SITE ASSESSMENT REPORT
FLORIDA GAS SITE
FLORIDA LOCATION, HOUGHTON COUNTY, MICHIGAN

January 2007

Prepared For:

U.S. Environmental Protection Agency
Emergency Response Branch
Region V
9311 Groh Road
Grosse Ile, Michigan 48138

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Prepared By: ______ For   **Date:** 1-18-07

Jed Chrestensen, P.E.
Site START Lead

Approved By: ______   **Date:** 1-18-07

Daniel M. Capone
START Manager

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- Threats to Human Health and the Environment – Identifies conditions observed at the Site that are consistent with the criteria established in the NCP for conducting a removal action.

- Scope of Removal Action – Describes in detail the area of soil and/or sediment that will be targeted for removal based on the results of the Site Assessment.

- Conclusions and Recommendations – Summarizes the findings of the Site Assessment and provides recommendations.

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LIST OF ABBREVIATIONS AND ACRONYMS

bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
CEC	Coleman Engineering Company
CFR	Code of Federal Regulations
CY	cubic yard
DNAPL	dense non-aqueous phase liquid
DCC	Part 201 Direct Contact Criteria
DWC	Part 201 Drinking Water Criteria
DWPC	Part 201 Drinking Water Protection Criteria
ft	feet
GCC	Part 201 Groundwater Contact Criteria
GCPC	Part 201 Groundwater Contact Protection Criteria
GRCC	Part 201 Generic Residential/Commercial I Cleanup Criteria
GSIC	Part 201 Groundwater/Surface Water Interface Criteria
GSIPC	Part 201 Groundwater/Surface Water Interface Protection Criteria
GSU	Geological Services Unit
HCRC	Houghton County Road Commission
LNAPL	light non-aqueous phase liquid
MDEQ	Michigan Department of Environmental Quality
MDOT	Michigan Department of Transportation
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MGP	manufactured gas plant
NCP	National Oil and Hazardous Substances Contingency Plan
NPDES	National Pollution Discharge Elimination System
NREPA	Natural Resources and Environmental Protection Act
OSC	On-Scene Coordinator
PAH	polynuclear aromatic hydrocarbon
PGC	Peninsular Gas Company
PID	photoionization detector
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
RDCC	Part 201 Residential Direct Contact Criteria
ROW	right of way
RRD	Remediation and Redevelopment Division
START	Superfund Technical Assessment and Response Team
sq	square
TAL	target analyte list
TCLP	Toxicity Characteristics Leachate Procedure
TDD	Technical Direction Document
TEF	Toxicity Equivalent Factor

LIST OF ABBREVIATIONS AND ACRONYMS (CONCLUDED)

TMB	trimethylbenzene
ug/kg	micrograms per kilogram
ug/L	micrograms per liter
UN	United Nations
USCS	Unified Soil Classification System
U.S. EPA	United States Environmental Protection Agency
VOC	volatile organic compound
WESTON	Weston Solutions, Inc.
WGP	Weston Geoprobe™ boring
WSS	Weston soil sample

SECTION 1
INTRODUCTION

On April 27, 2006, the U.S. EPA directed the Weston Solutions, Inc. (WESTON®) START to conduct a Site Assessment at the Peninsular Gas Company plant site (Site) portion of the Florida Gas Site located in Florida Location, Houghton County, Michigan. The Site Assessment was conducted under TDD S05-0605-001.

The Site Assessment objectives were to obtain site-specific information to verify and expand on existing Site information and to support development of potential removal action alternatives to respond to the discharge of coal tar wastes into the open roadside ditch adjacent to the Site. An additional objective was to determine if contamination that poses an imminent and substantial threat to public health, safety, welfare, or to the environment is emanating from the Site into previously remediated ditch areas.

To accomplish these objectives, the Site Assessment consisted of the following:

- Visual assessment of the ditch area to assess if coal tar waste seepage was evident;
- Performance of a field investigation in conjunction with the MDEQ-RRD, Superfund Section's GSU, which included:
  - advancement of 22 soil borings;
  - collection of subsurface soil samples;
  - collection of a sediment sample;
  - collection of a subsurface ditch bank sample from an unremediated area; and,
  - collection of a groundwater sample from an existing monitor well.

This Site Assessment Report is organized into the following sections.

- Site Background – Provides the Site's location, setting, and summary of the Site history.
- Site Investigation – Describes the methods and procedures used during the Site Assessment.

- Site Investigation Results – Describes the field observation and analytical results of soil, sediment, and groundwater samples compared to Part 201 of 1994 P.A. 451, the NREPA Generic Residential Cleanup Criteria (GRCC) and U.S. EPA Region IX PRGs.

- Threats to Human Health and the Environment – Identifies conditions observed at the Site that are consistent with the criteria established in the NCP for conducting a removal action.

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SECTION 2
SITE BACKGROUND

2.1 SITE DESCRIPTION

The Site is located in Florida Location, Houghton County, Michigan (**Figure 2-1**). Florida Location is part of the Village of Laurium. The geographic coordinates are 47.22881° north latitude and 88.44119° west longitude. The plant Site is defined as the former MGP property located in the northeast quadrant of the intersection of Franklin Street and Lake Linden Avenue (M-26). The drainage ditch, which historically received uncontrolled discharges of coal tar waste, is located on the south side of the Site along Franklin Street. These features are depicted on **Figure 2-2**. The Site topography is relatively flat with the exception of the slopes immediately adjacent to the drainage ditches.

According to the year 2000 U.S. census, the population of Laurium is 2,126 and the averaged population density within the census tract is 414 people per square mile, for an average of 2.36 people per housing unit. Residential areas are located adjacent to the west and south sides of the Site. An undeveloped wetland is located east and northeast of the Site while a commercial business is located north of the Site.

2.2 SITE HISTORY

The following historical information was excerpted from the July 2001 *Remedial Feasibility Study Report Florida Gas Project Plant Site"* by CEC contained in MDEQ-RRD files: "In the early 1900s, a MGP was constructed to provide gas for residential, commercial, and municipal use in the Florida Location. The MGP was operated as the Calumet Gas and Coke Company until 1935, when its Articles of Incorporation were amended and the name changed to the Peninsular Utilities Company. In 1946, the company name was changed to the Peninsular Gas Company. Between 1946 and 1947, PGC converted from a coal gasification process to distribution of propane gas. In 1966, PGC switched to the distribution of natural gas, and utilized the propane plant only during periods of peak demand (most recently 1978). Presently, PGC distributes propane and operates the natural gas distribution system at the Plant Site."

During the use of the Plant Site as an MGP, numerous "by-products" and wastes were produced including: coal tars, tar-water emulsions, ash, clinkers, oxide box materials, lamp black, and process wastewater. MGP wastes, collectively referred to as "coal tar wastes", were discharged directly into the drainage ditch adjacent to the Plant Site. Subsequently, the drainage ditch conveyed the waste through the residential neighborhood of Florida Location, a series of wetlands, and eventually Hammel Creek.

Previous Investigations and Remedial Actions

A series of investigations have been conducted by PGC, MDEQ, and U.S. EPA at the Site between 1992 and 2001. From these studies, the presence of gross coal tar contamination was confirmed at the Site and in the drainage ditch network stretching from the Site through a wetland system that connects to Hammel Creek. The locations of these features are depicted on **Figure 2-3**. As defined in previous reports related to the Site, gross contamination, as used herein, is dark tar-like waste material that is "saturated with an oil like substance or free phase liquid of an oil like substance".

The gross contamination appears to differ in relative composition between the eastern and western portion of the Site. The gross contamination in the central and western portion of the Site appears to be dominated by coal tar. In the eastern portion of the Site, the contamination appears to be more related to oil with less references to tar contamination. These observations are based on review of information contained in the "*Remedial Investigation Report Florida Gas Project Plant Site*" prepared by CEC.

Studies were conducted to evaluate the feasibility of removing the gross contamination from the ditch network, the wetlands, and the Plant Site. These studies culminated in the removal of approximately 8,208 tons of contaminated soil and sediment from the drainage ditch network and additional contaminated media from the wetlands between the drainage ditch and Hammel Creek.

Details of these activities are contained within summary reports within MDEQ files. Removal of gross contamination from the Plant Site has not occurred.

Based on information contained within the "*Florida Gas Ditch Remediation Documentation Report*", soil removal from the ditch adjacent to the Plant Site was limited by "property access limitations, adjacent structures, and the project objectives. Removal efforts began at the toe of the slope and proceeded toward Franklin Street. Upon removal of contaminated soil and sediment along this stretch, gross contamination was observed." The extent of excavation along this portion of the ditch is depicted on **Figure 2-4** along with a depiction of the area along the north side of the ditch where gross contamination was observed but could not be removed due to the limitations described above. Upon completion of excavation, the area was restored to grade with backfill sand, a geotextile fabric was installed upon the sand, and rip-rap was placed upon the geotextile.

In October 2005, MDEQ conducted a groundwater sampling event at the Site and surrounding network of monitor wells. MDEQ noted the presence of DNAPL in monitor well GMW-3, along Franklin Street on the south side of the ditch adjacent to the southwest corner of the Site. Free product had not previously been observed at this monitor well location. The appearance of free product at the GMW-3 location, adjacent to the ditch from which gross contamination had been removed in 1999, prompted the MDEQ to seek the assistance of U.S. EPA to evaluate the current ditch conditions for a potential removal action.

SECTION 3
SITE INVESTIGATION

On May 17, 2006, U.S. EPA OSC Mr. Brian Kelly and WESTON START representative Mr. Jed Chrestensen conducted a walkthrough to evaluate surface conditions along the residential ditch area adjacent to the Plant Site. The reconnaissance was conducted from the east end of the Site westerly (downstream) to the driveway for the first residence west of Lake Linden Avenue (M-26). The OSC and WESTON also accessed the Site for a visual reconnaissance of surface conditions. Photographs were taken of the conditions observed and are contained within the photographic log in **Appendix A**.

Between May 17 and 18, 2006, U.S. EPA, WESTON and the MDEQ-RRD GSU conducted an investigation of the ditch along Franklin Street adjacent to the Plant Site to:

- Evaluate the reported presence of free product in GMW-3;
- Determine if previously remediated ditch areas had been re-contaminated;
- Assess the horizontal and vertical extent of contamination in the ditch area;
- Evaluate contaminant migration pathways to human and ecological receptors; and,
- Record the stratigraphy beneath the ditch.

3.1 SITE ACCESS

All field tasks were performed outside of buildings or enclosures located at the Site. The HCRC granted access to the Franklin Street ROW while the MDOT granted access to the Lake Linden Avenue ROW. The current Site property owner granted access to the Site.

3.2 SAMPLE COLLECTION METHODS

On May 17 and 18, 2006 U.S. EPA, WESTON, and the MDEQ GSU performed the following:

- Advancement of 22 soil borings;
- Collection of subsurface soil samples;
- Collection of a sediment sample;
- Collection of a subsurface ditch bank sample from an unremediated area; and,
- Collection of a groundwater sample from an existing monitor well.

Figure 3-1 depicts the soil, sediment, and groundwater sample locations.

WESTON and the MDEQ advanced 22 soil borings in the right-of-way along the Franklin Street ditch adjacent to the Plant Site using a Geoprobe™. The soil borings were identified as WGP-01 through WGP-22. Installation of soil borings with the Geoprobe™ began near GMW-3 and generally progressed to the east. Desired boring locations were selected by WESTON and the OSC. Boring locations were targeted for placement to penetrate the sand backfill placed after the ditch excavation remediation activities in 1999.

The MDEQ Geoprobe™ operator collected soil samples continuously (from ground surface to boring termination depth) with four-foot long macrocore samplers. Typically, the boring termination depth was 8 ft bgs, but varied depending on the vertical location of the boring on the ditch bank. The borings were advanced to assess the following:

- Presence or absence of contamination in the backfill material and underlying native soils down to the dense glacial till layer that appears to be acting as a confining layer to retard contaminant migration;

- Geologic conditions and potential associated vertical and horizontal migration pathways; and,

- Presence of potential DNAPL.

Soil cores from each boring were field screened with a PID for the presence of volatile organic vapors. At five boring locations where contamination was evident, soil samples were collected from the visibly contaminated depth interval for laboratory analysis. Individually sealed, disposable plastic scoops were used to transfer the soil samples from the Geoprobe™ core liner to laboratory supplied containers. Soil samples were analyzed by Accura Analytical Laboratory in Norcross, Georgia for BTEX, 1,2,4-TMB, 1,3,5-TMB, PAHs, and TAL inorganics. WESTON and the OSC selected the soil samples for laboratory analysis based on field observations. WESTON collected a total of five subsurface soil samples from the Geoprobe™ borings for laboratory analysis.

WESTON classified soils at each boring location on geologic boring logs according to the USCS. Soil boring logs are presented in **Appendix B.**

WESTON collected one near-surface soil sample (soil sample WSS-01) using a stainless steel hand auger from 12 to 18 inches bgs to determine the characteristics of the contamination on the north side at the ditch (not previously excavated). Soil sample WSS-01 was collected approximately one foot from the edge of water flow in the ditch south of the existing eastern above ground compressed gas storage tank at the Site. This area appears to receive surface run-off from the Site based on the presence of erosional channels. It also appears to be periodically inundated during periods of high water flow in the ditch. The sample was analyzed for BTEX, TMBs, PAHs, and TAL inorganics.

WESTON also collected one sediment sample, SED-01, to assess the potential presence of contamination within the ditch atop the geotextile membrane that was placed beneath the rip-rap following remedial excavation efforts in 1999. Sample SED-01 was collected in the middle of the ditch south (downhill) of WSS-01 and the erosional channels from the Site noted in the above paragraph. Approximately one inch of sediment was present atop the geotextile beneath the vegetation growing around the rip-rap. The sediment sample was analyzed for BTEX, TMBs, PAHs, and TAL inorganics. WESTON collected the sediment sample using a disposable plastic scoop to fill the laboratory supplied containers.

WESTON gauged the static water level and collected a groundwater sample from GMW-3. An oil-water interface probe was slowly lowered into the monitor well to gauge the depth to water, potential presence of LNAPL and DNAPL, and total well depth. After recording the measurements, a bailer was slowly lowered into the well to visually examine the top and bottom of the water column within the monitor well. Low-flow sampling techniques were then utilized to collect a groundwater sample from GMW-3. Laboratory supplied sample containers were filled directly from the peristaltic pump discharge and appropriately labeled. The contracted laboratory analyzed the groundwater sample for BTEX, TMBs, PAHs, TAL inorganics, and cyanide.

3.3 DECONTAMINATION PROCEDURES

The MDEQ decontaminated down-hole sampling equipment between sampling locations with a high-pressure steam cleaner to remove fine particles and prevent cross contamination. Non-disposable sampling equipment was decontaminated using an initial water rinse, an alconox and water solution scrub, and a final water rinse. Field personnel bagged all disposable sampling equipment and personal protective equipment.

3.4 INVESTIGATION DERIVED WASTE

Soil cuttings and bagged materials described in **Section 3.3** were placed in a 55-gallon UN-rated drum and staged on-Site. One bag containing emptied Geoprobe™ plastic core liners, that would not fit in the soil drum, was double bagged and staged between the soil cuttings drum and the adjacent on-site building. Decontamination and purge water were contained within two 55-gallon UN-rated drums and staged on site. All drums were labeled with a non-hazardous waste sticker.

SECTION 4
SITE INVESTIGATION RESULTS

4.1 DITCH ASSESSMENT

WESTON and the OSC visually examined the water in the ditch and the surface of the ditch banks in the immediate residential area west of the Site, along the Site boundary, and just east of the Site. The visual assessment revealed no presence of sheen, free product, distressed vegetation, or discoloration in the sediment, surface water or surficial soils along the banks of the ditch.

4.2 EXTENT OF CONTAMINATION

The following subsections discuss the application of Part 201 GRCC and U.S. EPA PRGs and the extent of contamination by media.

4.2.1 Application of Part 201 Criteria

The following Part 201 GRCC were compared to the sample analytical results collected during the Site Assessment. These criteria are considered relevant for the Site based on a site-specific exposure pathway analysis conducted by WESTON. The Residential and Commercial I land use categories are applicable, because the predominant land uses at or near the Site are residential and/or commercial. Although Part 201 does not establish sediment criteria, results of the sediment sample collected during the Site Assessment were compared to Part 201 GRCC to preliminarily evaluate the relative magnitude of contamination in the ditch sediments at the Site.

State-Wide Default Background Levels

These criteria establish generic background concentrations of inorganic substances that can be applied state-wide. These values are relevant for all land uses and become the default criteria for inorganic substances whenever applicable generic risk-based criteria are lower than the state-wide background levels.

DWPC/DWC

These criteria establish soil concentration levels below which organic and inorganic contaminants are not expected to leach and/or migrate to groundwater at levels greater than the residential drinking water criteria.

The criteria also establish groundwater concentration levels that are safe for daily consumption of groundwater used as a drinking water source. These criteria are relevant because contaminants have migrated to groundwater at the Site and there are currently not believed to be deed restrictions preventing residents from using groundwater as a source of drinking water, even though municipal water is available.

GSIPC/GSIC

These criteria establish soil concentration levels below which organic and inorganic contaminants are not expected to leach and/or migrate to groundwater at levels greater than the GSI groundwater criteria. The criteria also establish groundwater concentration levels that are protective of a receiving surface water. Due to the proximity of the Site to surface water in the ditch and a wetland, the direction of shallow groundwater flow toward the ditch, and the presence of gross contamination approximately one foot from the surface water in the ditch, these criteria are considered relevant.

GCPC/GCC

These criteria establish soil concentration levels below which organic and inorganic contaminants are not expected to leach and/or migrate to groundwater at levels greater than the groundwater contact criteria. The criteria also establish groundwater concentration limits that are protective against adverse health effects resulting from dermal exposures to hazardous substances. This pathway is relevant due to the presence of gross soil contamination at shallow depth along the northern bank of the ditch, the shallow depth to groundwater that intersects and likely vents to the ditch flow, and the unrestricted access to the ditch.

Volatilization to Indoor Air Inhalation Criteria

These criteria establish soil and groundwater concentration levels that protect occupants from exposure to indoor air concentrations which may cause adverse health effects, resulting from volatilization of contaminants from soil or groundwater. These criteria address the migration of contaminant vapors from the soil and groundwater into buildings. Due to the presence of residential areas and other commercial buildings near the Site, this pathway is considered relevant.

RDCC

These criteria establish soil concentration levels that are protective against adverse health effects due to long-term ingestion and dermal exposure to contaminated soil. Due to the presence of gross contamination near the surface of the northern ditch bank, the contaminated sediment, and the lack of restricted entry to the ditch, this pathway is considered relevant.

Ecological and Aesthetic Impacts

Most of the Part 201 health-based criteria are generated using systemic, chronic toxicity data which are adjusted to protect sensitive human receptors. Terrestrial and aquatic ecological impacts and adverse aesthetic impacts are not specifically addressed by the generic health-based criteria (except for some drinking water criteria which address adverse aesthetics). As a result, Part 201 states that aesthetic and ecological impacts must be evaluated and addressed at certain facilities to assure protection of the environment and natural resources. The impacts that need to be considered include: aesthetics, phytotoxicity, food chain contamination, adverse impacts to soil organisms, and adverse impacts to aquatic fauna or wildlife. Key considerations of ecological and aesthetic impacts include:

- Evidence of a problem (such as soil discoloration or odors, stressed vegetation, injured wildlife, sheen, etc.) that may warrant further evaluation of aesthetics and/or ecological impacts;

- Evaluation of sites where drinking water use and surface water impacts are not relevant pathways; and

- Sites where soil contamination levels are in compliance with the appropriate health-based, chemical-specific criteria yet still exhibit adverse aesthetic impacts (considerations should be given to the intended use of the property, the depth of impacted soils, the source of the contamination, and the specific adverse characteristics of the soil).

Aesthetic impacts were considered relevant in evaluating the extent of contamination at the Site due to the sensitive nature of the Site (surface water flows to Hammel Creek) and surrounding ecosystem (nearby wetland), and the proximity to residential areas.

4.2.2 Surface and Subsurface Soil

Extent of Contamination Based on Field Observations

Based on initial field observations, the lateral extent of contamination at the surface is minimal. A visual inspection of the ditch banks and sediment did not reveal the presence of contamination.

Aesthetic considerations were evaluated in determining the extent of soil contamination beneath the ditch. All soil borings were evaluated for aesthetics, such as visual evidence of contamination (black staining, and/or sheen or odor characteristics). Visual evidence of contamination was encountered at WGP-03, WGP-06, WGP-08 through WGP-10, WGP-16, WGP-17, WGP-19, WGP-21, and WGP-22 as noted in the boring logs in **Appendix B**. The areas of concern that are driven by aesthetics are located at depths between 3.5 ft bgs and 8 ft bgs and therefore do not pose an immediate threat.

Extent of Contamination Based on Concentrations in Excess of Part 201 GRCC

The following paragraphs discuss the subsurface soil sample results that are in excess of the applicable Part 201 GRCC by each contaminant type. Analytical results summary tables are included in **Appendix C**.

VOCs

Samples from select soil borings were analyzed for the presence of BTEX and TMBs. All soil samples that were analyzed exceeded DWPC and GSIPC with the exception of WGP-08 (exceeds DWPC only). The following paragraphs detail GRCC exceedences by contaminant type. **Figure 4-1** depicts the soil and sediment locations with contaminant concentrations in excess of Part 201 GRCC.

Benzene and ethylbenzene exceed DWPC and GSIPC at soil boring locations WGP-06 (5ft to 6.5 ft), WGP-16 (6 ft to 8 ft), and WSS-01 (0 ft to 1 ft). Benzene also exceeds DWPC at WGP-08 (3.5 ft to 4.5 ft), and ethylbenzene exceeds DWPC and GSIPC at WGP-21. Soil sample WGP-16 contained toluene in excess of DWPC and GSIPC. Soil samples WGP-16, WGP-21, and WSS-01 contained xylenes, 1,2,4 TMB, and 1,3,5 TMB in excess of DWPC and GSIPC.

Soil boring locations were along the south edge of the drainage ditch. The lateral extent of BTEX contamination generally decreases downstream (westward) of WGP-16 and WGP-21, and the vertical extent of contamination increases with depth below ground space up to the dense till layer. All sampled soil borings noted sheen, presence of free product, or discoloration consistently at 6 ft bgs to 8 ft bgs, with the exception of WGP-08 (discoloration at 4 ft bgs). As supported by historical Site information, the top of the dense till layer defines the limits of vertical VOC contamination exceeding Part 201 GRCC.

Of note, soil sample WGP-08 contained BTEX at concentrations which exceeded detections of the same compounds by at least one order of magnitude in a nearby confirmation soil sample (FS 126, Coleman Engineering) collected in 1999. The two sample locations are in close proximity (laterally and vertically) therefore the comparison may suggest a deterioration or change in conditions between 1999 and the present time.

PAHs

Overall, PAHs made up the majority of the contaminants detected in soil samples and are considered the primary contaminants of concern at the Site. The following paragraphs present a detailed discussion of the horizontal and vertical extent of PAHs in near surface and subsurface soil that exceed Part 201 GRCC. The detections of PAHs during the Site Assessment are consistent with the sampling results from previous investigations as discussed in **Section 2.2**. **Figure 4-1** depicts the subsurface soil and sediment sampling locations with contaminant concentrations in excess of Part 201 GRCC.

As summarized in the analytical data tables presented in **Appendix C**, numerous PAHs including 2-methylnaphthalene, naphthalene, acenaphthene, fluoranthene, fluorene, and phenathrene were detected above GSIPC in subsurface soil samples WGP-06, WGP-16, WGP-21, and WSS-01. Subsurface soil sampling locations also indicated the presence of PAHs exceeding DWPC, GCPC, and DCC.

Soil sample location WGP-16 exceeded DWPC for naphthalene and RDCC for benzo(a)pyrene. Subsurface soil sample WGP-21 contained 2-methylnaphthalene, acenaphthene, and naphthalene in excess of DWPC and benzo(a)pyrene exceeded RDCC.

The near surface soil sample WSS-01, collected from 0.5 ft bgs to 1.5 ft bgs, contained gross coal tar contamination based on visual inspection. Sample WSS-01 exceeded DWPC, GSIPC, GCPC, and RDCC for numerous PAHs. This sample, and the associated high levels of PAH contamination and exceedences of GSIPC and RDCC is noteworthy because the sample is in close proximity to surface water and is less than one foot bgs. Access to the area around the sample and drainage ditch water and sediment is unrestricted to area residents.

Similar to the VOC concentrations, soil samples analyzed for PAHs indicate that contamination decreases laterally to the west of WGP-21. Correspondingly, detections in excess of Part 201 GRCC increased with depth and confirm the presence of DNAPL at depths of 6 ft bgs to 8 ft bgs as witnessed by sheen, odor, free product, and black discoloration in soil borings. This observation is consistent with historic observations.

Inorganics

Inorganic analytes were detected below state-wide default background levels in subsurface soil samples, with the exception of WSS-01. The subsurface soil sample WSS-01 is of concern because of the presence of elevated arsenic, cobalt, and mercury concentrations. Arsenic exceeds state-wide default background, DWPC, and RDCC. Cobalt exceeds DWPC and GSIPC. Mercury was detected in excess of GSIPC. Exceedences of these inorganic analytes at this location is significant due to the shallow depth of WSS-01 and proximity to surface water.

Extent of Contamination Based on Concentrations in Excess of U.S. EPA PRGs

The following paragraphs discuss the soil sample results that are in excess of the U.S. EPA PRGs for residential direct contact with soil by each contaminant type. Analytical results summary tables are included in **Appendix C**.

VOCs

The soil sample from WGP-08 exceeded the PRG for benzene while sample WSS-01 exceeded the PRGs for benzene and TMBs.

PAHs

Similar to the results for the comparison to Part 201 GRCC, the PRGs for numerous PAHs were exceeded in samples WGP-16, WGP-21, SED-01, and WSS-01. Noteworthy is that the benzo(a)anthracene and benzo(a)pyrene concentrations detected in SED-01 exceed the respective PRGs.

Inorganics

The arsenic concentrations detected in WGP-06, WGP-10, WGP-21, SED-01, and WSS-01 exceed the respective PRG. The PRG for iron is also exceeded in SED-01 and WSS-01. SED-01 also exceeds the PRGs for manganese and zinc.

4.2.3 Sediment

As mentioned previously, Part 201 does not establish cleanup criteria for sediment. However, analytical results for sediment were compared to Part 201 GRCC to evaluate the magnitude of contamination within the sediment in the drainage ditch. Analytical results summary tables are included in **Appendix C**.

Inorganics

Metals were the only contaminants with exceedences of Part 201 GRCC detected in sediment sample SED-01. This sample was collected from within the surface water area of the drainage ditch and was taken from above the geotextile that was placed during remedial efforts in 1999, therefore sediment deposition and contamination occurred subsequent to remediation at the Site. Several metals were detected in the sediment sample, and a significant number of those metals exceeded state-wide default background levels. Arsenic, cobalt, lead, and manganese exceeded DWPC. Arsenic in excess of RDCC is of concern because of the unrestricted access to the surface water and sediments and their potential migration downstream. Several metals may also exceed GSIPC, but the pH and hardness of the ditch water is not known so the corresponding GSIPC could not be calculated.

4.2.4 Groundwater

One groundwater sample was collected at GMW-3. WESTON did not identify the presence of LNAPL or DNAPL in the monitoring well or in the soil boring WGP-02 adjacent to GMW-3. However, a sheen was noted at the topsoil/sand interface (3.5 ft bgs) of WGP-03, which is approximately 10 ft east (upstream) of GMW-3. Groundwater at GMW-3 contained VOCs and PAHs in exceedence of Part 201 GRCC.

VOCs

Benzene, ethylbenzene, and 1,2,4-TMB were detected above DWC. These contaminants exceeded DWC and/or GSIC at low levels. The drinking water PRGs for benzene and 1,2,4-TMB were also exceeded.

PAHs

The groundwater sample collected contained acenaphthalene, fluorene, naphthalene, and phenathrene in excess of GSIC. The detected naphthalene concentration also exceeded the respective drinking water PRG.

Inorganics

Inorganic analytes were not detected in exceedence of Part 201 GRCC.

4.3 GEOLOGY AND HYDROGEOLOGY

The following discussion of the geology and hydrogeology of the Site is based on information collected during the Site Assessment as well as previous Site investigations. The information gathered during the Site remedial investigation was utilized to provide background information concerning the Site and surrounding area. Site Assessment boring data was used to provide geologic and hydrogeologic information specific to the ditch adjacent to the Site.

4.3.1 Geology

Based on the "*Remedial Investigation Report Florida Gas Project Plant Site*", "soils in the area are derived from...glacial deposits as well as post glacial peat and muck." "The glacial material was at least in part locally derived. It typically contains native copper" and "native silver, galena (lead sulfide), sphalerite (zinc sulfide), stibnite (antimony sulfide), and various arsenides."

Relatively homogeneous geologic conditions are reported to prevail across the Site. "In general, the upper several feet of overburden was sand and gravel fill material. At several locations building rubble, coal, cinders and rubbish were noted in the fill material. A thin layer of peat/organic silt was occasionally found underlying the fill material. More often underlying the fill material, brown fine sand with varying amounts of silt and of varying thickness was encountered. Underlying the sand/silt is an extremely dense, calcarious reddish brown or gray silty sand with varying amounts of gravel and cobbles/boulders. This formation was generally encountered between 15 ft bgs and 20 ft bgs and is a glacial till. A grain size analysis of this formation described the soil as dark brown silty sand with clay and trace clay...". "Previously performed work indicated this till was bedrock based on seismic refraction and drilling refusal."

During the Site Assessment, relatively uniform subsurface conditions were encountered along the ditch for borings WGP-04 through WGP-20. However, at the west end of the Site at WGP-01 through WGP-03 and near the east end at WGP-21 and WGP-22, the subsurface conditions varied. At the first group of borings, a fine to medium, reddish brown sand with a trace of silt was encountered down to approximately 3 ft to 6 ft below the bottom of the ditch. This material is believed to be backfill sand placed subsequent to the 1999 remedial excavation efforts. Beneath this material, was sand with varying amounts of silt and clay down to the dense, silty sand layer at approximately 8 ft below the bottom of the ditch.

Borings WGP-01 through WGP-03, WGP-21, and WGP-22 were advanced in the western and eastern portion of the ditch adjacent to the Site where remedial excavation activities in 1999 were terminated. The absence of backfill material is reflected in the presence of numerous shallow thin silty/clayey lenses and abundant organic soils, especially adjacent to the wetland area immediately east of the Site.

4.3.2 Hydrogeology

The "*Remedial Investigation Report Florida Gas Project Plant Site*" indicates that groundwater was encountered at 3 ft bgs to 5 ft bgs in all borings advanced at the Site. Shallow groundwater at the Site was observed to flow toward, and discharge to, the ditch along Franklin Street. South of Franklin Street, groundwater elevations measured in monitor wells suggests that shallow groundwater flows northerly toward the ditch.

Monitor wells have also historically been installed with screened intervals at approximately 20 ft bgs in the top of the dense till layer. Groundwater elevation data from these wells suggests that groundwater flows southwesterly.

Horizontal hydraulic gradients were determined to range from 0.044 ft/ft to 0.79 ft/ft. Vertical hydraulic gradients were determined to vary from 0.18 ft/ft in a downward direction to 0.034 ft/ft in an upward direction.

During the recent investigation, depth to groundwater in the Geoprobe™ borings varied from 0 ft bgs to 3 ft bgs, depending on boring location on the ditch bank. Water was flowing in the ditch during boring advancement and was at the same elevation as the groundwater encountered in the borings advanced near the top of the ditch banks, supporting the historic finding of the hydraulic connection between the shallow groundwater and the ditch.

The depth to groundwater measured in GMW-3 was 2.04 ft. The measured total well depth was 6.60 ft. This depth to groundwater corresponds to an elevation of 1181.53 ft, which is about 1 ft higher than historic measurements but this is not unexpected given the seasonal high water table and flowing water in the ditch. The total depth measurement yields a bottom of well elevation of 1174.93, which is within 0.2 ft of the previously reported depth.

SECTION 5

THREATS TO HUMAN HEALTH AND THE ENVIRONMENT

The conditions at and adjacent to the Site present an imminent and substantial threat to the public health, or welfare, and the environment, and meet the criteria for a removal action provided for in paragraph (b) (2) of Section 300.415 of the NCP, which specifically allows removal actions for:

- **Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;**

This factor is present adjacent to the Site as there is unrestricted access to soil and sediments that contain contaminant concentrations in excess of Part 201 Residential/Commercial I Direct Contact criteria at and near the surface of the drainage ditch. During the Site Assessment, children were observed playing in the ditch area. This is of concern because of the elevated levels of inorganics, specifically arsenic, cobalt, and lead, in the drainage ditch sediments. Additionally, there is a wetland located near the Site, and the larger surface water body, Hammel Creek is located downstream of the Site. Sediment sample SED-01 indicates that contamination subsequent to remedial efforts occurred and is a threat to nearby populations.

Coal tar is a known human carcinogen based on sufficient evidence of carcinogenicity in humans. Findings in humans are supported by evidence from experimental observations where coal tar caused cancer in rats, mice, and rabbits. Exposure to coal tar is associated with skin cancer. The primary routes of potential human exposure to coal tars and coal-tar products are inhalation, ingestion, and dermal contact.

Coal tar, a DNAPL, can dissolve in water, move in slugs, droplets, or masses, and has the ability to displace water in porous media. Coal tar may move beyond/ahead of subsurface masses of accumulated vadose-zone soil-pore coal tar residuals.

- **Actual or potential contamination of drinking water supplies or sensitive ecosystems;**

The Site is located adjacent to a residential community, surface water body, and a wetland. Groundwater near the site may be used as a drinking water source for area residents and the wetland and Hammel Creek are sensitive aquatic ecosystems. Releases from the Site may impact aquatic life. Groundwater at the Site is contaminated above DWC. Currently, there are no known groundwater use restrictions at the Site (such as a local ordinance), and therefore, if groundwater is or was to be used as a drinking water source, it would pose a threat to human health.

- **High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate;**

Highly contaminated soil/sediment (above GSIPC and RDCC) is present adjacent to the Site in soil near the surface as detected in sample WSS-01. Sediment sample SED-01 exceeds RDCC for arsenic and represents material that may have migrated from surface soil at the Site due to observation of erosional channels. Contamination of this nature may migrate further downstream by surface water and sediment transport.

- **Weather conditions that may cause hazardous substance or pollutants or contaminants to migrate or be released;**

Heavy rains and rapid snowmelts typically occur during the spring and summer months in Michigan's Upper Peninsula. These weather conditions may cause water elevations to rise and move rapidly downstream in the drainage ditch. Contamination at or near the surface may potentially be picked up by water movement and transported in water and sediments downgradient to human, plant or animal receptors. During the Site Assessment, WESTON observed what appeared to be a black particulate runoff from the Site over the north bank of the drainage ditch.

- **The availability of other appropriate federal or state response mechanisms to respond to the release;**

In April 2006, the MDEQ requested assistance from the U.S. EPA Region V, Emergency Response Branch to address coal tar contamination at the Site.

Hammel Creek in the Laurium vicinity does not meet the definition of a navigable waterway. The significant waterfall between Laurium and Portage Lake, which is a navigable waterway, places the Laurium reach of Hammel Creek well above Portage Lake's ordinary high water mark and out of navigable waterway status. Therefore, a response under Section 311(c)(1) of the Clean Water Act is not available.

SECTION 6
SCOPE OF REMOVAL ACTION

The PAH and/or metal concentrations associated with coal tar contamination detected in soil and/or sediment during the Site Assessment were above Part 201 DWPC and GSIPC at all locations sampled. Samples from WGP-16 and WGP-21 exceeded RDCC for PAHs while sample SED-01 exceeded RDCC for arsenic. Near surface soil at WSS-01, adjacent to SED-01 along the north bank of the ditch which was not previously excavated, also exceeded RDCC for PAHs and arsenic.

Evaluation of the soil samples collected from the Geoprobe™ borings (WGP series) in the previously remediated ditch area indicates that the contaminants that are present in excess of the Part 201 GRCC are primarily in the subsurface soil. The zones exhibiting sheen and the presence of DNAPL were similarly present in subsurface soil. Therefore, exposure to human receptors is not likely, as subsurface contaminants are not easily accessible at these locations.

Arsenic contamination at concentrations exceeding the Part 201 GRCC is present in the surficial sediment in the ditch, atop the geotextile placed as part of the 1999 remedial actions. The presence of even greater arsenic concentrations in nearby WSS-01, in an area that was not excavated, suggests that the arsenic may be related to Site contamination and is being deposited in the ditch through erosion of surface soils from the Site, as evident from the erosional channels observed leading from the Site, through the fence, and into the ditch. This ditch area is readily accessible and WESTON observed children playing in the nearby ditches during the Site Assessment. The unrestricted access to the ditch makes the scenario of human exposure to contaminated soil likely.

Visible gross contamination, coupled with PAH concentrations that exceed GSIPC, GCPC, and RDCC, and arsenic in excess of RDCC associated with coal tar contamination is present in shallow subsurface soil (0.5 ft bgs to 1.5 ft bgs) along the north bank of the ditch adjacent to the Site. This area is easily accessible to human receptors and was only one foot from the flowing water stream at the time of Site Assessment activities.

The unrestricted access to the ditch makes the scenario of human exposure to the contaminated soil possible. While direct seepage of gross contamination was not observed, the leaching of contaminants into the surface water is likely and poses a direct exposure threat to aquatic life.

Therefore, to mitigate the threats to human health and the environment, removal of contamination along the ditch to abate immediate threats coupled with removal of the Site contamination source to eliminate the ongoing migration of contaminants is recommended.

6.1 DESCRIPTION OF ZONE OF CONTAMINATION

The area of shallow soil/sediment contamination targeted for removal to eliminate the immediate threats to human health and the environment is depicted in plan view on **Figure 6-1**. This area encompasses the sediments in the ditch adjacent to the Site atop the geotextile and the upper 2 ft of soil along the north bank of the ditch up to the fence and structures. A removal of the material in this area would eliminate grossly contaminated soil that is subject to uncontrolled human exposure and is likely leaching contaminants to the surface water.

Based on the aforementioned removal area, the following is the volume of soil/sediment which must be removed:

Length	**340 feet**
Average Width	**12 feet**
Average Depth	**1.5 feet**
Area	**6,120 cubic feet**
Volume	**230 CY in-place**

6.2 ADDITIONAL RECOMMENDED CONTROL MEASURES

To abate the ongoing migration of contaminants, which are leading to contamination of the ditch, the following removal actions are recommended.

Source Area Removal, Including Franklin Street Ditch and M-26 Storm Sewer Drainage Corridor

This removal action will yield long term contaminant exposure mitigation by removing highly impacted soil from the Site source area, including DNAPL observed in soils beneath the Franklin Street ditch in June 2006, and removal of grossly contaminated material along the drainage corridor beneath M-26. The removal action will mitigate conditions that exceed RDCC and GCPC. Media that will remain in-place after the removal action is completed may exceed DWC/DWPC and GSIC/GSIPC. Treatment of residual contamination is outside the scope of work contemplated within this document but may be addressed by natural attenuation as it does not pose an immediate threat.

Site preparation will be required prior to an effective, comprehensive removal action. The preparation activities may include, but are not limited to:

- Permit acquisition and utility coordination;
- Locating active and abandoned piping;
- Temporarily de-energizing active piping;
- Draining and removing abandoned piping;
- Fence removal;
- Temporary above ground natural gas storage tank removal and storage;
- Demolition of existing buildings;
- Asphalt removal; and,
- Historic underground tar tank removal (if still present as suggested by historic reports).

Upon completion of Site preparation activities, the removal action can commence. The removal action will be comprised of three components:

- Excavation of Site source area soils;
- Excavation of Franklin Street ditch soil; and,
- Excavation of grossly impacted soil from the storm sewer drainage corridor beneath M-26.

Removed soils must be characterized and properly disposed. More specific descriptions of the removal areas are provided below.

Site Source Area

The area of soil contamination targeted for removal to eliminate gross contamination and the direct contact threats to human health and the environment is depicted in plan view on **Figure 6-2**. This area encompasses the soils known and suspected to be grossly contaminated at the Site as well as highly contaminated soils in the road ROW north of the Site and in a portion of the adjacent wetland northeast of the Site. As can be seen on **Figure 6-2**, to access the highly contaminated soil requires excavation of areas that are currently beneath buildings and the natural gas storage tanks.

The "*Remedial Investigation Report Florida Gas Project Plant Site*" indicates that a "review of historical data collected at the site suggests that most of the historical underground features such as underground tanks, building foundations, and above ground tank footings remain in place. Underground remnants of former structures still exist" including the water gas plant, a 100,000 cubic-foot gas holder in the southwest corner of the Site, an underground tar tank in the middle of the Site, a 35,000 cubic-foot gas holder in the eastern corner of the Site, historic gas mains and potentially process piping, and several homes that were present along the western margin of the Site. Locations of these features are depicted in the excerpts from the "*Remedial Investigation Report Florida Gas Project Plant Site*"contained in **Appendix D**. The presence of these features will complicate excavation efforts as their removal is often difficult. The volume of underground foundations is not known nor are the construction methods and materials known.

Based on the Site removal area depicted on **Figure 6-2**, the following volume of soil must be removed:

Average Depth	**8 feet**
Area	**36,550 square feet**
Volume	**10,830 CY (in-place)**
Weight	**16,245 tons (at 1.5 ton/CY)**

Franklin Street Ditch

The estimated area of soil contamination targeted for removal from the Franklin Street ditch area is depicted in plan view on **Figure 6-2**. This area encompasses the surficial soils described in **Section 6.1** as well as the deeper soils containing DNAPL as observed during site assessment activities in June 2006.

Based on the aforementioned removal area, the following is the volume of soil/sediment which must be removed:

Length	**340 feet**
Average Width	**30 feet**
Average Depth	**8 feet**
Area	**10,200 square feet**
Volume	**3,020 CY (in-place)**
Weight	**4,530 tons (at 1.5 ton/CY)**

M-26 Storm Sewer Drainage Corridor

During the previous drainage ditch contamination removal activities, the portion of the drainage ditch network beneath M-26 was not excavated. Near surface gross contamination was observed at either end of the culvert beneath M-26 upon completion of the previous removal activities. This near surface gross contamination could pose a direct contact risk, is likely acting as a continuing source of groundwater contamination, and may be leaching contaminants to the storm water drainage network.

The estimated area of soil contamination targeted for removal from the M-26 drainage corridor area is depicted in plan view on **Figure 6-2**. It is assumed that the existing culvert will be replaced as part of the removal efforts. Based on the depicted removal area, the following is the volume of soil which must be removed:

Length	**196 feet**
Average Width	**20 feet**
Average Depth	**8 feet**
Area	**3,920 square feet**
Volume	**1,165 CY (in-place)**
Weight	**1,748 tons (at 1.5 ton/CY)**

Upon completion of the removal and confirmation sampling activities, restoration of the Site to serve as a functioning natural gas storage facility will be required. The M-26 restoration must be completed to MDOT standards while the Franklin Street ditch restoration will be governed by HCRC. Replacement of damaged or removed monitor wells may also be necessary.

6.3 ADDITIONAL REMOVAL ACTION / CONTROL MEASURE OPTIONS

In addition to the recommendations provided in **Section 6.1** and **Section 6.2**, several alternative removal action and control measure options are available depending upon the long term effectiveness sought by U.S. EPA. Four options, largely selected by U.S. EPA, are discussed below.

Low Permeability Barrier Wall With Hydraulic Control

Engineering control measures such as the use of a slurry wall and hydraulic control techniques could be considered to inhibit on-going migration of contaminants into the ditch area from the Site. These measures, coupled with elimination of the immediate threats to human health and the environment by excavating the area of shallow soil/sediment contamination within the Franklin Street ditch, would effectively inhibit the immediate direct contact and soil leaching exposure risks. However, these actions would not significantly reduce the amount of contamination present at the Site and would not capture DNAPL that has already migrated south of the north edge of the ditch.

Prior to implementing this option, a surface and subsurface hydraulic study is recommended. The observed erosion channels from the Site into the ditch suggest that surface water, and contaminated soils, are being transported from the Site into the ditch. A feasibility study is recommended to determine the best course of action for surface water control at the Site to inhibit or prevent ditch contamination due to run-off. In addition, the study should include a groundwater evaluation. If shallow groundwater can no longer vent to the ditch due to the slurry wall, groundwater control will be required to prevent uncontrolled migration into previously un-impacted regions and exacerbation of surface ponding.

As part of the feasibility study, a topographic survey of the Site should be completed to determine existing slopes and drainage pathways. In addition, pumping tests should be conducted to determine groundwater recharge rates and estimate the pumping capacity required to off-set the hydraulic barrier provided by the slurry wall. A hydraulic model of the Site could then be formulated to determine run-off rates, evaluate grading options, and determine groundwater control parameters.

Local ordinances, HCRC, and MDOT requirements will need to be researched to determine if land changes will necessitate detention capabilities and other limitations for surface water drainage improvements. Upon completion of the feasibility study, removal actions can begin.

The area of soil/sediments that would be removed from the ditch is generally described in **Section 6.1** and depicted on **Figure 6-1**. However, during the excavation of the upper 2 to 3 ft of soil along the north bank of the ditch, a "bench" would be created. The purpose of the "bench" is described below. As noted in **Section 6.1**, the volume of soil that would be removed by this action is approximately 230 in-place CY.

A one-pass trencher should be able to install a slurry wall near the toe of the slope of the north edge of the ditch from the surface down to approximately 10 ft below the bottom of the ditch. This will place approximately 2 ft of the slurry wall into the dense glacial till and effectively inhibit migration of DNAPL.

Passage of the trencher along the north side of the ditch should be possible provided that the aforementioned "bench" is constructed to allow a flat enough ditch profile to allow a trencher to pass along the north edge. Some temporary reshaping of the south ditch bank may also be necessary in places to allow the trencher to pass in a stable manner.

To reconstruct the north bank of the ditch and prevent seepage of shallow gross contamination, a one foot layer of thick slurry could be placed from the top of the aforementioned slurry wall up the north bank to the existing grade elevation. This slurry layer could be topped with a geotextile grid to stabilize the slope prior to placement of approximately six inches of sand and six inches of topsoil (on the bank slope) or all sand (in the ditch bottom) to restore the ditch profile to existing conditions. The ditch bottom would then be reconstructed with a geotextile fabric and salvaged rip-rap replacement.

The extended slurry wall would minimize any future seepage from entering the surface water or potentially contaminating sediment. DNAPL migration would also be inhibited. A concept level placement of the slurry wall is depicted on **Figure 6-3**. The total estimated conceptual length of the slurry wall is 545 ft.

The outcome of the feasibility study will dictate the actions required to control surface water flow and resulting erosion and contaminant transport. It is assumed that regrading of at least a portion of the Site will be required and that some of the surface water will be routed to the water treatment system that will be constructed as part of the groundwater control plan. Upon completion of grading, grass seed and mulch should be applied to disturbed areas.

Groundwater control could likely be maintained through the use of a recovery trench or a series of vertical recovery wells. Soil generated during installation of the recovery system will require proper landfill disposal. The recovery system could likely be installed adjacent to the north (hydraulically upgradient) side of the slurry wall. Recovered groundwater would be routed to a treatment structure for processing through granulated activated carbon to remove VOCs and PAHs. Treatment for metals may also be required depending upon the outcome of treatment system pilot testing during the feasibility study.

Treated water would likely be discharged to the existing sanitary sewer system, depending upon discharge sampling requirements and fees that may be imposed by the North Houghton County Water and Sewage Authority. An alternative option may be to discharge the treated water to the storm water drainage network under a NPDES permit, but this alternative will likely require more extensive sampling and reporting than discharging to the sanitary sewer.

Ditch Lining and Surface Water Control

Engineering control measures such as lining the ditch adjacent to the Site with asphalt or concrete can be contemplated to prevent human exposure to impacted soils and inhibit seepage of shallow gross contamination. However, these actions would not significantly reduce the amount of contamination present at the Site and would not capture DNAPL that has already migrated south of the north edge of the ditch. To reconstruct the north bank of the ditch after the removal action described in **Section 6.1**, a 14 inch layer of engineered fill sand could be placed followed by 6 inches of gravel and 4 inches of asphalt or concrete. To restore the ditch profile to existing conditions, the ditch bottom would then be reconstructed with a geotextile fabric and salvaged rip-rap replacement.

Instead of rip-rap replacement, extension of the asphalt or concrete lining out across the bottom of the ditch, and possibly up the south ditch bank to Franklin Street, may be desirable to inhibit shallow groundwater venting. However, a hydrologic study will be required to examine the impact of an extended lining on shallow groundwater flow. Potential hydraulic uplift forces on an extended lining should also be examined prior to selecting this alternative.

The observed erosion channels from the Site into the ditch suggest that surface water, and contaminated soils, are being transported from the Site into the ditch. A feasibility study would be required to determine the best course of action for surface water control at the Site to inhibit or prevent ditch contamination due to run-off.

As part of the feasibility study, a topographic survey of the Site should be completed to determine existing slopes and drainage pathways. A hydraulic model of the Site could then be formulated to determine run-off rates and evaluate grading options. Local ordinances, HCRC, and MDOT requirements would need to be researched to determine if land changes will necessitate detention capabilities and other limitations for surface water drainage improvements.

Ideally, the study will yield a solution that involves limited Site regrading followed by placement of topsoil and sod along the portion of the Site that will drain to the ditch to eliminate contaminated surficial soil run-off. The existing drive through the west side of the property may potentially be covered with gravel. The conceptual area of placement is depicted on **Figure 6-4**. The actual placement area will depend on the outcome of the study.

From **Figure 6-4**, the estimated topsoil coverage area is 17,780 sq ft and the proposed loose depth of coverage is 6 inches. Therefore, the required loose volume of topsoil required is 330 CY. The drive covers an estimated 4,800 sq ft and the proposed loose depth of coverage is 6 inches. This yields a loose gravel volume of 90 CY. This alternative would allow infiltration of surface water and likely incur minimal local ordinance and permitting restrictions.

An alternative outcome of the study may be limited undercutting and regrading followed by placement of sand, gravel, and asphalt cover over the portion of the Site that will drain to the ditch. This alternative will likely yield an increased amount of surface water that must be managed, but has the added benefit of limiting water infiltration and direct contact with on-Site soils. Improvement of the Site with asphalt coverage may require the involvement of HCRC and MDOT due to the increase in water volume flowing to their drainage facilities.

Due to the vehicle and truck traffic at the Site, including propane tankers, it is assumed that the asphalt cover would be designed to support traffic. Accordingly, a 2 ft deep undercut of the shaded area in **Figure 6-4** would likely be required followed by placement of 1 ft of engineered fill sand, 8 inches of gravel, and 4 to 6 inches of asphalt. The thicker asphalt would be placed in truck traffic areas. This would yield approximately 1,675 in-place CY of contaminated soil for landfill disposal.

Fence Expansion

To rapidly address the direct contact risk posed by the surface and near-surface sediments in the ditch, the existing fence could be expanded to include the ditch adjacent to the Site. The fence would inhibit contact with the sediments and could be rapidly deployed. However, this alternative would not reduce the amount of contamination at the Site or within the ditch and would not prevent leaching to surface water or further contaminant transport.

A concept-level location for the expanded fence is depicted on **Figure 6-5**. The fence would be installed on the north shoulder of Franklin Street along the entire length of the Site. The installation as depicted on **Figure 6-5** would include approximately 560 ft of fence and one, 30-ft wide vehicle gate. Soil generated by post installation is not expected to be contaminated with coal tar residuals due to its shallow depth. Therefore, it is anticipated that generated soil will be placed on the east side of the Site property. However, verification of soil conditions prior to fence installation is recommended.

Although the fence would help limit the risks posed by the contaminated ditch sediments, it could pose additional hazards to the motoring public and pedestrians. The fence would effectively eliminate the road shoulder available for motorists to pull off the road if necessary. It would also eliminate the corridor typically used by pedestrians for safe travel along the road. Another significant problem posed by a fence would be elimination of space for snow removal from Franklin Street. It is likely that the HCRC would strongly object to an expanded fence due to these reasons.

Oversight of Potentially Responsible Party Under Unilateral Order

This alternative involves oversight of a PRP lead removal effort. This effort would include review of PRP work plans, limited confirmation sampling to verify PRP sampling results, and continuous oversight of PRP removal efforts.

SECTION 7

CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

The following conclusions are based on the results of the Site Assessment:

- Contamination (predominately PAHs and arsenic) is present in near-surface soil, subsurface soil, and sediment in excess of Part 201 RDCC.
- The migration of contaminants from the Site and previously unexcavated north bank of the ditch adjacent to the Site into the ditch is plausible given the surface contours, geology, and hydrogeology at the Site.
- Contamination encountered at WSS-01 is indicative of contamination that would continue to release contaminants to the ditch unless abated.
- Contaminant concentrations in sediment and near-surface soil in the ditch pose an imminent and substantial threat to human health and the environment as evidenced by sampling results which exceed GSIP and RDCC, and by aesthetic observations made during the Site Assessment.

7.2 RECOMMENDATIONS

Based on the results of the Site Assessment and the documented threats to human health and the environment posed by the Site, WESTON recommends the following actions, as discussed specifically in **Section 6**:

- Immediately remove the contaminated sediment and shallow grossly impacted soil from the ditch adjacent to the Site. As discussed in **Section 6.1**, the approximate in-place volume of soil/sediment that should be removed is 230 CY.
- Implement additional actions to remove the ongoing source of contaminants to prevent the further migration of contaminants into the ditch. As discussed in **Section 6.2**, removal of the Site source and grossly impacted drainage course areas is recommended to eliminate the source of contamination.

SECTION 8

REFERENCES

Coleman Engineering Company. "Florida Gas Ditch Remediation Documentation Report." February 2000.

Coleman Engineering Company. "Remedial Investigation Report Florida Gas Project Plant Site." December 2000.

Coleman Engineering Company. "Remedial Feasibility Study Report Plant Site Florida Gas Site." July 2001.

Report on Carcinogens, Eleventh Edition, U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program.

State of Michigan. "Administrative Rules for Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended." Michigan Compiled Laws 324.101 seq. Promulgated December 21, 2002.

United States Environmental Protection Agency, Region IX Superfund. "Preliminary Remediation Goals." Revision Date 12/28/04.

FIGURES

LEGEND

● Site Location

Source: www.topozone.com
USGS Laurium

Drawn By: NJK Checked By: JBC

N

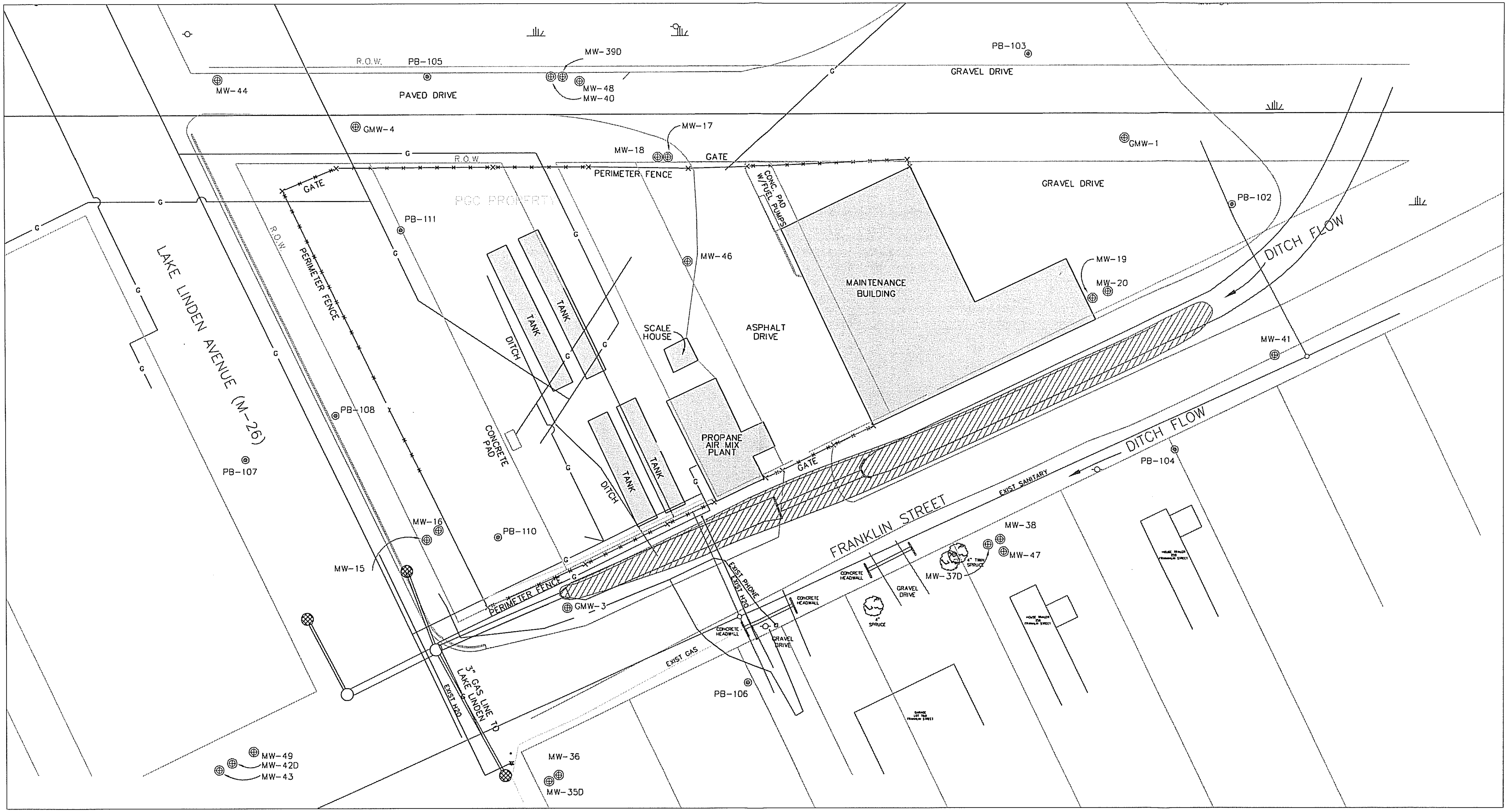
WESTON SOLUTIONS

Weston Solutions, Inc.
2501 Jolly Road
Suite 100
Okemos, MI 48864

Figure 2-1

Site Location Map
U.S. EPA Florida Gas Plant Site
Florida Location, Michigan

D:\Florida_Gas_GIS\apr\florida_gas_2006_06_07.apr



LEGEND

- PB-109 HISTORIC BORING LOCATION
- MW-39D MONITORING WELL LOCATION
- RIGHT OF WAY
- AREA THAT UNDERWENT SOIL REMOVAL IN 1999

N

SCALE IN FEET
0 40

Adapted from Coleman Engineering Company drawing 99001-F6-02A.dwg

FIGURE 2-2

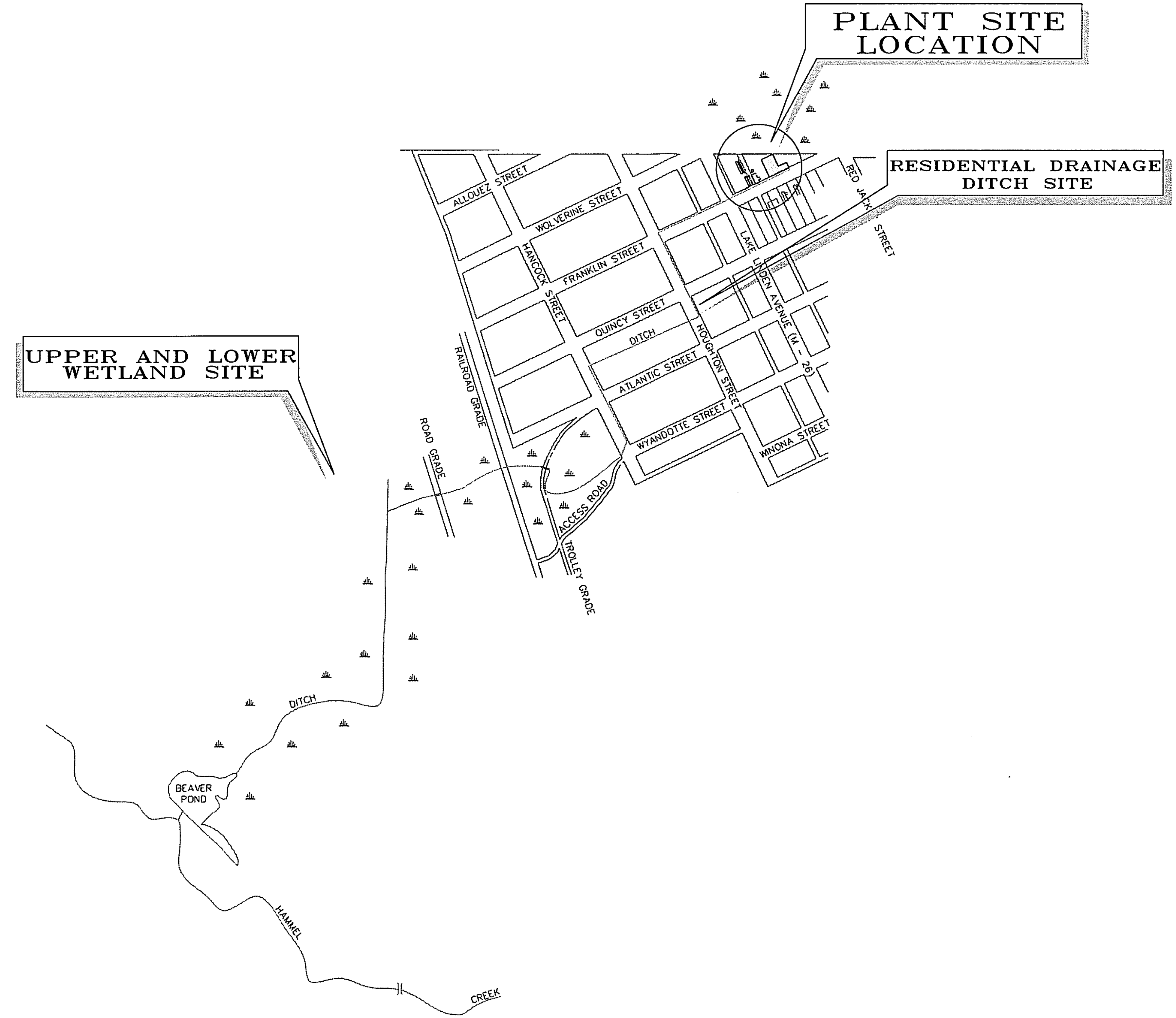
File Path and Name:HMI\USEPA Florida Gas\SAReport\Figures\site features.dwg	Designed by: Coleman Eng.	Drawn By: Coleman	Checked by: DMC	Approved by: DMC

WESTON SOLUTIONS

Suite 100
2501 Jolly Rd
Okemos, Michigan
48864

SITE FEATURES

U.S. EPA Florida Gas Plant Site
Florida Location, Michigan



NOT TO SCALE

Adapted from Coleman Engineering Company drawing 99001-F6-01A

FIGURE 2-3

File Path and Name:HMI\USEPA Florida Gas\SAReport\Figures\drainage.dwg	Designed by: Coleman Eng.	Drawn By: Coleman	Checked by: JBC	Approved by: DMC

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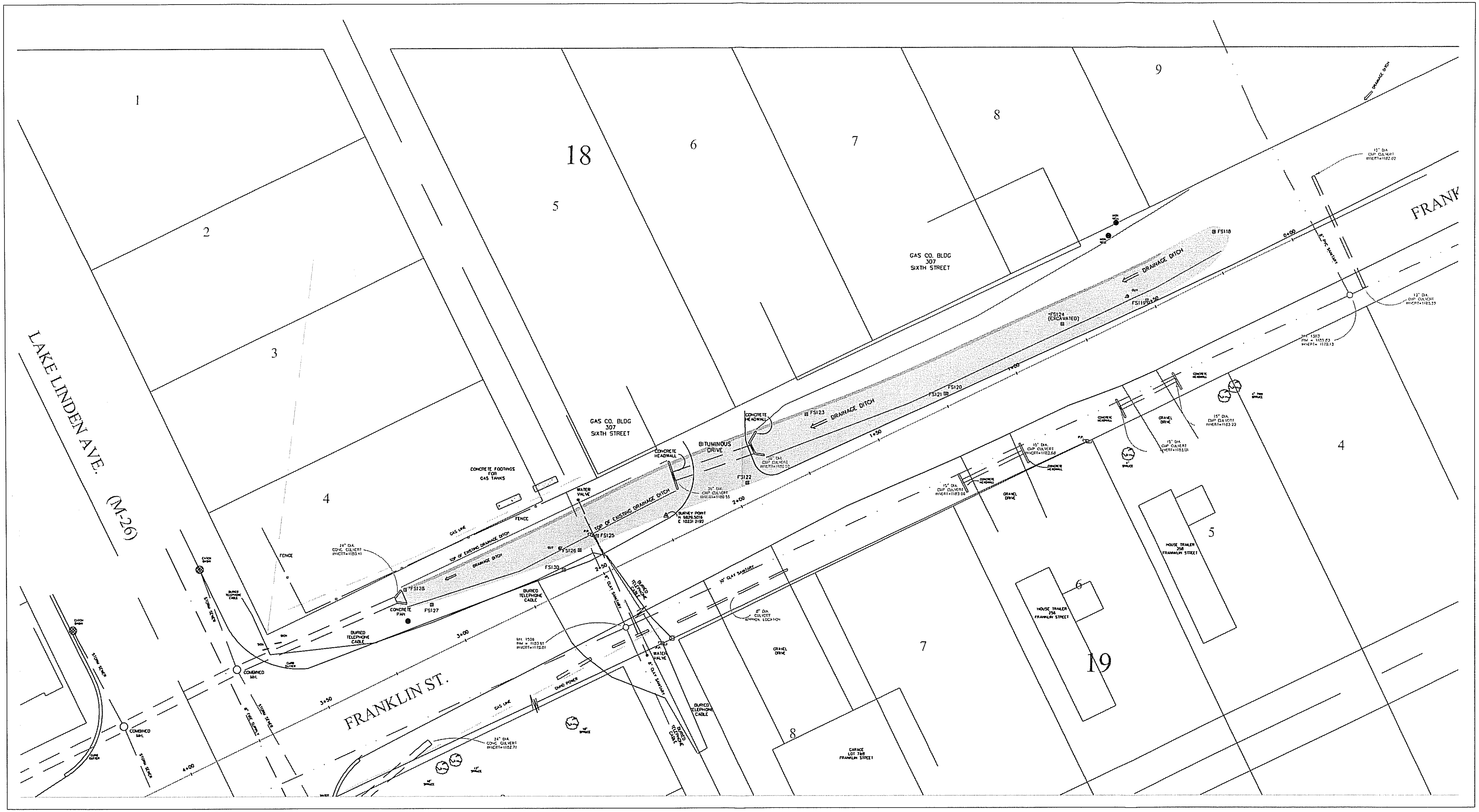
2501 Jolly Rd
Okemos, Michigan
48864

DRAINAGE SYSTEM

U.S. EPA Florida Gas Plant Site
Florida Location, Michigan



LEGEND

AREA OF OBSERVED GROSS CONTAMINATION

AREA OF EXCAVATION

⊠ FS123 HISTORIC EXCAVATION SOIL SAMPLE LOCATION

N

SCALE IN FEET

0 30

Adapted from Coleman Engineering Company drawing 99001 ab-02

FIGURE 2-4

File Path and Name:HMI\USEPA Florida Gas\SAReport\Figures\historic excav.dwg	Designed by: Coleman Eng.	Drawn By: Coleman/JBC	Checked by: DMC	Approved by: DMC

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Suite 100
2501 Jolly Rd
Okemos, Michigan
48864

HISTORIC EXCAVATION EXTENTS ADJACENT TO PLANT SITE

U.S. EPA Florida Gas Plant Site
Florida Location, Michigan

LEGEND:

- Monitoring Well Location
- Sediment Location
- Soil Sample Location
- Soil Boring Locations
- Roadway
- Approximate Site Boundary

NOTES:

Base Map Source:
www.MapMart.com
geoORTHO Aerial Photography
1998

N

0 100 Feet

U.S. EPA Florida Gas Plant Site
Florida Location, Michigan

Weston Solutions, Inc.
2501 Jolly Road, Suite 100
Okemos, Michigan 48864-3515
http://www.westonsolutions.com

Site Assessment Sampling Locations

WORK ORDER No.: 12634.001.001.0601.00	PROJECT MANAGER: DMC		
DRAWN BY: NJK	CHECKED BY: JBC		
DRAWING NAME:	DIRECTORY/ FOLDER: D:\Florida_Gas_GIS\apr\florida_gas_2006_06_07.apr		
CONTRACT No.:	DELIVERY ORDER No.:		
SCALE:	REPORT DATE:		
DATE: June 2006	REVISION No.:	FIGURE No.: 3-1	

LEGEND:

- Soil Borings Without Sheen or Discoloration (Not Lab Sampled)
- Soil Borings With Sheen or Discoloration (Not Lab Sampled)
- Soil Borings With Sheen but Sample Below RDCC
- Sediment/Soil Sample Exceeds RDCC
- Roadway
- Approximate Site Boundary

NOTES:

Base Map Source:
www.MapMart.com
geoORTHO Aerial Photography
1998

N

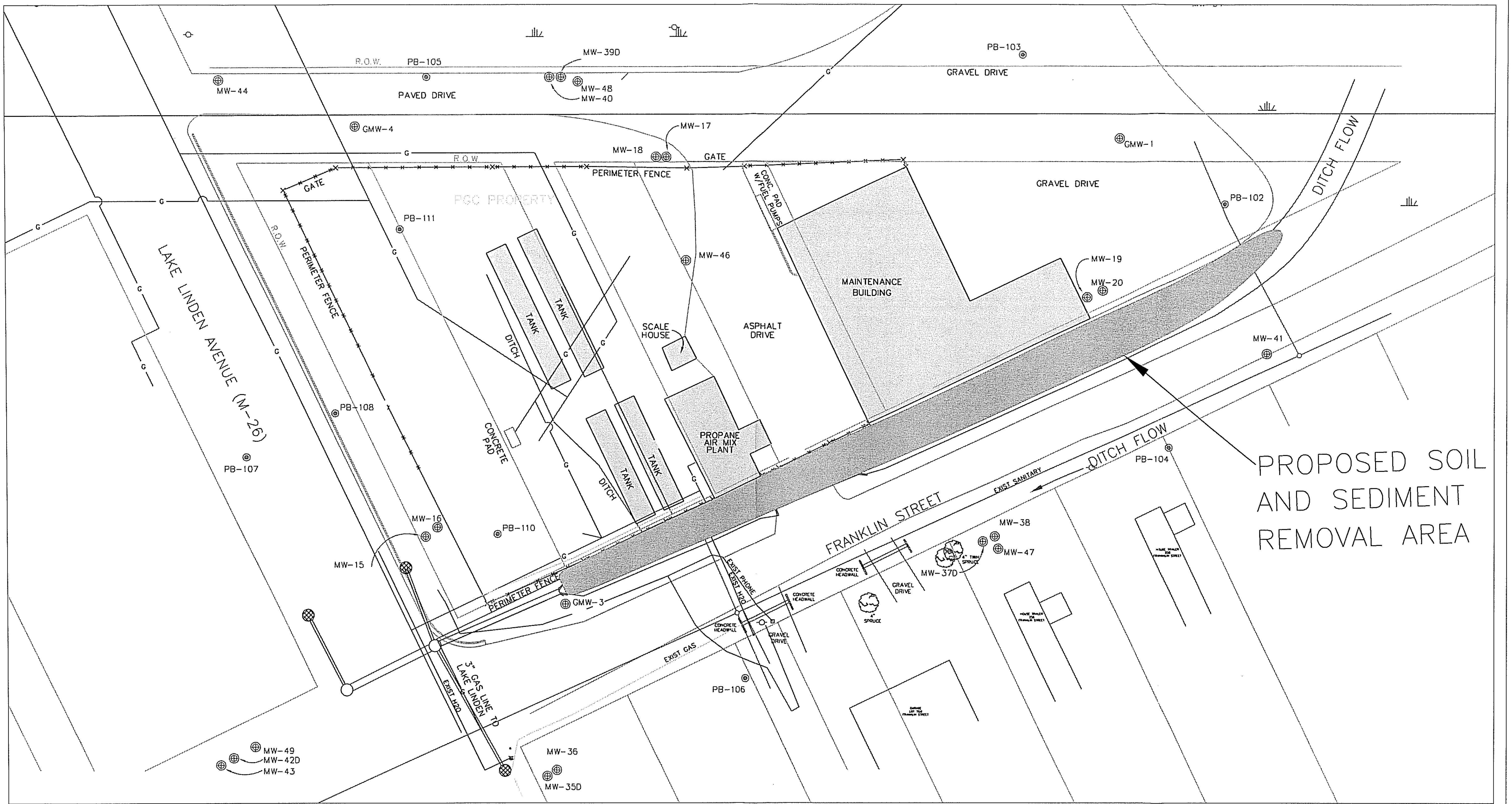
0 100 Feet

U.S. EPA Florida Gas Plant Site
Florida Location, Michigan

Weston Solutions, Inc.
2501 Jolly Road, Suite 100
Okemos, Michigan 48864-3515
http://www.westonsolutions.com

Contaminant Concentrations in Sediment and Soil in Excess of RDCC

WORK ORDER No.: 12634.001.001.0601.00		PROJECT MANAGER: DMC	
DRAWN BY: NJK		CHECKED BY: JBC	
DRAWING NAME:		DIRECTORY/ FOLDER: D:\Florida_Gas_GIS\apr\florida_gas_2006_06_07.apr	
CONTRACT No.:		DELIVERY ORDER No.:	
SCALE:		REPORT DATE:	
DATE: June 2006		REVISION No.:	FIGURE No.: 4-1



LEGEND

- PB-109 HISTORIC BORING LOCATION
- MW-39D MONITORING WELL LOCATION
- RIGHT OF WAY
- PROPOSED SOIL AND SEDIMENT REMOVAL AREA

N

SCALE IN FEET

0 40

Adapted from Coleman Engineering Company drawing 99001-F6-02A.dwg

File Path and Name: HMI\USEPA Florida Gas\SAReport\Figures\site features.dwg | Designed by: Coleman Eng. | Drawn By: Coleman | Checked by: DMC | Approved by: DMC

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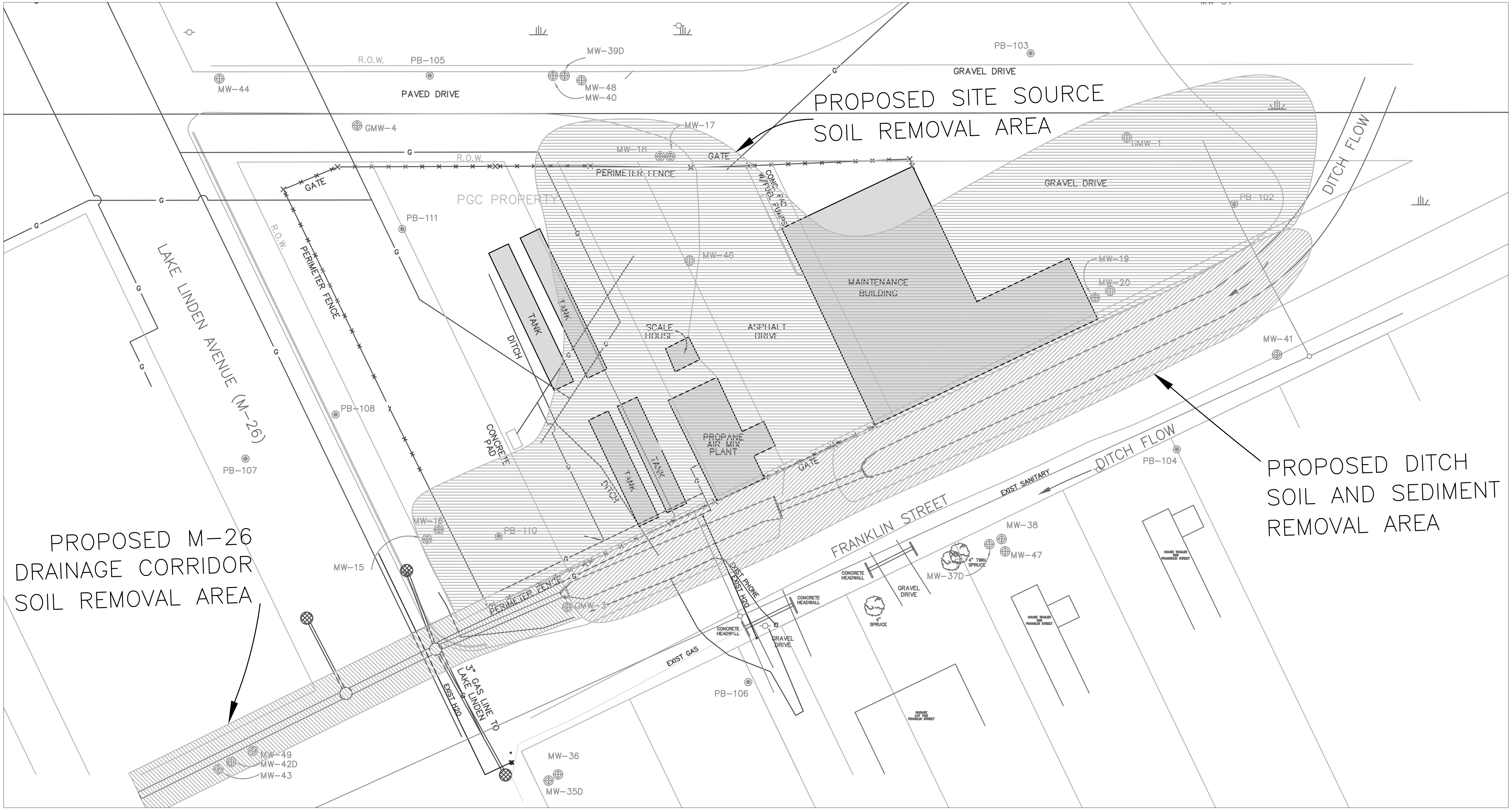
48864

FIGURE 6-1

PROPOSED LIMITS OF SOIL REMOVAL

U.S. EPA Florida Gas Plant Site
Florida Location, Michigan



LEGEND

- PB-109 HISTORIC BORING LOCATION
- MW-39D MONITORING WELL LOCATION
- RIGHT OF WAY
- PROPOSED SOIL AND SEDIMENT REMOVAL AREAS

N

SCALE IN FEET
0 40

Adapted from Coleman Engineering Company drawing 99001-F6-02A.dwg

FIGURE 6-2

File Path and Name:HMI\USEPA Florida Gas\SAReport\Figures\Fig 6-3.dwg	Designed by: Coleman Eng.	Drawn By: Coleman/JBC	Checked by: DMC	Approved by: DMC

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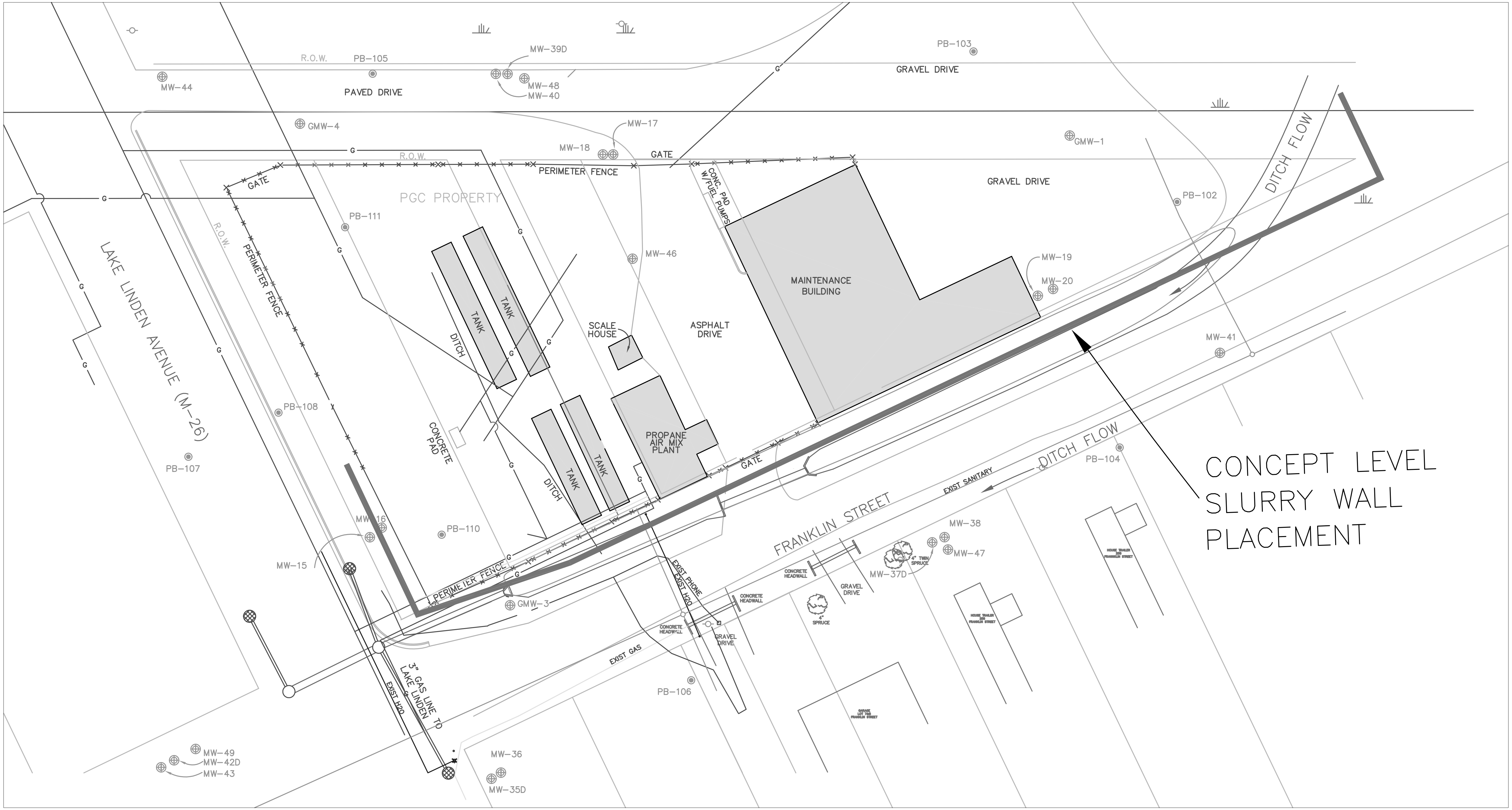
PROPOSED LIMITS OF SOURCE AREA SOIL REMOVAL

U.S. EPA Florida Gas Plant Site
Florida Location, Michigan



LEGEND

PB-109	HISTORIC BORING LOCATION
MW-39D	MONITORING WELL LOCATION
——	RIGHT OF WAY
	CONCEPT LEVEL SLURRY WALL LOCATION

N

SCALE IN FEET

0 40

Adapted from Coleman Engineering Company drawing 99001-F6-02A.dwg

FIGURE 6-3

File Path and Name:HMI\USEPA Florida Gas\SAReport\Figures\Fig 6-4.dwg | Designed by: Coleman Eng. | Drawn By: Coleman/JBC | Checked by: DMC | Approved by: DMC

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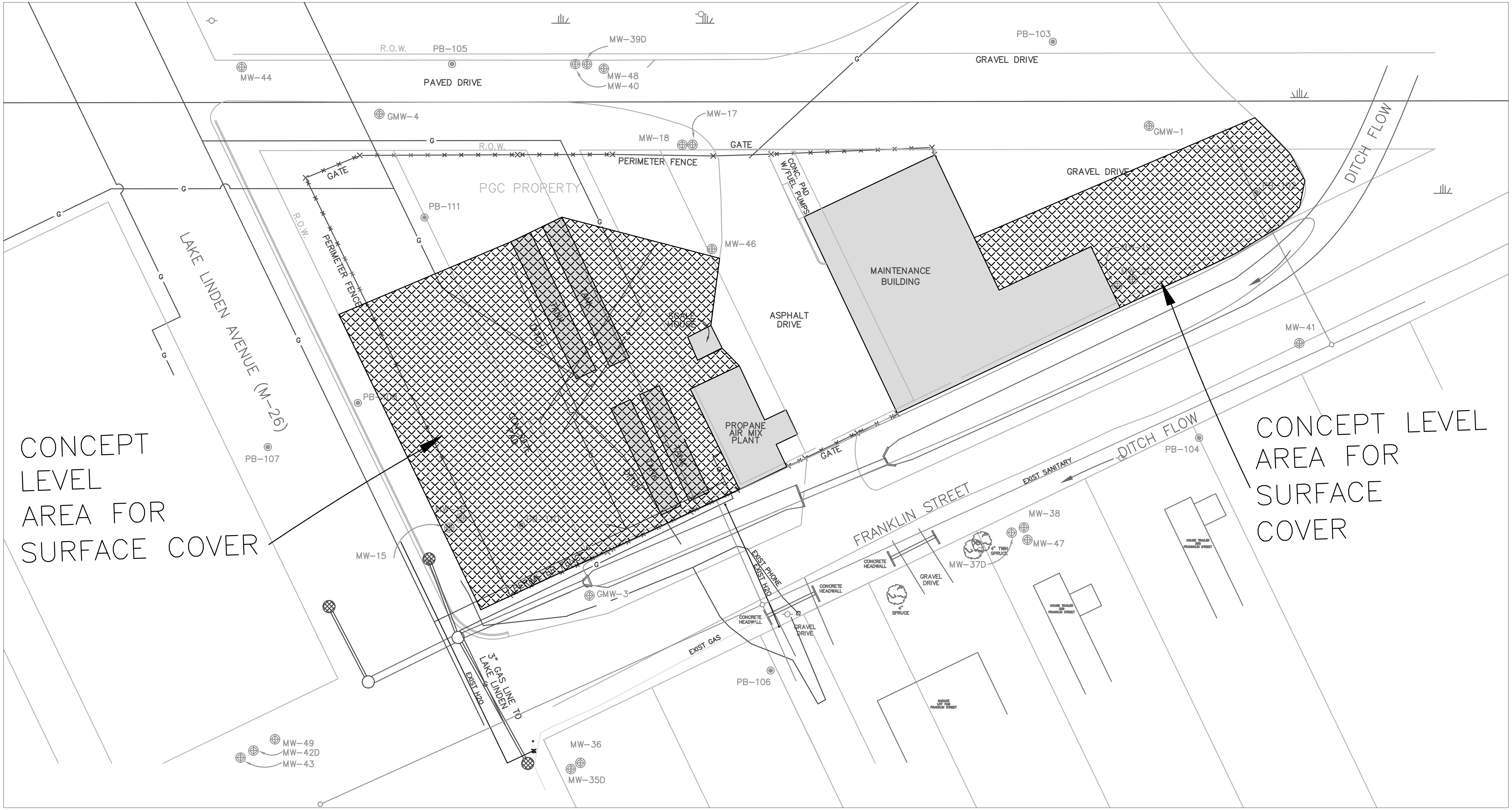
CONCEPT LEVEL SLURRY WALL PLACEMENT

U.S. EPA Florida Gas Plant Site
Florida Location, Michigan



LEGEND

- PB-109 HISTORIC BORING LOCATION
- MW-39D MONITORING WELL LOCATION
- RIGHT OF WAY
- PROPOSED AREA OF COVER

N

SCALE IN FEET

0 40

Adapted from Coleman Engineering Company drawing 99001-F6-02A.dwg

FIGURE 6-4

File Path and Name:HMI\USEPA Florida Gas\SAReport\Figures\seeding.dwg	Designed by: Coleman Eng.	Drawn By: Coleman	Checked by: DMC	Approved by: DMC

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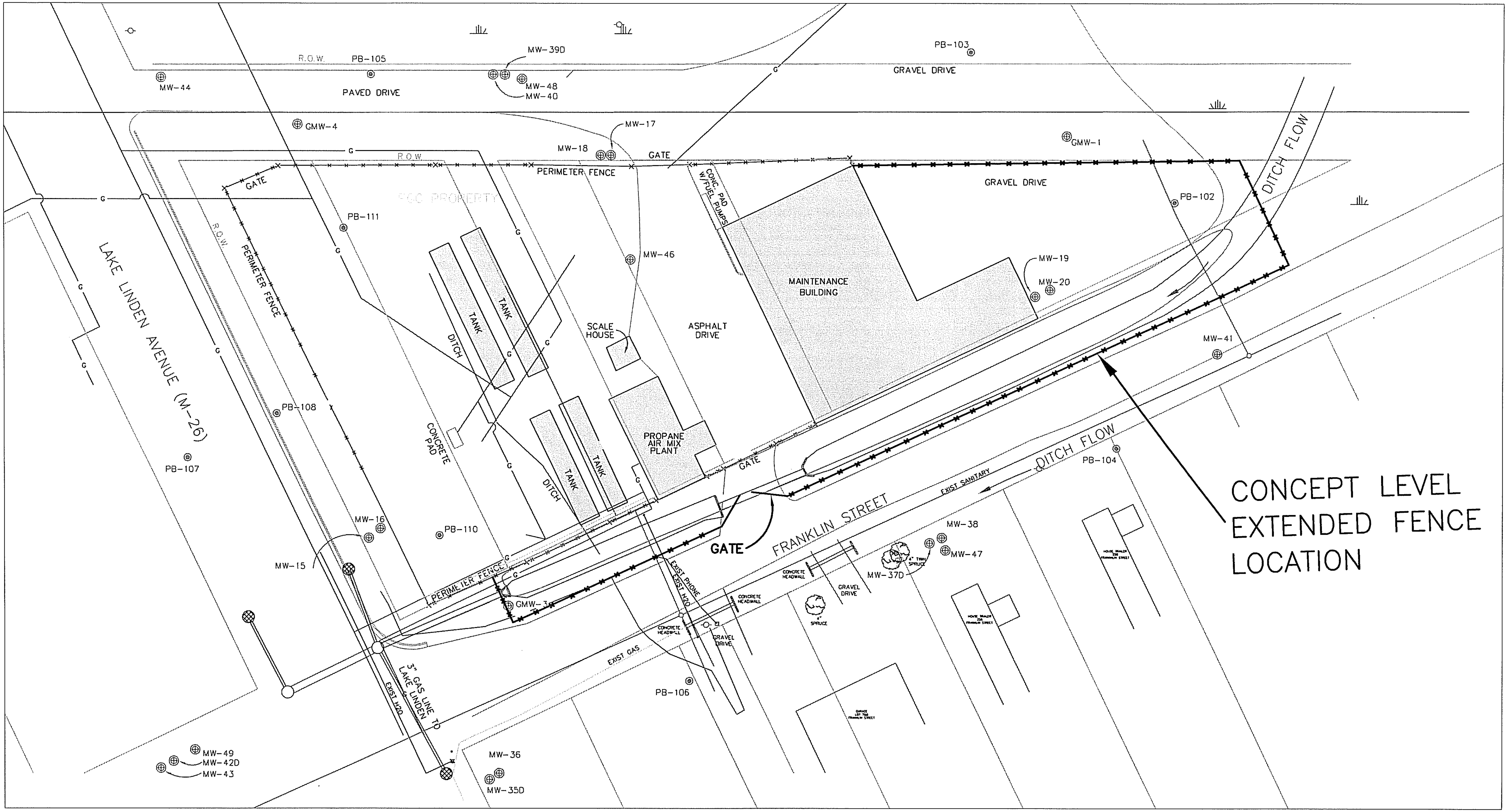
48864

CONCEPT LEVEL AREA OF COVER

U.S. EPA Florida Gas Plant Site
Florida Location, Michigan



LEGEND

PB-109 HISTORIC BORING LOCATION

MW-39D MONITORING WELL LOCATION

RIGHT OF WAY

CONCEPT LEVEL EXTENDED FENCE LOCATION

N

SCALE IN FEET

0 40

Adapted from Coleman Engineering Company drawing 99001-F6-02A.dwg

FIGURE 6-5

File Path and Name:HMI\USEPA Florida Gas\SAReport\Figures\Fig 6-5.dwg	Designed by: Coleman Eng.	Drawn By: Coleman/JBC	Checked by: DMC	Approved by: DMC

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CONCEPT LEVEL EXTENDED FENCE LOCATION

U.S. EPA Florida Gas Plant Site
Florida Location, Michigan

APPENDIX A

Photograph 1: 5/17/06 Looking northeasterly at the ditch east of the paved plant site entrance from Franklin Street. Photo by J. Chrestensen

Photograph 2: 5/17/06 Looking westerly at Franklin Street, the ditch, and southwest corner of the plant site. Note the above ground gas storage tanks. Photo by J. Chrestensen

Photograph 3: 5/17/06 Looking westerly at the ditch west of the paved plant site entrance from Franklin Street. Note flowing water in the ditch. Photo by J. Chrestensen

Photograph 4: 5/17/06 Looking northerly along Lake Linden Avenue (M-26) from Franklin Street. The west end of the plant site fence is along the right side of the picture. Photo by J. Chrestensen

Photograph 5: 5/17/06 Looking southerly along Lake Linden Avenue (M-26) from Franklin Street. Note the residences proximal to the site. Photo by J. Chrestensen

Photograph 6: 5/17/06 Looking easterly along Franklin Street from the west side of Lake Linden Avenue (M-26). Photo by J. Chrestensen

Photograph 7: 5/17/06 Looking westerly along Franklin Street from the west side of Lake Linden Avenue (M-26). Note the ditch is again accessible to residents after crossing Lake Linden Avenue. Photo by J. Chrestensen

Photograph 8: 5/17/06 Looking northeasterly at the plant site from the intersection of Franklin Street and Lake Linden Avenue (M-26). Note the active above ground gas storage tanks and associated piping. Photo by J. Chrestensen

Photograph 9: 5/17/06 15:05 Soil cores from WGP-01. Shallower soils are at the top left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 10: 5/17/06 15:30 Soil cores at bottom of photograph from WGP-02. Shallower soils are at the top left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 11: 5/17/06 15:50 Soil cores at bottom of photograph from WGP-03. Shallower soils are at the top left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 12: 5/17/06 16:30 Sheen on groundwater in test hole approximately 10 feet west of WSS-01. Ditch stream flow approximately one foot south (left) of the test hole. Photo by J. Chrestensen

Photograph 13: 5/17/06 16:30 Looking southerly at ditch and Franklin Street from test hole approximately 10 feet west of WSS-01 location. Sheen is evident on water in the hole. Ditch stream flow approximately one foot south of the test hole. Photo by J. Chrestensen

Photograph 14: 5/17/06 Looking northerly at the ditch and base for the southwestern above ground gas storage tank from Franklin Street. Note the discolored surface around the tank base, ponded water, and erosion channels toward the ditch. The base of the shovel is near the test hole in photographs 12 and 13. Photo by J. Chrestensen

Photograph 15: 5/17/06 16:50 Soil cores from WGP-04. Shallower soils are at the top left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 16: 5/17/06 17:00 Vial collected by MDEQ from GMW-3 on 10/12/05. Black substance settled out of the liquid upon sitting. Photo by J. Chrestensen

Photograph 17: 5/17/06 17:05 Vial collected by MDEQ from MW-46 on 10/12/05. Black substance on the inside surface of the vial did not move upon shaking, but there was liquid movement in the center of the vial. Photo by J. Chrestensen

Photograph 18: 5/17/06 18:10 Soil cores from WGP-05. Shallower soils are at the top left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 19: 5/17/06 18:10 Soil cores from WGP-06. Shallower soils are at the top left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 20: 5/17/06 18:10 Soil cores from WGP-07. Shallower soils are at the top left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 21: 5/17/06 18:10 Soil cores at bottom of photograph from WGP-08. Shallower soils are at the top left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 22: 5/17/06 18:20 Soil cores from WGP-09. Shallower soils are at the top left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 23: 5/17/06 18:30 Detail of 6 to 7.5 foot interval in soil core from WGP-10. Note the sheen from 6.5 to 7 feet. Photo by J. Chrestensen

Photograph 24: 5/17/06 18:35 Soil cores at bottom of photograph from WGP-10. Shallower soils are at the top left, the bottom of the boring is at the bottom right. Note the sheen from 6.5 to 7 feet as detailed in Photograph 23. Photo by J. Chrestensen

Photograph 25: 5/17/06 18:50 Soil cores from WGP-11. Shallower soils are at the top left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 26: 5/17/06 18:50 Soil cores at bottom of photograph from WGP-12. Shallower soils are at the top left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 27: 5/18/06 08:30 Soil cores from WGP-14. Shallower soils are at the top left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 28: 5/18/06 09:05 Soil cores at bottom of photograph from WGP-15. Shallower soils are at the top left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 29: 5/18/06 09:10 Detail of 6.5 to 7.5 foot interval from WGP-16. Note the dark brown free product at approximately 7 feet. Photo by J. Chrestensen

Photograph 30: 5/18/06 09:12 Detail of 6.5 to 7.5 foot interval from WGP-16. Note the sheen in the interval where dark brown free product was observed in Photograph 29 above. Photo by J. Chrestensen

Photograph 31: 5/18/06 09:30 Soil cores at bottom of photograph from WGP-16. Shallower soils are on the left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 32: 5/18/06 09:30 Soil cores at bottom of photograph from WGP-17. Shallower soils are on the left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 33: 5/18/06 10:10 Soil cores from WGP-18. Shallower soils are on the left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 34: 5/18/06 10:10 Soil cores from WGP-19. Shallower soils are on the left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 35: 5/18/06 10:10 Soil cores from WGP-20. Shallower soils are on the left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 36: 5/18/06 10:40 Detail of 6 to 7 foot interval in soil core from WGP-21. Note the visible free product. Photo by J. Chrestensen

Photograph 37: 5/18/06 10:50 Detail of 6 to 8 foot interval in soil core from WGP-16 after collecting a laboratory sample. Photo by J. Chrestensen

Photograph 38: 5/18/06 14:00 Looking southwesterly at sampling set-up at GMW-3. Photo by J. Chrestensen

Photograph 39: 5/18/06 15:04 Soil cores at bottom of photograph from WGP-21. Shallower soils are on the left, the bottom of the boring is at the bottom right. Photo by J. Chrestensen

Photograph 40: 5/18/06 15:04 Soil core at bottom of photograph from WGP-22. Shallower soils are on the left, the bottom of the boring is on the right. Photo by J. Chrestensen

Photograph 41: 5/18/06 Looking northerly from the paved entrance from Franklin Street showing site conditions upon demobilization. Photo by J. Chrestensen

Photograph 42: 5/18/06 Looking southerly toward the paved entrance from Franklin Street showing site conditions upon demobilization. Photo by J. Chrestensen

Photograph 43: 5/18/06 Looking easterly along the ditch from the paved entrance from Franklin Street showing site conditions upon demobilization. Photo by J. Chrestensen

Photograph 44: 5/18/06 Looking westerly along the ditch from the paved entrance from Franklin Street showing site conditions upon demobilization. Photo by J. Chrestensen

Photograph 45: 5/18/06 Labeled drums upon demobilization. Photo by J. Chrestensen

Photograph 46: 5/19/06 Previous location of drums after moving them inside the site fence. Photo by J. Chrestensen

Photograph 47: 5/19/06 Location of drums after moving them inside the site fence. Photo by J. Chrestensen

APPENDIX B

LOG OF BORING WGP-01

WESTON SOLUTIONS — Restoring Resource Efficiency

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/17/2006	Logged By	: J. Chrestensen
Date Completed	: 5/17/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Rec-overy	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0–0.75	1	75			Topsoil		
0.75–1.5				SW	SAND, fine to medium grained, trace coarse grained sand, little silt, red-brown, moist		
1.5–3				ML	SILT, organics (topsoil)- trace roots, dark brown and black, moist		▼ (3)
3–5	2	95		SP	SAND, fine to medium grained, little silt, red-brown, wet	PID 3.5' to 4' 0.3 ppm PID 4.5' to 5' 1.6 ppm	
5–6				CL	SANDY CLAY, red-brown, moist		
6–9.25				SC	CLAYEY SAND, some silt, red-brown, wet		
9.25–10	3	80		SC	CLAYEY SAND, fine grained , little silt, trace coarse grained sand, gray, moist		
10–12				SW	SAND, fine grained, trace to little clay, little silt, trace fine gravel, red-brown, moist	PID 10'-11' 0.1 ppm	

End of boring at 12 ft bgs.

LOG OF BORING WGP-02

WESTON SOLUTIONS — Restoring Resource Efficiency

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/17/2006	Logged By	: J. Chrestensen
Date Completed	: 5/17/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Recovery	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0–0.5	1 (0–4)	80			Topsoil		
0.5–3				SM	SILTY SAND, fine to medium grained, little clay, dark brown, moist		▼ (3)
3–5	2 (4–8)	95		SW	SAND, fine to medium grained, trace silt, little coarse sand, brown, wet	PID 3.5' to 4' 0.3 ppm PID 4' to 5' 0.6 ppm	
5–6				ML	SILT, some very fine sand, brown, moist		
6–8				SC	CLAYEY SAND, fine to medium grained, brown, moist		

End of boring at 8 ft bgs.

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LOG OF BORING WGP-03

WESTON SOLUTIONS — Restoring Resource Efficiency

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/17/2006	Logged By	: J. Chrestensen
Date Completed	: 5/17/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Recovery	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0–3.5	1 (0–4)	50			Clayey topsoil, dark brown, moist		
3.5–6.7	2 (4–8)	60		SW	SAND, fine to medium grained, some coarse sand, trace silt, red-brown, wet	Sheen at interface PID 3' to 4' 7.8 ppm PID 5' to 6' 1.7 ppm	▼ (3.5)
6.7–9				CL	CLAY, little fine sand, little silt, red-brown, moist to wet	PID 7.5' to 8' 0.3 ppm	
9–10	3 (8–12)	80		SP	SAND, fine to medium grained, trace silt, brown, wet	8' to 12' core liner shattered, recovered in pieces	
10–11				ML	SILT, little fine sand, little coarse sand, gray, stiff, moist		
11–12				SP	SAND, fine to medium grained, some silt, red-brown, hard, moist		

End of boring at 12 ft bgs.

Restoring Resource Efficiency

LOG OF BORING WGP-04

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/17/2006	Logged By	: J. Chrestensen
Date Completed	: 5/17/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Recovery	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0					Topsoil		▼
0.5–5	1	60		SW	SAND, fine to medium grained, trace to little silt, trace fine gravel, red-brown, wet	PID 3' to 4' 19 ppm PID 4' to 4.25' 8.9 ppm	
5–6.5	2	50		ML	SILT, trace to little coarse sand, gray, stiff, moist		

End of recoverable core

End of boring at 8 ft bgs.

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

LOG OF BORING WGP-05

WESTON SOLUTIONS — Restoring Resource Efficiency

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/17/2006	Logged By	: J. Chrestensen
Date Completed	: 5/17/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Recovery	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0					Topsoil		
0.5					SAND, fine to medium grained, trace silt, red-brown, wet		
1.5						PID 1' to 2' 4.3 ppm	
2	1	70		SP			
3.5						PID 3' to 4' 4.9 ppm	
5				ML	SILT, little coarse sand, gray, stiff, moist		
5.5					End of recoverable core		
6	2	20					
8.5					End of boring at 8 ft bgs.		

LOG OF BORING WGP-07

WESTON SOLUTIONS — Restoring Resource Efficiency

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/17/2006	Logged By	: J. Chrestensen
Date Completed	: 5/17/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Recovery	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0–2				SM	SILTY SAND, fine to medium grained, dark brown, moist		
2–5.5	1	50		SP	SAND, fine to medium grained, trace silt, red-brown, wet	PID 3.5' to 4' 0.1 ppm	
5.5–7.5	2	75		SC	CLAYEY SAND, fine to medium grained, brown, wet	PID 6.5' to 7' 0.9 ppm	

End of boring at 7.5 ft bgs

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WESTON SOLUTIONS
Restoring Resource Efficiency

LOG OF BORING WGP-08

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/17/2006	Logged By	: J. Chrestensen
Date Completed	: 5/17/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Recovery	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0	1	65		SM	SILTY SAND, some clay, dark brown-black, moist		
3.5	2	40		ML	SILT, some clay, olive, moist		
4				SP	SAND, fine to medium grained, some silt, dark brown and black, wet, sheen	Soil sample WGP-08 collected at 3.5 to 4.5 ft bgs	
5				SC	CLAYEY SAND, fine grained, red-brown, hard, moist	Sheen, black staining	

End of boring at 6.5 ft bgs

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

06-12-2006 z:\U.S. EPA Florida Gas\site assessment report\Boring Logs\WGP-08.BOR

WESTON SOLUTIONS
Restoring Resource Efficiency

LOG OF BORING WGP-09

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/17/2006	Logged By	: J. Chrestensen
Date Completed	: 5/17/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Recovery	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0					Topsoil		
0.5				SP	SAND, fine to medium grained, trace silt, brown, wet		
2	1	25					
5				SP	SAND, fine to medium grained, trace silt, black staining, wet	PID 5' to 6' 5.9 ppm	
5.75	2	70		SC	CLAYEY SAND, fine to medium grained, red-brown, wet		
7						PID 7' to 7.5' 0.5 ppm	
8					End of boring at 7.5 ft bgs		

06-12-2006 z:\U.S. EPA Florida Gas\site assessment report\Boring Logs\WGP-09.BOR

LOG OF BORING WGP-10

WESTON SOLUTIONS
Restoring Resource Efficiency

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/17/2006	Logged By	: J. Chrestensen
Date Completed	: 5/17/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Recovery	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0–0.5					Topsoil		
0.5–3	1	40		SP	SAND, fine to medium grained, trace silt, red-brown, wet	PID 2' to 2.5' 0.0 ppm	
3–4.5					CLAYEY SILT, some fine sand, organics, dark brown, moist	PID 3' to 3.5' 0.0 ppm PID 3.5' to 4' 0.4 ppm	
4.5–7	2	30		SP	SAND, fine to medium grained, trace silt, dark brown, wet	Sheen from 6.5-7 ft bgs Soil sample WGP-10 collected at 6.5 to 7 ft bgs PID 6.5' to 7' 0.9 ppm	
7–7.5				SC	CLAYEY SAND, fine to medium grained, some silt, red-brown, moist		

End of boring at 7.5 ft bgs

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

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LOG OF BORING WGP-11

WESTON SOLUTIONS — Restoring Resource Efficiency

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/17/2006	Logged By	: J. Chrestensen
Date Completed	: 5/17/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Rec-overy	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0–0.5				AR	Rocks		
0.5–2.5	1	75		SP	SAND, fine to medium grained, trace silt, brown, wet	PID 1' to 3' 0.5 ppm	
2.5–3				SP	SAND, fine to medium grained, trace silt, dark brown, wet		
3–6.5	2	65		SP	SAND, fine to medium grained, trace silt, brown, wet	PID 5' to 6.5' 0.8 ppm	
6.5–7.5				SC	CLAYEY SILT, red-brown, wet	PID 7' to 7.5' 0.2 ppm	

End of boring at 7.5 ft bgs

LOG OF BORING WGP-12

Restoring Resource Efficiency

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/17/2006	Logged By	: J. Chrestensen
Date Completed	: 5/17/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Recovery	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0				AR	Asphalt pieces		
0.5	1	60		SP	SAND, fine to medium grained, little silt, red-brown, wet	PID 3.5' 0.1 ppm	
4.7	2	70		SM	SILTY SAND, roots, dark brown, moist		
5.0				ML	CLAYEY SILT, fine to medium grained, olive green, moist		
5.7				CL	SILTY CLAY, roots, black, moist	PID 6' to 6.5' 0.2 ppm	
6.5				SP	SAND, fine to medium grained, little silt, red-brown, hard, moist End of boring at 7.5ft bgs		

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

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WESTON SOLUTIONS
Restoring Resource Efficiency

LOG OF BORING WGP-13

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/17/2006	Logged By	: J. Chrestensen
Date Completed	: 5/17/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Recovery	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0					Topsoil		
0–4.5	1	50		SP	SAND, fine to medium grained, trace silt, red-brown, wet		
4.5–5.5	2	80		SC	SILTY CLAY, some fine sand, dark brown, wet	PID 5' to 5.5' 0.1 ppm	
5.5–6.5				SW	SAND, fine to medium grained, little fine gravel, trace silt, red-brown, wet		
6.5–7.5				SP	SAND, fine to medium grained, little silt, hard, red-brown, wet		

End of boring at 7.5 ft bgs

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

WESTON SOLUTIONS
Restoring Resource Efficiency

LOG OF BORING WGP-14

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/18/2006	Logged By	: J. Chrestensen
Date Completed	: 5/18/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Rec-overy	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0–3.8	1	50		SP	SAND, fine to medium grained, trace silt, red-brown, wet	PID 2' to 4' 0.0 ppm	
3.8–7.2	2	80		SP	SAND, fine to medium grained, trace silt, dark brown, wet	PID 4' to 5' 0.0 ppm PID 6.5' to 7' 0.1 ppm	
7.2–8				SM	SAND, fine to medium grained, some clay, little silt, red-brown, wet		

End of boring at 8 ft bgs

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

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Restoring Resource Efficiency

LOG OF BORING WGP-15

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/18/2006	Logged By	: J. Chrestensen
Date Completed	: 5/18/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Recovery	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0–0.5					Topsoil		
0.5–5	1	55		SW	SAND, fine to medium grained, trace silt, trace fine gravel, red-brown, wet	PID 1' to 2' 0.0 ppm PID 4' to 5' 0.1 ppm	
5–7.5	2	75		SW	SAND, fine to medium grained, trace silt, trace fine gravel, dark brown, wet	PID 7' to 7.5' 0.3 ppm	
7.5–8				SW	SAND, fine to medium grained, some clay, little silt, red-brown, wet		

End of boring at 8 ft bgs

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

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WESTON SOLUTIONS
Restoring Resource Efficiency

LOG OF BORING WGP-16

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/18/2006	Logged By	: J. Chrestensen
Date Completed	: 5/18/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Recovery	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0				SP	SAND, fine to medium grained, trace silt, red-brown, wet		
2	1	60					
3						PID 3' to 4' 0.1 ppm	
6	2	90		SP-SM	SILTY SAND, medium grained, some clay, trace fine gravel, dark brown, sheen	PID 6' to 7' 12.7 ppm Soil Sample WGP-16 collected at 6' to 8' bgs	
7				SM	SILTY SAND, fine grained, red-brown, wet		
				SP	SAND, medium grained, some fine gravel, black, sheen	PID 7.5' to 8' 1 ppm	
				SC	CLAYEY SAND, medium grained, red-brown, wet		
8							

End of boring at 8 ft bgs

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WESTON SOLUTIONS
Restoring Resource Efficiency

LOG OF BORING WGP-17

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/18/2006	Logged By	: J. Chrestensen
Date Completed	: 5/18/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Rec-overy	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0–5.5	1 (0–4)	60		SP	SAND, fine to medium grained, trace silt, red-brown, wet	PID 3' to 4' 0.3 ppm	
5.5–8	2 (4–8)	95		SP	SAND, fine to medium grained, trace silt, dark brown, wet	Sheen from 7'3" to 7'10" bgs PID 7' to 8' 4.7 ppm	
8–12	3 (8–12)	40		SP	SAND, fine to medium grained, some clay, little silt, red-brown, wet	PID 10' to 11' 0.2 ppm	

End of boring at 12 ft bgs

LOG OF BORING WGP-18

Restoring Resource Efficiency

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/18/2006	Logged By	: J. Chrestensen
Date Completed	: 5/18/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Rec-overy	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0					SAND, fine to medium grained, trace silt, red-brown, wet		
2	1	50					
2–3						PID 2' to 3' 0.0 ppm	
3				SP			
6	2	90			SAND, fine to medium grained, little silt, dark brown, wet		
6.5				SP		PID 6' to 7' 3.0 ppm	
7				SC	CLAYEY SAND, medium grained, little silt, red-brown, wet		
8							

End of boring at 8 ft bgs

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

LOG OF BORING WGP-19

WESTON SOLUTIONS — Restoring Resource Efficiency

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/18/2006	Logged By	: J. Chrestensen
Date Completed	: 5/18/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Recovery	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0–4	1	50		SP	SAND, fine to medium grained, trace silt, trace fine gravel, red-brown, wet	PID 3' to 4' 0.1 ppm	
4–8	2	80					
7–7.5				SP	SAND, fine to medium graned, trace silt, trace fine gravel, red-brown, wet, sheen	PID 7' to 7.5' 0.8 ppm	
7.5–8				SC	CLAYEY SAND, medium grained, little silt, red-brown, wet	PID 8' 0.1 ppm	

End of boring at 8 ft bgs

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WESTON SOLUTIONS
Restoring Resource Efficiency

LOG OF BORING WGP-20

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/18/2006	Logged By	: J. Chrestensen
Date Completed	: 5/18/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Recovery	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0–3.7	1	60		SP	SAND, fine to medium grained, trace silt, red-brown, wet		
3.7–7.5	2	80		SP	SAND, fine to medium grained, trace silt, dark brown, wet	PID 3.5' to 4' 0.1 ppm	
7.5–8				SM	SILTY SAND, medium grained, roots, stones at 7.75', dark brown, wet	PID 7.5' to 8' 1.0 ppm	

End of boring at 8 ft bgs

WESTON SOLUTIONS
Restoring Resource Efficiency

LOG OF BORING WGP-21

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/18/2006	Logged By	: J. Chrestensen
Date Completed	: 5/18/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Rec-overy	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0–1				SW	SAND, fine to medium grained, little fine gravel, trace silt, brown, moist		
1–1.5					Topsoil, silty, roots, dark brown, moist		
1.5–2				SP	SAND, fine to medium grained, little silt, red-brown, wet		
2–5	1	70		SM	SILTY SAND, medium grained, some clay, roots, dark brown-black, moist	PID 3' to 4' 0.6 ppm	
5–6				SP	SAND, fine to medium grained, little silt, red-brown, wet		
6–8	2	80		SP	SAND, fine to medium grained, black staining, sheen, visible free product	Soil sample WGP-21 collected at 6' to 8' bgs PID 7.5' to 8.5' 10.0 ppm	

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

End of boring at 8 ft bgs

WESTON SOLUTIONS
Restoring Resource Efficiency

LOG OF BORING WGP-22

U.S. EPA
Florida Gas Site
W.O # 12634.001.001.0601.00

Date Started	: 5/18/2006	Logged By	: J. Chrestensen
Date Completed	: 5/18/2006	Checked By	: J. Chrestensen
Hole Diameter	: 2 inches	Drilled By	: MDEQ
Drilling Method	: Geoprobe	Crew Chief	: Mark Henry
Sampling Method	: Geoprobe/Discrete Sampler	Geoprobe	: Geoprobe 6600

Depth in Feet	Samples	% Recovery	GRAPHIC	USCS	DESCRIPTION	REMARKS	Water Levels
0–3	1	0		0	no recovery		
3–4	2	70		SP	SAND, fine grained, some medium grained sand, roots, brown-dark brown, wet, slight sheen	PID 3.5' to 4.5' 0.3 ppm	
4–6.5				SP	SAND, fine to medium grained, trace silt, red-brown, wet	PID 6' to 6.5' 0.3 ppm	
6.5–7				SC	SILTY CLAY, trace coarse sand, red-brown, moist		

End of boring at 7 ft bgs

APPENDIX C

APPENDIX C

Groundwater Analytical Results
U.S. EPA Florida Gas Site
Florida Location, Houghton County, Michigan

		PART 201 CRITERIA				EPA PRG*
Matrix:	Groundwater	1	2	3	4	5
Station ID:	**GMW-3**	Residential and Commercial I Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential and Commercial I Volatilization to Indoor Air Inhalation Criteria	Groundwater Contact Criteria	Direct Contact Tap Water
Laboratory Sample ID:	GMW-3					
EPA Laboratory Sample ID:	10364-011					
Top Sample Depth (ft):	2.04					
Bottom Sample Depth (ft):	6.60					
Date:	18-May-2006					
QC Status:	Field Sample					
VOC's (ug/L)						
Benzene	**84 [1,5]**	5.0 (A)	200 (X)	5,600	11,000	0.354
Ethylbenzene	**66 [2]**	74 (E)	18	110,000	170,000 (S)	1,340
Toluene	3.3 J	790 (E)	140	530,000 (S)	530,000 (S)	723
Xylenes, Total	14 J	280 (E)	35	186,000	186,000	206
1,2,4-Trimethylbenzene	**19 [2,5]**	63 (E)	17	56,000 (S)	56,000 (S)	12
1,3,5-Trimethylbenzene	2.3 J	72 (E)	45	61,000 (S)	61,000 (S)	12
SVOC's (ug/L)						
1-Methylnaphthalene	130	No Criteria Listed				No PRG Listed
2-Methylnaphthalene	<10 U	260	ID	ID	25,000 (S)	No PRG Listed
Acenaphthene	**76 J [2]**	1,300	19	4,200 (S)	4,200 (S)	365
Acenaphthylene	10	52	ID	3,900 (S)	3,900 (S)	No PRG Listed
Anthracene	<10 U	43 (S)	ID	43 (S)	43 (S)	1,825
Benzo(a)anthracene	<10 U	2.1	ID	NLV	9.4 (AA)	0.092
Benzo(a)pyrene	<10 U	5.0 (A)	ID	NLV	1.0 (M,AA)	0.009
Benzo(b)fluoranthene	<10 U	1.5 (S,AA)	ID	ID	1.5 (S,AA)	0.092
Benzo(g,h,i)perlyene	<10 U	1.0 (M)	NA	NLV	1.0 (M,AA)	No PRG Listed
Benzo(k)fluoranthene	<10 U	1.0 (M)	NA	NLV	1.0 (M,AA)	0.921
Chrysene	<10 U	1.6 (S)	ID	ID	1.6 (S,AA)	9.2
Dibenzo(a,h)anthracene	<10 U	2.0 (M)	ID	NLV	2.0 (M,AA)	0.009
Fluoranthene	<10 U	210 (S)	1.6	210 (S)	210 (S)	1460
Fluorene	**14 [2]**	880	12	2,000 (S)	2,000 (S)	243
Indeno(1,2,3-cd)pyrene	<10 U	2.0 (M)	ID	NLV	2.0 (M,AA)	0.092
Naphthalene	**240 D [2,5]**	520	13	31,000 (S)	31,000 (S)	6.2
Phenanthrene	**7.8 J [2]**	52	2.4	1,000 (S)	1,000 (S)	No PRG Listed
Pyrene	<10 U	140 (S)	ID	140 (S)	140 (S)	183
Metals (mg/L)						
Aluminum	<0.346 UJB	50 (V)	NA	NLV	64,000,000	36,499
Antimony	<0.00600 U	6.0 (A)	130 (X)	NLV	68,000	15
Arsenic	0.0100 U	10 (A)	150 (X)	NLV	4,300	0.045
Barium	0.168	2,000 (A)	(G,X)	NLV	NA	2,555
Beryllium	<0.00200 UJB	4.0 (A)	(G)	NLV	290,000	73
Cadmium	<0.00500 U	5.0 (A)	(G,X)	NLV	190,000	18
Calcium	104	No Criteria Listed				No PRG Listed
Chromium	0.00410 J	100 (A)	11	NLV	460,000	No PRG Listed
Cobalt	<0.0100 U	40	100	NLV	2,400,000	730
Copper	0.00410 J	1,000 (E)	(G)	NLV	7,400,000	1,460
Iron	3.31 J	300 (E)	NA	NLV	58,000,000	10,950
Lead	<0.0100 U	4.0 (L)	(G,X)	NLV	ID	No PRG Listed
Magnesium	18.7	4.00E+05	NA	NLV	1,000,000,000 (D)	No PRG Listed
Manganese	0.888	50 (E)	(G,X)	NLV	9,100,000	876
Mercury	<0.0020 U	2.0 (A)	0.0013	56 (S)	56 (S)	11
Nickel	0.00250 J	100 (A)	(G)	NLV	74,000,000	730
Potassium	6.64	No Criteria Listed				No PRG Listed
Selenium	0.0116	50 (A)	5	NLV	970,000	182
Silver	0.00100 J	34	0.2 (M)	NLV	1,500,000	182
Sodium	23.1	1.20E+05	NA	NLV	1,000,000,000 (D)	No PRG Listed
Thallium	<0.00200 U	2.0 (A)	3.7(X)	NLV	13,000	2.4
Vanadium	0.00510 J	4.5	12	NLV	970,000	36
Zinc	0.0299 J	2,400	(G)	NLV	110,000,000	11
Cyanide (mg/L)	0.092	200(A)	5.2	NLV	57,000	6.2

***Note: EPA PRG (Preliminary Remediation Goals) are Agency guidelines that are intended to be used for initial screening, and are not to be used as cleanup standards. Therefore PRGs have been included for comparison purposes only.**

APPENDIX C
Soil/Sediment Analytical Results
U.S. EPA Florida Gas Site
Florida Location, Houghton County, Michigan

									PART 201 CRITERIA						EPA PRG**
Matrix:	Subsurface Soil	Subsurface Soil	Subsurface Soil	Subsurface Soil	Subsurface Soil	Subsurface Soil	Sediment	Subsurface Soil	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Station ID:	**WGP-06**	**WGP-08**	**WGP-10**	**WGP-16**	**DUP-01 (WGP-16)**	**WGP-21**	**SED-01**	**WSS-01**	***Statewide Default Background Levels****	***Residential and Commercial I Drinking Water Protection Criteria***	***Groundwater Surface Water Interface Protection Criteria***	***Groundwater Contact Protection Criteria***	***Residential and Commercial I Soil Volatilization to Indoor Air Inhalation Criteria***	***Residential and Commercial I Direct Contact Criteria***	***Direct Contact Residential Soil***
Laboratory Sample ID:	WGP-06	WGP-08	WGP-10	WGP-16	DUP-01	WGP-21	SED-01	WSS-01							
EPA Laboratory Sample ID:	10364-001	10364-002	10364-003	10364-005	10364-006	10364-004	10364-007	10364-010							
Top Sample Depth (ft):	5	3.5	6.5	6	6	6	0	1							
Bottom Sample Depth (ft):	6.5	4.5	7	8	8	8	0.1	1.5							
Date:	17-May-2006	17-May-2006	17-May-2006	18-May-2006	18-May-2006	18-May-2006	18-May-2006	18-May-2006							
QC Status:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample							
VOC's ug/kg															
Benzene	**530 DJ [2]**	**1,500 D [2,7]**	NA	**260 EJ [2]**	**600 J [2]**	49 J	<16 U	**810 EJ [2,7]**	*NA*	*100*	*4000 (X)*	*220,000*	*1,600*	*180,000*	*643*
Ethylbenzene	**380 D [3]**	130	NA	**34,000 DJ [2,3]**	**67,000 J [2,3]**	**2,400 DJ [2,3]**	93	**16,000 DJ [2,3]**	*NA*	*1,500*	*360*	*140,000 C*	*87,000*	*140,000 C*	*395,000*
Toluene	160	1200 DJ	NA	**2,800 EJ [3]**	**3,200 J [3]**	130 J	<16 U	590 EJ	*NA*	*16,000*	*2,800*	*250,000 C*	*250,000 C*	*250,000 C*	*520,000*
Xylenes, Total	610 J	300	NA	**35,000 DJ [2,3]**	**70,000 J [2,3]**	**2,200 DJ [3]**	110	**21,000 DJ [2,3]**	*NA*	*5,600*	*700*	*150,000 C*	*150,000 C*	*150,000 C*	*270,631*
1,2,4-Trimethylbenzene	180	62	NA	**22,000 DJ [2,3]**	**41,000 J [2,3]**	**6,800 DJ [2,3]**	51	**64,000 DJ [2,3,7]**	*NA*	*2,100*	*570*	*110,000 C*	*110,000 C*	*110,000 C*	*51,608*
1,3,5-Trimethylbenzene	54	22	NA	**7,300 DJ [2,3]**	**13,000 J [2,3]**	**2,400 DJ [2,3]**	16 J	**25,000 DJ [2,3,7]**	*NA*	*1,800*	*1,100*	*94,000 C*	*94,000 C*	*94,000 C*	*21,253*
SVOC's ug/kg															
1-Methylnaphthalene	1,000	<390 U	1,200	25,000	89,000	53,000	<1,100 U	290,000	*No Criteria Listed*						*No PRG Listed*
2-Methylnaphthalene	**1,500 [3]**	<390 U	1,400	35,000	**130,000 [2]**	**80,000 [2]**	<1,100 U	**270,000 [2]**	*NA*	*57,000*	*ID*	*5,500,000*	*ID*	*8,100,000*	*No PRG Listed*
Acenaphthene	310 J	<390 U	1,300	**16,000 [3]**	**110,000 [3]**	**48,000 [3]**	<1,100 U	**73,000 [3]**	*NA*	*300,000*	*4,400*	*970,000*	*190,000,000*	*41,000,000*	*3,681,706*
Acenaphthylene	300 J	<390 U	330 J	3,900	**15,000 [2]**	**13,000 [2]**	1,000 J	**250,000 [2]**	*NA*	*5,900*	*ID*	*440,000*	*1,600,000*	*1,600,000*	*No PRG Listed*
Anthracene	<390 U	<390 U	<370 U	6,400	32,000	13,000	<1,100 U	**440,000 [2,4]**	*NA*	*41,000*	*ID*	*41,000*	*1,000,000,000*	*230,000,000*	*21,896,121*
Benzo(a)anthracene	220 J	540	710	**4,600 [7]**	**21,000 [6,7]**	**7,700 [7]**	**1,400 [7]**	**450,000 [6,7]**	*NA*	*NLL*	*NLL*	*NLL*	*NLV*	*20,000*	*621*
Benzo(a)pyrene	330 J	400	440	**3,600 [6,7]**	**16,000 [6,7]**	**5,500 [6,7]**	**1,400 [7]**	**360,000 [6,7]**	*NA*	*NLL*	*NLL*	*NLL*	*NLV*	*2,000*	*62*
Benzo(b)fluoranthene	270 J	400	390	**2,400 [7]**	**9,700 [7]**	**4,100 [7]**	1,100 J	**320,000 [6,7]**	*NA*	*NLL*	*NLL*	*NLL*	*ID*	*20,000*	*621*
Benzo(g,h,i)perlyene	350 J	260 J	260 J	1,800	6,900 J	2,700	840 J	210,000	*NA*	*NLL*	*NLL*	*NLL*	*NLV*	*2,500,000*	*No PRG Listed*
Benzo(k)fluoranthene	200 J	210 J	280 J	1,800	**8,100 [7]**	2,400	790 J	**160,000 [7]**	*NA*	*NLL*	*NLL*	*NLL*	*NLV*	*200,000*	*6,215*
Chrysene	210 J	300 J	510	3,900	16,000	5,700	970 J	**360,000 [7]**	*NA*	*NLL*	*NLL*	*NLL*	*ID*	*2,000,000*	*62,146*
Dibenzo(a,h)anthracene	<390 U	<390 U	<370 U	**480 [7]**	**1,700 [7]**	**750 [7]**	<1,100 U	**49,000 [6,7]**	*NA*	*NLL*	*NLL*	*NLL*	*NLV*	*2,000*	*62*
Fluoranthene	<390 U	580	510	**8,200 [3]**	**41,000 [3]**	**15,000 [3]**	1,300	**1,500,000 [2,3,4,6]**	*NA*	*730,000*	*5,500*	*730,000*	*1,000,000,000*	*46,000,000*	*2,293,610*
Fluorene	<390 U	<390 U	<370 U	**7,700 [3]**	**24,000 [3]**	**16,000 [3]**	<1,100 U	**300,000 [3]**	*NA*	*390,000*	*5,300*	*890,000*	*580,000,000*	*27,000,000*	*2,747,107*
Indeno(1,2,3-cd)pyrene	320 J	<390 U	220 J	**1,400 [7]**	**5,600 [7]**	**2,000 [7]**	780 J	**170,000 [6,7]**	*NA*	*NLL*	*NLL*	*NLL*	*NLV*	*20,000*	*621*
Naphthalene	**9,400 [3]**	460	**3200 [3]**	**54,000 [2,3]**	**690,000 [2,3,5,7]**	**110,000 [2,3,7]**	<1,100 U	**230,000 [2,3,7]**	*NA*	*35,000*	*870*	*2,100,000*	*250,000*	*16,000,000*	*55,916*
Phenanthrene	<390 U	<390 U	1,200	**27,000 [3]**	**150,000 [2,3]**	**61,000 [3]**	<1,100 U	**1,600,000 [2,3,4,6]**	*NA*	*56,000*	*5,300*	*1,100,000*	*2,800,000*	*1,600,000*	*No PRG Listed*
Pyrene	320 J	800	670	11,000	56,000	18,000	1,600	**1,800,000 [2,4]**	*NA*	*480,000*	*ID*	*480,000*	*1,000,000,000*	*29,000,000*	*2,315,951*
Metals mg/kg															
Aluminum	**3,460 J [2]**	**1,730 J [2]**	**4,260 J [2]**	**2,430 J [2]**	**1,850 J [2]**	**4,560 J [2]**	**9,010 J [1,2]**	**3,990 J [2]**	*6,900*	*1*	*NA*	*1,000,000*	*NLV*	*50,000*	*76,142*
Antimony	<5.39 UJ	<5.34 UJ	<5.04 UJ	<6.02 UJ	<0.559 UJ	<5.82 UJ	<16.3 UJ	<0.793 UJB	*NA*	*4.3*	*94*	*49,000*	*NLV*	*180*	*31*
Arsenic	**1.69 J [7]**	<5.34 UJ	**1.15 J [7]**	<6.02 UJ	1.63 J	**1.70 J [7]**	**8.76 J [1,2,6,7]**	**19.6 J [1,2,6,7]**	*5.8*	*4.6*	*70 (X)*	*2,000*	*NLV*	*7.6*	*0.390*
Barium	16.7	9.12	11.8	15.6	15.2	22.1	**98.1 [1]**	36.0	*75*	*1,300*	*(G,X)*	*1,000,000*	*NLV*	*37,000*	*5,375*
Beryllium	<0.561 UB	<0.380 UB	<0.332 UB	<0.289 UJB	0.297	<0.524 UB	<0.458 UJB	0.939 B	*NA*	*51*	*(G)*	*1,000,000*	*NLV*	*410*	*154*
Cadmium	<0.539 U	<0.543 U	<0.504 U	<0.602 U	<0.594	<0.582 U	<1.63 U	<0.809 U	*1.2*	*6*	*(G,X)*	*230,000*	*NLV*	*550*	*37*
Calcium	12,600 J	4,030 J	3,440 J	1,400 J	3,270 J	1,600 J	6,830 J	2,270 J	*No Criteria Listed*						*No PRG Listed*
Chromium	**8.86 [3]**	**3.78 J [3]**	**7.54 [3]**	**6.49 [3]**	**6.59 [3]**	**7.9 [3]**	**21.4 [3]**	**46.6 [2,3]**	*NA*	*30*	*3.3*	*140,000*	*NLV*	*2,500*	*211*
Cobalt	**3.71 [2,3]**	**1.91 [2]**	**5.62 [2,3]**	**2.71 [2,3]**	**2.1 [2,3]**	**3.23 [2,3]**	**16.7 [1,2,3]**	**7.25 [1,2,3]**	*6.8*	*0.8*	*2*	*48,000*	*NLV*	*2,600*	*903*
Copper	17.4 J	10.2 J	27.3 J	17.2 J	14.9 J	16.2 J	**416 J [1]**	**405 J [1]**	*32*	*5,800*	*(G)*	*1,000,000*	*NLV*	*20,000*	*3,129*
Iron	**7,590 J [2]**	**3,740 J [2]**	**6,420 J [2]**	**4,160 J [2]**	**3,670 J [2]**	**4,740 J [2]**	**25,200 J [1,2,7]**	**28,100 J [1,2,7]**	*12,000*	*6*	*NA*	*1,000,000*	*NLV*	*160,000*	*23,463*
Lead	<5.39 U	<5.43 U	<5.04 U	<6.02 U	1.36	3.25 J	**30.7 [1]**	**65.9 [1]**	*21*	*700*	*(G,X)*	*ID*	*NLV*	*400*	*400*
Magnesium	5,360 J	1,830 J	4,850 J	1,950 J	2,040 J	2,020 J	7,170 J	1,360 J	*NA*	*8,000*	*NA*	*1,000,000*	*NLV*	*1,000,000*	*No PRG Listed*
Manganese	**107 J [2]**	**49.1 J [2]**	**121 J [2]**	**63.3 J [2]**	**57.7 J [2]**	**73.3 J [2]**	**2,760 J [1,2,7]**	**115 J [2]**	*440*	*1*	*(G,X)*	*180,000*	*NLV*	*25,000*	*1,762*
Mercury	0.028 J	<0.057 UJ	<0.055 UJ	<0.063 UJ	<0.058 UJ	**0.064 J [3]**	**0.12 J [3]**	**1.0 J [1,3]**	*0.13*	*1.7*	*0.050 (M)*	*47*	*48*	*160*	*23*
Nickel	7.88	4.28 J	13.0	6.20	5.98	9.03	24.5	30.1	*20*	*100*	*(G)*	*1,000,000*	*NLV*	*40,000*	*1,564*
Potassium	503 J	184 J	92.9 J	209 J	247 J	96.3 J	372 J	163 J	*No Criteria Listed*						*No PRG Listed*
Selenium	0.561 J	<5.43 U	<5.04 U	0.686 J	<5.94	<5.82 U	2.55 J	1.89 J	*0.41*	*4*	*0.4*	*78,000*	*NLV*	*2,600*	*391*
Silver	<5.39 U	<5.43 U	<5.04 U	<6.02 U	<5.94	<5.82 U	0.621 J	<8.09 U	*1*	*4.5*	*0.1 (M)*	*200,000*	*NLV*	*2,500*	*391*
Sodium	<539 U	<543 U	<504 U	<602 U	<594	<582 U	559 J	<809 U	*NA*	*2,500*	*NA*	*1,000,000*	*NLV*	*1,000,000*	*No PRG Listed*
Thallium	1.67J	<5.43 UJ	1.92 J	0.987 J	1.52 J	1.13 J	**4.41 J [2,3]**	**2.72 J [2]**	*NA*	*2.3*	*4.2 (X)*	*15,000*	*NLV*	*35*	*5*
Vanadium	16.7 J	6.66 J	14.1J	10.3 J	8.89 J	12.6 J	35.7 J	40.5 J	*NA*	*72*	*190*	*1,000,000*	*NLV*	*750*	*78*
Zinc	14.1 J	7.19 JB	14.1 J	9.33 JB	7.88 J	12.6 J	**654 J [1,7]**	**162 J [1,7]**	*47*	*2,400*	*(G)*	*1,000,000*	*NLV*	*170,000*	*23*

***Note: According to Part 201, metal concentrations that do not exceed the respective statewide default concentrations [1] do not exceed any other highlighted criteria [2 through 6] as the Part 201 criteria defaults to the statewide background concentration. Highlighting of additional criteria is for comparison purposes only.**
****Note: EPA PRG (Preliminary Remediation Goals) are Agency guidelines that are intended to be used for initial screening. They are not to be used as cleanup standards. Therefore PRGs have been included for comparison purposes only.**

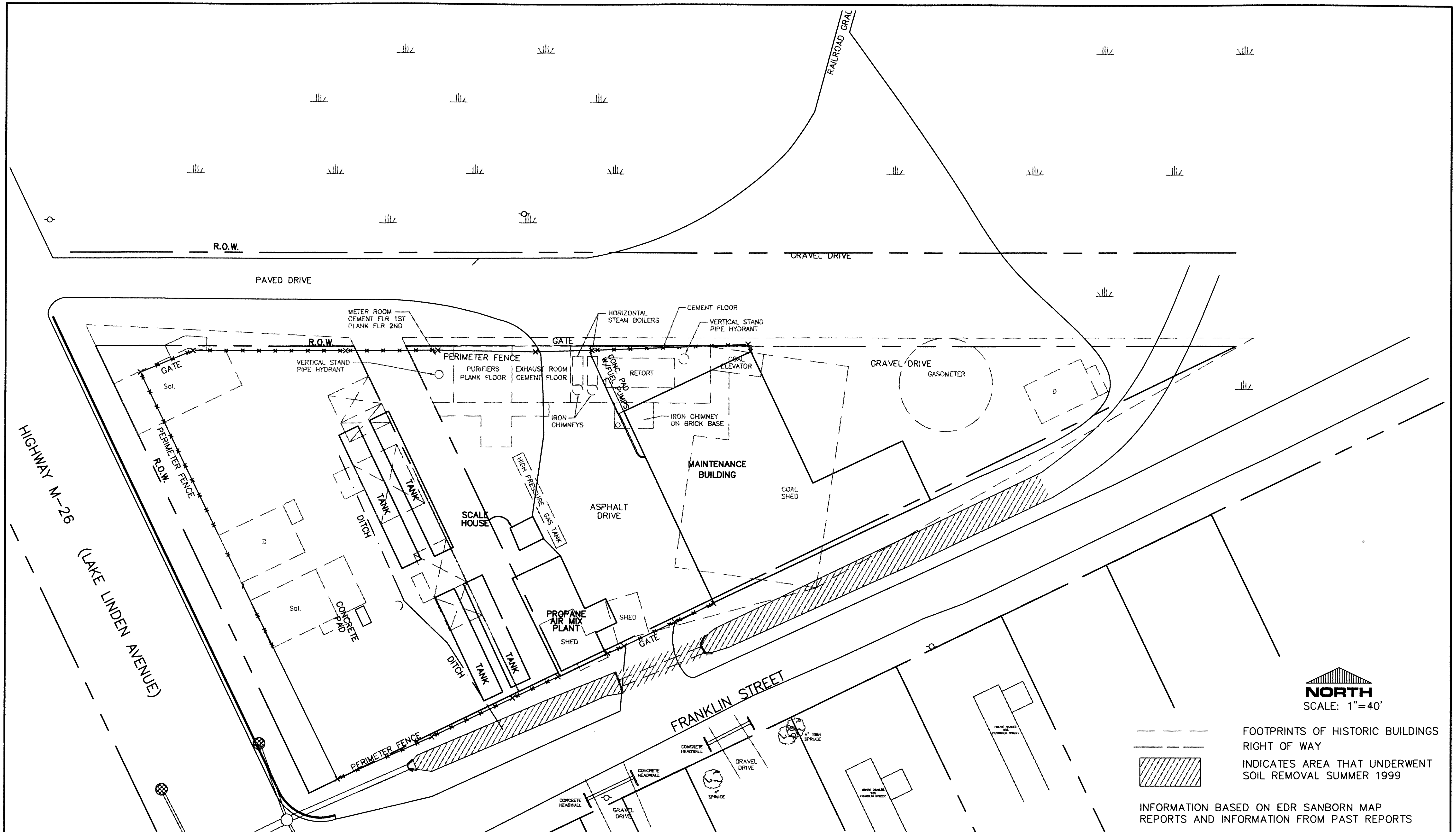
Footnotes

mg/kg =milligrams per kilogram
mg/L = milligrams per liter
ID = Insufficient data to develop criterion.
NA = Criterion is not available or not applicable.
NLL - Hazardous substance is not likely to leach.
NLV = Hazardous substance is not likely to volatilize under most conditions.
ug/L = micrograms per liter
ug/kg = micrograms per kilogram

Lab Footnotes:
B = analyte was detected in the laboratory method blank.
D = the concentration is expressed as a dilution.
J = the analyte was positively identified; the associated numerical value is an approximate concentration.
U = analyte was below the detection limit.
X = method 8270 is better suited for quantitation of naphthalene and 2-methyl naphthalene.

Part 201 Footnotes:
A = Criterion is the state of Michigan drinking water standard.
C = Value is a screening level based on the chemical-specific generic soil saturation concentration.
D = Calculated criterion exceeds 100%, hence it is reduced to 100% or 1.0E+09 ppb.
E = Criterion is the aesthetic drinking water value.
G = Groundwater surface water interface (GSI) criterion depends on the pH or water hardness, or both, of the receiving surface water.
L = Criteria for lead are derived using a biologically based model.
M = Calculated criterion is below the analytical target detection limint, therefore the criterion defaults to the target detection limit.
S = Criterion defaults to the hazardous substance-specific water solubility limit.
V = Criterion is the aesthetic drinking water value, concentrations up to 200 ug/L may be acceptable.
X = The groundwater surface water interface (GSI) criterion shown in the generic tables is not protective for surface water that is a drinking water source.
AA = Comparison to these criteria may take into account an evaluation of whether the hazardous substances are adsorbed to particulates rather than dissolved in water and whether filtered groundwater samples were used to evaluate groundwater.

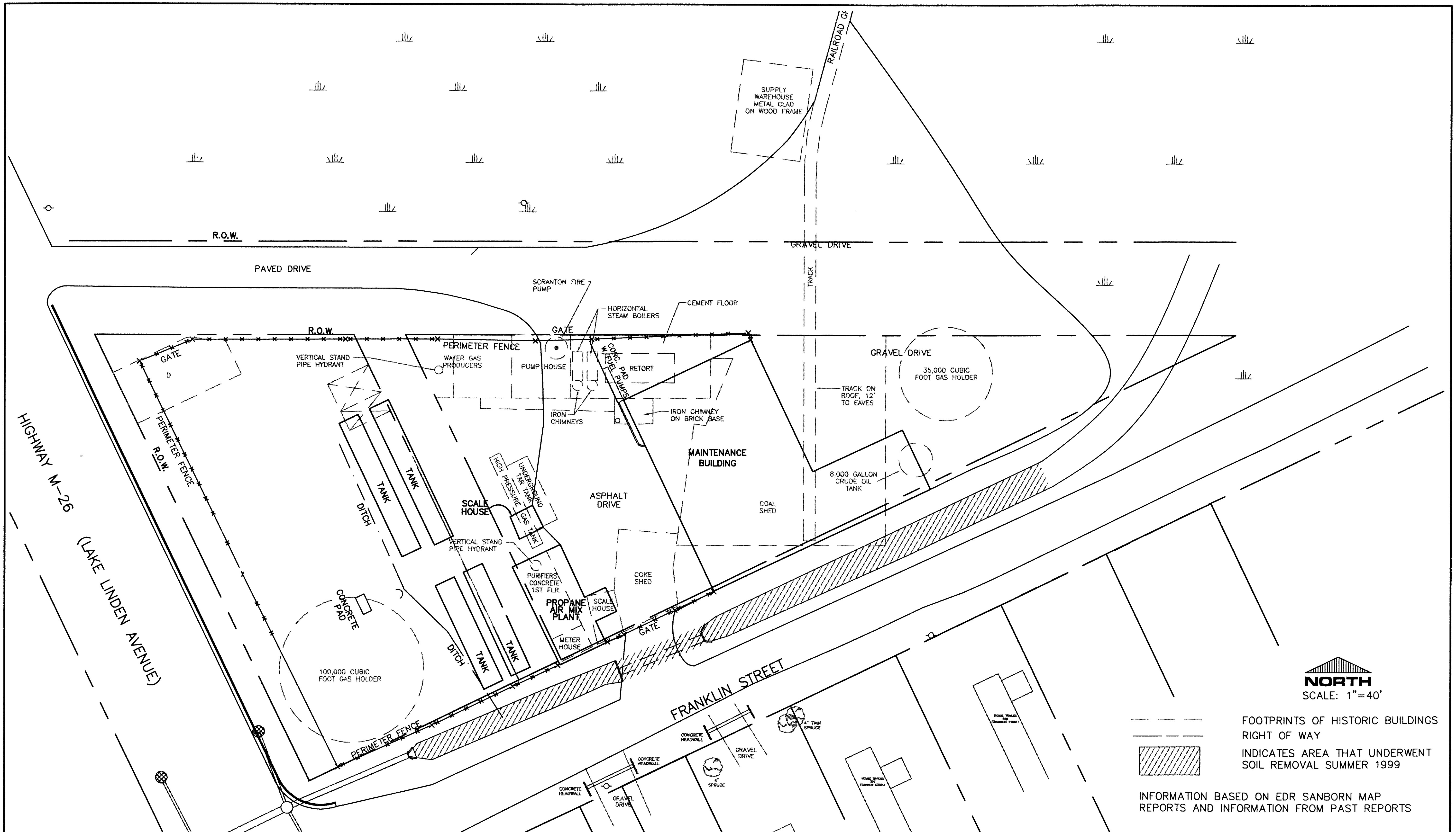
APPENDIX D



APPENDIX D-1 – SITE MAP SHOWING 1908 FEATURES
FLORIDA GAS-PLANT SITE
FLORIDA LOCATION, MICHIGAN

COLEMAN ENGINEERING COMPANY
635 CIRCLE DRIVE
IRON MOUNTAIN, MICHIGAN 49801
DATE 6/20/00
JOB NO 99001
CADD FILE 99001-F6-HISTORIC

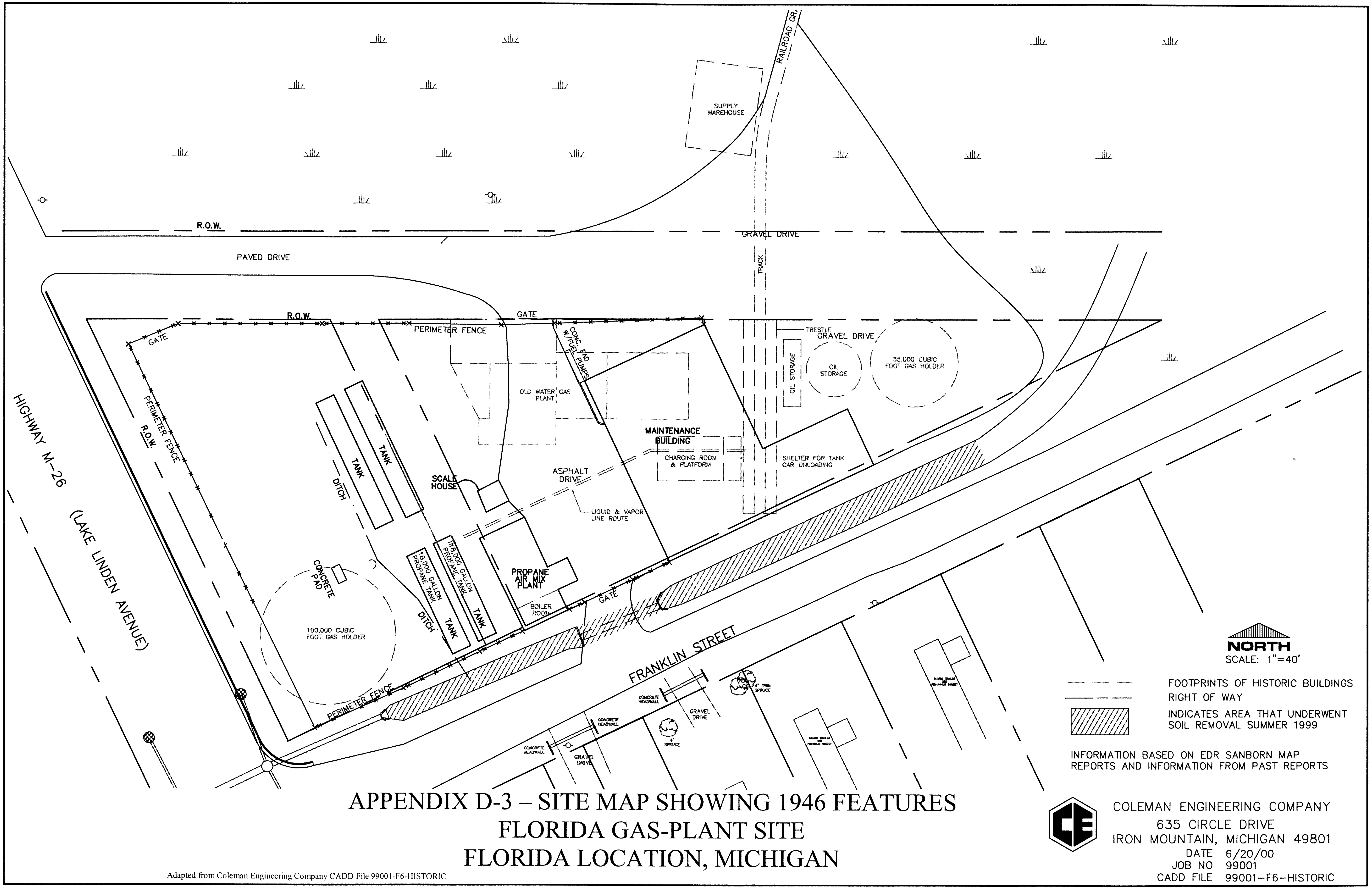
Adapted from Coleman Engineering Company CADD File 99001-F6-HISTORIC



APPENDIX D-2 – SITE MAP SHOWING 1917 FEATURES
FLORIDA GAS-PLANT SITE
FLORIDA LOCATION, MICHIGAN

Adapted from Coleman Engineering Company CADD File 99001-F6-HISTORIC

COLEMAN ENGINEERING COMPANY
635 CIRCLE DRIVE
IRON MOUNTAIN, MICHIGAN 49801
DATE 6/20/00
JOB NO 99001
CADD FILE 99001-F6-HISTORIC



APPENDIX D-3 – SITE MAP SHOWING 1946 FEATURES
FLORIDA GAS-PLANT SITE
FLORIDA LOCATION, MICHIGAN

Adapted from Coleman Engineering Company CADD File 99001-F6-HISTORIC