Final

TAMPEEL Remedial Investigation Report Addendum

Former Lordstown Ordnance Depot
Formerly Used Defense Site: G05OH0149
Lordstown, Ohio

Prepared for

U.S. Army Corps of Engineers

December 2011

CH2MHILL®

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Contents

Acronyms and Abbreviations ..... **vii**
1 Introduction **1-1**
1.1 Purpose and Objectives 1-2
2 Supplemental Investigation Activities **2-1**
2.1 Historical Debris Disposal Activities Evaluation 2-1
2.1.1 Interview 2-1
2.1.2 Geophysical Survey 2-1
2.1.3 Test Trenching 2-3
2.2 Quarterly Monitoring 2-3
2.2.1 Groundwater Monitoring 2-4
2.2.2 Surface Water Monitoring 2-4
2.2.3 Landfill Gas Monitoring 2-5
2.2.4 Quality Control Sampling 2-6
2.2.5 Sample Identification 2-6
2.2.6 Equipment Decontamination 2-7
2.2.7 Investigation-derived Waste 2-7
2.2.8 Health and Safety 2-7
2.2.9 Data Management and Validation 2-7
3 Results and Findings **3-1**
3.1 Historical Waste Disposal 3-1
3.1.1 Interview with Former Lordstown School Principal 3-1
3.1.2 Geophysical Survey 3-2
3.1.3 Test Trenching 3-3
3.2 Quarterly Monitoring Results 3-3
3.2.1 Groundwater Elevations and Potentiometric Contour Maps 3-3
3.2.2 Groundwater and Surface Water Monitoring Results 3-4
3.2.3 Landfill Gas Monitoring 3-7
3.3 Evaluation of Risk 3-7
3.3.1 Human Health Risk Assessment Results Summary 3-7
3.3.2 Ecological Risk 3-12
3.4 Site Conceptual Model 3-13
4 Conclusions **4-1**
5 References **5-1**

Appendixes

A Grumman Geophysical Survey Report and GPS Coordinates
B Test Trenching Photo Log
C Analytical Data Reports
D Data Quality Evaluations
E Risk Calculations

Tables

3-1 Summary of Quarterly Groundwater Elevations
3-2 Quarterly Groundwater Results MW112
3-3 Quarterly Groundwater Results MW113
3-4 Quarterly Groundwater Results MW114
3-5 Quarterly Groundwater Results MW115
3-6 Quarterly Groundwater Results MW116
3-7 Quarterly Surface Water Results—Aspen Creek
3-8 Quarterly Surface Water Results—TAMPEEL Spring
3-9 Explosive Gas Monitoring Punch Bar Station Report, 1st Quarter (December 2007), TAMPEEL and Satellite Waste Areas
3-10 Explosive Gas Monitoring Punch Bar Station Report, Second Quarter (March 2008), TAMPEEL and Satellite Waste Areas
3-11 Explosive Gas Monitoring Punch Bar Station Report, 3rd Quarter (June 2008), TAMPEEL and Satellite Waste Areas
3-12 Explosive Gas Monitoring Punch Bar Station Report, 4th Quarter (September 2008), TAMPEEL and Satellite Waste Areas
3-13 Summary of Receptor Risks and Hazards for COPCs in Aspen Creek/TAMPEEL Spring—Adult Resident
3-14 Summary of Receptor Risks and Hazards for COPCs in Aspen Creek/TAMPEEL Spring—Child Resident
3-15 Summary of Receptor Risks and Hazards for COPCs in Aspen Creek/TAMPEEL Spring—Adolescent Trespasser
3-16 Summary of Receptor Risks and Hazards for COPCs in Aspen Creek/TAMPEEL Spring—Adult Caretaker
3-17 Summary of Receptor Risks and Hazards for COPCs in Aspen Creek/TAMPEEL Spring—Adolescent Student
3-18 Summary of Receptor Risks and Hazards for COPCs in Aspen Creek/TAMPEEL Spring—Adult Construction Worker
3-19 Summary of RME Receptor Risks and Hazards for COPCs in Groundwater
3-20 Summary of CTE Receptor Risks and Hazards for COPCs in Groundwater
3-21 Summary of RME Receptor Risks and Hazards for COPCs in Groundwater
3-22 Summary of CTE Receptor Risks and Hazards for COPCs in Groundwater
3-23 Summary of RME Receptor Risks and Hazards for COPCs in Groundwater

Figures

1-1 Site Location Map
1-2 Site Features
2-1 Test Trench Locations
2-2 Groundwater Monitoring and Surface Water Sampling Locations
2-3 Landfill Gas Sampling Grid and Monitoring Points
3-1 Areas of Geophysical Anomalies and Test Trenches
3-2 December 2007 Groundwater Potentiometric Surface Contour Map
3-3 March 2008 Groundwater Potentiometric Surface Contour Map
3-4 June 2008 Groundwater Potentiometric Surface Contour Map
3-5 September 2008 Groundwater Potentiometric Surface Contour Map
3-6 Groundwater Monitoring Analytical Results—Detected Constituents

3-7 Surface Water Monitoring Analytical Results—Detected Constituents
3-8 Quarterly Landfill Gas Sampling Points

Acronyms and Abbreviations

µg/L	microgram per liter
ADR	Automated Data Review
AOC	area of concern
bgs	below ground surface
BTAG	Biological Technical Assistance Group
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPC	chemical of potential concern
DCE	dichloroethene
DDT	dichlorodiphenyltrichloroethane
EDD	electronic data deliverable
EM	electromagnetic
EPC	exposure point concentration
ERA	ecological risk assessment
ESL	ecological screening level
FLOD	Former Lordstown Ordnance Depot
FUDS	Formerly Used Defense Site
GPS	global positioning system
Grumman	Grumman Exploration, Inc.
GSSI	Geophysical Survey Systems, Inc.
HHRA	human health risk assessment
HI	hazard index
Hz	hertz
ID	identification
IDW	investigation-derived waste
ILCR	incremental lifetime cancer risk
IRIS	Integrated Risk Information System

MCL	maximum contaminant level
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/kg-day	milligrams per kilogram per day
mg/L	milligrams per liter
mL/day	milliliters per day
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
msl	mean sea level
NOAA	National Oceanographic and Atmospheric Administration
OAC	Ohio Administrative Code
OCC	Ohio Commerce Center
Ohio EPA	Ohio Environmental Protection Agency
PRG	preliminary remediation goal
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RI	remedial investigation
RME	reasonable maximum exposure
RSL	regional screening level
SAP	sampling and analysis plan
Shaw	Shaw Environmental, Inc.
SOP	standard operating procedure
SRI	supplemental remedial investigation
SVOC	semivolatile organic compound
TAMPEEL	Trumbull Area Multi-Purpose Environmental Education Laboratory
TCE	trichloroethene
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency

VOC	volatile organic compound
Work Plan	*TAMPEEL Landfill and 3 AOCs Investigation Work Plan*

SECTION 1

Introduction

The Former Lordstown Ordnance Depot (FLOD) is a Defense Environmental Restoration Program/Formerly Used Defense Site (FUDS) property located approximately 4 miles south of Warren, Ohio, just west of Ohio State Route 45 in Lordstown Township, Trumbull County (Figure 1-1). Two environmental projects exist at the FLOD under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program of 1980: The former Trumbull Area Multi-Purpose Environmental Education Laboratory (TAMPEEL) encompasses approximately 39 acres on the northwestern corner of the FLOD, and the three areas of concern (3 AOCs) are on the Ohio Commerce Center (OCC), which occupies the remainder of the FLOD.

Figure 1-2 presents the TAMPEEL parcel boundaries and the boundary fence. The investigation area, which extends outside the parcel and fence boundaries to the east toward Beaver Creek, includes Fire Road, the Study Pond, Beaver Pond, and a portion of Beaver Creek. This area includes other features such as the Aspen Creek, TAMPEEL Spring, and the three TAMPEEL structures (the main building, restroom, and shed).

This Remedial Investigation (RI) Report addendum addresses work completed at the TAMPEEL site between 2006 and 2010. The work completed at the TAMPEEL site was conducted along with work at the 3 AOCs site; however, the work completed at the 3 AOCs site will be documented in a separate RI Report specific to the 3 AOCs site.

An RI and Supplemental Remedial Investigation (SRI) were conducted in the late 1990s and early 2000s to characterize the nature and extent of environmental contamination; to assess risks to human health and the environment; and to provide data to develop, evaluate, and select appropriate remedial actions to mitigate adverse effects, if required. The activities and results of the RI and SRI are presented in the *TAMPEEL Remedial Investigation Report* (Shaw Environmental, Inc. [Shaw], 2005). As part of the RI and SRI activities, a Human Health Risk Assessment (HHRA) and an ecological risk assessment (ERA) were completed. The results of the HHRA are summarized as follows:

- Soil—The cancer risks for the reasonable maximum exposure (RME) to soil exceed the Ohio Environmental Protection Agency (Ohio EPA) target risk level of 1×10^{-5} for the adult resident (2×10^{-5}) and child resident (4×10^{-5}). The greatest contributions to these risks are from arsenic, benzo(a)pyrene, and dibenz(a, h)-anthracene. The noncancer hazards for the RME to soil exceed the hazard index (HI) limit of 1.0 for the child resident (HI = 4) exposure scenario. The greatest contributions to this HI are iron and manganese. It should be noted that when compared to the Recommended Daily Allowance, iron and manganese exposure point concentrations (EPCs) are below these values.
- Surface Water—The cancer risks for the RME to Aspen Creek and TAMPEEL Spring surface water do not exceed the Ohio EPA target risk level of 1×10^{-5}. The noncancer HIs is for exposures to Aspen Creek/TAMPEEL Spring, the Beaver Pond and the Study Pond surface water are below U.S. Environmental Protection Agency (USEPA) limit of 1.

- Sediment—The cancer risks for the RME to Aspen Creek and TAMPEEL Spring, Beaver Pond, and Study Pond sediment do not exceed the Ohio EPA target risk level of 1×10^{-5}. Noncancer risks are below the Ohio EPA HI limit (1).
- Groundwater—The cancer risks are below the Ohio EPA target risk level of 1×10^{-5}. The noncancer HIs for the RME to groundwater exceed the limit of 1.0 for the adult resident (HI = 6) and the child resident (HI = 22) exposure scenarios. The greatest contributors to this hazard are thallium, iron, and aluminum.

The results of the ERA are summarized as follows:

- Risks generally are acceptable for fish and wildlife potentially exposed to site surface water. Potential risks from exposure to site sediments and soil; however, generally are predicted to be unacceptable. Surface soils are predicted to be the most significant ecological concern, especially for sensitive insectivorous receptors such as the shrew (and to a lesser extent the deer mouse, cottontail, robin, and red fox) due to elevated levels of aluminum, barium, arsenic, zinc, dichlorodiphenyltrichloroethane (DDT), and chromium and the potential bioaccumulation in earthworms and/or plants. Also at risk is the American robin from DDT in soil (however, the levels of DDT detected onsite have been found to be consistent with agricultural levels, and may not be associated with inappropriate waste practices [Agency for Toxic Substances and Disease Registry, 1994]).

The RI report recommended the following additional investigation activities for the TAMPEEL Landfill Remedial Investigation:

- Four quarters of surface water sampling for volatile organic compounds (VOCs) from the TAMPEEL Spring and Aspen Creek to confirm only low levels of cis-1,2-dichloroethene (cis-1,2-DCE) are present.
- Four quarters of groundwater monitoring.
- Four quarters of landfill gas monitoring.
- Additional investigation to delineate the extent of the TAMPEEL Landfill.

1.1 Purpose and Objectives

The purpose of this RI addendum report is to describe the additional investigations conducted at the site and to present the findings as an addendum to the TAMPEEL RI report (Shaw, 2005), in support of a Feasibility Study, Proposed Plan, and Decision Document. The additional activities were limited to the following objectives, as presented in the *TAMPEEL Landfill and 3 AOCs Investigation Work Plan* (Work Plan) (CH2M HILL, 2007):

- Conduct a geophysical investigation and test trenching, and obtain additional historical information to delineate the core waste footprint and any satellite waste areas of the TAMPEEL landfill.
- Conduct four quarterly rounds of surface water sampling for VOCs at Aspen Creek and TAMPEEL Spring located north (downgradient) of the TAMPEEL landfill to evaluate seasonal impacts and verify low-level sporadic detections identified during the RI.

- Conduct four quarterly rounds of groundwater monitoring in the vicinity of the TAMPEEL landfill for VOCs and chlorides, as well as for two metals (thallium and iron) to evaluate whether there are any seasonal fluctuations and to confirm the findings of the RI that the landfill is not affecting groundwater.
- Perform four quarterly rounds of explosive gas monitoring per Ohio Administrative Code (OAC) 3745-27-12 to verify that landfilled material is not generating explosive gas at levels that require additional controls.

These activities were completed in accordance with procedures described in Work Plan (CH2M HILL, 2007). The Work Plan provided data quality objectives for this monitoring, along with a sampling and analysis plan (SAP), standard operating procedures (SOPs), and the quality assurance project plan (QAPP; CH2M HILL, 2007).

SECTION 2

Supplemental Investigation Activities

CH2M HILL conducted additional investigative activities at the TAMPEEL site in accordance with the approved Work Plan (CH2M HILL, 2007).These activities included a geophysical survey; test trenching; an interview with an individual historically affiliated with the site; and four quarterly groundwater, surface water, and landfill gas monitoring events to address data gaps identified in the RI. The following sections summarize these activities; the results and findings are presented in Section 3.

Before initiating any fieldwork, notifications were made to the appropriate stakeholders and access agreements were secured from all property owners and lessees. Stakeholders include representatives from the U.S. Army Corps of Engineers (USACE), Ohio EPA, Trumbull County School District, and the current TAMPEEL Land Lessee. The Ohio Utilities Protection Service was notified at least 10 days before each round of punch bar or landfill gas monitoring activities (due to punch bar penetration depth of 2 feet below ground surface [bgs]). Additionally, the field team leader notified all appropriate parties of any field activities taking place at least 1 week before they commenced.

2.1 Historical Debris Disposal Activities Evaluation

The results of a previous geophysical survey at the TAMPEEL site in 1998 were presented in the TAMPEEL RI report (Shaw, 2005). To further delineate the footprint of the former landfill and buried debris within the area of geophysical anomalies identified in the RI report, CH2M HILL conducted an interview with the current lessee of the TAMPEEL property and performed an additional geophysical survey in combination with test trenching. The activities and findings of the geophysical survey and test trenching are presented in Section 3.1 and also were documented in *the Former Lordstown Ordnance Depot TAMPEEL Site - Evaluation of Historical Landfilling/Dumping Activities* letter report submitted to the Ohio EPA, dated April 2, 2009.

2.1.1 Interview

The local school district is the current owner of the TAMPEEL property and leases the property to Vic Bell (personal interview, 2007). Mr. Bell was formerly a principal for the Lordstown School District and has been familiar with the property since the late 1960s. The interview provided a firsthand, historical account of site activities at the TAMPEEL property.

2.1.2 Geophysical Survey

Data from the previous RI indicated that the general area considered as the landfill is approximately 300 feet (east/west axis) by 400 feet (north/south axis). The TAMPEEL landfill is primarily an open area that includes three buildings (restroom, shed, and instructional building) and the landfill is wooded along its perimeter with thick vegetation in the eastern and northern portions that have some smaller open areas The goal of the geophysical survey was to delineate the landfill area and to identify buried debris piles

within it. Electromagnetic (EM) terrain conductivity profiling was chosen as the best method due to its success with similar landfill delineation projects. The GEM-300 is an EM instrument capable of making two measurements useful for landfill delineation:

- It can help define boundaries based on differences in electrical conductivity between excavated, filled areas and natural, undisturbed areas.
- The instrument is sensitive to metal signatures and can be used to locate buried metallic objects and waste.

The following work tasks were completed by the Grumman Exploration, Inc. (Grumman) geophysical subcontractor and CH2M HILL staff:

- Delineated the core waste footprint and any satellite waste areas of the TAMPEEL landfill by using geophysical survey methods to identify buried metal objects and other debris. The methodology was sufficient to delineate areas of buried material small enough to meet landfill gas sampling objectives.
- Recorded the EM traverses and the locations of buried debris using a backpack global positioning system (GPS) unit that was capable of continuous real-time recording. The data were recorded in North American Datum 87 with the appropriate Universal Transverse Mercator Zone.
- After identification, the landfill footprint and any satellite debris areas were marked in the field around their perimeters with flush-mounted, ground-level survey markers approximately every 25 feet, or as sufficient to accurately mark their periphery. This type of survey marker was determined to be the safest, least intrusive alternative. Upon completion of installing the delineation markers, these locations were recorded using a GPS unit, provided in Appendix A.

Grumman completed the geophysical survey under CH2M HILL oversight on October 29 and 30, 2007. Grumman established a grid throughout the survey area with transects spaced at 5-foot intervals, and area monitoring wells were used as reference points. Grumman performed the geophysical survey using a Geophysical Survey Systems, Inc. (GSSI), GEM-300 multi-frequency EM induction terrain conductivity profiling system. The GSSI GEM-300 profiling instrumentation measures soil electrical conductivity (quadrature phase) and in-phase response (sensitive to high-conductivity conditions or buried metal). Soil conductivity and in-phase (metal sensitive) measurements were completed at three frequencies (4,410 hertz [Hz], 9,810 Hz, and 15,010 Hz) and recorded electronically at each measurement location.

Approximately 4,140 measurements of the soil conductivity and in-phase responses were recorded during the survey of the TAMPEEL area. Reconnaissance-level EM profiling was performed in the densely wooded and overgrown area east of the TAMPEEL area where a grid could not be established. The EM responses were observed and anomalous responses marked on the ground surface and located for later mapping. A detailed description of the geophysical survey is included in *Geophysical Survey Using EM Terrain Conductivity Profiling at the Former TAMPEEL Landfill* (Grumman, 2007), provided in Appendix A.

2.1.3 Test Trenching

Based on the findings of the geophysical survey, two test trenches were excavated by backhoe on November 1, 2007, to evaluate the accuracy of the EM geophysical survey in delineating the former landfill. Figure 2-1 shows the approximate locations of the two test trenches. Excavation of each test trench began inside the landfill area and worked out past the footprint determined by the geophysical survey. The following work tasks were completed by CH2M HILL staff and the test trench subcontractor:

- Each test trench was excavated by backhoe under controlled conditions in 1-foot-deep increments.
- Debris and soils excavated from the test trenches were photographed and logged to document findings.
- Test trenches were completed to evaluate the accuracy of the geophysical survey.
  - Test Trench 1 was excavated in an east-west orientation near the eastern end of the TAMPEEL site's open area to evaluate the extent of observed EM anomalies. The test trench was excavated to approximately 5 feet bgs and was approximately 2 feet wide and 10 feet long.
  - Test Trench 2 was excavated in an east-west orientation near the southwestern end of the TAMPEEL site's open area to delineate the western edge of the geophysical response and understand the reasons for the differences in EM response at this part of the site. The test trench was excavated to approximately 4 feet bgs and was approximately 2 feet wide and 6 feet long.
- During test trench excavation, excavated debris was separated from the excavated soil. Upon completion, the debris was placed in each of the test trenches and then covered with the excavated soil to ensure adequate cover. On June 19, 2008, 6 cubic yards of clean topsoil were placed on top of each test trench and spread to a minimum thickness of 4 inches. The areas were then reseeded.

Vicki Deppisch of the Ohio EPA observed the test trenching.

2.2 Quarterly Monitoring

CH2M HILL completed four quarterly groundwater, surface water, and landfill explosive gas monitoring events at the TAMPEEL site in December 2007, March 2008, June 2008, and September 2008.

CH2M HILL collected, analyzed, managed, and validated the data in accordance with the USACE and Ohio EPA-approved SAP and QAPP presented in the Work Plan (CH2M HILL, 2007). The quarterly sampling events are described below. The results of the quarterly monitoring are presented in Section 3.2.

2.2.1 Groundwater Monitoring

Groundwater samples were collected from a total of five monitoring wells at the TAMPEEL landfill project area (MW112, MW113, MW114, MW115, and MW116). Figure 2-2 shows the locations of the monitoring wells that were sampled.

Prior to the first groundwater sampling event, the seven monitoring wells were redeveloped following guidelines specified in Field SOP 3, *Drilling and Monitoring Well Installation,* provided in Appendix A of the Work Plan (CH2M HILL, 2007). During the first quarterly sampling event, all monitoring wells were painted with the monitoring well identification number, and new locks, all keyed alike, were installed. Keys are kept by CH2M HILL and copies were provided to the appropriate parties.

Water levels and groundwater field parameters were measured in each well, as specified in Appendix A of the Work Plan (Field SOP 6, *Water Level Measurements,* and Field SOP 8, *Field Measurements Water Quality,* respectively). All Static water levels were measured within a 24-hour period and recorded before completion of the quarterly groundwater sampling activities. With the exception of MW115 and MW116, groundwater samples were collected on a quarterly basis for 1 year in accordance with the SAP. Groundwater samples were not collected from MW115 and MW116 during the December 2007 sampling event because of standing water and unstable ground conditions in the vicinity of these monitoring wells during this event. This deviation was documented with USACE and Ohio EPA via voicemail and e-mail on December 18, 2007. These wells were sampled during the other three quarters. Groundwater samples were collected by the methods specified in Appendix A of the Work Plan (Field SOP 9, *Groundwater Sampling).*

Sampling and analytical requirements for TAMPEEL groundwater samples were in accordance with the QAPP (Work Plan, Appendix B). All samples were submitted to CT Laboratories (1230 Lange Court, Baraboo, Wisconsin) for analysis. For groundwater, the laboratory method detection limits (MDLs) were below the USEPA maximum contaminant levels (MCLs) (or secondary MCLs); or if these did not apply, the USEPA Region 9 tap water preliminary remediation goals (PRGs). The following methods were used for laboratory analysis of groundwater samples:

- VOCs (SW-846 8260B)
- Chlorides (SW-846 9056)
- Dissolved iron, thallium (SW-846 6010B)
- Total iron, thallium (SW-846 6010B)

The results are discussed in Section 3.2.2.

2.2.2 Surface Water Monitoring

Surface water samples were collected from two locations north of the landfill area by methods specified in the Work Plan (Appendix A, Field SOP 10, *Surface Water Sampling*). One sample was collected from TAMPEEL Spring and one from Aspen Creek. Figure 2-2 shows the two surface water sampling locations. Surface water samples were collected on a quarterly basis for 1 year.

Sampling and analytical requirements for the TAMPEEL surface water samples were in accordance with the QAPP (Work Plan, Appendix B). All samples were submitted to CT Laboratories for analysis. For surface water, the laboratory MDLs were below the USEPA MCLs (or secondary MCLs); or if these did not apply, the USEPA Region 9 tap water PRGs. The following methods were used for analysis of the surface water samples:

- VOCs (SW-846 8260B)
- Chlorides (SW-846 9056)
- Dissolved iron, thallium (SW-846 6010B)
- Total iron, thallium (SW-846 6010B)

The results are discussed in Section 3.2.3.

2.2.3 Landfill Gas Monitoring

Quarterly landfill explosive gas monitoring was conducted in accordance with OAC 3745-27-12 and the procedures presented in the Work Plan (CH2M HILL, 2007). CH2M HILL personnel completed landfill gas monitoring in December 2007, March 2008, June 2008, and September 2008.

A 50-foot by 50-foot grid was established for this effort. The size of the grid and total number of monitoring points were based on the results of the geophysical delineation survey.

Monitoring points were established based on the following:

- A 50-foot by 50-foot grid was measured over the core landfill area. After the sample grid was established, GPS coordinates were obtained at each node. Additional sampling events used the same grid location.
- Landfill explosive gas monitoring points were randomly identified within each 50-foot by 50-foot grid block.
- A single monitoring point was identified from all satellite debris areas larger than 100 square feet (10 feet by 10 feet).
- Satellite debris piles larger or wider than 50 feet required more than one sampling and monitoring point (based on the 50-foot grid blocks as identified above).
- Ambient air readings also were obtained from within each structure and outside near the building foundation.

Figure 2-3 illustrates the landfill gas sampling grid and monitoring points. Soil gas measurements were collected at each randomly identified monitoring point (one sample per grid block) using the punch-bar method and a Landtec GEM 2000 portable handheld landfill gas meter. The readings were obtained immediately upon retracting of the punch-bar by inserting a probe attached to a Landtec GEM 2000 just within the punch-bar hole. Although not required by Ohio EPA procedures, a probe attached to a MiniRae multisensor was inserted just within the punch-bar hole during some field events. Upon completion, each punch bar hole was abandoned by filling it with bentonite chips and hydrating with potable water.

Additionally, direct readings were obtained each quarter from ambient air adjacent to nearby buildings foundations, and inside of buildings on the property. These readings were obtained immediately above the ground or floor surface.

Data (including GPS coordinates) collected at each sampling location were entered on the Ohio EPA form, *Explosive Gas Monitoring Punch Bar Station Report*. Required ambient parameters (such as barometric pressure) were obtained from the Youngstown-Warren Regional Airport.

The landfill gas monitoring results are discussed in Section 3.2.4.

2.2.4 Quality Control Sampling

Quality control (QC) groundwater and surface water samples were collected in accordance with the QAPP (Work Plan, Appendix B). These included the following:

- Field duplicates at a frequency of 1 per 10 samples
- Equipment blanks (when sampling equipment was reused) at a frequency of 1 per 20 samples
- Trip blanks (VOCs only) at a frequency of one per cooler containing VOC samples
- Matrix spike/matrix spike duplicates (MS/MSD) at a frequency of 1 per 20 samples

2.2.5 Sample Identification

All sample containers were labeled with the project name, sample number, analysis to be performed, date and time of collection, and sample processor's initials before sample collection. An independent identification (ID) number was assigned to groundwater duplicate samples collected for analysis. Sample labels used the following format for sample identification:

MediaLocation-date-QC type, where:

- *Media*: Groundwater ="MW" (for "monitoring well"); surface water = "SW."
- *Location*: 3-digit well ID (for groundwater) or TS (for TAMPEEL Spring) or AC for Aspen Creek.
- *Date = mmddyy.*
- *QC (where applicable):* FD = Field Duplicate; EB = equipment blank; TB = Trip Blank; FB = field blank).

  * Note that EB, TB, and FB will not be tied to a media or location and will be identified as *"QC"-date-QC type.*

  For example, a groundwater sample collected from Monitoring Well 105 on May 1, 2006, would be identified as MW105-050106. A duplicate surface water sample collected from the TAMPEEL Spring on December 14, 2006, would be identified as SWTS-121406-FD. A trip blank collected that same day would be identified as QC1-0121406-TB.

The unique sample identification numbers were affixed to each sample container before sample collection and then recorded on the chain-of-custody. Field team members maintained a list of the sample identification numbers in the field logbook.

For field duplicate samples only, the sample collection time was not recorded on the chain-of-custody or sample container. The actual identity and sample time of field duplicate samples was recorded in the field logbook.

The procedures used for proper packaging, shipping, and documentation of samples being transported from the field to the laboratory for analysis were in accordance with Field SOP *12 Sample Management* (Work Plan, Appendix A).

2.2.6 Equipment Decontamination

All sampling equipment that was reused in the field was decontaminated in accordance with Field SOP 11, *Field Decontamination Procedures* (Work Plan, Appendix A).

2.2.7 Investigation-derived Waste

Water from purging, well development, and decontamination of equipment was containerized upon generation. All investigation-derived (IDW) waste was disposed in accordance with Field SOP 13, *Investigation-derived Waste Handling and Disposal* (Work Plan, Appendix A).

Arrangements were made immediately upon the completion of sampling to have the contract waste handling firm remove the waste from the site. Using the groundwater sampling data from the field event, the IDW was characterized and profiled by CH2M HILL, and then reviewed and approved by USACE. The IDW was handled and disposed in accordance with state, federal, and local laws and regulations.

2.2.8 Health and Safety

A Health, Safety, and Environment Plan was prepared specifically for this site and approved by CH2M HILL's health and safety manager. It is included with the SAP (Work Plan, Appendix C).

2.2.9 Data Management and Validation

Analytical data met the standard laboratory specifications for precision, accuracy, completeness, and comparability except where specified in the quarterly data quality evaluation reports (Appendix D). The laboratory followed the Lordstown QAPP (Work Plan, Appendix B), which provided guidelines to ensure the reliability and validity of work conducted at the laboratory.

CH2M HILL performed data verification, review and validation for all the primary and quality assurance (QA) samples collected. Verification consisted of confirming the data packages were complete, correct, consistent, and compliant with the data package requirements. Review consisted of confirming that samples were analyzed for the methods requested, reviewing the laboratory case narrative, and reviewing summary QC indicator data. Validation included a comparison of data against the QC criteria and requirements outlined in the Lordstown QAPP (CH2M HILL, 2007).

For the first quarter, CH2M HILL obtained electronic data deliverables (EDDs) that were compatible with the Automated Data Review (ADR) software. The laboratory used the EDD error-checking tool in ADR before submittal to CH2M HILL. CH2M HILL then re-verified the quality of the EDD using the EDD checker and performed data verification, review and validation as specified in the Lordstown QAPP (CH2M HILL, 2007).

For the second, third and fourth quarters, CH2M HILL obtained EDDs in LabSpec7 format. The laboratory used the CH2M HILL EDD error-checking tool prior to submittal to CH2M HILL. CH2M HILL then loaded the EDD to the Lordstown database maintained by CH2M HILL. CH2M HILL then performed data verification, review and validation as specified in the Lordstown QAPP using a semi-automated data validation tool (CH2M HILL, 2007).

The results of the data verification, data review and validation efforts were presented in data quality evaluation reports on a quarterly basis and the data quality evaluation reports are in Appendix D.

The sampling at the TAMPEEL site was conducted along with sampling at the 3 AOCs site; therefore, the analytical data reports and the data quality review reports in Appendix D include the sampling data from both the TAMPEEL and 3 AOCs sites.

SECTION 3

Results and Findings

3.1 Historical Waste Disposal

CH2M HILL conducted several activities to better understand historical disposal activities and the type and extent of debris remaining at the TAMPEEL site. The findings are summarized below.

3.1.1 Interview with Former Lordstown School Principal

On October 29, 2007, CH2M HILL interviewed Vic Bell about his recollections of waste disposal activities at the TAMPEEL site. Mr. Bell is a former principal with the Lordstown School District and the current lessee, from the Lordstown School District, of the TAMPEEL property. He was involved with the Lordstown School District's acquisition and development of the property as an educational nature center in the late 1960s. Ms. Deppisch of the Ohio EPA Division of Emergency Responses and Remediation, and John Schmidt and Jerry Parker of the Ohio EPA Division of Solid Waste were also present at the interview.

Mr. Bell indicated that during operation of the FLOD, jeep parts, food, paint cans, glass, and other debris were dumped on the existing TAMPEEL site. This disposal was believed to be primarily from four or five families living in this area who also worked at the base. The trash pile created from this activity was approximately 5 feet high, 75 feet long (running north and south), and 50 feet wide. Mr. Bell indicated that no excavation took place to support the dumping, and that this was a natural low area at the site.

In the late 1960s, Mr. Bell and Gordon James, who was the Lordstown School District superintendent at the time, began discussing the idea of a nature center. Mr. James contacted the United States government about the site. Soon after, the government sold the 39 acres to the Lordstown School District for $1, with the provision that the property must be used for educational purposes for 30 years.

Mr. Bell stated that on the original Earth Day (April 22, 1970), volunteers removed debris from the site. The town also donated the use of a front-end loader and several dump trucks to aid in removing the debris. Toward the end of the cleanup, several dump truck tires were punctured from driving over the metal debris, and the volunteers decided to discontinue debris removal. They scattered remaining large debris in the woods to the east. Small debris was left in place and slag obtained from a local manufacturer was placed along what became an access road and parking area in the center of the nature center. Mr. Bell estimated that between two-thirds and three-fourths of the debris originally present at the site was removed during that cleanup.

The Study Pond was not created until about 1980, when fill was needed for a local road project. The Lordstown School District donated the fill from the Study Pond area in exchange for final grading and compaction to support the pond.

3.1.2 Geophysical Survey

The results of the geophysical survey are shown in Figure 3-1 and indicate the following:

- Overall, the area of geophysical anomalies appears to be smaller than geophysical anomalies from the 1998 geophysical survey reported in the RI report (Shaw, 2005). Much of the area of elevated geophysical response reported by Shaw shows a relatively lower metallic signature, and correlates with the area where Mr. Bell indicated slag was placed to support vehicle access and parking.
- The highest EM conductivity response and in-phase readings associated with conductive fill and scattered metallic debris were concentrated in the eastern portion of the TAMPEEL open area.
- Areas of scattered EM anomalies were noted in the survey area and appear to represent "satellite" debris areas. These areas occurred within the original debris footprint defined in the RI report (Shaw, 2005), but the 2007 geophysical survey conducted by Grumman Exploration clearly indicates that they are isolated from the TAMPEEL open area and probably are caused by the presence of isolated debris.
- Reconnaissance EM work performed in the wooded area to the east of the open area indicates that a 20- to 30-foot-wide strip of strong and erratic EM responses is present. The disturbed ground (mounds or hummocky terrain) and partially exposed metal and concrete debris found in this area appear to be aligned with a drainage feature northeast of the clearing. The southern end of this anomaly appears to occur to the east of the nature center's restrooms. This correlates with the area where Mr. Bell indicated the remaining debris was scattered.

Differences between the results from geophysical investigations conducted in 2007 and 1998 may be related to the differences in equipment used and survey grid spacing:

- In 2007, the device used was the GEM-300, but in 1998, the device used was the EM-31. The newer GEM-300 provides a larger range of measurement using multiple operating frequencies (providing both deeper and shallower depth penetration) than the mono-frequency EM-31. The GEM-300 has a wider dynamic range for the in-phase response and measures this parameter in parts per million; the EM-31 measures in-phase in parts per thousand. Both the GEM-300 and the EM-31 provide estimates of the apparent bulk electrical conductivity of the subsurface through the quadrature-phase response; however, differences in instrument design and operation of the equipment (inter-coil separation distance and digital versus analog operation) may account for some of the difference in results.
- The 2007 survey used a grid transect spacing that was significantly smaller than the 1998 survey. The 2007 survey used a transect spacing of 5 feet with an approximate 2-foot station interval. In contrast, the 1998 survey used a transect spacing of 50 feet with 5-foot station intervals. This corresponds to one tenth of the transect spacing and approximately 1/20 of the overall measurement density compared to the 2007 survey. The larger grid spacing of the 1998 survey may have resulted in an overestimation of the size of geophysical anomalies.

A more detailed description of the findings of the geophysical survey is included in the Grumman geophysical report, provided in Appendix A (Grumman, 2007).

3.1.3 Test Trenching

Based on information obtained during the interview with Mr. Bell and the preliminary results of the geophysical survey, two test trenches were excavated to verify subsurface conditions. Photographic documentation is included in Appendix B.

Test Trench 1 (Figure 3-1) was excavated to evaluate the area of higher geophysical response. Debris was encountered from approximately 3 to 4 feet bgs and included wire, tin cans, glass, nails, and metal chains. The debris was encountered in the eastern end of the test trench and was not present in the western end. This result supports the findings of the geophysical survey and establishes the localized nature of remaining metallic debris at the eastern end of the TAMPEEL former parking area.

Test Trench 2 (Figure 3-1) was performed to delineate the western edge of the lower EM response geophysical anomaly. Slag was encountered at a depth of 1 foot bgs and was about 6 inches thick. Debris was encountered at the eastern end of the test trench from about 20 to 30 inches bgs and consisted of scrap wood with some nails and other small debris. Debris was not encountered in the western end of the test trench. This result was consistent with expectations, based on the geophysical survey, and establishes the western extent and cause of the geophysical anomaly.

3.2 Quarterly Monitoring Results

The following subsections summarize the findings of the quarterly sampling events. The analytical laboratory reports are included in Appendix C. Data quality evaluation reports were included in the *Annual Monitoring Data Summary Report for the TAMPEEL and 3 Areas of Concern Sites Former Lordstown Ordnance Depot* (CH2M HILL, 2009) and are included in Appendix D. As noted in Section 2.2.9, the sampling at the TAMPEEL site was conducted along with sampling at the 3 AOCs site; therefore, the analytical laboratory reports and the data quality review reports in Appendix D include the sampling data from both the TAMPEEL and 3 AOCs sites

3.2.1 Groundwater Elevations and Potentiometric Contour Maps

Static water levels measured and recorded during the quarterly sampling events for the TAMPEEL site and the 3 AOCs site are listed in Table 3-1. The water levels from the 3 AOCs site are presented to provide a comprehensive overview of groundwater flow. As discussed in previous studies (Shaw, 2005), groundwater at TAMPEEL occurs under confined conditions in the fractures of the weathered bedrock. Clayey soil overlying bedrock forms the confining layer. Although the potentiometric surface of the water-bearing zone lies close to ground surface (approximately 1 to 3 feet bgs, the depth to groundwater in the water-bearing zone is controlled by the thickness of soil overlying bedrock and varies from approximately 3 to 10 ft (see Figure 3-8 in Shaw, 2005).

The groundwater elevations were used to generate the potentiometric surface maps in Figures 3-2 through 3-5. The figures indicate that groundwater generally flows to the

northeast at TAMPEEL. This groundwater flow direction generally reflects surface topography; however, cross section E-E' in the RI report (see Figure 3-8 in Shaw, 2005) through the TAMPEEL area shows that bedrock also dips in the north to northeast direction, and groundwater flow direction may be controlled by either or both surfaces.

Groundwater at the 3 AOCs site flows to the north and to the west toward Beaver Creek (Figures 3-2 through 3-5). Similar to TAMPEEL, the potentiometric surface at the 3 AOCs mimics both ground surface topography and the underlying bedrock topography, so either or both surfaces may affect groundwater flow at the 3 AOCs. Shaw (2005) presumed that groundwater in the 3 AOCs area discharged to Beaver Creek, even though Shaw classified the creek as an ephemeral stream (where flow is induced by precipitation runoff rather than by groundwater-fed base flow). The potentiometric elevation in monitoring well MW107, which is the closest well to Beaver Creek, ranged from 939.9 to 937.2 feet mean sea level (msl) during the quarterly monitoring. The elevation of the Beaver Creek bed, to the west of MW107, is approximately 937.5 feet msl, so depending on the hydraulic gradient between MW107 and Beaver Creek, groundwater potentially could discharge to Beaver Creek in the 3 AOCs area, at least on a seasonal basis. It seems unlikely that Beaver Creek forms a significant hydraulic barrier to groundwater flow (affecting portions of the aquifer deeper than a few feet), given the ephemeral and shallow nature of Beaver Creek; therefore, most groundwater in the water-bearing bedrock appears to flow beneath Beaver creek toward TAMPEEL.

Aspen Creek flows from the Beaver Pond to the Study Pond through the TAMPEEL area; however, there is little or no surface expression of this creek on the RI topographic map (see Figure 3-1 in Shaw, 2006) and it is unclear if groundwater in the TAMPEEL area is discharging to Aspen Creek. The fact that the spring area is located adjacent to Aspen Creek does demonstrate that groundwater discharges to the surface in this area.

The quarterly potentiometric surface maps in Figures 3-2 through 3-5 are consistent with those presented in the RI report (see Figures 3-10 and 3-11 in Shaw, 2005) with respect to the TAMPEEL area. The 3 AOCs area flow directions vary because additional wells have been added to better define the potentiometric surface since the RI was performed.

3.2.2 Groundwater and Surface Water Monitoring Results

The groundwater sample analytical data are summarized in Tables 3-2 through 3-6 and on Figure 3-6. The surface water sample analytical data are summarized by sampling location in Tables 3-7 and 3-8 and shown on Figure 3-7. These tables and figures include data validation qualifiers:

- U = The analyte was analyzed for but not detected. The value preceding the U is the method reporting limit (MRL).
  - The MRL is the lowest concentration that can be reliably achieved during routine laboratory operating conditions. MRLs are arbitrarily set at some multiple of typical MDLs, usually 2 to 10 times the MDL for reagent water.
  - The MDL is the lowest concentration that can be detected by an instrument with correction for the effects of sample matrix and method-specific parameters such as

sample preparation. MDLs are explicitly determined as set forth in 40 Code of Federal Regulations (CFR) Part 136.

- J = The identification of the analyte is estimated, because the QA criteria indicate that the quantitative value may be outside the normal expected range of precision. The estimated value is reported at less than the MRL, but greater than the MDL.
- UJ = The analyte was not detected above the reported sample quantitation limit; however, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- R = Data are considered to be rejected and should not be used. This flag denotes the failure of QC criteria such that it cannot be determined if the analyte is present or absent from the sample. Re-sampling and analysis would be necessary to confirm or deny the presence of the analyte.

Groundwater Monitoring Results

VOCs were not detected in the two easternmost monitoring wells, MW115 and MW116, except for 0.17 microgram per liter (µg/L) for m&p xylenes (an estimated concentration less than the reporting limit of 0.4 µg/L indicated by the "J" qualifier), which was detected in MW115. The three westernmost monitoring wells, MW112, MW113, and MW114, contained low levels (in most cases, estimated concentrations less than the reporting limit) of trichloroethene (TCE); cis-1,2- DCE; and vinyl chloride. Cis-1,2-DCE and vinyl chloride are commonly the principal products from the biodegradation of TCE in groundwater. TCE was only detected in MW112, which is the most upgradient (southern) of the three western wells. Sporadic detections of m&p xylenes, toluene, and chloromethane occurred in MW113 and MW114 during some of the sampling events.

Neither dissolved thallium nor total thallium was detected in any of the groundwater samples collected from the TAMPEEL wells. Thallium was only detected in MW114 during the RI at a concentration of 0.010 milligrams per liter (mg/L).

Dissolved iron ranged from 5.5 to 8.6 mg/L in wells MW112 and MW113, in the southwestern portion of TAMPEEL. Dissolved iron concentrations were lower in the remaining wells, ranging from 0.1 to 6.5 mg/L. Total iron concentrations were higher than dissolved concentrations, which is expected because the unfiltered total iron samples include suspended solids containing iron, and the total iron concentrations are affected by the turbidity of the samples (which can vary according to well construction, geologic factors, and purging techniques).

Groundwater analytical results were compared to published human health screening levels (USEPA MCL or USEPA Region 9 tap water PRG if an MCL has not been established). There were no screening level exceedances noted for VOCs during any of the quarterly sampling events. Total and dissolved iron exceeded the aesthetic secondary MCL during all four quarterly sampling events at MW112, MW113, MW114, and MW116. Total iron

concentrations at MW115 exceeded the aesthetic secondary MCL[1] during the March and September 2008 sampling events. Dissolved iron concentrations did not exceed the aesthetic secondary MCL at MW115 during the quarterly sampling events.

Surface Water Monitoring Results

TCE (0.067 µg/L) and its degradation products trans-1,2-DCE (0.079 µg/L) and vinyl chloride (0.26 µg/L) were detected in the Aspen Creek June 2008 sample. The TCE and trans-1,2-DCE concentrations were estimated values below the reporting limit. The TCE degradation product cis-1,2-DCE was detected in all of the Aspen Creek samples at concentrations ranging from 0.38 to 3.2 µg/L. Acetone and chloromethane also were detected at estimated concentrations less than the reporting limit in some of the Aspen Creek samples. Cis-1,2-DCE, vinyl chloride, and chloromethane were detected at similar concentrations in some of the groundwater samples collected from MW114, which is close to the Aspen Creek sampling location (Figure 3-7).

TCE and its degradation products also were detected in the TAMPEEL Spring samples. The concentrations in the TAMPEEL Spring samples were higher than those in the Aspen Creek samples. For example, the maximum cis-1,2-DCE concentration in the TAMPEEL Spring samples was 11 versus 3.2 µg/L in the Aspen Creek samples. Some of the TAMPEEL Spring samples also contained 1,1-DCE, 1,4-dichlorobenzene, benzene, and chlorobenzene at estimated concentrations less than the reporting limit.

Surface water samples collected from Aspen Creek and the TAMPEEL Spring during the RI (Shaw, 2005) contained cis-1,2-DCE at concentrations ranging from 1.8 to 4.9 µg/L. Surface water samples were also collected from the Beaver Pond and Study Pond during the RI; VOCs were not detected in the Study Pond or the Beaver Pond surface water samples. It should be noted that, based on the figures in the RI (Shaw, 2005), Beaver Pond was considerably larger at the time of the RI than during the quarterly sampling performed for this RI addendum. On the basis of the site maps, Shaw apparently did not recognize that Aspen Creek extended south to the Beaver Pond.

Thallium was not detected in any of the surface water samples. Total iron ranged between 0.27 and 3.5 mg/L in the TAMPEEL Spring samples and between 0.15 and 180 mg/L in the Aspen Creek samples. The greater range in concentrations in the Aspen Creek samples probably reflects the greater variability in the turbidity of creeks compared to groundwater discharging as a spring. Conversely, the samples from TAMPEEL Spring showed a greater range in dissolved iron concentrations than did the samples from Aspen Creek.

The surface water analytical results were compared to human health screening levels (USEPA MCLs or USEPA Region 9 tap water PRGs if an MCL has not been established) and USEPA Regions 5 ecological screening levels (ESLs). The analytical data and screening level comparison indicated the following:

- TAMPEEL Spring: There were no screening level exceedances noted for VOCs with the exception of vinyl chloride, which has a screening level of 2 µg/L (MCL) and

[1] National Secondary Drinking Water Standards (commonly referred to as secondary MCLs) are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water.

concentrations of 2.2 µg/L in June and in September 2008. Thallium was not detected during any of the quarterly sampling events. Total iron exceeded the aesthetic secondary MCL during the December 2007, March 2008, and June 2008 sampling events. Dissolved iron exceeded the aesthetic secondary MCL during the March 2008 and June 2008 sampling events.

- Aspen Creek: There were no screening level exceedances noted for VOCs, and total and dissolved thallium were not detected during any of the quarterly sampling events. Total iron exceeded the aesthetic secondary MCL during the December 2007, March 2008, and June 2008 sampling events. Dissolved iron concentrations exceeded the aesthetic secondary MCL during the March 2008, June 2008, and September 2008 sampling events.

3.2.3 Landfill Gas Monitoring

CH2M HILL conducted landfill gas monitoring during each of the four quarterly monitoring events at up to 29 locations within the delineated area of anomalous geophysical response (Figure 2-3). The quarterly results are tabulated in Tables 3-9 through 3-12. The results of the quarterly landfill gas monitoring indicate that explosive gases were not detected at any of the monitoring locations during any of the four quarterly sampling events.

3.3 Evaluation of Risk

An HHRA and ERA were performed and submitted in the RI report (Shaw, 2005) for the TAMPEEL site. CH2M HILL senior risk assessors evaluated the 2007 and 2008 groundwater and surface water data and reviewed the ERA and HHRA submitted in the RI report to assess whether the risk assessment results presented in the RI report are still valid. The results of the HHRA and ERA from the RI report and the results of CH2M HILL's evaluation are presented below. Risk values presented in this report are cumulative risk and hazard values.

3.3.1 Human Health Risk Assessment Results Summary

The RI report HHRA evaluated the soil, surface water, sediment, and groundwater. The RI report target cancer risk level was 1×10^{-6} (Shaw, 2005). However, since the RI report HHRA was completed, the Ohio EPA has revised the target cancer risk level to 1×10^{-5} (Ohio EPA, 2004); therefore, for this report, the total estimated incremental lifetime cancer risk (ILCR) for each receptor group is compared to a target level of 1×10^{-5}. For noncancer risks, an HI of 1 or below is considered acceptable; an HI above 1 indicates concern about the occurrence of adverse noncancer effects (USEPA, 1989).

Soil

As presented in the RI report (Shaw, 2005), metals, semivolatile organic compounds (SVOCs), pesticides, and dioxins/furans were selected as chemicals of potential concern (COPCs) for surface soil and total soil. The following ILCRs and noncancer HIs for the RME per receptor were presented for soil:

- Adult Resident (Surface Soil)—ILCR = 2×10^{-5} and HI = 0.5
- Adult Resident (Total Soil)—ILCR 2×10^{-5} and HI = 0.5

- Child Resident (Surface Soil)—ILCR = 4×10^{-5} and HI = 4
- Child Resident (Total Soil)—ILCR = 4×10^{-5} and HI = 4
- Trespasser—ILCR = 3×10^{-7} and HI = 0.03
- TAMPEEL Caretaker—ILCR = 1×10^{-5} and HI = 0.3
- TAMPEEL Student—ILCR = 1×10^{-7} and HI = 0.05
- Construction Worker—ILCR = 2×10^{-6} and HI = 1.3
- Industrial Worker—ILCR = 7×10^{-6} and HI = 0.2
- Exposure to Soil Lead—The representative concentrations of lead in surface soil (140 milligrams per kilogram [mg/kg]) and total soil (93 mg/kg) were below the residential (400 mg/kg) and industrial (1,414 mg/kg) screening levels, respectively. The representative concentrations of lead in surface and total soil are also less than the current industrial screening level for lead (800 mg/kg).

The cancer risks for the RME to soil exceed the Ohio EPA target risk level of 1×10^{-5} for the adult resident and child resident, the greatest contributor of these risks are from arsenic. However, the representative concentration calculated in the risk assessment was actually below the calculated background concentration. The noncancer hazards for RME to soil exceeded the HI limit of 1.0 for the child resident exposure scenario. The greatest contributions to this HI were from iron and manganese; the exposure point concentrations were below the recommended daily allowance for these constituents (Shaw, 2005).

Surface Water

Surface water exposures were evaluated for Aspen Creek and TAMPEEL Spring, the Beaver Pond, and the Study Pond. Metals and VOCs were selected as COPCs for surface water. There were no detected carcinogenic constituents in the surface water of the Beaver Pond and Study Pond.

Surface Water in Aspen Creek/TAMPEEL Spring

As presented in the RI report (Shaw, 2005), five metals (barium, iron, lead, manganese, and nickel) and one VOC (methylene chloride) were identified as COPCs. Because of its lack of toxicity values, risk estimates were not calculated for lead. Lead was detected at 0.015 mg/L, which is equal to, but does not exceed the drinking water action level. The following ILCRs and noncancer HIs for the RME per receptor were presented for surface water:

- Adult Resident—ILRC = 4×10^{-10} and HI = 0.08
- Child Resident—ILRC = 1×10^{-10} and HI = 0.1
- Trespasser—ILRC = 7×10^{-11} and HI = 0.08
- TAMPEEL Caretaker—ILRC = 3×10^{-10} and HI = 0.07
- TAMPEEL Student—ILRC = 1×10^{-11} and HI = 0.04
- Construction Worker—ILRC = 1×10^{-11} and HI = 0.08

In 2007 and 2008, two metals (iron and thallium) were analyzed in surface water from Aspen Creek and the TAMPEEL Spring; only iron was detected in the samples. The iron concentrations in TAMPEEL Spring were less than the current screening levels (the USEPA regional screening levels [RSLs] for tap water). Two of the surface water samples collected from Aspen Creek in 2007/2008 exceeded the RSL for iron (unfiltered samples).

The higher iron concentrations detected in 2007/2008 were evaluated in terms of their effect on the HHRA conclusions presented in the RI report (Shaw, 2005). The maximum detected iron concentration in the RI report was 71.8 mg/L, while the maximum detected iron concentration in the 2007/2008 data was 180 mg/L. The original HIs for iron range from 0.0004 to 0.001 for the receptors evaluated in the RI report listed previously. Because the EPC is linearly related with the HI, an EPC of 180 mg/L would result in HIs ranging from 0.001 to 0.003. Based on the HIs for iron, the cumulative HI for each receptor would not exceed Ohio EPA's target HI of 1. Therefore, the RI report (Shaw, 2005) conclusions regarding potential human health risks associated with iron in Aspen Creek/TAMPEEL Spring surface water (being below Ohio EPA's target HI) are still valid.

Six VOCs were detected in surface water samples collected from Aspen Creek in 2007 and 2008 (Table 3-7): acetone; chloromethane; cis-1,2-DCE; trans-1,2-DCE; TCE; and vinyl chloride. However, maximum detected concentrations of VOCs did not exceed the current RSLs. Nine VOCs were detected in surface water samples collected from TAMPEEL Spring in 2007 and 2008 (Table 3-8): 1,1-DCE; 1,4-dichlorobenzene; benzene; carbon disulfide; chlorobenzene; cis-1,2-DCE; trans-1,2-DCE; TCE; and vinyl chloride. The maximum detected concentration of vinyl chloride (2.2 µg/L) exceeded its current RSL (0.016 µg/L). Therefore, vinyl chloride would be identified as a COPC in surface water.

To evaluate the recent detections of vinyl chloride, risk and hazard estimates were calculated using the same receptors, exposure pathways, exposure factors, and equations presented in the RI report (Shaw, 2005). The risk and hazard estimates for the original COPCs identified in the RI report were not updated. The surface water exposure scenarios addressed in the RI report (Shaw, 2005) are incidental ingestion and dermal contact with surface water using a surface water ingestion rate of 50 milliliters per day (mL/day) and an exposure frequency of 19 to 39 days per year, depending on the receptor. The most recent toxicity values available from USEPA's Integrated Risk Information System (IRIS) database (USEPA, 2011) were used for vinyl chloride: slope factors—7.2×10^{-1} (milligrams per kilogram per day [mg/kg-day])$^{-1}$ (continuous lifetime exposure during adulthood) and 1.5 (mg/kg-day)$^{-1}$ (continuous lifetime exposure from birth); reference dose—3×10^{-3} mg/kg-day.

A summary of the vinyl chloride risk and hazard estimates for the receptors, as well as the 2005 estimates for the metals and methylene chloride are presented in Tables 3-13 through 3-18. Detailed calculations are presented in Appendix E, providing toxicity values and intake estimates for each COPC. The cumulative ILCRs and noncancer HIs were updated to include the risk and hazard estimates for vinyl chloride for the receptors for surface water are as follows:

- Adult Resident—ILRC = 8×10^{-8} and HI = 0.08
- Child Resident—ILRC = 6×10^{-8} and HI = 0.1
- Trespasser—ILRC = 2×10^{-8} and HI = 0.08
- TAMPEEL Caretaker—ILRC = 6×10^{-8} and HI = 0.07
- TAMPEEL Student—ILRC = 3×10^{-9} and HI = 0.04
- Construction Worker—ILRC = 3×10^{-9} and HI = 0.08

Based on screening of the 2007 and 2008 data and risk calculations for vinyl chloride, the RI report (Shaw, 2005) conclusions regarding potential human health risks associated with

Aspen Creek/TAMPEEL Spring surface water (being within Ohio EPA's target risk range and HI) are still valid.

Surface Water in Beaver Pond

As presented in the RI report (Shaw, 2005), only three metals (iron, lead, and manganese) were identified as COPCs. There are no carcinogenic COPCs for Beaver Pond surface water. The following HIs were presented as the COPCs for the Beaver Pond surface water:

- Adult Resident—HI = 0.02
- Child Resident—HI = 0.03
- Trespasser —HI = 0.02
- TAMPEEL Caretaker—HI = 0.02
- TAMPEEL Student—HI = 0.009
- Construction Worker—HI = 0.02
- Exposure to Lead—Lead in the Beaver Pond surface water is estimated at 0.007 mg/L, which is below the drinking water action level of 0.015 mg/L. Lead in sediment is estimated at 67 mg/kg, which is below the residential (400 mg/kg) and industrial (1,414 mg/kg) screening levels. The representative concentration of lead in sediment is also less than the current industrial screening level for lead (800 mg/kg).

Surface Water in Study Pond

As presented in the RI report (Shaw, 2005), only manganese was identified as a COPC in the Study Pond surface water. There are no carcinogenic COPCs for Study Pond surface water. The following HIs were presented as the COPCs for the Beaver Pond surface water:

- Adult Resident—HI = 0.01
- Child Resident—HI = 0.02
- Trespasser—HI = 0.01
- TAMPEEL Caretaker—HI = 0.009
- TAMPEEL Student—HI = 0.005
- Construction Worker—HI = 0.06
- Exposure to Lead—Lead was not detected in Study Pond water

Sediment

Sediment exposures were evaluated for Aspen Creek and TAMPEEL Spring, the Beaver Pond, and the Study Pond. Metals and SVOCs were selected as the COPCs for sediment.

Aspen Creek and TAMPEEL Spring

As presented in the RI report (Shaw, 2005), metals and SVOCs were identified as COPCs in the Aspen Creek and TAMPEEL Spring sediment. The following ILCRs and noncancer HIs for the RME per receptor were presented:

- Adult Resident—ILRC = 3×10^{-6} and HI = 0.2
- Child Resident—ILRC = 3×10^{-6} and HI = 0.7
- Trespasser—ILRC = 4×10^{-7} and HI = 0.09
- TAMPEEL Caretaker—ILRC = 3×10^{-6} and HI = 0.1
- TAMPEEL Student—ILRC = 2×10^{-7} and HI = 0.1
- Construction Worker—ILRC = 1×10^{-7} and HI = 0.2

- Exposure to Lead—Lead in sediment is estimated at 77 mg/kg, which is below the residential (400 mg/kg) and industrial (1,414 mg/kg) screening levels. The representative concentration of lead in sediment is also less than the current industrial screening level for lead (800 mg/kg).

Beaver Pond

As presented in the RI report (Shaw, 2005), metals and SVOCs were identified as COPCs in the Beaver Pond sediment. The following ILCRs and noncancer HIs for the RME per receptor were presented:

- Adult Resident—ILRC = 6×10^{-6} and HI = 0.07
- Child Resident—ILRC = 7×10^{-6} and HI = 0.3
- Trespasser—ILRC = 9×10^{-7} and HI = 0.04
- TAMPEEL Caretaker—ILRC = 6×10^{-6} and HI = 0.06
- TAMPEEL Student—ILRC = 3×10^{-7} and HI = 0.05
- Construction Worker—ILRC = 2×10^{-7} and HI = 0.06
- Exposure to Lead—Lead in sediment is estimated at 67 mg/kg, which is below the residential (400 mg/kg) and industrial (1,414 mg/kg) screening levels. The representative concentration of lead in sediment is also less than the current industrial screening level for lead (800 mg/kg).

Study Pond

As presented in the RI report (Shaw, 2005), metals were identified as COPCs in the Study Pond sediment. The following ILCRs and noncancer HIs for the RME per receptor were presented:

- Adult Resident—ILRC = 2×10^{-6} and HI = 0.05
- Child Resident—ILRC = 2×10^{-6} and HI = 0.2
- Trespasser —ILRC = 2×10^{-7} and HI = 0.03
- TAMPEEL Caretaker—ILRC = 1×10^{-6} and HI = 0.04
- TAMPEEL Student—ILRC = 8×10^{-8} and HI = 0.03
- Construction Worker—ILRC = 6×10^{-8} and HI = 0.05
- Exposure to Lead—Lead in Study Pond sediment is estimated at 29 mg/kg, which is below the residential (400 mg/kg) and industrial (1,414 mg/kg) screening levels. The representative concentration of lead in sediment is also less than the current industrial screening level for lead (800 mg/kg).

Groundwater

As presented in the RI report (Shaw, 2005), only one VOC (methylene chloride) was detected in groundwater. The maximum detected concentration of methylene chloride exceeded its screening level (USEPA Region 9 tap water PRG based on an ILCR of 1×10^{-7} and an HI of 0.1) and was identified as a COPC. The following ILCRs were presented for methylene chloride in groundwater:

- Adult Resident—2×10^{-7}
- Child Resident—2×10^{-7}
- Construction Worker—4×10^{-10}

In 2007 and 2008, six VOCs were detected in groundwater: chloromethane; cis-1,2-DCE; toluene; TCE; vinyl chloride; and m&p-xylenes. The maximum detected concentration of one constituent, vinyl chloride, (0.16 µg/L) exceeded its current RSL (0.016 µg/L). Therefore, vinyl chloride would be identified as a COPC in groundwater.

To evaluate the recent detections of vinyl chloride, risk and hazard estimates were calculated using the same receptors, exposure pathways, exposure factors, and equations presented in the RI report (Shaw, 2005). The risk and hazard estimates for the original COPCs identified in the RI report were not updated. The groundwater exposure scenarios addressed in the RI report (Shaw, 2005) are ingestion and dermal contact with groundwater and inhalation of volatiles while showering. Groundwater ingestion rates of 1.3 to 2 L/day, exposure frequencies of 20 to 350 days per year, and inhalation rates of 11 to 15 were used, depending on the receptor. The most recent toxicity values available from USEPA's IRIS database (USEPA, 2011) were used for vinyl chloride: oral slope factors – 7.2×10^{-1} (mg/kg-day)$^{-1}$ (continuous lifetime exposure during adulthood) and 1.5 (mg/kg-day)$^{-1}$ (continuous lifetime exposure from birth); inhalation slope factor – 1.5×10^{-2} (mg/kg-day)$^{-1}$ (continuous lifetime exposure during adulthood) and 3.1×10^{-2} (mg/kg-day)$^{-1}$ (continuous lifetime exposure from birth); oral reference dose - 3×10^{-3} mg/kg-day; and inhalation reference dose – 2.9×10^{-2} mg/kg-day.

A summary of the vinyl chloride risk and hazard estimates for the receptors, as well as the 2005 estimates for the metals and methylene chloride, are presented in Tables 3-19 through 3-23. Detailed calculations are presented in Appendix E, providing toxicity values and intake estimates for each COPC. The cumulative ILCRs and noncancer HIs were updated by conservatively adding the risk for vinyl chloride for the groundwater receptors to the previous cumulative risk estimates, as follows:

- Adult Resident—ILRC = 1×10^{-6}
- Child Resident—ILRC = 2×10^{-6}
- Construction Worker—ILRC = 1×10^{-9}

Based on screening of the 2007 and 2008 data and risk calculations for vinyl chloride, the RI report (Shaw, 2005) conclusions regarding potential human health risks associated with groundwater (being within Ohio EPA's target risk range) are still valid.

The noncancer HIs for RME to groundwater exceeded the target of 1.0 for the adult resident and the child resident exposure scenarios. The primary risk drivers in groundwater were thallium and iron. However, the results driving the risk were only detected in one well, one time, in both cases (Shaw, 2005). The 2007 and 2008 thallium and iron data were lower than the data collected as part of the RI report (Shaw, 2005) and the inclusion of vinyl chloride in the hazard estimates do not change the conclusions of the HHRA.

3.3.2 Ecological Risk

As presented in the RI report (Shaw, 2005), seven metals (aluminum, barium, iron, lead, manganese, nickel, and zinc) were identified as exceeding some or all of the screening benchmarks. Therefore, aquatic populations within Aspen Creek were predicted to be at some potential risk from exposure to constituents in surface water. It was noted, however, that it was unknown if significant populations actually reside in Aspen Creek, as it is relatively

isolated from other surface water bodies. The RI report concluded that risks were generally acceptable for fish and wildlife potentially exposed to site surface water (Shaw, 2005).

In 2007 and 2008, additional samples were collected from Aspen Creek and the TAMPEEL Spring. The samples were analyzed for iron, thallium, and VOCs. The sample results were compared against ecological screening values for surface water. USEPA Region 5 ecological screening levels (ESLs) were used where available to compare against. For chemicals without Region 5 ESLs, supplemental screening values were used, including: USEPA Region 3 Biological Technical Assistance Group (BTAG) freshwater screening values, USEPA Region 4 surface water screening values, and National Oceanographic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (Buchmann, 2008).

Iron was the only detected constituent that exceeded the screening values. Iron also exceeded the National Ambient Water Quality Criterion of 1.0 mg/L for aquatic life (USEPA, 2002) in three of the samples. Six VOCs were detected in surface water samples collected from Aspen Creek in 2007 and 2008 (Table 3-7): acetone; chloromethane; cis-1,2-DCE; trans-1,2-DCE; TCE; and vinyl chloride. Nine VOCs were detected in surface water samples collected from TAMPEEL Spring in 2007 and 2008 (Table 3-8): 1,1-DCE; 1,4-dichlorobenzene; benzene; carbon disulfide; chlorobenzene; cis-1,2-DCE; trans-1,2-DCE; TCE; and vinyl chloride. None of the maximum detected concentrations of VOCs exceeded the screening values.

As noted in the RI report, the Aspen Creek is relatively isolated, with limited habitat particularly during low flow conditions. Therefore, based on screening of the 2007 and 2008 data, the RI report (Shaw, 2005) conclusions regarding potential ecological risks associated with Aspen Creek/TAMPEEL Spring surface water are still valid.

3.4 Site Conceptual Model

The FLOD previously used the TAMPEEL site for the disposal of miscellaneous waste debris in a naturally low area on the site. The majority of the debris was removed in 1970. The site currently is used as the TAMPEEL Nature Center and is leased to an individual for grazing horses and occasional group events. Remaining debris such as wire, tin cans, glass, nails, metal chains, scrap wood, and nails is encountered at or within the upper 3 feet of ground surface in unconsolidated material that consists predominately of silty-clay/clayey-silt. Soil boring logs indicate that the unconsolidated material consists of soft, moist to wet clayey soil from approximately 0.5 to 3 feet bgs. Beyond this depth, the clay generally is described as stiff and moist. Geophysical surveys and test trenching activities completed at the site have shown that the remaining debris is limited in extent and generally metallic in nature. Explosive gas monitoring indicates the waste at the site is not generating detectable concentrations of explosive gases.

Groundwater occurs under confined conditions in bedrock; the clayey soil overlying bedrock forms the confining layer. Potentiometric surface elevations measured during the quarterly sampling events ranged from approximately 2 to 7 feet bgs and 925 to 935 feet above msl, and potentiometric flow maps indicate that groundwater flows to the northeast at the TAMPEEL site. As discussed in Section 3.2.1, groundwater in the 3 AOCs area (upgradient of the TAMPEEL area) flows to the north and west toward Beaver Creek and some groundwater may discharge into Beaver Creek; however, it is unlikely that Beaver

Creek forms a significant hydraulic barrier to groundwater flow, and at least some groundwater flows beneath Beaver Creek toward TAMPEEL. Groundwater discharges to the ground surface from the TAMPEEL Spring, which is south of the Study Pond in the northern section of the TAMPEEL area. The Study Pond was excavated below the water table and is fed by groundwater.

Quarterly sampling of groundwater indicates that the only constituents that exceed the screening criteria are the total and dissolved iron concentrations, which exceed the aesthetic secondary MCL of 0.3 mg/L. The total iron concentrations in the RI groundwater samples ranged from 2.9 to 7.7 mg/L, while the total iron concentrations in the RI addendum samples ranged from 0.22 to 16 mg/L. For comparison, the RI (Shaw, 2005) reported background iron concentrations to be 3.2 mg/L.

Surface water features in the vicinity of the TAMPEEL area consist of Aspen Creek, Beaver Creek, the Study Pond, and TAMPEEL Spring. Surface waters present at the TAMPEEL site generally flow to the northeast and feed Duck Creek with eventual discharge into the Mahoning River. Quarterly sampling of Aspen Creek and TAMPEEL Spring indicates that the only constituent that exceeds any relevant screening criteria is vinyl chloride (TAMPEEL Spring), which slightly exceeds the MCL; and total and dissolved iron concentrations, which exceed the aesthetic secondary MCL.

There are several potential sources of the low-level VOC detections reported in groundwater and surface water, including past disposal activities during and subsequent to FLOD operations. The HHRA and ERA completed for the site (Shaw, 2005) indicate there are no unacceptable risks present at the site associated with any environmental media (soil, sediment, surface water, and groundwater). The cancer risks for the RME to soil exceed the target risk level of $1x10^{-5}$ for the adult resident and child resident. The greatest contributor of these risks is arsenic. However, the representative arsenic concentration calculated in the risk assessment was actually below the calculated background concentration of 24 µg/kg (Shaw, 2005). This background level is not unexpected in Ohio. According to the Ohio Department of Natural Resources study, arsenic is a common element in Ohio and background values exceeding 20 mg/kg are not uncommon (Venteris 2010).

SECTION 4

Conclusions

Based on the findings of the RI, SRI, and additional investigation activities completed at the TAMPEEL site, CH2M HILL concludes the following:

- The interview with Mr. Bell and the additional geophysical survey have provided an improved characterization of debris disposal at the TAMPEEL site. Overall, the area of anomalies noted during the 2007 geophysical survey is smaller than originally reported in the TAMPEEL RI report (Shaw, 2005), and it is likely that the majority of the elevated geophysical responses are a result of slag placement associated with the access road and open area of the TAMPEEL site to support vehicle access. Additionally, the test trenching activities identified areas of buried metallic debris in the area on the eastern side of the TAMPEEL compound extending into the woods, and an area of shallow metallic debris located in the woods adjacent to Aspen Creek. These findings were consistent with the findings of the 2007 geophysical survey and the interview with Mr. Bell.
- Test trenching observed debris such as wire, tin cans, glass, nails, metal chains, slag, and scrap wood with no indications of chemical containers or source of VOCs.
- Quarterly landfill gas monitoring indicates that landfill gas is not being generated at the site and supports Mr. Bell's recollections that the area was not used for large-scale waste disposal, but rather for the surface disposal of refuse. The majority of that waste was removed during a cleanup conducted voluntarily on the first Earth Day in 1970. Furthermore, any remaining debris is covered and consists of metallic debris that is not producing landfill explosive gas.
- Five groundwater monitoring wells were installed at TAMPEEL to assess potential impacts of the former disposal activities at the site. There were no exceedances noted for VOCs during any of the sampling events. There were no detectable concentrations of total or dissolved thallium during the monitoring events. The only metal that exceeded the aesthetic secondary standard in groundwater wells was iron.
- Low-level detections of VOCs were reported in the TAMPEEL Spring and the Aspen Creek samples north of the former disposal area, upgradient and crossgradient of MW114. There are several potential sources of the low-level VOC detections reported in groundwater and surface water including past disposal activities during and subsequent to depot operations
- The human health risk assessment and ecological risk assessment completed for the site (Shaw, 2005) indicate there are no unacceptable risks present at the site associated with any environmental media (soil, sediment, surface water, and groundwater).
  - Although, the cancer risks for the RME to soil exceed the Ohio EPA target risk level of 1×10^{-5} for the adult resident and child resident, the greatest contributor of these risks are from arsenic. However, the representative concentration calculated in the risk assessment was actually below the calculated background concentration (Shaw, 2005).

  - Although the noncancer hazards for the RME to soil exceeded the HI limit of 1.0 for the child resident exposure scenario, and the noncancer HIs for the RME to groundwater exceeded the limit of 1.0 for the adult resident and the child resident exposure scenarios, the representative concentrations calculated in the risk assessment were below the calculated background concentrations. The greatest contributions to the HI for soil were from iron and manganese; the exposure point concentrations were below the recommended daily allowance for these constituents. The primary risk drivers in the HI for groundwater were thallium and iron. However, the results driving the risk were only detected in one well, one time, in both cases.

- The human health risk assessment submitted in the RI report did not identify any unacceptable risks for the intended land use, that is, TAMPEEL caretaker and TAMPEEL student activities. The risk assessment considered exposure to soil, sediment, and surface water, but did not consider caretaker or student exposure to groundwater; as such, exposure would be unlikely.
- The ERA submitted in the RI report (Shaw, 2005), identified seven metals (aluminum, barium, iron, lead, manganese, nickel, and zinc) as exceeding some or all of the screening benchmarks. Therefore, aquatic populations within Aspen Creek were predicted to be at some potential risk from exposure to constituents in surface water. It was noted; however, that it was unknown if significant populations actually reside in Aspen Creek, as it is relatively isolated from other surface water bodies. The RI report concluded that risks were generally acceptable for fish and wildlife potentially exposed to site surface water (Shaw, 2005).
- The 2007 and 2008 surface water and groundwater data confirm the RI findings and do not change the conclusions of the RI report HHRA (Shaw, 2005):
  - In 2007 and 2008, two metals (iron and thallium) were analyzed in surface water from Aspen Creek and the TAMPEEL Spring; however, only iron was detected in the samples. Based on the HIs for iron, the cumulative HI for each receptor would not exceed Ohio EPA's target HI of 1.
  - In 2007 and 2008, six VOCs were detected in surface water samples collected from Aspen Creek; however, of the VOCs detected, only the maximum detected concentration of vinyl chloride exceeded its current screening level. Based on screening of the 2007 and 2008 data and risk calculations for vinyl chloride, the RI report (Shaw, 2005) conclusions regarding potential human health risks associated with Aspen Creek/TAMPEEL Spring surface water are within Ohio EPA's target risk range and HI.
  - In 2007 and 2008, two metals (iron and thallium) were analyzed in groundwater; however, only iron was detected in the samples. Based on the HIs for iron and thallium, the cumulative HI for residents exceeds Ohio EPA's target HI of 1. The 2007 and 2008 iron concentrations were lower than the data collected as part of the RI report (Shaw, 2005).
  - In 2007 and 2008, six VOCs were detected in groundwater; however, of the VOCs detected, only vinyl chloride exceeded its current screening level. Based on

screening of the 2007 and 2008 data and risk calculations for vinyl chloride, the RI report (Shaw, 2005) conclusions regarding potential human health risks associated with groundwater are within Ohio EPA's target risk range.

- The 2007 and 2008 surface water data confirm the RI findings and do not change the conclusions of the RI report (Shaw, 2005) ERA. The 2007 and 2008 surface water samples were analyzed for iron, thallium, and VOCs. Iron was the only detected constituent that exceeded the current screening values. However, as noted in the RI report, the Aspen Creek is relatively isolated, with limited habitat particularly during low flow conditions (Shaw, 2005).

Based on the findings of the RI report and this RI addendum report, there are no unacceptable risks to human or ecological receptors associated with the former disposal activities on the TAMPEEL property. Therefore, USACE proposes to proceed to prepare a Proposed Plan recommending no further action with respect to the former disposal area.

The source(s) of the low level VOCs detected in the TAMPEEL Spring and surface water is unknown. The 3 AOCs, on the adjoining the OCC, cannot be entirely excluded as a source at this time. Therefore, VOCs in the TAMPEEL Spring and Aspen Creek surface water at TAMPEEL will continue to be monitored as part of the groundwater and surface water monitoring program associated with the 3 AOCs at the OCC

SECTION 5

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Tables

TABLE 3-1
Summary of Quarterly Groundwater Elevations
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

Monitoring Well ID	Static Water Level Measurements (Depth to Water; feet)				Groundwater Elevations (feet above MSL)[1]			
	Dec07 (1Q Event)	Mar08 (2Q Event)	Jun08 (3Q Event)	Sep08 (4Q Event)	Dec07 (1Q Event)	Mar08 (2Q Event)	Jun08 (3Q Event)	Sep08 (4Q Event)
MW101	3.09	3.25	4.62	4.53	943.32	943.16	941.79	941.88
MW102	3.05	3.25	4.50	4.52	943.23	943.03	941.78	941.76
MW103	2.81	3.01	4.27	4.24	943.88	943.68	942.42	942.45
MW104	4.91	4.43	6.36	6.59	941.30	941.78	939.85	939.62
MW105	5.18	4.68	6.30	6.90	940.87	941.37	939.75	939.15
MW106	5.20	5.10	6.82	6.82	941.87	941.97	940.25	940.25
MW107	3.53	3.82	4.19	6.25	939.94	939.65	939.28	937.22
MW108	4.01	4.02	6.02	6.39	941.80	941.79	939.79	939.42
MW109	4.05	4.93	6.58	6.77	942.17	941.29	939.64	939.45
MW110	3.41	3.46	5.06	4.87	944.68	944.63	943.03	943.22
MW111[2]	2.69	2.80	4.08	4.09	943.18	943.07	941.79	941.78
MW112	3.23	3.13	4.04	4.15	934.77	934.87	933.96	933.85
MW113	2.31	1.97	2.64	2.73	931.56	931.90	931.23	931.14
MW114	6.60	4.50	5.92	5.98	927.53	929.63	928.21	928.15
MW115	2.41	2.19	3.49	3.78	926.23	926.45	925.15	924.86
MW116	3.46	3.03	4.70	4.91	929.04	929.47	927.80	927.59
MW117	4.66	4.53	7.35	8.17	942.09	942.22	939.40	938.58
MW118	3.53	3.54	4.94	4.95	942.90	942.89	941.49	941.48
MW119	3.65	3.51	5.45	5.33	941.72	941.86	939.92	940.04
MW120	2.74	3.00	4.75	3.93	940.86	940.60	938.85	939.67
MW121[2]	4.17	4.22	5.63	5.61	941.51	941.46	940.05	940.07
MW122	4.35	4.52	5.92	5.90	940.06	939.89	938.49	938.51
MW123	3.95	4.12	5.59	5.56	941.61	941.44	939.97	940.00
MW124	4.60	4.59	6.62	5.90	940.23	940.24	938.21	938.93
MW125	3.46	2.76	3.91	3.18	935.80	936.50	935.35	936.08
MW128	1.91	2.10	3.28	3.32	940.19	940.00	938.82	938.78
MW129[2]	2.30	2.07	3.22	3.37	939.85	940.08	938.93	938.78

[1] Full measurement data used to determine groundwater elevation is provided in the Quarterly Data Summary Reports
[2] Denotes well screened at "deeper" interval, approximately 30 feet to 40 feet below ground surface
Water level measurements from TAMPEEL and the 3 AOCs site were used to prepare comprehensive groundwater potentiometric surface maps
MSL = mean sea level

TABLE 3-2
Quarterly Groundwater Results MW112
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

Analyte	CAS registry number	Screening Level	Sample ID Sample Date Screening Level Source**	MW112-121207 12/12/2007 Quarter 1		MW112-031708 3/17/2008 Quarter 2		MW112-061708 6/17/2008 Quarter 3		MW112-091608 9/16/2008 Quarter 4	
VOCs (all results reported in ug/L)											
1,1,1-Trichloroethane	71-55-6	200	USEPA, MCL	0.05	U	0.2	U	0.2	U	0.2	UJ
1,1,2,2-Tetrachloroethane	79-34-5	0.067	USEPA Region 9, Tap Water	0.019	U	0.2	U	0.2	U	0.2	R
1,1,2-Trichloroethane	79-00-5	5	USEPA, MCL	0.06	U	0.2	U	0.2	U	0.2	UJ
1,1-Dichloroethane	75-34-3	2.4	USEPA Region 9, Tap Water	0.06	U	0.2	U	0.2	U	0.2	UJ
1,1-Dichloroethene	75-35-4	7	USEPA, MCL	0.05	U	0.2	U	0.2	U	0.2	UJ
1,2,3-Trichlorobenzene	87-61-6			0.07	U	0.22	U	0.22	U	0.22	UJ
1,2,4-Trichlorobenzene	120-82-1	70	USEPA, MCL	0.06	U	0.2	U	0.2	U	0.2	UJ
1,2-Dibromo-3-chloropropane	96-12-8	0.2	USEPA, MCL	0.05	U	0.2	UJ	0.2	U	0.2	UJ
1,2-Dibromoethane (EDB)	106-93-4	0.05	USEPA, MCL	0.05	U	0.2	U	0.2	U	0.2	UJ
1,2-Dichlorobenzene	95-50-1	600	USEPA, MCL	0.05	U	0.2	U	0.2	U	0.2	UJ
1,2-Dichloroethane	107-06-2	5	USEPA, MCL	0.03	U	0.2	U	0.2	U	0.2	UJ
1,2-Dichloropropane	78-87-5	5	USEPA, MCL	0.05	U	0.2	U	0.2	U	0.2	UJ
1,3-Dichlorobenzene	541-73-1			0.027	U	0.2	U	0.2	U	0.2	UJ
1,4-Dichlorobenzene	106-46-7	75	USEPA, MCL	0.04	U	0.2	U	0.2	U	0.2	UJ
2-Butanone (MEK)	78-93-3	7100	USEPA Region 9, Tap Water	0.6	U	2	U	2	U	2	UJ
2-Hexanone	591-78-6			1.6	U	5.2	U	5.2	UJ	5.2	UJ
4-Methyl-2-pentanone (MIBK)	108-10-1	2000	USEPA Region 9, Tap Water	0.8	U	2.8	U	2.8	U	2.8	UJ
Acetone	67-64-1	22000	USEPA Region 9, Tap Water	2.3	U	5.2	R	5.2	U	5.2	R
Benzene	71-43-2	5	USEPA, MCL	0.05	U	0.2	U	0.2	U	0.2	UJ
Bromochloromethane	74-97-5			0.028	U	0.2	U	0.2	U	0.2	UJ
Bromodichloromethane	75-27-4	1.1	USEPA Region 9, Tap Water	0.03	U	0.2	U	0.2	U	0.2	UJ
Bromoform	75-25-2	8.5	USEPA Region 9, Tap Water	0.04	UJ	0.2	U	0.2	U	0.2	UJ
Bromomethane	74-83-9	8.7	USEPA Region 9, Tap Water	0.07	U	0.25	U	0.25	U	0.25	UJ
Carbon disulfide	75-15-0	1000	USEPA Region 9, Tap Water	0.09	U	0.4	U	0.4	U	0.4	UJ
Carbon tetrachloride	56-23-5	5	USEPA, MCL	0.022	U	0.2	U	0.2	U	0.2	UJ
Chlorobenzene	108-90-7	100	USEPA, MCL	0.04	U	0.2	U	0.2	U	0.2	UJ
Chloroethane	75-00-3	21000	USEPA Region 9, Tap Water	0.07	U	0.23	U	0.23	U	0.23	UJ
Chloroform	67-66-3	0.19	USEPA Region 9, Tap Water	0.022	U	0.2	U	0.2	U	0.2	UJ
Chloromethane	74-87-3	1.8	USEPA Region 9, Tap Water	0.05	U	0.2	U	0.2	U	0.2	R
cis-1,2-Dichloroethene	156-59-2	70	USEPA, MCL	0.05	U	**0.12**	**J**	**0.077**	**J**	**0.13**	**J**
cis-1,3-Dichloropropene	10061-01-5			0.017	U	0.2	U	0.2	U	0.2	UJ
Dibromochloromethane	124-48-1	0.8	USEPA Region 9, Tap Water	0.026	UJ	0.2	U	0.2	U	0.2	UJ
Dichlorodifluoromethane	75-71-8	390	USEPA Region 9, Tap Water	0.03	U	0.2	U	0.2	U	0.2	UJ
Ethylbenzene	100-41-4	700	USEPA, MCL	0.024	UJ	0.2	U	0.2	U	0.2	UJ
Isopropylbenzene	98-82-8	680	USEPA Region 9, Tap Water	0.04	UJ	0.2	U	0.2	U	0.2	UJ
m&p-Xylenes	136777-61-2			0.08	UJ	0.4	U	0.4	U	0.4	UJ
Methyl tert-butyl ether (MTBE)	1634-04-4	12	USEPA Region 9, Tap Water	0.08	U	0.26	U	0.26	U	0.26	UJ
Methylene chloride	75-09-2	5	USEPA, MCL	0.18	U	0.59	R	0.59	R	0.59	R
o-Xylene	95-47-6	1400	USEPA Region 9, Tap Water	0.023	UJ	0.2	U	0.2	U	0.2	UJ
Styrene	100-42-5	100	USEPA, MCL	0.022	R	0.2	U	0.2	UJ	0.2	UJ
Tetrachloroethene	127-18-4	5	USEPA, MCL	0.05	U	0.2	U	0.2	U	0.2	UJ
Toluene	108-88-3	1000	USEPA, MCL	0.06	UJ	0.2	U	0.2	U	0.2	UJ
trans-1,2-Dichloroethene	156-60-5	100	USEPA, MCL	0.06	U	0.21	U	0.21	U	0.21	UJ

TABLE 3-2
Quarterly Groundwater Results MW112
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

Analyte	CAS registry number	Screening Level	Sample ID Sample Date Screening Level Source**	MW112-121207 12/12/2007 Quarter 1		MW112-031708 3/17/2008 Quarter 2		MW112-061708 6/17/2008 Quarter 3		MW112-091608 9/16/2008 Quarter 4	
trans-1,3-Dichloropropene	10061-02-6			0.017	U	0.2	U	0.2	U	0.2	UJ
Trichloroethene	79-01-6	5	USEPA, MCL	0.05	U	**0.085**	**J**	0.2	U	0.2	UJ
Trichlorofluoromethane	75-69-4	1300	USEPA Region 9, Tap Water	0.06	U	0.2	U	0.2	U	0.2	UJ
Vinyl chloride	75-01-4	2	USEPA, MCL	0.013	U	0.2	U	**0.076**	**J**	**0.1**	**J**
Dissolved Metals (all results reported in mg/L)											
Iron	7439-89-6	0.3	USEPA, Secondary Standard	**7.7**	**J**	**7.4**		**8.3**		**8.6**	**J**
Thallium	7440-28-0	0.002	USEPA, MCL	0.0005	U	**0.0016**	**U**	**0.0013**	**U**	**0.0013**	**U**
Metals (all results reported in mg/L)											
Iron	7439-89-6	0.3	USEPA, Secondary Standard	**16**	**J**	**9.6**		**8.6**		**9.4**	**J**
Thallium	7440-28-0	0.002	USEPA, MCL	0.0005	U	0.0016	U	0.0013	U	0.0013	U
Miscellaneous (all results reported in mg/L)											
Chloride***	16887-00-6	250	USEPA, Secondary Standard	**7.5**		**9.1**		**11**	**J**	**12**	

Notes:
ug/L=micrograms per liter
J=estimated concentration
U = Result non detected
UJ = Non detected estimated value
NS=Not sampled
R = Rejected result
Bold=detected concentration
Bold & Shaded = detected result exceeds screening level
*Samples where duplicates were taken have only the higher of the two results displayed.
**The maximum contaminant level (MCL) was used or the U.S. Environmental Protection Agency (USEPA) Region 9 tap water preliminary remediation goal (PRG) was used if an MCL was not established
***Chloride was analyzed at the TAMPEEL monitoring wells, as requested by Ohio EPA, to assess potential impacts from nearby natural gas well drill cuttings.

TABLE 3-3
Quarterly Groundwater Results MW113
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

Analyte	CAS registry number	Screening Level	Screening Level Source**	MW113-121207 12/12/2007 Quarter 1		MW113-031808 3/18/2008 Quarter 2		MW113-061708 6/17/2008 Quarter 3		MW113-091608 9/16/2008 Quarter 4	
VOCs (all results reported in ug/L)											
1,1,1-Trichloroethane	71-55-6	200	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
1,1,2,2-Tetrachloroethane	79-34-5	0.067	USEPA Region 9, Tap Water	0.019	UJ	0.2	U	0.2	U	0.2	R
1,1,2-Trichloroethane	79-00-5	5	USEPA, MCL	0.06	UJ	0.2	U	0.2	U	0.2	U
1,1-Dichloroethane	75-34-3	2.4	USEPA Region 9, Tap Water	0.06	UJ	0.2	U	0.2	U	0.2	U
1,1-Dichloroethene	75-35-4	7	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
1,2,3-Trichlorobenzene	87-61-6			0.07	UJ	0.22	U	0.22	U	0.22	U
1,2,4-Trichlorobenzene	120-82-1	70	USEPA, MCL	0.06	UJ	0.2	U	0.2	U	0.2	U
1,2-Dibromo-3-chloropropane	96-12-8	0.2	USEPA, MCL	0.05	UJ	0.2	UJ	0.2	U	0.2	UJ
1,2-Dibromoethane (EDB)	106-93-4	0.05	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
1,2-Dichlorobenzene	95-50-1	600	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
1,2-Dichloroethane	107-06-2	5	USEPA, MCL	0.03	UJ	0.2	U	0.2	U	0.2	U
1,2-Dichloropropane	78-87-5	5	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
1,3-Dichlorobenzene	541-73-1			0.027	UJ	0.2	U	0.2	U	0.2	U
1,4-Dichlorobenzene	106-46-7	75	USEPA, MCL	0.04	UJ	0.2	U	0.2	U	0.2	U
2-Butanone (MEK)	78-93-3	7100	USEPA Region 9, Tap Water	0.6	UJ	2	U	2	U	2	U
2-Hexanone	591-78-6			1.6	UJ	5.2	U	5.2	UJ	5.2	U
4-Methyl-2-pentanone (MIBK)	108-10-1	2000	USEPA Region 9, Tap Water	0.8	UJ	2.8	U	2.8	U	2.8	U
Acetone	67-64-1	22000	USEPA Region 9, Tap Water	1.5	UJ	5.2	R	5.2	U	5.2	R
Benzene	71-43-2	5	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
Bromochloromethane	74-97-5			0.028	UJ	0.2	U	0.2	U	0.2	U
Bromodichloromethane	75-27-4	1.1	USEPA Region 9, Tap Water	0.03	UJ	0.2	U	0.2	U	0.2	U
Bromoform	75-25-2	8.5	USEPA Region 9, Tap Water	0.04	UJ	0.2	U	0.2	U	0.2	U
Bromomethane	74-83-9	8.7	USEPA Region 9, Tap Water	0.07	UJ	0.25	U	0.25	U	0.25	UJ
Carbon disulfide	75-15-0	1000	USEPA Region 9, Tap Water	0.09	UJ	0.4	U	0.4	U	0.4	U
Carbon tetrachloride	56-23-5	5	USEPA, MCL	0.022	UJ	0.2	U	0.2	U	0.2	U
Chlorobenzene	108-90-7	100	USEPA, MCL	0.04	UJ	0.2	U	0.2	U	0.2	U
Chloroethane	75-00-3	21000	USEPA Region 9, Tap Water	0.07	UJ	0.23	U	0.23	U	0.23	U
Chloroform	67-66-3	0.19	USEPA Region 9, Tap Water	0.022	UJ	0.2	U	0.2	U	0.2	U
Chloromethane	74-87-3	1.8	USEPA Region 9, Tap Water	**0.2**	**J**	0.2	U	**0.068**	**J**	0.2	R
cis-1,2-Dichloroethene	156-59-2	70	USEPA, MCL	**0.16**	**J**	**0.12**	**J**	**0.14**	**J**	**0.15**	**J**
cis-1,3-Dichloropropene	10061-01-5			0.017	UJ	0.2	U	0.2	U	0.2	U
Dibromochloromethane	124-48-1	0.8	USEPA Region 9, Tap Water	0.026	UJ	0.2	U	0.2	U	0.2	U
Dichlorodifluoromethane	75-71-8	390	USEPA Region 9, Tap Water	0.03	UJ	0.2	U	0.2	U	0.2	U
Ethylbenzene	100-41-4	700	USEPA, MCL	0.024	UJ	0.2	UJ	0.2	U	0.2	U
Isopropylbenzene	98-82-8	680	USEPA Region 9, Tap Water	0.04	UJ	0.2	UJ	0.2	U	0.2	U
m&p-Xylenes	136777-61-2			0.08	UJ	0.4	UJ	0.4	U	**0.18**	**J**
Methyl tert-butyl ether (MTBE)	1634-04-4	12	USEPA Region 9, Tap Water	0.08	UJ	0.26	U	0.26	U	0.26	U
Methylene chloride	75-09-2	5	USEPA, MCL	0.18	UJ	0.59	R	0.59	R	0.59	R
o-Xylene	95-47-6	1400	USEPA Region 9, Tap Water	0.023	UJ	0.2	UJ	0.2	U	0.2	U
Styrene	100-42-5	100	USEPA, MCL	0.022	UJ	0.2	R	0.2	U	0.2	U
Tetrachloroethene	127-18-4	5	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
Toluene	108-88-3	1000	USEPA, MCL	0.06	UJ	0.2	UJ	0.2	U	0.2	U
trans-1,2-Dichloroethene	156-60-5	100	USEPA, MCL	0.06	UJ	0.18	U	0.21	U	0.21	U

TABLE 3-3
Quarterly Groundwater Results MW113
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

Analyte	CAS registry number	Screening Level	Screening Level Source**	Sample ID Sample Date Quarter 1		Quarter 2		Quarter 3		Quarter 4	
				MW113-121207 12/12/2007		MW113-031808 3/18/2008		MW113-061708 6/17/2008		MW113-091608 9/16/2008	
trans-1,3-Dichloropropene	10061-02-6			0.017	UJ	0.21	U	0.2	U	0.2	U
Trichloroethene	79-01-6	5	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
Trichlorofluoromethane	75-69-4	1300	USEPA Region 9, Tap Water	0.06	UJ	0.2	U	0.2	U	0.2	U
Vinyl chloride	75-01-4	2	USEPA, MCL	**0.16**	**J**	**0.16**		**0.16**	**J**	**0.15**	**J**
Dissolved Metals (all results reported in mg/L)											
Iron	7439-89-6	0.3	USEPA, Secondary Standard	**7.0**		**6.5**		**5.8**		**5.5**	**J**
Thallium	7440-28-0	0.002	USEPA, MCL	0.0005	U	0.0016	U	0.0013	U	0.0013	U
Metals (all results reported in mg/L)											
Iron	7439-89-6	0.3	USEPA, Secondary Standard	**9.8**		**9.4**		**6.5**		**6.2**	**J**
Thallium	7440-28-0	0.002	USEPA, MCL	0.0005	U	0.0016	U	0.0013	U	0.0013	U
Miscellaneous (all results reported in mg/L)											
Chloride***	16887-00-6	250	USEPA, Secondary Standard	**8.7**		**8**		**8.2**		**7.3**	**J**

Notes:
ug/L=micrograms per liter
J=estimated concentration
U = Result non detected
UJ = Non detected estimated value
NS=Not sampled
R = Rejected result
Bold=detected concentration
Bold & Shaded = detected result exceeds screening level
*Samples where duplicates were taken have only the higher of the two results displayed.
**The maximum contaminant level (MCL) was used or the U.S. Environmental Protection Agency (USEPA) Region 9 tap water preliminary remediation goal (PRG) was used if an MCL was not established
***Chloride was analyzed at the TAMPEEL monitoring wells, as requested by Ohio EPA, to assess potential impacts from nearby natural gas well drill cuttings.

TABLE 3-4
Quarterly Groundwater Results MW114
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

Analyte	CAS registry number	Screening Level	Sample ID Sample Date Screening Level Source**	MW114-121307 12/13/2007 Quarter 1		MW114-031808 3/18/2008 Quarter 2		MW114-061708 6/17/2008 Quarter 3		MW114-091608 9/16/2008 Quarter 4	
VOCs (all results reported in ug/L)											
1,1,1-Trichloroethane	71-55-6	200	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	UJ
1,1,2,2-Tetrachloroethane	79-34-5	0.067	USEPA Region 9, Tap Water	0.019	UJ	0.2	U	0.2	U	0.2	R
1,1,2-Trichloroethane	79-00-5	5	USEPA, MCL	0.06	UJ	0.2	U	0.2	U	0.2	UJ
1,1-Dichloroethane	75-34-3	2.4	USEPA Region 9, Tap Water	0.06	UJ	0.2	U	0.2	U	0.2	UJ
1,1-Dichloroethene	75-35-4	7	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	UJ
1,2,3-Trichlorobenzene	87-61-6			0.07	UJ	0.22	U	0.22	U	0.22	UJ
1,2,4-Trichlorobenzene	120-82-1	70	USEPA, MCL	0.06	UJ	0.2	U	0.2	U	0.2	UJ
1,2-Dibromo-3-chloropropane	96-12-8	0.2	USEPA, MCL	0.05	UJ	0.2	UJ	0.2	U	0.2	UJ
1,2-Dibromoethane (EDB)	106-93-4	0.05	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	UJ
1,2-Dichlorobenzene	95-50-1	600	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	UJ
1,2-Dichloroethane	107-06-2	5	USEPA, MCL	0.03	UJ	0.2	U	0.2	U	0.2	UJ
1,2-Dichloropropane	78-87-5	5	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	UJ
1,3-Dichlorobenzene	541-73-1			0.027	UJ	0.2	U	0.2	U	0.2	UJ
1,4-Dichlorobenzene	106-46-7	75	USEPA, MCL	0.04	UJ	0.2	U	0.2	U	0.2	UJ
2-Butanone (MEK)	78-93-3	7100	USEPA Region 9, Tap Water	0.6	UJ	2	U	2	U	2	UJ
2-Hexanone	591-78-6			1.6	UJ	5.2	U	5.2	UJ	5.2	UJ
4-Methyl-2-pentanone (MIBK)	108-10-1	2000	USEPA Region 9, Tap Water	0.8	UJ	2.8	U	2.8	U	2.8	UJ
Acetone	67-64-1	22000	USEPA Region 9, Tap Water	1.5	UJ	5.2	R	5.2	U	5.2	R
Benzene	71-43-2	5	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	UJ
Bromochloromethane	74-97-5			0.028	UJ	0.2	U	0.2	U	0.2	UJ
Bromodichloromethane	75-27-4	1.1	USEPA Region 9, Tap Water	0.03	UJ	0.2	U	0.2	U	0.2	UJ
Bromoform	75-25-2	8.5	USEPA Region 9, Tap Water	0.04	UJ	0.2	U	0.2	U	0.2	UJ
Bromomethane	74-83-9	8.7	USEPA Region 9, Tap Water	0.07	UJ	0.25	U	0.25	U	0.25	UJ
Carbon disulfide	75-15-0	1000	USEPA Region 9, Tap Water	0.09	UJ	0.4	U	0.4	U	0.4	UJ
Carbon tetrachloride	56-23-5	5	USEPA, MCL	0.022	UJ	0.2	U	0.2	U	0.2	UJ
Chlorobenzene	108-90-7	100	USEPA, MCL	0.04	UJ	0.2	U	0.2	U	0.2	UJ
Chloroethane	75-00-3	21000	USEPA Region 9, Tap Water	0.07	UJ	0.23	U	0.23	U	0.23	UJ
Chloroform	67-66-3	0.19	USEPA Region 9, Tap Water	0.022	UJ	0.2	U	0.2	U	0.2	UJ
Chloromethane	74-87-3	1.8	USEPA Region 9, Tap Water	0.093	U	0.2	U	**0.05**	**J**	1.4	U
cis-1,2-Dichloroethene	156-59-2	70	USEPA, MCL	**0.16**	**J**	**0.09**	**J**	**0.069**	**J**	**0.15**	**J**
cis-1,3-Dichloropropene	10061-01-5			0.017	UJ	0.2	U	0.2	U	0.2	UJ
Dibromochloromethane	124-48-1	0.8	USEPA Region 9, Tap Water	0.026	UJ	0.2	U	0.2	U	0.2	UJ
Dichlorodifluoromethane	75-71-8	390	USEPA Region 9, Tap Water	0.03	UJ	0.2	U	0.2	U	0.2	UJ
Ethylbenzene	100-41-4	700	USEPA, MCL	0.024	UJ	0.2	U	0.2	U	0.2	UJ
Isopropylbenzene	98-82-8	680	USEPA Region 9, Tap Water	0.04	UJ	0.2	U	0.2	U	0.2	UJ
m&p-Xylenes	136777-61-2			0.08	UJ	0.4	U	0.4	U	0.4	UJ
Methyl tert-butyl ether (MTBE)	1634-04-4	12	USEPA Region 9, Tap Water	0.08	UJ	0.26	U	0.26	U	0.26	UJ
Methylene chloride	75-09-2	5	USEPA, MCL	0.18	UJ	0.59	R	0.59	R	0.59	R
o-Xylene	95-47-6	1400	USEPA Region 9, Tap Water	0.06	U	0.2	U	0.2	U	0.2	UJ
Styrene	100-42-5	100	USEPA, MCL	0.022	UJ	0.2	U	0.2	U	0.2	UJ
Tetrachloroethene	127-18-4	5	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	UJ
Toluene	108-88-3	1000	USEPA, MCL	**0.15**	**J**	0.2	U	0.2	U	0.2	UJ
trans-1,2-Dichloroethene	156-60-5	100	USEPA, MCL	0.06	UJ	0.21	U	0.21	U	0.21	UJ

TABLE 3-4
Quarterly Groundwater Results MW114
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

Analyte	CAS registry number	Screening Level	Sample ID Sample Date Screening Level Source**	MW114-121307 12/13/2007 Quarter 1		MW114-031808 3/18/2008 Quarter 2		MW114-061708 6/17/2008 Quarter 3		MW114-091608 9/16/2008 Quarter 4	
trans-1,3-Dichloropropene	10061-02-6			0.017	UJ	0.2	U	0.2	U	0.2	UJ
Trichloroethene	79-01-6	5	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	UJ
Trichlorofluoromethane	75-69-4	1300	USEPA Region 9, Tap Water	0.06	UJ	0.2	U	0.2	U	0.2	UJ
Vinyl chloride	75-01-4	2	USEPA, MCL	0.013	UJ	0.2	U	**0.035**	**J**	**0.074**	**J**
Dissolved Metals (all results reported in mg/L)											
Iron	7439-89-6	0.3	USEPA, Secondary Standard	**6.5**		**2.2**		**2.2**		**3**	**J**
Thallium	7440-28-0	0.002	USEPA, MCL	0.0005	U	0.0016	U	0.0013	U	0.0013	U
Metals (all results reported in mg/L)											
Iron	7439-89-6	0.3	USEPA, Secondary Standard	**15**		**6**		**10**		**4.6**	**J**
Thallium	7440-28-0	0.002	USEPA, MCL	0.0005	U	0.0016	U	0.0013	U	0.0013	U
Miscellaneous (all results reported in mg/L)											
Chloride***	16887-00-6	250	USEPA, Secondary Standard	**10**		**10**		**8**		**8.8**	

Notes:
ug/L=micrograms per liter
J=estimated concentration
U = Result non detected
UJ = Non detected estimated value
NS=Not sampled
R = Rejected result
Bold=detected concentration
Bold & Shaded = detected result exceeds screening level
*Samples where duplicates were taken have only the higher of the two results displayed.
**The maximum contaminant level (MCL) was used or the U.S. Environmental Protection Agency (USEPA) Region 9 tap water preliminary remediation goal (PRG) was used if an MCL was not established
***Chloride was analyzed at the TAMPEEL monitoring wells, as requested by Ohio EPA, to assess potential impacts from nearby natural gas well drill cuttings.

TABLE 3-5
Quarterly Groundwater Results MW115
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

Analyte	CAS registry number	Screening Level	Sample ID Sample Date Screening Level Source***	MW115** 12/11/2007 Quarter 1	MW115-031708 3/17/2008 Quarter 2		MW115-061608 6/16/2008 Quarter 3		MW115-091508 9/15/2008 Quarter 4	
VOCs (all results reported in ug/L)										
1,1,1-Trichloroethane	71-55-6	200	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,1,2,2-Tetrachloroethane	79-34-5	0.067	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	R
1,1,2-Trichloroethane	79-00-5	5	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,1-Dichloroethane	75-34-3	2.4	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
1,1-Dichloroethene	75-35-4	7	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,2,3-Trichlorobenzene	87-61-6			NS	0.22	U	0.22	U	0.22	U
1,2,4-Trichlorobenzene	120-82-1	70	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,2-Dibromo-3-chloropropane	96-12-8	0.2	USEPA, MCL	NS	0.2	UJ	0.2	U	0.2	UJ
1,2-Dibromoethane (EDB)	106-93-4	0.05	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,2-Dichlorobenzene	95-50-1	600	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,2-Dichloroethane	107-06-2	5	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,2-Dichloropropane	78-87-5	5	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,3-Dichlorobenzene	541-73-1			NS	0.2	U	0.2	U	0.2	U
1,4-Dichlorobenzene	106-46-7	75	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
2-Butanone (MEK)	78-93-3	7100	USEPA Region 9, Tap Water	NS	2	U	2	U	2	U
2-Hexanone	591-78-6			NS	5.2	U	5.2	UJ	5.2	U
4-Methyl-2-pentanone (MIBK)	108-10-1	2000	USEPA Region 9, Tap Water	NS	2.8	U	2.8	U	2.8	U
Acetone	67-64-1	22000	USEPA Region 9, Tap Water	NS	5.2	R	5.2	U	5.2	R
Benzene	71-43-2	5	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
Bromochloromethane	74-97-5			NS	0.2	U	0.2	U	0.2	U
Bromodichloromethane	75-27-4	1.1	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
Bromoform	75-25-2	8.5	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
Bromomethane	74-83-9	8.7	USEPA Region 9, Tap Water	NS	0.25	U	0.25	U	0.25	U
Carbon disulfide	75-15-0	1000	USEPA Region 9, Tap Water	NS	0.4	U	0.4	U	0.4	U
Carbon tetrachloride	56-23-5	5	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
Chlorobenzene	108-90-7	100	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
Chloroethane	75-00-3	21000	USEPA Region 9, Tap Water	NS	0.23	U	0.23	U	0.23	U
Chloroform	67-66-3	0.19	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
Chloromethane	74-87-3	1.8	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	R
cis-1,2-Dichloroethene	156-59-2	70	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
cis-1,3-Dichloropropene	10061-01-5			NS	0.2	U	0.2	U	0.2	U
Dibromochloromethane	124-48-1	0.8	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
Dichlorodifluoromethane	75-71-8	390	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
Ethylbenzene	100-41-4	700	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
Isopropylbenzene	98-82-8	680	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
m&p-Xylenes	136777-61-2			NS	0.4	U	0.4	U	**0.17**	**J**
Methyl tert-butyl ether (MTBE)	1634-04-4	12	USEPA Region 9, Tap Water	NS	0.26	U	0.26	U	0.26	U
Methylene chloride	75-09-2	5	USEPA, MCL	NS	0.59	R	0.59	R	0.59	R
o-Xylene	95-47-6	1400	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
Styrene	100-42-5	100	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
Tetrachloroethene	127-18-4	5	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
Toluene	108-88-3	1000	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
trans-1,2-Dichloroethene	156-60-5	100	USEPA, MCL	NS	0.21	U	0.21	U	0.21	U

TABLE 3-5
Quarterly Groundwater Results MW115
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

Analyte	CAS registry number	Screening Level	Screening Level Source***	Sample ID Sample Date MW115** 12/11/2007 Quarter 1	MW115-031708 3/17/2008 Quarter 2		MW115-061608 6/16/2008 Quarter 3		MW115-091508 9/15/2008 Quarter 4	
trans-1,3-Dichloropropene	10061-02-6			NS	0.2	U	0.2	U	0.2	U
Trichloroethene	79-01-6	5	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
Trichlorofluoromethane	75-69-4	1300	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
Vinyl chloride	75-01-4	2	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
Dissolved Metals (all results reported in mg/L)										
Iron	7439-89-6	0.3	USEPA, Secondary Standard	NS	0.18	U	**0.11**		**0.1**	**J**
Thallium	7440-28-0	0.002	USEPA, MCL	NS	0.0016	U	0.0013	U	0.0013	U
Metals (all results reported in mg/L)										
Iron	7439-89-6	0.3	USEPA, Secondary Standard	NS	**6.9**		**0.22**		**0.43**	**J**
Thallium	7440-28-0	0.002	USEPA, MCL	NS	0.0016	U	0.0013	U	0.0013	U
Miscellaneous (all results reported in mg/L)										
Chloride****	16887-00-6	250	USEPA, Secondary Standard	NS	**3.9**		**3.8**		**3.7**	

Notes:
ug/L=microgram per liter
J=estimated concentration
U = Result non detected
UJ = Non detected estimated value
NS=Not sampled
R = Rejected result
Bold=detected concentration
Bold & Shaded = detected result exceeds screening level
*Samples where duplicates were taken have only the higher of the two results displayed.
****** MW 115 not sampled in first quarter due to standing water at well location.
***The maximum contaminant level (MCL) was used or the U.S. Environmental Protection Agency (USEPA) Region 9 tap water preliminary remediation goal (PRG) was used if an MCL was not established
****Chloride was analyzed at the TAMPEEL monitoring wells, as requested by Ohio EPA, to assess potential impacts from nearby natural gas well drill cuttings.

TABLE 3-6
Quarterly Groundwater Results MW116
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

Analyte	CAS registry number	Screening Level	Screening Level Source***	MW116** 12/11/2007 Quarter 1	MW116-031708 3/17/2008 Quarter 2		MW116-061608 6/16/2008 Quarter 3		MW116-091508 9/15/2008 Quarter 4	
VOCs (all results reported in ug/L)										
1,1,1-Trichloroethane	71-55-6	200	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,1,2,2-Tetrachloroethane	79-34-5	0.067	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	R
1,1,2-Trichloroethane	79-00-5	5	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,1-Dichloroethane	75-34-3	2.4	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
1,1-Dichloroethene	75-35-4	7	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,2,3-Trichlorobenzene	87-61-6			NS	0.22	U	0.22	U	0.22	U
1,2,4-Trichlorobenzene	120-82-1	70	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,2-Dibromo-3-chloropropane	96-12-8	0.2	USEPA, MCL	NS	0.2	UJ	0.2	U	0.2	UJ
1,2-Dibromoethane (EDB)	106-93-4	0.05	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,2-Dichlorobenzene	95-50-1	600	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,2-Dichloroethane	107-06-2	5	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,2-Dichloropropane	78-87-5	5	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
1,3-Dichlorobenzene	541-73-1			NS	0.2	U	0.2	U	0.2	U
1,4-Dichlorobenzene	106-46-7	75	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
2-Butanone (MEK)	78-93-3	7100	USEPA Region 9, Tap Water	NS	2	U	2	U	2	U
2-Hexanone	591-78-6			NS	5.2	U	5.2	UJ	5.2	U
4-Methyl-2-pentanone (MIBK)	108-10-1	2000	USEPA Region 9, Tap Water	NS	2.8	U	2.8	U	2.8	U
Acetone	67-64-1	22000	USEPA Region 9, Tap Water	NS	5.2	R	5.2	U	5.2	R
Benzene	71-43-2	5	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
Bromochloromethane	74-97-5			NS	0.2	U	0.2	U	0.2	U
Bromodichloromethane	75-27-4	1.1	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
Bromoform	75-25-2	8.5	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
Bromomethane	74-83-9	8.7	USEPA Region 9, Tap Water	NS	0.25	U	0.25	U	0.25	U
Carbon disulfide	75-15-0	1000	USEPA Region 9, Tap Water	NS	0.4	U	0.4	U	0.4	U
Carbon tetrachloride	56-23-5	5	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
Chlorobenzene	108-90-7	100	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
Chloroethane	75-00-3	21000	USEPA Region 9, Tap Water	NS	0.23	U	0.23	U	0.23	U
Chloroform	67-66-3	0.19	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
Chloromethane	74-87-3	1.8	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	1.2	U
cis-1,2-Dichloroethene	156-59-2	70	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
cis-1,3-Dichloropropene	10061-01-5			NS	0.2	U	0.2	U	0.2	U
Dibromochloromethane	124-48-1	0.8	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
Dichlorodifluoromethane	75-71-8	390	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
Ethylbenzene	100-41-4	700	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
Isopropylbenzene	98-82-8	680	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
m&p-Xylenes	136777-61-2			NS	0.4	U	0.4	U	0.4	U
Methyl tert-butyl ether (MTBE)	1634-04-4	12	USEPA Region 9, Tap Water	NS	0.26	U	0.26	U	0.26	U
Methylene chloride	75-09-2	5	USEPA, MCL	NS	0.59	R	0.59	R	0.59	R
o-Xylene	95-47-6	1400	USEPA Region 9, Tap Water	NS	0.2	U	0.2	U	0.2	U
Styrene	100-42-5	100	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
Tetrachloroethene	127-18-4	5	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
Toluene	108-88-3	1000	USEPA, MCL	NS	0.2	U	0.2	U	0.2	U
trans-1,2-Dichloroethene	156-60-5	100	USEPA, MCL	NS	0.21	U	0.21	U	0.21	U

TABLE 3-6
Quarterly Groundwater Results MW116
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

			Sample ID	MW116**		MW116-031708		MW116-061608		MW116-091508	
	CAS registry		Sample Date	12/11/2007		3/17/2008		6/16/2008		9/15/2008	
Analyte	**number**	**Screening Level**	**Screening Level Source*** **	**Quarter 1**		**Quarter 2**		**Quarter 3**		**Quarter 4**	
trans-1,3-Dichloropropene	10061-02-6			NS		0.2	U	0.2	U	0.2	U
Trichloroethene	79-01-6	5	USEPA, MCL	NS		0.2	U	0.2	U	0.2	U
Trichlorofluoromethane	75-69-4	1300	USEPA Region 9, Tap Water	NS		0.2	U	0.2	U	0.2	U
Vinyl chloride	75-01-4	2	USEPA, MCL	NS		0.2	U	0.2	U	0.2	U
Dissolved Metals (all results reported in mg/L)											
Iron	7439-89-6	0.3	USEPA, Secondary Standard	NS		**2.4**		**4.3**		**4.1**	**J**
Thallium	7440-28-0	0.002	USEPA, MCL	NS		0.0016	U	0.0013	U	0.0013	U
Metals (all results reported in mg/L)											
Iron	7439-89-6	0.3	USEPA, Secondary Standard	NS		**14**		**5.3**		**4.2**	**J**
Thallium	7440-28-0	0.002	USEPA, MCL	NS		0.0016	U	0.0013	U	0.0013	U
Miscellaneous (all results reported in mg/L)											
Chloride****	16887-00-6	250	USEPA, Secondary Standard	NS		**7.8**		**9.5**		**9.1**	

Notes:
Ug/L=micrograms per liter
J=estimated concentration
U = Result non detected
UJ = Non detected estimated value
NS=Not sampled
R = Rejected result
Bold=detected concentration
Bold & Shaded = detected result exceeds screening level
*Samples where duplicates were taken have only the higher of the two results displayed.
**** MW 116 not sampled in first quarter due to standing water at well location.
***The maximum contaminant level (MCL) was used or the U.S. Environmental Protection Agency (USEPA) Region 9 tap water preliminary remediation goal (PRG) was used if an MCL was not established
****Chloride was analyzed at the TAMPEEL monitoring wells, as requested by Ohio EPA, to assess potential impacts from nearby natural gas well drill cuttings.

TABLE 3-7
Quarterly Surface Water Results - Aspen Creek
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

				Sample ID	SWAC-121307		SWAC-031808		SWAC-061708		SWAC-091608	
				Sample Date	12/13/2007		3/18/2008		6/17/2008		9/16/2008	
Analyte	CAS registry number	Region 5 Eco Screning Level	Human Health Screening Level	Human Health Screening Level Source	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
VOCs (all results reported in ug/L)												
1,1,1-Trichloroethane	71-55-6	76	200	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
1,1,2,2-Tetrachloroethane	79-34-5	380	0.067	USEPA Region 9, Tap Water	0.019	UJ	0.2	U	0.2	U	0.2	R
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		59000	USEPA Region 9, Tap Water	2.8	U	2.8	U	2.8	U	0.4	U
1,1,2-Trichloroethane	79-00-5	500	5	USEPA, MCL	0.06	UJ	0.2	U	0.2	U	0.2	U
1,1-Dichloroethane	75-34-3	47	2.4	USEPA Region 9, Tap Water	0.06	UJ	0.2	U	0.2	U	0.2	U
1,1-Dichloroethene	75-35-4	65	7	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
1,2,3-Trichlorobenzene	87-61-6				0.07	UJ	0.22	U	0.22	U	0.22	U
1,2,4-Trichlorobenzene	120-82-1	30	70	USEPA, MCL	0.06	UJ	0.2	U	0.2	U	0.2	U
1,2-Dibromo-3-chloropropane	96-12-8		0.2	USEPA, MCL	0.05	UJ	0.2	UJ	0.2	U	0.2	U
1,2-Dibromoethane (EDB)	106-93-4		0.05	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
1,2-Dichlorobenzene	95-50-1	14	600	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
1,2-Dichloroethane	107-06-2	910	5	USEPA, MCL	0.03	UJ	0.2	U	0.2	U	0.2	U
1,2-Dichloropropane	78-87-5	360	5	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
1,3-Dichlorobenzene	541-73-1	38			0.027	UJ	0.2	U	0.2	U	0.2	U
1,4-Dichlorobenzene	106-46-7	9.4	75	USEPA, MCL	0.04	UJ	0.2	U	0.2	U	0.2	U
2-Butanone (MEK)	78-93-3	2200	7100	USEPA Region 9, Tap Water	0.6	UJ	2	U	2	U	2	U
2-Hexanone	591-78-6	99			1.6	UJ	5.2	U	5.2	UJ	5.2	U
4-Methyl-2-pentanone (MIBK)	108-10-1	170	2000	USEPA Region 9, Tap Water	0.8	UJ	2.8	U	2.8	U	2.8	U
Acetone	67-64-1	1700	22000	USEPA Region 9, Tap Water	5	U	5.2	R	**2.6**	**J**	**3**	**J**
Benzene	71-43-2	114	5	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
Bromochloromethane	74-97-5				0.028	UJ	0.2	U	0.2	U	0.2	U
Bromodichloromethane	75-27-4		1.1	USEPA Region 9, Tap Water	0.03	UJ	0.2	U	0.2	U	0.2	U
Bromoform	75-25-2	230	8.5	USEPA Region 9, Tap Water	0.04	UJ	0.2	U	0.2	U	0.2	U
Bromomethane	74-83-9	16	8.7	USEPA Region 9, Tap Water	0.07	UJ	0.25	U	0.25	U	0.25	UJ
Carbon disulfide	75-15-0	15	1000	USEPA Region 9, Tap Water	0.09	UJ	0.4	U	0.4	U	0.4	U
Carbon tetrachloride	56-23-5	240	5	USEPA, MCL	0.022	UJ	0.2	U	0.2	U	0.2	U
Chlorobenzene	108-90-7	47	100	USEPA, MCL	0.04	UJ	0.2	U	0.2	U	0.2	U
Chloroethane	75-00-3	0	21000	USEPA Region 9, Tap Water	0.07	UJ	0.23	U	0.23	U	0.23	U
Chloroform	67-66-3	140	0.19	USEPA Region 9, Tap Water	0.022	UJ	0.2	U	0.2	U	0.2	U
Chloromethane	74-87-3		1.8	USEPA Region 9, Tap Water	0.13	U	0.056	U	**0.069**	**J**	0.2	R
cis-1,2-Dichloroethene	156-59-2		70	USEPA, MCL	**0.28**	**J**	**0.78**		**3.2**		**0.38**	
cis-1,3-Dichloropropene	10061-01-5				0.017	UJ	0.2	U	0.2	U	0.2	U
Dibromochloromethane	124-48-1		0.8	USEPA Region 9, Tap Water	0.026	UJ	0.2	U	0.2	U	0.2	U
Dichlorodifluoromethane	75-71-8		390	USEPA Region 9, Tap Water	0.03	UJ	0.2	U	0.2	U	0.2	U
Ethylbenzene	100-41-4	14	700	USEPA, MCL	0.024	UJ	0.2	UJ	0.2	U	0.2	U
Isopropylbenzene	98-82-8		680	USEPA Region 9, Tap Water	0.04	UJ	0.2	UJ	0.2	U	0.2	U
m&p-Xylenes	136777-61-2				0.08	UJ	0.4	UJ	0.4	U	0.4	U
Methyl tert-butyl ether (MTBE)	1634-04-4		12	USEPA Region 9, Tap Water	0.08	UJ	0.26	U	0.26	U	0.26	U

TABLE 3-7
Quarterly Surface Water Results - Aspen Creek
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

				Sample ID	**SWAC-121307**		**SWAC-031808**		**SWAC-061708**		**SWAC-091608**	
				Sample Date	**12/13/2007**		**3/18/2008**		**6/17/2008**		**9/16/2008**	
Analyte	**CAS registry number**	**Region 5 Eco Screning Level**	**Human Health Screening Level**	**Human Health Screening Level Source**	**Quarter 1**		**Quarter 2**		**Quarter 3**		**Quarter 4**	
Methylene chloride	75-09-2	940	5	USEPA, MCL	0.18	UJ	0.59	R	0.59	R	0.59	R
o-Xylene	95-47-6		1400	USEPA Region 9, Tap Water	0.023	UJ	0.2	UJ	0.2	U	0.2	U
Styrene	100-42-5	32	100	USEPA, MCL	0.022	R	0.2	R	0.2	U	0.2	U
Tetrachloroethene	127-18-4	45	5	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
Toluene	108-88-3	253	1000	USEPA, MCL	0.06	UJ	0.2	UJ	0.2	U	0.2	U
trans-1,2-Dichloroethene	156-60-5	970	100	USEPA, MCL	0.06	UJ	0.18	U	**0.079**	**J**	0.21	U
trans-1,3-Dichloropropene	10061-02-6				0.017	UJ	0.2	U	0.2	U	0.2	U
Trichloroethene	79-01-6	47	5	USEPA, MCL	0.05	UJ	0.2	U	**0.076**	**J**	0.2	U
Trichlorofluoromethane	75-69-4		1300	USEPA Region 9, Tap Water	0.06	UJ	0.2	U	0.2	U	0.2	U
Vinyl chloride	75-01-4	930	2	USEPA, MCL	0.013	UJ	0.2	U	**0.28**		0.032	U
Dissolved Metals (all results reported in mg/L)												
Iron	7439-89-6		0.3	USEPA, Secondary Standard	0.013	U	**0.31**		**1.6**		**0.38**	**J**
Thallium	7440-28-0	0.01	0.002	USEPA, MCL	0.0005	U	0.0016	U	0.0013	U	0.0013	U
Metals (all results reported in mg/L)												
Iron	7439-89-6		0.3	USEPA, Secondary Standard	**180**	**J**	**4.9**		**120**		**0.15**	**J**
Thallium	7440-28-0	0.01	0.002	USEPA, MCL	0.0005	UJ	0.0016	UJ	0.0013	U	0.0013	U
Miscellaneous (all results reported in mg/L)												
Chloride**	16887-00-6		250	USEPA, Secondary Standard	31	U	**18**		**39**		**38**	

Notes:
µg/L=micrograms per liter
J=estimated concentration
U = Result non detected
UJ = Non detected estimated value
NS=Not sampled
R = Rejected result
Bold=detected concentration
Bold & Shaded = detected result exceeds screening level
*****Samples where duplicates were taken have only the higher of the two results displayed.
**Chloride was analyzed at the TAMPEEL monitoring wells, as requested by Ohio EPA, to assess potential impacts from nearby natural gas well drill cuttings.

TABLE 3-8
Quarterly Surface Water Results TAMPEEL Spring
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

				Sample ID	**SWTS-121307**		**SWTS-031808**		**SWTS-061708**		**SWTS-091608**	
				Sample Date	**12/13/2007**		**3/18/2008**		**6/17/2008**		**9/16/2008**	
Analyte	**CAS registry number**	**Region 5 Eco Sceening Level**	**Human Health Screening Level**	**Human Health Screening Level Source**	**Quarter 1**		**Quarter 2**		**Quarter 3**		**Quarter 4**	
VOCs (all results reported in ug/L)												
1,1,1-Trichloroethane	71-55-6	76	200	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
1,1,2,2-Tetrachloroethane	79-34-5	380	0.067	USEPA Region 9, Tap Water	0.019	UJ	0.2	U	0.2	U	0.2	R
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		59000	USEPA Region 9, Tap Water	2.8	U	2.8	U	2.8	U	0.4	U
1,1,2-Trichloroethane	79-00-5	500	5	USEPA, MCL	0.06	UJ	0.2	U	0.2	U	0.2	U
1,1-Dichloroethane	75-34-3	47	2.4	USEPA Region 9, Tap Water	0.06	UJ	0.2	U	0.2	U	0.2	U
1,1-Dichloroethene	75-35-4	65	7	USEPA, MCL	0.05	UJ	0.2	U	**0.086**	**J**	0.05	U
1,2,3-Trichlorobenzene	87-61-6				0.07	UJ	0.22	U	0.22	U	0.22	U
1,2,4-Trichlorobenzene	120-82-1	30	70	USEPA, MCL	0.06	UJ	0.2	U	0.2	U	0.2	U
1,2-Dibromo-3-chloropropane	96-12-8	0	0.2	USEPA, MCL	0.05	UJ	0.2	UJ	0.2	U	0.2	U
1,2-Dibromoethane (EDB)	106-93-4	0	0.05	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
1,2-Dichlorobenzene	95-50-1	14	600	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
1,2-Dichloroethane	107-06-2	910	5	USEPA, MCL	0.03	UJ	0.2	U	0.2	U	0.2	U
1,2-Dichloropropane	78-87-5	360	5	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U
1,3-Dichlorobenzene	541-73-1	38			0.027	UJ	0.2	U	0.2	U	0.2	U
1,4-Dichlorobenzene	106-46-7	9.4	75	USEPA, MCL	0.04	UJ	0.2	U	**0.043**	**J**	**0.044**	**J**
2-Butanone (MEK)	78-93-3	2200	7100	USEPA Region 9, Tap Water	0.6	UJ	2	U	2	U	2	U
2-Hexanone	591-78-6	99			1.6	UJ	5.2	U	5.2	UJ	5.2	U
4-Methyl-2-pentanone (MIBK)	108-10-1	170	2000	USEPA Region 9, Tap Water	0.8	UJ	2.8	U	2.8	U	2.8	U
Acetone	67-64-1	1700	22000	USEPA Region 9, Tap Water	5.6	U	5.2	R	5.2	U	5.2	R
Benzene	71-43-2	114	5	USEPA, MCL	**0.071**	**J**	**0.083**	**J**	**0.085**	**J**	**0.082**	**J**
Bromochloromethane	74-97-5				0.028	UJ	0.2	U	0.2	U	0.2	U
Bromodichloromethane	75-27-4		1.1	USEPA Region 9, Tap Water	0.03	UJ	0.2	U	0.2	U	0.2	U
Bromoform	75-25-2	230	8.5	USEPA Region 9, Tap Water	0.04	UJ	0.2	U	0.2	U	0.2	U
Bromomethane	74-83-9	16	8.7	USEPA Region 9, Tap Water	0.07	UJ	0.25	U	0.25	U	0.25	UJ
Carbon disulfide	75-15-0	15	1000	USEPA Region 9, Tap Water	**0.25**	**J**	0.4	U	0.4	U	**0.3**	**J**
Carbon tetrachloride	56-23-5	240	5	USEPA, MCL	0.022	UJ	0.2	U	0.2	U	0.2	U
Chlorobenzene	108-90-7	47	100	USEPA, MCL	**0.069**	**J**	**0.091**	**J**	0.2	U	0.2	U
Chloroethane	75-00-3		21000	USEPA Region 9, Tap Water	0.07	UJ	0.23	U	0.23	U	0.23	U
Chloroform	67-66-3	140	0.19	USEPA Region 9, Tap Water	0.022	UJ	0.2	U	0.2	U	0.2	U
Chloromethane	74-87-3		1.8	USEPA Region 9, Tap Water	0.12	U	0.05	U	0.2	U	0.84	U
cis-1,2-Dichloroethene	156-59-2		70	USEPA, MCL	**7.8**	**J**	**10**	**J**	**11**		**8.6**	
cis-1,3-Dichloropropene	10061-01-5				0.017	UJ	0.2	U	0.2	U	0.2	U
Dibromochloromethane	124-48-1		0.8	USEPA Region 9, Tap Water	0.026	UJ	0.2	U	0.2	U	0.2	U
Dichlorodifluoromethane	75-71-8		390	USEPA Region 9, Tap Water	0.03	UJ	0.2	U	0.2	U	0.2	U
Ethylbenzene	100-41-4	14	700	USEPA, MCL	0.024	UJ	0.2	U	0.2	U	0.2	U
Isopropylbenzene	98-82-8		680	USEPA Region 9, Tap Water	0.04	UJ	0.2	U	0.2	U	0.2	U
m&p-Xylenes	136777-61-2				0.08	UJ	0.4	U	0.4	U	0.4	U
Methyl tert-butyl ether (MTBE)	1634-04-4		12	USEPA Region 9, Tap Water	0.08	UJ	0.26	U	0.26	U	0.26	U
Methylene chloride	75-09-2	940	5	USEPA, MCL	0.18	UJ	0.59	R	0.59	R	0.59	R
o-Xylene	95-47-6		1400	USEPA Region 9, Tap Water	0.023	UJ	0.2	U	0.2	U	0.2	U
Styrene	100-42-5	32	100	USEPA, MCL	0.022	UJ	0.2	U	0.2	U	0.2	U

TABLE 3-8
Quarterly Surface Water Results TAMPEEL Spring
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

				Sample ID	**SWTS-121307**		**SWTS-031808**		**SWTS-061708**		**SWTS-091608**		
				Sample Date	**12/13/2007**		**3/18/2008**		**6/17/2008**		**9/16/2008**		
Analyte	**CAS registry number**	**Region 5 Eco Sceening Level**	**Human Health Screening Level**	**Human Health Screening Level Source**	**Quarter 1**		**Quarter 2**		**Quarter 3**		**Quarter 4**		
Tetrachloroethene	127-18-4	45	5	USEPA, MCL	0.05	UJ	0.2	U	0.2	U	0.2	U	
Toluene	108-88-3	253	1000	USEPA, MCL	0.06	UJ	0.2	U	0.2	U	0.2	U	
trans-1,2-Dichloroethene	156-60-5	970	100	USEPA, MCL	**0.14**	**J**	**0.18**	**J**	**0.12**	**J**	0.21	U	
trans-1,3-Dichloropropene	10061-02-6				0.017	UJ	0.2	U	0.2	U	0.2	U	
Trichloroethene	79-01-6	47	5	USEPA, MCL	**0.49**	**J**	**0.61**		**0.62**		**0.41**		
Trichlorofluoromethane	75-69-4		1300	USEPA Region 9, Tap Water	0.06	UJ	0.2	U	0.2	U	0.2	U	
Vinyl chloride	75-01-4	930	2	USEPA, MCL	**1.2**	**J**	**1.4**		**2.2**		**2.2**	**J**	
Dissolved Metals (all results reported in mg/L)													
Iron	7439-89-6		0.3	USEPA, Secondary Standard	**0.075**	**J**	**3.3**		**1.9**		**0.27**	**J**	
Thallium	7440-28-0	0.01	0.002	USEPA, MCL	0.0005	U	0.0005	U	0.0013	U	0.0013	U	
Metals (all results reported in mg/L)													
Iron	7439-89-6		0.3	USEPA, Secondary Standard	**3.5**		**3.5**		**2.3**		**0.27**	**J**	
Thallium	7440-28-0	0.01	0.002	USEPA, MCL	0.0005	U	0.0016	U	0.0013	U	0.0013	U	
Miscellaneous (all results reported in mg/L)													
Chloride**	16887-00-6		250	USEPA, Secondary Standard	2.2	UJ	**24**		**36**		**33**		

Notes:
µg/L=micrograms per liter
J=estimated concentration
U = Result non detected
UJ = Non detected estimated value
NS=Not sampled
R = Rejected result
Bold=detected concentration
Bold & Shaded = detected result exceeds screening level
*****Samples where duplicates were taken have only the higher of the two results displayed.
**Chloride was analyzed at the TAMPEEL monitoring wells, as requested by Ohio EPA, to assess potential impacts from nearby natural gas well drill cuttings.

TABLE 3-9

Explosive Gas Monitoring Punch Bar Station Report, 1st Quarter (December 2007), TAMPEEL and Satellite Waste Areas

Remedial Investigation Addendum

Former Lordstown Ordnance Depot, Lordstown, Ohio

Sanitary Landfill: TAMPEEL & Satellite Waste
Tested By: Drue Roberts/CH2M HILL
Gas Instrument Type: GEM 2000
Last Calibrated: 12-10-2007 Calibration Gas: 15%-CH_4, 15%-CO_2, 70%-N_2
Sampling Method: Stabilization/1 min pump time
Barometric Pressure: 29.63" Relative Humidity: 90%
Soil Conditions: Predominantly mixed clay soil and road slag.

Location (County): Trumbull Co., Ohio
Date: 12-10-2007
Serial No.: #51390
Detection Limit: 0.01 % CH_4 by Volume
Outside Air Temperature: 45 °F
Test Method: Punch Bar

Station Designation/ Location	Time	Coordinates		Explosive Gas (% Volume)	Threshold Limit	% Gas is higher/lower than threshold	Punch bar hole depth (Inches)
		Northing	Easting				
TPL-01	1220	169803.22	746313.32	0.0	NA	Lower	18
TPL-02	1222	169817.51	746313.4	0.0	NA	Lower	17
TPL-03	1225	169833.24	746313.21	0.0	NA	Lower	20
TPL-04	1231	169849.37	746313.3	0.0	NA	Lower	19
TPL-05	1240	169818.03	746328.63	0.0	NA	Lower	21
TPL-06	1243	169833.7	746328.58	0.0	NA	Lower	17
TPL-07	1330	169849.42	746328.55	0.0	NA	Lower	23
TPL-08	1333	169798.78	746298.04	0.0	NA	Lower	25
TPL-09	1338	169817.61	746297.98	0.0	NA	Lower	26
TPL-10	1342	169840.58	746302.13	0.0	NA	Lower	21
TPL-11	1345	169853.97	746298.1	0.0	NA	Lower	23
TPL-12	1348	169802.43	746278.69	0.0	NA	Lower	25
TPL-13	1351	169831.04	746282.72	0.0	NA	Lower	19
TPL-14	1402	169860.81	746288.28	0.0	NA	Lower	20
TPL-15	1410	169891.18	746323.96	0.0	NA	Lower	19
TPL-16	1412	169904.12	746294.87	0.0	NA	Lower	20
TPL-17	1417	169886.74	746292.43	0.0	NA	Lower	24
TPL-18	1420	169881.23	746354.55	0.0	NA	Lower	21
TPL-19	1427	169849.45	746359.39	0.0	NA	Lower	18
TPL-20	1431	169822.89	746356.65	0.0	NA	Lower	24
TPL-21	1438	169801.91	746346.95	0.0	NA	Lower	25
Restroom-01	1320	169823.86	746334.48	0.0	NA	Lower	Collected in Men's Room
Restroom-02	1324	169822.53	746330.73	0.0	NA	Lower	22
Main-01	1355	169789.57	746297.97	0.0	NA	Lower	Collected in Central Room
Main-02	1359	169782.49	746301.4	0.0	NA	Lower	22
Shed-01	1301	169860.15	746324.81	0.0	NA	Lower	Collected in Work Area
Shed-02	1304	169860.15	746328.15	0.0	NA	Lower	20
Storage-01	1441	169860.15	746324.81	0.0	NA	Lower	Collected in shed with door closed
Storage-02	1446	169860.15	746328.15	0.0	NA	Lower	21

TABLE 3-10

Explosive Gas Monitoring Punch Bar Station Report, Second Quarter (March 2008), TAMPEEL and Satellite Waste Areas

TAMPEEL Remedial Investigation Report Addendum

Former Lordstown Ordnance Depot, Lordstown, Ohio

Sanitary Landfill: TAMPEEL & Satellite Waste
Tested By: Steve Chumney/CH2M HILL
Gas Instrument Type: GEM 2000
Last Calibrated: 03-20-2008 Calibration Gas: 15%-CH4, 15%-CO2, 70%-N2
Sampling Method: Stabilization/1 min pump time
Barometric Pressure: 30.01" Relative Humidity: 56%
Soil Conditions: Predominantly mixed clay soil and road slag.

Location (County): Trumbull Co., Ohio
Date: 03-20-2008
Serial No.: #07166
Detection Limit: 0.01 % CH4 by Volume
Outside Air Temperature: 33 °F
Test Method: Punch Bar

Station Designation/ Location	Time	Coordinates		Explosive Gas (% Volume)	Threshold Limit	% Gas is higher/lower than threshold	Punch bar hole depth (Inches)
		Northing	Easting				
TPL-01	1100	169803.22	746313.32	0.0	NA	Lower	24
TPL-02	1105	169817.51	746313.4	0.0	NA	Lower	18
TPL-03	1110	169833.24	746313.21	0.0	NA	Lower	18
TPL-04	1120	169849.37	746313.3	0.0	NA	Lower	24
TPL-05	1125	169818.03	746328.63	0.0	NA	Lower	24
TPL-06	1130	169833.7	746328.58	0.0	NA	Lower	24
TPL-07	1135	169849.42	746328.55	0.0	NA	Lower	24
TPL-08	1140	169798.78	746298.04	0.0	NA	Lower	24
TPL-09	1145	169817.61	746297.98	0.0	NA	Lower	18
TPL-10	1155	169840.58	746302.13	0.0	NA	Lower	24
TPL-11	1200	169853.97	746298.1	0.0	NA	Lower	24
TPL-12	1205	169802.43	746278.69	0.0	NA	Lower	18
TPL-13	1215	169831.04	746282.72	0.0	NA	Lower	24
TPL-14	1400	169860.81	746288.28	0.0	NA	Lower	24
TPL-15	1410	169891.18	746323.96	0.0	NA	Lower	24
TPL-16	1412	169904.12	746294.87	0.0	NA	Lower	24
TPL-17	1417	169886.74	746292.43	0.0	NA	Lower	24
TPL-18	1420	169881.23	746354.55	0.0	NA	Lower	24
TPL-19	1427	169849.45	746359.39	0.0	NA	Lower	24
TPL-20	1431	169822.89	746356.65	0.0	NA	Lower	24
TPL-21	1438	169801.91	746346.95	0.0	NA	Lower	24
Restroom-01	1320	169823.86	746334.48	0.0	NA	Lower	Collected in Men's Room
Restroom-02	1324	169822.53	746330.73	0.0	NA	Lower	at ground surface
Main-01	1355	169789.57	746297.97	0.0	NA	Lower	Collected in Central Room
Main-02	1359	169782.49	746301.4	0.0	NA	Lower	at ground surface
Shed-01	1301	169860.15	746324.81	0.0	NA	Lower	Collected in Work Area
Shed-02	1304	169860.15	746328.15	0.0	NA	Lower	at ground surface
Storage-01	1441	169860.15	746324.81	0.0	NA	Lower	Collected in shed with door closed
Storage-02	1430	169860.15	746328.15	0.0	NA	Lower	at ground surface

TABLE 3-11

Explosive Gas Monitoring Punch Bar Station Report, 3rd Quarter (June 2008), TAMPEEL and Satellite Waste Areas

TAMPEEL Remedial Investigation Report Addendum

Former Lordstown Ordnance Depot, Lordstown, Ohio

Sanitary Landfill: TAMPEEL & Satellite Waste
Location (County): Trumbull Co., Ohio
Tested By: Steve Chumney, Sarah Conkle
Date: 06-19-2008
Gas Instrument Type: GEM 2000
Serial # GM10312
Last Calibrated: 06-19-2008 Calibration Gas: 15%-CH_4, 15%-CO_2, 70%-N_2
Sampling Method: Stabilization/1 min pump time
Detection Limit: 0.01 % CH_4 by Volume
Barometric Pressure: 29.95" Relative Humidity: 60%
Outside Air Temperature: 63°F
Soil Conditions: Predominantly mixed clay soil and road slag.
Test Method: Punch Bar

Station Designation/ Location	Time	Coordinates		Explosive Gas (% Volume)	Threshold Limit	% Gas is higher/lower than threshold	Punch bar hole depth (Inches)
		Northing	Easting				
TPL-01	1156	169814.50	735780.92	0.0	NA	Lower	18
TPL-02	1207	169826.97	735780.21	0.0	NA	Lower	18
TPL-03	1213	169843.25	735782.31	0.0	NA	Lower	12
TPL-04	1218	169857.81	735784.58	0.0	NA	Lower	20
TPL-05	1237	169822.34	735797.01	0.0	NA	Lower	19
TPL-06	1257	169835.63	735797.85	0.0	NA	Lower	18
TPL-07	1302	169850.63	735799.35	0.0	NA	Lower	18
TPL-08	1311	169807.99	735763.89	0.0	NA	Lower	18
TPL-09	1316	169826.65	735767.49	0.0	NA	Lower	20
TPL-10	1328	169845.90	735775.62	0.0	NA	Lower	18
TPL-11	1336	169867.16	735774.21	0.0	NA	Lower	19
TPL-12	1458	169802.43*	746278.69*	0.0	NA	Lower	18
TPL-13	1505	169831.04*	746282.72*	0.0	NA	Lower	17
TPL-14	1512	169860.81*	746288.28*	0.0	NA	Lower	20
TPL-15	1530	169891.18*	746323.96*	0.0	NA	Lower	18
TPL-16	1523	169904.12*	746294.87*	0.0	NA	Lower	21
TPL-17	1519	169886.74*	746292.43*	0.0	NA	Lower	19
TPL-18	1548	169881.23*	746354.55*	0.0	NA	Lower	23
TPL-19	1553	169849.45*	746359.39*	0.0	NA	Lower	24
TPL-20	1558	169822.89*	746356.65*	0.0	NA	Lower	22
TPL-21	1604	169801.91*	746346.95*	0.0	NA	Lower	21
Restroom-01	1613	169823.86*	746334.48*	0.0	NA	Lower	Collected in Women's Room
Restroom-02	1615	169822.53*	746330.73*	0.0	NA	Lower	20
Main-01				No Access			
Main-02	1607	169782.49*	746301.40*	0.0	NA	Lower	18
Shed-01	1618	169860.15*	746324.81*	0.0	NA	Lower	20
Shed-02	1621	169860.15*	746328.15*	0.0	NA	Lower	Collected in Main Room

Notes:
* Approximate sample location based on previous sampling events.

TABLE 3-12

Explosive Gas Monitoring Punch Bar Station Report, 4th Quarter (September 2008), TAMPEEL and Satellite Waste Areas

TAMPEEL Remedial Investigation Report Addendum

Former Lordstown Ordnance Depot, Lordstown, Ohio

Sanitary Landfill: TAMPEEL & Satellite Waste
Location (County): Trumbull Co., Ohio
Tested By: S. Chumney, A. Goodrich
Date: 09-18-2008
Gas Instrument Type: GEM 2000
Serial No.: GM05592
Last Calibrated: 09-18-2008 Calibration Gas: 15%-CH_4, 15%-CO_2, 70%-N_2
Sampling Method: Punch Bar-Stabilization/1 min pump time
Detection Limit: 0.01 % CH_4 by Volume
Barometric Pressure: 29.05" Relative Humidity: 46%
Outside Air Temperature: 69°F
Soil Conditions: Predominantly mixed clay soil and road slag
Test Method: Punch Bar

Station Designation/ Location	Time	Coordinates Northing	Coordinates Easting	Explosive Gas (% Volume)	Threshold Limit	% Gas is higher/lower than threshold	Punchbar hole depth (Inches)
TPL-01	1204	169814.04	735784.10	0.0	NA	Lower	18
TPL-02	1216	169828.26	735783.36	0.0	NA	Lower	20
TPL-03	1219	169843.60	735783.14	0.0	NA	Lower	18
TPL-04	1222	169859.17	735782.55	0.0	NA	Lower	20
TPL-05	1228	169827.40	735796.86	0.0	NA	Lower	20
TPL-06	1236	169842.80	735797.06	0.0	NA	Lower	22
TPL-07	1241	169854.55	735800.56	0.0	NA	Lower	22
TPL-08	1248	169812.04	735767.94	0.0	NA	Lower	20
TPL-09	1252	169826.60	735769.27	0.0	NA	Lower	21
TPL-10	1257	169843.36	735770.57	0.0	NA	Lower	20
TPL-11	1302	169859.23	735769.32	0.0	NA	Lower	21
TPL-12	1310	169814.63	735752.61	0.0	NA	Lower	20
TPL-13	1323	169847.81	735755.49	0.0	NA	Lower	22
TPL-14	1331	169876.76	735760.40	0.0	NA	Lower	18
TPL-15	1356	169905.61	735764.36	0.0	NA	Lower	20
TPL-16	1341	169919.02	735766.95	0.0	NA	Lower	18
TPL-17	1335	169902.71	735789.91	0.0	NA	Lower	18
TPL-18	1403	169879.80	735824.24	0.0	NA	Lower	20
TPL-19	1411	169845.71	735826.73	0.0	NA	Lower	20
TPL-20	1415	169826.30	735823.33	0.0	NA	Lower	20
TPL-21	1421	169811.32	735808.60	0.0	NA	Lower	20
Restroom-01	1427	169823.86	746334.48	0.0	NA	Lower	18
Restroom-02	1424	169822.53	746330.73	0.0	NA	Lower	Collected in Men's Room
Main-01				No Access			
Main-02	1431	169782.49	746301.40	0.0	NA	Lower	18
Shed-01	1437	169860.15	746324.81	0.0	NA	Lower	18
Shed-02	1439	169860.15	746328.15	0.0	NA	Lower	Collected Inside

TABLE 3-13

Summary of Receptor Risks and Hazards for COPCs in Aspen Creek/TAMPEEL Spring - Adult Resident

TAMPEEL Remedial Investigation Report Addendum

Former Lordstown Ordnance Depot, Lordstown, Ohio

Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Aspen Creek/TAMPEEL Spring	Barium	0.0E+00	NA	0.0E+00	0.0E+00	4.0E-04	NA	3.2E-04	7.2E-04
			Iron	0.0E+00	NA	0.0E+00	0.0E+00	1.8E-02	NA	1.0E-03	1.9E-02
			Lead	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00
			Manganese	0.0E+00	NA	0.0E+00	0.0E+00	3.2E-02	NA	2.9E-02	6.1E-02
			Nickel	0.0E+00	NA	0.0E+00	0.0E+00	3.2E-04	NA	4.5E-04	7.7E-04
			Methylene Chloride	2.5E-10	NA	1.2E-10	3.6E-10	1.3E-06	NA	4.9E-07	1.8E-06
			Vinyl chloride	5.2E-08	NA	3.0E-08	8.1E-08	5.6E-05	NA	3.2E-05	8.8E-05
			Chemical Total	5E-08	NA	3E-08	8E-08	5E-02	NA	3E-02	8E-02
		Exposure Point Total					8E-08				8E-02
	Exposure Medium Total						8E-08				8E-02
Medium Total							8E-08				8E-02

COPC - Chemical of Potential Concern
HI - Hazard Index
NA - Pathway not evaluated.

TABLE 3-14

Summary of Receptor Risks and Hazards for COPCs in Aspen Creek/TAMPEEL Spring - Child Resident

TAMPEEL Remedial Investigation Report Addendum

Former Lordstown Ordnance Depot, Lordstown, Ohio

Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Aspen Creek/TAMPEEL Spring	Barium	0.0E+00	NA	0.0E+00	0.0E+00	9.2E-04	NA	2.6E-04	1.2E-03
			Iron	0.0E+00	NA	0.0E+00	0.0E+00	4.2E-02	NA	8.2E-04	4.2E-02
			Lead	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00
			Manganese	0.0E+00	NA	0.0E+00	0.0E+00	7.2E-02	NA	2.4E-02	9.6E-02
			Nickel	0.0E+00	NA	0.0E+00	0.0E+00	7.4E-04	NA	3.6E-04	1.1E-03
			Methylene Chloride	1.1E-10	NA	1.9E-11	1.3E-10	2.9E-06	NA	4.0E-07	3.3E-06
			Vinyl chloride	4.9E-08	NA	1.0E-08	5.9E-08	1.3E-04	NA	2.6E-05	1.5E-04
			Chemical Total	5E-08	NA	1E-08	6E-08	1E-01	NA	3E-02	1E-01
		Exposure Point Total					6E-08				1E-01
	Exposure Medium Total						6E-08				1E-01
Medium Total							6E-08				1E-01

COPC - Chemical of Potential Concern
HI - Hazard Index
NA - Pathway not evaluated.

TABLE 3-15

Summary of Receptor Risks and Hazards for COPCs in Aspen Creek/TAMPEEL Spring - Adolescent Trespasser

TAMPEEL Remedial Investigation Report Addendum

Former Lordstown Ordnance Depot, Lordstown, Ohio

Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Aspen Creek/TAMPEEL Spring	Barium	0.0E+00	NA	0.0E+00	0.0E+00	4.8E-04	NA	2.5E-04	7.2E-04
			Iron	0.0E+00	NA	0.0E+00	0.0E+00	2.2E-02	NA	7.8E-04	2.3E-02
			Lead	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00
			Manganese	0.0E+00	NA	0.0E+00	0.0E+00	3.8E-02	NA	2.3E-02	6.0E-02
			Nickel	0.0E+00	NA	0.0E+00	0.0E+00	3.8E-04	NA	3.5E-04	7.3E-04
			Methylene Chloride	5.8E-11	NA	1.5E-11	7.3E-11	1.5E-06	NA	3.8E-07	1.9E-06
			Vinyl chloride	1.2E-08	NA	4.6E-09	1.7E-08	6.6E-05	NA	2.5E-05	9.1E-05
			Chemical Total	1E-08	NA	5E-09	2E-08	6E-02	NA	2E-02	8E-02
		Exposure Point Total					2E-08				8E-02
	Exposure Medium Total						2E-08				8E-02
Medium Total							2E-08				8E-02

COPC - Chemical of Potential Concern
HI - Hazard Index
NA - Pathway not evaluated.

TABLE 3-16

Summary of Receptor Risks and Hazards for COPCs in Aspen Creek/TAMPEEL Spring - Adult Caretaker

TAMPEEL Remedial Investigation Report Addendum

Former Lordstown Ordnance Depot, Lordstown, Ohio

Receptor Population: Caretaker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Aspen Creek/TAMPEEL Spring	Barium	0.0E+00	NA	0.0E+00	0.0E+00	3.7E-04	NA	2.7E-04	6.5E-04
			Iron	0.0E+00	NA	0.0E+00	0.0E+00	1.7E-02	NA	8.7E-04	1.8E-02
			Lead	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00
			Manganese	0.0E+00	NA	0.0E+00	0.0E+00	2.9E-02	NA	2.5E-02	5.5E-02
			Nickel	0.0E+00	NA	0.0E+00	0.0E+00	3.0E-04	NA	3.8E-04	6.8E-04
			Methylene Chloride	1.9E-10	NA	6.8E-11	2.6E-10	1.2E-06	NA	4.3E-07	1.6E-06
			Vinyl chloride	4.0E-08	NA	2.1E-08	6.1E-08	5.2E-05	NA	2.8E-05	7.9E-05
			Chemical Total	4E-08	NA	2E-08	6E-08	5E-02	NA	3E-02	7E-02
		Exposure Point Total					6E-08				7E-02
	Exposure Medium Total						6E-08				7E-02
Medium Total							6E-08				7E-02

COPC - Chemical of Potential Concern
HI - Hazard Index
NA - Pathway not evaluated.

TABLE 3-17

Summary of Receptor Risks and Hazards for COPCs in Aspen Creek/TAMPEEL Spring - Adolescent Student

TAMPEEL Remedial Investigation Report Addendum

Former Lordstown Ordnance Depot, Lordstown, Ohio

Receptor Population: Student
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Aspen Creek/TAMPEEL Spring	Barium	0.0E+00	NA	0.0E+00	0.0E+00	2.5E-04	NA	1.3E-04	3.7E-04
			Iron	0.0E+00	NA	0.0E+00	0.0E+00	1.1E-02	NA	4.0E-04	1.2E-02
			Lead	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00
			Manganese	0.0E+00	NA	0.0E+00	0.0E+00	1.9E-02	NA	1.2E-02	3.1E-02
			Nickel	0.0E+00	NA	0.0E+00	0.0E+00	2.0E-04	NA	1.8E-04	3.7E-04
			Methylene Chloride	1.0E-11	NA	2.5E-12	1.2E-11	7.7E-07	NA	2.0E-07	9.7E-07
			Vinyl chloride	2.1E-09	NA	7.8E-10	2.9E-09	3.4E-05	NA	1.3E-05	4.7E-05
			Chemical Total	2E-09	NA	8E-10	3E-09	3E-02	NA	1E-02	4E-02
		Exposure Point Total					3E-09				4E-02
	Exposure Medium Total						3E-09				4E-02
Medium Total							3E-09				4E-02

COPC - Chemical of Potential Concern
HI - Hazard Index
NA - Pathway not evaluated.

TABLE 3-18

Summary of Receptor Risks and Hazards for COPCs in Aspen Creek/TAMPEEL Spring - Adult Construction Worker

TAMPEEL Remedial Investigation Report Addendum

Former Lordstown Ordnance Depot, Lordstown, Ohio

Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Aspen Creek/TAMPEEL Spring	Barium	0.0E+00	NA	0.0E+00	0.0E+00	3.7E-04	NA	2.9E-04	6.6E-04
			Iron	0.0E+00	NA	0.0E+00	0.0E+00	1.7E-02	NA	9.3E-04	1.8E-02
			Lead	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00
			Manganese	0.0E+00	NA	0.0E+00	0.0E+00	2.9E-02	NA	2.7E-02	5.6E-02
			Nickel	0.0E+00	NA	0.0E+00	0.0E+00	3.0E-04	NA	4.1E-04	7.1E-04
			Methylene Chloride	7.5E-12	NA	2.9E-12	1.0E-11	1.2E-06	NA	4.6E-07	1.6E-06
			Vinyl chloride	1.6E-09	NA	9.1E-10	2.5E-09	5.2E-05	NA	2.9E-05	8.1E-05
			Chemical Total	2E-09	NA	9E-10	3E-09	5E-02	NA	3E-02	8E-02
		Exposure Point Total					3E-09				8E-02
	Exposure Medium Total						3E-09				8E-02
Medium Total							3E-09				8E-02

COPC - Chemical of Potential Concern
HI - Hazard Index
NA - Pathway not evaluated.

TABLE 3-19

Summary of RME Receptor Risks and Hazards for COPCs in Groundwater

Remedial Investigation Report Addendum

Former Lordstown Ordnance Depot, Lordstown, Ohio

Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Groundwater	Aluminum	0.0E+00	NA	0.0E+00	0.0E+00	4.8E-01	NA	1.4E-03	4.8E-01
			Chromium (VI)	0.0E+00	NA	0.0E+00	0.0E+00	2.3E-01	NA	3.3E-02	2.6E-01
			Iron	0.0E+00	NA	0.0E+00	0.0E+00	1.6E+00	NA	4.5E-03	1.6E+00
			Lead	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00
			Thallium	0.0E+00	NA	0.0E+00	0.0E+00	3.3E+00	NA	3.2E-02	3.4E+00
			Vanadium	0.0E+00	NA	0.0E+00	0.0E+00	1.8E-01	NA	5.1E-02	2.3E-01
			Methylene Chloride	1.2E-07	NA	5.7E-09	1.3E-07	6.2E-04	NA	3.0E-05	6.5E-04
			Vinyl chloride	1.1E-06	NA	5.8E-08	1.1E-06	1.2E-03	NA	6.2E-05	1.2E-03
			Chemical Total	1E-06	NA	6E-08	1E-06	6E+00	NA	1E-01	6E+00
		Exposure Point Total					1E-06				6E+00
	Exposure Medium Total						1E-06				6E+00
Groundwater	Air	Household Air	Methylene Chloride	NA	9.6E-08	NA	9.6E-08	NA	1.6E-04	NA	1.6E-04
			Vinyl chloride	NA	8.7E-08	NA	8.7E-08	NA	4.6E-04	NA	4.6E-04
			Chemical Total	NA	2E-07	NA	2E-07	NA	NA	NA	6E-04
		Exposure Point Total					2E-07				6E-04
	Exposure Medium Total						2E-07				6E-04
Medium Total							1E-06				6E+00

COPC - Chemical of Potential Concern

HI - Hazard Index

NA - Pathway not evaluated.

RME - Reasonable Maximum Exposure

TABLE 3-20

Summary of CTE Receptor Risks and Hazards for COPCs in Groundwater

Remedial Investigation Report Addendum

Former Lordstown Ordnance Depot, Lordstown, Ohio

Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Groundwater	Aluminum	0.0E+00	NA	0.0E+00	0.0E+00	4.2E-01	NA	1.5E-03	4.2E-01
			Chromium (VI)	0.0E+00	NA	0.0E+00	0.0E+00	2.0E-01	NA	3.5E-02	2.3E-01
			Iron	0.0E+00	NA	0.0E+00	0.0E+00	1.4E+00	NA	4.9E-03	1.4E+00
			Lead	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00
			Thallium	0.0E+00	NA	0.0E+00	0.0E+00	2.9E+00	NA	3.5E-02	2.9E+00
			Vanadium	0.0E+00	NA	0.0E+00	0.0E+00	1.6E-01	NA	5.6E-02	2.1E-01
			Methylene Chloride	3.1E-08	NA	1.9E-09	3.3E-08	5.4E-04	NA	3.2E-05	5.8E-04
			Vinyl chloride	2.8E-07	NA	1.9E-08	3.0E-07	1.0E-03	NA	6.8E-05	1.1E-03
			Chemical Total	3E-07	NA	2E-08	3E-07	5E+00	NA	1E-01	5E+00
		Exposure Point Total					3E-07				5E+00
	Exposure Medium Total						3E-07				5E+00
Groundwater	Air	Household Air	Methylene Chloride	NA	3.6E-08	NA	3.6E-08	NA	2.0E-04	NA	2.0E-04
			Vinyl chloride	NA	3.3E-08	NA	3.3E-08	NA	5.8E-04	NA	5.8E-04
			Chemical Total	NA	7E-08	NA	7E-08	NA	NA	NA	8E-04
		Exposure Point Total					7E-08				8E-04
	Exposure Medium Total						7E-08				8E-04
Medium Total							3E-07				5E+00

COPC - Chemical of Potential Concern

HI - Hazard Index

NA - Pathway not evaluated.

CTE - Central Tendency Exposure

TABLE 3-21

Summary of RME Receptor Risks and Hazards for COPCs in Groundwater

Remedial Investigation Report Addendum

Former Lordstown Ordnance Depot, Lordstown, Ohio

Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Groundwater	Aluminum	0.0E+00	NA	0.0E+00	0.0E+00	1.8E+00	NA	3.0E-03	1.8E+00
			Chromium (VI)	0.0E+00	NA	0.0E+00	0.0E+00	8.6E-01	NA	7.0E-02	9.3E-01
			Iron	0.0E+00	NA	0.0E+00	0.0E+00	6.0E+00	NA	9.7E-03	6.0E+00
			Lead	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00
			Thallium	0.0E+00	NA	0.0E+00	0.0E+00	1.3E+01	NA	6.8E-02	1.3E+01
			Vanadium	0.0E+00	NA	0.0E+00	0.0E+00	6.8E-01	NA	1.1E-01	7.9E-01
			Methylene Chloride	9.1E-08	NA	2.4E-09	9.3E-08	2.4E-03	NA	6.4E-05	2.4E-03
			Vinyl chloride	1.7E-06	NA	5.1E-08	1.8E-06	4.4E-03	NA	1.3E-04	4.6E-03
			Chemical Total	2E-06	NA	5E-08	2E-06	2E+01	NA	3E-01	2E+01
		Exposure Point Total					2E-06				2E+01
	Exposure Medium Total						2E-06				2E+01
Groundwater	Air	Household Air	Methylene Chloride	NA	8.2E-08	NA	8.2E-08	NA	7.0E-04	NA	7.0E-04
			Vinyl chloride	NA	1.5E-07	NA	1.5E-07	NA	2.0E-03	NA	2.0E-03
			Chemical Total	NA	2E-07	NA	2E-07	NA	NA	NA	3E-03
		Exposure Point Total					2E-07				3E-03
	Exposure Medium Total						2E-07				3E-03
Medium Total							2E-06				2E+01

COPC - Chemical of Potential Concern

HI - Hazard Index

NA - Pathway not evaluated.

RME - Reasonable Maximum Exposure

TABLE 3-22

Summary of CTE Receptor Risks and Hazards for COPCs in Groundwater

Remedial Investigation Report Addendum

Former Lordstown Ordnance Depot, Lordstown, Ohio

Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Groundwater	Aluminum	0.0E+00	NA	0.0E+00	0.0E+00	9.8E-01	NA	2.6E-03	9.8E-01
			Chromium (VI)	0.0E+00	NA	0.0E+00	0.0E+00	4.6E-01	NA	6.0E-02	5.2E-01
			Iron	0.0E+00	NA	0.0E+00	0.0E+00	3.2E+00	NA	8.4E-03	3.2E+00
			Lead	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00
			Thallium	0.0E+00	NA	0.0E+00	0.0E+00	6.8E+00	NA	5.9E-02	6.8E+00
			Vanadium	0.0E+00	NA	0.0E+00	0.0E+00	3.6E-01	NA	9.5E-02	4.6E-01
			Methylene Chloride	4.9E-08	NA	2.1E-09	5.1E-08	1.3E-03	NA	5.5E-05	1.3E-03
			Vinyl chloride	9.2E-07	NA	4.4E-08	9.7E-07	2.4E-03	NA	1.2E-04	2.5E-03
			Chemical Total	1E-06	NA	5E-08	1E-06	1E+01	NA	2E-01	1E+01
		Exposure Point Total					1E-06				1E+01
	Exposure Medium Total						1E-06				1E+01
Groundwater	Air	Household Air	Methylene Chloride	NA	3.7E-08	NA	3.7E-08	NA	3.2E-04	NA	3.2E-04
			Vinyl chloride	NA	6.8E-08	NA	6.8E-08	NA	8.9E-04	NA	8.9E-04
			Chemical Total	NA	1E-07	NA	1E-07	NA	NA	NA	1E-03
		Exposure Point Total					1E-07				1E-03
	Exposure Medium Total						1E-07				1E-03
Medium Total							1E-06				1E+01

COPC - Chemical of Potential Concern

HI - Hazard Index

NA - Pathway not evaluated.

CTE - Central Tendency Exposure

TABLE 3-23

Summary of RME Receptor Risks and Hazards for COPCs in Groundwater

Remedial Investigation Report Addendum

Former Lordstown Ordnance Depot, Lordstown, Ohio

Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Groundwater	Aluminum	0.0E+00	NA	0.0E+00	0.0E+00	5.7E-04	NA	2.5E-06	5.7E-04
			Chromium (VI)	0.0E+00	NA	0.0E+00	0.0E+00	2.7E-04	NA	5.8E-05	3.3E-04
			Iron	0.0E+00	NA	0.0E+00	0.0E+00	1.9E-03	NA	8.1E-06	1.9E-03
			Lead	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00
			Thallium	0.0E+00	NA	0.0E+00	0.0E+00	4.0E-03	NA	5.7E-05	4.0E-03
			Vanadium	0.0E+00	NA	0.0E+00	0.0E+00	2.1E-04	NA	9.1E-05	3.0E-04
			Methylene Chloride	1.4E-10	NA	5.4E-12	1.5E-10	7.4E-07	NA	2.8E-08	7.7E-07
			Vinyl chloride	1.3E-09	NA	5.7E-11	1.3E-09	1.4E-06	NA	6.2E-08	1.5E-06
			Chemical Total	1E-09	NA	6E-11	1E-09	7E-03	NA	2E-04	7E-03
		Exposure Point Total					1E-09				7E-03
	Exposure Medium Total						1E-09				7E-03
Medium Total							1E-09				7E-03

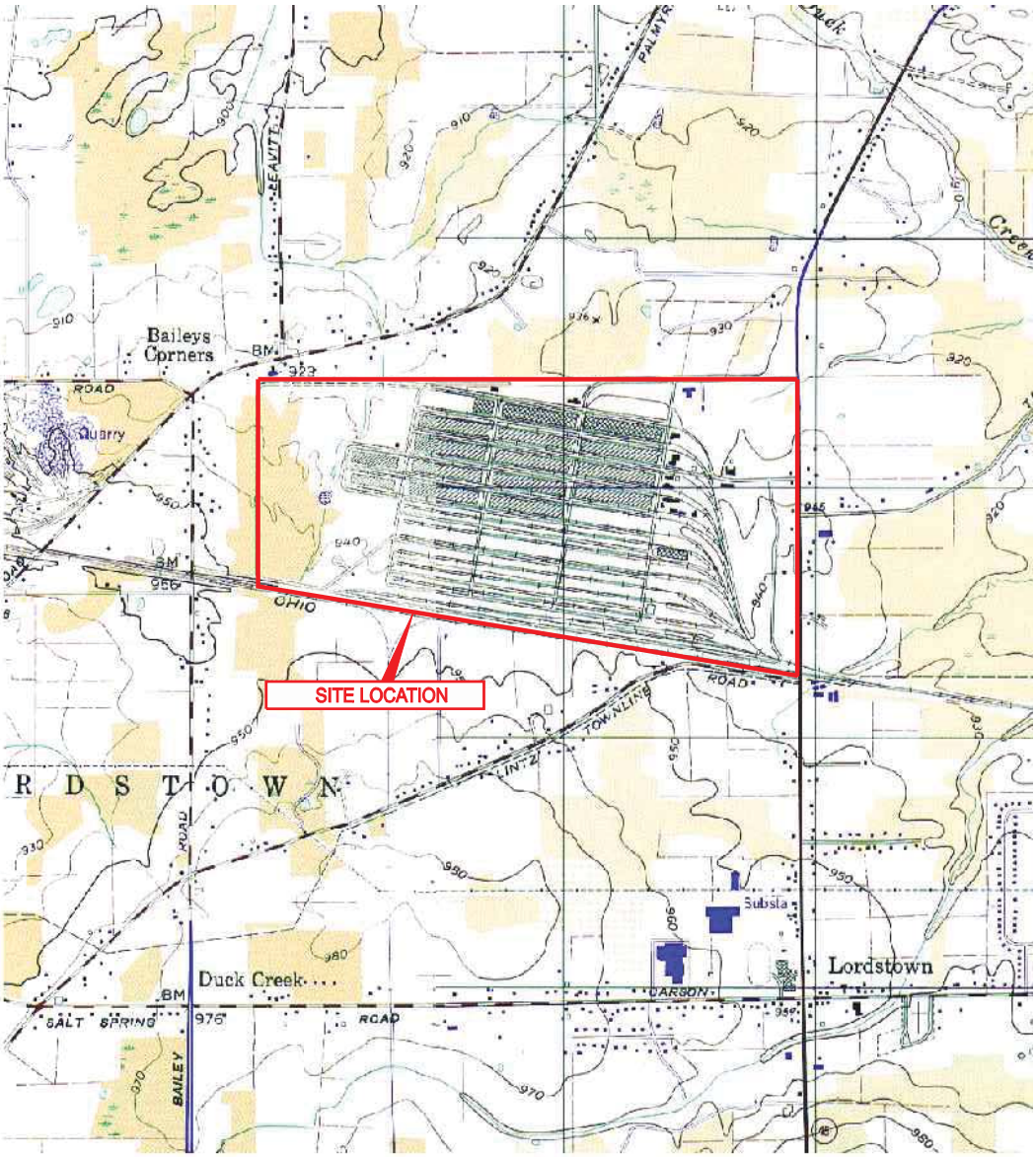
COPC - Chemical of Potential Concern

HI - Hazard Index

NA - Pathway not evaluated.

RME - Reasonable Maximum Exposure

Figures



Warren, Ohio and Newton Falls, Ohio
USGS Quadrangle, 7.5 minute series

North

0 1500 3000
Approximate scale in feet

FIGURE 1-1
Site Location Map
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

CH2MHILL

figure1-1_sitelocationmap.dgn

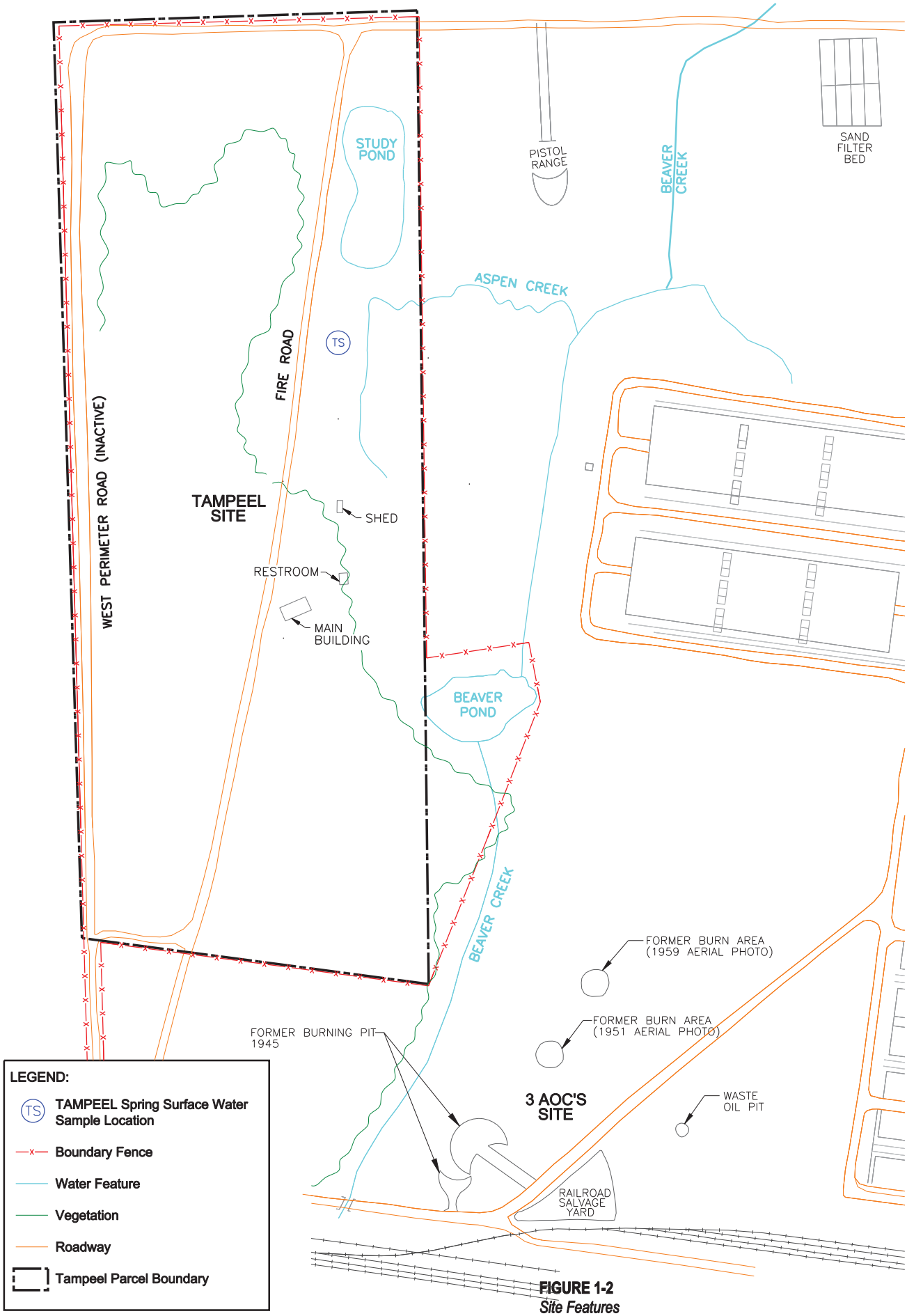


FIGURE 1-2
Site Features
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

lord_fig3-2.dgn

CH2MHILL

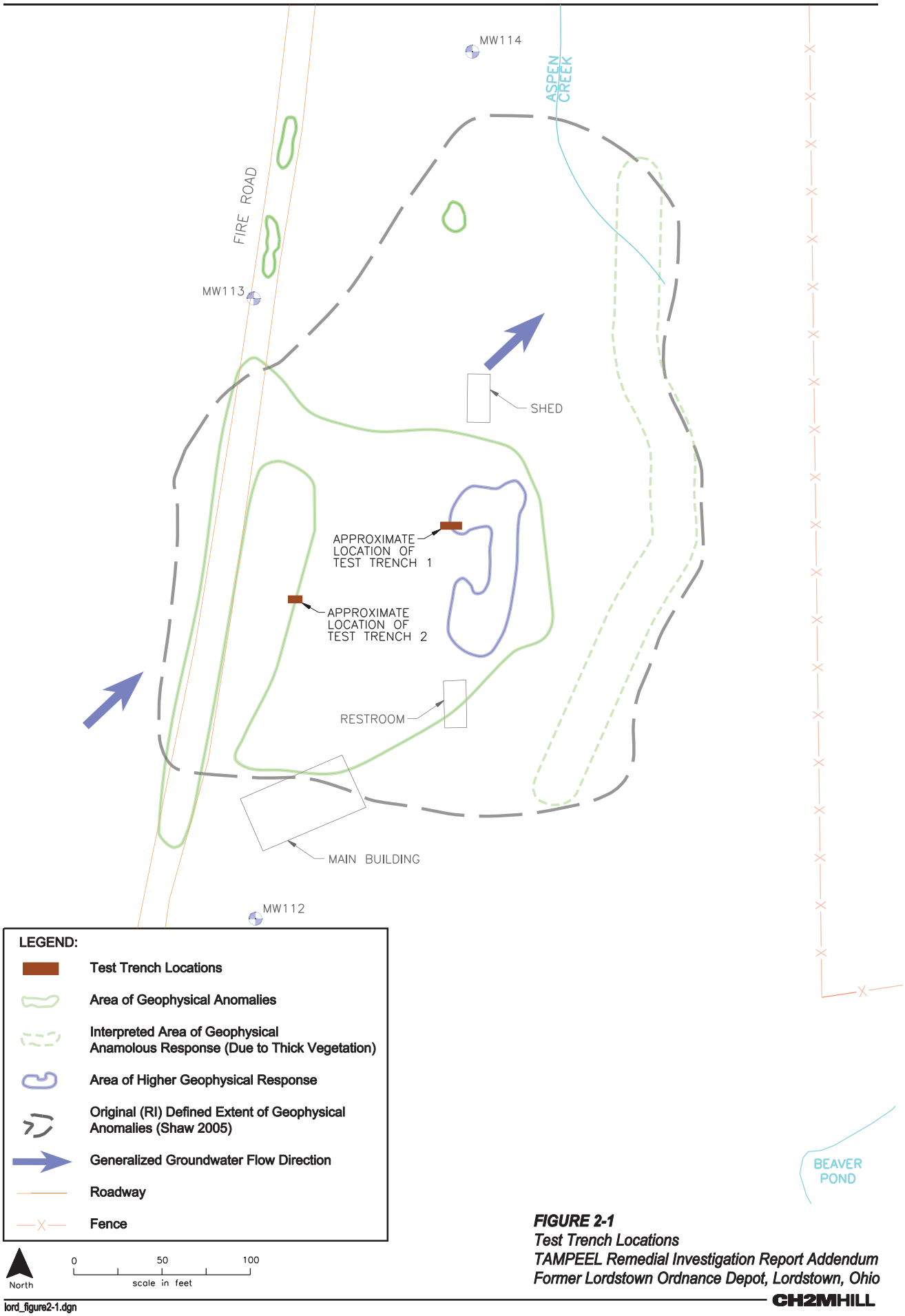


FIGURE 2-1
Test Trench Locations
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

lord_figure2-1.dgn

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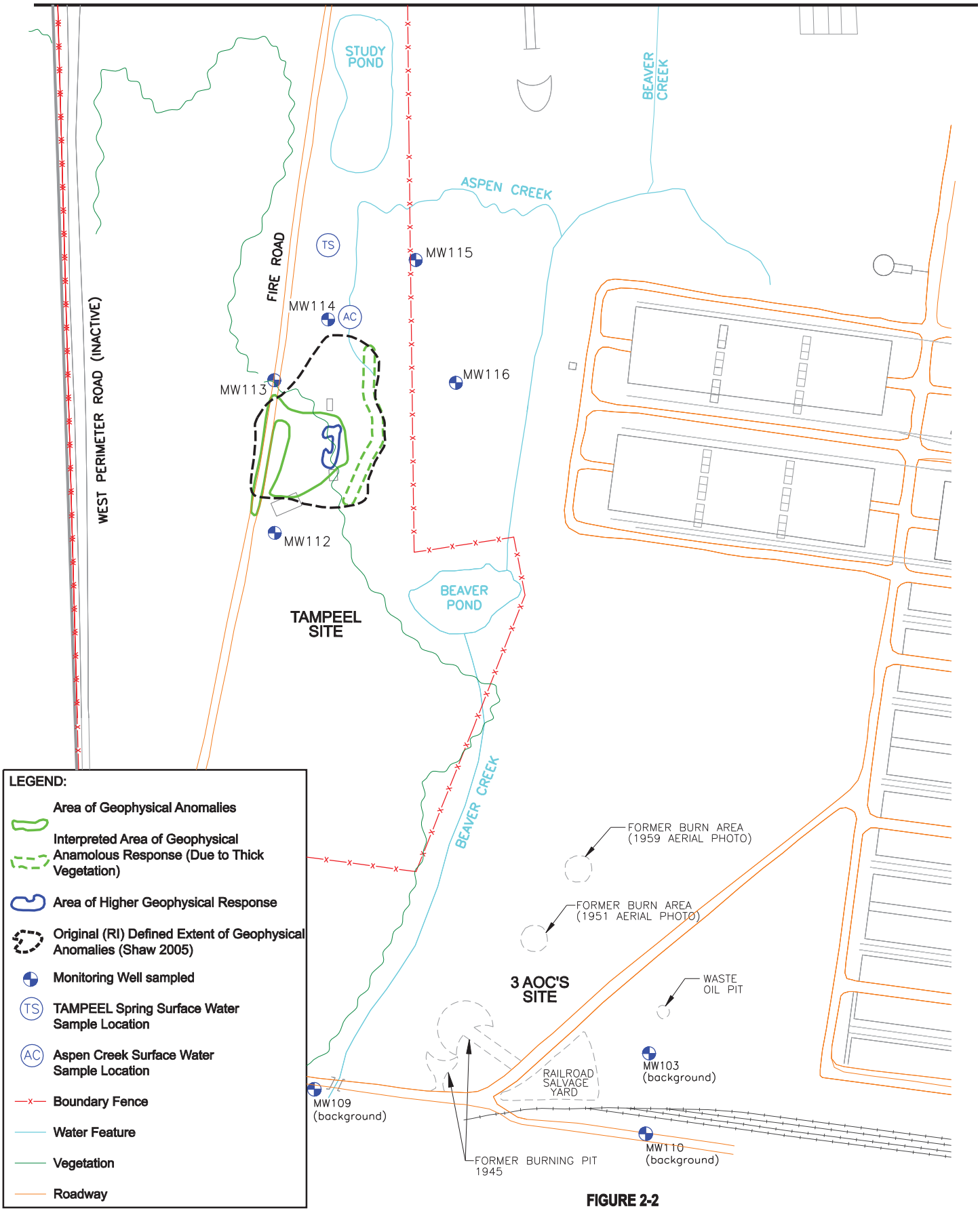

FIGURE 2-2
Groundwater Monitoring and Surface Water Sampling Locations
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

lord_fig3-2.dgn

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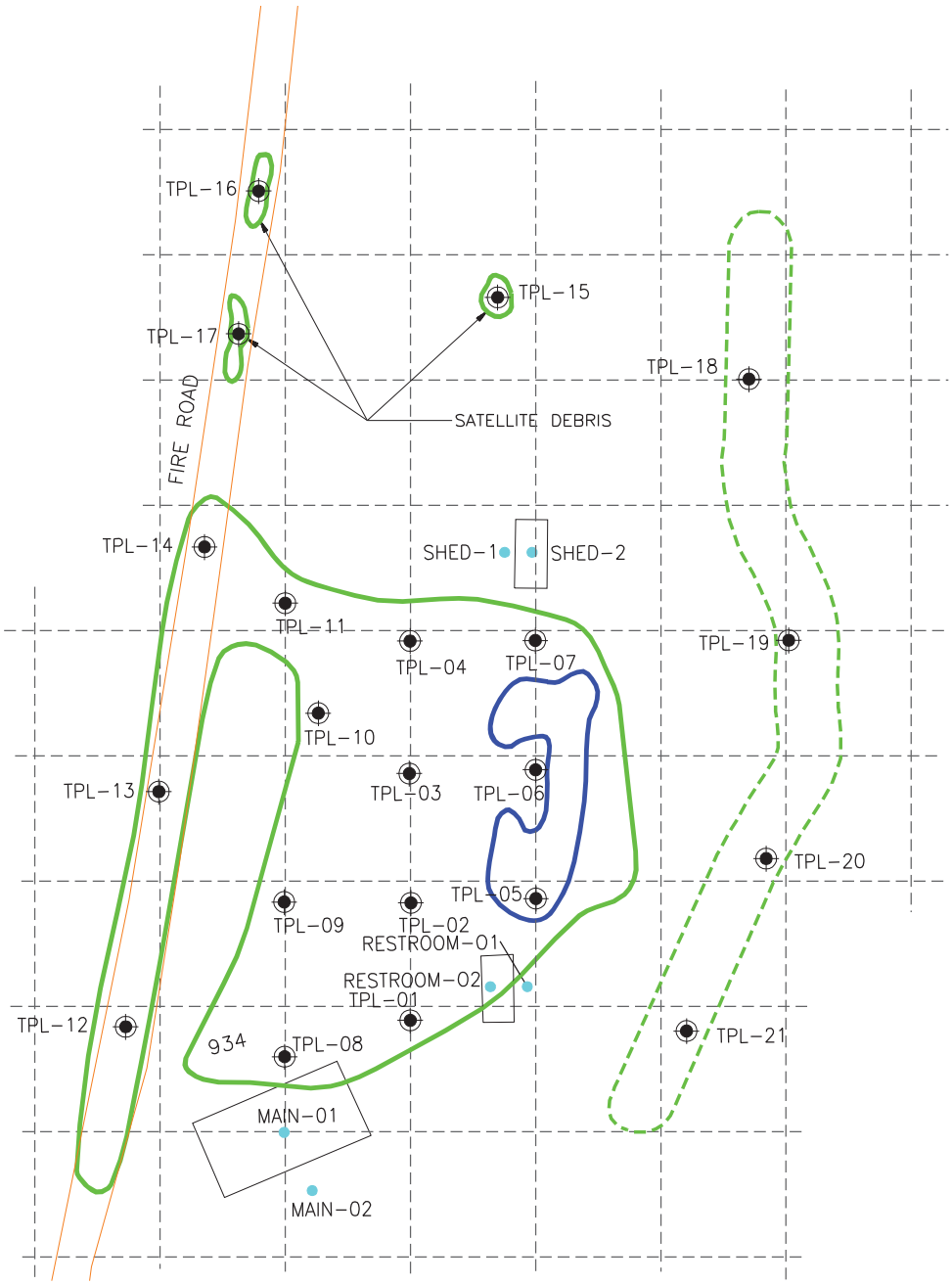

LEGEND:

- Actual Sampling Point
- Ambient Air Sampling Location (One Inside, One foundation Per Structure)
- Area of Strong EM Anomalies
- Interpreted Area of Geophysical Anamolous Response (Due to Thick Vegetation)
- Area of Higher Geophysical Response
- Grid (50' Spacing)
- Roadway

North

0 50 100
scale in feet

FIGURE 2-3
Landfill Gas Sampling Grid and Monitoring Points
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

lord_fig2-3.dgn

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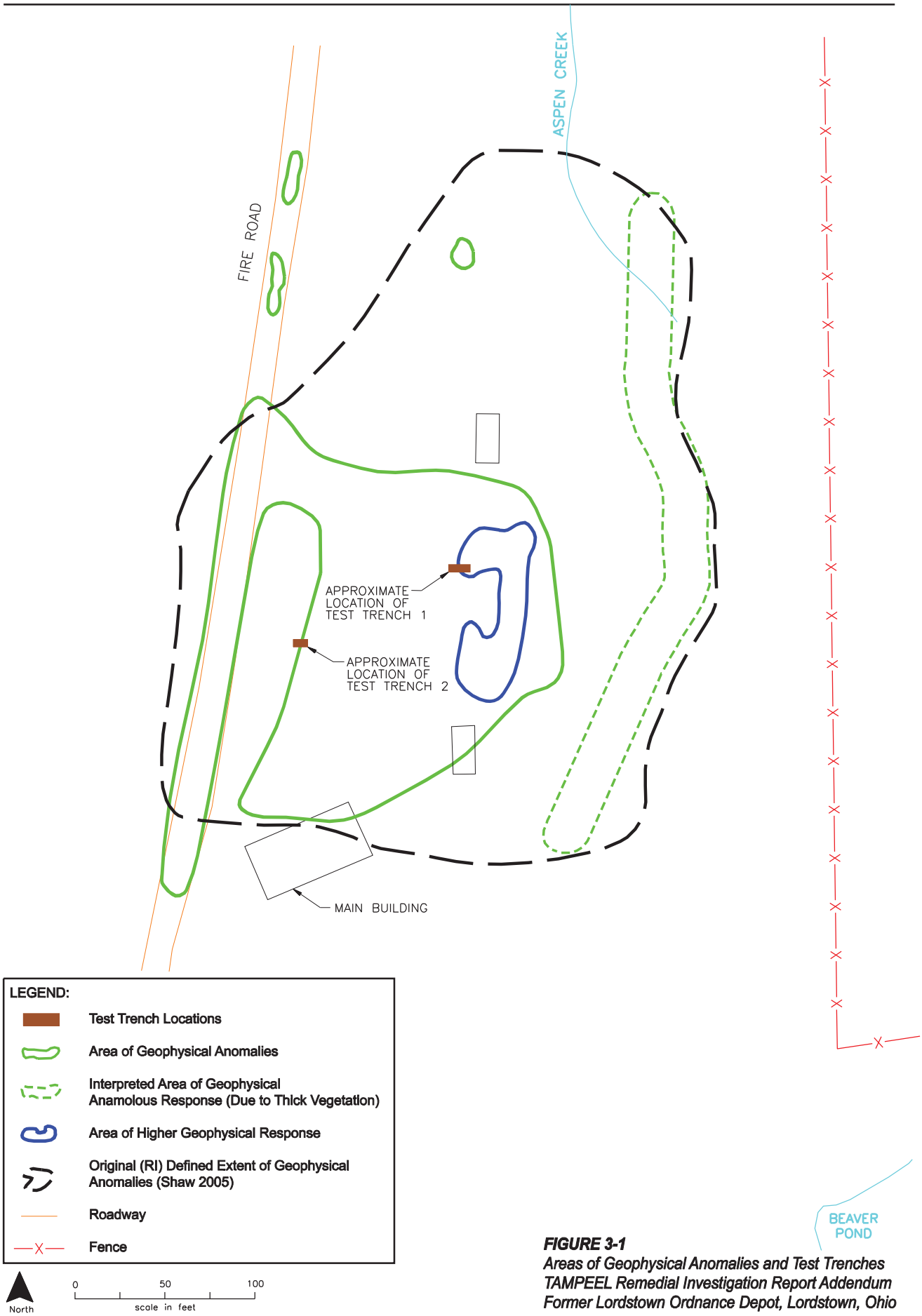

FIGURE 3-1
Areas of Geophysical Anomalies and Test Trenches
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

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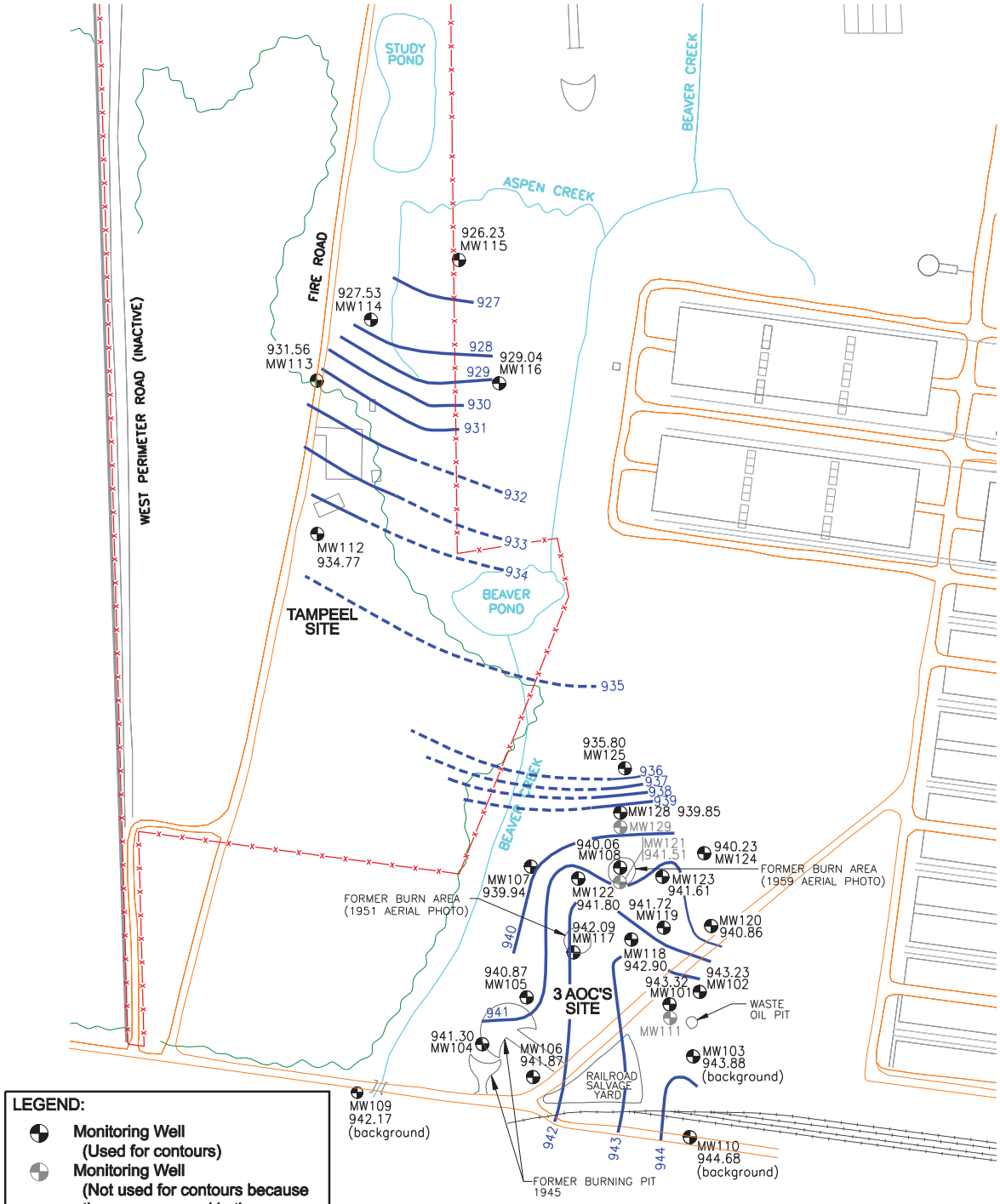

LEGEND:

- Monitoring Well (Used for contours)
- Monitoring Well (Not used for contours because they are screened in the deeper zone)
- MW105 Monitoring Well ID
- 942.17 Measured Groundwater Elevation
- Potentiometric Contour Lines (Contour Intervals = 1 Foot)
- Boundary Fence
- Surface Water Feature
- Vegetation
- Roadway

Note:
1. Potentiometric Contour Line Elevations are feet above mean sea level.

North

0 200 400
Approximate scale in feet

FIGURE 3-2
December 2007 Groundwater Potentiometric Surface Contour Map
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

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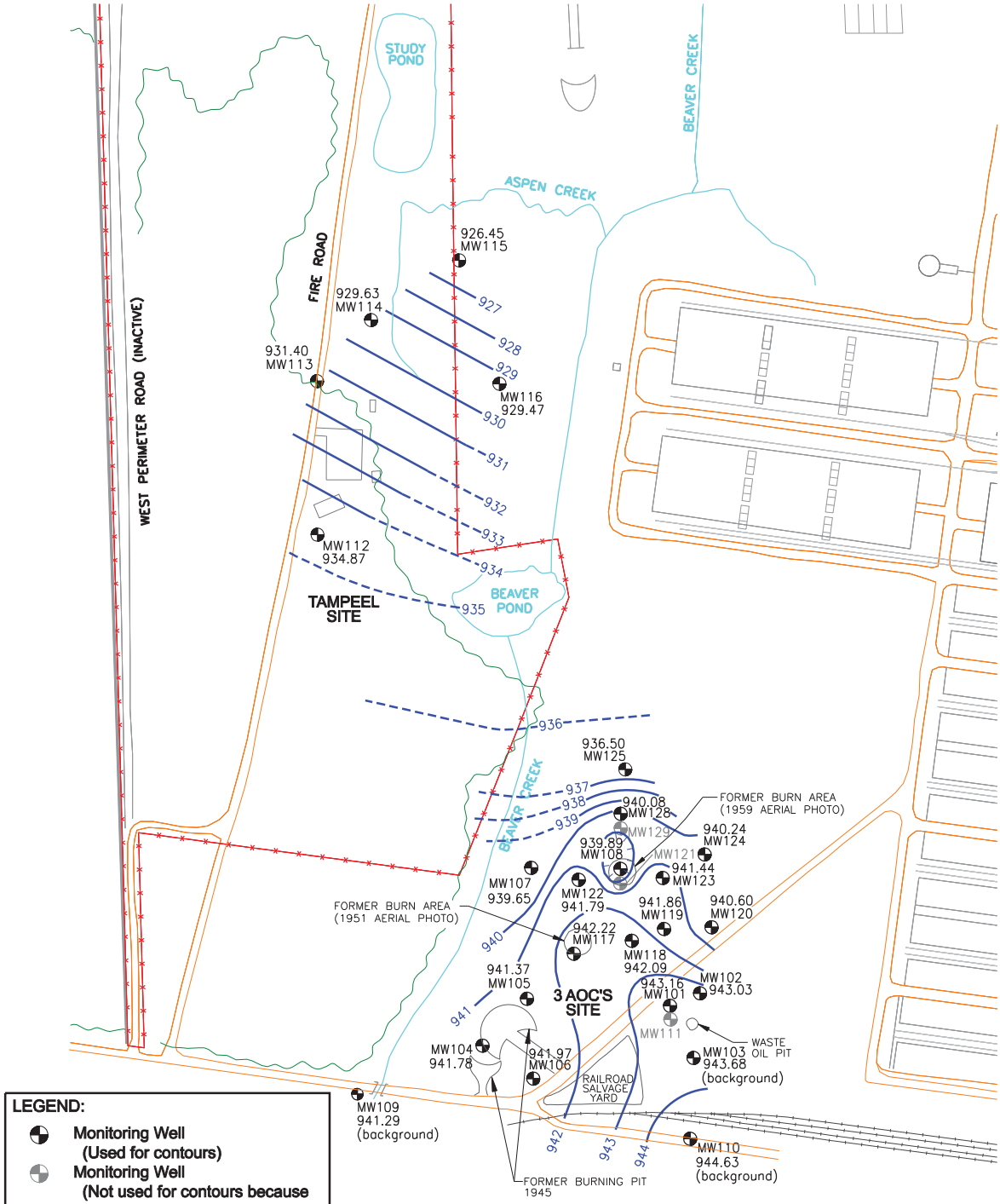

FIGURE 3-3

March 2008 Groundwater Potentiometric Surface Contour Map
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

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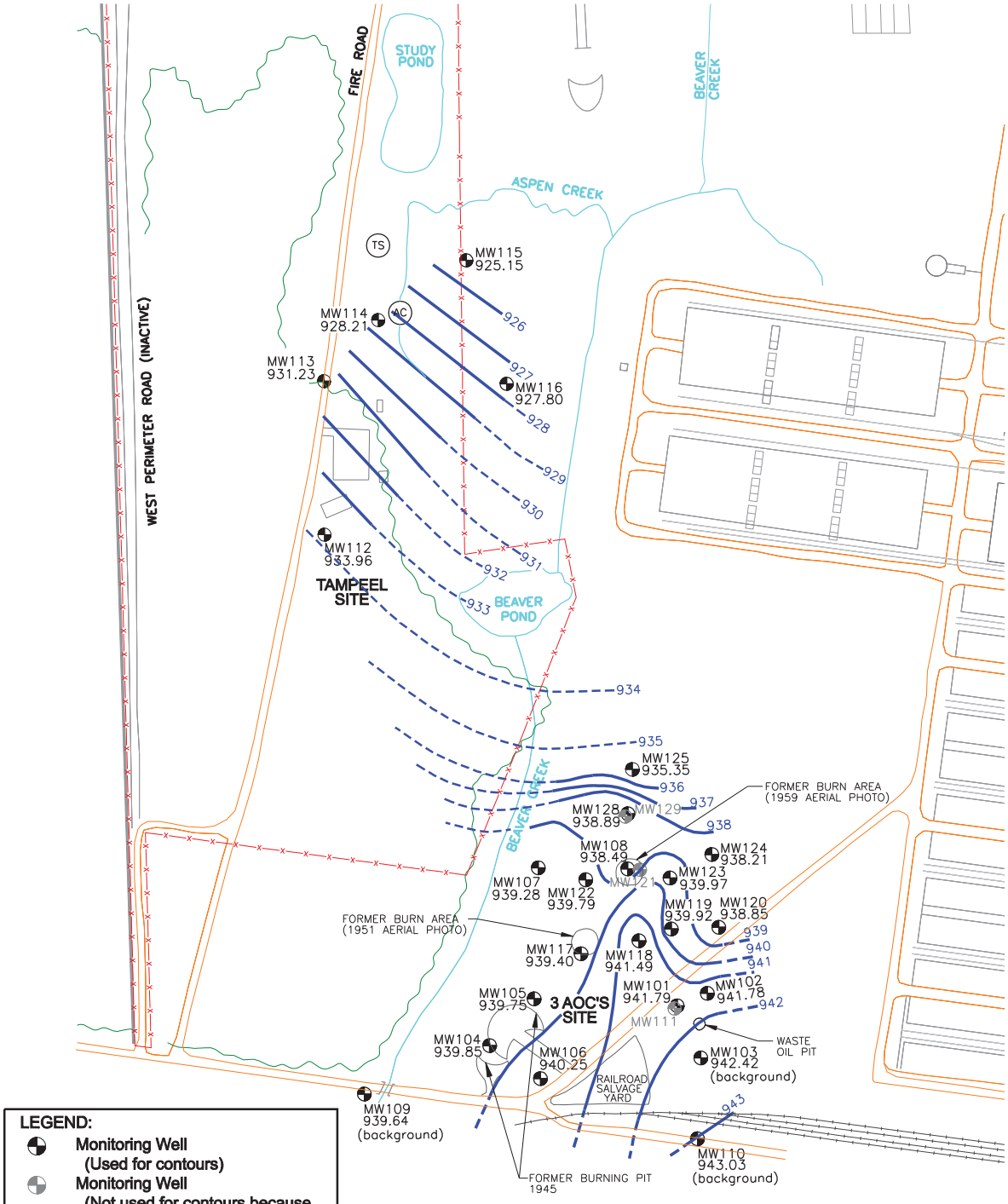
lord_fig3-3.dgn



LEGEND:

- Monitoring Well (Used for contours)
- Monitoring Well (Not used for contours because they are screened in the deeper zone)
- TS — TAMPEEL Spring Surface Water Sample Location
- AC — Aspen Creek Surface Water Sample Location
- 932 — Groundwater Elevation Contour (Contour Interval = 1 Foot)
- Boundary Fence
- Water Feature
- Vegetation
- Roadway

North

0 200 400

Approximate scale in feet

FIGURE 3-4

June 2008 Groundwater Potentiometric Surface Contour Map
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

lord_fig3-4.dgn

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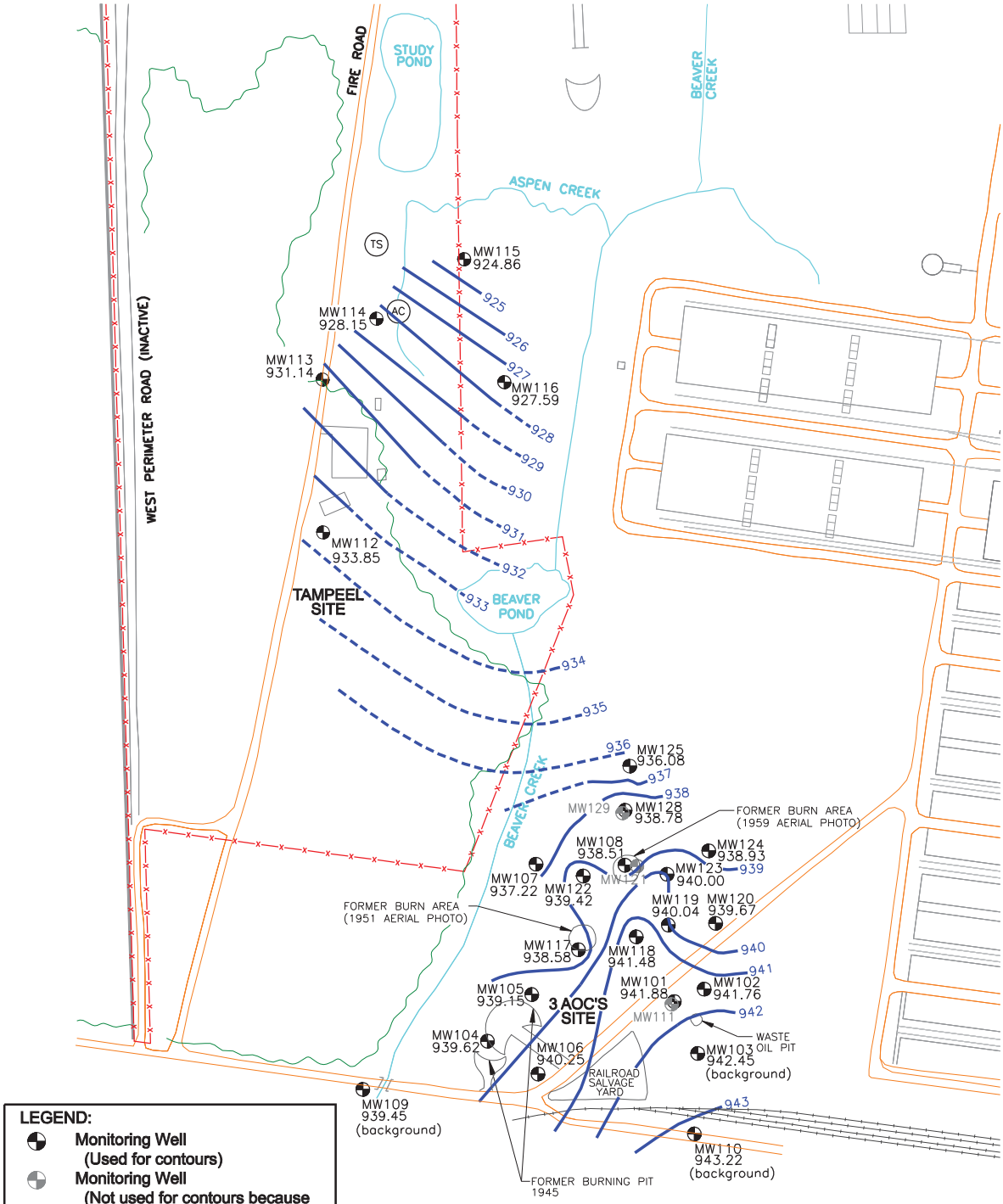

FIGURE 3-5

September 2008 Groundwater Potentiometric Surface Contour Map
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

lord_fig2.dgn

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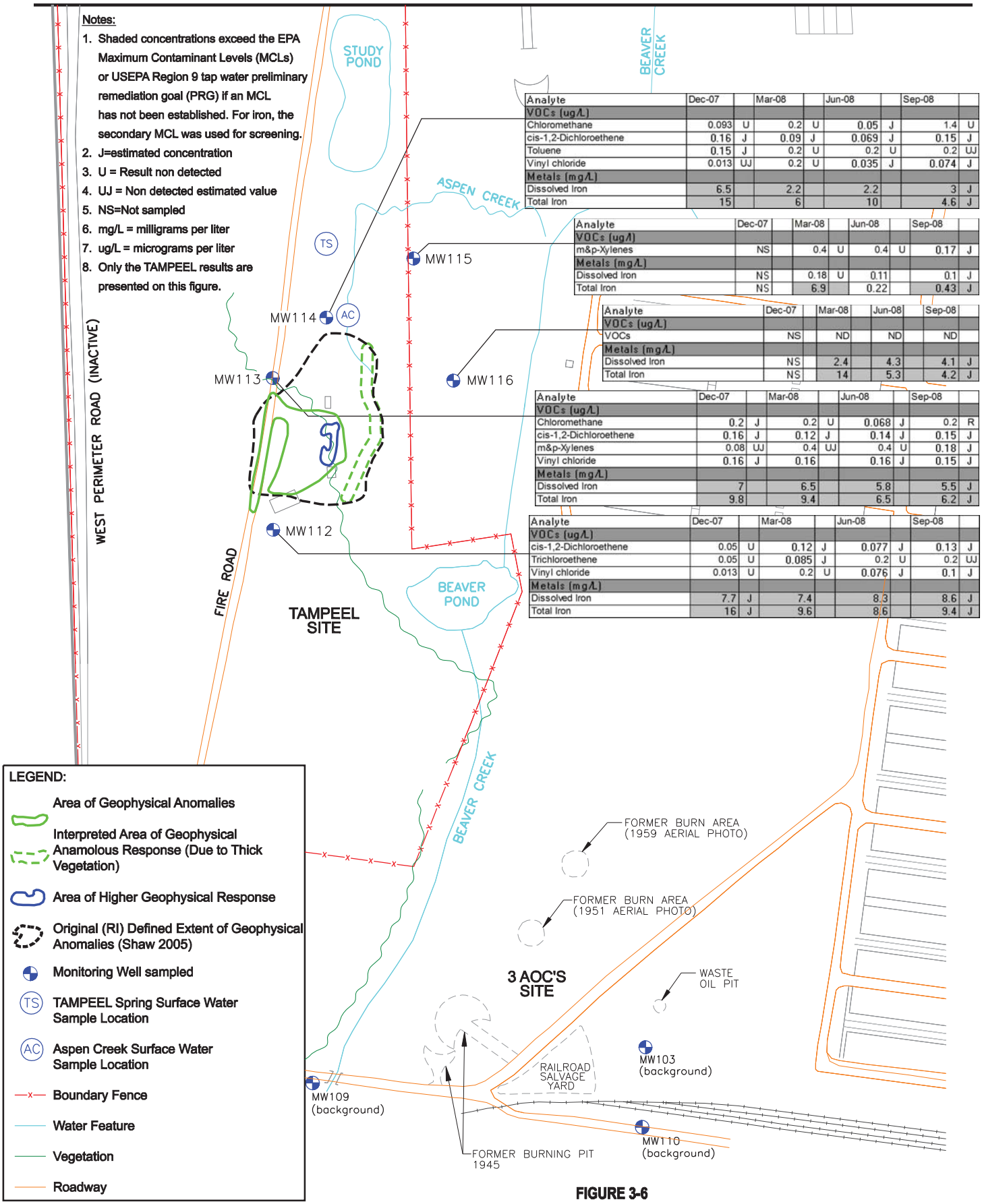
Notes:

1. Shaded concentrations exceed the EPA Maximum Contaminant Levels (MCLs) or USEPA Region 9 tap water preliminary remediation goal (PRG) if an MCL has not been established. For iron, the secondary MCL was used for screening.
2. J=estimated concentration
3. U = Result non detected
4. UJ = Non detected estimated value
5. NS=Not sampled
6. mg/L = milligrams per liter
7. ug/L = micrograms per liter
8. Only the TAMPEEL results are presented on this figure.



Analyte	Dec-07		Mar-08		Jun-08		Sep-08	
VOCs (ug/L)								
Chloromethane	0.093	U	0.2	U	0.05	J	1.4	U
cis-1,2-Dichloroethene	0.16	J	0.09	J	0.069	J	0.15	J
Toluene	0.15	J	0.2	U	0.2	U	0.2	UJ
Vinyl chloride	0.013	UJ	0.2	U	0.035	J	0.074	J
Metals (mg/L)								
Dissolved Iron	6.5		2.2		2.2		3	J
Total Iron	15		6		10		4.6	J

Analyte	Dec-07		Mar-08		Jun-08		Sep-08	
VOCs (ug/L)								
m&p-Xylenes	NS		0.4	U	0.4	U	0.17	J
Metals (mg/L)								
Dissolved Iron	NS		0.18	U	0.11		0.1	J
Total Iron	NS		6.9		0.22		0.43	J

Analyte	Dec-07	Mar-08	Jun-08	Sep-08
VOCs (ug/L)				
VOCs	NS	ND	ND	ND
Metals (mg/L)				
Dissolved Iron	NS	2.4	4.3	4.1 J
Total Iron	NS	14	5.3	4.2 J

Analyte	Dec-07		Mar-08		Jun-08		Sep-08	
VOCs (ug/L)								
Chloromethane	0.2	J	0.2	U	0.068	J	0.2	R
cis-1,2-Dichloroethene	0.16	J	0.12	J	0.14	J	0.15	J
m&p-Xylenes	0.08	UJ	0.4	UJ	0.4	U	0.18	J
Vinyl chloride	0.16	J	0.16		0.16	J	0.15	J
Metals (mg/L)								
Dissolved Iron	7		6.5		5.8		5.5	J
Total Iron	9.8		9.4		6.5		6.2	J

Analyte	Dec-07		Mar-08		Jun-08		Sep-08	
VOCs (ug/L)								
cis-1,2-Dichloroethene	0.05	U	0.12	J	0.077	J	0.13	J
Trichloroethene	0.05	U	0.085	J	0.2	U	0.2	UJ
Vinyl chloride	0.013	U	0.2	U	0.076	J	0.1	J
Metals (mg/L)								
Dissolved Iron	7.7	J	7.4		8.3		8.6	J
Total Iron	16	J	9.6		8.6		9.4	J

FIGURE 3-6

Groundwater Monitoring Analytical Results - Detected Constituents
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

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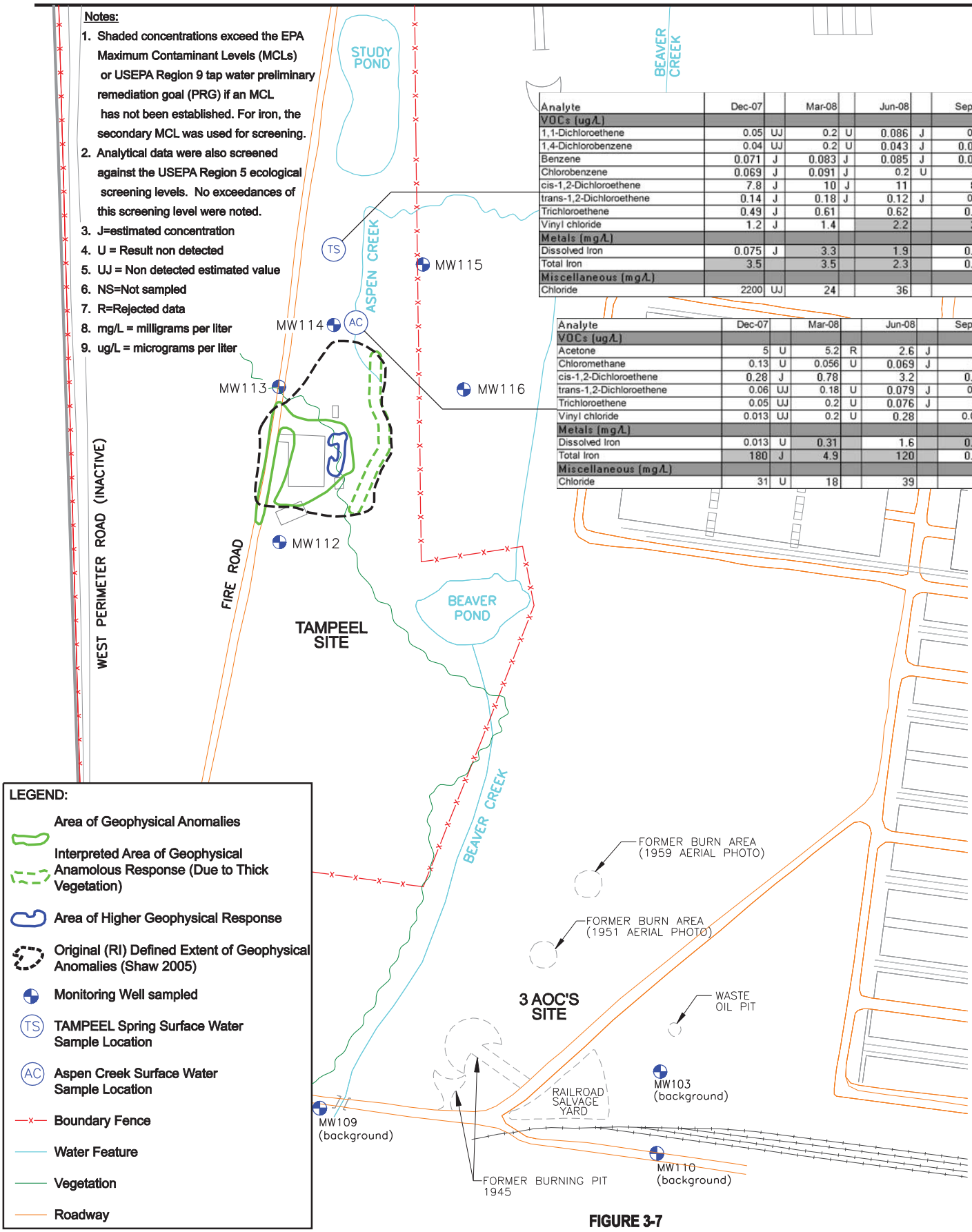
Notes:

1. Shaded concentrations exceed the EPA Maximum Contaminant Levels (MCLs) or USEPA Region 9 tap water preliminary remediation goal (PRG) if an MCL has not been established. For iron, the secondary MCL was used for screening.
2. Analytical data were also screened against the USEPA Region 5 ecological screening levels. No exceedances of this screening level were noted.
3. J=estimated concentration
4. U = Result non detected
5. UJ = Non detected estimated value
6. NS=Not sampled
7. R=Rejected data
8. mg/L = milligrams per liter
9. ug/L = micrograms per liter



Analyte	Dec-07		Mar-08		Jun-08		Sep-08	
VOCs (ug/L)								
1,1-Dichloroethene	0.05	UJ	0.2	U	0.086	J	0.05	U
1,4-Dichlorobenzene	0.04	UJ	0.2	U	0.043	J	0.044	J
Benzene	0.071	J	0.083	J	0.085	J	0.082	J
Chlorobenzene	0.069	J	0.091	J	0.2	U	0.2	U
cis-1,2-Dichloroethene	7.8	J	10	J	11		8.6	
trans-1,2-Dichloroethene	0.14	J	0.18	J	0.12	J	0.21	U
Trichloroethene	0.49	J	0.61		0.62		0.41	
Vinyl chloride	1.2	J	1.4		2.2		2.2	J
Metals (mg/L)								
Dissolved Iron	0.075	J	3.3		1.9		0.27	J
Total Iron	3.5		3.5		2.3		0.27	J
Miscellaneous (mg/L)								
Chloride	2200	UJ	24		36		33	

Analyte	Dec-07		Mar-08		Jun-08		Sep-08	
VOCs (ug/L)								
Acetone	5	U	5.2	R	2.6	J	3	J
Chloromethane	0.13	U	0.056	U	0.069	J	0.2	R
cis-1,2-Dichloroethene	0.28	J	0.78		3.2		0.38	
trans-1,2-Dichloroethene	0.06	UJ	0.18	U	0.079	J	0.21	U
Trichloroethene	0.05	UJ	0.2	U	0.076	J	0.2	U
Vinyl chloride	0.013	UJ	0.2	U	0.28		0.032	U
Metals (mg/L)								
Dissolved Iron	0.013	U	0.31		1.6		0.38	J
Total Iron	180	J	4.9		120		0.15	J
Miscellaneous (mg/L)								
Chloride	31	U	18		39		38	

FIGURE 3-7
Surface Water Monitoring Analytical Results - Detected Constituents
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

lord_fig3-7.dgn

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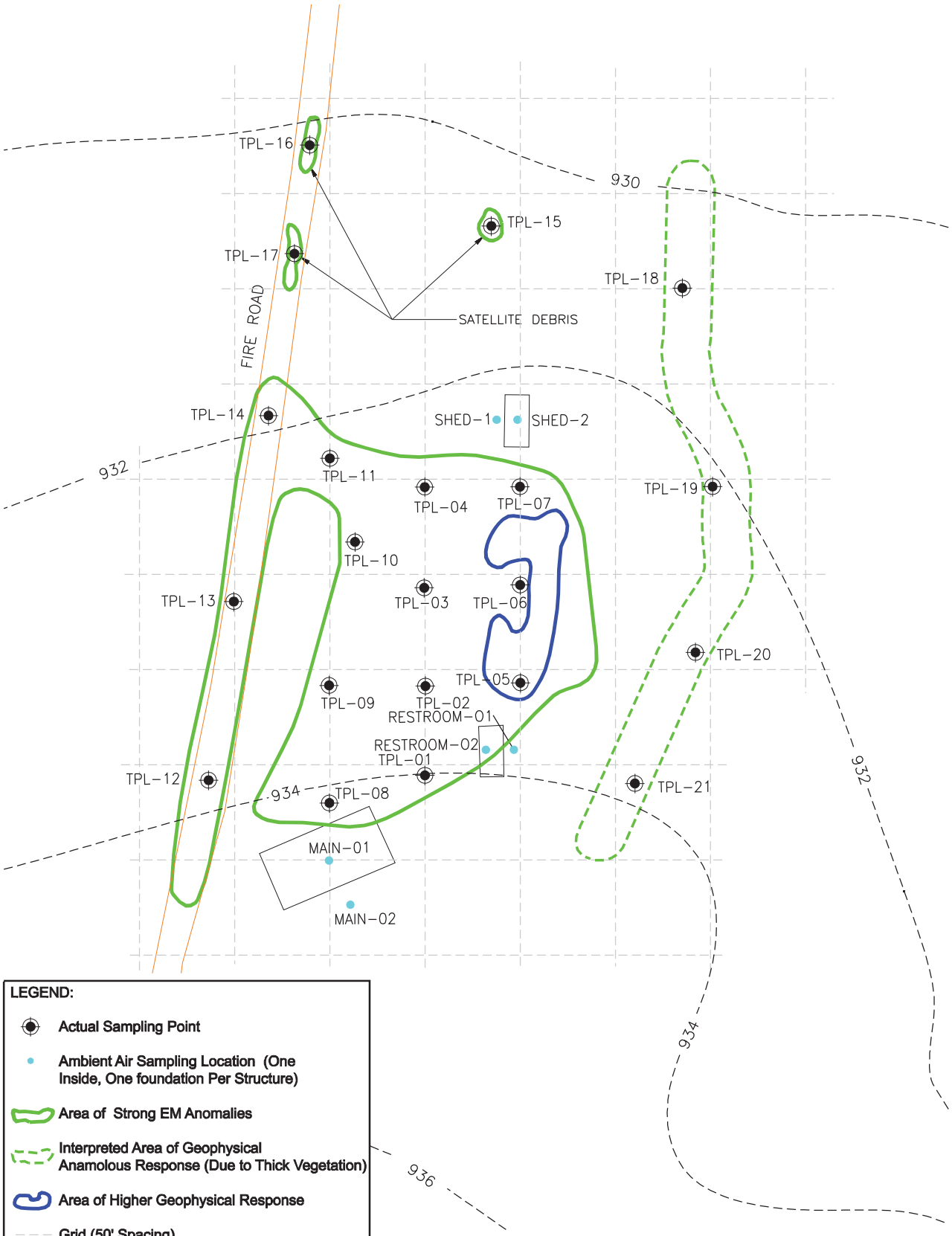

LEGEND:

- Actual Sampling Point
- Ambient Air Sampling Location (One Inside, One foundation Per Structure)
- Area of Strong EM Anomalies
- Interpreted Area of Geophysical Anamolous Response (Due to Thick Vegetation)
- Area of Higher Geophysical Response
- Grid (50' Spacing)
- Roadway

North

0 50 100
scale in feet

FIGURE 3-8
Quarterly Landfill Gas Sampling Points
TAMPEEL Remedial Investigation Report Addendum
Former Lordstown Ordnance Depot, Lordstown, Ohio

lord_fig4.dgn

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Appendix B
Test Trenching Photo Log

Figure 1 – Looking north, view of 0- to 2-foot of excavation material. Test Trench 1.

Figure 2 – Looking northeast, view of Test Trench 1, at 3-foot depth.

Figure 3 – Looking north, view of chain found at 4 feet near east end of Test Trench 1.

Figure 4 – Looking north, view of 4- to 5-foot excavation material, Test Trench 1.

Figure 5 – Looking north, view a piece of metal sticking out from sidewall, Test Trench 1.

Figure 6 – Looking northeast, view of excavation material pile, Test Trench 1. Pen is used to scale.

Figure 7 – Looking southeast, view of Test Trench 1 with construction debris extents.

Figure 8 – Looking south, Test Trench 1 view of 4- to 5-foot excavation material; wire, tin cans, and glass present.

Figure 9 – Looking northwest, view of excavation debris, Test Trench 1. Pen is used to scale.

Figure 10 – Looking east, Test Trench 2 view of debris inside test trench.

Figure 11 – View of the west end of the Test Trench 2.

Figure 12 – Looking northwest, view of the west end of the Test Trench 2.

Figure 13 – Looking northwest, Test Trench 2 view of excavation debris, mainly wood. Pen used to scale.

Figure 14 – View looking at the north wall of the Test Trench 2.

Figure 15 – View looking at the south wall of the Test Trench 2.