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FEASIBILITY STUDY REPORT

Former Plainwell, Inc. Mill Property
Plainwell, Michigan

Prepared for: Weyerhaeuser NR Company

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Executive Summary

This document presents the Feasibility Study (FS) Report for the former Plainwell, Inc. Mill property located at 200 Allegan Street in Plainwell, Michigan (Site). The FS report was prepared pursuant to the Statement of Work (SOW) for the Remedial Investigation (RI)/FS, and the terms of the Consent Decree for the Design and Implementation of Certain Response Actions at Operable Unit #4 and the Plainwell, Inc. Mill Property of the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site (Consent Decree), which became effective February 22, 2005. The RI Report was submitted to the United States Environmental Protection Agency (U.S. EPA) on June 20, 2011, with revisions submitted on April 20, 2012 (Revision 1), July 10, 2012 (Revision 1), October 19, 2012 (Revision 2), and February 4, 2013 (Revision 2), based on comments received from and discussions with representatives of the U.S. EPA and the Michigan Department of Environmental Quality (MDEQ). The RI Report was approved by U.S. EPA on February 26, 2013.

The FS Report is briefly summarized below under the following four headings:

1. Remedial Action Objectives (RAOs)
2. Technologies Screening
3. Alternatives Array
4. Detailed Analysis of Remedial Alternatives

Remedial Action Objectives

The RAOs provide the basis for developing cleanup options for the site that will be protective of human health and the environment. The RAOs are based on the information gathered during the RI, U.S. EPA guidance, applicable or relevant and appropriate requirements (ARARs), and the conclusions of the Baseline Human Health Risk Assessment (HHRA) and Screening-Level Ecological Risk Assessment (SLERA) including exposure pathways to be addressed and preliminary remediation goals (PRGs). RAOs were developed for soil, groundwater, and ecological receptors.

Technologies Screening

The technologies screening developed general response actions for soil, groundwater, and ecological resources consistent with the RAOs. Areas and/or volumes of contaminated media were estimated, as applicable. Remedial technology types and process options were identified for each applicable general response action for each of the media of interest. The process options that were identified to be technically implementable were evaluated in greater detail to select one or a small number of process options to represent each remedial technology type. Each process option was evaluated based on effectiveness, implementability, and cost.

Alternatives Array

The retained remedial technology types and process options were assembled into Site-wide comprehensive remedial alternatives by media.

The following remedial alternatives have been developed for soil:

- Soil Remedial Alternative 1 – No Action
- Soil Remedial Alternative 2 – Excavation, Consolidation, Capping, and Off-Site Disposal
  - Soil Remedial Alternative 2A to Meet Part 201 Generic Cleanup Criteria
  - Soil Remedial Alternative 2B to Meet Part 201 Generic Residential and Non-Residential Cleanup Criteria with Iterative Approach for Arsenic
  - Soil Remedial Alternative 2C to Meet 10^{-5} Risk Level for Arsenic with Iterative Approach
  - Soil Remedial Alternative 2D to Meet 10^{-6} Risk Level for Arsenic with Iterative Approach
- Soil Remedial Alternative 3 – Excavation and Off-Site Disposal
  - Soil Remedial Alternative 3A to Meet Part 201 Generic Cleanup Criteria
  - Soil Remedial Alternative 3B to Meet Part 201 Generic Residential and Non-Residential Cleanup Criteria with Iterative Approach for Arsenic
  - Soil Remedial Alternative 3C to Meet 10^{-5} Risk Level for Arsenic with Iterative Approach
  - Soil Remedial Alternative 3D to Meet 10^{-6} Risk Level for Arsenic with Iterative Approach

The following remedial alternatives have been developed for groundwater:

- Groundwater Remedial Alternative 1 – No Action
- Groundwater Remedial Alternative 2 – Institutional Controls

The remedial alternatives were screened against the short- and long-term aspects of effectiveness, implementability, and cost. All of the remedial alternatives, including No Action, were retained for detailed analysis.

Detailed Analysis of Remedial Alternatives

The detailed analysis of remedial alternatives consists of an assessment of the individual alternatives against each of nine evaluation criteria, and a comparative analysis that focuses on the relative performance of each alternative against those criteria.

With the exception of Soil Remedial Alternative 1 and Groundwater Remedial Alternative 1 (No Action), all of the alternatives address RAOs for identified exposure pathways in the same manner, but with varying degrees of effectiveness. All of the alternatives, except Soil Remedial Alternative 1 and

Groundwater Remedial Alternative 1(No Action) achieve protection at the completion of construction and with implementation of institutional controls.

The principal distinction between the Soil Remedial Alternative 2-Series options, and the Soil Remedial Alternative 3 -Series options is the on Site consolidation and capping of inorganics-impacted materials, as opposed to off-Site disposal of all impacted material. The principal distinction between the sub-series alternatives within the Soil Remedial Alternative 2 and 3-Series is the level to which soil excavation occurs (i.e., 10^{-5}, 10^{-6}, etc.).

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List of Acronyms and Abbreviations

ARAR	Applicable or Relevant and Appropriate Requirement
AST	Aboveground Storage Tank
BCOC	Bioaccumulative Chemical of Concern
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	Chemical/Contaminant of Concern
Consent Decree	Consent Decree for the Design and Implementation of Certain Response Actions at Operable Unit #4 and the Plainwell, Inc. Mill Property of the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
COPEC	Constituent of Potential Ecological Concern
CRA	Conestoga-Rovers & Associates
CSM	Conceptual Site Model
CWA	Clean Water Act
cy	Cubic Yards
DCC	Direct Contact Criteria
DOT	Department of Transportation
DRO	Diesel Range Organics
DWC	Drinking Water Criteria
DWPC	Drinking Water Protection Criteria
ERA	Environmental Risk Assessment
ERM	Environmental Resources Management
ESV	Ecological Screening Value
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act of 1972
FS	Feasibility Study
ft bgs	feet below ground surface
GCC	Groundwater Contact Criteria
GCPC	Groundwater Contact Protection Criteria
GRA	General Response Action
GRO	Gasoline Range Organics
GSIC	Groundwater Surface Water Interface Criteria
GSIPC	Groundwater Surface Water Interface Protection Criteria
GVIAC	Groundwater Volatilization to Indoor Air Inhalation Criteria

HHRA	Baseline Human Health Risk Assessment
HI	Hazard Index
HMW	High Molecular Weight
IC	Institutional Control
LMW	Low Molecular Weight
LOAEL	Lowest Observed Adverse Effect Level
LOD	Limit of Detection
MCL	Maximum Contaminant Limit or Michigan Compiled Laws
MDEQ	Michigan Department of Environmental Quality
MDOT	Michigan Department of Transportation
MGD	million gallons per day
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NOAEL	No Observed Adverse Effect Level
NOM	Notice of Migration
NPDES	National Pollutant Discharge Elimination System
NPV	Net Present Value
OM&M	Operations, Maintenance, and Monitoring
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbon
Part 201	Part 201, Environmental Remediation, 1994 PA 451 as amended
PCB	Polychlorinated Biphenyl
POC	Point of Compliance
POTW	Publicly Owned Treatment Works
PPM	parts per million
PRG	Preliminary Remediation Goal
PSIC	Particulate Soil Inhalation Criteria
RAO	Remedial Action Objective
RBC	Risk-Based Criteria
RBPRG	Risk-based Preliminary Remediation Goal
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
RMT	RMT, Inc.
SDBL	State Default Background Level
SDWA	Safe Drinking Water Act
Site	Former Plainwell, Inc. Mill Property

SLERA	Screening Level Ecological Risk Assessment
SOW	Statement of Work
SPLP	Synthetic Precipitation Leaching Procedure
SQ	Screening Quotient
SVIAC	Soil Volatilization to Indoor Air Inhalation Criteria
SVOC	Semi-Volatile Organic Compound
TBC	to be considered
TCRA	Time Critical Removal Action
TMV	Toxicity, mobility, or volume
TPH	Total Petroleum Hydrocarbons
TRV	Toxicity Reference Value
TSCA	Toxic Substances Control Act
UCL	Upper Confidence Limit
µg/L	micrograms per liter
U.S.	United States
USC	United States Code
U.S. EPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VAS	Vertical Aquifer Sampling
VOC	Volatile Organic Compound
VSIC	Volatile Soil Inhalation Criteria
Weyerhaeuser	Weyerhaeuser NR Company
WPCA	Water Pollution Control Act
WWTP	Wastewater Treatment Plant

Section 1.0 Introduction

This Feasibility Study (FS) Report has been prepared by Conestoga-Rovers & Associates (CRA), on behalf of Weyerhaeuser NR Company (Weyerhaeuser), for submittal to the United States Environmental Protection Agency (U.S. EPA) Region 5 for the former Plainwell, Inc. Mill property located at 200 Allegan Street in Plainwell, Michigan (Site). The FS report was prepared pursuant to the Statement of Work (SOW) for the Remedial Investigation (RI)/FS, and the terms of the Consent Decree for the Design and Implementation of Certain Response Actions at Operable Unit #4 and the Plainwell, Inc. Mill Property of the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site (Consent Decree), which became effective February 22, 2005. The Site location is presented on Figure 1.1. A Site plan is presented on Figure 1.2.

As approved by the U.S. EPA on August 6, 2008, the RI was implemented in a phased approach. As a result, the RI was completed under a multi-volume work plan for the Site. To facilitate the evaluation of the Site related information as part of the development and implementation of the RI, the Site was divided into three areas based on their locations and noted historical environmental impacts. The three historical operational areas are as follows:

- Area 1 – Former wastewater sludge dewatering lagoons and aeration basin area
- Area 2 – Mill Buildings area
- Area 3 – North central portion area

The results of the investigations conducted on the aforementioned areas were evaluated relative to the anticipated future use scenarios based on the current redevelopment plan, which consists of 11 primary redevelopment areas. The 11 redevelopment areas are as follows:

- Residential Area 1
- Residential Area 2
- Residential Area 3
- Residential Area 4
- Waterfront Plaza
- Mixed Residential/Commercial Area 1
- Mixed Residential/Commercial Area 2
- Commercial Area 1
- Commercial Area 2
- Commercial Area 3
- Commercial Area 4

A layout of the Site, showing the boundaries of the 11 redevelopment areas is provided on Figure 1.2. As defined in the Consent Decree, *"Mill Operation and Maintenance shall not include any operation and maintenance of any portion of the Mill Property, if any, located between the top of the banks of the Kalamazoo River and the middle of the Kalamazoo River stream bed. Any operation and maintenance of such river banks and adjacent stream bed sediments will be addressed as part of the remedial action to be developed by EPA for the Kalamazoo River Operable Unit"* (United States District Court Western District of Michigan Southern Division, 2005). Therefore, the Site includes areas up to the top of the Kalamazoo River bank. Areas associated with the Kalamazoo River (i.e., beyond the top of the riverbank and Mill Race) are not included in the scope of the RI/FS and are being addressed as part of the river remedial activities.

The RI Report was submitted to the U.S. EPA on June 20, 2011, with revisions submitted on April 20, 2012 (Revision 1), July 10, 2012 (Revision 1), October 19, 2012 (Revision 2), and February 4, 2013 (Revision 2), based on comments received from and discussions with representatives of the U.S. EPA and the Michigan Department of Environmental Quality (MDEQ). The RI Report was approved by U.S. EPA on February 26, 2013.

The FS Report was submitted to the U.S. EPA on June 27, 2013. On November 1, 2013 Weyerhaeuser received comments on the June 27, 2013 FS Report. Subsequently, representatives from the U.S. EPA, MDEQ, SulTRAC, Weyerhaeuser, and CRA participated in a conference call on November 13, 2013 related to the November 1, 2013 comments.

Responses to the November 1, 2013 comments related to the June 27, 2013 FS Report are addressed under separate cover and incorporated herein, as applicable.

1.1 Purpose of Report and Report Organization

The overall objective of the RI/FS was to identify and investigate any environmental concerns regarding prior use of the Site. As provided in the SOW, the objectives of the RI/FS for the Site are as follows:

- **To determine the nature and extent of the contamination to assess risk and support development and evaluation of remedial alternatives** – Collect the data necessary to adequately characterize the nature and extent of contamination at the Site, consistent with the requirements of the National Oil and Hazardous Substance Pollution Contingency Plan (March 8, 1990) (NCP) and the Consent Decree.
- **To evaluate potential risk** – Assess any current and potential risks to human health or the environment caused by the release or threatened release of hazardous substances, pollutants, or contaminants at or from the Site.

- **To develop and evaluate remedial alternatives** – Develop and evaluate alternatives, consistent with reasonably anticipated future land use(s) at the Site, for remedial action to prevent, mitigate, control, or eliminate risks posed by any release or threatened release of historical contaminants present at or from the Site.

The purpose of the FS Report is to analyze and present the relevant information needed to allow decision makers to select a site remedy that will protect human health and the environment. The FS Report has been prepared consistent with the anticipated future use scenarios based on the current redevelopment plan. In the event that the Site redevelopment plan is modified, the remedial alternatives may need to be reviewed, and potential re-issued, to ensure that the assumptions and scenarios evaluated are consistent with the proposed future use of the Site. In correspondence dated January 14, 2013, Weyerhaeuser submitted a revised RI/FS Schedule to U.S. EPA for the tasks remaining pursuant to the SOW. The revised RI/FS scheduled included the incorporation of Task 5: Identification of Remedial Action Objectives and Task 6: Development and Screening of Remedial Alternatives of the SOW into Task 7: Feasibility Study, consistent with the provisions of the SOW. U.S. EPA approved the consolidation of the remaining tasks and schedule on May 16, 2013.

The FS Report is organized as follows:

- Section 1.0 provides an introduction, including purpose and objectives, report organization, site background, and the nature and extent of contamination.
- Section 2.0 identifies the remedial action objectives (RAOs) that, when met, will result in control of potential risks to public health and the environment posed by contamination identified at the site. The RAOs specify the contaminants and media of interest, completed exposure pathways, and preliminary remediation goals (PRGs). The RAOs are based on existing data and information contained in the approved RI Report. Section 2.0 includes a discussion of contaminant sources, affected media, exposure pathways to be addressed, applicable or relevant and appropriate requirements (ARARs), and risk-based preliminary remediation goals (RBPRGs).
- Section 3.0 provides the technologies screening, including general response actions, areas and volumes of contaminated media, identification and technical implementability screening of remedial technology types and process options, and evaluation of process options.
- Section 4.0 provides the alternatives array, including assembly of retained technologies and process options into remedial alternatives, and screening of remedial alternatives based on effectiveness, implementability, and cost.
- Section 5.0 provides the detailed and comparative analysis of alternatives.
- Section 6.0 provides references.

1.2 Mill Description and Background

The background information for the Site provided below is summarized from the approved RI report (CRA, 2013a).

1.2.1 Mill Location and Physical Setting

The Site is located in the southeast ¼ of the northeast ¼ of Section 30, Town 1 North, Range 11 West, in the City of Plainwell, Allegan County, Michigan. The property address is 200 Allegan Street in Plainwell, Michigan and is currently zoned as Central Business District.

The Site comprises approximately 35.6 acres of land and consists of the former Plainwell, Inc. Mill property and buildings. Current Site features include the former Mill Buildings (Buildings 1, 1A, 2, 3, 4, 4A, 5, 5A, 5B, 6, 6A, 7, 9, 10, 11, 11A, 12, 14/5E, 15, 16, 17, 18 [remodeled] 19, 20, 26, 27, and the Train Shed), the former Specialty Minerals, Inc. Building (only the concrete pad of the former building remains), former Sludge Dewatering Building (remodeled), concrete pads, one 50,000-gallon water tower (one 50,000-gallon water tower was removed in 2012), ancillary support buildings (pump houses, former guard shacks, etc.), wooded areas, and asphalt-paved areas. The Site buildings and structures are presented on Figure 1.2. As part of the on-going property redevelopment activities, portions of the former Mill Buildings were razed between March and August 2012, or are undergoing renovation for future anticipated occupancy by the City of Plainwell in 2014. The former Sludge Dewatering Building was renovated for use by the City of Plainwell Public Safety Department, with occupancy in late 2012.

The former Mill is located on the eastern portion of the Site, adjacent to the Mill Race. The former Mill was comprised of approximately 25 adjacent and conjoined buildings, primarily constructed between 1900 and 1995. The former Specialty Minerals, Inc. Building previously occupied the south central portion of the Site, the former Sludge Dewatering Building (currently the City of Plainwell Public Safety Building) is located to the west/northwest of the former Specialty Minerals, Inc. Building, with the previous Quality Products Building formerly located adjacent to the west of the former Sludge Dewatering Building. The wastewater treatment plant (WWTP) buildings, clarifiers, and former aeration basin were located on the northwestern portion of the Site. The western portion of the Site along the riverbank contained the former wastewater settling lagoons. The remaining residuals from various settling lagoons were consolidated into the four westerly lagoons, which are presently covered with soil and vegetation. The other lagoons were dredged and backfilled with soil. Former lagoons were filled to approximately the adjacent grade. A vacant wooded lot is present on the southwest portion of the Site. A significant portion of the Site is covered with buildings or concrete and asphalt pavement; however, there are areas, primarily along the riverbank, where vegetation is present.

The Site is located in a mixed industrial, commercial, and residential area in the City of Plainwell, Allegan County, Michigan. According to the City of Plainwell 2002 Land Use Plan, existing land use in 2000

consisted of 40 percent Residential, 25 percent Vacant Land, 10 percent Industrial, 10 percent Institutional, 7 percent Commercial/Mixed Use, 6 percent Railroad Right-of-Way, and 2 percent Open Space/Recreational. The Site is bordered by the following properties:

North:	by the Kalamazoo River (to the top of the river bank as defined in the Consent Decree) and beyond by residential and commercial properties
East:	by the Mill Race and beyond by commercial properties and Main Street North
South:	by Allegan Street and beyond by residential and commercial properties
West:	by residential properties and the City of Plainwell Water Renewal Plant, and beyond by US-131

1.2.2 Present and Past Facility Operations and Disposal Practices

1.2.2.1 Historical Mill Operations

Based on historical information reviewed, the Mill Buildings Area (Commercial Area 4 and portions of Mixed Residential/Commercial Area 2, Commercial Area 3, and Residential Area 4) was originally developed for use as a paper mill in the early 1880s. The portions of the Site west of the Mill were acquired by various historical Site owners between 1950 and the mid-1980s for the purpose of expanding Mill operations and supporting associated WWTP and manufacturing processes. Throughout the 1900s, the Site underwent numerous improvements including the construction and removal of various buildings within Mill Buildings Area, and construction of WWTP buildings and lagoons and clarifiers (Residential Areas 1 through 4, Waterfront Plaza and Mixed Residential/Commercial Area 2), the former Specialty Minerals, Inc. Building (Mixed Residential/Commercial Area 1), the former Sludge Dewatering Building and the former Quality Products Building (Commercial Area 2). Residential structures occupied portions of the western area of the Site prior to their development for uses associated with Mill operations. The southwestern portion of the Site (Commercial Area 1) has always reportedly been vacant land or utilized for agricultural purposes.

The historical information reviewed indicates that various activities took place at the Site during its operation as a paper mill, including the manufacturing of paper products and recycling of paper materials (which included the process of deinking), on-Site parking, paper sludge dewatering, wastewater treatment, waste storage, raw materials storage, storage of coal, storage of fuel and hydraulic oils, and general manufacturing-related activities. Available historical information indicates that the Mill produced "coated and uncoated book and cover release base and technical specialty paper products." Precipitated calcium carbonate slurry used in the paper making process was developed for the Site and other surrounding paper mills in the former Specialty Minerals, Inc. Building. Process wastewater was treated in the on-Site WWTP and paper waste from Mill operations was treated in the former Sludge Dewatering Building. These operations were located in the central portion of the Site.

The former Quality Products Building, a retail store, and an associated metal storage building also operated in the central portion of the Site.

1.2.2.2 Historical Ownership and Operations

Within the Mill Buildings Area, papermaking operations began as early as 1884 and continued until Site closure in 2000. During this time period, ownership of the Site was passed between various entities, including Weyerhaeuser who owned and operated the Site for approximately 9 years (1961 to 1970). The last operating owner, Plainwell, Inc., filed for bankruptcy in 2000 and the City of Plainwell subsequently purchased the property on August 31, 2006 with the objective of redeveloping the Site. A summary of previous owners is provided below.

Dates (approximate)	Property Ownership
(at least) 1884	Lyon Paper Mill
1891 to 1956	Michigan Paper Company
1956 to 1961	Hamilton Paper Company
1961 to 1970	Weyerhaeuser Company
1970 to 1985	Phillip Morris (operated the Nicolet Paper Company)
1985 to 1987	Chesapeake Corporation
1987 to 1996	Simpson Plainwell Paper Company
1996 to 2000	Plainwell, Inc.
2006 to present	City of Plainwell (portion)
2011 to present	CRA 200 Allegan Street LLC (portion)

On July 18, 2011, ownership of the eastern portion of the Site, including Building 17 and Building 18, was transferred to CRA 200 Allegan Street LLC. Since that time, CRA 200 Allegan Street LLC has conducted renovation activities on offices and access ways. In March 2012, CRA moved its Kalamazoo, Michigan office staff into Building 17 and now occupies the top floor of this building.

The City of Plainwell is currently conducting renovation activities on office areas in Building 19 for the anticipated occupation of those areas in 2014 for City Hall operations. Additionally, the City of Plainwell is currently utilizing portions of the Site for storage of various seasonal decorative supplies, presentation rooms, fire hose testing, and ambulance driver testing. Demolition of the former Quality Products Building was conducted in October 2011, and demolition of the former Specialty Minerals Building was conducted in December 2011 on behalf of the City of Plainwell. Demolition activities associated with portions of the Mill Buildings were conducted on behalf of the City of Plainwell with oversight from the MDEQ for Buildings 3A, 9A, 9B, 9C, 9D, 9E, 9F, 23 and 28, the former 200,000-gallon fuel oil aboveground storage tank (AST) and associated area, the brine underground storage tanks (USTs), the former clay, starch, and ammonia AST areas, and one of the 50,000-gallon water towers from March to

August 2012. The former Sludge Dewatering Building was renovated for use by the City of Plainwell Public Safety Department, with occupancy in late 2012. Additional demolition activities were conducted on behalf of the City of Plainwell in November and December 2013. The former WWTP buildings and associated clarifiers were demolished along with Building 25. The bottoms of the clarifiers were left in place and cracked to allow for groundwater to seep below the concrete. The specific timing for demolition of other structures associated with the future redevelopment of the Site has not yet been established. Additionally, several buildings (1, 2, 3, 9, 10, 11, 11A, 12, 15, 16, 17, 18, 19 and 20) have been designated as historical structures and are not anticipated to be demolished; however, will be redeveloped/renovated/reused.

Prior to initiation of demolition activities in these areas, a non-intrusive decommissioning assessment was conducted by CRA on behalf of the City of Plainwell. Decommissioning assessment activities included a Site inspection and file review to evaluate potential areas of environmental concern, which included: potential polychlorinated biphenyl (PCB) materials; asbestos-containing materials; lead-based paint; mercury containing devices; pits, trenches and sumps; refrigerants; electrical systems; battery charging systems; utilities; lighting; air pollution control systems/exhaust stacks; batteries; miscellaneous hydraulic equipment; miscellaneous chemicals; and cathode ray tubes. Based on the decommissioning assessment inspection, initial sampling was conducted, with additional delineation completed for Buildings 3A, 9A, 9B, 9C, 9D, 9E, 9F, 23, and 28, the ASTs and associated areas, and the water tower prior to demolition. Sampling conducted for the structures included the collection of concrete, oil, paint, expansion joint, surface wipe, window caulk, and various other solid samples. The decommissioning and demolition work is being conducted under grants obtained by the City of Plainwell for the work.

The portions of the Site west of the Mill were acquired by various historical Site owners between 1950 and the mid-1980s for the purpose of expanding Mill operations and supporting associated WWTP and manufacturing processes. Throughout the 1900s, the Site underwent numerous improvements including the construction and removal of various buildings within Mill Buildings Area, construction of WWTP buildings, lagoons and clarifiers (Residential Areas 1 through 4, Waterfront Plaza and Mixed Residential/Commercial Area 2), the addition of the former Specialty Minerals, Inc. Building (Mixed Residential/Commercial Area 1), and the construction of the former Sludge Dewatering Building and the former Quality Products Building (Commercial Area 2). Residential structures occupied portions of the western area of the Site prior to their development for uses associated with Mill operations. The southwestern portion of the Site (Commercial Area 1) has always reportedly been vacant land or utilized for agricultural purposes.

The historical information reviewed indicates that various activities took place at the Site during its operation as a paper mill, including the manufacturing of paper products and recycling of paper materials (which included the process of deinking), on-Site parking, paper sludge dewatering,

wastewater treatment, waste storage, raw materials storage, storage of coal, storage of fuel and hydraulic oils, and general manufacturing-related activities. Available historical information indicates that the Mill produced "coated and uncoated book and cover release base and technical specialty paper products." Precipitated calcium carbonate slurry used in the paper making process was developed for the Site and other surrounding paper mills in the former Specialty Minerals, Inc. Building beginning in the early 1990s. Process wastewater was treated in the on-Site WWTP and paper waste from Mill operations was dewatered at the former Sludge Dewatering Building beginning in 1981. These operations were located in the central portion of the Site. The former Quality Products Building and a retail store also operated in the central portion of the Site.

1.2.2.3 Wastewater Treatment Operations

According to historical documentation, prior to 1954 wastewater generated during papermaking processes was discharged directly into the Kalamazoo River, without any treatment. Between 1954 and 1967, wastewater treatment was carried out through a primary clarifier that was constructed northwest of the Mill Buildings and a number of wastewater sludge dewatering lagoons on the northwest portion of the Site, as presented on Figure 1.2. After treatment of wastewater in the primary clarifier, the clarifier effluent was discharged into the Kalamazoo River and the clarifier underflow was discharged into the lagoons for further dewatering. The dewatered sludge in each lagoon was excavated and transported off Site to the 12th Street Landfill in Otsego Township, Michigan (RMT, 2006).

In 1967, a 1.85 million gallon plastic lined aeration basin and a secondary clarifier, collectively referred to herein as the secondary clarifier, were constructed at the Site to the east of the lagoons. The primary clarifier's effluent passed through an aeration basin prior to discharge to Kalamazoo River and biosludges from the aeration basins along with the primary clarifier underflow were discharged to the dewatering lagoons. The dewatered sludge continued to be excavated and transported off-Site for disposal at the 12th Street Landfill (RMT, 2006).

From 1981 until termination of operations at the Site in 2000, a new wastewater treatment facility, consisting of a new primary clarifier, a mechanical dewatering system, a new secondary clarifier, and an activated sludge treatment system was constructed. The primary clarifier and wastewater sludge dewatering lagoons were replaced with the new primary clarifier and a mechanical dewatering system, respectively. The new secondary clarifier and the activated sludge treatment system were constructed over several of the eastern lagoons (i.e., Lagoons D, E, and G) and the old primary clarifier was removed. The removal of the paper residuals from the dewatering lagoons continued across the Site and between 1981 and 1983, most of the remainder of the residuals in the lagoons were removed and transported off-Site for disposal or consolidated in western lagoons and covered with soil (RMT, 2006). In 1983, the former aeration system was taken out of service and partially backfilled.

Between October and December 2013, the primary clarifier, secondary clarifier, wastewater activated sludge tank, and associated ancillary buildings were razed on behalf of the City of Plainwell. The area was subsequently backfilled to grade.

1.2.2.4 Hazardous Substances

Based on the existing Site information, several Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulated hazardous substances were used, generated, and/or stored during the paper manufacturing operations.

Coal and Fly Ash

Coal was historically utilized as a fuel for steam generation for papermaking operations. Based on the review of historical aerial photographs, the north central portion of the Site (i.e., Residential Area 4) was used for exterior coal storage. Fly ash generated as a by-product of the combustion of coal in the boilers was mixed with wastewater sludge in the lagoons, prior to off-Site sludge disposal. Coal products, and waste generated from incineration of coal products, may contain metals and polycyclic aromatic hydrocarbons (PAHs) at various concentrations, depending on the origin of the coal. The resulting fly ash contains organic compounds and metals as noted in historical sample results.

Other Petroleum-Based Products

Several on-Site aboveground and underground storage tanks (ASTs/USTs) that historically contained petroleum products such as No. 6 fuel oil, gasoline, diesel, and kerosene were used at the Site.

Additives for the Papermaking Process

dditives, such as support products from the former Specialty Minerals Inc., were utilized during the papermaking process, along with cleaning products and petroleum products. Several paper machine additives, felt, and wire cleaning products containing volatile organic compounds (VOCs) and semi-volatile organic compound (SVOCs) were used during papermaking process at the Site.

Wastewater Sludge

Wastewater sludge was created during the papermaking processes on-Site. The sludge was removed from the facility and processed through a series of clarifiers before entering the former wastewater lagoons for dewatering. Once the paper sludge was dewatered, the material was then removed from the Site. In the late 1950s and early 1960s, paper that was de-inked and recycled at the Mill may have included carbonless copy paper containing PCBs and inks containing heavy metals. De-inking was discontinued at the Mill in 1963. The U.S. EPA's Technical and Procedural Amendments to the Toxic

Substances Control Act (TSCA) Regulations indicates that the potential for PCBs present within the wastewater sludge would not be regulated under TSCA.

Electrical Equipment and Hydraulic Lubricants

Some fluids used in electrical equipment (e.g., transformers and capacitors), as well as hydraulic fluids, commonly contained PCBs during the timeframe the Mill was operational. As documented in the previous reports for the Site, PCBs were historically used in transformers (7 removed), capacitors (41 removed), and in the hydraulic fluids of five elevators inside the mill buildings (fluids have been removed and disposed off Site).

1.2.2.5 Waste Storage and Disposal

The potentially regulated waste generated at the Site included used oil, spent solvents (prior to 1994), and wastewater sludge (RMT, 2006). All known disposal activities have been discussed above and landfilling activities associated with these waste streams are not known to have occurred on Site. PCBs that may be present in the paper residuals on Site are discussed in Section 1.2.2.4.

1.2.3 Geology/Hydrology/Hydrogeology

1.2.3.1 Regional and Site Geology

The regional geology consists of unconsolidated glacial materials deposited during the last advance/retreat of the Laurentide Ice Sheet during the Wisconsinan Glacial Stage. These deposits consist of various amounts of gravel, sand, silt, and clay and are approximately 200 feet thick in this region (Lillienthal, 1978). The Site is located within the Kalamazoo River valley, which was likely formed as large amounts of water drained from the ice sheet.

Underlying the glacial deposits, are the consolidated bedrock formations of the Michigan Basin (a bowl-shaped structure with its approximate center located well to the northeast of this region). The immediate bedrock formation underlying the glacial deposits at the Site is the Mississippian Coldwater Shale. The Coldwater consists predominantly of gray to bluish-gray shale and is approximately 800 feet thick in this region (Lillienthal, 1978).

The unconsolidated deposits beneath the Site consist of various amounts of fill material (debris, clay, sand) and native unconsolidated glacial material and recent alluvium (sands, gravels, silts, and clay). To better understand the surficial geology at the Site, eight cross-sections were prepared during the RI, based on observations during subsurface investigation results. The entire Site consists predominantly of poorly graded fill material of fine to coarse grained sand, with fine to coarse grained gravel. Interbedded within the fill material are discontinuous lenses of concrete and brick debris, paper residuals, and sandy clay. Generally, within 10 to 15 feet below ground surface (bgs) across the Site,

native materials consist of poorly graded, fine to medium sand with fine to coarse gravel and lenses of poorly graded fine to coarse grained gravel with sand. At one location, the native sand and gravel was found to be underlain by a layer of silt and clay at approximately 32 feet bgs. Previous production supply wells once utilized in the manufacturing process also encountered this silt and clay unit at approximately 30 to 40 feet bgs. No records were found of any borings penetrating this unit at the Site.

1.2.3.2 Regional and Site Hydrology

The Site lies within the lower one-third of the Kalamazoo River drainage basin. This surface water drainage basin drains over 2,000 square miles in southwestern Michigan. The Kalamazoo River drainage basin begins to the southeast in Hillsdale County and discharges into Lake Allegan and ultimately into Lake Michigan near the City of Saugatuck to the northwest of the Site (approximately 162 miles in total river length: Kalamazoo River Watershed Council, 2007).

Locally, the Kalamazoo River controls most surface water drainage from the uplands and flows from the southeast to the northwest along the northern property boundary of the Site. From the earliest development of the property, on which the former Mill is currently located, a man-made drainage way (i.e., Mill Race) was constructed to bring water from the Kalamazoo River (south of the City of Plainwell – upstream) immediately adjacent to the mill property to the east. The City of Plainwell is known as the "Island City" due to the fact that the majority of the city is located between the Kalamazoo River and the Mill Race.

The Mill Race is dammed just prior to its confluence back to the Kalamazoo River. Hydraulically, the Mill Race is approximately 6 feet higher than the Kalamazoo River. A portion of the Mill Race is diverted to run beneath the former Mill prior to the dam. The diverted portion of the Mill Race runs under Building 20 and the difference in hydraulic head was captured by a turbine to generate electricity to power the Mill property during operations prior to rejoining the Kalamazoo River downstream of the confluence of the Mill Race and Kalamazoo River. The divergence of the Mill Race beneath the building prior to the Mill Race entering the Kalamazoo River, and the reintroduction of the flow associated with the divergence after the confluence of the Mill Race and Kalamazoo River may impact the interaction between the associated surface water bodies and groundwater in this portion of the Site, as inferred in figures presented in Appendix C.

With the removal of the Plainwell Impoundment downstream of the project Site, river stage levels would be primarily influenced by precipitation events or drought. There appears to be a direct relationship of the surface water in the Mill Race recharging the groundwater to the east of the Site. This recharge directly influences the direction of groundwater flow and hydraulic gradients across the Site. In addition, a portion of the Kalamazoo River may also be a source of local recharge to the aquifer in the immediate area of the confluence of the Mill Race with the Kalamazoo River. Based on available

information to date, groundwater appears to discharge to the Kalamazoo River in the downgradient (westerly) portion of the Site.

There are no other surface water drainage features located within the vicinity that would be expected to affect the hydrology at the Site.

During the implementation of the Phase I RI activities, three staff gauges (SG-1 through SG-3) were installed in the Mill Race (SG-1) and the Kalamazoo River (SG-2 and SG-3). The staff gauges could not be located during the implementation of the Phase II RI activities and were subsequently reinstalled. One additional staff gauge (SG-4) was installed during the Additional RI activities immediately downstream of the confluence of the Mill Race and the Kalamazoo River.

1.2.3.3 Regional and Site Hydrogeology

Regionally, the groundwater flow directions approximate the surface water drainage basin, typically mimicking the topography. The Kalamazoo River is typically the discharge point for groundwater located within this groundwater drainage basin.

Based on information collected to date and presented in the RI Report, the uppermost, unconfined, water table aquifer present on the east side of the Site appears to be recharged by the surface water within the Mill Race as a result of the dam located east of the Site. On the Site-wide scale, groundwater flow within this water table aquifer is predominantly to the west from the Mill Race (flowing sub-parallel to the flow of the Kalamazoo River) across the Site. Review of the groundwater-surface water interaction indicates that the Kalamazoo River acts as a semi-hydraulic barrier at this scale (i.e., the river elevation is higher than the adjacent groundwater elevation along most of the frontage along the Site). The hydraulic gradient along the northwestern portion of the Site, at times of higher groundwater elevations (i.e., February 2010 and March 2012), appears to be discharging to the Kalamazoo River, while the majority of the Site maintains the semi-hydraulic barrier with the surface water primarily at greater elevations than the adjacent groundwater. The actual groundwater-surface water interaction is a more complicated dynamic system at a local scale, with interactions to some degree where surface water and the groundwater are likely mixing. This can be inferred near monitoring well MW-7, where it appears there may be local groundwater discharge to the Kalamazoo River on an intermittent basis. Information regarding groundwater flow is presented in the RI and FS Reports. Groundwater contour maps from the RI Report for January 2010, February 2010, March 2012, August 2012, and October 2012 are included in Appendix C for reference. Additionally, groundwater contour maps for April, July, and September 2013 were prepared subsequent to the submittal and approval of the RI Report and are included in Appendix C for reference.

Vertical hydraulic gradients within the aquifer itself are minimal with a slight upward component at monitoring wells MW-4S/D of 0.007 ft./ft. and at monitoring wells MW-12S/D of 0.001 ft./ft, and a slight downward gradient at monitoring wells MW-21S/D of 0.002 ft./ft.

Based on static water levels measured over all measurement dates, the change in head from east to west across the Site is consistent at approximately 2.5 feet over a span of approximately 2,400 feet horizontally, thereby giving an average hydraulic gradient of 0.001 ft./ft.

1.2.3.4 Current and Past Groundwater Use in the Mill Area

The City of Plainwell provides potable water to the surrounding area via three wells, which draw groundwater from the regional aquifer. Potable water service has been disconnected to all Mill Buildings except for Building No. 17, due to the current operational status of the Site.

According to information reviewed, non-potable water for Mill operations was historically supplied by seven on-Site groundwater wells. According to information in the Phase I RI Work Plan (RMT, 2008), this included four process water wells, which pumped approximately 2.8 million gallons per day (MGD) to support paper making operations. Two additional wells supplied water for fire suppression purposes and one well, used for non-sanitary purposes, was present near the wastewater treatment system.

Four wells (identified as 3, 4, 5, and 6) are depicted west of the Mill in historical drawings dated 1969 and reviewed by CRA. Well No. 3 is depicted west of the former engine room and boiler room area and Wells 4, 5, and 6 are depicted in the west yard near the railroad spurs. Based on review of available well records, Well No. 5 was installed in 1964 (rescreened in 1989) and a well in the same location identified on historical drawings as Well No. 6 was installed in 1974. The use of this well was identified as "industrial" on the well record. One fire well (also referred to as Well No. 6 on the well record) was installed south of Mill Building 17 in 1967. A second fire well was installed north of Building 11 and East of Building 11A in 1988. A Type IIa Public well, identified as Well No. 8 on the well record, was installed in 1989.

Based on observations during on-Site activities, Well Nos. 3 and 4 are no longer present. No documentation regarding the abandonment of these wells was available for review by CRA. Well No. 6 (near Scott Street, identified in previous reports as "production well") is periodically utilized by the City of Plainwell for fire hose testing activities. The "fire well" to the northeast of the Mill Building and Well No. 8 are currently present at the Site, but not in use. The current presence of the "fire well" (to the south of Mill Building 17, identified in previous reports as "Well No. 6") could not be confirmed.

1.2.4 Nature and Extent of Contamination

1.2.4.1 Locations and Character of Potential Sources of Contamination

Based on the historical land uses of the property, three specific historical operational areas were evaluated during the RI, as described in Sections 2.0 and 5.0 of the RI Report (CRA, 2013a) and as summarized below.

Former Lagoon and Wastewater Treatment Area (Area 1)

Historical land uses of this area included the treatment and dewatering of wastewater sludge prior to off-Site disposal. The area includes 14 former wastewater sludge dewatering lagoons (i.e., Lagoons A through L), primary clarifier, former secondary clarifier, former wastewater treatment building activated sludge tank, former aeration basin, secondary clarifier, and activated sludge treatment system. This operational area was identified as Area 1 in the Phase II RI Work Plan. Area 1 includes redevelopment areas Residential Areas 1 and 2 and Commercial Area 1, and a portion of Residential Area 3. Figure 1.2 shows the operational areas (i.e., Area 1, etc.) relative to the redevelopment areas (i.e., Residential Area 1, etc.).

Plainwell Mill Building Area (Area 2)

This area includes the former primary clarifier, Mill Buildings, and two former and current water towers. The primary clarifier was constructed northwest of the mill buildings and treated wastewater from the mill buildings. Prior to 1967, the effluent of the clarifier discharged to the Kalamazoo River and the underflow discharged to the dewatering lagoons. By introduction of secondary clarifier and aeration basin in 1967, the effluent of former primary clarifier was processed through the aeration basin and then into the secondary clarifier before being discharged to the Kalamazoo River. The underflow of both the former primary and secondary clarifier was discharged into the dewatering lagoons. Suspected areas relating to historical operations within the Mill Buildings are also considered as potential source areas. This operational area was identified as Area 2 in the Phase II RI Work Plan. Area 2 includes redevelopment area Commercial Area 4, and portions of Mixed Residential/Commercial Area 2, Commercial Area 3, and Residential Area 4. Figure 1.2 shows the operational areas (i.e., Area 1, etc.) relative to the redevelopment areas (i.e., Residential Area 1, etc.).

Central Portion of the Site (Area 3)

This area includes the former Quality Products and Sludge Dewatering buildings, the former Specialty Minerals, Inc. building, the former coal pile storage area, the former 200,000-gallon No. 6 fuel oil AST, former Coal Tunnel area, and the remainder of the areas located in central portion of the Site. These operational areas were identified as Areas 3, 3A, 3B, 3C, 3D, and 3E, respectively, in the Phase II RI Work Plan. Area 3 includes portions of redevelopment areas Waterfront Plaza, Residential Area 4, Mixed Residential/Commercial Area 1, and Commercial Area 3. Area 3A includes portions of redevelopment

areas Residential Area 3 and Commercial Area 2. Area 3B includes portions of redevelopment areas Commercial Area 2 and Mixed Residential/Commercial Area 2. Area 3C includes portions of redevelopment areas Residential Area 4 and Waterfront Plaza. Area 3D includes portions of redevelopment areas Residential Area 4 and Mixed Residential/Commercial Area 2. Area 3E includes portions of redevelopment areas Mixed Residential/Commercial Area 2 and Commercial Area 3. Figure 1.2 shows the operational areas (i.e., Area 1, etc.) relative to the redevelopment areas (i.e., Residential Area 1, etc.).

1.2.4.2 Nature and Extent of Contamination

Soil and groundwater samples collected during the pre-RI, RI, and additional RI activities and the analytical results therefrom were evaluated against the following Generic Residential and Non-Residential Cleanup Criteria and Screening Levels established in Part 7 of Administrative Rules, effective September 28, 2012, pursuant to Part 201, Environmental Remediation, 1994 PA 451 as amended (Part 201)(MDEQ, 2012a).

Soil:

- State Default Background (as applicable)(SDBL)
- Drinking Water Protection Criteria (DWPC)
- Groundwater Surface Water Interface Protection Criteria (GSIPC)
- Groundwater Contact Protection Criteria (GCPC)
- Soil Volatilization to Indoor Air Inhalation Criteria (SVIAC)
- Volatile Soil Inhalation Criteria (VSIC)
- Particulate Soil Inhalation Criteria (PSIC)
- Direct Contact Criteria (DCC)
- Soil Saturation Concentration Screening Levels (C_{sat})

Groundwater:

- Drinking Water Criteria (DWC)
- Groundwater Surface Water Interface Criteria (GSIC)
- Groundwater Volatilization to Indoor Air Inhalation Criteria (GVIAC)
- Groundwater Contact Criteria (GCC)
- Acute Inhalation Screening Levels (AISLs)
- Flammability and Explosivity Screening Level (FESLs)

– Water Solubility Limits

Based on the comparison to the Part 201 Generic Residential and Non-Residential Cleanup Criteria, VOCs [benzene, ethylbenzene, methylene chloride, tetrachloroethene, toluene, 1,1,1-trichloroethane, trichloroethene, 1,2,4-trimethylbenzene, and xylenes (total)], SVOCs[benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, carbazole, 4-chloro-3-methylphenol, dibenzo (a,h) anthracene, dibenzofuran, fluoranthene, fluorine, indeno(1,2,3-cd) pyrene, 2-methylnaphthalene, 4-methylphenol, naphthalene, pentachlorophenol, phenanthrene, 2,2,6-trichlorophenol], PCBs, metals (aluminum, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, magnesium, manganese, mercury, selenium, silver, sodium, thallium, vanadium, and zinc), cyanide (total), nitrate, and phosphorus were identified as chemicals of concern in soil at the Site.

Based on the comparison to the Part 201 Generic Residential and Non-Residential Cleanup Criteria, SVOCs [benzo(g,h,i) perylene and bis(2-ethylhexyl)phthalate] and metals (aluminum, antimony, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, selenium, vanadium, and zinc) were identified as chemicals of concern in groundwater at the Site. It should be noted that of the constituents previously listed, only aluminum, arsenic, iron, lead, manganese, and mercury exceeded the Part 201 Generic Residential and Non-Residential Cleanup Criteria in groundwater samples collected from monitoring wells. The remainder of the constituents were detected in vertical aquifer samples or temporary monitoring wells (i.e., grab samples).

The nature and extent of the contamination is discussed below, by operational and redevelopment area.

Site-Wide Historical Fill Material (Portions of All Redevelopment Areas)

In general, the majority of the metals exceedances are limited to Part 201 Residential and/or Non-Residential DWPC and GSIPC in soil, and Part 201 Residential and/or Non-Residential DWC and GSIC in groundwater. Based on the results of the Synthetic Precipitation Leaching Procedure (SPLP) analysis, manganese, mercury, silver, copper, arsenic, selenium, and chromium, were identified to have the potential to leach at concentrations that exceed either the Part 201 DWC and/or GSIC.

Additional exceedances in various locations across the Site to the Part 201 Residential and/or Non-Residential DCC were noted for lead and arsenic in soil, with the predominant metal being arsenic. Arsenic and manganese were identified at one location each above the Part 201 Residential PSIC. Manganese was also identified above the Part 201 Non-Residential PSIC in three locations.

Former Wastewater Treatment Area (Residential Areas 1 through 4, Waterfront Plaza and Mixed Residential/Commercial Area 2)

Various VOCs, SVOCs, metals, and inorganics are present in soil above the Part 201 Residential and/or Non-Residential DWPC. Additionally, various VOCs, SVOCs, metals, and inorganics are present in soil above the Part 201 GSIPC. SPLP results for soil samples indicate that some metals have the potential to leach at concentrations in exceedance of the Part 201 GSIC. Numerous exceedances of the Part 201 Residential DCC for arsenic are present across this area, which appear to be related to historical placement of fill material, as discussed above. This includes both the areas known to have been utilized as historical lagoons, and the surrounding areas to the north (along the Kalamazoo River) and to the east (former aeration basin and secondary clarifier areas) in Residential Areas 1 through 3 and Waterfront Plaza, as well as the former primary clarifier in Residential Area 4 and Mixed Residential/Commercial Area 2.

Based on a correlation of observed paper residuals and various fill materials in this area to the exceedances of VOCs and SVOCs identified in soil above the Part 201 Cleanup Criteria, it appears that the exceedances of the phenolic compounds are associated with noted paper residuals, with the remainder associated with various sandy fill materials. Numerous samples were collected in and around the former lagoons during the RI, with paper residuals or "gray clay" observed in some of the locations. With the exception of the "white clay layer" sample collected by the Michigan Department of Transportation (MDOT) during storm sewer installation in 2012 where PCBs were detected at a reported concentration of 17 mg/kg, the highest concentration of PCBs detected in samples collected in this area for PCBs was 2.7 mg/kg, which is below the Part 201 Residential Cleanup Criteria. A gray (noted to vary between gray, light gray, white, and bluish) clay layer was observed in several borings between approximately 4 and 10 feet below ground surface (bgs). This layer often contained paper residuals or was observed immediately above or below a layer of paper residuals. In general based on analytical results for samples analyzed, little difference was noted in PCB concentrations between samples collected from sand fill and gray clay/paper residuals. A summary of samples and detected concentrations of PCBs collected from within and around the former lagoon area is presented below.

Sample Location	Sample Depth (feet bgs)	Material Description	Detected Concentration of PCBs (mg/kg)
MW-14	0 – 2	Sand and gravel fill; no paper residuals observed	0.049
	8 - 10		Non-Detect
SB-101	0 -1	Sand fill; no paper residuals observed	0.136
	6.8 – 8.8		0.015
	8 – 9.25		Non-Detect
SB-102	0 – 1	8 to 10-foot sample collected from sand fill, gray to black, with paper residuals	Non-Detect
	8 - 10		Non-Detect

Sample Location	Sample Depth (feet bgs)	Material Description	Detected Concentration of PCBs (mg/kg)
SB-103	0 – 1	No paper residuals observed	0.32
	7 - 9		Non-Detect
SB-104	0 – 1	Sand fill with paper residuals observed at 3.5 ft	0.39
	3 - 5		1
	5 – 7		Non-Detect
	8 - 10		Non-Detect
SB-105	0 – 1	Samples collected from sand fill; trace paper residuals observed in sand fill at 0.8 ft bgs only; thin gray clay fill layer observed between 5.5 and 6 feet bgs; no sample collected from thin gray clay	0.227
	1 – 3		1.6
	3 – 5		0.0086/ 0.0095 (Dup.)
	8 – 10		0.56
SB-106	0 – 1	Sandy clay fill, gray with paper residuals between 3.5 and 8 feet bgs	Non-Detect
	3.5 – 5.5		0.46
	8 - 10		Non-Detect/ Non-Detect (Dup.)
SB-107	0 - 1	Paper residuals from 4.5 to 8.5 feet bgs; gray clay fill present above paper residuals, not sampled	0.031
	4.5 – 6.5		0.33
	6.5 – 8.5		0.36
SB-108	0 – 1	Gray to blueish gray clay layer at approximately 4 to5 feet bgs, not sampled; samples collected from sand fill and brown sandy clay fill; no paper residuals observed in boring	0.24
	6.5 – 8.5		0.25
	8 - 10		0.408
SB-109	0 – 2	Sand fill to 5 feet bgs; gray clay fill with paper residuals observed from approximately 5 to 9 feet bgs; paper residuals observed from 9 to 10 feet bgs	Non-Detect
	8 – 10		0.462
SB-110	0 – 1	Sand and brown clay fill; no paper residuals observed	0.022
	8 - 10		0.166/ 0.29 (Dup.)
SB-111	0 - 1	Sand fill to 4 feet bgs; gray clay fill with paper residuals present between 4 and 8.5 feet bgs, with sand fill below	0.022
	7 - 9		0.215
SB-112	0 – 1	Sand fill to 3.5 feet bgs; paper residuals from 5 to 9 feet bgs with light gray clay fill (with paper residuals) present above and below; no samples collected from clay fill layer	Non-Detect/ 0.017 (Dup.)
	6 – 8		Non-Detect
SB-113	0 – 1	Sand fill with some paper residuals at 3.5 feet bgs to 8 feet bgs; clay fill with paper residuals present at 8 to 10 feet bgs	0.039
	8 - 10		0.71
SB-114	0 – 1	Sand fill with no paper residuals to 8.5 feet bgs;gray and white clay fill with paper residuals from 8.5 to 10 feet bgs	0.061
	8 - 10		0.42
SB-115	0 – 1	Sand fill to 4.5 feet bgs with paper residuals at 4 feet bgs; white to gray clay fill with paper residuals from 4.5 to 5 feet bgs; sand fill with concrete debris below	0.011
	3 – 5		0.15
	5 – 7		Non-Detect
	8 – 10		Non-Detect
SB-116	0 – 1	Sand fill with concrete debris; no paper residuals observed	0.64
	7 – 9		0.051
	9.5 - 10		0.011

Sample Location	Sample Depth (feet bgs)	Material Description	Detected Concentration of PCBs (mg/kg)
SB-117	0 – 1	Sand and gravel fill; no paper residuals observed	0.012
	8 - 10		0.043
SB-118	0 – 1	Sand fill; no paper residuals observed	0.25
	7.5 – 9.4		Non-Detect
SB-119	0 – 1	Sand fill; no paper residuals observed	Non-Detect
	8 - 10		0.0091
SB-120	0 -1	Sand fill; no paper residuals observed	Non-Detect
	7.75 – 9.75		Non-Detect
SB-121	0 – 1	Sand fill with paper residuals	0.33
	1 – 3		Non-Detect
	11 - 13		Non-Detect
SB-122	0 – 1	Sand fill and brown clay fill; no paper residuals observed	0.017
	8 - 10		0.026
SB-123	0 – 1	Sand fill; no paper residuals observed	0.077
	7 - 9		0.045
SB-124	0 - 1	Sand fill to 9 feet bgs;gray and white clay fill with paper residuals observed around 9 feet bgs	0.147
	7 - 9		0.52
SB-125	0 - 1	Sand fill with paper residuals and debris	0.16
	3 – 5		0.077/ 0.1 (Dup.)
	8 - 10		Non-Detect
SB-126	0 - 1	Sand fill with dark gray clay fill layer at 8.5 to 9 feet bgs	0.089
	7.5 – 9.5		2.38
SB-127	0 – 1	Sand and gravel fill with paper residuals	0.03
	6.5 – 8.5		0.592
	10.5 – 12.5		0.099
SB-128	0 -1	Sand with trace paper residuals	0.125
	11.5 – 13.5		0.34
SB-129	0 – 1	Thin layer of brown and white clay fill and thin layer of paper residuals from 7 to 7.5 feet bgs	0.025
	6 – 8		0.13
	8 – 10		0.022
SB-130	0 – 1	Sand fill and brown clay fill; no paper residuals observed	0.072
	12.5 – 14.5		Non-Detect
SB-131	0 – 1	Dark gray sandy clay fill with paper residuals from 8.5 to 9.5 feet bgs; not sampled because below the water table	Non-Detect
	6 - 8		0.051
SB-132	0 – 1	Sand fill with coal; thin layer of paper residuals at 9 feet bgs	1.19
	8 - 10		Non-Detect
SB-133	0 – 1	Sand fill with a thin layer of brown and gray clay fill with paper residuals between 8.5 and 9 feet bgs.	1.02
	7 - 9		2.6/ 2.7 (Dup.)
VA-1	0 – 2	Sand fill to 6.5 feet bgs; clay fill, white, blue, and gray present between 6.5 and 8.5 feet bgs; paper residuals, white, gray, and blue from 8.5 to 10 feet bgs	Non-Detect
	8 - 10		0.91

Former Substation/Area North of Mill Building (Commercial Area 4)

A former substation, that was owned and operated by Consumers Energy, was historically present to the north of Buildings 11 and 11A. Subsequent to the off-Site Environmental Risk Assessment (ERA) and evidence of impacts to the north of the former substation, an investigation was conducted as part of the RI to evaluate potential issues in this area. Oily soils were observed in this area during the installation of test pits, with detections of Total Petroleum Hydrocarbons-Diesel Range Organics (TPH-DRO) as high as 3,300 parts per million (ppm)(there is no Part 201 Cleanup Criteria for TPH). Various PAHs, tetrachloroethene, methylene chloride, trichloroethene, and 1,1,1-trichloroethane have been detected in soil samples in this area, along with various metals, at concentrations above the Part 201 Residential and/or Non-Residential DWPC, GSIPC, and Residential DCC. Historical information indicates that Building 11 was constructed in 1906 and was used for storage and maintenance activities, and Building 11A was constructed in 1940 and was used for maintenance activities, which may have included the use and storage of solvents and/or petroleum products utilized during routine maintenance activities.

Non-Specific Historical Operational Impacts (Residential Area 3, Waterfront Plaza, Mixed Residential/Commercial Areas 1 and 2, and Commercial Areas 2, 3, and 4)

The non-specific historical operational impacts include the MW-16 area, the Mill Buildings (except Buildings 11 and 11A, as discussed above), one former water tower, one current water tower (Mixed Residential/Commercial Area 2 and Commercial Areas 3 and 4), the former Sludge Dewatering and former Quality Products Buildings (Residential Area 3, Waterfront Plaza, and Commercial Area 2), and former Specialty Minerals Building (Mixed Residential/Commercial Area 1 and Commercial Area 2). Suspected areas relating to general historical operations within the aforementioned structures were also considered as potential source areas. Specifically related to the Mill Buildings in Mixed Residential/Commercial Area 2 and Commercial Areas 3 and 4, additional potential areas where multiple sample locations indicated exceedances of similar organic constituents included the Train Shed, Building 6A, the parking lot east of Buildings 9F and 9E, Building 7, Former Buildings 3A and 28, and Former Buildings 9C and 9A. Additionally, during redevelopment activities conducted at the former Sludge Dewatering Building, two small below grade structures in series were encountered.

During the 2010 RI field activities, PCBs were identified in a soil sample from MW-16 above the Part 201 Residential DCC. Based on the identified detection and redevelopment activities that were proposed in this area, further evaluation was completed in 2012 to delineate the extent of PCB impacts in soil in the vicinity of MW-16.

Various PAHs, PCBs, benzene, ethylbenzene, toluene, tetrachloroethene, methylene chloride, trichloroethene, and 1,1,1-trichloroethane have been detected in soil samples in these areas, along with

various metals, at concentrations above the Part 201 Residential and/or Non-Residential DWPC, GSIPC, and DCC.

Non-Specific Support Operational Area Impacts (Residential Area 4, Mixed Residential/Commercial Area 1, Waterfront Plaza, and Commercial Area 3)

The non-specific support operations include the areas defined by Residential Area 4, Waterfront Plaza, a portion of Mixed Residential/Commercial Area 1, and a portion of Commercial Area 3, which are primarily located on the northern portion of this area, along the Kalamazoo River, and may be related to historical filling activities in this area.

Various PAHs, benzene, ethylbenzene, toluene, methylene chloride, and xylenes, have been detected in soil samples in these areas, along with various metals, at concentrations above the Part 201 Residential and/or Non-Residential DWPC and GSIPC. Additionally, PAHs and PCBs were detected in soil above the Residential DCC.

Former Coal Storage Pile Area (Residential Area 4 and Waterfront Plaza)

The impacts to soil in this area include exceedances of the Part 201 Generic Cleanup Criteria for the listed constituents, which include inorganics discussed above as being associated with fill materials. However, several of these inorganics could also be the result of storage and handling practices associated with coal in this area, in conjunction with impacts from other fill materials in this area; although, insufficient data is available to differentiate the source of the impacts.

Various PAHs, benzene, ethylbenzene, toluene, and xylenes, have been detected in soil samples in these areas, along with various metals, at concentrations above the Part 201 Residential and/or Non-Residential DWPC and GSIPC. Additionally, arsenic and lead were detected in soil above the Residential DCC, and lead and PCBs were detected above the Non-Residential DCC. Benzene was detected above the Part 201 Residential SVIAC in one location.

Former No. 6 Fuel Oil AST Area (Mixed Residential/Commercial Area 2 and Residential Area 4)

This area includes the former 200,000-gallon No. 6 fuel oil AST and a portion of the below grade process piping distribution system. Historical fuel oil releases to the ground surface in this area have been documented. The historical operation of railroad tracks and below grade product delivery systems also occurred in this area. During redevelopment activities, product was observed in the below grade piping from the former No. 6 fuel oil AST area to the former power house area. Product observed in the lines was containerized at the point where the piping formerly entered the AST area structures, and was

characterized and disposed off-Site during the redevelopment activities. No below grade evaluation of the piping line was completed during the redevelopment activities.

Various PAHs, tetrachloroethene, methylene chloride, benzene, and ethylbenzene, have been detected in soil samples in these areas, along with various metals, at concentrations above the Part 201 Residential and/or Non-Residential DWPC and GSIPC. Additionally, arsenic, benzo(a)pyrene and dibenzo(a,h)anthracene were detected in soil above the Residential DCC.

Coal Tunnel Area (Mixed Residential/Commercial Area 2)

Various VOCs, SVOCs, and metals are present in soil above Part 201 DWPC and/or GSIPC in the area of the coal tunnel. In addition, manganese was detected in groundwater above the Part 201 DWC and mercury was detected in groundwater above the Part 201 GSIC. Review of SPLP data for cobalt, manganese, mercury, selenium, and/or silver did not indicate an exceedance of the Part 201 GSIC for the leachate from soil samples collected. It should be noted that SPLP analysis was not conducted on all constituents that exceeded the Part 201 GSIPC. Benzo(a)pyrene, benzo(a)anthracene, dibenzo(a,h)anthracene, and arsenic are present in soil above Part 201 DCC. The benzo(a)pyrene, benzo(a)anthracene, and dibenzo(a,h)anthracene exceedances are associated with the soil sample from CTP-4, along the piping run for the former No. 6 fuel oil AST, to the east of the coal tunnel, adjacent to the coal hopper/Building 5E. The arsenic exceedances are associated with soil samples from multiple locations.

Based on the results for the samples in the vicinity of the coal tunnel, it appears that soils have been impacted by historical operations conducted at the Site, which were not specifically related to the operation of the coal tunnel. Impacts have been identified associated with the former Fuel Oil No. 6 product delivery piping that traversed the coal tunnel in the direction of the boiler room and in areas historically known to have been used for the exterior storage of coal and fly ash. Visual observations of the accessible portions of the coal tunnel noted the presence of approximately 12 to 18 inches of liquid, described as a "heavy fuel oil with a layer of water over the top," was observed covering the bottom of the concrete floor of the tunnel. The thickness of the water was identified as approximately 1 to 2 inches, with the balance being the "heavy fuel oil." Due to the presence of the liquid, a visual evaluation of the condition of floor of the coal tunnel could not be conducted. Impacts to the soil immediately underlying the coal tunnel could not be determined; however, groundwater in the downgradient direction of the coal tunnel did not exhibit impacts from petroleum products and no free product was observed in the monitoring well (MW-2). Based on the January and February 2010 groundwater contours, the positions of MW-2 and MW-19 are not located immediately downgradient of the coal tunnel. Subsequently, an additional monitoring well (MW-22) was installed in August 2012 to further evaluate groundwater in this area. Observations and analytical results for groundwater samples collected in August 2012 were consistent with those for MW-2 and MW-19.

Based on the above discussion regarding the nature and extent of the contamination by former operational area, the following exceedances of the Part 201 Residential and/or Non-Residential Cleanup Criteria were identified by redevelopment area relative to soil impacts. For the purposes of the below tables, Residential is abbreviated as "R" and Non-Residential is abbreviated as "NR". It should be noted that where the Part 201 SDBL is higher than the generic cleanup criteria, the SDBL replaces the generic cleanup criteria, as applicable and consistent with Part 201.

Soil

Residential Area 1

Exceedances of constituents in soil samples are present at various locations as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
Lagoon J-3 A	4.5 – 5	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9
Lagoon M-1B	4 – 4.5	RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7
SB-2	9 – 10	GSIPC	Selenium	0.41	0.49
SB-3	2 – 2.5	RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.3
		GSIPC	Chromium	3.3	19
		GSIPC	Mercury	0.13	0.22
	4 – 5	GSIPC	Mercury	0.13	0.16
SB-4	9 – 10	GSIPC	Selenium	0.41	1.1
SS-100	0 – 2	RDWPC and NRDWPC GSIPC	Manganese	440 440	733
MW-14	0 – 2	RDWPC and NRDWPC GSIPC	Manganese	440 440	838
	8 – 10	RDWPC and NRDWPC	Iron	12,000	15,600,000
		RDWPC NRDWPC	Magnesium	8,000 22,000	23,600/ 35,100 (Dup.)
		RDWPC and NRDWPC GSIPC RDCC	Arsenic	5.8 7.6 5.8	11.6
SB-101	0 –1	GSIPC	Cyanide (total)	0.39	0.9
		RDWPC and NRDWPC	Aluminum	6,900	7,280
		RDWPC and NRDWPC	Iron	12,000	14,100
		RDWPC and NRDWPC GSIPC	Manganese	440 440	654
		RDWPC	Magnesium	8,000	12,500

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.3
	6.8 – 8.8	RDWPC and NRDWPC	Aluminum	6,900	9,660
		RDWPC and NRDWPC	Iron	12,000	24,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	897
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	15
		GSIPC	Selenium	0.41	0.6
		GSIPC	Cyanide (total)	0.39	2.6
SB-102	0 – 1	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	16.2
		GSIPC	Selenium	0.41	0.7
SB-103	0 – 1	RDWPC and NRDWPC	Aluminum	6,900	7,010
		RDWPC and NRDWPC	Iron	12,000	16,700
		RDWPC and NRDWPC GSIPC	Manganese	440 440	469
		GSIPC	Mercury	0.13	0.17
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.6
	7 – 9	RDWPC and NRDWPC	Iron	12,000	16,200
		RDWPC and NRDWPC GSIPC	Manganese	440 440	972
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.7
		GSIPC	Selenium	0.41	0.6
SB-104	0 - 1	GSIPC	Cyanide (total)	0.39	0.9
		RDWPC	Magnesium	8,000	16,000
		GSIPC	Mercury	0.13	0.24
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.5
		GSIPC	Selenium	0.41	0.5
	3 – 5	GSIPC	Cyanide (total)	0.39	1.9
		RDWPC and NRDWPC	Iron	12,000	12,600
		GSIPC	Mercury	0.13	0.34
		RDWPC and NRDWPC	Pentachlorophenol	0.022	0.21
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	25.3
		GSIPC	Selenium	0.41	0.8
	5 – 7	GSIPC	Cyanide (total)	0.39	2.7

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC	Iron	12,000	32,400
		RDWPC and NRDWPC	Antimony	4.3	16
		RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	92
		GSIPC	Selenium	0.41	2.2
	8 – 10	GSIPC	Cyanide (total)	0.39	2.8
		RDWPC and NRDWPC	Iron	12,000	12,100
		RDWPC and NRDWPC GSIPC	Manganese	440 440	461
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	29
		GSIPC	Selenium	0.400	1.3
SB-106	0 – 1	RDWPC	Magnesium	8,000	12,000
	3.5 – 5.5	RDWPC and NRDWPC	Aluminum	6,900	9,600
		GSIPC	Chromium	3.3	20
		GSIPC	Mercury	0.13	0.24
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.3
		GSIPC	Selenium	0.41	0.8
	8 – 10	RDWPC NRDWPC	Magnesium	8,000 22,000	22,300/ 34,200 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	7.3/ 11.7 (Dup.)
		RDWPC and NRDWPC	Iron	12,000	14,600/ 17,500 (Dup.)
		RDWPC and NRDWPC GSIPC	Manganese	440 440	622/ 614 (Dup.)
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.6 (Dup.)
		GSIPC	Selenium	0.41	0.5 (Dup.)
SB-107	0 – 1	RDWPC and NRDWPC	Iron	12,000	12,800
		RDWPC	Magnesium	8,000	17,700
		GSIPC	Selenium	0.41	0.6
	4.5 – 6.5	RDWPC and NRDWPC	Aluminum	6,900	13,300
		GSIPC	Selenium	0.41	1.1
	6.5 – 8.5	RDWPC and NRDWPC	Aluminum	6,900	7,760
		GSIPC	Mercury	0.13	0.21
		RDWPC and NRDWPC	Pentachlorophenol	0.022	0.42
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.1
		GSIPC	Selenium	0.41	0.9

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-108	0 – 1	RDWPC	Magnesium	8,000	13,000
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6
		GSIPC	Selenium	0.41	1.2
	6.5 – 8.5	RDWPC and NRDWPC	Iron	12,000	14,800
		GSIPC	Mercury	0.13	0.14
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.4
		GSIPC	Selenium	0.41	0.9
SB-109	0 – 2	RDWPC	Magnesium	8,000	22,000
	8 – 10	RDWPC and NRDWPC	Aluminum	6,900	14,500
		GSIPC	Chromium	3.3	22
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	8.7
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	14
		GSIPC	Selenium	0.41	2.6
		GSIPC	4-Methylphenol	1	2.8
SB-110	0 – 1	RDWPC	Magnesium	8,000	14,600
	8 – 10	RDWPC and NRDWPC	Methylene chloride	0.1	0.11
		RDWPC and NRDWPC	Iron	12,000	12,200
		RDWPC	Magnesium	8,000	18,400/ 14,000 (Dup.)
		GSIPC	Selenium	0.41	0.6
		RDWPC and NRDWPC GSIPC	Manganese	440 440	562
SB-111	0 – 1	RDWPC	Magnesium	8,000	12,200
	7 – 9	RDWPC and NRDWPC	Aluminum	6,900	8,630
		GSIPC	Chromium	3.3	19
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	7.8
		GSIPC	Selenium	0.41	0.8
SB-112	0 – 1	RDWPC and NRDWPC	Iron	12,000	18,500
		RDWPC NRDWPC	Magnesium	8,000 22,000	18,200/ 23,800 (Dup.)
	6 – 8	RDWPC and NRDWPC	Tetrachloroethene	0.1	0.21
		RDWPC and NRDWPC	Aluminum	6,900	12,300
		GSIPC	4-Methylphenol	1	2.2
		GSIPC	Naphthalene	0.73	1.5
SB-113	0 – 1	RDWPC	Magnesium	8,000	11,000
		GSIPC	Selenium	0.4	0.5
	8 – 10	RDWPC and NRDWPC	Aluminum	6,900	11,800
		RDWPC and NRDWPC	Iron	12,000	19,000

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC GSIPC	Manganese	440 440	452
		GSIPC	Chromium	3.3	22
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.2
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.5
		GSIPC	Selenium	0.41	1.7
SB-114	0 – 1	RDWPC and NRDWPC	Aluminum	6,900	7,420
		RDWPC and NRDWPC GSIPC	Manganese	440 440	992
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.1
		GSIPC	Selenium	0.41	0.6
	8 – 10	RDWPC and NRDWPC	Aluminum	6,900	12,800
		GSIPC	Selenium	0.41	1
SB-115	0 – 1	RDWPC	Magnesium	8,000	12,300
	3 – 5	RDWPC and NRDWPC	Aluminum	6,900	7,730
		GSIPC	Mercury	0.13	0.45
		GSIPC	Selenium	0.41	0.5
	8 – 10	RDWPC and NRDWPC GSIPC	Manganese	440 440	527
		RDWPC NRDWPC	Magnesium	8,000 22,000	32,600
SB-116	0 – 1	RDWPC and NRDWPC	Iron	12,000	19,600
		RDWPC	Magnesium	8,000	14,500
		RDWPC and NRDWPC GSIPC	Manganese	440 440	548
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7
	9.5 – 10	GSIPC	Selenium	0.41	0.5
		RDWPC and NRDWPC	Aluminum	6,900	8,320
		RDWPC and NRDWPC	Iron	12,000	16,200
		GSIPC	Chromium	3.3	24
SB-117	0 – 1	RDWPC NRDWPC	Magnesium	8,000 22,000	23,800
	8 – 10	RDWPC and NRDWPC	Iron	12,000	13,200
		RDWPC	Magnesium	8,000	20,000
SB-118	0 – 1	GSIPC	Selenium	0.41	0.7
		GSIPC	Mercury	0.13	0.26
		GSIPC	Xylenes (total)	0.82	1.39
	7.5 – 9.5	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	21
		GSIPC	Selenium	0.41	1

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-119	0 – 1	RDWPC	Magnesium	8,000	11,000
		GSIPC	Phenanthrene	2.1	2.6
	8 – 10	RDWPC and NRDWPC	Iron	12,000	16,300
		RDWPC NRDWPC	Magnesium	8,000 22,000	26,700
		RDWPC and NRDWPC GSIPC	Manganese	440 440	572
		GSIPC	Chromium	3.3	22
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.5
SB-120	0 – 1	RDWPC	Magnesium	8,000	16,700/ 21,300 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	14/ 11 (Dup.)
		GSIPC	Selenium	0.41	1.6
	7.75 – 9.75	RDWPC NRDWPC	Magnesium	8,000 22,000	33,900
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	11
SB-121	0 – 1	GSIPC	Mercury	0.13	0.3
	1 – 3	RDWPC	Magnesium	8,000	17,100
	11 – 13	RDWPC	Magnesium	8,000	14,700
SB-122	0 – 1	RDWPC	Magnesium	8,000	10,600
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.4
SB-123	0 – 1	RDWPC	Magnesium	8,000	19,800
SB-132	0 – 1	RDWPC and NRDWPC	Iron	12,000	23,200
		RDWPC and NRDWPC GSIPC	Manganese	440 440	641
		GSIPC	Mercury	0.13	0.33
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	13.4
		GSIPC	Selenium	0.41	0.8
	8 – 10	RDWPC and NRDWPC	Iron	12,000	20,900
		RDWPC NRDWPC	Magnesium	8,000 22,000	63,800
		RDWPC and NRDWPC GSIPC	Manganese	440 440	638
		GSIPC	Mercury	0.13	0.15
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	16.7
		GSIPC	Selenium	0.41	0.6

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-143	0 – 1	RDWPC and NRDWPC GSIPC	Manganese	1 105	485
	8 – 10	RDWPC NRDWPC	Magnesium	8,000 22,000	23,000
		RDWPC and NRDWPC	Iron	12,000	13,800
VA-1	0 – 2	RDWPC	Magnesium	8,000	17,200
	8 – 10	GSIPC	Ethylbenzene	0.36	0.43
		RDWPC and NRDWPC	Tetrachloroethene	0.1	0.43
		RDWPC and NRDWPC	Aluminum	1	16,300
		GSIPC	Chromium	3.3	21
		GSIPC	Selenium	0.4	1
		GSIPC	4-Methylphenol	1	2.6
		GSIPC	4-Chloro-3-methylphenol	0.28	0.38
		RDWPC and NRDWPC	Pentachlorophenol	0.022	0.91
		GSIPC	2,4,6-Trichlorophenol	0.33	0.36

No other parameters were detected in soil samples analyzed in Residential Area 1 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Residential Area 2

Exceedances of constituents in soil samples are present at various locations in Residential Area 1 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-1	12.5 - 13	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.5
		GSIPC	Chromium	3.3	20

SB-105	0 - 1	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.6
		RDWPC and NRDWPC	Aluminum	6,900	8,800
		RDWPC and NRDWPC	Iron	12,000	12,500
	1 – 3	RDWPC and NRDWPC	Benzene	0.1	0.21
		GSIPC	Mercury	0.13	0.16
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	17.5
	3 – 5	RDWPC and NRDWPC	Iron	12,000	12,600/ 14,800 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	7.3/ 7.9 (Dup.)
		RDWPC and NRDWPC GSIPC	Manganese	440 440	467
	8 - 10	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	7.8
		RDWPC and NRDWPC	Iron	12,000	12,500
SB-124	0 - 1	RDWPC and NRDWPC	Iron	12,000	14,100
		RDWPC	Magnesium	8,000	9,660
		RDWPC and NRDWPC GSIPC	Manganese	440 440	697
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.4
		GSIPC	Selenium	0.41	0.6
	7 - 9	RDWPC and NRDWPC	Iron	12,000	14,000
		RDWPC	Magnesium	8,000	20,600
		RDWPC and NRDWPC GSIPC	Manganese	440 440	447
		RDWPC and NRDWPC	Pentachlorophenol	0.022	0.21
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.9
SB-125	0 - 1	RDWPC	Magnesium	8,000	11,000
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	13.5
		GSIPC	Selenium	0.41	0.5
	3 - 5	RDWPC and NRDWPC	Iron	12,000	12,800
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6
	9.25 - 10	RDWPC NRDWPC	Magnesium	8,000 22,000	53,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	578

SB-126	0 - 1	RDWPC and NRDWPC	Iron	12,000	15,100
		RDWPC	Magnesium	8,000	12,100
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.9
	7.5 - 9.5	RDWPC and NRDWPC	Iron	12,000	12,400
		RDWPC and NRDWPC GSIPC	Manganese	440 440	456
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	33
		GSIPC	Mercury	0.13	0.54
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.4
SB-127	0 - 1	RDWPC and NRDWPC GSIPC	Manganese	440 440	486
		GSIPC	Selenium	0.41	0.8
	6.5 - 8.5	RDWPC and NRDWPC	Iron	12,000	15,800
		RDWPC	Magnesium	8,000	13,200
		GSIPC	Chromium	3.3	26
		GSIPC	Copper	135	184
		GSIPC	Zinc	303	415
		GSIPC	Mercury	0.13	0.72
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.2
	10.5 - 12.5	RDWPC NRDWPC	Magnesium	8,000 22,000	81,100
		GSIPC	Copper	135	170
		GSIPC	Mercury	0.13	0.14
SB-128	0 - 1	RDWPC NRDWPC	Magnesium	8,000 22,000	37,900
	11.5 - 13.5	RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.2
SB-129	0 - 1	RDWPC	Magnesium	8,000	21,600
	6 - 8	RDWPC and NRDWPC	Iron	12,000	26,200
		RDWPC NRDWPC	Magnesium	8,000 22,000	22,800
		RDWPC and NRDWPC GSIPC	Manganese	440 440	729
		GSIPC	Mercury	0.13	0.14
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.5
		GSIPC	Selenium	0.41	0.6
	8 - 10	RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.2
		RDWPC	Magnesium	8,000	15,100
SB-130	0 - 1	GSIPC	Chromium	3.3	24
		GSIPC	Selenium	0.41	0.5
	12.5 - 14.5	RDWPC	Magnesium	8,000	15,200/ 13,300 (Dup.)
SB-131	0 - 1	RDWPC	Magnesium	8,000	19,700

	6 - 8	RDWPC	Magnesium	8,000	18,200

No other parameters were detected in soil samples analyzed in Residential Area 2 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Residential Area 3

Exceedances of constituents in soil samples are present at various locations in Residential Area 3 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
MW-15	0 - 2	RDWPC and NRDWPC	Aluminum	6,900	7,260
		RDWPC and NRDWPC GSIPC	Manganese	440 440	543
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	19.9
		GSIPC	Selenium	0.41	0.8
	4 – 6	RDWPC	Magnesium	8,000	10,800
		RDWPC and NRDWPC GSIPC	Manganese	440 440	606
		GSIPC	Phenanthrene	2.1	2.6
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	11.9
		GSIPC	Selenium	0.41	0.6
SB-134	0 - 1	RDWPC and NRDWPC GSIPC	Manganese	440 440	476
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	5.9
	1.5 - 3.5	RDWPC and NRDWPC	Aluminum	6,900	8,550
		RDWPC and NRDWPC	Iron	12,000	33,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	1,440
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	60
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	8.6
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	20.3
		GSIPC	Selenium	0.41	0.8
SB-135	0 - 1	GSIPC	Cyanide (total)	0.39	1

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC GSIPC	Manganese	440 440	489
		GSIPC	Mercury	0.13	0.21
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.6
	8 - 10	GSIPC	Cyanide (total)	0.39	2.3
		RDWPC	Magnesium	8,000	12,700
SB-136	0 - 1	RDWPC	Magnesium	8,000	20,800/ 17,100 (Dup.)
		GSIPC	Selenium	0.41	1
		RDWPC and NRDWPC	Iron	12,000	13,500 (Dup.)
	8 - 10	RDWPC and NRDWPC	Methylene chloride	0.1	0.18
		RDWPC and NRDWPC	Iron	12,000	33,300
		RDWPC and NRDWPC GSIPC	Manganese	440 440	491
		GSIPC	Copper	135	139
		GSIPC	Zinc	303	455
		GSIPC	Mercury	0.05	0.98
		RDWPC and NRDWPC	Antimony	4.3	9.4
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	21.1
		GSIPC	Selenium	0.41	0.9
SB-137	0 - 1	RDWPC	Magnesium	8,000	11,400
		GSIPC	Mercury	0.13	0.67
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.7
		GSIPC	Selenium	0.41	1.1
	8 - 10	RDWPC and NRDWPC	Iron	12,000	22,300
		RDWPC NRDWPC	Magnesium	8,000 22,000	22,900
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	26.4
		GSIPC	Selenium	0.41	0.6
SB-138	0 - 1	RDWPC and NRDWPC GSIPC	Manganese	440 440	698
		GSIPC	Mercury	0.13	0.29
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.2
		GSIPC	Selenium	0.41	0.5
	8 - 10	RDWPC	Magnesium	8,000	14,500
SB-139	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	7,520
		RDWPC and NRDWPC	Iron	12,000	15,100
		RDWPC	Magnesium	8,000	12,900

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC GSIPC	Manganese	440 440	637
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	36
		GSIPC	Mercury	0.13	0.42
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.5
		GSIPC	Selenium	0.41	0.5
	6 - 8	RDWPC and NRDWPC GSIPC	Manganese	440 440	508
		RDWPC and NRDWPC	Iron	12,000	17,300
		RDWPC NRDWPC	Magnesium	8,000 22,000	30,100
SB-140	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	9,010
		RDWPC and NRDWPC	Iron	12,000	25,800
		RDWPC	Magnesium	8,000	10,500
		RDWPC and NRDWPC GSIPC	Manganese	440 440	568
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	11
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.1
		GSIPC	Selenium	0.41	0.8
	8 - 10	RDWPC	Magnesium	8,000	14,800 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	19/ 15 (Dup.)
		GSIPC	Selenium	0.41	2/ 1.9 (Dup.)
SB-141	0 - 1	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.5
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	2.19
		GSIPC	Selenium	0.41	1
	9 - 11	RDWPC	Magnesium	8,000	26,900
TP-319	0 - 1	RDWPC	Magnesium	8,000	11,800
		GSIPC	Selenium	0.41	0.6
	6 - 8	RDWPC	Magnesium	8,000	8,400
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7
TP-320	0 - 1	RDWPC and NRDWPC GSIPC	Manganese	440 440	689

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
	6 - 8	RDWPC	Magnesium	8,000	15,700

No other parameters were detected in soil samples analyzed in Residential Area 3 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Residential Area 4

Exceedances of constituents in soil samples are present at various locations in Residential Area 4 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
DG-3	0 – 1.5	RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.8
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	5.6
		RDCC	Benzo(a)pyrene	2	4.9
		GSIPC	Phenanthrene	2.1	3.6
DG-4	0 – 1.5	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	16
		GSIPC	Chromium	3.3	28
		GSIPC	Copper	135	220
		RDWPC and NRDWPC RDCC NRDCC	Lead	700 400 900	990
		GSIPC	Mercury	0.13	1.1
		GSIPC	Zinc	303	450
		RDCC	Dibenzo(a,h)anthracene	2	6.4
SB-7	0 – 0.5	GSIPC	Mercury	0.13	0.28
		GSIPC	Selenium	0.41	0.5
	7 – 7.5	GSIPC	Chromium	3.3	30
		GSIPC	Copper	135	350
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	6.3
		GSIPC	Zinc	303	620

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SCSB-2A	0 – 2	RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.5
SB-5	2.5 – 3.5	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12
		GSIPC	Mercury	0.13	0.27
		GSIPC	Copper	135	240
		GSIPC	Selenium	0.41	1.4
SB-301	0 - 1	RDWPC and NRDWPC	Iron	12,000	13,100
		RDWPC	Magnesium	8,000	18,700
		GSIPC	Mercury	0.13	0.22
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	21.6
		GSIPC	Xylenes (total)	0.82	2.19
		GSIPC	Selenium	0.41	1.1
	5.5 - 7.5	RDCC	Total PCBs	4	13.8 6.29 (Dup.)
		RDWPC	Magnesium	8,000	17,000/ 8,350 (Dup.)
		RDWPC and NRDWPC GSIPC	Manganese	440 440	748/ 676 (Dup.)
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	75/ 64 (Dup.)
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	14.4/ 10.2 (Dup.)
		GSIPC	Copper	135	671/ 560 (Dup.)
		GSIPC	Zinc	303	1,020/ 737 (Dup.)
		RDWPC and NRDWPC	Pentachlorophenol	0.022	0.12
		RDWPC and NRDWPC	Antimony	4.3	8/ 7.8 (Dup.)
		RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	55.8/ 14.2 (Dup.)
		RDCC	Lead	400	647/ 542 (Dup.)
		RDWPC and NRDWPC	Iron	12,000	150,000/ 83,600 (Dup.)
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	4.8/ 6.5 (Dup.)
		RDWPC and NRDWPC	Aluminum	6,900	7,890 (Dup.)
		GSIPC	Selenium	0.41	1.1

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-302	0 - 1	RDWPC and NRDWPC GSIPC	Ethylbenzene	1.5 0.36	2.6
		RDWPC and NRDWPC	Benzene	0.1	1.3
		RDWPC and NRDWPC GSIPC	Xylenes (total)	5.6 0.82	18.4
		RDWPC and NRDWPC GSIPC	Toluene	16 5.4	22
		RDWPC and NRDWPC RDCC GSIPC	Cyanide (total)	4 12 0.39	0.5
		GSIPC	Mercury	0.13	0.16
		GSIPC	Naphthalene	0.73	1.5
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.9
		GSIPC	Selenium	0.41	1.8
	6.8 - 8.8	GSIPC	Cyanide (total)	0.39	1.9
		RDWPC and NRDWPC	Aluminum	6,900	9,290
		RDWPC and NRDWPC	Iron	12,000	44,000
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	35
		GSIPC	Copper	135	246
		GSIPC	Zinc	303	439
		RDWPC and NRDWPC	Antimony	4.3	44.7
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.1
		GSIPC	Selenium	0.41	0.7
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	15.5
	8.8 - 9.8	RDWPC and NRDWPC	Aluminum	6,900	12,800
		GSIPC	Silver	0.1	1.4
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	96
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.4
		GSIPC	Copper	135	205
		GSIPC	Zinc	303	333
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.7
		GSIPC	Selenium	0.41	1.2
		RDCC	Lead	400	667
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	4

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-321	0 - 1	GSIPC	Cyanide (total)	0.39	1.7/ 1.8 (Dup.)
		RDWPC and NRDWPC GSIPC	Manganese	440 440	541/ 518 (Dup.)
		GSIPC	Mercury	0.13	0.18
		RDWPC and NRDWPC	Aluminum	6,900	6,960 (Dup.)
		RDWPC and NRDWPC	Iron	12,000	12,200 (Dup.)
		RDWPC	Magnesium	8,000	9,360 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	7.2/ 8.1 (Dup.)
		GSIPC	Selenium	0.41	0.7/ 0.6 (Dup.)
	7 - 9	RDWPC	Magnesium	8,000	11,000
TP-302	0.5 - 1.5	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.1
		RDCC	Benzo(a)pyrene	2	3.6
		GSIPC	Carbazole	1.1	3.2
		GSIPC	Fluoranthene	5.5	24
		GSIPC	Phenanthrene	2.1	19
	4 - 6	RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.5
		GSIPC	Selenium	0.41	1
		RDWPC and NRDWPC RDCC NRDCC	Lead	700 400 900	1,620
		RDWPC and NRDWPC	Iron	12,000	14,400
		RDWPC and NRDWPC GSIPC	Manganese	440 440	1,270
		GSIPC	Chromium	3.3	24
		GSIPC	Mercury	0.13	0.23
	10 - 11	RDWPC NRDWPC	Magnesium	8,000 22,000	41,200
		GSIPC	Chromium	3.3	24

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
TP-308	0 - 1	RDWPC and NRDWPC GSIPC	Ethylbenzene	1.5 0.36	4.3/ 3.5 (Dup.)
		RDWPC and NRDWPC RSVIAC	Benzene	0.1 1.6	3.4/ 1.2 (Dup.)
		RDWPC and NRDWPC GSIPC	Xylenes (total)	5.6 0.82	29/ 23.9 (Dup.)
		RDWPC and NRDWPC GSIPC	Toluene	16 5.4	25/ 19 (Dup.)
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	5.9
		GSIPC	Selenium	0.41	3.6/ 3.6 (Dup.)
		GSIPC	Naphthalene	0.73	2.3/ 2 (Dup.)
	4 - 6	GSIPC	Cyanide (total)	0.39	0.8
TP-309	0 - 1	RDWPC and NRDWPC GSIPC	Manganese	440 440	585
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.4
		GSIPC	Selenium	0.41	1
	6 - 8	RDWPC NRDWPC	Magnesium	8,000 22,000	73,000
TP-310	1 - 2	GSIPC	Selenium	0.41	1.6
	8 - 10	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	16.4
		GSIPC	Selenium	0.41	0.6
		RDWPC and NRDWPC	Iron	12,000	12,400
		RDWPC	Magnesium	8,000	15,600
TP-311	0 - 1	RDWPC and NRDWPC	Iron	12,000	18,700
		GSIPC	Phenanthrene	2.1	2.7
		GSIPC	Xylenes (total)	0.82	1.37
		GSIPC	Naphthalene	0.73	0.84
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	13.9
		GSIPC	Selenium	0.41	2.6
	4 - 6	RDWPC NRDWPC	Magnesium	8,000 22,000	33,900
		GSIPC	Selenium	0.41	0.8
TP-312	0 - 1	GSIPC	Ethylbenzene	0.36	1.1
		GSIPC	Toluene	5.4	6.6
		RDWPC and NRDWPC	Xylenes (total)	5.6	8.9

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC		0.82	
		RDWPC and NRDWPC	Benzene	0.1	0.36
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7
		GSIPC	Mercury	0.13	0.14
		GSIPC	Phenanthrene	2.1	2.4
		GSIPC	Naphthalene	0.73	2.7
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.7
		RDWPC and NRDWPC GSIPC	Selenium	0.41	4.5
	5 - 7	GSIPC	Cyanide (total)	0.39	1.8
		RDWPC NRDWPC	Magnesium	8,000 22,000	12,200/ 26,900 (Dup.)
TP-313	2 - 4	RDWPC and NRDWPC	Aluminum	6,900	7,200
		RDWPC and NRDWPC GSIPC	Manganese	440 440	1,020
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	14.2
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12
		GSIPC	Selenium	0.41	2
	4 - 6	RDWPC and NRDWPC	Aluminum	6,900	16,500 17,900 (Dup.)
		GSIPC	Silver	0.1	3.4/ 3.3 (Dup.)
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	101 102
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.4/ 7.5 (Dup.)
		GSIPC	Zinc	303	742/ 846 (Dup.)
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	2.78/ 1.78 (Dup.)
		RDWPC and NRDWPC	Pentachlorophenol	0.022	0.26/ 0.34 (Dup)
		RDCC NRDCC	Total PCBs	4 16	37.9/ 31 (Dup.)
		RDCC	Lead	400	502/ 461 (Dup.)
		GSIPC	Selenium	0.41	0.9/ 1 (Dup.)
		RDWPC and NRDWPC	Arsenic	5.8	6.7 (Dup.)

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC		7.6 5.8	
		RDWPC NRDWPC	Phosphorus	1,300 4,800	5,890/ 6,580 (Dup.)
	8 - 9	GSIPC	Selenium	0.41	0.5
TP-314	0 - 1	GSIPC	Ethylbenzene	0.36	1.2
		GSIPC	Toluene	5.4	6.2
		RDWPC and NRDWPC GSIPC	Xylenes (total)	5.6 0.82	9.5
		RDWPC and NRDWPC	Benzene	0.1	0.56
		GSIPC	Phenanthrene	2.1	2.4
		GSIPC	Naphthalene	0.73	2.5
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.1
		RDWPC and NRDWPC GSIPC	Selenium	0.41	4.1
	6 - 8	GSIPC	Cyanide (total)	0.39	2
		RDWPC and NRDWPC	Aluminum	6,900	16,300
		RDWPC and NRDWPC	Iron	12,000	60,200
		RDWPC and NRDWPC GSIPC	Manganese	440 440	668
		GSIPC	Silver	0.1	2.5
		GSIPC	Barium	950	1,030
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	88
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	10.1
		GSIPC	Copper	135	870
		GSIPC	Zinc	303	1,710
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.05	2.78
		RDWPC and NRDWPC	Antimony	4.3	47.2
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	25
		RDWPC and NRDWPC RDCC NRDCC	Lead	700 400 900	2,050
		GSIPC	Selenium	0.41	2
	10 - 11	RDWPC NRDWPC	Magnesium	8,000 22,000	38,700
		GSIPC	Selenium	0.41	1.8

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
TP-315	0 - 1	GSIPC	Cyanide (total)	0.39	1.8
		RDWPC and NRDWPC GSIPC	Manganese	440 440	695
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.2
		GSIPC	Selenium	0.41	0.7
	4 - 6	GSIPC	Cyanide (total)	0.39	1
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.4

No other parameters were detected in soil samples analyzed in Residential Area 4 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Waterfront Plaza

Exceedances of constituents in soil samples are present at one location in the Waterfront Plaza as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
TP-301	6 - 8	RDWPC NRDWPC	Magnesium	8,000 22,000	37,400
	8 - 10	RDWPC	Magnesium	8,000	14,600
		GSIPC	Chromium	3,300	23
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.6

No other parameters were detected in soil samples analyzed in Waterfront Plaza above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Mixed Residential/Commercial Area 1

Exceedances of constituents in soil samples are present at various locations in Mixed Residential/Commercial Area 1 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-334	0 - 1	GSIPC	Cyanide (total)	0.39	0.76
		RDWPC	Magnesium	8,000	12,000
	8 - 10	RDWPC and NRDWPC	Aluminum	6,900	7,980
		RDWPC and NRDWPC	Iron	12,000	20,400
		RDWPC and NRDWPC GSIPC	Manganese	440 440	571
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	44
		RDWPC	Magnesium	8,000	11,700
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.7
		GSIPC	Selenium	0.41	0.9
SB-335	0 - 1	RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	29.6
SB-336	8 - 10	RDWPC and NRDWPC	Iron	12,000	16,600
		RDWPC and NRDWPC GSIPC	Manganese	440 440	492
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.3
		GSIPC	Selenium	0.41	0.6
SB-337	0 - 1	RDWPC	Magnesium	8,000	15,400
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.2
		GSIPC	Selenium	0.41	0.5
	10.5 - 12.5	RDWPC	Magnesium	8,000	19,800
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.0
SB-338	0 - 1	RDWPC NRDWPC	Magnesium	8,000 22,000	24,000
	8 - 10	RDWPC	Magnesium	8,000	8,240
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.6
		GSIPC	Selenium	0.41	2.1

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-339	2.75 - 3.75	GSIPC	Mercury	0.13	1.04
		RDWPC	Magnesium	8,000	8,560
		GSIPC	Selenium	0.41	0.5
		RDWPC and NRDWPC	Tetrachloroethene	0.1	0.14
	8 - 10	RDWPC and NRDWPC	Iron	12,000	31,800/ 38,800 (Dup.)
		RDWPC and NRDWPC GSIPC	Manganese	440 440	857/ 1,120 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	11.2
		GSIPC	Selenium	0.41	0.6
		RDWPC NRDWPC	Magnesium	8,000 22,000	18,900/ 23,700 (Dup.)
SB-341	0 - 1	RDWPC	Magnesium	8,000	15,000
	8 - 10	RDWPC	Magnesium	8,000	20,700
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.7
TP-303	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	7,220
		RDWPC and NRDWPC GSIPC	Manganese	440 440	985
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.6
	6 - 8	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	15
		RDWPC NRDWPC	Magnesium	8,000 22,000	100,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	705
TP-306	0.5 - 1.5	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	20
		RDWPC and NRDWPC GSIPC	Manganese	440 440	508
	6 - 7	RDWPC	Magnesium	8,000	18,400 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	20 (Dup.)
TP-333	0 - 1	RDWPC	Magnesium	8,000	17,400
		GSIPC	Selenium	0.41	0.6
	6 - 8	RDWPC NRDWPC	Magnesium	8,000 22,000	27,900
		RDWPC and NRDWPC	Arsenic	5.8	6.9

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC		5.8	
		GSIPC	Selenium	0.41	0.5
TP-334	0 - 1	RDWPC and NRDWPC NRPSIC GSIPC	Manganese	440 1,500 440	1,880
		GSIPC	Mercury	0.13	0.16
		GSIPC	Selenium	0.41	0.6
	7 - 9	RDWPC NRDWPC	Magnesium	8,000 22,000	23,500
TP-335	0 - 1	RDWPC	Magnesium	8,000	12,600
		GSIPC	Selenium	0.41	0.6
	3 - 5	RDWC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.5
		GSIPC	Selenium	0.41	1.1
		RDWPC and NRDWPC GSIPC	Manganese	440 440	666
		GSIPC	Mercury	0.13	0.16
TP-336	0 - 1	GSIPC	Cyanide (total)	0.39	1.2
		RDWPC	Magnesium	8,000	15,800
	8 - 10	RDWPC	Magnesium	8,000	17,400

No other parameters were detected in soil samples analyzed in Mixed Residential/Commercial Area 1 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Mixed Residential/Commercial Area 2

Exceedances of constituents in soil samples are present at various locations in Mixed Residential/Commerical Area 2 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
Sample #2	0.7 – 1.7	GSIPC	Phenanthrene	2.1	5.6
		GSIPC	Naphthalene	0.73	7.6
		RDWPC and NRDWPC	Benzene	0.1	0.12
		GSIPC	Xylenes (total)	0.82	2.8
		GSIPC	1,2,4-Trimethylbenzene	0.57	0.68

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
Sample #3	0.7 – 1.7	GSIPC	Phenanthrene	2.1	2.5
		GSIPC	Xylenes (total)	0.82	0.86
		GSIPC	Naphthalene	0.73	2.3
SB-6	0 – 1	GSIPC	Naphthalene	0.73	1
		GSIPC	Xylenes (total)	0.82	1.64
SBA-1A	0 – 2	GSIPC	Phenanthrene	2.1	2.3
SBA-2A	0 – 2	RDCC	Benzo(a)pyrene	2	4.8
		RDCC	Dibenzo(a,h)anthracene	2	4.4
		GSIPC	Phenanthrene	2.1	15
		GSIPC	2-Methylnaphthalene	4.2	7.4
SBA-3A	0 – 2	RDWPC and NRDWPC	Tetrachloroethene	0.1	0.52
SB-2010	0 - 1	RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	2.21
		RDWPC	Magnesium	8,000	13,300
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.5
		GSIPC	Selenium	0.41	1.1
	7 - 9	RDWPC and NRDWPC	Aluminum	6,900	7,600
		RDWPC and NRDWPC	Iron	12,000	12,200
		RDWPC and NRDWPC GSIPC	Manganese	440 440	522
		GSIPC	Mercury	0.13	0.28
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	17.5
		GSIPC	Selenium	0.41	1.1
SB-2011	0 - 1	GSIPC	Mercury	0.13	0.21

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
	3.4 - 4.75	GSIPC	Cyanide (total)	0.39	0.8
		RDWPC and NRDWPC	Iron	12,000	23,900
		GSPIC	Mercury	0.13	0.18
		GSIPC	Carbazole	1.1	1.5
		GSIPC	Naphthalene	0.73	1.1
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	15.7
		GSIPC	Selenium	0.41	1.6
		GSIPC	Fluoranthene	5.5	5.6
		GSIPC	Phenanthrene	2.1	6.6
	12.5 - 14.5	GSIPC	Cyanide (total)	0.39	1.4
		RDWPC and NRDWPC	Iron	12,000	12,600
		RDWPC and NRDWPC GSIPC	Manganese	440 440	571
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.6
		GSIPC	Selenium	0.41	0.5
SB-2013	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	8,510

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC	Iron	12,000	26,700
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	32
		GSIPC	Mercury	0.13	0.47
		RDWPC	Magnesium	8,000	14,000
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	31.4
		GSIPC	Selenium	0.41	1.4
		RDWPC and NRDWPC RDCC NRDCC	Lead	700 400 900	2,330
	3 - 5	RDWPC and NRDWPC	Aluminum	6,900	7,380
		RDWPC and NRDWPC	Iron	12,000	17,200
		GSIPC	Chromium	3.3	21/ 20.2 (Dup.)
		GSIPC	Mercury	0.13	0.61/ 0.44 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9 7.5 (Dup.)
		GSIPC	Selenium	0.41	0.8/ 0.7 (Dup.)
		RDWPC	Magnesium	8,000	8,020 (Dup.)
SB-205	0 - 1	RDWPC	Magnesium	8,000	12,900
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.6
		GSIPC	Selenium	0.41	0.5
		RDWPC and NRDWPC GSIPC	Manganese	440 440	526
	2.5 - 4.5	RDWPC	Magnesium	8,000	15,300/ 11,700 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.3/ 7.0 (Dup.)
		GSIPC	Selenium	0.41	0.8/ 0.6 (Dup.)
		RDWPC and NRDWPC GSIPC	Manganese	440 440	754/ 536 (Dup.)
SB-206	0.5 – 1.5	RDWPC	Magnesium	8,000	12,800
	2.5 - 4.5	RDWPC and NRDWPC	Aluminum	6,900	7,400
		RDWPC and NRDWPC	Iron	12,000	20,300
		RDWPC and NRDWPC GSIPC	Manganese	440 440	735

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8
SB-207	0 - 1	RDWPC	Magnesium	8,000	9,860
	3 - 5	RDWPC	Magnesium	8,000	9,810
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.9
		GSIPC	Selenium	0.41	0.6
SB-208	0 - 1	RDWPC and NRDWPC	Benzene	0.1	0.26
		GSIPC	Xylenes (total)	0.82	2.6
		RDWPC and NRDWPC	Aluminum	6,900	7,140
		RDWPC and NRDWPC	Iron	12,000	26,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	504
		GSIPC	Zinc	303	414
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	30.8
		GSIPC	Selenium	0.41	1
	4 - 6	RDWPC and NRDWPC	Aluminum	6,900	8,220
		RDWPC and NRDWPC	Iron	12,000	20,500
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.9	7.3
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.5
		GSIPC	Selenium	0.41	1.1
		GSIPC	Xylenes (total)	0.82	4.7
		GSIPC	Ethylbenzene	0.36	0.38
SB-209	0 - 1	RDWPC and NRDWPC	Nitrate (as N)	200	253

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC	Toluene	5.4	7.5
		RDWPC and NRDWPC	Benzene	0.1	0.11
		GSIPC	Xylenes (total)	0.82	3.1
		RDWPC and NRDWPC	Aluminum	6,900	13,600
		RDWPC and NRDWPC	Iron	12,000	23,500
		GSIPC	Chromium	3.3	19
		GSIPC	Mercury	0.13	0.25
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	21.9
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	10.8
		GSIPC	Selenium	0.41	1
	6 - 8	RDWPC	Magnesium	8,000	12,200
		GSIPC	Selenium	0.41	0.6
SB-210	0.5 - 1.5	GSIPC	Naphthalene	0.73	1.9
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	7.9
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.5
		GSIPC	Selenium	0.41	0.6
		GSIPC	Ethylbenzene	0.36	0.65
		RDWPC and NRDWPC	Benzene	0.1	0.23
		GSIPC	Xylenes (total)	0.82	5.6
	3 - 5	RDWPC and NRDWPC	Iron	12,000	13,200
		GSIPC	Naphthalene	0.73	0.77
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.8
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.1
		GSIPC	Selenium	0.41	1.1
		GSIPC	Xylenes (total)	0.82	4.9
		GSIPC	Ethylbenzene	0.36	0.4
		RDWPC and NRDWPC	Benzene	0.1	0.19
SB-211	4 - 6	RDWPC and NRDWPC	Iron	12,000	13,300
		RDWPC NRDWPC	Magnesium	8,000 22,000	28,000
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6
		GSIPC	Selenium	0.41	0.5

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-212	0 - 1	GSIPC	Cyanide (total)	0.39	1.1
		GSIPC	Selenium	0.41	0.5
	4 - 6	RDWPC and NRDWPC	Iron	12,000	13,500
		RDWPC NRDWPC	Magnesium	8,000 22,000	16,900/ 26,100(Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	7.9/ 8.6 (Dup.)
		GSIPC	Selenium	0.41	0.6
SB-213	0 - 1	GSIPC	Selenium	0.41	0.5
	4 - 6	RDWPC NRDWPC	Magnesium	8,000 22,000	26,000
SB-214	0 - 1	GSIPC	Selenium	0.41	0.5
	3.5 - 5.5	RDWPC and NRDWPC	Iron	12,000	18,700
		RDWPC NRDWPC	Magnesium	8,000 22,000	26,400
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.0
SB-215	0 - 1	RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	10.9
	4 - 6	RDWPC and NRDWPC	Iron	12,000	14,200
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.3
		RDWPC NRDWPC	Magnesium	8,000 22,000	26,900/ 17,200 (Dup.)
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.7/ 22.6 (Dup.)
		GSIPC	Selenium	0.41	0.5/0.5 (Dup.)
SB-216	0 - 4	GSIPC	Mercury	0.13	0.98
		RDWPC	Magnesium	8,000	8,920
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	19
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	18.4
		GSIPC	Selenium	0.41	0.6
SB-217	0 - 1	RDWPC and NRDWPC	Iron	12,000	15,000
		GSIPC	Mercury	0.13	0.21
		RDWPC	Magnesium	8,000	10,900
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.6

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC	Selenium	0.41	0.5
	3 - 5	GSIPC	Chromium	3.3	19
		RDWPC NRDWPC	Magnesium	8,000 22,000	26,000
		GSIPC	Selenium	0.41	0.5
SB-218	0 - 1	RDWPC and NRDWPC	Iron	12,000	13,300
		RDWPC and NRDWPC GSIPC	Manganese	440 440	516
		RDWPC	Magnesium	8,000	9,910
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.6
		GSIPC	Selenium	0.41	0.5
	2.5 - 4.5	RDWPC and NRDWPC	Iron	12,000	14,800
		GSIPC	Chromium	3.3	19
		RDWPC NRDWPC	Magnesium	8,000 22,000	25,300
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	15.1
		RDWPC and NRDWPC GSIPC	Selenium	4 0.41	8.4
SB-219	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	8,210
		RDWPC and NRDWPC	Iron	12,000	16,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	676
		GSIPC	Mercury	0.13	0.44
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.8

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-220	0 - 1	RDWPC and NRDWPC	Iron	12,000	22,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	640
		GSIPC	Zinc	303	376
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	1.96
		RDWPC and NRDWPC	Antimony	4.3	54.5
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.3
		GSIPC	Selenium	0.41	0.6
		GSIPC	Copper	135	318
		RDWPC and NRDWPC RDCC NRDCC	Lead	700 400 900	1,050
		GSIPC	Fluoranthene	5.5	5.6
		GSIPC	Phenanthrene	2.1	3.1
SB-221	2 - 4	RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.6/ 6.1 (Dup.)
		GSIPC	Selenium	0.41	0.6
		RDWPC and NRDWPC GSIPC	Manganese	440 440	444 (Dup.)

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-222	1.5 - 3.5	RDWPC and NRDWPC	Aluminum	6,900	9,600
		RDWPC and NRDWPC	Iron	12,000	24,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	463
		GSIPC	Chromium	3.3	21
		GSIPC	Zinc	303	413
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	2.87
		GSIPC	Silver	1	1.8
		RDWPC and NRDWPC	Antimony	4.3	10.9
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	15.7
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	6.9
		GSIPC	Selenium	0.41	1.2
		RDWPC and NRDWPC RDCC	Lead	700 400	782
		GSIPC	Copper	135	911
		RDCC	Indeno(1,2,3-cd)pyrene	20	22
		RDCC	Benzo(b)fluoranthene	20	39
		GSIPC	Fluoranthene	5.5	87
		RDCC	Benzo(a)anthracene	20	43
		RDWPC GSIPC	Phenanthrene	56 2.1	68
		GSIPC	Dibenzofuran	1.7	4.3
		RDCC	Dibenzo(a,h)anthracene	2	6.1
		GSIPC	Fluorene	5.3	7.3
		GSIPC	Carbazole	1.1	9.2
		GSIPC	Naphthalene	0.73	1.8
		RDCC NRDCC	Benzo(a)pyrene	2 8	33
SB-223	1 - 4	RDWPC and NRDWPC	Methylene chloride	0.1	0.14
		RDWPC and NRDWPC	Aluminum	6,900	7,000
		RDWPC and NRDWPC	Iron	12,000	14,800
		RDWPC and NRDWPC GSIPC	Manganese	440 440	590
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	1.85
		RDWPC	Magnesium	8,000	13,200
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	15.7
		GSIPC	Selenium	0.41	0.8

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-224	1 - 2	RDWPC and NRDWPC	Iron	12,000	14,000
		RDWPC	Magnesium	8,000	12,200
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.4
		GSIPC	Selenium	0.41	0.5
		GSIPC	Mercury	0.13	0.8
	2 - 4	RDWPC	Magnesium	8,000	14,500
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.1
		GSIPC	Mercury	0.13	0.53
SB-225	1 - 4	GSIPC	Selenium	0.41	0.6
SB-226	1 - 4	RDWPC and NRDWPC	Aluminum	6,900	9,110
		GSIPC	Chromium	3.3	22
		GSIPC	Mercury	0.13	0.64
		RDWPC	Magnesium	8,000	13,200
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.4
		GSIPC	Selenium	0.41	0.5
SB-227	0.4 – 1.4	RDWPC	Magnesium	8,000	13,200
	1.5 – 3.5	GSIPC	Mercury	0.13	0.15
		RDWPC	Magnesium	8,000	9,490
SB-229	0 - 1	GSIPC	Mercury	0.13	0.36
		RDWPC	Magnesium	8,000	16,500
	0.5 - 1.5	RDWPC	Magnesium	8,000	11,200
		GSIPC	Selenium	0.41	0.6
SB-230	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	7,290
		RDWPC and NRDWPC	Iron	12,000	18,500
		RDWPC and NRDWPC GSIPC	Manganese	440 440	524
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	24.3
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.5
		GSIPC	Selenium	0.41	1
	3 - 5	RDWPC	Magnesium	8,000	19,000
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.4
		GSIPC	Selenium	0.41	0.7

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-231	0 - 1	RDWPC NRDWPC	Magnesium	8,000 22,000	26,800
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	17.6
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	38.1
		GSIPC	Selenium	0.41	1.1
		GSIPC	Copper	135	752
		RDWPC and NRDWPC	Iron	12,000	62,500
		RDWPC and NRDWPC GSIPC	Manganese	440 440	667
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	66
		RDWPC GSIPC	Zinc	2,400 303	4,600
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	4
		GSIPC	Fluoranthene	5.5	14
		GSIPC	Phenanthrene	2.1	6.8
		RDWPC	Phosphorus	1,300	1,380
SB-232	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	9,000
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	37
		GSIPC	Mercury	0.13	0.56
		RDWPC	Magnesium	8,000	13,800
		RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	49.6
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.9
		GSIPC	Selenium	0.41	2.6
	6 - 8	RDWPC	Phosphorus	1,300	1,920
		RDWPC and NRDWPC	Aluminum	6,900	16,700
		RDWPC and NRDWPC	Iron	12,000	63,200
		GSIPC	Chromium	3.3	29
		GSIPC	Mercury	0.13	0.74
		RDWPC and NRDWPC GSIPC	Thallium	2.3 4.2	8.1
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	12.8
		RDWPC and NRDWPC	Selenium	4	33.3

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC		0.41	
		RDWPC and NRDWPC RPSIC RDCC NRDCC GSIPC	Arsenic	5.8 720 7.6 37 5.8	804
SB-233	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	7,340
		RDWPC and NRDWPC	Iron	12,000	21,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	581
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	36
		GSIPC	Mercury	0.13	0.15
		RDWPC	Magnesium	8,000	20,700
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.5
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	17.8
		GSIPC	Selenium	0.41	0.7
		GSIPC	Xylenes (total)	0.82	1.66
	2.5 - 4.5	RDWPC NRDWPC	Magnesium	8,000 22,000	22,400
SB-234	0 - 1	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	15.9
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	14.9
		GSIPC	Selenium	0.41	1
		RDWPC and NRDWPC	Iron	12,000	23,800
		RDWPC and NRDWPC GSIPC	Manganese	440 440	546
	4 - 6	GSIPC	Cyanide (total)	0.39	2.1
		RDWPC NRDWPC	Magnesium	8,000 22,000	22,600/ 14,400 (Dup.)
SB-235	0.5 - 1.5	RDWPC and NRDWPC	Aluminum	6,900	9,160
		RDWPC and NRDWPC	Iron	12,000	17,500
		RDWPC	Magnesium	8,000	10,400
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.1
		GSIPC	Selenium	0.41	0.8
	3 - 5	RDWPC and NRDWPC	Aluminum	6,900	8,160

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC	Iron	12,000	21,300
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	28.8
		GSIPC	Selenium	0.41	1
SB-236	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	6,960
		RDWPC and NRDWPC	Iron	12,000	23,400
		RDWPC and NRDWPC GSIPC	Manganese	440 440	496
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	31.8
		GSIPC	Mercury	0.13	1.18
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	13.2
		GSIPC	Selenium	0.41	1
SB-237	0 - 1	RDWPC and NRDWPC	Trichloroethene	0.1	0.23
		RDWPC and NRDWPC	Aluminum	6,900	8650
		RDWPC and NRDWPC	Iron	12,000	17800
		RDWPC and NRDWPC GSIPC	Manganese	440 440	759
		GSIPC	Mercury	0.13	0.7
		RDWPC and NRDWPC	Pentachlorophenol	0.022	0.11
		RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	39.6
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.2
		GSIPC	Selenium	0.41	2.7
		GSIPC	Fluoranthene	5.5	22
		GSIPC	Phenanthrene	2.1	19
		RDCC	Benzo(a)pyrene	2	4.9
		GSIPC	Carbazole	1.1	2.7
	2 - 4	RDWPC and NRDWPC	Aluminum	6,900	8,000
		RDWPC and NRDWPC	Iron	12,000	19,700
		RDWPC and NRDWPC GSIPC	Manganese	440 440	495
		GSIPC	Mercury	0.13	0.74
		GSIPC	Carbazole	1.1	2.1
		RDWPC and NRDWPC	Pentachlorophenol	0.022	0.42
		RDWPC and NRDWPC	Arsenic	5.8	57.9

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC		5.8	
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.4
		GSIPC	Selenium	0.41	4
		RDCC	Benzo(a)pyrene	2	4.3
		GSIPC	Phenanthrene	2.1	12
		GSIPC	Fluoranthene	5.5	16

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-238	0 - 1	GSIPC	Cyanide (total)	0.39	2.3
		RDWPC and NRDWPC	Aluminum	6,900	7,700
		RDWPC and NRDWPC	Iron	12,000	19,700
		GSIPC	Zinc	303	1,560
		GSIPC	Mercury	0.13	0.59
		RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	39.3
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	8.5
		GSIPC	Selenium	0.41	3
		GSIPC	Fluoranthene	5.5	6.6
		GSIPC	Phenanthrene	2.1	5
	2 - 4	RDWPC and NRDWPC	Nitrate (as N)	200	349/318 (Dup.)
		RDWPC and NRDWPC	Aluminum	6,900	8,020
		RDWPC and NRDWPC	Iron	12,000	16,200
		GSIPC	Mercury	0.13	0.74/0.65 (Dup.)
		RDWPC and NRDWPC	Pentachlorophenol	0.022	0.27
		GSIPC	Fluoranthene	5.5	5.6
		GSIPC	Phenanthrene	2.1	3.8/3.1 (Dup.)
		RDWPC	Magnesium	8,000	10,100 (Dup.)
		RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	49.7/ 46.7 (Dup.)
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.7/ 6.9 (Dup.)
		RDWPC and NRDWPC GSIPC	Selenium	4 0.41	4.6 4.3 (Dup.)
		RDCC	Lead	400	480 (Dup.)
		GSIPC	Xylenes (total)	0.82	1.17
SB-240	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	7,100
		RDWPC and NRDWPC	Iron	12,000	16,300
		RDWPC and NRDWPC GSIPC	Manganese	440 440	458
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.6
		GSIPC	Selenium	0.41	0.5
	4 - 6	RDWPC NRDWPC	Magnesium	8,000 22,000	25,300
SB-241	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	8,080

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC	Iron	12,000	20,500
		RDWPC	Magnesium	8,000	11,600
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	13.6
		GSIPC	Selenium	0.41	0.7
	4 - 6	RDWPC	Magnesium	8,000	17,900
SB-242	0 - 1	RDWPC and NRDWPC GSIPC	Manganese	440 440	623
		RDWPC	Magnesium	8,000	18,800
	4 - 6	RDWPC and NRDWPC	Iron	12,000	19,700
		RDWPC NRDWPC	Magnesium	8,000 22,000	23,900/ 20,000 (Dup.)
SB-243	0 - 1	GSIPC	Cyanide (total)	0.39	2.5
		RDWPC and NRDWPC	Aluminum	6,900	9,190
		RDWPC and NRDWPC	Iron	12,000	15,600
		RDWPC and NRDWPC GSIPC	Manganese	440 440	633
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.9
		GSIPC	Selenium	0.41	0.6
		RDCC	Lead	400	428
	4 - 6	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.4
		GSIPC	Selenium	0.41	0.7
SB-244	0 - 1	RDWPC and NRDWPC	Iron	12,000	12,800
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	13.6
		GSIPC	Selenium	0.41	0.5
	4 - 6	RDWPC and NRDWPC	Iron	12,000	12,400
		RDWPC	Magnesium	8,000	16,600
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	18.4
		GSIPC	Selenium	0.41	0.7
SB-246	0 - 1	GSIPC	Cyanide (total)	0.39	0.5
		GSIPC	Selenium	0.41	0.8
	3 - 4	RDWPC and NRDWPC	Iron	12,000	23,600
		RDWPC and NRDWPC RDCC	Arsenic	5.8 7.6	21.8

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC		5.8	
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.8
		GSIPC	Selenium	0.41	2.6
		GSIPC	Xylenes (total)	0.82	2.58
		GSIPC	Phenanthrene	2.1	2.7
		RDWPC and NRDWPC	Trichloroethene	0.1	0.43
	4 - 6	RDWPC and NRDWPC GSIPC	Manganese	440 440	640/ 629 (Dup.)
		GSIPC	Selenium	0.41	0.6/0.7 (Dup.)
SB-254	0 - 4	RDWPC and NRDWPC	Aluminum	6,900	11,000
		RDWPC and NRDWPC	Iron	12,000	18,500
		RDWPC and NRDWPC GSIPC	Manganese	440 440	608
		RDWPC	Magnesium	8,000	12,500
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.1
		GSIPC	Selenium	0.41	1.4
		GSIPC	Cyanide (total)	0.39	2
		GSIPC	Mercury	0.13	0.42
SB-255	1 - 2	GSIPC	Mercury	0.13	0.20
		RDWPC and NRDWPC	Aluminum	6,900	7,070
		RDWPC and NRDWPC	Iron	12,000	14,300
		RDWPC and NRDWPC GSIPC	Manganese	440 440	496
		RDWPC	Magnesium	8,000	12,100
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.3
		GSIPC	Selenium	0.41	0.6
	2 - 4	RDWPC NRDWPC	Magnesium	8,000 22,000	25,700
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.2
		GSIPC	Selenium	0.41	0.5
SB-256B	0 - 1	GSIPC	Mercury	0.13	0.23
		RDWPC	Magnesium	8,000	19,000
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.1
		GSIPC	Selenium	0.41	0.5
	2.5 - 4.5	GSIPC	Cyanide (total)	0.39	0.7
		RDWPC	Magnesium	8,000	17,500

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.4
SB-257	2 - 4	RDWPC	Magnesium	8,000	21,200
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	33.5
SB-258	0.8 - 3	RDWPC and NRDWPC	Aluminum	6,900	8,270
		RDWPC and NRDWPC	Iron	12,000	22,900
		RDWPC and NRDWPC GSIPC	Manganese	440 440	812
		GSIPC	Chromium	3.3	20.8
		GSIPC	Zinc	303	2,240
		GSIPC	Silver	1	1.04
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.6
		GSIPC	Selenium	0.41	0.6
		GSIPC	Copper	135	2,350
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	4.2
		RDWPC and NRDWPC RDCC NRDCC	Lead	700 400 900	1,720
SB-259	1 - 4	RDWPC NRDWPC	Magnesium	8,000 22,000	25,400
		GSIPC	Selenium	0.41	1.7
SB-262	1 - 2	RDWPC and NRDWPC	Iron	12,000	12,300
		RDWPC	Magnesium	8,000	13,000
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.7
		GSIPC	Selenium	0.41	0.5
	2.5 - 4.5	RDWPC	Magnesium	8,000	16,300
SB-303	0 - 2	RDWPC and NRDWPC	Iron	12,000	13,100
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.3
		GSIPC	Mercury	0.13	0.18
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.8
		GSIPC	Selenium	0.41	1.3
	3.5 - 5.5	RDWPC and NRDWPC	Aluminum	6,900	7,250
		RDWPC and NRDWPC GSIPC	Manganese	440 440	716
	5.5 - 7.5	RDWPC	Magnesium	8,000	20,600
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.2

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
	8 - 10	RDWPC NRDWPC	Magnesium	8,000 22,000	23,500/ 33,800 (Dup.)
SB-304	0 - 2	RDWPC and NRDWPC	Iron	12,000	15,200
		RDWPC	Magnesium	8,000	10,600
		GSIPC	Mercury	0.13	0.43
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.1
		GSIPC	Selenium	0.41	0.8
		RDWPC and NRDWPC	Tetrachloroethene	0.1	0.12
		GSIPC	Xylenes (total)	0.82	1.67
		RDWPC and NRDWPC	Benzene	0.1	0.17
	4 - 6	RDWPC and NRDWPC	Iron	12,000	12,300
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.8
	6 - 8	RDWPC NRDWPC	Magnesium	8,000 22,000	27,700
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.6
	8 - 10	RDWPC	Magnesium	8,000	18,600
		RDWPC and NRDWPC GSIPC	Manganese	440 440	487
SB-305	0 - 2	RDWPC and NRDWPC	Tetrachloroethene	0.1	0.38
		RDWPC and NRDWPC	Methylene chloride	0.1	0.21
		RDWPC and NRDWPC GSIPC	Manganese	440 440	661
		GSIPC	Xylenes (total)	0.82	1.5
		GSIPC	Mercury	0.13	0.17
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.5
		GSIPC	Selenium	0.41	0.7
	8 - 10	RDWPC and NRDWPC	Iron	12,000	12,300
SB-306	0 - 1	RDWPC and NRDWPC	Tetrachloroethene	0.1	0.12
		RDWPC and NRDWPC	Iron	12,000	12,500
		RDWPC	Magnesium	8,000	8,640
		RDWPC and NRDWPC GSIPC	Manganese	440 440	467
		GSIPC	Xylenes (total)	0.82	1.79
		GSIPC	Mercury	0.13	1.67
		RDWPC and NRDWPC	Pentachlorophenol	0.022	0.25
		RDWPC and NRDWPC	Arsenic	5.8	11.4

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDCC GSIPC		7.6 5.8	
		GSIPC	Selenium	0.41	0.9
	7.5 - 9.5	GSIPC	Chromium	3.3	19 (Dup.)
	9.5 - 11	RDWPC NRDWPC	Magnesium	8,000 22,000	17,300
SB-307	0 - 1	GSIPC	Ethylbenzene	0.36	0.88
		RDWPC and NRDWPC	Benzene	0.1	0.24
		RDWPC and NRDWPC GSIPC	Xylenes (total)	5.6 0.82	8.1
		GSIPC	Mercury	0.13	0.39
		GSIPC	Naphthalene	0.73	0.91
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.6
		GSIPC	Selenium	0.41	1.1
	6 - 8	RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.4 7.4 (Dup.)
		GSIPC	Selenium	0.41	0.6
		RDWPC and NRDWPC	Iron	12,000	14,000 (Dup.)
		RDWPC and NRDWPC GSIPC	Manganese	440 440	548 (Dup.)
	8 - 10	RDWPC NRDWPC	Magnesium	8,000 22,000	26,000
CTP-4	4	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	14.8
		GSIPC	Selenium	0.41	1.5
		RDCC NRDCC	Benzo(a)pyrene	2 8	24
		RDCC	Dibenzo(a,h)anthracene	2	4.9
		RDCC	Benzo(a)anthracene	20	26
		GSIPC	Phenanthrene	2.1	6.1
		GSIPC	2-Methylnaphthalene	4.2	5.5
SB-308	0 - 2	RDWPC	Magnesium	8,000	20,300
	3 - 5	RDWPC and NRDWPC	Aluminum	6,900	7,660
		RDWPC and NRDWPC	Iron	12,000	16,100
		RDWPC and NRDWPC GSIPC	Manganese	440 440	516
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	3.12
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	16.3

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC	Selenium	0.41	1
	7.5 - 9.5	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.1
		GSIPC	Selenium	0.41	0.6
		RDWPC and NRDWPC	Iron	12,000	21,700
		RDWPC	Magnesium	8,000	8,810
		RDWPC and NRDWPC GSIPC	Manganese	440 440	778
SB-309	0 - 1	RDWPC and NRDWPC	Tetrachloroethene	0.1	0.83/0.96 (Dup.)
		GSIPC	Xylenes (total)	0.82	1.89/2.08 (Dup.)
		GSIPC	Mercury	0.13	0.99/1 (Dup.)
		GSIPC	Naphthalene	0.73	0.98/1.1 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	7.8 9.2 (Dup.)
		RDWPC and NRDWPC	Iron	12,000	14,900 (Dup.)
		GSIPC	Selenium	0.41	1.1/0.9 (Dup.)
	12.5 - 14.5	RDWPC NRDWPC	Magnesium	8,000 22,000	47,700
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.4
		GSIPC	Selenium	0.41	0.6
SB-310	0 - 1	RDWPC and NRDWPC GSIPC	Ethylbenzene	1.5 0.36	3.1
		GSIPC	Toluene	5.4	13
		RDWPC and NRDWPC	Benzene	0.1	0.72
		RDWPC and NRDWPC GSIPC	Xylenes (total)	5.6 0.82	27
		GSIPC	Phenanthrene	2.1	2.2
		GSIPC	Naphthalene	0.73	2.1
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.3
		GSIPC	Selenium	0.41	2.8
	12 - 14	RDWPC NRDWPC	Magnesium	8,000 22,000	40,600
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	11.1
		GSIPC	Selenium	0.41	3.7

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-311	0 - 1	RDWPC	Magnesium	8,000	8,370
		GSIPC	Mercury	0.13	0.55
		GSIPC	Naphthalene	0.73	1.3
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.6
		GSIPC	Xylenes (total)	0.82	1.77
		GSIPC	Selenium	0.41	1.1
		GSIPC	Fluoranthene	5.5	28
		GSIPC	Phenanthrene	2.1	39
		GSIPC	Dibenzofuran	1.7	4.4
		GSIPC	Fluorene	5.3	10
		GSIPC	Carbazole	1.1	7
	13 - 15	RDWPC NRDWPC	Magnesium	8,000 22,000	57,600
SB-312	0 - 1	RDWPC and NRDWPC	Iron	12,000	32,000
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	27
		RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	95.4
		GSIPC	Selenium	0.41	1
TP-339	0 - 1	GSIPC	Ethylbenzene	0.36	0.57
		RDWPC and NRDWPC	Benzene	0.1	0.24
		RDWPC and NRDWPC GSIPC	Xylenes (total)	5.6 0.82	6.1
		GSIPC	Cyanide (total)	0.39	0.8
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9
		GSIPC	Selenium	0.41	1.2
TP-340	0 - 1	RDWPC and NRDWPC	Iron	12,000	12,700
		RDWPC and NRDWPC GSIPC	Manganese	440 440	584
		RDWPC	Magnesium	8,000	9,560
		GSIPC	Selenium	0.41	1
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	18.7
	3 - 4	RDWPC and NRDWPC	Iron	12,000	14,100
		GSIPC	Phenanthrene	2.1	2.4

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC	Magnesium	8,000	18,300
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	18.1
		GSIPC	Selenium	0.41	0.9
		GSIPC	Copper	135	178
TP-342	0 - 1	RDWPC and NRDWPC	Tetrachloroethene	0.1	0.41
		RDWPC and NRDWPC	Iron	12,000	19,300
		GSIPC	Zinc	303	465
		RDWPC and NRDWPC	Pentachlorophenol	0.022	0.16
		RDWPC NRDWPC	Magnesium	8,000 22,000	22,300
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	11.4
		GSIPC	Selenium	0.41	2
		GSIPC	Copper	135	2,550
		RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	102
		GSIPC	Fluoranthene	5.5	6.8
		GSIPC	Phenanthrene	2.1	4.1
	3.5 - 4	RDWPC and NRDWPC	Iron	12,000	23,500
		RDWPC and NRDWPC GSIPC	Manganese	440 440	492
		RDWPC	Magnesium	8,000	19,600
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	17.7
		GSIPC	Selenium	0.41	0.6

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
TP-343	0 - 1	RDWPC and NRDWPC	Iron	12,000	13,400
		RDWPC and NRDWPC GSIPC	Manganese	440 440	493
		RDWPC and NRDWPC	Pentachlorophenol	0.022	0.14
		RDWPC	Magnesium	8,000	10,900
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	25.3
		GSIPC	Selenium	0.41	1.3
	3 - 4	RDWPC and NRDWPC	Tetrachloroethene	0.1	0.31
		RDWPC and NRDWPC	Aluminum	6,900	7,830
		RDWPC and NRDWPC	Iron	12,000	16,200
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	19.6
		GSIPC	Selenium	0.41	1.4
TP-344	0 - 1	RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.6/ 6.5 (Dup.)
		GSIPC	Selenium	0.41	1.2/0.6 (Dup.)
		RDWPC and NRDWPC GSIPC	Manganese	440 440	1,100
	1 - 3	RDWPC and NRDWPC	Aluminum	6,900	7,200
		RDWPC and NRDWPC	Pentachlorophenol	0.022	0.27
		RDWPC	Magnesium	8,000	9,610
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	16.6
		GSIPC	Selenium	0.41	1
	4 - 6	RDWPC and NRDWPC	Aluminum	6,900	12,200
		RDWPC and NRDWPC	Iron	12,000	34,200
		RDWPC	Vanadium	72	72.1
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	28.3
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.6
		GSIPC	Selenium	0.41	1.2
		RDWPC and NRDWPC	Tetrachloroethene	0.1	0.24
MW-19	0 - 2	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	18
		GSIPC	Xylenes (total)	0.82	1.5

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC	Selenium	0.41	1.6
		RDWPC and NRDWPC	Aluminum	6,900	7,370
		RDWPC and NRDWPC	Iron	12,000	14,100
		RDWPC and NRDWPC GSIPC	Manganese	440 440	602
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.5
		GSIPC	Mercury	0.13	0.61
	8 - 10	RDWPC	Magnesium	8,000	15,700

No other parameters were detected in soil samples analyzed in Mixed Residential/Commercial Area 2 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Commercial Area 1

Exceedances of constituents in soil samples are present at various locations in Commercial Area 1 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SS-101	0 - 2	RDWPC and NRDWPC GSIPC	Manganese	440 440	687
		GSIPC	Selenium	0.41	0.6
SS-102	0 – 2	RDWPC and NRDWPC GSIPC	Manganese	440 440	735
SS-103	0 - 2	RDWPC and NRDWPC	Aluminum	6,900	8,200
		RDWPC and NRDWPC	Iron	12,000	14,200
		RDWPC and NRDWPC GSIPC	Manganese	440 440	1,260
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.6
		GSIPC	Selenium	0.41	0.6
SS-104	0 - 2	RDWPC and NRDWPC GSIPC	Manganese	440 440	731
		GSIPC	Selenium	0.41	0.5
SS-105	0 - 2	RDWPC and NRDWPC	Aluminum	6,900	8,460
		RDWPC and NRDWPC	Iron	12,000	14,000
		RDWPC and NRDWPC	Manganese	440	1,510

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		NRPSIC GSIPC		1,500 440	
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.7
		GSIPC	Selenium	0.41	0.6
SS-106	0 – 2	RDWPC and NRDWPC	Aluminum	6,900	8,250/ 7,870 (Dup.)
		RDWPC and NRDWPC	Iron	12,000	12,300
		RDWPC and NRDWPC GSIPC	Manganese	440 440	1,120/ 1,220 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.8/ 8.9 (Dup.)
		GSIPC	Selenium	0.41	0.8
SS-107	0 – 2	RDWPC and NRDWPC GSIPC	Manganese	440 440	582
		GSIPC	Selenium	0.41	0.5
SB-133	0 - 1	RDWPC and NRDWPC	Iron	12,000	14,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	449
		GSIPC	Mercury	0.13	0.24
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10
		GSIPC	Selenium	0.41	1
	7 - 9	RDWPC	Magnesium	8,000	11,900/ 14,400 (Dup.)
		GSIPC	Zinc	303	789 (Dup.)
		GSIPC	Mercury	0.13	0.15 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	6.9/ 8.4 (Dup.)
		GSIPC	Selenium	0.41	0.8/ 1.2 (Dup.)
		GSIPC	Xylenes (total)	0.82	1.22 (Dup.)
SB-142	0 - 1	RDWPC and NRDWPC GSIPC	Manganese	440 440	832
	8.5 - 10.5	RDWPC	Magnesium	8,000	21,700
SB-144	0 - 1	RDWPC and NRDWPC GSIPC	Manganese	440 440	936
	7 - 9	RDWPC and NRDWPC	Iron	12,000	14,900
		RDWPC NRDWPC	Magnesium	8,000 22,000	22,900/ 13,600 (Dup.)

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.6
		GSIPC	Chromium	3.3	22 (Dup.)
SB-145	0 - 1	RDWPC and NRDWPC GSIPC	Manganese	440 440	594
	7.5 - 9.5	RDWPC and NRDWPC	Iron	12,000	13,400
		RDWPC and NRDWPC GSIPC	Manganese	440 440	590
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.4

No other parameters were detected in soil samples analyzed in Commercial Area 1 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Commercial Area 2

Exceedances of constituents in soil samples are present at various locations in Commercial Area 2 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-323	0 - 1	RDWPC and NRDWPC GSIPC	Manganese	440 440	739
		GSIPC	Mercury	0.13	0.19
		GSIPC	Selenium	0.41	0.7
	8 - 10	RDWPC and NRDWPC	Iron	12,000	15,700/ 15,900 (Dup.)
		RDWPC	Magnesium	8,000	13,100/ 13,000 (Dup.)
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.2/ 7.2 (Dup.)
		GSIPC	Selenium	0.41	0.8/ 0.7 (Dup.)
SB-325	0 - 1	GSIPC	Cyanide (total)	0.39	2.3
		RDWPC and NRDWPC GSIPC	Manganese	440 440	484
	8 - 10	RDWPC	Magnesium	8,000	21,400
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.5

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-326	8 - 10	RDWPC NRDWPC	Magnesium	8,000 22,000	19,900/ 24,600 (Dup.)
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.5
SB-327	0 - 1	RDWPC and NRDWPC	Methylene chloride	0.1	0.11
		RDWPC	Magnesium	8,000	8,710
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.4
SB-327B	8 - 10	RDWPC and NRDWPC	Aluminum	6,900	7,160
		RDWPC and NRDWPC	Iron	12,000	13,200
		RDWPC and NRDWPC GSIPC	Manganese	440 440	584
		GSIPC	Chromium	3.3	19
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	7.7
		GSIPC	Selenium	0.41	0.8
SB-328	0 - 1	GSIPC	Cyanide (total)	0.39	2.4
		RDWPC and NRDWPC GSIPC	Manganese	440 440	543
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.2
		GSIPC	Selenium	0.41	1.2
	8 - 10	RDWPC and NRDWPC	Aluminum	6,900	7,740
		RDWPC and NRDWPC	Iron	12,000	18,600
		GSIPC	Chromium	3.3	20
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	11.7
		GSIPC	Selenium	0.41	0.7
SB-329	0 - 1	RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.4
		GSIPC	Selenium	0.41	0.7
	8 - 10	RDWPC NRDWPC	Magnesium	8,000 22,000	23,400
SB-330	0 - 1	RDWPC	Magnesium	8,000	11,000
		GSIPC	Selenium	0.41	0.6
	8 - 10	RDWPC and NRDWPC	Aluminum	6,900	6,980
		RDWPC and NRDWPC	Iron	12,000	14,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	441
		RDWPC	Magnesium	8,000	14,700

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	11.3
		GSIPC	Selenium	0.41	0.8
SB-331	8 - 10	RDWPC and NRDWPC	Aluminum	6,900	8,770
		RDWPC and NRDWPC	Iron	12,000	29,700
		RDWPC and NRDWPC GSIPC	Manganese	440 440	1,310
		GSIPC	Chromium	3.3	19
		RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	46.9
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.2
		GSIPC	Selenium	0.41	1.4
SB-340	0 - 1	RDWPC and NRDWPC GSIPC	Manganese	440 440	639/ 616 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.3
		GSIPC	Selenium	0.41	0.6/ 0.5 (Dup.)
SB-342	0 - 1	GSIPC	Cyanide (total)	0.39	1
	8 - 10	GSIPC	Selenium	0.41	0.6
SB-343	0 - 1	RDWPC and NRDWPC GSIPC	Manganese	440 440	547
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6
		GSIPC	Selenium	0.41	0.7
TP-316	0 - 1	RDWPC and NRDWPC	Iron	12,000	12,700
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	16.4
		GSIPC	Selenium	0.41	0.5
	6 - 8	RDWPC	Magnesium	8,000	12,000
		GSIPC	Selenium	0.41	0.5
TP-317	0 - 1	RDWPC	Magnesium	8,000	8,210
	4 - 6	RDWPC NRDWPC	Magnesium	8,000 22,000	43,100
TP-318	6 - 8	GSIPC	Selenium	0.41	0.5
TP-321	0 - 1	RDWPC and NRDWPC	Methylene chloride	0.1	0.21
		RDWPC and NRDWPC	Iron	12,000	13,700

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	34.7
TP-322	6 - 8	GSIPC	Cyanide (total)	0.39	1.3
		GSIPC	Selenium	0.41	0.5
TP-323	0 - 1	GSIPC	Selenium	0.41	0.5
TP-324	0 - 1	GSIPC	Selenium	0.41	0.5
	9 - 10	RDWPC and NRDWPC	Aluminum	6,900	7,010 (Dup.)
		RDWPC and NRDWPC	Iron	12,000	17,100/ 22,000 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.8/ 16.5 (Dup.)
		GSIPC	Selenium	0.41	0.5/ 0.7 (Dup.)
		RDWPC	Magnesium	8,000	16,400
TP-325	0 - 1	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	13.9
	8 - 10	RDWPC and NRDWPC	Iron	12,000	13,800
		RDWPC	Magnesium	8,000	11,800
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	21.4
		GSIPC	Selenium	0.41	0.9
TP-326	6 - 8	RDWPC and NRDWPC	Iron	12,000	13,400
		RDWPC	Magnesium	8,000	10,700
		GSIPC	Selenium	0.41	0.5
TP-327	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	9,340
		RDWPC and NRDWPC	Iron	12,000	14,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	912
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.6
		GSIPC	Selenium	0.41	0.7
	7 - 9	RDWPC and NRDWPC GSIPC	Manganese	440 440	496
		RDWPC	Magnesium	8,000	18,200
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6
		GSIPC	Selenium	0.41	0.5

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
TP-328	0 - 1	RDWPC and NRDWPC GSIPC	Manganese	440 440	675
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.4
	6 - 8	RDWPC and NRDWPC	Iron	12,000	14,000
		RDWPC	Magnesium	8,000	20,400/ 20,500 (Dup.)
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.2

No other parameters were detected in soil samples analyzed in Commercial Area 2 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Commercial Area 3

Exceedances of constituents in soil samples are present at various locations in Commercial Area 3 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
MW-18	0 - 2	RDWPC and NRDWPC	Aluminum	6,900	6,960
		RDWPC and NRDWPC GSIPC	Manganese	440 440	740
		GSIPC	Selenium	0.41	0.6
	8 - 10	RDWPC and NRDWPC	Iron	12,000	15,800
		RDWPC NRDWPC	Magnesium	8,000 22,000	22,100
		RDWPC and NRDWPC GSIPC	Manganese	440 440	580
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	7.8
		GSIPC	Selenium	0.41	0.6

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-248	0 - 1	GSIPC	Cyanide (total)	0.39	2.2
		RDWPC and NRDWPC	Iron	12,000	12,800
		RDWPC and NRDWPC GSIPC	Manganese	440 440	600
		GSIPC	Mercury	0.13	0.26
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.5
		GSIPC	Selenium	0.41	1
	4 - 6	RDWPC and NRDWPC	Iron	12,000	12,900
		RDWPC and NRDWPC GSIPC	Manganese	440 440	485
		GSIPC	Chromium	3.3	25
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8
		GSIPC	Selenium	0.41	0.7
	0.5 - 1.5	RDWPC and NRDWPC	Aluminum	6,900	8,460
		RDWPC and NRDWPC	Iron	12,000	14,800
		RDWPC and NRDWPC GSIPC	Manganese	440 440	613
		GSIPC	Mercury	0.13	0.25
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.4
		GSIPC	Selenium	0.41	0.8
TP-304	0.5 - 1.5	RDWPC and NRDWPC	Methylene chloride	0.1	0.23
		RDWPC and NRDWPC GSIPC	Mercury	0.13 1.7	4.69
	5 - 7	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	11.1
		RDWPC and NRDWPC	Iron	12,000	16,600
		RDWPC	Magnesium	8,000	18,900
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	9.4
TP-305	0.5 - 1.5	RDWPC and NRDWPC	Methylene chloride	0.1	0.20
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	16
		GSIPC	Selenium	0.41	2.6
	2 - 4	RDWPC and NRDWPC	Aluminum	6,900	7,140
		RDWPC and NRDWPC GSIPC	Manganese	440 440	1,200

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	9.7
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.6
	6 - 8	RDWPC	Magnesium	8,000	8,220
TP-307	0.5 - 1.5	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	16/ 18 (Dup.)
	2 - 3	RDWPC and NRDWPC	Methylene chloride	0.1	0.21
		GSIPC	Mercury	0.13	0.33
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	13
		GSIPC	Selenium	0.41	1
TP-337	0 - 1	RDWPC NRDWPC	Magnesium	8,000 22,000	26,700
		GSIPC	Selenium	0.41	0.5
	2 - 4	GSIPC	Cyanide (total)	0.39	0.6
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	13.3
		GSIPC	Selenium	0.41	1.3
	8 - 10	GSIPC	Cyanide (total)	0.39	1.3
		RDWPC	Magnesium	8,000	11,000
		GSIPC	Selenium	0.41	0.5
TP-338	0 - 1	GSIPC	Selenium	0.41	0.6/ 0.7 (Dup.)
		GSIPC	Xylenes (total)	0.82	2.62/ 1.45 (Dup.)
		RDWPC and NRDWPC	Benzene	0.1	0.13
	8 - 10	RDWPC and NRDWPC	Aluminum	6,900	7,020
		RDWPC and NRDWPC	Iron	12,000	18,800
		RDWPC and NRDWPC GSIPC	Manganese	440 440	519
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	15.6
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.0
		GSIPC	Selenium	0.41	0.7

No other parameters were detected in soil samples analyzed in Commercial Area 3 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Commercial Area 4

Exceedances of constituents in soil samples are present at various locations in Commercial Area 4 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
BK-5	2.5 – 3	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	11
		GSIPC	Mercury	0.13	0.34
MW-16	0 - 2	RDWPC and NRDWPC	Aluminum	6,900	8,070
		RDWPC and NRDWPC	Iron	12,000	13,500
		RDWPC	Magnesium	8,000	22,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	547
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	39
		GSIPC	Mercury	0.13	0.43
		RDCC	Total PCBs	4	11
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.9
		GSIPC	Selenium	0.41	0.6
	3 - 5	RDWPC	Magnesium	8,000	18,000
	8 - 10	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	11.6
		GSIPC	Selenium	0.41	1.4
		RDWPC and NRDWPC	Aluminum	6,900	8,320
		RDWPC and NRDWPC	Iron	12,000	16,800
		RDWPC and NRDWPC GSIPC	Manganese	440 440	841
		GSIPC	Chromium	3.3	19
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	2.22

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
MW-17	0 - 2	RDWPC and NRDWPC GSIPC	Manganese	440 440	795/ 590 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	7.8/ 8.6 (Dup.)
		RDWPC and NRDWPC	Iron	12,000	12,100
	8 - 10	RDWPC and NRDWPC	Iron	12,000	33,800
		RDWPC	Magnesium	8,000	8,700
		RDWPC and NRDWPC GSIPC	Manganese	440 440	1,120
		GSIPC	Chromium	3.3	23
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.3
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	29.6
		GSIPC	Selenium	0.41	1.2
SB-201	0 - 1	GSIPC	Cyanide (total)	0.39	1.5
		RDWPC and NRDWPC	Iron	12,000	14,200
		GSIPC	Copper	135	194
		GSIPC	Zinc	303	668
		GSIPC	Mercury	0.13	0.42
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.1
		GSIPC	Selenium	0.41	0.6

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
	2 - 4	RDWPC and NRDWPC	Iron	12,000	42,100
		RDWPC	Magnesium	8,000	8,800
		GSIPC	Copper	135	349
		GSIPC	Zinc	303	1,210
		GSIPC	Mercury	0.13	0.72
		RDWPC and NRDWPC	Antimony	4.3	8.4
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	13.3
		GSIPC	Selenium	0.41	1.1
		RDWPC and NRDWPC RDCC	Lead	700 400	771
SB-202	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	7,320
		RDWPC and NRDWPC	Iron	12,000	14,700
		RDWPC	Magnesium	8,000	11,800
		GSIPC	Chromium	3.3	19
		GSIPC	Copper	135	194
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.8
		GSIPC	Selenium	0.41	1
	2 - 4	RDWPC and NRDWPC	Tetrachloroethene	0.1	1.1
		RDWPC and NRDWPC	Aluminum	6,900	7,190
		RDWPC and NRDWPC	Iron	12,000	12,400
		RDWPC	Magnesium	8,000	17,200
		RDWPC and NRDWPC GSIPC	Manganese	440 440	677
		GSIPC	Chromium	3.3	19
		GSIPC	Copper	135	926
		GSIPC	Zinc	303	470
		GSIPC	Mercury	0.13	0.32
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	20.0
		GSIPC	Selenium	0.41	0.9

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-203	0 - 1	RDWPC and NRDWPC	Tetrachloroethene	0.1	0.53
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.8
		GSIPC	Selenium	0.41	0.8
		RDWPC and NRDWPC	Iron	12,000	17,300
		RDWPC	Magnesium	8,000	14,200
		GSIPC	Mercury	0.13	0.35
	2 - 4	RDWPC and NRDWPC	Aluminum	6,900	7,070/ 7,110(Dup.)
		RDWPC and NRDWPC	Iron	12,000	16,200/ 25,500 (Dup.)
		RDWPC	Magnesium	8,000	9,600/ 8,900(Dup.)
		GSIPC	Chromium	3.3	23 (Dup.)
		GSIPC	Zinc	303	1,130/ 843(Dup.)
		GSIPC	Mercury	0.13	0.68/ 0.67(Dup.)
		RDWPC and NRDWPC	Antimony	4.3	8.2/ 13.7 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	17.6/ 13.0 (Dup.)
		GSIPC	Selenium	0.41	0.7/ 0.6 (Dup.)
		RDWPC and NRDWPC RDCC	Lead	700 400	723 (Dup.)
		RDWPC GSIPC	Silver	4.5 1	10.9
		GSIPC	Phenanthrene	2.1	2.4
		RDWPC and NRDWPC GSIPC	Copper	5,800 135	20,000/ 3,590 (Dup.)
SB-204	0 - 1	RDWPC and NRDWPC	Iron	12,000	23,000
		RDWPC	Magnesium	8,000	11,400
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.9
		GSIPC	Selenium	0.41	1
	2 - 4	RDWPC and NRDWPC	Tetrachloroethene	0.1	0.21
		RDWPC and NRDWPC	Iron	12,000	19,500
		RDWPC NRDWPC	Magnesium	8,000 22,000	43,800
		GSIPC	Copper	135	290
		GSIPC	Zinc	303	849

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC	Mercury	0.13	0.48
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.5
		GSIPC	Selenium	0.41	0.7
SB-245	0 - 1	RDWPC and NRDWPC	Iron	12,000	19,700
		RDWPC and NRDWPC GSIPC	Manganese	440 440	590
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	16.4
		GSIPC	Selenium	0.41	1
	5 - 7	RDWPC NRDWPC	Magnesium	8,000 22,000	23,500
SB-249	0 - 1	RDWPC and NRDWPC	Iron	12,000	13,300
		RDWPC and NRDWPC GSIPC	Manganese	440 440	690
		GSIPC	Mercury	0.13	0.32
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.9
		GSIPC	Selenium	0.41	0.7
	12 - 14	RDWPC and NRDWPC	Tetrachloroethene	0.1	0.52
		RDWPC and NRDWPC	Aluminum	6,900	10,300
		RDWPC and NRDWPC	Iron	12,000	15,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	580
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	11.8
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	6.9
		GSIPC	Selenium	0.41	0.7
SB-250	0 - 1	RDWPC and NRDWPC	Iron	12,000	12,400
		GSIPC	Selenium	0.41	0.5
	3 - 5	RDWPC	Magnesium	8,000	17,900
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.2
		GSIPC	Selenium	0.41	0.5
SB-253	2.5 - 4.5	RDWPC NRDWPC	Magnesium	8,000 22,000	28,400

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-263	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	7,170
		RDWPC and NRDWPC	Iron	12,000	13,100
		RDWPC and NRDWPC GSIPC	Manganese	440 440	480
		GSIPC	Mercury	0.13	0.26
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.6
		GSIPC	Selenium	0.41	0.6
	3 - 5	RDWPC and NRDWPC GSIPC	Tetrachloroethene	0.1 1.2	3
		RDWPC and NRDWPC GSIPC	1,1,1-Trichloroethane	4 1.8	4.1
		RDWPC and NRDWPC	Aluminum	6,900	7,440
		RDWPC and NRDWPC	Iron	12,000	16,600
		GSIPC	Mercury	0.13	0.27
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.4
		GSIPC	Selenium	0.41	1.3
SB-264	0 - 1	RDWPC and NRDWPC	Tetrachloroethene	0.1	0.96
		RDWPC and NRDWPC	Benzene	0.1	0.35
		RDWPC and NRDWPC	Trichloroethene	0.1	0.37
		RDWPC and NRDWPC	Iron	12,000	14,800
		GSIPC	Mercury	0.13	0.8
		GSIPC	Naphthalene	0.73	1.6
		RDWPC and NRDWPC	Antimony	4.3	6.7
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.8
		GSIPC	Selenium	0.41	1.4
		GSIPC	Copper	135	302
		GSIPC	Fluoranthene	5.5	7.2
		GSIPC	Phenanthrene	2.1	5.8
		GSIPC	Xylenes (total)	0.82	1.53
	2.5 - 4.5	GSIPC	Cyanide (total)	0.39	1.8
		RDWPC NRDWPC	Magnesium	8,000 22,000	28,400
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.9
		GSIPC	Selenium	0.41	0.6

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-265	0 - 1	RDWPC and NRDWPC	Iron	12,000	23,400
		RDWPC and NRDWPC GSIPC	Manganese	440 440	632
		GSIPC	Naphthalene	0.73	0.99
		RDWPC and NRDWPC	Antimony	4.3	8.7
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	31.6
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	9
		GSIPC	Selenium	0.41	1.5
		GSIPC	Phenanthrene	2.1	4.1
		RDWPC and NRDWPC	Tetrachloroethene	0.1	0.23
		RDWPC and NRDWPC	Benzene	0.1	0.14
		GSIPC	Mercury	0.13	0.47
		GSIPC	Xylenes (total)	0.82	0.85
	2 - 4	RDWPC and NRDWPC	Aluminum	6,900	7,040
		RDWPC and NRDWPC	Iron	12,000	34,800
		RDWPC and NRDWPC GSIPC	Manganese	440 440	1,150
		RDWPC	Magnesium	8,000	13,900
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	15.9
		GSIPC	Selenium	0.41	2
		RDWPC and NRDWPC	Methylene chloride	0.1	0.19
SB-266	1.4 - 2.4	RDWPC and NRDWPC	Iron	12,000	13,300
		RDWPC	Magnesium	8,000	14,700
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.5
		GSIPC	Selenium	0.41	1
	2.5 - 4.5	RDWPC NRDWPC	Magnesium	8,000 22,000	22,800/ 30,300 (Dup.)
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.5
		GSIPC	Selenium	0.41	0.8

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-267	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	7,200
		RDWPC and NRDWPC	Iron	12,000	12,200
		GSIPC	Chromium	3.3	26
		RDWPC NRDWPC	Magnesium	8,000 22,000	22,100
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.3
		GSIPC	Selenium	0.41	0.9
	2.5 - 4.5	RDWPC and NRDWPC	Iron	12,000	13,100
		RDWPC NRDWPC	Magnesium	8,000 22,000	28,800
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.4
		GSIPC	Selenium	0.41	1
SB-268	0 - 1	RDWPC and NRDWPC	Iron	12,000	12,400
		RDWPC	Magnesium	8,000	8,140
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7
		GSIPC	Selenium	0.41	0.8
	5 - 7	RDWPC NRDWPC	Magnesium	8,000 22,000	33,300
SB-269	0 - 1	RDWPC	Magnesium	8,000	9,750
	2.5 - 4.5	RDWPC and NRDWPC	Iron	12,000	14,100
		RDWPC NRDWPC	Magnesium	8,000 22,000	33,000
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.4
SB-270	0 - 1	GSIPC	Selenium	0.41	0.6
		RDWPC and NRDWPC GSIPC	Manganese	440 440	521
SB-270B	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	7,440
		GSIPC	Mercury	0.13	0.28
		RDWPC	Magnesium	8,000	17,800
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.8
		GSIPC	Selenium	0.41	0.5
	3 - 5	RDWPC NRDWPC	Magnesium	8,000 22,000	27,900
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.9
		RDWPC and NRDWPC	Aluminum	6,900	9,130
		RDWPC and NRDWPC	Iron	12,000	22,800
		RDWPC and NRDWPC	Tetrachloroethene	0.1	0.25

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-271	1.5 - 4	RDWPC and NRDWPC	Aluminum	6,900	7,060
		RDWPC and NRDWPC	Iron	12,000	14,700
		GSIPC	Selenium	0.41	0.6
SB-272	1 - 3	RDWPC and NRDWPC	Aluminum	6,900	8,350
		GSIPC	Chromium	3.3	26
		RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	3.01
		RDWPC	Magnesium	8,000	15,800
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.1
		GSIPC	Selenium	0.41	0.9
SB-273	1 - 3	RDWPC and NRDWPC	Aluminum	6,900	9,650
		RDWPC and NRDWPC	Iron	12,000	21,100
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	32
		RDWPC	Magnesium	8,000	8,030
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	12.8
		GSIPC	Selenium	0.41	0.8
SB-274	0 - 1	RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	42.3
		GSIPC	Selenium	0.41	1.3
		RDWPC and NRDWPC	Iron	12,000	85,200
		RDWPC and NRDWPC RPSIC NRPSIC GSIPC	Manganese	440 1,500 3,300 440	3,900
	2.5 - 4.5	RDWPC and NRDWPC	Iron	12,000	17,700
		RDWPC and NRDWPC GSIPC	Manganese	440 440	673
		RDWPC	Magnesium	8,000	19,100
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.5
		GSIPC	Selenium	0.41	0.6
SB-275	0 - 1	RDWPC and NRDWPC	Iron	12,000	20,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	608
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	14.6

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC	Selenium	0.41	0.8
	2.5 - 4.5	RDWPC NRDWPC	Magnesium	8,000 22,000	22,700
		GSIPC	Selenium	0.41	0.5
SB-276	0 - 1	RDWPC	Magnesium	8,000	16,600
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.1
		GSIPC	Selenium	0.41	0.6
	4 - 6	RDWPC	Magnesium	8,000	18,200
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6
		GSIPC	Selenium	0.41	0.6
SB-277	0 - 1	RDWPC and NRDWPC	Tetrachloroethene	0.1	0.34
		RDWPC and NRDWPC	Iron	12,000	12,500
		GSIPC	Mercury	0.13	0.2
		RDWPC	Magnesium	8,000	14,800
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.2
		GSIPC	Selenium	0.41	0.6
	3 - 5	RDWPC NRDWPC	Magnesium	8,000 22,000	24,400
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.8
SB-278	0 - 1	RDWPC and NRDWPC	Iron	12,000	19,800
		RDWPC and NRDWPC GSIPC	Manganese	440 440	650
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	14.2
		GSIPC	Selenium	0.41	1.4
	3 - 5	RDWPC and NRDWPC	Iron	12,000	12,800
		RDWPC NRDWPC	Magnesium	8,000 22,000	28,800
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.6
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	8.3

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-279	0 - 1	GSIPC	Cyanide (total)	0.39	2.4
		RDWPC and NRDWPC	Iron	12,000	18,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	506
		RDWPC	Magnesium	8,000	19,900
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	16.8
		GSIPC	Selenium	0.41	0.9
	3 - 5	RDWPC NRDWPC	Magnesium	8,000 22,000	26,000/ 26,600 (Dup.)
		GSIPC	Selenium	0.41	0.6
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	21.8 (Dup.)
		GSIPC	Cyanide (total)	0.39	0.6
SB-280	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	11,500
		RDWPC and NRDWPC	Iron	12,000	47,200
		RDWPC and NRDWPC GSIPC	Manganese	440 440	786
		GSIPC	Chromium	3.3	26
		RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	75.4
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	10.6
		GSIPC	Selenium	0.41	1.5
	3 - 5	RDWPC and NRDWPC	Aluminum	6,900	10,400
		RDWPC and NRDWPC	Iron	12,000	19,900
		RDWPC and NRDWPC GSIPC	Manganese	440 440	512
		GSIPC	Chromium		19
		RDWPC	Magnesium	8,000	10,100
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.5
		GSIPC	Selenium	0.41	0.8

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-281	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	13,400
		RDWPC and NRDWPC	Iron	12,000	34,300
		RDWPC and NRDWPC GSIPC	Manganese	440 440	765
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	33
		RDWPC	Magnesium	8,000	9,740
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	17.2
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	9.3
		GSIPC	Selenium	0.41	1.4
	3 - 5	RDWPC and NRDWPC	Aluminum	6,900	13,100
		RDWPC and NRDWPC	Iron	12,000	44,400
		RDWPC and NRDWPC GSIPC	Manganese	440 440	656
		RDWPC	Magnesium	8,000	17,700
		RDWPC	Sodium	2,500	3,270
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	23.8
		GSIPC	Selenium	0.41	1.8
		RDWPC	Phosphorus	1,300	3,860
SB-282	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	9,960
		RDWPC and NRDWPC	Iron	12,000	21,200
		RDWPC and NRDWPC GSIPC	Manganese	440 440	491
		RDWPC	Magnesium	8,000	16,200
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	21.1
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	8.6
		GSIPC	Selenium	0.41	1.1
	3 - 5	RDWPC and NRDWPC	Aluminum	6,900	7,410
		RDWPC and NRDWPC	Iron	12,000	15,300
		RDWPC and NRDWPC GSIPC	Manganese	440 440	460
		GSIPC	Chromium		20
		RDWPC NRDWPC	Magnesium	8,000 22,000	25,400
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	8.2
		GSIPC	Selenium	0.41	0.7
SB-283	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	8,730
		RDWPC and NRDWPC	Iron	12,000	17,900
		RDWPC and NRDWPC GSIPC	Manganese	440 440	662
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	16.4
		GSIPC	Selenium	0.41	0.8
	3 - 5	RDWPC and NRDWPC	Iron	12,000	12,700
		RDWPC	Magnesium	8,000	19,300
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.2
		GSIPC	Selenium	0.41	0.5
SB-284	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	10,800
		RDWPC and NRDWPC	Iron	12,000	24,300
		RDWPC and NRDWPC GSIPC	Manganese	440 440	464
		GSIPC	Chromium	3.3	22
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	13.4
		GSIPC	Selenium	0.41	0.9
	2.5 - 4.5	RDWPC and NRDWPC	Methylene chloride	0.1	0.23
		RDWPC and NRDWPC	Aluminum	6,900	8,310
		RDWPC and NRDWPC	Iron	12,000	21,600
		RDWPC and NRDWPC GSIPC	Manganese	440 440	496
		GSIPC	Chromium	3.3	22
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.6
		GSIPC	Selenium	0.41	0.9
SB-285	0 - 1	RDWPC and NRDWPC	Iron	12,000	16,000
		RDWPC NRDWPC	Magnesium	8,000 22,000	22,500
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	14.2
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	6.9

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC	Selenium	0.41	0.5
	4 - 6	RDWPC NRDWPC	Magnesium	8,000 22,000	24,600
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7
		GSIPC	Selenium	0.41	0.7
SB-286	0 - 1	RDWPC and NRDWPC GSIPC	Tetrachloroethene	0.1 1.2	4.3
		GSIPC	Selenium	0.41	0.9
		GSIPC	Phenanthrene	2.1	3.6
		GSIPC	Naphthalene	0.73	1.7
		GSIPC	Xylenes (total)	0.82	1.44
	4 - 6	RDWPC NRDWPC	Magnesium	8,000 22,000	24,700
		GSIPC	Selenium	0.41	0.5
SB-287	0 - 1	RDWPC	Magnesium	8,000	19,900
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	7.8
		GSIPC	Selenium	0.41	0.5
	3 - 5	RDWPC	Magnesium	8,000	22,000
		GSIPC	Selenium	0.41	0.6
SB-288	0 - 1	RDWPC NRDWPC	Magnesium	8,000 22,000	25,300
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.1
		GSIPC	Selenium	0.41	0.8
	5 - 7	RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	7.8 (Dup.)
		GSIPC	Selenium	0.41	0.7/ 0.7 (Dup.)
		RDWPC and NRDWPC	Aluminum	6,900	7,360
		RDWPC and NRDWPC	Iron	12,000	14,500
		RDWPC NRDWPC	Magnesium	8,000 22,000	29,500/ 21,500 (Dup.)
SB-289	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	8,020
		RDWPC and NRDWPC	Iron	12,000	22,500
		RDWPC and NRDWPC GSIPC	Manganese	440 440	628
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	21.6

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC	Selenium	0.41	0.8
	5 - 7	RDWPC NRDWPC	Magnesium	8,000 22,000	29,100
SB-290	0 - 1	RDWPC and NRDWPC	Iron	12,000	27,000
		RDWPC and NRDWPC GSIPC	Manganese	440 440	545
		RDWPC	Magnesium	8,000	14,500
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	36.0
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 5.8	7.6
		GSIPC	Selenium	0.41	0.9
	5 - 7	RDWPC and NRDWPC	Aluminum	6,900	15,100
		RDWPC and NRDWPC	Iron	12,000	23,700
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	37
		RDWPC	Magnesium	8,000	21,300
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	20
		GSIPC	Selenium	0.41	0.9
		GSIPC	Copper	135	378
SB-291	0 - 1	RDWPC NRDWPC	Magnesium	8,000 22,000	29,200
		GSIPC	Selenium	0.41	0.6
	3 - 5	RDWPC NRDWPC	Magnesium	8,000 22,000	27,600/ 27,500 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	6/ 8 (Dup.)
		GSIPC	Selenium	0.41	0.6/ 0.6 (Dup.)

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-292	0 - 1	RDWPC	Magnesium	8,000	12,500
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.4
		GSIPC	Selenium	0.41	0.5
	3 - 5	RDWPC and NRDWPC	Iron	12,000	16,800/ 14,700 (Dup.)
		RDWPC and NRDWPC GSIPC	Manganese	440 440	1,020
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	11.4/ 7.7 (Dup.)
		RDWPC	Magnesium	8,000	11,800 (Dup.)
		GSIPC	Selenium	0.41	0.8/ 0.9 (Dup.)
SB-293	0 - 1	RDWPC	Magnesium	8,000	11,200
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.3
		GSIPC	Selenium	0.41	0.7
	2.5 - 4.5	RDWPC and NRDWPC	Aluminum	6,900	7,200
		RDWPC and NRDWPC	Iron	12,000	15,600
		RDWPC	Magnesium	8,000	18,500
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.7
SB-294	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	8,160
		RDWPC and NRDWPC	Iron	12,000	15,100
		RDWPC and NRDWPC GSIPC	Manganese	440 440	591
		RDWPC	Magnesium	8,000	9,440
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	20.5
		GSIPC	Selenium	0.41	1.2
	3 - 5	RDWPC	Magnesium	8,000	18,500
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	7.7
		GSIPC	Selenium	0.41	0.6
		RDWPC and NRDWPC	Iron	12,000	13,100
SB-295	0 - 1	RDWPC and NRDWPC	Aluminum	6,900	7,760
		RDWPC and NRDWPC	Iron	12,000	16,000
		GSIPC	Chromium	3.3	24
		RDWPC	Magnesium	8,000	9,250

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	7.7
		GSIPC	Selenium	0.41	0.8
	3 - 5	RDWPC NRDWPC	Magnesium	8,000 22,000	23,800
		GSIPC	Selenium	0.41	0.5
SB-296	0 - 1	RDWPC NRDWPC	Magnesium	8,000 22,000	23,200
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.4
	2.5 - 4.5	RDWPC	Magnesium	8,000	20,300
		GSIPC	Selenium	0.41	0.6
SB-297	0 - 1	RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.7
		GSIPC	Selenium	0.41	0.5
	1 - 2	GSIPC	Cyanide (total)	0.39	0.7
		RDWPC and NRDWPC	Iron	12,000	17,600
		GSIPC	Mercury	0.13	0.19
		RDWPC	Magnesium	8,000	8,050
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.7
		GSIPC	Xylenes (total)	0.82	1.37
		GSIPC	Selenium	0.41	1
	14 - 16	RDWPC and NRDWPC	Iron	12,000	15,600
		RDWPC and NRDWPC GSIPC	Manganese	440 440	478
		RDWPC NRDWPC	Magnesium	8,000 22,000	22,200
		GSIPC	Selenium	0.41	0.5
SB-298	0 - 1	RDWPC	Magnesium	8,000	15,600
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.4
		GSIPC	Selenium	0.41	0.8
	3.5 - 4.5	RDWPC	Magnesium	8,000	18,300
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.4
SB-299	0 - 1	RDWPC	Magnesium	8,000	16,300

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.0
		GSIPC	Selenium	0.41	0.7
	4 - 5	RDWPC and NRDWPC	Iron	12,000	15,100
		RDWPC NRDWPC	Magnesium	8,000 22,000	22,700
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	15.8
		GSIPC	Selenium	0.41	0.5
SB-2001	0 - 1	RDWPC and NRDWPC GSIPC	Manganese	440 440	464
		RDWPC	Magnesium	8,000	16,100
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.3
		GSIPC	Selenium	0.41	0.6
	2.75 - 4.75	RDWPC and NRDWPC	Iron	12,000	13,600
		RDWPC	Magnesium	8,000	18,300
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.6
		GSIPC	Selenium	0.41	0.7
SB-2002	0 - 1	RDWPC	Phosphorus	1,300	2,030
		RDWPC and NRDWPC	Iron	12,000	15,100
		RDWPC	Magnesium	8,000	12,800
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	12.2
		GSIPC	Selenium	0.41	0.8
	2.5 - 4.5	RDWPC NRDWPC	Magnesium	8,000 22,000	24,800
		GSIPC	Selenium	0.41	0.6
SB-2003	0 - 1	RDWPC NRDWPC	Magnesium	8,000 22,000	26,900
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.6
		GSIPC	Selenium	0.41	0.6
	1.5 - 3.5	RDWPC NRDWPC	Magnesium	8,000 22,000	23,800
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.2
SB-2004	0 - 1	RDWPC and NRDWPC	Iron	12,000	23,500
		RDWPC	Magnesium	8,000	14,300

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.6
		GSIPC	Selenium	0.41	0.9
	2 - 4	RDWPC	Magnesium	8,000	18,400
SB-2005	0 - 1	RDWPC	Magnesium	8,000	18,800
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9
		GSIPC	Selenium	0.41	0.5
	2.5 - 4.5	RDWPC and NRDWPC GSIPC	Manganese	440 440	509
		GSIPC	Mercury	0.13	0.14
		RDWPC	Magnesium	8,000	9,200
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9
		GSIPC	Selenium	0.41	0.7
SB-2006	2 - 5	RDWPC	Magnesium	8,000	17,900
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.4
		GSIPC	Selenium	0.41	0.8
SB-2007	0 - 1	RDWPC NRDWPC	Magnesium	8,000 22,000	23,800
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	5.9
		GSIPC	Selenium	0.41	0.6
	2.5 - 4.5	GSIPC	Selenium	0.41	0.6/ 0.5 (Dup.)
		RDWPC NRDWPC	Magnesium	8,000 22,000	62,400/ 31,200 (Dup.)
		RDWPC and NRDWPC	Iron	12,000	17,400 (Dup.)
		RDWPC and NRDWPC GSIPC	Manganese	440 440	471 (Dup.)
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.6 (Dup.)
SB-2008	0 - 1	RDWPC	Phosphorus	1,300	2,040
		RDWPC and NRDWPC	Iron	12,000	18,900
		RDWPC and NRDWPC GSIPC	Manganese	440 440	566
		RDWPC	Magnesium	8,000	21,000
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.4

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC	Selenium	0.41	0.8
	3 - 5	RDWPC NRDWPC	Magnesium	8,000 22,000	29,300
		GSIPC	Selenium	0.41	0.8
SB-2009	1 - 2	RDWPC and NRDWPC	Tetrachloroethene	0.1	0.18
		RDWPC and NRDWPC	Aluminum	6,900	9,770
		RDWPC and NRDWPC	Iron	12,000	21,100
		RDWPC and NRDWPC GSIPC	Manganese	440 440	633
		GSIPC	Chromium	3.3	21
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	17.4
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	8.4
		GSIPC	Selenium	0.41	1
	5 - 7	RDWPC	Magnesium	8,000	19,500
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.6
		GSIPC	Selenium	0.41	0.6
SB-2012	0 - 1	RDWPC	Magnesium	8,000	13,700
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.5
	3 - 5	RDWPC and NRDWPC	Iron	12,000	14,000
		RDWPC	Magnesium	8,000	10,200
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7.2
		GSIPC	Selenium	0.41	0.5
SB-2014	0.5 – 1.5	RDWPC	Magnesium	8,000	20,100/ 14,100 (Dup.)
		RDWPC and NRDWPC GSIPC	Manganese	440 440	776 (Dup.)
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 7.6 5.8	6.22 (Dup.)
		GSIPC	Cyanide (total)	0.41	1.02 (Dup.)
	12.5 – 13.5	RDWPC NRDWPC	Magnesium	8,000 22,000	26,000
SB-2015	0.5 – 1.5	RDWPC NRDWPC	Magnesium	8,000 22,000	32,700
	12.5 – 13.5	RDWPC	Magnesium	8,000	20,100
SB-2016	4 – 6	RDCC NRDCC	PCBs (total)	4 16	17

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
	6 – 8	RDCC NRDCC	PCBs (total)	4 16	53

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
SB-2017	2 – 4	RDCC	PCBs (total)	4	14.5
	4 – 6	RDCC NRDCC	PCBs (total)	4 16	28
	6 – 8	RDCC NRDCC	PCBs (total)	4 16	35/ 29 (Dup.)
SB-2021	4 – 6	RDCC NRDCC	PCBs (total)	4 16	25
SB-2022	2 – 4	RDCC	PCBs (total)	4	4.7
	4 – 6	RDCC NRDCC	PCBs (total)	4 16	17
	6 – 8	RDCC NRDCC	PCBs (total)	4 16	47
	8 – 10	RDCC	PCBs (total)	4	16
SB-2023	2 – 4	RDCC	PCBs (total)	4	7.1
SB-2027	6 – 8	RDCC	PCBs (total)	4	7.4
SB-2028	4 – 6	RDCC NRDCC	PCBs (total)	4 16	17
	6 – 8	RDCC NRDCC	PCBs (total)	4 16	17
	8 – 10	RDCC NRDCC	PCBs (total)	4 16	36
SB-2029	4 – 6	RDCC	PCBs (total)	4	13
SB-2030	2 – 4	RDCC	PCBs (total)	4	11
	6 – 8	RDCC	PCBs (total)	4	14
	8 - 10	RDCC	PCBs (total)	4	9
SB-2040	1.5 – 2.5	RDWPC and NRDWPC	Iron	12,000	29,000
		RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	52.8
		GSIPC	Selenium	0.41	1.7
		GSIPC	Naphthalene	0.73	0.97
SB-2041	1 – 2	RDWPC and NRDWPC	Iron	12,000	30,400
		RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	69.4
		GSIPC	Selenium	0.41	1.5
		GSIPC	Mercury	0.13	0.133
SB-2042	2 – 5	RDWPC and NRDWPC	Aluminum	6,900	14,900
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8.42
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	6.92
		GSIPC	Selenium	0.41	2.4

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/kg)	Detected Concentration (mg/kg)
		GSIPC	Naphthalene	0.73	1.1

SB-2043	2.5 – 2.7	RDWPC and NRDWPC	Iron	12,000	14,100
		RDWPC and NRDWPC GSIPC	Manganese	440 440	509
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	13.3
		GSIPC	Selenium	0.41	0.8
		GSIPC	Mercury	0.13	0.203
TP-5	6	GSIPC	Mercury	0.13	1.2
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	75
		GSIPC	Selenium	0.41	1.9
		RDCC	Benzo(a)pyrene	2	2.4
TP-17	7	GSIPC	Mercury	0.13	0.5
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	10.1
		GSIPC	Selenium	0.41	0.6
TP-18	8	GSIPC	Mercury	0.13	0.9
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	9.7
		RDWPC and NRDWPC GSIPC	Cadmium	6 6.15	6.5
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	37
		GSIPC	Selenium	0.41	0.9
		GSIPC	Fluoranthene	5.5	7.7
		RDCC	Benzo(a)pyrene	2	3.1
		GSIPC	Phenanthrene	2.1	3.2
TP-19	8	GSIPC	Mercury	0.13	0.9
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	8
		GSIPC	Selenium	0.41	0.8
TP-20	6	GSIPC	Mercury	0.13	0.6
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.2
	8.5	RDWPC and NRDWPC GSIPC	Mercury	1.7 0.13	3.3
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	11.7
		GSIPC	Selenium	0.41	2.4

TP-201	1 - 2	RDWPC and NRDWPC	Iron	12,000	25,200
		RDWPC	Magnesium	8,000	8,430
		RDWPC and NRDWPC	Pentachlorophenol	0.022	0.36
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	11.7
		GSIPC	Selenium	0.41	1.3
		RDWPC and NRDWPC	Tetrachloroethene	0.1	0.25
	8 - 10	RDWPC and NRDWPC GSIPC	Manganese	440 440	549
		GSIPC	Fluoranthene	5.5	7
TP-202	0.5 - 1.5	RDWPC and NRDWPC GSIPC	Manganese	440 440	514/ 516 (Dup.)
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	16.2/ 11.2 (Dup.)
		GSIPC	Selenium	0.41	0.6
	8 - 10	RDWPC NRDWPC	Magnesium	8,000 22,000	33,300
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	11.7
TP-203	8 - 10	RDWPC	Magnesium	8,000	13,800
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	5.9
TP-341	0.5 - 1.5	RDWPC and NRDWPC	Aluminum	6,900	9,670
		RDWPC and NRDWPC	Iron	12,000	22,200
		RDWPC and NRDWPC GSIPC	Chromium	30 3.3	40
		GSIPC	Zinc	303	764
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	20.1
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	7.7
		GSIPC	Selenium	0.41	1.5
		RDCC	Lead	400	555
		GSIPC	Copper	135	308
		GSIPC	Fluoranthene	5.5	7.7
		GSIPC	Phenanthrene	2.1	5.3
		RDWPC and NRDWPC GSIPC	Tetrachloroethene	0.1 1.2	2
	3.5 - 5	RDWPC NRDWPC	Magnesium	8,000 22,000	30,800
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	7

NW Sidewall	1.5	RDWPC and NRDWPC	Iron	12,000	32,100
		RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	60.8
		GSIPC	Selenium	0.41	2.1
		GSIPC	Mercury	0.13	0.141
		GSIPC	Naphthalene	0.73	2.4
SE Floor	3	RDWPC and NRDWPC GSIPC	Manganese	440 440	590
		GSIPC	Selenium	0.41	0.5
NW Floor	3	RDWPC and NRDWPC	Iron	12,000	12,200
		RDWPC and NRDWPC GSIPC	Manganese	440 440	859
		RDWPC and NRDWPC GSIPC	Arsenic	5.8 5.8	6.42
NE Sidewall	2	RDWPC and NRDWPC	Iron	12,000	44,800/ 33,400 (Dup.)
		RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	65.6/ 49.4 (Dup.)
		RDWPC and NRDWPC GSIPC	Cobalt	6.8 6.8	9.860/ 7.540 (Dup.)
		GSIPC	Selenium	0.41	1.7/ 2 (Dup.)
		GSIPC	Naphthalene	0.73	1.8/ 1.7 (Dup.)
SE Sidewall	1.5	RDWPC and NRDWPC	Iron	12,000	23,900
		RDWPC NRDWPC	Magnesium	8,000 22,000	25,200
		RDWPC and NRDWPC RDCC NRDCC GSIPC	Arsenic	5.8 7.6 37 5.8	50.7
		GSIPC	Selenium	0.41	1.0
		GSIPC	Naphthalene	0.73	1.2
SW Sidewall	2	RDWPC and NRDWPC	Iron	12,000	26,300
		RDWPC and NRDWPC RDCC GSIPC	Arsenic	5.8 7.6 5.8	31.5
		GSIPC	Selenium	0.41	1.7
		GSIPC	Naphthalene	0.73	1.9

No other parameters were detected in soil samples analyzed in Commercial Area 4 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Groundwater

Based on the above discussion regarding the nature and extent of the contamination by former operational area, the following exceedances were identified by redevelopment area relative to groundwater impacts.

Residential Area 1

Exceedances of constituents in groundwater samples are present at the identified locations in Residential Area 1 as summarized below.

Sample Location	Sample Date	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
TW-3	2006	RDWC and NRDWC GSIC	Arsenic	0.1 0.1	0.025/ 0.026 (Dup.)
SGWB-1	1997	GSIC	Chromium	0.011	0.013
SGWB-2	1997	GSIC	Chromium	0.011	0.012
MW-11	2008	RDWC and NRDWC	Iron	0.3	3.3
		RDWC and NRDWC	Manganese	0.05	0.665
	2010	RDWC and NRDWC	Iron	0.3	4.06
		RDWC and NRDWC	Manganese	0.05	0.614
	2012	RDWC and NRDWC	Iron	0.3	2.14
		RDWC and NRDWC	Manganese	0.05	0.597
MW-12S	2008	RDWC and NRDWC	Iron	0.3	35/ 33 (Dup.)
		RDWC and NRDWC	Manganese	0.05	2.83/ 2.92 (Dup.)
		RDWC and NRDWC GSIC	Arsenic	0.1 0.1	0.0113/ 0.0115 (Dup.)
	2010	RDWC and NRDWC	Iron	0.3	11.4/ 12.2 (Dup.)
		RDWC and NRDWC	Manganese	0.05	1.14/ 1.11 (Dup.)
	2012	GSIC	Mercury	0.0000013	0.00000199
		RDWC and NRDWC	Iron	0.3	7.21/ 6.93 (Dup.)
		RDWC and NRDWC	Manganese	0.05	0.618/ 0.655 (Dup.)
		RDWC and NRDWC GSIC	Arsenic	0.1 0.1	0.0111/ 0.0115 (Dup.)

MW-12D	2012	GSIC	Mercury	0.0000013	0.00000211
MW-13	2010	RDWC and NRDWC	Iron	0.3	3.83
		RDWC and NRDWC	Manganese	0.05	0.448
	2012	RDWC and NRDWC	Iron	0.3	3.42
		RDWC and NRDWC	Manganese	0.05	0.474
MW-14	2010	RDWC and NRDWC	Iron	0.3	0.4
		RDWC and NRDWC	Manganese	0.05	0.823
	2012	RDWC and NRDWC	Iron	0.3	0.48/ 0.426(Dup.)
		RDWC and NRDWC	Manganese	0.05	0.534/ 0.433(Dup.)

Exceedances of constituents in groundwater samples from the vertical profiling well are present in Residential Area 1 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
VA-1	10 - 14	RDWC and NRDWC	Iron	0.3	6.33
		RDWC and NRDWC	Manganese	0.05	1.81
	14 - 18	RDWC and NRDWC	Iron	0.3	8.51
		RDWC and NRDWC	Manganese	0.05	0.841
		RDWC and NRDWC	Aluminum	0.05	0.27
	18 - 22	RDWC and NRDWC	Iron	0.3	5.37/ 4.71 (Dup.)
		RDWC and NRDWC	Manganese	0.05	0.478/ 0.471 (Dup.)
		RDWC and NRDWC	Aluminum	0.05	0.23/ 0.16 (Dup.)
	22 - 26	RDWC and NRDWC	Iron	0.3	6.63
		RDWC and NRDWC	Manganese	0.05	0.607
		RDWC and NRDWC	Aluminum	0.05	0.42
		GSIC	Chromium	0.011	0.0142
	26 – 30	RDWC and NRDWC	Iron	0.3	65.9
		RDWC and NRDWC	Manganese	0.05	2.27
		RDWC and NRDWC	Aluminum	0.05	12
		RDWC and NRDWC	Lead	0.004	0.0473
		RDWC and NRDWC GSIC	Arsenic	0.1 0.1	0.0296
		RDWC and NRDWC GSIC	Chromium	0.1 0.011	0.192
		RDWC GSIC	Vanadium	0.0045 0.027	0.0397
		GSIC	Zinc	0.31	0.64
		GSIC	Copper	0.023	0.122
	30 - 34	RDWC and NRDWC	Iron	0.3	4.84

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
		RDWC and NRDWC	Manganese	0.05	0.417
		RDWC and NRDWC	Aluminum	0.05	0.16
	34 - 38	RDWC and NRDWC	Iron	0.3	62.1
		RDWC and NRDWC	Manganese	0.05	2.6
		RDWC and NRDWC	Aluminum	0.05	12
		RDWC and NRDWC	Lead	0.004	0.0393
		RDWC and NRDWC GSIC	Arsenic	0.1 0.1	0.0319
		RDWC and NRDWC GSIC	Chromium	0.1 0.011	0.145
		RDWC GSIC	Vanadium	0.0045 0.027	0.0394
		GSIC	Zinc	0.31	0.62
		GSIC	Copper	0.023	0.116
	38 - 42	RDWC and NRDWC	Iron	0.3	89.6
		RDWC and NRDWC	Bis(2-ethylhexyl)phthalate	0.006	0.02
		RDWC and NRDWC	Manganese	0.05	2.7
		RDWC and NRDWC	Aluminum	0.05	16
		RDWC and NRDWC GSIC	Lead	0.004 0.05	0.0566
		RDWC and NRDWC GSIC	Arsenic	0.1 0.1	0.487
		RDWC and NRDWC GSIC	Chromium	0.1 0.011	0.235
		RDWC GSIC	Vanadium	0.0045 0.027	0.0529
		GSIC	Zinc	0.31	1.04
		GSIC	Copper	0.023	0.142

No other parameters were detected in groundwater samples collected in Residential Area 1 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria. It should be noted that benzo(g,h,i)perylene was detected in a water sample at a concentration above the water solubility criteria; however, this sample was collected in 1997 and subsequent samples in the area did not identify the presence of this constituent above criteria.

Residential Area 2

No groundwater samples were collected from Residential Area 2.

Residential Area 3

Exceedances of constituents in groundwater samples from monitoring wells are present at various locations in Residential Area 3 as summarized below.

Sample Location	Sample Date	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
MW-10	2008	RDWC and NRDWC	Manganese	0.05	1.21
	2010	RDWC and NRDWC	Manganese	0.05	0.946
	2012	RDWC and NRDWC	Manganese	0.05	0.81/ 1.07(Dup.)
MW-15	2010	RDWC and NRDWC	Iron	0.3	0.63
		RDWC and NRDWC	Manganese	0.05	1.33
	2012	RDWC and NRDWC	Iron	0.3	1.38
		RDWC and NRDWC	Manganese	0.05	0.746

No other parameters were detected in groundwater samples collected in Residential Area 3 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Residential Area 4

Exceedances of constituents in groundwater samples from monitoring wells are present at various locations in Residential Area 4 as summarized below.

Sample Location	Sample Date	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
TW-7	2006	GSIC	Mercury	0.0000013	0.000037
MW-5	2008	RDWC and NRDWC	Manganese	0.05	1.04
		GSIC	Mercury	0.0000013	0.0000057
	2010	RDWC and NRDWC	Iron	0.3	0.75
		RDWC and NRDWC	Manganese	0.05	1.02
		GSIC	Mercury	0.0000013	0.00000366
	2012	RDWC and NRDWC	Iron	0.3	0.818
		RDWC and NRDWC	Manganese	0.05	0.971
		GSIC	Mercury	0.0000013	0.0000022
MW-7	2008	RDWC and NRDWC	Iron	0.3	1.4
		RDWC and NRDWC	Manganese	0.05	2.57
		RDWC and NRDWC GSIC	Arsenic	0.1 0.1	0.0131
		GSIC	Mercury	0.0000013	0.0000103
	2010	RDWC and NRDWC	Iron	0.3	3.07

		RDWC and NRDWC	Manganese	0.05	3.1
		RDWC and NRDWC GSIC	Arsenic	0.1 0.1	0.012
		GSIC	Mercury	0.0000013	0.00000173
	2012	RDWC and NRDWC	Iron	0.3	3.31
		RDWC and NRDWC	Manganese	0.05	2.37
		RDWC and NRDWC GSIC	Arsenic	0.1 0.1	0.0171
		GSIC	Mercury	0.0000013	0.00000218
MW-23	2012	RDWC and NRDWC	Manganese	0.05	0.944
		GSIC	Mercury	0.0000013	0.00000166

No other parameters were detected in groundwater samples analyzed in Residential Area 4 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Waterfront Plaza

Exceedances of constituents in groundwater samples from monitoring wells are present at various locations in Waterfront Plaza as summarized below.

Sample Location	Sample Date	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
SGWB-3	1997	GSIC	Chromium	0.011	0.015
MW-8	2008	RDWC and NRDWC	Manganese	0.05	0.484
	2010	RDWC and NRDWC	Manganese	0.05	0.316
	2012	RDWC and NRDWC	Iron	0.3	0.512
		RDWC and NRDWC	Manganese	0.05	0.297

No other parameters were detected in groundwater samples analyzed in Waterfront Plaza above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Mixed Residential/Commercial Area 1

Exceedances of constituents in groundwater samples from monitoring wells are present at various locations in Mixed Residential/Commercial Area 1 as summarized below.

Sample Location	Sample Date	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
SGWB-4	1997	GSIC	Chromium	0.011	0.013
MW-6	2012	GSIC	Mercury	0.0000013	0.00000161

No other parameters were detected in groundwater samples analyzed in Mixed Residential/Commercial Area 1 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Mixed Residential/Commercial Area 2

Exceedances of constituents in groundwater samples from monitoring wells are present at various locations in Mixed Residential/Commercial Area 2 as summarized below.

Sample Location	Sample Date	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
SGWA-4	1997	GSIC	Chromium	0.011	0.012
SGWA-5	1997	GSIC	Chromium	0.011	0.016
SGWB-5	1997	GSIC	Chromium	0.011	0.014
SGWB-7	1997	Water Solubility Limit [(1)]	Benzo(g,h,i)perylene	0.00026	0.00034
	1997	GSIC	Chromium	0.011	0.014
SGWB-6	1997	RDWC and NRDWC GSIC	Cadmium	0.005 0.0051	0.011
SGWG-1	1997	GSIC	Chromium	0.011	0.014
SGWK-1	1997	GSIC	Chromium	0.011	0.012
TW-8	2006	RDWC and NRDWC	Lead	0.004	0.0054
		GSIC	Mercury	0.0000013	0.00021
		GSIC	Copper	0.023	0.026
TW-9	2006	RDWC and NRDWC	Lead	0.004	0.021
		GSIC	Mercury	0.0000013	0.00069
MW-2	2008	RDWC and NRDWC	Manganese	0.05	0.329
		GSIC	Mercury	0.0000013	0.0000018
	2010	RDWC and NRDWC	Manganese	0.05	0.497
	2012	RDWC and NRDWC	Manganese	0.05	0.499
MW-4S	2008	RDWC and NRDWC	Manganese	0.05	0.535/ 0.542 (Dup.)
		GSIC	Mercury	0.0000013	0.0000197/ 0.00003 (Dup.)
	2010	RDWC and NRDWC	Manganese	0.05	0.29
		GSIC	Mercury	0.0000013	0.00000945
	2012	RDWC and NRDWC	Manganese	0.05	0.275
		GSIC	Mercury	0.0000013	0.0000151
MW-4D	2012	RDWC and NRDWC	Manganese	0.05	0.0946
MW-19	2010	RDWC and NRDWC	Manganese	0.05	0.535
	2012	RDWC and NRDWC	Manganese	0.05	0.146
MW-22	2012	RDWC and NRDWC	Manganese	0.05	0.0759
	2012	RDWC and NRDWC	Manganese	0.05	0.0838

[(1)] Not a health-based criteria.

Exceedances of constituents in groundwater samples from the vertical profiling well are present in Mixed Residential/Commercial Area 2 as summarized below.

Sample Location	Sample Depth	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
VA-2	6 - 10	RDWC and NRDWC	Lead	0.004	0.006
		RDWC and NRDWC	Antimony	0.006	0.0106
		RDWC and NRDWC	Iron	0.3	2.38
		RDWC and NRDWC	Manganese	0.05	0.16
		RDWC and NRDWC	Aluminum	0.05	0.65
		RDWC and NRDWC GSIC	Cadmium	0.005 0.0051	0.100
		RDWC and NRDWC GSIC	Selenium	0.05 0.005	0.101
	10 - 14	RDWC	Vanadium	0.0045	0.0114
		RDWC and NRDWC	Lead	0.004	0.0088
		RDWC and NRDWC	Antimony	0.006	0.1
		RDWC and NRDWC	Iron	0.3	13.6
		RDWC and NRDWC	Manganese	0.05	0.801
		RDWC and NRDWC	Aluminum	0.05	2.3
		RDWC and NRDWC GSIC	Cadmium	0.005 0.0051	0.100
		RDWC and NRDWC GSIC	Selenium	0.05 0.005	0.100
		GSIC	Mercury	0.0000013	0.0001
	14 - 18	RDWC and NRDWC	Antimony	0.006	0.1/ 0.1 (Dup.)
		RDWC and NRDWC	Iron	0.3	1.86/ 5.94 (Dup.)
		RDWC and NRDWC	Manganese	0.05	0.652/ 0.751
		RDWC and NRDWC	Aluminum	0.05	0.16/ 0.57
		RDWC and NRDWC GSIC	Cadmium	0.005 0.0051	0.100/ 0.100 (Dup.)
		RDWC and NRDWC GSIC	Selenium	0.05 0.005	0.100/ 0.100 (Dup.)
		GSIC	Mercury	0.0000013	0.0001 (Dup.)
	18 - 22	RDWC and NRDWC	Antimony	0.006	0.1
		RDWC and NRDWC	Iron	0.3	4
		RDWC and NRDWC	Manganese	0.05	0.523
		RDWC and NRDWC	Aluminum	0.05	0.38
		RDWC and NRDWC GSIC	Cadmium	0.005 0.0051	0.100

Sample Location	Sample Depth	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
		RDWC and NRDWC GSIC	Selenium	0.05 0.005	0.100
	22 - 26	RDWC and NRDWC	Lead	0.004	0.0055
		RDWC and NRDWC	Antimony	0.006	0.1
		RDWC and NRDWC	Iron	0.3	8.04
		RDWC and NRDWC	Manganese	0.05	0.412
		RDWC and NRDWC	Aluminum	0.05	0.77
		RDWC and NRDWC GSIC	Arsenic	0.1 0.1	0.0104
		RDWC and NRDWC GSIC	Cadmium	0.005 0.0051	0.100
		RDWC and NRDWC GSIC	Selenium	0.05 0.005	0.100
	26 - 30	RDWC and NRDWC	Lead	0.004	0.0053
		RDWC and NRDWC	Antimony	0.006	0.1
		RDWC and NRDWC	Iron	0.3	7.93
		RDWC and NRDWC	Manganese	0.05	0.381
		RDWC and NRDWC	Aluminum	0.05	0.92
		RDWC and NRDWC GSIC	Cadmium	0.005 0.0051	0.100
		RDWC and NRDWC GSIC	Selenium	0.05 0.005	0.100
	30 - 32	RDWC and NRDWC	Antimony	0.006	0.0105
		RDWC and NRDWC	Iron	0.3	142
		RDWC and NRDWC	Manganese	0.05	4.4
		RDWC and NRDWC	Aluminum	0.05	17
		RDWC and NRDWC GSIC	Lead	0.004 0.05	0.0921
		RDWC and NRDWC GSIC	Arsenic	0.1 0.1	0.0377
		RDWC and NRDWC GSIC	Cadmium	0.005 0.0051	0.100
		RDWC NRDWC GSIC	Vanadium	0.0045 0.062 0.027	0.0692
		RDWC and NRDWC GSIC	Chromium	0.011	0.168
		GSIC	Selenium	0.005	0.0107
		GSIC	Zinc	0.31	0.52
		GSIC	Mercury	0.0000013	0.0008
		GSIC	Copper	0.023	0.142

No other parameters were detected in groundwater samples analyzed in Mixed Residential/Commercial Area 2 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Commercial Area 1

Exceedances of constituents in groundwater samples from monitoring wells are present at various locations in Commercial Area 1 as summarized below.

Sample Location	Sample Date	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
MW-9	2008	RDWC and NRDWC	Manganese	0.05	0.318
	2010	RDWC and NRDWC	Manganese	0.05	0.591
	2012	RDWC and NRDWC	Manganese	0.05	1.04
MW-20	2012	RDWC and NRDWC	Manganese	0.05	0.759
		GSIC	Mercury	0.0000013	0.00000459

No other parameters were detected in groundwater samples analyzed in Commercial Area 1 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Commercial Area 2

Exceedances of constituents in groundwater samples from monitoring wells are present at one location in Commercial Area 2 as summarized below.

Sample Location	Sample Date	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
MW-21S	2012	GSIC	Mercury	0.0000013	0.00000151

No other parameters were detected in groundwater samples analyzed in Commercial Area 2 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Commercial Area 3

Exceedances of constituents in groundwater samples are present at various locations in Commercial Area 3 as summarized below.

Sample Location	Sample Date	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
SGWB-9	1997	GSIC	Chromium	0.011	0.013
SGWB-10	1997	GSIC	Chromium	0.011	0.015

No other parameters were detected in groundwater samples analyzed in Commercial Area 3 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Commercial Area 4

Exceedances of constituents in groundwater samples are present at various locations in Commercial Area 4 as summarized below.

Sample Location	Sample Date	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
SGWB-8	1997	GSIC	Chromium	0.011	0.014
MW-16	2010	RDWC and NRDWC	Manganese	0.05	0.123
		GSIC	Mercury	0.0000013	0.0000284
	2012	RDWC and NRDWC	Manganese	0.05	0.184
MW-17	2012	RDWC and NRDWC	Manganese	0.05	0.25
MW-3	2008	RDWC and NRDWC	Aluminum	0.05	0.062
		RDWC and NRDWC	Lead	0.004	0.0059
		RDWC and NRDWC	Manganese	0.05	0.538
		GSIC	Mercury	0.0000013	0.0000324
	2010	RDWC and NRDWC	Iron	0.3	0.38/ 0.37(Dup.)
		RDWC and NRDWC	Manganese	0.05	0.878/ 0.864(Dup.)
		GSIC	Mercury	0.0000013	0.00000405/ 0.00000437 (Dup.)
	2012	RDWC and NRDWC	Iron	0.3	1.31
		RDWC and NRDWC	Manganese	0.05	0.987
		GSIC	Mercury	0.0000013	0.0000173
		RDWC and NRDWC	Lead	0.0004	0.00421
TW-263	2010	RDWC and NRDWC	Manganese	0.05	1.39
		RDWC and NRDWC	Iron	0.3	4.83
		RDWC and NRDWC GSIC	Arsenic	0.1 0.1	0.0131
TW-279	2010	RDWC and NRDWC	Aluminum	0.05	0.0811
		RDWC and NRDWC	Iron	0.3	0.526
		RDWC and NRDWC	Manganese	0.05	0.0736

TW-297	2010	RDWC and NRDWC	Manganese	0.05	0.0856
SB-2015	2011	RDWC and NRDWC	Manganese	0.05	0.857

No other parameters were detected in groundwater samples analyzed in Commercial Area 4 above the laboratory method detection limits, or if detected were below the Part 201 Residential Cleanup Criteria.

Soil SPLP

Based on exceedances of the GSIPC in soil samples collected during the RI, additional analysis was conducted utilizing SPLP for comparison to the Part 201 Generic Residential and Non-Residential Cleanup Criteria for groundwater.

Based on the above discussion regarding the nature and extent of the contamination by former operational area, the following exceedances were identified by redevelopment area relative to SPLP in soil potential impacts.

Residential Area 1

Exceedances are present at various locations in Residential Area 1 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
SB-103	7 – 9	RDWC and NRDWC	Manganese	0.05	0.056
SB-104	5 – 7	RDWC and NRDWC	Manganese	0.05	0.141
	8 - 10	RDWC and NRDWC	Manganese	0.05	0.149
SB-111	0 – 1	RDWC and NRDWC	Manganese	0.05	0.057
SB-114	0 – 1	RDWC and NRDWC	Manganese	0.05	0.107
SB-116	9.5 – 10	RDWC and NRDWC	Manganese	0.05	0.187
SB-118	7.5 – 9.5	RDWC and NRDWC	Manganese	0.05	0.052
SB-123	0 – 1	RDWC and NRDWC	Manganese	0.05	0.0598
SB-143	0 – 1	RDWC and NRDWC	Manganese	0.05	0.153
SS-100	0 – 2	RDWC and NRDWC	Manganese	0.05	0.132

Residential Area 2

Exceedances are present at one location in Residential Area 2 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
SB-105	1 – 3	RDWC and NRDWC	Manganese	0.05	0.055

Residential Area 3

Exceedances are present at various locations in Residential Area 3 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
SB-135	0 – 1	RDWC and NRDWC	Manganese	0.05	0.0543
SB-136	8 – 10	GSIC	Copper	0.023	0.0354
		GSIC	Mercury	0.0000013	0.0001
SB-139	0 – 1	RDWC and NRDWC	Manganese	0.05	0.0508
SB-141	0 – 1	GSIC	Mercury	0.0000013	0.0006
TP-320	0 – 1	RDWC and NRDWC	Manganese	0.05	0.133

Residential Area 4

Exceedances are present at various locations in Residential Area 4 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
SB-301	5.5 – 7.5	GSIC	Copper	0.023	0.0320 (Dup.)
		GSIC	Mercury	0.0000013	0.0002 (Dup.)
SB-302	6.8 – 8.8	GSIC	Chromium	0.011	0.0413
		GSIC	Copper	0.023	0.0430
		GSIC	Mercury	0.0000013	0.0001
	8.8 – 9.8	GSIC	Copper	0.023	0.0234
		GSIC	Mercury	0.0000013	0.0002
TP-309	0 – 1	RDWC and NRDWC	Manganese	0.05	0.0710
	3 - 4	RDWC and NRDWC	Manganese	0.05	0.0742
TP-313	4 – 6	GSIC	Silver	0.0002	0.0003/ 0.0003(Dup.)
		GSIC	Mercury	0.0000013	0.0001
TP-314	6 – 8	GSIC	Chromium	0.011	0.0145

Waterfront Plaza

No soil samples were collected from Waterfront Plaza during the RI; therefore, no exceedances of the GSIPC were identified and no additional analysis was conducted utilizing SPLP for comparison to the Part 201 Generic Residential and Non-Residential Cleanup Criteria for groundwater.

Mixed Residential/Commercial Area 1

Exceedances are present at various locations in Mixed Residential/Commercial Area 1 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
SB-339	2.75 – 3.75	GSIC	Mercury	0.0000013	0.0005
TP-303	0 – 1	RDWC and NRDWC	Manganese	0.05	0.200
TP-306	0.5 – 1.5	RDWC and NRDWC	Manganese	0.05	0.057
TP-334	0 – 1	RDWC and NRDWC	Manganese	0.05	0.108
TP-335	3 – 5	RDWC and NRDWC	Manganese	0.05	0.0547

Mixed Residential/Commercial Area 2

Exceedances are present at various locations in Mixed Residential/Commercial Area 2 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
SB-211	0 – 1	RDWC and NRDWC	Manganese	0.05	0.0656
SB-216	0 – 4	GSIC	Mercury	0.0000013	0.0002
SB-224	1 – 2	GSIC	Copper	0.023	0.0237
SB-220	0 – 1	GSIC	Mercury	0.0000013	0.0001
SB-221	1 – 2	RDWC and NRDWC	Lead	0.004	0.0084
		RDWC and NRDWC	Manganese	0.05	0.0534
	2 – 4	RDWC and NRDWC	Manganese	0.05	0.0519/ 0.0519 (Dup.)
SB-222	1.5 – 3.5	GSIC	Copper	0.023	0.0466
		GSIC	Mercury	0.0000013	0.0002
SB-232	0 - 1	GSIC	Mercury	0.0000013	0.0001
	6 – 8	RDWC and NRDWC GSIC	Arsenic	0.1 0.1	0.307
		GSIC	Mercury	0.0000013	0.0001
		GSIC	Selenium	0.005	0.009
SB-236	0 – 1	GSIC	Chromium	0.011	0.0132
		RDWC and NRDWC	Manganese	0.05	0.0526
		GSIC	Mercury	0.0000013	0.0004
SB-235	0.5 – 1.5	RDWC and NRDWC	Manganese	0.05	0.0628
SB-237	0 – 1	GSIC	Selenium	0.005	0.0078
	2 – 4	GSIC	Selenium	0.005	0.0085
SB-238	0 – 1	GSIC	Selenium	0.005	0.0079
	2 - 4	GSIC	Selenium	0.005	0.0106/

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
					0.0113 (Dup.)
SB-246	4 – 6	RDWC and NRDWC	Manganese	0.05	0.0671/ 0.0744 (Dup.)
SB-258	0.8 - 3	GSIC	Copper	0.023	0.0368
		GSIC	Mercury	0.0000013	0.0002
SB-2010	0 - 1	GSIC	Mercury	0.0000013	0.0004
SB-2013	0 – 1	RDWC and NRDWC GSIC	Chromium	0.1 0.011	0.158
		GSIC	Mercury	0.0000013	0.0002
	3 – 5	GSIC	Mercury	0.0000013	0.0001
SB-305	8 – 10	RDWC and NRDWC	Manganese	0.05	0.1
SB-306	7.5 – 9.5	RDWC and NRDWC	Manganese	0.05	0.102/ 0.106 (Dup.)
SB-307	6 – 8	RDWC and NRDWC	Manganese	0.05	0.07/ 0.053 (Dup.)
TP-342	0 – 1	RDWC and NRDWC GSIC	Arsenic	0.1 0.1	0.0169
TP-343	3 – 4	RDWC and NRDWC	Manganese	0.05	0.0549
TP-344	0 – 1	RDWC and NRDWC	Manganese	0.05	0.0755/ 0.0608 (Dup.)

Commercial Area 1

Exceedances are present at various locations in Commercial Area 1 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
SB-142	0 – 1	RDWC and NRDWC	Manganese	0.05	0.216
SB-144	0 – 1	RDWC and NRDWC	Manganese	0.05	0.125
SB-145	0 – 1	RDWC and NRDWC	Manganese	0.05	0.164
	7.5 – 9.5	RDWC and NRDWC	Manganese	0.05	0.178
SS-101	0 – 2	RDWC and NRDWC	Manganese	0.05	0.0822
SS-102	0 – 2	RDWC and NRDWC	Manganese	0.05	0.136
SS-103	0 – 2	RDWC and NRDWC	Manganese	0.05	0.144
SS-104	0 – 2	RDWC and NRDWC	Manganese	0.05	0.150
SS-105	0 – 2	RDWC and NRDWC	Manganese	0.05	0.175
SS-106	0 – 2	RDWC and NRDWC	Manganese	0.05	0.114/ 0.0977 (Dup.)
SS-107	0 – 2	RDWC and NRDWC	Manganese	0.05	0.0590

Commercial Area 2

Exceedances are present at various locations in Commercial Area 2 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
SB-323	0 – 1	RDWC and NRDWC	Manganese	0.05	0.0669
SB-343	0 – 1	RDWC and NRDWC	Manganese	0.05	0.0598
TP-316	0 – 1	RDWC and NRDWC	Manganese	0.05	0.104
	6 – 8	RDWC and NRDWC	Manganese	0.05	0.0712
TP-321	0 – 1	RDWC and NRDWC	Manganese	0.05	0.0773
	6 – 8	RDWC and NRDWC	Manganese	0.05	0.0928
TP-323	0 – 1	RDWC and NRDWC	Manganese	0.05	0.0593
TP-324	0 – 1	RDWC and NRDWC	Manganese	0.05	0.0934
TP-326	0 – 1	RDWC and NRDWC	Manganese	0.05	0.0732
TP-327	0 – 1	RDWC and NRDWC	Manganese	0.05	0.104
TP-328	0 – 1	RDWC and NRDWC	Manganese	0.05	0.0644

Commercial Area 3

Exceedances are present at various locations in Commercial Area 3 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
MW-18	0 – 2	RDWC and NRDWC	Manganese	0.05	0.052
TP-304	0.5 – 1.5	GSIC	Mercury	0.0000013	0.0016
	2 – 4	RDWC and NRDWC	Manganese	0.05	0.176
TP-305	2 - 4	RDWC and NRDWC	Manganese	0.05	0.108
TP-307	2 – 3	GSIC	Mercury	0.0000013	0.0001
TP-338	0 – 1	RDWC and NRDWC	Manganese	0.05	0.0515
	8 – 10	RDWC and NRDWC	Manganese	0.05	0.0767

Commercial Area 4

Exceedances are present at various locations in Commercial Area 4 as summarized below.

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
SB-203	2 – 4	GSIC	Copper	0.023	0.0306/ 0.0244 (Dup.)
SB-265	0 – 1	RDWC and NRDWC	Lead	0.004	0.0074
SB-272	1 – 3	GSIC	Mercury	0.0000013	0.0001

Sample Location	Sample Depth (feet bgs)	Part 201 Cleanup Criteria Exceedance	Constituent	Part 201 Cleanup Criteria (mg/L)	Detected Concentration (mg/L)
SB-283	0 – 1	RDWC and NRDWC	Manganese	0.05	0.0546
SB-284	0 – 1	RDWC and NRDWC	Manganese	0.05	0.181
	2.5 – 4.5	RDWC and NRDWC	Manganese	0.05	0.0848
TP-201	8 – 10	RDWC and NRDWC	Manganese	0.05	0.158
TP-202	0.5 – 1.5	RDWC and NRDWC	Manganese	0.05	0.09/ 0.076 (Dup.)
TP-203	0.5 – 1.5	RDWC and NRDWC GSIC	Arsenic	0.1 0.1	0.0405
	2 - 4	RDWC and NRDWC	Manganese	0.05	0.056
TP-341	0.5 – 1.5	GSIC	Copper	0.023	0.0388
		GSIC	Chromium	0.011	0.0696
TP-5	6	RDWC and NRDWC GSIC	Lead	0.004 0.05	0.6

In addition, a Human Health Risk Assessment (HHRA) and Screening Level Ecological Risk Assessment (SLERA) were performed on the dataset and presented in the RI Report, as summarized below in Sections 1.2.6 and 1.2.7, respectively.

1.2.4.3 Previous Response Actions

In 2007 and 2008, the Plainwell Impoundment Time Critical Removal Action (TCRA) was undertaken in accordance with the Administrative Settlement Agreement and Order on Consent for Removal Action, Docket No. V-W-07-C-863, with members of the Kalamazoo River Study Group. TCRA activities were designed and conducted in targeted areas along the Kalamazoo River, but did not include any response actions associated with the banks adjacent to the Site.

At the request of the City of Plainwell, emergency response actions for the southern banks of the Kalamazoo River adjacent to the Site were initiated by RMT on behalf of Weyerhaeuser in 2007. Response actions were planned concurrently with TCRA activities. An Emergency Response Action (ERA) approach was authorized by the U.S. EPA, in accordance with the emergency action provisions of the Consent Decree, in correspondence dated June 29, 2007. ERA activities for the adjacent Plainwell Mill Banks were designed and implemented consistent with applicable provisions of the Administrative Settlement Agreement and the Plainwell Impoundment TCRA Design Report prepared by Arcadis BBL in 2007 (Arcadis BBL, 2007). Details of the ERA are discussed in the Emergency Response Plan Documentation Report prepared by RMT and dated January 2009 (RMT, 2009).

According to the Emergency Response Plan, the emergency action was driven by three objectives:

- *"Remove or contain visible paper residuals and address previously identified areas of reported polychlorinated biphenyls (PCBs) concentrations of greater than 50 mg/kg in soils/sediments along the former Plainwell Mill banks to a target concentration of either 4 mg/kg or 1 mg/kg*
- *Reconstruct the river bank, as needed, to minimize future release of PCBs*
- *Reconfigure banks to limit upland cutbacks into former Plainwell Mill property and place erosion controls to provide comparable stability to pre-excavation conditions*"

The ERA activities associated with the adjacent Plainwell Mill Banks were conducted in the following phased approach between 2007 and 2009.

Excavation activities were conducted in four stages (Zone A through Zone D), each stage addressing a separate section of the adjacent Plainwell Mill Banks, which were selected based on similar bank and/or river conditions. Removal activities began with Zone A, a 600-foot length of river bank adjacent to the west end of the Site and then moved upstream to Zone B, a 700-foot length of river bank east of Zone A, followed by Zone D, a 650-foot length of river bank adjacent to the east end of the Site, and finally Zone C, a 650-foot length of river bank area situated between Zones B and D. A summary of the removal actions, by Zone, is presented below. Figures identifying the extent of excavation areas and sample locations are presented in the Emergency Response Plan Documentation Report (RMT 2009). These figures have not been reproduced herein due to the fact that these areas are outside the defined area of the Site within the scope of the FS Report.

Zone A

Approximately 2,500 cubic yards of sediment and floodplain soil were removed from Zone A and placed in the containment area. Initially, 13 verification soil and sediment samples were collected and analyzed for PCBs. PCB concentrations were below the target level of 1 milligram per kilogram (mg/kg) in all but 2 of the samples (PM-SD-003 and PM-SD-013). Additional material was removed and two additional verification samples were collected (PM-SD-003R and PM-SD-013R) in these areas. PCB concentrations detected in the samples were below 1 mg/kg.

Zone B

Approximately 400 cubic yards of near shore sediment was removed from Zone B and placed in the containment area. The banks in Zone B were characterized as heavily wooded and steep with no observable floodplain areas. A total of 21 verification sediment samples were collected from the underlying sediment and analyzed for PCBs. PCB concentrations were below the target level of 1 mg/kg in all but 2 samples (PM-SD-029 and PM-SD-032). An additional 3.5 to 4 cubic yards of sediment were removed and these areas were re-sampled. PCB concentrations were below 1 mg/kg in PM-SD-029R and PM-SD-032R.

Zone C

Seven pre-excavation samples were collected from Zone C. Excavation activities were conducted in three sections beginning with the 300-foot eastern section of Zone C. Visible residuals were removed and placed in the containment area and seven verification samples were collected for PCB analysis. PCBs were below the target level of 1 mg/kg in all but two samples (PM-SD-048 and PM-SD-051). Additional material was excavated in the area of these samples until the natural river bed was encountered. Verification samples PM-SD-48R and PM-SD-51R were collected and according to laboratory results, PCB concentrations in the samples still exceeded 1 mg/kg. In accordance with the approved methods, no further removal was conducted and the banks were reconfigured and stabilized with rip-rap.

Removal activities continued in the central portion of Zone C and four verification samples were collected for PCB analysis. PCBs exceeded the action level of 1 mg/kg in three of the four samples (PM-SD-55, PM-SD-56, and PM-SD-57) and also exceeded 50 mg/kg in one sample (PM-SD-57). Therefore, a portion of the material was segregated into a roll off container for disposal. Based on the results of the verification sampling, additional sediment was removed until the original river bottom was encountered. Additional verification samples were collected and PCBs were again detected above 1 mg/kg in PM-SD-55R and PM-SD-57R; however, in accordance with the approved methods, no further removal was conducted and the banks were stabilized with geotextile fabric and rip-rap.
Based on previous visual reconnaissance of the 180-foot western portion of Zone C, it was not anticipated that paper residuals were present in this section of the Plainwell Mill Banks. Therefore, six test pits were conducted prior to commencing removal activities. No residual material was observed in the test pits and one sample was collected from each test pit for PCB analysis. Based on the locations presented on the figures included with RMT's Emergency Response Plan Documentation Report, these results are included in the Pre-RI sample results for Residential Area 3 and were all below 1 mg/kg. Additional hand auger samples were also collected in this area and were analyzed for PCBs. According to RMT's report, PCB concentrations ranged from 0.092 mg/kg to 5.6 mg/kg. Based on the presence of steep banks and high velocity flow conditions associated with this section of the river, Weyerhaeuser requested U.S. EPA approval to cover the area with geotextile fabric and erosion control stone, without completion of excavation activities. This approach was approved by the U.S. EPA on March 28, 2008.

Zone D

Zone D was characterized as having lower banks with little observable floodplain area. While excavating near shore sediments in the eastern half of Zone D, RMT encountered concrete debris and when the debris was penetrated an oily sheen appeared on the water surface. A clay layer was immediately placed over the concrete debris to limit further contact with surface water. Seven verification samples were collected during excavation activities in the eastern half of Zone D and analyzed for PCBs. PCB concentrations exceeded the action level in all of the samples and were as high as 513 mg/kg in one

sample (PM-SD-041). To prevent further exacerbation and limit potential for further release to surface water, the entire 300-foot eastern section of Zone D was capped with 1 to 1.5 feet of clay and stabilized with rip-rap without further excavation.

Based on the PCB concentrations detected in sediments from the eastern half of Zone D, RMT began collecting pre-excavation samples from the remaining removal areas. A total of seven pre-excavation samples were collected from the western half of Zone D and analyzed for PCBs. PCB concentrations were below the target level in all but two of the samples. Elevated PCB concentrations were detected in PEX-1 and PEX-2; therefore, no excavation activities were conducted in the vicinity of these two samples as to minimize potential for a release. Instead, the area was covered with a clay barrier and stabilized with rip-rap. Approval for this interim measure was granted by U.S. EPA on February 19, 2008. Excavation activities continued in the remainder of the western portion of Zone D and five verification samples were collected for PCB analysis. Some questions were raised by U.S. EPA and MDEQ as to whether an appropriate sampling method was used to collect the verification samples in Zone D; therefore, five additional verification samples were collected using an approved method. No PCBs were detected above the target level of 1 mg/kg in any of the ten verification samples collected in the western portion of Zone D.

A total of 300 cubic yards of sediment and floodplain soil were removed from Zone D. 25 cubic yards of this total were removed from the eastern portion of Zone D in the area of elevated PCB concentrations (above 50 mg/kg) and were therefore segregated into lined roll off containers for characterization and disposal.

Zone A through D removal information is provided in the Emergency Response Plan Documentation Report prepared by RMT and dated January 2009 (RMT, 2009).

According to the Emergency Response Plan prepared by RMT, excavation on shore was considered complete when visible residuals were removed and PCB concentrations in composite verification samples collected from underlying soils were less than 4 mg/kg. Excavation of floodplain and near shore sediments was considered complete when the original river bottom was encountered or when residuals were no longer visible in soil and sediment samples and PCB concentrations in verification samples collected from the underlying material were less than 1 mg/kg. Areas where PCB concentrations exceeding target levels remained in place were covered with geotextile fabric and 6 inches of clean soil or stone.

A residuals containment area was constructed in the area of the former aeration basin. The containment area was constructed using a sand covered low density polyethylene liner and was surrounded by an earthen containment berm. The containment area was graded to allow water to drain to a collection area where it could be transferred to an on-Site holding tank for treatment. A

wastewater treatment system was installed adjacent to the containment area, which consisted of a 20,000-gallon holding tank, multi-media filters and carbon absorption columns. A total of 185,000 gallons of treated water was discharged to the Kalamazoo River under a National Pollutant Discharge Elimination System (NPDES) permit.

Subsequent to completion of activities, the temporary access road was scraped and material disposed off Site with the excavated materials. Additionally, the sand and liner system from the containment pad were removed and disposed off Site after sampling and waste characterization.

Excavated areas were backfilled with clean fill material, graded, and stabilized with rip-rap in accordance with the approved design report.

1.2.5 Contaminant Fate and Transport

Contaminant fate and transport is discussed in Section 3.0, Section 8.1.3.2, and Section 9.1.4 of the RI Report (CRA, 2013a), including potential routes of migration, contaminant persistence, and contaminant migration. Figure 1.3 presents the human health Conceptual Site Model (CSM). Figure 1.4 presents the SLERA CSM.

Many factors control the partitioning of a chemical in the environment. An understanding of the general fate and transport characteristics of the constituents identified in media is important when predicting future theoretical exposure, linking sources with currently contaminated media, and identifying potentially complete pathways to Site media. Based on the historical analytical data collected for the environmental media of concern at the Site, comparison of the results to the Part 201 Cleanup Criteria, and current and anticipated future Site conditions, the following potential contaminant transport mechanisms at the Site are:

- Movement with wind
- Movement with surface water
- Movement during future Site re-use construction disturbance
- Movement of constituents leached from soil
- Movement with groundwater
- Movement of VOCs (from soil and groundwater) within subsurface gas

The exposure of soil at the surface may result in the transport of dust and VOCs by wind. Cover material is present, but limited in some areas of the Site. The existing cover likely does not totally prevent upward migration of chemicals within vapors. The existing cover has also been found to contain

detectable concentrations of chemicals. The presence of chemicals within the existing cover may contribute to chemical migration of VOCs or fugitive dust. VOCs in the air will be subject to dispersion by the wind and photolysis due to exposure to sunlight, thereby limiting their concentrations.

The exposure of soil at the surface may also result in the transport of dissolved or suspended contaminants along surface water drainage pathways. The potential for this to occur is limited because of the topography of the Site. Organic chemicals dissolved in surface water may be subject to adsorption, hydrolysis, or photolysis. VOCs may also volatilize during transport in surface water.

Construction activities may also result in disturbance of contaminants in the various media. Contaminants attached to soil particulates may become suspended in the air column and transported by wind. Additionally, contaminants may be moved from the subsurface to the ground surface during excavation and/or earthwork.

Movement of leached constituents is another potential contaminant transport mechanism. Leached constituents can be produced through infiltration of precipitation into impacted surface soils. Once leached constituents have been produced, the following migration pathways are possible:

1. Leached constituents can be transferred to subsurface soil from percolation away from the surface soils. This transfer may occur through the process of mechanical filtration, precipitation, and/or sorption.
2. Leached constituents can percolate through the soil underlying and impact the underlying aquifer(s).
3. VOCs in leached material can migrate through the vadose zone via diffusion to ambient and/or indoor air.

Movement with groundwater is a potential transport mechanism. Once the chemicals have entered the groundwater, the following migration pathways are possible:

1. Lateral groundwater migration toward the Kalamazoo River.
2. Impacted groundwater can migrate vertically to deeper aquifers.
3. VOCs in groundwater can migrate through the vadose zone via diffusion to ambient and/or indoor air.

During groundwater transport, the contaminants released to the groundwater will be subject to dispersion, adsorption, volatilization, and biotic and abiotic degradation.

1.2.5 Baseline Human Health Risk Assessment

A Baseline HHRA was performed during the RI, which complied with the requirements of the SOW. The HHRA presented an evaluation of potential human exposure under both the current and planned future Site uses. Consistent with U.S. EPA guidance, the basis of the evaluation in the RI Report was worst case and assumed that no remediation ever occurs at the Site. The HHRA is presented in Section 8.0 of the RI Report (CRA, 2013a).

As discussed in the approved RI Report (Revision 2) Section 8.1.6.1 Sampling Procedure Bias, all development areas of the Site had a sufficient number of soil samples (minimum sample size between 8 and 10 soil samples as identified by U.S. EPA), with the exception of Waterfront Plaza and Commercial Area 3. Based on the conceptual redevelopment plan, there was 1 surface soil sample and 3 surface and subsurface soils samples available for the Waterfront Plaza. Therefore, 4 surface soil samples and 9 surface and subsurface soil samples collected adjacent to Waterfront Plaza and within Residential Areas 3 and 4 were combined to form the Waterfront Plaza soil dataset to permit evaluation of soil exposure within this development area. Based on the conceptual redevelopment plan, there were 6 surface soil samples and 15 surface and subsurface soil samples available for Commercial Area 3. The number of surface soil samples for both Waterfront Plaza and Commercial Area 3 are less than the U.S. EPA recommended minimum sample size of 8 to 10 samples; however, given that the potentially contaminating activities within these development areas were very limited and investigated and that the HHRA also included evaluation of all receptors to the combined surface and subsurface soils, which has a sufficient sample size, it is expected that the low sample size for surface soil at Waterfront Plaza and Commercial Area 3 would not be identified as a significant uncertainty in the datasets for these areas.

For groundwater, many of the development areas had sample sizes less than the U.S. EPA recommended minimum sample size of 8 to 10 samples. Therefore, to supplement relative small sample sizes in the development areas, the groundwater data for the Site was separated into three areas (Area 1, Area 2, and Area 3) consistent with the separation of the Site during the Site Characterization and that followed by the HHRA in the previous submission (see Figure 1.2 of the RI report). To determine which Area (Area 1, Area 2, or Area 3) each development area occurs, the conceptual redevelopment plan presented on Figure 8.1 of the RI report was overlaid on Figure 1.2 of the RI report (some overlap occurred). For example, Residential Area 4 on Figure 8.1 of the RI Report is located within Area 1 on Figure 1.2 of the RI report. Therefore, the groundwater dataset for Residential Area 4 would be the Area 1 groundwater dataset. The following bullets summarize the distribution of the groundwater datasets:

- Area 1 groundwater data was applied in Residential Areas 1, 2, and 3 and Commercial Area 1

- Area 2 groundwater data was applied in Commercial Area 4 and Mixed Residential/Commercial Area 2
- Area 3 groundwater data was applied in Commercial Areas 2 and 3, Mixed Residential/Commercial Area 1, Residential Area 4, and Waterfront Plaza

Based on the above discussion regarding the nature and extent of the contamination by former operational area and the HHRA complete as part of the RI Report (Revision 2), the following conclusions were identified by redevelopment area relative to soil impacts.

Residential Area 1

The HHRA target risk and hazard level exceedances for Residential Area 1 soil are summarized as follows:

- The calculated cancer risks and hazards for the trespasser, recreational user, resident, commercial worker, and utility worker direct contact (incidental ingestion, dermal contact, and ambient air inhalation) with soil were below the target risk level of 1×10^{-4}, at or above the target risk level of 1×10^{-6} (arsenic and pentachlorophenol were the major contributors), and below the target hazard of 1.

Residential Area 2

The HHRA target risk and hazard level exceedances for Residential Area 2 soil are summarized as follows:

- The calculated cancer risks and hazards for the recreational user, resident, commercial worker, and utility worker direct contact (incidental ingestion, dermal contact, and ambient air inhalation) with soil were below the target risk level of 1×10^{-4}, at or above the target risk level of 1×10^{-6} (arsenic was the major contributor), and below the target hazard of 1.
- The calculated cancer risk and hazard for the resident inhalation of indoor air (from soil) was above the target risk levels of 1×10^{-4} and 1×10^{-6}, and above the target hazard of 1, with benzene the major contributor to cumulative risk and hazard.
- The calculated cancer risk and hazard for the commercial worker inhalation of indoor air (from soil) was below the target risk level of 1×10^{-4}, at or above the target risk level of 1×10^{-6} (benzene was the major contributor), and below the target hazard of 1.

Residential Area 3

The HHRA target risk and hazard level exceedances for Residential Area 3 soil are summarized as follows:

- The calculated cancer risks and hazards for the trespasser, recreational user, resident, commercial worker, and utility worker direct contact (incidental ingestion, dermal contact, and ambient air inhalation) with soil were below the target risk level of 1×10^{-4}, at or above the target risk level of 1×10^{-6} (arsenic was the major contributor), and below the target hazard of 1.

Residential Area 4

The HHRA target risk and hazard level exceedances for Residential Area 4 soil are summarized as follows:

- The calculated cancer risks for the trespasser, recreational user, resident, commercial worker, and utility worker direct contact (incidental ingestion, dermal contact, and ambient air inhalation) with soil were below the target risk level of 1×10^{-4} and at or above the target risk level of 1×10^{-6} (benzo(a)pyrene, dibenz(a,h)anthracene, arsenic, and total PCBs were the major contributors). In addition, the calculated hazard for the recreational user and resident direct contact (incidental ingestion, dermal contact, and ambient air inhalation) with soil was above the target hazard of 1, with total PCBs the major contributor to cumulative hazard.
- The calculated cancer risk and hazard for the resident inhalation of indoor air (from soil) was above the target risk levels of 1×10^{-4} (benzene was the major contributor) and 1×10^{-6} (benzene and ethylbenzene were the major contributors), and above the target hazard of 1 (benzene, xylene, mercury were the major contributors).
- The calculated cancer risk and hazard for the commercial worker inhalation of indoor air (from soil) was below the target risk levels of 1×10^{-4} (benzene was the major contributor), at or above the target risk level of 1×10^{-6} (benzene and ethylbenzene were the major contributors), and above the target hazard of 1 (mercury was the major contributor).

Waterfront Plaza

The HHRA target risk and hazard level exceedances for Waterfront Plaza soil are summarized as follows:

- The calculated cancer risks and hazards for the trespasser, recreational user, commercial worker, and utility worker direct contact (incidental ingestion, dermal contact, and ambient air inhalation)

with soil were below the target risk level of 1 x 10^{-4}, at or above the target risk level of 1 x 10^{-6} (arsenic was the major contributor), and below the target hazard of 1.

Mixed Residential/Commercial Area 1

The HHRA target risk and hazard level exceedances for Mixed Residential/Commercial Area 1 soil are summarized as follows:

- The calculated cancer risks and hazards for the recreational user, resident, commercial worker, and utility worker direct contact (incidental ingestion, dermal contact, and ambient air inhalation) with soil were below the target risk level of 1 x 10^{-4}, at or above the target risk level of 1 x 10^{-6} (arsenic was the major contributor), and below the target hazard of 1.
- The calculated cancer risk and hazard for the resident inhalation of indoor air (from soil) was below the target risk level of 1 x 10^{-4}, at or above the target risk level of 1 x 10^{-6} (tetrachloroethene was the major contributor), and below the target hazard of 1.

Mixed Residential/Commercial Area 2

The HHRA target risk and hazard level exceedances for Mixed Residential/Commercial Area 2 soil are summarized as follows:

- The calculated cancer risks and hazards for the trespasser, recreational user, resident, commercial worker, utility worker, and construction worker direct contact (incidental ingestion, dermal contact, and ambient air inhalation) with soil were above the target risk level of 1 x 10^{-4} (resident only; arsenic was the major contributor), at or above the target risk level of 1 x 10^{-6} (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and arsenic were the major contributors), and above the target hazard level of 1 (resident only; arsenic and thallium were the major contributors).
- The calculated cancer risk and hazard for the resident inhalation of indoor air (from soil) was below the target risk level of 1 x 10^{-4}, at or above the target risk level of 1 x 10^{-6} (benzene, ethylbenzene, and tetrachloroethene were the major contributors), and above the target hazard of 1 (mercury was the major contributor).
- The calculated cancer risk and hazard for the commercial worker inhalation of indoor air (from soil) was below the target risk level of 1 x 10^{-4}, at or above the target risk level of 1 x 10^{-6} (benzene and ethylbenzene were the major contributors), and below the target hazard of 1.

Commercial Area 1

The HHRA target risk and hazard level exceedances for Commercial Area 1 soil are summarized as follows:

- The calculated cancer risks for the commercial worker and utility worker direct contact (incidental ingestion, dermal contact, and ambient air inhalation) with soil were below the target risk level of 1×10^{-4}, at or above the target risk level of 1×10^{-6} (arsenic was the major contributor), and below the target hazard level of 1.

Commercial Area 2

The HHRA target risk and hazard level exceedances for Commercial Area 2 soil are summarized as follows:

- The calculated cancer risks for the trespasser, commercial worker, and utility worker direct contact (incidental ingestion, dermal contact, and ambient air inhalation) with soil were below the target risk level of 1×10^{-4}, at or above the target risk level of 1×10^{-6} (arsenic was the major contributor), and below the target hazard level of 1.

Commercial Area 3

The HHRA target risk and hazard level exceedances for Commercial Area 3 soil are summarized as follows:

- The calculated cancer risks and hazards for the commercial worker and utility worker direct contact (incidental ingestion, dermal contact, and ambient air inhalation) with soil were below the target risk level of 1×10^{-4}, at or above the target risk level of 1×10^{-6} (arsenic was the major contributor), and below the target hazard level of 1.
- The calculated cancer risk and hazard for the commercial worker inhalation of indoor air (from soil) was below the target risk levels of 1×10^{-4}, at or above the target risk level of 1×10^{-6} (benzene was the major contributor), and above the target hazard of 1 (mercury was the major contributor).

Commercial Area 4

The HHRA target risk and hazard level exceedances for Commercial Area 4 soil are summarized as follows:

- The calculated cancer risks and hazards for the trespasser, recreational user, commercial worker, and utility worker direct contact (incidental ingestion, dermal contact, and ambient air inhalation) with soil were below the target risk level of 1×10^{-4}, at or above the target risk level of 1×10^{-6} (arsenic and total PCBs were the major contributors), and below the target hazard level of 1.
- The calculated cancer risk and hazard for the commercial worker inhalation of indoor air (from soil) was below the target risk levels of 1×10^{-4}, at or above the target risk level of 1×10^{-6} (benzene and tetrachloroethene were the major contributors), and below the target hazard of 1.

Based on the above discussion regarding the nature and extent of the contamination by former operational area, the following conclusions were identified by redevelopment area relative to groundwater impacts.

Residential Area 1

The HHRA target risk and hazard level exceedances for Residential Area 1 groundwater are summarized as follows:

- The calculated cancer risks and hazards for the resident potable groundwater exposure were above the target risk levels of 1×10^{-4} and 1×10^{-6} (arsenic and hexavalent chromium were the major contributors), and above the target hazard level of 1 (arsenic, iron, and manganese were the major contributors).

Residential Area 2

The HHRA target risk and hazard level exceedances for Residential Area 2 groundwater are summarized as follows:

- The calculated cancer risks and hazards for the resident potable groundwater exposure were above the target risk levels of 1×10^{-4} and 1×10^{-6} (arsenic and hexavalent chromium were the major contributors), and above the target hazard level of 1 (arsenic, iron, and manganese were the major contributors).

Residential Area 3

The HHRA target risk and hazard level exceedances for Residential Area 3 groundwater are summarized as follows:

- The calculated cancer risks and hazards for the resident potable groundwater exposure were above the target risk levels of 1×10^{-4} and 1×10^{-6} (arsenic and hexavalent chromium were the major

contributors), and above the target hazard level of 1 (arsenic, iron, and manganese were the major contributors).

Residential Area 4

The HHRA target risk and hazard level exceedances for Residential Area 4 groundwater are summarized as follows:

- The calculated cancer risks and hazards for the resident potable groundwater exposure were above the target risk levels of 1×10^{-4} and 1×10^{-6} (arsenic was the major contributor), and above the target hazard level of 1 (arsenic and manganese were the major contributors).

Waterfront Plaza

Following the HHRA, there were no target risk and hazard level exceedances for Waterfront Plaza groundwater.

Mixed Residential/Commercial Area 1

The HHRA target risk and hazard level exceedances for Mixed Residential/Commercial Area 1 groundwater are summarized as follows:

- The calculated cancer risks and hazards for the resident potable groundwater exposure were above the target risk levels of 1×10^{-4} and 1×10^{-6} (arsenic was the major contributor), and above the target hazard level of 1 (arsenic and manganese were the major contributors).

Mixed Residential/Commercial Area 2

The HHRA target risk and hazard level exceedances for Mixed Residential/Commercial Area 2 groundwater are summarized as follows:

- The calculated cancer risks and hazards for the resident potable groundwater exposure were above the target risk levels of 1×10^{-4} (arsenic was the major contributor) and 1×10^{-6} (arsenic and hexavalent chromium were the major contributors), and above the target hazard level of 1 (antimony, arsenic, cadmium, iron, and manganese were the major contributors).

Commercial Area 1

Following the HHRA, there were no target risk and hazard level exceedances for Commercial Area 1 groundwater.

Commercial Area 2

Following the HHRA, there were no target risk and hazard level exceedances for Commercial Area 2 groundwater.

Commercial Area 3

Following the HHRA, there were no target risk and hazard level exceedances for Commercial Area 3 groundwater.

Commercial Area 4

Following the HHRA, there were no target risk and hazard level exceedances for Commercial Area 4 groundwater.

1.2.6 Screening-Level Ecological Risk Assessment

A SLERA was performed during the RI, which complied with the requirements of the SOW. The SLERA supplemented the approved Final (Revised) Baseline Ecological Risk Assessment (BERA)(CDM, 2003) completed for the Kalamazoo River and adjacent aquatic habitats and evaluated the potential risk to ecological receptors in the terrestrial habitats adjacent to the Kalamazoo River. As identified in Section 1.0, the Site includes areas up to the top of the Kalamazoo River bank. Areas associated with the Kalamazoo River (i.e., beyond the top of the riverbank and Mill Race) were not included in the scope of the SLERA. The SLERA consisted of Step 1 (screening level problem formulation) and Step 2 (screening level exposure estimation and risk calculation). The SLERA is presented in Section 9.0 of the RI Report (CRA, 2013a). Additionally, a memorandum summarizing Toxicity Reference Values (TRVs) was submitted to U.S. EPA concurrent with the RI Report on October 19, 2012.

Based on the above discussion regarding the nature and extent of the contamination by former operational area and the reasonably anticipated future land re-use of the Site as identified by the City of Plainwell, the following conclusions were identified by redevelopment area relative to soil impacts.

Residential Area 1

Twenty-one constituents or constituent groups (e.g., PAHs, PCBs) were identified as Constituent of Potential Ecological Concern (COPECs). One SVOC [bis(2-ethylhexyl)phthalate], High Molecular Weight (HMW) PAHs, total PCBs, and nine metals (cadmium, copper, iron, lead, manganese, mercury, selenium, vanadium, and zinc) were identified as COPECs based on Screening Quotients (SQs) greater than unity. One VOC (isopropylbenzene) and two SVOCs (carbazole and dibenzofuran) were identified as COPECs because they were detected, but do not have an Ecological Screening Value (ESV). One VOC (1,2-dibromo-3-chloropropane) and four SVOCs (2-chlorophenol, 4,6-dinitro-2-methylphenol, hexachlorobenzene, and hexachlorobutadiene) were identified as COPECs because they were not detected, but the Limit of Detection (LODs) for less than 20 percent of the samples exceed their ESVs. Nickel was identified as a COPEC because it is a Bioaccumulative Chemical of Concern (BCOC) and the ESV does not consider bioaccumulation. Habitat for ecological receptors is currently present in this redevelopment area. The portion of this area adjacent to the Kalamazoo River was anticipated to continue to provide habitat under the current redevelopment plan.

Residential Area 2

Sixteen constituents or constituent groups (e.g., PAHs, PCBs) were identified as COPECs. HMW PAHs, total PCBs, and seven metals (copper, iron, lead, manganese, selenium, vanadium, and zinc) were identified as COPECs based on SQs greater than unity. One VOC (1,2-dibromo-3-chloropropane and four SVOCs (2-chlorophenol, 4,6-dinitro-2-methylphenol, hexachlorobenzene, and hexachlorobutadiene) were identified as COPECs because they were not detected, but the LODs for less than 20 percent of the samples exceed their ESVs. Mercury and nickel were identified as COPECs because they are BCOCs and their ESVs do not consider bioaccumulation. Habitat for ecological receptors is currently present in this redevelopment area. The portion of this area adjacent to the Kalamazoo River was anticipated to continue to provide habitat under the current redevelopment plan.

Residential Area 3

Twenty-one constituents or constituent groups (e.g., PAHs, PCBs) were identified as COPECs. HMW PAHs, total PCBs, and 11 metals (antimony, arsenic, chromium, copper, iron, lead, manganese, mercury, selenium, vanadium, and zinc) were identified as COPECs based on SQs greater than unity. Two SVOCs (carbazole and dibenzofuran) were identified as COPECs because they were detected, but do not have an ESV. One VOC (1,2-dibromo-3-chloropropane) and four SVOCs (2-chlorophenol, 4,6-dinitro-2-methylphenol, hexachlorobenzene, and hexachlorobutadiene) were identified as COPECs because they were not detected, but the LODs for less than 20 percent of the samples exceed their ESVs. Nickel was identified as a COPEC because it is a BCOC and the ESV does not consider bioaccumulation. Habitat for ecological receptors is currently present in this redevelopment area. The

portion of this area adjacent to the Kalamazoo River was anticipated to continue to provide habitat under the current redevelopment plan.

Residential Area 4

Thirty-one constituents or constituent groups (e.g., PAHs, PCBs) were identified as COPECs. One VOC (acetone), four benzene, toluene, ethylbenzene and xylenes(BTEX) constituents (benzene, toluene, o-xylene, and m&p-xylene), HMW PAHs, total PCBs, 12 metals (antimony, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, selenium, vanadium, and zinc) and cyanide were identified as COPECs based on SQs greater than unity. One VOC (isopropylbenzene) and two SVOCs (carbazole and dibenzofuran) were identified as COPECs because they were detected, but do not have an ESV. One VOC (1,2-dibromo-3-chloropropane) and six SVOCs (2,4-dimethylphenol, 2,4-dinitrophenol, 2-chlorophenol, 4,6-dinitro-2-methylphenol, hexachlorobenzene, and hexachlorobutadiene) were identified as COPECs because they were not detected, but the LODs for less than 20 percent of the samples exceed their ESVs. Nickel was identified as a COPEC because it is a BCOC and the ESV does not consider bioaccumulation. Habitat for ecological receptors is currently present in this redevelopment area. The portion of this area adjacent to the Kalamazoo River was anticipated to continue to provide habitat under the current redevelopment plan.

Waterfront Plaza

Iron was identified as COPEC based on a SQ greater than unity. Nickel was identified as a COPEC because it is a BCOC and the ESV does not consider bioaccumulation. The evaluation of risk to ecological receptors was based on a single sample. Because this area is anticipated to be fully developed under the current redevelopment plan, no further evaluation of risk to ecological receptors will be undertaken.

Mixed Residential/Commercial Area 1

Nineteen constituents or constituent groups (e.g., PAHs) were identified as COPECs. HMW PAHs and 10 metals (arsenic, cadmium, cobalt, iron, lead, manganese, mercury, selenium, vanadium, and zinc) were identified as COPECs based on SQs greater than unity. One SVOC (carbazole) was identified as a COPEC because it was detected, but does not have an ESV. One VOC (1,2-dibromo-3-chloropropane) and five SVOCs (2,4-dimethylphenol, 2-chlorophenol, 4,6-dinitro-2-methylphenol, hexachlorobenzene, and hexachlorobutadiene) were identified as COPECs because they were not detected, but the LODs for less than 20 percent of the samples exceed their ESVs. Nickel was identified as a COPEC because it is a BCOC and the ESV does not consider bioaccumulation. Vegetative cover in this redevelopment area has limited value as habitat for ecological receptors. Furthermore, this area is anticipated to be fully developed under the current redevelopment plan. Based on these considerations, no further evaluation of risk to ecological receptors will be undertaken for this redevelopment area.

Mixed Residential/Commercial Area 2

Forty constituents or constituent groups (e.g., PAHs, PCBs) were identified as COPECs. One VOC (acetone), four BTEX constituents (benzene, toluene, o-xylene, and m&p-xylene), low molecular weight (LMW) PAHs, HMW PAHs, total PCBs, 15 metals (antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, vanadium, and zinc) and cyanide were identified as COPECs based on SQs greater than unity. Eight VOCs (1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 2-phenylbutane, cymene, isopropylbenzene, n-butybenzene, n-propylbenzene, and tetrahydrofuran,) and two SVOCs (carbazole and dibenzofuran) were identified as COPECs because they were detected, but do not have an ESV. One VOC (1,2-dibromo-3-chloropropane) and five SVOCs (2,4-dimethylphenol, 2-chlorophenol, 4,6-dinitro-2-methylphenol, hexachlorobenzene, and hexachlorobutadiene) were identified as COPECs because they were not detected, but the LODs for less than 20 percent of the samples exceed their ESVs. Habitat for ecological receptors is currently present in this redevelopment area. Some portions of this area were anticipated to provide habitat under the current redevelopment plan.

Commercial Area 1

Nineteen constituents or constituent groups (e.g., PAHs, PCBs) were identified as COPECs. HMW PAHs, total PCBs, and eight metals (copper, iron, lead, manganese, mercury, selenium, vanadium, and zinc) were identified as COPECs based on SQs greater than unity. Two SVOCs (carbazole and dibenzofuran) was identified as COPECs because they were detected, but do not have an ESV. One VOC (1,2-dibromo-3-chloropropane) and five SVOCs (2,4-dimethylphenol, 2-chlorophenol, 4,6-dinitro-2-methylphenol, hexachlorobenzene, and hexachlorobutadiene) were identified as COPECs because they were not detected, but the LODs for less than 20 percent of the samples exceed their ESVs. Nickel was identified as a COPEC because it is a BCOC and the ESV does not consider bioaccumulation. Habitat for ecological receptors is currently present in this redevelopment area. The portion of this area adjacent to the Kalamazoo River was anticipated to continue to provide habitat under the current redevelopment plan.

Commercial Area 2

Nineteen constituents or constituent groups (e.g., PAHs, PCBs) were identified as COPECs. HMW PAHs, total PCBs, and nine metals (arsenic, cadmium, iron, lead, manganese, mercury, selenium, vanadium, and zinc), and cyanide were identified as COPECs based on SQs greater than unity. One VOC (1,2-dibromo-3-chloropropane) and five SVOCs (2,4-dimethylphenol, 4,6-dinitro-2-methylphenol, 2-chlorophenol, hexachlorobenzene, and hexachlorobutadiene) were identified as COPECs because they were not detected, but the LODs for less than 20 percent of the samples exceed their ESVs. Nickel was

identified as a COPEC because it is a BCOC and the ESV does not consider bioaccumulation. Habitat for ecological receptors is currently present in this redevelopment area. Some portions of this area were anticipated to continue to provide habitat under the current redevelopment plan.

Commercial Area 3

Nineteen constituents or constituent groups (e.g., PAHs) were identified as COPECs. HMW PAHs, and nine metals (antimony, cadmium, iron, lead, manganese, mercury, selenium, vanadium, and zinc), and cyanide were identified as COPECs based on SQs greater than unity. One VOC (isopropylbenzene) and one SVOC (dibenzofuran) were identified as COPECs because they were detected, but do not have an ESV. One VOC (1,2-dibromo-3-chloropropane) and four SVOCs (2-chlorophenol, 4,6-dinitro-2-methylphenol, hexachlorobenzene, and hexachlorobutadiene) were identified as COPECs because they were not detected, but the LODs for less than 20 percent of the samples exceed their ESVs. Nickel was identified as a COPEC because it is a BCOC and the ESV does not consider bioaccumulation. Vegetative cover in this redevelopment area has limited value as habitat for ecological receptors. Furthermore, this area was anticipated to be fully developed under the current redevelopment plan. Based on these considerations, no further evaluation of risk to ecological receptors will be undertaken for this redevelopment area.

Commercial Area 4

Twenty-seven constituents or constituent groups (e.g., PAHs, PCBs) were identified as COPECs. One BTEX constituent (benzene), HMW PAHs, total PCBs, 13 metals (antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, selenium, vanadium, and zinc) and cyanide were identified as COPECs based on SQs greater than unity. One VOC (isopropylbenzene) and two SVOCs (carbazole and dibenzofuran) were identified as COPECs because they were detected, but do not have an ESV. One VOC (1,2-dibromo-3-chloropropane) and five SVOCs (2,4-dimethylphenol, 2-chlorophenol, 4,6-dinitro-2-methylphenol, hexachlorobenzene, and hexachlorobutadiene) were identified as COPECs because they were not detected, but the LODs for less than 20 percent of the samples exceed their ESVs. Nickel was identified as a COPEC because it is a BCOC and the ESV does not consider bioaccumulation. Habitat for ecological receptors is currently present in this redevelopment area. The portions of this area adjacent to the Kalamazoo River and Mill Race were anticipated to continue to provide habitat under the current redevelopment plan.

Based on the information reviewed and presented in the RI Report, further evaluation and refinement of the constituents identified as COPECs during the Steps 1 and 2 was recommended based on several Site-specific factors, including reasonable maximum exposure (RME) concentrations rather than maximum concentrations, alternative ecological benchmarks for specific receptor groups (soil invertebrates, terrestrial plants, birds, and mammals), and historical use and generation as Step 3a of

the U.S. EPA 8-step process. For BCOCs, food chain models will be used to evaluate the potential for risk to upper trophic level receptors. A Step 3 refinement of constituents of potential ecological concern was conducted as part of this FS and was used to development the ecological RAOs and PRGs (see Section 3.0).

Section 2.0 Remedial Action Objectives (RAOs)

This section presents RAOs, identifies potential ARARs and TBCs, and presents PRGs for the soil and groundwater at the locations of concern that are the subject of this FS Report.

2.1 Potential Applicable or Relevant and Appropriate Requirements (ARARs)

Section 121(d)(2)(a) of CERCLA specifies that Superfund remedial actions meet any Federal standards, requirements, criteria, or limitations that are determined to be legally ARARs. State ARARs must be met if they are more stringent than Federal requirements. Additionally, non-promulgated Federal or State guidance materials, local/county ordinances/requirements, and regulatory standards that are not ARARs may be considered as TBC criteria.

ARARs and TBC criteria are defined as follows:

- Applicable Requirements are cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances found at a CERCLA site.
- Relevant and Appropriate Requirements are cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site and are well-suited to the particular site.
- TBC Criteria include non-promulgated guidance or advisories that are not legally binding and that do not have the status of potential ARARs. TBCs generally fall within three categories: health effects information with a high degree of credibility; technical information on how to perform or evaluate site investigations; or response actions, and policy.

ARARs are divided into three categories: chemical-specific, location-specific, and action-specific. The three categories are described below:

- Chemical-Specific ARARs are usually health- or risk-based numerical values or methodologies, which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.
- Location-Specific ARARs apply to the geographical or physical location of the site. These requirements limit where and how the remedial action can occur.
- Action-Specific ARARs include performance, design, or other controls on the specific activities to be performed as part of the remedial action for a site.

Potential ARARs and TBCs for the Site are presented in Table 2.1. Additional requirements that were reviewed and considered, but were ultimately concluded to not apply to the Site are discussed below.

The following requirements were excluded from the list of ARARs pursuant to U.S. EPA's "CERCLA Compliance with State Requirements" (U.S. EPA, 1989), which states that if a State is authorized to implement a program in lieu of a Federal agency, then State laws arising out of that program constitute the ARARs instead of the Federal authorizing legislation. A stringency comparison is unnecessary because State regulations under Federally authorized programs are considered to be Federal requirements:

- 40 Code of Federal Regulations (CFR) Part 257 (Criteria for Classification of Solid Waste Disposal Facilities and Practices) establishes standards for determining whether solid waste disposal facilities and practices may pose adverse effects on human health and the environment
- 40 CFR Part 261 (Identification and Listing of Hazardous Waste) specifies requirements for identification and listing of Resource Conservation and Recovery Act (RCRA) Hazardous Waste
- 40 CFR Part 262 (Standards Applicable to Generators of Hazardous Waste) specifies requirements for generation and off-site transport of hazardous wastes
- 40 CFR Part 403 (General Pretreatment Regulations for Existing and New Sources of Pollution) establishes standards for discharge to publicly owned treatment works (POTWs) to control pollutants which pass through or interfere with treatment processes in POTWs

The following requirements were reviewed, but were concluded to not be ARARs because there will be no discharges to surface water or groundwater for the selected remedy:

- 40 CFR Parts 122 and 125 (NPDES Permits, Criteria, and Standards), and Michigan Compiled Laws (MCL) 323.1201-1221 and MCL 323.2101-2195 [Michigan Act 451, Part 31 (Water Resources

Protection)] set chemical-specific standards to discharge any pollutant from a point source to the waters of the United States.

- 40 CFR Part 129 (Toxic Pollutant Effluent Standards) sets chemical-specific standards for discharges of "toxic compounds" to navigable waters.
- 40 CFR Part 136 (Guidelines for Establishing Test Procedures for Analyses of Pollutants) establishes procedures for the analysis of pollutants in water.
- 40 CFR Part 230 (Section 404(B)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material) provide guidelines to restore and maintain the chemical, physical, and biological integrity of the waters of the U.S. by controlling the discharge of fill material.
- 40 CFR Part 232 (Exempt Activities Not Requiring 404 Permits) establishes the requirements for the placement of fill related to Section 404 permits that are generally required for discharges of dredged or fill material to waters of the United States.
- 33 United States Code (USC) Part 403, 33 CFR Part 322, and 33 CFR Part 3230 of the Rivers & Harbors Act prohibit unauthorized obstruction or alteration of navigable waters.
- MCL 324.3112 [Michigan Public Act 451, Part 31 (Water Resources Protection)] prohibits discharges of waste or water effluent to surface water bodies without approval of the State of Michigan.
- MCL 232.2204-2207 [Michigan Public Act 451, Part 31 (Water Resources Protection)] establishes rules regarding water and wastewater provisions for the non-degradation of groundwater quality and uses of groundwater.
- MCL 323.1201-1221 and 323.2101-2195 [Michigan Public Act 451, Part 31 (Water Resources Protection)] effluent standards in accordance with the Federal Water Pollution Control Act (WPCA) and Clean Water Act (CWA).

The following requirements were reviewed, but were concluded to not be ARARs because it is anticipated that management of identified hazardous materials may include transportation off site for treatment and/or disposal for the selected remedy:

- 40 CFR Part 268 (Land Disposal Restrictions) restricts land placement of materials that were RCRA hazardous waste at the point of generation and that exceed applicable Universal Treatment Standards
- 40 CFR Part 267 (Standards for Hazardous Waste Facilities) establishes standards for design, construction, and operation of hazardous waste landfills

The Federal Safe Drinking Water Act (SDWA) Section 1424(e) (Sole Source Aquifer Protection Program) was considered but is not an ARAR for the Site because there will be no federal financial assistance and the remedial action will not contaminate the aquifer.

The Federal Occupational Safety and Health Standards (29 CFR Part 1910.120) is applicable to the Site, but is not an ARAR because ARARs are requirements that protect human health and the environment and, as such, they do not include occupational safety or worker protection requirements. EPA requires compliance with the Occuptational Safety and Health Administration (OSHA) standards and other worker protection requirements in 40 CFR 300.150 of the NCP, not through the ARARs process (55 FR 8679, March 8, 1990).

The requirements of 40 CFR Part 6.302 and Executive Order No. 11990 (Protection of Wetlands), Protection of Wetlands Executive Order 11990 (40 CFR Part 6, Appendix A), Michigan Public Act 451, Part 303 (Wetland Protection), Michigan Public Act 451, Part 301 (Inland Lakes and Streams), MCL 324.3108 (Michigan Public Act 451, Part 31 (Water Resources Protection), and Michigan Public Act 451, Part 13 (Floodplains and Floodways) are not ARARs for the Site because there are no wetlands or floodplains present at the Site.

The requirements of 16 USC 661-667e, 33 CFR 320-330, and 40 CFR 6.304 (Fish and Wildlife Coordination Act), 16 USC 1531-1544, 50 CFR 200, and 50 CFR 402 (Endangered Species Act), and Michigan Act 451, Part 365 (Endangered Species Protection) are not ARARs for the Site because no threatened/endangered species were identified to be present on the Site during the RI Report (CRA, 2013a).

The Federal statute 40 CFR Part 165 [Pesticide Management and Disposal (FIFRA)] is not an ARAR for the Site because it is not anticipated that pesticides will be brought to and used at the Site.

The National Historic Preservation Act (16 USC Section 469) and (16 USC 470 et. seq.) is not an ARAR for the Site because no modification/demolition of existing structures governed under this act will occur.

As ARARs, the U.S. EPA Primary Maximum Contaminant Levels (MCLs) (or Part 201 Drinking Water Criteria where more stringent, or Site-specific background where higher) are considered to be PRGs for groundwater (see Section 2.2). MCLs are established for individual constituents and do not take into account cumulative risks that may be posed by mixtures of contaminants. Therefore, evaluation of compliance with groundwater remediation goals at the POC also requires an evaluation of cumulative risk. The cumulative risk may not exceed a carcinogenic risk of 10^{-5} or a hazard index of 1.

2.2 Preliminary Remediation Goals (PRGs)

The PRGs for each chemical of concern (COC), in each medium of concern, for each pathway to be addressed, within each redevelopment area for human health, with the exception of human direct contact/ingestion/inhalation exposure to soil impacted with arsenic, are the Part 201 Generic

Residential or Non-Residential Cleanup Criteria, as applicable based on the anticipated future land use of the redevelopment area.

The U.S. EPA Primary MCLs (or Part 201 DWC where more stringent, or Site-specific background where higher) are considered to be PRGs for groundwater. The table below presents a comparison of the U.S. EPA Primary and Secondary MCLs, Part 201 Residential and Non-Residential DWC, and the Part 201 Residential and Non-Residential Health-Based Drinking Water Values for the COCs in groundwater at the Site.

	Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria [(1)]				***National Primary and Secondary Drinking Water Regulations*** [(3)]	
Chemical of Concern	***Residential Drinking Water Criteria***	***Non-Residential Drinking Water Criteria***	***Residential Health-Based Drinking Water Value*** [(2)]	***Non-Residential Health-Based Drinking Water Value*** [(2)]	***Primary Maximum Contaminant Level***	***Secondary Maximum Contaminant Level***
Aluminum	0.05	0.05	0.3	4.1	NC	0.05 [(4)]
Arsenic	0.01	0.01	NC	NC	0.010	NC
Iron	0.3	0.3	2	5.6	NC	0.3
Lead	0.004	0.004	ND	NC	0.015	NC
Manganese	0.05	0.05	0.86	2.5	NC	0.05

Notes:

(1) Part 201 Cleanup criteria, updated 9/28/2012 pursuant to 1994 PA 451 as amended.

(2) Footnotes for Part 201 Criteria and Part 213 Risk-Based Screening Levels, updated 9/28/2012 pursuant to 1994 PA 451 as amended.

(3) National Primary and Secondary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

(4) Level ranges from 0.05 to 2.0 mg/L.

The Part 201 DWC is the more conservative of the two applicable comparison criteria (Part 201 DWC or MCLs). Part 201 DWC and Primary MCLs have been developed for arsenic and lead. Part 201 DWC (aesthetic and health-based drinking water values) and Secondary MCLs have been developed for manganese, iron and aluminum. The Part 201 DWCs for these parameters are either equal to or more stringent than their respective Primary or Secondary MCLs, as follows:

- The Part 201 DWC for arsenic (0.01 mg/L) is the same value as the Primary MCL for arsenic
- The Part 201 DWC for lead (0.004 mg/L) is more stringent than the Primary MCL for lead
- The Part 201 DWC for iron (0.3 mg/L) and manganese (0.05 mg/L) are the same values as their respective Secondary MCLs

- The Part 201 DWC for aluminum (0.05 mg/L) is more stringent than the Secondary MCL.

The cleanup standards for PCBs set forth in 40 CFR 761.61 would not be a PRG because the releases of PCBs would have occurred prior to 1978; and, therefore, TSCA cleanup levels are not applicable. Based on available information, in the late 1950s and early 1960s, paper that was de-inked and recycled at the Mill may have included carbonless copy paper containing PCBs. De-inking was discontinued at the Mill in 1963. The U.S. EPA's Technical and Procedural Amendments to TSCA indicates that the potential for PCBs present within the wastewater sludge would not be regulated under TSCA. TSCA disposal requirements would remain applicable for material to be characterized and send off-Site for disposal.

The PRGs for human direct contact/ingestion/inhalation exposure to soil impacted with arsenic are the Site-specific risk-based concentrations (RBCs).

The PRGs for each COPEC for ecological receptors are based on the result of the completion of Step 3 of the 8-step process for conducting ecological risk assessment under guidance developed by the U.S. EPA.

Each of the aforementioned PRGs is further discussed below.

2.2.1 Part 201 Generic Residential and Non-Residential Cleanup Criteria

Chemical-specific PRGs, with the exception of arsenic, were selected for the identified COCs for soil and groundwater samples consistent with the Generic Residential and Non-Residential Cleanup Criteria and Screening Levels established in Part 7 of Administrative Rules, effective September 28, 2012, pursuant to Part 201, Environmental Remediation, 1994 PA 451 as amended (MDEQ, 2012a). Part 201 has been identified as an ARAR for the Site. COCs were identified as constituents that had one or more exceedances of the Part 201 Generic Residential Cleanup Criteria.

Table 2.2 and Table 2.3 present the COCs and PRGs for soil and groundwater, respectively.

2.2.2 Site-Specific Risk-Based Arsenic PRG

RBCs were developed that are protective of human health direct contact exposure to arsenic in soil for trespassers, recreational users, residents, commercial workers, utility workers, and construction workers. These same receptors were evaluated in the RI Report (CRA, 2013a). Two RBCs were initially developed: one protective of carcinogenic health impacts and a second protective of non-carcinogenic health impacts. The RBC for each receptor was determined to be the lower value between carcinogenic and non-carcinogenic health impacts. The RBCs were calculated using a combination of default U.S. EPA exposure assumptions similar to those used in the RI Report and Site-specific exposure assumptions and based on target cancer risk levels of 1.0×10^{-6}, 1.0×10^{-5}, and 1.0×10^{-4}, and the target non-cancer hazard quotient of 1.0.

It should be noted that in the November 23, 2011 United States Environmental Protection Agency's (U.S. EPA's) comments on the HHRA portion of the RI Report, the U.S. EPA provided a comment (U.S. EPA Specific Comment #11) regarding the potential for residents ingesting homegrown produce at the Site. On April 20, 2012, CRA provided the following response to this comment: *The Residential Areas of the Site will not be comprised of single family detached homes, where the possibility of residents ingesting homegrown produce would be a potential exposure pathway. Rather, condominiums are proposed for these Residential Areas.* The U.S. EPA accepted this response and subsequently approved the RI Report (CRA, 2013a). Given this information, potential exposure of residents to arsenic through ingestion of homegrown produce is an unlikely exposure scenario for the Site and; therefore, has not been considered in the RBC development for a PRG for arsenic in soil.

A copy of the revised memorandum entitled Revised Development of Risk-Based Concentrations for Arsenic in Soil (CRA, 2013b) is presented in Appendix A. The memorandum presents the equations used to develop the RBCs, the receptor-specific exposure assumptions applied in the development of the RBCs, and the human health toxicity values applied for arsenic. The equations, exposure assumptions, and toxicity values utilized in the derivation of the RBCs in the memorandum are the same as those used in the forward risk and hazard calculations, as summarized in the RI Report, unless otherwise noted in the memorandum.

Table 2.4 presents the PRGs for direct contact exposure to arsenic in soil.

2.2.3 Ecological PRGs

A refinement of chemical constituents identified in the SLERA portion of the RI Report (CRA, 2013a) as COPECs for the Site was performed as part of this FS. The refinement process is Step 3 of the 8-step process for conducting ecological risk assessment under guidance developed by the U.S. EPA. The Revised Step 3 – Refinement of Constituents of Potential Ecological Concern and Development of Ecological Preliminary Remediation Goals report (CRA, 2013c) is presented in Appendix B, with a summary provided below.

The majority of the Site evaluated in the SLERA is anticipated to be redeveloped for residential and/commercial use. As complete exposure pathways will be eliminated in those areas that will be developed, the dataset for the refinement process consisted of samples from those areas that will not be disturbed by development activities. The revised assessment area is within the riparian corridor of the Kalamazoo River. The data for the revised assessment were re-screened using the same methodology and ESVs that were used in the SLERA. The re-screening retained 2 VOCs (acetone and isopropylbenzene), 3 BTEX constituents (benzene, toluene, and m&p-xylenes), 1 SVOC (carbazole), HMW

PAHs, total PCBs, and 14 inorganic constituents (antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, selenium, vanadium, zinc, and cyanide (total)) as COPECs.

The refinement process focused on avian and mammalian wildlife. Refinement consisted of a two-phase process. In the first phase, 95 percent upper confidence limit (UCL) concentrations of the COPECs were compared to ecological benchmarks (i.e., soil concentrations) specific to avian and/or mammalian wildlife. A constituent was carried forward to the second phase if the 95 percent UCL concentration was greater than the ecological benchmark or if an ecological benchmark was not available. This phase eliminated total PCBs, antimony, arsenic, barium, cadmium, chromium, manganese, and vanadium as COPECs.

The second phase of the refinement process involved use of food chain models to assess the potential for risk to avian and mammalian wildlife. The food chain models identified a potential for risk to avian insectivores exposed to lead at both a no observed adverse effect level (NOAEL) and lowest observed adverse effect level (LOAEL), and mammalian wildlife exposed to lead at the LOAEL. The food chain models also identified a potential for risk to avian and/or mammalian wildlife exposed to carbazole, HMW PAHs, copper, mercury, selenium, and zinc at the LOAEL.

Initial PRGs were developed for carbazole, HMW PAHs, copper, lead, mercury, selenium, and zinc. These initial PRGs were compared to the 95 percent UCL concentrations of the seven COPECs. The 95 percent UCL concentrations for HMW PAHs, lead, mercury, and zinc were greater than their initial PRGs. As the initial PRGs were based on conservative exposure parameters, and NOAELs and LOAELs, HWM PAHs, lead, mercury, and zinc were further evaluated using exposure parameters identified in U.S. EPA's Wildlife Scenario Builder (U.S. EPA, 2013), and more ecologically realistic NOAELs and LOAELs. Results of the second phase of the evaluation, coupled with results of the first phase, were used to identify final ecological PRGs.

Table 2.5 presents the 95 percent UCL concentrations of the COPECs, initial ecological PRGs, initial and modified avian and mammalian PRGs, final ecological PRGs, and the need for risk management measures. The 95 percent UCL concentrations for all seven COPECs are below their final ecological PRGs. Consequently, further evaluation and risk management measures are not required for protection of avian and mammalian wildlife at the Site.

2.3 Remedial Action Objectives (RAOs)

RAOs are medium-specific goals for protecting human health and the environment. RAOs provide the basis for selecting potential remedial alternatives and options for a Site. The RAOs have been prepared in accordance with the results of the RI, U.S. EPA's Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (U.S. EPA, 1988), and ARARs for the Site, to address human and

ecological pathways and receptors for soil and groundwater media. The RAOs have been developed consistent with the conclusions of the RI Report and discussions with the U.S. EPA.

Based on the conclusions of the RI Report, the following RAOs were developed:

RAO 1 Prevent human direct contact exposure to soil impacted with VOCs, SVOCs, PCBs, metals (except arsenic), and other inorganics in exceedance of the Michigan Act 451, Part 201 Cleanup Criteria and human direct contact/ingestion/inhalation exposure to soil impacted with arsenic posing excess carcinogenic risk levels of 10^{-4} to 10^{-6} or a non-carcinogenic hazard level of 1.0.

RAO 2 Prevent the potential for leaching of contaminants from soil to groundwater and ultimately migrating to surface water at concentrations above the Michigan Act 451, Part 201 Cleanup Criteria for VOCs, SVOCs, PCBs, metals, and other inorganics.

RAO 3 Mitigate the potential for human inhalation exposure to indoor air vapors resulting from soil impacted above Michigan Act 451, Part 201 Cleanup Criteria for VOCs and metals.

RAO 4 Prevent avian and mammalian receptor exposure to surface soil in wooded riparian areas along the Kalamazoo River with 95 percent UCL concentrations above the Site-specific ecological preliminary remediation goals.

RAO 5 Protect surface water and sediments by mitigating the potential for erosion of soil to the Kalamazoo River and Mill Race.

RAO 6 Prevent human exposure to groundwater with concentrations exceeding Michigan Act 451, Part 201 Drinking Water Criteria.

RAO 7 Protect surface water by mitigating the potential for groundwater to migrate to surface water above Michigan Act 451, Part 201 requirements protective of the groundwater-surface water interface.

RAO 8 Restore groundwater impacted with metals at concentrations above the Michigan Act 451, Part 201 Generic Residential Cleanup Criteria to beneficial use.

Section 3.0 Development and Screening of Technologies

3.1 General Response Actions

General Response Actions (GRAs) are medium-specific actions that may satisfy the RAOs. During the development of alternatives, applicable areas of concern for each medium were identified to which the GRAs may be applied. GRAs have been developed for soil and groundwater, as discussed below.

3.1.1 Soil

The following GRAs, to be used singly or in combination, were identified for soil at the Site:

- *No Action* – The No Action response would maintain potential risks under existing conditions and provide a baseline against which the other GRAs can be compared.
- *Institutional Controls* – Institutional controls may be undertaken to isolate potential receptors from COCs in soil. Institutional controls may be necessary to reduce the likelihood of completed exposure pathways to certain receptors by providing property management guidelines and restrictions regarding on-Site activities, coupled with compliance and enforcement mechanisms.
- *Containment* - Containment actions may be undertaken to isolate potential receptors from COCs in soil and to reduce mobility of COCs. These actions may be completed through on-Site capping or a combination of on-Site consolidation and capping.
- *Excavation and Disposal* – Excavation actions may be undertaken to physically remove impacted soil for off-Site disposal at an appropriately permitted facility.
- *Treatment* – Treatment actions may be undertaken to complete on-Site treatment in-situ treatment of soil to reduce the toxicity, mobility, or volume (TMV) of media exhibiting unacceptable risk. Treatment actions may be undertaken to physically remove impacted media from in situ, followed by either on-Site or off-Site ex-situ treatment to reduce the TMV of media exhibiting unacceptable risk.

3.1.2 Groundwater

The following GRAs, to be used singly or in combination, were identified for groundwater at the Site:

- *No Action* – The No Action response would maintain potential risks under existing conditions and provide a baseline against which the other GRAs can be compared.
- *Institutional Controls* – Institutional controls may be undertaken to isolate potential receptors from COCs in groundwater. Institutional controls may be necessary to reduce the likelihood of completed exposure pathways to certain receptors by providing property management guidelines and restrictions regarding on-Site activities, coupled with compliance and enforcement mechanisms.

- *Monitoring* – Routine monitoring may be undertaken to confirm conditions at the downgradient property boundary or other compliance point.
- *Monitored Natural Attenuation* – Routine monitoring may be undertaken to evaluate natural degradation of COCs and confirm conditions across the Site.
- *Containment* - Containment actions may be undertaken to isolate potential receptors from COCs in groundwater and to reduce mobility of COCs.
- *Collection/Treatment* - Collection/treatment actions may be undertaken to physically remove impacted groundwater, followed by on-site treatment to reduce the TMV of groundwater. This option may be supplemented through selective injection of materials to enhance reduction of contaminant levels.

3.2 Areas and Volumes of Contaminated Media

The areas or volumes to which the GRAs may be applied are based on the potential exposure routes, the nature and extent of impact, the PRGs, and the preliminary list of action-specific ARARs. In addition, the requirement for protectiveness identified in the RAOs, and the chemical and physical characteristics of the Site were considered during the development of the GRAs. The estimated areas and/or volumes of impacted soil and groundwater to which the GRAs may be applicable, are discussed below.

3.2.1 Soil

Chemical-specific exceedances of the Part 201 Generic Residential and Non-Residential Cleanup Criteria in soil for the 11 redevelopment areas are presented on databox plans in the RI Report. Figures 3.1 through 3.40 present the conceptual area of materials impacted above the PRGs identified in Section 2.2, based on proposed future land use for the 11 redevelopment areas.

The PRGs for each COC in each medium of concern, for each pathway to be addressed within each redevelopment area for human health, with the exception of human direct contact/ingestion/inhalation exposure to soil impacted with arsenic, are the Part 201 Generic Residential and Non-Residential Cleanup Criteria, as applicable based on the anticipated future use of each redevelopment area. The PRGs for human direct contact/ingestion/inhalation exposure to soil impacted with arsenic include Site-specific RBCs calculated for the 10^{-5} and 10^{-6} risk levels with a hazard index of 1.0, in addition to comparison to the pathway specific Part 201 Generic Residential and Non-Residential Cleanup Criteria that are also based on a 10^{-5} risk level. The 10^{-4} risk level does not meet the Part 201 ARAR and is not considered a viable PRG; therefore, it is not further evaluated in this FS Report. Additionally, the calculated value for the RBC for arsenic at the 10^{-6} risk level with a hazard index of 1.0 was below the Part 201 State Default Background Level of 5.8 mg/kg; therefore, the SDBL was substituted for the calculated value for the purposes of this evaluation.

Upon completion of the Step 3 Refinement of Constitutents of Potential Ecological Concern and Development of Ecological RAOs presented in Appendix B, it was identified that the 95 percent UCL concentrations for all seven COPECs are below their final ecological PRGs. Consequently, further evaluation and risk management measures are not required for protection of avian and mammalian wildlife at the Site and there are no impacted areas of soil to be addressed.

In addition to materials present above the PRGs, the areas shown on Figures 3.1 through 3.40 and the volumes described below include materials anticipated to be remediated based on operational history and future redevelopment plans, including the coal tunnel, the former fuel oil AST lines from the former tank to the boiler house, and an area identified to be impacted during the installation of a storm sewer line by MDOT.

As identified above and in Section 2.2, exceedances of Part 201 Residential/Non-Residential Cleanup Criteria for VOCs, SVOCs, PCBs, and inorganics (with the exception of arsenic, as detailed below) were screened based on anticipated future land use. Exceedances were further screened against a subset of the Part 201 Residential/Non-Residential Cleanup Criteria including the GCPC, VSIC, SVIAC, PSIC, and DCC, and Soil Saturation Screening Levels. Exceedances of soil criteria protective of the groundwater pathway, such as the DWPC and GSIPC, were not used in the evaluation of soil volumes because they relate to the groundwater and are anticipated to be addressed through other measures (i.e., at the point of compliance in groundwater).

Areas to be remediated for arsenic were based on the Site-specific approach presented in Section 2.4.2 of the Revised Development of Risk-Based Concentrations for Arsenic in Soil memorandum (CRA, 2013b), which is presented in Appendix A. The memorandum presents a comparison of the surface soil and soil (surface and subsurface) exposure point concentrations (EPCs) from the RI Report to the calculated RBCs for arsenic. Those areas with EPCs greater than the RBCs were identified to require further action (management or remediation) to ensure protection of human receptors from direct contact exposure to soil. Those areas with EPCs less than the RBCs were identified to require no further action with respect to direct contact with soil. The EPC for each area is based on the 95 percent UCL of the mean, which is calculated using U.S. EPA's ProUCL 5.0 statistical software. Using this approach, only redevelopment areas were identified for each of the scenarios that would require further action to mitigate potential exposure to arsenic through direct contact with soil. Using an iterative approach, specific soil sampling locations containing the highest concentrations of arsenic from these redevelopment areas were removed from the soil datasets used to calculate the EPC until the EPC met the RBC. Remediation of these areas was included in the below volumes of materials for options utilizing the iterative approach.

The general approach for identification of the extent of the conceptual areas of materials to be addressed through remedial activities was developed based on the below:

- PRGs for a given redevelopment area were based on anticipated redevelopment plans by the City of Plainwell for land use (i.e., Residential versus Non-Residential)
- Impacts above the Part 201 DWPC and GSIPC were not included in the volumes presented below.
- VOCs, SVOCs, PCBs, and metals (except arsenic) were evaluated against the Part 201 Generic Residential Cleanup Criteria for Residential Areas 1 through 4, Waterfront Plaza and Mixed Residential/Commercial Areas 1 and 2 for all scenarios
- VOCs, SVOCs, PCBs, and metals (except arsenic) were evaluated against the Part 201 Generic Non-Residential Cleanup Criteria for Commercial Areas 1 through 4 for all scenarios
- Arsenic was evaluated utilizing the Part 201 GRCC, the iterative approach to meet Part 201 Generic Residential and Non-Residential Cleanup Criteria based on land-use, the iterative approach to meet the 10^{-5} risk level, and the iterative approach to meet the 10^{-6} risk level, respectively
- Areas and volumes for single sample location exceedances were calculated assuming a 10-foot by 10-foot area, to a depth of one-foot below the last PRG exceedance
- Areas and volumes for multiple sample locations within a reasonably close proximity to one another at equivalent elevations, with comparable analytical results for COCs and with related operational history, were identified as a larger area under the assumption that the surrounding area was impacted at similar levels as those exhibited at single sample points
- For the scenarios utilizing the iterative approach, materials present beneath buildings or at depth with an appropriate cover were assumed to be managed in place utilizing institutional controls and/or engineering controls consistent with the City of Plainwell's approach to redevelopment which includes either leaving historically significant buildings in place or leaving building slabs/foundations in place for buildings that are demolished
- The areas identified as the Site and beyond the "top of bank" are consistent with the approved RI Report (Revision 2)

Utilizing the above general approach, estimated volumes of soil to be addressed at the Site were developed based on the following scenarios:

- Soil impacted with VOCs, SVOCs, PCBs, and/or metals above the Part 201 Generic Cleanup Criteria
- Soil impacted with VOCs, SVOCs, PCBs, and/or metals (except for arsenic) above the Part 201 Generic Residential and Non-Residential Cleanup Criteria utilizing the iterative approach for arsenic to meet Part 201 Generic Residential and Non-Residential Cleanup Criteria, as applicable based on anticipated future land use
- Soil impacted with VOCs, SVOCs, PCBs, and/or metals (except for arsenic) above the Part 201 Generic Residential and Non-Residential Cleanup Criteria utilizing the iterative approach for arsenic to meet the 10^{-5} risk level, as applicable based on anticipated future land use

- Soil impacted with VOCs, SVOCs, PCBs, and/or metals (except for arsenic) above the Part 201 Generic Residential and Non-Residential Cleanup Criteria utilizing the iterative approach for arsenic to meet the 10^{-6} risk level, as applicable based on anticipated future land use

The estimated volume of materials to be remediated utilizing strict comparison to Part 201 Generic Cleanup Criteria for all COCs is presented below and identified on Figures 3.1 through 3.10:

- Residential Area 1 - 3,275 cubic yards (cy)
- Residential Area 2 – 655 cy
- Residential Area 3 1,665 cy
- Residential Area 4 - 9,950 cy
- Waterfront Plaza - No materials will be removed from this redevelopment area under this scenario.
- Mixed Residential and Commercial Area 1 – 1,060 cy
- Mixed Residential and Commercial Area 2 – 7,670 cy
- Commercial Area 1 - 2,215 cy
- Commercial Area 2 - 3,000 cy
- Commercial Area 3 - 5,765 cy
- Commercial Area 4 – 16,115 cy

The estimated volume of materials to be remediated utilizing Part 201 Generic Residential and Non-Residential Cleanup Criteria for all COCs (except arsenic) utilizing the iterative approach for arsenic to meet Part 201 Generic Residential and Non-Residential Cleanup Criteria, as applicable based on anticipated future land use is presented below and identified on Figures 3.11 through 3.20:

- Residential Area 1 - 910 cy
- Residential Area 2 – 25 cy
- Residential Area 3 - 1,255 cy
- Residential Area 4 - 4,950 cy
- Waterfront Plaza - No materials will be removed from this redevelopment area under this scenario.
- Mixed Residential and Commercial Area 1 - 40 cy
- Mixed Residential and Commercial Area 2 – 5,800 cy
- Commercial Area 1 - 12 cy
- Commercial Area 2 - No materials will be removed from this redevelopment area under this scenario.

- Commercial Area 3 - No materials will be removed from this redevelopment area under this scenario.
- Commercial Area 4 – 7,185 cy

The estimated volume of materials to be remediated utilizing Part 201 Generic Residential and Non-Residential Cleanup Criteria for all COCs (except arsenic), utilizing the iterative approach for arsenic to meet the 10^{-5} risk level, as applicable based on anticipated future land use is presented below and identified on Figures 3.21 through 3.30:

- Residential Area 1 - 935 cy
- Residential Area 2 – 620 cy
- Residential Area 3 - 1,665 cy
- Residential Area 4 - 9,000 cy
- Waterfront Plaza - No materials will be removed from this redevelopment area under this scenario.
- Mixed Residential and Commercial Area 1 - 70 cy
- Mixed Residential and Commercial Area 2 – 6,395 cy
- Commercial Area 1 - 12 cy
- Commercial Area 2 - No materials will be removed from this redevelopment area under this scenario.
- Commercial Area 3 - No materials will be removed from this redevelopment area under this scenario.
- Commercial Area 4 – 7,185 cy

The estimated volume of materials to be remediated utilizing Part 201 Generic Residential and Non-Residential Cleanup Criteria for all COCs (except arsenic) utilizing the iterative approach for arsenic to meet the 10^{-6} risk level, as applicable based on anticipated future land use is presented below and identified on Figures 3.31 through 3.40:

- Residential Area 1 - 1,100 cy
- Residential Area 2 – 620 cy
- Residential Area 3 – 4,230 cy
- Residential Area 4 - 9,380 cy
- Waterfront Plaza - No materials will be removed from this redevelopment area under this scenario.
- Mixed Residential and Commercial Area 1 - 205 cy
- Mixed Residential and Commercial Area 2 – 6,725 cy

- Commercial Area 1 - 165 cy
- Commercial Area 2 - 2,460 cy
- Commercial Area 3 - 3,845 cy
- Commercial Area 4 – 15,375 cy

3.2.2 Groundwater

Representatives from Weyerhaeuser, the U.S. EPA and the MDEQ met on March 20, 2013 to discuss preliminary RAOs, GRAs and conceptual remedial alternatives for the Site. During this discussion, questions were raised relative to groundwater flow direction at the Site and the preliminary RAOs designed to address constituents present in groundwater exceeding Part 201 Criteria (PRGs). A memorandum was prepared to present an evaluation of groundwater conditions along the Kalamazoo River relative to Part 201 GSIC and groundwater conditions across the Site in the downgradient direction relative to Part 201 DWC. A copy of the memorandum entitled Revised Evaluation of Part 201 GSIC and DWC Exceedances in Groundwater (CRA, 2013d) is provided in Appendix C and summarized below.

Based on information collected to date and presented in the RI Report, the uppermost, unconfined, water table aquifer present on the east side of the Site appears to be recharged by the surface water within the Mill Race as a result of the dam located east of the Site. On the Site-wide scale, groundwater flow within this water table aquifer is predominantly to the west from the Mill Race (flowing sub-parallel to the flow of the Kalamazoo River) across the Site. Review of the groundwater-surface water interaction indicates that the Kalamazoo River acts as a semi-hydraulic barrier at this scale (i.e., the river elevation is higher than the adjacent groundwater elevation along most of the frontage along the Site). The hydraulic gradient along the northwestern portion of the Site, at times of higher groundwater elevations, appears to be discharging to the Kalamazoo River, while the majority of the Site maintains the semi-hydraulic barrier with the surface water primarily at greater elevations than the adjacent groundwater. The actual groundwater-surface water interaction is a more complicated dynamic system at a local scale, with interactions to some degree where surface water and the groundwater are likely mixing. This can be inferred near monitoring well MW-7, where it appears there may be local groundwater discharge to the Kalamazoo River on an intermittent basis. The GSI pathway has the potential to be relevant in the northern and northwestern portions of the Site. As such, monitoring wells MW-5, MW-7, MW-8, MW-10, MW-11, MW-12S/D, and MW-15, are considered to represent potential compliance points for the GSI pathway. Monitoring wells that are considered as potential point of compliance to further assess the future migration of metals in groundwater relative to the Part 201 DWC are MW-21S/D, MW-9, MW-20, MW-14, MW-13, and MW-12S/D.

Review of groundwater analytical data collected to date in conjunction with groundwater flow data collected to date does not identify any discernible trends in COC concentrations in exceedance of Part 201 Cleanup Criteria or the presence of a distinct plume. Based on information presented in the RI Report (CRA, 2013a) and the aforementioned memorandum (CRA, 2013d), the only COCs in groundwater above the PRGs are metals, specifically arsenic and mercury above the Part 201 GSIC, and arsenic, manganese, lead, iron, and aluminum above the Part 201 DWC.

Direct comparison of Site groundwater data to the Part 201 GSIC indicates exceedances of the Part 201 GSIC for arsenic at MW-12S/D and MW-7. Mercury concentrations exceed GSIC along the river at MW-3, MW-4S, MW-5, and MW-7 in the northeastern portion of the Site and at MW-12S and MW-12D in the northwestern portion of the Site, however, the concentrations are well below the MDEQ screening level for mercury of 0.2 micrograms per liter (µg/L) for venting to groundwater and would be considered to be a de minimis condition. Therefore, no further evaluation of mercury in groundwater relative to the GSI pathway is required.

Direct comparison of Site groundwater data to the Part 201 DWC indicates exceedances for arsenic and lead. Direct comparison of Site groundwater data to the Residential and Non-Residential Health-Based Drinking Water Values indicates exceedances for manganese, iron, and aluminum.

In an effort to differentiate between concentrations of the aforementioned metals in groundwater that are the result of historical operations conducted at the Site and "background" concentrations of the aforementioned metals present consistent with local groundwater conditions, an evaluation of potential background levels present in monitoring wells located along the Mill Race, which are considered to be upgradient of historical operations at the Site based on groundwater flow direction, was conducted. After subtraction of the "background" values calculated utilizing the 95 percent UTLs and the S^3TM method from the groundwater concentrations, no Part 201 GSIC exceedances were identified. Whereas comparison of the subtracted data to the Part 201 DWC resulted in generally the same exceedances of the Residential and Non-Residential Health-Based Drinking Water Values, with the same variability observed relative to the exceedances.

After subtraction of the "background" values calculated utilizing the statistical methods employed from the groundwater concentrations, no Part 201 DWC exceedances for aluminum, arsenic and lead were identified. Iron exceeds Part 201 DWC only in the wells present along the Kalamazoo River, including MW-7, MW-11, MW-12S, and MW-13. Manganese exceeds Part 201 DWC in MW-12S and MW-7. The Part 201 DWC for iron (0.3 mg/L) and manganese (0.05 mg/L) are based on an aesthetic drinking water value. Comparison of the iron and manganese concentrations in groundwater to the Residential and Non-Residential Health-Based Drinking Water Values identifies that iron and manganese exceed the Residential and/or Non-Residential Health-Based Drinking Water Values at MW-12S and MW-13, and MW-12S and MW-7, respectively. No distinct trend relative to iron concentrations is evident in the

direction of groundwater flow and the highest concentrations are present in the downgradient wells located in the northwestern part of the Site. Additional details on the "background" concentrations are presented in Appendix C.

Based on the above, a definable plume has not been identified in groundwater across the Site; therefore, an estimated volume of impacted groundwater to be remediated has not been calculated as part of this FS.

3.3 Identification and Technical Implementability Screening of Remedial Technology Types and Process Options

Remedial technologies and associated process options, corresponding to the identified GRAs, were developed and screened by evaluation of the process options with respect to technical implementability at the Site. Remedial technology types and process options are identified on Figure 3.41 for soil and Figure 3.42 for groundwater, respectively, for each applicable GRA identified above in Section 3.1.

Within each of the identified remedial technology types (underlined below), the below process options were identified for soil (bulleted below), as follows:

<u>No Action</u>

- No action

<u>Access Restriction Technologies</u>

- Zoning restrictions
- Deed/use restrictions
- Restrictive covenants

<u>Containment Technologies</u>

- Capping
- Consolidation/capping

<u>Excavation Technologies</u>

- Excavation and off-Site disposal

<u>Treatment Technologies</u>

- In-situ chemical/biological treatment
- Ex-situ physical/chemical/biological treatment

Within each of the identified remedial technology types (underlined below), the below process options were identified for groundwater (bulleted below), as follows:

No Action

- No action

Access Restriction Technologies

- Zoning restrictions
- Deed/use restrictions
- Restrictive covenants
- Groundwater use restrictions

Monitoring Technology

- Groundwater monitoring

Monitored Natural Attenuation Technology

- Groundwater monitoring/natural degradation

Containment Technologies

- Physical barrier – Slurry wall
- Physical barrier – Grout curtain
- Physical barrier – Vertical membrane
- Hydraulic barrier – Flow diversion drain
- Hydraulic barrier – Phytoremediation
- Reactive barrier – Permeable reactive barrier

Collection/Treatment Technologies

- Groundwater pump and treat system
- Enhanced groundwater pump and treat system

The identified process options were screened relative to technical implementability based on Site contaminant types and concentrations, and other Site-specific characteristics. The identification of remedial technology types and process options for soil and groundwater, together with a description of each process option, and the results of the technical implementability screening is presented on Figure 3.41 for soil and Figure 3.42 for groundwater, respectively.

3.4 Evaluation of Process Options

The process options that were identified on Figures 3.41 and 3.42 for soil and groundwater, respectively, to be technically implementable were evaluated in greater detail to select one or a smaller number of process options to represent each remedial technology type. Each process option was evaluated based on effectiveness, implementability and cost. The evaluation placed more emphasis on effectiveness and less emphasis on implementability and cost. Because the process options had already undergone technical implementability screening in Section 3.3, the implementability screening of the evaluation in this section placed greater emphasis on the institutional aspects of implementability. The evaluation criteria are discussed below.

Effectiveness

- The effectiveness in handling the estimated areas or volumes of contaminated media and meeting the remediation goals identified in the RAOs
- The effectiveness in protecting human health and the environment during the construction and implementation phase
- The effectiveness with respect to the COCs and conditions at the Site

Implementability

- Disruption to the project site and surrounding area
- Ability to obtain necessary permits, if required
- Availability of treatment, storage, and disposal services
- Availability of necessary specialized equipment and technically proficient workers to implement the technology

Cost

- Based on evaluating whether costs are low, moderate, or high relative to other processes in the same remedial technology type and capital versus operations, maintenance, and monitoring (OM&M) costs

Figure 3.43 and Figure 3.44 summarize the results of the evaluation process for soil and groundwater process options, respectively. The process options retained following evaluation represent an inventory of process options considered most suitable for addressing the media of interest at the Site. The remedial technology types and process options retained in this section may be used either alone or combined with others to develop remedial alternatives.

Section 4.0 Alternatives Array

4.1 Assembly of Retained Remedial Technology Types and Process Options into Remedial Alternatives

The retained remedial technology types and process options were assembled into Site-wide comprehensive remedial alternatives by media.

The following remedial alternatives have been developed for soil:

- Soil Remedial Alternative 1 – No Action
- Soil Remedial Alternative 2 – Excavation, Consolidation, Capping, and Off-Site Disposal
  - Soil Remedial Alternative 2A to Meet Part 201 Generic Cleanup Criteria
  - Soil Remedial Alternative 2B to Meet Part 201 Generic Residential and Non-Residential Cleanup Criteria with Iterative Approach for Arsenic
  - Soil Remedial Alternative 2C to Meet 10^{-5} Risk Level for Arsenic with Iterative Approach
  - Soil Remedial Alternative 2D to Meet 10^{-6} Risk Level for Arsenic with Iterative Approach
- Soil Remedial Alternative 3 – Excavation and Off-Site Disposal
  - Soil Remedial Alternative 3A to Meet Part 201 Generic Cleanup Criteria
  - Soil Remedial Alternative 3B to Meet Part 201 Generic Residential and Non-Residential Cleanup Criteria with Iterative Approach for Arsenic
  - Soil Remedial Alternative 3C to Meet 10^{-5} Risk Level for Arsenic with Iterative Approach
  - Soil Remedial Alternative 3D to Meet 10^{-6} Risk Level for Arsenic with Iterative Approach

The following remedial alternatives have been developed for groundwater:

- Groundwater Remedial Alternative 1 – No Action
- Groundwater Remedial Alternative 2 – Institutional Controls

Each remedial alternative is discussed in the following sections, including generalized design components and achievements of RAOs:

Section 4.1.1	Soil Remedial Alternative 1 – No Action
Section 4.1.2	Soil Remedial Alternative 2-Series – Excavation, Consolidation, Capping, and Off-Site Disposal
Section 4.1.3	Soil Remedial Alternative 3-Series – Excavation and Off-Site Disposal
Section 4.1.4	Groundwater Remedial Alternative 1 – No Action
Section 4.1.5	Groundwater Remedial Alternative 2 – Institutional Controls

4.1.1 Soil Remedial Alternative 1 – No Action

Soil Alternative 1, the No Action alternative, is required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 CFR 300) and its purpose is to serve as a baseline for the comparative analysis of alternatives.

No active remediation would be performed at the Site.

Based on the results of the Step 3 Refinement of Constitutents of Potential Ecological Concern and Development of Ecological RAOs presented in Appendix B, it was identified that the 95 percent UCL concentrations for all seven COPECs are below their final ecological PRGs. Consequently, further evaluation and risk management measures are not required for protection of avian and mammalian wildlife at the Site and there are no impacted areas of soil to be addressed. Therefore, the No Action alternative for soil would be used to achieve the following RAO:

RAO 4 Prevent avian and mammalian receptor exposure to surface soil in wooded riparian areas along the Kalamazoo River with 95 percent UCL concentrations above the Site-specific ecological preliminary remediation goals.

4.1.2 Soil Remedial Alternatives 2-Series – Excavation, Consolidation, Capping, and Off-Site Disposal

The Soil Remedial Alternative 2-Series includes the following options for PRGs to meet the ARARs:

- Soil Remedial Alternative 2A to Meet Part 201 Generic Cleanup Criteria
- Soil Remedial Alternative 2B to Meet Part 201 Generic Residential and Non-Residential Cleanup Criteria with Iterative Approach for Arsenic
- Soil Remedial Alternative 2C to Meet 10^{-5} Risk Level for Arsenic with Iterative Approach
- Soil Remedial Alternative 2D to Meet 10^{-6} Risk Level for Arsenic with Iterative Approach

Soil Remedial Alternative 2A would include implementation of the excavation and off-Site removal of materials impacted with VOCs, SVOCs, and PCBs, the excavation, consolidation and capping, and off-Site disposal of materials impacted with metals above the Part 201 Generic Cleanup Criteria. Figures 3.1 through 3.10 present the conceptual excavation areas to meet these PRGs. Soil Remedial Alternative 2B would include implementation of the excavation and off-Site removal of materials impacted with VOCs, SVOCs, and PCBs, and the excavation, consolidation and capping, and off-Site disposal of materials impacted with metals above the Part 201 Generic Residential and/or Non-Residential Cleanup Criteria utilizing an iterative approach for arsenic remediation. Figures 3.11 through 3.20 present the conceptual excavation areas to meet these PRGs. Soil Remedial Alternative 2C would include the implementation of the excavation and off-Site removal of materials impacted with VOCs, SVOCs, and

PCBs, and the excavation, consolidation and capping, and off-Site disposal of materials impacted with metals above the 10^{-5} risk level an iterative approach for arsenic remediation. Figures 3.21 through 3.30 present the conceptual excavation areas to meet these PRGs. Soil Remedial Alternative 2D would include the implementation of the excavation and off-Site removal of materials impacted with VOCs, SVOCs, and PCBs, and the excavation, consolidation and capping, and off-Site disposal of materials impacted with metals above the 10^{-6}risk level an iterative approach for arsenic remediation. Figures 3.31 through 3.40 present the conceptual excavation areas to meet these PRGs. Section 3.2.1 presents a summary of general approaches utilized when developing the conceptual excavation areas; specific details regarding excavation areas are presented in Appendix D. Figure 4.1 presents the conceptual area for placement of the consolidated material to be capped.

The primary components of Soil Remedial Alternative 2-Series are:

- Pre-design delineation of the vertical and horizontal extent of soil impacts in each area exceeding the PRGs
- Excavation of areas impacted above the PRGs for soil
- Removal of coal tunnel and associated former fuel oil AST lines
- Consolidation of inorganics-impacted material to select area of the Site
- Installation of a capping/cover system over consolidated material
- Off-Site disposal of VOC, SVOC, and PCB-impacted material
- Backfilling of excavation areas with clean fill
- Restoration, as appropriate
- Monitoring and maintenance of cap/cover
- Institutional controls
- Engineering controls

The excavation, consolidation, capping, and off-Site disposal of the soil to the above PRGs would be used to achieve the following RAOs:

RAO 1 Prevent human direct contact exposure to soil impacted with VOCs, SVOCs, PCBs, metals (except arsenic), and other inorganics in exceedance of the Michigan Act 451, Part 201 Cleanup Criteria and human direct contact/ingestion/inhalation exposure to soil impacted with arsenic posing excess carcinogenic risk levels of 10^{-4} to 10^{-6} or a non-carcinogenic hazard level of 1.0.

RAO 3 Mitigate the potential for human inhalation exposure to indoor air vapors resulting from soil impacted above Michigan Act 451, Part 201 Cleanup Criteria for VOCs and metals.

RAO 4 Prevent avian and mammalian receptor exposure to surface soil in wooded riparian areas along the Kalamazoo River with 95 percent UCL concentrations above the Site-specific ecological preliminary remediation goals.

RAO 5 Protect surface water and sediments by mitigating the potential for erosion of soil to the Kalamazoo River and Mill Race.

Prior to implementation of this option, deed restrictions would be prepared and implemented consistent with the future land use plan to serve as a basis for the applicable PRGs for a given geographic area, including but not limited to:

- Zoning and/or land use restrictions on-Site consistent with future anticipated land use, including the requirement for existing building foundations/slabs to remain in place and the development of Soil Management Plans as part of the future development process to ensure that materials in place following completion of the Remedial Action either remain in place or are re-placed at similar locations/depths
- Designation of an area for use as a raised bed community garden for residential properties
- Prohibition of digging in areas not remediated to Part 201 GRCC without proper training
- Implementation of a restrictive covenant for contamination remaining in place above Part 201 GRCC pursuant to Michigan Consolidated Laws (MCL) 324.20120b, if applicable
- Implementation of a deed restrictions for contamination remaining in place $\geq$ 1 mg/kg and $\leq$ 10 mg/kg for high occupancy areas, if applicable

Table 4.1 presents an institutional control relationship matrix.

A pre-design investigation would be completed to evaluate the vertical and horizontal extent of impacts identified in soil during the RI. The delineated areas will be utilized to determine the final areas to be excavated and volumes/concentrations of media to be addressed.

Based on the future residential use of the Site under this scenario, excavation of materials exceeding the appropriate PRGs will be conducted. The estimated volume of materials to be removed during this option ranges from 20,177 to 51,370 cubic yards. Soil verification sampling will be conducted in accordance with the Part 201 requirements in the MDEQ's Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria (MDEQ, 2002), as applicable. Areas will be backfilled with clean imported fill and restoration completed, as necessary. Materials containing VOCs, SVOCs, and/or PCBs at concentrations above the land use-based PRGs will be disposed off-Site at an appropriately licensed

facility. Materials impacted with metals above the proposed PRGs for Soil Remedial Alternatives 2B and 2C will be consolidated on-Site and capped. An estimated 3,225 cy of material will be consolidated on-Site for Soil Remedial Alternative 2B and an extimated 5,050 cy of material will be consolidated on-Site for Soil Remedial Alternative 2C. Consolidation and capping under Remedial Alternatives 2A and 2D will not meet the Part 201 ARAR and, therefore, were not included in the cost estimates or notes, as it is not a viable alternative. Figure 4.1 presents the conceptual consolidation and capping area, which is located in the former basement areas of Buildings 9A, 9B, 9D, 9E, and 23. The cover system was assumed to be a three-foot system, with a 40 mil LLDPE liner with a 12-ounce geotextile over the material, with general fill to within six inches of grade, with gravel placed to grade. Prior to the excavation and relocation of the materials on-Site, a Soil Relocation Plan will be prepared and submitted to the U.S. EPA and MDEQ for approval. The cap will be constructed in accordance with the requirements of Michigan Act 451, Part 115. An OM&M Plan will be developed and implemented for the cap.

In addition to the removal of materials impacted above the PRGs, the coal tunnel and piping run will be evaluated and removed, along with any identified impacted adjoining materials at concentrations above the PRGs.

Specific assumptions utilized for the preparation of this alternative are presented in the Cost Summary Notes in Appendix D.

4.1.3 Soil Remedial Alternatives 3-Series – Excavation and Off-Site Disposal

The Soil Remedial Alternative 3-Series includes the following options for PRGs to meet the ARARs:

- Soil Remedial Alternative 3A to Meet Part 201 Generic Cleanup Criteria
- Soil Remedial Alternative 3B to Meet Part 201 Generic Residential and Non-Residential Cleanup Criteria with Iterative Approach for Arsenic
- Soil Remedial Alternative 3C to Meet 10^{-5} Risk Level for Arsenic with Iterative Approach
- Soil Remedial Alternative 3D to Meet 10^{-6} Risk Level for Arsenic with Iterative Approach

Soil Remedial Alternative 3A would include implementation of the excavation and off-Site removal of materials impacted with VOCs, SVOCs, PCBs, and metals above the Part 201 Generic Cleanup Criteria. Figures 3.1 through 3.10 present the conceptual excavation areas to meet these PRGs. Soil Remedial Alternative 3B would include implementation of the excavation and off-Site removal of materials impacted with VOCs, SVOCs, PCBs, and metals above the Part 201 Generic Residential and/or Non-Residential Cleanup Criteria utilizing an iterative approach for arsenic remediation. Figures 3.11 through 3.20 present the conceptual excavation areas to meet these PRGs. Soil Remedial Alternative 3C

would include the implementation of the excavation and off-Site removal of materials impacted with VOCs, SVOCs, PCBs, and metals above the 10^{-5} risk level an iterative approach for arsenic remediation. Figures 3.21 through 3.30 present the conceptual excavation areas to meet these PRGs. Soil Remedial Alternative 3D would include the implementation of the excavation and off-Site removal of materials impacted with VOCs, SVOCs, and PCBs, and the excavation, consolidation and capping, and off-Site disposal of materials impacted with metals above the 10^{-6}risk level an iterative approach for arsenic remediation. Figures 3.31 through 3.40 present the conceptual excavation areas to meet these PRGs. Section 3.2.1 presents a summary of general approaches utilized when developing the conceptual excavation areas; specific details regarding excavation areas are presented in Appendix D.

The primary components of Soil Remedial Alternative 3-Series are:

- Implement deed restrictions consistent with future land use plan
- Pre-design delineation of the vertical and horizontal extent of soil impacts in each area exceeding the PRGs
- Excavation of areas impacted above PRGs for soil
- Removal of coal tunnel and associated former fuel oil AST lines
- Off-Site disposal of impacted material
- Backfilling of excavation areas with clean fill
- Restoration, as appropriate
- Institutional controls
- Engineering controls

The remedial technology types and process options for addressing soil are discussed below.

The excavation to land use criteria of the soil would be used to achieve the following RAOs:

RAO 1 Prevent human direct contact exposure to soil impacted with VOCs, SVOCs, PCBs, metals (except arsenic), and other inorganics in exceedance of the Michigan Act 451, Part 201 Cleanup Criteria and human direct contact/ingestion/inhalation exposure to soil impacted with arsenic posing excess carcinogenic risk levels of 10^{-4} to 10^{-6} or a non-carcinogenic hazard level of 1.0.

RAO 3 Mitigate the potential for human inhalation exposure to indoor air vapors resulting from soil impacted above Michigan Act 451, Part 201 Cleanup Criteria for VOCs and metals.

RAO 4 Prevent avian and mammalian receptor exposure to surface soil in wooded riparian areas along the Kalamazoo River with 95 percent UCL concentrations above the Site-specific ecological preliminary remediation goals.

RAO 5 Protect surface water and sediments by mitigating the potential for erosion of soil to the Kalamazoo River and Mill Race.

Prior to implementation of this option, deed restrictions would be prepared and implemented consistent with the future land use plan to serve as a basis for the applicable PRGs for a given geographic area, including but not limited to:

- Zoning and/or land use restrictions on-Site consistent with future anticipated land use, including the requirement for existing building foundations/slabs to remain in place and the development of Soil Management Plans as part of the future development process to ensure that materials in place following completion of the Remedial Action either remain in place or are re-placed at similar locations/depths
- Designation of an area for use as a raised bed community garden for residential properties
- Prohibition of digging in areas not remediated to Part 201 GRCC without proper training
- Implementation of a restrictive covenant for contamination remaining in place above Part 201 GRCC pursuant to MCL 324.20120b, if applicable
- Implementation of a deed restrictions for contamination remaining in place $\geq$ 1 mg/kg and $\leq$ 10 mg/kg for high occupancy areas, if applicable

Table 4.1 presents an institutional control relationship matrix.

Subsequent to implementation of land use deed restrictions, a pre-design investigation would be completed to evaluate the vertical and horizontal extent of impacts identified in soil during the RI. These will be utilized to determine the final areas to be excavated and volumes/concentrations of media to be addressed.

Based on the future use of each redevelopment area (i.e., Residential or Non-Residential), excavation of materials exceeding the appropriate PRGs will be conducted. The estimated volume of materials to be removed during this option is 20,177 to 51,370 cubic yards. Soil verification sampling will be conducted in accordance with the Part 201 requirements in the MDEQ's Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria (MDEQ, 2002), as applicable. Areas will be backfilled with clean imported fill and restoration completed, as necessary. Materials containing VOCs, SVOCs, PCBs, and/or inorganics at concentrations above the land use-based PRGs will be disposed off-Site at an appropriately licensed facility.

In addition to the removal of materials impacted above the PRGs, the coal tunnel and piping run will be evaluated and removed, along with any identified impacted adjoining materials at concentrations above the PRGs.

4.1.4 Groundwater Remedial Alternative 1 – No Action

Groundwater Alternative 1, the No Action alternative, is required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 CFR 300) and its purpose is to serve as a baseline for the comparative analysis of alternatives.

No active remediation would be performed at the Site. Natural attenuation of COCs would likely occur; however, no monitoring would be performed to evaluate and document whether or not this would achieve the RAOs.

4.1.5 Groundwater Remedial Alternative 2 – Institutional Controls

Prior to implementation of this option, deed restrictions would be prepared and implemented consistent with the future land use plan to serve as a basis for the applicable PRGs for a given geographic area, including but not limited to:

- Zoning and/or land use restrictions on-Site consistent with future anticipated land use
- Restriction of on-Site groundwater use, including the uppermost, unconfined, water table aquifer that has been identified to have metals present above the PRGs, through the implementation of a deed restriction
- Restriction of off-Site groundwater use, including the uppermost, unconfined, water table aquifer that has been identified to have metals present above the PRGs, through the implementation of a deed restriction of local ordinance
- Implementation of a restrictive covenant for contamination remaining in place above Part 201 GRCC pursuant to MCL 324.20120b, if applicable
- Preparation and submittal of Notices of Migration (NOM) under Part 201 as a liable party, if applicable

Table 4.1 presents an institutional control relationship matrix.

The Institutional Controls alternative for groundwater would be used to achieve the following RAOs:

RAO 2 Prevent the potential for leaching of contaminants from soil to groundwater and ultimately migrating to surface water at concentrations above the Michigan Act 451, Part 201 Cleanup Criteria for VOCs, SVOCs, PCBs, metals, and other inorganics.

RAO 7 Protect surface water by mitigating the potential for groundwater to migrate to surface water above Michigan Act 451, Part 201 requirements protective of the groundwater-surface water interface.

RAO 8 Restore groundwater impacted with metals at concentrations above the Michigan Act 451, Part 201 Generic Residential Cleanup Criteria to beneficial use.

While the implementation of Groundwater Remedial Alternative 2 in and of itself will not address RAO 2 through the prevention of leaching of contaminants from soil to groundwater, exceedances of soil criteria protective of the groundwater pathway, such as the DWPC and GSIPC, relate to the groundwater and will be addressed at the point of compliance in groundwater through the proposed controls and monitoring program.

While the implementation of Groundwater Remedial Alternative 2 in and of itself will not address RAO 7 through the mitigation of groundwater to surface water, after review of "background" concentrations or contributions from the Site to detected constituents, no exceedances of the GSIC remains. Therefore, RAO 7 is currently being met at the Site and a monitoring program will confirm that Site conditions have not changed, as identified below.

Groundwater Remedial Alternative 2 will address RAO 8 because the impacted groundwater is located at a depth which is prohibited by Michigan Public Health law for use as a drinking water source (i.e., drinking water wells at depths shallower than 25 feet bgs is prohibited) and potable water is supplied in the vicinity of the Site by a municipal source. Additionally, beneficial use of the property can still occur through redevelopment independent of the shallow impacts to groundwater because of the aforementioned reasons.

Continued monitoring of the potential interaction of groundwater and surface water at the Site, along with monitoring of COCs in groundwater, would be performed as part of this alternative to confirm that no interactions are occurring between groundwater and surface water above Part 201 requirements, and to confirm that the leaching of contaminants from soil to groundwater and ultimately migrating to surface water at concentrations above the GSIC at the point of compliance is not occurring.

Natural attenuation of COCs would likely occur. Groundwater monitoring will be performed at the Site to evaluate and document the natural degradation of impacts from COCs across the Site.

4.2 Screening of Remedial Alternatives

In accordance with U.S. EPA (1988), the remedial alternatives were screened against the short- and long-term aspects of effectiveness, implementability, and cost. The effectiveness of each remedial alternative was assessed based on its ability to provide protection, and reduction in TMV through treatment. The implementability of each remedial alternative was assessed from both the technical perspective (i.e., the ability to construct, reliably operate, and meet technology-specific regulations for process options until a remedial action is complete, and OM&M after the remedial action is complete) and the administrative perspective (i.e., the ability to obtain approvals, equipment, and services). The estimated cost for each remedial alternative was assessed based on the net present value (NPV) of capital, OM&M, and periodic costs.

The results of screening based on effectiveness, implementability, and cost are discussed below in Sections 4.2.1, 4.2.2, and 4.2.3, respectively. The discussion below excludes the No Action alternatives for soil and groundwater. Retained remedial alternatives are discussed in Section 4.2.4.

4.2.1 Effectiveness

The Soil Remedial Alternative 2-series and 3-series alternatives are effective at reducing the volume of impacted materials on-Site through the removal and off-Site disposal of impacted materials above the PRGs. The Soil Remedial Alternative 2-series alternatives do not reduce the entirety of the volume of impacted materials on-Site due to the consolidation and capping of a limited volume of impacted materials on the Site.

The Soil Remedial Alternative 2-series and 3-series alternatives are all effective at reducing the exposure to COCs for human receptors through the removal and off-Site disposal and/or consolidation and capping of impacted materials.

The Soil Remedial Alternative 2-series and 3-series alternatives would require institutional controls for land use to be effective, including those listed in Section 4.1.

The Groundwater Remedial Alternative 2 requires implementation of groundwater use restrictions and monitoring to be effective, including those listed in Section 4.1.

4.2.2 Implementability

The implementability of each remedial alternative was assessed from both the technical perspective (i.e., the ability to construct, reliably operate, and meet technology-specific regulations for process options until a remedial action is complete, and OM&M after the remedial action is complete) and the administrative perspective (i.e., the ability to obtain approvals from other offices and agencies, the

availability of treatment, storage, and disposal services and capacity). In general, the technologies associated with the remedial alternatives are readily available and contractors capable of implementing the work are readily available. Similar alternatives have been successfully implemented at many other sites and can be readily accomplished.

4.2.3 Cost

Estimated capital costs for the Soil Remedial Alternatives A-subseries alternatives are higher than the B-subseries, C-subseries and D-series alternatives due to the volume of material to be removed to meet the more restrictive PRGs. The OM&M costs for the Soil Remedial Alternative 2-series alternatives are higher than the Soil Remedial Alternative 3-series alternatives due to the on-going OM&M that would be required associated with the consolidated and capped materials.

Specific assumptions utilized in the development of the cost estimates for each of the remedial alternatives are presented in the Cost Summary Notes in Appendix D.

4.2.4 Retained Remedial Alternatives

All of the remedial alternatives, including the No Action alternative, have been retained for detailed analysis in Section 5.0.

Section 5.0 Detailed Analysis of Remedial Alternatives

5.1 Introduction

This section presents the detailed analysis of remedial alternatives that are described in Section 4.0. The detailed analysis consists of an assessment of individual alternatives against each of seven evaluation criteria, and a comparative analysis that focuses on the relative performance of each alternative against those criteria [40 CFR 300.430(e)(9)(ii)]. The seven evaluation criteria are categorized into two groups; namely threshold criteria that each alternative must meet in order to be eligible for selection (see Section 5.1.1) and primary balancing criteria (see Section 5.1.2). In addition, the U.S. EPA will evaluate two modifying criteria (see Section 5.1.3) that will be considered in remedy selection [40 CFR 300.430(f)(1)(i)(A) through (C)].

The nine evaluation criteria are categorized into three groups as follows:

- Threshold Criteria – "statutory requirements that each alternative must satisfy in order to be eligible for selection"
- Balancing Criteria – "technical criteria that are considered during the detail analysis"
- Modifying Criteria – State support and agency acceptance, and community acceptance

The nine criteria are described below [descriptions taken from Section 6.2.2 of U.S. EPA (1988)].

5.1.1 Threshold Criteria

1. *Overall Protection of Human Health and the Environment* – CRA assessed the alternatives to determine whether they can adequately protect human health and the environment from unacceptable risks posed by exposure to media at concentrations greater than applicable criteria. This criterion also draws on the assessment of other criteria especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.
2. *Compliance with ARARs* – CRA assessed the alternatives to determine whether they attain ARARs or provide justification for invoking a variance. A summary of ARARs is presented in Table 2.1.

5.1.2 Balancing Criteria

3. *Long-Term Effectiveness and Permanence* – CRA assessed the alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will prove successful considering the magnitude of residual risk and the adequacy and reliability of controls.
4. *Reduction of Toxicity, Mobility, or Volume through Treatment* – CRA assessed the alternatives to determine the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume of contaminants at the Site.
5. *Short-Term Effectiveness* – CRA assessed the alternatives to determine the short-term impacts of alternatives considering the community, the workers, potential environmental contaminants, and timing.
6. *Implementability* – CRA assessed the alternatives to determine the ease or difficulty of implementing the alternatives considering technical and administrative feasibility, and the availability of services and materials.
7. *Cost* – CRA assessed the alternatives to determine their costs and the types of costs including capital, OM&M, and periodic costs. In accordance with U.S. EPA guidance, the cost estimates were prepared to provide accuracy in the range of +50 to -30 percent. The capital, OM&M, and periodic cost estimates are expressed in 2013 dollars. After development of the capital, OM&M, and periodic costs, NPV analysis of the overall remedial action costs associated with each alternative was conducted. An NPV analysis relates costs that occur over different time periods to present costs by discounting all future costs to the present value. This allows the cost of remedial alternatives to be compared on the basis of a single figure that represents the capital required in 2013 dollars to construct, operate, and maintain the remedial alternative throughout its planned life. The NPV calculations were based on a discount rate of 7 percent. A

summary of the remedial action cost estimates for each alternative are provided in Table 5.1. The detailed remedial action cost estimates are provided in Appendix D.

5.1.3 Modifying Criteria

8. *State Acceptance* - Assessment of State concerns/position related to the alternatives, ARARs, and variances.
9. *Community Acceptance* - Assessment includes determining which components of the alternatives interested persons in the community support, have reservations about, or oppose.

5.2 Individual Analysis of Alternatives

In this section each of the remedial alternatives that were developed undergoes a detailed analysis against each of the first seven of the nine evaluation criteria. Because the remedial alternatives were already described in Section 4.0, and given the descriptive nature of the titles of this section of the report, the detailed description of each alternative is not repeated in this section, but rather, the text proceeds directly to the detailed analysis of each of the individual alternatives. This section is structured as follows:

Section 5.2.1 Soil Remedial Alternative 1 – No Action
Section 5.2.2 Soil Remedial Alternatives 2-Series – Excavation, Consolidation, Capping and Off-Site Disposal
Section 5.2.3 Soil Remedial Alternatives 3-Series – Excavation and Off-Site Disposal
Section 5.2.4 Groundwater Remedial Alternative 1 – No Action
Section 5.2.5 Groundwater Remedial Alternative 2 – Institutional Controls

Table 5.2 presents a summary of the individual analysis of alternatives.

5.2.1 Soil Remedial Alternative 1 – No Action

Overall Protection of Human Health and the Environment
This alternative provides no additional overall protection of human health and the environment. Risks posed by contaminated media would remain the same as those identified in the RI Report.

Compliance with ARARs
ARARs would not be met.

Long-Term Effectiveness and Permanence
This alternative provides a low degree of long-term effectiveness and permanence because there is no remedial action and no controls.

Reduction of TMV through Treatment

This alternative would not reduce the TMV of contaminated media through treatment.

Short-Term Effectiveness

Short-term effectiveness is not relevant to this alternative because there are no additional risks posed to the community, workers, or the environment.

Implementability

This alternative is easily implemented because there is no construction or permitting considerations.

Cost

The net present value (NPV) of Alternative 1 is estimated to be $0.

5.2.2 Soil Remedial Alternatives 2-Series - Excavation, Consolidation, Capping, and Off-Site Disposal

The Soil Remedial Alternative 2-Series includes the following options during the implementation of the excavation and off-Site disposal of materials impacted VOCs, SVOCs, and PCBs and the excavation, consolidation, capping, and off-Site disposal of materials impacted with metals to the below PRGs to meet the ARARs:

- Soil Remedial Alternative 2A to Meet Part 201 Generic Cleanup Criteria
- Soil Remedial Alternative 2B to Meet Part 201 Generic Residential and Non-Residential Cleanup Criteria with Iterative Approach for Arsenic
- Soil Remedial Alternative 2C to Meet 10^{-5} Risk Level for Arsenic with Iterative Approach
- Soil Remedial Alternative 2D to Meet 10^{-6} Risk Level for Arsenic with Iterative Approach

The primary components of Soil Remedial Alternative 2-Series are:

- Pre-design delineation of the vertical and horizontal extent of soil impacts in each area exceeding the PRGs
- Excavation of areas impacted above the PRGs for soil
- Removal of coal tunnel and associated former fuel oil AST lines
- Consolidation of inorganics-impacted material to select area of the Site
- Installation of a capping/cover system over consolidated material
- Off-Site disposal of VOC, SVOC, and PCB-impacted material
- Backfilling of excavation areas with clean fill
- Restoration, as appropriate

- Monitoring and maintenance of cap/cover
- Institutional controls
- Engineering controls

RAOs are addressed by the Soil Remedial Alternative 2-Series in the following manner:

Exposure Pathway Objectives

- Human direct contact exposure to soil COCs, with the exception of arsenic: likelihood of exposure reduced/controlled through excavation and off-Site disposal, consolidation, capping, and institutional controls
- Human direct contact/ingestion/inhalation exposure to soil impacted with arsenic posing excess carcinogen risk levels of 10^{-4} to 10^{-6} or a non-carcinogenic hazard level of 1.0: likelihood of exposure reduced/controlled through excavation and off-Site disposal, consolidation, capping, and institutional controls
- Human inhalation exposure to indoor air vapors to soil COCs: likelihood of exposure reduced/controlled through excavation and off-Site disposal, consolidation, capping, and institutional controls

Containment Objectives

- Leaching of constituents from soil to groundwater and ultimately migrating to surface water: likelihood of significant migration reduced/controlled through excavation and off-Site disposal, consolidation, and capping
- Erosion of COC-impacted soil potentially migrating to surface water and sediments: likelihood of significant migration reduced/controlled through use of appropriate construction controls, excavation and off-Site disposal, consolidation, and capping

Overall Protection of Human Health and the Environment

This alternative provides overall protection of human health and the environment through the: on-Site containment of inorganics-impacted soil; removal and off-Site disposal of VOC, SVOC, and/or PCB-impacted soil; removal and off-Site disposal of the coal tunnel and associated former fuel oil AST lines; and implementation of zoning and/or land use restrictions, including: zoning and/or land use restrictions, designation of an area for use as a raised bed community garden, prohibition of digging in areas not remediated to Part 201 GRCC without proper training, implementation of a restrictive covenant for contamination remaining in place above Part 201 GRCC pursuant to MCL 324.20120b, if applicable, and implementation of a deed restrictions for contamination remaining in place $\geq$ 1 mg/kg and $\leq$ 10 mg/kg for high occupancy areas, if applicable.

Compliance with ARARs

The Soil Remedial Alternative 2-Series complies with ARARs as identified in Table 2.1.

Compliance with the ARARs through the implementation of Soil Remedial Alternative 2-Series would be demonstrated by:

- Removal, consolidation, capping, and/or off-Site disposal of materials impacted above the PRGs to levels meeting the Part 201 ARAR
- Off-Site disposal consistent with the characterization, handling and disposal requirements set forth in Michigan Act 451 and 40 CFR
- Capping of consolidated materials, as outlined in Section 4.0 and in Appendix D, consistent with the requirements in Michigan Act 451, Part 115
- Implementation of institutional controls to mitigate remaining human health or the environment exposures and meet restrictive covenant requirements under Michigan Act 451 and 40 CFR

Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence of the Soil Remedial Alternative 2-Series is dependent on the effective design, operation, maintenance, and monitoring of the containment systems and compliance with the institutional controls.

The types of OM&M activities necessary to ensure continued performance of Soil Remedial Alternative 2-Series include:

<u>Cap</u>

- Maintaining healthy vegetation
- Mowing
- Repairing settled or eroded areas

Reduction of TMV through Treatment

No reduction of TMV through treatment will be accomplished by Soil Remedial Alternative 2-Series. The overall reduction in TMV will be accomplished through the removal and off-Site disposal and consolidation/capping on-Site of materials above the PRGs.

Impacted materials present on Site are considered low-level threat waste for which removal/off-Site disposal and containment are appropriate and treatment impracticable.

Short-Term Effectiveness

The Soil Remedial Alternative 2-Series poses low level risks to the community during construction (e.g., dust, noise, transportation, emissions associated with excavation of waste) that can be readily mitigated through dust control, restricted work hours, engineering controls, compliance with United States Department of Transportation (U.S. DOT) regulations, and air monitoring. Risks to Site workers and the community can also be mitigated by adherence to the "Superfund Green Remediation Strategy" (U.S. EPA, 2010) and "Green Remediation: Best Management Practices for Excavation and Surface Restoration" (U.S. EPA, 2008).

The Soil Remedial Alternative 2-Series poses risks to Site workers associated with construction (e.g., exposure to contaminated media, occupational hazards) that can be mitigated through a health and safety plan and personal protective equipment.

Estimated time for construction is less than 1 year, at the conclusion of which the containment systems should be operational and effective.

Implementability

This alternative would require limited asbestos abatement within some of the former Mill buildings, installation of containment to facilitate excavation along the Mill Race and installation of shoring to maintain building foundation integrity. No other special techniques, materials, or labor are required to complete the excavation, backfilling, consolidation, and capping, or to expand the groundwater monitoring network as may be needed. Because the majority of the constructed components of this alternative are common to many remediation projects, major technical difficulties and unknowns are not expected. Technical problems associated with implementation of the shoring could lead to significant schedule delays. The effectiveness of the components associated with this alternative is easily monitored. Additional details on the specific areas requiring asbestos abatement are presented in Appendix D, by redevelopment area as applicable.

This alternative requires access to the Site to complete the excavation, backfilling, consolidation, capping, and off-Site disposal handling activities. An access agreement is already in place for the Site.

Manufactured materials needed for construction of the components of this alternative are readily available. The availability of soil materials for capping will depend on development activity in the area at the time of cap construction.

Cost

The 30-year NPV of Soil Remedial Alternative 2B is estimated to be $4,544,902 with a capital cost of $4,401,950 and annual OM&M cost of $11,520. The 30-year NPV for Soil Remedial Alternative 2C is estimated to be $4,978,378 with a capital cost of $4,885,426 and an annual OM&M cost of $11,520.

The capital cost is primarily for the excavation, backfilling, consolidation, capping, and off-Site disposal. The annual OM&M costs are for the cap OM&M.

5.2.3 Soil Remedial Alternative 3-Series – Excavation and Off-Site Disposal

The Soil Remedial Alternative 3-Series includes the following options during the implementation of the excavation and off-Site disposal of materials impacted VOCs, SVOCs, PCBs, and metals to the below PRGs to meet the ARARs:

- Soil Remedial Alternative 3A to Meet Part 201 Generic Cleanup Criteria
- Soil Remedial Alternative 3B to Meet Part 201 Generic Residential and Non-Residential Cleanup Criteria with Iterative Approach for Arsenic
- Soil Remedial Alternative 3C to Meet 10^{-5} Risk Level for Arsenic with Iterative Approach
- Soil Remedial Alternative 3D to Meet 10^{-6} Risk Level for Arsenic with Iterative Approach

The primary components of Soil Remedial Alternative 3-Series are:

- Implement deed restrictions consistent with future land use plan
- Pre-design delineation of the vertical and horizontal extent of soil impacts in each area exceeding the PRGs
- Excavation of areas impacted above PRGs for soil
- Removal of coal tunnel and associated former fuel oil AST lines
- Off-Site disposal of impacted material
- Backfilling of excavation areas with clean fill
- Restoration, as appropriate
- Institutional controls
- Engineering controls

Overall Protection of Human Health and the Environment

This alternative provides overall protection of human health and the environment through the: removal and off-Site disposal of VOC, SVOC, PCB and/or metals-impacted soil to the PRGs; removal and off-Site disposal of the coal tunnel and associated former fuel oil AST lines; and implementation of zoning and/or land use restrictions, including: zoning and/or land use restrictions, designation of an area for use as a raised bed community garden, prohibition of digging in areas not remediated to Part 201 GRCC without proper training, implementation of a restrictive covenant for contamination remaining in place above Part 201 GRCC pursuant to MCL 324.20120b, if applicable, and implementation of a deed

restrictions for contamination remaining in place ≥ 1 mg/kg and ≤ 10 mg/kg for high occupancy areas, if applicable.

RAOs are addressed by Soil Remedial Alternative 3-Series in the following manner:

Exposure Pathway Objectives

- Human direct contact exposure to soil COCs, with the exception of arsenic: likelihood of exposure reduced/controlled through excavation to land use PRGs and off-Site disposal, and institutional controls
- Human direct contact/ingestion/inhalation exposure to soil impacted with arsenic posing excess carcinogen risk levels of 10^{-4} to 10^{-6} or a non-carcinogenic hazard level of 1.0: likelihood of exposure reduced/controlled through excavation to land use PRGs and off-Site disposal, and institutional controls
- Human inhalation exposure to indoor air vapors to soil COCs: likelihood of exposure reduced/controlled through excavation to land use PRGs and off-Site disposal, and institutional controls

Compliance with ARARs

The Soil Remedial Alternative 3-Series complies with ARARs as identified in Table 2.1.

Compliance with the ARARs through the implementation of Soil Remedial Alternative 2-Series would be demonstrated by:

- Removal and off-Site disposal of materials impacted above the PRGs to levels meeting the Part 201 ARAR
- Off-Site disposal consistent with the characterization, handling and disposal requirements set forth in Michigan Act 451 and 40 CFR
- Implementation of institutional controls to mitigate remaining human health or the environment exposures and meet restrictive covenant requirements under Michigan Act 451 and 40 CFR

Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence of the Soil Remedial Alternative 3-Series is dependent on the effective removal of materials and compliance with the institutional controls.

No OM&M activities are necessary to ensure continued performance of the Soil Remedial Alternative 3-Series, with the exception of meeting the requirements of the institutional controls

Reduction of TMV through Treatment

No reduction of TMV through treatment will be accomplished by Soil Remedial Alternative 3-Series. The overall reduction in TMV will be accomplished through the removal and off-Site disposal of materials above the PRGs.

Impacted materials present on Site are considered low-level threat waste for which removal/off-Site disposal are appropriate and treatment impracticable.

Short-Term Effectiveness

The Soil Remedial Alternative 3-Series poses low level risks to the community during construction (e.g., dust, noise, transportation, emissions associated with excavation of waste) that can be readily mitigated through dust control, restricted work hours, engineering controls, compliance with U.S. DOT regulations, and air monitoring. Risks to Site workers and the community can also be mitigated by adherence to the "Superfund Green Remediation Strategy" (U.S. EPA, 2010) and "Green Remediation: Best Management Practices for Excavation and Surface Restoration" (U.S. EPA, 2008).

The Soil Remedial Alternative 3-Series poses risks to Site workers associated with construction (e.g., exposure to contaminated media, occupational hazards) that can be mitigated through a health and safety plan and personal protective equipment.

Estimated time for construction is less than 1 year.

Implementability

This alternative would require limited asbestos abatement within some of the former Mill buildings, installation of containment to facilitate excavation along the Mill Race and installation of shoring to maintain building foundation integrity. No other special techniques, materials, or labor are required to complete the excavation and backfilling, or to expand the groundwater monitoring network as may be needed. Because the majority of the constructed components of this alternative are common to many remediation projects, major technical difficulties and unknowns are not expected. Technical problems associated with implementation of the shoring could lead to significant schedule delays. The effectiveness of the components associated with this alternative is easily monitored. Additional details on the specific areas requiring asbestos abatement are presented in Appendix D, by redevelopment area as applicable.

This alternative requires access to the Site to complete the excavation and backfilling. An access agreement is already in place for the Site.

Manufactured materials needed for construction of the components of this alternative are readily available.

Cost

The 30-year NPV of Soil Remedial Alternative 3A is estimated to be $8,876,526 with a capital cost of $8,840,788 and annual OM&M costs of $2,880. The 30-year NPV or Soil Remedial Alternative 3B is estimated to be $4,433,313 with a capital cost of $4,397,575 and annual OM&M cost of $2,880. The 30-year NPV of Soil Remedial Alternative 3C is estimated to be $4,872,039 with a capital cost of $4,836,301 and an annual OM&M cost of $2,880. The 30-year NPV of Soil Remedial Alternative 3D is estimated to be $6,695,428 with a capital cost of $6,659,690 and an annual OM&M cost of $2,880. The capital cost is primarily for the excavation, backfilling, and off-Site disposal.

5.2.4 Groundwater Remedial Alternative 1 – No Action

Overall Protection of Human Health and the Environment

This alternative provides no additional overall protection of human health and the environment. Risks posed by contaminated media would remain the same as those identified in the RI Report.

Compliance with ARARs

ARARs would not be met.

Long-Term Effectiveness and Permanence

This alternative provides a low degree of long-term effectiveness and permanence because there is no remedial action and no controls. However, groundwater contamination would likely continue to be reduced through the natural attenuation of groundwater occurring at the Site.

Reduction of TMV through Treatment

This alternative would not reduce the TMV of contaminated media through treatment.

Short-Term Effectiveness

Short-term effectiveness is not relevant to this alternative because there are no additional risks posed to the community, workers, or the environment. It is expected that groundwater RAOs would not be achieved in a reasonable timeframe.

Implementability

This alternative is easily implemented because there is no construction or permitting considerations.

Cost

The NPV of Groundwater Remedial Alternative 1 is estimated to be $0.

5.2.5 Groundwater Remedial Alternative 2 – Institutional Controls

The primary components of Groundwater Remedial Alternative 2 are:

- Implement a groundwater use deed restriction
- Institutional controls
- Groundwater monitoring

Overall Protection of Human Health and the Environment

This alternative provides overall protection of human health and the environment through the implementation of a groundwater use restriction, institutional controls, and groundwater monitoring.

RAOs are addressed by Groundwater Remedial Alternative 2 in the following manner:

Exposure Pathway Objectives

- Human ingestion of drinking water exposure to groundwater COCs: likelihood of exposure reduced/controlled through the natural degradation of COCs, and implementation of institutional controls and monitoring

- Discharge of groundwater COCs to surface water above requirements protective of the groundwater-surface water interface: likelihood of migration evaluated through groundwater monitoring

Restoration Objectives

- Restore impacted groundwater to additional beneficial uses in a reasonable timeframe to upgradient levels: likelihood of new groundwater impacts reduced/source-controlled through excavation and off-Site disposal, natural degradation of COCs, and groundwater monitoring

Compliance with ARARs

Groundwater Remedial Alternative 2 complies with ARARs as identified in Table 2.1.

Compliance with the ARARs through the implementation of Groundwater Remedial Alternative 2 would be demonstrated by:

- Implementation of institutional controls to mitigate remaining human health or the environment exposures and meet restrictive covenant requirements under Michigan Act 451 and 40 CFR

- Monitoring to ensure compliance with the institutional controls

Long-Term Effectiveness and Permanence

Groundwater contamination would likely continue to be reduced through the natural attenuation of groundwater occurring at the Site. Monitoring would be conducted assure compliance with institutional controls.

Reduction of TMV through Treatment

This alternative would not reduce the TMV of contaminated media through treatment.

Short-Term Effectiveness

Short-term effectiveness is not relevant to this alternative because there are no additional risks posed to the community, workers, or the environment. It is expected that groundwater RAOs would not be achieved in a reasonable timeframe; however, the impacted groundwater is located at a depth which is prohibited by Michigan Public Health law (i.e., drinking water wells at depths shallower than 25 feet bgs is prohibited) and potable water is supplied in the vicinity of the Site by a municipal source. Additionally, beneficial use of the property can still occur through redevelopment independent of the shallow impacts to groundwater because of the aforementioned reasons.

Implementability

This alternative is easily implemented because there is no construction or permitting considerations.

Cost

The 30-year NPV of Groundwater Remedial Alternative 2 is estimated to be $1,056,350 with a capital cost of $26,750 and annual OM&M cost of $137,060 for years 1 to 5 and $56,280 for years 6 to 30. The capital cost is primarily for the initiation of the OM&M program. The annual OM&M costs are for groundwater monitoring.

5.3 Comparative Analysis of Alternatives

This section presents a comparative analysis of the remedial alternatives against each other in consideration of the two threshold and five primary balancing criteria.

5.3.1 Overall Protection of Human Health and the Environment

<u>Exposure Pathway RAOs</u>

Soil Remedial Alternative 1 and Groundwater Remedial Alternative 1 (No Action) are not protective as it does not address identified exposure pathways.

With the exception of Alternative 1, all of the alternatives address RAOs for identified exposure pathways in the same manner, but with varying degrees of effectiveness. All of the alternatives (except No Action) achieve protection at the completion of construction and with implementation of the institutional controls. However, the Soil Remedial Alternatives 2A and 3A would not require the use of institutional controls relative to soil impacts. Groundwater Remedial Alternative 2 evaluates and monitors groundwater through the implementation of institutional controls and groundwater monitoring.

Containment RAOs

Soil Remedial Alternative 1 and Groundwater Remedial Alternative 1 (No Action) do not address migration of contamination.

The Soil Remedial Alternative 2-series alternatives meet the containment requirements through the construction of an engineered cap system to contain consolidated impacted material, and the removal of impacted soil from the Site. No other alternatives include a containment component.

Restoration RAOs

Soil Remedial Alternative 1 and Groundwater Remedial Alternative 1 (No Action) do not actively contribute to restoration of impacted media; however, natural degradation of COCs would likely occur in soil and groundwater. Groundwater Remedial Alternative 2 evaluates and monitors groundwater through the implementation of institutional controls and groundwater monitoring.

5.3.2 Compliance with ARARs

Soil Remedial Alternative 1 and Groundwater Remedial Alternative 1 (No Action) do not comply with ARARs identified in Table 2.1.

The Soil Remedial Alternative 2 and 3-Series, with the exception of Soil Remedial Alternative 2D, which would require consolidation of impacted materials above the Part 201 Cleanup Criteria and; therefore, would not meet the unrestricted requirement, comply with ARARs identified in Table 2.1. The Groundwater Remedial Alternative 2 complies with ARARs identified in Table 2.1.

5.3.3 Long-Term Effectiveness and Permanence

Soil Remedial Alternative 1 and Groundwater Remedial Alternative 1 (No Action) have the lowest degree of long-term effectiveness and permanence as no additional remedial action is taken.

The long-term effectiveness and permanence of all of the other alternatives is dependent on the effective design, operation, maintenance, and monitoring of the containment systems and compliance with the institutional controls. The magnitude of residual risk associated with the consolidated and capped materials to be contained on Site is only applicable to the Soil Remedial Alternative 2-Series, and failure of the containment system could result in unacceptable human health exposures.

The long-term effectiveness of the containment and removal components of all of the alternatives is easily monitored. Evaluations of remedy performance should be included in periodic reports, the frequency and content of which will be established during remedial design. As impacted material will remain on Site, all of the alternatives will require 5-year reviews to determine if the selected alternative is functioning as intended and continues to provide adequate protection.

The long-term effectiveness timeframe for achieving groundwater restoration RAO will need to be further assessed during the soil post-remedial period monitoring period.

5.3.4 Reduction of Toxicity, Mobility or Volume Through Treatment

None of the alternatives would reduce the TMV of contaminated media through treatment. The overall reduction in TMV will be accomplished through the removal and off-Site disposal and/or consolidation/capping of materials on Site above the PRGs.

Impacted materials present on Site are considered low-level threat waste for which removal/off-Site disposal and/or consolidation/capping on Site are appropriate and treatment impracticable.

5.3.5 Short-Term Effectiveness

Soil Remedial Alternative 1 and Groundwater Remedial Alternative 1 (No Action) pose no additional short-term risks to the community, workers, or the environment; however, they are not effective.

All of the other alternatives pose some risks to the community associated with the construction (e.g., dust, noise, transportation, emissions associated with excavation of waste). These risks can be readily mitigated through dust control, restricted work hours, engineering controls, compliance with U.S. DOT regulations, and air monitoring. Risks to workers and the community can also be reduced by adherence to the "Superfund Green Remediation Strategy" (U.S. EPA, 2010) and "Green Remediation: Best Management Practices for Excavation and Surface Restoration" (U.S. EPA, 2008).

All of the other alternatives pose risks to workers associated with construction (e.g., exposure to contaminated media, occupational hazards) that can be reduced through a health and safety plan and personal protective equipment. A worker health and safety plan and personal protective equipment would be used because construction workers would be exposed to contaminated media during

consolidation, capping, and excavation. It is anticipated that these activities would occur during an overall construction period of less than one year for the Soil Remedial Alternative 2 and 3-Series alternatives; therefore, the timeframe for achieving protection (construction completion, implementation of institutional controls) is approximately one year for the Soil Remedial Alternative 2 and 3-Series alternatives.

5.3.6 Implementability

Soil Remedial Alternative 1 and Groundwater Remedial Alternative 1 (No Action) are the easiest to implement because they require no action.

The Soil Remedial Alternative 2-Series and 3-Series alternatives would require limited asbestos abatement within some of the former Mill buildings, installation of shoring to maintain building foundation integrity, and installation of containment to facilitate excavation along the Mill Race, as detailed in Appendix D. In addition to the aforementioned items, the Soil Remedial Alternative 2-Series and 3-Series alternatives would require evaluation, decommissioning, removal, and disposal of abandoned process-related equipment and ancillary structures. No other special techniques, materials, or labor are required to complete the excavation and backfilling, or to expand the groundwater monitoring network as may be needed. Because the majority of the constructed components of this alternative are common to many remediation projects, major technical difficulties and unknowns are not expected. Technical problems associated with implementation of the shoring could lead to significant schedule delays. The effectiveness of the components associated with this alternative is easily monitored.

This alternative requires access to the Site to complete the consolidation, capping, excavation, and backfilling, and groundwater monitoring activities, and may require access to other properties to expand the monitoring network. An access agreement is already in place for the Site. Access to other properties may need to be negotiated if the groundwater monitoring network is expanded.

Manufactured materials needed for construction of the components of this alternative are readily available.

5.3.7 Cost

The estimated capital and NPV OM&M costs for the remedial alternatives are presented in Table 5.1.

The Cost Summary Tables in Appendix D provide details on capital and NPV OM&M costs relative to each cleanup scenario and proposed cleanup level utilizing the different PRGs.

5.4 Summary

The principal distinction between the Soil Remedial Alternative 2-Series options, and the Soil Remedial Alternative 3-Series options is the on Site consolidation and capping of inorganics-impacted materials, as opposed to off-Site disposal of all impacted material. The principal distinction between the sub-series alternatives within the Soil Remedial Alternative 2 and 3-Series is the level to which soil excavation occurs (i.e., 10^{-5}, 10^{-6}, etc.).

Section 6.0 References

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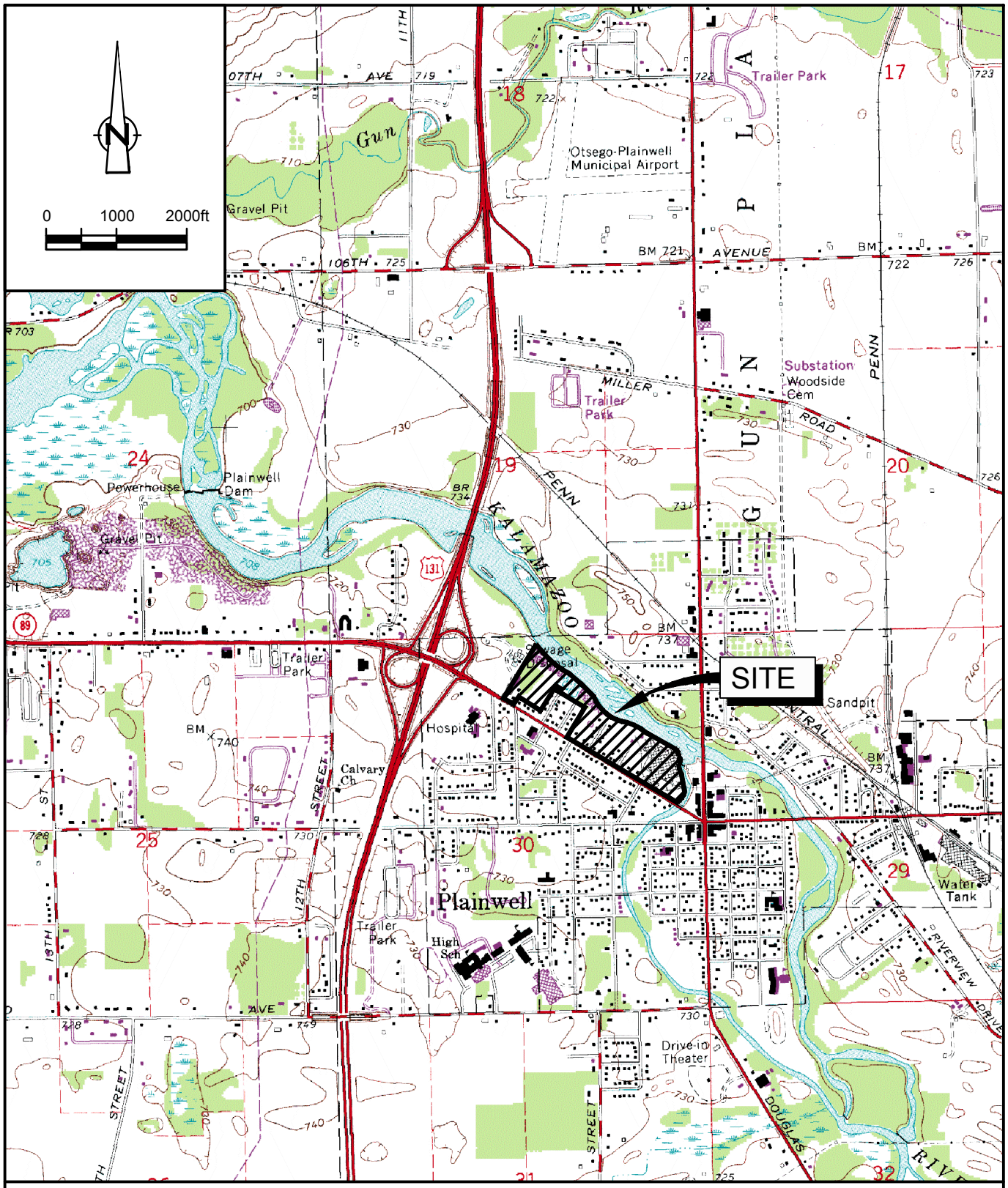
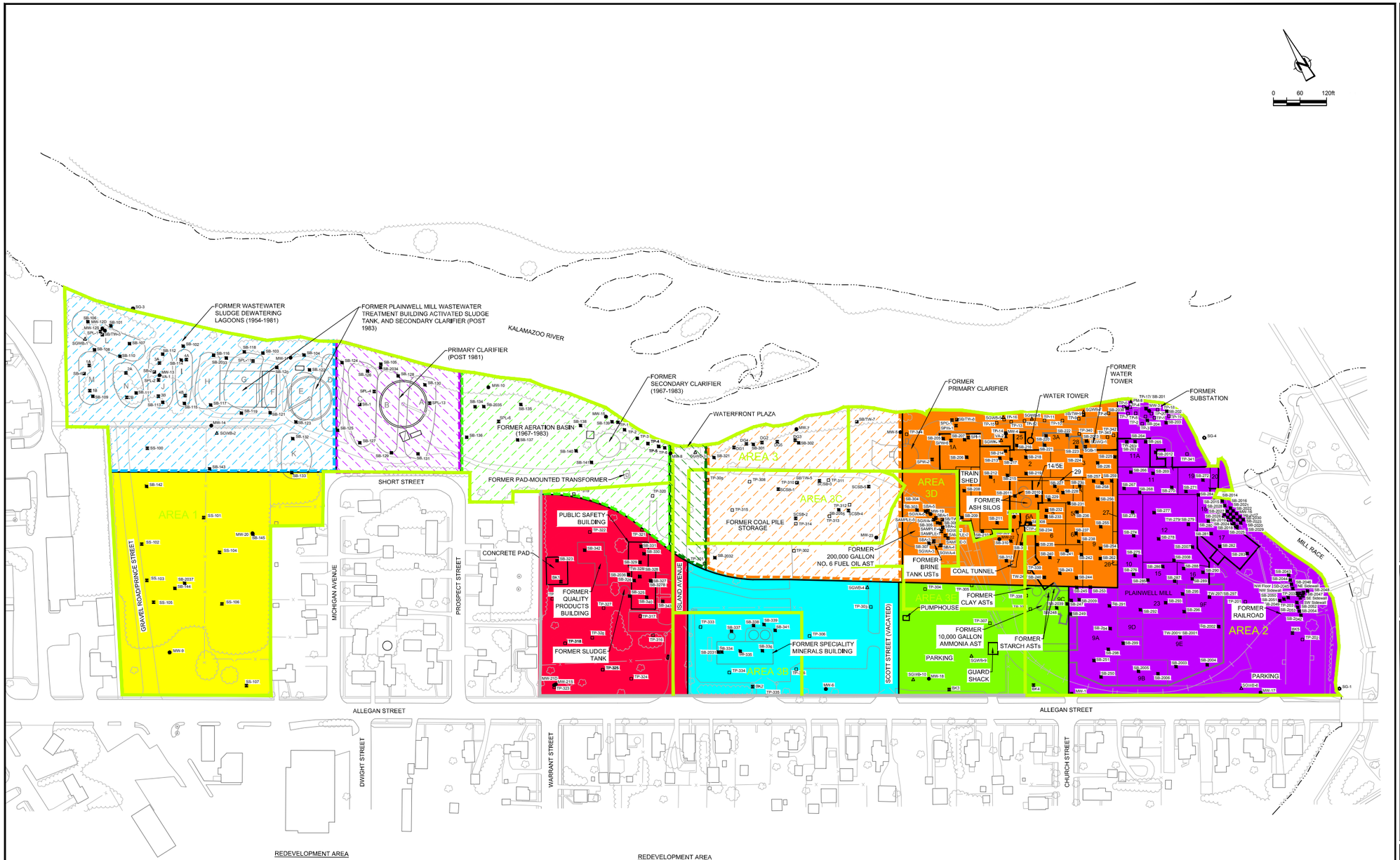
FIGURES



SOURCE: USGS QUADRANGLE MAP;
OTSEGO, MICHIGAN
1967, REVISED 1973

figure 1.1
SITE LOCATION MAP
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-DE002 JUN 20/2013



REDEVELOPMENT AREA

- COMMERCIAL AREA 1
- COMMERCIAL AREA 2
- COMMERCIAL AREA 3
- MIXED RESIDENTIAL/COMMERCIAL AREA 1
- MIXED RESIDENTIAL/COMMERCIAL AREA 2
- COMMERCIAL AREA 4
- RESIDENTIAL AREA 1
- RESIDENTIAL AREA 2
- RESIDENTIAL AREA 3
- RESIDENTIAL AREA 4
- WATERFRONT PLAZA

REDEVELOPMENT AREA

- COMMERCIAL AREA 1
- COMMERCIAL AREA 2
- COMMERCIAL AREA 3
- MIXED RESIDENTIAL/COMMERCIAL AREA 1
- MIXED RESIDENTIAL/COMMERCIAL AREA 2
- COMMERCIAL AREA 4
- RESIDENTIAL AREA 1
- RESIDENTIAL AREA 2
- RESIDENTIAL AREA 3
- RESIDENTIAL AREA 4
- WATERFRONT PLAZA

Nº	Revision	Date	Initial

LEGEND

- PROPERTY BOUNDARY
- AREA BOUNDARY
- FORMER FEATURE
- TREE LINE
- FENCE LINE
- RAILROAD
- SURFACE WATER
- SB-262 SOIL BORING LOCATION - PHASE II RI
- SB-2029 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-339 TEST PIT LOCATION - PHASE II RI
- TW-246 TEMPORARY WELL LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II, AND ADDITIONAL RI
- VA-1 VERTICAL AQUIFER SAMPLE LOCATION - PHASE II RI
- CTP-4 SOIL SAMPLE LOCATION - PHASE I RI
- TP-1 TEST PIT LOCATION - PHASE I RI
- SG-2 STAFF GAUGE - PHASE I RI
- PREVIOUS SOIL SAMPLE LOCATION (TAPLIN ENVIRONMENTAL SERVICES, 1999)
- PREVIOUS SOIL SAMPLE LOCATION (BBL, 1994)
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS SOIL BORING LOCATION (FTC&H, 2006)
- PREVIOUS TEMPORARY WELL LOCATION (FTC&H, 2006)
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)
- PREVIOUS TEST PIT EXCAVATION LOCATION (RMT, 2008)
- SOIL BORING LOCATION - FANNIE PELL BRIDGE FOOTING
- PREVIOUS SOIL SAMPLE LOCATION (CDM, 2001)
- ABANDONED MONITORING WELL LOCATION

NOTE:
THE FOLLOWING STRUCTURES WERE DEMOLISHED ON BEHALF OF THE CITY OF PLAINWELL BETWEEN MARCH & AUGUST 2012: BUILDING 3A, 9A, 9B, 9C, 9D, 9E, 9F, 23 AND 28, ONE 50,000-GALLON WATER TOWER, THE 200,000-GALLON FUEL OIL AST, THE BRINE TANKS, THE FORMER CLAY STARCH TANKS AND FORMER AMMONIA AST SECONDARY CONTAINMENT STRUCTURE. THE FORMER SPECIALTY MINERALS BUILDING AND FORMER SLUDGE TANK (ADJACENT TO THE FORMER SLUDGE DEWATERING BUILDING) WAS DEMOLISHED IN DECEMBER 2011. THE FORMER QUALITY PRODUCTS BUILDING WAS DEMOLISHED IN OCTOBER 2011. THE RAILROAD WAS REMOVED BY THE CITY OF PLAINWELL IN THE FALL OF 2011.

THE FORMER WASTE WATER TREATMENT BUILDING, ASSOCIATED STRUCTURES AND BUILDING 25 WERE DEMOLISHED IN 2013.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

FEASIBILITY STUDY REPORT

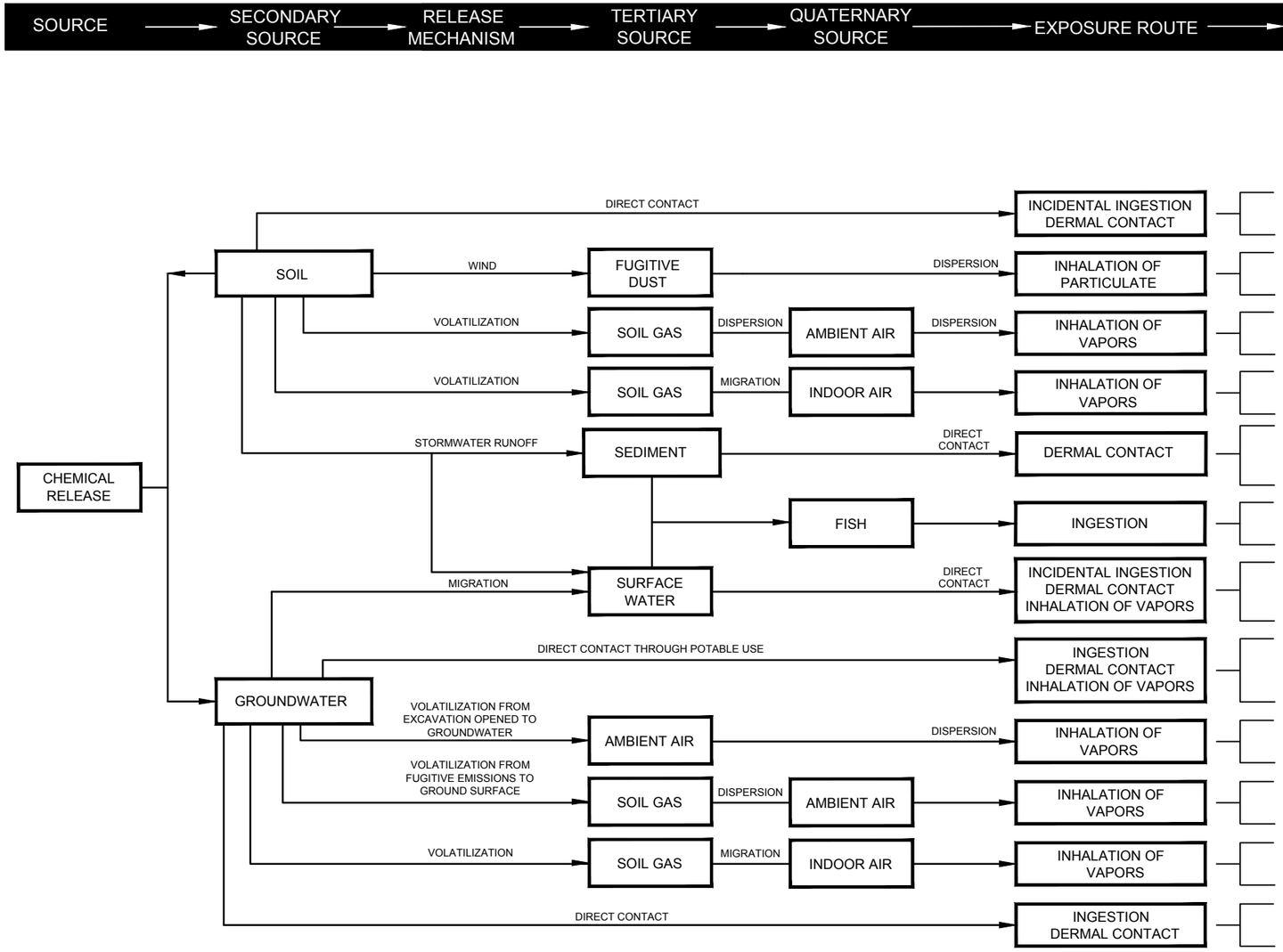
MILL PROPERTY LAYOUT

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:
ECOLOGICAL RISK ASSESSMENT SAMPLE LOCATION

Project Manager:	Reviewed By:	Date:	
J.Q.	J.D.	DECEMBER 2013	
Scale: 1:120	Project Nº: 056394-07	Report Nº: 009	Drawing Nº: figure 1.2

056394-07(009)GN-DE025 DEC 19/2013



POTENTIALLY EXPOSED RECEPTORS					
CURRENT/FUTURE				FUTURE	
TRESPASSER (2)	UTILITY (2) WORKER	CONSTRUCTION WORKER (3)	COMMERCIAL WORKER (4)	RESIDENT (5)	RECREATIONAL USER (6)
●	●	●	●	●	●
●	●	●	●	●	●
●	●	●	●	●	●
–	–	–	●	●	–
– (1)	–	–	–	–	– (1)
– (1)	–	–	–	–	– (1)
– (1)	–	–	–	–	– (1)
–	–	–	–	●	–
–	●	●	–	–	–
●	●	●	●	●	●
–	–	–	●	●	–
–	●	●	–	–	–

LEGEND

● POTENTIALLY COMPLETE EXPOSURE PATHWAY

– INCOMPLETE EXPOSURE PATHWAY

NOTES:

(1) SEDIMENT AND SURFACE WATER ARE NOT PRESENT ON-SITE. SEDIMENT AND SURFACE WATER OFF-SITE IN THE KALAMAZOO RIVER AND MILL RACE ARE BEING CONSIDERED UNDER SEPARATE SITE.

(2) CURRENT AND FUTURE SCENARIOS APPLY TO ALL DEVELOPMENT AREAS FOR THE TRESPASSER AND UTILITY WORKER.

(3) CURRENT SCENARIO APPLIES TO COMMERCIAL AREA 2 AND COMMERCIAL AREA 4 FOR THE CONSTRUCTION WORKER. FUTURE SCENARIO APPLIES TO ALL DEVELOPMENT AREAS FOR THE CONSTRUCTION WORKER

(4) CURRENT SCENARIO APPLIES TO COMMERCIAL AREA 4 FOR THE COMMERCIAL WORKER. FUTURE SCENARIO APPLIES TO ALL DEVELOPMENT AREAS FOR THE COMMERCIAL WORKER.

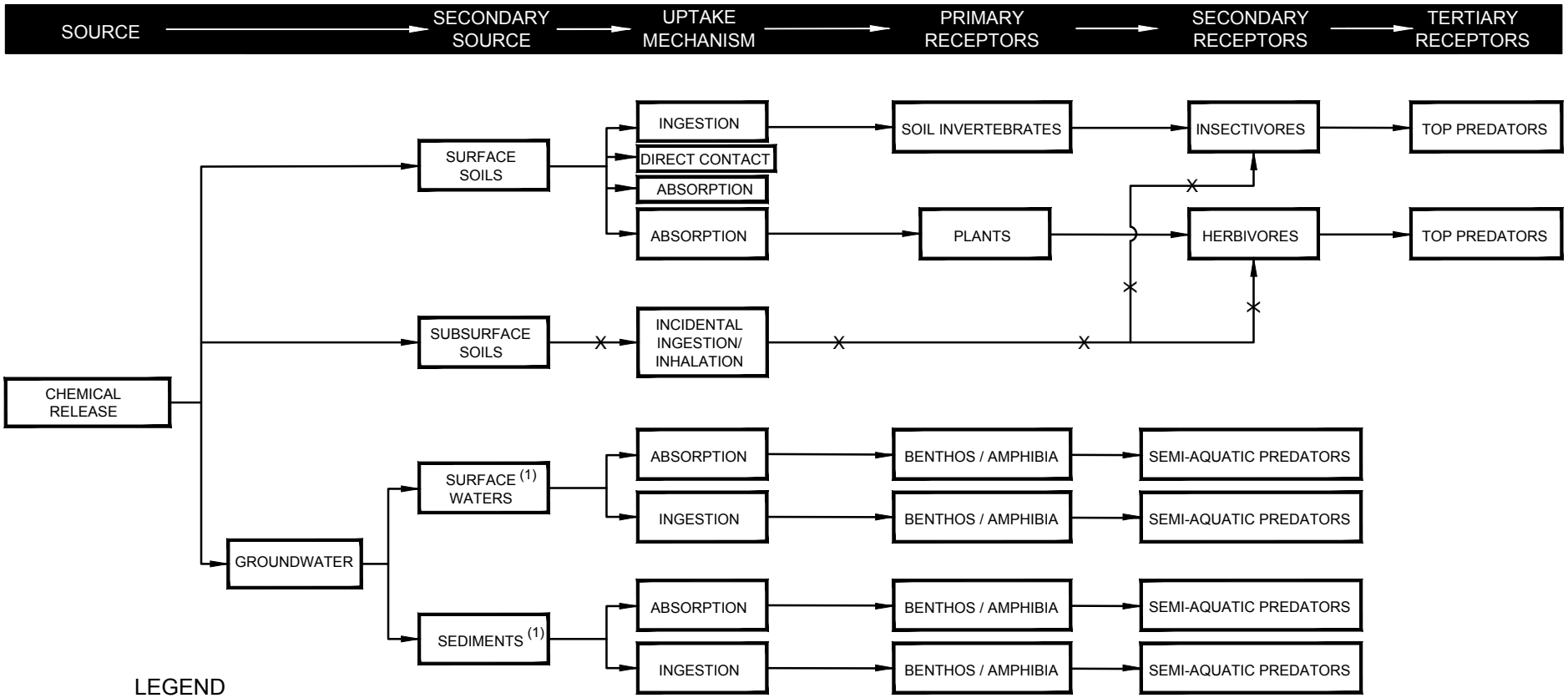
(5) FUTURE SCENARIO APPLIES TO RESIDENTIAL AREAS 1, 2, 3, AND 4, AND MIXED RESIDENTIAL/COMMERCIAL AREAS 1 AND 2 FOR THE RESIDENT.

(6) FUTURE SCENARIO APPLIES TO RESIDENTIAL AREAS 1, 2, 3, AND 4, COMMERCIAL AREA 4, WATERFRONT PLAZA, AND MIXED RESIDENTIAL/COMMERCIAL AREAS 1 AND 2 FOR THE RECREATIONAL USER.

figure 1.3

HUMAN HEALTH CONCEPTUAL SITE MODEL
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-DE004 JUN 21/2013



LEGEND

—X→ INCOMPLETE OR FUNCTIONALLY INCOMPLETE PATHWAY

NOTES:

(1) SEDIMENT AND SURFACE WATER ARE NOT PRESENT ON-SITE AND ARE BEING DISCUSSED TO THE EXTENT THAT POTENTIAL IMPACTED GROUNDWATER DISCHARGES TO SURFACE WATER SEDIMENT AND SURFACE WATER OFF-SITE IN THE KALAMAZOO RIVER AND MILL RACE ARE BEING CONSIDERED UNDER SEPARATE SITE.

figure 1.4

SLERA CONCEPTUAL SITE MODEL
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-DE005 JUN 21/2013

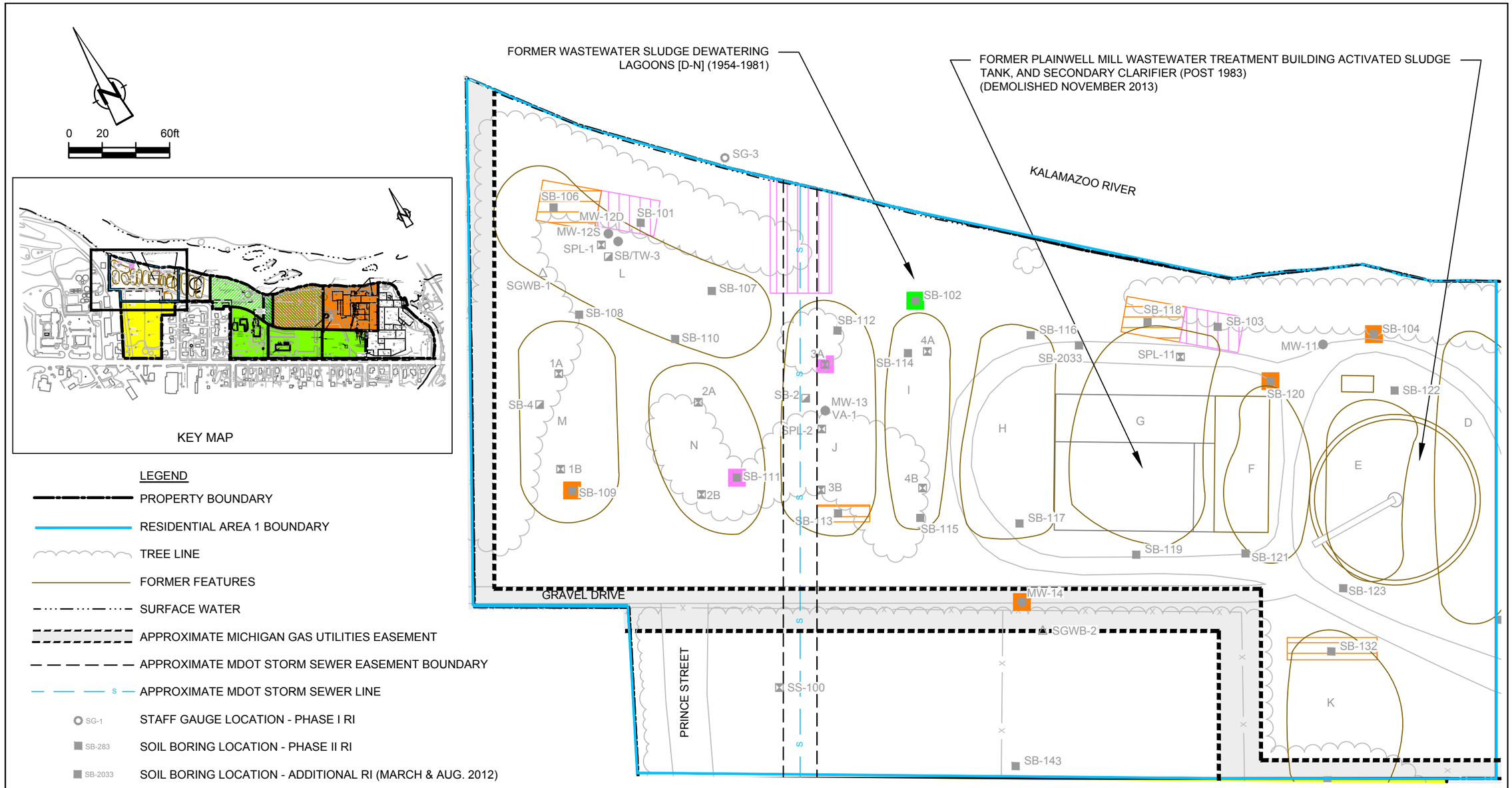
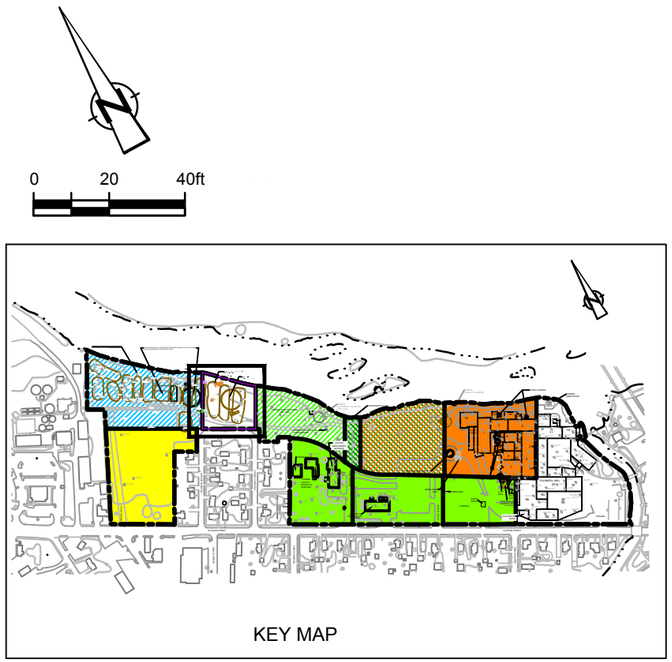
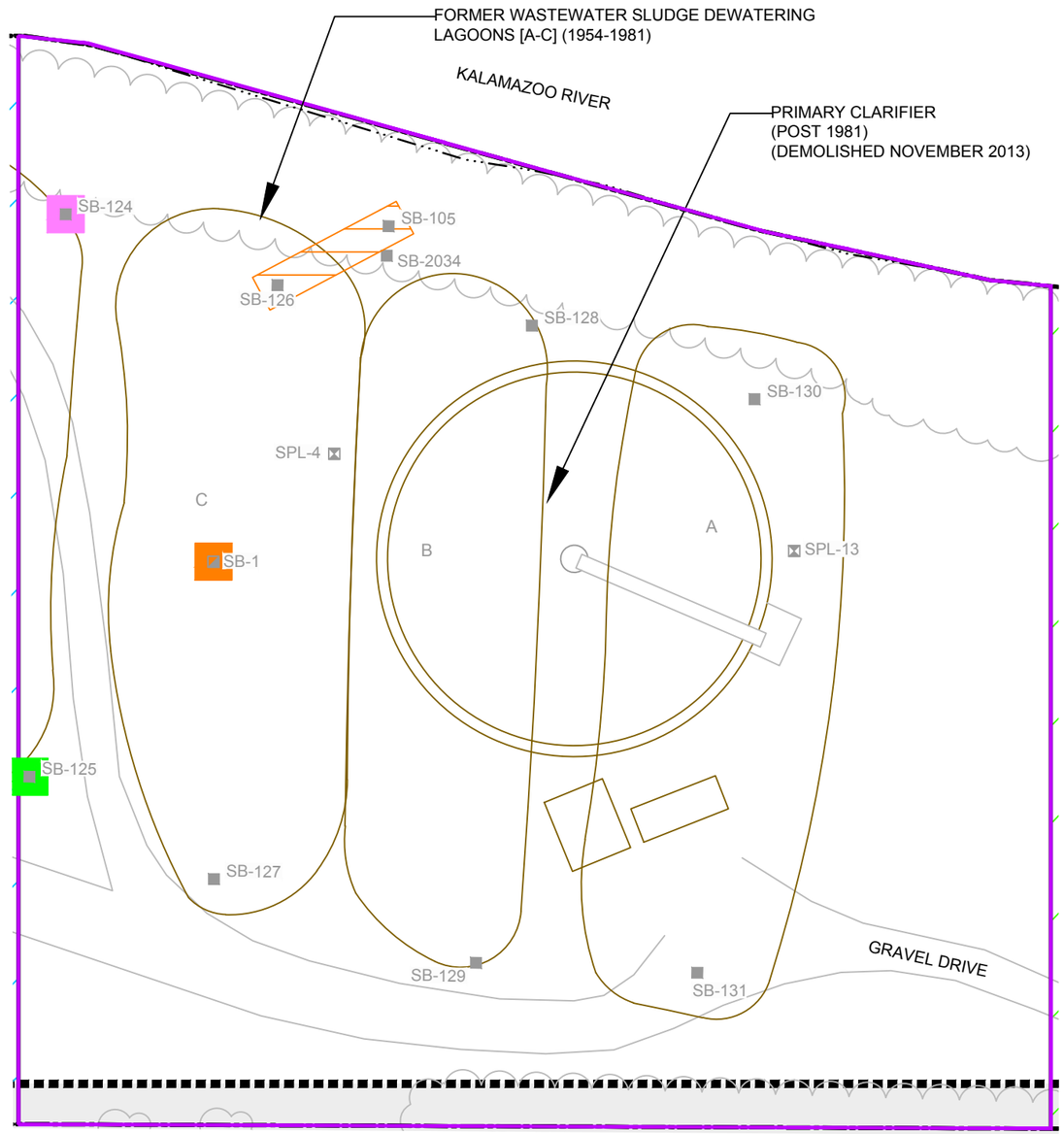


figure 3.1

CONCEPTUAL EXCAVATION AREA
RESIDENTIAL AREA 1: ALTERNATIVES 2A AND 3A
TO MEET PART 201 CLEANUP CRITERIA
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA025 DEC 19/2013





LEGEND

- PROPERTY BOUNDARY
- RESIDENTIAL AREA 2 BOUNDARY
- TREE LINE
- FORMER FEATURES
- SURFACE WATER
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- PREVIOUS SOIL SAMPLE LOCATION (FTC&H, 2006)
- PREVIOUS SOIL SAMPLE LOCATION (BBL, 1994)

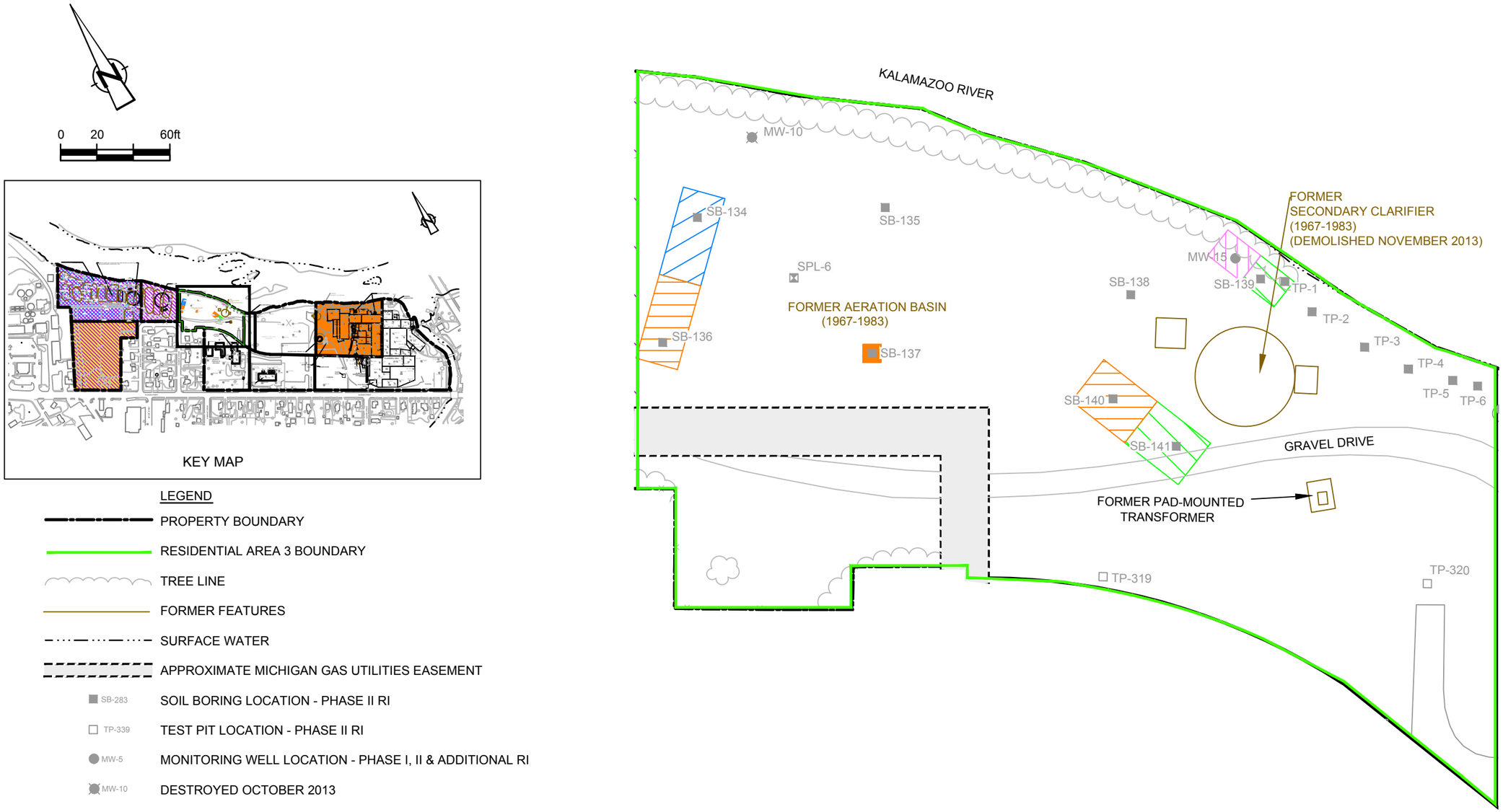
APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

figure 3.2

CONCEPTUAL EXCAVATION AREAS
RESIDENTIAL AREA 2: ALTERNATIVES 2A AND 3A TO MEET PART 201 CLEANUP CRITERIA
FEASIBLITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA021 DEC 19/2013



LEGEND

- PROPERTY BOUNDARY
- RESIDENTIAL AREA 3 BOUNDARY
- TREE LINE
- FORMER FEATURES
- SURFACE WATER
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- TP-339 TEST PIT LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- MW-10 DESTROYED OCTOBER 2013
- PREVIOUS SOIL SAMPLE LOCATION (BBL, 1994)
- PREVIOUS TEST PIT EXCAVATION LOCATION (RMT, 1994)

APPROXIMATE EXCAVATION DEPTHS (BGS)

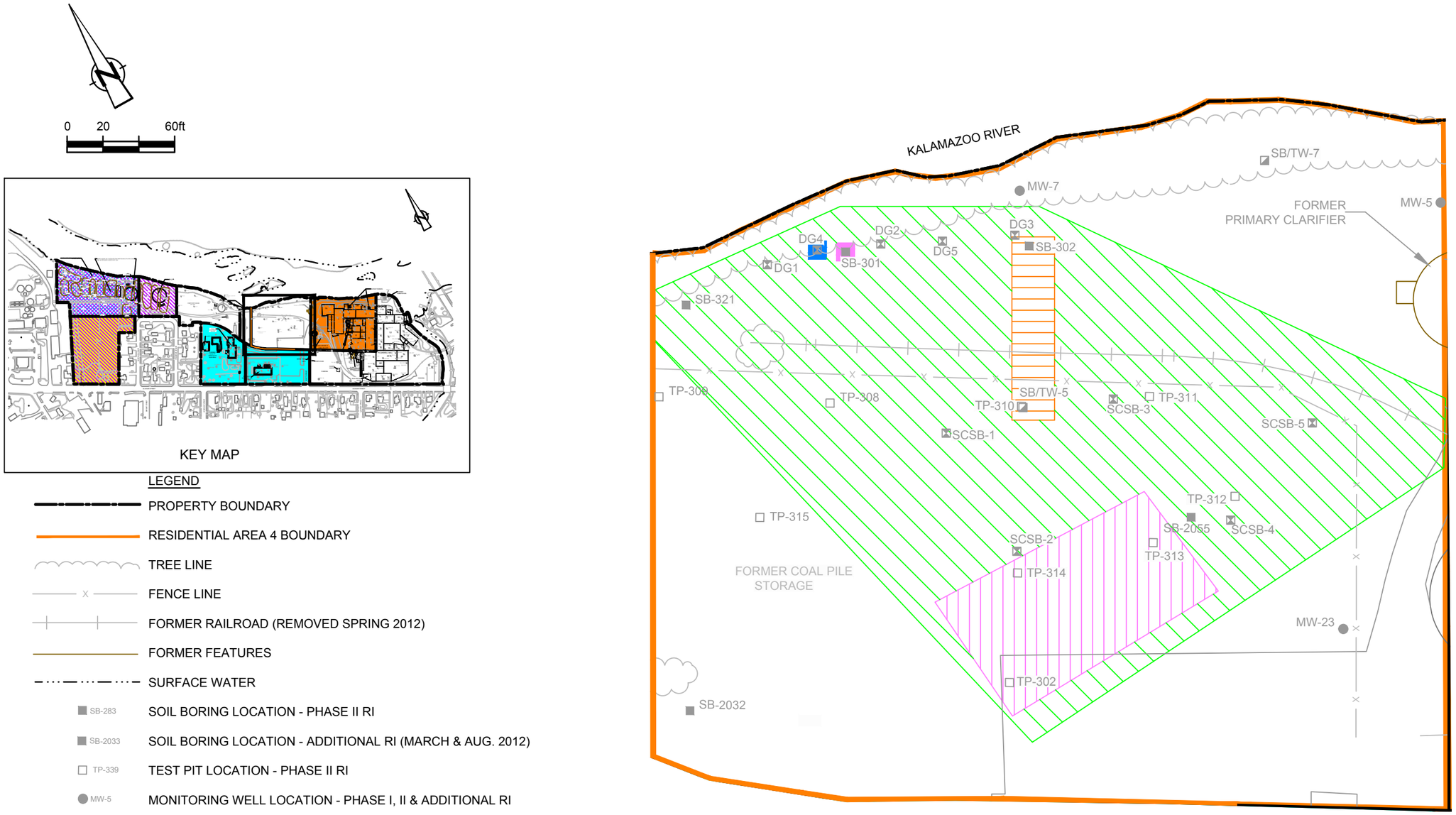
- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

NOTE:
SB-136, SB-137, AND SB-140 ARE AT DIFFERENT ELEVATIONS, AND, THEREFORE THE EXCAVATIONS WERE NOT COMBINED.

figure 3.3

CONCEPTUAL EXCAVATION AREAS
RESIDENTIAL AREA 3: ALTERNATIVES 2A AND 3A TO MEET PART 201 CLEANUP CRITERIA
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA017 DEC 19/2013



LEGEND

- PROPERTY BOUNDARY
- RESIDENTIAL AREA 4 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER RAILROAD (REMOVED SPRING 2012)
- FORMER FEATURES
- SURFACE WATER
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-339 TEST PIT LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS SOIL SAMPLE LOCATION (FTC&H, 2006)
- PREVIOUS TEMPORARY WELL LOCATION (FTC&H, 2006)

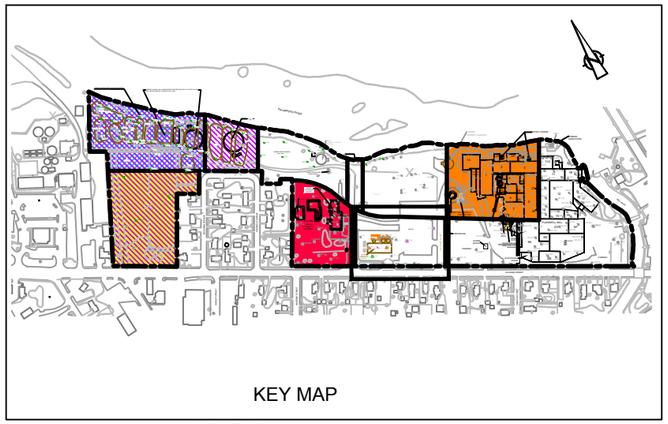
APPROXIMATE EXCAVATION DEPTHS (BGS)

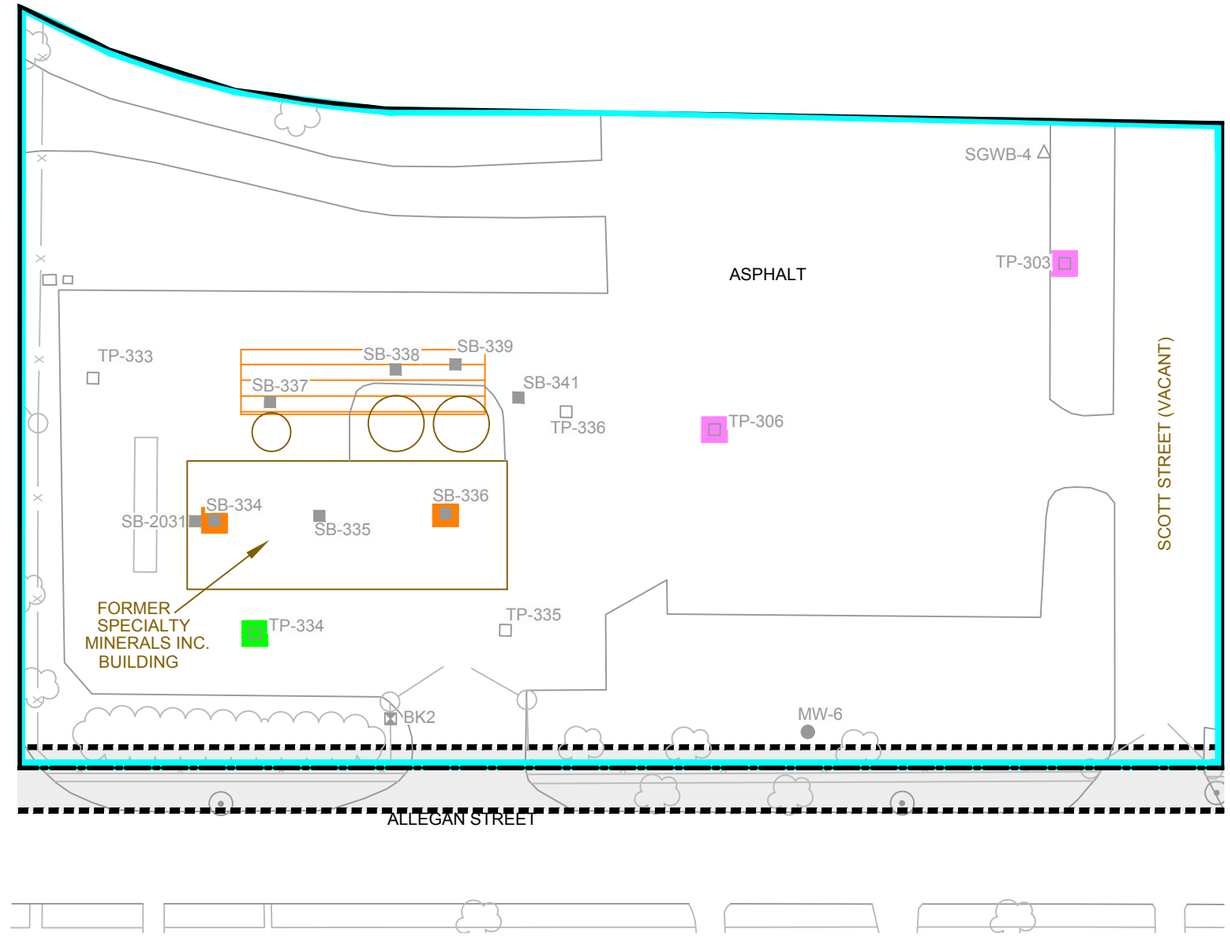
- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

figure 3.4

CONCEPTUAL EXCAVATION AREAS
RESIDENTIAL AREA 4: ALTERNATIVES 2A AND 3A TO MEET PART 201 CLEANUP CRITERIA
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA001 DEC 19/2013





LEGEND

- PROPERTY BOUNDARY
- MIXED RESIDENTIAL/COMMERCIAL AREA 1 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-339 TEST PIT LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)

APPROXIMATE EXCAVATION DEPTHS(BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

NOTE: SPECIALTY MINERALS BUILDING AND ASSOCIATED STRUCTURES DEMOLISHED ON BEHALF OF THE CITY OF PLAINWELL DECEMBER 2011

figure 3.5

CONCEPTUAL EXCAVATION AREAS
MIXED RESIDENTIAL/COMMERCIAL AREA 1 : ALTERNATIVES 2A AND 3A TO MEET PART 201 CLEANUP CRITERIA
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA013 DEC 20/2013

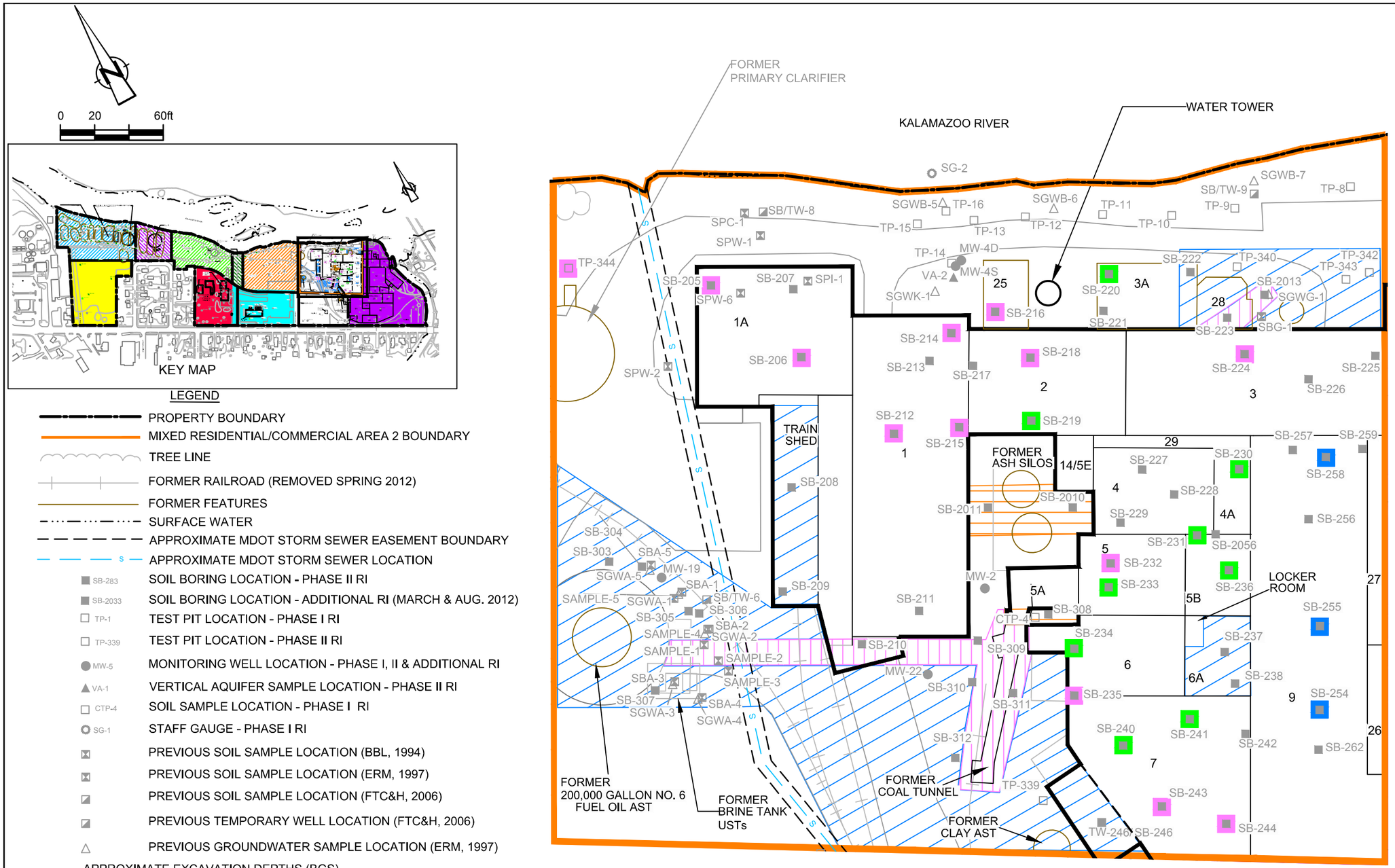
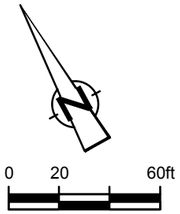
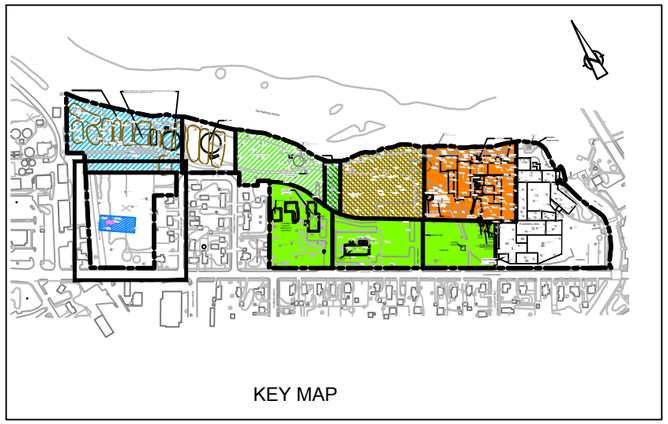


figure 3.6

CONCEPTUAL EXCAVATION AREAS
MIXED RESIDENTIAL / COMMERCIAL AREA 2 : ALTERNATIVES 2A AND 3A TO MEET PART 201 CLEANUP CRITERIA
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-DE051 DEC 19/2013





LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 1 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- APPROXIMATE MDOT STORM SEWER EASEMENT BOUNDARY
- APPROXIMATE MDOT STORM SEWER LINE
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- SS-101 SURFACE SOIL SAMPLE LOCATION - PHASE II RI

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

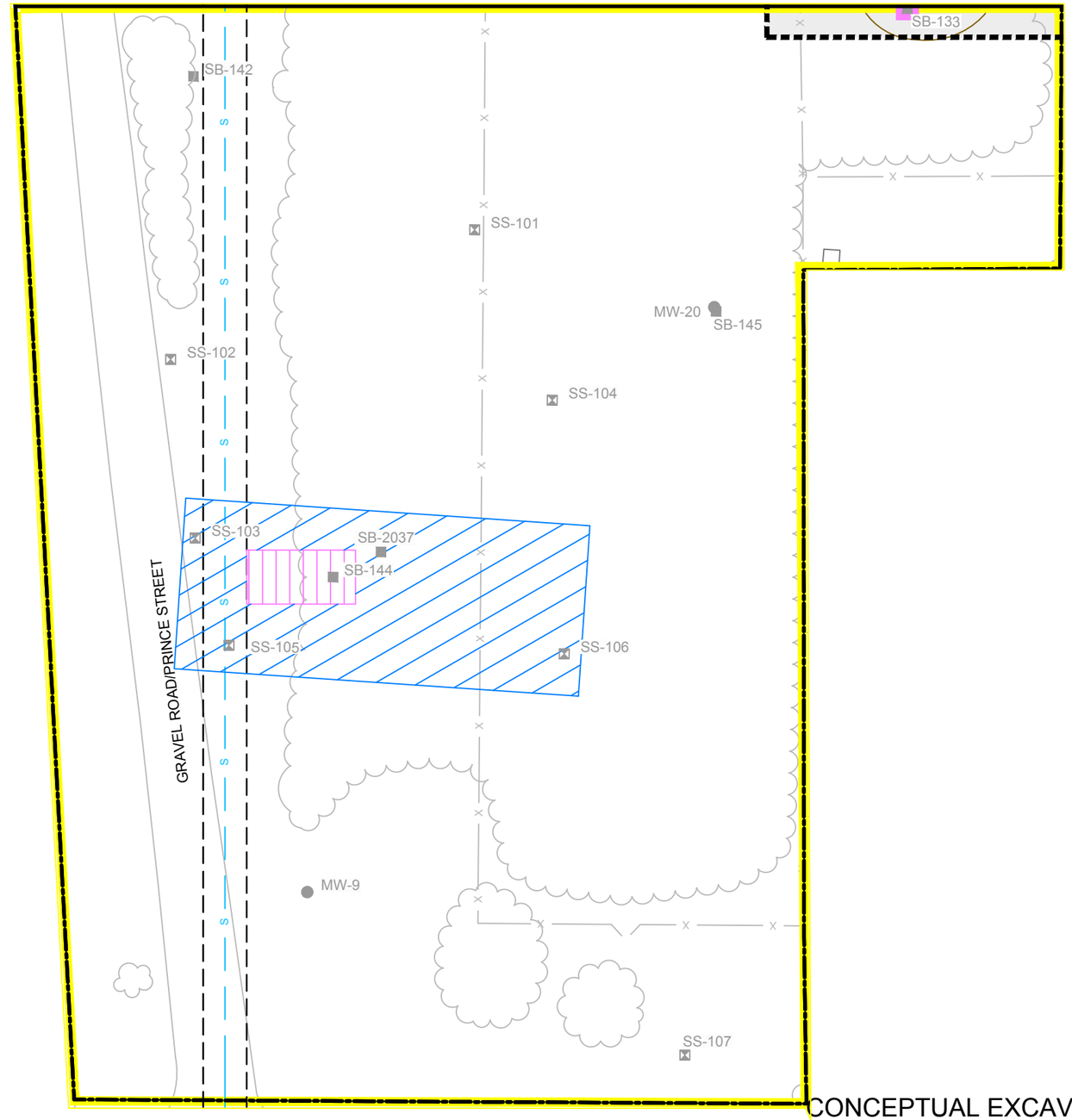


figure 3.7

CONCEPTUAL EXCAVATION AREAS
COMMERCIAL AREA 1: ALTERNATIVES 2A AND 31TO MEET PART 201 CLEANUP CRITERIA
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA029 DEC 20/2013

LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 2 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-339 TEST PIT LOCATION - PHASE II RI
- TW-246 TEMPORARY WELL LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

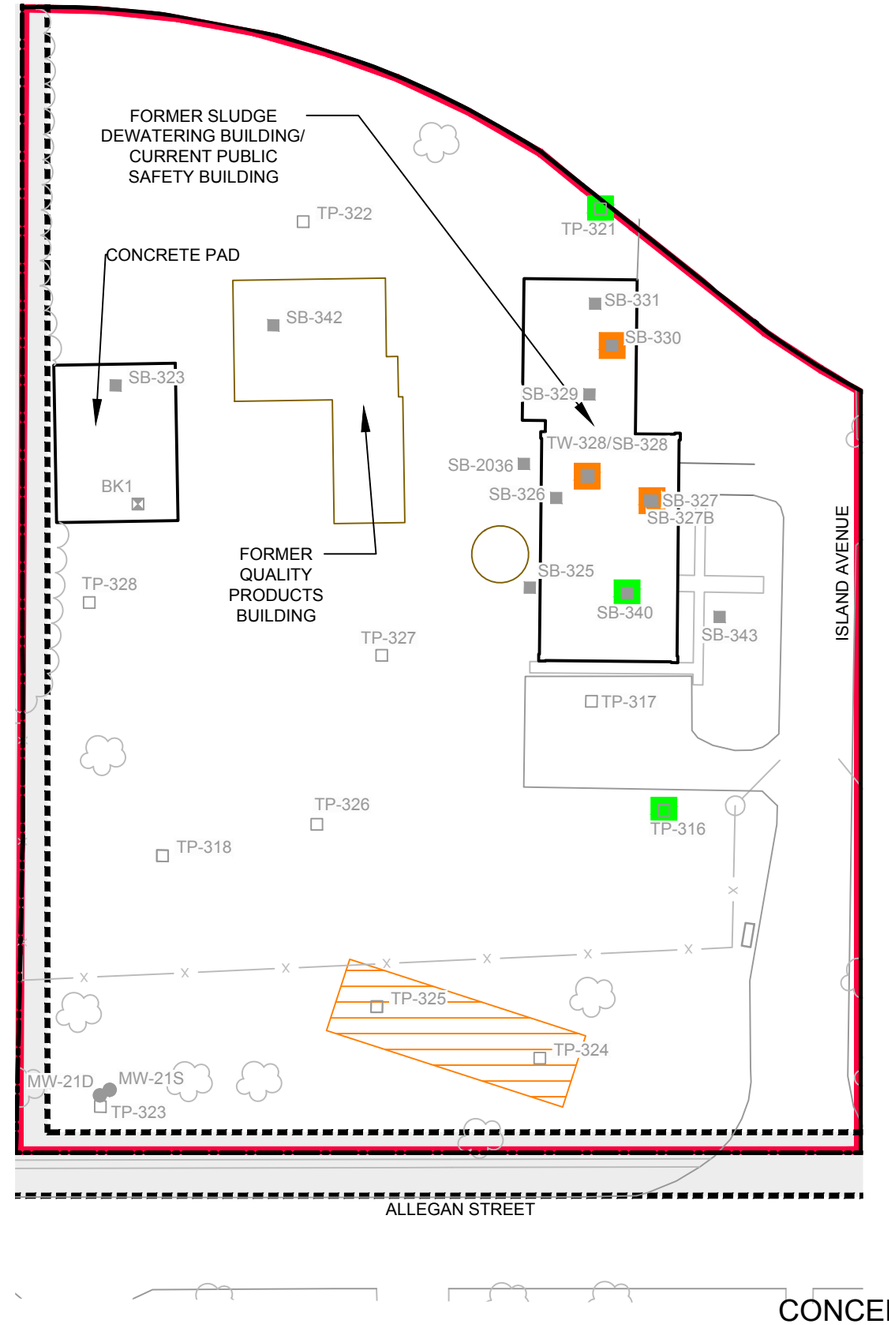
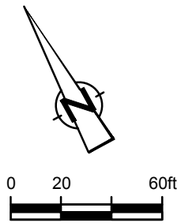
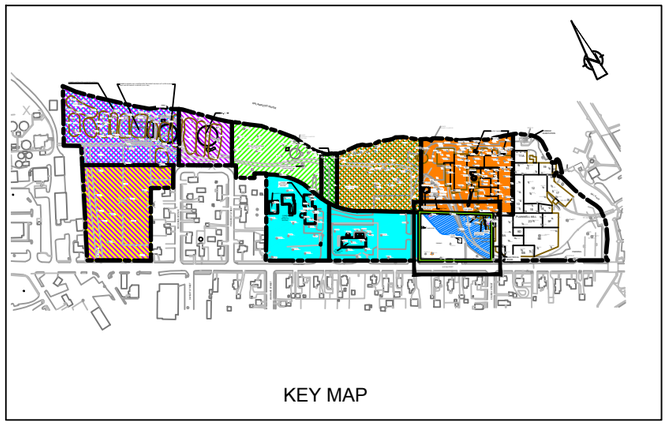


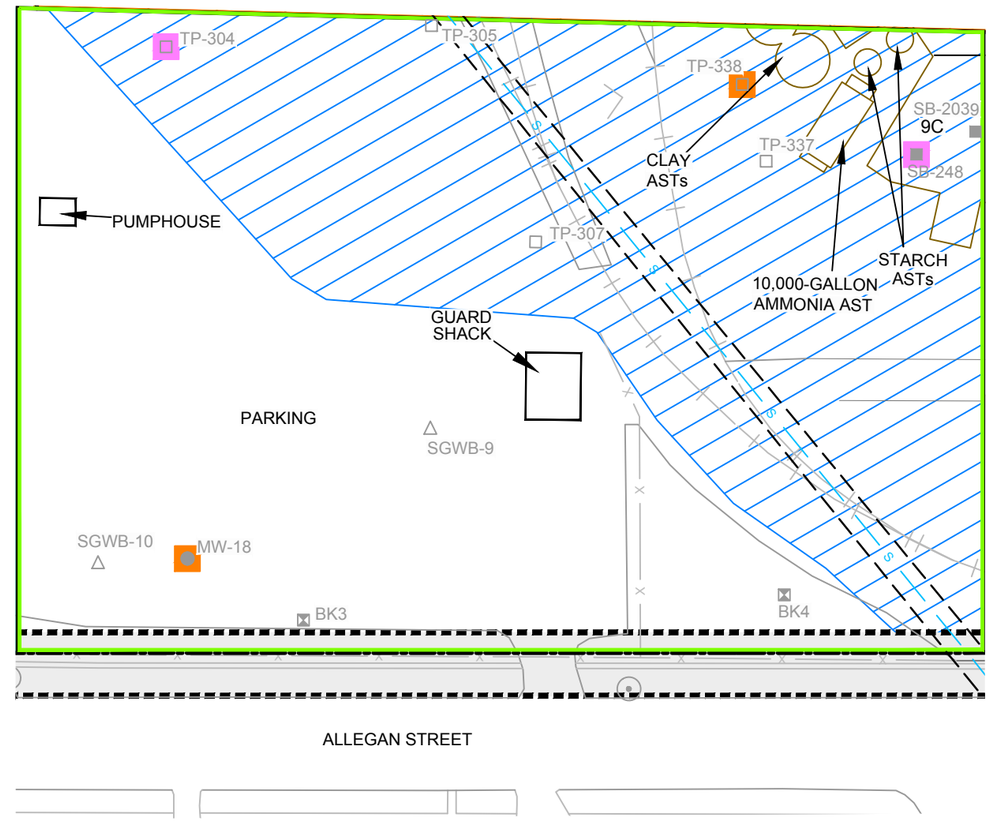
figure 3.8

CONCEPTUAL EXCAVATION AREAS
COMMERCIAL AREA 2: ALTERNATIVES 2A AND 3A TO MEET PART 201 CLEANUP CRITERIA
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA005 DEC 20/2013







LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 3 BOUNDARY
- FENCE LINE
- FORMER RAILROAD
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- APPROXIMATE MDOT STORM SEWER EASEMENT BOUNDARY
- APPROXIMATE MDOT STORM SEWER LINE
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)

APPROXIMATE EXCAVATION DEPTHS (BGS)

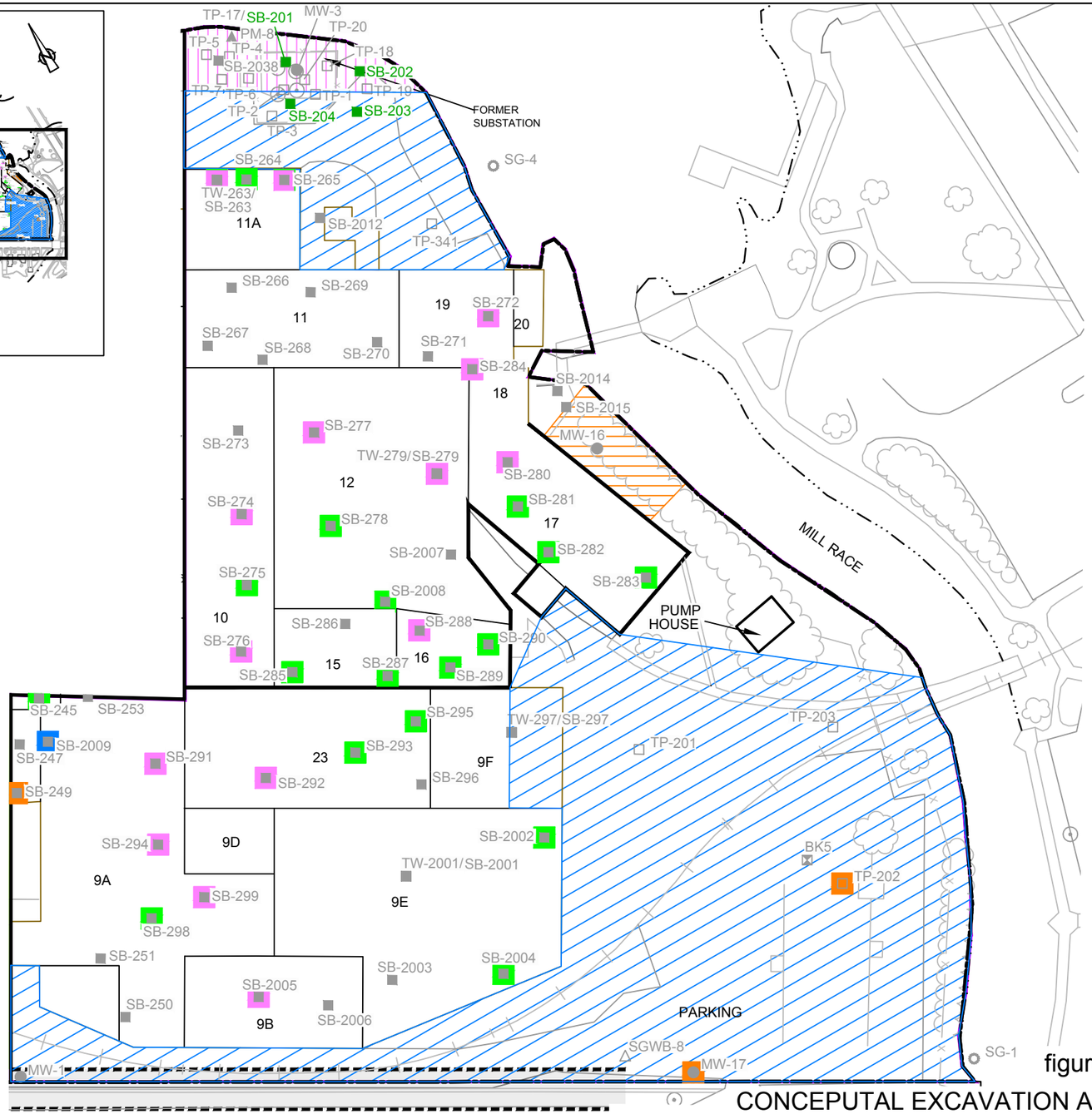
- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

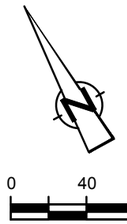
NOTE: THE FOLLOWING STRUCTURES WERE DEMOLISHED ON BEHALF OF THE CITY OF PLAINWELL BETWEEN MARCH AND AUGUST 2012: BUILDING 9C AND CLAY STARCH ASTs AND THE AMMONIA AST SECONDARY CONTAINMENT STRUCTURE.

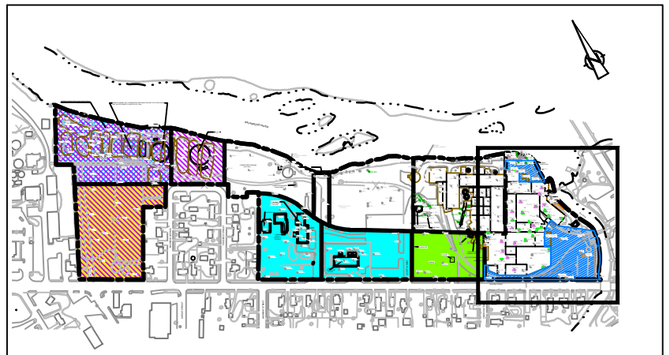
figure 3.9

CONCEPTUAL EXCAVATION AREAS
COMMERCIAL AREA 3 : ALTERNATIVES 2A AND 3A TO MEET PART 201 CLEANUP CRITERIA
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA033 DEC 19/2013







KEY MAP

LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 4 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER RAILROAD (REMOVED SPRING 2012)
- FORMER FEATURES
- SURFACE WATER
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SG-1 STAFF GAUGE LOCATION - PHASE I RI
- SB-283 SOIL BORING LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- TP-1 TEST PIT LOCATION - PHASE I RI
- TW-246 TEMPORARY WELL LOCATION - PHASE II RI
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)
- SOIL BORING LOCATION - FANNIE PELL BRIDGE FOOTING
- PREVIOUS SOIL SAMPLE LOCATION (CDM, 2001)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

NOTE: THE FOLLOWING STRUCTURES WERE DEMOLISHED ON BEHALF OF THE CITY OF PLAINWELL BETWEEN MARCH AND AUGUST 2012: BUILDINGS 9A, 9B, 9D, 9E, 9F, AND 23

figure 3.10

CONCEPUTAL EXCAVATION AREAS
COMMERCIAL AREA 4: ALTERNATIVES 2A AND 3A TO MEET PART 201 CLEANUP CRITERIA
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA009 DEC 20/2013

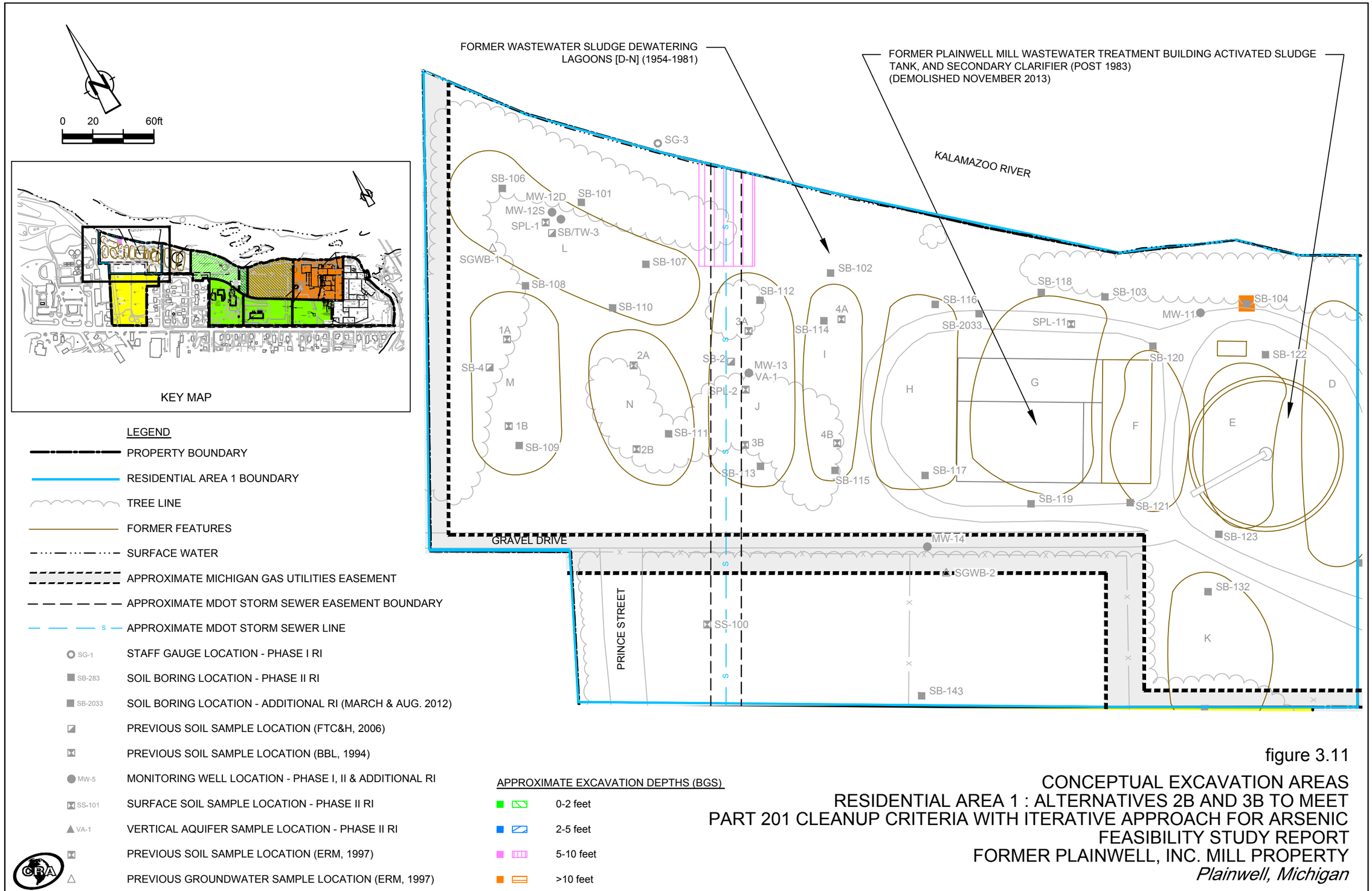
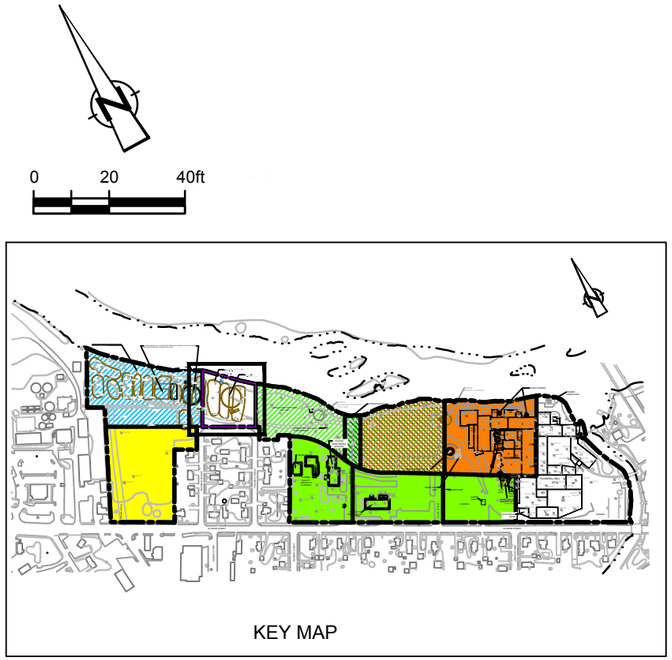
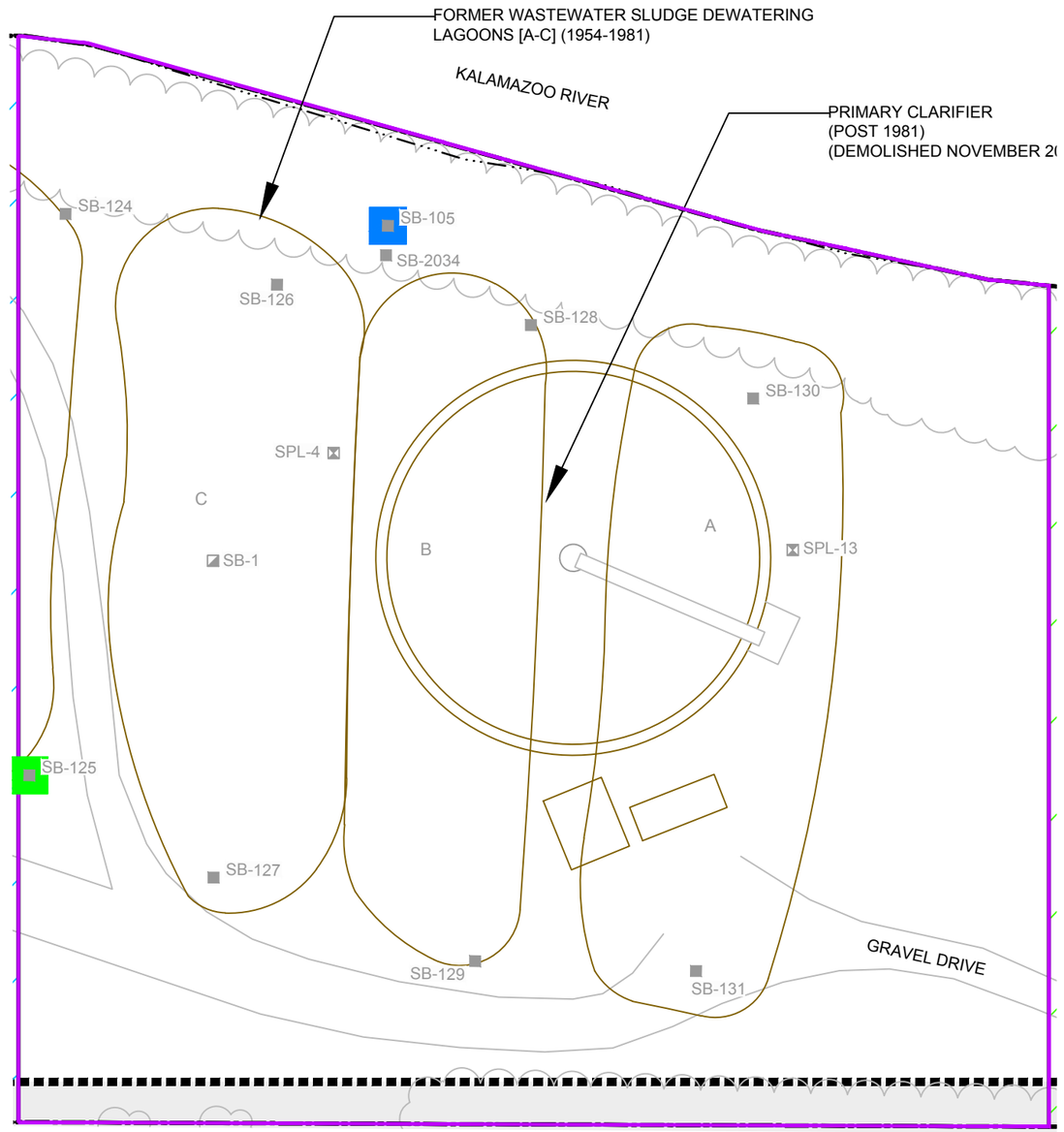


figure 3.11

CONCEPTUAL EXCAVATION AREAS
RESIDENTIAL AREA 1 : ALTERNATIVES 2B AND 3B TO MEET
PART 201 CLEANUP CRITERIA WITH ITERATIVE APPROACH FOR ARSENIC
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA026 DEC 20/2013





LEGEND

- PROPERTY BOUNDARY
- RESIDENTIAL AREA 2 BOUNDARY
- TREE LINE
- FORMER FEATURES
- SURFACE WATER
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- PREVIOUS SOIL SAMPLE LOCATION (FTC&H, 2006)
- PREVIOUS SOIL SAMPLE LOCATION (BBL, 1994)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

figure 3.12

CONCEPTUAL EXCAVATION AREAS

RESIDENTIAL AREA 2 : ALTERNATIVES 2B AND 3B TO MEET PART 201 CLEANUP CRITERIA WITH ITERATIVE APPROACH FOR ARSENIC

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Plainwell, Michigan

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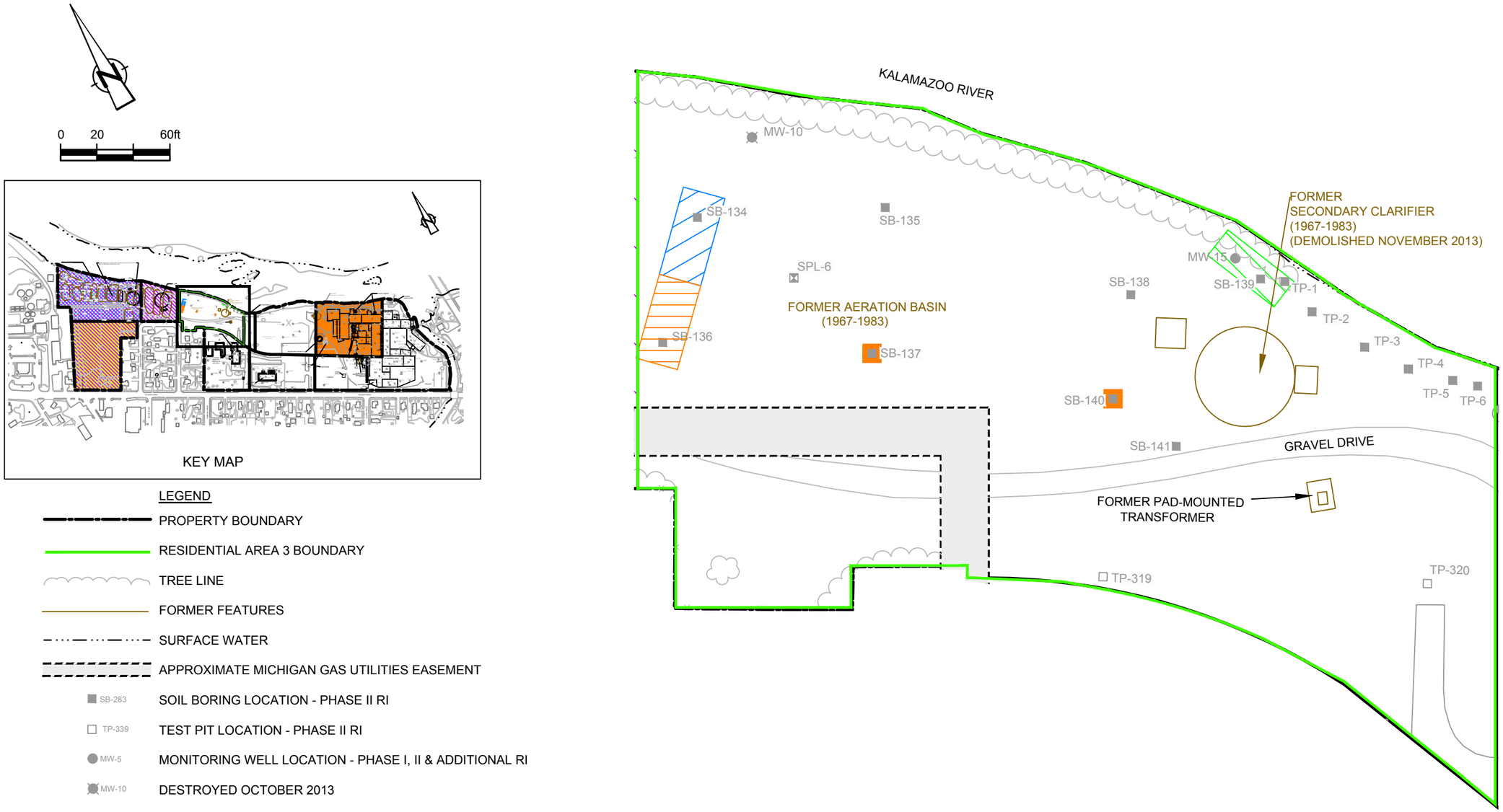


LEGEND

- PROPERTY BOUNDARY
- RESIDENTIAL AREA 3 BOUNDARY
- TREE LINE
- FORMER FEATURES
- SURFACE WATER
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- TP-339 TEST PIT LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- MW-10 DESTROYED OCTOBER 2013
- PREVIOUS SOIL SAMPLE LOCATION (BBL, 1994)
- PREVIOUS TEST PIT EXCAVATION LOCATION (RMT, 1994)

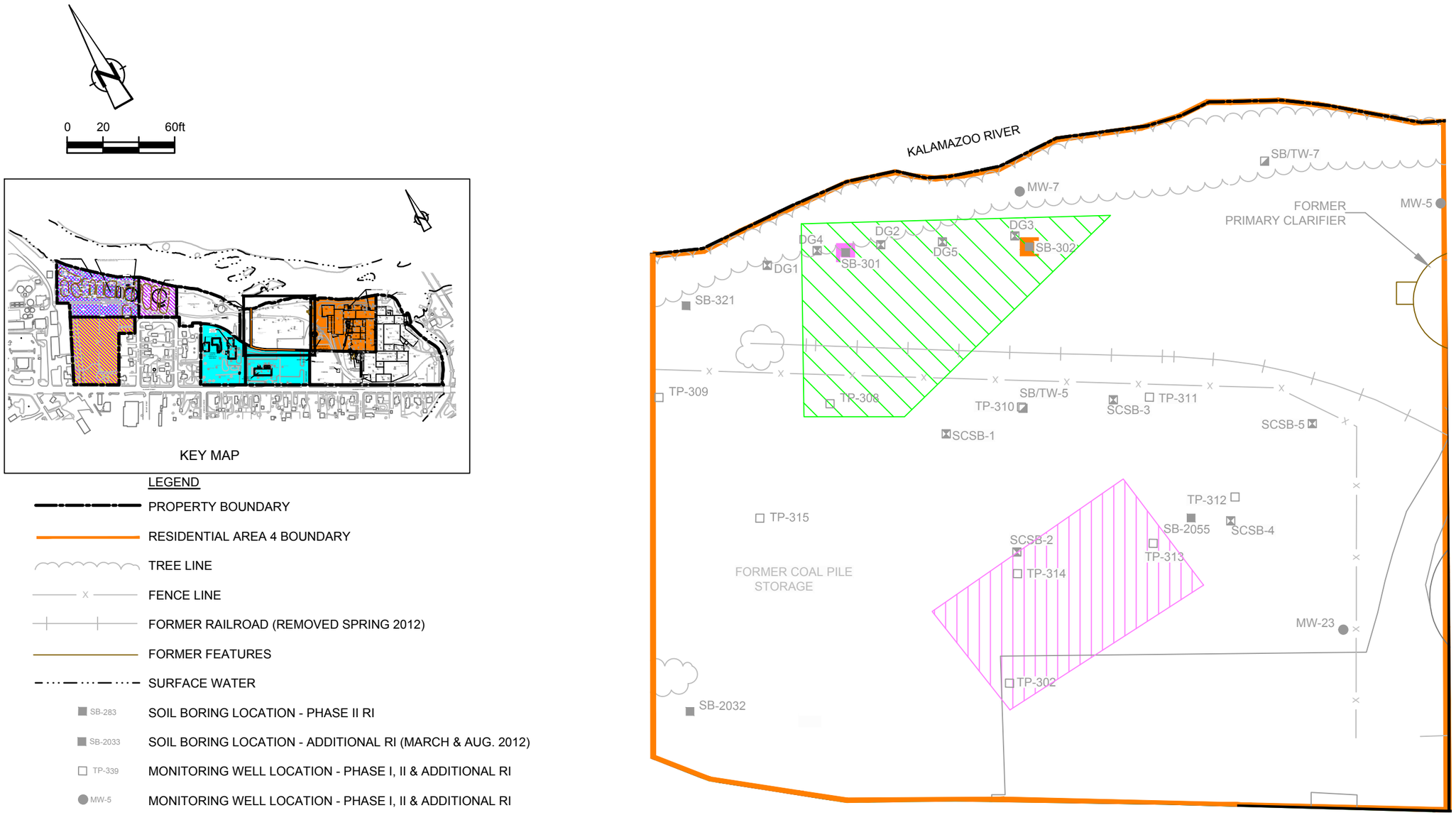
APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

figure 3.13

CONCEPTUAL EXCAVATION AREAS
RESIDENTIAL AREA 3 : ALTERNATIVES 2B AND 3B TO MEET PART 201
CLEANUP CRITERIA WITH ITERATIVE APPROACH FOR ARSENIC
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA018 DEC 20/2013



LEGEND

- PROPERTY BOUNDARY
- RESIDENTIAL AREA 4 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER RAILROAD (REMOVED SPRING 2012)
- FORMER FEATURES
- SURFACE WATER
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-339 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS SOIL SAMPLE LOCATION (FTC&H, 2006)
- PREVIOUS TEMPORARY WELL LOCATION (FTC&H, 2006)

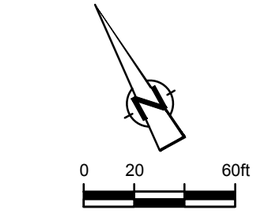
APPROXIMATE EXCAVATION DEPTHS (BGS)

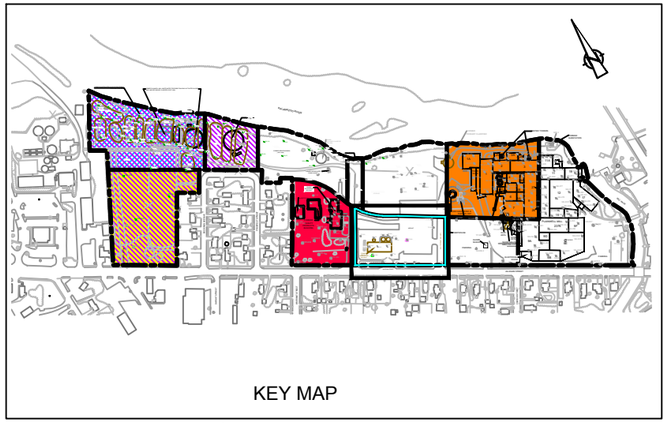
- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

figure 3.14

CONCEPTUAL EXCAVATION AREAS
RESIDENTIAL AREA 4 : ALTERNATIVES 2B AND 3B TO MEET
PART 201 CLEANUP CRITERIA WITH ITERATIVE APPROACH FOR ARSENIC
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA002 DEC 20/2013



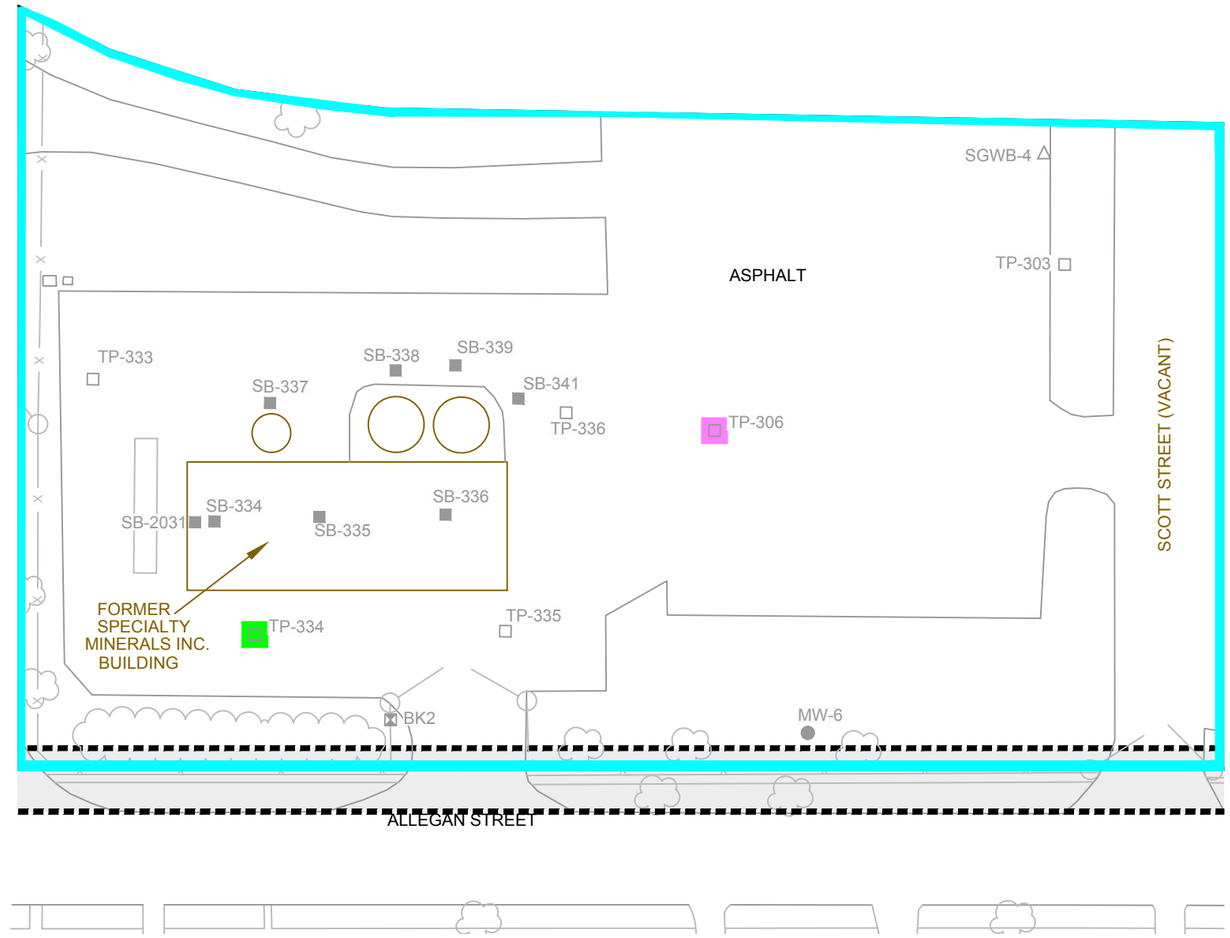


LEGEND

- PROPERTY BOUNDARY
- MIXED RESIDENTIAL/COMMERCIAL AREA 1 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-339 TEST PIT LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

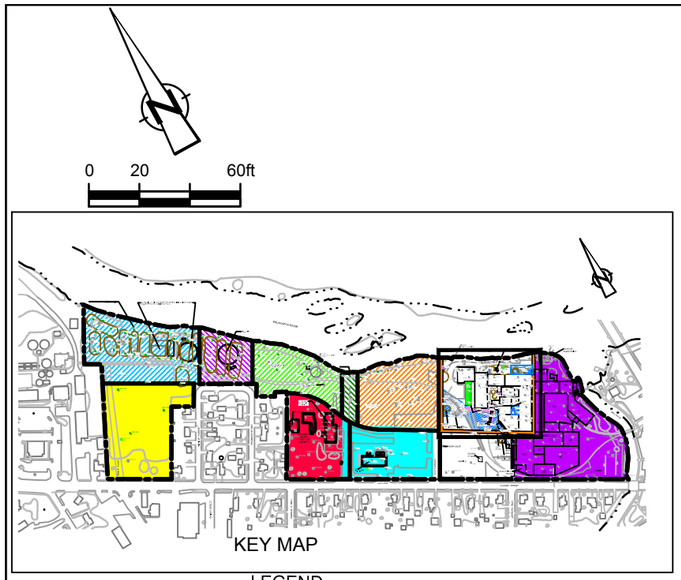


NOTE: SPECIALTY MINERALS BUILDING AND ASSOCIATED STRUCTURES DEMOLISHED ON BEHALF OF THE CITY OF PLAINWELL DECEMBER 2011

figure 3.15

CONCEPTUAL EXCAVATION AREAS
MIXED RESIDENTIAL/COMMERCIAL AREA 1: ALTERNATIVES 2B AND 3B TO MEET PART 201 CLEANUP CRITERIA WITH ITERATIVE APPROACH FOR ARSENIC
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA014 DEC 20/2013



LEGEND

- PROPERTY BOUNDARY
- MIXED RESIDENTIAL/COMMERCIAL AREA 2 BOUNDARY
- TREE LINE
- FORMER RAILROAD (REMOVED SPRING 2012)
- FORMER FEATURES
- SURFACE WATER
- APPROXIMATE MDOT STORM SEWER EASEMENT BOUNDARY
- APPROXIMATE MDOT STORM SEWER LOCATION
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-1 TEST PIT LOCATION - PHASE I RI
- TP-339 TEST PIT LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- VA-1 VERTICAL AQUIFER SAMPLE LOCATION - PHASE II RI
- CTP-4 SOIL SAMPLE LOCATION - PHASE I RI
- SG-1 STAFF GAUGE - PHASE I RI
- PREVIOUS SOIL SAMPLE LOCATION (BBL, 1994)
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS SOIL SAMPLE LOCATION (FTC&H, 2006)
- PREVIOUS TEMPORARY WELL LOCATION (FTC&H, 2006)
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)

APPROXIMATE EXCAVATION DEPTHS

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

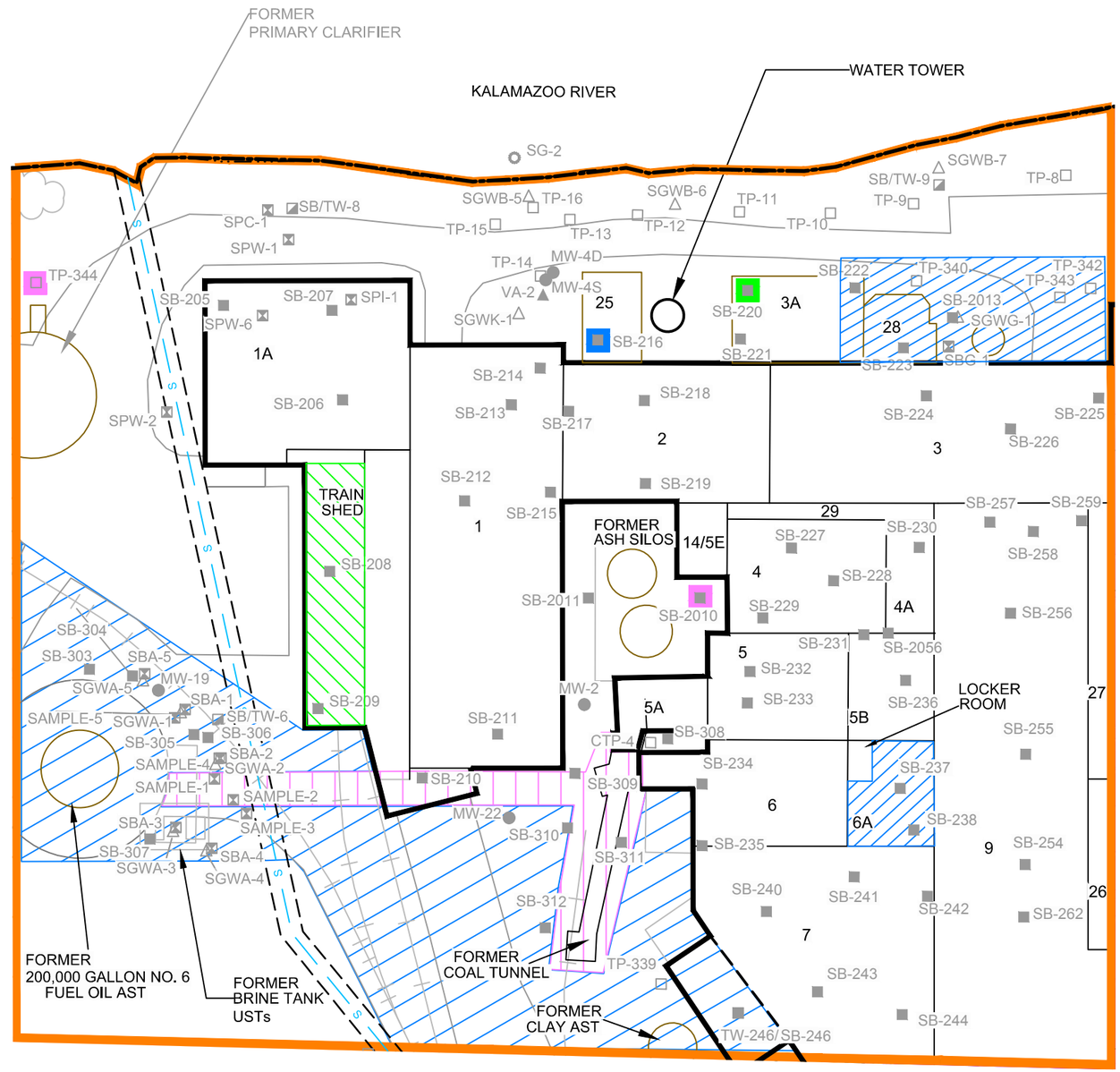
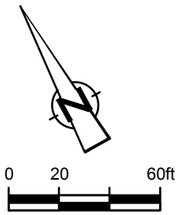
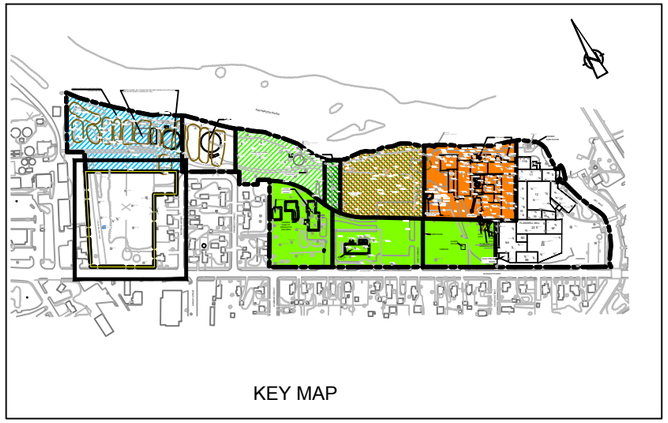


figure 3.16

MIXED RESIDENTIAL/COMMERCIAL AREA 2
CONCEPTUAL EXCAVATION AREAS TO MEET PART 201
CLEAN UP CRITERIA WITH ITERATIVE APPROACH FOR ARSENIC
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-DE052 DEC 18/2013





LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 1 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- APPROXIMATE MDOT STORM SEWER EASEMENT BOUNDARY
- APPROXIMATE MDOT STORM SEWER LINE
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- SS-101 SURFACE SOIL SAMPLE LOCATION - PHASE II RI

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

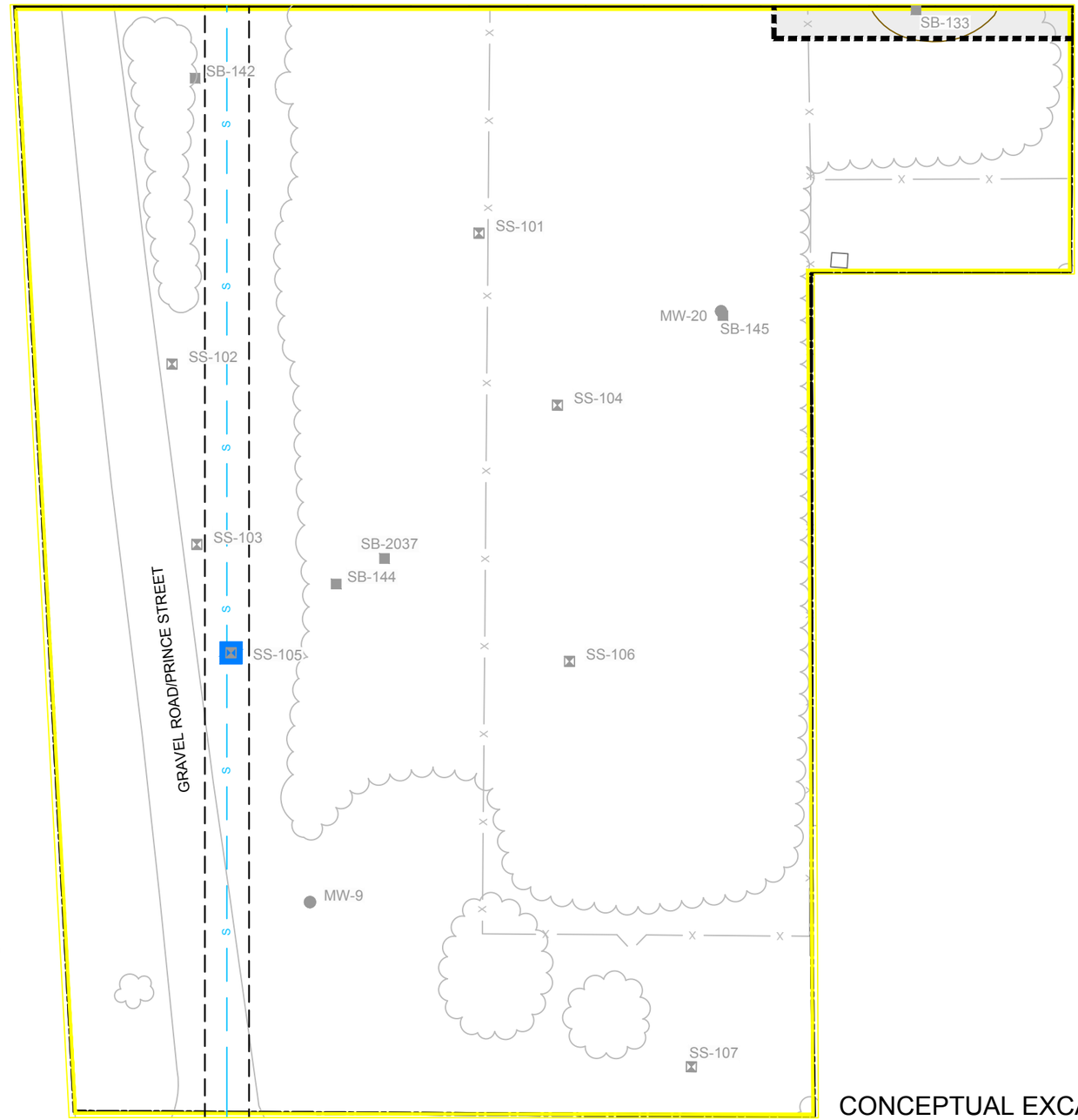


figure 3.17

CONCEPTUAL EXCAVATION AREAS
COMMERCIAL AREA 1: ALTERNATIVES 2B AND 3B TO MEET PART 201 CLEANUP CRITERIA
WITH ITERATIVE APPROACH FOR ARSENIC
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA030 DEC 20/2013

LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 2 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-339 TEST PIT LOCATION - PHASE II RI
- TW-246 TEMPORARY WELL LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

NOTE:
NO EXCAVATION REQUIRED.

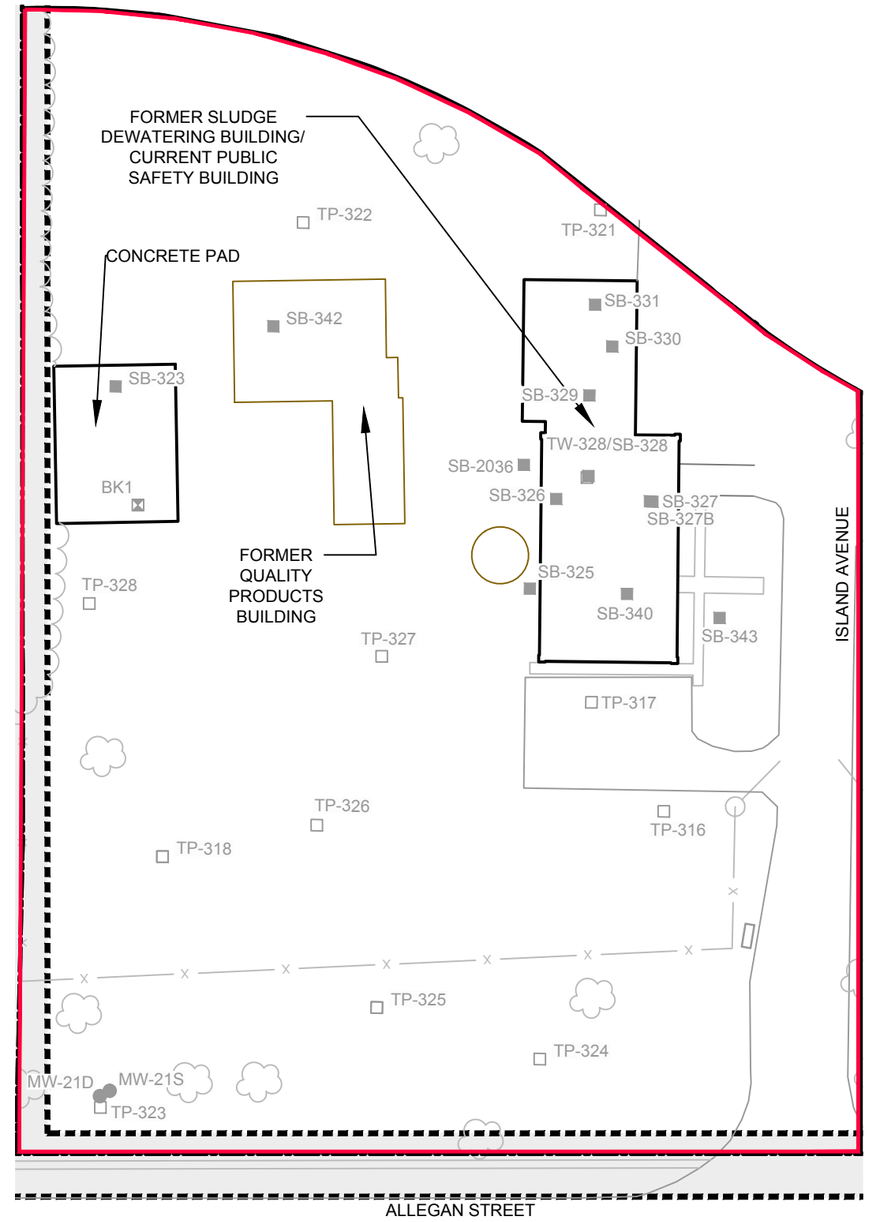
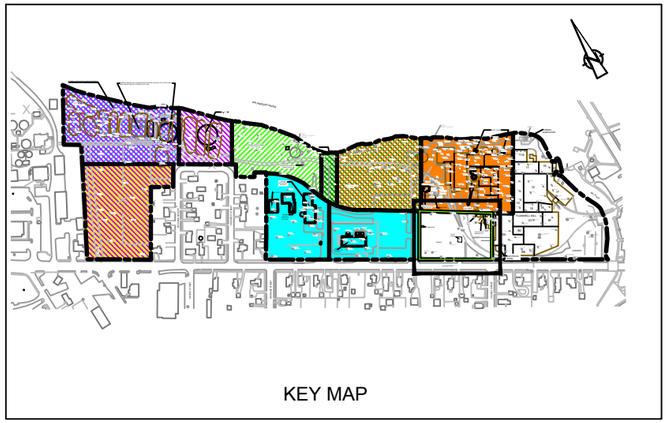


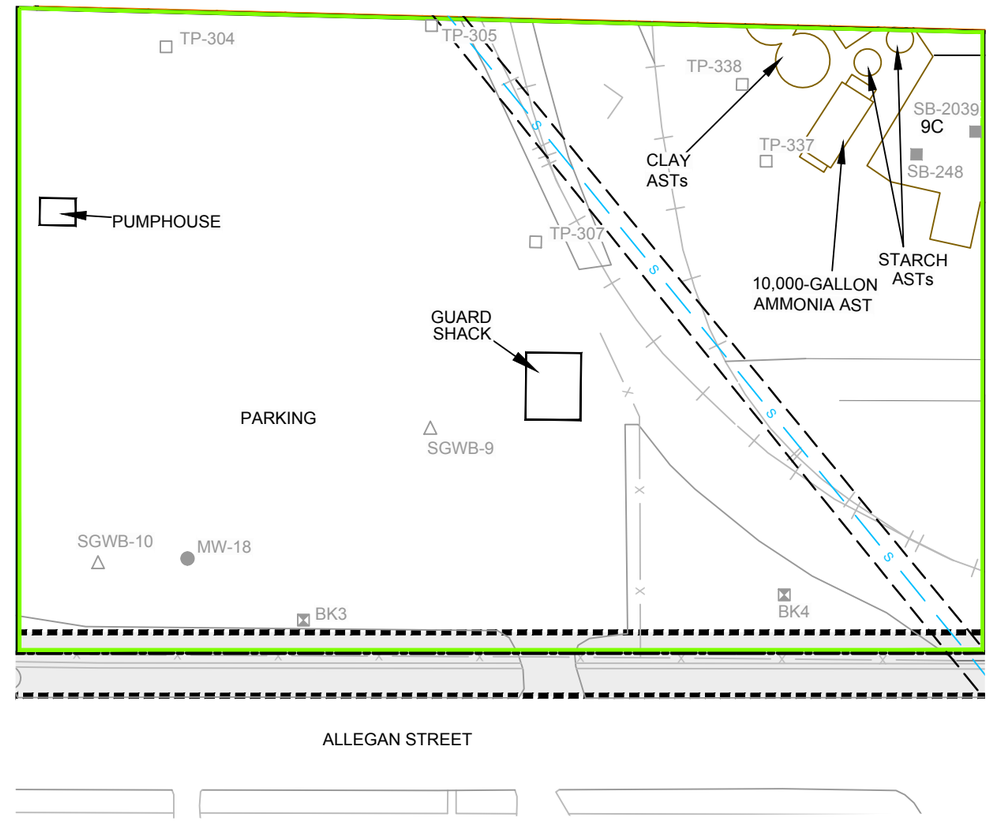
figure 3.18

CONCEPTUAL EXCAVATION AREAS
COMMERCIAL AREA 2: ALTERNATIVES 2B AND 3B TO MEET PART 201 CLEANUP CRITERIA
WITH ITERATIVE APPROACH FOR ARSENIC
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA006 DEC 20/2013

0 20 60ft





LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 3 BOUNDARY
- FENCE LINE
- FORMER RAILROAD
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- APPROXIMATE MDOT STORM SEWER EASEMENT BOUNDARY
- APPROXIMATE MDOT STORM SEWER LINE
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)

APPROXIMATE EXCAVATION DEPTHS (BGS)

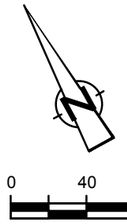
- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

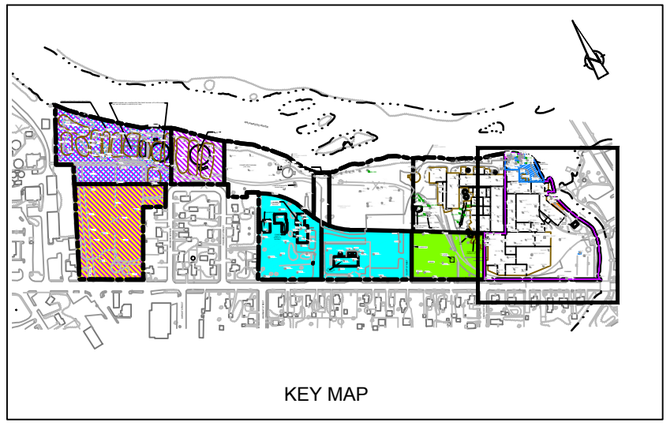
NOTES:
THE FOLLOWING STRUCTURES WERE DEMOLISHED ON BEHALF OF THE CITY OF PLAINWELL BETWEEN MARCH AND AUGUST 2012: BUILDING 9C AND CLAY STARCH ASTs AND THE AMMONIA AST SECONDARY CONTAINMENT STRUCTURE.
NO EXCAVATION REQUIRED.

figure 3.19

CONCEPTUAL EXCAVATION AREAS
COMMERCIAL AREA 3: ALTERNATIVES 2B AND 3B TO MEET PART 201 CLEANUP CRITERIA WITH ITERATIVE APPROACH FOR ARSENIC
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA034 DEC 20/2013





LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 4 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER RAILROAD (REMOVED SPRING 2012)
- FORMER FEATURES
- SURFACE WATER
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SG-1 STAFF GAUGE LOCATION - PHASE I RI
- SB-283 SOIL BORING LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- TP-1 TEST PIT LOCATION - PHASE I RI
- TW-246 TEMPORARY WELL LOCATION - PHASE II RI
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)
- SOIL BORING LOCATION - FANNIE PELL BRIDGE FOOTING
- PREVIOUS SOIL SAMPLE LOCATION (CDM, 2001)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

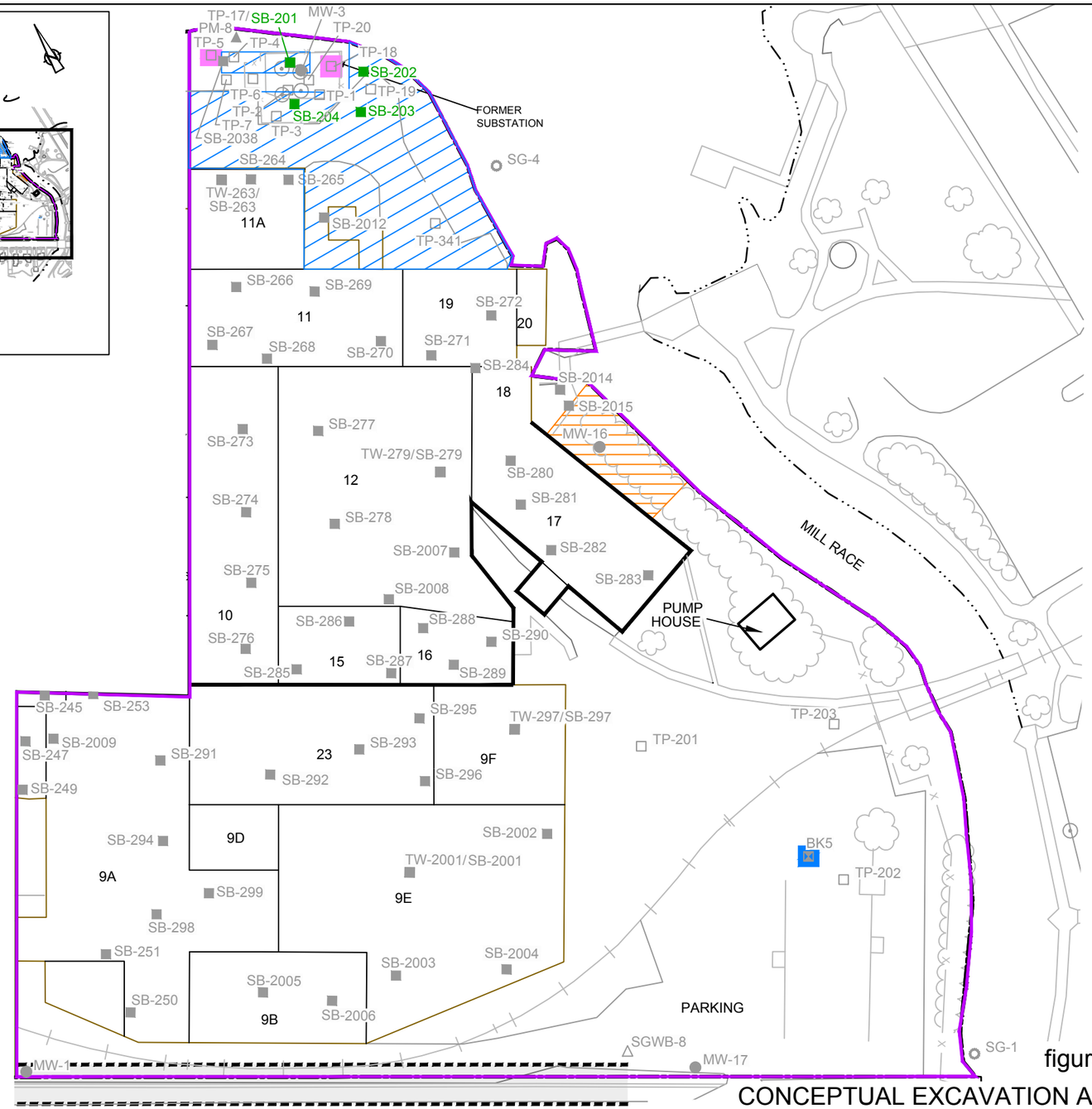


figure 3.20

CONCEPTUAL EXCAVATION AREAS

COMMERCIAL AREA 4: ALTERNATIVES 2B AND 3B TO MEET PART 201 CLEANUP CRITERIA WITH ITERATIVE APPROACH FOR ARSENIC

FEASIBILITY STUDY REPORT

FORMER PLAINWELL, INC. MILL PROPERTY

Plainwell, Michigan

NOTES: THE FOLLOWING STRUCTURES WERE DEMOLISHED ON BEHALF OF THE CITY OF PLAINWELL BETWEEN MARCH AND AUGUST 2012: BUILDINGS 9A, 9B, 9D, 9E, 9F, AND 23.
ASSUMES ALL SOIL UNDER BUILDING TO REMAIN.

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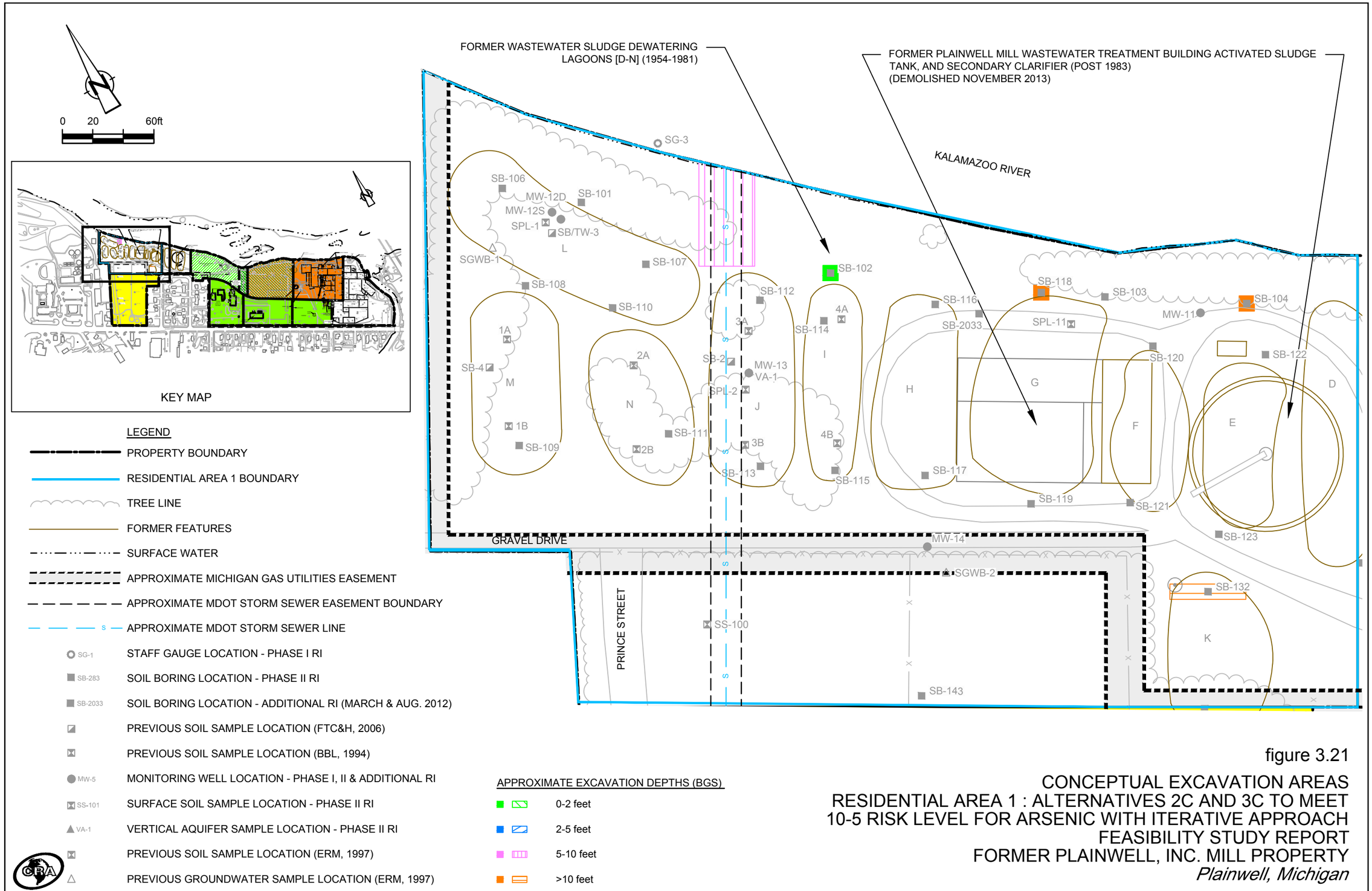
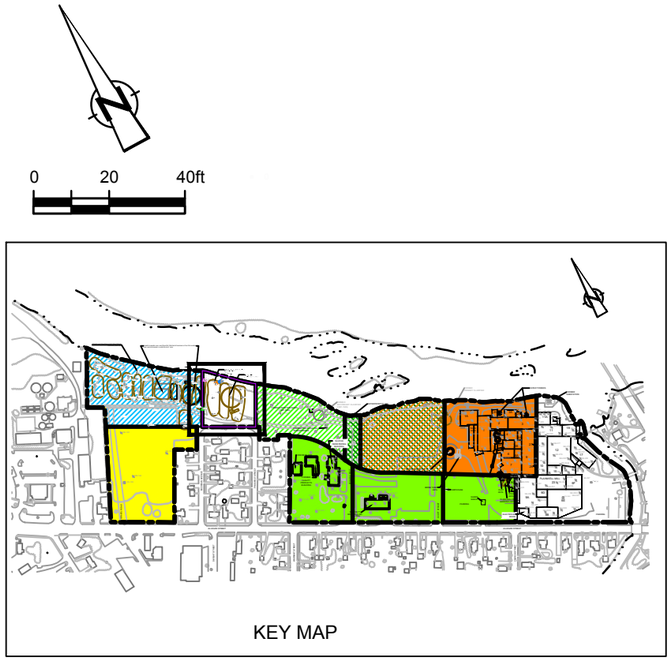
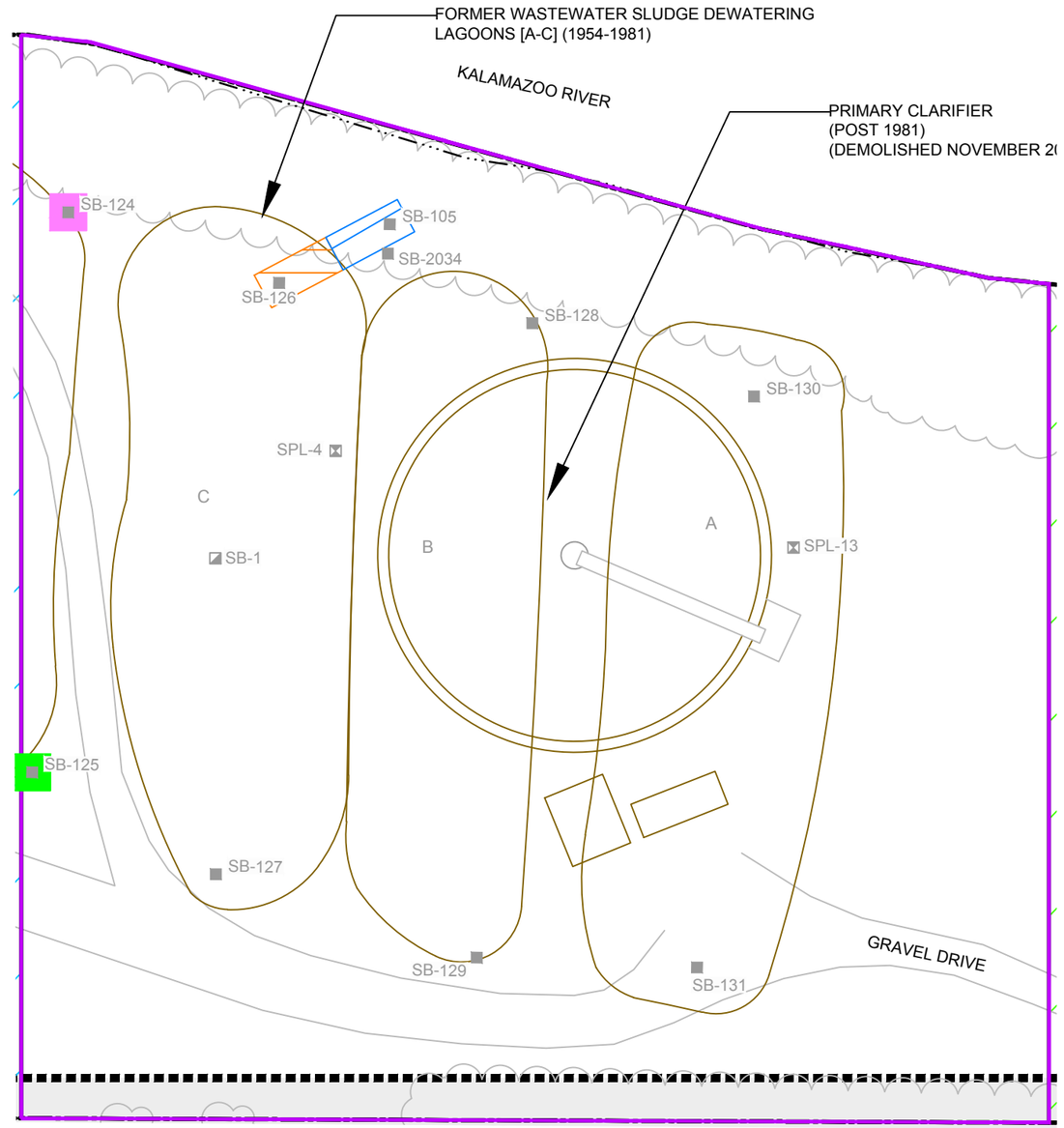


figure 3.21

CONCEPTUAL EXCAVATION AREAS
RESIDENTIAL AREA 1 : ALTERNATIVES 2C AND 3C TO MEET
10-5 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA027 DEC 19/2013





LEGEND

- PROPERTY BOUNDARY
- RESIDENTIAL AREA 2 BOUNDARY
- TREE LINE
- FORMER FEATURES
- SURFACE WATER
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- PREVIOUS SOIL SAMPLE LOCATION (FTC&H, 2006)
- PREVIOUS SOIL SAMPLE LOCATION (BBL, 1994)

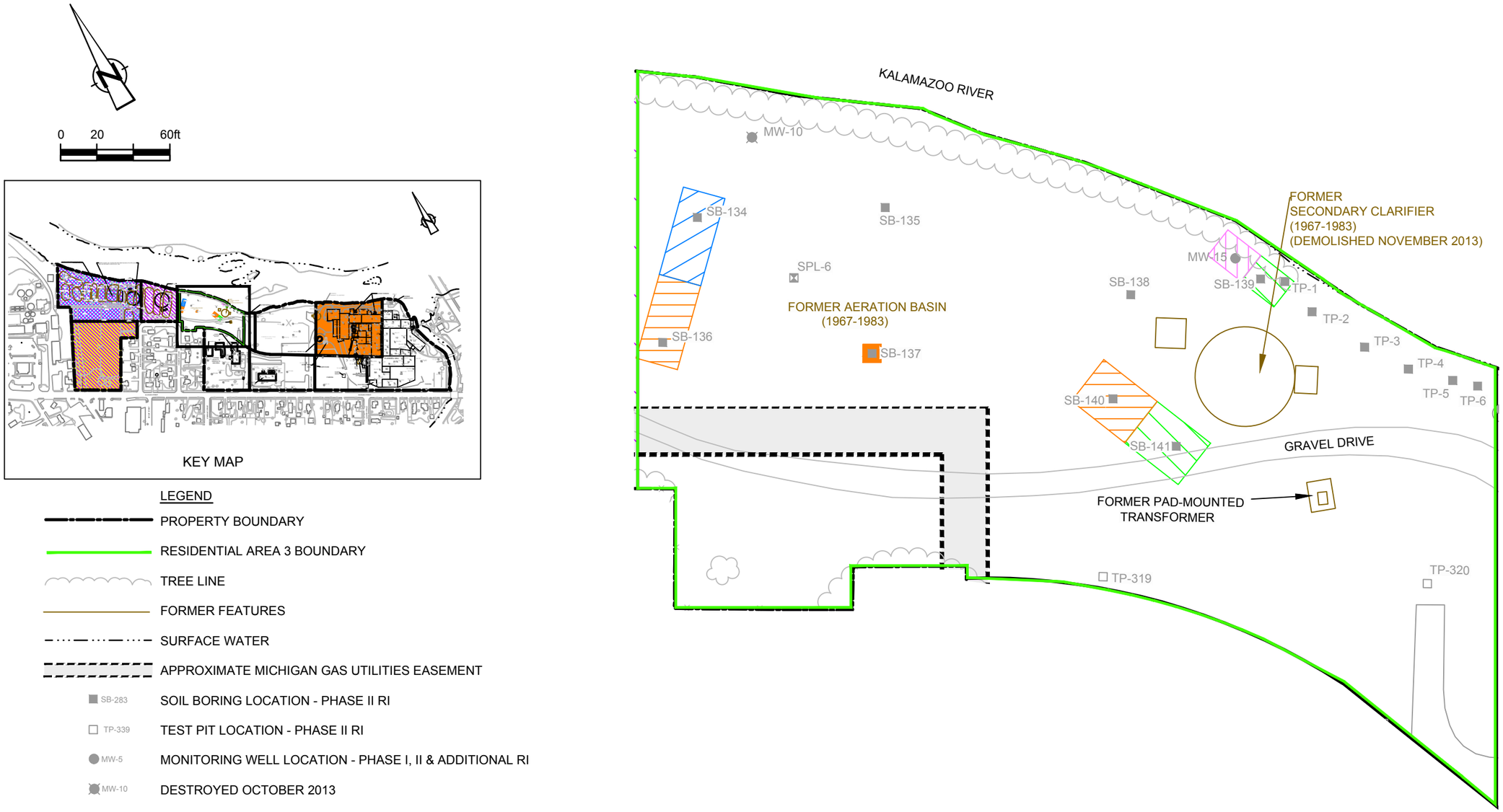
APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

figure 3.22

CONCEPTUAL EXCAVATION AREAS
RESIDENTIAL AREA 2 : ALTERNATIVES 2C AND 3C TO MEET 10-5 RISK LEVEL FOR ARESENIC WITH ITERATIVE APPROACH
FEASIBLITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA023 DEC 19/2013



LEGEND

- PROPERTY BOUNDARY
- RESIDENTIAL AREA 3 BOUNDARY
- TREE LINE
- FORMER FEATURES
- SURFACE WATER
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- TP-339 TEST PIT LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- MW-10 DESTROYED OCTOBER 2013
- PREVIOUS SOIL SAMPLE LOCATION (BBL, 1994)
- PREVIOUS TEST PIT EXCAVATION LOCATION (RMT, 1994)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

figure 3.23

CONCEPTUAL EXCAVATION AREAS

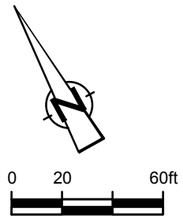
RESIDENTIAL AREA 3 : ALTERNATIVES 2C AND 3C TO MEET 10-5 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH

FEASIBILITY STUDY REPORT

FORMER PLAINWELL, INC. MILL PROPERTY

Plainwell, Michigan

056394-07(009)GN-WA019 DEC 19/2013



KEY MAP

LEGEND

- PROPERTY BOUNDARY
- RESIDENTIAL AREA 4 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER RAILROAD (REMOVED SPRING 2012)
- FORMER FEATURES
- SURFACE WATER
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-339 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS SOIL SAMPLE LOCATION (FTC&H, 2006)
- PREVIOUS TEMPORARY WELL LOCATION (FTC&H, 2006)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

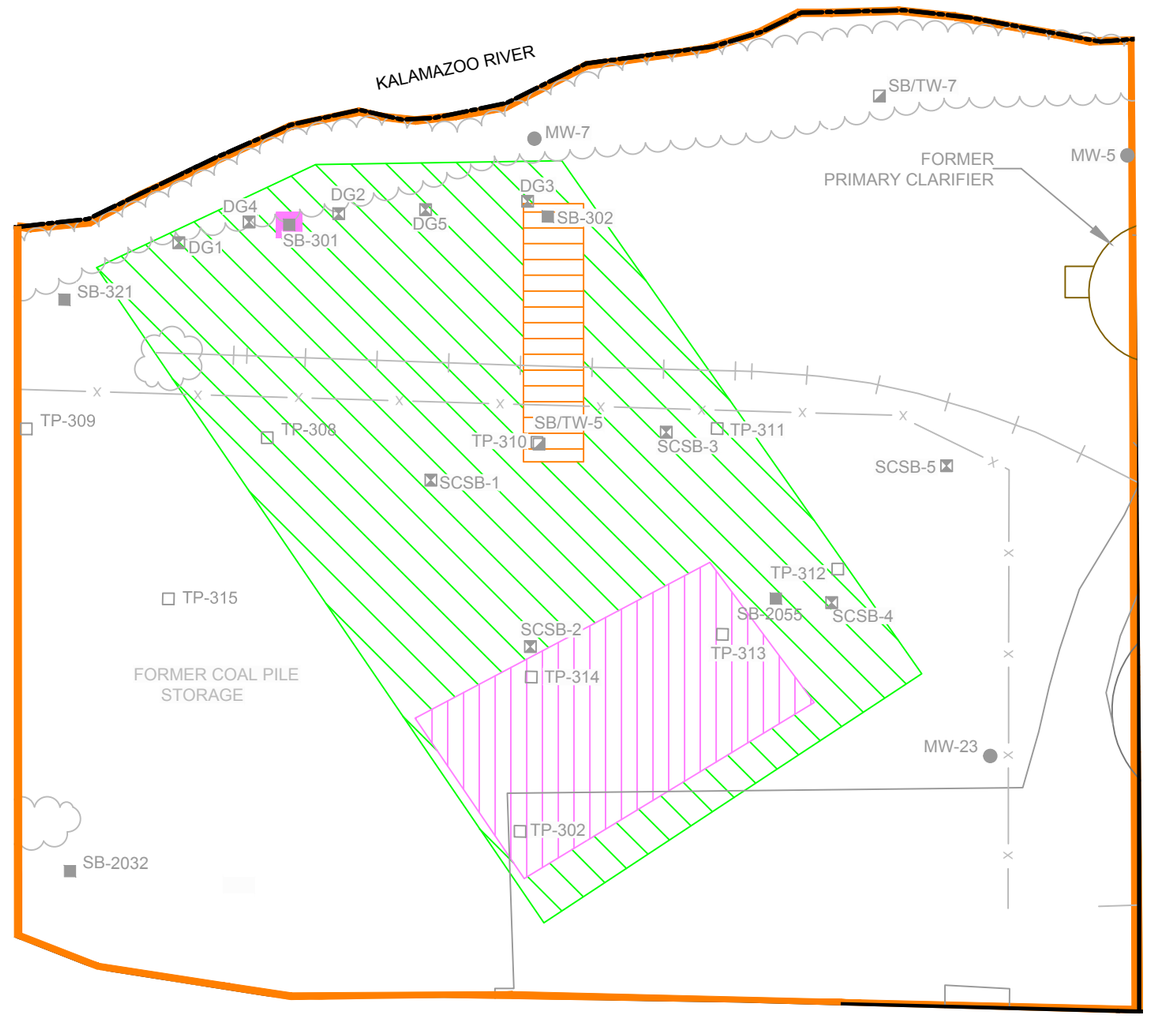


figure 3.24

CONCEPTUAL EXCAVATION AREAS

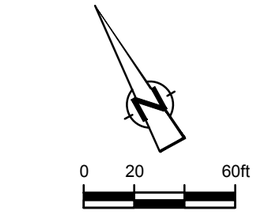
RESIDENTIAL AREA 4: ALTERNATIVES 2C AND 3C TO MEET 10-5 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH

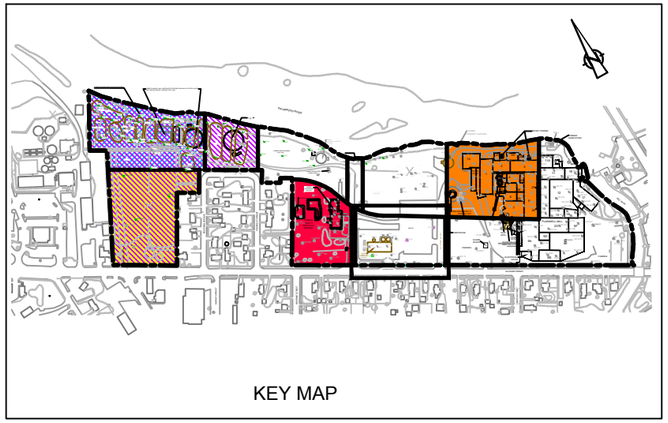
FEASIBILITY STUDY REPORT

FORMER PLAINWELL, INC. MILL PROPERTY

Plainwell, Michigan

056394-07(009)GN-WA003 DEC 20/2013





LEGEND

- PROPERTY BOUNDARY
- MIXED RESIDENTIAL/COMMERCIAL AREA 1 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-339 TEST PIT LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

NOTE: SPECIALTY MINERALS BUILDING AND ASSOCIATED STRUCTURES DEMOLISHED ON BEHALF OF THE CITY OF PLAINWELL DECEMBER 2011

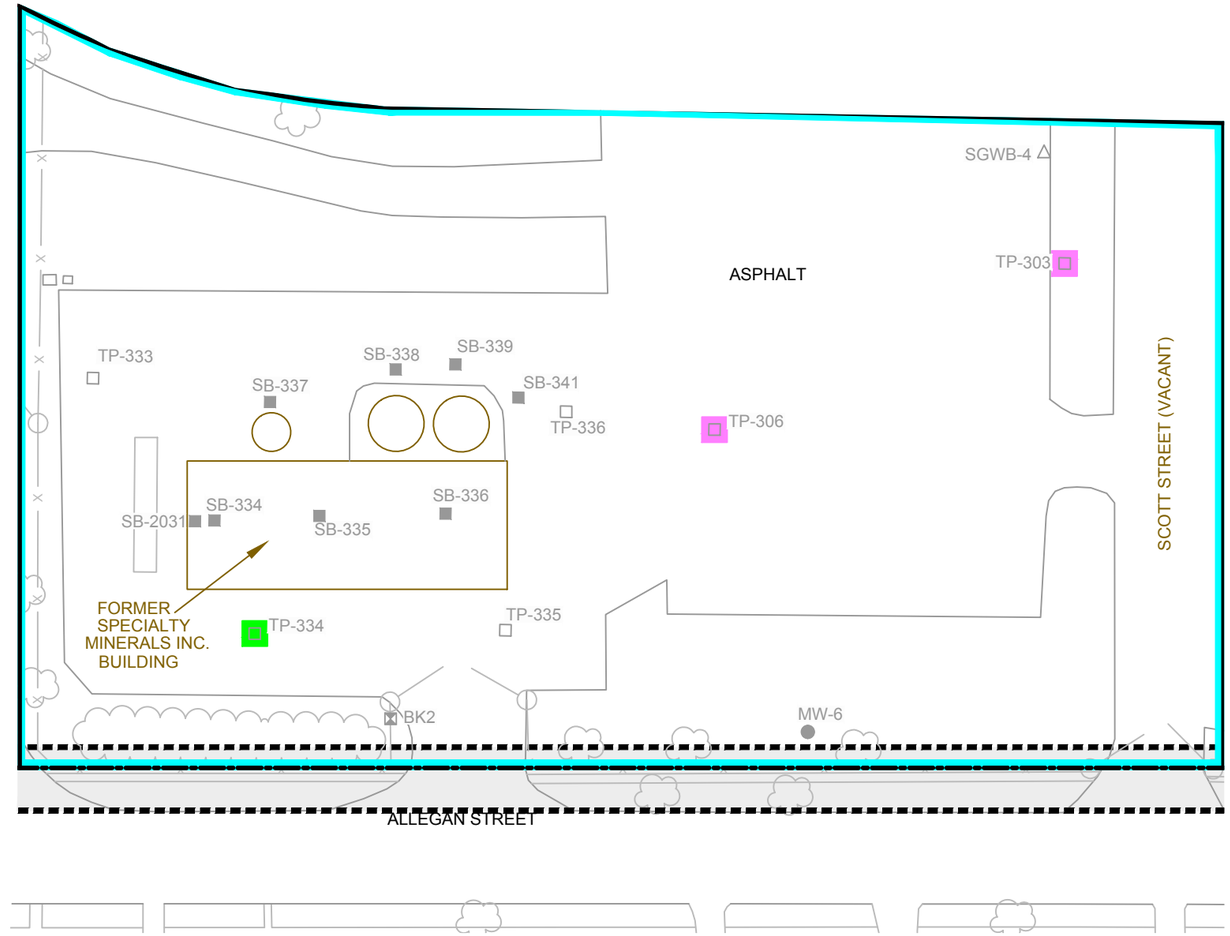


figure 3.25

CONCEPTUAL EXCAVATION AREAS
MIXED RESIDENTIAL/COMMERCIAL AREA 1 : ALTERNATIVES 2C AND 3C
TO MEET 10-5 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

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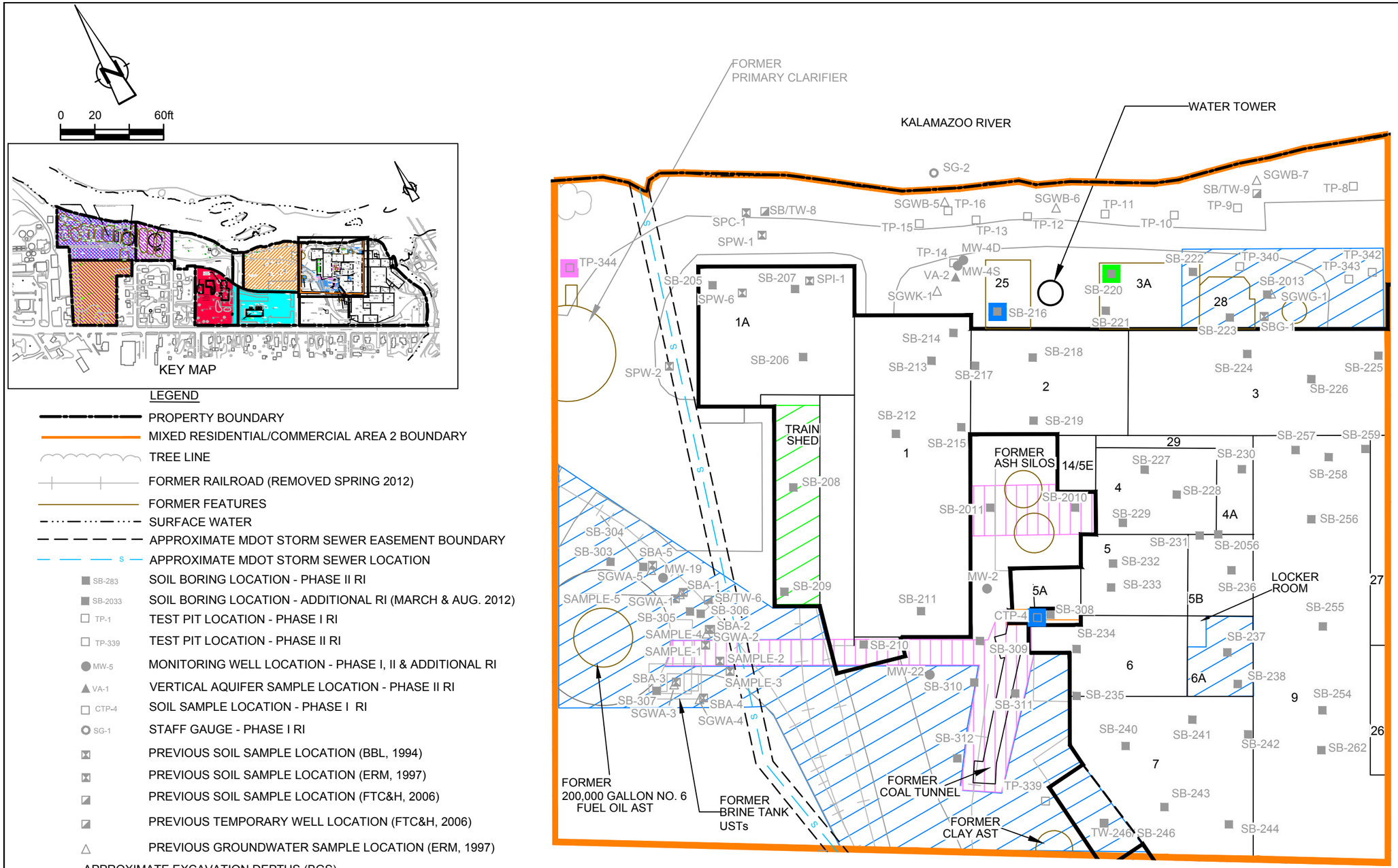


LEGEND

- PROPERTY BOUNDARY
- MIXED RESIDENTIAL/COMMERCIAL AREA 2 BOUNDARY
- TREE LINE
- FORMER RAILROAD (REMOVED SPRING 2012)
- FORMER FEATURES
- SURFACE WATER
- APPROXIMATE MDOT STORM SEWER EASEMENT BOUNDARY
- APPROXIMATE MDOT STORM SEWER LOCATION
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-1 TEST PIT LOCATION - PHASE I RI
- TP-339 TEST PIT LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- VA-1 VERTICAL AQUIFER SAMPLE LOCATION - PHASE II RI
- CTP-4 SOIL SAMPLE LOCATION - PHASE I RI
- SG-1 STAFF GAUGE - PHASE I RI
- PREVIOUS SOIL SAMPLE LOCATION (BBL, 1994)
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS SOIL SAMPLE LOCATION (FTC&H, 2006)
- PREVIOUS TEMPORARY WELL LOCATION (FTC&H, 2006)
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)

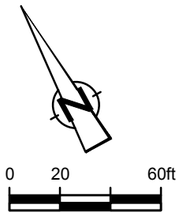
APPROXIMATE EXCAVATION DEPTHS (BGS)

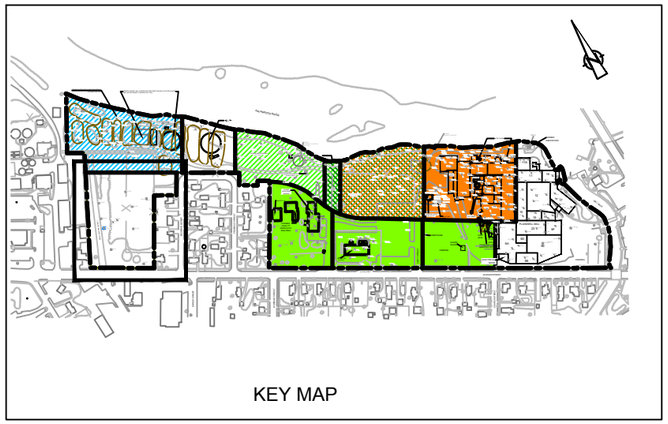
- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

figure 3.26

CONCEPTUAL EXCAVATION AREAS
MIXED RESIDENTIAL/COMMERCIAL AREA 2: ALTERNATIVES 2C AND 3C TO MEET
10-5 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-DE053 DEC 20/2013





LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 1 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- APPROXIMATE MDOT STORM SEWER EASEMENT BOUNDARY
- APPROXIMATE MDOT STORM SEWER LINE
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- SS-101 SURFACE SOIL SAMPLE LOCATION - PHASE II RI

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

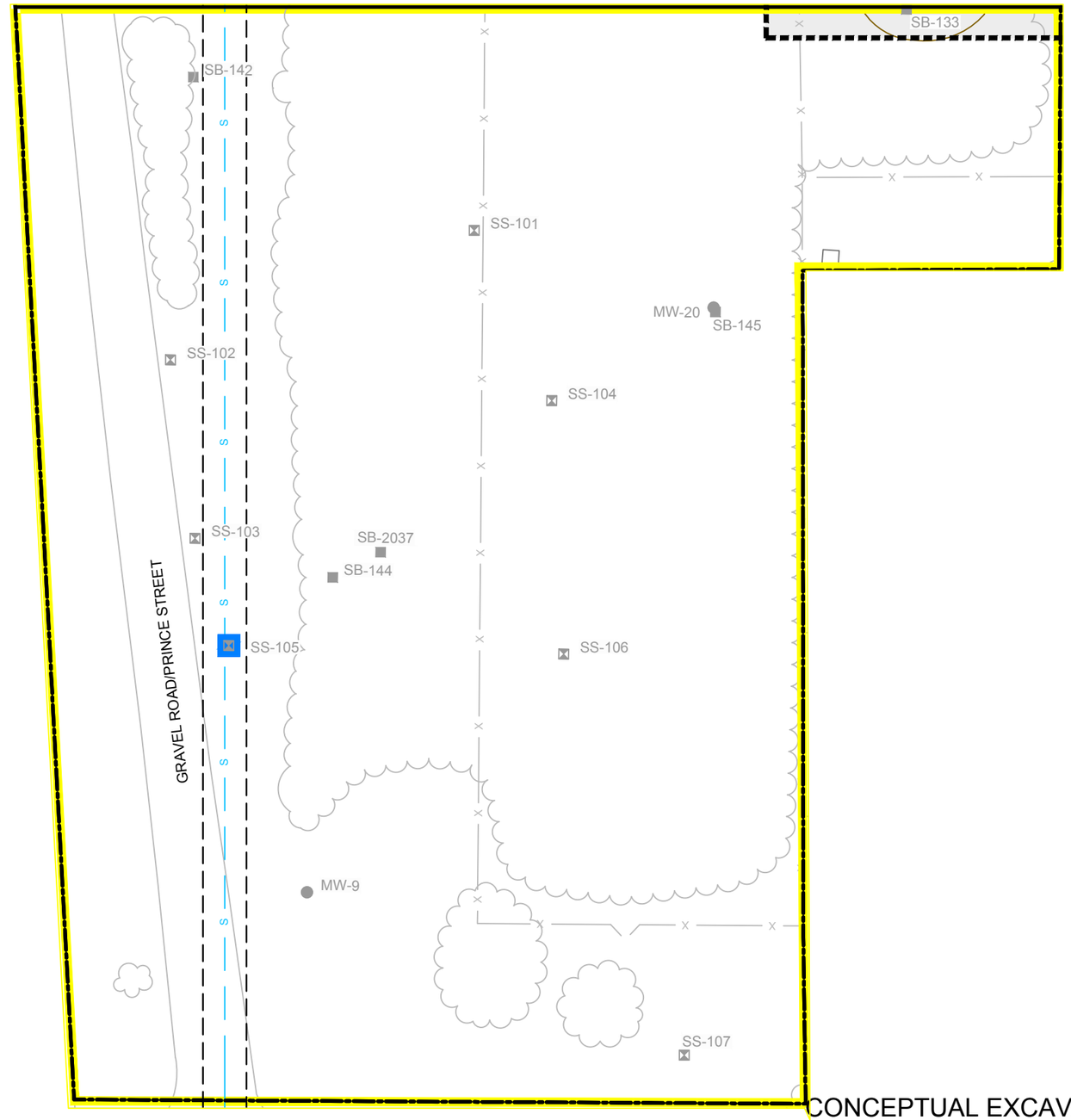


figure 3.27

CONCEPTUAL EXCAVATION AREAS

COMMERCIAL AREA 1 ALTERNATIVES 2C AND 3C : TO MEET 10-5 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH

FEASIBILITY STUDY REPORT

FORMER PLAINWELL, INC. MILL PROPERTY

Plainwell, Michigan

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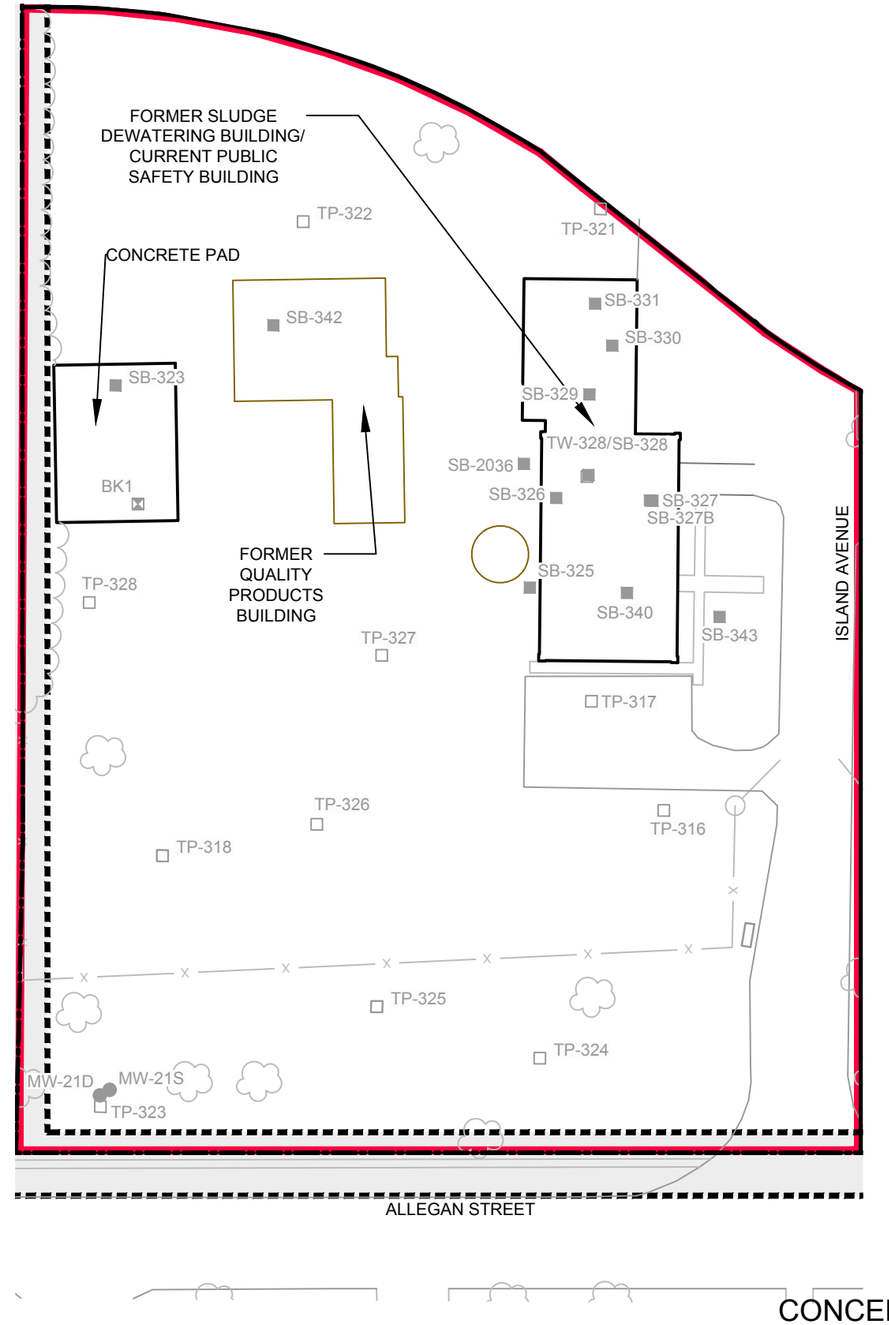
LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 2 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-339 TEST PIT LOCATION - PHASE II RI
- TW-246 TEMPORARY WELL LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet



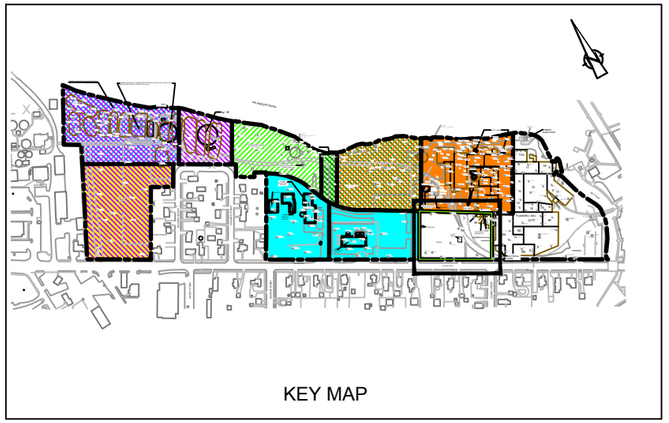
NOTE:
NO EXCAVATION REQUIRED.

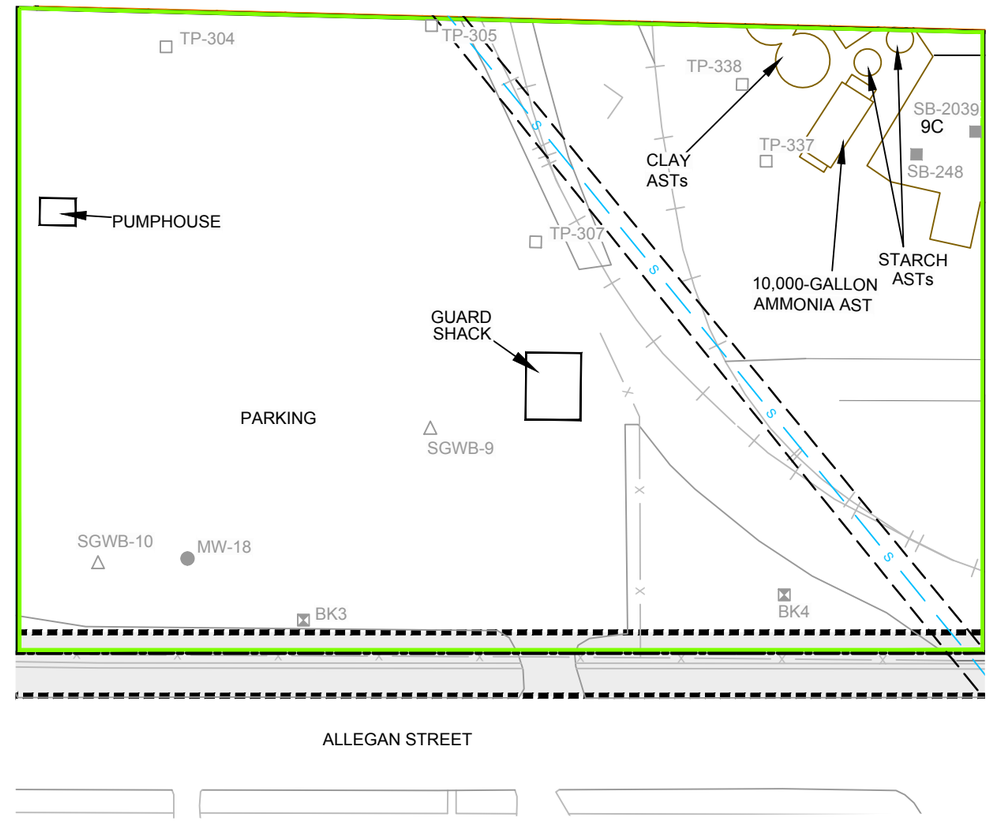
figure 3.28

CONCEPTUAL EXCAVATION AREAS
COMMERCIAL AREA 2 : ALTERNATIVES 2C AND 3C TO MEET 10-5 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA007 DEC 18/2013

0 20 60ft





LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 3 BOUNDARY
- FENCE LINE
- FORMER RAILROAD
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- APPROXIMATE MDOT STORM SEWER EASEMENT BOUNDARY
- APPROXIMATE MDOT STORM SEWER LINE
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)

APPROXIMATE EXCAVATION DEPTHS (BGS)

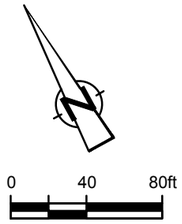
- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

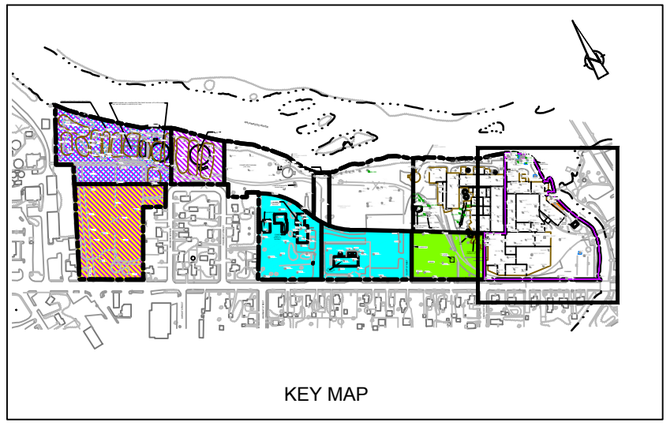
NOTES:
THE FOLLOWING STRUCTURES WERE DEMOLISHED ON BEHALF OF THE CITY OF PLAINWELL BETWEEN MARCH AND AUGUST 2012:
BUILDING 9C AND CLAY STARCH ASTs AND THE AMMONIA AST SECONDARY CONTAINMENT STRUCTURE.
NO EXCAVATION REQUIRED.

figure 3.29

CONCEPTUAL EXCAVATION AREAS
COMMERCIAL AREA 3 : ALTERNATIVES 2C AND 3C TO MEET 10-5 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA035 DEC 20/2013





LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 4 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER RAILROAD (REMOVED SPRING 2012)
- FORMER FEATURES
- SURFACE WATER
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SG-1 STAFF GAUGE LOCATION - PHASE I RI
- SB-283 SOIL BORING LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- TP-1 TEST PIT LOCATION - PHASE I RI
- TW-246 TEMPORARY WELL LOCATION - PHASE II RI
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)
- SOIL BORING LOCATION - FANNIE PELL BRIDGE FOOTING
- PREVIOUS SOIL SAMPLE LOCATION (CDM, 2001)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

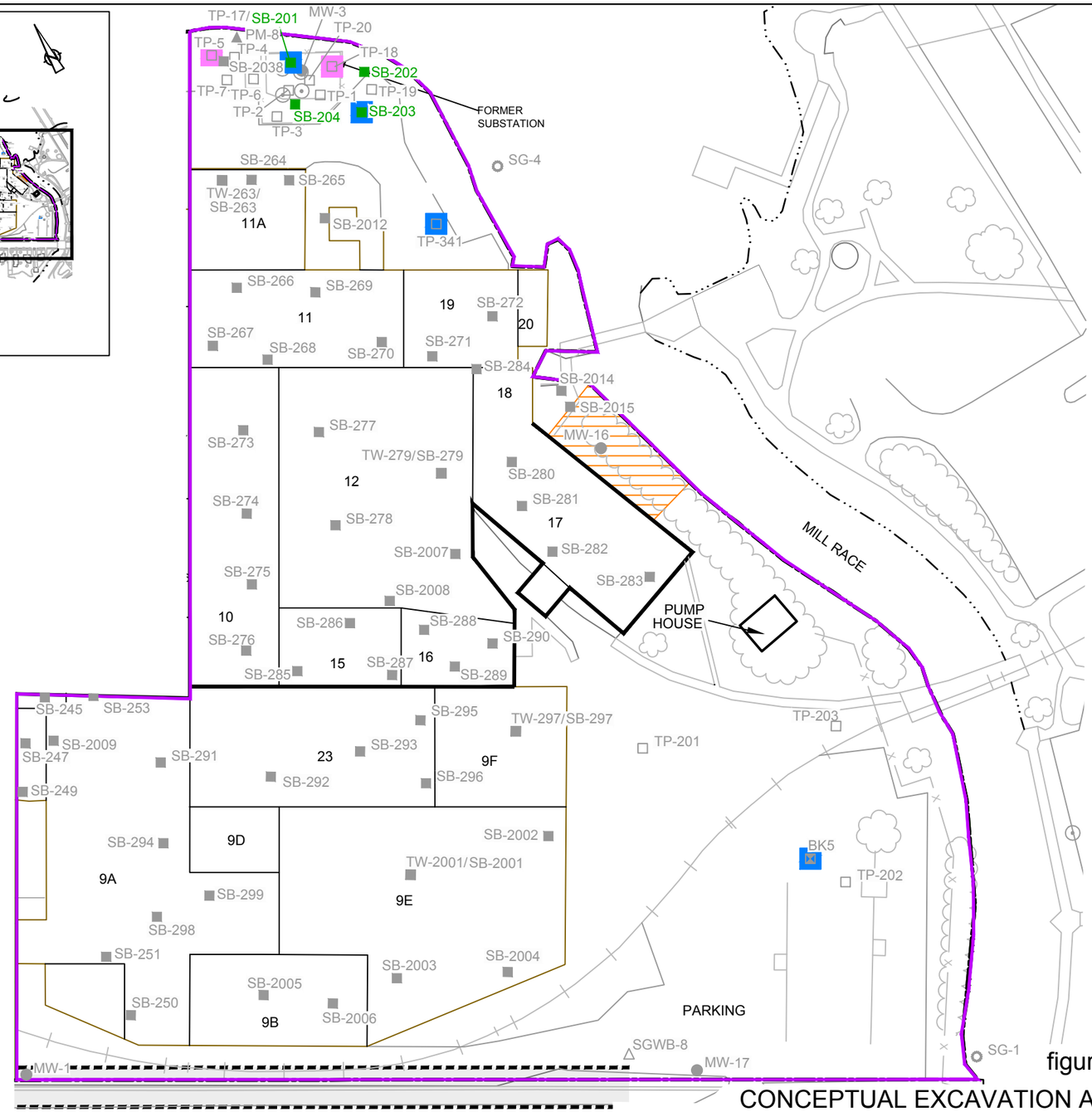


figure 3.30

CONCEPTUAL EXCAVATION AREAS

COMMERCIAL AREA 4 : ALTERNATIVES 2C AND 3C TO MEET 10-5 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH

FEASIBILITY STUDY REPORT

FORMER PLAINWELL, INC. MILL PROPERTY

Plainwell, Michigan

NOTES: THE FOLLOWING STRUCTURES WERE DEMOLISHED ON BEHALF OF THE CITY OF PLAINWELL BETWEEN MARCH AND AUGUST 2012: BUILDINGS 9A, 9B, 9D, 9E, 9F, AND 23.
ASSUMES ALL SOIL UNDER BUILDING TO REMAIN.

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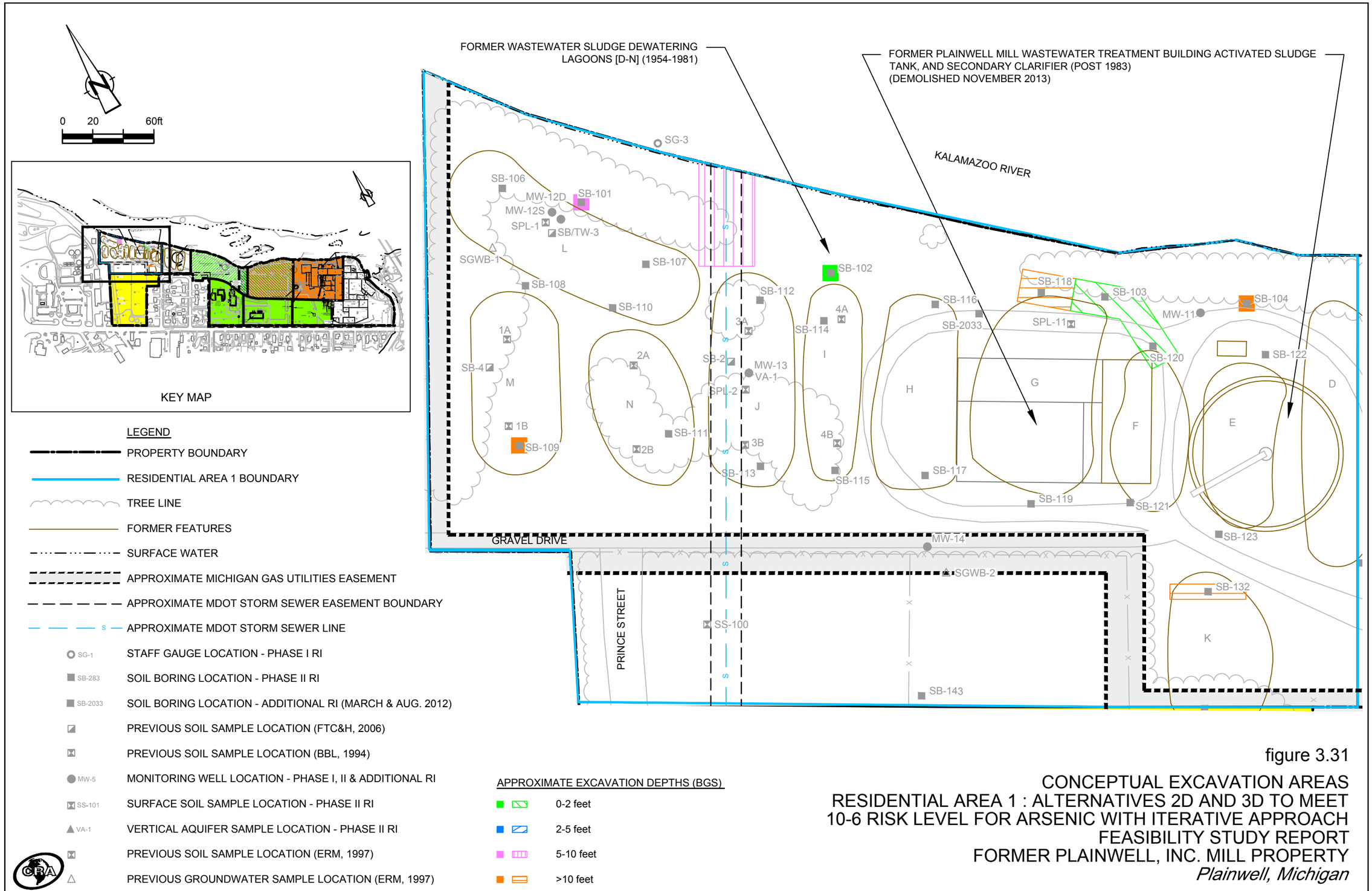
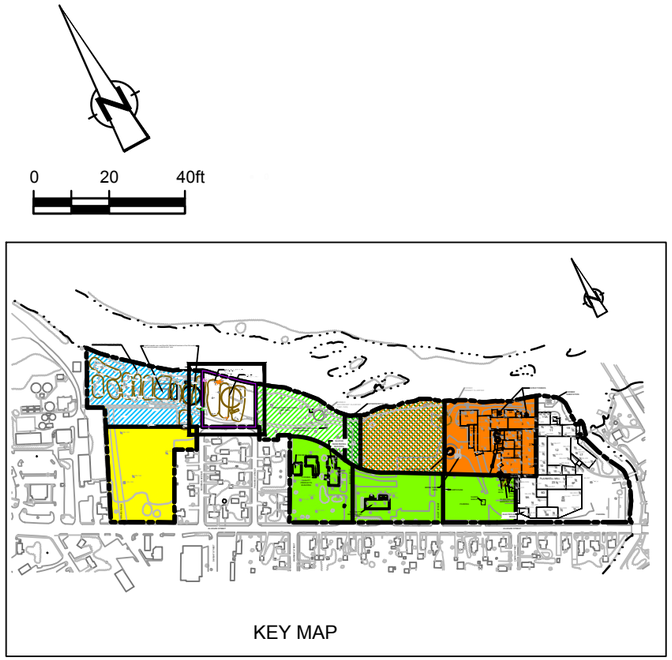
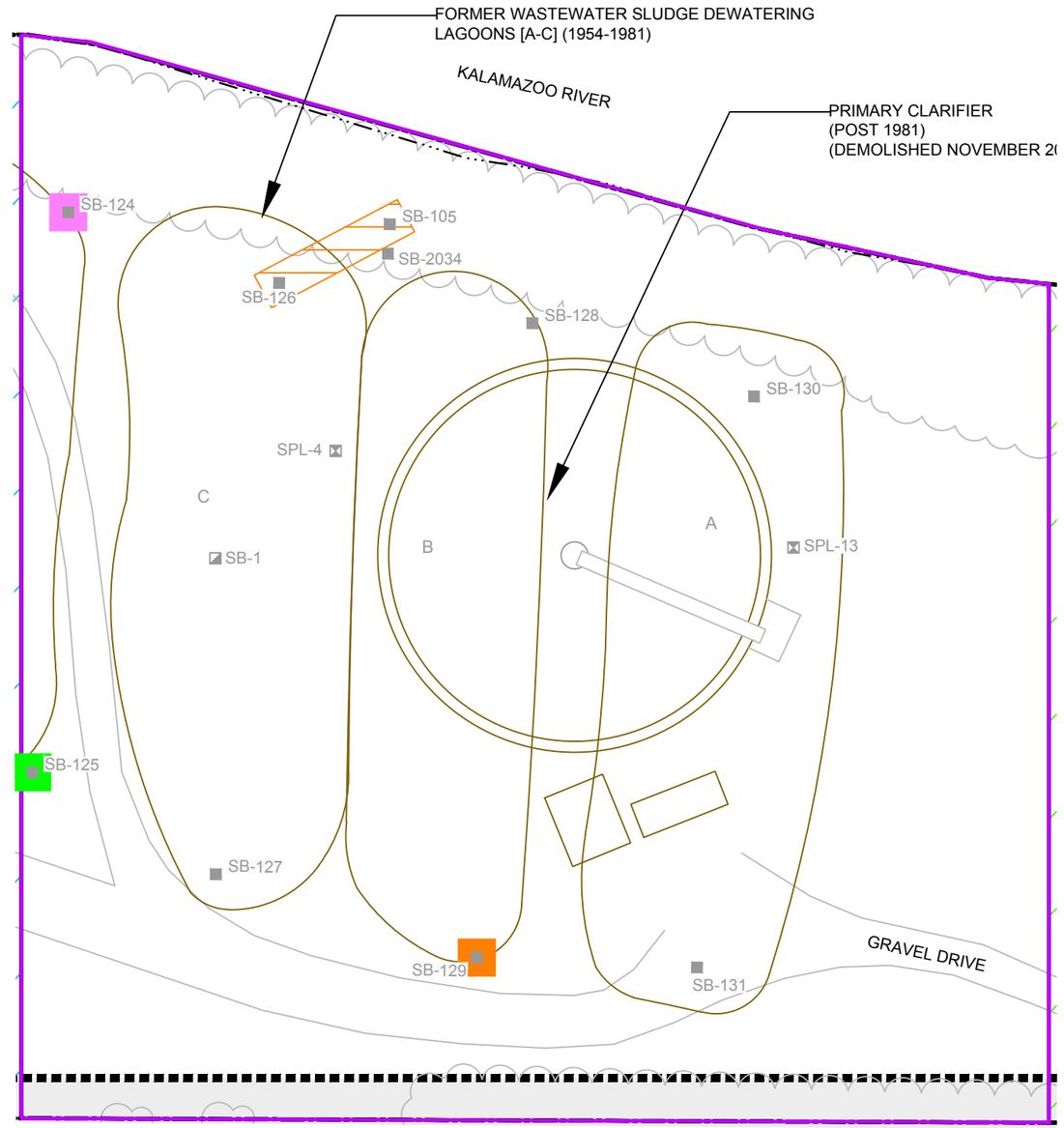


figure 3.31

CONCEPTUAL EXCAVATION AREAS
RESIDENTIAL AREA 1 : ALTERNATIVES 2D AND 3D TO MEET
10-6 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA028 DEC 20/2013





LEGEND

- PROPERTY BOUNDARY
- RESIDENTIAL AREA 2 BOUNDARY
- TREE LINE
- FORMER FEATURES
- SURFACE WATER
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- PREVIOUS SOIL SAMPLE LOCATION (FTC&H, 2006)
- PREVIOUS SOIL SAMPLE LOCATION (BBL, 1994)

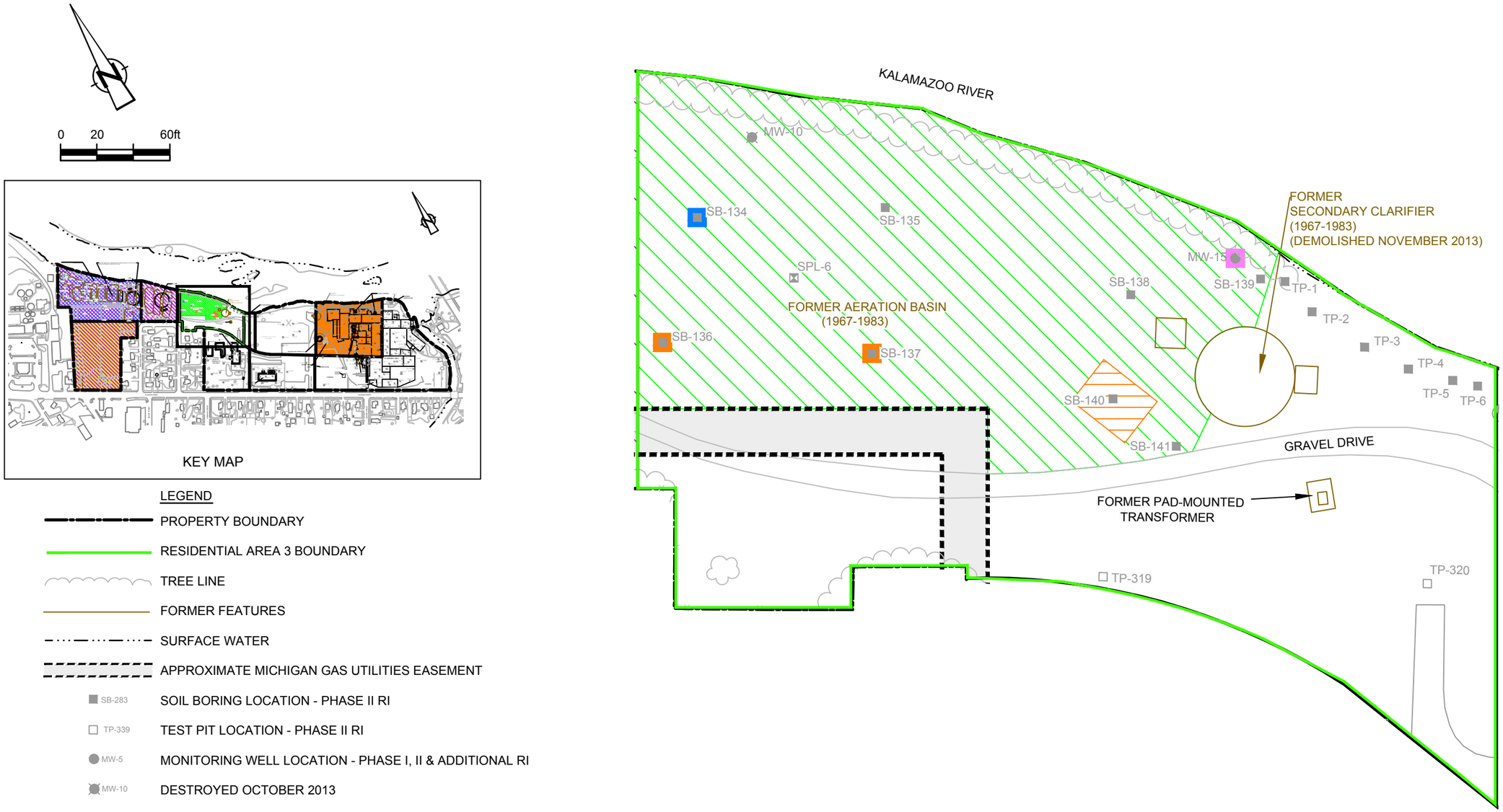
APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

figure 3.32

CONCEPTUAL EXCAVATION AREAS
RESIDENTIAL AREA 2 : ALTERNATIVES 2D AND 3D TO MEET 10-6 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH
FEASIBLITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA024 DEC 20/2013



LEGEND

- PROPERTY BOUNDARY
- RESIDENTIAL AREA 3 BOUNDARY
- TREE LINE
- FORMER FEATURES
- SURFACE WATER
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- TP-339 TEST PIT LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- MW-10 DESTROYED OCTOBER 2013
- PREVIOUS SOIL SAMPLE LOCATION (BBL, 1994)
- PREVIOUS TEST PIT EXCAVATION LOCATION (RMT, 1994)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

figure 3.33

CONCEPTUAL EXCAVATION AREAS

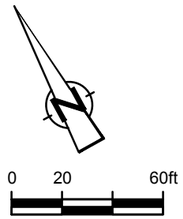
RESIDENTIAL AREA 3 : ALTERNATIVES 2D AND 3D TO MEET 10-6 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH

FEASIBILITY STUDY REPORT

FORMER PLAINWELL, INC. MILL PROPERTY

Plainwell, Michigan

056394-07(009)GN-WA020 DEC 20/2013



KEY MAP

LEGEND

- PROPERTY BOUNDARY
- RESIDENTIAL AREA 4 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER RAILROAD (REMOVED SPRING 2012)
- FORMER FEATURES
- SURFACE WATER
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-339 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS SOIL SAMPLE LOCATION (FTC&H, 2006)
- PREVIOUS TEMPORARY WELL LOCATION (FTC&H, 2006)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

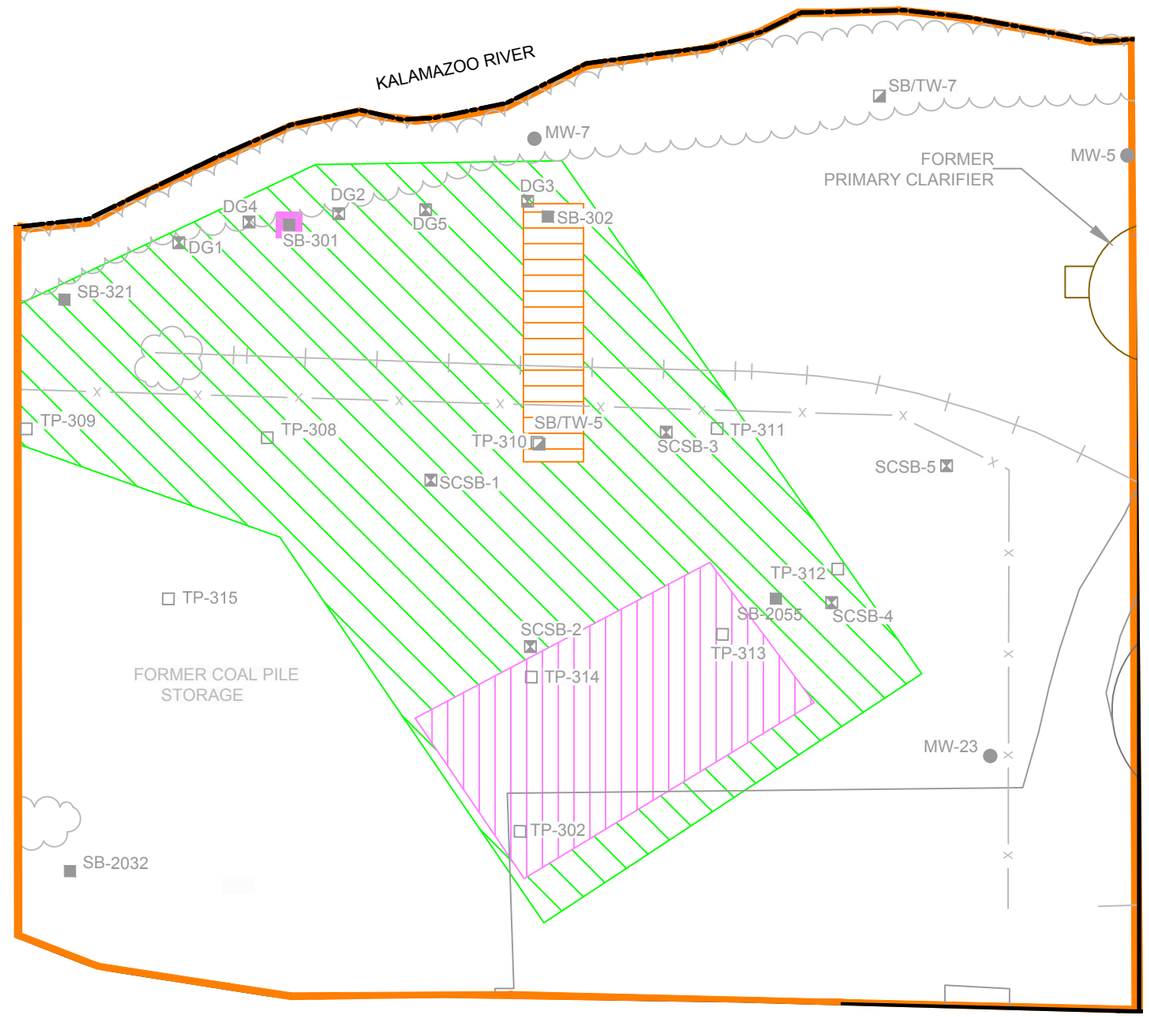


figure 3.34

CONCEPTUAL EXCAVATION AREAS

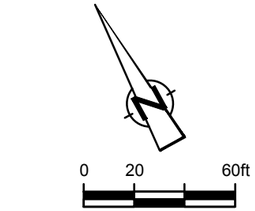
RESIDENTIAL AREA 4 : ALTERNATIVES 2D AND 3D TO MEET 10-6 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH

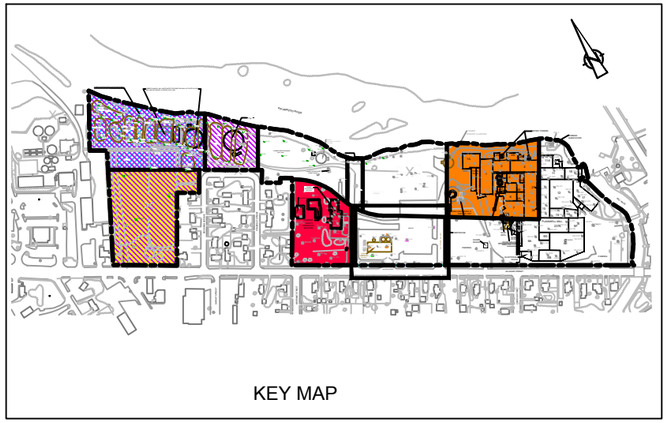
FEASIBILITY STUDY REPORT

FORMER PLAINWELL, INC. MILL PROPERTY

Plainwell, Michigan

056394-07(009)GN-WA004 DEC 20/2013





LEGEND

- PROPERTY BOUNDARY
- MIXED RESIDENTIAL/COMMERCIAL AREA 1 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-339 TEST PIT LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

NOTE: SPECIALTY MINERALS BUILDING AND ASSOCIATED STRUCTURES DEMOLISHED ON BEHALF OF THE CITY OF PLAINWELL DECEMBER 2011

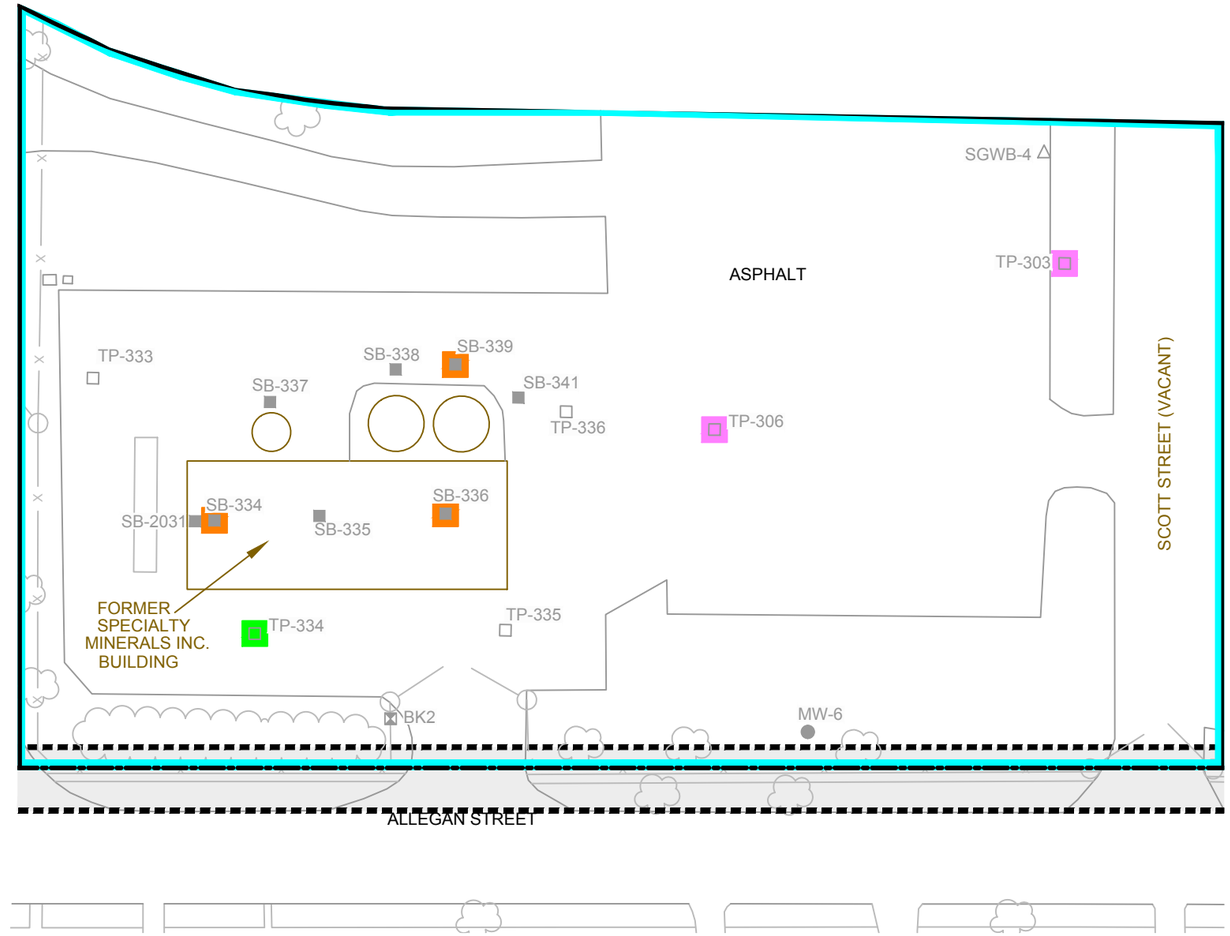
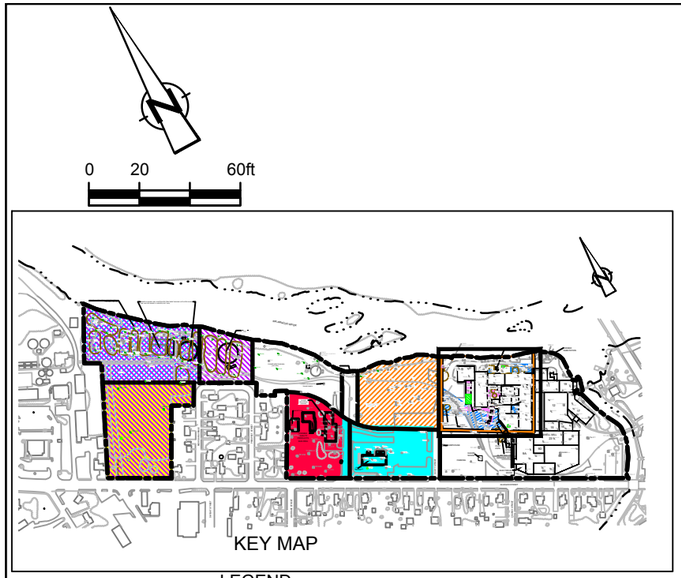


figure 3.35

CONCEPTUAL EXCAVATION AREAS
MIXED RESIDENTIAL/COMMERCIAL AREA 1 ; ALTERNATIVES 2D AND 3D
TO MEET 10-6 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-WA016 DEC 20/2013



LEGEND

- PROPERTY BOUNDARY
- MIXED RESIDENTIAL/COMMERCIAL AREA 2 BOUNDARY
- TREE LINE
- FORMER RAILROAD (REMOVED SPRING 2012)
- FORMER FEATURES
- SURFACE WATER
- APPROXIMATE MDOT STORM SEWER EASEMENT BOUNDARY
- APPROXIMATE MDOT STORM SEWER LOCATION
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-1 TEST PIT LOCATION - PHASE I RI
- TP-339 TEST PIT LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- VA-1 VERTICAL AQUIFER SAMPLE LOCATION - PHASE II RI
- CTP-4 SOIL SAMPLE LOCATION - PHASE I RI
- SG-1 STAFF GAUGE - PHASE I RI
- PREVIOUS SOIL SAMPLE LOCATION (BBL, 1994)
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS SOIL SAMPLE LOCATION (FTC&H, 2006)
- PREVIOUS TEMPORARY WELL LOCATION (FTC&H, 2006)
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

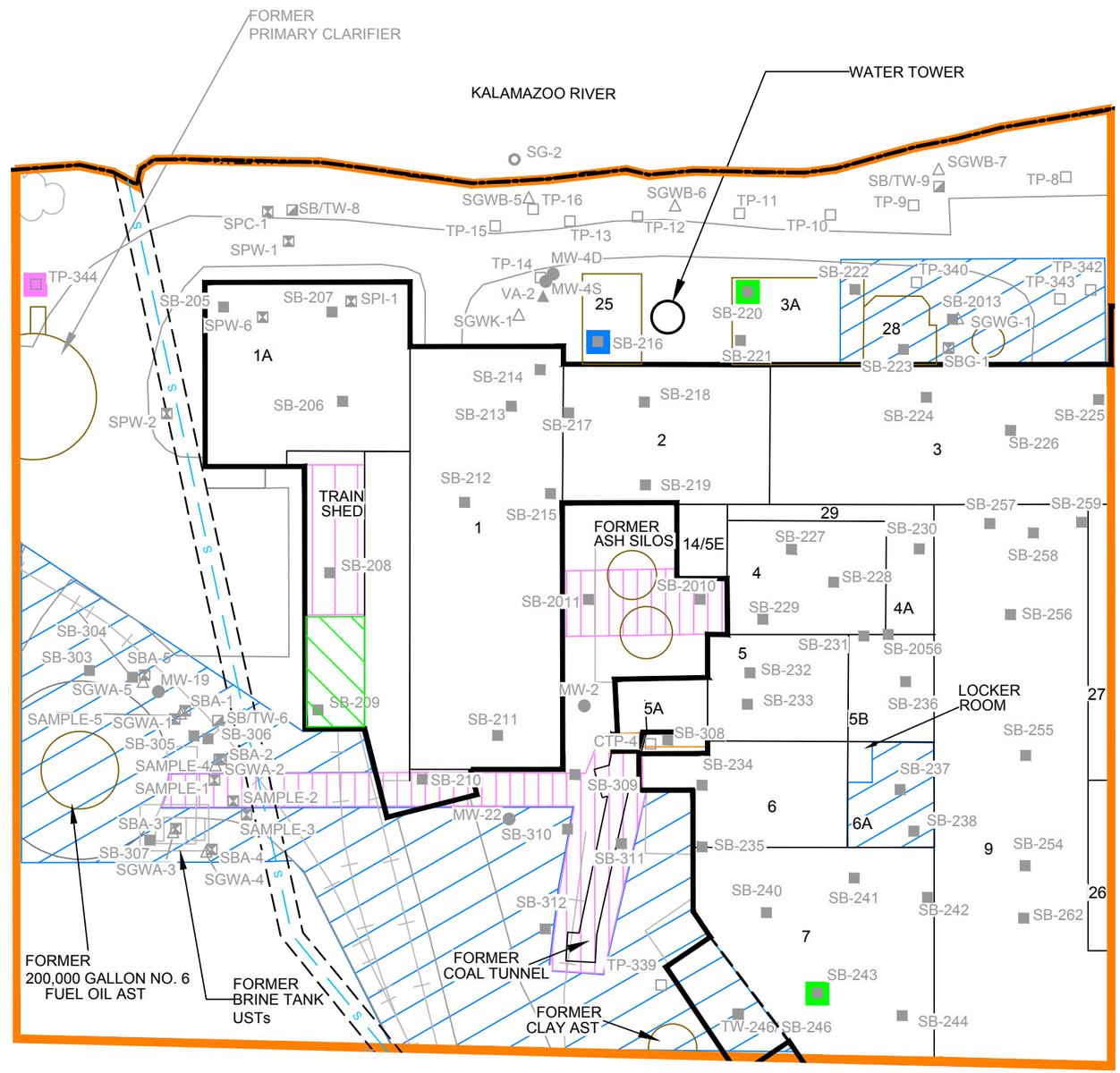
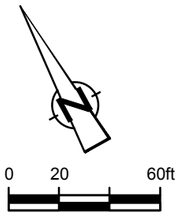
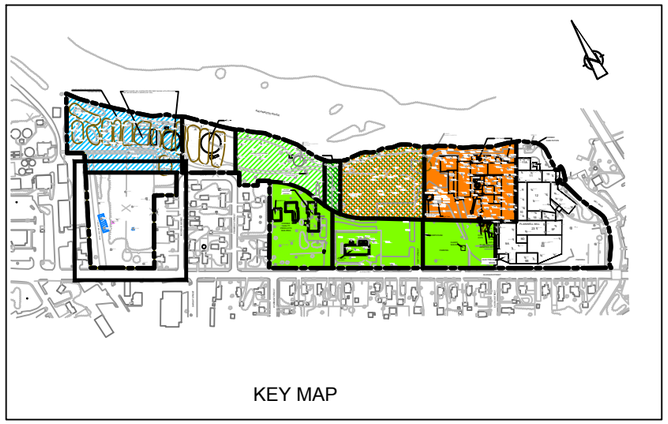


figure 3.36

CONCEPTUAL EXCAVATION AREAS
MIXED RESIDENTIAL/COMMERCIAL AREA 2: ALTERNATIVES 2D AND 3D TO MEET
10-6 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-DE054 DEC 20/2013





LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 1 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- APPROXIMATE MDOT STORM SEWER EASEMENT BOUNDARY
- APPROXIMATE MDOT STORM SEWER LINE
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- SS-101 SURFACE SOIL SAMPLE LOCATION - PHASE II RI

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

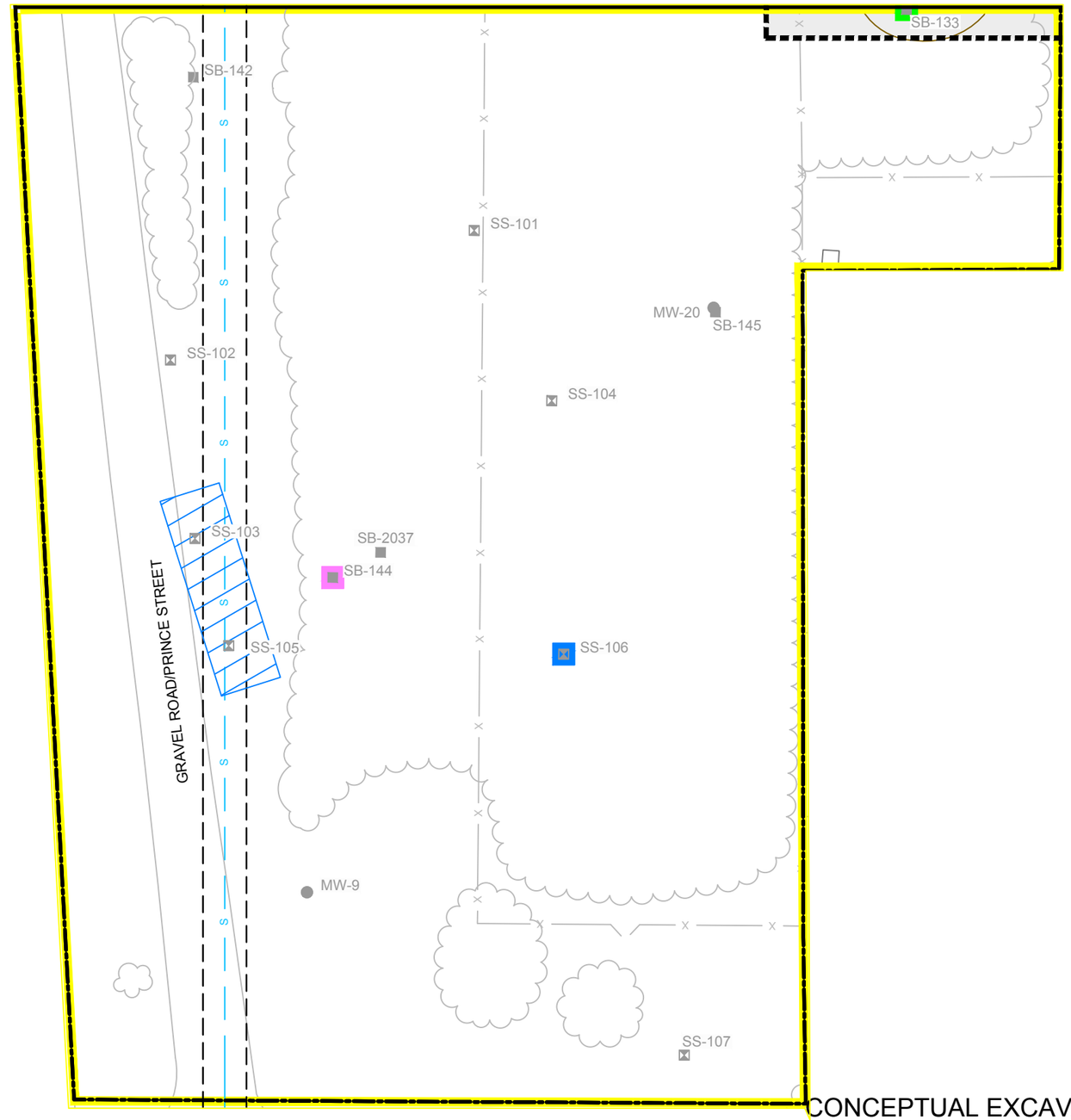


figure 3.37

CONCEPTUAL EXCAVATION AREAS

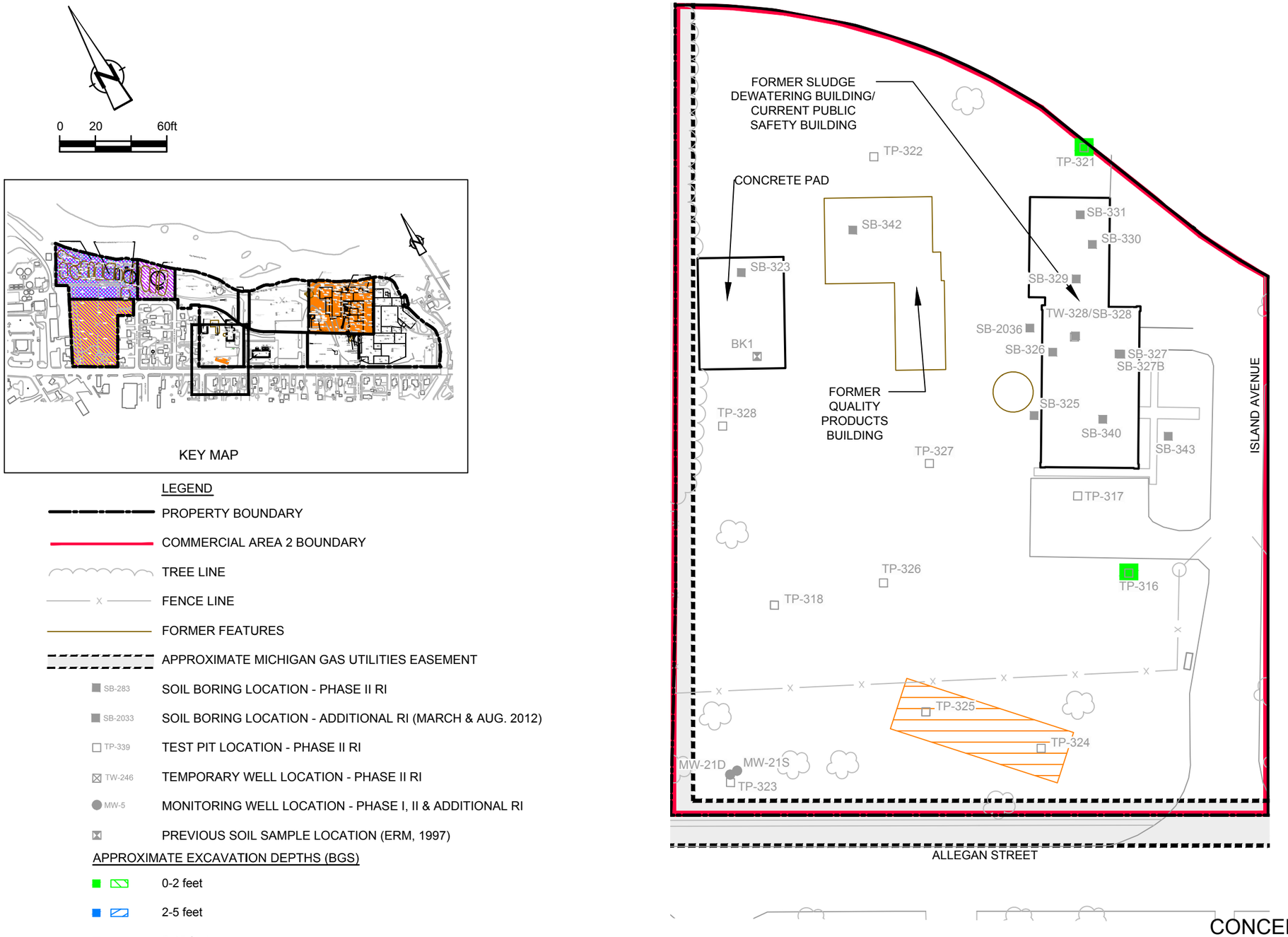
COMMERCIAL AREA 1 : ALTERNATIVES 2D AND 3D TO MEET 10-6 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH

FEASIBILITY STUDY REPORT

FORMER PLAINWELL, INC. MILL PROPERTY

Plainwell, Michigan

056394-07(009)GN-WA032 DEC 20/2013



LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 2 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-339 TEST PIT LOCATION - PHASE II RI
- TW-246 TEMPORARY WELL LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

figure 3.38

CONCEPTUAL EXCAVATION AREAS

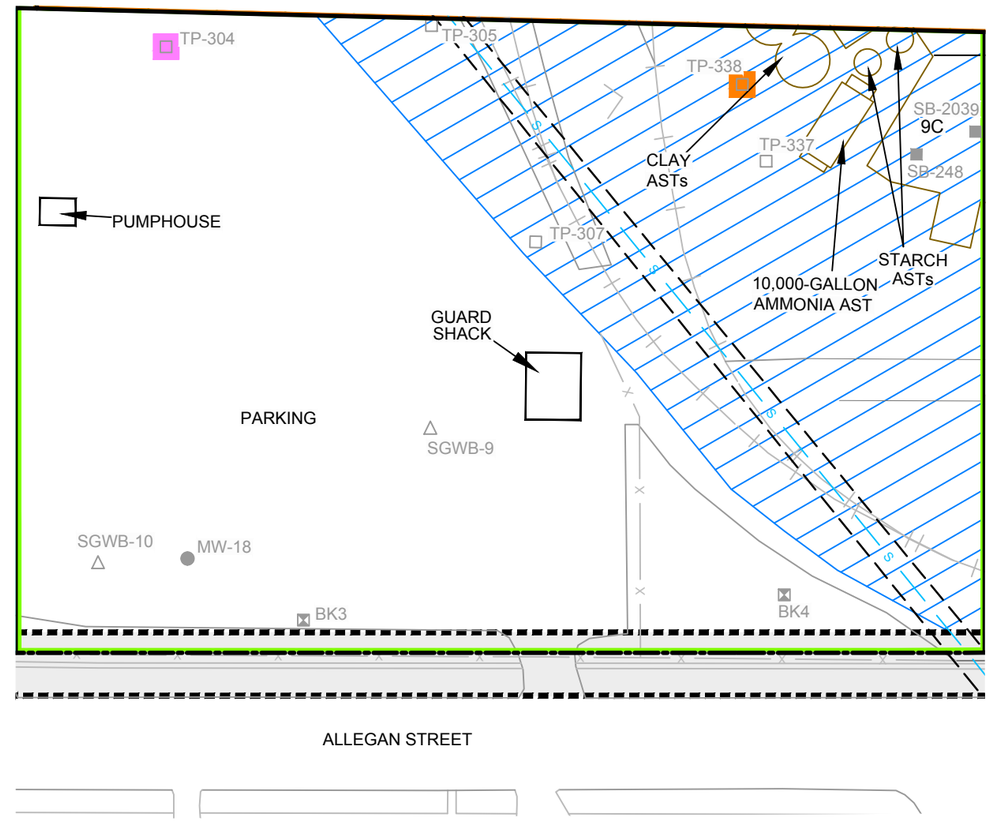
COMMERCIAL AREA 2 : ALTERNATIVES 2D AND 3D TO MEET 10-6 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH

FEASIBILITY STUDY REPORT

FORMER PLAINWELL, INC. MILL PROPERTY

Plainwell, Michigan

056394-07(009)GN-WA008 DEC 20/2013



LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 3 BOUNDARY
- FENCE LINE
- FORMER RAILROAD
- FORMER FEATURES
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- APPROXIMATE MDOT STORM SEWER EASEMENT BOUNDARY
- APPROXIMATE MDOT STORM SEWER LINE
- SB-283 SOIL BORING LOCATION - PHASE II RI
- SB-2033 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

NOTE: THE FOLLOWING STRUCTURES WERE DEMOLISHED ON BEHALF OF THE CITY OF PLAINWELL BETWEEN MARCH AND AUGUST 2012: BUILDING 9C AND CLAY STARCH ASTs AND THE AMMONIA AST SECONDARY CONTAINMENT STRUCTURE.

figure 3.39

CONCEPTUAL EXCAVATION AREAS

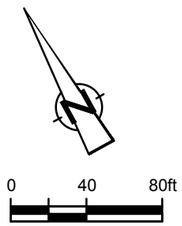
COMMERCIAL AREA 3 : ALTERNATIVES 2D AND 3D TO MEET 10-6 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH

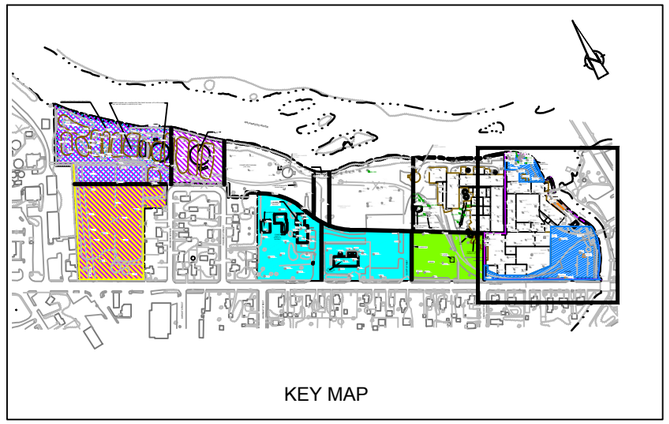
FEASIBILITY STUDY REPORT

FORMER PLAINWELL, INC. MILL PROPERTY

Plainwell, Michigan

056394-07(009)GN-WA036 DEC 20/2013





LEGEND

- PROPERTY BOUNDARY
- COMMERCIAL AREA 4 BOUNDARY
- TREE LINE
- FENCE LINE
- FORMER RAILROAD (REMOVED SPRING 2012)
- FORMER FEATURES
- SURFACE WATER
- APPROXIMATE MICHIGAN GAS UTILITIES EASEMENT
- SG-1 STAFF GAUGE LOCATION - PHASE I RI
- SB-283 SOIL BORING LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II & ADDITIONAL RI
- TP-1 TEST PIT LOCATION - PHASE I RI
- TW-246 TEMPORARY WELL LOCATION - PHASE II RI
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)
- SOIL BORING LOCATION - FANNIE PELL BRIDGE FOOTING
- PREVIOUS SOIL SAMPLE LOCATION (CDM, 2001)

APPROXIMATE EXCAVATION DEPTHS (BGS)

- 0-2 feet
- 2-5 feet
- 5-10 feet
- >10 feet

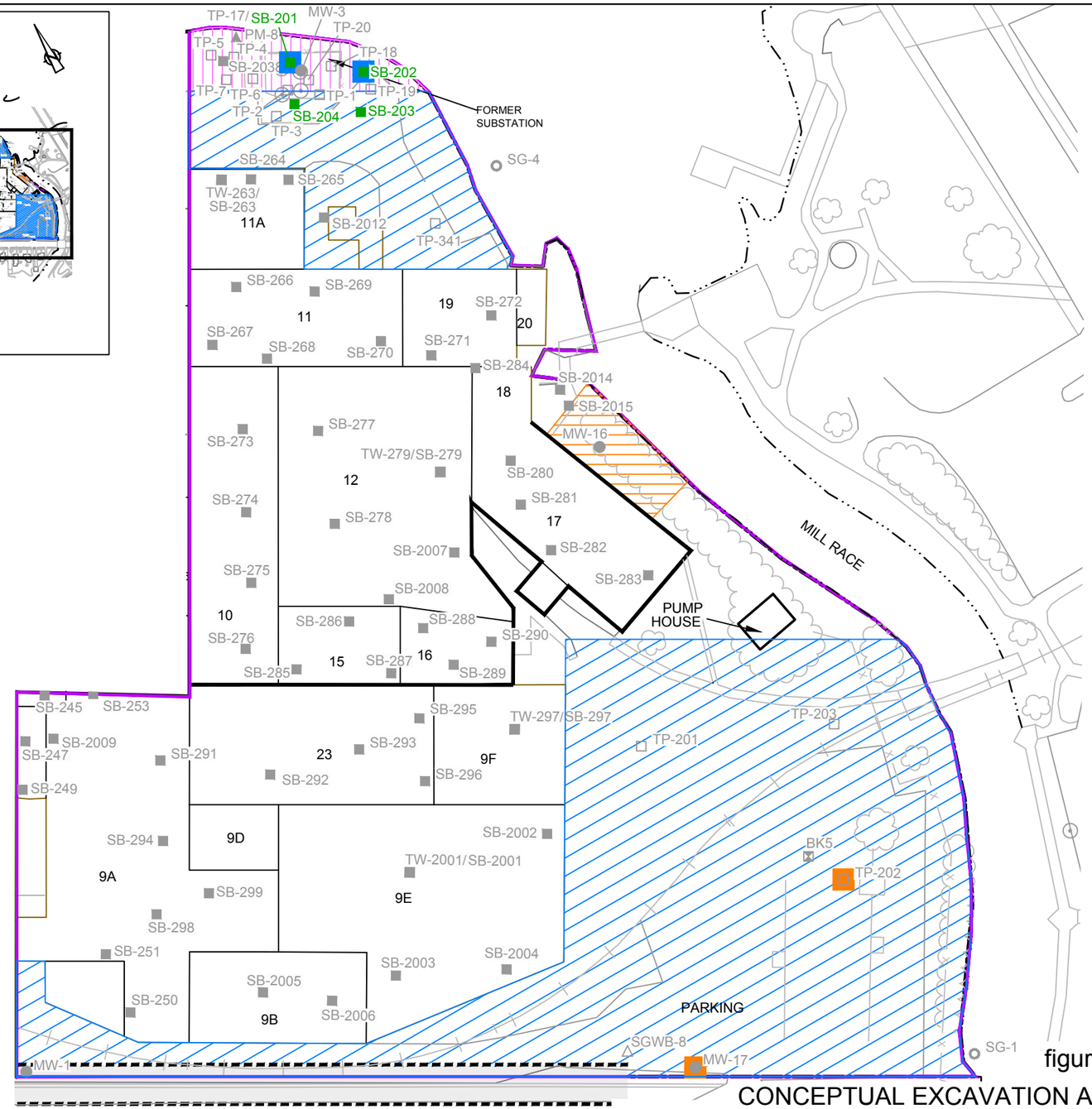


figure 3.40

CONCEPTUAL EXCAVATION AREAS

COMMERCIAL AREA 4 : ALTERNATIVES 2D AND 3D TO MEET 10-6 RISK LEVEL FOR ARSENIC WITH ITERATIVE APPROACH

FEASIBILITY STUDY REPORT

FORMER PLAINWELL, INC. MILL PROPERTY

Plainwell, Michigan

NOTES: THE FOLLOWING STRUCTURES WERE DEMOLISHED ON BEHALF OF THE CITY OF PLAINWELL BETWEEN MARCH AND AUGUST 2012: BUILDINGS 9A, 9B, 9D, 9E, 9F, AND 23.
ASSUMES ALL SOIL UNDER BUILDING TO REMAIN.

CRA

056394-07(009)GN-WA012 DEC 20/2013

ENVIRONMENTAL MEDIA	REMEDIAL ACTION OBJECTIVES (RAOs)	GENERAL RESPONSE ACTIONS (FOR REMEDIAL ACTION OBJECTIVES)	REMEDIAL TECHNOLOGY TYPES (FOR GENERAL RESPONSE ACTIONS)	PROCESS OPTIONS	AREA OF CONCERN	DESCRIPTION	SCREENING COMMENTS
SOIL	1. PREVENT HUMAN DIRECT CONTACT EXPOSURE TO SOIL IMPACTED WITH VOCs, SVOCs, PCBs, METALS (EXCEPT ARSENIC), AND OTHER INORGANICS IN EXCEEDANCE OF THE MICHIGAN ACT 451, PART 201 CLEANUP CRITERIA AND HUMAN DIRECT CONTACT/INGESTION/ INHALATION EXPOSURE TO SOIL IMPACTED WITH ARSENIC POSING EXCESS CARCINOGENIC RISK LEVELS OF 10^{-4} TO 10^{-6} OR A NON-CARCINOGENIC HAZARD LEVEL OF 1.0. 2. PREVENT THE POTENTIAL FOR LEACHING OF CONTAMINANTS FROM SOIL TO GROUNDWATER AND ULTIMATELY MIGRATING TO SURFACE WATER AT CONCENTRATIONS ABOVE THE MICHIGAN ACT 451, PART 201 CLEANUP CRITERIA FOR VOCs, SVOCs, PCBs, METALS, AND OTHER INORGANICS. 3. MITIGATE THE POTENTIAL FOR HUMAN INHALATION EXPOSURE TO INDOOR AIR VAPORS RESULTING FROM SOIL IMPACTED ABOVE MICHIGAN ACT 451, PART 201 CLEANUP CRITERIA FOR VOCs AND METALS. 4. PREVENT AVIAN AND MAMMALIAN RECEPTOR EXPOSURE TO SURFACE SOIL IN WOODED RIPARIAN AREAS ALONG THE KALAMAZOO RIVER WITH 95 PERCENT UPPER CONFIDENCE LIMIT (UCL) CONCENTRATIONS ABOVE SITE-SPECIFIC ECOLOGICAL PRELIMINARY REMEDIATION GOALS. 5. PROTECT SURFACE WATER AND SEDIMENTS BY MITIGATING THE POTENTIAL FOR EROSION OF SOIL TO THE KALAMAZOO RIVER AND MILL RACE.	A. NO ACTION	NOT APPLICABLE	NONE	SITE WIDE	NO ACTION	REQUIRED FOR CONSIDERATION BY NCP
		B. INSTITUTIONAL CONTROLS	ACCESS RESTRICTIONS	DEED RESTRICTIONS	SITE WIDE	IMPLEMENT LEGAL MECHANISMS TO ENFORCE LAND USE RESTRICTIONS TO REQUIRE LAND USE CONSISTENT WITH DEVELOPMENT PLAN	POTENTIALLY APPLICABLE
		C. CONTAINMENT	CAPPING	CLEAN FILL	SITE WIDE	PLACE APPROPRIATE COVER/CAPPING SYSTEM OVER AREAS OF SOIL IMPACT EXCEEDING RAOs	POTENTIALLY APPLICABLE, BUT NOT APPROPRIATE/EFFECTIVE BECAUSE ONLY LOCALIZED LOW LEVEL SOIL IMPACTS EXIST
			CONSOLIDATION/ CAPPING	CONSOLIDATE IMPACTED MATERIALS/CAP WITH CLEAN FILL	SITE WIDE	EXCAVATE AREAS OF SOIL IMPACT EXCEEDING RAOs AND CONSOLIDATE MATERIAL IN CENTRALIZED AREA OF SITE; CONSTRUCT APPROPRIATE COVER/CAPPING SYSTEM OVER CONSOLIDATION AREA, AND ALONG KALAMAZOO RIVER AND MILL RACE	POTENTIALLY APPLICABLE
		D. EXCAVATION	EXCAVATION	REMOVAL AND OFF-SITE DISPOSAL	SITE WIDE	EXCAVATE AREAS OF SOIL IMPACT EXCEEDING RAOs FOR TRANSPORTATION AND DISPOSAL OFF-SITE AT APPROPRIATELY PERMITTED FACULTIES	POTENTIALLY APPLICABLE
		E. TREATMENT	IN-SITU	CHEMICAL/BIOLOGICAL TREATMENT	SITE WIDE	TREAT AREAS OF SOIL IMPACT USING CHEMICAL OR BIOLOGICAL TREATMENT METHODS TO REDUCE CONTAMINANTS PRESENT TO LEVELS BELOW THE RAOs	NOT APPROPRIATE/EFFECTIVE BECAUSE ONLY LOCALIZED LOW LEVEL SOIL IMPACTS EXIST
			EX-SITU	PHYSICAL/CHEMICAL/ BIOLOGICAL TREATMENT	SITE WIDE	EXCAVATE AREAS OF SOIL IMPACT EXCEEDING RAOs FOR ON-SITE TREATMENT USING APPROPRIATE TREATMENT TECHNOLOGY TO REDUCE CONTAMINANTS PRESENT TO BELOW THE RAOs AND PLACE TREATED MATERIAL BACK IN EXCAVATION AREAS	NOT APPROPRIATE/EFFECTIVE BECAUSE ONLY LOCALIZED LOW LEVEL SOIL IMPACTS EXIST

LEGEND

RETAINED FOR USE IN REMEDIAL ALTERNATIVES

ELIMINATED FROM CONSIDERATION

NCP THE NATIONAL CONTINGENCY PLAN

figure 3.41

INITIAL SCREENING OF SOIL REMEDIAL TECHNOLOGIES
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

ENVIRONMENTAL MEDIA	REMEDIAL ACTION OBJECTIVES (RAOs)	GENERAL RESPONSE ACTIONS (FOR REMEDIAL ACTION OBJECTIVES)	REMEDIAL TECHNOLOGY TYPES (FOR GENERAL RESPONSE ACTIONS)	PROCESS OPTIONS	AREA OF CONCERN	DESCRIPTION	SCREENING COMMENTS
GROUNDWATER	6. PREVENT HUMAN EXPOSURE TO GROUNDWATER WITH CONCENTRATIONS EXCEEDING MICHIGAN ACT 451, PART 201 DRINKING WATER CRITERIA. 7. PROTECT SURFACE WATER BY MITIGATING THE POTENTIAL FOR GROUNDWATER TO MIGRATE TO SURFACE WATER ABOVE MICHIGAN ACT 451, PART 201 REQUIREMENTS PROTECTIVE OF THE GROUNDWATER-SURFACE WATER INTERFACE. 8. RESTORE GROUNDWATER IMPACTED WITH METALS ABOVE THE MICHIGAN ACT 451, PART 201 GENERIC RESIDENTIAL CLEANUP CRITERIA TO BENEFICIAL USE.	A. NO ACTION	NOT APPLICABLE	NONE	SITE WIDE	NO ACTION	REQUIRED FOR CONSIDERATION BY NCP
		B. INSTITUTIONAL ACTIONS	ACCESS RESTRICTIONS	DEED RESTRICTIONS	SITE WIDE	IMPLEMENT LEGAL MECHANISMS TO ENFORCE LAND USE RESTRICTIONS TO PREVENT INSTALLATION OF NEW DRINKING WATER WELLS IN/NEAR IMPACTED GROUNDWATER AREAS	POTENTIALLY APPLICABLE
		C. MONITORING	NOT APPLICABLE	GROUNDWATER MONITORING	DOWNGRADIENT PROPERTY BOUNDARY	CONDUCT ROUTINE MONITORING OF GROUNDWATER WELLS AT MW-12 AREA/DOWN GRADIENT PROPERTY BOUNDARY	POTENTIALLY APPLICABLE
		D. MONITORED NATURAL ATTENUATION	NOT APPLICABLE	GROUNDWATER MONITORING / NATURAL DEGRADATION	DOWNGRADIENT PROPERTY BOUNDARY	CONDUCT ROUTINE MONITORING OF GROUNDWATER WELLS AT MW-12 AREA/DOWN GRADIENT PROPERTY BOUNDARY	POTENTIALLY APPLICABLE
		E. CONTAINMENT	PHYSICAL BARRIER	SLURRY WALL	DOWNGRADIENT PROPERTY BOUNDARY	CONSTRUCT TRENCHES THEN BACKFILL WITH SOIL BENTONITE SLURRY	NOT NEEDED TO MEET OBJECTIVES. NOT REQUIRED BECAUSE ONLY LOCALIZED LOW LEVEL GROUNDWATER IMPACTS EXIST AND MIGRATION IS LIMITED
				GROUT CURTAIN	DOWNGRADIENT PROPERTY BOUNDARY	INJECT GROUT UNDER PRESSURE IN A REGULAR PATTERN	NOT NEEDED TO MEET OBJECTIVES. NOT REQUIRED BECAUSE ONLY LOCALIZED LOW LEVEL GROUNDWATER IMPACTS EXIST AND MIGRATION IS LIMITED
				VERTICAL GEOMEMBRANE	DOWNGRADIENT PROPERTY BOUNDARY	INSTALL A PHYSICAL BARRIER TO RE-DIRECT GROUNDWATER FLOW	NOT NEEDED TO MEET OBJECTIVES. NOT REQUIRED BECAUSE ONLY LOCALIZED LOW LEVEL GROUNDWATER IMPACTS EXIST AND MIGRATION IS LIMITED
			HYDRAULIC BARRIER	FLOW DIVERSION DRAIN	DOWNGRADIENT PROPERTY BOUNDARY	CONSTRUCT A DRAIN IN CONJUNCTION WITH PHYSICAL BARRIER TO AVOID MOUNDING	NOT NEEDED TO MEET OBJECTIVES. NOT REQUIRED BECAUSE ONLY LOCALIZED LOW LEVEL GROUNDWATER IMPACTS EXIST AND MIGRATION IS LIMITED
				PHYTOREMEDIATION	DOWNGRADIENT PROPERTY BOUNDARY	CONSTRUCT A PHYTOREMEDIATION ZONE TO CREATE HYDRAULIC BARRIER	NOT NEEDED TO MEET OBJECTIVES. NOT REQUIRED BECAUSE ONLY LOCALIZED LOW LEVEL GROUNDWATER IMPACTS EXIST AND MIGRATION IS LIMITED
			REACTIVE BARRIER	PERMEABLE REACTION BARRIER	DOWNGRADIENT PROPERTY BOUNDARY	INSTALL A PRB TO BREAKDOWN CONTAMINANTS AS WATER PASSES THROUGH BARRIER	NOT NEEDED TO MEET OBJECTIVES. NOT REQUIRED BECAUSE ONLY LOCALIZED LOW LEVEL GROUNDWATER IMPACTS EXIST AND MIGRATION IS LIMITED
		F. COLLECTION/ TREATMENT	EXTRACTION/ TREATMENT	PUMP AND TREAT	DOWNGRADIENT PROPERTY BOUNDARY	INSTALL GROUNDWATER EXTRACTION AND TREATMENT SYSTEM TO REDUCE CONTAMINANT LEVELS	NOT NEEDED TO MEET OBJECTIVES. NOT REQUIRED BECAUSE ONLY LOCALIZED LOW LEVEL GROUNDWATER IMPACTS EXIST AND MIGRATION IS LIMITED
				ENHANCED PUMP AND TREAT	DOWNGRADIENT PROPERTY BOUNDARY	INSTALL GROUNDWATER EXTRACTION AND TREATMENT SYSTEM, AND SELECTIVELY INJECT MATERIALS TO ENHANCE REDUCTION OF CONTAMINANT LEVELS	NOT NEEDED TO MEET OBJECTIVES. NOT REQUIRED BECAUSE ONLY LOCALIZED LOW LEVEL GROUNDWATER IMPACTS EXIST AND MIGRATION IS LIMITED

LEGEND

RETAINED FOR USE IN REMEDIAL ALTERNATIVES

ELIMINATED FROM CONSIDERATION

NCP THE NATIONAL CONTINGENCY PLAN

PRB PERMEABLE REACTIVE BARRIER

figure 3.42

INITIAL SCREENING OF GROUNDWATER REMEDIAL TECHNOLOGIES
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-DE057 DEC 19/2013

GENERAL RESPONSE ACTIONS (FOR REMEDIAL ACTION OBJECTIVES)	REMEDIAL TECHNOLOGY TYPES (FOR GENERAL RESPONSE ACTIONS)	PROCESS OPTIONS	AREA OF CONCERN	EFFECTIVENESS	IMPLEMENTABILITY	COST
A. NO ACTION	NOT APPLICABLE	NONE	SITE WIDE	NOT EFFECTIVE, DOES NOT ACHIEVE RAOs	NOT ACCEPTABLE	NONE
B. INSTITUTIONAL CONTROLS	ACCESS RESTRICTIONS	DEED RESTRICTIONS	SITE WIDE	MAINTAINS LAND USE CONSISTENT WITH RAOs, BUT ONLY ACHIEVES RAOs IN COMBINATION WITH OTHER ALTERNATIVES	EASILY IMPLEMENTED, REQUIRES LEGAL SERVICES AND ONGOING ENFORCEMENT	LOW
C. EXCAVATION, CONSOLIDATION & CAPPING	CONSOLIDATION/CAPPING	CONSOLIDATE IMPACTED MATERIALS/CAP WITH CLEAN FILL	SITE WIDE	EFFECTIVE TO REDUCE EXPOSURE TO CONTAMINANTS OF CONCERN FOR HUMAN AND ECOLOGICAL RECEPTORS. DOES NOT REDUCE THE QUALITY OF IMPACTED MATERIAL ON-SITE	EASILY IMPLEMENTED, REQUIRES INSTITUTIONAL CONTROLS TO BE EFFECTIVE	MODERATE CAPITAL, MODERATE O&M
D. EXCAVATION TO LAND USE-BASED CRITERIA WITH OFF-SITE DISPOSAL	EXCAVATION	REMOVAL AND OFF-SITE DISPOSAL	SITE WIDE	EFFECTIVE TO REDUCE EXPOSURE TO CONTAMINANTS OF CONCERN FOR HUMAN AND ECOLOGICAL RECEPTORS AND REDUCING QUANTITY OF IMPACTED MATERIAL ON-SITE	EASILY IMPLEMENTED, REQUIRES INSTITUTIONAL CONTROLS TO BE EFFECTIVE	MODERATE CAPITAL, LOW O&M
E. EXCAVATION TO RESIDENTIAL CRITERIA WITH OFF-SITE DISPOSAL	EXCAVATION	REMOVAL AND OFF-SITE DISPOSAL	SITE WIDE	EFFECTIVE TO REDUCE EXPOSURE TO CONTAMINANTS OF CONCERN FOR HUMAN AND ECOLOGICAL RECEPTORS AND REDUCING QUANTITY OF IMPACTED MATERIAL ON-SITE	EASILY IMPLEMENTED	HIGH CAPITAL, LOW O&M

LEGEND

RETAINED FOR USE IN REMEDIAL ALTERNATIVES

ELIMINATED FROM CONSIDERATION

RAO REMEDIAL ACTION OBJECTIVE

O&M OPERATIONS AND MAINTENANCE

figure 3.43

SECONDARY SCREENING OF SOIL PROCESS OPTIONS
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan

056394-07(009)GN-DE058 DEC 19/2013

GENERAL RESPONSE ACTIONS (FOR REMEDIAL ACTION OBJECTIVES)	REMEDIAL TECHNOLOGY TYPES (FOR GENERAL RESPONSE ACTIONS)	PROCESS OPTIONS	AREA OF CONCERN	EFFECTIVENESS	IMPLEMENTABILITY	COST
A. NO ACTION	NOT APPLICABLE	NONE	SITE WIDE	NOT EFFECTIVE, DOES NOT ACHIEVE RAOs	NOT ACCEPTABLE	NONE
B. INSTITUTIONAL ACTIONS	ACCESS RESTRICTIONS	DEED RESTRICTIONS	SITE WIDE	PREVENTS THE USE OF IMPACTED GROUNDWATER AS A SOURCE OF DRINKING WATER	EASILY IMPLEMENTED; REQUIRES LEGAL SERVICES AND ONGOING ENFORCEMENT	LOW
C. MONITORING	NOT APPLICABLE	GROUNDWATER MONITORING	DOWNGRADIENT PROPERTY BOUNDARY	USEFUL FOR DOCUMENTING CONDITIONS, MAY NOT REDUCE IMPACTS; HOWEVER, IMPACTS ARE MARGINAL	EASILY IMPLEMENTED	LOW CAPITAL, LOW O&M
D. MONITORED NATURAL ATTENUATION	NOT APPLICABLE	GROUNDWATER MONITORING/ NATURAL DEGRADATION	DOWNGRADIENT PROPERTY BOUNDARY	USEFUL FOR DOCUMENTING CONDITIONS, MAY NOT REDUCE IMPACTS; HOWEVER, IMPACTS ARE MARGINAL	EASILY IMPLEMENTED	LOW CAPITAL, LOW O&M

LEGEND

RETAINED FOR USE IN REMEDIAL ALTERNATIVES

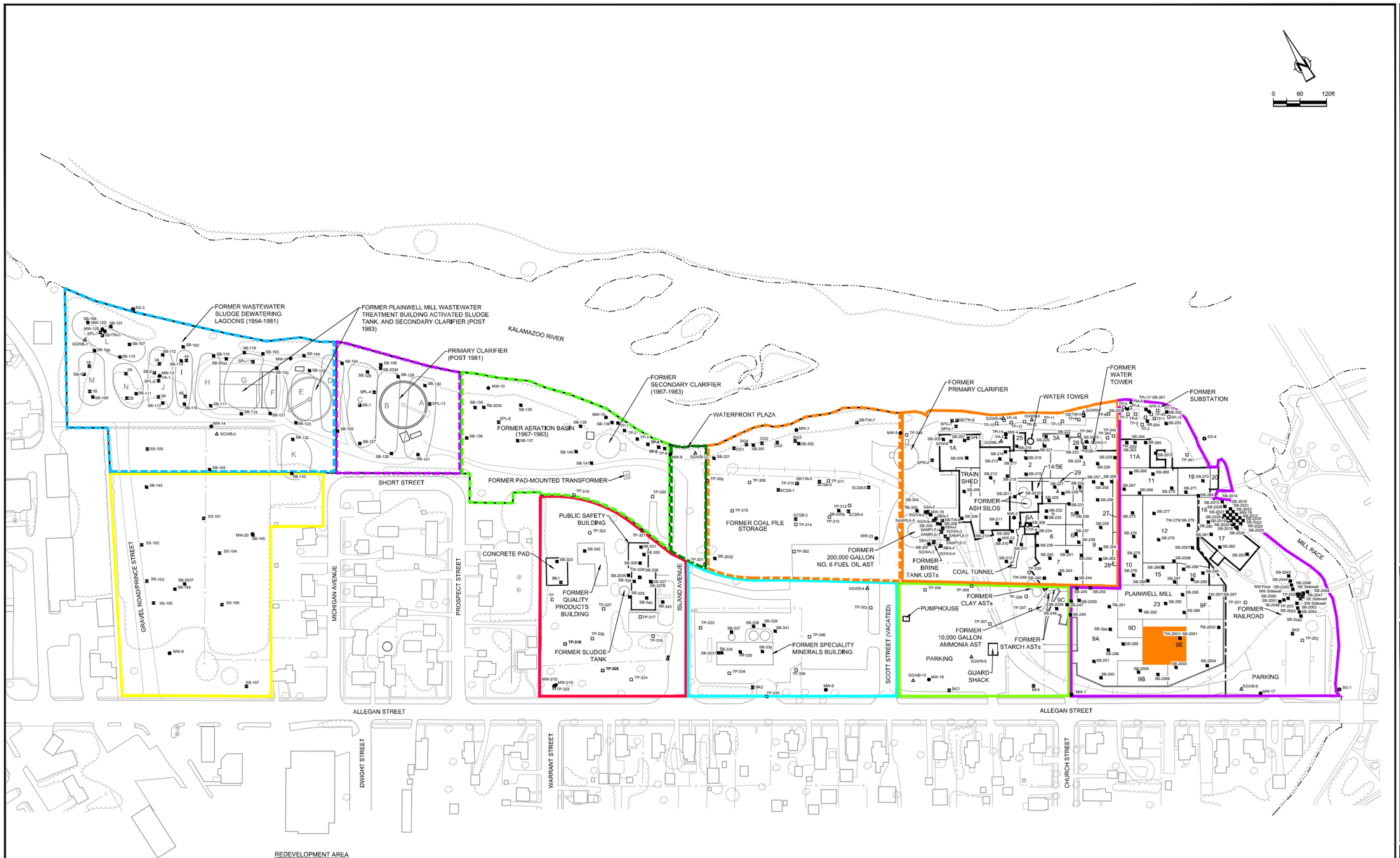
ELIMINATED FROM CONSIDERATION

RAO REMEDIAL ACTION OBJECTIVE

O&M OPERATIONS AND MAINTENANCE

figure 3.44

SECONDARY SCREENING OF GROUNDWATER PROCESS OPTIONS
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
Plainwell, Michigan



REDEVELOPMENT AREA

- COMMERCIAL AREA 1
- COMMERCIAL AREA 2
- COMMERCIAL AREA 3
- MIXED RESIDENTIAL/COMMERCIAL AREA 1
- MIXED RESIDENTIAL/COMMERCIAL AREA 2
- COMMERCIAL AREA 4
- RESIDENTIAL AREA 1
- RESIDENTIAL AREA 2
- RESIDENTIAL AREA 3
- RESIDENTIAL AREA 4
- WATERFRONT PLAZA

CONCEPTUAL AREA FOR CONSOLIDATION OF SOIL UNDER PARKING LOT AND ABOVE FORMER BASEMENT SLABS.

Nº	Revision	Date	Initial

LEGEND

- PROPERTY BOUNDARY
- FORMER FEATURE
- TREE LINE
- FENCE LINE
- RAILROAD
- SURFACE WATER
- SB-262 SOIL BORING LOCATION - PHASE II RI
- SB-2020 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-339 TEST PIT LOCATION - PHASE II RI
- TW-246 TEMPORARY WELL LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II, AND ADDITIONAL RI
- VA-1 VERTICAL AQUIFER SAMPLE LOCATION - PHASE II RI
- CTP-4 SOIL SAMPLE LOCATION - PHASE I RI
- TP-1 TEST PIT LOCATION - PHASE I RI
- SG-2 STAFF GAUGE - PHASE I RI
- PREVIOUS SOIL SAMPLE LOCATION (TAPLIN ENVIRONMENTAL SERVICES, 1999)
- PREVIOUS SOIL SAMPLE LOCATION (BBL, 1994)
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS SOIL BORING LOCATION (FTC&H, 2006)
- PREVIOUS TEMPORARY WELL LOCATION (FTC&H, 2006)
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)
- PREVIOUS TEST PIT EXCAVATION LOCATION (RMT, 2008)
- SOIL BORING LOCATION - FANNIE PELL BRIDGE FOOTING
- PREVIOUS SOIL SAMPLE LOCATION (CDM, 2001)
- ABANDONED MONITORING WELL LOCATION

NOTE:
THE FOLLOWING STRUCTURES WERE DEMOLISHED ON BEHALF OF THE CITY OF PLAINWELL BETWEEN MARCH & AUGUST 2012: BUILDING 3A, 9A, 9B, 9C, 9D, 9E, 9F, 23 AND 28, ONE 50,000-GALLON WATER TOWER, THE 200,000-GALLON FUEL OIL AST, THE BRINE TANKS, THE FORMER CLAY STARCH TANKS AND FORMER AMMONIA AST SECONDARY CONTAINMENT STRUCTURE, THE FORMER SPECIALTY MINERALS BUILDING AND FORMER SLUDGE TANK (ADJACENT TO THE FORMER SLUDGE DEWATERING BUILDING) WAS DEMOLISHED IN DECEMBER 2011. THE FORMER QUALITY PRODUCTS BUILDING WAS DEMOLISHED IN OCTOBER 2011. THE RAILROAD WAS REMOVED BY THE CITY OF PLAINWELL IN THE FALL OF 2011.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

FEASIBILITY STUDY REPORT

CONCEPTUAL AREAS FOR CONSOLIDATION OF SOILS

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:
ECOLOGICAL RISK ASSESSMENT SAMPLE LOCATION

Project Manager:	Reviewed By:	Date:	
J.Q.	S.J.	DECEMBER 2013	
Scale: 1:120	Project Nº: 056394-07	Report Nº: 009	Drawing Nº: figure 4.1

056394-07(009)GN-DE055 DEC 18/2013

TABLES

TABLE 2.1

SUMMARY OF POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Regulation	*Citation*	*Description*	*ARAR/TBC*	*Comments*
FEDERAL				
Toxic Substances Control Act	40 CFR 761	Establishes storage, treatment and disposal requirements for PCB remediation wastes and for non-porous and porous surfaces contaminated with PCBs.	ARAR	Sampling and disposal requirements may be applicable to investigation-derived waste (IDW) and/or equipment evaluated
		Determines PCB cleanup level for soil using self-implementing, performance-based, or risk-based criteria; cleanup levels based on future land use.	ARAR	PCB cleanup levels for PCB remediation waste may be applicable
Clean Air Act	40 CFR 50 and 52	Establishes requirements for constituent emission rates in accordance with National Ambient Air Quality Standards.	TBC	May be considered for remedial alternatives that include relocation of materials. State criteria may also apply.
	42 U.S.C. 7401 et seq.	Provides guidelines with respect to minimizing the harmful effects of fugitive dust and airborne contaminants that result from excavation, construction, and other removal activities. Establishes primary and secondary ambient air quality standards for emissions of chemicals and particulate matter.	TBC	May be considered for remedial alternatives that include excavation/removal of residual/soil.
U.S. DOT Placarding and Handling	40 CFR 264.227 49 CFR 171	Transportation and handling requirements for materials containing PCBs with concentrations of 20 mg/kg or more.	ARAR	Applicable for the MW-16 area.
Safe Drinking Water Act	40 CFR 141	National Primary Drinking Water Regulations - Maximum Contaminant Levels.	ARAR	Provides Federal drinking water standards.
Safe Drinking Water Act – Section 1428	42 USC 300h	Wellhead protection	TBC	The City of Plainwell has a Wellhead Protection Area. Michigan's Wellhead Protection Program is implemented through this regulation.
Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites	U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response Directive 9200.4-17P	Policy regarding the use of monitored natural attenuation (MNA) for the cleanup of contaminated soil and groundwater in the Superfund, RCRA Corrective Action, and Underground Storage Tank programs	TBC	Applicable if MNA is selected.
Monitored Natural Attenuation of Inorganic Contaminants in Ground Water - Volume 1 Technical Basis for Assessment	EPA/600/R-07/139 October 2007	Provide a framework for assessing the potential application of monitored natural attenuation as part of the remedy for inorganic contaminant plumes in ground water.	TBC	Applicable if MNA is selected.

TABLE 2.1

SUMMARY OF POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Regulation	*Citation*	*Description*	*ARAR/TBC*	*Comments*
FEDERAL (Continued)				
Monitored Natural Attenuation of Inorganic Contaminants in Ground Water - Volume 2 Assessment for Non-Radionuclides Including Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Nitrate, Perchlorate, and Selenium	EPA/600/R-07/140 October 2007	Provide a framework for assessing the potential application of monitored natural attenuation as part of the remedy for inorganic contaminant plumes in ground water.	TBC	Applicable if MNA is selected.
STATE				
Michigan Act 451, Part 201 - Environmental Remediation and Rules Promulgated Thereunder	MCL 324.20118(2) MCL 324.20120a MAC 299.5705	Requires that a remedial action shall provide for response activity that will satisfy cleanup criteria.	ARAR	The remedial action implemented must meet generic or Site-specific cleanup criteria.
	MCL 324.20120a MAC 299.5708	If the target detection limit or background concentration is greater than the risk-based cleanup criteria, the target detection limit or background concentration shall be used instead of the risk-based cleanup criterion.	ARAR	Applicable to all environmental media and may be used to gauge the success of the remedial action.
	MCL 324.2017a MCL 324.20114	Requirements for owner of a facility, such as preventing exacerbation and exercising due care.	ARAR	Applicable if materials are consolidated on-Site or if there is a release of materials above the PRGs from the Site.
	MCL 324.20120c MCL 324.20116 MCL 324.20120a(16) MCL 324.20120b MAC 299.5524	Requirements for relocation of excavated soil Restrictions on transfer of real property designated as a facility. Requirement that if residential criteria are not met, land use restrictions must be provided. Actions required upon approval of remedial action plans.	ARAR ARAR	Application for consolidation alternative Due to the presence of COCs above the Part 201 Residential Cleanup Criteria, property cannot be transferred without notification of land use restrictions that apply to the Site. All actions leaving COCs in place or cleanup that does not achieve unrestricted/residential use must include deed restrictions on activities that may interfere with the integrity of the remedial action and on activities that may result in unacceptable exposure.
	MCL 324.20118, et al. MAC 299.5532(11)	Required elements of remedial action plans (remedial design documents).	ARAR	Primary requirements can be met in remedial design documents by including plans identifying points of compliance for evaluating the effectiveness of the remedial action.
	MCL 324.20120c	Required action if contaminated soil is moved off-Site or relocated within the site.	ARAR	Material disposed off Site must be properly characterized to determine if it is subject to the requirements of Part 111 (Hazardous Waste Management). Required approval for soil relocation can be attained through MDEQ approval of a Remedial Design.

TABLE 2.1

SUMMARY OF POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Regulation	*Citation*	*Description*	*ARAR/TBC*	*Comments*
Michigan Act 451, Part 201 - Environmental Remediation and Rules Promulgated Thereunder (continued)	MAC 299.5520 MAC 299.51003-51005	Objectives of response activities, determination (or nullification) that a response activity is complete.	ARAR	Upon completion of remedial actions, the PRP is required to demonstrate all requirements are achieved.
	MAC 299.5522 MAC 299.51017	Liable parties must provide notice to the department and adjacent land owners in certain situations, such as if hazardous substances emanate beyond the property boundary.	ARAR	Applicable if there is a release (above criteria) from the Site or if Generic Residential Cleanup Criteria are exceeded and contamination is believed to be migrating off-Site.
Michigan Act 451, Part 111 - Hazardous Waste Management and Rules Promulgated Thereunder	MCL 324.11101-11153 MAC 299.9101 -11107	Establishes requirements for hazardous waste generators, transporters, and treatment/storage/disposal facilites.	ARAR	Used for the characterization and identification of hazardous waste, and identification of appropriate treatment and disposal.
Michigan Act 451, Part 31 - Water Resources Protection and Rules Promulgated Thereunder	MCL 324.3109a	Allows for mixing zone for discharge of venting groundwater	ARAR	The mixing zone criteria shall not be less stringent than for point source discharges where materials are consolidated.
	MCL 324.3109b	Identifies definition of completion of Part 31 remedial actions	TBC	Applicable to remedial alternatives where Part 31 requirements are met.
Michigan Act 451, Part 91 - Soil Erosion and Sedimentation Control	MCL 324.9112 MCL 324.9116 MAC 323.1701-1714	Requirements for owners of land undergoing an earth change. Establishes rules prescribing soil erosion and sedimentation control plans, procedures, and measures.	ARAR	For any remedial action involving an earth change, liable parties must implement and maintain soil erosion and sedimentation control measures. Substantive requirements of permit must be satisfied.
Michigan Act 451, Part 55 - Air Pollution Control and Rules Promulgated Thereunder	MAC 336.1101-2706	Establishes rules prohibiting the emission of air contaminants in quantities which cause injurious effects to human health, animal life, plant life or significant economic value, and/or property.	ARAR	Applicable for remedial alternatives that would generate air emissions (e.g., dust during excavation, soil stabilization, or compaction). For certain remedial alternatives, air emissions must comply with substantive requirements of permits and monitoring would be required.
Michigan Public Act 300 of 1949, as amended. Michigan Vehicle Code	MCL 257.716, 257.722, et seq MAC 257.101, et seq	Rules governing the reduction of maximum axle loads during springtime frost periods.	ARAR	Remedial action and construction may require heavy loads of equipment, fill dirt, PCB- containing media, etc. to be transported over roadways; however, this is not allowed during frost periods.
Michigan Public Act 306 of 1969, as amended – Well Construction Code	MCL 24.233, 24.263, and 333.12714	Establishes rules for well installation and abandonment.	ARAR	Applicable to wells that are abandoned or wells that may be installed as part of groundwater monitoring activities.

TABLE 2.1

SUMMARY OF POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Regulation	*Citation*	*Description*	*ARAR/TBC*	*Comments*
Michigan Act 451, Part 115 - Solid Waste Management and Rules Promulgated Thereunder	MCL 324.11501-11504 MCL 324.11507 MCL 324.11540 MAC 299.4101-4106a MAC 299.4301 (3)(d)	Establishes rules for methods of solid waste disposal and for design/operational standards for disposal areas.	ARAR	May apply for on-Site remedial actions that rely on solid waste to remain on-Site.
	MAC 299.4305 MAC 299.4307 MAC 299.4308	Landfill location restrictions and liner design standards.	TBC	Not applicable because the Site is not a new disposal area. However, location restrictions and liner design standards may be considered for alternatives that include on-Site disposal.
Michigan Act 451, Part 115 - Solid Waste Management and Rules Promulgated Thereunder (continued)	MAC 299.4306	Water quality performance standards.	ARAR	The cap design must ensure that all requirements for the protection of surface and groundwater under Part 31 (and rules) are met. A design that keeps the final cover from being inundated is capable of limiting erosion and infiltration to the extent necessary to protect human health and the environment.
	MAC 299.4912	Requirements for natural soil barriers.	TBC	Natural soil barriers (or augments) may be evaluated by the specifications in this rule to help determine if the barriers are adequate to prevent lateral flow of groundwater into and out of the waste.
	MAC 299.4913 MAC 299.4915	Requirements for final cover materials.	ARAR	Covers must meet the specifications in the rules.
	MAC 299.4916-4921	Construction Quality Control Program	ARAR	Substantive portions of construction quality control must be met in Remedial Design and Remedial Action.
Evaluating Mercury in Groundwater Plumes Relative to the Groundwater/Surface Water Interface (GSI) Pursuant to Part 201	Policy and Procedure Number: 09 014	Evaluation of mercury venting to surface waters via groundwater relative to the environmental risks and standards available, considering Section 20120e of Part 201	TBC	This policy allows for the use of U.S. EPA Method 245.1 to quantify the level of mercury in groundwater that is venting to surface waters as part of an evaluation of the GSI pathway.
LOCAL				
Public Safety - Excavations	Chapter 9-3 - Plainwell Code of City Ordinances	Requires that any open excavation be surrounded by fencing to protect the public.	TBC	Any remedial action involving excavations will require implementation of proper engineering controls to protect the public.
Soil Erosion and Sedimentation Control	Allegan County Ordinance No. 1013.1	Control soil erosion and sedimentation with respect to earth change activities within the County.	TBC	For any remedial action involving an earth change, liable parties must implement and maintain soil erosion and sedimentation control measures. Substantive requirements of permit must be satisfied.

TABLE 2.2

LIST OF PRELIMINARY REMEDIATION GOALS FOR COCs IN SOIL
FEASIBILITY STUDY REPORT
FORMER PLAINWELL MILL, INC. PROPERTY
PLAINWELL, MICHIGAN

		Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria [1]								
		Statewide Default Background	Residential Drinking Water Protection	Non-Residential Drinking Water Protection	Groundwater Surface Water Interface Protection [2]	Groundwater Contact Protection	Residential Soil Volatilization to Indoor Air Inhalation	Non-Residential Soil Volatilization to Indoor Air Inhalation	Residential Infinite Source Volatile Soil Inhalation	Non-Residential Infinite Source Volatile Soil Inhalation
Volatile Organic Compounds (VOCs)										
Benzene	mg/kg	--	0.1	0.1	4	220	1.6	8.4	13	45
Ethylbenzene	mg/kg	--	1.5	1.5	0.36	140	87	140	720	2400
Methylene chloride	mg/kg	--	0.1	0.1	30	2300	45	240	210	700
Tetrachloroethene	mg/kg	--	0.1	0.1	1.2	88	11	21	170	210
Toluene	mg/kg	--	16	16	5.4	250	250	250	2800	3300
1,1,1-Trichloroethane	mg/kg	--	4	4	1.8	460	250	460	3800	4500
Trichloroethene	mg/kg	--	0.1	0.1	4	440	1.0	1.9	11	14
1,2,4-Trimethylbenzene	mg/kg	--	2.1	2.1	0.57	110	110	110	21000	25000
Xylenes (total)	mg/kg	--	5.6	5.6	0.82	150	150	150	46000	54000
Semi-Volatile Organic Compounds (SVOCs)										
Benzo(a)anthracene	mg/kg	--	NLL	NLL	NLL	NLL	NLV	NLV	NLV	NLV
Benzo(a)pyrene	mg/kg	--	NLL	NLL	NLL	NLL	NLV	NLV	NLV	NLV
Benzo(b)fluoranthene	mg/kg	--	NLL	NLL	NLL	NLL	ID	ID	ID	ID
Carbazole	mg/kg	--	9.4	39	1.1	820	NLV	NLV	NLV	NLV
4-Chloro-3-methylphenol	mg/kg	--	5.8	16	0.28	3000	NLV	NLV	NLV	NLV
Dibenz(a,h)anthracene	mg/kg	--	NLL	NLL	NLL	NLL	NLV	NLV	NLV	NLV
Dibenzofuran	mg/kg	--	ID	ID	1.7	ID	2000	3600	130	160
Fluoranthene	mg/kg	--	730	730	5.5	730	1000000	1000000	740000	890000
Fluorene	mg/kg	--	390	890	5.3	890	580000	1000000	130000	150000
Indeno(1,2,3-cd)pyrene	mg/kg	--	NLL	NLL	NLL	NLL	NLV	NLV	NLV	NLV
2-Methylnaphthalene	mg/kg	--	57	170	4.2	5500	2700	4900	1500	1800
4-Methylphenol	mg/kg	--	7.4	20	1	16000	NLV	NLV	NLV	NLV
Naphthalene	mg/kg	--	35	100	0.73	2100	250	470	300	350
Pentachlorophenol	mg/kg	--	0.022	0.022	26.5	4.3	NLV	NLV	NLV	NLV
Phenanthrene	mg/kg	--	56	160	2.1	1100	2800	5100	160	190
2,4,6-Trichlorophenol	mg/kg	--	2.4	9.4	0.33	200	NLV	NLV	NLV	NLV
PCBs										
Total PCBs	mg/kg		NLL	NLL	NLL	NLL	3000	16000	240	810
Metals										
Aluminum	mg/kg	6900	1	1	--	1000000	NLV	NLV	NLV	NLV
Antimony	mg/kg	--	4.3	4.3	94	49000	NLV	NLV	NLV	NLV
Arsenic	mg/kg	5.8	4.6	4.6	4.6	2000	NLV	NLV	NLV	NLV
Barium	mg/kg	75	1300	1300	950	1000000	NLV	NLV	NLV	NLV
Cadmium	mg/kg	1.2	6	6	6.15	230000	NLV	NLV	NLV	NLV
Chromium	mg/kg	18	30	30	3.3	140000	NLV	NLV	NLV	NLV

TABLE 2.2

LIST OF PRELIMINARY REMEDIATION GOALS FOR COCs IN SOIL
FEASIBILITY STUDY REPORT
FORMER PLAINWELL MILL, INC. PROPERTY
PLAINWELL, MICHIGAN

		Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria [1]								
		Residential Finite VSIC for 5 Meter Source Thickness	Non-Residential Finite VSIC for 5 Meter Source Thickness	Residential Finite VSIC for 2 Meter Source Thickness	Non-Residential Finite VSIC for 2 Meter Source Thickness	Residential Particulate Soil Inhalation	Non-Residential Particulate Soil Inhalation	Residential Direct Contact	Non-Residential Direct Contact	Soil Saturation Concentration Screening
Volatile Organic Compounds (VOCs)										
Benzene	mg/kg	34	99	79	230	380000	470000	180	400	400
Ethylbenzene	mg/kg	1000	3100	2200	6500	10000000	13000000	140	140	140
Methylene chloride	mg/kg	590	1700	1400	4000	6600000	8300000	1300	2300	2300
Tetrachloroethene	mg/kg	480	490	1100	1100	2700000	1200000	88	88	88
Toluene	mg/kg	5100	36000	12000	36000	27000000	12000000	250	250	250
1,1,1-Trichloroethane	mg/kg	12000	15000	28000	31000	67000000	29000000	460	460	460
Trichloroethene	mg/kg	25	25	57	58	130000	59000	500	500	500
1,2,4-Trimethylbenzene	mg/kg	500000	600000	500000	600000	82000000	36000000	110	110	110
Xylenes (total)	mg/kg	61000	65000	130000	130000	290000000	130000000	150	150	150
Semi-Volatile Organic Compounds (SVOCs)										
Benzo(a)anthracene	mg/kg	NLV	NLV	NLV	NLV	ID	ID	20	80	--
Benzo(a)pyrene	mg/kg	NLV	NLV	NLV	NLV	1500	1900	2	8	--
Benzo(b)fluoranthene	mg/kg	ID	ID	ID	ID	ID	ID	20	80	--
Carbazole	mg/kg	NLV	NLV	NLV	NLV	62000	78000	530	2400	--
4-Chloro-3-methylphenol	mg/kg	NLV	NLV	NLV	NLV	ID	ID	4500	15000	--
Dibenz(a,h)anthracene	mg/kg	NLV	NLV	NLV	NLV	ID	ID	2	8	--
Dibenzofuran	mg/kg	130	160	130	160	6700	2900	ID	ID	--
Fluoranthene	mg/kg	740000	880000	740000	880000	9300000	4100000	46000	130000	--
Fluorene	mg/kg	130000	150000	130000	150000	9300000	4100000	27000	87000	--
Indeno(1,2,3-cd)pyrene	mg/kg	NLV	NLV	NLV	NLV	ID	ID	20	80	--
2-Methylnaphthalene	mg/kg	1500	1800	1500	1800	670000	290000	8100	26000	--
4-Methylphenol	mg/kg	NLV	NLV	NLV	NLV	6700000	2900000	11000	36000	--
Naphthalene	mg/kg	300	350	300	350	200000	88000	16000	52000	--
Pentachlorophenol	mg/kg	NLV	NLV	NLV	NLV	100000	130000	90	320	--
Phenanthrene	mg/kg	160	190	160	190	6700	2900	1600	5200	--
2,4,6-Trichlorophenol	mg/kg	NLV	NLV	NLV	NLV	1000000	1300000	710	3300	--
PCBs										
Total PCBs	mg/kg	7900	28000	7900	28000	5200	6500	4	16	--
Metals										
Aluminum	mg/kg	NLV	NLV	NLV	NLV	ID	ID	50000	370000	--
Antimony	mg/kg	NLV	NLV	NLV	NLV	13000	5900	180	670	--
Arsenic	mg/kg	NLV	NLV	NLV	NLV	720	910	7.6	37	--
Barium	mg/kg	NLV	NLV	NLV	NLV	330000	150000	37000	130000	--
Cadmium	mg/kg	NLV	NLV	NLV	NLV	1700	2200	550	2100	--
Chromium	mg/kg	NLV	NLV	NLV	NLV	260	240	2500	9200	--

TABLE 2.2

LIST OF PRELIMINARY REMEDIATION GOALS FOR COCs IN SOIL
FEASIBILITY STUDY REPORT
FORMER PLAINWELL MILL, INC. PROPERTY
PLAINWELL, MICHIGAN

			Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria [1]							
		Statewide Default Background	Residential Drinking Water Protection	Non-Residential Drinking Water Protection	Groundwater Surface Water Interface Protection [2]	Groundwater Contact Protection	Residential Soil Volatilization to Indoor Air Inhalation	Non-Residential Soil Volatilization to Indoor Air Inhalation	Residential Infinite Source Volatile Soil Inhalation	Non-Residential Infinite Source Volatile Soil Inhalation
Metals (Continued)										
Cobalt	mg/kg	6.8	0.8	2	2	48000	NLV	NLV	NLV	NLV
Copper	mg/kg	32	5800	5800	135	1000000	NLV	NLV	NLV	NLV
Iron	mg/kg	12000	6	6	--	1000000	NLV	NLV	NLV	NLV
Lead	mg/kg	21	700	700	8780	ID	NLV	NLV	NLV	NLV
Magnesium	mg/kg	--	8000	22000	--	1000000	NLV	NLV	NLV	NLV
Manganese	mg/kg	440	1	1	105	180000	NLV	NLV	NLV	NLV
Mercury	mg/kg	0.13	1.7	1.7	0.05	47	48	89	52	62
Selenium	mg/kg	0.41	4	4	0.4	78000	NLV	NLV	NLV	NLV
Silver	mg/kg	1	4.5	13	0.1	200000	NLV	NLV	NLV	NLV
Sodium	mg/kg	--	2500	7000	--	1000000	NLV	NLV	NLV	NLV
Thallium	mg/kg	--	2.3	2.3	4.2	15000	NLV	NLV	NLV	NLV
Vanadium	mg/kg	--	72	990	430	1000000	NLV	NLV	NLV	NLV
Zinc	mg/kg	47	2400	5000	303	1000000	NLV	NLV	NLV	NLV
General Chemistry										
Cyanide (total)	%	0.39	4	4	0.1	250	NLV	NLV	NLV	NLV
Cyanide (total)	mg/kg	0.39	4	4	0.1	250	NLV	NLV	NLV	NLV
Nitrate (as N)	mg/kg	--	200	200	ID	1000000	NLV	NLV	NLV	NLV
Phosphorus	mg/kg	--	1300	4800	1	ID	NLV	NLV	NLV	NLV

Notes:
-- No criterion promulgated under Part 201
NLV - Hazardous substance is not likely to volatilize under most conditions.
ID - Insufficient data to develop criterion
NLL - Hazardous substance is not likely to leach under most soil conditions.
mg/kg - milligrams per kilogram
[1] Part 201 Cleanup criteria, updated 9/28/2012 pursuant to 1994 PA 451 as amended.
[2] Carbonate Hardness of 307 mg/L and pH of 7.97 were used to calculate site-specific groundwater.
Surface Water Interface Protection Criteria, as applicable.

TABLE 2.2

LIST OF PRELIMINARY REMEDIATION GOALS FOR COCs IN SOIL
FEASIBILITY STUDY REPORT
FORMER PLAINWELL MILL, INC. PROPERTY
PLAINWELL, MICHIGAN

		Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria [1]								
		Residential Finite VSIC for 5 Meter Source Thickness	Non-Residential Finite VSIC for 5 Meter Source Thickness	Residential Finite VSIC for 2 Meter Source Thickness	Non-Residential Finite VSIC for 2 Meter Source Thickness	Residential Particulate Soil Inhalation	Non-Residential Particulate Soil Inhalation	Residential Direct Contact	Non-Residential Direct Contact	Soil Saturation Concentration Screening
Metals (Continued)										
Cobalt	mg/kg	NLV	NLV	NLV	NLV	13000	5900	2600	9000	--
Copper	mg/kg	NLV	NLV	NLV	NLV	130000	59000	20000	73000	--
Iron	mg/kg	NLV	NLV	NLV	NLV	ID	ID	160000	580000	--
Lead	mg/kg	NLV	NLV	NLV	NLV	100000	44000	400	900	--
Magnesium	mg/kg	NLV	NLV	NLV	NLV	6700000	2900000	1000000	1000000	--
Manganese	mg/kg	NLV	NLV	NLV	NLV	3300	1500	25000	90000	--
Mercury	mg/kg	52	62	52	62	20000	8800	160	580	--
Selenium	mg/kg	NLV	NLV	NLV	NLV	130000	59000	2600	9600	--
Silver	mg/kg	NLV	NLV	NLV	NLV	6700	2900	2500	9000	--
Sodium	mg/kg	NLV	NLV	NLV	NLV	ID	ID	1000000	1000000	--
Thallium	mg/kg	NLV	NLV	NLV	NLV	13000	5900	35	130	--
Vanadium	mg/kg	NLV	NLV	NLV	NLV	ID	ID	750	5500	--
Zinc	mg/kg	NLV	NLV	NLV	NLV	ID	ID	170000	630000	--
General Chemistry										
Cyanide (total)	%	NLV	NLV	NLV	NLV	250	250	12	250	--
Cyanide (total)	mg/kg	NLV	NLV	NLV	NLV	250	250	12	250	--
Nitrate (as N)	mg/kg	NLV	NLV	NLV	NLV	ID	ID	ID	ID	--
Phosphorus	mg/kg	NLV	NLV	NLV	NLV	67000	29000	1000000	1000000	--

Notes:
-- No criterion promulgated under Part 201
NLV - Hazardous substance is not likely to volatilize under most conditions.
ID - Insufficient data to develop criterion
NLL - Hazardous substance is not likely to leach under most soil conditions.
mg/kg - milligrams per kilogram
[1] Part 201 Cleanup criteria, updated 9/28/2012 pursuant to 1994 PA 451 as amended.
[2] Carbonate Hardness of 307 mg/L and pH of 7.97 were used to calculate site-specific groundwater.
Surface Water Interface Protection Criteria, as applicable.

TABLE 2.3

LIST OF PRELIMINARY REMEDIATION GOALS FOR COCs IN GROUNDWATER
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

		Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria [1]										
		Residential Drinking Water Criteria	*Non-Residential Drinking Water Criteria*	*Residential Health-Based Drinking Water Value* [2]	*Non-Residential Health-Based Drinking Water Value* [2]	*Groundwater Surface Water Interface Criteria* [3]	*Residential Groundwater Volatilization to Indoor Air Inhalation Criteria*	*Non-Residential Groundwater Volatilization to Indoor Air Inhalation Criteria*	*Groundwater Contact Criteria*	*Water Solubility Criteria*	*Flammability and Explosivity Screening Levels*	*Acute Inhalation Screening Levels*
Metals	***Units***											
Aluminum	mg/L	0.05	0.05	0.3	4.1	--	NLV	NLV	64000	--	ID	ID
Arsenic	mg/L	0.01	0.01	--	--	0.01	NLV	NLV	4.3	--	ID	ID
Iron	mg/L	0.3	0.3	2	5.6	--	NLV	NLV	58000	--	ID	ID
Lead	mg/L	0.004	0.004	--	--	0.050	NLV	NLV	ID	--	ID	ID
Manganese	mg/L	0.05	0.05	0.86	2.5	5.3	NLV	NLV	9100	--	ID	ID
Mercury	mg/L	0.002	0.002	--	--	0.0000013	0.056	0.056	0.056	0.056	ID	ID

Notes:

NLV - Hazardous substance is not likely to volatilize under most conditions.

ID - Insufficient data to develop criterion

-- No criterion promulgated under Part 201

[1] Part 201 Cleanup criteria, updated 9/28/2012 pursuant to 1994 PA 451 as amended.

[2] Footnotes for Part 201 Criteria and Part 213 Risk‑Based Screening Levels, updated 9/28/2012 pursuant to 1994 PA 451 as amended. Applies to aesthetic criteria.

[3] Carbonate Hardness of 307 mg/L and pH of 7.97 were used to calculate site-specific Groundwater Surface Water Interface Criteria, as applicable.

TABLE 2.4

SUMMARY OF RISK-BASED CONCENTRATIONS (RBCs) FOR ARSENIC IN SOIL
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Chemical of Potential Concern (COPC)	*Units*	*Risk-Based Concentration for Soil, RBC_{soil}* [1]						*Minimum RBC_{soil}*		
		Trespasser	*Recreational User*	*Resident*	*Commercial Worker*	*Utility Worker*	*Construction Worker*	*Residential* [2]	*Commercial* [3]	*Commercial+Recreational* [4]
TARGET CANCER RISK = 1.0 x 10^{-4}; TARGET HAZARD QUOTIENT = 1.0										
Arsenic	µg/g	1,258 HQ	178 HQ	36 HQ	267 Cancer	280 HQ	1,028 Cancer	36	267	178
TARGET CANCER RISK = 1.0 x 10^{-5}; TARGET HAZARD QUOTIENT = 1.0										
Arsenic	µg/g	196 Cancer	32 Cancer	6.4 Cancer	27 Cancer	280 HQ	103 Cancer	6.4	27	27
TARGET CANCER RISK = 1.0 x 10^{-6}; TARGET HAZARD QUOTIENT = 1.0										
Arsenic	µg/g	20 Cancer	3.2 Cancer	0.64 Cancer	2.7 Cancer	44 Cancer	10.3 Cancer	5.8 [5,6]	5.8 [5,6]	5.8 [5,6]

Notes:
[1] The basis of the calculated RBCs is provided below the RBC value: HQ = the RBC value is based on a hazard quotient; Cancer = the RBC value is based on cancer risk.
[2] RBC_{soil} for the residential areas include all receptors.
[3] RBC_{soil} for the commercial areas include all receptors, except residents and recreational users.
[4] RBC_{soil} for the commercial+recreational areas include all receptors, except residents.
[5] 5.8 µg/g is the Part 201 State Default Background Level for arsenic. The minimum calculated RBC is below background; therefore, the value was substituted with background.
[6] Part 201 Cleanup criteria, updated 9/28/2012 pursuant to 1994 PA 451 as amended.

TABLE 2.5

FINAL ECOLOGICAL PRELIMINARY REMEDIATION GOALS
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*95% UCL Concentration (mg/kg)*	*Initial Ecological PRG (mg/kg)*	*Modified Avian PRG (mg/kg)*	*Modified Mammalian PRG (mg/kg)*	*Final Ecological PRG (mg/kg)*	*95% UCL < Final Ecological PRG*	*Risk Management Required to Meet RAO*
Semi-Volatile Organic Constituents (SVOCs)							
Carbazole	0.083	0.313	---	---	0.313	Yes	No
Polycyclic Aromatic Hydrocarbons (PAHs)							
High Molecular Weight PAHs	36.1	18.6	38.2	36.6	36.6	Yes	No
Inorganic Constituents							
Copper	143	187	---	---	187	Yes	No
Lead	181	40	535	---	535	Yes	No
Mercury	1.53	1.27	1.94	---	1.94	Yes	No
Selenium	0.73	5.7	---	---	5.7	Yes	No
Zinc	333	307	856	---	856	Yes	No

Notes **:**

PRG - Preliminary Remediation Goal
RAO - Remedial Action Objective
UCL - Upper Confidence Limit
mg - milligram
kg - kilogram

TABLE 4.1

INSTITUTIONAL CONTROLS RELATIONSHIP MATRIX
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	Contaminants Remaining	Contaminated Media	Proposed Engineering Controls	Cleanup Objective	Use Restriction/IC Objective	Conditions for Termination	IC Instruments (Planned or Implemented)
All Redevelopment Areas	arsenic, lead, manganese, iron, and aluminum	Groundwater	None	Prohibit drinking of contaminated groundwater	No water supply wells may be installed on the Site; water must be provided by a municipal source	Once Part 201 DWC/MCLs have been attained	Deed Restriction (Planned)
Downgradient Areas	arsenic, iron, and manganese	Groundwater	None	Prohibit drinking of contaminated groundwater	No water supply wells may be installed; water must be provided by a municipal source	Once Part 201 DWC/MCLs have been attained	Local Ordinance or Deed Restrictions (Planned)
Commercial Areas 1 through 4	1,1,1-trichloroethane, aluminum, antimony, PCBs, arsenic, benzene, benzo(a)pyrene, cadmium, chromium, copper, cyanide, fluoranthene, iron, lead, magnesium, manganese, mercury, methylene chloride, naphthalene, pentachlorophenol, phenanthrene, phosphorus, selenium, silver, sodium, tetrachloroethene, trichloroethene, xylenes, and zinc	Soil	None	Prevent unacceptable risks due to Residential exposures.	Restriction of Land Use to Non-Residential	IC needed in perpetuity; levels allowing for unrestricted or Residential use will not be met by all response activities	Deed Restriction (Planned)
Residential Areas 1 and 2; Commercial Areas 1 and 4; Mixed Residential/Commercial Area 2	PCBs $\geq$ 1 ppm and $\leq$10 ppm, which are from a TSCA-regulated source, to be designated as "high occupancy" areas	Soil	Capped and marked in accordance with 40 CFR 761	Prevent unacceptable risks due residual concentrations and occupancy	Deed restrictions consistent with restricted "high occupancy" use, as defined in 40 CFR 761	IC needed in perpetuity; levels allowing for unrestricted "high occupancy" use will not be met by response activities	Deed Restriction (Planned)
All Redevelopment Areas	various constituents	Soil	Existing building slabs and capped areas meeting Michigan Act 451 requirements remain in place; Soil Management Plan prepared and implemented	Prevent unacceptable risks due to direct contact or inhalation	Restriction of Land Use	IC needed in perpetuity unless material above applicable standard is removed; levels allowing for unrestricted or Residential use will not be met by all response activities	Deed Restriction (Planned)
All Redevelopment Areas	various constituents	Surface Soil	None	Prevent unacceptable risks to ecological receptors	Restriction of Land Use; contingency for re-evaluation of ecological risk if re-development plan changes	IC needed in perpetuity	Deed Restriction (Planned)
Residential Areas 1 through 4; Mixed Residential/Commercial Areas 1 and 2	arsenic	Soil	Any community gardens must be of raised bed construction, with no subsurface excavation permitted without proper training.	Prevent unacceptable risks due to direct contact	Restriction of Land Use	IC needed in perpetuity; levels allowing for unrestricted or Residential use will not be met by all response activities	Deed Restriction (Planned)

TABLE 5.1

SUMMARY OF ALTERNATIVES COST ANALYSIS
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

REMEDIAL ALTERNATIVE	SOIL ALTERNATIVE 1	SOIL ALTERNATIVE 2B		SOIL ALTERNATIVE 2C		SOIL ALTERNATIVE 3A	
	NO ACTION	*EXCAVATION AND OFF-SITE DISPOSAL WITH CONSOLIDATION AND CAPPING TO RESIDENTIAL AND NON RESIDENTIAL CRITERIA - ITERATIVE APPROACH*		*EXCAVATION AND OFF-SITE DISPOSAL WITH CONSOLIDATION AND CAPPING TO LAND USE CRITERIA WITH RISK BASED APPROACH OF 10-5 FOR ARSENIC*		*EXCAVATION AND OFF-SITE DISPOSAL TO RESIDENTIAL CRITERIA ITERATIVE APPROACH*	
CAPITAL COSTS							
A. ***Pre-Design***	**$0**						
		1.0 Sampling and Analyis Plan	$33,200	1.0 Sampling and Analyis Plan	$33,200	1.0 Sampling and Analyis Plan	$33,200
		2.0 SAP Implementation	$197,900	2.0 SAP Implementation	$197,900	2.0 SAP Implementation	$197,900
		3.0 Contingency	$114,300	3.0 Contingency	$114,300	3.0 Contingency	$114,300
		4.0 Remedial Action Plan	$50,000	4.0 Remedial Action Plan	$50,000	4.0 Remedial Action Plan	$50,000
Subtotal Pre-Design Costs			**$395,400**		**$395,400**		**$395,400**
B. ***Construction***	**$0**						
		1.0 Mobilization and Setup	$264,000	1.0 Mobilization and Setup	$264,000	1.0 Mobilization and Setup	$431,800
		2.0 Preparation and/or Demolition	$138,000	2.0 Preparation and/or Demolit	$138,700	2.0 Preparation and/or Demolition	$363,800
		3.0 Excavation	$281,300	3.0 Excavation	$288,000	3.0 Excavation	$946,700
		4.0 Transportation and Disposal	$1,535,470	4.0 Transportation and Disposa	$1,663,370	4.0 Transportation and Disposal	$2,709,665
		5.0 Consolidation of Soils on Site	$33,600	5.0 Consolidation of Soils on Sit	$54,600	5.0 Restoration	$1,139,565
		6.0 Capping Soils On Site	$61,700	6.0 Capping Soils On Site	$96,500	6.0 Demobilization	$26,600
		7.0 Restoration	$430,890	7.0 Restoration	$517,171		
		8.0 Demobilization	$32,300	8.0 Demobilization	$32,300		
Subtotal Construction Costs	**$0**		**$2,777,260**		**$3,054,641**		**$5,618,130**
C. ***Engineering and/or Oversight***	**$0**						
		1.0 Institutional Controls	$50,000	1.0 Institutional Controls	$50,000	1.0 Institutional Controls	$50,000
		2.0 Engineering	$416,600	2.0 Engineering	$458,200	2.0 Engineering	$842,700
		3.0 Construction Oversight	$277,700	3.0 Construction Oversight	$305,500	3.0 Construction Oversight	$561,800
Subtotal Engineering and Oversight Costs	**$0**		**$744,300**		**$813,700**		**$1,454,500**
Capital Costs	**$0**		**$3,521,560**		**$3,868,341**		**$7,072,630**
Contingency	**$0**		**$880,390**		**$967,085**		**$1,768,158**
Total Capital Costs	**$0**		**$4,401,950**		**$4,835,426**		**$8,840,788**
OPERATION, MAINTENANCE, & MONITORING COSTS							
A. ANNUAL MONITORING AND MAINTENANCE	**$0**		**$9,600**		**$9,600**		**$2,400**
Contingency on OM & M Costs - Years 1 - 30			**$1,920**		**$1,920**		**$200**
Contingency on OM & M Costs - Years 1 - 5							
Contingency on OM & M Costs - Years 6-30							
OM & M Costs	**$0**		**$11,520**		**$11,520**		**$2,600**
TOTAL CAPITAL COSTS	**$0**		**$4,401,950**		**$4,835,426**		**$8,840,788**
NET PRESENT VALUE OF OM & M (30 YEARS @ 7% DISCOUNT RATE)	**$0**		**$142,952**		**$142,952**		**$35,738**
TOTAL COST	**$0**		**$4,544,902**		**$4,978,378**		**$8,876,526**

TABLE 5.1

SUMMARY OF ALTERNATIVES COST ANALYSIS
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

REMEDIAL ALTERNATIVE	SOIL ALTERNATIVE 3B		SOIL ALTERNATIVE 3C		SOIL ALTERNATIVE 3D	
	EXCAVATION AND OFF-SITE DISPOSAL TO RESIDENTIAL AND NON-RESIDENTIAL CRITERIA ITERATIVE APPROACH		*EXCAVATION AND OFF-SITE DISPOSAL TO LAND USE CRITERIA WITH RISK BASED APPROACH OF 10-5 FOR ARSENIC*		*EXCAVATION AND OFF-SITE DISPOSAL TO LAND USE CRITERIA WITH RISK BASED APPROACH OF 10-6 FOR ARSENIC*	
CAPITAL COSTS						
A. ***Pre-Design***						
	1.0 Sampling and Analyis Plan	$33,200	1.0 Sampling and Analyis Plan	$33,200	1.0 Sampling and Analyis Plan	$33,200
	2.0 SAP Implementation	$197,900	2.0 SAP Implementation	$197,900	2.0 SAP Implementation	$197,900
	3.0 Contingency	$114,300	3.0 Contingency	$114,300	3.0 Contingency	$114,300
	4.0 Remedial Action Plan	$50,000	4.0 Remedial Action Plan	$50,000	4.0 Remedial Action Plan	$50,000
Subtotal Pre-Design Costs		**$395,400**		**$395,400**		**$395,400**
B. ***Construction***						
	1.0 Mobilization and Setup	$255,600	1.0 Mobilization and Setup	$254,500	1.0 Mobilization and Setup	$255,600
	2.0 Preparation and/or Demolition	$138,000	2.0 Preparation and/or Demolition	$138,700	2.0 Preparation and/or Demolition	$149,400
	3.0 Excavation	$281,300	3.0 Excavation	$288,000	3.0 Excavation	$405,400
	4.0 Transportation and Disposal	$1,642,070	4.0 Transportation and Disposal	$1,830,270	4.0 Transportation and Disposal	$2,455,982
	5.0 Restoration	$430,890	5.0 Restoration	$517,171	5.0 Restoration	$929,270
	6.0 Demobilization	$26,600	6.0 Demobilization	$26,600	6.0 Demobilization	$26,600
			8.0 Demobilization			
Subtotal Construction Costs		**$2,774,460**		**$3,055,241**		**$4,222,252**
C. ***Engineering and/or Oversight***						
	1.0 Institutional Controls	$50,000	1.0 Institutional Controls	$50,000	1.0 Institutional Controls	$50,000
	2.0 Engineering	$416,200	2.0 Engineering	$458,300	2.0 Engineering	$633,300
	3.0 Construction Oversight	$277,400	3.0 Construction Oversight	$305,500	3.0 Construction Oversight	$422,200
Subtotal Engineering and Oversight Costs		**$743,600**		**$813,800**		**$1,105,500**
Capital Costs		**$3,518,060**		**$3,869,041**		**$5,327,752**
Contingency		**$879,515**		**$967,260**		**$1,331,938**
Total Capital Costs		**$4,397,575**		**$4,836,301**		**$6,659,690**
OPERATION, MAINTENANCE, & MONITORING COSTS						
A. ANNUAL MONITORING AND MAINTENANCE		**$2,400**		**$2,400**		**$2,400**
Contingency on OM & M Costs - Years 1 - 30		**$200**		**$200**		**$200**
Contingency on OM & M Costs - Years 1 - 5						
Contingency on OM & M Costs - Years 6-30						
OM & M Costs		**$2,600**		**$2,600**		**$2,600**
TOTAL CAPITAL COSTS		**$4,397,575**		**$4,836,301**		**$6,659,690**
NET PRESENT VALUE OF OM & M (30 YEARS @ 7% DISCOUNT RATE)		**$35,738**		**$35,738**		**$35,378**
TOTAL COST		**$4,433,313**		**$4,872,039**		**$6,695,068**

TABLE 5.1

SUMMARY OF ALTERNATIVES COST ANALYSIS
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

REMEDIAL ALTERNATIVE	GROUNDWATER ALTERNATIVE 1		GROUNDWATER ALTERNATIVE 2
	NO ACTION		***INSTITUTIONAL CONTROLS***
CAPITAL COSTS			
A. ***Pre-Design***			
Subtotal Pre-Design Costs	**$0**		**$0**
B. ***Construction***		1.0 New Piezometers and Staff Gauges	$17,100
Subtotal Construction Costs	**$0**		**$17,100**
			$106,400
C. ***Engineering and/or Oversight***			
		1.0 Engineering	$2,600
		2.0 Construction Oversight	$1,700
Subtotal Engineering and Oversight Costs	**$0**		**$4,300**
Capital Costs	**$0**		**$21,400**
Contingency	**$0**		**$5,350**
Total Capital Costs	**$0**		**$26,750**
OPERATION, MAINTENANCE, & MONITORING COSTS			
A. ANNUAL MONITORING AND MAINTENANCE	**$0**		
		1.0 Annual Cost for Semi-Annual GW Monitoring Years 1 - 5	**$66,300**
		2.0 Annual Well Maintenance - Years 1 - 5	**$2,500**
		3.0 Annual Cost for Semi-Annual Reporting - Years 1 - 5	**$37,600**
		4.0 Annual Groundwater Monitoring - Years 6-30	**$25,600**
		5.0 Annual Well Maintenance - Years 6-30	**$2,500**
		6.0 Annual Reporting - Years 6-30	**$18,800**
Contingency on OM & M Costs - Years 1 - 30			
Contingency on OM & M Costs - Years 1 - 5	**$0**		**$30,660**
Contingency on OM & M Costs - Years 6-30	**$0**		**$9,380**
OM & M Costs	**$0**		**$193,340**
TOTAL CAPITAL COSTS	**$0**		**$26,750**
NET PRESENT VALUE OF OM & M (30 YEARS @ 7% DISCOUNT RATE)	**$0**		**$1,029,600**
TOTAL COST	**$0**		**$1,056,350**

TABLE 5.2

SUMMARY OF INDIVIDUAL ANALYSIS OF REMEDIAL ALTERNATIVES
FEASIBILITY STUDY REPORT
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Alternative No./ Description	***Soil Remedial Alternative 1 No Action***	***Soil Remedial Alternative 2-Series Excavation, Consolidation, Capping, and Off-Site Disposal***	***Soil Remedial Alternative 3-Series Excavation and Off-Site Disposal***	***Groundwater Remedial Alternative 1 No Action***	***Groundwater Remedial Alternative 2 Institutional Controls***
Overall Protection of Human Health and the Environment	Not Protective	Protective: likelihood of exposure reduced/ controlled through excavation and off-Site disposal, consolidation, capping, and institutional controls	Protective: likelihood of exposure reduced/ controlled through excavation and off-Site disposal, and institutional controls	Not Protective	Protective: likelihood of exposure controlled through implementation of institutional controls and monitoring
Compliance with ARARs	ARARs would not be met	Complies with ARARs except for Soil Remedial Alternative 2D, where consolidation of materials above Part 201 GRCC would result in exceedances of the 10^{-6} PRG for arsenic.	Complies with ARARs	ARARs would not be met	Complies with ARARs
Long-Term Effectiveness and Permanence	Low degree of long-term effectiveness and permanence	Effective and reliable with O&M with a good degree of certainty. Residual risk remains as a result of contained materials.	Effective and reliable with a good degree of certainty.	Low degree of long-term effectiveness and permanence	Effective and reliable with a good degree of certainty. Variability of groundwater concentrations risk remains as a result of impacted soil above the protection of groundwater pathways.
Reduction of Toxicity, Mobility, or Volume Through Treatment	No reduction in TMV through treatment	No reduction in TMV through treatment	No reduction in TMV through treatment	No reduction in TMV through treatment	No reduction in TMV through treatment
Short-Term Effectiveness	No additional risks posed to the community, workers, or the environment	Low-level potential and manageable risks to the community (e.g., dust, noise, transportation, emissions) and workers, (e.g., exposure to contaminated media, occupational hazards). Estimated construction period of less than a year.	Low-level potential and manageable risks to the community (e.g., dust, noise, transportation, emissions) and workers, (e.g., exposure to contaminated media, occupational hazards). Estimated construction period of less than a year.	No additional risks posed to the community, workers, or the environment	Low-level potential and manageable risks to the community (e.g., dust, noise, transportation, emissions) and workers, (e.g., exposure to contaminated media, occupational hazards). Estimated construction period of less than a year.
Implementability	No approvals or services needed	Limited asbestos abatement within some of the former Mill buildings under one PRG scenario, installation of containment to facilitate excavation along the Mill Race and installation of shoring to maintain building foundation integrity required. No other special techniques, materials, or labor to construct. Major technical, administrative, and schedule difficulties not expected. Approvals required by property owner for implementation of deed restrictions.	Limited asbestos abatement within some of the former Mill buildings under one PRG scenario, installation of containment to facilitate excavation along the Mill Race and installation of shoring to maintain building foundation integrity required. No other special techniques, materials, or labor to construct. Major technical, administrative, and schedule difficulties not expected. Approvals required by property owner for implementation of deed restrictions.	No approvals or services needed	Approvals required by property owner for implementation of deed restrictions.
Cost as Net Present Value	$0			$0	

Notes:
ARAR - Applicable or Relevant and Appropriate Requirements
TMV - Toxicity, Mobility or Volume

Appendix A

Revised Development of Risk-Based Concentrations for Arsenic in Soil Memorandum
CRA, December 20, 2013

CONESTOGA-ROVERS & ASSOCIATES

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MEMORANDUM

TO:	Greg Carli/Jeni Quigley	REF. NO.:	056394
FROM:	April Gowing/Vincent Nero/ds/16	DATE:	June 26, 2013
		REVISION 1	December 20, 2013

RE: Revised Development of Risk-Based Concentrations for Arsenic in Soil
Former Plainwell, Inc. Mill Property
Plainwell, Michigan

1.0 Introduction

Conestoga-Rovers & Associates (CRA) has prepared this memorandum to document the development of risk-based concentrations (RBCs) that are protective of human health direct contact exposure to arsenic in soil located at the former Plainwell, Inc. Mill Property in Plainwell, Michigan (Site). The development of the RBCs generally followed the approved Human Health Risk Assessment (HHRA) portion of the Remedial Investigation Report (Revision 2) (RI Report), which indicated that direct contact exposure to arsenic in soil was the main contributor to unacceptable risks/hazards. Therefore, any actions that are required to mitigate potential exposure to the arsenic impacts would need to address the unacceptable risks/hazards associated with direct contact exposure with soil. The RI Report (Revision 2) was submitted to United States Environmental Protection Agency (U.S. EPA) on February 4, 2013 and was approved by U.S. EPA on February 26, 2013.

2.0 Development of Risk-Based Concentrations

RBCs were developed for arsenic in soil that are protective of trespassers, recreational users, residents, commercial workers, utility workers, and construction workers. These same receptors were evaluated in the RI Report. Two RBCs were initially developed: one protective of carcinogenic health impacts and a second protective of non-carcinogenic health impacts. The RBC for each receptor was determined to be the lower value between carcinogenic and non-carcinogenic health impacts.

The equations used to develop the RBCs are presented in Section 2.1. Section 2.2 presents the receptor-specific exposure assumptions applied in the development of the RBCs. Section 2.3 presents the human health toxicity values applied for arsenic. The equations, exposure assumptions, and toxicity values utilized in the derivation of the RBCs are the same as those used in the forward risk and hazard calculations, as summarized in the RI Report, unless otherwise noted below. Section 2.4 presents the calculated RBCs for each receptor.

2.1 RBC Equations

RBCs have been developed for a trespasser, recreational user, resident, commercial worker, utility worker, and construction worker exposure to arsenic in soil. The soil RBCs were developed for incidental ingestion, dermal contact, and inhalation routes of exposure using the following equations:

REGISTERED COMPANY FOR ISO 9001 ENGINEERING DESIGN

Recreational User/Resident

Carcinogenic Endpoint:

Carcinogenic RBCs were developed to be protective of the child and adult recreational user/resident exposure. Therefore, exposure for each life stage was combined in the following equation:

$$RBC_{soil} = \frac{TR \times AT_c}{\left(\left(\left(CSF \times IR_c \times ABS_o \times CF \times EFa \times ED_c\right)/BW_c\right)\right) + \left(\left(CSF \times SA_c \times AF_c \times ABS_d \times CF \times EFb \times ED_c\right)/BW_c\right)\right) + \left(\left(URF \times FT \times EFa \times ED_c \times (1/PEF)\right)\right) + \left(\left(CSF \times IR_a \times ABS_o \times CF \times EFa \times ED_a\right)/BW_a\right)\right) + \left(\left(CSF \times SA_a \times AF_a \times ABS_d \times CF \times EFb \times ED_a\right)/BW_a\right)\right) + \left(\left(URF \times FT \times EFa \times ED_a \times (1/PEF)\right)\right)}$$

Non-Carcinogenic Endpoint:

For the determination of the non-carcinogenic RBCs, the exposure for the child recreational user/resident, the most sensitive life stage, was applied as a conservative method using the following equation:

$$RBC_{soil} = \frac{THQ \times ATnc}{ED_c \times \left[\left((1/RfD) \times IR_c \times ABS_o \times CF \times EFa\right)/BW_c\right) + \left((1/RfD) \times SA_c \times AF_c \times ABS_d \times CF \times EFb\right)/BW_c\right) + \left((1/RfC) \times EFa \times FT \times (1/(PEF))\right]}$$

Where:

RBC_{soil}	=	Risk-based concentration in soil based on ingestion, dermal contact, and inhalation exposure (mg/kg)
TR	=	Target Cancer Risk
THQ	=	Target Hazard Quotient
BW_c	=	Body Weight - child (kg)
BW_a	=	Body Weight - adult (kg)
ATc	=	Averaging Time - carcinogen
ATnc	=	Averaging Time - non-carcinogen - child (days)
CSF	=	Cancer Slope Factor – oral/dermal - chemical-specific $(mg/kg/day)^{-1}$
URF	=	Unit Risk Factor - inhalation - chemical-specific $(mg/m^3)^{-1}$
RfD	=	Reference Dose – oral/dermal - chemical-specific (mg/kg/day)
RfC	=	Reference Concentration - inhalation - chemical-specific (mg/m^3)
ABS_o	=	Absorption Factor - oral - chemical-specific (%/100)
ABS_d	=	Absorption Factor - dermal - chemical-specific (%/100)
IR_c	=	Ingestion Rate - child (mg/day)
IR_a	=	Ingestion Rate - adult (mg/day)
CF	=	Conversion Factor (1.0×10^{-6} kg/mg)
SA_c	=	Surface Area Exposed - child (cm^2/day)
SA_a	=	Surface Area Exposed - adult (cm^2/day)
AF_c	=	Adherence Factor - child (mg/cm^2)
AF_a	=	Adherence Factor - adult (mg/cm^2)
FT	=	Fraction Time Exposed (hours/24 hours)
EFa	=	Exposure Frequency (days/year) – ingestion/inhalation
EFb	=	Exposure Frequency (days/year) – dermal
ED_c	=	Exposure Duration - child (years)
ED_a	=	Exposure Duration - adult (years)
PEF	=	Particulate Emission Factor - inhalation (m^3/kg)

Trespasser/Commercial Worker/ Utility Worker/Construction Worker

Carcinogenic Endpoint:

$$RBC_{soil} = \frac{TR \times AT_c}{ED \times [((CSF \times IR \times CF \times ABS_o \times EFa)/BW) + ((CSF \times SA \times AF \times CF \times ABS_d \times EFb)/BW) + ((URF \times FT \times EFa \times (1/PEF))]}$$

Non-Carcinogenic Endpoint:

$$RBC_{soil} = \frac{THQ \times ATnc}{ED \times [((1/RfD) \times IR \times CF \times ABS_o \times EFa)/BW) + ((1/RfD) \times SA \times AF \times CF \times ABS_d \times EFb)/BW) + ((1/RfC) \times FT \times EFa \times (1/PEF))]}$$

Where:

RBC_{soil}	=	Risk-based concentration in soil based on ingestion, dermal contact, and inhalation exposure (µg/g)
TR	=	Target Cancer Risk
THQ	=	Target Hazard Quotient
BW	=	Body Weight (kg)
ATc	=	Averaging Time - carcinogen
ATnc	=	Averaging Time - non-carcinogen
CSF	=	Cancer Slope Factor – oral/dermal - chemical-specific $(mg/kg/day)^{-1}$
URF	=	Unit Risk Factor – inhalation - chemical-specific $(mg/m^3)^{-1}$
RfD	=	Reference Dose – oral/dermal - chemical-specific (mg/kg/day)
RfC	=	Reference Concentration – inhalation – chemical-specific (mg/m^3)
ABS_o	=	Absorption Factor - oral - chemical-specific (%/100)
ABS_d	=	Absorption Factor - dermal - chemical-specific (%/100)
IR	=	Ingestion Rate (mg/day)
CF	=	Conversion Factor (1.0×10^{-6}kg/mg)
SA	=	Surface Area Exposed (cm^2/day)
AF	=	Adherence Factor (mg/cm^2)
FT	=	Fraction Time Exposed (hours/24 hours)
EFa	=	Exposure Frequency (days/year) – ingestion/inhalation
EFb	=	Exposure Frequency (days/year) – dermal
ED	=	Exposure Duration (years)
PEF	=	Particulate Emission Factor - inhalation (m^3/kg)

For utility and construction workers, the potential inhalation exposure to arsenic in soil particulates migrating to ambient air as part of fugitive dust emissions was determined through the calculation of a particulate emission factor (PEF), which was used to estimate ambient air concentrations based on soil concentrations. The PEF is Site-specific and was calculated using the approach presented in U.S. EPA (2002)[1]. The equations and inputs for the calculated PEF values for soil are presented in Tables 1 and 2 for the utility worker and construction worker, respectively.

[1] U.S. EPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.

2.2 Receptor-Specific Exposure Assumptions

With the exception of the oral absorption factor and exposure frequency, all other exposure assumptions that were applied in the equations presented above for the derivation of the RBCs were obtained from the RI Report for each of the receptors indicated above and thus are not reproduced here. These exposure assumptions are primarily U.S. EPA default exposure assumptions. A detailed discussion of receptor-specific exposure assumptions applied is presented in the RI Report. The assumptions applied for the oral absorption factor and exposure frequency in the derivation of the RBCs is presented below.

Oral Absorption Factor

Absorption factors are applied in the development of the RBCs as a measure of the bioavailable fraction that enters the human body as a result of oral, dermal, and inhalation exposure. An oral absorption factor of 100 percent, or 1 was applied in the RI Report. More recent information has been published that indicates that this absorption factor is highly conservative and significantly overestimated risks/hazards. The current default oral absorption factor is based on the assumption that the bioavailability of arsenic in soil is the same as the bioavailability in the exposure medium used to derive the toxicity value (water in the case of arsenic), and; therefore, relative bioavailability of arsenic is assumed to be 100 percent (i.e., oral absorption factor of 1). However, studies have shown that the bioavailability of arsenic in soil is less than that of arsenic in water. U.S. EPA have conducted a review of these studies, and based on the results have recommended a relative bioavailability factor of 60 percent or 0.6 for arsenic in soil (U.S. EPA, 2012)[2]. Therefore, an oral absorption factor of 0.6 was applied in the development of the RBCs for arsenic in soil.

Exposure Frequency

Generic screening criteria are developed in a conservative manner, based on an assumed exposure frequency of 7 days per week for 50 weeks per year, or 350 days per year (2 weeks for vacation is assumed) for residential land use and an assumed exposure frequency of 5 days per week for 50 weeks per year, or 250 days per year (2 weeks for vacation is assumed) for commercial land use (U.S. EPA, 2004)[3]. In reality, the exposure frequency to soils in residential and/or commercial settings is influenced by weather conditions.

Direct contact exposure to soil can be affected by weather conditions. For instance, it is expected that soils during the winter months are snow-covered and; therefore, unavailable for dermal contact. Based on this information, soil exposure frequency was based on consideration of local climate conditions, specifically, the number of days where the soil is not snow-covered (and the ground is not frozen), similar to the approach applied by the Michigan Department of Environment Quality (MDEQ) in the development of the Michigan Act 451, Part 201 (Part 201) Generic Cleanup Criteria (GCC)(MDEQ, 2012)[4]. This approach assumes that ingestion and inhalation exposure pathways would occur for a period of 350 days per year for a resident and 245 days per year (50 weeks per year x 5 days per week – 5 days per year for vacation/sick leave) for a commercial worker. For dermal exposure to soil, the MDEQ approach assumes that soils are snow-covered for a period of 4 months of the year (120 days per year) and during this period there is no dermal contact with soils. Therefore, dermal exposure pathways are assessed based on exposure frequencies of 245 days per year for a resident (365 days per year – 120 days per year snow cover) and 160 days per year for a commercial worker (365 days per year -120 days per year snow cover – 21 days per year vacation/sick leave x 5/7 days per week). The table below presents the exposure frequencies applied for the trespasser and recreational user using the same approach applied by the MDEQ for the resident and commercial worker.

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[2] U.S. EPA, 2012. Recommendations for Default Value for Relative Bioavailability of Arsenic in Soil, OSWER 9200.1-113, December 2012.
[3] U.S. EPA, 2004. U.S. EPA Risk Assessment Guidance for Superfund (RAGS): Volume 1 Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), EPA/540/R/99/005, July 2004.
[4] MDEQ, 2012. Operational Memoranda for the Remediation and Redevelopment Division: Part 201 Cleanup Criteria and Part 213 Risk Based Screening Levels. September 2012.

Exposure Assumption	*Trespasser (1)*	*Recreational User (2)*
Exposure Frequency – Ingestion/Inhalation	50	70
Exposure Frequency - Dermal	34	48

Notes:

(1) The basis for the Exposure Frequency is the 50th percentile from Table 16-1, Recommended Values for Activity Factors – Time Outdoors (total) from U.S. EPA (2008)[5]. ***Ingestion/Inhalation***: the time spent outdoors for 11 to 16 year olds of 100 minutes/day out of a possible 365 days equates to 25 days (100 minutes/day x 365 days x 1 hour/60 minutes x 1 day/24 hours). The final exposure frequency is double the 50th percentile value, or 50 days. ***Dermal***: the time spent outdoors for 11 to 16 year olds of 100 minutes/day out of a possible 245 days (365 days per year – 120 days snow cover) equates to 17 days (100 minutes/day x 245 days x 1 hour/60 minutes x 1 day/24 hours). The final exposure frequency is double the 50th percentile value, or 34 days.

(2) The basis for the exposure frequency is the 50th percentile from Table 16-1, Recommended Values for Activity Factors – Time Outdoors (total) from U.S. EPA (2008). ***Ingestion/Inhalation***: the time spent outdoors for 6 to 12 month olds of 139 minutes/day out of a possible 365 days equates to 35 days (139 minutes/day x 365 days x 1 hour/60 minutes x 1 day/24 hours). The final exposure frequency is double the 50th percentile value, or 70 days. ***Dermal***: the time spent outdoors for 6 to 12 month olds of 139 minutes/day out of a possible 245 days (365 days per year – 120 days snow cover) equates to 24 days (139 minutes/day x 245 days x 1 hour/60 minutes x 1 day/24 hours). The final exposure frequency is double the 50th percentile value, or 48 days. It is assumed that the adult will spend the same amount of time outdoors with their child.

The exposure frequencies for the utility worker and construction worker were unchanged from those applied in the RI Report, given the fact that utility worker and construction worker activities could occur any time during the year regardless of the weather.

2.3 Toxicity Values

The toxicity values that were applied in the equations presented above for the derivation of the RBCs are the same as those applied in the RI Report.

2.4 Summary of Risk-Based Concentrations

The anticipated future use scenarios based on the current redevelopment plan for the Site consists of the following 11 Redevelopment Areas:

- Residential Area 1
- Residential Area 2
- Residential Area 3
- Residential Area 4
- Waterfront Plaza
- Mixed Residential/Commercial Area 1
- Mixed Residential/Commercial Area 2
- Commercial Area 1

[5] U.S. EPA, 2008. Child-Specific Exposure Factors Handbook, September 2008.

- Commercial Area 2
- Commercial Area 3
- Commercial Area 4

A RBC was selected for each area representing the minimum calculated RBC for all receptors (for the most sensitive receptor) that could potentially be present within that area. All potential receptors could be present at Residential Areas 1 through 4 and Mixed Residential/Commercial Areas 1 and 2. All potential receptors, except residents and recreational users could be present at Commercial Areas 1 through 4. All potential receptors, except residents, could be present at Waterfront Plaza.

The calculated RBCs for arsenic in soil are presented in the following tables:

Receptor	***Table Reference***
Trespasser	Table 3
Recreational User	Table 4
Resident	Table 5
Commercial Worker	Table 6
Utility Worker	Table 7
Construction Worker	Table 8

Table 9 presents a summary of the calculated RBCs for each receptor at target cancer risk levels of 10^{-4}, 10^{-5}, and 10^{-6}, respectively, and a target hazard quotient of 1.0.

The proposed RBCs for each area of redevelopment are presented in the table below. These RBCs are based on the most sensitive receptor that is present within these areas, and target cancer risk range of 10^{-6} to 10^{-4} and target hazard quotient of 1.0. It should be noted that the calculated arsenic RBCs based on a cancer risk of 10^{-5} and 10^{-6} are below the Part 201 GCC for arsenic based on direct contact (7.6 µg/g for residential land use and 37 µg/g for non-residential land use) and the calculated arsenic RBCs based on a cancer risk of 10^{-6} are below the Part 201 Statewide Default Background Level (SDBL) (5.8 µg/g).

Redevelopment Area	***Arsenic RBC (µg/g)***		
	Cancer Risk = 10^{-4} Hazard Quotient = 1	***Cancer Risk = 10^{-5} Hazard Quotient = 1***	***Cancer Risk = 10^{-6} Hazard Quotient = 1***
Residential Area 1	36	6.4	0.64
Residential Area 2	36	6.4	0.64
Residential Area 3	36	6.4	0.64
Residential Area 4	36	6.4	0.64
Waterfront Plaza	178	27	2.7
Mixed Residential/Commercial Area 1	36	6.4	0.64
Mixed Residential/Commercial Area 2	36	6.4	0.64
Commercial Area 1	267	27	2.7
Commercial Area 2	267	27	2.7
Commercial Area 3	267	27	2.7
Commercial Area 4	267	27	2.7

The sections below compare the surface soil and soil (surface and subsurface) exposure point concentrations (EPCs) to the RBCs calculated for arsenic at each cancer risk level. Those areas with EPCs greater than the RBCs will require further action (management or remediation) to ensure protection of human receptors from direct contact exposure to soil. Those areas with EPCs less than the RBCs will require no further action with respect to direct contact with soil. The EPC for each area is based on the 95 percent upper confidence limit (UCL) of the mean, which is calculated using U.S. EPA's ProUCL 5.0 statistical software. It should be noted that the EPCs calculated in the RI Report were based on a previous version of ProUCL (Version 4.1) that was current at that time; however, subsequently U.S. EPA have published an updated version of ProUCL (as of September 2013), which was applied within this document. Given the low sample numbers available for Waterfront Plaza, soil samples collected adjacent to Waterfront Plaza and within Residential Areas 3 and 4 were combined to form the Waterfront Plaza soil dataset to permit evaluation of soil exposure within this Redevelopment Area.

2.4.1 Arsenic RBC (Cancer Risk = 10^{-4}; Hazard Quotient = 1)

The table below presents a comparison of the arsenic EPC to the calculated arsenic RBC for each redevelopment area. The calculated RBC is based on a cancer risk of 1 x 10^{-4} and hazard quotient of 1.

Redevelopment Area	***EPC (µg/g)***		***Arsenic RBC (Cancer Risk = 10^{-4} and Hazard Quotient = 1) (µg/g)***
	Surface Soil	***Soil (Surface and Subsurface)***	
Residential Area 1	7.382	10.21	36
Residential Area 2	8.751	8.7	36
Residential Area 3	11.16	13.05	36
Residential Area 4	9.391	12.3	36
Waterfront Plaza	69.28	18.13	178
Mixed Residential/Commercial Area 1	8.111	11.02	36
Mixed Residential/Commercial Area 2	19.31	**47.39**	36
Commercial Area 1	7.361	7.234	267
Commercial Area 2	9.947	13.33	267
Commercial Area 3	12.24	9.59	267
Commercial Area 4	19.38	16.68	267

Notes:
Bold and Shading: EPC exceeds the arsenic RBC

Based on the information presented in the above table, only one Redevelopment Area (Mixed Residential/Commercial Area 2) requires further action to mitigate potential exposure to arsenic through direct contact with soil. Using an iterative approach, specific soil sampling locations containing the highest concentrations of arsenic from this Redevelopment Area were removed from the soil dataset used to calculate the EPC until the EPC met the RBC. The results of this analysis are presented in the table below for Mixed Residential/Commercial Area 2.

Mixed Residential/Commercial Area 2				
Original EPC (µg/g)	*Soil Locations Removed*		*Revised EPC (µg/g)*	*Arsenic RBC (Cancer Risk = 10^{-4} and Hazard Quotient = 1) (µg/g)*
	Location	*Arsenic Concentration (µg/g)*		
Soil (Surface and Subsurface)				
47.39	SB-232 (6-8 ft BGS)	804	18.44	36

Notes:
ft BGS: feet below ground surface

As indicated in the above table, removal of one soil location reduced the arsenic surface and subsurface soil EPC from 47.39 to 18.44 µg/g, which is below the arsenic RBC based on a cancer risk of 10^{-4}.

2.4.2 Arsenic RBC (Cancer Risk = 10^{-5}; Hazard Quotient = 1)

The table below presents a comparison of the arsenic EPC to the calculated arsenic RBC for each redevelopment area. The calculated RBC is based on a cancer risk of 1 x 10^{-5} and hazard quotient of 1.

Redevelopment Area	*EPC (µg/g)*		*Arsenic RBC (Cancer Risk = 10^{-5} and Hazard Quotient = 1) (µg/g)*
	Surface Soil	*Soil (Surface and Subsurface)*	
Residential Area 1	**7.382**	**10.21**	6.4
Residential Area 2	**8.751**	**8.7**	6.4
Residential Area 3	**11.16**	**13.05**	6.4
Residential Area 4	**9.391**	**12.3**	6.4
Waterfront Plaza	**69.28**	18.13	27
Mixed Residential/Commercial Area 1	**8.111**	**11.02**	6.4
Mixed Residential/Commercial Area 2	**19.31**	**47.39**	6.4
Commercial Area 1	7.361	7.234	27
Commercial Area 2	9.947	13.33	27
Commercial Area 3	12.24	9.59	27
Commercial Area 4	19.38	16.68	27

Notes:
Bold and Shading: EPC exceeds the arsenic RBC

Based on the information presented in the above table, all Redevelopment Areas, with the exception of Commercial Areas 1 through 4 require further action to mitigate potential exposure to arsenic through direct contact with soil. Using an iterative approach, specific soil sampling locations containing the highest concentrations of arsenic from these Redevelopment Areas were removed from the soil datasets used to calculate the EPCs until the EPCs met the RBC. The results of this analysis are presented in Table 10 for each Redevelopment Area.

The Part 201 GCC for arsenic based on direct contact are 7.6 µg/g for residential land use and 37 µg/g for non-residential land use, which are higher in comparison to the arsenic RBCs calculated in this memorandum (residential = 6.4 µg/g; commercial = 27 µg/g) using the same target cancer risk (10^{-5}) and hazard quotient (1). Therefore, the iterative approach was also conducted using the Part 201 GCC.

The table below presents a comparison of the arsenic EPC to the Part 201 GCC for each redevelopment area. The MDEQ GCC is based on a cancer risk of 1 x 10^{-5} and hazard quotient of 1.

Redevelopment Area	***EPC (µg/g)***		***Part 201 GCC (µg/g)***
	Surface Soil	***Soil (Surface and Subsurface)***	
Residential Area 1	7.382	**10.71**	7.6
Residential Area 2	**8.751**	**8.7**	7.6
Residential Area 3	**11.16**	**13.05**	7.6
Residential Area 4	**9.391**	**12.3**	7.6
Waterfront Plaza	69.28 (34.7) (1)	18.13	37
Mixed Residential/Commercial Area 1	**8.111**	**11.02**	7.6
Mixed Residential/Commercial Area 2	**19.31**	**47.39**	7.6
Commercial Area 1	7.361	7.234	37
Commercial Area 2	9.947	13.33	37
Commercial Area 3	12.24	9.59	37
Commercial Area 4	19.38	16.68	37

Notes:
Bold and Shading: EPC exceeds the Part 201 GCC
(1) The calculated EPC is greater than the maximum detected concentration of 34.7 µg/g for surface and subsurface soil due to the low sample numbers. Given that the Part 201 GCC is greater than the maximum detected concentration, no locations need to be removed.

Based on the information presented in the above table, all Redevelopment Areas, with the exception of Waterfront Plaza and Commercial Areas 1 through 4 require further action to mitigate potential exposure to arsenic through direct contact with soil. Using an iterative approach, specific soil sampling locations containing the highest concentrations of arsenic from these Redevelopment Areas were removed from the soil datasets used to calculate the EPCs until the EPCs met the MDEQ GCC. The results of this analysis are presented in Table 11 for each Redevelopment Area.

2.4.3 Arsenic RBC (Cancer Risk = 10^{-6}; Hazard Quotient = 1)

The table below presents a comparison of the arsenic EPC to the calculated arsenic RBC for each development area. The calculated RBC is based on a cancer risk of 1 x 10^{-6} and hazard quotient of 1.

Development Area	***EPC (µg/g)***		***Arsenic RBC (Cancer Risk = 10^{-6} and Hazard Quotient = 1) (µg/g)***
	Surface Soil	***Soil (Surface and Subsurface)***	
Residential Area 1	**7.382**	**10.21**	0.64
Residential Area 2	**8.751**	**8.7**	0.64
Residential Area 3	**11.16**	**13.05**	0.64
Residential Area 4	**9.391**	**12.3**	0.64
Waterfront Plaza	**69.28**	**18.13**	2.7
Mixed Residential/Commercial Area 1	**8.111**	**11.02**	0.64
Mixed Residential/Commercial Area 2	**19.31**	**47.39**	0.64
Commercial Area 1	**7.361**	**7.234**	2.7
Commercial Area 2	**9.947**	**13.33**	2.7
Commercial Area 3	**12.24**	**9.59**	2.7
Commercial Area 4	**19.38**	**16.68**	2.7

Notes:
Bold and Shading: EPC exceeds the arsenic RBC

Based on the information presented in the above table, all Redevelopment Areas require further action to mitigate potential exposure to arsenic through direct contact with soil. The calculated arsenic RBCs for both residential and non-residential land use based on a cancer risk of 1 x 10^{-6} are extremely low, and below the Part 201 SDBL of 5.8 µg/g. Virtually all soil sampling locations within each Redevelopment Area would need to be removed to meet the arsenic RBCs based on a cancer risk of 1 x 10^{-6}, and; therefore, the iterative approach was not conducted for this scenario. However, given that the calculated RBCs based on a cancer risk of 1 x 10^{-6} are below the Part 201 SDBL, the iterative approach was conducted using the Part 201 SDBL. The results of this analysis are presented in Table 12 for each Redevelopment Area.

TABLES

TABLE 1

DERIVATION OF PARTICULATE EMISSION FACTOR (PEF) FOR SOIL
CURRENT/ FUTURE UTILITY WORKER INHALATION EXPOSURE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

$$PEF_{SC} = Q/C_{sr} \times 1/F_D \times [(T \times A_R) / (556 \times ((W/3)^{0.4} \times ((365\ d/y - p) / 365\ d/y) \times VKT)]$$

$$Q/C_{sr} = A \times EXP [(\ln A_s - B)^2 / C]$$

INPUT PARAMETERS		*REFERENCE*
PEF_{sc}/ subchronic road particulate emission factor (m^3/kg) =	**2.39E+09**	Equation 5-5, U.S. EPA, 2002
Q/C_{sr}/ inverse of ratio of the 1-h geometric mean air concentration =	23.02	Equation 5-6, U.S. EPA, 2002
A/ constant (unitless) =	12.9351	U.S. EPA, 2002
B/ constant (unitless) =	5.7383	U.S. EPA, 2002
C/ constant (unitless) =	71.7711	U.S. EPA, 2002
A_s/ areal extent of site surface soil contamination (acres) =	0.5	U.S. EPA, 2002
F_D/ dispersion correction factor (unitless) =	0.185	U.S. EPA, 2002
T/ exposure interval (s) =	7.88E+08	U.S. EPA, 2002 (site-specific, within 25 year duration)
A_R/ surface area of contaminated road segment (m^2) =	274	U.S. EPA, 2002 (AR = LR*WR*0.092903 m2/ft2)
LR - length of road segment (ft) =	148	U.S. EPA, 2002
WR - width of road segment (ft) =	20	U.S. EPA, 2002
W/ mean vehicle weight (tons) =	8	U.S. EPA, 2002, Assumes 20 two-ton cars and 10 twenty-ton trucks (W = (20*2+10*20)/30)
p/ number of days with at least 0.01 inches of precipitation (days/yr) =	180	U.S. EPA, 2002
VKT/ sum of fleet vehicle kilometres travelled during the exposure duration (km) =	27.0	Assuming that the area is configured as a square with the unpaved construction access road segment dividing the square evenly, the road length would be equal to the square root of 2023.5 m^2, also equal to 45 m or 0.045 km. Assuming that each vehicle travels the length of the road for a total of 20 days, (30*0.045*20).

Reference:

U.S. EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.

TABLE 2

DERIVATION OF PARTICULATE EMISSION FACTOR (PEF) FOR SOIL
FUTURE CONSTRUCTION WORKER INHALATION EXPOSURE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

$$PEF_{SC} = Q/C_{sr} \times 1/F_D \times [(T \times A_R) / (556 \times ((W/3)^{0.4} \times ((365\ d/y - p) / 365\ d/y) \times VKT)]$$

$$Q/C_{sr} = A \times EXP [(\ln A_s - B)^2 / C]$$

INPUT PARAMETERS		*REFERENCE*
PEF_{sc}/ subchronic road particulate emission factor (m^3/kg) =	**1.59E+07**	Equation 5-5, U.S. EPA, 2002
Q/C_{sr}/ inverse of ratio of the 1-h geometric mean air concentration =	23.02	Equation 5-6, U.S. EPA, 2002
A/ constant (unitless) =	12.9351	U.S. EPA, 2002
B/ constant (unitless) =	5.7383	U.S. EPA, 2002
C/ constant (unitless) =	71.7711	U.S. EPA, 2002
A_s/ areal extent of site surface soil contamination (acres) =	0.5	U.S. EPA, 2002
F_D/ dispersion correction factor (unitless) =	0.185	U.S. EPA, 2002
T/ total time over which construction occurs (s) =	3.15E+07	U.S. EPA, 2002 (site-specific, within a 1 year construction campaign)
A_R/ surface area of contaminated road segment (m^2) =	274	U.S. EPA, 2002 (AR = LR*WR*0.092903 m2/ft2)
LR - length of road segment (ft) =	148	U.S. EPA, 2002
WR - width of road segment (ft) =	20	U.S. EPA, 2002
W/ mean vehicle weight (tons) =	8	U.S. EPA, 2002, Assumes 20 two-ton cars and 10 twenty-ton trucks (W = (20*2+10*20)/30)
p/ number of days with at least 0.01 inches of precipitation (days/yr) =	180	U.S. EPA, 2002
VKT/ sum of fleet vehicle kilometres travelled during the exposure duration (km) =	162	Assuming that the area is configured as a square with the unpaved construction access road segment dividing the square evenly, the road length would be equal to the square root of 2023.5 m^2, also equal to 45 m or 0.045 km. Assuming that each vehicle travels the length of the road once per day, 5 days per week for a total of 120 days, (30*0.045*120).

Reference:

U.S. EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.

TABLE 3

DERIVATION OF RISK-BASED CONCENTRATIONS (RBCs) FOR SOIL - TRESPASSER ORAL, DERMAL, AND INHALATION EXPOSURE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Chemical of Potential Concern	CSF oral 1/(mg/kg-d)	CSF dermal 1/(mg/kg-d)	URF inhalation 1/(mg/m^3)	RfD oral (mg/kg-d)	RfD dermal (mg/kg-d)	RfC inhalation (mg/m^3)	Oral Absorption Factor, ABS_o (%/100)	Dermal Absorption Factor, ABS_d (%/100)	Trespasser Carcinogen TR Adolescent (µg/g)	Trespasser Non-Carcinogen THQ Adolescent (µg/g)	Soil Risk-Based Concentration RBC_{soil} (1) (µg/g)
Metals											
Arsenic (10^{-4} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.0E-01	3.0E-02	1.96E+03	1.26E+03	1,258
Arsenic (10^{-5} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.0E-01	3.0E-02	1.96E+02	1.26E+03	196
Arsenic (10^{-6} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.0E-01	3.0E-02	1.96E+01	1.26E+03	20

Notes:

-- = Not Available

NV = No Value

(1) The selected RBC is the lower of the carcinogenic-based concentration and the non-carcinogenic-based concentration.

(2) The basis for SA is assuming that potential exposed skin (U.S. EPA Exhibit C-1) consists of the face (425 cm^2), hands (700 cm^2), forearms (787 cm^2), lower legs (1610 cm^2) and feet (949 cm^2).

(3) The basis for the FT is the 50th percentile from Table 16-1, Recommended Values for Activity Factors - Time Outdoors (total). The time spent outdoors for 11-16 years old of 100 min/day equates to 1.7 hours (100 min/60 min). The final FT is double the 50th percentile value or 3.4 hours.

(4) The basis for the EF is the 50th percentile from Table 16-1, Recommended Values for Activity Factors - Time Outdoors (total).
Ingestion/Inhalation: The time spent outdoors for 11-16 years old of 100 min/day out of a possible 365 days equates to 25 days (CT) (100 min/day x 365 days x 1 hour/60 min x 1 day/24 hours). The final EF is double the 50th percentile value or 50 days.
Dermal: the time spent outdoors for 11-16 years old of 100 min/day out of a possible 245 days equates to 17 days (CT) (100 min/day x 365 days x 1 hour/60 min x 1 day/24 hours). The final EF is double the 50th percentile value or 34 days.

(5) Trespasser is a 7 through 16 year old therefore the exposure duration is 10 years, based on U.S. EPA Region 4 (2000).

Trespasser Assumptions

Risk-Based Concentration in Soil (µg/g)	RBC_{soil}	calculated	
Target Cancer Risk (unitless)	TR	1.0E-04	
Target Cancer Risk (unitless)	TR	1.0E-05	
Target Cancer Risk (unitless)	TR	1.0E-06	
Target Hazard Quotient (unitless)	THQ	1.0	
Cancer Slope Factor (per mg/kg-day)	CSF	chemical-specific	IRIS
Reference Dose (mg/kg-day)	RfD	chemical-specific	IRIS
Unit Risk Factor (per mg/m^3)	URF	chemical-specific	IRIS
Reference Concentration (mg/m^3)	RfC	chemical-specific	U.S. EPA RSL Table
Ingestion Rate (mg/day) - adult	IR	100	U.S. EPA, 2002
Surface Area Exposed (cm^2/day)	SA	4,471	U.S. EPA, 2004 (2)
Adherence Factor (mg/cm^2)	AF	0.2	U.S. EPA, 2004
Absorption Factor - Oral (%/100)	ABS_o	chemical-specific	see Section 2.2 of the Memorandum
Absorption Factor - Dermal (%/100)	ABS_d	chemical-specific	U.S. EPA, 2004
Fraction Time Exposed (hours/24 hours)	FT	3.4/24	U.S. EPA, 2008 (3)
Exposure Frequency (days/year) - ingestion/inhalation	EFa	50	see Section 2.2 of the Memorandum (4)
Exposure Frequency (days/year) - dermal	EFb	34	see Section 2.2 of the Memorandum (4)
Exposure Duration (years)	ED	10	U.S. EPA, 2000 (5)
Body Weight (kg)	BW	45	U.S. EPA, 2000
Conversion Factor (kg/mg)	CF	1.0E-06	
Averaging Time - carcinogenic (days)	ATc	25,550	U.S. EPA, 1989
Averaging Time - non-carcinogenic (days)	ATnc	3,650	U.S. EPA, 1989
Particulate Emission Factor (m^3/kg)	PEF	1.36E+09	U.S. EPA, 2002

Exposure Equations

Carcinogenic Endpoints:

$$RBC_{soil} = \frac{TR \times ATc}{ED \times [(CSF \times IR \times EFa \times CF \times ABS_o)/BW + (CSF \times SA \times AF \times EFb \times CF \times ABS_d)/BW + (URF \times EFa \times FT \times (1/PEF))]}$$

Non-Carcinogenic Endpoints:

$$RBC_{soil} = \frac{THQ \times ATnc}{ED \times [((1/RfD) \times IR \times EFa \times CF \times ABS_o)/BW + ((1/RfD) \times SA \times AF \times EFb \times CF \times ABS_d)/BW + ((1/RfC) \times EFa \times FT \times (1/PEF))]}$$

References:

IRIS, Integrated Risk Information System (IRIS) Database, (http://cfpub.epa.gov/ncea/iris/index.cfm?fuseaction=iris.showSubstanceList).

U.S. EPA RSL Table, U.S. EPA Regional Screening Levels Summary Table, November 2013.

U.S. EPA, 1989: Risk Assessment Guidance for Superfund (RAGS): Volume 1 – Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, December 1989.

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U.S. EPA, 2004: Risk Assessment Guidance for Superfund (RAGS):Volume 1 - Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), EPA/540/R/99/005, July 2004.

U.S. EPA, 2008: Child Specific Exposure Factors Handbook, September 2008.

TABLE 4

DERIVATION OF RISK-BASED CONCENTRATIONS (RBCs) FOR SOIL - RECREATIONAL USER ORAL, DERMAL, AND INHALATION EXPOSURE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Chemical of Potential Concern (COPC)	*CSF oral 1/(mg/kg-d)*	*CSF dermal 1/(mg/kg-d)*	*URF inhalation 1/(mg/m^3)*	*RfD oral (mg/kg-d)*	*RfD dermal (mg/kg-d)*	*RfC inhalation (mg/m^3)*	*Oral Absorption Factor, ABS$_o$ (%/100)*	*Dermal Absorption Factor, ABS$_d$ (%/100)*	*Recreational User TR Child & Adult (µg/g)*	*Recreational User THQ Child (µg/g)*	*Soil Risk-Based Concentration RBC$_{soil}$ (1) (µg/g)*
Metals											
Arsenic (10^{-4} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.0E-01	3.0E-02	3.20E+02	1.78E+02	178
Arsenic (10^{-5} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.0E-01	3.0E-02	3.20E+01	1.78E+02	32
Arsenic (10^{-6} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.0E-01	3.0E-02	3.20E+00	1.78E+02	3.2

Notes:

(1) The selected RBC is the lower of the carcinogenic-based concentration and the non-carcinogenic-based concentration.

(2) The basis for the EF is the 50th percentile from Table 16-1, Recommended Values for Activity Factors - Time Outdoors (total).
Ingestion/Inhalation: The time spent outdoors for 6-12 month olds of 139 min/day out of a possible 365 days equates to 35 days (CT) (139 min/day x 365 days x 1 hour/60 min x 1 day/24 hours).
The final EF is double the 50th percentile value or 70 days.
Dermal: the time spent outdoors for 6-12 month olds of 139 min/day out of a possible 245 days equates to 24 days (CT) (139 min/day x 365 days x 1 hour/60 min x 1 day/24 hours).
The final EF is double the 50th percentile value or 48 days.

(3) The basis for the FT is based on ages 3-5 yrs from Table 16-1, Recommended Values for Activity Factors - Time Outdoors Playing on Dirt.
It is assumed that the adult will spend the same amount of time outdoors with their child.

Recreational User Exposure Assumptions

Risk-Based Concentration in Soil (µg/g)	RBC_{soil}	calculated	
Target Cancer Risk (unitless)	TR	1.0E-04	
Target Cancer Risk (unitless)	TR	1.0E-05	
Target Cancer Risk (unitless)	TR	1.0E-06	
Target Hazard Quotient (unitless)	THQ	1.0	
Cancer Slope Factor (per mg/kg-day)	CSF	chemical-specific	IRIS
Reference Dose (mg/kg-day)	RfD	chemical-specific	IRIS
Unit Risk Factor (per mg/m^3)	URF	chemical-specific	IRIS
Reference Concentration (mg/m^3)	RfC	chemical-specific	U.S. EPA RSL Table
Ingestion Rate (mg/day) - child	IR_c	200	U.S. EPA, 2002
Ingestion Rate (mg/day) - adult	IR_a	100	U.S. EPA, 2002
Surface Area Exposed (cm^2/day) - child	SA_c	2,800	U.S. EPA, 2004
Surface Area Exposed (cm^2/day) - adult	SA_a	5,700	U.S. EPA, 2004
Adherence Factor (mg/cm^2) - child	AF_c	0.2	U.S. EPA, 2004
Adherence Factor (mg/cm^2) - adult	AF_a	0.07	U.S. EPA, 2004
Absorption Factor - Oral (%/100)	ABS_o	chemical-specific	see Section 2.2 of the Memorandum
Absorption Factor - Dermal (%/100)	ABS_d	chemical-specific	U.S. EPA, 2004
Exposure Frequency (days/year) - ingestion/inhalation	EFa	70	see Section 2.2 of the Memorandum (2)
Exposure Frequency (days/year) - dermal	EFb	48	see Section 2.2 of the Memorandum (2)
Exposure Duration (years) - child	ED_c	6	U.S. EPA, 2004
Exposure Duration (years) - adult	ED_a	24	U.S. EPA, 2004
Fraction Time Exposed (hours/24 hours)	FT	2/24	U.S. EPA, 2008 (3)
Body Weight (kg) - child	BW_c	15	U.S. EPA, 2008
Body Weight (kg) - adult	BW_a	70	U.S. EPA, 2002
Conversion Factor (kg/mg)	CF	1.0E-06	
Averaging Time - carc. (days)	ATc	25,550	U.S. EPA, 1989
Averaging Time - noncarc. (days) - child	ATnc	2,190	U.S. EPA, 1989
Averaging Time - noncarc. (days) - adult	ATnc - a	8,760	U.S. EPA, 1989
Particulate Emission Factor (m^3/kg)	PEF	1.36E+09	U.S. EPA, 2002

Exposure Equations

Carcinogenic Endpoints:

$$RBC_{soil} = \frac{TR \times ATc}{[(((CSF \times IR_c \times EFa \times ED_c \times CF \times ABS_o)/BW_c + (CSF \times SA_c \times AF_c \times EFb \times ED_c \times CF \times ABS_d)/BW_c + (URF \times FT \times EFa \times ED_c \times (1/PEF))) + (((CSF \times IR_a \times EFa \times ED_a \times CF \times ABS_o)/BWa + (CSF \times SA_a \times AF_a \times EFb \times ED_a \times CF \times ABS_d)/BW_a) + (URF \times FT \times EFa \times ED_a \times (1/PEF))]}$$

Non-Carcinogenic Endpoints:

$$RBC_{soil} = \frac{THQ \times ATnc}{ED_c \times [(((1/RfD) \times IR_c \times EFa \times CF \times ABS_o)/BW_c + ((1/RfD) \times SA_c \times AF_c \times EFb \times CF \times ABS_d)/BW_c + ((1/RfC) \times FT \times EFa \times (1/PEF))]}$$

References:

IRIS, Integrated Risk Information System (IRIS) Database, (http://cfpub.epa.gov/ncea/iris/index.cfm?fuseaction=iris.showSubstanceList).

U.S. EPA RSL Table, U.S. EPA Regional Screening Levels Summary Table, November 2013.

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U.S. EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.

U.S. EPA, 2004: Risk Assessment Guidance for Superfund (RAGS):Volume 1 - Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), EPA/540/R/99/005, July 2004.

U.S. EPA, 2008: Child Specific Exposure Factors Handbook, September 2008.

TABLE 5

DERIVATION OF RISK-BASED CONCENTRATIONS (RBCs) FOR SOIL - RESIDENTIAL ORAL, DERMAL, AND INHALATION EXPOSURE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Chemical of Potential Concern (COPC)	*CSF oral 1/(mg/kg-d)*	*CSF dermal 1/(mg/kg-d)*	*URF inhalation 1/(mg/m³)*	*RfD oral (mg/kg-d)*	*RfD dermal (mg/kg-d)*	*RfC inhalation (mg/m³)*	*Oral Absorption Factor, ABS_o (%/100)*	*Dermal Absorption Factor, ABS_d (%/100)*	*Resident TR Child & Adult (µg/g)*	*Resident THQ Child (µg/g)*	*Soil Risk-Based Concentration RBC_{soil} (1) (µg/g)*
Metals											
Arsenic (10^{-4} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.0E-01	3.0E-02	6.39E+01	3.56E+01	36
Arsenic (10^{-5} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.0E-01	3.0E-02	6.39E+00	3.56E+01	6.4
Arsenic (10^{-6} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.0E-01	3.0E-02	6.39E-01	3.56E+01	0.64

Notes:

(1) The selected RBC is the lower of the carcinogenic-based concentration and the non-carcinogenic-based concentration.

(2) The basis for the FT is based on ages 3-5 yrs from Table 16-1, Recommended Values for Activity Factors - Time Outdoors Playing on Dirt.

Resident Exposure Assumptions

Risk-Based Concentration in Soil (µg/g)	RBC_{soil}	calculated	
Target Cancer Risk (unitless)	TR	1.0E-04	
Target Cancer Risk (unitless)	TR	1.0E-05	
Target Cancer Risk (unitless)	TR	1.0E-06	
Target Hazard Quotient (unitless)	THQ	1.0	
Cancer Slope Factor (per mg/kg-day)	CSF	chemical-specific	IRIS
Reference Dose (mg/kg-day)	RfD	chemical-specific	IRIS
Unit Risk Factor (per mg/m³)	URF	chemical-specific	IRIS
Reference Concentration (mg/m³)	RfC	chemical-specific	U.S. EPA RSL Table
Ingestion Rate (mg/day) - child	IR_c	200	U.S. EPA, 2002
Ingestion Rate (mg/day) - adult	IR_a	100	U.S. EPA, 2002
Surface Area Exposed (cm²/day) - child	SA_c	2,800	U.S. EPA, 2004
Surface Area Exposed (cm²/day) - adult	SA_a	5,700	U.S. EPA, 2004
Adherence Factor (mg/cm²) - child	AF_c	0.2	U.S. EPA, 2004
Adherence Factor (mg/cm²) - adult	AF_a	0.07	U.S. EPA, 2004
Absorption Factor - Oral (%/100)	ABS_o	chemical-specific	see Section 2.2 of the Memorandum
Absorption Factor - Dermal (%/100)	ABS_d	chemical-specific	U.S. EPA, 2004
Exposure Frequency (days/year) - ingestion/inhalation	EFa	350	see Section 2.2 of the Memorandum
Exposure Frequency (days/year) - dermal	EFb	245	see Section 2.2 of the Memorandum
Exposure Duration (years) - child	ED_c	6	U.S. EPA, 2004
Exposure Duration (years) - adult	ED_a	24	U.S. EPA, 2004
Fraction Time Exposed (hours/24 hours)	FT	2/24	U.S. EPA, 2008 (2)
Body Weight (kg) - child	BW_c	15	U.S. EPA, 2008
Body Weight (kg) - adult	BW_a	70	U.S. EPA, 2002
Conversion Factor (kg/mg)	CF	1.0E-06	
Averaging Time - carc. (days)	ATc	25,550	U.S. EPA, 1989
Averaging Time - noncarc. (days) - child	ATnc	2,190	U.S. EPA, 1989
Averaging Time - noncarc. (days) - adult	ATnc - a	8,760	U.S. EPA, 1989
Particulate Emission Factor (m³/kg)	PEF	1.36E+09	U.S. EPA, 2002

Exposure Equations

Carcinogenic Endpoints:

$$RBC_{soil} = \frac{TR \times ATc}{[(((CSF \times IR_c \times EFa \times ED_c \times CF \times ABS_o)/BW_c + (CSF \times SA_c \times AF_c \times EFb \times ED_c \times CF \times ABS_d)/BW_c + (URF \times FT \times EFa \times ED_c \times (1/PEF))) + (((CSF \times IR_a \times EFa \times ED_a \times CF \times ABS_o)/BW_a + (CSF \times SA_a \times AF_a \times EFb \times ED_a \times CF \times ABS_d)/BW_a) + (URF \times FT \times EFa \times ED_a \times (1/PEF))]}$$

Non-Carcinogenic Endpoints:

$$RBC_{soil} = \frac{THQ \times ATnc}{ED_c \times [(((1/RfD) \times IR_c \times EFa \times ABS_o)/BW_c + ((1/RfD) \times SA_c \times AF_c \times EFb \times CF \times ABS_d)/BW_c + ((1/RfC) \times EFa \times FT \times (1/PEF))]}$$

References:

IRIS, Integrated Risk Information System (IRIS) Database, (http://cfpub.epa.gov/ncea/iris/index.cfm?fuseaction=iris.showSubstanceList).

U.S. EPA RSL Table, U.S. EPA Regional Screening Levels Summary Table, November 2013.

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U.S. EPA, 2004: Risk Assessment Guidance for Superfund (RAGS):Volume 1 - Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), EPA/540/R/99/005, July 2004.

U.S. EPA, 2008: Child Specific Exposure Factors Handbook, September 2008.

TABLE 6

DERIVATION OF RISK-BASED CONCENTRATIONS (RBCs) FOR SOIL - COMMERCIAL WORKER ORAL, DERMAL, AND INHALATION EXPOSURE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Chemical of Potential Concern	*CSF oral 1/(mg/kg-d)*	*CSF dermal 1/(mg/kg-d)*	*URF inhalation 1/(mg/m³)*	*RfD oral (mg/kg-d)*	*RfD dermal (mg/kg-d)*	*RfC inhalation (mg/m³)*	*Oral Absorption Factor, ABS_o (%/100)*	*Dermal Absorption Factor, ABS_d (%/100)*	*Commercial Worker Carcinogen TR Adult (µg/g)*	*Commercial Worker Non-Carcinogen THQ Adult (µg/g)*	*Soil Risk-Based Concentration RBC_{soil} (1) (µg/g)*
Metals											
Arsenic (10^{-4} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.00E-01	3.0E-02	2.67E+02	4.27E+02	267
Arsenic (10^{-5} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.00E-01	3.0E-02	2.67E+01	4.27E+02	27
Arsenic (10^{-6} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.00E-01	3.0E-02	2.67E+00	4.27E+02	2.7

Notes:

(1) The selected RBC is the lower of the carcinogenic-based concentration and the non-carcinogenic-based concentration.

(2) Professional Judgment; assumed 8 hour work day.

Commercial Worker Assumptions

Risk-Based Concentration in Soil (µg/g)	RBC_{soil}	calculated	
Target Cancer Risk (unitless)	TR	1.0E-04	
Target Cancer Risk (unitless)	TR	1.0E-05	
Target Cancer Risk (unitless)	TR	1.0E-06	
Target Hazard Quotient (unitless)	THQ	1.0	
Cancer Slope Factor (per mg/kg-day)	CSF	chemical-specific	IRIS
Reference Dose (mg/kg-day)	RfD	chemical-specific	IRIS
Unit Risk Factor (per mg/m³)	URF	chemical-specific	IRIS
Reference Concentration (mg/m³)	RfC	chemical-specific	U.S. EPA RSL Table
Ingestion Rate (mg/day) - adult	IR	100	U.S. EPA, 2002
Surface Area Exposed (cm²/day)	SA	3,300	U.S. EPA, 2004
Adherence Factor (mg/cm²)	AF	0.2	U.S. EPA, 2004
Absorption Factor - Oral (%/100)	ABS_o	chemical-specific	see Section 2.2 of the Memorandum
Absorption Factor - Dermal (%/100)	ABS_d	chemical-specific	U.S. EPA, 2004
Fraction Time Exposed (hours/24 hours)	FT	8/24	Professional Judgement (2)
Exposure Frequency (days/year) - ingestion/inhalation	EFa	245	see Section 2.2 of the Memorandum
Exposure Frequency (days/year) - dermal	EFb	160	see Section 2.2 of the Memorandum
Exposure Duration (years)	ED	25	U.S. EPA, 2004
Body Weight (kg)	BW	70	U.S. EPA, 2002
Conversion Factor (kg/mg)	CF	1.0E-06	
Averaging Time - carcinogenic (days)	ATc	25,550	U.S. EPA, 1989
Averaging Time - non-carcinogenic (days)	ATnc	9,125	U.S. EPA, 1989
Particulate Emission Factor (m³/kg)	PEF	1.36E+09	U.S. EPA, 2002

Exposure Equations

Carcinogenic Endpoints:

$$RBC_{soil} = \frac{TR \times ATc}{ED \times [(CSF \times IR \times EFa \times CF \times ABS_o)/BW + (CSF \times SA \times AF \times EFb \times CF \times ABS_d)/BW + (URF \times EFa \times FT \times (1/PEF))]}$$

Non-Carcinogenic Endpoints:

$$RBC_{soil} = \frac{THQ \times ATnc}{ED \times [((1/RfD) \times IR \times EFa \times CF \times ABS_o)/BW + ((1/RfD) \times SA \times AF \times EFb \times CF \times ABS_d)/BW + ((1/RfC) \times EFa \times FT \times (1/PEF))]}$$

References:

IRIS, Integrated Risk Information System (IRIS) Database, (http://cfpub.epa.gov/ncea/iris/index.cfm?fuseaction=iris.showSubstanceList).

U.S. EPA RSL Table, U.S. EPA Regional Screening Levels Summary Table, November 2013.

U.S. EPA, 1989: Risk Assessment Guidance for Superfund (RAGS): Volume 1 – Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, December 1989.

U.S. EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.

U.S. EPA, 2004: Risk Assessment Guidance for Superfund (RAGS):Volume 1 - Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), EPA/540/R/99/005, July 2004.

TABLE 7

DERIVATION OF RISK-BASED CONCENTRATIONS (RBCs) FOR SOIL - UTILITY WORKER ORAL, DERMAL, AND INHALATION EXPOSURE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Chemical of Potential Concern	*CSF oral 1/(mg/kg-d)*	*CSF dermal 1/(mg/kg-d)*	*URF inhalation 1/(mg/m³)*	*RfD oral (mg/kg-d)*	*RfD dermal (mg/kg-d)*	*RfC inhalation (mg/m³)*	*Oral Absorption Factor, ABS_o (%/100)*	*Dermal Absorption Factor, ABS_d (%/100)*	*Utility Worker Carcinogen TR Adult (µg/g)*	*Utility Worker Non-Carcinogen THQ Adult (µg/g)*	*Soil Risk-Based Concentration RBC_{soil} (1) (µg/g)*
Metals											
Arsenic (10^{-4} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.0E-01	3.0E-02	4.36E+03	2.80E+02	280
Arsenic (10^{-5} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.0E-01	3.0E-02	4.36E+02	2.80E+02	280
Arsenic (10^{-6} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.0E-01	3.0E-02	4.36E+01	2.80E+02	44

Notes:

-- = Not Available

NV = No Value

(1) The selected RBC is the lower of the carcinogenic-based concentration and the non-carcinogenic-based concentration.

(2) Professional Judgement; assumed 8 hour work day.

(3) Professional Judgement; assumes 5 days/week for 6 months or 120 days/year.

(4) Professional Judgement; assumes utility maintenance activities occurs within a one year time period.

Utility Worker Assumptions

Risk-Based Concentration in Soil (µg/g)	RBC_{soil}	calculated	
Target Cancer Risk (unitless)	TR	1.0E-04	
Target Cancer Risk (unitless)	TR	1.0E-05	
Target Cancer Risk (unitless)	TR	1.0E-06	
Target Hazard Quotient (unitless)	THQ	1.0	
Cancer Slope Factor (per mg/kg-day)	CSF	chemical-specific	IRIS
Reference Dose (mg/kg-day)	RfD	chemical-specific	IRIS
Unit Risk Factor (per mg/m³)	URF	chemical-specific	IRIS
Reference Concentration (mg/m³)	RfC	chemical-specific	U.S. EPA RSL Table
Ingestion Rate (mg/day) - adult	IR	330	U.S. EPA, 2002
Surface Area Exposed (cm²/day)	SA	3,300	U.S. EPA, 2004
Adherence Factor (mg/cm²)	AF	0.3	U.S. EPA, 2004
Absorption Factor - Oral (%/100)	ABS_o	chemical-specific	see Section 2.2 of the Memorandum
Absorption Factor - Dermal (%/100)	ABS_d	chemical-specific	U.S. EPA, 2004
Fraction Time Exposed (hours/24 hours)	FT	8/24	Professional Judgement (2)
Exposure Frequency (days/year)	EF	120	Professional Judgement (3)
Exposure Duration (years)	ED	1	Professional Judgement (4)
Body Weight (kg)	BW	70	U.S. EPA, 2002
Conversion Factor (kg/mg)	CF	1.0E-06	
Averaging Time - carcinogenic (days)	ATc	25,550	U.S. EPA, 1989
Averaging Time - non-carcinogenic (days)	ATnc	365	U.S. EPA, 1989
Particulate Emission Factor (m³/kg)	PEF	2.39E+09	U.S. EPA, 2002; See Table 1

Exposure Equations

Carcinogenic Endpoints:

$$RBC_{soil} = \frac{TR \times ATc}{EF \times ED \times [(CSF \times IR \times CF \times ABS_o)/BW + (CSF \times SA \times AF \times CF \times ABS_d)/BW + (URF \times FT \times (1/PEF))]}$$

Non-Carcinogenic Endpoints:

$$RBC_{soil} = \frac{THQ \times ATnc}{EF \times ED \times [((1/RfD) \times IR \times CF \times ABS_o)/BW + ((1/RfD) \times SA \times AF \times CF \times ABS_d)/BW + ((1/RfC) \times FT \times (1/PEF))]}$$

References:

IRIS, Integrated Risk Information System (IRIS) Database, (http://cfpub.epa.gov/ncea/iris/index.cfm?fuseaction=iris.showSubstanceList).

U.S. EPA RSL Table, U.S. EPA Regional Screening Levels Summary Table, November 2013.

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U.S. EPA, 2004: Risk Assessment Guidance for Superfund (RAGS):Volume 1 - Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), EPA/540/R/99/005, July 2004.

TABLE 8

DERIVATION OF RISK-BASED CONCENTRATIONS (RBCs) FOR SOIL - CONSTRUCTION WORKER ORAL, DERMAL, AND INHALATION EXPOSURE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Chemical of Potential Concern	*CSF oral 1/(mg/kg-d)*	*CSF dermal 1/(mg/kg-d)*	*URF inhalation 1/(mg/m³)*	*RfD oral (mg/kg-d)*	*RfD dermal (mg/kg-d)*	*RfC inhalation (mg/m³)*	*Oral Absorption Factor, ABS_o (%/100)*	*Dermal Absorption Factor, ABS_d (%/100)*	*Construction Worker Carcinogen TR Adult (µg/g)*	*Construction Worker Non-Carcinogen THQ Adult (µg/g)*	*Soil Risk-Based Concentration RBC_{soil} (1) (µg/g)*
Metals											
Arsenic (10^{-4} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.0E-01	3.0E-02	1.03E+03	1.49E+03	1,028
Arsenic (10^{-5} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.0E-01	3.0E-02	1.03E+02	1.49E+03	103
Arsenic (10^{-6} cancer risk)	1.50E+00	1.50E+00	4.30E+00	3.00E-04	3.00E-04	1.50E-05	6.0E-01	3.0E-02	1.03E+01	1.49E+03	10.3

Notes:

-- = Not Available

NV = No Value

(1) The selected RBC is the lower of the carcinogenic-based concentration and the non-carcinogenic-based concentration.

(2) Professional Judgement; assumed 8 hour work day.

(3) Professional Judgement; assumes 5 days/week for 1 month or 20 days/year.

Construction Worker Assumptions

Risk-Based Concentration in Soil (µg/g)	RBC_{soil}	calculated	
Target Cancer Risk (unitless)	TR	1.0E-04	
Target Cancer Risk (unitless)	TR	1.0E-05	
Target Cancer Risk (unitless)	TR	1.0E-06	
Target Hazard Quotient (unitless)	THQ	1.0	
Cancer Slope Factor (per mg/kg-day)	CSF	chemical-specific	IRIS
Reference Dose (mg/kg-day)	RfD	chemical-specific	IRIS
Unit Risk Factor (per mg/m³)	URF	chemical-specific	IRIS
Reference Concentration (mg/m³)	RfC	chemical-specific	U.S. EPA RSL Table
Ingestion Rate (mg/day) - adult	IR	330	U.S. EPA, 2002
Surface Area Exposed (cm²/day)	SA	3,300	U.S. EPA, 2004
Adherence Factor (mg/cm²)	AF	0.3	U.S. EPA, 2004
Absorption Factor - Oral (%/100)	ABS_o	chemical-specific	see Section 2.2 of the Memorandum
Absorption Factor - Dermal (%/100)	ABS_d	chemical-specific	U.S. EPA, 2004
Fraction Time Exposed (hours/24 hours)	FT	8/24	Professional Judgement (2)
Exposure Frequency (days/year)	EF	20	Professional Judgement (3)
Exposure Duration (years)	ED	25	U.S. EPA, 2004
Body Weight (kg)	BW	70	U.S. EPA, 2002
Conversion Factor (kg/mg)	CF	1.0E-06	
Averaging Time - carcinogenic (days)	ATc	25,550	U.S. EPA, 1989
Averaging Time - non-carcinogenic (days)	ATnc	9,125	U.S. EPA, 1989
Particulate Emission Factor (m³/kg)	PEF	1.59E+07	U.S. EPA, 2002; see Table 2

Exposure Equations

Carcinogenic Endpoints:

$$RBC_{soil} = \frac{TR \times ATc}{EF \times ED \times [(CSF \times IR \times CF \times ABS_o)/BW + (CSF \times SA \times AF \times CF \times ABS_d)/BW + (URF \times FT \times (1/PEF))]}$$

Non-Carcinogenic Endpoints:

$$RBC_{soil} = \frac{THQ \times ATnc}{EF \times ED \times [((1/RfD) \times IR \times CF \times ABS_o)/BW + ((1/RfD) \times SA \times AF \times CF \times ABS_d)/BW + ((1/RfC) \times FT \times (1/PEF))]}$$

References:

IRIS, Integrated Risk Information System (IRIS) Database, (http://cfpub.epa.gov/ncea/iris/index.cfm?fuseaction=iris.showSubstanceList).

U.S. EPA RSL Table, U.S. EPA Regional Screening Levels Summary Table, November 2013.

U.S. EPA, 1989: Risk Assessment Guidance for Superfund (RAGS): Volume 1 – Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, December 1989.

U.S. EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.

U.S. EPA, 2004: Risk Assessment Guidance for Superfund (RAGS):Volume 1 - Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), EPA/540/R/99/005, July 2004.

TABLE 9

SUMMARY OF RISK-BASED CONCENTRATIONS (RBCs) FOR ARSENIC IN SOIL
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Chemical of Potential Concern (COPC)	*Units*	*Risk-Based Concentration for Soil, RBC_{soil}*						*Minimum RBC_{soil}*		
		Trespasser	*Recreational User*	*Resident*	*Commercial Worker*	*Utility Worker*	*Construction Worker*	*Residential (1)*	*Commercial (2)*	*Commercial+Recreational (3)*
TARGET CANCER RISK = 1.0×10^{-4}; TARGET HAZARD QUOTIENT = 1.0										
Arsenic	µg/g	1,258	178	36	267	280	1,028	36	267	178
TARGET CANCER RISK = 1.0×10^{-5}; TARGET HAZARD QUOTIENT = 1.0										
Arsenic	µg/g	196	32	6.4	27	280	103	6.4	27	27
TARGET CANCER RISK = 1.0×10^{-6}; TARGET HAZARD QUOTIENT = 1.0										
Arsenic	µg/g	20	3.2	0.64	2.7	44	10.3	0.64	2.7	2.7

Notes:
(1) RBC_{soil} for the residential areas include all receptors.
(2) RBC_{soil} for the commercial areas include all receptors, except residents and recreational users.
(3) RBC_{soil} for the commercial+recreational areas include all receptors, except residents.

TABLE 10

LOCATIONS REQUIRING REMOVAL TO MEET THE ARSENIC RBC BASED ON A CANCER RISK = 10^{-5} AND HAZARD QUOTIENT = 1
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	*Depth*	*Original EPC µg/g*	*Soil Locations Removed*		*Revised Arsenic EPC µg/g*	*Arsenic RBC µg/g*
			Location	*Arsenic Concentration µg/g*		
Residential Area 1	Surface Soil	7.382	SB-102 (0-1 ft bgs)	16.2	6.318	6.4
			SB-132 (0-1 ft bgs)	13.4		
	Surface and Subsurface Soil	10.71	SB-102 (0-1 ft bgs)	16.2	6.384	6.4
			SB-104 (3-5) ft bgs	25.3 J		
			SB-104 (5-7) ft bgs	92 J		
			SB-104 (8-10) ft bgs	29 J		
			SB-118 (7.5-9.5) ft bgs	21 J		
			SB-132 (0-1) ft bgs	13.4		
			SB-132 (8-10) ft bgs	16.7		
Residential Area 2	Surface Soil	8.751	SB-105 (0-1) ft bgs	9.6	5.805	6.4
			SB-124 (0-1) ft bgs	8.4 J		
			SB-125 (0-1) ft bgs	13.5		
	Surface and Subsurface Soil	8.7	SB-105 (0-1) ft bgs	9.6	6.439	6.4
			SB-105 (1-3) ft bgs	17.5		
			SB-124 (0-1) ft bgs	8.4 J		
			SB-124 (7-9) ft bgs	8.9 J		
			SB-125 (0-1) ft bgs	13.5		
			SB-126 (7.5-9.5) ft bgs	9.4		
Residential Area 3	Surface Soil	11.16	MW-15 (0-2) ft bgs	19.9	6.262	6.4
			SB-137 (0-1) ft bgs	8.7		
			SB-139 (0-1) ft bgs	12.5		
			SB-140 (0-1) ft bgs	12.1		
			SB-141 (0-1) ft bgs	8.5		
	Surface and Subsurface Soil	13.05	MW-15 (0-2) ft bgs	19.9	5.682	6.4
			MW-15 (4-6) ft bgs	11.9		
			SB-134 (1.5-3.5) ft bgs	20.3		
			SB-136 (8-10) ft bgs	21.1		
			SB-137 (0-1) ft bgs	8.7		
			SB-137 (8-10) ft bgs	26.4		
			SB-139 (0-1) ft bgs	12.5		
			SB-140 (0-1) ft bgs	12.1		
			SB-140 (8-10) ft bgs	19/15		
			SB-141 (0-1) ft bgs	8.5		
Residential Area 4	Surface	9.391	DG4 (0-1.5) ft bgs	16	6.133	6.4
			SB-301 (0-1) ft bgs	21.6		
			TP-311 (0-1) ft bgs	13.9		
			TP-314 (0-1) ft bgs	12.1		
	Surface and Subsurface Soil	12.3	DG4 (0-1.5) ft bgs	16	6.233	6.4
			SB-301 (0-1) ft bgs	21.6		
			SB-301 (5.5-7.5) ft bgs	55.8 J/14.2 J		
			TP-310 (8-10) ft bgs	16.4		
			TP-311 (0-1) ft bgs	13.9		
			TP-314 (0-1) ft bgs	12.1		
			TP-314 (6-8) ft bgs	25		

TABLE 10

LOCATIONS REQUIRING REMOVAL TO MEET THE ARSENIC RBC BASED ON A CANCER RISK = 10^{-5} AND HAZARD QUOTIENT = 1
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	*Depth*	*Original EPC µg/g*	*Soil Locations Removed*		*Revised Arsenic EPC µg/g*	*Arsenic RBC µg/g*
			Location	*Arsenic Concentration µg/g*		
Waterfront Plaza	Surface Soil	69.28	TP-321 (0-1) ft bgs	34.7	NC	27
Mixed Residential/Commercial Area 1	Surface Soil	8.111	TP-306 (0.5-1.5) ft bgs	20	5.189	6.4
	Surface and Subsurface Soil	11.02	TP-303 (6-8) ft bgs	15	6.469	6.4
			TP-306 (0.5-1.5) ft bgs	20		
			TP-306 (6-7) ft bgs	--/20		
Mixed Residential/Commercial Area 2	Surface Soil	19.31	MW-19 (0-2) ft bgs	18	6.424	6.4
			SB-208 (0-1) ft bgs	30.8		
			SB-209 (0-1) ft bgs	21.9		
			SB-220 (0-1) ft bgs	12.3 J		
			SB-230 (0-1) ft bgs	24.3 J		
			SB-231 (0-1) ft bgs	17.6		
			SB-232 (0-1) ft bgs	49.6 J		
			SB-234 (0-1) ft bgs	15.9		
			SB-235 (0.5-1.5) ft bgs	12.1		
			SB-236 (0-1) ft bgs	13.2		
			SB-237 (0-1) ft bgs	39.6		
			SB-238 (0-1) ft bgs	39.3		
			SB-240 (0-1) ft bgs	12.6 J		
			SB-241 (0-1) ft bgs	13.6 J		
			SB-243 (0-1) ft bgs	9.9 J		
			SB-244 (0-1) ft bgs	13.6 J		
			SB-303 (0-2) ft bgs	12.8		
			SB-304 (0-2) ft bgs	12.1		
			SB-306 (0-1) ft bgs	11.4		
			SB-310 (0-1) ft bgs	10.3		
			SB-312 (0-1) ft bgs	95.4		
			SB-2010 (0-1) ft bgs	12.5		
			SB-2013 (0-1) ft bgs	31.4		
			TP-340 (0-1) ft bgs	18.7		
			TP-342 (0-1) ft bgs	102		
			TP-343 (0-1) ft bgs	25.3		
	Surface and Subsurface Soil	47.39	CTP-4 (4-) ft bgs	14.8	6.366	6.4
			MW-19 (0-2) ft bgs	18		
			SB-208 (0-1) ft bgs	30.8		
			SB-209 (0-1) ft bgs	21.9		
			SB-216 (0-4) ft bgs	19		
			SB-218 (2.5-4.5) ft bgs	15.1 J		
			SB-220 (0-1) ft bgs	12.3 J		
			SB-222 (1.5-3.5) ft bgs	15.7		
			SB-223 (1-4) ft bgs	15.7		
			SB-230 (0-1) ft bgs	24.3 J		
			SB-231 (0-1) ft bgs	17.6		
			SB-232 (0-1) ft bgs	49.6 J		
			SB-232 (6-8) ft bgs	804 J		
			SB-234 (0-1) ft bgs	15.9		
			SB-235 (0.5-1.5) ft bgs	12.1		
			SB-235 (3-5) ft bgs	28.8		

TABLE 10

LOCATIONS REQUIRING REMOVAL TO MEET THE ARSENIC RBC BASED ON A CANCER RISK = 10^{-5} AND HAZARD QUOTIENT = 1
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	*Depth*	*Original EPC µg/g*	*Soil Locations Removed*		*Revised Arsenic EPC µg/g*	*Arsenic RBC µg/g*
			Location	*Arsenic Concentration µg/g*		
	Surface and Subsurface Soil	(continued)	SB-236 (0-1) ft bgs	13.2		
			SB-237 (0-1) ft bgs	39.6		
			SB-237 (2-4) ft bgs	57.9		
			SB-238 (0-1) ft bgs	39.3		
			SB-238 (2-4) ft bgs	49.7/46.7		
			SB-240 (0-1) ft bgs	12.6 J		
			SB-241 (0-1) ft bgs	13.6 J		
			SB-243 (0-1) ft bgs	9.9 J		
			SB-244 (0-1) ft bgs	13.6 J		
			SB-244 (4-6) ft bgs	18.4 J		
			SB-246 (3-4) ft bgs	21.8		
			SB-303 (0-2) ft bgs	12.8		
			SB-304 (0-2) ft bgs	12.1		
			SB-306 (0-1) ft bgs	11.4		
			SB-308 (3-5) ft bgs	16.3		
			SB-310 (0-1) ft bgs	10.3		
			SB-312 (0-1) ft bgs	95.4		
			SB-2010 (0-1) ft bgs	12.5		
			SB-2010 (7-9) ft bgs	17.5		
			SB-2011 (3.4-4.75) ft bgs	15.7		
			SB-2013 (0-1) ft bgs	31.4		
			TP-340 (0-1) ft bgs	18.7		
			TP-340 (3-4) ft bgs	18.1		
			TP-342 (0-1) ft bgs	102		
			TP-342 (3.5-4) ft bgs	17.7		
			TP-343 (0-1) ft bgs	25.3		
			TP-343 (3-4) ft bgs	19.6		
			TP-344 (1-3) ft bgs	16.6		
			TP-344 (4-6) ft bgs	28.3		

Notes:
EPC - Exposure point concentration
J Estimated
ft bgs - Feet below ground surface
RBC - Risk-based concentration

TABLE 11

LOCATIONS REQUIRING REMOVAL TO MEET THE PART 201 GENERIC CLEANUP CRITERIA (DIRECT CONTACT)
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	*Depth*	*Original EPC µg/g*	*Soil Locations Removed*		*Revised Arsenic EPC µg/g*	*Arsenic RBC µg/g*
			Location	*Arsenic Concentration µg/g*		
Residential Area 1	Surface and Subsurface Soil	10.71	SB-104 (5-7) ft bgs	92 J	7.61	7.6
			SB-104 (8-10) ft bgs	29 J		
Residential Area 2	Surface Soil	8.751	SB-125 (0-1) ft bgs	13.5	7.348	7.6
	Surface and Subsurface Soil	8.7	SB-105 (1-3) ft bgs	17.5	7.279	7.6
			SB-125 (0-1) ft bgs	13.5		
Residential Area 3	Surface Soil	11.16	MW-15 (0-2) ft bgs	19.9	7.373	7.6
			SB-139 (0-1) ft bgs	12.5		
			SB-140 (0-1) ft bgs	12.1		
	Surface and Subsurface Soil	13.05	MW-15 (0-2) ft bgs	19.9	7.012	7.6
			SB-134 (1.5-3.5) ft bgs	20.3		
			SB-136 (8-10) ft bgs	21.1		
			SB-137 (8-10) ft bgs	26.4		
			SB-139 (0-1) ft bgs	12.5		
			SB-140 (0-1) ft bgs	12.1		
			SB-140 (8-10) ft bgs	19/15		
Residential Area 4	Surface	9.391	DG4 (0-1.5) ft bgs	16	7.245	7.6
			SB-301 (0-1) ft bgs	21.6		
	Surface and Subsurface Soil	12.3	DG4 (0-1.5) ft bgs	16	7.217	7.6
			SB-301 (0-1) ft bgs	21.6		
			SB-301 (5.5-7.5) ft bgs	55.8 J/14.2 J		
			TP-314 (6-8) ft bgs	25		
Mixed Residential/Commercial Area 1	Surface Soil	8.111	TP-306 (0.5-1.5) ft bgs	20	5.189	7.6
	Surface and Subsurface Soil	11.02	TP-306 (0.5-1.5) ft bgs	20	7.198	7.6
			TP-306 (6-7) ft bgs	--/20		
Mixed Residential/Commercial Area 2	Surface Soil	19.31	MW-19 (0-2) ft bgs	18	7.428	7.6
			SB-208 (0-1) ft bgs	30.8		
			SB-209 (0-1) ft bgs	21.9		
			SB-230 (0-1) ft bgs	24.3 J		
			SB-231 (0-1) ft bgs	17.6		
			SB-232 (0-1) ft bgs	49.6 J		
			SB-234 (0-1) ft bgs	15.9		
			SB-236 (0-1) ft bgs	13.2		
			SB-237 (0-1) ft bgs	39.6		
			SB-238 (0-1) ft bgs	39.3		
			SB-240 (0-1) ft bgs	12.6 J		
			SB-241 (0-1) ft bgs	13.6 J		
			SB-244 (0-1) ft bgs	13.6 J		
Mixed Residential/Commercial Area 2	Surface Soil	(Continued)	SB-303 (0-2) ft bgs	12.8		
			SB-312 (0-1) ft bgs	95.4		

TABLE 11

LOCATIONS REQUIRING REMOVAL TO MEET THE PART 201 GENERIC CLEANUP CRITERIA (DIRECT CONTACT)
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	*Depth*	*Original EPC µg/g*	*Soil Locations Removed*		*Revised Arsenic EPC µg/g*	*Arsenic RBC µg/g*
			Location	*Arsenic Concentration µg/g*		
			SB-2010 (0-1) ft bgs	12.5		
			SB-2013 (0-1) ft bgs	31.4		
			TP-340 (0-1) ft bgs	18.7		
			TP-342 (0-1) ft bgs	102		
			TP-343 (0-1) ft bgs	25.3		
Mixed Residential/Commercial Area 2	Surface and Subsurface Soil	47.39	MW-19 (0-2) ft bgs	18	7.519	7.6
			SB-208 (0-1) ft bgs	30.8		
			SB-209 (0-1) ft bgs	21.9		
			SB-216 (0-4) ft bgs	19		
			SB-230 (0-1) ft bgs	24.3 J		
			SB-231 (0-1) ft bgs	17.6		
			SB-232 (0-1) ft bgs	49.6 J		
			SB-232 (6-8) ft bgs	804 J		
			SB-234 (0-1) ft bgs	15.9		
			SB-235 (3-5) ft bgs	28.8		
			SB-236 (0-1) ft bgs	13.2		
			SB-237 (0-1) ft bgs	39.6		
			SB-237 (2-4) ft bgs	57.9		
			SB-238 (0-1) ft bgs	39.3		
			SB-238 (2-4) ft bgs	49.7/46.7		
			SB-240 (0-1) ft bgs	12.6 J		
			SB-241 (0-1) ft bgs	13.6 J		
			SB-244 (0-1) ft bgs	13.6 J		
			SB-244 (4-6) ft bgs	18.4 J		
			SB-246 (3-4) ft bgs	21.8		
			SB-303 (0-2) ft bgs	12.8		
			SB-312 (0-1) ft bgs	95.4		
			SB-2010 (0-1) ft bgs	12.5		
			SB-2010 (7-9) ft bgs	17.5		
			SB-2013 (0-1) ft bgs	31.4		
			TP-340 (0-1) ft bgs	18.7		
			TP-340 (3-4) ft bgs	18.1		
			TP-342 (0-1) ft bgs	102		
			TP-342 (3.5-4) ft bgs	17.7		
			TP-343 (0-1) ft bgs	25.3		
			TP-343 (3-4) ft bgs	19.6		
			TP-344 (1-3) ft bgs	16.6		
			TP-344 (4-6) ft bgs	28.3		

Notes:
EPC - Exposure point concentration
J - Estimated
ft bgs - Feet below ground surface
RBC - Risk-based concentration

TABLE 12

LOCATIONS REQUIRING REMOVAL TO MEET PART 201 STATEWIDE DEFAULT BACKGROUND LEVEL FOR ARSENIC
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	*Depth*	*Original EPC µg/g*	*Soil Locations Removed*		*Revised Arsenic EPC µg/g*	*Arsenic RBC µg/g*
			Location	*Arsenic Concentration µg/g*		
Residential Area 1	Surface Soil	7.382	SB-102 (0-1) ft bgs	16.2	5.56	5.8
			SB-103 (0-1) ft bgs	10.6 J		
			SB-120 (0-1) ft bgs	14 J/11 J		
			SB-132 (0-1) ft bgs	13.4		
	Surface and Subsurface Soil	10.71	SB-101 (6.8-8.8) ft bgs	15	5.778	5.8
			SB-102 (0-1) ft bgs	16.2		
			SB-103 (0-1) ft bgs	10.6 J		
			SB-104 (3-5) ft bgs	25.3 J		
			SB-104 (5-7) ft bgs	92 J		
			SB-104 (8-10) ft bgs	29 J		
			SB-109 (8-10) ft bgs	14		
			SB-118 (7.5-9.5) ft bgs	21 J		
			SB-120 (0-1) ft bgs	14 J/11 J		
			SB-132 (0-1) ft bgs	13.4		
			SB-132 (8-10) ft bgs	16.7		
Residential Area 2	Surface Soil	8.751	SB-105 (0-1) ft bgs	9.6	5.805	5.8
			SB-124 (0-1) ft bgs	8.4 J		
			SB-125 (0-1) ft bgs	13.5		
	Surface and Subsurface Soil	8.7	SB-105 (0-1) ft bgs	9.6	5.638	5.8
			SB-105 (1-3) ft bgs	17.5		
			SB-105 (3-5) ft bgs	7.3/7.9		
			SB-105 (8-10) ft bgs	7.8		
			SB-124 (0-1) ft bgs	8.4 J		
			SB-124 (7-9) ft bgs	8.9 J		
			SB-125 (0-1) ft bgs	13.5		
			SB-126 (7.5-9.5) ft bgs	9.4		
			SB-129 (6-8) ft bgs	7.5		
			SB-129 (8-10) ft bgs	7.2		
Residential Area 3	Surface Soil	11.16	MW-15 (0-2) ft bgs	19.9	5.853	5.8
			SB-134 (0-1) ft bgs	5.9		
			SB-135 (0-1) ft bgs	6.6		
			SB-137 (0-1) ft bgs	8.7		
			SB-138 (0-1) ft bgs	6.2		
			SB-139 (0-1) ft bgs	12.5		
			SB-140 (0-1) ft bgs	12.1		
			SB-141 (0-1) ft bgs	8.5		
	Surface and Subsurface Soil	13.05	MW-15 (0-2) ft bgs	19.9	5.374	5.8
			MW-15 (4-6) ft bgs	11.9		
			SB-134 (0-1) ft bgs	5.9		
			SB-134 (1.5-3.5) ft bgs	20.3		
			SB-135 (0-1) ft bgs	6.6		
			SB-136 (8-10) ft bgs	21.1		
			SB-137 (0-1) ft bgs	8.7		
			SB-137 (8-10) ft bgs	26.4		
			SB-138 (0-1) ft bgs	6.2		
			SB-139 (0-1) ft bgs	12.5		
			SB-140 (0-1) ft bgs	12.1		
			SB-140 (8-10) ft bgs	19/15		
			SB-141 (0-1) ft bgs	8.5		

TABLE 12

LOCATIONS REQUIRING REMOVAL TO MEET PART 201 STATEWIDE DEFAULT BACKGROUND LEVEL FOR ARSENIC
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	*Depth*	*Original EPC µg/g*	*Soil Locations Removed*		*Revised Arsenic EPC µg/g*	*Arsenic RBC µg/g*
			Location	*Arsenic Concentration µg/g*		
Residential Area 4	Surface	9.391	DG4 (0-1.5) ft bgs	16	5.798	5.8
			SB-301 (0-1) ft bgs	21.6		
			TP-311 (0-1) ft bgs	13.9		
			TP-312 (0-1) ft bgs	9.7		
			TP-314 (0-1) ft bgs	12.1		
	Surface and Subsurface Soil	12.3	DG4 (0-1.5) ft bgs	16	5.611	5.8
			SB-5 (2.5-3.5) ft bgs	12		
			SB-301 (0-1) ft bgs	21.6		
			SB-301 (5.5-7.5) ft bgs	55.8 J/14.2 J		
			SB-302 (6.8-8.8) ft bgs	12.1		
			TP-310 (8-10) ft bgs	16.4		
			TP-311 (0-1) ft bgs	13.9		
			TP-312 (0-1) ft bgs	9.7		
			TP-314 (0-1) ft bgs	12.1		
			TP-314 (6-8) ft bgs	25		
Waterfront Plaza	Surface Soil	69.28	TP-321 (0-1) ft bgs	34.7	NC	5.8
			SB-321 (0-1) ft bgs	7.2/8.1		
			TP-309 (0-1) ft bgs	6.4		
	Surface and Subsurface Soil	18.13	TP-321 (0-1) ft bgs	34.7	4.632	5.8
			SB-321 (0-1) ft bgs	7.2/8.1		
			TP-309 (0-1) ft bgs	6.4		
Mixed Residential/Commercial Area 1	Surface Soil	8.111	TP-306 (0.5-1.5) ft bgs	20	5.189	5.8
	Surface and Subsurface Soil	11.02	SB-334 (8-10) ft bgs	10.7 J	5.47	5.8
			SB-336 (8-10) ft bgs	10.3 J		
			SB-339 (8-10) ft bgs	11.2 J		
			TP-303 (6-8) ft bgs	15		
			TP-306 (0.5-1.5) ft bgs	20		
			TP-306 (6-7) ft bgs	--/20		
Mixed Residential/Commercial Area 2	Surface Soil	19.31	MW-19 (0-2) ft bgs	18	5.76	5.8
			SB-208 (0-1) ft bgs	30.8		
			SB-209 (0-1) ft bgs	21.9		
			SB-219 (0-1) ft bgs	9.8		
			SB-220 (0-1) ft bgs	12.3 J		
			SB-230 (0-1) ft bgs	24.3 J		
			SB-231 (0-1) ft bgs	17.6		
			SB-232 (0-1) ft bgs	49.6 J		
			SB-233 (0-1) ft bgs	8.5 J		
			SB-234 (0-1) ft bgs	15.9		
			SB-235 (0.5-1.5) ft bgs	12.1		
			SB-236 (0-1) ft bgs	13.2		
			SB-237 (0-1) ft bgs	39.6		
			SB-238 (0-1) ft bgs	39.3		
			SB-240 (0-1) ft bgs	12.6 J		
			SB-241 (0-1) ft bgs	13.6 J		
			SB-243 (0-1) ft bgs	9.9 J		
			SB-244 (0-1) ft bgs	13.6 J		
			SB-303 (0-2) ft bgs	12.8		
Mixed Residential/Commercial Area 2	Surface Soil	(Continued)	SB-304 (0-2) ft bgs	12.1		
			SB-306 (0-1) ft bgs	11.4		

TABLE 12

LOCATIONS REQUIRING REMOVAL TO MEET PART 201 STATEWIDE DEFAULT BACKGROUND LEVEL FOR ARSENIC
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	*Depth*	*Original EPC µg/g*	*Soil Locations Removed*		*Revised Arsenic EPC µg/g*	*Arsenic RBC µg/g*
			Location	*Arsenic Concentration µg/g*		
			SB-310 (0-1) ft bgs	10.3		
			SB-311 (0-1) ft bgs	8.6		
			SB-312 (0-1) ft bgs	95.4		
			SB-2010 (0-1) ft bgs	12.5		
			SB-2013 (0-1) ft bgs	31.4		
			TP-339 (0-1) ft bgs	9		
			TP-340 (0-1) ft bgs	18.7		
			TP-342 (0-1) ft bgs	102		
			TP-343 (0-1) ft bgs	25.3		
Mixed Residential/Commercial Area 2	Surface and Subsurface Soil	47.39	CTP-4 (4-) ft bgs	14.8	5.796	5.8
			MW-19 (0-2) ft bgs	18		
			SB-208 (0-1) ft bgs	30.8		
			SB-208 (4-6) ft bgs	9.5		
			SB-209 (0-1) ft bgs	21.9		
			SB-210 (3-5) ft bgs	9.8		
			SB-214 (3.5-5.5) ft bgs	12.0 J		
			SB-216 (0-4) ft bgs	19		
			SB-218 (2.5-4.5) ft bgs	15.1 J		
			SB-219 (0-1) ft bgs	9.8		
			SB-220 (0-1) ft bgs	12.3 J		
			SB-222 (1.5-3.5) ft bgs	15.7		
			SB-223 (1-4) ft bgs	15.7		
			SB-230 (0-1) ft bgs	24.3 J		
			SB-231 (0-1) ft bgs	17.6		
			SB-232 (0-1) ft bgs	49.6 J		
			SB-232 (6-8) ft bgs	804 J		
			SB-233 (0-1) ft bgs	8.5 J		
			SB-234 (0-1) ft bgs	15.9		
			SB-235 (0.5-1.5) ft bgs	12.1		
			SB-235 (3-5) ft bgs	28.8		
			SB-236 (0-1) ft bgs	13.2		
			SB-237 (0-1) ft bgs	39.6		
			SB-237 (2-4) ft bgs	57.9		
			SB-238 (0-1) ft bgs	39.3		
			SB-238 (2-4) ft bgs	49.7/46.7		
			SB-240 (0-1) ft bgs	12.6 J		
			SB-241 (0-1) ft bgs	13.6 J		
			SB-243 (0-1) ft bgs	9.9 J		
			SB-244 (0-1) ft bgs	13.6 J		
			SB-244 (4-6) ft bgs	18.4 J		
			SB-246 (3-4) ft bgs	21.8		
			SB-254 (0-4) ft bgs	12.1		
			SB-303 (0-2) ft bgs	12.8		
			SB-304 (0-2) ft bgs	12.1		
			SB-306 (0-1) ft bgs	11.4		
			SB-308 (3-5) ft bgs	16.3		
			SB-308 (7.5-9.5) ft bgs	10.1		
			SB-310 (0-1) ft bgs	10.3		
			SB-311 (0-1) ft bgs	8.6		
Mixed Residential/Commercial Area 2	Surface and Subsurface Soil	(Continued)	SB-312 (0-1) ft bgs	95.4		
			SB-2010 (0-1) ft bgs	12.5		
			SB-2010 (7-9) ft bgs	17.5		
			SB-2011 (3.4-4.75) ft bgs	15.7		

TABLE 12

LOCATIONS REQUIRING REMOVAL TO MEET PART 201 STATEWIDE DEFAULT BACKGROUND LEVEL FOR ARSENIC
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	*Depth*	*Original EPC µg/g*	*Soil Locations Removed*		*Revised Arsenic EPC µg/g*	*Arsenic RBC µg/g*
			Location	*Arsenic Concentration µg/g*		
			SB-2013 (0-1) ft bgs	31.4		
			TP-339 (0-1) ft bgs	9		
			TP-340 (0-1) ft bgs	18.7		
			TP-340 (3-4) ft bgs	18.1		
			TP-342 (0-1) ft bgs	102		
			TP-342 (3.5-4) ft bgs	17.7		
			TP-343 (0-1) ft bgs	25.3		
			TP-343 (3-4) ft bgs	19.6		
			TP-344 (1-3) ft bgs	16.6		
			TP-344 (4-6) ft bgs	28.3		
Commercial Area 1	Surface Soil	7.361	SB-133 (0-1) ft bgs	10.0	4.628	5.8
			SS-103 (0-2) ft bgs	8.6		
			SS-105 (0-2) ft bgs	8.7		
			SS-106 (0-2) ft bgs	8.8 /8.9		
	Surface and Subsurface Soil	7.234	SB-133 (0-1) ft bgs	10.0	5.81	5.8
			SB-144 (7-9) ft bgs	10.6/5.0		
			SS-103 (0-2) ft bgs	8.6		
			SS-105 (0-2) ft bgs	8.7		
			SS-106 (0-2) ft bgs	8.8 /8.9		
Commercial Area 2	Surface Soil	9.947	TP-316 (0-1) ft bgs	16.4 J	5.742	5.8
			TP-325 (0-1) ft bgs	13.9 J		
			TP-321 (0-1) ft bgs	34.7		
	Surface and Subsurface Soil	13.33	SB-331 (8-10) ft bgs	46.9 J	5.757	5.8
			TP-316 (0-1) ft bgs	16.4 J		
			TP-324 (9-10) ft bgs	12.8 J/16.5 J		
			TP-325 (0-1) ft bgs	13.9 J		
			TP-325 (8-10) ft bgs	21.4 J		
			TP-321 (0-1) ft bgs	34.7		
Commercial Area 3	Surface Soil	12.24	SB-248 (0-1) ft bgs	8.5 J	NC	5.8
			SB-248 (0.5-1.5) ft bgs	9.4		
			TP-307 (0.5-1.5) ft bgs	16 /18		
			TP-305 (0.5-1.5) ft bgs	16		
	Surface and Subsurface Soil	9.59	SB-248 (0-1) ft bgs	8.5 J	5.575	5.8
			SB-248 (0.5-1.5) ft bgs	9.4		
			TP-307 (0.5-1.5) ft bgs	16 /18		
			TP-307 (2-3) ft bgs	13.0		
			TP-337 (2-4) ft bgs	13.3		
			TP-338 (8-10) ft bgs	15.6		
			TP-304 (5-7) ft bgs	11.1		
			TP-305 (0.5-1.5) ft bgs	16		

TABLE 12

LOCATIONS REQUIRING REMOVAL TO MEET PART 201 STATEWIDE DEFAULT BACKGROUND LEVEL FOR ARSENIC
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	*Depth*	*Original EPC µg/g*	*Soil Locations Removed*		*Revised Arsenic EPC µg/g*	*Arsenic RBC µg/g*
			Location	*Arsenic Concentration µg/g*		
Commercial Area 4	Surface Soil	19.38	MW-16 (0-2) ft bgs	8.9	5.723	5.8
			MW-17 (0-2) ft bgs	7.8/8.6		
			SB-201 (0-1) ft bgs	9.1 J		
			SB-202 (0-1) ft bgs	9.8 J		
			SB-203 (0-1) ft bgs	9.8 J		
			SB-204 (0-1) ft bgs	8.9 J		
			SB-245 (0-1) ft bgs	16.4 J		
			SB-249 (0-1) ft bgs	9.9 J		
			SB-263 (0-1) ft bgs	8.6		
			SB-264 (0-1) ft bgs	12.8		
			SB-265 (0-1) ft bgs	31.6		
			SB-267 (0-1) ft bgs	7.3		
			SB-268 (0-1) ft bgs	7		
			SB-270B (0-1) ft bgs	6.8 J		
			SB-274 (0-1) ft bgs	42.3		
			SB-275 (0-1) ft bgs	14.6		
			SB-276 (0-1) ft bgs	9.1		
			SB-277 (0-1) ft bgs	7.2		
			SB-278 (0-1) ft bgs	14.2		
			SB-279 (0-1) ft bgs	16.8		
			SB-280 (0-1) ft bgs	75.4		
			SB-281 (0-1) ft bgs	17.2		
			SB-282 (0-1) ft bgs	21.1		
			SB-283 (0-1) ft bgs	16.4		
			SB-284 (0-1) ft bgs	13.4		
			SB-285 (0-1) ft bgs	14.2		
			SB-287 (0-1) ft bgs	7.8		
			SB-289 (0-1) ft bgs	21.6 J		
			SB-290 (0-1) ft bgs	36.0 J		
			SB-293 (0-1) ft bgs	8.3 J		
			SB-294 (0-1) ft bgs	20.5		
			SB-295 (0-1) ft bgs	7.7		
			SB-298 (0-1) ft bgs	8.4 J		
			SB-299 (0-1) ft bgs	9.0 J		
			SB-2001 (0-1) ft bgs	7.3		
			SB-2002 (0-1) ft bgs	12.2 J		
			SB-2004 (0-1) ft bgs	8.6		
			SB-2005 (0-1) ft bgs	9		
			SB-2008 (0-1) ft bgs	10.4		
			SB-2012 (0-1) ft bgs	8.5		
			TP-202 (0.5-1.5) ft bgs	16.2/11.2		
			TP-341 (0.5-1.5) ft bgs	20.1		
Commercial Area 4	Surface and Subsurface Soil	16.68	BK5 (2.5-3) ft bgs	11	5.758	5.8
			NW Sidewall (1.5) ft bgs	60.8		
			NE Sidewall (2) ft bgs	65.6/49.4		
			SE Sidewall (1.5) ft bgs	50.7		
			SW Sidewall (2) ft bgs	31.5		
			MW-16 (0-2) ft bgs	8.9		
			MW-16 (8-10) ft bgs	11.6		
			MW-17 (8-10) ft bgs	29.6		
			MW-17 (0-2) ft bgs	7.8/8.6		
Commercial Area 4	Surface and Subsurface Soil	(Continued)	SB-201 (0-1) ft bgs	9.1 J		
			SB-201 (2-4) ft bgs	13.3 J		

TABLE 12

LOCATIONS REQUIRING REMOVAL TO MEET PART 201 STATEWIDE DEFAULT BACKGROUND LEVEL FOR ARSENIC
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	*Depth*	*Original EPC µg/g*	*Soil Locations Removed*		*Revised Arsenic EPC µg/g*	*Arsenic RBC µg/g*
			Location	*Arsenic Concentration µg/g*		
			SB-202 (0-1) ft bgs	9.8 J		
			SB-202 (2-4) ft bgs	20.0 J		
			SB-203 (0-1) ft bgs	9.8 J		
			SB-203 (2-4) ft bgs	17.6 J/13 J		
			SB-204 (0-1) ft bgs	8.9 J		
			SB-204 (2-4) ft bgs	10.5 J		
			SB-245 (0-1) ft bgs	16.4 J		
			SB-249 (0-1) ft bgs	9.9 J		
			SB-263 (0-1) ft bgs	8.6		
			SB-263 (3-5) ft bgs	10.4		
			SB-264 (0-1) ft bgs	12.8		
			SB-265 (0-1) ft bgs	31.6		
			SB-265 (2-4) ft bgs	15.4		
			SB-266 (1.4-2.4) ft bgs	7.5		
			SB-267 (0-1) ft bgs	7.3		
			SB-268 (0-1) ft bgs	7		
			SB-270B (0-1) ft bgs	6.8 J		
			SB-272 (1-3) ft bgs	10.1		
			SB-274 (0-1) ft bgs	42.3		
			SB-274 (2.5-4.5) ft bgs	9.5		
			SB-275 (0-1) ft bgs	14.6		
			SB-276 (0-1) ft bgs	9.1		
			SB-277 (0-1) ft bgs	7.2		
			SB-277 (3-5) ft bgs	8.8		
			SB-278 (0-1) ft bgs	14.2		
			SB-278 (3-5) ft bgs	7.6		
			SB-279 (0-1) ft bgs	16.8		
			SB-279 (3-5) ft bgs	4.9 J/21.8 J		
			SB-280 (0-1) ft bgs	75.4		
			SB-280 (3-5) ft bgs	12.5		
			SB-281 (0-1) ft bgs	17.2		
			SB-282 (0-1) ft bgs	21.1		
			SB-283 (0-1) ft bgs	16.4		
			SB-284 (0-1) ft bgs	13.4		
			SB-284 (2.5-4.5) ft bgs	10.6		
			SB-285 (0-1) ft bgs	14.2		
			SB-287 (0-1) ft bgs	7.8		
			SB-289 (0-1) ft bgs	21.6 J		
			SB-290 (0-1) ft bgs	36.0 J		
			SB-292 (3-5) ft bgs	11.4/7.7		
			SB-293 (0-1) ft bgs	8.3 J		
			SB-294 (0-1) ft bgs	20.5		
			SB-294 (3-5) ft bgs	7.7		
			SB-295 (0-1) ft bgs	7.7		
			SB-297 (1-2) ft bgs	10.7		
			SB-298 (0-1) ft bgs	8.4 J		
			SB-299 (0-1) ft bgs	9.0 J		
			SB-299 (4-5) ft bgs	15.8 J		
			SB-2001 (0-1) ft bgs	7.3		
Commercial Area 4	Surface and Subsurface Soil	(Continued)	SB-2002 (0-1) ft bgs	12.2 J		
			SB-2004 (0-1) ft bgs	8.6		
			SB-2005 (0-1) ft bgs	9		
			SB-2005 (2.5-4.5) ft bgs	9		

TABLE 12

LOCATIONS REQUIRING REMOVAL TO MEET PART 201 STATEWIDE DEFAULT BACKGROUND LEVEL FOR ARSENIC
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	*Depth*	*Original EPC µg/g*	*Soil Locations Removed*		*Revised Arsenic EPC µg/g*	*Arsenic RBC µg/g*
			Location	*Arsenic Concentration µg/g*		
			SB-2008 (0-1) ft bgs	10.4		
			SB-2009 (1-2) ft bgs	17.4 J		
			SB-2009 (5-7) ft bgs	7.6 J		
			SB-2012 (0-1) ft bgs	8.5		
			SB-2040 (1.5-2.5) ft bgs	52.8		
			SB-2041 (1-2) ft bgs	69.4		
			SB-2042 (2-5) ft bgs	8.42		
			SB-2043 (2.5-2.7) ft bgs	13.3		
			TP-17 (7-) ft bgs	10.1		
			TP-18 (8-) ft bgs	9.7		
			TP-19 (8-) ft bgs	8		
			TP-20 (8.5-) ft bgs	11.7		
			TP-201 (1-2) ft bgs	11.7		
			TP-202 (0.5-1.5) ft bgs	16.2/11.2		
			TP-202 (8-10) ft bgs	11.7		
			TP-341 (0.5-1.5) ft bgs	20.1		

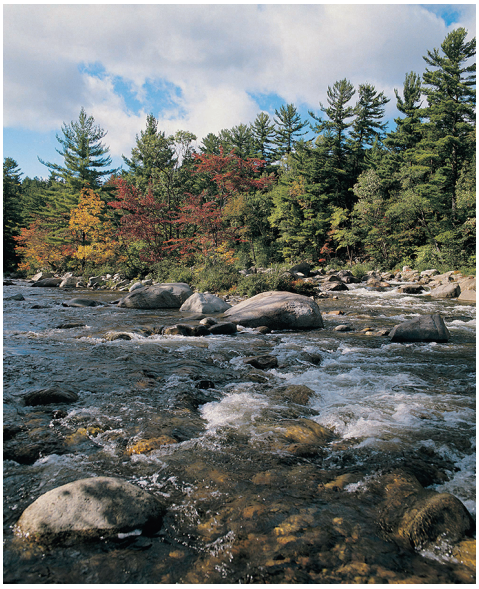
Notes:
EPC - Exposure point concentration
J - Estimated
ft bgs - Feet below ground surface
RBC - Risk-based concentration

Appendix B

Revised Ecological Risk Assessment – Step 3 – Refinement of Constituents of Potential Ecological Concern and Development of Ecological Remedial Action Objectives
CRA, December 2013

CONESTOGA-ROVERS & ASSOCIATES

www.CRAworld.com



Ecological Risk Assessment

Step 3 Refinement of Constituents of Potential Ecological Concern and Development of Ecological Remedial Action Objectives

Prepared for: Weyerhaeuser NR Company

Conestoga-Rovers & Associates
200 W. Allegan St., Suite 300
Plainwell, Michigan 49080-1397

December 20, 2013 • 056394-07 •
Report No. 10_Revision 1

Partners in Sustainability

Executive Summary

Conestoga-Rovers & Associates (CRA), on behalf of Weyerhaeuser NR Company (Weyerhaeuser), conducted a refinement of chemical constituents identified in the screening-level ecological risk assessment (SLERA) portion of the Remedial Investigation Report (RI Report) as constituents of potential ecological concern (COPECs) for the former Plainwell Inc., Mill Property in Plainwell, Michigan (Site). The RI Report was approved on February 26, 2013. The refinement process is Step 3 of the 8-step process for conducting ecological risk assessment under guidance developed by the United States Environmental Protection Agency (U.S. EPA).

The majority of the Site evaluated in the SLERA is anticipated to be redeveloped for residential and/or commercial use. As complete exposure pathways will be eliminated in those areas that will be developed, the dataset for the refinement process consisted of samples from those areas that will not be disturbed by development activities. The revised assessment area is within the riparian corridor of the Kalamazoo River. The data for the revised assessment were re-screened using the same methodology and ecological screening values (ESVs) that were used in the SLERA. The re-screening retained two volatile organic compounds (VOCs) (i.e., acetone and isopropylbenzene), three benzene, toluene, ethylbenzene, and xylenes (BTEX) constituents (i.e., benzene, toluene, and m&p-xylenes), one semi-volatile organic compound (SVOC) (i.e., carbazole), high molecular weight (HMW) polycyclic aromatic hydrocarbons (PAHs), total polychlorinated biphenyls (PCBs), and 14 inorganic constituents [i.e., antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, selenium, vanadium, zinc, and cyanide (total)] as COPECs.

The refinement process focused on avian and mammalian wildlife. Refinement consisted of a two-phase process. In the first phase, 95 percent upper confidence limit (UCL) concentrations of the COPECs were compared to ecological benchmarks (i.e., soil concentrations) specific to avian and/or mammalian wildlife. A constituent was carried forward to the second phase if the 95 percent UCL concentration was greater than the ecological benchmark or if an ecological benchmark was not available. This phase eliminated total PCBs, antimony, arsenic, barium, cadmium, chromium, manganese, and vanadium as COPECs.

The second phase of the refinement process involved use of food chain models to assess the potential for risk to avian and mammalian wildlife. The food chain models identified a potential for risk to avian insectivores exposed to lead at both a no observed adverse effect level (NOAEL) and lowest observed adverse effect level (LOAEL), and mammalian wildlife exposed to lead at the LOAEL. The food chain models also identified a potential for risk to avian and/or mammalian wildlife exposed to carbazole, HMW PAHs, copper, mercury, selenium, and zinc at the LOAEL.

Initial Preliminary Remediation Goals (PRGs) were developed for carbazole, HMW PAHs, copper, lead, mercury, selenium, and zinc. These initial PRGs were compared to the 95 percent UCL concentrations of the seven COPECs. The 95 percent UCL concentrations for HMW PAHs, lead, mercury, and zinc were greater than their initial PRGs. As the initial PRGs were based on conservative exposure parameters, and NOAELs and LOAELs, HWM PAHs, lead, mercury, and zinc were further evaluated using exposure parameters identified in U.S. EPA's Wildlife Scenario Builder (U.S. EPA, 2013). In addition, the technical basis of NOAELs and LOAELs were critically reviewed. This review resulted in the replacement of NOAELs and LOAELs for HMW PAHs for mammalian receptors and for lead for avian receptors. Results of the second phase of the evaluation, coupled with results of the first phase, were used to identify final ecological PRGs.

The final ecological PRGs are 0.313 milligrams per kilogram (mg/kg) for carbazole, 36.6 mg/kg for HMW PAHs, 187 mg/kg for copper, 535 mg/kg for lead, 1.94 mg/kg for mercury, 5.7 mg/kg for selenium, and 856 mg/kg for zinc, respectively. The 95 percent UCL concentrations for all seven COEPCs are below their final ecological PRGs. Consequently, further evaluation and risk management measures are not required for protection of avian and mammalian wildlife at the Site.

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List of Acronyms and Abbreviations

BCOC	Bioaccumulative Chemical of Concern
BERA	Baseline Ecological Risk Assessment
bgs	Below Ground Surface
CCME	Canadian Council of Ministers of the Environment
$Conc_{food}$	Concentration of a Chemical Constituent in Food
$Conc_{soil}$	Concentration of a Chemical Constituent in Soil
$Conc_{water}$	Concentration of a Chemical Constituent in Water
COPEC	Constituent of Potential Ecological Concern
CRA	Conestoga-Rovers & Associates
CSM	Conceptual Site Model
DNA	Deoxyribonucleic acid
DW	Dry Weight
Eco-SSL	Ecological Soil Screening Level
ESL	Ecological Screening Level
ESV	Ecological Screening Value
FOD	Frequency of Detection
HMW	High Molecular Weight
HQ	Hazard Quotient
IR_{food}	Ingestion Rate of Food
IR_{total}	Total Ingestion Rate of a Chemical Constituent
IR_{water}	Ingestion Rate of Water
IRIS	Integrated Risk Information System
KCAL	Kilocalories
K_{OW}	Octanol-Water Partition Coefficient
LOAEL	Lowest Observed Adverse Effect Level
LOD	Limit of Detection
MDEQ	Michigan Department of Environmental Quality
NOAEL	No Observed Adverse Effect Level
OSWER	Office of Solid Waste and Emergency Response
P_S	Proportion of Soil Ingested
PCB	Polychlorinated Biphenyl
PAH	Polycyclic Aromatic Hydrocarbon
PRG	Preliminary Remediation Goal
RB	Refinement Benchmark
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
RQ_{UCL}	Refinement Quotient Based on the 95% UCL
SLERA	Screening-Level Ecological Risk Assessment
SQ	Screening Quotient
SQG_E	Soil Quality Guidelines
SVOC	Semi-Volatile Organic Compound
TRV	Toxicity Reference Value
UCL	Upper Confidence Limit
U.S. EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

Section 1.0 Introduction

Conestoga-Rovers & Associates (CRA), on behalf of Weyerhaeuser NR Company (Weyerhaeuser), conducted a Remedial Investigation (RI) at the former Plainwell Inc., Mill property in Plainwell, Michigan (Site). The RI Report was submitted to the United States Environmental Protection Agency (U.S. EPA) on June 20, 2011, with revisions submitted on April 20, 2012 (Revision 1), July 10, 2012 (Revision 1), October 19, 2012 (Revision 2), and February 4, 2013 (Revision 2), based on comments received from and discussions with representatives of the U.S. EPA and the Michigan Department of Environmental Quality (MDEQ). The RI Report was approved by the U.S. EPA on February 26, 2013.

A screening-level ecological risk assessment (SLERA) was included as a component of the RI. The SLERA consisted of Steps 1 and 2 of the 8-step process for conducting ecological risk assessment in accordance with guidance published by the United States Environmental Protection Agency (U.S. EPA, 1997). The SLERA identified 42 individual chemical constituents or constituent groups as constituents of potential ecological concern (COPECs). The methods and assumptions used in the SLERA were intentionally conservative in order to minimize the probability of incorrectly eliminating constituents that may actually pose risk to ecological receptors. Consequently, not all of the individual constituents or constituent groups are expected to pose an unacceptable potential for risk.

This document represents the next step in the 8-step process. In this step, which is Step 3, or the problem formulation for the baseline ecological risk assessment (BERA), the constituents identified in the SLERA as COPECs are refined by evaluating the assumptions for exposure and toxicological responses of ecological receptors to the COPECs. The primary objective of the refinement process is to eliminate from further consideration those constituents that have a limited potential for risk so the BERA can focus on those constituents and pathways that have the greatest potential to pose risk.

The majority of the Site evaluated for the SLERA will ultimately be redeveloped for residential, commercial, and mixed residential and commercial land use. Consequently, ecological receptors will not be exposed to those areas that will be developed. The dataset for the refinement process has been modified to include only samples from those areas that are unlikely to be disturbed by development activities. These samples are located within the riparian corridor of the Kalamazoo River, as shown on Figure 1.1.

The remainder of this report is organized as follows:

- Section 2.0 – summarizes the results of the SLERA
- Section 3.0 – provides a general description of the methodology for the refinement process
- Section 4.0 – presents the results of re-screening of the revised dataset

- Section 5.0 – provides additional details and results of the refinement process
- Section 6.0 – describes the methodology and presents results for development of ecological preliminary remediation goals (PRGs)
- Section 7.0 – identifies complete exposure pathways and ecosystems at risk
- Section 8.0 – identifies assessment endpoints for the BERA
- Section 9.0 – presents the conceptual site model and risk questions for the BERA
- Section 10.0 – discusses uncertainties associated with the refinement process
- Section 11.0 – presents summary and conclusions of the refinement process
- Section 12.0 – provides citations for references

Section 2.0 Summary of the Screening-Level Ecological Risk Assessment

2.1 Constituents of Potential Ecological Concern

The SLERA, which was submitted as part of the RI report, identified a total of 42 individual or groups of chemical constituents as COPECs. A constituent was identified as a COPEC if:

- The maximum concentration exceeded an ecological screening value (ESV)
- The constituent was detected and an ESV was not identified
- The constituent was not detected and the limit of detection (LOD) in greater than 20 percent of the samples exceeded an ESV
- The constituent was detected and was identified as a bioaccumulative chemical of concern (BCOC)

Table 2.1 summarizes the constituents and groups of constituents identified in the SLERA as COPECs and the basis upon which each was identified as a COPEC.

In order to minimize the potential for incorrectly eliminating a constituent as a COPEC, the SLERA employed a number of conservation assumptions. In Step 3 of the process, those assumptions are evaluated and, as appropriate, replaced with more ecological realistic assumptions with the overall objective of refining the list of COPECs identified in Table 2.1 to those with the greatest potential for posing risk to ecological receptors.

2.2 Assessment Endpoints

Assessment endpoints are explicit expressions of environmental values or characteristics to be protected at a site, and reflect societal and ecological values (Suter, 1993). Societal values address the need to protect species that are endangered, threatened, or of special interest, important as game or commercial species, or that are recognized as having aesthetic value. The assessment endpoints for the SLERA were species richness and productivity of terrestrial plant and soil invertebrate communities, and the relative and absolute densities of avian and mammalian insectivores, herbivores, omnivores, and carnivores.

The refinement process presented in this document focuses on the assessment endpoints associated with avian and mammalian wildlife. The rationale for this focus is that the methods and exposure factors for evaluating potential for wildlife are better developed and have a stronger technical basis than those available for terrestrial plants and soil invertebrates. As an example, the vast majority of studies used to evaluate risk to terrestrial plants have been conducted using common agricultural crops. These "species" are typically annuals that have been artificially selected for yield over many generations and, as a result, lack the genetic diversity characteristic of naturally occurring species. Furthermore, observations of the assessment area during numerous sampling events and other field activities have not identified significant areas of stressed vegetation.

2.3 Measurement Endpoints

Data necessary to directly evaluate the assessment endpoints are difficult to generate and rarely available. Therefore, measurement endpoints are used to bridge this gap. Measurement endpoints are quantifiable responses to stressors related to assessment endpoints, and are intended to provide a basis for assessing risk potential for the assessment endpoint. They may be defined in terms of an unacceptable level of impact to ecological receptors, such as a certain relative percent decrease in survival, growth or reproduction of ecological populations (Suter, 1993).

For the refinement process, two types of measurement endpoints are considered. One type consists of ecological benchmarks, or concentrations, that have been developed specifically to assess the potential for risk to avian and/or mammalian wildlife. The second type of measurement endpoints are toxicity reference values (TRVs), which are expressed as milligrams of a chemical ingested per body weight of a receptor per day (mg/kg/day). A no observed adverse effect level (NOAEL) is a TRV below which adverse effects on growth, reproduction, and/or survival are not expected to be expressed. A lowest observed adverse effect level (LOAEL) is the lowest TRV at which adverse effects have been documented to occur.

Section 3.0 Refinement Methodology

3.1 Dataset

The dataset evaluated in the SLERA consisted of all samples of surface soil collected within the assessment area. Surface soil is considered to be that collected from the depth interval of 0 to 2 feet below ground surface (bgs). The Site was partitioned into 11 redevelopment areas, with each area evaluated as a separate sub-area. For the refinement process, those areas that will ultimately be developed for residential, commercial, and mixed land use have been removed from the dataset. Development of these areas will result in an incomplete exposure pathway. Samples from those locations that are not likely to be disturbed by redevelopment activities and that provide habitat for ecological receptors have been retained. These samples are located along the riparian corridor of the Kalamazoo River. The riparian corridor of the Kalamazoo River was evaluated as a single assessment area.

Figure 1.1 identifies the locations of the samples retained for the refinement process. Appendix A presents the analytical data associated with those sample locations used for the refinement process.

3.2 Re-Screening for Constituents of Potential Ecological Concern

The dataset for the SLERA had a total of 250 samples. The dataset for the refinement process consists of 30 samples. As many of the constituents identified in the SLERA as COPECs were detected in only one or a few samples, the first step in the refinement process was to re-screen those constituents identified in the SLERA as COPECs and were detected in one or more samples in the revised dataset. The ESVs used in the SLERA were also used for the re-screening. The maximum concentration of a COPEC was divided by its ESV to produce a screening quotient (SQ). A constituent was retained as a COPEC if the maximum concentration exceeded its ESV (SQ > 1.0), or the constituent was detected and an ESV was not identified.

The refinement process did not consider those constituents that were not detected as they are not expected to be the primary drivers of risk to ecological receptors.

3.3 Avian and Mammalian Wildlife

Assessment of risk to avian and mammalian wildlife in the refinement process was conducted using a two-phase approach. In the first phase, the 95 percent upper confidence limit (UCL) concentrations for the COPECs were compared to ecological benchmarks specific to avian and/or mammalian wildlife, if available. The 95 percent UCL were selected as the exposure concentrations as they represent reasonable maximum exposure (RME) to receptors that forage at numerous locations within the assessment area. The 95 percent UCLs were calculated using ProUCL Version 4.1 (U.S. EPA, 2010) prior

to the release of the current ProUCL Version 5.0 as part of the June 27, 2013 FS Report (CRA, 2013). The 95 percent UCLs for constituents for which PRGs were calculated (see Section 6.0) were re-calculated using ProUCL Version 5.0 to evaluate the potential for impacts to the overall conclusions of this report. Based on the results of the re-calculation, the 95 percent UCLs for HMW PAHs, copper, lead, mercury, selenium, and zinc were essentially unchanged from the previously calculated values and did not impact the conclusions of this report. Therefore, the entirety of the dataset was not re-run utilizing ProUCL Version 5.0.

Sources of benchmarks for avian and mammalian wildlife were the source documents for the ecological soil screening levels (Eco-SSLs), Efroymson et al. (1997a), and fact sheets prepared by the Canadian Council of Ministers of the Environment (CCME). For mammalian wildlife, ecological screening levels (ESLs) identified by U.S. EPA, Region 5 (2003) were used if an ESL was based on masked shrew or meadow vole. Benchmarks for the refinement process were selected using the following hierarchy:

- Eco-SSLs were the first tier of the hierarchy for both avian and mammalian wildlife
- For mammalian wildlife, ESLs based on the masked shrew or meadow vole, were the second tier of the hierarchy if an Eco-SSL was not available
- PRGs identified by Efroymson et al. (1997a) were the second tier benchmarks for avian wildlife and third tier benchmarks for mammalian wildlife
- Soil quality guidelines (SQG_E) for agricultural land use developed by CCME were the third tier benchmarks for avian wildlife and fourth tier benchmarks for mammalian wildlife

If the 95 percent UCL concentration of a constituent was greater than benchmarks specific to avian and/or mammalian wildlife, the constituent was carried forward to the second phase of the assessment. This second phase consisted of the use of food chain models to further evaluate the potential for risk. Section 5.2.1 provides details for the use of food chain models.

Section 4.0 Re-Screening of the Dataset for the Refinement Process

Table 4.1 summarizes the results of the re-screening of the data for the refinement process. Information presented in Table 4.1 includes the ESV and source of the ESV, or lack thereof, for each constituent detected; the number of samples, number of samples with detected concentrations, and frequency of detection (FOD); maximum concentration and area and sample with the maximum concentration; SQ; identification of BCOCs; retention of a constituent as a COPEC; and rationale for retaining or eliminating a constituent as a COPEC.

Two volatile organic compounds (VOCs), acetone and isopropylbenzene, were detected. The SQ for acetone (2.2) is greater than 1.0. An ESV was not identified for isopropylbenzene. Accordingly, both acetone and isopropylbenzene are retained as COPECs.

Four BTEX (benzene, toluene, ethylbenzene, and xylenes) constituents were detected. The SQs for benzene (5.1), toluene (4.0), and m&p-xylene (1.1) are greater than 1.0. These three constituents are retained as COPECs. The SQ for o-xylene (0.74) is less than 1.0. Consequently, o-xylene is eliminated as a COPEC.

Two semi-volatile organic compounds (SVOCs), bis(2-ethylhexyl)phthalate and carbazole, were detected. The SQ for bis(2-ethylhexyl)phthalate (0.38) is less than 1.0. An ESV was not identified for carbazole. Accordingly, bis(2-ethylhexyl)phthalate is eliminated as a COPEC and carbazole is retained.

The SLERA identified high molecular weight (HMW) polycyclic aromatic hydrocarbons (PAHs) as a COPEC. For the revised dataset, the SQ (24) for HMW PAHs [benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluoranthene, and pyrene] is greater than 1.0. Based on this SQ, all HMW PAHs are retained as COPECs.

Three Aroclors of polychlorinated biphenyls (PCBs) were detected. The three Aroclors are Aroclor-1248, Aroclor-1254, and Aroclor-1260. Similar to PAHs, PCBs are evaluated as a group. For the revised dataset, the SQ for total PCBs (1,205) is greater than 1.0. Consequently, total PCBs, which are BCOCs, are retained as a COPEC.

Sixteen inorganic constituents identified as COPECs in the SLERA were detected. The SQs for cobalt (0.59) and nickel (0.77) are less than 1.0. Nickel is a BCOC. Although the ESV for nickel (38 mg/kg) is based on plants, it is lower than the Eco-SSLs for avian (210 mg/kg) and mammalian (130 mg/kg) wildlife (U.S. EPA, 2007d). Cobalt and nickel are eliminated as COPECs.

The SQs for antimony (11), arsenic (1.2), barium (1.5), cadmium (11), chromium (1.5), copper (11), iron (111), lead (90), manganese (3.2), mercury (56), selenium (3.5), vanadium (3.6), zinc (17), and cyanide (total) (1.3) are greater than 1.0. Iron is a naturally occurring metal with limited toxicity to ecological receptors (U.S. EPA, 2003a), and is eliminated as a COPEC. Antimony, arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, selenium, vanadium, zinc, and cyanide (total) are retained as COPECs. Cadmium, chromium, copper, lead, mercury, selenium, and zinc are BCOCs.

Section 5.0 Refinement of Constituents of Potential Ecological Concern

5.1 Comparison to Wildlife Benchmarks

5.1.1 Avian Wildlife

Table 5.1 identifies the available benchmarks for avian wildlife. Information presented in Table 5.1 includes benchmark concentrations identified in Eco-SSL source documents (U.S. EPA 2005a-f, 2007b-g, 2008), Efroymson et al. (1997a), and CCME (1999a-f, 2001, 2009, 2010) as well as background concentrations specific to the Michigan Glacial Lobe identified by the MDEQ(MDEQ, 2005) and specific to Michigan identified by U.S. EPA (2007a). Table 5.1 also identifies the value selected as the refinement benchmark (RB).

Background concentrations were considered in the selection of RBs. Priority in the selection of RBs was given to the Eco-SSLs developed by U.S. EPA. If an Eco-SSL was not available, RBs were selected using the hierarchy discussed in Section 3.3, with the following exceptions. The Eco-SSL for cadmium is 0.77 mg/kg, which is below the background concentration of 0.90 mg/kg identified by U.S. EPA (2007a). Similarly, the Eco-SSL for vanadium of 7.8 mg/kg is below the background concentration of 44 mg/kg. An ecological benchmark specific to avian wildlife is not available for antimony. For these three metals, background concentrations were selected as the RBs.

Table 5.2 summarizes the first phase of refinement for avian wildlife. Information presented in Table 5.2 includes the RB, number of samples, number of samples with detected concentrations, the minimum and maximum detected concentrations, 95 percent UCLs, the refinement quotients (RQUCL = 95 percent UCL concentration divided by the RB), and rationale for retaining or eliminating a constituent as a COPEC.

Refinement benchmarks are not available for acetone, isopropylbenzene, benzene, toluene, xylenes (total), and carbazole. These six organic compounds are retained as COPECs.

The RQUCLs for HMW PAHs (23), copper (5.1), lead (16), mercury (3,000), and zinc (7.2) are greater than 1.0. These five constituents are retained as COPECs and carried forward for further evaluation using food chain models.

The RQUCLs for total PCBs (0.15), antimony (0.83), arsenic (0.25), barium (0.60), cadmium (0.96), chromium (0.64), manganese (0.11), selenium (0.61), vanadium (0.42), and cyanide (total)(0.13) are less than 1.0. These ten constituents are eliminated as COPECs for avian wildlife.

5.1.2 Mammalian Wildlife

Table 5.3 identifies the available benchmarks for mammalian wildlife. Information presented in Table 5.3 is similar to that presented in Table 5.1. The sources of ecological benchmarks for mammalian wildlife are the same as those for avian wildlife, with the addition of U.S. EPA, Region 5 ESLs that are based on masked shrew or meadow vole.

As was done for avian wildlife, background concentrations were considered in the selection of RBs for mammalian wildlife. Priority in the selection of RBs was given to the Eco-SSLs developed by U.S. EPA. If an Eco-SSL was not available, RBs were selected using the hierarchy discussed in Section 3.3, with the following exceptions. The Eco-SSL of 0.27 mg/kg and ESL of 0.142 mg/kg for antimony are below the mean background concentration of 1.3 mg/kg identified by U.S. EPA (2007a). The Eco-SSL of 0.36 mg/kg and ESL of 0.0022 mg/kg for cadmium are also below the mean background concentration of 0.90 mg/kg. The mean background concentrations were selected as the RBs for antimony and cadmium.

Table 5.4 summarizes the first phase of refinement for mammalian wildlife. Information presented in Table 5.4 is similar to that presented in Table 5.2.

Refinement benchmarks are not available for isopropylbenzene, xylenes (total), and carbazole. These three organic compounds are retained as COPECs.

The RQUCLs for acetone (2.2), HMW PAHs (13), copper (2.9), lead (3.2), mercury (10), selenium (1.2), zinc (4.2), and cyanide (total) (1.1) are greater than 1.0. These eight constituents are retained as COPECs and carried forward for further evaluation using food chain models.

The RQUCLs for benzene (0.65), toluene (0.49), total PCBs (0.15), antimony (0.83), arsenic (0.23), barium (0.086), cadmium (0.96), chromium (0.49), manganese (0.12), and vanadium (0.065) are less than 1.0. These ten constituents are eliminated as COPECs for mammalian wildlife.

5.2 Food Chain Models

5.2.1 Overview

Six species were selected as indicator species for avian and mammalian insectivores, herbivores, and carnivores. American woodcock and short-tailed shrew were selected as the indicator species for avian and mammalian insectivores, respectively. Mourning dove and meadow vole were selected as the indicator species for avian and mammalian herbivores, respectively. Red-tailed hawk and long-tailed weasel were selected as the indicator species for avian and mammalian carnivores, respectively. The six indicator species were selected based on their use by U.S. EPA to develop the Eco-SSLs for avian and mammalian wildlife (U.S. EPA, 2007a).

For each indicator species, total ingestion of a COPEC was calculated using the general equation:

$$IR_{total} = (IR_{food} * Conc_{food}) + (IR_{water} * Conc_{water}) + (P_S * IR_{food} * Conc_{soil}) \quad \text{Equation 1}$$

Where:

IR_{total} = Total ingestion rate of a COPEC (mg of COPEC per kg body weight per day)

IR_{food} = Ingestion rate of food (kg of food [dry weight] per kg body weight per day)

IR_{water} = Ingestion rate of drinking water (liter per kg body weight per day)

P_S = Proportion of IR_{food} that is soil (incidental soil ingestion)

$Conc_{food}$ = Concentration of a COPEC in food (mg of COPEC per kg [dry weight] of food)

$Conc_{water}$ = Concentration of a COPEC in drinking water (mg of COPEC per liter

$Conc_{soil}$ = Concentration of a COPEC in soil (mg of COC per kg [dry weight] of soil)

The calculated IR_{total} for each COPEC was divided by a TRV (NOAEL and/or LOAEL) specific to the COEPC to produce a hazard quotient (HQ). A HQ greater than 1.0 identifies a potential for risk.

Table 5.5 and Table 5.6 identify IR_{food}, IR_{water}, and P_S for the avian and mammalian indicator species, respectively. These values for IR_{food} and P_S are from U.S. EPA (2007a). The values for IR_{water} are from U.S. EPA (1999). Tables 5.5 and 5.6 also identify the diets of the indicator species. The food chain models assumed that all food consumed by all indicator species is obtained from the assessment area. Bioavailability of all COPECs evaluated was conservatively assumed to be 100 percent.

Concentrations of the COPECs in soil invertebrates, terrestrial plants, and small mammals consumed by the indicator species were calculated using general equations available in the risk assessment literature. Sources of the equations were U.S. EPA (1999, 2007a) and Sample et al. (1998). Table 5.7 identifies the equations for each dietary item and COPEC, as well as the source. If available, equations used to develop the Eco-SSLs (U.S. EPA, 2007a) were used.

For organic compounds with a log water-octanol partitioning coefficient (log K_{ow}) less than 3.5 [acetone and xylenes (total)], soil-to-invertebrate and soil-to-plant bioaccumulation was assumed to be negligible (U.S. EPA, 2000). For organic compounds with a log K_{ow} greater than 3.5 (isopropylbenzene and carbazole), equations identified in U.S. EPA (1999) were used to calculate concentrations in soil invertebrates and terrestrial plants. If an equation was not identified and the COPEC was not a BCOC, a bioaccumulation factor of 1.0 was assumed. Concentrations in all dietary items were calculated on a dry weight (DW) basis.

Table 5.8 identifies the exposure concentrations for soil invertebrates, terrestrial plants, and small mammals as calculated using the equations in Table 5.7. The 95 percent UCL concentrations in soil, as calculated using ProUCL (U.S. EPA, 2010), were used to calculate exposure concentrations in dietary items. As there are no open water bodies within the assessment area (the Kalamazoo River is outside the assessment area), concentrations of COPECs in drinking water were assumed to be negligible.

Table 5.9 identifies the NOAELs and LOAELs for avian and mammalian wildlife. The values for acetone, HMW PAHs, copper, lead, mercury, selenium, and zinc were submitted to U.S. EPA Region 5, and subsequently approved, in a Technical Memorandum dated October 19, 2012. The NOAELs and/or LOAELs for benzene, toluene, xylenes (total), and cyanide (total) are from Sample et al. (1996). The TRVs for isopropylbenzene were developed based on studies identified in the U.S. EPA's Integrated Risk Information System (IRIS) database. The TRVs for carbazole were developed based on studies identified in the National Library of Medicine's TOXNET database. Table 5.9 also identifies the source of each TRV.

5.2.2 Avian Wildlife

American Woodcock

Table 5.10 summarizes the results of the food chain model for American woodcock, the indicator species for avian insectivores. Information presented in Table 5.10 includes ingestion of a COPEC via food and soil, total ingestion, the NOAEL and HQ based on the NOAEL (HQ_{NOAEL}), LOAEL and HQ based on the LOAEL (HQ_{LOAEL}), and if the constituent is carried forward for development of a Site-specific ecological PRG. A constituent was carried forward for development of a PRG if the HQ_{NOAEL} was greater than 1.0.

TRVs for avian receptors were not identified for isopropylbenzene, benzene, toluene, xylenes (total), and carbazole. As TRVs for these constituents are available for mammalian wildlife, evaluation of risk to wildlife will be based on the food chain models for mammalian wildlife.

The HQ_{NOAEL} for acetone (0.037) is below 1.0. Based on this result, it can be concluded that acetone does not pose a potential for risk to avian insectivores above the threshold for concern and; therefore, calculation of a Site-specific PRG is not required.

For HMW PAHs, copper, mercury, and zinc, the HQ_{NOAEL} s are greater than 1.0, whereas the HQ_{LOAEL}s are less than 1.0. The HQ_{NOAEL}s are 4.1 for HMW PAHs, 9.1 for copper, 3.4 for mercury, and 7.8 for zinc, respectively. The HQ_{LOAEL}s are 0.41 for HMW PAHs, 0.40 for copper, 0.73 for mercury, and 0.78 for zinc, respectively. For lead, both the HQ_{NOAEL} (1,268) and HQ_{LOAEL} (2.0) are greater than 1.0. HMW PAHs, copper, lead, mercury, and zinc are carried forward for development of Site-specific PRGs for avian insectivores.

Mourning Dove

Table 5.11 summarizes the results of the food chain model for mourning dove, the indicator species for avian herbivores. Information presented in Table 5.11 is similar to that presented in Table 5.10.

The HQ_{NOAEL}s for acetone (0.028) and HMW PAHs (0.39) are below 1.0. Based on these results, it can be concluded that acetone and HMW PAHs do not pose a potential for risk to avian herbivores above the threshold for concern and; therefore, calculation of Site-specific PRGs is not required.

For copper, lead, mercury, and zinc, the HQ_{NOAEL} is greater than 1.0, whereas the HQ_{LOAEL} is less than 1.0. The HQ_{NOAEL}s are 2.8 for copper, 408 for lead, 1.3 for mercury, and 1.8 for zinc, respectively. The HQ_{LOAEL}s are 0.12 for copper, 0.65 for lead, 0.28 for mercury, and 0.18 for zinc, respectively. Copper, lead, mercury, and zinc are carried forward for development of Site-specific PRGs for avian herbivores.

Red-Tailed Hawk

Table 5.12 summarizes the results of the food chain model for red-tailed hawk, the indicator species for avian carnivores. Information presented in Table 5.12 is similar to that presented in Table 5.10 and Table 5.11.

The HQ_{NOAEL}s for acetone (0.0004) HMW PAHs (0.002), copper (0.26), mercury (0.088), and zinc (0.25) are below 1.0. Based on these results, it can be concluded that acetone, HMW PAHs, copper, mercury, and zinc do not pose a potential for risk to avian carnivores above the threshold for concern and; therefore, calculation of Site-specific PRGs is not required.

For lead, the HQ_{NOAEL} (32) is greater than 1.0, whereas the HQ_{LOAEL} (0.051) is less than 1.0. Lead is carried forward for development of a Site-specific PRG for avian carnivores.

5.2.3 Mammalian Wildlife

Short-Tailed Shrew

Table 5.13 summarizes the results of the food chain model for short-tailed shrew, the indicator species for mammalian insectivores. Information presented in Table 5.13 includes ingestion of a COPEC via food and soil, total ingestion, the NOAEL and HQ_{NOAEL}, LOAEL and HQ_{LOAEL}, and if the constituent is carried forward for development of a Site-specific ecological PRG. A constituent was carried forward for development of a PRG if the HQ_{NOAEL} was greater than 1.0.

The HQ_{NOAEL}s for acetone (0.003), isopropylbenzene (0.086), xylenes (total) (0.007), and cyanide (total) (0.031) are below 1.0. Based on these results, it can be concluded that acetone, isopropylbenzene, xylenes (total), and cyanide (total) do not pose a potential for risk to mammalian insectivores above the

threshold for concern and; therefore, calculation of Site-specific PRGs are not required for mammalian insectivores.

For carbazole, HMW PAHs, copper, lead, mercury, selenium, and zinc, the HQ_{NOAEL}s are greater than 1.0, whereas the HQ_{LOAEL}s are less than 1.0. The HQ_{NOAEL}s are 1.6 for carbazole, 12 for HMW PAHs, 6.1 for copper, 12 for lead, 3.2 for mercury, 3.2 for selenium, and 13 for zinc, respectively. The HQ_{LOAEL}s are 0.14 for carbazole, 0.27 for HMW PAHs, 0.026 for copper, 0.051 for lead, 0.022 for mercury, 0.13 for selenium, and 0.30 for zinc, respectively. Carbazole, HMW PAHs, copper, lead, mercury, selenium, and zinc are carried forward for development of Site-specific PRGs for avian insectivores.

Meadow Vole

Table 5.14 summarizes the results of the food chain model for meadow vole, the indicator species for mammalian herbivores. Information presented in Table 5.14 is similar to that presented in Table 5.13.

The HQ_{NOAEL}s for acetone (0.002), isopropylbenzene (0.00003), xylenes (total) (0.003), carbazole (0.0004), HMW PAHs (0.38), copper (0.60), lead (0.93), mercury (0.34), selenium (0.66), and cyanide (total) (0.002) are below 1.0. Based on these results, it can be concluded that acetone, isopropylbenzene, xylenes (total), carbazole, HMW PAHs, copper, lead, mercury, selenium, and cyanide (total) do not pose a potential for risk to mammalian herbivores above the threshold for concern and; therefore, calculation of Site-specific PRGs is not required.

For zinc, the HQ_{NOAEL} (1.2) is greater than 1.0, whereas the HQ_{LOAEL} (0.028) is less than 1.0. Zinc is carried forward for development of a Site-specific PRG for mammalian herbivores.

Long-Tailed Weasel

Table 5.15 summarizes the results of the food chain model for long-tailed weasel, the indicator species for mammalian carnivores. Information presented in Table 5.15 is similar to that presented in Table 5.13 and Table 5.14.

The HQ_{NOAEL}s for acetone (0.003), isopropylbenzene (0.054), xylenes (total) (0.006), carbazole (0.99), HMW PAHs (0.126), mercury (0.72), and cyanide (total) (0.019) are below 1.0. Based on these results, it can be concluded that acetone, isopropylbenzene, xylenes (total), carbazole, HMW PAHs, mercury, and cyanide (total) do not pose a potential for risk to mammalian carnivores above the threshold for concern and; therefore, calculation of Site-specific PRGs is not required.

For copper, lead, selenium, and zinc, the HQ_{NOAEL}s are greater than 1.0, whereas the HQ_{LOAEL}s are less than 1.0. The HQ_{NOAEL}s are 1.1 for copper, 2.4 for lead, 1.6 for mercury, and 1.8 for zinc, respectively. The HQ_{LOAEL}s are 0.005 for copper, 0.01 for lead, 0.066 for mercury, and 0.042 for zinc, respectively.

Copper, lead, selenium, and zinc are carried forward for development of Site-specific PRGs for mammalian carnivores.

Section 6.0 Ecological Preliminary Remediation Goals

6.1 Overview

PRGs were calculated for those constituents for which the HQ_{NOAEL} for one or more indicator species was greater than 1.0. The PRGs were calculated using the food chain models discussed in Section 5.0. For each indicator species and COPEC with a HQ_{NOAEL} greater than 1.0, a lower bound PRG was developed by back-calculating a soil concentration that produced a HQ_{NOAEL} of 1.0. Similarly, an upper bound PRG was developed by back-calculating a soil concentration that produced a HQ_{LOAEL} of 1.0. The PRG for that indicator species and COPEC was the mid-point of the lower bound and upper bound PRGs.

Individual mid-point PRGs were calculated for each avian indicator species with a HQ_{NOAEL} greater than 1.0. The PRG for avian wildlife was the lowest of the mid-point PRGs. Similarly, the PRG for mammalian wildlife was the lowest of the mid-point PRGs. The ecological PRG was the lower of the avian and mammalian PRGs. The ecological PRG was then compared to the 95 percent UCL concentrations of the COPECs. A 95 percent UCL concentration greater than the ecological PRG identifies a need for risk management measures.

The calculation of PRGs was conducted using a two-phase approach. In the first phase, initial ecological PRGs were calculated using the exposure parameters and NOAELs and LOAELs used for the food chain models. Many of these parameters are very conservative and intentionally overestimate the potential for risk. For example, the food ingestion rates of the indicator species (IRfood) are high end point estimates used to develop the Eco-SSLs. Similarly, the PS values for incidental soil ingestion are 90th percentile values (U.S. EPA, 2007a). These high estimates are intended for use only in screening for COPECs, not for the development of PRGs. In addition, some of the NOAELs and LOAELs used for the food chain are extremely low. For example, the NOAEL for lead for avian receptors produces a lower bound PRG for avian insectivores (0.039 mg/kg) that is substantially below naturally occurring concentrations.

Those COPECs with 95 percent UCL concentrations greater than their initial ecological PRGs were further evaluated in the second phase of the process. For this second phase, exposure parameters and ingestion rates were based on the U.S. EPA's Wildlife Scenario Builder program (U.S. EPA, 2013). In this program, ingestion is based on the metabolic requirements of free ranging organisms [free metabolic rate expressed as kilocalories (kcal) per day] and assimilation efficiencies for the various dietary components. Whereas the food chain models in Section 5.0 assumed a single food item for an indicator

species, the U.S. EPA's Wildlife Scenario Builder program (U.S. EPA, 2013) identifies a number of dietary items for an indicator species, each with a distinct values for gross energy (kilocalorie per gram) and assimilation efficiencies. Body weights to normalize ingestion are based on values in the program that have been vetted by U.S. EPA. The result is a more ecologically realistic modeling of ingestion and exposure.

American woodcock and short-tailed shrew, both insectivores, were modeled using the U.S. EPA's Wildlife Scenario Builder program (U.S. EPA, 2013). Parameters for these two indicator species are provided in the program. As concentrations in soil invertebrates are higher than in terrestrial plants (see Table 5.8), the potential for risk to insectivores is greater than for herbivores or carnivores. Table 6.1 identifies the exposure parameters for American woodcock and short-tailed shrew based on the U.S. EPA's Wildlife Scenario Builder program (U.S. EPA, 2013).

In addition to use of the U.S. EPA's Wildlife Scenario Builder program (U.S. EPA, 2013) to modify exposure parameters, the NOAELs and LOAELs used for the food chain models were critically reviewed and modified, as appropriate, to more ecologically realistic values. Upon completion of the second phase of the analysis, final ecological PRGs were selected and the requirements, if any, for risk management measures identified.

6.2 Initial Ecological Preliminary Remediation Goals

Table 6.2 and Table 6.3 identify the initial PRGs for avian wildlife and mammalian wildlife, respectively. Table 6.4 identifies the initial ecological PRG, which is the lower of the avian PRG and mammalian PRG. Information presented in Table 6.4 includes the 95 percent UCL concentrations of the COPECs, initial avian and mammalian PRGs, initial ecological PRG, and the need to carry forward for further evaluation.

The 95 percent UCL concentration for carbazole, copper, and selenium are below their initial PRGs. Consequently, no further evaluation or risk management measures are required for carbazole, copper, and selenium.

The 95 percent UCL concentrations for HMW PAHs, lead, mercury, and zinc are greater than their initial PRGs. These four constituents are carried forward for further evaluation.

6.3 Modified Ecological Preliminary Remediation Goals

High molecular weight PAHs, lead, mercury, and zinc were carried forward for further evaluation for development of PRGs. Food chain models for American woodcock (avian insectivore) and short-tailed shrew (mammalian insectivore) were re-evaluated using the exposure parameters identified in

Table 6.1. In addition, the NOAELs and LOAELs for HWM PAHs, lead, mercury, and zinc were evaluated to determine if they are ecologically relevant for the purpose of developing PRGs.

The NOAEL for HMW PAHs for mammalian receptors is 0.615 mg/kg/day. This value is the lowest of 17 NOAELs for reproduction, growth, and survival in the Eco-SSL source document for PAHs (U.S. EPA, 2007e) and an order of magnitude less than the next lowest NOAEL (3.09 mg/kg/day). Because the geometric mean of the NOAEL for growth and reproduction (18 mg/kg) is greater than the lowest bounded LOAEL for growth, reproduction, and mortality, 0.615 mg/kg/day was identified as the NOAEL for development of the Eco-SSL for HMW PAHs. It is the highest (only) NOAEL below the lowest bounded LOAEL (3.09 mg/kg/day).

The NOAEL of 0.615 mg/kg is based on a study of mouse survival in cancer bioassays conducted with benzo(a)pyrene (Culp et al., 1998). This study is inappropriate for the Eco-SSL dataset in general, much less as a NOAEL for developing site-specific PRGs. The strain of mouse used, B6C3F1, is a highly imbred strain with a sensitivity to cancer 10 times higher than other imbred strains of mice typically used in toxicity testing (King-Herbet and Thayer, 2006). Furthermore, the next highest dose tested was 3.1 mg/kg/day (the LOAEL), which is an order of magnitude higher than the identified NOAEL. Therefore, the actual NOAEL is likely somewhere within this broad range of doses. Moreover, the NOAEL is based on moderate reductions in late-life survival of a small mammal with a short life span (2 years), which has limited applicability to natural mammal populations. Smith (2013) evaluated population level effects of the late life effects on reproduction identified by Culp et al. (1998) by entering age-specific reproduction and survival into a Leslie matrix (Suter et al., 1993; Forbes et al., 2010). The detrimental late life survival at a dose of 0.615 mg/kg/day had no effects at the population level. Smith (2013) concluded that the Culp et al. (1998) study, in addition to having no relevance at the population level, is an outlier and should be removed from the Eco-SSL dataset. Following removal of the Culp et al. (1998), the geometric mean of the NOAELs for growth and reproduction, is 22.5 mg/kg/day, which is still higher than the lowest bounded LOAEL for growth, reproduction, and survival. Following the guidelines for development of the Eco-SSLs (U.S. EPA, 2007a), the NOAEL for the re-evaluation is 11.8 mg/kg/day, which is the highest NOAEL below the lowest bounded LOAEL for growth and reproduction (12.4 mg/kg). The LOAEL for the re-evaluation is 39.6 mg/kg, which is the geometric mean of the bounded LOAELs for growth and reproduction after removal of Culp et al. (1998).

The NOAEL and LOAEL for lead for avian receptors are those identified by U.S. EPA, Region 9 (U.S. EPA 2009). The NOAEL of 0.014 mg/kg/day is identified as a study published in Toxicology and Applied Pharmacology by Edens et al. (1967). This value is questionable for several reasons. This source could not be verified in the citation identified (Volume 38; pages 307-314). Volume 38 does not appear to have been published in 1967. The value of 0.014 mg/kg/day is an order of magnitude lower than the lowest NOAEL of 0.194 mg/kg/day used to develop the Eco-SSL for avian wildlife (U.S. EPA, 2005f). In

addition, Edens et al. (1967) is not identified in the Eco-SSL document as either a study that met the criteria for development of Eco-SSLs or was rejected as not meeting the criteria (see Appendix 5.1 in U.S. EPA, 2005f). As another line of evidence, use of 0.014 mg/kg/day as a TRV produces a PRG for American woodcock of 0.039 mg/kg. The background concentration of lead for the Michigan Glacial Lobe reported by MDEQ (2005) is 7.4 mg/kg, which is two orders of magnitude greater than NOAEL-based PRG of 0.039 mg/kg. A NOAEL that produces a PRG two orders of magnitude below background raises uncertainties regarding the scientific basis of the study and its applicability to development of site-specific PRGs. Consistent with identification of RBs, a value of 0.598 mg/kg/day, which is based on a background concentration of 7.4 mg/kg, is selected as the NOAEL for the re-evaluation.

The LOAEL of 8.75 mg/kg/day is identified as a study by Edens and Garlich (1983) that reports the effects of lead on reproduction of chickens. As with the NOAEL, the LOAEL for this study is also questionable based on several lines of evidence. The Eco-SSL source document for lead (U.S. EPA, 2005f) does present the results of a study by Edens and Garlich (1983) for chicken, as well as Japanese quail. The study LOAELs summarized in Appendix 5.1 are 10 mg/kg diet and 50 mg/kg diet for Japanese quail and chicken, respectively. The converted dose values are 1.94 mg/kg/day and 3.26 mg/kg/day for Japanese quail and chicken, respectively. The LOAEL of 8.75 mg/kg/day identified by U.S. EPA (2009) does not match the converted doses for either Japanese quail or chicken identified in U.S. EPA (2005f).

Assuming the LOAEL of 8.75 mg/kg/day identified by Region 9 is based on Edens and Garlich (1983), the form of lead used in the study is one that is not present under field conditions. The form tested is lead acetate. As identified in Table 3 of Attachment 4.3 of the guidelines for developing Eco-SSLs (U.S. EPA, 2007a), lead acetate is not identified as a form that "*could be found in the soil environment.*" Lead acetate has a relatively high solubility (1,600 µg/L), as calculated using U.S. EPA's EPI-Suite program (U.S. EPA, 2012). Furthermore, Jones (2013) documented that LOAELs based on lead acetate are significantly lower than forms of lead that are expected to occur in the soil environment.

One additional line of evidence for rejecting 8.75 mg/kg/day as the LOAEL for development of site-specific PRGs is that this value is lower than both the geometric mean (10.9 mg/kg/day) and median (12.3 mg/kg/day) for NOAELs for reproduction and growth identified in the Eco-SSL lead (U.S. EPA, 2005e). A value of 42.7 mg/kg/day, which is the geometric mean of the bounded LOAELs (i.e., LOAELs for which a corresponding NOAEL is also reported) in the Eco-SSL dataset is selected as the LOAEL. This value approximates the 25th percentile of bounded LOAELs. This value is conservative in that it includes LOAELs from numerous studies based on lead acetate.

The NOAELs and LOAELs for mercury and zinc are retained for the re-evaluation. Table 6.5 identifies the original and modified TRVs and summarizes the rationale for the modifications.

Table 6.6 identifies the modified avian and mammalian PRGs for HMW PAHs, lead, mercury, and zinc based on the exposure factors in Table 6.1 and the TRVs in Table 6.5. Appendix B provides details of the calculations for the revised food chain models using exposure factors identified in the U.S. EPA's Wildlife Scenario Builder program (U.S. EPA, 2013).

6.4 Final Ecological Preliminary Remediation Goals

Table 6.7 identifies the final ecological PRGs for the assessment area. Information presented in Table 6.7 includes the 95 percent UCL concentrations of the COPECs, initial PRGs, initial and modified avian and mammalian PRGs, final ecological PRGs, and the need risk management measures.

For all seven constituents identified in Table 6.7, the 95 percent UCL concentration is below the final ecological PRG. Based on this result, risk management measures are not required to protect avian and mammalian wildlife.

Section 7.0 Complete Exposure Pathways and Ecosystems at Risk

7.1 Complete Exposure Pathways

The SLERA presented a Conceptual Site Model (CSM) that identified all potentially complete exposure pathways for ecological receptors. Although all the exposure pathways identified in the SLERA are potentially complete, the refinement step focused on exposure to avian and mammalian wildlife exposed to COPECs via ingestion of food and soil. The results of the refinement process document that, although avian and mammalian wildlife are exposed to COPECs in soil within the assessment area, the potential for risk for all receptors is below the threshold for concern.

7.2 Ecosystems at Risk

The assessment area for the refinement process is located within the riparian corridor of the Kalamazoo River. Based on the results of the refinement process, there are no known ecosystems at risk within the assessment area.

Section 8.0 Selection of Assessment Endpoints

At this point in ecological risk assessment process, assessment endpoints for the BERA are selected. The assessment endpoints focus on those exposure pathways that are identified as complete and those constituents with concentrations that potentially pose risk to ecological receptors. Because no constituents were identified as posing risk to avian and mammalian wildlife above the threshold for

concern, the ecological risk assessment process does not proceed past the refinement process. Consequently, selection of assessment endpoints for the BERA is not required.

Section 9.0 Conceptual Site Model and Risk Questions

9.1 Conceptual Site Model

If the refinement process had identified one or more constituents with the potential to pose risk to ecological receptors, the CSM would be revised to identify those exposure pathways and ecological receptors exposed to the constituents retained as COPECs. Because no constituents were identified as COPECs, revision of the CSM is not required.

9.2 Risk Questions

Development of risk hypotheses and questions is not required. No constituents were retained as COPECs for any exposure pathway for avian and mammalian wildlife. Therefore, the ecological risk assessment process does not proceed past the refinement process.

Section 10.0 Analysis of Uncertainties

Evaluation of risk to ecological receptors is typically associated with several areas of uncertainty. In the absence of data, assumptions must be made regarding exposure concentrations and responses of ecological receptors to COPECs. To avoid incorrectly dismissing the potential for risk, exposure concentrations and other assumptions are intentionally biased toward identifying risk. As a result of this bias, it can be concluded with a high level of certainty that chemical constituents with RQs and HQs below 1.0 do not pose an unacceptable potential for risk to ecological receptors. However, a RQ or HQ greater than 1.0 does not necessarily demonstrate that the risk actually exists, only that additional evaluation should be undertaken.

One major area of uncertainty is the actual concentration of COPECs in prey items consumed by avian and mammalian wildlife. Concentrations of COPECs were estimated for soil invertebrates, plants, and small mammals using generic equations. An uptake factor of 1.0 was assumed for those COPECs and pathways without an available equation. For organic compounds with a log Kow less than 3.5, bioaccumulation was assumed to be negligible. The uncertainty of actual concentrations in the tissue of prey items could be significantly reduced by collecting and conducting chemical analysis of potential prey items. These analyses are beyond the scope of refinement process.

Selection of TRVs for both the refinement process and development of PRGs is a source of uncertainty. Values for both NOAELs and LOAELs can vary by up to four orders of magnitude. This is not unexpected as studies utilize different species, different forms of a contaminant, different age groups, different durations of exposure, and different exposure routes, to name a few. To maintain conservatism, geometric means, which reduce the influence of high values on central tendency, are used of define a single value when numerous values are available. A critical review of the TRVs for HWM PAHs (mammalian wildlife) and lead (avian wildlife) identified several issues that strongly suggest the TRVs were not appropriate for use in developing PRGs. Even with the removal of the questionable values, there is a high degree of uncertainty in selection of TRVs.

There are other areas of uncertainty associated with the refinement process. Bioavailability of all COPECs was conservatively assumed to be 100 percent. The actual bioavailability of the chemicals evaluated is unknown, but is likely less than 100 percent. Accounting for bioavailability would reduce the HQs and PRGs. Indicator species were selected to represent the various trophic guilds evaluated in this risk assessment. The actual presence of these indicator species or other species within the trophic guilds evaluated is unknown. The actual area use of the indicator species is also unknown, and was conservatively assumed to be 100 percent.

Section 11.0 Summary and Conclusions

Chemical constituents identified in the SLERA as COPECs were refined in accordance with U.S. EPA guidance for conducting ecological risk assessment (U.S. EPA, 1997). The refinement process is Step 3 of the 8-step process. Prior to refinement, the dataset used for the SLERA was modified by eliminating those samples collected from areas that are anticipated to be redeveloped, thus eliminating complete exposure pathways for ecological receptors. The revised dataset was then re-screened using the same methodology and ESVs as were used in the SLERA. The re-screening retained two VOCs (i.e., acetone and isopropylbenzene), three BTEX constituents (i.e., benzene, toluene, and m&p-xylene), one SVOC (i.e., carbazole), HMW PAHs, and 14 inorganic constituents [i.e., antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, selenium, vanadium, zinc, and cyanide (total)] as COPECs.

The constituents retained as COPECs were refined using a two phase process. In the first phase, 95 percent UCL concentrations, as calculated using ProUCL (U.S. EPA, 2010), were compared to ecological benchmarks specific to avian and/or mammalian wildlife (RBs). Those constituents with 95 percent UCL concentrations greater than their RBs were carried forward to the second phase of the analysis. Those constituents that do not have a RB specific to avian and/or mammalian wildlife were also carried forward.

For the second phase of the refinement process, food chain models were used to evaluate the potential for risk to avian and mammalian wildlife. The food chain models identified a potential for risk to avian insectivores exposed to lead based on both the NOAEL and LOAEL. A potential for risk was identified for carbazole, HMW PAHs, copper, lead, mercury, selenium, and zinc to one or more receptor groups based on NOAELs, but not for LOAELs.

Initial PRGs were developed for carbazole, HMW PAHs, copper, lead, mercury, selenium, and zinc based on the exposure parameters and TRVs used for the food chain models. The initial PRGs were compared to the 95 percent UCL concentrations of the seven COPECs. The 95 percent UCL concentrations of carbazole, copper, and selenium were below their initial PRGs, indicating no need for further evaluation or risk management measures. As the 95 percent UCL concentrations of HMW PAHs, lead, mercury, and zinc were greater than their initial PRGs, they were carried forward for further evaluation.

The initial PRGs were based on conservative assumptions and TRVs used in the food chain models, which overestimated the potential for risk. The conservative assumptions included high rates of ingestion and small body size. The TRVs for HMW PAHs and lead were unrealistically low for development of PRGs. The initial PRGs for HMW PAHs, lead, mercury, and zinc were re-evaluated using exposure parameters derived from the U.S. EPA's Wildlife Scenario Builder program (U.S. EPA, 2013), which are based on energy requirements of free ranging organisms, energy derived from a variety of dietary items, and assimilation efficiencies for the individual dietary items. The NOAELs for HMW PAHs and lead, and LOAEL for lead were replaced with more realistic values.

Based on the results of the re-evaluation, final ecological PRGs were identified for carbazole, HMW PAHs, copper, lead, mercury, selenium, and zinc. Table 6.7 identifies the final ecological PRGs. For all seven COPECs, the 95 percent UCL concentrations were below their final ecological PRGs. Based on these results, the potential for risk to avian and mammalian wildlife is below the threshold for concern and risk management measures for the protection of ecological receptors are not required.

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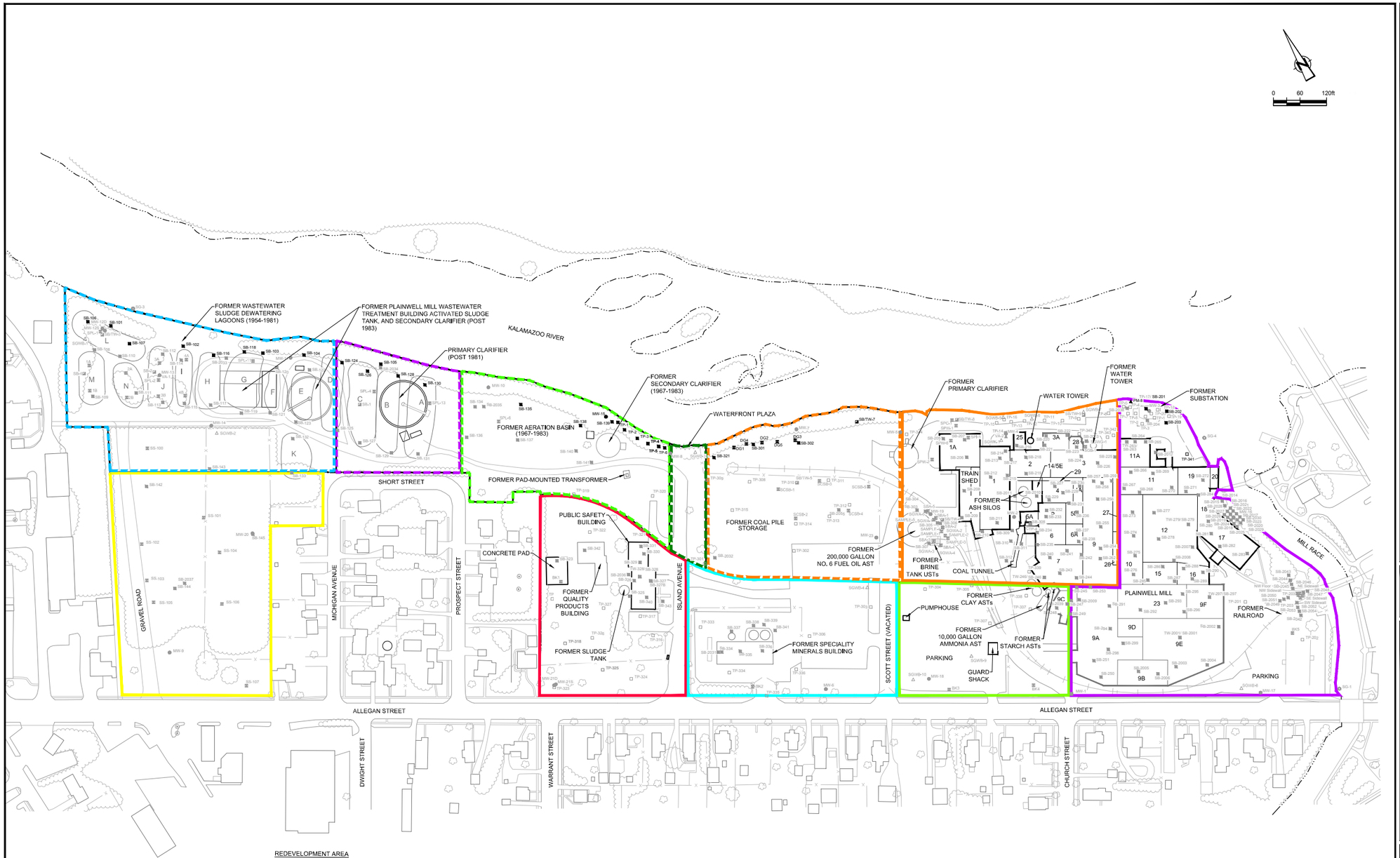

REDEVELOPMENT AREA

- COMMERCIAL AREA 1
- COMMERCIAL AREA 2
- COMMERCIAL AREA 3
- MIXED RESIDENTIAL/COMMERCIAL AREA 1
- MIXED RESIDENTIAL/COMMERCIAL AREA 2
- COMMERCIAL AREA 4
- RESIDENTIAL AREA 1
- RESIDENTIAL AREA 2
- RESIDENTIAL AREA 3
- RESIDENTIAL AREA 4
- WATERFRONT PLAZA

Nº	Revision	Date	Initial

LEGEND

- PROPERTY BOUNDARY
- FORMER FEATURE
- TREE LINE
- FENCE LINE
- RAILROAD
- SURFACE WATER
- SB-262 SOIL BORING LOCATION - PHASE II RI
- SB-2020 SOIL BORING LOCATION - ADDITIONAL RI (MARCH & AUG. 2012)
- TP-339 TEST PIT LOCATION - PHASE II RI
- TW-246 TEMPORARY WELL LOCATION - PHASE II RI
- MW-5 MONITORING WELL LOCATION - PHASE I, II, AND ADDITIONAL RI
- VA-1 VERTICAL AQUIFER SAMPLE LOCATION - PHASE II RI
- CTP-4 SOIL SAMPLE LOCATION - PHASE I RI
- TP-1 TEST PIT LOCATION - PHASE I RI
- SG-2 STAFF GAUGE - PHASE I RI
- PREVIOUS SOIL SAMPLE LOCATION (TAPLIN ENVIRONMENTAL SERVICES, 1999)
- PREVIOUS SOIL SAMPLE LOCATION (BBL, 1994)
- PREVIOUS SOIL SAMPLE LOCATION (ERM, 1997)
- PREVIOUS SOIL BORING LOCATION (FTC&H, 2006)
- PREVIOUS TEMPORARY WELL LOCATION (FTC&H, 2006)
- PREVIOUS GROUNDWATER SAMPLE LOCATION (ERM, 1997)
- PREVIOUS TEST PIT EXCAVATION LOCATION (RMT, 2008)
- SOIL BORING LOCATION - FANNIE PELL BRIDGE FOOTING
- PREVIOUS SOIL SAMPLE LOCATION (CDM, 2001)
- ABANDONED MONITORING WELL LOCATION

NOTE:
THE FOLLOWING STRUCTURES WERE DEMOLISHED ON BEHALF OF THE CITY OF PLAINWELL BETWEEN MARCH & AUGUST 2012: BUILDING 3A, 9A, 9B, 9C, 9D, 9E, 9F, 23 AND 28, ONE 50,000-GALLON WATER TOWER, THE 200,000-GALLON FUEL OIL AST, THE BRINE TANKS, THE FORMER CLAY STARCH TANKS AND FORMER AMMONIA AST SECONDARY CONTAINMENT STRUCTURE. THE FORMER SPECIALTY MINERALS BUILDING AND FORMER SLUDGE TANK (ADJACENT TO THE FORMER SLUDGE DEWATERING BUILDING) WAS DEMOLISHED IN DECEMBER 2011. THE FORMER QUALITY PRODUCTS BUILDING WAS DEMOLISHED IN OCTOBER 2011. THE RAILROAD WAS REMOVED BY THE CITY OF PLAINWELL IN THE FALL OF 2011.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

FORMER PLAINWELL, INC. MILL PROPERTY PLAINWELL, MICHIGAN

ECOLOGICAL RISK ASSESSMENT - STEP 3

LOCATIONS OF SURFACE SOIL SAMPLES

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
J.Q.	S.J.	DECEMBER 2013	
Scale: 1:120	Project Nº: 056394-07	Report Nº: 010	Drawing Nº: figure 1.1

056394-07(010)GN-DE001 DEC 18/2013

TABLE 2.1

CONSTITUENTS OF POTENTIAL ECOLOGICAL CONCERN IDENTIFIED IN THE SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

COPECs	*Residential Area 1*	*Residential Area 2*	*Residential Area 3*	*Residential Area 4*	*Waterfront Plaza*	*Mixed Residential/ Commercial Area 1*	*Mixed Residential/ Commercial Area 2*	*Commercial Area 1*	*Commercial Area 2*	*Commercial Area 3*	*Commercial Area 4*
Volatile Organic Compounds (VOCs)											
1,2-Dibromo-3-chloropropane (DBCP)	LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV		LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV
1,2,4-Trimethylbenzene							No ESV				
1,3,5-Trimethylbenzene							No ESV				
2-Phenylbutane (sec-Butylbenzene)							No ESV				
Acetone				SQ = 3.4			SQ = 2.2				
Cymene							No ESV				
Isopropyl benzene	No ESV			No ESV			No ESV			No ESV	No ESV
N-Propylbenzene							No ESV				
N-Butylbenzene							No ESV				
Tetrahydrofuran							No ESV				
BTEX											
Benzene				SQ = 13			SQ = 2.8				SQ = 1.4
Toluene				SQ = 4.6			SQ = 2.4				
o-Xylene				SQ = 1.2			SQ =1.1				
m&p-Xylenes				SQ = 1.7			SQ = 1.6				
Semi-Volatile Organic Compounds (SVOCs)											
2,4-Dimethylphenol				LOD > ESV		LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV		LOD > ESV
2,4-Dinitrophenol				LOD > ESV							
2-Chlorophenol	LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV		LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV
4,6-Dinitro-2-methylphenol (4,6-Dinitro-o-cresol)	LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV		LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV
bis(2-Ethylhexyl)phthalate (DEHP)	SQ = 3.8										
Carbazole	No ESV		No ESV	No ESV		No ESV	No ESV	No ESV			No ESV
Dibenzofuran	No ESV		No ESV	No ESV		---	No ESV	No ESV		No ESV	No ESV
Hexachlorobenzene	LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV		LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV
Hexachlorobutadiene	LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV		LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV	LOD > ESV
Polcyclic Aromatic Hydrocarbons (PAHs)											
Sum of LMW PAHs							SQ = 3.0				
Sum of HMW PAHs	SQ = 7.4	SQ = 1.4	SQ = 1.6	SQ = 54		SQ = 3.5	SQ = 57	SQ = 7.5	SQ = 4.1	SQ = 1.2	SQ = 18

TABLE 2.1

CONSTITUENTS OF POTENTIAL ECOLOGICAL CONCERN IDENTIFIED IN THE SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

COPECs	*Residential Area 1*	*Residential Area 2*	*Residential Area 3*	*Residential Area 4*	*Waterfront Plaza*	*Mixed Residential/ Commercial Area 1*	*Mixed Residential/ Commercial Area 2*	*Commercial Area 1*	*Commercial Area 2*	*Commercial Area 3*	*Commercial Area 4*
Polychlorinated Biphenyls (PCBs)											
Aroclor-1016 (PCB-1016)											
Aroclor-1221 (PCB-1221)											
Aroclor-1242 (PCB-1242)											
Aroclor-1248 (PCB-1248)											
Aroclor-1254 (PCB-1254)											
Aroclor-1260 (PCB-1260)											
Total PCBs	SQ = 3,584	SQ = 684	SQ = 1,205	SQ = 1,205			SQ = 3,313	SQ = 3,072	SQ = 361		SQ = 33,133
Inorganic Constituents											
Antimony			SQ = 1.5	SQ = 5.6			SQ = 202			SQ = 1.1	SQ = 32
Arsenic			SQ = 1.1	SQ = 1.2		SQ = 1.1	SQ = 5.7		SQ = 1.9		SQ = 4.2
Barium							SQ = 2.6				SQ = 1.5
Cadmium	SQ = 3.1			SQ = 11		SQ = 2.6	SQ = 6.4		SQ = 3.6	SQ = 3.1	SQ = 4.7
Chromium			SQ = 1.4	SQ = 1.1			SQ = 3.3				SQ = 1.5
Cobalt						SQ 2.3	SQ = 2.9				
Copper	SQ = 1.8	SQ = 1.6	SQ = 1.3	SQ = 7.9	BCOC		SQ = 91	SQ = 1.1			SQ = 11
Iron	SQ = 116	SQ = 76	SQ = 129	SQ = 94	SQ = 23	SQ = 51	SQ = 313	SQ = 71	SQ = 70	SQ = 74	SQ = 426
Lead	SQ = 6.1	SQ = 4.1	SQ = 5.8	SQ = 90		SQ = 15	SQ = 212	SQ = 7.7	SQ = 8.2	SQ = 7.9	SQ = 50
Manganese	SQ = 4.5	SQ = 3.2	SQ = 3.2	SQ = 3.2		SQ = 8.5	SQ = 5.0	SQ = 6.9	SQ = 4.1	SQ = 3.4	SQ = 18
Mercury	SQ = 3.3	BCOC	SQ = 22	SQ = 56		SQ = 1.6	SQ = 40	SQ = 2.4	SQ = 1.9	SQ > 47	SQ = 8.0
Nickel	BCOC	BCOC	BCOC	BCOC	BCOC	BCOC	SQ = 1.6	BCOC	BCOC	BCOC	BCOC
Selenium	SQ = 3.1	SQ = 1.5	SQ = 2.1	SQ = 8.7		SQ = 1.2	SQ = 5.8	SQ = 1.9	SQ = 2.3	SQ = 5.0	SQ = 2.9
Vanadium	SQ = 3.6	SQ = 2.4	SQ = 6.9	SQ = 2.4		SQ = 1.8	SQ = 5.0	SQ = 2.6	SQ = 2.7	SQ = 2.3	SQ = 6.3
Zinc	SQ = 2.8	SQ = 1.3	SQ = 2.4	SQ = 9.8		SQ = 2.3	SQ = 100	SQ = 1.6	SQ = 1.9	SQ = 1.5	SQ = 17
Cyanide (Total)				SQ = 1.4			SQ = 1.9		SQ = 1.8	SQ = 1.7	SQ = 1.8

Notes *:*
BCOC - Bioaccumulative Chemical of Concern
COPEC - Constituent of Potential Ecological Concern
ESV - Ecological Screening Value
LOD - Limit of Detection
SQ - Screening Quotient
BTEX - Benzene, toluene, ethylbenzene, and xylenes
LMW - Low Molecular Weight
HMW - High Molecular Weight

TABLE 4.1

RE-SCREENING SUMMARY FOR REFINEMENT DATASET
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*Units*	*ESV*	*Source*	*No. Samples*	*No. Detects*	*FOD*	*Max Conc.*	*Area of Max. Conc.*	*Sample with Max. Conc.*	*SQ*	*BCOC*	*Retain as COPEC*	*Rationale for Retaining or Eliminating*
Volatile Organic Compounds (VOCs)													
Acetone	**µg/kg**	**2,500**	**a**	**3**	**3**	**100%**	**5,500**	**Residential Area 4**	**SB-302**	**2.2**	**No**	**Yes**	**SQ > 1**
Isopropylbenzene	**µg/kg**	**n/a**	**---**	**24**	**3**	13%	**660**	**Residential Area 4**	**SB-302**	**-**	**No**	**Yes**	**No ESV**
BTEX													
Benzene	**µg/kg**	**255**	**a**	**24**	**8**	**33%**	**1,300**	**Residential Area 4**	**SB-302**	**5.1**	**No**	**Yes**	**SQ > 1**
Toluene	**µg/kg**	**5,450**	**a**	**24**	**10**	**42%**	**22,000**	**Residential Area 4**	**SB-302**	**4.0**	**No**	**Yes**	**SQ > 1**
o-Xylene	**µg/kg**	10,000	a	24	10	42%	7,400	Residential Area 4	SB-302	0.74	No	No	SQ < 1
m&p-Xylenes	**µg/kg**	**10,000**	**a**	**24**	**9**	**38%**	**11,000**	**Residential Area 4**	**SB-302**	**1.1**	**No**	**Yes**	**SQ > 1**
Semi-Volatile Organic Compounds (SVOCs)													
bis(2-Ethylhexyl)phthalate	**µg/kg**	925	a	24	13	54%	350	Commercial Area 4	SB-201	0.38	No	No	SQ < 1
Carbazole	**µg/kg**	**n/a**	**---**	**23**	**3**	13%	**83**	**Residential Area 4**	**SB-302**	**-**	**No**	**Yes**	**No ESV**
Polcyclic Aromatic Hydrocarbons (PAHs)													
High Molecular Weight (HMW) PAHs													
Benzo(a)anthracene	**µg/kg**			30	16	53%	3,800	Residential Area 4	DG3				
Benzo(a)pyrene	**µg/kg**			30	17	57%	4,900	Residential Area 4	DG3				
Chrysene	**µg/kg**			30	19	63%	8,100	Residential Area 4	DG3				
Dibenzo(a,h)anthracene	**µg/kg**			30	10	33%	6,400	Residential Area 4	DG4				
Fluoranthene	**µg/kg**			30	17	57%	7,700	Commercial Area 4	TP-341				
Pyrene	**µg/kg**			26	15	58%	6,000	Residential Area 4	DG3				
Sum of HMW PAHs		**1,100**	**b**	**30**	**22**	**73%**	**26,500**	**Residential Area 4**	**DG3**	**24**	**No**	**Yes**	**SQ > 1**
Polychlorinated Biphenyls (PCBs)													
Aroclor-1248	**µg/kg**			17	1	5.9%	52	Residential Area 1	SB-101		**Yes**		
Aroclor-1254	**µg/kg**			17	14	82%	230	Residential Area 1	SB-104		**Yes**		
Aroclor-1260	**µg/kg**			17	12	71%	200	Residential Area 4	SB-302		**Yes**		
Total PCBs	**µg/kg**	**0.332**	**a**	**23**	**19**	**83%**	**400**	Residential Area 4	SB-302	**1,205**	**Yes**	**Yes**	**SQ > 1**
Inorganic Constituents													
Antimony	**mg/kg**	**0.27**	**c**	**24**	**8**	**33%**	**3.1**	**Commercial Area 4**	**TP-341**	**11**	**No**	**Yes**	**SQ > 1**
Arsenic	**mg/kg**	**18**	**d**	**30**	**29**	**97%**	**21.6**	**Residential Area 4**	**SB-301**	**1.2**	**No**	**Yes**	**SQ > 1**
Barium	**mg/kg**	**330**	**e**	**24**	**24**	**100%**	**500**	**Commercial Area 4**	**TP-341**	**1.5**	**No**	**Yes**	**SQ > 1**
Cadmium	**mg/kg**	**0.36**	**f**	**30**	**15**	**50%**	**3.9**	**Residential Area 4**	**DG4**	**11**	**Yes**	**Yes**	**SQ > 1**
Chromium	**mg/kg**	**26**	**g**	**30**	**30**	**100%**	**40**	**Commercial Area 4**	**TP-341**	**1.5**	**Yes**	**Yes**	**SQ > 1**
Cobalt	mg/kg	13	h	24	24	100%	7.7	Commercial Area 4	TP-341	0.59	No	No	SQ < 1
Copper	**mg/kg**	**28**	**i**	**30**	**29**	**97%**	**308**	**Commercial Area 4**	**TP-341**	**11**	**Yes**	**Yes**	**SQ > 1**
Iron	**mg/kg**	**200**	**j**	**24**	**24**	**100%**	**22,200**	**Commercial Area 4**	**TP-341**	**111**	**No**	**Yes**	**SQ > 1**
Lead	**mg/kg**	**11**	**k**	**30**	**30**	**100%**	**990**	**Residential Area 4**	**DG4**	**90**	**Yes**	**Yes**	**SQ > 1**
Manganese	**mg/kg**	**220**	**l**	**24**	**24**	**100%**	**698**	**Residential Area 3**	**SB-138**	**3.2**	**No**	**Yes**	**SQ > 1**
Mercury	**mg/kg**	**0.1**	**m**	**30**	**24**	**80%**	**5.6**	**Residential Area 4**	**DG3**	**56**	**Yes**	**Yes**	**SQ > 1**
Nickel	mg/kg	38	n	30	24	80%	29.3	Residential Area 3	SB-138	0.77	**Yes**	No	SQ < 1
Selenium	**mg/kg**	**0.52**	**o**	**30**	**19**	**63%**	**1.8**	**Residential Area 4**	**SB-302**	**3.5**	**Yes**	**Yes**	**SQ > 1**
Vanadium	**mg/kg**	**7.8**	**p**	**24**	**24**	**100%**	**28.0**	**Residential Area 1**	**SB-102**	**3.6**	**No**	**Yes**	**SQ > 1**
Zinc	**mg/kg**	**46**	**q**	**30**	**27**	**90%**	**764**	**Commercial Area 4**	**TP-341**	**17**	**Yes**	**Yes**	**SQ > 1**
Cyanide (Total)	**mg/kg**	**1.33**	**a**	**6**	**6**	**81%**	**1.75**	**Residential Area 4**	**SB-321**	**1.3**	**No**	**Yes**	**SQ > 1**

TABLE 4.1

RE-SCREENING SUMMARY FOR REFINEMENT DATASET
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Notes:

Bold Font identifies constituent identified as Constituent of Potential Ecological Concern (COPEC)
n/a - Ecological Screening Value (ESV) not available
BCOC - Bioaccumulative Chemical of Concern
COPEC - Constituent of Potential Ecological Concern
ESV - Ecological Screening Value
FOD - Frequency of Detection
SQ - Screening Quotient
BTEX - Benzene, toluene, ethylbenzene, and xylenes
µg/kg- micrograms per kilogram
mg/kg- milligrams per kilogram
LMW - Low Molecular Weight
HMW - High Molecular Weight

For LMW PAHs, constituents were summed for each sample, and the max was compared to the screening value for total LMW PAHs. The same was done for HWM PAHs. Non-detects were treated as 1/2 the detection limit.

Rationale for Retaining or Eliminating

No ESV - Constituent was detected; ESV not available
SQ < 1 - Maximum concentration is less than the ESV
SQ > 1 - Maximum concentration is greater than the ESV

ESV Source:

a - USEPA Region 5 Ecological Soil Screening Level (USEPA, 2003a)
b - Ecological Soil Screening Level - Mammalian Wildlife (USEPA, 2007e)
c - Ecological Soil Screening Level - Mammalian Wildlife (USEPA, 2005a)
d - Ecological Soil Screening Level - Plants (USEPA, 2005b)
e - Ecological Soil Screening Level - Invertebrates (USEPA, 2005c)
f - Ecological Soil Screening Level - Mammalian Wildlife (USEPA, 2005d)
g - Ecological Soil Screening Level - Avian Wildlife (USEPA, 2008)
h - Ecological Soil Screening Level - Plants (USEPA, 2005e)
i - Ecological Soil Screening Level - Avian Wildlife (USEPA, 2007b)
j - Oak Ridge National Laboratory - Microbes (Efroymson et al., 1997b)
k - Ecological Soil Screening Level - Avian Wildlife (USEPA, 2005f)
l - Ecological Soil Screening Level - Plants (USEPA, 2007c)
m - Oak Ridge National Laboratory - Invertebrates (Efroymson et al., 1997b)
n - Ecological Soil Screening Level - Plants (USEPA, 2007d)
o - Ecological Soil Screening Level - Plants (USEPA, 2007f)
p - Ecological Soil Screening Level - Avian Wildlife (USEPA, 2005g)
q - Ecological Soil Screening Level - Avian Wildlife (USEPA, 2007g)

TABLE 5.1

REFINEMENT BENCHMARKS FOR AVIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*Background*		*Eco-SSL*	*Effroymson et al. (1997a)*	*CCME*	*Refinement Benchmark*
	MDEQ (2005)	*U.S. EPA (2007a)*				
Volatile Organic Compounds (VOCs) (µg/kg)						
Acetone	---	---	---	---	---	n/a
Isopropylbenzene	---	---	---	---	---	n/a
BTEX (µg/kg)						
Benzene	---	---	---	---	---	n/a
Toluene	---	---	---	---	---	n/a
Xylene (Total)	---	---	---	---	---	n/a
Semi-Volatile Organic Compounds (SVOCs) (µg/kg)						
Carbazole	---	---	---			n/a
Polcyclic Aromatic Hydrocarbons (PAHs) (µg/kg)						
High Molecular Weight (HMW) PAHs	---	---	---	---	600	600
Polychlorinated Biphenyls (PCBs) (µg/kg)						
Total PCBs	---	---	---	655	1,300	655
Inorganic Constituents (mg/kg)						
Antimony	---	1.3	---	---	---	1.3
Arsenic	1.09	4.2	43	102	380	43
Barium	14.2	127	---	283	---	283
Cadmium	< 2.0	0.90	0.77	4.2	3.8	0.90
Chromium	2.8	13.8	26	16.1	---	26
Copper	2.7	12	28	515	300	28
Lead	7.4	9.2	11	40.5	70	11
Manganese	117	230	4,300	---	---	4,300
Mercury	< 0.1	---	---	0.00051	---	0.00051
Selenium	< 0.5	0.30	1.2	---	4.5	1.2
Vanadium	---	44	7.8	---	---	44
Zinc	13	33	46	8.5	640	46
Cyanide (Total)	---	---	---	---	11	11

TABLE 5.1

REFINEMENT BENCHMARKS FOR AVIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Notes:

--- Ecological benchmark concentration is not available
CCME - Canadian Council of Ministers of the Environment
Eco-SSL - Ecological Soil Screening Level
MDEQ - Michigan Department of Environmental Quality
U.S. EPA - United States Environmental Protection Agency
BTEX - Benzene, toluene, ethylbenzene, and xylenes
µg/kg - micrograms per kilogram
mg/kg - milligrams per kilogram

TABLE 5.2

REFINEMENT OF CONSTITUENTS OF POTENTIAL ECOLOGICAL CONCERN - AVIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*Units*	*Refinement Benchmark*	*No. Samples*	*No. Detects*	*Minimum Detected*	*Maximum Detected*	*95% UCL*	*RQ_{UCL}*	*Retain as COPEC*	*Rationale*
Volatile Organic Compounds (VOCs)										
Acetone	**µg/kg**	**n/a**	**3**	**3**	**310**	**5,500**	**n/c**	**---**	**Yes**	**No RB**
Isopropylbenzene	**µg/kg**	**n/a**	**22**	**3**	**50**	**660**	**150**	**---**	**Yes**	**No RB**
BTEX										
Benzene	**µg/kg**	**n/a**	**22**	**7**	**5.6**	**1,300**	**167**		**Yes**	**No RB**
Toluene	**µg/kg**	**n/a**	**22**	**9**	**16**	**22,000**	**2,661**		**Yes**	**No RB**
Xylenes (Total)	**µg/kg**	**na**	**22**	**9**	**27**	**18,400**	**2,343**		**Yes**	**No RB**
Semi-Volatile Organic Compounds (SVOCs)										
Carbazole	**µg/kg**	**n/a**	**21**	**3**	**40**	**83**	**83**	**---**	**Yes**	**No RB**
Polycyclic Aromatic Hydrocarbons (PAHs)										
High Molecular Weight PAHs	**µg/kg**	**600**	**28**	**28**	**82.1**	**26,500**	**13,900**	**23**	**Yes**	**RQ_{UCL} > 1**
Polychlorinated Biphenyls (PCBs)										
Total PCBs	µg/kg	655	21	19	10	400	193	0.29	No	RQ_{UCL} < 1
Inorganic Constituents										
Antimony	mg/kg	1.3	24	8	0.30	3.1	1.1	0.83	No	RQ_{UCL} < 1
Arsenic	mg/kg	43	30	29	3.3	21.6	10.7	0.25	No	RQ_{UCL} < 1
Barium	mg/kg	283	24	24	17.2	500	171	0.60	No	RQ_{UCL} < 1
Cadmium	mg/kg	0.90	30	14	0.27	3.9	0.87	0.96	No	RQ_{UCL} < 1
Chromium	mg/kg	26	30	30	5.5	40	16.7	0.64	No	RQ_{UCL} < 1
Copper	**mg/kg**	**28**	**30**	**29**	**3.8**	**308**	**143**	**5.1**	**Yes**	**RQ_{UCL} > 1**
Lead	**mg/kg**	**11**	**30**	**30**	**4.0**	**990**	**181**	**16**	**Yes**	**RQ_{UCL} > 1**
Manganese	mg/kg	4,300	24	24	127	698	468	0.11	No	RQ_{UCL} < 1
Mercury	**mg/kg**	**0.00051**	**30**	**24**	**0.049**	**5.6**	**1.53**	**3,000**	**Yes**	**RQ_{UCL} > 1**
Selenium	mg/kg	1.2	30	19	0.30	1.8	0.73	0.61	No	RQ_{UCL} < 1
Vanadium	mg/kg	44	24	24	8.0	28	18.3	0.42	No	RQ_{UCL} < 1
Zinc	**mg/kg**	**46**	**30**	**27**	**18**	**764**	**333**	**7.2**	**Yes**	**RQ_{UCL} > 1**
Cyanide (Total)	mg/kg	11	6	6	0.50	1.7	1.5	0.13	Yes	RQ_{UCL} < 1

TABLE 5.2

REFINEMENT OF CONSITITUENTS OF POTENTIAL ECOLOGICAL CONCERN - AVIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Notes **:**

COPEC - Constituent of Potential Eecological Concern

RB - Refinement Benchmark

RQ_{UCL} - Refinement quotient based on the 95% upper confidence limit

UCL - Upper Confidence Limit

µg/kg- micrograms per kilogram

mg/kg- milligrams per kilogram

TABLE 5.3

REFINEMENT BENCHMARKS FOR MAMMALIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*Background*		*Eco-SSL*	*U.S. EPA 5 ESL*	*Effroymson et al. (1997a)*	*CCME*	*Refinement Benchmark*
	MDEQ (2005)	*U.S. EPA (2007a)*					
Volatile Organic Compounds (VOCs) (µg/kg)							
Acetone	---	---	---	2,500	---	---	2,500
Isopropylbenzene	---	---	---	---	---	---	n/a
BTEX (µg/kg)							
Benzene	---	---	---	255	---	---	255
Toluene	---	---	---	5,450	---	---	5,450
Xylenes (Total)	---	---	---	---	---	---	n/a
Semi-Volatile Organic Compounds (SVOCs) (µg/kg)							
Carbazole	---	---	---	---	---		n/a
Polcyclic Aromatic Hydrocarbons (PAHs) (µg/kg)							
High Molecular Weight (HMW) PAHs	---	---	1,100	0.332	391	1,300	1,100
Polychlorinated Biphenyls (PCBs) (µg/kg)							
Total PCBs	---	---	---	---	---	1,300	1,300
Inorganic Constituents (mg/kg)							
Antimony	---	1.3	0.27	0.142	---	---	1.3
Arsenic	1.09	4.2	46	5.7	9.9	380	46
Barium	14.2	127	2,000	1.04	329	---	2,000
Cadmium	< 2.0	0.90	0.36	0.0022	6.0	3.8	0.90
Chromium	2.8	13.8	34	0.40	110	---	34
Copper	2.7	12	49	5.4	370	300	49
Lead	7.4	9.2	56	0.0537	740	70	56
Manganese	117	230	4,000	---	---	---	4,000
Mercury	< 0.1	---	---	---	0.146	---	0.146
Selenium	< 0.5	0.30	0.63	0.0276	---	4.5	0.63
Vanadium	---	44	280	1.59	55	---	280
Zinc	13	33	79	---	1,600	640	79
Cyanide (Total)	---	---	---	1.33	---	11	1.33

TABLE 5.3

REFINEMENT BENCHMARKS FOR MAMMALIAN WILDLIFE
FORMER PLAINWELL, INC, MILL PROPERTY
PLAINWELL, MICHIGAN

Notes:

--- Ecological benchmark concentration is not available

CCME - Canadian Council of Ministers of the Environment

Eco-SSL - Ecological Soil Screening Level

ESL - Ecological Screening Level

MDEQ - Michigan Department of Environmental Quality

U.S. EPA - United States Environmental Protection Agency

BTEX - Benzene, toluene, ethylbenzene, and xylenes

µg/kg- micrograms per kilogram

mg/kg- milligrams per kilogram

TABLE 5.4

REFINEMENT OF CONSTITUENTS OF POTENTIAL ECOLOGICAL CONCERN - MAMMALIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*Units*	*Refinement Benchmark*	*No. Samples*	*No. Detects*	*Minimum Detected*	*Maximum Detected*	*95% UCL*	*RQ_{UCL}*	*Retain as COPEC*	*Rationale*
Volatile Organic Compounds (VOCs)										
Acetone	**µg/kg**	**2,500**	**3**	**3**	**310**	**5,500**	**n/c**	**2.2**	**Yes**	**RQ_{UCL} > 1**
Isopropylbenzene	**µg/kg**	**n/a**	**22**	**3**	**50**	**660**	**150**	**---**	**Yes**	**No RB**
BTEX										
Benzene	µg/kg	255	22	7	5.6	1,300	167	0.65	No	RQ_{UCL} < 1
Toluene	µg/kg	5,450	22	9	16	22,000	2,661	0.49	No	RQ_{UCL} < 1
Xylene (Total)	**µg/kg**	**na**	**22**	**9**	**27**	**18,400**	**2,343**		**Yes**	**No RB**
Semi-Volatile Organic Compounds (SVOCs)										
Carbazole	**µg/kg**	**n/a**	**21**	**3**	**40**	**83**	**83**	**---**	**Yes**	**No RB**
Polycyclic Aromatic Hydrocarbons (PAHs)										
High Molecular Weight PAHs	**µg/kg**	**1,100**	**28**	**28**	**82.1**	**26,500**	**13,900**	**13**	**Yes**	**RQ_{UCL} > 1**
Polychlorinated Biphenyls (PCBs)										
Total PCBs	µg/kg	1,300	21	19	10	400	193	0.15	No	RQ_{UCL} < 1
Inorganic Constituents										
Antimony	mg/kg	1.3	24	8	0.30	3.1	1.1	0.83	No	RQ_{UCL} < 1
Arsenic	mg/kg	46	30	29	3.3	21.6	10.7	0.23	No	RQ_{UCL} < 1
Barium	mg/kg	2,000	24	24	17.2	500	171	0.086	No	RQ_{UCL} < 1
Cadmium	mg/kg	0.90	30	14	0.27	3.9	0.87	0.96	No	RQ_{UCL} < 1
Chromium	mg/kg	34	30	30	5.5	40	16.7	0.49	No	RQ_{UCL} < 1
Copper	**mg/kg**	**49**	**30**	**29**	**3.8**	**308**	**143**	**2.9**	**Yes**	**RQ_{UCL} > 1**
Lead	**mg/kg**	**56**	**30**	**30**	**4.0**	**990**	**181**	**3.2**	**Yes**	**RQ_{UCL} > 1**
Manganese	mg/kg	4,000	24	24	127	698	468	0.12	No	RQ_{UCL} < 1
Mercury	**mg/kg**	**0.146**	**30**	**24**	**0.049**	**5.6**	**1.53**	**10**	**Yes**	**RQ_{UCL} > 1**
Selenium	**mg/kg**	**0.63**	**30**	**19**	**0.30**	**1.8**	**0.73**	**1.2**	**Yes**	**RQ_{UCL} > 1**
Vanadium	mg/kg	280	24	24	8.0	28	18.3	0.065	No	RQ_{UCL} < 1
Zinc	**mg/kg**	**79**	**30**	**27**	**18**	**764**	**333**	**4.2**	**Yes**	**RQ_{UCL} > 1**
Cyanide (Total)	**mg/kg**	**1.33**	**6**	**6**	**0.50**	**1.7**	**1.5**	**1.1**	**Yes**	**RQ_{UCL} > 1**

TABLE 5.4

REFINEMENT OF CONSTITUENTS OF POTENTIAL ECOLOGICAL CONCERN - MAMMALIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Notes **:**

COPEC - Constituent of potential ecological concern

RB - Refinement Benchmark

RQ_{UCL} - Refinement quotient based on the 95% upper confidence limit

UCL - Upper Confidence Limit

µg/kg- micrograms per kilogram

mg/kg- milligrams per kilogram

TABLE 5.5

EXPOSURE PARAMETERS FOR AVIAN INDICATOR SPECIES
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Parameter	***Units***	***American Woodcock***	***Mourning Dove***	***Red-Tailed Hawk***
Body Weight	kg	0.18	0.02	1.13
Ingestion				
IR_{Food}	mg/kg BW/day	0.214	0.190	0.0353
IR_{Water}	L/kg/day	Negligible	Negligible	Negligible
P_s	Unitless	0.164	0.139	0.057
Diet				
Terrestrial Invertebrates	Percent	100	0	0
Terrestrial Plants	Percent	0	100	0
Small Terrestrial Mammals	Percent	0	0	100
Area Use				
Diet from Assessment Area	Unitless	1	1	1
Bioavailability	Percent	100	100	100

Notes :

BW - Body Weight
Body Weight from Table 12A-1 of U.S. EPA (1999)
IR_{Food} - Ingestion Rate of Food
IR_{Water} - Ingestion Rate of Water
P_s - Proportion of Soil Ingested
IR_{Food} from Table 4.1 of Attachment 4-1 of U.S. EPA (2007a)
P_s from Table 4-1 of U.S. EPA (2007a)
kg - kilogram
mg - milligram
L - liter

TABLE 4.1

RE-SCREENING SUMMARY FOR REFINEMENT DATASET
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*Units*	*ESV*	*Source*	*No. Samples*	*No. Detects*	*FOD*	*Max Conc.*	*Area of Max. Conc.*	*Sample with Max. Conc.*	*SQ*	*BCOC*	*Retain as COPEC*	*Rationale for Retaining or Eliminating*
Volatile Organic Compounds (VOCs)													
Acetone	**µg/kg**	**2,500**	**a**	**3**	**3**	**100%**	**5,500**	**Residential Area 4**	**SB-302**	**2.2**	**No**	**Yes**	**SQ > 1**
Isopropylbenzene	**µg/kg**	**n/a**	**---**	**24**	**3**	13%	**660**	**Residential Area 4**	**SB-302**	**-**	**No**	**Yes**	**No ESV**
BTEX													
Benzene	**µg/kg**	**255**	**a**	**24**	**8**	**33%**	**1,300**	**Residential Area 4**	**SB-302**	**5.1**	**No**	**Yes**	**SQ > 1**
Toluene	**µg/kg**	**5,450**	**a**	**24**	**10**	**42%**	**22,000**	**Residential Area 4**	**SB-302**	**4.0**	**No**	**Yes**	**SQ > 1**
o-Xylene	**µg/kg**	10,000	a	24	10	42%	7,400	Residential Area 4	SB-302	0.74	No	No	SQ < 1
m&p-Xylenes	**µg/kg**	**10,000**	**a**	**24**	**9**	**38%**	**11,000**	**Residential Area 4**	**SB-302**	**1.1**	**No**	**Yes**	**SQ > 1**
Semi-Volatile Organic Compounds (SVOCs)													
bis(2-Ethylhexyl)phthalate	**µg/kg**	925	a	24	13	54%	350	Commercial Area 4	SB-201	0.38	No	No	SQ < 1
Carbazole	**µg/kg**	**n/a**	**---**	**23**	**3**	13%	**83**	**Residential Area 4**	**SB-302**	**-**	**No**	**Yes**	**No ESV**
Polcyclic Aromatic Hydrocarbons (PAHs)													
High Molecular Weight (HMW) PAHs													
Benzo(a)anthracene	**µg/kg**			30	16	53%	3,800	Residential Area 4	DG3				
Benzo(a)pyrene	**µg/kg**			30	17	57%	4,900	Residential Area 4	DG3				
Chrysene	**µg/kg**			30	19	63%	8,100	Residential Area 4	DG3				
Dibenzo(a,h)anthracene	**µg/kg**			30	10	33%	6,400	Residential Area 4	DG4				
Fluoranthene	**µg/kg**			30	17	57%	7,700	Commercial Area 4	TP-341				
Pyrene	**µg/kg**			26	15	58%	6,000	Residential Area 4	DG3				
Sum of HMW PAHs		**1,100**	**b**	**30**	**22**	**73%**	**26,500**	**Residential Area 4**	**DG3**	**24**	**No**	**Yes**	**SQ > 1**
Polychlorinated Biphenyls (PCBs)													
Aroclor-1248	**µg/kg**			17	1	5.9%	52	Residential Area 1	SB-101		**Yes**		
Aroclor-1254	**µg/kg**			17	14	82%	230	Residential Area 1	SB-104		**Yes**		
Aroclor-1260	**µg/kg**			17	12	71%	200	Residential Area 4	SB-302		**Yes**		
Total PCBs	**µg/kg**	**0.332**	**a**	**23**	**19**	**83%**	**400**	Residential Area 4	SB-302	**1,205**	**Yes**	**Yes**	**SQ > 1**
Inorganic Constituents													
Antimony	**mg/kg**	**0.27**	**c**	**24**	**8**	**33%**	**3.1**	**Commercial Area 4**	**TP-341**	**11**	**No**	**Yes**	**SQ > 1**
Arsenic	**mg/kg**	**18**	**d**	**30**	**29**	**97%**	**21.6**	**Residential Area 4**	**SB-301**	**1.2**	**No**	**Yes**	**SQ > 1**
Barium	**mg/kg**	**330**	**e**	**24**	**24**	**100%**	**500**	**Commercial Area 4**	**TP-341**	**1.5**	**No**	**Yes**	**SQ > 1**
Cadmium	**mg/kg**	**0.36**	**f**	**30**	**15**	**50%**	**3.9**	**Residential Area 4**	**DG4**	**11**	**Yes**	**Yes**	**SQ > 1**
Chromium	**mg/kg**	**26**	**g**	**30**	**30**	**100%**	**40**	**Commercial Area 4**	**TP-341**	**1.5**	**Yes**	**Yes**	**SQ > 1**
Cobalt	mg/kg	13	h	24	24	100%	7.7	Commercial Area 4	TP-341	0.59	No	No	SQ < 1
Copper	**mg/kg**	**28**	**i**	**30**	**29**	**97%**	**308**	**Commercial Area 4**	**TP-341**	**11**	**Yes**	**Yes**	**SQ > 1**
Iron	**mg/kg**	**200**	**j**	**24**	**24**	**100%**	**22,200**	**Commercial Area 4**	**TP-341**	**111**	**No**	**Yes**	**SQ > 1**
Lead	**mg/kg**	**11**	**k**	**30**	**30**	**100%**	**990**	**Residential Area 4**	**DG4**	**90**	**Yes**	**Yes**	**SQ > 1**
Manganese	**mg/kg**	**220**	**l**	**24**	**24**	**100%**	**698**	**Residential Area 3**	**SB-138**	**3.2**	**No**	**Yes**	**SQ > 1**
Mercury	**mg/kg**	**0.1**	**m**	**30**	**24**	**80%**	**5.6**	**Residential Area 4**	**DG3**	**56**	**Yes**	**Yes**	**SQ > 1**
Nickel	mg/kg	38	n	30	24	80%	29.3	Residential Area 3	SB-138	0.77	**Yes**	No	SQ < 1
Selenium	**mg/kg**	**0.52**	**o**	**30**	**19**	**63%**	**1.8**	**Residential Area 4**	**SB-302**	**3.5**	**Yes**	**Yes**	**SQ > 1**
Vanadium	**mg/kg**	**7.8**	**p**	**24**	**24**	**100%**	**28.0**	**Residential Area 1**	**SB-102**	**3.6**	**No**	**Yes**	**SQ > 1**
Zinc	**mg/kg**	**46**	**q**	**30**	**27**	**90%**	**764**	**Commercial Area 4**	**TP-341**	**17**	**Yes**	**Yes**	**SQ > 1**
Cyanide (Total)	**mg/kg**	**1.33**	**a**	**6**	**6**	**81%**	**1.75**	**Residential Area 4**	**SB-321**	**1.3**	**No**	**Yes**	**SQ > 1**

TABLE 4.1

RE-SCREENING SUMMARY FOR REFINEMENT DATASET
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Notes:

Bold Font identifies constituent identified as Constituent of Potential Ecological Concern (COPEC)
n/a - Ecological Screening Value (ESV) not available
BCOC - Bioaccumulative Chemical of Concern
COPEC - Constituent of Potential Ecological Concern
ESV - Ecological Screening Value
FOD - Frequency of Detection
SQ - Screening Quotient
BTEX - Benzene, toluene, ethylbenzene, and xylenes
µg/kg- micrograms per kilogram
mg/kg- milligrams per kilogram
LMW - Low Molecular Weight
HMW - High Molecular Weight

For LMW PAHs, constituents were summed for each sample, and the max was compared to the screening value for total LMW PAHs. The same was done for HWM PAHs. Non-detects were treated as 1/2 the detection limit.

Rationale for Retaining or Eliminating

No ESV - Constituent was detected; ESV not available
SQ < 1 - Maximum concentration is less than the ESV
SQ > 1 - Maximum concentration is greater than the ESV

ESV Source:

a - USEPA Region 5 Ecological Soil Screening Level (USEPA, 2003a)
b - Ecological Soil Screening Level - Mammalian Wildlife (USEPA, 2007e)
c - Ecological Soil Screening Level - Mammalian Wildlife (USEPA, 2005a)
d - Ecological Soil Screening Level - Plants (USEPA, 2005b)
e - Ecological Soil Screening Level - Invertebrates (USEPA, 2005c)
f - Ecological Soil Screening Level - Mammalian Wildlife (USEPA, 2005d)
g - Ecological Soil Screening Level - Avian Wildlife (USEPA, 2008)
h - Ecological Soil Screening Level - Plants (USEPA, 2005e)
i - Ecological Soil Screening Level - Avian Wildlife (USEPA, 2007b)
j - Oak Ridge National Laboratory - Microbes (Efroymson et al., 1997b)
k - Ecological Soil Screening Level - Avian Wildlife (USEPA, 2005f)
l - Ecological Soil Screening Level - Plants (USEPA, 2007c)
m - Oak Ridge National Laboratory - Invertebrates (Efroymson et al., 1997b)
n - Ecological Soil Screening Level - Plants (USEPA, 2007d)
o - Ecological Soil Screening Level - Plants (USEPA, 2007f)
p - Ecological Soil Screening Level - Avian Wildlife (USEPA, 2005g)
q - Ecological Soil Screening Level - Avian Wildlife (USEPA, 2007g)

TABLE 5.1

REFINEMENT BENCHMARKS FOR AVIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*Background*		*Eco-SSL*	*Effroymson et al. (1997a)*	*CCME*	*Refinement Benchmark*
	MDEQ (2005)	*U.S. EPA (2007a)*				
Volatile Organic Compounds (VOCs) (µg/kg)						
Acetone	---	---	---	---	---	n/a
Isopropylbenzene	---	---	---	---	---	n/a
BTEX (µg/kg)						
Benzene	---	---	---	---	---	n/a
Toluene	---	---	---	---	---	n/a
Xylene (Total)	---	---	---	---	---	n/a
Semi-Volatile Organic Compounds (SVOCs) (µg/kg)						
Carbazole	---	---	---			n/a
Polcyclic Aromatic Hydrocarbons (PAHs) (µg/kg)						
High Molecular Weight (HMW) PAHs	---	---	---	---	600	600
Polychlorinated Biphenyls (PCBs) (µg/kg)						
Total PCBs	---	---	---	655	1,300	655
Inorganic Constituents (mg/kg)						
Antimony	---	1.3	---	---	---	1.3
Arsenic	1.09	4.2	43	102	380	43
Barium	14.2	127	---	283	---	283
Cadmium	< 2.0	0.90	0.77	4.2	3.8	0.90
Chromium	2.8	13.8	26	16.1	---	26
Copper	2.7	12	28	515	300	28
Lead	7.4	9.2	11	40.5	70	11
Manganese	117	230	4,300	---	---	4,300
Mercury	< 0.1	---	---	0.00051	---	0.00051
Selenium	< 0.5	0.30	1.2	---	4.5	1.2
Vanadium	---	44	7.8	---	---	44
Zinc	13	33	46	8.5	640	46
Cyanide (Total)	---	---	---	---	11	11

TABLE 5.1

REFINEMENT BENCHMARKS FOR AVIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Notes:

--- Ecological benchmark concentration is not available
CCME - Canadian Council of Ministers of the Environment
Eco-SSL - Ecological Soil Screening Level
MDEQ - Michigan Department of Environmental Quality
U.S. EPA - United States Environmental Protection Agency
BTEX - Benzene, toluene, ethylbenzene, and xylenes
µg/kg - micrograms per kilogram
mg/kg - milligrams per kilogram

TABLE 5.2

REFINEMENT OF CONSTITUENTS OF POTENTIAL ECOLOGICAL CONCERN - AVIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*Units*	*Refinement Benchmark*	*No. Samples*	*No. Detects*	*Minimum Detected*	*Maximum Detected*	*95% UCL*	*RQ_{UCL}*	*Retain as COPEC*	*Rationale*
Volatile Organic Compounds (VOCs)										
Acetone	**µg/kg**	**n/a**	**3**	**3**	**310**	**5,500**	**n/c**	**---**	**Yes**	**No RB**
Isopropylbenzene	**µg/kg**	**n/a**	**22**	**3**	**50**	**660**	**150**	**---**	**Yes**	**No RB**
BTEX										
Benzene	**µg/kg**	**n/a**	**22**	**7**	**5.6**	**1,300**	**167**		**Yes**	**No RB**
Toluene	**µg/kg**	**n/a**	**22**	**9**	**16**	**22,000**	**2,661**		**Yes**	**No RB**
Xylenes (Total)	**µg/kg**	**na**	**22**	**9**	**27**	**18,400**	**2,343**		**Yes**	**No RB**
Semi-Volatile Organic Compounds (SVOCs)										
Carbazole	**µg/kg**	**n/a**	**21**	**3**	**40**	**83**	**83**	**---**	**Yes**	**No RB**
Polycyclic Aromatic Hydrocarbons (PAHs)										
High Molecular Weight PAHs	**µg/kg**	**600**	**28**	**28**	**82.1**	**26,500**	**13,900**	**23**	**Yes**	**RQ_{UCL} > 1**
Polychlorinated Biphenyls (PCBs)										
Total PCBs	µg/kg	655	21	19	10	400	193	0.29	No	RQ_{UCL} < 1
Inorganic Constituents										
Antimony	mg/kg	1.3	24	8	0.30	3.1	1.1	0.83	No	RQ_{UCL} < 1
Arsenic	mg/kg	43	30	29	3.3	21.6	10.7	0.25	No	RQ_{UCL} < 1
Barium	mg/kg	283	24	24	17.2	500	171	0.60	No	RQ_{UCL} < 1
Cadmium	mg/kg	0.90	30	14	0.27	3.9	0.87	0.96	No	RQ_{UCL} < 1
Chromium	mg/kg	26	30	30	5.5	40	16.7	0.64	No	RQ_{UCL} < 1
Copper	**mg/kg**	**28**	**30**	**29**	**3.8**	**308**	**143**	**5.1**	**Yes**	**RQ_{UCL} > 1**
Lead	**mg/kg**	**11**	**30**	**30**	**4.0**	**990**	**181**	**16**	**Yes**	**RQ_{UCL} > 1**
Manganese	mg/kg	4,300	24	24	127	698	468	0.11	No	RQ_{UCL} < 1
Mercury	**mg/kg**	**0.00051**	**30**	**24**	**0.049**	**5.6**	**1.53**	**3,000**	**Yes**	**RQ_{UCL} > 1**
Selenium	mg/kg	1.2	30	19	0.30	1.8	0.73	0.61	No	RQ_{UCL} < 1
Vanadium	mg/kg	44	24	24	8.0	28	18.3	0.42	No	RQ_{UCL} < 1
Zinc	**mg/kg**	**46**	**30**	**27**	**18**	**764**	**333**	**7.2**	**Yes**	**RQ_{UCL} > 1**
Cyanide (Total)	mg/kg	11	6	6	0.50	1.7	1.5	0.13	Yes	RQ_{UCL} < 1

TABLE 5.2

REFINEMENT OF CONSITITUENTS OF POTENTIAL ECOLOGICAL CONCERN - AVIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Notes **:**

COPEC - Constituent of Potential Eecological Concern

RB - Refinement Benchmark

RQ_{UCL} - Refinement quotient based on the 95% upper confidence limit

UCL - Upper Confidence Limit

µg/kg- micrograms per kilogram

mg/kg- milligrams per kilogram

TABLE 5.3

REFINEMENT BENCHMARKS FOR MAMMALIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*Background*		*Eco-SSL*	*U.S. EPA 5 ESL*	*Effroymson et al. (1997a)*	*CCME*	*Refinement Benchmark*
	MDEQ (2005)	*U.S. EPA (2007a)*					
Volatile Organic Compounds (VOCs) (µg/kg)							
Acetone	---	---	---	2,500	---	---	2,500
Isopropylbenzene	---	---	---	---	---	---	n/a
BTEX (µg/kg)							
Benzene	---	---	---	255	---	---	255
Toluene	---	---	---	5,450	---	---	5,450
Xylenes (Total)	---	---	---	---	---	---	n/a
Semi-Volatile Organic Compounds (SVOCs) (µg/kg)							
Carbazole	---	---	---	---	---		n/a
Polcyclic Aromatic Hydrocarbons (PAHs) (µg/kg)							
High Molecular Weight (HMW) PAHs	---	---	1,100	0.332	391	1,300	1,100
Polychlorinated Biphenyls (PCBs) (µg/kg)							
Total PCBs	---	---	---	---	---	1,300	1,300
Inorganic Constituents (mg/kg)							
Antimony	---	1.3	0.27	0.142	---	---	1.3
Arsenic	1.09	4.2	46	5.7	9.9	380	46
Barium	14.2	127	2,000	1.04	329	---	2,000
Cadmium	< 2.0	0.90	0.36	0.0022	6.0	3.8	0.90
Chromium	2.8	13.8	34	0.40	110	---	34
Copper	2.7	12	49	5.4	370	300	49
Lead	7.4	9.2	56	0.0537	740	70	56
Manganese	117	230	4,000	---	---	---	4,000
Mercury	< 0.1	---	---	---	0.146	---	0.146
Selenium	< 0.5	0.30	0.63	0.0276	---	4.5	0.63
Vanadium	---	44	280	1.59	55	---	280
Zinc	13	33	79	---	1,600	640	79
Cyanide (Total)	---	---	---	1.33	---	11	1.33

TABLE 5.3

REFINEMENT BENCHMARKS FOR MAMMALIAN WILDLIFE
FORMER PLAINWELL, INC, MILL PROPERTY
PLAINWELL, MICHIGAN

Notes:

--- Ecological benchmark concentration is not available

CCME - Canadian Council of Ministers of the Environment

Eco-SSL - Ecological Soil Screening Level

ESL - Ecological Screening Level

MDEQ - Michigan Department of Environmental Quality

U.S. EPA - United States Environmental Protection Agency

BTEX - Benzene, toluene, ethylbenzene, and xylenes

µg/kg- micrograms per kilogram

mg/kg- milligrams per kilogram

TABLE 5.4

REFINEMENT OF CONSTITUENTS OF POTENTIAL ECOLOGICAL CONCERN - MAMMALIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*Units*	*Refinement Benchmark*	*No. Samples*	*No. Detects*	*Minimum Detected*	*Maximum Detected*	*95% UCL*	*RQ_{UCL}*	*Retain as COPEC*	*Rationale*
Volatile Organic Compounds (VOCs)										
Acetone	**µg/kg**	**2,500**	**3**	**3**	**310**	**5,500**	**n/c**	**2.2**	**Yes**	**RQ_{UCL} > 1**
Isopropylbenzene	**µg/kg**	**n/a**	**22**	**3**	**50**	**660**	**150**	**---**	**Yes**	**No RB**
BTEX										
Benzene	µg/kg	255	22	7	5.6	1,300	167	0.65	No	RQ_{UCL} < 1
Toluene	µg/kg	5,450	22	9	16	22,000	2,661	0.49	No	RQ_{UCL} < 1
Xylene (Total)	**µg/kg**	**na**	**22**	**9**	**27**	**18,400**	**2,343**		**Yes**	**No RB**
Semi-Volatile Organic Compounds (SVOCs)										
Carbazole	**µg/kg**	**n/a**	**21**	**3**	**40**	**83**	**83**	**---**	**Yes**	**No RB**
Polycyclic Aromatic Hydrocarbons (PAHs)										
High Molecular Weight PAHs	**µg/kg**	**1,100**	**28**	**28**	**82.1**	**26,500**	**13,900**	**13**	**Yes**	**RQ_{UCL} > 1**
Polychlorinated Biphenyls (PCBs)										
Total PCBs	µg/kg	1,300	21	19	10	400	193	0.15	No	RQ_{UCL} < 1
Inorganic Constituents										
Antimony	mg/kg	1.3	24	8	0.30	3.1	1.1	0.83	No	RQ_{UCL} < 1
Arsenic	mg/kg	46	30	29	3.3	21.6	10.7	0.23	No	RQ_{UCL} < 1
Barium	mg/kg	2,000	24	24	17.2	500	171	0.086	No	RQ_{UCL} < 1
Cadmium	mg/kg	0.90	30	14	0.27	3.9	0.87	0.96	No	RQ_{UCL} < 1
Chromium	mg/kg	34	30	30	5.5	40	16.7	0.49	No	RQ_{UCL} < 1
Copper	**mg/kg**	**49**	**30**	**29**	**3.8**	**308**	**143**	**2.9**	**Yes**	**RQ_{UCL} > 1**
Lead	**mg/kg**	**56**	**30**	**30**	**4.0**	**990**	**181**	**3.2**	**Yes**	**RQ_{UCL} > 1**
Manganese	mg/kg	4,000	24	24	127	698	468	0.12	No	RQ_{UCL} < 1
Mercury	**mg/kg**	**0.146**	**30**	**24**	**0.049**	**5.6**	**1.53**	**10**	**Yes**	**RQ_{UCL} > 1**
Selenium	**mg/kg**	**0.63**	**30**	**19**	**0.30**	**1.8**	**0.73**	**1.2**	**Yes**	**RQ_{UCL} > 1**
Vanadium	mg/kg	280	24	24	8.0	28	18.3	0.065	No	RQ_{UCL} < 1
Zinc	**mg/kg**	**79**	**30**	**27**	**18**	**764**	**333**	**4.2**	**Yes**	**RQ_{UCL} > 1**
Cyanide (Total)	**mg/kg**	**1.33**	**6**	**6**	**0.50**	**1.7**	**1.5**	**1.1**	**Yes**	**RQ_{UCL} > 1**

TABLE 5.4

REFINEMENT OF CONSTITUENTS OF POTENTIAL ECOLOGICAL CONCERN - MAMMALIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Notes **:**

COPEC - Constituent of potential ecological concern

RB - Refinement Benchmark

RQ_{UCL} - Refinement quotient based on the 95% upper confidence limit

UCL - Upper Confidence Limit

µg/kg- micrograms per kilogram

mg/kg- milligrams per kilogram

TABLE 5.5

EXPOSURE PARAMETERS FOR AVIAN INDICATOR SPECIES
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Parameter	***Units***	***American Woodcock***	***Mourning Dove***	***Red-Tailed Hawk***
Body Weight	kg	0.18	0.02	1.13
Ingestion				
IR_{Food}	mg/kg BW/day	0.214	0.190	0.0353
IR_{Water}	L/kg/day	Negligible	Negligible	Negligible
P_s	Unitless	0.164	0.139	0.057
Diet				
Terrestrial Invertebrates	Percent	100	0	0
Terrestrial Plants	Percent	0	100	0
Small Terrestrial Mammals	Percent	0	0	100
Area Use				
Diet from Assessment Area	Unitless	1	1	1
Bioavailability	Percent	100	100	100

Notes :

BW - Body Weight
Body Weight from Table 12A-1 of U.S. EPA (1999)
IR_{Food} - Ingestion Rate of Food
IR_{Water} - Ingestion Rate of Water
P_s - Proportion of Soil Ingested
IR_{Food} from Table 4.1 of Attachment 4-1 of U.S. EPA (2007a)
P_s from Table 4-1 of U.S. EPA (2007a)
kg - kilogram
mg - milligram
L - liter

TABLE 5.6

EXPOSURE PARAMETERS FOR MAMMALIAN INDICATOR SPECIES
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Parameter	*Units*	*Short-Tailed Shrew*	*Meadow Vole*	*Long-Tailed Weasel*
Body Weight	kg	0.02	0.02	0.19
Ingestion				
IR_{Food}	mg/kg bw/day	0.209	0.0875	0.13
IR_{Water}	L/kg/day	Negligible	Negligible	Negligible
P_s	Unitless	0.03	0.032	0.043
Diet				
Terrestrial Invertebrates	Percent	100	0	0
Terrestrial Plants	Percent	0	100	0
Small Terrestrial Mammals	Percent	0	0	100
Area Use				
Diet from Assessment Area	Unitless	1	1	1
Bioavailability	Percent	100	100	100

Notes **:**

BW - Body Weight

Body Weight from Table 12A-1 of U.S. EPA (1999)

IR_{Food} - Ingestion Rate of Food

IR_{Water} - Ingestion Rate of Water

P_s - Proportion of Soil Ingested

IR_{Food} from Table 4.1 of Attachment 4-1 of U.S. EPA (2007a)

P_s from Table 4-1 of U.S. EPA (2007a)

kg - kilogram

mg - milligram

L - liter

TABLE 5.7

EQUATIONS FOR CALCULATING EXPOSURE CONCENTRATIONS IN DIETARY ITEMS
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

COPEC	Soil Invertebrates		Terrestrial Plants		Small Mammals	
	Equation	Source	Equation	Source	Equation	Source
Volatile Organic Compounds (VOCs)						
Acetone	$C_I = 0 * C_S$	a	$C_P = 0 * C_S$	a	C_M = Greater of C_I and C_P	a
Isopropylbenzene	$C_I = 71.05 * C_S * 5.99$	c	$C_P = 0.30 * C_S$	c	C_M = Greater of C_I and C_P	e
BTEX						
Xylenes (Total)	$C_I = 0 * C_S$	a	$C_P = 0 * C_S$	a	C_M = Greater of C_I and C_P	e
Semi-Volatile Organic Compounds (SVOCs)						
Carbazole	$C_I = 79.6 * C_S * 5.99$	c	$C_P = 0.274 * C_S$	c	C_M = Greater of C_I and C_P	e
Polycyclic Aromatic Hydrocarbons (PAHs)						
HMW PAHs	$C_I = 2.6 * C_S$	c	$\ln(C_P) = 0.9469 * \ln(C_S) - 1.7026$	c	$C_M = 0 * C_S$	e
Inorganic Constituents						
Copper	$C_I = 0.515 * C_S$	b	$\ln(C_P) = 0.394 * \ln(C_S) + 0.668$	b	$\ln(C_M) = 0.1444 * \ln(C_S) + 2.042$	b
Lead	$\ln(C_I) = 0.807 * \ln(C_S) - 0.218$	b	$\ln(C_P) = 0.561 * \ln(C_S) - 1.328$	b	$\ln(C_M) = 0.4422 * \ln(C_S) + 0.0761$	b
Mercury	$C_I = 0.04 * C_S * 5.99$	c	$C_P = 0.0357 * C_S$	c	$C_M = 0.0543 * C_S$	d
Selenium	$\ln(C_I) = 0.733 * \ln(C_S) - 0.075$	b	$\ln(C_P) = 1.104 * \ln(C_S) - 0.677$	b	$\ln(C_M) = 0.3764 * \ln(C_S) - 0.4158$	b
Zinc	$\ln(C_I) = 0.328 * \ln(C_S)$ -+ 4.449	b	$\ln(C_P) = 0.554 * \ln(C_S) + 1.575$	b	$\ln(C_M) = 0.0706 * \ln(C_S) + 4.3632$	b
Cyanide (Total)	$C_I = 1.12 * C_S * 5.99$	c	$C_P = 1.0 * C_S$	e	C_M = Greater of C_I and C_P	e

Notes :

C_I - Concentration in soil invertebrates
C_P - Concentration terrestrial plants
C_S - Concentration in soil
C_M - Concentration in small mammals
BTEX - Benzene, toluene, ethylbenzene, and xylenes
HMW - High Molecular Weight
PAH - Polycyclic Aromatic Hydrocarbon

Source:

a - U.S. EPA (2000)
b - U.S. EPA (2007a)
c - U.S. EPA (1999)
d - Sample et al. (1998)
e - Data not available. Bioaccumulation factor of 1.0 assumed.

TABLE 5.8

EXPOSURE CONCENTRATIONS FOR FOOD CHAIN MODELS
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*Water (mg/L)*	*Soil (mg/kg DW)*	*Soil Invertebrates (mg/kg DW)*	*Terrestrial Plants (mg/kg DW)*	*Small Mammals (mg/kg DW)*
Volatile Organic Compounds (VOCs)					
Acetone	0	5.50	0	0	0
Isopropylbenzene	0	0.150	63.8	0.045	63.8
BTEX					
Xylenes (Total)	0	2.34	0	0	0
Semi-Volatile Organic Compounds (SVOCs)					
Carbazole	0	0.083	40	0.023	
Polycyclic Aromatic Hydrocarbons (PAHs)					
High Molecular Weight PAHs	0	13.9	2.20	0	0
Inorganic Compounds					
Copper	0	143	73.6	13.8	15.8
Lead	0	181	53.4	4.90	10.7
Mercury	0	1.53	0.367	0.057	0.083
Selenium	0	0.73	0.737	0.359	0.586
Zinc	0	333	575	121	118
Cyanide (Total)	0	1.50	10.1	1.50	10.1

Notes **:**

DW - Dry weight
BTEX - Benzene, toluene, ethylbenzene and xylenes
mg - milligram
kg - kilogram
L - liter

TABLE 5.9

TOXICITY REFERENCE VALUES FOR AVIAN AND MAMMALIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*Avian Wildlife*				*Mammalian Wildlife*			
	NOAEL	*Source*	*LOAEL*	*Source*	*NOAEL*	*Source*	*LOAEL*	*Source*
Volatile Organic Compounds (VOCs)								
Acetone	5.2	a	52	a	10	d	50	d
Isopropylbenzene	n/a	---	n/a	---	154	e	462	e
BTEX								
Benzene	n/a	---	n/a	---	26.36	d	263.6	d
Toluene	n/a	---	n/a	---	26	d	260	d
Xylenes (Total)	n/a	---	n/a	---	2.1	d	2.6	d
Semi-Volatile Organic Compounds (SVOCs)								
Carbazole	n/a	---	n/a	---	5.2	e	57.3	e
Polycyclic Aromatic Hydrocarbons (PAHs)								
High Molecular Weight PAHs	2.0	b	20	b	0.615	b	28.6	e
Inorganic Constituents								
Copper	2.3	c	52.3	c	2.67	c	632	c
Lead	0.014	c	8.75	c	1.0	c	241	c
Mercury	0.039	c	0.18	c	0.027	c	4.0	c
Selenium	0.23	c	0.93	c	0.05	c	1.21	c
Zinc	17.2	c	172	c	9.6	c	411	c
Cyanide (Total)	n/a	---	n/a	---	68.7	d	n/c	---

Notes :

LOAEL - Lowest Observed Adverse Effect Level
NOAEL - No Observed Adverse Effect Level
n/a -Value not available

Source:

a - U.S. EPA (1999)
b - U.S. EPA (2007a)
c - U.S. EPA, Region 9
d - Sample et al. (1996)
e - See text for derivation

TABLE 5.10

SUMMARY OF FOOD CHAIN MODEL FOR AMERICAN WOODCOCK
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

CONSTITUENT	*Ingestion (mg/kg/day)*				*NOAEL (mg/kg/day)*	*HQ_{NOAEL} (Unitless)*	*LOAEL (mg/kg/day)*	*HQ_{LOAEL} (Unitless)*	*Develop Ecological PRG*
	Food	*Soil*	*Water*	*Total*					
Volatile Organic Compounds (VOCs)									
Acetone	0	0.193	0	0.193	5.2	0.037	---	---	No
Isopropylbenzene	13.7	0.005	0	13.7	n/a	---	n/a	---	---
BTEX									
Benzene	0	0.006	0	0.006	n/a	---	n/a	---	---
Toluene	0	0.093	0	0	n/a	---	n/a	---	---
Xylenes (Total)	0	0.082	0	0	n/a	---	n/a	---	---
Semi-Volatile Organic Compounds (SVOCs)									
Carbazole	8.47	0.003	0	8.47	n/a	---	n/a	---	---
Polycyclic Aromatic Hydrocarbons (PAHs)									
High Molecular Weight PAHs	7.73	0.488	0	8.22	2.0	**4.1**	20	0.41	Yes
Inorganic Constituents									
Copper	15.8	5.02	0	20.8	2.3	**9.1**	52.3	0.40	Yes
Lead	11.4	6.35	0	17.8	0.014	**1,268**	8.75	**2.0**	Yes
Mercury	0.078	0.054	0	0.132	0.039	**3.4**	0.18	0.73	Yes
Zinc	123	11.69	0	135	17.2	**7.8**	172	0.78	Yes

Notes **:**

Bold Font identifies hazard quotient greater than 1.0

n/a - Value not available

BTEX - Benzene, toluene, ethylbenzene, and xylenes

mg - milligram

kg - kilogram

LOAEL - Lowest Observed Adverse Effect Level

NOAEL - No Observed Adverse Effect Level

HQ_{LOAEL} - Hazard quotient based on LOAEL

HQ_{NOAEL} - Hazard quotient based on NOAEL

PRG - Preliminary Remediation Goal

TABLE 5.11

SUMMARY OF FOOD CHAIN MODEL FOR MOURNING DOVE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

CONSTITUENT	*Ingestion (mg/kg/day)*				*NOAEL (mg/kg/day)*	*HQ_{NOAEL} (Unitless)*	*LOAEL (mg/kg/day)*	*HQ_{LOAEL} (Unitless)*	*Develop Ecological PRG*
	Food	*Soil*	*Water*	*Total*					
Volatile Organic Compounds (VOCs)									
Acetone	0	0.145	0	0.145	5.2	0.028	---	---	No
Isopropylbenzene	0.0086	0.004	0	0.013	n/a	---	n/a	---	---
BTEX									
Benzene	0	0.004	0	0.004	n/a	---	n/a	---	---
Toluene	0	0.070	0	0.070	n/a	---	n/a	---	---
Xylenes (Total)	0	0.062	0	0.062	n/a	---	n/a	---	---
Semi-Volatile Organic Compounds (SVOCs)									
Carbazole	0.004	0.002	0	0.007	n/a	---	n/a	---	---
Polycyclic Aromatic Hydrocarbons (PAHs)									
High Molecular Weight PAHs	0.418	0.367	0	0.785	2.0	0.39	---	---	No
Inorganic Constituents									
Copper	2.62	3.78	0	6.40	2.3	**2.8**	52.3	0.12	Yes
Lead	0.930	4.78	0	5.71	0.014	**408**	8.75	0.65	Yes
Mercury	0.011	0.04	0	0.051	0.039	**1.3**	0.180	0.28	Yes
Zinc	22.9	8.79	0	31.7	17.2	**1.8**	172	0.18	Yes

Notes :

Bold Font identifies hazard quotient greater than 1.0

n/a - Value not available

BTEX - Benzene, toluene, ethylbenzene, and xylenes

mg - milligram

kg - kilogram

LOAEL - Lowest Observed Adverse Effect Level

NOAEL - No Observed Adverse Effect Level

HQ_{LOAEL} - Hazard quotient based on LOAEL

HQ_{NOAEL} - Hazard quotient based on NOAEL

PRG - Preliminary Remediation Goal

TABLE 5.12

SUMMARY OF FOOD CHAIN MODEL FOR RED-TAILED HAWK
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

CONSTITUENT	*Ingestion (mg/kg/day)*				*NOAEL (mg/kg/day)*	*HQ_{NOAEL} (Unitless)*	*LOAEL (mg/kg/day)*	*HQ_{LOAEL} (Unitless)*	*Develop Ecological PRG*
	Food	*Soil*	*Water*	*Total*					
Volatile Organic Compounds (VOCs)									
Acetone	0	0.002	0	0.002	5.2	0.0004	---	---	No
Isopropylbenzene	2.25	0.00005	0	2.250	n/a	---	n/a	---	---
BTEX									
Benzene	0	0.00006	0	0.00006	n/a	---	n/a	---	---
Toluene	0	0.0009	0	0.0009	n/a	---	n/a	---	---
Xylenes (Total)	0	0.0008	0	0.0008	n/a	---	n/a	---	---
Semi-Volatile Organic Compounds (SVOCs)									
Carbazole	1.40	0.00003	0	1.400	n/a	---	n/a	---	---
Polycyclic Aromatic Hydrocarbons (PAHs)									
High Molecular Weight PAHs	0	0.005	0	0.005	2.0	0.002	---	---	No
Inorganic Constituents									
Copper	0.557	0.050	0	0.607	2.3	0.26	---	---	No
Lead	0.379	0.064	0	0.443	0.014	**32**	8.75	0.051	Yes
Mercury	0.003	0.0005	0	0.003	0.039	0.088	---	---	No
Zinc	4.18	0.118	0	4.30	17.2	0.25	---	---	No

Notes **:**

Bold Font identifies hazard quotient greater than 1.0

n/a - Value not available

BTEX - Benzene, toluene, ethylbenzene, and xylenes

mg - milligram

kg - kilogram

LOAEL - Lowest Observed Adverse Effect Level

NOAEL - No Observed Adverse Effect Level

HQ_{LOAEL} - Hazard quotient based on LOAEL

HQ_{NOAEL} - Hazard quotient based on NOAEL

PRG - Preliminary Remediation Goal

TABLE 5.13

SUMMARY OF FOOD CHAIN MODEL FOR SHORT-TAILED SHREW
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

CONSTITUENT	*Ingestion (mg/kg/day)*				*NOAEL (mg/kg/day)*	*HQ_{NOAEL} (Unitless)*	*LOAEL (mg/kg/day)*	*HQ_{LOAEL} (Unitless)*	*Develop Ecological PRG*
	Food	*Soil*	*Water*	*Total*					
Volatile Organic Compounds (VOCs)									
Acetone	0	0.034	0	0.034	10	0.003	---	---	No
Isopropylbenzene	13.3	0.0009	0	13.3	154	0.086	---	---	No
BTEX									
Xylenes (Total)	0	0.015	0	0.015	2.1	0.007	---	---	No
Semi-Volatile Organic Compounds (SVOCs)									
Carbazole	8.27	0.0005	0	8.27	5.2	**1.6**	57.3	0.14	Yes
Polycyclic Aromatic Hydrocarbons (PAHs)									
High Molecular Weight PAHs	7.55	0.087	0	7.64	0.615	**12**	28.6	0.27	Yes
Inorganic Constituents									
Copper	15.4	0.897	0	16.3	2.67	**6.1**	632	0.026	Yes
Lead	11.2	1.13	0	12.3	1.0	**12**	241	0.051	Yes
Mercury	0.077	0.010	0	0.087	0.027	**3.2**	4.0	0.022	Yes
Selenium	0.154	0.005	0	0.159	0.05	**3.2**	1.21	0.13	Yes
Zinc	120	2.09	0	122	9.6	**13**	411	0.30	Yes
Cyanide (Total)	2.10	0.0094	0	2.11	68.7	0.031	---	---	No

Notes **:**

Bold Font identifies hazard quotient greater than 1.0

BTEX - Benzene, toluene, ethylbenzene, and xylenes

mg - milligram

kg - kilogram

LOAEL - Lowest Observed Adverse Effect Level

NOAEL - No Observed Adverse Effect Level

HQ_{LOAEL} - Hazard quotient based on LOAEL

HQ_{NOAEL} - Hazard quotient based on NOAEL

PRG - Preliminary Remediation Goal

TABLE 5.14

SUMMARY OF FOOD CHAIN MODEL FOR MEADOW VOLE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

CONSTITUENT	*Ingestion (mg/kg/day)*				*NOAEL (mg/kg/day)*	*HQ_{NOAEL} (Unitless)*	*LOAEL (mg/kg/day)*	*HQ_{LOAEL} (Unitless)*	*Develop Ecological PRG*
	Food	*Soil*	*Water*	*Total*					
Volatile Organic Compounds (VOCs)									
Acetone	0	0.015	0	0.015	10	0.002	---	---	No
Isopropylbenzene	0.004	0.0004	0	0.004	154	0.00003	---	---	No
BTEX									
Xylenes (Total)	0	0.007	0	0.007	2.1	0.003	---	---	No
Semi-Volatile Organic Compounds (SVOCs)									
Carbazole	0.002	0.0002	0	0.002	5.2	0.0004	---	---	No
Polycyclic Aromatic Hydrocarbons (PAHs)									
High Molecular Weight PAHs	0.193	0.039	0	0.232	0.615	0.38	---	---	No
Inorganic Constituents									
Copper	1.21	0.400	0	1.61	2.67	0.60	---	---	No
Lead	0.428	0.507	0	0.935	1.0	0.93	---	---	No
Mercury	0.005	0.004	0	0.009	0.027	0.34	---	---	No
Selenium	0.031	0.002	0	0.033	0.05	0.66	---	---	No
Zinc	10.6	0.932	0	11.5	9.6	**1.2**	411	0.028	Yes
Cyanide (Total)	0.131	0.004	0	0.14	68.7	0.002	---	---	No

Notes **:**

Bold Font identifies hazard quotient greater than 1.0

BTEX - Benzene, toluene, ethylbenzene, and xylenes

mg - milligram

kg - kilogram

LOAEL - Lowest Observed Adverse Effect Level

NOAEL - No Observed Adverse Effect Level

HQ_{LOAEL} - Hazard quotient based on LOAEL

HQ_{NOAEL} - Hazard quotient based on NOAEL

PRG - Preliminary Remediation Goal

TABLE 5.15

SUMMARY OF FOOD CHAIN MODEL FOR LONG-TAILED WEASEL
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

CONSTITUENT	*Ingestion (mg/kg/day)*				*NOAEL (mg/kg/day)*	*HQ_{NOAEL} (Unitless)*	*LOAEL (mg/kg/day)*	*HQ_{LOAEL} (Unitless)*	*Develop Ecological PRG*
	Food	*Soil*	*Water*	*Total*					
Volatile Organic Compounds (VOCs)									
Acetone	0	0.031	0	0.031	10	0.003	---	---	No
Isopropylbenzene	8.3	0.0008	0	8.30	154	0.054	---	---	No
BTEX									
Xylenes (total)	0	0.013	0	0.013	2.1	0.006	---	---	No
Semi-Volatile Organic Compounds (SVOCs)									
Carbazole	5.14	0.0005	0	5.14	5.2	0.99	---	---	No
Polycyclic Aromatic Hydrocarbons (PAHs)									
High Molecular Weight PAHs	0	0.078	0	0.078	0.615	0.126	---	---	No
Inorganic Constituents									
Copper	2.05	0.799	0	2.85	2.67	**1.1**	632	0.005	Yes
Lead	1.40	1.01	0	2.41	1.0	**2.4**	241	0.010	Yes
Mercury	0.011	0.009	0	0.020	0.027	0.72	---	---	No
Selenium	0.076	0.004	0	0.080	0.050	**1.6**	1.21	0.066	Yes
Zinc	15.4	1.86	0	17.3	9.6	**1.8**	411	0.042	Yes
Cyanide (Total)	1.31	0.008	0	1.32	68.7	0.019	---	---	No

Notes **:**

Bold Font identifies hazard quotient greater than 1.0

BTEX - Benzene, toluene, ethylbenzene, and xylenes

mg - milligram

kg - kilogram

LOAEL - Lowest Observed Adverse Effect Level

NOAEL - No Observed Adverse Effect Level

HQ_{LOAEL} - Hazard quotient based on LOAEL

HQ_{NOAEL} - Hazard quotient based on NOAEL

PRG - Preliminary Remediation Goal

TABLE 6.1

MODIFIED EXPOSURE PARAMETERS FOR AMERICAN WOODCOCK AND SHORT-TAILED SHREW
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Parameter	*Units*	*American Woodcock*	*Short-Tailed Shrew*
Body Weight	kg	0.213	0.015
Free Metabolic Rate	kcal/day	96.65	8.4
Assimilation Efficiency	Unitless		
Soil Invertebrates		0.83	0.90
Plant Material		0.76	0.91
Weighted Average Metabolizable Energy	kcal/g	2.93	2.27
Normalized Daily Intake	mg/kg/day	0.187	0.259
Soil Ingestion Rate	mg/kg/day	0.031	0.008
Diet	Unitless		
Soil Invertebrates		0.678	0.820
Plant Material		0.322	0.180

Notes *:*

kcal - kilocalories

kg - kilogram

g - gram

mg - milligram

Exposure parameters from Wildlife Scenario Builder (U.S. EPA, 2013)

TABLE 6.2

INITIAL ECOLOGICAL PRELIMINARY REMEDIATION GOALS - AVIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*American Woodcock*			*Mourning Dove*			*Red-Tailed Hawk*			*Initial Avian PRG*
	Lower Bound	*Upper Bound*	*Mid Point*	*Lower Bound*	*Upper Bound*	*Mid Point*	*Lower Bound*	*Upper Bound*	*Mid Point*	
Polycyclic Aromatic Hydrocarbons (PAHs)										
High Molecular Weight PAHs	3.38	33.8	18.6	---	---	---	---	---	---	18.6
Inorganic Compounds										
Copper	15.8	359	187	32.0	1,715	874	---	---	---	187
Lead	0.039	80.3	40	0.077	285	143	0.103	16,820	8,410	40
Mercury	0.451	2.08	1.27	1.16	5.36	3.26	---	---	---	1.27
Zinc	0.822	614	307	131	3,380	1,756	---	---	---	307

Notes **:**

PRG - Preliminary Remediation Goal

TABLE 6.3

INITIAL ECOLOGICAL PRELIMINARY REMEDIATION GOAL - MAMMALIAN WILDLIFE
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*Short-Tailed Shrew*			*Meadow Vole*			*Long-Tailed Weasel*			*Initial Mammalian PRG*
	Lower Bound	*Upper Bound*	*Mid Point*	*Lower Bound*	*Upper Bound*	*Mid Point*	*Lower Bound*	*Upper Bound*	*Mid Point*	
Semi-Volatile Organic Compounds (SVOCs)										
Carbazole	0.052	0.574	0.313	---	---	---	---	---	---	0.313
Polycyclic Aromatic Hydrocarbons (PAHs)										
High Molecular Weight PAHs	1.11	52.0	26.6	---	---	---	---	---	---	26.6
Inorganic Compounds										
Copper	23.4	5,548	2,786	---	---	---	161	172,000	86,081	2,786
Lead	8.51	6,485	3,247	---	---	---	52.5	61,100	30,576	3,247
Mercury	0.479	70.9	35.7	---	---	---	---	---	---	35.7
Selenium	0.153	11.2	5.68	---	---	---	0.228	169	84.6	5.7
Zinc	0.150	9,015	4,508	253	86,400	43,327	0.421	106,500	53,250	4,508

Notes:

PRG - Preliminary Remediation Goal

TABLE 6.4

INITIAL PRELIMINARY REMEDIATION GOALS
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*95% UCL Concentration (mg/kg)*	*Initial Avian PRG (mg/kg)*	*Initial Mammalian PRG (mg/kg)*	*Initial PRG (mg/kg)*	*95% UCL < Initial PRGs*	*Carry Forward for Phase 2 Evaluation*
Semi-Volatile Organic Constituents (SVOCs)						
Carbazole	0.083	---	0.313	0.313	Yes	No
Polycyclic Aromatic Hydrocarbons (PAHs)						
High Molecular Weight PAHs	**36.1**	**18.6**	**26.6**	**18.6**	**No**	**Yes**
Inorganic Constituents						
Copper	143	187	2,786	187	Yes	No
Lead	**181**	**40**	**3,247**	**40**	**No**	**Yes**
Mercury	**1.53**	**1.27**	**35.7**	**1.27**	**No**	**Yes**
Selenium	0.73	---	6	5.7	Yes	No
Zinc	**333**	**307**	**4,508**	**307**	**Yes**	**Yes**

Notes **:**

Bold Font indentifies 95% UCL concentration above Initial PRG

PRG - Preliminary Remediation Goal

UCL - Upper Confidence Limit

TABLE 6.5

MODIFIED TOXICITY REFERENCE VALUES
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	Indicator Taxon	TRV	Original Value (mg/kg/day)	Modified Value (mg/kg/day)	Rationale
Polycyclic Aromatic Hydrocarbons (PAHs)					
High Molecular Weight PAHs	Mammals	NOAEL	0.615	11.8	The original value of 0.615 mg/kg/day is the lowest NOAEL in the Eco-SSL dataset (U.S. EPA, 2007e) by an order of magnitude. It is based on late life effects on survival of an extremely sensitive imbred strain of laboratory mice with a short life span. Smith (2013) identified the study as an outlier than had no adverse effects at the population level. The modified value of 11.8 mg/kg/day is the highest NOAEL less than the lowest bounded LOAEL after removal of the outlier.
		LOAEL	28.6	39.6	The original value of 28.6 mg/kg/day is the geometric mean of the bounded LOAELs for growth and reproduction, which includes the outlier study identified by Smith (2013). The modified value is the geometric mean of the bounded LOAELs for growth and reproduction with the outlier removed.
Inorganic Constituents					
Lead	Birds	NOAEL	0.014	0.598	The original value of 0.014 mg/kg/day is lower than any of the NOAELs in the Eco-SSL dataset (U.S. EPA, 2005), and produces an unrealistically low protective soil concentration of 0.039 mg/kg for avian receptors. The modified value is a NOAEL that produces a hazard quotient of 1.0 for American woodcock at the Michigan background concentration of 7.4 mg/kg.
		LOAEL	8.75	42.7	The original value of 8.75 mg/kg/day is below the geometric mean of the NOAELs in the Eco-SSL dataset (U.S. EPA, 2005), which is unrealistically low for an upper bound TRV. The modified value of 42.7 mg/kg is geometric mean of the bounded LOAELs in the Eco-SSL dataset, and approximates the 20th percentile of the bounded LOAELs.

Notes **:**

Eco-SSL - Ecological Soil Screening Level
LOAEL - Lowest Observed Adverse Effect Level
NOAEL - No Observed Adverse Effect Level
TRV - Toxicity Reference Value
mg - milligram
kg - kilogram

TABLE 6.6

MODIFIED ECOLOGICAL PRELIMINARY REMEDIATION GOALS
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*Modified Avian PRG (mg/kg)*			*Modified Mammalian PRG (mg/kg)*		
	Lower Bound	*Upper Bound*	*Mid Point*	*Lower Bound*	*Upper Bound*	*Mid Point*
Polycyclic Aromatic Hydrocarbons (PAHs)						
High Molecular Weight PAHs	6.91	69.5	38.2	19.8	66.5	43.2
Inorganic Constituents						
Lead	7.4	1,062	535	---	---	---
Mercury	0.690	3.18	1.94	---	---	---
Zinc	7.62	1,705	856	---	---	---

Notes **:**

PRG - Preliminary Remediation Goal

mg - milligram

kg - kilogram

TABLE 6.7

FINAL ECOLOGICAL PRELIMINARY REMEDIATION GOALS
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Constituent	*95% UCL Concentration (mg/kg)*	*Initial Ecological PRG (mg/kg)*	*Modified Avian PRG (mg/kg)*	*Modified Mammalian PRG (mg/kg)*	*Final Ecological PRG (mg/kg)*	*95% UCL < Final Ecological PRG*	*Risk Management Required to Meet RAO*
Semi-Volatile Organic Constituents (SVOCs)							
Carbazole	0.083	0.313	---	---	0.313	Yes	No
Polycyclic Aromatic Hydrocarbons (PAHs)							
High Molecular Weight PAHs	36.1	18.6	38.2	43.2	38.2	Yes	No
Inorganic Constituents							
Copper	143	187	---	---	187	Yes	No
Lead	181	40	535	---	535	Yes	No
Mercury	1.53	1.27	1.94	---	1.94	Yes	No
Selenium	0.73	5.7	---	---	5.7	Yes	No
Zinc	333	307	856	---	856	Yes	No

Notes **:**

PRG - Preliminary Remediation Goal
RAO - Remedial Action Objective
UCL - Upper Confidence Limit
mg - milligram
kg - kilogram

Appendix A

Dataset for the Refinement Process

APPENDIX A

DATASET FOR THE REFINEMENT PROCESS
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	***Residential Area 1***	***Residential Area 1***	***Residential Area 1***	***Residential Area 1***	***Residential Area 1***	***Residential Area 1***	***Residential Area 1***	***Residential Area 1***
Sample Location	***SB-101***	***SB-102***	***SB-103***	***SB-104***	***SB-106***	***SB-107***	***SB-116***	***SB-118***
Sample Date	***1/18/2010***	***1/20/2010***	***1/20/2010***	***1/21/2010***	***1/18/2010***	***1/18/2010***	***1/19/2010***	***1/20/2010***
Sample Depth	***(0-1) ft BGS***	***(0-1) ft BGS***	***(0-1) ft BGS***	***(0-1) ft BGS***	***(0-1) ft BGS***	***(0-1) ft BGS***	***(0-1) ft BGS***	***(0-1) ft BGS***
Constituent								
Volatile Organic Compounds (VOCs)								
Acetone	R	R	R	R	R	R	R	0.82 J
Isopropylbenzene	0.25 U	0.60 U	0.25 U	0.26 U	0.25 U	0.26 U	0.25 U	0.050 J
BTEX								
Benzene	0.062 U	0.15 U	0.061 U	0.0090 J	0.062 U	0.065 U	0.061 U	0.037 J
Toluene	0.062 U	0.37	0.061 U	0.092	0.062 U	0.023 J	0.061 U	0.67
o-Xylene	0.062 U	0.31	0.061 U	0.049 J	0.062 U	0.065 U	0.061 U	0.57
m&p-Xylene	0.062 U	0.51	0.061 U	0.073	0.062 U	0.065 U	0.061 U	0.82
SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs)								
bis(2-Ethylhexyl)phthalate (DEHP)	0.35 U	0.4 U	0.34 U	0.14 J	0.33 U	0.32 U	0.33 U	0.041 J
Carbazole	0.35 U	0.4 U	0.34 U	0.36 U	0.33 U	0.32 U	0.33 U	0.38 U
POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)								
HMW PAHs	1.05	1.2	1.02	0.622	0.99	0.96	0.99	0.558
Benzo(a)anthracene	0.35 U	0.4 U	0.34 U	0.067 J	0.33 U	0.32 U	0.33 U	0.05 J
Benzo(a)pyrene	0.35 U	0.4 U	0.34 U	0.085 J	0.33 U	0.32 U	0.33 U	0.082 J
Chrysene	0.35 U	0.4 U	0.34 U	0.08 J	0.33 U	0.32 U	0.33 U	0.067 J
Dibenz(a,h)anthracene	0.35 U	0.4 U	0.34 U	0.12 J	0.33 U	0.32 U	0.33 U	0.38 U
Fluoranthene	0.35 U	0.4 U	0.34 U	0.15 J	0.33 U	0.32 U	0.33 U	0.092 J
Pyrene	0.35 U	0.4 U	0.34 U	0.12 J	0.33 U	0.32 U	0.33 U	0.077 J
POLYCHLORINATED BIPHENYLS (PCBs)								
Total PCBs	0.136 J	0.008 U	0.32 J	0.39 J	0.0066 U	0.031 J	0.064 J	0.25 J
Aroclor-1248 (PCB-1248)	0.052	0.008 U	0.0069 U	0.0071 U	0.0066 U	0.0065 U	0.0066 U	0.0077 U
Aroclor-1254 (PCB-1254)	0.049 J	0.008 U	0.17 J	0.23 J	0.0066 U	0.018 J	0.036 J	0.13 J
Aroclor-1260 (PCB-1260)	0.035 J	0.008 U	0.15 J	0.16 J	0.0066 U	0.013 J	0.028 J	0.12 J
INORGANIC CONSTITUENTS								
Anitmony	0.6 UJ	0.7 UJ	0.6 UJ	0.6 UJ	0.5 UJ	0.3 UJ	0.5 UJ	0.6 UJ
Arsenic	10.3	16.2	10.6 J	6.5 J	3.3	3.7	7.0	5.7 J
Barium	41.4	228	91.3 J	53.9 J	17.2	18.1	50.8	87.6 J
Cadmium	0.6 U	0.7 U	0.3 U	0.3 U	0.2 U	0.2 U	0.5 U	0.3 U
Chromium	11 J	9	18	9	8	8 J	12	16
Cobalt	4.5	5.8	5.5	2.9	2.4	3.0	5.0	3.8
Copper	9	23	13	14	7 J	6	12 J	20
Iron	14100	9020	16700	9370	5820	12800	19600	8640
Lead	11.2	32.5	41.9	30.6	4.0	6.3	12.7	37.9
Manganese	654	127	469	339	157	326	548	162
Mercury	0.05	0.04 U	0.17	0.24	0.05 U	0.05 U	0.05	0.26
Nickel	7.6	13.2	9.6	7.9	6.1	7.1	10.4	12.1
Selenium	0.6 U	0.7	0.3	0.5	0.4	0.6	0.5 U	0.7
Vanadium	17	28	22	13	8	13	18	13
Zinc	26	22	44	36	18	22	34	55
Cyanide (Total)	0.9			0.9				

Notes **:**

All results in milligrams per kilogram (mg/kg)
Blank Cell - Constituent not analyzed
J - Estimated
R - Rejected
U - Not Detected at the indicated concentration
ft - feet
BGS - Below Ground Surface

APPENDIX A

DATASET FOR THE REFINEMENT PROCESS
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	***Residential Area 2***	***Residential Area 2***	***Residential Area 2***	***Residential Area 2***	***Residential Area 2***	***Residential Area 3***	***Residential Area 3***	***Residential Area 3***
Sample Location	***SB-105***	***SB-124***	***SB-126***	***SB-128***	***SB-130***	***MW-15***	***SB-135***	***SB-138***
Sample Date	***1/21/2010***	***1/21/2010***	***1/21/2010***	***1/21/2010***	***1/25/2010***	***1/11/2010***	***1/26/2010***	***1/26/2010***
Sample Depth	***(0-1) ft BGS***	***(0-1) ft BGS***	***(0-1) ft BGS***	***(0-1) ft BGS***	***(0-1) ft BGS***	***(0-2) ft BGS***	***(0-1) ft BGS***	***(0-1) ft BGS***
Constituent								
Volatile Organic Compounds (VOCs)								
Acetone	0.31 J	R	R	R	R			
Isopropylbenzene	0.24 U	0.27 U	0.24 U	0.23 U	0.26 U	0.25 U	0.24 U	0.24 U
BTEX								
Benzene	0.059 U	0.067 U	0.059 U	0.056 U	0.0089 J	0.061 U	0.060 U	0.059 U
Toluene	0.059 U	0.067 U	0.059 U	0.056 U	0.043 J	0.061 U	0.060 U	0.016 J
o-Xylene	0.059 U	0.011 J	0.059 U	0.056 U	0.029 J	0.061 U	0.060 U	0.059 U
m&p-Xylene	0.059 U	0.016 J	0.059 U	0.056 U	0.038 J	0.061 U	0.060 U	0.059 U
SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs)								
bis(2-Ethylhexyl)phthalate (DEHP)	0.37 U	0.33 J	0.15 J	0.33 U	0.04 J	0.051 J	0.042 J	0.051 J
Carbazole	0.37 U	0.36 U	0.33 U	0.33 U	0.37 U	0.37 U	0.34 U	0.35 U
POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)								
HMW PAHs	0.706	0.602	0.861	0.99	1.527	0.553	0.756	1.05
Benzo(a)anthracene	0.37 U	0.36 U	0.33 U	0.33 U	0.2 J	0.054 J	0.34 U	0.35 U
Benzo(a)pyrene	0.37 U	0.07 J	0.33 U	0.33 U	0.072 J	0.043 J	0.34 U	0.35 U
Chrysene	0.04 J	0.04 J	0.33 U	0.33 U	0.21 J	0.06 J	0.34 U	0.35 U
Dibenz(a,h)anthracene	0.37 U	0.36 U	0.33 U	0.33 U	0.37 U	0.37 U	0.34 U	0.35 U
Fluoranthene	0.064 J	0.076 J	0.036 J	0.33 U	0.48	0.12 J	0.042 J	0.35 U
Pyrene	0.047 J	0.056 J	0.33 U	0.33 U	0.38	0.091 J	0.034 J	0.35 U
POLYCHLORINATED BIPHENYLS (PCBs)								
Total PCBs	0.227 J	0.147 J	0.089 J	0.125 J	0.072 J			
Aroclor-1248 (PCB-1248)	0.0075 U	0.0071 U	0.0067 U	0.0065 U	0.0074 U			
Aroclor-1254 (PCB-1254)	0.13 J	0.081 J	0.051 J	0.067 J	0.072 J			
Aroclor-1260 (PCB-1260)	0.097 J	0.066 J	0.038 J	0.058 J	0.0074 U			
INORGANIC CONSTITUENTS								
Anitmony	0.6 U	0.6 UJ	0.6 U	0.6 U	0.6 UJ	0.3 J	0.5 U	0.4 UJ
Arsenic	9.6	8.4 J	6.9	3.9	5.1	19.9	6.6	6.2
Barium	65.6	87.8 J	50.8	21.6	53.2	115 J	56.0	49.7
Cadmium	0.6 U	0.3 U	0.6 U	0.6 U	0.6 U	0.3	0.5 U	0.3 U
Chromium	13	14	14	11	24	13	12	10
Cobalt	5.4	4.8	4.5	5.1	4.2	4.2	3.7	3.6
Copper	18	15	45	14	26 J	28	23	10
Iron	12500	14100	15100	8100	9440	9820	11200	9220 J
Lead	32.0	22.9	45.6	18.2	38.4	63.9	45.0	14.1
Manganese	402	697	410	183	359	543	489	698 J
Mercury	0.07	0.10	0.08	0.05	0.09	0.10	0.21	0.29
Nickel	13.0	10.3	9.2	8.2	9.6	12.8 J	8.0	7.4
Selenium	0.6 U	0.6	0.6 U	0.6 U	0.5	0.8	0.5 U	0.5
Vanadium	15	19	13	16	14	15 J	15	12
Zinc	46	47	47	33	60	92 J	53	30 J
Cyanide (Total)							1.0	

Notes :

All results in milligrams per kilogram (mg/kg)
Blank Cell - Constituent not analyzed
J - Estimated
R - Rejected
U - Not Detected at the indicated concentration
ft - feet
BGS - Below Ground Surface

APPENDIX A

DATASET FOR THE REFINEMENT PROCESS
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	***Residential Area 3***	***Residential Area 3***	***Residential Area 3***	***Residential Area 3***	***Residential Area 3***	***Residential Area 3***	***Residential Area 3***	***Residential Area 4***
Sample Location	***SB-139***	***TP-1***	***TP-2***	***TP-3***	***TP-4***	***TP-5***	***TP-6***	***DG1***
Sample Date	***1/27/2010***	***3/14/2008***	***3/14/2008***	***3/14/2008***	***3/14/2008***	***3/14/2008***	***3/14/2008***	***4/21/1997***
Sample Depth	***(0-1) ft BGS***	-	-	-	-	-	-	***(0-1.5) ft BGS***
Constituent								
Volatile Organic Compounds (VOCs)								
Acetone								
Isopropylbenzene	0.28 U							
BTEX								
Benzene	0.069 U							
Toluene	0.069 U							
o-Xylene	0.069 U							
m&p-Xylene	0.069 U							
SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs)								
bis(2-Ethylhexyl)phthalate (DEHP)	0.35 U							
Carbazole	0.35 U							
POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)								
HMW PAHs	0.837							0.0821
Benzo(a)anthracene	0.096 J							0.0095
Benzo(a)pyrene	0.036 J							0.013
Chrysene	0.11 J							0.017
Dibenz(a,h)anthracene	0.35 U							0.0056
Fluoranthene	0.22 J							0.053 U
Pyrene	0.2 J							0.021 U
POLYCHLORINATED BIPHENYLS (PCBs)								
Total PCBs		0.35	0.28	0.04	0.05	0.01	0.08	
Aroclor-1248 (PCB-1248)								
Aroclor-1254 (PCB-1254)								
Aroclor-1260 (PCB-1260)								
INORGANIC CONSTITUENTS								
Anitmony	0.4 J							
Arsenic	12.5							3.6
Barium	94.2							
Cadmium	0.3							0.99
Chromium	36							5.9
Cobalt	5.5							
Copper	24							3.8
Iron	15100 J							
Lead	55.3							7.4
Manganese	637 J							
Mercury	0.42							0.043 U
Nickel	29.3							
Selenium	0.5							0.53 U
Vanadium	17							
Zinc	80 J							27 U
Cyanide (Total)								

Notes **:**
All results in milligrams per kilogram (mg/kg)
Blank Cell - Constituent not analyzed
J - Estimated
R - Rejected
U - Not Detected at the indicated concentration
ft - feet
BGS - Below Ground Surface

APPENDIX A

DATASET FOR THE REFINEMENT PROCESS
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	***Residential Area 4***	***Residential Area 4***	***Residential Area 4***	***Residential Area 4***	***Residential Area 4***	***Residential Area 4***	***Residential Area 4***
Sample Location	***DG2***	***DG3***	***DG4***	***DG5***	***SB-7***	***SB-301***	***SB-302***
Sample Date	***4/21/1997***	***4/21/1997***	***4/21/1997***	***4/21/1997***	***9/5/2006***	***1/27/2010***	***1/27/2010***
Sample Depth	***(0-1.5) ft BGS***	***(0-1.5) ft BGS***	***(0-1.5) ft BGS***	***(0-1.5) ft BGS***	***(0-0.5) ft BGS***	***(0-1) ft BGS***	***(0-1) ft BGS***
Constituent							
Volatile Organic Compounds (VOCs)							
Acetone						R	5.5 J
Isopropylbenzene						0.087 J	0.66
BTEX							
Benzene						0.074	1.3
Toluene						1.4	22
o-Xylene						0.89	7.4
m&p-Xylene						1.3	11
SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs)							
bis(2-Ethylhexyl)phthalate (DEHP)						0.13 J	0.08 J
Carbazole						0.98 U	0.083 J
POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)							
HMW PAHs	0.135	26.5	17.15	0.1077	4.346	2.16	2.43
Benzo(a)anthracene	0.02	3.8	0.47	0.013	0.56 J/0.44 J	0.23 J	0.38
Benzo(a)pyrene	0.03	4.9	0.58	0.02	0.35 J/0.34 J	0.27 J	0.36 J
Chrysene	0.019	8.1	5.5	0.016	0.42 J/0.46 J	0.36 J	0.56
Dibenz(a,h)anthracene	0.0045	0.9	6.4	0.0052	0.071 J/0.076 J	0.98 U	0.08 J
Fluoranthene	0.053 U	5.6 U	6 U	0.053 U	1.4/1.4	0.46 J	0.52
Pyrene	0.035	6	2.4 U	0.027	1.2/1.5	0.35 J	0.53
POLYCHLORINATED BIPHENYLS (PCBs)							
Total PCBs						0.066 U	0.4 J
Aroclor-1248 (PCB-1248)						0.066 U	0.072 U
Aroclor-1254 (PCB-1254)						0.066 U	0.2 J
Aroclor-1260 (PCB-1260)						0.066 U	0.2 J
INORGANIC CONSTITUENTS							
Anitmony						1.5 J	1.2 J
Arsenic	4.4	6.8	16	2.7 U	5.8	21.6	6.9
Barium						73.1	151
Cadmium	1.1	1.9	3.9	1	0.27	0.3	0.6
Chromium	5.5	11	28	6.3	7.6	10	12
Cobalt						6	6
Copper	2.6 U	120	220	5	22	40	71
Iron						13100 J	10900 J
Lead	32	140	990	11	41	58.1	99.5
Manganese						296 J	351 J
Mercury	0.049	5.6	1.1	0.043 U	0.28	0.22	0.16
Nickel						12.8	12.0
Selenium	0.53 U	0.56 U	0.6 U	0.53 U	0.5	1.1	1.8
Vanadium						16	14
Zinc	26 U	230	450	27 U	64	75 J	154 J
Cyanide (Total)							0.5

Notes **:**

All results in milligrams per kilogram (mg/kg)
Blank Cell - Constituent not analyzed
J - Estimated
R - Rejected
U - Not Detected at the indicated concentration
ft - feet
BGS - Below Ground Surface

APPENDIX A

DATASET FOR THE REFINEMENT PROCESS
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Redevelopment Area	***Residential Area 4***	***Commercial Area 4***	***Commercial Area 4***	***Commercial Area 4***	***Commercial Area 4***	***Commercial Area 4***
Sample Location	***SB-321***	***PM8***	***SB-201***	***SB-202***	***SB-203***	***TP-341***
Sample Date	***1/27/2010***	***1/1/2009***	***1/27/2010***	***1/27/2010***	***1/27/2010***	***5/20/2010***
Sample Depth	***(0-1) ft BGS***	***(0.3-0.5) ft BGS***	***(0-1) ft BGS***	***(0-1) ft BGS***	***(0-1) ft BGS***	***(0.5-1.5) ft BGS***
Constituent						
Volatile Organic Compounds (VOCs)						
Acetone	R/R		R	R	R	R
Isopropylbenzene	0.22 U/0.25 U		0.19 U	0.25 U	0.22 U	0.28 U
BTEX						
Benzene	0.054 U/0.061 U		0.0085 J	0.061 U	0.055 U	0.0056 J
Toluene	0.054 U/0.061 U		0.074 U	0.022 J	0.047 J	0.070 U
o-Xylene	0.054 U/0.061 U		0.045 J	0.061 U	0.082	0.057 J
m&p-Xylene	0.054 U/0.061 U		0.071 U	0.061 U	0.096	0.078
SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs)						
bis(2-Ethylhexyl)phthalate (DEHP)	0.34 U/0.35 U		0.35	0.14 J	0.072 J	0.37 U
Carbazole	0.34 U/0.35 U		R	0.98 U	0.34 UJ	
POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)						
HMW PAHs	0.791		2.118	2.68	3.216	15.88
Benzo(a)anthracene	0.34 U/0.35 U		0.26 J	0.37 J	0.37	
Benzo(a)pyrene	0.34 U/0.35 U		0.15 J	0.39 J	0.37	
Chrysene	0.34 U/0.35 U		0.35	0.62 J	0.68	2.5
Dibenz(a,h)anthracene	0.34 U/0.35 U		0.058 J	0.98 U	0.056 J	0.88
Fluoranthene	0.048 J/0.044 J		0.78	0.42 J	1	7.7
Pyrene	0.043 J/0.039 J					
POLYCHLORINATED BIPHENYLS (PCBs)						
Total PCBs	0.041 J/0.034 J	0.113				
Aroclor-1248 (PCB-1248)	0.0067 U/0.007 U	0.0652 U				
Aroclor-1254 (PCB-1254)	0.023 J/0.02 J	0.113				
Aroclor-1260 (PCB-1260)	0.018 J/0.014 J	0.0652 U				
INORGANIC CONSTITUENTS						
Anitmony	0.4 UJ/0.3 UJ		2.8 J	0.7 J	0.8 J	3.1 J
Arsenic	7.2/8.1		9.1 J	9.8 J	9.8 J	20.1
Barium	65.1/69.7		480 J	167 J	122 J	500 J
Cadmium	0.3 U/0.3		1.2	0.4	0.3	1.7
Chromium	12/14		13	19	13	40
Cobalt	3.9/4.4		3.4	5.1	4.1	7.7 J
Copper	17/21		194	194	128	308
Iron	10600 J/12200 J		14200 J	14700 J	17300 J	22200 J
Lead	52.0/46.6		359	98.3	182	555
Manganese	541 J/518 J		336 J	354 J	410 J	364 J
Mercury	0.18/0.13		0.42	0.09	0.35	1.29 U
Nickel	8.0/9.4		8.6 J	22.4 J	12.0 J	16.4 J
Selenium	0.7/0.6		0.6	1	0.8	1.5
Vanadium	15/18		14	26	18	25
Zinc	110 J/87 J		668 J	207 J	151 J	764 J
Cyanide (Total)	1.7/1.8		1.5			

Notes **:**

All results in milligrams per kilogram (mg/kg)
Blank Cell - Constituent not analyzed
J - Estimated
R - Rejected
U - Not Detected at the indicated concentration
ft - feet
BGS - Below Ground Surface

Appendix B

Food Chain Calculations Using Exposure Parameters Identified in the Wildlife Scenario Builder

APPENDIX B

FOOD CHAIN CALCULATIONS USING EXPOSURE PARAMETERS IDENTIFIED IN THE WILDLIFE SCENARIO BUILDER
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

COPEC	High Molecular Weight PAHs	
Indicator Species	American Woodcock	
Class	Bird	
Trophic Level	Insectivore	
Body Weight	kg	0.213
Free Metabolic Rate	kcal/day	96.65
Water Ingestion	L/day/day	0
Soil Ingestion	Proportion dry food ingestion	0.164
NOAEL	mg/kg/day	2.0
LOAEL	mg/kg/day	20

Diet	***Gross Energy***	***Assimilation Efficiency***	***Metabolizable Energy***	***Proportion of Diet***	***Weighted Average Metabolizable Energy***	***Itemized Daily Intake***	***Normalized Itemized Daily Intake***	C_{Insect}	C_{Plant}	C_{soil}	C_{Water}	IR_{Diet}	IR_{Soil}	IR_{Water}	IR_{Total}
	kcal/g DW	*Unitless*	*kcal/g*	*Unitless*	*kcal/g*	*kg/day*	*kg/kg/day*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/L*	*mg/kg/day*	*mg/kg/day*	*mg/kg/day*	*mg/kg/day*
Beetle Larvae	5.83	0.83	4.84	0.077	0.3713	0.0015	0.0072	36.1				0.26			
Centipedes	5.3	0.83	4.4	0.166	0.7283	0.0036	0.0171	36.1				0.62			
Earthworm	3.16	0.83	2.62	0.341	0.8944	0.0126	0.0591	36.1				2.13			
Fly Larvae	3.93	0.83	3.26	0.027	0.0871	0.0008	0.0037	36.1				0.13			
Grit	1.98	0.76	1.5	0.256	0.3841	0.0164	0.0772		2.2			0.17			
Misc. Animal	5.72	0.83	4.75	0.022	0.1024	0.0004	0.0021	36.1				0.07			
Seed	4.3	0.76	3.27	0.022	0.0733	0.0007	0.0031		2.2			0.01			
Unknown Insect Parts	5.72	0.83	4.75	0.047	0.2211	0.0009	0.0044	36.1				0.16			
Vegetable Matter	1.99	0.76	1.51	0.043	0.0651	0.0028	0.0129		2.2			0.03			
Sums/Totals			**30.9**	**1.0**	**2.93**	**0.040**	**0.187**			**13.9**	**0**	**3.59**	**0.426**	**0**	**4.01**

Notes :
PAHs - Polycyclic Aromatic Hydrocarbons
kg - kilogram
kcal - kilocalorie
L - Liter
mg - milligram
g - gram
LOAEL - Lowest Observed Adverse Effect Level
NOAEL - No Observed Adverse Effect Level

APPENDIX B

FOOD CHAIN CALCULATIONS USING EXPOSURE PARAMETERS IDENTIFIED IN THE WILDLIFE SCENARIO BUILDER
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

COPEC	Lead	
Indicator Species	American Woodcock	
Class	Bird	
Trophic Level	Insectivore	
Body Weight	kg	0.213
Free Metabolic Rate	kcal/day	96.65
Water Ingestion	L/day/day	0
Soil Ingestion	Proportion dry food ingestion	0.164
NOAEL	mg/kg/day	0.598
LOAEL	mg/kg/day	42.7

Diet	***Gross Energy***	***Assimilation Efficiency***	***Metabolizable Energy***	***Proportion of Diet***	***Weighted Average Metabolizable Energy***	***Itemized Daily Intake***	***Normalized Itemized Daily Intake***	C_{Insect}	C_{Plant}	C_{soil}	C_{Water}	IR_{Diet}	IR_{Soil}	IR_{Water}	IR_{Total}
	kcal/g DW	*Unitless*	*kcal/g*	*Unitless*	*kcal/g*	*kg/day*	*kg/kg/day*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/L*	*mg/kg/day*	*mg/kg/day*	*mg/kg/day*	*mg/kg/day*
Beetle Larvae	5.83	0.83	4.84	0.077	0.3713	0.0015	0.0072	53				0.38			
Centipedes	5.3	0.83	4.4	0.166	0.7283	0.0036	0.0171	53				0.91			
Earthworm	3.16	0.83	2.62	0.341	0.8944	0.0126	0.0591	53				3.15			
Fly Larvae	3.93	0.83	3.26	0.027	0.0871	0.0008	0.0037	53				0.20			
Grit	1.98	0.76	1.5	0.256	0.3841	0.0164	0.0772		4.9			0.38			
Misc. Animal	5.72	0.83	4.75	0.022	0.1024	0.0004	0.0021	53				0.11			
Seed	4.3	0.76	3.27	0.022	0.0733	0.0007	0.0031		4.9			0.02			
Unknown Insect Parts	5.72	0.83	4.75	0.047	0.2211	0.0009	0.0044	53				0.24			
Vegetable Matter	1.99	0.76	1.51	0.043	0.0651	0.0028	0.0129		4.9			0.06			
Sums/Totals			**30.9**	**1.0**	**2.93**	**0.040**	**0.187**			**333**	**0**	**5.45**	**3.52**	**0**	**8.97**

Notes :

kg - kilogram
kcal - kilocalorie
L - Liter
mg - milligram
g - gram
LOAEL - Lowest Observed Adverse Effect Level
NOAEL - No Observed Adverse Effect Level

APPENDIX B

FOOD CHAIN CALCULATIONS USING EXPOSURE PARAMETERS IDENTIFIED IN THE WILDLIFE SCENARIO BUILDER
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

COPEC	Mercury	
Indicator Species	American Woodcock	
Class	Bird	
Trophic Level	Insectivore	
Body Weight	kg	0.213
Free Metabolic Rate	kcal/day	96.65
Water Ingestion	L/day/day	0
Soil Ingestion	Proportion dry food ingestion	0.164
NOAEL	mg/kg/day	0.039
LOAEL	mg/kg/day	0.18

Diet	***Gross Energy***	***Assimilation Efficiency***	***Metabolizable Energy***	***Proportion of Diet***	***Weighted Average Metabolizable Energy***	***Itemized Daily Intake***	***Normalized Itemized Daily Intake***	C_{Insect}	C_{Plant}	C_{soil}	C_{Water}	IR_{Diet}	IR_{Soil}	IR_{Water}	IR_{Total}
	kcal/g DW	*Unitless*	*kcal/g*	*Unitless*	*kcal/g*	*kg/day*	*kg/kg/day*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/L*	*mg/kg/day*	*mg/kg/day*	*mg/kg/day*	*mg/kg/day*
Beetle Larvae	5.83	0.83	4.84	0.077	0.3713	0.0015	0.0072	0.37				0.0026			
Centipedes	5.3	0.83	4.4	0.166	0.7283	0.0036	0.0171	0.37				0.0063			
Earthworm	3.16	0.83	2.62	0.341	0.8944	0.0126	0.0591	0.37				0.0217			
Fly Larvae	3.93	0.83	3.26	0.027	0.0871	0.0008	0.0037	0.37				0.0014			
Grit	1.98	0.76	1.5	0.256	0.3841	0.0164	0.0772		0.057			0.0044			
Misc. Animal	5.72	0.83	4.75	0.022	0.1024	0.0004	0.0021	0.37				0.0008			
Seed	4.3	0.76	3.27	0.022	0.0733	0.0007	0.0031		0.057			0.0002			
Unknown Insect Parts	5.72	0.83	4.75	0.047	0.2211	0.0009	0.0044	0.37				0.0016			
Vegetable Matter	1.99	0.76	1.51	0.043	0.0651	0.0028	0.0129		0.057			0.0007			
Sums/Totals			**30.9**	**1.0**	**2.93**	**0.040**	**0.187**			**1.53**	**0**	**0.040**	**0.047**	**0**	**0.087**

Notes :

kg - kilogram
kcal - kilocalorie
L - Liter
mg - milligram
g - gram
LOAEL - Lowest Observed Adverse Effect Level
NOAEL - No Observed Adverse Effect Level

APPENDIX B

FOOD CHAIN CALCULATIONS USING EXPOSURE PARAMETERS IDENTIFIED IN THE WILDLIFE SCENARIO BUILDER
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

COPEC	Zinc	
Indicator Species	American Woodcock	
Class	Bird	
Trophic Level	Insectivore	
Body Weight	kg	0.213
Free Metabolic Rate	kcal/day	96.65
Water Ingestion	L/day/day	0
Soil Ingestion	Proportion dry food ingestion	0.164
NOAEL	mg/kg/day	17.2
LOAEL	mg/kg/day	172

Diet	***Gross Energy***	***Assimilation Efficiency***	***Metabolizable Energy***	***Proportion of Diet***	***Weighted Average Metabolizable Energy***	***Itemized Daily Intake***	***Normalized Itemized Daily Intake***	C_{Insect}	C_{Plant}	C_{soil}	C_{Water}	IR_{Diet}	IR_{Soil}	IR_{Water}	IR_{Total}
	kcal/g DW	*Unitless*	*kcal/g*	*Unitless*	*kcal/g*	*kg/day*	*kg/kg/day*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/L*	*mg/kg/day*	*mg/kg/day*	*mg/kg/day*	*mg/kg/day*
Beetle Larvae	5.83	0.83	4.84	0.077	0.3713	0.0015	0.0072	575				4.14			
Centipedes	5.3	0.83	4.4	0.166	0.7283	0.0036	0.0171	575				9.81			
Earthworm	3.16	0.83	2.62	0.341	0.8944	0.0126	0.0591	575				33.95			
Fly Larvae	3.93	0.83	3.26	0.027	0.0871	0.0008	0.0037	575				2.14			
Grit	1.98	0.76	1.5	0.256	0.3841	0.0164	0.0772		121			9.31			
Misc. Animal	5.72	0.83	4.75	0.022	0.1024	0.0004	0.0021	575				1.18			
Seed	4.3	0.76	3.27	0.022	0.0733	0.0007	0.0031		121			0.38			
Unknown Insect Parts	5.72	0.83	4.75	0.047	0.2211	0.0009	0.0044	575				2.56			
Vegetable Matter	1.99	0.76	1.51	0.043	0.0651	0.0028	0.0129		121			1.56			
Sums/Totals			**30.9**	**1.0**	**2.93**	**0.040**	**0.187**			**333**	**0**	**65.0**	**10.2**	**0**	**75.2**

Notes :

kg - kilogram
kcal - kilocalorie
L - Liter
mg - milligram
g - gram
LOAEL - Lowest Observed Adverse Effect Level
NOAEL - No Observed Adverse Effect Level

APPENDIX B

FOOD CHAIN CALCULATIONS USING EXPOSURE PARAMETERS IDENTIFIED IN THE WILDLIFE SCENARIO BUILDER
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

COPEC	High Molecular Weight PAHs	
Indicator Species	Short-Tailed Shrew	
Class	Mammal	
Trophic Level	Insectivore	
Body Weight	kg	0.015
Free Metabolic Rate	kcal/day	8.99
Water Ingestion	L/day/day	0
Soil Ingestion	Proportion dry food ingestion	0.03
NOAEL	mg/kg/day	11.8
LOAEL	mg/kg/day	39.6

Diet	***Gross Energy***	***Assimilation Efficiency***	***Metabolizable Energy***	***Proportion of Diet***	***Weighted Average Metabolizable Energy***	***Itemized Daily Intake***	***Normalized Itemized Daily Intake***	C_{Insect}	C_{Plant}	C_{soil}	C_{Water}	IR_{Diet}	IR_{Soil}	IR_{Water}	IR_{Total}
	kcal/g DW	*Unitless*	*kcal/g*	*Unitless*	*kcal/g*	*kg/day*	*kg/kg/day*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/L*	*mg/kg/day*	*mg/kg/day*	*mg/kg/day*	*mg/kg/day*
Chilopoda	5.3	0.90	4.75	0.02	0.0944	0.00004	0.0025	36.1				0.090			
Coleoptera	5.72	0.90	5.12	0.072	0.3664	0.00012	0.0083	36.1				0.301			
Beetle Larvae	5.83	0.90	5.22	0.011	0.0571	0.00002	0.0012	36.1				0.045			
Diplopoda	5.3	0.90	4.75	0.008	0.0378	0.00001	0.0010	36.1				0.036			
Dipterous Larve	3.93	0.90	3.52	0.007	0.0245	0.00002	0.0012	36.1				0.043			
Dipterous Pupae	3.93	0.90	3.52	0.003	0.0105	0.00001	0.0005	36.1				0.018			
Earthworm	3.16	0.90	2.83	0.177	0.5007	0.00056	0.0373	36.1				1.348			
Endogone	1.78	0.91	1.62	0.133	0.2158	0.00074	0.0493	36.1				1.781			
Grasshopper	5.3	0.90	4.75	0.001	0.0047	0.00000	0.0001	36.1				0.005			
Hymenogaster	1.78	0.91	1.62	0.002	0.0032	0.00001	0.0007	36.1				0.027			
Hymenoptera	5.42	0.90	4.86	0.005	0.0242	0.00001	0.0006	36.1				0.022			
Hymenopterous Larvae	1.12	0.90	1.00	0.004	0.0040	0.00004	0.0024	36.1				0.085			
Leptidophorus Larvae	3.93	0.90	3.52	0.051	0.1784	0.00013	0.0086	36.1				0.310			
Misc. Animal	5.3	0.90	4.75	0.061	0.2880	0.00011	0.0076	36.1				0.275			
Misc. Vegetation	4.3	0.91	3.91	0.042	0.1632	0.00010	0.0064		2.2			0.014			
Odonota	5.7	0.90	5.10	0.003	0.0152	0.00001	0.0003	36.1				0.013			
Slugs and Snails	2.02	0.90	1.81	0.389	0.7035	0.00192	0.1281	36.1				4.631			
Sowbugs	2.96	0.90	2.65	0.009	0.0237	0.00003	0.0020	36.1				0.073			
Spider	4.83	0.90	4.32	0.001	0.0043	0.00000	0.0001	36.1				0.005			
Unidentified Material	4.3	0.91	3.91	0.003	0.0117	0.00001	0.0005	36.1				0.017			
Sums/Totals			**63.66**	**1.0**	**2.27**	**0.0002**	**0.259**			**13.9**	**0**	**8.75**	**0.108**	**0**	**8.85**

Notes :
PAHs - Polycyclic Aromatic Hydrocarbons
kg - kilogram
kcal - kilocalorie
L - Liter
mg - milligram
g - gram
LOAEL - Lowest Observed Adverse Effect Level
NOAEL - No Observed Adverse Effect Level

Appendix C

Revised Evaluation of Part 201 GSIC and DWC Exceedances in Groundwater Memorandum
CRA, December 20, 2013

CONESTOGA-ROVERS & ASSOCIATES

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MEMORANDUM

TO:	Sheila Desai, USEPA	REF. NO.:	056394-07-0003
FROM:	Greg Carli/Jeni Quigley/jq/15/Pwl.	DATE:	April 19, 2013
		REVISION 1:	December 20, 2013
CC:	Paul Bucholtz, MDEQ Jeffrey Lifka, Tetra Tech Ray Mastrolonardo, Tetra Tech Richard Gay, Weyerhaeuser Jodie Dembowske, CRA		
RE:	**Revised Evaluation of Part 201 GSIC and DWC Exceedances in Groundwater Former Plainwell, Inc. Mill Property Plainwell, Michigan**		

1.0 Introduction

Conestoga-Rovers & Associates (CRA) was retained by Weyerhaeuser Company (Weyerhaeuser) to conduct Remedial Investigation/Feasibility Study (RI/FS) activities at the former Plainwell, Inc. Mill Property located at 200 Allegan Street in Plainwell, Michigan (Site). The RI/FS activities are being conducted in accordance with the terms of the consent decree for the Design and Implementation of Certain Response Actions at Operable Unit No. 4 and the Plainwell, Inc. Mill Property Operable Unit No. 7 of the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site (Consent Decree), which became effective February 22, 2005. The RI Report was approved by United States Environmental Protection Agency (USEPA) on February 26, 2013. FS activities are currently on-going.

Representatives from Weyerhaeuser, USEPA and the Michigan Department of Environmental Quality (MDEQ) met on March 20, 2013 to discuss preliminary Remedial Action Objectives (RAOs) and conceptual remedial alternatives for the Site. During this discussion, questions were raised relative to groundwater flow direction at the Site and the preliminary RAOs designed to address constituents present in groundwater exceeding Michigan Act 451, Part 201 Generic Cleanup Criteria (Part 201 Criteria). The purpose of this memorandum is to:

i.) Evaluate groundwater conditions along the Kalamazoo River relative to Part 201 Groundwater Surface Water Interface Criteria (GSIC).

ii.) Evaluate groundwater conditions across the Site in the downgradient direction relative to Part 201 Drinking Water Criteria (DWC) and the National Primary and Secondary Drinking Water Standard Maximum Contaminant Levels (MCLs).

iii.) Evaluate groundwater conditions on the Site and at the property boundaries relative to concentrations along the eastern upgradient portion of the Site, which for the purposes of this evaluation were considered "background".

2.0 Site Hydrogeology

Based on information collected to date and presented in the RI Report, the uppermost, unconfined, water table aquifer present on the east side of the Site appears to be recharged by the surface water within the Mill Race as

a result of the dam located east of the Site. On the Site-wide scale, groundwater flow within this water table aquifer is predominantly to the west from the Mill Race (flowing sub-parallel to the flow of the Kalamazoo River) across the Site. Review of the groundwater-surface water interaction indicates that the Kalamazoo River acts as a semi-hydraulic barrier at this scale (i.e., the river elevation is higher than the adjacent groundwater elevation along most of the frontage along the Site). The hydraulic gradient along the northwestern portion of the Site, at times of higher groundwater elevations (i.e., February 2010 and March 2012), appears to be discharging to the Kalamazoo River, while the majority of the Site maintains the semi-hydraulic barrier with the surface water primarily at greater elevations than the adjacent groundwater. The actual groundwater-surface water interaction is a more complicated dynamic system at a local scale, with interactions to some degree where surface water and the groundwater are likely mixing. This can be inferred near monitoring well MW-7, where it appears there may be local groundwater discharge to the Kalamazoo River on an intermittent basis. Information regarding groundwater flow is presented in the RI and FS Reports. Groundwater contour maps from the RI Report for January 2010, February 2010, March 2012, August 2012, and October 2012 are included in Attachment A for reference. Additionally, groundwater contour maps for April, July, and September 2013 were prepared subsequent to the approval of the RI Report and are included in Attachment A for reference.

3.0 Evaluation of the GSI Pathway

Based on groundwater and surface water elevation measurements, and groundwater flow direction information obtained during and subsequent to the RI, groundwater along the Site boundaries with the Mill Race and Kalamazoo River does not appear to have a large discharge area to surface water except potentially in the northwestern corner of the Site (i.e., MW-12) and near MW-7 during periods of higher groundwater elevations (measurements obtained February 2010, March 2012 and July 2013). Due to the apparent more complicated local conditions and the scale of the monitoring well network along the Kalamazoo River frontage, the GSI pathway appears to be relevant in the northern and northwestern portions of the Site. As such, monitoring wells MW-5, MW-7, MW-8, MW-10, MW-11, MW-12S/D, and MW-15, would be considered to represent compliance points for the GSI pathway.

Review of analytical data in direct comparison to Part 201 GSIC for samples collected from the 11 monitoring wells located along the Kalamazoo River indicates Part 201 GSIC exceedances are present for mercury and arsenic. Mercury concentrations exceed GSIC throughout the Site including along the river at MW-3, MW-4S, MW-5, and MW-7 in the northeastern portion of the Site and at MW-12S and MW-12D in the northwestern portion of the Site, respectively as presented in the RI Report. The maximum detected concentration of mercury in groundwater occurred in August 2012 (0.0173 µg/L) at MW-3 on the northeastern corner of the Site. This concentration is well below the MDEQ screening level for mercury of 0.2 µg/L for venting to groundwater presented in MDEQ's Policy and Procedure Number: 09 014 "Evaluating Mercury in Groundwater Plumes Relative to the Groundwater/Surface Water Interface (GSI) Pursuant to Part 201," dated June 20, 2012. According to the Policy and Procedure, concentrations of mercury below 0.2 µg/L are considered to be a *de minimis* condition pursuant to Section 20120e of Part 201 and activity beyond evaluation will not be required. Therefore, no further evaluation of mercury in groundwater relative to the GSI pathway is required.

Arsenic exceeds Part 201 Criteria GSIC at MW-7 and MW-12S. Figure 1 presents Part 201 exceedances in groundwater.

4.0 Evaluation of the Drinking Water Pathway and Potential for off-Site Migration of Contaminants

Review of analytical data in direct comparison to Part 201 DWC, and USEPA Primary and Secondary MCLs for samples collected from monitoring wells Site-wide indicated Part 201 DWC and/or MCL exceedances are present for

manganese, arsenic, lead, iron, and aluminum. However, since the Part 201 DWC is the more conservative of the two applicable comparison criteria as discussed below, the Part 201 DWC was utilized for the drinking water pathway evaluation.

Part 201 DWC and Primary MCLs have been developed for arsenic and lead. Part 201 DWC and Secondary MCLs have been developed for manganese, iron and aluminum. The Part 201 DWCs for these parameters are either equal to or more stringent than their respective Primary or Secondary MCLs, as follows:

- The Part 201 DWC for arsenic (0.01 mg/L) is the same value as the Primary MCL for arsenic
- The Part 201 DWC for lead (0.004 mg/L) is more stringent than the Primary MCL for lead
- The Part 201 DWC for iron (0.3 mg/L) and manganese (0.05 mg/L) are the same values as their respective Secondary MCLs
- The Part 201 DWC for aluminum (0.05 mg/L) is more stringent than the Secondary MCL.

Lead and aluminum only exceeded Part 201 DWC at MW-3 and arsenic only exceeded Part 201 DWC at MW-7 and MW-12S. Therefore, the extent of impacts to groundwater associated with these metals is limited in areal extent and within the Site boundaries.

Iron exceeds Part 201 DWC only in the wells present along the Kalamazoo River. The Part 201 DWC for iron (0.3 mg/L) is based on an aesthetic drinking water value. Comparison of the iron concentrations in groundwater to the Residential and Non-Residential Health-Based Drinking Water Values of 2.0 mg/l and 5.6 mg/L presented in the "Footnotes for Part 201 Criteria and Part 213 Risk-Based Screening Levels" dated September 28, 2012 identifies that iron exceeds the Residential and/or Non-Residential Health-Based Drinking Water Values at MW-7, MW-11, MW-12S, and MW-13. No distinct trend relative to iron concentrations is evident in the direction of groundwater flow and the highest concentrations are present in the downgradient wells located in the northwestern part of the Site.

Manganese concentrations also vary considerably across the Site with no distinct trend evident in the direction of groundwater flow. Manganese exceeds Part 201 DWC in all of the Site monitoring wells except for MW-6, MW-12D, MW-18, MW-21S, and MW-21D. The Part 201 DWC for manganese (0.05 mg/L) is also based on an aesthetic drinking water value. Comparison to the Residential and Non-Residential Health-Based Drinking Water Values of 0.86 mg/L and 2.5 mg/L identifies that manganese exceeds the Residential and/or Non-Residential Health-Based Drinking Water Values at MW-3, MW-5, MW-7, MW-9, MW-10, MW-12S, and MW-23. Figure 1 presents Part 201 exceedances in groundwater. Table 1 presents a summary of exceedances with comparison to the Part 201 Cleanup Criteria.

Relative to the potential for off-Site migration of metals exceeding Part 201 DWC, manganese is present above Part 201 Residential and Non-Residential Health-Based Drinking Water Value in monitoring wells MW-9 and MW-12S located nearest to the western Site boundary. Additionally, iron exceeds Part 201 Residential and Non-Residential Health-Based Drinking Water Value at MW-12S and arsenic exceeds the Part 201 DWC at MW-12S. No constituents were detected above Part 201 DWC or Residential and Non-Residential Health-Based Drinking Water Value in wells MW-21S and MW-21D located upgradient of the residential neighborhood adjacent to the east, west and south of the Site. Based on the variability of manganese concentrations across the Site, a pattern of manganese migration in groundwater at the Site is not apparent and concentrations in off-Site groundwater are also anticipated to be variable. At times where groundwater elevations are lower and groundwater in the northwestern corner of the Site flow to the west-southwest rather than discharge to the river, arsenic, manganese and iron detected in MW-12S may be migrating off-Site.

Based on the information available to date, adequate data have been collected to show the extent of impacts to groundwater above Part 201 DWC and/or Residential and Non-Residential Health-Based Drinking Water Values is

limited. Additionally, concentrations of metals in the monitoring wells nearest the western Site boundary are consistent with concentrations detected across the Site, with the exception of arsenic.

Monitoring wells that would currently be considered as point of compliance to further assess the potential for potential for future migration of metals in groundwater relative to the Part 201 DWC are MW-21S/D, MW-9, MW-20, MW-14, MW-13, and MW-12S/D. Revisions to all current points of compliance discussed above may be considered and proposed in the future based on chemical concentrations and physical migration pathways.

5.0 Evaluation of the "Background" Groundwater Concentrations at the Site

In an effort to differentiate between concentrations of the aforementioned metals in groundwater that are the result of historical operations conducted at the Site and "background" concentrations of the aforementioned metals present consistent with local groundwater conditions, an evaluation of potential background levels present in monitoring wells located along the Mill Race, which are considered to be upgradient of historical operations at the Site based on groundwater flow direction, was conducted. Groundwater background concentrations for the Site were calculated using analytical data from groundwater samples collected from upgradient monitoring wells MW-3, MW-16, and MW-17 at the Site. This evaluation was completed utilizing methodologies presented in the MDEQ document *Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria* (MDEQ, 2002, referred to as the "S^3TM") and the USEPA's ProUCL (Version 5.0) software. The contaminants of concern (COCs) identified for the development of background concentrations were aluminum, arsenic, iron, lead, and manganese. The COCs were selected for further evaluation based on exceedances of Part 201 DWC upon direct comparison to the aforementioned criteria. Background concentrations were calculated utilizing U.S. EPA's ProUCL 5.0 software and selected based on the background data distributions for each COC.

The table below identifies the upper tolerance limit (UTL) calculated by ProUCL 5.0 for each compound and the calculation method utilized to determine the UTL to be used as the background concentration. Additionally, a comparison to the results of background concentration calculations utilizing the S^3TM method of using the mean plus three standard deviations (SD) is presented. Both methods of background concentration calculation were completed in an effort to select the most conservative approach to the development of background concentrations. It is understood that the S^3TM method requires a minimum of nine sample points and that the number of sample points that were utilized for this evaluation were less than nine; however, two separate methods were utilized for evaluation of the data set for comparison purposes and conservatism. Given the conservative approach, the results presented herein are representative for the purposes of this evaluation. A table displaying the background data input and the ProUCL output are included in Attachment B.

Table 1 Calculated Background Concentrations in Groundwater			
Compound	***Recommended UTL (mg/L)***	***ProUCL Calculation Method***	***S^3TM Method Mean + 3 SDs***
Aluminum	0.0934	Approximate gamma distribution (WH) 95% UTL with 95% coverage with KM estimates	0.0691
Arsenic	0.0112	Approximate normal distribution 95% UTL with 95% coverage with KM estimates	0.0107
Iron	1.614	Normal distribution 95% UTL with 95% coverage with KM estimates	1.5369
Lead	0.0059	Non-parametric 33.7% UTL with 95% coverage	0.0079
Manganese	1.704	Normal distribution 95% UTL with 95% coverage	1.6325
Notes: UTL - Upper Tolerance Limit SD – Standard Deviation WH - Wilson Hilferty KM - Kaplan Meier			

The calculated background concentrations were subtracted from the analytical result concentrations for samples collected at all monitoring wells on the Site. In the case that the initial analytical result concentration was less than the calculated background concentration, the background concentration was substituted for the initial analytical result. The resulting values were compared to Part 201 DWC and GSIC, as presented in Table 1 and as discussed below.

After subtraction of the "background" values calculated utilizing the 95 percent UTLs and the S^3TM method from the groundwater concentrations, no Part 201 GSIC exceedances were identified. Whereas comparison of the subtracted data (i.e., concentrations after subtracting the 95 percent UTLs and the S^3TM method) to the Part 201 DWC resulted in generally the same exceedances of the Residential and Non-Residential Health-Based Drinking Water Values, with the same variability observed relative to the exceedances.

After subtraction of the "background" values calculated utilizing the 95 percent UTLs and the S^3TM method from the groundwater concentrations, no Part 201 DWC exceedances for aluminum, arsenic and lead were identified.

Iron exceeds Part 201 DWC only in the wells present along the Kalamazoo River, including MW-7, MW-11, MW-12S, and MW-13. The Part 201 DWC for iron (0.3 mg/L) is based on an aesthetic drinking water value. Comparison of the iron concentrations in groundwater to the Residential and Non-Residential Health-Based Drinking Water Values of 2.0 mg/l and 5.6 mg/L identifies that iron exceeds the Residential and/or Non-Residential Health-Based Drinking Water Values at MW-12S and MW-13. No distinct trend relative to iron concentrations is evident in the direction of groundwater flow and the highest concentrations are present in the downgradient wells located in the northwestern part of the Site.

Manganese concentrations also vary considerably across the Site with no distinct trend evident in the direction of groundwater flow. Manganese exceeds Part 201 DWC in MW-12S and MW-7. The Part 201 DWC for manganese (0.05 mg/L) is also based on an aesthetic drinking water value. Comparison to the Residential and Non-Residential Health-Based Drinking Water Values of 0.86 mg/L and 2.5 mg/L identifies that manganese exceeds the Residential and/or Non-Residential Health-Based Drinking Water Values at MW-7 and MW-12S. Figure 1 presents Part 201 exceedances in groundwater.

Relative to the potential for off-Site migration of metals exceeding Part 201 DWC, iron and manganese are present above Part 201 Residential and/or Non-Residential Health-Based Drinking Water Values in monitoring wells MW-12S located nearest to the western Site boundary. No constituents were detected above Part 201 DWC or Residential

and Non-Residential Health-Based Drinking Water Value in wells MW-9, MW-21S and MW-21D located upgradient of the residential neighborhood adjacent to the east, west and south of the Site. Based on the variability of iron and manganese concentrations across the Site, a pattern of iron and manganese migration in groundwater at the Site is not apparent and concentrations in off-Site groundwater are also anticipated to be variable. At times where groundwater elevations are lower and groundwater in the northwestern corner of the Site flow to the west-southwest rather than discharge to the river, iron and manganese detected in MW-12S may be migrating off-Site.

Based on the information available to date, adequate data have been collected to show the extent of impacts to groundwater above Part 201 DWC and/or Residential and Non-Residential Health-Based Drinking Water Values is limited. Additionally, concentrations of metals in the monitoring wells nearest the western Site boundary are consistent with concentrations detected across the Site.

As previously discussed, monitoring wells that would currently be considered as point of compliance to further assess the potential for future migration of metals in groundwater relative to the Part 201 DWC are MW-21S/D, MW-9, MW-20, MW-14, MW-13, and MW-12S/D. Revisions to all current points of compliance discussed above may be considered and proposed in the future based on chemical concentrations and physical migration pathways.

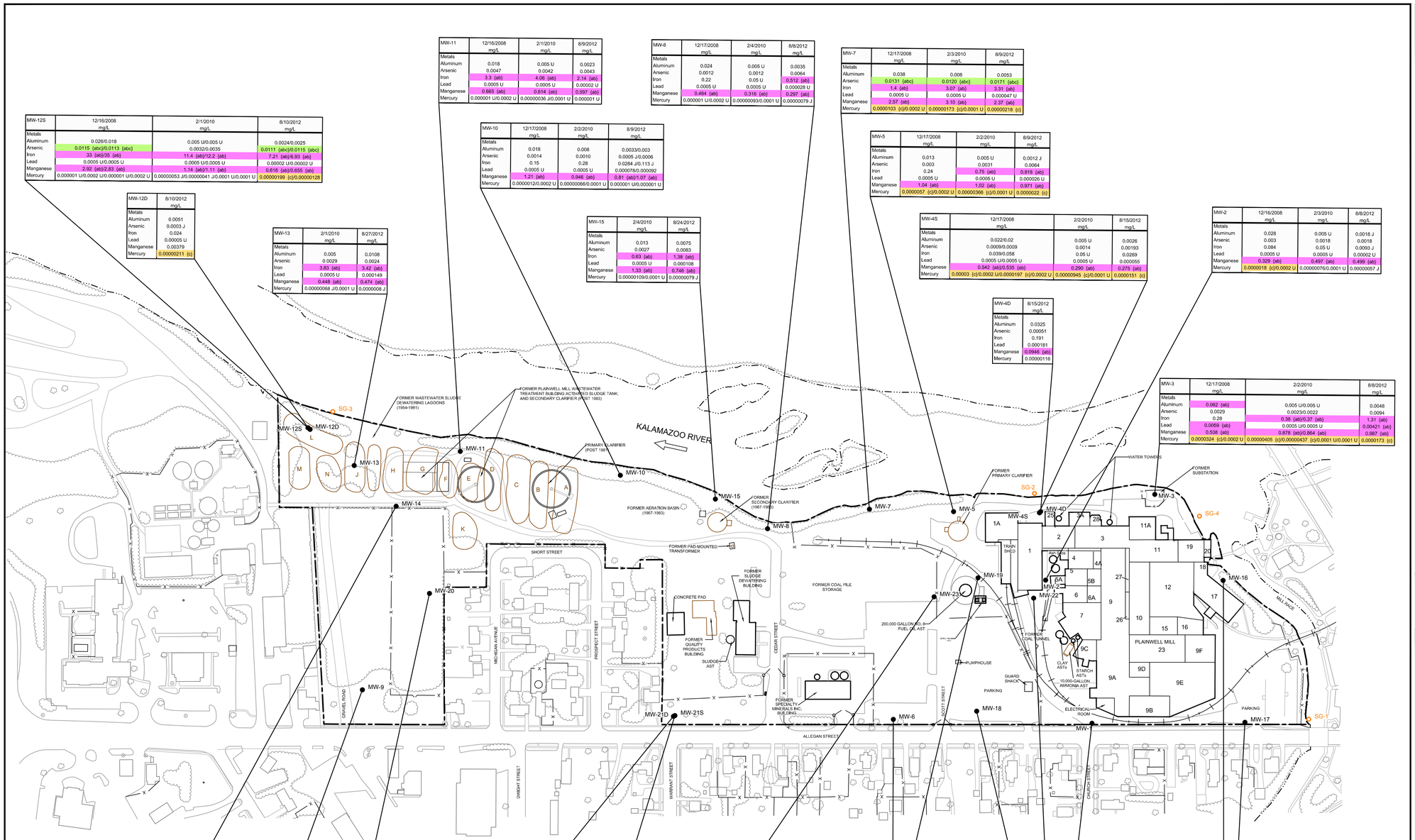
Figure 2a presents Part 201 exceedances in groundwater samples after taking into account the calculated UTLs presented above as the background value. Figure 2b presents Part 201 exceedances in groundwater samples after utilizing the mean plus three SDs as the background value. Table 1 presents a summary of exceedances with comparison to the Part 201 Cleanup Criteria after accounting for the calculated UTLs and the mean plus three SDs.

6.0 Summary and Conclusions

Direct comparison of Site groundwater data to the Part 201 GSIC indicates exceedances of the Part 201 GSIC for arsenic at MW-12S/D and MW-7. Comparison of Site groundwater data to the Part 201 GSIC after subtraction of Site upgradient "background" concentrations does not identify any exceedances.

Direct comparison of Site groundwater data to the Part 201 DWC indicates exceedances for arsenic and lead. Direct comparison of Site groundwater data to the Residential and Non-Residential Health-Based Drinking Water Values indicates exceedances for manganese, iron, and aluminum. Comparison of Site groundwater data to the Part 201 DWC after subtraction of Site upgradient "background" concentrations does not identify any exceedances. Comparison of Site groundwater data to the Residential and Non-Residential Health-Based Drinking Water Values after subtraction of Site upgradient "background" concentrations indicates exceedances for manganese in MW-7 and MW-12S, and exceedances for iron were identified in MW-12S and MW-13. MW-12S and MW-13 are currently considered as point of compliance to further assess the potential for future migration of metals in groundwater.

FIGURES



MW-12S	12/16/2008 mg/L	2/1/2010 mg/L	8/10/2012 mg/L
Metals			
Aluminum	0.026/0.018	0.005 U/0.005 U	0.0024/0.0025
Arsenic	0.0115 (abc)/0.0113 (abc)	0.0032/0.0035	0.0111 (abc)/0.0115 (abc)
Iron	33 (ab)/35 (ab)	11.4 (ab)/12.2 (ab)	7.21 (ab)/6.93 (ab)
Lead	0.0005 U/0.0005 U	0.0005 U/0.0005 U	0.00002 U/0.00002 U
Manganese	2.92 (ab)/2.83 (ab)	1.14 (ab)/1.11 (ab)	0.616 (ab)/0.655 (ab)
Mercury	0.000001 U/0.0002 U/0.000001 U/0.0002 U	0.00000053 J/0.00000041 J/0.0001 U/0.0001 U	0.00000199 (c)/0.00000128

MW-12D	8/10/2012 mg/L
Metals	
Aluminum	0.0051
Arsenic	0.0003 J
Iron	0.024
Lead	0.00005 U
Manganese	0.00379
Mercury	0.00000211 (c)

MW-13	2/1/2010 mg/L	8/27/2012 mg/L
Metals		
Aluminum	0.005	0.0108
Arsenic	0.0029	0.0024
Iron	3.83 (ab)	3.42 (ab)
Lead	0.0005 U	0.000149
Manganese	0.448 (ab)	0.474 (ab)
Mercury	0.00000068 J/0.0001 U	0.0000008 J

MW-11	12/16/2008 mg/L	2/1/2010 mg/L	8/9/2012 mg/L
Metals			
Aluminum	0.018	0.005 U	0.0023
Arsenic	0.0047	0.0042	0.0043
Iron	3.3 (ab)	4.06 (ab)	2.14 (ab)
Lead	0.0005 U	0.0005 U	0.00002 U
Manganese	0.665 (ab)	0.614 (ab)	0.597 (ab)
Mercury	0.000001 U/0.0002 U	0.00000036 J/0.0001 U	0.000001 U

MW-10	12/17/2008 mg/L	2/2/2010 mg/L	8/9/2012 mg/L
Metals			
Aluminum	0.018	0.008	0.0033/0.003
Arsenic	0.0014	0.0010	0.0005 J/0.0006
Iron	0.15	0.28	0.0284 J/0.113 J
Lead	0.0005 U	0.0005 U	0.000078/0.000092
Manganese	1.21 (ab)	0.946 (ab)	0.81 (ab)/1.07 (ab)
Mercury	0.0000012/0.0002 U	0.00000066/0.0001 U	0.000001 U/0.000001 U

MW-15	2/4/2010 mg/L	8/24/2012 mg/L
Metals		
Aluminum	0.013	0.0075
Arsenic	0.0027	0.0063
Iron	0.63 (ab)	1.38 (ab)
Lead	0.0005 U	0.000108
Manganese	1.33 (ab)	0.746 (ab)
Mercury	0.0000109/0.0001 U	0.00000079 J

MW-8	12/17/2008 mg/L	2/4/2010 mg/L	8/8/2012 mg/L
Metals			
Aluminum	0.024	0.005 U	0.0035
Arsenic	0.0012	0.0012	0.0064
Iron	0.22	0.05 U	0.512 (ab)
Lead	0.0005 U	0.0005 U	0.000028 U
Manganese	0.484 (ab)	0.316 (ab)	0.297 (ab)
Mercury	0.000001 U/0.0002 U	0.00000093/0.0001 U	0.00000079 J

MW-7	12/17/2008 mg/L	2/3/2010 mg/L	8/9/2012 mg/L
Metals			
Aluminum	0.038	0.008	0.0053
Arsenic	0.0131 (abc)	0.0120 (abc)	0.0171 (abc)
Iron	1.4 (ab)	3.07 (ab)	3.31 (ab)
Lead	0.0005 U	0.0005 U	0.000047 U
Manganese	2.57 (ab)	3.10 (ab)	2.37 (ab)
Mercury	0.0000103 (c)/0.0002 U	0.00000173 (c)/0.0001 U	0.0000218 (c)

MW-5	12/17/2008 mg/L	2/2/2010 mg/L	8/9/2012 mg/L
Metals			
Aluminum	0.013	0.005 U	0.0012 J
Arsenic	0.003	0.0031	0.0064
Iron	0.24	0.75 (ab)	0.818 (ab)
Lead	0.0005 U	0.0005 U	0.000026 U
Manganese	1.04 (ab)	1.02 (ab)	0.971 (ab)
Mercury	0.0000057 (c)/0.0002 U	0.0000366 (c)/0.0001 U	0.0000022 (c)

MW-4S	12/17/2008 mg/L	2/2/2010 mg/L	8/15/2012 mg/L
Metals			
Aluminum	0.022/0.02	0.005 U	0.0026
Arsenic	0.0009/0.0009	0.0014	0.00193
Iron	0.039/0.058	0.05 U	0.0269
Lead	0.0005 U/0.0005 U	0.0005 U	0.000055
Manganese	0.542 (ab)/0.535 (ab)	0.290 (ab)	0.275 (ab)
Mercury	0.00003 (c)/0.0002 U/0.0000197 (c)/0.0002 U	0.00000945 (c)/0.0001 U	0.0000151 (c)

MW-4D	8/15/2012 mg/L
Metals	
Aluminum	0.0325
Arsenic	0.00051
Iron	0.191
Lead	0.000181
Manganese	0.0946 (ab)
Mercury	0.00000116

MW-2	12/16/2008 mg/L	2/3/2010 mg/L	8/8/2012 mg/L
Metals			
Aluminum	0.028	0.005 U	0.0018 J
Arsenic	0.003	0.0018	0.0018
Iron	0.084	0.05 U	0.0093 J
Lead	0.0005 U	0.0005 U	0.00002 U
Manganese	0.329 (ab)	0.497 (ab)	0.499 (ab)
Mercury	0.0000018 (c)/0.0002 U	0.0000076/0.0001 U	0.00000057 J

MW-3	12/17/2008 mg/L	2/2/2010 mg/L	8/8/2012 mg/L
Metals			
Aluminum	0.062 (ab)	0.005 U/0.005 U	0.0048
Arsenic	0.0029	0.0023/0.0022	0.0094
Iron	0.28	0.38 (ab)/0.37 (ab)	1.31 (ab)
Lead	0.0059 (ab)	0.0005 U/0.0005 U	0.00421 (ab)
Manganese	0.538 (ab)	0.878 (ab)/0.864 (ab)	0.987 (ab)
Mercury	0.0000324 (c)/0.0002 U	0.00000405 (c)/0.00000437 (c)/0.0001 U/0.0001 U	0.0000173 (c)

MW-14	2/1/2010 mg/L	8/8/2012 mg/L	8/27/2012 mg/L
Metals			
Aluminum	0.005 U	0.0051	0.0026 U
Arsenic	0.0018	0.0008	0.001
Iron	0.40 (ab)	0.426 (ab)	0.49 (ab)
Lead	0.0005 U	0.000023 U	0.000034 U
Manganese	0.823 (ab)	0.433 (ab)	0.534 (ab)
Mercury	0.00000056 J/0.0001 U	0.000001 U/0.000001 U	-

MW-9	12/16/2008 mg/L	2/2/2010 mg/L	8/10/2012 mg/L
Metals			
Aluminum	0.019	0.022	0.0053
Arsenic	0.0005	0.0005 U	0.0003 J
Iron	0.043	0.08	0.0359
Lead	0.0005 U	0.0005 U	0.000029 U
Manganese	0.318 (ab)	0.591 (ab)	1.04 (ab)
Mercury	0.0000011/0.0002 U	0.00000106/0.0001 U	0.00000115

MW-20	8/14/2012 mg/L
Metals	
Aluminum	0.0094
Arsenic	0.001
Iron	0.129
Lead	0.000041
Manganese	0.759 (ab)
Mercury	0.00000459 (c)

MW-21D	8/15/2012 mg/L
Metals	
Aluminum	0.0104
Arsenic	0.00025 J
Iron	0.0645
Lead	0.000077
Manganese	0.0344
Mercury	0.00000099

MW-21S	8/15/2012 mg/L
Metals	
Aluminum	0.0077
Arsenic	0.00023 J
Iron	0.0214
Lead	0.000031
Manganese	0.00192
Mercury	0.00000151 (c)

MW-23	8/15/2012 mg/L
Metals	
Aluminum	0.0159
Arsenic	0.00054
Iron	0.11
Lead	0.000077
Manganese	0.844 (ab)
Mercury	0.00000166 (c)

MW-6	12/16/2008 mg/L	2/3/2010 mg/L	8/9/2012 mg/L
Metals			
Aluminum	0.031	0.023/0.024	0.0012 J
Arsenic	0.0005	0.0005 U/0.0005 U	0.0004 J
Iron	0.1	0.08/0.11	0.0034 J
Lead	0.0005 U	0.0005 U/0.0005 U	0.00002 U
Manganese	0.005	0.005 U/0.005 U	0.000701
Mercury	0.000001 U/0.0002 U	0.00000057/0.00000066/0.0001 U/0.0001 U	0.00000161 (c)

MW-18	2/3/2010 mg/L	8/9/2012 mg/L
Metals		
Aluminum	0.005 U	0.0077
Arsenic	0.0005 U	0.0003 J
Iron	0.05 U	0.0326
Lead	0.0005 U	0.000046 U
Manganese	0.005 U	0.00217
Mercury	0.00000039/0.0001 U	0.00000066 J

MW-19	2/3/2010 mg/L	8/9/2012 mg/L
Metals		
Aluminum	0.007	0.0015 J
Arsenic	0.0005	0.0004 J
Iron	0.05	0.0094 J
Lead	0.0005 U	0.00002 U
Manganese	0.535 (ab)	0.146 (ab)
Mercury	0.0000078/0.0001 U	0.0000011 U

MW-22	8/8/2012 mg/L	8/15/2012 mg/L
Metals		
Aluminum	0.0042	0.0052
Arsenic	0.0016	0.00169
Iron	0.0162 J	0.0307
Lead	0.000086	0.000024
Manganese	0.0759 (ab)	0.0838 (ab)
Mercury	0.00000102	-

MW-16	2/4/2010 mg/L	8/9/2012 mg/L
Metals		
Aluminum	0.006	0.0016 J
Arsenic	0.0005 U	0.0005 J
Iron	0.05 U	0.0534
Lead	0.0005 U	0.000039 U
Manganese	0.123 (ab)	0.184 (ab)
Mercury	0.0000284 (c)/0.0001 U	0.00000065 J

MW-1	12/16/2008 mg/L	2/4/2010 mg/L
Metals		
Aluminum	0.023	0.005 U
Arsenic	0.0009	0.0010
Iron	0.055	0.05 U
Lead	0.0005 U	0.0005 U
Manganese	0.005	0.005 U
Mercury	0.000001 U/0.0002 U	0.00000055/0.0001 U

MW-17	2/4/2010 mg/L	8/24/2012 mg/L
Metals		
Aluminum	0.005 U	0.007
Arsenic	0.0005 U	0.0008
Iron	0.05 U	0.0216
Lead	0.0005 U	0.000045 U
Manganese	0.040	0.28 (ab)
Mercury	0.0000073/0.0001 U	0.00000058 J

Nº	Revision	Date	Initial

0 75 150ft

LEGEND

- PROPERTY BOUNDARY
- TREE LINE
- FENCE LINE
- RAILROAD
- SURFACE WATER
- FORMER FEATURE
- MW-16 MONITORING WELL LOCATION - PHASE I & II RI
- MW-1 ABANDONED MONITORING WELL LOCATION
- SG-3 STAFF GAUGES
- EXCEEDANCE OF PART 201 RESIDENTIAL AND NON-RESIDENTIAL DRINKING WATER AND GROUNDWATER SURFACE WATER INTERFACE CRITERIA
- EXCEEDANCE OF PART 201 GROUNDWATER SURFACE WATER INTERFACE CRITERIA
- EXCEEDANCE OF PART 201 RESIDENTIAL AND NON-RESIDENTIAL DRINKING WATER CRITERIA

NOTE:
LOW-LEVEL MERCURY SAMPLES WERE COLLECTED BETWEEN AUGUST 7th, and 9th, 2012

	Residential Drinking Water a	*Non-Residential Drinking Water* b	*Groundwater Surface Water Interface* c
Metals (mg/L)			
Aluminum	0.05	0.05	NA
Arsenic	0.01	0.01	0.01
Iron	0.3	0.3	NA
Lead	0.004	0.004	0.050
Manganese	0.05	0.05	5.3
Mercury	0.002	0.002	0.0000013

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

FORMER PLAINWELL, INC. MILL PROPERTY PLAINWELL, MICHIGAN

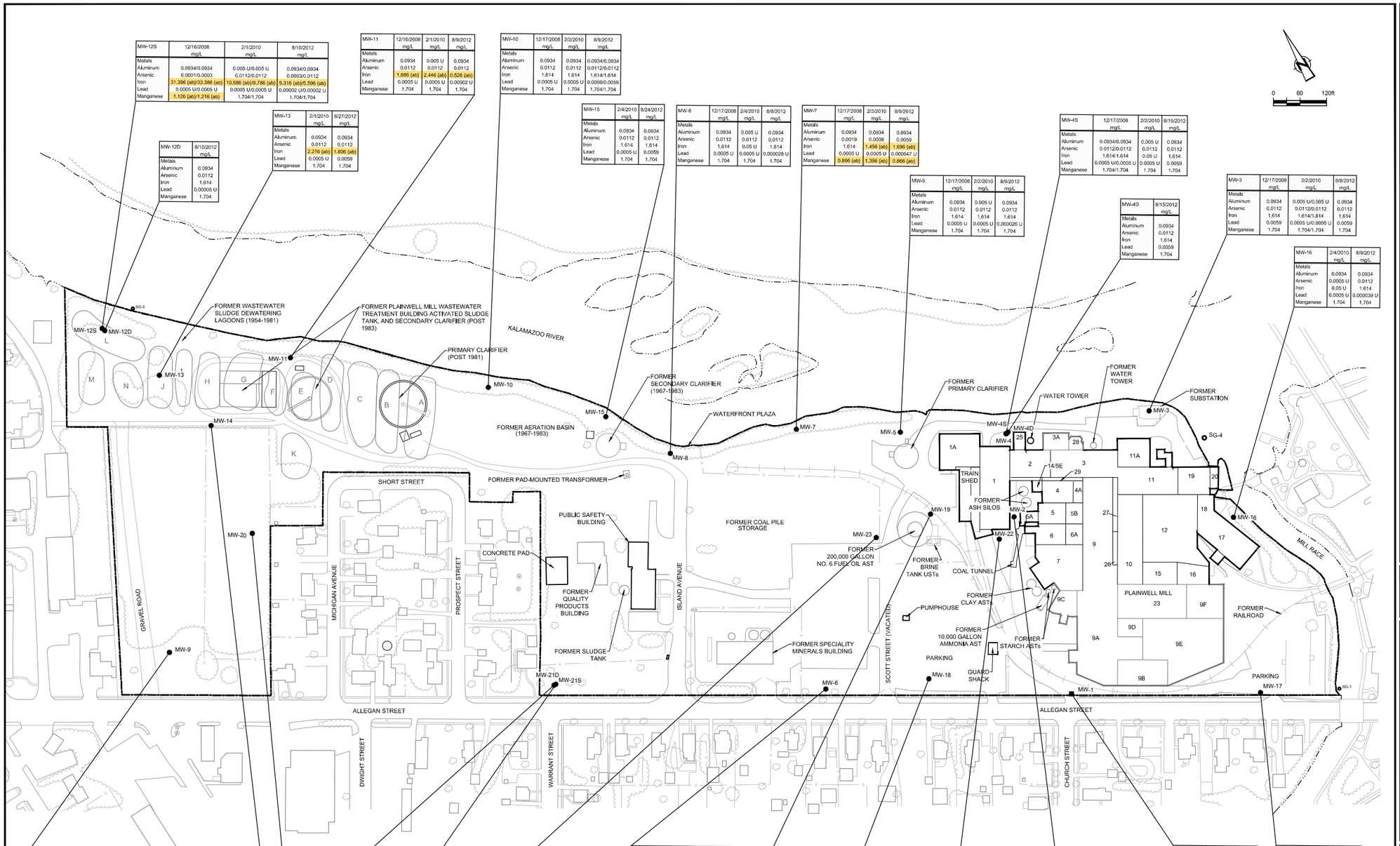
PART 201 EXCEEDANCES IN GROUNDWATER - MONITORING WELLS

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
J.Q.	L.C.	APRIL 2013	
Scale: 1:150	Project Nº: 056394-07	Report Nº: MEMO015	Drawing Nº: figure 1

056394-07(MEMO015)GN-DE002 APR 19/2013



MW-12S	12/16/2008 mg/L	2/1/2010 mg/L	8/10/2012 mg/L
Metals			
Aluminum	0.0934/0.0934	0.005 U/0.005 U	0.0934/0.0934
Arsenic	0.00010/0.0003	0.0112/0.0112	0.0003/0.0112
Iron	31.386 (ab)/33.386 (ab)	10.586 (ab)/9.786 (ab)	5.316 (ab)/5.526 (ab)
Lead	0.0005 U/0.0005 U	0.0005 U/0.0005 U	0.00002 U/0.00002 U
Manganese	1.126 (ab)/1.216 (ab)	1.704/1.704	1.704/1.704

MW-12D	8/10/2012 mg/L
Metals	
Aluminum	0.0934
Arsenic	0.0112
Iron	1.614
Lead	0.00005 U
Manganese	1.704

MW-13	2/1/2010 mg/L	8/27/2012 mg/L
Metals		
Aluminum	0.0934	0.0934
Arsenic	0.0112	0.0112
Iron	2.216 (ab)	1.806 (ab)
Lead	0.0005 U	0.0059
Manganese	1.704	1.704

MW-11	12/16/2008 mg/L	2/1/2010 mg/L	8/9/2012 mg/L
Metals			
Aluminum	0.0934	0.005 U	0.0934
Arsenic	0.0112	0.0112	0.0112
Iron	1.686 (ab)	2.446 (ab)	0.526 (ab)
Lead	0.0005 U	0.0005 U	0.00002 U
Manganese	1.704	1.704	1.704

MW-10	12/17/2008 mg/L	2/2/2010 mg/L	8/9/2012 mg/L
Metals			
Aluminum	0.0934	0.0934	0.0934/0.0934
Arsenic	0.0112	0.0112	0.0112/0.0112
Iron	1.614	1.614	1.614/1.614
Lead	0.0005 U	0.0005 U	0.0059/0.0059
Manganese	1.704	1.704	1.704/1.704

MW-15	2/4/2010 mg/L	8/24/2012 mg/L
Metals		
Aluminum	0.0934	0.0934
Arsenic	0.0112	0.0112
Iron	1.614	1.614
Lead	0.0005 U	0.0059
Manganese	1.704	1.704

MW-8	12/17/2008 mg/L	2/4/2010 mg/L	8/8/2012 mg/L
Metals			
Aluminum	0.0934	0.005 U	0.0934
Arsenic	0.0112	0.0112	0.0112
Iron	1.614	0.05 U	1.614
Lead	0.0005 U	0.0005 U	0.000028 U
Manganese	1.704	1.704	1.704

MW-7	12/17/2008 mg/L	2/3/2010 mg/L	8/9/2012 mg/L
Metals			
Aluminum	0.0934	0.0934	0.0934
Arsenic	0.0019	0.0008	0.0059
Iron	1.614	1.456 (ab)	1.696 (ab)
Lead	0.0005 U	0.0005 U	0.000047 U
Manganese	0.866 (ab)	1.396 (ab)	0.868 (ab)

MW-5	12/17/2008 mg/L	2/2/2010 mg/L	8/9/2012 mg/L
Metals			
Aluminum	0.0934	0.005 U	0.0934
Arsenic	0.0112	0.0112	0.0112
Iron	1.614	1.614	1.614
Lead	0.0005 U	0.0005 U	0.000026 U
Manganese	1.704	1.704	1.704

MW-4S	12/17/2008 mg/L	2/2/2010 mg/L	8/15/2012 mg/L
Metals			
Aluminum	0.0934/0.0934	0.005 U	0.0934
Arsenic	0.0112/0.0112	0.0112	0.0112
Iron	1.614/1.614	0.05 U	1.614
Lead	0.0005 U/0.0005 U	0.0005 U	0.0059
Manganese	1.704/1.704	1.704	1.704

MW-4D	8/15/2012 mg/L
Metals	
Aluminum	0.0934
Arsenic	0.0112
Iron	1.614
Lead	0.0059
Manganese	1.704

MW-3	12/17/2008 mg/L	2/2/2010 mg/L	8/8/2012 mg/L
Metals			
Aluminum	0.0934	0.005 U/0.005 U	0.0934
Arsenic	0.0112	0.0112/0.0112	0.0112
Iron	1.614	1.614/1.614	1.614
Lead	0.0059	0.0005 U/0.0005 U	0.0059
Manganese	1.704	1.704/1.704	1.704

MW-16	2/4/2010 mg/L	8/9/2012 mg/L
Metals		
Aluminum	0.0934	0.0934
Arsenic	0.0005 U	0.0112
Iron	0.05 U	1.614
Lead	0.0005 U	0.000039 U
Manganese	1.704	1.704

MW-9	12/16/2008 mg/L	2/2/2010 mg/L	8/10/2012 mg/L
Metals			
Aluminum	0.0934	0.0934	0.0934
Arsenic	0.0112	0.0005 U	0.0112
Iron	1.614	1.614	1.614
Lead	0.0005 U	0.0005 U	0.000029 U
Manganese	1.704	1.704	1.704

MW-14	2/1/2010 mg/L	8/8/2012 mg/L	8/27/2012 mg/L
Metals			
Aluminum	0.005 U	0.0934	0.0026 U
Arsenic	0.0112	0.0112	0.0112
Iron	1.614	1.614	1.614
Lead	0.0005 U	0.000023 U	0.000034 U
Manganese	1.704	1.704	1.704

MW-20	8/14/2012 mg/L
Metals	
Aluminum	0.0934
Arsenic	0.0112
Iron	1.614
Lead	0.0059
Manganese	1.704

MW-21D	8/15/2012 mg/L
Metals	
Aluminum	0.0934
Arsenic	0.0112
Iron	1.614
Lead	0.0059
Manganese	1.704

MW-21S	8/15/2012 mg/L
Metals	
Aluminum	0.0934
Arsenic	0.0112
Iron	1.614
Lead	0.0059
Manganese	1.704

MW-23	8/15/2012 mg/L
Metals	
Aluminum	0.0934
Arsenic	0.0112
Iron	1.614
Lead	0.0059
Manganese	1.704

MW-6	12/16/2008 mg/L	2/3/2010 mg/L	8/9/2012 mg/L
Metals			
Aluminum	0.0934	0.0934/0.0934	0.0934
Arsenic	0.0112	0.0005 U/0.0005 U	0.0112
Iron	1.614	1.614/1.614	1.614
Lead	0.0005 U	0.0005 U/0.0005 U	0.00002 U
Manganese	1.704	0.005 U/0.005 U	1.704

MW-19	2/3/2010 mg/L	8/9/2012 mg/L
Metals		
Aluminum	0.0934	0.0934
Arsenic	0.0112	0.0112
Iron	1.614	1.614
Lead	0.0005 U	0.000002 U
Manganese	1.704	1.704

MW-18	2/3/2010 mg/L	8/9/2012 mg/L
Metals		
Aluminum	0.005 U	0.0934
Arsenic	0.0005 U	0.0112
Iron	0.05 U	1.614
Lead	0.0005 U	0.000046 U
Manganese	0.005 U	1.704

MW-22	8/8/2012 mg/L	8/15/2012 mg/L
Metals		
Aluminum	0.0934	0.0934
Arsenic	0.0112	0.0112
Iron	1.614	1.614
Lead	0.0059	0.0059
Manganese	1.704	1.704

MW-2	12/16/2008 mg/L	2/3/2010 mg/L	8/8/2012 mg/L
Metals			
Aluminum	0.0934	0.005 U	0.0934
Arsenic	0.0112	0.0112	0.0112
Iron	1.614	0.05 U	1.614
Lead	0.0005 U	0.0005 U	0.00002 U
Manganese	1.704	1.704	1.704

MW-1	12/16/2008 mg/L	2/4/2010 mg/L
Metals		
Aluminum	0.0934	0.005 U
Arsenic	0.0112	0.0112
Iron	1.614	0.05 U
Lead	0.0005 U	0.0005 U
Manganese	1.704	0.005 U

MW-17	2/4/2010 mg/L	8/24/2012 mg/L
Metals		
Aluminum	0.005 U	0.0934
Arsenic	0.0005 U	0.0112
Iron	0.05 U	1.614
Lead	0.0005 U	0.000045 U
Manganese	1.704	1.704

Nº	Revision	Date	Initial

LEGEND

- PROPERTY BOUNDARY
- FORMER FEATURE
- TREE LINE
- FENCE LINE
- RAILROAD
- SURFACE WATER
- MW-5 MONITORING WELL LOCATION - PHASE I, II, AND ADDITIONAL RI
- SG-2 STAFF GAUGE - PHASE I RI
- ABANDONED MONITORING WELL LOCATION
- EXCEEDANCE OF PART 201 RESIDENTIAL AND/OR NON-RESIDENTIAL CLEANUP CRITERIA

NOTE:

1. CALCULATED BACKGROUND CONCENTRATON WERE SUBSTITUTED IF HIGHER THAN THE ORIGINAL ANALYTICAL RESULT.

	Calculated Background Concentration	*Residential Drinking Water*	*Non-Residential Drinking Water*	*Groundwater Surface Water Interface*
		a	b	c
Metals (mg/L)				
Aluminum	0.0934	0.05	0.05	NA
Arsenic	0.0112	0.01	0.01	0.01
Iron	1.614	0.3	0.3	NA
Lead	0.0059	0.004	0.004	0.050
Manganese	1.704	0.05	0.05	5.3

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

PART 201 EXCEEDANCES IN GROUNDWATER

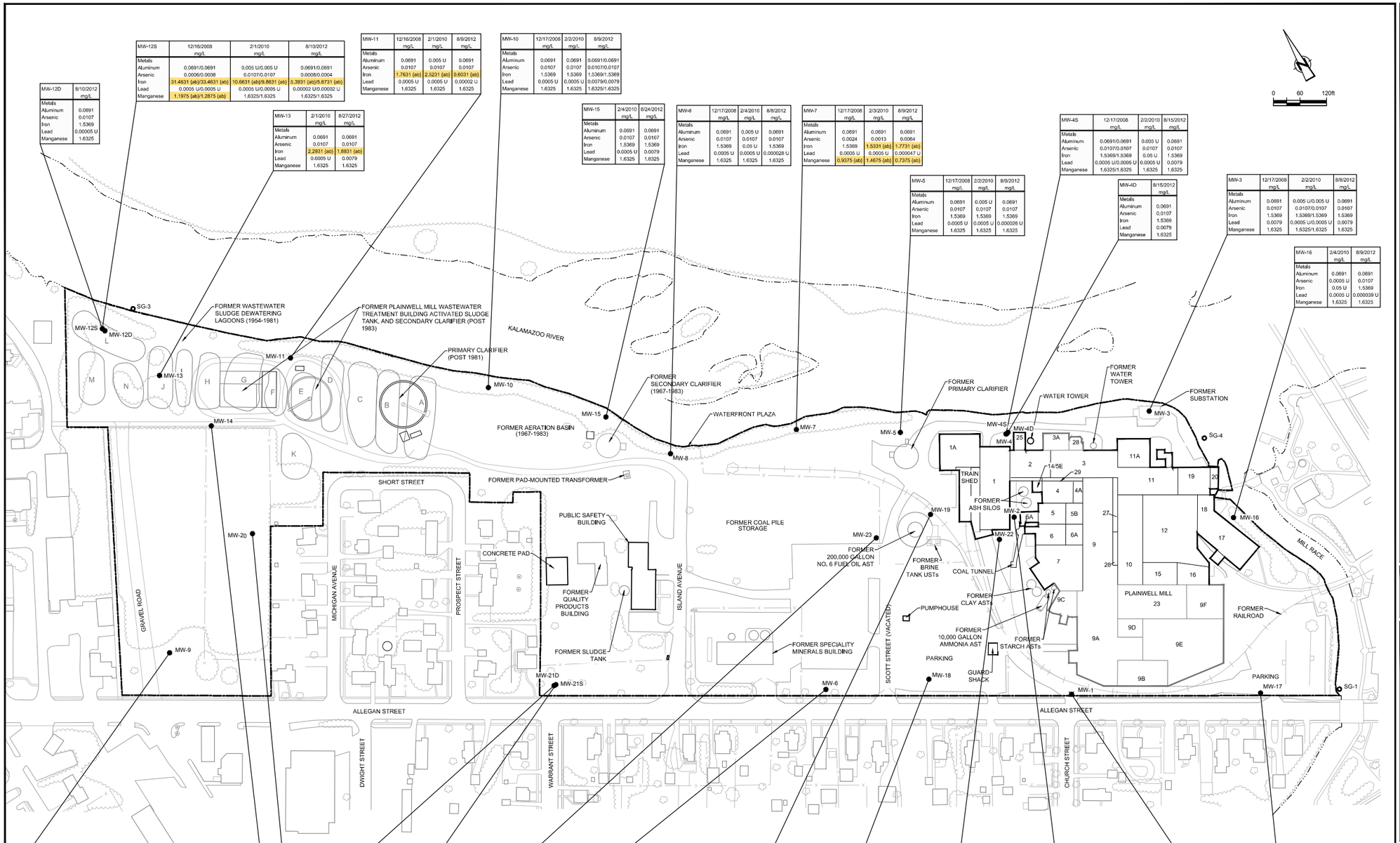
95% UTL BACKGROUND CONCENTRATIONS - MONITORING WELLS

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:
J.Q.	G.C.	DECEMBER 2013
Scale: 1:120	Project Nº: 056394-07	Report Nº: MEMO015
		Drawing Nº: figure 2a

056394-07(MEMO015)GN-DE004 REV 1 DEC 18/2013



MW-12S	12/16/2008 mg/L	2/1/2010 mg/L	8/10/2012 mg/L
Metals			
Aluminum	0.0691/0.0691	0.005 U/0.005 U	0.0691/0.0691
Arsenic	0.0006/0.0008	0.0107/0.0107	0.0008/0.0004
Iron	31.4631 (ab)/33.4631 (ab)	10.6631 (ab)/9.8631 (ab)	5.3931 (ab)/5.6731 (ab)
Lead	0.0005 U/0.0005 U	0.0005 U/0.0005 U	0.00002 U/0.00002 U
Manganese	1.1975 (ab)/1.2875 (ab)	1.6325/1.6325	1.6325/1.6325

MW-11	12/16/2008 mg/L	2/1/2010 mg/L	8/9/2012 mg/L
Metals			
Aluminum	0.0691	0.005 U	0.0691
Arsenic	0.0107	0.0107	0.0107
Iron	1.7631 (ab)	2.5211 (ab)	0.6031 (ab)
Lead	0.0005 U	0.0005 U	0.00002 U
Manganese	1.6325	1.6325	1.6325

MW-10	12/17/2008 mg/L	2/2/2010 mg/L	8/9/2012 mg/L
Metals			
Aluminum	0.0691	0.0691	0.0691/0.0691
Arsenic	0.0107	0.0107	0.0107/0.0107
Iron	1.5369	1.5369	1.5369/1.5369
Lead	0.0005 U	0.0005 U	0.0079/0.0079
Manganese	1.6325	1.6325	1.6325/1.6325

MW-12D	8/10/2012 mg/L
Metals	
Aluminum	0.0691
Arsenic	0.0107
Iron	1.5369
Lead	0.00005 U
Manganese	1.6325

MW-13	2/1/2010 mg/L	8/27/2012 mg/L
Metals		
Aluminum	0.0691	0.0691
Arsenic	0.0107	0.0107
Iron	2.2931 (ab)	1.8831 (ab)
Lead	0.0005 U	0.0079
Manganese	1.6325	1.6325

MW-15	2/4/2010 mg/L	8/24/2012 mg/L
Metals		
Aluminum	0.0691	0.0691
Arsenic	0.0107	0.0107
Iron	1.5369	1.5369
Lead	0.0005 U	0.0079
Manganese	1.6325	1.6325

MW-8	12/17/2008 mg/L	2/4/2010 mg/L	8/8/2012 mg/L
Metals			
Aluminum	0.0691	0.005 U	0.0691
Arsenic	0.0107	0.0107	0.0107
Iron	1.5369	0.05 U	1.5369
Lead	0.0005 U	0.0005 U	0.000028 U
Manganese	1.6325	1.6325	1.6325

MW-7	12/17/2008 mg/L	2/3/2010 mg/L	8/9/2012 mg/L
Metals			
Aluminum	0.0691	0.0691	0.0691
Arsenic	0.0024	0.0013	0.0064
Iron	1.5369	1.5331 (ab)	1.7731 (ab)
Lead	0.0005 U	0.0005 U	0.000047 U
Manganese	0.9375 (ab)	1.4675 (ab)	0.7375 (ab)

MW-5	12/17/2008 mg/L	2/2/2010 mg/L	8/9/2012 mg/L
Metals			
Aluminum	0.0691	0.005 U	0.0691
Arsenic	0.0107	0.0107	0.0107
Iron	1.5369	1.5369	1.5369
Lead	0.0005 U	0.0005 U	0.000026 U
Manganese	1.6325	1.6325	1.6325

MW-4S	12/17/2008 mg/L	2/2/2010 mg/L	8/15/2012 mg/L
Metals			
Aluminum	0.0691/0.0691	0.005 U	0.0691
Arsenic	0.0107/0.0107	0.0107	0.0107
Iron	1.5369/1.5369	0.05 U	1.5369
Lead	0.0005 U/0.0005 U	0.0005 U	0.0079
Manganese	1.6325/1.6325	1.6325	1.6325

MW-4D	8/15/2012 mg/L
Metals	
Aluminum	0.0691
Arsenic	0.0107
Iron	1.5369
Lead	0.0079
Manganese	1.6325

MW-3	12/17/2008 mg/L	2/2/2010 mg/L	8/8/2012 mg/L
Metals			
Aluminum	0.0691	0.005 U/0.005 U	0.0691
Arsenic	0.0107	0.0107/0.0107	0.0107
Iron	1.5369	1.5369/1.5369	1.5369
Lead	0.0079	0.0005 U/0.0005 U	0.0079
Manganese	1.6325	1.6325/1.6325	1.6325

MW-16	2/4/2010 mg/L	8/9/2012 mg/L
Metals		
Aluminum	0.0691	0.0691
Arsenic	0.0005 U	0.0107
Iron	0.05 U	1.5369
Lead	0.0005 U	0.000039 U
Manganese	1.6325	1.6325

MW-9	12/16/2008 mg/L	2/2/2010 mg/L	8/10/2012 mg/L
Metals			
Aluminum	0.0691	0.0691	0.0691
Arsenic	0.0107	0.0005 U	0.0107
Iron	1.5369	1.5369	1.5369
Lead	0.0005 U	0.0005 U	0.000029 U
Manganese	1.6325	1.6325	1.6325

MW-14	2/1/2010 mg/L	8/8/2012 mg/L	8/27/2012 mg/L
Metals			
Aluminum	0.005 U	0.0691	0.0026 U
Arsenic	0.0107	0.0107	0.0107
Iron	1.5369	1.5369	1.5369
Lead	0.0005 U	0.000023 U	0.000034 U
Manganese	1.6325	1.6325	1.6325

MW-20	8/14/2012 mg/L
Metals	
Aluminum	0.0691
Arsenic	0.0107
Iron	1.5369
Lead	0.0079
Manganese	1.6325

MW-21D	8/15/2012 mg/L
Metals	
Aluminum	0.0691
Arsenic	0.0107
Iron	1.5369
Lead	0.0079
Manganese	1.6325

MW-21S	8/15/2012 mg/L
Metals	
Aluminum	0.0691
Arsenic	0.0107
Iron	1.5369
Lead	0.0079
Manganese	1.6325

MW-23	8/15/2012 mg/L
Metals	
Aluminum	0.0691
Arsenic	0.0107
Iron	1.5369
Lead	0.0079
Manganese	1.6325

MW-6	12/16/2008 mg/L	2/3/2010 mg/L	8/9/2012 mg/L
Metals			
Aluminum	0.0691	0.0691/0.0691	0.0691
Arsenic	0.0107	0.0005 U/0.0005 U	0.0107
Iron	1.5369	1.5369/1.5369	1.5369
Lead	0.0005 U	0.0005 U/0.0005 U	0.00002 U
Manganese	1.6325	0.005 U/0.005 U	1.6325

MW-19	2/3/2010 mg/L	8/9/2012 mg/L
Metals		
Aluminum	0.0691	0.0691
Arsenic	0.0107	0.0107
Iron	1.5369	1.5369
Lead	0.0005 U	0.00002 U
Manganese	1.6325	1.6325

MW-18	2/3/2010 mg/L	8/9/2012 mg/L
Metals		
Aluminum	0.005 U	0.0691
Arsenic	0.0005 U	0.0107
Iron	0.05 U	1.5369
Lead	0.0005 U	0.000046 U
Manganese	0.005 U	1.6325

MW-22	8/8/2012 mg/L	8/15/2012 mg/L
Metals		
Aluminum	0.0691	0.0691
Arsenic	0.0107	0.0107
Iron	1.5369	1.5369
Lead	0.0079	0.0079
Manganese	1.6325	1.6325

MW-2	12/16/2008 mg/L	2/3/2010 mg/L	8/8/2012 mg/L
Metals			
Aluminum	0.0691	0.005 U	0.0691
Arsenic	0.0107	0.0107	0.0107
Iron	1.5369	0.05 U	1.5369
Lead	0.0005 U	0.0005 U	0.00002 U
Manganese	1.6325	1.6325	1.6325

MW-1	12/16/2008 mg/L	2/4/2010 mg/L
Metals		
Aluminum	0.0691	0.005 U
Arsenic	0.0107	0.0107
Iron	1.5369	0.05 U
Lead	0.0005 U	0.0005 U
Manganese	1.6325	0.005 U

MW-17	2/4/2010 mg/L	8/24/2012 mg/L
Metals		
Aluminum	0.005 U	0.0691
Arsenic	0.0005 U	0.0107
Iron	0.05 U	1.5369
Lead	0.0005 U	0.000045 U
Manganese	1.6325	1.6325

Nº	Revision	Date	Initial

LEGEND

- PROPERTY BOUNDARY
- FORMER FEATURE
- TREE LINE
- FENCE LINE
- RAILROAD
- SURFACE WATER
- MW-6 MONITORING WELL LOCATION - PHASE I, II, AND ADDITIONAL RI
- SG-2 STAFF GAUGE - PHASE I RI
- ABANDONED MONITORING WELL LOCATION
- EXCEEDANCE OF PART 201 RESIDENTIAL AND/OR NON-RESIDENTIAL CLEANUP CRITERIA

NOTE:

1. CALCULATED BACKGROUND CONCENTRATON WERE SUBSTITUTED IF HIGHER THAN THE ORIGINAL ANALYTICAL RESULT.

	Calculated Background Concentration	*Residential Drinking Water* a	*Non-Residential Drinking Water* b	*Groundwater Surface Water Interface* c
Metals (mg/L)				
Aluminum	0.0691	0.05	0.05	NA
Arsenic	0.0107	0.01	0.01	0.01
Iron	1.5369	0.3	0.3	NA
Lead	0.0079	0.004	0.004	0.050
Manganese	1.6325	0.05	0.05	5.3

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

FORMER PLAINWELL, INC. MILL PROPERTY PLAINWELL, MICHIGAN

PART 201 EXCEEDANCES IN GROUNDWATER

S3TM BACKGROUND CONCENTRATIONS - MONITORING WELLS

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:
J.Q.	G.C	DECEMBER 2013
Scale: 1:120	Project Nº: 056394-07	Report Nº: MEMO015
		Drawing Nº: figure 2b

056394-07(MEMO015)GN-DE005 REV 1 DEC 18/2013

TABLES

TABLE 1

SUMMARY OF EXCEEDANCES IN GROUNDWATER SAMPLES
PART 201 DWC AND GSIC AND FEDERAL MCLs
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

			Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria [1]					*National Primary and Drinking Water Regulations* [3]				
Sample Location	*Sample Date*	*Detected Parameter*	*Residential Drinking Water Criteria a*	*Non-Residential Drinking Water Criteria b*	*Groundwater Surface Water Interface Criteria c*	*Residential Health-Based Drinking Water Value d*	*Non-Residential Health-Based Drinking Water Value e*	*Primary Maximum Contaminant Level f*	*Secondary Maximum Contaminant Level g*	*Detected Concentration (mg/L)*	*Detected Concentration Minus S[3] TM Background Concentration (mg/L)*	*Detected Concentration Minus 95% UTL Background Concentration (mg/L)*
MW-2	12/16/08	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.329**[abg]	1.6325[5]	1.704[5]
MW-2	02/03/10	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.497**[abg]	1.6325[5]	1.704[5]
MW-2	08/08/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.499**[abg]	1.6325[5]	1.704[5]
MW-3	12/17/08	Aluminum	0.05	0.05	NC	0.3	4.1	NC	0.05 [4]	**0.062**[abdg]	0.0691[5]	0.0934[5]
MW-3	12/17/08	Lead	0.004	0.004	0.050 [2]	NC	NC	0.015	NC	**0.0059**[ab]	0.0079 [5]	0.0059[5]
MW-3	12/17/08	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.538**[abg]	1.6325[5]	1.704[5]
MW-3	02/02/10	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**0.38**[abg]	1.5369[5]	1.614[5]
MW-3	02/02/10	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.878**[abdg]	1.6325[5]	1.704[5]
MW-3	02/02/10	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**0.37**[abg]	1.5369[5]	1.614[5]
MW-3	02/02/10	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.864**[abdg]	1.6325[5]	1.704[5]
MW-3	08/08/12	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**1.31**[abg]	1.5369[5]	1.614[5]
MW-3	08/08/12	Lead	0.004	0.004	0.050 [2]	NC	NC	0.015	NC	**0.00421**[ab]	0.0079 [5]	0.0059[5]
MW-3	08/08/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.987**[abdg]	1.6325[5]	1.704[5]
MW-4D	08/15/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.0946**[abg]	1.6325[5]	1.704[5]
MW-4S	12/17/08	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.542**[abg]	1.6325[5]	1.704[5]
MW-4S	12/17/08	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.535**[abg]	1.6325[5]	1.704[5]
MW-4S	02/02/10	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.29**[abg]	1.6325[5]	1.704[5]
MW-4S	08/15/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.275**[abg]	1.6325[5]	1.704[5]
MW-5	12/17/08	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**1.04**[abdg]	1.6325[5]	1.704[5]
MW-5	02/02/10	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**0.75**[abg]	1.5369[5]	1.614[5]
MW-5	02/02/10	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**1.02**[abdg]	1.6325[5]	1.704[5]
MW-5	08/09/12	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**0.818**[abg]	1.5369[5]	1.614[5]
MW-5	08/09/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.971**[abdg]	1.6325[5]	1.704[5]
MW-7	12/17/08	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**1.4**[abg]	1.5369[5]	1.614[5]
MW-7	12/17/08	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**2.57**[abdeg]	**0.9375**[abdeg]	**0.866**[abdg]
MW-7	12/17/08	Arsenic	0.01	0.01	0.01	NC	NC	0.010	NC	**0.0131**[abcf]	0.0024	0.0019
MW-7	02/03/10	Arsenic	0.01	0.01	0.01	NC	NC	0.010	NC	**0.012**[abcf]	0.0013	0.0008
MW-7	02/03/10	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**3.07**[abdg]	**1.5331**[abg]	**1.456**[abg]
MW-7	02/03/10	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**3.1**[abdeg]	**1.4675**[abdeg]	**1.396**[abdg]
MW-7	08/09/12	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**3.31**[abdg]	**1.7731**[abg]	**1.696**[abg]
MW-7	08/09/12	Arsenic	0.01	0.01	0.01	NC	NC	0.010	NC	**0.0171**[abcf]	0.0064	0.0059
MW-7	08/09/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**2.37**[abdg]	**0.7375**[abg]	**0.666**[abg]
MW-8	12/17/08	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.484**[abg]	1.6325[5]	1.704[5]
MW-8	02/04/10	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.316**[abg]	1.6325[5]	1.704[5]
MW-8	08/08/12	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**0.512**[abg]	1.5369[5]	1.614[5]
MW-8	08/08/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.297**[abg]	1.6325[5]	1.704[5]
MW-9	12/16/08	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.318**[abg]	1.6325[5]	1.704[5]

TABLE 1

SUMMARY OF EXCEEDANCES IN GROUNDWATER SAMPLES
PART 201 DWC AND GSIC AND FEDERAL MCLs
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

			Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria (1)					*National Primary and Drinking Water Regulations* (3)				
Sample Location	*Sample Date*	*Detected Parameter*	*Residential Drinking Water Criteria* *a*	*Non-Residential Drinking Water Criteria* *b*	*Groundwater Surface Water Interface Criteria* *c*	*Residential Health-Based Drinking Water Value* *d*	*Non-Residential Health-Based Drinking Water Value* *e*	*Primary Maximum Contaminant Level* *f*	*Secondary Maximum Contaminant Level* *g*	*Detected Concentration (mg/L)*	*Detected Concentration Minus S 3 TM Background Concentration (mg/L)*	*Detected Concentration Minus 95% UTL Background Concentration (mg/L)*
MW-9	02/02/10	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**0.591**[abg]	1.6325(5)	1.704(5)
MW-9	08/10/12	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**1.04**[abdg]	1.6325(5)	1.704(5)
MW-10	12/17/08	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**1.21**[abdg]	1.6325(5)	1.704(5)
MW-10	02/02/10	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**0.946**[abdg]	1.6325(5)	1.704(5)
MW-10	08/09/12	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**0.81**[abg]	1.6325(5)	1.704(5)
MW-10	08/09/12	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**1.07**[abdg]	1.6325(5)	1.704(5)
MW-11	12/16/08	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**3.3**[abdg]	**1.7631**[abg]	**1.686**[abg]
MW-11	12/16/08	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**0.665**[abg]	1.6325(5)	1.704(5)
MW-11	02/01/10	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**4.06**[abdg]	**2.5231**[abdg]	**2.446**[abdeg]
MW-11	02/01/10	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**0.614**[abg]	1.6325(5)	1.704(5)
MW-11	08/09/12	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**2.14**[abdg]	**0.6031**[abg]	**0.526**[abg]
MW-11	08/09/12	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**0.597**[abg]	1.6325(5)	1.704(5)
MW-12S	12/16/08	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**33**[abdeg]	**31.4631**[abdeg]	**31.386**[abdeg]
MW-12S	12/16/08	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**2.92**[abdeg]	**1.2875**[abdf]	**1.216**[abdg]
MW-12S	12/16/08	Arsenic	0.01	0.01	0.01	NC	NC	0.010	NC	**0.0115**[abcf]	0.0006	0.0003
MW-12S	12/16/08	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**35**[abdeg]	**33.4631**[abdeg]	**33.386**[abdeg]
MW-12S	12/16/08	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**2.83**[abdeg]	**1.1975**[abdg]	**1.126**[abdg]
MW-12S	12/16/08	Arsenic	0.01	0.01	0.01	NC	NC	0.010	NC	**0.0113**[abcf]	0.0008	1E-04
MW-12S	02/01/10	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**11.4**[abdeg]	**9.8631**[abdeg]	**10.586** [abdeg]
MW-12S	02/01/10	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**1.14**[abdg]	1.6325(5)	1.704(5)
MW-12S	02/01/10	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**12.2**[abdeg]	**10.6631**[abdeg]	**9.786**[abdeg]
MW-12S	02/01/10	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**1.11**[abdg]	1.6325(5)	1.704(5)
MW-12S	08/10/12	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**7.21**[abdeg]	**5.6731**[abdeg]	**5.316** [abdg]
MW-12S	08/10/12	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**0.618**[abg]	1.6325(5)	1.704(5)
MW-12S	08/10/12	Arsenic	0.01	0.01	0.01	NC	NC	0.010	NC	**0.0111**[abcf]	0.0004	0.0112
MW-12S	08/10/12	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**6.93**[abdeg]	**5.3931**[abdg]	**5.596**[abdg]
MW-12S	08/10/12	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**0.655**[abg]	1.6325(5)	1.704(5)
MW-12S	08/10/12	Arsenic	0.01	0.01	0.01	NC	NC	0.010	NC	**0.0115**[abcf]	0.0008	0.0003
MW-13	02/01/10	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**3.83**[abdg]	**2.2931**[abdg]	**2.216**[abdg]
MW-13	02/01/10	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**0.448**[abg]	1.6325(5)	1.704(5)
MW-13	08/27/12	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**3.42**[abdg]	**1.8831**[abg]	**1.806**[abg]
MW-13	08/27/12	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**0.474**[abg]	1.6325(5)	1.704(5)
MW-14	02/01/10	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**0.4**[abg]	1.5369(5)	1.614(5)
MW-14	02/01/10	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**0.823**[abg]	1.6325(5)	1.704(5)
MW-14	08/08/12	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**0.426**[abg]	1.5369(5)	1.614(5)
MW-14	08/08/12	Manganese	0.05	0.05	5.3 (2)	0.86	2.5	NC	0.05	**0.433**[abg]	1.6325(5)	1.704(5)
MW-14	08/27/12	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**0.48**[abg]	1.5369(5)	1.614(5)

TABLE 1

SUMMARY OF EXCEEDANCES IN GROUNDWATER SAMPLES
PART 201 DWC AND GSIC AND FEDERAL MCLs
FORMER PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

			Michigan Act 451, Part 201 Cleanup Criteria and Part 213 Risk-based Screening Levels: Residential and Non-Residential Generic Cleanup Criteria [1]					*National Primary and Drinking Water Regulations* [3]				
Sample Location	*Sample Date*	*Detected Parameter*	*Residential Drinking Water Criteria* *a*	*Non-Residential Drinking Water Criteria* *b*	*Groundwater Surface Water Interface Criteria* *c*	*Residential Health-Based Drinking Water Value* *d*	*Non-Residential Health-Based Drinking Water Value* *e*	*Primary Maximum Contaminant Level* *f*	*Secondary Maximum Contaminant Level* *g*	*Detected Concentration (mg/L)*	*Detected Concentration Minus S 3 TM Background Concentration (mg/L)*	*Detected Concentration Minus 95% UTL Background Concentration (mg/L)*
MW-14	08/27/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.534**[abg]	1.6325[5]	1.704[5]
MW-15	02/04/10	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**0.63**[abg]	1.5369[5]	1.614[5]
MW-15	02/04/10	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**1.33**[abdg]	1.6325[5]	1.704[5]
MW-15	08/24/12	Iron	0.3	0.3	NC	2	5.6	NC	0.3	**1.38**[abg]	1.5369[5]	1.614[5]
MW-15	08/24/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.746**[abg]	1.6325[5]	1.704[5]
MW-16	02/04/10	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.123**[abg]	1.6325[5]	1.704[5]
MW-16	08/09/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.184**[abg]	1.6325[5]	1.704[5]
MW-17	08/24/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.25**[abg]	1.6325[5]	1.704[5]
MW-19	02/03/10	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.535**[abg]	1.6325[5]	1.704[5]
MW-19	08/09/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.146**[abg]	1.6325[5]	1.704[5]
MW-20	08/14/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.759**[abg]	1.6325[5]	1.704[5]
MW-22	08/08/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.0759**[abg]	1.6325[5]	1.704[5]
MW-22	08/15/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.0838**[abg]	1.6325[5]	1.704[5]
MW-23	08/15/12	Manganese	0.05	0.05	5.3 [2]	0.86	2.5	NC	0.05	**0.944**[abdg]	1.6325[5]	1.704[5]

Notes:

[1] Part 201 Cleanup criteria, updated 9/28/2012 pursuant to 1994 PA 451 as amended.

[2] Carbonate Hardness of 307 mg/L and pH of 7.97 were used to calculate site-specific Groundwater Surface Water Interface Criteria.

[3] National Primary and Secondary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

[4] Level ranges from 0.05 to 2.0 mg/L.

[5] The initial analytical result was less than the calculated background concentration; therefore, background was substituted for the result.

NC - No Criterion.

Appendix D

Feasibility Study Remedial Alternatives Cost Estimates

TABLE D.2B

COST SUMMARY
REMEDIAL ALTERNATIVE 2B – EXCAVATION AND OFF-SITE DISPOSAL
WITH CONSOLIDATION AND CAPPING
TO RESIDENTIAL AND NON RESIDENTIAL CRITERIA - ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost*	
					Subtotal	*Total*
CAPITAL COSTS						
A.	***PRE-DESIGN***					**$33,200**
1.0	Sampling and Analysis Work Plan (SAP)	LS	1	$25,000	$25,000	
	Survey top of banks at Site	LS	1	$2,000	$2,000	
	Health and Safety Plan Update	LS	1	$1,200	$1,200	
	Multi-Area Quality Assurance Project Plan	LS	1	$5,000	$5,000	
2.0	SAP Implementation					**$197,900**
	Project Set up (mark locations etc.)	LS	1	$8,790	$8,800	
	Private Utility Locate	LS	1	$8,000	$8,000	
	Field Activities	DA	41	$2,900	$118,900	
	Field Technicians					
	Sampling Equipment (push probe technology)					
	Expendables (PPE etc)					
	Temporary Lighting and Carbon Monoxide Control	LS	1	$6,000	$6,000	
	Concrete Coring	LS	1	$6,000	$6,000	
	Laboratory Analysis	LS	1	$48,070	$48,100	
	Investigation Derived Waste Disposal	DA	41	$50	$2,100	
3.0	Contingency Sampling and Analysis	LS	1	$114,280	$114,300	**$114,300**
	Based on 50 % of SAP costs					
4.0	Remedial Action Plan	LS	1	$50,000	$50,000	**$50,000**
	TOTAL PRE-DESIGN COSTS					**$395,400**
B.	***CONSTRUCTION***					
1.0	**Mobilization and Set up**					**$264,000**
	Mobilization and Set up	LS	1	$51,500	$51,500	
	Health and Safety	Monthly	5	$28,450	$142,300	
	Erosion Control and Staging Areas	LS	1	$18,700	$18,700	
	Site Facilities					
	Temporary Facilities	Monthly	5	$6,810	$34,100	
	Decontamination Pad and Stations	LS	1	$17,375	$17,400	
2.0	**Additional Preparation and/or Demolition (by Redevelopment Area)**					**$138,000**
	Residential 1	LS	1	$12,680	$12,700	
	Residential 2	LS	1	-	-	
	Residential 3	LS	1	$1,225	$1,200	
	Residential 4	LS	1	$850	$900	
	Waterfront Plaza	LS	1	-	-	
	Mixed Residential/Commercial Area 1	LS	1	$600	$600	
	Mixed Residential/Commercial Area 2	LS	1	$56,625	$56,600	
	Commercial Area 1	LS	1	-	-	
	Commercial Area 2	LS	1	-	-	
	Commercial Area 3	LS	1	-	-	
	Commercial Area 4	LS	1	$65,980	$66,000	
3.0	**Excavation (by Redevelopment Area)**					**$281,300**

TABLE D.2B

COST SUMMARY
REMEDIAL ALTERNATIVE 2B – EXCAVATION AND OFF-SITE DISPOSAL
WITH CONSOLIDATION AND CAPPING
TO RESIDENTIAL AND NON RESIDENTIAL CRITERIA - ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost*	
					Subtotal	*Total*
	Residential 1	CY	910	$12	$11,100	
	Residential 2	CY	25	$88	$2,200	
	Residential 3	CY	1,255	$9	$11,100	
	Residential 4	CY	4,950	$4	$17,500	
	Waterfront Plaza	CY	-	-	-	
	Mixed Residential/Commercial Area 1	CY	40	$93	$3,700	
	Mixed Residential/Commercial Area 2	CY	5,800	$33	$189,300	
	Commercial Area 1	CY	12	$106	$1,300	
	Commercial Area 2	CY	-	-	-	
	Commercial Area 3	CY	-	-	-	
	Commercial Area 4	CY	7,185	$6	$45,100	
4.0	**Transportation and Disposal (by Redevelopment Area)**					**$1,535,470**
	Residential 1 - Non Haz Non TSCA Soils	Ton	1,365	$22	$30,000	
	Residential 2 - Non Haz Non TSCA Soils	Ton	-	-	-	
	Residential 3 - Non Haz Non TSCA Soils	Ton	-	-	-	
	Residential 4 - Non Haz Non TSCA Soils	Ton	7,425	$22	$163,400	
	Residential 4 - Misc Debris	LS	1		$600	
	Waterfront Plaza - Non Haz Non TSCA Soils	Ton	-	$22	-	
	Mixed Residential/Commercial Area 1 - Non Haz Non TSCA Soils	Ton	18	$22	$400	
	Mixed Residential/Commercial Area 1 - Misc. Debris	LS	-	$125	$1,675	
	Mixed Residential/Commercial Area 2 - Non Haz Non TSCA Soils	Ton	7,600	$22	$166,700	
	Mixed Residential/Commercial Area 2 - Misc. Debris	LS	1		$8,245	
	Commercial Area 1 - Non Haz Non TSCA Soils	Ton	18	$22	$400	
	Commercial Area 2 - Non Haz Non TSCA Soils	Ton	-	-	-	
	Commercial Area 2 - Misc. Debris	LS	-	-	-	
	Commercial Area 3 - Non Haz Non TSCA Soils	Ton	-	-	-	
	Commercial Area 3 - Misc. Debris	LS	-	-	-	
	Commercial Area 4 - Non Haz Non TSCA	Ton	2,000	$22	$44,000	
	Commercial Area 4 - Misc. Debris	LS	-		$3,550	
	Commercial Area 4 - TSCA	Ton	7,000	$160	$1,116,500	
5.0	**Consolidation of Soils on Site**					**$33,600**
	Preparation of Consolidation Area (south of Mill Buildings)	LS	1	$27,110	$27,100	
	Consolidation of On Site Soils (Placement of Material)	CY	3,225	$2	$6,500	
6.0	**Capping of Soils On Site**	LS	1	$61,700	$61,700	**$61,700**
7.0	**Restoration (by Redevelopment Area)**					**$430,890**
	Residential 1	LS	1		$22,500	
	Residential 2	LS	1		$5,070	
	Residential 3	LS	1		$30,275	
	Residential 4	LS	1		$80,000	
	Waterfront Plaza	LS	-		-	
	Mixed Residential/Commercial Area 1	LS	1		$7,425	
	Mixed Residential/Commercial Area 2	LS	1		$139,455	
	Commercial Area 1	LS	1		$32,950	
	Commercial Area 2	LS	-		-	
	Commercial Area 3	LS	-		-	

TABLE D.2B

COST SUMMARY
REMEDIAL ALTERNATIVE 2B – EXCAVATION AND OFF-SITE DISPOSAL
WITH CONSOLIDATION AND CAPPING
TO RESIDENTIAL AND NON RESIDENTIAL CRITERIA - ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost* *Subtotal*	*Estimated Cost* *Total*
	Commercial Area 4	LS	1		$113,215	
8.0	**Demobilization**	LS	1	$32,300	$33,000	**$32,300**
	Decontamination and Demobilization					
	TOTAL CONSTRUCTION COST					**$2,777,260**
C.	***ENGINEERING/OVERSIGHT***					
1.0	**Institutional Controls**					**$50,000**
2.0	**Engineering/ Design (15 % of Construction Costs)**					**$416,600**
3.0	**Construction Oversight (10 % of Construction Costs)**					**$277,700**
	TOTAL ENGINEERING/OVERSIGHT COSTS					**$744,300**
	CONTINGENCY ON CAPITAL COSTS (25 %)					**$880,390**
	TOTAL CAPITAL COSTS					**$4,401,950**
OPERATION, MAINTENANCE, & MONITORING COSTS						
A.	***ANNUAL MONITORING AND MAINTENANCE***					**$9,600**
	Monthly Operation and Maintenance of System	Month	12	$800	$9,600	
	CONTINGENCY ON OM & M COSTS (20 %)					**$1,920**
	TOTAL CAPITAL COSTS					**$4,401,950**
	NET PRESENT VALUE OF OM & M (30 YEARS @ 7 % DISCOUNT RATE)					**$142,952**
	TOTAL COST					**$4,544,902**

Table D.2B

COST SUMMARY NOTES
REMEDIAL ALTERNATIVE 2B – EXCAVATION AND OFF-SITE DISPOSAL
WITH CONSOLIDATION AND CAPPING
TO RESIDENTIAL AND NON RESIDENTIAL CRITERIA - ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

GENERAL NOTES

A. Estimate for Remedial Alternative 2B - Excavation to Residential and non-Residential Criteria, Off-Site Disposal with On-Site Consolidation and Capping has been prepared based on available information at the time of this document. Redevelopment activities conducted, being conducted and anticipated for the Site by the City of Plainwell may affect the remediation costs. Costs presented in the Feasibility Study (FS) Report have taken into consideration anticipated redevelopment plans by the City of Plainwell. Redevelopment plans include demolition of non-historical buildings to the concrete slab as well as specific land use restrictions/designations for the Site as presented on Figure 1.2 of the FS Report. This cost estimate is expected to be within -30 percent to +50 percent of the actual remedial costs in accordance with United States Environmental Protection Agency (U.S. EPA) guidance.

B. Remediation activities for each of the 11 proposed redevelopment areas were estimated separately; however, the estimate assumes one mobilization and demobilization effort to conduct the work.

C. The cost estimate assumes that new structures have not been constructed in areas that are planned for soil excavation and existing structures remain in place.

D. Costs assume that additional soil investigation will not be conducted under building slabs unless otherwise noted in the pre-design notes below.

E. Areas targeted for soil removal and off-site disposal were determined based on a risk-based approach for arsenic as detailed in Appendix A of the FS Revision 1.

F. The estimated costs assume that excavation of impacted soils under the building slabs will not be conducted.

G. The cost estimate includes abandonment and replacement costs of groundwater monitoring wells within excavation areas.

H. Figure 4.1 of the FS Report shows the conceptual area for consolidation of on Site materials in Commercial Area 4 south of the former Mill Buildings in the area formerly occupied by Buildings 9A, 9B, 9D, 9E and 23.

I. Material was considered for consolidation on Site if the following conditions are met:
   1. Soil that was reported with an arsenic concentration of below 37 milligrams per kilogram (mg/kg)
   2. The soil was not reported with an inhalation exceedance
   3. The soil did not contain PCBs
   4. The soil does not contain coal
   5. The soil does not contain semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs) above Part 201 Residential Criteria

J. Costs are based on 2013 dollars.

K. All volumes are based on in-place measures unless otherwise stated.

L. Abbreviations used in the "Unit" column in the Cost Estimate Table are as follows:
   - CY = Cubic Yard
   - EA = Each
   - LS = Lump Sum
   - TN = Ton
   - LF= linear foot

TASK NOTES:

CAPITAL COSTS

A. INVESTIGATION/CONSTRUCTION

1.0 Pre-Design Investigation (PDI) Activities

The following assumptions were made relative to the PDI activities in each of the redevelopment areas and reflected in the cost estimate.

- Generation of a Sampling and Analysis Plan (SAP).
- Update the Health and Safety Plan as necessary.
- Update the Multi-Area Quality Assurance Project Plan as necessary.
- Completion of the SAP - soil boring installation and soil sample collection to delineate the horizontal extent of impact. Soil borings are assumed to be collected via direct push method. PDI samples will be collected and submitted for laboratory analysis for specific parameters determined to exceed Preliminary Remediation Goals (PRGs) during the Remedial Investigation (RI). It is assumed that the vertical extent of the impacted soil is already established by the samples collected during the Remedial Investigation (RI). Delineation samples will not be collected in areas that were not selected for excavation activities (i.e. under building slabs, etc.)
- Quality Assurance/Quality Control samples are included on a 1 per 10 basis.
- A survey of the "top of bank" is included in the PDI cost estimate.
- All areas where subsurface work is to be conducted will be cleared through a public utility locate (i.e., MISS Dig), a private utility locate, review of available drawings, and discussions with individuals knowledgeable of the Site and utilities located thereon.

Residential Area 1
PRGs exceeded in Residential Area 1 include Part 201 non-residential and residential direct contact criteria for arsenic. Soil samples will be collected to delineate the extent of soil impacted with PCBs adjacent to the storm sewer line installed by the Michigan Department of Transportation (MDOT) in 2012.

- Allowance for 30 soil samples for PCBs
- Allowance for 12 soil samples for arsenic

Residential Area 2
The PRG exceeded in Residential Area 2 is Part 201 residential direct contact criteria for arsenic.

- Allowance for 24 soil samples for arsenic

Residential Area 3
The PRG exceeded in Residential Area 3 is Part 201 residential direct contact criteria for arsenic.

- Allowance for 56 soil samples for arsenic

Residential Area 4
PRGs exceeded in Residential Area 4 include Part 201 non-residential direct contact criteria for arsenic, lead and PCBs. Residential direct contact criteria is exceeded at locations within Residential Area 4 for arsenic, benzo(a)pyrene, cyanide, dibenz(a,h)anthracene, lead and PCBs. Residential soil volatilization to indoor air inhalation criteria (SVIIC) was exceeded at one location for benzene.

- An allowance for 36 soil samples for arsenic

- Benzene above the residential SVIIC at TP-308
    - An allowance for 4 soil samples for benzene was included in the estimate.
- Cyanide was above residential direct contact criteria at SB-302 in the shallow (0-1 foot) interval
    - Four samples for cyanide were included in the estimate
- An allowance for 20 samples for lead was included in the estimate
- PCBs were above criteria at TP-313 and SB-301
    - An allowance for 16 soil samples for PCBs was included in the estimate
- The PNA parameters were identified in shallow samples (0-1.5 feet) below grade at DG3, DG4 and TP-302
    - Allowance for 12 PNA samples

Waterfront Plaza
PDI activities will not be specifically conducted within the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
PRGs exceeded in Mixed Residential/Commercial Area 1 include Part 201 non-residential inhalation criteria for manganese and residential direct contact criteria for arsenic.

- Delineation samples will be collected around 2 locations (TP-30 and TP-334)
- A total of 12 soil samples for arsenic will be collected
- Four samples for manganese will be collected and analyzed around TP-334

Mixed Residential/Commercial Area 2
PRGs exceeded in Mixed Residential/Commercial Area 2 include Part 201 non-residential direct contact criteria for arsenic, benzo(a)pyrene, and lead. Residential direct contact criteria is exceeded at locations within Mixed Residential/Commercial Area 2 for arsenic, benzo(a)pyrene, dibenz(a,h)anthracene; benzo(a)anthracene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene and lead.

Soil delineation by work area as follows:

<u>Arsenic ONLY locations</u>:
Building 25
- Allowance for 8 samples
- A portion of the concrete slab was removed during demolition

Building 28
- Allowance for 8 samples
- A portion of the concrete slab was removed during demolition

Train Shed
- Allowance for 4 samples

Coal Tunnel Area
- Allowance for 30 samples

Former Ash Silo Area (SB-2010 and SB-2011)
- Allowance for 12 samples

Former clarifier area (TP-344)
- Allowance for 8 samples

Area north of Building 3/Former Water Tower Area (TP-340, TP-342, TP-343)
- Allowance for 16 samples

<u>Arsenic and Lead sample locations:</u>
Area around SB-2013
- Allowance for 12 samples

Arsenic, PNAs and Lead sample locations:
Building 3A
- Allowance for 12 samples

Building 6A
- Allowance for 18 samples
- Technicians will be required to don respirators for this work
- The floor in the majority of this building is exposed soil

Arsenic and PNAs sample locations
Fuel Oil AST Area
- Allowance for 24 PNA soil samples
- Allowance for 12 arsenic samples

A total of 140 samples will be collected and analyzed for arsenic.
A total of 30 samples will be collected and analyzed for PNAs.
A total of 42 samples will be collected and analyzed for lead.

Commercial Area 1
PRGs exceeded in Commercial Area 1 include Part 201 non-residential inhalation criteria for manganese and the residential direct contact for arsenic.

- Delineation samples will be collected around SS-105
- Four soil samples will be collected from the 0-2 foot below grade interval and analyzed for arsenic and manganese

Commercial Area 2
Delineation efforts will not be conducted in Commercial Area 2.

Commercial Area 3
Delineation efforts will not be conducted in Commercial Area 2.

Commercial Area 4
PRGs exceeded in Commercial Area 4 include Part 201 non-residential direct contact criteria for arsenic, and PCBs. Residential direct contact criteria is exceeded at locations within Commercial Area 4 for arsenic, benzo(a)pyrene, lead and PCBs.

Soil delineation by building / work area as follows:

Arsenic ONLY locations:
SB-2012
- Allowance for 4 samples

Parking lot area south of Building 17
- Allowance for 60 samples

Arsenic and Lead sample locations:
TP-341
- Allowance for 4 samples

Arsenic, PNAs and Lead sample locations:

Former Substation Area/North of Mill Buildings

- Allowance for 30 samples

PCBs and Arsenic sample locations:

MW-16 Area

- Allowance for 18 samples

A total of 116 samples will be collected and analyzed for arsenic.
A total of 30 samples will be collected and analyzed for PNAs.
A total of 18 samples will be collected and analyzed for PCBs.
A total of 4 samples will be collected and analyzed for lead.

2.0 Mobilization/Set-Up

The following assumptions were made relative to the mobilization/set-up in each of the redevelopment areas and reflected in the cost estimate.

- Mobilization and set-up includes: mobilization of personnel and equipment; construction survey work (e.g., excavation layout and verification sample locations); and geotechnical and chemical testing on backfill materials.
  - An allowance of $8,000 to mobilize personnel and equipment was included in the estimate.
  - $30,000 for survey work was included in the estimate.
  - Geotechnical and chemical analysis for imported materials was included in the estimate. One set of chemical analysis [Target Analyte List Metals, Target Compound List (TCL) for volatile organic compounds, TCL for semi-volatile compounds, and polychlorinated biphenyl (PCBs) per material (topsoil, general fill and 21AA/gravel]. The topsoil sample will also be analyzed for pH, phosphorous, organic content, pesticides and herbicides.
- Health and Safety includes an on-Site Health and Safety Officer (HSO) for 5 months. Also included in the costs are: air monitoring equipment and calibration gases; a decontamination trailer; and disposable personal protection equipment (PPE).
- Air monitoring assumes real-time air monitoring will be conducted during all excavation work utilizing a photoionization detector (11.7 electronVolt [eV] lamp) and fugitive dust monitor(s). Air monitoring does not include the collection of samples for laboratory analysis or laboratory analytical costs.
- Erosion control includes an allowance for silt fence (4,000 LF) and geofabric to cover catch basins on the Site. Costs for erosion control measures specific to individual redevelopment areas (i.e., turbidity curtains, etc.) are included in individual redevelopment area estimates (e.g., Commercial Area 4). Erosion control (visqueen, hay bales etc.) for the staged consolidation pile(s) of soil and the relocated and staged gravel material area included here.
- Site facility costs include electrical hookup and electricity for two office trailers (one for the contractor and one for the U.S. EPA) for 5 months. Other temporary facilities include portable sanitary services, a drinking water allowance and a small dumpster for worker general refuse. The expense of one Site truck for the duration of the services was included.
- Site facility costs include materials and construction of temporary decontamination pads and decontamination stations for workers. It was assumed that potable water could be obtained from the City of Plainwell for use during the project.
- Site facility costs include $6,000 to for the installation and maintenance of a staging area for waste.

- A perimeter fence currently exists around the majority of the Site. The cost estimate assumes the fence will remain and can be utilized as a security measure to prevent access to the Site during construction activities.

3.0 Preparation/Pre-Excavation Work by Redevelopment Area

The following assumptions were made relative to the preparation/pre-excavation work in each of the redevelopment areas and reflected in the cost estimate.

- A Soil Erosion and Sedimentation Control Permit will be obtained from Allegan County. All other necessary permits will also be obtained prior to intrusive work at the Site.
- All areas where subsurface work is to be conducted will be cleared through a public utility locate (i.e., MISS Dig), a private utility locate, review of available drawings, and discussions with individuals knowledgeable of the Site and utilities located thereon.

Residential Area 1
Specific assumptions for preparation/pre-excavation work in Residential Area 1 under Remedial Alternative 2B are presented below.

- Trees and shrubs in the excavation areas will need to be cleared and grubbed.
- Turbidity curtain will be temporally installed in the Kalamazoo River during excavation and backfill activities.
- One power pole will need to be relocated for the excavation work around SB-104.

Residential Area 2
No specific assumptions for preparation/pre-excavation work in Residential Area 2 under Remedial Alternative 2B were utilized.

Residential Area 3
Specific assumptions for preparation/pre-excavation work in Residential Area 3 under Remedial Alternative 2B are presented below.

- MW-15 will be abandoned.
- Clearing will be required in the area around MW-15.

Residential Area 4
Specific assumptions for preparation/pre-excavation work in Residential Area 4 under Remedial Alternative 2B are presented below.

- Clearing will be required in the area around SB-301/SG-4.
- Pavement by TP-302 will be saw cut.

Waterfront Plaza
No specific assumptions for preparation/pre-excavation work in Waterfront Plaza under Remedial Alternative 2B were utilized.

Mixed Residential/Commercial Area 1
The specific assumption for preparation/pre-excavation work in Mixed Residential/Commercial Area 1 under Remedial Alternative 2B is presented below.

- Pavement in the work areas will be saw cut prior to excavation to leave a clean line for restoration activities.

Mixed Residential/Commercial Area 2
Specific assumptions for preparation/pre-excavation work in Mixed Residential/Commercial Area 2 under Remedial Alternative 2B are presented below.

- The loading dock at the south end of Building 1 will be evaluated by a structural engineering evaluation to ensure excavation of the fuel oil line will not damage either the loading dock or Building 1. Excavation will not occur within Building 1.
- A demolition notice will be submitted to the State of Michigan for the demolition of Building 5A/part of the coal tunnel. Asbestos abatement may be necessary on pipe wrap found outside of Building 5A.
- Excavation of soils under the concrete slabs of the demolished buildings (3A, 25 and 28) will require the relocation of the backfill (less than 3 feet thick) prior to excavation.
- Fuel Oil No. 6 within the former coal tunnel will be removed from the tunnel before the tunnel itself is removed.
- The piping run from the former Fuel Oil No. 6 AST and Building 5 will be exposed at one end and drained of any residual fuel oil prior to removing the line.
- Monitoring well MW-19 will be abandoned prior to excavation activities in this area.
- Monitoring well MW-22 will be abandoned prior to removal of the former fuel oil line.
- Monitoring well MW-2 will be abandoned prior to excavation activities at SB-2010 and SB-2011.
- The concrete floor (Buildings 25 and 3A) will be saw cut prior to excavation (concrete will be broke out during excavation – but saw cut first to create clean lines for restoration).

Commercial Area 1
No specific assumptions for preparation/pre-excavation work Commercial Area 1 under Remedial Alternative 2B were utilized.

Commercial Area 2
No specific assumptions for preparation/pre-excavation work Commercial Area 2 under Remedial Alternative 2B were utilized.

Commercial Area 3
No specific assumptions for preparation/pre-excavation work Commercial Area 3 under Remedial Alternative 2B were utilized.

Commercial Area 4
Specific assumptions for preparation/pre-excavation work in Commercial Area 4 under Remedial Alternative 2B are presented below.

- Excavation of soils under the concrete slabs of the demolished buildings will require the relocation of backfill placed within the former basement cavities to surrounding grade (up to 9 feet thick) prior to excavation. An allowance for five working days to complete this work was included in the estimate at a cost of $20,400.
- Turbidity curtain will be installed in the Mill Race in the area by MW-16 (along the Mill Race) and in the area of MW-3 prior to excavation activities.
- Monitoring of the Mill Race and Kalamazoo River for turbidity will be conducted during excavation activities.

- MW-16 will be abandoned prior to excavation work in that area.
- Protection of MW-3 (barriers) will be installed.
- A structural engineering evaluation of the pedestrian bridge for stability during excavation activities will be conducted. The evaluation will determine if shoring of the bridge is necessary. An allowance of $5,000 is included in the estimate to conduct the evaluation. Shoring costs have not been included in the estimate.
- The water flow of the Mill Race will be diverted in the excavation area. The methodology for this work to be determined in the pre-design phase of the project.
- Rip rap along the Mill Race will be removed and staged for re-use.
- Pavement in the work areas will be saw cut prior to excavation to allow for restoration activities.

4.0 Excavation by Redevelopment Area

Conceptual excavation areas for each of the Redevelopment areas are shown of Figures 3.11 through 3.20 of the FS Report (Revision 1).

The following assumptions were made relative to excavation in each of the redevelopment areas and reflected in the cost estimate.

- Excavation estimates assume dewatering will not be necessary and that all work can be completed in Level D PPE except Building 6A which will be conducted with supplied air (Level B) PPE.
- Standby time was not added to account for the time for laboratory analysis of verification samples. It was assumed that the project would proceed across the Site allowing for laboratory analysis to be conducted while another redevelopment area was being excavated or restored.

Specific assumptions to each redevelopment area, in addition to those presented above globally, are provided below.

Residential Area 1

Residential Area 1 is located at the far west end of the Site, where the majority of the former sludge dewatering lagoons were located. The former Mill wastewater treatment building, activated sludge tank and secondary clarifier were constructed over the lagoons. The wastewater treatment structures were demolished on behalf of the City of Plainwell in November and December 2013. The specific assumption for excavation in Residential Area 1 under Remedial Alternative 2B is presented below.

- Overburden present beyond the target excavation area that must be removed to achieve the full depth of excavation will be disposed of off-site.
- The rip rap at the Kalamazoo River outfall from the storm sewer line does not need to be removed.

Residential Area 2

Residential Area 2 is located between Residential Area 1 and Residential Area 3 and is positioned along the Kalamazoo River. This area was historically occupied by sludge dewatering lagoons (A, B, C) and a primary clarifier. The primary clarifier was demolished to the concrete slab in November 2013. No specific assumptions for excavation in Residential Area 2 under Remedial Alternative 2B are presented.

Residential Area 3

Residential Area 3 is located near the center of the Site. The former aeration basin location occupies the majority of the area. A former secondary clarifier was historically present in this area, which was demolished in November 2013 with the floor of the former clarifier remaining. This area was backfilled to

surrounding grade, which was approximately 7-8 feet higher than the floor of the clarifier and aeration basin. Specific assumptions for excavation in Residential Area 3 under Remedial Alternative 2B are presented below.

- Material removed from the bottom of the aeration basin will require double handling due to the slopes of the former aeration basin and the depth of the excavation.

Residential Area 4

Residential Area 4 is positioned along the Kalamazoo River between Residential Area 3 and Mixed Residential Area 2. No aboveground structures are currently present on this area. A portion of this area was historically utilized by the Mill as a coal storage area. No specific assumptions for excavation in Residential Area 4 under Remedial Alternative 2B were made.

Waterfront Plaza

No excavation activities are anticipated in the Waterfront Plaza Area.

Mixed Residential/Commercial Area 1

Mixed Residential/Commercial Area 1 is located between Commercial Area 2 and Commercial Area 3 on the southern property line along Allegan Street. This area was once occupied by the former Specialty Minerals Building and associated above ground storage tanks. The Specialty Minerals building and ASTs were demolished to the concrete slab in December 2011. The specific assumption for excavation in Mixed Residential/Commercial Area 1 under Remedial Alternative 2B is presented below.

- Underground utilities encountered (TP-306) between the former Specialty Minerals Building and the main Mill Buildings will be capped at either end of the excavation.

Mixed Residential and Commercial Area 2

Mixed Residential and Commercial Area 2 is located between Residential Area 4 and Commercial Area 4 at the northern end of the Site along the Kalamazoo River. The majority of the area is occupied by Mill Buildings and pavement. Buildings 3A, 25 and 28 along with the eastern water tower, 200,000-gallon Fuel Oil AST, and the brine USTs, were demolished on behalf of the City of Plainwell. The majority of the concrete slabs were left in place for Buildings 3A and 28. Building 25 was part of the Site's historical wastewater treatment system and had a subsurface vault and system to pump the waste water from the Mill to the onsite WWTP at the west end of the Site. The vault under the northern portion of Building 25 was not removed. The vault floor was cracked and the sidewalls removed to 4 feet below grade, then the vault was filled with imported general fill. The concrete slab under the remaining portion of Building 25 was left in place.

Specific assumptions for excavation in Mixed Residential/Commercial Area 2 under Remedial Alternative 2B are presented below.

- A storm sewer was installed through the west side of Mixed Residential/Commercial Area 2 in 2012 by the Michigan Department of Transportation (MDOT). The approximate location of the storm sewer is shown on Figure 3.16. Before conducting excavation work to remove the former fuel oil AST line and excavate the east side of the former fuel AST, the exact location of the storm sewer line will be determined, shoring of the line may be necessary during the removal of the fuel oil AST line.
- Soils in Building 6A will be removed using a vacuum extraction system.

Commercial Area 1

Commercial Area 1 is located in the far southwest portion of the Site. No structures or paved areas are currently present in this area that would require unique equipment or procedures to conduct the proposed remedial activities. This area of the Site has not been developed and was not part of historic

Mill operations. The area specific assumption for excavation in Commercial Area 1 under Remedial Alternative 2B is presented below.

- A storm sewer was installed through this area in 2012 by the Michigan Department of Transportation (MDOT). The approximate location of the storm sewer is shown on Figure 3.17. Before conducting excavation work in the area of SS-105, the exact location of the line will be determined.

Commercial Area 2
Commercial Area 2 is located in the southwest central portion of the Site. Structures on this portion of the Site include the City of Plainwell Public Safety Building and associated paved parking and egress/ingress areas.

Excavation activities are not anticipated in the Commercial Area 2 for Remedial Alternative 2B.

Commercial Area 3
Commercial Area 3 is located adjacent to the former southwest corner of the Mill Buildings along Allegan Street. Structures on this area include a pump house and a former guard shack. Other historical features within this area have been demolished on behalf of the City of Plainwell. The Clay ASTs, Ammonia AST secondary containment structure, the Starch ASTs and Building 9C were demolished in 2012. The concrete slabs for all demolished features were left in place. Specific assumptions for excavation in Commercial Area 3 under Remedial Alternative 2B are presented below.

Excavation activities are not anticipated in the Commercial Area 3 for Remedial Alternative 2B.

Commercial Area 4
Commercial Area 4 is located on the eastern side of the Site. The majority of this area is covered with either pavement, buildings (vacant and occupied) or former building concrete slabs. Buildings (9A, 9B, 9C, 9D, 9E, 9F, and 23) were demolished on behalf of the City of Plainwell in 2012, with the majority of the former building concrete slabs left in place and backfilled to surrounding grade. The basement areas were backfilled with a combination of crushed concrete (from the buildings on Site), soil from an adjacent retaining wall that was removed, and imported gravel material and vary in thickness from 6 feet to 9 feet. Specific assumptions for excavation in Commercial Area 4 under Remedial Alternative 2B are presented below.

- Access to both the former substation area and around MW-16 will be restricted due to the distance between existing structures and either the Kalamazoo River or the Mill Race. Excavated soils will likely need to be double handled.

5.0 Transportation and Disposal by Redevelopment Area

The following assumptions were made relative to the transportation and disposal of materials in each of the redevelopment areas and reflected in the cost estimate.

- Soil volumes were converted to tonnage assuming a ratio of 1.5 tons per cubic yard for soils. Tonnage for concrete was based on 1.65 tons per cubic yard of material. Waste has been categorized as non-hazardous and non-TSCA soils; TSCA soil; TSCA debris; and miscellaneous debris.
- Transportation and disposal pricing is based on the non-hazardous, non-TSCA material being accepted at Waste Management Autumn Hills Landfill in Zeeland, Michigan. A cost of $22.00 per ton for both transportation and disposal of non-hazardous, non-TSCA waste was used for the estimates.
- A disposal price of $135.00 per ton was used for TSCA soils. For estimation purposes it was assumed that the TSCA soils would be transported to the Environmental Quality Belleville, Michigan Landfill for

direct landfill disposal. Transportation of the soils was assumed to be conducted in lined 50 ton gravel trains. Transportation of each load of 50 tons was assumed to cost $500.00.

- Transportation costs assume fuel prices for diesel will not exceed $4.00 per gallon.
- Organic material generated from clearing activities was assumed to be chipped and left on Site.
- Concrete and asphalt will be disposed of off-Site, not recycled.

Residential Area 1

The specific assumption for transportation and disposal work in Residential Area 1 under Remedial Alternative 2B is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 910 CY.

Residential Area 2

The specific assumption for transportation and disposal work in Residential Area 2 under Remedial Alternative 2B is presented below.

- Waste was assumed suitable for on-site consolidation (25 CY).

Residential Area 3

The specific assumption for transportation and disposal work in Residential Area 2 under Remedial Alternative 2B is presented below.

- Waste was assumed suitable for on-site consolidation (1,255 CY).

Residential Area 4

The specific assumption for transportation and disposal work in Residential Area 3 under Remedial Alternative 2B is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 4,950 CY.
- Allowance of $600 for asphalt.

Waterfront Plaza

No specific assumptions for transportation and disposal work in Waterfront Plaza under Remedial Alternative 2B were utilized. Excavation activities will not be conducted within the Waterfront Plaza area.

Mixed Residential/Commercial Area 1

Specific assumptions for transportation and disposal work in Mixed Residential/Commercial Area 1 under Remedial Alternative 2B are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 12 CY.
- Remaining 40 CY of waste targeted for excavation assumed suitable for on-site consolidation (28 CY).
- Allowance of 50 CY for asphalt disposal.

Mixed Residential/Commercial Area 2

Specific assumptions for transportation and disposal work in Mixed Residential/Commercial Area 2 under Remedial Alternative 2B are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil from Building 6A with a volume of 200 CY.
- Waste was assumed suitable for on-site consolidation (205 CY).

- Waste was assumed to be non-hazardous, non-TSCA soil from the coal tunnel area with a volume of 1,270 CY.
- Allowance of $3,500 for miscellaneous debris from the coal tunnel area (bricks, concrete)
- Waste was assumed to be non-hazardous, non-TSCA soil from the fuel oil line with a volume of 525 CY.
- Allowance of $600 for disposal of the fuel oil line piping
- Waste was assumed to be non-hazardous, non-TSCA soil from the fuel oil No. 6 AST area with a volume of 2,500 CY.
- Allowance of $1,200 for the concrete ring the tank was sitting on and buried concrete and asphalt.
- Waste was assumed to be non-hazardous, non-TSCA soil from the north end of the Mill Buildings (test pits- TP-342 and TP-343) with a volume of 260 CY.
- Waste was assumed to suitable for on-site consolidation from the north end of the Mill Buildings (Buildings-3A, 25, 28, test pits-TP-340 and SB-2013) with a volume of 730 CY.
- Allowance of $6,000 for miscellaneous debris from these areas at the north end of the Mill Building.

Commercial Area 1
Specific assumptions for transportation and disposal work in Commercial Area 1 under Remedial Alternative 2B are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 12 CY.

Commercial Area 2
Waste will not be transported off site from Commercial Area 2 for Remedial Alternative 2B.

Commercial Area 3
Waste will not be transported off site from Commercial Area 2 for Remedial Alternative 2B.

Commercial Area 4
Specific assumptions for transportation and disposal work in Commercial Area 4 under Remedial Alternative 2B are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil from the former substation area with a volume of 1,325 CY.
- Waste was assumed to be suitable for on-site consolidation from the area north of the Mill Buildings with a volume of 1,185 CY
- Waste was assumed to be TSCA soil from the area around MW-16 with a volume of 4,660 CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from the area around boring BK5 with a volume of 15 CY.
- Allowance of $250 for asphalt transportation and disposal

6.0 Preparation of Consolidation Area and Consolidation of On-Site Soils

The conceptual area selected for on-site consolidation of suitable soils is located in Commercial Area 4 (Figure 4.1). The Buildings in this area were demolished in 2011 and the concrete floors were generally left in place (Building 9A has a section of its concrete floor removed). The basement areas were then backfilled with gravel to match the grade to the west and south of the buildings. The thickness of the gravel varies from 6-7 feet (near Allegan Street) to 9 feet (adjacent to the existing Buildings). The gravel material would be excavated to achieve a receiving area for the consolidated soils. Gravel will be staged nearby on the asphalt

parking area within Commercial Areas 2 and 3. This area will not generally require remedial excavation activities and is close by to reduce efforts of relocating the gravel material. Erosion control around the relocated gravel will be established. Erosion control costs for this activity were included in the Mobilization Erosion Control Costs.

Based on the conditions identified in the General Notes, 3,225 CY of soil would be available for consolidation under Alternative 2B. Based on the assumptions below, the area selected for consolidation would accept approximately 8,500 CY of soil. The cost estimate for Remedial Alternative 2B assumes 3,225 CY of material will be consolidated on site. Material will come from Residential Area 2, Residential Area 3 Mixed Area 1, Mixed Area 2 and Commercial Area 1. It was assumed that the material would all be excavated and staged together so that the time the receiving excavation would need to be left open was minimized.

The following specific assumptions for the consolidation area were utilized for the cost estimate:

- The consolidation area was 150 feet by 150 feet in size
- A set back of greater than 20 feet was included on all four sides of the consolidation area
- An average thickness of 5 feet of consolidated soils was allowed
- The relocated / consolidated material would be compacted in place to 95 percent of the proctor
- The gravel material left over after consolidation would be utilized by the City of Plainwell for redevelopment activities.

7.0 Capping On-Site Soils

The area utilized for consolidation of the on-Site soils was assumed to be 150 feet by 150 feet. The estimate allows for 10 percent waste of capping materials (liner and geotextile).

- A three foot cover system was assumed:
  1. A 40 mil LLDPE liner with 12 ounce geotextile will be placed over the material
     a. 25,000 SF of liner and geotextile was included in the estimate
  2. General fill would be placed over the geotextile up to 6 inches of the surface
  3. The existing gravel material would be placed on top (6 inches)
- The liner will not be anchored in
- The general fill would be compacted to 95 -98 percent if the proctor
- The gravel would be compacted to 98 percent of the proctor

8.0 Restoration by Redevelopment Area

The following assumption was made relative to Site restoration in each of the redevelopment areas and reflected in the cost estimate.

- Restoration activities include backfill (material and placement), compaction, compaction testing and any other location specific restoration that may be deemed necessary at this time.
- General fill from a local gravel pit at a delivered material cost of $4.58 ton was used for the estimates. Unprocessed topsoil at a delivered price of $18.98 cubic yard was also used where appropriate.
- A six-inch layer of unscreened topsoil will be placed over the compacted general fill in areas that were previously pervious (i.e. not paved or impervious). Topsoil will be hydroseeded including mulch.
- Restoration for excavation areas under pavement will be backfilled with general fill and compacted to 95 percent of the proctor.

- A six-inch layer of 21AA or equivalent will be placed on the compacted general fill and compacted to 95 percent or greater of the proctor where restoration includes replacing the pavement.
- Concrete will be replaced where removed during excavation activities (sidewalk along Building 17).
- Asphalt will be replaced where removed during excavation activities.

Residential Area 1
Specific assumptions for Site restoration in Residential Area 1 under Remedial Alternative 2B are presented below.

- Rip rap at the Kalamazoo River around the storm sewer does not need to be replaced.

Residential Area 2
No specific assumptions for Site restoration in Residential Area 2 under Remedial Alternative 2B were utilized.

Residential Area 3
Specific assumptions for Site restoration in Residential Area 3 under Remedial Alternative 2B are presented below.

- Backfill material will be imported general fill and overburden material removed to achieve excavation depth requirements but beyond the area exceeding cleanup criteria.
- MW-15 will be replaced.

Residential Area 4
No specific assumptions for Site restoration in Residential Area 4 under Remedial Alternative 2B were utilized.

Waterfront Plaza
No specific assumptions for Site restoration in Waterfront Plaza under Remedial Alternative 2B were utilized. Restoration will not be required in the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
No specific assumptions for Site restoration in Mixed Residential/Commercial Area 1 under Remedial Alternative 2B were utilized.

Mixed Residential/Commercial Area 2
Specific assumptions for Site restoration in Mixed Residential/Commercial Area 2 under Remedial Alternative 2B are presented below.

- Building 6A currently has a dirt floor; restoration would not include a concrete floor.
- Concrete (former ash silos) will not be replaced at SB-2010.
- Concrete around the former 200,000 gallon fuel oil AST will not be replaced.
- Concrete removed for excavations at SB-216, SB-220, SB-222 and SB-223 will not be replaced.
- Additional backfill will be required to fill in the void space of the coal tunnel.
- MW-2, MW-19 and MW-22 will be replaced as necessary.

Commercial Area 1
No specific assumptions for Site restoration in Commercial Area 1 under Remedial Alternative 2B were utilized.

Commercial Area 2
No specific assumptions for Site restoration in Commercial Area 2 under Remedial Alternative 2B were utilized.

Commercial Area 3
No specific assumptions for Site restoration in Commercial Area 3 under Remedial Alternative 2B were utilized.

Commercial Area 4
Specific assumptions for Site restoration in Commercial Area 4 under Remedial Alternative 2B are presented below.

- Asphalt will be 3 inches thick.
- Geotextile and Rip rap will be installed along the Mill Race.
- The Mill Race will be returned to its normal flow path.
- The turbidity curtain will be removed from the Mill Race and Kalamazoo River.

9.0 Demobilization

The following assumptions were made relative to the demobilization from the Site and reflected in the cost estimate.

- Costs included in the demobilization task include time for Site tear down and final decontamination of equipment, and demobilization of equipment and personnel. Demobilization activities were assumed to take five working days.

B. ENGINEERING/OVERSIGHT

1.0 Engineering/Design

The following assumption was made relative to the installation of engineering/design and reflected in the cost estimate.

- Engineering and project design/specifications were estimated to be 15 percent of the Construction Costs.

2.0 Construction Oversight

The following assumption was made relative to the construction oversight and reflected in the cost estimate.

- Construction oversight was estimated to be 10 percent of the Construction Costs.

TABLE D.2C

COST SUMMARY
REMEDIAL ALTERNATIVE 2C – EXCAVATION AND OFF-SITE DISPOSAL
WITH CONSOLIDATION AND CAPPING
TO LAND USE CRITERIA WITH RISK BASED APPROACH OF 10-5 FOR ARSENIC
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost* *Subtotal*	*Total*
CAPITAL COSTS						
A.	***PRE-DESIGN***					**$33,200**
1.0	Sampling and Analysis Work Plan (SAP)	LS	1	$25,000	$25,000	
	Survey top of banks at Site	LS	1	$2,000	$2,000	
	Health and Safety Plan Update	LS	1	$1,200	$1,200	
	Multi-Area Quality Assurance Project Plan	LS	1	$5,000	$5,000	
2.0	SAP Implementation					**$197,900**
	Project Set up (mark locations etc.)	LS	1	$8,790	$8,800	
	Private Utility Locate	LS	1	$8,000	$8,000	
	Field Activities	DA	41	$2,900	$118,900	
	Field Technicians					
	Sampling Equipment (push probe technology)					
	Expendables (PPE etc)					
	Temporary Lighting and Carbon Monoxide Control	LS	1	$6,000	$6,000	
	Concrete Coring	LS	1	$6,000	$6,000	
	Laboratory Analysis	LS	1	$48,070	$48,100	
	Investigation Derived Waste Disposal	DA	41	$50	$2,100	
3.0	Contingency Sampling and Analysis	LS	1	$114,280	$114,300	**$114,300**
	Based on 50 % of SAP costs					
4.0	Remedial Action Plan	LS	1	$50,000	$50,000	**$50,000**
	TOTAL PRE-DESIGN COSTS					**$395,400**
B.	***CONSTRUCTION***					
1.0	**Mobilization and Set up**					**$264,000**
	Mobilization and Set up	LS	1	$51,500	$51,500	
	Health and Safety	Monthly	5	$28,450	$142,300	
	Erosion Control and Staging Areas	LS	1	$18,700	$18,700	
	Site Facilities					
	Temporary Facilities	Monthly	5	$6,810	$34,100	
	Decontamination Pad and Stations	LS	1	$17,375	$17,400	
2.0	**Additional Preparation and/or Demolition (by Redevelopment Area)**					**$138,700**
	Residential 1	LS	1	$14,000	$14,000	
	Residential 2	LS	1	-	-	
	Residential 3	LS	1	$1,225	$1,200	
	Residential 4	LS	1	$850	$900	
	Waterfront Plaza	LS	1	-	-	
	Mixed Residential/Commercial Area 1	LS	1	-	-	
	Mixed Residential/Commercial Area 2	LS	1	$56,625	$56,600	
	Commercial Area 1	LS	1	-	-	
	Commercial Area 2	LS	1	-	-	
	Commercial Area 3	LS	1	-	-	
	Commercial Area 4	LS	1	$65,980	$66,000	
3.0	**Excavation (by Redevelopment Area)**					**$288,000**

TABLE D.2C

COST SUMMARY
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FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost*	
					Subtotal	*Total*
	Residential 1	CY	935	$14	$12,900	
	Residential 2	CY	620	$12	$7,300	
	Residential 3	CY	1,665	$9	$14,800	
	Residential 4	CY	9,000	$4	$31,700	
	Waterfront Plaza	CY	-	-	-	
	Mixed Residential/Commercial Area 1	CY	70	$61	$4,300	
	Mixed Residential/Commercial Area 2	CY	6,375	$27	$170,600	
	Commercial Area 1	CY	12	$106	$1,300	
	Commercial Area 2	CY	-	-	-	
	Commercial Area 3	CY	-	-	-	
	Commercial Area 4	CY	7,185	$6	$45,100	
4.0	**Transportation and Disposal (by Redevelopment Area)**					**$1,663,370**
	Residential 1 - Non Haz Non TSCA Soils	Ton	765	$22	$16,800	
	Residential 2 - Non Haz Non TSCA Soils	Ton	-	-	-	
	Residential 3 - Non Haz Non TSCA Soils	Ton	-	-	-	
	Residential 4 - Non Haz Non TSCA Soils	Ton	13,500	$22	$297,000	
	Residential 4 - Misc Debris	LS	1		$600	
	Waterfront Plaza - Non Haz Non TSCA Soils	Ton	-	-	-	
	Mixed Residential/Commercial Area 1 - Non Haz Non TSCA Soils	Ton	18	$22	$400	
	Mixed Residential/Commercial Area 1 - Misc. Debris	LS	-	$125	$1,675	
	Mixed Residential/Commercial Area 2 - Non Haz Non TSCA Soils	Ton	7,965	$22	$174,700	
	Mixed Residential/Commercial Area 2 - Misc. Debris	LS	1		$8,245	
	Commercial Area 1 - Non Haz Non TSCA Soils	Ton	18	$22	$400	
	Commercial Area 2 - Non Haz Non TSCA Soils	Ton	-	-	-	
	Commercial Area 2 - Misc. Debris	LS	-	-	-	
	Commercial Area 3 - Non Haz Non TSCA Soils	Ton	-	-	-	
	Commercial Area 3 - Misc. Debris	LS	-	-	-	
	Commercial Area 4 - Non Haz Non TSCA Soils	Ton	1,975	$22	$43,500	
	Commercial Area 4 - Misc. Debris	LS	-		$3,550	
	Commercial Area 4 - TSCA	Ton	7,000	$160	$1,116,500	
5.0	**Consolidation of Soils on Site**					**$54,600**
	Preparation of Consolidation Area (south of Mill Buildings)	LS	1	$44,450	$44,500	
	Consolidation of On Site Soils (Placement of Material)	CY	5,050	$2	$10,100	
6.0	**Capping of Soils On Site**	LS	1	$96,525	$96,500	**$96,500**
7.0	**Restoration (by Redevelopment Area)**					**$517,171**
	Residential 1	LS	1		$25,000	
	Residential 2	LS	1		$18,260	
	Residential 3	LS	1		$32,830	
	Residential 4	LS	1		$139,350	
	Waterfront Plaza	LS	-		-	
	Mixed Residential/Commercial Area 1	LS	1		$8,625	
	Mixed Residential/Commercial Area 2	LS	1		$146,941	
	Commercial Area 1	LS	1		$32,950	
	Commercial Area 2	LS	-		-	
	Commercial Area 3	LS	-		-	

TABLE D.2C

COST SUMMARY
REMEDIAL ALTERNATIVE 2C – EXCAVATION AND OFF-SITE DISPOSAL
WITH CONSOLIDATION AND CAPPING
TO LAND USE CRITERIA WITH RISK BASED APPROACH OF 10-5 FOR ARSENIC
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost*	
					Subtotal	*Total*
	Commercial Area 4	LS	1		$113,215	
8.0	**Demobilization**	LS	1	$32,300	$33,000	**$32,300**
	Decontamination and Demobilization					
	TOTAL CONSTRUCTION COST					**$3,054,641**
C.	***ENGINEERING/OVERSIGHT***					
1.0	**Institutional Controls**					**$50,000**
2.0	**Engineering/ Design (15 % of Construction Costs)**					**$458,200**
3.0	**Construction Oversight (10 % of Construction Costs)**					**$305,500**
	TOTAL ENGINEERING/OVERSIGHT COSTS					**$813,700**
	CONTINGENCY ON CAPITAL COSTS (25 %)					**$967,085**
	TOTAL CAPITAL COSTS					**$4,835,426**
OPERATION, MAINTENANCE, & MONITORING COSTS						
A.	***ANNUAL MONITORING AND MAINTENANCE***					**$9,600**
	Monthly Operation and Maintenance of System	Month	12	$800	$9,600	
	CONTINGENCY ON OM & M COSTS (20 %)					**$1,920**
	TOTAL CAPITAL COSTS					**$4,835,426**
	NET PRESENT VALUE OF OM&M (30 YEARS @ 7 % DISCOUNT RATE)					**$142,952**
	TOTAL COST					**$4,978,378**

Table D.2C

COST SUMMARY NOTES
REMEDIAL ALTERNATIVE 2C – EXCAVATION AND OFF-SITE DISPOSAL
WITH CONSOLIDATION AND CAPPING
TO LAND USE CRITERIA WITH RISK BASED APPROACH OF 10-5 FOR ARSENIC
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GENERAL NOTES

A. Estimate for Remedial Alternative 2C - Excavation and Off-Site Disposal Land Use Criteria with Risk Based Approach of 10-5 for Arsenic [6.4 milligrams per kilogram (mg/kg) for Residential and Mixed Residential/Commercial Areas and 27 mg/kg for Commercial Areas] and has been prepared based on available information at the time of this document. Redevelopment activities conducted, being conducted and anticipated for the Site by the City of Plainwell may affect the remediation costs. Costs presented in the Feasibility Study (FS) Report have taken into consideration anticipated redevelopment plans by the City of Plainwell. Redevelopment plans include demolition of non-historical buildings to the concrete slab as well as specific land use restrictions/designations for the Site as presented on Figure 1.2 of the FS Report. This cost estimate is expected to be within -30 percent to +50 percent of the actual remedial costs in accordance with United States Environmental Protection Agency (U.S. EPA) guidance.

B. Remediation activities for each of the 11 proposed redevelopment areas were estimated separately; however, the estimate assumes one mobilization and demobilization effort to conduct the work.

C. Costs assume that additional soil investigation will not be conducted under building slabs unless otherwise noted in the pre-design notes below.

D. Areas targeted for soil removal and off-site disposal were determined based on a risk-based approach for arsenic as detailed in Appendix A of the FS Revision 1.

E. The cost estimate assumes that new structures have not been constructed in areas that are planned for soil excavation and existing structures remain in place.

F. The cost estimate includes abandonment and replacement costs of groundwater monitoring wells within excavation areas.

G. Figure 4.1 of the FS Report shows the conceptual area for consolidation of on Site materials in Commercial Area 4 south of the former Mill Buildings in the area formerly occupied by Buildings 9A, 9B, 9D, 9E and 23.

H. Material was considered for consolidation on Site if the following conditions are met:
   1. Soil that was reported with an arsenic concentration of below 27 milligrams per kilogram (mg/kg)
   2. The soil was not reported with an inhalation exceedance
   3. The soil did not contain PCBs
   4. The soil does not contain coal

I. The soil does not contain semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs) above Part 201 Residential Criteria

J. Costs are based on 2013 dollars.

K. All volumes are based on in-place measures unless otherwise stated.

L. Abbreviations used in the "Unit" column in the Cost Estimate Table are as follows:
   - CY = Cubic Yard
   - EA = Each
   - LS = Lump Sum
   - TN = Ton
   - LF= linear foot

TASK NOTES:

CAPITAL COSTS

A. INVESTIGATION/CONSTRUCTION

1.0 Pre-Design Investigation (PDI) Activities

The following assumptions were made relative to the PDI activities in each of the redevelopment areas and reflected in the cost estimate.

- Generation of a Sampling and Analysis Plan (SAP).
- Update the Health and Safety Plan as necessary.
- Update the Multi-Area Quality Assurance Project Plan as necessary.
- Completion of the SAP - soil boring installation and soil sample collection to delineate the horizontal extent of impact. Soil borings are assumed to be collected via direct push method. PDI samples will be collected and submitted for laboratory analysis for specific parameters determined to exceed Preliminary Remediation Goals (PRGs) during the Remedial Investigation (RI). It is assumed that the vertical extent of the impacted soil is already established by the samples collected during the Remedial Investigation (RI).
- Quality Assurance/Quality Control samples are included on a 1 per 10 basis.
- A survey of the "top of bank" is included in the PDI cost estimate.
- All areas where subsurface work is to be conducted will be cleared through a public utility locate (i.e., MISS Dig), a private utility locate, review of available drawings, and discussions with individuals knowledgeable of the Site and utilities located thereon.

Residential Area 1
PRGs exceeded in Residential Area 1 include the risked based criteria for arsenic of 6.4 milligrams per kilogram (mg/kg). Soil samples will be collected to delineate the extent of soil impacted with PCBs adjacent to the storm sewer line installed by the Michigan Department of Transportation (MDOT) in 2012.

- Allowance for 30 soil samples for PCBs
- Allowance for 28 soil samples for arsenic

Residential Area 2
PRGs exceeded in Residential Area 2 include the risked based criteria for arsenic of 6.4 mg/kg.

- Allowance for 36 soil samples for arsenic

Residential Area 3
PRGs exceeded in Residential Area 3 include the risked based criteria for arsenic of 6.4 mg/kg.

- Allowance for 60 soil samples for arsenic

Residential Area 4
PRGs exceeded in Residential Area 4 include the risked based criteria for arsenic of 6.4 mg/kg. Part 201 residential direct contact criteria is exceeded at locations within Residential Area 4 for benzo(a)pyrene, cyanide, dibenz(a,h)anthracene, lead and PCBs. Residential soil volatilization to indoor air inhalation criteria (SVIIC) was exceeded at one location for benzene. Part 201 non-residential direct contact criteria for lead and PCBs were also exceeded in Residential Area 4.

- An allowance for 52 soil samples for arsenic
- Benzene above the residential SVIIC at TP-308
    - An allowance for 4 soil samples for benzene was included in the estimate.
- Cyanide was above residential direct contact criteria at SB-302 in the shallow (0-1 foot) interval
    - Four samples for cyanide were included in the estimate
- An allowance for 20 samples for lead was included in the estimate
- PCBs were above criteria at TP-313 and SB-301
    - An allowance for 16 soil samples for PCBs was included in the estimate
- The PNA parameters were identified in shallow samples (0-1.5 feet) below grade at DG3, DG4 and TP-302
    - Allowance for 12 PNA samples

Waterfront Plaza
PDI activities will not be specifically conducted within the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
PRGs exceeded in Mixed Residential/Commercial Area 1 include Part 201 non-residential inhalation criteria for manganese and the risked based PRG for arsenic of 6.4 mg/kg.

- A total of 24 soil samples for arsenic will be collected.
- Soil samples will be collected from borings around TP-334 for manganese. Eight samples will be collected for manganese analysis.

Mixed Residential/Commercial Area 2
PRGs exceeded in Mixed Residential/Commercial Area 2 include Part 201 non-residential direct contact criteria for benzo(a)pyrene, and lead. Residential direct contact criteria is exceeded at locations within Mixed Residential/Commercial Area 2 for benzo(a)pyrene, dibenz(a,h)anthracene; benzo(a)anthracene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene and lead. The risked based PRG for arsenic of 6.4 mg/kg is also exceeded at locations within Mixed Residential/Commercial Area 2.

Soil delineation by work area as follows:

<u>Arsenic ONLY locations</u>:
Building 25
- Allowance for 8 samples

Building 28
- Allowance for 8 samples

Train Shed
- Allowance for 4 samples

Coal Tunnel Area
- Allowance for 30 samples

Former Ash Silo Area (SB-2011)
- Allowance for 8 samples

Former clarifier area (TP-344)
- Allowance for 8 samples

Area north of Building 3/Former Water Tower Area (TP-340, TP-342, TP-343)
- Allowance for 16 samples

<u>Arsenic and Lead sample locations:</u>
Area around SB-2013

- Allowance for 12 samples

<u>Arsenic, PNAs and Lead sample locations:</u>
Building 3A
- Allowance for 12 samples

Building 6A
- Allowance for 18 samples
- Technicians will be required to don respirators for this work
- The floor in the majority of this building is exposed soil

<u>Arsenic and PNAs sample locations</u>
Fuel Oil AST Area
- Allowance for 24 PNA soil samples
- Allowance for 12 arsenic samples

A total of 136 samples will be collected and analyzed for arsenic.
A total of 30 samples will be collected and analyzed for PNAs.
A total of 42 samples will be collected and analyzed for lead.

Commercial Area 1
PRGs exceeded in Commercial Area 1 include Part 201 non-residential inhalation criteria for manganese.

- Delineation samples (4) will be collected around SS-105 for manganese.

Commercial Area2
PRGs are not exceeded in Commercial Area 2.

Commercial Area3
PRGs are not exceeded in Commercial Area 3.

Commercial Area 4
PRGs exceeded in Commercial Area 4 include Part 201 non-residential direct contact criteria for PCBs. Residential direct contact criteria is exceeded at locations within Commercial Area 4 for benzo(a)pyrene, lead and PCBs. The risked based PRG criteria for arsenic of 27 mg/kg was exceeded within Commercial Area 4.

Soil delineation by area as follows:

<u>Arsenic ONLY locations</u>:
SB-2012
- Allowance for 4 samples

Parking lot area south of Building 17
- Allowance for 60 samples

<u>Arsenic and Lead sample locations:</u>
TP-341
- Allowance for 4 samples

<u>Arsenic, PNAs and Lead sample locations:</u>
Former Substation Area/North of Mill Buildings
- Allowance for 30 samples

PCBs and Arsenic sample locations:
MW-16 Area
- Allowance for 18 samples

A total of 116 samples will be collected and analyzed for arsenic.
A total of 30 samples will be collected and analyzed for PNAs.
A total of 18 samples will be collected and analyzed for PCBs.
A total of 34 samples will be collected and analyzed for lead.

2.0 Mobilization/Set-Up

The following assumptions were made relative to the mobilization/set-up in each of the redevelopment areas and reflected in the cost estimate.

- Mobilization and set-up includes: mobilization of personnel and equipment; construction survey work (e.g., excavation layout and verification sample locations); and geotechnical and chemical testing on backfill materials.
  - An allowance of $8,000 to mobilize personnel and equipment was included in the estimate.
  - $30,000 for survey work was included in the estimate.
  - Geotechnical and chemical analysis for imported materials was included in the estimate. One set of chemical analysis [Target Analyte List Metals, Target Compound List (TCL) for volatile organic compounds, TCL for semi-volatile compounds, and polychlorinated biphenyl (PCBs) per material (topsoil, general fill and 21AA/gravel]. The topsoil sample will also be analyzed for pH, phosphorous, organic content, pesticides and herbicides.
- Health and Safety includes an on-Site Health and Safety Officer (HSO) for 4 months, the HSO will not stay on site during all restoration activities. Also included in the costs are: air monitoring equipment and calibration gases; a decontamination trailer; and disposable personal protection equipment (PPE).
- Air monitoring assumes real-time air monitoring will be conducted during all excavation work utilizing a photoionization detector (11.7 electronVolt [eV] lamp) and fugitive dust monitor(s). Air monitoring does not include the collection of samples for laboratory analysis or laboratory analytical costs.
- Erosion control includes an allowance for silt fence (4,000 LF) and geofabric to cover catch basins on the Site. Costs for erosion control measures specific to individual redevelopment areas (i.e., turbidity curtains, etc.) are included in individual redevelopment area estimates (e.g., Commercial Area 4). Erosion control (visqueen, hay bales etc.) for the staged consolidation pile(s) of soil and the relocated and staged gravel material area included here.
- Site facility costs include electrical hookup and electricity for two office trailers (one for the contractor and one for the U.S. EPA) for 5 months. Other temporary facilities include portable sanitary services, a drinking water allowance and a small dumpster for worker general refuse. The expense of one Site truck for the duration of the services was included.
- Site facility costs include materials and construction of temporary decontamination pads and decontamination stations for workers. It was assumed that potable water could be obtained from the City of Plainwell for use during the project.
- Site facility costs include $6,000 to for the installation and maintenance of a staging area for waste.
- A perimeter fence currently exists around the majority of the Site. The cost estimate assumes the fence will remain and can be utilized as a security measure to prevent access to the Site during construction activities.

3.0 Preparation/Pre-Excavation Work by Redevelopment Area

The following assumptions were made relative to the preparation/pre-excavation work in each of the redevelopment areas and reflected in the cost estimate.

- A Soil Erosion and Sedimentation Control Permit will be obtained from Allegan County. All other necessary permits will also be obtained prior to intrusive work at the Site.
- All areas where subsurface work is to be conducted will be cleared through a public utility locate (i.e., MISS Dig), a private utility locate, review of available drawings, and discussions with individuals knowledgeable of the Site and utilities located thereon.

Residential Area 1
Specific assumptions for preparation/pre-excavation work in Residential Area 1 under Remedial Alternative 2C are presented below.

- Trees and shrubs in the excavation areas will need to be cleared and grubbed.
- Turbidity curtain will be temporally installed in the Kalamazoo River during excavation and backfill activities.
- One power pole will need to be relocated for the excavation work around SB-104.

Residential Area 2
No specific assumptions for preparation/pre-excavation work in Residential Area 2 under Remedial Alternative 2C were utilized.

Residential Area 3
Specific assumptions for preparation/pre-excavation work in Residential Area 3 under Remedial Alternative 2C are presented below.

- MW-15 will be abandoned.
- Clearing will be required in the area around MW-15.

Residential Area 4
Specific assumptions for preparation/pre-excavation work in Residential Area 4 under Remedial Alternative 2C are presented below.

- Clearing will be required in the area around SB-301/SG-4.
- Pavement by TP-302 will be saw cut.

Waterfront Plaza
No specific assumptions for preparation/pre-excavation work in Waterfront Plaza under Remedial Alternative 2C were utilized.

Mixed Residential/Commercial Area 1
The specific assumption for preparation/pre-excavation work in Mixed Residential/Commercial Area 1 under Remedial Alternative 2C is presented below.

- Pavement in the work areas will be saw cut prior to excavation to leave a clean line for restoration activities.

Mixed Residential/Commercial Area 2

Specific assumptions for preparation/pre-excavation work in Mixed Residential/Commercial Area 2 under Remedial Alternative 2C are presented below.

- The loading dock at the south end of Building 1 will be evaluated by a structural engineering assessment to ensure excavation of the fuel oil line will not damage either the loading dock or Building 1.
- The pavement and concrete will be saw cut prior to excavation to create clean lines for restoration.
- A demolition notice will be submitted to the State of Michigan for the demolition of Building 5A/part of the coal tunnel. Asbestos abatement may be necessary on pipe wrap found outside of Building 5A.
- Excavation of soils under the concrete slabs of the demolished buildings (3A, 25 and 28) will require the relocation of the backfill (less than 3 feet thick) prior to excavation.
- Fuel Oil No. 6 within the former coal tunnel will be removed from the tunnel before the tunnel itself is removed.
- The piping run from the former Fuel Oil No. 6 AST and Building 5 will be exposed at one end and drained of any residual fuel oil prior to removing the line.
- Monitoring well MW-19 will be abandoned prior to excavation activities in this area.
- Monitoring well MW-22 will be abandoned prior to removal of the former fuel oil line.
- Monitoring well MW-2 will be abandoned prior to excavation activities at SB-2010 and SB-2011.

Commercial Area 1

No specific assumptions for preparation/pre-excavation work in Commercial Area 1 under Remedial Alternative 2C were utilized.

Commercial Area 2

No specific assumptions for preparation/pre-excavation work in Commercial Area 2 under Remedial Alternative 2C were utilized.

Commercial Area 3

No specific assumptions for preparation/pre-excavation work in Commercial Area 3 under Remedial Alternative 2C were utilized. Excavation work will not be conducted in Commercial Area 3 for Remedial Alternative 2C.

Commercial Area 4

Specific assumptions for preparation/pre-excavation work in Commercial Area 4 under Remedial Alternative 2C are presented below.

- Turbidity curtain will be installed in the Mill Race in the area by MW-16 (along the Mill Race) and in the area of MW-3 prior to excavation activities.
- Monitoring of the Mill Race and Kalamazoo River for turbidity will be conducted during excavation activities.
- MW-16 will be abandoned prior to excavation work in that area.
- Protection of MW-3 (barriers) will be installed.
- A structural engineering evaluation of the pedestrian bridge for stability during excavation activities will be conducted. The evaluation will determine if shoring of the bridge is necessary. An allowance of $5,000 is included in the estimate to conduct the evaluation. Shoring costs have not been included in the estimate.
- The water flow of the Mill Race will be diverted in the excavation area. The methodology for this work to be determined in the pre-design phase of the project.

- Rip rap along the Mill Race will be removed and staged for re-use.
- Pavement in the work areas will be saw cut prior to excavation to allow for restoration activities.

4.0 Excavation by Redevelopment Area

Conceptual excavation areas for each of the Redevelopment areas are shown of Figures 3.21 through 3.30 of the FS Report (Revision 1).

The following assumptions were made relative to excavation in each of the redevelopment areas and reflected in the cost estimate.

- Soil excavation quantities within the buildings are based on excavating horizontally by five feet in each direction and one-foot vertically beyond the sample location exceeding criteria.
- Excavation estimates assume dewatering will not be necessary and that all work can be completed in Level D PPE except Building 6A which will be conducted with supplied air (Level B) PPE.
- Standby time was not added to account for the time for laboratory analysis of verification samples. It was assumed that the project would proceed across the Site allowing for laboratory analysis to be conducted while another redevelopment area was being excavated or restored.

Specific assumptions to each redevelopment area, in addition to those presented above globally, are provided below.

Residential Area 1

Residential Area 1 is located at the far west end of the Site, where the majority of the former sludge dewatering lagoons were located. The former Mill wastewater treatment building, activated sludge tank and secondary clarifier were constructed over the lagoons. The wastewater treatment structures were demolished on behalf of the City of Plainwell in November and December 2013. The specific assumption for excavation in Residential Area 1 under Remedial Alternative 2C is presented below.

- Overburden present beyond the target excavation area that must be removed to achieve the full depth of excavation will be disposed of off-site.

Residential Area 2

Residential Area 2 is located between Residential Area 1 and Residential Area 3 and is positioned along the Kalamazoo River. This area was historically occupied by sludge dewatering lagoons (A, B, C) and a primary clarifier. The primary clarifier was demolished to the concrete slab in November 2013. No specific assumptions for excavation work in Residential Area 2 under Remedial Alternative 2C were utilized.

Residential Area 3

Residential Area 3 is located near the center of the Site. The former aeration basin location occupies the majority of the area. A former secondary clarifier was historically present in this area, which was demolished in November 2013 with the floor of the former clarifier remaining. This area was backfilled to surrounding grade, which was approximately 7-8 feet higher than the floor of the clarifier and aeration basin. Specific assumptions for excavation in Residential Area 3 under Remedial Alternative 2C are presented below.

- Material removed from the bottom of the aeration basin will require double handling due to the slopes of the former aeration basin and the depth of the excavation.

Residential Area 4
Residential Area 4 is positioned along the Kalamazoo River between Residential Area 3 and Mixed Residential Area 2. No aboveground structures are currently present on this area. A portion of this area was historically utilized by the Mill as a coal storage area. No specific assumptions for excavation in Residential Area 4 under Remedial Alternative 2C were made.

Waterfront Plaza
No excavation activities are anticipated in the Waterfront Plaza Area.

Mixed Residential/Commercial Area 1
Mixed Residential/Commercial Area 1 is located between Commercial Area 2 and Commercial Area 3 on the southern property line along Allegan Street. This area was once occupied by the former Specialty Minerals Building and associated above ground storage tanks. The Specialty Minerals building and ASTs were demolished to the concrete slab in December 2011.

- Underground utilities encountered (TP-303 and TP-306) between the former Specialty Minerals Building and the main Mill Buildings will be capped at either end of the excavation.

Mixed Residential and Commercial Area 2
Mixed Residential and Commercial Area 2 is located between Residential Area 4 and Commercial Area 4 at the northern end of the Site along the Kalamazoo River. The majority of the area is occupied by Mill Buildings and pavement. Buildings 3A, 25 and 28 along with the eastern water tower, 200,000-gallon Fuel Oil AST, and the brine USTs, were demolished on behalf of the City of Plainwell. The concrete slabs were left in place for Buildings 3A and 28. Building 25 was part of the Site's historical wastewater treatment system and had a subsurface vault and system to pump the waste water from the Mill to the onsite WWTP at the west end of the Site. The vault under the northern portion of Building 25 was not removed. The vault floor was cracked and the sidewalls removed to 4 feet below grade, then the vault was filled with imported general fill. The concrete slab under the remaining portion of Building 25 was left in place.

Specific assumptions for excavation in Mixed Residential/Commercial Area 2 under Remedial Alternative 2C are presented below.

- A storm sewer was installed through the west side of Mixed Residential/Commercial Area 2 in 2012 by the Michigan Department of Transportation (MDOT). The approximate location of the storm sewer is shown on Figure 3.26. Before conducting excavation work to remove the former fuel oil AST line and excavate the east side of the former fuel AST, the exact location of the storm sewer line will be determined, shoring of the line may be necessary during the removal of the fuel oil AST line.
- Soils in Building 6A will be removed using a vacuum extraction system.

Commercial Area 1
Commercial Area 1 is located in the far southwest portion of the Site. No structures or paved areas are currently present in this area that would require unique equipment or procedures to conduct the proposed remedial activities. This area of the Site has not been developed and was not part of historic Mill operations.

- A storm sewer was installed through this area in 2012 by the Michigan Department of Transportation (MDOT). The approximate location of the storm sewer is shown on Figure 3.27. Before conducting excavation work in the area of SS-105, the exact location of the line will be determined.

Commercial Area 2
Excavation work will not be conducted in Commercial Area 2 for Remedial Alternative 2C.

Commercial Area 3
Excavation work will not be conducted in Commercial Area 3 for Remedial Alternative 2C.

Commercial Area 4
Commercial Area 4 is located on the eastern side of the Site. The majority of this area is covered with either pavement, buildings (vacant and occupied) or former building concrete slabs. Buildings (9A, 9B, 9C, 9D, 9E, 9F, and 23) were demolished on behalf of the City of Plainwell in 2012, with the majority of the former building concrete slabs left in place and backfilled to surrounding grade. The basement areas were backfilled with a combination of crushed concrete (from the buildings on Site), soil from an adjacent retaining wall that was removed, and imported gravel material and vary in thickness from 6 feet to 9 feet. Specific assumptions for excavation in Commercial Area 4 under Remedial Alternative 2C are presented below.

- Access to both the former substation area and around MW-16 will be restricted due to the distance between existing structures and either the Kalamazoo River or the Mill Race. Excavated soils will likely need to be double handled.

5.0 Transportation and Disposal by Redevelopment Area

The following assumptions were made relative to the transportation and disposal of materials in each of the redevelopment areas and reflected in the cost estimate.

- Soil volumes were converted to tonnage assuming a ratio of 1.5 tons per cubic yard for soils. Tonnage for concrete was based on 1.65 tons per cubic yard of material. Waste has been categorized as non-hazardous and non-TSCA soils; TSCA soil; TSCA debris; and miscellaneous debris.
- Transportation and disposal pricing is based on the non-hazardous, non-TSCA material being accepted at Waste Management Autumn Hills Landfill in Zeeland, Michigan. A cost of $22.00 per ton for both transportation and disposal of non-hazardous, non-TSCA waste was used for the estimates.
- A disposal price of $135.00 per ton was used for TSCA soils. For estimation purposes it was assumed that the TSCA soils would be transported to the Environmental Quality Belleville, Michigan Landfill for direct landfill disposal. Transportation of the soils was assumed to be conducted in lined 50 ton gravel trains. Transportation of each load of 50 tons was assumed to cost $500.00.
- Transportation costs assume fuel prices for diesel will not exceed $4.00 per gallon.
- Organic material generated from clearing activities was assumed to be chipped and left on Site.
- Concrete and asphalt will be disposed of off-Site, not recycled.

Residential Area 1
The specific assumption for transportation and disposal work in Residential Area 1 under Remedial Alternative 2C is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 510 CY.
- Remaining waste targeted for excavation assumed suitable for on-site consolidation (425 CY).

Residential Area 2
The specific assumption for transportation and disposal work in Residential Area 2 under Remedial Alternative 2C is presented below.

- Waste was assumed suitable for on-site consolidation (620 CY).

Residential Area 3
The specific assumption for transportation and disposal work in Residential Area 2 under Remedial Alternative 2C is presented below.

- Waste was assumed suitable for on-site consolidation (1,655 CY).

Residential Area 4
The specific assumption for transportation and disposal work in Residential Area 3 under Remedial Alternative 2C is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 9,000 CY.
- Allowance of $600 for asphalt.

Waterfront Plaza
No specific assumptions for transportation and disposal work in Waterfront Plaza under Remedial Alternative 2C were utilized. Excavation activities will not be conducted within the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
Specific assumptions for transportation and disposal work in Mixed Residential/Commercial Area 1 under Remedial Alternative 2C are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 12 CY.
- Remaining waste targeted for excavation assumed suitable for on-site consolidation (58 CY).
- Allowance of 50 CY for asphalt disposal.

Mixed Residential/Commercial Area 2
Specific assumptions for transportation and disposal work in Mixed Residential/Commercial Area 2 under Remedial Alternative 2C are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil from Building 6A with a volume of 200CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from the coal tunnel area with a volume of 1,270 CY.
- Allowance of $3,500 for miscellaneous debris from the coal tunnel area (bricks, concrete)
- Waste was assumed to be non-hazardous, non-TSCA soil from the fuel oil line with a volume of 525 CY.
- Allowance of $600 for disposal of the fuel oil line piping
- Waste was assumed to be non-hazardous, non-TSCA soil from the fuel oil No. 6 AST area with a volume of 2,500 CY.
- Allowance of $1,200 for the concrete ring the Fuel Oil AST was sitting on and buried concrete and asphalt.
- Waste from the Train Shed was assumed to be suitable for on-site consolidation (205 CY).
- Waste was assumed to be non-hazardous, non-TSCA soil from the north end of the Mill Buildings (test pits-TP-340, TP-342 and TP-343) with a volume of 610 CY.
- Waste was assumed to be suitable from Buildings 3A, 25, 28 plus the area around SB-2010 and SB-2011 (860 CY).
- Allowance of $6,000 for miscellaneous debris from these areas at the north end of the Mill Building.

Commercial Area 1
Specific assumptions for transportation and disposal work in Commercial Area 1 under Remedial Alternative 2C are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 12 CY.

Commercial Area 2
No specific assumptions for transportation and disposal work in Commercial Area 2 under Remedial Alternative 2C were utilized. Excavation activities will not be conducted within the Commercial Area 2.

Commercial Area 3
No specific assumptions for transportation and disposal work in Commercial Area 3 under Remedial Alternative 2C were utilized. Excavation activities will not be conducted within the Commercial Area 3.

Commercial Area 4
Specific assumptions for transportation and disposal work in Commercial Area 4 under Remedial Alternative 2C are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil from the former substation area and north of the Mill Buildings with a volume of 1,300 CY.
- Waste was assumed to be suitable from north of the Mill Buildings 11, 11A and 19 (1,200 CY).
- Waste was assumed to be TSCA soil from the area around MW-16 with a volume of 4,660 CY.
- Waste was assumed to suitable for consolidation on-site from the area around BK5 (15 CY).
- Allowance of 400 CY of asphalt

6.0 Preparation of Consolidation Area and Consolidation of On-Site Soils

The conceptual area selected for on-site consolidation of suitable soils is located in Commercial Area 4 (Figure 4.1). The Buildings in this area were demolished in 2011 and the concrete floors were generally left in place (Building 9A has a section of its concrete floor removed). The basement areas were then backfilled with gravel to match the grade to the west and south of the buildings. The thickness of the gravel varies from 6-7 feet (near Allegan Street) to 9 feet (adjacent to the existing Buildings). The gravel material would be excavated to achieve a receiving area for the consolidated soils. Gravel will be staged nearby on the asphalt parking area within Commercial Areas 2 and 3. This area will not generally require remedial excavation activities and is close by to reduce efforts of relocating the gravel material. Erosion control around the relocated gravel will be established. Erosion control costs for this activity were included in the Mobilization Erosion Control Costs.

Based on the conditions identified in the General Notes, 5,050 CY of soil would be available for consolidation under Alternative 2C. The area selected for consolidation could accept approximately 8,500 CY of soil (using a 180 foot by 260 foot area). Material will come from Residential Area 1, Residential Area 2, Residential Area 3, Mixed Area 1, Mixed Area 2, Commercial Area 1 and Commercial Area 4. It was assumed that the material would all be excavated and staged together so that the time the receiving excavation would need to be left open was minimized.

The following specific assumptions for the consolidation area were utilized for the cost estimate:

- The consolidation area was 150 feet by 200 feet in size
- A set back of greater than 20 feet was included on all four sides of this consolidation area
- An average thickness of 5 feet of consolidated soils was allowed

- The relocated / consolidated material would be compacted in place to 95 percent of the proctor
- The gravel material left over after consolidation would be utilized by the City of Plainwell for redevelopment activities.

7.0 Capping On-Site Soils

The area utilized for consolidation of the on-Site soils was assumed to be 150 feet by 200 feet. The estimate allows for 10 percent waste of capping materials (liner and geotextile).

- A three foot cover system was assumed:
  1. A 40 mil LLDPE liner with 12 ounce geotextile will be placed over the material
     a. 33,000 SF of liner was included in the estimate
  2. General fill would be placed over the geotextile up to 6 inches of the surface
- 3. The existing gravel material would be placed on top (6 inches)
- The liner will not be anchored in
- The general fill would be compacted to 95 -98 percent of the proctor
- The gravel would be compacted to 98 percent of the proctor

8.0 Restoration by Redevelopment Area

The following assumption was made relative to Site restoration in each of the redevelopment areas and reflected in the cost estimate.

- Restoration activities include backfill (material and placement), compaction, compaction testing and any other location specific restoration that may be deemed necessary at this time (e.g. replacing a floor).
- General fill from a local gravel pit at a delivered material cost of $4.58 ton was used for the estimates. Unprocessed topsoil at a delivered price of $18.98 cubic yard was also used where appropriate.
- Restoration for the excavation areas include general fill backfill compacted to 92-95 percent of the proctor.
- A six-inch layer of unscreened topsoil will be placed over the compacted general fill in areas that were previously pervious (i.e. not paved or impervious). Topsoil will be hydroseeded including mulch.
- Restoration for excavation areas under pavement will be backfilled with general fill and compacted to 95 percent of the proctor.
- A six-inch layer of 21AA or equivalent will be placed on the compacted general fill and compacted to 95 percent or greater of the proctor where pavement will be installed.
- Asphalt will be replaced where removed during excavation activities.

<u>Residential Area 1</u>
Specific assumptions for Site restoration in Residential Area 1 under Remedial Alternative 2C are presented below.

- Backfill material will be imported general fill and overburden material removed to achieve excavation depth requirements but beyond the area exceeding PRGs.

<u>Residential Area 2</u>
No specific assumptions for Site restoration in Residential Area 2 under Remedial Alternative 2C were utilized.

Residential Area 3
Specific assumptions for Site restoration in Residential Area 3 under Remedial Alternative 2C are presented below.

- Backfill material will be imported general fill and overburden material removed to achieve excavation depth requirements but beyond the area exceeding cleanup criteria.
- MW-15 will be replaced.

Residential Area 4
No specific assumptions for Site restoration in Mixed Residential/Commercial Area 1 under Remedial Alternative 2C were utilized.

Waterfront Plaza
No specific assumptions for Site restoration in Waterfront Plaza under Remedial Alternative 2C were utilized. Restoration will not be required in the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
No specific assumptions for Site restoration in Mixed Residential/Commercial Area 1 under Remedial Alternative 2C were utilized.

Mixed Residential/Commercial Area 2
Specific assumptions for Site restoration in Mixed Residential/Commercial Area 2 under Remedial Alternative 2C are presented below.

- Building 6A currently has a dirt floor; restoration would not include a concrete floor.
- Concrete (former ash silos) will not be replaced at SB-2010.
- Concrete around the former 200,000 gallon fuel oil AST will not be replaced.
- Concrete removed for excavations at SB-216, SB-220, SB-222 and SB-223 will not be replaced.
- Additional backfill will be required to fill in the void space of the coal tunnel.
- MW-2, MW-19 and MW-22 will be replaced as necessary.

Commercial Area 1
No specific assumptions for Site restoration in Commercial Area 1 under Remedial Alternative 2C were utilized.

Commercial Area 2
No specific assumptions for Site restoration in Commercial Area 2 under Remedial Alternative 2C were utilized.

Commercial Area 3
No specific assumptions for Site restoration in Commercial Area 3 under Remedial Alternative 2C were utilized.

Commercial Area 4
Specific assumptions for Site restoration in Commercial Area 4 under Remedial Alternative 2C are presented below.

- Asphalt will be 3 inches thick.
- Geotextile and Rip rap will be installed along the Mill Race.
- The Mill Race will be returned to its normal flow path.

- The turbidity curtain will be removed from the Mill Race and Kalamazoo River.

9.0 Demobilization

The following assumptions were made relative to the demobilization from the Site and reflected in the cost estimate.

- Costs included in the demobilization task include time for Site tear down and final decontamination of equipment, and demobilization of equipment and personnel. Demobilization activities were assumed to take five working days.

B. <u>ENGINEERING/OVERSIGHT</u>

1.0 Engineering/Design

The following assumption was made relative to the installation of engineering/design and reflected in the cost estimate.

- Engineering and project design/specifications were estimated to be 15 percent of the Construction Costs.

2.0 Construction Oversight

The following assumption was made relative to the construction oversight and reflected in the cost estimate.

- Construction oversight was estimated to be 10 percent of the Construction Costs.

TABLE D.3A

COST SUMMARY
REMEDIAL ALTERNATIVE 3A – EXCAVATION AND OFF-SITE DISPOSAL TO RESIDENTIAL CRITERIA
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost*	
					Subtotal	*Total*
CAPITAL COSTS						
A.	***PRE-DESIGN***					**$33,200**
1.0	Sampling and Analysis Work Plan (SAP)	LS	1	$25,000	$25,000	
	Survey top of banks at Site	LS	1	$2,000	$2,000	
	Health and Safety Plan Update	LS	1	$1,200	$1,200	
	Multi-Area Quality Assurance Project Plan	LS	1	$5,000	$5,000	
2.0	SAP Implementation					**$197,900**
	Project Set up (mark locations etc.)	LS	1	$8,790	$8,800	
	Private Utility Locate	LS	1	$8,000	$8,000	
	Field Activities	DA	41	$2,900	$118,900	
	Field Technicians					
	Sampling Equipment (push probe technology)					
	Expendables (PPE etc)					
	Temporary Lighting and Carbon Monoxide Control	LS	1	$6,000	$6,000	
	Concrete Coring	LS	1	$6,000	$6,000	
	Laboratory Analysis	LS	1	$48,070	$48,100	
	Investigation Derived Waste Disposal	DA	41	$50	$2,100	
3.0	Contingency Sampling and Analysis	LS	1	$114,280	$114,300	**$114,300**
	Based on 50 % of SAP costs					
4.0	Remedial Action Plan	LS	1	$50,000	$50,000	**$50,000**
	TOTAL PRE-DESIGN COSTS					**$395,400**
B.	***CONSTRUCTION***					
1.0	**Mobilization and Set up**					**$431,800**
	Mobilization and Set up	LS	1	$45,700	$45,700	
	Health and Safety	Monthly	10	$28,450	$284,500	
	Erosion Control	LS	1	$16,060	$16,100	
	Site Facilities					
	Temporary Facilities	Monthly	10	$6,810	$68,100	
	Decontamination Pad and Stations	LS	1	$17,375	$17,400	
2.0	**Additional Preparation and/or Demolition (by Redevelopment Area)**					**$363,800**
	Residential 1	LS	1	$17,282	$17,300	
	Residential 2	LS	1	-	-	
	Residential 3	LS	1	$1,225	$1,200	
	Residential 4	LS	1	$850	$900	
	Waterfront Plaza	LS	1	-	-	
	Mixed Residential/Commercial Area 1	LS	1	$2,914	$2,900	
	Mixed Residential/Commercial Area 2	LS	1	$181,117	$181,100	
	Commercial Area 1	LS	1	$1,981	$2,000	
	Commercial Area 2	LS	1	$16,170	-	
	Commercial Area 3	LS	1	$1,165	-	
	Commercial Area 4	LS	1	$158,447	$158,400	

TABLE D.3A

COST SUMMARY
REMEDIAL ALTERNATIVE 3A – EXCAVATION AND OFF-SITE DISPOSAL TO RESIDENTIAL CRITERIA
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost* *Subtotal*	*Total*
3.0	**Excavation (by Redevelopment Area)**					**$946,700**
	Residential 1	CY	3,275	$9	$28,400	
	Residential 2	CY	655	$11	$7,100	
	Residential 3	CY	1,665	$10	$16,800	
	Residential 4	CY	9,950	$3	$30,000	
	Waterfront Plaza	CY	-	-	-	
	Mixed Residential/Commercial Area 1	CY	1,060	$18	$18,600	
	Mixed Residential/Commercial Area 2	CY	7,670	$32	$243,700	
	Commercial Area 1	CY	2,215	$6	$13,000	
	Commercial Area 2	CY	3,000	$52	$156,900	
	Commercial Area 3	CY	5,765	$5	$27,100	
	Commercial Area 4	CY	16,115	$25	$405,100	
4.0	**Transportation and Disposal (by Redevelopment Area)**					**$2,709,665**
	Residential 1 - Non Haz Non TSCA Soils	Ton	4,925	$22	$108,400	
	Residential 2 - Non Haz Non TSCA Soils	Ton	980	$22	$21,600	
	Residential 3 - Non Haz Non TSCA Soils	Ton	2,500	$22	$55,000	
	Residential 4 - Non Haz Non TSCA Soils	Ton	14,925	$22	$328,400	
	Residential 4 - Misc Debris	LS	1		$600	
	Waterfront Plaza - Non Haz Non TSCA Soils	Ton	-	$22	-	
	Mixed Residential/Commercial Area 1 - Non Haz Non TSCA Soils	Ton	1,590	$22	$35,000	
	Mixed Residential/Commercial Area 1 - Misc. Debris	LS	-	$1,675	$1,675	
	Mixed Residential/Commercial Area 2 - Non Haz Non TSCA Soils	Ton	11,505	$22	$252,400	
	Mixed Residential/Commercial Area 2 - Misc. Debris	LS	1		$18,995	
	Commercial Area 1 - Non Haz Non TSCA Soils	Ton	3,325	$22	$73,200	
	Commercial Area 2 - Non Haz Non TSCA Soils	Ton	4,500	$22	$99,000	
	Commercial Area 2 - Misc. Debris	LS	1		$5,825	
	Commercial Area 3 - Non Haz Non TSCA Soils	Ton	8,645	$22	$190,200	
	Commercial Area 3 - Misc. Debris	LS	1		$1,750	
	Commercial Area 4 - Non Haz Non TSCA Soils	Ton	17,185	$22	$378,100	
	Commercial Area 4 - Misc. Debris	LS	-		$23,020	
	Commercial Area 4 - TSCA	Ton	7,000	$160	$1,116,500	
7.0	**Restoration (by Redevelopment Area)**					**$1,139,565**
	Residential 1	LS	1		$64,950	
	Residential 2	LS	1		$17,800	
	Residential 3	LS	1		$31,975	
	Residential 4	LS	1		$152,050	
	Waterfront Plaza	LS	-		-	
	Mixed Residential/Commercial Area 1	LS	1		$41,140	
	Mixed Residential/Commercial Area 2	LS	1		$209,125	
	Commercial Area 1	LS	1		$32,950	
	Commercial Area 2	LS	1		$104,275	
	Commercial Area 3	LS	1		$132,210	
	Commercial Area 4	LS	1		$353,090	

TABLE D.3A

COST SUMMARY
REMEDIAL ALTERNATIVE 3A – EXCAVATION AND OFF-SITE DISPOSAL TO RESIDENTIAL CRITERIA
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost* *Subtotal*	*Total*
8.0	**Demobilization**	LS	1	$26,550		**$26,600**
	Decontamination and Demobilization					
	TOTAL CONSTRUCTION COST					**$5,618,130**
C.	***ENGINEERING/OVERSIGHT***					
1.0	**Institutional Controls**					**$50,000**
2.0	**Engineering/ Design (15 % of Construction Costs)**					**$842,700**
3.0	**Construction Oversight (10 % of Construction Costs)**					**$561,800**
	TOTAL ENGINEERING/OVERSIGHT COSTS					**$1,454,500**
	CONTINGENCY ON CAPITAL COSTS (25 %)					**$1,768,158**
	TOTAL CAPITAL COSTS					**$8,840,788**
OPERATION, MAINTENANCE, & MONITORING COSTS						
A.	***ANNUAL MONITORING AND MAINTENANCE***					**$2,400**
	Monthly Operation and Maintenance of System	Month	12	$200	$2,400	
	CONTINGENCY ON OM & M COSTS (20 %)					**$480**
	TOTAL CAPITAL COSTS					**$8,840,788**
	NET PRESENT VALUE OF OM & M (30 YEARS @ 7 % DISCOUNT RATE)					**$35,738**
	TOTAL COST					**$8,876,525**

Table D.3A

COST SUMMARY NOTES
REMEDIAL ALTERNATIVE 3A – EXCAVATION AND OFF-SITE DISPOSAL TO RESIDENTIAL CRITERIA
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

GENERAL NOTES

A. Estimate for Remedial Alternative 3A - Excavation and Off-Site Disposal to Residential Criteria has been prepared based on available information at the time of this document. Redevelopment activities conducted, being conducted and anticipated for the Site by the City of Plainwell may affect the remediation costs. Costs presented in the Feasibility Study (FS) Report have taken into consideration anticipated redevelopment plans by the City of Plainwell. Redevelopment plans include demolition of non-historical buildings to the concrete slab as well as specific land use restrictions/designations for the Site as presented on Figure 1.2 of the FS Report. This cost estimate is expected to be within -30 percent to +50 percent of the actual remedial costs in accordance with United States Environmental Protection Agency (USEPA) guidance.

B. Remediation activities for each of the 11 proposed redevelopment areas were estimated separately; however, the estimate assumes one mobilization and demobilization effort to conduct the work.

C. The cost estimate assumes that new structures have not been constructed in areas that are planned for soil excavation and existing structures remain in place.

D. The cost estimate includes abandonment and replacement costs of groundwater monitoring wells within excavation areas.

E. Costs are based on 2013 dollars.

F. All volumes are based on in-place measures unless otherwise stated.

G. Abbreviations used in the "Unit" column in the Cost Estimate Table are as follows:
   - CY = Cubic Yard
   - EA = Each
   - LS = Lump Sum
   - TN = Ton
   - LF= linear foot

TASK NOTES:

CAPITAL COSTS

A. INVESTIGATION/CONSTRUCTION

1.0 Pre-Design Investigation (PDI) Activities

The following assumptions were made relative to the PDI activities in each of the redevelopment areas and reflected in the cost estimate.

- Generation of a Sampling and Analysis Plan (SAP).
- Update the Health and Safety Plan as necessary.
- Update the Multi-Area Quality Assurance Project Plan as necessary.
- Completion of the SAP - soil boring installation and soil sample collection to delineate the horizontal extent of impact. Soil borings are assumed to be collected via direct push method. PDI samples will be collected and submitted for laboratory analysis for specific parameters determined to exceed

Preliminary Remediation Goals (PRGs) during the Remedial Investigation (RI). It is assumed that the vertical extent of the impacted soil is already established by the samples collected during the Remedial Investigation (RI).

- Quality Assurance/Quality Control samples are included on a 1 per 10 basis.
- A survey of the "top of bank" is included in the PDI cost estimate.
- All areas where subsurface work is to be conducted will be cleared through a public utility locate (i.e., MISS Dig), a private utility locate, review of available drawings, and discussions with individuals knowledgeable of the Site and utilities located thereon.

Residential Area 1
PRGs exceeded in Residential Area 1 include Part 201 non-residential and residential direct contact criteria for arsenic. Soil samples will be collected to delineate the extent of soil impacted with PCBs adjacent to the storm sewer line installed by the Michigan Department of Transportation (MDOT) in 2012.

- Allowance for 30 soil samples for PCBs
- Allowance for 132 soil samples for arsenic

Residential Area 2
The PRG exceeded in Residential Area 2 is Part 201 residential direct contact criteria for arsenic.

- Allowance for 48 soil samples for arsenic

Residential Area 3
The PRG exceeded in Residential Area 3 is Part 201 residential direct contact criteria for arsenic.

- Allowance for 60 soil samples for arsenic

Residential Area 4
PRGs exceeded in Residential Area 4 include Part 201 non-residential direct contact criteria for arsenic, lead and PCBs. Residential direct contact criteria is exceeded at locations within Residential Area 4 for arsenic, benzo(a)pyrene, cyanide, dibenz(a,h)anthracene, lead and PCBs. Residential soil volatilization to indoor air inhalation criteria (SVIIC) was exceeded at one location for benzene.

- An allowance for 56 soil samples for arsenic
- Benzene above the residential SVIIC at TP-308
- An allowance for 4 soil samples for benzene was included in the estimate.
- Cyanide was above residential direct contact criteria at SB-302 in the shallow (0-1 foot) interval
    - Four samples for cyanide were included in the estimate
- An allowance for 20 samples for lead was included in the estimate
- PCBs were above criteria at TP-313 and SB-301
    - An allowance for 16 soil samples for PCBs was included in the estimate
- The PNA parameters were identified in shallow samples (0-1.5 feet) below grade at DG3, DG4 and TP-302
    - Allowance for 12 PNA samples

Waterfront Plaza
PDI activities will not be specifically conducted within the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
PRGs exceeded in Mixed Residential/Commercial Area 1 include Part 201 non-residential inhalation criteria for manganese and residential direct contact criteria for arsenic.

- Delineation samples will be collected around eight locations (SB-334, SB-336, SB-337, SB-338, SB-339, TP-303, TP-306, TP-334).
- A total of 62 soil samples for arsenic will be collected.
- Soil samples will be collected from 3 depth intervals from 22 of the 30 borings proposed for this area.
- Soil samples for arsenic analysis will be collected from two depth intervals from four borings around TP-334 for manganese.

Mixed Residential/Commercial Area 2
PRGs exceeded in Mixed Residential/Commercial Area 2 include Part 201 non-residential direct contact criteria for arsenic, benzo(a)pyrene, and lead. Residential direct contact criteria is exceeded at locations within Mixed Residential/Commercial Area 2 for arsenic, benzo(a)pyrene, dibenz(a,h)anthracene; benzo(a)anthracene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene and lead.

Soil delineation by Building / work area as follows:

Arsenic ONLY locations:
Building 1
- Allowance for 13 samples

Building 1A
- Allowance for 8 samples

Building 2
- Allowance for 8 samples

Building 3
- Allowance for 8 samples

Building 4A
- Allowance for 4 samples

Building 5
- Allowance for 8 samples

Building 5B
- Allowance for 7 samples
- Soil borings around SB-231 will be completed manually

Building 6
- Allowance for 8 samples

Building 25
- Allowance for 8 samples

Building 28
- Allowance for 8 samples

Train Shed
- Allowance for 4 samples

Coal Tunnel Area
- Allowance for 30 samples

Former Ash Silo Area (SB-2010 and SB-2011)
- Allowance for 12 samples

Former clarifier area (TP-344)
- Allowance for 8 samples

Area north of Building 3/Former Water Tower Area (TP-340, TP-342, TP-343)
- Allowance for 16 samples

Arsenic and Lead sample locations:
Building 7
- Allowance for 6 samples for lead
- Allowance for 8 samples for arsenic

Area around SB-2013
- Allowance for 12 samples

Arsenic, PNAs and Lead sample locations:
Building 3A
- Allowance for 12 samples

Building 6A
- Allowance for 18 samples
- Technicians will be required to don respirators for this work

Arsenic and PNAs sample locations
Fuel Oil AST Area
- Allowance for 24 PNA soil samples
- Allowance for 12 arsenic samples

A total of 200 samples will be collected and analyzed for arsenic.
A total of 54 samples will be collected and analyzed for PNAs.
A total of 36 samples will be collected and analyzed for lead.

Commercial Area 1
PRGs exceeded in Commercial Area 1 include Part 201 non-residential inhalation criteria for manganese and the residential direct contact for arsenic.

- Delineation samples will be collected around 5 locations (SB-133, SB-144, SS-103, SS-105 and SS-106).
- Soil samples will be collected from the 0-2 foot below grade interval at SS-103, SS-105 and SS-106 and analyzed for arsenic. Samples from SS-105 will also be analyzed for manganese.
- Soil samples will be collected from the 0-2 and 7-9 foot interval for SB-133 and SB-144 and analyzed for arsenic.

Commercial Area 2
PRGs exceeded in Residential Area 1 include Part 201 non-residential and residential direct contact criteria for arsenic.

- Delineation samples were note proposed for indoor exceedances (SB-326, SB-237, SB-340) because this portion of the building is in operation as the Plainwell Public Safety Building.
- Four borings within the garage portion of the Public Safety Building were included in the estimate – 12 samples for arsenic included in the estimate.
- 24 additional samples would be collected for arsenic from areas outside of the building footprint (around TP-316, TP-321, TP-324 and TP-325)

Commercial Area 3
The PRG exceeded in Commercial Area 3 is Part 201 residential direct contact criteria for arsenic.

- Allowance for 48 soil samples for arsenic

Commercial Area 4
PRGs exceeded in Commercial Area 4 include Part 201 non-residential direct contact criteria for arsenic, and PCBs. Residential direct contact criteria is exceeded at locations within Commercial Area 4 for arsenic,

benzo(a)pyrene, lead and PCBs. The non-residential inhalation criterion for manganese is exceeded at one location.

Soil delineation by Building / work area as follows:

Arsenic ONLY locations:

Building 9A
- Allowance for 40 samples

Building 9B
- Allowance for 8 samples

Building 9E
- Allowance for 8 samples

Building 9F
- Allowance for 16 samples

Building 10
- Allowance for 8 samples

Building 11A
- Allowance for 24 samples

Building 12
- Allowance for 23 samples
- Can only get three borings in position around SB-2008

Building 15
- Allowance for 4 samples

Building 16
- Allowance for 11 samples
- SB-289 and SB-290 close together and shallow interval

Building 17
- Allowance for 20 samples

Building 19
- Allowance for 4 samples

Building 23
- Allowance for 16 samples

SB-2012
- Allowance for 4 samples

Parking lot area south of Building 17
- Allowance for 60 samples

Arsenic and Lead sample locations:

TP-341
- Allowance for 4 samples

Arsenic and Manganese sample locations:

Building 10
- Allowance for 8 samples

Arsenic, PNAs and Lead sample locations:

Former Substation Area/North of Mill Buildings
- Allowance for 30 samples

PCBs and Arsenic sample locations:

MW-16 Area
- Allowance for 18 samples

A total of 306 samples will be collected and analyzed for arsenic.
A total of 30 samples will be collected and analyzed for PNAs.
A total of 18 samples will be collected and analyzed for PCBs.
A total of 8 samples will be collected and analyzed for manganese.
A total of 34 samples will be collected and analyzed for lead.

2.0 Mobilization/Set-Up

The following assumptions were made relative to the mobilization/set-up in each of the redevelopment areas and reflected in the cost estimate.

- Mobilization and set-up includes: mobilization of personnel and equipment; construction survey work (e.g., excavation layout and verification sample locations); and geotechnical and chemical testing on backfill materials.
  - An allowance of $8,000 to mobilize personnel and equipment was included in the estimate.
  - $30,000 for survey work was included in the estimate.
  - Geotechnical and chemical analysis for imported materials was included in the estimate. One set of chemical analysis [Target Analyte List Metals, Target Compound List (TCL) for volatile organic compounds, TCL for semi-volatile compounds, and polychlorinated biphenyl (PCBs) per material (topsoil, general fill and 21AA/gravel]. The topsoil sample will also be analyzed for pH, phosphorous, organic content, pesticides and herbicides.
- Health and Safety includes an on-Site Health and Safety Officer (HSO) for the duration of the services (10 months). Also included in the costs are: air monitoring equipment and calibration gases; a decontamination trailer; and disposable personal protection equipment (PPE).
- Air monitoring assumes real-time air monitoring will be conducted during all excavation work utilizing a photoionization detector (11.7 electronVolt [eV] lamp) and fugitive dust monitor(s). Air monitoring does not include the collection of samples for laboratory analysis or laboratory analytical costs.
- Erosion control includes an allowance for silt fence (4,000 LF) and geofabric to cover catch basins on the Site. Costs for erosion control measures specific to individual redevelopment areas (i.e., turbidity curtains, etc.) are included in individual redevelopment area estimates (e.g., Commercial Area 4).
- Site facility costs include electrical hookup and electricity for two office trailers (one for the contractor and one for the USEPA) for 10 months. Other temporary facilities include portable sanitary services, a drinking water allowance and a small dumpster for worker general refuse. The expense of one Site truck for the duration of the services was included.
- Site facility costs include materials and construction of temporary decontamination pads and decontamination stations for workers. It was assumed that potable water could be obtained from the City of Plainwell for use during the project.
- Site facility costs include $6,000 to for the installation and maintenance of a staging area for waste.
- A perimeter fence currently exists around the majority of the Site. The cost estimate assumes the fence will remain and can be utilized as a security measure to prevent access to the Site during construction activities.

3.0 Preparation/Pre-Excavation Work by Redevelopment Area

The following assumptions were made relative to the preparation/pre-excavation work in each of the redevelopment areas and reflected in the cost estimate.

- A Soil Erosion and Sedimentation Control Permit will be obtained from Allegan County. All other necessary permits will also be obtained prior to intrusive work at the Site.

- All areas where subsurface work is to be conducted will be cleared through a public utility locate (i.e., MISS Dig), a private utility locate, review of available drawings, and discussions with individuals knowledgeable of the Site and utilities located thereon.

Residential Area 1
Specific assumptions for preparation/pre-excavation work in Residential Area 1 under Remedial Alternative 3A are presented below.

- MW-14 will be abandoned.
- The fence adjacent to MW-14 will need to be removed and replaced after restoration activities are complete.
- Trees and shrubs in the excavation areas will need to be cleared and grubbed.
- Turbidity curtain will be temporally installed in the Kalamazoo River during excavation and backfill activities.
- One power pole will need to be relocated for the excavation work around SB-104.

Residential Area 2
No specific assumptions for preparation/pre-excavation work in Residential Area 2 under Remedial Alternative 3A were utilized.

Residential Area 3
Specific assumptions for preparation/pre-excavation work in Residential Area 3 under Remedial Alternative 3A are presented below.

- MW-15 will be abandoned.
- Clearing will be required in the area around MW-15.

Residential Area 4
Specific assumptions for preparation/pre-excavation work in Residential Area 4 under Remedial Alternative 3A are presented below.

- Clearing will be required in the area around SB-301/SG-4.
- Pavement by TP-302 will be saw cut.

Waterfront Plaza
No specific assumptions for preparation/pre-excavation work in Waterfront Plaza under Remedial Alternative 3A were utilized.

Mixed Residential/Commercial Area 1
The specific assumption for preparation/pre-excavation work in Mixed Residential/Commercial Area 1 under Remedial Alternative 3A is presented below.

- Pavement and concrete in the work areas will be saw cut prior to excavation to leave a clean line for restoration activities.

Mixed Residential/Commercial Area 2
Specific assumptions for preparation/pre-excavation work in Mixed Residential/Commercial Area 2 under Remedial Alternative 3A are presented below.

Inside the Buildings:

- A renovation notice will be submitted to the State of Michigan to comply with Federal Clean Air Act National Emission Standards for Hazardous Air Pollutants (NESHAP) requirements. The notice will

include all areas/asbestos within the Mill Buildings scheduled for removal during the remediation efforts.

- Asbestos abatement will need to be conducted primarily due to thermal system insulation on the piping within Buildings 5, 6 and 6A. Asbestos is also present on the boilers housed within Buildings 5 and 6. The asbestos is in poor, heavily damaged condition throughout these buildings.
- A structural engineering evaluation of the elevator in Building 1 will be conducted to ensure that the soil (SB-212) can be removed without compromising the elevator shaft.
- A structural engineering evaluation of the northeast corner of Building 1 will be completed before conducting excavation work in this area (SB-214).
- The loading dock at the south end of Building 1 will be evaluated by a structural engineering evaluation to ensure excavation of the fuel oil line will not damage either the loading dock or Building 1.
- A structural engineering evaluation of the historical western wall of Building 9 will be conducted to ensure excavation activities near this wall will not jeopardize the integrity of the wall.
- A structural engineering evaluation will be completed before conducting the excavation work in Buildings 5 and 6. The evaluation will determine a shoring methodology for ensuring the boiler footing/supports are not compromised during excavation activities.
- Excavations within Buildings 2, 3 and 7 will require the removal of structures within the buildings (e.g., equipment pads).
- Abandoned mill equipment (various chemical tanks [biocides, water softener, etc.], compressors and pumps, will need to be removed from Buildings 2, 5, 6, and 7 prior to excavation activities. Liquids remaining in the vessels will be removed, containerized, characterized and prepared for off-site disposal at a licensed facility as appropriate.
- The concrete floor will be saw cut prior to excavation (concrete will be broke out during excavation – but saw cut first to create clean lines for restoration).

Outdoor Areas:

- A demolition notice will be submitted to the State of Michigan for the demolition of Building 5A/part of the coal tunnel. Asbestos abatement may be necessary on pipe wrap found outside of Building 5A.
- Excavation of soils under the concrete slabs of the demolished buildings (3A, 25 and 28) will require the relocation of the backfill (less than 3 feet thick) prior to excavation.
- Fuel Oil No. 6 within the former coal tunnel will be removed from the tunnel before the tunnel itself is removed.
- The piping run from the former Fuel Oil No. 6 AST and Building 5 will be exposed at one end and drained of any residual fuel oil prior to removing the line.
- Monitoring well MW-19 will be abandoned prior to excavation activities in this area.
- Monitoring well MW-22 will be abandoned prior to removal of the former fuel oil line.
- Monitoring well MW-2 will be abandoned prior to excavation activities at SB-2010 and SB-2011.

Commercial Area 1

Specific assumptions for preparation/pre-excavation work in Commercial Area 1 under Remedial Alternative 3A are presented below.

- Limited clearing and grubbing will be performed in the area around SS-106 and SB-144.

Commercial Area 2

Specific assumptions for preparation/pre-excavation work in Commercial Area 2 under Remedial Alternative 3A are presented below.

- Significant pre-excavation preparation is required due to the presence of the City of Plainwell Public Safety Building above the areas to be excavated, including relocating cabinetry, furnishings and flooring.
- Saw cutting of the concrete floor is required to gain access to the soils.

Commercial Area 3

Specific assumptions for preparation/pre-excavation work in Commercial Area 3 under Remedial Alternative 3A are presented below.

- Monitoring well MW-18 will be abandoned prior to excavation activities in this area.
- Pavement within the work area around MW-18 will be saw cut.

Commercial Area 4

Specific assumptions for preparation/pre-excavation work in Commercial Area 4 under Remedial Alternative 3A are presented below.

Inside the Buildings:

- A renovation notice will be submitted to the State of Michigan to comply with Federal Clean Air Act National Emission Standards for Hazardous Air Pollutants (NESHAP) requirements. The notice will include all areas/asbestos within the Mill Buildings scheduled for removal during the remediation efforts.
- Limited asbestos abatement will need to be conducted within the excavation areas/surrounding areas due to thermal system insulation on the piping.
- Excavations within Buildings 10, 11A, and 15 will require the removal of structures within the buildings (e.g., electrical panel, paper stock tanks, and internal walls).
- Abandoned mill equipment will need to be removed from Buildings 16 and 12 prior to excavation activities. Oil in the equipment in both areas contains polychlorinated biphenyls (PCBs). The waste would be disposed of at a licensed TSCA facility.
- The concrete floor will be saw cut prior to excavation.

Outdoor Areas:

- Excavation of soils under the concrete slabs of the demolished buildings will require the relocation of backfill placed within the former basement cavities to surrounding grade (up to 9 feet thick) prior to excavation. An allowance for 5 working days to complete this work was included in the estimate at a cost of $20,400.
- Turbidity curtain will be installed in the Mill Race in the area by MW-16 (along the Mill Race) and in the area of MW-3 prior to excavation activities.
- Monitoring of the Mill Race and Kalamazoo River for turbidity will be conducted during excavation activities.
- MW-16 will be abandoned prior to excavation work in that area.
- Protection of MW-3 (barriers) will be installed.
- A structural engineering evaluation of the pedestrian bridge for stability during excavation activities will be conducted. The evaluation will determine if shoring of the bridge is necessary. An allowance of $5,000 is included in the estimate to conduct the evaluation. Shoring costs have not been included in the estimate.
- The water flow of the Mill Race will be diverted in the excavation area. The methodology for this work to be determined in the pre-design phase of the project.
- Rip rap along the Mill Race will be removed and staged for re-use.
- Pavement in the work areas will be saw cut prior to excavation to allow for restoration activities.

4.0 Excavation by Redevelopment Area

Conceptual excavation areas for each of the Redevelopment areas are shown of Figures 3.1 through 3.10 of the FS Report (Revision 1).

The following assumptions were made relative to excavation in each of the redevelopment areas and reflected in the cost estimate.

- Soil excavation quantities within the buildings are based on excavating horizontally by five feet in each direction and one-foot vertically beyond the sample location exceeding criteria.
- Excavation estimates assume dewatering will not be necessary and that all work can be completed in Level D PPE except Building 6A which will be conducted with supplied air (Level B) PPE.
- Standby time was not added to account for the time for laboratory analysis of verification samples. It was assumed that the project would proceed across the Site allowing for laboratory analysis to be conducted while another redevelopment area was being excavated or restored.
- All work conducted within Site buildings will require an independent power supply, with the exception of Building 17.

Specific assumptions to each redevelopment area, in addition to those presented above globally, are provided below.

Residential Area 1

Residential Area 1 is located at the far west end of the Site, where the majority of the former sludge dewatering lagoons were located. The former Mill wastewater treatment building, activated sludge tank and secondary clarifier were constructed over the lagoons. The wastewater treatment structures were demolished on behalf of the City of Plainwell in November and December 2013. The specific assumption for excavation in Residential Area 1 under Remedial Alternative 3A is presented below.

- Overburden present beyond the target excavation area that must be removed to achieve the full depth of excavation will be disposed of off-site.

Residential Area 2

Residential Area 2 is located between Residential Area 1 and Residential Area 3 and is positioned along the Kalamazoo River. This area was historically occupied by sludge dewatering lagoons (A, B, C) and a primary clarifier. The primary clarifier was demolished to the concrete slab in November 2013. The specific assumption for excavation in Residential Area 2 under Remedial Alternative 3A is presented below.

- Overburden present beyond the target excavation area that must be removed to achieve the full depth of excavation can be staged and used for backfill from the area around SB-1.

Residential Area 3

Residential Area 3 is located near the center of the Site. The former aeration basin location occupies the majority of the area. A former secondary clarifier was historically present in this area, which was demolished in November 2013 with the floor of the former clarifier remaining. This area was backfilled to surrounding grade, which was approximately 7-8 feet higher than the floor of the clarifier and aeration basin. Specific assumptions for excavation in Residential Area 3 under Remedial Alternative 3A are presented below.

- Material removed from the bottom of the aeration basin will require double handling due to the slopes of the former aeration basin and the depth of the excavation.

Residential Area 4

Residential Area 4 is positioned along the Kalamazoo River between Residential Area 3 and Mixed Residential Area 2. No aboveground structures are currently present on this area. A portion of this area was historically utilized by the Mill as a coal storage area. No specific assumptions for excavation in Residential Area 4 under Remedial Alternative 3A were made.

Waterfront Plaza

No excavation activities are anticipated in the Waterfront Plaza Area.

Mixed Residential/Commercial Area 1

Mixed Residential/Commercial Area 1 is located between Commercial Area 2 and Commercial Area 3 on the southern property line along Allegan Street. This area was once occupied by the former Specialty Minerals Building and associated above ground storage tanks. The Specialty Minerals building and ASTs were demolished to the concrete slab in December 2011.

- Underground utilities encountered (TP-303, TP-306) between the former Specialty Minerals Building and the main Mill Buildings will be capped at either end of the excavation.

Mixed Residential and Commercial Area 2

Mixed Residential and Commercial Area 2 is located between Residential Area 4 and Commercial Area 4 at the northern end of the Site along the Kalamazoo River. The majority of the area is occupied by Mill Buildings and pavement. Buildings 3A, 25 and 28 along with the eastern water tower, 200,000-gallon Fuel Oil AST, and the brine USTs, were demolished on behalf of the City of Plainwell. The concrete slabs were left in place for Buildings 3A and 28. Building 25 was part of the Site's historical wastewater treatment system and had a subsurface vault and system to pump the waste water from the Mill to the onsite WWTP at the west end of the Site. The vault under the northern portion of Building 25 was not removed. The vault floor was cracked and the sidewalls removed to 4 feet below grade, then the vault was filled with imported general fill. The concrete slab under the remaining portion of Building 25 was left in place.

Redevelopment plans by the City of Plainwell include the demolition of Buildings 1A, 4, 4A, 5, 5A, 5B, 6, 6A, 7 and the Train Shed; however, there are no plans currently to implement this work. Therefore excavation costs assume the buildings will be in place during this work. Specific assumptions for excavation in Mixed Residential/Commercial Area 2 under Remedial Alternative 3A are presented below.

- A storm sewer was installed through the west side of Mixed Residential/Commercial Area 2 in 2012 by the Michigan Department of Transportation (MDOT). The approximate location of the storm sewer is shown on Figure 3.6. Before conducting excavation work to remove the former fuel oil AST line and excavate the east side of the former fuel AST, the exact location of the storm sewer line will be determined, shoring of the line may be necessary during the removal of the fuel oil AST line.
- Excavations within Buildings 1, 1A, 2, 3, 4A, 5, 5B, 6, 7 and 9 will require mini-equipment.
- Soils in Building 6A will be removed using a vacuum extraction system.
- Removal of the soils in Building 4A/5B at SB-231 will require manual labor.
- Excavation work within the buildings will require temporary lighting and mechanical means to remove carbon dioxide generated by running equipment from the work areas/building.
- All waste removed from the excavation areas within the buildings will need to be double handled.

Commercial Area 1

Commercial Area 1 is located in the far southwest portion of the Site. No structures or paved areas are currently present in this area that would require unique equipment or procedures to conduct the proposed remedial activities. This area of the Site has not been developed and was not part of historic Mill operations.

- Any excavation work conducted in the vicinity of SB-133 will require oversight by Michigan Gas Utilities due to proximity of the soil boring to the 6-inch high pressure natural gas line/working within the gas company easement.
- A storm sewer was installed through this area in 2012 by the Michigan Department of Transportation (MDOT). The approximate location of the storm sewer is shown on Figure 3.7. Before conducting excavation work in the area of SS-103 and SS-105, the exact location of the line will be determined.

Commercial Area 2

Commercial Area 2 is located in the southwest central portion of the Site. Structures on this portion of the Site include the City of Plainwell Public Safety Building and associated paved parking and egress/ingress areas. The specific assumption for excavation in Commercial Area 2 under Remedial Alternative 3A is presented below.

- Excavation work with Commercial Area 2 would require mini-equipment to access the soil exceedances above the PRGs within the current City of Plainwell Public Safety Building.

Commercial Area 3

Commercial Area 3 is located adjacent to the former southwest corner of the Mill Buildings along Allegan Street. Structures on this area include a pump house and a former guard shack. Other historical features within this area have been demolished on behalf of the City of Plainwell. The Clay ASTs, Ammonia AST secondary containment structure, the Starch ASTs and Building 9C were demolished in 2012. The concrete slabs for all demolished features were left in place. Specific assumptions for excavation in Commercial Area 3 under Remedial Alternative 3A are presented below.

- The majority of Building 9C did not include a basement. The area where SB-248 was completed was located on the ground floor; however, this area was elevated from the surrounding ground surface by approximately 4 feet. As a result of the demolition of Building 9C the upper 4 feet of the sample interval was relocated (as part of a Soil Relocation Plan (June, 2012) generated on behalf of the City of Plainwell) and placed under imported fill in the general area of Buildings 9A, 9E.
- MDOT installed a storm sewer through this area in 2012. The approximate location of the storm sewer is shown on Figure 3.9. Before conducting excavation work in the area of TP-305 the exact location of the line will be determined.

Commercial Area 4

Commercial Area 4 is located on the eastern side of the Site. The majority of this area is covered with either pavement, buildings (vacant and occupied) or former building concrete slabs. Buildings (9A, 9B, 9C, 9D, 9E, 9F, and 23) were demolished on behalf of the City of Plainwell in 2012, with the majority of the former building concrete slabs left in place and backfilled to surrounding grade. The basement areas were backfilled with a combination of crushed concrete (from the buildings on Site), soil from an adjacent retaining wall that was removed, and imported gravel material and vary in thickness from 6 feet to 9 feet. Specific assumptions for excavation in Commercial Area 4 under Remedial Alternative 3A are presented below.

- Excavations within Buildings 10, 11A, 11, 12, 15, 16, 17 and 19 will require mini-equipment.
- All excavation work within the buildings will require temporary lighting and mechanical means to remove carbon dioxide generated by running equipment from the work areas/building.
- All waste removed from the excavation areas will need to be double handled.

5.0 Transportation and Disposal by Redevelopment Area

The following assumptions were made relative to the transportation and disposal of materials in each of the redevelopment areas and reflected in the cost estimate.

- Soil volumes were converted to tonnage assuming a ratio of 1.5 tons per cubic yard for soils. Tonnage for concrete was based on 1.65 tons per cubic yard of material. Waste has been categorized as non-hazardous and non-TSCA soils; TSCA soil; TSCA debris; and miscellaneous debris.
- Transportation and disposal pricing is based on the non-hazardous, non-TSCA material being accepted at Waste Management Autumn Hills Landfill in Zeeland, Michigan. A cost of $22.00 per ton for both transportation and disposal of non-hazardous, non-TSCA waste was used for the estimates.
- A disposal price of $135.00 per ton was used for TSCA soils. For estimation purposes it was assumed that the TSCA soils would be transported to the Environmental Quality Belleville, Michigan Landfill for direct landfill disposal. Transportation of the soils was assumed to be conducted in lined 50 ton gravel trains. Transportation of each load of 50 tons was assumed to cost $500.00.
- An allowance for the PCB impacted equipment removed as part of the project was included in the estimate since the weight and size of what will need to be removed has not been determined at this time. An allowance of $10,000 for transportation and disposal of the waste to the Environmental Quality Belleville, Michigan Landfill.
- Transportation costs assume fuel prices for diesel will not exceed $4.00 per gallon.
- Organic material generated from clearing activities was assumed to be chipped and left on Site.
- Concrete and asphalt will be disposed of off-Site, not recycled.

Residential Area 1

The specific assumption for transportation and disposal work in Residential Area 1 under Remedial Alternative 3A is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 3,275 CY.

Residential Area 2

The specific assumption for transportation and disposal work in Residential Area 2 under Remedial Alternative 3A is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 655 CY.

Residential Area 3

The specific assumption for transportation and disposal work in Residential Area 2 under Remedial Alternative 3A is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 1,655 CY.

Residential Area 4

The specific assumption for transportation and disposal work in Residential Area 3 under Remedial Alternative 3A is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 9,950 CY.
- Allowance of $600 for asphalt.

Waterfront Plaza

No specific assumptions for transportation and disposal work in Waterfront Plaza under Remedial Alternative 3A were utilized. Excavation activities will not be conducted within the Waterfront Plaza area.

Mixed Residential/Commercial Area 1

Specific assumptions for transportation and disposal work in Mixed Residential/Commercial Area 1 under Remedial Alternative 3A are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 1,060 CY.
- Allowance of 50 tons of concrete from within the various buildings.
- Allowance of 50 CY for asphalt disposal.

Mixed Residential/Commercial Area 2

Specific assumptions for transportation and disposal work in Mixed Residential/Commercial Area 2 under Remedial Alternative 3A are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil from Building 5 with a volume of 30 CY.
- Allowance of $3,100 for miscellaneous equipment from Building 5
- Allowance of 25 tons of concrete from Building 5.
- Waste was assumed to be non-hazardous, non-TSCA soil from Building 6A with a volume of 200 CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from the coal tunnel area with a volume of 1,270 CY.
- Allowance of $3,500 for miscellaneous debris from the coal tunnel area (bricks, concrete)
- Waste was assumed to be non-hazardous, non-TSCA soil from the fuel oil line with a volume of 525 CY.
- Allowance of $600 for disposal of the fuel oil line piping
- Waste was assumed to be non-hazardous, non-TSCA soil from the fuel oil No. 6 AST area with a volume of 2,500 CY.
- Allowance of $1,200 for the concrete ring the tank was sitting on and buried concrete and asphalt.
- Waste was assumed to be non-hazardous, non-TSCA soil from Buildings 1, 2, 4A, 5B, 7, 9 and Train Shed with a volume of 835 CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from the north end of the Mill Buildings (Buildings-3A, 25, 28, test pits-TP-340, TP-342,TP-343 and SB-2013) with a volume of 2,310 CY.
- Allowance of $6,000 for miscellaneous debris from these areas at the north end of the Mill Building.

Commercial Area 1

Specific assumptions for transportation and disposal work in Commercial Area 1 under Remedial Alternative 3A are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 2,215 CY.

Commercial Area 2

Specific assumptions for transportation and disposal work in Commercial Area 2 under Remedial Alternative 3A are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 3,000 CY.
- Allowance of $6,000 for construction debris (concrete, flooring, etc.) generated during the preparation activities.

Commercial Area 3

Specific assumptions for transportation and disposal work in Commercial Area 3 under Remedial Alternative 3A are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 5,765 CY.
- Allowance of $900 for the transport and disposal of asphalt and/or concrete from the excavation areas.

Commercial Area 4

Specific assumptions for transportation and disposal work in Commercial Area 4 under Remedial Alternative 3A are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil from inside Buildings 10, 11A, 12, 15, 16, 17, and 19 with a volume of 412 CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from inside building footprints/demolished Buildings 9A, 9B, 9E, 9F, and 23 with a volume of 325CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from the former substation area and north of the Mill Buildings with a volume of 3,050CY.
- Waste was assumed to be TSCA soil from the area around MW-16 with a volume of 4,660 CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from the parking lot area south of Building 17 with a volume of 7,665 CY.
- Allowance of $12,000 for equipment from Buildings 15 and 16 (PCB impacted).
- Allowance of 1,575 tons of concrete from within the various buildings.
- Allowance of 400 CY of asphalt

6.0 Restoration by Redevelopment Area

The following assumption was made relative to Site restoration in each of the redevelopment areas and reflected in the cost estimate.

- Restoration activities include backfill (material and placement), compaction, compaction testing and any other location specific restoration that may be deemed necessary at this time (e.g., replacing a floor).
- General fill from a local gravel pit at a delivered material cost of $4.58 ton was used for the estimates. Unprocessed topsoil at a delivered price of $18.98 cubic yard was also used where appropriate.
- Restoration for the excavation areas outside of building footprints include general fill backfill compacted to 92-95 percent of the proctor.
- A six-inch layer of unscreened topsoil will be placed over the compacted general fill in areas that were previously pervious (i.e. not paved or impervious). Topsoil will be hydroseeded, including mulch.
- Restoration for excavation areas under pavement, existing or former building slabs will be backfilled with general fill and compacted to 95 percent of the proctor.
- A six-inch layer of 21AA or equivalent will be placed on the compacted general fill and compacted to 95% or greater of the proctor.
- Concrete will be replaced where removed during excavation activities inside of existing buildings.
- Asphalt will be replaced where removed during excavation activities.
- Concrete removed during excavation activities under former building slabs will not be replaced.

Residential Area 1

Specific assumptions for Site restoration in Residential Area 1 under Remedial Alternative 3A are presented below.

- Backfill material will be imported general fill and overburden material removed to achieve excavation depth requirements but beyond the area exceeding PRGs.
- MW-14 will be replaced.

Residential Area 2

Specific assumptions for Site restoration in Residential Area 2 under Remedial Alternative 3A are presented below.

- Backfill material will be imported general fill and overburden material removed to achieve excavation depth requirements but beyond the area exceeding cleanup criteria.
- MW-15 will be replaced.

Residential Area 3
No specific assumptions for Site restoration in Residential Area 3 under Remedial Alternative 3A were utilized.

Residential Area 4
No specific assumptions for Site restoration in Mixed Residential/Commercial Area 1 under Remedial Alternative 3A were utilized.

Waterfront Plaza
No specific assumptions for Site restoration in Waterfront Plaza under Remedial Alternative 3A were utilized. Restoration will not be required in the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
Specific assumptions for Site restoration in Mixed Residential/Commercial Area 1 under Remedial Alternative 3A are presented below.

- Concrete replaced inside the buildings will be 6 inches thick.

Mixed Residential/Commercial Area 2
Specific assumptions for Site restoration in Mixed Residential/Commercial Area 2 under Remedial Alternative 3A are presented below.

- Building 6A currently has a dirt floor; restoration would not include a concrete floor.
- Concrete replaced inside the buildings will be 6 inches thick
- Concrete (former ash silos) will not be replaced at SB-2010 and SB-2011.
- Concrete around the former 200,000 gallon fuel oil AST will not be replaced.
- Concrete removed for excavations at SB-216, SB-220, SB-222 and SB-223 will not be replaced.
- Additional backfill will be required to fill in the void space of the coal tunnel.
- MW-2, MW-19 and MW-22 will be replaced as necessary.

Commercial Area 1
No specific assumptions for Site restoration in Commercial Area 1 under Remedial Alternative 3A were utilized.

Commercial Area 2
Specific assumptions for Site restoration in Commercial Area 2 under Remedial Alternative 3A are presented below.

- Areas within the current Public Safety Building will be restored to the previous condition including the replacement of all removed flooring, cabinetry, interior walls, repainting, etc. An allowance of $40,000 was included in the estimate for the restoration inside of the building for these items.
- Concrete replaced will match existing floor conditions and will vary within the building from 4 to 8 inches thick.

Commercial Area 3
No specific assumptions for Site restoration in Commercial Area 3 under Remedial Alternative 3A were utilized.

Commercial Area 4
Specific assumptions for Site restoration in Commercial Area 4 under Remedial Alternative 3A are presented below.

- Concrete replaced inside the buildings will be 6 inches thick.
- Backfill placed in the parking lot will be 2 feet lower than current grade to achieve the desired grade requested by the current property owner.
- Asphalt will be 3 inches thick.
- Geotextile and Rip rap will be installed along the Mill Race.
- The Mill Race will be returned to its normal flow path.
- The turbidity curtain will be removed from the Mill Race and Kalamazoo River.

7.0 Demobilization

The following assumptions were made relative to the demobilization from the Site and reflected in the cost estimate.

- Costs included in the demobilization task include time for Site tear down and final decontamination of equipment, and demobilization of equipment and personnel. Demobilization activities were assumed to take five working days.

B. ENGINEERING/OVERSIGHT

1.0 Engineering/Design

The following assumption was made relative to the installation of engineering/design and reflected in the cost estimate.

- Engineering and project design/specifications were estimated to be 15 percent of the Construction Costs.

2.0 Construction Oversight

The following assumption was made relative to the construction oversight and reflected in the cost estimate.

- Construction oversight was estimated to be 10 percent of the Construction Costs.

TABLE D.3B

COST SUMMARY
REMEDIAL ALTERNATIVE 3B – EXCAVATION AND OFF-SITE DISPOSAL
TO RESIDENTIAL AND NON RESIDENTIAL CRITERIA - ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost*	
					Subtotal	*Total*
CAPITAL COSTS						
A.	***PRE-DESIGN***					**$33,200**
1.0	Sampling and Analysis Work Plan (SAP)	LS	1	$25,000	$25,000	
	Survey top of banks at Site	LS	1	$2,000	$2,000	
	Health and Safety Plan Update	LS	1	$1,200	$1,200	
	Multi-Area Quality Assurance Project Plan	LS	1	$5,000	$5,000	
2.0	SAP Implementation					**$197,900**
	Project Set up (mark locations etc.)	LS	1	$8,790	$8,800	
	Private Utility Locate	LS	1	$8,000	$8,000	
	Field Activities	DA	41	$2,900	$118,900	
	Field Technicians					
	Sampling Equipment (push probe technology)					
	Expendables (PPE etc)					
	Temporary Lighting and Carbon Monoxide Control	LS	1	$6,000	$6,000	
	Concrete Coring	LS	1	$6,000	$6,000	
	Laboratory Analysis	LS	1	$48,070	$48,100	
	Investigation Derived Waste Disposal	DA	41	$50	$2,100	
3.0	Contingency Sampling and Analysis	LS	1	$114,280	$114,300	**$114,300**
	Based on 50 % of SAP costs					
4.0	Remedial Action Plan	LS	1	$50,000	$50,000	**$50,000**
	TOTAL PRE-DESIGN COSTS					**$395,400**
B.	***CONSTRUCTION***					
1.0	**Mobilization and Set up**					**$255,600**
	Mobilization and Set up	LS	1	$45,700	$45,700	
	Health and Safety	Monthly	5	$28,450	$142,300	
	Erosion Control	LS	1	$16,060	$16,100	
	Site Facilities					
	Temporary Facilities	Monthly	5	$6,810	$34,100	
	Decontamination Pad and Stations	LS	1	$17,375	$17,400	
2.0	**Additional Preparation and/or Demolition (by Redevelopment Area)**					**$138,000**
	Residential 1	LS	1	$12,680	$12,700	
	Residential 2	LS	1	-	-	
	Residential 3	LS	1	$1,225	$1,200	
	Residential 4	LS	1	$850	$900	
	Waterfront Plaza	LS	1	-	-	
	Mixed Residential/Commercial Area 1	LS	1	$600	$600	
	Mixed Residential/Commercial Area 2	LS	1	$56,625	$56,600	
	Commercial Area 1	LS	1	-	-	
	Commercial Area 2	LS	1	-	-	
	Commercial Area 3	LS	1	-	-	
	Commercial Area 4	LS	1	$65,980	$66,000	

TABLE D.3B

COST SUMMARY
REMEDIAL ALTERNATIVE 3B – EXCAVATION AND OFF-SITE DISPOSAL
TO RESIDENTIAL AND NON RESIDENTIAL CRITERIA - ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost*	
					Subtotal	*Total*
3.0	**Excavation (by Redevelopment Area)**					**$281,300**
	Residential 1	CY	910	$12	$11,100	
	Residential 2	CY	25	$88	$2,200	
	Residential 3	CY	1,255	$9	$11,100	
	Residential 4	CY	4,950	$4	$17,500	
	Waterfront Plaza	CY	-	-	-	
	Mixed Residential/Commercial Area 1	CY	40	$93	$3,700	
	Mixed Residential/Commercial Area 2	CY	5,800	$33	$189,300	
	Commercial Area 1	CY	12	$106	$1,300	
	Commercial Area 2	CY	-	-	-	
	Commercial Area 3	CY	-	-	-	
	Commercial Area 4	CY	7,185	$6	$45,100	
4.0	**Transportation and Disposal (by Redevelopment Area)**					**$1,642,070**
	Residential 1 - Non Haz Non TSCA Soils	Ton	1,365	$22	$30,000	
	Residential 2 - Non Haz Non TSCA Soils	Ton	38	$22	$800	
	Residential 3 - Non Haz Non TSCA Soils	Ton	1,885	$22	$41,500	
	Residential 4 - Non Haz Non TSCA Soils	Ton	7,425	$22	$163,400	
	Residential 4 - Misc Debris	LS	1		$600	
	Waterfront Plaza - Non Haz Non TSCA Soils	Ton	-	$22	-	
	Mixed Residential/Commercial Area 1 - Non Haz Non TSCA Soils	Ton	60	$22	$1,300	
	Mixed Residential/Commercial Area 1 - Misc. Debris	LS	-	$125	$1,675	
	Mixed Residential/Commercial Area 2 - Non Haz Non TSCA Soils	Ton	8,700	$22	$190,800	
	Mixed Residential/Commercial Area 2 - Misc. Debris	LS	1		$8,245	
	Commercial Area 1 - Non Haz Non TSCA Soils	Ton	18	$22	$400	
	Commercial Area 2 - Non Haz Non TSCA Soils	Ton	-	-	-	
	Commercial Area 2 - Misc. Debris	LS	-	-	-	
	Commercial Area 3 - Non Haz Non TSCA Soils	Ton	-	-	-	
	Commercial Area 3 - Misc. Debris	LS	-	-	-	
	Commercial Area 4 - Non Haz Non TSCA Soils	Ton	3,788	$22	$83,300	
	Commercial Area 4 - Misc. Debris	LS	-		$3,550	
	Commercial Area 4 - TSCA	Ton	7,000	$160	$1,116,500	
7.0	**Restoration (by Redevelopment Area)**					**$430,890**
	Residential 1	LS	1		$22,500	
	Residential 2	LS	1		$5,070	
	Residential 3	LS	1		$30,275	
	Residential 4	LS	1		$80,000	
	Waterfront Plaza	LS	-		-	
	Mixed Residential/Commercial Area 1	LS	1		$7,425	
	Mixed Residential/Commercial Area 2	LS	1		$139,455	
	Commercial Area 1	LS	1		$32,950	
	Commercial Area 2	LS	-		-	
	Commercial Area 3	LS	-		-	
	Commercial Area 4	LS	1		$113,215	

TABLE D.3B

COST SUMMARY
REMEDIAL ALTERNATIVE 3B – EXCAVATION AND OFF-SITE DISPOSAL
TO RESIDENTIAL AND NON RESIDENTIAL CRITERIA - ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost*	
					Subtotal	*Total*
8.0	**Demobilization**	LS	1	$26,550		**$26,600**
	Decontamination and Demobilization					
	TOTAL CONSTRUCTION COST					**$2,774,460**
C.	***ENGINEERING/OVERSIGHT***					
1.0	**Institutional Controls**					**$50,000**
2.0	**Engineering/ Design (15 % of Construction Costs)**					**$416,200**
3.0	**Construction Oversight (10 % of Construction Costs)**					**$277,400**
	TOTAL ENGINEERING/OVERSIGHT COSTS					**$743,600**
	CONTINGENCY ON CAPITAL COSTS (25 %)					**$879,515**
	TOTAL CAPITAL COSTS					**$4,397,575**
OPERATION, MAINTENANCE, & MONITORING COSTS						
A.	***ANNUAL MONITORING AND MAINTENANCE***					**$2,400**
	Monthly Operation and Maintenance of System	Month	12	$200	$2,400	
	CONTINGENCY ON OM & M COSTS (20 %)					**$480**
	TOTAL CAPITAL COSTS					**$4,397,575**
	NET PRESENT VALUE OF OM & M (30 YEARS @ 7 % DISCOUNT RATE)					**$35,738**
	TOTAL COST					**$4,433,313**

Table D.3B

COST SUMMARY NOTES
REMEDIAL ALTERNATIVE 3B – EXCAVATION AND OFF-SITE DISPOSAL TO RESIDENTIAL AND NON-RESIDENTIAL CRITERIA
ITERATIVE APPROACH
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

GENERAL NOTES

A. Estimate for Remedial Alternative 3B - Excavation and Off-Site Disposal to Residential and Non-residential Criteria has been prepared based on available information at the time of this document. Redevelopment activities conducted, being conducted and anticipated for the Site by the City of Plainwell may affect the remediation costs. Costs presented in the Feasibility Study (FS) Report have taken into consideration anticipated redevelopment plans by the City of Plainwell. Redevelopment plans include demolition of non-historical buildings to the concrete slab as well as specific land use restrictions/designations for the Site as presented on Figure 1.2 of the FS Report. This cost estimate is expected to be within -30 percent to +50 percent of the actual remedial costs in accordance with United States Environmental Protection Agency (USEPA) guidance.
B. Remediation activities for each of the 11 proposed redevelopment areas were estimated separately; however, the estimate assumes one mobilization and demobilization effort to conduct the work.
C. The cost estimate assumes that new structures have not been constructed in areas that are planned for soil excavation and existing structures remain in place.
D. Costs assume that additional soil investigation will not be conducted under building slabs unless otherwise noted in the pre-design notes below.
E. Areas targeted for soil removal and off-site disposal were determined based on a risk-based approach for arsenic as detailed in Appendix A of the FS Revision 1.
F. The estimated costs assume that excavation of impacted soils under the building slabs will not be conducted.
G. The cost estimate includes abandonment and replacement costs of groundwater monitoring wells within excavation areas.
H. Costs are based on 2013 dollars.
I. All volumes are based on in-place measures unless otherwise stated.
J. Abbreviations used in the "Unit" column in the Cost Estimate Table are as follows:
   - CY = Cubic Yard
   - EA = Each
   - LS = Lump Sum
   - TN = Ton
   - LF= linear foot

TASK NOTES:

CAPITAL COSTS

A. INVESTIGATION/CONSTRUCTION

1.0 Pre-Design Investigation (PDI) Activities

The following assumptions were made relative to the PDI activities in each of the redevelopment areas and reflected in the cost estimate.

- Generation of a Sampling and Analysis Plan (SAP).
- Update the Health and Safety Plan as necessary.
- Update the Multi-Area Quality Assurance Project Plan as necessary.
- Completion of the SAP - soil boring installation and soil sample collection to delineate the horizontal extent of impact. Soil borings are assumed to be collected via direct push method. PDI samples will be collected and submitted for laboratory analysis for specific parameters determined to exceed Preliminary Remediation Goals (PRGs) during the Remedial Investigation (RI). It is assumed that the vertical extent of the impacted soil is already established by the samples collected during the Remedial Investigation (RI). Delineation samples will not be collected in areas that were not selected for excavation activities (i.e. under building slabs, etc.)
- Quality Assurance/Quality Control samples are included on a 1 per 10 basis.
- A survey of the "top of bank" is included in the PDI cost estimate.
- All areas where subsurface work is to be conducted will be cleared through a public utility locate (i.e., MISS Dig), a private utility locate, review of available drawings, and discussions with individuals knowledgeable of the Site and utilities located thereon.

Residential Area 1
PRGs exceeded in Residential Area 1 include Part 201 non-residential and residential direct contact criteria for arsenic. Soil samples will be collected to delineate the extent of soil impacted with PCBs adjacent to the storm sewer line installed by the Michigan Department of Transportation (MDOT) in 2012.

- Allowance for 30 soil samples for PCBs
- Allowance for 12 soil samples for arsenic

Residential Area 2
The PRG exceeded in Residential Area 2 is Part 201 residential direct contact criteria for arsenic.

- Allowance for 24 soil samples for arsenic

Residential Area 3
The PRG exceeded in Residential Area 3 is Part 201 residential direct contact criteria for arsenic.

- Allowance for 56 soil samples for arsenic

Residential Area 4
PRGs exceeded in Residential Area 4 include Part 201 non-residential direct contact criteria for arsenic, lead and PCBs. Residential direct contact criteria is exceeded at locations within Residential Area 4 for arsenic, benzo(a)pyrene, cyanide, dibenz(a,h)anthracene, lead and PCBs. Residential soil volatilization to indoor air inhalation criteria (SVIIC) was exceeded at one location for benzene.

- An allowance for 36 soil samples for arsenic
- Benzene above the residential SVIIC at TP-308
- An allowance for 4 soil samples for benzene was included in the estimate.
- Cyanide was above residential direct contact criteria at SB-302 in the shallow (0-1 foot) interval
    - Four samples for cyanide were included in the estimate

- An allowance for 20 samples for lead was included in the estimate
- PCBs were above criteria at TP-313 and SB-301
    - An allowance for 16 soil samples for PCBs was included in the estimate
- The PNA parameters were identified in shallow samples (0-1.5 feet) below grade at DG3, DG4 and TP-302
    - Allowance for 12 PNA samples

Waterfront Plaza
PDI activities will not be specifically conducted within the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
PRGs exceeded in Mixed Residential/Commercial Area 1 include Part 201 non-residential inhalation criteria for manganese and residential direct contact criteria for arsenic.

- Delineation samples will be collected around 2 locations (TP-30 and TP-334)
- A total of 12 soil samples for arsenic will be collected
- Four samples for manganese will be collected and analyzed around TP-334

Mixed Residential/Commercial Area 2
PRGs exceeded in Mixed Residential/Commercial Area 2 include Part 201 non-residential direct contact criteria for arsenic, benzo(a)pyrene, and lead. Residential direct contact criteria is exceeded at locations within Mixed Residential/Commercial Area 2 for arsenic, benzo(a)pyrene, dibenz(a,h)anthracene; benzo(a)anthracene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene and lead.

Soil delineation by work area as follows:

Arsenic ONLY locations:
Building 25
- Allowance for 8 samples
- A portion of the concrete slab was removed during demolition

Building 28
- Allowance for 8 samples
- A portion of the concrete slab was removed during demolition

Train Shed
- Allowance for 4 samples

Coal Tunnel Area
- Allowance for 30 samples

Former Ash Silo Area (SB-2010 and SB-2011)
- Allowance for 12 samples

Former clarifier area (TP-344)
- Allowance for 8 samples

Area north of Building 3/Former Water Tower Area (TP-340, TP-342, TP-343)
- Allowance for 16 samples

Arsenic and Lead sample locations:
Area around SB-2013
- Allowance for 12 samples

Arsenic, PNAs and Lead sample locations:
Building 3A
- Allowance for 12 samples

Building 6A

- Allowance for 18 samples
- Technicians will be required to don respirators for this work
- The floor in the majority of this building is exposed soil

Arsenic and PNAs sample locations

Fuel Oil AST Area

- Allowance for 24 PNA soil samples
- Allowance for 12 arsenic samples

A total of 140 samples will be collected and analyzed for arsenic.
A total of 30 samples will be collected and analyzed for PNAs.
A total of 42 samples will be collected and analyzed for lead.

Commercial Area 1

PRGs exceeded in Commercial Area 1 include Part 201 non-residential inhalation criteria for manganese and the residential direct contact for arsenic.

- Delineation samples will be collected around SS-105
- Four soil samples will be collected from the 0-2 foot below grade interval and analyzed for arsenic and manganese

Commercial Area 2

Delineation efforts will not be conducted in Commercial Area 2.

Commercial Area 3

Delineation efforts will not be conducted in Commercial Area 2.

Commercial Area 4

PRGs exceeded in Commercial Area 4 include Part 201 non-residential direct contact criteria for arsenic, and PCBs. Residential direct contact criteria is exceeded at locations within Commercial Area 4 for arsenic, benzo(a)pyrene, lead and PCBs.

Soil delineation by building / work area as follows:

Arsenic ONLY locations:

SB-2012

- Allowance for 4 samples

Parking lot area south of Building 17

- Allowance for 60 samples

Arsenic and Lead sample locations:

TP-341

- Allowance for 4 samples

Arsenic, PNAs and Lead sample locations:

Former Substation Area/North of Mill Buildings

- Allowance for 30 samples

PCBs and Arsenic sample locations:

MW-16 Area

- Allowance for 18 samples

A total of 116 samples will be collected and analyzed for arsenic.
A total of 30 samples will be collected and analyzed for PNAs.
A total of 18 samples will be collected and analyzed for PCBs.
A total of 34 samples will be collected and analyzed for lead.

2.0 Mobilization/Set-Up

The following assumptions were made relative to the mobilization/set-up in each of the redevelopment areas and reflected in the cost estimate.

- Mobilization and set-up includes: mobilization of personnel and equipment; construction survey work (e.g., excavation layout and verification sample locations); and geotechnical and chemical testing on backfill materials.
  - An allowance of $8,000 to mobilize personnel and equipment was included in the estimate.
  - $30,000 for survey work was included in the estimate.
  - Geotechnical and chemical analysis for imported materials was included in the estimate. One set of chemical analysis [Target Analyte List Metals, Target Compound List (TCL) for volatile organic compounds, TCL for semi-volatile compounds, and polychlorinated biphenyl (PCBs) per material (topsoil, general fill and 21AA/gravel]. The topsoil sample will also be analyzed for pH, phosphorous, organic content, pesticides and herbicides.
- Health and Safety includes an on-Site Health and Safety Officer (HSO) for 5 months. Also included in the costs are: air monitoring equipment and calibration gases; a decontamination trailer; and disposable personal protection equipment (PPE).
- Air monitoring assumes real-time air monitoring will be conducted during all excavation work utilizing a photoionization detector (11.7 electronVolt [eV] lamp) and fugitive dust monitor(s). Air monitoring does not include the collection of samples for laboratory analysis or laboratory analytical costs.
- Erosion control includes an allowance for silt fence (4,000 LF) and geofabric to cover catch basins on the Site. Costs for erosion control measures specific to individual redevelopment areas (i.e., turbidity curtains, etc.) are included in individual redevelopment area estimates (e.g., Commercial Area 4).
- Site facility costs include electrical hookup and electricity for two office trailers (one for the contractor and one for the U.S. EPA) for 5 months. Other temporary facilities include portable sanitary services, a drinking water allowance and a small dumpster for worker general refuse. The expense of one Site truck for the duration of the services was included.
- Site facility costs include materials and construction of temporary decontamination pads and decontamination stations for workers. It was assumed that potable water could be obtained from the City of Plainwell for use during the project.
- Site facility costs include $6,000 to for the installation and maintenance of a staging area for waste.
- A perimeter fence currently exists around the majority of the Site. The cost estimate assumes the fence will remain and can be utilized as a security measure to prevent access to the Site during construction activities.

3.0 Preparation/Pre-Excavation Work by Redevelopment Area

The following assumptions were made relative to the preparation/pre-excavation work in each of the redevelopment areas and reflected in the cost estimate.

- A Soil Erosion and Sedimentation Control Permit will be obtained from Allegan County. All other necessary permits will also be obtained prior to intrusive work at the Site.

- All areas where subsurface work is to be conducted will be cleared through a public utility locate (i.e., MISS Dig), a private utility locate, review of available drawings, and discussions with individuals knowledgeable of the Site and utilities located thereon.

Residential Area 1
Specific assumptions for preparation/pre-excavation work in Residential Area 1 under Remedial Alternative 3B are presented below.

- Trees and shrubs in the excavation areas will need to be cleared and grubbed.
- Turbidity curtain will be temporally installed in the Kalamazoo River during excavation and backfill activities.
- One power pole will need to be relocated for the excavation work around SB-104.

Residential Area 2
No specific assumptions for preparation/pre-excavation work in Residential Area 2 under Remedial Alternative 3B were utilized.

Residential Area 3
Specific assumptions for preparation/pre-excavation work in Residential Area 3 under Remedial Alternative 3B are presented below.

- MW-15 will be abandoned.
- Clearing will be required in the area around MW-15.

Residential Area 4
Specific assumptions for preparation/pre-excavation work in Residential Area 4 under Remedial Alternative 3B are presented below.

- Clearing will be required in the area around SB-301/SG-4.
- Pavement by TP-302 will be saw cut.

Waterfront Plaza
No specific assumptions for preparation/pre-excavation work in Waterfront Plaza under Remedial Alternative 3B were utilized.

Mixed Residential/Commercial Area 1
The specific assumption for preparation/pre-excavation work in Mixed Residential/Commercial Area 1 under Remedial Alternative 3B is presented below.

- Pavement in the work areas will be saw cut prior to excavation to leave a clean line for restoration activities.

Mixed Residential/Commercial Area 2
Specific assumptions for preparation/pre-excavation work in Mixed Residential/Commercial Area 2 under Remedial Alternative 3B are presented below.

- The loading dock at the south end of Building 1 will be evaluated by a structural engineering evaluation to ensure excavation of the fuel oil line will not damage either the loading dock or Building 1. Excavation will not occur within Building 1.
- A demolition notice will be submitted to the State of Michigan for the demolition of Building 5A/part of the coal tunnel. Asbestos abatement may be necessary on pipe wrap found outside of Building 5A.
- Excavation of soils under the concrete slabs of the demolished buildings (3A, 25 and 28) will require the relocation of the backfill (less than 3 feet thick) prior to excavation.
- Fuel Oil No. 6 within the former coal tunnel will be removed from the tunnel before the tunnel itself is removed.
- The piping run from the former Fuel Oil No. 6 AST and Building 5 will be exposed at one end and drained of any residual fuel oil prior to removing the line.
- Monitoring well MW-19 will be abandoned prior to excavation activities in this area.
- Monitoring well MW-22 will be abandoned prior to removal of the former fuel oil line.
- Monitoring well MW-2 will be abandoned prior to excavation activities at SB-2010 and SB-2011.
- The concrete floor (Buildings 25 and 3A) will be saw cut prior to excavation (concrete will be broken out during excavation – but saw cut first to create clean lines for restoration).

Commercial Area 1
No specific assumptions for preparation/pre-excavation work Commercial Area 1 under Remedial Alternative 3B were utilized.

Commercial Area 2
No specific assumptions for preparation/pre-excavation work Commercial Area 2 under Remedial Alternative 3B were utilized.

Commercial Area 3
No specific assumptions for preparation/pre-excavation work Commercial Area 3 under Remedial Alternative 3B were utilized.

Commercial Area 4
Specific assumptions for preparation/pre-excavation work in Commercial Area 4 under Remedial Alternative 3B are presented below.

- Excavation of soils under the concrete slabs of the demolished buildings will require the relocation of backfill placed within the former basement cavities to surrounding grade (up to 9 feet thick) prior to excavation. An allowance for 5 working days to complete this work was included in the estimate at a cost of $20,400.
- Turbidity curtain will be installed in the Mill Race in the area by MW-16 (along the Mill Race) and in the area of MW-3 prior to excavation activities.
- Monitoring of the Mill Race and Kalamazoo River for turbidity will be conducted during excavation activities.
- MW-16 will be abandoned prior to excavation work in that area.
- Protection of MW-3 (barriers) will be installed.
- A structural engineering evaluation of the pedestrian bridge for stability during excavation activities will be conducted. The evaluation will determine if shoring of the bridge is necessary. An allowance of $5,000 is included in the estimate to conduct the evaluation. Shoring costs have not been included in the estimate.
- The water flow of the Mill Race will be diverted in the excavation area. The methodology for this work to be determined in the pre-design phase of the project.

- Rip rap along the Mill Race will be removed and staged for re-use.
- Pavement in the work areas will be saw cut prior to excavation to allow for restoration activities.

4.0 Excavation by Redevelopment Area

Conceptual excavation areas for each of the Redevelopment areas are shown of Figures 3.11 through 3.20 of the FS Report (Revision 1).

The following assumptions were made relative to excavation in each of the redevelopment areas and reflected in the cost estimate.

- Excavation estimates assume dewatering will not be necessary and that all work can be completed in Level D PPE except Building 6A which will be conducted with supplied air (Level B) PPE.
- Standby time was not added to account for the time for laboratory analysis of verification samples. It was assumed that the project would proceed across the Site allowing for laboratory analysis to be conducted while another redevelopment area was being excavated or restored.

Specific assumptions to each redevelopment area, in addition to those presented above globally, are provided below.

Residential Area 1

Residential Area 1 is located at the far west end of the Site, where the majority of the former sludge dewatering lagoons were located. The former Mill wastewater treatment building, activated sludge tank and secondary clarifier were constructed over the lagoons. The wastewater treatment structures were demolished on behalf of the City of Plainwell in November and December 2013. The specific assumption for excavation in Residential Area 1 under Remedial Alternative 3B is presented below.

- Overburden present beyond the target excavation area that must be removed to achieve the full depth of excavation will be disposed of off-site.
- The rip rap at the Kalamazoo River outfall from the storm sewer line does not need to be removed.

Residential Area 2

Residential Area 2 is located between Residential Area 1 and Residential Area 3 and is positioned along the Kalamazoo River. This area was historically occupied by sludge dewatering lagoons (A, B, C) and a primary clarifier. The primary clarifier was demolished to the concrete slab in November 2013. No specific assumptions for excavation in Residential Area 2 under Remedial Alternative 3B are presented.

Residential Area 3

Residential Area 3 is located near the center of the Site. The former aeration basin location occupies the majority of the area. A former secondary clarifier was historically present in this area, which was demolished in November 2013 with the floor of the former clarifier remaining. This area was backfilled to surrounding grade, which was approximately 7-8 feet higher than the floor of the clarifier and aeration basin. Specific assumptions for excavation in Residential Area 3 under Remedial Alternative 3B are presented below.

- Material removed from the bottom of the aeration basin will require double handling due to the slopes of the former aeration basin and the depth of the excavation.

Residential Area 4

Residential Area 4 is positioned along the Kalamazoo River between Residential Area 3 and Mixed Residential Area 2. No aboveground structures are currently present on this area. A portion of this area

was historically utilized by the Mill as a coal storage area. No specific assumptions for excavation in Residential Area 4 under Remedial Alternative 3B were made.

Waterfront Plaza

No excavation activities are anticipated in the Waterfront Plaza Area.

Mixed Residential/Commercial Area 1

Mixed Residential/Commercial Area 1 is located between Commercial Area 2 and Commercial Area 3 on the southern property line along Allegan Street. This area was once occupied by the former Specialty Minerals Building and associated above ground storage tanks. The Specialty Minerals building and ASTs were demolished to the concrete slab in December 2011. The specific assumption for excavation in Mixed Residential/Commercial Area 1 under Remedial Alternative 3B is presented below.

- Underground utilities encountered (TP-306) between the former Specialty Minerals Building and the main Mill Buildings will be capped at either end of the excavation.

Mixed Residential and Commercial Area 2

Mixed Residential and Commercial Area 2 is located between Residential Area 4 and Commercial Area 4 at the northern end of the Site along the Kalamazoo River. The majority of the area is occupied by Mill Buildings and pavement. Buildings 3A, 25 and 28 along with the eastern water tower, 200,000-gallon Fuel Oil AST, and the brine USTs, were demolished on behalf of the City of Plainwell. The majority of the concrete slabs were left in place for Buildings 3A and 28. Building 25 was part of the Site's historical wastewater treatment system and had a subsurface vault and system to pump the waste water from the Mill to the onsite WWTP at the west end of the Site. The vault under the northern portion of Building 25 was not removed. The vault floor was cracked and the sidewalls removed to 4 feet below grade, then the vault was filled with imported general fill. The concrete slab under the remaining portion of Building 25 was left in place.

Specific assumptions for excavation in Mixed Residential/Commercial Area 2 under Remedial Alternative 3B are presented below.

- A storm sewer was installed through the west side of Mixed Residential/Commercial Area 2 in 2012 by the Michigan Department of Transportation (MDOT). The approximate location of the storm sewer is shown on Figure 3.16. Before conducting excavation work to remove the former fuel oil AST line and excavate the east side of the former fuel AST, the exact location of the storm sewer line will be determined, shoring of the line may be necessary during the removal of the fuel oil AST line.
- Soils in Building 6A will be removed using a vacuum extraction system.

Commercial Area 1

Commercial Area 1 is located in the far southwest portion of the Site. No structures or paved areas are currently present in this area that would require unique equipment or procedures to conduct the proposed remedial activities. This area of the Site has not been developed and was not part of historic Mill operations. The area specific assumption for excavation in Commercial Area 1 under Remedial Alternative 3B is presented below.

- A storm sewer was installed through this area in 2012 by the Michigan Department of Transportation (MDOT). The approximate location of the storm sewer is shown on Figure 3.17. Before conducting excavation work in the area of SS-105, the exact location of the line will be determined.

Commercial Area 2

Commercial Area 2 is located in the southwest central portion of the Site. Structures on this portion of the Site include the City of Plainwell Public Safety Building and associated paved parking and egress/ingress areas.

Excavation activities are not anticipated in the Commercial Area 2 for Remedial Alternative 3B.

Commercial Area 3

Commercial Area 3 is located adjacent to the former southwest corner of the Mill Buildings along Allegan Street. Structures on this area include a pump house and a former guard shack. Other historical features within this area have been demolished on behalf of the City of Plainwell. The Clay ASTs, Ammonia AST secondary containment structure, the Starch ASTs and Building 9C were demolished in 2012. The concrete slabs for all demolished features were left in place. Specific assumptions for excavation in Commercial Area 3 under Remedial Alternative 3B are presented below.

Excavation activities are not anticipated in the Commercial Area 3 for Remedial Alternative 3B.

Commercial Area 4

Commercial Area 4 is located on the eastern side of the Site. The majority of this area is covered with either pavement, buildings (vacant and occupied) or former building concrete slabs. Buildings (9A, 9B, 9C, 9D, 9E, 9F, and 23) were demolished on behalf of the City of Plainwell in 2012, with the majority of the former building concrete slabs left in place and backfilled to surrounding grade. The basement areas were backfilled with a combination of crushed concrete (from the buildings on Site), soil from an adjacent retaining wall that was removed, and imported gravel material and vary in thickness from 6 feet to 9 feet. Specific assumptions for excavation in Commercial Area 4 under Remedial Alternative 3B are presented below.

- Access to both the former substation area and around MW-16 will be restricted due to the distance between existing structures and either the Kalamazoo River or the Mill Race. Excavated soils will likely need to be double handled.

5.0 Transportation and Disposal by Redevelopment Area

The following assumptions were made relative to the transportation and disposal of materials in each of the redevelopment areas and reflected in the cost estimate.

- Soil volumes were converted to tonnage assuming a ratio of 1.5 tons per cubic yard for soils. Tonnage for concrete was based on 1.65 tons per cubic yard of material. Waste has been categorized as non-hazardous and non-TSCA soils; TSCA soil; TSCA debris; and miscellaneous debris.
- Transportation and disposal pricing is based on the non-hazardous, non-TSCA material being accepted at Waste Management Autumn Hills Landfill in Zeeland, Michigan. A cost of $22.00 per ton for both transportation and disposal of non-hazardous, non-TSCA waste was used for the estimates.
- A disposal price of $135.00 per ton was used for TSCA soils. For estimation purposes it was assumed that the TSCA soils would be transported to the Environmental Quality Belleville, Michigan Landfill for direct landfill disposal. Transportation of the soils was assumed to be conducted in lined 50 ton gravel trains. Transportation of each load of 50 tons was assumed to cost $500.00.
- Transportation costs assume fuel prices for diesel will not exceed $4.00 per gallon.
- Organic material generated from clearing activities was assumed to be chipped and left on Site.
- Concrete and asphalt will be disposed of off-Site, not recycled.

Residential Area 1
The specific assumption for transportation and disposal work in Residential Area 1 under Remedial Alternative 3B is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 910 CY.

Residential Area 2
The specific assumption for transportation and disposal work in Residential Area 2 under Remedial Alternative 3B is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 25 CY.

Residential Area 3
The specific assumption for transportation and disposal work in Residential Area 2 under Remedial Alternative 3B is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 1,255 CY.

Residential Area 4
The specific assumption for transportation and disposal work in Residential Area 3 under Remedial Alternative 3B is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 4,950 CY.
- Allowance of $600 for asphalt.

Waterfront Plaza
No specific assumptions for transportation and disposal work in Waterfront Plaza under Remedial Alternative 3B were utilized. Excavation activities will not be conducted within the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
Specific assumptions for transportation and disposal work in Mixed Residential/Commercial Area 1 under Remedial Alternative 3B are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 40 CY.
- Allowance of 50 CY for asphalt disposal.

Mixed Residential/Commercial Area 2
Specific assumptions for transportation and disposal work in Mixed Residential/Commercial Area 2 under Remedial Alternative 3B are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil from Building 6A with a volume of 200 CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from the Train Shed with a volume of 205 CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from the coal tunnel area with a volume of 1,270 CY.
- Allowance of $3,500 for miscellaneous debris from the coal tunnel area (bricks, concrete)
- Waste was assumed to be non-hazardous, non-TSCA soil from the fuel oil line with a volume of 525 CY.
- Allowance of $600 for disposal of the fuel oil line piping

- Waste was assumed to be non-hazardous, non-TSCA soil from the fuel oil No. 6 AST area with a volume of 2,500 CY.
- Allowance of $1,200 for the concrete ring the tank was sitting on and buried concrete and asphalt.
- Waste was assumed to be non-hazardous, non-TSCA soil from the north end of the Mill Buildings (Buildings-3A, 25, 28, test pits-TP-340, TP-342,TP-343 and SB-2013) with a volume of 990 CY.
- Allowance of $6,000 for miscellaneous debris from these areas at the north end of the Mill Building.

Commercial Area 1
Specific assumptions for transportation and disposal work in Commercial Area 1 under Remedial Alternative 3B are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 12 CY.

Commercial Area 2
Waste will not be transported off site from Commercial Area 2 for Remedial Alternative 3B.

Commercial Area 3
Waste will not be transported off site from Commercial Area 2 for Remedial Alternative 3B.

Commercial Area 4
Specific assumptions for transportation and disposal work in Commercial Area 4 under Remedial Alternative 3B are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil from the former substation area and north of the Mill Buildings with a volume of 2,510 CY.
- Waste was assumed to be TSCA soil from the area around MW-16 with a volume of 4,660 CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from the area around boring BK5 with a volume of 15 CY.
- Allowance of $250 for asphalt transportation and disposal

6.0 Restoration by Redevelopment Area

The following assumption was made relative to Site restoration in each of the redevelopment areas and reflected in the cost estimate.

- Restoration activities include backfill (material and placement), compaction, compaction testing and any other location specific restoration that may be deemed necessary at this time.
- General fill from a local gravel pit at a delivered material cost of $4.58 ton was used for the estimates. Unprocessed topsoil at a delivered price of $18.98 cubic yard was also used where appropriate.
- A six-inch layer of unscreened topsoil will be placed over the compacted general fill in areas that were previously pervious (i.e. not paved or impervious). Topsoil will be hydroseeded, including mulch.
- Restoration for excavation areas under pavement will be backfilled with general fill and compacted to 95 percent of the proctor.
- A six-inch layer of 21AA or equivalent will be placed on the compacted general fill and compacted to 95 percent or greater of the proctor where restoration includes replacing the pavement.
- Concrete will be replaced where removed during excavation activities (sidewalk along Building 17).
- Asphalt will be replaced where removed during excavation activities.

Residential Area 1
Specific assumptions for Site restoration in Residential Area 1 under Remedial Alternative 3B are presented below.

- Rip rap at the Kalamazoo River around the storm sewer does not need to be replaced.

Residential Area 2
No specific assumptions for Site restoration in Residential Area 2 under Remedial Alternative 3B were utilized.

Residential Area 3
Specific assumptions for Site restoration in Residential Area 3 under Remedial Alternative 3B are presented below.

- Backfill material will be imported general fill and overburden material removed to achieve excavation depth requirements but beyond the area exceeding cleanup criteria.
- MW-15 will be replaced.

Residential Area 4
No specific assumptions for Site restoration in Residential Area 4 under Remedial Alternative 3B were utilized.

Waterfront Plaza
No specific assumptions for Site restoration in Waterfront Plaza under Remedial Alternative 3B were utilized. Restoration will not be required in the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
No specific assumptions for Site restoration in Mixed Residential/Commercial Area 1 under Remedial Alternative 3B were utilized.

Mixed Residential/Commercial Area 2
Specific assumptions for Site restoration in Mixed Residential/Commercial Area 2 under Remedial Alternative 3B are presented below.

- Building 6A currently has a dirt floor; restoration would not include a concrete floor.
- Concrete (former ash silos) will not be replaced at SB-2010.
- Concrete around the former 200,000 gallon fuel oil AST will not be replaced.
- Concrete removed for excavations at SB-216, SB-220, SB-222 and SB-223 will not be replaced.
- Additional backfill will be required to fill in the void space of the coal tunnel.
- MW-2, MW-19 and MW-22 will be replaced as necessary.

Commercial Area 1
No specific assumptions for Site restoration in Commercial Area 1 under Remedial Alternative 3B were utilized.

Commercial Area 2
No specific assumptions for Site restoration in Commercial Area 2 under Remedial Alternative 3B were utilized.

Commercial Area 3
No specific assumptions for Site restoration in Commercial Area 3 under Remedial Alternative 3B were utilized.

Commercial Area 4
Specific assumptions for Site restoration in Commercial Area 4 under Remedial Alternative 3B are presented below.

- Asphalt will be 3 inches thick.
- Geotextile and Rip rap will be installed along the Mill Race.
- The Mill Race will be returned to its normal flow path.
- The turbidity curtain will be removed from the Mill Race and Kalamazoo River.

7.0 Demobilization

The following assumptions were made relative to the demobilization from the Site and reflected in the cost estimate.

- Costs included in the demobilization task include time for Site tear down and final decontamination of equipment, and demobilization of equipment and personnel. Demobilization activities were assumed to take five working days.

B. ENGINEERING/OVERSIGHT

1.0 Engineering/Design

The following assumption was made relative to the installation of engineering/design and reflected in the cost estimate.

- Engineering and project design/specifications were estimated to be 15 percent of the Construction Costs.

2.0 Construction Oversight

The following assumption was made relative to the construction oversight and reflected in the cost estimate.

- Construction oversight was estimated to be 10 percent of the Construction Costs.

TABLE D.3C

COST SUMMARY
REMEDIAL ALTERNATIVE 3C – EXCAVATION AND OFF-SITE DISPOSAL
TO LAND USE CRITERIA WITH RISK BASED APPROACH OF 10-5 FOR ARSENIC
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost* *Subtotal*	*Total*
CAPITAL COSTS						
A.	***PRE-DESIGN***					**$33,200**
1.0	Sampling and Analysis Work Plan (SAP)	LS	1	$25,000	$25,000	
	Survey top of banks at Site	LS	1	$2,000	$2,000	
	Health and Safety Plan Update	LS	1	$1,200	$1,200	
	Multi-Area Quality Assurance Project Plan	LS	1	$5,000	$5,000	
2.0	SAP Implementation					**$197,900**
	Project Set up (mark locations etc.)	LS	1	$8,790	$8,800	
	Private Utility Locate	LS	1	$8,000	$8,000	
	Field Activities	DA	41	$2,900	$118,900	
	Field Technicians					
	Sampling Equipment (push probe technology)					
	Expendables (PPE etc)					
	Temporary Lighting and Carbon Monoxide Control	LS	1	$6,000	$6,000	
	Concrete Coring	LS	1	$6,000	$6,000	
	Laboratory Analysis	LS	1	$48,070	$48,100	
	Investigation Derived Waste Disposal	DA	41	$50	$2,100	
3.0	Contingency Sampling and Analysis	LS	1	$114,280	$114,300	**$114,300**
	Based on 50 % of SAP costs					
4.0	Remedial Action Plan	LS	1	$50,000	$50,000	**$50,000**
	TOTAL PRE-DESIGN COSTS					**$395,400**
B.	***CONSTRUCTION***					
1.0	**Mobilization and Set up**					**$254,500**
	Mobilization and Set up	LS	1	$45,700	$45,700	
	Health and Safety	Monthly	5	$28,450	$142,300	
	Erosion Control	LS	1	$15,000	$15,000	
	Site Facilities					
	Temporary Facilities	Monthly	5	$6,810	$34,100	
	Decontamination Pad and Stations	LS	1	$17,375	$17,400	
2.0	**Additional Preparation and/or Demolition (by Redevelopment Area)**					**$138,700**
	Residential 1	LS	1	$14,000	$14,000	
	Residential 2	LS	1	-	-	
	Residential 3	LS	1	$1,225	$1,200	
	Residential 4	LS	1	$850	$900	
	Waterfront Plaza	LS	1	-	-	
	Mixed Residential/Commercial Area 1	LS	1	-	-	
	Mixed Residential/Commercial Area 2	LS	1	$56,625	$56,600	
	Commercial Area 1	LS	1	-	-	
	Commercial Area 2	LS	1	-	-	
	Commercial Area 3	LS	1	-	-	
	Commercial Area 4	LS	1	$65,980	$66,000	

TABLE D.3C

COST SUMMARY
REMEDIAL ALTERNATIVE 3C – EXCAVATION AND OFF-SITE DISPOSAL
TO LAND USE CRITERIA WITH RISK BASED APPROACH OF 10-5 FOR ARSENIC
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost* *Subtotal*	*Total*
3.0	**Excavation (by Redevelopment Area)**					**$288,000**
	Residential 1	CY	935	$14	$12,900	
	Residential 2	CY	620	$12	$7,300	
	Residential 3	CY	1,665	$9	$14,800	
	Residential 4	CY	9,000	$4	$31,700	
	Waterfront Plaza	CY	-	-	-	
	Mixed Residential/Commercial Area 1	CY	70	$61	$4,300	
	Mixed Residential/Commercial Area 2	CY	6,375	$27	$170,600	
	Commercial Area 1	CY	12	$106	$1,300	
	Commercial Area 2	CY	-	-	-	
	Commercial Area 3	CY	-	-	-	
	Commercial Area 4	CY	7,185	$6	$45,100	
4.0	**Transportation and Disposal (by Redevelopment Area)**					**$1,830,270**
	Residential 1 - Non Haz Non TSCA Soils	Ton	1,403	$22	$30,900	
	Residential 2 - Non Haz Non TSCA Soils	Ton	930	$22	$20,500	
	Residential 3 - Non Haz Non TSCA Soils	Ton	2,498	$22	$54,900	
	Residential 4 - Non Haz Non TSCA Soils	Ton	13,500	$22	$297,000	
	Residential 4 - Misc Debris	LS	1		$600	
	Waterfront Plaza - Non Haz Non TSCA Soils	Ton	-	$22	-	
	Mixed Residential/Commercial Area 1 - Non Haz Non TSCA Soils	Ton	105	$22	$2,300	
	Mixed Residential/Commercial Area 1 - Misc. Debris	LS	-	$125	$1,675	
	Mixed Residential/Commercial Area 2 - Non Haz Non TSCA Soils	Ton	9,593	$22	$210,400	
	Mixed Residential/Commercial Area 2 - Misc. Debris	LS	1		$8,245	
	Commercial Area 1 - Non Haz Non TSCA Soils	Ton	18	$22	$400	
	Commercial Area 2 - Non Haz Non TSCA Soils	Ton	-	-	-	
	Commercial Area 2 - Misc. Debris	LS	-	-	-	
	Commercial Area 3 - Non Haz Non TSCA Soils	Ton	-	-	-	
	Commercial Area 3 - Misc. Debris	LS	-	-	-	
	Commercial Area 4 - Non Haz Non TSCA Soils	Ton	3,788	$22	$83,300	
	Commercial Area 4 - Misc. Debris	LS	-		$3,550	
	Commercial Area 4 - TSCA	Ton	7,000	$160	$1,116,500	
7.0	**Restoration (by Redevelopment Area)**					**$517,171**
	Residential 1	LS	1		$25,000	
	Residential 2	LS	1		$18,260	
	Residential 3	LS	1		$32,830	
	Residential 4	LS	1		$139,350	
	Waterfront Plaza	LS	-		-	
	Mixed Residential/Commercial Area 1	LS	1		$8,625	
	Mixed Residential/Commercial Area 2	LS	1		$146,941	
	Commercial Area 1	LS	1		$32,950	
	Commercial Area 2	LS	-		-	
	Commercial Area 3	LS	-		-	
	Commercial Area 4	LS	1		$113,215	

TABLE D.3C

COST SUMMARY
REMEDIAL ALTERNATIVE 3C – EXCAVATION AND OFF-SITE DISPOSAL
TO LAND USE CRITERIA WITH RISK BASED APPROACH OF 10-5 FOR ARSENIC
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost* *Subtotal*	*Total*
8.0	**Demobilization**	LS	1	$26,550		**$26,600**
	Decontamination and Demobilization					
	TOTAL CONSTRUCTION COST					**$3,055,241**
C.	***ENGINEERING/OVERSIGHT***					
1.0	**Institutional Controls**					**$50,000**
2.0	**Engineering/ Design (15 % of Construction Costs)**					**$458,300**
3.0	**Construction Oversight (10 % of Construction Costs)**					**$305,500**
	TOTAL ENGINEERING/OVERSIGHT COSTS					**$813,800**
	CONTINGENCY ON CAPITAL COSTS (25 %)					**$967,260**
	TOTAL CAPITAL COSTS					**$4,836,301**

OPERATION, MAINTENANCE, & MONITORING COSTS

A.	***ANNUAL MONITORING AND MAINTENANCE***					**$2,400**
	Monthly Operation and Maintenance of System	Month	12	$200	$2,400	
	CONTINGENCY ON OM & M COSTS (20 %)					**$480**
	TOTAL CAPITAL COSTS					**$4,836,301**
	NET PRESENT VALUE OF OM & M (30 YEARS @ 7 % DISCOUNT RATE)					**$35,738**
	TOTAL COST					**$4,872,039**

Table D.3C

COST SUMMARY NOTES
REMEDIAL ALTERNATIVE 3C – EXCAVATION AND OFF-SITE DISPOSAL
TO LAND USE CRITERIA WITH RISK BASED APPROACH OF 10-5 FOR ARSENIC
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

GENERAL NOTES

A. Estimate for Remedial Alternative 3C - Excavation and Off-Site Disposal Land Use Criteria with Risk Based Approach of 10-5 for Arsenic [6.4 milligrams per kilogram (mg/kg) for Residential and Mixed Residential/Commercial Areas and 27 mg/kg for Commercial Areas] and has been prepared based on available information at the time of this document. Redevelopment activities conducted, being conducted and anticipated for the Site by the City of Plainwell may affect the remediation costs. Costs presented in the Feasibility Study (FS) Report have taken into consideration anticipated redevelopment plans by the City of Plainwell. Redevelopment plans include demolition of non-historical buildings to the concrete slab as well as specific land use restrictions/designations for the Site as presented on Figure 1.2 of the FS Report. This cost estimate is expected to be within -30 percent to +50 percent of the actual remedial costs in accordance with United States Environmental Protection Agency (U.S. EPA) guidance.

B. Remediation activities for each of the 11 proposed redevelopment areas were estimated separately; however, the estimate assumes one mobilization and demobilization effort to conduct the work.

C. Costs assume that additional soil investigation will not be conducted under building slabs unless otherwise noted in the pre-design notes below.

D. Areas targeted for soil removal and off-site disposal were determined based on a risk-based approach for arsenic as detailed in Appendix A of the FS Revision 1.

E. The cost estimate assumes that new structures have not been constructed in areas that are planned for soil excavation and existing structures remain in place.

F. The cost estimate includes abandonment and replacement costs of groundwater monitoring wells within excavation areas.

G. Costs are based on 2013 dollars.

H. All volumes are based on in-place measures unless otherwise stated.

I. Abbreviations used in the "Unit" column in the Cost Estimate Table are as follows:
   - CY = Cubic Yard
   - EA = Each
   - LS = Lump Sum
   - TN = Ton
   - LF= linear foot

TASK NOTES:

CAPITAL COSTS

A. INVESTIGATION/CONSTRUCTION

1.0 Pre-Design Investigation (PDI) Activities

The following assumptions were made relative to the PDI activities in each of the redevelopment areas and reflected in the cost estimate.

- Generation of a Sampling and Analysis Plan (SAP).
- Update the Health and Safety Plan as necessary.
- Update the Multi-Area Quality Assurance Project Plan as necessary.
- Completion of the SAP - soil boring installation and soil sample collection to delineate the horizontal extent of impact. Soil borings are assumed to be collected via direct push method. PDI samples will be collected and submitted for laboratory analysis for specific parameters determined to exceed Preliminary Remediation Goals (PRGs) during the Remedial Investigation (RI). It is assumed that the vertical extent of the impacted soil is already established by the samples collected during the Remedial Investigation (RI).
- Quality Assurance/Quality Control samples are included on a 1 per 10 basis.
- A survey of the "top of bank" is included in the PDI cost estimate.
- All areas where subsurface work is to be conducted will be cleared through a public utility locate (i.e., MISS Dig), a private utility locate, review of available drawings, and discussions with individuals knowledgeable of the Site and utilities located thereon.

Residential Area 1
PRGs exceeded in Residential Area 1 include the risked based criteria for arsenic of 6.4 milligrams per kilogram (mg/kg). Soil samples will be collected to delineate the extent of soil impacted with PCBs adjacent to the storm sewer line installed by the Michigan Department of Transportation (MDOT) in 2012.

- Allowance for 30 soil samples for PCBs
- Allowance for 28 soil samples for arsenic

Residential Area 2
PRGs exceeded in Residential Area 2 include the risked based criteria for arsenic of 6.4 mg/kg.

- Allowance for 36 soil samples for arsenic

Residential Area 3
PRGs exceeded in Residential Area 3 include the risked based criteria for arsenic of 6.4 mg/kg.

- Allowance for 60 soil samples for arsenic

Residential Area 4
PRGs exceeded in Residential Area 4 include the risked based criteria for arsenic of 6.4 mg/kg. Part 201 residential direct contact criteria is exceeded at locations within Residential Area 4 for benzo(a)pyrene, cyanide, dibenz(a,h)anthracene, lead and PCBs. Residential soil volatilization to indoor air inhalation criteria (SVIIC) was exceeded at one location for benzene. Part 201 non-residential direct contact criteria for lead and PCBs were also exceeded in Residential Area4.

- An allowance for 52 soil samples for arsenic
- Benzene above the residential SVIIC at TP-308
    - An allowance for 4 soil samples for benzene was included in the estimate.
- Cyanide was above residential direct contact criteria at SB-302 in the shallow (0-1 foot) interval
    - Four samples for cyanide were included in the estimate
- An allowance for 20 samples for lead was included in the estimate
- PCBs were above criteria at TP-313 and SB-301
    - An allowance for 16 soil samples for PCBs was included in the estimate

- The PNA parameters were identified in shallow samples (0-1.5 feet) below grade at DG3, DG4 and TP-302
    - Allowance for 12 PNA samples

Waterfront Plaza
PDI activities will not be specifically conducted within the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
PRGs exceeded in Mixed Residential/Commercial Area 1 include Part 201 non-residential inhalation criteria for manganese and the risked based PRG for arsenic of 6.4 mg/kg.

- A total of 24 soil samples for arsenic will be collected.
- Soil samples will be collected from borings around TP-334 for manganese. Eight samples will be collected for manganese analysis.

Mixed Residential/Commercial Area 2
PRGs exceeded in Mixed Residential/Commercial Area 2 include Part 201 non-residential direct contact criteria for benzo(a)pyrene, and lead. Residential direct contact criteria is exceeded at locations within Mixed Residential/Commercial Area 2 for benzo(a)pyrene, dibenz(a,h)anthracene; benzo(a)anthracene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene and lead. The risked based PRG for arsenic of 6.4 mg/kg is also exceeded at locations within Mixed Residential/Commercial Area 2.

Soil delineation by work area as follows:

Arsenic ONLY locations:
Building 25
- Allowance for 8 samples

Building 28
- Allowance for 8 samples

Train Shed
- Allowance for 4 samples

Coal Tunnel Area
- Allowance for 30 samples

Former Ash Silo Area (SB-2011)
- Allowance for 8 samples

Former clarifier area (TP-344)
- Allowance for 8 samples

Area north of Building 3/Former Water Tower Area (TP-340, TP-342, TP-343)
- Allowance for 16 samples

Arsenic and Lead sample locations:
Area around SB-2013
- Allowance for 12 samples

Arsenic, PNAs and Lead sample locations:
Building 3A
- Allowance for 12 samples

Building 6A
- Allowance for 18 samples
- Technicians will be required to don respirators for this work
- The floor in the majority of this building is exposed soil

Arsenic and PNAs sample locations
Fuel Oil AST Area

- Allowance for 24 PNA soil samples
- Allowance for 12 arsenic samples

A total of 136 samples will be collected and analyzed for arsenic.
A total of 30 samples will be collected and analyzed for PNAs.
A total of 42 samples will be collected and analyzed for lead.

Commercial Area 1
PRGs exceeded in Commercial Area 1 include Part 201 non-residential inhalation criteria for manganese.

- Delineation samples (4) will be collected around SS-105 for manganese.

Commercial Area2
PRGs are not exceeded in Commercial Area 2.

Commercial Area3
PRGs are not exceeded in Commercial Area 3.

Commercial Area 4
PRGs exceeded in Commercial Area 4 include Part 201 non-residential direct contact criteria for PCBs. Residential direct contact criteria is exceeded at locations within Commercial Area 4 for benzo(a)pyrene, lead and PCBs. The risked based PRG criteria for arsenic of 27 mg/kg was exceeded within Commercial Area 4.

Soil delineation by area as follows:

Arsenic ONLY locations:
SB-2012

- Allowance for 4 samples

Parking lot area south of Building 17

- Allowance for 60 samples

Arsenic and Lead sample locations:
TP-341

- Allowance for 4 samples

Arsenic, PNAs and Lead sample locations:
Former Substation Area/North of Mill Buildings

- Allowance for 30 samples

PCBs and Arsenic sample locations:
MW-16 Area

- Allowance for 18 samples

A total of 116 samples will be collected and analyzed for arsenic.
A total of 30 samples will be collected and analyzed for PNAs.
A total of 18 samples will be collected and analyzed for PCBs.
A total of 34 samples will be collected and analyzed for lead.

2.0 Mobilization/Set-Up

The following assumptions were made relative to the mobilization/set-up in each of the redevelopment areas and reflected in the cost estimate.

- Mobilization and set-up includes: mobilization of personnel and equipment; construction survey work (e.g., excavation layout and verification sample locations); and geotechnical and chemical testing on backfill materials.
  - An allowance of $8,000 to mobilize personnel and equipment was included in the estimate.
  - $30,000 for survey work was included in the estimate.
  - Geotechnical and chemical analysis for imported materials was included in the estimate. One set of chemical analysis [Target Analyte List Metals, Target Compound List (TCL) for volatile organic compounds, TCL for semi-volatile compounds, and polychlorinated biphenyl (PCBs) per material (topsoil, general fill and 21AA/gravel]. The topsoil sample will also be analyzed for pH, phosphorous, organic content, pesticides and herbicides.
- Health and Safety includes an on-Site Health and Safety Officer (HSO) for 4 months, the HSO will not stay on site during all restoration activities. Also included in the costs are: air monitoring equipment and calibration gases; a decontamination trailer; and disposable personal protection equipment (PPE).
- Air monitoring assumes real-time air monitoring will be conducted during all excavation work utilizing a photoionization detector (11.7 electronVolt [eV] lamp) and fugitive dust monitor(s). Air monitoring does not include the collection of samples for laboratory analysis or laboratory analytical costs.
- Erosion control includes an allowance for silt fence (4,000 LF) and geofabric to cover catch basins on the Site. Costs for erosion control measures specific to individual redevelopment areas (i.e., turbidity curtains, etc.) are included in individual redevelopment area estimates (e.g., Commercial Area 4).
- Site facility costs include electrical hookup and electricity for two office trailers (one for the contractor and one for the U.S. EPA) for 5 months. Other temporary facilities include portable sanitary services, a drinking water allowance and a small dumpster for worker general refuse. The expense of one Site truck for the duration of the services was included.
- Site facility costs include materials and construction of temporary decontamination pads and decontamination stations for workers. It was assumed that potable water could be obtained from the City of Plainwell for use during the project.
- Site facility costs include $6,000 to for the installation and maintenance of a staging area for waste.
- A perimeter fence currently exists around the majority of the Site. The cost estimate assumes the fence will remain and can be utilized as a security measure to prevent access to the Site during construction activities.

3.0 Preparation/Pre-Excavation Work by Redevelopment Area

The following assumptions were made relative to the preparation/pre-excavation work in each of the redevelopment areas and reflected in the cost estimate.

- A Soil Erosion and Sedimentation Control Permit will be obtained from Allegan County. All other necessary permits will also be obtained prior to intrusive work at the Site.
- All areas where subsurface work is to be conducted will be cleared through a public utility locate (i.e., MISS Dig), a private utility locate, review of available drawings, and discussions with individuals knowledgeable of the Site and utilities located thereon.

Residential Area 1
Specific assumptions for preparation/pre-excavation work in Residential Area 1 under Remedial Alternative 3C are presented below.

- Trees and shrubs in the excavation areas will need to be cleared and grubbed.
- Turbidity curtain will be temporally installed in the Kalamazoo River during excavation and backfill activities.
- One power pole will need to be relocated for the excavation work around SB-104.

Residential Area 2
No specific assumptions for preparation/pre-excavation work in Residential Area 2 under Remedial Alternative 3C were utilized.

Residential Area 3
Specific assumptions for preparation/pre-excavation work in Residential Area 3 under Remedial Alternative 3C are presented below.

- MW-15 will be abandoned.
- Clearing will be required in the area around MW-15.

Residential Area 4
Specific assumptions for preparation/pre-excavation work in Residential Area 4 under Remedial Alternative 3C are presented below.

- Clearing will be required in the area around SB-301/SG-4.
- Pavement by TP-302 will be saw cut.

Waterfront Plaza
No specific assumptions for preparation/pre-excavation work in Waterfront Plaza under Remedial Alternative 3C were utilized.

Mixed Residential/Commercial Area 1
The specific assumption for preparation/pre-excavation work in Mixed Residential/Commercial Area 1 under Remedial Alternative 3C is presented below.

- Pavement in the work areas will be saw cut prior to excavation to leave a clean line for restoration activities.

Mixed Residential/Commercial Area 2
Specific assumptions for preparation/pre-excavation work in Mixed Residential/Commercial Area 2 under Remedial Alternative 3C are presented below.

- The loading dock at the south end of Building 1 will be evaluated by a structural engineering assessment to ensure excavation of the fuel oil line will not damage either the loading dock or Building 1.
- The pavement and concrete will be saw cut prior to excavation to create clean lines for restoration.
- A demolition notice will be submitted to the State of Michigan for the demolition of Building 5A/part of the coal tunnel. Asbestos abatement may be necessary on pipe wrap found outside of Building 5A.
- Excavation of soils under the concrete slabs of the demolished buildings (3A, 25 and 28) will require the relocation of the backfill (less than 3 feet thick) prior to excavation.

- Fuel Oil No. 6 within the former coal tunnel will be removed from the tunnel before the tunnel itself is removed.
- The piping run from the former Fuel Oil No. 6 AST and Building 5 will be exposed at one end and drained of any residual fuel oil prior to removing the line.
- Monitoring well MW-19 will be abandoned prior to excavation activities in this area.
- Monitoring well MW-22 will be abandoned prior to removal of the former fuel oil line.
- Monitoring well MW-2 will be abandoned prior to excavation activities at SB-2010 and SB-2011.

Commercial Area 1
No specific assumptions for preparation/pre-excavation work in Commercial Area 1 under Remedial Alternative 3C were utilized.

Commercial Area 2
No specific assumptions for preparation/pre-excavation work in Commercial Area 2 under Remedial Alternative 3C were utilized.

Commercial Area 3
No specific assumptions for preparation/pre-excavation work in Commercial Area 3 under Remedial Alternative 3C were utilized. Excavation work will not be conducted in Commercial Area 3 for Remedial Alternative 3C.

Commercial Area 4
Specific assumptions for preparation/pre-excavation work in Commercial Area 4 under Remedial Alternative 3C are presented below.

- Turbidity curtain will be installed in the Mill Race in the area by MW-16 (along the Mill Race) and in the area of MW-3 prior to excavation activities.
- Monitoring of the Mill Race and Kalamazoo River for turbidity will be conducted during excavation activities.
- MW-16 will be abandoned prior to excavation work in that area.
- Protection of MW-3 (barriers) will be installed.
- A structural engineering evaluation of the pedestrian bridge for stability during excavation activities will be conducted. The evaluation will determine if shoring of the bridge is necessary. An allowance of $5,000 is included in the estimate to conduct the evaluation. Shoring costs have not been included in the estimate.
- The water flow of the Mill Race will be diverted in the excavation area. The methodology for this work to be determined in the pre-design phase of the project.
- Rip rap along the Mill Race will be removed and staged for re-use.
- Pavement in the work areas will be saw cut prior to excavation to allow for restoration activities.

4.0 Excavation by Redevelopment Area

Conceptual excavation areas for each of the Redevelopment areas are shown of Figures 3.21 through 3.30 of the FS Report (Revision 1).

The following assumptions were made relative to excavation in each of the redevelopment areas and reflected in the cost estimate.

- Soil excavation quantities within the buildings are based on excavating horizontally by five feet in each direction and one-foot vertically beyond the sample location exceeding criteria.

- Excavation estimates assume dewatering will not be necessary and that all work can be completed in Level D PPE except Building 6A which will be conducted with supplied air (Level B) PPE.
- Standby time was not added to account for the time for laboratory analysis of verification samples. It was assumed that the project would proceed across the Site allowing for laboratory analysis to be conducted while another redevelopment area was being excavated or restored.

Specific assumptions to each redevelopment area, in addition to those presented above globally, are provided below.

Residential Area 1
Residential Area 1 is located at the far west end of the Site, where the majority of the former sludge dewatering lagoons were located. The former Mill wastewater treatment building, activated sludge tank and secondary clarifier were constructed over the lagoons. The wastewater treatment structures were demolished on behalf of the City of Plainwell in November and December 2013. The specific assumption for excavation in Residential Area 1 under Remedial Alternative 3C is presented below.

- Overburden present beyond the target excavation area that must be removed to achieve the full depth of excavation will be disposed of off-site.

Residential Area 2
Residential Area 2 is located between Residential Area 1 and Residential Area 3 and is positioned along the Kalamazoo River. This area was historically occupied by sludge dewatering lagoons (A, B, C) and a primary clarifier. The primary clarifier was demolished to the concrete slab in November 2013. No specific assumptions for excavation work in Residential Area 2 under Remedial Alternative 3C were utilized.

Residential Area 3
Residential Area 3 is located near the center of the Site. The former aeration basin location occupies the majority of the area. A former secondary clarifier was historically present in this area, which was demolished in November 2013 with the floor of the former clarifier remaining. This area was backfilled to surrounding grade, which was approximately 7-8 feet higher than the floor of the clarifier and aeration basin. Specific assumptions for excavation in Residential Area 3 under Remedial Alternative 3C are presented below.

- Material removed from the bottom of the aeration basin will require double handling due to the slopes of the former aeration basin and the depth of the excavation.

Residential Area 4
Residential Area 4 is positioned along the Kalamazoo River between Residential Area 3 and Mixed Residential Area 2. No aboveground structures are currently present on this area. A portion of this area was historically utilized by the Mill as a coal storage area. No specific assumptions for excavation in Residential Area 4 under Remedial Alternative 3C were made.

Waterfront Plaza
No excavation activities are anticipated in the Waterfront Plaza Area.

Mixed Residential/Commercial Area 1
Mixed Residential/Commercial Area 1 is located between Commercial Area 2 and Commercial Area 3 on the southern property line along Allegan Street. This area was once occupied by the former Specialty

Minerals Building and associated above ground storage tanks. The Specialty Minerals building and ASTs were demolished to the concrete slab in December 2011.

- Underground utilities encountered (TP-303 and TP-306) between the former Specialty Minerals Building and the main Mill Buildings will be capped at either end of the excavation.

Mixed Residential and Commercial Area 2

Mixed Residential and Commercial Area 2 is located between Residential Area 4 and Commercial Area 4 at the northern end of the Site along the Kalamazoo River. The majority of the area is occupied by Mill Buildings and pavement. Buildings 3A, 25 and 28 along with the eastern water tower, 200,000-gallon Fuel Oil AST, and the brine USTs, were demolished on behalf of the City of Plainwell. The concrete slabs were left in place for Buildings 3A and 28. Building 25 was part of the Site's historical wastewater treatment system and had a subsurface vault and system to pump the waste water from the Mill to the onsite WWTP at the west end of the Site. The vault under the northern portion of Building 25 was not removed. The vault floor was cracked and the sidewalls removed to 4 feet below grade, then the vault was filled with imported general fill. The concrete slab under the remaining portion of Building 25 was left in place.

Specific assumptions for excavation in Mixed Residential/Commercial Area 2 under Remedial Alternative 3C are presented below.

- A storm sewer was installed through the west side of Mixed Residential/Commercial Area 2 in 2012 by the Michigan Department of Transportation (MDOT). The approximate location of the storm sewer is shown on Figure 3.26. Before conducting excavation work to remove the former fuel oil AST line and excavate the east side of the former fuel AST, the exact location of the storm sewer line will be determined, shoring of the line may be necessary during the removal of the fuel oil AST line.
- Soils in Building 6A will be removed using a vacuum extraction system.

Commercial Area 1

Commercial Area 1 is located in the far southwest portion of the Site. No structures or paved areas are currently present in this area that would require unique equipment or procedures to conduct the proposed remedial activities. This area of the Site has not been developed and was not part of historic Mill operations.

- A storm sewer was installed through this area in 2012 by the Michigan Department of Transportation (MDOT). The approximate location of the storm sewer is shown on Figure 3.27. Before conducting excavation work in the area of SS-105, the exact location of the line will be determined.

Commercial Area 2

Excavation work will not be conducted in Commercial Area 2 for Remedial Alternative 3C.

Commercial Area 3

Excavation work will not be conducted in Commercial Area 3 for Remedial Alternative 3C.

Commercial Area 4

Commercial Area 4 is located on the eastern side of the Site. The majority of this area is covered with either pavement, buildings (vacant and occupied) or former building concrete slabs. Buildings (9A, 9B, 9C, 9D, 9E, 9F, and 23) were demolished on behalf of the City of Plainwell in 2012, with the majority of the former building concrete slabs left in place and backfilled to surrounding grade. The basement areas were backfilled with a combination of crushed concrete (from the buildings on Site), soil from an adjacent retaining wall that was removed, and imported gravel material and vary in thickness from 6 feet to 9 feet. Specific assumptions for excavation in Commercial Area 4 under Remedial Alternative 3C are presented below.

- Access to both the former substation area and around MW-16 will be restricted due to the distance between existing structures and either the Kalamazoo River or the Mill Race. Excavated soils will likely need to be double handled.

5.0 Transportation and Disposal by Redevelopment Area

The following assumptions were made relative to the transportation and disposal of materials in each of the redevelopment areas and reflected in the cost estimate.

- Soil volumes were converted to tonnage assuming a ratio of 1.5 tons per cubic yard for soils. Tonnage for concrete was based on 1.65 tons per cubic yard of material. Waste has been categorized as non-hazardous and non-TSCA soils; TSCA soil; TSCA debris; and miscellaneous debris.
- Transportation and disposal pricing is based on the non-hazardous, non-TSCA material being accepted at Waste Management Autumn Hills Landfill in Zeeland, Michigan. A cost of $22.00 per ton for both transportation and disposal of non-hazardous, non-TSCA waste was used for the estimates.
- A disposal price of $135.00 per ton was used for TSCA soils. For estimation purposes it was assumed that the TSCA soils would be transported to the Environmental Quality Belleville, Michigan Landfill for direct landfill disposal. Transportation of the soils was assumed to be conducted in lined 50 ton gravel trains. Transportation of each load of 50 tons was assumed to cost $500.00.
- Transportation costs assume fuel prices for diesel will not exceed $4.00 per gallon.
- Organic material generated from clearing activities was assumed to be chipped and left on Site.
- Concrete and asphalt will be disposed of off-Site, not recycled.

Residential Area 1
The specific assumption for transportation and disposal work in Residential Area 1 under Remedial Alternative 3C is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 935 CY.

Residential Area 2
The specific assumption for transportation and disposal work in Residential Area 2 under Remedial Alternative 3C is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 620 CY.

Residential Area 3
The specific assumption for transportation and disposal work in Residential Area 2 under Remedial Alternative 3C is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 1,655 CY.

Residential Area 4
The specific assumption for transportation and disposal work in Residential Area 3 under Remedial Alternative 3C is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 9,000 CY.
- Allowance of $600 for asphalt.

Waterfront Plaza
No specific assumptions for transportation and disposal work in Waterfront Plaza under Remedial Alternative 3C were utilized. Excavation activities will not be conducted within the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
Specific assumptions for transportation and disposal work in Mixed Residential/Commercial Area 1 under Remedial Alternative 3C are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 70 CY.
- Allowance of 50 CY for asphalt disposal.

Mixed Residential/Commercial Area 2
Specific assumptions for transportation and disposal work in Mixed Residential/Commercial Area 2 under Remedial Alternative 3C are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil from Building 6A with a volume of 200CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from the coal tunnel area with a volume of 1,270 CY.
- Allowance of $3,500 for miscellaneous debris from the coal tunnel area (bricks, concrete)
- Waste was assumed to be non-hazardous, non-TSCA soil from the fuel oil line with a volume of 525 CY.
- Allowance of $600 for disposal of the fuel oil line piping
- Waste was assumed to be non-hazardous, non-TSCA soil from the fuel oil No. 6 AST area with a volume of 2,500 CY.
- Allowance of $1,200 for the concrete ring the Fuel Oil AST was sitting on and buried concrete and asphalt.
- The waste from the Train Shed was assumed to be non-hazardous, non-TSCA soil from with a volume of 205 CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from the north end of the Mill Buildings (Buildings 3A, 25, 28, test pits-TP-340, TP-342,TP-343 and SB-2013) plus the area around SB-2011 with a volume of 1,695 CY.
- Allowance of $6,000 for miscellaneous debris from these areas at the north end of the Mill Building.

Commercial Area 1
Specific assumptions for transportation and disposal work in Commercial Area 1 under Remedial Alternative 3C are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 12 CY.

Commercial Area 2
No specific assumptions for transportation and disposal work in Commercial Area 2 under Remedial Alternative 3C were utilized. Excavation activities will not be conducted within the Commercial Area 2.

Commercial Area 3
No specific assumptions for transportation and disposal work in Commercial Area 3 under Remedial Alternative 3C were utilized. Excavation activities will not be conducted within the Commercial Area 3.

Commercial Area 4
Specific assumptions for transportation and disposal work in Commercial Area 4 under Remedial Alternative 3C are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil from the former substation area and north of the Mill Buildings with a volume of 2,500 CY.
- Waste was assumed to be TSCA soil from the area around MW-16 with a volume of 4,660 CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from the area around BK5 with a volume of 15 CY.
- Allowance of 400 CY of asphalt

6.0 Restoration by Redevelopment Area

The following assumption was made relative to Site restoration in each of the redevelopment areas and reflected in the cost estimate.

- Restoration activities include backfill (material and placement), compaction, compaction testing and any other location specific restoration that may be deemed necessary at this time (e.g.,. replacing a floor).
- General fill from a local gravel pit at a delivered material cost of $4.58 ton was used for the estimates. Unprocessed topsoil at a delivered price of $18.98 cubic yard was also used where appropriate.
- Restoration for the excavation areas include general fill backfill compacted to 92-95 percent of the proctor.
- A six-inch layer of unscreened topsoil will be placed over the compacted general fill in areas that were previously pervious (i.e., not paved or impervious). Topsoil will be hydroseeded, including mulch.
- Restoration for excavation areas under pavement will be backfilled with general fill and compacted to 95 percent of the proctor.
- A six-inch layer of 21AA or equivalent will be placed on the compacted general fill and compacted to 95 percent or greater of the proctor where pavement will be installed.
- Asphalt will be replaced where removed during excavation activities.

Residential Area 1
Specific assumptions for Site restoration in Residential Area 1 under Remedial Alternative 3C are presented below.

- Backfill material will be imported general fill and overburden material removed to achieve excavation depth requirements but beyond the area exceeding PRGs.

Residential Area 2
No specific assumptions for Site restoration in Residential Area 2 under Remedial Alternative 3A were utilized.

Residential Area 3
Specific assumptions for Site restoration in Residential Area 3 under Remedial Alternative 3C are presented below.

- Backfill material will be imported general fill and overburden material removed to achieve excavation depth requirements but beyond the area exceeding cleanup criteria.
- MW-15 will be replaced.

Residential Area 4
No specific assumptions for Site restoration in Mixed Residential/Commercial Area 1 under Remedial Alternative 3C were utilized.

Waterfront Plaza
No specific assumptions for Site restoration in Waterfront Plaza under Remedial Alternative 3C were utilized. Restoration will not be required in the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
No specific assumptions for Site restoration in Mixed Residential/Commercial Area 1 under Remedial Alternative 3C were utilized.

Mixed Residential/Commercial Area 2
Specific assumptions for Site restoration in Mixed Residential/Commercial Area 2 under Remedial Alternative 3C are presented below.

- Building 6A currently has a dirt floor; restoration would not include a concrete floor.
- Concrete (former ash silos) will not be replaced at SB-2010.
- Concrete around the former 200,000 gallon fuel oil AST will not be replaced.
- Concrete removed for excavations at SB-216, SB-220, SB-222 and SB-223 will not be replaced.
- Additional backfill will be required to fill in the void space of the coal tunnel.
- MW-2, MW-19 and MW-22 will be replaced as necessary.

Commercial Area 1
No specific assumptions for Site restoration in Commercial Area 1 under Remedial Alternative 3C were utilized.

Commercial Area 2
No specific assumptions for Site restoration in Commercial Area 2 under Remedial Alternative 3C were utilized.

Commercial Area 3
No specific assumptions for Site restoration in Commercial Area 3 under Remedial Alternative 3C were utilized.

Commercial Area 4
Specific assumptions for Site restoration in Commercial Area 4 under Remedial Alternative 3C are presented below.

- Asphalt will be 3 inches thick.
- Geotextile and Rip rap will be installed along the Mill Race.
- The Mill Race will be returned to its normal flow path.
- The turbidity curtain will be removed from the Mill Race and Kalamazoo River.

7.0 Demobilization

The following assumptions were made relative to the demobilization from the Site and reflected in the cost estimate.

- Costs included in the demobilization task include time for Site tear down and final decontamination of equipment, and demobilization of equipment and personnel. Demobilization activities were assumed to take five working days.

B. ENGINEERING/OVERSIGHT

1.0 Engineering/Design

The following assumption was made relative to the installation of engineering/design and reflected in the cost estimate.

- Engineering and project design/specifications were estimated to be 15 percent of the Construction Costs.

2.0 Construction Oversight

The following assumption was made relative to the construction oversight and reflected in the cost estimate.

- Construction oversight was estimated to be 10 percent of the Construction Costs.

TABLE D.3D

COST SUMMARY
REMEDIAL ALTERNATIVE 3D – EXCAVATION AND OFF-SITE DISPOSAL
TO LAND USE CRITERIA WITH RISK BASED APPROACH OF 10-6 FOR ARSENIC
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost* *Subtotal*	*Total*
CAPITAL COSTS						
A.	***PRE-DESIGN***					**$33,200**
1.0	Sampling and Analysis Work Plan (SAP)	LS	1	$25,000	$25,000	
	Survey top of banks at Site	LS	1	$2,000	$2,000	
	Health and Safety Plan Update	LS	1	$1,200	$1,200	
	Multi-Area Quality Assurance Project Plan	LS	1	$5,000	$5,000	
2.0	SAP Implementation					**$197,900**
	Project Set up (mark locations etc.)	LS	1	$8,790	$8,800	
	Private Utility Locate	LS	1	$8,000	$8,000	
	Field Activities	DA	41	$2,900	$118,900	
	Field Technicians					
	Sampling Equipment (push probe technology)					
	Expendables (PPE etc)					
	Temporary Lighting and Carbon Monoxide Control	LS	1	$6,000	$6,000	
	Concrete Coring	LS	1	$6,000	$6,000	
	Laboratory Analysis	LS	1	$48,070	$48,100	
	Investigation Derived Waste Disposal	DA	41	$50	$2,100	
3.0	Contingency Sampling and Analysis	LS	1	$114,280	$114,300	**$114,300**
	Based on 50 % of SAP costs					
4.0	Remedial Action Plan	LS	1	$50,000	$50,000	**$50,000**
	TOTAL PRE-DESIGN COSTS					**$395,400**
B.	***CONSTRUCTION***					
1.0	**Mobilization and Set up**					**$255,600**
	Mobilization and Set up	LS	1	$45,700	$45,700	
	Health and Safety	Monthly	5	$28,450	$142,300	
	Erosion Control	LS	1	$16,060	$16,100	
	Site Facilities					
	Temporary Facilities	Monthly	5	$6,810	$34,100	
	Decontamination Pad and Stations	LS	1	$17,375	$17,400	
2.0	**Additional Preparation and/or Demolition (by Redevelopment Area)**					**$149,400**
	Residential 1	LS	1	$16,950	$17,000	
	Residential 2	LS	1	-	-	
	Residential 3	LS	1	$1,225	$1,200	
	Residential 4	LS	1	$1,100	$1,100	
	Waterfront Plaza	LS	1	-	-	
	Mixed Residential/Commercial Area 1	LS	1	$2,500	$2,500	
	Mixed Residential/Commercial Area 2	LS	1	$59,647	$59,600	
	Commercial Area 1	LS	1	$2,000	$2,000	
	Commercial Area 2	LS	1	-	-	
	Commercial Area 3	LS	1	$625	-	
	Commercial Area 4	LS	1	$65,987	$66,000	

TABLE D.3D

COST SUMMARY
REMEDIAL ALTERNATIVE 3D – EXCAVATION AND OFF-SITE DISPOSAL
TO LAND USE CRITERIA WITH RISK BASED APPROACH OF 10-6 FOR ARSENIC
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost* *Subtotal*	*Total*
3.0	**Excavation (by Redevelopment Area)**					**$405,400**
	Residential 1	CY	1,100	$16	$18,000	
	Residential 2	CY	620	$12	$7,500	
	Residential 3	CY	4,230	$6	$26,400	
	Residential 4	CY	9,380	$3	$29,500	
	Waterfront Plaza	CY	-	-	-	
	Mixed Residential/Commercial Area 1	CY	205	$59	$12,100	
	Mixed Residential/Commercial Area 2	CY	6,725	$26	$177,600	
	Commercial Area 1	CY	165	$36	$6,000	
	Commercial Area 2	CY	2,460	$9	$21,100	
	Commercial Area 3	CY	3,845	$6	$21,600	
	Commercial Area 4	CY	15,375	$6	$85,600	
4.0	**Transportation and Disposal (by Redevelopment Area)**					**$2,455,982**
	Residential 1 - Non Haz Non TSCA Soils	Ton	1,650	$22	$36,300	
	Residential 2 - Non Haz Non TSCA Soils	Ton	930	$22	$20,500	
	Residential 3 - Non Haz Non TSCA Soils	Ton	6,345	$22	$139,600	
	Residential 4 - Non Haz Non TSCA Soils	Ton	14,070	$22	$309,500	
	Residential 4 - Misc Debris	LS	1		$600	
	Waterfront Plaza - Non Haz Non TSCA Soils	Ton	-	$22	-	
	Mixed Residential/Commercial Area 1 - Non Haz Non TSCA Soils	Ton	308	$22	$6,800	
	Mixed Residential/Commercial Area 1 - Misc. Debris	LS	-	$1,675	$1,675	
	Mixed Residential/Commercial Area 2 - Non Haz Non TSCA Soils	Ton	10,088	$22	$221,300	
	Mixed Residential/Commercial Area 2 - Misc. Debris	LS	1		$5,512	
	Commercial Area 1 - Non Haz Non TSCA Soils	Ton	248	$22	$5,400	
	Commercial Area 2 - Non Haz Non TSCA Soils	Ton	3,690	$22	$81,200	
	Commercial Area 2 - Misc. Debris	LS	1		$5,825	
	Commercial Area 3 - Non Haz Non TSCA Soils	Ton	5,768	$22	$126,900	
	Commercial Area 3 - Misc. Debris	LS	1		$1,750	
	Commercial Area 4 - Non Haz Non TSCA Soils	Ton	16,073	$22	$353,600	
	Commercial Area 4 - Misc. Debris	LS	-		$23,020	
	Commercial Area 4 - TSCA	Ton	7,000	$160	$1,116,500	
7.0	**Restoration (by Redevelopment Area)**					**$929,270**
	Residential 1	LS	1		$42,115	
	Residential 2	LS	1		$18,710	
	Residential 3	LS	1		$108,750	
	Residential 4	LS	1		$152,050	
	Waterfront Plaza	LS	-		-	
	Mixed Residential/Commercial Area 1	LS	1		$21,275	
	Mixed Residential/Commercial Area 2	LS	1		$161,127	
	Commercial Area 1	LS	1		$10,560	
	Commercial Area 2	LS	1		$32,385	
	Commercial Area 3	LS	1		$127,800	
	Commercial Area 4	LS	1		$254,498	

TABLE D.3D

COST SUMMARY
REMEDIAL ALTERNATIVE 3D – EXCAVATION AND OFF-SITE DISPOSAL
TO LAND USE CRITERIA WITH RISK BASED APPROACH OF 10-6 FOR ARSENIC
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost* *Subtotal*	*Total*
8.0	**Demobilization** Decontamination and Demobilization	LS	1	$26,550		**$26,600**
	TOTAL CONSTRUCTION COST					**$4,222,252**
C.	***ENGINEERING/OVERSIGHT***					
1.0	**Institutional Controls**					**$50,000**
2.0	**Engineering/ Design (15 % of Construction Costs)**					**$633,300**
3.0	**Construction Oversight (10 % of Construction Costs)**					**$422,200**
	TOTAL ENGINEERING/OVERSIGHT COSTS					**$1,105,500**
	CONTINGENCY ON CAPITAL COSTS (25 %)					**$1,331,938**
	TOTAL CAPITAL COSTS					**$6,659,690**

OPERATION, MAINTENANCE, & MONITORING COSTS

A.	***ANNUAL MONITORING AND MAINTENANCE***					**$2,400**
	Monthly Operation and Maintenance of System	Month	12	$200	$2,400	
	CONTINGENCY ON OM & M COSTS (20 %)					**$480**
	TOTAL CAPITAL COSTS					**$6,659,690**
	NET PRESENT VALUE OF OM & M (30 YEARS @ 7 % DISCOUNT RATE)					**$35,738**
	TOTAL COST					**$6,695,428**

Table D.3D

COST SUMMARY NOTES
REMEDIAL ALTERNATIVE 3D – EXCAVATION AND OFF-SITE DISPOSAL
TO LAND USE CRITERIA WITH RISK BASED APPROACH OF 10^{-6} FOR ARSENIC
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

GENERAL NOTES

A. Estimate for Remedial Alternative 3D - Excavation and Off-Site Disposal to Land Use Criteria with Risk Based Approach of 10^{-6} for Arsenic (5.8 milligrams per kilogram (mg/kg) has been prepared based on available information at the time of this document. Redevelopment activities conducted, being conducted and anticipated for the Site by the City of Plainwell may affect the remediation costs. Costs presented in the Feasibility Study (FS) Report have taken into consideration anticipated redevelopment plans by the City of Plainwell. Redevelopment plans include demolition of non-historical buildings to the concrete slab as well as specific land use restrictions/designations for the Site as presented on Figure 1.2 of the FS Report. This cost estimate is expected to be within -30 % to +50 % of the actual remedial costs in accordance with United States Environmental Protection Agency (U.S. EPA) guidance.

B. Remediation activities for each of the 11 proposed redevelopment areas were estimated separately; however, the estimate assumes one mobilization and demobilization effort to conduct the work.

C. Costs assume that additional soil investigation will not be conducted under building slabs unless otherwise noted in the pre-design notes below.

D. Areas targeted for soil removal and off-site disposal were determined based on a risk-based approach for arsenic as detailed in Appendix A of the FS Report Revision 1.

E. The cost estimate assumes that new structures have not been constructed in areas that are planned for soil excavation and existing structures remain in place.

F. The cost estimate includes abandonment and replacement costs of groundwater monitoring wells within excavation areas.

G. Costs are based on 2013 dollars.

H. All volumes are based on in-place measures unless otherwise stated.

I. Abbreviations used in the "Unit" column in the Cost Estimate Table are as follows:
   - CY = Cubic Yard
   - EA = Each
   - LS = Lump Sum
   - TN = Ton
   - LF= linear foot

TASK NOTES:

CAPITAL COSTS

A. INVESTIGATION/CONSTRUCTION

1.0 Pre-Design Investigation (PDI) Activities

The following assumptions were made relative to the PDI activities in each of the redevelopment areas and reflected in the cost estimate.

- Generation of a Sampling and Analysis Plan (SAP).

- Update the Health and Safety Plan as necessary.
- Update the Multi-Area Quality Assurance Project Plan as necessary.
- Completion of the SAP - soil boring installation and soil sample collection to delineate the horizontal extent of impact. Soil borings are assumed to be collected via direct push method. PDI samples will be collected and submitted for laboratory analysis for specific parameters determined to exceed Preliminary Remediation Goals (PRGs) during the Remedial Investigation (RI). It is assumed that the vertical extent of the impacted soil is already established by the samples collected during the Remedial Investigation (RI).
- Quality Assurance/Quality Control samples are included on a 1 per 10 basis.
- A survey of the "top of bank" is included in the PDI cost estimate.
- All areas where subsurface work is to be conducted will be cleared through a public utility locate (i.e., MISS Dig), a private utility locate, review of available drawings, and discussions with individuals knowledgeable of the Site and utilities located thereon.

Residential Area 1
PRGs exceeded in Residential Area 1 include the risked based criteria for arsenic of 5.8 mg/kg. Soil samples will be collected to delineate the extent of soil impacted with PCBs adjacent to the storm sewer line installed by the Michigan Department of Transportation (MDOT) in 2012.

- Allowance for 30 soil samples for PCBs
- Allowance for 76 soil samples for arsenic

Residential Area 2
PRGs exceeded in Residential Area 2 include the risked based criteria for arsenic of 5.8 mg/kg.

- Allowance for 36 soil samples for arsenic

Residential Area 3
PRGs exceeded in Residential Area 3 include the risked based criteria for arsenic of 5.8 mg/kg.

- Allowance for 60 soil samples for arsenic

Residential Area 4
PRGs exceeded in Residential Area 4 include the risked based criteria for arsenic of 5.8 mg/kg. Part 201 residential direct contact criteria is exceeded at locations within Residential Area 4 for benzo(a)pyrene, cyanide, dibenz(a,h)anthracene, lead and PCBs. Residential soil volatilization to indoor air inhalation criteria (SVIIC) was exceeded at one location for benzene. Part 201 non-residential direct contact criteria for lead and PCBs were also exceeded in Residential Area 4.

- An allowance for 60 soil samples for arsenic
- Benzene above the residential SVIIC at TP-308
    - An allowance for 4 soil samples for benzene was included in the estimate.
- Cyanide was above residential direct contact criteria at SB-302 in the shallow (0-1 foot) interval
    - Four samples for cyanide were included in the estimate
- An allowance for 20 samples for lead was included in the estimate
- PCBs were above criteria at TP-313 and SB-301
    - An allowance for 16 soil samples for PCBs was included in the estimate
- The PNA parameters were identified in shallow samples (0-1.5 feet) below grade at DG3, DG4 and TP-302
    - Allowance for 12 PNA samples

Waterfront Plaza
PDI activities will not be specifically conducted within the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
PRGs exceeded in Mixed Residential/Commercial Area 1 include Part 201 non-residential inhalation criteria for manganese and the risked based PRG for arsenic of 5.8 mg/kg.

- A total of 46 soil samples for arsenic will be collected.
- Soil samples will be collected from borings around TP-334 for manganese. Four samples will be collected for manganese analysis.

Mixed Residential/Commercial Area 2
PRGs exceeded in Mixed Residential/Commercial Area 2 include Part 201 non-residential direct contact criteria for benzo(a)pyrene, and lead. Residential direct contact criteria is exceeded at locations within Mixed Residential/Commercial Area 2 for benzo(a)pyrene, dibenz(a,h)anthracene; benzo(a)anthracene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene and lead. The risked based PRG for arsenic of 5.8 mg/kg is also exceeded at locations within Mixed Residential/Commercial Area 2.

Soil delineation by work area as follows:

Arsenic ONLY locations:
Building 25
- Allowance for 8 samples

Building 28
- Allowance for 8 samples

Train Shed
- Allowance for 8 samples

Coal Tunnel Area
- Allowance for 30 samples

Former Ash Silo Area (SB-2011)
- Allowance for 8 samples

Former clarifier area (TP-344)
- Allowance for 8 samples

Area north of Building 3/Former Water Tower Area (TP-340, TP-342, TP-343)
- Allowance for 16 samples

Arsenic and Lead sample locations:
Area around SB-2013
- Allowance for 12 samples

Arsenic, PNAs and Lead sample locations:
Building 3A
- Allowance for 12 samples

Building 6A
- Allowance for 18 samples
- Technicians will be required to don respirators for this work
- The floor in the majority of this building is exposed soil

Arsenic and PNAs sample locations
Fuel Oil AST Area
- Allowance for 24 PNA soil samples
- Allowance for 12 arsenic samples

A total of 140 samples will be collected and analyzed for arsenic.
A total of 30 samples will be collected and analyzed for PNAs.
A total of 42 samples will be collected and analyzed for lead.

Commercial Area 1
PRGs exceeded in Commercial Area 1 include Part 201 non-residential inhalation criteria for manganese and the risked based PRG for arsenic of 5.8 mg/kg.

- Soil samples will be collected from the 0-2 foot below grade interval at SS-103, SS-105, SS-106 and SB-133 and analyzed for arsenic. Samples from SS-105 will also be analyzed for manganese.
- Soil samples will be collected from the 0-2 and 7-9 foot interval for SB-144 and analyzed for arsenic.

Commercial Area2
PRGs exceeded in Residential Area 1 include Part 201 non-residential and the risked based PRG for arsenic of 5.8 mg/kg.

- 24 additional samples would be collected for arsenic from areas outside of the building footprint (around TP-316, TP-321, TP-324 and TP-325)

Commercial Area3
The PRG exceeded in Commercial Area 3 is the risked based PRG for arsenic of 5.8 mg/kg.

- Allowance for 48 soil samples for arsenic

Commercial Area 4
PRGs exceeded in Commercial Area 4 include, the risked based PRG for arsenic of 5.8 mg/kg and PCBs. Residential direct contact criteria is exceeded at locations within Commercial Area 4 for benzo(a)pyrene, lead and PCBs.

Soil delineation by area as follows:

Arsenic ONLY locations:
SB-2012
- Allowance for 4 samples

Parking lot area south of Building 17
- Allowance for 28 samples

Arsenic and Lead sample locations:
TP-341
- Allowance for 4 samples

Arsenic, PNAs and Lead sample locations:
Former Substation Area/North of Mill Buildings
- Allowance for 30 samples

PCBs and Arsenic sample locations:
MW-16 Area
- Allowance for 18 samples

A total of 76 samples will be collected and analyzed for arsenic.
A total of 30 samples will be collected and analyzed for PNAs.

A total of 18 samples will be collected and analyzed for PCBs.
A total of 34 samples will be collected and analyzed for lead.

2.0 Mobilization/Set-Up

The following assumptions were made relative to the mobilization/set-up in each of the redevelopment areas and reflected in the cost estimate.

- Mobilization and set-up includes: mobilization of personnel and equipment; construction survey work (e.g., excavation layout and verification sample locations); and geotechnical and chemical testing on backfill materials.
  - An allowance of $8,000 to mobilize personnel and equipment was included in the estimate.
  - $30,000 for survey work was included in the estimate.
  - Geotechnical and chemical analysis for imported materials was included in the estimate. One set of chemical analysis [Target Analyte List Metals, Target Compound List (TCL) for volatile organic compounds, TCL for semi-volatile compounds, and polychlorinated biphenyl (PCBs) per material (topsoil, general fill and 21AA/gravel]. The topsoil sample will also be analyzed for pH, phosphorous, organic content, pesticides and herbicides.
- Health and Safety includes an on-Site Health and Safety Officer (HSO) for 4 and a half months. Also included in the costs are: air monitoring equipment and calibration gases; a decontamination trailer; and disposable personal protection equipment (PPE).
- Air monitoring assumes real-time air monitoring will be conducted during all excavation work utilizing a photoionization detector (11.7 electronVolt [eV] lamp) and fugitive dust monitor(s). Air monitoring does not include the collection of samples for laboratory analysis or laboratory analytical costs.
- Erosion control includes an allowance for silt fence (4,000 LF) and geofabric to cover catch basins on the Site. Costs for erosion control measures specific to individual redevelopment areas (i.e., turbidity curtains, etc.) are included in individual redevelopment area estimates (e.g., Commercial Area 4).
- Site facility costs include electrical hookup and electricity for two office trailers (one for the contractor and one for the U.S. EPA) for 5 months. Other temporary facilities include portable sanitary services, a drinking water allowance and a small dumpster for worker general refuse. The expense of one Site truck for the duration of the services was included.
- Site facility costs include materials and construction of temporary decontamination pads and decontamination stations for workers. It was assumed that potable water could be obtained from the City of Plainwell for use during the project.
- Site facility costs include $6,000 to for the installation and maintenance of a staging area for waste.
- A perimeter fence currently exists around the majority of the Site. The cost estimate assumes the fence will remain and can be utilized as a security measure to prevent access to the Site during construction activities.

3.0 Preparation/Pre-Excavation Work by Redevelopment Area

The following assumptions were made relative to the preparation/pre-excavation work in each of the redevelopment areas and reflected in the cost estimate.

- A Soil Erosion and Sedimentation Control Permit will be obtained from Allegan County. All other necessary permits will also be obtained prior to intrusive work at the Site.

- All areas where subsurface work is to be conducted will be cleared through a public utility locate (i.e., MISS Dig), a private utility locate, review of available drawings, and discussions with individuals knowledgeable of the Site and utilities located thereon.

Residential Area 1
Specific assumptions for preparation/pre-excavation work in Residential Area 1 under Remedial Alternative 3D are presented below.

- Trees and shrubs in the excavation areas will need to be cleared and grubbed.
- Turbidity curtain will be temporally installed in the Kalamazoo River during excavation and backfill activities.
- One power pole will need to be relocated for the excavation work around SB-104.

Residential Area 2
No specific assumptions for preparation/pre-excavation work in Residential Area 2 under Remedial Alternative 3D were utilized.

Residential Area 3
Specific assumptions for preparation/pre-excavation work in Residential Area 3 under Remedial Alternative 3D are presented below.

- MW-15 will be abandoned.
- Clearing will be required in the area around MW-15.

Residential Area 4
Specific assumptions for preparation/pre-excavation work in Residential Area 4 under Remedial Alternative 3D are presented below.

- Clearing will be required in the area around SB-301/SG-4.
- Pavement by TP-302 will be saw cut.

Waterfront Plaza
No specific assumptions for preparation/pre-excavation work in Waterfront Plaza under Remedial Alternative 3D were utilized.

Mixed Residential/Commercial Area 1
The specific assumption for preparation/pre-excavation work in Mixed Residential/Commercial Area 1 under Remedial Alternative 3D is presented below.

- Pavement and concrete in the work areas will be saw cut prior to excavation to leave a clean line for restoration activities.

Mixed Residential/Commercial Area 2
Specific assumptions for preparation/pre-excavation work in Mixed Residential/Commercial Area 2 under Remedial Alternative 3D are presented below.

- A demolition notice will be submitted to the State of Michigan for the demolition of Building 5A/part of the coal tunnel. Asbestos abatement may be necessary on pipe wrap found outside of Building 5A.

- Excavation of soils under the concrete slabs of the demolished buildings (3A, 25 and 28) will require the relocation of the backfill (less than 3 feet thick) prior to excavation.
- Fuel Oil No. 6 within the former coal tunnel will be removed from the tunnel before the tunnel itself is removed.
- The piping run from the former Fuel Oil No. 6 AST and Building 5 will be exposed at one end and drained of any residual fuel oil prior to removing the line.
- Monitoring well MW-19 will be abandoned prior to excavation activities in this area.
- Monitoring well MW-22 will be abandoned prior to removal of the former fuel oil line.
- Monitoring well MW-2 will be abandoned prior to excavation activities at SB-2010 and SB-2011.

Commercial Area 1
Specific assumptions for preparation/pre-excavation work in Commercial Area 1 under Remedial Alternative 3D are presented below.

- Limited clearing and grubbing will be performed in the area around SS-106 and SB-144.

Commercial Area 2
No specific assumptions for preparation/pre-excavation work in Commercial Area 2 under Remedial Alternative 3D were utilized.

Commercial Area 3
Specific assumptions for preparation/pre-excavation work in Commercial Area 3 under Remedial Alternative 3D are presented below.

- Pavement in the work areas will be saw cut prior to excavation to leave a clean line for restoration activities

Commercial Area 4
Specific assumptions for preparation/pre-excavation work in Commercial Area 4 under Remedial Alternative 3D are presented below.

- Turbidity curtain will be installed in the Mill Race in the area by MW-16 (along the Mill Race) and in the area of MW-3 prior to excavation activities.
- Monitoring of the Mill Race and Kalamazoo River for turbidity will be conducted during excavation activities.
- MW-16 will be abandoned prior to excavation work in that area.
- Protection of MW-3 (barriers) will be installed.
- A structural engineering evaluation of the pedestrian bridge for stability during excavation activities will be conducted. The evaluation will determine if shoring of the bridge is necessary. An allowance of $5,000 is included in the estimate to conduct the evaluation. Shoring costs have not been included in the estimate.
- The water flow of the Mill Race will be diverted in the excavation area. The methodology for this work to be determined in the pre-design phase of the project.
- Rip rap along the Mill Race will be removed and staged for re-use.
- Pavement in the work areas will be saw cut prior to excavation to allow for restoration activities.

4.0 Excavation by Redevelopment Area

Conceptual excavation areas for each of the Redevelopment areas are shown of Figures 3.31 through 3.40 of the FS Report (Revision 1).

The following assumptions were made relative to excavation in each of the redevelopment areas and reflected in the cost estimate.

- Excavation estimates assume dewatering will not be necessary and that all work can be completed in Level D PPE except Building 6A which will be conducted with supplied air (Level B) PPE.
- Standby time was not added to account for the time for laboratory analysis of verification samples. It was assumed that the project would proceed across the Site allowing for laboratory analysis to be conducted while another redevelopment area was being excavated or restored.

Specific assumptions to each redevelopment area, in addition to those presented above globally, are provided below.

Residential Area 1

Residential Area 1 is located at the far west end of the Site, where the majority of the former sludge dewatering lagoons were located. The former Mill wastewater treatment building, activated sludge tank and secondary clarifier were constructed over the lagoons. The wastewater treatment structures were demolished on behalf of the City of Plainwell in November and December 2013. The specific assumption for excavation in Residential Area 1 under Remedial Alternative 3D is presented below.

- Overburden present beyond the target excavation area that must be removed to achieve the full depth of excavation will be disposed of off-site.

Residential Area 2

Residential Area 2 is located between Residential Area 1 and Residential Area 3 and is positioned along the Kalamazoo River. This area was historically occupied by sludge dewatering lagoons (A, B, C) and a primary clarifier. The primary clarifier was demolished to the concrete slab in November 2013. The specific assumption for excavation in Residential Area 2 under Remedial Alternative 3D is presented below.

- Overburden present beyond the target excavation area that must be removed to achieve the full depth of excavation can be staged and used for backfill from the area around SB-1.

Residential Area 3

Residential Area 3 is located near the center of the Site. The former aeration basin location occupies the majority of the area. A former secondary clarifier was historically present in this area, which was demolished in November 2013 with the floor of the former clarifier remaining. This area was backfilled to surrounding grade, which was approximately 7-8 feet higher than the floor of the clarifier and aeration basin. Specific assumptions for excavation in Residential Area 3 under Remedial Alternative 3D are presented below.

- Material removed from the bottom of the aeration basin will require double handling due to the slopes of the former aeration basin and the depth of the excavation.

Residential Area 4

Residential Area 4 is positioned along the Kalamazoo River between Residential Area 3 and Mixed Residential Area 2. No aboveground structures are currently present on this area. A portion of this area was historically utilized by the Mill as a coal storage area. No specific assumptions for excavation in Residential Area 4 under Remedial Alternative 3D were made.

Waterfront Plaza
No excavation activities are anticipated in the Waterfront Plaza Area.

Mixed Residential/Commercial Area 1
Mixed Residential/Commercial Area 1 is located between Commercial Area 2 and Commercial Area 3 on the southern property line along Allegan Street. This area was once occupied by the former Specialty Minerals Building and associated above ground storage tanks. The Specialty Minerals building and ASTs were demolished to the concrete slab in December 2011.

- Underground utilities encountered (TP-303, TP-306) between the former Specialty Minerals Building and the main Mill Buildings will be capped at either end of the excavation.

Mixed Residential and Commercial Area 2
Mixed Residential and Commercial Area 2 is located between Residential Area 4 and Commercial Area 4 at the northern end of the Site along the Kalamazoo River. The majority of the area is occupied by Mill Buildings and pavement. Buildings 3A, 25 and 28 along with the eastern water tower, 200,000-gallon Fuel Oil AST, and the brine USTs, were demolished on behalf of the City of Plainwell. The concrete slabs were left in place for Buildings 3A and 28. Building 25 was part of the Site's historical wastewater treatment system and had a subsurface vault and system to pump the waste water from the Mill to the onsite WWTP at the west end of the Site. The vault under the northern portion of Building 25 was not removed. The vault floor was cracked and the sidewalls removed to 4 feet below grade, then the vault was filled with imported general fill. The concrete slab under the remaining portion of Building 25 was left in place.

Specific assumptions for excavation in Mixed Residential/Commercial Area 2 under Remedial Alternative 3D are presented below.

- A storm sewer was installed through the west side of Mixed Residential/Commercial Area 2 in 2012 by the Michigan Department of Transportation (MDOT). The approximate location of the storm sewer is shown on Figure 3.36. Before conducting excavation work to remove the former fuel oil AST line and excavate the east side of the former fuel AST, the exact location of the storm sewer line will be determined, shoring of the line may be necessary during the removal of the fuel oil AST line.
- Soils in Building 6A will be removed using a vacuum extraction system.

Commercial Area 1
Commercial Area 1 is located in the far southwest portion of the Site. No structures or paved areas are currently present in this area that would require unique equipment or procedures to conduct the proposed remedial activities. This area of the Site has not been developed and was not part of historic Mill operations.

- Any excavation work conducted in the vicinity of SB-133 will require oversight by Michigan Gas Utilities due to proximity of the soil boring to the 6-inch high pressure natural gas line/working within the gas company easement.

- A storm sewer was installed through this area in 2012 by the Michigan Department of Transportation (MDOT). The approximate location of the storm sewer is shown on Figure 3.37. Before conducting excavation work in the area of SS-103 and SS-105, the exact location of the line will be determined.

Commercial Area 2
Commercial Area 2 is located in the southwest central portion of the Site. Structures on this portion of the Site include the City of Plainwell Public Safety Building and associated paved parking and egress/ingress areas. No specific assumptions for excavation in Commercial Area 2 under Remedial Alternative 3D were made.

Commercial Area 3

Commercial Area 3 is located adjacent to the former southwest corner of the Mill Buildings along Allegan Street. Structures on this area include a pump house and a former guard shack. Other historical features within this area have been demolished on behalf of the City of Plainwell. The Clay ASTs, Ammonia AST secondary containment structure, the Starch ASTs and Building 9C were demolished in 2012. The concrete slabs for all demolished features were left in place. Specific assumptions for excavation in Commercial Area 3 under Remedial Alternative 3D are presented below.

- The majority of Building 9C did not include a basement. The area where SB-248 was completed was located on the ground floor; however, this area was elevated from the surrounding ground surface by approximately 4 feet. As a result of the demolition of Building 9C the upper 4 feet of the sample interval was relocated (as part of a Soil Relocation Plan (June, 2012) generated on behalf of the City of Plainwell) and placed under imported fill in the general area of Buildings 9A, 9E.
- MDOT installed a storm sewer through this area in 2012. The approximate location of the storm sewer is shown on Figure 3.9. Before conducting excavation work in the area of TP-305 the exact location of the line will be determined.

Commercial Area 4

Commercial Area 4 is located on the eastern side of the Site. The majority of this area is covered with either pavement, buildings (vacant and occupied) or former building concrete slabs. Buildings (9A, 9B, 9C, 9D, 9E, 9F, and 23) were demolished on behalf of the City of Plainwell in 2012, with the majority of the former building concrete slabs left in place and backfilled to surrounding grade. The basement areas were backfilled with a combination of crushed concrete (from the buildings on Site), soil from an adjacent retaining wall that was removed, and imported gravel material and vary in thickness from 6 feet to 9 feet. Specific assumptions for excavation in Commercial Area 4 under Remedial Alternative 3D are presented below.

- Access to both the former substation area and around MW-16 will be restricted due to the distance between existing structures and either the Kalamazoo River or the Mill Race. Excavated soils will likely need to be double handled.

5.0 Transportation and Disposal by Redevelopment Area

The following assumptions were made relative to the transportation and disposal of materials in each of the redevelopment areas and reflected in the cost estimate.

- Soil volumes were converted to tonnage assuming a ratio of 1.5 tons per cubic yard for soils. Tonnage for concrete was based on 1.65 tons per cubic yard of material. Waste has been categorized as non-hazardous and non-TSCA soils; TSCA soil; TSCA debris; and miscellaneous debris.
- Transportation and disposal pricing is based on the non-hazardous, non-TSCA material being accepted at Waste Management Autumn Hills Landfill in Zeeland, Michigan. A cost of $22.00 per ton for both transportation and disposal of non-hazardous, non-TSCA waste was used for the estimates.
- A disposal price of $135.00 per ton was used for TSCA soils. For estimation purposes it was assumed that the TSCA soils would be transported to the Environmental Quality Belleville, Michigan Landfill for direct landfill disposal. Transportation of the soils was assumed to be conducted in lined 50 ton gravel trains. Transportation of each load of 50 tons was assumed to cost $500.00.
- Transportation costs assume fuel prices for diesel will not exceed $4.00 per gallon.
- Organic material generated from clearing activities was assumed to be chipped and left on Site.
- Concrete and asphalt will be disposed of off-Site, not recycled.

Residential Area 1
The specific assumption for transportation and disposal work in Residential Area 1 under Remedial Alternative 3D is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 1,100 CY.

Residential Area 2

The specific assumption for transportation and disposal work in Residential Area 2 under Remedial Alternative 3D is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 620 CY.

Residential Area 3

The specific assumption for transportation and disposal work in Residential Area 2 under Remedial Alternative 3D is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 4,230 CY.

Residential Area 4

The specific assumption for transportation and disposal work in Residential Area 3 under Remedial Alternative 3D is presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 9,380 CY.
- Allowance of $600 for asphalt.

Waterfront Plaza
No specific assumptions for transportation and disposal work in Waterfront Plaza under Remedial Alternative 3D were utilized. Excavation activities will not be conducted within the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
Specific assumptions for transportation and disposal work in Mixed Residential/Commercial Area 1 under Remedial Alternative 3D are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 205 CY.
- Allowance of 50 CY for asphalt and concrete disposal.

Mixed Residential/Commercial Area 2
Specific assumptions for transportation and disposal work in Mixed Residential/Commercial Area 2 under Remedial Alternative 3D are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil from Building 6A with a volume of 200CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from the coal tunnel area with a volume of 1,320 CY. Additional volume from a deeper excavation at SB-308 location.
- Allowance of $3,500 for miscellaneous debris from the coal tunnel area (bricks, concrete)
- Waste was assumed to be non-hazardous, non-TSCA soil from the fuel oil line with a volume of 525 CY.
- Allowance of $600 for disposal of the fuel oil line piping

- Waste was assumed to be non-hazardous, non-TSCA soil from the fuel oil No. 6 AST area with a volume of 2,500 CY.
- Allowance of $1,200 for the concrete ring the tank was sitting on and buried concrete and asphalt.
- Waste was assumed to be non-hazardous, non-TSCA soil from the Train Shed with a volume of 485CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from the north end of the Mill Buildings (Buildings-3A, 25, 28, test pits-TP-340, TP-342,TP-343 and SB-2013) with a volume of 2,310 CY.
- Allowance of $6,000 for miscellaneous debris from these areas at the north end of the Mill Building.

Commercial Area 1
Specific assumptions for transportation and disposal work in Commercial Area 1 under Remedial Alternative 3D are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 165 CY.

Commercial Area 2
Specific assumptions for transportation and disposal work in Commercial Area 2 under Remedial Alternative 3D are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 2,460 CY.

Commercial Area 3
Specific assumptions for transportation and disposal work in Commercial Area 3 under Remedial Alternative 3D are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil with a volume of 3,845 CY.
- Allowance of $900 for the transport and disposal of asphalt and/or concrete from the excavation areas.

Commercial Area 4
Specific assumptions for transportation and disposal work in Commercial Area 4 under Remedial Alternative 3D are presented below.

- Waste was assumed to be non-hazardous, non-TSCA soil from the former substation area and north of the Mill Buildings with a volume of 3,050CY.
- Waste was assumed to be TSCA soil from the area around MW-16 with a volume of 4,660 CY.
- Waste was assumed to be non-hazardous, non-TSCA soil from the parking lot area south of Building 17 with a volume of 7,665 CY.
- Allowance of 1,575 tons of concrete from within the various buildings.
- Allowance of 400 CY of asphalt

6.0 Restoration by Redevelopment Area

The following assumption was made relative to Site restoration in each of the redevelopment areas and reflected in the cost estimate.

- Restoration activities include backfill (material and placement), compaction, compaction testing and any other location specific restoration that may be deemed necessary at this time.
- General fill from a local gravel pit at a delivered material cost of $4.58 ton was used for the estimates. Unprocessed topsoil at a delivered price of $18.98 cubic yard was also used where appropriate.

- Restoration for the excavation areas outside of building footprints include general fill backfill compacted to 92-95% of the proctor.
- A six-inch layer of unscreened topsoil will be placed over the compacted general fill in areas that were previously pervious (i.e., not paved or impervious). Topsoil will be hydroseeded, including mulch.
- Restoration for excavation areas under pavement, existing or former building slabs will be backfilled with general fill and compacted to 95 % of the proctor.
- A six-inch layer of 21AA or equivalent will be placed on the compacted general fill and compacted to 95% or greater of the proctor where pavement will be installed.
- Asphalt will be replaced where removed during excavation activities.
- Concrete removed during excavation activities under former building slabs will not be replaced.

Residential Area 1
Specific assumptions for Site restoration in Residential Area 1 under Remedial Alternative 3D are presented below.

- Backfill material will be imported general fill and overburden material removed to achieve excavation depth requirements but beyond the area exceeding PRGs.

Residential Area 2
Specific assumptions for Site restoration in Residential Area 2 under Remedial Alternative 3D are presented below.

- Backfill material will be imported general fill and overburden material removed to achieve excavation depth requirements but beyond the area exceeding cleanup criteria.
- MW-15 will be replaced.

Residential Area 3
No specific assumptions for Site restoration in Residential Area 3 under Remedial Alternative 3D were utilized.

Residential Area 4
No specific assumptions for Site restoration in Mixed Residential/Commercial Area 1 under Remedial Alternative 3D were utilized.

Waterfront Plaza
No specific assumptions for Site restoration in Waterfront Plaza under Remedial Alternative 3D were utilized. Restoration will not be required in the Waterfront Plaza area.

Mixed Residential/Commercial Area 1
Specific assumptions for Site restoration in Mixed Residential/Commercial Area 1 under Remedial Alternative 3D are presented below.

- Concrete removed will not be replaced.

Mixed Residential/Commercial Area 2
Specific assumptions for Site restoration in Mixed Residential/Commercial Area 2 under Remedial Alternative 3D are presented below.

- Building 6A currently has a dirt floor; restoration would not include a concrete floor.
- Concrete (former ash silos) will not be replaced at SB-2010 and SB-2011.

- Concrete around the former 200,000 gallon fuel oil AST will not be replaced.
- Concrete removed for excavations at SB-216, SB-220, SB-222 and SB-223 will not be replaced.
- Additional backfill will be required to fill in the void space of the coal tunnel.
- MW-2, MW-19 and MW-22 will be replaced as necessary.

Commercial Area 1
No specific assumptions for Site restoration in Commercial Area 1 under Remedial Alternative 3D were utilized.

Commercial Area 2
No specific assumptions for Site restoration in Commercial Area 2 under Remedial Alternative 3D were utilized.

Commercial Area 3
No specific assumptions for Site restoration in Commercial Area 3 under Remedial Alternative 3D were utilized.

Commercial Area 4

Specific assumptions for Site restoration in Commercial Area 4 under Remedial Alternative 3D are presented below.

- Backfill placed in the parking lot will be 2 feet lower than current grade to achieve the desired grade requested by the current property owner.
- Asphalt will be 3 inches thick.
- Geotextile and Rip rap will be installed along the Mill Race.
- The Mill Race will be returned to its normal flow path.
- The turbidity curtain will be removed from the Mill Race and Kalamazoo River.

7.0 Demobilization

The following assumptions were made relative to the demobilization from the Site and reflected in the cost estimate.

- Costs included in the demobilization task include time for Site tear down and final decontamination of equipment, and demobilization of equipment and personnel. Demobilization activities were assumed to take five working days.

B. ENGINEERING/OVERSIGHT

1.0 Engineering/Design

The following assumption was made relative to the installation of engineering/design and reflected in the cost estimate.

- Engineering and project design/specifications were estimated to be 15 percent of the Construction Costs.

2.0 Construction Oversight

The following assumption was made relative to the construction oversight and reflected in the cost estimate.

- Construction oversight was estimated to be 10 percent of the Construction Costs.

TABLE D.4

COST SUMMARY
GROUNDWATER REMEDIAL ALTERNATIVE 2 INSTITUTIONAL CONTROLS
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost Subtotal*	*Estimated Cost Total*
A.	**CAPITAL COSTS**					
	1.0 New Piezometers and Staff Gauges					**$17,100**
	TOTAL CONSTRUCTION COST					**$17,100**
B.	***ENGINEERING/OVERSIGHT***					
	1 Engineering/ Design (15 % of Construction Costs)					**$2,600**
	2 Construction Oversight (10 % of Construction Costs)					**$1,700**
	TOTAL ENGINEERING/OVERSIGHT COSTS					**$4,300**
	CONTINGENCY ON CAPITAL COSTS (25 %)					**$5,350**
	TOTAL CAPITAL COSTS					**$26,750**

OPERATION, MAINTENANCE, & MONITORING COSTS

A.	***GROUNDWATER MONITORING***					
1.0	**Annual Cost for Semi-Annual Groundwater Monitoring - Years 1 -5**					**$66,300**
	Project Manager	hour	5	$167	$837	
	Project Coordinator	hour	15	$135	$2,025	
	Field Technician-1 (static water levels preceding event and sampling)	hour	110	$90	$9,900	
	Field Technician-2	hour	60	$90	$5,400	
	Analytical Chemist(s)	hour	4	$125	$500	
	Data Management	hour	8	$111	$886	
	Secretarial/Support Staff	hour	10	$52	$522	
	Laboratory Analytical (TCL VOCs, PCBs, SVOCs, TAL Metals)	event	1	$12,467	$12,467	
	Disbursements (Field Equipment/travel etc.)	event	1	$625	$625	
	Cost Per Event	Sub-Total Task 1.0 (per event)			$33,162	
				Task Total	**$66,300**	
2.0	**Annual Well Maintenance - Years 1 - 5**					**$2,500**
	- repair, maintenance, replace etc.	L.S.	--	--	$2,500	
			Sub-Total Task 2.0		$2,500	
				Task Total	**$12,500**	
3.0	**Annual Cost for Semi-Annual Reporting - Years 1 -5**					**$37,600**
	Project Manager	hour	10	$167	$1,674	
	Project Hydrogeologist	hour	5	$153	$765	
	Project Coordinator	hour	40	$135	$5,400	
	Project Engineer	hour	40	$110	$4,400	
	Analytical Chemist(s)	hour	25	$125	$3,128	

TABLE D.4

COST SUMMARY
GROUNDWATER REMEDIAL ALTERNATIVE 2 INSTITUTIONAL CONTROLS
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description		*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost* *Subtotal*	*Estimated Cost* *Total*
	Data Management	hour	8	$111	$886	
	Drafting	hour	16	$90	$1,440	
	Secretarial/Support Staff	hour	16	$52	$835	
	Disbursements	L.S.	1	$300	$300	
			Sub-Total Task 3.0		$18,800	
4.0	**Annual Groundwater Monitoring - Years 6-30**					**$25,600**
	Project Manager	hour	5	$167	$837	
	Project Coordinator	hour	15	$135	$2,025	
	Field Technician-1 (static water levels preceding event and sampling)	hour	110	$90	$9,900	
	Field Technician-2	hour	60	$90	$5,400	
	Analytical Chemist(s)	hour	4	$125	$500	
	Data Management	hour	4	$111	$443	
	Secretarial/Support Staff	hour	10	$52	$522	
	Laboratory Analytical (TAL Metals)	event	1	$5,600	$5,600	
	Disbursements (Field Equipment/travel etc.)	event	1	$400	$400	
	Cost Per Event		Sub-Total Task 4.0 (per event)		$25,600	
5.0	**Annual Well Maintenance - Years 6-30**					**$2,500**
			Sub-Total Task 2.0		$2,500	
6.0	**Annual Reporting - Years 6-30**					**$18,800**
	Project Manager	hour	10	$167	$1,674	
	Project Hydrogeologist	hour	5	$153	$765	
	Project Coordinator	hour	40	$135	$5,400	
	Project Engineer	hour	40	$110	$4,400	
	Analytical Chemist(s)	hour	25	$125	$3,128	
	Data Management	hour	8	$111	$886	
	Drafting	hour	16	$90	$1,440	
	Secretarial/Support Staff	hour	16	$52	$835	
	Disbursements	L.S.	1	$300	$300	
			Sub-Total Task 6.0		$18,800	
				Task Total		

ANNUAL OPERATIONS, MAINTENANCE AND MONITORING COSTS YEARS 1 - 5	**$106,400**
CONTINGENCY ON OM & M COSTS YEARS 1 - 5 (20 %)	**$30,660**
ANNUAL OPERATIONS, MAINTENANCE AND MONITORING COSTS YEARS 6 - 30	**$46,900**
CONTINGENCY ON OM & M COSTS YEARS 6 - 30 (20 %)	**$9,380**
TOTAL CAPITAL COSTS	**$26,750**
NET PRESENT VALUE OF OM & M (30 YEARS @ 7 % DISCOUNT RATE)	**$1,029,600**
TOTAL COST	**$1,056,350**

Notes:

TABLE D.4

COST SUMMARY
GROUNDWATER REMEDIAL ALTERNATIVE 2 INSTITUTIONAL CONTROLS
FEASIBILITY STUDY REPORT
PLAINWELL, INC. MILL PROPERTY
PLAINWELL, MICHIGAN

Description	*Unit*	*Approx. Quantity*	*Unit Price*	*Estimated Cost*	
				Subtotal	*Total*

1. Assumes groundwater monitoring will be completed at 19 monitoring wells for TAL Metals and 6 monitoring wells for PCBs.
2. Assumes semi annual monitoring years 1 to 5, followed by annual monitoring years 6 to 30.
3. Costs are presented in 2013 dollars.
4. Costs to implement institutional controls (ICs) are included with soil alternatives given that soil alterative that meet ARARs required ICs except Alternative 3A. However, for consistency of cost estimate preparation, IC cost have been included in Soil Alterative 3A to address groundwater ICs that would be required.