DRAFT Plan

Pre-Design Investigation Work Plan

Former Manufactured Gas Plant
BRRTS # 02-16-275446

Project I.D.: 18S024

Superior Water, Light & Power
Superior, Wisconsin

November 2019

Pre-Design Investigation Work Plan

Distribution

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Prepared for

Superior Water, Light & Power

Superior, Wisconsin

Prepared by

Foth Infrastructure & Environment, LLC

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List of Abbreviations, Acronyms, and Symbols

bml	below mudline
BNSF	Burlington Northern Santa Fe
BRRTS	Bureau of Remediation and Redevelopment Tracking System
BTEX	benzene, toluene, ethylbenzene, and xylene
CAD	computer aided drafting
City	City of Superior
CLM/Graymont or Graymont	Cutler Laliberte Macdougal Corp.
COC	contaminants of concern
CSM	conceptual site model
CSTP or CSTP2	combined sewer treatment plant
DGPS	digital global positioning system
ENSR	
Foth	Foth Infrastructure & Environment, LLC
GPS	global positioning system
HASP	*Health and Safety Plan*
ID	identification
IDW	investigation derived waste
IGLD	International Great Lakes Datum
ISCO	in-situ chemical oxidation
LIF	laser-induced fluorescence
mg/kg	milligrams per kilogram
MGP	Manufactured Gas Plant
MIP/HPT/EC	membrane interface probe, hydraulic profiling tool, and electrical conductivity probe
MS	matrix spike
MSD	matrix spike duplicate
NAD	North American Datum
NOAA	National Oceanographic and Atmospheric Administration
PAH	polycyclic aromatic hydrocarbons
PDI	pre-design investigation
PDI Work Plan	*Pre-Design Investigation Work Plan*
PEC	probable effect concentration
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
QA	quality assurance
QAPP	*Quality Assurance Project Plan*
QC	quality control
RAOR	*Remedial Actions Options Report*
RD	remedial design
RR	Remediation and Redevelopment
SIR	*Site Investigation Report*
Site	former SWL&P Manufactured Gas Plant

List of Abbreviations, Acronyms, and Symbols *(continued)*

SOP	Standard Operating Procedure
SPT	Standard Penetrometer Test
SWL&P	Superior Water, Light & Power
total PAH	total polycyclic aromatic hydrocarbons
USACE	U.S. Army Corps of Engineers
USDOT	U.S. Department of Transportation
VOC	volatile organic compounds
WDNR	Wisconsin Department of Natural Resources
Wis. Admin. Code	Wisconsin Administrative Code
WWTP	wastewater treatment plant

1 Introduction

Foth Infrastructure & Environment, LLC (Foth) was retained by Superior Water, Light & Power (SWL&P) to prepare a *Pre-Design Investigation Work Plan* (*PDI Work Plan*). This work is being conducted at the former SWL&P Manufactured Gas Plant (MGP), associated with Bureau of Remediation and Redevelopment Tracking System (BRRTS) #02-16-275446 (i.e., the "Site"). Site investigation and design activities, cleanup efforts, and post-remedial closure and care are regulated under Chapters NR 700-799 (collectively referred to as the "NR 700 series" or "NR 700 process") of the Wisconsin Administrative Code (Wis. Admin. Code), and administered by the Remediation and Redevelopment (RR) program of the Wisconsin Department of Natural Resources (WDNR).

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1.1 Site Location and Description

The Site is located northeast of the intersection of Winter Street and East 1st Street, on the shore of Superior Bay in Superior, Wisconsin, in Douglas County. The Site is located in the northwest quarter of Section 13, Township 49 North and Range 14 West (NW ¼ of Sec. 13, T49N, R14W). A Site location map is provided on Figure 1.

As shown on Figure 2, portions of the Site and the areas to be investigated are owned by SWL&P, the City of Superior (City), the U.S. Department of Transportation (USDOT), Cutler Laliberte Macdougal Corp. (also known as "Graymont," hereafter referred to as "CLM/Graymont"), Burlington Northern Santa Fe railroad (BNSF), the State of Wisconsin, and Lafarge Corporation.

Locations of historic Site features (along with present day features of potential significance) are shown on Figure 3. In general, the upland portion of the Site roughly centers around a 3,000 square foot brick building that was constructed in 1929 and is used by the current property owners for storage. Although this is not the original MGP building, which apparently burned down prior to 1929 and was replaced by the existing structure (ENSR, 2002), it is understood that the current building generally sits within the approximate footprint of the previous SWL&P buildings at the Site, and has been referred to as the "MGP building," "former MGP building," or simply "the building."

Gravel parking areas surround the building, and several vacant parcels of land that were used during historic Site operations are located immediately to the west, southwest, and south of the building. These vacant parcels include a grass-covered field to the west where the facility's original two gas holders were once located; a grass-covered field to the southwest where a third, and larger, gas holder was once located (south of U.S. Highway 53); and a grass-covered field directly to the south of the building where the facility's fourth and final gas holder (also known as the "Horton sphere") had once stood.

The Site also includes a portion of the boat slip used by CLM/Graymont for receipt of coal shipments to their Superior lime plant, and BNSF railroad tracks run through the Site from northwest to southeast between the former MGP building and the Superior Bay lakeshore. As shown on Figure 4, both below and above grade utilities cross the Site, including water, gas, electric, and sanitary/storm sewer; and two municipal outfalls discharge into the boat slip, including a 36- by 58-inch storm sewer outfall and a discharge pipe that extends from the adjacent combined sewer treatment plant (CSTP) (known today as "CSTP2"). In general, the Site can be characterized as highly developed/urbanized in terms of infrastructure, industrial activity, and historic anthropogenic influences.

1.2 Previous Investigations and Project Status

Environmental investigations have been ongoing since 2001, with WDNR oversight and approval, and have included multiple studies to evaluate impacted media both at, and in the immediate vicinity of, the Site. These investigations are summarized in the *Site Investigation Report* (*SIR*) (Foth, 2019) and have included collection of groundwater samples, soil samples, sediment samples, soil laser-induced fluorescence (LIF) screening of materials, monitoring well installations, slug testing, and advancement of lithologic soil borings. These previous studies have confirmed the presence of benzene, toluene, ethylbenzene, and xylene (BTEX) and polycyclic aromatic hydrocarbons (PAH)-related contaminants of concern (COCs) in soil, groundwater, and sediment associated with historical activities at the former MGP. The nature and extent of these impacts, by media, are described in Section 4 of the *SIR*. An interim remedial action was performed in 2008 to remove impacted materials located along a former 12-

inch diameter clay tile pipe extending from the location of the MGP building to the former MGP building discharge area. Additional remediation of BTEX and PAH-related COCs is anticipated in the upland (e.g., soil excavation and in-situ treatment) and in-water (e.g. dredging and capping) areas.

Further discussion of the Site history and Site conditions, including the nature and extent of contamination, is provided in the *SIR*.

As requested by the WDNR, in a letter dated December 8, 2017 (WDNR, 2017), the *SIR* served as the “final” Remedial Investigation Report for the Site. The *SIR* was approved in the WDNR’s letter dated June 26, 2019 (WDNR, 2019). While the next step in the NR 700 process is to prepare a *Remedial Actions Options Report* (*RAOR*) in accordance with NR 722.07, it was determined, with WDNR approval, that the remedial options could be better refined by filling the data gaps described in Section 3 of this *PDI Work Plan*. Upon completion of the work described in this *PDI Work Plan,* the *RAOR* for the Site will be completed.

2 PDI Objectives and Data Needs

The objective of the pre-design investigation (PDI) is to gather sufficient information to support development of the *RAOR* and inform the remedial design (RD) process. Existing data was reviewed to identify data gaps and uncertainties that influence RD and the selection of a preferred alternative. The data planned for collection during this PDI generally fills the following objectives:

A. Data to define physical characteristics of the media

1. Perform bathymetric survey to better understand the configuration of the lake bottom and banks;

2. Advance sediment cores and perform sub-bottom profiling to refine the elevation of the top of the Miller Creek Clay Formation and thickness of overlying sediment; and

3. Perform treatability tests on bulk sediment to inform dredged material stabilization, dewatering, and disposal assumptions.

B. Data to define the COC concentrations in soil and sediment

1. Collect soil around the perimeters of the potential excavation areas to refine the extent of target areas of benzene impacts;

2. Evaluate COC concentrations in the area between the head of the slip and the railroad tracks where elevated PAH concentrations were identified at one boring location, B-25;

3. Confirm LIF results previously collected off-site to the southeast and at one location on the wastewater treatment plant (WWTP) berm;

4. Collect data for waste characterization for the soil excavation and sediment dredging remedial alternative; and

5. Define the lateral extent of contamination in sediment exceeding the probable effect concentration (PEC) for total PAHs (tPAH).

C. Data to define constituent migration pathways and the fate and transport of constituents

1. Further characterize soil chemistry to inform selection of amendments for in-situ chemical oxidation;

2. Further characterize groundwater and contaminant migration and distribution vertically to inform the design of in-situ chemical oxidation injections;

3. Characterize groundwater chemistry and biological activity to inform the selection of chemicals for groundwater treatment and Monitored Natural Attenuation Assessment; and

4. Further characterize the groundwater-surface water interaction in the area near the head of the boat slip.

D. Data to define stability of existing structures and shoreline

1. Inspect the sewer and stormwater utilities;

2. Advance upland geotechnical borings and in-water geotechnical cores to evaluate stability along the shoreline (where removal of impacted sediment may be warranted) and the proposed excavation areas;

3. Advance upland and in-water geotechnical borings near the head of the boat slip to inform potential sheet pile/streel structure design; and

4. Perform inspection of the existing Graymont sheetpile wall, the WWTP berm, and the southern shoreline of the slip to evaluate current conditions.

The proposed environmental sampling locations, analytical approach, and sample purpose are further described, by media in Section 3.

3 Sampling Design and Approach

The PDI is being conducted to fill the data gaps identified in Section 2 and provide the information needed to refine the RD and remedial alternatives at the Site. Sections 3.1 through 3.4 provide additional information on the proposed PDI scope and rationale by task.

3.1 Proposed Surveying Scope and Rationale

3.1.1 Upland Survey

A global positioning system (GPS) unit will be used to locate previous LIF boring locations to advance co-located soil borings to confirm previous results. Following advancement of PDI soil borings, all soil boring locations will be surveyed and the boring locations will be added to site figures to inform the RD.

3.1.2 Utility Locate

To protect the safety of personnel performing the investigation work and to protect public utilities, a utility locate will be performed prior to the underground investigation work. The utility information will also be used to inform the RD.

3.1.3 Utility Inspection

The *SIR* (Foth, 2019) states it is plausible that benzene-contaminated groundwater originating from source material located upgradient in the former Horton Sphere location is migrating along the City storm sewer toward the former MGP discharge area, where intersection with the City sanitary sewer, along with comingling of additional contaminant mass in this area, results in cross-gradient dispersion along a secondary, transverse preferential pathway. Further downgradient, contaminant distribution is restricted to the vicinity of the City storm sewer, likely because it is the only preferential flow path leading into the boat slip.

A physical inspection of the storm and sanitary sewers that cross through the Site will be performed to confirm the structural integrity of these utilities, including visible leaks and cracks in the lines. The inspection will include the City storm sewer between the former Horton Sphere location and the boat slip as well as the sanitary sewer line that runs perpendicular to it near the former discharge area. This information will be used to refine the conceptual site model (CSM) presented in the *SIR* as it pertains to groundwater interaction with utilities.

3.1.4 Bathymetric Survey

Based on existing data, tPAH contamination within the boat slip sediments appears to be restricted to the silty sandy materials that have accumulated on top of the relatively impermeable Miller Creek Clay Formation. Given the poor recovery observed in previous sediment sampling efforts and the lack of high-resolution bathymetric data, there is uncertainty in the thickness of the accumulated sediment and the actual configuration of the lakebed surface (i.e., mudline) within the boat slip. The quantity of woody and/or other debris is also uncertain and will affect dredging and disposal cost estimates. The purpose of the PDI bathymetric survey is to better understand:

- The configuration and elevation of the lake bottom and banks;
- The thickness of sediment above the Miller Creek Clay Formation; and
- The presence of large debris on the lake bottom and/or banks.

To support these objectives, a combination of multi-beam bathymetry, single-beam bathymetry, and sub-bottom profiling methodology are proposed, as described in Section 4.1.4. The planned survey extent is the entire boat slip area, of approximately 5.1 acres, as shown on Figure 5.

3.2 Groundwater Sampling, Proposed Monitoring Locations and Rationale

A subset of existing site monitoring wells is proposed to be monitored as part of the PDI. The sample analyses are summarized in Table 1. The objectives of the groundwater investigation are to:

- Characterize groundwater chemistry and biological activity to inform the selection of chemicals for groundwater treatment and Monitored Natural Attenuation Assessment; and

- Further characterize the groundwater-surface water interaction in the area near the head of the boat slip.

Existing monitoring wells were selected in locations upgradient, downgradient, and within the source area, as listed in Table 2 and shown on Figure 6. The intent of the groundwater sampling program is to collect more detailed groundwater chemistry data to support a natural attenuation analysis and confirm concentrations of COCs previously detected. Additionally, pressure transducers with water quality probes will be deployed in two existing groundwater monitoring wells to provide longer-term semi-continuous data to better understand the hydraulic and water chemistry interaction between groundwater and surface water near the boat slip and WWTP pond. The monitoring wells selected for monitoring are subject to change based on a field inspection. The field inspection will involve a visual inspection and depth measurement of each of the monitoring wells. Once located, the wells will be inspected for visible damage including missing caps, broken surface seals, frost heave, bent protective casing and any other indicators. A water level meter will then be used to measure the total depth of the well and the depth to the static water level. These measurements will be compared with any historical observations available to make sure they have not changed significantly. Significant changes in water level or total depth may indicate damage to the well screen. If the foreign matter (i.e., leaves, insects) is observed in the water in the monitoring well or if flooding has occurred in the protective casing this may indicate that the well has been contaminated. Foth may substitute another well in the sampling program if wells are found to be damaged, missing, or otherwise unusable.

3.3 Proposed Soil Sampling Locations and Rationale

Soil boring locations have been proposed to meet four main data objectives, as defined in Section 2:

- Refine the extent of target areas of benzene impacts in potential excavation areas;
- Evaluate soil COC concentrations in the area between the head of the slip and the railroad tracks;
- Confirm LIF results previously collected off-site; and
- Collect geotechnical information to inform potential sheetpile/streel structure and remedial excavation design.

The following subsections will describe the approach to soil characterization and the rationale for sample location selection, which is also summarized in Table 2. Proposed soil boring and sample locations are shown on Figure 6. The final locations and number of borings may change based on field conditions and discussion with the Project Manager.

3.3.1 Proposed Environmental Soil Borings

Environmental soil borings include proposed excavation area soil borings, proposed head of boat slip soil borings, and proposed LIF offset soil borings. At all environmental soil boring locations soils will be logged, classified, photographed and screened with a photoionization detector (PID). Soils will also be screened in-situ at these locations using a direct-push probe equipped with a membrane interface probe, hydraulic profiling tool, and electrical conductivity probe (MIP/HPT/EC) tool to provide data about volatile organic compound (VOC) soil impacts with depth and also estimate hydraulic conductivity with depth and water table elevation. Proposed soil boring locations are shown on Figure 6 and listed in Table 2.

3.3.1.1 Proposed Excavation Area Soil Borings

Figure 6 illustrates proposed remedial excavation areas that are being considered for the *RAOR*. These areas are based on the results of soil sampling completed during previous studies. The proposed excavation area PDI borings were selected to fill data gaps to refine the remedial excavation extent laterally and vertically. Additionally, some boring locations were selected within the proposed remedial excavation areas to further characterize the chemical composition of the soils to inform the RD and waste disposal. Additional borings were added to define the extent of soil impacts in the area off-site near Boring B-31, as indicated in Table 2.

The proposed excavation areas represent the estimated extent of soils with greater than 100 parts per million (ppm) total benzene/naphthalene/benzo(a)pyrene. Additional areas beyond the excavation extent with estimated soil total benzene/naphthalene/benzo(a)pyrene concentrations of between 5 and 100 ppm will be targeted for in-situ chemical oxidation (ISCO) or air sparging. Therefore, the PDI soil boring program has been designed to identify areas with between 5 and 100 ppm soil total benzene/naphthalene/benzo(a)pyrene concentrations. All proposed excavation area borings will be advanced to a depth of approximately 20 feet. For borings outside the planned excavation extent, soil sample intervals will be selected targeting the most impacted interval, based on field screening. For borings within the planned excavation extent, the soil sample will be collected approximately 1 foot below the planned depth of the excavation at that location. Refer to Table 2 for a list of the proposed borings and the sampling rationale and analyses for each.

3.3.1.2 Proposed Head of Boat Slip Soil Borings

Soil borings will be advanced in the area between the head of the boat slip and the railroad tracks (Figure 6) where elevated PAH concentrations were identified at one boring location, B-25, to further define the horizontal extent of COCs in this area. These borings will each be advanced to approximately 20 feet. Refer to Table 2 for a list of the proposed borings and the sampling rationale and analyses for each.

3.3.1.3 Proposed LIF Offset Soil Borings

Soil borings will be advanced to approximately 15 feet at locations co-located with former LIF boring locations where previous elevated LIF responses were detected. These borings are located off-site to the southeast and at one location on the WWTP berm. One soil sample will be collected from each boring at the approximate depth of the previous elevated LIF response.

3.3.2 Proposed Upland Geotechnical Borings

A geotechnical soil boring will be advanced to a target depth of 80 feet at the head of the boat slip to evaluate stability of the soils and to inform potential sheet pile/steel structure design. Two geotechnical soil borings will be advanced to target depths of 40 feet near the proposed remedial excavation and the E. 2nd Street overpass to evaluate stability of the soils. The location and final depth of geotechnical borings may be adjusted by the Foth Field Team Leader based on field observations and conditions. Refer to Table 2 for a list of the proposed borings and the sampling rationale and analyses for each.

3.4 Proposed Sediment Sampling Locations and Rationale

Figure 7 shows the proposed environmental and geotechnical sediment investigation locations relative to sediment that is anticipated to have tPAH concentrations greater than the PEC (12.2 milligrams per kilogram [mg/kg]). The impacted sediment has been labeled as “Potential Dredge Remedy” on Figure 7 and because it’s also important to evaluate side slope configurations that may result from the dredging process, the anticipated side-slope of the potential dredge remedy is also shown for reference.

A triangular grid environmental sediment sampling approach will be utilized to meet the following objectives:

- Define the lateral extent of PAH contamination (greater than 12.2 mg/kg);

- Determine the vertical extent (i.e., thickness) of PAH contamination (greater than 12.2 mg/kg);

- Refine the depth and elevation of the top of the Miller Creek Clay Formation across the in-water Project Area; and

- Better understand the physical properties of the impacted sediment/future dredged material.

The 13 proposed environmental sediment cores are shown on Figure 7, with sample coordinates and the rationale for each coring location provided in Table 3. These sediment samples will be analyzed for PAHs and physical properties, as shown in Table 1 and described in Section 4.4.4.

In addition to the environmental sediment samples, four in-water geotechnical borings will be advanced to deeper depths in order to meet the following additional objectives:

- Collect data to inform sheet pile/steel structure design; and

- Perform stability evaluation.

Geotechnical information will be collected from these borings, as described in Section 4.4. The location and final depth of sediment core locations may be adjusted by the Foth Field Team Leader based on field observations and conditions.

4 Data Collection Procedures

Foth, with the assistance of its subcontractors will conduct the field work described in Section 4. Additional information on the field work requirements is provided in the following Appendices:

- Appendix A – Subcontractor Bid Specifications
- Appendix B – Quality Assurance Project Plan
- Appendix C – Foth Standard Operating Procedures
- Appendix D – Field Forms
- Appendix E – Health and Safety Plan

4.1 Surveying and Inspections

4.1.1 Upland Survey

Following advancement of PDI soil borings, the soil boring locations will be surveyed by Foth or a contractor and added to a site map created using publicly available LiDAR data available from the City of Superior.

4.1.2 Utility Locate

Before initiating intrusive subsurface activities, Foth's drilling subcontractor will contact Wisconsin Digger's Hotline to identify and locate underground utilities. The field team will review utility maps and navigation charts for the study area to evaluate if planned activities conflict with known utilities. Foth will verify that the locate ticket remains valid from the time the utility locate/onsite meeting is conducted through the end of the field work. If utilities are identified near proposed sample locations, the locations will be modified to provide safe clearance from the identified utility.

In addition, prior to advancement of soil borings or sediment cores a private utility location contractor will be utilized to locate on-site underground and above ground utilities and create an updated utility map. This utility map will also be used in planning the RD.

4.1.3 Utility Inspection

A physical inspection of the storm and sanitary sewers that cross through the Site will be performed to confirm the structural integrity of these utilities, including visible leaks and cracks in the lines. A contractor will be utilized to perform this inspection. A report, including a site map, will be provided by the contractor following the inspection.

4.1.4 Bathymetric Survey

A bathymetric survey will be completed to fulfill the objectives stated in Section 3.1.4. The survey will be conducted across the full boat slip area, as shown on Figure 5. The primary survey method will be multi-beam sonar. The multi-beam data will measure lake bottom elevation, and also provide information about potential structures or debris within the project footprint. In addition to multi-beam data, and due to the lack of as-built drawings of the CSTP berm, side scan sonar data will be collected to aid in evaluation of existing structures and bank slopes. These bathymetric survey results will be combined with publicly available LiDAR data available from the City of Superior to prepare a complete 3-D surface of the lake bottom and banks, and will be incorporated into the computer aided drafting (CAD) base model for use in the RD process.

In addition to the multi-beam and single-beam bathymetric data, sub-bottom profiling may be conducted, if such equipment is readily available, in an attempt to identify the contact between the Miller Creek Clay Formation and the overlying sediment, which primarily consists of silts and sands. The depth to this unit from the top of sediment is anticipated to range from zero feet (in the Graymont berthing areas) to up to 24 feet in the back portion of the slip. Details of the bathymetric survey requirements are provided in the Bathymetric Services Scope and Bid Request (Appendix A).

In addition, Foth will conduct manual push-probing soundings of the lake bottom and banks within the Site boundary to understand changes in sediment composition/strength, identify buried debris, and confirm the edge of the WWTP berm armoring. Sampling procedures will follow *Standard Operating Procedure* (*SOP) -01*, *Manual Push Probing in Sediment* (Appendix C) and include probing on 5-foot centers, with 25-foot spacing between transects.

4.1.5 Shoreline Inspection

Sediments in the southern portion of the boat slip are contaminated with PAHs and may need to be remediated, which could include removal of sediments through dredging. The impacts on adjacent shoreline structural stability and limitations on these potential removals will need to be determined during the RD process. The purpose of the shoreline inspection and outfall survey is to inventory and perform an evaluation of the existing shoreline features and conditions to inform stability analyses and potential steel structure design (e.g., retaining walls). This understanding of slope and structural stability will also inform the evaluation of remedial alternatives in the *RAOR*.

The western boundary of the boat slip consists of a vertical bulkhead that is owned and operated by CLM/Graymont. The eastern boundary of the boat slip consists of the sloped WWTP berm, from which the armored structure is anticipated to extend approximately 20 feet offshore. Visual inspections of these structures and the unarmored shoreline along the southern end (i.e., head) of the boat slip will be completed by Foth, primarily by above-water visual inspection utilizing both land and water access and the push-probe soundings described above.

The inspection will be documented through photography and field notes and areas with potential structural or slope stability concerns will be noted. These observations will be compiled into a field inspection report and will support evaluation of remedial alternatives and the RD. Additional detail is provided in *SOP-02, Bulkhead and Shoreline Inspection Survey* (Appendix C).

4.2 Groundwater Sampling and Monitoring

As described in Section 3.2, a subset of existing site monitoring wells will be monitored as part of the PDI. The objectives of the groundwater investigation are to characterize groundwater chemistry and biological activity and characterize the groundwater-surface water interaction in the area near the head of the boat slip. The wells selected for monitoring are subject to change, based on a field inspection, if some wells are found to be damaged, missing, or otherwise unusable. The methods for collecting groundwater samples are described below with additional detail provided in the Foth SOPs (Appendix C). Sample handling, transport, and chain of custody procedures will be followed as described in Section 5. Monitoring wells are shown on Figure 6, and the wells to be sampled with sample analyses are listed in Table 2. Purge water will be containerized as investigation derived waste (IDW) for characterization sampling, profiling, and proper disposal, as discussed in Section 4.6.

4.2.1 Water Level Monitoring

Data loggers will be deployed in existing monitoring wells MW-15 and MW-20 for a period up to six months. The data loggers will be equipped with a pressure transducer and a multi-parameter water quality probe to record water level and water quality continuously while deployed. An AquaTROLL 600 sonde or similar instrument may be used, following *SOP-03, AquaTROLL 600 Multiparameter Sonde*.

4.2.2 Groundwater Sample Collection

Groundwater samples will be collected from five existing Site groundwater monitoring wells during one event. The selected wells and analyses are listed in Table 2. Low flow sampling procedures will be used to collect groundwater samples, as described in *SOP-04, Low Flow Stabilization Purging and Sampling Procedure,* using a pump and a multi-parameter water quality meter. Stabilized water quality readings will be recorded and will be used to inform the natural attenuation analysis. Purge water will be handled as described in Section 4.6. A vendor's SOP will be utilized for microbial sampling. Groundwater samples will be collected into laboratory supplied containers and submitted to the laboratories in a manner consistent with the *Quality Assurance Project Plan (QAPP)* (Appendix B) and project SOPs (Appendix C). Reusable tools will be decontaminated between samples following the processes described in SOP-12 *Equipment Cleaning and Decontamination.*

4.3 Soil Sampling

As described in Section 3.3, upland soil sampling will be completed by advancing environmental soil borings and geotechnical soil borings. The environmental borings will consist of proposed excavation area borings, head of boat slip borings, and LIF sample confirmation borings, with different data objectives for each. Soil boring locations are shown on Figure 6. Table 2 lists all boring locations with rationale and analyses.

The methods for collecting upland soil samples are described below with additional detail provided in the Foth SOPs (Appendix C). Sample handling, transport, and chain of custody procedures will be followed as described in Section 5. Unused soil generated during sample processing will be containerized as IDW for characterization sampling, profiling, and proper disposal, as discussed in Section 4.6.

4.3.1 Drilling Procedure

4.3.1.1 Environmental Soil Sampling

Upland soil borings will be advanced by a contractor using standard environmental drilling techniques, which may include hollow stem auger, air rotary, or direct push. Continuous soil cores will be collected from boreholes. Boreholes will be advanced as close as possible to the coordinates listed in Table 2. If refusal is encountered, the borehole will be attempted again within 10 feet of the original location. If refusal is encountered three times, the Foth Field Team Leader or designee will contact the Foth project manager for further instruction to relocate a sample location or accept a boring with poor recovery. Drilling oversight will be provided by Foth in accordance with *SOP-05, Direct-Push Technology* and/or *SOP-06, Drilling Oversight Checklist*. The drilling bid specification (Appendix A) allows for flexibility in drilling methodology.

Soils will also be screened in-situ at each of the soil boring locations using a direct-push probe equipped with a MIP/HPT/EC tool to provide data about VOC soil impacts with depth and also estimate hydraulic conductivity with depth and water table elevation. The MIP/HPT/EC tool will be used first, utilizing direct push technology, at each soil boring location. The soil core will then be collected from a second, adjacent hole.

4.3.1.2 Geotechnical Soil Sampling

Geotechnical soil samples will be collected at the boring locations listed in Table 2. Each boring will be advanced to the target depth shown in Table 2. Borings will not be advanced into bedrock and bedrock is not expected to be encountered. The geotechnical drilling equipment, provided and operated by the contractor, will accommodate collection of piston-core samples or Shelby tubes, split-spoon samples, and Standard Penetrometer Test (SPT) results. The exact drilling methods and equipment will be refined once a drilling contractor is selected. (See Appendix A for subcontractor bid specifications.) If refusal is encountered, the borehole will be attempted again within 10 feet of the original location. If refusal is encountered three times, the Foth Field Team Leader or designee will contact the Foth project manager for further instruction to relocate a sample location or accept a boring with poor recovery. Drilling locations and the final drilling depths may also be adjusted by the Foth Field Team Leader based on field observations and conditions. Drilling oversight will be provided by Foth in accordance with *SOP-05, Direct-Push Technology* and/or *SOP-06, Drilling Oversight Checklist*. The drilling bid specification (Appendix A) allows for flexibility in drilling methodology. Foth will encourage drilling subcontractors to have a variety of tooling available to allow for modifications to the methodology based on field observations/conditions.

4.3.2 Soil Sample Collection and Processing

Soil sample collection and record keeping requirements are specified in the following SOPs, contained in Appendix C of this *PDI Work Plan*:

- *Field Log Book SOP-07*
- *Soil Boring Collection and Processing SOP-08*
- *Subsurface Soil Sampling for Geotechnical Analysis SOP-09*
- *Subsurface Soil Sampling and Description SOP-10*
- *Sample Packaging and Shipping SOP-11*
- *Equipment Cleaning and Decontamination SOP-12*
- *Investigation Derived Waste Handling and Disposal SOP-13*
- *Sample Custody SOP-14*
- *MIP Data Collection SOP-15*

IDW will be handled as described in Section 4.6, and samples will be handled as described in Section 5. Field documentation will be completed as described in Section 4.5.

Soil core processing will be performed by Foth staff, likely in a heated storage container on the Site. The temporary core processing area will be equipped with the necessary supplies for core splitting, logging, sample processing, and IDW staging activities. Cores will be photographed, screened with a PID, and soils will be visually characterized and logged on the Soil Logging Form in *SOP-10, Subsurface Soil Sampling and Description* (Appendix C) according to textural class, color, moisture content, particle size and shape, consistency, and other observations (for example, staining and odor).

4.3.2.1 Environmental Soil Sampling

For some borings, located around the planned extent of the remedial excavation as indicated in Table 2, the MIP/HPT/EC tool results and PID readings will be evaluated to select the sampling interval. At these locations, all cores from the borehole will be collected and laid out before opening, to avoid losing VOCs to volatilization, then all cores will be screened and a sample interval will be selected. At other boreholes, the soil samples will be collected from the planned depth interval in Table 2.

At all borehole locations, the VOC sample will be collected first with an En Core ® sampling syringe or similar directly from the core. Then, a sufficient quantity of soil sample will be collected from the core and homogenized in a clean aluminum or stainless steel bowl with a clean steel spoon before collecting the soil sample in the laboratory containers. Soil samples will be collected into laboratory supplied containers and submitted to the laboratories in a manner consistent with the *QAPP* (Appendix B) and project SOPs (Appendix C). Reusable tools will be decontaminated between samples following the processes described in *SOP-12, Equipment Cleaning and Decontamination.*

Samples may be shipped or sent by courier to different laboratory locations based on the analyses. The Foth Field Team Leader will organize the samples into proper coolers and review chains of custody for accuracy before they are sent to the laboratories.

4.3.2.2 Geotechnical Soil Sampling

Because the primary objective of the geotechnical borings is to provide information on material characteristics and stability, the geotechnical drilling program will alternate between methods that allow for collection of sediment samples and physical information as follows:

- SPT will be conducted at 5-foot intervals. The Engineer or Scientist on site will collect the blow count data, as well as pocket penetrometer readings of the collected soil. The lithology of each core will also be noted on the boring log to understand changes in lithology with depth and the core will be screened with a PID.

- Two-foot Shelby tube samples will be collected from each soil type encountered. The Shelby tube will allow for collection of undisturbed samples and provide bulk material for laboratory testing.

- A split spoon sample will be collected on alternating 5-foot intervals. The split spoon will also provide for collection of undisturbed samples and provide bulk material for laboratory testing or chemistry sampling as summarized in Table 2. Sampling intervals and frequency may be adjusted by the Foth Field Team Leader based on field observations.

The drilling methodology, sequence, boring depths, and sampling intervals may be adjusted by the Foth Field Team Leader based on field observations and conditions. All collected geotechnical soil cores will be stored in an appropriate manner and will be transported to the selected geotechnical testing laboratory. Once the collected samples are at the lab, Foth staff will inspect the samples and identify the appropriate testing for each sample.

As described in the geotechnical bid specifications (Appendix A), two types of bulk sediment samples (i.e., piston or Shelby tube samplers and split spoon samplers) will be collected from the geotechnical sediment cores to understand the physical and strength properties of the sediment. Upon receipt and inspection, the Foth Engineer shall determine the type and number of laboratory tests to be performed. Geotechnical samples will include laboratory testing for index characterization (Atterberg limits and unit weight), grain size distribution, and compressive strength testing. The laboratory testing may include but are not be limited to the tests listed in Table 2. Soil samples will be collected and submitted to the laboratories in a manner consistent with the *QAPP* (Appendix B) and project SOPs (Appendix C).

4.4 Sediment Sampling

The methods for collecting environmental sediment cores and geotechnical borings are described below with additional detail provided in the Foth SOPs (Appendix C). Assuming that at least 24 inches of solid ice develops within the boat slip this winter, the borings will be advanced from the ice. Depending upon the ice conditions during the winter of 2019/2020, some of the drilling may need to be postponed and conducted from a barge mounted platform during Spring 2020.

4.4.1 Drilling Methods and Equipment

Accurately delineating the contact between the potentially contaminated sediment and the top of the Miller Creek Clay is one of the primary objectives of the sediment PDI. Therefore, sediment drilling methods and tooling will be selected to maximize recovery and vertical accuracy while obtaining a relatively undisturbed core. The drilling bid specification (Appendix A) therefore allows for flexibility in drilling methodology but provides a minimum recovery requirement of 70%.

4.4.1.1 Environmental Sediment Cores

It is anticipated that the 13 environmental sediment cores will be collected using either a track-mounted direct push sampling rig (e.g., Geoprobe) or an auger drill rig equipped with appropriate sampling equipment that can accomplish the sampling depths and objectives noted in this *PDI Work Plan* and the subcontractor bid specifications, which are provided in Appendix A. The drill rig will be mounted directly on the ice or on a floating barge platform. In order to get good recovery, observe the sediment characteristics, and positively identify the depth/elevation of the top of the Miller Creek Clay Formation, short drive lengths (e.g., 5 feet) are preferable. Sample equipment selection will vary depending upon the subcontractor and the recovery observed in the field but continuous sampling systems, piston samplers, and split-spoon samplers are being considered. It is anticipated that the same drill rig can be used for the upland and in-water environmental cores. It is however likely that a second drill rig may need to be mobilized to complete the geotechnical drilling program.

4.4.1.2 Geotechnical Sediment Cores

It is anticipated that the four in-water geotechnical borings will be advanced using a hollow stem auger drill rig mounted directly on the ice, or on a floating barge platform. Once the Miller Creek Clay Formation is reached, the driller may opt to isolate potential contamination using borehole casing and advance the remainder of the boring using mud rotary. The two easterly borings will be advanced to 50 feet below mudline (bml) and the two southerly borings should be advanced to 70 feet bml, unless otherwise instructed by the Foth Field Team Leader. The geotechnical drilling equipment will accommodate collection of piston-core samples or Shelby tubes, split-spoon samples, and SPT results. The exact drilling methods and equipment will be refined once a drilling contractor is selected. (See Appendix A for subcontractor bid specifications.)

4.4.2 Station Positioning and Vertical Control

To meet the goals of the sampling event, precise positioning of sediment coring locations is required. Both accuracy (i.e., ability to define position) and repeatability (i.e., ability to return to a sampling station) are essential. The required horizontal and vertical accuracy of positional data is ±10 and ±3 foot, respectively. The units of measurement for this project are in United States Survey Feet.

Coordinates will be recorded in the following datums:

- The horizontal datum will be North American Datum (NAD) 1983, 2011 WISCRS Douglas County, U.S. Survey Feet.

- Vertical Datum using International Great Lakes Datum (IGLD) 1985.

Navigation precision and accuracy of the digital GPS (DGPS) equipment will be checked each morning and evening by recording the x and y coordinates of a stationary reference checkpoint, which is anticipated to be the U.S. Army Corps of Engineers (USACE) survey control identified near the anticipated core processing area.

The anticipated sediment investigation locations are shown on Figure 7, with station coordinates, anticipated water depths, and the maximum anticipated core depths provided in Table 3. These target sample coordinates will be preloaded into a handheld differential GPS, which will be used for navigating to the proposed sample locations. Navigation and positioning will be performed in accordance with *SOP-16, Navigation and Positioning*. The actual station locations may be adjusted by up to 10 feet based on obstructions or field conditions.

Successful core location coordinates will be collected using the DGPS held above the borehole. The water depth will be measured to the nearest 0.1 foot and recorded as per *SOP-16, Navigation and Positioning*. Water surface elevation will also be recorded using the DGPS at each location from the deck of the barge. The water elevation record at the local tide gauge (station 9099064; National Oceanic and Atmospheric Administration, 2019) will be downloaded for quality assurance (QA). Core drive lengths and sample elevations will be recorded on the field log as depth bml. The actual environmental sediment core depths will be dependent upon the position of the Miller Creek Clay contact, as the goal is to advance each environmental sediment core 2 feet into that unit (anticipated to range from zero to 25 feet bml). The geotechnical borings will be advanced to the target depths provided in Table 3.

If drilling occurs through the ice, then sample locations will also be marked with a flag and included in the upland boring location survey (see Section 4.1.1).

4.4.3 Core Collection

The methods for collecting environmental and geotechnical sediment cores are described below. Field data will be recorded in a Sediment Core Collection Log, which is provided in Appendix D, and will include geotechnical field testing results, GPS coordinates, water depth, core penetration, and recovery.

4.4.3.1 Environmental Sediment Cores

Environmental sediment cores collection procedures are specified in *SOP-17, Sediment Core Collection,* which will be modified to reflect the selected drilling subcontractors drilling methods and equipment. While drilling methods may vary, recovery of at least 70% of the sediment for each drive length is required. To increase sediment recovery, sediment coring equipment will be outfitted with a sediment retainer or a device designed to maximize sediment core recovery. Initially, if the sediment core recovery is less than 70%, then the sampling position will be offset to remain within 10 feet of the proposed location, and a second sampling attempt will be made.

If no acceptable core is obtained after three attempts, the Foth Field Team Leader or designee will contact the Foth project manager for further instruction to relocate a sample location or accept a core with less than 70% recovery.

As cores of acceptable recovery are obtained, they will be sealed, marked with the upright orientation and start and end depth (in feet bml), maintained in a vertical and upright position and transported as necessary (anticipated to be at least twice per day) from the sampling location or vessel to the temporary core processing area for observation and sampling (Section 4.4.4).

4.4.3.2 Geotechnical Sediment Cores

Because the primary objective of the geotechnical borings is to provide information on material characteristics and stability, the geotechnical drilling program will alternate between methods that allow for collection of sediment samples and physical information as follows:

- SPT will be conducted at 5-foot intervals. The Engineer or Scientist on site will collect the blow count data, as well as pocket penetrometer readings of the collected sediments. The lithology of each core will also be noted on the boring log to understand changes in lithology with depth.

- In the sediment above the Miller Creek Clay Formation, a 2-foot Shelby tube sample will be collected at the sediment surface (i.e., mudline), and every 10 feet below mudline until the clay is encountered. The Shelby tube will allow for collection of undisturbed samples and provide bulk material for laboratory testing or chemistry sampling as described in Section 4.4.4.

- Where sediment accumulation allows (i.e., is greater than or equal to 5 feet thick above the Miller Creek Clay Formation), a split spoon sample will be collected on alternating 5-foot intervals until the clay is encountered. The split spoon will also provide for collection of undisturbed samples and provide bulk material for laboratory testing or chemistry sampling as described in Section 4.4.4.

- From the top of the Miller Creek Clay to the full depth of each boring, split spoon samples will continue to be collected at approximately 5-foot intervals. Sampling intervals and frequency may be adjusted by the Foth Field Team Leader based on field observations.

All collected geotechnical sediment cores will be stored in an appropriate manner and will be transported to the selected geotechnical testing laboratory. Once the collected samples are at the lab, Foth staff will inspect the samples and identify the appropriate testing for each sample (Section 4.4.4).

4.4.4 Sample Collection and Processing

Sediment sample collection and record keeping requirements are specified in the following SOPs, which are provided in Appendix C of this *PDI Work Plan*:

- *Field Log Book SOP-07*
- *Sediment Core Processing SOP-18*
- *Unconsolidated Sediment Borehole Logging SOP-19*
- *Sample Packaging and Shipping SOP-11*
- *Equipment Cleaning and Decontamination SOP-12*
- *Investigation Derived Waste Handling and Disposal SOP-13*
- *Sample Custody SOP-14*

4.4.4.1 Environmental Sediment Cores

Core processing will be conducted by Foth staff, likely in a heated storage container on the Site. The temporary core processing area will be equipped with the necessary supplies for core splitting, logging, sample processing, and IDW staging activities.

Before processing, the top core cap will be removed, and any free water drained by drilling a hole in the side of the tube, just above the sediment/water interface. After draining, remaining free water will be removed with a siphon hose or turkey baster. Each core will then be cut open lengthwise while in a horizontal position. Once opened, high-resolution digital photographs of each core will be taken to document the undisturbed structure. Each photograph will include a scale (tape measure), station identification (ID), depth interval being represented, and date of core collection. In order to see variations of color and stratigraphy, appropriate lighting will be provided in the core processing area.

Once photographed and prior to segmenting the core into samples, sediments will be visually characterized and logged on the Sediment Core Processing Log (Appendix D) according to textural class, color, moisture content, particle size and shape, consistency, and other observations (for example, staining and odor) as described in, as per the requirements of *SOP-18, Sediment Core Processing* and *SOP-19, Unconsolidated Sediment Borehole Logging* (Appendix C). During these initial observations, the contact between the Miller Creek Clay Formation and overlying sediment will be identified.

After photographing and logging the sediment cores, Foth staff will process the core, segregating it into 1-foot intervals above and below the contact between the Miller Creek Clay and overlying unconsolidated sediment[1]. A representative volume from the center of each core segment will be collected and field homogenized (i.e., thoroughly mixed until uniform texture and color are achieved) as described in *SOP-18, Sediment Core Processing*.

Sediment samples will be collected into laboratory supplied containers and submitted to the laboratories in a manner consistent with the *QAPP* (Appendix B) and project SOPs (Appendix C). Namely, sediment samples collected in 1-foot intervals above and below the contact top of the Miller Clay Formation contact, will be submitted for analysis or archival as follows:

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[1] If the uppermost sample interval is less than 4 inches, it will be included in the underlying interval; if it is greater than 4 inches, it will be processed as a separate sample interval.

- Analyze the lowest 1-foot sampling interval above the top of the Miller Creek Clay (where applicable). This sample will be analyzed for PAHs and physical parameters, as shown in Table 1.

- Archive any remaining sampling intervals in sediment above the Miller Creek Clay for potential future analysis.

- Analyze a sample of the upper 1 foot of Miller Creek Clay.

- Archive a sample from 1 to 2 feet below the top of the Miller Creek Clay for potential future analysis.

- After processing, the full volume of excess sediment remaining from three representative sediment cores will be placed into labeled 5-gallon drums and submitted for treatability testing as described in Section 4.4.5.

Unused sediment generated during sample processing will be containerized as IDW for characterization sampling, profiling, and proper disposal, as discussed in Section 4.6.

In accordance with the project *Health and Safety Plan (HASP)*, which is provided in Appendix E, powderless latex or nitrile gloves shall be worn during sample collection and sample handling. More information on decontamination procedures, field quality control (QC) samples, and QA can be found in the site specific *QAPP* (Appendix B). Laboratory methods and detection limits for the above chemical parameters are identified in the *QAPP* (Appendix B).

4.4.4.2 Geotechnical Sediment Cores

As described in the geotechnical bid specifications (Appendix A), two types of bulk sediment samples (i.e., piston or Shelby tube samplers and split spoon samplers) will be collected from the geotechnical sediment cores to understand the physical and strength properties of the sediment. Upon receipt and inspection, the Foth Field Team Leader shall determine the type and number of laboratory tests to be performed. Geotechnical samples will include laboratory testing for index characterization (Atterberg limits and unit weight), grain size distribution, and compressive strength testing. The laboratory testing may include but are not be limited to the tests listed in Table 1. In order to compliment the environmental sediment cores, a sediment sample will also be collected from the lower foot of sediment overlying the Miller Creek Clay Formation. That sample will be collected using either a Shelby Tube or split-spoon sampler, field homogenized, and submitted to the laboratory for PAH analysis.

4.4.5 Treatability Testing

Laboratory testing of composited sediment will be conducted to evaluate the amount of drying reagent required to adjust the moisture of dredge sediments to a level suitable for disposal. The specific testing procedures will be refined once a subcontractor laboratory is selected but the anticipated approach is described below:

- Composite sediment samples from three representative environmental sediment cores (see Section 4.4.4) will be collected for use in these treatability studies. The composite samples will represent the entire thickness of sediment overlying the Miller Creek Clay.

- Upon receipt at the testing laboratory, the bulk samples will be mixed and allowed to settle, allowing the settling rate and amount of supernatant liquid in each sample to be measured.

- Bulk samples will them be remixed and subsampled to create an array (e.g., four) of representative sub-samples that will be used to determine the initial moisture content, and the reduced moisture content after a set period (e.g., 24 hours) of natural drainage.

- All, but one of the sample subset, which will remain as an unaltered control, will then be amended with various predetermined percentages (e.g., 2% to 6%) of a drying agent such as Graymont Quick Lime or Portland Cement.

- The sub samples will temper for pre-determined periods (e.g., 24 and 48 hours) before the moisture content is measured and paint filter tests are completed (for landfill disposal).

The results of the treatability tests will inform the reagent approach and application percentages for sediment stabilization following debris removal during RA. It will also assist in refining RD assumptions regarding the quantity of water that will need to be treated in the dredged sediment dewatering area, as well as the mass of sediment that will need to be transported to an appropriate disposal facility. Following selection of the contractor, the specific treatability evaluations to be performed will be reviewed with the appropriate stakeholders.

4.5 Field and Sample Documentation and Quality Control

4.5.1 Field Documentation

Field sampling activities will be recorded in Field Log Books, in accordance with *SOP-07, Field Log Book* (Appendix C), and on Field Forms (Appendix D). Field Log Book entries will provide as much detail as possible. Modifications to field sampling protocols must be documented in the Field Log Book. The Field Team Leader is responsible for verifying that modifications to sampling protocols have been documented.

Environmental samples will be collected following the sampling procedures documented in the field SOPs provided in Appendix C. In addition to the Field Log Book, standard forms will be used during sampling to ensure necessary data are recorded consistently and provide a more detailed record of field data. Field forms to be implemented by Foth for this project include Sediment Core Collection Log, Sediment Core Processing Log, Photoionization Detector Calibration Form, and an IDW Tracking Form (Appendix D).

The Foth Field Team Leader or designee will selectively photograph field activities and field conditions to complement descriptions of field activities in the Field Log Book and field forms.

Field personnel will provide comprehensive documentation of field sampling, field analysis, and sample chain-of-custody, including any changes or deviations from the sampling plan, including a record of decision making. Documents, records and information relating to field work performance will be retained in project file.

4.5.2 Sample Documentation

Foth will implement a sample numbering system that will identify each sample, including QA/QC samples. The sample number will provide a unique identifier for each sample, required by Earthsoft's Environmental Quality Information Systems (EQuIS®) data management software, which is compatible with the Environmental Protection Agency's comprehensive manual for electronic data delivery format. Each sample, regardless of analytical protocol, also will be assigned a site-specific ID, which will contain the specific location identifiers to indicate where the sample was obtained. Sediment samples also will be identified using sample interval depths. The site-specific ID is based on the following system:

- Study Area – MGP
  - The three-letter location code correlates to the study area.

- Sample Location Type – The next two or three letters following the study area indicate the type of sample as follows:
  - B = Environmental Soil Boring
  - C = Environmental Sediment Core
  - GT = Geotechnical Sediment Core
  - UGT = Upland Geotechnical Soil Boring
  - IDW = waste characterization sample – Investigation Derived Waste
  - EB = equipment blank sample

- Location Number – Sediment sample locations will be sequentially numbered within each of the respective subareas using numeric digits. In sediment, the numbering will start with number 1 and in soil the numbering will start with number 100.
  - Sediment: MGP-C-1
  - Soil: MGP-B-100

- Sample Depth – Depth, in tenths of feet, below the ground or sediment surface from which the sample was collected will be added after the station location.
  - Sediment: MGP-C-10.0-11.0
  - Soil: MGP-B-100-8.5-10.5

- QA/QC Identifier – Field QA/QC samples will be identified using the following QA/QC identifiers:
  - Field duplicates, which are associated with the same station location as the native sample, will be identified with an "FD" (for "Field Duplicate") appended to the end of the location code. (MGP-C-10.0-11.0-FD)

- Matrix spike (MS)/matrix spike duplicate (MSD) samples are not identified in the station location identifier, but on the tag and the chain-of-custody form.

- Waste Characterization Sample – Samples collected for waste characterization will be identified using the following identifiers:
  - Waste characterization samples will be identified with "IDW", and identified with numeric digits starting at 1 and increasing by one for each subsequent sample (MGP-IDW-1, M-IDW-2, etc.)
  - Collection of waste characterization samples will be performed as described in Section 3.8.

- Equipment Blanks – Equipment blanks will be identified using the following identifiers:
  - Equipment blanks will be taken on non-disposable equipment and will be identified with an "EB."
  - Equipment blanks will be identified with numeric digits starting at 1 and increasing by one for each subsequent sample (i.e., EB-1) assigned sequentially.

- Groundwater Sample – Samples collected for groundwater will be identified using the following identifiers:
  - Groundwater characterization samples will be identified with "MW", the well number, and the date in YYYYMMDD format (MGP-MW-1-20200131, etc.)

4.5.3 Field Data Quality Control

Information collected in the field through visual observation, manual measurement, and/or field instrumentation will be recorded in a Field Log Book and/or on data forms. The Field Team Leader will review the data for consistency and adherence to this *PDI Work Plan* and the *QAPP*. Concerns identified will be corrected and incorporated into the data evaluation process. The Foth Field Team Leader also will review field data calculations, transfers, and interpretations conducted by the field team. Original field documents will be kept in the project file and scanned copies saved in the electronic project file. Field documents will be checked for the following:

- General completeness.
- Readability.
- Clearly stated use of appropriate procedures and modifications to probing and sediment sampling procedures.
- Appropriate instrument calibration and maintenance records (as appropriate).
- Reasonableness of data collected.
- Correctness of sample locations.
- Correctness of reporting units, calculations, and interpretations.

Field sampling precision, accuracy, and bias will be evaluated by collecting the QA/QC samples. QA/QC samples will be collected at a 10% frequency for field duplicates and 5% frequency for MS/MSD samples, and follow laboratory performance criteria detailed in Table 2 of the *QAPP*.

Equipment blanks will be collected from each piece of associated sampling equipment to assess potential for contamination. Further detail regarding QA/QC samples is provided in the *QAPP*.

4.6 Management of Investigation Derived Waste

Foth will appropriately manage and segregate IDW by media, including groundwater, soil, and sediments, decanted overlying water, liquid decontamination solutions, and disposable sampling items such as personal protective equipment (PPE) and sampling supplies generated from the field activities and sample processing. IDW is proposed to be handled as described in *SOP-13, Investigation Derived Waste Handling and Disposal*, and as summarized in the following manner:

- Excess soil and sediment remaining after sample processing will be treated as IDW, containerized in 5-gallon buckets at the processing area, and then transferred into new placarded 55-gallon drums (segregated by media) with secure lids or dedicated dumpster.

- Decanted overlying water, purged groundwater, and liquid decontamination solutions will be containerized in 5-gallon buckets, and then transferred into a new placarded 55-gallon drum with secure lid or compatible tote.

- Other IDW, such as polycarbonate sediment core and acetate DPT macro-core liners, plastic sheeting, disposable sampling materials, and impacted PPE, will be disposed of as general refuse.

At the end of each day, IDW generated through drilling and sample processing will be transferred to a secure IDW staging area. Each container for the storage or transfer of IDW will be labeled with the following information: media, source, date generated, and generator (SWL&P) contact information.

A composite sample will be collected from each type of drummed IDW generated including liquids and solids (sediment and soil) and analyzed for waste characterization parameters. Waste characterization parameters will be determined by the appropriately licensed disposal facility. Foth will review analytical results to characterize the IDW, obtain a Resource Conservation and Recovery Act generator ID number (if necessary), and complete a waste manifest (if necessary) for disposal at an appropriate disposal facility. Waste will be characterized according to requirements of the appropriately permitted disposal facility. SWL&P will be considered the generator of the waste material and will be required to sign waste manifests or other disposal paperwork, if necessary.

5 Sample Handling, Transport, and Custody

Laboratory samples for all matrices will be handled and transported according to the following SOPs, which are included in Appendix C:

- *SOP-14 Sample Custody*
- *SOP-11 Sample Packaging and Shipping*

Samples will be kept in the custody of a Foth member or locked up on-site, protected from freezing but below the preservation temperature listed in the *QAPP* in Appendix B.

6 Laboratory Analysis

Laboratory analyses will be run on samples as listed individually in Tables 2 and 3 and summarized in Table 1. A more detailed summary of laboratory analyses, methods, and reporting limits is provided in the *QAPP* in Appendix B.

7 Data Management and Reporting

7.1.1 Data Verification and Quality Control Requirements

Laboratory reports will be reviewed by Foth to verify accuracy with requested analyses, methods and detection limits and review any laboratory quality issues. Additional detail on data verification is provided in the *QAPP* (Appendix B).

7.1.2 Data Management and Reporting

The analytical and geotechnical data will be incorporated into an EQuIS® project database upon completion of validation. The results of the PDI will be incorporated into the *RAOR* as necessary. The remaining data will be reported in the design documentation once the *RAOR* has been accepted. Field-generated data will also be incorporated into the database and onto summary tables, as appropriate.

8 Schedule

The anticipated schedule for executing this PDI work is as follows:

- Draft PDI Work Plan (minus appendices) to WDNR – November 26, 2019
- Receive Agency Comments on Draft PDI Work Plan – December 13, 2019
- Procure subcontractors and revise Draft PDI Work Plan based on Agency Comments – December 16 through January 10, 2020
- Submit Final PDI Work Plan (including appendices) to WDNR – January 10, 2020
- Receive WDNR approval of Final PDI Work Plan – January 24, 2020
- Conduct Environmental and Geotechnical Soil Borings and Sediment Cores (pending ice conditions) – February 2020
- Conduct bathymetric survey and manual probing – May 2020 (or after ice melts)

Note: The actual schedule may be altered based on subcontractor availability, adverse weather, or unforeseen conditions.

9 References

Foth Infrastructure & Environment, LLC, 2019. *Site Investigation Report*, Former Manufactured Gas Plant, Superior Water, Light & Power, Superior, Wisconsin. March 27, 2019.

National Oceanic and Atmospheric Administration, 2019. Water elevation record at local tide gauge (station 9099064), https://tidesandcurrents.noaa.gov/stationhome.html?id=9099064

Wisconsin Department of Natural Resources, 2017. Letter to Superior Water, Light & Power regarding *Supplemental Remedial Investigation Report*. December 8, 2017.

Wisconsin Department of Natural Resources, 2019. Letter to Superior Water, Light & Power regarding the approval of *Supplemental Remedial Investigation Report.* June 26, 2019.

Tables

Table 1

Sampling and Analysis Summary
Pre-Design Investigation
Superior Water, Light & Power
Superior Wisconsin

Sample Type and Area	Proposed Analyses	Number of Samples
Groundwater		
Grab groundwater samples - From existing wells	VOC	5
	PAH	5
	TOC	5
	S04, NO3	5
	Iron	5
	Manganese	5
	Alkalinity	5
	Me/Ethane/Ethene	5
	Microbial Strain & Stable Isotope; In-situ Microcosm (30 day sample)	2 (from MWs-4 & 7)
	Waste Characterization - TBD	1
Soil		
Soil samples - Former LIF boring locations and excavation area borings	VOC	36
	PAH	36
	TOC	36
	TPH	35
Soil samples - Proposed excavation areas	Bulk Density	7
	Classification	7
	Iron	7
	Manganese	7
	pH/Buffering	7
	NOD	5
	TOD	5
	Waste Characterization - TBD	7
Geotechnical soil samples - near E 2nd Street overpass and head of boat slip	Particle Size Analysis - Mechanical Sieve/Hydrometer	6-15
	Liquid Limit, Plastic Limit, and Plasticity Index	6-15
	Moisture Content	6-15
	Unconsolidated Undrained Triaxial Compression Tests	3-9
	Unconfined compressive strength of soils	3-9

Table 1 *(continued)*

Sample Type and Area	Proposed Analyses	Number of Samples
Sediment		
Direct push sediment samples	PAHs	29-70
	Total Solids	29-70
	Total Organic Carbon	29-70
	Particle Size Analysis - Hydrometer	29-70
	Bulk Density	29-70
	Moisture Content	29-70
	Atterberg Limits	29-70
	Waste Characterization - TBD	2-4
Geotechnical sediment samples	Treatability Tests - TBD	2-4
	Particle Size Analysis - Mechanical Sieve/Hydrometer	8-20
	Liquid Limit, Plastic Limit, and Plasticity Index	8-20
	Natural Moisture Content	8-20
	Unconsolidated Undrained Triaxial Compression Tests	8-20
	Unconfined compressive strength of soils	4-12
	Unconfined compressive strength of rocks	4-12

Notes:

TBD - to be determined

PAH - polycyclic aromatic hydrocarbons

TOC - total organic carbon

VOC - volatile organic compounds

TPH - total petroleum hydrocarbons

SO_4 - sulfate

NO_3 - nitrate

MWs - monitoring wells

NOD - natural oxidant demand

TOD - total oxidant demand

Me/Ethane/Ethene - dissolved methane, ethane, and ethene

Prepared by: ECH1

Checked by: HLH

Table 2
Upland Investigation Locations and Rationale
Pre-Design Investigation
Superior Water, Light & Power
Superior Wisconsin

	Proposed Sampling Location					Sampling Rationale									
Soil Boring Number	Boring Depth	Sample Depth	Northing	Easting	Number of Samples	Waste Classification for Remedial Excavation	Inform ISCO Design	Verification of Depth of Remedial Excavation	Refine Horizontal Extent of Excavation Area	Refine Horizontal Extent of In-situ Remediation	Investigate Former MGP Building Discharge Area	Geotechnical Information at Head of Boat Slip	Geotechnical Information where Remedial Excavation is Close to Overpass	Investigate area of Benzene Detections Near B-31	Refine Extent of Soil Impacts at Head of Boat Slip
B-100	20	7.5	308125.1	153899.9	1	x	x	x							
B-101	20	11	307958.0	154087.2	1	x	x	x							
B-102	20	4	308012.7	154150.5	1	x	x	x							
B-103	20	14	308101.6	154240.9	1	x	x	x							
B-104	20	4	308131.4	154048.5	1	x	x	x							
B-105	20	Field[1]	308254.4	153845.7	1				x						
B-106	20	Field[1]	308272.1	153922.5	1				x						
B-107	20	4	308184.2	153912.4	1				x						
B-108	20	Field[1]	308203.0	153994.8	1				x						
B-109	20	4	308120.3	153951.3	1				x						
B-110	20	9	307968.5	154096.0	1				x						
B-111	20	Field[1]	308057.8	154178.4	1				x						
B-112	20	Field[1]	308061.3	154212.4	1				x						
B-113	20	Field[1]	308002.3	154240.9	1				x						
B-114	20	14	308136.3	154245.0	1				x						
B-115	20	Field[1]	308230.8	154153.4	1					x					
B-116	20	Field[1]	308231.4	154070.7	1						x				
B-117	20	Field[1]	308296.2	153976.3	1						x				
B-118	20	Field[1]	308373.4	153964.8	1						x				
B-119	20	Field[1]	308210.6	154329.1	1										x
B-120	20	4	308055.8	153921.4	1				x						
B-121	20	Field[1]	307978.7	154306.1	1									x	
B-122	20	Field[1]	308039.1	154015.2	1				x						
B-123	20	Field[1]	308229.7	153950.2	1				x						
B-124	20	Field[1]	308183.2	154225.7	1					x					
B-125	20	Field[1]	308099.0	154310.7	1					x					
B-126	20	Field[1]	308067.2	154280.4	1					x					
B-127	20	Field[1]	308067.2	154280.4	1					x				x	
TG-07	28	15-17 and 23-25	308346.2	154673.4	1										
SLIF26	16	7-9	308065.1	154340.4	1										
SLIF27	16	6-8	307991.9	154414.6	1										
SLIF31	16	5.5-7.5	307700.9	154802.7	1										
SLIF32	16	5-7	307594.4	154910.4	1										
SLIF33	16	7-9	307855.1	154633.2	1										
LIF45	16	5-7	307503.8	155002.7	1										
UGT-1	80	Field[2]	154383.3	308238.8	1							x			
UGT-2	40	Field[2]	153857.4	308044.7	1								x		
UGT-3	40	Field[2]	153917.3	308037.3	1								x		
MW-4	NA	NA	NA	NA	1		x			x					
MW-7	NA	NA	NA	NA	1		x			x					
MW-20	NA	NA	NA	NA	1		x			x					
MW-8	NA	NA	NA	NA	1		x			x					
MW-3	NA	NA	NA	NA	1		x			x					

Table 2 ***(continued)***

Soil Boring Number	Proposed Analyses																				
	Bulk Density	**Classification**	**Iron**	**Manganese**	**pH/Buffering**	**NOD**	**TOD**	**Waste Characterization - TBD**	**VOC**	**PAH**	**TOC**	**TPH**	**SPT/PP**	**S04, NO3**	**Alkalinity**	**Me/Ethane/ Ethene**	**Microbial Strain & Stable Isotope; In-situ Microcosm (30 day sample)**	**Particle Size Analysis - Mechanical Sieve/Hydrometer**	**Liquid Limit, Plastic Limit, and Plasticity Index**	**Moisture Content**	**Unconsolidated Undrained Triaxial Compression Tests**	**Unconfined Compressive Strength of Soils**
B-100	x	x	x	x	x	x	x	x	x	x	x	x	x									
B-101	x	x	x	x	x	x	x	x	x	x	x	x	x									
B-102	x	x	x	x	x	x	x	x	x	x	x	x	x									
B-103	x	x	x	x	x	x	x	x	x	x	x	x	x									
B-104	x	x	x	x	x	x	x	x	x	x	x	x	x									
B-105									x	x	x	x	x									
B-106									x	x	x	x	x									
B-107									x	x	x	x	x									
B-108									x	x	x	x	x									
B-109									x	x	x	x	x									
B-110									x	x	x	x	x									
B-111									x	x	x	x	x									
B-112									x	x	x	x	x									
B-113									x	x	x	x	x									
B-114									x	x	x	x	x									
B-115									x	x	x	x	x									
B-116									x	x	x	x	x									
B-117	x	x	x	x	x			x	x	x	x	x	x									
B-118									x	x	x	x	x									
B-119									x	x	x	x	x									
B-120									x	x	x	x	x									
B-121									x	x	x	x	x									
B-122									x	x	x	x	x									
B-123									x	x	x	x	x									
B-124	x	x	x	x	x			x	x	x	x	x	x									
B-125									x	x	x	x	x									
B-126									x	x	x	x	x									
B-127									x	x	x	x	x									
TG-07									x	x	x	x	x									
SLIF26									x	x	x	x	x									
SLIF27									x	x	x	x	x									
SLIF31									x	x	x	x	x									
SLIF32									x	x	x	x	x									
SLIF33									x	x	x	x	x									
LIF45									x	x	x	x	x									
UGT-1									x	x	x		x					x	x	x	x	x
UGT-2													x					x	x	x	x	x
UGT-3													x					x	x	x	x	x
MW-4			x	x					x	x	x			x	x	x	x					
MW-7			x	x					x	x	x			x	x	x	x					
MW-20			x	x					x	x	x			x	x	x						
MW-8			x	x				x	x	x	x			x	x	x						
MW-3			x	x					x	x	x			x	x	x						

Table 2 *(continued)*

Notes:

Field - Sample depth interval to be determined in the field based on field screening results as follows:

Field[1] - a sample will be collected from the most contaminated depth interval based on field screening

Field[2] - a sample will be collected from each primary soil type encountered, based on field observation

NA - not applicable

Horizontal Coordinate System: NAD 1983 Douglas County, units of feet.

PAH - polycyclic aromatic hydrocarbons

TOC - total organic carbon

VOC - volatile organic compounds

TPH - total petroleum hydrocarbons

SO_4 - sulfate

NO_3 - nitrate

MWs - monitoring wells

NOD - natural oxidant demand

TOD - total oxidant demand

SPT/PP - standard penetration test/pocket penetrometer

Me/Ethane/Ethene - dissolved methane, ethane, and ethene

TBD - specific analyses to be determined

ISCO - in-situ chemical oxidation

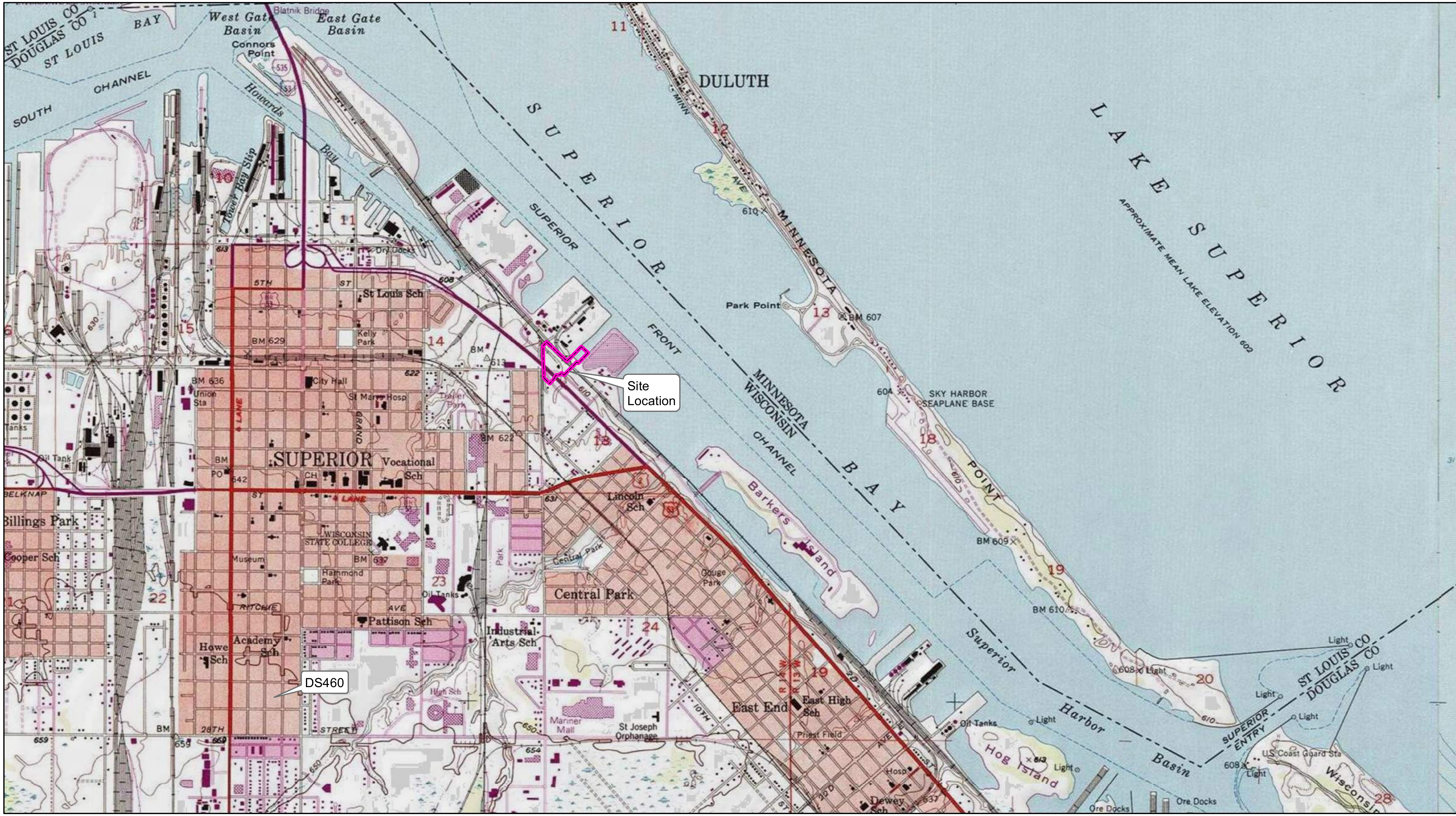
Table 3
Sediment Investigation Locations and Rationale
Pre-Design Investigation
Superior Water, Light & Power
Superior Wisconsin

Location ID	Proposed Sample Locations				Sampling Rationale					
	Northing	Easting	Anticipated Water Depth (feet)	Maximum Anticipated Core Depth (feet bml)	Refine Elevation of the Top of the Miller Creek Clay Formation	Define the Vertical Extent (i.e. thickness) of PAH contamination (greater than 12.2 mg/kg)	Define the lateral Extent of PAH Contaminatio n (greater than 12.2 mg/kg)	Evaluate the Physical Properties of the Impacted Sediment/Future Dredged Material	Collect Data to Inform Sheet Pile/Steel Structure Design	Perform Stability Evaluation
Chemistry Sediment Samples										
C-1	308322.2	154358.5	3.5	25	X	X	X	X		
C-2	308264.7	154413.1	3	25	X	X		X		
C-3	308207.5	154469.3	3	25	X	X		X		
C-4	308341.7	154435.7	10.2	15	X	X		X		
C-5	308284.6	154490.7	3	25	X	X		X		
C-6	308418.6	154457.6	20.1	10	X	X		X		
C-7	308361.2	154512.8	12.3	15	X	X		X		
C-8	308304.2	154568.0	3	25	X	X		X		
C-9	308438.0	154534.3	21.9	10	X	X	X	X		
C-10	308381.2	154589.4	3.7	15	X	X	X	X		
C-11	308515.8	154556.0	23.7	5	X	X	X			
C-12	308458.0	154611.1	15.6	10	X	X	X			
C-13	308401.7	154666.5	3	25	X	X	X			
Geotechnical Sediment Samples										
GT-1	308294.5	154382.2	3	70	X	X		X	X	X
GT-2	308236.2	154442.6	3	70	X	X		X	X	X
GT-3	308240.3	154511.3	3	50	X	X		X	X	X
GT-4	308323.7	154592.6	3	50	X	X	X	X	X	X

Notes:
TBD - to be determined
PAH - polycyclic aromatic hydrocarbons
mg/kg - milligrams/kilogram
Horizontal Coordinate System: NAD 1983 Douglas County, units of feet.
bml - below mudline

Prepared by: ECH1
Checked by: HLH

Figures



NOTES:

1. Topographic basemap supplied by Esri and its suppliers.
2. Horizontal coordinate system: NAD 1983 Douglas County, units in feet.

LEGEND

Approximate Site Boundary

SW L&P

Foth

N

0 1,000 2,000 Feet

DRAFT

This drawing is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only.

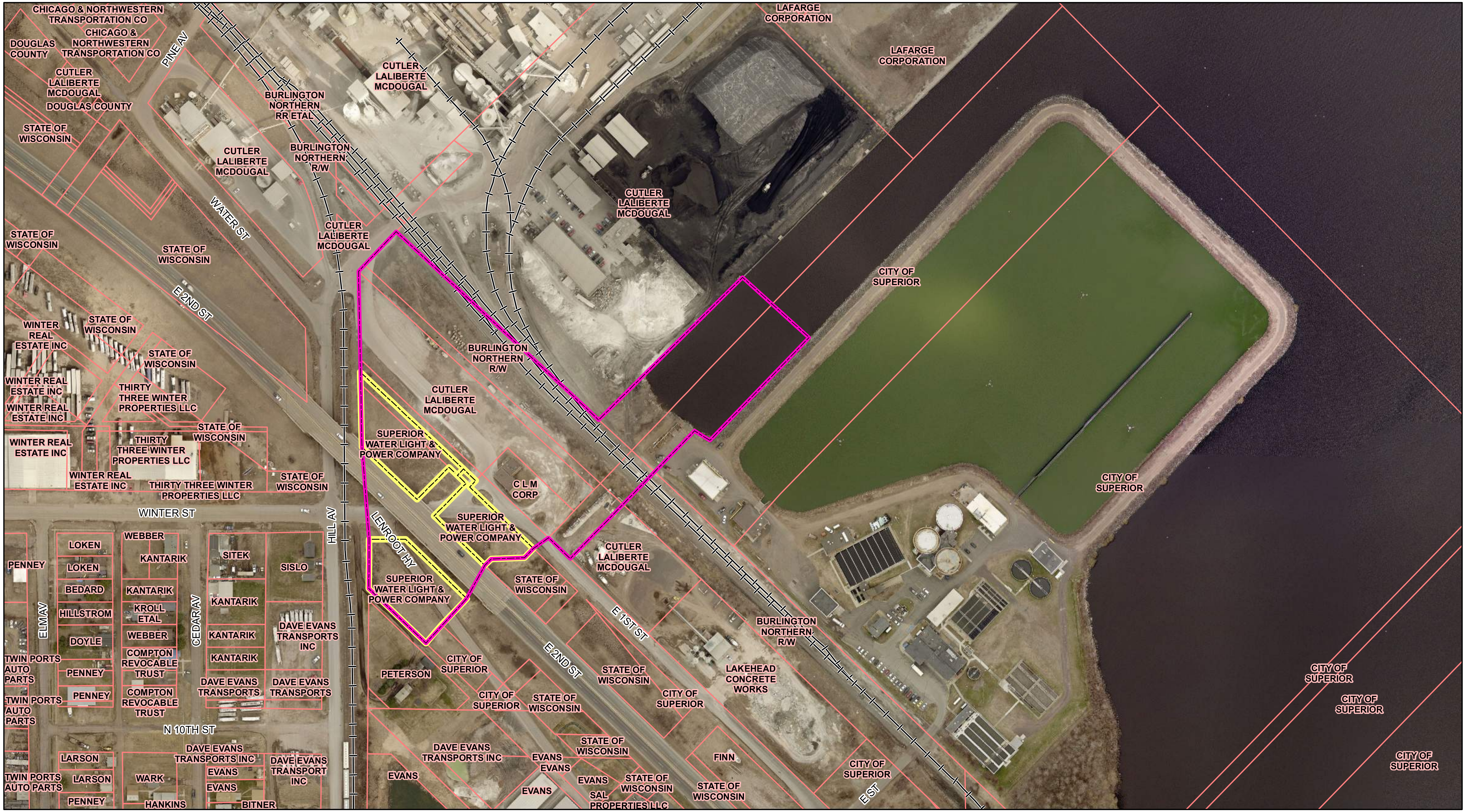
SUPERIOR WATER, LIGHT & POWER

FIGURE 1

SITE LOCATION MAP
PRE-DESIGN INVESTIGATION WORK PLAN
SUPERIOR, WISCONSIN

Date: NOVEMBER 2019	Revision Date:	
Drawn By: DAT	Checked By: HLH	Project: 18S024

Path: Q:\Superior Water Light and Power\18s024\GIS\mxd\Pre Design Investigation\Figure 1 Site Location Map.mxd Date: 11/13/2019



NOTES:

1. 2016 - 3" resolution air photo from Douglas County.
2. Horizontal coordinate system: NAD 1983 Douglas County, units in feet.
3. Parcels supplied by Douglas County GIS.

LEGEND

- Owned by Superior Water, Light & Power
- Railroad
- Tax Parcel
- Approximate Site Boundary

DRAFT

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SW L&P

Foth

N

0 100 200 Feet

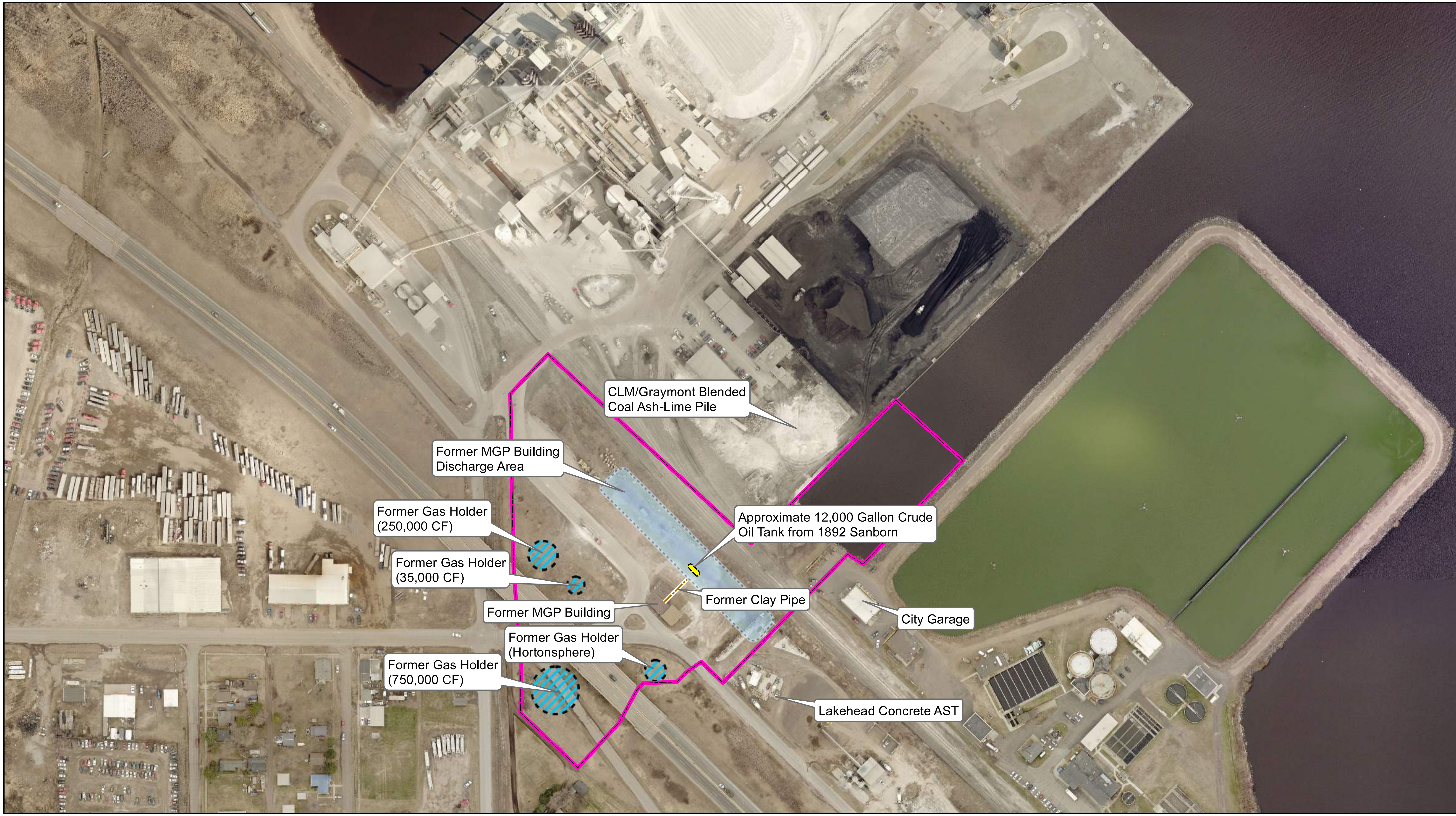
SUPERIOR WATER, LIGHT & POWER

FIGURE 2

PROPERTY OWNERSHIP
PRE-DESIGN INVESTIGATION WORK PLAN
SUPERIOR, WISCONSIN

Date: NOVEMBER 2019	Revision Date:	
Drawn By: DAT	Checked By: HLH	Project: 18S024

Path: Q:\Superior Water Light and Power\18s024\GIS\mxd\Pre Design Investigation\Figure 2 Property Ownership Map.mxd Date: 11/13/2019



NOTES:

1. 2016 - 3" resolution air photo from Douglas County.
2. Horizontal coordinate system: NAD 1983 Douglas County, units in feet.
3. Pond from Chart of Harbor at Duluth, Minn. and Superior, Wis. / Prepared Under the Direction of Major W.L. Fisk, USACE
4. Former 12,000 Gallon Crude Oil Tank from 1892 Sanborn.

LEGEND

- Former 12,000 Gallon Crude Oil Tank
- Approximate Site Boundary
- Former Clay Pipe
- Former MGP Building Discharge Area
- Former Gas Holders

DRAFT

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SWL&P

Foth

N

0 100 200 Feet

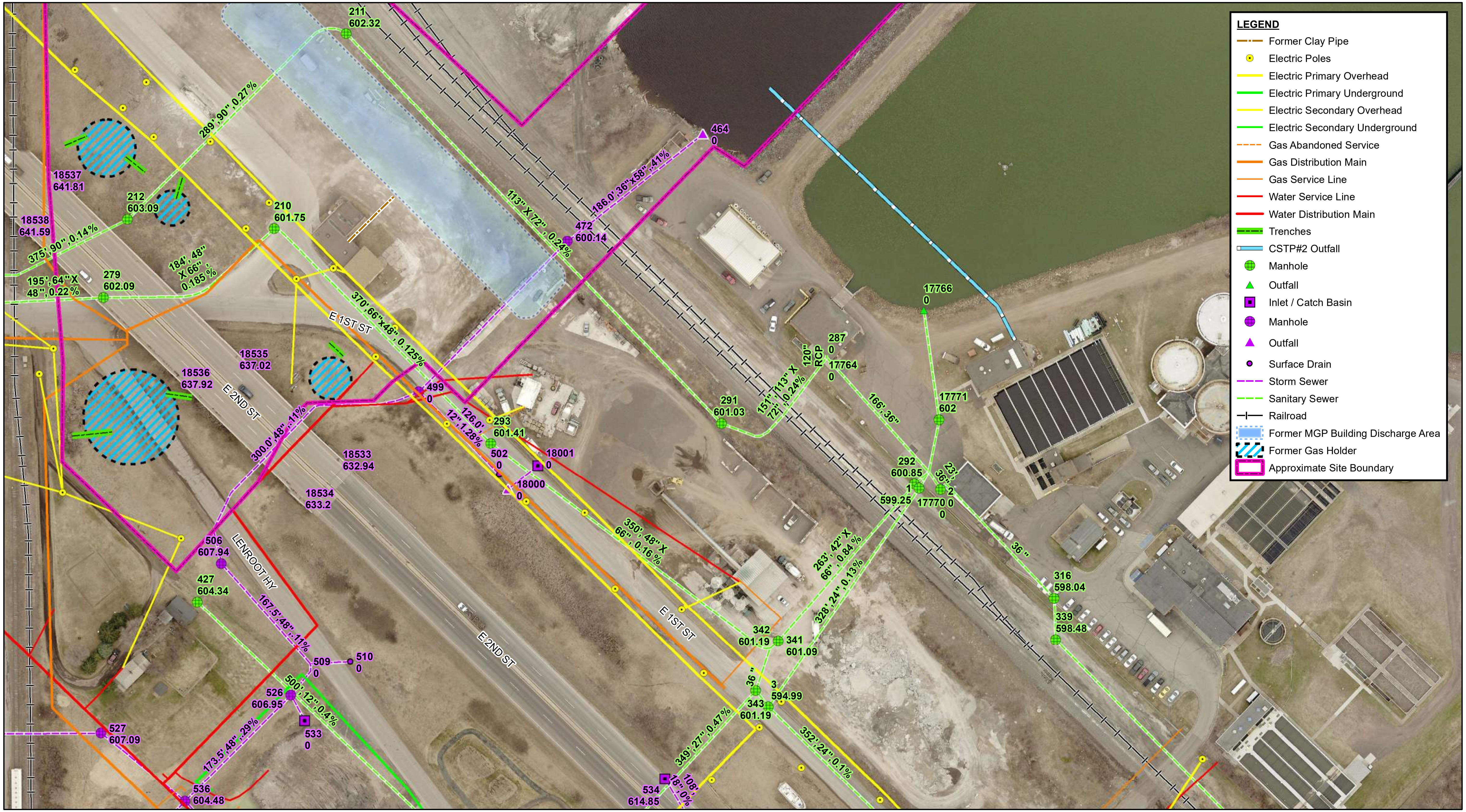
SUPERIOR WATER, LIGHT & POWER

FIGURE 3

HISTORICAL PLANT LAYOUT
PRE-DESIGN INVESTIGATION WORK PLAN
SUPERIOR, WISCONSIN

Date: NOVEMBER 2019	Revision Date:
Drawn By: DAT	Checked By: HLH	Project: 18S024

Path: Q:\Superior Water Light and Power\18s024\GIS\mxd\Pre Design Investigation\Figure 3 Historical Plant Layout Map.mxd Date: 11/14/2019



NOTES:

1. 2016 - 3" resolution air photo from Douglas County.
2. Horizontal coordinate system: NAD 1983 Douglas County, units in feet.
3. Storm and Sanitary Sewer data supplied by Douglas County GIS.
4. Electric, Gas and Water datasets supplied by Superior Water, Light and Power.

DRAFT

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SW L&P

Foth

0 50 100 Feet

N

SUPERIOR WATER, LIGHT & POWER

FIGURE 4

VICINITY SEWER AND UTILITY MAP
PRE-DESIGN INVESTIGATION WORK PLAN
SUPERIOR, WISCONSIN

Date: NOVEMBER 2019	Revision Date:	
Drawn By: DAT	Checked By: HLH	Project: 18S024

Path: Q:\Superior Water Light and Power\18s024\GIS\mxd\Pre Design Investigation\Figure 4 Vicinity Sewer and Utility Map.mxd Date: 11/13/2019

NOTES:

1. 2016 - 3" resolution air photo from Douglas County.
2. Horizontal coordinate system: NAD 1983 Douglas County, units in feet.

This drawing is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only.

LEGEND

- Bathymetric Survey Area (5.1 Acres)
- Toe of WWTP Berm
- Outfall
- Storm Sewer
- Sanitary Sewer
- Railroad
- Discharge Pipe
- Approximate Site Boundary

DRAFT

SW L&P

Foth

N

0 60 120 Feet

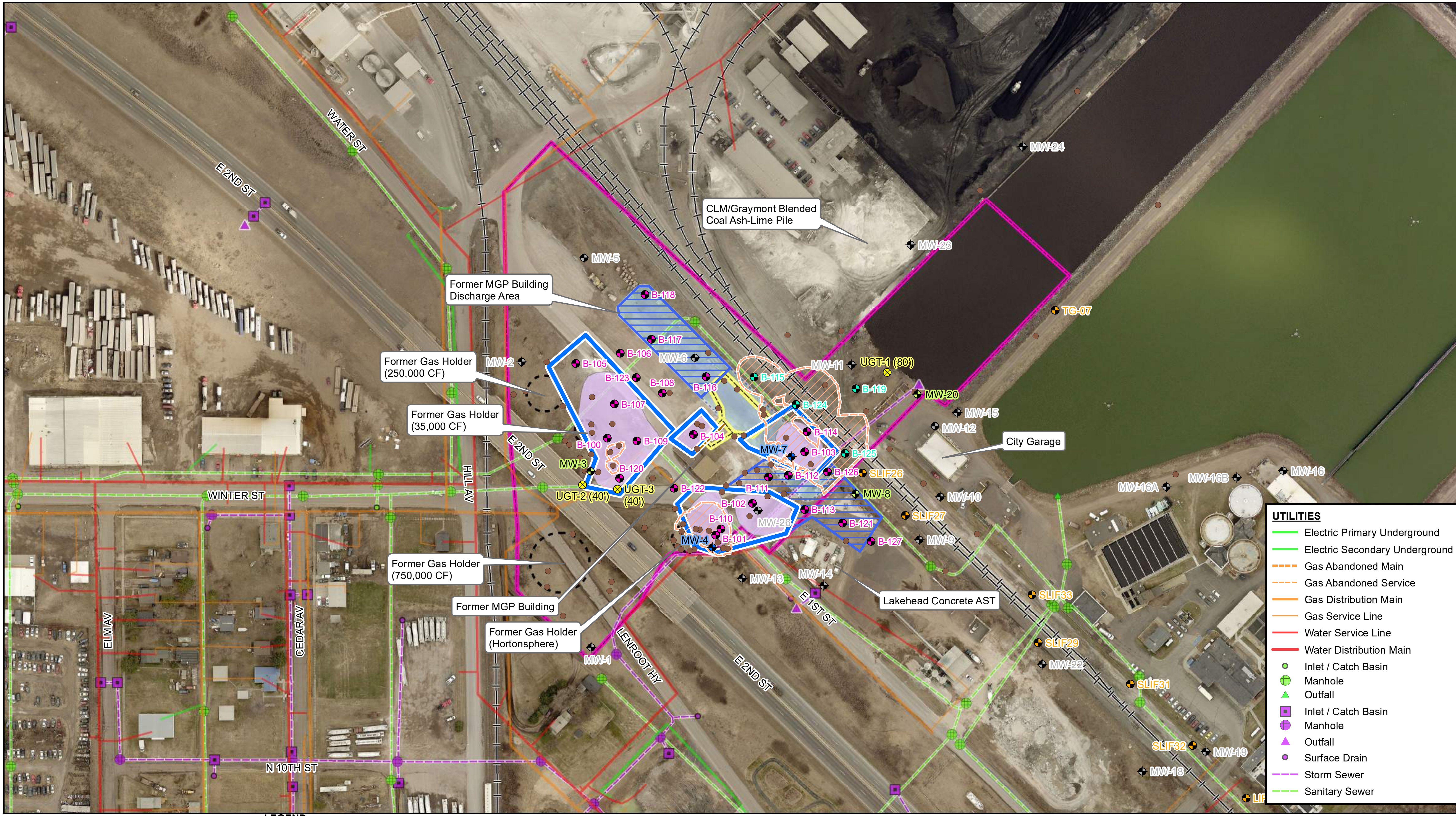
SUPERIOR WATER, LIGHT & POWER

FIGURE 5

BATHYMETRIC SURVEY EXTENT
PRE-DESIGN INVESTIGATION WORK PLAN
SUPERIOR, WISCONSIN

Date: NOVEMBER 2019	Revision Date:	
Drawn By: DAT	Checked By: ECH1	Project: 18S024

Path: Q:\Superior Water Light and Power\18s024\GIS\mxd\Pre Design Investigation\Figure 5 Bathymetric Survey Extent.mxd Date: 11/13/2019



NOTES:

1. 2016 - 3" resolution air photo from Douglas County.
2. Horizontal coordinate system: NAD 1983 Douglas County, units in feet.
3. ND = No Detect
4. MNA = Monitored natural attenuation parameters
5. VOCs = Volatile organic compounds

This drawing is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only.

LEGEND

- Proposed Upland Geotechnical Borings
- Existing Monitoring Wells - Not Sampled
- Existing Monitoring Wells - Proposed for VOCs, MNA
- Existing Monitoring Wells - Proposed for VOCs, MNA & microbial
- Proposed LIF offset soil boring locations (15' Deep)
- Proposed Head of Boat Slip Soil Borings (20' Deep)
- Proposed Excavation Area Soil Boring Locations (20' Deep)
- Historical Soil Sample Location
- Former Clay Pipe
- Soil with benzene between 10 and 100 ppm
- Railroad
- Former MGP Building Discharge Area
- Approximate 2008 Remedial Excavation
- Former Gas Holders
- Proposed Remedial Excavation and Amendment Areas
- Additional Investigation
- Remediation Area
- Approximate Site Boundary

DRAFT

SWL&P

Foth

0 80 160 Feet

N

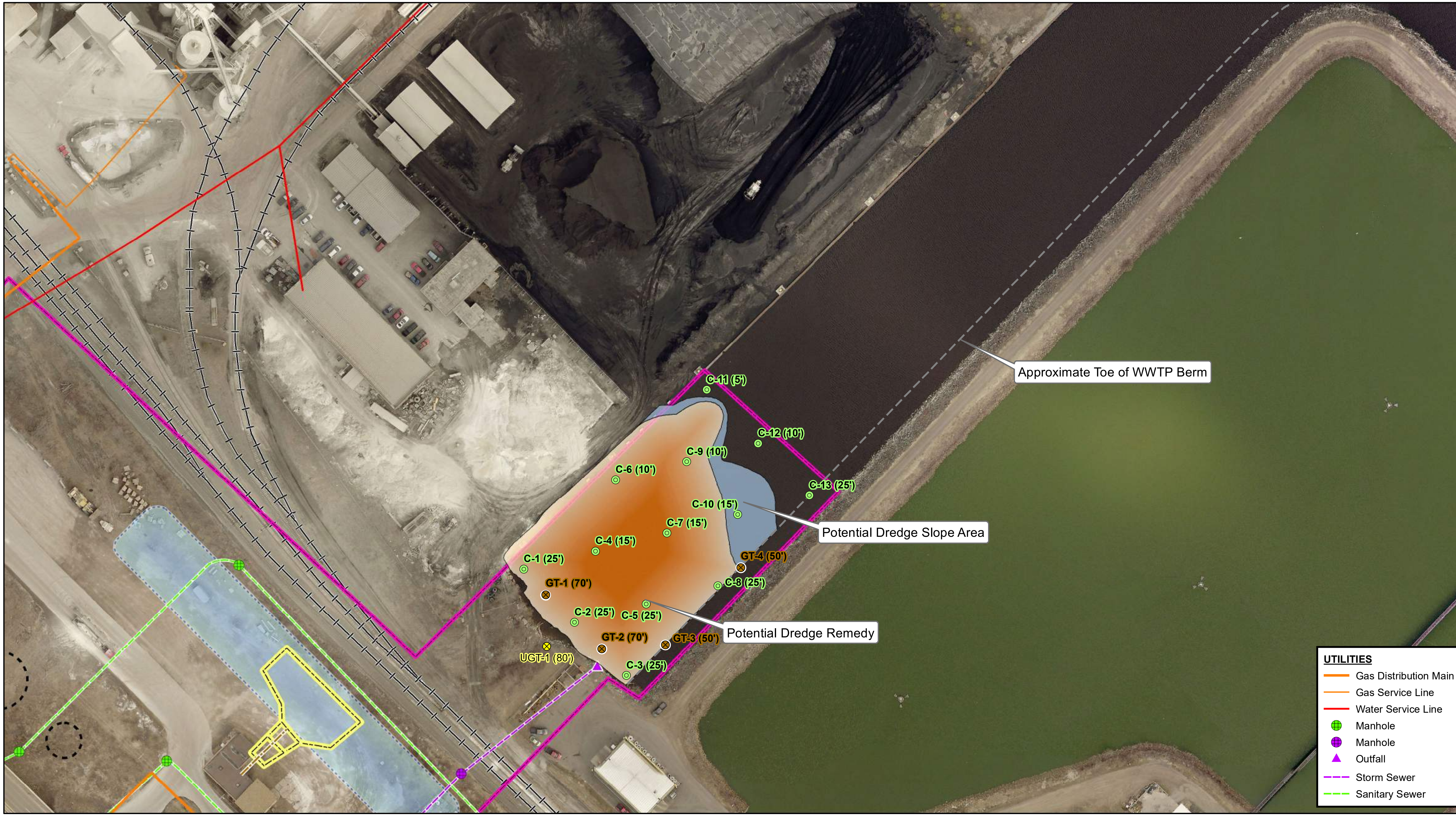
SUPERIOR WATER, LIGHT & POWER

FIGURE 6

UPLAND INVESTIGATION LOCATIONS
PRE-DESIGN INVESTIGATION WORK PLAN
SUPERIOR, WISCONSIN

Date: NOVEMBER 2019	Revision Date:	
Drawn By: DAT	Checked By: BCH	Project: 18S024

Path: Q:\Superior Water Light and Power\18s024\GIS\mxd\Pre Design Investigation\Figure 6 Upland Investigation.mxd Date: 11/26/2019



NOTES:

1. 2016 - 3" resolution air photo from Douglas County.
2. Horizontal coordinate system: NAD 1983 Douglas County, units in feet.
3. Each Environmental Sediment Cores will be advanced approximately 2-feet into the Miller Creek Clay. Maximum anticipated core depths are labeled.

This drawing is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only.

LEGEND

Proposed Pre-Design Investigation Sample Location

- Proposed Environmental Sediment Cores (Maximum Boring Depth, feet)[3]
- Proposed Geotechnical Sediment Cores
- Proposed Upland Geotechnical Borings
- Potential Dredge Slope Area
- Potential Dredge Remedy
- Former MGP Building Discharge Area
- Approximate 2008 Remedial Excavation
- Former Gas Holders
- Former Clay Pipe
- Railroad
- Toe of WWTP Berm
- Approximate Site Boundary

DRAFT

SWL&P

Foth

N

0 50 100 Feet

SUPERIOR WATER, LIGHT & POWER

FIGURE 7

SEDIMENT INVESTIGATION LOCATIONS
PRE-DESIGN INVESTIGATION WORK PLAN
SUPERIOR, WISCONSIN

Date: OCTOBER 2019	Revision Date:

Drawn By: DAT	Checked By: BCH	Project: 18S024

Path: Q:\Superior Water Light and Power\18s024\GIS\mxd\Pre Design Investigation\Figure 7 Sediment Investigation.mxd Date: 11/26/2019

Appendix A

Subcontractor's Bid Specifications

Appendix B

Quality Assurance Project Plan

Appendix C

Foth Standard Operating Procedures

Appendix D

Field Forms

Appendix E

Health and Safety Plan