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INTERIM MEASURES WORK PLAN SOLID WASTE MANAGEMENT UNIT 17 (SWMU 17)
PCB CAPACITORY BURIAL/POLE YARD NSA CRANE IN
3/1/2013
TETRA TECH

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Interim Measures Work Plan
for
SWMU 17 - PCB Capacitor Burial/Pole Yard

Naval Support Activity
Crane, Indiana

Naval Facilities Engineering Command
Midwest
Contract Number N62472-03-D-0057
Contract Task Order F271

March 2013

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FINAL
INTERIM MEASURES WORK PLAN FOR SWMU 17 – PCB CAPACITOR BURIAL/POLE YARD

NAVAL SUPPORT ACTIVITY
CRANE, INDIANA

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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TABLE OF CONTENTS

SECTION **PAGE NO.**

LIST OF ACRONYMS **4**

EXECUTIVE SUMMARY **ES-1**

1.0 INTRODUCTION **1-1**
1.1 PURPOSE AND SCOPE 1-1
1.2 FACILITY DESCRIPTION 1-2
1.3 REGULATORY SUMMARY 1-2
1.3.1 NSA Crane 1-2
1.3.2 SWMU 17 – PCB Capacitor Burial/Pole Yard 1-3
1.4 REPORT ORGANIZATION 1-4

2.0 SITE SUMMARY **2-1**
2.1 SITE SUMMARY 2-1
2.1.1 Physiography and Topography 2-1
2.1.2 Surface Water Hydrology 2-1
2.1.3 Geology 2-2
2.1.4 Hydrogeology 2-3
2.2 PREVIOUS INVESTIGATIONS 2-3
2.3 CLEANUP GOALS 2-8
2.4 EXTENT OF CONTAMINATION 2-8
2.5 RATIONALE AND LIMITS OF EXCAVATION 2-10
2.5.1 Removal of Contamination within Drainage Ditch Segments 2-11
2.5.2 Removal of Contaminated Sediment From Within Stream Segments 2-12
2.5.3 Removal of Contaminated Soil From Stream Segment Floodplains 2-14
2.5.4 Building Areas 2-17

3.0 INTERIM MEASURES WORK PLAN **3-1**
3.1 DESCRIPTION OF THE INTERIM MEASURES 3-1
3.2 PERFORMANCE STANDARDS 3-6
3.2.1 Drainage Channels, Northwest Ditch, and Ditch 8a and 8b Excavation Areas 3-7
3.2.2 Stream Excavation Areas 3-9
3.2.3 Floodplains, Excavation Areas 3A through 3P 3-11
3.2.4 Building Area Excavations 3-15
3.3 DEWATERING 3-22
3.4 SAMPLING AND ANALYSIS 3-23
3.5 DISPOSAL 3-23
3.6 BACKFILLING 3-24
3.7 RESTORATION 3-26
3.8 EROSION AND SEDIMENT CONTROL 3-27
3.9 GRAVEL CONSTRUCTION ENTRANCE 3-27
3.10 DECONTAMINATION PAD 3-27
3.11 DEWATERING PAD 3-28
3.12 CLEARING 3-28
3.13 TEMPORARY ACCESS TRAILS 3-28
3.14 STORMWATER POLLUTION PREVENTION 3-29

TABLE OF CONTENTS (Continued)

SECTION **PAGE NO.**

3.15 OTHER IMWP IMPLEMENTATION REQUIREMENTS 3-29
3.15.1 Utilities 3-29
3.15.2 Protection of Natural Resources 3-29
3.15.3 Traffic Control Plan 3-30
3.15.4 Contractor Requirements 3-31
3.16 IMPLEMENTATION 3-31

4.0 EROSION AND SEDIMENT CONTROL PLAN 4-1
4.1 PURPOSE 4-1
4.2 EROSION AND SEDIMENT CONTROL REQUIREMENTS 4-1
4.3 INSPECTION AND MAINTENANCE OF EROSION AND SEDIMENT CONTROLS 4-3
4.4 SITE RESTORATION 4-4
4.5 RESPONSE PROCEDURES FOR SPILL MITIGATION 4-5

REFERENCES R-1

APPENDICES

A CALCULATIONS
B SUPPLEMENTAL SPECIFICATIONS
C IDEM STABILIZATION SPECIFICATIONS

TABLES

NUMBER

ES-1 Summary of Interim Measures Activities and Specifications
2-1 Sampling Locations and Associated Data
3-1 Work Assignment Responsibility Chart
3-2 Excavation Node Northing and Easting Coordinates

FIGURES

NUMBER

1-1 Site Location Map
1-2 Site Layout – 2009 Aerial Photograph
1-3 Land Use Map
1-4 Site Layout Map
2-1 2004 Interim Measure Excavation Areas
2-2 Tetra Tech 2005 and 2006 Field Investigations
2-3 Tetra Tech 2005 and 2006 Field Investigations
2-4 2005/2006 Field Investigation Sample Results - Boggs Creek Detail
2-5 Extent of Contamination Near Sediment Sampling Location 17SD105
2-6 2005-06-11-12 Total PCB Concentrations Greater Than 1 mg/kg
2-7 2005-06-11-12 PCB Concentrations in Ditch 8
2-8 2005-06-11-12 Sample Results Stream Segment 1
2-9 2005-06-11-12 Sample Results – Stream Segment 2
2-10 2005-06-11-12 Sample Results – Stream Segment 3
2-11 2005-06-11-12 Sample Results – Stream Segment 4
2-12 2005-06-11-12 Sample Results – Stream Segments 5 and 6
2-13 2005-06-11-12 Sample Results – Stream Segment 6
2-14 2005-06-11-12 Total PCB Concentrations in Soil, SWMU 17- PCB Capacitor Burial/Pole Yard Dump/Fill Area and Excavation Area 4A, Including Trench Data
2-15 2005-06-11-12 Total PCB Concentrations in Soil, SWMU 17- PCB Capacitor Burial/Pole Yard Dump/Fill Area and Excavation Area 4A
2-16 Previous TolTest Excavation Area Residual PCB Concentrations and 2012 PCB Concentrations SWMU 17 - PCB Capacitor Burial/Pole Yard TolTest Excavation Area 4B
2-17 Previous TolTest Excavation Area D Residual PCB Concentrations and 2012 PCB Concentrations SWMU 17 - PCB Capacitor Burial/Pole Yard TolTest Excavation Area 4C
3-1 Extent of Sediment Excavation in Northwest Ditch and Ditch 8
3-2 Extent of Sediment Excavation in Area 2A
3-3 Extent of Sediment and Soil Excavation in Ditch 3 Stream Segments 1 Through 3 and TolTest Excavation Area (Figure 1 of 2)
3-4 Extent of Sediment and Soil Excavation in Ditch 3 Stream Segments 4 Through 6 and Area 4D (Figure 1 of 2)
3-5 Extent of Sediment and Soil Excavation at TolTest Excavation Area
3-6 Dump Area Excavation Detail
3-7 Traffic Routing Plan
4-1 Conceptual Support Areas
4-2 Erosion and Sedimentation Control Plan
4-3A Erosion and Sediment Control Devices
4-3B Erosion and Sediment Control Devices (Sheet 2 of 2)

LIST OF ACRONYMS

bgs	below ground surface
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Action Navy
Contractor	Interim Measures Implementation Contractor
CTO	Contract Task Order
cy	cubic yard
DNR	Department of Natural Resources
DRMO	Defense Reutilization Marketing Office
ESA	Endangered Species Act
Handbook	Indiana Handbook for Erosion Control in Developing Areas
HSWA	Hazardous and Solid Waste Amendments
IAS	Initial Assessment Study
IDEM	Indiana Department of Environmental Management
IDOT	Indiana Department of Transportation
IM	Interim Measure
IMWP	Interim Measures Work Plan
IR	Installation Restoration
LDPE	Low density poylethylene
mg/kg	milligram(s) per kilogram
MSDS	Material Safety Data Sheet
msl	mean sea level
NAVFAC	Naval Facilities Engineering Command
NSA	Naval Support Activity
OICC	Officer in Charge of Construction
PCB	polychlorinated biphenyl
ppm	parts per million
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SAIC	Science Applications International Corporation
sq.ft.	square feet
SVOC	Semivolatile Organic Compound

SWMU	Solid Waste Management Unit
TSCA	Toxic Substance Control Act
Tetra Tech	Tetra Tech, Inc.
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

The Polychlorinated Biphenyl (PCB) Capacitor Burial/Pole Yard, also known as Solid Waste Management Unit (SWMU) 17, at Naval Support Activity (NSA) Crane located in Crane, Indiana, has been studied extensively with regard to PCB contamination. Within this SWMU are four primary categories of environmental media groups that exhibit PCB contamination:

- Group 1: Ditches. These are natural water conveyances on the steeper slopes of SWMU 17 that do not necessarily contain water year round and are not necessarily under tree canopy.

- Group 2: Stream Sediments. These are sediments in streams that do contain water year round and are therefore considered to pose a slightly different set of challenges for PCB sediment removal.

- Group 3: Floodplain Soils. These soil areas are located adjacent to the streams that contain the Group 2 stream sediments. The extent of floodplain contamination, however, does not necessarily extend the entire length of stream channel containing contaminated sediments.

- Group 4: SWMU 17 Dump/Fill Area and Building Area Soils. This group is commonly called "building areas" throughout this document. The Dump/Fill Area is a known dumping ground for debris including electrical equipment that has been covered over and is known to contain the highest levels of PCB contamination observed in soils at SWMU 17. Previous excavations at select building areas has reduced the amount of PCB contamination but residual PCB contamination persists at levels greater than 1 mg/kg and even greater than 500 mg/kg in some areas.

Each of the four groups listed above comprises multiple excavation areas and each excavation area is typically divided into subareas. These areas and subareas, and the planned excavations within them, are described in detail in the main body of this plan. Table ES-1 presents data regarding the amount of sediment or soil to be removed, physical characteristics, and an estimate of the amount of waste in each subarea that will have a PCB concentration equal to or greater than 50 mg/kg and is therefore considered to be a waste regulated under the Toxic Substances Control Act (TSCA).

This plan is compartmentalized in a way that allows for completing the Interim Measures in phases. Remediation may be implemented concurrently, sequentially, or separately as directed by the Navy.

TABLE ES-1

SUMMARY OF INTERIM MEASURES ACTIVITIES AND SPECIFICATIONS
INTERIM MEASURES WORK PLAN SWMU 17 - PCB CAPACITOR BURIAL / POLE YARD
NSA CRANE, CRANE, INDIANA

Excavation Area	Sub - Area	Appendix A Calculation Sheet	IMWP Section	IMWP Figures	Remediation Area, sq. ft.	Target Maximum Excavation Depth, ft. bgs.	Estimated Average Excavation Depth, ft. bgs.	Estimated Excavation Vol., cubic ft.	Estimated Excavation Vol., cubic yds.	TSCA Status	Comment
Group 1: Ditches											
Northwest Ditch	NWD	1A	2.5.1.1	2-6, 3-1	6,240	2.0	1.5	9,360	347	non-TSCA	
Ditch 8	8a	1B	2.5.1.3	2-6, 2-7, and 3-1	400	1.0	1.0	400	15	non-TSCA	
Ditch 8	8b	1C	2.5.1.3	2-7 and 3-1	620	1.0	1.0	620	23	non-TSCA	
Group 2: Stream Sediments											
Boggs Cr.	17SD105	--	2.5.2.1	2-5, 3-2	400	1.5	1.5	600	22	non-TSCA	Figure 3-2 (East side of Boggs Creek, near Sample Point 17SD105
Boggs Cr.	Seg. 1	--	2.5.2.2	2-8, 3-1, and 3-3	2,970	0.5	0.5	1,485	55	non-TSCA	Boggs Creek, Segment 1 sediments
Ditch 3	Seg. 2	--	2.5.2.3	2-9, 3-1, and 3-3	6,000	0.5	0.5	3,000	111	non-TSCA	Ditch 3, Segment 2 sediments
Ditch 3	Seg. 3	--	2.5.2.4	2-10, 3-3	5,600	0.5	0.5	2,800	104	non-TSCA	Ditch 3, Segment 3 sediments
Ditch 3	Seg. 4	--	2.5.2.5	2-11, 3-4	7,500	0.5	0.34	2,550	94	non-TSCA	Ditch 3, Segment 4 sediments
Ditch 3	Seg. 5	--	2.5.2.6	2-12, 3-4	5,250	0.5	0.17	893	33	non-TSCA	Ditch 3, Segment 5 sediments
Ditch 3	Seg. 6	Upstream and Downstream Non-TSCA Areas	2.5.2.7	2-12, 2-13, 3-4	2,280	1.0	0.6	1,368	50.7	non-TSCA	Ditch 3, Segment 6 sediments outside two TSCA Areas shown on Figure 3-4.
Ditch 3	**Seg. 6**	**Downstream TSCA Area**	2.5.2.7	2-12, 2-13, 3-4	**500**	**0.5**	**0.25**	**125**	**4.63**	**TSCA**	**TSCA-regulated Sediments (Downstream Area)**
Ditch 3	**Seg. 6**	**Upstream TSCA Area**	2.5.2.7	2-13 and 3-4	**90**	**1.0**	**1.0**	**90**	**3.33**	**TSCA**	**TSCA-regulated Sediments (Upstream Area)**

TABLE ES-1

SUMMARY OF INTERIM MEASURES ACTIVITIES AND SPECIFICATIONS
INTERIM MEASURES WORK PLAN SWMU 17 - PCB CAPACITOR BURIAL / POLE YARD
NSA CRANE, CRANE, INDIANA

Excavation Area	Sub - Area	Appendix A Calculation Sheet	IMWP Section	IMWP Figures	Remediation Area, sq. ft.	Target Maximum Excavation Depth, ft. bgs.	Estimated Average Excavation Depth, ft. bgs.	Estimated Excavation Vol., cubic ft.	Estimated Excavation Vol., cubic yds.	TSCA Status	Comment
Group 3: Floodplain Soils											
Ditch 3	Seg. 1	3A-1	2.5.3.1	2-8, 3-1, and 3-3	3,770	2.0	2.0	7,540	279	non-TSCA	Figure 2-8 (north side of Boggs Creek)
Ditch 3	Seg. 1	3A-2	2.5.3.1	2-8, 3-1, and 3-3	1,688	1.5	1.5	2,532	94	non-TSCA	Figure 2-8 (north side of Boggs Creek)
Ditch 3	Seg. 1	3B	2.5.3.1	2-8, 3-1, and 3-3	8,122	1.5	1.5	12,183	451	non-TSCA	Figure 2-8 (south side of Boggs Creek)
Ditch 3	Seg. 2	3C	2.5.3.2	2-9, 3-1, and 3-3	2,144	0.5	0.5	1,072	40	non-TSCA	Figure 2-9 (southwest side of Segment 2 of Ditch 3)
Ditch 3	Seg. 2	3D	2.5.3.2	2-9, 3-1, and 3-3	3,858	1.0	1.0	3,858	155	non-TSCA	Figure 2-9 (south side of Segment 2 of Ditch 3). Includes Areas 3D-1 through 3D-4
Ditch 3	Seg. 2	3E	2.5.3.2	2-9, 3-1, and 3-3	4,322	1.0	1.0	4,322	172	non-TSCA	Figure 2-9 (north side of Segment 2 of Ditch 3). Includes areas 3E-1 and 3E-2.
Ditch 3	Seg. 3	3F	2.5.3.3	2-10, 3-1, and 3-3	1,032	Bedrock (about 1.5 ft bgs)	1.5	1,548	57	non-TSCA	Figure 2-10 (north side of Segment 3 of Ditch 3)
Ditch 3	Seg. 4	3G	2.5.3.4	2-11, 3-4	1,878	1.0	1.0	1,878	70	non-TSCA	Figure 2-11 (south side of Segment 4 of Ditch 3)
Ditch 3	**Seg. 4**	**3H**	2.5.3.4	2-11, 3-4	**1,778**	**1.0**	**1.0**	**1,778**	**66**	**TSCA**	Figure 2-11 (north [TSCA Removal Area] side of Segment 4 of Ditch 3)-**FP soil**
Ditch 3	Seg. 4	3I	2.5.3.4	2-11, 3-4	713	1.5	1.5	1,070	40	non-TSCA	Figure 2-11 (north side of Segment 4 of Ditch 3)
Ditch 3	Seg. 5	3J	2.5.3.5	2-12, 3-4	8,965	(0.5 in floodplain; 1.5 in oxbow area)	1.3	11,655	432	non-TSCA	Figure 2-12 (north side of Segment 5 of Ditch 3)
Ditch 3	Seg. 5	3K	2.5.3.5	2-12, 3-4	1,915	1.0	1.0	1,915	71	non-TSCA	Figure 2-12 (south side of Segment 5 of Ditch 3)
Ditch 3	**Seg. 5**	**3L**	2.5.3.5	2-12, 3-4	**808**	**Bedrock (about 1.5 ft bgs)**	**1.5**	**1,212**	**45**	**TSCA**	Figure 2-12 **(TSCA-regulated FP soil)**
Ditch 3	Seg. 5	3M	2.5.3.5	2-12, 3-4	703	0.5	0.5	352	13	non-TSCA	Figure 2-12 (south side of Segment 5 of Ditch 3)
Ditch 3	Seg. 5	3N	2.5.3.5	2-12, 3-4	1,377	1.0	1.0	1,377	51	non-TSCA	Figure 2-12 (north side of Segment 5 of Ditch 3)
Ditch 3	Seg. 6	3O	2.5.3.6	2-13, 3-4	1,006	Bedrock (about 2.0 ft bgs)	2.0	2,012	75	non-TSCA	Figure 2-13 - North side of Segment 6 of Ditch 3)

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INTERIM MEASURES WORK PLAN SWMU 17 - PCB CAPACITOR BURIAL / POLE YARD
NSA CRANE, CRANE, INDIANA

Excavation Area	Sub - Area	Appendix A Calculation Sheet	IMWP Section	IMWP Figures	Remediation Area, sq. ft.	Target Maximum Excavation Depth, ft. bgs.	Estimated Average Excavation Depth, ft. bgs.	Estimated Excavation Vol., cubic ft.	Estimated Excavation Vol., cubic yds.	TSCA Status	Comment
Ditch 3	Seg. 6	3P	2.5.3.6	2-13, 3-4	674	Bedrock (about 2.0 ft bgs)	2.0	1,348	50	non-TSCA	Figure 2-13 - (south side of Segment 6 of Ditch 3)
Group 4: SWMU 17 Dump/Fill Area and Other Building Area Soils											
Dump/Fill Area SW of Bldg. 3072	**4A**	4A-1	2.5.4.1	2-14, 2-15, 3-3, and 3-5	823	4.0	4.0	3,292	122	non-TSCA	Figures 2-14 and 3-6 [Assume approximately 60 percent of the total 4A excavation volume (1,946 cubic yards) is TSCA-regulated soil and the other 40 percent (1,316 cubic yards) consists of 48 percent non-TSCA soil and 2 percent non-TSCA debris]
		4A-2	2.5.4.1	2-14, 2-15, 3-3, and 3-5	786	4.0	4.0	3,144	116	non-TSCA	
		4A-3	2.5.4.1	2-14, 2-15, 3-3, and 3-5	844	8.0	8.0	6,752	250	non-TSCA	
		4A-4	2.5.4.1	2-14, 2-15, 3-3, and 3-5	**555**	**6.0**	**6.0**	**3,330**	**123**	**TSCA**	
		4A-5	2.5.4.1	2-14,2-15, 3-3, and 3-5	4,180	4.0	4.0	16,720	619	non-TSCA	
		4A-6	2.5.4.1	2-14, 2-15, 3-3, and 3-5	**4,290**	**12.0**	**9.0**	**38,610**	**1,430**	**TSCA**	
		4A-7	2.5.4.1	2-14, 2-15, 3-3, and 3-5	**987**	**7.0**	**7.0**	**6,909**	**256**	**TSCA**	
		4A-8	2.5.4.1	2-14, 2-15, 3-3, and 3-5	974	6.0	4.0	3,896	144	non-TSCA	
		4A-9	2.5.4.1	2-14, 2-15, 3-3, and 3-5	**1,059**	**4.0**	**3.5**	**3,707**	**137**	**TSCA**	
		4A-10	2.5.4.1	2-14, 2-15, 3-3, and 3-5	196	9.0	9.0	1,764	65	non-TSCA	

TABLE ES-1

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Excavation Area	Sub - Area	Appendix A Calculation Sheet	IMWP Section	IMWP Figures	Remediation Area, sq. ft.	Target Maximum Excavation Depth, ft. bgs.	Estimated Average Excavation Depth, ft. bgs.	Estimated Excavation Vol., cubic ft.	Estimated Excavation Vol., cubic yds.	TSCA Status	Comment
Between B357 and Road	4B	4B-1	2.5.4.2	2-16 and 3-5	8,781	1.5	1.5	13,172	488	non-TSCA	Figure 2-16 (in front of Building 357)
		4B-2	2.5.4.2	2-16 and 3-5	567	2.5	2.5	1,418	53	non-TSCA	Figure 2-16 (small area in middle, north-central portion of 4B)
		4B-3	2.5.4.2	2-16 and 3-5	179	4.0	4.0	716	27	non-TSCA	Figure 2-16 (small area in northeast section of 4B, east of 4B-50)
TSCA area between B357 and Road	**4B-50**	**4B-50**	2.5.4.2	2-15, 3-3, and 3-5	**814**	**Bedrock (about 4.0 ft bgs)**	**2.5**	**2,035**	**75**	**TSCA**	Figure 2-15 - 4B-50 (NE Corner of TolTest Excavation Area C) - **(TSCA-regulated soil)**
Northeast of TolTest Excavation Area D and West of Ditch 2	4C	4C	2.5.4.3	2-16, 3-3, and 3-5	7,392	2.5	2.5	18,480	684	non-TSCA	Figure 2-16 - (TolTest Excavation Area D, near headwaters of Ditch 2)
Near SW Corner of Bldg. 2721	**4D**	**4D**	2.5.4.4	2-13 and 3-4	**269**	**2.0**	**2.0**	**538**	**20**	**TSCA**	Figure 2-13 - 2721 4D (near the southwest corner of Bldg. 2721) - **(TSCA-regulated soil)**

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this document is to present the Interim Measures Work Plan (IMWP) for the Polychlorinated Biphenyl (PCB) Capacitor Burial/Pole Yard, also known as Solid Waste Management Unit (SWMU) 17, Naval Support Activity (NSA) Crane located in Crane, Indiana. This IMWP includes the excavation and off-site disposal of contaminated soils and sediment located within the floodplains, drainage channels, and streams that receive surface water runoff from the PCB Capacitor Burial/Pole Yard. Contaminated soil is also present in the areas adjacent to Buildings 357 and 2721 and in the buried electrical debris area adjacent to Building 3072. Excavation and off-site disposal of contaminated soil in these areas is governed by this IMWP. IMWP activities include backfilling of excavation areas and stream restoration. A small amount of final delineation sampling and confirmation sampling are also required, as well as waste characterization sampling and analysis. The IMWP was prepared for the United States Navy, Naval Facilities Engineering Command (NAVFAC) Midwest by Tetra Tech, Inc. (Tetra Tech) under Contract Task Order (CTO) F271 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) IV Contract Number N62472-03-D-0057.

This work is being performed under the Navy's Installation Restoration (IR) Program. The following are the four distinct phases of work conducted for IR sites:

- Phase 1 is the Preliminary Assessment [formerly known as the Initial Assessment Study (IAS)]
- Phase 2 is the Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA)
- Phase 3 is the RCRA Facility Investigation (RFI)/Corrective Measures Proposal
- Phase 4 is the Corrective Measures Implementation

This IMWP has been prepared under Phase 3 of the IR Program as part of an interim measure. The IMWP defines the activities associated with the corrective measures conducted to address PCB-contaminated soils and sediments that remain within the limits of SWMU 17. These include areas within several drainage channels, adjacent floodplains located southwest, west, northwest, north, and northeast of Buildings 357 and 2721, and soil near the buildings.

1.2 FACILITY DESCRIPTION

NSA Crane is located in the southern portion of Indiana, approximately 75 miles southwest of Indianapolis and 71 miles northwest of Louisville, Kentucky, immediately east of Crane Village and Burns City (Figure 1-1). NSA Crane encompasses 62,463 acres (approximately 98 square miles), most of which are located in the northern portion of Martin County. Smaller portions of NSA Crane are located in Greene, Daviess, and Lawrence Counties. NSA Crane is located in a rural, sparsely populated area. Most of NSA Crane is forested, and the surrounding area is wooded or farmed land.

NSA Crane provides material, technical, and logistical support to the Navy for equipment, shipboard weapons systems, and nonexpendable ordnance items. In addition, NSA Crane supports the Crane Army Ammunition Activity with production, renovation, storage, shipment, demilitarization, and disposal of conventional ammunition.

1.3 REGULATORY SUMMARY

1.3.1 NSA Crane

Following promulgation of the RCRA hazardous waste regulatory program, NSA Crane filed notification and application to operate as a RCRA hazardous waste treatment, storage, or disposal facility in October 1980. Interim status was granted subject to operating requirements and applicable technical standards found in Title 40 of the Code of Federal Regulations (CFR), Part 265.

Corrective action programs established as part of the 1984 RCRA Hazardous and Solid Waste Amendments (HSWA) required NSA Crane to address past releases of hazardous waste or hazardous constituents at SWMUs. Accordingly, NSA Crane submitted a Hazardous Waste Management Report, and several RFIs were conducted to characterize the potential for releases of hazardous waste or constituents from approximately 100 SWMUs identified during the RFA, including the SWMU 17 RFI (Tetra Tech, 2002).

On December 23, 1989, the United States Environmental Protection Agency (USEPA) issued the federal portion of the final RCRA Part B Permit for NSA Crane to the Navy. USEPA renewed the permit in 1995. The Indiana Department of Environmental Management (IDEM) now has responsibility for the Federal Corrective Action Permit. IDEM renewed the Corrective Action Permit on October 18, 2001. However, certain ongoing corrective actions, including corrective actions at SWMU 17, will continue under the USEPA/IDEM Work Sharing Agreement for Corrective Action Activities at NSA Crane.

1.3.2 SWMU 17 – PCB Capacitor Burial/Pole Yard

SWMU 17 is located in the north-central portion of NSA Crane, as shown on Figure 1-1. Figure 1-2 is an aerial photograph of SWMU 17. The PCB Capacitor Burial/Pole Yard has been in use since before 1966. Historically, SWMU 17 has been used for the following:

- Storage of electrical capacitors, some of which contained PCBs.
- Storage of electrical transformers, some of which contained PCBs.
- Burial of capacitors, some of which may have contained PCBs.
- Storage of creosote-impregnated utility poles, some of which may have been contaminated with PCBs.

It is known that capacitors were buried near Building 357 of SWMU 17 in the early to mid-1970s, but it is not known whether any capacitors were buried before the early 1970s or after the mid-1970s. Figure 1-3 is a land use map that shows the operational area of SWMU 17 near Building 357. Investigation of facilities documentation revealed that Building 2721, located approximately 1,500 feet northeast of Building 357, was used as a transformer maintenance facility, and that PCB-contaminated oils were collected in an oil-water separator. Investigation of facilities documentation revealed that Building 2721 was historically used as a transformer maintenance facility, and that PCB-contaminated oils were collected in an oil-water separator. Transformer maintenance operations ceased during the late 1970s. Building 2721 was decontaminated and the oil water separator was cleaned. The building was then released for other uses and is currently occupied by an EOD Detachment. No information was found that indicated that any soils sampling had been conducted or that soils had been remediated. Based on the nature of operations conducted and contamination observed in nearby ditches, the Navy has included Building 2721 as a separate (more recently identified) source of PCB contamination within SWMU 17.

The location of Building 2721 is shown on Figure 1-4 along with drainage channel and stream flow directions and topographical lines for the area surrounding SWMU 17.

The soil and sediment at SWMU 17 has been extensively investigated, and a previous Interim Measure (IM) to remove contaminated soil was conducted in August 2003 (TolTest, 2004). The following is a listing of the SWMU 17 investigations, the IM performed to date, and other SWMU 17 related investigations:

- Science Applications International Corporation (SAIC) Soil Investigation, March 2001
- Tetra Tech RFI, March 2002 (Tetra Tech, 2002)

- TolTest IM, August 2003 (TolTest, 2004)
- Tetra Tech RFI Addendum Field Investigations, October 2005, April 2006, May 2006, and October 2006 (Tetra Tech, 2007)
- Unites States Fish and Wildlife Service (USFWS) Fish Tissue Report, August 2008
- Tetra Tech Boggs Creek Field Investigation, December 2008 (Tetra Tech, 2010)
- Tetra Tech Field Investigation, January 2011 (Tetra Tech, 2011b)
- Technical Memorandum, Prescriptive Remediation Sampling and Analysis for SWMU 17 – PCB Capacitor Burial/Pole Yard. April. (Tetra Tech, 2012)

A summary of the environmental investigations and previous IM conducted at SWMU 17 is provided in Section 2.0.

1.4 REPORT ORGANIZATION

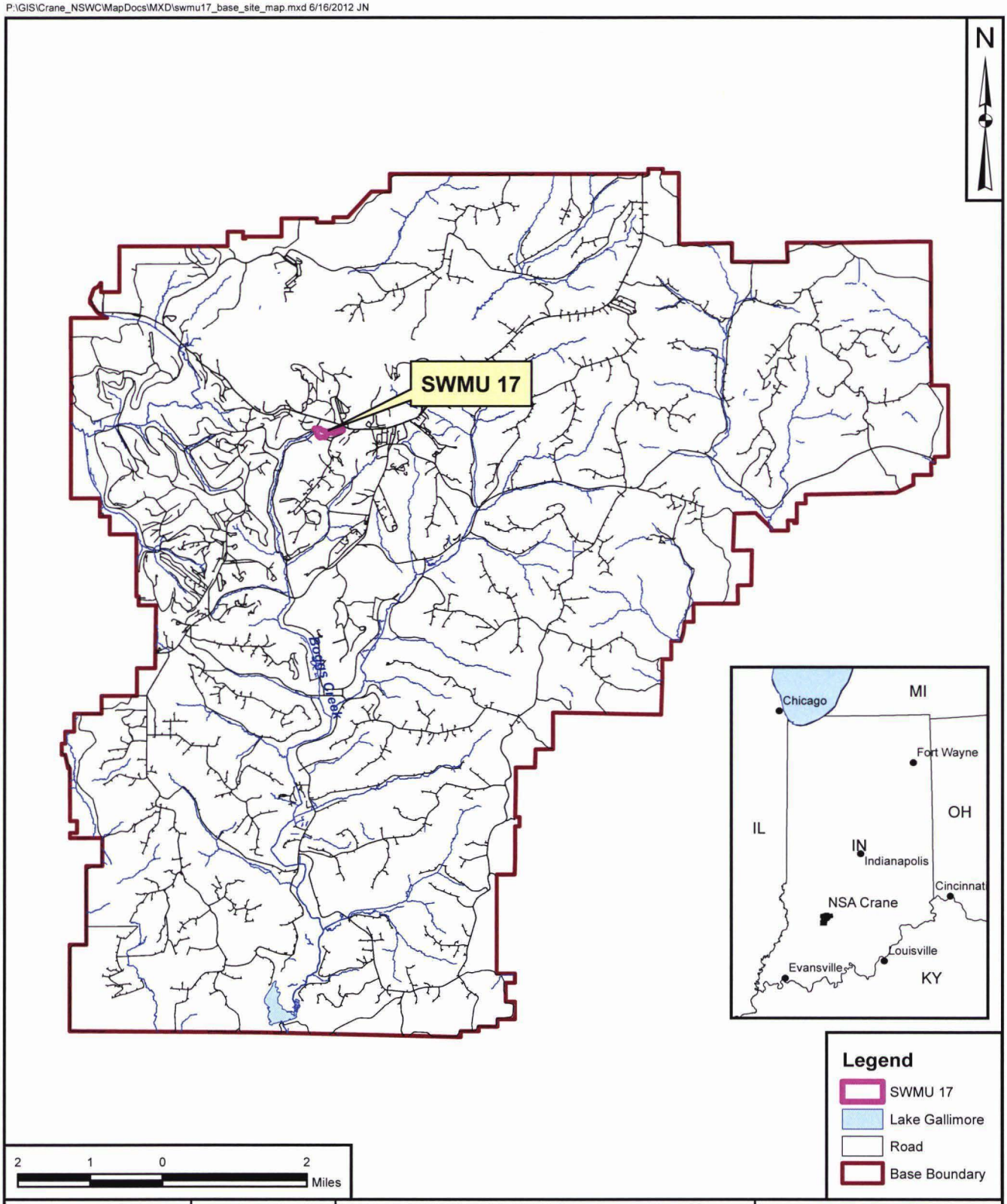
The following highlights the information contained in the remainder of this document:

- Section 2.0 summarizes site characteristics, including site physical and environmental characteristics, summary of environmental investigations conducted at SWMU 17, nature and extent of contamination, and rationale and limits of excavation. Data that were used to designate PCB contamination are presented in this section by major area and subarea as identified in Table ES-1. The 1 mg/kg PCB contamination boundaries are also presented. Major subheadings of this section correspond to the four groups of environmental media types and excavation areas identified in Table ES-1.

- Section 3.0 presents the IMWP. The structure of this section parallels that of Section 2.0.

- Section 4.0 presents erosion and sediment control features proposed for the IMWP described in Section 3.0.

P:\GIS\Crane_NSWC\MapDocs\MXD\swmu17_base_site_map.mxd 6/16/2012 JN



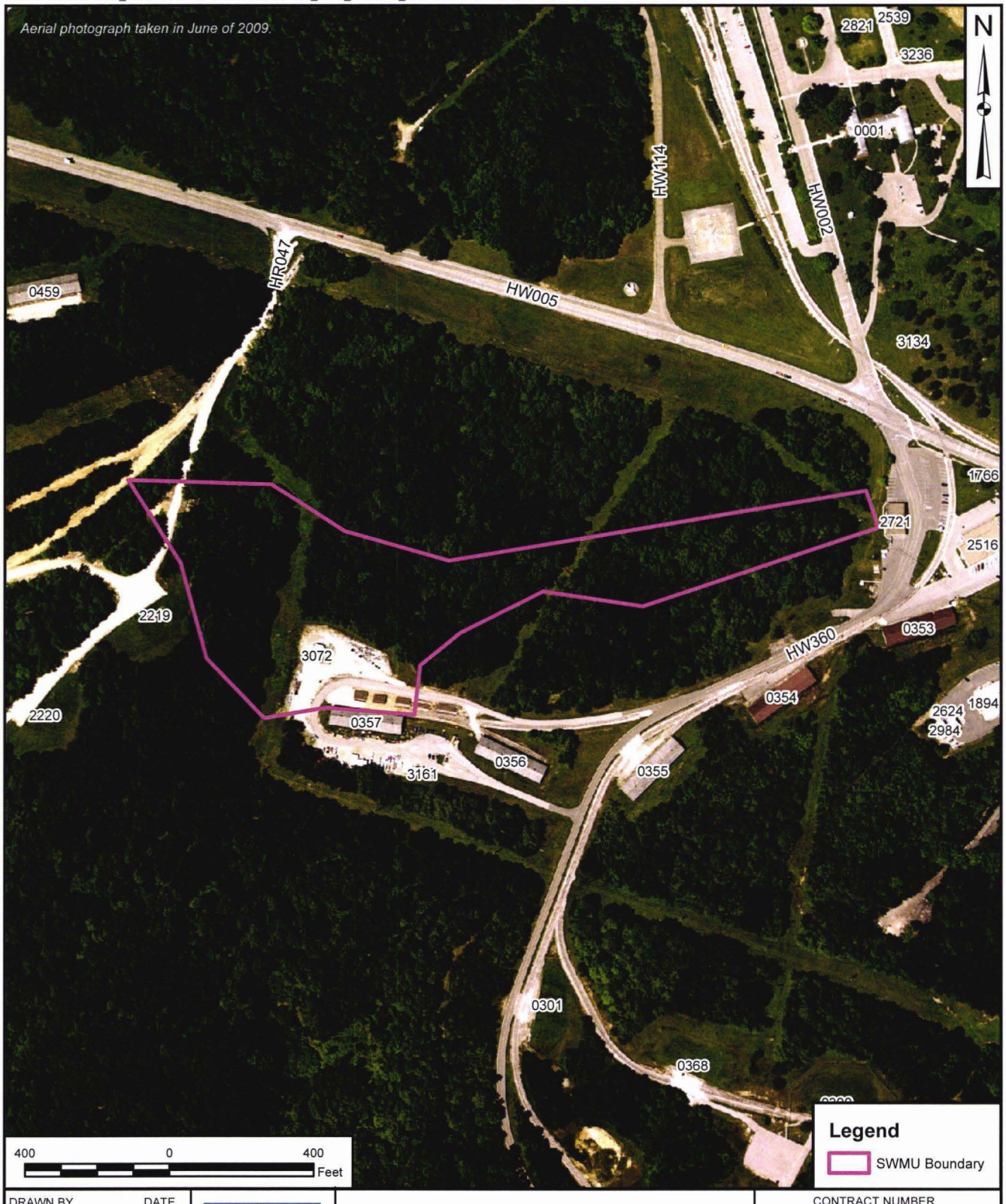
DRAWN BY	DATE
T. WHEATON	11/04/09
CHECKED BY	DATE
T. JOHNSTON	06/16/12
REVISED BY	DATE
J. NOVAK	06/16/12
SCALE AS NOTED	

NAVFAC

SITE LOCATION MAP
SWMU 17 - PCB CAPACITOR BURIAL / POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

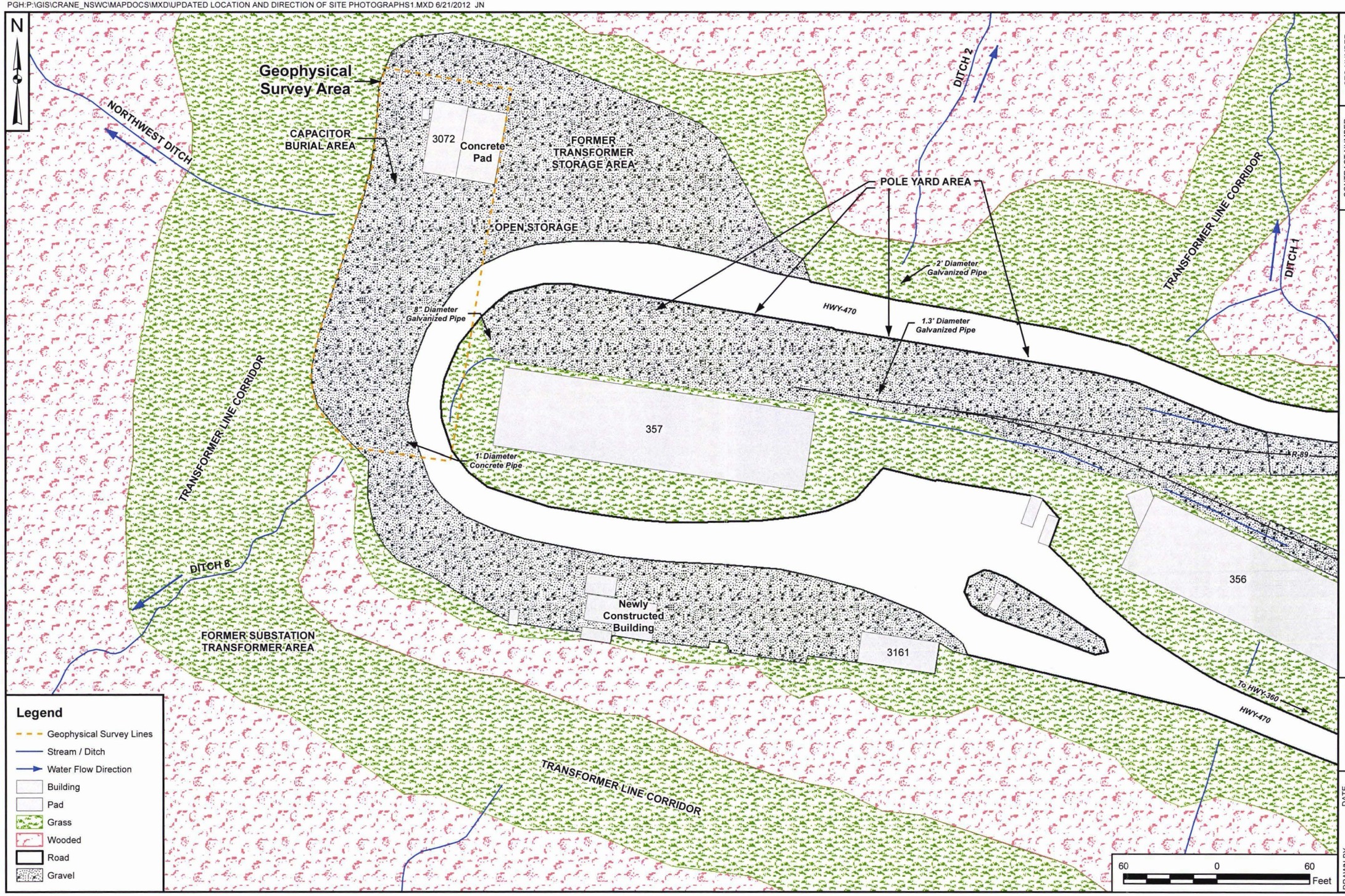
CONTRACT NUMBER	
F271	
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO. FIGURE 1-1	REV 0

PGH:P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU17_SITE_LAYOUT_AERIAL.MXD 6/20/2012 JN



DRAWN BY J. ENGLISH	DATE 05/06/11	NAVFAC	SITE LAYOUT - 2009 AERIAL PHOTOGRAPH SWMU 17 - PCB CAPACITOR BURIAL / POLE YARD INTERIM MEASURES WORK PLAN NSA CRANE CRANE, INDIANA	CONTRACT NUMBER F271
CHECKED BY T. JOHNSTON	DATE 06/20/12			APPROVED BY ___ DATE ___
REVISED BY J. NOVAK	DATE 06/20/12			APPROVED BY ___ DATE ___
SCALE AS NOTED				FIGURE NO. FIGURE 1-2 / REV 0

PGH:P:\GIS\CRANE_NSWC\MAPDOCS\MXD\UPDATED LOCATION AND DIRECTION OF SITE PHOTOGRAPHS1.MXD 6/21/2012 JN



CONTRACT NUMBER	CTO NUMBER F271
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO. 1-3	REV 0

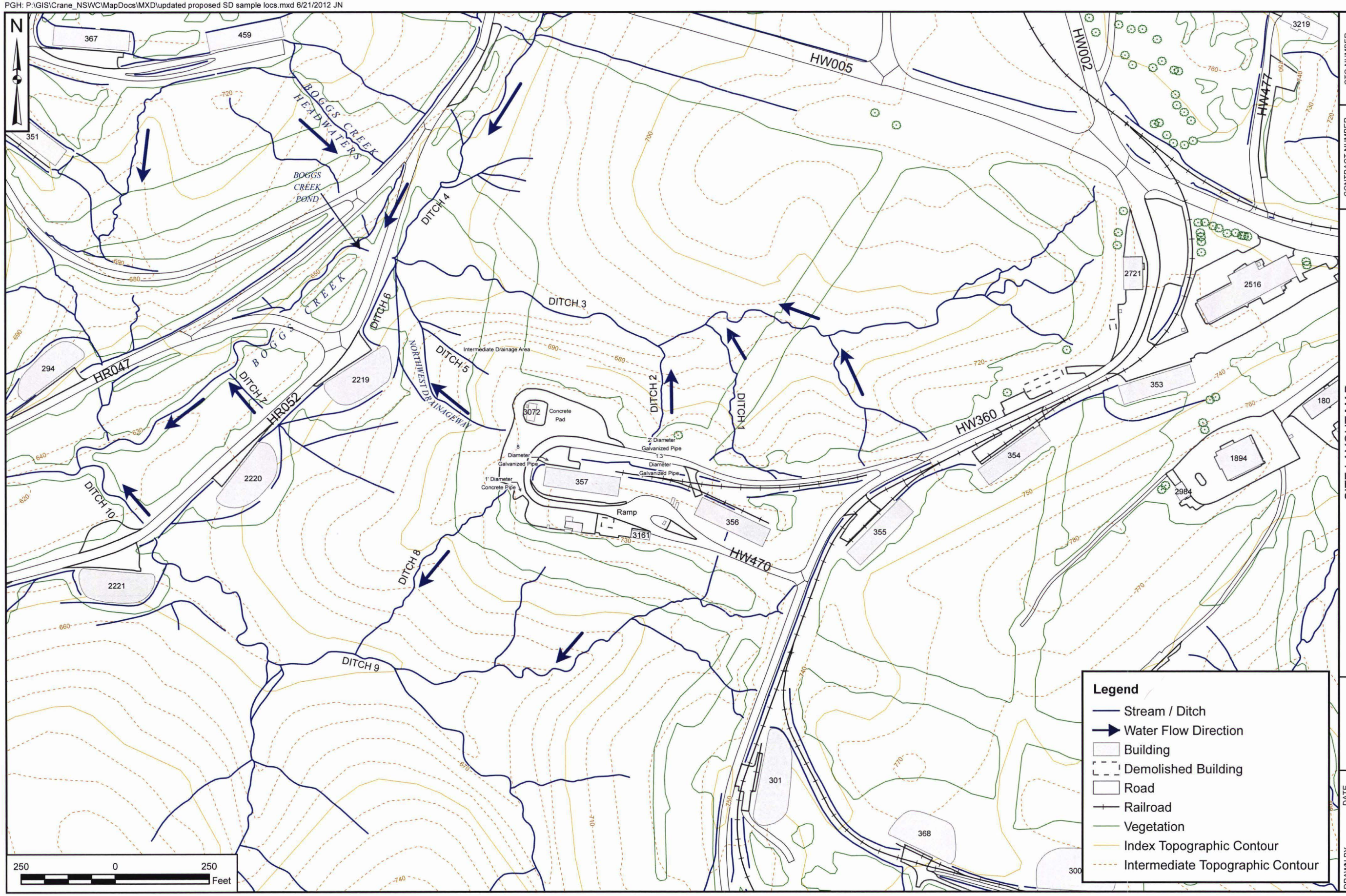
LAND USE MAP
SWMU17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA, CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY J. NOVAK	DATE 06/21/12
CHECKED BY T. JOHNSTON	DATE 06/21/12
REVISED BY	DATE

SCALE AS NOTED

PGH: P:\GIS\Crane_NSWC\MapDocs\MXD\updated proposed SD sample locs.mxd 6/21/2012 JN



CONTRACT NUMBER
CTO NUMBER F271
APPROVED BY
DATE
APPROVED BY
DATE
FIGURE NO. 1-4
REV 0

SITE LAYOUT MAP
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURE WORK PLAN
NSA CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY J. NOVAK	DATE 06/16/12	
CHECKED BY T. JOHNSTON	DATE 06/21/12	
REVISED BY J. NOVAK	DATE 06/21/12	
SCALE AS NOTED		

2.1.4 Hydrogeology

PCBs are relatively insoluble and tend to remain attached to soil particles close to where they were spilled. Therefore, they are not typically found in groundwater underlying PCB-contaminated sites. Even though PCBs are considered to be immobile in groundwater systems, three temporary wells were installed in the soil overburden and screened at the soil/bedrock interface to evaluate possible migration of PCBs in shallow groundwater. Perched groundwater was encountered in one location on the north side of Building 357 at a depth of 3.8 feet bgs. No perched groundwater was encountered in the other two temporary wells. No permanent monitoring wells were installed at SWMU 17 during this phase of the field investigation, or in any of the previous phases of investigation. Analytical results from the groundwater samples collected from temporary wells indicated that there was no PCB contamination found in the SWMU 17 groundwater. Groundwater sample analytical results are presented in the 2007 RFI report addendum (Tetra Tech, 2007).

2.2 PREVIOUS INVESTIGATIONS

Previous soil investigations at the PCB Capacitor Burial/Pole Yard are summarized below. Soil and sediment data from these investigations that are germane to this IMWP are presented in Table 2-1. This table also identifies the figure numbers and excavation areas where each sampling location can be found.

2001 Soil Investigation – In March 2001, SAIC conducted a limited surface and subsurface soil, i.e., 6 composite and 11 grab samples were collected for PCB analysis, investigation in and around the SWMU 17 capacitor burial and pole storage areas. The sampling results indicated elevated concentrations of PCBs, primarily aroclor-1260, within the surface soils of the investigated areas.

2002 RFI – Based on the results of the 2001 soil investigation, Tetra Tech conducted an RFI for SWMU 17. Field work consisted of surface and subsurface soil sampling and a geophysical survey. In total, 88 samples were collected from 44 surface soil sample locations (17SB01 through 17SB44). The sampling results identified five areas of concern immediately north and west of Building 357 and within the Northwest Ditch. The geophysical survey identified the limits of the reported capacitor burial area and several anomalies in the reported capacitor burial area.

2004 Interim Measure – Based on the results of the 2002 RFI, TolTest was contracted to remove PCB-contaminated soils from the SWMU 17 area. During the IM a large area of buried electrical equipment (electrical insulators) and other debris ("capacitor burial area" on Figure 2-1) was discovered in the central portion of the geophysical survey area. A search of the most upgradient portion (eastern-most portion) of

the Northwest Ditch revealed the presence of a small transformer and more debris, which was disposed of in compliance with NSA Crane's PCB Management Program.

Post-excavation sampling indicated PCBs remained in the surface soil within the drainageway downgradient of the Dump/Fill Area (the Northwest Ditch) and in the area between Building 357 and the asphalt paved road (eastern end of building) at concentrations greater than 1 milligram per kilogram (mg/kg). The sampling, however, did not identify the extent of the remaining contamination. The surface soil within the drainageway downgradient of the Dump/Fill Area was not excavated because the area was beyond the identified work area and posed no health risk to site workers. Surface soil between Building 357 and the paved road at the eastern end of Building 357 was not excavated based on a regulatory decision (TolTest, 2004). It was identified in the TolTest report that these areas would be targeted for further evaluation in a future RFI.

RFI Addendum Sampling – In October 2005, April 2006, and May 2006, Tetra Tech conducted sediment sampling within the drainage channels that receive runoff from the SWMU 17 area and surface soil sampling around Buildings 357 and 2721.

- The October 2005 sampling event included the collection of seven sediment samples (17SD01 through 17SD07) from within the Northwest Ditch, Boggs Creek, Ditch 8, and Ditch 3, five surface soil samples, and six subsurface soil samples from around Building 357 (see Figures 2-2 and 2-3). Results of the October 2005 sampling event identified PCB concentrations ranging from non-detection to 37 mg/kg.

- The April 2006 sampling event included the collection of 33 sediment samples (17SD08 through 17SD41; no sample from 17SD12) from upstream drainageways originating at SWMU 17. Results of the April 2006 identified PCB concentrations ranging from non-detection to 5.3 mg/kg. PCBs were detected at 1.3 mg/kg at location 17SD14, upgradient of a contributing stream that originated from SWMU 17. This detection suggested that an additional source of PCB contamination existed for this tributary other than Building 357. Further investigation of facilities upgradient of sample location 17SD14, indicated that Building 2721 was historically used as a transformer maintenance facility and that PCB-contaminated oils were discharged through an oil-water separator to the drainage ditch.

- The May 2006 sampling event included 23 sediment samples (17SD42 through 17SD64) from the drainage ditch where PCB detections occurred in the April 2006 sampling event, and other drainage channels upgradient of SWMU 17. The May 2006 results identified PCB concentrations ranging from non-detection to 70 mg/kg.

As a result of finding additional PCB contamination in the stream originating at Building 2721, additional soil and sediments samples were collected in the vicinity of the building in October 2006. Samples were collected within areas along the stream outside its banks that would likely receive flood waters, and within the drainage ditches within the vicinity of SWMU 17 not previously sampled. In total, 62 additional samples were collected from 35 soil boring (17SB50 through 17SB72; 17SB75 through 17SB86) and 5 sediment locations (17SD65 through 17SD69). PCB concentrations within the soil samples collected around Building 2721 and within the potential flood zone along the stream north of SWMU 17 range from non-detect to 73 mg/kg. PCB concentrations within the sediment samples collected from the streams and drainage channels range from non-detect to 0.96 mg/kg. The results of all the 2005 and 2006 investigations are presented on Figures 2-2 and 2-3.

April 2007 Regulatory Meeting – A draft IMWP was submitted to the Navy in February 2007 with the objective of protecting aquatic habitat through removal of all soil and sediment with PCB concentrations greater than 1 part per million (ppm). However, there is little or no aquatic habitat in the drainage ditches and upper portions of Ditch 3 so PCB levels in excess of 1 ppm were not expected to pose unacceptable risks to receptors in these areas. Ditch 3 was divided into segments and average concentrations were calculated for each segment. The ecological habitat in the middle portion of Ditch 3 had lower than average PCB concentrations (average concentrations for Segments 3, 4, and 5 ranging from 1.3 mg/kg to 3.2 mg/kg) and would likely be negatively impacted by a removal action. Therefore, an excavation approach based on removal of the highest mass of PCBs was developed. A draft Powerpoint presentation detailing the excavation approach of removing the stream segments containing the greatest mass of PCBs was submitted to the Navy and USEPA in March 2007.

Following the presentation of this mass excavation approach, comments were received from the United States Fish and Wildlife Service (USFWS) that if a mass removal approach was to be used, further studies would be necessary to ensure PCB contamination from SWMU 17 had not migrated into downstream portions of Boggs Creek and Lake Gallimore. To address these USFWS comments and support IMWP development based on a mass removal approach, the following studies were completed:

- A USFWS fish tissue study to determine if PCBs in Boggs Creek migrated to Lake Gallimore and contaminated fish tissue in the lake,

- A 2008 Boggs Creek surface water and sediment investigation to determine if PCB contaminated soil and sediment from SWMU 17 contaminated surface water and sediment in downstream areas of Boggs Creek (Tetra Tech, 2010).

USFWS Fish Tissue Report – In August 2008, the USFWS hired Geochemical Environmental Research to analyze fish tissue samples (spotted suckers) from Lake Gallimore for PCBs. The purpose of the study was to determine if PCBs in Boggs Creek had migrated to Lake Gallimore and contaminated fish in the lake, which might then be consumed by the Bald Eagles nesting there. The following three composite sample groups from Lake Gallimore spotted suckers were analyzed for PCBs:

- Whole Body (filet with carcass)
- Filets (filet without skin)
- Carcasses (no filet carcass)

The results of the fish tissue study demonstrated that spotted sucker filets are at the threshold of the Fish Consumption Advisory Group 1 (greater than 0.05 mg/kg) and Group 2 (0.06 to 0.2 mg/kg) concentration levels and that the whole body concentration is not ideal (dry weight = 1.52 mg/kg). These results suggest that downstream PCB migration from Boggs Creek into Lake Gallimore has occurred. The study concluded that cleanup in the upstream areas from Lake Gallimore is the most appropriate remedy for PCB contamination in spotted sucker tissue.

2008 Boggs Creek Field Investigation – Sediment and surface water samples were collected along Boggs Creek from locations near previous sample location 17SD069 (see southwest quadrant of Figure 2-2) near SWMU 17 south to the termination of the creek into Lake Gallimore. Sample 17SD1050006 was collected at the northernmost sample location of this field investigation, location 17SW/SD105. Sampling results indicate that PCB contamination associated with sample 17SD1050006 (2.8 mg/kg) at location 17SW/SD105 is an isolated case (see top third of Figure 2-4, and Figure 2-5). All sample locations further downstream (toward the south) had PCB concentrations less than 0.25 mg/kg, and the three closest samples to the north, which were collected in October 2006, had PCB concentrations of 0.96 mg/kg (17SW/SD069), 0.12 mg/kg (17SW/SD068), and 0.51 mg/kg (17SW/SD067) (Figure 2-2). These results were interpreted by the Navy to mean that PCBs are not being transported downstream via Boggs Creek sediment and that there appeared to be no link between PCBs in fish tissue in Lake Gallimore and PCBs in headwaters of Boggs Creek (near SWMU 17) (Tetra Tech, 2010).

April 2010 Powerpoint Presentation – The March 2007 Powerpoint presentation was revised to include the results of the USFWS fish tissue report and the Boggs Creek Field Investigation Report summarized above (Tetra Tech, 2010). The USFWS commented that excavation in Stream Segment 6, which was not included in the draft April 2010 Powerpoint presentation, would need to be included in the IMWP, in addition to the stream segments proposed for excavation (Boggs Creek Segment 1, Ditch 3 Segment 2,

and the Northwest Ditch). The USFWS also noted that the eastern half of Stream Segment 6 was not well characterized, and it was determined that sediment samples would be collected in the eastern portion of Stream Segment 6 at a later time to further characterize this area. Excavation in Stream Segment 6 was added and regulatory approval was received on the final version of the presentation.

2011 Field Investigation Letter Report – Samples were collected in January 2011 to determine the extent of sediment contamination in Ditch 3 Segment 6 and the horizontal and vertical extent of soil contamination in the floodplain of Boggs Creek Segment 1, Ditch 3 (Segments 2 and 6), and the Northwest Ditch. A technical memorandum (Tetra Tech, 2011a) was prepared for additional sampling and analysis in accordance with Quality Assurance Project Plan (QAPP) Addendum No. 4 (Tetra Tech, 2008) to delineate the extent of sediment and soil contamination in these areas to obtain sufficient data to prepare the IMWP in support of removal actions. A letter report (Tetra Tech, 2011b) was prepared to summarize the results of this additional sampling.

A total of 47 locations were sampled during the 2011 investigation. Eighteen locations were in Ditch 3, Segment 6 (15 sediment and three soil locations), 17 soil locations were in Ditch 3, Segment 2, one soil location was in the Northwest Ditch, and 11 soil locations were in Bogg's Creek, Segment 1. Of the 32 soil locations sampled, 15 surface soil samples and 13 subsurface soil samples contained PCB concentrations greater than 1 mg/kg. The two sediment samples collected from location 17SD120 contained PCB concentrations less than 1 mg/kg; the remaining 20 sediment samples contained PCB concentrations greater than 1 mg/kg. Figures 2-6 through 2-17 present the soil and sediment results from this 2011 sampling event and all previous sampling, including a 2012 sampling event described in the next paragraph.

2012 Field Investigation – In 2012 a prescriptive remediation approach to SWMU 17 PCB contamination was proposed to USEPA Region 5. This approach would involve removal of contaminated material based on the PCB contamination profiles throughout SWMU 17, but because the vertical and lateral extent of contamination would be well defined, sampling to confirm satisfactory removal of PCBs would be unnecessary. After conducting a site walk reviewing the results of previous investigations with USEPA Region 5, it was determined that additional sampling would be prudent, especially in areas not previously identified for removal. Fourteen additional sediment samples, two surface water samples, and more than 1,100 soil samples were collected. Of these, more than 700 samples were analyzed for PCBs, and four sediment samples and both surface water samples were analyzed for semivolatile organic compounds (SVOCs) and volatile organic compounds (VOCs). The SVOC and VOC data were collected for information only and do not affect the PCB corrective action decisions. The goal of this investigation was to delineate PCB contamination in soil and sediment to a level of 1 mg/kg and identify soil and sediment

volumes with PCB concentrations greater than 1 mg/kg and volumes with PCB concentrations greater than 50 mg/kg. Only samples that were required to achieve this goal were analyzed.

Sample Nomenclature – Different sample numbering systems have been used throughout the SWMU 17 investigations. One system identifies the SWMU number (i.e., 17) followed by a location code indicating what matrix (e.g., soil or sediment) is represented by the sample, a sequential location number, and, if the sample represents soil or sediment, the depth interval represented by the sample (sediment and soil). Early samples numbered this way were represented with a two-digit sequential location identifier. Because the number of soil samples totaled more than 100, however, new samples incorporated a three-digit sequential location identifier. Therefore, all location identifiers less than "100" were changed to incorporate a leading "0" so, for example, location "17SB74" is now "17SB074." The updated sample numbers are used on most figures.

2.3 CLEANUP GOALS

This IMWP includes the removal of PCB contaminated soil and sediment in the floodplains, ditches, and streams at SWMU 17, as well as surface debris at the head of the Northwest Ditch, and PCB-contaminated soil near Buildings 357, 2721, and 3072. The extent of contamination in these media was established to a level of 1 mg/kg. The cleanup goals established for SWMU 17 floodplains and streams for this IM include the following:

- Remove surface debris at the head of the Northwest Ditch which may contain PCBs.
- Remove contaminated Boggs Creek sediments and floodplain surface soils. Boggs Creek sediments and floodplain surface soils with PCB concentrations, which are greater than 1 mg/kg will be considered contaminated.
- Remove contaminated soil, from the surface or subsurface, as appropriate, from the Dump/Fill Area, immediately southwest of Building 2721, and select areas where TolTest had excavated surface soil.
- Minimize damage to ecological receptors resulting from soil/sediment removal actions.

2.4 EXTENT OF CONTAMINATION

The extent of contamination within the floodplains, ditches, streams of SWMU 17, and building areas was adequately delineated during the above mentioned investigations and interim measures to support

prescriptive remediation. PCB contamination is present in sediments and soils within the drainage channel network surrounding SWMU 17 and surface and subsurface soils surrounding Buildings 357, 2721, and 3072 (Figures 2-6 through 2-17). A single contamination point (location 17SW/SD105 on Figures 2-4 and 2-5) in Bogg's Creek, southwest of Building 225 was identified in the 2010 Field Investigation Report (Tetra Tech, 2010).

The contaminated areas and environmental media were divided into four groups representing areas to be excavated:

Group	Description
1	Contaminated drainage channels on steep slopes that often do not contain water
2	Streams that contain water perennially and in which contaminated sediments were found
3	Contaminated floodplain soil flanking the contaminated stream channels
4	Contaminated building area soils

Each of these groups was subdivided into smaller areas for presentation purposes and to support selective implementation of the interim measure in individual areas. The subareas are represented by alpha characters. All areas are tabulated on Table ES-1 with references to figures on which the individual areas are shown.

Figures 2-4 through 2-17 identify the contaminated areas planned for excavation and the associated PCB concentrations as a function of depth. If PCB concentrations at a particular sampling location were less than 1 mg/kg at all sampled depths, the dot (for soil samples) or triangle (for sediment samples) representing that location is colored green. Orange dots or triangles represent a location where at least one sampled interval had PCB concentrations equal to or greater than 1 mg/kg but less than 50 mg/kg. Red dots or triangles represent locations where PCB concentrations were greater than 50 mg/kg in at least one of the sampled depth intervals.

Select areas near SWMU 17 buildings were excavated previously by TolTest. In those areas soil was excavated to a maximum of 3 feet bgs. Post excavation sampling showed that residual contamination was present at select locations at the bottoms and sidewalls of the excavations but the excavations were filled with soil containing no PCBs after excavation was complete. In Figures 2-14 through 2-17 data tags for TolTest samples (labeled "17FL..." or "17EW...") show the residual PCB concentrations at the bottom (17FL) or side walls (17EW) of the excavations. If a sample was collected deeper, the PCB concentrations deeper in the soil are also shown with the bottom of the excavated interval at the top of this next deeper interval. Therefore, if the next deeper interval PCB concentration was less than 1 mg/kg,

it could be concluded that the PCB concentration from the surface to the bottom of this next deeper interval was less than 1 mg/kg and the elevated PCB concentration at the bottom of the excavation represented a thin veneer of residual PCB concentrations greater than 1 mg/kg. The significance of this is that, for example, in TolTest excavation area D, none of the soil exceeds 1 mg/kg PCBs in a 2-foot soil interval beginning at the bottom of the excavation even though the excavation confirmation samples alone would indicate otherwise.

2.5 RATIONALE AND LIMITS OF EXCAVATION

Based on the results of the sampling events summarized above, removal actions are recommended to address PCB contamination in soil and sediment of floodplains, ditches, streams, and building areas at SWMU 17. This includes:

- Spot removal of sediment from one location in Boggs Creek around sampling point 17SB105
- Removal of soil and sediment from the channels and floodplain areas of the Northwest Ditch, near Ditch 2, Ditch 8, Boggs Creek Stream Segment 1, and Ditch 3 Stream Segments 2 through 6
- Removal of soil near Buildings 357, and 2721
- Removal soil in the SWMU 17 Dump/Fill Area near Building 3072
- Removal of debris from the buried electrical equipment area near Building 3072. Note: the amount of debris and electronic/electrical components uncovered during exploratory trenching and soil boring (described later) has been small compared to contaminated soil volumes.
- Removal of approximately 10 tons of debris on the surface of the western portion of the Dump/Fill Area that coincides with the eastern most portion of the northwest ditch
- Avoiding the excavation of bedrock.

Figures 2-6 through 2-17 show the proposed limits of excavation for these areas. More detail is provided in Section 3 and on Section 3 figures. As explained in Section 3, there are some excavation areas that are not completely bounded by sampled locations with <1 mg/kg total PCBs. In those cases, excavation boundaries were developed based on topographic controls or provisions have been made for additional delineation sampling. More detail is provided in Section 3 and for individual excavation areas, as

appropriate. Table ES-1 is a summary of excavation volumes that also links the estimated volumes to text, figures, and calculation sheets supporting the estimated volumes.

In the ditches, streams and floodplains, removal of all contamination above the 1 mg/kg limit (for surface soil and sediment) is planned. For the building areas, removal of all contaminated soil to a level of 1 mg/kg or less is also planned. Volume calculations used to develop the limits of excavation are included as Appendix A. Any remaining sediment contamination contains low concentrations of PCBs (average concentrations of remaining segments less than 1 mg/kg) and represents no significant benefit if it would be removed compared to the planned removals. The rationales for the planned excavation limits are presented below.

When estimating ditch and stream sediment removal volumes, average channel widths were used. When performing the actual sediment removal, however, all stream bottom sediments for the entire stream width must be excavated along the length of channel designated for excavation. Segregation of TSCA level waste (i.e., > 50 mg/kg total PCBs) and non-TSCA waste (≤50 mg/kg total PCBs) and preventing TSCA level contamination from mixing with lesser contaminated materials are requirements of this work plan. Furthermore, erosion and sediment control devices are to be used in a way that ensures segregation of TSCA from non-TSCA wastes and prevents contamination of non-TSCA areas with TSCA level contamination. The more contaminated of drainage channel sediments generally occur near the upper elevations. To prevent recontamination of already excavated areas, removal of higher elevation contamination before removing lower elevation contamination is expected.

2.5.1 Removal of Contamination within Drainage Ditch Segments

The limits of ditch bottom sediment excavation shown on Figures 2-5 through 2-7 are based on the volume of sediment present in the sediment and soils within each of the ditches and ditch banks, as calculated in Appendix A. Limits of contamination were determined using analytical data, topography, photos, and field observations. Table ES-1 identifies excavation volumes and links the excavation areas and volumes to text, tables, figures, and calculation sheets supporting the volume estimates (the Northwest Ditch and Ditch 8).

2.5.1.1 Northwest Ditch (Area 1A)

Removal of contaminated sediments in the Northwest Ditch (see Figure 2-6) alone is expected to remove nearly all PCB concentrations greater than 1 mg/kg in the sediment of SWMU 17 ditches. Removal of this sediment will protect human and ecological receptors in this area and protect downstream areas from

potential migration of a large mass of PCBs. The last paragraph of Section 2.5 describes in more detail how excavation volumes were determined and how wide the actual excavations will be.

2.5.1.2 Ditch 2

This Ditch warrants special treatment because of a discrepancy between previous data and current understanding of extent of contamination. The culvert at the top of Ditch 2 drains the eastern end of the Building 357 area, where PCB contaminated soil had been observed. Ditch 2 had been noted in previous versions of this work plan as being contaminated with PCBs because of a sample collected from location 17SD011 that exhibited 1.8 mg/kg PCBs in the top 6 inch interval (see Figure 2-2). Sample 17SD011, however, is a soil sample, not a sediment sample, and was collected from an area west of Ditch 2, not from within Ditch 2. All sediment samples actually collected from within Ditch 2 exhibit PCB concentrations less than 1 mg/kg. Therefore contamination in Ditch 2 was not found to be unacceptable and excavation of Ditch 2 is not planned.

2.5.1.3 Ditch 8 (Segments 8a and 8b)

The two ditch segments of Ditch 8 that were identified for sediment/soil removal are labeled Ditch 8a and Ditch 8b on Figure 2-7. The downstream contamination/excavation boundary of Segment 8a is tentatively depicted pending confirmation sampling that will occur prior to or near the beginning date of excavation. The additional sampling will occur between locations 17SW/SD025 and 17SW/SD127 to more precisely establish the extent of contamination in Ditch 8a, as described in Section 3.2.1.2. Removals of soil (Ditch 8a) and sediment (Ditch 8b) are planned for these two segments of Ditch 8 and the soil flanking the ditch, which is more akin to a swale, near sampling location 17SWSD007 (i.e., in Ditch 8a). Removal of the contaminated soil and sediment will prevent downstream migration of PCBs in this Ditch. The last paragraph of Section 2.5 describes in more detail how excavation volumes were determined and how wide the actual excavations will be, but note that Ditch 8 does not contain TSCA level contamination.

2.5.2 Removal of Contaminated Sediment From Within Stream Segments

The limits of excavation shown on Figures 2-5 and 2-8 through 2-13 are based on the volume of sediment present in the sediment within each of the ditches and channel segments, as calculated in Appendix A. The rationale for sediment excavation in each of the stream segments is detailed below. Table ES-1 identifies excavation volumes and links the planned excavation areas and excavation volumes to text, tables, figures, and calculation sheets supporting the volume estimates. Refer to the last paragraph of Section 2.5 for details regarding excavation sequence, determining how much sediment is to be removed, and waste segregation.

2.5.2.1 Spot Sediment Removal in Boggs Creek (17SD105 Area)

The limits of excavation for the 17SD105 Area shown on Figure 2-5 are based on photos taken at location 17SD105 (during the December 2008 Boggs Creek Investigation) and on the site visit conducted on April 27/28, 2012. These excavation limits are approximate. Sample 17SD105 was collected from an area of sediment accumulation on the side of the stream channel that was estimated to be approximately 40 feet long, 10 feet wide, and 1.5 feet deep. All contaminated sediment in the depositional area around location 17SD105 must be removed, which may result in removal of more or less than the estimated 22 cubic yards of sediment. By removing this contaminated sediment, all sediment PCB concentrations along the entire length of Boggs Creek from Stream Segment 1 to Lake Gallimore will be rendered less than 1 mg/kg.

2.5.2.2 Boggs Creek, Segment 1 (Ditch 3, Segment 1) Sediment

The sediment in Boggs Creek Segment 1 contains a relatively low mass of PCBs based on the PCB concentrations (near 1 mg/kg or less) and length of the stream segment. Nevertheless, removal of this sediment (see Figure 2-8) will limit future migration of PCB contamination in Boggs Creek.

Additional sampling between locations 17SW/SD033 and 17SW/SD123 will occur to more precisely establish the extent of contamination in Boggs Creek Stream Segment 1. The downstream boundary of Ditch 8a will be extended downstream to include all samples with >1mg/kg total PCBs based on 3-day turnaround analysis for PCB Aroclors. At least two soil samples will be collected to represent the 0-1 ft interval. The additional samples will be sequentially analyzed from upstream to downstream, as needed, to bound the contamination.

2.5.2.3 Ditch 3, Segment 2 Sediment

The PCB concentrations of sediment samples from this segment (see Figure 2-9) ranged from less than 1 mg/kg to less than 4 mg/kg. The combined concentration and segment length are an indication that this segment contains a greater mass of PCBs than Segment 1; therefore, removing sediment from this segment will significantly help prevent downstream migration into Boggs Creek.

2.5.2.4 Ditch 3, Segment 3 Sediment

The range of concentrations in this stream segment (see Figure 2-10) is between those of Stream Segments 1 and 2. Removing sediment from this segment will help prevent downstream migration into Boggs Creek.

2.5.2.5 Ditch 3, Segment 4 Sediment

The sediment contamination in Stream Segment 4 (see Figure 2-11) is comparable to that of Stream Segments 1 and 3. Removing sediment from this segment will help prevent downstream migration into Boggs Creek.

2.5.2.6 Ditch 3, Segment 5 Sediment

The sediment in Stream Segment 5 (see Figure 2-12) contains slightly greater PCB concentrations than in segments 1 through 4. Removing sediment from this segment will help prevent downstream migration into Boggs Creek.

2.5.2.7 Ditch 3, Segment 6 Sediment (Up- and Down-stream non-TSCA Areas, and Up- and Down-stream TSCA Areas)

Stream Segment 6 (see Figures 2-12 and 2-13) contains significantly greater PCB concentrations than the other stream segments and is estimated to contain approximately one third of total PCB mass in the stream segments. Removal of this mass would represent a substantial reduction in total PCB mass in stream sediments.

2.5.3 Removal of Contaminated Soil From Stream Segment Floodplains

The limits of floodplain soil excavation shown on Figures 2-8 through 2-13 are based on the volume of soil present in the floodplain associated with each of the stream segments, as calculated in Appendix A. Limits of contamination in the floodplain of Boggs Creek Stream Segment 1 and Ditch 3 Stream Segments 2 through 6 were determined using analytical data, topography, photos, and field observations. Table ES-1 identifies excavation volumes and links the various areas and excavation volumes to text, figures, and calculation sheets supporting the volume estimates.

2.5.3.1 Boggs Creek, Segment 1 Floodplain Soil (Ditch 3, Segment 1, Areas 3A and 3B)

Removal of the contaminated soil in the floodplain of this stream segment (see Figure 2-8) will prevent future migration of PCBs into Boggs Creek. The area of contamination on each side of this stream segment is at least 70 percent of the floodplain. Area 3A is subdivided into two sections (3A-1 and 3A-2) each of which must be excavated to a different depth as shown on figure 2-8. The southwestern boundary of 3A-1 makes use of topographical elevations that limit the extent of contaminant transport in stream flow and the drainage channel that forms part of the southwestern boundary to bound the extent of contamination.

2.5.3.2 Ditch 3, Segment 2 Floodplain Soil (Areas 3C, 3D and 3E)

This segment is the most downstream segment of Ditch 3 (see Figure 2-9), so removing contaminated soil from this segment will help prevent downstream migration of PCBs with concentrations greater than 1 mg/kg into Boggs Creek.

The southwestern boundary of Area 3C was drawn after considering observed PCB concentrations and the topography and drainage channel network. Sediment samples collected upgradient of this southwestern boundary at locations 17SW/SD023 and 17SW/SD041 had <1 mg/kg PCBs. Flow in these channels is northward from the south to the main stream channel. The adjacent Northwest Ditch, from the top of Northwest Ditch to soil sampling location 17SB135, is deeply to moderately incised in several places, including the region southeast of soil boring 17SB135. The steep sidewalls of the ditch prevent transport of PCB contamination outside of the ditch. Near 17SB135, however, the stream banks of the Northwest Ditch flatten into the area north of 17SB135 where spread of PCB contaminated soil and sediment is possible and probable. The Area C boundary represents the area beyond which transport of contaminated soil or sediment with concentrations greater than 1 mg/kg is viewed to be improbable based on local topography. All floodplain data east of soil boring 17SB135 indicates that PCB contamination greater than 1 mg/kg has not spread above the 652 ft elevation above means sea level (amsl). Therefore, the eastern boundary of Area 3C was drawn from the Northwest Ditch northward to encompass elevations lower than 652 ft amsl.

The boundary of Area 3D was established based on soil data collected to the east that indicate contamination greater than 1 mg/kg is limited to elevations less than 652 ft amsl. To confirm this, a sample will be collected on the southern edge of the Area D boundary south of 17SB139. See Section 3.2.3 for details.

2.5.3.3 Ditch 3, Segment 3 Floodplain Soil (Area 3F)

A relatively small amount of soil flanking Stream Segment 3 contains PCB concentrations greater than 1 mg/kg to bedrock (see Figure 2-10). The contamination boundary shown in Figure 2-10 was drawn based on the available data that suggest the contamination in Area 3F is isolated. Specifically, all locations sampled over about 300 ft of floodplain parallel to the stream channel had <1 mg/kg PCBs except for three samples located in stretch of floodplain about 15 ft long. To confirm the western and eastern boundaries, however, confirmation sampling will be conducted on the western and eastern boundaries as described in Section 3.2.3. Removing this volume of soil will help prevent downstream migration of PCBs into Boggs Creek.

2.5.3.4 Ditch 3, Segment 4 Floodplain Soil (Areas 3G, 3H and 3I)

Three areas of soil flanking Stream Segment 4 contain PCBs at concentrations greater than 1 mg/kg (see Figure 2-11). One of these areas, 3H, contains soil with PCB concentrations greater than 50 mg/kg and must be managed as Toxic Substance Control Act (TSCA) waste. Removing sediment from this segment will help significantly limit PCB migration into Boggs Creek.

2.5.3.5 Ditch 3, Segment 5 Floodplain Soil (Areas 3J, 3K, 3L, 3M, and 3N)

The relatively large areas of soil flanking Stream Segment 5 (see Figure 2-12) contain a large proportion of the total floodplain PCB mass based on the concentrations and area of contamination. Area 3J includes an oxbow. The boundary of the oxbow was made larger than the oxbow to ensure that the deepest soil PCB contamination greater than 1 mg/kg would be removed from this excavation. The northern boundary of Area 3J was based on topography and nearby PCB concentration data that indicate the contamination is limited to elevations within the prescribed excavation boundary.

The lateral western boundary of Area 3K was terminated along a line perpendicular to the stream channel and included boring 17SB296 because that boring had <1 mg/kg total PCBs. Topography and spatial contamination patterns were considered. These factors indicated that the contaminated area had been delineated west of 17SB297. For example, no total PCB concentration greater than 1 mg/kg was detected south of this stream segment at an elevation greater than about 703 ft amsl. Extension to boring 17SB295 is not necessary based on the overall contamination pattern. The lateral eastern boundary was terminated along a line that connects boring 17SB198 and the stream. This line, which is perpendicular to the stream, separates a non-TSCA and TSCA excavation areas.

In Area 3L, the PCB concentrations exceed the TSCA limit of 50 mg/kg. Removing soil from this segment will significantly reduce the total mass of PCBs in floodplain soil and help prevent downstream migration of PCBs into Boggs Creek. To ensure all unacceptable contamination is removed, a confirmation sample will be collected along the southern and eastern walls of Area 3L. The details of sampling and continued excavation, if necessary, are described in Section 3.2.3.

2.5.3.6 Ditch 3, Segment 6 Floodplain Soil (Areas 3O and 3P)

Two areas, 3O and 3P, of the Stream Segment 6 floodplain (see Figures 2-12 and 2-13) contain PCBs in excess of 1 mg/kg. This segment is nearest to a presumed historical PCB source that no longer exists and removal of contaminated soil in these two areas is expected significantly reduce the potential for migration of PCBs into Boggs Creek. The prescribed excavation boundaries were based on available PCB data and topography. Confirmation sampling will occur, however, in accordance with Section 3.2.3.

2.5.4 Building Areas

Although select areas around SWMU 17 buildings have been excavated to a maximum depth of 3 feet, some residual PCB contamination remains, especially near the SWMU 17 Dump/Fill Area. The areas requiring additional excavation are described below. Table ES-1 identifies excavation volumes and links the various areas and excavation volumes to text, figures, and calculation sheets supporting the volume estimates.

2.5.4.1 Dump/Fill Area, Near Building 3072 (Area 4A)

Figures 2-14 and 2-15 show PCB concentrations measured in exploratory trenches and soil borings used to delineate the extent of buried debris and PCB-contaminated soil in the SWMU 17 Dump/Fill Area. PCB analyses were conducted on soil removed from the trenches during test pitting. If a trench contained less than 1 mg/kg PCBs at all depths, the rectangle representing the trench on Figure 2-14 is colored green to signify that the trench is not significantly contaminated. If the PCB concentration in any depth interval within a trench exceeded 1 mg/kg PCBs, the rectangle representing the trench is colored orange (1 to 50 mg/kg total PCBs) or red (≥ 50 mg/kg total PCBs). A tag is attached to all rectangles colored orange or red on Figure 2-14 to identify the PCB concentrations as a function of depth interval for the respective trenches. After trenching, soil borings were installed to more completely delineate the PCB contamination in soil (see Figure 2-15). It is estimated that approximately 60 percent of the Area 4A soil volume with PCB concentrations greater than 1 mg/kg could also be greater than 50 mg/kg PCBs. Area 4A is subdivided into 10 subareas labeled 4A-1 through 4A-10. Each subarea represents an excavation depth

and/or PCB contamination level significantly different than adjacent subareas (refer to Figures 2-14 and 2-15). About 90 ft of the Northwest Ditch is included in Area 4A.

The debris in Area 4A is primarily limited to the level portion of the Dump/Fill Area and the uppermost 40 feet of the Northwest Ditch. A minor amount of sparsely distributed debris extends about 150 feet downstream from the Dump/Fill Area. The major area of debris will be excavated as part of the Dump/Fill Area and the remaining, sparsely distributed debris, will be removed as a separate Northwest Ditch sediment removal.

2.5.4.2 Previous TolTest Excavation Area C (Areas 4B and 4B-50)

Surface and subsurface soil must be removed from these areas to attain a PCB concentration less than 1 mg/kg in the surface and subsurface throughout the areas. Area 4B is subdivided into four areas (4B-1, 4B-2, 4B-3, and 4B-50), each of which represents a different excavation depth or contamination level than adjacent areas as show on figure 2-16. Subareas 4B-1, 4B-2, and 4-B3 contain non-TSCA level contamination. The excavation volumes presented in Table ES-1 assume the goal is to achieve less than 1 mg/kg PCBs in both surface and subsurface of these areas. Sampling locations of Area 4B-50, where subsurface soil currently exceeds 50 mg/kg PCBs at the bottom of the previous excavation, are marked on Figure 2-16. The surface soil between 0 and 2 ft bgs is clean fill except in a small area, Area 4B-3. Because the past excavations were installed to a depth of 2 feet, and clean fill was used to fill the excavations, excavation will begin at a depth of 1.5 ft bgs after removing the top 1.5 ft of clean material except in Area 4B-3. In subarea 4B-1 the excavation will extend from 1.5 to 3 ft bgs; in subarea 4B-2 the excavation will extend from 1.5 to 4 ft bgs; in subarea 4B-50 the excavation will extend from 1.5 ft to bedrock which is about 4 ft deep; in Area 4B-3 the excavation will extend form surface to 4 ft bgs.

2.5.4.3 Northeast of Previous TolTest Excavation Area D (Area 4C)

Surface soil, where PCB concentrations range from less than 1 mg/kg to slightly greater than 1 mg/kg must be removed from this area to a depth of 2.5 feet bgs (See Figure 2-17). Subsurface soil removal is not planned as bedrock is generally less than 3 feet deep and contamination greater than 1 mg/kg was not detected below 2.0 ft bgs. Sampling from the bottom of the previous TolTest excavation indicate that there is a small amount of residual PCB contamination at a depth of about 2 ft bgs but more recent sampling in the 2 to 4 ft interval indicated that concentrations in that interval are less than 1 mg/kg. Detection limits were typically less than 0.01 mg/kg PCBs. This removal will require removal of some of the clean fill that was emplaced by TolTest after the previous excavation but the cost of excavating only surface soil and slightly into surface soil is expected to outweigh the cost of removing clean surface fill

that is already in place and excavating deeper to remove residual PCB contamination to less than 1 mg/kg.

2.5.4.4 Area Near Southwest Corner of Building 2721 (Area 4D)

Surface soil with a PCB concentration greater than 50 mg/kg over an area of approximately 270 sq. ft. must be removed from this area to a depth of 2 feet bgs. Removal of this soil is designed to reduce surface soil concentrations to less than 1 mg/kg PCBs. Subsurface soil removal is not planned as contamination greater than 1 mg/kg was not detected in the subsurface. Detection limits were less than 0.01 mg/kg PCBs. Figure 2-13 identifies Area 4D.

PGH:P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU17_TOLTEST IMWP AREA.MXD 6/21/2012 JN

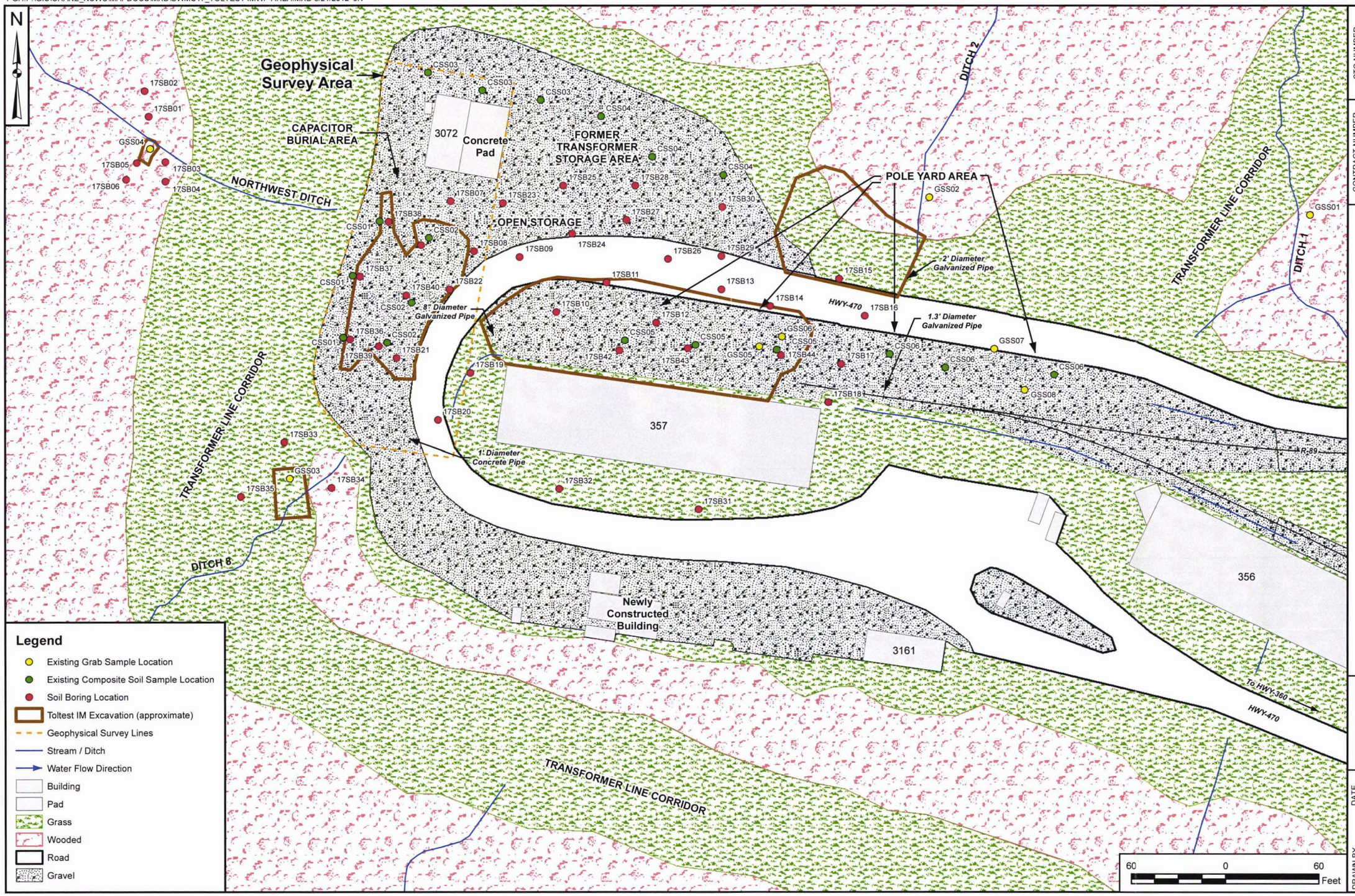


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FIGURE NO. 2-1
REV 0

2004 INTERIM MEASURES EXCAVATION AREAS
SWMU17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA, CRANE
CRANE, INDIANA

NAVFAC

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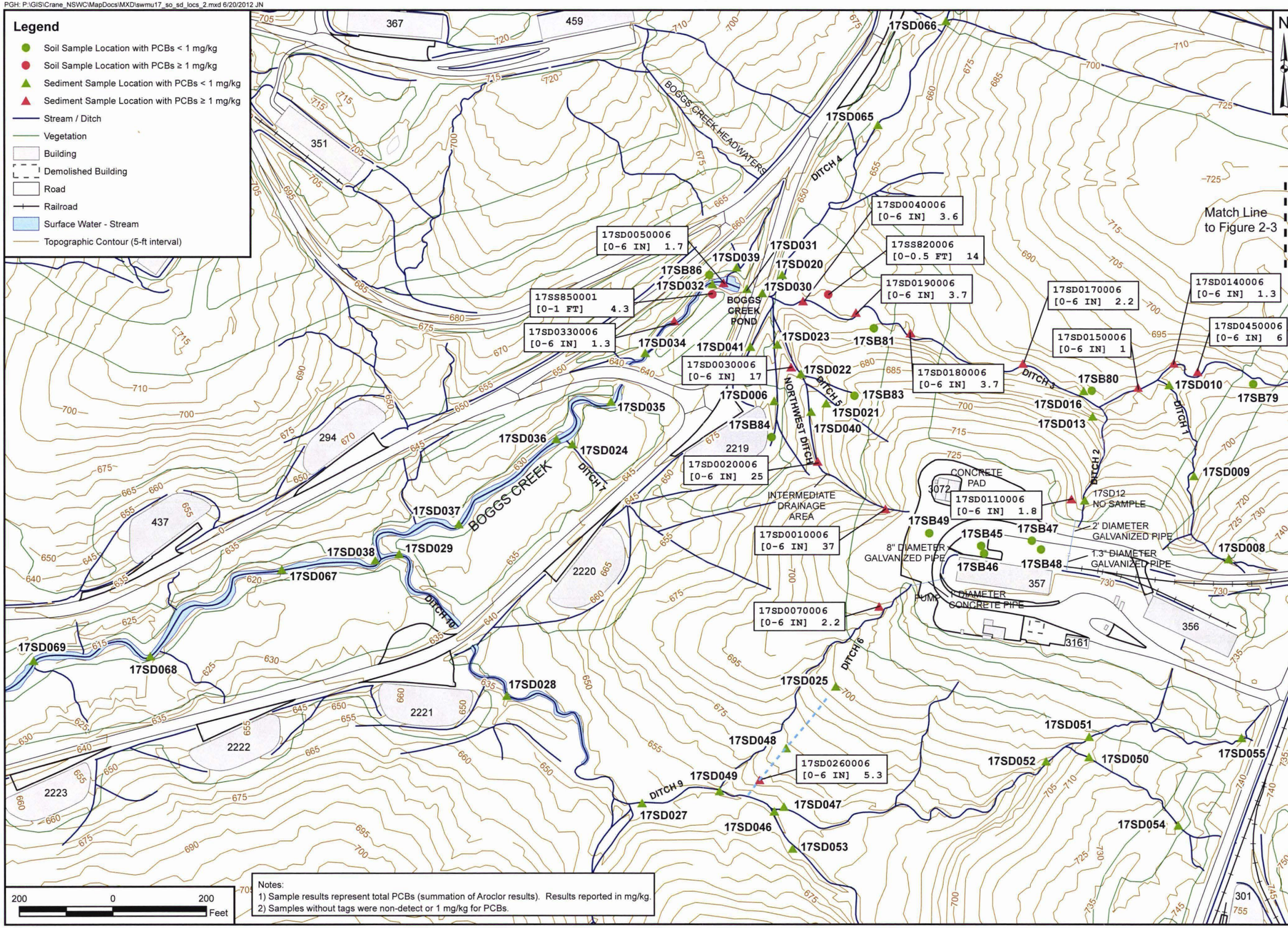
CHECKED BY T. JOHNSTON DATE 06/21/12
REVISED BY — DATE —
SCALE AS NOTED

PGH: P:\GIS\Crane_NSWC\MapDocs\MXD\swmu17_so_sd_locs_2.mxd 6/20/2012 JN



Notes:
1) Sample results represent total PCBs (summation of Aroclor results). Results reported in mg/kg.
2) Samples without tags were non-detect or 1 mg/kg for PCBs.

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CTO F271

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FIGURE NO. 2-2
REV 0

TETRA TECH 2005 AND 2006 FIELD INVESTIGATIONS
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

NAVFAC

	DATE
DRAWN BY S. STROZ	05/03/11
CHECKED BY T. JOHNSTON	06/20/12
REVISED BY J. NOVAK	06/20/12

SCALE AS NOTED

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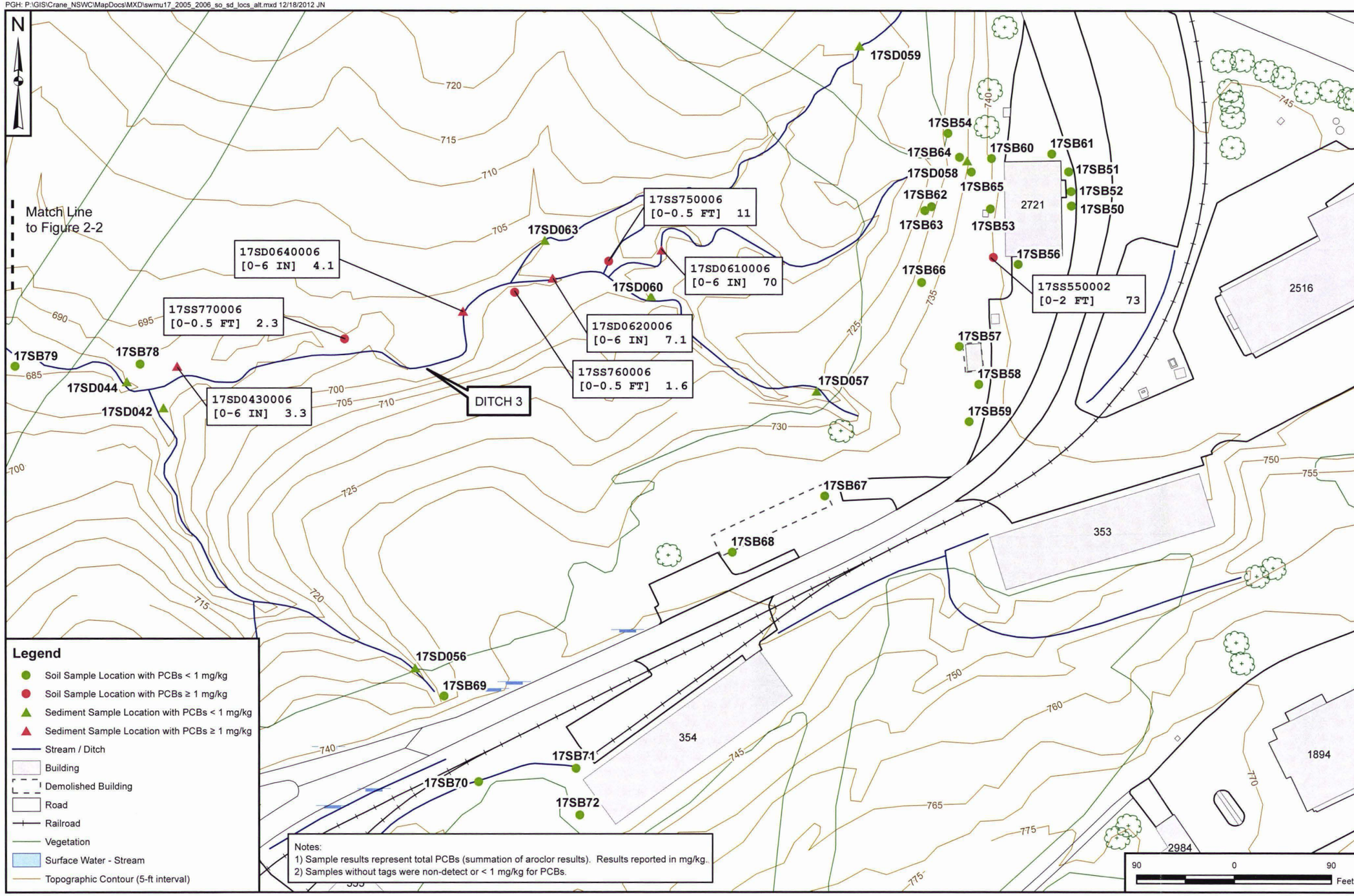

Notes:
1) Sample results represent total PCBs (summation of aroclor results). Results reported in mg/kg.
2) Samples without tags were non-detect or < 1 mg/kg for PCBs.

CONTRACT NUMBER F271

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FIGURE NO. 2-3

REV 1

TETRA TECH 2005 AND 2006 FIELD INVESTIGATIONS
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY S. STROZ DATE 05/02/11

CHECKED BY T. JOHNSTON DATE 12/18/12

REVISED BY J. NOVAK DATE 12/18/12

SCALE AS NOTED

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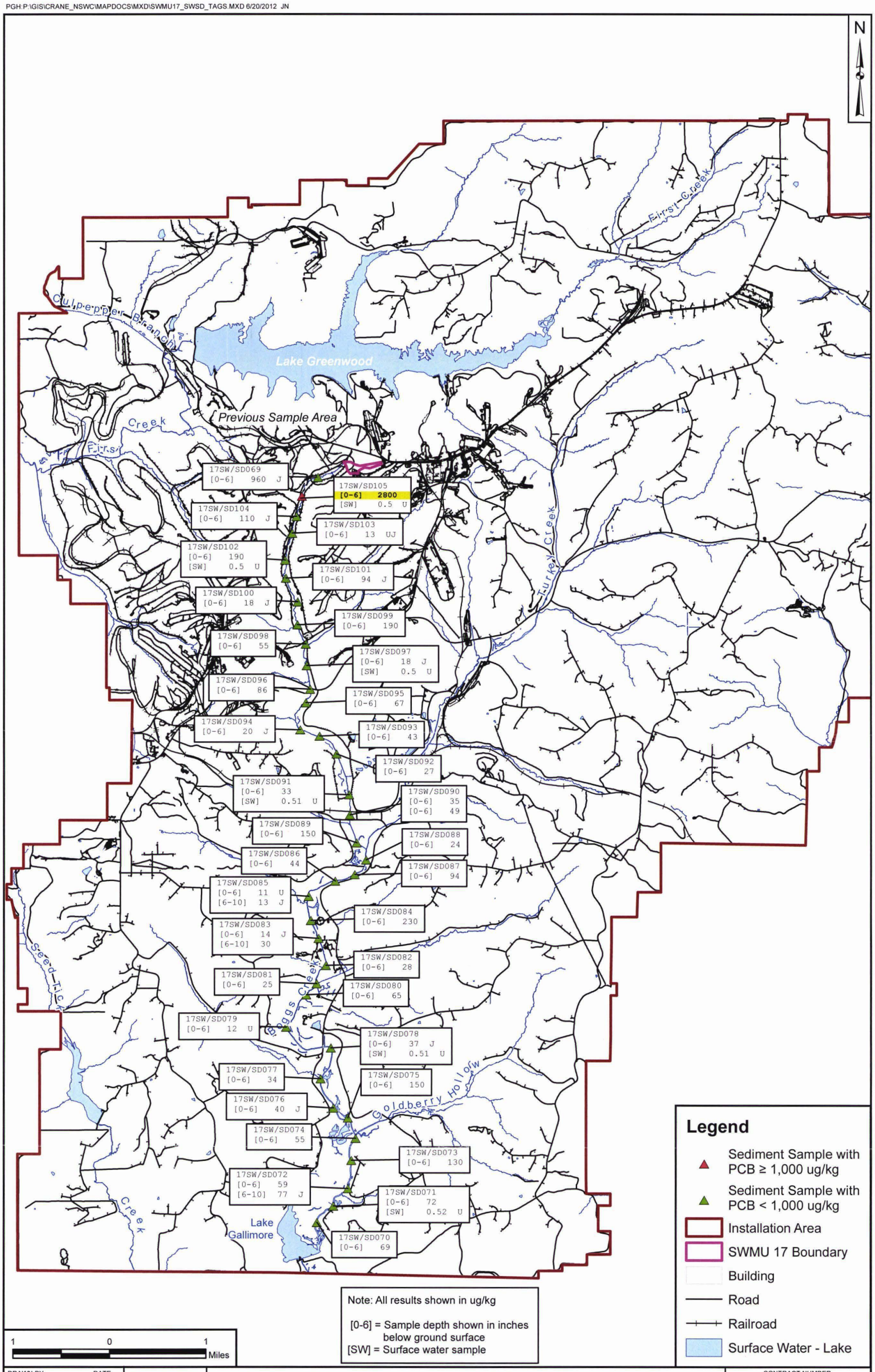

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T. WHEATON	05/21/10	F271
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REVISED BY	DATE	APPROVED BY / DATE
J. NOVAK	06/20/12	
SCALE		FIGURE NO. / REV
AS NOTED		2-4 / 0

NAVFAC

2005/2006FIELD INVESTIGATION SAMPLE RESULTS - BOGGS CREEK DETAIL
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

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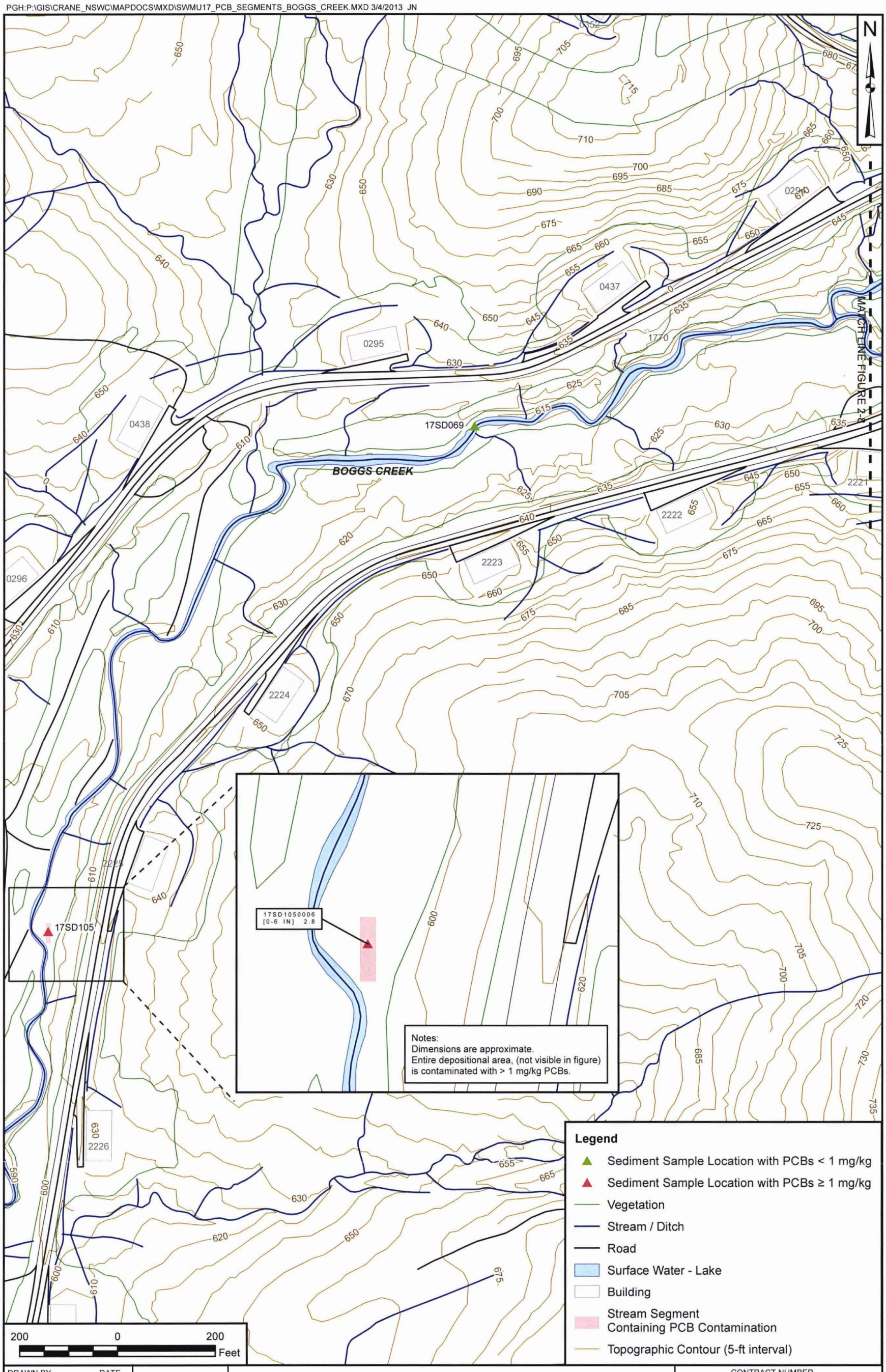

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T. JOHNSTON	06/20/12
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J. NOVAK	06/20/12
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EXTENT OF CONTAMINATION NEAR SEDIMENT SAMPLING LOCATION 17SD105
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

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APPROVED BY	DATE
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FIGURE NO. 2-5	REV 0

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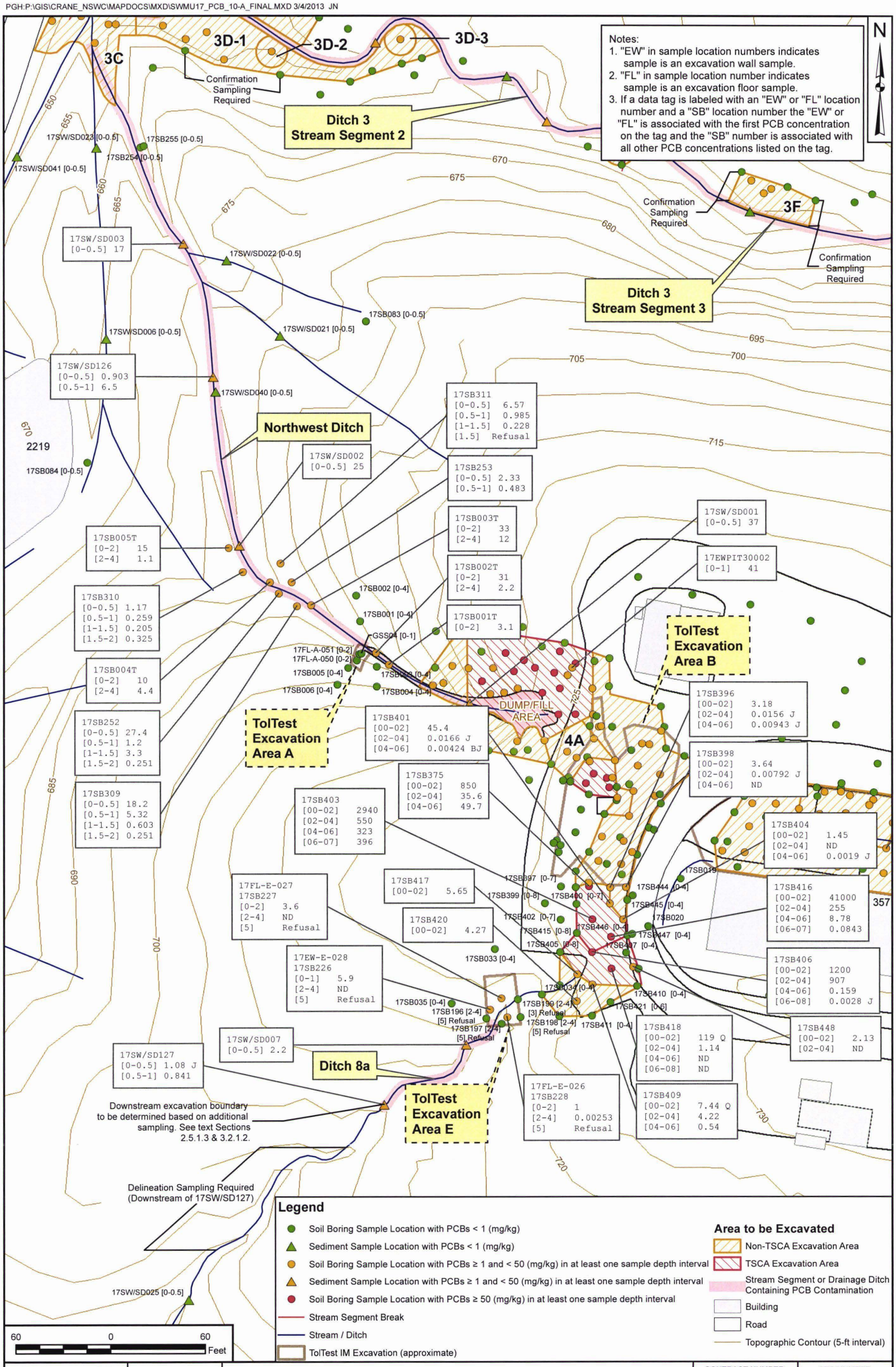

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T. JOHNSTON	3/4/2013
REVISED BY	DATE
J. NOVAK	3/4/2013
SCALE	
AS NOTED	

NAVFAC

2005-06-11-12 TOTAL PCB CONCENTRATIONS GREATER THAN 1 mg/kg
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

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APPROVED BY	DATE
—	—
FIGURE NO. 2-6	REV 0

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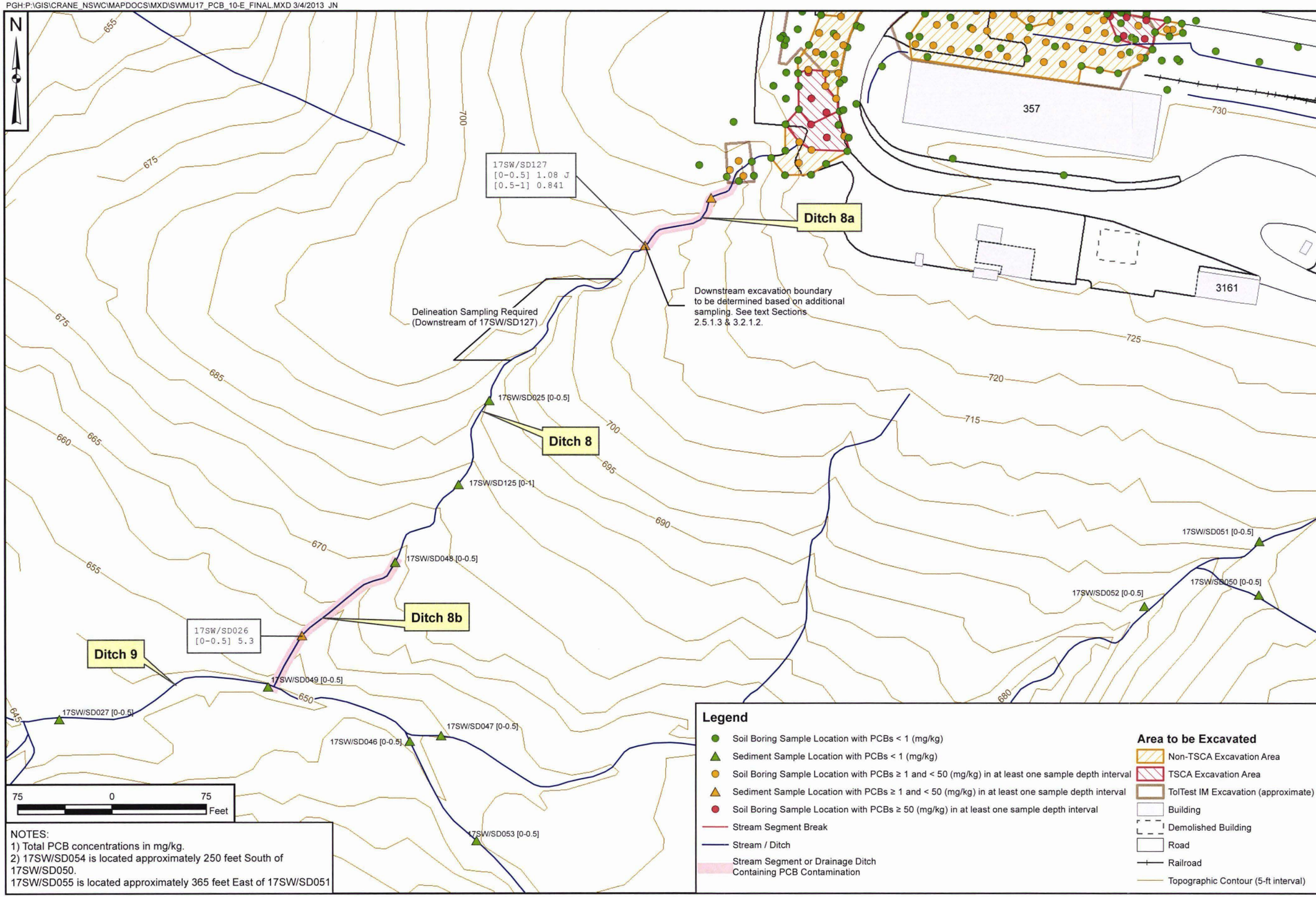

NOTES:
1) Total PCB concentrations in mg/kg.
2) 17SW/SD054 is located approximately 250 feet South of 17SW/SD050.
17SW/SD055 is located approximately 365 feet East of 17SW/SD051

CONTRACT NUMBER
CTO F271

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FIGURE NO. 2-7

REV 0

2005-06-11-12 PCB CONCENTRATIONS IN DITCH 8
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

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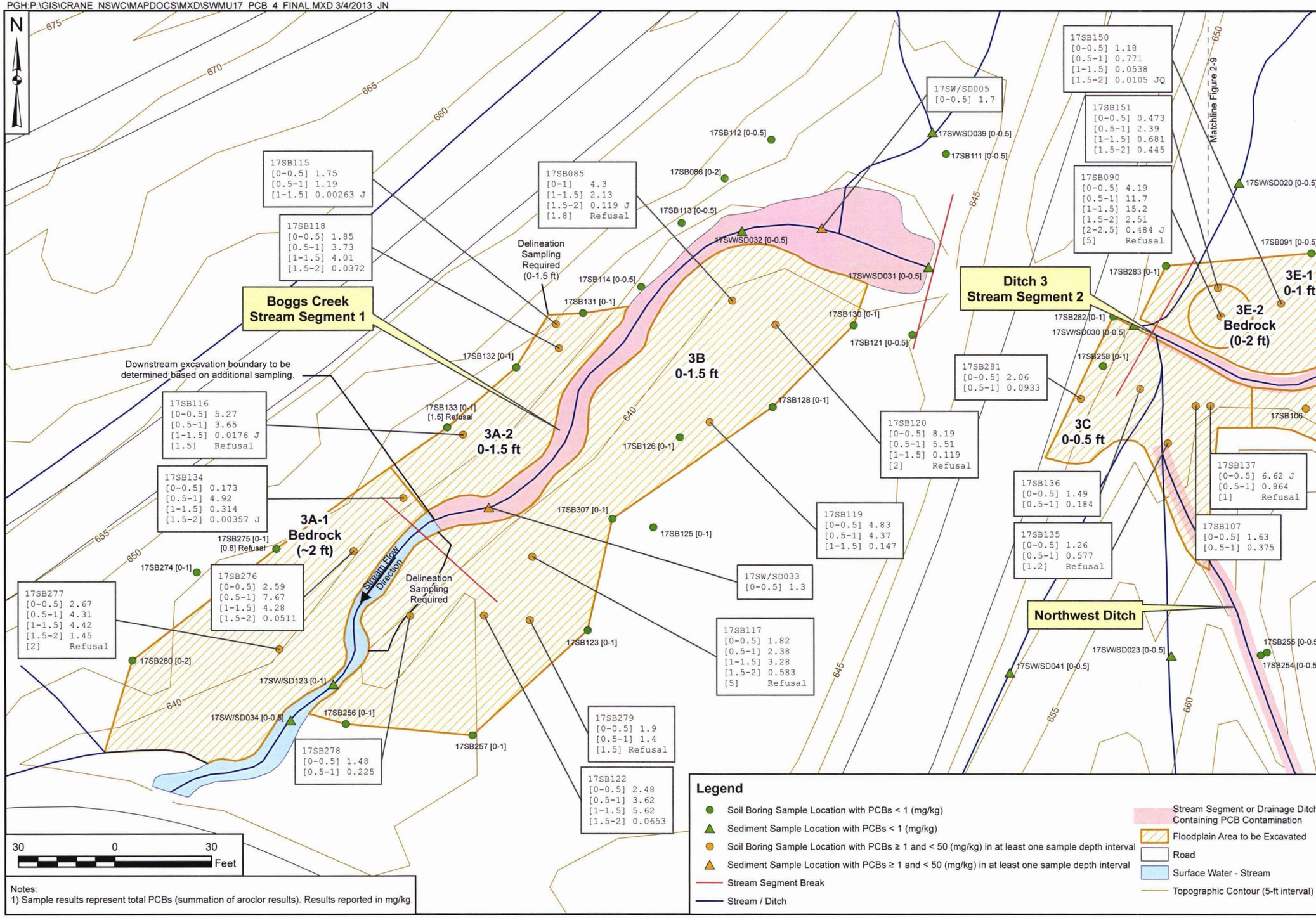

Notes:
1) Sample results represent total PCBs (summation of aroclor results). Results reported in mg/kg.

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FIGURE NO. 2-8

REV 0

2005-06-11-12 SAMPLE RESULTS-STREAM SEGMENT 1
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

NAVFAC

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		REVISED BY J. NOVAK	DATE 3/4/2013	

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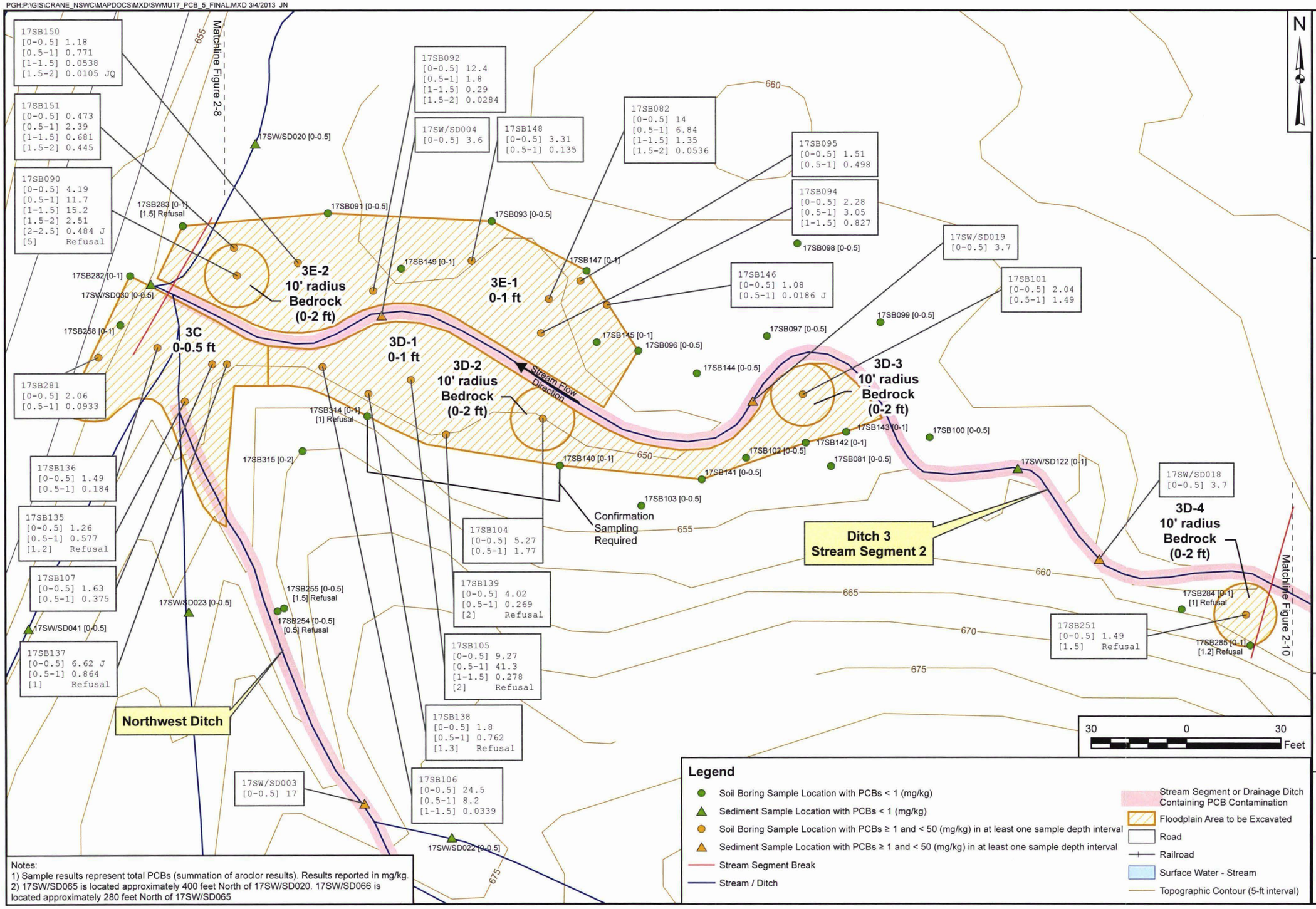

Notes:
1) Sample results represent total PCBs (summation of aroclor results). Results reported in mg/kg.
2) 17SW/SD065 is located approximately 400 feet North of 17SW/SD020. 17SW/SD066 is located approximately 280 feet North of 17SW/SD065

CONTRACT NUMBER
CTO F271

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FIGURE NO. 2-9

REV 0

2005-06-11-12 SAMPLE RESULTS - STREAM SEGMENT 2
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

NAVFAC

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CHECKED BY T. JOHNSTON	DATE 3/4/2013	
REVISED BY J. NOVAK	DATE 3/4/2013	SCALE AS NOTED

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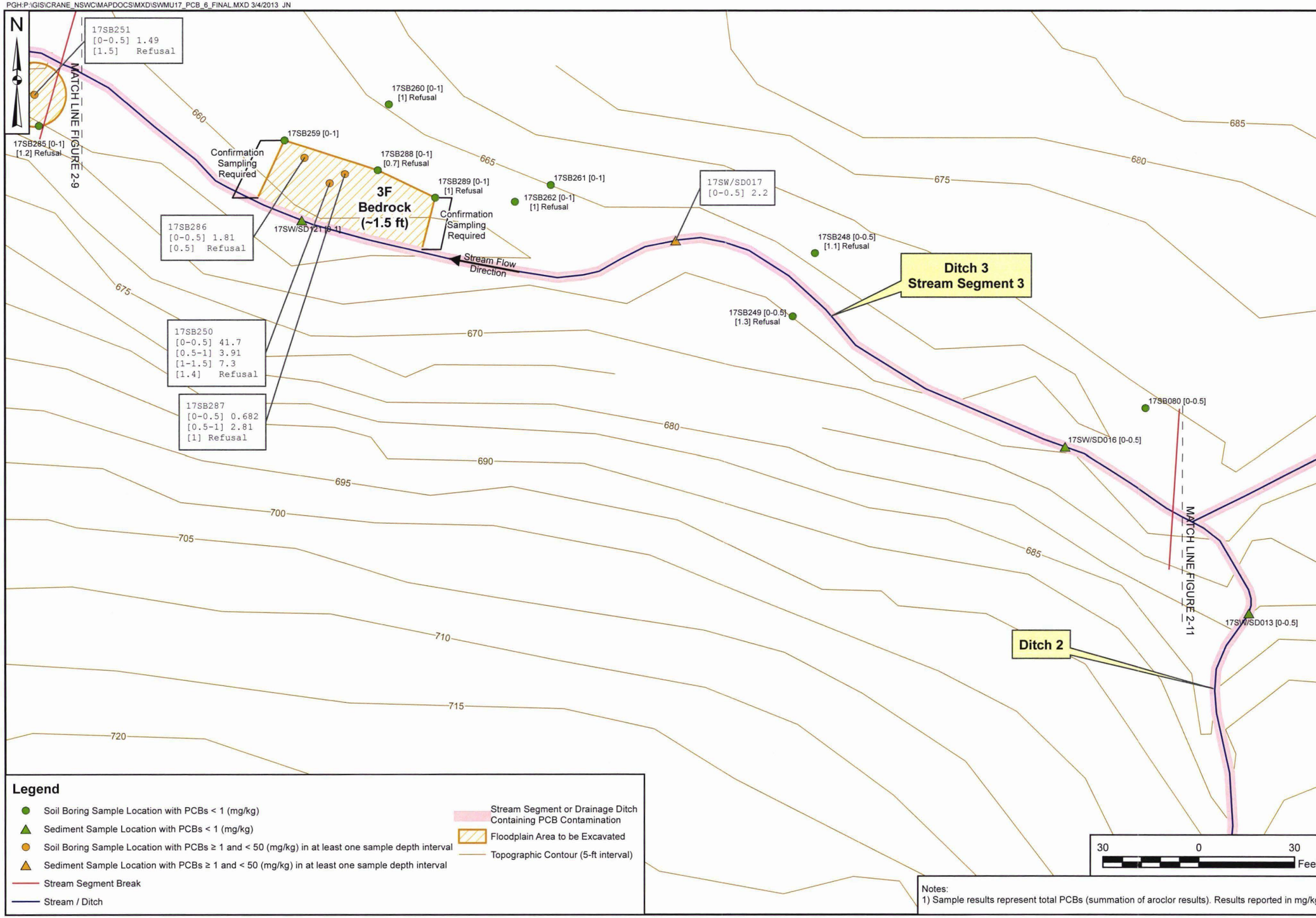

Legend

- Soil Boring Sample Location with PCBs < 1 (mg/kg)
- Sediment Sample Location with PCBs < 1 (mg/kg)
- Soil Boring Sample Location with PCBs ≥ 1 and < 50 (mg/kg) in at least one sample depth interval
- Sediment Sample Location with PCBs ≥ 1 and < 50 (mg/kg) in at least one sample depth interval
- Stream Segment Break
- Stream / Ditch
- Stream Segment or Drainage Ditch Containing PCB Contamination
- Floodplain Area to be Excavated
- Topographic Contour (5-ft interval)

Notes:
1) Sample results represent total PCBs (summation of aroclor results). Results reported in mg/kg.

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FIGURE NO. 2-10

REV 0

2005-06-11-12 SAMPLE RESULTS - STREAM SEGMENT 3
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

NAVFAC

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REVISED BY J. NOVAK	DATE 3/4/2013
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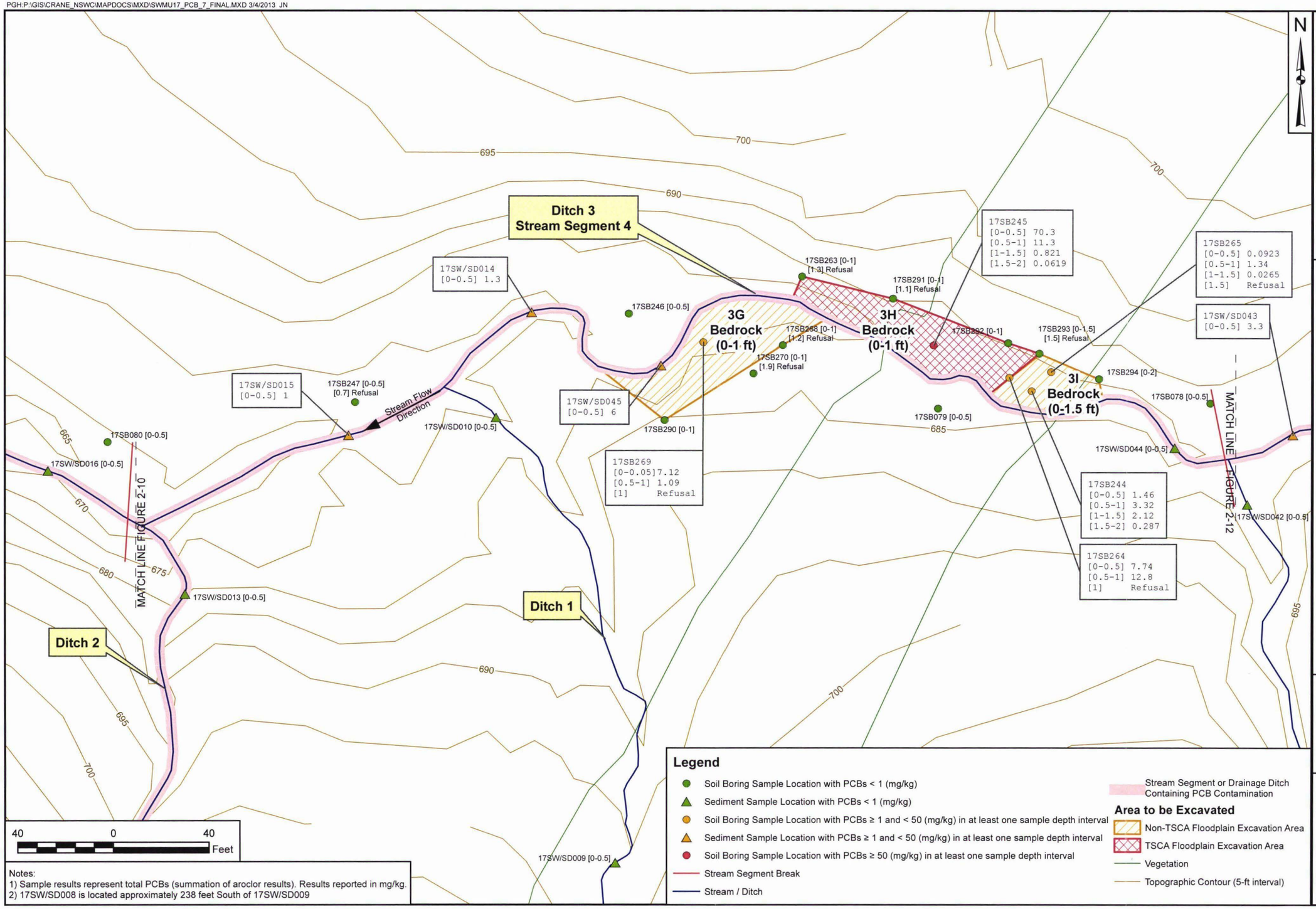

Notes:
1) Sample results represent total PCBs (summation of aroclor results). Results reported in mg/kg.
2) 17SW/SD008 is located approximately 238 feet South of 17SW/SD009

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CTO F271

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REV 0

FIGURE NO. 2-11

2005-06-11-12 SAMPLE RESULTS - STREAM SEGMENT 4
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

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REVISED BY J. NOVAK	DATE 3/4/2013	
SCALE AS NOTED		

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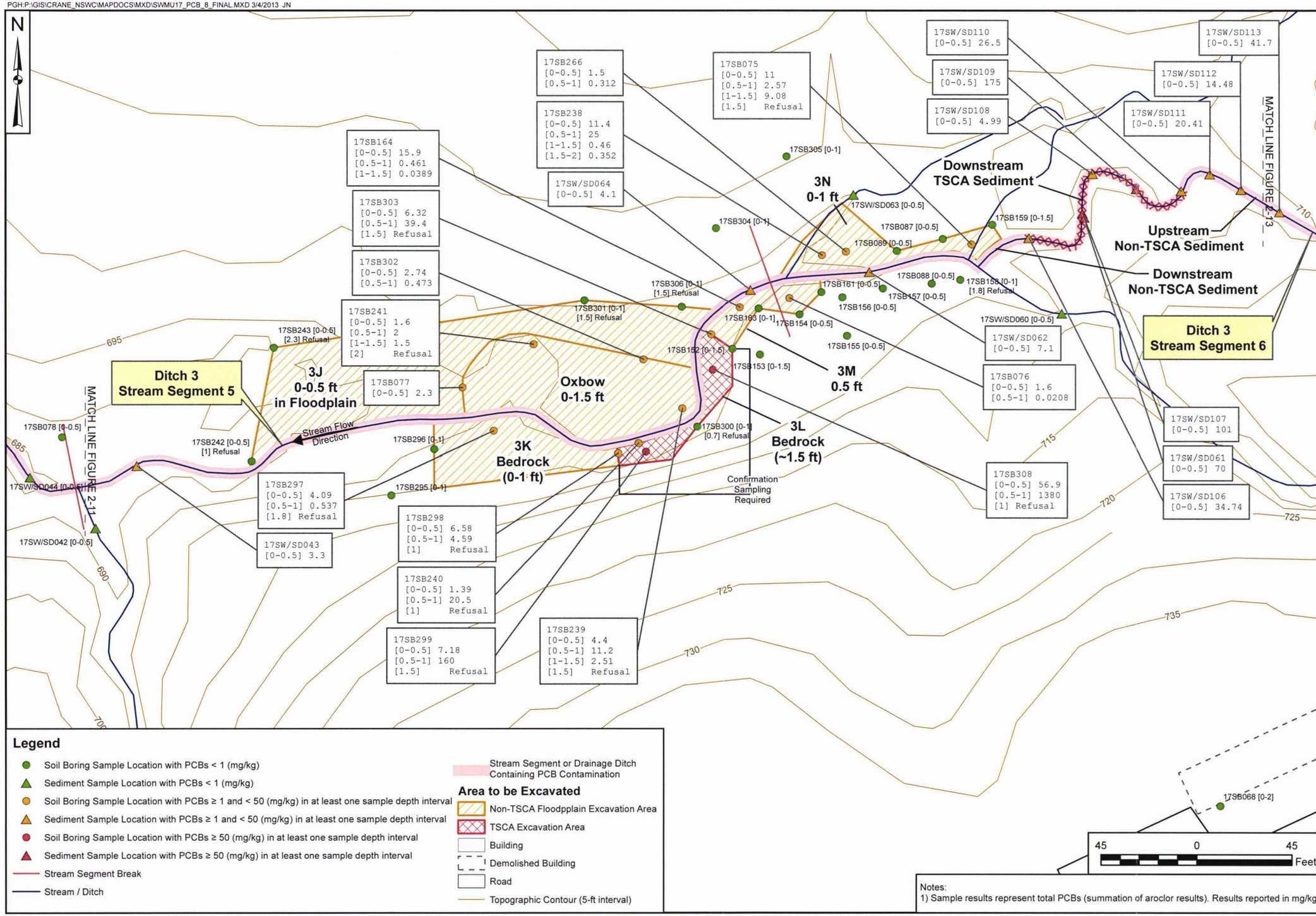

Notes:
1) Sample results represent total PCBs (summation of aroclor results). Results reported in mg/kg.

CONTRACT NUMBER CTO F271

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FIGURE NO. 2-12

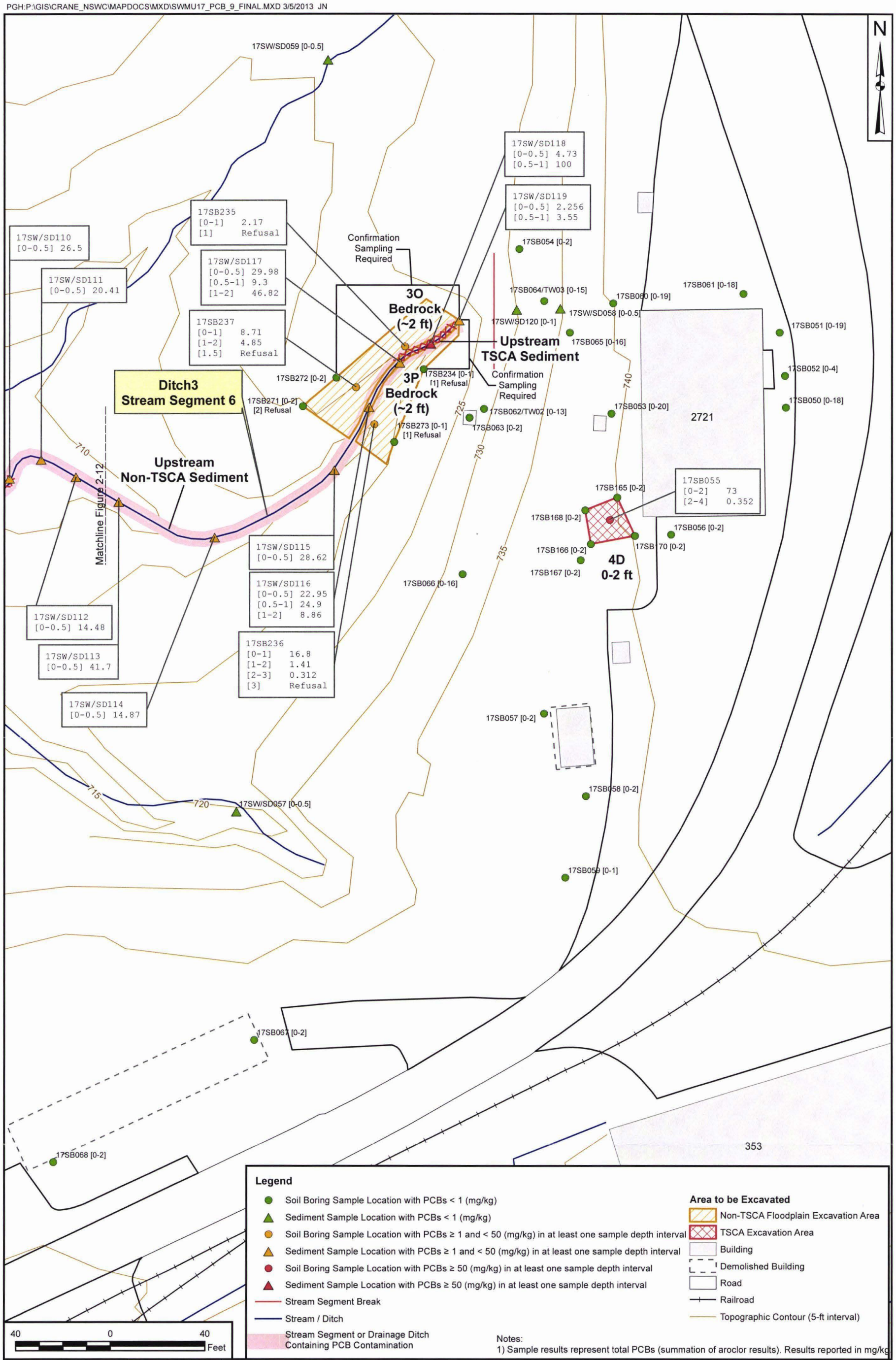
REV 0

2005-06-11-12 SAMPLE RESULTS - STREAM SEGMENTS 5 AND 6
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURE WORK PLAN
NSA CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY J. NOVAK	DATE 5/24/2012
CHECKED BY T. JOHNSTON	DATE 3/4/2013
REVISED BY J. NOVAK	DATE 3/4/2013
SCALE AS NOTED	

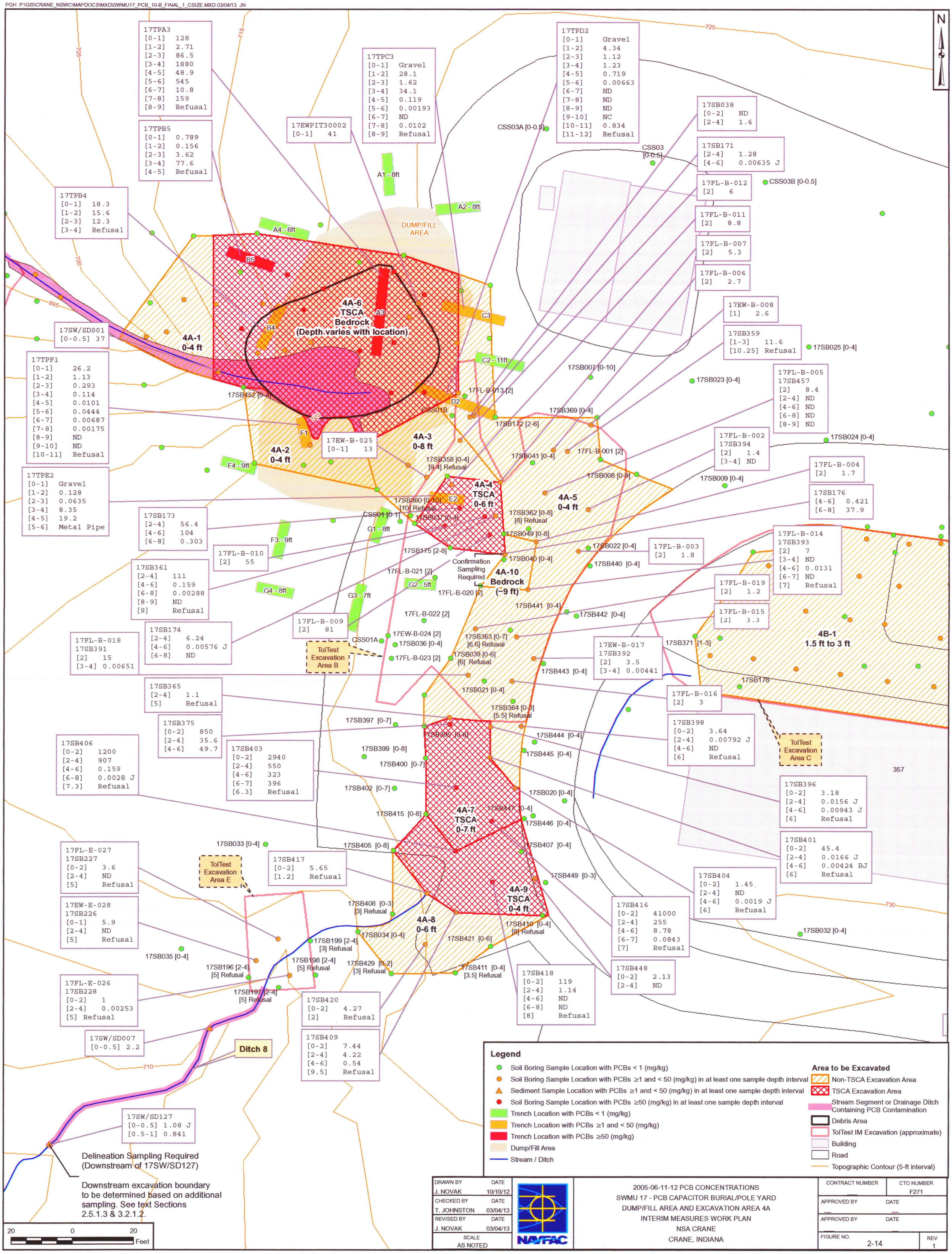
PGH:P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU17_PCB_9_FINAL.MXD 3/5/2013 JN



Notes:
1) Sample results represent total PCBs (summation of aroclor results). Results reported in mg/kg

DRAWN BY J. NOVAK	DATE 5/24/2012	2005-06-11-12 SAMPLE RESULTS - STREAM SEGMENT 6 SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD INTERIM MEASURES WORK PLAN NSA CRANE CRANE, INDIANA	CONTRACT NUMBER — / CTO NUMBER F271
CHECKED BY T. JOHNSTON	DATE 3/5/2013		APPROVED BY — / DATE —
REVISED BY J. NOVAK	DATE 3/5/2013		APPROVED BY — / DATE —
SCALE AS NOTED	NAVFAC		FIGURE NO. 2-13 / REV 0

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU17_PCB_10-B_FINAL_1_CSIZE.MXD 03/04/13 JN



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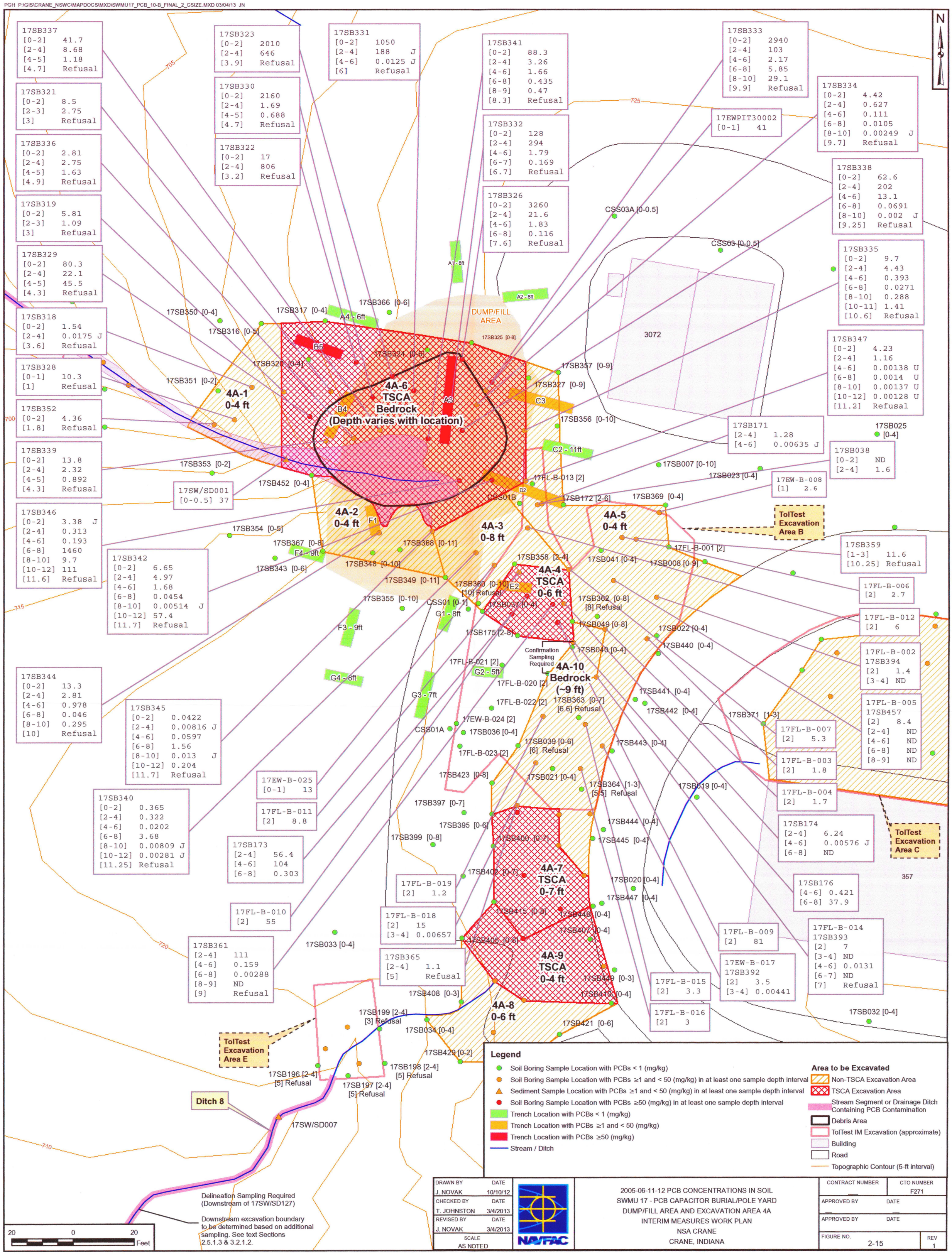
J. NOVAK	10/10/12
CHECKED BY	DATE
T. JOHNSTON	03/04/13
REVISED BY	DATE
J. NOVAK	03/04/13
SCALE	
AS NOTED	

NAVFAC

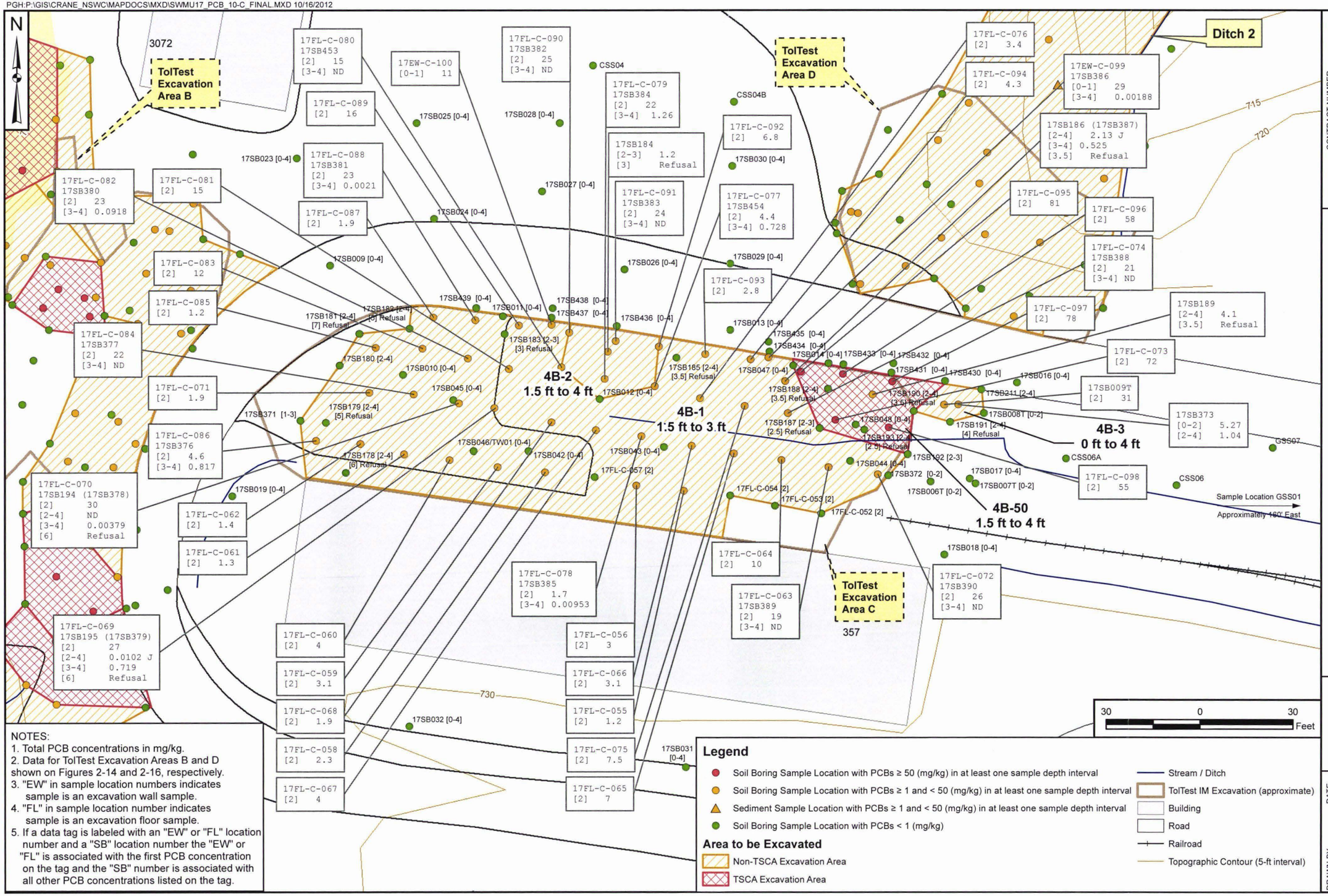
2005-06-11-12 PCB CONCENTRATIONS
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
DUMP/FILL AREA AND EXCAVATION AREA 4A
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
—	F271
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO.	REV
2-14	1

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU17_PCB_10-B_FINAL_2_CSIZE.MXD 03/04/13 JN



PGH:P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU17_PCB_10-C_FINAL.MXD 10/16/2012



NOTES:
1. Total PCB concentrations in mg/kg.
2. Data for TolTest Excavation Areas B and D shown on Figures 2-14 and 2-16, respectively.
3. "EW" in sample location numbers indicates sample is an excavation wall sample.
4. "FL" in sample location number indicates sample is an excavation floor sample.
5. If a data tag is labeled with an "EW" or "FL" location number and a "SB" location number the "EW" or "FL" is associated with the first PCB concentration on the tag and the "SB" number is associated with all other PCB concentrations listed on the tag.

Legend

- Soil Boring Sample Location with PCBs ≥ 50 (mg/kg) in at least one sample depth interval
- Soil Boring Sample Location with PCBs ≥ 1 and < 50 (mg/kg) in at least one sample depth interval
- Sediment Sample Location with PCBs ≥ 1 and < 50 (mg/kg) in at least one sample depth interval
- Soil Boring Sample Location with PCBs < 1 (mg/kg)

Area to be Excavated

- Non-TSCA Excavation Area
- TSCA Excavation Area
- Stream / Ditch
- TolTest IM Excavation (approximate)
- Building
- Road
- Railroad
- Topographic Contour (5-ft interval)

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FIGURE NO. 2-16

REV 0

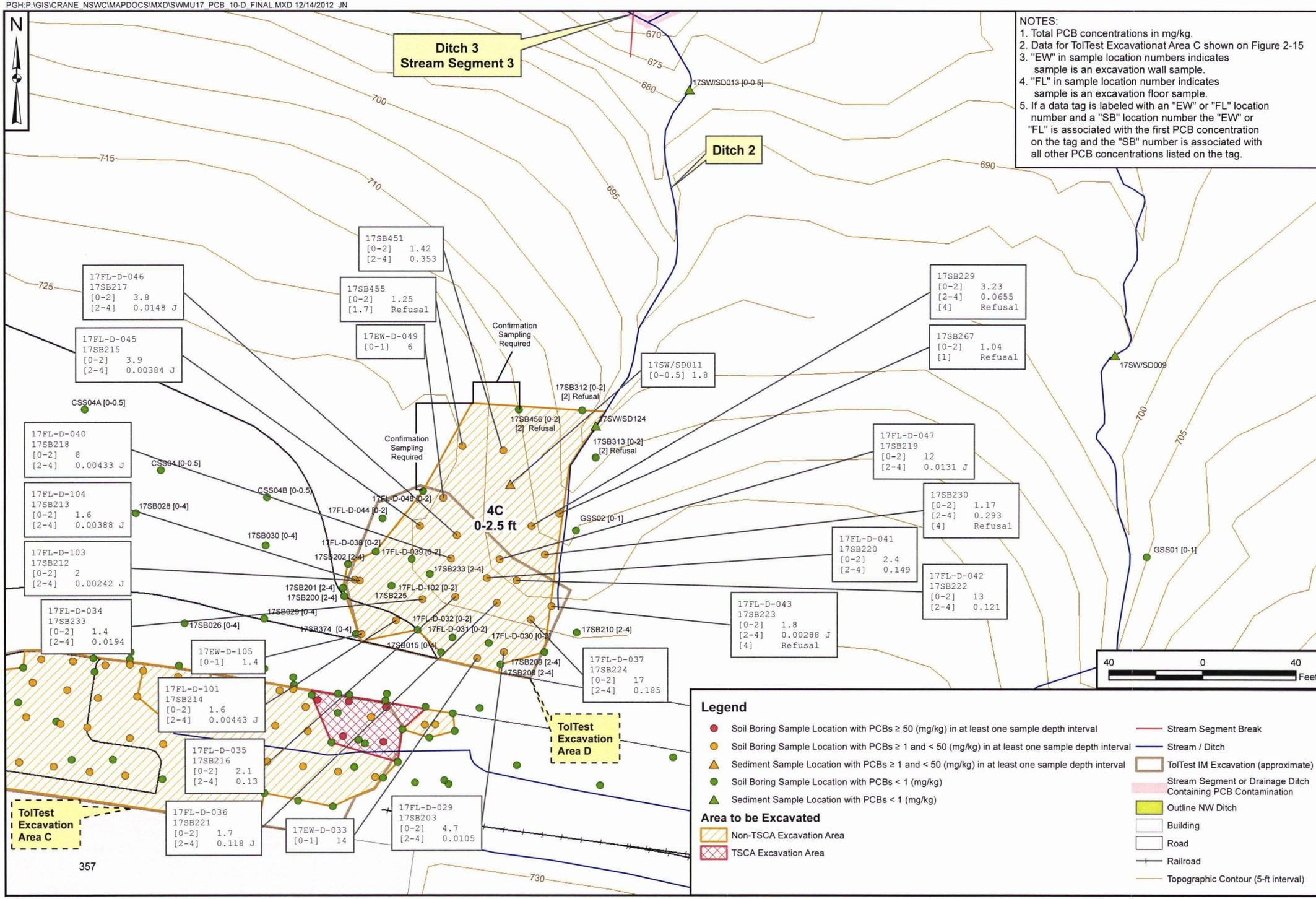
PREVIOUS TOLTEST EXCAVATION AREA C RESIDUAL PCB CONCENTRATIONS AND 2012 PCB CONCENTRATIONS
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD EXCAVATION AREA 4B
INTERIM MEASURE WORK PLAN
NSA CRANE
CRANE, INDIANA

NAVFAC

		DATE
DRAWN BY	J. NOVAK	5/31/2012
CHECKED BY	T. JOHNSTON	10/16/2012
REVISED BY	J. NOVAK	10/16/2012

SCALE AS NOTED

PGH:P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU17_PCB_10-D_FINAL.MXD 12/14/2012 JN



NOTES:
1. Total PCB concentrations in mg/kg.
2. Data for TolTest Excavationat Area C shown on Figure 2-15
3. "EW" in sample location numbers indicates sample is an excavation wall sample.
4. "FL" in sample location number indicates sample is an excavation floor sample.
5. If a data tag is labeled with an "EW" or "FL" location number and a "SB" location number the "EW" or "FL" is associated with the first PCB concentration on the tag and the "SB" number is associated with all other PCB concentrations listed on the tag.

CONTRACT NUMBER
CTO F271

APPROVED BY — DATE —

APPROVED BY — DATE —

FIGURE NO. 2-17

REV 1

PREVIOUS TOLTEST EXCAVATION AREA D RESIDUAL PCB CONCENTRATIONS AND 2012 PCB CONCENTRATIONS
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD EXCAVATION AREA 4C
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY J. NOVAK	DATE 5/31/2012	
CHECKED BY T. JOHNSTON	DATE 12/14/2012	
REVISED BY J. NOVAK	DATE 12/14/2012	SCALE AS NOTED

3.0 INTERIM MEASURES WORK PLAN

The interim measure for the floodplains, ditches, and streams at SWMU 17 includes the excavation and off-site disposal of contaminated soils and sediments within the limits and downgradient of SWMU 17. The intent of this IMWP is to describe the performance standards and associated requirements for removal and off-site disposal of contaminated soil and sediment from the downgradient drainage ditches, streams, floodplains, and SWMU 17 building areas so that PCBs will no longer have the potential to migrate downstream and affect human and ecological receptors.

The IM Implementation Contractor (Contractor) should be aware that the Navy may elect to implement this IMWP in phases. To accommodate this possibility, the excavation volumes reported in this IMWP are presented in a manner that allows the Navy to direct the Contractor to perform individual tasks (i.e., phases). In the event this IMWP is implemented in phases, the Navy will indicate the individual tasks of this IMWP to be implemented.

When estimating ditch and stream sediment removal volumes, average channel widths were used. When performing the actual sediment removal, however, all stream bottom sediments for the entire stream width must be excavated along the length of channel designated for excavation. Segregation of TSCA level waste (i.e., > 50 mg/kg total PCBs) and non-TSCA waste (<50 mg/kg total PCBs) and preventing TSCA level contamination from mixing with lesser contaminated materials are requirements of this work plan. Furthermore, erosion and sediment control devices are to be used in a way that ensures segregation of TSCA from non-TSCA wastes and prevents contamination of non-TSCA areas with TSCA level contamination. The more contaminated of drainage channel sediments generally occur near the upper elevations. To prevent recontamination of already excavated areas, removal of higher elevation contamination before removing lower elevation contamination is expected.

3.1 DESCRIPTION OF THE INTERIM MEASURES

This IMWP specifies the removal of contaminated soils and sediments within and adjacent to SWMU 17 and removal of debris in select areas, primarily the SWMU 17 Dump/Fill Area and the top of the Northwest Ditch located immediately downgradient of the Dump/Fill Area. In addition, the IMWP specifies the restoration of the floodplains, streams, drainage ditches, and excavated areas around select SWMU 17 buildings impacted by PCB contamination, and all other areas disturbed by IMWP activities. The contaminated soils and sediments to be removed have been identified as SWMU 17 Building Areas near Buildings 357, 2721, and the Building 3072 Dump/Fill Area, as well as downgradient streams,

ditches, and floodplains with PCBs at concentrations greater than 1 mg/kg. Aroclor-1260, Aroclor-1254, and Aroclor-1242 were the PCBs detected in the SWMU 17 soils and sediments, with Aroclor-1260 being the most frequently detected Aroclor. The volumes presented for the soils and sediments to be excavated are in-place estimates. It is anticipated that these volumes will increase after the soils and sediments are excavated and are in an unconsolidated state. The Navy may elect to remove contaminated soil around buildings in such a manner as to leave some areas of subsurface soil with PCB concentrations greater than 1 mg/kg and will indicate this option prior to removals.

A work assignment responsibility chart (Table 3-1) identifies the responsibilities that the Contractor, NSA Crane, and Tetra Tech will have in the implementation of the IMWP.

Specifically, the IMWP consists of the following major components:

- Sediment Excavation/Removal – Sediments with PCB concentrations greater than 1 mg/kg are present within:
  - Select drainage channels (approximately 1,160 linear feet) that drain the SWMU 17 building areas to lower elevation streams,
  - Select stream segments (approximately 2,620 linear feet of stream) in Ditch 3, that collect and convey surface water runoff from SWMU 17 and the surrounding area,
  - Two sections of Boggs Creek, one (approximately 40 linear feet of the creek) of which is well downstream of SWMU 17.

- Sediments with total PCB concentrations greater than 1 mg/kg will be excavated. Sediment will be disposed at a Navy-approved waste disposal facility based on the in-situ delineation. Sediment with a total PCB concentration greater than 50 mg/kg must be disposed at a TSCA or Subtitle C hazardous waste facility; all other soil will be disposed at a Navy approved off-site non-hazardous waste disposal facility. The locations of the sediment excavation/removal areas are identified on Figures 3-1, 3-2, 3-3, and 3-4. Portions of streams containing sediment with PCB concentrations greater than or equal to 50 mg/kg are identified on these figures. Figure 3-1 identifies the drainage channels planned for excavation and Figures 3-2 through 3-4 identify the stream segments scheduled for contaminated sediment removal.

- Floodplain Surface Soil Excavation/Removal –Floodplain areas adjacent to the stream channels designated for sediment removal contain soil with high concentrations of PCBs. The locations of these floodplain areas (Areas 3A through 3P) are identified on Figures 3-3 and 3-4. Surface and

subsurface soil in these floodplain areas that exceed 50 mg/kg total PCBs, as determined by in-situ delineation, will be excavated for disposal offsite at a Navy-approved TSCA or Subtitle C hazardous waste facility as PCB-contaminated soil; all other soil will be disposed as non-hazardous waste in a Navy-approved facility. The locations and depths of excavation for these floodplain areas are identified on Figures 3-3 and 3-4.

- Excavation of buried debris in the SWMU 17 Dump/Fill Area southwest of Building 3072 and at the top of the Northwest Ditch – Figures 2-14 and 2-15 show the locations of trenches and soil borings installed to delineate buried debris and soil PCB contamination in this area. These figures and Figure 3-5 show the known limits of the debris based on these test pits and the concentrations of total PCBs in soil for those trenches. Buried debris is primarily limited to the level portion at the top of the Dump/Fill Area but surface debris is visible primarily in the uppermost 40 feet of the Northwest Ditch. The volume of buried debris and electronic/electrical components uncovered during exploratory trenching was small compared to contaminated soil volumes. A minor amount of surface debris extends to about 150 feet downstream from the Dump/Fill Area, and will be removed and disposed off-site as non-regulated material during a separate, Northwest Ditch remediation. The location of buried debris and surface debris is shown on Figure 3-5. The volume of surface debris, consisting of dead trees, brush, glass, metal, wood, concrete, electrical insulators, and other materials at the top of the Northwest Ditch is estimated to be 7 cy (approximately 10 tons); the volume of buried debris in the Dump/Fill Area is estimated to be 52 cy or about 78 tons. A minor amount of surface debris is found in the form of metallic items (e.g., a partial rusted drum) further downstream.

- Excavation of surface and subsurface soil to an estimated maximum depth of 12 feet in the Dump/Fill Area near Building 3072 – Figures 2-14, 2-15, and 3-5 show PCB concentrations measured in exploratory trenches and soil borings used to delineate the extent of buried debris in this area. If a trench contained less than 1 mg/kg PCBs at all depths, the rectangle representing the trench on Figure 2-14 is colored green to signify that all trench PCB concentrations were less than 1 mg/kg. If the PCB concentration in any depth interval within a trench exceeded 1 mg/kg PCBs, the rectangle representing the trench is colored orange (≥1 to <50 mg/kg total PCBs) or red (≥50 mg/kg total PCBs) to signify that appreciable PCB contamination was detected there. A tag is attached to all rectangles on Figure 2-14 that are colored orange or red to identify the PCB concentrations as a function of depth interval for the respective trenches. The actual depth to bedrock varies with location but the maximum depth observed during trenching was 11 feet and during DPT sampling the maximum depth was 12 feet. Area 4A is subdivided to show planned excavation depths on Figures 2-15 and 3-6.

Approximately 60 percent of soil to be excavated in Area 4A is considered to be TSCA waste and must be managed accordingly. Based on trenching and DPT results, it does not appear that free oil is present in this area. A layer of gray organic material was observed at approximately 5 feet below ground surface in Test Pit A3 but it did not contain visible oil. The distribution of PCBs in this area is heterogeneous. Some debris was encountered during trenching.

- Excavation of surface and subsurface soil near Building 357 to a maximum depth of about 4 feet bgs – TolTest previously excavated PCB-contaminated soil to a depth of 2 feet bgs in an area overlapping what is labeled as 4B on Figure 2-16 and Figure 3-5. Additional depths must be excavated and some additional lateral area must also be excavated to remove all soil containing PCB concentrations greater than 1 mg/kg. One area, which was identified to contain greater than 50 mg/kg PCBs after the TolTest interim measure, is labeled as Area 4B-50 to signify that the subsurface soil concentrations there exceed the subsurface TSCA limit of 50 mg/kg. Excavation to 3 or 4 ft bgs is planned for non-TSCA portions of Area 4B as indicated in Figures 2-16 and 3-5, and to top of bedrock for Area 4B-50.

- Excavation of contaminated soil northeast of Building 357 immediately west of Ditch 2. Figure 3-5 identifies an area labeled 4C, which contains surface and subsurface soil with PCB concentration greater than 1 mg/kg. It is noteworthy that bedrock is shallow in this area so excavation is likely to be interrupted by encountering bedrock at some locations. Bedrock is not to be excavated.

- Excavation of surface soil to a depth of 2 feet bgs near the southwest corner of Building 2721 (Area 4D) – A small volume of surface soil is contaminated with PCBs greater than 50 mg/kg concentration and shall be removed (see Figure 2-13 and 3-4).

- Dewatering of Excavated/Removed Sediment – Prior to off-site disposal, sediments will be stockpiled within a dewatering pad located within the construction area. The water drained from the sediments will be containerized, filtered, and analyzed prior to discharge. All discharges to the NSA Crane NPDES-permitted waste water treatment plant (WWTP) must meet a discharge limit of 3 µg/L PCBs [40 Code of Federal Regulations (CFR) §761.79(b)(1)(ii)] and 100 µg/L total toxic organics as defined by the NSA Crane WWTP operator. Samples will be collected and analyzed for each batch of water that is discharged. If filtered waters are discharged to the drainage channel the unrestricted discharge limit is 0.5 µg/LPCBs and each batch of water discharged must be tested to ensure it meets this limit [40 CFR §761.79(b)]. The Contractor is responsible for conducting all required sampling and analyses. The volume of water collected through dewatering is not expected to be

large. Sediment excavation/removal will not be performed during periods of heavy rain. Steps should be taken to minimize collection of waters.

- Sampling and Analysis – At the completion of this IM and following the removal of the support facilities (e.g., dewatering pad, decontamination pad, and material storage area) Tetra Tech will collect support area verification samples to confirm that the lining systems of the support facilities did not fail during implementation of this IM. These samples will be collected as composite samples comprising six separate grab samples acquired using the standard hand augering technique. The spatial distribution shall be two rows of three equally spaced sampling points in a 20 x 20 ft^2 area (or smaller footprint if the support area is smaller). As many 20 x 20 ft^2 areas will be used as necessary to span the entire footprint underneath the support area. Each grab sample shall constitute a 1-ft depth interval, to exclude vegetation. If it is determined that the lining system under any of the support facilities did fail, potentially resulting in the contamination of the soils below the support facilities, the Contractor will be required to remove that contamination (greater than 1 mg/kg PCBs) at their own expense. Sampling will continue until each 6-point composite sample has a total PCB concentration less than or equal to 1 mg/kg.

Off-site Disposal of Soils, Sediments, and Debris – Excavated soil, sediment, and debris will be disposed at an off-site NSA Crane-approved waste disposal facility. It is anticipated that sediment from two discrete portions of Ditch 3 Segment 6 (see Figure 3-4), soil in two floodplain areas (3H of Ditch 3 Segment 4 and 3L of Ditch 3 Segment 5), and soil from the building areas (4A, 4B-50, and 4D), will be disposed at a TSCA or Subtitle C hazardous waste disposal facility because the total PCB concentrations are greater than 50 mg/kg. All other sediment and soil is expected to be disposed at a non-hazardous waste facility because the in-place PCB concentrations are less than 50 mg/kg. Debris removed from the Northwest Ditch may be contaminated with PCBs. For example, the PCB contaminated sediment in approximately 150 linear feet of Ditch 3, Segment 6 was characterized by samples from four locations that contained PCB concentrations greater than 50 mg/kg (17SD061, 17SD107, 17SD109, and 17SD118) (Figures 2-12 and 2-13). Disposal of PCB-contaminated soil will be based on the in-situ delineation results for total PCBs. All soil with a total PCB concentration greater than 50 mg/kg must be disposed as TSCA waste at a Navy-approved TSCA or Subtitle C hazardous waste facility. Debris from an excavation should be disposed under the assumption that the PCB contamination level of the debris is commensurate with the in place PCB contamination level of the collocated soil (Note: The debris may not be used as fill). Alternatively, the contractor may elect to verify this assumption by conducting characterization sampling and analysis and satisfying the waste disposal facility requirements in accordance with 40 CFR §761.60. If, upon visual

inspection, the debris appears to be liquid filled electrical equipment (e.g., transformers or capacitors), the debris shall be disposed in accordance with requirements of 40 CFF §761.60. Growing vegetation may be cut at one foot (or higher) above ground level and disposed as non-hazardous waste and grass cut during mowing may be disposed similarly.

- Backfilling and Restoration of Floodplain Excavations – After excavation of PCB contaminated soils in the 17 floodplain areas located adjacent to Boggs Creek Segment 1 and Ditch 3 (Segments 2 through 6), the excavated areas will be backfilled and regraded to the pre-construction grade (Figures 3-3 and 3-4). In addition, the backfilled area will be restored to pre-construction conditions using a variety of habitat enhancement vegetation.

- Backfilling and Restoration of Drainage Ditches, Drainage Channels, and Streams – After the removal of sediment as indicated on Figures 3-1 through 3-5, the drainage channels and streams will be backfilled to pre-construction conditions and restored using stabilization practices that include use of sands and gravels, biodegradable erosion control mats, native rocks, and vegetation. Contractor shall also restore these areas with habitat diversity in mind by restoring features such as pool and riffle areas.

- Backfilling and Restoration of SWMU 17 Building Areas – During removal of contaminated soil as indicated on Figures 3-5 and 3-6, the excavated building areas will be backfilled to pre-construction conditions and restored using soil, gravel, grass seed, and moisture retention cover, as appropriate. Confirmation sampling, which would require leaving excavations open until confirmation data are available, will be required only in limited areas; therefore, this backfilling should occur throughout the course of excavation (except when awaiting confirmation sampling analytical results) to minimize the amount of time excavations are open. Backfilling under roadway pavement at the southeast end of Area 4A-7 must be compacted to support replacement of the excavated roadbed to original condition or better.

3.2 PERFORMANCE STANDARDS

For the purposes of defining the excavation areas and performance standards associated with each excavation area presented on Figures 3-1 through 3-5, Table ES-1 summarizes important information about the excavation areas shown and the associated performance standards for that excavation area. Performance standards for the IMWP are presented in the following sections.

In general, performance standards are based on a need to remove PCB contamination in excess of 1 mg/kg from all SWMU 17 areas. Most excavation areas are completely bounded by "clean" sampling points that were demonstrated to have less than 1 mg/kg contamination. For excavation areas not completely bounded by clean sampling points, topography was inspected to determine whether contamination could logically have migrated beyond the excavation boundary. If it was believed that topography confidently bounded the contaminant migration, the boundary was left as is. If, however, contaminant migration beyond the designated excavation boundary seemed plausible, the boundary was revised or additional sampling was prescribed to ensure that the excavations will remove all contamination greater than 1 mg/kg total PCBs. For areas where topography or other factors played a significant role in establishing the excavation boundary, details are provided below.

3.2.1 Drainage Channels, Northwest Ditch, and Ditch 8a and 8b Excavation Areas

Drainage channel excavation will occur in the Northwest Ditch, and two segments of Ditch 8 (segments 8a and 8b). Based on in-situ delineation results, all excavated sediment with a total PCB concentration greater than 50 mg/kg (Northwest Ditch only) will be disposed off-site at a Navy–approved TSCA or Subtitle C hazardous waste disposal facility; all other sediment will be disposed at a Navy-approved off-site non-hazardous waste disposal facility. Excavated sediments will be placed in a small off-road dump truck with a sealed tailgate to prevent the loss of sediment and liquids while the material is transported to a dewatering pad, if necessary. The excavated sediments will gravity-drain within the dewatering pad prior to off-site transport and disposal.

Sediment that accumulates in erosion and sediment control devices (see Section 4.0) prior to excavation of contaminated sediment within the drainage channels will be disposed offsite along with the excavated contaminated sediments. Following backfilling of the excavation, sediments that accumulate in the erosion and sediment control devices will be spread across the disturbed ground surface of the drainage channel excavation.

Because most of the excavation of contaminated sediments from the drainage channels will occur in wooded areas, the dewatering pad (stockpile location) will be located away from the excavation area. To minimize the impact to the wooded areas in which excavation will occur, biodegradable temporary access trails (woodchip/mulch) will be used instead of temporary gravel access roads. The Contractor will ensure that the temporary access trails are not contaminated with excavated sediment. In the event the Contractor spills excavated sediments on a temporary access trail, the Contractor will be responsible for removing the contaminated sediments along with the impacted surface soils, verifying that all contaminated materials have been removed, and disposing of that material at their own expense.

The Contractor should note that the process of transporting excavated sediments and the use of access trails may vary based on the phasing identified by the Navy. These processes should be identified in the Contractor's work plan.

3.2.1.1 Northwest Ditch

Sediment in the Northwest Ditch from the western edge of the Dump/Fill Area excavation node 82 to the southern edge of Floodplain Area 3C, excavation node 23, will be removed. The uppermost portion of the Northwest Ditch overlaps with the planned Dump/Fill Area excavation and is therefore covered in detail in Section 2.5.4.1 that describes the Dump/Fill Area excavation.

The volume of sediment to be removed from the Northwest Ditch is based on the average thickness of sediment overlying consolidated soils, average width of the channel (base width plus height of channel banks), and length of the channel from the edge of the Dump/Fill Area to the lowest elevation of the Northwest Ditch. The extent of excavation in the Northwest Ditch is identified on Figure 3-1. The field location may differ slightly from that shown on Figure 3-1, but this entire channel length of the ditch should be excavated, excluding the Building Area excavation portion. Northing and easting coordinates for the beginning and end of the Northwest Ditch are provided in Table 3-2.

3.2.1.2 Ditch 8, Excavation Area 1B (Segment 8a)

Ditch 8, Segment 8a, is near the beginning of Ditch 8 and the soil of this area to be excavated is shown on Figure 3-1. The downstream excavation boundary of Segment 8a, however, is tentatively depicted pending confirmation sampling that will occur prior to or near the beginning date of the excavation (see next paragraph). Important information about estimated sediment removal volumes and other information is provided in Table ES-1.

Additional sampling between locations 17SW/SD025 and 17SW/SD127 will occur to more precisely establish the extent of contamination in Ditch 8a. The downstream boundary of Ditch 8a will be extended downstream to include all samples with >1mg/kg total PCBs based on 3-day turnaround analysis for PCBs. At least two soil samples will be collected to represent the 0-1 ft interval. The additional samples will be sequentially analyzed from upstream to downstream, as needed, to bound the contamination.

3.2.1.3 Ditch 8, Excavation Area 1C (Segment 8b)

Ditch 8, Segment 8b, is at the lower end of Ditch 8 and this area to be excavated is shown on Figure 3-1. Important information about estimated sediment removal volumes and other information is provided in Table ES-1.

3.2.2 Stream Excavation Areas

Sediments in four sampling locations of Ditch 3 Segment 6 (17SD061, 17SD107, 17SD109, and 17SD118) are identified as having PCB concentrations greater than 50 mg/kg (Figures 2-12 and 2-13). Based on in-situ delineation results, all excavated sediment with a total PCB concentration greater than 50 mg/kg will be disposed off-site at a Navy-approved TSCA or Subtitle C hazardous waste disposal facility; all other sediment will be disposed at a Navy-approved off-site non-hazardous waste disposal facility. TSCA anti-dilution Rule [40 CFR §761.1(b)] states that it is prohibited to dilute PCB materials at a concentration of greater than or equal to 50 mg/kg with PCB-free materials or low concentration PCB materials in order to reduce the concentration in the resultant mixture to below 50 mg/kg. Therefore, for this project PCB contaminated soils with PCB concentrations greater than or equal to 50 mg/kg cannot be mixed with non-PCB contaminated soils or PCB contaminated soils with PCB concentrations less than 50 mg/kg to avoid land disposal restrictions. Sediment samples from all other locations are identified as having PCB concentrations less than 50 mg/kg. It is assumed that all material removed from these locations will be analyzed (characterized), and sent for disposal at an approved off-site non-hazardous waste facility (based on the assumption that disposal characterization sampling identifies PCBs at concentrations less than 50 mg/kg) unless the Contractor obtained characterization sample results indicate that non-hazardous waste disposal would violate state or federal law. Excavated sediments will be placed in a small off-road dump truck with a sealed tail-gate to prevent the loss of sediment and liquid while the material is transported. If necessary, the sediments will be taken to a dewatering pad. The excavated sediments will gravity-drain within the dewatering pad prior to off-site transport and disposal. As identified in Section 2.5.2, stream excavation will occur in all sections of Boggs Creek downstream near sampling location 17SW/SD105, Boggs Creek Segment 1, and Ditch 3, Segments 2 through 6 (Figures 3-2, 3-3, and 3-4). The extent of excavation in each stream is defined in Section 2.5.2 although some additional sampling to refine excavation boundaries will take place as described at the end of this section. Table ES-1 identified important excavation areas and volumes and related information for sediment excavations in these stream segments.

The volume of sediment to be removed from each of the stream segments is based on the average thickness of sediment overlying bedrock, average width of the drainage channel (base width plus height

of channel banks), and length of excavation in each channel. The extent of excavation is identified on Figures 3-2, 3-3, and 3- with possible modification to be made based on additional sampling as described at the end of this section. Excavation nodes 8 (downstream end of Boggs Creek Segment 1 shown on Figure 3-3) and 73 (upstream end of Ditch 3, Segment 6 shown on Figure 3-4) indicate the beginnings and ends of stream channel sediment excavations. The excavation volume calculations are provided in Appendix A and summarized in Table ES-1. These estimates are based on excavation boundaries shown on Figures 3-2, 3-3, and 3-4 and could change slightly based on additional sampling.

Manmade materials (concrete, lumber, etc.) will likely be found within some stream excavation areas. Such debris found to be in contact with sediment will be assumed to be contaminated at the same PCB concentrations as the sediment in which it is found and must be disposed in the same manner as the contaminated sediment. Debris that is not in contact with contaminated soil or sediment, is determined not to contain or be contaminated with PCBs, and is otherwise non-hazardous, may be disposed as non-hazardous waste. The volume of manmade material to be removed from the stream excavation areas is estimated to be approximated at 10 cy. Buried or partially buried natural debris such as large rocks, tree stumps, or branches must be disposed under the assumption that the contamination level of this debris is the same as soil or sediment with which it is in contact. Growing vegetation (except grass) may be cut at 1 foot above ground level (or higher) and disposed as non-hazardous waste. Cutting of vegetation higher than 1 ft above ground surface should be limited to minimize waste volume. Mowed grass will be exempt from these requirements.

Sediment that accumulates in erosion and sediment control devices (see Section 4.0) prior to backfilling the stream excavations will be disposed off-site along with the contaminated sediments. Following backfilling of the excavations, sediments that accumulate in the erosion and sediment control devices will be used to restore the stream or spread across the disturbed ground surface of the stream excavation. Sediment and erosion controls must prevent migration of TSCA-level contamination to non-TSCA level materials.

Because the excavation of contaminated sediments from the stream segments will occur in wooded areas, the dewatering pad (stockpile location) will be located away from the excavation area. To minimize the impact to the wooded areas in which excavation will occur, biodegradable temporary access trails (woodchip/mulch) will be used instead of temporary gravel access roads. The Contractor will ensure that temporary access trails are not contaminated with excavated sediment. In the event that the Contractor spills excavated sediments on a temporary access trail, the Contractor will be responsible for

removing the contaminated sediments along with the impacted surface soils, verify that all contaminated materials have been removed, and disposal of that material will be at their own expense.

The Contractor should note that the process of transporting excavated sediments and the use of access trails may vary based on the phasing identified by the Navy. These processes should be identified in the Contractor's work plan.

Additional sampling between locations 17SW/SD033 and 17SW/SD123 will occur near the start date of excavation to more precisely establish the extent of contamination in Boggs Creek Stream Segment 1 (see Figures 2-8 and 3-3). The downstream excavation boundary of Ditch 3 Segment 1 will be extended downstream to include all samples upstream of 17SW/SD123 with >1mg/kg total PCBs based on 3-day turnaround analysis for PCBs. At least two sediment samples will be collected, each representing the surface-to-bedrock interval which is about 0.5 to 1 ft deep. The additional samples will be sequentially analyzed from upstream to downstream, as needed, to bound the contamination.

3.2.3 Floodplains, Excavation Areas 3A through 3P

Floodplain areas adjacent to the stream segments where excavation will occur will also be excavated (as described in Section 2.5.3). Soil will be disposed at a Navy-approved waste disposal facility based on the in-situ delineation. Soil with a total PCB concentration greater than 50 mg/kg must be disposed at a TSCA or Subtitle C hazardous waste facility; all other soil will be disposed at an approved off-site non-hazardous waste disposal facility. Most soil will not be transported to a TSCA disposal facility. Loss of soil and liquids while the material is transported, including transport to a dewatering pad, if necessary, will be prevented. The excavated soils will gravity-drain within the dewatering pad prior to off-site transport and disposal. As detailed in Section 2.5.3, floodplain excavation will occur adjacent to Boggs Creek Stream Segment 1 and Ditch 3 Segments 2 through 6, as identified on Figures 3-3 and 3-4.

The volume of soil to be removed from each of the 16 floodplain areas (identified on Figures 3-3 and 3-4) is based on field observations of the extent of the floodplain, and the locations of samples with concentrations of PCBs greater than 1 mg/kg within the floodplain areas, as shown on Table ES-1. The extent of excavation is identified on Figures 3-3 and 3-4. On Figure 2-9, three additional circular areas are designated for excavation to remove localized contamination from surface to bedrock depth. These three circular areas, each of which is 20-ft in diameter are centered on the following points:

3D-1, centered on soil boring 17SB101.

3D-2, centered on soil boring 17SB104.

3D-3, centered on soil boring 17SB251.

Because the actual location of the stream channel may vary from that shown on the figures, excavation node coordinates at the stream channel edge may require adjustment based on field conditions but nodes not along the stream edge should not change. Floodplain excavation should extend from the stream channel edge to the most upstream and downstream excavation nodes of each floodplain closest to the stream as shown on Figures 3-3 and 3-4. Additional detail is visible on corresponding figures located in Section 2. Northing and easting coordinates for the excavation area nodes are provided in Table 3-2. Excavations will extend over each floodplain area represented by the associated nodes regardless of where the stream is actually positioned within that area. Volume calculations are provided in Appendix A and are summarized on Table ES-1.

Topographic considerations were used to help bound contamination in some areas. These areas and an explanation of how topography was used are provided below. If additional flood plain sampling is required to bound or confirm the bounding of contamination, it is indicated.

Area	Rationale	Additional Sampling
3A-1	Elevated topography and a drainage channel on the southwestern edge of this area bound the extent and limit migration potential of contamination.	Not Required.
3A-2	Boundaries are based on observed PCB concentrations and, on the northeastern boundary of this area, the topography which limits the elevation to which contamination can be transported in stream flow.	**Required.** Collect one sidewall soil boring confirmation sample at a single location (i.e., no lateral spread) from 0-1.5 ft bgs on the northwest corner near 17SB115 at the highest boundary elevation. If total PCB concentration is >1 mg/kg, collect additional samples in a northward direction until no longer >1 mg/kg and redraw excavation boundary to point nearest 17SB115 with <1 mg/kg PCBs.
3C	See Section 2.5.3.2	Not Required.
3D	All data south of this area indicates that contamination is limited to elevations less than 652 ft.	**Required.** Sample south wall of indicated excavation boundary (see Figure 2-9) using a composite sample collected in the same manner as described in Section 3.2.4.3, but between soil boring soil borings 17SB314 and 17SB140. Continue confirmation sampling and excavation away from the main stream channel until the confirmation sample PCB concentration is ≤1 mg/kg. Each additional step out excavation boundary should be located no more than 1 ft south of the stream channel than the previous boundary.

Area	Rationale	Additional Sampling
3F	The boundary of this area was drawn based on the collection of data in this area that indicates contamination is isolated. to facilitate excavation, however, there is a reasonably chance that the eastern or western boundary do not encompass all PCB contamination.	**Required.** Samples will be composites using the same approach described in Section 3.2.4.3, but on the western and eastern edges of the designated excavation. Continue confirmation sampling and excavation away from the main stream channel until the confirmation sample PCB concentration is ≤1 mg/kg. Each step out excavation boundaries should be located 3 feet up or downstream from where PCB concentrations exceed 1 mg/kg on the eastern or western excavation wall, respectively.
3G	The western edge of this area was extended from soil boring 17SB290 along approximately the 675 ft elevation contour to the bank of the main stream channel.	Not Required.
3K	The western boundary is along a line perpendicular to the stream channel and includes boring 17SB296 because that boring had <1 mg/kg total PCBs. Topography and spatial contamination patterns indicated that the contaminated area had been delineated west of 17SB297. For example, no total PCB concentration greater than 1 mg/kg was detected south of this stream segment at an elevation greater than 700 ft except at 17SB076, which is located at least two hundred feet upstream. The eastern boundary is along a line connecting boring 17SB198 and the stream. This line, which is perpendicular to the stream, separates a non-TSCA and TSCA excavation areas.	Not required.
3L	The southern and eastern boundaries of this area were based on topography and available data.	**Required.** Collect one composite sample using the same approach described in Section 3.2.4.3, but on the southern and eastern edges of the excavation boundary shown on Figures 2-12 and 3-4 (from surface to bedrock depths). Continue confirmation sampling and excavation away from the main stream channel until the confirmation sample PCB concentration is ≤1 mg/kg. Each step out excavation boundaries should be located 1 ft further from where PCB concentrations exceed 1 mg/kg on the excavation wall.

Area	Rationale	Additional Sampling
3O	The tentative boundary of this area was based on topography and available data but is subject to confirmation sampling.	**Required.** On northern and northeastern sidewalls of Area 3O between soil boring 17SB272 and the stream bank collect one composite sample using the same approach described in Section 3.2.4.3 and consisting of up to nine grab samples. The grab samples will be collected approximately every 10 ft along the wall beginning at 17SB272 to the stream channel. If contamination greater than 1 mg/kg is found in this composite sample, excavation will be expanded and additional confirmation sampling will conducted until ≤1 mg/kg total PCBs is demonstrated to exist in the lateral direction in this area.
3P	The tentative boundary of this area was based on topography and available data but is subject to confirmation sampling.	**Required.** On southern and eastern sidewalls of Area 3P between soil boring 17SB234 and the stream bank collect one composite sample using the same approach described in Section 3.2.4.3, consisting of up to nine grab samples. The grab samples will be collected approximately every 10 ft along the wall beginning at 17SB234 to the stream channel. If contamination greater than 1 mg/kg is found in this composite sample, excavation will be expanded and additional confirmation sampling will conducted until ≤1 mg/kg total PCBs is demonstrated to exist in the lateral direction in this area.

Manmade debris (concrete, lumber, etc.) might be found within the floodplain excavation areas. Such debris found to be in contact with soil will be assumed to be contaminated at the same PCB concentrations as the soil and must be disposed in the same manner as the soil. Debris that is not in contact with contaminated soil or sediment, is determined not to contain or be contaminated with PCBs, and is otherwise non-hazardous, may be disposed as non-hazardous waste. The anticipated volume of manmade material to be removed from the floodplain excavation areas is approximated at 10 cy. Buried or partially buried natural debris such as large rocks, tree stumps, or branches must be disposed under the assumption that the contamination level of this debris is the same as soil or sediment with which it is in contact. Growing vegetation (except grass) may be cut at one foot above ground level and disposed as non-hazardous waste. If necessary, the cut may be higher than 1 ft above ground surface but cuts this high should be limited to minimize waste. Mowed grass will be exempt from these requirements.

Soil that accumulates in erosion and sediment control devices (see Section 4.0) prior to backfilling of the floodplain excavations will be disposed off-site along with the contaminated soil. Following backfilling of the excavation, soil that accumulates in the erosion and sediment control devices will be used to restore the floodplain or spread across the disturbed ground surface of the floodplain excavation. Sediment and erosion controls must prevent migration of TSCA-level contamination to non-TSCA level materials.

Because the excavation of contaminated soil from the floodplain will occur in wooded areas, the dewatering pad (stockpile location) will be located away from the excavation area. To minimize the impact to the wooded areas in which excavation will occur, biodegradable temporary access trails (woodchip/mulch) will be used instead of temporary gravel access roads. The Contractor will ensure that the temporary access trails are not contaminated with excavated soil. In the event the Contractor spills excavated soil on a temporary access trail, the Contractor will be responsible for removing the contaminated soil along with the impacted surface soils, verify that all contaminated materials have been removed, and dispose of that material at their own expense.

The Contractor should note that the process of transporting excavated soil and the use of access trails may vary based on the phasing identified by the Navy. These processes should be identified in the Contractor's work plan.

Growing vegetation (except grass) may be cut at one foot above ground level and disposed as non-hazardous solid waste. If necessary, the cut may be greater than 1 ft above ground surface but instances of cuts this high should be minimized. If grass mowing occurs, no particular height cutting restrictions will apply. Truck corridors used to gain access to the site may be cleared as necessary to make them passable (see Section 4).

3.2.4 Building Area Excavations

3.2.4.1 Dump/Fill Area and Upper Reach of Northwest Ditch, Excavation Area 4A

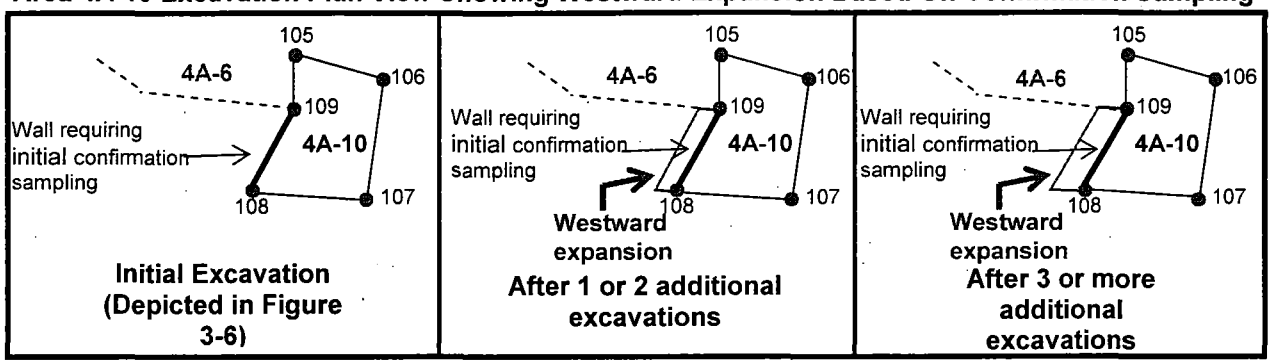
The approximate location of surface debris in the upgradient portion of the Northwest Ditch is based on the TolTest IM report (TolTest, 2004) and is shown on Figures 3-5 and 3-6. The exact volume of this debris could not be estimated based on the current information, but for costing purposes, assume that 10 tons of surface debris will be collected and disposed off-site from this area of the site. Upon removal, this debris will be visually inspected to determine whether liquid filled electrical equipment or other material potentially contaminated with PCBs is present. If any material that appears to be potentially contaminated with PCBs is present, it will be removed from the debris. This removed debris will then be evaluated to visually determine its TSCA status and if it is potentially contaminated with PCBs, it will be disposed off-site at a Navy-approved TSCA or Subtitle C hazardous waste disposal facility. Liquid filled electrical equipment (e.g., transformers and capacitors) must be disposed in accordance with 40 CFR §761.60. Natural or manmade debris that is in contact with soil or sediment must be disposed under the assumption that the debris is contaminated at the same level as the soil or sediment with which it is in

contact. If the debris is not in contact with soil or sediment and it is determined not to be contaminated with PCBs or to otherwise be a hazardous waste, the debris may be disposed as non-hazardous solid waste. Growing vegetation (except grass) may be cut at one foot (or higher) above ground level and disposed as non-hazardous waste. Cutting of vegetation higher than 1 ft above ground surface should be limited to minimize waste volume. Mowed grass will be exempt from these requirements.

Soil in the area designated as Area 4A will be excavated to various depths based on the observed PCB contamination levels. These depths and locations are shown on Figures 2-15 and 3-6 and are listed in Table ES-1. Excavation volume calculations are provided in Appendix A and excavation node coordinates are listed in Table 3-2 and are shown on Figures 3-5 and 3-6. Roughly 60 percent of the total sol excavation volume contains PCBs at a concentration greater than 50 mg/kg and must be excavated. Bedrock will not be excavated. TSCA anti-dilution Rule [40 CFR §761.1(b)] states that it is prohibited to dilute PCB materials at a concentration of greater than or equal to 50 mg/kg with PCB-free materials or low concentration PCB materials in order to reduce the concentration in the resultant mixture to below 50 mg/kg. Therefore, for this project PCB contaminated soils with PCB concentrations greater than or equal to 50 mg/kg cannot be mixed with non-PCB contaminated soils or PCB contaminated soils with PCB concentrations less than 50 mg/kg to avoid land disposal restrictions.

During excavation of Area 4A-10, at least one verification sample must be collected along the western excavation wall between previously sampled locations 17SB176 and 17FL-B-020. The sample(s) must be analyzed to confirm whether total PCB concentrations exceed 1 mg/kg. The initial excavation sidewall at which this confirmation sampling must be conducted is identified near the middle of Figure 3-6 with the label "Confirmation Sampling Required." If the confirmation sample exhibits a total PCB concentration greater than 1 mg/kg, excavation and confirmation sampling must continue in the direction of PCB concentrations greater than 1 mg/kg until the total PCB concentration for the last confirmation sample no longer exceeds 1 mg/kg. If the initial sidewall shown on Figure 3-6 is excavated because of a 1 mg/kg total PCB exceedance, a new northern and southern boundary will develop along the northern and southern edges, respectively, of this expanded excavation. The schematic diagram below (not to scale) depicts the evolution of the new western, northern, and southern sidewalls (red lines) under a scenario requiring additional excavation in the western direction after the initial excavation.

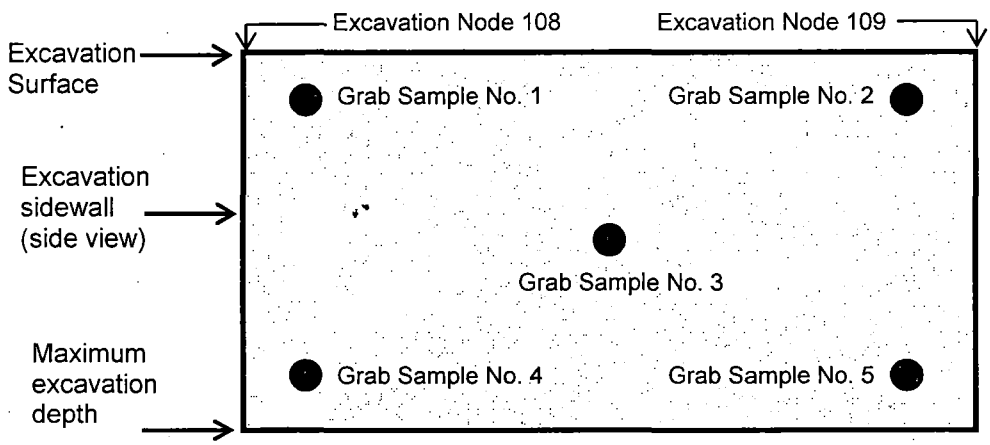
Area 4A-10 Excavation Plan View Showing Westward Expansion Based On Confirmation Sampling



These new northern and southern sidewalls must also be sampled (and excavated as necessary). The developing northern sidewall will extend along the southern boundary of Excavation Area 4A-6 to bedrock depth. Confirmation sampling and additional excavation (as needed) shall proceed as follows:

1. Lay out a five-point pattern comprising four corners and one middle point of a rectangle representing the entire exposed wall down to the maximum excavated depth for excavation area 4A-10. The diagram below is an example of this five-point pattern.

Five-Point Excavation Sidewall Grab Sampling Pattern for Composite Confirmation Samples



Note: The maximum depth is anticipated to be about 8 ft bgs but sampling must represent the actual entire depth.

2. At each of the five points, collect grab samples, each of which is nominally 2-inches in diameter and extends 6 inches into the excavation side wall.

3. Combine the soil of the five grab samples in a stainless steel mixing bowl or in a disposable plastic bag.

4. Remove vegetation and gravel, if present, by physically extracting the vegetation/gravel but retaining the soil. This may require crushing soil clumps and shaking soil loose from the vegetation/gravel until no more loose soil is produced.

5. Mix the five grab samples in the mixing bowl (or bag) and remove 4 to 8 ounces of this well mixed soil for analysis.

6. Transfer the removed soil to an amber glass wide-mouth sampling container with Teflon® lined lid.

7. Label the sample container using the numbering system described in the note below.

Note: The sample number assigned to each sample shall be in the format of 174A10xxCyyzz, where "17" represents SWMU 17; "4A10" represents excavation area 4A-10; "xx" represents the sequential composite sample number (beginning with "01" and allowing for up to 99 different samples to be collected); "C" represents a composite sample; "yy" represents the top depth of the composite measured in feet bgs (this should generally be "00" unless, for example, too much vegetation or gravel is present); and "zz" represents the bottom depth of the composite, in feet bgs rounded to the nearest whole foot (e.g., if the excavation is 8.3 ft deep, use "08"). Sequential composite sample numbers (xx) and the top and bottom sampling depths (yyzz) will be determined in the field; the two-digit top and bottom depths should be rounded to the nearest whole foot for inclusion in the sample number.

8. Place the sample in a cooler with enough ice to maintain a temperature between 0 and 6 degrees Celsius throughout sample storage and shipping.

9. Ship the sample to the analytical laboratory for total PCB analysis as Aroclors (three-day turnaround time or less).

10. If the confirmation sample total PCB concentration exceeds 1 mg/kg, excavate an additional one to two feet of sidewall (as directed by the Navy) in the direction of total PCB concentrations greater than 1 mg/kg and repeat this process (Steps 1 through 10) until the total PCB concentration no longer exceeds 1 mg/kg.

Note: The areal density of the five grab samples comprising each composite sample will be high, initially, for new northern and southern excavation walls and will decrease as excavation continues (because the area increases but the number of grab samples remains constant). If either of the new northern or southern sidewalls increases to more than 100 square feet, consult with NSA Crane to determine the appropriate course of action. The intent will be to limit the maximum size of a five-point grab sampling pattern to approximately 100 square feet.

Manmade materials (concrete, lumber, etc.) will be found within the Northwest Ditch and Dump/Fill Area excavation area. Such debris found to be in contact with soil will be assumed to be contaminated at the same PCB concentrations as the soil with which it is in contact and must be disposed in the same manner as the soil. Material that is not in contact with contaminated soil or sediment and is determined not to be associated with PCB use and is not otherwise considered to be a hazardous waste may be disposed as non-hazardous solid waste. Any material not contaminated with PCBs but is otherwise a potential hazardous waste will either be disposed as hazardous waste or will be evaluated in accordance with applicable hazardous waste regulations to determine how to dispose of it. The debris may not be used as fill. The volume of manmade material to be removed from the Northwest Ditch excavation area is approximated at 7 cy. Additionally, large rocks with an average nominal diameter of 9-inches or more will be found throughout the length of the Northwest Ditch. These rocks will be removed, and disposed in a manner commensurate with the soil or sediment in contact with them.

A small section of the road on the southeast side of Area 4A-7 requires removal along with contaminated soil under that section of the road to a depth of 7 ft. bgs.

3.2.4.2 Area Between Building 357 and Road, Excavation Area 4B

This area was excavated by TolTest to a depth of 2 ft bgs. Residual contamination was found at the bottom of the excavated areas but subsequent sampling indicates that PCB concentrations greater than 1 mg/kg a sporadically located throughout this excavation area. Bedrock depth is also shallow, typically within 4 ft of the surface. To remove all soil contaminated with PCBs greater than 1 mg/kg, the planned approach is to remove and stockpile the top 1.5 feet of clean soil, which will be used after excavation for fill, and excavate the remaining soil to 4 ft. The excavation volumes are documented in Appendix A and summarized in Table ES-1. Excavation nodes are identified on Figure 3-5.

A small area labeled 4B-50 in the northeast corner of Area 4B contains PCB concentrations in soil greater than 50 mg/kg. TSCA anti-dilution Rule [40 CFR §761.1(b)] states that it is prohibited to dilute PCB materials at a concentration of greater than or equal to 50 mg/kg with PCB-free materials or low

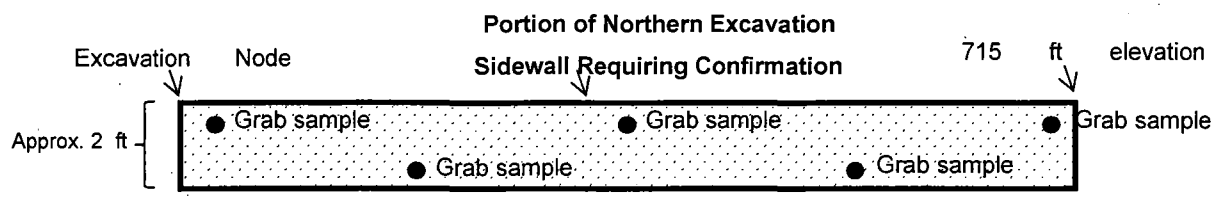
concentration PCB materials in order to reduce the concentration in the resultant mixture to less than 50 mg/kg. Therefore, for this project PCB contaminated soils with PCB concentrations greater than or equal to 50 mg/kg cannot be mixed with non-PCB contaminated soils or PCB contaminated soils with PCB concentrations less than 50 mg/kg to avoid land disposal restrictions. Soil excavation in Area 4B-50 will be to top of bedrock.

3.2.4.3 Northeast of Building 357, Excavation Area 4C

A limited amount of contaminated soil greater than 1 mg/kg PCB but less than 25 mg/kg remains in this area. Excavation of all surface soil to a depth of 2 feet is planned and this excavation would remove all soil contaminated at a level of 1 mg/kg PCBs and greater. Bedrock may be encountered at shallower depths and is not to be excavated. The excavation volume calculations are presented in Appendix A and are summarized in Table ES-1. Excavation nodes are identified on Figure 3-5.

During excavation of Area 4C, a composite verification sample must be collected from the excavation sidewall between Excavation Nodes 172 and 173 (see Figure 3-5), and a composite verification sample must be collected from the excavation sidewall between Excavation Node 173 and the 715 ft topographic elevation contour (see Figures 3-5) located 20 feet due east. The initial boundaries at which this confirmation sampling must be conducted are identified on Figure 3-5 with the label "Confirmation Sampling Required." If the confirmation sample from either boundary exhibits a total PCB concentration greater than 1 mg/kg, excavation and confirmation sampling must continue in the direction of PCB concentrations greater than 1 mg/kg until the total PCB concentration for the last confirmation sample no longer exceeds 1 mg/kg. If either sidewall designated for initial confirmation sampling is excavated, a new boundary perpendicular to the boundaries shown on Figure 3-5 will develop. These new sidewalls must also be sampled and excavated as necessary until the total PCB concentration no longer exceeds 1 mg/kg. Confirmation sampling and additional excavation (as needed) shall proceed as follows:

1. For every 100 square feet or less of sidewall, lay out a five-point zigzag pattern representing the entire exposed wall down to the maximum excavated depth for excavation area 4C. Using the northern 4C boundary as an example, the grab sample pattern would appear as follows (this pattern biases toward finding shallow contamination because surface runoff is the perceived contamination migration mechanism):



Note: The maximum depth is anticipated to be limited by bedrock to about 2 ft bgs or less but sampling must represent the actual entire depth, with a maximum 2.5 ft bgs depth.

2. At each of the five points, collect grab samples, each of which is nominally 2-inches in diameter and extends 6 inches into the excavation side wall.

3. Combine the soil of the five grab samples in a stainless steel mixing bowl or in a disposable plastic bag.

4. Remove vegetation, if present, by physically extracting the vegetation but retaining the soil. This may require crushing soil clumps and shaking soil loose from the vegetation until no more soil falls from the vegetation upon shaking.

5. Mix the five grab samples in the mixing bowl (or bag) and remove 4 to 8 ounces of this well mixed soil for analysis.

6. Transfer the removed soil to an amber glass wide-mouth sampling container with Teflon® lined lid.

7. Label the sample container using the numbering system described in the note below.

Note: The sample number assigned to each sample shall be in the format of 174CxxCyyzz, where "17" represents SWMU 17; "4C" represents excavation area 4C; "xx" represents the sequential composite sample number (beginning with "01" and allowing for up to 99 different samples to be collected); "C" represents a composite sample; "yy" represent the top depth of the composite measured in feet bgs (this should generally be "00" unless, for example, too much vegetation is present); and "zz" represents the bottom depth of the composite, in feet bgs rounded to the nearest whole foot (e.g., if the excavation is 1.3 ft deep, use "01"). Sequential composite sample numbers (xx) and the top and bottom sampling depths (yyzz) will be determined in the field; the two-digit top and bottom depths should be rounded to the nearest whole foot for inclusion in the sample number.

8. Place the sample in a cooler with enough ice to maintain a temperature between 0 and 6 degrees Celsius throughout sample storage and shipping.

9. Ship the sample to the analytical laboratory for total PCB analysis as Aroclors (three-day turnaround time or less).

10. If the confirmation sample total PCB concentration exceeds 1 mg/kg, excavate an additional one to two feet of sidewall (as directed by the Navy) in the direction of total PCB concentrations greater than 1 mg/kg and repeat this process (Steps 1 through 10) until the total PCB concentration no longer exceeds 1 mg/kg.

Note: The areal density of the five grab samples comprising each composite sample will be high, initially, for new excavation walls perpendicular to those identified on Figure 3-5 as the initial confirmation sampling walls. This areal density, however, will decrease if excavation continues in a northern or westward direction. If either of the initial northwestern or northern sidewalls designated for confirmation sampling increases to more than 100 square feet, consult with NSA Crane to determine the appropriate course of action. Sampling in this area indicates that bedrock is approximately 2 ft bgs or shallower; the maximum excavation depth is scheduled to be 2.5 ft bgs.

3.2.4.4 Southwest of Building 2721, Excavation Area 4D

A small volume of soil southwest of Building 2721 contains more than 50 mg/kg PCBs. Excavation nodes are shown on Figure 3-4 and the volume calculations for soil to be removed are presented in Appendix A and summarized on Table ES-1. This soil must be disposed as TSCA waste. TSCA anti-dilution Rule [40 CFR §761.1(b)] states that it is prohibited to dilute PCB materials at a concentration of greater than or equal to 50 mg/kg with PCB-free materials or low concentration PCB materials in order to reduce the concentration in the resultant mixture to below 50 mg/kg. Therefore, for this project PCB contaminated soils with PCB concentrations greater than or equal to 50 mg/kg cannot be mixed with non-PCB contaminated soils or PCB contaminated soils with PCB concentrations less than 50 mg/kg to avoid land disposal restrictions.

3.3 DEWATERING

When necessary, excavated soil and sediments will be placed on the dewatering pad and allowed to drain by gravity. Following dewatering, the Contractor will collect the required disposal analyses

(characterization samples) and mix the sediment lift to promote additional dewatering. It is anticipated that the only material that will need dewatering includes floodplain soil and channel/stream sediment. Sediment and erosion controls must prevent migration of TSCA-level contamination to non-TSCA level materials.

The Contractor is responsible to cover and maintain covers at the excavation sites to minimize dewatering requirements. Additionally, excavation during periods of "heavy precipitation" is to be avoided. A heavy precipitation is any precipitation event that would require dewatering of the excavated materials.

Because of the tendency of PCBs to bond with soil and sediment and not be water soluble, water removed from material within the dewatering pad is not expected to contain PCB contamination after the filtering process is completed. Therefore, following filtration, the water is not expected to require further treatment. The water drained from the sediments will be containerized, filtered, and each batch of water to be discharged will be analyzed (characterized) prior to discharge. All discharges to the NSA Crane NPDES-permitted WWTP must meet a discharge limit of 3 µg/L PCBs and 100 µg/L total toxic organics [40 CFR §761.69(b)(1)(ii)]. If filtered waters are discharged to the drainage channel the unrestricted discharge limit is 0.5 µg/L PCBs, as required by 40 CFR §761.79(b).

3.4 SAMPLING AND ANALYSIS

Support area verification samples will be collected by Tetra Tech from the surface soil below the decontamination pad, material storage area, dewatering pad, and temporary access trails. Additional excavation may or may not be required, based on the results of this verification sampling. Soil that exceeds 50 mg/kg total PCBs, as determined by in-situ delineation, will be excavated for disposal off site at a Navy-approved TSCA or Subtitle C hazardous waste facility as PCB-contaminated soil; all other soil with total PCB concentrations greater than 1 mg/kg will be disposed as non-hazardous waste in a Navy-approved facility. Excavation and confirmation sampling and analysis will continue until the total PCB concentration is no longer greater than 1 mg/kg.

3.5 DISPOSAL

Dewatering pad materials, filtered solids, filter media, and excavated soils and sediments will be sampled by the Contractor and analyzed (characterized) for waste disposal using the methods required by the NSA Crane-approved waste disposal facility. The soils and sediments will be sampled following the dewatering process and the disposal requirements for these media are presented in earlier sections. The

dewatering pad materials will be sampled upon decommissioning of the dewatering pad. PCB impacted decontamination wastes (e.g., residues and filter media) should be disposed of in accordance with 40 CFR §761.79(b)(1)(ii), i.e., in a manner commensurate with the level of PCB contamination adhering to or contained in the wastes. The Contractor is responsible for satisfying all disposal requirements of the selected disposal facility. Table ES-1 summarizes the volumes of soil and sediment expected to be disposed off-site. Only the approximate weight of surface and buried debris could be estimated based on the current information and the dewatering pad disposal volume should be identified in the Contractor's work plan. Total off-site disposal volumes in Table ES-1 also exclude the volume of the surface debris from Northwest Ditch.

3.6 BACKFILLING

Floodplain surface soil, building area, drainage channel, and stream excavation areas will be backfilled to pre-construction conditions. Backfill material is to be staged on site such that backfilling activities can commence immediately upon completion of an excavation, or no later than at the end of each excavation day. The backfill materials obtained from an off-site borrow source will have properties similar to the native SWMU 17 soils and sediments. These soils will be subject to analytical testing by the Contractor to assure the material satisfies the following requirements:

- Total petroleum hydrocarbon, diesel range organics, EPA SW-845 8015M DRO - less than 1 ppm
- Total petroleum hydrocarbon, gasoline range organics, EPA SW-845 8015M GRO - less than 1 ppm
- Sum of benzene, toluene, ethylbenzene, and xylenes, EPA SW-846 5030 / 8021 - less than 1 ppm
- Characteristic waste determination (ignitability, corrosivity, reactivity, and toxicity), EPA SW-846 1311 - shall not fail the test for characteristic waste
- Total PCB, EPA SW-846 8082 - less than 1 ppm.

Additionally, the backfill material shall meet the following physical characteristics for each of the four types (Groups) of excavation areas.

Drainage Channel and Stream Excavation Backfill (Groups 1 and 2) – Backfill for the drainage channel and stream excavation areas will be placed and compacted, for example, by track-walking across the backfilled area with a track-type tractor or equivalent. The backfill material placed on the drainage channel and stream side slopes, shall meet the following physical characteristics:

- ASTM D 2487, Classifications GW, GP, GM, SW, SP, or SM
- ASTM D 4318, Liquid limit, 35 maximum
- ASTM D 4318, Plasticity index, 12 maximum
- Maximum of 25 percent by weight passing ASTM D 1140, No. 200 sieve
- Maximum particle size of 2 inches

The backfill material to be used to re-establish the drainage channel and stream beds will satisfy the Indiana Department of Transportation (IDOT) requirements for bank-run sands and gravel.

Large rocks that were removed from the drainage channels and streams, cleaned, and saved during excavation activities will be used to help re-establish the drainage channels and streams at the general locations from where they were removed.

Floodplain Surface Soil Excavation Backfill (Group 3) - Backfill soil for the floodplain excavation areas will be placed in 0.5 to 1-foot thick lifts and compacted, for example, by track-walking across the backfilled area with track-type equipment. The backfill material shall meet the following physical characteristics:

- ASTM D 2487, Classifications GW, GP, GM, SW, SP, or SM
- ASTM D 4318, Liquid limit, 35 maximum
- ASTM D 4318, Plasticity index, 12 maximum
- Maximum of 25 percent by weight passing ASTM D 1140, No. 200 sieve
- Maximum particle size of 1 inch

Building Area Excavation Backfill (Group 4) -- Backfill for the building areas will be placed and compacted to 95% of ASTM D 698, using excavation and/or compaction equipment. The backfill material placed shall meet the following physical characteristics:

- ASTM D 2487, Classifications GM, SW, SP, SM, SC, ML, ML-CL, or CL
- ASTM D 4318, Liquid limit, 40 maximum
- ASTM D 4318, Plasticity index, 25 maximum
- Maximum particle size of 2 inches

3.7 RESTORATION

The disturbed areas backfilled and regraded as part of the IMWP implementation will be restored/stabilized using permanent stabilization practices. Restoration will consist of surface preparation, fertilizing, seeding, mulching, gravel surfacing, and stream restoration, where appropriate. Seeding procedures and procedures for associated activities (fertilizing and mulching) are presented in detail in Section 4.4. The following paragraphs describe the restoration activities to be performed at each of the four types of excavation areas.

Drainage Channel Excavation Area Restoration – Restoration includes placing biodegradable erosion control matting in the grass-lined portions, seeding, and placing bank-run sands and gravels and large rocks removed during excavation. The upper reaches of the drainage channels to be excavated are grass-lined and the lower reaches are lined with sands and gravels. The Contractor will identify these transitions prior to excavation and restore the drainage channels to pre-construction conditions.

Stream Excavation Area Restoration – Restoration includes seeding and placing bank-run sands and gravels and large rocks removed during excavation. Biodegradable erosion control matting will be used in portions of the stream channels that are grass-lined. Seeding will be performed on the banks of the excavated streams, and in portions of the stream that were grass-lined prior to excavation, and sands, gravels, and rocks will be placed within the stream bed. The Contractor will identify stream conditions and take photographs of natural pools, locations of natural aquatic features, and locations of stream bed transitions from grass lined to sand and gravel lined prior to excavation and restore the disturbed stream sections to pre-construction conditions, including pre-construction alignment and pre-construction aquatic features.

Floodplain Excavation Area Restoration – Restoration includes placement of biodegradable erosion control matting, seeding, and placing common fill/topsoil and large rocks removed during excavation. Biodegradable erosion control matting will be used over the entire excavation area.

Building Areas – Restoration includes seeding and replacement of gravel and asphalt pavement. Existing gravel surfaces shall be returned to gravel surfaces by providing a 6-inch thick layer of gravel, matching the existing gravel, compacted with excavation and/or compaction equipment. Grassy surfaces shall be restored to grassy condition. Removed roadway (asphalt pavement) shall be restored to original condition or better by replacing the roadbed and pavement.

Building Area Excavation Restoration - Restoration includes placement of biodegradable erosion control matting in slopes areas, seeding, and placing common fill and large rocks removed during excavation. The areas must be returned to original grade and allowance for settling must be made, especially in the deeper areas of excavation such as Areas 4A and 4B.

3.8 EROSION AND SEDIMENT CONTROL

Before excavation activities begin, erosion and sediment controls will be established to prevent impacts to surface water downgradient of the disturbance areas, namely Boggs Creek (see Section 4.0). These controls must especially prevent migration of TSCA-level contamination to non-TSCA level materials.

During excavation, backfilling, and restoration operations and until stabilization is achieved, either through placement of biodegradable erosion control matting or vegetation establishment, the erosion and sediment controls will be regularly inspected and maintained. Erosion and sediment control requirements to be complied with during IMWP implementation include the Indiana Handbook for Erosion Control in Developing Areas (IDEM, 1992).

3.9 GRAVEL CONSTRUCTION ENTRANCE

Gravel construction entrances will be installed from the access trails to the disturbed areas, which are described in detail in Section 4.0. The Contractor is required to minimize the amount of disturbance to the wooded areas where excavation activities will be performed. This requirement and the Navy's selected construction phasing will result in the use of several temporary access trails. The Contractor will be required to have a gravel construction entrance at the end of each temporary access trail that connects to NSA Crane facility roads.

3.10 DECONTAMINATION PAD

A temporary decontamination pad will be set up to clean equipment used to excavate and transport contaminated soils and sediments at an estimated four locations. The pads will be sized to accommodate all the equipment to be used at the site and will be constructed in a manner that contains all the contaminated materials removed from equipment and the liquids used to clean the equipment. Contaminated materials removed from the equipment will be disposed off-site with the excavated sediment and soil. Wash water will be filtered and discharged to the NSA Crane sanitary sewer system. Additional decontamination pad requirements are discussed in Section 4.5. Care will be taken to keep off-road transport equipment clean to minimize the spread of contaminated soils and sediments to areas

adjacent to the excavations or the temporary access trails. Any soil or sediment removal from these areas and the associated disposal and restoration costs will be the responsibility of the Contractor.

3.11 DEWATERING PAD

A temporary dewatering pad will be set up to dewater sediments excavated from the drainage channels and streams at an estimated two locations. The dewatering pads will be sized to accommodate excavated sediments and loading equipment, as necessary. The dewatering pads will be constructed in such a manner that will retain all materials while allowing the water to drain by gravity from the sediment and be collected in a sump. The water will then be filtered to remove any remaining sediments. Following the filtering of the water, and if approved by the OICC, the filtered water will be discharged to an NSA Crane approved stabilized drainage channel or storm drain or disposed off-site. The filtered water will be characterized and if the water contains a total PCB concentration greater than 3 µg/L, it will be disposed at a Navy-approved wastewater disposal facility. If the total PCB concentration of the water is less than or equal to 0.5 µg/L, and if the NSA Crane OICC approves, the filtered water will be discharged to an NSA Crane approved stabilized drainage channel or storm drain. If the total PCB concentration is greater than or equal to 0.5 µg/L and less than 3 µg/L and the OICC approves, the water may be discharged to a NSA Crane WWTP manhole designated by NSA Crane. Water with PCB concentrations greater than 3 µg/L must be removed to an off-site treatment facility.

3.12 CLEARING

Clearing will be performed only within the limits of disturbance shown on Figures 3-1 through 3-5. Any disturbance for access trails as shown on Figures 4-1 and 4-2 should be detailed in the Contractor's work plan. Clearing activities will be kept to a minimum to minimize impacts to natural habitat. Vegetation cleared at a height greater than 1 foot above ground surface will be chipped and used for the temporary access trails. Standing trees will not be removed between April 1 and September 30 to comply with Indiana bat regulations, further addressed in Section 3.16.2.

3.13 TEMPORARY ACCESS TRAILS

Temporary access trails will be constructed with chipped vegetation obtained during clearing operations and wood chips and/or mulch material obtained from an off-site borrow source. The temporary access trails will be left in place following the completion of this IM.

3.14 STORMWATER POLLUTION PREVENTION

The SWMU 17 ground surface hydrology, grading, and cover will not be altered due to IMWP implementation activities. Pre- and post-development runoff from the limits of disturbance will be the same; therefore, additional stormwater detention capacity is not required.

An IDEM Storm Water General Permit is required (stormwater permits are required for disturbances greater than 1 acre). Navy construction phasing may result in smaller areas of disturbances; in these cases, a permit may not be required. In addition, because IM activities include working in and around a water course, the IDEM 401 Permit and Department of Natural Resources (DNR) Construction in Floodway Permit is required (refer to Table 3-1). Additionally, IMWP implementation activities require the use of best management practices for erosion and sediment control and stormwater pollution prevention as described in Section 4.0.

3.15 OTHER IMWP IMPLEMENTATION REQUIREMENTS

3.15.1 Utilities

The Contractor is required to verify all utility locations and adequately protect any utilities located in the active work areas before any earth-disturbing activities begin.

3.15.2 Protection of Natural Resources

Threatened and endangered species or species of special concern protected under Indiana or Federal regulations exist or may exist in SWMU 17 and will be protected. Protected bird species that may use SWMU 17 as part of their home ranges include the bald eagle, osprey, sharp-shinned hawk, red-shouldered hawk, broad-winged hawk, black and white warbler, hooded warbler, and the worm-eating warbler (B&RE, 1997). Also, the Indiana bat, a federal endangered species, is known to forage at NSA Crane. During the spring and summer, Indiana bats roost in trees and forage for insects primarily in riparian and upland forests. The most important characteristic of roost trees is thought to be structural-exfoliating bark with space for bats to roost between the bark and the bole of the tree. To a limited extent, tree cavities and crevices are also used for roosting.

In 1997, NSA Crane received a letter from the USFWS stating that, in their opinion, NSA Crane had an abundance of Indiana bat habitat and that any activity that would result in the clearing of woody vegetation may affect the Indiana bat and would require consultation under the Endangered Species Act (ESA). The USFWS recommended interim guidelines for protecting Indiana bats and their habitat from

silvicultural activities, and these recommendations were immediately implemented by NSA Crane under the timber management program.

Due to the presence of the Indiana bat and its potential habitat, the cutting of trees at NSA Crane is restricted to certain times during the year, and the cutting of shagbark hickory trees (potential Indiana bat habitat) is prohibited. A summary of Indiana bat-related restrictions prepared by the NAVFAC Crane Natural Resources Office (i.e., "bat primer") is as follows:

- Woody vegetation that is 5 inches in diameter or greater at 4.5 feet above the ground surface may not be removed between April 1 and September 30.

- Standing dead trees may not be removed between April 1 and September 30.

- Timber harvesting may occur between October 1 and March 31 without a case-by-case consultation provided the interim guidelines for silvicultural treatment issued to the NSA Crane Natural Resources Office by the USFWS are followed.

- During emergency situations, necessary and prudent tree removal is allowed at all times without consultation. Though the need for emergency tree cutting is unlikely, any emergency tree cutting that occurs from April 1 through September 30 must be reported immediately to the NAVFAC Crane Natural Resources office and must be reported to the US Fish and Wildlife service within 24 hours of the tree cutting.

- Brush clearing of woody vegetation less than 3 inches in diameter at 4.5 feet above the ground may occur at any time of the year without consultation.

- All other tree removal or clearing projects not covered above must be submitted to the NAVFAC Crane Natural Resources Office for informal consultation with the USFWS on a case-by-case basis.

3.15.3 Traffic Control Plan

Access to NSA Crane is via four gates: the Main Gate referred to as the Bloomington Gate (Gate House No. 1) in the north, Burns City Gate (Gate House No. 2) in the west, Bedford Gate (Gate House No. 3) in the east, and Crane Gate (Gate house No. 4) in the northwest. NSA Crane will be accessed by the Contractor only through the Crane Gate. All vehicles will pass through the Crane Gate via the traffic

routing plan shown on Figure 3-7. The Contractor is not permitted to travel within restricted areas of the Crane facility. All waste hauling vehicles will be weighed upon arrival and at time of departure using the certified weight scale located at the Defense Reutilization and Marketing Office (DRMO) (Building 1940). The DRMO scale is operated during normal business hours, and weight tickets are available. The DRMO scale is the preferred scale for Contractors' use. Alternatively, if the DRMO scale is not available, the Army scale (Building 2913) may be used. The Army scale is no longer manned and weight tickets are not available. However, a weight readout is available at the Army scale. If this scale is used, the Contractor is required to maintain a log of recorded weights.

3.15.4 Contractor Requirements

The Contractor will be required to perform all IMWP implementation activities in accordance with the Contractor's Basic Contract, NSA Crane Contractor's Operations Manual (NSWC Crane, 2002), and supplemental specifications provided in Appendix B.

The IWMP will be implemented by the Contractor, NSA Crane, and Tetra Tech, with work assignments summarized on Table 3-1.

3.16 IMPLEMENTATION

The Contractor will coordinate all field work through the OICC.

IMWP implementation may be impacted by NSA Crane activities and the facility's "Protective Measures". NSA Crane will implement a corresponding set of "Protective Measures" based on the warnings provided by the Homeland Security Advisory System in the form of graduated "Threat Conditions." The Contractor will be subject to any implemented "Protective Measures."

The Navy will provide a full-time oversight representative during IMWP implementation. Potable water for project personnel and equipment decontamination will be provided by NSA Crane.

TABLE 3-1

WORK ASSIGNMENT RESPONSIBILITY CHART
INTERIM MEASURES WORK PLAN SWMU 17 – PCB CAPACITOR BURIAL/POLE YARD
NSA CRANE
CRANE, INDIANA

WORK ITEM	CONTRACTOR	NSA CRANE	Tetra Tech
Pre-IMWP Implementation Meeting	X	X	X
Interim Measure Implementation	X		
Contractor Work Plan (1)	X		
Site Specific Health and Safety Plan / Activity Hazard Analysis	X		
Project Quality Control Plan	X		
Surveying and marking of excavation node			X
Environmental Conditions Report	(2)		X
Permits			
- Safety & Building Availability Permit (ESO 8020/11)	X		
- Digging Permit (NWSCC 11000/3)	X	(3)	
- Flame Tool / Hot Work Permit (NWSCC 11320)	X		
- HERO Permit (approval for portable radios)	X		
- Tree Clearing Permit		X	
- IDEM Storm Water General Permit			X
- IDEM 401 Permit			X
- DNR Construction in the Floodway Permit			X
Field Work Reports and Submittals (4)	X		
Sampling and Analysis	X(5)		
Wastewater Disposal (Decontamination Water)	X	(6)	
CTO Closure Report	X (6)		X

NOTES:

1. Contractor Work Plan includes, but is not limited to, an excavation and handling plan, waste management plan, environmental protection plan, erosion and sediment control plan, stormwater pollution prevention plan, sampling plan, and transportation and disposal plan.
2. Contractor will participate in documenting environmental conditions before, during, and after implementation of the interim measures.
3. Contractor completes the permit form. NSA Crane performs the utility clearance.
4. Contractor will furnish items identified in the Basic Contract, NSA Crane Contractor's Operations Manual, and the Supplemental Specifications provided in Appendix B.
5. Tetra Tech will collect verification samples to confirm that the lining systems of the support facilities did not fail during the implementation of this IM. Contractor will be responsible for collection, storage, characterization, and discharge of wastewater to the NSA Crane approved stabilized drainage channel, storm drain, or wastewater treatment plant. Contractor will be required to characterize backfill materials. Contractor will be required to characterize soil and sediment to meet non-PCB disposal criteria of the disposal facility.
6. Contractor will furnish items identified in the Supplemental Specifications provided in Appendix D.

CTO - Contract Task Order
HERO - Hazards of Electromagnetic Radiation to Ordnance
IMWP - Interim Measures Work Plan
NSA - Naval Support Activity
Tetra Tech - Tetra Tech, Inc.
X – Indicates responsible party

TABLE 3-2

EXCAVATION NODE NORTHING AND EASTING COORDINATES
INTERIM MEAUSRES WORK PLAN, SWMU 17 - PCB CAPACITOR BURIAL / POLE YARD
NSA CRANE
CRANE, INDIANA

Node ID	Northing	Easting
1	1318121.06000	3021459.31000
1a	1318092.72048	3021459.27123
2	1318181.79095	3021539.88743
3	1318229.07050	3021588.60621
4	1318231.79323	3021613.73167
5	1318088.85980	3021482.58282
6	1318097.65840	3021564.95510
7	1318101.15820	3021525.52920
8	1318104.34244	3021514.07874
9	1318130.44450	3021600.79470
10	1318165.34340	3021608.57260
11	1318200.16200	3021658.39070
12	1318225.71160	3021683.53790
13	1318238.61581	3021687.99312
14	1318251.10883	3021654.47882
15	1318244.39540	3021780.76890
15a	1318248.11165	3021830.96797
16	1318245.83000	3021877.81000
17	1318230.13590	3021907.53440
17a	1318204.87100	3021923.70840
18	1318186.90855	3021912.89370
19	1318227.79397	3021772.78953
20	1318228.57510	3021764.25450
21	1318184.43459	3021743.23224
22	1318183.13251	3021757.16453
23	1318187.68980	3021774.09162
24	1318155.65855	3021787.24266
25	1318149.40855	3021794.27391
26	1318193.80959	3021796.87807
27	1318193.80959	3021807.42495
28	1318206.43980	3021807.42495
29	1318193.02834	3021820.18537
30	1318175.18980	3021857.29474
31	1318168.66080	3021899.02220
32	1318164.25410	3021943.61510
33	1318183.52313	3022000.39370
34	1318107.19590	3022192.60920
35	1318097.89240	3022221.57010

TABLE 3-2

EXCAVATION NODE NORTHING AND EASTING COORDINATES
INTERIM MEAUSRES WORK PLAN, SWMU 17 - PCB CAPACITOR BURIAL / POLE YARD
NSA CRANE
CRANE, INDIANA

Node ID	Northing	Easting
36	1318089.29710	3022239.30720
37	1318073.10644	3022235.21676
38	1318089.25228	3022184.30530
39	1318054.26963	3022666.75502
40	1318032.81900	3022693.29200
41	1318075.19346	3022761.05642
42	1318084.52506	3022747.27603
43	1318093.30930	3022751.16320
44	1318083.99730	3022789.19940
45	1318060.54502	3022850.90017
46	1318044.26898	3022830.17534
47	1318042.42436	3022876.83333
48	1318050.17480	3022875.32020
49	1318025.92392	3023009.95968
50	1318081.90300	3023021.17470
51	1318104.14200	3023166.25540
52	1318099.81776	3023226.17216
53	1318115.18235	3023257.55237
54	1318132.23964	3023268.35966
55	1318149.94797	3023286.45862
56	1318127.43000	3023312.29860
57	1318139.71120	3023356.86150
58	1318133.15110	3023361.19820
58a	1318132.69788	3023378.99582
58b	1318156.45037	3023446.97709
59	1318114.53130	3023276.56278
60	1318108.02060	3023277.09360
61	1318097.56060	3023266.92250
62	1318100.31620	3023247.82250
63	1318081.34930	3023235.47340
64	1318090.31255	3023221.61487
65	1318063.88026	3023235.54716
66	1318029.50526	3023207.03153
67	1318026.64068	3023182.55237
68	1318035.10422	3023181.64091
69	1318046.43235	3023095.96383
70	1318015.96360	3023096.22424
71	1318185.91990	3023569.38040

TABLE 3-2

EXCAVATION NODE NORTHING AND EASTING COORDINATES
INTERIM MEAUSRES WORK PLAN, SWMU 17 - PCB CAPACITOR BURIAL / POLE YARD
NSA CRANE
CRANE, INDIANA

Node ID	Northing	Easting
72	1318230.97995	3023621.77575
73	1318219.91224	3023631.21586
73a	1318202.36534	3023609.52961
74	1318215.68047	3023635.44763
75	1318201.43670	3023620.66380
76	1318161.31849	3023604.84867
77	1318170.97561	3023591.82784
78	1318141.98810	3023689.16960
79	1318147.33190	3023702.80030
80	1318131.17090	3023710.34730
81	1318127.62020	3023691.59020
82	1317782.10977	3021987.47334
83	1317815.90242	3022011.52857
84	1317816.17502	3022017.98237
85	1317775.57941	3022018.24809
86	1317768.91131	3022018.04977
87	1317816.78464	3022032.41479
88	1317814.47862	3022047.52221
89	1317812.39768	3022061.15500
90	1317809.52288	3022079.98861
91	1317803.32369	3022097.99232
92	1317764.12298	3022097.88988
93	1317760.37897	3022090.89125
94	1317747.59813	3022067.00012
95	1317749.69719	3022066.42765
96	1317778.83809	3022061.44601
97	1317778.09156	3022047.75851
98	1317766.09590	3022027.90434
99	1317765.72408	3022034.47614
100	1317741.18418	3022031.47556
101	1317732.47814	3022071.20986
102	1317721.31200	3022083.53200
103	1317736.85696	3022094.18846
104	1317734.88800	3022111.78300
105	1317717.89000	3022112.96000
106	1317715.26900	3022123.55400
107	1317699.57400	3022120.80800
108	1317700.61367	3022105.11200

TABLE 3-2

EXCAVATION NODE NORTHING AND EASTING COORDINATES
INTERIM MEAUSRES WORK PLAN, SWMU 17 - PCB CAPACITOR BURIAL / POLE YARD
NSA CRANE
CRANE, INDIANA

Node ID	Northing	Easting
109	1317711.05540	3022113.36260
110	1317676.79867	3022095.40800
111	1317664.76640	3022086.87140
112	1317654.56670	3022086.87140
113	1317657.38310	3022095.07520
114	1317656.11211	3022108.77966
115	1317644.25860	3022108.57280
116	1317634.27597	3022116.92784
117	1317634.33182	3022118.21034
118	1317671.82092	3022123.77704
119	1317700.50287	3022134.89960
120	1317720.76318	3022152.14074
121	1317732.83789	3022167.98462
122	1317742.34400	3022144.35000
123	1317756.15630	3022143.25850
124	1317756.31320	3022110.07560
125	1317777.18241	3022108.95530
126	1317799.71280	3022108.47906
127	1317625.70392	3022087.52245
128	1317613.59450	3022097.15780
129	1317624.20371	3022118.75994
130	1317592.49311	3022127.75146
131	1317593.36885	3022097.39659
132	1317599.67260	3022087.83210
133	1317613.76810	3022076.88870
134	1317592.82630	3022076.67170
135	1317588.62736	3022065.41404
136	1317586.93600	3022065.40800
137	1317573.18656	3022076.34624
138	1317573.51208	3022097.17957
139	1317582.19263	3022108.89832
140	1317666.09184	3022177.10423
141	1317684.12037	3022175.20940
142	1317711.99540	3022194.02730
143	1317713.62030	3022210.04510
144	1317720.99035	3022210.83312
145	1317719.27589	3022231.28118
146	1317715.33252	3022261.62290

TABLE 3-2

EXCAVATION NODE NORTHING AND EASTING COORDINATES
INTERIM MEAUSRES WORK PLAN, SWMU 17 - PCB CAPACITOR BURIAL / POLE YARD
NSA CRANE
CRANE, INDIANA

Node ID	Northing	Easting
147	1317701.23100	3022258.37700
148	1317691.03640	3022270.56230
149	1317695.10400	3022288.11900
150	1317711.16042	3022289.79889
151	1317703.91107	3022332.39760
152	1317701.83000	3022332.40000
153	1317681.73180	3022340.71160
154	1317673.40590	3022368.74000
155	1317687.22220	3022370.66510
156	1317695.86400	3022380.50717
157	1317693.97394	3022392.45813
158	1317686.55100	3022393.04800
159	1317683.72720	3022382.24390
160	1317662.29198	3022358.80388
161	1317658.94359	3022350.76774
162	1317654.51100	3022341.22200
163	1317660.25500	3022312.24500
164	1317646.72180	3022309.76473
165	1317717.39782	3022386.82238
166	1317720.06300	3022387.28300
167	1317729.69700	3022377.21900
168	1317724.85780	3022353.73851
169	1317747.52800	3022345.71580
170	1317757.72730	3022347.87980
171	1317763.01400	3022359.60400
172	1317788.67200	3022379.64500
173	1317826.15593	3022400.49814
174	1317822.48479	3022456.96307
175	1317799.65407	3022441.63050
176	1317720.11660	3022431.02100
177	1317714.95350	3022412.48840
178	1317711.47157	3022411.84307
179	1317569.05035	3022035.33793
180	1317264.88368	3021766.58793
181	1317163.14757	3021669.01848

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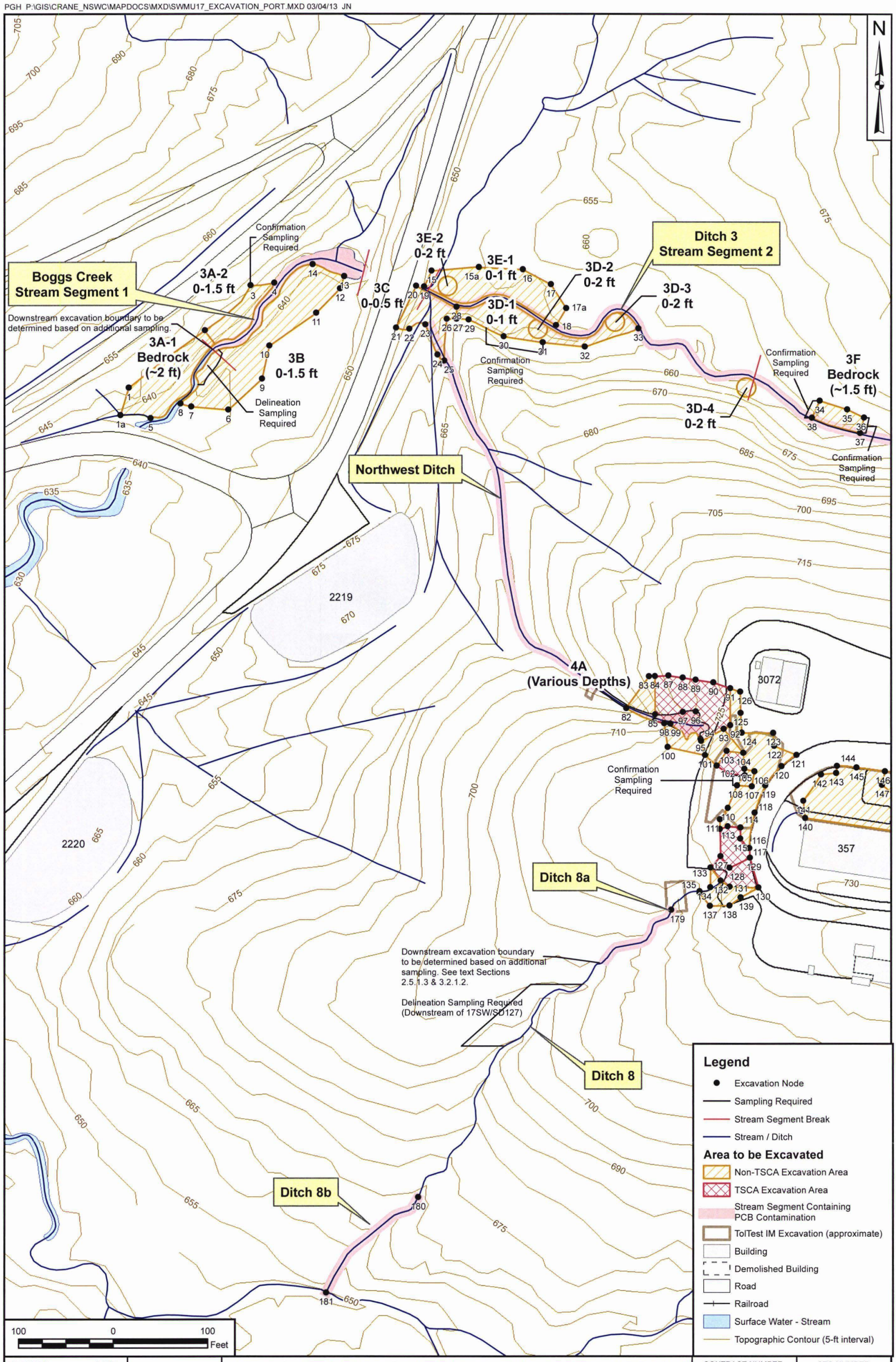

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J. NOVAK	06/21/12
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T. JOHNSTON	03/04/13
REVISED BY	DATE
J. NOVAK	03/04/13
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EXTENT OF SEDIMENT EXCAVATION IN NORTHWEST DITCH AND DITCH 8
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
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FIGURE NO. 3-1	REV 0

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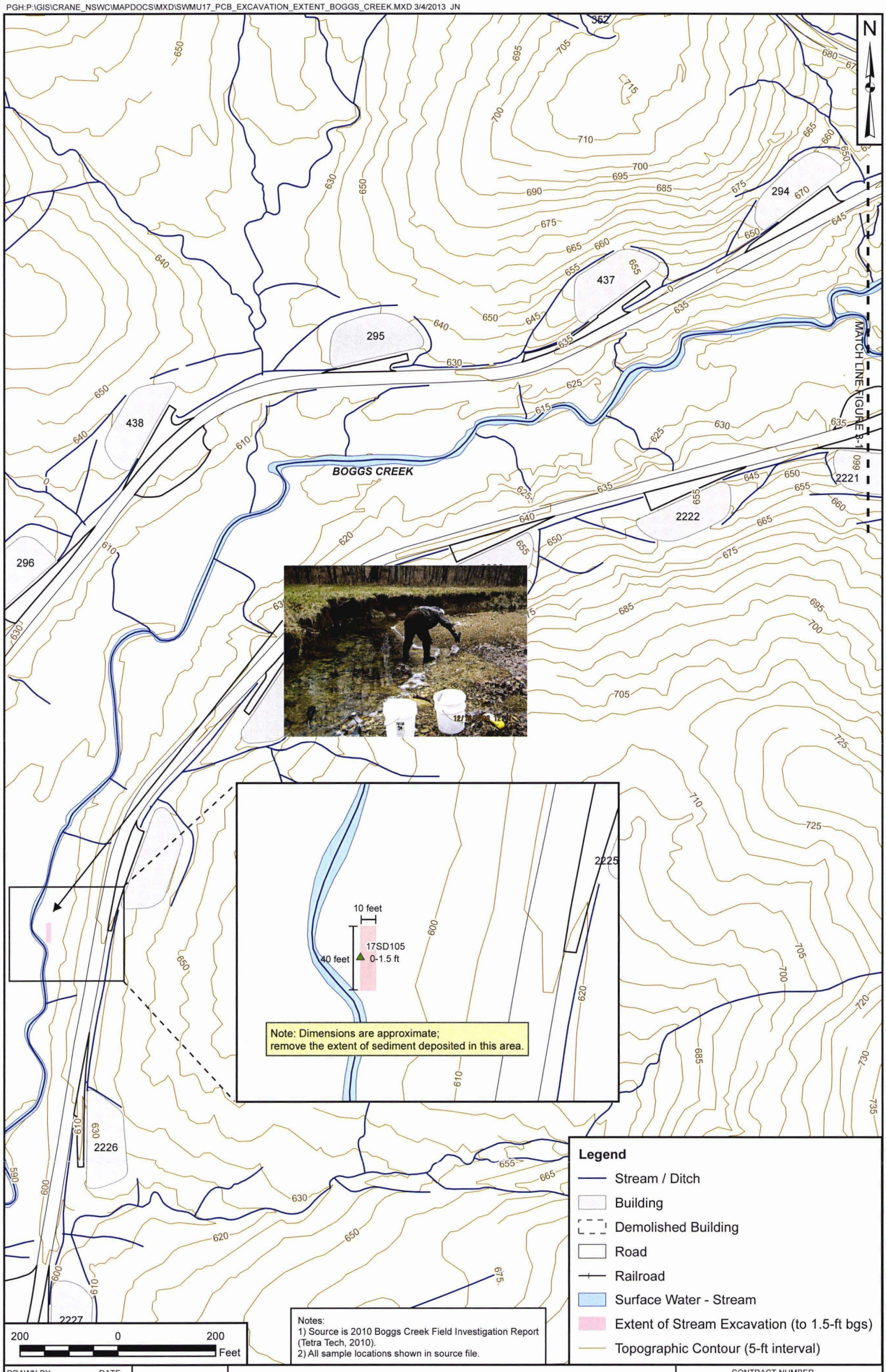

Notes:
1) Source is 2010 Boggs Creek Field Investigation Report (Tetra Tech, 2010).
2) All sample locations shown in source file.

DRAWN BY	DATE	EXTENT OF SEDIMENT EXCAVATION IN AREA 17SD105 AREA SWMU 17 PCB CAPACITOR BURIAL/POLE YARD INTERIM MEASURES WORK PLAN NSA CRANE CRANE, INDIANA	CONTRACT NUMBER CTO F271	
K. MOORE	5/11/11		APPROVED BY —	DATE —
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T. JOHNSTON	03/04/13		FIGURE NO. 3-2	REV 0
REVISED BY	DATE			
J. NOVAK	03/04/13			
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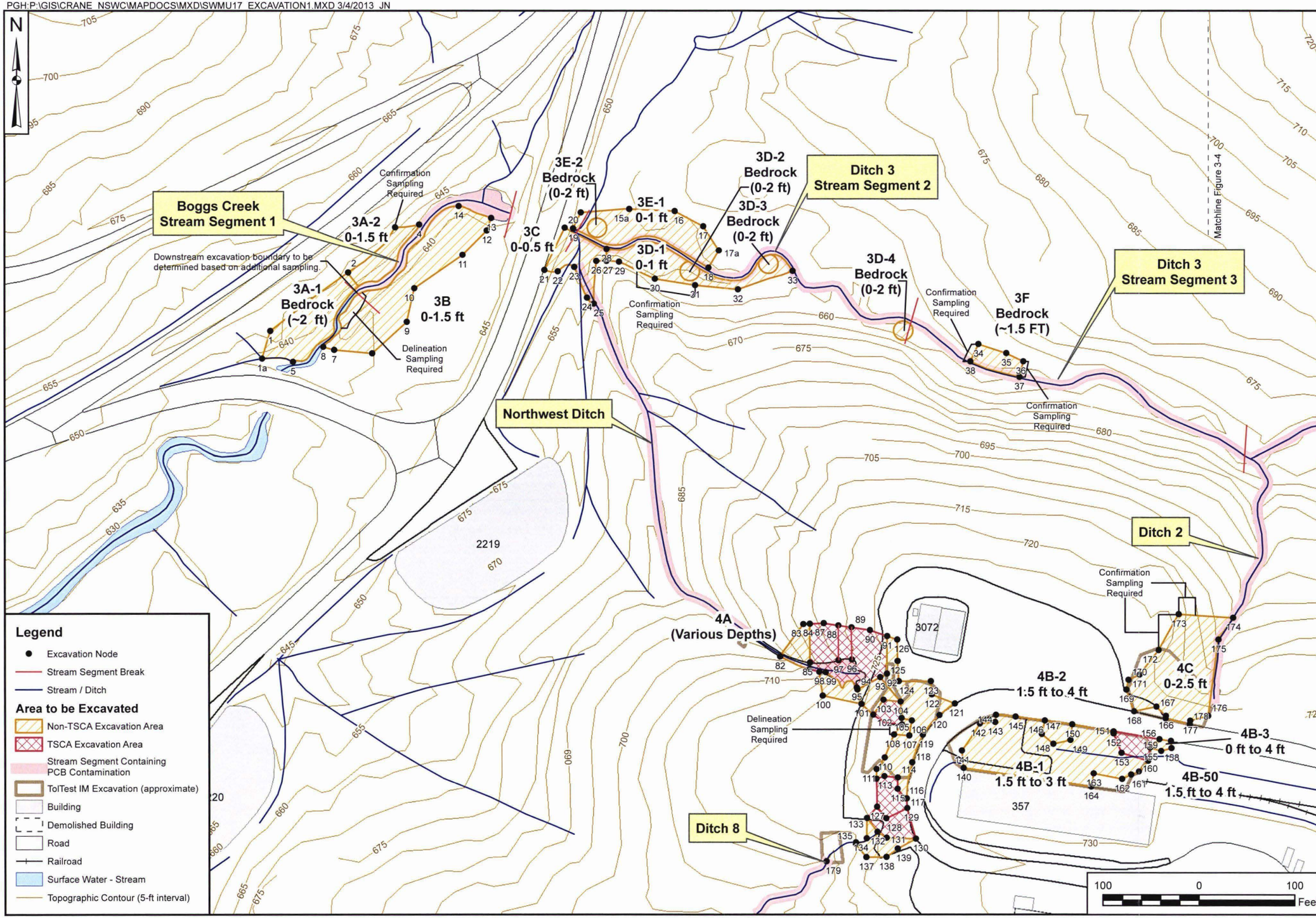

CONTRACT NUMBER
CTO F271

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FIGURE NO. 3-3

REV 0

EXTENT OF SEDIMENT AND SOIL EXCAVATION IN DITCH 3
STREAM SEGMENTS 1 THROUGH 3 AND TOLTEST EXCAVATION AREA
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

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REVISED BY J. NOVAK	3/4/2013

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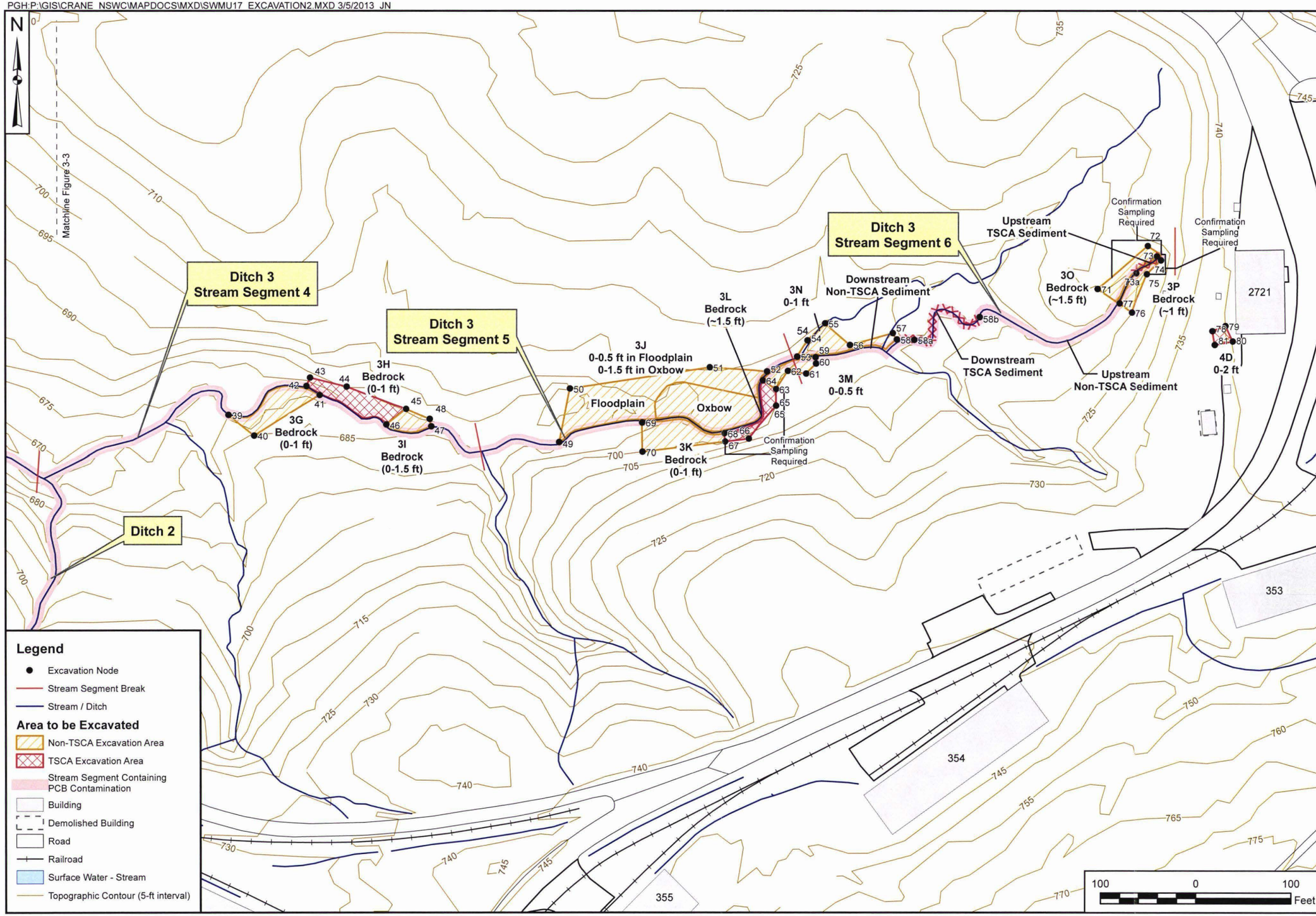

CONTRACT NUMBER
CTO F271

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FIGURE NO.	3-4	REV 0

EXTENT OF SEDIMENT AND SOIL EXCAVATION IN DITCH 3
STREAM SEGMENTS 4 THROUGH 6 AND AREA 4D
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

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J. NOVAK	5/15/2012	
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T. JOHNSTON	3/5/2013	
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J. NOVAK	3/5/2013	

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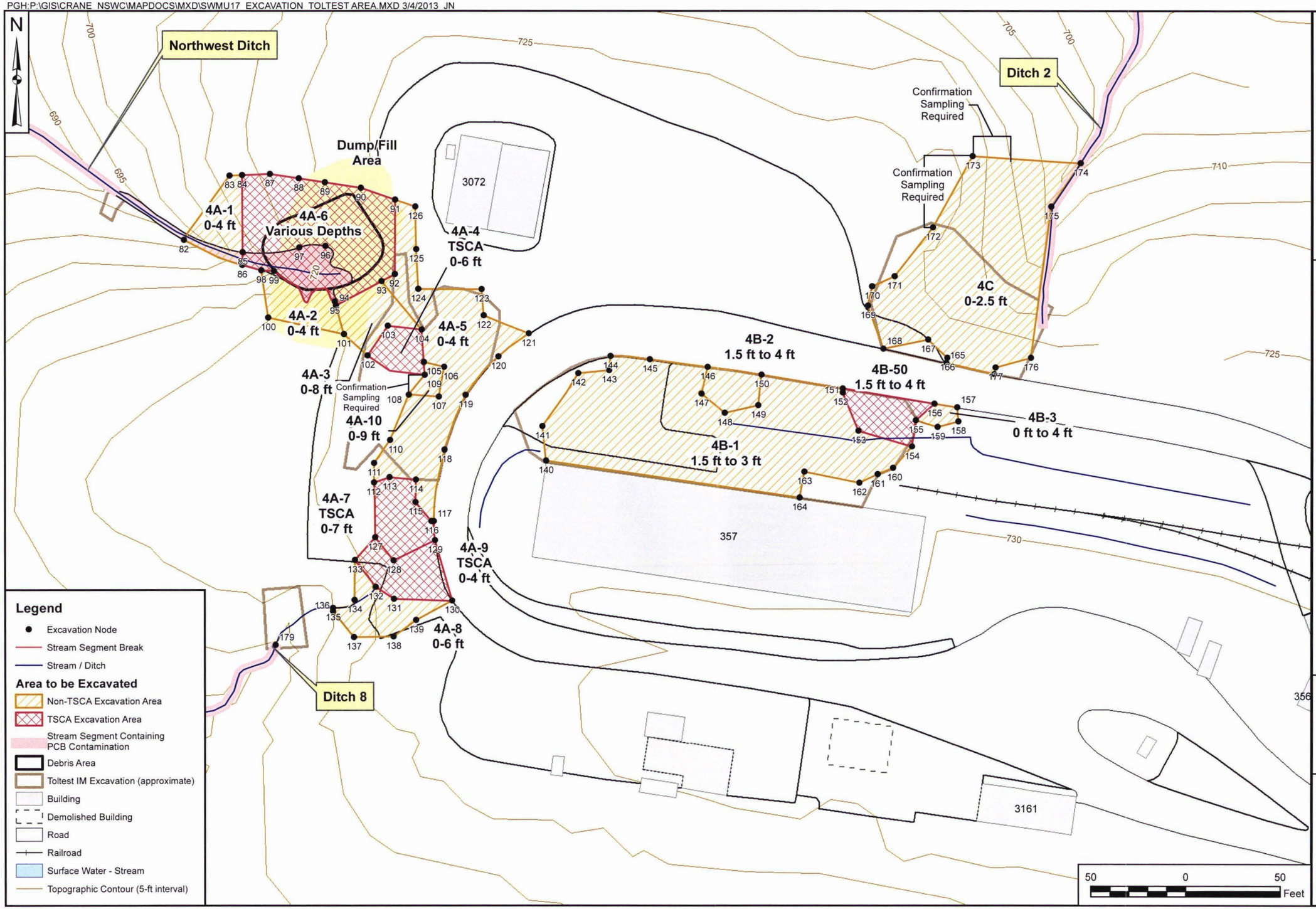

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CTO F271

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FIGURE NO. 3-5

REV 1

EXTENT OF SEDIMENT AND SOIL EXCAVATION AT
AREAS 4A, 4B AND 4C
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

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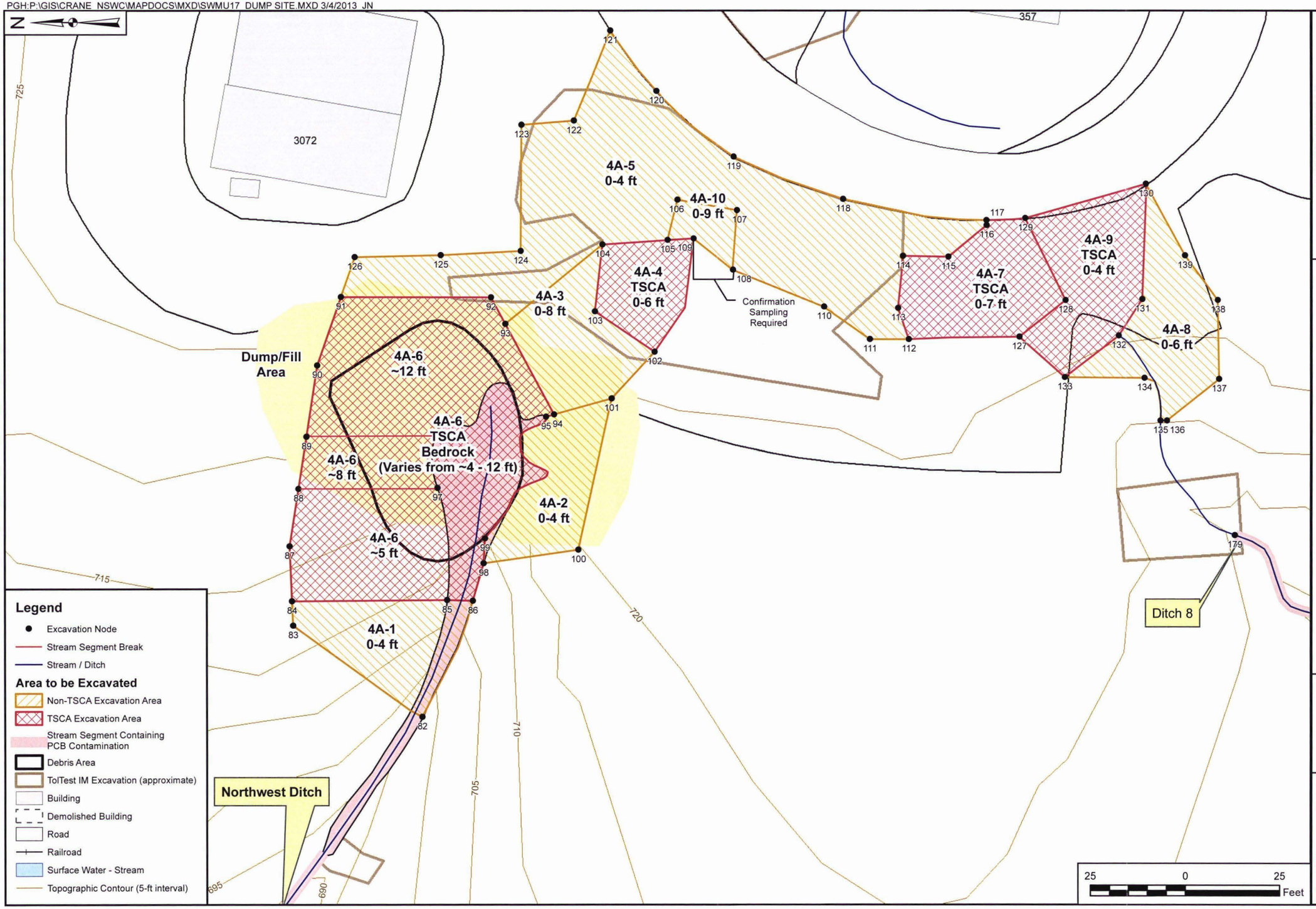

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CTO F271

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FIGURE NO. 3-6

REV 1

DUMP/FILL AREA EXCAVATION DETAIL
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

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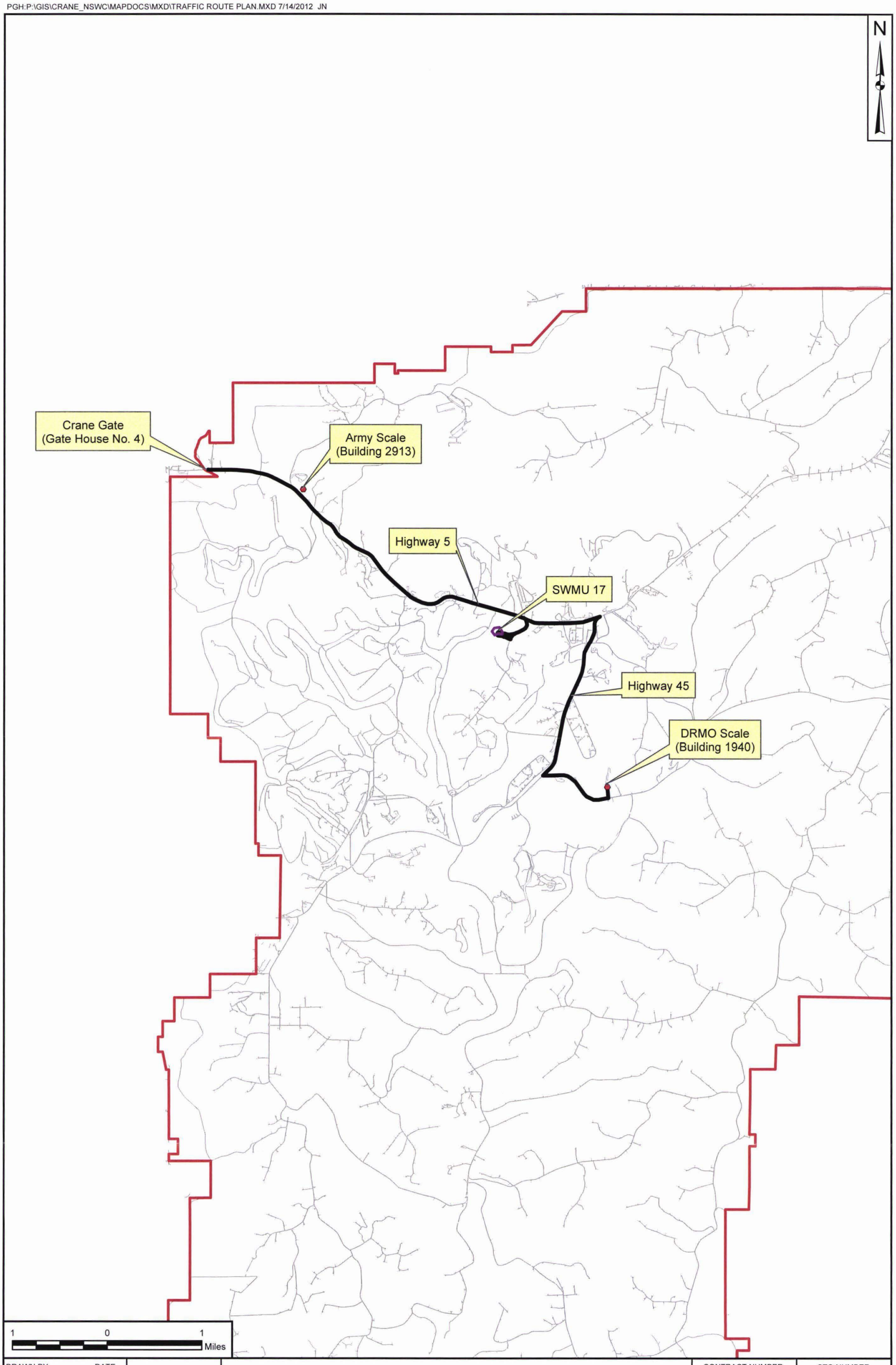

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TRAFFIC ROUTING PLAN
SWUM 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NAS CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
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FIGURE NO. 3-7	REV 0

4.0 EROSION AND SEDIMENT CONTROL PLAN

4.1 PURPOSE

The purpose of this section is to provide the steps that will be taken to minimize and/or eliminate erosion and sedimentation during the implementation of the IMWP for floodplains, ditches, and streams at SWMU 17. The erosion and sediment control plan has been developed in accordance with the guidelines defined in the Indiana Handbook for Erosion Control in Developing Areas (Handbook) (IDEM, 1992). Relevant standards and specifications from the Handbook are included in this section and Appendix C. The erosion and sediment control devices described in this text can be modified based on construction equipment and techniques presented in the Contractor's Work Plan. Selected erosion and sediment control devices must be identified in the Erosion and Sediment Control Plan submitted with the Contractor Work Plan. After the Erosion and Sediment Control Plan is approved, no changes may be made without approval by the OICC and the IDEM.

The Contractor should note that this Erosion and Sediment Control Plan assumes that all elements of the SWMU 17 removal action will occur at one time. In the event the Navy elects to phase the construction activities at SWMU 17 all of the Erosion and Sediment Controls identified in this plan may or may not be required. The Contractor must identify the Erosion and Sediment Controls required for the construction activities identified in their work plan.

4.2 EROSION AND SEDIMENT CONTROL REQUIREMENTS

Erosion and sediment control measures are implemented to reduce or eliminate erosion and sedimentation of soils that would be detrimental to surface water quality. Several of the excavation activities associated with the IMWP are within or adjacent to drainage channels and streams. All the surface water runoff from disturbed areas migrates to Boggs Creek. Some of the SWMU 17 drainage channels to be excavated only carry flow from stormwater runoff during rain events; the remaining drainage channels and streams have a base flow and support aquatic life. Boggs Creek, which discharges into Lake Gallimore, is located approximately 120 feet from SWMU 17 at its closest point. Lake Gallimore discharges to a tributary of the Wabash River.

IMWP implementation activities for SWMU 17 consist of excavation and off-site disposal of PCB-contaminated surface soils and sediments, backfilling excavations, and restoration of disturbed areas. Surface soil will be excavated from the floodplains adjacent to Boggs Creek Segment 1 and Ditch 3, Segments 2 through 6, as well as the SWMU 17 Dump/Fill Area located southwest of Building 3072, the

area between Building 357 and the road to the immediate north of this building, the previously excavated soil area west and southwest of Ditch 2, and a small area immediately southwest of Building 2721. Sediment will be excavated from the Northwest Ditch, Segments 8a and 8b of Ditch 8, Boggs Creek downstream near sampling location 17SW/SD105, Boggs Creek Segment 1, and Ditch 3 Segments 2 through 6. Because of site conditions, temporary access trails will need to be constructed to allow access to the excavation areas.

Considering the type of IMWP activities and access issues, the proposed erosion and sediment control measures include the following:

- Silt Fence – Placed along the downslope sides of the gravel construction entrances, trails, and support facilities to provide a temporary sediment barrier. Silt fencing consists of synthetic filter fabric and wooden posts.

- In-stream Sediment Trap – Placed within the drainage channels and streams downstream of the portions from which PCB-contaminated sediments will be removed to provide a temporary sediment barrier while allowing flow within the disturbed channel. Multiple in-stream sediment traps will be required based on the proposed segments of channel to be disturbed within a given time period. In-stream sediment traps are constructed of gravel, riprap, and filter fabric and will not be placed greater than 300 feet apart.

- Gravel Construction Entrances – Placed as a controlled site entrance to reduce the amount of sediment transported by construction vehicles onto facility and public roads.

- Dust Control – Used to prevent surface and air movement of dust from exposed soil surfaces and to reduce the amount of airborne substances that may present health hazards, traffic safety problems, or harm plant/animal life.

- Permanent Seeding – Used to establish perennial vegetation on disturbed areas by planting seeds of native grasses.

The construction, implementation, and maintenance of these erosion and sediment control devices will be in accordance with the Handbook. Figures 4-1 and 4-2 present proposed excavation areas along with the limits of disturbance and locations of proposed erosion and sediment control devices. Figures 4-3A and 4-3B present typical details of the erosion and sediment control devices proposed for the IMWP

implementation (i.e., silt fence, gravel construction entrance, and in-stream sediment trap). It is important to note that the example (conceptual) road locations and support facility shown on Figures 4-1 and 4-2 are only examples. The excavation contractor may determine, based on field conditions, that support facility locations and size, roads, stream crossings, etc. must be moved to most efficiently support the interim measures. **THEREFORE, PRIOR TO IMPLEMENTATION OF THE INTERIM MEASURES, THE CONTRACTOR MUST SUBMIT AN UPDATED VERSION OF THESE FIGURES AND OBTAIN NAVY APROVAL OF THEM.**

Permanent seeding is discussed in Section 4.4. Dust control will be addressed in the Contractor's Work Plan. All erosion and sediment controls will remain in place until all upstream areas have been stabilized. Stabilization will be determined by the OICC.

4.3 INSPECTION AND MAINTENANCE OF EROSION AND SEDIMENT CONTROLS

In general, all erosion and sediment control measures will be checked daily and after each runoff-producing rainfall event. Any required repairs will be made immediately. The following items will be checked:

- The stone construction entrance will be maintained in a condition that will minimize tracking sediment and dust onto facility or public roads.

- Silt fence will be checked for undermining or deterioration of the fabric. Sediment will be removed when the level of sediment causes bulging or reaches one-half of the fabric height.

- In-stream sediment traps will be checked for undermining or erosion around the edges of the trap(s). Sediment will be removed when the level of sediment reaches one-half the height of the in-stream sediment trap or when the quantity of flow through the in-stream sediment trap is significantly reduced.

- Seeded areas will be checked regularly to ensure that a good growth of vegetation is maintained and these areas will be fertilized and reseeded, as needed.

- The fuel and lubricant materials storage area will be checked to ensure that stored containers are not leaking and that the lining system is functioning properly.

All erosion and sediment control devices will be inspected and maintained until the OICC has formally accepted the permanent stabilization of the disturbed areas. The Contractor will maintain a log book of all erosion and sediment control device inspections and maintenance. This log book will be available at the site at all times for inspection by duly authorized officials including NSA Crane personnel and the IDEM.

4.4 SITE RESTORATION

All areas disturbed by the IMWP implementation activities (excavation and support facility areas) will be restored/stabilized using soil, gravel, bank-run sands and gravels, pavement, and permanent seeding. Activities to establish permanent stabilization will be implemented as soon as possible following the establishing of final grades. The establishment of permanent vegetation includes site/seed bed preparation, seeding, and mulching of the following locations:

- Banks of the drainage channels and streams and floodplain areas
- Drainage channel and stream beds where applicable
- Surface soils below support facilities
- Grassy areas disturbed by excavation or access/support activities

In addition, gravel shall be replaced in existing gravel areas to meet the specifications of Sections 3.6 and 3.7 and return site conditions to pre-remediation condition. Asphalt pavement that is removed as part of the Area 4A-7 excavation must be replaced to restore the road to its original condition or better.

The procedures and requirements for permanent seeding activities are presented in Section 3.7 of the Handbook. The seed mixture recommended for use at SWMU 17 is a standard Indiana seed mixture for open and disturbed areas. The seed mixture includes perennial ryegrass and tall fescue. Planting rates and optimum soil pH for this mixture are presented in Exhibit 3.12-C of the Handbook (this exhibit is provided in Appendix C). Following seeding, the seeded areas will be covered with temporary erosion control matting (e.g., coconut fiber matting) to provide additional stabilization until vegetation is established. In the event that disturbed areas are brought to final grade outside of the optimal growing season for the permanent seed mixture, the disturbed areas will be temporarily stabilized using a temporary seed mixture. The procedures and requirements for establishing temporary stabilization are presented in Section 3.11 of the Handbook. As indicated in the Handbook, erosion and sediment control devices will remain in place until permanent stabilization is established over the disturbed areas. Therefore, erosion and sediment control devices will not be removed by the Contractor until directed by the OICC.

Sections 3.11 through 3.15 (Temporary Seeding, Permanent Seeding, Dormant and Frost Seeding, and Mulching) of the Handbook are provided in Appendix C.

4.5 RESPONSE PROCEDURES FOR SPILL MITIGATION

Potential non-stormwater discharges anticipated during IMWP implementation activities include dewatering liquids, wash water resulting from decontamination efforts associated with field equipment and vehicles, fuel and lubricant spills from vehicle fueling, lubrication, and maintenance, and spills of fertilizers and small quantities of laboratory chemicals used in sample collection, and other flammable substances.

All decontamination wash water will be collected in a lined decontamination and equipment wash pad area. All waters generated from decontamination and/or other washing activities will be collected, analyzed, and transported to the NSA Crane wastewater treatment facility, if approved by NSA Crane, or to an approved off-site treatment facility. All vehicle fueling, lubrication, and maintenance will be performed utilizing drip pans to contain any spills that may occur or within the decontamination pad to contain spills. Containers of detergents and vehicle maintenance fluids (oil, grease, antifreeze, hydraulic fluid, etc.) will be stored within an enclosed, lined, diked area along with the equipment fuel, which is stored in tanks. This area, referred to as the materials storage area, will be bermed and lined with a 60-mil low-density polyethylene (LDPE) geomembrane and will be sized to contain 110 percent of the volume stored within the area. A small sump or low point in the liner will be designed to serve as a collection and monitoring point for any leaks or spills from the containers stored within the materials storage area. When not in use, chemicals, paints, and other flammable substances must be stored in a flammable materials storage cabinet. A HAZMAT locker may be placed temporarily onsite during remediation.

Good housekeeping procedures will be followed to reduce risks associated with these materials. These procedures include, but are not limited to, keeping materials in their original containers whenever possible, maintaining original labels and Material Safety Data Sheets (MSDSs), and using proper disposal methods for surplus materials. Accidental spills that may occur will be contained as appropriate for the spilled medium (liquid or solid) and collected and containerized immediately after discovery of the spill. Containerized material will be analyzed (characterized) for off-site transportation and disposal. The following spill mitigation equipment should be available on site during construction activities:

- Drip pans
- Oil-dry or similar compound
- Absorbent socks

- Shovels
- 55-gallon drums or storage tank (for containerization)
- Labels for contents identification

Following spill cleanup, the cause of the spill will be investigated, and material storage and handling procedures will be reviewed and revised where appropriate. All spills will be reported to the NAVFAC Crane Environmental Department.

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FIGURE NO. 4-1 | REV 0

CONCEPTUAL SUPPORT AREAS
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NAS CRANE
CRANE, INDIANA

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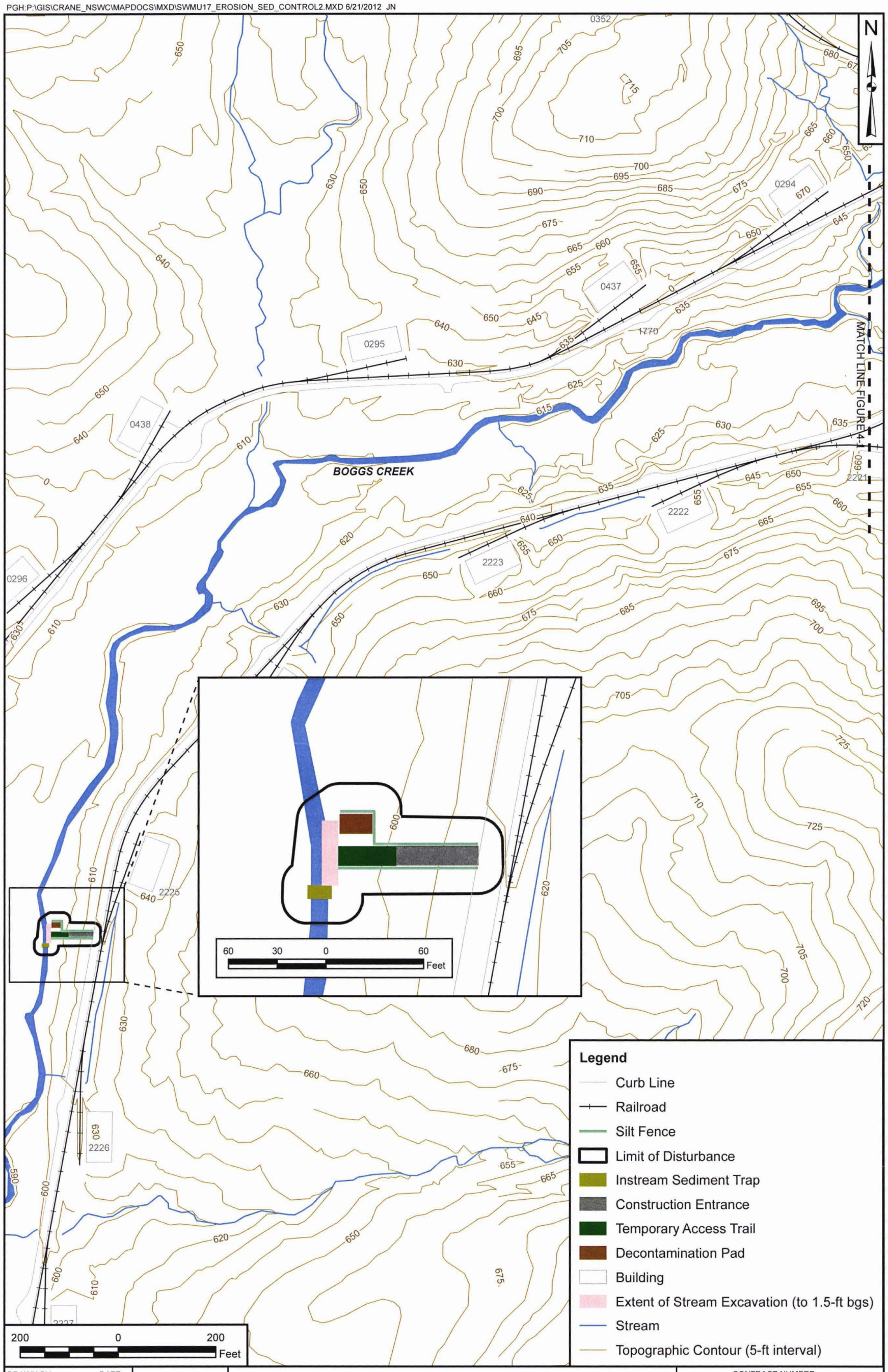

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EROSION AND SEDIMENT CONTROL PLAN
SWMU 17 PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES WORK PLAN
NSA CRANE
CRANE, INDIANA

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FIGURE NO. FIGURE 4-2	REV 0

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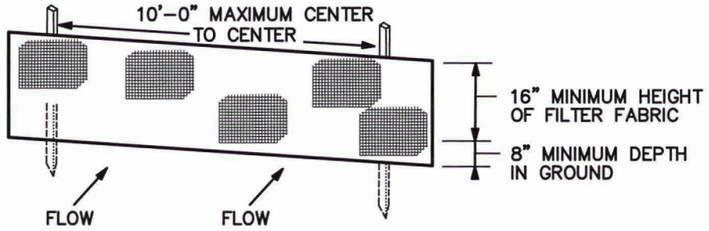
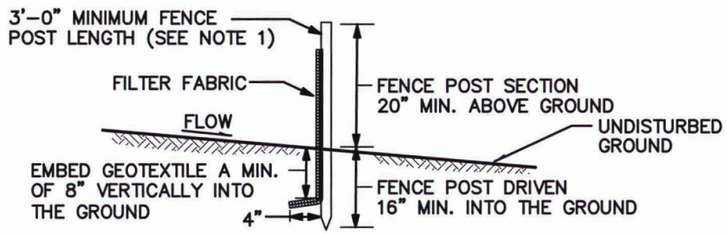
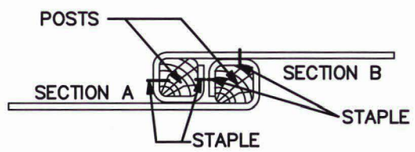


PERSPECTIVE VIEW



CROSS SECTION

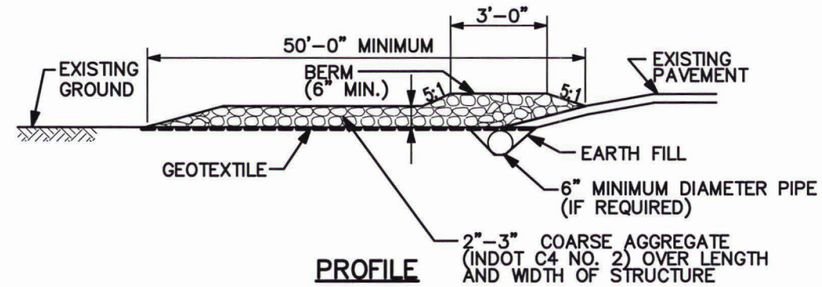


TOP VIEW – JOINING TWO ADJACENT SILT FENCE SECTIONS

NOTES:

1. WOOD POSTS SHALL BE 1.5" BY 1.5" SQUARE (MIN) CUT OR 1.75" DIAMETER (MIN) ROUND AND SHALL BE OF SOUND QUALITY HARDWOOD. STEEL POSTS WILL BE STANDARD T OR U SECTION WEIGHING NOT LESS THAN 1.00 POUND PER LINEAR FOOT.
2. FILTER FABRIC SHALL BE FASTENED SECURELY TO EACH FENCE POST WITH WIRE TIES OR STAPLES AT TOP AND MID-SECTION.
3. INSTALL SILT FENCE PARALLEL TO THE CONTOUR OF THE LAND.

SILT FENCE



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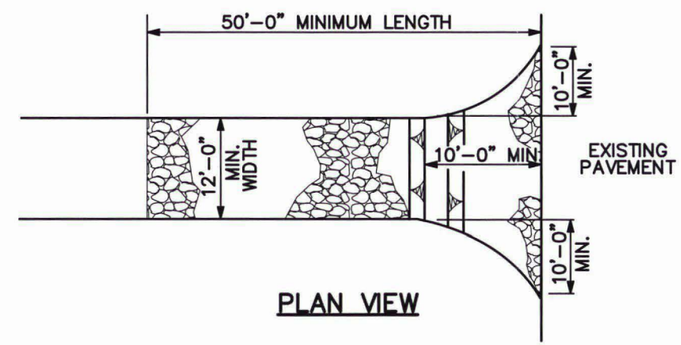
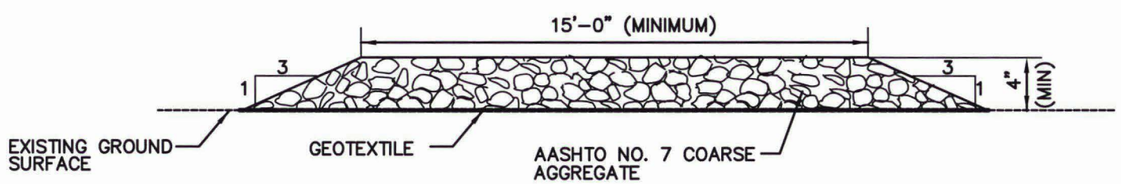


PLAN VIEW

NOTES:

1. ALL SURFACE WATER FLOWING TO OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED THROUGH THE ENTRANCE, MAINTAINING POSITIVE DRAINAGE.
2. IF REQUIRED PIPE SHOULD BE SIZED ACCORDING TO THE AMOUNT OF RUNOFF TO BE CONVEYED. A 6" MINIMUM DIAMETER WILL BE REQUIRED.

GRAVEL CONSTRUCTION ENTRANCE



TEMPORARY SITE ACCESS ROAD

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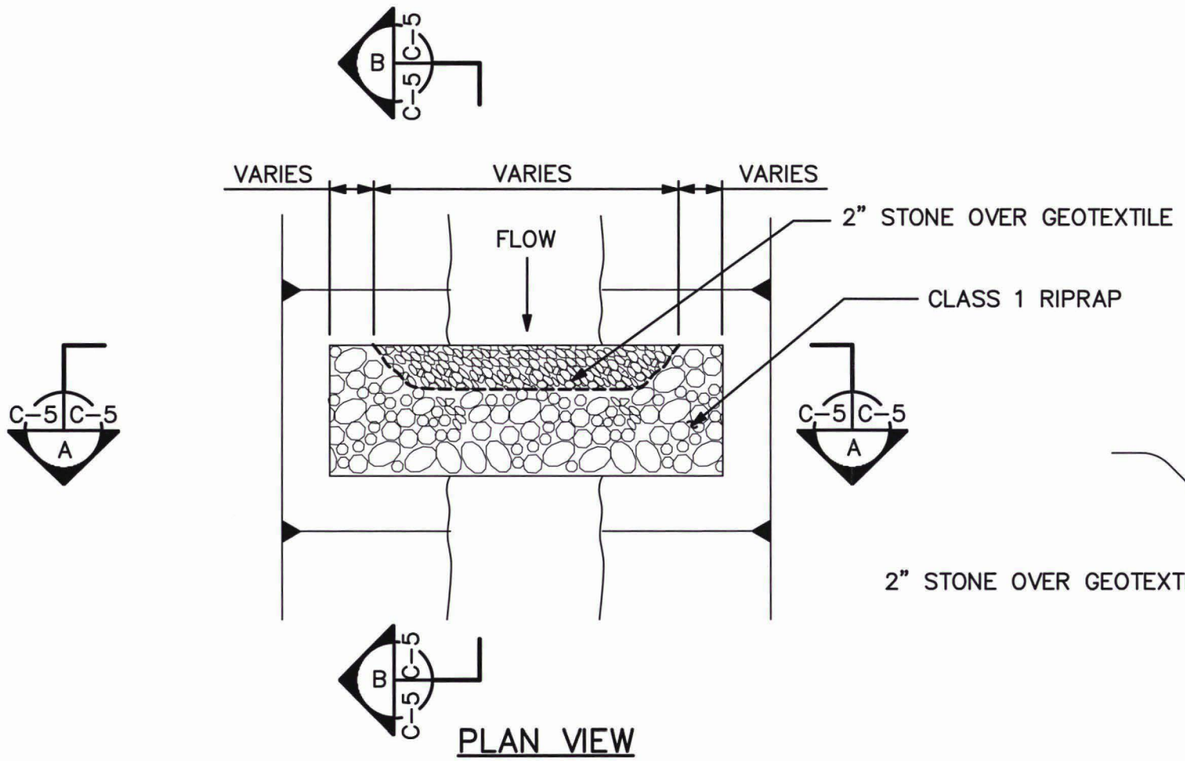
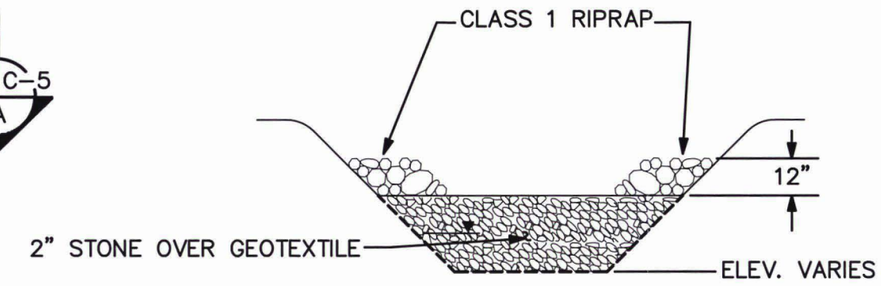
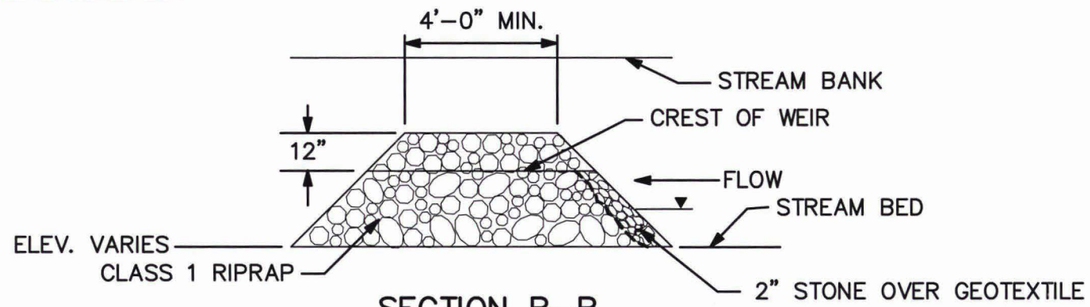


PLAN VIEW



SECTION A-A



SECTION B-B

NOTE:

1. GABION BASKETS – GABION BASKETS WITH GEOTEXTILE CAN BE USED INSTEAD OF STONE.

IN-STREAM SEDIMENT TRAP

NOT TO SCALE

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CONTRACT NO. F271	
OWNER NO. 0020	
APPROVED BY	DATE
DRAWING NO. FIGURE 4-3B	REV. 0

FORM CADD NO. TTNUS-BH.DWG – REV 1 – 9/10/98

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Tetra Tech, 2011b. Letter Report for Results of Additional Sampling and Analysis in SWMU 17 Boggs Creek [Segment 1, Ditch 3 (Segments 2 and 6), and Northwest Ditch], NSA Crane, Crane, Indiana. May.

Tetra Tech, 2012. Technical Memorandum, Prescriptive Remediation Sampling and Analysis for SWMU 17 – PCB Capacitor Burial/Pole Yard. April.

CLIENT:	NAVAL SUPPORT ACTIVITY, CRANE	JOB NUMBER:	112G01573 - 0000.1520
SUBJECT:	SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD - PCB REMOVALS FROM FLOODPLAINS/DITCHES/STREAMS/BUILDING AREAS		
BASED ON:	Soil / Sediment Field Sample Logs and Photographs	DRAWING NUMBER:	Figures 2-5 thru 2-17 and 3-1 thru 3-6 (IMWP)
BY: R. Barringer Date: 3-4-13	CHECKED BY: T. Johnston Date: 3-4-13	APPROVED BY: T. Johnston	DATE: 3-4-13

OBJECTIVE: **Note:** Revised 10-16-12 by Johnston/checked by Barringer to modify boundaries based on most recent data.

The purpose of this calculation is to estimate the volume of surface soil and sediment within the stream/drainage channel and floodplain areas and general building areas near Buildings 357, 3072, and 2721 (SWMU 17) containing PCB concentrations greater than 1 mg/kg, as identified in this report.

APPROACH:

1. Based on information collected during the Tetra Tech 2005, 2006, 2011, and 2012 field investigations (depth of sediment measurements, field photographs, and channel width), the volume of sediment in each drainage channel and stream segment associated with SWMU 17 containing sediment with PCB concentrations greater than 1 mg/kg was calculated.

2. Based on the information collected during the Tetra Tech 2005, 2006, 2011, and 2012 field investigations (field photographs, field notes, width of floodplain), the area of floodplain adjacent to each drainage channel and stream segment associated with SWMU 17 that will be excavated was estimated. The areas to be excavated were then used to calculate the volumes of soil in the floodplains requiring excavation

REFERENCES:

1 TolTest (TolTest Inc.), 2004. Interim Measures Report, PCB Capacitor Burial Pole Yard Remediation, NSWC Crane, Crane, Indiana, November.

2 Tetra Tech, 2007. Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report Addendum for PCB Capacitor Burial/Pole Yard Solid Waste Management Unit (SWMU) 17, NSWC Crane, Crane, Indiana, August [Appendix B].

3 Tetra Tech, 2011. Letter Report for Results of Additional Sampling and Analysis in SWMU 17 Boggs Creek [Segment 1, Ditch 3 (Segments 2 and 6), and Northwest Ditch], Appendix B.

4 Tetra Tech, 2010. Field Investigation Report for SWMU 17 – Boggs Creek, Naval Support Activity Crane, Crane, Indiana. September.

5 Tetra Tech, 2002. Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report for PCB Capacitor Burial/Pole Yard Solid Waste Management Unit (SWMU) 17, NSWC Crane, Crane, Indiana, August [Appendix C].

6 Tetra Tech, 2011. Interim Measures Work Plan SWMU 17 - PCB Capacitor Burial/Pole Yard Floodplains, Ditches, and Streams, Naval Support Activity Crane, Crane, Indiana. June 2011.

7 Tetra Tech, 2012. Final Technical Memorandum Dated April 2012: Sampling and Analysis to Support Prescriptive Remediation for SWMU 17 and Response to Comments on Draft Version of Same Memorandum, Naval Support Activity Crane, Crane, Indiana. April 2012.

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CALCULATIONS

Group 1 - Ditch Bottoms and Adjacent Soil Volumes in Drainage Channels

There are two drainage channels containing PCB-contaminated sediment with a concentration greater than 1 mg/kg. These channels include the Northwest Ditch and two discrete portions of Ditch 8. The remaining drainage channels sampled in the SWMU 17 area did not contain sediment with PCB concentrations greater than 1 mg/kg, so the volume of sediment in these channels was not calculated. The depth of sediment within these three ditch channel segments was estimated based on the soil / sediment sample log sheets and site photographs (References 2 and 3). The information from all of the sample locations within the length of drainage channel were used to calculate the average stream dimensions and sediment depths. No significant floodplains were recorded in these ditches (based on field observations).

1A. Northwest Ditch:

Based on the results of the surface soil samples collected during the 2004 Interim Measure (samples 17SS01 through 17SS05), Tetra Tech collected 3 sediment samples within the Northwest Ditch during the SWMU 17 RFI Addendum sampling event performed in October 2005. The reported sediment depths at each location are as follows (Soil / Sediment Field Sample Logs are provided in Reference 2).

	Sample Number	Sediment Depth	Notes
Area 1A	17SD01	6 in	Sample depth interval
	17SD02	6 in	Sample depth interval
	17SD03	6 in	Sample depth interval
	17SD126	12 in	Sample depth interval
	Average Sediment Depth =	1.5 ft	(2 feet or bedrock - assume 1.5 feet for average depth)

The width of the Northwest Ditch was determined by reviewing historic photographs from the 2004 Interim Measure and Tetra Tech field personnel recollection. The reported average channel width equals the channel bottom plus the channel banks. Excavation will begin at the left edge of Area 4A in the Dump Area and continue to the point where it intersects the adjacent ditch (near Floodplain Area 3C on Ditch 3 - See Figures 2-6 and 3-1 of the text).

Average Channel Width =	12 ft	Based on field observations and historic photographs.
Length of Channel =	520 ft	(See Figures 2-6 and 3-1 of text)
Square Footage of Ditch Area =	6240 sq. ft.	(Channel Width ft. X Channel Length ft.)
Sediment Volume =	9,360 cf	(520 x 12 x 1.5)
Sediment Volume =	**347 cy**	(9,360 / 27) **non-TSCA**

Volume of Sediment (Northwest Ditch) = 347 cy

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1B and 1C. Portions of Ditch No. 8 (Segments 8a and 8b):

During the October 2005, April 2006, and May 2006 RFI Addendum sampling event 4 sediment samples were collected from within Ditch No. 8. The reported sediment depths at each location are as follows (Soil / Sediment Field Sample Logs are provided in Reference 2). More recent sediment sampling added data point 17SD127 and verified that contamination was limited to two discrete segments of Ditch 8. Ditch 8a (Area 1B) consists of the ditch sediments within approximately100 feet immediately downslope of TolTest Excavation Area E to Location 17SD127 (Figure 2-6). Ditch 8b (Area 1C) consists of another segment in this same ditch beginning at point 17SD048 and continuing downslope about 155 feet (though 17SD026) down to the confluence with Ditch 9 (Figures 2-6, 2-7, and 3-1 of the text).

	Sample Number	Sediment Depth	Notes
Area 1B (8a)	17SD07	6 in	Sample depth interval
	17SD127	12 in	Depth of sediment reported on log sheet
Portion of Ditch 8 not to be excavated	17SD25	8 in	Depth of sediment reported on log sheet
	17SD125	12 in	Depth of sediment reported on log sheet
Area 1C (8b)	17SD26	5 in	Depth of sediment reported on log sheet
	17SD48	3 in	Depth of sediment reported on log sheet
	Average Sediment Depth =	6.8 in	(assume 1 foot for average depth)

The width of Drainage Channel Ditch No. 8 was recorded on the soil and sediment field sampling logs during the April 2006 and May 2006 investigations. The width of Drainage Channel Ditch No. 8 at the October 2005 sample locations was estimated based on photographs (Soil / Sediment Field Sample Logs are provided in Reference 2).

Sample Number	Channel Width	Notes
17SD07	4 ft	Estimated based on site photographs
17SD25	4.5 ft	2.5-foot base width and 1-foot channel depth
17SD26	4.3 ft	2.5-foot base width and 0.9-foot channel depth
17SD48	3 ft	2-foot base width and 0.5-foot channel depth
Average Channel Width =	3.95 ft	
Rounded Channel Width =	4.0 ft	
Length of Channel in Ditch 8a =	100 ft	(See Figures 2-6, 2-7, and 3-1 of text)

Area 1B (8a)

Square Footage of Ditch Area = 400 sq. ft. (Channel Width ft. X Channel Length ft.)

Sediment Volume = 400 cf (100 x 4.0 x 1.0)
Sediment Volume = **15 cy** 400 / 27 **non-TSCA**

Volume of Sediment (Portion of Ditch No. 8a) = 15 cy

Length of Channel in Ditch 8b = 155 ft (See Figures 2-6, 2-7, and 3-1 of text)

Area 1C (8b)

Square Footage of Ditch Area = 620 sq. ft. (Channel Width ft. X Channel Length ft.)

Sediment Volume = 620 cf (155 x 4.0 x 1.0)
Sediment Volume = **23 cy** 620 / 27 **non-TSCA**

Volume of Sediment (Portion of Ditch No. 8b) = 23 cy

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Group 2 - Stream/Ditch Sediment Volumes

Sediment Volume in Streams

There are 2 streams that contain PCB-contaminated sediment with a concentration greater than 1 mg/kg. These streams include Ditch 3 and Boggs Creek. The depth of sediment within these streams was estimated based on the soil / sediment sample log sheets and the site photographs (soil logs are in References 2 and 3). The information from all of the sample locations within the length of the streams was used to calculate the average stream dimensions and sediment depths. To facilitate the segmental excavation approach, the upper reach of Boggs Creek has been identified as Stream Segment 1, and Ditch 3 has been divided into Stream Segments 2 through 6.

Boggs Creek Location 17SD105

Surface water and sediment samples were collected in Boggs Creek to determine if contamination from SWMU 17 had migrated downstream. One sample (17SD1050006) contained PCB concentrations greater than 1 mg/kg and spot sediment removal was recommended at that location. The depth of sediment and the width of the stream as reported on the sample logsheet was used to determine the volume of sediment requiring removal. Soil / Sediment Field Sample Logs are provided in Reference 4. A photograph is provided on Figure 3-2 of the IMWP.

Sample Number	Sediment Depth	Notes
17SD105	1.5 ft	Thickness of sediment based on photographs
Sediment Depth =	1.5 ft	

The width of sediment in this area of Boggs Creek was estimated from photographs taken during the December 2010 sampling event. The width of the portion of the channel with flowing water does not contain sediment (rocky bottom), so only the width of the sediment depositional area on the side of the channel was used (see photograph on Figure 3-2 of the IMWP). The length of the sediment depositional area in this section was estimated to be 20 feet downstream and 20 feet upstream of location 17SD105.

Average Channel Width =	10.0 ft	Estimated from photographs	
Length of Channel =	40 ft	Estimated from photographs	
Square Footage of Ditch Area =	400 sq. ft.	(Channel Width ft. X Channel Length ft.)	
Sediment Volume =	600 cf	(10 x 40 x 1.5)	
Sediment Volume =	**22 cy**	(600 / 27)	**non-TSCA**

Volume of Sediment (Location 17SD105) = 22 cy

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BY: R. Barringer Date: 3-4-13	CHECKED BY: T. Johnston Date: 3-4-13	APPROVED BY: T. Johnston	DATE: 3-4-13

Boggs Creek (Ditch 3 - Stream Segment 1)

During the October 2005 and April 2006 RFI Addendum sampling events 10 sediment samples were originally collected from within Boggs Creek. Because the size of Boggs Creek changes rapidly the average dimensions are based on the four sample locations collected within the top reach of Boggs Creek (Soil / Sediment Field Sample Logs are provided in Reference 2). Supplemental samples were collected during May-June 2012.

Sample Number	Sediment Depth	Notes
17SD32	0.33 ft	Thickness of sediment reported on log sheet
17SD33	0.67 ft	Thickness of sediment reported on log sheet
17SD34	0.33 ft	Thickness of sediment reported on log sheet
17SD05	0.50 ft	Thickness of sediment reported on log sheet
Average Sediment Depth =	0.46 ft	(assume 0.5 feet for average depth)
Rounded Sediment Depth =	0.5 ft	(target depth)

The width of Boggs Creek was recorded on the soil and sediment field sampling logs during the April 2006 investigations. (Soil / Sediment Field Sample Logs are provided in Reference 2).

Sample Number	Channel Width	Notes
17SD32	7.2 ft	4.4-foot base width and 1.4-foot channel depth
17SD33	11 ft	8-foot base width and 1.5-foot channel depth
17SD34	15.6 ft	10-foot base width and 2.8-foot channel depth
17SD05	20 ft	15-foot base width and 2.5-foot channel depth
Average Channel Width =	13.5 ft	
Length of Channel =	220 ft	(See Figure 2-8 of text)
Square Footage of Stream Segment =	2,970 sq. ft.	(Channel Width ft. X Channel Length ft.)
Sediment Volume =	1,485 cf	(220 x 13.5 x 0.5)
Sediment Volume =	**55 cy**	(1,485 / 27)

non-TSCA

Volume of Sediment (Stream Segment 1) = 55 cy

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Ditch 3

During the October 2005, April 2006, and May 2006 RFI Addendum sampling events 14 sediment samples were collected from within Ditch No. 3. During the January 2011 sampling event 15 sediment samples were collected in Ditch 3 segment 6 only. The reported sediment depth at each location is as follows (Soil / Sediment Field Sample Logs are provided in References 2 and 3). For the purposes of generating segmented excavation areas ditch 3 was subdivided into 5 stream segments (see Figures 2-8 through 2-13 and 3-3 and 3-4 in text for channel reach designation).

Ditch 3 - Stream Segment 2

Sample Number	Sediment Depth	Notes
17SD04	0.50 ft	Thickness of sediment reported on log sheet
17SD19	0.42 ft	Thickness of sediment reported on log sheet
17SD18	0.50 ft	Thickness of sediment reported on log sheet
Average Sediment Depth =	0.47 ft	(assume 0.5 feet for average depth)
Rounded Sediment Depth =	0.5 ft	(target depth)

Sample Number	Channel Width	Notes
17SD04	14 ft	10-foot base width and 2-foot channel depth
17SD19	14 ft	10-foot base width and 2-foot channel depth
17SD18	16 ft	12-foot base width and 2-foot channel depth
Average Channel Width =	14.7 ft	(assume 15 feet for average width)
Rounded Channel Width =	15.0 ft	
Length of Channel =	400 ft	(See Figures 2-9 and 3-3 of text)
Square Footage of Ditch Segment =	6,000 sq. ft.	(Channel Width ft. X Channel Length ft.)
Sediment Volume =	3,000 cf	(400 x 15 x 0.5)
Sediment Volume =	**111 cy**	(3,000 / 27)

non-TSCA

Volume of Sediment (Stream Segment 2) = 111 cy

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SUBJECT:	SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD - PCB REMOVALS FROM FLOODPLAINS/DITCHES/STREAMS/BUILDING AREAS		
BASED ON:	Soil / Sediment Field Sample Logs and Photographs	DRAWING NUMBER:	Figures 2-5 thru 2-17 and 3-1 thru 3-6 (IMWP)
BY: R. Barringer Date: 3-4-13	CHECKED BY: T. Johnston Date: 3-4-13	APPROVED BY: T. Johnston	DATE: 3-4-13

Ditch 3 - Stream Segment 3

Sample Number	Sediment Depth	Notes
17SD17	0.50 ft	Thickness of sediment reported on log sheet
17SD16	0.42 ft	Thickness of sediment reported on log sheet
Average Sediment Depth =	0.46 ft	(assume 0.5 feet for average depth)
Rounded Sediment Depth =	0.5 ft	(target depth)

Sample Number	Channel Width	Notes
17SD17	16 ft	12-foot base width and 2-foot channel depth
17SD16	12 ft	8-foot base width and 2-foot channel depth
Average Channel Width =	14.0 ft	
Length of Channel =	400 ft	(See Figures 2-10 and 3-3 of text)
Square Footage of Ditch Segment =	5,600 sq. ft.	(Channel Width ft. X Channel Length ft.)
Sediment Volume =	2,800 cf	(400 x 14 x 0.5)
Sediment Volume =	**104 cy**	(2,800 / 27) **non-TSCA**

Volume of Sediment (Stream Segment 3) = 104 cy

Ditch 3 - Stream Segment 4

Sample Number	Sediment Depth	Notes
17SD15	0.42 ft	Thickness of sediment reported on log sheet
17SD14	0.42 ft	Thickness of sediment reported on log sheet
17SD45	0.33 ft	Thickness of sediment reported on log sheet
17SD44	0.17 ft	Thickness of sediment reported on log sheet
Average Sediment Depth =	0.34 ft	
	0.5 ft	(target depth)

Sample Number	Channel Width	Notes
17SD15	16 ft	12-foot base width and 2-foot channel depth
17SD14	14 ft	10-foot base width and 2-foot channel depth
17SD45	9 ft	5-foot base width and 2-foot channel depth
17SD44	11 ft	7-foot base width and 2-foot channel depth
Average Channel Width =	12.5 ft	
Length of Channel =	600 ft	(See Figures 2-11 and 3-4 of text)
Square Footage of Ditch Segment =	7,500 sq. ft.	(Channel Width ft. X Channel Length ft.)
Sediment Volume =	2,550 cf	(600 x 12.5 x 0.34)
Sediment Volume =	**94 cy**	(2,550 / 27) **non-TSCA**

Volume of Sediment (Stream Segment 4) = 94 cy

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BASED ON:	Soil / Sediment Field Sample Logs and Photographs	DRAWING NUMBER:	Figures 2-5 thru 2-17 and 3-1 thru 3-6 (IMWP)
BY: R. Barringer Date: 3-4-13	CHECKED BY: T. Johnston Date: 3-4-13	APPROVED BY: T. Johnston	DATE: 3-4-13

Ditch 3 - Stream Segment 5

Sample Number	Sediment Depth	Notes
17SD43	0.17 ft	Thickness of sediment reported on log sheet
17SD64	0.17 ft	Thickness of sediment reported on log sheet
Average Sediment Depth =	0.17 ft	
	0.5 ft	(target depth)

Sample Number	Channel Width	Notes
17SD43	11 ft	7-foot base width and 2-foot channel depth
17SD64	10 ft	6-foot base width and 2-foot channel depth
Average Channel Width =	10.5 ft	
Length of Channel =	500 ft	(See Figures 2-12 and 3-4 of text)
Square Footage of Ditch Segment =	5,250 sq. ft.	(Channel Width ft. X Channel Length ft.)
Sediment Volume =	893 cf	(500 x 10.5 x 0.17)
Sediment Volume =	**33 cy**	(893 / 27) **non-TSCA**

Volume of Sediment (Stream Segment 5) = 33 cy

Ditch 3 - Stream Segment 6

Sample Number	Sediment Depth	Notes
17SD62	0.33 ft	Thickness of sediment reported on log sheet
17SD61	0.17 ft	Thickness of sediment reported on log sheet
17SD58	0.58 ft	Thickness of sediment reported on log sheet
17SD106	0.40 ft	Thickness of sediment reported on log sheet
17SD107	0.30 ft	Thickness of sediment reported on log sheet
17SD108	0.50 ft	Thickness of sediment reported on log sheet
17SD109	0.20 ft	Thickness of sediment reported on log sheet
17SD110	0.50 ft	Thickness of sediment reported on log sheet
17SD111	0.30 ft	Thickness of sediment reported on log sheet
17SD112	0.40 ft	Thickness of sediment reported on log sheet
17SD113	0.20 ft	Thickness of sediment reported on log sheet
17SD114	0.45 ft	Thickness of sediment reported on log sheet
17SD115	0.20 ft	Thickness of sediment reported on log sheet
17SD116	0.80 ft	Thickness of sediment reported on log sheet
17SD117	1.50 ft	Thickness of sediment reported on log sheet
17SD118	1.00 ft	Thickness of sediment reported on log sheet
17SD119	1.10 ft	Thickness of sediment reported on log sheet
17SD120	1.15 ft	Thickness of sediment reported on log sheet
Average Sediment Depth =	0.56 ft	
Rounded Sediment Depth =	0.56 ft	

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SUBJECT:	SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD - PCB REMOVALS FROM FLOODPLAINS/DITCHES/STREAMS/BUILDING AREAS		
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BY: R. Barringer Date: 3-4-13	CHECKED BY: T. Johnston Date: 3-4-13	APPROVED BY: T. Johnston	DATE: 3-4-13

Sample Number	Channel Width	Notes
17SD62	10 ft	6-foot base width and 2-foot channel depth
17SD61	6 ft	4-foot base width and 1-foot channel depth
17SD58	3 ft	2-foot base width and 0.5-foot channel depth
17SD106	12 ft	Width of channel reported on log sheet
17SD107	4 ft	Width of channel reported on log sheet
17SD108	3.5 ft	Width of channel reported on log sheet
17SD109	4 ft	Width of channel reported on log sheet
17SD110	4 ft	Width of channel reported on log sheet
17SD111	4 ft	Width of channel reported on log sheet
17SD112	10 ft	Width of channel reported on log sheet
17SD113	8 ft	Width of channel reported on log sheet
17SD114	4 ft	Width of channel reported on log sheet
17SD115	2 ft	Width of channel reported on log sheet
17SD116	5 ft	Width of channel reported on log sheet
17SD117	12 ft	Width of channel reported on log sheet
17SD118	3 ft	Width of channel reported on log sheet
17SD119	3.5 ft	Width of channel reported on log sheet
17SD120	5 ft	Width of channel reported on log sheet

Average Channel Width = 5.7 ft
Rounded Channel Width = 5.7 ft

Length of Channel = 500 ft (See Figures 2-12, 2-13, and 3-4 of text)

Square Footage of Ditch Segment = 2,850 sq. ft. (Channel Width ft. X Channel Length ft.)

Ditch 3, Seg. 6 Sediment Vol. = 1,596 cf (500 x 5.7 x 0.56)
Ditch 3, Seg. 6 Sediment Vol. = **59 cy** (1,596 / 27) **TSCA plus non-TSCA**

Four locations within stream segment 6 (17SD61, 17SD107, 17SD109 in the Downstgram TSCA Area, and 17SD118 in the Upstream TSCA Area) contained sediment with concentrations exceeding 50 ppm (the TSCA limit). The volume of this material was calculated by multiplying the length of the channel segment represented by the sample (to the next sample in both directions) and the above width and depth measurements.
Rounding uncertainty causes these calculated values to differ slightly from the values on Table ES-1

	Sample Number	Channel Width (ft)	Depth (ft)	Length (ft)	Volume (cf) (width x depth x length)	Volume (cy) (cf/27)
Down-stream TSCA Area	17SD61	6	0.17	30	30.6	1.1
	17SD107	4	0.30	48	57.6	2.1
	17SD109	4	0.20	45	36	1.3
Upstream TSCA Area	17SD118	3	1.00	30	90	3.3

Volume of sediment (Stream Segment 6) (TSCA)= 8 (1.1+2.1+1.3+3.3)

Volume of Sediment (Stream Segment 6) (non-TSCA) = **51 cy** Total Ditch 3, Segment 6 Sediment Volume Minus the Volume of the Upstream and Downstream TSCA Areas noted in the line below

Volume of Sediment (Stream Segment 6) (TSCA) = 8 cy (sum of upstream and downstream TSCA Areas)

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BASED ON:	Soil / Sediment Field Sample Logs and Photographs	DRAWING NUMBER:	Figures 2-5 thru 2-17 and 3-1 thru 3-6 (IMWP)
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Group 3 - Floodplain Soil Excavation

During the October 2006, January 2011, and April-June 2012 investigations, surface soil samples and as necessary, subsequent deeper or more distant samples were collected from the floodplains associated with the streams that contain PCB-contaminated sediment to determine if PCB-contaminated sediment migrated beyond the banks of the streams during flood conditions. Site walks and reconnaissance in mid-March 2012 and late April 2012 supported the April-June 2012 investigation Specific sections of Boggs Creek Segment 1 and Ditch 3 Segments 2 through Segment 6 were determined to contain flood zones that required some limited removal to address the PCB contamination detected in the floodplain soils and the stream/ditch channel sediment.

Prior to 2012, floodplain materials in Segment 1 (Boggs Creek) and Segments 2 and 6 of Ditch 3 were targeted for removal to address detected PCB contamination. Based on the 2012 data, the floodplain PCB contamination was more completely delineated and PCB contamination was identified and delineated in the floodplains of Ditch 3, Segments 3, 4, and 5.

The areas of contaminated soil requiring excavation within the floodplains of Boggs Creek Segment 1 and Ditch 3 Segments 2 through 6 were identified based on the results of all samples collected within the field-determined floodplain boundaries (See Figures 2-8 through 2-13 and 3-3 and 3-4) with supplemental information obtained from field notes, site photographs, map coordinates from professional land surveys, and global positioning system (GPS) instruments. The actual areas were computed using a geographical information system and the established coordinates of sampling locations. These areas were multiplied by the depth of contaminated soil to determine the volume of excavation required in Boggs Creek Segment 1, Ditch 3 Segment 2 through Ditch 3 Segment 6.

Calculations are described in the following pages.

The depth used to calculate the volume of surface soil requiring excavation in each flood zone is based in the vertical limits of defined contamination (PCBs above 1.0 ppm).

3A-1, 3A-2, and 3B. Boggs Creek - Floodplain Stream Segment 1

Boggs Creek contains two floodplain areas with contaminated soil: the floodplain area on the north side of the stream channel (Area 3A-1 and 3A-2) and the floodplain area on the south side of the stream channel (Area 3B). A separate calculation was done for each one of these areas and the volumes are shown below. See Figure 2-8 for the locations of these areas within the floodplain.

Area 3A-1 dimensions	Area =	3,770 square feet	(field notes, survey and GPS data)	
	Depth =	2 feet	(surface soil analytical data)	
Boggs Creek Floodplain - Area 3A Volume =		7,540 cf	(3,770 x 2)	
Boggs Creek Floodplain - Area 3A Volume =		**279 cy**	(7,540 / 27)	**non-TSCA**
Area 3A-2 dimensions	Area =	1,688 square feet	(field notes, survey and GPS data)	
	Depth =	1.5 feet	(surface soil analytical data)	
Boggs Creek Floodplain - Area 3A Volume =		2,532 cf	(1,688x 1.5)	
Boggs Creek Floodplain - Area 3A Volume =		**94 cy**	(2,532 / 27)	**non-TSCA**
Area 3B dimensions	Area =	8,122 square feet	(field notes, survey and GPS data)	
	Depth =	1.5 feet	(surface soil analytical data)	
Boggs Creek Floodplain - Area 3B Volume =		12,183 cf	(8,122 x 1.5)	
Boggs Creek Floodplain - Area 3B Volume =		**451 cy**	(12,183 / 27)	**non-TSCA**

Volume of Contaminated Floodplain Soil (Stream Segment 1 - Areas 3A-1/3A-2/3B) = 824 cy non-TSCA

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BASED ON:	Soil / Sediment Field Sample Logs and Photographs	DRAWING NUMBER:	Figures 2-5 thru 2-17 and 3-1 thru 3-6 (IMWP)
BY: R. Barringer Date: 3-4-13	CHECKED BY: T. Johnston Date: 3-4-13	APPROVED BY: T. Johnston	DATE: 3-4-13

3C / 3D / 3E. Ditch 3 - Floodplain Stream Segment 2

Stream Segment 2 contains three floodplain areas with contaminated soil: the floodplain area on the south side of the stream between segment 2 and the northwest ditch (Area 3C), the floodplain area on the north side of the stream channel (Area 3E) and the floodplain area on the south side of the stream channel (Area 3D). A separate calculation was done for each one of these areas and the volumes are shown below. See Figure 2-9 for the location of these areas within the floodplain.

Area 3C dimensions	Area =	2,144 square feet	(field notes, survey and GPS data)	
	Depth =	0.5 foot	(surface soil analytical data)	
Ditch 3 Stream Segment 2 - Area 3C Volume =		1,072 cf	(2,144 x 0.5)	
Ditch 3 Stream Segment 2 - Area 3C Volume =		**40 cy**	(1,072 / 27)	**non-TSCA**
Area 3D dimensions	Area =	3,858 square feet	(field notes, survey and GPS data)	
	Depth =	1 feet	(surface soil analytical data)	
Ditch 3 Stream Segment 2 - Area D Volume =		3,858 cf	(3,858 x 1)	
Ditch 3 Stream Segment 2 - Area D Volume =		**143** cy	(3,858 / 27)	
Add 12 c.y. for including Area 3D-4 (10-ft radius^2*3.14*1 ft deep)=		**155** cy	(143 + 12)	**non-TSCA**
Area 3E dimensions	Area =	4,322 square feet	(field notes, survey and GPS data)	
	Depth =	1 feet	(surface soil analytical data)	
Ditch 3 Stream Segment 2 - Area E Volume =		4,322 cf	(4,322 x 1)	
Ditch 3 Stream Segment 2 - Area E Volume =		**160 cy**	(4,322 / 27)	
Add 12 c.y. for additional depth at Area 3E-1 (10-ft radius^2*3.14*1 ft deep)=		**172** cy	(160 + 12)	

Volume of Contaminated Floodplain Soil (Stream Segment 2 - Areas 3C/3D/3E) = 367 cy non-TSCA

3F. Ditch 3 - Floodplain Stream Segment 3

In Stream Segment 3, three samples containing between 1 and 42 mg/kg total PCBs were collected from the relatively small floodplain. These samples were located within 10 feet from the bank of the stream. Stream Segment 3 contains one area (Area 3F) on the north side of the stream that surrounds the three locations and is targeted for soil excavation. Figure 2-10 shows the location of Area 3F.

Area 3F dimensions	Area =	1,032 square feet	(field notes, survey and GPS data)	
	Depth =	1.5 feet	(avg. depth to bedrock)	
Ditch 3 Stream Segment 3 - Area 3F Volume =		1,548 cf	(1,032 x 1.5)	
Ditch 3 Stream Segment 3 - Area 3F Volume =		**57 cy**	(1,548 / 27)	

Volume of Contaminated Floodplain Soil (Stream Segment 3 - Area 3F) = 57 cy non-TSCA

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3G / 3H / 3I. Ditch 3 - Floodplain Stream Segment 4

Stream Segment 4 contains three floodplain areas with contaminated soil to be excavated: the floodplain on the south side of the stream about 160 feet upstream of the confluence with Ditch 1 (Area 3G), the floodplain area on the north side of the stream channel (Area 3H) with TSCA-regulated PCB concentrations (>50 ppm) and the adjacent upstream floodplain area also on the north side of the stream channel (Area 3I). A separate calculation was done for each one of these areas and the volumes are shown below. See Figure 2-11 for the locations of these areas within the floodplain.

Area 3G dimensions	Area =	1,878 square feet	(field notes, survey and GPS data)	
	Depth =	1.0 foot	(depth of contamination)	
Ditch 3 Stream Segment 4 - Area 3G Volume =		1,878 cf	(1,878 x 1.0)	
Ditch 3 Stream Segment 4 - Area 3G Volume =		**70 cy**	(1,878 / 27)	**non-TSCA**
Area 3H dimensions (TSCA Waste)	Area =	1,778 square feet	(field notes, survey and GPS data)	
	Depth =	1 feet	(surface soil analytical data)	
Ditch 3 Stream Segment 4 - Area 3H Volume =		1,778 cf	(1,778 x 1.0)	
Ditch 3 Stream Segment 4 - Area 3H Volume =		66 cy	(1,778 / 27)	TSCA
Area 3I dimensions	Area =	713 square feet	(field notes, survey and GPS data)	
	Depth =	1.5 feet	(surface soil analytical data)	
Ditch 3 Stream Segment 4 - Area 3I Volume =		1,070 cf	(713 x 1.5)	
Ditch 3 Stream Segment 4 - Area 3I Volume =		**40 cy**	(1,070 / 27)	**non-TSCA**
Volume of Contaminated Floodplain Soil (Stream Segment 4 - Areas 3G/3H/3I) =		**176 cy**	**(66 cu. Yd. is TSCA)**	

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3J / 3K/ 3L / 3M / 3N. Ditch 3 - Floodplain Stream Segments 5 and 6

Stream Segments 5 and 6 contain five floodplain areas with contaminated soil targeted for removal: (Areas 3J, 3K, 3L, 3M, and 3N). A separate calculation was done for each one of these areas and the volumes are shown below. See Figures 2-12 and 3-4 for the locations of these areas within the floodplain.

Area 3J dimensions	Area =	8,965	square feet	(field notes, survey and GPS data)	
	Depth =	1.3	foot*	(surface soil analytical data)	
*Depths in Area 3J vary from 0.5 feet in floodplains to 1.5 feet in oxbow area (1.3 ft used for estimates)					
Ditch 3 Stream Segment 5 - Area 3J Volume =		11,655	cf	(8.965 x 1.3)	
Ditch 3 Stream Segment 5 - Area 3J Volume =		**432**	**cy**	(11,655 / 27)	**non-TSCA**
Area 3K dimensions	Area =	1,915	square feet	(field notes, survey and GPS data)	
	Depth =	1	foot	(surface soil analytical data)	
Ditch 3 Stream Segment 5 - Area 3K Volume =		1,915	cf	(1,915 x 1.0)	
Ditch 3 Stream Segment 5 - Area 3K Volume =		**71**	**cy**	(1,915 / 27)	**non-TSCA**
Area 3L dimensions (TSCA Waste)	Area =	808	square feet	(field notes, survey and GPS data)	
	Depth =	1.5	feet	(surface soil analytical data)	
Ditch 3 Stream Segment 6 - Area 3L Volume =		1,212	cf	(808 x 1.5)	
Ditch 3 Stream Segment 6 - Area 3L Volume =		45	cy	(1,212 / 27)	TSCA
Area 3M dimensions	Area =	703	square feet	(field notes, survey and GPS data)	
	Depth =	0.5	feet	(surface soil analytical data)	
Ditch 3 Stream Segment 6 - Area 3M Volume =		352	cf	(703 x 0.5)	
Ditch 3 Stream Segment 6 - Area 3M Volume =		**13**	**cy**	(352 / 27)	**non-TSCA**
Area 3N dimensions	Area =	1,377	square feet	(field notes, survey and GPS data)	
	Depth =	1	foot	(surface soil analytical data)	
Ditch 3 Stream Segment 6 - Area 3N Volume =		1,377	cf	(1,377 x 1.0)	
Ditch 3 Stream Segment 6 - Area 3N Volume =		**51**	**cy**	(1377 / 27)	**non-TSCA**

Volume of Contaminated Floodplain Soil (Stream Segments 5/6 - Areas 3J/3K/3L/3M/3N) = 612 cy
(45 cu. Yd. is TSCA)

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3O / 3P. Ditch 3 - Floodplain Stream Segment 6

The upstream portion of Segment 6 contains two floodplain areas with contaminated soil targeted for removal: (Areas 3O and 3P). A separate calculation was done for each one of these areas and the volumes are shown below. See Figures 2-13 and 3-4 for the location of these areas within the floodplain.

Area 3O dimensions	Area =	1,006	square feet	(field notes, survey and GPS data)
	Depth =	2	feet	(soil analytical data)
Ditch 3 Stream Segment 6 - Area 3O Volume =		2,012	cf	(1,006 x 2)
Ditch 3 Stream Segment 6 - Area 3O Volume =		**75**	**cy**	(2,025/ 27)
Area 3P dimensions	Area =	674	square feet	(field notes, survey and GPS data)
	Depth =	2	feet	(soil analytical data)
Ditch 3 Stream Segment 6 - Area 3P Volume =		1,348	cf	(674 x 2)
Ditch 3 Stream Segment 6 - Area 3P Volume =		**50**	**cy**	1,348 / 27)

Volume of Contaminated Floodplain Soil (Stream Segment 6 - Areas 3O/3P) = 125 cy non-TSCA

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BY: R. Barringer Date: 3-4-13	CHECKED BY: T. Johnston Date: 3-4-13	APPROVED BY: T. Johnston	DATE: 3-4-13

Group 4 - Dump and Building Areas

4A. Dump Area West of Buildings 0357 and 3072 (upslope of Northwest Ditch and Ditch 8) - (Partial TSCA Waste)

Multiple trenches were excavated in the western laydown area and slope southwest of Building 3072. The presence of a Dump Areas was confirmed near the center of Area 4A based on recorded surface debris (capacitors, other electrical equipment debris), uncovered buried debris, and elevated PCB concentrations present in soil samples from this area. It is believed that this Dump Area and the past waste management activities performed in the immediate area are the likely source areas for PCBs detected in the sediments of the Northwest Ditch and possibly Ditch 8. Two trenches in the Dump Area (Area 4A) near the headwaters of the Northwest Ditch contained PCB contamination at concentrations greater than 50 mg/kg, so those wastes must be managed as TSCA waste. The perimeter of Area 4A defines the extent of the TSCA-regulated PCB Soil Contamination, but also includes lower (non-TSCA) PCB concentrations and continues out to soil analysis results of less that 1 ppm PCBs. To remove all soil containing greater than 1 mg/kg PCBs, removals will be down to bedrock ina significant portion of Area 4A. The average excavation depth for this entire area is estimated to be eight feet bgs based on the trenches installed in the area. See Figures 2-14, 2-15, 3-3, and 3-6 for the location of this former dump / building area.

Area 4A-1 dimensions	Area =	823	square feet	(field notes, survey and GPS data)	
	Depth =	4	feet	(estimated avg. depth to bedrock)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-1 Volume =		3,292	cf	(823 x 4.0)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-1 Volume =		**122**	**cy**	(3,292 / 27)	**non-TSCA**
Area 4A-2 dimensions	Area =	786	square feet	(field notes, survey and GPS data)	
	Depth =	4	feet	(soil analytical data)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-2 Volume =		3,144	cf	(786 x 4.0)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-2 Volume =		**116**	**cy**	(3,144 / 27)	**non-TSCA**
Area 4A-3 dimensions	Area =	844	square feet	(field notes, survey and GPS data)	
	Depth =	8	feet	(soil analytical data)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-3 Volume =		6,752	cf	(844 x 8.0)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-3 Volume =		**250**	**cy**	6,752 / 27)	**non-TSCA**
Area 4A-4 dimensions (TSCA Waste)	Area =	555	square feet	(field notes, survey and GPS data)	
	Depth =	6	feet	(estimated avg. depth to bedrock)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-4 Volume =		3,330	cf	(555 x 6.0)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-4 Volume =		123	cy	(3,330 / 27)	TSCA
Area 4A-5 dimensions	Area =	4,180	square feet	(field notes, survey and GPS data)	
	Depth =	4	feet	(soil analytical data)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-5 Volume =		16,720	cf	(4,180 x 4.0)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-5 Volume =		**619**	**cy**	(16,720 / 27)	**non-TSCA**
Area 4A-6 dimensions (TSCA Waste)	Area =	4,290	square feet	(field notes, survey and GPS data)	
	Depth =	9	feet	(soil analytical data)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-6 Volume =		38,610	cf	(4,290 x 9.0)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-6 Volume =		1430	cy	38,610 / 27)	TSCA
Area 4A-7 dimensions (TSCA Waste)	Area =	987	square feet	(field notes, survey and GPS data)	
	Depth =	7	feet	(estimated avg. depth to bedrock)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-7 Volume =		6,909	cf	(987 x 7.0)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-7 Volume =		256	cy	(6,909 / 27)	TSCA
Area 4A-8 dimensions	Area =	974	square feet	(field notes, survey and GPS data)	
	Depth =	4	feet	(soil analytical data)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-8 Volume =		3,896	cf	(974 x 4.0)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-8 Volume =		**144**	**cy**	(3,896 / 27)	**non-TSCA**

CLIENT:	NAVAL SUPPORT ACTIVITY, CRANE	JOB NUMBER:	112G01573 - 0000.1520
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Area 4A-9 dimensions (TSCA Waste)	Area =	1059 square feet	(field notes, survey and GPS data)	
	Depth =	3.5 feet	(soil analytical data)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-9 Volume =		3,707 cf	(1,059 x 3.5)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-9 Volume =		137.0 cy	(3,707 / 27)	TSCA
Area 4A-10 dimensions (non-TSCA Waste)	Area =	196 square feet	(field notes, survey and GPS data)	
	Depth =	9 feet	(soil analytical data)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-9 Volume =		1,764 cf	(196 x 9.0)	
Dump Area West of Buildings 0357 and 3072 - Area 4A-9 Volume =		**65.0 cy**	(1,764 / 27)	**non-TSCA**

Volume of Contaminated Soil (Dump W. of Bldgs. 0357 / 3072 - Area 4A) = 3,262 cy **Total for Areas 4A-1 thru 4A-10**

(Assume 60 percent of the volume for Building Area 4A [1,946 cubic yards] is TSCA-regulated soil and the other 40 percent [1,316 cubic yards] consists of 48 percent non-TSCA soil and 2 percent non-TSCA debris)

Volume of Contaminated Soil (Dump W. of Bldgs. 0357 / 3072 - Area 4A) =	**1,316 cy**	(Non-TSCA Waste)
Volume of Contaminated Soil (Dump W. of Bldgs. 0357 / 3072 - Area 4A) =	1,946 cy	(TSCA Waste)
Total =	**3,262 cy**	**Total for Areas 4A-1 thru 4A-10**

4B. Area North of Building 0357 Between the Building and the Road

A limited number of subsurface soil samples (2-4 ft bgs) were identified in the area north of Building 0357 and south of the road with detected PCB contamination at concentrations less than 25 mg/kg but greater than 1 mg/kg. The former surface soil (0 - 2 ft bgs) in this area was excavated and removed by TolTest during 2003-2004. Clean fill was placed in the former excavation area. The next deeper two-foot interval of subsurface soil beneath the sampled points with low-level PCB detections (2-4 ft bgs) encountered refusal in multiple locations. The overall dpeth of non-TSCA-regulated PCB soil contamination (Area 4B) is limited and is covered by 2 ft of clean fill. See Figures 2-16 and 3-6 for the location of this building area.

Area 4B-1 dimensions	Area =	8,781 square feet	(field notes, survey and GPS data)	
	Depth =	1.5 feet	(estimated avg. depth to bedrock)	
Area North of Building 0357 and the Road - Area 4B-1 Volume =		13,172 cf	(8,781 x 1.5)	
Area North of Building 0357 and the Road - Area 4B-1 Volume =		**488 cy**	(13,172 / 27)	**non-TSCA**
Area 4B-2 dimensions	Area =	567 square feet	(field notes, survey and GPS data)	
	Depth =	2.5 feet	(soil analytical data)	
Area North of Building 0357 and the Road - Area 4B-2 Volume =		1,418 cf	(567 x 2.5)	
Area North of Building 0357 and the Road - Area 4B-2 Volume =		**53 cy**	(1,418 / 27)	**non-TSCA**
Area 4B-3 dimensions	Area =	179 square feet	(field notes, survey and GPS data)	
	Depth =	4 feet	(avg. depth to bedrock)	
Area North of Building 0357 and the Road - Area 4B Volume =		716 cf	(179 x 4)	
Area North of Building 0357 and the Road - Area 4B Volume =		**27 cy**	(716 / 27)	**non-TSCA**

Volume of Contaminated Soil (N. of Bldg. 0357 and Road - Area 4B) = 568 cy **non-TSCA**

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4B - 50. Northeastern corner of the Area North of Building 0357 Between the Building and the Road (TSCA Waste)

A limited number of subsurface soil samples (2-4 ft bgs) were identified in the area north of Building 0357 and south of the road with detected PCB contamination at concentrations of more than 50 mg/kg (TSCA-regulated). The former surface soil (0 - 2 ft bgs) in this area was excavated and removed by TolTest during 2003-2004. Clean fill was placed in the former excavation area. The next deeper two-foot interval of subsurface soil beneath the sampled points with low-level PCB detections (2-4 ft bgs) typically could not be collected due to shallow bedrock. The depth of subsurface soil containing PCB soil contamination greater than 50mg/kg (Area 4B -50) is limited to the northeastern corner of Area 4B. See Figures 2-16 and 3-6 for the location of this building area.

Area 4B - 50 dimensions	Area =	814 square feet	(field notes, survey and GPS data)	
	Depth =	2.5 feet	(avg. depth to bedrock)	
Soil Contamination NE of Building 0357 - Area 4B Volume =		2,035 cf	(814 x 2.5)	
Soil Contamination NE of Building 0357 - Area 4B Volume =		**75 cy**	(2,035 / 27)	TSCA
Volume of Contaminated Soil (NE. of Bldg. 0357 - Area 4B - 25) =		75.0 cy		TSCA

4C. Northeast of Building 0357 (upslope of Ditch 2)

A limited number of surface soil samples (0 - 2 ft bgs) were identified in the headwaters area of Ditch 2 (northeast of Building 0357) with PCB contamination at concentrations less than 25 mg/kg but greater than 1 mg/kg. The two-foot interval of subsurface soil beneath these points (2 - 4 ft bgs) had no detections greater 1 mg/kg and defined the depth of the non-TSCA-regulated PCB soil contamination (Area 4C). Additional sampling downslope of the original excavation area revealed additional surface soil contamination and also that bedrock is shallow in that area. See Figures 2-17 and 3-6 for the location of this area.

Area 4C dimensions	Area =	7,392 square feet	(field notes, survey and GPS data)	
	Depth =	2.5 feet	(avg. depth to bedrock)	
Soil Contamination NE of Building 0357 - Area 4C Volume =		18,480 cf	(7,392 x 2.5)	
Soil Contamination NE of Building 0357 - Area 4C Volume =		684 cy	(18.480 / 27)	
Volume of Contaminated Soil (NE. of Bldg. 0357 - Area 4C) =		**684 cy**		**non-TSCA**

4D. Building 2721 - Soil Near SW Corner (TSCA Waste)

A single soil sample was collected from the soil adjacent to the SW corner of Building 2721 which contained PCB contamination at concentrations greater than 50 mg/kg. The sample was located about 10 feet from the building wall. The two-foot interval of soil underneath this point and the four surface soil samples collected from the soil borings closest to this point had no PCB detections greater than 1 mg/kg and defined the extent of the TSCA-regulated PCB soil contamination (Area P). See Figures 2-13, 3-4, and 3-6 for the location of this building area.

Area 4D dimensions	Area =	269 square feet	(field notes, survey and GPS data)	
	Depth =	2 feet	(avg. depth to bedrock)	
Building 2721 SW Corner Soil - Area 4D Volume =		538 cf	(269 x 2.0)	
Building 2721 SW Corner Soil - Area 4D Volume =		20 cy	(538 / 27)	TSCA
Volume of Contaminated Soil (SW Corner of Bldg. 2721 - Area 4D) =		**20 cy**	(TSCA Waste)	

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VOLUME SUMMARY

Subtotal Volume of Contaminated Sediment in Group 1 Ditch Channels (non-TSCA)	**384 cy**
Subtotal Volume of Contaminated Sediment in Group 1 Ditch Channels (TSCA)	0 cy
Subtotal Volume of Contaminated Sediment in Group 2 Stream Channels (non-TSCA)	**470 cy**
Subtotal Volume of Contaminated Sediment in Group 2 Stream Channels (TSCA)	8 cy
Subtotal Volume of Contaminated Soil in Group 3 Stream Segment Floodplains (non-TSCA)	**1,993 cy**
Subtotal Volume of Contaminated Soil in Group 3 Stream Segment Floodplains (TSCA)	111 cy
Subtotal Volume of Contaminated Soil in Group 4 Building Areas and Dumps (non-TSCA)	**2,568 cy**
Subtotal Volume of Contaminated Soil in Group 4 Building Areas and Dumps (TSCA)	2,041 cy
Total Volume of Contaminated Sediments/Soils in Groups 1 - 4 (non-TSCA)	**5,415 cy**
Total Volume of Contaminated Sediments/Soils in Groups 1 - 4 (TSCA)	2,160 cy
Total Volume of All Excavated Sediments/Soils in Groups 1 - 4 (TSCA and non-TSCA)	**7,575 cy**

APPENDIX B

SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SPECIFICATIONS
INTERIM MEASURES WORK PLAN
SWMU 17 – PCB CAPACITOR BURIAL/POLE YARD
NSA CRANE
CRANE, INDIANA

Contractor Requirements

The Contractor will be responsible for performing the following work:

1. Attend pre-IMWP implementation conference.
2. Submit documentation in accordance with the 'Basic Contract' 30 days prior to beginning work to allow the Navy sufficient time to review and comment. The Contractor will then incorporate Navy comments into the documents. These documents include the following:
    - Work Plan
        - Excavation and Handling Plan
        - Hazardous/Waste Management Plan
        - Environmental Protection Plan
        - Erosion and Sediment Control Plan
        - Stormwater Pollution Prevention Plan
        - Transportation and Disposal Plan
    - Site Specific Health and Safety Plan (SSHSP) and Activity Hazard Analysis
    - Project Quality Control Plan (QCP)
3. Acquire Facility-specific permits, including but not limited to the following:
    - Safety & Building Availability Permit (ESO 8020/11)
    - Digging Permit (NWSCC 11000/3)
    - Flame Tool/Hot Work Permit (NWSCC 11320)
    - Hazards of Electromagnetic Radiation to Ordnance (HERO) (approval for portable radios)
4. Mobilize required equipment and personnel to excavate the indicated contaminated soil and sediments.
5. Construct and maintain the required erosion and sediment control devices for the duration of the project.
6. Construct required support facilities including, but not limited to, temporary gravel construction entrance, temporary access trails, dewatering pad, decontamination pad(s), and material storage areas.
7. Excavate, transport, and dispose PCB-contaminated surface soils and sediments.
8. Stabilize and restore surface soil excavation area to meet surrounding grades.
9. Restore drainage channels and streams to pre-construction conditions and alignment.
10. Remove all temporary support facilities, leaving perimeter erosion and sediment controls in place until revegetation is complete and as instructed by the Navy.
11. Restore areas used for temporary support facilities (regrading and revegetation).
12. Demobilize equipment and personnel.

In addition to the QC submittals and Safety and Health submittals required by the NSA Crane Contractor's Operations Manual and the Basic Contract, the Contractor shall submit the following to the Navy:

- Field work reports in accordance with Part 6.4 Section C of the Basic Contract.
- Contractor 40 CFR 1910.120 Employee Training Certificates for all Contractor employees scheduled to be on-site.
- Erosion and Sediment Control installation and inspection logs.
- Copies of NSA Crane specific permits.
- Certification and sampling results for backfill material and topsoil. A minimum of one sample per borrow source is required.

- Waste transportation subcontractor name, address, contact name, telephone number, and USDOT number.
- Hazardous waste disposal facility name, address, contact name, telephone number, and USEPA and State identification numbers, if required.
- Solid waste disposal facility name, address, contact name, telephone number, USEPA and State identification numbers.
- Copies of Treatment/Disposal Facility Permits.
- Waste profiles, complete waste characterization results, and any waste disposal facility pre-approval or approval documentation.
- Work Site Decontamination Certificates (verification that all vehicles equipment and containers were properly decontaminated prior to leaving the work site).
- Disposal Site Decontamination Certificates (verification that vehicles and containers were decontaminated prior to leaving the disposal facility).
- Shipment Manifests (manifests and other documents required to ship waste).
- Delivery Certificates (verification that waste was received at identified waste disposal facility).
- Treatment and Disposal Certificates (verification that waste was successfully received and disposed).
- Decontamination Log.

The Contractor-provided information will be compiled in the project CTO Closure Report to be prepared by the Navy.

Supplemental Specifications

In addition to the performance specifications presented in the NSA Crane Contractor's Operation Manual and in the Basic Contract, the Contractor shall perform the activities in accordance with the supplemental specifications provided below.

General Requirements

The Contractor is advised that this project is subject to Federal, State, and local regulatory agency inspections and review for compliance with environmental laws and regulations. The Contractor shall fully cooperate with any representative from any Federal, State, or local regulatory agency who may visit the job site and shall provide immediate notification to the Officer in Charge of Construction (OICC), who shall accompany them on any subsequent site inspections. The Contractor shall complete, maintain, and make available to the OICC, Facility, or regulatory agency personnel all documentation relating to environmental compliance under applicable Federal, State, and local laws and regulations. The Contractor shall immediately notify the OICC if a Notice of Violation, Notice of Deficiency, or similar regulatory notice is issued to the Contractor.

The Contractor shall be responsible for all damages to persons or property resulting from Contractor fault or negligence as well as for the payment of any civil fines or penalties which may be assessed by any Federal, State, or local regulatory agency as a result of the Contractor's or any subcontractor's violation of an applicable Federal, State, or local environmental law or regulation. Should a Notice of Violation, Notice of Noncompliance, Notice of Deficiency, or similar regulatory agency notice be issued to the Government or Facility owner/operator on account of the actions or inactions of the Contractor or one if its subcontractors in the performance of work under this contract, the Contractor shall fully cooperate with the Government in defending against regulatory assessment of any civil fines or penalties arising out of such actions or inactions.

After approval of the Contractor's Work Plan and before commencement of work the Contractor shall submit to the OICC the required certifications. As requested by the OICC, the Navy Representative for this project may review and provide surveillance for the OICC to determine if Contractor's submittals comply with the contract requirements.

The Contractor shall be required to commence work on the approved Contractor's Work Plan within 5 calendar days after receiving the notice to proceed and to prosecute the work diligently after receiving the notice to proceed.

NSA Crane will remain in operation during the entire construction period. The Contractor shall schedule the work as to cause the least amount of interference with the Facility. Work schedules shall be subject to the approval of the OICC. Permission to interrupt Facility road services shall be requested in writing a minimum of 15 calendar days prior to the desired date of interruption. The OICC shall be notified 48 hours prior to starting excavation activities.

Regular work hours shall consist of an 8-1/2 hour daily period established by the OICC, Monday through Friday, excluding Government holidays. The Contractor should assume an 8-1/2 hour daily period. Working outside of the 8-1/2 hour daily period will require approval by the OICC. Work hours shall be established during the pre-IMWP implementation conference.

On-site storage, laydown, material handling, and decontamination activities shall be limited to areas approved by the OICC.

During the progress of construction activities, the work area and adjacent areas shall be kept clean and free of rubbish, surplus materials, and unneeded construction equipment. No material or debris shall be allowed to flow or wash into watercourses, ditches, gutters, drains, or pipes. Upon completion of the work, the Contractor shall sweep paved areas and rake clean landscaped areas, and remove waste and surplus materials, rubbish, and construction facilities from the site.

Work Restrictions

Contractor personnel employed at the Facility shall become familiar with and obey Facility regulations and keep within the limits of the work and avenues of ingress and egress as directed. Personnel shall not enter any restricted areas unless required to do so and until cleared for such entry. The Contractor's equipment shall be clearly marked for identification.

The Contractor shall indicate on the construction schedule any activity that could potentially interrupt Facility operations. The Contractor shall notify the OICC in writing 15 calendar days prior to the required interruption.

Facilities and Services

Provide utility permits in accordance with Part 4.13 Section C of the Basic Contract.

NSA Crane shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as indicated. The amount of each utility service consumed shall be charged to or paid for by the Contractor at the prevailing rates charged to NSA Crane or shall be furnished at no charge as indicated. The Contractor shall carefully conserve any utilities furnished without charge.

The point at which NSA Crane will deliver such utilities or services and the quantity available will be identified by NSA Crane.

The Contractor, at its expense and in a workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of each utility used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

Electric – Electrical power available, primary voltage is [2400 volt 3 phase, 3 wire, 60 cycle AC. Secondary voltages may be 120/208 or 120/240 volts.] Final taps and tie-ins to the NSA Crane utility grid will be made by NSA Crane electric shop.

Potable Water – Potable water is not available. Contractor shall provide potable water for use by all personnel.

Water – A reasonable quantity of water is available at [Building [ ] fire station] at no charge. Provide backflow preventor devices on connections to potable water supplies. Under no circumstances will taps to NSA Crane fire hydrants be allowed for obtaining water.

Telephone – Telephone service is not available.

Sanitary Facilities - Provide temporary sanitary facilities for use by all personnel in accordance with Part 3.10 Section C of the Basic Contract.

Municipal Waste – Municipal waste storage and disposal is not available.

Sewer – Water resulting from personnel and equipment decontamination, excavation dewatering, and water from materials handling pad may be discharged to the NSA Crane sanitary sewer system, subject to approval of the NSA Crane based on characterization samples of water to be discharged.

Site Personnel Qualifications

Site Superintendent - The Contractor shall designate a Site Superintendent who shall have responsibility and authority to direct work performed. The Site Superintendent shall be responsible for the management and execution of all site activities in accordance with the IMWP, approved Contractor's Work Plan, and all Federal, State, and local laws and regulations. The Site Superintendent may not act in the dual role as the Project Quality Control Manager or Site Health and Safety Specialist (SHSS). The Site Superintendent shall have, as a minimum, the following qualifications:

- A minimum of six years site superintendent experience.
- A minimum of three years experience on hazardous, toxic and radioactive waste (HTRW) projects.
- Familiar with the requirements of the U.S. Army Corps of Engineers Safety - Safety and Health Requirements (EM 385-1-1).
- Experience in the areas of hazard identification and safety compliance.

Project Quality Control Manager - The Contractor shall designate a Project Quality Control (QC) Manager who shall assist and represent the QC Program Manager in continued implementation and enforcement of the approved Project QC Plan. The QC Program Manager or Project QC Manager shall be physically present at the project site whenever work is in progress. The Project QC Manager may be dual hatted with the SHSS if qualified. The Project QC Manager shall have, as a minimum, the following qualifications:

- A minimum two years experience as a Project QC Manager.
- A minimum of ten years combined experience in the following positions: project superintendent, QC manager, project manager, project engineer or construction manager on similar size and type of construction contracts which included the major trades that are part of this IM.
- Alternatively, the above ten year combined experience requirement may be satisfied by providing a professional engineer registered in the State of Indiana having at least two years experience as a Project QC Manager.
- Familiar with the requirements of the U.S. Army Corps of Engineers Safety - Safety and Health Requirements (EM 385-1-1).
- Experience in the areas of hazard identification and safety compliance.

Site Health and Safety Specialist - The Contractor shall designate a Site Health and Safety Specialist (SHSS) who shall assist and represent the Contractor's Health and Safety (H/S) Manager in continued implementation and enforcement of the approved Site Health and Safety Plan (SSHSP). The SHSS shall have the on-site responsibility and authority to modify and stop work, or remove personnel from the site if working conditions change which may effect on-site and off-site health and safety. The SHSS shall be physically present at the project site at all times. The SHSS may be dual hatted with the Project QC Manager. The SHSS shall have, as a minimum, the following qualifications:

- A minimum of five years safety work on similar projects.
- 30-hour OSHA construction safety class or equivalent within the last five years.
- An average of at least 24 hours of formal safety training each year for the last five years.
- Competent person status for at least the following:
    - excavation,
    - health hazard recognition, evaluation and control of chemical, physical and biological agents, and
    - personal protective equipment and clothing to include selection, use and maintenance.
- First aid and cardiopulmonary resuscitation (CPR) qualified.

Quality Control

Approval of the QC Plan is required prior to the start of construction. The OICC reserves the right to require changes in the QC Plan and operations as necessary to ensure the specified quality of work. The Contracting Officer reserves the right to interview the QC Manager at any time in order to verify his/her submitted qualifications.

The OICC shall be notified, in writing, of any proposed changes to the QC Plan, at a minimum of seven calendar days prior to the implementation of the proposed change. Proposed changes must be approved by the OICC.

Combined Contractor Production Report/Contractor Quality Control Report (CPR/CQCR) is required for each day that work is performed. CPR/CQCRs are to be prepared, signed, and dated by the Project QC Manager.

Safety and Occupational Health Requirements

The SHSS and Contractor representatives who have a responsibility or significant role in accident prevention shall attend the pre-IMWP implementation conference. The purpose of the conference is for the Contractor and the OICC to become acquainted and explain the functions and operating procedures of their respective organizations and to reach mutual understanding relative to the administration of the overall project before the initiation of work. The Contractor shall discuss the details of the work identified in the approved Contractor's Work Plan and discuss which construction phases will require significant or additional activity hazard analysis. In addition, a schedule for the preparation, submittal, review, and acceptance of additional hazard analysis shall be established to preclude project delays. Lastly, deficiencies in the submitted accident prevention report will be brought to the attention of the Contractor at the conference. The Contractor shall revise the plan to correct deficiencies and resubmit the plan for acceptance.

New employees (prime or subcontractor) will be informed of specific site hazards before they begin work. Documentation of this orientation shall be kept on file at the project site.

If unforeseen materials hazardous to human health are encountered during operations, that portion of the work shall be stopped and the OICC shall be notified immediately. Within 14 days, the Navy will determine if the material is hazardous. If the material is not hazardous or poses no danger, the OICC will direct the Contractor to proceed without change. If the material is determined to be hazardous or to pose danger, and handling of the material is necessary to accomplish the work, the Contracting Officer will issue modifications to the proposed work.

Equipment shall be operated by designated qualified operators. Proof of qualifications shall be kept on the project site for review. Manufacturer's specifications or owner's manual for the equipment shall be on site and reviewed for additional safety precautions or requirements. Such additional safety precautions or requirements shall be incorporated into the activity hazard analysis. Mechanized equipment shall be inspected in accordance with manufacturer's recommendations for safe operations by a competent person prior to being placed into use. Daily checks or tests shall be conducted and documented on mechanized equipment by designated competent persons.

The competent person for excavations performed as a result of contract work shall be on-site when excavation work is being performed, and shall inspect and document the excavations daily prior to entry by workers. The competent person must evaluate all hazards, including atmospheric, that may be associated with the work, and shall have the resources necessary to correct hazards promptly.

Environmental Controls

An Erosion and Sediment Control Plan is included in the IMWP. The Erosion and Sediment Control Plan describes the location and description of all erosion and sediment control measures, a sequence of construction to be followed, graphic details of all erosion and sediment control measures to be used, and an approval sign-off block containing the names of the Facility and Contractor contacts, whose signatures indicate plan acceptance/approval.

The Contractor shall strictly follow the Erosion and Sediment Control Plan and maintain all measures used during construction. Modifications to the Erosion and Sediment Control Plan shall be submitted to the OICC and the Indiana Department of Environmental Management (IDEM) for approval. No modifications to the Erosion and Sediment Control Plan will be allowed until these changes have been approved by the OICC and IDEM and three copies of the approved modifications have been submitted to the OICC and one copy of the approved modifications have been submitted to IDEM.

Transportation and Disposal of Contaminated Material

The Contractor shall be solely responsible for complying with all Federal, State, and local requirements for decontamination of vehicles, equipment, and containers and shall bear all responsibility and cost for any noncompliance. In addition to these requirements, the Contractor shall perform the following:

- Visually inspect all vehicles, equipment, and containers leaving the work site for proper decontamination.
- Prepare and maintain a written decontamination log.

The Contractor shall be solely responsible for complying with all Federal, State, and local requirements for transporting contaminated materials through the applicable jurisdictions and shall bear all responsibility and cost for any noncompliance. In addition to these requirements, the Contractor shall perform the following:

- Inspect and document all vehicles and containers for proper operation and covering.
- Inspect all vehicles and containers for proper markings, manifest documents, and other requirements for waste shipment.

All contaminated materials removed from the site shall be disposed in a treatment/disposal facility permitted to accept such material.

The Contractor shall properly dispose of investigation derived waste, personnel protective equipment, and miscellaneous wastes associated with implementation of the IMWP, including sampling and analysis that are generated by the Navy representatives.

APPENDIX C

IDEM STABILIZATION SPECIFICATIONS

Practice 3.11
Temporary Seeding

Purpose
(Exhibit 3.11-A)

* To reduce erosion and sedimentation damage by stabilizing disturbed areas where additional work (e.g., grading) is not scheduled for a period of 2 mo. to 1 yr.
* To reduce problems associated with mud or dust from bare soil surfaces during construction.
* To reduce sediment runoff to downstream areas.
* To improve visual aesthetics of the construction areas.

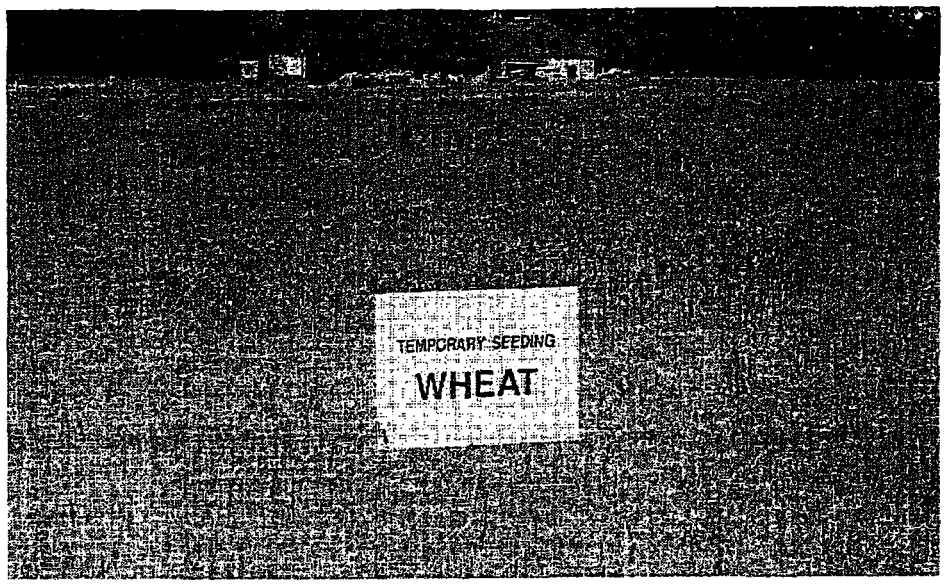

Exhibit 3.11-A. A temporary seeding of wheat to reduce erosion on a future home lot.

Requirements

Site and seedbed preparation: Graded and fertilizer applied.
Plant species: Selected on the basis of quick germination, growth, and time of year to be seeded (see *Exhibit 3.11-B*).
Mulch: Clean grain straw, hay, wood fibre, etc., to protect seedbed and encourage plant growth.
Seeding frequency: As often as possible following construction activity. Daily seeding of rough graded areas when the soil is loose and moist is usually most effective.

Application
(Exhibit 3.11-B)

SITE PREPARATION:

1. Install practices needed to control erosion, sedimentation, and water runoff, such as temporary and permanent diversions, sediment traps or basins, silt fences, and straw bale dams (Practices 3.21, 3.22, 3.72, 3.73, 3.74, and 3.75).
2. Grade the site as specified in the construction plan.

SEEDBED PREPARATION:

1. Test soil to determine its nutrient levels. (Contact your county SWCD or Cooperative Extension office for assistance and soils information, including available soil testing services.)
2. Fertilize as recommended by the soil test. If testing is not done, consider applying 400-600 lbs./acre of 12-12-12 analysis, or equivalent, fertilizer.
3. Work the fertilizer into the soil 2-4 in. deep with a disk or rake operated across the slope.

SEEDING:

1. Select a seeding mixture and rate from *Exhibit 3.11-B*, and plant at depth and on dates shown.
2. Apply seed uniformly with a drill or cultipacker-seeder or by broadcasting, and cover to the depth shown in *Exhibit 3.11-B*.

3. If drilling or broadcasting, firm the seedbed with a roller or cultipacker.
4. Mulch seeded areas to increase seeding success. Anchor all mulch by crimping or tackifying. Use of netting or erosion control blankets is possible, but may not be cost-effective for temporary seedings.

Exhibit 3.11-B. Temporary Seeding Recommendations.

Seed species*	Rate/acre	Planting depth	Optimum dates**
Wheat or rye	150 lbs.	1 to 1½ in.	9/15 to 10/30
Spring oats	100 lbs.	1 in.	3/1 to 4/15
Annual ryegrass	40 lbs.	1/4 in.	3/1 to 5/1 8/1 to 9/1
German millet	40 lbs.	1 to 2 in.	5/1 to 6/1
Sudangrass	35 lbs.	1 to 2 in.	5/1 to 7/30

* Perennial species may be used as a temporary cover, especially if the area to be seeded will remain idle for more than a year (Practice 3.12).

** Seeding done outside the optimum dates increases the chances of seeding failure.

Maintenance

* Inspect periodically after planting to see that vegetative stands are adequately established; re-seed if necessary.
* Check for erosion damage after storm events and repair; reseed and mulch if necessary.
* Topdress fall seeded wheat or rye seedings with 50 lbs./acre of nitrogen in February or March if nitrogen deficiency is apparent. (*Exhibit 3.11-B* shows only wheat/rye fall seeded.)

Common concern

Fertilizer not incorporated at least 2 in. deep—may be lost in runoff or remain concentrated near the surface to inhibit germination.
Mulch rate inadequate—results in poor germination and failure.
Seeding uneven or rate too low—results in patchy growth and erosion.

Practice 3.12
Permanent Seeding

Purposes
(Exhibit 3.12-A)

* To reduce erosion and sedimentation damage by stabilizing exposed areas where additional work (e.g., grading) is not scheduled for a period of more than a year or areas where final grading has been completed.
* To reduce problems associated with mud or dust from bare soil surfaces during construction.
* To reduce sediment runoff to downstream areas.
* To improve the visual aesthetics of the construction area.

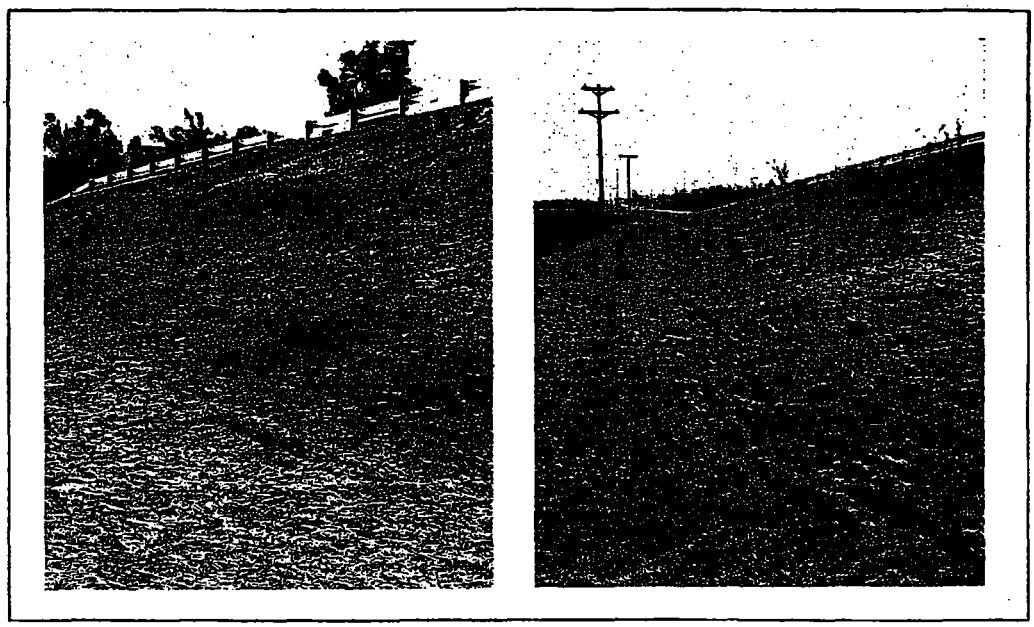

Exhibit 3.12-A. A road right-of-way (left) newly permanent seeded and mulched and (right) 6 mo. later.

Requirements

Site and seedbed preparation: Graded, and lime and fertilizer applied.

Plant species: Selected on the basis of soil type, soil pH, region of the state, time of year, and planned use of the area to be seeded *(see Exhibit 3.12-C)*.

Mulch: Clean grain straw, hay, wood fibre, etc., to protect seedbed and encourage plant growth. The mulch may need to be anchored to reduce removal by wind or water, or erosion control blankets may be considered.

Application
(Exhibits 3.12-B, C, and D)

Permanently seed all final grade areas (e.g., landscape berms, drainage swales, erosion control structures, etc.) as each is completed and all areas where additional work is not scheduled for a period of more than a year.

SITE PREPARATION:

1. Install practices needed to control erosion, sedimentation, and runoff prior to seeding. These include temporary and permanent diversions, sediment traps and basins, silt fences, and straw bale dams (Practices 3.21, 3.22, 3.72, 3.73, 3.74, and 3.75).
2. Grade the site and fill in depressions that can collect water.
3. Add topsoil to achieve needed depth for establishment of vegetation (Practice 3.02).

SEEDBED PREPARATION:

1. Test soil to determine pH and nutrient levels. (Contact your county SWCD or Cooperative Extension office for assistance and soils information, including available testing services.)
2. If soil pH is unsuitable for the species to be seeded, apply lime according to test recommendations.

3. Fertilize as recommended by the soil test. If testing was not done, consider applying 400-600 lbs./acre of 12-12-12 analysis, or equivalent, fertilizer.
4. Till the soil to obtain a uniform seedbed, working the fertilizer and lime into the soil 2-4 in. deep with a disk or rake operated across the slope *(Exhibit 3.12-B)*.

SEEDING:

Optimum seeding dates are Mar. 1-May 10 and Aug. 10-Sept. 30. Permanent seeding done between May 10 and Aug. 10 may need to be irrigated. As an alternative, use temporary seeding (Practice 3.11) until the preferred date for permanent seeding.

1. Select a seeding mixture and rate from *Exhibit 3.12-C*, based on site conditions, soil pH, intended land use, and expected level of maintenance.
2. Apply seed uniformly with a drill or cultipacker-seeder *(Exhibit 3.12-D)* or by broadcasting, and cover to a depth of 1/4-1/2 in.
3. If drilling or broadcasting, firm the seedbed with a roller or cultipacker.
4. Mulch all seeded areas (Practice 3.15). Consider using erosion control blankets on sloping areas (Practice 3.17). (NOTE: If seeding is done with a hydroseeder, fertilizer and mulch can be applied with the seed in a slurry mixture.)

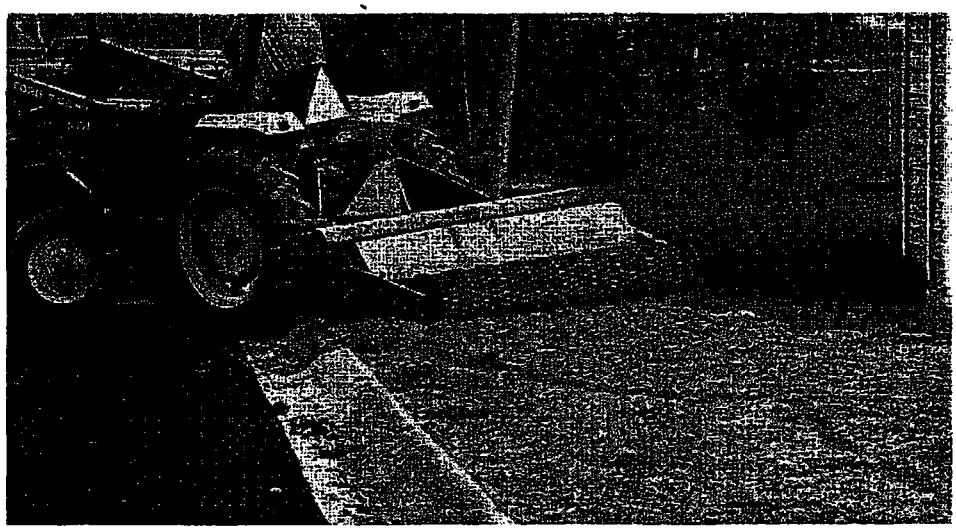

Exhibit 3.12-B. Preparing the seedbed with a combination roto-tiller and cultipacker.

Exhibit 3.12-C. Permanent Seeding Recommendations.

This table provides several seeding options. Additional seed species and mixtures are available commercially. When selecting a mixture, consider site conditions, including soil properties (e.g., soil pH and drainage), slope aspect and the tolerance of each species to shade and droughtiness.

Seed species and mixtures	Rate per acre	Optimum soil pH
OPEN AND DISTURBED AREAS (REMAINING IDLE MORE THAN 1 YR.)		
1. Perennial ryegrass	35 to 50 lbs.	5.6 to 7.0
+ white or ladino clover*	1 to 2 lbs.	
2. Kentucky bluegrass	20 lbs.	5.5 to 7.5
+ smooth bromegrass	10 lbs.	
+ switchgrass	3 lbs.	
+ timothy	4 lbs.	
+ perennial ryegrass	10 lbs.	
+ white or ladino clover*	1 to 2 lbs.	

Exhibit 3.12-C. Continued.

Seed species and mixtures	Rate per acre	Optimum soil pH
3. Perennial ryegrass	15 to 30 lbs.	5.6 to 7.0
+ tall fescue**	15 to 30 lbs.	
4. Tall fescue**	35 to 50 lbs.	5.5 to 7.5
+ ladino or white clover*	1 to 2 lbs.	
STEEP BANKS AND CUTS, LOW MAINTENANCE AREAS (NOT MOWED)		
1. Smooth bromegrass	25 to 35 lbs.	5.5 to 7.5
+ red clover*	10 to 20 lbs.	
2. Tall fescue**	35 to 50 lbs.	5.5 to 7.5
+ white or ladino clover*	1 to 2 lbs.	
3. Tall fescue**	35 to 50 lbs.	5.5 to 7.5
+ red clover*	10 to 20 lbs.	
(Recommended north of US 40)		
4. Orchardgrass	20 to 30 lbs.	5.6 to 7.0
+ red clover*	10 to 20 lbs.	
+ ladino clover*	1 to 2 lbs.	
5. Crownvetch*	10 to 12 lbs.	5.6 to 7.0
+ tall fescue**	20 to 30 lbs.	
(Recommended south of US 40)		
LAWNS AND HIGH MAINTENANCE AREAS		
1. Bluegrass	105 to 140 lbs.	5.5 to 7.0
2. Perennial ryegrass (turf-type)	45 to 60 lbs.	5.6 to 7.0
+ bluegrass	70 to 90 lbs.	
3. Tall fescue (turf-type)**	130 to 170 lbs.	5.6 to 7.5
+ bluegrass	20 to 30 lbs.	
CHANNELS AND AREAS OF CONCENTRATED FLOW		
1. Perennial ryegrass	100 to 150 lbs.	5.6 to 7.0
+ white or ladino clover*	1 to 2 lbs.	
2. Kentucky bluegrass	20 lbs.	5.5 to 7.5
+ smooth bromegrass	10 lbs.	
+ switchgrass	3 lbs.	
+ timothy	4 lbs.	
+ perennial ryegrass	10 lbs.	
+ white or ladino clover*	1 to 2 lbs.	
3. Tall fescue**	100 to 150 lbs.	5.5 to 7.5
+ ladino or white clover*	1 to 2 lbs.	
4. Tall fescue**	100 to 150 lbs.	5.5 to 7.5
+ Perennial ryegrass	15 to 20 lbs.	
+ Kentucky bluegrass	15 to 20 lbs.	

* For best results: (a) legume seed should be inoculated; (b) seeding mixtures containing legumes should preferably be spring-seeded, although the grass may be fall-seeded and the legume frost-seeded (Practice 3.13); and (c) if legumes are fall-seeded, do so in early fall.

** Tall fescue provides little cover for, and may be toxic to, some species of wildlife. The IDNR rec-ognizes the need for additional research on alternatives to tall fescue, such as buffalograss, orchard-grass, smooth brome-grass, and switch-grass. This research, in conjunction with demonstration areas, should focus on erosion control characteristics, wildlife toxicity, turf durability, and drought resistance.

NOTE: An oat or wheat companion or nurse crop may be used with any of the above permanent seeding mixtures. If so, it is best to seed during the fall seeding period, especially after Sept. 15, and at the following rates: spring oats--1/4 to 3/4 bu./acre; wheat--no more than 1/2 bu./acre.

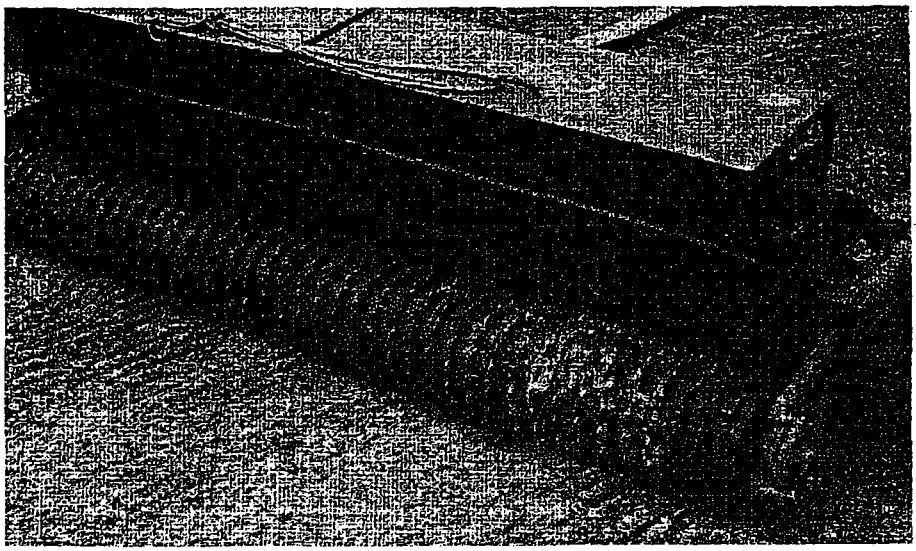

Exhibit 3.12-D. A cultipacker-seeder.

Maintenance

* Inspect periodically, especially after storm events, until the stand is successfully established. (Characteristics of a successful stand include: vigorous dark green or bluish-green seedlings; uniform density with nurse plants, legumes, and grasses well inter-mixed; green leaves; and the perennials remaining green throughout the summer, at least at the plant base.)
* Plan to add fertilizer the following growing season according to soil test recommendations.
* Repair damaged, bare, or sparse areas by filling any gullies, re-fertilizing, over- or re-seeding, and mulching.
* If plant cover is sparse or patchy, review the plant materials chosen, soil fertility, moisture condition, and mulching; then repair the affected area either by over-seeding or by re-seeding and mulching after re-preparing the seedbed.
* If vegetation fails to grow, consider soil testing to determine acidity or nutrient deficiency problems. (Contact your SWCD or Cooperative Extension office for assistance.)
* If additional fertilization is needed to get a satisfactory stand, do so according to soil test recommendations.

Common concerns

Insufficient topsoil or inadequately tilled, limed, and/or fertilized seedbed—results in poor establishment of vegetation.

Unsuitable species or seeding mixture—results in poor establishment of vegetation.

Nurse crop rate too high in the mixture—results in competition with the perennials.

Seeding done at the wrong time of year—results in poor establishment of vegetation, also plant hardiness is significantly decreased.

Mulch rate inadequate—results in poor germination and failure.

Practice 3.13
Dormant and Frost Seeding

Dormant seeding is a temporary or permanent seeding application at a time when soil temperatures are too low for germination to occur (less than 50°F). *Frost seeding* is a temporary or permanent seeding application in early spring when soils are in the freeze-thaw stage. (This practice can be used to repair or enhance areas having thin or declining cover or to re-vegetate an area.)

Purposes
(Exhibit 3.13-A)

* To provide early germination and soil stabilization in the spring.
* To reduce sediment runoff to downstream areas.
* To improve the visual aesthetics of the construction area.
* To repair previous seedings.

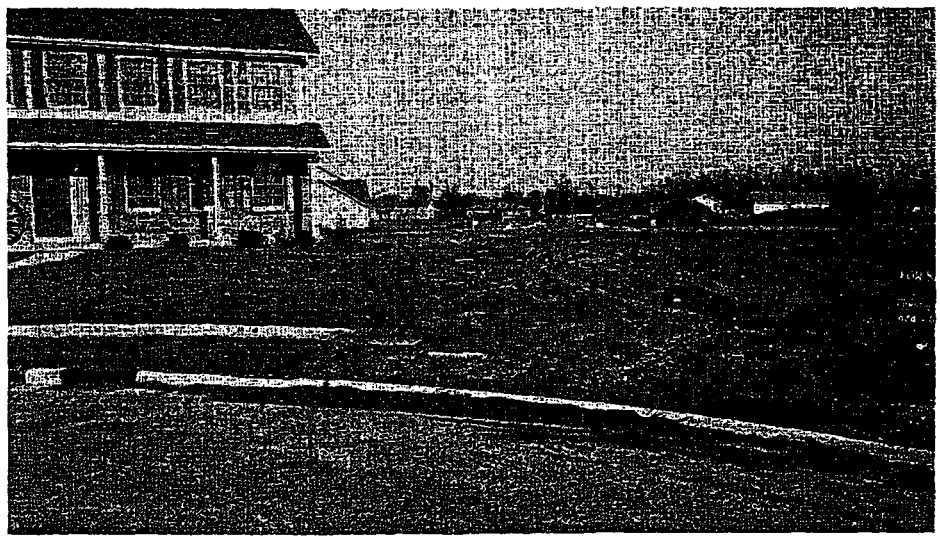

Exhibit 3.13-A. Use of dormant seeding could have reduced excessive early spring erosion on this site.

Requirements

Site and seedbed preparation: Graded as needed, and lime and fertilizer applied.

Plant species: Selected on the basis of soil type, adaptability to the region, and planned use of the area (see *Exhibits 3.13-B* and *3.13-C*).

Application
(Exhibits 3.13-B and C)

SITE PREPARATION:

1. Grade the area to be seeded.
2. Install needed erosion/water runoff control practices, such as temporary or permanent diversions, sediment basins, silt fences, or straw bale dams (Practices 3.21, 3.22, 3.72, 3.74, or 3.75).

FOR DORMANT SEEDING:

Site and seedbed preparation and mulching can be done months ahead of actual seeding; or if the existing ground cover is adequate, seeding can be done directly into it.

Seeding dates: Dec. 1-Feb. 28 (north of U.S. 40), Dec. 10-Jan. 15 (south of U.S. 40).

1. Broadcast fertilizer as recommended by a soil test; or if testing was not done, consider applying 400-600 lbs./acre of 12-12-12 analysis, or equivalent, fertilizer.
2. Apply mulch upon completion of grading (Practice 3.15).
3. Select an appropriate seed species or mixture from *Exhibit 3.13-B* for temporary seeding or *Exhibit 3.13-C* for permanent seeding, and broadcast on top of the mulch and/or into existing ground cover at the rate shown. (If site preparation occurs within the recommended dates, fertilize and lime, seed, and mulch at that time.)

FOR FROST SEEDING:

Seed is broadcast over the prepared seedbed and incorporated into the soil by natural freeze-thaw action.

Seeding dates: Feb. 28-Mar. 28 (north of U.S. 40), Feb. 15-Mar. 15 (south of U.S. 40).

1. Broadcast fertilizer as recommended by a soil test; or if testing was not done, consider applying 400-600 lbs./acre of 12-12-12 analysis, or equivalent, fertilizer.
2. Select an appropriate seed species or mixture from *Exhibit 3.13-B* for temporary seeding or *Exhibit 3.13-C* for permanent seeding, and broadcast on to the seedbed or into the existing ground cover at the rate shown. (Do not work the seed into the soil.)

Exhibit 3.13-B. Temporary Dormant or Frost Seeding Recommendations.

Seed species*	Rate per acre
Wheat or rye	150 lbs.
Spring oats	150 lbs.
Annual ryegrass	60 lbs.

* Perennial species may be used as a temporary cover, especially if the area to be seeded will remain idle for more than a year (Practice 3.12).

Exhibit 3.13-C. Permanent Dormant or Frost Seeding Recommendations.

This table provides several seeding options. Additional seed species and mixtures are available commercially. When selecting a mixture, consider site conditions, including soil properties (e.g., soil pH and drainage), slope aspect and the tolerance of each species to shade and droughtiness.

Seed species and mixtures	Rate per acre	Optimum soil pH
OPEN AND DISTURBED AREAS (REMAINING IDLE MORE THAN 1 YR.)		
1. Perennial ryegrass	50 to 75 lbs.	5.6 to 7.0
+ white or ladino clover*	1½ to 3 lbs.	
2. Kentucky bluegrass	30 lbs.	5.5 to 7.5
+ smooth bromegrass	15 lbs.	
+ switchgrass	5 lbs.	
+ timothy	6 lbs.	
+ perennial ryegrass	15 lbs.	
+ white or ladino clover*	1½ to 3 lbs.	
3. Perennial ryegrass	22 to 45 lbs.	5.6 to 7.0
+ tall fescue**	22 to 45 lbs.	
4. Tall fescue**	50 to 75 lbs.	5.5 to 7.5
+ ladino or white clover*	1½ to 3 lbs.	
STEEP BANKS AND CUTS, LOW MAINTENANCE AREAS (NOT MOWED)		
1. Smooth bromegrass	35 to 50 lbs.	5.5 to 7.5
+ red clover*	15 to 30 lbs.	
2. Tall fescue**	50 to 75 lbs.	5.5 to 7.5
+ white or ladine clover*	1½ to 3 lbs.	
3. Tall fescue**	50 to 75 lbs.	5.5 to 7.5
+ red clover*	15 to 30 lbs.	
(Recommended north of US 40)		
4. Orchardgrass	30 to 45 lbs.	5.6 to 7.0
+ red clover*	15 to 30 lbs.	
+ ladino clover*	1½ to 3 lbs.	
5. Crownvetch*	15 to 18 lbs.	5.6 to 7.0
+ tall fescue**	30 to 45 lbs.	
(Recommended south of US 40)		

Exhibit 3.13-C. Continued.

Seed species and mixtures	Rate per acre	Optimum soil pH
LAWNS AND HIGH MAINTENANCE AREAS		
1. Bluegrass	160 to 210 lbs.	5.5 to 7.0
2. Perennial ryegrass (turf-type)	70 to 90 lbs.	5.6 to 7.0
+ bluegrass	105 to 135 lbs.	
3. Tall fescue (turf-type)**	195 to 250 lbs.	5.6 to 7.5
+ bluegrass	30 to 45 lbs.	
CHANNELS AND AREAS OF CONCENTRATED FLOW		
1. Perennial ryegrass	150 to 225 lbs.	5.6 to 7.0
+ white or ladino clover*	1½ to 3 lbs.	
2. Kentucky bluegrass	30 lbs.	5.5 to 7.5
+ smooth bromegrass	15 lbs.	
+ switchgrass	5 lbs.	
+ timothy	6 lbs.	
+ perennial ryegrass	15 lbs.	
+ white or ladino clover*	1½ to 3 lbs.	
3. Tall fescue**	150 to 225 lbs.	5.5 to 7.5
+ ladino or white clover*	1½ to 3 lbs.	
4. Tall fescue**	150 to 225 lbs.	5.5 to 7.5
+ Perennial bluegrass	22 to 30 lbs.	
+ Kentucky bluegrass	22 to 30 lbs.	

* For best results: (a) legume seed should be inoculated; (b) seeding mixtures containing legumes should preferably be spring-seeded, although the grass may be fall-seeded and the legume frost-seeded; and (c) if legumes are fall-seeded, do so in early fall.

** Tall fescue provides little cover for, and may be toxic to, some species of wildlife. The IDNR recognizes the need for additional research on alternatives to tall fescue, such as buffalograss, orchardgrass, smooth bromegrass, and switch-grass. This research, in conjunction with demonstration areas, should focus on erosion control characteristics, wildlife toxicity, turf durability, and drought resistance.

NOTE: If using mixtures other than those listed here, increase the seeding rate by 50% over the conventional rate.

Maintenance

* Apply 200-300 lbs./acre of 12-12-12 or equivalent fertilizer between Apr. 15 and May 10 or during periods of vigorous growth.
* Re-seed and mulch any areas that have inadequate cover by mid- to late-April. For best results, re-seed within the recommended dates shown in Practices 3.11 for temporary seeding or 3.12 for permanent seeding.

Common concerns

Seeding done at wrong time of year--results in poor seed germination and vegetative stands.
Seeding on too steep a slope--results in seed loss and poor stands.
Seeding failure due to late freeze, killing germinated seedlings.
Mulch rate inadequate--results in poor germination and failure of dormant seeding.
Unsuitable choice of seed species or seeding mixture--results in poor vegetative stands or vegetation that does not serve the intended purpose.
Poor soil and seed contact--results in poor seed germination and vegetative stands.
Dormant seeding over mulch or frost seeding in concentrated flow areas--can result in seed being washed away before seed-soil contact and germination can occur.

Exhibit 3.13-C. Continued.

Seed species and mixtures	Rate per acre	Optimum soil pH
LAWNS AND HIGH MAINTENANCE AREAS		
1. Bluegrass	160 to 210 lbs.	5.5 to 7.0
2. Perennial ryegrass (turf-type)	70 to 90 lbs.	5.6 to 7.0
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+ Kentucky bluegrass	22 to 30 lbs.	

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* Re-seed and mulch any areas that have inadequate cover by mid- to late-April. For best results, re-seed within the recommended dates shown in Practices 3.11 for temporary seeding or 3.12 for permanent seeding.

Common concerns

Seeding done at wrong time of year--results in poor seed germination and vegetative stands.
Seeding on too steep a slope--results in seed loss and poor stands.
Seeding failure due to late freeze, killing germinated seedlings.
Mulch rate inadequate--results in poor germination and failure of dormant seeding.
Unsuitable choice of seed species or seeding mixture--results in poor vegetative stands or vegetation that does not serve the intended purpose.
Poor soil and seed contact--results in poor seed germination and vegetative stands.
Dormant seeding over mulch or frost seeding in concentrated flow areas--can result in seed being washed away before seed-soil contact and germination can occur.

Practice 3.15
Mulching

Purposes
(Exhibit 3.15-A)

* To prevent erosion by protecting the soil from wind and water impact.
* To provide temporary surface stabilization.
* To prevent soil from crusting.
* To conserve moisture thereby promoting seed germination and seedling growth.

Exhibit 3.15-A. Applying straw mulch with a chopper-blower on freshly seeded soil adjacent to a road.

Requirements
(Exhibits 3.15-B and C)

Material: Straw, hay, wood fiber, cellulose, or excelsior (see *Exhibit 3.15-B*), or erosion control blankets or turf reinforcement mats (Practices 3.17 and 3.18), as specified in the erosion and sediment control plan.

Coverage: At least 75% of the soil surface.

Anchoring: Required for straw or hay mulch and sometimes excelsior to prevent displacement by wind and/or water (see *Exhibit 3.15-C*).

Exhibit 3.15-B. Mulch Materials, Rates, and Comments.

Material	Rate	Comments
Straw or hay	1½-2 tons/acre	Should be dry, unchopped, free of undesirable seeds. Spread by hand or machine. Must be crimped or anchored (see *Exhibit 3.15-D*).
Wood fiber or cellulose	1 ton /acre	Apply with a hydromulcher and use with tacking agent.
Long fiber wood (excelsior)	1/2-3/4 ton/acre	Anchor in areas subject to wind.

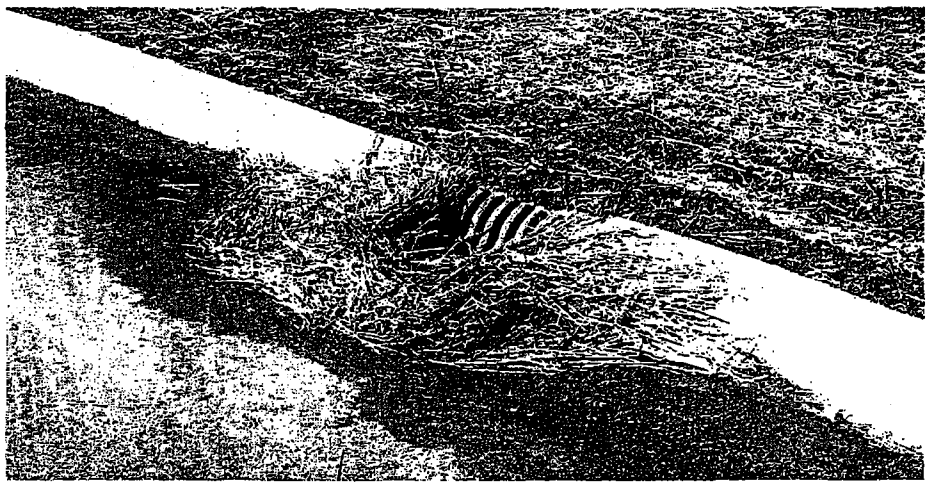

Exhibit 3.15-C. This unanchored straw mulch flowed with runoff to the storm drain. While acting somewhat as an inlet protection filter, it would have been more effective keeping soil from eroding off the site.

Application and anchoring

(Exhibits 3.15-D, E, and F)

1. Apply mulch at the recommended rate.
2. Spread uniformly by hand, hay fork, mulch blower, or hydromulcher. After spreading, no more than 25% of the ground surface should be visible.
3. If straw or hay is used, anchor it immediately one of the following ways (see *Exhibit 3.15-D*):
   - Crimp with a mulch anchoring tool, a weighted farm disk with dull serrated blades set straight (see *Exhibit 3.15-E*), or track cleats of a bulldozer; OR
   - Hydromulch with short cellulose fibers (see *Exhibit 3.15-F*); OR
   - Apply a liquid tackifier; OR
   - Cover with netting secured by metal staples.

Exhibit 3.15-D. Mulch Anchoring Methods.

Anchoring method	How to apply
Mulch anchoring tool OR Farm disk (dull, serrated, and set straight)	Crimp or punch the straw or hay into the soil 2-4 in. Operate machinery on the contour of the slope.
Cleating with dozer tracks	Operate dozer up and down slope, not across, or else the tracks will form rills.
Wood hydromulch fibers	Apply 1-2 tons/acre using a hydromulcher at a rate of 750 lbs./acre with a tacking agent (or according to contractor specifications). Do not use in areas of concentrated flow.
Asphalt emulsion	Emulsified asphalt should conform to the requirements of ASTM Spec. #977. Apply with suitable equipment at a rate of 0.05 gal./sq. yd. Do not use in areas of concentrated flow.
Synthetic tackifier, binder or soil stabilizer	Apply according to manufacturer's recommendation.
Biodegradable netting (polypropylene or similar material)*	Apply over mulch and staple with 6-8 in. wire staples. Follow manufacturer's recommendations for installation. Best suited to slope application.

* Install the netting immediately after applying the mulch. In areas of concentrated water flow, lay it parallel to the direction of flow; on other slopes, lay it either parallel or perpendicular to direction of flow. Edges of adjacent netting strips should overlap 4-6 in., with the strip on the upgrade side of any lateral water flow on top. Installation details are site specific, so follow manufacturer's directions.

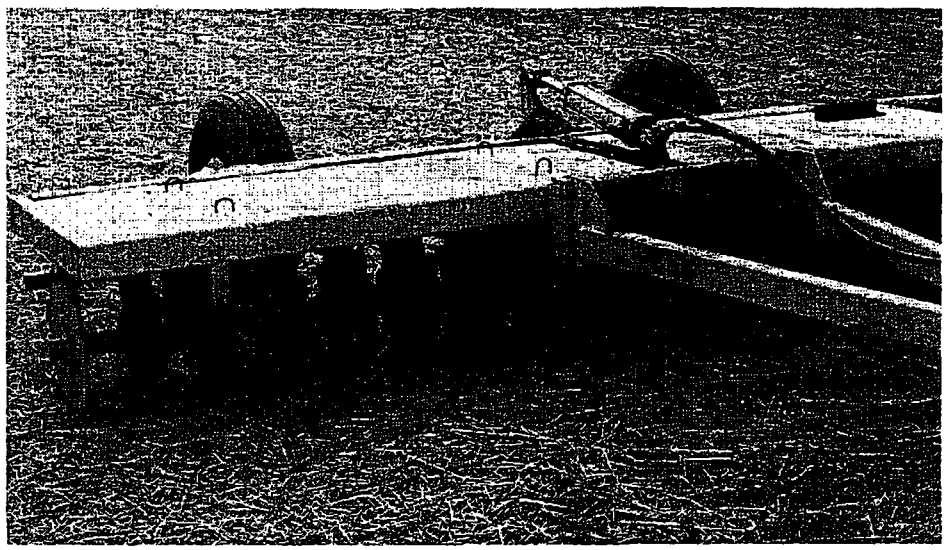

Exhibit 3.15-E. A crimper can be used to anchor mulch into the soil more securely.

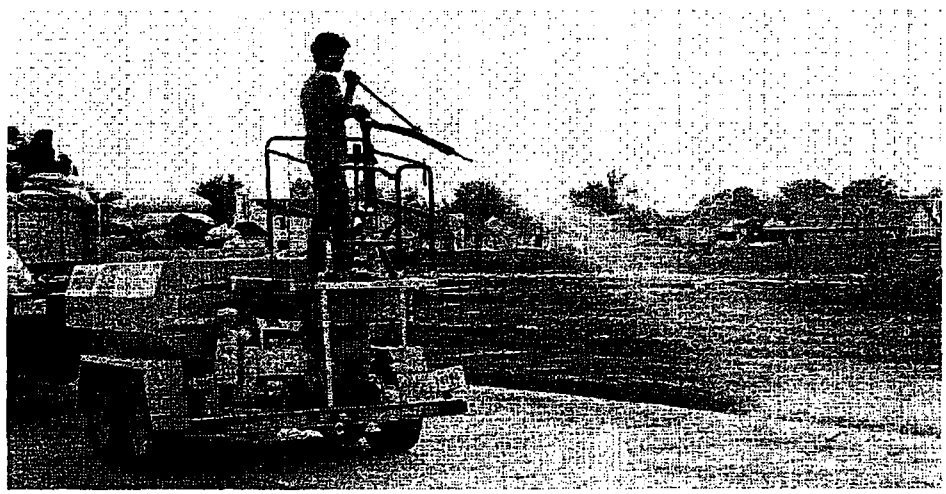

Exhibit 3.15-F. Hydroseeding the roadside in a new subdivision.

Maintenance

* Inspect after storm events to check for movement of mulch or for erosion.
* If washout, breakage, or erosion is present, repair the surface, then re-seed, re-mulch and, if applicable, install new netting.
* Continue inspections until vegetation is firmly established.

Common concerns

Inadequate coverage—results in erosion, washout, and poor plant establishment.

Appropriate tacking agent not applied or applied in insufficient amount—results in mulch being lost to wind and runoff.

Flow too concentrated to use straw mulch—results in erosion in channel; consider use of erosion control blankets and/or a diversion until vegetation is established.

Hydromulch applied in winter—results in deterioration of mulch before plants can become established.

Netting washed away—because insufficient number of staples used.