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INTERIM MEASURES WORK PLAN SOLID WASTE MANAGEMENT UNIT 13 (SWMU 13)
MINE FILL B NSA CRANE IN
2/1/2007
TETRA TECH

246

Comprehensive Long-term Environmental Action Navy

CONTRACT NUMBER N62467-04-D-0055

Rev. 0
02/07

Interim Measures Work Plan
for
SWMU 13 - Mine Fill B

Naval Surface Warfare Center Crane
Crane, Indiana

Contract Task Order 0020

February 2007

NAVFAC
Naval Facilities Engineering Command
Southeast
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470506008

INTERIM MEASURES WORK PLAN
SWMU 13 - MINE FILL B

NAVAL SURFACE WARFARE CENTER CRANE
CRANE, INDIANA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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CONTRACT NO. N62467-04-D-0055
CONTRACT TASK ORDER 0020

FEBRUARY 2007

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ACRONYMS

amsl	above mean sea level
bgs	below ground surface
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Action Navy
CTO	Contract Task Order
DNR	Department of Natural Resources
DQO	data quality objective
DRMO	Defense Reutilization Marketing Office
EMAC	Environmental Multiple Award Contract
EP	Extraction Procedure
ESA	Endangered Species Act
HMX	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
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 polyethylene
MFB	Mine Fill B
mg/kg	milligram(s) per kilogram
MSDS	Material Safety Data Sheet
msl	mean sea level
NSWC	Naval Surface Warfare Center
OICC	Officer in Charge of Construction
PCB	polychlorinated biphenyl
ppm	parts per million
Puz	Upper Pennsylvanian water-bearing zone
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RFA	RCRA Facility Assessment

RFI	RCRA Facility Investigation
SWMU	Solid Waste Management Unit
TCLP	Toxicity Characteristic Leaching Procedure
TNT	2,4,6-trinitrotoluene
TSCA	Toxic Substance Control Act
TtNUS	Tetra Tech NUS, Inc.
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOCs	volatile organic compounds

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this document is to present the Interim Measures Work Plan (IMWP) for the Mine Fill B (MFB), which has been designated Solid Waste Management Unit (SWMU) 13, at Naval Surface Warfare Center (NSWC) Crane located in Crane, Indiana. The IMWP provides requirements for the excavation and off-site disposal of polychlorinated biphenyl (PCB) contaminated soils and sediment located in the vicinity of Building 166, Building 169, and Building 171 and the drainage channels and streams that receive surface water runoff from this area. The IMWP was prepared for the United States Navy, Naval Facilities Engineering Command, Engineering Field Division South by Tetra Tech NUS, Inc. (TtNUS) under Contract Task Order (CTO) 0020 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) IV Contract Number N62467-04-D-0055.

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 4 of the IR Program as part of an interim measure. The IMWP defines activities associated with corrective measures conducted to address PCB-contaminated surface soils in the vicinity of Buildings 166 and 171 and PCB-contaminated sediments in downgradient culverts and drainage channels.

1.2 FACILITY DESCRIPTION

NSWC 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). NSWC Crane encompasses 62,463 acres (approximately 98 square miles), most of which are located in the northern portion of Martin County. Smaller portions of NSWC Crane are located in Greene, Daviess, and Lawrence Counties. NSWC Crane is located in a rural, sparsely populated area. Most of NSWC Crane is forested, and the surrounding area is wooded or farmed land. NSWC Crane

provides material, technical, and logistical support to the Navy for equipment, shipboard weapons systems, and nonexpendable ordnance items. In addition, NSWC 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 NSWC Crane

Following promulgation of the RCRA hazardous waste regulatory program, NSWC 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 NSWC Crane to address past releases of hazardous waste or hazardous constituents at SWMUs. Accordingly, NSWC Crane submitted a Hazardous Waste Management Report, and an RFI was conducted to characterize the potential for releases of hazardous waste or constituents from approximately 100 SWMUs identified during the RFI (TtNUS, 2005).

On December 23, 1989, United States Environmental Protection Agency (USEPA) issued the federal portion of the final RCRA Part B Permit for NSWC 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 13, will continue under the USEPA/IDEM Work Sharing Agreement for Corrective Action Activities at NSWC Crane.

1.3.2 SWMU 13 - Mine Fill B

SWMU 13 is located in the central portion of NSWC Crane as shown on Figure 1-1. Figure 1-2 is an aerial photograph of SWMU 13 and Figure 1-3 is a map showing the facility locations at Mine Fill B. Mine Fill B has been in use since 1941 when NSWC Crane was commissioned, and explosive ordnance was produced at MFB from 1941 until 1973. Since 1973, the facilities at MFB have been used to renovate ordnance and equipment. This IMWP focuses on the PCB-contaminated soils and sediments in the area of Buildings 166, 169, and 171, which were used for the following activities:

- Buildings 166 and 171 - Therminol boilers were operated in these buildings and it is believed that oils containing PCBs were heated in the boilers then transported to the melt building (Building 2500), where the oil was used as a heat-transfer medium in the melting of explosive mixtures (Halliburton NUS, 1992).

- Building 169 - This building includes a paint booth where an enamel coating containing 22 percent naphtha by weight and bituminous solvent-type coating containing 30 percent naphtha by weight were applied. Additionally, Building 169 had been used to load bullets with titanium tetrachloride and vanadium oxytrichloride or to dummy load bullets with sands and salts (Halliburton NUS, 1992).

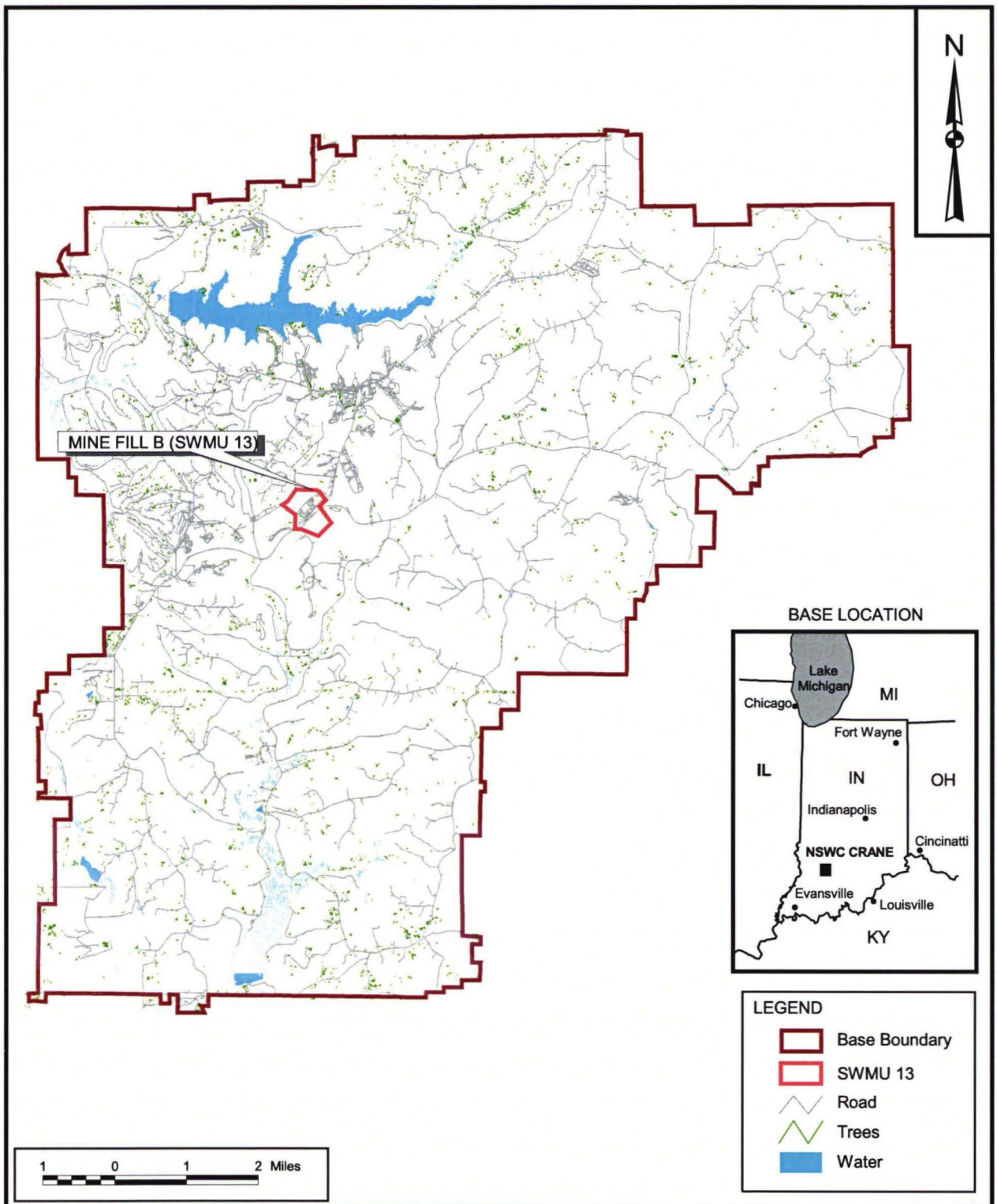
The major sources of contamination at MFB were the washdown of explosive formulations from building roofs onto the ground surface and exhausts vented from ventilation systems. Also, the therminol boilers located near Buildings 166 and 171 leaked oils containing PCBs. The boilers and surrounding contaminated soil were removed in 1989, but subsequent soil samples collected near the former locations of the boilers indicated that PCB concentrations were greater than 10 mg/kg in residual soils.

MFB was remediated in 1999, 2000, and 2001 as part of a bioremediation program that included sampling, excavation, on-site treatment through bioremediation (composting) of explosives-contaminated soil, and backfilling of the compost at MFB. The types of analytes measured before and after the remediation included volatile organic compounds (VOCs), explosives, and metals, and PCBs (Aroclor 1242, 1254, and 1260).

1.4 REPORT ORGANIZATION

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

- Section 2.0 summarizes site characteristics including site description, summary of environmental investigations conducted at SWMU 13, and nature and extent of contamination.
- Section 3.0 presents the IMWP.
- Section 4.0 presents erosion and sediment controls.
- Section 5.0 presents the sampling and analysis plan.



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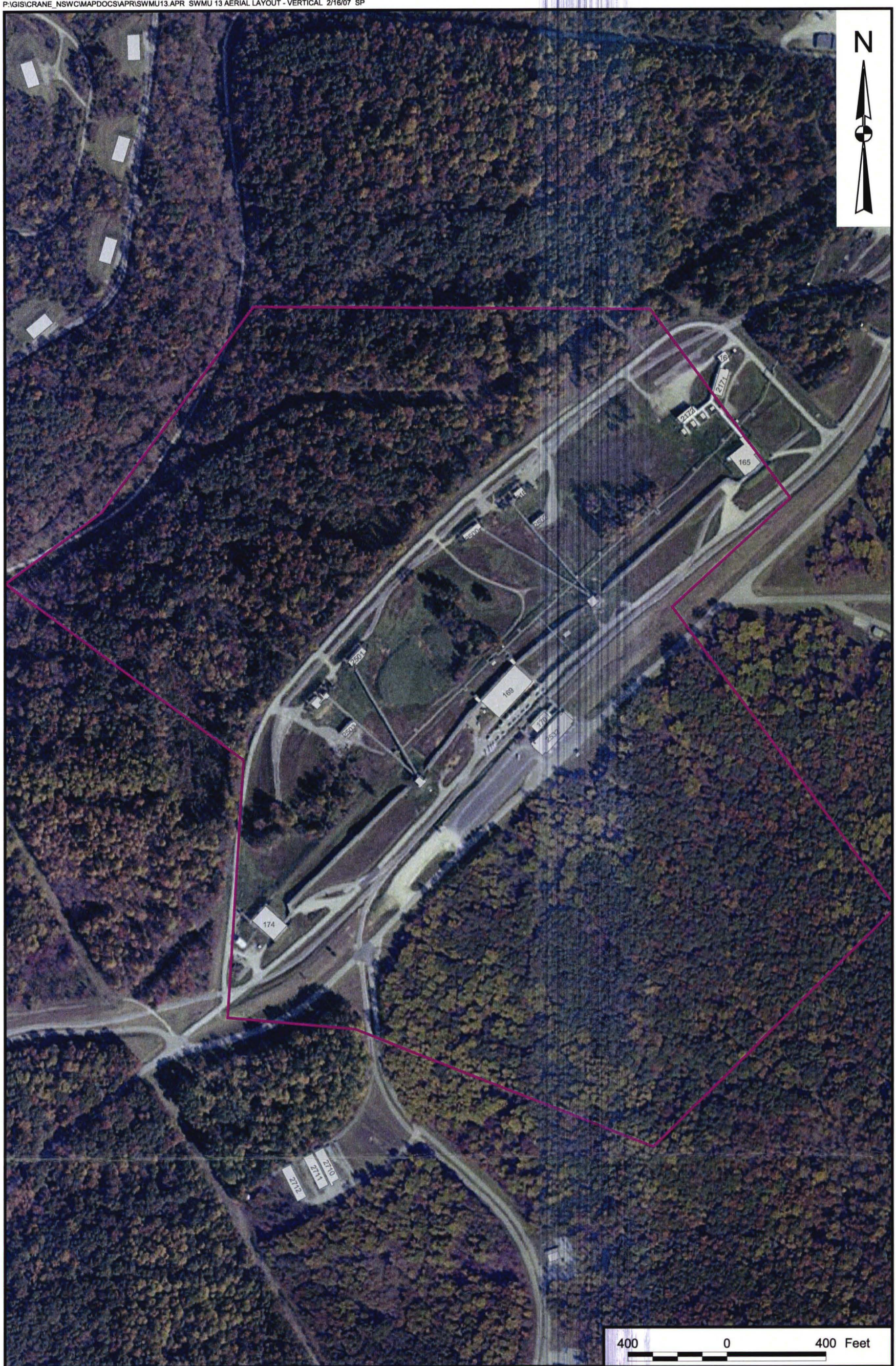
J. LAMEY	8/27/01		112G00352	0020
CHECKED BY	DATE	BASE AND SITE LOCATION MAP	APPROVED BY	DATE
T. SMITH	2/16/07	SWMU 13 - MINE FILL B		
COST/SCHEDULE-AREA		INTERIM MEASURES WORK PLAN	APPROVED BY	DATE
SCALE		NSWC CRANE	DRAWING NO.	REV
AS NOTED		CRANE, INDIANA	FIGURE 1 - 1	0

P:\GIS\CRANE_NSWC\SURFICIAL.APR SITE LOCATIONS LAYOUT 2/16/07 SP

P:\GIS\CRANE_NSWC\MAPDOCS\APR\SWMU13.APR SWMU 13 AERIAL LAYOUT - VERTICAL 2/16/07 SP



DRAWN BY S. PAXTON	DATE 2/16/07	SITE LAYOUT - 2003 AERIAL PHOTOGRAPH	CONTRACT NUMBER 112G00352
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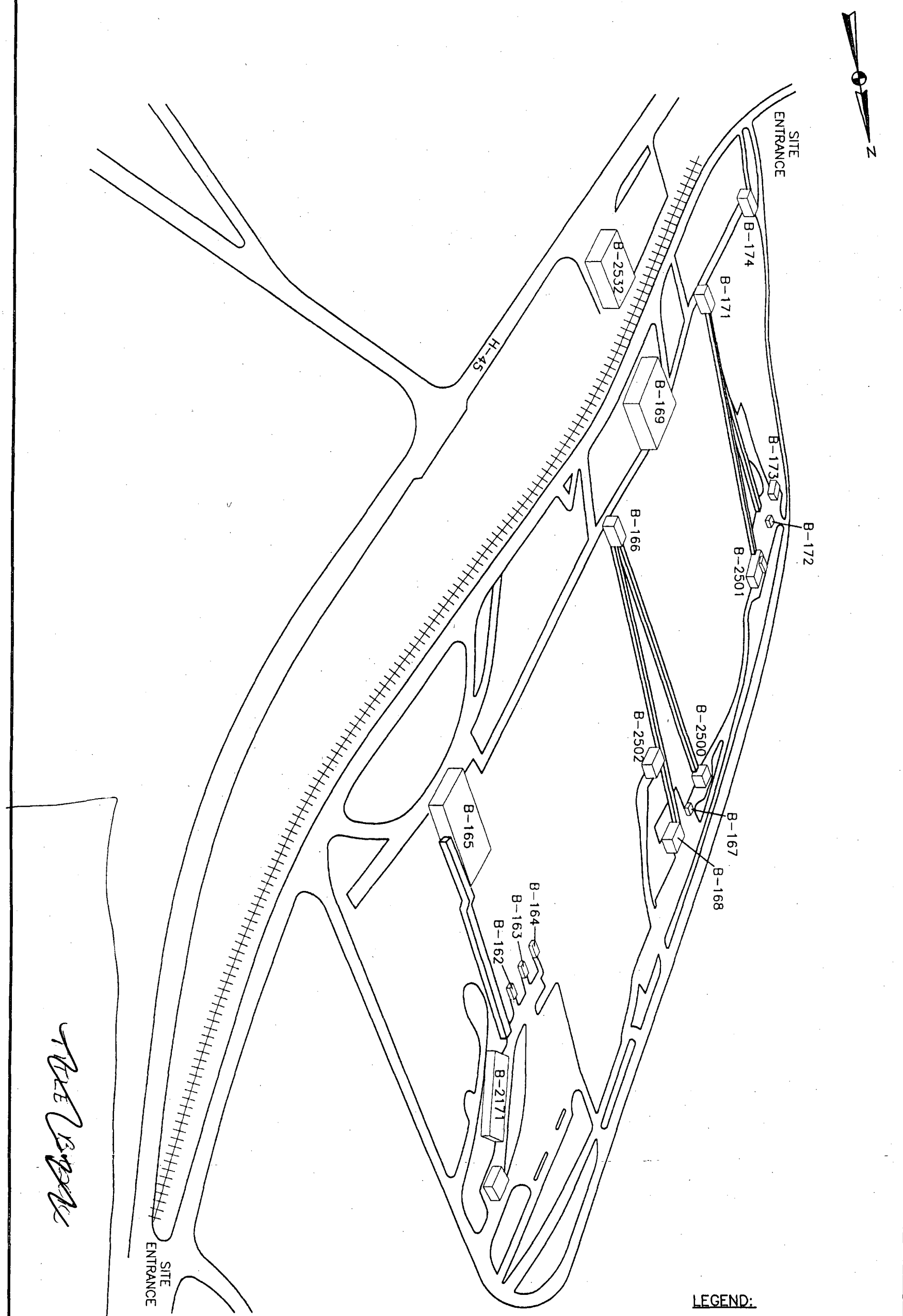

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INTERIM MEASURES WORK PLAN

2.0 SITE SUMMARY

2.1 SITE SUMMARY

This section describes the physical and geophysical conditions of areas to be addressed in the SWMU 13 IMWP. These descriptions were excerpted from the SWMU 13 RFI Report (TtNUS, 2005).

2.1.1 Physiography and Topography

MFB is located in the Crawford Upland area of the NSWC facility. MFB lies on top of a ridge that was flattened to some extent in the 1940s prior to the construction of buildings, roads, and associated parking and staging areas. Figure 2-1 shows the topography of the MFB area. The areas in between buildings and roads are grass covered. The active operations of MFB lie within an elongated trapezoid with a long axis that runs in a northeast-southwest direction and lie along the southwestern side of MFB. Most buildings are located on the northwestern side of this road, within the fenced area. At the fenceline on the northwestern side of MFB, the ridge top abruptly ends and the land surface slopes steeply down to an unnamed tributary of Boggs Creek. On the southwestern side of the main road, the other side of the ridge drops steeply in elevation to the southeast. Both sides of the ridge beyond the fenceline and the main road are heavily forested, except along numerous rights-of-way that contain power lines, pipelines, and other utilities.

Elevations at MFB range from a low of approximately 550 feet above mean sea level (amsl) along the unnamed tributary of Boggs Creek up to approximately 720 feet amsl along the main roadway on the northeastern side of MFB. Thus, there is a total relief in the area of approximately 170 feet.

2.1.2 Surface Water Hydrology

The topography at MFB consists of a ridge that runs along Highway 45 in a northeast-southwest orientation with gradual slopes to the northwest across MFB. The sides of the ridge consist of steeper slopes to the northwest and southeast that lead down to the adjacent stream valleys. Several man-made ditch systems located throughout MFB convey surface water runoff away from the buildings toward the sides of the ridge. The main road and the rail line are located on the crest of the ridge, which forms a surface water drainage divide.

Surface drainage at MFB is routed through storm sewers and ditches located throughout the relatively flat portion of the ridgetop. The ditches lead to larger drainageways and gullies that flow down both sides of

the ridge in northwest and southeast directions. Drainage from the northwestern side of the rail line flows to the northwest, down the side of the ridge, and into the unnamed tributary of Boggs Creek.

Because the rail line essentially lies along the crest of the ridge, a large majority of the surface drainage from MFB flows northwestern toward the northwest fenceline and down the side of the ridge via the gullies described above into the unnamed tributary of Boggs Creek.

Drainage gullies leading away from the southeastern side of the rail line flow southeast, down the side of the ridge, and eventually coalesce to form two unnamed tributaries of Turkey Creek, which lies approximately 5,000 feet (1 mile) southeast of MFB. A small area in the southwestern corner of MFB drains southwest and eventually flows directly into Boggs Creek about 4,000 feet southwest of MFB.

During these initial RFI sampling events, surface water sampling stations and staff gauges located on the southeastern side of the ridge were either dry or the flow rates were small [less than 10 gallons per minute (gpm)]: On the west side of MFB along the fenceline, surface water flow ranged from 0 gpm to moderate (10 to 50 gpm) in the drainageways. Thus, more surface water seemed to be draining from the northwestern side of MFB compared to the southeastern side. At the base of the ridge on the northeastern side of the SWMU, flow rates in the gullies were generally between 10 and 100 gpm during or immediately after a storm event. The streambed of the unnamed tributary of Boggs Creek located northwest of MFB was often dry. There were about 15 to 25 gpm of flow visible in the streambed in late October 2003. The flow rates observed in the stream channel in late October and mid-November 2004 were much greater, about 160 to 700 gpm. Because of the steep terrain and generally impermeable nature of the shallow bedrock, the flow rates in gullies and the receiving stream tend to be very flashy (i.e., flow rates can quickly rise and decline during and immediately following storm events).

2.1.3 Geology

Bedrock underlying NSWC Crane consists of sedimentary rocks from the Lower Pennsylvanian-age Mansfield Formation of the Raccoon Creek Group and the underlying Upper Mississippian-age Stephensport and West Baden Groups. The Pennsylvanian-age sandstones, siltstone, shales, coal beds, and thin limestone units of the Mansfield Formation can reach thicknesses of 250 to 300 feet at NSWC Crane in the central and western portions of the facility. Below the Pennsylvanian rock lie Mississippian-age limestone and sandstone formations of the Stephensport Group, including the Glen Dean, Golconda, and Beech Creek Limestones, and the Big Clifty Sandstone.

The elevation of the erosional unconformity separating the Pennsylvanian and Mississippian rocks is estimated to be between 500 to 550 feet amsl near SWMU 13 (Barnhill, 1993), or approximately 168 to 218 feet below the top of the ridge. This places the base of the Pennsylvanian rock below the elevation of the tributary stream on the northwestern side of SWMU 13. Monitoring well 13MWT50, located along the base of the ridge on the northwestern side of MFB, has penetrated to the lowest elevation at MFB (bottom elevation = 532.77 feet amsl). This boring encountered gray shale and gray shaley siltstone in the lower part of the borehole, which is assumed to be Pennsylvanian in age. Boreholes did not penetrated any limestone formations (e.g., Glen Dean, Golconda, or Beech Creek limestones) or sandstone units that might be Mississippian in age, so it is inferred that the Mississippian unconformity and Mississippian age rock formations lie below 532 feet amsl at MFB. Therefore, all of the bedrock that lies above stream level consists of Pennsylvanian rock and is at least 186 feet thick from the top of the ridge.

Pennsylvanian bedrock was encountered beneath natural unconsolidated materials and fill, and consisted of discontinuous layers of siltstones, sandstones, shales, and coal seams. Most fractures found in the bedrock were horizontal bedding plane fractures. The top of the ridge is capped with sandstone and siltstone that is weathered and stained brown because of iron oxidation. These rock units extend from the ridgetop down to about 630 to 635 feet amsl. When grouped together, the ridge-capping sandstone and siltstone units form what is termed the Upper Pennsylvanian water-bearing zone (Puz).

A veneer of natural soil and fill materials blankets the top and the sideslopes of the MFB ridge. In some cases, the fill extended to the bedrock surface. The fill material includes cinders, gravel, sand, and sandstone fragments. Natural unconsolidated materials, residual soils of the Raccoon Creek Group, underlie the fill and exist at the ground surface wherever fill is not present. The residual soils on the ridgetop and sideslopes consist predominantly of fine materials, including varying amounts of clay, silt, and sand. In the valley bottom on the western side of SWMU 13, 8 to 15 feet of unconsolidated overburden materials, assumed to be a mixture of residual soil, colluvium, and stream alluvium, were encountered. These materials were a mixture of clayey sand, clayey sandy silt, gravel, and rock fragments.

2.1.4 Hydrogeology

The maximum thickness of overburden encountered on the ridgetop at MFB was 17.5 feet. Elsewhere, the overburden was generally 10 feet thick or less. While drilling through the overburden on top of the ridge, no saturated conditions or flowing water was observed. Therefore, it is concluded that very little if any groundwater is stored at the interface between bedrock and overburden. Surface water located in

drainage gullies is not hydraulically connected to the bedrock groundwater. The surface water, where it exists, is believed to be perched on top of the clayey residual soils overlying the bedrock surface. In general, the ridgetop sandstone aquifer is recharged by downward infiltration through the residual soil, and recharge occurs more readily where the soil is thin or disturbed and supplanted with fill material.

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. As a result, PCBs are considered to be immobile in groundwater systems and thus were not analyzed in groundwater samples taken at SWMU 13.

2.2 PREVIOUS INVESTIGATIONS

The major sources of contamination at MFB were the washdown of explosive formulations from building roofs onto the ground surface and exhausts vented from ventilation systems. Also, the therminol boilers located near Buildings 166 and 171 leaked oils containing PCBs. The boilers and surrounding contaminated soil were removed in 1989, but subsequent soil samples collected near the former locations of the boilers indicated that PCB concentrations greater than 10 mg/kg were present in residual soils.

Surface Water Sampling (1972, 1978, and 1979) - Selected surface water samples were collected in drains and ditches in 1972, 1978, and 1979 by the Department of the Army (Halliburton NUS, 1992). Samples were collected adjacent to and in the vicinity of the SWMU 13 buildings. TNT, cyclotrimethylenetrinitramine (RDX), and cyclotetramethylenetetranitramine (HMX) were detected in most samples, and concentrations in the samples collected nearer the buildings were greater than the concentrations found further away from the buildings.

Initial Assessment Survey (1985) - As part of the Initial Assessment Survey (IAS) for MFB, eight soil samples were collected around Buildings 167 and 172 at a depth of 20 inches in 1985 and analyzed for explosives (Halliburton NUS, 1992). Concentrations of TNT ranged from 4.8 to 2,410 mg/kg, concentrations of HMX ranged from 10.8 to 2,020 mg/kg, and concentrations of RDX ranged from 20.6 to 24,100 mg/kg. The data indicated that the area around Building 172 was much more contaminated than the area around Building 167.

In 1985, a soil sample was also collected from the area around Building 169. The sample was tested by the Extraction Procedure (EP) Toxicity Test to determine the susceptibility of contaminants to leach. Concentrations of metals, methylene chloride, and PCBs in the sample leachate were all less than 1990 Toxicity Characteristic Leaching Procedure (TCLP) action levels.

Interim Measures (1999 - 2002) - MFB was remediated between June 1999 to January 2002 as part of the bioremediation program that included sampling, excavation, on-site treatment through bioremediation (composting) of explosives-contaminated soil, and backfilling of the compost at MFB. The types of analytes measured before and after the remediation included VOCs, explosives, and metals, and PCBs (Aroclor 1242, 1254, and 1260).

RCRA Facility Investigation (2003, 2004, and 2006) - Based upon the results of the IAS and the IM remediation, TtNUS conducted a RCRA Facility Investigation (RFI) for SWMU 13. The IAS documented that residual PCB contamination remained in the soil near Buildings 166 and 171 where the therminol boilers were operated (Halliburton NUS, 1992). It is believed that oils containing PCBs were heated in the therminol boilers and then transported to the melt building where the oil was used as a heat-transfer medium in the melting of explosive mixtures. In 1992, PCB contamination was detected near Buildings 166 and 171 (Halliburton NUS, 1992). Some soils containing PCBs were removed during IM remediation of explosives-contaminated soil at MFB, but PCBs were not the focus of the bioremediation (composting) of explosives-contaminated soil that occurred between 1999 and 2002.

2.3 EXTENT OF CONTAMINATION

The IM removed the majority of PCB contamination in the soil at SWMU 13. However, IM verification samples collected following the IM identified isolated areas where PCB contamination remained in the subsurface soil. In addition, the 2003, 2004, and 2006 RFI soil and sediment sampling events conducted within the drainage channel network surrounding SWMU 13, verified PCB contamination within the surface soil and within several drainage channels.

For SWMU 13, a preliminary cleanup goal of 1 mg/kg (ground surface to 2 feet bgs) has been established for the surface soil and sediments. Although this proposed cleanup goal will not remove all of the SWMU 13 PCB contamination present in the soil and sediment, it removes the human health risk and reduces ecological risk such that average concentrations will meet ecological requirements. This PCB cleanup goal has been used and found acceptable by IDEM for similar cleanup operations at a nearby General Motors site and at cleanup projects in the Lower Fox River, Illinois, and Green Bay, Wisconsin. This PCB cleanup goal also represents the Toxic Substance Control Act (TSCA) High Occupancy Standard (1 mg/kg).

The TSCA Low Occupancy Standard (25 mg/kg) will be used for subsurface soils below 2 feet bgs. The extent of soil and sediment contamination that requires removal under this IM is identified in Figures 2-2 and 2-3.

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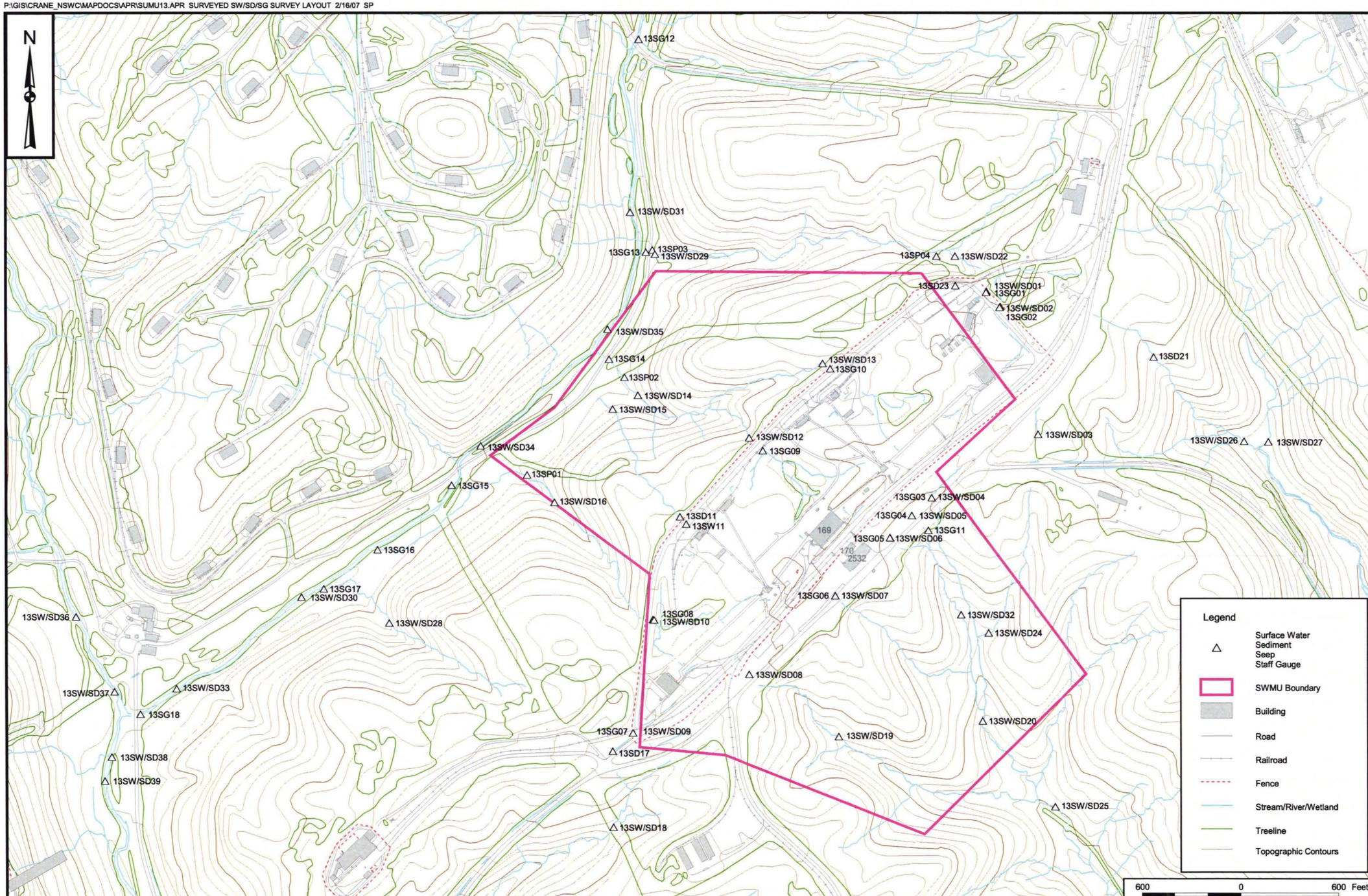

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DRAWING NO. FIGURE 2 - 1

REV –

TOPOGRAPHIC AREA MAP
SWMU 13 - MINE FILL B
INTERIM MEASURES WORK PLAN
NSWC CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY C. FOSTER — DATE 12/29/04

CHECKED BY T. SMITH — DATE 2/16/07

COST/SCHED-AREA

SCALE AS NOTED

Legend

- Soil Sample Location
- Sediment Sample Location
- Extent of PCBs > 1 MG/KG
- Estimated Extent of PCBs > 1 MG/KG
- Road
- Fence
- Wall
- Stream/River
- Vegetation
- Topographic Contour
- Culvert
- SWMU Boundary
- Building

Note:
All results are in MG/KG.
J = Estimated Value
U = Not Detected
NA = No data abailable for sample location

N

25 0 25 Feet

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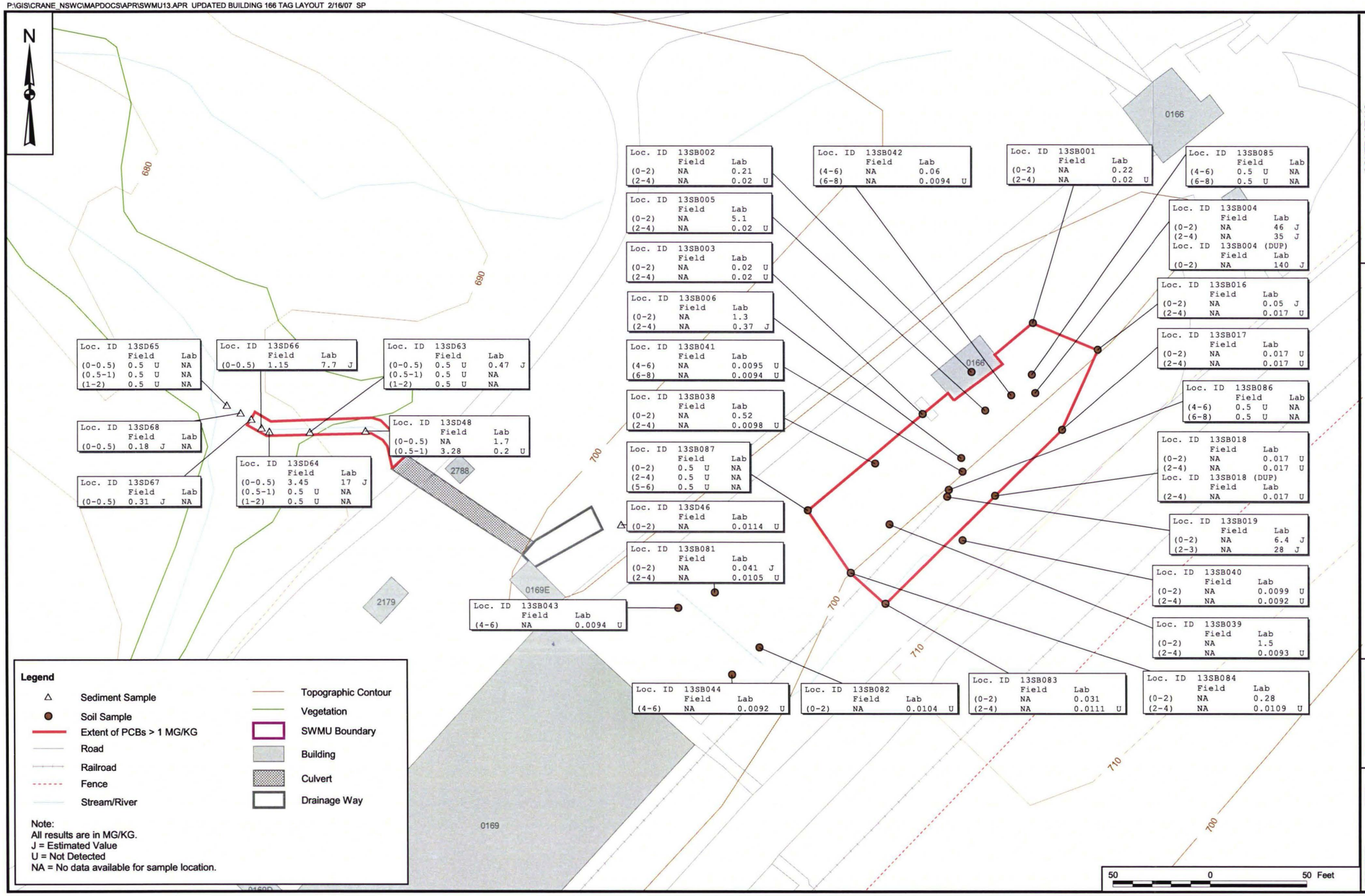
DRAWN BY	S. PAXTON	DATE 2/16/07
CHECKED BY	T. SMITH	DATE 2/16/07
REVISED BY		DATE
SCALE	AS NOTED	

NAVFAC

EXTENT OF PCB CONTAMINATION (BUILDING 171 AREA)
SWMU 13 - MINE FILL B
INTERIM MEASURES WORK PLAN
NSWC CRANE
CRANE, INDIANA

CONTRACT NO. CTO 0357
OWNER NO.
APPROVED BY DATE
DRAWING NO. FIGURE 2 - 2
REV. 0

P:\GIS\CRANE_NSWC\MAPDOCS\APR\SWMU13.APR UPDATED BUILDING 166 TAG LAYOUT 2/16/07 SP



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DRAWING NO. FIGURE 2 - 3

REV 0

EXTENT OF PCB CONTAMINATION (BUILDING 166 AREA)
SWMU 13 - MINE FILL B
INTERIM MEASURES WORK PLAN
NSWC CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY S. PAXTON DATE 2/16/07

CHECKED BY T. SMITH DATE 2/16/07

COST/SCHED-AREA

SCALE AS NOTED

3.0 INTERIM MEASURES WORK PLAN

The intent of this IM is to remove surface soils [0 to 2 feet below ground surface (bgs)] and sediments with PCB concentrations greater than 1 mg/kg from the SWMU 13 area and the downgradient drainage channels impacted by PCB contamination. The activities associated with this IMWP are intended to result in the elimination of human health risks and reduce the ecological risks to within acceptable limits within the surface soils and sediments associated SWMU 13. It is not intended that the completion of this IMWP will result in the removal of all PCB contamination from the SWMU 13 subsurface soil. However, the Navy may elect to add one of the following options to this IMWP.

- Option 1 - Additional excavation to include subsurface excavation (excavation at depths greater than 2 feet blow ground surface) to remove PCB contamination at concentrations greater than 25 mg/kg.

- Option 2 - Additional excavation to include subsurface excavation (excavation at depth greater than 2 feet below ground surface) to remove PCB contamination at concentrations greater than 1 mg/kg.

The remainder of this section describes the activities and volumes associated with the removal of PCB contamination in the surface soil. Additional activities and volumes associated with the two subsurface excavation options are also presented.

3.1 DESCRIPTION OF THE INTERIM MEASURES

The IMWP specifies the removal of contaminated surface soils and sediments within and adjacent to SWMU 13. In addition, the IMWP specifies the restoration of the drainageways impacted by PCB contamination and all other areas disturbed by IMWP activities. The contaminated sediments and surface soils to be removed have been identified as containing PCB concentrations in excess of the cleanup goal of 1 mg/kg. The contaminated soils to be removed under SWMU 13 IMWP Options 1 and 2 have been identified as containing PCB concentration in excess of the subsurface cleanup goals of 25 (Option 1) and 1 mg/kg (Option 2). The volumes presented for the surface soils and sediments to be excavated are in-place, estimates. It is anticipated that these volumes will increase 5 to 10 percent after the soils and sediments are excavated and are in an unconsolidated state.

A work assignment responsibility chart (Table 3-1) identifies the responsibilities that Environmental Multiple Award Contract (EMAC) contractor, NSWC Crane, and TtNUS have in the implementation of the IMWP.

Specifically, the IMWP consists of the following major components:

- Surface Soil Excavation (near Building 166) - An area approximately 180 feet (length) by 50 feet (width) by 2 feet (depth) south of Building 166 and northwest of the rail line contains PCB concentrations greater than 1 mg/kg. This surface soil will be excavated, characterized for disposal purposes, and transported and disposed off-site. The location of the surface soil excavation is identified on Figure 3-1. Under Options 1 and 2, two additional excavation areas measuring approximately 50 feet by 50 feet require excavation from 2 to 4 feet bgs. These excavation areas are located within the limits of the surface soil excavation limits. The soil within these excavation areas are identified as having PCB concentrations in excess of 25 mg/kg (Option 1) and greater than 1 mg/kg (Option 2). The limits of the Optional excavation are identified in Figures 3-2 and 3-3. Materials excavated under Options 1 and 2 will be handled and disposed in the same manner as the excavated surface soils. Bedrock will determine the exact depth of excavation, in the event bedrock is encountered.

- Surface Soil Excavation (near Building 171) - An area approximately 300 feet (length) by 110 feet (width) by 2 feet (depth) east of Building 171 and northwest of the rail line contains PCB concentrations greater than 1 mg/kg. A smaller area located northwest of Building 171 measures approximately 50 feet (length) by 50 feet (width) by 2 feet (depth) contains PCB-contaminated soil at concentrations that exceed 1 mg/kg. These surface soil areas will be excavated, characterized for disposal purposes, and transported and disposed off site. The location of the surface soil excavation is identified on Figure 3-1.

  Under Option 1, one additional excavation area measuring approximately 50 feet by 50 feet requires excavation from 2 to 4 feet bgs. This excavation area is located within the limits of the surface soil excavation limits. The subsurface soil within the Option 1 excavation area is identified as having PCB concentrations greater than 25 mg/kg. The limits of the Option 1 excavation are identified in Figure 3-2. Materials excavated under Option 1 will be handled and disposed in the same manner as the excavated surface soils. Under Option 2, one additional excavation area measuring approximately 120 feet by 70 feet requires excavation from 2 to 4 feet bgs. This excavation area is located within the surface soil excavation limits. The soil within the Option 1 excavation area is identified as having PCB concentrations greater than 1 mg/kg. The limits of the Option 1 excavation are identified in Figure 3-3. Materials excavated under Option 2 will be handled and disposed in the same manner as the excavated surface soils. Bedrock will determine the exact depth of excavation, in the event bedrock is encountered.

- Sediment Excavation/Removal - Sediments with PCB concentrations greater than 1 mg/kg are present within the drainage channels (approximately 560 linear feet of drainage channel) that collect and convey surface water runoff from SWMU 13 and the surrounding area. These sediments will be excavated/removed from the drainage channels, dewatered, characterized for disposal purposes, and transported and disposed off-site. The locations of the sediment excavation/removal areas are identified on Figure 3-1.

  Under Option 1, no additional soil requires excavation from the drainage channels that collect surface water runoff from the SWMU 13 and surrounding areas. However, under Option 2, 280 linear feet of the drainage way located southwest of Building 171 require excavation from 2 to 4 feet bgs. This excavation area is located within the limits of the surface soil excavation limits within this same drainage way. The soil within the Option 2 excavation areas is identified as having PCB concentrations greater than 1 mg/kg. The limits of the Option 2 excavation are identified in Figure 3-3. Materials excavated under Option 2 will be handled and disposed in the same manner as the excavated surface soils. Bedrock will determine the exact depth of excavation, in the event bedrock is encountered.

- Underground Culverts - Underground culvert pipes (approximately 140 feet) will be cleaned of sediment. The sediment removed from the pipes will be characterized for disposal, transported, and disposed off-site. The locations of the contaminated culverts are shown in Figure 3-1. The volume of sediment collected from the culverts is not expected to be significant.

- 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, characterized, and discharged to a NSWC Crane- approved stabilized drainage channel. It is assumed that, following characterization, treatment will not be required and that the collected water will be discharged to a local stabilized drainage channel or the nearest NSWC Crane storm drain. The volume of water collected through dewatering is not expected to be a large quantity, unless sediment excavation/removal is performed during periods of heavy rain.

- Sampling and Analysis - Following the excavation/removal of PCB-contaminated surface soils and sediments to the specified limits, the exposed surfaces of the excavation areas will be sampled to verify contaminant removal. The Navy may require additional excavation based on the analytical results of the verification sampling. At the completion of this IM and following the removal of the support facilities (e.g., dewatering pad, decontamination pad, and material storage area), the Navy

will require verification samples to confirm that the lining systems of the support facilities did not fail during the implementation of this IM. 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 EMAC contractor will be required to remove that contamination at their own expense. Section 5.0 presents sampling and analysis procedures.

- Off-site Disposal of Surface Soils and Sediments - Surface soil and sediments will be disposed at an off-site, NSWC Crane-approved waste disposal facility. It is expected that these materials will be disposed at a non-hazardous waste disposal facility. Verification of this assumption will be the responsibility of the EMAC contractor by conducting characterization sampling and analysis and satisfying the waste disposal facility requirements.

- Backfilling and Restoration of Surface Soil Excavations - After the verification of PCB-contaminated surface soil removal [removal of surface soil containing PCB concentrations greater than 1 mg/kg and subsurface soil containing PCB concentrations greater than 25 mg/kg (Option 1) and 1 mg/kg (Option 2)], the excavated areas will be backfilled and regarded to match pre-construction grades and to match surrounding grades. In addition, the backfilled area will be restored to pre-construction conditions using permanent stabilization practices that include vegetation.

- Backfilling and Restoration of Drainage Channels - After the verification of PCB-contaminated sediment removal [removal of sediment containing PCB concentrations greater than 1 mg/kg and subsurface soil containing PCB concentrations greater than 1 mg/kg (Option 2)], the drainage channels will be backfilled to pre-construction conditions and restored using stabilization practices that include the use of gravels and vegetation.

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, 3-2, and 3-3, the following is a summary of the excavation areas and the associated performance standards:

Excavation Location Identification	Performance Standards	Applicable Subsurface Excavation Options
Surface Soil Area South of Building 166	Surface Soil Excavation and Restoration	Options 1 and 2
Surface Soil Area East of Building 171	Surface Soil Excavation and Restoration	Options 1 and 2

Excavation Location Identification	Performance Standards	Applicable Subsurface Excavation Options
Drainageway North of Building 169E	Drainage Channel Excavation and Restoration	None
Drainageway Southwest of Building 171	Drainage Channel Excavation and Restoration	Option 2
Underground Culvert Pipes	Culvert Cleaning	None

Performance standards for the IMWP are presented in the following sections.

3.2.1 Surface Soil Excavation

All surface soils excavated from SWMU 13 that are identified as having PCB concentrations greater than 1 mg/kg will be removed, characterized, and disposed at an approved off-site non-hazardous waste disposal facility. Excavated surface soils will be placed in approved waste hauling containers (e.g., roll-off boxes) staged adjacent to the surface soil excavation area.

The planned initial excavation for the surface soil area located south of Building 166 measures approximately 150 feet by 50 feet by 2 feet bgs for a total of 630 cubic yards of excavated surface soils. The planned initial excavation for the surface soil area located near Building 171 measures approximately 300 feet by varying widths of up to 110 feet by 2 feet bgs for a total of 1,860 cubic yards of excavated surface soils. The additional area located northwest of Building 171 measures approximately 50 feet (length) by 50 feet (width) by 2 feet (depth), for a total of 190 cubic yards of excavated surface soil. The initial surface soil excavation limits are shown on Figure 3-1. Northing and Easting coordinates for the initial surface soil excavation area vertices are provided in Table 3-2. The volume calculations are provided in Appendix A and summarized below:

Surface Soil Area	Area	Depth of Excavation	Volume of Surface Soil	Weight of Surface Soil
Area Southwest of Building 166	9,000 square feet	2 feet bgs	630 cubic yards	940 tons
Area East of Building 171	29,510 feet	2 feet bgs	1,860 cubic yards	2,760 tons
Area Northwest of Building 171	2,500 square feet	2 feet bgs	190 cubic yards	280 tons
Total Surface Soil to be Excavated			**cubic yards**	**3,980 tons**

Physical features will not be removed during the excavation of surface soils. Physical features include, but are not limited to, buildings, concrete pads, railroad track, and paved roads. The Contracting Officer

will clearly identify the physical features not to be removed or disturbed prior to implementation of this IMWP. The volume estimates presented in this IMWP assume that these physical features remain in place.

Sediment that accumulate in the erosion and sediment control devices (see Section 4.0) prior to verification that all contaminated surface soils have been removed from the surface soil excavation will be disposed off-site along with the excavated contaminated surface soils. Following verification of contaminant removal, sediment that accumulated in the erosion and sediment control devices will be placed in the excavation as backfill material or spread across the disturbed ground surface of the surface soil excavation.

The implementation of subsurface soil excavation Option 1 will increase the total in place excavation volume from 2,680 cubic yards to 3,180 cubic yards. Under Option 2 the in place excavation volume will increase to 3,570 cubic yards. Northing and easting coordinates for the Option 1 and Option 2 excavations are provided in Table 3-2. Areas included in the Option 1 and 2 excavations are identified on Figures 3-2 and 3-3, respectively.

3.2.2 Drainage Channel Excavation

All sediments excavated from SWMU 13 drainage channel excavation areas that are identified as having PCB concentrations greater than the 1 mg/kg will be removed, characterized, and disposed at an approved off-site non-hazardous waste disposal facility. Excavated sediments will be placed in a small off-road dump truck with a sealed tail-gate to prevent the loss of sediment while the material is transported to a dewatering pad. The excavated sediments will gravity-drain within the dewatering pad prior to off-site transport and disposal. Drainage channel excavation will occur in the area north of Building 169E and an area southwest of Building 171. The extent of excavation in each drainage channel is defined by sediment sample analytical results that indicate PCB concentrations greater than 1 mg/kg and less than 1 mg/kg (see Figures 2-2 and 2-3).

The volume of soil and sediment to be removed from each of the drainage channels is based on the 2 foot thickness, the average width of the drainage channel (base width plus channel depth), and length of excavation in each channel. The extent of excavation in each drainage channel is identified on Figure 3-3. The calculations for the volume of excavated sediment to be removed from the drainage channels are provided in Appendix A. The average dimensions of excavation for each drainage channel are summarized below.

Drainage Channel	Soil Sediment Thickness	Avg. Channel Width	Channel Length	Volume of Sediment
Drainageway North of Building 169E	2 feet	7 feet	100 feet	50 cubic yards
Drainageway Southwest of Building 171	2 feet	15 feet	460 feet	520 cubic yards
Total Volume of Sediment to be Excavated from Drainageways				**570 cubic yards**

The implementation of subsurface soil excavation Option 1 does not increase the volume of soil and sediment to be removed from the drainage channels. However, the implementation of subsurface soil excavation Option 2 will increase the total in place excavation volume within the drainage channels from 570 cubic yards to 890 cubic yards. Areas included in the Option 2 excavation are identified on Figure 3-3.

Sediment that accumulates in erosion and sediment control devices (see Section 4.0) prior to verification that all contaminated sediment within the associated drainage channel has be removed will be disposed off-site along with the excavated contaminated sediments. Following verification of contaminant removal, sediments that have accumulated in the erosion and sediment control devices will be used to restore the drainage channel or spread across the disturbed ground surface of the drainage channel excavation.

Because 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 EMAC contractor will ensure that the temporary access trails are not contaminated with excavated sediment. In the event that the EMAC contractor spills excavated sediments on a temporary access trail, the EMAC contractor will be responsible for removing the contaminated sediments along with the impacted surface soils, verify that all contaminated materials have been removed and dispose of that material at its own expense.

3.2.3 Dewatering

Excavated sediments will be placed on the dewatering pad at a lift thickness no greater than 3 feet and allowed to drain by gravity. Following dewatering, the EMAC contractor will collect the required disposal characterization samples and mix the sediment lift to promote additional dewatering. It is estimated that following the second day of dewatering, the moisture content of the sediments will have been sufficiently

reduced and the sediment will not require the addition of an absorbent agent to be suitable for transportation and disposal.

Because of the tendency of PCBs to bond with sediment and not be soluble, water removed from sediment within the dewatering pad is not expected to contain PCB contamination. Therefore, the water will not require treatment and following filtration will be discharged to an approved stabilized drainage channel or storm drain. An initial characterization sample will be required to verify this assumption.

3.2.4 Sampling and Analysis

Verification samples will be collected from the excavation floors and sidewalls to determine the PCB concentrations for soils left in place following the implementation of this IMWP. Based on the comparison of verification sample results to the 1 and 25 mg/kg cleanup goals, the Navy may or may not direct the EMAC contractor to perform additional excavation and soil removal. In addition, verification samples will be collected from the surface soil below the decontamination pad, material storage area, dewatering pad, and temporary access tails. Verification sampling and analysis procedures are provided in Section 5.0.

3.2.5 Disposal

Excavated soils and sediments will be sampled and analyzed for waste disposal characterization using the methods required by the NSWC Crane-approved waste disposal facility. The soils and sediments will be sampled following the dewatering process, if dewatering is required. It is anticipated that all soils and sediments will be disposed at a non-hazardous NSWC Crane-approved waste disposal facility. The EMAC contractor is responsible for satisfying all disposal requirements. The following is a summary of the volumes (in-place) expected to be disposed off-site:

- Volume of Soils and Sediment 3,250 cubic yards
- Volume of Soil and Sediments (Option 1) 3,750 cubic yards
- Volume of Soil and Sediments (Option 2) 4,460 cubic yards

3.2.6 Backfilling

Excavation areas will be backfilled to pre-construction conditions. The backfill soil obtained from an off-site borrow source will have properties similar to the native SWMU 13 surface soils and sediments. These soils will be subject to analytical testing to assure that the material satisfies the following requirements:

- Total petroleum hydrocarbon, diesel range organics, EPA SW-845 8015M DRO - less than 1 part per million (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 excavation areas.

Excavation Backfill - Backfill soil for the surface soil excavation areas and the drainage channel excavations will be placed in 1-foot thick lifts and compacted by track-walking across the backfilled area with a 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

3.2.7 Restoration

Following backfilling, the entire limits of disturbance will be restored/stabilized using permanent stabilization practices. Restoration will consist of surface preparation, fertilizing, seeding, and mulching, where appropriate. Seeding procedures and procedures for associated activities (fertilizing and mulching) are presented in detail in Section 4.4.

3.2.8 Erosion and Sediment Control

Before excavation activities begin, erosion and sediment controls will be established to prevent impacts to surface water bodies downgradient of the disturbance areas, namely Boggs Creek (see Section 4.0). During excavation, backfilling, and restoration operations and until vegetation is established, 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).

3.2.9 Gravel Construction Entrance

Ingress to and egress from the disturbed areas will be controlled using a gravel construction entrance, which is described in detail in Section 4.0. The EMAC contractor is required to minimize the amount of disturbance to the wooded areas where excavation activities will be performed. This requirement may result in the use of several temporary access trails. If this is the case, the EMAC contractor will be required to have a gravel construction entrance at the end of each temporary access trail that connects to NSWC Crane facility roads.

3.2.10 Decontamination Pad

A temporary decontamination pad will be set up to clean equipment used to excavate and transport contaminated soils and sediments. The pad 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 NSWC 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 EMAC contractor.

3.2.11 Dewatering Pad

A temporary dewatering pad will be set up to dewater sediments excavated from the drainage channels. The dewatering pad will be sized to accommodate excavated sediments and loading equipment as necessary. The dewatering pad will be constructed in such a manner that it will retain all materials and allow the water that drains by gravity from the sediment to 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 NSWC Crane, the filtered water will be discharged to a NSWC Crane-approved stabilized drainage channel or storm drain. In addition, the dewatering pad will be constructed to allow for the loading of trucks that will be used to transport the excavated sediments to the NSWC Crane-approved off-site disposal facility. Additional dewatering pad requirements are discussed in Section 4.5.

3.2.12 Clearing

Clearing will be performed only within the limits of disturbance shown on the figures. Clearing activities will be kept to a minimum to minimize impacts to natural habitat. Cleared vegetation will be chipped and used for the temporary access trails. Standing trees will not be removed between April 15 and September 15 to comply with Indiana bat regulations, which are further addressed Section 3.5.2. Prior to starting clearing activities, the EMAC contractor will meet with the NWSC Crane Biologist to define the clearing activities and receive approval to proceed.

3.2.13 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 approved off-site borrow source. The temporary access trails will not be constructed of gravel and will be left in place following the completion of this IM.

3.3 SEQUENCE OF IMWP IMPLEMENTATION

The time required to perform the proposed IMWP activities at the site is estimated to be approximately 10 weeks. The generalized sequence of construction activities is presented below. This sequence of construction is subject to change based on the EMAC contractor's Work Plan.

1. Hold a pre-IMWP implementation meeting with the NSWC Crane Officer in Charge of Construction (OICC), Contracting Officer, EMAC contractor, and TtNUS representative, at a minimum.

2. Inspect SWMU 13 to verify existing site conditions and overhead and underground utility locations, and obtain all required permits as detailed in Table 3-1.

3. Install perimeter controls for the gravel construction entrance(s) and construct the gravel construction entrance(s). Install the remaining perimeter controls as indicated in the Erosion and Sediment Control Plan (Section 4.0).

4. Clear areas for support features including, but not limited to, the decontamination pad, dewatering pad, and materials storage area. Construct the support features.

5. Excavate sediment and soil material from the drainage channel excavation areas beginning at the uppermost reaches of required excavation and continuing excavation in the direction of drainage channel flow. Remove sediment from the drainage culverts and clean the culverts. TtNUS will collect verification samples as identified in Section 5.0 of this IMWP. Perform additional excavation if required by the OICC. Following verification of contaminated sediment removal, restore the drainage channels as required. Allow excavated sediments placed in the dewatering pad to dewater by gravity, mixing excavated sediments daily to promote additional dewatering. Following dewatering, collect disposal characterization samples from the dewatered sediment. Following disposal characterization, load and transport sediment to the NSWC Crane-approved off-site disposal facility. During excavation, maintain erosion and sediment controls.

6. Excavate surface soil from the surface soil excavation area. TtNUS will collect verification samples as identified in Section 5.0 of this IMWP. Perform additional excavation, if required by the OICC. Following verification of contaminated surface soil removal, restore the disturbed excavation area as required. Following excavation, collect disposal characterization samples from excavated soils. Following disposal characterization, load and transport surface soil to the NSWC Crane-approved off-site disposal facility.

7. Following transportation and disposal of all excavated surface soil and sediments, remove the dewatering pad, decontamination pad, and materials storage area, and collect verification samples from within the footprint of the support features and from the temporary access trails as described in Section 5.0. Following verification that the temporary access trails and the ground below the support features was not impacted by construction activities, regrade as necessary and establish permanent stabilization.

8. Following permanent stabilization of all disturbed areas, and with the approval of the OICC, remove all remaining perimeter controls and immediately stabilize all remaining disturbed areas.

3.4 STORMWATER CONTROLS

The SWMU 13 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, permanent stormwater detention capacity is not required and pre- and post-construction stormwater runoff calculations were not prepared.

The disturbed area will be greater than 1 acre; therefore, an IDEM Storm Water General Permit is required (stormwater permits are required for disturbances greater than 1 acre). However, because the IM activities do not include working in and around a water course, the IDEM 401 Permit and Department of Natural Resources (DNR) Construction in Floodway Permit are not required (refer to Table 3-1). IMWP implementation activities will require the use of best management practices for erosion and sediment control and stormwater pollution prevention as described in Section 4.0.

3.5 OTHER IMWP IMPLEMENTATION REQUIREMENTS

3.5.1 Utilities

The EMAC contractor is responsible for obtaining utility locations, and adequately protecting any utilities located in the active work areas before any earth-disturbing activities begin.

3.5.2 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 13 and will therefore be protected. Protected bird species that may use SWMU 13 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 NSWC 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, NSWC Crane received a letter from the United States Fish and Wildlife Service (USFWS) stating that, in their opinion, NSWC 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 NSWC Crane under the timber management program.

Because of the Indiana bat and its potential habitat, the cutting of trees at NSWC 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 NSWC 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 15 and September 15.

- Standing dead trees may not be removed between April 15 and September 15.

- Timber harvesting may occur between September 15 and April 15 without a case-by-case consultation provided the interim guidelines for silvicultural treatment issued to the NSWC Crane Natural Resources Office by the USFWS are followed.

- During emergency situations, necessary and prudent tree removal is allowed at all times without consultation.

- Tree removal from residential settings and industrial areas for safety reasons is allowed between September 15 and April 15 without further consultation. This includes tree trimming.

- Tree removal within 25 feet of railroad tracks and within 50 feet of explosive storage and explosive operating buildings is allowed between September 15 and April 15 without further consultation.

- 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 USFWS for informal consultation on a case-by-case basis.

3.5.3 Traffic Control Plan

Access to NSWC 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. NSWC Crane will be accessed by the EMAC contractor only through the Crane Gate. All vehicles will pass through the Crane Gate via the traffic routing plan shown on Figure 3-4. The EMAC contractor is not permitted to travel

within restricted areas of the 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, 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.

3.5.4 EMAC Contractor Requirements

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

The IWMP will be implemented by the EMAC contractor, NSWC Crane, and TtNUS, with work assignments summarized on Table 3-1.

3.6 IMPLEMENTATION

The EMAC contractor will coordinate all field work through the OICC.

IMWP implementation may be impacted by NSWC Crane activities and the facility's "Protective Measures". NSWC 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 EMAC contractor will be subject to any implemented "Protective Measures."

The Navy will provide a full-time oversight representative during IMWP implementation.

TABLE 3-1

WORK ASSIGNMENT RESPONSIBILITY CHART
INTERIM MEASURES WORK PLAN SWMU 13 – MINE FILL B
NSWC CRANE
CRANE, INDIANA

WORK ITEM	EMAC CONTRACTOR[1]	NSWC CRANE	TtNUS
Pre-IMWP Implementation Meeting	X	X	X
Interim Measure Implementation	X		
EMAC Contractor Work Plan [1]	X		
Site Specific Health and Safety Plan / Activity Hazard Analysis	X		
Project Quality Control Plan	X		
Environmental Conditions Report	[1]		X
Permits			
- Safety & Building Availability Permit (ESO 8020/11)	X		
- Digging Permit (NWSCC 11000/3)	X	[4]	
- 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 [5]	X		
Sampling and Analysis	X[6]		X[6]
Wastewater Disposal (Decontamination Water)	X	[7]	
CTO Closure Report	[8]		X

NOTES:

1. In addition to the listed items, the EMAC contractor is required to perform all IMWP implementation activities in accordance with the EMAC Basic Contract, NSWC Crane Contractor's Operations Manual (NSWC Crane, 2002), and supplemental specifications provided in Appendix D.
2. EMAC 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, and transportation and disposal plan.
3. EMAC contractor will participate in documenting environmental conditions before, during, and after implementation of the interim measures.
4. EMAC contractor completes the permit form. NSWC Crane performs the utility clearance.
5. EMAC contractor will furnish items identified in the Basic Contract, NSWC Crane Contractor's Operations Manual, and the Supplemental Specifications provided in Appendix B.
6. EMAC contractor will be responsible for the collection of characterization samples required for off-site disposal of excavated surface soils and sediments. TtNUS will collect verification samples from the excavation areas and from the surface soils below the support facilities following the removal of the support facilities. TtNUS will also collect verification samples from the temporary access trails. The EMAC contractor will need to coordinate and accommodate TtNUS sampling and field activities.
7. EMAC Contractor will be responsible for collection, storage, characterization, and discharge of wastewater to the NSWC Crane approved stabilized drainage channel, storm drain, or wastewater treatment plant.
8. EMAC Contractor will furnish items identified in the Supplemental Specifications provided in Appendix B.

CTO - Contract Task Order
EMAC - Environmental Multiple Award Contract
HERO - Hazards of Electromagnetic Radiation to Ordnance
IMWP - Interim Measures Work Plan
NSWC - Naval Surface Warfare Center
TtNUS - Tetra Tech NUS, Inc
X – Indicates responsible party

TABLE 3-2

NORTHING AND EASTING COORDINATES FOR SOIL EXCAVATION AREA VERTICES
INTERIM MEASURES WORK PLAN SWMU 13 – MINE FILL B
NSWC CRANE
CRANE, INDIANA

BASELINE EXCAVATION		
FIGURE 3-1 VERTEX	EASTING	NORTHING
C1	3,023,050.52	1,308,896.78
C2	3,023,056.01	1,308,897.16
C3	3,023,069.24	1,308,885.06
C4	3,023,076.62	1,308,888.08
C5	3,023,088.15	1,308,901.89
C6	3,023,101.24	1,308,901.82
C7	3,023,114.88	1,308,890.91
C8	3,023,115.95	1,308,884.87
C9	3,023,111.03	1,308,878.44
C10	3,023,108.15	1,308,885.81
C11	3,023,098.87	1,308,891.82
C12	3,023,093.23	1,308,891.82
C13	3,023,081.77	1,308,878.54
C14	3,023,073.04	1,308,874.17
C15	3,023,064.86	1,308,874.90
C16	3,023,052.31	1,308,883.45
C17	3,023,051.28	1,308,889.99
C18	3,023,148.59	1,308,845.59
C19	3,023,154.01	1,308,852.81
C20	3,023,173.78	1,308,865.51
C21	3,023,204.61	1,308,902.96
C22	3,023,255.26	1,308,950.98
C23	3,023,332.65	1,308,996.24
C24	3,023,337.55	1,308,996.64
C25	3,023,347.15	1,308,999.87
C26	3,023,376.29	1,308,988.80
C27	3,023,391.93	1,308,982.51
C28	3,023,412.07	1,308,977.87
C29	3,023,450.90	1,308,974.25
C30	3,023,462.53	1,308,957.59
C31	3,023,393.11	1,308,951.84
C32	3,023,380.43	1,308,972.19
C33	3,023,365.90	1,308,979.09
C34	3,023,355.06	1,308,984.74
C35	3,023,341.91	1,308,978.39
C36	3,023,302.20	1,308,959.89
C37	3,023,264.32	1,308,932.74
C38	3,023,231.04	1,308,910.19
C39	3,023,181.97	1,308,858.48
C40	3,023,159.60	1,308,844.66
C41	3,023,756.50	1,309,590.39
C42	3,023,749.14	1,309,583.64
C43	3,023,746.68	1,309,594.99
C44	3,023,744.23	1,309,598.06
C45	3,023,738.71	1,309,601.43
C46	3,023,685.04	1,309,600.21
C47	3,023,675.22	1,309,605.73

TABLE 3-2

NORTHING AND EASTING COORDINATES FOR SOIL EXCAVATION AREA VERTICES
INTERIM MEASURES WORK PLAN SWMU 13 – MINE FILL B
NSWC CRANE
CRANE, INDIANA

C48	3,023,677.15	1,309,608.63
C49	3,023,679.21	1,309,612.47
C50	3,023,687.18	1,309,607.57
C51	3,023,739.02	1,309,609.41
C52	3,023,743.31	1,309,608.18
C53	3,023,748.22	1,309,603.27
E1	3,023,961.79	1,309,562.09
E2	3,024,020.45	1,309,611.44
E3	3,024,033.42	1,309,622.31
E4	3,024,036.54	1,309,618.59
E5	3,024,061.54	1,309,637.22
E6	3,024,057.49	1,309,642.20
E7	3,024,076.73	1,309,658.26
E8	3,024,109.94	1,309,644.53
E9	3,024,091.61	1,309,603.41
E10	3,024,057.47	1,309,569.54
E11	3,024,001.27	1,309,514.33
E12	3,023,983.59	1,309,530.14
E13	3,023,495.14	1,308,957.45
E14	3,023,473.42	1,308,975.91
E15	3,023,446.54	1,309,009.71
E16	3,023,473.85	1,309,038.46
E17	3,023,483.12	1,309,070.94
E18	3,023,598.05	1,309,216.06
E19	3,023,640.37	1,309,199.57
E20	3,023,669.49	1,309,163.30
E21	3,023,667.95	1,309,133.56
E22	3,023,650.54	1,309,089.26
E23	3,023,563.33	1,309,004.34
E24	3,023,548.51	1,309,009.64
E25	3,023,545.56	1,309,027.92
E26	3,023,554.70	1,309,045.91
E27	3,023,580.36	1,309,069.80
E28	3,023,565.62	1,309,085.43
E29	3,023,551.75	1,309,074.93
E30	3,023,532.00	1,309,047.09
E31	3,023,521.68	1,309,022.91
E32	3,023,524.92	1,309,006.10
E33	3,023,525.22	1,308,987.52
E34	3,023,391.86	1,309,087.21
E35	3,023,391.54	1,309,026.61
E36	3,023,331.59	1,309,027.57
E37	3,023,331.26	1,309,087.85

OPTION 1 - ADDITIONAL EXCAVTION

FIGURE 3-2 VERTEX	EASTING	NORTHING
O1	3,023,551.75	1,309,074.93
O2	3,023,521.26	1,309,049.14
O3	3,023,489.84	1,309,074.19
O4	3,023,515.69	1,309,107.19

TABLE 3-2

NORTHING AND EASTING COORDINATES FOR SOIL EXCAVATION AREA VERTICES
INTERIM MEASURES WORK PLAN SWMU 13 – MINE FILL B
NSWC CRANE
CRANE, INDIANA

O5	3,024,003.47	1,309,554.95
O6	3,023,995.86	1,309,586.06
O7	3,024,040.04	1,309,588.93
O8	3,024,057.47	1,309,569.54
O9	3,024,035.21	1,309,547.69
O10	3,024,091.61	1,309,603.41
O11	3,024,052.34	1,309,613.19
O12	3,024,076.73	1,309,658.26
O13	3,024,109.94	1,309,644.53

OPTION 2 - ADDITIONAL EXCAVTION

FIGURE 3-3 VERTEX	EASTING	NORTHING
C18	3,023,148.59	1,308,845.59
C19	3,023,154.01	1,308,852.81
C20	3,023,173.78	1,308,865.51
C21	3,023,204.61	1,308,902.96
C22	3,023,255.26	1,308,950.98
C23	3,023,332.65	1,308,996.24
C24	3,023,337.55	1,308,996.64
C25	3,023,347.15	1,308,999.87
C26	3,023,376.29	1,308,988.80
C33	3,023,365.90	1,308,979.09
C34	3,023,355.06	1,308,984.74
C35	3,023,341.91	1,308,978.39
C36	3,023,302.20	1,308,959.89
C37	3,023,264.32	1,308,932.74
C38	3,023,231.04	1,308,910.19
C39	3,023,181.97	1,308,858.48
C40	3,023,159.60	1,308,844.66
O1	3,023,551.75	1,309,074.93
O2	3,023,521.26	1,309,049.14
O5	3,024,003.47	1,309,554.95
O6	3,023,995.86	1,309,586.06
O7	3,024,040.04	1,309,588.93
O8	3,024,057.47	1,309,569.54
O9	3,024,035.21	1,309,547.69
O10	3,024,091.61	1,309,603.41
O11	3,024,052.34	1,309,613.19
O12	3,024,076.73	1,309,658.26
O13	3,024,109.94	1,309,644.53
O14	3,023,582.62	1,309,100.74
O15	3,023,569.49	1,309,176.40
O16	3,023,489.84	1,309,074.19

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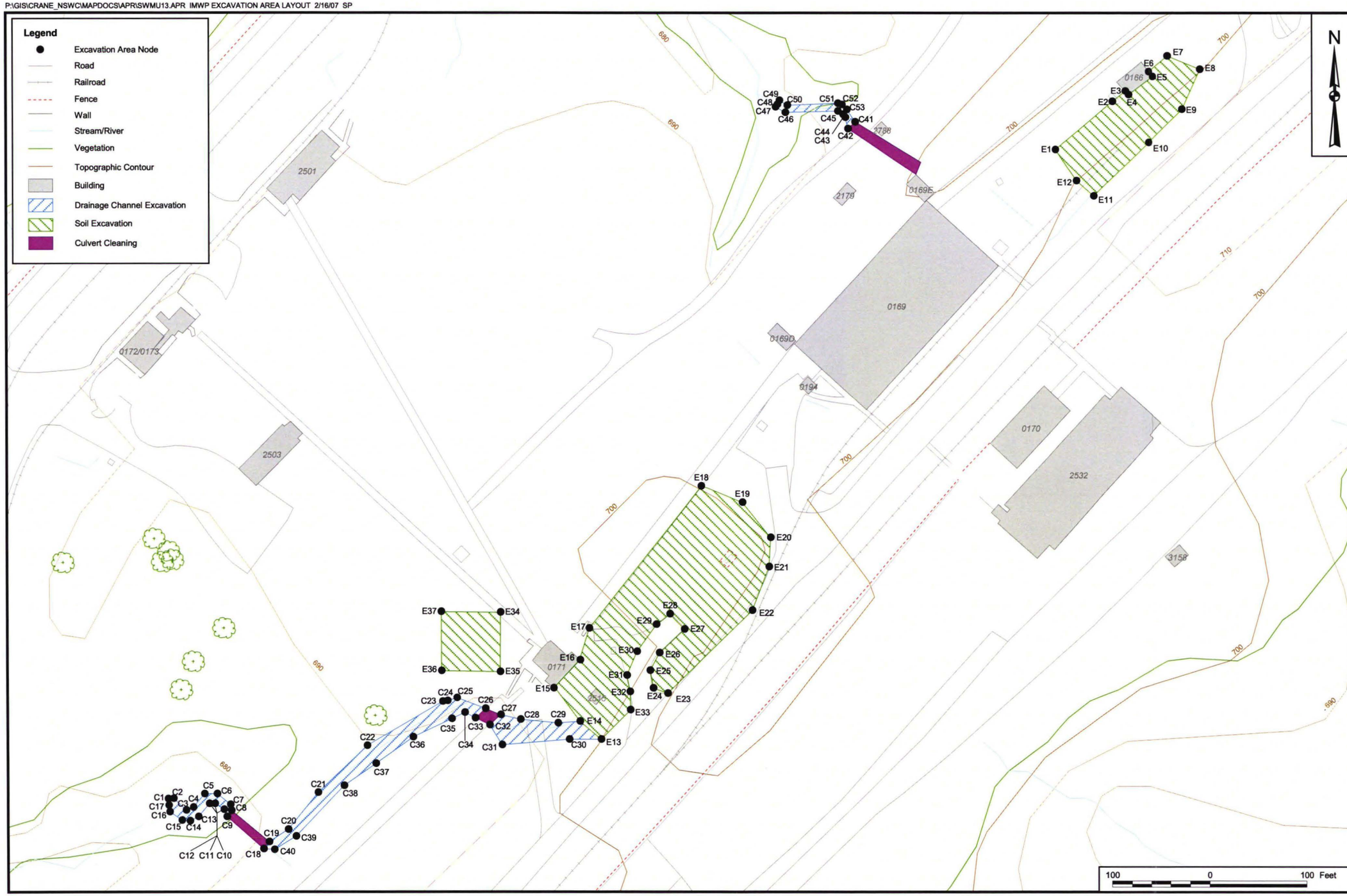

CONTRACT NO. 112G00352

APPROVED BY ___ DATE ___

APPROVED BY ___ DATE ___

DRAWING NO. FIGURE 3 - 1

REV 0

IMWP EXCAVATION AREAS
SWMU 13 - MINE FILL B
INTERIM MEASURES WORK PLAN
NSWC CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY S. PAXTON DATE 2/16/07

CHECKED BY T. SMITH DATE 2/16/07

COST/SCHED-AREA

SCALE AS NOTED

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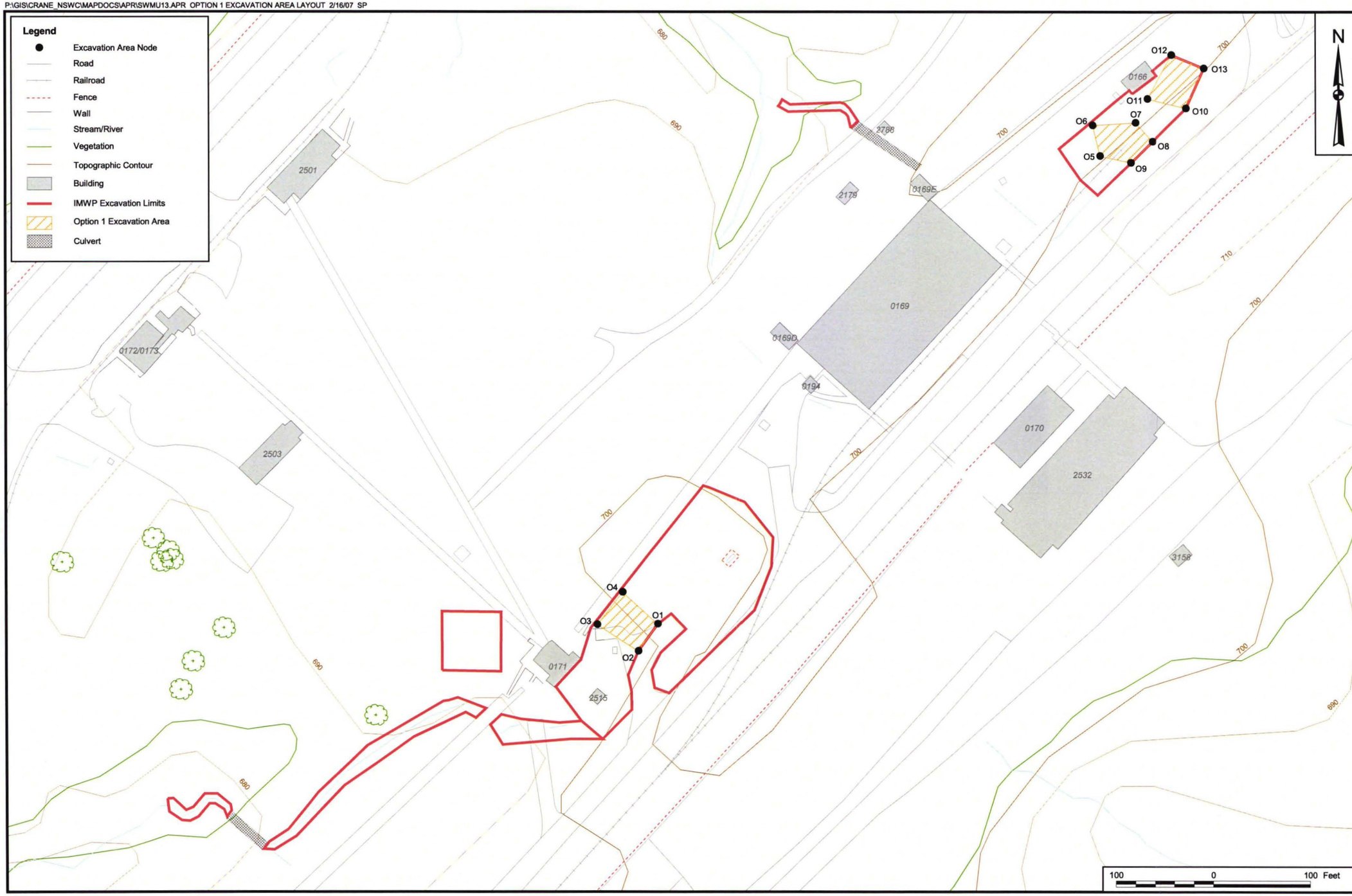


CONTRACT NO. 112G00352

APPROVED BY ___ DATE ___

APPROVED BY ___ DATE ___

DRAWING NO. FIGURE 3 - 2

REV 0

OPTION 1 - EXCAVATION AREA
SWMU 13 - MINE FILL B
INTERIM MEASURES WORK PLAN
NSWC CRANE
CRANE, INDIANA

NAVFAC

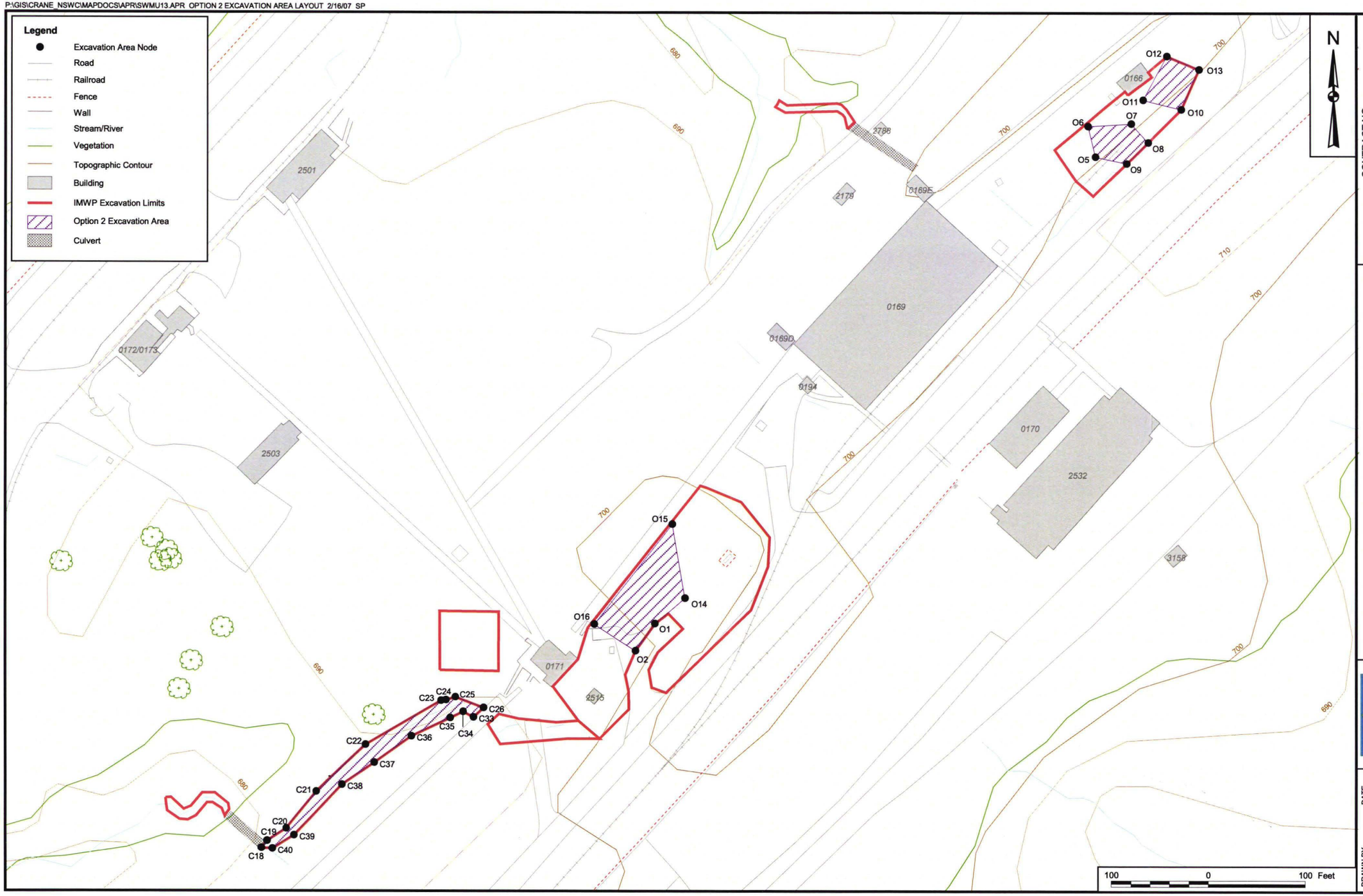
DRAWN BY S. PAXTON DATE 2/16/07

CHECKED BY T. SMITH DATE 2/16/07

COST/SCHED-AREA

SCALE AS NOTED

P:\GIS\CRANE_NSWC\MAPDOCS\APR\SWMU13.APR OPTION 2 EXCAVATION AREA LAYOUT 2/16/07 SP



CONTRACT NO. 112G00352

APPROVED BY ___ DATE ___

APPROVED BY ___ DATE ___

DRAWING NO. FIGURE 3 - 3

REV 0

OPTION 2 - EXCAVATION AREA
SWMU 13 - MINE FILL B
INTERIM MEASURES WORK PLAN
NSWC CRANE
CRANE, INDIANA

NAVFAC

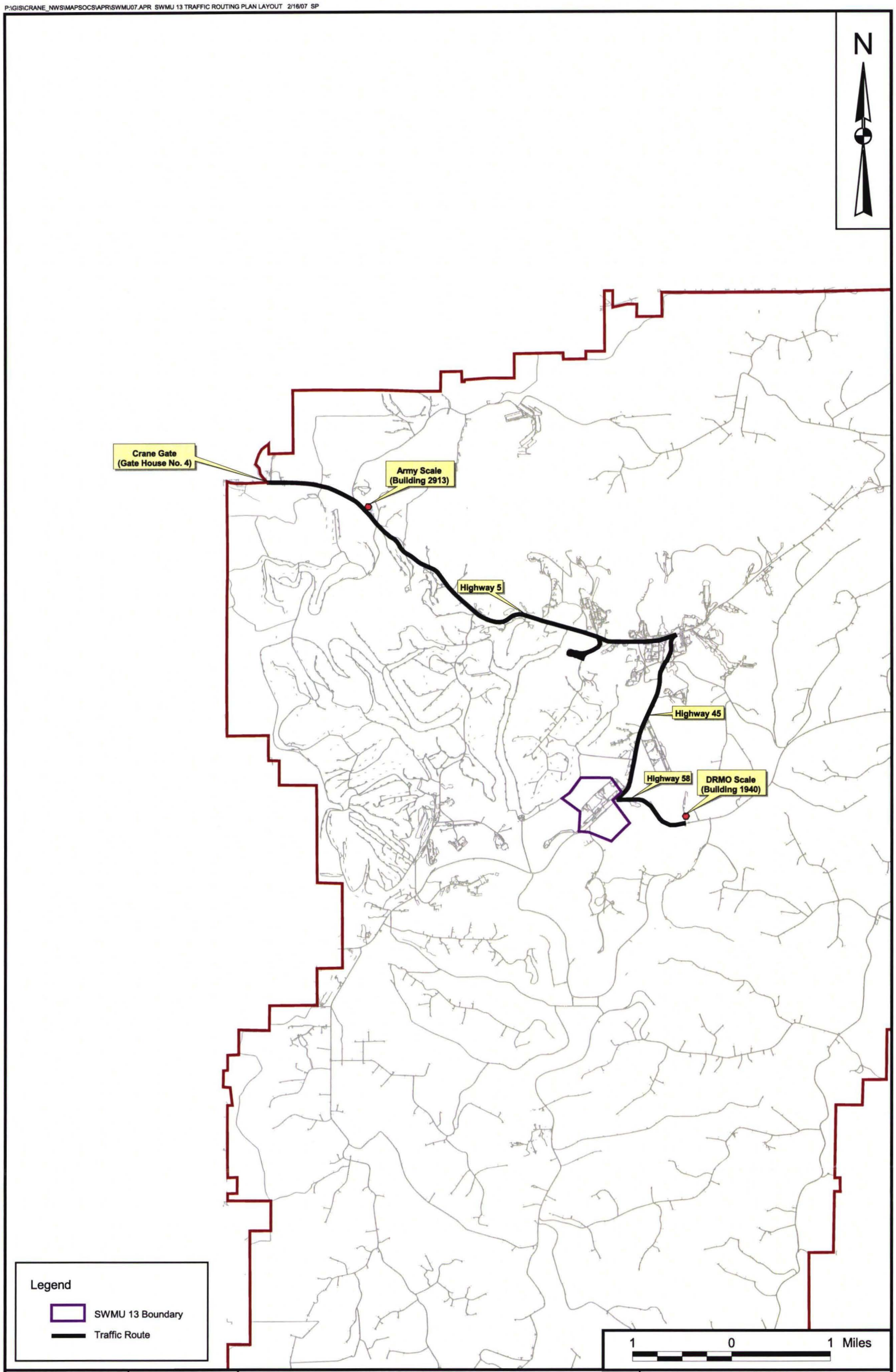
DRAWN BY S. PAXTON DATE 2/16/07

CHECKED BY T. SMITH DATE 2/16/07

COST/SCHED-AREA

SCALE AS NOTED

P:\GIS\CRANE_NWS\MAPSOCS\APR\SWMU07.APR SWMU 13 TRAFFIC ROUTING PLAN LAYOUT 2/16/07 SP



DRAWN BY S. PAXTON	DATE 2/16/07	TRAFFIC ROUTING PLAN SWMU 13 - MINE FILL B INTERIM MEASURES WORK PLAN NSWC CRANE CRANE, INDIANA	CONTRACT NUMBER 112G00352
CHECKED BY T. SMITH	DATE 2/16/07		APPROVED BY — DATE —
COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED	NAVFAC		DRAWING NO. FIGURE 3 - 4 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 at SWMU 13. 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 EMAC contractor's Work Plan. Selected erosion and sediment control devices must be identified in the Erosion and Sediment Control Plan submitted with the EMAC contractor Work Plan. After the Erosion and Sediment Control Plan is approved, no changes can be made without approval by the OICC and the IDEM.

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. Some of the SWMU 13 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. Surface drainage at MFB is routed through storm sewers and ditches located throughout the relatively flat portion of the ridgetop. The ditches lead to larger drainageways and gullies that flow down both sides of the ridge in northwest and southeast directions. Drainage from the northwestern side of the rail line flows to the northwest, down the side of the ridge, and into the unnamed tributary of Boggs Creek. Drainage gullies leading away from the southeastern side of the rail line flow southeast, down the side of the ridge, and eventually coalesce to form two unnamed tributaries of Turkey Creek, which lies approximately 5,000 feet (1 mile) southeast of MFB.

IMWP implementation activities for SWMU 13 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 one area located south of Building 169 and another area east of Building 171. Sediment will be excavated from drainage channels and streams that feed the unnamed tributary of Boggs Creek or the unnamed tributaries of Turkey Creek. 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 surface soil excavation area and the gravel construction entrance 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 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 - Utilized 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 - Utilized 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. Figure 4-1 presents the proposed excavation areas along with the limits of disturbance and the locations of the proposed erosion and sediment control devices. Figure 4-2 presents 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). Permanent seeding is discussed in Section 4.4. Dust control will be addressed in the EMAC contractor's Work Plan. All erosion and sediment controls will remain in place until all upstream areas have been stabilized. Completion of 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 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 EMAC 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 NSWC 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 appropriate soils, 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:

- Restored surface soil excavation areas
- Banks of the drainage channels
- Drainage channel beds where applicable
- Surface soils below support facilities

The procedures and requirements for permanent seeding activities are presented in Section 3.12 of the Handbook. The seed mixture recommended for use at SWMU 13 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 EMAC 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 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, characterized, and transported to the NSWC Crane wastewater treatment facility, if approved by NSWC

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 will be stored in a flammable storage cabinet located within the EMAC contractor's equipment trailer.

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 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 NSWC Crane Environmental Department.

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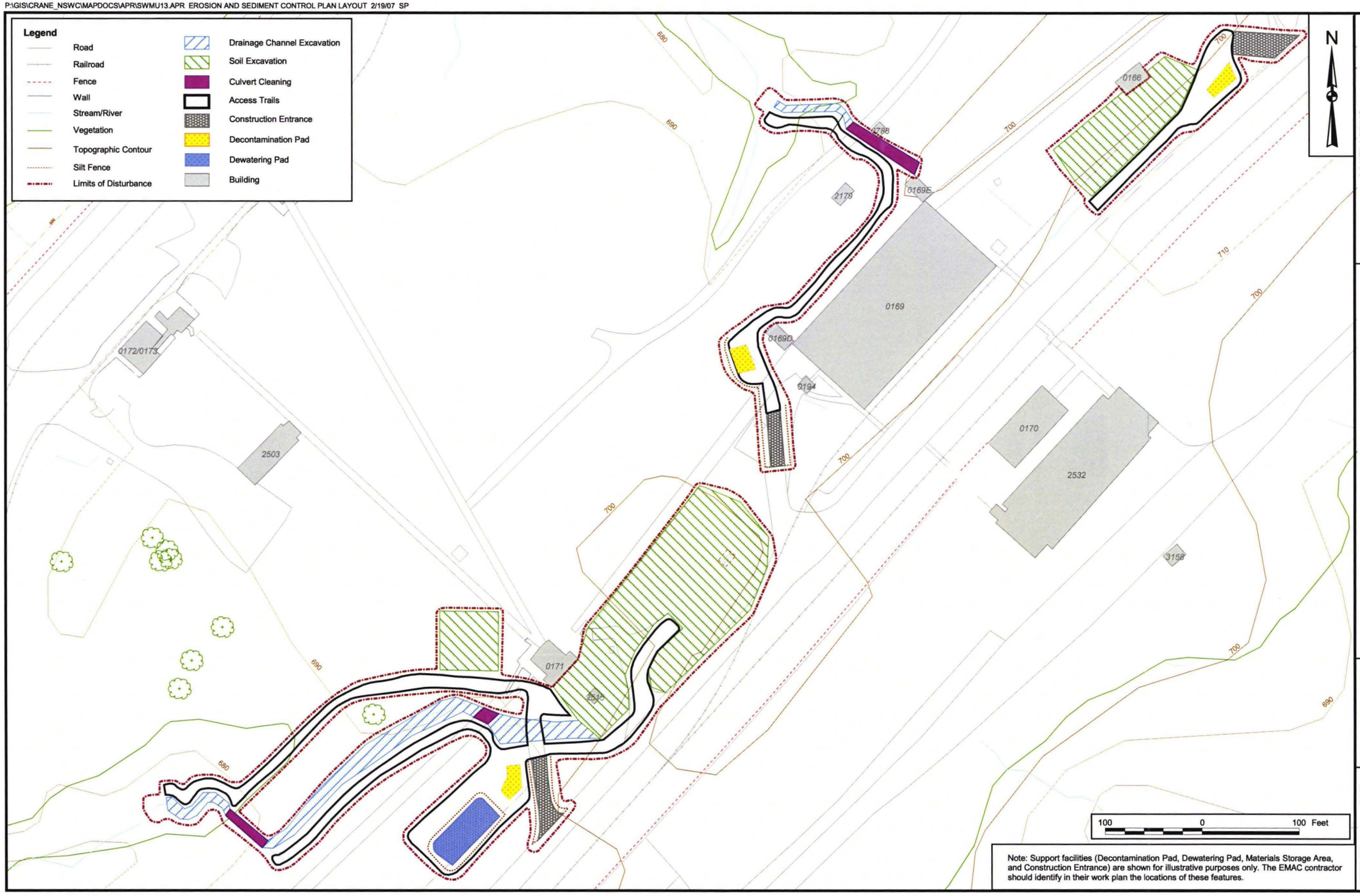

Note: Support facilities (Decontamination Pad, Dewatering Pad, Materials Storage Area, and Construction Entrance) are shown for illustrative purposes only. The EMAC contractor should identify in their work plan the locations of these features.

CONTRACT NO. 112G00352

APPROVED BY ___ DATE ___

APPROVED BY ___ DATE ___

DRAWING NO. FIGURE 4 - 1

REV 0

EROSION AND SEDIMENT CONTROL PLAN
SWMU 13 - MINE FILL B
INTERIM MEASURES WORK PLAN
NSWC CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY S. PAXTON DATE 2/19/07

CHECKED BY T. SMITH DATE 2/19/07

COST/SCHED-AREA

SCALE AS NOTED

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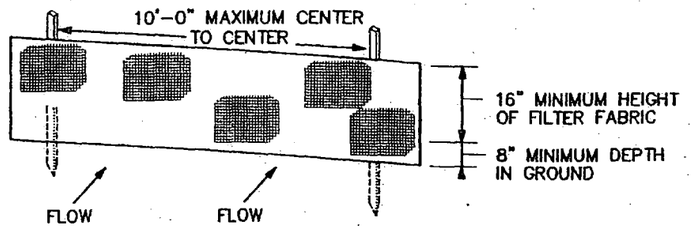
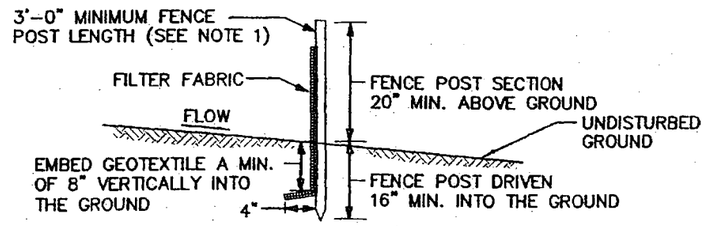
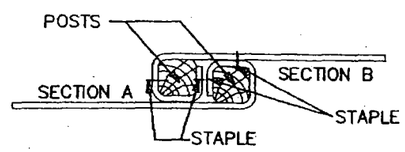


PERSPECTIVE VIEW



CROSS SECTION

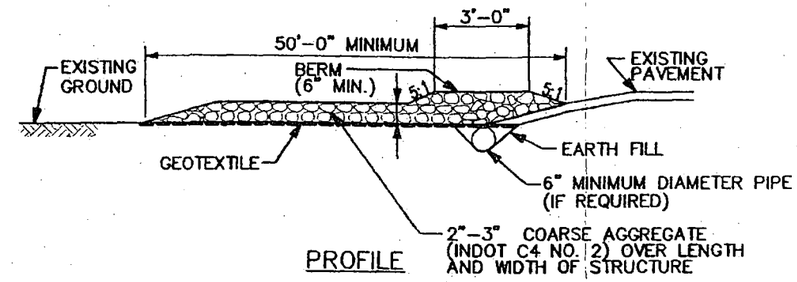


TOP VIEW – JOINING TWO ADJACENT SILT FENCE SECTIONS

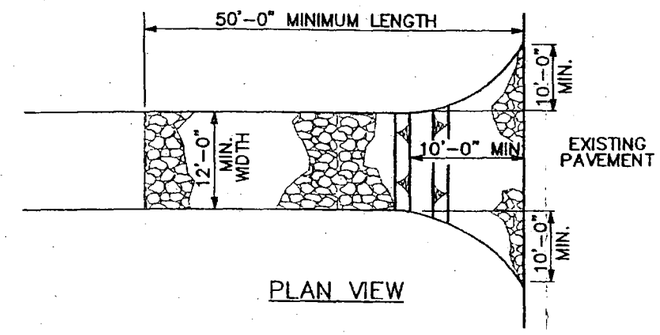
NOTES:

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



PROFILE

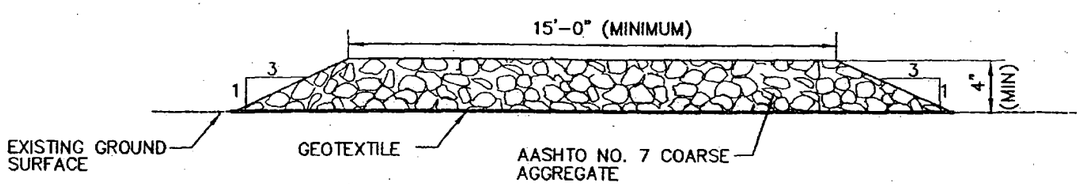


PLAN VIEW

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

NOT TO SCALE

SWMU 13 - MINE FILL B

DRAWN BY MF DATE 5/16/06	NAVFAC	EROSION AND SEDIMENT CONTROL DEVICES ~~SWMU 17 – PCB CAPACITOR BURIAL/POLE YARD~~ INTERIM MEASURES WORK PLAN NSWC CRANE CRANE, INDIANA	CONTRACT NO. 0352
CHECKED BY DATE			OWNER NO. 0020
REVISED BY DATE			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 4-2A REV. 0

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

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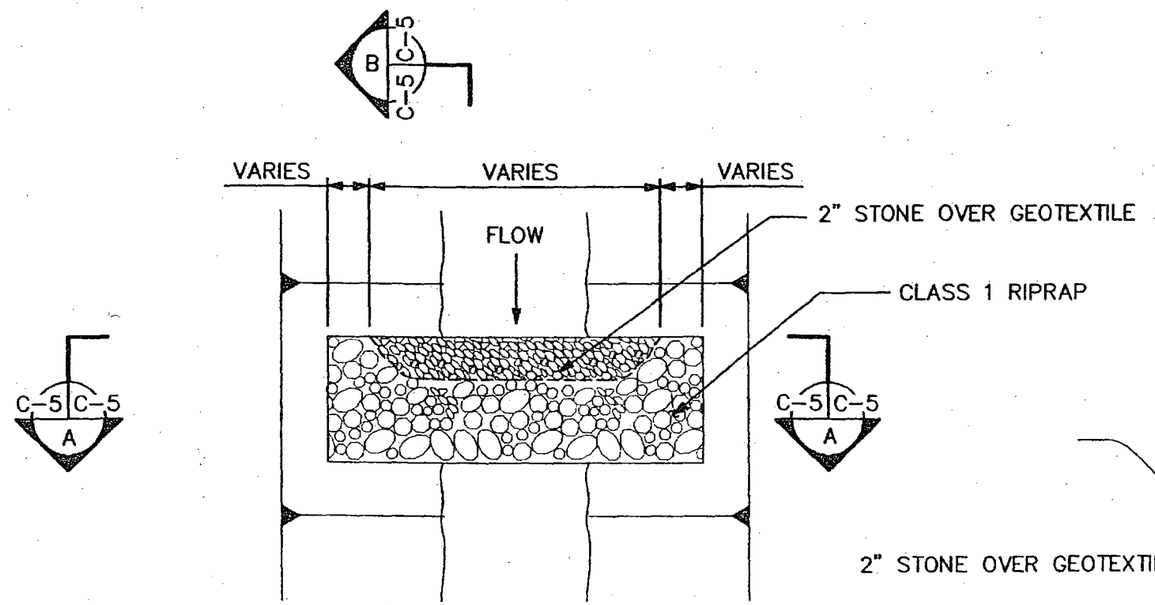
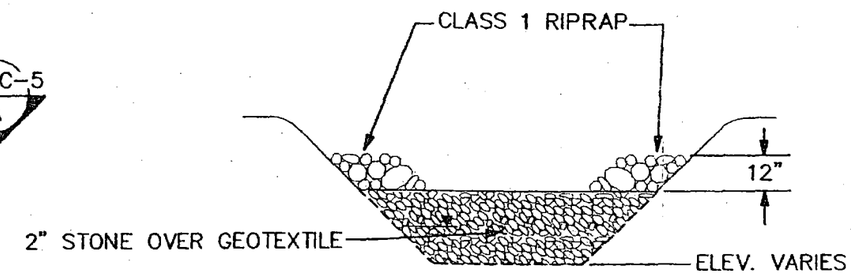
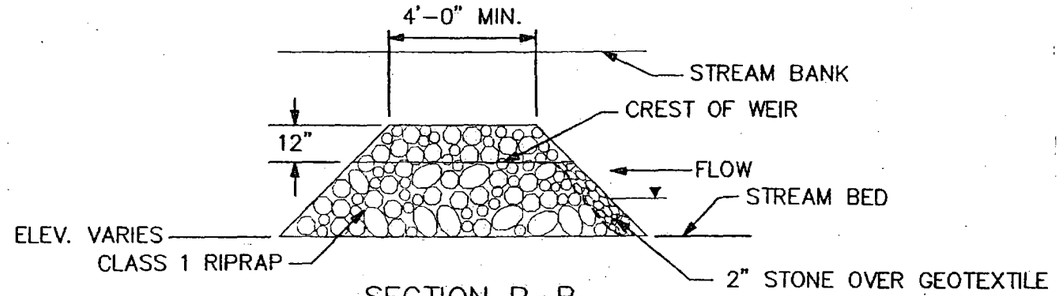


PLAN VIEW



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

SWMU 13 - MINE FILL B

DRAWN BY MF	DATE 5/16/06	NAVFAC	EROSION AND SEDIMENT CONTROL DEVICES (SHEET 2 OF 2) ~~SWMU 17 – PCB CAPACITOR BURIAL/POLE YARD~~ INTERIM MEASURES WORK PLAN NSWC CRANE CRANE, INDIANA	CONTRACT NO. 0352
CHECKED BY	DATE			OWNER NO. 0020
REVISED BY	DATE			APPROVED BY / DATE
SCALE AS NOTED				DRAWING NO. FIGURE 4-2B / REV. 0

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

5.0 VERIFICATION SAMPLING PLAN

5.1 PURPOSE

The purpose of this section is to present the two types of verification samples to be collected during and following the implementation of the IMWP. The two types of verification samples include the samples collected from within the excavation areas to verify the removal of soils and sediments with PCB concentrations in excess of cleanup goals, and the samples collected from surface soils located beneath support facilities (decontamination pad, soil dewatering pad, and material storage area) and the surfaces of the temporary access trails after IMWP implementation is complete to ensure that IMWP implementation did not contaminate support facility areas. This section also presents criteria and procedures used to evaluate verification sample data to determine the acceptability of residual soil contamination, if present. Verification samples will be collected by TtNUS. The sampling procedures, sample locations, and fixed-base laboratory analytical methods will be addressed in the Quality Assurance Project Plan (QAPP) Addendum (to be provided under separate cover).

5.2 VERFICATION SAMPLING OF EXCAVATION AREAS

The IMWP implementation includes the excavation and off-site disposal of surface soils and sediments containing PCB concentrations greater than 1 mg/kg (25 mg/kg for subsurface excavation Option 1 and 1 mg/kg for subsurface excavation Option 2). These excavation areas are shown on Figures 3-1, 3-2, and 3-3. Based on the excavation area, verification samples will be collected from the excavation floors and sidewalls to determine if all the surface soil and sediment with PCB concentrations greater than the cleanup goals have been removed. In general, excavation floor samples will be collected at a rate of one composite sample for every 10,000 square feet of exposed surface area and excavation side wall samples will be collected at a rate of one composite sample for every 100 linear feet of exposed side wall. The following paragraphs describe the verification sampling procedures to be performed for each of the three excavation areas.

- Soil Excavation Areas - Verification samples will be collected from the excavation side walls and excavation floor in the soil excavation areas. One excavation floor sample will be collected and four excavation side wall samples will be collected (one from each of the four excavation side walls) from the Building 166 excavation. Due to the planned excavation areas near Building 171, 4 excavation floor samples and 12 excavation side wall samples will be collected. The results of these verification samples will be evaluated to determine if PCB contamination remains within the excavated floor and/or sidewalls at concentrations greater than 1 mg/kg. In the event that a verification sample result

from an excavation side wall exceeds 1 mg/kg, the excavation will be extended a minimum of 2 feet in the appropriate direction(s). Following additional excavation, additional verification samples will be collected by TtNUS. Excavation expansion may continue until all verification sample results indicate PCB concentrations less than 1 mg/kg. Because the initial excavation will be 2 feet in depth, the results of the verification samples collected from the excavation floor will be compared to the subsurface criteria (25 mg/kg), because the area will be backfilled with a minimum of 2 feet of soil material. If PCB concentrations are detected in the excavation floor verification samples at concentrations greater than 25 mg/kg, the Navy may require additional excavation to a greater depth. In the event subsurface excavation Option 2 is performed, all verification sample results will be compared to 1 mg/kg.

- Drainage Channel Excavation Areas - Verification samples will be collected from the excavation side walls and excavation floor in the drainage channel excavation areas. Due to the linear nature of these excavations, one excavation floor sample will be collected for every 1,000 square feet of excavation area and one side wall sample will be collected for every 100 feet of exposed drainage channel banks (i.e., if 200 feet of drainage channel is excavated four verification samples will be collected from the exposed drainage channel banks, two from the left bank and two from the right bank). At a minimum, three verification samples will be collected from each length of drainage channel excavated (one from the excavation floor and two from the drainage channel banks). Based on the initial length of drainage channel requiring sediment removal (420 linear feet), 14 verification samples (4 floor samples and 10 side wall samples) will be collected from the drainage channels. The results of these verification samples will be evaluated to determine if PCB contamination remains on the exposed surface soils at concentrations greater than 1 mg/kg. In the event a verification sample result exceeds 1 mg/kg (from floor samples or side wall samples), the excavation will be extended a minimum of 6 inches in the appropriate direction(s). Following additional excavation, additional verification samples will be collected by TtNUS. Excavation expansion may continue until verification samples indicate PCB concentrations are less than 1 mg/kg. Based on the results of the RFI and 2006 sediment sampling events, verification sample results should not increase the length of drainage channel excavation areas.

To minimize EMAC contractor downtime associated with waiting for analytical results from fixed-base laboratory, collected samples will be packaged and shipped to the fixed-base laboratory for analysis with a 1-day turn-around time. Therefore, verification sampling results should be available 24 hours following sample pick-up if a local fixed-base laboratory is used, or within 48 hours of sample shipment if samples need to be express-shipped to a remote fixed-base laboratory. The reported results received by TtNUS will be forwarded to the Navy and EMAC contractor as they are received from the laboratory.

Sampling, sample preparation, sample shipment, and fixed-base laboratory sample analysis will be presented in the QAPP Addendum that will be available prior to implementation of the IMWP. Initial analytical results from the fixed-base laboratory will be subjected to a cursory data validation process. Sample results will not be considered final until the full validation process is complete.

5.3 VERFICATION SAMPLING OF SUPPORT FACILITIES

The frequency of verification sampling for the soils located beneath the support facilities after IMWP implementation has been completed is the same as that for excavation samples (one verification sample for every 1,000 square feet of area disturbed). Due to the nature of the support facilities, side wall samples are not included in the support facility verification sampling program. Based on the anticipated areas of the support facilities, it is estimated that three verification samples will be collected from the support facility areas (decontamination pad, dewatering pad, and materials storage area). In addition, verification samples will be collected from the temporary access trails. These samples will be collected at a rate of one composite sample for every 200 linear feet of temporary access trail (minimum of one sample if sections of temporary access trail are less than 200 feet in length). Based on the proposed locations of temporary access trails, 18 verification samples will be collected from the temporary access trails. The results of these verification samples will be evaluated to determine if PCB contamination was introduced to the temporary access trails or the surface soils below the foot print of the support facilities at concentrations greater than 1 mg/kg. In the event that a verification sample result exceeds 1 mg/kg, 6 inches of soil will be removed from the associated temporary access road section or support facility footprint (support facility footprint equals the actual footprint plus an additional 10 feet in all directions). Following additional excavation, additional verification samples will be collected by TtNUS. Excavation expansion may continue until all verification samples indicate PCB concentrations are less than 1 mg/kg. All excavation of surface soil beneath the support facilities and the associated handling and disposal of that material will be done at EMAC contractor's expense.

5.4 SAMPLING LOCATIONS

The numbers and locations of verification samples for the excavation areas and support facilities will be identified in a QAPP Addendum that will be provided under separate cover.

REFERENCES

Halliburton NUS, 1992. RCRA Facility Investigation Phase I Environmental Monitoring Reports, Solid Waste Management Units 19/00, 08/17, 12/14, 13/14, Naval Surface Warfare Center, Crane Division, Crane, Indiana, August 1992.

IDEM (Indiana Department of Environmental Management), 1992. Indiana Handbook for Erosion Control in Developing Areas, Department of Natural Resources.

NSWC (Naval Surface Warfare Center) Crane, 2002. Contractor's Operations Manual, Naval Surface Warfare Center Crane Division, http://www.crane.navy.mil/contacts/ContractorsOperationsManual.pdf. March.

Tetra Tech NUS, Inc. (TtNUS), 2005. Resource Conservation and Recovery Act Facility Investigation Report for Mine Fill B (SWMU 13), Naval Surface Warfare Center Crane Division, Crane, Indiana. July.

APPENDIX A

EXCAVATION VOLUME CALCULATIONS

CLIENT: NAVAL SURFACE WARFARE CENTER, CRANE		JOB NUMBER: 112G00352 – 14.215A	
SUBJECT: SWMU 13 – MINE FILL B			
BASED ON: RFI Soil / Sediment Sample Logs		DRAWING NO.: IMWP Figs 3-1, 3-2, and 3-3	
BY: T. Smith DATE: 02/15/07	BY: V. Plachy DATE: 02/15/07	APPROVED BY:	DATE:

OBJECTIVE:

Estimate the volume and weight of PCB-contaminated surface soil and sediment to be excavated at SWMU 13 to meet the 1 mg/kg cleanup goal and Optional cleanup goals.

APPROACH:

1. Surface Soil:

- Area southwest of Building 166: The data from the SWMU 13 RFI Report was plotted on Figure 2-3. The area to be excavated (>1 mg/kg PCB) was outlined on the figure. This area was then copied on to Figure 3-1 and nodes were added to assign coordinates for the excavation areas. The area was measured off of Figure 3-1 and the volume was calculated assuming an excavation depth of approximately 2 feet. A soil density of 110 pounds per cubic foot (lb/ft^3) [1.485 tons per cubic yards (tons/cy)] was assumed for the weight calculation.

- Area east of Building 171: The data from the SWMU 13 RFI Report was plotted on Figure 2-2. The area to be excavated [>1 milligrams per kilogram (mg/kg) polychlorinated biphenol (PCB)] was outlined on the figure. This area was then copied on to Figure 3-1 and nodes were added to assign coordinates for the excavation areas. The area was measured off of Figure 3-1 and the volume was calculated assuming an excavation depth of approximately 2 feet. A soil density of 110 lb/ft^3 (1.485 tons/cy) was assumed for the weight calculation.

- Area northwest of Building 171: The data from the SWMU 13 RFI Report was plotted on Figure 2-2. The area to be excavated (>1 mg/kg PCB) was outlined on the figure. This area was then copied on to Figure 3-1 and nodes were added to assign coordinates for the excavation areas. The area was measured off of Figure 3-1 and the volume was calculated assuming an excavation depth of approximately 2 feet. A soil density of 110 lb/ft^3 (1.485 tons/cy) was assumed for the weight calculation.

2. Sediments:

- Data obtained from sampling in 2006, was used to determine which sediments will need to be excavated (>1 mg/kg PCB) by plotting the data on a map of the SWMU (Figure 2-2 and 2-3). This area was then copied on to Figure 3-1 and nodes were added to assign coordinates for the excavation areas. The area was measured off of Figure 3-1 and the volume was calculated assuming an excavation depth of approximately 2 feet. A soil density of 110 lb/ft^3 (1.485 tons/cy) was assumed for the weight calculation.

3. Excavation Options:

Following the calculation of surface excavation [0 to 2 feet below ground surface (bgs)], optional excavation volumes were calculated for the removal of PCBs at concentrations >25 mg/kg (Option 1) and >1 mg/kg (Option 2) within the subsurface soil (2 to 4 feet bgs). The areas of additional excavation under Option 1 are identified on Figure 3-2. The areas of additional excavation under Option 2 are identified on Figure 3-3. The optional excavation areas were measured off of Figures 3-1 and 3-3 and the volume was calculated assuming an excavation depth of approximately 2 feet. A soil density of 110 lb/ft^3 (1.485 tons/cy) was assumed for the weight calculation.

CLIENT: NAVAL SURFACE WARFARE CENTER, CRANE			JOB NUMBER: 112G00352 – 14.215A
SUBJECT: SWMU 13 – MINE FILL B			
BASED ON: RFI Soil / Sediment Sample Logs			DRAWING NO.: IMWP Figs 3-1, 3-2, and 3-3
BY: T. Smith DATE: 02/15/07	BY: V. Plachy DATE: 02/15/07		APPROVED BY: DATE:

REFERENCES:

TtNUS (Tetra Tech NUS, Inc.), 2005. *Resource Conservation and Recovery Act Facility Investigation Report for Mine Fill B (SWMU 13), Naval Surface Warfare Center Crane Division, Crane, Indiana.* July.

TtNUS, 2006. *Additional Soil and Sediment Investigation at Mine Fill B (SWMU 13), Naval Surface Warfare Center Crane Division, Crane, Indiana.* June. ***(To be provided)***

CALCULATIONS:

Volumes and weights are rounded to the nearest 10.

1. Surface Soil (area southwest of B166)

Estimate Base Case contaminated soil volume and weight:

Surface Area (southwest of Building 166) = 8,552 square feet

Volume = (surface area, ft^2) x (depth of excavation, ft) x (yd^3 / 27 ft^3)

= (8,552 ft^2) (2 ft) (yd^3 / 27 ft^3) ≅ 630 yd^3

Weight = (630 yd^3) (1.485 ton/yd^3) ≅ 940 ton

2. Surface Soil (area east and area northwest of B171):

Estimate Base Case contaminated soil volume and weight:

Surface Area (east of Building 171) = 25,125 square feet

Volume = (surface area, ft^2) x (depth of excavation, ft) x (yd^3 / 27 ft^3)

= (25,125 ft^2) (2 ft) (yd^3 / 27 ft^3) ≅ 1,860 yd^3

Weight = (1,820 yd^3) (1.485 ton/yd^3) ≅ 2,760 ton

Surface Area (northwest of Building 171) ≅ 2,500 square feet

Volume = (surface area, ft^2) x (depth of excavation, ft) x (yd^3 / 27 ft^3)

= (2,500 ft^2) (2 ft) (yd^3 / 27 ft^3) ≅ 190 yd^3

Weight = (190 yd^3) (1.485 ton/yd^3) ≅ 280 ton

CLIENT: **NAVAL SURFACE WARFARE CENTER, CRANE**		JOB NUMBER: **112G00352 – 14.215A**
SUBJECT: **SWMU 13 – MINE FILL B**		
BASED ON: RFI Soil / Sediment Sample Logs		DRAWING NO.: IMWP Figs 3-1, 3-2, and 3-3
BY: T. Smith DATE: 02/15/07	BY: V. Plachy DATE: 02/15/07	APPROVED BY: DATE:

Estimate Base Case contaminated sediment volume and weight:

Channel Area (northwest of Building 166) = 653 square feet

Volume = (surface area, ft^2) x (depth of excavation, ft) x (yd^3 / 27 ft^3)

= (653 ft^2) (2 ft) (yd^3 / 27 ft^3) ≅ 50 yd^3

Weight = (50 yd^3) (1.485 ton/yd^3) ≅ 70 ton

Channel Area (west of Building 171) = 7,022 square feet

Volume = (surface area, ft^2) x (depth of excavation, ft) x (yd^3 / 27 ft^3)

= (7,022 ft^2) (2 ft) (yd^3 / 27 ft^3) ≅ 520 yd^3

Weight = (520 yd^3) (1.485 ton/yd^3) ≅ 770 ton

3. Subsurface Excavation (Options 1 and 2):

Estimate contaminated subsurface soil volume and weight for Options 1 and 2:

Surface Area (Additional excavation required for Option 1) = 6,750 square feet

Volume = (surface area, ft^2) x (depth of excavation, ft) x (yd^3 / 27 ft^3)

= (6,750 ft^2) (2 ft) (yd^3 / 27 ft^3) ≅ 500 yd^3

Weight = (500 yd^3) (1.485 ton/yd^3) ≅ 740 ton

Surface Area (Additional excavation required for Option 2) = 16,335 square feet

Volume = (surface area, ft^2) x (depth of excavation, ft) x (yd^3 / 27 ft^3)

= (16,335 ft^2) (2 ft) (yd^3 / 27 ft^3) ≅ 1,210 yd^3

Weight = (1,210 yd^3) (1.485 ton/yd^3) ≅ 1,800 ton

CLIENT: NAVAL SURFACE WARFARE CENTER, CRANE		JOB NUMBER: 112G00352 – 14.215A	
SUBJECT: SWMU 13 – MINE FILL B			
BASED ON: RFI Soil / Sediment Sample Logs		DRAWING NO.: IMWP Figs 3-1, 3-2, and 3-3	
BY: T. Smith DATE: 02/15/07	BY: V. Plachy DATE: 02/15/07	APPROVED BY:	DATE:

RESULTS SUMMARY

Base Case Excavation

Area	Volume (cubic yards)	Weight (tons)
Area South West of Building 166	630	940
Area East of Building 171	1,860	2,760
Area Northwest of Building 171	190	280
Drainage Channel Northwest of Building 166	50	70
Drainage Channel West of Building 171	520	770
Total Excavation	**3,250**	**4,820**

Option 1 Excavation

Area	Volume (cubic yards)	Weight (tons)
Additional Excavation for Option 1	500	740
Total Excavation Base Case plus Option 1	**3,750**	**5,560**

Option 2 Excavation

Area	Volume (cubic yards)	Weight (tons)
Additional Excavation for Option 2	1,210	1,800
Total Excavation Base Case plus Option 2	**4,460**	**6,620**

APPENDIX B

SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SPECIFICATIONS
INTERIM MEASURES WORK PLAN
SWMU 13 – MINE FILL B
NSWC CRANE
CRANE, INDIANA

EMAC Contractor Requirements

The Environmental Multiple Award Contract (EMAC) contractor will be responsible for performing the following work:

1. Attend pre-IMWP implementation conference.
2. Submit documentation in accordance with the EMAC 'Basic Contract' 30 days prior to beginning work to allow the Navy sufficient time to review and comment. The EMAC 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 surface 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. 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 NSWC Crane Contractor's Operations Manual and the Basic Contract, the EMAC 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 NSWC 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 EMAC 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 NSWC Crane Contractor's Operation Manual and in the Basic Contract, the EMAC contractor shall perform the activities in accordance with the supplemental specifications provided below.

General Requirements

The EMAC 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 EMAC 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 EMAC 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 EMAC contractor shall immediately notify the OICC if a Notice of Violation, Notice of Deficiency, or similar regulatory notice is issued to the EMAC contractor.

The EMAC contractor shall be responsible for all damages to persons or property resulting from EMAC 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 EMAC 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 EMAC contractor or one if its subcontractors in the performance of work under this contract, the EMAC 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 EMAC contractor's Work Plan and before commencement of work the EMAC 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 EMAC contractor's submittals comply with the contract requirements.

The EMAC contractor shall be required to commence work on the approved EMAC 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.

NSWC Crane will remain in operation during the entire construction period. The EMAC 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 EMAC 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 EMAC 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

EMAC 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 EMAC contractor's equipment shall be clearly marked for identification.

The EMAC contractor shall indicate on the construction schedule any activity that could potentially interrupt Facility operations. The EMAC 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.

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

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

The EMAC 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 EMAC 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 NSWC Crane utility grid will be made by NSWC Crane electric shop.

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

Water – A reasonable quantity of water is available at [Building ( )] at no charge. Provide backflow preventor devices on connections to potable water supplies. Under no circumstances will taps to NSWC 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 NSWC Crane sanitary sewer system, subject to approval of the NSWC Crane based on characterization samples of water to be discharged.

Site Personnel Qualifications

Site Superintendent - The EMAC 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 EMAC 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 EMAC 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 EMAC contractor shall designate a Site Health and Safety Specialist (SHSS) who shall assist and represent the EMAC 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 affect 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 EMAC 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 EMAC 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 EMAC contractor shall discuss the details of the work identified in the approved EMAC 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 EMAC contractor at the conference. The EMAC 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 EMAC 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 EMAC contractor contacts, whose signatures indicate plan acceptance/approval.

The EMAC 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 EMAC 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 EMAC 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 EMAC 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 EMAC 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 EMAC 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.

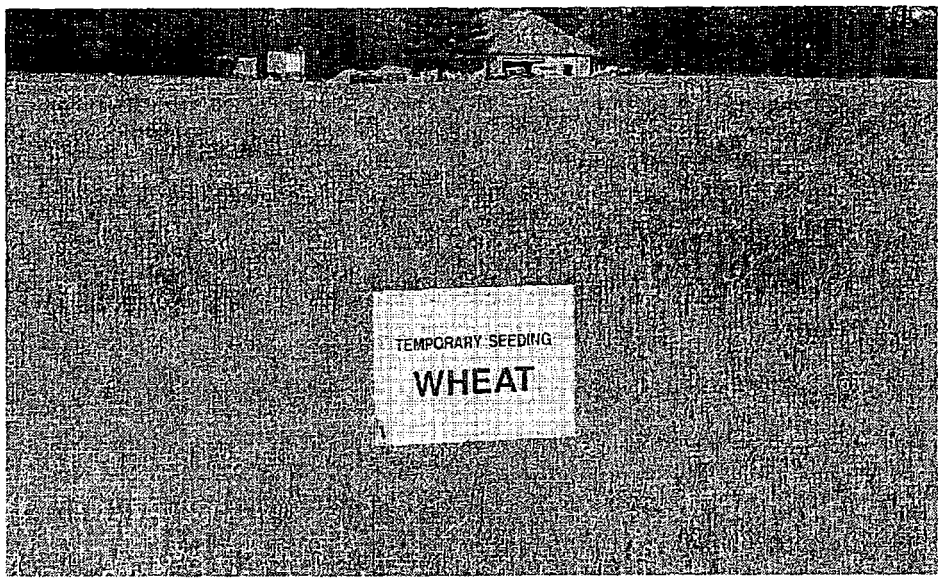


Exhibit 3.11-A. A temporary seeding of wheat to reduce erosion on a future home lot.

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.

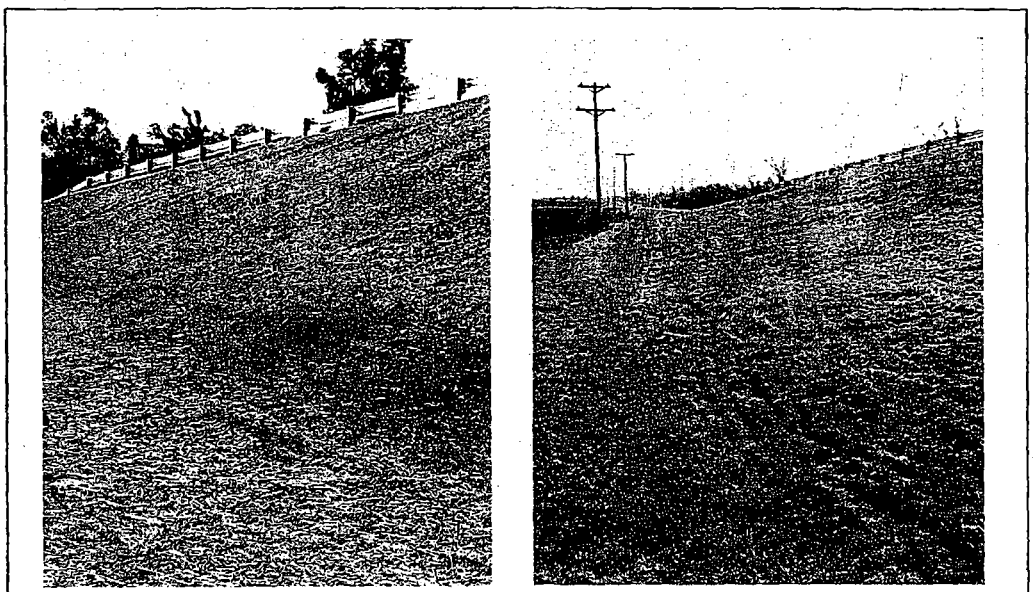


Exhibit 3.12-A. A road right-of-way (left) newly permanent seeded and mulched and (right) 6 mo. later.

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.)

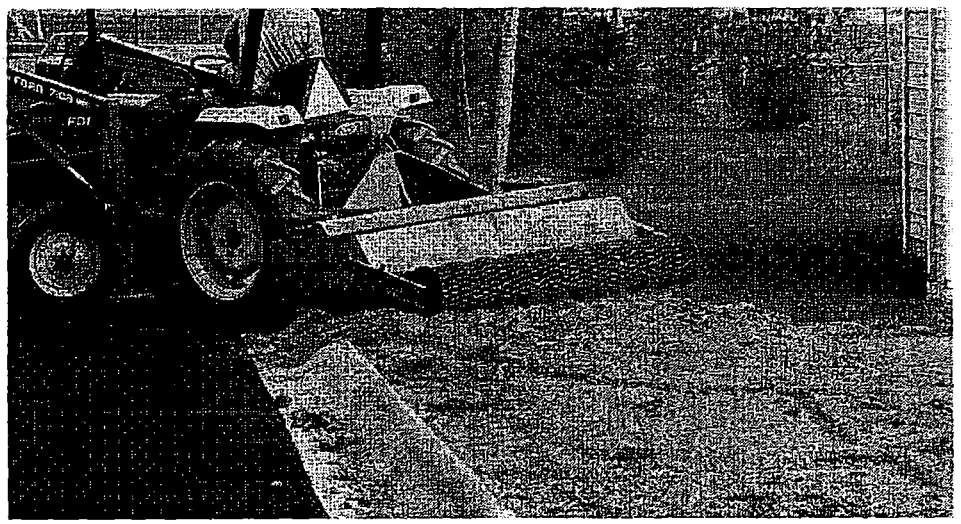


Exhibit 3.12-B. Preparing the seedbed with a combination roto-tiller and cultipacker.

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.

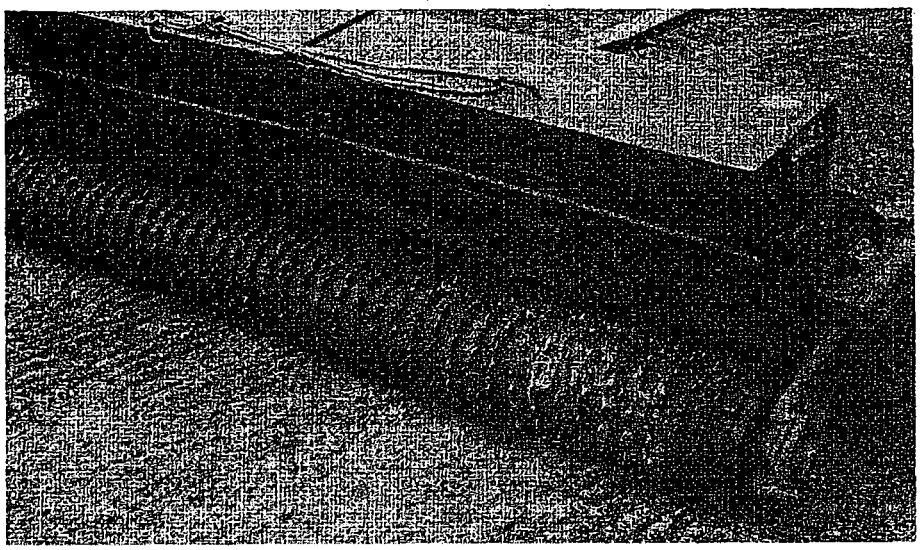


Exhibit 3.12-D. A cultipacker-seeder.

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.

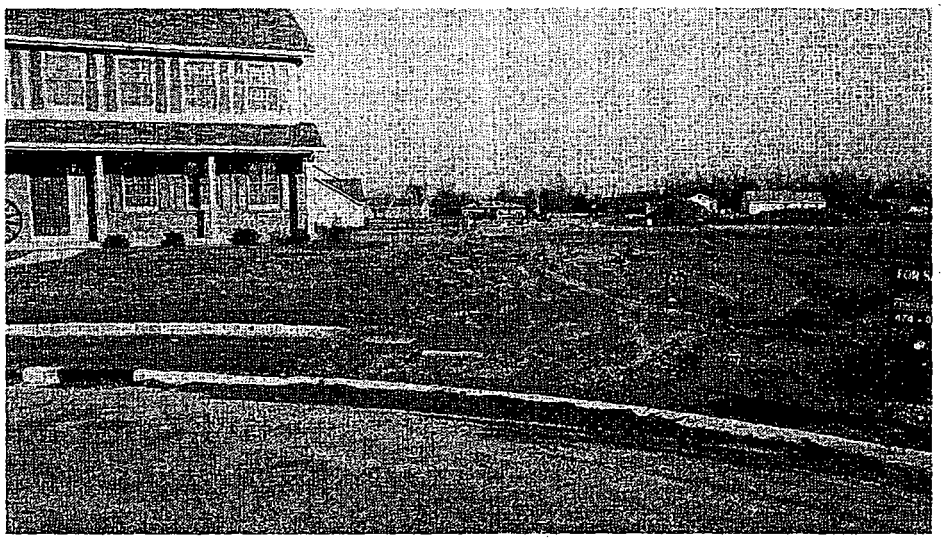


Exhibit 3.13-A. Use of dormant seeding could have reduced excessive early spring erosion on this site.

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
+ 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.

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.

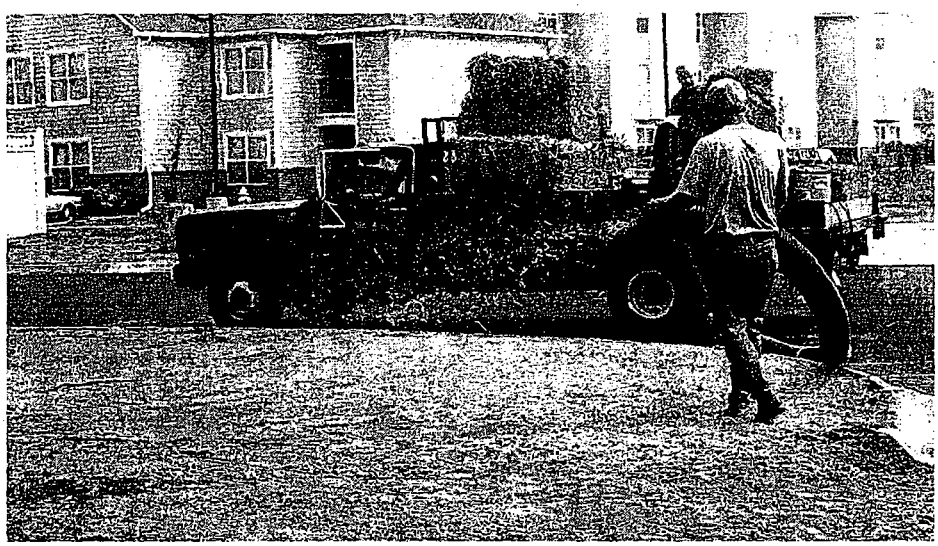


Exhibit 3.15-A. Applying straw mulch with a chopper-blower on freshly seeded soil adjacent to a road.

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.

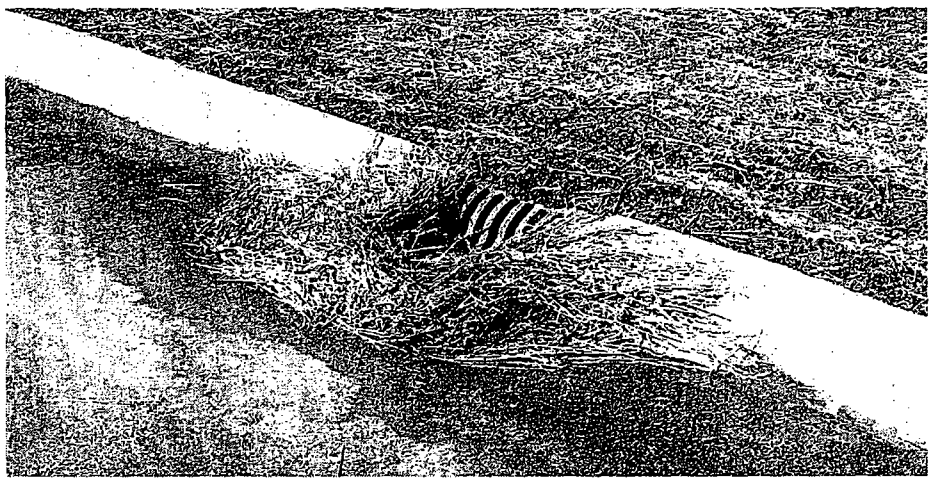


Exhibit 3.15-C. This unanchored straw mulch flowed with runoff to the storm drain. While acting somewhat as an inlet protection filter, it would have been more effective keeping soil from eroding off the site.

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.

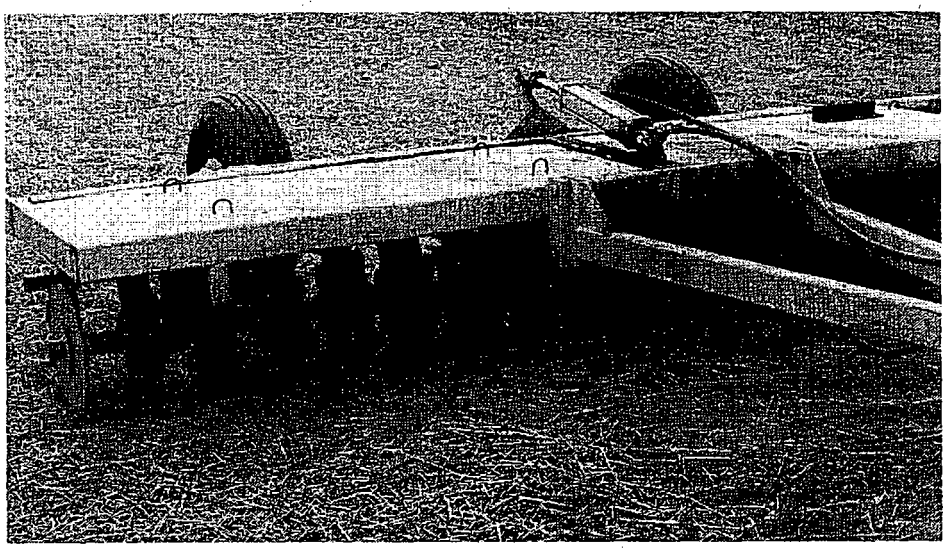


Exhibit 3.15-E. A crimper can be used to anchor mulch into the soil more securely.

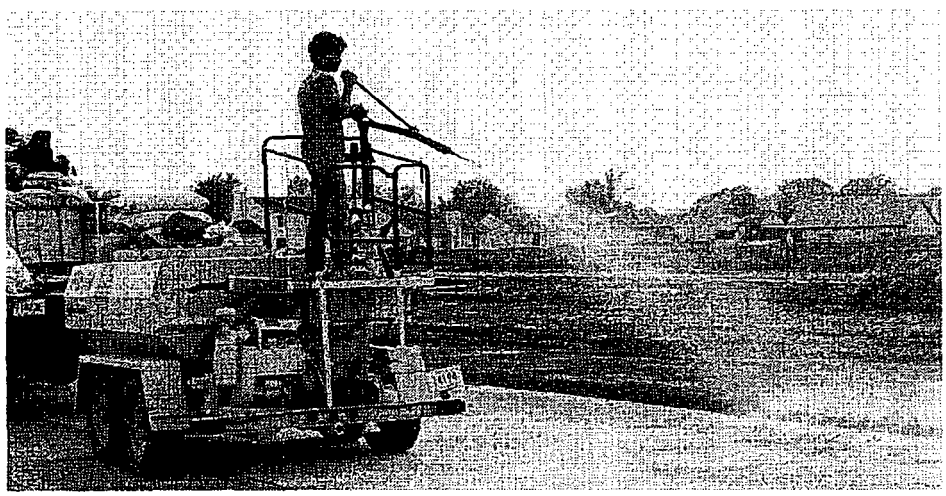


Exhibit 3.15-F. Hydroseeding the roadside in a new subdivision.

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.