUPPORT ACTIVITY CRANECRANE, INDIANA



3.0 LONG-TERM MONITORING FIELD OPERATIONS

Field operations for the LTM program for SWMU 3 will be in accordance with the RCRA GWMP that is part of the RCRA operating permit for the ABG (Navy, 2007). The RCRA GWMP presents the corrective action wells and their monitoring analytes and LSC surface water monitoring locations and requirements.

4.0 FIXED-BASE LABORATORY REQUIREMENTS FOR LONG-TERM MONITORING

Fixed-base laboratory requirements for the LTM program for SWMU 3 will be in accordance with the RCRA GWMP that is part of the RCRA operating permit for the ABG (Navy, 2007).

5.0 LONG-TERM MONITORING DATA EVALUATIONS

Data evaluations for the LTM program for SWMU 3 will be in accordance with the RCRA GWMP that is part of the RCRA operating permit for the ABG (Navy, 2007). The corrective action wells (see RCRA GWMP) will be monitored for the chemicals listed on Table 5-1.

TABLE 5-1
MONITORED CHEMICALS
SWMU 3 - AMMUNITIONS BURNING GROUNDS
CORRECTIVE MEASURES IMPLEMENTATION PLAN
NSWC CRANE
CRANE, INDIANA

Compound	CASRN
1,1-Dichloroethene (1,1-DCE)	75-35-4
1,1-Dichloroethene (1,1-DCE)[9]	75-35-4
1,3,5-Trinitrobenzene (1,3,5-TNB)	99-35-4
1,3-Dinitrobenzene (1,3-DNB)	99-65-0
2,2'-6,6'-Tetranitro-4,4'-azoxytoluene (4,4-TN-AZOXY)	Not Available
2,4,6-Trinitrophenyl-N-methylnitramine (Tetryl)	479-45-8
2,4,6-Trinitrotoluene (TNT)	118-96-7
2,4-Diamino-6-Nitrotoluene (2,4-DA-6-NT)	6629-29-4
2,4-Dinitrotoluene (2,4-DNT)	121-14-2
2,6-Diamino-4-Nitrotoluene (2,6-DA-4-NT)	121-14-2
2,6-Dinitrotoluene (2,6-DNT)	606-20-2
2-Amino-4,6-dinitrotoluene (2AmDNT)	35572-78-2
2-Nitrotoluene (2-NT)	88-72-2
3,5-Dinitroaniline (3,5-DNA)	618-87-1
3-Nitrotoluene (3-NT)	99-08-1
4-Amino-2,6-dinitrotoluene (4AmDNT)	19406-51-0
4-Nitrotoluene (4-NT)	99-99-0
cis-1,2-Dichloroethene (cis-1,2-DCE)	156-59-2
cis-1,2-Dichloroethene (cis-1,2-DCE)[9]	156-59-2
Hexahydro-1,3,5-Dinitroso-1,3,5-triazine (DNX)	Not Available
Hexahydro-1,3,5-mononitroso-1,3,5-triazine (MNX)	2691-41-0
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4
Hexahydro-1,3,5-trinitroso-1,3,5-triazine (TNX)	13980-04-6
Nitrobenzene (NB)	528-29-0 (1,2-NB) 99-65-0 (1,3-NB)
n-Nitrosodimethylamine (Dimethylnitrosamine) (DMNA)	62-75-9
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0
Perchloroethylene (PCE)	127-18-4
Perchloroethylene (PCE)[9]	127-18-4
Tetrachloroethane (PCA)	630-20-6 79-34-5
Tetrachloroethane (PCA)[9]	630-20-6
trans-1,2-Dichloroethene (trans-1,2-DCE)	156-60-5
trans-1,2-Dichloroethene (trans-1,2-DCE)[9]	156-60-5
Trichloroethane	71-55-6 79-00-5
Trichloroethene (TCE)	79-01-6
Trichloroethylene (TCE)[9]	79-01-6
Vinyl Chloride (VC)	75-01-4
Vinyl Chloride (VC)[9]	75-01-4

6.0 LAND USE CONTROL IMPLEMENTATION PLAN

6.1 PURPOSE

The purpose of this LUCIP for SWMU 3 (ABG) is to provide information on how the LUC portion of the remedy selected in the RCRA SB for SWMU 3 will be implemented and maintained. The SB stipulates that LUCs will be instituted to prevent access to contaminated soil, prevent access and/or use of contaminated groundwater and surface water, prohibit future residential use, and maintain the integrity of any current or future remedial system or monitoring system. The LUC portion of this CMIP/QAPP was prepared as a result of the selection of LUCs as a component of the remedy in accordance with the SB for SWMU 3 and RCRA Hazardous Waste Management Permit IN5170023498 for NSA Crane. In addition, LTM will be conducted as described in other sections of this CMIP/QAPP and the RCRA GWMP.

The inspections and reporting requirements described herein will be effective immediately upon approval of this CMIP/QAPP by IDEM. Once put into effect, the requirements set forth in this document will remain applicable to SWMU 3 during Navy ownership, as well as subsequent ownership, or until SWMU 3 is deemed suitable for unrestricted use.

6.2 LAND USE CONTROL PERFORMANCE OBJECTIVES

The performance objectives for the LUC remedy for SWMU 3 are as follows::

- Prevent access to and use of contaminated soil (i.e., area near soil borings 03SB116 and 03SB120) or groundwater (i.e. from the BC/BC aquifer) within the MTA; and access to and use of contaminated soil and groundwater within the OJT until MCSs are achieved throughout those areas.

- Maintain the integrity of any current or future remedial system or monitoring system (e.g., monitoring wells).

- Prohibit the development and use of the MTA and OJT properties for residential or other unrestricted use.

- Ensure that new drinking water intakes are not installed between the NSA Crane property boundary and the Shoals, Indiana drinking water intake until MCSs are met in LSC.

6.3 BACKGROUND

NSA Crane is currently surrounded by a chain-link fence and is accessible only through vehicular traffic gates. People allowed access to NSA Crane and SWMU 3 are base workers, authorized base visitors, temporary residents, and permitted game hunters. Hunting permits are obtained from NSA Crane and are granted only to licensed hunters. Access to Little Sulphur Creek between the NSA Crane property boundary and the Shoals, Indiana drinking water intake is not restricted.

The SWMU 3 MTA is an active facility but groundwater from the contaminated BC/BC aquifer is not used. Exposure to SWMU 3 groundwater from this aquifer can only occur if a visitor drills into the soil overburden or bedrock to extract groundwater or extracts groundwater from an existing well head.

Construction activities on the base that could result in exposure of construction workers to soil, disturbance of remedial or monitoring systems (e.g., wells), and/or any changes to land use are controlled by NSA Crane Environmental Management System Instruction 5090.13, which governs major construction activities base wide. Before any major construction activities are authorized, this instruction is reviewed to determine whether any restrictions apply.

6.4 REMEDY IMPLEMENTATION ACTIONS

Upon approval of this CMIP/QAPP, Instruction 5090.13 will be modified to include instructions to review LUCs that are managed in the NSA Crane geographic information system (GIS). The objective of the review will be to ensure that LUC objectives are achieved at all times.

The Navy is responsible for implementing, maintaining, reporting on, and enforcing the LUCs at NSA Crane. The Director of the NSA Crane Environmental Protection Department (EPD) is responsible for undertaking the LUC implementation actions described in the following sections to ensure that the aforementioned LUC performance objectives for SWMU 3 are met and maintained.

6.4.1 LUCIP Distribution

Within 30 days of receiving IDEM approval of this CMIP/QAPP, the NSA Crane EPD will undertake the following specific actions:

a. Provide a copy of the LUC requirements to the NSA Crane Planning Department with instructions to record the LUCs in the NSA Crane GIS and the geographical data management (GDM) systems.

b. Not issue any digging or drilling permits, other than to the Navy, for the installation of any wells for the extraction of groundwater from beneath SWMU 3 from the BC/BC aquifer.

c. Not issue any digging permits for the MTA near soil borings 03SB116 and 03SB120 without written approval from the Commander of NSA Crane and IDEM.

d. Ensure that the MTA and OJT not be zoned for residential use without prior written approval from the Commander of NSA Crane and IDEM and identify that the area has restrictions regarding access, installation of groundwater wells, and/or any other uses of groundwater.

e. Place this CMIP/QAPP in the NSA Crane Information Repository currently located at Building 3245.

The following are the points of contact for the Navy and IDEM:

Navy Point of Contact
Commander, NSA Crane
Code N00, Building 3129
300 Highway 361
Crane, Indiana 47522

IDEM Point of Contact
Indiana Department of Environmental Management
Office of Land Quality Permits Branch
Mail Code 64-45 IGCN 1101
100 North Senate Avenue
Indianapolis, Indiana 42606-6015

6.4.2 Site Inspections

Upon approval of this CMIP/QAPP by IDEM, the Navy will undertake annual on-site monitoring for compliance with this LUCIP. Furthermore, the Navy will conduct a semi-annual field inspection to determine whether the current land use remains protective and consistent with all LUC objectives, including monitoring to ensure that no new drinking water intakes have been installed between the NSA Crane property boundary and the Shoals, Indiana drinking water intake. This inspection may be combined with a groundwater monitoring event. Site inspections shall include review of public records pertinent to determining whether any drinking water intakes have been installed in LSC between the NSA Crane property boundary and the Shoals, Indiana, drinking water intake.

6.4.3 Land Use Control Compliance Reporting

The Commander of NSA Crane will submit an annual LUC Compliance Certificate for SWMU 3 equivalent to the form attached hereto as Figure 6-1, which includes Figure 6-2. This Certificate will serve as verification of LUC maintenance status. The initial submittal will verify that the requirements of Sections 6.2 and 6.4.1 were met. Should any deficiencies be found during the annual reporting period, the Navy will provide to IDEM along with the Certificate, a separate written explanation indicating the specific deficiencies found and what efforts or measures have been or will be taken to correct the deficiencies.

6.4.4 Land Use Control Enforcement

Should the LUC remedy reflected in this CMIP/QAPP fail, the Navy will coordinate with IDEM as described in Section 6.4.3 above to ensure that appropriate actions are taken to re-establish its protectiveness.

6.4.5 Modification/Termination of Land Use Controls

When the Navy determines, with IDEM concurrence, that one or more of the LUCs at SWMU 3 may be modified or is no longer needed for protection of human health and the environment, the Navy shall revise the NSA Crane GIS accordingly and will also advise in a timely manner the entities identified in Sections 6.4.1.a through 6.4.1.e of that action.

6.4.6 Notification of Planned Major Land Use Changes

At least 60 days prior to implementation of any major change in land usage at SWMU 3 that may result in exposure to contaminated soil or groundwater, the Navy shall provide notification to IDEM for the purpose of obtaining concurrence with the NSA Crane determination as to whether or not such a change will require re-evaluation of the selected site controls or specific measures contained in this LUCIP.

6.4.7 Notification of Planned Property Conveyances

At least 60 days prior to conveyance of either title to, or some lesser form of property interest in, the SWMU 3 property to any other agency, private person, or entity, the Navy will provide notice to IDEM of such intended conveyance. At that time, it may be appropriate to develop a legal definition of the parcel of land and to have the boundary of the parcel surveyed by a licensed surveyor, depending on requirements for land transfer or other use. In lieu of a new survey the boundaries shown on Figure 1-3 shall apply within the NSA Crane property boundary. Outside the NSA Crane property boundary, the

LUC boundary shall be the banks of LSC between the NSA Crane property boundary and the Shoals, Indiana drinking water intake.

FIGURE 6-1

NAVY LAND USE CONTROL (LUC) COMPLIANCE CERTIFICATE

SWMU 3 – AMMUNITION BURNING GROUNDS

Naval Surface Warfare Center Crane
Hazardous Waste Management Permit IN5170023498

This evaluation is being conducted to comply with the requirements of the Statement of Basis for SWMU 3 dated June 2010. LUC requirements are delineated in Section 6.0 of the Corrective Measures Implementation Plan, and the area under control (Land Use Control Boundary) is the shown on Figure 6-2 of that document. This evaluation covers the period from 1 January _____ through 31 December _____. This completed form shall be submitted by 1 March of the year following the reporting period.

Certification Checklist

	In Compliance	Non-Compliant	See Comment
1) The requirements of LUCIP Sections 6.4.1.a through 6.4.1.e have been met.	☐	☐	☐
2) Parcel not being used for residential purposes.	☐	☐	☐
3) No groundwater being used for any purpose.	☐	☐	☐
4) No tampering or damage to any Navy wells, monitoring system(s), or remediation system(s).	☐	☐	☐
5) No construction activities at MTA near 03SB116 and/or 03SB120.	☐	☐	☐
6) Verify no new public water supply intakes between Crane property and Shoals intake.	☐	☐	☐

Comments: *(Add explanatory text as needed.):* _____

_____

_____

_____

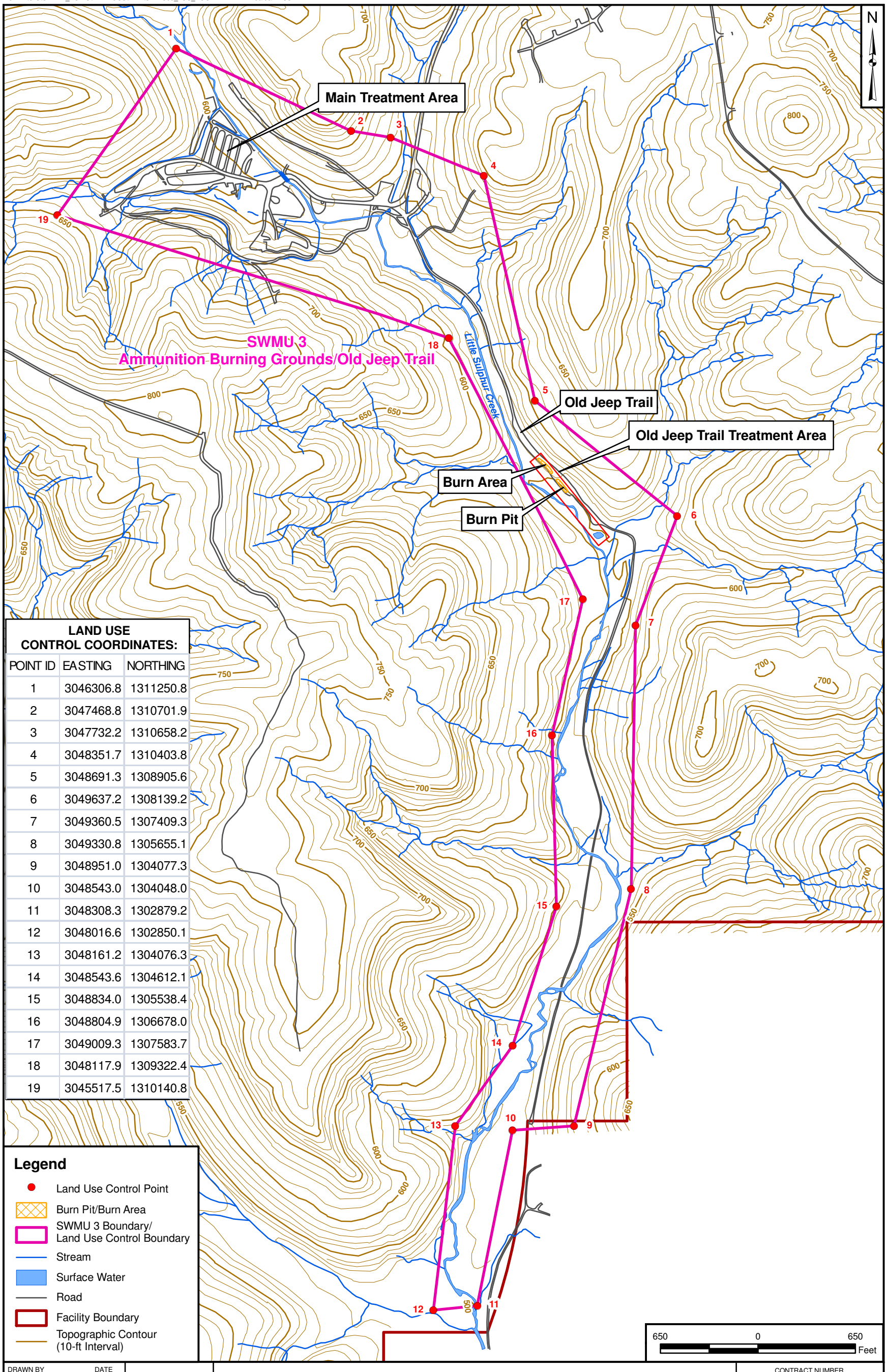
_____

I, the undersigned, hereby certify that I am an authorized representative of the Department of the Navy and that the above-described land use controls have been complied with for the period noted. Alternately, any known deficiencies and completed or planned actions to address such deficiencies are described in the attached Explanation of Deficiencies.

_____ _____
Commander, NSA Crane Date

Mail completed form(s) to IDEM (see Table 2-1).

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU03_LUC_BOUNDARY.MXD 06/03/11 SS



LAND USE CONTROL COORDINATES:

POINT ID	EASTING	NORTHING
1	3046306.8	1311250.8
2	3047468.8	1310701.9
3	3047732.2	1310658.2
4	3048351.7	1310403.8
5	3048691.3	1308905.6
6	3049637.2	1308139.2
7	3049360.5	1307409.3
8	3049330.8	1305655.1
9	3048951.0	1304077.3
10	3048543.0	1304048.0
11	3048308.3	1302879.2
12	3048016.6	1302850.1
13	3048161.2	1304076.3
14	3048543.6	1304612.1
15	3048834.0	1305538.4
16	3048804.9	1306678.0
17	3049009.3	1307583.7
18	3048117.9	1309322.4
19	3045517.5	1310140.8

Legend

- Land Use Control Point
- Burn Pit/Burn Area
- SWMU 3 Boundary/ Land Use Control Boundary
- Stream
- Surface Water
- Road
- Facility Boundary
- Topographic Contour (10-ft Interval)

650 0 650 Feet

DRAWN BY	S. STROZ
DATE	06/02/11
CHECKED BY	V. PLACHY
DATE	06/03/11
REVISED BY	___
DATE	___
SCALE	AS NOTED

NAVFAC

LAND USE CONTROL BOUNDARY
SWMU 3 - CMIP
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO 21
APPROVED BY	___
DATE	___
APPROVED BY	___
DATE	___
FIGURE NO.	FIGURE 6-2
REV	0

7.0 LONG-TERM MONITORING REPORTS

LTM reports will be prepared in accordance with the RCRA GWMP that is part of the RCRA operating permit for the ABG (Navy, 2007).

8.0 SEVEN-YEAR REVIEWS

Seven-year reviews will be conducted at SWMU 3 and documented as described below.

8.1 BACKGROUND

Seven-year reviews are conducted at sites where corrective action results in hazardous substances, pollutants, or contaminants remaining on site. Corrective action at SWMU 3 does not immediately remove all contaminants from the site; therefore, residual contaminants will remain on site until natural attenuation has successfully completed, or until an active corrective measure is implemented.

The 7-year review report will be due within 6 months of the end of every seventh year of monitoring.

8.2 PURPOSE

Seven-year reviews are conducted to evaluate whether the remedies selected in the SB remain protection of human health and the environment.

8.3 EXECUTION

The 7-year review process will consist of the following:

- Review of background documents concerning SWMU 3, including LTM reports and changes to the RCRA permit affecting corrective measures.
- Identification and review of new regulatory standards as may have been promulgated since the signing of the SB or since the previous 7-year review.
- LUC compliance review.
- Collection of cost information related to past and projected monitoring activities.
- Preparation of a 7-year review report including conclusions and recommendations for future actions as may be required.

8.4 REPORTING

A report will be prepared at the end of each 7-year review period and will include the following elements:

- An introduction including a summary of site characteristics.
- A brief discussion of corrective action goals and goal attainment.
- A description of monitoring and maintenance activities at the site.
- A presentation of monitoring results, including an evaluation of changes in monitoring parameters.
- A summary of LUC compliance and noncompliance, if any.
- An evaluation of how well the selected remedy has protected human health and the environment, including a formal statement of protectiveness of human health and the environment, a determination of remaining risks, and an analysis of potential deterioration of the remedy.
- A presentation of cost incurred.
- A summary description of the site visit.
- Documentation of areas of noncompliance, as may apply.
- Recommendations for future response actions, as may be required.

The 7-year review reports will be submitted to IDEM.

The 7-year review report will follow an outline similar to that shown on Figure 8-1.

FIGURE 8-1

EXAMPLE SEVEN-YEAR REVIEW REPORT OUTLINE
SWMU 3 - AMUNITION BURNING GROUNDS CORRECTIVE MEASURES IMPLEMENTATION PLAN
NAVAL SUPPORT ACTIVITY CRANECRANE, INDIANA

Title Page

Table of Contents, including lists of tables, figures, and acronyms

Seven-Year Review Summary Form

Executive Summary

1.0 Introduction and Purpose of Document

2.0 Site Chronology/Investigation History

3.0 Background (includes site physical description)

4.0 Remedial Actions (summarize past remedial actions, enforcement actions, cost summaries, etc.)

5.0 Progress Since the Last Seven-Year Review

6.0 Description of Seven-Year Review Process

7.0 Technical Assessments (e.g., temporal/spatial trend analysis, evaluation of continued COC attenuation, etc.)

8.0 Issues Affecting Implementation of Current Remedy

9.0 Recommendations

10.0 Protectiveness Statement

11.0 Next Review (state when the next 7-year review will be conducted)

12.0 Certification of Report Accuracy

9.0 REFERENCES

Albertson, P., J.H. May, J.S. Nohrstedt, R.W. Magee, and P. Payonk, 1998. Final Report: RCRA Facility Investigation, Part 2 Phase III Soils Study, Ammunition Burning Ground, SWMU 03/10, Naval Surface Warfare Center Crane, Indiana. Prepared by United States Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi, Technical Report GL-98-23. May.

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TtNUS, 2010a. Corrective Measures Proposal for Solid Waste Management Unit 3 (Ammunition Burning Grounds), Naval Support Activity, Crane Division, Crane, Indiana. Prepared for Naval Facilities Engineering Command Southeast, North Charleston, South Carolina. Pittsburgh, Pennsylvania. June.

TtNUS, 2010b. United States Environmental Protection Agency Statement of Basis for Corrective Action at Solid Waste Management Unit #03/10 Ammunition Burning Ground Naval Support Activity Crane, Crane, Indiana. Prepared for Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina.

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