Comprehensive Long-term Environmental Action Navy

CONTRACT NUMBER N62467-94-D-0888

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NSWC CRANE
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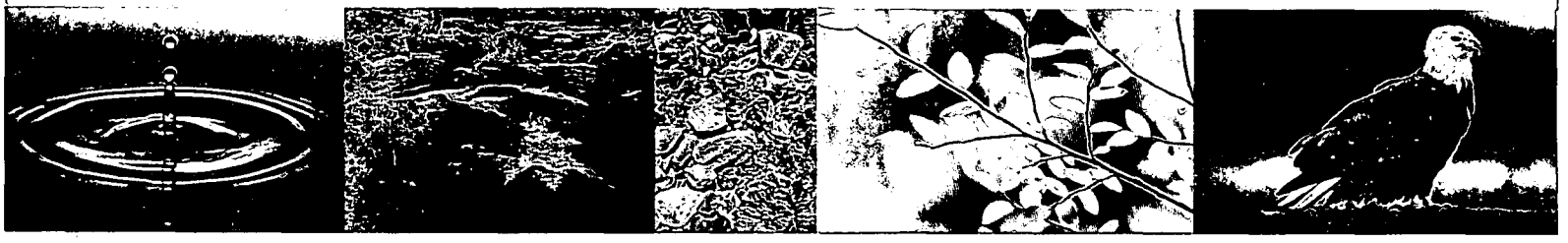

Rev. 0
01/06

Quality Assurance Project Plan Addendum No. 4

for

Mine Fill A (SWMU 12)
Mine Fill B (SWMU 13)
Cast High Explosives Fill/B146 Incinerator (SWMU 16) and Pyrotechnic Test Area (SWMU 19)

RCRA Facility Investigation

Naval Surface Warfare Center
Crane
Crane, Indiana

Contract Task Order 0357

January 2006

NAVFAC
Naval Facilities Engineering Command
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

TETRA TECH NUS, Inc.

DEPARTMENT OF THE NAVY
CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE, INDIANA 47522-5000

IN REPLY REFER TO:
5090/S4.7.1
Ser PRCR4/6031
2 FEB 2006

U.S. Environmental Protection Agency, Region V
Waste, Pesticides, & Toxics Division
Waste Management Branch
Corrective Action Section
77 West Jackson Blvd.
Chicago, IL 60604

Dear Mr. Ramanauskas:

Crane Division, Naval Surface Warfare Center (NSWC Crane) submits the Draft Quality Assurance Project Plan (QAPP) No. 4 for Mine Fill A (MFA), Mine Fill B (MFB), Cast High Explosives Fill-Building 146 Incinerator (B146), and Ordnance Test Areas (OTA), Solid Waste Management Units 12, 13, 16, & 19, respectively as enclosure (1) for your review and comment. The purpose of the QAPP Addendum No. 4 is to support the sampling effort around sumps and other potential sources of explosives contamination at MFA and MFB. As we are planning on mobilizing the field team on February 13, 2006, NSWC Crane respectfully requests an expedited review of the QAPP. The permit required Certification Statement is provided as enclosure (2).

If you require any further information, my point of contact is Mr. Thomas J. Brent, Code PRCR4-TB, at 812-854-6160, email thomas.brent@navy.mil.

Sincerely,

James M. Hunsicker

JAMES M. HUNSICKER
Manager, Environmental Protection
By direction of the Commanding Officer

Enclosures: 1. Draft QAPP Addendum No. 4 for SWMUs 12, 13, 16, and 19
2. Certification Statement

Copy to:
ADMINISTRATIVE RECORD
SOUTHNAVFACENGCOM (Code ES31) (w/o encl)
IDEM (Doug Griffin)
TTNUS (Ralph Basinski) (w/o encl)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

SIGNATURE

Manager, Environmental Protection
TITLE

2/2/06
DATE

REVISON 0
JANUARY 2006

QUALITY ASSURANCE PROJECT PLAN
ADDENDUM NO. 4
FOR
MINE FILL A (SWMU 12), MINE FILL B (SWMU 13), CAST HIGH EXPLOSIVES FILL/B146 INCINERATOR (SWMU 16) AND PYROTECHNIC TEST AREA (SWMU 19)

RCRA FACILITY INVESTIGATION

NAVAL SURFACE WARFARE CENTER CRANE
CRANE, INDIANA

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

Submitted by:
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CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0357

JANUARY 2006

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1.0 PROJECT DESCRIPTION

The purpose of this report is to define the field program for the investigation of potential releases of explosives into soils from drainage ways and sumps used for the collection and transfer of waters containing explosives. This investigation will take place at the following Naval Surface Warfare Center (NSWC) Crane Solid Waste Management Units (SWMUs):

- SWMU 12 - Mine Fill A (MFA)
- SWMU 13 - Mine Fill B (MFB)

The NSWC Crane had prepared a Quality Assurance Project Plan (QAPP) [Tetra Tech NUS, Inc. (TtNUS), 2003a] for a Phase III Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at the following Solid Waste Management Units (SWMUs):

- SWMU 12
- SWMU 13
- SWMU 16 - Cast High Explosives Fill/B146 Incinerator
- SWMU 19 - Pyrotechnic Test Area

This QAPP was approved by the United States Environmental Protection Agency (U.S. EPA) Region 5. Following approval of the QAPP various aspects of the field program were implemented. Based on the results of the field program four QAPP addendums have been developed to modify the field program for one or more SWMUs. This document is Addendum No. 4. Following is a description of these four QAPP addendums.

<u>QAPP Addendum No. 1</u>: The Round 1 field program for SWMU 13 was conducted in May 2003. The groundwater and soils data from samples collected at SWMU 13 had the following data gaps:

- Explosives [primarily hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)] contamination is not bounded in groundwater.

- Polychlorinated biphenyl (PCB) contamination is not bounded in soils near the site of the Therminol boiler.

SWMUs 12 and 13 both had similar contamination patterns for explosives in soil. The groundwater data collected at SWMU 13 indicate a relationship between historical explosives contamination in soil and groundwater explosives contamination. A review of these data shows that modifications are necessary to the monitoring well network at SWMU 12 to more completely delineate anticipated explosives contamination in groundwater during the initial round of groundwater monitoring well installation and sampling.

QAPP Addendum No. 1 (TtNUS, 2003b) was approved by U.S. EPA Region 5 in October 2003 to conduct Round 2 field investigations at SWMU 13 to further delineate contamination. This Addendum also described the modified field program for SWMU 12. However, no investigations were conducted at SWMU 12. The Round 2 field investigation at SWMU 13 was conducted from October 2003 through January 2004. The groundwater and soils data from samples collected at SWMU 13 in Round 2 showed the following remaining data gaps:

- Explosives (primarily RDX) contamination in groundwater was not bounded in the horizontal direction.
- PCB contamination was not bounded in soils near the site of the Therminol boiler.

QAPP Addendum No. 2: QAPP Addendum No. 2, addressed the following at SWMU 13:

- Round 3 monitoring well installation and groundwater and surface water sampling to complete the delineation of explosives contamination in groundwater.

- Rounds 3, 4, 5, 6, 7, 8, and 9 groundwater monitoring at select locations to determine whether explosives may be naturally degrading.

- Collection of additional soil samples in Round 3 to complete the delineation of PCB contamination in the Therminol boiler area.

QAPP Addendum No. 3: The results of the Round 1 and Round 2 field programs at SWMU 12 showed the presence of explosives in groundwater. QAPP Addendum No. 3 described the Rounds 3, 4, 5, 6, 7, 8, and 9 groundwater monitoring at select locations to determine whether explosives and chlorinated organics may be naturally degrading.

QAPP Addendum No. 4: This document is QAPP Addendum No. 4. The results of the Rounds 1 and 2 field program at SWMU 12 and the Rounds 1, 2, and 3 field program at SWMU 13 have been used to prepare the draft RFI Reports. RFI Reports have been prepared and submitted to U.S. EPA Region 5 for

both SWMUs. The SWMU 12 RFI Report was submitted during January 2006. The SWMU 13 RFI Report was submitted during July 2005.

Recently NSWC Crane has made a decision to demolish process buildings at SWMUs 12 and 13. During a review of actions necessary to demolish these buildings, it was determined that a concrete drainage system conveyed explosive-contaminated waters to exterior sumps. No information was available regarding the integrity of the drainage system or the sumps. Previously, it had been assumed that all explosive contamination in soils at both SWMUs was due to the wash down of explosives that had accumulated on roofs during explosive loading operations and the direct discharge of wastewaters containing explosives into ditches. An interim removal action was conducted at both SWMUs in which explosive-contaminated soils were removed for bioremediation. With the exception of small isolated areas where soil removal would have compromised the integrity of building supports, all explosive-contaminated soils were removed during the interim removal action.

If the drainage system or sumps have leaked explosive-contaminated waters, the surrounding soils may also be contaminated with explosives. The purpose of this new investigation, which is described in QAPP Addendum No. 4, is to determine whether soils at SWMUs 12 and 13 have been contaminated as the result of releases of explosive-contaminated waste waters from the drainage system and sumps. The results of this fieldwork will be evaluated to determine if previously unidentified sources of explosives in soils are present and if present whether additional fieldwork is necessary to delineate the extent of contamination and will also be incorporated into the draft RFIs.

The locations, which are listed in Section 3, were selected for soil sampling during site walks conducted by the Navy and TtNUS on September 20 and 21, 2005 and on January 10, 2006. The site walks took place at both SWMUs (12 and 13). Process knowledge and facility drawings were used during the site walks to determine which sumps/drains/structures had the highest potential and frequency of handling explosive-contaminated waters and those with lesser potential. All features identified on facility drawings were found. No additional sumps were identified in facility drawings or found during the site walk (e.g., MFA B-3037, B-3110, B-2715, B-0155, etc.). All locations which may have handled explosive contaminated wasters at high frequencies, were selected for sampling. These included the process water sumps, boot/shoe change houses, etc. Locations were also selected for sampling where releases of explosives may have occurred during transportation of explosives while being processed.

This QAPP Addendum No. 4 does not repeat any information already provided in the previously approved QAPP and QAPP Addendums. The listing of project personnel in Section 2.0 (Project Organization and Responsibilities) has been updated to incorporate various changes in project personnel. Section 3.0

(Sampling and Analysis) describes the field program. Changes are included for one standard operating procedure to address additions in sample nomenclature terminology.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section presents the project management and organization for conducting field operations at NSWC Crane SWMUs 12 and 13. Staffing and coordination requirements are described in Section 2.0 of the approved Contract Task Order (CTO) 0166 QAPP (TtNUS, 2003a). Table 2-1 and Figure 2-1 were updated to include the most current contact information for the involved parties.

Laucks Testing Laboratories, Inc. of Seattle, Washington will perform all sample analyses for this field activity.

The subcontracted laboratory is responsible for analyzing all samples in accordance with the analytical methods and additional requirements specified in the attendant QAPP. It also will be the responsibility of the analytical laboratory to properly dispose of unused sample aliquots. Responsibilities of key laboratory personnel are outlined in Section 2.2.6 of the approved CTO 0166 QAPP (TtNUS, 2003a). Although an unexploded ordnance (UXO) specialist is identified in Sections 2.3 and 2.3.4 of the approved CTO 0166 QAPP, no UXO concerns exist for the work conducted under this QAPP Addendum No. 4 and a UXO specialist is not required. All other personnel and training requirements identified in the approved CTO 0166 QAPP apply.

TABLE 2-1

KEY PROJECT PERSONNEL
NAMES, PHONE NUMBERS, AND ADDRESSES
SWMU 12 - MFA AND SWMU 13 - MFB
QAPP ADDENDUM NO. 4
NSWC CRANE
CRANE, INDIANA

PERSON / TITLE / ORGANIZATION	ADDRESS	TELEPHONE
Peter Ramanauskas Project Manager U.S. EPA Region 5	U.S. EPA Region 5 77 West Jackson Blvd. Chicago, Illinois 60604	(312) 886-7890 FAX: (312) 353-4788
Allen Debus QA Coordinator U.S. EPA Region 5	U.S. EPA Region 5 77 West Jackson Blvd. Chicago, Illinois 60604	(312) 886-6186
Doug Griffin Corrective Action Section Office of Land Quality Hazardous Waste Permits IDEM	Corrective Action Section Office of Land Quality Hazardous Waste Permits 100 N. Senate Avenue P. O. Box 6015 Indianapolis, Indiana 46206-6015	(317) 233-2710
Bill Gates Remedial Project Manager U.S. Navy NAVFAC EFD SOUTH	Department of Navy NAVFAC EFD SOUTH Code ES32 2155 Eagle Drive North Charleston, South Carolina 29406	(843) 820-7360 FAX: (843) 820-7465
Tom Brent Environmental Site Manager NSWC Crane	NSWC Crane Code PRCR4-TB Building 3260 300 Highway 361 Crane, Indiana 47522-5009	(812) 854-6160 FAX: (812) 854-4177
Debra M. Humbert Program Manager Tetra Tech NUS	Tetra Tech NUS, Inc. 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	(412) 921-8968 FAX: (412) 921-4040
Paul Frank Quality Assurance Manager Tetra Tech NUS	Tetra Tech NUS, Inc. 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	(412) 921-8950 FAX: (412) 921-4040
Matt Soltis Health and Safety Manager Tetra Tech NUS	Tetra Tech NUS, Inc. 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	(412) 921-8912 FAX: (412) 921-4040
Ralph Basinski Task Order Manager Tetra Tech NUS	Tetra Tech NUS, Inc. 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	(412) 921-8308 FAX: (412) 921-4040
Terry Rojahn Field Operations Leader Tetra Tech NUS	Tetra Tech NUS, Inc. 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	(412) 921-8857 FAX: (412) 921-4040
Joseph Samchuck Data Validation Manager Tetra Tech NUS	Tetra Tech NUS, Inc. 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	(412) 921-8510 FAX: (412) 921-4040

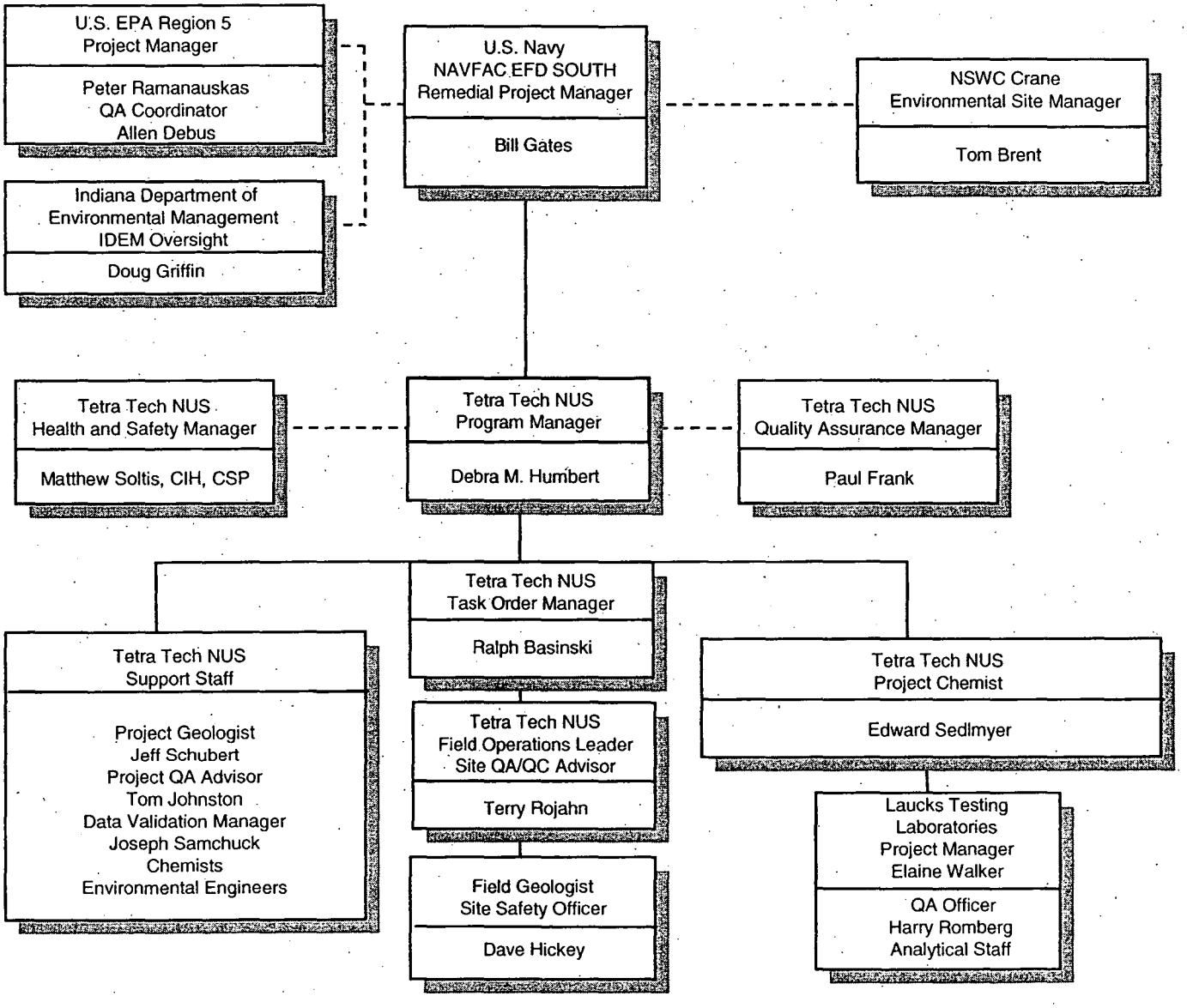
TABLE 2-1

KEY PROJECT PERSONNEL
NAMES, PHONE NUMBERS, AND ADDRESSES
SWMU 12 - MFA AND SWMU 13 - MFB
QAPP ADDENDUM NO. 4
NSWC CRANE
CRANE, INDIANA

PERSON / TITLE / ORGANIZATION	ADDRESS	TELEPHONE
Jeff Schubert Project Geologist Tetra Tech NUS	Tetra Tech NUS, Inc. 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	(412) 921-8794 FAX: (412) 921-4040
Ed Sedlmyer Project Chemist Tetra Tech NUS	Tetra Tech NUS, Inc. 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	(412) 921-7273 FAX: (412) 921-4040
Tom Johnston Quality Assurance Advisor Tetra Tech NUS	Tetra Tech NUS, Inc. 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	(412) 921-8615 FAX: (412) 921-4040
Todd Kushner Statistician Tetra Tech NUS	Tetra Tech NUS, Inc. 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	(412) 921-8539 Fax: (412) 921-4040
Elaine Walker Project Manager Laucks Testing	Laucks Testing Laboratories, Inc. 940 South Harney Street Seattle, Washington 98108	(206) 957-2433 FAX: (206)767-5063
Harry Romberg Lab QA Manager Laucks Testing	Laucks Testing Laboratories, Inc. 940 South Harney Street Seattle, Washington 98108	(206) 767-5060 FAX: (206)767-5063

FIGURE 2-1

PROJECT ORGANIZATION CHART
SWMU 12 -MFA and SWMU 13 - MFB
QAPP ADDENDUM NO. 4
NSWC CRANE
CRANE, INDIANA



3.0 SAMPLING AND ANALYSIS PLAN

3.1 GENERAL APPROACH

This section describes sampling locations and rationales for the sampling activities to be conducted at SWMU 12 - MFA and SWMU 13 - MFB. The equipment and procedures to be used for collecting, handling, preserving, recording, logging, and shipping the samples to the analytical laboratory is presented in the approved QAPP Addendum No. 2 (TtNUS, 2004) and therefore, are not repeated here. The field standard operating procedures (SOPs) can be found in Appendix C of the QAPP Addendum No. 2. SOP Number CTO166-02 has been revised to update the nomenclature used at NSWC Crane. Sample types SU (water sample within a sump), SL (sediment sample within a sump) and TW (ground water sample from temporary well) have been added to better describe the type of sample collected. The text in Section 3.1 of SOP Number CTO166-02 has also been altered to include an additional four characters at the end of the sediment sample nomenclature to identify the depth at which the sediment sample was collected. For example, the sediment sample ID for the first sediment sample collected at a depth of 6 inches from sump location 001 at SWMU 12 would be 12SL001010006. The revised SOP is located in Appendix A of this document.

Prior to any field activities, the Task Order Manager (TOM) will ensure that all field personnel read and understand this QAPP Addendum and associated HASPs for SWMUs 12 and 13. The documents will be read and understood by each person working at the site. Each worker or visitor to the site must sign an acknowledgment that he or she has read and understands the HASPs.

The Field Operations Leader (FOL) will ensure that all required field equipment for non-health-and-safety-related operations is available and operational, and the Site Safety Officer (SSO) will ensure that all health-and-safety-related equipment is available and operational.

Several rounds of drilling, well installation, and multimedia sampling have already been performed at SWMUs 12 and 13. Field activities scheduled for this field activity will include additional soil, sediment, groundwater from temporary wells, and water sampling from sumps, drainage system, and under enclosed transfer corridors at both SWMUs to provide information on possible explosives contamination in soil.

3.2 SAMPLING LOCATIONS, ANALYSES, AND RATIONALES

This section presents sampling rationales, locations, quality assurance/quality control (QA/QC) samples to be collected, and analyses to be performed for the sampling and analytical program.

SWMU 12 sampling rationales are provided in Table 3-1 for soil (12SB40 through 12SB71) and Table 3-2 for sump and sediment (12SU/SL001 through 12SU/SL010). SWMU 13 sampling rationales are provided in Table 3-3 for soil (13SB48 through 13SB71) and Table 3-4 for sump and sediment (13SU/SL001 through 13SU/SL008). Table 3-5 provides temporary monitoring well sample rationales for SWMU 12 and SWMU 13.

QA/QC samples will be collected at frequencies listed in Tables 3-10 and 3-11 (SWMU 12) and Tables 3-16 and 3-17 (SWMU 13). Duplicate samples will be collected at a rate of one for every 20 regular soil samples and analyzed for the same analytes as the corresponding soil samples. MS/MSD samples will be collected and analyzed at a rate of one for every 20 soil samples. The total number of soil analyses for each analyte group is tabulated in Tables 3-6 (SWMU 12) and 3-12 (SWMU 13).

Table 3-18 (solids) and Table 3-19 (aqueous) present a summary of the sample analyses, container types and volumes, preservation requirements, and holding times for the samples to be collected at SWMUs 12 and 13.

3.2.1 Surface and Subsurface Soil Sampling Activities

Surface and subsurface soil samples will be collected at SWMUs 12 and 13, as described in the remainder of this section. The analyses to be performed on each soil sample are listed in Tables 3-6 (SWMU 12) and 3-12 (SWMU 13). Surface and subsurface soil sampling will most likely be performed using Direct-Push Technology (DPT) and hand augering techniques.

Figures 3-1 through 3-7 (SWMU 12) and Figures 3-8 through 3-13 (SWMU 13) presents locations for the soil borings to be completed as part of this field sampling activity at NSWC Crane. All soil samples will be analyzed for explosives and the bottom sample of each boring will also be analyzed for explosive degradation products.

The soil borings will be completed in the drainage system; adjacent to drainage system collection points, exterior sumps, storm water drains, and waste water sumps; under enclosed transfer corridors; and next to boot and shoe change buildings. Soil borings will be advanced to bedrock or refusal and up to four soil

samples will be collected from each boring [0 to 2, 4 to 6, and 8 to 10 feet below ground surface (bgs), and the last 2 feet to bedrock, or until refusal], as listed in Tables 3-6 (SWMU 12) and 3-12 (SWMU 13).

Leakage from the sumps would most likely have resulted in contamination of soils at the base of the sumps and below the sumps. Therefore, deeper samples will be collected at the base of the sump and below the sump based on field observations.

Perched Ground Water Samples

To the extent feasible, up to 10 perched ground water samples will be collected at each SWMU and analyzed as indicated in Table 3-5. Attempts will be made to collect perched ground water samples from the bedrock-overburden interface at soil boring locations where ground water is present. This water is expected to represent precipitation that may have percolated through the overburden or ground water that has migrated along the bedrock-overburden interface, thus accumulating contaminants from the overburden. All ground water samples will be analyzed for explosives only.

A summary of the aqueous samples and the associated QC samples to be collected at each SWMU are presented in Tables 3-11 (SWMU 12) and 3-16 (SWMU 13).

3.2.2 Sediment and Water Sampling Activities

Sediment and water samples will be collected at SWMUs 12 and 13, as described in the remainder of this section. The analyses to be performed on each sample are listed in Tables 3-7 and 3-8 (SWMU 12) and Tables 3-13 and 3-14 (SWMU 13).

Figure 3-1 (SWMU 12) and Figure 3-8 (SWMU 13) presents locations for the sediment and water samples to be completed as part of this field sampling activity at NSWC Crane.

The sediment and water samples will be collected within exterior sumps and drainage system collection points. Water samples will be collected by direct fill where possible and sediment samples will be collected with disposable plastic trowels where possible as listed in Tables 3-7 and 3-8 (SWMU 12), and Tables 3-13 and 3-14 (SWMU 13). All sediment and water samples will be analyzed for explosives only.

TABLE 3-1

PROPOSED SAMPLE LOCATIONS AND RATIONALE FOR SELECTION OF SOIL SAMPLES
QAPP ADDENDUM NO. 4
SWMU 12 - MFA
NSWC CRANE
CRANE, INDIANA

Sample Location	Comments and Selection Rationale
12SB40	Sample soils adjacent to exterior sump.
12SB41	Sample soils adjacent to exterior sump.
12SB42	Sample soils adjacent to exterior sump.
12SB43	Sample soils adjacent to exterior sump.
12SB44	Sample soils adjacent to exterior sump.
12SB45	Sample soils adjacent to exterior sump.
12SB46	Sample soils adjacent to exterior sump.
12SB47	Sample soils at exterior collection sump at end of interior drainage system.
12SB48	Sample soils at exterior collection sump at end of interior drainage system.
12SB49	Sample soils adjacent to exterior sump.
12SB50	Sample soils adjacent to exterior sump.
12SB51	Sample soils at exterior drainage system.
12SB52	Sample soils at exterior drainage system.
12SB53	Sample soils at exterior drainage system.
12SB54	Sample soils at exterior collection sump at end of interior drainage system.
12SB55	Sample soils at drainage system near boot and shoe change building.
12SB56	Sample soils at exterior drainage system.
12SB57	Sample soils at exterior drainage system.
12SB58	Sample soils at storm water drainage system.
12SB59	Sample soils at exterior collection sump at end of interior drainage system.
12SB60	Sample soils at exterior collection sump at end of interior drainage system.
12SB61	Sample soils adjacent to exterior sump.
12SB62	Sample soils adjacent to exterior sump.
12SB63	Sample soils adjacent to exterior sump.
12SB64	Sample soils adjacent to exterior sump.
12SB65	Sample soils at exterior collection sump at end of interior drainage system.
12SB66	Sample soils under enclosed transfer corridor where explosives may have spilled.
12SB67	Sample soils at exterior drainage system.
12SB68	Sample soils under enclosed transfer corridor where explosives may have spilled.
12SB69	Sample soils under enclosed transfer corridor where explosives may have spilled.
12SB70	Sample soils under enclosed transfer corridor where explosives may have spilled.
12SB71	Sample soils under enclosed transfer corridor where explosives may have spilled.

TABLE 3-2

PROPOSED SAMPLE LOCATIONS AND RATIONALE FOR SELECTION OF SEDIMENT AND SUMP SAMPLES
QAPP ADDENDUM NO. 4
SWMU 12 - MFA
NSWC CRANE
CRANE, INDIANA

Sample Location	Comments and Selection Rationale
12SU/SL001	Sample sediment and water within exterior sump or drainage collection point.
12SU/SL002	Sample sediment and water within exterior sump or drainage collection point.
12SU/SL003	Sample sediment and water within exterior sump or drainage collection point.
12SU/SL004	Sample sediment and water within exterior sump or drainage collection point.
12SU/SL005	Sample sediment and water within exterior sump or drainage collection point.
12SU/SL006	Sample sediment and water within exterior sump or drainage collection point.
12SU/SL007	Sample sediment and water within exterior sump or drainage collection point.
12SU/SL008	Sample sediment and water within exterior sump or drainage collection point.
12SU/SL009	Sample sediment and water within exterior sump or drainage collection point.
12SU/SL010	Sample sediment and water within exterior sump or drainage collection point.

TABLE 3-3

PROPOSED SAMPLE LOCATIONS AND RATIONALE FOR SELECTION OF SOIL SAMPLES
QAPP ADDENDUM NO. 4
SWMU 13 - MFB
NSWC CRANE
CRANE, INDIANA

Sample Location	Comments and Selection Rationale
13SB48	Sample soils at exterior collection sump at end of interior drainage system.
13SB49	Sample soils adjacent to exterior sump.
13SB50	Sample soils adjacent to exterior sump.
13SB51	Sample soils adjacent to exterior sump.
13SB52	Sample soils at drainage system near boot and shoe change building.
13SB53	Sample soils at drainage system near boot and shoe change building.
13SB54	Sample soils at exterior collection sump at end of interior drainage system.
13SB55	Sample soils at exterior collection sump at end of interior drainage system.
13SB56	Sample soils at extension of exterior collection sump at end of interior drainage system.
13SB57	Sample soils adjacent to exterior waste water sump.
13SB58	Sample soils adjacent to exterior waste water sump.
13SB59	Sample soils adjacent to exterior sump.
13SB60	Sample soils at drainage system near boot and shoe change building.
13SB61	Sample soils at drainage system near boot and shoe change building.
13SB62	Sample soils adjacent to exterior sump.
13SB63	Sample soils adjacent to exterior sump.
13SB64	Sample soils adjacent to exterior waste water sump.
13SB65	Sample soils adjacent to exterior waste water sump.
13SB66	Sample soils adjacent to exterior waste water sump.
13SB67	Sample soils adjacent to exterior waste water sump.
13SB68	Sample soils under enclosed transfer corridor where explosives may have spilled.
13SB69	Sample soils under enclosed transfer corridor where explosives may have spilled.
13SB70	Sample soils under enclosed transfer corridor where explosives may have spilled.
13SB71	Sample soils under enclosed transfer corridor where explosives may have spilled.

TABLE 3-4

PROPOSED SAMPLE LOCATIONS AND RATIONALE FOR SELECTION OF SEDIMENT AND SUMP SAMPLES
QAPP ADDENDUM NO. 4
SWMU 13 - MFB
NSWC CRANE
CRANE, INDIANA

Sample Location	Comments and Selection Rationale
13SU/SL001	Sample sediment and water within exterior sump or drainage collection point.
13SU/SL002	Sample sediment and water within exterior sump or drainage collection point.
13SU/SL003	Sample sediment and water within exterior sump or drainage collection point.
13SU/SL004	Sample sediment and water within exterior sump or drainage collection point.
13SU/SL005	Sample sediment and water within exterior sump or drainage collection point.
13SU/SL006	Sample sediment and water within exterior sump or drainage collection point.
13SU/SL007	Sample sediment and water within exterior sump or drainage collection point.
13SU/SL008	Sample sediment and water within exterior sump or drainage collection point.

TABLE 3-5

PROPOSED SAMPLE LOCATIONS AND RATIONALE FOR SELECTION OF TEMPORARY GROUNDWATER MONITORING WELL SAMPLES
QAPP ADDENDUM NO. 4
SWMU 12 - MFA AND SWMU 13 - MFB
NSWC CRANE
CRANE, INDIANA

Sample Location	Comments and Selection Rationale
SWMU 12	
12TW001	Sample perched groundwater to determine if explosive contamination exists.
12TW002	Sample perched groundwater to determine if explosive contamination exists.
12TW003	Sample perched groundwater to determine if explosive contamination exists.
12TW004	Sample perched groundwater to determine if explosive contamination exists.
12TW005	Sample perched groundwater to determine if explosive contamination exists.
12TW006	Sample perched groundwater to determine if explosive contamination exists.
12TW007	Sample perched groundwater to determine if explosive contamination exists.
12TW008	Sample perched groundwater to determine if explosive contamination exists.
12TW009	Sample perched groundwater to determine if explosive contamination exists.
12TW010	Sample perched groundwater to determine if explosive contamination exists.
SWMU 13	
13TW001	Sample perched groundwater to determine if explosive contamination exists.
13TW002	Sample perched groundwater to determine if explosive contamination exists.
13TW003	Sample perched groundwater to determine if explosive contamination exists.
13TW004	Sample perched groundwater to determine if explosive contamination exists.
13TW005	Sample perched groundwater to determine if explosive contamination exists.
13TW006	Sample perched groundwater to determine if explosive contamination exists.
13TW007	Sample perched groundwater to determine if explosive contamination exists.
13TW008	Sample perched groundwater to determine if explosive contamination exists.
13TW009	Sample perched groundwater to determine if explosive contamination exists.
13TW010	Sample perched groundwater to determine if explosive contamination exists.

TABLE 3-6

LISTING OF SOIL SAMPLES AND LABORATORY ANALYSES
QAPP ADDENDUM NO. 4
SWMU 12 - MFA
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample ID[1]	Explosives	
		Nitroaromatics and Nitramines SW-846 8330	RDX Degradation Products SW-846-8330, Modified[2]
SWMU 12			
12SB40	12SS400002	1	
	12SB400406	1	
	12SB400810	1	
	12SB40xxxx	1	1
12SB41	12SS410002	1	
	12SB410406	1	
	12SB410810	1	
	12SB41xxxx	1	1
12SB42	12SS420002	1	
	12SB420406	1	
	12SB420810	1	
	12SB42xxxx	1	1
12SB43	12SS430002	1	
	12SB430406	1	
	12SB430810	1	
	12SB43xxxx	1	1
12SB44	12SS440002	1	
	12SB440406	1	
	12SB40810	1	
	12SB44xxxx	1	1
12SB45	12SS450002	1	
	12SB450406	1	
	12SB450810	1	
	12SB45xxxx	1	1
12SB46	12SS460002	1	
	12SB460406	1	
	12SB460810	1	
	12SB46xxxx	1	1
12SB47	12SS470002	1	
	12SB470406	1	
	12SB470810	1	
	12SB47xxxx	1	1
12SB48	12SS480002	1	
	12SB480406	1	
	12SB480810	1	
	12SB48xxxx	1	1

TABLE 3-6

LISTING OF SOIL SAMPLES AND LABORATORY ANALYSES
QAPP ADDENDUM NO. 4
SWMU 12 - MFA
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample ID[1]	Explosives	
		Nitroaromatics and Nitramines SW-846 8330	RDX Degradation Products SW-846-8330, Modified[2]
12SB49	12SS490002	1	
	12SB490406	1	
	12SB490810	1	
	12SB49xxxx	1	1
12SB50	12SS500002	1	
	12SB500406	1	
	12SB500810	1	
	12SB50xxxx	1	1
12SB51	12SS510002	1	
	12SB510406	1	
	12SB510810	1	
	12SB51xxxx	1	1
12SB52	12SS520002	1	
	12SB520406	1	
	12SB520810	1	
	12SB52xxxx	1	1
12SB53	12SS530002	1	
	12SB530406	1	
	12SB530810	1	
	12SB53xxxx	1	1
12SB54	12SS540002	1	
	12SB540406	1	
	12SB540810	1	
	12SB54xxxx	1	1
12SB55	12SS550002	1	
	12SB550406	1	
	12SB550810	1	
	12SB55xxxx	1	1
12SB56	12SS560002	1	
	12SB560406	1	
	12SB560810	1	
	12SB56xxxx	1	1
12SB57	12SS570002	1	
	12SB570406	1	
	12SB570810	1	
	12SB57xxxx	1	1

TABLE 3-6

LISTING OF SOIL SAMPLES AND LABORATORY ANALYSES
QAPP ADDENDUM NO. 4
SWMU 12 - MFA
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample ID[1]	Explosives	
		Nitroaromatics and Nitramines SW-846 8330	RDX Degradation Products SW-846-8330, Modified[2]
12SB58	12SS580002	1	
	12SB580406	1	
	12SB580810	1	
	12SB58xxxx	1	1
12SB58	12SS580002	1	
	12SB580406	1	
	12SB580810	1	
	12SB58xxxx	1	1
12SB59	12SS590002	1	
	12SB590406	1	
	12SB590810	1	
	12SB59xxxx	1	1
12SB60	12SS600002	1	
	12SB600406	1	
	12SB600810	1	
	12SB60xxxx	1	1
12SB61	12SS610002	1	
	12SB610406	1	
	12SB610810	1	
	12SB61xxxx	1	1
12SB62	12SS620002	1	
	12SB620406	1	
	12SB620810	1	
	12SB62xxxx	1	1
12SB63	12SS630002	1	
	12SB630406	1	
	12SB630810	1	
	12SB63xxxx	1	1
12SB64	12SS640002	1	
	12SB640406	1	
	12SB640810	1	
	12SB64xxxx	1	1
12SB65	12SS650002	1	
	12SB650406	1	
	12SB650810	1	
	12SB65xxxx	1	1

TABLE 3-6

LISTING OF SOIL SAMPLES AND LABORATORY ANALYSES
QAPP ADDENDUM NO. 4
SWMU 12 - MFA
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample ID[1]	Explosives	
		Nitroaromatics and Nitramines SW-846 8330	RDX Degradation Products SW-846-8330, Modified[2]
12SB66	12SS660002	1	
	12SB660406	1	
	12SB660810	1	
	12SB66xxxx	1	1
12SB67	12SS670002	1	
	12SB670406	1	
	12SB670810	1	
	12SB67xxxx	1	1
12SB68	12SS680002	1	
	12SB680406	1	
	12SB680810	1	
	12SB68xxxx	1	1
12SB69	12SS690002	1	
	12SB690406	1	
	12SB690810	1	
	12SB69xxxx	1	1
12SB70	12SS700002	1	
	12SB700406	1	
	12SB700810	1	
	12SB70xxxx	1	1
12SB71	12SS710002	1	
	12SB710406	1	
	12SB710810	1	
	12SB71xxxx	1	1
Total Soil Samples - SWMU 12		**132**	**33**

1 xxxx denotes a sample depth of the last 2 feet above bedrock.
2 RDX degradation analysis sample to be collected at deepest location of each boring.

TABLE 3-7

LISTING OF SEDIMENT SAMPLES AND LABORATORY ANALYSES
QAPP ADDENDUM NO. 4
SWMU 12 - MFA
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample ID	Explosives
		Nitroaromatics and Nitramines SW-846 8330
SWMU 12		
12SU/SL001	12SL001010006	1
12SU/SL002	12SL002010006	1
12SU/SL003	12SL003010006	1
12SU/SL004	12SL004010006	1
12SU/SL005	12SL005010006	1
12SU/SL006	12SL006010006	1
12SU/SL007	12SL007010006	1
12SU/SL008	12SL008010006	1
12SU/SL009	12SL009010006	1
12SU/SL010	12SL010010006	1
Total Sediment Samples - SWMU 12		**10**

SU = Sump
SL = Sediment within a sump

TABLE 3-8

LISTING OF SUMP WATER SAMPLES AND LABORATORY ANALYSES
QAPP ADDENDUM NO. 4
SWMU 12 - MFA
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample ID	Explosives
		Nitroaromatics and Nitramines SW-846 8330
SWMU 12		
12SU/SL001	12SU00101	1
12SU/SL002	12SU00201	1
12SU/SL003	12SU00301	1
12SU/SL004	12SU00401	1
12SU/SL005	12SU00501	1
12SU/SL006	12SU00601	1
12SU/SL007	12SU00701	1
12SU/SL008	12SU00801	1
12SU/SL009	12SU00901	1
12SU/SL010	12SU01001	1
Total Sump Samples - SWMU 12		**10**

SU = Sump
SL = Sediment within a sump

TABLE 3-9

LISTING OF TEMPORARY MONITORING WELL SAMPLES AND LABORATORY ANALYSES
QAPP ADDENDUM NO. 4
SWMU 12 - MFA
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample ID	Explosives Nitroaromatics and Nitramines SW-846 8330
SWMU 12		
12TW001	12GWTW001	1
12TW002	12GWTW002	1
12TW003	12GWTW003	1
12TW004	12GWTW004	1
12TW005	12GWTW005	1
12TW006	12GWTW006	1
12TW007	12GWTW007	1
12TW008	12GWTW008	1
12TW009	12GWTW009	1
12TW010	12GWTW010	1
Total Temporary Well Samples - SWMU 12		**10**

TW = Temporary well

TABLE 3-10

SUMMARY OF SOIL AND SEDIMENT ANALYSES AND QUALITY CONTROL SAMPLES
QAPP ADDENDUM NO. 4
SWMU 12 - MFA
NSWC CRANE
CRANE, INDIANA

Sample Type	Explosives		
	Nitroaromatics and Nitramines SW-846 8330		RDX Degradation Products SW-846 8330, Modified
	SOIL	SEDIMENT	SOIL
Total SWMU 12 Samples	132	10	33
Field Duplicates (1)	7	1	2
Trip Blanks (2)	NA	NA	NA
Rinsate Blanks (3)	1	1	1
Ambient Condition Blanks (4)	1	1	1
Matrix Spikes (5)	7	1	2
Matrix Spike Duplicates (6)	7	1	2

1 Field duplicates will be collected at a frequency of one per every 20 environmental samples (minimum of one field duplicate per fraction).

2 Trip blanks will be submitted for analysis at a frequency of one per cooler containing samples for volatile analysis. Because the number of sample coolers shipped may vary, the number of trip blanks is estimated.

3 Rinsate blanks will be collected at a frequency of one per sampling device or instrument. These amounts are estimates and may vary.

4 Ambient condition blanks are optional samples that may be collected based on the judgment of the Field Operations Leader.

5 Matrix spikes are collected for all organic and inorganic parameters at a frequency of one per every 20 field samples per matrix per fraction.

6 Matrix spike duplicates are collected for all organic parameters. Laboratory duplicates are analyzed for inorganic parameters in lieu of matrix spike duplicates. Matrix spike duplicates are collected at a frequency of one per every 20 field samples per matrix per fraction.

NA - Not applicable
QAPP - Quality Assurance Project Plan

TABLE 3-11

SUMMARY OF SUMP AND TEMPORARY MONITORING WELL ANALYSES AND QUALITY CONTROL SAMPLES
QAPP ADDENDUM NO. 4
SWMU 12 - MFA
NSWC CRANE
CRANE, INDIANA

Sample Type	Explosives
	Nitroaromatics and Nitramines SW-846 8330
Total SWMU 12 Samples	20
Field Duplicates (1)	1
Trip Blanks (2)	NA
Rinsate Blanks (3)	NA
Ambient Condition Blanks (4)	1
Matrix Spikes (5)	1
Matrix Spike Duplicates (6)	1

1 Field duplicates will be collected at a frequency of one per every 20 environmental samples (minimum of one field duplicate per fraction).

2 Trip blanks will be submitted for analysis at a frequency of one per cooler containing samples for volatile analysis. Because the number of sample coolers shipped may vary, the number of trip blanks is estimated.

3 Rinsate blanks will be collected at a frequency of one per sampling device or instrument. These amounts are estimates and may vary.

4 Ambient condition blanks are optional samples that may be collected based on the judgment of the Field Operations Leader.

5 Matrix spikes are collected for all organic and inorganic parameters at a frequency of one per every 20 field samples per matrix per fraction.

6 Matrix spike duplicates are collected for all organic parameters. Laboratory duplicates are analyzed for inorganic parameters in lieu of matrix spike duplicates. Matrix spike duplicates are collected at a frequency of one per every 20 field samples per matrix per fraction.

NA - Not applicable
QAPP - Quality Assurance Project Plan

TABLE 3-12

LISTING OF SOIL SAMPLES AND LABORATORY ANALYSES
QAPP ADDENDUM NO. 4
SWMU 13 - MFB
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample ID[1]	Explosives	
		Nitroaromatics and Nitramines SW-846 8330	RDX Degradation Products SW-846-8330, Modified[2]
SWMU 13			
13SB48	13SS480002	1	
	13SB480406	1	
	13SB480810	1	
	13SB48xxxx	1	1
13SB49	13SS490002	1	
	13SB490406	1	
	13SB490810	1	
	13SB49xxxx	1	1
13SB50	13SS500002	1	
	13SB500406	1	
	13SB500810	1	
	13SB50xxxx	1	1
13SB51	13SS510002	1	
	13SB510406	1	
	13SB510810	1	
	13SB51xxxx	1	1
13SB52	13SS520002	1	
	13SB520406	1	
	13SB520810	1	
	13SB52xxxx	1	1
13SB53	13SS530002	1	
	13SB530406	1	
	13SB530810	1	
	13SB53xxxx	1	1
13SB54	13SS540002	1	
	13SB540406	1	
	13SB540810	1	
	13SB54xxxx	1	1
13SB55	13SS550002	1	
	13SB550406	1	
	13SB550810	1	
	13SB55xxxx	1	1
13SB56	13SS560002	1	
	13SB560406	1	
	13SB560810	1	
	13SB56xxxx	1	1

TABLE 3-12

LISTING OF SOIL SAMPLES AND LABORATORY ANALYSES
QAPP ADDENDUM NO. 4
SWMU 13 - MFB
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample ID[1]	Explosives	
		Nitroaromatics and Nitramines SW-846 8330	RDX Degradation Products SW-846-8330, Modified[2]
13SB57	13SS570002	1	
	13SB570406	1	
	13SB570810	1	
	13SB57xxxx	1	1
13SB58	13SS580002	1	
	13SB580406	1	
	13SB580810	1	
	13SB58xxxx	1	1
13SB59	13SS590002	1	
	13SB590406	1	
	13SB590810	1	
	13SB59xxxx	1	1
13SB60	13SS600002	1	
	13SB600406	1	
	13SB600810	1	
	13SB60xxxx	1	1
13SB61	13SS610002	1	
	13SB610406	1	
	13SB610810	1	
	13SB61xxxx	1	1
13SB62	13SS620002	1	
	13SB620406	1	
	13SB620810	1	
	13SB62xxxx	1	1
13SB63	13SS630002	1	
	13SB630406	1	
	13SB630810	1	
	13SB63xxxx	1	1
13SB64	13SS640002	1	
	13SB640406	1	
	13SB640810	1	
	13SB64xxxx	1	1
13SB65	13SS650002	1	
	13SB650406	1	
	13SB650810	1	
	13SB65xxxx	1	1

TABLE 3-12

LISTING OF SOIL SAMPLES AND LABORATORY ANALYSES
QAPP ADDENDUM NO. 4
SWMU 13 - MFB
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample ID[1]	Explosives	
		Nitroaromatics and Nitramines SW-846 8330	RDX Degradation Products SW-846-8330, Modified[2]
13SB66	13SS660002	1	
	13SB660406	1	
	13SB660810	1	
	13SB66xxxx	1	1
13SB67	13SS670002	1	
	13SB670406	1	
	13SB670810	1	
	13SB67xxxx	1	1
13SB68	13SS680002	1	
	13SB680406	1	
	13SB680810	1	
	13SB68xxxx	1	1
13SB69	13SS690002	1	
	13SB690406	1	
	13SB690810	1	
	13SB69xxxx	1	1
13SB70	13SS700002	1	
	13SB700406	1	
	13SB700810	1	
	13SB70xxxx	1	1
13SB71	13SS710002	1	
	13SB710406	1	
	13SB710810	1	
	13SB71xxxx	1	1
Total Soil Samples - SWMU 13		**96**	**24**

1 xxxx denotes a sample depth of the last 2 feet above bedrock.
2 RDX degradation analysis sample to be collected at deepest location of each boring.

TABLE 3-13

LISTING OF SEDIMENT SAMPLES WITHIN SUMPS AND LABORATORY ANALYSES
QAPP ADDENDUM NO. 4
SWMU 13 - MFB
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample ID	Explosives
		Nitroaromatics and Nitramines SW-846 8330
SWMU 13		
13SU/SL001	13SL001010006	1
13SU/SL002	13SL002010006	1
13SU/SL003	13SL003010006	1
13SU/SL004	13SL004010006	1
13SU/SL005	13SL005010006	1
13SU/SL006	13SL006010006	1
13SU/SL007	13SL007010006	1
13SU/SL008	13SL008010006	1
Total Sediment Samples - SWMU 13		**8**

SU = Sump
SL = Sediment within a sump

TABLE 3-14

LISTING OF SUMP WATER SAMPLES AND LABORATORY ANALYSES
QAPP ADDENDUM NO. 4
SWMU 13 - MFB
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample ID	Explosives
		Nitroaromatics and Nitramines SW-846 8330
SWMU 13		
13SU/SL001	13SU00101	1
13SU/SL002	13SU00201	1
13SU/SL003	13SU00301	1
13SU/SL004	13SU00401	1
13SU/SL005	13SU00501	1
13SU/SL006	13SU00601	1
13SU/SL007	13SU00701	1
13SU/SL008	13SU00801	1
Total Sump Samples - SWMU 13		**8**

SU = Sump
SL = Sediment within a sump

TABLE 3-15

LISTING OF TEMPORARY MONITORING WELL SAMPLES AND LABORATORY ANALYSES
QAPP ADDENDUM NO. 4
SWMU 13 - MFB
NSWC CRANE
CRANE, INDIANA

Sample Location	Sample ID	Explosives Nitroaromatics and Nitramines SW-846 8330
SWMU 13		
13TW001	13GWTW001	1
13TW002	13GWTW002	1
13TW003	13GWTW003	1
13TW004	13GWTW004	1
13TW005	13GWTW005	1
13TW006	13GWTW006	1
13TW007	13GWTW007	1
13TW008	13GWTW008	1
13TW009	13GWTW009	1
13TW010	13GWTW010	1
Total Temporary Well Samples - SWMU 13		**10**

TW = Temporary well

TABLE 3-16

SUMMARY OF SOIL AND SEDIMENT ANALYSES AND QUALITY CONTROL SAMPLES
QAPP ADDENDUM NO. 4
SWMU 13 - MFB
NSWC CRANE
CRANE, INDIANA

Sample Type	Explosives		
	Nitroaromatics and Nitramines SW-846 8330		RDX Degradation Products SW-846 8330, Modified
	SOIL	SEDIMENT	SOIL
Total SWMU 13 Samples	96	8	24
Field Duplicates (1)	5	1	2
Trip Blanks (2)	NA	NA	NA
Rinsate Blanks (3)	1	1	1
Ambient Condition Blanks (4)	1	1	1
Matrix Spikes (5)	5	1	2
Matrix Spike Duplicates (6)	5	1	2

1 Field duplicates will be collected at a frequency of one per every 20 environmental samples (minimum of one field duplicate per fraction).

2 Trip blanks will be submitted for analysis at a frequency of one per cooler containing samples for volatile analysis. Because the number of sample coolers shipped may vary, the number of trip blanks is estimated.

3 Rinsate blanks will be collected at a frequency of one per sampling device or instrument. These amounts are estimates and may vary.

4 Ambient condition blanks are optional samples that may be collected based on the judgment of the Field Operations Leader.

5 Matrix spikes are collected for all organic and inorganic parameters at a frequency of one per every 20 field samples per matrix per fraction.

6 Matrix spike duplicates are collected for all organic parameters. Laboratory duplicates are analyzed for inorganic parameters in lieu of matrix spike duplicates. Matrix spike duplicates are collected at a frequency of one per every 20 field samples per matrix per fraction.

NA - Not applicable
QAPP - Quality Assurance Project Plan

TABLE 3-17

SUMMARY OF SUMP AND TEMPORARY MONITORING WELL ANALYSES AND QUALITY CONTROL SAMPLES
QAPP ADDENDUM NO. 4
SWMU 13 - MFB
NSWC CRANE
CRANE, INDIANA

Sample Type	Explosives
	Nitroaromatics and Nitramines SW-846 8330
Total SWMU 13 Samples	18
Field Duplicates (1)	1
Trip Blanks (2)	NA
Rinsate Blanks (3)	NA
Ambient Condition Blanks (4)	1
Matrix Spikes (5)	1
Matrix Spike Duplicates (6)	1

1 Field duplicates will be collected at a frequency of one per every 20 environmental samples (minimum of one field duplicate per fraction).

2 Trip blanks will be submitted for analysis at a frequency of one per cooler containing samples for volatile analysis. Because the number of sample coolers shipped may vary, the number of trip blanks is estimated.

3 Rinsate blanks will be collected at a frequency of one per sampling device or instrument. These amounts are estimates and may vary.

4 Ambient condition blanks are optional samples that may be collected based on the judgment of the Field Operations Leader.

5 Matrix spikes are collected for all organic and inorganic parameters at a frequency of one per every 20 field samples per matrix per fraction.

6 Matrix spike duplicates are collected for all organic parameters. Laboratory duplicates are analyzed for inorganic parameters in lieu of matrix spike duplicates. Matrix spike duplicates are collected at a frequency of one per every 20 field samples per matrix per fraction.

NA - Not applicable
QAPP - Quality Assurance Project Plan

TABLE 3-18

SUMMARY OF SAMPLE ANALYSES, CONTAINER TYPES AND VOLUMES, PRESERVATION REQUIREMENTS, AND HOLDING TIMES FOR SOILS AND SEDIMENTS
SWMU 12 - MFA AND SWMU 13 - MFB
NSWC CRANE
CRANE, INDIANA

Parameter	Analyte/Methodology	Sample Container	Container Volume[1]	Preservation	Maximum Holding Time[2]
Explosives (Nitroaromatics and Nitramines)	SW-846 8330	Wide-mouth jar, Teflon-lined plastic cap	(1) 4 ounce	Cool to 4 °C, dark	Extraction within 7 days; analysis within 40 days of extraction.
RDX Degradation Products	SW-846 8330, Modified	Wide-mouth jar, Teflon-lined plastic cap	(1) 4 ounce	Cool to 4 °C, dark	Extraction within 7 days; analysis within 40 days of extraction.

1 The number in parenthesis indictes the sample container quantity.
2 All holding times are from date of collection.

°C - Degrees Centigrade
mL - Milliliters

TABLE 3-19

SUMMARY OF SAMPLE ANALYSES, CONTAINER TYPES AND VOLUMES, PRESERVATION REQUIREMENTS, AND HOLDING TIMES FOR AQUEOUS SAMPLES
SWMU 12 – MFA AND SWMU 13 - MFB
NSWC CRANE
CRANE, INDIANA

Parameter	Analyte/Methodology	Sample Container	Container Volume[1]	Preservation	Maximum Holding Time[2]
Explosives (nitroaromatics and nitramines)	SW-846 8330	Amber glass, Teflon-lined cap	(2) 1000 mL	Cool to 4 °C, dark	Extraction within 7 days; analysis within 40 days of extraction.

Note: Aqueous samples include surface water.
1 The number in parenthesis indictes the sample container quantity.
2 All holding times are from date of collection.

°C - Degrees centigrade
mL - Milliliters

N

0197
0160
3111/3167
3110
12SB40
12SB41
12SB42
12SB43
12SB44
12SB45
12SB46
12SB47
2512
12SB55
0157
12SB48
12SB50
12SB49
12SB54
2794
12SB51
12SB52
12SB53
2193
12SU/SL001
12SU/SL002
2715
0159
12SB71
0158
12SB70
2792
12SU/SL005
3039
12SU/SL003
12SU/SL004
12SB56
0155E
0156
2531
0155
3036
3037
2960
0196
0155D
2950
12SB58
12SB57
12SB59
12SB60
12SB64
12SB63
12SB62
0152
12SB61
12SB65
12SB66
12SU/SL008
2793
3038
12SU/SL006
12SU/SL007
12SB69
12SB68
2714
0153
0154
2195
12SU/SL009
12SU/SL010
12SB67
0151
2771

LEGEND

- Proposed Soil Boring
- Proposed Sump/ Sediment Sample Location
- Estimated SWMU Boundary
- Building
- Road
- Railroad
- Fence
- Vegetation
- Stream
- Topographic Contour - 20 Foot Contour Interval

100 0 100 200 Feet

P:\GIS\CRANE_NSWC\MAPDOCS\APR\QAPP_ADDENDUM_NO4.APR
SWMU 12 - MINE FILL A LAYOUT 1/19/06 AJ

DRAWN BY	DATE
A. JANOCHA	1/18/06
CHECKED BY	DATE
J. GOERDT	1/19/06
REVISED BY	DATE
—	—
SCALE	
AS NOTED	

NAVFAC

PROPOSED SOIL BORINGS AND
SUMP AND SEDIMENT SAMPLE LOCATIONS
SWMU 12 - MINE FILL A
NSWC CRANE
CRANE, INDIANA

CONTRACT NO.	
CTO 0357	
OWNER NO.	
6878	
APPROVED BY	DATE
—	—
DRAWING NO.	REV.
FIGURE 3 - 1	0

001000Y01Y

P:\GIS\CRANE_NSWC\MAPDOCS\APR\QAPP_ADDENDUM_NO4.APR SWMU 12 - BLDG 151 LAYOUT 1/19/06 AJ

CONTRACT NO.
CTO 0357

APPROVED BY ___ DATE ___

APPROVED BY ___ DATE ___

DRAWING NO. FIGURE 3 - 2

REV 0

BUILDING 151 SAMPLE LOCATIONS
SWMU 12 - MINE FILL A
NSWC CRANE
CRANE, INDIANA

NAVFAC

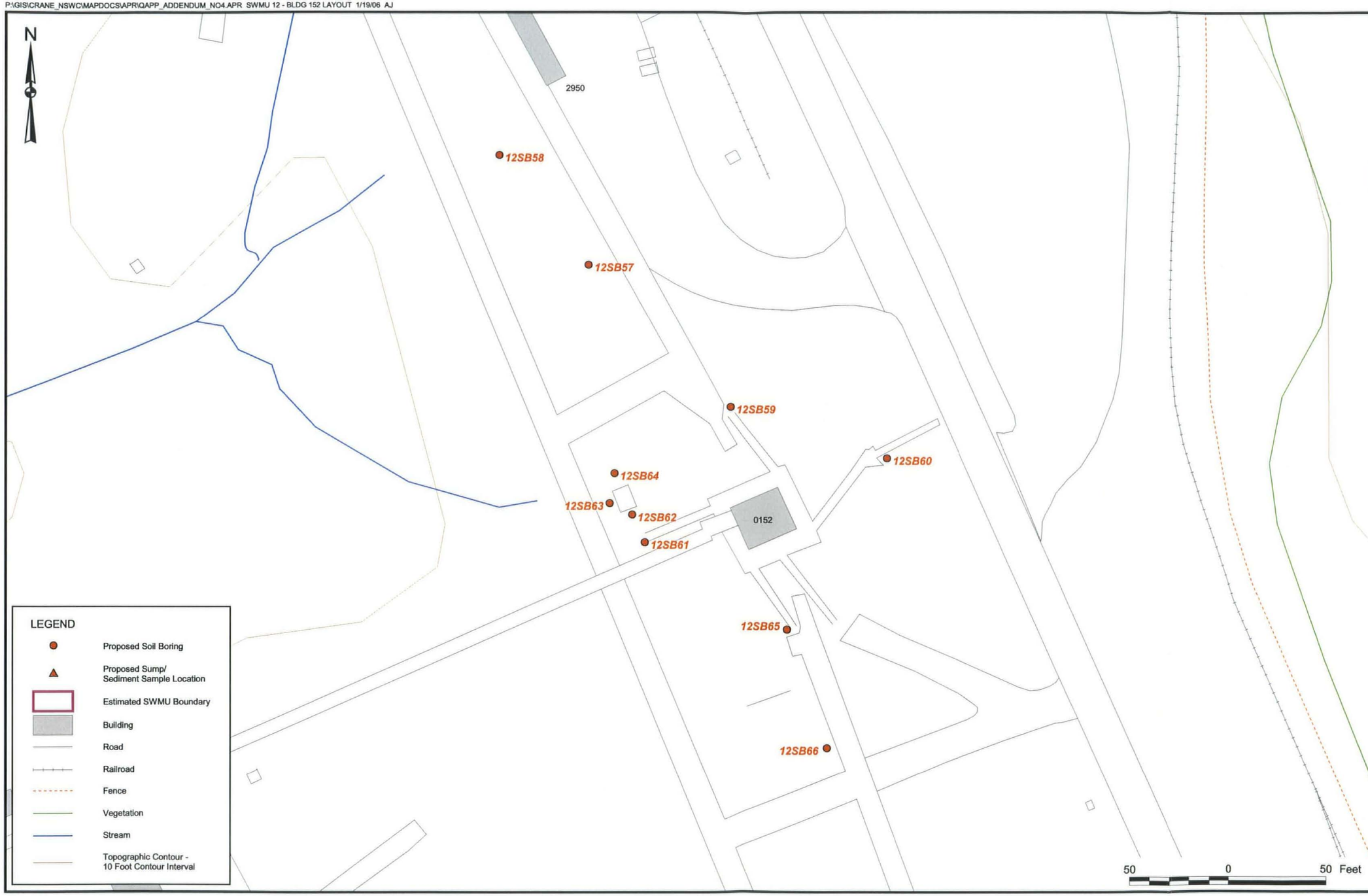
DRAWN BY A. JANOCHA DATE 1/19/06

CHECKED BY J. GOERDT DATE 1/19/06

COST/SCHED-AREA

SCALE AS NOTED

P:\GIS\CRANE_NSWC\MAPDOCS\APR\QAPP_ADDENDUM_NO4.APR SWMU 12 - BLDG 152 LAYOUT 1/19/06 AJ



CONTRACT NO. CTO 0357

APPROVED BY ___ DATE ___

APPROVED BY ___ DATE ___

DRAWING NO. FIGURE 3 - 3

REV 0

BUILDING 152 SAMPLE LOCATIONS
SWMU 12 - MINE FILL A
NSWC CRANE
CRANE, INDIANA

NAVFAC

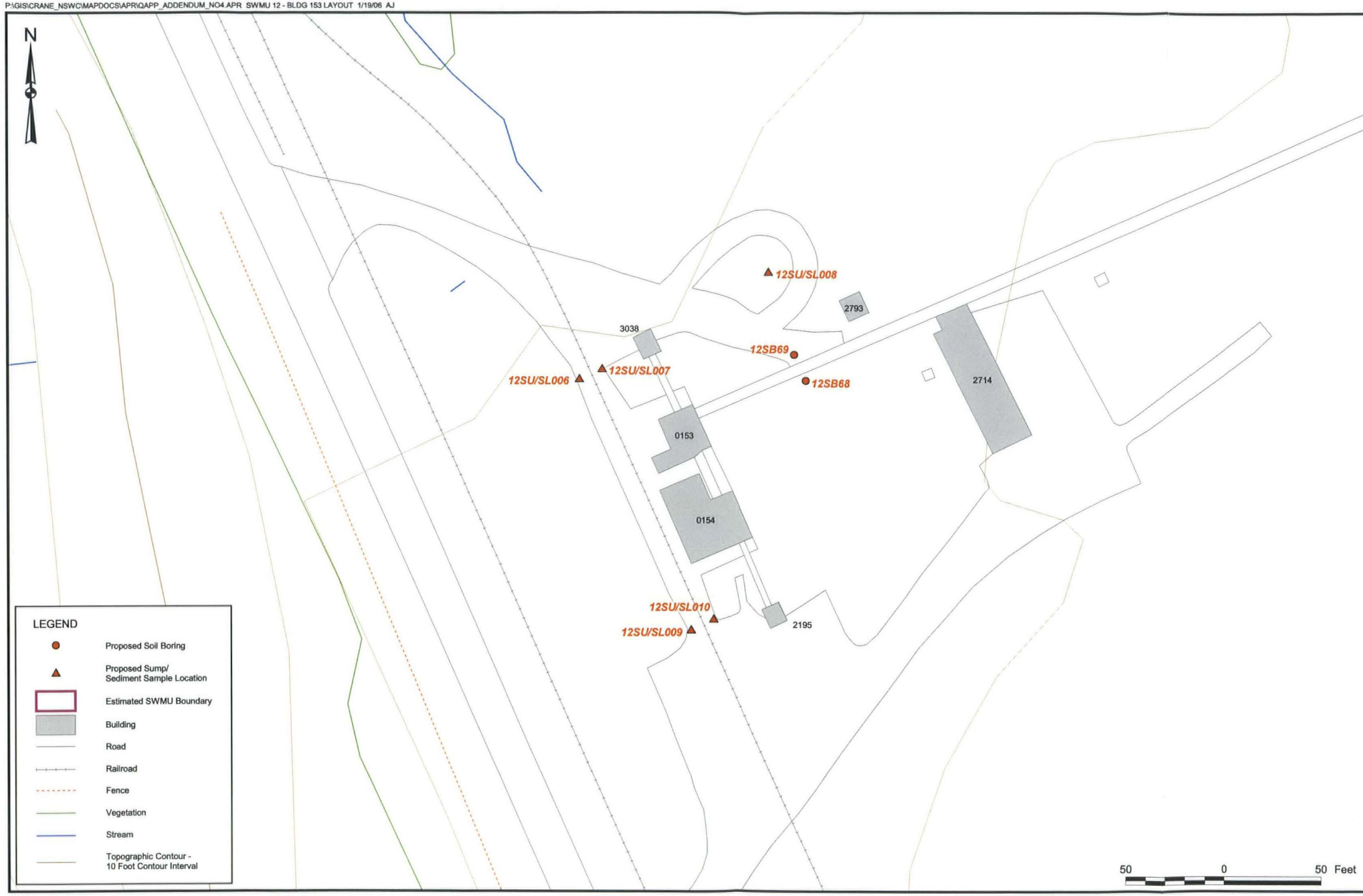
DRAWN BY A. JANOCHA DATE 1/19/06

CHECKED BY J. GOERDT DATE 1/19/06

COST/SCHED-AREA

SCALE AS NOTED

P:\GIS\CRANE_NSWC\MAPDOCS\APR\QAPP_ADDENDUM_NO4.APR SWMU 12 - BLDG 153 LAYOUT 1/19/06 AJ



CONTRACT NO.
CTO 0357

APPROVED BY ___ DATE ___

APPROVED BY ___ DATE ___

DRAWING NO. FIGURE 3 - 4

REV 0

BUILDING 153 SAMPLE LOCATIONS
SWMU 12 - MINE FILL A
NSWC CRANE
CRANE, INDIANA

NAVFAC

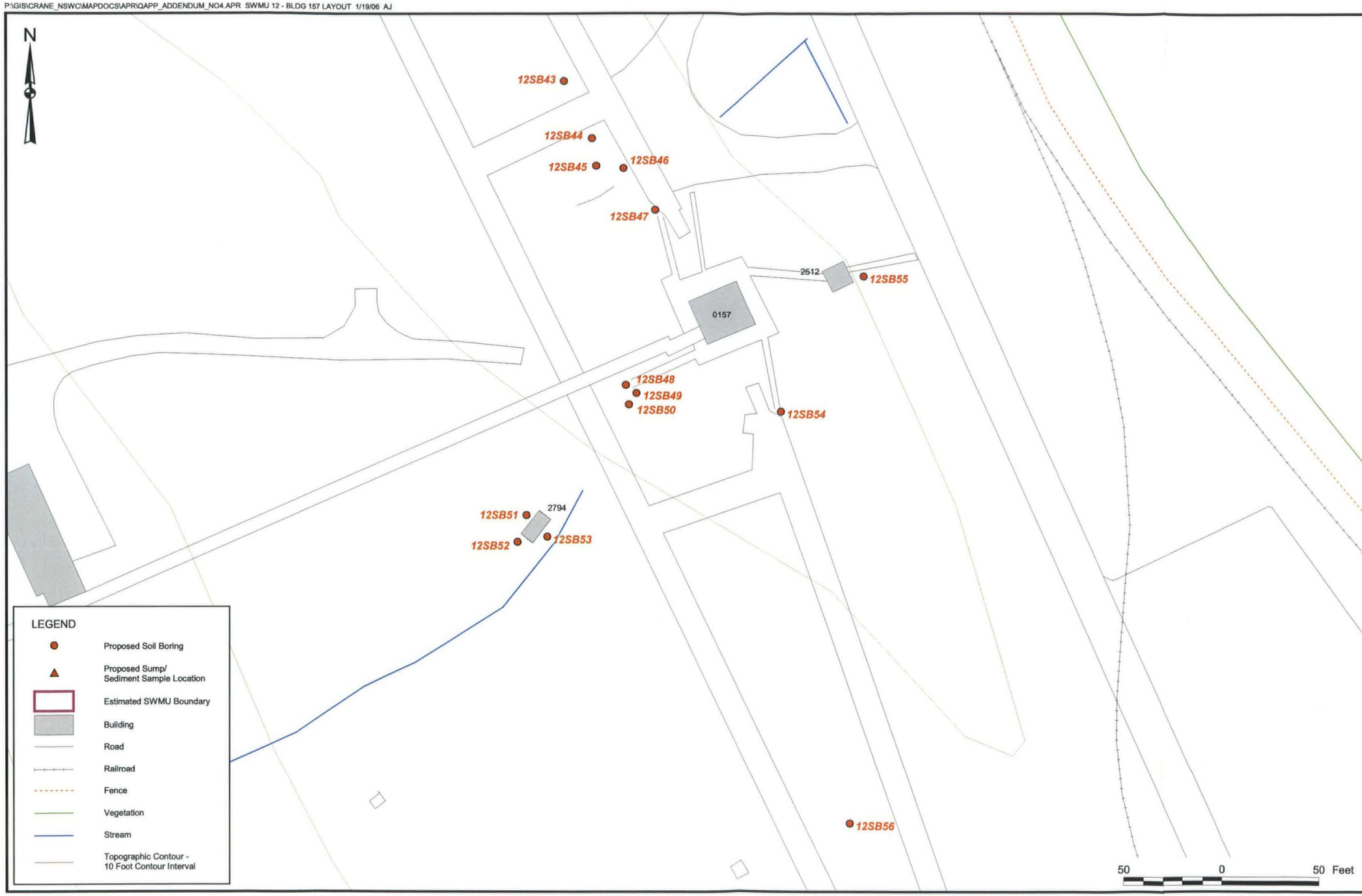
DRAWN BY A. JANOCHA DATE 1/19/06

CHECKED BY J. GOERDT DATE 1/19/06

COST/SCHED-AREA

SCALE AS NOTED

P:\GIS\CRANE_NSWC\MAPDOCS\APR\QAPP_ADDENDUM_NO4.APR SWMU 12 - BLDG 157 LAYOUT 1/19/06 AJ



CONTRACT NO.
CTO 0357

APPROVED BY ___ DATE ___

APPROVED BY ___ DATE ___

DRAWING NO. FIGURE 3 - 5

REV 0

BUILDING 157 SAMPLE LOCATIONS
SWMU 12 - MINE FILL A
NSWC CRANE
CRANE, INDIANA

NAVFAC

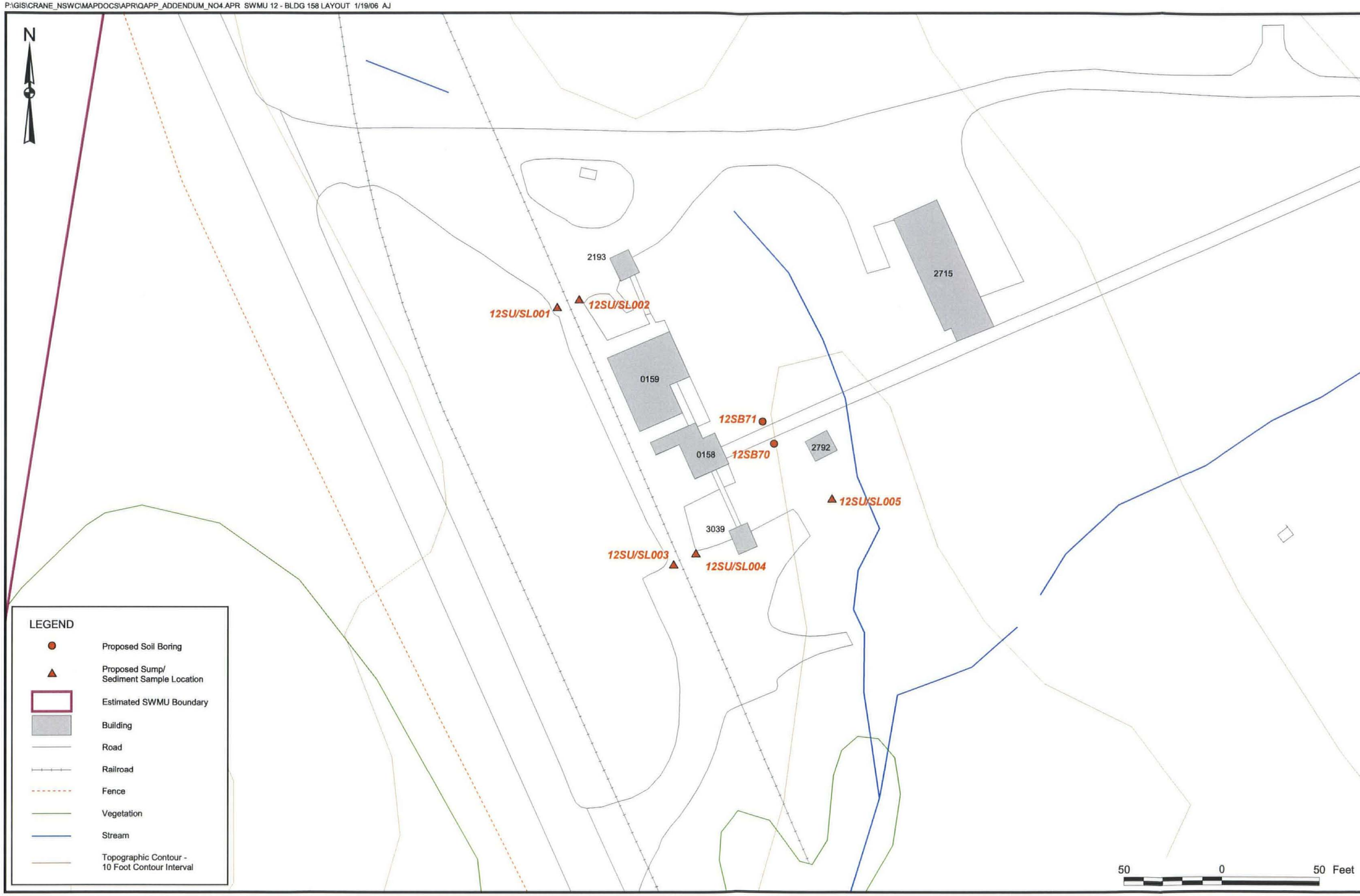
DRAWN BY A. JANOCHA DATE 1/19/06

CHECKED BY J. GOERDT DATE 1/19/06

COST/SCHED-AREA

SCALE AS NOTED

P:\GIS\CRANE_NSWC\MAPDOCS\APR\QAPP_ADDENDUM_NO4.APR SWMU 12 - BLDG 158 LAYOUT 1/19/06 AJ



CONTRACT NO. CTO 0357

APPROVED BY DATE

APPROVED BY DATE

DRAWING NO. FIGURE 3 - 6

REV 0

BUILDING 158 SAMPLE LOCATIONS
SWMU 12 - MINE FILL A
NSWC CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY A. JANOCHA DATE 1/19/06

CHECKED BY J. GOERDT DATE 1/19/06

COST/SCHED-AREA

SCALE AS NOTED

P:\GIS\CRANE_NSWC\MAPDOCS\APR\QAPP_ADDENDUM_NO4.APR SWMU 12 - BLDG 160 LAYOUT 1/19/06 AJ

CONTRACT NO. CTO 0357

APPROVED BY ___ DATE ___

APPROVED BY ___ DATE ___

DRAWING NO. ___

REV 0

FIGURE 3 - 7

BUILDING 160 SAMPLE LOCATIONS
SWMU 12 - MINE FILL A
NSWC CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY A. JANOCHA DATE 1/19/06

CHECKED BY J. GOERDT DATE 1/19/06

COST/SCHED-AREA

SCALE AS NOTED

N

13SU/SL002
13SU/SL003
0168
13SU/SL001
13SB69
13SB68
2502
2500
2789
13SB51
13SB63
13SB50
13SB49
13SB48
13SB62
0168
13SB60
2514
13SB61
0166
2788
2501
2179
0169E
13SU/SL007
13SU/SL006
13SU/SL008
0169
0172/0173
13SB70
13SB71
0169D
13SU/SL005
0194
13SU/SL004
0170
2503
2532
3158
13SB59
13SB58
13SB54
13SB57
0171
2515
13SB56
13SB55
13SB52
13SB53
13SB64
13SB65
13SB67
13SB66
0174
0193

LEGEND

- Proposed Soil Boring
- Proposed Sump/ Sediment Sample Location
- Estimated SWMU Boundary
- Building
- Road
- Railroad
- Fence
- Vegetation
- Stream
- Topographic Contour - 20 Foot Contour Interval

100 0 100 200 Feet

P:\GIS\CRANE_NSWC\MAPDOCS\APR\QAPP_ADDENDUM_NO4.APR
SWMU 13 - MINE FILL B LAYOUT 1/19/06 AJ

DRAWN BY	DATE
A. JANOCHA	1/18/06
CHECKED BY	DATE
J. GOERDT	1/19/06
REVISED BY	DATE
—	—
SCALE	
AS NOTED	

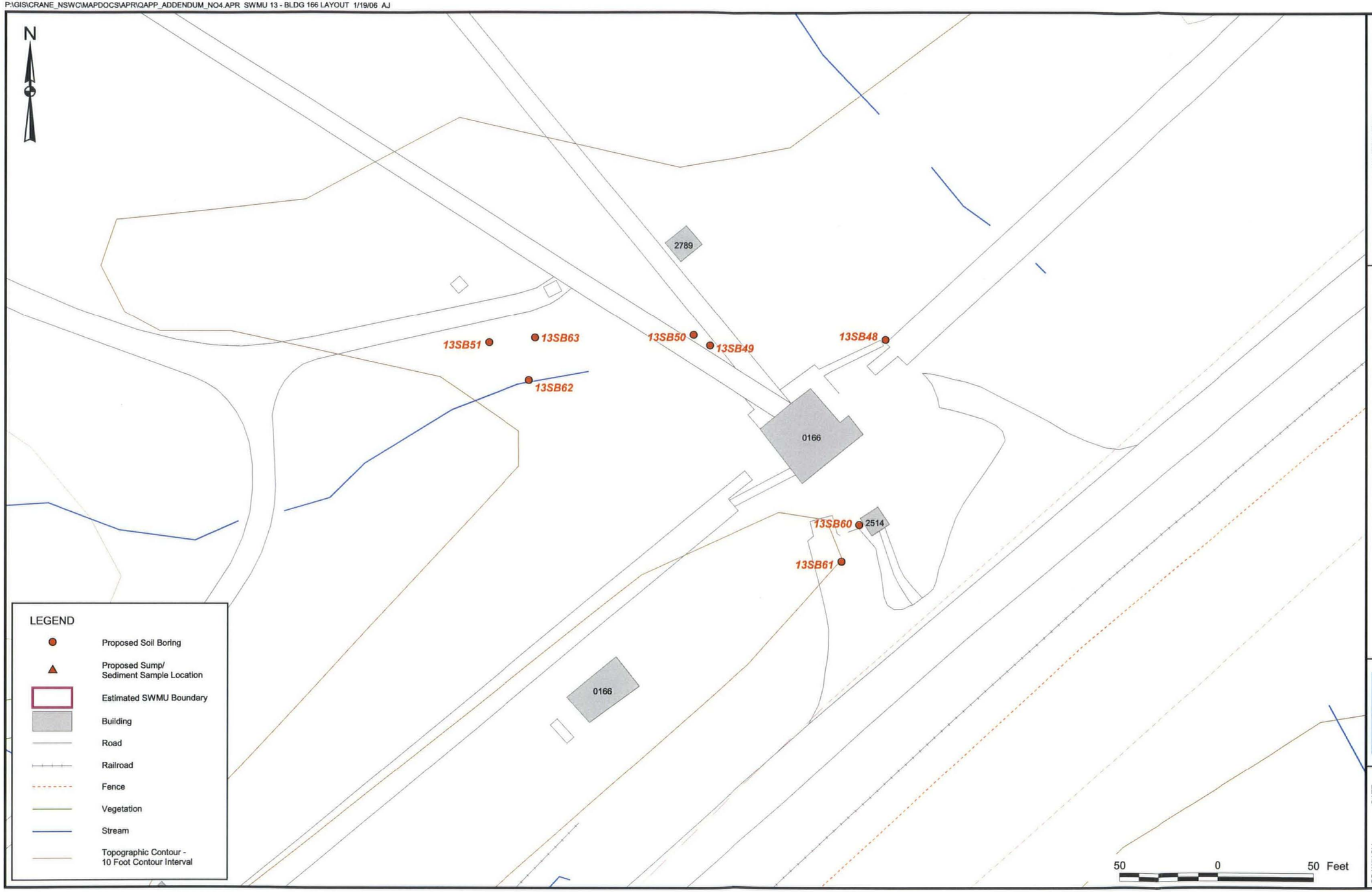
NAVFAC

PROPOSED SOIL BORINGS AND
SUMP AND SEDIMENT SAMPLE LOCATIONS
SWMU 13 - MINE FILL B
NSWC CRANE
CRANE, INDIANA

CONTRACT NO.	
CTO 0357	
OWNER NO.	
6878	
APPROVED BY	DATE
—	—
DRAWING NO.	REV.
FIGURE 3 - 8	0

C01000402Y

P:\GIS\CRANE_NSWC\MAPDOCS\APR\QAPP_ADDENDUM_NO4.APR SWMU 13 - BLDG 166 LAYOUT 1/19/06 AJ



CONTRACT NO.
CTO 0357

APPROVED BY ___ DATE ___

APPROVED BY ___ DATE ___

DRAWING NO. FIGURE 3 - 9

REV 0

BUILDING 166 SAMPLE LOCATIONS
SWMU 13 - MINE FILL B
NSWC CRANE
CRANE, INDIANA

NAVFAC

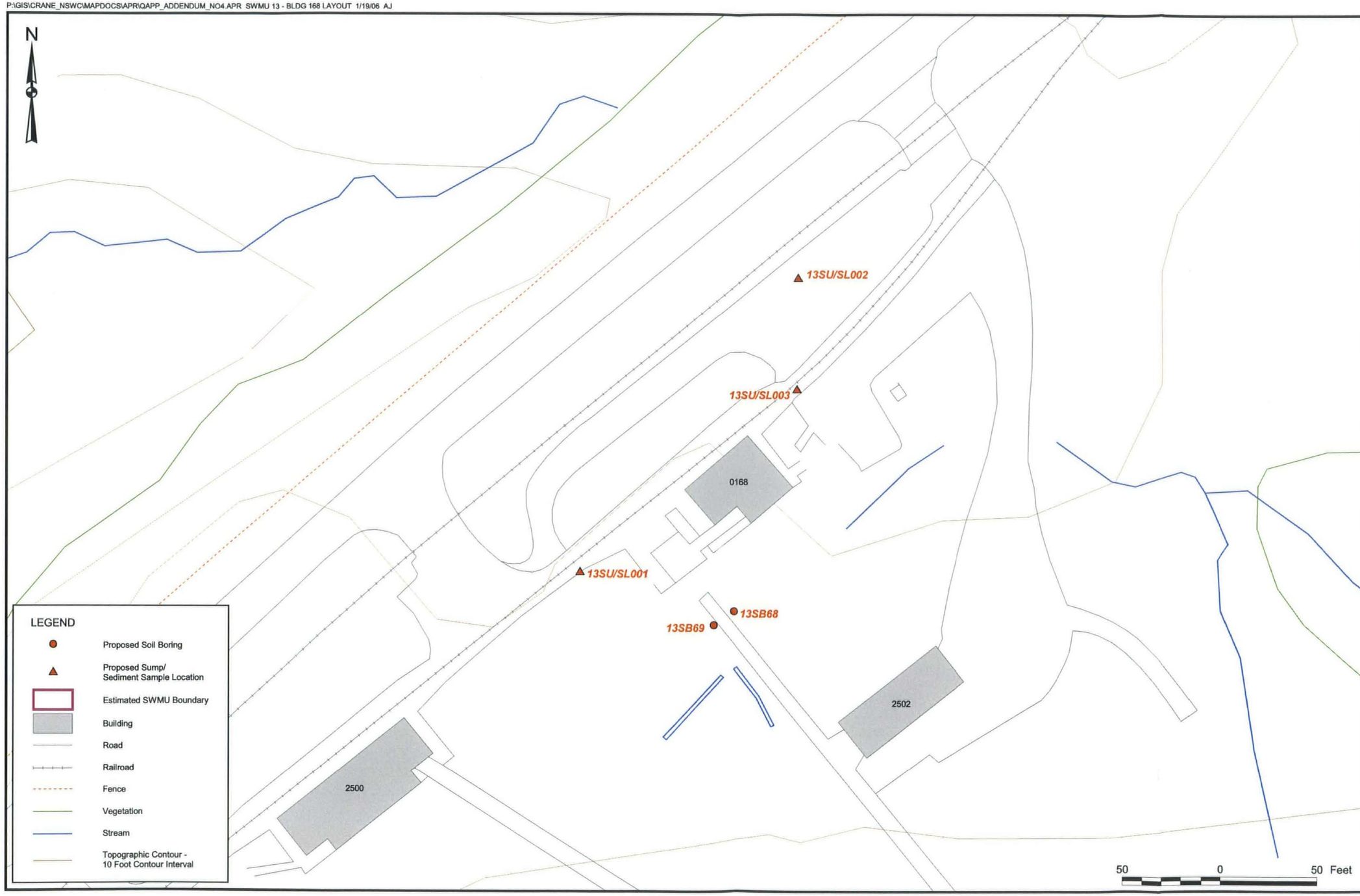
DRAWN BY A. JANOCHA DATE 1/19/06

CHECKED BY J. GOERDT DATE 1/19/06

COST/SCHED-AREA

SCALE AS NOTED

P:\GIS\CRANE_NSWC\MAPDOCS\APR\QAPP_ADDENDUM_NO4.APR SWMU 13 - BLDG 168 LAYOUT 1/19/06 AJ



CONTRACT NO.
CTO 0357

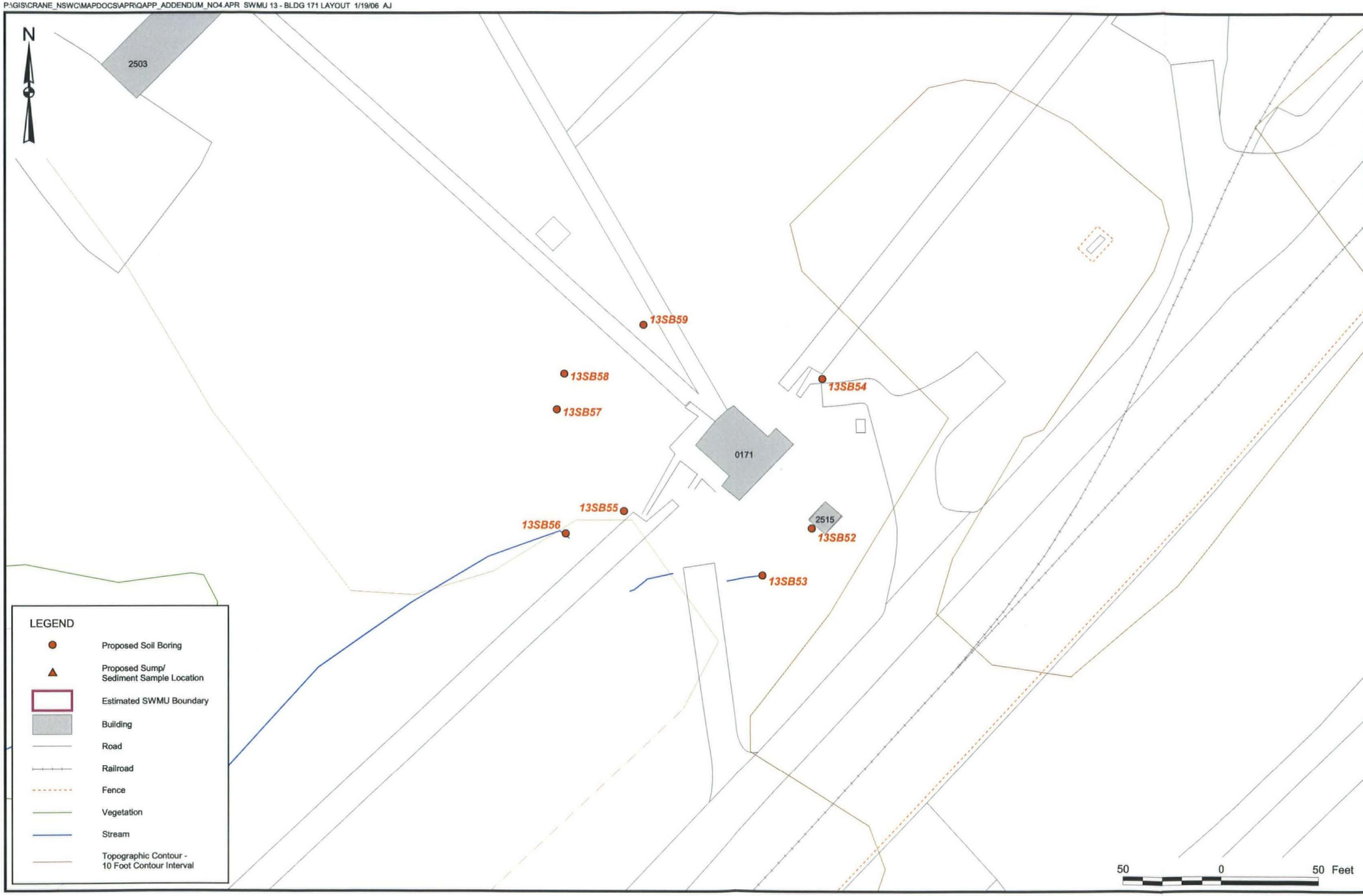
APPROVED BY ___ DATE ___
APPROVED BY ___ DATE ___
DRAWING NO. FIGURE 3 - 10
REV 0

BUILDING 168 SAMPLE LOCATIONS
SWMU 13 - MINE FILL B
NSWC CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY A. JANOCHA DATE 1/19/06
CHECKED BY J. GOERDT DATE 1/19/06
COST/SCHED-AREA
SCALE AS NOTED

P:\GIS\CRANE_NSWC\MAPDOCS\APR\QAPP_ADDENDUM_NO4.APR SWMU 13 - BLDG 171 LAYOUT 1/19/06 AJ



CONTRACT NO.
CTO 0357

APPROVED BY ___ DATE ___

APPROVED BY ___ DATE ___

DRAWING NO. FIGURE 3 - 11

REV 0

BUILDING 171 SAMPLE LOCATIONS
SWMU 13 - MINE FILL B
NSWC CRANE
CRANE, INDIANA

NAVFAC

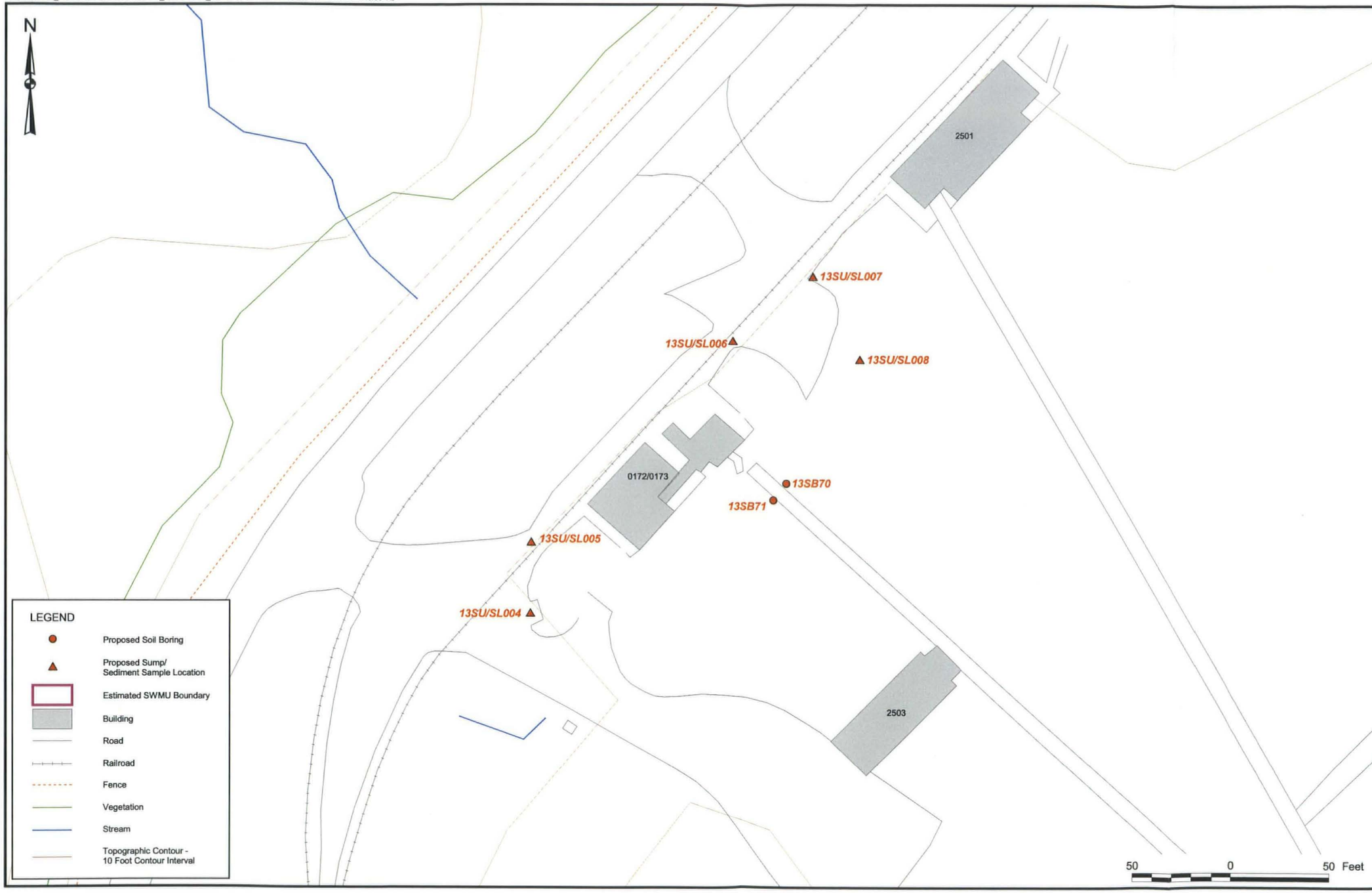
DRAWN BY A. JANOCHA DATE 1/19/06

CHECKED BY J. GOERDT DATE 1/19/06

COST/SCHED-AREA

SCALE AS NOTED

P:\GIS\CRANE_NSWC\MAPDOCS\APR\QAPP_ADDENDUM_NO4.APR SWMU 13 - BLDG 172 LAYOUT 1/19/06 AJ



CONTRACT NO. CTO 0357

APPROVED BY DATE

APPROVED BY DATE

DRAWING NO. FIGURE 3 - 12

REV 0

BUILDING 172 SAMPLE LOCATIONS
SWMU 13 - MINE FILL B
NSWC CRANE
CRANE, INDIANA

NAVFAC

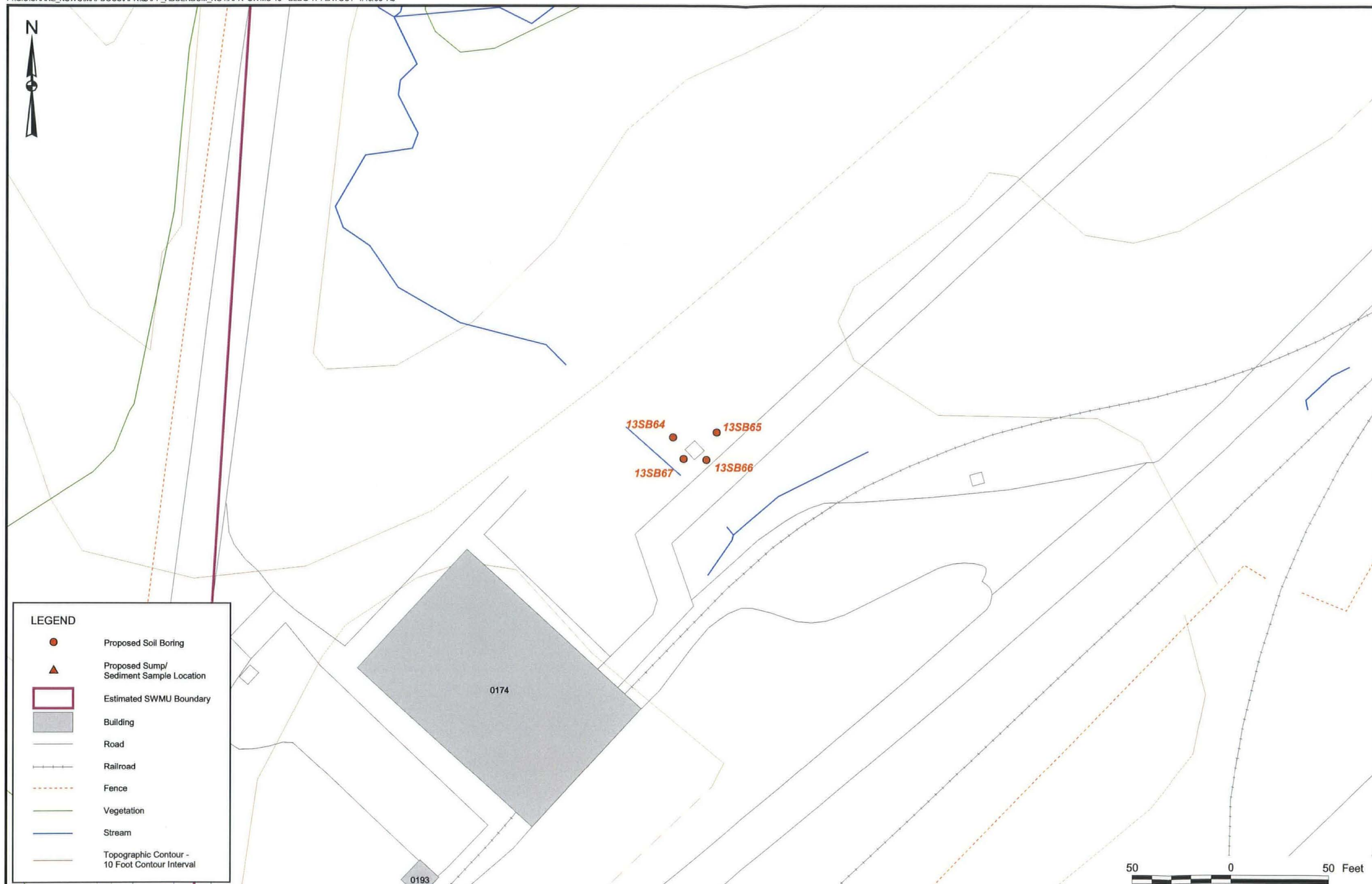
DRAWN BY A. JANOCHA DATE 1/19/06

CHECKED BY J. GOERDT DATE 1/19/06

COST/SCHED-AREA

SCALE AS NOTED

P:\GIS\CRANE_NSWC\MAPDOCS\APR\QAPP_ADDENDUM_NO4.APR SWMU 13 - BLDG 174 LAYOUT 1/19/06 AJ



CONTRACT NO.
CTO 0357

APPROVED BY ___ DATE ___

APPROVED BY ___ DATE ___

DRAWING NO. FIGURE 3 - 13

REV 0

BUILDING 174 SAMPLE LOCATIONS
SWMU 13 - MINE FILL B
NSWC CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY A. JANOCHA DATE 1/19/06

CHECKED BY J. GOERDT DATE 1/19/06

COST/SCHED-AREA

SCALE AS NOTED

APPENDIX A

REVISED STANDARD OPERATING PROCEDURE
NUMBER CTO166-02

STANDARD OPERATING PROCEDURE
NUMBER CTO166-02

SAMPLE IDENTIFICATION NOMENCLATURE

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish a consistent sample nomenclature system that will facilitate subsequent data management at the Naval Surface Warfare Center (NSWC). The sample nomenclature system has been devised such that the following objectives can be attained.

- Sorting of data by site, location, or matrix
- Maintenance of consistency (field, laboratory, and database sample numbers)
- Accommodation of all project-specific requirements
- Accommodation of laboratory sample number length constraints
- Ease of identification and direct link to site and year

The NSWC Crane Environmental Protection Department must approve any deviations from this procedure.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Pen with indelible ink
Sample tags
Sample container labels

3.0 SAMPLE IDENTIFICATION NOMENCLATURE

3.1 Monitoring Samples

All monitoring samples collected at NSWC Crane will be properly labeled with a sample label affixed to the sample container and a tag tied around the neck of the sample container. Each sample will be assigned a unique sample tracking number. The sample tracking number will consist of a four- or five-segment alpha-numeric code that identifies the sample's associated solid waste management unit (SWMU) or

associated site, sample type, location, and, for aqueous samples, where applicable, whether a sample is filtered, and/or the sample round number. For soil and sediment samples, the final four tracking numbers will identify the depth at which the soil or sediment sample was collected.

3.1.1 Numbering of Samples Other Than Vegetation Samples

The alpha-numeric coding to be used in the NSWC Crane sample system for all samples except vegetation samples is explained in the diagram below and the subsequent definitions:

NN	**AA**	**A or N** **2 to 5-Characters**	**NN and/or A**	**NNNN** **Soils and Sediment only**
SWMU or Site Number	Sample Type	Location	Round Identifier and/or Filtered	Depth Interval

Character Type:

A = Alpha
N = Numeric

SWMU or Site Number:

12 = Mine Fill A
13 = Mine Fill B
16 = Cast High Explosives Fill/B146 Incinerator
19 = Pyrotechnic Test Area

Sample Type:

GW - Groundwater Sample from a Permanent Monitoring Well
ID - Investigation-Derived Waste Sample
SB - Soil Boring Sample
SD - Sediment Sample
SP - Seep Sample or Spring Sample
SS - Surface Soil Sample
SW - Surface Water Sample
SU - Water Sample within a Sump
SL - Sediment Sample within a Sump
TW - Groundwater Sample from a Temporary Monitoring Well

Location:

The sample location code is the well number, soil sample location, sediment sample location, or the water sample location (i.e., surface water, springs, seeps, or sumps). The location code for each sample is listed on figures and tables in the site-specific work plan. Existing well numbers are used when unique. New wells will be designated by a SWMU or site number, followed by "MW" for permanent monitoring well, "TW" for temporary well, etc.; a "T" for Tetra Tech NUS; and numbered sequentially, by SWMU, beginning with zero one (MWT01).

Well clusters that are newly installed by TtNUS (two or more wells in close proximity) in the same investigative effort will be designated with the letter P followed by the number 2, 3, 4, etc. The number signifies the well depth in relation to other wells in that cluster. This two-digit code will follow the well identification. Using well T02 as an example of a three-well cluster, the well identification will be as follows:

T02	=	The deepest well in the cluster
T02P2	=	Intermediate well
T02P3	=	Shallowest well in the cluster

Note: To keep the sample identification nomenclature to a minimum number of characters and to avoid redundancy, "MW" (monitoring well) is used for text, figures, and tables and replaced with "GW" (groundwater) in the sample identification. For example, MWT01 would be GWT01.

Round Identifier and/or Filtered:

This code section will be used for aqueous samples only.

Round Identifier:

A two-digit round identifier will be used to track the number of aqueous samples (GW, SW) and sediment taken from a particular aqueous sample location or sediment sampling location. The first sample collected from a location will be assigned round identifier 01, the second 02, etc. This applies to both existing and proposed monitoring wells, surface water, and sediment locations.

Filtered:

Water samples that are field filtered (dissolved analysis) will be identified with an "F" in the last code section. No entry in this segment signifies an unfiltered (total) sample.

Depth Interval:

This code section will be used for soil and sediment samples only.

The depth code is used to note the depth below ground surface (bgs) at which a soil or sediment sample is collected. The first two numbers of the four-number code specify the top interval, and the third and fourth specify the bottom interval in feet bgs (soil) or inches bgs (sediment) of the sample. The depths will be noted in whole numbers only; further detail, if needed, will be recorded on the sample log sheet, boring log, logbook, etc.

Depth (for soils, in feet bgs)

0002 = soil collected from 0 to 2 feet bgs

0204 = soil collected from 2 to 4 feet bgs

0810 = soil collected from 8 to 10 feet bgs

Depth (for sediments, in inches bgs)

0006 = sediment collected from 0 to 6 inches bgs

0612 = sediment collected from 6 to 12 inches bgs

3.1.2 Numbering of Vegetation Samples

For vegetation samples, the numbering system is similar to the one described in Section 3.1.1, but there are significant differences. The numbering scheme is presented below:

NN	**AA**	**A or N** **2 to 5-Characters**	**NN and/or A** **Aqueous only**	**NNNN** **Soils and Sediment only**
SWMU or Site Number	Sample Type	Location	Species Identifier	Sample Group Number

Character Type:

A = Alpha

N = Numeric

SWMU or Site Number:

12 = Mine Fill A

13 = Mine Fill B

16 = Cast High Explosives Fill/B146 Incinerator

19 = Pyrotechnic Test Area

Sample Type:

VG - Vegetation

Species Identifier:

XX - A two-character code to be determined by the TtNUS biologist after samples are submitted to him for identification.

Sample Group Number:

NNNN - A four digit number representing the number of samples of a given species collected at a given location. This is similar to a groundwater round number and allows repeat sampling of a given species form a particular location. For sampling Round 3, the number is 0001 because a single sample will be collected from each location for a given plant species.

3.1.3 Examples of Sample Nomenclature

The first groundwater sample collected from existing monitoring well 01 at the Cast High Explosives Fill/B146 Incinerator (SWMU 16) for a filtered sample would be designated as 16GW0101F.

The second groundwater sample collected from existing monitoring well C20P2 at SWMU 16 for an unfiltered sample would be designated as 16GWC20P202.

The first unfiltered groundwater sample collected from new monitoring well MWT01 at SWMU 13 would be designated as 13GWT0101.

The second surface water sample collected from point 01 at SWMU 13 for an unfiltered sample would be designated as 13SW0102.

The first surface soil sample collected from soil boring 03 at SWMU 16 at the 0- to 2-foot interval would be designated as 16SS03010002.

The first subsurface soil sample from the same soil boring 03 at an interval of 4 to 5 feet bgs would be designated as 16SB03010405.

The first sediment sample collected at SWMU 13 from 0 to 6 inches at location 14 would be designated as 13SD14010006. The second sediment sample collected at the same location from 6 to 10 inches would be numbered 13SD14020610, and so on, regardless of how many field events have occurred for SWMU 13. Thus, the round number is linked to the sequential number of samples collected at a given location and not the sequential number of the field event.

During biota sampling for leaves in Sampling Round 3 at SWMU 13, leaves were collected from an oak tree. The sample location was 13VG006. This sample number will be 13VG006OK0001. Another sample of leaves was collected at that same location from a sassafras plant. The sample number for those leaves is 13VG006SF001. The next sample of sassafras leaves to be collected from that location will be number 13VG006SF002. **Note: OK and SF may not be the species designators actually used for these plants. Check with the biologist.**

3.2 Field Quality Assurance/Quality Control (QA/QC) Sample Nomenclature

Field QA/QC samples are described in the approved field sampling plan and QAPP. They will be designated using a different coding system. The QC code will consist of a three- to four-segment alpha-numeric code that identifies the sample QC type, the date the sample was collected, and the number of this type of QC sample collected on that date.

AA	NNNNNN	NN	F
QC Type	Date	Sequence Number (per day)	Filtered (aqueous only, if needed)

The QC types are identified as:

TB = Trip Blank
RB = Rinsate Blank (Equipment Blank)
FD = Field Duplicate
AB = Ambient Conditions Blank
SB = Source Water Blank

The sampling time recorded on the Chain-of-Custody Form, labels, and tags for duplicate samples will be 0000 so that the samples are "blind" to the laboratory. Notes detailing the sample number, time, date, and type will be recorded on the sample log sheets and will document the location of the duplicate sample (sample log sheets are not provided to the laboratory).

3.2.2 Examples of Field QA/QC Sample Nomenclature

The first duplicate of the day for a filtered groundwater sample collected on June 3, 2000 would be designated as FD06030001F.

The third duplicate of the day taken of a subsurface soil sample collected on November 17, 2003 would be designated as FD11170303.

The first trip blank associated with samples collected on October 12, 2000 would be designated as TB10120001.

The only rinsate blank collected on November 17, 2001 would be designated as RB11170101.