REMEDIAL ACTION PLAN
AREA OF CONCERN 3
PETROLEUM CONTAMINATION OF SOIL AND GROUNDWATER AT FORMER UNDERGROUND STORAGE TANK FARMS
#25010679-N00001

Lockbourne Air Force Base

Franklin County, Ohio

Presented to:

U.S. ARMY CORPS OF ENGINEERS LOUISVILLE DISTRICT
600 Dr. Martin Luther King Jr. Place
Louisville, Kentucky 40202

Prepared by:

S&A ENVIRONMENTAL CONSULTANTS, LLC
3516 Mallard Cove
Williamsburg, VA 23185

SCS ENGINEERS
10975 El Monte, Suite 100
Overland Park, KS 66211
(913) 451-7510

September 27, 2013
CELRL Contract Number W912QR-09-D-0015

Table of Contents

Section **Page**

EXECUTIVE SUMMARY iii
1.0 Introduction 1
1.1 Former Lockbourne Air Force Base Site Description and History 1
1.2 Remedial Action Objectives 2
1.3 Purpose of The Remedial Action Plan 4
1.4 Remedial Action Plan Organization 4
2.0 Site Conditions and AOC History 6
2.1 Physical Conditions 6
2.1.1 Surface Water Hydrology 6
2.1.2 Geology and Soils 6
2.1.3 Hydrogeology 6
2.2 Summary of Prior Investigations at AOC 3 7
2.3 Summary of Chemical Contamination Documented at AOC 3 11
2.3.1 Sources 11
2.3.2 Free Product 11
2.3.3 Soil Contamination 12
2.3.4 Groundwater Contamination 12
3.0 Remedial Alternatives 13
3.1 Innovative Alternative Technologies 13
3.1.1 Natural Source Zone Depletion 13
3.1.2 In Situ Soil Mixing 13
3.1.3 Multi-phase Extraction 14
3.1.4 Multi-phase Extraction with Heating 15
3.1.5 In Situ Chemical Oxidation 15
3.1.6 Surfactant Enhanced LNAPL Removal 16
3.1.7 Electrical Resistance Heating 17
3.2 Evaluation of All Alternatives 18
3.3 Rationale for Selected Program 19
4.0 Summary of the Selected Remedial Action 20
4.1 Area and Media to be Remediated 20
4.2 Mobilization 21
4.3 Construction Implementation 21
4.4 Demobilization and Site Restoration 22
5.0 Implementation of the Selected Remedial Action 23
5.1 Additional Data Requirements 23
5.2 Plan Development (Design) 24
5.3 Permitting And Regulatory Requirements 24
5.4 Access Requirements 25
5.5 Sampling and Monitoring 26

5.5.1 Sampling During the Remedial Action 26
5.5.2 Groundwater Monitoring Plan 28
5.6 Remedial Action Schedule and Projected Remediation Completion Date 29
6.0 References 31
Acronyms and Abbreviations 33

Tables

Table 1 Remedial Action Objectives 3
Table 2 Re-Use Action Levels 26
Table 3 Remedial Action Schedule 28

Figures

Figure 1 Site Location Map
Figure 2 Areas of Concern
Figure 3 Conceptual Model of Excavation: Plan View
Figure 4 Conceptual Model of Excavation: Cross Section

Appendices

Appendix A Well Search Information
Appendix B Figures from Previous Reports
Appendix C Tables and Figures from the MNA Assessment
Appendix D ATSDR JP-4 Properties
Appendix E Technology Evaluation Tables from RTE Report
Appendix F Ohio NPDES Construction General Permit and NOI Application
Appendix G Treated Water Discharge Application
Appendix H Example Waste Disposal Application
Appendix I Petroleum Contaminated Soil Form

EXECUTIVE SUMMARY

S&A Environmental Consultants, LLC and SCS Engineers have been contracted by the U.S. Army Corps of Engineers, Louisville District to develop Remedial Action Plans for three areas of concern (AOCs) at the former Lockbourne Air Force Base in Columbus, Ohio. This RAP addresses AOC 3, which was used as a fueling and defueling station during the 1950s. Underground storage tanks at the AOC have been removed, but some piping, free product, and residual soil and groundwater contamination with petroleum hydrocarbons remain within the AOC. The objectives of this remedial action plan are to remediate free product, soil, and groundwater at AOC 3 to the Ohio State Fire Marshall's Bureau of Underground Storage Tank Regulations <0.01 foot recovery action level for free product and Soil Class 1 Non-Residential Action Levels for soil and groundwater.

As part of the remedial technologies evaluation in 2012, eight remedial technologies were evaluated in the *Remedial Technologies Evaluation Report, Petroleum Contamination of Soil and Groundwater at Former Underground Storage Tank Farms, Lockbourne Air Force Base, Columbus, Ohio*, prepared October 9, 2012. The technologies were selected for their potential effectiveness in addressing free product and included natural source zone depletion, excavation, in situ soil mixing, multi-phase extraction, multi-phase extraction with heating, in situ chemical oxidation, surfactant enhanced free light nonaqueous phase liquid removal, and electrical resistance heating.

Soil excavation with off-site disposal was selected as the remedial action for AOC 3 on the basis of combined effectiveness, implementability, and cost. Excavation is a proven technology that will permanently remove free product and soil contaminated in concentrations above the action levels from the site in less than one year. Disposal of the soil at a licensed disposal facility will provide containment or treatment and will minimize potential exposure to the contaminants. Excavation and transport are readily implementable using conventional construction equipment and other resources, and several licensed disposal facilities are located within 60 miles of the site. Removal of water and free product and on-site treatment and discharge to the sanitary sewer are also conventional and readily implemented technologies. Costs are lower or similar to costs for other comparably effective alternatives.

On the basis of the historical site data and the Tier 2 Evaluation, free product above the action level and concentrations of contaminants of concern in soil and groundwater above the applicable action levels are limited to the free product area (78,400 square feet). The depth and thickness of the contaminated zone will likely vary over this area, but is assumed to be at most from 12 to 18 feet below the ground surface. The quantity of contaminated soil within this area is estimated to be 17,500 cubic yards or 26,250 tons. An additional 35,000 cubic yards of clean overburden will be excavated and stockpiled on site for use as backfill.

The overall scope of the proposed remedial action includes work planning, mobilization, excavation and stockpiling of clean overburden, dewatering and on-site treatment and discharge of dewatering fluids, off-site recycling or treatment/disposal of separated light non-aqueous phase liquid, excavation of contaminated soil, off-site transportation of contaminated soil, disposal of contaminated soil at a licensed disposal facility, confirmation sampling, backfilling,

site restoration, and demobilization. Work planning will include addressing in detail identified additional data needs, physical and legal access requirements, design, permitting and regulatory requirements, relocation of utilities, and sampling and monitoring requirements.

A groundwater monitoring plan that includes installation of additional monitoring wells and four quarters of groundwater monitoring is included to demonstrate that the free product has been removed and that concentrations of the contaminants of concern in the groundwater remain below action levels in the free product area after the free product has been excavated.

1.0 INTRODUCTION

S&A Environmental Consultants, LLC (S&A) and SCS Engineers (SCS) have been contracted by the U.S. Army Corps of Engineers (USACE), Louisville District (CELRL) to develop Remedial Action Plans (RAPs) for three areas of concern (AOCs) at the former Lockbourne Air Force Base (LAFB) in Columbus, Ohio. This RAP addresses AOC 3, which was used as a fueling and defueling station during the 1950s. Underground storage tanks (USTs) at the AOC have been removed, but some free product, piping, and residual soil and groundwater contamination with petroleum hydrocarbons remain within the AOC. This plan has been prepared as specified in the CELRL Performance Work Statement (PWS) dated August 17, 2012 (Ref.1) and in accordance with Ohio State Fire Marshall's Bureau of Underground Storage Tank Regulations (BUSTR, Ref. 2).

1.1 FORMER LOCKBOURNE AIR FORCE BASE SITE DESCRIPTION AND HISTORY

The former LAFB is located in Franklin County, Ohio, south of the City of Columbus in the central portion of the state (Figure 1). It began operation as the Lockbourne Army-Airfield in 1942 on approximately 1,574 acres. The base was used to train glider pilots during World War II. In the early 1950s, the base was redesigned for use by jet bombers and eventually renamed LAFB. By 1974 it had expanded to 4,400 acres and the name was changed to Rickenbacker Air Force Base (RAFB). RAFB was closed in 1980 and the land divided. Approximately half the property was licensed to the Ohio Air National Guard, and the remaining property was sold to the Rickenbacker Port Authority [now Columbus Regional Airport Authority (CRAA)] and private developers between 1980 and 1984. In 1994 the remaining base was closed, and the property owned by CRAA became known as the Rickenbacker International Airport (Ref. 3).

AOC 3 (Figure 2) served as a fueling and defueling operations for the larger planes used after the base was redesigned in the early 1950s. It provided 400,000 gallons of underground fuel storage, as well as lesser storage capacity for defueling. Contamination with petroleum hydrocarbons from jet fuel was documented during the UST removal activities at AOC 3, and multiple investigations have been performed to evaluate the extent of free product and petroleum hydrocarbons in soil and groundwater (Ref. 3). According to the Monitored Natural Attenuation (MNA) Assessment (Ref.4), the free product consists of weathered light non-aqueous phase (LNAPL) jet fuel that has already been naturally depleted of much of the more mobile and readily degradable volatile organic compound (VOC) fraction.

A BUSTR RAP (Ref. 5) was previously prepared for AOC 3 but was not approved because it did not address contaminated soil. In addition, since that document was prepared, additional studies have been performed. These include a Well Injection Depth Extraction (WIDE) Study (Ref. 6), the MNA Assessment (Ref. 4), and most recently a Remedial Technologies Evaluation (RTE, Ref. 7). The RTE evaluated eight technologies intended to address free product and associated contaminated soil and groundwater. The technologies included natural source zone depletion (NSZD), excavation, in situ soil mixing (ISSM), multi-phase extraction (MPE), multi-phase extraction with heating (MPEH), in situ chemical oxidation (ISCO), surfactant enhanced LNAPL removal (SELR), and electrical resistance heating (ERH). Free product recovery is ongoing in

selected monitoring wells at AOC 3, but only small volumes of free product have been recovered (Ref. 8).

1.2 REMEDIAL ACTION OBJECTIVES

The selection of the remedial action objectives (RAOs) for AOC 3 is based on the Tier 2 Evaluation report accepted by BUSTR (Refs. 9 and 10) and on subsequent evaluation of site conditions during the RTE. The Tier 2 Evaluation determined free product to be present and recommended free product recovery and preparation of a RAP. A previous RAP prepared for AOC 3 in November 2007 (Ref. 5) focused solely on LNAPL removal. BUSTR did not approve the November 2007 RAP because it did not address contaminated soil or groundwater media. However, the review of the site conditions in the RTE report indicated that the heterogeneity of the subsurface conditions may limit free product recovery, leaving contaminants trapped or adsorbed in the soil matrix. Therefore the remedial action objectives of this RAP are to remediate free product, soil, and groundwater at AOC 3 to applicable BUSTR action levels (ALs).

Because of the variability of the subsurface soils and the presence of the LNAPL and the highest contaminant concentrations in the more permeable soil lenses, Class 1 soil has been selected as the applicable soil type for risk-based ALs for AOC 3. Class 1 soil is defined as coarse grained soil with more than 50 percent of the material retained on a #200 sieve, and it includes gravel, sand, and sand with silt or clay fines. This approach to the soil classification is also consistent with the previous investigations submitted to BUSTR for AOC 3.

According to the Tier 2 Evaluation, current and planned land use is non-residential, so exposure pathways to be evaluated include those affecting non-residential and excavation workers. Surface soil and surface water are not considered to be media of concern, so direct-contact with surface soil, non-residential and aquatic life and recreational exposure pathways to surface water are not complete (Ref. 9).

The following soil exposure pathways were determined to be potentially complete:

- Soil to indoor air – non-residential
- Soil to outdoor air – non-residential
- Soil to outdoor air – excavation worker
- Soil to groundwater – non-drinking water
- Soil direct contact – excavation worker

With respect to the groundwater pathway, the following criteria apply:

- There are no groundwater potable drinking wells within 1,500 feet of the former USTs. (Refer to well search information in Appendix A).

- AOC 3 is not located within, or within 300 feet of, a Drinking Water Source Protection Area (Ref. 9).

- AOC 3 is not located within a sensitive area.

- No surface water body is located within 300 feet of AOC 3. The nearest surface water body is Walnut Creek, which at the closest point is approximately one mile southeast of AOC 3 (Ref 3).

- No potable wells are located within 300 feet of AOC 3 and 100% of the properties within 300 feet have a municipal water source readily available (Ref. 9).

- In the absence of property boundaries applicable to the AOCs and ordinances or other measures precluding use of the groundwater as a drinking water source, the default point of exposure (POE) of 300 feet from the source area is applicable to AOC 3.

On the basis of the preceding analysis, the only groundwater exposure pathway that is potentially complete is groundwater to indoor air, non-residential, <15 feet[1].

The soil AL for each contaminant of concern (COC) was determined by identifying the lowest BUSTR AL for each of the identified pathways for soil Class 1. Total petroleum hydrocarbons (TPH)-Light Distillate Fraction (LDF)[2] and Middle Distillate Fraction (MDF) do not have exposure-pathway-based action levels, so the BUSTR-specified ALs were selected as the remedial action objectives for those compounds. The BUSTR free product recovery (remediation) requirement has been included as the remedial action objective for LNAPL. The resulting soil ALs for the COCs are included in Table 1. The groundwater ALs for the COCs based on the specified groundwater exposure pathway are also included in Table 1.

Table 1. Remedial Action Objectives: Soil Class 1, Non-Residential

	Soil AL	**Groundwater AL**	**Free Phase Liquid**
Compound	(mg/kg)	(mg/L)	
Benzene	**6.50**	**26.8**	
Toluene	760	2,510	
Ethylbenzene	2,480	6,180	
Xylenes	**194**	670	
Benzo(a)anthracene	1,000,000	4,170	
Benzo(a)pyrene	1,000,000	794	
Benzo(b)fluoranthene	1,000,000	421	
Benzo(k)fluoranthene	1,000,000	149,000	
Chrysene	1,000,000	44,700	
Dibenzo(a,h)anthracene	1,000,000	2,210	
Indeno(1,2,3-c,d)pyrene	1,000,000	12,600	
Naphthalene	632	359	
TPH-LDF	**1,000**		

[1] On the basis of analytical data, exposure resulting from deeper contamination is also possible, but the ALs based on exposure to contaminants at a shallower depth are lower.
[2] BUSTR uses TPH-LDF (C6-C12) and TPH-MDF (C10-C20) designations. These are comparable to TPH-gasoline range organics (GRO) and diesel range organics (DRO), respectively. TPH-GRO and DRO designations are used in the text of this plan where they were applied in previous investigations at the AOC.

	Soil AL	Groundwater AL	Free Phase Liquid
TPH-MDF	**2,000**		
LNAPL			**>0.01 foot**

Note:

6.50 ALs highlighted in bold were exceeded during previous sampling events.

1.3 PURPOSE OF THE REMEDIAL ACTION PLAN

According to BUSTR, if remedial action is required, a RAP must be completed to select a method that will effectively achieve the appropriate ALs or site-specific target levels (SSTLs). This RAP has been prepared to select an appropriate remedial action to address free product and associated soil and groundwater contamination at AOC 3. It has been prepared in accordance with the Ohio Administrative Code (OAC) 1301:7-9-13 and the BUSTR *Technical Guidance Manual For Closure, Corrective Action, and Petroleum Contaminated Soil Rules*, July 1, 2012, revised August 2012 (Ref. 2).

1.4 REMEDIAL ACTION PLAN ORGANIZATION

The RAP consists of the following sections:

- Section 1.0, Introduction, presents project background, the remedial action objectives, the RAP purpose, and the RAP organization.

- Section 2.0, Site Conditions and AOC History, is a summary of relevant site-specific topography, surface water, geology and soils, and hydrogeology, as well as previous activities performed AOC 3. The nature and extent of contamination at the AOC is summarized in this section.

- Section 3.0, Evaluation of Remedial Alternatives, includes a review of innovative technologies evaluated; evaluation of the remedial action alternatives on the basis of reliability, effectiveness, cost and time needed for completion; and the rationale for the selected remedial alternative.

- Section 4.0, Summary of the Selected Remedial Alternative, describes implementation of the selected remedial action including the area and media to be remediated, mobilization, construction implementation, and demobilization and site restoration.

- Section 5.0, Implementation of the Selected Remedial Action, discusses additional data requirements, work planning, permitting and regulatory requirements, access requirements, sampling and monitoring, and the remedial action schedule.

- Section 6.0, References, specifies the references used in preparing the report.

A list of acronyms is included at the end of the report, and the following information is included in the appendices: well search information, figures from previous reports, tables and figures from the MNA Assessment, properties of JP-4 jet fuel, technology evaluation tables from the RTE report, Ohio storm water construction general permit and notice of intent, treated water discharge application, example waste disposal application, and petroleum contaminated soil form.

2.0 SITE CONDITIONS AND AOC HISTORY

This section presents physical conditions and the history of previous investigations at AOC 3.

2.1 PHYSICAL CONDITIONS

AOC 3 is relatively flat and grass-covered, with paved areas on the east and south portions. The surface elevations range from 751.9 feet above mean sea level (msl) on the northwest portion to 735.9 feet msl on east. The overall slope of the land surface is to the southeast toward Walnut Creek, which at the closest point is approximately one mile southeast of AOC 3.

2.1.1 Surface Water Hydrology

Surface water flow on the former LAFB is controlled through an extensive storm drain network comprised of corrugated metal and concrete drainage pipes and open drainage ditches. At AOC 3, storm water inlets are located along the access road on the east side and in the parking lot to the south. Surface water from the LAFB storm water network discharges to Walnut Creek, which flows north to south and discharges to the Scioto River (Ref. 3).

2.1.2 Geology and Soils

There are approximately 250 to 350 feet of glacial drift beneath the former LAFB. The glacial drift consists of unconsolidated, stratified and unstratified, clay, silt, sand, gravel, cobbles and boulders, which filled a pre-glacial bedrock valley. The glacial drift generally includes approximately 80 feet of clay and silt, containing relatively thin layers of sand and gravel. Below this is a sand and gravel layer, approximately 50 to 100 feet thick, underlain by a silt and clay layer up to 60 feet thick. Another sand and gravel layer, ranging from 50 to 100 feet thick, forms the base of the glacial drift. Included in these glacial deposits are fragments of the underlying shale of the Ohio and Olentangy Formations and limestone of the Columbus and Delaware Formations. These rock formations were formed during the Devonian Period (Ref. 3).

Data collected during previous studies at the LAFB indicate the presence of two distinguishable glacial tills located within the upper 40 feet of soils beneath the former LAFB. The uppermost (brown) till generally consists of a brown to gray, low plastic silty clay or clayey silt with scattered to abundant sand and gravel-sized particles. Discontinuous sand and gravel layers vary from a few inches to several feet thick and occur near the surface to approximately 10 to 15 feet below the ground surface (bgs) at various locations within the study area. The contact of the lower (gray) till was generally encountered within 15 feet of the ground surface and consisted of gray, low plastic, silty clay or clayey silt with scattered to abundant sand and gravel-sized particles. Sand and gravel lenses in the lower till appeared to be thicker and more continuous than in the upper till (Ref. 3).

2.1.3 Hydrogeology

Drinking water is supplied to the region by the City of Columbus public water supply system, which utilizes both surface water from reservoirs and groundwater from municipal wells. Pumping rates from 100 to 500 gallons per minute (gpm) of relatively good water quality are

common in wells in all but the northeast part of Franklin County. Devonian and Silurian Period limestone and dolomitic limestone in the western half of the county and Pleistocene Epoch glacial sand and gravel deposits in the south-central and southeast part of the county are two of the major high-yielding aquifer types. Sand and gravel deposits along the Scioto River, Walnut Creek, and Big Walnut Creek can yield as much as 1,000 gpm.

Data collected during previous studies at the LAFB identified at least three water-bearing zones beneath the former LAFB. The uppermost water-bearing zone is situated within poorly connected sand and gravel lenses found in the brown and gray till. The middle and lower aquifers are situated within the thick sand and gravel layers. Each of these sand and gravel layers is separated from the upper water-bearing zone by aquitards that consist of silty clay or clayey silt. Available monitoring well and water supply well logs indicated that these aquitards are possibly continuous beneath the site (Ref. 3).

The depth to groundwater measured in monitoring wells installed in the upper water-bearing zone in AOC 3 ranged from approximately 11 to 23 feet bgs during the Phase II RI (1998-2000) and from approximately six to 17 feet bgs during the Monitored Natural Attenuation (MNA) assessment (2009-2010). The depth to groundwater measured in monitoring wells within the AOC 3 free product area (LMW-4, 8, 9, and 37) ranged from approximately 15 to 23 feet during the Phase II RI and 12 to 17 feet during the MNA assessment. Seasonal fluctuations in groundwater monitoring well elevations observed during the MNA assessment varied from approximately two feet to approximately nine feet within a single well at AOC 3. However, fluctuations observed in wells within the free product area only ranged from approximately two to four feet. Despite variations in elevations, flow at AOC 3 appeared to be consistently inward along a trough located within the free product area during all the MNA assessment events.

Groundwater velocities are expected to be low, as the hydraulic gradient of the site is relatively flat. Groundwater recharge to the upper-water-bearing zone occurs through precipitation in the form of rain and snow. Groundwater discharge from perched water in the upper water-bearing zone is assumed to occur horizontally through surface ditches and utility trenches when the groundwater table is relatively high and vertically by gradual leakage through the underlying aquitard to the lower aquifer (Ref. 3).

The range of hydraulic conductivities (up to four orders of magnitude of variation) determined from slug tests performed during the Phase II RI on monitoring wells at AOC 3 reflect the heterogeneity of the shallow subsurface conditions and the highly discontinuous nature of the sand and gravel layers present in the glacial deposits at the site. The average hydraulic conductivities calculated for AOC 3 ranged from 4.08×10^{-4} centimeters per second (cm/s) to 2.08×10^{-1} cm/s (Ref. 3).

2.2 SUMMARY OF PRIOR INVESTIGATIONS AT AOC 3

This section presents a summary of the scope of previous investigations and information gathered for AOC 3. This summary is based on the references included in Section 6.0, which are noted as applicable. Figures from previous reports showing the locations of former and existing site structures and the extent of free product and soil and groundwater contamination are included in Appendix B. These figures are referenced as applicable.

In 1993, eight 50,000 gallon USTs that contained JP-4, one 25,000 gallon defueling tank, and one 2,000 gallon water/waste tank were removed. Portions of the fuel lines were removed and the remaining lines plugged and abandoned in place. The concrete anchors were left in place. (The former locations of the eight USTs, fuel lines, and other features are shown on Figure 4, Appendix B.) Liquids were pumped from the excavation and disposed of off-site. No other remediation was performed at that time due to budgetary/contract limitations, although soil contamination was observed (Ref. 3).

In 1994, a Phase I RI was performed for buildings 1045 (AOC 3), 1055, 1062, and 1076. As part of this investigation, six soil borings were drilled and one monitoring well was installed in the vicinity of AOC 3. Soil and groundwater samples were collected and analyzed. Numerous additional/supplemental field investigation programs were performed as part of the Phase I RI at AOC 3. In 1996, 30 direct push borings were performed. In 1998, 26 direct push boring were performed. In 1998, six groundwater monitoring wells were installed. In 1999, four additional borings were performed. In 2000, six additional groundwater monitoring wells were installed (Ref. 3). (The locations of AOC 3 borings and monitoring wells from this and subsequent investigations are shown on Figure 3, Appendix B.)

In 1995, the Building 1045 hydrant pit fuel lines were defueled, cleaned, and closed in place. The field investigation program associated with this effort included 13 test borings that were drilled to characterize potential soil contamination. Some contaminated soil was removed from an access pit and disposed of off-site (Ref. 3).

In 1997, free product removal was initiated at well LMW-4. In 1999, free product removal began at two additional wells, LMW-8 and LMW-9 (Ref. 3).

In 1996, the Phase II RI began. During the course of this investigation, approximately 103 soil samples were analyzed for benzene, toluene, ethyl benzene, and xylenes (BTEX) and TPH[3]. The AOC was also scored using BUSTR Site Feature Scoring System (SFSS) in place at the time, which classified the AOC as a Category 2 site. The results of the BTEX and TPH analyses of the soil samples were compared to BUSTR Category 2 action levels. Twenty-six of the samples exceeded BUSTR Category 2 action levels for BTEX and/or TPH. In general, on the basis of the analytical data, the average vertical extent of soils exceeding BUSTR action levels was considered to range from 12 to 18 feet bgs (Ref. 3).

Thirteen monitoring wells were also installed in the vicinity of AOC 3 and sampled during the Phase II RI in December 1998. The groundwater samples were analyzed for TPH-gasoline range organics (GRO), BTEX, VOCs, semi-volatile organic compounds (SVOCs), and total and dissolved Resource Conservation and Recovery Act (RCRA) metals. Concentrations of benzene in four of the wells (LMW-4, LMW-8, LMW-9, and LMW-10) exceeded the BUSTR Category 2 action level of 0.005 mg/L. The groundwater plume above this level was considered to extend over 655,000 square feet centered on the former USTs (Ref. 3).

[3] Some samples collected during the Phase II RI were also analyzed for volatile organic compounds (VOCs) and polynuclear aromatic hydrocarbons (PAHs), which results were compared to EPA Region 9 Preliminary Remediation Goals. Since BUSTR is the applicable regulatory authority, and BTEX and TPH are representative of contamination on the AOCs, only those results are summarized in these discussions.

Soil and groundwater biofeasibility studies were also conducted during the Phase II RI at AOC 3. The Phase II RI report concluded that although there were several strains of bacteria present that were capable of biodegrading petroleum hydrocarbons, the numbers and growth rates of the bacterial strains were relatively low, which may indicate that the microbes are being stressed in their natural environment. The report stated that the potential stress may be the result of one or more of the following factors:

- Toxicity of the petroleum hydrocarbons to the aerobic bacteria.
- Limited food substrate source (i.e., petroleum hydrocarbons).
- Nutrient deficiency.
- Anaerobic conditions prevalent due to the lack of dissolved oxygen in the groundwater (Ref. 3).

Water quality parameters were also tested during the Phase II RI to evaluate whether conditions were suitable for natural attenuation of petroleum hydrocarbons and whether aerobic and/or anaerobic biodegradation are naturally occurring. Temperature, pH, dissolved oxygen (DO), oxidation/reduction potential (ORP), ferrous iron, alkalinity, sulfate, nitrate, conductivity, and chloride were evaluated. The results of the testing for these parameters appeared mixed with respect to biodegradation of contaminants at AOC 3. According to the report, sulfate and ferric iron results suggested some anaerobic degradation in wells with higher contaminant concentrations, while DO results indicated very little aerobic degradation. Alkalinity results indicated insignificant natural bioremediation, and ORP results suggested anaerobic/anoxic conditions in these wells (Ref. 3).

Free product delineation during the Phase II RI using the USACE's Site Characterization and Analysis Penetrometer System (SCAPS) laser induced fluorescence sensor estimated the free product plume (JP-4) to be 90,000 square feet with an average thickness of 1.5 feet at AOC 3 (Ref. 3).

A WIDE prototype was installed and operated at AOC 3 from October 2005 through early April 2007. The WIDE technology is a variation of dual-phase extraction. The final report concluded that "the difficulty of achieving complete remediation at the test site arises mainly from the nature of the 'wide cut' JP-4 contamination as well as from complex entrapment of jet fuel in the heterogeneous subsurface profile with such entrapment being in saturated and unsaturated modes." (JP-4 is called a wide-cut fuel because it is produced from a broad distillation temperature range and contains a wide array of carbon chain-lengths, from 4 to 16 carbons long.) The report goes on to recommend that "in addition to extraction of jet fuel available to gradient-induced flow, it seems that the approach to remediating the entrapped residual globules should encompass vapor and liquid extraction, air circulation for promoting mass transfer to gas phase, vapor extraction for removal of organic vapors, and bioventing (increase dissolved-oxygen concentration for subsurface microbial populations to degrade organic compounds)" (Ref. 6).

In August 2007, a BUSTR Tier 2 Evaluation was performed for AOC 3 using existing information. No additional field investigations were performed in support of the Tier 2

Evaluation report. The Tier 2 Evaluation used default BUSTR ALs based on non-residential exposure pathways. Benzene, xylenes, TPH-GRO, and/or TPH-diesel range organics (DRO) in soil (at SB-11, SB-29, SB-306, SB-307, WDP-601, WDP-603, and WDP-604) were detected above the ALs. Benzene in groundwater (at monitoring wells LMW-8 and LMW-9) was detected above the delineation criterion (delineation criteria are the lowest BUSTR screening values). However, free product was determined to be present[4]. The Tier 2 Evaluation proposed continued free product removal, installation of additional sentinel groundwater monitoring wells, and preparation of a RAP (Ref. 9). The Tier 2 Evaluation was accepted by BUSTR in September 2007 (Ref. 10).

In November 2007, a final RAP was prepared for AOC 3. The RAP stated that remediation of free product in the area of AOC 3 would likely satisfy BUSTR remediation requirements and, therefore, focused on alternatives that address that issue. The RAP included an evaluation of the extent of the free product using WIDE free product thickness data and the delineated surface area of the free product in the site's subsurface. Free product thickness within the free product zone was estimated at 0.25 feet over a 1.8 acre surface area with a soil porosity of 0.4 for an estimated volume of free product of 58,300 gallons of JP-4 (Ref. 5). A revised estimated free product volume of 35,200 gallons of JP-4 LNAPL at AOC 3 was calculated in the RTE Report issued in 2012 (Ref. 7). Figure 3, Appendix B shows the area of free product, while Figure 4, Appendix B shows existing and former underground utilities and fuel piping.

The baseline alternative presented in the November 2007 RAP was skimming of free product from three groundwater monitoring wells, which was ongoing at the time the RAP was prepared. The RAP evaluated five alternatives (two with subsets), and recommended the WIDE technology, if expanded free product removal is desired (Ref. 5).

BUSTR Free Product Recovery forms were submitted for AOC 3 in July 2013. The report documented recovery of 395 gallons of free product at AOC 3 (five wells and WIDE pilot study) since free product was identified in 1994. Tables showing monthly recovery quantities were provided for 2007 through June 2013, with a gap from July 2010 through March 2011. The amount of free product measured in the five wells varied from zero to 2.9 feet over that period. No measurable free product was observed in LMW-8 and measurable product was only observed once in TB-02 (the two southernmost monitoring wells) from February 2008 through June 2013. The greatest thickness of product (2.9 feet) was observed in LMW-9 in December 2012 (Ref. 8).

In 2009 and 2010, a MNA Assessment Investigation was performed that covered AOC 3, AOC 8/9, and AOC 11. Groundwater samples, along with free product samples (if present), were collected quarterly from selected wells in the three AOCs. Twelve wells were sampled in the AOC 3 area, with two additional wells added later in the investigation. None of the concentrations of COCs in the groundwater samples exceeded the project action limits, which were based on BUSTR groundwater to indoor air action levels for groundwater less than 15 feet bgs, non-residential, Soil Class 1. However, concentrations of benzene in five wells (LMW-04, LMW-08, LMW-09, TB-01, and TB-02 and naphthalene in two wells (LMW-04 and TB-01) within the free product area exceeded groundwater ingestion ALs.

[4] The referenced soil sample and groundwater sample locations are all within the free product area.

The groundwater quality data from the MNA Assessment were compared for wells located in the source area and further down the migration pathway. The free product samples were analyzed and compared to fresh JP-4. In general, the groundwater quality results showed that compounds consumed during degradation processes decreased in concentration away from the source area, and byproducts of the degradation increased in concentration away from the source area. This indicated that natural attenuation was occurring. The free product analyses confirmed that the JP-4 had been degraded. The concentrations of the lighter, more easily degraded compounds had decreased. The continued presence of the heavier compounds that are more resistant to degradation indicated that natural attenuation of these compounds would proceed more slowly. Data tables from the 2010 MNA Assessment, including groundwater elevations, free product thickness measurements, and LNAPL analytical results are included in Appendix C (Ref. 4).

The results of the RTE (Ref. 7) for AOC 3 are discussed in Section 3: Evaluation of Remedial Alternatives.

2.3 SUMMARY OF CHEMICAL CONTAMINATION DOCUMENTED AT AOC 3

2.3.1 Sources

The sources of contamination at AOC 3 are presumed to be the (former) eight 50,000 gallon USTs and the associated 25,000 gallon defueling tank, 2,000 gallon water/waste tank, and fuel lines (Figure 4, Appendix B). The tanks have been removed. Some fuel lines were removed and some closed in place. Tank installation details are not known for the 50,000 gallon tanks. However, a photograph of one of the tanks indicates that the diameter was approximately 12 feet. It is assumed that they were installed with the bottom of the tanks at depths ranging from 12 to at most 15 feet bgs.

The predominant source of contamination appears to have been JP-4 jet fuel. JP-4 is called a wide-cut fuel because it is produced from a broad distillation temperature range and contains a wide array of carbon chain-lengths, from 4 to 16 carbons long. The composition of JP-4 is approximately 13% aromatic hydrocarbons, 1.0% olefin hydrocarbons, and 86% saturated hydrocarbons. Paraffins and cycloparaffins are the major components. The chemical and physical properties of JP-4 are summarized on the table in Appendix D from the Agency for Toxic Substances and Disease Registry (ATSDR) *Toxicological Profile for Jet Fuels JP-4 and JP-7*, June 1995 (Ref. 11).

2.3.2 Free Product

On the basis of the SCAPS data, the area of free product is as shown on Figure 3, Appendix B. According to the MNA Assessment, free product was encountered with thicknesses ranging from 0.01 to 0.30 feet in AOC 3 (Ref. 4). In the 2007 RAP, free product thickness within the free product zone was estimated at 0.25 feet over a 78,400 square feet surface area with a soil porosity of 0.4 for an estimated volume of free product of 58,300 gallons of JP-4 (Ref. 5). A revised estimated free product volume of 35,000 gallons at AOC 3 was calculated in 2012 (Ref.7). However, according to the June 2013 Free Product Recovery Reports, no measurable free product has been observed in monitoring well LMW-08 since October 2007, and measurable

free product has been observed in monitoring well TB-02 only once since February 2008 (0.12 inches in April 2011.) Total recovery since free product recovery began in 1994 is 395 gallons, including 384 gallons removed during the WIDE pilot study (Ref. 8). Sand was the predominant soil identified at the free product interface, indicating that there is probably a strong correlation between the free product and the lenses of coarse-grained material observed at the site.

On the basis of analyses of LNAPL from three wells in AOC 3, the 2010 MNA Assessment concludes that volatile and soluble compounds (BTEX) have been depleted from the free product, so that the remaining LNAPL is likely to be less susceptible to volatilization and solution and, hence, biodegradation. The MNA Assessment also concludes that fluctuations observed in the groundwater elevations over time likely indicate that a smear zone of residual LNAPL may be present in the soil immediately above and below the mobile free product on the groundwater surface (Ref. 4).

2.3.3 Soil Contamination

Soil contamination seems to be localized in association within the areas of free product. Applying the ALs identified in Section 1.2, concentrations of contaminants in only seven soil samples (from seven boring locations: SB-11, SB-29, SB-306, SB-307, WDP-601, WDP-603, and WDP-604) exceeded the ALs (Ref. 3). All seven locations were within the area of free product as identified in the preceding section. In addition, the sample depths ranged from 12 to 17 feet bgs, which indicates that they were probably within the LNAPL smear zone (or below the groundwater table). Three of the samples exceeded the AL for benzene, three exceeded the AL for TPH-LDF, two exceeded the AL for xylenes, and one exceeded the AL for TPH-MDF.

2.3.4 Groundwater Contamination

Groundwater contamination also seems to be localized within the area of free product. According to data from the Tier 2 Evaluation and the MNA Assessment, the only contaminants detected above the lowest BUSTR ALs (ingestion) were detected in groundwater samples from wells within the free product area. However, no contaminants were detected above the ALs identified in Section 1.2 (groundwater to indoor air, non-residential, <15 feet) in any of the monitoring wells within AOC 3. The new building (Exhibit 01, Air Cargo Terminal #4, Appendix B) constructed south of AOC 3 is at least 150 feet at the nearest point from any well containing free product and approximately 300 feet from the location of the former USTs (source area).

3.0 REMEDIAL ALTERNATIVES

The evaluation of remedial alternatives is based on the RTE report (Ref. 7), which compared eight remedial technologies that could be used to address the fuel contamination present at AOCs 3, 8/9, and 11. Although cleanup of all media (i.e., soil, groundwater, free product, indoor air) to meet BUSTR requirements was the overall objective, the RTE focused on treatment of recalcitrant LNAPL at each of the AOCs and included seven innovative alternative technologies. This section provides a summary of the innovative alternative technologies, the results of the evaluation of all the alternatives, and the rationale for the selected program at AOC 3.

3.1 INNOVATIVE ALTERNATIVE TECHNOLOGIES

Innovative alternative technologies reviewed included natural source zone depletion (NSZD), in situ soil mixing (ISSM), multi-phase extraction (MPE), multi-phase extraction with heating (MPEH), in situ chemical oxidation (ISCO), surfactant enhanced LNAPL removal (SELR), and electrical resistance heating (ERH). Each of these technologies is described in this section.

3.1.1 Natural Source Zone Depletion

NSZD is a combination of processes that naturally reduces the mass of LNAPL in the subsurface. It occurs when certain processes act to (a) physically redistribute LNAPL components to the aqueous or gaseous phase and (b) biologically break down source zone components. These processes include dissolution of LNAPL constituents into groundwater and volatilization of LNAPL constituents into the vadose zone. In turn, LNAPL constituents dissolved to groundwater and volatilized to the vadose zone can be biodegraded by microbial and/or enzymatic activity. Biodegradation rates depend on the type and availability of electron acceptors (oxygen, nitrate, sulfate, ferrous iron, manganese, and methane) in the subsurface soils and groundwater. Long-term monitoring of contaminant and biodegradation parameter concentrations in groundwater and soil gas is required to assess this technology.

NSZD is significant because it occupies a position in the spectrum of remediation options that can be used as a basis for comparing the performance and relative benefit of other remediation options. It is also significant because engineered remedial actions typically do not completely remove all LNAPL from soils, and NSZD may be useful to address the residual hydrocarbon. Although considerable data are required to evaluate the potential effectiveness of this technology and to monitor its continued performance, the costs of collecting these data will typically be less than costs to implement more aggressive technologies. However, the presence of recalcitrant LNAPL and low groundwater flow conditions may limit the effectiveness of NSZD and increase the time to achieve remediation goals, and verification of depletion mechanisms will have to be established and demonstrated. It is likely that with weathered JP-4 LNAPL, the rate of dissolution of the free product will be the limiting factor for NSZD. In the RTE, NSZD served as a baseline for evaluating other technologies (Refs. 12 and 13).

3.1.2 In Situ Soil Mixing

ISSM is a construction technology for remediating contaminated soils. Contaminated media is transformed through solidification and stabilization into durable, solid, low-hydraulic

conductivity material in order to reduce the rate of contaminant migration. ISSM uses specialized hydraulically driven augers and mixing paddles to simultaneously drill and inject material. The auger flights loosen the soil as they move through the subsurface allowing the soils to be mixed with the paddles. The technique may be used to homogenize existing materials or to blend stabilizing material into the soil. Typically some grout is required to facilitate mixing of existing soil material. The homogenized material is then injected back out through the augers.

Stabilizing additives may include slurries of bentonite, cement, lime, and other additives (e.g., fly ash and slag that change the composition/durability of the material). ISSM creates individual columns of material, which can be overlapped to create walls or divided into block or grid patterns. This technology is most effective at depths of up to 40 feet, but has been used at depths of up to 120 feet depending on subsurface soil characteristics. For shallow applications with contaminated material depths of up to 20 feet, the area to be treated is typically divided into grid cells.

There are several potential challenges related to ISSM. Removal of debris or underground obstructions must be conducted prior to treatment as they can limit drilling ability. VOC emissions may need to be treated. Because not all contaminants are destroyed or removed, long-term stewardship may be required. ISSM requires surface access to all locations where soils are contaminated, which rules out its effective use if contamination underlies site structures (Refs 14 and 15).

3.1.3 Multi-phase Extraction

The MPE process was developed for the remediation of LNAPL, aromatic VOCs, total petroleum hydrocarbons, and chlorinated VOCs in moderate permeability subsurface formations. The technology is meant to address contaminants in free-phase liquid, residual and sorbed phases, and vapors. The process is a modification and combination of two conventional remediation technologies: soil vapor extraction (SVE) and groundwater extraction.

Traditional SVE is the process of stripping and extracting volatile compounds from the soil by inducing air flow through the soil. Soil vapor flow is induced by applying a vacuum to extraction wells. Generally, SVE is applied to soil above the groundwater table.

Unlike SVE alone, MPE simultaneously extracts both liquid (groundwater and LNAPL) and soil vapor. The groundwater table is lowered in order to dewater the saturated zone so that the SVE process can be applied to the newly exposed soil. This allows volatile compounds adsorbed on the previously saturated soil to be stripped by the induced vapor flow and extracted. The increased air movement through the unsaturated zone also increases oxygen content and enhances aerobic bioremediation. The lowering of the water table also allows residual phase product trapped within the pore space of the previously saturated zone to coalesce into free phase liquid, allowing it to flow toward a recovery well, where a skimming pump may also be used to remove LNAPL. MPE will often require treatment of the extracted groundwater and vapor at the surface prior to discharge. LNAPL may also be collected separately for off-site disposal.

The use of MPE is not suggested for sites with very high permeability and is better suited for soils with low to moderate permeability to reduce the risk of short-circuiting. It is also not

recommended for use in soils with very low permeability because of a lack of secondary flow path. When used at sites with low to moderate permeability, this system can potentially create a large radius of influence causing greater capture of the contaminant plume and reducing the need for extra wells (Refs. 16 and 17).

3.1.4 Multi-phase Extraction with Heating

MPEH was developed for the remediation of LNAPL, aromatic VOCs, total petroleum hydrocarbons, and chlorinated VOCs in low to moderate permeability subsurface formations. The process is a modification of the conventional MPE system and is meant to address contaminants in free-phase liquid, residual and adsorbed phases, and vapor.

The information provided in the previous summary for MPE also applies to MPE with heating. Heating is added to conventional MPE to increase the rate of recovery or the range of contaminants that can be recovered by the process. Soil heating will volatilize higher molecular weight compounds that a traditional MPE system will not affect, will reduce the viscosity of free-phase and residual NAPL, and will increase chemical reaction rates for contaminant breakdown.

The source of heat to implement this technology may be from Electrical Resistance Heating or from soil heating technologies such as steam injection, hot compressed air injection, thermal conduction heating, or radio-frequency heating. The source of the required electrical power or waste heat from nearby utility or industrial applications is a critical consideration in application of this technology. There is also the opportunity to use renewable energy sources such as solar to provide power for heating or to use waste heat from the MPE process equipment. As for conventional MPE, the use of MPE with heating is not suggested for sites with very high permeability and is better suited for soils with low to moderate permeability to reduce the risk of short-circuiting. It is also not recommended for use in soils with very low permeability because of a lack of secondary flow paths. When used at sites with low to moderate permeability, this system can potentially create a large radius of influence causing greater capture of the contaminant plume and reducing the need for extra wells (Refs. 18, 19, and 20).

3.1.5 In Situ Chemical Oxidation

ISCO employs the injection of chemical oxidants directly into the aquifer to react with and destroy dissolved-phase organic constituents. ISCO is most commonly employed for the treatment of dissolved phase organic constituents and is usually employed as a source control measure for high concentration dissolved contaminants at or near the original release site. With respect to petroleum constituents, which are comprised primarily of carbon and hydrogen, the oxidation products are carbon dioxide and water.

Chemical oxidants commonly employed in ISCO include hydrogen peroxide, ozone, permanganates, and persulfates. All of these compounds are potentially hazardous to human health and the environment. They require careful handling to assure the safety of workers and the public. It is also important to understand and control transport and reactions in the subsurface environment. Hydrogen peroxide and ozone are fast-acting and short-lived oxidants, while permanganates and persulfates are employed in a slow-release form in situations that

require longer-term treatment. Most oxidizing agents are relatively non-selective and will react with many organic materials and some inorganic materials. The presence of high concentrations of naturally occurring organic materials and LNAPL will increase the oxidizing agent dose required for effective destruction and may decrease overall performance. In addition, chemical oxidants are not miscible in NAPL, so contaminant oxidation occurs in the aqueous phase on dissolved contaminants. Therefore, the solubility of the contaminant ultimately controls the rate of possible oxidation.

Subsurface injection is generally performed using a network of permanent injection wells or temporary hydraulic probe injection points. Pilot-scale testing may be required to evaluate the radius of influence and appropriate well spacing. High pressure injection may be employed to increase the radius of influence and reduce the number of injection points. Multiple applications are often required to meet remedial endpoints.

Perhaps the greatest challenge in effectively employing ISCO is achieving effective oxidant delivery and contact with the target contaminants. ISCO is most effectively employed in homogeneous, highly conductive (permeable) matrices. The presence of low conductivity materials such as clays and non-homogeneous soils can reduce oxidant/contaminant contact, resulting in decreased ISCO effectiveness. Subsurface structures and utility lines may create physical obstacles to injection or may be damaged by oxidizing compounds (Refs. 21 and 22).

3.1.6 Surfactant Enhanced LNAPL Removal

SELR is a technique to remove nonaqueous phase liquids from the saturated zone using chemical surfactants to mobilize contaminants and allow recovery using conventional groundwater extraction. Because SELR involves the introduction of a manufactured chemical to the environment to mobilize a known contaminant, the use of this technology requires a thorough understanding of the risks to receptors and a high degree of confidence in the physical containment of the contaminant plume during implementation.

Surfactants are chemicals that are amphiphilic, meaning they have a polar end and a non-polar end. These chemicals can also be classified as having a hydrophilic group and a hydrophobic group. Because of this property, surfactants serve as a ‘bridge’ between polar (e.g., water) and non-polar (e.g., oil) liquids. When surfactants are placed in an environment that has both polar and non-polar solvents, such as LNAPL (non-polar) mixed with groundwater (polar), they tend to migrate to the interfaces of the two different solvents and orient so that the polar group lies in water and the non-polar group lies in the non-polar solvent. When this orientation occurs, the surface tension between the two solvents is lowered and allows the non-polar chemical to more easily move through the water, thus expediting the removal of the chemical from groundwater.

There are three general classes of surfactants based on their dissociation in water: anionic, non-ionic, and cationic. Anionic surfactants have an anionic end, consisting of a negatively charged atom attached to a 12 to 18 carbon chain, and a cationic end. The non-polar end of the chemical interacts with the non-polar solvent and the negatively charged anionic end forms a hydrogen bond with the water, helping to lower the surface tension between the two solvents. Non-ionic surfactants do not ionize because their hydrophilic groups are of a non-dissociable type such as

alcohols, phenols, or esters. Cationic surfactants are relatively rare because of the high cost of production.

High to moderate permeabilities are necessary for surfactant enhanced LNAPL removal to be effective. A pilot study will help to investigate system performance and cost feasibility prior to a full-scale implementation and to determine whether the gradients necessary for capturing the contaminant and surfactant fluids can be maintained for improved contaminant contact and recovery.

The most common technique for the use of surfactants is a flooding configuration. This involves the preparation of low viscosity surfactant solutions that is pumped through the contaminated zone. The surfactant is put into the ground through up-gradient injection points and then removed down-gradient through extraction wells. This technology will not address contamination that is present in the smear zone at an elevation above the water level (Refs. 23, 24, and 25).

3.1.7 Electrical Resistance Heating

ERH is an intensive remediation process that uses the heat resulting from the resistance of soil to the flow of electricity to evaporate and release contaminants from soil and groundwater. The resistance to electric flow by the soil causes the formation of heat resulting in increased temperatures until the boiling point of water is reached. As the heat is applied, contaminants are volatilized and mobilized within the soil matrix. The source of the required electrical power is a critical consideration in application of this technology.

Once the contaminants have been volatilized they are more mobile and available for collection and treatment. Collection of contaminants is typically accomplished using a vacuum system such as SVE, while treatment often consists of combustion to destroy the compounds.

There are two types of ERH systems. The first uses a three phase system with the electrodes arranged in a repeating triangle formation with each electrode giving off a different level of voltage. The second ERH system is a six phase system arranged in a hexagonal pattern with a neutral electrode in the middle to absorb the electrical imbalances generated by the difference in soil resistance. There is a possibility with the six phase ERH system that cold and hot spots will develop. Therefore, it is recommended that these systems be used in small circular areas with a diameter less than 65 feet.

ERH is adaptable to all soil types, as well as sedimentary bedrock, and is effective in both the vadose and saturated zones. Having a lighter, more volatile, contaminant will also improve the effectiveness of this system. Once the treatment is completed, the soil temperatures will remain elevated and over time will decrease to ambient temperatures.

It should be noted that during the operation of ERH, “stray” voltages can appear outside of the electrode pattern. These “stray” voltages can energize metallic objects that are in contact with the ground, resulting in significant safety issues. Some ways to combat the safety issues are to limit access to the area through the use of wooden fencing. Another necessary precaution is the installation of a grounding ring that is connected to any above ground equipment to eliminate

any electrical potential differences between components. A wire mesh equipotential mat should also be placed over the electrified zone and be connected to the grounding ring to help eliminate the possibilities for step-touch potentials (Refs. 26, 27, and 28).

3.2 EVALUATION OF ALL ALTERNATIVES

In addition to the innovative alternative technologies discussed in the preceding section, excavation of contaminated soil was included in the alternative evaluation. The results of the evaluation of all the technologies at AOC 3 are summarized below and presented in more detail in the tables in Appendix E.

- **NSZD** involves monitoring the physical and biological transformation of LNAPL over time. Since the technology only requires drilling and sampling, implementability is high, and costs are relatively low. However, this technology would not be effective in achieving remedial action objectives within a reasonable time due to slow dissolution of weathered LNAPL under heterogeneous subsurface conditions at AOC 3.

- **Excavation** involves physical removal and off-site disposal of petroleum-contaminated soil and LNAPL petroleum fuels to the maximum depth of the free product smear zone. This technology is implementable, but costs would be high at AOC 3, because of the presence of above and below ground structures, utilities, and piping. Costs would generally be moderate to high, and would increase if significant water management were required. The effectiveness of this technology would be moderate to high, because free product and contaminated soil would be permanently removed.

- **ISSM** involves in place mixing of soil with water and grout to the maximum depth of the free product smear zone. This technology is implementable, but because of the presence of above and below ground structures, utilities, and piping that would have to be removed and relocated, costs would generally be high. The effectiveness of this technology would be moderate. Although free product and contaminated soil would be homogenized and solidified to minimize potential exposure and migration, contaminants would be left in place on the site and future land use would be restricted.

- **MPE** combines free product recovery, groundwater extraction, and soil vapor extraction to remove LNAPL, contaminants dissolved in the groundwater, and volatile compounds trapped in the soil. Since the technology only requires drilling, extraction, and treatment, implementability and costs are moderate. However, effectiveness is uncertain. Although free product reduction would probably meet remedial action objectives within a reasonable period of time, residual soil and groundwater contamination might remain because of the heterogeneous subsurface conditions and the presence of less soluble and volatile constituents in the weathered LNAPL.

- **MPEH** adds heating to MPE to increase the rate and recovery and/or range of contaminants that can be extracted. Installation of heating equipment increases the complexity of implementation over MPE. Depending on the heating method, surface and subsurface obstructions and hazards may require removal or relocation. Costs are

relatively high, unless a waste heat source is available. Effectiveness is likely to be high, since heating will help to overcome the limitations associated with MPE alone.

- **ISCO** involves injection of chemicals into the subsurface to oxidize dissolved-phase organic contaminants. This technology was eliminated from consideration, because it is unlikely to be effective because of the slow dissolution of the weathered LNAPL and the difficulties of achieving contact between the oxidant and the contaminants under the heterogeneous subsurface conditions.

- **SELR** involves injection of a surfactant into the subsurface to mobilize contaminants in free phase product and adsorbed to the soil matrix. The mobilized contaminants are then extracted with the groundwater. This technology was eliminated from consideration, because it is unlikely that the surfactant could be distributed effectively under the heterogeneous subsurface conditions.

- **ERH** uses arrays of electrodes to create a concentrated flow of current that creates heat as a result of the resistance to the flow of electricity in the soil. The heat volatilizes the contaminants, which are captured by vacuum extraction and piped to condenser. Implementation is somewhat complicated and energy requirements are high, resulting in high costs for this technology. Surface and subsurface obstructions and hazards may require removal or relocation. The effectiveness of this technology is high.

3.3 RATIONALE FOR SELECTED PROGRAM

Soil excavation with off-site disposal has been selected as the remedial action for AOC 3 on the basis of combined effectiveness, implementability, and cost. Excavation is a proven technology that will permanently remove free product and associated soil and groundwater contaminated in concentrations above the ALs from the site in less than one year. Treatment of contaminated groundwater entering the excavation will allow recovery of free product and removal or destruction of dissolved contaminants, which will minimize potential exposure to contaminants in the groundwater. Disposal of the soil at a licensed disposal facility will provide containment or treatment and will minimize potential exposure to the contaminants in the soil. Pumping to remove LNAPL and groundwater, LNAPL recovery, groundwater treatment, and soil excavation and transport are readily implementable using conventional construction equipment and other resources, and several licensed disposal facilities are located within 60 miles of the former LAFB. Costs are lower or similar to costs for other comparably effective alternatives (MPEH and ERH).

4.0 SUMMARY OF THE SELECTED REMEDIAL ACTION

This section describes the area and media to be remediated and presents the conceptual design of the excavation remedial action. A conceptual site model of the excavation remedial action is included in Figures 3 and 4. The overall scope of the remedial action includes:

- Mobilization
- Excavation and stockpiling of clean overburden.
- Dewatering of the excavation, and on-site separation of LNAPL, treatment and discharge of groundwater, recycling or disposal of separated LNAPL.
- Excavation of contaminated soil.
- Off-site transportation of contaminated soil.
- Disposal of contaminated soil at a licensed disposal facility.
- Backfilling.
- Site Restoration
- Demobilization

Implementation items including access requirements (including removal and relocation of below-ground utilities), additional data requirements, permitting and other regulatory requirements, design, sampling and monitoring, and the overall schedule are discussed in Section 5.0.

4.1 AREA AND MEDIA TO BE REMEDIATED

The media to be remediated include LNAPL (petroleum fuel free product) and petroleum fuel-contaminated soil and groundwater. On the basis of the historical site data and the Tier 2 Evaluation, free product above the ALs and concentrations of COCs in soil and groundwater above the applicable ALs are limited to the free product area (78,400 square feet) shown on Figure 3, Appendix B. The depth and thickness of the contaminated zone will likely vary over this area, but is assumed to be at most from 10 to 18 feet bgs based on soil sample analytical data from the Phase II RI and the Tier 2 Evaluation Report intervals. The quantity of free product is estimated to be 35,000 gallons. The quantity of contaminated soil within this area is estimated to be 23,200 cubic yards or 34,800 tons. (This is slightly more conservative than the volume estimated in the RTE, which used an average thickness based on the LNAPL smear zone.) However, soil will be removed as needed to meet the BUSTR ALs. An additional 35,000 cubic yards of clean overburden will be excavated and stockpiled on site for use as backfill[5].

[5] This volume does not include additional soil that might have to be excavated to provide safe excavation side slopes. This additional quantity may vary with site conditions and the contractor's method of excavation.

4.2 MOBILIZATION

Personnel, equipment, and supplies will be mobilized to the site. This will include installing temporary chain link fencing and setting up a field office, work zones, storage tanks, an on-site treatment system, if applicable, a storage area for excavated material to use for backfill, and a decontamination pad for equipment. Equipment will be decontaminated before use on the site. To minimize water management, efforts will be made to implement excavation during drier portions of the year (summer and fall). The boundaries of the free product areas will be staked during or prior to mobilization to provide a starting point for excavation of the contaminated soil. If it is not feasible to do this using measurements from site landmarks, a land surveyor will mark the free product area.

4.3 CONSTRUCTION IMPLEMENTATION

Once mobilization is complete, excavation will start in an unimproved area where contamination is likely. The planned excavation depth will be defined by data from previous investigations, but will continue until the free product has been removed. Uncontaminated overburden will be stockpiled for testing and use as backfill or for blending with wetter soil before transportation off-site. Once the desired excavation depth has been reached, the excavation will progress laterally, adjusting the depth as needed to include only contaminated soil.

Water that enters the excavation will be pumped to the on-site storage tanks. On the basis of existing data, the water will have to be treated before being discharged to the sanitary sewer. Treatment requirements may vary, but will likely include oil/water separation, sedimentation, and carbon adsorption. The treated water will be sampled before discharge under a pretreatment agreement with the City of Columbus. Recovered free product will be transported off-site for recycling or treatment/disposal, contingent on the product characteristics.

If feasible, contaminated soil will be pre-qualified for disposal, so that it may be placed directly into trucks that will haul the soil off-site for disposal. On the basis of existing data, the soil will be disposed of off-site as a special waste at a solid waste landfill or at a licensed bioremediation facility. The nearest landfill is the Franklin County landfill, which is located approximately 10 miles east of the former LAFB. PETRO Cell operates a licensed bioremediation facility in Washington Courthouse, Ohio, approximately 45 miles south of the former LAFB. At the presumed soil quantity and 15 tons per load, this will require transportation of 1,750 truckloads.

As the excavation proceeds, backfilling the previously excavated areas will be simultaneously occurring to minimize surface water infiltration, limit the size of the open excavation, minimize the clean soil stockpile, and stabilize excavation side walls. Clean overburden soil will be stockpiled on site until chemical analysis confirms that the re-use ALs (Section 5.5.1) have not been exceeded and the soil is acceptable to be used as backfill. Additional clean backfill from an off-site source will be brought to the site as needed. Areas will not be backfilled until analytical results are obtained for soil excavation confirmation samples. Backfill will be compacted to meet CRAA specifications.

Berms will be constructed around the active excavation areas to minimize run-on and run-off, and other storm water best management practices (BMPs) such as silt fences will be

implemented to minimize erosion and storm water run-off from the AOC. Water sprays or other dust suppression measures will be employed as needed to reduce dust generation during excavation, stockpiling and loading soil. Stockpiles may be covered to minimize dust and/or runon/runoff. Temporary construction fencing will be placed around disturbed construction areas until the site is safe for the general public to access.

Monitoring wells and former pipelines that were closed in place and associated anchors will be removed during excavation and recycled, if feasible, or disposed of at the landfill. Concrete removed for excavation in the parking lot and access road will be recycled. It is estimated that 20,000 square feet of concrete will be removed and replaced.

4.4 DEMOBILIZATION AND SITE RESTORATION

Demobilization will include removal of fencing, storage tanks, decontamination pads, and the field office. Storm sewers, telephone line, electrical lines, water lines and other utilities will be re-installed, if they have not been permanently relocated. The parking lot and roadway will be repaved with concrete to restore them to the original condition in accordance with CRAA specifications. Site restoration will include final capping of previously vegetated areas with a two foot layer of soil capable of sustaining vegetative growth. Once all major construction traffic has been eliminated from the site these areas will be seeded. Storm water BMPs will be used to minimize erosion and sediment transport until vegetative growth is stabilized.

5.0 IMPLEMENTATION OF THE SELECTED REMEDIAL ACTION

Implementation items including additional data, permitting and regulatory requirements, design, access, confirmation sampling, the monitoring plan, and other requirements are discussed in this section, along with the overall schedule for the remedial action.

5.1 ADDITIONAL DATA REQUIREMENTS

AOC 3 has been extensively investigated and, therefore, additional data requirements for excavation are relatively limited. However, a few potential data gaps/uncertainties have been identified:

- The rate of groundwater recharge needs to be evaluated to estimate water storage and treatment requirements. It is likely that the groundwater recharge will be at a low rate based on the presumed heterogeneity of the subsurface and likely discontinuity of the granular lenses. However, excavation of a test pit before implementing the full-scale remedial action would be helpful in assessing this. Groundwater samples would be used to evaluate treatment/disposal requirements.

- The soil, groundwater, and free product may need to be further characterized for disposal or treatment. It will facilitate removal, if the soil can be characterized and accepted by the disposal facility before excavation begins. This will permit the excavated soil to be loaded directly into trucks for transport, rather than being stored on site while waiting for sample analysis and facility approval. The characterization requirements will depend on the receiving facility and will be identified before the remedial action is implemented. If existing data are insufficient for characterization, representative soil samples will be collected as needed within the free product areas before excavation of contaminated soil begins. The number of samples and the chemical analyses will be as specified by the selected disposal facility to obtain approval for disposal of the soil as a special waste or for land treatment. Groundwater and free product samples may be collected at the same time to further evaluate treatment requirements and free product recovery and characteristics.

- The boundaries of the free product areas need to be marked and details concerning surface and subsurface structures in the target removal area need to be verified. The estimated free product area will be staked during or prior to mobilization. If it is not feasible to do this using measurements from site landmarks, a land surveyor will mark the free product area. Telephone, water, storm sewer, sanitary sewer, jet fuel, and electrical lines within the proposed excavation area (Figure 4, Appendix B) will be located so that they may be disconnected, removed, and/or relocated, as appropriate, before excavation begins.

A field investigation will be performed, as needed to provide the information identified above.

5.2 PLAN DEVELOPMENT (DESIGN)

This would involve the following planning phases:

1. Field investigation. This will involve collecting any additional information necessary to design the removal action, as specified in the preceding section. A work plan and health and safety plan will be prepared for the additional investigation.

2. Design. This will involve development of bid documents for the remedial action, including drawings and specifications.

3. Contractor procurement. Bids will be solicited and a contractor selected to perform the remedial action. The contractor will provide details regarding proposed construction implementation.

4. Coordination with CRAA. The implementation of the remedial action, including relocation of utilities, will be coordinated with CRAA to minimize disruption of airport activities.

5.3 PERMITTING AND REGULATORY REQUIREMENTS

Permitting and regulatory requirements will include the following:

- Public Notice. BUSTR requires a public notice to be provided before implementing a remedial action[6]. At a minimum, public notice must include notification to all adjacent property owners, all owners of properties impacted by the release, all properties impacted by the proposed RAP, and the unit of local government. The time frame of the public notice is not specified, but it is assumed that a minimum of 30 days must be allowed for public comment. AOC 3 is located within the Rickenbacker International Airport and is entirely surrounded by airport and commercial/industrial property uses. The nearest residential areas are located approximately three quarters of a mile to the west and northwest of AOC 3. Land use immediately north of the airport at AOC 3 includes three commercial or industrial buildings. At a minimum, the owners of these properties and those immediately adjacent to the east, south, and west on the airport will be notified, as well as CRAA and the City of Columbus. If sufficient public interest exists, or for any other reason, BUSTR may hold a public meeting to consider comments on the proposed RAP before approving it.

- Ohio Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) permit. Since the area is larger than one acre, a Notice of Intent (NOI) application must be filed under the Ohio EPA NPDES General Permit for Discharges of Storm Water Associated with Construction Activity (OHC000004). The General Permit (current draft) and NOI are included in Appendix F.

[6] However, the proposed remedial action (excavation) could be implemented as an Interim Remedial Action, which does not require a public notice. Therefore, the public notice requirement could be waived.

- City of Columbus Division of Sewerage and Drainage Industrial Wastewater Pretreatment Group permit for groundwater discharge. If water will removed and discharged to the sanitary sewer, a formal letter requesting a permit to discharge groundwater from the excavation to the sanitary sewer must be submitted along with a Special Waste Evaluation Request Form. Since pretreatment of the water will be required to meet the City discharge limits, a Permit to Install application and sampling of the treated water will also be required. The applicable discharge applications are included in Appendix G.

- Acceptance of soil for disposal[7]. Approval must be obtained to dispose of the soil at a licensed disposal facility. This will require submission of a special waste profile and analytical data to a landfill for approval or an application to accept contaminated soil and analytical data to a bioremediation facility. An example of the documentation required by the Franklin County landfill and PETRO Cell is included in Appendix H.

- Acceptance of free product for recovery or treatment. Approval must be obtained to dispose of free product at a licensed recycling or treatment facility. Analytical data will need to be provided to the disposal/treatment facility.

- Petroleum Contaminated Soil (PCS) form. BUSTR assumes excavated soil is PCS unless analytical data prove otherwise. Refer to Section 5.5 with respect to sampling soil for re-use. On-site storage of PCS is limited to 180 days in storage containers or 120 days in stockpiles. A PCS form must be submitted within 10 days of on-site storage of PCS and also must be prepared for disposal of PCS at a licensed disposal facility. The PCS form is included in Appendix I.

- Occupational Health and Safety Act (OSHA). The contractor will prepare a health and safety plan and will comply with requirements of 29 Code of Federal Regulation (CFR) 1910 and 1926. Safety considerations to be addressed during construction include slope stability and other excavation hazards, potential ignitability of free product, inhalation and direct contact with contaminants of concern, and heavy equipment operations.

5.4 ACCESS REQUIREMENTS

It is anticipated that the owner will readily provide legal access to the property. AOC 3 is physically accessible by an access road to the north and east. Since there will be considerable truck traffic, CRAA will need to be consulted with respect to the most appropriate access route. Excavation will disturb 20,000 square feet of paved surfaces. This will temporarily reduce the only access to a nearby building to one lane and will reduce parking space for building occupants. Depending on building occupancy at the time of the remedial action, a temporary access route may need to be established. In addition, the time during which these areas are disturbed will need to be minimized.

[7] It has been assumed that all soil will qualify for disposal as a special waste. If any soil is determined to be a Resource Conservation and Recovery Act (RCRA) hazardous waste, it will be managed and disposed of as such at a properly permitted facility.

The AOC does not contain any structures, but it does contain active utilities and overlaps a portion of a paved access road and parking lot. Water, electric and telephone lines will be removed, disconnected, and/or replaced or relocated before excavation of contaminated soil is implemented. Utility disconnect locations will be marked, if appropriate for future site development.

5.5 SAMPLING AND MONITORING

Sampling and monitoring will be required for waste characterization for disposal, to confirm removal of soil containing COC concentrations above action levels, to ensure concentrations in stockpiled overburden and backfill do not exceed re-use ALs, and to verify that LNAPL has been removed and that groundwater concentrations are below action levels following soil removal. This section summarizes the sampling and monitoring requirements, including the groundwater monitoring plan.

It is not anticipated that ambient air monitoring will be required during the remedial action based on the type and concentration of contaminants anticipated and the moisture content of the soil in which the contaminants have been detected (below the smear zone). Air monitoring will be conducted as required under the health and safety plan and will be used to evaluate whether ambient air monitoring is required.

5.5.1 Sampling During the Remedial Action

A work plan will be prepared for the proposed sampling activities. Sampling during the remedial action will include the following:

- Groundwater sampling during field investigation or remedial action. During the field investigation or during the remedial action, groundwater may be analyzed for VOCs and SVOCs, total suspended solids, oil and grease, and total organic carbon to evaluate treatment and disposal options.

- Treated water sampling. The City of Columbus will require at least one sample of treated water to approve discharge to the sanitary sewers. Depending on the volume of water generated, additional samples may be required. Analytical requirements for groundwater contaminated with petroleum hydrocarbons include BTEX; hydrocarbons fats, oil and grease (FOG), pH, and lower explosive limit. Volume discharged must also be reported in gallons per day.

- Soil characterization sampling. This will be contingent upon disposal facility requirements. According to 40 CFR 261.4(b)10, petroleum-contaminated media that fails the toxicity characteristic leaching procedure (TCLP) for wastes D018-D043, is exempt from management as a RCRA hazardous waste and is subject to 40 CFR Part 280 corrective action. This exemption does not include wastes identified as characteristic hazardous wastes on the basis of toxicity for metals. No metals analyses were identified in the historical soil data. If additional characterization is required, it is proposed that the samples be collected in a preliminary field investigation, so that the waste may be pre-approved for disposal. The samples would be collected at depths between 10 and 18 feet

bgs using a hydraulic probe. The hydraulic probe might also be used to collect groundwater samples. The types of analyses and the number of samples to be collected would be contingent on the disposal facility requirements.

- Recovered free product characterization sampling. This will be contingent upon the disposal/recycling facility. Analytical requirements typically include BTEX and ignitability. The petroleum exemptions discussed in the preceding bullet would also apply to recovered product. On the basis of existing data, the free product is unlikely to be a RCRA characteristic hazardous waste on the basis of toxicity for metals. Recovered product could be a RCRA characteristic waste based on ignitability, if it is not recycled.

- Stockpile sampling. BUSTR requires that excavated soil to be re-used as backfill must be sampled to evaluate whether re-use ALs are exceeded. Samples for field screening must be collected every 50 cubic yards, with sampling for laboratory analysis approximately every 100 cubic yards. The stockpile volume will be estimated, and stockpile sampling conducted as specified in Section 4 of the BUSTR technical manual. On the basis of the estimated volume to be stockpiled for re-use, approximately 700 samples will be required for field screening and 350 for laboratory analysis. Re-use Action Levels are included in Table 2. Samples will be analyzed for all the identified COCs, with the exception of methyl tertiary butyl ether (MTBE), which is not applicable to jet fuel.

Table 2. Re-use Action Levels

Chemical of Concern	Re-use AL
Benzene	0.015
Toluene	4.910
Ethylbenzene	4.550
Xylenes	15.700
Methyl tertiary butyl ether	0.047
Benzo(a)anthracene	2.200
Benzo(b)fluoranthene	5.530
Benzo(k)fluoranthene	1.970
Benzo(a)pyrene	1.100
Chrysene	1.270
Dibenzo(a,h)anthracene	0.940
Indeno(1,2,3-cd)pyrene	0.150
Naphthalene	3.980
TPH (C6-12)	1,000
TPH (C10-C20)	2,000
TPH (C20-C34)	5,000

- Backfill sampling. Although not required by BUSTR, at least one soil sample will be collected from each off-site backfill source. The sample will be analyzed for the same analytes as the stockpiled soil, and the results will be compared to the re-use action levels.

- Soil confirmation sampling. Soil samples will be collected on the sides and base of the excavation to confirm that COC concentrations are below the specified action levels. As required by BUSTR, samples for field screening will be collected from every 100 square

feet of the excavation walls and base. These samples will be biased towards areas of highest contamination. Since the soil volume will be greater than 400 cubic yards, only two samples from each excavation wall and the base of the excavation must be submitted for laboratory analysis. However, because of the size of the excavation and the need to backfill as the excavation progresses, it is proposed that one sample be collected for every 40 by 40 foot grid on the base of the excavation and every 40 feet along the sides of the excavation for an estimated total of 65 samples. The samples will be analyzed for BTEX and TPH-LDF and MDF.

Sampling techniques specified in Appendix A of the BUSTR technical manual will be followed for field screening and soil confirmation sampling.

5.5.2 Groundwater Monitoring Plan

On the basis of the historical groundwater data and the proposed ALs, groundwater monitoring is necessary to demonstrate that measurable free product is no longer present within the free product area. No modeling was conducted to establish SSTLs, and no contaminant concentrations in groundwater in any of the monitoring wells previously exceeded the ALs in Section 1.2. A period of groundwater monitoring will be required to demonstrate that the free product has been removed and that concentrations of the COCs in the groundwater remain below ALs in the free product area after the free product has been excavated. As discussed in Section 1.2, the point of exposure (POE) is located 300 feet from the former UST area, but is not considered relevant to the monitoring plan, since contaminant concentrations in groundwater have not previously exceeded the ALs. The proposed monitoring wells (points of demonstration) are located within the former source area and between the source area and the POE in all directions.

5.5.2.1 Monitoring Well Installation

Since the monitoring wells within the free product area will be removed during excavation, new monitoring wells will be installed within the former free product area. The borings will be drilled with hollow stem augers and continuously sampled, and the wells will be installed and constructed in the same manner as existing monitoring wells at AOC 3 and in accordance with Appendix A of the BUSTR technical manual. The number and location of these wells will be determined once the excavation has been completed and the actual extent is known. A minimum of three new wells will be installed based on the proposed area of excavation and the number of wells where free product in excess of 0.01 foot has been observed since 2007. The well locations and elevations will be surveyed before sampling, and the survey will be tied into existing site survey data.

5.5.2.2 Groundwater Sampling

The new wells and six existing monitoring wells (LMW-7, LMW-38, LMW-37, LMW-33, LMW-36, and LMW-35, assuming these wells are not removed during excavation) will be monitored quarterly for one year to demonstrate that free product has been removed and concentrations in groundwater remain below ALs. All the wells will be developed at least 24 hours before the first sampling event. Water levels and free product thickness, if present, will be measured using an oil/water interface probe before sampling each well during each sampling

event. Purging and sampling will be conducted using low-flow sampling procedures. Dedicated equipment will be used to the extent possible at each well, and other equipment will decontaminated between wells. Development, purge, and decontamination fluids will be containerized in 55-gallon drums and disposed of properly once analytical data have been received.

Groundwater samples will be shipped under chain of custody by overnight courier to a laboratory accredited in accordance with BUSTR requirements. The groundwater samples will be analyzed for BTEX, PAHs, and TPH-LDF and MDF. Well development, purging, sample procedures, sample preservation and management, and record keeping will conform to the requirements of Appendix A of the BUSTR technical manual.

5.5.2.3 Quality Assurance/Quality Control

A quality assurance project plan will be prepared for the groundwater monitoring in accordance with the *Uniform Federal Policy for Quality Assurance Project Plans*, EPA-5050B004-900A and DTIC ADA 427785, March 2005. Quality control samples will include trip blanks, equipment blanks, and duplicates.

5.5.2.4 Termination and Completion Report

If at the end of four quarters of monitoring free product and concentrations of COCs have remained below the proposed AL, a completion report will be prepared and submitted within 90 days of receipt of the analytical results from the last sampling event. The completion report will present the well installation and the results of all the sampling events. It will include boring and well construction logs, laboratory data, well development documentation, low-flow purging field measurements, and other field documentation. Following BUSTR acceptance of the monitoring results, the wells will be sealed in accordance with the Ohio Environmental Protection Agency Water Well Standards OAC 3745-9.

5.6 REMEDIAL ACTION SCHEDULE AND PROJECTED REMEDIATION COMPLETION DATE

A project involving removal of 17,500 cubic yards of contaminated soil and stockpiling of an additional 35,000 cubic yards of soil will take six to nine months to complete on site. Table 3 presents a generic outline of the time to complete various tasks.

Table 3. Remedial Action Schedule

Task	Months from Notice to Proceed
Prepare Bid Documents	6
Receive and Review Bids	9
Prepare Construction/Sampling Planning Documents	15
Public Notice	16
Investigation/Mobilization	17

Task	Months from Notice to Proceed
Construction Completion	26
Site Restoration/Monitoring	41

The projected project completion date is June 2017, if work begins in January 2014.

6.0 REFERENCES

1. *Performance Work Statement*
2. *Technical Guidance Manual for Closure, Corrective Action, and Petroleum Contaminated Soil Rules*, Ohio Department of Commerce Bureau of Underground Storage Tank Regulations, July 1, 2012, Revised August 2012.
3. *Remedial Investigation (RI), Phase II Report, Area of Concern (AOC) 3 Former Building 1045 Area,* Maxim Technologies, Inc., June 2002.
4. *Final Monitored Natural Attenuation Assessment Report Former Lockbourne Air Force Base*, URS, June 2011.
5. *Remedial Action Plan (RAP), Area of Concern (AOC) 3 Former Building 1045 Area,* US Army Corps of Engineers, November 2007.
6. *WIDE Implementation for LNAPL Extraction, Rickenbacker International Airport Area of Concern 3 (AOC – 3), Phase III – Final Report*, Army Corps of Engineers, May 15, 2008.
7. *Remedial Technologies Evaluation Report, Petroleum Contamination of Soil and Groundwater at Former Underground Storage Tank Farms, Lockbourne Air Force Base, Columbus, Ohio*, S&A , SCS, SEH, October 9, 2012.
8. *Free Product Recovery Forms for Rickenbacker International Airport AOCs 3, 8/9, and 11*, prepared by Environmental Quality Management, Inc., July 3, 2013.
9. Tier 2 Evaluation Report Form Building 1045 Area AOC 3, prepared by Tetra Tech, August 2007.
10. Letter to Kevin Jasper, USACE Louisville District, from David Israel, Ohio Department of Commerce, regarding approval of AOC 3 Tier 2 evaluation, September 24, 2007.
11. *Toxicological Profile for Jet Fuels JP-4 and JP-7*, Agency for Toxic Substances and Disease Registry, June 1995.
12. *Technology Overview Evaluating Natural Source Zone Depletion at Sites with LNAPL,* Interstate Technology & Regulatory Council, April 2009.
13. *Technical/Regulatory Guidance Evaluating LNAPL Remedial Technologies for Achieving Project Goals,* Interstate Technology & Regulatory Council, December 2009.
14. *Technical/Regulatory Guidance Development of Performance Specifications for Solidification/Stabilization,* Interstate Technology & Regulatory Council, July 2011.
15. "Resurgence of In Situ Soil Mixing for Treating NAPL Source Areas," Tom Palaia/CH2MHILL, 2007 Air Force ESOH Training Symposium.
16. *Presumptive Remedy: Supplemental Bulletin Multi-Phase Extraction (MPE) Technology for VOCS in Soil and Groundwater*, EPA 540-F-97-004, United States Environmental Protection Agency, April 1997.
17. *Multi-Phase Extraction: State-of-the-Practice*, EPA 542-R-99-004, United States Environmental Protection Agency, June 1999.
18. *Enhanced Removal of Separate Phase Viscous Fuel by Electrical Resistance Heating and Multi Phase Extraction*, Mr. Gregory Beyke, P.E., Vice President of Engineering, Thermal Remediation Services, Inc.

19. *Soil Vapor Extraction Enhanced by Six-Phase Soil Heating at Poleline Road Disposal Area, Fort Richardson, Alaska*, Federal Remediation Technologies Roundtable.

20. *Electrical Resistance Heating (ERH) Technology Coupled with Air Sparging and Soil Vapor Extraction for Remediation of MTBE and BTEX in Soils and Groundwater in Ronan, Montana*, Jeffrey A. Kuhn, Kenneth R. Manchester, and Patrick Skibicki.

21. *In-Situ Chemical Oxidation*, EPA/600/R-06/072, USEPA Office of Research and Development, National Risk Management Research laboratory, Cincinnati, Ohio, August 2006.

22. *Principles of Chemical Oxidation Technology for the Remediation of Groundwater and Soil, Design and Application Manual* Section 5.3.1. Version 2.0, Regenesis, March 2007.

23. *Surfactants Types and Uses*, FRIP Booklet #E300-A, Universidad De Los Andes, 2002. Web. 12 Aug. 2011.

24. *Surfactant-Enhanced Aquifer Remediation (SEAR) Implementation Manual*, Naval Facilities Engineering Command, NFESC Technical Report TR-2219-ENV, Intera Inc. and Naval Facilities Engineering Service Center, April 2003.

25. *Surfactants Types and Uses*, FIRP Booklet #E300-A, Teaching Aid in Surfactant Science and Engineering. Jean-Lois Salager, 2002.

26. *Electrical Resistance Heating*, Water and Soil Bio-Remediation, 2011.

27. *Thermal Treatment: In Situ Overview*, US EPA Technology Innovation and Field Services Division Contaminated Site Clean-Up Information,<http://clu-in.org/techfocus/default.focus/sec/Thermal_Treatment%3A_In_Situ/cat/Overview/>

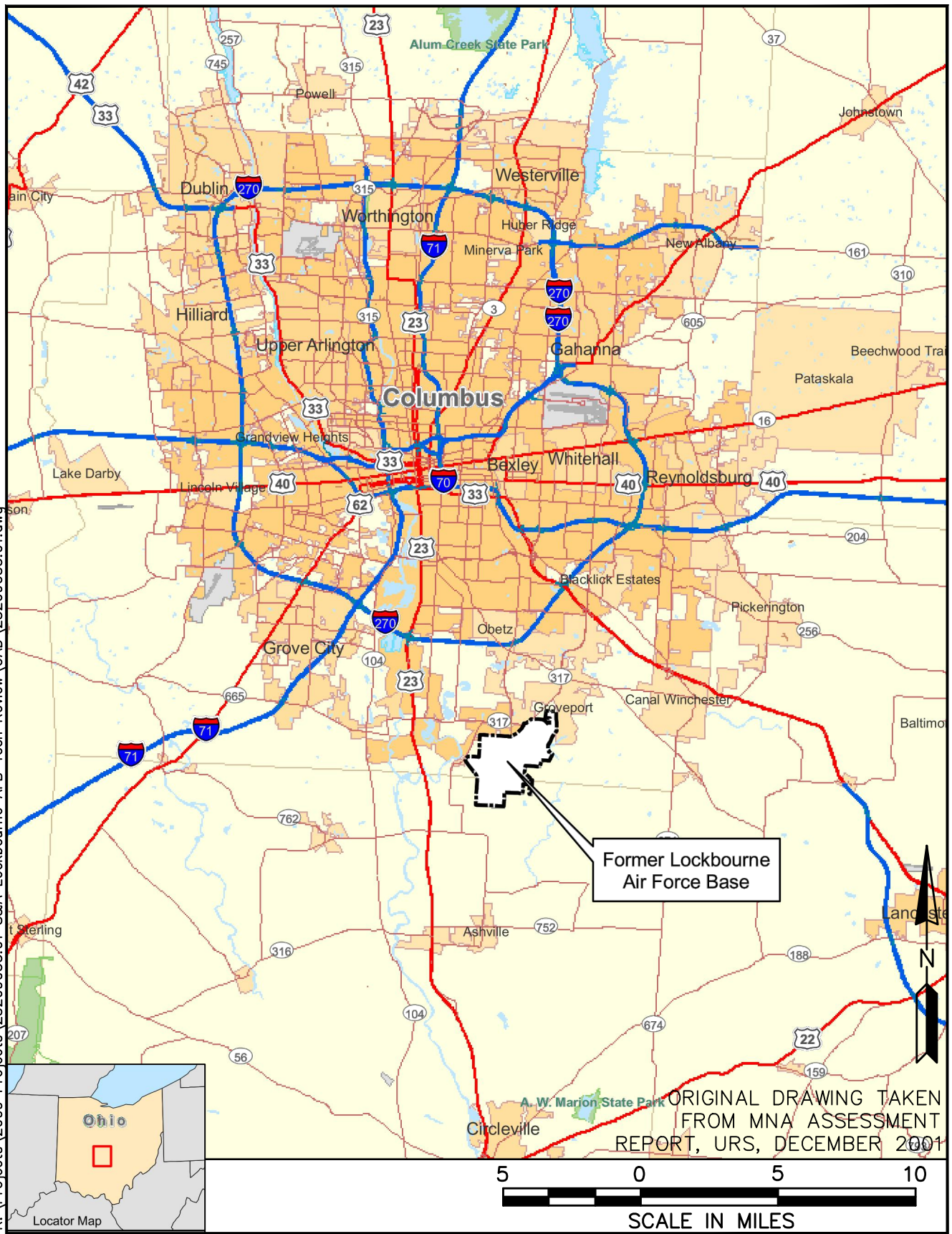
28. *LNAPL Remediation Using Electrical Resistance Heating,* Jerry Wolf, TRS Group, Inc., November 30, 2009. <http://www.thermalrs.com/technology/whitePapers/ERH%20NAPL%20OH%20113009%20acf.pdf>

ACRONYMS AND ABBREVIATIONS

AL	Action Level
AOC	Area of Concern
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	Below Ground Surface
BMP	Best Management Practice
BTEX	Benzene, Toluene, Ethyl benzene, and Xylenes
BUSTR	Bureau of Underground Storage Tank Regulations
CELRL	Louisville District U.S. Army Corps of Engineers
CFR	Code of Federal Regulations
cm/s	Centimeters per Second
COC	Contaminant of Concern
CRAA	Columbus Regional Airport Authority
CSM	Conceptual Site Model
DNAPL	Dense Nonaqueous Phase Liquid
DO	Dissolved Oxygen
DRO	Diesel Range Organics
EA	Environmental Assessment
EPA	Environmental Protection Agency
ERH	Electrical Resistance Heating
FOG	Fats, Oil, and Grease
gpm	Gallons per Minute
GRO	Gasoline Range Organics
ISCO	In-Situ Chemical Oxidation
ISSM	In-Situ Soil Mixing
LAFB	Lockbourne Air Force Base
LDF	Light Distillate Fraction
LNAPL	Light Nonaqueous Phase Liquid
LLC	Limited Liability Company
MDF	Middle Distillate Fraction
MNA	Monitored Natural Attenuation Assessment
MPE	Multi-Phase Extraction
MPEH	Multi-Phase Extraction with Heating
msl	mean sea level
MTBE	Methyl Tert-Butyl Ether
NPDES	National Pollutant Discharge Elimination Systems Permit
NSZD	Natural Source Zone Depletion
NOI	Notice of Intent
OAC	Ohio Administrative Code
ORP	Oxidation/Reduction Potential
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbon
PCS	Petroleum Contaminated Soil
PID	Photo-Ionization Detector
POE	Point of Exposure

PWS	Performance Work Statement
RAFB	Rickenbacker Air Force Base
RAO	Remedial Action Objective
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RTE	Remedial Technology Evaluation
S&A	S&A Environmental Consultants, LLC
SCAPS	Site Characterization and Analysis Penetrometer System
SCS	SCS Engineers
SELR	Surfactant Enhanced LNAPL Removal
SFSS	Site Feature Scoring System
SSTLs	Site-Specific Target Levels
SVE	Soil Vapor Extraction
SVOC	Semi-Volatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total Petroleum Hydrocarbons
USACE	United States Army Corps of Engineers
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds
WIDE	Well Injection Depth Extraction

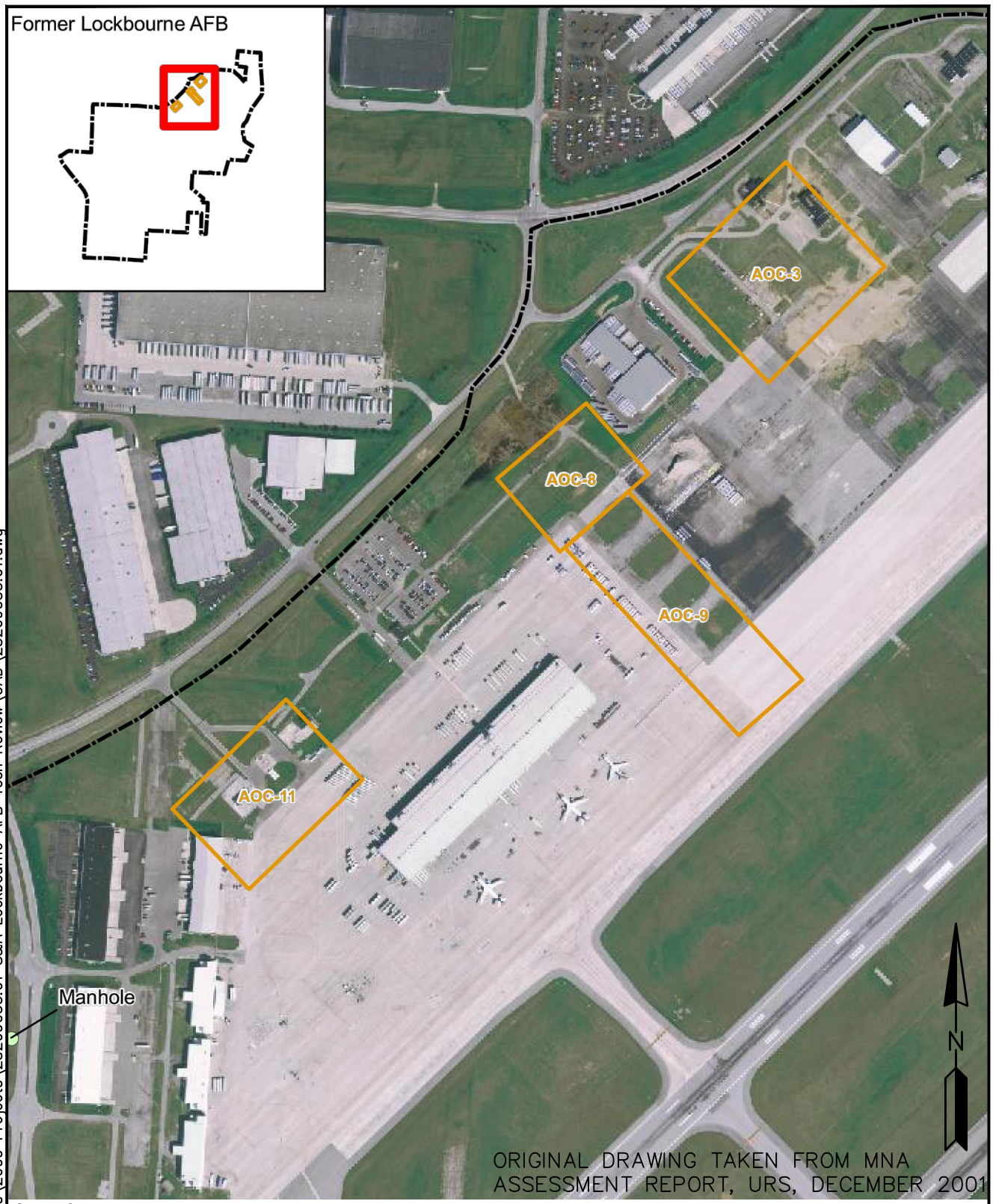
Figures



ORIGINAL DRAWING TAKEN FROM MNA ASSESSMENT REPORT, URS, DECEMBER 2001

K:\Projects\2009 Projects\23209055.01 S&A Lockbourne AFB Tech Review\CAD\23209055.01.dwg

SCS ENGINEERS	SITE LOCATION MAP	FIGURE 1
DSN. BY _____ CHK. BY D. ENGLISH	FORMER LOCKBOURNE AIR FORCE BASE	
DWN. BY B. CLEMENTS REV: _____	OHIO	



Legend

- Area of Concern
- Installation Boundary
- Manhole

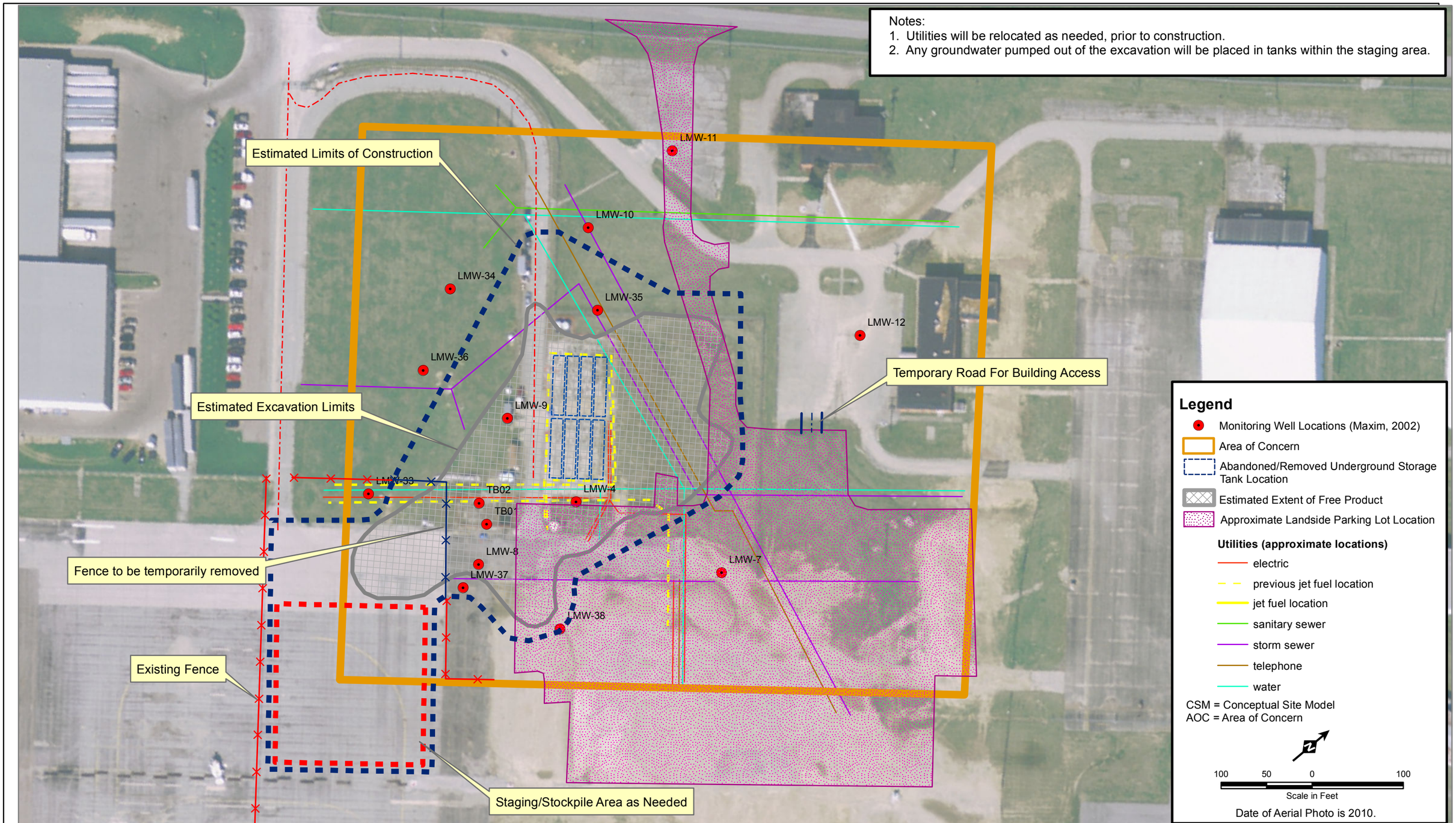
600 0 600 1200

SCALE IN FEET

K:\Projects\2009 Projects\23209055.01 S&A Lockbourne AFB Tech Review\CAD\23209055.01.dwg

SCS ENGINEERS	AREAS OF CONCERN FORMER LOCKBOURNE AIR FORCE BASE OHIO	FIGURE 2
DSN. BY_____ CHK. BY D. ENGLISH DWN. BY B. CLEMENTS REV: _____		

Notes:
1. Utilities will be relocated as needed, prior to construction.
2. Any groundwater pumped out of the excavation will be placed in tanks within the staging area.



REMEDIAL ACTION PLAN AOC 3
AT FORMER LOCKBOURNE AIR FORCE BASE
OHIO

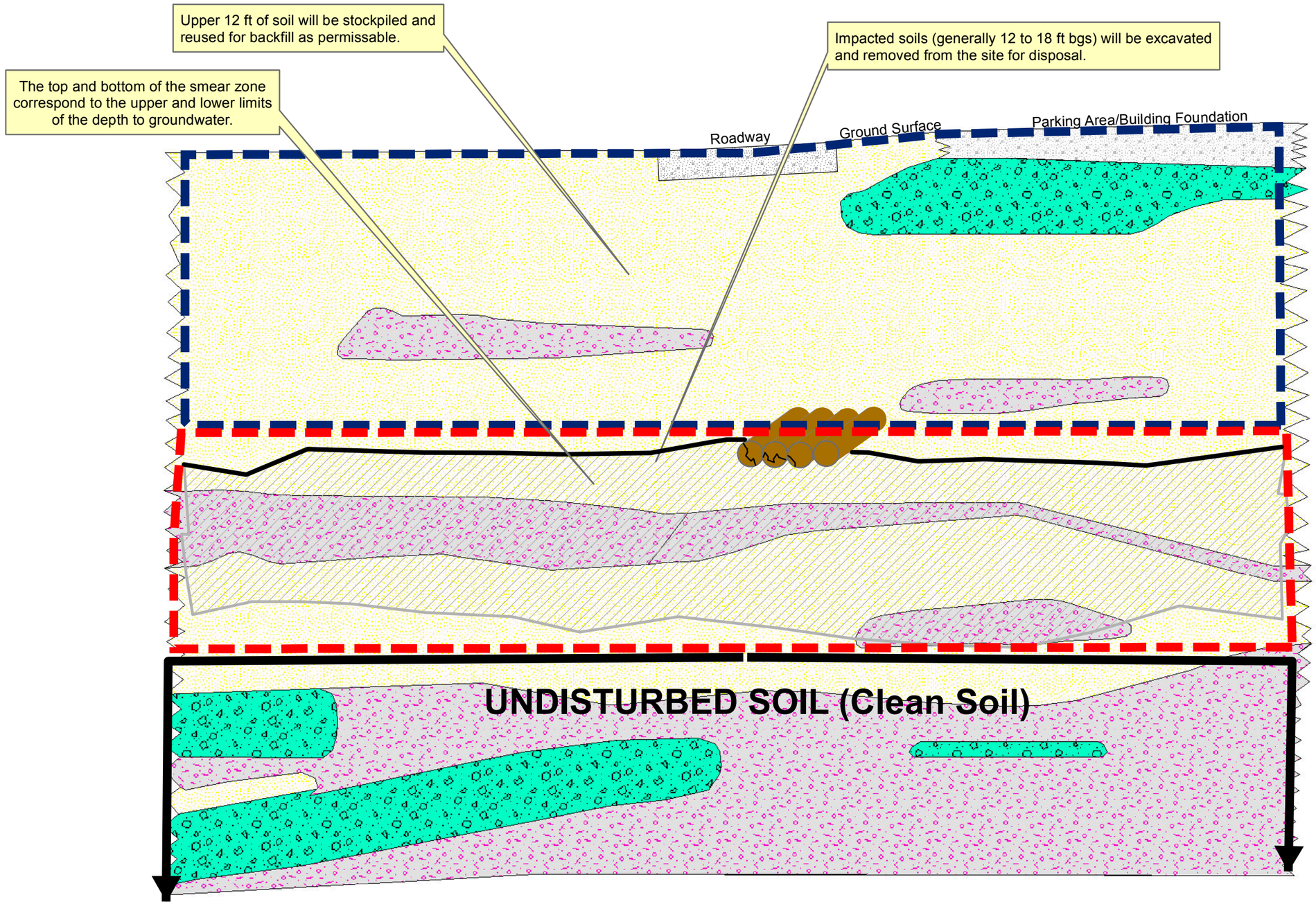
SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
10975 EL MONTE, SUITE 100
OVERLAND PARK, KS 66211
PH. (913) 451-7510 FAX NO. (913) 451-7513

PROJECT NO. 23209055.03 | DATE: APRIL 2013

CSM Excavation Planar View AOC 3

Figure 3

Path: K:\Projects\2009 Projects\23209055.03 S&A LAFB RAPs\CAD\ArcMap\Figure 3_AOC3_Excavation_Planar_View.mxd



Legend

- Concrete/asphalt & subgrade fill material
- Course Grained Soils (Gravels and Gravels with Fines)
- Fine Grained Soils (Silts and Clays)
- Medium to Course Grained Soils (Clean Sands and Sands with Fines)
- Free Product (LNAPL)
- Residual Phase Smear Zone
- Boundary of soil to be stockpiled and reused for backfill as permissible
- Boundary of soil to be excavated and removed from site for disposal

CSM = Conceptual Site Model
AOC = Area of Concern
ft bgs = feet below ground surface
ft = feet
LNAPL = light non-aqueous phase liquid

Note:
1. Stockpiled soil may be mixed with general backfill delivered to site.
2. Utilities will be relocated as needed, prior to construction.
3. Structural backfill will be placed underneath buildings and/or parking areas. General backfill will be used for all other areas.
4. Drawing represents a conceptual model based on general characteristics of the AOC.
5. This drawing is a representative cross section of the upper 30 to 40 feet and is not to scale.
6. Based on available information, the free product exists mostly in the higher permeability zones and is smeared into the lower permeability zone just above and just below.
7. Actual excavation walls will be sloped for safety purposes beyond the limits shown.

REMEDIAL ACTION PLAN AOC 3
AT FORMER LOCKBOURNE AIR FORCE BASE
OHIO

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
10975 EL MONTE, SUITE 100
OVERLAND PARK, KS 66211
PH. (913) 451-7510 FAX NO. (913) 451-7513

PROJECT NO. 23209055.03 | DATE: APRIL 2013

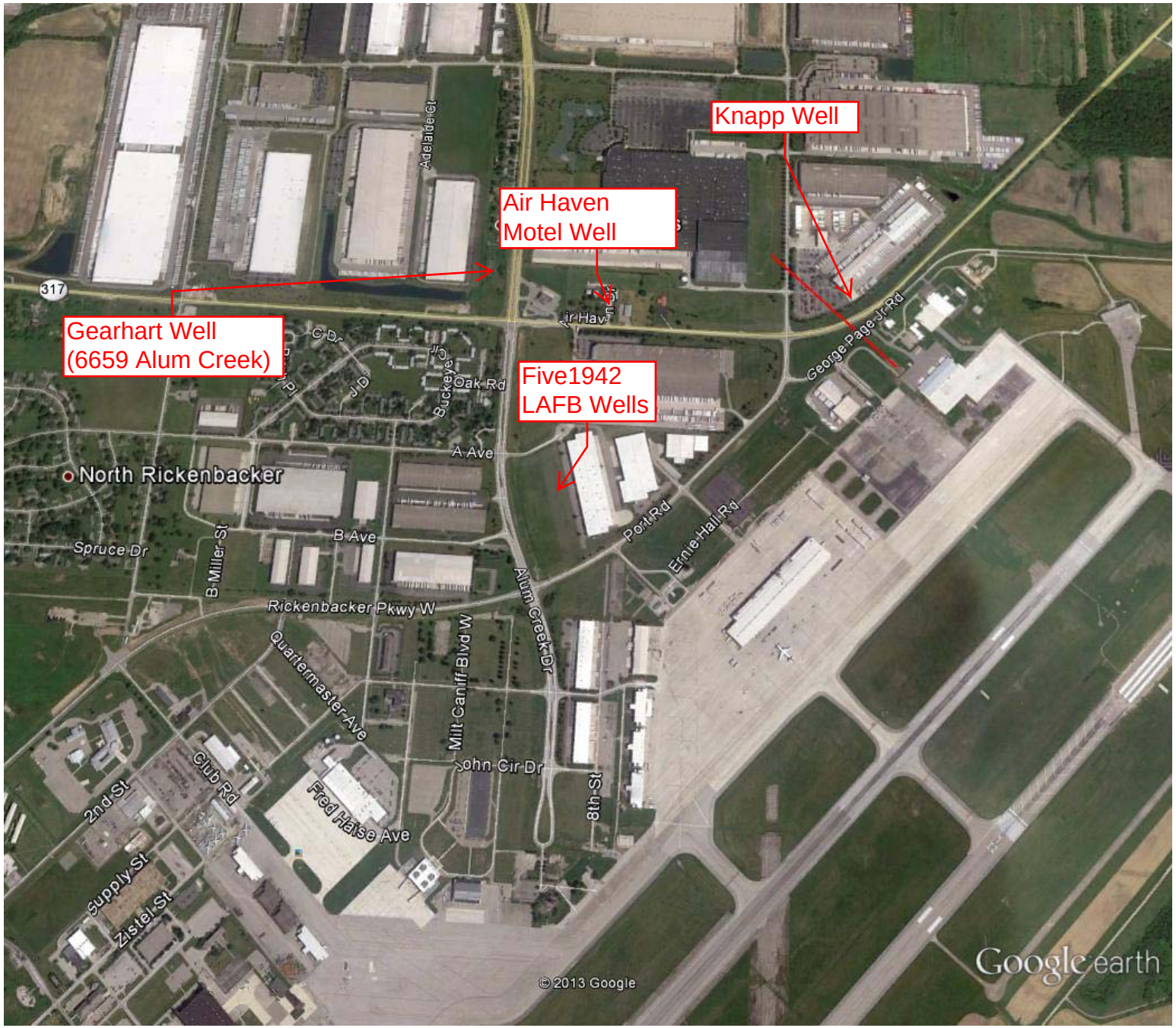
CSM Excavation Cross Section AOC 3

Figure 4

Path: K:\Projects\2009 Projects\23209055.03 S&A LAFB RAPs\CAD\ArcMap\Figure 4_ExcavationCrossSection_AOC3_v0.1.mxd

Appendix A

Well Search Information



Google earth

Nearest Wells to Former Lockbourne Air Force Base Areas of Concern
(Excluding Monitoring Wells)

~1500 Feet

Water Well Log Report On-line Search Results
-Radius Search-

Your Search Criteria Are: Latitude=39.828492, Longitude=82.921489, Radius=2000 ft.

Record count: 1

Modify Radius Search

VIEW IMAGE	LOG NO	HOUSE NO	STREET NAME	OWNER FNAME	OWNER LNAME	COUNTY	TOWNSHIP	TOTAL DEPTH	TEST RATE	STATIC WATER LEVEL	AQUIFER TYPE	VIEW REPORT
TIF	382641	7900	317	JAMES	KNAPP	FRANKLIN	MADISON	45	20	18	SAND & GRAVEL	

Download XML and CSV format of Selected Records (Limit 2000)

Download XML/CSV file

Download Images of Selected Records as ZIPPED file (Limit 2000)
View individual log images by clicking on the TIF icon in the above list.

Download Zipped images

Water Well Log and Drilling Report

Ohio Department of Natural Resources
Division of Soil and Water
Phone: 614-265-6740 Fax: 614-265-6767

Well Log Number: 382641

View Image of Original Well Log

ORIGINAL OWNER AND LOCATION

Original Owner Name: *JAMES KNAPP*

County: *FRANKLIN* **Township:** *MADISON* **Section Number:**

Address: *7900 SR 317* **Lot Number:**

City: **State:** *OH* **Zip Code:**

Location Number: *555* **Location Map Year:** *1990* **Location Area:**

Latitude: *39.830756* **Longitude:** *-82.923785*

CONSTRUCTION DETAILS

Borehole Diameter: 1: **2:** **Borehole Depth: 1:** *45 ft.* **2:** **Depth to Bedrock:**

Casing Diameter: 1: *4.25 in.* **2:** **Casing Length: 1:** *45 ft.* **2:** **Casing Thickness: 1:** **2:**

Casing Height Above Ground: **Aquifer Type:** *SAND & GRAVEL*

Date of Completion: *3/20/1970* **Total Depth:** *45 ft.* **Well Use:**

Driller's Name: *LEWIS WELL DRILLING, SAM*

Screen Diameter: **Slot Size:** **Screen Length:**

Type: **Material:**

Set Between:

Gravel Pack Material/Size: **Vol/Wt Used:**

Method of Installation: **Placed:**

Grout Material/Size: **Vol/Wt Used:**

Method of Installation: **Placed**

WELL TEST DETAILS

Static Water Level: *18 ft.* **Test Rate:** *20 gpm* **Associated Reports**

Drawdown: **Test Duration:** *2 hrs.*

COMMENTS:

WELL LOG

Formations	From	To
CLAY	0	38
SAND & GRAVEL	38	45

Printing Tips (opens in new window)

Print This Page Close

Well log questions - Web site questions - Web policies

Water Well Log Report On-line Search

Your Search Criteria Are: COUNTY=FRANKLIN,TOWNSHIP=MADISON,STREET NUMBER=6500-7500,STREET NAME EXACTLY ALUM CREEK,STREET NAME EXACTLY LONDON-GROVEPORT,STREET NAME EXACTLY GEORGE PAIGE,STREET NAME EXACTLY PORT

Record count: 32

Modify Custom Search

VIEW IMAGE	LOG NO	HOUSE NO	STREET NAME	OWNER FNAME	OWNER LNAME	COUNTY	TOWNSHIP	TOTAL DEPTH	TEST RATE	STATIC WATER LEVEL	AQUIFER TYPE	VIEW REPORT
TIF	396521	6505	ALUM CREEK	GEL	MELREGON	FRANKLIN	MADISON	110	12	41	GRAVEL	
TIF	1009479	6515	ALUM CREEK	PAUL	GRAVES	FRANKLIN	MADISON	85	100	12	SAND & GRAVEL	
TIF	765401	6543	ALUM CREEK		CERTIFIED OIL	FRANKLIN	MADISON	111	20	21	SAND & GRAVEL	
TIF	848930	6659	ALUM CREEK	ORA	GEARHART	FRANKLIN	MADISON	107	50	35	SAND & GRAVEL	
TIF	2018015	7400	ALUM CREEK		RICKENBACKER AIR	FRANKLIN	MADISON	26		26	SAND & GRAVEL	
TIF	2018016	7400	ALUM CREEK		RICKENBACKER AIR NAT	FRANKLIN	MADISON	30		30	SAND & GRAVEL	
TIF	2018018	7400	ALUM CREEK		RICKENBACKER AIR NAT	FRANKLIN	MADISON	16		16	SAND & GRAVEL	
TIF	2018019	7400	ALUM CREEK		RICKENBACKER AIR NAT	FRANKLIN	MADISON	15.50		15.50	SAND & GRAVEL	
TIF	976276	7500	ALUM CREEK		RICKENBACKER AFCEE	FRANKLIN	MADISON	20			GRAVEL	
TIF	976327	7500	ALUM CREEK		RICKENBACHER ANGB	FRANKLIN	MADISON	20			GRAVEL	
TIF	976328	7500	ALUM CREEK		RICKENBACKER ANGB	FRANKLIN	MADISON	20			GRAVEL	
TIF	976329	7500	ALUM CREEK		RICKENBACKER ANGB	FRANKLIN	MADISON	20			GRAVEL	
TIF	257475		ALUM CREEK	AL	LIPPERT	FRANKLIN	MADISON	154	10	25	SAND & GRAVEL	
TIF	257487		ALUM CREEK	DON	MCRAY	FRANKLIN	MADISON	32	8	17	SAND & GRAVEL	
TIF	284771		ALUM CREEK	DON	MCRAY	FRANKLIN	MADISON	48	8	22	SAND & GRAVEL	
TIF	284772		ALUM CREEK	DON	MCRAY	FRANKLIN	MADISON	84	10	26	SAND & GRAVEL	

		382484		ALUM CREEK	N	ARCHER	FRANKLIN	MADISON	170			SHALE	
		382485		ALUM CREEK	N	ARCHER	FRANKLIN	MADISON	999	8	30		
		407037		ALUM CREEK	DON	BOTTOMS	FRANKLIN	MADISON	138	15	35	SAND & GRAVEL	
		443820		ALUM CREEK	E	DE BOARD	FRANKLIN	MADISON	83	12	50	SAND & GRAVEL	
		443836		ALUM CREEK	EVERETT	DEBOARD	FRANKLIN	MADISON	123	18	40	SAND & GRAVEL	
		443848		ALUM CREEK	EVERETT	DE BOARD	FRANKLIN	MADISON	91	10	50	SAND & GRAVEL	
		490881		ALUM CREEK		DALE DEBOARD BUILDER	FRANKLIN	MADISON	38	16	16	SAND & GRAVEL	
		490887		ALUM CREEK		DALE DEBOARD BUILDER	FRANKLIN	MADISON	98	7	42	SAND & GRAVEL	
		490894		ALUM CREEK		DALE DEBOARD BUILDER	FRANKLIN	MADISON	123	16	42	SAND & GRAVEL	
		994498		ALUM CREEK		MCNALLY/KIEWIT	FRANKLIN	MADISON	82	1001	16		
		400043	3050	LONDON-GROVEPORT		AIR HAVEN MOTEL	FRANKLIN	MADISON	48	30	19	SAND & GRAVEL	
		728632	3310	LONDON-GROVEPORT	LARRY	CONKEL	FRANKLIN	MADISON	33	10	15	SAND & GRAVEL	
		716735		LONDON-GROVEPORT		RICKENBACKER PORT AU	FRANKLIN	MADISON	21			GRAVEL & CLAY	
		716736		LONDON-GROVEPORT		RICKENBACKER PORT AU	FRANKLIN	MADISON	17			CLAY	
		716737		LONDON-GROVEPORT		RICKENBACKER PORT AU	FRANKLIN	MADISON	17			GRAVEL	
		716738		LONDON-GROVEPORT		RICKENBACKER PORT AU	FRANKLIN	MADISON	17			VOID	

Download XML and CSV format of Selected Records (Limit 2000)

Download XML/CSV file

Download Images of Selected Records as ZIPPED file (Limit 2000)

View individual log images by clicking on the TIF icon in the above list.

Download Zipped images

Contact Us - Website comments/questions - DNR web policy statements

WELL LOG NUMBER	HOUSE NO.	STREET NAME	OWNER'S FIRST NAME	OWNER'S LAST NAME	COUNTY	TOWNSHIP	LATITUDE	LONGITUDE	TOTAL DEPTH	CASE LENGTH	SCREEN LENGTH	SCREEN DIAMETER	TEST RATE	STATIC WATER LEVEL	AQUIFER TYPE	Notes
396521	6505	ALUM CREEK	GEL	MELREGON	FRANKLIN	MADISON	39.83513	-82.93383	110	110			12	41	GRAVEL	North of Hwy 665(317)
1009479	6515	ALUM CREEK	PAUL	GRAVES	FRANKLIN	MADISON	39.8354	-82.934283	85	85	2		100	12	SAND & GRAVEL	North of Hwy 665(317)
765401	6543	ALUM CREEK		CERTIFIED OIL	FRANKLIN	MADISON	39.83451	-82.93389	111	10			20	21	SAND & GRAVEL	North of Hwy 665(317)
848930	6659	ALUM CREEK	ORA	GEARHART	FRANKLIN	MADISON	39.83241	-82.93405	107	97			50	35	SAND & GRAVEL	North of Hwy 665(317)
2018015	7400	ALUM CREEK		RICKENBACKER AIR	FRANKLIN	MADISON	39.81841	-82.93232	26	21	5	2		26	SAND & GRAVEL	Monitoring Well
2018016	7400	ALUM CREEK		RICKENBACKER AIR NAT	FRANKLIN	MADISON	39.81841	-82.93232	30	26.5	5	2		30	SAND & GRAVEL	Monitoring Well
2018018	7400	ALUM CREEK		RICKENBACKER AIR NAT	FRANKLIN	MADISON	39.81841	-82.93232	16	12.5	5	2		16	SAND & GRAVEL	Monitoring Well
2018019	7400	ALUM CREEK		RICKENBACKER AIR NAT	FRANKLIN	MADISON	39.81841	-82.93232	15.5	10.5	5	2		15.5	SAND & GRAVEL	Monitoring Well
976276	7500	ALUM CREEK		RICKENBACKER AFCEE	FRANKLIN	MADISON			20	10	10				GRAVEL	Monitoring Well
976327	7500	ALUM CREEK		RICKENBACHER ANGB	FRANKLIN	MADISON			20	10	10				GRAVEL	Monitoring Well
976328	7500	ALUM CREEK		RICKENBACKER ANGB	FRANKLIN	MADISON			20	10	10				GRAVEL	Monitoring Well
976329	7500	ALUM CREEK		RICKENBACKER ANGB	FRANKLIN	MADISON			20	10	10				GRAVEL	Monitoring Well
257475		ALUM CREEK	AL	LIPPERT	FRANKLIN	MADISON			154	154			10	25	SAND & GRAVEL	West of Alum Creek and North of 665
257487		ALUM CREEK	DON	MCRAY	FRANKLIN	MADISON			32	32			8	17	SAND & GRAVEL	West of Alum Creek and North of 665
284771		ALUM CREEK	DON	MCRAY	FRANKLIN	MADISON			48	48			8	22	SAND & GRAVEL	West of Alum Creek and North of 665
284772		ALUM CREEK	DON	MCRAY	FRANKLIN	MADISON			84	84			10	26	SAND & GRAVEL	West of Alum Creek and North of 665
382484		ALUM CREEK	N	ARCHER	FRANKLIN	MADISON			170	0					SHALE	West of Alum Creek and North of 665
382485		ALUM CREEK	N	ARCHER	FRANKLIN	MADISON			999	73			8	30		West of Alum Creek and North of 665
407037		ALUM CREEK	DON	BOTTOMS	FRANKLIN	MADISON			138	138			15	35	SAND & GRAVEL	West of Alum Creek and North of 665
443820		ALUM CREEK	E	DE BOARD	FRANKLIN	MADISON			83	83			12	50	SAND & GRAVEL	West of Alum Creek and North of 665
443836		ALUM CREEK	EVERETT	DEBOARD	FRANKLIN	MADISON			123	123			18	40	SAND & GRAVEL	West of Alum Creek and North of 665
443848		ALUM CREEK	EVERETT	DE BOARD	FRANKLIN	MADISON			91	91			10	50	SAND & GRAVEL	West of Alum Creek and North of 665
490881		ALUM CREEK		DALE DEBOARD BUILDER	FRANKLIN	MADISON			38	38			16	16	SAND & GRAVEL	West of Alum Creek and North of 665

WELL LOG NUMBER	HOUSE NO.	STREET NAME	OWNER'S FIRST NAME	OWNER'S LAST NAME	COUNTY	TOWNSHIP	LATITUDE	LONGITUDE	TOTAL DEPTH	CASE LENGTH	SCREEN LENGTH	SCREEN DIAMETER	TEST RATE	STATIC WATER LEVEL	AQUIFER TYPE	Notes
490887		ALUM CREEK		DALE DEBOARD BUILDER	FRANKLIN	MADISON			98	98			7	42	SAND & GRAVEL	West of Alum Creek and North of 665
490894		ALUM CREEK		DALE DEBOARD BUILDER	FRANKLIN	MADISON			123	123			16	42	SAND & GRAVEL	West of Alum Creek and North of 665
994498		ALUM CREEK		MCNALLY/KIEWIT	FRANKLIN	MADISON			82	86			1001	16		Not in area (far north)
400043	3050	LONDON-GROVEPORT		AIR HAVEN MOTEL	FRANKLIN	MADISON	39.830595	-82.931839	48	49			30	19	SAND & GRAVEL	East of Alum Creek and North of London-Groveport Road
728632	3310	LONDON-GROVEPORT	LARRY	CONKEL	FRANKLIN	MADISON	39.83968	-82.91041	33	33			10	15	SAND & GRAVEL	Too far east
716735		LONDON-GROVEPORT		RICKENBACKER PORT AU	FRANKLIN	MADISON			21	10					GRAVEL & CLAY	Monitoring Well
716736		LONDON-GROVEPORT		RICKENBACKER PORT AU	FRANKLIN	MADISON			17	7					CLAY	Monitoring Well
716737		LONDON-GROVEPORT		RICKENBACKER PORT AU	FRANKLIN	MADISON			17	7					GRAVEL	Monitoring Well
716738		LONDON-GROVEPORT		RICKENBACKER PORT AU	FRANKLIN	MADISON			17	7					VOID	Monitoring Well

Appendix B

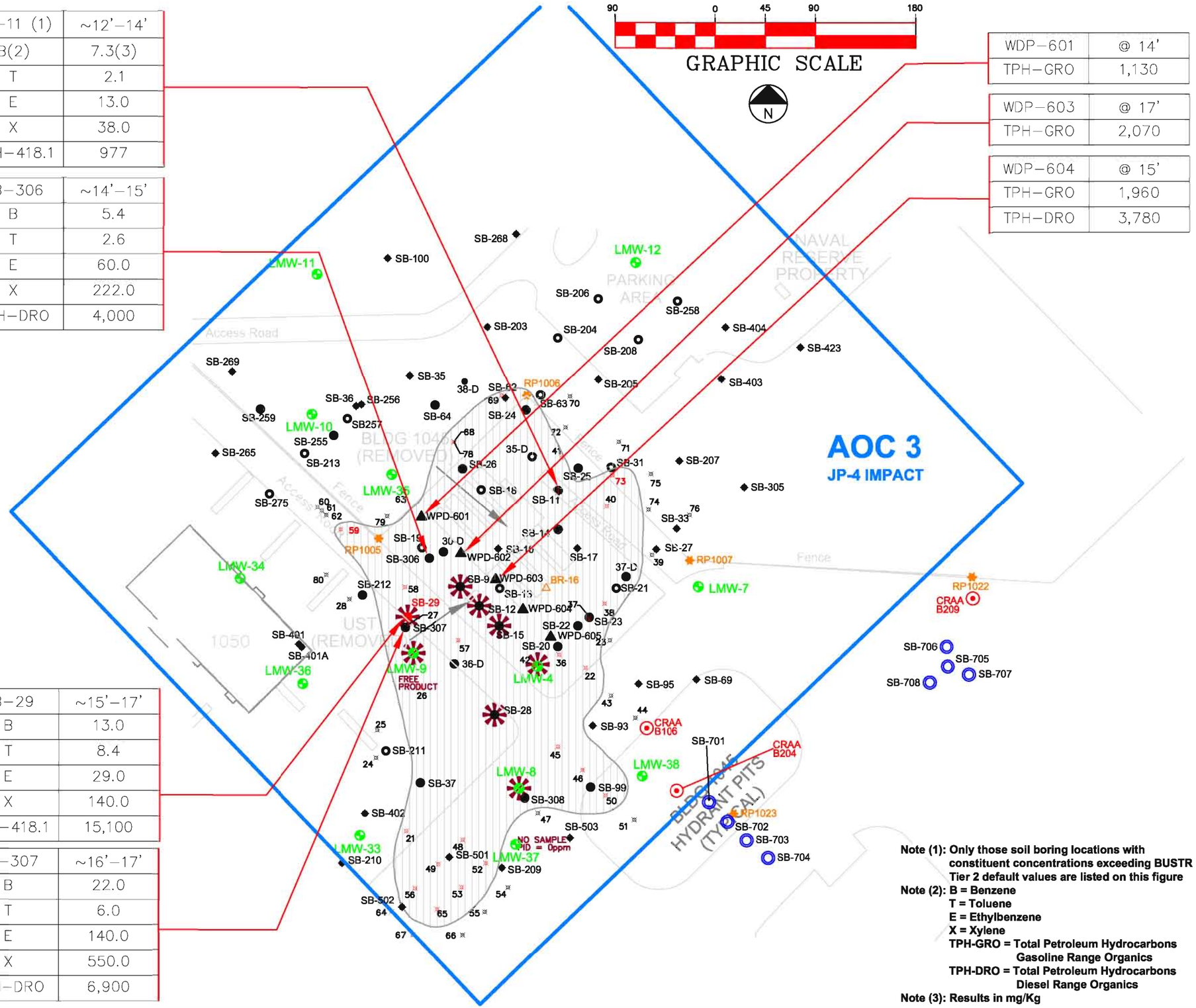
Figures from Previous Reports

SB-11 (1)	~12'-14'
B(2)	7.3(3)
T	2.1
E	13.0
X	38.0
TPH-418.1	977

SB-306	~14'-15'
B	5.4
T	2.6
E	60.0
X	222.0
TPH-DRO	4,000

SB-29	~15'-17'
B	13.0
T	8.4
E	29.0
X	140.0
TPH-418.1	15,100

SB-307	~16'-17'
B	22.0
T	6.0
E	140.0
X	550.0
TPH-DRO	6,900



WDP-601	@ 14'
TPH-GRO	1,130

WDP-603	@ 17'
TPH-GRO	2,070

WDP-604	@ 15'
TPH-GRO	1,960
TPH-DRO	3,780

LEGEND:

- ESTIMATED EXTENT OF FREE PRODUCT
- FREE PRODUCT ENCOUNTERED IN WELL OR BORING
- PHASE I DEEP SOIL BORING LOCATION (0-27')
- PHASE I SHALLOW SOIL BORING LOCATION 90-15')
- MONITOR WELL LOCATION
- RPA MONITOR WELL LOCATION
- CRAA GEOTECHNICAL BORINGS
- TT SOIL BORINGS (701-708)
- SOIL BORING LOCATION ABOVE PRIOR BUSTR CATEGORY 3 CRITERIA
- SOIL BORING LOCATION ABOVE PRIOR BUSTR
- SOIL BORING LOCATION ABOVE PRIOR BUSTR
- SOIL BORING LOCATION BELOW PRIOR BUSTR
- SOIL BORING REFUSAL LOCATION
- SURVEYED REFERENCE POINTS
- WIDE DP-601 to 605 (TPH ANALYSES NOV '06)
- STORM SEWER INLET
- S — SAN. SEWER LINE
- W — WATER LINE
- TOPOGRAPHIC CONTOUR LINE
- DRAINAGE
- SS — STORM SEWER LINE
- STREAM
- JET FUEL/AVGAS(PREV. REMOVED)
- JF — JET FUEL/AVGAS(GROUTED/PLACE)
- JF — JET FUEL/AVGAS
- T — TELEPHONE LINE
- E — ELECTRIC LINE

Note (1): Only those soil boring locations with constituent concentrations exceeding BUSTR Tier 2 default values are listed on this figure

Note (2): B = Benzene
T = Toluene
E = Ethylbenzene
X = Xylene
TPH-GRO = Total Petroleum Hydrocarbons Gasoline Range Organics
TPH-DRO = Total Petroleum Hydrocarbons Diesel Range Organics

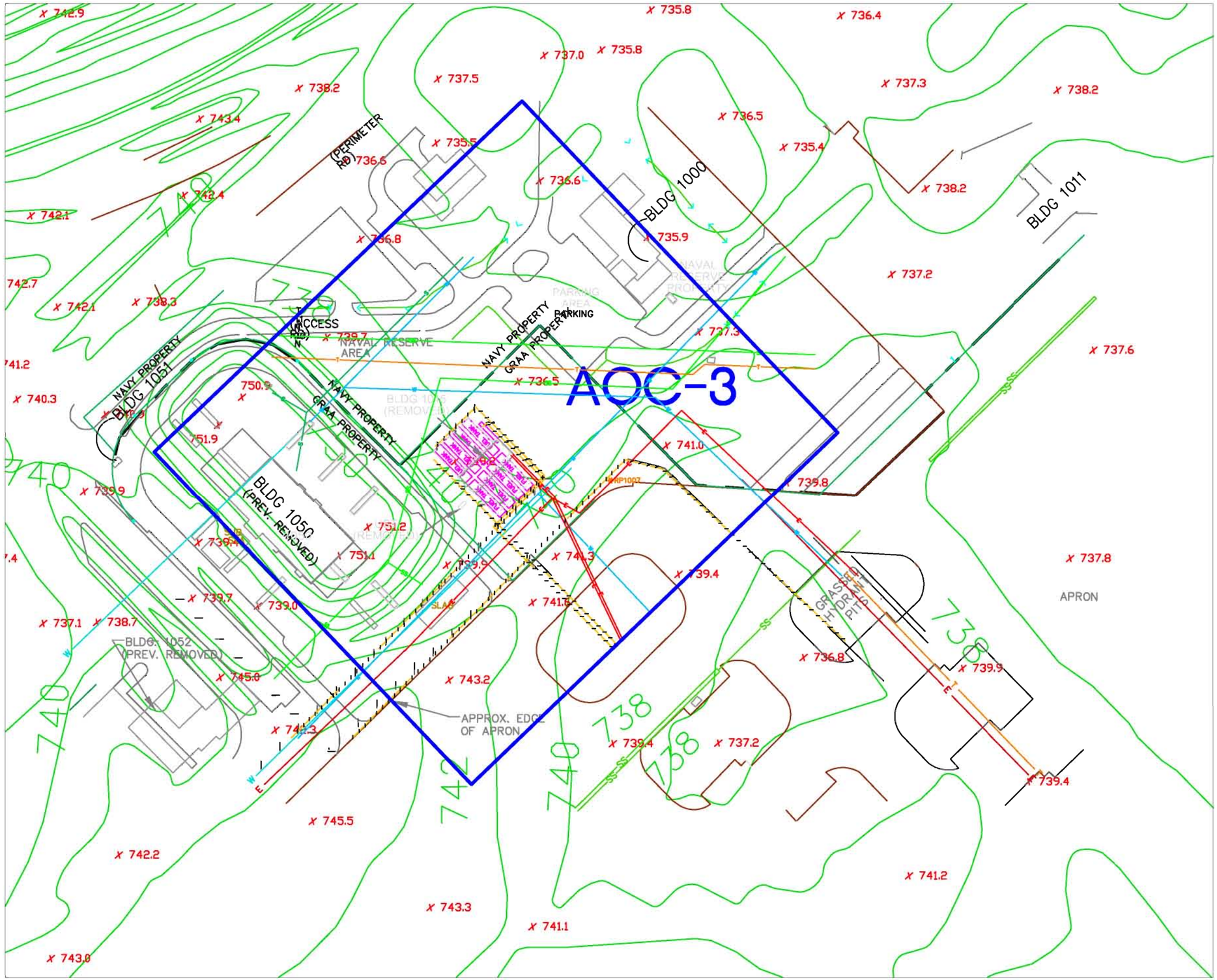
Note (3): Results in mg/Kg

Tetra Tech, Inc.
Environmental Engineers & Scientists

SITE:	Former Lockbourne Air Force Base		
LOCATION:	Columbus, Ohio		
PROJECT:	BUSTR Tier 2 Report - AOC 3		
TITLE:	SITE MAP - AOC 3		
USACE CONTRACT #:	DACW62-94-D-0001		
TETRA TECH PROJECT NO.:	19170		
SCALE:	Graphic	CHECKED BY:	DNL
DATE:	8/16/2007	DRAWN BY:	DWC

FIGURE 3

FILE NAME: Figure 3 Site Map AOC 3.dwg



N

130 0 65 130 260

GRAPHIC SCALE
(IN FEET)

LEGEND:

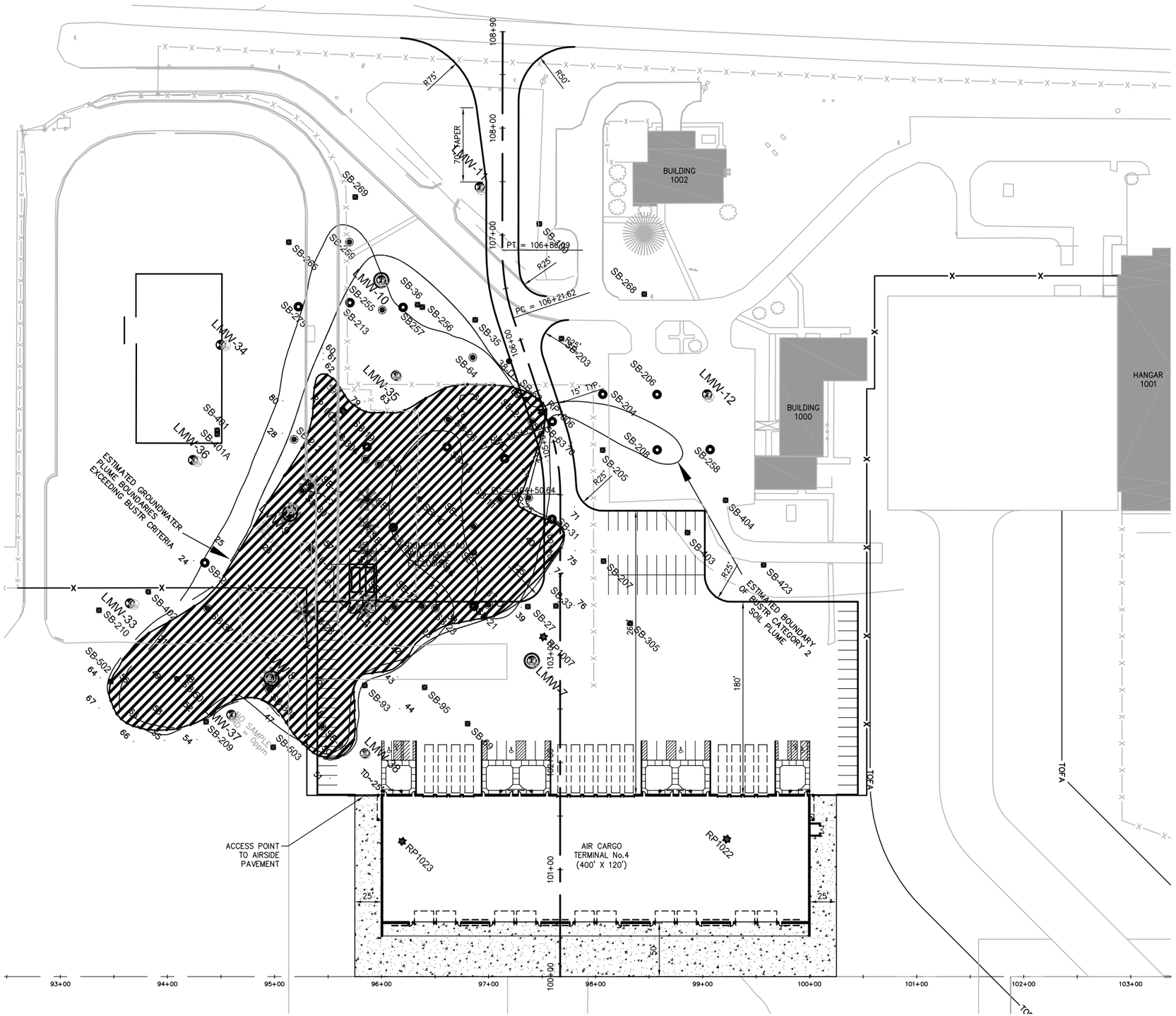
- AREA OF CONCERN
- MONITOR WELL LOCATION
- RPA MONITOR WELL LOCATION
- SOIL BORING LOCATION ABOVE OHIO BUSTR CATEGORY 3 CRITERIA
- SOIL BORING LOCATION ABOVE OHIO BUSTR CATEGORY 2 CRITERIA
- SOIL BORING LOCATION ABOVE OHIO BUSTR CATEGORY 1 CRITERIA
- SOIL BORING LOCATION BELOW OHIO BUSTR CATEGORY 1 CRITERIA
- SOIL BORING REFUSAL LOCATION
- SURVEYED REFERENCE POINTS
- STORM SEWER INLET
- S — SAN. SEWER LINE
- W — WATER LINE
- TOPOGRAPHIC CONTOUR LINE
- DRAINAGE
- SS — STORM SEWER LINE
- STREAM
- JET FUEL/AVGAS(PREV. REMOVED)
- JF — JET FUEL/AVGAS(GROUTED/PLACE)
- JF — JET FUEL/AVGAS
- T — TELEPHONE LINE
- E — ELECTRIC LINE

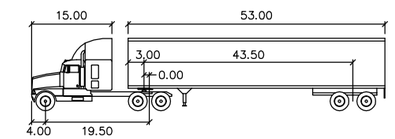
Tetra Tech, Inc.
Environmental Engineers & Scientists

SITE:	Former Lockbourne Air Force Base		
LOCATION:	Columbus, Ohio		
PROJECT:	BUSTR Tier 2 Report - AOC 3		
TITLE:	SITE UTILITIES AND CONTOURS MAP - AOC 3		
USACE CONTRACT #:	DACW62-94-D-0001		
TETRA TECH PROJECT NO.:	19170		
SCALE:	Graphic	CHECKED BY:	DNL
DATE:	8/16/2007	DRAWN BY:	DWC

FIGURE 4

FILE NAME: Figure_4_Site Utilities/ContourAOC 3.dwg





WB–65 feet

Tractor Width	: 8.00	Lock to Lock Time	: 6.00
Trailer Width	: 8.50	Steering Angle	: 28.40
Tractor Track	: 8.00	Articulating Angle	: 70.00
Trailer Track	: 8.50		

DESIGN VEHICLE: WB–65

SITE DATA

PARKING SPACES CAR (9' X 18.5' TYP.)	78
HANDICAP PARKING SPACES	4
TOTAL PARKING SPACES	82

NORTH

0 50 100 150
SCALE IN FEET

REVISIONS

DATE	BY

SCALE: 1"=50'
DATE: 03–29–07
DRAWN BY: RDH

RS&H®
Architecture, Engineering, Planning and Environmental Services
RS&H Ohio, Inc.
670 Morrison Road, Suite 200
Gahanna, Ohio 43230
614-475-8201 FAX 614-475-8401
www.rsandh.com

Rickenbacker International Airport
Air Cargo Terminal No. 4
PARKING & ENTRANCE ROAD
LAYOUT No. 1

COLUMBUS REGIONAL AIRPORT AUTHORITY
COLUMBUS, OHIO

PORT COLUMBUS INTERNATIONAL AIRPORT RICKENBACKER INTERNATIONAL AIRPORT BOLTON FIELD

EXHIBIT
01

Appendix C

Tables and Figures from the MNA Assessment

TABLE 4-2
WATER LEVELS AND GROUNDWATER ELEVATIONS
FORMER LOCKBOURNE AIR FORCE BASE, FRANKLIN COUNTY, OHIO

Well ID	Top of Casing Elevation (feet above MSL)	Depth to Water (feet BTOC)				Water Level Elevation (feet Above MSL)			
		Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4
AOC 3									
LMW-04 (W)	738.92	16.70	16.52	16.52	14.08	722.22 (722.31)	722.40 (722.41)	722.40 (722.42)	724.84 (724.97)
LMW-04 (FP)	738.92	16.59	16.51	16.50	13.92	722.33	722.41	722.42	725.00
LMW-07	738.7	13.70	14.35	13.72	10.86	725.00	724.35	724.98	727.84
LMW-08	740.16	15.31	15.90	14.60	12.31	724.85	724.26	725.56	727.85
LMW-09 (W)	739.29	16.37	16.17	15.23	13.55	722.92 (723.07)	723.12 (723.14)	724.06 (724.63)	725.74 (725.85)
LMW-09 (FP)	739.29	16.18	16.15	15.11	13.41	723.11	723.14	724.18	725.88
LMW-10	738.33	14.85	15.59	15.08	12.23	723.48	722.74	723.25	726.10
LMW-11	736.44	12.27	13.33	12.57	8.94	724.17	723.11	723.87	727.50
LMW-12	734.21	9.10	9.48	8.50	5.83	725.11	724.73	725.71	728.38
LMW-33	741.93	16.31	17.17	16.35	12.56	725.62	724.76	725.58	729.37
LMW-34	740.56	13.95	14.77	12.80	5.66	726.61	725.79	727.76	734.90
LMW-35	738.02	14.41	14.91	14.78	11.81	723.61	723.11	723.24	726.21
LMW-36	740.68	15.65	16.30	14.82	11.50	725.03	724.38	725.86	729.18
LMW-37	739.85	14.93	15.67	14.77	11.85	724.92	724.18	725.08	728.00
LMW-38[1]	738.56	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TB-01 (W)	738.79	N/A	N/A	15.62	13.44	N/A	N/A	723.17 (723.19)	725.35 (725.59)
TB-01 (FP)	738.79	N/A	N/A	15.61	13.14	N/A	N/A	723.18	725.65
TB-02	738.63	N/A	N/A	15.55	13.45	N/A	N/A	723.08	725.18
AOC 8/9									
LMW-03	745.14	10.64	12.45	10.35	7.48	734.50	732.69	734.79	737.66
LMW-13	742.19	11.71	12.61	11.05	9.83	730.48	729.58	731.14	732.36
LMW-14	743.60	12.95	13.61	12.03	9.67	730.65	729.99	731.57	733.93
LMW-15	741.80	7.87	11.60	5.63	5.58	733.93	730.20	736.17	736.22
LMW-16	739.97	9.02	10.63	7.85	5.81	730.95	729.34	732.12	734.16
LMW-17	741.70	9.88	11.18	7.93	6.10	731.82	730.52	733.77	735.60
LMW-18	739.78	6.30	7.82	2.20	2.40	733.48	731.96	737.58	737.38
LMW-39	741.41	3.95	8.55	4.42	1.04	737.46	732.86	736.99	740.37
LMW-40	744.66	6.98	7.43	6.55	3.75	737.68	737.23	738.11	740.91
LMW-H9 (W)	742.40	N/A	N/A	11.21	16.97	N/A	N/A	731.19 (731.25)	725.43 (725.61)
LMW-H9 (FP)	742.40	N/A	N/A	11.13	16.75	N/A	N/A	731.27	725.65

TABLE 4-2
WATER LEVELS AND GROUNDWATER ELEVATIONS
FORMER LOCKBOURNE AIR FORCE BASE, FRANKLIN COUNTY, OHIO

Well ID	Top of Casing Elevation (feet above MSL)	Depth to Water (feet BTOC)				Water Level Elevation (feet Above MSL)			
		Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4
AOC 11									
LMW-23	739.62	8.92	9.03	8.58	7.33	730.70	730.59	731.04	732.29
LMW-24	739.00	12.48	13.38	12.84	11.61	726.52	725.62	726.16	727.39
LMW-25	739.06	10.74	10.84	10.45	9.05	728.32	728.22	728.61	730.01
LMW-32	738.17	10.00	9.71	9.49	8.34	728.17	728.46	728.68	729.83
LMW-41 (W)	739.61	14.47	13.79	14.66	13.95	725.14 (725.20)	725.82 (725.89)	724.95 (725.11)	725.66
LMW-41 (FP)	739.61	14.40	13.70	14.46	N/A	725.21	725.91	725.15	N/A
LMW-42	739.42	13.64	13.70	13.42	13.43	725.78	725.72	726.00	725.99
LMW-43 (W)	739.77	13.89	15.11	15.49	14.55	725.88	724.66 (724.78)	724.28 (724.30)	725.22
LMW-43 (FP)	739.77	N/A	15.00	15.46	N/A	N/A	724.77	724.31	N/A
LMW-46	740.15	11.53	11.96	10.98	9.66	728.62	728.19	729.17	730.49

	Round 1	Round 2	Round 3	Round 4
LMW-04 Free Product Thickness (feet)	0.11	0.01	0.02	0.16
LMW-09 Free Product Thickness (feet)	0.19	0.02	0.12	0.14
LMW-41 Free Product Thickness (feet)	0.07	0.09	0.20	N/A
LMW-43 Free Product Thickness (feet)	N/A	0.11	0.03	N/A
TB-01 Free Product Thickness (feet)	N/A	N/A	0.01	0.30
LMW-H9 Free Product Thickness (feet)	N/A	N/A	0.08	0.22

Notes:

Sampling Dates:

Round 1 - mid-July 2009.

Round 2 - mid-October 2009.

Round 3 - mid-January 2010.

Round 4 - early-April 2010

[1] - Well is dry.

Elevations are in National Geodetic Vertical Datum of 1929 (NGVD29) in feet above Mean Sea Level.

(FP) = Free Product Level

(W) = Water Level

(725.89) = Water Level corrected for the presence of free product.

bgs = below ground surface

BTOC = Below Top-of-Casing

ID = Identification

MSL = Mean Sea Level

N/A = Not applicable

TABLE 6-4
SUMMARY OF LNAPL ANALYSIS AT AOC 3, 8/9, AND 11
FORMER LOCKBOURNE AIR FORCE BASE, FRANKLIN COUNTY, OHIO

FIELD ID DATE COLLECTED	Project Action Limit (mg/L)[1]	Project Action Limit (mg/L)[2]	Maximum	Frequency	AOC3-MW04-09A July 21, 2009			AOC3-MW04-10B April 5, 2010			AOC3-MW09-09A July 14, 2009			AOC3-MW09-09B October 7, 2009		
					Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
VOLATILE ORGANIC COMPOUNDS (mg/L)																
1,2,4-Trimethylbenzene	N/A	N/A	920	11 / 11	1.7	0.025		920	5		63	0.5		190	5	
1,3,5-Trimethylbenzene	N/A	N/A	270	10 / 11	0.2	0.025		82	5		26	0.5		85	5	
Benzene	26.8	515	30	11 / 11	0.04	0.025		2.3	5	J	6.8	0.5		7.9	5	
Ethylbenzene	6,180	53,100	380	10 / 11	0.02	0.025	J	44	5		4.4	0.5		6.8	5	
m,p-Xylenes	670	14,000	1200	11 / 11	0.2	0.025		120	5		12	0.5		34	5	
Methyl tert-butyl ether	200,000	1,000,000	ND	0 / 11	<	0.025	U	<	5	U	<	0.5	U	<	5	U
Naphthalene	359	1,970	140	11 / 11	0.2	0.025		140	5		9.1	0.5		27	5	
o-Xylene	670	14,000	303 J	1 / 11	<	0.025	U	<	5	U	<	0.5	U	<	5	U
Toluene	2,510	53,100	1.5 J	1 / 11	<	0.025	U	<	5	U	<	0.5	U	<	5	U
SEMI-VOLATILE ORGANIC COMPOUNDS (mg/L)																
1-Methylnaphthalene	N/A	N/A	3500	10 / 11	3500	500		340	125		95	250	J	87	10	
2-Methylnaphthalene	N/A	N/A	3900	10 / 11	3900	500		440	125		130	250	J	110	10	
Benzo(a)anthracene	4,170	15,600	32 J	2 / 11	<	500	U	<	125	U	<	250	U	5.8	10	J
Benzo(a)pyrene	794	4,840	ND	0 / 11	<	500	U	<	125	U	<	250	U	<	10	U
Benzo(b)fluoranthene	421	1,270	ND	0 / 11	<	500	U	<	125	U	<	250	U	<	10	U
Benzo(k)fluoranthene	149,000	1,000,000	ND	0 / 11	<	500	U	<	125	U	<	250	U	<	10	U
Chrysene	44,700	133,000	220 J	2 / 11	220	500	J	<	125	U	<	250	U	3.8	10	J
Dibenzo(a,h)anthracene	2,210	49,400	ND	0 / 11	<	500	U	<	125	U	<	250	U	<	10	U
Indeno(1,2,3-cd)pyrene	12,600	77,200	ND	0 / 11	<	500	U	<	125	U	<	250	U	<	10	U
Naphthalene	359	1,970	1000	10 / 11	1000	500		450	125		160	250	J	180	10	

Notes:

[1] = Ohio BUSTR Soil Class 1, Groundwater to Indoor Air, Non-Residential, <15 feet.
[2] = Ohio BUSTR Soil Class 1, Groundwater to Outdoor Air, Non-Residential.
AOC = Area of Concern
J = Estimated
LNAPL = Light Non-Aqueous Phase Liquid
mg/L = milligram per liter
MNA = Monitored Natural Attenuation
ND = Not Detected
Qual = Qualifier
RL = Reporting Limit
U = Nondetect
The calculation of detection frequency does not include results from reanalyzed samples.

TABLE 6-4
SUMMARY OF LNAPL ANALYSIS AT AOC 3, 8/9, AND 11
FORMER LOCKBOURNE AIR FORCE BASE, FRANKLIN COUNTY, OHIO

FIELD ID DATE COLLECTED	Project Action Limit (mg/L)[1]	Project Action Limit (mg/L)[2]	Maximum	Frequency	AOC3-MW09-10A January 20, 2010			AOC3-MW09-10B April 5, 2010			AOC3-TB01-10A January 20, 2010			AOC3-TB01-10B April 5, 2010		
					Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
VOLATILE ORGANIC COMPOUNDS (mg/L)																
1,2,4-Trimethylbenzene	N/A	N/A	920	11 / 11	29	1		280	5		850	5		380	5	
1,3,5-Trimethylbenzene	N/A	N/A	270	10 / 11	15	1		130	5		270	5		130	5	
Benzene	26.8	515	30	11 / 11	0.4	1	J	2	5	J	12	5		1.5	5	J
Ethylbenzene	6,180	53,100	380	10 / 11	0.79	1	J	16	5		380	5		93	5	
m,p-Xylenes	670	14,000	1200	11 / 11	2.8	1		31	5		1200	5		360	5	
Methyl tert-butyl ether	200,000	1,000,000	ND	0 / 11	<	1	U	<	5	U	<	5	U	<	5	U
Naphthalene	359	1,970	140	11 / 11	4	1		47	5		110	5		55	5	
o-Xylene	670	14,000	303 J	1 / 11	<	1	U	<	5	U	<	5	U	<	5	U
Toluene	2,510	53,100	1.5 J	1 / 11	<	1	U	<	5	U	<	5	U	<	5	U
SEMI-VOLATILE ORGANIC COMPOUNDS (mg/L)																
1-Methylnaphthalene	N/A	N/A	3500	10 / 11	160	100		100	125	J	490	100		270	125	
2-Methylnaphthalene	N/A	N/A	3900	10 / 11	170	100		120	125	J	650	100		360	125	
Benzo(a)anthracene	4,170	15,600	32 J	2 / 11	<	100	U	<	125	U	32	100	J	<	125	U
Benzo(a)pyrene	794	4,840	ND	0 / 11	<	100	U	<	125	U	<	100	U	<	125	U
Benzo(b)fluoranthene	421	1,270	ND	0 / 11	<	100	U	<	125	U	<	100	U	<	125	U
Benzo(k)fluoranthene	149,000	1,000,000	ND	0 / 11	<	100	U	<	125	U	<	100	U	<	125	U
Chrysene	44,700	133,000	220 J	2 / 11	<	100	U	<	125	U	<	100	U	<	125	U
Dibenzo(a,h)anthracene	2,210	49,400	ND	0 / 11	<	100	U	<	125	U	<	100	U	<	125	U
Indeno(1,2,3-cd)pyrene	12,600	77,200	ND	0 / 11	<	100	U	<	125	U	<	100	U	<	125	U
Naphthalene	359	1,970	1000	10 / 11	210	100		160	125		510	100		410	125	

Notes:

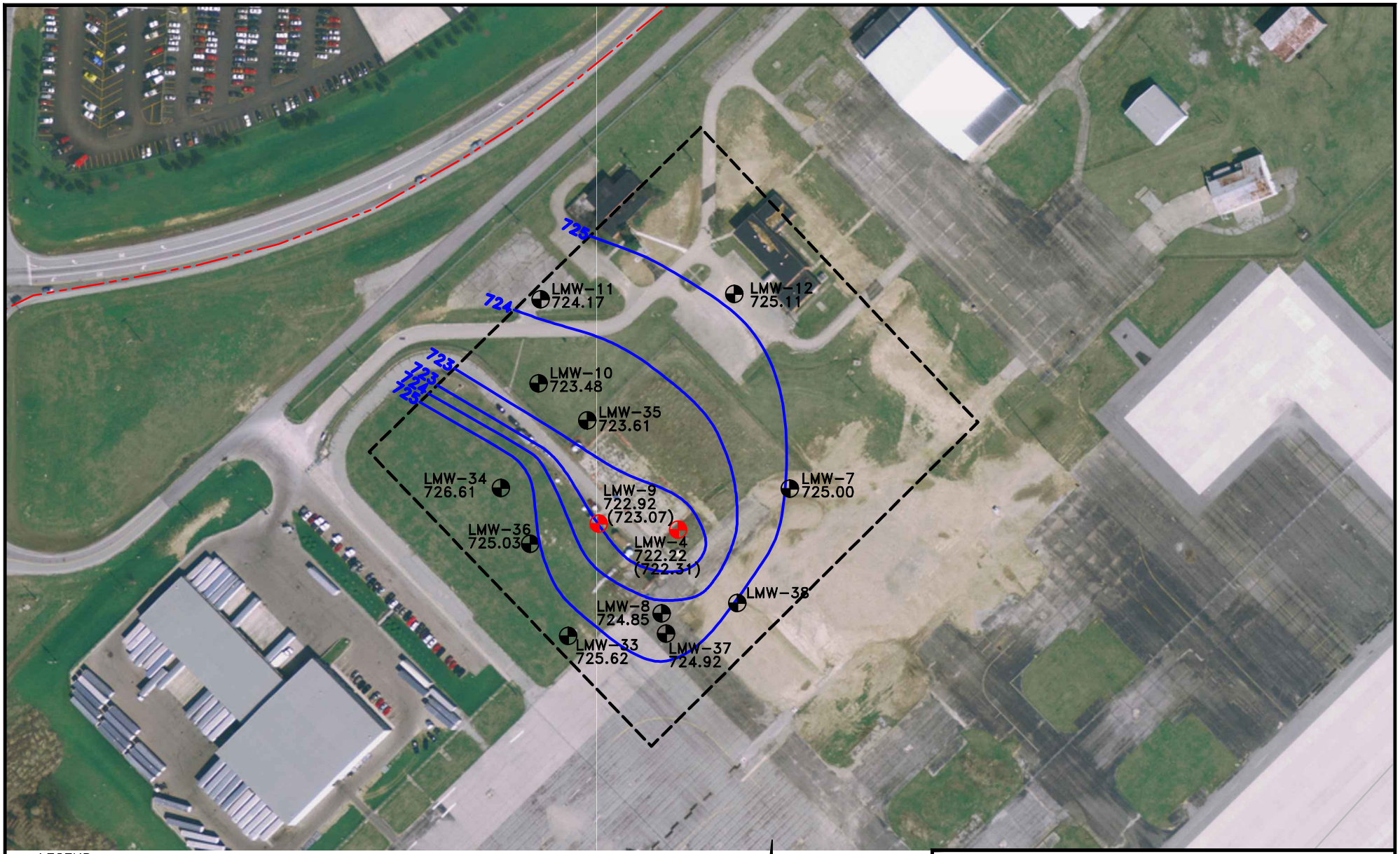
[1] = Ohio BUSTR Soil Class 1, Groundwater to Indoor Air, Non-Residential, <15 feet.
[2] = Ohio BUSTR Soil Class 1, Groundwater to Outdoor Air, Non-Residential.
AOC = Area of Concern
J = Estimated
LNAPL = Light Non-Aqueous Phase Liquid
mg/L = milligram per liter
MNA = Monitored Natural Attenuation
ND = Not Detected
Qual = Qualifier
RL = Reporting Limit
U = Nondetect
The calculation of detection frequency does not include results from reanalyzed samples.

TABLE 6-4
SUMMARY OF LNAPL ANALYSIS AT AOC 3, 8/9, AND 11
FORMER LOCKBOURNE AIR FORCE BASE, FRANKLIN COUNTY, OHIO

FIELD ID DATE COLLECTED	Project Action Limit (mg/L)[1]	Project Action Limit (mg/L)[2]	Maximum	Frequency	AOC8/9-MWH9-10A January 20, 2010			AOC8/9-MWH9-10B April 5, 2010			AOC11-MW41-09A July 17, 2009		
					Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
VOLATILE ORGANIC COMPOUNDS (mg/L)													
1,2,4-Trimethylbenzene	N/A	N/A	920	11 / 11	880	5		680	5		0.3	0.025	
1,3,5-Trimethylbenzene	N/A	N/A	270	10 / 11	250	5		190	5		<	0.025	U
Benzene	26.8	515	30	11 / 11	30	5		11	5		0.2	0.025	
Ethylbenzene	6,180	53,100	380	10 / 11	320	5		140	5		<	0.025	U
m,p-Xylenes	670	14,000	1200	11 / 11	690	5		380	5		0.006	0.025	J
Methyl tert-butyl ether	200,000	1,000,000	ND	0 / 11	<	5	U	<	5	U	<	0.025	U
Naphthalene	359	1,970	140	11 / 11	68	5		47	5		0.05	0.025	
o-Xylene	670	14,000	303 J	1 / 11	3.3	5	J	<	5	U	<	0.025	U
Toluene	2,510	53,100	1.5 J	1 / 11	1.5	5	J	<	5	U	<	0.025	U
SEMI-VOLATILE ORGANIC COMPOUNDS (mg/L)													
1-Methylnaphthalene	N/A	N/A	3500	10 / 11	410	100		270	125		<	0.5	U
2-Methylnaphthalene	N/A	N/A	3900	10 / 11	480	100		330	125		<	0.5	U
Benzo(a)anthracene	4,170	15,600	32 J	2 / 11	<	100	U	<	125	U	<	0.5	U
Benzo(a)pyrene	794	4,840	ND	0 / 11	<	100	U	<	125	U	<	0.5	U
Benzo(b)fluoranthene	421	1,270	ND	0 / 11	<	100	U	<	125	U	<	0.5	U
Benzo(k)fluoranthene	149,000	1,000,000	ND	0 / 11	<	100	U	<	125	U	<	0.5	U
Chrysene	44,700	133,000	220 J	2 / 11	<	100	U	<	125	U	<	0.5	U
Dibenzo(a,h)anthracene	2,210	49,400	ND	0 / 11	<	100	U	<	125	U	<	0.5	U
Indeno(1,2,3-cd)pyrene	12,600	77,200	ND	0 / 11	<	100	U	<	125	U	<	0.5	U
Naphthalene	359	1,970	1000	10 / 11	290	100		320	125		<	0.5	U

Notes:

[1] = Ohio BUSTR Soil Class 1, Groundwater to Indoor Air, Non-Residential, <15 feet.
[2] = Ohio BUSTR Soil Class 1, Groundwater to Outdoor Air, Non-Residential.
AOC = Area of Concern
J = Estimated
LNAPL = Light Non-Aqueous Phase Liquid
mg/L = milligram per liter
MNA = Monitored Natural Attenuation
ND = Not Detected
Qual = Qualifier
RL = Reporting Limit
U = Nondetect
The calculation of detection frequency does not include results from reanalyzed samples.



LEGEND

- FORMER LOCKBOURNE AFB BOUNDARY
- AOC BOUNDARY
- WATER LEVEL CONTOUR
- MONITORING WELL
- MONITORING WELL WITH LNAPL
- 725.00 WATER LEVEL (FEET,MSL)
- (725.00) CORRECTED WATER LEVEL (FEET,MSL)

December 07, 2010 8:53:01 a.m.
Drawing: T:\16170434\100\4-1a.dwg

NOTE: MONITORING WELLS WITH LNAPL WERE INCLUDED TO DEVELOP WATER TABLE ELEVATION MAPS.

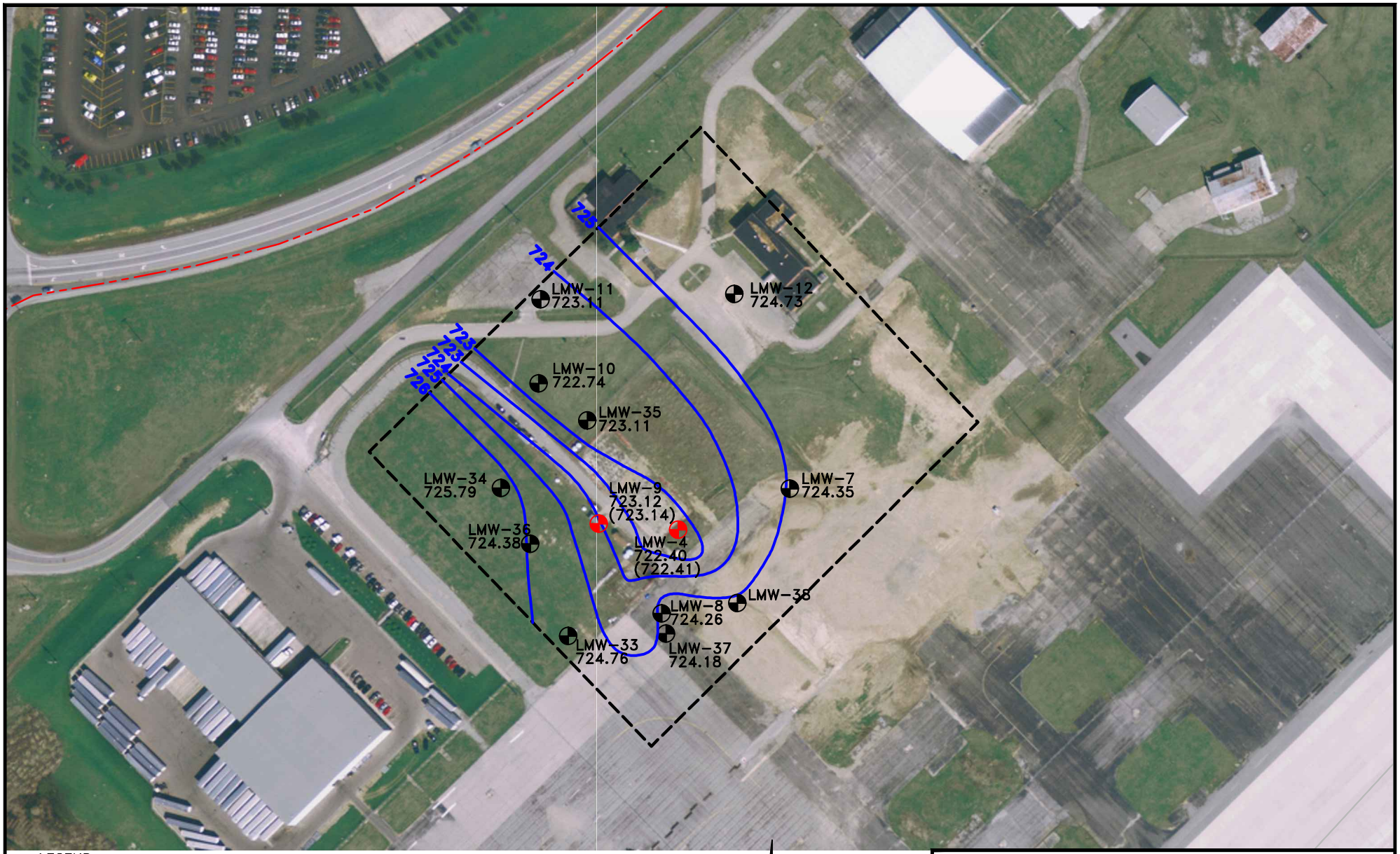
N

200 100 0 200
SCALE IN FEET

URS

AOC 3
JULY 2009 (ROUND 1) WATER LEVELS
FORMER LOCKBOURNE AIR FORCE BASE, OHIO

DRN. BY: LLS	DATE: 12/01/10	PROJECT NO. 16170434	FIG. NO. 4-1a
CHK'D. BY: BG	REVISION: 0		



LEGEND

- FORMER LOCKBOURNE AFB BOUNDARY
- AOC BOUNDARY
- WATER LEVEL CONTOUR
- MONITORING WELL
- MONITORING WELL WITH LNAPL
- 725.00 WATER LEVEL (FEET,MSL)
- (725.00) CORRECTED WATER LEVEL (FEET,MSL)

December 07, 2010 9:00:05 a.m.
Drawing: T:\16170434\100\4-1b.dwg

NOTE: MONITORING WELLS WITH LNAPL WERE INCLUDED TO DEVELOP WATER TABLE ELEVATION MAPS.

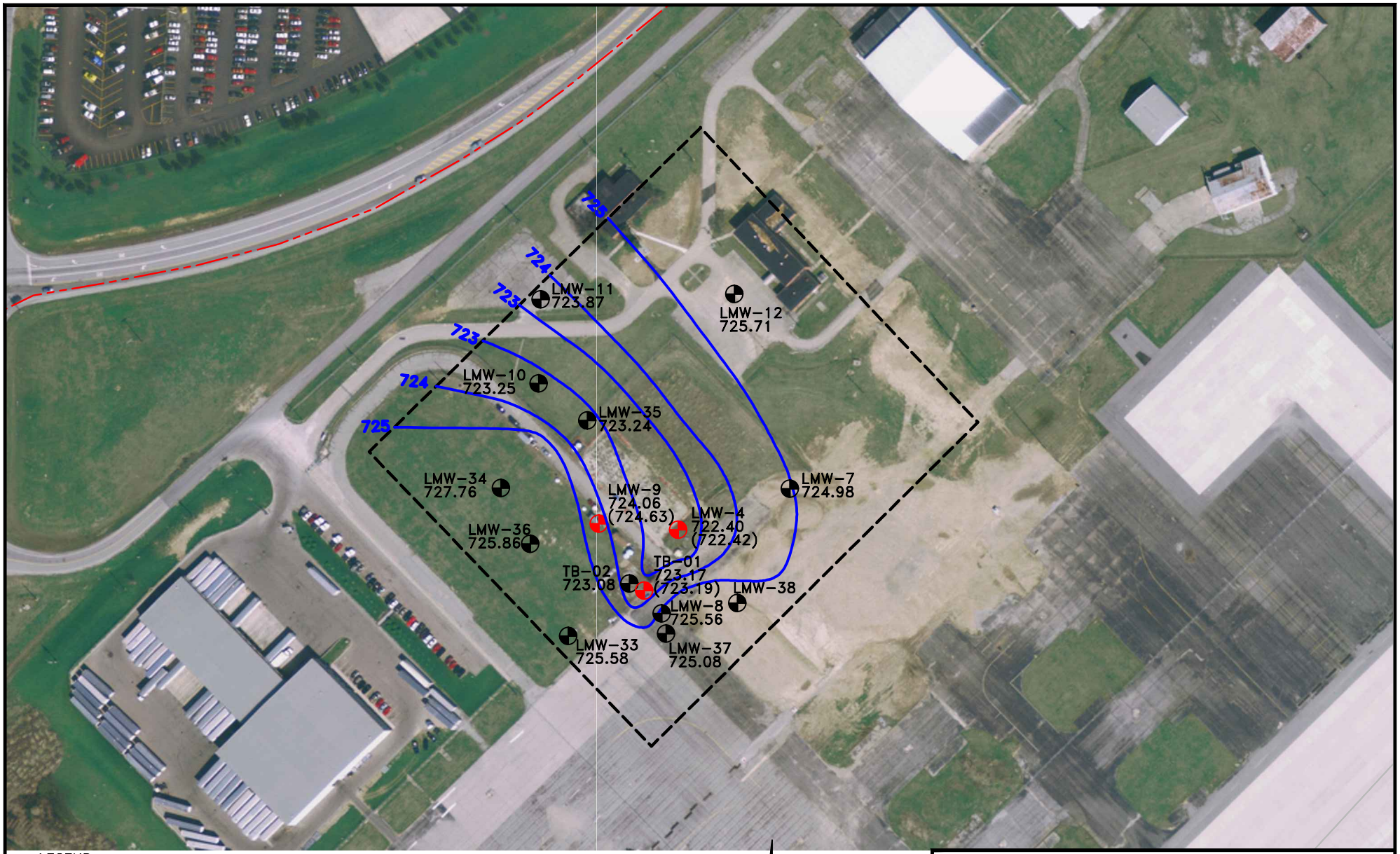
N

200 100 0 200
SCALE IN FEET

URS

AOC 3
OCTOBER 2009 (ROUND 2) WATER LEVELS
FORMER LOCKBOURNE AIR FORCE BASE, OHIO

DRN. BY: LLS	DATE: 12/01/10	PROJECT NO. 16170434	FIG. NO. 4-1b
CHK'D. BY: BG	REVISION: 0		



LEGEND

- FORMER LOCKBOURNE AFB BOUNDARY
- AOC BOUNDARY
- WATER LEVEL CONTOUR
- MONITORING WELL
- MONITORING WELL WITH LNAPL
- 725.00 WATER LEVEL (FEET,MSL)
- (725.00) CORRECTED WATER LEVEL (FEET,MSL)

December 07, 2010 8:55:20 a.m.
Drawing: T:\16170434\100\4-1c.dwg

NOTE: MONITORING WELLS WITH LNAPL WERE INCLUDED TO DEVELOP WATER TABLE ELEVATION MAPS.

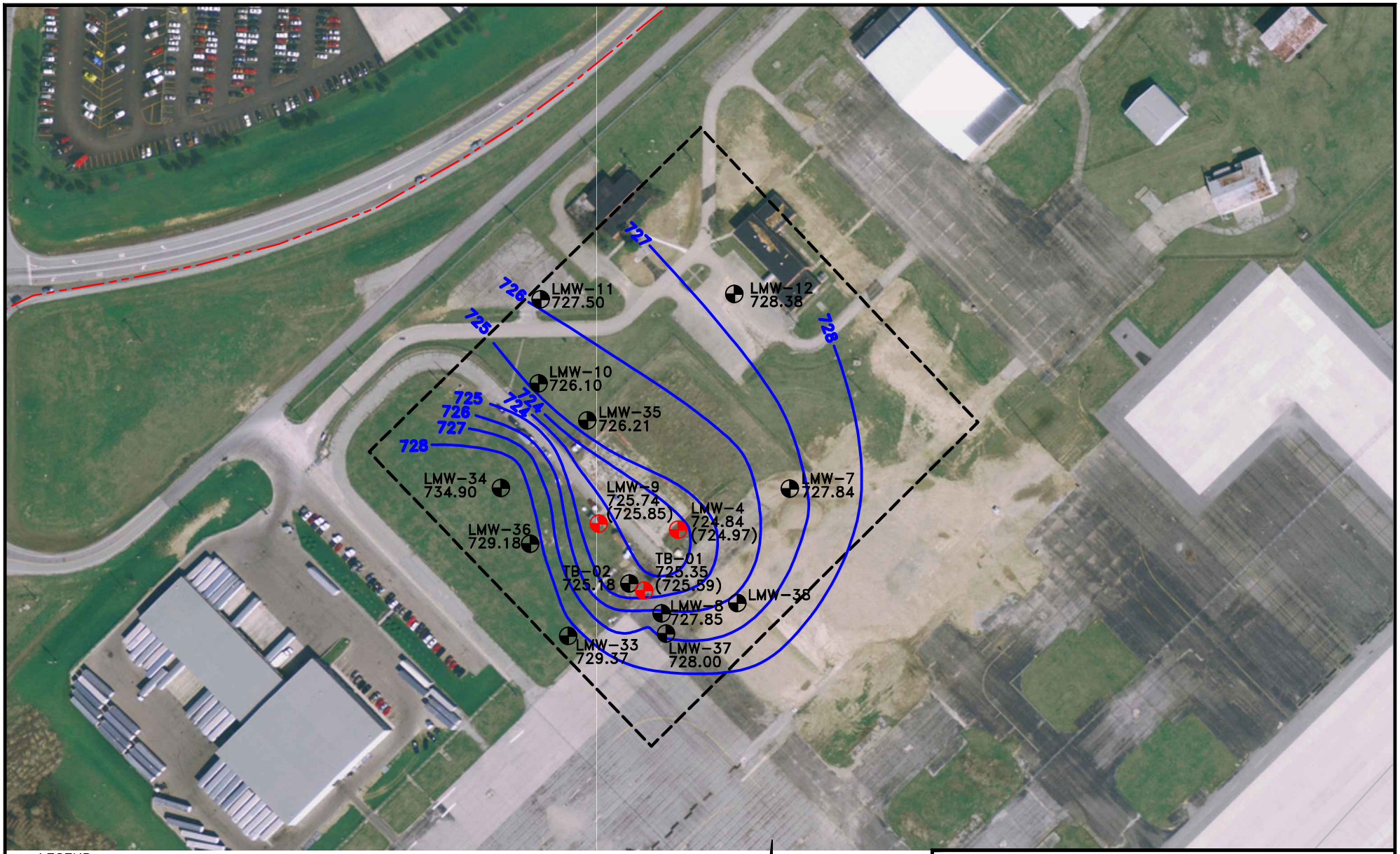
N

200 100 0 200
SCALE IN FEET

URS

AOC3
JANUARY 2010 (ROUND 3) WATER LEVELS
FORMER LOCKBOURNE AIR FORCE BASE, OHIO

DRN. BY: LLS	DATE: 12/01/10	PROJECT NO. 16170434	FIG. NO. 4-1c
CHK'D. BY: BG	REVISION: 0		



LEGEND

- FORMER LOCKBOURNE AFB BOUNDARY
- AOC BOUNDARY
- WATER LEVEL CONTOUR
- MONITORING WELL
- MONITORING WELL WITH LNAPL
- 725.00 WATER LEVEL (FEET,MSL)
- (725.00) CORRECTED WATER LEVEL (FEET,MSL)

December 07, 2010 8:57:18 a.m.
Drawing: T:\16170434\100\4-1d.dwg

NOTE: MONITORING WELLS WITH LNAPL WERE INCLUDED TO DEVELOP WATER TABLE ELEVATION MAPS.

N

200 100 0 200
SCALE IN FEET

URS

AOC3
APRIL 2010 (ROUND 4) WATER LEVELS
FORMER LOCKBOURNE AIR FORCE BASE, OHIO

DRN. BY: LLS	DATE: 12/01/10	PROJECT NO. 16170434	FIG. NO. 4-1d
CHK'D. BY: BG	REVISION: 0		

Appendix D

ATSDR JP-4 Properties

TABLE 3-3. Physical and Chemical Properties of JP-4[a]

Property	Information	Reference
Molecular weight	Not applicable[b]	
Color	Colorless to straw colored	CHRIS 1986; Martel 1992
Physical state	Liquid	CHRIS 1986
Melting point	-46 °C	OHM/TADS 1985
	-40–72 °C	ITC 1985
Boiling point (1 atm)	50–270 °C	Air Force 1989b
	90–300 °C	ITC 1985
	45–280 °C	Dickson and Woodward 1987
Density:		
at 15 °C	751–802 kg/m^3 (specification)	
Odor	Like gasoline and/or kerosene	
Odor threshold:		
Water	No data	
Air	1 ppm	CHRIS 1986
Solubility:		
Water at 20 °C	57 mg/L	CRC 1984
Organic solvent(s)	Since many of the components are organic solvents, the fuel is generally miscible with organic solvents	ITC 1985
Partition coefficients:		
Log K_{ow}	Major components range from 3 to 4.5	ITC 1985
Log K_{oc}	No data	
Vapor pressure at 20 °C	91 mm Hg	Air Force 1989b
Henry's law constant	1.00×10^{-4}-$1.00 \times 10^{+1}$ atm-m^3/mol	Air Force 1989b
Autoignition temperature	246 °C	CRC 1984
Flashpoint	-23–1 °C	NFPA 1986
Flammability limits	1.3% lower; 8.0% upper	NFPA 1986
Explosive limits	No data	

[a]JP-4, or jet propellant-4, is a mixed compound composed primarily of hydrocarbons (i.e., alkanes, cycloalkanes, alky-benzenes, indan/tetralins, and naphthalenes).
[b]Jet fuels are blends prepared to meet certain gross property specifications. Most characteristic data only reflect gross properties covered in the specifications. Proportions and values vary with the type of crude oil from which the final fuel is derived and the refining process used.

Appendix E

Technology Evaluation Tables from RTE Report

Table 4. AOC 3 Technology Comparison

Alternative	Description	Criteria		
		Effectiveness	Implementability	Cost
Natural Source Zone Depletion	Natural processes act to (a) physically redistribute LNAPL components to the aqueous or gaseous phase and (b) biologically break down these source zone components. Requires monitoring well installation and long-term monitoring.	Very Low. Not likely to achieve RAOs within a reasonable period of time due to slow dissolution and evaporation of weathered LNAPL under heterogeneous subsurface conditions.	Moderate to High. Requires only conventional, short-term, and demonstrated activities (drilling, sampling, disposal). Facilities, equipment, and labor are readily available. The site is accessible, and drilling can be planned around existing underground utilities. Minimal site restoration required. However, requires long term monitoring, and public and regulatory acceptance might be low, because of time to reach RAOs.	Low. Capital: $234,000 Present Worth: $418,000
Excavation	Contaminated soil would be excavated to the maximum depth of the free product smear zone and hauled to a landfill for disposal as a special waste. Clean overburden soil would be stockpiled and used in backfilling the excavation, along with additional clean soil from an off-site source. Water entering the excavation would be treated on site and discharged to the sanitary sewer.	Moderate to High. Free product and contaminated soil would be permanently removed from the site, which should achieve all RAOs. Although contaminants would not be destroyed, potential exposure would be minimized through containment within a properly constructed off- site landfill. Potential short term worker and public exposure would be minimized through use of appropriate personal protective equipment and environmental controls.	Moderate to High. Requires only conventional construction equipment and services and site is readily accessible. Although labor-intensive in the short-term, long-term monitoring should not be required. Depending on the haul distance, public and regulatory acceptance of transporting a large volume of contaminated soil off site might be low. Would require relocation of utilities.	Moderate. Capital: $3,627,000

Table 4. AOC 3 Technology Comparison

Alternative	Description	Criteria		
		Effectiveness	Implementability	Cost
In Situ Soil Mixing	Contaminated soil would be mixed in place with water and grout to the maximum depth of the free product smear zone. Mixing would be achieved using augers and mixing paddles to drill and inject material. Soil, groundwater, and free product within the mixing zone would be homogenized, stabilized, and solidified.	Moderate. Free product would be eliminated through the mixing process. Although contaminants would not be removed from the site, homogenization and solidification would minimize potential exposure to and migration of contaminants. Potential short term worker and public exposure would be minimized through use of appropriate personal protective equipment and environmental controls.	Moderate. Requires somewhat specialized drilling equipment, but several contractors are available. Although labor-intensive in the short-term, long-term monitoring should not be required. Public and regulatory acceptance might be reduced by the contaminants remaining on the site and by associated administrative and physical land use constraints. Would require relocation of utilities.	High Capital: $6,932,000
Multi-phase Extraction	Multi-phase extraction combines free product recovery, groundwater extraction, and soil vapor extraction. The water table is lowered in order to dewater the saturated zone so that volatile organic compounds can be stripped from the exposed soil. The lowering of the water table also increases the flow of residual product from the now unsaturated soil pore spaces, while the air flow enhances aerobic bioremediation.	Low to Moderate. Effectiveness somewhat uncertain because of limiting factors, including discontinuous granular lenses and weathered LNAPL. It is likely that free product reduction would meet RAOs in 3-8 years, but residual soil contamination would likely remain. Potential short term worker and public exposure would be minimized through use of appropriate personal protective equipment and environmental controls.	Moderate. Requires only conventional, short-term, and demonstrated activities (drilling, pumping, SVE, onsite treatment). Facilities, equipment, and labor are readily available. The site is accessible, and drilling can be planned around existing underground utilities. However, site conditions would require close well spacing, and operation, maintenance, and monitoring up to 8 years. Minimal site restoration would be required. Public and regulatory acceptance contingent on ability to achieve RAOs in a reasonable period of time. Land use restrictions might be required for residual soil contamination.	High Capital: $4,036,000 Present Worth: $4,129,000

Table 4. AOC 3 Technology Comparison

Alternative	Description	Criteria		
		Effectiveness	Implementability	Cost
Multi-phase Extraction with Heating	Heating is added to conventional multi-phase extraction to increase the rate of recovery and/or the range of contaminants that can be treated. Heating will volatilize higher weight compounds, reduce viscosity of LNAPL, and speed up chemical reactions. Steam injection, electrical resistance heating, or other methods may be used.	Moderate. Heating will help to overcome limiting factors, including discontinuous granular lenses and weathered LNAPL. It is likely that free product reduction would meet RAOs in 2-3 years, and residual soil contamination is less likely. Potential short term worker and public exposure would be minimized through use of appropriate personal protective equipment and environmental controls.	Low to Moderate. Installation of heating equipment increases complexity of multi-phase extraction implementation. Facilities, equipment, and labor are readily available. The site is accessible; however, relocation of utilities may be required. Site conditions would require close well spacing, and operation, maintenance, and monitoring up to 3 years. Minimal site restoration would be required. Public and regulatory acceptance contingent on ability to achieve RAOs in a reasonable period of time.	High Capital: $3,633,000 Present Worth: $3,685,000
In Situ Chemical Oxidation	Chemical oxidants are injected into the subsurface to react with and destroy dissolved-phase organic contaminants. Common oxidants include hydrogen peroxide, ozone, permanganate, and persulfate.	Very Low. Process will be limited by the rate of dissolution of free product, which will be slow for weathered LNAPL. Contact of the oxidant with dissolved compounds will be limited by the heterogeneous subsurface conditions.	Low to Moderate. Requires only conventional, short-term, and demonstrated activities (drilling, chemical mixing and injection, sampling, disposal). Facilities, equipment, and labor are readily available. Oxidants are hazardous to human health and require careful handling by trained workers using appropriate protective equipment. This could reduce public and regulatory acceptance. Utilities might have to be relocated because of damaging effects of oxidants. Minimal site restoration and no long term monitoring would be required.	Very High. Cost of oxidant alone based on LNAPL volume at the site: $8,700,000. Costs of installing and operating mixing and injection system and additional oxidant required for naturally occurring organic compounds were not calculated.

Table 4. AOC 3 Technology Comparison

Alternative	Description	Criteria		
		Effectiveness	Implementability	Cost
Surfactant-Enhanced LNAPL Removal	Injection of low viscosity surfactant solution into the subsurface to mobilize contaminants in free phase product and adsorbed to the soil matrix into the aqueous phase.	Very Low. Subsurface is too heterogeneous and has too low a hydraulic conductivity for this technology to be effective.	Low to Moderate. Requires only conventional, short-term, and demonstrated activities (drilling, mixing and injection, sampling, disposal). Facilities, equipment, and labor are readily available. However, implementation is unlikely to achieve adequate distribution of the surfactant, and control of the injected material might be difficult under site conditions.	Not calculated.
Electrical Resistance Heating	Uses arrays of electrodes installed around a central neutral electrode to create a concentrated flow of current toward the central point. Soil resistance to the flow of electricity creates heat above 100° C, which is used to evaporate contaminants from soil and groundwater. Steam and volatilized contaminants are captured by vacuum extraction wells and piped to a condenser.	High. This technology can achieve RAOs in less than a year. However, more heat is required to achieve complete remediation of contaminants with higher boiling points, especially in tight soils with high organic content.	Low to moderate. Installation and operation is relatively complicated, but equipment and contractors are available. Although labor-intensive in the short-term, long-term monitoring should not be required. Public and regulatory acceptance would likely be high, because contaminants are permanently destroyed in a relatively short period of time. Utilities would likely have to be relocated.	High. Capital: $7,400,000

Appendix F

Ohio NPDES Construction General Permit and NOI Application

Division of Surface Water - *Notice of Intent (NOI) For Coverage Under Ohio Environmental Protection Agency General NPDES Permit*

(Read accompanying instructions carefully before completing this form.)

Submission of this NOI constitutes notice that the party identified in Section I of this form intends to be authorized to discharge into state surface waters under Ohio EPA's NPDES general permit program. Becoming a permittee obligates a discharger to comply with the terms and conditions of the permit. Complete all required information as indicated by the instructions. Do not use correction fluid on this form. Forms transmitted by fax will not be accepted. A check for the proper amount must accompany this form and be made payable to "Treasurer, State of Ohio." (See the fee table in Attachment C of the NOI instructions for the appropriate processing fee.)

I. Applicant Information/Mailing Address

Company (Applicant) Name:		
Mailing (Applicant) Address:		
City:	**State:**	**Zip Code:**
Contact Person:	**Phone:**	**Fax:**
Contact E-mail Address:		

II. Facility/Site Location Information

Facility Name:		
Facility Address/Location:		
City:	**State:** Ohio	**Zip Code:**
County(ies):	**Township(s):**	
Facility Contact Person:	**Phone:**	**Fax:**
Facility Contact E-mail Address:		
Latitude:	**Longitude:**	*(For Construction & Coal, must complete lat/long & attach map)*
Receiving Stream or MS4:		

III. General Permit Information

General Permit Number: Choose an item.	**Initial Coverage:** ☐	**Renewal Coverage:** ☐
Type of Activity: Choose an item.	**SIC Code(s):**	
Existing NPDES Permit Number:	**ODNR Coal Mining Application Number:**	

If Household Sewage Treatment System, is system for: ☐ **new home construction** **or** ☐ **replacement of failed existing system**

Outfall:	Design Flow (MGD):	Associated Permit Effluent Table:	Latitude:	Longitude:
		Choose an item.		
		Choose an item.		
		Choose an item.		
		Choose an item.		

Are These Permits Required?	**PTI** Choose one.	**Individual 401 Water Quality Certification** Choose one.
Isolated Wetland Choose one.	**U.S. Army Corp Nationwide Permit** Choose one.	**Individual NPDES** Choose one.
Proposed Project Start Date:	**Estimated Completion Date:**	
Total Land Disturbance (Acres):	**MS4 Drainage Area (Sq. Miles):**	

IV. Payment Information

Check #:

Check Amount:

Date of Check:

For Ohio EPA Use Only

Check ID (OFA): _____ **ORG #:** _____

Rev ID: _____ **DOC #:** _____

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

Applicant Name:	**Title:**
Applicant Signature:	**Date:**

Issuance Date:
Effective Date:
Expiration Date: 5 Years After Effective Date

OHIO ENVIRONMENTAL PROTECTION AGENCY

GENERAL PERMIT AUTHORIZATION FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the federal Water Pollution Control Act, as amended (33 U.S.C. Section 1251 et. seq. hereafter referred to as "the Act") and the Ohio Water Pollution Control Act [Ohio Revised Code ("ORC") Chapter 6111], dischargers of storm water from sites where construction activity is being conducted, as defined in Part I.B of this permit, are authorized by the Ohio Environmental Protection Agency, hereafter referred to as "Ohio EPA," to discharge from the outfalls at the sites and to the receiving surface waters of the state identified in their Notice of Intent ("NOI") application form on file with Ohio EPA in accordance with the conditions specified in Parts I through VII of this permit.

It has been determined that a lowering of water quality of various waters of the State associated with granting coverage under this permit is necessary to accommodate important social and economic development in the state of Ohio. In accordance with OAC 3745-1-05, this decision was reached only after examining a series of technical alternatives, reviewing social and economic issues related to the degradation, and considering all public and intergovernmental comments received concerning the proposal.

This permit is conditioned upon payment of applicable fees, submittal of a complete NOI application form and written approval of coverage from the director of Ohio EPA in accordance with Ohio Administrative Code ("OAC") Rule 3745-38-02.

_____

Scott J. Nally
Director

TABLE OF CONTENTS

PART I. COVERAGE UNDER THIS PERMIT
A. Permit Area
B. Eligibility
C. Requiring an individual permit or an alternative general permit
D. Permit requirements when portions of a site are sold
E. Authorization
F. Notice of Intent Requirements

PART II. NON-NUMERIC EFFLUENT LIMITATIONS
A. Erosion and Sediment Controls
B. Soil Stabilization
C. Dewatering
D. Pollution Prevention Measures
E. Prohibited Discharges
F. Surface Outlets

PART III. STORM WATER POLLUTION PREVENTION PLAN (SWP3)
A. Storm Water Pollution Prevention Plans
B. Timing
C. SWP3 Signature and Review
D. Amendments
E. Duty to inform contractors and subcontractors
F. Total Maximum Daily Load (TMDL) allocations
G. SWP3 Requirements

PART IV. NOTICE OF TERMINATION REQUIREMENTS
A. Failure to notify
B. When to submit an NOT
C. How to submit an NOT

PART V. STANDARD PERMIT CONDITIONS
A. Duty to comply
B. Continuation of the expired general permit
C. Need to halt or reduce activity not a defense
D. Duty to mitigate
E. Duty to provide information
F. Other information
G. Signatory requirements
H. Certification
I. Penalties for falsification of monitoring systems
J. Oil and hazardous substance liability
K. Property rights
L. Severability
M. Transfers
N. Environmental laws
O. Proper operation and maintenance
P. Inspection and entry

PART VI. REOPENER CLAUSE

PART VII. DEFINITIONS

PART I. COVERAGE UNDER THIS PERMIT

A. Permit Area.

This permit covers the entire State of Ohio.

B. Eligibility.

1. Construction activities covered. Except for storm water discharges identified under Part I.B.2, this permit may cover all new and existing discharges composed entirely of storm water discharges associated with construction activity that enter surface waters of the state or a storm drain leading to surface waters of the state.

   For the purposes of this permit, construction activities include any clearing, grading, excavating, grubbing and/or filling activities that disturb the threshold acreage described in the next paragraph. Discharges from trench de-watering are also covered by this permit as long as the de-watering activity is carried out in accordance with the practices outlined in Part III.G.2.k.iv of this permit.

   Construction activities disturbing one or more acres of total land, or will disturb less than one acre of land but are part of a larger common plan of development or sale that will ultimately disturb one or more acres of land will be eligible for coverage under this permit. The threshold acreage includes the entire area disturbed in the larger common plan of development or sale.

   This permit also authorizes storm water discharges from support activities (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) provided:

   a. The support activity is directly related to a construction site that is required to have NPDES permit coverage for discharges of storm water associated with construction activity;

   b. The support activity is not a commercial operation serving multiple unrelated construction projects and does not operate beyond the completion of the construction activity at the site it supports;

   c. Appropriate controls and measures are identified in a storm water pollution prevention plan (SWP3) covering the discharges from the support activity; and

   d. The support activity is on or contiguous with the property defined in the NOI.

2. Limitations on coverage. The following storm water discharges associated with construction activity are not covered by this permit:

   a. Storm water discharges that originate from the site after construction activities have been completed, including any temporary support activity, and the site has achieved final stabilization. Industrial post-construction storm water discharges may need to be covered by an NPDES permit;

b. Storm water discharges associated with construction activity that the director has shown to be or may reasonably expect to be contributing to a violation of a water quality standard; and

c. Storm water discharges authorized by an individual NPDES permit or another NPDES general permit;

3. Waivers. After March 10, 2003, sites whose larger common plan of development or sale have at least one, but less than five acres of land disturbance, which would otherwise require permit coverage for storm water discharges associated with construction activities, may request that the director waive their permit requirement. Entities wishing to request such a waiver must certify in writing that the construction activity meets one of the two waiver conditions:

   a. Rainfall Erosivity Waiver. For a construction site to qualify for the rainfall erosivity waiver, the cumulative rainfall erosivity over the project duration must be five or less and the site must be stabilized with a least a 70 percent vegetative cover or other permanent, non-erosive cover. The rainfall erosivity must be calculated according to the method in U.S. EPA Fact Sheet 3.1 Construction Rainfall Erosivity Waiver dated January 2001 and be found at: http://epa.ohio.gov/portals/35/permits/USEPAfact3-1_s.pdf. If it is determined that a construction activity will take place during a time period where the rainfall erosivity factor is less than five, a written waiver certification must be submitted to Ohio EPA at least 21 days before construction activity is scheduled to begin. If the construction activity will extend beyond the dates specified in the waiver certification, the operator must either: (a) recalculate the waiver using the original start date with the new ending date (if the R factor is still less than five, a new waiver certification must be submitted) or (b) submit an NOI application form and fee for coverage under this general permit at least seven days prior to the end of the waiver period; or

   b. TMDL (Total Maximum Daily Load) Waiver. Storm water controls are not needed based on a TMDL approved or established by U.S. EPA that addresses the pollutant(s) of concern or, for non-impaired waters that do not require TMDLs, and equivalent analysis that determines allocations for small construction sites for the pollutant(s) of concern or that determines that such allocations are not needed to protect water quality based on consideration of existing in-stream concentrations, expected growth in pollutant contributions from all sources, and a margin of safety. The pollutant(s) of concern include sediment or a parameter that addresses sediment (such as total suspended solids, turbidity or siltation) and any other pollutant that has been identified as a cause of impairment of any water body that will receive a discharge from the construction activity. The operator must certify to the director of Ohio EPA that the construction activity will take place, and storm water discharges will occur, within the drainage area addressed by the TMDL or equivalent analysis. A written waiver certification must be submitted to Ohio EPA at least 21 days before the construction activity is scheduled to begin.

4. Prohibition on non-storm water discharges. All discharges covered by this permit must be composed entirely of storm water with the exception of the following: discharges from firefighting activities; fire hydrant flushings; potable water sources including waterline flushings; irrigation drainage; lawn watering; air conditioning condensate; springs;

uncontaminated ground water from trench or well point de-watering and foundation or footing drains where flows are not contaminated with process materials such as solvents. De-watering activities must be done in compliance with Part II.C and Part III.G.2.g.iv of this permit. Discharges of material other than storm water or the authorized non-storm water discharges listed above must comply with an individual NPDES permit or an alternative NPDES general permit issued for the discharge.

Except for flows from firefighting activities, sources of non-storm water listed above that are combined with storm water discharges associated with construction activity must be identified in the SWP3. The SWP3 must identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

5. Spills and unintended releases (Releases in excess of Reportable Quantities). This permit does not relieve the permittee of the reporting requirements of Title 40 of the Code of Federal Regulations ("CFR") Part 117 and 40 CFR Part 302. In the event of a spill or other unintended release, the discharge of hazardous substances in the storm water discharge(s) from a construction site must be minimized in accordance with the applicable storm water pollution prevention plan for the construction activity and in no case, during any 24-hour period, may the discharge(s) contain a hazardous substance equal to or in excess of reportable quantities.

   40 CFR Part 117 sets forth a determination of the reportable quantity for each substance designated as hazardous in 40 CFR Part 116. The regulation applies to quantities of designated substances equal to or greater than the reportable quantities, when discharged to surface waters of the state. 40 CFR Part 302 designates under section 102(a) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, those substances in the statutes referred to in section 101(14), identifies reportable quantities for these substances and sets forth the notification requirements for releases of these substances. This regulation also sets forth reportable quantities for hazardous substances designated under section 311(b)(2)(A) of the Clean Water Act (CWA).

C. Requiring an individual NPDES permit or an alternative NPDES general permit.

1. The director may require an alternative permit. The director may require any operator eligible for this permit to apply for and obtain either an individual NPDES permit or coverage under an alternative NPDES general permit in accordance with OAC Rule 3745-38-04. Any interested person may petition the director to take action under this paragraph.

   The director will send written notification that an alternative NPDES permit is required. This notice shall include a brief statement of the reasons for this decision, an application form and a statement setting a deadline for the operator to file the application. If an operator fails to submit an application in a timely manner as required by the director under this paragraph, then coverage, if in effect, under this permit is automatically terminated at the end of the day specified for application submittal.

2. Operators may request an individual NPDES permit. Any owner or operator eligible for this permit may request to be excluded from the coverage of this permit by applying for an individual permit. The owner or operator shall submit an individual application with reasons supporting the request to the director in accordance with the requirements of 40 CFR 122.26. If the reasons adequately support the request, the director shall grant it by issuing an individual NPDES permit.

3. When an individual NPDES permit is issued to an owner or operator otherwise subject to this permit or the owner or operator is approved for coverage under an alternative NPDES general permit, the applicability of this permit to the individual NPDES permittee is automatically terminated on the effective date of the individual permit or the date of approval for coverage under the alternative general permit, whichever the case may be.

D. Permit requirements when portions of a site are sold

If an operator obtains a permit for a development, and then the operator (permittee) sells off lots or parcels within that development, permit coverage must be continued on those lots until a Notice of Termination (NOT) in accordance with Part IV.B is submitted. For developments which require the use of centralized sediment and erosion controls (i.e., controls that address storm water runoff from one or more lots) for which the current permittee intends to terminate responsibilities under this permit for a lot after sale of the lot to a new owner and such termination will either prevent or impair the implementation of the controls and therefore jeopardize compliance with the terms and conditions of this permit, the permittee will be required to maintain responsibility for the implementation of those controls. For developments where this is not the case, it is the permittee's responsibility to temporarily stabilize all lots sold to individual lot owners unless an exception is approved in accordance with Part III.G.4. In cases where permit responsibilities for individual lot(s) will be terminated after sale of the lot, the permittee shall inform the individual lot owner of the obligations under this permit and ensure that the Individual Lot NOI application is submitted to Ohio EPA.

E. Authorization

1. Obtaining authorization to discharge. Operators that discharge storm water associated with construction activity must submit an NOI application form and SWP3 in accordance with the requirements of Part II of this permit to obtain authorization to discharge under this general permit. As required under OAC Rule 3745-38-06(E), the director, in response to the NOI and SWP3 submission, will notify the applicant in writing that he/she has or has not been granted general permit coverage to discharge storm water associated with construction activity under the terms and conditions of this permit or that the applicant must apply for an individual NPDES permit or coverage under an alternate general NPDES permit as described in Part I.C.1.

2. No release from other requirements. No condition of this permit shall release the permittee from any responsibility or requirements under other environmental statutes or regulations. Other permit requirements commonly associated with construction activities include, but are not limited to, section 401 water quality certifications, isolated wetland permits, permits to install sanitary sewers or other devices that discharge or convey polluted water, permits to install drinking water lines, single lot sanitary system permits and disturbance of land which was used to operate a solid or hazardous waste facility (i.e., coverage under this NPDES general permit does not satisfy the requirements of

OAC Rule 3745-27-13 or ORC Section 3734.02(H)). The issuance of this permit is subject to resolution of an antidegradation review. This permit does not relieve the permittee of other responsibilities associated with construction activities such as contacting the Ohio Department of Natural Resources, Division of Water, to ensure proper well installation and abandonment of wells.

F. Notice of Intent Requirements

1. Deadlines for notification.

   a. Initial coverage: Operators who intend to obtain initial coverage for a storm water discharge associated with construction activity under this general permit must submit a complete and accurate NOI application form and appropriate fee at least 21 days prior to the commencement of construction activity. If more than one operator, as defined in Part VII of this general permit, will be engaged at a site, each operator shall seek coverage under this general permit. Coverage under this permit is not effective until an approval letter granting coverage from the director of Ohio EPA is received by the applicant. Where one operator has already submitted an NOI prior to other operator(s) being identified, the additional operator shall request modification of coverage to become a co-permittee. In such instances, the co-permittees shall be covered under the same facility permit number. No additional permit fee is required.

   b. Individual lot transfer of coverage: Operators must each submit an individual lot notice of intent (Individual Lot NOI) application form (no fee required) to Ohio EPA at least seven days prior to the date that they intend to accept responsibility for permit requirements for their portion of the original permitted development from the previous permittee. The original permittee may submit an Individual Lot NOT at the time the Individual Lot NOI is submitted. Transfer of permit coverage is not granted until an approval letter from the director of Ohio EPA is received by the applicant.

2. Failure to notify. Operators who fail to notify the director of their intent to be covered and who discharge pollutants to surface waters of the state without an NPDES permit are in violation of ORC Chapter 6111. In such instances, Ohio EPA may bring an enforcement action for any discharges of storm water associated with construction activity.

3. Where to submit an NOI. Operators seeking coverage under this permit must submit a signed NOI form, provided by Ohio EPA, to the address found in the associated instructions.

4. Additional notification. The permittee shall make NOIs and SWP3s available upon request of the director of Ohio EPA, local agencies approving sediment and erosion control plans, grading plans or storm water management plans, local governmental officials, or operators of municipal separate storm sewer systems (MS4s) receiving drainage from the permitted site. Each operator that discharges to an NPDES permitted MS4 shall provide a copy of its Ohio EPA NOI submission to the MS4 in accordance with the MS4's requirements, if applicable.

5. Re-notification. In accordance with Ohio Administrative Code (OAC) 3745-38-02(E)(2)(a)(i), entities authorized under a construction storm water general permit are required to renew their coverage every five years for projects which are not complete. Permittees

having coverage under previous generations of this general permit (OHC000003, OHC000002 and OHR100000) will have continued coverage under OHC000004 until their approval for coverage date exceeds five (5) years. Permittees who want to continue coverage under OHC000004 shall submit a renewal Notice of Intent (NOI) form and appropriate application fee at least 21 days prior to their coverage date reaching five (5) years. (For example, if a permittee was issued coverage under OHC000003 on June 1, 2008 then a renewal application must be submitted at least 21 days prior to June 1, 2013).

Part II. NON-NUMERIC EFFLUENT LIMITATIONS

You shall comply with the following non-numeric effluent limitations for discharges from your site and/or from construction support activities. Part III of this permit contains the specific design criteria to meet the objectives of the following non-numeric effluent limitations.

A. **Erosion and Sediment Controls**. You shall design, install and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants. At a minimum, such controls shall be designed, installed and maintained to:

1. Control storm water volume and velocity within the site to minimize soil erosion;

2. Control storm water discharges, including both peak flowrates and total storm water volume, to minimize erosion at outlets and to minimize downstream channel and streambank erosion;

3. Minimize the amount of soil exposed during construction activity;

4. Minimize the disturbance of steep slopes;

5. Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls shall address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting storm water runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site;

6. If feasible, provide and maintain a 50-foot undisturbed natural buffer around surface waters of the State, direct storm water to vegetated areas to increase sediment removal and maximize storm water infiltration. If it is infeasible to provide and maintain an undisturbed 50-foot natural buffer you shall comply with the stabilization requirements found in Part II.B for areas within 50 feet of a surface water; and

7. Minimize soil compaction and, unless infeasible, preserve topsoil.

B. **Soil Stabilization**. Stabilization of disturbed areas shall, at a minimum, be initiated in accordance with the time frames specified in the following tables.

Table 1: Permanent Stabilization

Area requiring permanent stabilization	Time frame to apply erosion controls
Any areas that will lie dormant for one year or more	Within seven days of the most recent disturbance
Any areas within 50 feet of a surface water of the State and at final grade	Within two days of reaching final grade
Any other areas at final grade	Within seven days of reaching final grade within that area

Table 2: Temporary Stabilization

Area requiring temporary stabilization	Time frame to apply erosion controls
Any disturbed areas within 50 feet of a surface water of the State and not at final grade	Within two days of the most recent disturbance if the area will remain idle for more than 14 days
For all construction activities, any disturbed areas that will be dormant for more than 14 days but less than one year, and not within 50 feet of a surface water of the State	Within seven days of the most recent disturbance within the area For residential subdivisions, disturbed areas must be stabilized at least seven days prior to transfer of permit coverage for the individual lot(s).
Disturbed areas that will be idle over winter	Prior to the onset of winter weather

Where vegetative stabilization techniques may cause structural instability or are otherwise unobtainable, alternative stabilization techniques must be employed. Permanent and temporary stabilization are defined in Part VII.

C. **Dewatering.** Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, are prohibited unless managed by appropriate controls.

D. **Pollution Prevention Measures.** Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants. At a minimum, such measures must be designed, installed, implemented and maintained to:

1. Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters shall be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;

2. Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials present on the site to precipitation and to storm water; and

3. Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.

E. Prohibited Discharges. The following discharges are prohibited:

1. Wastewater from washout of concrete, unless managed by an appropriate control;

2. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;

3. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and

4. Soaps or solvents used in vehicle and equipment washing.

F. Surface Outlets. When discharging from sediment basins utilize outlet structures that withdraw water from the surface, unless infeasible. Note: Ohio EPA believes that the circumstances in which it is infeasible to design outlet structures in this manner are rare. Exceptions may include time periods with extended cold weather during winter months. If you have determined that it is infeasible to meet this requirement, you shall provide documentation in your SWPPP to support your determination.

PART III. STORM WATER POLLUTION PREVENTION PLAN (SWP3)

A. Storm Water Pollution Prevention Plans.

A SWP3 shall be developed for each site covered by this permit. For a multi-phase construction project, a separate NOI shall be submitted when a separate SWP3 will be prepared for subsequent phases. SWP3s shall be prepared in accordance with sound engineering and/or conservation practices by a professional experienced in the design and implementation of standard erosion and sediment controls and storm water management practices addressing all phases of construction. The SWP3 shall identify potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges associated with construction activities. The SWP3 shall be a comprehensive, stand-alone document, which is not complete unless it contains the information required by Part III.G of this permit. In addition, the SWP3 shall describe and ensure the implementation of best management practices (BMPs) that reduce the pollutants in storm water discharges during construction and pollutants associated with post-construction activities to ensure compliance with ORC Section 6111.04, OAC Chapter 3745-1 and the terms and conditions of this permit.

B. Timing

A SWP3 shall be completed prior to the timely submittal of an NOI and updated in accordance with Part III.D. Upon request and good cause shown, the director may waive the requirement to have a SWP3 completed at the time of NOI submission. If a waiver has been granted, the SWP3 must be completed prior to the initiation of construction activities. The SWP3 must be implemented upon initiation of construction activities.

Permittees continuing coverage from the previous generations of this permit (OHR100000, OHC000002 and OHC000003) that have initiated construction activity prior to the effective date

of this general permit (OHC000004) are not required to update their SWP3 as a result of this renewal (OHC000004).

C. SWP3 Signature and Review.

1. Plan Signature and Retention On-Site. The SWP3 shall include the certification in Part V.H, be signed in accordance with Part V.G., and be retained on site during working hours.

2. Plan Availability

   a. On-site: The plan shall be made available immediately upon request of the director or his authorized representative during working hours. A copy of the NOI and letter granting permit coverage under this general permit also shall be made available at the site.

   b. By written request: The permittee must provide the most recent copy of the SWP3 within 10 days upon written request by any of the following:

      i. The director or the director's authorized representative;

      ii. A local agency approving sediment and erosion plans, grading plans or storm water management plans; or

      iii. In the case of a storm water discharge associated with construction activity which discharges through a municipal separate storm sewer system with an NPDES permit, to the operator of the system.

   c. To the public: All NOIs, general permit approval for coverage letters, and SWP3s are considered reports that shall be available to the public in accordance with the Ohio Public Records law. The permittee shall make documents available to the public upon request or provide a copy at public expense, at cost, in a timely manner. However, the permittee may claim to Ohio EPA any portion of an SWP3 as confidential in accordance with Ohio law.

3. Plan Revision. The director or authorized representative may notify the permittee at any time that the SWP3 does not meet one or more of the minimum requirements of this part. Within 10 days after such notification from the director or authorized representative (or as otherwise provided in the notification), the permittee shall make the required changes to the SWP3 and, if requested, shall submit to Ohio EPA the revised SWP3 or a written certification that the requested changes have been made.

D. Amendments

The permittee shall amend the SWP3 whenever there is a change in design, construction, operation or maintenance, which has a significant effect on the potential for the discharge of pollutants to surface waters of the State or if the SWP3 proves to be ineffective in achieving the general objectives of controlling pollutants in storm water discharges associated with construction activity. Amendments to the SWP3 may be reviewed by Ohio EPA in the same manner as Part III.C.

E. Duty to inform contractors and subcontractors

The permittee shall inform all contractors and subcontractors not otherwise defined as "operators" in Part VII of this general permit who will be involved in the implementation of the SWP3 of the terms and conditions of this general permit. The permittee shall maintain a written document containing the signatures of all contractors and subcontractors involved in the implementation of the SWP3 as proof acknowledging that they reviewed and understand the conditions and responsibilities of the SWP3. The written document shall be created and signatures shall be obtained prior to commencement of work on the construction site.

F. Total Maximum Daily Load (TMDL) allocations

If a TMDL is approved for any waterbody into which the permittee's site discharges and requires specific BMPs for construction sites, the director may require the permittee to revise his/her SWP3.

G. SWP3 Requirements

Operations that discharge storm water from construction activities are subject to the following requirements and the SWP3 shall include the following items:

1. Site description. Each SWP3 shall provide:

    a. A description of the nature and type of the construction activity (e.g., low density residential, shopping mall, highway, etc.);

    b. Total area of the site and the area of the site that is expected to be disturbed (i.e., grubbing, clearing, excavation, filling or grading, including off-site borrow areas);

    c. An estimate of the impervious area and percent imperviousness created by the construction activity;

    d. A calculation of the runoff coefficients for both the pre-construction and post-construction site conditions;

    e. Existing data describing the soil and, if available, the quality of any discharge from the site;

    f. A description of prior land uses at the site;

    g. An implementation schedule which describes the sequence of major construction operations (i.e., designation of vegetative preservation areas, grubbing, excavating, grading, utilities and infrastructure installation) and the implementation of erosion, sediment and storm water management practices or facilities to be employed during each operation of the sequence;

    h. The name and/or location of the immediate receiving stream or surface water(s) and the first subsequent named receiving water(s) and the areal extent and description of wetlands or other special aquatic sites at or near the site which will

be disturbed or which will receive discharges from disturbed areas of the project. For discharges to an MS4, the point of discharge to the MS4 and the location where the MS4 ultimately discharges to a stream or surface water of the State shall be indicated.

i. For subdivided developments where the SWP3 does not call for a centralized sediment control capable of controlling multiple individual lots, a detail drawing of a typical individual lot showing standard individual lot erosion and sediment control practices.

   This does not remove the responsibility to designate specific erosion and sediment control practices in the SWP3 for critical areas such as steep slopes, stream banks, drainage ways and riparian zones

j. Location and description of any storm water discharges associated with dedicated asphalt and dedicated concrete plants covered by this permit and the best management practices to address pollutants in these storm water discharges;

k. A copy of the permit requirements (attaching a copy of this permit is acceptable);

l. A cover page or title identifying the name and location of the site, the name and contact information of all construction site operators, the name and contact information for the person responsible for authorizing and amending the SWP3, preparation date, and the estimated dates that construction will start and be complete;

m. A log documenting grading and stabilization activities as well as amendments to the SWP3, which occur after construction activities commence; and

n. Site map showing:

   i. Limits of earth-disturbing activity of the site including associated off-site borrow or spoil areas that are not addressed by a separate NOI and associated SWP3;

   ii. Soils types for all areas of the site, including locations of unstable or highly erodible soils;

   iii. Existing and proposed contours. A delineation of drainage watersheds expected during and after major grading activities as well as the size of each drainage watershed, in acres;

   iv. Surface water locations including springs, wetlands, streams, lakes, water wells, etc., on or within 200 feet of the site, including the boundaries of wetlands or stream channels and first subsequent named receiving water(s) the permittee intends to fill or relocate for which the permittee is seeking approval from the Army Corps of Engineers and/or Ohio EPA;

v. Existing and planned locations of buildings, roads, parking facilities and utilities;

vi. The location of all erosion and sediment control practices, including the location of areas likely to require temporary stabilization during the course of site development;

vii. Sediment and storm water management basins noting their sediment settling volume and contributing drainage area;

viii. The location of permanent storm water management practices to be used to control pollutants in storm water after construction operations have been completed.

ix. Areas designated for the storage or disposal of solid, sanitary and toxic wastes, including dumpster areas, areas designated for cement truck washout, and vehicle fueling;

x. The location of designated construction entrances where the vehicles will access the construction site; and

xi. The location of any in-stream activities including stream crossings.

2. Controls. In accordance with Part II.A, the SWP3 shall contain a description of the controls appropriate for each construction operation covered by this permit and the operator(s) shall implement such controls. The SWP3 shall clearly describe for each major construction activity identified in Part III.G.1.g: (a) appropriate control measures and the general timing (or sequence) during the construction process that the measures will be implemented; and (b) which contractor is responsible for implementation (e.g., contractor A will clear land and install perimeter controls and contractor B will maintain perimeter controls until final stabilization). The SWP3 shall identify the subcontractors engaged in activities that could impact storm water runoff. The SWP3 shall contain signatures from all of the identified subcontractors indicating that they have been informed and understand their roles and responsibilities in complying with the SWP3. Ohio EPA recommends that the primary site operator review the SWP3 with the primary contractor prior to commencement of construction activities and keep a SWP3 training log to demonstrate that this review has occurred.

Ohio EPA recommends that the erosion, sediment, and storm water management practices used to satisfy the conditions of this permit should meet the standards and specifications in the most current edition of Ohio's Rainwater and Land Development (see definitions) manual or other standards acceptable to Ohio EPA. The controls shall include the following minimum components:

a. Non-Structural Preservation Methods. The SWP3 shall make use of practices which preserve the existing natural condition as much as feasible. Such practices may include: preserving existing vegetation and vegetative buffer strips, phasing of construction operations in order to minimize the amount of disturbed land at any one time and designation of tree preservation areas or other protective clearing or grubbing practices. The recommended buffer that

operators should leave undisturbed along a surface water of the State is 50 feet as measured from the ordinary high water mark of the surface water.

b. Erosion Control Practices. The SWP3 shall make use of erosion controls that are capable of providing cover over disturbed soils unless an exception is approved in accordance with Part III.G.4. A description of control practices designed to restabilize disturbed areas after grading or construction shall be included in the SWP3. The SWP3 shall provide specifications for stabilization of all disturbed areas of the site and provide guidance as to which method of stabilization will be employed for any time of the year. Such practices may include: temporary seeding, permanent seeding, mulching, matting, sod stabilization, vegetative buffer strips, phasing of construction operations, use of construction entrances and the use of alternative ground cover.

i. **Stabilization.** In accordance with Part II.B, disturbed areas shall be stabilized as specified in the following tables below. Permanent and temporary stabilization are defined in Part VII.

Table 1: Permanent Stabilization

Area requiring permanent stabilization	Time frame to apply erosion controls
Any areas that will lie dormant for one year or more	Within seven days of the most recent disturbance
Any areas within 50 feet of a surface water of the State and at final grade	Within two days of reaching final grade
Any other areas at final grade	Within seven days of reaching final grade within that area

Table 2: Temporary Stabilization

Area requiring temporary stabilization	Time frame to apply erosion controls
Any disturbed areas within 50 feet of a surface water of the State and not at final grade	Within two days of the most recent disturbance if the area will remain idle for more than 14 days
For all construction activities, any disturbed areas that will be dormant for more than 14 days but less than one year, and not within 50 feet of a surface water of the State	Within seven days of the most recent disturbance within the area For residential subdivisions, disturbed areas must be stabilized at least seven days prior to transfer of permit coverage for the individual lot(s).
Disturbed areas that will be idle over winter	Prior to the onset of winter weather

Where vegetative stabilization techniques may cause structural instability or are otherwise unobtainable, alternative stabilization techniques must be employed.

ii. **Permanent stabilization of conveyance channels**. Operators shall undertake special measures to stabilize channels and outfalls and prevent erosive flows. Measures may include seeding, dormant seeding (as defined in the most current edition of the Rainwater and Land Development manual), mulching, erosion control matting, sodding, riprap, natural channel design with bioengineering techniques or rock check dams.

c. Runoff Control Practices. The SWP3 shall incorporate measures which control the flow of runoff from disturbed areas so as to prevent erosion from occurring. Such practices may include rock check dams, pipe slope drains, diversions to direct flow away from exposed soils and protective grading practices. These practices shall divert runoff away from disturbed areas and steep slopes where practicable. Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel to provide non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected.

d. Sediment Control Practices. The plan shall include a description of structural practices that shall store runoff allowing sediments to settle and/or divert flows away from exposed soils or otherwise limit runoff from exposed areas. Structural practices shall be used to control erosion and trap sediment from a site remaining disturbed for more than 14 days. Such practices may include, among others: sediment settling ponds, silt fences, earth diversion dikes or channels which direct runoff to a sediment settling pond and storm drain inlet protection. All sediment control practices must be capable of ponding runoff in order to be considered functional. Earth diversion dikes or channels alone are not considered a sediment control practice unless those are used in conjunction with a sediment settling pond.

The SWP3 shall contain detail drawings for all structural practices.

i. **Timing.** Sediment control structures shall be functional throughout the course of earth disturbing activity. Sediment basins and perimeter sediment barriers shall be implemented prior to grading and within seven days from the start of grubbing. They shall continue to function until the up slope development area is restabilized. As construction progresses and the topography is altered, appropriate controls shall be constructed or existing controls altered to address the changing drainage patterns.

ii. **Sediment settling ponds.** A sediment settling pond is required for any one of the following conditions:

- Concentrated storm water runoff (e.g., storm sewer or ditch);
- Runoff from drainage areas, which exceed the design capacity of silt fence or other sediment barriers;
- Runoff from drainage areas that exceed the design capacity of inlet protection; or
- Runoff from common drainage locations with 10 or more acres of disturbed land.

The permittee may request approval from Ohio EPA to use alternative controls if the permittee can demonstrate the alternative controls are equivalent in effectiveness to a sediment settling pond.

In accordance with Part II.F, if feasible, sediment settling ponds shall be dewatered at the pond surface using a skimmer or equivalent device. The sediment settling pond volume consists of both a dewatering zone and a sediment storage zone. The volume of the dewatering zone shall be a minimum of 1800 cubic feet (ft3) per acre of drainage (67 yd^3/acre) with a minimum 48-hour drain time for sediment basins serving a drainage area over 5 acres. The volume of the sediment storage zone shall be calculated by one of the following methods:

Method 1: The volume of the sediment storage zone shall be 1000 ft^3 per disturbed acre within the watershed of the basin. OR

Method 2: The volume of the sediment storage zone shall be the volume necessary to store the sediment as calculated with RUSLE or a similar generally accepted erosion prediction model.

The accumulated sediment shall be removed from the sediment storage zone once it's full. When determining the total contributing drainage are, off-site areas and areas which remain undisturbed by construction activity shall be included unless runoff from these areas is diverted away from the sediment settling pond and is not co-mingled with sediment-laden runoff. The depth of the dewatering zone shall be less than or equal to five feet. The configuration between inlets and the outlet of the basin shall provide at least two units of length for each one unit of width (> 2:1 length;width ratio); however, a length to width ratio of 4:1 is recommended. When designing sediment settling ponds, the permittee shall consider public safety, especially as it relates to children, as a design factor for the sediment basin and alternative sediment controls shall be used where site limitations would preclude a safe design. The use of a combination of sediment and erosion control measures in order to achieve maximum pollutant removal is encouraged.

iii. **Silt Fence and Diversions.** Sheet flow runoff from denuded areas shall be intercepted by silt fence or diversions to protect adjacent properties and water resources from sediment transported via sheet flow. Where intended to provide sediment control, silt fence shall be placed on a level contour downslope of the disturbed area. This permit does not preclude the use of other sediment barriers designed to control sheet flow runoff. The relationship between the maximum drainage area to silt fence for a particular slope range is shown in the following table:

Silt Fence Maximum Drainage Area Based on Slope

Maximum drainage area (in acres) to 100 linear feet of silt fence	Range of slope for a particular drainage area (in percent)
0.5	< 2%
0.25	≥ 2% but < 20%
0.125	≥ 20% but < 50%

Placing silt fence in a parallel series does not extend the size of the drainage area. Storm water diversion practices shall be used to keep runoff away from disturbed areas and steep slopes where practicable. Such devices, which include swales, dikes or berms, may receive storm water runoff from areas up to 10 acres.

iv. **Inlet Protection.** Other erosion and sediment control practices shall minimize sediment laden water entering active storm drain systems, unless the storm drain system drains to a sediment settling pond. All inlets receiving runoff from drainage areas of one or more acres will require a sediment settling pond.

v. **Surface Waters of the State Protection.** If construction activities disturb areas adjacent to surface waters of the State, structural practices shall be designed and implemented on site to protect all adjacent surface waters of the State from the impacts of sediment runoff. No structural sediment controls (e.g., the installation of silt fence or a sediment settling pond) shall be used in a surface water of the State. For all construction activities immediately adjacent to surface waters of the State, it is recommended that a setback of at least 50 feet, as measured from the ordinary high water mark of the surface water, be maintained in its natural state as a permanent buffer. Where impacts within this setback area are unavoidable due to the nature of the construction activity (e.g., stream crossings for roads or utilities), the project shall be designed such that the number of stream crossings and the width of the disturbance within the setback area are minimized.

vi. **Modifying Controls**. If periodic inspections or other information indicates a control has been used inappropriately or incorrectly, the permittee shall replace or modify the control for site conditions.

e. Post-Construction Storm Water Management Requirements. So that receiving stream's physical, chemical and biological characteristics are protected and stream functions are maintained, post-construction storm water practices shall provide perpetual management of runoff quality and quantity. To meet the post-construction requirements of this permit, the SWP3 shall contain a description of the post-construction BMPs that will be installed during construction for the site and the rationale for their selection. The rationale shall address the anticipated impacts on the channel and floodplain morphology, hydrology, and water quality. Post-construction BMPs cannot be installed within a surface water of the State (e.g., wetland or stream) unless it's authorized by a CWA 401 water quality certification, CWA 404 permit, or Ohio EPA non-jurisdictional wetland/stream

program approval. Note: localities may have more stringent post-construction requirements.

Detail drawings and maintenance plans shall be provided for all post-construction BMPs. Maintenance plans shall be provided by the permittee to the post-construction operator of the site (including homeowner associations) upon completion of construction activities (prior to termination of permit coverage). For sites located within a community with a regulated municipal separate storm sewer system (MS4), the permittee, land owner, or other entity with legal control of the property may be required to develop and implement a maintenance plan to comply with the requirements of the MS4. Maintenance plans shall ensure that pollutants collected within structural post-construction practices, be disposed of in accordance with local, state, and federal regulations. To ensure that storm water management systems function as they were designed and constructed, the post-construction operation and maintenance plan shall be a stand-alone document, which contains: (1) a designated entity for storm water inspection and maintenance responsibilities; (2) the routine and non-routine maintenance tasks to be undertaken; (3) a schedule for inspection and maintenance; (4) any necessary legally binding maintenance easements and agreements; and (5) a map showing all access and maintenance easements. Permittees are not responsible under this permit for operation and maintenance of post-construction practices once coverage under this permit is terminated.

Post-construction storm water BMPs that discharge pollutants from point sources once construction is completed, may in themselves, need authorization under a separate NPDES permit (one example is storm water discharges from regulated industrial sites).

Construction activities that do not include the installation of any impervious surface (e.g., soccer fields), abandoned mine land reclamation activities regulated by the Ohio Department of Natural Resources, stream and wetland restoration activities, and wetland mitigation activities are not required to comply with the conditions of Part III.G.2.e of this permit. Linear construction projects, (e.g., pipeline or utility line installation), which do not result in the installation of additional impervious surface, are not required to comply with the conditions of Part III.G.2.e of this permit. However, linear construction projects shall be designed to minimize the number of stream crossings and the width of disturbance and achieve final stabilization of the disturbed area as defined in Part VII.H.1.

<u>Large Construction Activities</u>. For all large construction activities (involving the disturbance of five or more acres of land or will disturb less than five acres, but is a part of a larger common plan of development or sale which will disturb five or more acres of land), the post construction BMP(s) chosen shall be able to detain storm water runoff for protection of the stream channels, stream erosion control, and improved water quality. The BMP(s) chosen must be compatible with site and soil conditions. Structural (designed) post-construction storm water treatment practices shall be incorporated into the permanent drainage system for the site. The BMP(s) chosen must be sized to treat the water quality volume (WQ_v) and ensure compliance with Ohio's Water Quality Standards in OAC

Chapter 3745-1. The WQ_v shall be equivalent to the volume of runoff from a 0.75-inch rainfall and shall be determined according to the following equation:

$WQ_v = C * P * A / 12$
where:
WQ_v = water quality volume in acre-feet
C = runoff coefficient appropriate for storms less than 1 inch
(Either use the following formula: $C = 0.858i^3 - 0.78i^2 + 0.774i + 0.04$,
where i = fraction of post-construction impervious surface or use Table 1)
P = 0.75 inch precipitation depth
A = area draining into the BMP in acres

Table 1
Runoff Coefficients Based on the Type of Land Use

Land Use	Runoff Coefficient
Industrial & Commercial	0.8
High Density Residential (>8 dwellings/acre)	0.5
Medium Density Residential (4 to 8 dwellings/acre)	0.4
Low Density Residential (<4 dwellings/acre)	0.3
Open Space and Recreational Areas	0.2

Where the land use will be mixed, the runoff coefficient should be calculated using a weighted average. For example, if 60% of the contributing drainage area to the storm water treatment structure is Low Density Residential, 30% is High Density Residential, and 10% is Open Space, the runoff coefficient is calculated as follows (0.6)(0.3) + (0.3)(0.5) + (0.1)(0.2) = 0.35.

An additional volume equal to 20 percent of the WQ_v shall be incorporated into the BMP for sediment storage. Ohio EPA recommends that BMPs be designed according to the methodology included in the most current edition of the Rainwater and Land Development manual or in another design manual acceptable for use by Ohio EPA.

The BMPs listed in Table 2 below shall be considered standard BMPs approved for general use. However communities with a regulated MS4 may limit the use of some of these BMPs. BMPs shall be designed such that the drain time is long enough to provide treatment, but short enough to provide storage for successive rainfall events and avoid the creation of nuisance conditions. The outlet structure for the post-construction BMP shall not discharge more than the first half of the WQv or extended detention volume (EDv) in less than one-third of the drain time. The EDv is the volume of storm water runoff that must be detained by a structural post-construction BMP. The EDv is equal to 75 percent of the WQv for wet extended detention basins, but is equal to the WQv for all other BMPs listed in Table 2.

Table 2
Structural Post-Construction BMPs & Associated Drain (Drawdown) Times

Best Management Practice	Drain Time of WQv
Infiltration Basin or Trench^	24 – 48 hours
Permeable Pavement-Extended Detention	24 hours
Permeable Pavement-Infiltration	48 hours
Enhanced Water Quality Swale (i.e., Bioretention)	24 hours
Dry Extended Detention Basin*	48 hours
Wet Extended Detention Basin**	24 hours
Constructed Wetland (above permanent pool)+	24 hours
Sand & Other Media Filtration	24 hours
Bioretention Area/Cell^	24 hours
Pocket Wetland#	24 hours
Vegetated Filter Strip with Berm	24 hours

* Dry basins must include forebay and micropool each sized at 10% of the WQv.
** Provide both a permanent pool and an EDv above the permanent pool, each sized at 0.75 * WQv.
+ Extended detention shall be provided for the full WQv above the permanent water pool.
^ The WQv shall completely infiltrate within 48 hours so there is no standing or residual water in the BMP.
# Pocket wetlands must have a wet pool equal to the WQv, with 25% of the WQv in a pool and 75% in marshes. The EDv above the permanent pool must be equal to the WQv.

The permittee may request approval from Ohio EPA to use alternative structural post-construction BMPs if the permittee can demonstrate that the alternative BMPs are equivalent in effectiveness to those listed in Table 2 above. Construction activities shall be exempt from this condition if it can be demonstrated that the WQ_v is provided within an existing structural post-construction BMP that is part of a larger common plan of development or if structural post-construction BMPs are addressed in a regional or local storm water management plan. A municipally operated regional storm water BMP can be used as a post-construction BMP provided that the BMP can detain the WQv from its entire drainage area and release it over a 24 hour period.

Transportation Projects. The construction of new roads and roadway improvement projects by public entities (i.e., the state, counties, townships, cities, or villages) may implement post-construction BMPs in compliance with the current version (as of the effective date of this permit) of the Ohio Department of Transportation's "Location and Design Manual, Volume Two Drainage Design" that has been accepted by Ohio EPA as an alternative to the conditions of this permit.

Offsite Mitigation of Post-Construction. Ohio EPA may authorize the offsite mitigation of the post-construction requirements of Part III.G.2.e of this permit on a case by case basis provided the permittee clearly demonstrates the BMPs listed in Table 2 are not feasible and the following criteria is met: (1) a maintenance agreement or policy is established to ensure operations and treatment in perpetuity; (2) the offsite location discharges to the same HUC-14 watershed unit; and (3) the mitigation ratio of the WQv is 1.5 to 1 or the WQv at

the point of retrofit, whichever is greater. Requests for offsite mitigation must be received prior to receipt of the NOI applications.

Redevelopment Projects Sites that have been previously developed where no post-construction BMPs were installed shall either ensure a 20 percent net reduction of the site impervious area, provide for treatment of at least 20 percent of the WQv, or a combination of the two. A one-for-one credit towards the 20 percent net reduction of impervious area can be obtained through the use of green roofs. Where projects are a combination of new development and redevelopment, the total WQv that must be treated shall be calculated by a weighted average based on acreage, with the new development at 100 percent WQv and redevelopment at 20 percent WQv.

Non-Structural Post-Construction BMPs The size of the structural post-construction can be reduced by incorporating non-structural post-construction BMPs into the design. Practices such as preserving open space will reduce the runoff coefficient and, thus, the WQv. Ohio EPA encourages the implementation of riparian and wetland setbacks. Practices which reduce storm water runoff include green roofs, rain barrels, conservation development, smart growth, low-impact development, and other site design techniques contained in the Ohio Lake Commission's Balanced Growth Program (see www.glc.org/landuse/ohroundtable/ohiobgi.html).

In order to promote the implementation of such practices, the Director may consider the use of non-structural practices to demonstrate compliance with Part III.G.2.e of this permit for areas of the site not draining into a common drainage system of the site, i.e., sheet flow from perimeter areas such as the rear yards of residential lots, for low density development scenarios, or where the permittee can demonstrate that the intent of pollutant removal and stream protection, as required in Part III.G.2.e of this permit is being addressed through non-structural post-construction BMPs based upon review and approval by Ohio EPA.

Use of Alternative Post-Construction BMPs This permit does not preclude the use of innovative or experimental post-construction storm water management technologies. However, the Director may require these practices to be tested using the protocol outlined in the Technology Acceptance Reciprocity Partnership's (TARP) Protocol for Stormwater Best Management Practice Demonstrations or other approvable protocol. For guidance, see the following:

- http://www.dep.state.pa.us/dep/deputate/pollprev/techservices/tarp
- http://www.njstormwater.org

The Director may require discharges from such structures to be monitored to ensure compliance with Part III.G.2.e of this permit. Permittees shall request approval from Ohio EPA to use alternative post-construction BMPs if the permittee can demonstrate that the alternative BMPs are equivalent in effectiveness to those listed in Table 2 above. To demonstrate this equivalency, the permittee shall show that the alternative BMP has a minimum total suspended solids (TSS) removal efficiency of 80 percent. Also, the WQv discharge rate from the practice shall be reduced to prevent stream bed erosion and protect the physical and biological stream integrity unless there will be

negligible hydrological impact to the receiving surface water of the State. The discharges will have a negligible impact if the permittee can demonstrate that one of the following four conditions exist:

i. The entire WQv is recharged to groundwater;
ii. The larger common plan of development or sale will create less than one acre of impervious surface;
iii. The project is a redevelopment project within an ultra-urban setting (i.e., a downtown area or on a site where 100 percent of the project area is already impervious surface and the storm water discharge is directed into an existing storm sewer system); or
iv. The storm water drainage system of the development discharges directly into a large river (fourth order or greater) or to a lake and where the development area is less than 5 percent of the watershed area upstream of the development site, unless a TMDL identified water quality problems into the receiving surface waters of the State.

The Director shall only consider the use of alternative BMPs on projects where the permittee can demonstrate that the implementation of the BMPs listed in Table 2 is infeasible due to physical site constraints that prevent the ability to provide functional BMP design. Alternative practices may include, but are not limited to, underground detention structures, vegetated swales and vegetated filter strips designed using water quality flow, natural depressions, rain barrels, green roofs, rain gardens, catch basin inserts, and hydrodynamics separators. The Director may also consider non-structural post-construction approaches where no local requirements for such practices exist.

Small Construction Activities For all small land disturbance activities (which disturb one or more, but less than five acres of land and is not a part of a larger common plan of development or sale which will disturb five or more acres of land), a description of measures that will be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed must be included in the SWP3. Structural measures should be placed on upland soils to the degree attainable. Such practices may include, but are not limited to: storm water detention structures (including wet basins); storm water retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff onsite; and sequential systems (which combine several practices). The SWP3 shall include an explanation of the technical basis used to select the practices to control pollution where flows exceed pre-development levels.

f. Surface Water Protection. If the project site contains any streams, rivers, lakes, wetlands or other surface waters, certain construction activities at the site may be regulated under the CWA and/or state isolated wetland permit requirements. Sections 404 and 401 of the Act regulate the discharge of dredged or fill material into surface waters and the impacts of such activities on water quality, respectively. Construction activities in surface waters which may be subject to CWA regulation and/or state isolated wetland permit requirements include, but are not limited to: sewer line crossings, grading, backfilling or culverting streams, filling wetlands, road and utility line construction, bridge installation and

installation of flow control structures. If the project contains streams, rivers, lakes or wetlands or possible wetlands, the permittee shall contact the appropriate U.S. Army Corps of Engineers District Office. (CAUTION: Any area of seasonally wet hydric soil is a potential wetland - please consult the Soil Survey and list of hydric soils for your County, available at your county's Soil and Water Conservation District. If you have any questions about Section 401 water quality certification, please contact the Ohio Environmental Protection Agency, Section 401 Coordinator.)

U.S. Army Corps of Engineers (Section 404 regulation):

- Huntington, WV District (304) 399-5210 (Muskingum River, Hocking River, Scioto River, Little Miami River, and Great Miami River Basins)
- Buffalo, NY District (716) 879-4191 (Lake Erie Basin)
- Pittsburgh, PA District (412) 395-7154 (Mahoning River Basin)
- Louisville, KY District (502) 315-6733 (Ohio River)

Ohio EPA 401/404 and non-jurisdictional stream/wetland coordinator can be contacted at (614) 644-2001 (all of Ohio)

Concentrated storm water runoff from BMPs to natural wetlands shall be converted to diffuse flow before the runoff enters the wetlands. The flow should be released such that no erosion occurs downslope. Level spreaders may need to be placed in series, particularly on steep sloped sites, to ensure non-erosive velocities. Other structural BMPs may be used between storm water features and natural wetlands, in order to protect the natural hydrology, hydroperiod, and wetland flora. If the applicant proposes to discharge to natural wetlands, a hydrologic analysis shall be performed. The applicant shall attempt to match the pre-development hydroperiods and hydrodynamics that support the wetland. The applicant shall assess whether their construction activity will adversely impact the hydrologic flora and fauna of the wetland. Practices such as vegetative buffers, infiltration basins, conservation of forest cover, and the preservation of intermittent streams, depressions, and drainage corridors may be used to maintain wetland hydrology.

g. Other controls.

i. **Non-Sediment Pollutant Controls.** In accordance with Part II.E, no solid (other than sediment) or liquid waste, including building materials, shall be discharged in storm water runoff. The permittee must implement all necessary BMPs to prevent the discharge of non-sediment pollutants to the drainage system of the site or surface waters of the state. Under no circumstance shall wastewater from the washout of concrete trucks, stucco, paint, form release oils, curing compounds, and other construction materials be discharged directly into a drainage channel, storm sewer or surface waters of the state. Also, no pollutants from vehicle fuel, oils, or other vehicle fluids can be discharged to surface waters of the State. No exposure of storm water to waste materials is recommended. The SWP3 must include methods to minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, and sanitary waste to

precipitation, storm water runoff, and snow melt. In accordance with Part II.D.3, the SWP3 shall include measures to prevent and respond to chemical spills and leaks. You may also reference the existence of other plans (i.e., Spill Prevention Control and Countermeasure (SPCC) plans, spill control programs, Safety Response Plans, etc.) provided that such plan addresses conditions of this permit condition and a copy of such plan is maintained on site.

ii. **Off-site traffic.** Off-site vehicle tracking of sediments and dust generation shall be minimized. In accordance with Part II.D, the SWP3 shall include methods to minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. No detergents may be used to wash vehicles. Wash waters shall be treated in a sediment basin or alternative control that provides equivalent treatment prior to discharge.

iii. **Compliance with other requirements.** The SWP3 shall be consistent with applicable State and/or local waste disposal, sanitary sewer or septic system regulations, including provisions prohibiting waste disposal by open burning and shall provide for the proper disposal of contaminated soils to the extent these are located within the permitted area.

iv. **Trench and ground water control**. In accordance with Part II.C, there shall be no turbid discharges to surface waters of the state resulting from de-watering activities. If trench or ground water contains sediment, it shall pass through a sediment settling pond or other equally effective sediment control device, prior to being discharged from the construction site. Alternatively, sediment may be removed by settling in place or by de-watering into a sump pit, filter bag or comparable practice. Ground water which does not contain sediment or other pollutants is not required to be treated prior to discharge. However, care must be taken when discharging ground water to ensure that it does not become pollutant-laden by traversing over disturbed soils or other pollutant sources.

v. **Contaminated Sediment.** Where construction activities are to occur on sites with contamination from previous activities, operators shall be aware that concentrations of materials that meet other criteria (is not considered a Hazardous Waste, meeting VAP standards, etc.) may still result in storm water discharges in excess of Ohio Water Quality Standards. Such discharges are not authorized by this permit. Appropriate BMPs include, but are not limited to:

- The use of berms, trenches, and pits to collect contaminated runoff and prevent discharges;
- Pumping runoff into a sanitary sewer (with prior approval of the sanitary sewer operator) or into a container for transport to an appropriate treatment/disposal facility; and
- Covering areas of contamination with tarps or other methods that prevent storm water from coming into contact with the material.

Operators should consult with Ohio EPA Division of Surface Water prior to seeking permit coverage.

h. Maintenance. All temporary and permanent control practices shall be maintained and repaired as needed to ensure continued performance of their intended function. All sediment control practices must be maintained in a functional condition until all up slope areas they control are permanently stabilized. The SWP3 shall be designed to minimize maintenance requirements. The applicant shall provide a description of maintenance procedures needed to ensure the continued performance of control practices.

i. Inspections. At a minimum, procedures in an SWP3 shall provide that all controls on the site are inspected at least once every seven calendar days and within 24 hours after any storm event greater than one-half inch of rain per 24 hour period. The inspection frequency may be reduced to at least once every month if the entire site is temporarily stabilized or runoff is unlikely due to weather conditions (e.g., site is covered with snow, ice, or the ground is frozen). A waiver of inspection requirements is available until one month before thawing conditions are expected to result in a discharge if all of the following conditions are met: the project is located in an area where frozen conditions are anticipated to continue for extended periods of time (i.e., more than one month); land disturbance activities have been suspended; and the beginning and ending dates of the waiver period are documented in the SWP3. Once a definable area is finally stabilized, the area may be marked on the SWP3 and no further inspection requirements apply to that portion of the site. The permittee shall assign "qualified inspection personnel" to conduct these inspections to ensure that the control practices are functional and to evaluate whether the SWP3 is adequate and properly implemented in accordance with the schedule proposed in Part III.G.1.g of this permit or whether additional control measures are required.

Following each inspection, a checklist must be completed and signed by the qualified inspection personnel representative. At a minimum, the inspection report shall include:

i. the inspection date;
ii. names, titles, and qualifications of personnel making the inspection;
iii. weather information for the period since the last inspection (or since commencement of construction activity if the first inspection) including a best estimate of the beginning of each storm event, duration of each storm event, approximate amount of rainfall for each storm event (in inches), and whether any discharges occurred;
iv. weather information and a description of any discharges occurring at the time of the inspection;
v. location(s) of discharges of sediment or other pollutants from the site;
vi. location(s) of BMPs that need to be maintained;
vii. location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;
viii. location(s) where additional BMPs are needed that did not exist at the time of inspection; and
ix. corrective action required including any changes to the SWP3 necessary and implementation dates.

Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of or the potential for pollutants entering the drainage system. Erosion and sediment control measures identified in the SWP3 shall be observed to ensure that those are operating correctly. Discharge locations shall be inspected to ascertain whether erosion and sediment control measures are effective in preventing significant impacts to the receiving waters. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site vehicle tracking.

The permittee shall maintain for three years following the submittal of a notice of termination form, a record summarizing the results of the inspection, names(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the SWP3 and a certification as to whether the facility is in compliance with the SWP3 and the permit and identify any incidents of non-compliance. The record and certification shall be signed in accordance with Part V.G. of this permit.

i. **When practices require repair or maintenance.** If the inspection reveals that a control practice is in need of repair or maintenance, with the exception of a sediment settling pond, it shall be repaired or maintained within 3 days of the inspection. Sediment settling ponds shall be repaired or maintained within 10 days of the inspection.

ii. **When practices fail to provide their intended function.** If the inspection reveals that a control practice fails to perform its intended function and that another, more appropriate control practice is required, the SWP3 shall be amended and the new control practice shall be installed within 10 days of the inspection.

iii. **When practices depicted on the SWP3 are not installed.** If the inspection reveals that a control practice has not been implemented in accordance with the schedule contained in Part III.G.1.g of this permit, the control practice shall be implemented within 10 days from the date of the inspection. If the inspection reveals that the planned control practice is not needed, the record shall contain a statement of explanation as to why the control practice is not needed.

3. Approved State or local plans. All dischargers regulated under this general permit must comply, except those exempted under state law, with the lawful requirements of municipalities, counties and other local agencies regarding discharges of storm water from construction activities. All erosion and sediment control plans and storm water management plans approved by local officials shall be retained with the SWP3 prepared in accordance with this permit. Applicable requirements for erosion and sediment control and storm water management approved by local officials are, upon submittal of a NOI form, incorporated by reference and enforceable under this permit even if they are not specifically included in an SWP3 required under this permit. When the project is located within the jurisdiction of a regulated municipal separate storm sewer system (MS4), the permittee shall certify that the SWP3 complies with the requirements of the storm water management program of the MS4 operator.

4. Exceptions. If specific site conditions prohibit the implementation of any of the erosion and sediment control practices contained in this permit or site specific conditions are such that implementation of any erosion and sediment control practices contained in this permit will result in no environmental benefit, then the permittee shall provide justification for rejecting each practice based on site conditions. Exceptions from implementing the erosion and sediment control standards contained in this permit will be approved or denied on a case-by-case basis.

   The permittee may request approval from Ohio EPA to use alternative methods to satisfy conditions in this permit if the permittee can demonstrate that the alternative methods are sufficient to protect the overall integrity of receiving streams and the watershed. Alternative methods will be approved or denied on a case-by-case basis.

PART IV. NOTICE OF TERMINATION REQUIREMENTS

A. Failure to notify.

The terms and conditions of this permit shall remain in effect until a signed Notice of Termination (NOT) form is submitted. Failure to submit an NOT constitutes a violation of this permit and may affect the ability of the permittee to obtain general permit coverage in the future.

B. When to submit an NOT.

1. Permittees wishing to terminate coverage under this permit shall submit an NOT form in accordance with Part V.G. of this permit. Compliance with this permit is required until an NOT form is submitted. The permittee's authorization to discharge under this permit terminates at midnight of the day the NOT form is submitted. Prior to submitting the NOT form, the permittee shall conduct a site inspection in accordance with Part III.G.2.i of this permit and have a maintenance agreement in place to ensure all post-construction BMPs will be maintained in perpetuity.

2. All permittees shall submit an NOT form within 45 days of completing all permit requirements. Enforcement actions may be taken if a permittee submits an NOT form without meeting one or more of the following conditions:

   a. Final stabilization (see definition in Part VII) has been achieved on all portions of the site for which the permittee is responsible (including, if applicable, returning agricultural land to its pre-construction agricultural use);

   b. Another operator(s) has assumed control over all areas of the site that have not been finally stabilized;

   c. A maintenance agreement is in place to ensure all post-construction BMPs are adequately maintained in perpetuity;

   d. For residential construction only, temporary stabilization has been completed and the lot, which includes a home, has been transferred to the homeowner. (Note: individual lots without housing which are sold by the developer must undergo final stabilization prior to termination of permit coverage.); or

e. An exception has been granted under Part III.G.4.

C. How to submit an NOT.

Permittees shall use Ohio EPA's approved NOT form. The form shall be completed and mailed according to the instructions and signed in accordance with Part V.G of this permit.

PART V. STANDARD PERMIT CONDITIONS.

A. Duty to comply.

The permittee shall comply with all conditions of this permit. Any permit noncompliance constitutes a violation of ORC Chapter 6111 and is grounds for enforcement action.

Ohio law imposes penalties and fines for persons who knowingly make false statements or knowingly swear or affirm the truth of a false statement previously made.

B. Continuation of an expired general permit.

An expired general permit continues in force and effect until a new general permit is issued.

C. Need to halt or reduce activity not a defense.

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to mitigate.

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Duty to provide information.

The permittee shall furnish to the director, within 10 days of written request, any information which the director may request to determine compliance with this permit. The permittee shall also furnish to the director upon request copies of records required to be kept by this permit.

F. Other information.

When the permittee becomes aware that he or she failed to submit any relevant facts or submitted incorrect information in the NOI, SWP3, NOT or in any other report to the director, he or she shall promptly submit such facts or information.

G. Signatory requirements.

All NOIs, NOTs, SWP3s, reports, certifications or information either submitted to the director or that this permit requires to be maintained by the permittee, shall be signed.

1. These items shall be signed as follows:

   a. For a corporation: By a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

      i. A president, secretary, treasurer or vice-president of the corporation in charge of a principal business function or any other person who performs similar policy or decision-making functions for the corporation; or

      ii. The manager of one or more manufacturing, production or operating facilities, provided, the manager is authorized to make management decisions that govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

   b. For a partnership or sole proprietorship: By a general partner or the proprietor, respectively; or

   c. For a municipality, State, Federal or other public agency: By either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes (1) the chief executive officer of the agency or (2) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of U.S. EPA).

2. All reports required by the permits and other information requested by the director shall be signed by a person described in Part V.G.1 of this permit or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described in Part V.G.1 of this permit and submitted to the director;

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of manager, operator of a well or well field, superintendent, position of equivalent responsibility or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and

   c. The written authorization is submitted to the director.

3. Changes to authorization. If an authorization under Part V.G.2 of this permit is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part V.G.2 of

this permit must be submitted to the director prior to or together with any reports, information or applications to be signed by an authorized representative.

H. Certification.

Any person signing documents under this section shall make the following certification:

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

I. Oil and hazardous substance liability.

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties to which the permittee is or may be subject under section 311 of the CWA or 40 CFR Part 112. 40 CFR Part 112 establishes procedures, methods and equipment and other requirements for equipment to prevent the discharge of oil from non-transportation-related onshore and offshore facilities into or upon the navigable surface waters of the State or adjoining shorelines.

J. Property rights.

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

K. Severability.

The provisions of this permit are severable and if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

L. Transfers.

Ohio NPDES general permit coverage is transferable. Ohio EPA must be notified in writing sixty days prior to any proposed transfer of coverage under an Ohio NPDES general permit. The transferee must inform Ohio EPA it will assume the responsibilities of the original permittee transferor.

M. Environmental laws.

No condition of this permit shall release the permittee from any responsibility or requirements under other environmental statutes or regulations.

N. Proper operation and maintenance.

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of SWP3s. Proper operation and maintenance requires the operation of backup or auxiliary facilities or similar systems, installed by a permittee only when necessary to achieve compliance with the conditions of the permit.

O. Inspection and entry.

The permittee shall allow the director or an authorized representative of Ohio EPA, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment).

PART VI. REOPENER CLAUSE

If there is evidence indicating potential or realized impacts on water quality due to any storm water discharge associated with construction activity covered by this permit, the permittee of such discharge may be required to obtain coverage under an individual permit or an alternative general permit in accordance with Part I.C of this permit or the permit may be modified to include different limitations and/or requirements.

Permit modification or revocation will be conducted according to ORC Chapter 6111.

PART VII. DEFINITIONS

A. "Act" means Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483, Pub. L. 97-117 and Pub. L. 100-4, 33 U.S.C. 1251 et. seq.

B. "Best management practices (BMPs)" means schedules of activities, prohibitions of practices, maintenance procedures and other management practices (both structural and non-structural) to prevent or reduce the pollution of surface waters of the state. BMP's also include treatment requirements, operating procedures and practices to control plant and/or construction site runoff, spillage or leaks, sludge or waste disposal or drainage from raw material storage.

C. "Commencement of construction" means the initial disturbance of soils associated with clearing, grubbing, grading, placement of fill, or excavating activities or other construction activities.

D. "Concentrated storm water runoff" means any storm water runoff which flows through a drainage pipe, ditch, diversion or other discrete conveyance channel.

E. "Director" means the director of the Ohio Environmental Protection Agency.

F. "Discharge" means the addition of any pollutant to the surface waters of the state from a point source.

G. "Disturbance" means any clearing, grading, excavating, filling, or other alteration of land surface where natural or man-made cover is destroyed in a manner that exposes the underlying soils.

H. "Drainage watershed" means for purposes of this permit the total contributing drainage area to a BMP, i.e., the "watershed" directed to the practice. This would also include any off-site drainage.

I. "Final stabilization" means that either:

1. All soil disturbing activities at the site are complete and a uniform perennial vegetative cover (e.g., evenly distributed, without large bare areas) with a density of at least 70 percent cover for the area has been established on all unpaved areas and areas not covered by permanent structures or equivalent stabilization measures (such as the use of mulches, rip-rap, gabions or geotextiles) have been employed. In addition, all temporary erosion and sediment control practices are removed and disposed of and all trapped sediment is permanently stabilized to prevent further erosion; or

2. For individual lots in residential construction by either:

   a. The homebuilder completing final stabilization as specified above or
   b. The homebuilder establishing temporary stabilization including perimeter controls for an individual lot prior to occupation of the home by the homeowner and informing the homeowner of the need for and benefits of, final stabilization. (Homeowners typically have an incentive to put in the landscaping functionally equivalent to final stabilization as quick as possible to keep mud out of their homes and off sidewalks and driveways.); or

3. For construction projects on land used for agricultural purposes (e.g., pipelines across crop or range land), final stabilization may be accomplished by returning the disturbed land to its pre-construction agricultural use. Areas disturbed that were previously used for agricultural activities, such as buffer strips immediately adjacent to surface waters of the state and which are not being returned to their pre-construction agricultural use, must meet the final stabilization criteria in (1) or (2) above.

J. "Individual Lot NOI" means a Notice of Intent for an individual lot to be covered by this permit (see parts I and II of this permit).

K. "Larger common plan of development or sale"- means a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one plan.

L. "MS4" means municipal separate storm sewer system which means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels or storm drains) that are:

1. Owned or operated by the federal government, state, municipality, township, county, district(s) or other public body (created by or pursuant to state or federal law) including special district under state law such as a sewer district, flood control district or drainage districts or similar entity or a designated and approved management agency under section 208 of the act that discharges into surface waters of the state; and
2. Designed or used for collecting or conveying solely storm water,
3. Which is not a combined sewer and
4. Which is not a part of a publicly owned treatment works.

M. "National Pollutant Discharge Elimination System (NPDES)" means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits and enforcing pretreatment requirements, under sections 307, 402, 318 and 405 of the CWA. The term includes an "approved program."

N. "NOI" means notice of intent to be covered by this permit.

O. "NOT" means notice of termination.

P. "Operator" means any party associated with a construction project that meets either of the following two criteria:

1. The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or

2. The party has day-to-day operational control of those activities at a project which are necessary to ensure compliance with an SWP3 for the site or other permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the SWP3 or comply with other permit conditions).

As set forth in Part II.A, there can be more than one operator at a site and under these circumstances, the operators shall be co-permittees.

Q. "Ordinary high water mark" means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

R. "Owner or operator" means the owner or operator of any "facility or activity" subject to regulation under the NPDES program.

S. "Permanent stabilization" means the establishment of permanent vegetation, decorative landscape mulching, matting, sod, rip rap and landscaping techniques to provide permanent erosion control on areas where construction operations are complete or where no further disturbance is expected for at least one year.

T. "Percent imperviousness" means the impervious area created divided by the total area of the project site.

U. "Point source" means any discernible, confined and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or the floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.

V. "Qualified inspection personnel" means a person knowledgeable in the principles and practice of erosion and sediment controls, who possesses the skills to assess all conditions at the construction site that could impact storm water quality and to assess the effectiveness of any sediment and erosion control measures selected to control the quality of storm water discharges from the construction activity.

W. "Rainwater and Land Development" is a manual describing construction and post-construction best management practices and associated specifications. A copy of the manual may be obtained by contacting the Ohio Department of Natural Resources, Division of Soil & Water Conservation.

X. "Riparian area" means the transition area between flowing water and terrestrial (land) ecosystems composed of trees, shrubs and surrounding vegetation which serve to stabilize erodible soil, improve both surface and ground water quality, increase stream shading and enhance wildlife habitat.

Y. "Runoff coefficient" means the fraction of total rainfall that will appear at the conveyance as runoff.

Z. "Sediment settling pond" means a sediment trap, sediment basin or permanent basin that has been temporarily modified for sediment control, as described in the latest edition of the Rainwater and Land Development manual.

AA. "State isolated wetland permit requirements" means the requirements set forth in Sections 6111.02 through 6111.029 of the ORC.

BB. "Storm water" means storm water runoff, snow melt and surface runoff and drainage.

CC. "Surface waters of the state" or "water bodies" means all streams, lakes, reservoirs, ponds, marshes, wetlands or other waterways which are situated wholly or partially within the boundaries of the state, except those private waters which do not combine or effect a junction with natural surface or underground waters. Waters defined as sewerage systems, treatment works or disposal systems in Section 6111.01 of the ORC are not included.

DD. "SWP3" means storm water pollution prevention plan.

EE. "Temporary stabilization" means the establishment of temporary vegetation, mulching, geotextiles, sod, preservation of existing vegetation and other techniques capable of quickly establishing cover over disturbed areas to provide erosion control between construction operations.

FF. "Water Quality Volume (WQ_v)" means the volume of storm water runoff which must be captured and treated prior to discharge from the developed site after construction is complete. WQ_v is based on the expected runoff generated by the mean storm precipitation volume from post-construction site conditions at which rapidly diminishing returns in the number of runoff events captured begins to occur.

Appendix G

Treated Water Discharge Application

City of Columbus
Division of Sewerage and Drainage
Industrial Wastewater Pretreatment Group
Groundwater Discharge Guidelines

Pursuant to Columbus City Code Chapter 1145.12, the Division of Sewerage and Drainage has developed guidelines for the discharge of groundwater from corrective action or closure of underground storage tanks and other groundwater discharge activities. A Special Waste Evaluation Request Form (SWERF) must be submitted before discharge can commence. The SWERF is evaluated to determine the approval of discharge using either a short-term or long-term discharge permit.

1. Short term permits will be issued for discharges that can be completed in thirty (30) days or less. Permits will be issued for the discharge of liquids associated with, but not limited to, tank ballast water, tank cavity pits, tank excavation holes, monitor wells or any other form of groundwater to the City's Sanitary Sewer System. At no time will the discharge be allowed to be directed to the City's separate storm sewer system. If the discharge cannot be completed in thirty days, a thirty day permit extension may be granted upon notification to the Division of Sewerage and Drainage.

2. Long term permits will be issued for sites requiring long term remediation. Permits are issued for one (1) year. A permit extension may be granted upon notification to the Division of Sewerage and Drainage.

3. All discharge requests will require a formal letter requesting a permit to discharge prior to any discharge to the sewer system.

4. A Special Waste Evaluation Request Form (SWERF) for groundwater remediation sites must be submitted.

5. Water samples must be collected and analyzed from around <u>each</u> tank cavity, tank excavation hole, monitoring well, or the final effluent after pretreatment. For petroleum related contamination, samples must be analyzed for the parameters listed below using appropriate methods of analysis found in 40 CFR 136. Additional parameters may be required from sites where other than petroleum contamination is suspected and will be determined on a case by case basis.

Parameter	**Limit**
Benzene	10 µg/L
Ethylbenzene	10 µg/L
Toluene	10 µg/L
Xylene	10 µg/L
Hydrocarbons FOG	100,000 µg/L
pH	5.0 – 12.5 S.U.
Lower Explosive Limit	10%
Flow	Monitor & Record as gallons per day

6. Preliminary analysis must be submitted to the Pretreatment Group for review and approval.

7. Projects with preliminary analysis above the discharge limits will require usage of a pretreatment system prior to discharge to the sanitary sewer system. Pretreatment requirements are:

    a. The owner/operator shall contact the Ohio EPA Central District Office for a Permit to Install (PTI) application.

    b. PTI permit applications are to be submitted to the Ohio EPA Central District Office, Division of Surface Water, Lazarus Government Center, P.O. Box 1049, Columbus, Ohio 43216-1049. Copies of the PTI application must also be submitted to the City of Columbus, Division of Sewerage and Drainage, Industrial Pretreatment Group, 1250 Fairwood Ave., Suite 186, Columbus, Ohio 43206.

    c. All pretreatment systems will be required to install fail-safe protection against flammables overwhelming the recovery system. Systems will be required to have a vapor monitor to measure Lower Explosive Limits (LEL) on the final effluent. Monitors will be set to alarm and shut down the pumps at 20% L.E.L. A manual reset will be required to restart the pumps. Systems shut down by a L.E.L. alarm will require a Remedial Action Plan (RAP) to identify what caused the alarm and what steps were taken to correct the problem prior to restarting the system.

8. Sites requiring a new connection to the sanitary sewer will require a sewer tap permit. Contact the City Sewer Permit Office at 645-7490 for sewer tap information.

9. Temporary permission to discharge will be granted once the vapor monitor and effluent meter have been installed. Permission to discharge will be granted in order to collect a representative sample of the final effluent. The system must be shut down until analysis has been submitted to verify compliance with all discharge limits as specified in Columbus City Code Chapter 1145 and/or the discharge permit.

10. Long term remediation projects will require additional sample analysis once per month. A monthly status report must be submitted in lieu of sample analysis if no sample is collected. Monthly reports must be submitted by the 15th of the following month. A final discharge report must be submitted within ten (10) days of completing the discharge or within ten (10) days of the permit expiration date.

11. All discharges must be measured by a metering method approved by the Division of Sewerage and Drainage. Effluent meters may read in gallons or cubic feet. Monthly discharge reports shall include the beginning and ending meter readings.

12. Where effluent meters cannot be installed, an alternative method for determining the volume entering the sanitary sewer must be approved. Alternative methods may include a pump operating log, frac holding tanks or tank excavation pit volumes. Where a pump operating log is used, information shall include the discharge date and time and discharge pumping rate.

13. A discharge location will be established by the Industrial Wastewater Pretreatment Group.

14. A new sewer account will be established for project billing. Accounts must be established in the name reflected on the information submitted on the SWERF. A $60.00 administrative fee will be charged for processing permit applications. Long Term Permits will be billed quarterly and charged an additional administrative fee of $30.00 per month for review of sample analysis and status reports. Wastewater will be billed at the current applicable rate. For collection purposes, any outstanding balances due will be transferred to an existing property owner's water/sewer account if one exists.

A final permit to discharge will be issued only after all conditions have been met and approved. Please notify the Industrial Wastewater Pretreatment Group at 645-5876 or by fax at 645-0227 at the start-up of all pretreatment systems and/or discharge to the sewer system. All correspondence should be mailed to:

City of Columbus
Division of Sewerage and Drainage
Industrial Wastewater Pretreatment Group
1250 Fairwood Ave., Suite 186
Columbus, Ohio 43206-3372

Approval to discharge is contingent upon providing adequate supervision at the site to insure that unacceptable wastewater is not discharged to the sewer system. Election to discharge will be considered an agreement with the City of Columbus to be financially responsibility for any damages resulting from discharge activities. The permittee is responsible for accurate representation of all materials discharged to the City of Columbus Sanitary Sewer System. If future information indicates inconsistencies with information originally submitted on the SWERF, permission to discharge will be revoked.

Persons found to be in violation of Columbus City Code Chapter 1145 or their Discharge Permit are subject to enforcement actions as provided by Columbus City Code Chapter 1145, which may include, but be not limited to, administrative fines, temporary suspension of discharge privileges or termination of sewer services.

Contact the Industrial Wastewater Pretreatment Section at 614-645-5876 for additional information.

Special Waste Evaluation Request Form

(Please Print)

SITE ADDRESS:

Company Name:_____

Address: _____

City:_____ State:_____ Zip Code:_____

Contact Person:_____ Phone:_____

PERSON OR ENTITY REQUESTING EVALUATION: (company, lab, consultant, etc.)

Company Name:_____

Address:_____

City:_____ State:_____ Zip Code:_____

Contact Person:_____Phone:_____

DESCRIPTION OF SITE:

Is remediation required as a result of the removal of an underground storage tank (UST)? YES NO

If " YES", circle the type of tank removed: *Gasoline* *Diesel* *Waste Oil* *Chemical* *Other*

If " Other" describe material stored in tank:_____

_____

What best describes the source of wastewater? (Circle one)

Treatment System *Monitor Well* *Tank Cavity Pit* *Tank Excavation Hole* *Other*

If " Other" describe the source:_____

Estimated duration of discharge?_____

Estimated quantity to be discharged:_____

Has the wastewater been analyzed? YES NO

If "YES", please attach the analysis.

PROPOSED TREATMENT:

If a treatment system is to be used, briefly describe the system:_____

_____

_____

_____

Has a Permit To Install (PTI) application been submitted to the Ohio EPA? YES NO

Has a copy of the PTI application been submitted to the Division of Sewerage and Drainage? YES NO

Will a Lower Explosive Level (LEL) monitor alarm is installed on the final effluent? YES NO

Does the proposed system include a flow meter on the effluent? YES NO

METER INFORMATION:

Brand name of meter:_____ Starting meter reading:_____

Unit of measure: *Gallons* *Cubic Feet* *Cubic Meters*

DISCHARGE INFORMATION:

If discharge is not metered, will the pump discharge rate be used? YES NO

If "YES", what is the pump discharge rate? GPM_____ GPH_____ GPD_____

Is a pump operating time log used? YES NO

Is a running totalizer used? YES NO

Is the tank excavation pit volume used to measure discharge amounts? YES NO

If "YES", what are the dimensions? WIDTH_____ LENGTH_____ DEPTH_____

Estimated quantity to be discharged:_____

BILLING INFORMATION:

Company or Person:_____

Address:_____

City:_____ State:_____ Zip Code:_____

Contact Person:_____ Phone:_____

City of Columbus Water/Sewer account number:_____

A final discharge report must be submitted within ten (10) days of completing the discharge or after the permit expiration date. Please attach any additional information that may help in our review of this discharge request. All information should be returned to:

City of Columbus
Division of Sewerage and Drainage
Industrial Wastewater Pretreatment Group
1250 Fairwood Ave., Suite 186
Columbus, Ohio 43206-3372

CERTIFICATION:

I UNDERSTAND THAT FAILURE TO COMPLETE ANY PART OF THIS FORM MAY RESULT IN REJECTION OF THIS REQUEST. THE INFORMATION CONTAINED IN THIS REQUEST IS COMPLETE AND TRUE TO THE BEST OF MY KNOWLEDGE AND ABILITY TO DETERMINE.

DATE:_____ PRINT NAME:_____

SIGNATURE:_____

Specific Pollutant Limits; Per CCC 1145.23, and Director's Rules and Regulations pursuant to CCC 1145.11,no user shall discharge any wastewater in excess of the following standards.

Pollutant	Maximum Composite Sample Concentration, ug/L
Arsenic, Total	1,000
Cadmium, Total	500
Chromium, Total	20,000
Copper, Total	2,700
Cyanide, Total	5,000
Hydrocarbon FOG	200,000
Lead, Total	4,000
Mercury, Total	20
Nickel, Total	5,000
Selenium, Total	10,000
Silver, Total	3,000
Zinc, Total	3,000
pH	Shall remain between 5.0 and 12.5 S.U.

Other pollutants to sample:

1,1-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethane
1,2-Dichlorobenzene
1,2-Dichloropropane
1,3-Dichloropropene
1,4-Dichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
1,2,4-Trichlorobenzene
1,1,2,2-Tetrachloroethane
4,6-Dinitro-o-cresol
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
Acrylonitrile
Aldrin
Aroclor 1242
Aroclor 1254
Benzene
Bis(2-chloromethyl)ether
Bromoform
Bromomethane
Carbon disulfide
Carbon tetrachloride
Chlordane
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
Dichlorodifluoromethane
Dieldrin
Diethyl phthalate
Dinitrotoluene
Endrin
Ethyl benzene
Ethylene dichloride
Formaldehyde
Heptachlor
Hexachloro-1,3-butadiene
Hexachloroethane
Hexachlorocyclopentadiene
Methyl chloride
Methyl ethyl ketone
Methylene chloride
Naphthalene
Nitrobenzene
Pentachlorophenol
Phenol
Styrene (vinyl benzene)
Tetrachloroethylene
Toluene
Toxaphene
Trichloroethylene
Trichlorofluoromethane
Vinyl acetate
Vinyl chloride
Vinylidene chloride
Total polynuclear aromatic hydrocarbons
Xylene

Appendix H

Example Waste Disposal Application

Special Waste Packet

The Solid Waste Authority of Central Ohio
4239 London Groveport Road
Grove City, Ohio 43123
Office: 614-871-5100

Dear Special Waste Generator,

Whether we are reviewing your special waste disposal request for the first time or updating our files on your material, we offer the following guidelines to assist you in providing us with the information we need to process your request as efficiently as possible. There have been a number of inconsistencies in previous submittals that have caused delays in our review process resulting in substantial delays between the submittal of a request and the time at which we can finally allow disposal of the material. Please take time to thoroughly read and understand this letter and the special waste profile instructions before filling out and submitting your request or update. By understanding the review process and our information needs fully, you should be able to avoid any delays that have been experienced in the past.

To determine if your special waste can be accepted at Franklin County Sanitary Landfill, you must have:

1. Submitted a completely executed original Special Waste Profile Sheet and all available information.

2. Completed and signed Generator's Certification; Certifies that your material is not a hazardous waste - this is solely the generator's responsibility as implied in OAC 3745-51-03(E) - and that disposal of material will not cause a violation of any State or Federal regulations or any conditions of our Permit to Install.

3. Set up a billing account with Jessica McCoy at (614) 871-6753, if you are to transport your waste material using your own equipment.

To facilitate your special waste disposal request, we offer the following guidelines:

A) If you are unsure of the analytical requirement of your waste stream, please consult Attachment B and then contact SWACO for guidance.

B) Analysis for ignitability, corrosively, and reactivity may be required for all special wastes.

B) FCSL can accept only solid waste. If your waste may contain free liquids, a paint filter test will be required. Free liquids are not acceptable for disposal at the FCSL. If you believe the FCSL cannot accept you waste due to free liquids, please contact SWACO.

C) A full Toxicity Characteristic Leaching Procedure (TCLP) characterization (all 39 regulated constituents) may be required on all special waste for initial approval. Please contact SWACO for guidance on your particular waste stream.

D) Be specific in your description of the process generating your waste. Our concern is that your waste material is not a listed hazardous waste by process. A schematic or flowchart is always helpful, if available.

E) To avoid delays and properly prepare a response to your special waste disposal request, the Special Waste Profile Sheet **MUST** be completed and submitted with all other special waste profile paperwork to:

Ernie Blankenship, Landfill Engineer
SWACO Operations Office
4239 London Groveport Rd.
Grove City, Ohio 43123
ernie.blankeship@swaco.org

F) Supply any available MSDS for components of your waste. This helps SWACO in screening for any special handling requirements that might be necessary.

Should you have questions regarding your submittal, please call my office at (614) 801-6424.

Sincerely,

Ernie Blankenship
Landfill Engineer

FRANKLIN COUNTY SANITARY LANDFILL
3851 London Groveport Rd.
Grove City, Ohio 43123

Generator Notification With Regard to Special Waste Disposal

The Solid Waste Authority of Central Ohio (SWACO) Rules definition for "Special Handling Waste" means a portion of Solid Waste which consists of Sludge, Treated Infectious/Pathological Waste, Ash Residue, Contaminated Soil and other materials requiring additional handling by SWACO prior to normal disposal. For this, SWACO issues a Special Waste Packet for (FCSL), which includes a Special Waste Profile Sheet that requires analytical testing. Complete and submit the originals along with all paperwork related to this project to the Special Waste Coordinator. Please note that SWACO may visit the generator's facility to observe the process generating the waste stream.

FCSL requires at least a two-hour notification prior to disposal of all special waste. This allows the operators to prepare for disposal. For the special waste loads that arrive less than two hours after the opening of the landfill, the required call ahead shall be made the day before the arrival of the load. Notify the scale house cashier at (614) 875-8563. Your approval letter will dictate the appropriate disposal times.

A completed Special Waste Manifest, which includes the current profile number and the name of the material, is to be given to the scalehouse cashier with each special waste load. FCSL has the right to reject disposal of special waste material if it does not meet reported characteristics or weather conditions so dictate. Should problems occur upon disposal of the special waste material, disposal acceptance will cease until problems are alleviated.

This Special Waste Packet Includes:

Cover letter from the Environmental Compliance Manager
Generator Notification With Regard to Special Waste Disposal
Policy Regarding Disposal of Special Waste
Instructions
Special Waste Profile Sheet
Analytical Methods & Maximum Allowable Constituent Levels

Franklin County Sanitary Landfill
3851 London Groveport Rd.
Grove City, Ohio 43123

Policy Regarding Disposal of Special Waste

SWACO does not accept hazardous waste as defined by Ohio and Federal regulations, liquid wastes, regulated radioactive materials, materials containing regulated concentrations of PCBs, asbestos containing materials, appliances containing CFCs, infectious waste, whole tires, or source segregated yard waste. SWACO reserves the right to inspect and reject any waste load partially or in full. Any waste deposited in the landfill that is prohibited will be reloaded on the haulers vehicle for removal. If any deposited wastes are found to be hazardous or otherwise unacceptable as described above, the customer shall be liable for any resulting penalties or damages assessed against the landfill, any and all costs associated with removal of such wastes, remediation of the landfill, monitoring of the landfill, and any other costs associated with or arising from such waste being sent to the landfill.

Generators requesting to dispose of a process waste stream for the first time must perform an initial characterization and complete the Special Waste Profile Sheet in order for SWACO to determine if the waste is acceptable for disposal in the FCSL.

If the waste stream has not been approved for disposal within the last three (3) years (for most wastes), a Special Waste Profile Sheet, including a laboratory analysis, is required to be completed and submitted for approval. Complete instructions and forms are included in each Special Waste Packet and can be obtained by contacting SWACO's office at (614) 801-6429

FRANKLIN COUNTY SANITARY LANDFILL
INSTRUCTIONS FOR COMPLETING THE SPECIAL WASTE PROFILE SHEET

In compliance with the requirements of regulations promulgated under the Resource Conservation and Recovery Act of 1976 (RCRA), specifically 40 CFR 262.11, any generator of a waste must determine whether their waste is to be managed as a hazardous waste.

The following information is required for all waste to be considered for transportation, storage, treatment, or disposal. It is used to determine that the waste may be transported, stored, treated, or disposed of in a legal, safe, and environmental sound manner. This information will be maintained in strict confidence. Answers must be made to all questions and must be completed in ink. Responses of "NONE" or "NOT APPLICABLE" should be made if appropriate. Most items required are self-explanatory. Other items need definition or instruction as follows:

SPECIAL WASTE PROFILE SHEET

Part I. Waste Generator Information

1. Generator Name – Enter the name of the company or municipality generating the waste.
2. Mailing Address – Enter the address of the technical contact for the Generator.
3. Technical Contact – Enter the name and title of the technical contact for the Generator who can answer technical questions about the waste. (Typically, this is the person responsible for signing the Generator certification).
4. Phone/Fax: Enter the phone and fax numbers of the technical contact for the Generator.
5. Plant/Facility Name – Enter the name of the plant or facility where the waste is generated.
6. Facility Address - Enter the address of the plant or facility where the waste is generated.
7. Facility Contact - Enter the name and title of the contact at the plant or facility where the waste is generated.
8. Phone/Fax - Enter the phone and fax numbers of the contact at the plant or facility where the waste is generated.

Part II. Customer Information

1. Customer Name - Enter the name of the Broker or Contractor that is working directly with the Generator regarding the waste.
2. Address - Enter the address of the Broker or Contractor.
3. Contact - Enter the name and title of the contact for the Broker or Contractor.
4. Phone/Fax - Enter the phone and fax numbers of the contact for the Broker or Contractor.

Part III. Transporter Information

1. Transporter Name - Enter the name of the company transporting the waste.
2. Address - Enter the address of the company transporting the waste.
3. Contact - Enter the name and title of the contact for the Transporter.
4. Phone/Fax - Enter the phone and fax numbers of the contact for the Transporter.

Part IV. Waste Stream Information

1. Name or Description of waste – Enter the name or general description of the waste and its source. Examples such as paint sludge from tank bottoms.
2. Generator SIC Code – Enter the four digit Standard Industrial Classification Code for the facility where the waste is generated.
3. Detailed description of the process – Describe the process generating the waste in detail. List the specific process/operation or source that generates the waste, e.g., incineration of municipal refuse, wastewater treatment, building maintenance, etc. At a minimum, the description should be adequate to answer the following questions:
   - What chemicals are used in the process?

- What is the type of production/manufacturing facility (e.g., wood preservation, inorganic pigments, organic pigments, pesticides, explosives, petroleum refining, iron, steel, or zinc production, etc.)?
- Is the waste a result of degreasing, solvent parts cleaning, recovery/reclaiming of solvents (still bottoms), wastewater treatment (sludges), or electroplating?

4. Indicate if the waste material is regulated by Federal regulatory agency as a "Hazardous Waste." Materials designated as hazardous wastes by the USEPA cannot be accepted.
6. Physical Characteristics of Waste –
   Color – Describe the color of the waste, (e.g., blue, transparent, varies) or if non-homogeneous, the colors associated with the waste.
   Odor – If the waste has a known odor, then describe the odor, for example, sweet, acidic, solvent, foul. Describe the intensity of the odor (none, mild, strong).
   Physical State @ 68 degrees F - Self-explanatory
   Powder Materials - Please indicate method of packaging to prevent dust dispersion such as super sacks or other special packaging.
   Free Liquids - Self-explanatory
   Density – Indicate the expected weight range of the waste per unit volume. If this data has not been determined, check "N/D." Laboratory analytical for density is required in order to qualify for a reduced gate rate.
7. Analysis of a REPRESENTATIVE sample – Ohio Administrative Rule 3745-50-10(A)(106) defines a REPRESENTATIVE sample as "a sample of a universe or whole (e.g., waste pile, lagoon, ground water) which can be expected to exhibit the average properties of the universe or whole." Please refer to OAC Rule 3745-51-20 for a list of approved sampling methods.
8. Any other information regarding the waste - Describe the hazards which you know or reasonably believe may be associated with exposure to this waste. If appropriate, attach relevant documents that have been identified significant or substantial risk to health or Material Safety Data Sheets (MSDS). Failure to provide special handling information is considered a representation that you neither know nor believe there is any adverse human health effects associated with exposure to this waste.

Part V Chemical Composition

The chemical composition of the waste must be thoroughly identified using common or generic chemical terms, not trade names or abbreviations. The components are to be listed with concentration ranges in percent (%) or parts per million (ppm). If the waste contains water, it must be included and its concentration noted. No vague content descriptions such as oil and water, sludge, etc. will be accepted. The total of all components must equal 100% compositions, or greater, if concentration ranges are specified. If trace toxic elements, compounds, or substances listed in Part VII are present, they are to be listed with their respective concentrations.

1. List all organic and/or inorganic components of the waste using special chemical names. If trade names are used, attach Material Safety Data Sheets or other documents which adequately describe the composition of the waste. For each component, estimate the range (in percents) in which the component is present. In addition, indicate whether any of the TCLP constituents are present in the waste. The total of the maximum values of the components must be greater than or equal to 100% including water, earth, etc.
2. Indicate whether the method used to determine the chemical composition was the TCLP (Toxicity Characteristic Leaching Procedure) method, an analysis to determine the total Concentrations, or another method. Attach additional pages as required.

FRANKLIN COUNT SANITARY LANDFILL
INSTRUCTIONS FOR COMPLETING THE SPECIAL WASTE PROFILE SHEET

Part VI Transportation and Shipping Information

INDICATE IF THIS WASTE IS A USDOT (see 49 CFR 171) HAZARDOUS MATERIAL. If so, complete the following information:

- If the waste is a USDOT Hazardous Material, the Proper USDOT Shipping Name, Hazard Class, UN or NA Number, and CERCLA Reportable Quantity must be noted for manifesting and placarding purposes (see 40 CFR 172.101)
- SHIPPING NAME – Enter the proper USDOT shipping name for this waste.
- HAZARDOUS CLASS/ID – Enter the proper USDOT hazard class / enter the proper USDOT Identification Number (see 40 CFR 172).
- REPORTABLE QUANTITY (RQ/Units (lb/kg) – Enter the RQ established by 40 CFR 302.4 for this waste. Indicate the appropriate units of the RQ.
- METHOD OF SHIPMENT – Indicate the anticipated method of shipment, mark as appropriate.
- SUPPLEMENTAL SHIPPING INFORMATION – Enter any additional shipping information.
- ANTICIPATED VOLUME – The quantity and frequency of generation of the waste described is to be noted. Also, note the manner in which the waste is to be transported for disposal (e.g., bulk, 55-gallon drums, 35-gallon fiber pack containers, supersaks, etc.
- FREQUENCY – The period during which the above ANTICIPATED VOLUME will be generated.

Part VII. Supplemental Information

Identify all supplemental information that is attached to the Special Waste Profile Sheet, if any. For example, Characteristics Toxicity Data, other waste characterization data, MSDS, additional waste composition data or any other information. Note the total number of supplemental pages attached.

Part VIII. Generator Certification

Provide the appropriate response to Question Nos. 1 through 7. By signing the Special Waste Profile Sheet, the Generator (identified in Part I) certifies the responses are true and accurate with respect to the waste stream listed to the best of his/her knowledge.

Signature – Signature of a DULY AUTHORIZED employee of the Generator or representative of the Generator (Broker or Contractor). A DULY AUTHORIZED representative must be a corporate officer or a manager who is authorized to sign contracts on behalf of the company or municipality by whom he/she is employed. NOTE: If the person signing the Special Waste Profile Sheet is not an employee of the Generator (i.e., Broker or Contractor), a notarized statement signed by the Generator must be submitted that authorizes the Broker or Contractor to sign on behalf of the Generator.

Date – Enter the date on which the Special Waste Profile Sheet was signed.

Name/Title – Enter the name and title of the person signing the Special Waste Profile Sheet.

Company Name - Enter the name of the company or municipality employing the person signing the Special Waste Profile Sheet.

FRANKLIN COUNTY SANITARY LANDFILL
SPECIAL WASTE PROFILE SHEET

I. Waste Generator Information

1. Generator Name:_____
2. Mailing Address:_____
3. Technical Contact:_____ Title:_____
4. Phone: ( )_____ Fax: ( )_____
5. Plant/Facility Name:_____
6. Facility Address:_____
7. Facility Contact:_____ Title:_____
8. Phone: ( )_____ Fax: ( )_____
9. Contact email address:_____

II. Customer Information (if different than above)

1. Customer Name:_____
2. Address:_____
3. Contact:_____ Title:_____
4. Phone: ( )_____ Fax: ( )_____

III. Transporter Information

1. Transporter Name:_____
2. Address:_____
3. Contact:_____ Title:_____
4. Phone: ( )_____ Fax: ( )_____

IV. Waste Stream Information

In order to determine the acceptability of the waste and the required method of disposal, the following information must be submitted for review by the Solid Waste Authority of Central Ohio (SWACO):

1. Name or Description of waste:_____
   _____
2. Generator SIC Code:_____
3. A detailed description of the process generating the waste, including a listing of all chemical compounds and/or solutions used in the process, any treatment provided such as dewatering, stabilization, etc. and any other pertinent information (flow chart/schematics and other supporting documents should be submitted as an attachment):

   _____
   _____
   _____
   _____
   _____

FRANKLIN COUNTY SANITARY LANDFILL
SPECIAL WASTE PROFILE SHEET

4. Is waste classified as "Hazardous Waste" as defined by Federal Regulations? _____ Yes ___No

5. Physical Characteristics of the Waste:
   Color:_____

   Odor:_____ None _____ Mild _____ Strong Describe:_____

   Physical state @ 68 degrees F:_____ Solid _____ Semi-solid ____Liquid _____Powder _____

   If Powder, clarify – describe packaging to prevent dusting:_____

   _____

7. Analysis of a REPRESENTATIVE sample(s) of the waste performed by an independent, approved laboratory acceptable to SWACO (**include as an attachment**). The recommended test methods are included in Attachment A. Samples shall be collected in accordance with standards and protocols of the U.S. EPA as identified in U.S. EPA's SW-846, latest edition, including sampling, preservation, handling, and transportation procedures. The analytical report must be signed by an authorized representative of the laboratory. Please call SWACO at the above phone number prior to sample collection/analysis if there any questions regarding the analytical requirements.

8. Any other information regarding the waste, which may not be evident from the description or analysis, that dictate special handling during disposal (supporting documents should be submitted as an attachment, if needed):

   _____

   _____

V. Chemical Composition

The chemicals listed below must add to 100%

_____ _____%

_____ _____%

_____ _____%

_____ _____%

_____ _____%

_____ _____%

_____ _____%

_____%

TCLP_____ Total_____ Other (specify)_____

*********Attach Additional Pages as Required*********

VI. Transportation and Shipping Information

Is this waste considered U. S. DOT Hazardous material? Yes___ No____

If so, complete the following information:

Proper Shipping Name:_____

Hazardous Class:_____ I.D. No.:_____ CERCLA Reportable Quantity_____

FRANKLIN COUNTY SANITARY LANDFILL
SPECIAL WASTE PROFILE SHEET

Method of Shipment:

Bulk Solid____ Drum _____ (specify type, size)_____

Other_____ (please specify)_____

Frequency: One time _____ Weekly ____ Bi-Weekly _____ Monthly ___ Quarterly_____

Semi-Annually ___ Annually_____ Other (specify)_____

Anticipated Volume Per Frequency: _____ (Circle One) Tons Cubic Yards Drums Other (specify)

VII. Supplemental Information

Below is additional requested information to enable SWACO to determine if the waste is suitable for disposal in the FCSL. Please check all that apply and enclose attachments as part of this submittal.

None	_____	Special Handling Requirements	_____
Letter	_____	Clearance from Federal Regulatory Agency	_____
MSDS	_____	Clearance by State/Local Regulatory Agency	_____
Chemical Waste Composition	_____	Memorandum	_____
Schematic/flow chart	_____	COC	_____
Phase 1, 2 ESA	_____		

VIII. Generator Certification

1. Is this waste considered a hazardous waste as defined by Ohio or Federal regulations?
   _____ Yes _____ No
2. If this waste is not generated in Ohio, is it considered a hazardous waste in the country, state, or province in which it is generated? _____ Yes _____ No
   If yes, please explain (include as an attachment).
3. Does this waste contain regulated radioactive material or regulated concentrations of PCBs (polychlorinated biphenyls)? _____ Yes _____ No
4. Does this waste contain any of the following RCRA pesticides and/or herbicides: endrin, methoxychlor, lindane, chlordane, toxaphene, 2,4-D, 2,4,5-TP (Silvex), or heptachlor and its epoxides? _ Yes __ No
5. Has all relevant information in the possession of the Generator regarding known or suspected hazards pertaining to this waste been disclosed to SWACO? _____ Yes _____ No
6. Is the attached analytical data derived from testing of a REPRESENTATIVE sample as defined in Ohio Administrative Code Rule 3745-51--20 or equivalent rules? _____ Yes _____No
7. Will all changes that occur in the character of the waste be identified by the Generator and disclosed to SWACO prior to providing the waste for disposal? _____ Yes _____ No

FRANKLIN COUNTY SANITARY LANDFILL
SPECIAL WASTE PROFILE SHEET

The undersigned states that he/she is a DULY AUTHORIZED representative of the Generator; has personally examined and is familiar with the information submitted herein; and believes that this information is true and correct to the best of his/her knowledge and ability to determine that no deliberate or willful omissions of composition or properties exists, that all known or suspected hazards have been disclosed, and that the waste is not designated a Hazardous Waste by U.S. EPA, Ohio EPA or others and does not contain PCBs pesticides, or asbestos regulated by TSCA under 40 CFE 760 through 40 CFR 763 or current SWACO policy. By completing and the signing the below information, I acknowledge that false or misleading information may result in fines, imprisonment, or both.

Signature:_____ Date:_____

Name (Type or Print):_____ Title:_____

Company Name:_____

NOTE: If the person signing the Special Waste Profile Sheet is not an employee of the Generator (i.e., Broker or Contractor), a notarized statement signed by the Generator must be submitted that authorizes the Broker or Contractor to sign on behalf of the Generator.

Franklin County Sanitary Landfill
Attachment A
Analytical Methods and Maximum Allowable Constituent Levels

Parameter	TCLP Extraction Procedure [b]	Analytical Method	Maximum Allowable Level	Units	Analytical Results	Comments
TCLP Metals[a]						
Arsenic	SW-846-1311	SW-846-6010	<5.0	mg/l		
Barium	SW-846-1311	SW-846-6010	<100.0	mg/l		
Cadmium	SW-846-1311	SW-846-6010	<1.0	mg/l		
Chromium	SW-846-1311	SW-846-6010	<5.0	mg/l		
Lead	SW-846-1311	SW-846-6010	<5.0	mg/l		
Mercury	SW-846-1311	SW-846-7470	<0.2	mg/l		
Selenium	SW-846-1311	SW-846-6010	<1.0	mg/l		
Silver	SW-846-1311	SW-846-6010	<5.0	mg/l		
TCLP Volatile Organics [a]						
Benzene	SW-846-1311	SW-846-8260	<0.5	mg/l		
Carbon Tetrachloride	SW-846-1311	SW-846-8260	<0.5	mg/l		
Chlorobenzene	SW-846-1311	SW-846-8260	<100.0	mg/l		
Chloroform	SW-846-1311	SW-846-8260	<6.0	mg/l		
1,2-Dichloroethane	SW-846-1311	SW-846-8260	<0.5	mg/l		
1,1-Dichloroethene (-ethylene)	SW-846-1311	SW-846-8260	<0.7	mg/l		
Methyl Ethyl Ketone (2 –Butanone)	SW-846-1311	SW-846-8260	<200.0	mg/l		
Tetrachloroethene (-ethylene)	SW-846-1311	SW-846-8260	<0.7	mg/l		
Trichloroethene (-ethylene)	SW-846-1311	SW-846-8260	<0.5	mg/l		
Vinyl Chloride	SW-846-1311	SW-846-8260	<0.2	mg/l		
TCLP Semi-Volatile Organics (Base Neutrals)[a]						
1,4-Dichlorobenzene	SW-846-1311	SW-846-8270	<7.5	mg/l		
Hexachlorobenzene	SW-846-1311	SW-846-8270	<0.13	mg/l		
Hexachlorobutadiene	SW-846-1311	SW-846-8270	<0.5	mg/l		
Hexachloroethane	SW-846-1311	SW-846-8270	<3.0	mg/l		
Nitrobenzene	SW-846-1311	SW-846-8270	<2.0	mg/l		
Pyridine	SW-846-1311	SW-846-8270	<5.0	mg/l		
2,4-Dinitrotoluene	SW-846-1311	SW-846-8270	<0.13	mg/l		
TCLP Semi-Volatile Organics (Acid Compounds)[a]						
o-Cresol (2-methylphenol)	SW-846-1311	SW-846-8270	<200.0	mg/l		
m-Cresol (3-methylphenol)	SW-846-1311	SW-846-8270	<200.0	mg/l		
p-Cresol (4-methylphenol)	SW-846-1311	SW-846-8270	<200.0	mg/l		
Cresol, Total	SW-846-1311	SW-846-8270	<200.0	mg/l		
Pentachlorophenol	SW-846-1311	SW-846-8270	<100.0	mg/l		
2,4,5-Trichlorophenol	SW-846-1311	SW-846-8270	<400.0	mg/l		
2,4,6-Trichlorophenol	SW-846-1311	SW-846-8270	<2.0	mg/l		

Franklin County Sanitary Landfill
Attachment A
Analytical Methods and Maximum Allowable Constituent Levels

Parameter	TCLP Extraction Procedure [b]	Analytical Method	Maximum Allowable Level	Units	Analytical Results	Comments
TCLP Pesticides [a]						
Chlordane	SW-846-1311	SW-846-8081	<0.03	mg/l		
Endrin	SW-846-1311	SW-846-8081	<0.02	mg/l		
Heptachlor (and its epoxide)	SW-846-1311	SW-846-8081	<0.008	mg/l		
Lindane (gamma-BHC)	SW-846-1311	SW-846-8081	<0.4	mg/l		
Methoxychlor	SW-846-1311	SW-846-8081	<10.0	mg/l		
Toxaphene	SW-846-1311	SW-846-8081	<0.5	mg/l		
TCLP Herbicides [a]						
2,4-D	SW-846-1311	SW-846-8151	<10.0	mg/l		
2,4,5-TP (Silvex)	SW-846-1311	SW-846-8151	<1.0	mg/l		
General						
pH	ASTM D 3987	SW-846-9045	2.0<pH<12.5	Standard Units		
Ignitability	NA	SW-846-1010	>140	Degrees Fahrenheit		
Reactive Cyanide	NA	SW-846-C7.3.3.2/9012	<500	mg/kg		
Reactive Sulfide	NA	SW-846-C7.3.4.2/9030	<500	mg/kg		
Free Liquids	NA	SW-846-9095	Pass			
PCBs	NA	SW-846-8082	<50	mg/kg		
Benzene	NA	SW-846-8021/8260	<10 [c]	mg/kg		
Toluene	NA	SW-846-8021/8260	<5000	mg/kg		
Ethylbenzene	NA	SW-846-8021/8260	<5000	mg/kg		
Xylene	NA	SW-846-8021/8260	<5000	mg/kg		
Lead	NA	SW-846-6010	<100 [d]	mg/kg		
Phenol	ASTM D 3987-85	SW-846-9065/9066	NA [e]	NA		
Cyanide	ASTM D 3987-85	SW-846-9012	NA [e]	NA		
Fluoride	ASTM D 3987-85	EPA 600-340.2/SW-846-9056	NA [e]	NA		

Franklin County Sanitary Landfill
Attachment A
Analytical Methods and Maximum Allowable Constituent Levels

[a] Parameter used to determine if a waste can be classified as a characteristic hazardous waste.
[b] Total analysis may be used (by SWACO approval) instead of TCLP analysis. If total analysis is used, analytical results must be less than 20 times the value show for TCLP analysis.
[c] If Benzene > 10 mg/kg then a TCLP Benzene must be performed.
[d] If total lead > 100 mg/kg, then a TCLP Lead must be performed.
[e] Test to be performed on spent foundry sand only to determine if it qualifies as a "non-toxic" exempt waste.

Unit Conversions

1 part per million (ppm) = 1 milligram per liter (mg/l) [TCLP Analysis] = 1 milligram per kilogram (mg/kg) [Total Analysis]
1 part per billion (ppb) = 1 microgram per liter (ug/l) [TCLP Analysis] = 1 microgram per kilogram (ug/kg) [Total Analysis]
1 ppm = 1,000 ppb
1 mg/l = 1,000 ug/l
1 mg/kg = 1,000 ug/kg

FRANKLIN COUNTY SANITARY LANDFILL
ATTACHMENT B
WASTE TYPES AND ANALYTICAL REQUIREMENTS[1]

WASTE CODE	WASTE TYPES	ANALYTICAL REQUIREMENTS													Remarks
		pH (ASTM leachate)	Ignitability	Reactivity	Paint Filter	TCLP Metals	TCLP Volatiles	TCLP Semi-Volatiles	TCLP Herbs/Pests	PCBs	TPH	Other	MSDS[2]	Re-analysis Frequency (yrs)	
1	**ADHESIVES**														
A	Elastomer-solvent cements		X				X						X	3	
B	Inorganic(portland cement, mortar, gypsum)														No analysis required
C	Mineral(asphalt, pitches, hydrocarbon resins)						benzene	cresols pyridine					X	3	
D	Silicone polymers and cements												X		
E	Thermoplastic resins(polyetheylene, polyvinyl acetate)												X		
F	Thermosetting epoxy(phenol-formaldehyde - see Phenolic Resins)												X		
G	Vegetable(gum, latex, rubber)												X		
2	**AGRICULTURAL WASTE(Fertilizers, Pesticides, Feed Supplements)**								X				X	3	
3	**ANTIFREEZE CONTAMINATED MATERIALS**														
A	Unused														No analysis required with verification that product is virgin (unused)
B	Used					X	X						X	3	
4	**ASPHALT**														
A	Cured														No analysis required
B	Uncured						benzene						X	3	
5	**BAGHOUSE DUST(non-metallurgical)**	X	X	X		X								3	Verification required that the waste is not a K126 listed hazardous waste
6	**BATTERIES**														
A	Alkaline					X								3	
B	Lead-Acid														Hazardous waste
C	Lithium					X								3	
D	Manganese					X								3	
E	Mercuric oxide (watch)					X								3	
F	Nickel-cadmium														Hazardous waste
G	Silver oxide cell					X								3	
I	Zinc-carbon cell					X								3	
7	**CATALYST**														
A	Unused												X	3	Analysis may be required after review of MSDS
B	Used or Spent Catalyst	X	X	X	X	X	X				X		X	3	
8	**CERAMIC WASTES**					X								3	
9	**CHEMICAL WASTES**														
A	Acidic chemicals (pH<6)	X	X	X	X								X	3	
B	Basic chemicals (pH>8)	X	X	X	X								X	3	
C	Carbon Residues (Decoloring, Filtering Toner)	X	X	X	X	X	X	X					X	3	

FRANKLIN COUNTY SANITARY LANDFILL
ATTACHMENT B
WASTE TYPES AND ANALYTICAL REQUIREMENTS[1]

WASTE CODE	WASTE TYPES	ANALYTICAL REQUIREMENTS													Remarks
		pH (ASTM leachate)	Ignitability	Reactivity	Paint Filter	TCLP Metals	TCLP Volatiles	TCLP Semi-Volatiles	TCLP Herbs/Pests	PCBs	TPH	Other	MSDS[2]	Re-analysis Frequency (yrs)	
9	CHEMICAL WASTES														
D	Chemical Salts	X	X	X	X	X							X	3	
E	Combustible Chemicals	X	X	X	X								X	3	
F	Detergents, Cleaning Agents	X	X	X	X	X	X	X					X	3	
G	Filter Aids (i.e. Diatomaceous Earth)	X	X	X	X	X	X	X					X	3	
H	Off-Spec Products												X		Analysis may be required after review of MSDS
I	Pharmaceutical Wastes	X	X	X	X	X	X	X					X	3	
J	Spent Dyes	X	X	X	X	X	X	X					X	3	
K	Spent Filter Media	X	X	X	X	X	X	X					X	3	
L	Surface Collagens (Paints, Inks, Adhesives)	X	X	X	X	X	X	X					X	3	
M	Other Chemical Wastes													3	Analytical requirements to be determined on a case-by-case basis (process dependent)
10	CIRCUIT BOARDS					X								3	
11	COMBUSTION RESIDUES														
A	Bottom Ash/Flyash (Coal-Derived)					X								3	See Checklists C and D for analytical requirements to qualify as Exempt Waste
B	Flue Gas Desulfurization Residue (FGD)	X				X								3	
C	Medical Incinerator Ash					X								3	
D	Municipal Incinerator Ash	X				X						Dioxins & dibenzo-furans		1	Additional analyses may be required - contact FCSL for details
E	Municipal Wastewater Treatment Plant Incinerator Ash					X								3	
F	Other Ash					X								3	Analytical requirements to be determined on a case-by-case basis (process dependent)
12	DESICCANTS														
A	Unused												X		
B	Used												X		Analytical requirements to be determined on a case-by-case basis (process dependent)
13	EMPTY CONTAINERS														Generator certification that containers are empty per 40 CFR 261.7 must accompany each load; No analysis required
14	FILTERS														
A	Coolant					X								3	
B	Fuel, non-terneplated					X	benzene							3	Generator must state on Waste Profile that filters are non-terneplated and hot drained
C	Glycol filter from gas production					X	benzene							3	

FRANKLIN COUNTY SANITARY LANDFILL
ATTACHMENT B
WASTE TYPES AND ANALYTICAL REQUIREMENTS[1]

WASTE CODE	WASTE TYPES	ANALYTICAL REQUIREMENTS													Remarks
		pH (ASTM leachate)	Ignitability	Reactivity	Paint Filter	TCLP Metals	TCLP Volatiles	TCLP Semi-Volatiles	TCLP Herbs/Pests	PCBs	TPH	Other	MSDS[2]	Re-analysis Frequency (yrs)	
14	FILTERS														
D	Oil, non-terneplated														No analysis required; Generator must state on Waste Profile that filters are non-terneplated, hot-drained, and exempt from regulation per 40 CFR 261.4(b)(13)
15	FOOD WASTES (Excluding Sludge)														No analysis required
16	GLASS														
A	Optical Glass					X								3	
B	Windshields					X								3	
C	Windows														No analysis required
17	GREASE TRAP WASTES				X									3	
18	LEATHER WASTES	X	X	X		X		X						3	
19	ION EXCHANGE RESIN														
A	Potable water purification														No analysis required
B	Industrial													3	Analytical requirements to be determined on a case-by-case basis (process dependent)
20	LIGHT BULBS														Preferred OEPA method of handling is recycling, however dispoal is allowed with passing TCLP results
A	Fluorescent					X								3	
B	High Intensity					X								3	
C	Mercury Vapor					X								3	
21	MEDICAL WASTES (TREATED)														No analysis required; each load must be accompanied w/ manifest from treatment facility
22	METALLURGICAL PROCESS RESIDUES														
A	Auto Shredder Fluff					X				X				0.25	Quarterly re-analysis for PCBs, TCLP cadmium and TCLP lead
B	Ferrous Baghouse Dust	X				X								3	Verification required that the waste is not a K061 listed hazardous waste
C	Non-Ferrous Baghouse Dust	X				X								3	
D	Foundry Sand					X								3	See Checklists C and D for analytical requirements to qualify as Exempt Waste
E	Metal Grindings/Shavings					X								3	
F	Refractory Material					X								3	
G	Slag													3	See Checklists C and D for analytical requirements to qualify as Exempt Waste
H	Excluded High Temp. Metal Recovery Slag from the Recovery of F006, K061 & K062	X	X	X		X								3	
I	Other Metallurgical Process Residues	X	X	X	X	X								3	Additional analytical requirements may be required after review of process information

FRANKLIN COUNTY SANITARY LANDFILL
ATTACHMENT B
WASTE TYPES AND ANALYTICAL REQUIREMENTS[1]

WASTE CODE	WASTE TYPES	ANALYTICAL REQUIREMENTS													Remarks
		pH (ASTM leachate)	Ignitability	Reactivity	Paint Filter	TCLP Metals	TCLP Volatiles	TCLP Semi-Volatiles	TCLP Herbs/Pests	PCBs	TPH	Other	MSDS[2]	Re-analysis Frequency (yrs)	
23	OFF-SPEC OR OUTDATED PRODUCTS												X		Analysis may be required after review of MSDS
24	PAINT FILTERS		X			X	X							3	Verification required regarding spent solvent management
25	PHENOLIC RESINS														
A	Cured												X		
B	Uncured		X	X				X					X	3	
26	PHOTOGRAPHIC WASTE														
	Color or Black and White Film					X								3	
27	PLASTIC SCRAP (CURED)														No analysis required
28	POWDER COATING WASTE					X	X							3	Verification required regarding spent solvent management
29	RUBBER & ELASTOMER WASTES (CURED)														No analysis required
30	SAND BLASTING RESIDUES														
A	Unused												X		
B	Used					X							X	3	
31	SANITARY SEWER GRIT OR BAR SCREENINGS				X	X	X	X	X					3	If WWTP services residential areas only, paint filter is only analysis required
32	SOIL / DEBRIS CONTAMINATED W/ USED PETROLEUM PRODUCTS														
A	Cutting/Grinding Oil				X	X				X			X	1	Additional analysis may be required after review of MSDS
B	Hydraulic Fluid														No analysis required
C	Grease					X	X			x				1	
D	Lubricating Oil					X	X			x				1	
E	Waste Oil					X	X			x				1	
33	SOIL / DEBRIS CONTAMINATED W/ VIRGIN PETROLEUM PRODUCTS														
A	Crude Oil					X	X							1	No analysis required with verification that waste is exempt per 40 CR261.4(b)(5)
B	Diesel Fuel; Grease; Heating Oil; Hydraulic Oil; Kerosene; Lubricating Oil														No analysis required with verification that product is virgin (unused)
C	Gasoline, Leaded (Non-UST)					lead						BTEX		1	
D	Gasoline, Leaded (UST)					lead								1	Verification req'd that soils are from corrective action per 40 CFR 280
E	Gasoline, Unleaded (Non-UST)											BTEX		1	
F	Gasoline, Unleaded (UST)														No analysis req'd w/verification that soils are from corrective action per 40 CFR 280

FRANKLIN COUNTY SANITARY LANDFILL
ATTACHMENT B
WASTE TYPES AND ANALYTICAL REQUIREMENTS[1]

WASTE CODE	WASTE TYPES	ANALYTICAL REQUIREMENTS													Remarks
		pH (ASTM leachate)	Ignitability	Reactivity	Paint Filter	TCLP Metals	TCLP Volatiles	TCLP Semi-Volatiles	TCLP Herbs/Pests	PCBs	TPH	Other	MSDS[2]	Re-analysis Frequency (yrs)	
34	SLUDGES AND SCALES														
A	Car Wash Sludge		X		X							BTEX		3	
B	Cooling Tower Debris/Sludge					X							X	3	MSDS for water treatment chemical/corrosion inhibitors
34	SLUDGES AND SCALES														
C	Dry Cleaning Sludge	X	X	X	X	X	X	X					X	3	
D	Emission Control Sludge	X		X	X	X	X							3	
E	Food Processing Sludge	X		X	X	X	X							3	
F	Ink Sludge				X	X	X							3	
G	Laundry Sludge	X		X	X	X	X	X						3	
H	Lime-Cement Kiln Scale, Residue	X			X	X	X							3	
I	Lime-Stabilized Pickle Liquor	X			X	X								3	
J	Metallurgical Sludge	X		X	X	X	X							3	
K	Oily Sludge, Petroleum Derived	X	X	X	X	X	X	X		X				3	
L	Paint/Coating Sludge & Scale	X	X	X	X	X	X	X						3	Verification required regarding spent solvent management
M	Paper Mill Sludge				X	X								3	
N	Still Bottoms	X	X	X	X	X	X	X						3	
O	Tank Bottoms	X	X	X	X	X	X	X						3	
P	Wastewater Treatment Plant Sludge (Municipal)				X	X	X	X	X	X				3	
Q	Wastewater Treatment Plant Sludge (Industrial)	X	X	X	X	X	X	X	X	X				3	
R	Water Treatment Sludge	X			X	X								3	
S	Delisted Residue from the Treatment of Listed Hazardous Waste	X	X	X	X	X	X	X	X	X				0.25	
T	Non-Hazardous Residue from the Treatment of Hazardous Waste	X	X	X	X	X	X	X	X	X				0.25	
U	Other Industrial Sludges and Scales													3	Analytical requirements to be determined on a case-by-case basis (process dependent)
35	SOLVENT CONTAMINATED SOILS AND DEBRIS														Analytical requirements to be determined on a case-by-case basis (process dependent)
36	STREET SWEEPINGS (MUNICIPAL)														No analysis required
37	TANKS														
A	Petroleum Tanks, cleaned (with no residue remaining - must state on Waste Profile steam cleaned or detergent washed)														No analysis required
B	Other Tanks														Analytical requirements to be determined on a case-by-case basis (process dependent)

FRANKLIN COUNTY SANITARY LANDFILL
ATTACHMENT B
WASTE TYPES AND ANALYTICAL REQUIREMENTS[1]

WASTE CODE	WASTE TYPES	ANALYTICAL REQUIREMENTS													Remarks
		pH (ASTM leachate)	Ignitability	Reactivity	Paint Filter	TCLP Metals	TCLP Volatiles	TCLP Semi-Volatiles	TCLP Herbs/Pests	PCBs	TPH	Other	MSDS[2]	Re-analysis Frequency (yrs)	
38	TREATED WOOD (including telephone poles, railroad ties)														
A	Fresh Creosote Preserved Wood							X						3	
B	Weathered														No analysis required; Generator must describe as weathered on Waste Profile
39	WOOD BLOCK FLOORING					X	X	X	X	X				3	
40	OTHER WASTES NOT LISTED ABOVE														Analytical requirements to be determined on a case-by-case basis (process dependent)

(1) The analyses shown are the typical requirements for each waste type. A certification from the generator that certain contaminants are not present in the waste stream may be accepted in lieu of analysis provided that sufficient documentation (list of raw materials used, detailed description of all processes generating the waste, process flow schematic, etc.) is submitted and approved by FCSL and/or its consultant.

(2) Waste types that only require submittal of an MSDS may require analysis following review of the information presented therein.

Appendix I

Petroleum Contaminated Soil Form

PETROLEUM CONTAMINATED SOIL (PCS) FORM

This form should be completed and submitted within 120 days of generating a stockpile, within 180 days of placing the soil in portable containers, or prior to storage or treatment, whichever comes first. ***A separate PCS form shall be completed for each stockpile generated.***

OWNER/OPERATOR INFORMATION:

OWNER/OPERATOR NAME: _____ CONTACT PERSON: _____ PHONE: _____

UST FACILITY INFORMATION:

FACILITY ID#: _____
FACILITY NAME: _____
ADDRESS: _____
CITY: _____
COUNTY: _____
STATE: _____ ZIP: _____

STORAGE FACILITY INFORMATION:

FACILITY ID#: _____
FACILITY NAME: _____
ADDRESS: _____
CITY: _____
COUNTY: _____
STATE: _____ ZIP: _____

DISPOSAL/TREATMENT FACILITY INFORMATION:

FACILITY ID#: _____
FACILITY NAME: _____
ADDRESS: _____
CITY: _____
COUNTY: _____
STATE: _____ ZIP: _____

CUBIC YARDS:

_____ On-site treatment (requires a treatment plan)
_____ Off-site treatment (requires a treatment plan)
_____ Soil analysis falls below Rule 16 re-use levels (RUL)
_____ Returned to excavation (below site specific action levels) (RTE BAL)
_____ Returned to excavation (above site specific action levels) (RTE AAL)
_____ Disposal at a landfill (LFL)

STOCKPILE ID: _____ DATE GENERATED: _____ DATE TRANSFERRED: _____