Proposed Plan for Soil and Groundwater Cleanup at the Wisconsin Public Service Corporation Marinette Former Manufactured Gas Plant Superfund Alternative Site Marinette, Wisconsin realignment

Date: July 2024

Community Participation

EPA and Wisconsin DNR provide information regarding the Wisconsin Public Service Corporation Marinette Former Manufactured Gas Plant Superfund Alternative Site to the community by participating in established community meetings, maintaining an Administrative Record for the Site, and publishing announcements in the *Marinette and Menominee Eagle Herald*. Through these means, EPA and Wisconsin DNR encourage the public to gain a more comprehensive understanding of the Superfund activities that have been conducted at the Site. Site information can also be found on EPA Region 5's website at: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0509952.

EPA maintains the Site Administrative Record, which contains the information EPA used to develop the proposed Site remedy, at the following locations:

Stephenson Public Library	EPA Region 5
1700 Hall Avenue	77 W. Jackson St.
Marinette, Wisconsin	7th Floor Records Center
Hours: 9AM – 6PM	Chicago, Illinois
(715) 732-7570	M-F 8AM to 4PM

EPA will accept written comments on the WPSC Marinette MGP Site's Proposed Plan during the public comment period, which **runs for a total of 30 days, from July 17-August 16, 2024.** Written comments may be sent to the following address:

Karen Chen
Community Involvement Coordinator
United States Environmental Protection Agency
Mail Code RE-19J
77 W. Jackson Blvd. Chicago, IL 60604

A. INTRODUCTION

The purpose of this Proposed Plan is to: (1) provide background information regarding the Wisconsin Public Service Corporation Marinette Manufactured Gas Plant (MGP) Superfund Alternative Site (WPSC Marinette MGP or "the Site") (2) provide information on the need to amend the selected remedy in the 2017 Record of Decision (ROD); (3) describe the various cleanup alternatives considered for cleaning up non-aqueous phase liquid (NAPL) and polycyclic aromatic hydrocarbon (PAH) contamination in the soil and groundwater at the WPSC Marinette MGP Site; (4) identify U.S. Environmental Protection Agency's (EPA's) preferred cleanup alternative for the Site and explain the reasons for that preference; and (5) solicit public review of and comment on the alternatives evaluated.

This document is issued by EPA, the lead agency for Site activities. The Wisconsin Department of Natural Resources (WDNR) is the support agency. EPA, in consultation with WDNR, will select a final remedy for WPSC Marinette MGP Site after considering all comments submitted during a 30-day public comment period.

EPA encourages the public to review and comment on this Proposed Plan.

EPA's decision on the amended remedy for WPSC Marinette MGP Site will be announced in local newspaper notices and presented in an EPA document called a Record of Decision (ROD) Amendment.

EPA's final cleanup decision for the Site could differ from the preferred alternative in this Proposed Plan depending on information or comments EPA receives during the public comment period, so it is important for the public to comment on all of the cleanup alternatives discussed in this document.

In 2017 EPA selected a remedy to treat NAPL- and PAH-contaminated soil, which constitutes the principal threat waste at the Site. The remedy consisted of excavation and off-site disposal of accessible source material located within the Boom Landing Source Area (BLSA) and the waste water treatment plant (WWTP) Zone; installation of horizontal engineered barriers over surficial soil exceeding preliminary remediation goals (PRGs); in-situ treatment of affected groundwater; effectiveness monitoring of the existing reactive core mat (RCM) and dredge inventory remaining after the Non-time Critical Removal Action (NTCRA); and implementation of institutional controls (ICs) to manage remaining potential soil, groundwater, soil gas, and sediment risks.

As described in more detail later in this Proposed Plan, EPA is proposing to amend the remedy selected in the 2017 ROD for the Waste Water Treatment Plant (WWTP) North Source Area (NSA) and the Boom Landing Source Area (BLSA) because a Preliminary Design Investigation (PDI) conducted for the Remedial Design led to the discovery of additional contaminants at deeper levels that could no longer be safely excavated.

EPA is proposing the following alternatives for each source area: Alternative 4 in the WWTP NSA; Alternative 2 for the BLSA; and Alternative 2 for the areas within the WWTP NSA and BLSA that cannot be excavated safely now referred to as the Inaccessible Source Areas (ISA). These proposed alternatives will remediate non-aqueous phase liquid (NAPL) and polycyclic aromatic hydrocarbon (PAH) contamination in the soil and groundwater. Alternative 4 for the WWTP NSA and Alternative 2 for the BLSA use in-situ stabilization (ISS). ISS will treat accessible MGP source material in soils at Boom Landing and the WWTP zones that are the primary contributors to the dissolved-phase plume. Alternative 4 and Alternative 2 also call for the maintaining of existing pavement and building slabs, installation of a soil barrier, and soil institutional controls (ICs). Alternative 2 for the ISA will use ICs in the form of Continuing Obligations (COs) and horizontal barriers. This Proposed Plan does not address the remedies for non-source soil, soil vapor, and sediment, which were selected in the 2017 ROD and will remain unchanged.

The proposed measures to remediate the contaminated soil and groundwater at the WPSC Marinette MGP Site would be protective of human health and the environment, would meet applicable or relevant and appropriate requirements (ARARs), would be cost-effective, and would be effective in the long-term.

EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) 42 U.S.C. § 9617(a); 40 C.F.R. § 300.430(f)(2).

This Proposed Plan summarizes information that can be found in greater detail in the Remedial Investigation (RI) Report and the Feasibility Study (FS) Report, the Focused Feasibility Study (FFS), and other documents contained in the Administrative Record file. EPA and WDNR encourage the public to review these documents to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted at the Site to date.

The remedial alternatives that EPA evaluated for the surface soil, subsurface soil, and groundwater contamination at the Site are detailed in the FFS report. The evaluated remedial alternatives are listed in Table 1, below. Each of the active remedies evaluated also include long-term monitoring (LTM) and ICs in the form of COs to prevent future exposures to contaminated soil and groundwater.

Table 1: Site Remedial Alternatives

Media/Location	Alternative Number	Alternative Title
WWTP North Source Area	1	No Further Action
	2	In-situ Geochemical Stabilization; Horizontal Engineered Barriers
	3	Aerobic Bioremediation
	4	In-situ Stabilization; Groundwater Drainage Vent with Reactive Media
	5	Excavation; In-situ Groundwater Treatment; Passive Dense NAPL (DNAPL) Recovery
Boom Landing Source Area	1	No Further Action
	2	In-situ Stabilization; Groundwater Drainage Vent with Reactive Media; Passive DNAPL Recovery
	3	Excavation; Passive DNAPL Recovery
Inaccessible Source Material Areas	1	No Further Action
	2	Horizontal Engineered Barriers

B. SITE BACKGROUND

1. Site Location and Description

The Site is composed of 19 acres, delineated as the former MGP property and the upland portion of the Site. The 4-acre former Marinette MGP facility property is currently owned by the City of Marinette (City) and 1428 Main Street Holdings (Figure 1). The 1428 Main Street Holdings property was previously owned by Goodwill Industries.

Currently, the City operates a WWTP at the facility property. The portion of the former MGP facility located on the 1428 Main Street Holdings property is currently a parking lot for the commercial building located on the property. The former MGP facility property is within 700 feet of the Menominee River. It is bounded on the north by Mann Street and railroad tracks, on the southwest by Ludington Street, and on the southeast by Ely Street (Figure 2).

The approximate area of the upland portion of the Site, illustrated in Figure 2, is 15 acres and includes properties owned by WPSC (now Wisconsin Energy Corporation or WEC), Canadian National Railroad, Marinette Central Broadcasting, and the City, which owns Boom Landing, the WWTP, the Fire Station, and City rights-of-way. The upland portion of the Site is primarily located within heavy manufacturing and park districts; however, small portions of the Site also fall within community business and waterfront overlay districts. Most of the upland portion of the Site is covered with pavement, buildings, or manicured lawns.

The City has constructed a public boat launch (Boom Landing) along the Menominee River adjacent to the former MGP property where a former slough/log-run had passed through the property. The boat landing is located approximately 2 miles west from the mouth of Lake Michigan. The Menominee River, which separates Wisconsin from Michigan's Upper Peninsula, is a gaining stream that receives groundwater and surface water from the Marinette area and discharges into Lake Michigan. According to the bathymetric surveys, water depths near the Site range from 1 to 20 feet. The river is nearly 1,075 feet wide near the Site. Because of Site proximity to the river, there is a likelihood of flooding into the Boom Landing portion of the Site. There could be additional climate change impacts; however, flooding is the most likely impact.

Residential structures are located two blocks away. Based on EPA's environmental justice (EJ) screening tool, EJ Screen, the communities within the surrounding area have a high potential for EJ concerns. Within a 0.5-mile radius of the Site, the population is in the 80th percentile for low income, less than high school education, and over the age of 64 compared to the rest of the country and/or state.

2. Site History

This section of the Proposed Plan provides the history of the Site and briefly discusses the various investigations that have been conducted at the Site.

MGPs were industrial facilities that were found in most sizable towns or cities in the U.S. from the 1820s to right after World War II (WWII). MGPs heated coal in large industrial ovens to produce manufactured gas used for street and home lighting, heating, and cooking.

After the war, natural gas use replaced manufactured gas use because it was abundant, lower priced, and overall cleaner for the environment. Some MGPs continued to operate after WWII, and most ceased operations by the 1960s and were torn down. Typically, the aboveground structures, such as buildings, tar/oil tanks, and storage sheds, were demolished and the foundations were backfilled, leaving hardly any visible traces of the former operations. Below ground structures such as traces of underground piping and storage tanks, along with residual contaminants, were often left behind.

The former Marinette MGP facility was constructed between 1901 and 1910 and operated through 1960. Prior to 1903, the Marinette Lighting Company owned the former MGP property. In 1903, electric and gas utilities in Marinette, Wisconsin, and Menominee, Michigan, were merged to form the Menominee and Marinette Light and Traction Company. In 1922, WPSC (now WEC) acquired control of the Menominee and Marinette Light and Traction Company and operated it as a wholly owned subsidiary. In 1953, the subsidiary was merged with the parent company and the potentially responsible party (PRP) responsible for the cleanup of the Site is WPSC under WEC. In 1962, the former MGP property was sold to the City of Marinette under a land contract. The City subsequently used the property to expand the WWTP facilities.

Coal gas production from construction of the facility to 1928 involved heating and volatilizing coal in an airtight chamber (retort). At retort temperatures (about 2,200 degrees Fahrenheit [^{o}F]), the coal decomposed into gas and tar. The gas was then passed through a purifier to remove impurities such as sulfur, carbon dioxide, cyanide, and ammonia. Dry purifiers used trays and sieves containing lime or hydrated iron oxide mixed with wood chips. The gas was then stored in large holders at the facility prior to distribution for lighting and heating.

Coal gas production from 1928 to 1960 used the carbureted water gas (CWG) process. This process involved passing air and steam over incandescent coal in a brick-filled vessel to form a combustible gas, which was then enriched by squirting a fine mist of oil over the bricks. The gas was then purified and stored in holders prior to distribution. In 1948, propane was introduced as a fuel and used in combination with CWG to meet the demand for gas for space heating. Natural gas pipelines subsequently replaced the need for propane and manufactured gas, and the MGP in Marinette ceased operation in 1960.

Coal tar was a byproduct of the coal gas production at the Site. Coal tar was a valuable commodity and typically sold as a chemical feedstock and for wood treatment; the timber industry thrived in the Marinette area. Based on the location of the tar tanks adjacent to the railroad tracks, it is reasonable to presume that a significant amount of tar produced at the MGP facility was shipped off-site.

The City's WWTP was originally constructed east of the former slough/log-run in 1938 and was expanded twice—approximately in 1945 and again in 1952. When the City purchased the former MGP property in 1962, it expanded the WWTP again in 1972 and 1989 to its current size.

3. Environmental Investigations and Response Actions

WPSC's (now WEC's) contractor, NRT (now Ramboll), issued a 2009 Completion Report that contains a full bibliography of the reports and summaries issued for the Site. The Completion Report can be found in the Administrative Record (AR). A summary of sampling events includes the following:

- 1989 and 1991: The City of Marinette encountered MGP-affected soils during the 1989 WWTP expansion, which led the City to contact WDNR regarding its findings and conduct a soil investigation. Approximately 9,700 tons of affected soil, identified through visual and olfactory evidence only, were excavated and disposed of by the City at a licensed landfill.
- 1992: A more complete Site investigation conducted by Robert E. Lee & Associates, Inc.
- 1994: NRT (now Ramboll) performed soil and groundwater sampling to determine lateral and vertical extent of contamination in those media.
- 1996: NRT (now Ramboll) conducted a Phase II investigation, including more soil borings and additional monitoring well installation.
- 2002: NRT (now Ramboll) conducted groundwater sampling and assessment of the municipal water source.
- 2004: NRT (now Ramboll) sampled soil and installed monitoring wells in the proposed boat-launch expansion area and along the former slough.
- 2011: Ambient sediment sampling that included poling, surface water sampling, and river bathymetry in preparation for the Non-Time Critical Removal Action (NTCRA).
- 2012: Remaining sediment sampling prior to removal action.
- 2012: Conduct upland RI fieldwork, including soil borings, installation of monitoring wells, and installation and sampling of soil gas probes.
- 2013-2015: NRT (now Ramboll) resumed semiannual groundwater monitoring efforts.
- 2012-2014: Seasonal soil vapor sampling.
- 2014: Supplemental upland RI fieldwork.
- April 2013-2015: Monitoring of the residual sand cover placed on sediment during the NTCRA.
- September 2017: Record of Decision (being amended by this upcoming decision document)
- 2019-2020: Preliminary Design Investigation (PDI) for Remedial Design led to the discovery of additional contaminants at deeper levels that could no longer be safely excavated.

In addition to the 1989 soil removal, in June 2004, the City began another sewer expansion project requiring additional excavation of soils on the former MGP property. Approximately 1,030 tons of MGP-affected soil were excavated and disposed of at an appropriate landfill.

From October 2012 through March 2013, WPSC (now WEC) conducted a NTCRA under EPA oversight and removed approximately 14,799 cubic yards (CY) of MGP-impacted sediments down to 22.8 parts per million [ppm or milligrams per kilogram (mg/kg)] Total (13) PAHs.

An additional 422 CY were removed for navigational purposes as part of an access agreement between WPSC (now WEC) and the Nestegg Marine, an adjacent property.

The removal action objective was to mechanically excavate contaminated sediments in areas with total PAH concentrations above the remedial action level (RAL) of 22.8 ppm or visual NAPL. The value 22.8 ppm was selected because it is WDNR's probable effects cause (PEC) at which PAHs impact microorganisms (Figure 3). Over the majority of the NTCRA area, post-dredge verification samples indicated that the remaining sediments contained Total (13) PAH concentrations less than 22.8 ppm and no visual NAPL remained.

Despite multiple attempts by the contractor, there were a few areas where sediment on the uneven bedrock surface could not be fully removed. This was due to multiple factors such as irregularity of the bedrock surface and the size and type of equipment used.

Consequently, a total of approximately 12,250 square feet (ft^2) of sand (residual sand cover) with a minimum thickness of 10 inches was placed in areas where post-dredge verification samples showed residual Total (13) PAH concentrations greater than 22.8 ppm. Monitoring of the residual sand cover is discussed in the following paragraphs with other sediment sample collection and results.

Dredging progressed upland into the shoreline in areas where NAPL was observed to be present. Due to upland land use and associated space constraints, not all upland NAPL was able to be removed. Consequently, reactive core mat (RCM) was placed along the shoreline in these areas to prevent future migration of upland NAPL into the river. This RCM extends out onto the riverbed from the shoreline and covers some of the residual sediments on the irregular bedrock surface with concentrations of Total (13) PAH greater than 22.8 ppm. Upland dredging/excavation required removal and replacement of an existing sewer outfall structure on the shoreline. In this area, RCM was placed on the side slope of the upland excavation prior to backfill to prevent contamination of clean backfill adjacent to the replacement outfall structure.

Sediment removed from the river was mixed with stabilization additives on a geomembrane-lined, asphalt pad before being transported to Waste Management's Menominee, Michigan, Landfill for disposal. Debris encountered during dredging activities and from removal of the former outfall structure was also disposed of at the aforementioned landfill under a separate waste profile. Sediment contact water collected at the stabilization pad was treated on a batch basis with an on-site treatment system in accordance with the substantive requirements of the Wisconsin Pollution Discharge Elimination System (WPDES).

4. Remedial Investigation/Feasibility Study (RI/FS)

In August 2006, EPA and WPSC (now WEC) entered into an Administrative Order on Consent that required WPSC (now WEC) to conduct an RI/FS at the WPSC Marinette former MGP Site in Marinette. WPSC (now WEC) completed the RI report on January 22, 2014 and completed the

FS report on June 26, 2017. After EPA issued the 2017 ROD, WPSC (now WEC) conducted a PDI based on the selected remedy of excavation. The PDI findings identified significant Site constraints beyond those known when developing the EPA-approved FS. In addition, the PDI identified greater volumes of source material impacts adjacent to critical infrastructure. Therefore, EPA and WPSC (now WEC) agreed that a post-PDI evaluation of the source material remedy was warranted and that no changes to the remedies for non-source soil, soil vapor, and sediment selected in the ROD (EPA, 2017) were warranted.

The 2017 ROD-selected groundwater remedy included a one-time application of chemical oxidant in the base of excavations prior to backfilling. The limits of groundwater impacts were also further defined as part of the PDI; therefore, a modification to the groundwater remedy may be warranted in consideration of a potential change to the source area remedy.

With the PDI information, it was clear that excavation would not be a safe alternative at the WWTP. Therefore, EPA had WPSC (now WEC) perform a Focused Feasibility Study (FFS) to determine an array of safe remedial alternatives at the Site's WWTP NSA. The FFS was completed on March 17, 2023. EPA has placed all three reports into the Site Administrative Record.

5. Public Participation Activities

Since 2006, EPA has conducted community interviews, created and implemented a community involvement plan, and participated in a public meeting to present the alternative selected for the NTCRA of NAPL in sediments and near-shore soils. In 2017, EPA conducted another public meeting to present the preferred alternative for principle treat wastes, non-source soil, soil vapor, and sediment that was ultimately included in the 2017 ROD. EPA issued a response summary to the public comments received.

C. SITE CHARACTERISTICS

This section of the Proposed Plan summarizes the physical characteristics and the nature and extent of contamination at the WPSC Marinette MGP Site. The significant findings and conclusions from the site characterization activities completed during the RI are summarized below. Additional details are available in the WPSC Marinette MGP Site RI Report.

1. Physical Characteristics

The regional geology of Marinette consists of sedimentary deposits with unconsolidated deposits over the top. Fill is encountered on top of these unconsolidated deposits, at or near the surface over much of the Site. At locations in or adjacent to the former slough, the fill layer is as great as 18 feet thick.

The fill material typically consists of fine sands with discontinuous clay, silt, and gravel.

Glass, wood, brick, and concrete were also found, especially in the area of the former slough and the former MGP building locations. Within the former slough, the fill was often black in color and occasionally exhibited strong odors. In the vicinity of the former MGP facility, the fill material consists of fine sand, silt, and clay with occasional bedrock fragments and the aforementioned debris.

The Wisconsin-Lake Michigan basin contains three main aquifers, the unlithified sand and gravel aquifer, the Niagara dolomite aquifer, and the Cambrian sandstone aquifer. The sand and gravel glacial alluvium in the basin is a significant source of water. Generally, groundwater flow in the Niagara and Cambrian aquifers is north, northeast toward Lake Michigan. Recharge to the aquifers is local, and paths of movement are short.

The Site groundwater is monitored in three different zones including the shallow sand wells screened at 580 feet elevation above mean sea-level (amsl), deep sand wells screened at 555 feet amsl to monitor the deep sand above bedrock, and the bedrock wells screened at 525 feet amsl to monitor the shallow bedrock.

2. Regional Setting, Demography, and Land Use

- Marinette is located in northeast Wisconsin and is separated from Menominee in the Upper Peninsula of Michigan, by the Menominee River.
- Marinette County, Wisconsin encompasses approximately 1,402 square miles of area, with agricultural land use being the dominant classification.
- The population of Marinette County is 41,872 people (2020 Census). The greatest concentrations of people are located in and around the City of Marinette.
- The City of Marinette encompasses approximately 8 square miles and has a population of approximately 11,119 people (2020 Census). The City of Marinette has a mixture of agricultural, residential, and industrial land use, with residential use being dominant.
- The land around the former MGP facility has been zoned for residential, commercial/industrial (including communications/utilities and governmental/institutional), and park district uses. According to the Marinette City Assessor's Public Assess website for Marinette, the former MGP facility is zoned as communications/utilities use. Most of the land surrounding the former MGP facility is zoned as heavy manufacturing or business district. Residential zoning can be found to the east/northeast across the street from the WWTP on the corner of Mann Street and Ludington Street. Additional residential zoning is located approximately a block away to the south and southeast along Main Street. This zoning information was obtained through the Bay Lakes Regional Planning Commission GIS website and the August 3, 2009, City of Marinette zoning map. The current land use is also the reasonably anticipated future land use.
- As discussed above, groundwater is not used as a drinking water source for the City of Marinette. The City collects surface water from intake pipes located on the Green Bay to supply potable water.

3. Ecology

The WPSC Marinette MGP Site is located in the northern Lake Michigan coastal ecoregion. This ecoregion encompasses 2,004 square miles (1,282,877 acres) in Marinette, Oconto, Shawano, and Door counties and represents 3.6 percent (%) of the area of the state of Wisconsin. Historically, the uplands were almost entirely covered by maple-basswood and aspen-birch forests. Today, more than 64% is now un-forested with 51% covered by agricultural crops, 6% grassland, 6% non-forested wetlands, 0.1% shrubland, and 1% urbanized areas. A review of the Natural Heritage Inventory Database for and within one mile of the Site resulted in the identification of a federally protected bird species. However, the identified bird species is located a significant distance from the former MGP Site and the species will not be adversely affected from projected Site activities. No other state or federally threatened or endangered species were identified. Additionally, no documented wetlands were identified.

4. Climate

The Site is located in northeast Wisconsin, which has a continental climate characterized by moderate winters and warm summers. Cold winters and warm summers are moderated by the thermal mass of Lake Michigan. Climate conditions for the Marinette area were gathered at Weather Station 475091 of the Wisconsin State Climatology office website. The weather station is located at latitude 45°5' North, longitude 87°38' West, elevation 610 feet amsl, in Marinette County, Wisconsin.

5. Geology

The regional geology of Marinette consists of sedimentary deposits with unconsolidated deposits over the top. Fill is encountered on top of these unconsolidated deposits, at or near the surface over much of the Site. Glacial till deposits were found below the fill.
The glacial deposits consist of fine sand, silt, and clay and may inhibit the movement of NAPL and/or groundwater. Bedrock occurs approximately 20 feet below ground surface (bgs) and appears to slope towards the Menominee River.

6. Hydrogeology

Four aquifer systems have been identified in the Marinette area (Oakes and Hamilton, 1973). These aquifers are: 1) the sand-and-gravel aquifer of the unconsolidated glacial deposits; 2) the Galena-Platteville aquifer; 3) the sandstone aquifer of the Ordovician and Cambrian bedrock; and 4) the crystalline bedrock aquifer. The sand and gravel aquifer is very thin and produces less than 100 gallons per minute in the southern portion of Marinette County.
Generally, groundwater flow in the Quaternary sand and gravel is toward rivers and streams eventually discharging into Green Bay (Lake Michigan). Recharge is local from precipitation and surface water bodies.

The Site groundwater is monitored in three different zones including the shallow sand wells screened at 580 feet elevation, deep sand wells screened at 555 feet to monitor the deep sand above bedrock, and the bedrock wells screened at 525 feet and monitor the shallow bedrock.

D. NATURE AND EXTENT OF CONTAMINATION

This section summarizes the nature and extent of contamination in the soil, groundwater, and sediments of the Site.

1. Soil and Groundwater Sampling Summary

As discussed above, from 1989 to 2015 there were significant Site-wide sampling efforts. The investigations included sampling soil, groundwater, soil gas probes for total PAHs, semi-volatile organic compounds like benzene, toluene, ethylbenzene, and xylene, and metals.

2. Sediment and Surface Water

Sediments are defined as materials collected in areas with standing water. The spatial distribution of PAHs in the Site has been influenced by historical changes in the water level elevation associated with the former log-run/slough and geomorphology in this segment of the Menominee River.

Detailed discussions of the PAH concentrations in sediment are included in the NTCRA Completion Report and the RI Report. The majority of MGP-wastes from the sediment and near-shore areas were addressed by the NTCRA. The NTCRA cleanup value was WDNR's PEC of 22.8 mg/kg Total (13) PAHs. Any areas in the Menominee River over 50 mg/kg Total PAHs received a 10-inch sand cover. Near-shore areas above 50 mg/kg were covered with a reactive core mat to prevent sediment recontamination.

If left unaddressed, it is possible for source material in soil and groundwater and MGP-related contaminants (NAPL) to migrate toward and into the remediated areas addressed during the NTCRA. Groundwater samples will be collected to ensure that site-related contaminants are not migrating into the remediated areas.

3. Conceptual Site Model

A conceptual site model (CSM) was developed for WPSC Marinette MGP Site based on Site characteristics and results from the RI investigations. The CSM tells the story of how and where the PAH and NAPL contamination moved and what impacts such movement may have had upon human health and the environment (Figure 4 and Figure 5).

As described in the CSM, NAPL and PAHs are the primary contaminants of concern (COCs). Site data shows that exposure to PAHs will drive risks at the Site, and that the management of risks due to PAH exposure will also address risks associated with other non-PAH constituents.

The media of concern at the Site are soil and groundwater (Figure 6). PAH-contaminated soil and groundwater both can lead to PAH exposure to future Site workers. The targeted remediation areas at the Site are soil and groundwater exceeding human health risk criteria.

4. Principal Threat Wastes

The principal threat concept is applied to the characterization of "source material" at a Superfund site. Source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contaminants to ground water, surface water or air, or acts as a source for direct exposure. EPA has defined principal threat wastes as those source materials considered to be highly toxic or highly mobile that generally cannot reliably be contained or would present a significant risk to human health or the environment should exposure occur.

EPA has identified NAPL in the subsurface soil as the principal threat waste at the WPSC Marinette MGP Site. Subsurface soil is defined as greater than or equal to, two feet in depth below ground surface, while surface soil is defined as less than or equal to, two feet in depth below ground surface. NAPL is considered source material that contains hazardous substances, pollutants, or contaminants that act as a reservoir for the migration of contaminants to groundwater.

The current Site-specific definition of principal threat waste/source material is defined as soil that meets one or more of the following metrics:
- NAPL identified as separated liquid.
- Oil-coated or oil-wetted soil.
- High concentrations of adsorbed phase COCs exceeding a lifetime incremental cancer risk (CR) of 10^{-3} or a hazard index (HI) of 10 under applicable, industrial land use assumptions.

The concentrations of PAHs at the Site are considered to be low-level threat wastes because they are not highly mobile.

E. SCOPE AND ROLE OF THE ACTION

This Proposed Plan consists of a sitewide remedy to address the remaining MGP contaminants, including NAPL and PAHs, at the WPSC Marinette former MGP Site. Following the 2012 NTCRA, which addressed contaminated sediment and near-shore contamination, this remedy addresses the remainder of the upland cleanup, as well as prescribes a long-term sediment monitoring routine to ensure the removal action adequately addressed sediment Site risks. These upland source materials constitute principal-threat wastes at the Site.
As explained above, this Proposed Plan does not address the remedies for non-source soil, soil vapor, and sediment, which were selected in the 2017 ROD and will remain unchanged.

F. SUMMARY OF SITE RISKS

This section summarizes the risks to human health and the environment that are posed by the contamination.

1. Contaminants of Concern

As described in the generalized CSM, PAHs are the primary COCs. The available data indicate that exposure to PAHs will drive risks at the Site, and that management of risks due to PAH exposure will also address risks associated with other non-PAH constituents.

2. Baseline Human Health Risk Assessment

The PRP's contractor, NRT (now Ramboll), completed the baseline human health risk assessment (HHRA) for the Site in 2014 as part of the RI. The HHRA evaluated potential current and future risks to people who may engage in recreational activities near the Menominee River.

Several potential exposure pathways were described in the 2014 HHRA that are relevant to the Site, as follows:

- Industrial or commercial workers
    - Incidental ingestion of soil (surface and subsurface)
    - Dermal contact with soil (surface and subsurface) as a result of soil disturbance
    - Inhalation of vapors and dusts as a result of soil disturbance
    - Inhalation of vapors as a result of vapor intrusion from subsurface soils and groundwater into commercial/industrial buildings on the Site
    - Ingestion of groundwater
    - Dermal contact with groundwater.
- Construction workers
    - Incidental ingestion of soil (surface and subsurface) and groundwater associated with excavation activities
    - Dermal contact with soil and groundwater associated with excavation activities
    - Inhalation of vapors and dust derived from soil and groundwater associated with excavation activities.
- Recreational visitors
    - Incidental ingestion of surface soil
    - Dermal contact with surface soil.
- Residents (under a hypothetical future land-use scenario, including the unlikely possibility of significant disturbance of subsurface soils)
    - Incidental ingestion of soil (surface and subsurface)
    - Dermal contact with soil (surface and subsurface) as a result of soil disturbance
    - Inhalation of vapors and dust as a result of soil disturbance
    - Inhalation of vapors as a result of vapor intrusion from subsurface soils and groundwater into a future residential building constructed on the Site.

HHRA Conclusions

The likelihood of any kind of cancer resulting from exposure to carcinogens at a Superfund site is generally expressed as an upper bound incremental probability, such as a "1 in 10,000 chance" (expressed as 1×10^{-4}). In other words, for every 10,000 people exposed to the site contaminants under reasonable maximum exposure conditions, one extra cancer may occur as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risk of cancer individuals face from other causes such as smoking or too much sun. The potential for non-cancer health effects is evaluated by comparing an exposure level over a specified time period (such as a lifetime) with a "reference dose" derived for a similar exposure period. A reference dose represents a level that is not expected to cause any harmful effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ less than (<) 1 indicates that the dose from an individual contaminant is less than the reference dose, so non-cancer health effects are unlikely. The hazard index (HI) is generated by adding the HQs for all COCs that affect the same target organ (such as the liver). An HI < 1 indicates that, based on the sum of all HQs from different contaminants and exposure routes, non-cancer health effects from all contaminants are unlikely. An HI greater than (>) 1 indicates that site-related exposures may present a risk to human health. EPA's acceptable risk range is defined as a cancer risk range of 1×10^{-6} to 1×10^{-4} and an HI < 1. Generally, remedial action at a site is warranted if cancer risks exceed 1×10^{-4} and/or if non-cancer hazards exceed an HI of 1.

The HHRA for the Site presented estimated cancer risks and non-cancer hazards for recreational receptors exposed to surface and subsurface soils, groundwater and soil vapor, and sediments. Sediment risks were addressed through the 2012 NTCRA and detailed risk analysis can be found in the 2013 NTCRA Completion Report.

Surface Soils

Surface soils in Boom Landing and the WWTP NSA and surrounding properties were within the risk management range for an industrial scenario. Under current conditions, recreational visitors would be unlikely to be exposed to surface soils in Boom Landing because the unpaved area is small, and the soils in this area are covered with a manicured lawn. The presence of pavement, buildings, and manicured landscaping in the WWTP NSA and surrounding properties also results in very low potential for exposure to chemicals in soil under present conditions. If some degree of surface soil exposure were assumed for a recreational user under current conditions, the exposure frequency for a recreational visitor would be expected to be at least an order of magnitude less than that of a resident (i.e., less than 35 days/year rather than 350 days/year), which would correspond to cancer risk estimates within the risk management range.

For a resident, the risks are above the risk management range; however, it is very unlikely that the Site will be used for a residential use scenario due to the fact that that the Site is being used as a waste water treatment plan and a public boat launch.

For a construction worker, risks are anticipated to be within the risk management range, given that estimated cancer risks for the industrial worker scenario were within the risk management range, and the potential level of chemical exposure is anticipated to be similar for these two potential receptors based on Site-specific conditions. No observations of MGP-residuals in the surface soils (*i.e*., less than 2 feet) were documented in the RI that would present a special condition for construction workers.

Subsurface Soils

Subsurface soils in Boom Landing and the WWTP NSA and surrounding properties do not currently pose a risk to human receptors because they are not available for contact and buildings are not present near the subsurface soil contamination. However, estimated potential risks would be above the risk management range if future construction disturbed the soil sufficiently to allow exposure similar to either a residential or a generic industrial worker scenario. Considering the results for the industrial worker and residential scenario, there is a potential for risks to construction workers or recreational visitors above the risk management range as well. Direct exposure to MGP residuals, which have been observed in the subsurface soils in this area, would also pose a potential risk above the risk management range.

Groundwater

Groundwater is not currently used as drinking water within the City of Marinette, and there are no known current users of groundwater for any other purpose in proximity to the Site. Based on the groundwater results, concentrations would not meet the legally enforceable standards for drinking water. There were numerous exceedances of the drinking-water standards and tap water RSLs, including benzene, ethylbenzene, xylenes, PAHs, iron, and manganese. Although the groundwater is not used as the drinking water source, the NCP's expectation is that groundwater will be restored to beneficial use. The groundwater is classified by the State of Wisconsin as a Class II drinking water aquifer; therefore, the Site groundwater needs to be restored to the Safe Drinking Water Act maximum contaminant limits (MCLs) for all contaminants of concern.

If future construction in the area would result in workers having direct physical contact with groundwater or inhaling associated vapors in excavations at or below the water table, there would be some potential for exposure to the contaminated groundwater. However, contact with groundwater is likely to be infrequent, because of safety considerations when entering excavations with standing water that are unrelated to the potential presence of chemical contamination in that groundwater. In addition, groundwater would not be encountered until a minimum of 2 feet bgs near the Menominee River, with depths more commonly ranging from 4 to 10 feet bgs. Intrusive work occurring at depths less than this would not result in groundwater exposure.

Based on results of the RI, groundwater in specific areas of the Site may be contaminated with MGP residuals (*i.e*., Boom Landing and focused areas within the WWTP NSA).

If MGP residuals were encountered in an excavation by a construction worker, exposure to the groundwater would represent risks above the risk management range, due to the potential for direct contact with the MGP residuals and the inhalation of chemical vapors formed due to the presence of the MGP residuals.

Soil Vapor

Soil vapor data were screened against Vapor Intrusion Screening Levels (VISLs) obtained using the EPA's vapor intrusion screening level calculator (U.S. EPA 2014b).

For soil vapor samples taken beneath the Vehicle Storage building in the WWTP NSA, the majority of results were non-detect, and all chemical concentrations were below the industrial worker VISLs, and thus associated with risks below the risk management range. All but one sample was also below residential VISLs, and the estimated risk for a hypothetical residential scenario for this one sample was at the low end of the risk management range.

For soil vapor samples collected directly beneath the WWTP Service Building, all results were below industrial VISLs, and thus associated with risks below the risk management range. The estimated cancer risks for soil gas samples under a hypothetical residential scenario were within or below the risk management range. One sample had a non-cancer hazard (2) above the risk management criterion. For exterior soil gas samples near the Service Building, estimated risks for either a hypothetical future industrial building or a residence were within the risk management range.

For soil vapor samples collected in Boom Landing where inhabited buildings do not exist at present, estimated risks for either a hypothetical future industrial building or residence were estimated to be within the EPA's risk management range.

For soil vapor samples collected in the WWTP NSA in areas where no buildings currently are present, estimated risks for either a hypothetical future industrial building or residence were within the risk management range except for a single location (Soil Gas SG05). Considering, collectively, the results of the soil vapor sampling that was performed on-site, if construction workers performed maintenance or redevelopment activities involving excavations, the air quality in the excavation area would not be expected to pose a health concern due to chemical concentrations in air. Based on the low concentrations of COCs in soil vapors other than in an isolated location in the WWTP NSA, the concentrations of chemicals in air inside an excavation area would be expected to be low as well, considering the amount of dilution that would occur when soil vapors are mixed with ambient air, as long as MGP residuals are not encountered. As pointed out earlier in this Proposed Plan , if MGP residuals are encountered during excavations, soil vapor concentrations would potentially result in risks above the risk management range.

Sediment

Prior to the 2012 NTCRA that occurred in the Menominee River, surface water samples were collected to evaluate if contaminated sediments were impacting the water quality.

The surface water quality was not found to pose a health concern to either human or ecological receptors based on screening assessments performed on these data; further, the NTCRA would have improved the current water quality.

Prior to the NTCRA, there were localized areas of surface sediments that were estimated to pose a risk to sensitive ecological receptors. In these areas, water depth would generally minimize the potential for human exposure to the sediments. These sediments have been removed to the extent practical. A small area where bedrock prevented further dredging has been covered with 10 inches of sand.

Because of this NTCRA and the placement of the sand cover, human and ecological receptors under current conditions do not have the potential for exposure to MGP-affected sediments. Following two years of monitoring, results of sand cover sampling meet the conditions for monitoring to cease until the Five-Year review, as described in the approved residual sand cover monitoring plan.

3. Baseline Ecological Risk Assessment

As part of the RI, NRT (now Ramboll) prepared a baseline ecological risk assessment (BERA) that identified terrestrial and aquatic receptors and exposure pathways.

Summary of the BERA

The BERA was conducted to evaluate potential adverse effects to aquatic ecological receptors associated with PAH exposures in surface water and sediment of the Menominee River. These risks were addressed under the 2012 NTCRA.

Under a future risk scenario, if NAPL migrated back into the areas addressed by the NTCRA, EPA would have to determine the ecological and human health risk based on the quantity of contamination that migrated. Presently, based on groundwater data that is used to measure and track groundwater contaminant migration, there is no migration of NAPL toward the NTCRA-remediated areas. Therefore, there is no risk to potential recreational use or ecological receptors at present.

Additional information regarding the BERA can be found in the RI report.

4. Basis for Taking Action

EPA's current judgment is that the Preferred Alternatives identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

G. REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are goals for protecting human health and the environment that the proposed remedial action is expected to accomplish. RAOs are developed to address the contaminant levels and exposure pathways that present unacceptable current or potential future risk to human health and the environment. The development of RAOs and proposed cleanup levels, known as preliminary remediation goals (PRGs), is the first step in identifying and screening remedial alternatives for addressing the COCs and media of concern.

1. Remedial Action Objectives

The following RAOs have been developed for PAHs-containing media in the Site:

RAOs for the Site were developed to protect human health and environmental receptors from unacceptable risk resulting from former MGP operations at the Site. A RAO provides a basis to evaluate the process options discussed in Section 3 and the remedial alternatives evaluated in Section 4. The RAOs address current and reasonably anticipated future land use.

- Soil/Soil Vapor
    - RAO-1 – Prevent human exposure (dermal, as well as incidental ingestion of particulates and vapor) to NAPL-saturated soil and subsurface soil containing MGP-related contaminants above levels that pose unacceptable risk for future construction/industrial workers and residents.
- Groundwater
    - RAO-2 – Prevent human exposure, including dermal contact, ingestion, and inhalation (as a result of vapor intrusion) of groundwater containing MGP residuals posing unacceptable risk for future construction/industrial workers and residents.
    - RAO-3 – Reduce dissolved-phase flux from inaccessible source material and restore groundwater to drinking water standards for MGP-related contaminants within a reasonable timeframe.
    - RAO-4 – Minimize the potential for migration of groundwater with MGP-related constituents above the PRGs to surface water and sediment.

2. Preliminary Remediation Goals

PRGs are risk-based or ARAR-based chemical-specific concentrations that help further define the RAOs. PRGs are considered “preliminary” remediation goals until a remedy is selected in a ROD. The ROD establishes the final remedial goals and/or cleanup levels. PRGs are also used to define the extent of contaminated media requiring remedial action and are the targets for the analysis and selection of long-term remedial goals.

The HHRA developed a series of risk-based concentrations (RBCs) for total PAHs intended to be protective of future workers. The RBCs are calculated, chemical-specific concentrations below which no significant health effects are anticipated for a receptor.

For human receptors, the Site RBCs correspond to a target risk for carcinogenic effects of 1×10^{-6} and a target HI of 1 for non-carcinogenic effects.

The proposed Remediation Levels for soil are generally based on EPA default exposure parameters and factors representing reasonable maximum exposure conditions for long-term/chronic exposures for cancer risk of 10^{-6} with a corresponding hazard quotient of 1 under a hypothetical residential and industrial exposure scenario. Remediation to residential PRGs will result in unrestricted use and unrestricted exposures. Remediation to industrial remediation levels will be protective, if there are corresponding controls to prevent residential land use, unless additional remedial action is undertaken (Table 2).
As specified by WDNR's Update to Remediation and Redevelopment (RR) 890 and residual contaminant levels (RCL) Spreadsheet (WDNR, June 2014), certain EPA default exposure parameters were modified to match current WDNR requirements. The PRGs were developed based on the most recent toxicity values included in the EPA November 2015 Regional Screening Level web calculator.

During implementation of a remedy, flexibility will be provided to modify the above PRGs by conducting a post-remedy verification. If the post-remedy verification concludes cumulative Site risk is below the target cancer risk and noncancerous hazard index for the targeted exposure scenario, then no additional remedial action will be required.

Table 2: Soil Remediation Levels

Constituents of Concern	Minimum to Maximum Range in PPM	CR>1×10^{-6}; HQ>1 in PPM
Ethylbenzene	ND-288	37
Benzo(a)pyrene	ND-534	2.1
Naphthalene	ND-1630	26

*PPM=Parts per million
*ND=non-detect; a value below detection limits

3. Groundwater Remediation Levels

EPA Tap-Water regional screening levels are a screening tool and are not appropriate or enforceable cleanup levels. Therefore, the selected groundwater remediation levels will be based on enforceable federal or state groundwater standards (Table 3). For groundwater at the Site, the remediation levels will be the more conservative of Wisconsin Natural Resources Code (NR) 140 Groundwater Enforcement Standard (NR 140) or the National Primary Drinking Water Regulations Maximum Contaminant Level as presented in the Multi-Site Risk Assessment Framework Addendum Revision 3 (Exponent, July 2014, found in the AR).

Table 3: Groundwater Remediation Levels

Contaminant of Concern	Minimum to Maximum Range in µg/L	PRG in µg/L	Basis for PRG
Benzene	ND-580	5	MCL and NR140
Ethylbenzene	ND-1,700	35.4	MCL and NR140
Benzo(a)pyrene	ND-80	0.2	MCL and NR140
Benzo(b)fluoranthene	ND-45	0.2	NR140
Chrysene	ND-59	0.2	NR140
Naphthalene	ND-3,200	10.2	NR140

*µg/L= micrograms per liter
*ND = Non-Detect, or below detection levels

H. SUMMARY OF REMEDIAL ALTERNATIVES

A range of alternatives was developed for soil and groundwater to achieve the Site RAOs. Remedial alternatives were developed by assembling combinations of appropriate remedial technologies. The WPSC Marinette MGP Site remedial alternatives are described below and summarized on Table 4. Additional details about all the remedial alternatives are available in the Site FS Report.

Capital costs are those expenditures that are required to construct a remedial alternative. Operation and maintenance (O&M) costs are those post-construction costs necessary to ensure or verify the continued effectiveness of a remedial alternative and are estimated on an annual basis. The "present worth" cost is the amount of money which, if invested in the current year, would be sufficient to cover all the costs over time associated with a project.
The present worth costs for the remedial alternatives below were calculated using a discount rate of seven percent and a 30-year time interval to estimate long-term O&M costs.
Construction time is the time required to construct and implement the alternative and does not include the time required to design the remedy or procure contracts for design and construction.

EPA recommends Alternative 4 for the WWTP NSA, and Alternative 2 for both the BLSA and the ISA as the remedy for the Site.

A summary of all the cleanup alternatives for which EPA conducted a detailed analysis to consider for this response action is provided below.

Description of Remedial Alternatives

Table 4: Site Remedial Alternatives

Media/Treatment Area	Alternative Number	Alternative Title
Soil, Groundwater/Waste Water Treatment Plant North Source Area (WWTP NSA)	1	No Action
	2	In-Situ Geochemical Stabilization
	3	Aerobic Bioremediation
	4	In-Situ Stabilization
	5	Excavation
Soil, Groundwater/Boom Landing Source Area (BLSA)	1	No Action
	2	In-Situ Stabilization
	3	Excavation
Soil, Groundwater/Inaccessible Source Areas (ISA)	1	No Action
	2	Institutional Controls (ICs) in the form of Continuing Obligations and Horizontal Barriers

Waste Water Treatment Plant North Source Area

WWTP NSA Alternative 1: No Action

Regulations governing the Superfund program require that the "no action" alternative be evaluated generally to establish a baseline for comparison. This No Action remedial alternative, would rely on natural recovery processes for soil and groundwater. No active remediation or monitoring would be conducted under this alternative. The time to reach protective levels and compliance with PRGs is estimated to be a minimum of 100 years, but no monitoring would be conducted to document progress toward achievement of PRGs. A cost of $50,000 is associated with this alternative to account for five-year review reporting since waste will be left in place.

Estimated Costs for Alternative 1:
Direct Capital Costs: $0
30-year O&M Costs: $50,000
Total Estimated Costs: $50,000
Time until RAOs are achieved: RAOs will not be achieved.

WWTP NSA Alternative 2: In-situ Geochemical Stabilization (ISGS), Horizontal Engineered Barriers, Institutional Controls, Passive DNAPL Recovery, Permeable Reactive Barrier

This alternative includes in-situ treatment of oil-coated/oil-wetted material within the accessible WWTP NSA by in-situ geochemical stabilization, a horizontal engineered surface barrier where soil concentrations in the upper two feet exceed RGs, passive DNAPL recovery via vertical recovery wells and a permeable reactive barrier (PRB) on the upgradient edge of the treatment area.

Estimated Costs for Alternative 2:

Direct Capital Costs: $2.02 Million + $390,000 for a second injection
30-year O&M Costs: $375,000
Total Estimated Costs: $2.02 Million to $2.41 Million
Time until RAOs are achieved: 1.5 years including one year of effectiveness monitoring.

ISGS involves the injection of an engineered solution containing permanganate to chemically stabilize the NAPL and byproducts by creating a crystalline crust on the exterior of the NAPL mass. The mineral crust reduces the NAPL mobility potential and reduces the magnitude of dissolved-phase flux in groundwater.

ISGS is typically performed by overlapping pressurized injection of the engineered solution within the delineated area of source material. Injection can be completed using direct push delivery or fixed injection wells. Due to the limited accessible area, the FFS considered application via direct push. Overlapping pressurized injection points will be used to address the source material. Quantity of injection fluid is calculated based on pore space of treatment area rather than estimated quantity of source material to be addressed. Appropriate treatment of the source material requires full migration of the injection fluid through the treatment area aquifer.

It is assumed that ISGS injection points could be placed within 5 feet of the identified sewers and the ISGS radius of influence (ROI) would extend up to the utility line. There is the potential that these injections may preferentially migrate into backfill around the utility. If loss of injection fluids is noted near utilities the offset distance from utilities will be increased.

For the purposes of the Proposed Plan, it is assumed that Canadian National (CN) Railroad will not allow any injections within the 25-foot railroad offset; however, given that ISGS will be applied via injection, no excavation will occur, and no permanent structures (such as injection wells) will remain in place, ISGS may be conducted closer than 25 feet following additional coordination with CN as part of the remedial design phase. The ISGS ROI would extend laterally from the injection point allowing for some treatment of source material within the CN Railroad offset. The lateral extent of source material to be treated based on the PDI results (Appendix A to the FFS) with this technology corresponds to a surface area of approximately 22,500 ft^2. Vertically, source material was encountered from 5.0 to 15.5 feet bgs. This corresponds to a treatment volume of approximately 8,800 CY of source material. Overburden material (approximately 4,200 CY) where source material was not observed would not require treatment via ISGS.

Horizontal Engineered Barriers:

In the western portion of the WWTP NSA, surface soil (0-2 feet) concentrations exceed RGs. To mitigate potential exposure to surficial soils with RG exceedances, WWTP NSA– Alternative 2 will involve construction of a surface barrier. Conceptually, barrier installation would consist of excavating the top two feet of affected soil and backfilling the excavation with 18 inches of clean fill and 6 inches of clean topsoil. Based on the PDI results, the surface area where soil concentrations in the upper two feet exceed RGs in the WWTP NSA is approximately 7,600 ft^2.

The total estimated volume of surface soil removal in the WWTP NSA is 600 CY. Alternate engineered barriers such as asphalt paving may be considered during the remedial design phase in coordination with the property owner and future Site development plans.

COs and ICs:

Following treatment of source material within the WWTP NSA and installation of horizontal engineered barriers, potential risks resulting from exposure to remaining subsurface soil, will be managed through institutional controls (ICs). Note, that in Wisconsin, WDNR uses the term continuing obligations (COs), which are based on requirements under State law that are considered governmental controls. COs will be implemented throughout the Site in accordance with the ROD to address non-source material, soil gas/vapor intrusion (Figure 7), and groundwater. For the purposes of this Proposed Plan, and per the existing Remedial Action Consent Decree, WDNR's Geographic Information System (GIS) Registry will be used to implement COs. Requirements, limitations, or conditions relating to restrictions of sites listed on the WDNR GIS database are required to be met by property owners. See Wisconsin Statutes Section 292.12(5)(b)-(d). As a result, the statute requires that the GIS database conditions be maintained for a property, regardless of changes in ownership. See Wisconsin Statutes Section 292.12(3). The WDNR GIS Registry also serves as an informational control. COs may include deed notices that run with the land (legal requirements that apply to a property even after the ownership changes).

Additional ICs, beyond the COs may be necessary. These ICs may include prohibition of groundwater from being used as a drinking water source, and maintenance of an engineered barrier to prevent exposure to contaminants.

For WWTP NSA - Alternative 2, soil COs will likely be required throughout the source area and horizontal engineered barrier limits. In addition to inclusion on the GIS registry, a Soil Management Plan will also be required to ensure proper management of subsurface soil disturbed through future site redevelopment, utility repairs, and other intrusive activities. An Institutional Control Implementation and Assurance Plan will be developed to detail land-use restrictions and will document procedures for effectively implementing the COs. For cost estimating purposes, it is assumed that COs will be assessed in the Five-Year Reviews for 30 years.

DNAPL Migration Control Measure

As described above, based on the conceptual site model, additional source material may be present upgradient (to the south) of the WWTP NSA. This material is inaccessible. As source material may remain in place upgradient of the WWTP NSA, measures to reduce potential for DNAPL migration and dissolved-phase flux will be installed upgradient of the ISGS area to protect against potential recontamination from inaccessible source areas. Monitoring wells were installed at the most notable observations of oil-coated/oil-wetted material as part of the PDI. Two years of subsequent sampling of wells has indicated the absence of recoverable DNAPL.

However, a DNAPL Migration Control Measure, in the form of DNAPL recovery wells, is included as a conservative measure to protect the ISGS treatment area from potential future migration of DNAPL from the inaccessible WWTP South Source Area. Given the state of the Site after over 100 years after MGP operations commenced, significant changes to the NAPL characteristics are not indicated nor expected.

The intersection of the WWTP South and WWTP North Source Areas where the passive DNAPL recovery wells will be placed is approximately 150 feet wide. For cost estimation purposes, a 25-foot well spacing for DNAPL recovery wells is assumed. Recovery wells will be installed upgradient of the ISGS extent.

Dissolved-Phase Flux Control Measure

A dissolved-phase flux control measure is anticipated to be installed between the passive DNAPL recovery wells and the ISGS Area. The measure is expected to address contaminated groundwater flux from the upgradient inaccessible source material areas into the area treated by ISGS.

The dissolved-phase flux control measure is assumed to consist of a PRB. A PRB will be installed between the passive DNAPL recovery wells and the ISGS Area. The PRB is designed to address contaminated groundwater flux from the upgradient inaccessible source material areas into the area treated by ISGS. Because the ISGS treatment will reduce the hydraulic conductivity of the treatment area, there is also the potential for contaminated groundwater to be rerouted around the lower conductivity ISGS area. The PRB will treat this impacted groundwater in the event that groundwater flow paths are modified by the ISGS injection.

PRBs involve the installation of reactive media within a trench or a series of injection points to create a permeable barrier perpendicular to groundwater flow, through which the dissolved phase contaminants flow. Multiple reactive media can be used in a PRB to treat site-specific groundwater COCs including activated carbon and organophilic clay (ITRC, 2011).

Given the subsurface infrastructure at the Site, an injectable reactive media is preferred for this Site as trenching is not practicable or safe in the presence of the sewers and other subsurface infrastructure. Given the desired installation method and site-specific COCs, an injectable colloidal activated carbon reactive media such as Regenesis Product PetroFixTM was selected for evaluation in the FFS. PetroFix™ is a highly concentrated water-based suspension made up of micron-scale activated carbon and bio-stimulating electron acceptors consisting of a sulfate/nitrate combination. COCs will partition from the dissolved phase by adsorption to the activated carbon particles. The contaminants will be anaerobically biodegraded through electron acceptors. The inaccessible source material area is approximately 150 feet wide at the intersection of the WWTP South and WWTP North Source Areas where the PRB will be placed.

An assessment will be completed after the fourth monitoring event to determine if monitoring can be reduced to match other semi-annual events on-site.

Given that under existing conditions, the affected groundwater attenuates prior to reaching the river, it is assumed that one PRB installation will be sufficient to address dissolved phase flux and maintenance injections will not be required.

WWTP NSA Alternative 3: Aerobic Bioremediation

This alternative includes in-situ treatment of oil-coated/oil-wetted material by aerobic bioremediation, horizontal engineered surface barriers, COs, and passive DNAPL recovery via vertical recovery wells. Only the component unique to this alternative, aerobic bioremediation, will be presented in detail below. The other component details are listed above.

Aerobic bioremediation in-situ treatment relies on the existing subsurface microbial populations to degrade organic contaminants within the saturated zone. Ambient air or supplied oxygen is injected to the saturated zone using relatively low and sometimes pulsating rates. The goal of this process is to increase the metabolic rates of existing aerobic microorganisms within the source area by creating an aerobic environment within the groundwater, saturated soil below the water table, and within the capillary fringe.

Estimated Costs for Alternative 3:
Direct Capital Costs: $1.67 Million
30-year O&M Costs: $870,000
Total Estimated Costs: $2.54 Million (with a range of $1.67 Million to $3.07 Million)
Time until RAOs are achieved: Between 2 and 10 years; FFS assumes adequate treatment at 5 years.

Aerobic biodegradation enhances weathering of the source and increases the degradation rate of NAPL constituents. This process reduces the risk associated with the source material by changing the composition and reducing the mass discharge to groundwater. Following treatment, remaining source material is anticipated to have putty-like or asphalt-like consistency. Aerobic bioremediation has been documented at several MGP sites in Florida and Montana where mass reduction of greater than 90% of volatile NAPL constituents (e.g., naphthalene) has been observed in less than 10 years (Sillan,2021). The goal of aerobic bioremediation is to increase the dissolved oxygen concentration of groundwater to facilitate aerobic biodegradation.

Unlike air sparging, aerobic bioremediation is not typically implemented concurrently with a vapor extraction system. Air sparging generally relies on injecting large volumes of air into the groundwater to encourage partitioning of volatile constituents from groundwater into vapor within air bubbles, which migrate upwards via buoyancy into the vadose zone. A vapor recovery system is thus needed to extract volatile constituents from the vadose zone. The goal of aerobic bioremediation is not to encourage contaminant partitioning from the dissolved phase to the vapor phase, but to increase the dissolved oxygen concentration of groundwater to facilitate aerobic biodegradation of soluble contaminants. As is noted in Section D.4, the groundwater plume is principally comprised of soluble coal tar NAPL constituents including benzene.

At the conclusion of successful remediation, dissolved phase-flux would be reduced, RAO-3 and RAO-4 would be achieved, and remaining oil-coated/wetted material would be dominated by high molecular weight PAHs, highly viscous, and immobile.

It is assumed that aerobic bioremediation injection points could be placed within 5 feet of the reinforced concrete pipe sewers and the aerobic bioremediation ROI would extend up to the utility line.

It is also assumed that aerobic bioremediation injection points could be placed up to 25 feet of the railroad centerline (corresponding to the CN no excavation limit) as permanent well vaults and trenches to accommodate air lines will need to remain outside of the CN Railroad 25-foot buffer.

As Aerobic Bioremediation does not modify the conductivity of the aquifer, Aerobic Bioremediation can be conducted up to the WWTP North Source Area boundary prior to installation of the DNAPL recovery wells. The lateral extent of source material to be treated based on PDI results taking into account utility constraints and the CN Railroad offsets with this technology corresponds to a surface area of approximately 23,200 ft^2. Vertically, source material was encountered from 5 to 15.5 feet bgs. This corresponds to a treatment volume of approximately 9,100 CY. Overburden material (approximately 4,300 CY) where source material was not observed would not require treatment via aerobic bioremediation.

WWTP NSA Alternative 4: ISS, Groundwater Drainage Vent with Reactive Media

This alternative includes ISS of accessible oil-coated/oil-wetted material, the installation of a groundwater drainage vent to provide a groundwater drainage pathway through the lower permeability ISS monolith, placement of a reactive media within a portion of the groundwater drainage vent to treat groundwater, COs, and passive DNAPL recovery via vertical recovery wells on the upgradient edge of the treatment area. Only the component unique to this alternative, ISS, will be presented in detail below. The other component details are listed above.

Estimated Costs for Alternative 4:
Direct Capital Costs: $2.81 Million
30-year O&M Costs: $363,000
Total Estimated Costs: $3.18 Million (or $2.31 Million if Alternative 2 is selected for BLSA[1])
Time until RAOs are achieved: 3 months

ISS

The ISS process involves blending impacted soil with amendments (cement, bentonite, ground granulated blast furnace slag, etc.), to encapsulate and immobilize COCs.

[1] The cost will be reduced if ISS is selected for the NSA and the BLSA because mobilization costs will be limited, and they share the DNAPL recovery system.

A hydraulic blender, excavator bucket or large diameter auger is used to mix a slurry of amendments into soils to solidify them in-situ. As the augers are advanced into the soils, a reagent is injected, resulting in a mixed subsurface column. ISS reagent addition is used to physically bind (solidify) and/or chemically react with (stabilize) compounds in soil, resulting in a solidified or stabilized mass with reduced constituent mobility and leachability. ISS isolates COCs and source material from human contact and from groundwater by entombing them in a low-permeability monolith. Active reagents used in ISS can include pozzolanic compounds such as cement or blast furnace slag. Other additives such as bentonite may be included to help decrease permeability, especially in higher permeability formations such as those present at the Site. Reagents are typically mixed with water to create a flowable and pumpable slurry that is then mixed with the affected soil.

We estimate the lateral extent of source material in the WWTP NSA to be treated based on PDI results (taking into account utility constraints and the CN railroad offsets) with this technology to include a surface area of approximately 16,000 ft^2. Vertically, source material was encountered from 5.0 to 15.5 feet bgs. This corresponds to a treatment volume of approximately 6,300 CY. Overburden swell material, or the expansion of the ISS over the top of ground surface, (approximately 1,800 CY) will be disposed of off-site.

WWTP NSA Alternative 5: Excavation of Source Material, In-situ Groundwater Treatment, Passive DNAPL Recovery

This alternative includes excavation of source material, chemical amendment addition in excavation backfill, and passive DNAPL recovery via vertical recovery wells on the upgradient edge of the treatment area.

Estimated Costs for Alternative 5:
Direct Capital Costs: $4.25 Million
30-year O&M Costs: $332,000
Total Estimated Costs: $4.58 Million
Time until RAOs are achieved: 3 months

Excavation

Alternative 5 would involve excavation and off-site disposal of accessible source material. Based on historical and PDI soil borings, the soil type at this Site is considered Class C Soil for sloping/benching purposes and the OSHA Standard 1926 Subpart P App B requires a maximum slope of 1.5 horizontal to 1 vertical for excavations less than 20 feet deep. To reach the depth of source material in this area (15.5 feet bgs) via sloping, a horizontal distance of 23.3 feet is required.

The middle and eastern sanitary sewer in the WWTP NSA are approximately 20 feet apart and the middle and western sanitary sewer range from 20 to 60 feet apart. All three sanitary sewers also turn between 45 and 90 degrees at the southern edge of the Area further complicating the excavation stabilization options.

Additionally, the CN Railroad is present on the north side of the WWTP NSA and excavation cannot be conducted within 25 feet of the track centerline. Within the CN Railroad zone of influence, shoring is also required if excavation is conducted. Given these constraints, removal of source material would likely require the use of shoring or other excavation support methods at the northern limit of the area adjacent to the CN railroad, at the southern limit of the area adjacent to the sanitary sewers, and within the area adjacent to each of the sanitary sewers.

The lateral extent of source material to be treated based on PDI results (taking into account the above utility constraints, shoring/side sloping assumptions, and CN Railroad offsets) is approximately 13,700 ft^2 and corresponds to an impacted treatment volume of approximately 5,400 CY. Non-impacted overburden and non-impacted material to be removed for sloping is estimated at approximately 4,200 CY.

To reach the vertical extent of source material, excavation below the water table is required. Dewatering will be necessary to support the proposed excavation activities. Conceptually, water will be extracted from the excavation using trash pumps. Extracted water will undergo pretreatment (assumed to be particle separation and adsorptive media filtration) prior to discharge to the City POTW, if permitted. Alternative disposal approaches, including surface water discharge through a WPDES permit, and off-site disposal will also be considered. The exact method of water management will be determined during the remedial design.

Given the shallow bedrock, traditional cantilevered sheet piling can likely not be used. Alternative earth retention systems that may be used include soldier pile and lagging, a slide rail system, a secant pile wall, or sheet piling with tiebacks drilled into the bedrock. For costing purposes in the FFS, a soldier pile and lagging earth retention system was selected. For the purposes of the FS, it is assumed that the soldier piles will extend into bedrock approximately 1.5 times the depth of excavation (approximately 24 feet). Alternative earth retention alternatives will be considered during the remedial design and contracting stage of the project.

Approximately 870 linear feet of excavation sidewalls will require earth retention in order to address the 5,400 CY of source material. It is assumed that sloping with a 1.5 horizontal to 1 vertical slope can be safely conducted at the eastern and western boundary of the WWTP North Source Area excavation.

Boom Landing Source Area (BLSA)

BLSA Alternative 1: No Action

Consistent with NCP requirements, a No-Further Action alternative is considered. Alternative 1 does not include remediation or monitoring to minimize potential exposures to media and associated COCs present at the Site. The No-Further Action alternative will be used as a baseline for comparisons of other remedial alternatives. In accordance with CERCLA, Site reviews will be performed every five years for Boom Landing Source Area - Alternative 1.

Estimated Costs for Alternative 1:
Direct Capital Costs: $0
30-year O&M Costs: $50,000
Total Estimated Costs: $50,000
Time until RAOs are achieved: RAOs will not be achieved.

BLSA Alternative 2: ISS, Groundwater Drainage Vent with Reactive Media, Passive DNAPL Recovery

Boom Landing Source Area – Alternative 2 includes ISS of accessible oil-coated/oil-wetted material, the installation of a groundwater drainage vent to provide a groundwater drainage pathway through the lower permeability ISS monolith, COs, placement of reactive media within the groundwater drainage vent, and passive DNAPL recovery via vertical recovery wells on the upgradient edge of the treatment area.

Estimated Costs for Alternative 2:
Direct Capital Costs: $3.7 Million
30-year O&M Costs: $340,750
Total Estimated Costs: $4.0 Million
Time until RAOs are achieved: 3 months

It is assumed that ISS can be safely conducted to within 5 feet of utility lines.

The lateral extent of source material in the BLSA to be treated based on PDI results (considering utility constraints) corresponds to a surface area of approximately 30,400 ft^2. Vertically, source material was encountered from 4 to 14.5 feet bgs in the BLSA. This corresponds to a treatment volume of approximately 11,300 CY. Overburden swell material (approximately 4,400 CY) will be disposed of off-site.

Similar to WWTP NSA Alternative 4, ISS in Boom Landing has the potential to result in mounding and/or rerouting of groundwater flow. The magnitude of groundwater mounding or rerouting and impact on dissolved-phased transport will be modeled during the remedial design. Modeling may indicate that mounding or rerouting is not a significant concern and that no action is necessary to address these conditions. Should modeling indicate potential concern, modification to the remedy can be incorporated to reduce impact. The most common approach is to install a groundwater drainage trench.

It is assumed that a groundwater drainage system will be incorporated into BLSA – Alternative 2. The presumptive trench dimensions are approximately 3 feet wide, 340 feet long and 8 feet deep. Potentially impacted groundwater moving from the upgradient inaccessible source material area towards BLSA will be addressed by the upgradient dissolved phase flux control measure. Current PAHs are largely less than RGs at current conditions and it is reasonable to expect that concentrations will be comparable, if not reduced following application of ISS.

The location and the potential need for reactive media within the trench will be further evaluated during remedial design through groundwater modeling to predict flow volumes and flow pathways associated with conditions post-construction of the ISS monolith.

DNAPL Migration Control Measure

Based on the conceptual site model, additional inaccessible source material may be present upgradient (to the south) of the BLSA in Mann Street and underneath the CN railroad ROW. This material is inaccessible. As source material may remain in place upgradient of the BLSA, a DNAPL Migration Control Measure will be incorporated into Boom Landing Source Area – Alternative 2.

There are a variety of potential approaches to the design of a DNAPL Migration Control Measure. General categories of barriers include impermeable barriers (*e.g*., soil-bentonite mixed wall), adsorptive barriers (*e.g*., organoclay reactive barrier), or passive DNAPL recovery (*e.g*. passive vertical recovery wells or a horizontal French Drain installed within an open-graded stone trench). Each category has unique advantages and disadvantages that will be further evaluated during the remedial design. For the purpose of the FFS, passive DNAPL recovery in horizontal French Drain installed within an open-graded stone trench along the 80-foot long face of the ISS monolith was selected as the presumptive approach.

The trench will be backfilled with a pea gravel or equivalent high conductivity material and an approximately 80-foot-long slotted pipe will be installed within the pea gravel sloped towards recovery sumps located at either end of the French Drain.

For cost estimating purposes, it is assumed that passive DNAPL recovery will be performed on a monthly basis for the first year and a quarterly basis for the subsequent four years of operation given the limited mobile DNAPL observed in on-site monitoring wells.

Dissolved-Phase Flux Control Measure

To prevent upgradient impacted groundwater associated with the inaccessible source material from flowing back into the more permeable excavation backfill, a PRB will be placed upgradient of the BLSA excavation area and downgradient of the horizontal DNAPL recovery well. Reactive media will be placed along with the backfill material along the upgradient face of the ISS monolith (total length of approximately 80 feet) to address groundwater flux from the inaccessible source material areas. Similar to WWTP NSA – Alternative 2, it is assumed that the PRB will be approximately 3-feet wide extending from the top of bedrock (14.5 feet bgs) to the high-water table elevation (approximately 4 feet bgs). The presumed reactive media will be a powdered activated carbon product such as Remediation Products, Inc.'s BOS-200® applied at 20% by volume. The specified reagent, concentration and geometry will be further evaluated during remedial design. Additionally, 3 monitoring wells are to be installed to be used in conjunction with existing monitoring wells for performance monitoring purposes. Quarterly monitoring of groundwater will be conducted for the first year to assess concentrations of groundwater COCs and biodegradation dynamics.

An assessment will be completed after the fourth monitoring event to determine if monitoring can be reduced to match other semi-annual events on-site.

BLSA Alternative 3: Excavation of Source Material, Passive DNAPL Recovery

BLSA– Alternative 3 includes excavation of source material, COs, chemical amendment addition in excavation backfill, and passive DNAPL recovery via vertical recovery wells on the upgradient edge of the treatment area.

Estimated Costs for Alternative 3:
Direct Capital Costs: $4.8 Million
30-year O&M Costs: $448,750
Total Estimated Costs: $5.25 Million
Time until ROAs are achieved: 3 months

Excavation

The soil type at this Site is considered Class C Soil for sloping/benching purposes and OSHA requires a maximum slope of 1.5 horizontal to 1 vertical for excavations less than 20 feet deep. To reach the vertical limit of source material in this area (14.5 feet bgs) via sloping, a horizontal distance of 21.8 feet is required.

A 30" effluent storm sewer serves as the western boundary of source material in the Boom Landing Source Area and the property boundary with Fincantieri Marinette Marine Corporation (MMC) serves as the eastern boundary of the source material in the Boom Landing Source Area.

Given previous experience coordinating access with MMC for drilling, obtaining access to the MMC property for excavation sloping is not anticipated.

In order to excavate the maximum amount of source material (adjacent to the storm sewer to the west, the water main to the south, and property boundary to the east) the use of shoring or other excavation stabilization methods at the western, eastern and southern limits of the area will likely be required and is assumed as part of the FFS.

The lateral extent of source material to be treated based on PDI results taking into account the above utility constraints and access constraints is approximately 30,400 ft^2 and corresponds to an impacted treatment volume of approximately 11,300 CY. Non-impacted overburden and non-impacted material to be removed for sloping is approximately 6,600 CY.

To reach the vertical extent of source material, excavation below the water table is required. Dewatering will be necessary to support the proposed excavation activities as described in WWTP NSA Alternative 5, above.

Inaccessible Source Material Areas (WWTP South and Mann Street and CN Railroad)

ISA Alternative 1: No Action

Consistent with NCP requirements, a No-Further Action alternative is considered. Alternative 1 does not include remediation or monitoring to minimize potential exposures to media and associated COCs present at the Site. The No-Further Action alternative will be used as a baseline for comparisons of other remedial alternatives. In accordance with CERCLA, Site reviews will be performed every five years for Alternative 1.

Estimated Costs for Alternative 1:
Direct Capital Costs: $0
30-year O&M Costs: $50,000
Total Estimated Costs: $50,000
Time until RAOs are achieved: RAOs will not be achieved.

ISA Alternative 2: Horizontal Engineered Barriers, Institutional Controls

Inaccessible Source Material Areas (WWTP South and Mann Street and CN Railroad)– Alternative 2 includes maintenance of existing direct-contact barriers and installation of new direct-contact barriers, as required, over affected inaccessible source material in the WWTP South Source Area, and CN Railroad and Mann Street Source Area and COs to manage potential risks associated with remaining inaccessible source material.

Estimated Costs for Alternative 2:
Direct Capital Costs: $220,000
30-year O&M Costs: $308,000
Total Estimated Costs: $530,000
Time until ROAs are achieved: 1 month

Horizontal Engineered Barriers

The WWTP South Source Area consists of well-maintained grassy lawn underlain by significant WWTP process piping. The topography slopes steeply upward toward the aeration basin. Concrete walkways also bisect the area. The CN/Mann Street Source Area includes the railroad and the asphalt roadway.

The asphalt roadway and railroad currently mitigate potential exposure to surficial soil with RG exceedances. In the WWTP South Source Area, human exposure to surficial soil containing COCs above the RGs may be possible. ISA (WWTP South and Mann Street and CN Railroad)-Alternative 2 will involve initial surveying, monitoring, and maintaining existing surface improvements that are currently successful at preventing direct contact with soil containing COCs above the RGs. Construction of a barrier will be challenging but may be practicable in the WWTP South Source Area. Conceptually, barrier installation would consist of excavating the top six inches of soil, placing a visual barrier such as orange warning barrier geotextile and backfilling the excavation with 6 inches of clean topsoil. Alternative barrier approaches, including gravel or asphalt, will be evaluated during the remedial design phase of the project and will in part consider the preference of the property owner and in consultation with EPA and WDNR.

Institutional Controls/Continuing Obligations

Following installation of horizontal engineered barriers throughout the Site, potential risks resulting from exposure to remaining soil will be managed through ICs in the form of COs. Requirements, limitations, or conditions relating to restrictions of sites listed on the WDNR GIS database are required to be met by all property owners [Wisconsin Statutes Section 292.12(5)]. As a result, the statute requires that the GIS database conditions be maintained for a property, regardless of changes in ownership. A violation of Section 292.12 is enforceable under Wisconsin Statutes Sections 292.93 and 292.99. In addition to inclusion on the GIS registry, a Soil Management Plan will also be required to ensure proper management of subsurface soil disturbed through future site redevelopment, utility repairs, and other intrusive activities.

An Institutional Control Implementation Plan will be developed to detail land-use restrictions and will document procedures for effectively implementing the COs. For cost estimating purposes, it is assumed that COs will be assessed in the Five-Year Reviews for 30 years.

I. EVALUATION OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that EPA is required to consider in its assessment of alternatives. 42 U.S.C. § 9621(b)(1). Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives. 40 C.F.R. § 300.430(e)(9)(iii). The purpose of this evaluation is to promote consistent identification of the relative advantages and disadvantages of each alternative, thereby guiding selection of remedies offering the most effective and efficient means of achieving site cleanup goals.

While all nine criteria are important, they are weighed differently in the decision-making process depending on whether they evaluate protection of human health and the environment or compliance with federal and state ARARs (threshold criteria), consider technical or economic merits (primary balancing criteria), or involve the evaluation of non-EPA reviewers that may influence an EPA decision (modifying criteria). These nine criteria are described below, followed by a discussion of how each alternative meets or does not meet each criterion.

Explanation of the Nine Evaluation Criteria

Threshold Criteria

1. ***Overall Protection of Human Health and the Environment*** addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed by the Site are eliminated, reduced or controlled through treatment, engineering, or institutional controls.

2. ***Compliance with Applicable or Relevant and Appropriate Requirements*** addresses whether a remedy will meet the applicable or relevant and appropriate federal and state requirements, known as ARARs.

Primary Balancing Criteria

3. ***Long-Term Effectiveness and Permanence*** refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met.

4. ***Reduction of Toxicity, Mobility, or Volume Through Treatment*** addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances as their principal element. 42 U.S.C. § 9621(b)(1). This preference is satisfied when treatment is used to reduce the principal threats at the Site through destruction of toxic contaminants, reduction of the total mass of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media.

5. ***Short-Term Effectiveness*** addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction of the remedy until cleanup levels are achieved. This criterion also considers the effectiveness of mitigative measures and time until protection is achieved through attainment of the RAOs.

6. ***Implementability*** addresses the technical and administrative feasibility of a remedy from design through construction, including the availability of services and materials needed to implement a particular option and coordination with other governmental entities.

7. ***Cost*** includes estimated capital costs, annual operation and maintenance (O&M) costs, and the net present value of the capital and O&M costs, including long-term monitoring.

Modifying Criteria

8. ***State Agency Acceptance*** considers whether the state support agency supports the preferred alternative presented in the Proposed Plan and concurs with the selected remedy.

9. ***Community Acceptance*** addresses the public's general response to the remedial alternatives and the preferred alternative presented in the Proposed Plan.

Comparison of Alternatives

In this section, the remedial alternatives are compared to each other in terms of how well they meet the specified evaluation criteria. Threshold and primary balancing criteria are presented and evaluated for each remedial alternative. The two modifying criteria, state and community acceptance, are briefly addressed below and will be further evaluated after this Proposed Plan undergoes public comment, then addressed in the Record of Decision.

Overall Protection of Human Health and the Environment

EPA is required to select remedies that will protect human health and the environment. All of the retained alternatives – with the exception of each source area's "No Action" alternative – would protect human health and the environment. Because the "No Action" alternatives would not protect human health and the environment, EPA eliminated the "No Action" alternatives from consideration and will not discuss this alternative further in this Proposed Plan. For all retained alternatives, all of the RAOs would be achieved upon successful treatment of the contaminated media.

WWTP NSA Alternatives 2, 3, 4 and 5 would be fully protective of human health with respect to potential risks from accessible source material. For these alternatives, all of the RAOs would be achieved upon successful treatment of the contaminated media. The migration and monitoring of Site related COCs is not anticipated to be impacted by any varying climatological factor(s), and thus, WWTP NSA Alternatives 2 through 5 are resilient to climate change.

BLSA Alternatives 2 and 3 would be fully protective of human health with respect to potential risks from accessible source material. For both of these alternatives, all of the RAOs would be achieved upon successful treatment of the contaminated media. The migration and monitoring of Site related COCs is not anticipated to be impacted by any varying climatological factor(s), and thus, BLSA Alternatives 2 and 3 are resilient to climate change.

ISA Alternative 2 would be fully protective of human health with respect to potential risks from accessible source material. For this alternative, all of the RAOs would be achieved upon successful treatment of the contaminated media. The migration and monitoring of site related COCs is not anticipated to be impacted by any varying climatological factor(s), and thus, ISA Alternative 2 is resilient to climate change.

Compliance with ARARs

Section 121(d) of CERCLA, 42 U.S.C. § 9621(d), and the NCP 40 C.F.R. § 300.430(f)(l)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA section 121(d)(4), 42 U.S.C. § 9621(d)(4), and 40 C.F.R. § 300.430(f)(1)(ii)(C).

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations that are sufficiently similar to, or are generally

pertinent to, the conditions at the CERCLA site that their use is well suited to the particular Site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be applicable or relevant and appropriate. Three types of ARARs are identified on a site-specific basis: chemical-, location-, and action specific ARARs. Each type of ARAR is briefly described below.

Chemical-specific ARARs are usually health- and risk-based numerical values or methodologies used to determine the acceptable amount or concentrations of chemicals that may remain in, or be discharged to, the ambient environment.

Location-specific ARARs generally are restrictions placed on the concentrations of hazardous substances or the conduct of activities solely because they are in special locations.
Some examples of special locations include floodplains, wetlands, historic places and sensitive ecosystems or habitats.

Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes or requirements to conduct certain actions to address particular circumstances at a site.

All the retained remedial alternatives comply with applicable ARARs. The primary ARARs to be met relate to reducing COC concentrations in soils and groundwater to below their PRGs and proper management and disposal of waste generated during the remedial action. Specific proposed ARARs are included as Appendix 1 to this document.

Each source area's "No Action" alternative (Alternative 1) would not fully comply with all chemical-, location-, and action-specific ARARs.

WWTP NSA Alternatives 2, 3, 4 and 5 will fully comply with all chemical-, location-, and action-specific ARARs.

BLSA Alternatives 2 and 3 will fully comply with all chemical-, location-, and action-specific ARARs.

ISA Alternative 2 will fully comply with all chemical-, location-, and action-specific ARARs.

Long-term Effectiveness and Permanence
Each source area's "No Action" alternative (Alternative 1) would not provide for tracking or confirmation of future achievement of RAOs, so long-term effectiveness would not be demonstrated or documented.

WWTP NSA Alternatives 2, 3, 4, and 5 will provide varying degrees of long-term effectiveness and permanent control of potential human health risks from exposure to source material and soil with COCs above PRGs.

WWTP NSA Alternative 2 will provide a moderate degree of effectiveness by treating potential mobile source material using ISGS and addressing any remaining residual risk with horizontal barriers and ICs in the form of COs. Risk of exposure to source material under existing conditions is limited based on the presence of oil-coated/oil-wetted material being greater than 5 feet below ground surface. ISGS will provide an oxidized crust to the NAPL and reduce the conductivity of the formation, thereby reducing potential for separate phase mobility and dissolved-phase flux.

The oxidized crust resulting from the ISGS reactions is stable in-situ, however the vendor has indicated that the crust would likely be compromised if future mechanical disturbances were to occur (soil borings, excavations, etc.).

WWTP NSA Alternative 3 will provide long-term effectiveness and permanent control of potential human health risk from exposure to source material by treating potential mobile source material through aerobic bioremediation and addressing any remaining residual risk with horizontal barriers and COs. The conditions of the WDNR GIS Registry are maintained for a property, regardless of future changes in ownership. As a result, WWTP North Source Area - Alternative 3 will provide reliable control of long-term potential risks associated with source material.

WWTP NSA Alternative 4 will provide long-term effectiveness and permanent control of potential human health risk from exposure to source material by treating potentially accessible mobile source material using ISS. It is expected that ISS will sufficiently reduce the downgradient flux of contaminants into the dissolved phase to meet RGs. The groundwater plume has been relatively stable in concentration and location and attenuates before reaching the river. It is expected that ISS will further reduce the flux of contaminants into the dissolved phase.

To address potential dissolved phase groundwater flux from the inaccessible source material being redirected around the lower permeability ISS monolith, a groundwater drainage vent will be installed through the monolith. The upgradient portion of the trench will be amended with activated carbon to treat groundwater flux from the inaccessible source material areas. Similar to Alternative 3, in the event that the adsorptive capacity of the carbon material is exceeded, contingency injections of an oxidant or biostimulant into the PRB can accelerate degradation and increase the lifespan of the PRB without requiring additional substantial intrusive work. Near-term risks resulting from affected groundwater will be managed through COs and the effectiveness of the COs will be documented through regular monitoring of groundwater quality with down-gradient wells.

WWTP NSA Alternative 5 will be fully protective of human health and environment with respect to potential risks from accessible source material. Alternative 5 will excavate accessible source material from the WWTP North Source Area which will improve groundwater quality addressing RAO-2 through RAO-4. In addition, dermal contact, ingestion, and inhalation of DNAPL-saturated soil (RAO-1) will be prevented through excavation of source material.

The dissolved-phase groundwater plume will be addressed through application of in-situ treatment reagents in the excavation combined with monitored natural attenuation. Controls, in the form of COs, to prevent the use of Site groundwater within a defined zone will be implemented until groundwater remediation levels are achieved and the combination of treatment and use controls will fully address RAO-2through RAO-4.

BLSA Alternative 2 will provide long-term effectiveness and permanent control of potential human health risk from exposure to source material by treating potential accessible mobile source material using ISS. It is expected that ISS will sufficiently reduce the downgradient flux of contaminants into the dissolved phase to meet RGs.

To address potential groundwater flux from the inaccessible source material being redirected around the lower permeability ISS monolith, a groundwater drainage vent will be installed through the monolith. The upgradient portion of the trench will be amended with reactive media to treat groundwater flux from the inaccessible source material areas. In the event that the adsorptive capacity of the carbon material is exceeded, contingency injections of an oxidant or biostimulant into the PRB can accelerate degradation and increase the lifespan of the PRB without requiring additional substantial intrusive work. Near-term risks resulting from affected groundwater will be managed through COs and the effectiveness of the COs will be documented through regular monitoring of groundwater quality with down-gradient wells.

BLSA Alternative 3 will provide moderate long-term effectiveness and permanent control of potential human health risk from exposure to source material by removing accessible source material. Due to implementability concerns, it may be infeasible to remove all source material in the BLSA. Due to the need for excavation shoring, underground infrastructure and proximity to the MMC property boundary and above ground assets, it will be challenging to expand the extents of excavation should additional source material be encountered during the excavation.

In-situ treatment reagents will be placed within open excavations to expedite attenuation of groundwater to RGs. Monitored natural attenuation will be relied on to fully restore groundwater to RGs; however, given that upgradient source material will not be removed, additional treatment to meet groundwater RGs may be required tempering the potential long-term effectiveness.

The conditions of the WDNR GIS Registry are maintained for a property, regardless of future changes in ownership.

ISA Alternative 2 will provide long-term effectiveness and permanent control of potential human health risk from exposure to MGP-affected material via installing horizontal direct contact barriers, restricting land use, and restricting intrusive activities. The conditions of the WDNR GIS Registry are maintained for a property regardless of future changes in ownership.

Reduction of Toxicity, Mobility, or Volume through Treatment

Each source area's "No Action" alternative (Alternative 1) would not reduce the toxicity, mobility of volume of the COCs.

WWTP NSA Alternative 2 will involve ISGS treatment of an estimated 8,800 CY of source material from the WWTP NSA, thereby significantly reducing the mobility of the most toxic material at the Site through treatment. In addition, source material in the WWTP NSA is co-located with the well with the highest historic concentrations of benzene and naphthalene found in monitoring well (MW) J1. This will be addressed using ISGS.

Treatment of source material will address the primary source contributing to the dissolved-phase groundwater plume, thereby reducing contaminant mobility. ISGS will also stabilize the NAPL and byproducts by creating a crystalline crust on the exterior of the NAPL mass limiting NAPL mobility.

In addition, surficial soil will be removed to allow for installation of a direct contact barrier. The volume of this soil removal is approximately 600 CY. Installation of a direct contact barrier will reduce the volume of affected surficial soil on Site, and will also reduce the mobility of affected soil by minimizing the potential for windward erosion of affected soil. Toxicity will not be directly reduced; however, risk from toxicity will be mitigated through installation of the horizontal barrier and requiring continuing obligations to ensure long-term risk mitigation.

EPA has a statutory preference for treatment as a principal element of an alternative found in 42 U.S.C. § 9621(b)(1). Source material that is the primary contributor to the dissolved-phase groundwater plume will be treated through ISGS. Therefore, WWTP NSA– Alternative 2 will satisfy the EPA statutory preference for treatment as a principal element of an alternative.

WWTP NSA Alternative 3 will involve Aerobic Bioremediation of an estimated 9,100 CY of source material from the WWTP NSA, thereby significantly reducing the mobility of the most toxic material at the Site through treatment. In addition, source material in the WWTP NSA is co-located with the monitoring well with the highest historic concentrations of benzene and naphthalene (MW-J1). This will be addressed through Aerobic Bioremediation. Treatment of source material will address the primary source contributing to the dissolved-phase groundwater plume, thereby reducing contaminant mobility.

In addition, surficial soil will be removed to allow for installation of a direct contact barrier. The volume of this soil removal is approximately 600 CY. Installation of a direct contact barrier will reduce the volume of affected surficial soil on Site and will also reduce the mobility of affected soil by minimizing the potential for windward erosion of affected soil. Toxicity will not be directly reduced; however, risk from toxicity will be mitigated through installation of the horizontal barrier and requiring continuing obligations to ensure long-term risk mitigation.

EPA has a statutory preference for treatment as a principal element of an alternative. Source material that is the primary contributor to the dissolved-phase groundwater plume will be treated through Aerobic Bioremediation.

Therefore, WWTP North Source Area – Alternative 3 will satisfy the EPA statutory preference for treatment as a principal element of an alternative.

WWTP NSA Alternative 4 will involve ISS treatment of an estimated 6,300 CY of accessible source material from the WWTP NSA, thereby significantly reducing the mobility of the most toxic material at the Site through treatment. In addition, source material in the WWTP NSA is collocated with the monitoring well with the highest historic concentrations of benzene and naphthalene (MW-J1). Treatment of source material will address the primary source contributing to the dissolved-phase groundwater plume, thereby reducing contaminant mobility.

EPA has a statutory preference for treatment as a principal element of an alternative. Source material that is the primary contributor to the dissolved-phase groundwater plume will be treated through ISS. Therefore, WWTP NSA– Alternative 4 will satisfy the EPA statutory preference for treatment as a principal element of an alternative.
WWTP NSA Alternative 5 will involve excavation and off-site disposal of an estimated 5,400 CY of accessible source material, thereby significantly reducing the volume of the most toxic material at the Site. Excavation and off-site disposal will irreversibly reduce the volume of MGP-affected media present at the Site; however, it does not reduce the quantity of untreated material. Off-site disposal does not officially constitute treatment under the EPA's statutory preference for treatment as a principal element of an alternative; however, relocation of affected soil from the Site to a permitted disposal facility will control risk from toxicity and reduce contaminant mobility. Due to implementability concerns, it will likely be infeasible to remove all source material in the WWTP NSA adjacent to utilities and the CN Railroad.

In addition, source material in the WWTP NSA is collocated with the well with the highest historic concentrations of benzene and naphthalene (MW-J1). Removal of source material will remove the primary ongoing source contributing to the dissolved-phase groundwater plume, thereby reducing contaminant mobility.

BLSA Alternative 2 will involve ISS treatment of an estimated 11,300 CY of source material from the BLSA, thereby significantly reducing the mobility of the most toxic material at the Site through treatment. In addition, source material in the BLSA is collocated with groundwater exceedances of the remedial goal (RG). Treatment of source material will address the primary source contributing to the dissolved-phase groundwater plume, thereby reducing contaminant mobility.

EPA has a statutory preference for treatment as a principal element of an alternative. Source material that is the primary contributor to the dissolved-phase groundwater plume will be treated through ISS. Therefore, BLSA– Alternative 2 will satisfy the EPA statutory preference for treatment as a principal element of an alternative.

BLSA Alternative 3 will involve excavation and off-site disposal of an estimated 11,300 CY of accessible source material, thereby significantly reducing the volume of the most toxic material at the Site. Excavation and off-site disposal will irreversibly reduce the volume of MGP-affected media present at the Site; however, it does not reduce the quantity of untreated material. Off-site disposal does not constitute treatment under the EPA's statutory preference for treatment as a principal element of an alternative; however, relocation of affected soil from the Site to a permitted disposal facility will control risk from toxicity and reduce contaminant mobility. In addition, source material in the BLSA is collocated with groundwater RG exceedances. Removal of source material will remove the primary ongoing source contributing to the dissolved-phase groundwater plume, thereby reducing contaminant mobility.

ISA Alternative 2 will not reduce the toxicity, mobility, or volume of source material through treatment as the material is not accessible to treatment.

Short-term Effectiveness

Each source area's "No Action" alternative (Alternative 1) would have no adverse short-term impacts, as no active construction work is associated with these alternatives.
However, the time to achieve RAOs is also considered as part of the short-term effectiveness criterion, and the "No Action" alternatives would not achieve all of the RAOs. For this reason, all "No Action" alternatives are not considered effective in the short term.

WWTP NSA Alternative 3 construction activities associated with installing injection points and associated trenching and excavation of horizontal barriers is anticipated to be completed in approximately 3 months.

Once the Aerobic Bioremediation commences, treatment times could be expected to be between 2 and 10 years to address heavier PAHs and coal tar as degradation rates are dependent on reaction rates and percent water in pore spaces. Slower reaction rates are expected during winter months, as microbial metabolic rates are reduced in colder temperatures and effectively cease around or below 5ºC. Given the cold winter temperatures in Marinette, to reduce O&M requirements during times of lower microbial metabolic rates, the system could be designed to run for 9 months of the year, with shutoff windows from December to March. This approach would also increase treatment time.

WWTP NSA- Alternative 3 Aerobic Bioremediation will create short-term effects within the WWTP NSA for construction of the injection wellfield, trenching and placement of manifold piping. Injection well vaults will need to remain accessible for the duration of the anticipated five-year operational period for operation and maintenance. Periodic access to the temporary building housing the compressor and ancillary equipment will also be required throughout the operational period. The installation and Aerobic Bioremediation activities will limit City access to areas of the Site during construction and throughout the implementation period. Construction activities should take place over a relatively short time period. However, redevelopment or repaving of the Site cannot be completed until the Aerobic Bioremediation operational period is complete which is anticipated to take five years.

When Aerobic Bioremediation is completed improperly it can lead to volatilization of COCs in addition to promoting biodegradation. Off gassing can pose a potential risk to on-site workers. Volatilization can also accumulate potentially dangerous COC concentrations in sewers or other confined spaces near the Site.

These risks can be minimized by using low ventilation rates and using an in-well oxygen diffuser, such as the Tersus Environmental Waterloo Emitter™ to encourage uniform oxygenation and reduce stripping of VOCs. Monitoring of vapor off-gassing will be performed during the pilot study and during the full-scale remediation. Utility location will be required to prevent contacting a utility when installing injection wells. Potential contact with a sewer would have negative impacts on the operations of the WWTP.

The limited soil excavation required for installation of the horizontal barriers will create the potential for direct contact exposure during excavation, fugitive volatile organic emissions, and nuisance odors. Transporting affected soil to a landfill creates a short-term impact on the community due to increased truck traffic, noise, and the potential for increased accidents. These risks can be minimized through best management practices (e.g., misting to minimize dust and odors) and covering trucks when transporting soil to the landfill.

WWTP NSA Alternative 4 ISS, DNAPL recovery well installation, a groundwater drainage vent construction, and restoration activities are expected to be completed in approximately 3 months.

The primary intrusive component of WWTP NSA- Alternative 4 is ISS. ISS treatment will temporarily increase direct contact exposure, fugitive volatile organic emissions, and nuisance odors. The ISS process typically involves mixing an approximately eight-foot diameter column of soil with hydrated grout slurry. The small, disturbed surface area and addition of moisture assists in reducing organic emissions and nuisance odors as compared with an excavation remedy. Odor reducing foams are commonly implemented to minimize the emissions and odors inherent to the ISS process, and air monitoring is conducted to assess both worker safety as well as safety of the surrounding community. Workers are exposed to lesser physical hazards, as this alternative does not typically require shoring, dewatering or access to a deep excavation. The potential exists for workers and the immediate community to be exposed to dust associated with the grout plant operations. Dust monitoring and suppression activities will be implemented in conjunction with this Alternative. WWTP NSA- Alternative 4 involves treating the majority of soil on-site, thereby limiting the increase in truck traffic and its associated hazards. Swell material that cannot be graded on Site will be transported off-site for Subtitle D landfill disposal. The ISS process requires curing for approximately a month to reach effectiveness goals.

The WWTP NSA is used primarily as a parking lot. ISS of source material will temporarily require closure of the parking lot and may require closure or modification to nearby City of Marinette activities including maintenance garage activities, construction material storage and WWTP operations.

WWTP NSA Alternative 5—Source material excavation activities are expected to be completed in approximately three months. Soil excavations associated with WWTP NSA - Alternative 5 will create the potential for direct contact exposure during excavation, fugitive volatile organic emissions, dust generation and nuisance odors. Transporting affected soil to a landfill creates a short-term impact on the community due to increased truck traffic, noise, and the potential for increased accidents.

These risks can be minimized through best management practices (e.g., misting to minimize dust and odors) and covering trucks when transporting soil to the landfill. Installation of shoring will likely be required to reach the desired excavation extents. As a result, there are increased risks associated with damage to surrounding infrastructure and increased risks to construction workers involved in installation of shoring and entering a deep excavation.

The WWTP NSA is used primarily as a parking lot. Excavation of source material will temporarily require closure of the parking lot and may require closure or modification to nearby City activities including maintenance garage activities, construction material storage and WWTP operations. Excavation can be conducted in phases to minimize the surface area of open excavations and the associated short-term impact to the City.

The in-situ groundwater treatment component of Alternative 5 has the potential to generate fugitive emissions and release vapors to the atmosphere during oxidant mixing. As a result, construction workers and nearby building occupants would have the potential exposure to airborne contaminants. These exposures can be controlled through best management practices, engineering controls, and adhering to task-specific health and safety procedures (e.g., personal protective equipment and observing appropriate practices for designated safety zones).

Large quantities of chemical reagents will be required for in-situ treatment. Many of these reagents are reactive and concentrated chemicals, which pose a potential risk to construction workers and surrounding parties during transportation, handling, storage, and treatment application. Several approaches could be used to minimize risk, including administrative requirements and procedures during shipping and storage; selection of highly experienced contractors to mix oxidant with soil; selection of slower-reacting and safer reagents; and engineering controls.

BLSA Alternative 1 has no adverse short-term impacts, as no active construction work is associated with this alternative. However, the time to achieve RAOs is also considered as part of the short-term effectiveness criterion, and Alternative 1 would not achieve all of the RAOs. For this reason, Alternative 1 is not considered effective in the short term.

BLSA Alternative 2 ISS, DNAPL recovery well installation, a groundwater drainage vent construction, and restoration activities are expected to be completed in approximately 3 to 6 months.

The primary intrusive component of BLSA Alternative 2 is ISS. ISS treatment will temporarily increase direct contact exposure, fugitive volatile organic emissions, and nuisance odors. The ISS process typically involves mixing an approximately eight-foot diameter column of soil with hydrated grout slurry. The small, disturbed surface area and addition of moisture assists in reducing organic emissions and nuisance odors as compared with an excavation remedy.

Odor reducing foams are commonly implemented to minimize the emissions and odors inherent to the ISS process, and air monitoring is conducted to assess both worker safety as well as safety of the surrounding community. Workers are exposed to lesser physical hazards, as this alternative does not typically require shoring, dewatering or access to a deep excavation. The potential exists for workers and the immediate community to be exposed to dust associated with the grout plant operations. The ISS process requires curing for approximately a month to reach effectiveness goals.

Closure of the BLSA and the associated boat launch will be required throughout the duration of ISS activities. In addition, the fish cleaning house will likely need to be temporarily relocated. The impact of closure of this public space can be reduced by performing remedial activities outside of regular boating season (between October and early March).

BLSA Alternative 3--Source material excavation activities are expected to be completed in approximately three to six months.

Soil excavations associated with BLSA– Alternative 3 will create the potential for direct contact exposure during excavation, fugitive volatile organic emissions, and nuisance odors. Transporting affected soil to a landfill creates a short-term impact on the community due to increased truck traffic, noise, and the potential for increased accidents. These risks can be minimized through best management practices (*e.g.*, misting to minimize dust and odors) and covering trucks when transporting soil to the landfill. Installation of shoring will likely be required to reach the desired excavation extents. As a result, there are increased risks associated with damage to surrounding infrastructure and increased risks to construction workers involved in installation of shoring and entering a deep excavation.

Closure of the BLSA and the associated boat launch will be required throughout the duration of excavation activities. In addition, it is likely that the fish cleaning house will need to be temporarily relocated. The impact of closure of this public space can be reduced by performing remedial activities outside of regular boating season (between October and early March).

The in-situ groundwater treatment component of Alternative 3 has the potential to generate fugitive emissions and release vapors to the atmosphere during oxidant mixing. As a result, construction workers and nearby building occupants would have the potential exposure to airborne contaminants. These exposures can be controlled through best management practices, engineering controls, and adhering to task-specific health and safety procedures (*e.g.*, personal protective equipment and observing appropriate practices for designated safety zones).

Large quantities of chemical reagents will be required for in-situ treatment. Many of these reagents are reactive and concentrated chemicals, which pose a potential risk to construction workers and surrounding parties during transportation, handling, storage, and treatment application. Several approaches could be used to minimize risk, including administrative requirements and procedures during shipping and storage; selection of highly experienced contractors to mix oxidant with soil; selection of slower-reacting and safer reagents; and engineering controls.

ISA Alternative 1 has no adverse short-term impacts, as no active construction work is associated with this alternative. However, the time to achieve RAOs is also considered as part of the short-term effectiveness criterion, and Alternative 1 would not achieve all of the RAOs. For this reason, Alternative 1 is not considered effective in the short term.

ISA Alternative 2—Horizontal barrier installation activities are expected to be completed in approximately one month.

Excavations associated with horizontal engineered barrier placement will create the potential for direct contact exposure during excavation, fugitive volatile organic emissions, and nuisance odors. Transporting affected soil to a landfill creates a short-term impact on the community due to increased truck traffic, noise, and the potential for increased accidents. These risks can be minimized through best management practices (*e.g.*, misting to minimize dust and odors) and covering trucks when transporting soil to the landfill.

Excavations of surficial soil will take place in the vicinity of the active WWTP and will have temporary impacts on standard operations and maintenance of the WWTP. Excavation of surficial soil can be conducted in phases to minimize the surface area of open excavations and the associated short-term impact to the City.

Implementability

Each source area's "No Action" alternative (Alternative 1) could be easily implemented. No active measures are associated with the "No Action" alternative.

WWTP NSA Alternative 2 will be technically and administratively implementable. ISGS is applied through direct push injections which is a commonly used technology. The extent of ISGS can be increased or decreased to accommodate differing field conditions during implementation and to address utility and railroad constraints. In addition, ISGS is not limited by side slope stability, depth to groundwater, and other constraints typical of excavation. ISGS can likely be safely conducted within the CN Railroad zone of influence and potentially within the 25-foot railroad buffer.

The effectiveness of ISGS is predominantly determined through reduction in the concentration of the dissolved-phase plume.

Effectiveness can also be inferred from visual or microscopic observation of soil borings; however, the vendor has cautioned that the disruptive nature of the soil borings to collect confirmation/construction quality assurance samples may cause the oxidized crust to facture, complicating effectiveness determination.

ISGS is an emerging technology with limited field applications in Wisconsin and EPA Region 5. ISGS has been selected and implemented as a component of the remedial action at the Cabot Carbon/Koppers Superfund Site in Gainesville, Florida located in EPA Region 4 (EPA, 2011). A single vendor (Peroxychem) and single application contractor (Innovative Environmental Technologies, Inc.) supply ISGS services.

WWTP NSA Alternative 3 will be technically and administratively implementable. Injection points will be installed using a hollow stem auger or sonic drill rig which is a commonly used technology. The extent of Aerobic Bioremediation can be increased or decreased to accommodate differing field conditions during implementation and to address utility and railroad constraints. In addition, Aerobic Bioremediation is not limited by side slope stability, depth to groundwater, and other constraints typical of excavation. Aerobic Bioremediation can likely be safely conducted within the CN Railroad zone of influence and may facilitate ancillary degradation of inaccessible material beneath the CN railroad.

The shallow trenching required to place manifold piping will represent some implementation difficulties in the vicinity of the complex utility network. Additionally, utility location will be required to prevent contacting a utility when installing injection wells. Potential contact with a sewer would have negative impacts on the operations of the WWTP.

Aerobic Bioremediation is a commonly used treatment technology. Well installation and implementation can be performed by many contractors. Limited equipment (primarily a large air compressor) is required and should be easily obtainable. The effectiveness of Aerobic Bioremediation can be evaluated by long-term groundwater monitoring.

WWTP NSA Alternative 4 will be moderately difficult to implement. ISS has been implemented at several other MGP sites throughout Wisconsin. The extent and method of application of ISS can be increased or decreased to accommodate differing field conditions during implementation. In addition, ISS is not limited by side slope stability, depth to groundwater, and other constraints typical of excavation. ISS can be safely conducted within the CN railroad zone of influence without the need for earth retention systems. The primary implementability issue associated with WWTP NSA- Alternative 4 will be conducting ISS in the vicinity of the concrete sewers. Lateral expansion of the treatment area will be challenging given the complex utility network.

The effectiveness of ISS can be evaluated by standard permeability and compressive strength testing on the treatment area as well as long-term groundwater monitoring. Both EPA and WDNR have approved ISS and several vendors have the necessary equipment and materials readily available.

WWTP NSA Alternative 5 will be technically and administratively challenging to implement. Excavation has been implemented as the primary remedy at several MGP sites and is a proven and reliable approach. Construction of temporary shoring to a 15.5 feet bgs will be required to safely perform excavations and to ensure structural stability of underground infrastructure and the CN Railroad roadbed. Traditional cantilevered sheet pile cannot be used due to the shallow depth of bedrock at the Site. In addition, a dewatering system will be required to reach the desired excavation depth. Due to the need for excavation shoring, lateral expansions of the excavation will be challenging.

The presence of critical utilities, including the effluent discharge pipe from the City WWTP will create significant implementability challenges to safely and effectively removing source material. Dewatering to support excavating MGP-affected soil is commonly implemented and consists of readily available mobile treatment processes followed by assumed discharge to the local wastewater treatment plant. Should discharge to the local wastewater treatment plant prove to be impractical, alternative disposal strategies such as treatment and discharge to the Menominee River via a WPDES discharge permit or off-site transport, treatment and disposal are available.

The effectiveness of the excavation can be determined through confirmation sampling and landfill weight tickets documenting the mass of impacted soil transported off-site. Earthwork contractors, and materials required to implement excavation components of WWTP North Source Area - Alternative 5 are readily available.

BLSA Alternative 1 could be easily implemented. No active measures are associated with Alternative 1.

BLSA Alternative 2 is moderately difficult to implement. ISS has been implemented at several other MGP sites throughout Wisconsin. The extent of ISS can be increased or decreased to accommodate differing field conditions during implementation. In addition, ISS is not limited by side slope stability, depth to groundwater, and other constraints typical of excavation. ISS can be safely conducted up to the property line with MMC and up to the storm sewer without the need for earth retention systems, although both of those constraints will pose implementability concerns. The effectiveness of ISS can be determined by standard permeability and compressive strength testing on the treatment area as well as long-term groundwater monitoring. Both EPA and WDNR have approved ISS and several vendors have the necessary equipment and materials readily available.

BLSA Alternative 3 will be technically and administratively challenging to implement. Previous excavations have been performed on Site. Excavation has been implemented as the primary remedy at several MGP sites and is a proven and reliable approach. Construction of temporary shoring to a 14.5 feet bgs will be required to safely perform excavations and to ensure structural stability of underground infrastructure and the MMC property.

Traditional cantilevered sheet pile cannot be used due to the shallow depth of bedrock at the Site. In addition, a dewatering system will be required to reach the desired excavation depth.

Dewatering to support excavating MGP-affected soil is commonly implemented and consists of readily available mobile treatment processes followed by discharge to the local wastewater treatment plant. Should discharge to the local wastewater treatment plant prove to be impractical, alternative disposal strategies such as treatment and discharge to the Menominee River via a WPDES discharge permit or off-site disposal and treatment are available.

The effectiveness of the excavation can be determined through confirmation sampling and landfill weigh tickets documenting the mass of impacted soil transported off-site. Earthwork contractors, and materials required to implement excavation components of Boom Landing Source Area – Alternative 3 are readily available.

ISA Alternative 1 could be easily implemented. No active measures are associated with Alternative 1.

ISA Alternative 2-- Installation of a horizontal barrier in the WWTP South Source Area will be complex due to the presence of WWTP infrastructure and disruptive nature of shallow soil excavation on the WWTP property. Any physical remediation work in this area would have to conducted in such a manner as to not affect the operation of the WWTP.

Cost

The estimated total costs for each alternative are FS-level cost estimates that have an expected accuracy of +50% to -30%.

WWTP NSA Alternative 1	$50,000
WWTP NSA Alternative 2	$2.4 Million
WWTP NSA Alternative 3	$2.54 Million (between $1.8 and $2.75 Million)
WWTP NSA Alternative 4	$3.18 Million (or $2.61 Million if Alternative 2 is selected for BLSA)
WWTP NSA Alternative 5	$4.59 Million

BLSA Alternative 1	$50,000
BLSA Alternative 2	$4.0 Million
BLSA Alternative 3	$5.25 Million

ISA Alternative 1	$50,000
ISA Alternative 2	$530,000

The final cost estimate for the selected remedy will be developed and refined during the RD.

State Agency Acceptance

The State of Wisconsin's acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the ROD for the Site.

Community Acceptance
The local community's acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the ROD for the Site.

J. EPA's PREFERRED ALTERNATIVES

This section describes EPA's preferred alternatives and explains the rationale for those preferences.

EPA's Preferred Alternative – WWTP NSA-Alternative 4; BLSA-Alternative 2; ISA-Alternative 2
EPA's preferred alternatives for the following exposure areas are:

WWTP NSA - Alternative 4 - ISS, Groundwater Drainage Vent with Reactive Media, which includes the following main components:

- ISS of accessible oil-coated/oil-wetted material
- COs
- Placement of a PRB
- Placement of passive DNAPL recovery via vertical recovery wells.

BLSA - Alternative 2 - ISS, Groundwater Drainage Vent with Reactive Media, Passive DNAPL Recovery, which includes the following main components:

- ISS of accessible oil-coated/oil-wetted material
- COs
- Placement of a PRB
- Placement of passive DNAPL recovery via vertical recovery wells on the upgradient edge of the treatment area.

ISA - Alternative 2 - Horizontal Engineered Barriers and Institutional Controls, which includes the following main components:

- Maintenance of existing direct-contact barriers and installation of new direct-contact barriers, as required, over affected inaccessible source material in the WWTP South Source Area and CN Railroad and Mann Street Source Area
- COs to manage potential risks associated with remaining inaccessible source material

Based on the evaluation of the various remedial alternatives summarized in the *Evaluation of Alternatives* section above, EPA proposes that WWTP NSA-Alternative 4, BLSA-Alternative 2, and ISA-Alternative 2 are the most appropriate cleanup alternatives for the WPSC Marinette MGP Site. The Preferred Alternatives meet the threshold criteria and provide the best balance of tradeoffs among the alternatives evaluated with respect to balancing and modifying criteria.

EPA expects the Preferred Alternatives to satisfy the following statutory requirements of CERCLA Section 121(b): (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective (total cost would be approximately $6.181) , (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element. 42 U.S.C. § 9621(b).

Summary of Rationale for the Preferred Alternatives

WWTP NSA- Alternative 4 would provide long-term and permanent protection against exposure to contaminated materials through the application of ISS at WWTP NSA to chemically stabilize and physically immobilize source material and through the installation of horizontal engineered barriers. The groundwater plume will be addressed through application of in-situ reagents in the excavated soil areas and monitoring will continue until groundwater PRGs are achieved.

In considering the evaluation criteria as set by the NCP and the overall cost-benefit for the alternatives, WWTP NSA Alternative 4 is recommended for implementation. WWTP NSA Alternative 4 includes elements that will sufficiently comply with ARARs, reduce the volume of the MGP-affected media permanently, and be feasibly implementable. While Alternative 4 has greater short-term impacts to the surrounding community, the lack of long-term operations and certainty of remedial outcome make it slightly more favorable than WWTP NSA-Alternative 3.

BLSA Alternative 2 relies on ISS to chemically stabilize and physically immobilize source material. Advantages of this approach are the highest degree of certainty regarding remedial outcome and lack of shoring or dewatering required to achieve target depths. Compared with Alternative 3, there are no comparative disadvantages.

In considering the evaluation criteria as set by the NCP and overall cost-benefit for the alternatives, BLSA Alternative 2 is recommended for implementation. BLSA Alternative 2 includes elements that will sufficiently comply with ARARs, reduce the volume of the MGP-affected media permanently, and be feasibly implementable.

ISA-Alternative 2 relies on COs and Horizontal Direct Contact Barriers to mitigate risk associated with inaccessible source material. While implementation of a direct contact barrier may present some challenges, ISA-Alternative 2 is the only feasible alternative to adequately address risk. In considering the evaluation criteria as set by the NCP and overall cost-benefit for the alternatives, ISA-Alternative 2 is recommended for implementation. ISA-Alternative 2 includes elements that will sufficiently comply with ARARs, will provide long-term effectiveness and permanent control of potential human health risk, and has no adverse short-term impacts.

Since it will be several decades before groundwater concentrations attain PRGs, and PAHs may remain in soil above levels that allow for unlimited use and unrestricted exposure (*i.e.* residential use), the remedy at the WPSC Marinette MGP Site will be reviewed every five years, in a process that results in a report called the Five-Year Review.

If the remedy is found not to be effective within a reasonable timeframe, or if new issues arise at the Site, EPA will address this during the Five-Year Review process.

K. COMMUNITY PARTICIPATION

EPA, in consultation with WDNR, will evaluate any public comments regarding the preferred cleanup alternatives received during the public comment period before selecting a final Site remedy. Based on new information or public comments, EPA may modify its preferred alternative or choose another, so EPA encourages the public to review and comment on all of the cleanup alternatives.

EPA will respond in writing to all significant comments in a Responsiveness Summary which will be part of the amended ROD. EPA will announce the selected cleanup alternative in local newspaper advertisements and will place a copy of the amended ROD in the local information repositories and on EPA's website at https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0509952

Appendix Materials

- Site ARARs
- Figure 1 – Site Location Map
- Figure 2 – Site Features Map
- Figure 3 – Post-Removal Sediment Conditions Map
- Figure 4 – Visual Conceptual Site Model
- Figure 5 – Conceptual Site Model Chart
- Figure 6 – Estimated Extent of Groundwater Contamination
- Figure 7 – Estimated Extent of Soil Gas Contamination and Possible Vapor Intrusion
- Figure 8 – Total Areas to be Remediated Under WWTP NSA Alternative 4
- Figure 9 – Total Areas to be Remediated Under BLSA Alternative 2
- Figure 10 – Total Areas to be Remediated Under ISA Alternative 2

Chemical-Specific ARARs/TBC

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	LEGAL CITATION	TYPE OF ARAR	REQUIREMENT SYNOPSIS	APPLICABILITY TO SELECTED REMEDY
			FEDERAL		
Groundwater	Groundwater Quality Standards	40 CFR Part 141.61(a) and (c)	Relevant and Appropriate	The National Primary Drinking Water Regulations establish health-based standards for public drinking water systems called MCLs. Groundwater concentrations shall not exceed the MCLs as specified in 40 CFR 141.71(a) and (c). MCLs for COCs at the site include: benzene (0.005 mg/L), ethylbenzene (0.7 mg/L), xylenes (total) (10 mg/L), and benzo(a)pyrene (0.0002 mg/L).	For this Site: benzene, ethylbenzene, xylenes(total), benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and napthalene are the COCs in groundwater that must attenuate to MCLs. Levels may be considered for use as initial cleanup goals.
			WISCONSIN		
Groundwater	Groundwater Quality Standards	WAC NR 140.10	Applicable	NR 140.10 identifies the groundwater quality standards for substances of public health concern. Enforcement standards (more stringent than federal MCLs) for COCs at this Site include: xylenes (total) (2,000 µg/L), benzo(b)fluoranthene (0.2 µg/L), chrysene (0.2 µg/L), and naphthalene (100 µg/L).	Specifically the ES for xylenes (total) (2,000 µg/L), benzo(b)fluoranthene (0.2 µg/L), chrysene (0.2 µg/L), and naphthalene (100 µg/L) are applicable here because they are more stringent than the federal MCLs [and these COCs were found to be present during sampling at the site.
Groundwater	Groundwater Quality Standards	WAC NR 726.05(6)	Relevant and Appropriate	WAC NR 726.05(6) identifies that site closure can be achieved if groundwater enforcement standards are not met provided that 1) adequate source control action is conducted, 2) natural attenuation will bring the groundwater into compliance with groundwater quality standards within a reasonable period of time, and 3) monitoring shows a stable or receding plume everywhere groundwater is monitored including source and NAPL areas. Per WAC NR 726.05(6)(a), adequate source control measures include the removal of all existing USTs, all other tanks, pipes, containers which may discharge hazardous substance have been removed, contained or controlled to prevent new discharges to groundwater, immediate and interim actions have been taken in accordance with NR 708 to protect public health, safety, or welfare or the environment, free product has been removed in accordance with the criteria in NR 708.13, and the concentration and mass of a substance have been reduce to naturally occurring processes as necessary to adequately protect public health and the environment, and prevent groundwater contamination from migrating beyond the boundaries of the property or properties which are required to be entered onto the department database.	This citation is relevant and appropriate to the selection of groundwater remediation goals. This citation is relevant and appropriate because this site has applicable groundwater ESs which trigger this provision for site closure.
Groundwater	Groundwater Quality Standards	WAC NR 708.13	Relevant and Appropriate	Per WAC NR 708.13, responsible parties shall conduct free product removal whenever it is necessary to halt or contain the discharge of a hazardous substance or to minimize the harmful effects of the discharge to the air, lands or water of the state of Wisconsin.	This citation is relevant and appropriate due to its incorporation into to WAC NR 726.05(6). Due to the remedial option to excavate, it is possible for free product (here, non-aqueous phase liquid called NAPL) to be exposed. NAPL must be dealt with to prevent further contamination of groundwater.
Surface Water	Surface Water Quality Standards	WAC NR 102.04	Relevant and Appropriate	Regulation identifies narrative requirements associated with surface water including: (a) Substances that will cause objectionable deposits on the shore or in the bed of a body of water, shall not be present in such amounts as to interfere with public rights in waters of the state.	Surface Water Quality Standards including narrative standards and numeric standards for the MGP-related COCs at the Site are applicable to monitoring of surface water as

				(b) Floating or submerged debris, oil, scum or other material shall not be present in such amounts as to interfere with public rights in waters of the state. (c) Materials producing color, odor, taste or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state. (d) Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life.	part of evaluation of the effectiveness of the Reactive Core Mat.
Surface Water	Surface Water Quality Standards	WAC NR 105.08	Relevant and Appropriate	Regulation identifies the human threshold criterion which are the maximum concentration of a substance established to protect humans from adverse effects resulting from contact with or ingestion of surface waters of the state and from ingestion of aquatic organisms taken from surface waters of the state. The cold-water public supply surface water quality standards for COCs at the site include benzene (5 ug/L) and ethylbenzene (401 ug/L). Storm water runoff requirements apply during excavation activities at sites. 40 CFR 450.21 necessitates that any point source must achieve, at minimum, certain effluent limitations attainable by application of the best practicable control technologies currently available. This citation provides a listing of practices that erosion and sediment controls must be designed, installed and maintained to manage. The listed items relevant to this site include: (1) Control stormwater volume and velocity to minimize soil erosion in order to minimize pollutant discharges; (2) Control stormwater discharges, including both peak flowrates and total stormwater volume, to minimize channel and streambank erosion and scour in the immediate vicinity of discharge points; (3) Minimize the amount of soil exposed during construction activity; (4) Minimize the disturbance of steep slopes; (5) Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site; (6) Provide and maintain natural buffers around waters of the United States, direct stormwater to vegetated areas and maximize stormwater infiltration to reduce pollutant discharges, unless infeasible; (7) Minimize soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted; and (8) Unless infeasible, preserve topsoil. Preserving topsoil is not required where the intended function of a specific area of the site dictates that the topsoil be disturbed or removed.	Surface Water Quality Standards including narrative standards and numeric standards for the MGP-related COCs at the Site are applicable to monitoring of surface water as part of evaluation of the effectiveness of the Reactive Core Mat.

Location-Specific ARARs

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	LEGAL CITATION	TYPE OF ARAR	REQUIREMENT SYNOPSIS	APPLICABILITY TO SELECTED REMEDY
FEDERAL					
NONE IDENTIFIED					
WISCONSIN					
NONE IDENTIFIED					

Soil Action-Specific ARARs

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	LEGAL CITATION	TYPE OF ARAR	REQUIREMENT SYNOPSIS	APPLICABILITY TO SELECTED REMEDY
				FEDERAL	
Site Disturbance	Storm Water Runoff Requirements	40 CFR 450.21(a)	Applicable	Storm water runoff requirements apply during excavation activities at sites. 40 CFR 450.21 necessitates that any point source must achieve, at minimum, certain effluent limitations attainable by application of the best practicable control technologies currently available. This citation provides a listing of practices that erosion and sediment controls must be designed, installed and maintained to manage. The listed items relevant to this site include: (1) Control stormwater volume and velocity to minimize soil erosion in order to minimize pollutant discharges; (2) Control stormwater discharges, including both peak flowrates and total stormwater volume, to minimize channel and streambank erosion and scour in the immediate vicinity of discharge points; (3) Minimize the amount of soil exposed during construction activity; (4) Minimize the disturbance of steep slopes; (5) Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site; (6) Provide and maintain natural buffers around waters of the United States, direct stormwater to vegetated areas and maximize stormwater infiltration to reduce pollutant discharges, unless infeasible; (7) Minimize soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted; and (8) Unless infeasible, preserve topsoil. Preserving topsoil is not required where the intended function of a specific area of the site dictates that the topsoil be disturbed or removed.	Applies to construction activities including clearing, grading, and excavating that result in land disturbance of equal to or greater than one acre. WWTP Alternatives 4 and 5 and Boom Landing Alternatives 2 and 3 will result in site disturbance of greater than 1 acre.
		40 CFR 450.21 (b)	Applicable	Regulation requires that soil stabilization must begin immediately once earth disturbing activities are completed or on any portion of the site where earth disturbing activities have temporarily ceases and will not resume for a period exceeding 14 calendar days. In limited circumstances, stabilization may not be required if the intended function of a specific area of the site necessitates that it remain disturbed.	Applies to construction activities including clearing, grading, and excavating that result in land disturbance of equal to or greater than one acre. WWTP Alternatives 4 and 5 and Boom Landing Alternatives 2 and 3 will result in site disturbance of greater than 1 acre.
		40 CFR 450.21 (c)	Applicable	Regulation prohibits discharges from dewatering of trenches and excavations, unless managed by appropriate controls.	
Wastewater Discharges To POTW	General Pretreatment Requirements	40 CFR 403.4	Applicable	Regulation prohibits specific discharges to POTW. 40 CFR 403.5.a(1) prohibits a user from introducing any pollutants into a POTW that may cause Pass Through or Interference. 40 CFR 403.5.a(2) limits specific discharges. Specific prohibitions that may apply to this site include: (1) pollutants which create a fire or explosion hazard (6) petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through and (7) pollutants which result in the presence of toxic gases, vapors or fumes within the POTW in a quantity that may cause acute worker health and safety problems. Regulations states that: No owner or operator shall construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR part 142 or may otherwise adversely affect the health of persons.	Applies to discharges of water to POTWs. Excavation alternatives (WWTP Soil Alternative 5 and Boom Landing Soil Alternatives 3) will require dewatering to lower the water table within the excavation footprint. It is assumed that the removed groundwater will be treated at an onsite mobile treatment plant and discharged to the City of Marinette POTW under permit. Prior to discharge, the
Wastewater Discharges To POTW	General Pretreatment Requirements	40 CFR 403.5	Applicable		

Wastewater Discharges To POTW	General Pretreatment Requirements	40 CFR 144.12(a)	Applicable		treated water will be subject to pretreatment requirements. Excavation dewatering, treatment and discharge may also be required for the ISS alternatives (WWTP Soil Alternative 4 and Boom Landing Soil Alternative 2) dependent on the ISS implementation approach.
In-situ Treatment of Soil via Injection (ISGS)	Underground Injection Requirements	40 CFR 144.82	Applicable	This regulation stipulates that an operator underground inject wells must comply with 40 CFR parts 144 through 147. Specific regulations applicable at the site are provide in the following rows. This regulation also includes closure requirements such that you must close the well in a manner that complies with prohibition of fluid movement. Also, you must dispose or otherwise manage any soil, gravel, sludge, liquids, or other materials removed from or adjacent to your well in accordance with all applicable Federal, State, and local regulations and requirements.	WWTP Alternative 2 includes in-situ chemical treatment via injection of fluids such as ISGS.
		40 CFR 146.6	Applicable	This regulation provides the method for determining the zone of influence for each injection well or field, project or area.	
		40 CFR 146.10(c)	Applicable	This regulation specifies how Class V injection wells must be abandoned. Specifically: (1) Prior to abandoning a Class V well, the owner or operator shall close the well in a manner that prevents the movement of fluid containing any contaminant into an underground source of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR part 141 or may otherwise adversely affect the health of persons. (2) The owner or operator shall dispose of or otherwise manage any soil, gravel, sludge, liquids, or other materials removed from or adjacent to the well in accordance with all applicable Federal, State, and local regulations and requirements	
		40 CFR 146.51	Applicable	This regulation specifies that all underground injection wells not regulated in previous subparts are considered class V injection wells. Remediation injection wells fall into this category.	
WISCONSIN					
Site Disturbance	Storm Water Runoff Requirements	Wis. Stat. NR 216.46(8)	Applicable	This regulation specifies that velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel as necessary to provide a non−erosive flow from the structure to a watercourse so that the natural physical and biological characteristics and functions are maintained and protected.	Applies to construction activities including clearing, grading, and excavating that result in land disturbance of equal to or greater than one acre. WWTP Alternatives 4 and 5 and Boom Landing Alternatives 2 and 3 will result in site disturbance of greater than 1 acre.
		Wis. Stat. NR 216.48(4)	Applicable	The regulation specifies that erosion and sediment control practices shall be inspected weekly, and within 24 hours following a rainfall of 0.5 inches or greater. Additionally, this regulation specifies that erosion and sediment control best management practices must be repaired or replaced within 24 hours of an inspection indicating that repair or inspection is needed.	
		WAC NR 151.11(6m)a	Applicable	This citation provides a listing of practices that erosion and sediment controls must prevent or reduce. The listed items that are more stringent or specific than those listed in federal regulations include: 1. The deposition of soil from being tracked onto streets by vehicles. 2. The discharge of sediment from disturbed areas into on-site storm water inlets. 6. The discharge of sediment eroding from soil stockpiles existing for more than 7 days. 7. The discharge of sediment from erosive flows at outlets and in downstream channels. 8. The transport by runoff into waters of the state of chemicals, cement, and other building compounds and materials on the construction site during the construction period. 9. The transport by runoff into waters of the state of untreated wash water from vehicle and wheel washing.	
		WAC NR 151.11(6m)b	Applicable	This regulation specifies that BMPs shall be used that, by design, discharge no more than 5 tons per acre per year, or to the maximum extent practicable, of the sediment load carried in runoff from initial grading to final stabilization.	

Groundwater Action-Specific ARARs

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	LEGAL CITATION	TYPE OF ARAR	REQUIREMENT SYNOPSIS	APPLICABILITY TO SELECTED REMEDY
				FEDERAL	
In-Situ Treatment of Soil via Injection (ISGS)	Underground Injection Requirements	40 CFR 144.12(a)	Applicable	Regulations states that: No owner or operator shall construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR part 142 or may otherwise adversely affect the health of persons. This regulation stipulates that an operator underground inject wells must comply with 40 CFR parts 144 through 147. Specific regulations applicable at the site are provided in the following rows. This regulation also includes closure requirements such that you must close the well in a manner that complies with prohibition of fluid movement. Also, you must dispose or otherwise manage any soil, gravel, sludge, liquids, or other materials removed from or adjacent to your well in accordance with all applicable Federal, State, and local regulations and requirements.	WWTP North Alternatives 2 through 5 include a permeable reactive barrier that is likely to be installed via injection methods. Installation via injection would necessitate compliance with underground injection requirements.
		40 CFR 144.82	Applicable		
		40 CFR 146.6	Applicable	This regulation provides the method for determining the zone of influence for each injection well or field, project or area.	
		40 CFR 146.10(c)	Applicable	This regulation specifies how Class V injection wells must be abandoned. Specifically: (1) Prior to abandoning a Class V well, the owner or operator shall close the well in a manner that prevents the movement of fluid containing any contaminant into an underground source of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR part 141 or may otherwise adversely affect the health of persons. (2) The owner or operator shall dispose of or otherwise manage any soil, gravel, sludge, liquids, or other materials removed from or adjacent to the well in accordance with all applicable Federal, State, and local regulations and requirements	
		40 CFR 146.51	Applicable	This regulation specifies that all underground injection wells not regulated in previous subparts are considered class V injection wells. Remediation injection wells fall into this category.	
				WISCONSIN	
	Groundwater monitoring	WAC NR 140.28(5)(c)(4)	Relevant and Appropriate	Requires an owner or operator to make a demonstration that no uncontaminated or contaminated water, substance or remedial material will be infiltrated or injected into an area where a floating non-aqueous phase liquid is present in the contaminated soil or groundwater when a PAL or ES under NR 140.10 or NR 140.12 has been attained or exceeded	Under some alternatives, a floating non-aqueous liquid may be present at the Site
All Groundwater Alternatives	Groundwater Monitoring Well Requirements	WAC NR 141.065	Applicable	This citation provides requirements for monitoring well locations.	Abandonment or construction of new monitoring wells associated with the selected remedy will require compliance with well construction regulations. All alternatives will require the abandonment of monitoring wells in the Source Areas for remedy implementation. WWTP Alternatives 2 through 5 and Boom Landing Alternatives 2 and 3 include a dissolved phase flux control measure which will require the installation of additional monitoring wells for performance monitoring. Additionally, other alternatives such as WWTP
		WAC NR 141.07	Applicable	This citation provides requirements for well casings used in monitoring well construction.	
		WAC NR 141.09	Applicable	This citation provides requirements for well screens used in monitoring well construction.	
		WAC NR 141.10	Applicable	This citation provides requirements for tremie pipes and sealing procedures used in monitoring well construction.	
		WAC NR 141.11	Applicable	This citation provides requirements for filter pack specifications used in monitoring well construction.	
		WAC NR 141.13	Applicable	This citation provides sealing requirements for monitoring well construction.	
		WAC NR 141.15	Applicable	This citation provides drilling method requirements to be used for monitoring well construction.	
		WAC NR 141.16	Applicable	This citation provides requirements to limit cross contamination during monitoring well construction.	
		WAC NR 141.17	Applicable	This citation provides requirements for disposal of drill cuttings and fluids. The citation also stipulates that well construction and development equipment be decontaminated to prevent cross-contamination.	
		WAC NR 141.19	Applicable	This citation provides requirements for borehole diameter dependent on well installation methods.	
		WAC NR 141.21	Applicable	This citation provides requirements for monitoring well development following well installation.	
		WAC NR 141.25	Applicable	This citation provides requirements for abandonment of all boreholes greater than 10 feet deep or which intersect a water table and all groundwater monitoring wells.	

						Alternative 2 (ISGS) and WWTP Alternative 3 (Aerobic Bioremediation) would require installation of additional monitoring wells during the pilot study or implementation phase for design and performance monitoring. Additionally, the anticipated sediment remedy includes regular effectiveness monitoring to assess migration of MGP source materials. The effectiveness monitoring is anticipated to include installation of an additional groundwater monitoring well within the former slough immediately adjacent to the river, subject to physical constraints (i.e., river stage elevation, etc.).

All Media Action-Specific ARARs

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	LEGAL CITATION	TYPE OF ARAR	REQUIREMENT SYNOPSIS	APPLICABILITY TO SELECTED REMEDY
FEDERAL					
Groundwater or Soil Treatment that Generates Vapors	Air Emissions Requirements, Criteria, Limitations	40 CFR 50.11	Applicable	This regulation specifies that national primary and secondary 24-hour ambient air quality standards for particulate matter is 150 µg/m3, 24-hour average concentration. The standards are attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m3 is equal to or less than one.	Air emission requirements are applicable to soil excavation and blending activities that generate fugitive dust and/or vapors. The proposed alternatives include soil excavation and blending activities likely to generate fugitive dust as well as in-situ treatment alternatives that generate vapors. It is anticipated that vapors and PM10 will be monitored during construction activities.
		40 CFR 53.43	Applicable	This regulation outlines the testing procedures to measure PM10 for comparison to the air quality standards listed in 40 CFR 50.11.	
WISCONSIN					
Groundwater or Soil Treatment that Gener Vapors	Air Emissions Requirements, Crit Limitations	WAC NR 415.04(1), NR 415.04(2a), NR415.04(2b)	Applicable	WAC NR 415.04 (Control of Particulate Emissions) regulates the generation of fugitive dust emissions including required precautions such as use of water or chemicals and covering of stockpiles. Applicable components of NR 415.04 (1) include precautions to limit fugitive dust such as the use of water or chemicals for control of dust, the application of asphalt, water, suitable chemicals or plastic covering on stockpiles or other surfaces that can create airborne dust, and the covering or securing of materials likely to become airborne while being moved on public roads. WAC NR 415.04(2a) stipulates that storage piles having a material transfer greater than 100 tons in any year are subject to specific management and storage requirements. WAC NR 415.04(2b) stipulates that materials handling operations s handling of waste material are subject to certain particulate matte emissions requirements.	Air emission requirements are applicable to soil excavation and blending activities that generate fugitive dust and/or vapors. The proposed alternatives include soil excavation and blending activities likely to generate fugitive dust as well as in-situ treatment alternatives that may generate vapors. Excavation and backfill is anticipated to be required.
		WAC NR 419.07	Applicable	WAC § NR 419.07 (Control of Organic Compound Emissions) applies to the remediation of contaminated soil or groundwater and regulates the daily organic emissions limits associated with remediation. The emissions from the remediation or disposal of contaminated soil or water may not exceed 216 pounds per day. Per NR 419.07, the WDNR may waive compliance with any requirement of this section to the extent necessary to prevent an emergency condition which threatens public health, safety, welfare or the environment.	
		WAC NR 429.03	Applicable	NR 429.03 (Malodorous Emissions and Open Burning) prohibits the emissions of any substances that result in objectional odors and provides the methods for determining whether an odor is objectionable.	
		WAC NR 431.05	Applicable	NR 431.05 (Control of Visible Emissions) prohibits visible emissions of shade or density greater than number of the Ringlemann chart or 20% opacity with listed exceptions.	

		WAC NR 445.07	Applicable	NR 445.07 states that no owner or operator of a source may cause, allow or permit emissions of a hazardous air contaminant in such quantity or concentration or for such duration as to cause an ambient air concentration of the contaminant off the source property that exceeds a stated concentration. For chemicals anticipated on this site, ambient air concentration limits per 24-hour average include: ethylbenzene = 10,421 µg/m3, naphthalene = 1,258 µg/m3, toluene = 4,522 µg/m3, and xylenes = 10,421 µg/m3	
All	Statutes for Remedial Action – Sites with Residual Contamination	Wis. Stat. 292.12(2)(c) Wis. Stat. 292.12(3)(a) and (b) Wis. Stat. 292.12(5)(b), (c), and (d)	Relevant and Appropriate	Wis Statute 291.12 regulates the requirements for sites with residual contamination remaining in place. Wis. Stat. 292.12(2)(c) provides authority for the state to impose substantive limitations or other conditions related to property to ensure that conditions at the site remain protective of public health, safety, and welfare and the environment as part of reviewing a remedial action 292.12(3)(a)- provides for a public database where records of sites with residual contamination is stored, which is a component of how Superfund implements institutional controls through the State's continuing obligation program 292.12(3)(b) states that if contamination remains on a site that includes the use of an engineering control, the agency with administrative authority shall request the WDNR to list the site in the database maintained by the WDNR. 292.12(5)(b), (c), and (d) state that requirements, limitations, or conditions relating to restrictions of sites listed on the WDNR GIS database are required to be met by all property owners.	All the alternatives include residual contamination to remain in place under appropriate engineered barriers and institutional controls. The main properties are owned the City of Marinette; therefore, appropriate notification is required. Impacts may remain in place within the Mann Street Right-of-Way and underneath a railroad ROW.
		WAC NR 727.05	Relevant and Appropriate	This regulation specifies the minimum responsibilities of responsible parties and owners and occupants of properties with residual contamination, where continuing obligations have been. Relevant responsibilities outlined in NR 727.05 include: 1) Operate and maintain the response required and 2) conduct long term monitoring. The responsible party is also required to allow reasonable access to the agency for inspection of continuing obligations.	

To Be Considered Standards, Guidance, and Initiatives

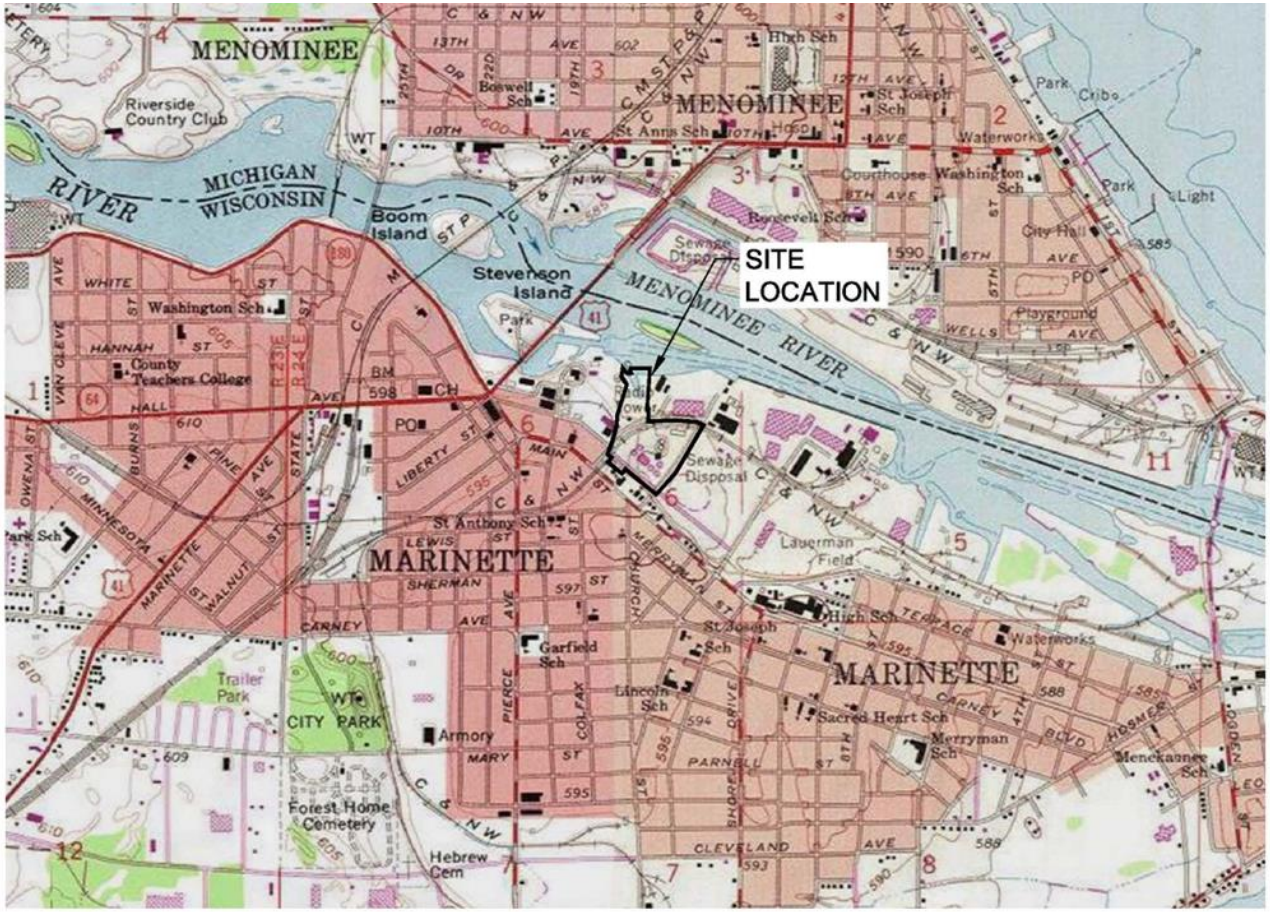
ALTERNATIVE COMPONENT	LEGAL CITATION	REQUIREMENT SYNOPSIS	APPLICABILITY TO SELECTED REMEDY
		FEDERAL	
		NONE IDENTIFIED	
		WISCONSIN	
Air Management Guidelines & Community Involvement	Wisconsin Bureau of Environmental and Occupational Health, Department of Health and Family Services: "Health-based Guidelines for Air Management and Community Involvement During Former Manufactured Gas Plant Clean-ups" (March 23, 2014)	This document provides guidance on developing Air Management Plans to protect human health during remedial activities at MGP sites in Wisconsin. Relevant recommendations in the Guidance Document include: Background air monitoring should be conducted prior to any excavation. The following action level ranges may be considered during excavations: - VOCs at Site Perimeter: 0.1 ppm to 1.0 ppm total VOCs - Benzene at Site Perimeter: 0.1 ppm to 0.5 ppm - Particulates at Site Perimeter: 0.150 to 1.0 mg/m_3 DHS recommendations: - Air quality at the unsecured perimeter of MGP remediation sites should meet existing public health-based 24-hour standards and guidelines on ambient air. - Neighbors of MGP excavations should be able to avoid tar odors within their homes with doors and windows closed. Meeting this goal should focus on site management but might also entail special accommodations for neighbors.	WWTP Alternatives 4 and 5 and Boom Landing Alternatives 2 and 3 will include excavation of MGP-impacted soils. Additionally, all alternatives will include some excavation for the placement of engineered barriers to address shallow non-source material.
Soil Cover Guidance	WDNR Guidance Document: "Guidance for Cover Systems as Soil Performance Standard Remedies" (WDNR PUBL-RR-709, October 2013)	This document provides guidance on cover systems and soil performance standard remedies. Relevant, substantive components of this guidance include: Section 4) General goals for all covers. The design, construction and maintenance of a cover system should be implemented to address the following concerns, where appropriate: - Erosion from precipitation, surface water flow or winds - Cracking and deterioration from natural forces including water saturation and freeze/thaw cycles and expected human activities/use on the cover - Incompatible human activities such as digging, gardening, and construction - Settlement and shifting - Damage from migration of groundwater into the cover - Contamination migration, including migration to the surface of the cover and vapor migration Section 5) General Design Concepts – Direct Contact Cover Systems: b) In addition to the general design goals in Section 4, the design must prevent direct contact exposure to contaminated soil and should consider site-specific factors. c) Soil covers may be used to prevent direct contact exposure to contaminated soils. Generally, a 2-foot thickness of clean soil should be placed over the contaminated soil. Soil covers should be vegetated to prevent erosion and deterioration. Therefore, at least 6 inches of topsoil, with appropriate seeding or sod, to establish a good growth of grass should be placed on top of the clean soil. If topsoil is used, then consideration can be given to reducing the minimum thickness of the clean soil layer by the same amount as the topsoil layer thickness. Other materials, such as gravel or bark, may substitute for vegetated topsoil, as discussed below. The slope for clean soil with vegetated topsoil direct contact cover should normally not be steeper than 3:1 (H:V), but preferably no steeper than 4:1 or, better, 5:1. Steeper slopes may be considered on a case by case basis if it can be shown that erosion will be adequately controlled through additional design features and/or O&M. Steeper slopes will generally call for an evaluation of the need for slope reinforcement to provide long-term stability d) Pavement systems may be used to prevent direct contact exposure to contaminated soils. Contaminated soil particles can work their way to pavement surfaces where pavement settlement, cracking, freeze/thaw cycles, weathering, and deterioration are not adequately addressed in the design, construction and maintenance of the cover. Settlement and shifting can greatly increase the chances of this occurring as well. Therefore, sites where settlement and shifting are a potential problem may not be candidates for pavement direct contact covers. Pavement material should have appropriate bottom base soil preparation (grading, re-compaction, dewatering, etc., as appropriate), sufficient base course to minimize freeze/thaw problems, settling and shifting which can cause the development of cracks. Designs that minimize long-term maintenance needs should be evaluated. There should be an appropriate layer of base material placed over the contaminated soil before the pavement material is placed.	All alternatives (non-source area and inaccessible source material areas) include engineered barriers including areas of soil cover and areas of pavement cover.

Continuing Obligations Guidance	"Continuing Obligations for Environmental Protection Responsibilities of Wisconsin Property Owners" (WDNR PUBL-RR-819, June 2017)	Provides additional detail as to various types of continuing obligations	The substantive portions of this guidance will be relevant to implementing and maintaining institutional controls at the Site

Acronyms

Acronyms µg/L: microgram per liter
µg/m3: microgram per cubic meter
ARARs: Applicable or Relevant and Appropriate Requirements
CFR: Code of Federal Regulations
COCs: constituents of concern
DHS: Wisconsin Department of Health and Family Services
ES: Enforcement Standards
ISGS: in situ geochemical stabilization
ISS: in situ solidification and stabilization
MCL: maximum contaminant level
mg/L: milligram per liter
MGP: manufactured gas plant
NAPL: non-aqueous phase liquid
NR: Natural Resources
POTW: publicly owned treatment works
PM10: particulate matter with diameters that are generally 10 micrometers and smaller.
PPM: parts per million
TBC: to be considered
USEPA: United States Environmental Protection Agency
UST: underground storage tank
WAC: Wisconsin Administrative Code
WDNR: Wisconsin Department of Natural Resources
Wis. Stat.: Wisconsin Statute
WWTP: wastewater treatment plant

Figure 1. WPSC Marinette Former MGP Site Location



SOURCE NOTES:

1. NATIONAL GEOGRAPHIC TOPO. 1:24,000-SCALE MAPS FOR THE UNITED STATES. THE TOPO! MAPS ARE SEAMLESS, SCANNED IMAGES OF UNITED STATES GEOLOGICAL SURVEY (USGS) PAPER TOPOGRAPHIC MAPS. FOR MORE INFORMATION ON THIS MAP, VISIT US ONLINE AT HTTP://GOTO.ARCGISONLINE.COM/MAPS/USA_TOPO_MAPS COPYRIGHT:© 2011 NATIONAL GEOGRAPHIC SOCIETY, I-CUBED
2. COORDINATE SYSTEM IS WISCONSIN COUNTY COORDINATE SYSTEM, MARINETTE COUNTY, US FOOT.

Figure 2. WPSC Marinette Former MGP Site Property Boundaries

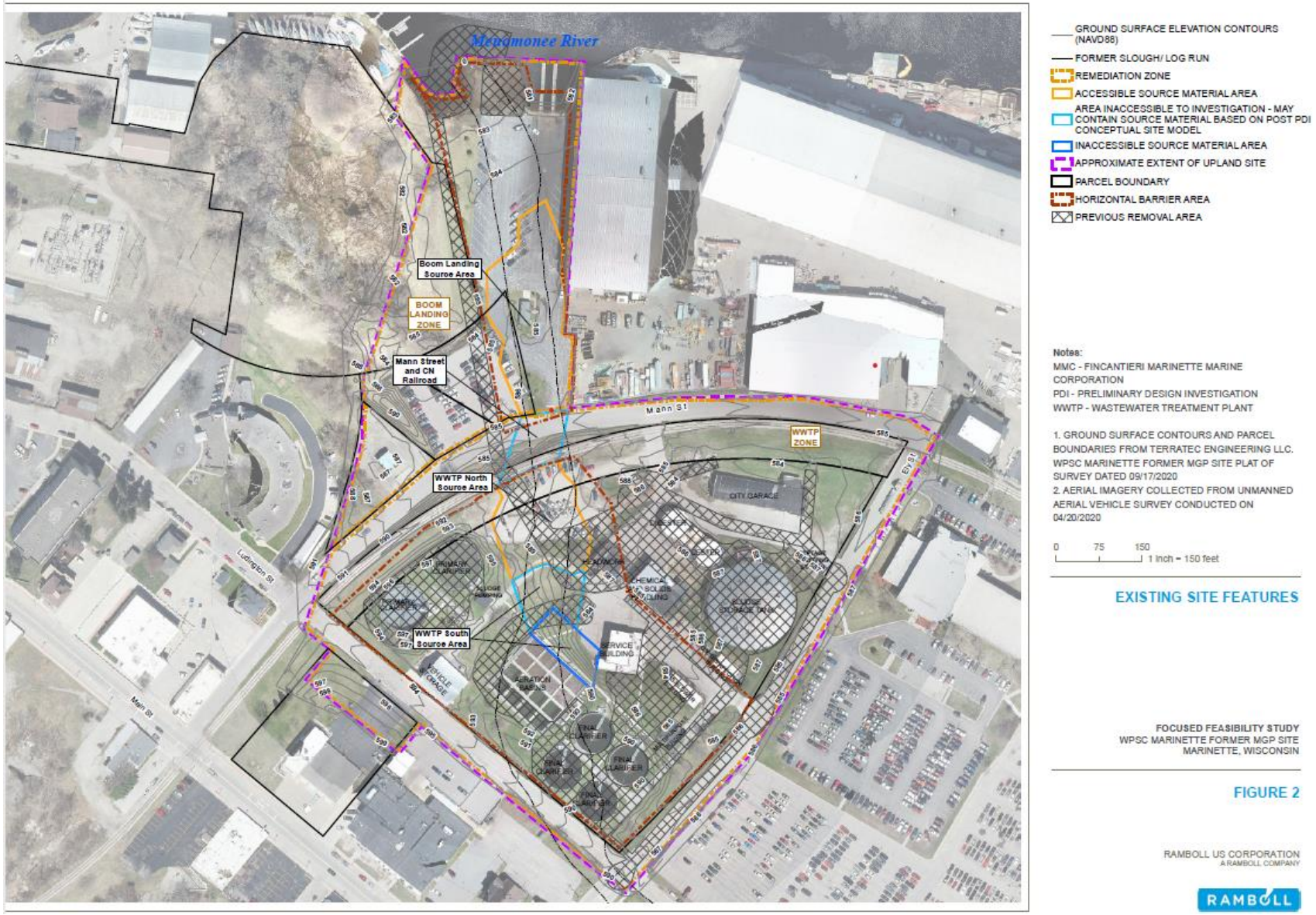


Figure 3. Post-Removal Sediment Conditions

Reactive Core Mat

Dredge Management Unit Boundary

Limits of Residual Sand Layer

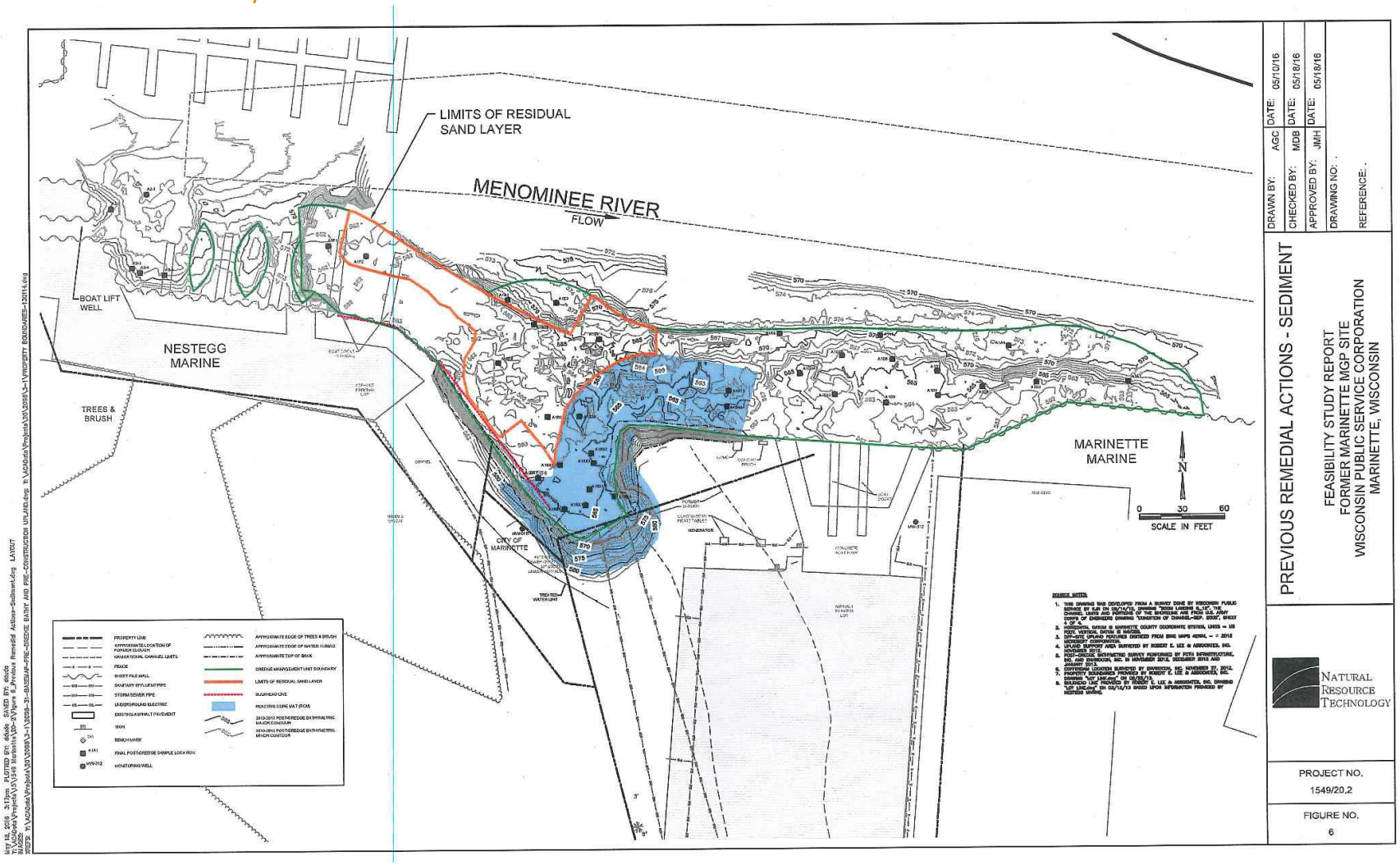


Figure 4. Visual Conceptual Site Model for the WPSC Marinette Former MGP Site

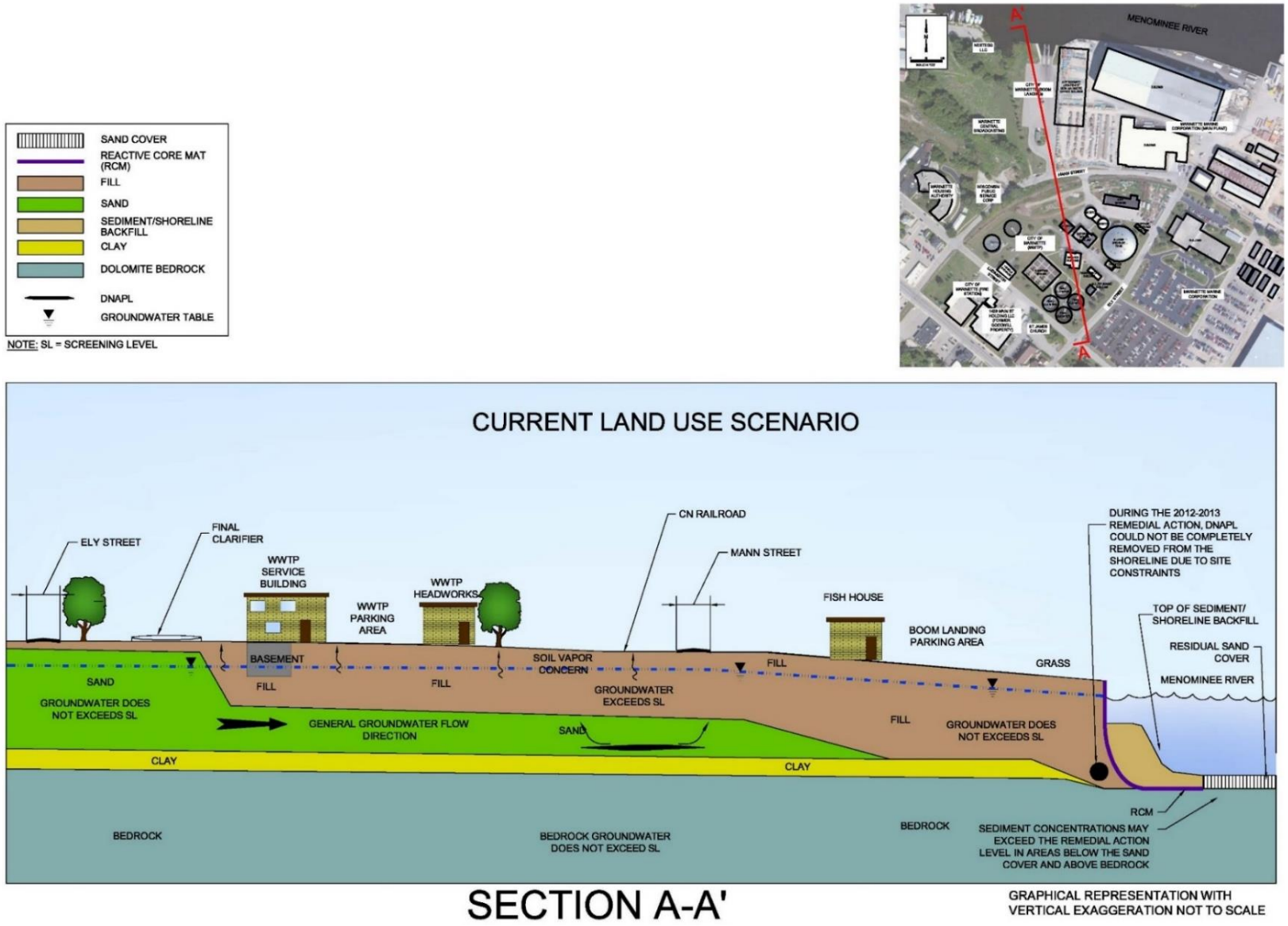
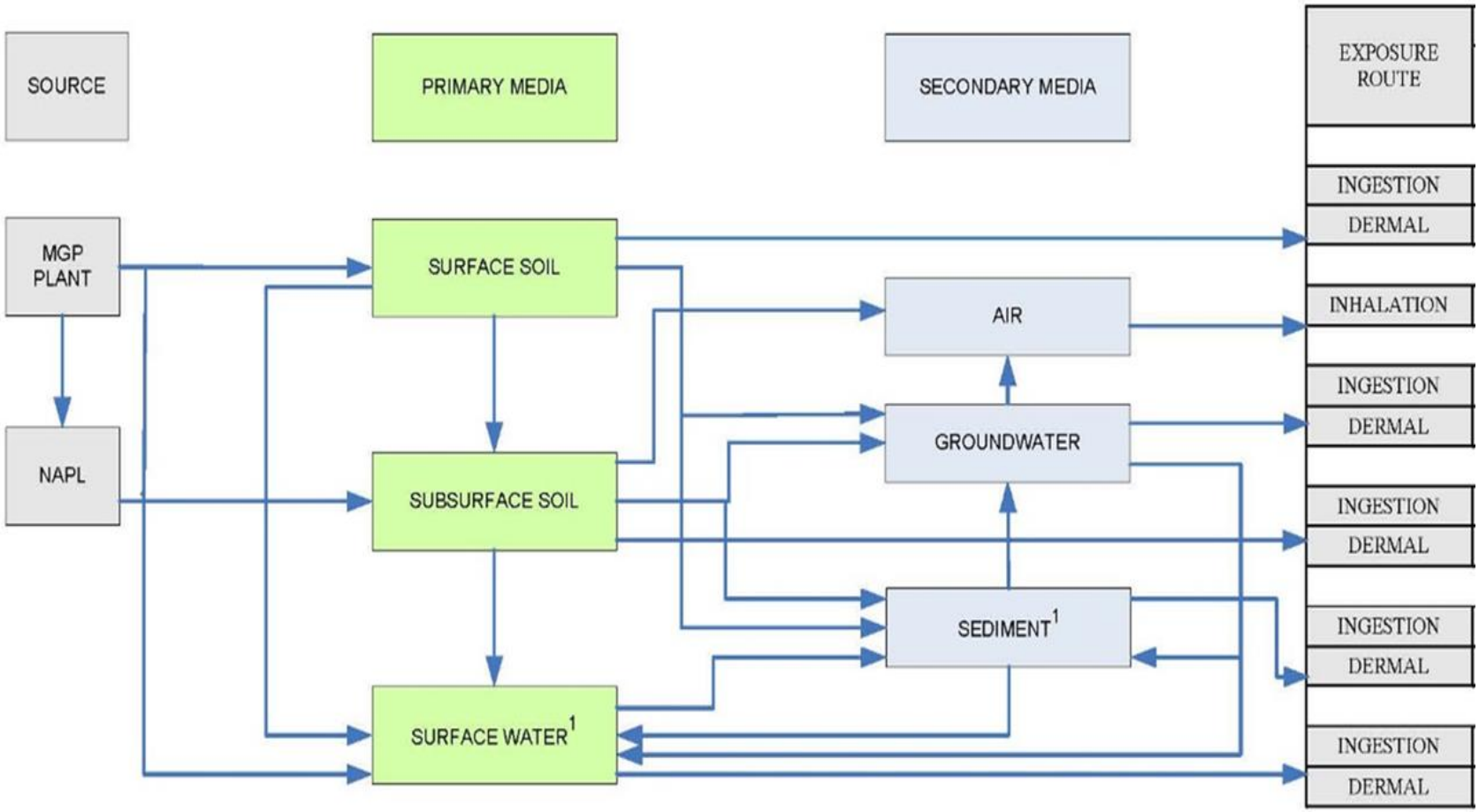


Figure 5. Conceptual Site Model Chart for the WPSC Marinette Former MGP Site



GENERAL NOTES:
This site-specific Conceptual Site Model was developed based on the Generalized Conceptual Site Model Revision 0 (August 5, 2007) and observations made during the July 17, 2009 site reconnaissance, and the results of the sediment remediation and remedial investigation.

[1] A qualitative exposure assessment found this pathway to be incomplete or insignificant under current and future scenarios. Refer to Section 2.3.4 Potential Exposure to Surface Water and Sediment of the BLRA for the details of this assessment.

Figure 6. Estimated Extent of Groundwater Contamination

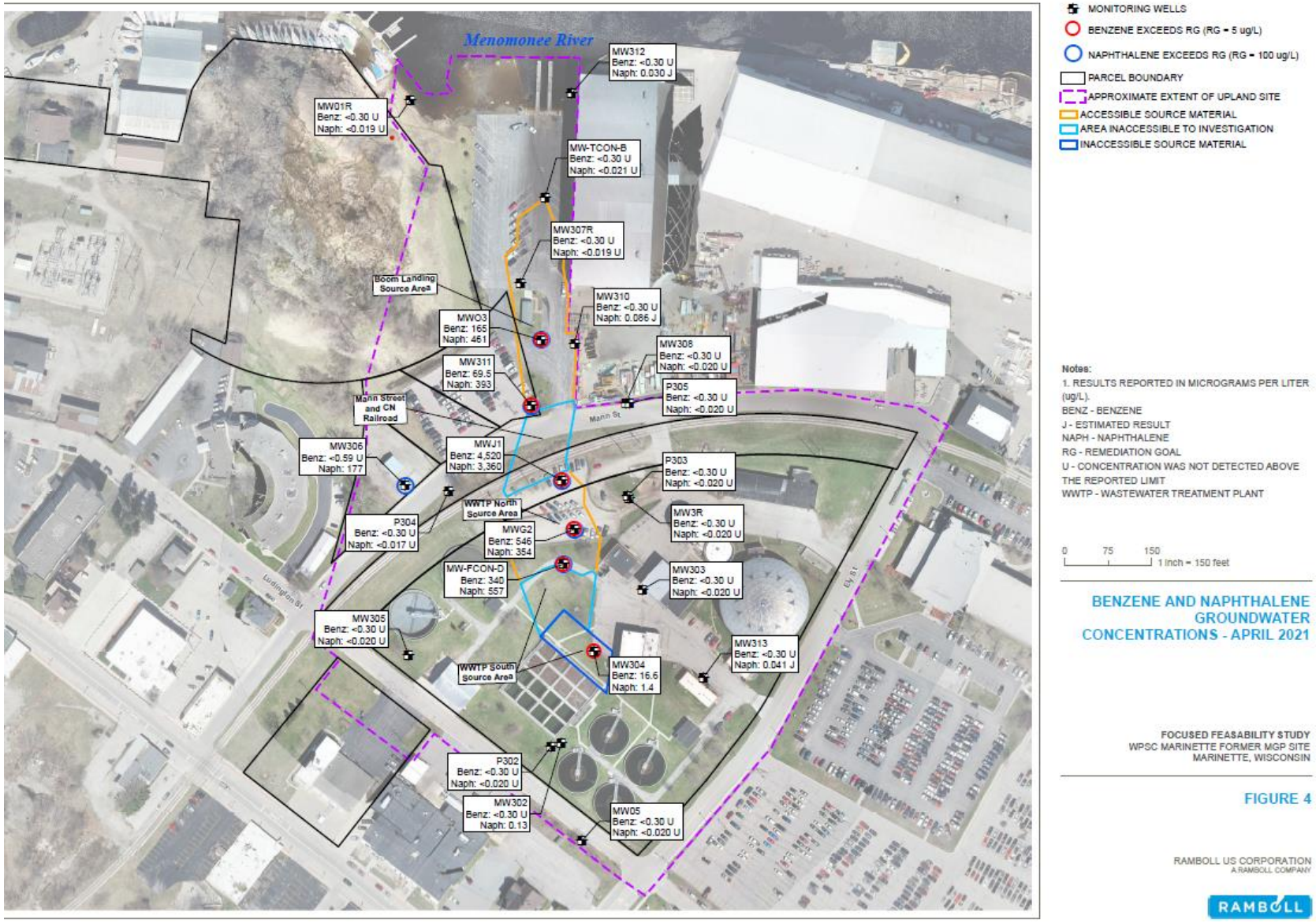
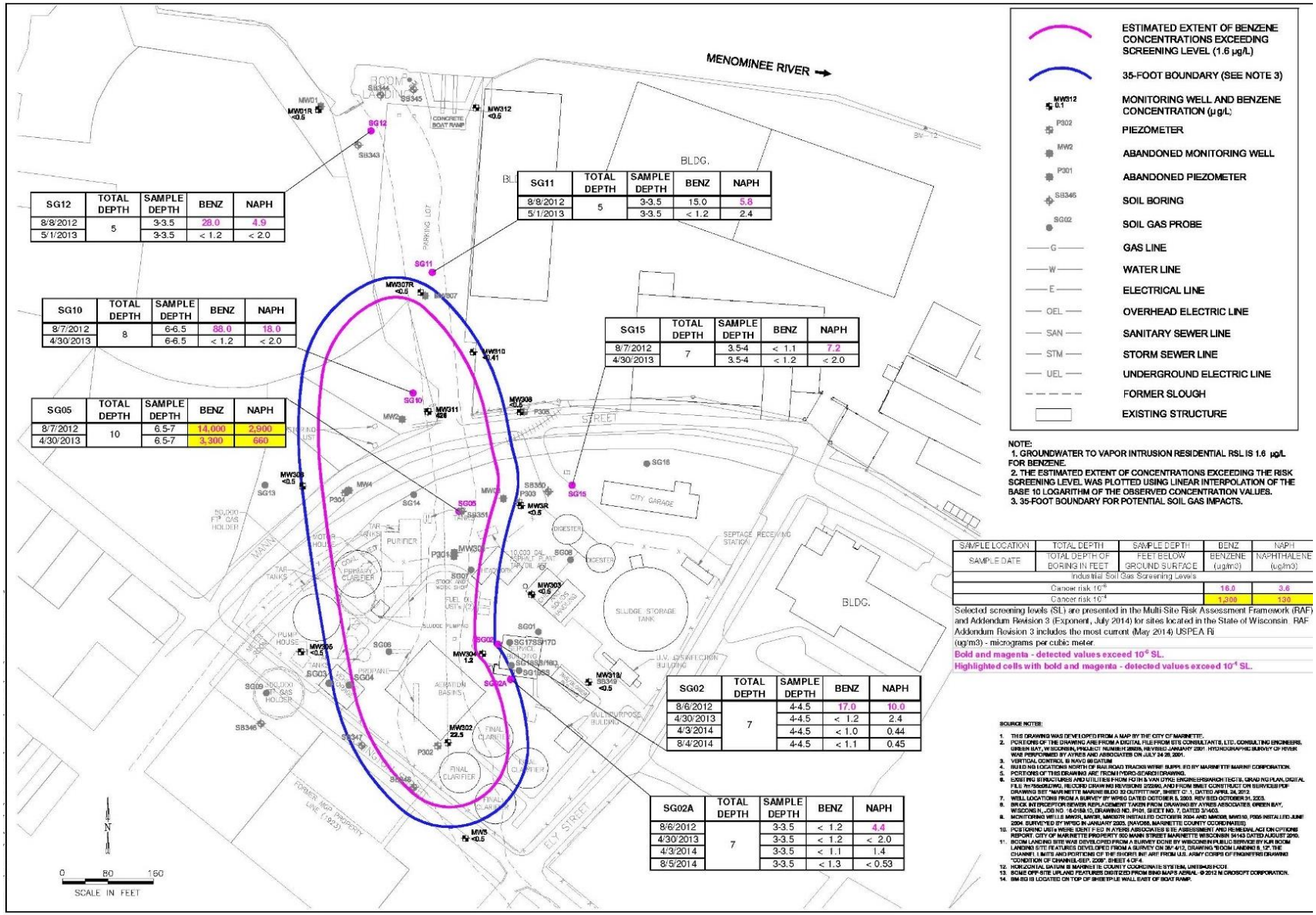


Figure 7. Estimated Extent of Soil Gas Contamination and Possible Vapor Intrusion



SG12	TOTAL DEPTH	SAMPLE DEPTH	BENZ	NAPH
8/8/2012	5	3-3.5	28.0	4.9
5/1/2013		3-3.5	< 1.2	< 2.0

SG11	TOTAL DEPTH	SAMPLE DEPTH	BENZ	NAPH
8/8/2012	5	3-3.5	15.0	5.8
5/1/2013		3-3.5	< 1.2	2.4

SG10	TOTAL DEPTH	SAMPLE DEPTH	BENZ	NAPH
8/7/2012	8	6-6.5	88.0	18.0
4/30/2013		6-6.5	< 1.2	< 2.0

SG15	TOTAL DEPTH	SAMPLE DEPTH	BENZ	NAPH
8/7/2012	7	3.5-4	< 1.1	7.2
4/30/2013		3.5-4	< 1.2	< 2.0

SG05	TOTAL DEPTH	SAMPLE DEPTH	BENZ	NAPH
8/7/2012	10	6.5-7	14,000	2,900
4/30/2013		6.5-7	3,300	660

SG02	TOTAL DEPTH	SAMPLE DEPTH	BENZ	NAPH
8/6/2012	7	4-4.5	17.0	10.0
4/30/2013		4-4.5	< 1.2	2.4
4/3/2014		4-4.5	< 1.0	0.44
8/4/2014		4-4.5	< 1.1	0.45

SG02A	TOTAL DEPTH	SAMPLE DEPTH	BENZ	NAPH
8/6/2012	7	3-3.5	< 1.2	4.4
4/30/2013		3-3.5	< 1.2	< 2.0
4/3/2014		3-3.5	< 1.1	1.4
8/5/2014		3-3.5	< 1.3	< 0.53

SAMPLE LOCATION / SAMPLE DATE	TOTAL DEPTH OF BORING IN FEET	SAMPLE DEPTH FEET BELOW GROUND SURFACE	BENZENE (ug/m3)	NAPHTHALENE (ug/m3)
Industrial Soil Gas Screening Levels				
Cancer risk 10^{-6}			16.0	3.6
Cancer risk 10^{-4}			1,300	130

Selected screening levels (SL) are presented in the Multi-Site Risk Assessment Framework (RAF) and Addendum Revision 3 (Exponent, July 2014) for sites located in the State of Wisconsin. RAF Addendum Revision 3 includes the most current (May 2014) USPEA Ri
(ug/m3) - micrograms per cubic meter.
Bold and magenta - detected values exceed 10^{-6} SL.
Highlighted cells with bold and magenta - detected values exceed 10^{-4} SL.

SOURCE NOTES:

1. THIS DRAWING WAS DEVELOPED FROM A MAP BY THE CITY OF MARINETTE.
2. PORTIONS OF THE DRAWING ARE FROM A DIGITAL FILE FROM STS CONSULTANTS, LTD., CONSULTING ENGINEERS, GREEN BAY, WISCONSIN, PROJECT NUMBER 1850N, REVISED JANUARY 2001. HYDROGRAPHIC SURVEY OF RIVER WAS PERFORMED BY AYRES AND ASSOCIATES ON JULY 24-26, 2001.
3. VERTICAL CONTROL IS NAVD 88 DATUM
4. BUILDING LOCATIONS NORTH OF RAILROAD TRACKS WERE SUPPLIED BY MARINETTE MARINE CORPORATION.
5. PORTIONS OF THIS DRAWING ARE FROM HYDRO-SEARCH DRAWING.
6. EXISTING STRUCTURES AND UTILITIES FROM FOTH & VAN DYKE ENGINEERS/ARCHITECTS, GRADING PLAN, DIGITAL FILE 7m7560s05.DWG, RECORD DRAWING REVISIONS 2/22/00, AND FROM SHEET CONSTRUCT ON SERVICES PDF DRAWING SET "MARINETTE MARINE BLDG 30 OUTFITTING", SHEET C1.1, DATED APRIL 24, 2012.
7. WELL LOCATIONS FROM A SURVEY BY WPRG DATED OCTOBER 5, 2003 REVISED OCTOBER 31, 2003.
8. BROKE INTERCEPTOR SEWER REPLACEMENT TAKEN FROM DRAWING BY AYRES ASSOCIATES, GREEN BAY, WISCONSIN, JOB NO. 16-0158.10, DRAWING NO. P101, SHEET NO. 7, DATED 3/14/03.
9. MONITORING WELLS MW2R, MW3R, MW307R INSTALLED OCTOBER 2004 AND MW308, MW310, P305 INSTALLED JUNE 2004. SURVEYED BY WPSC IN JANUARY 2005. (NAD83, MARINETTE COUNTY COORDINATES).
10. POSITIONS USED WERE IDENTIFIED IN AYRES ASSOCIATES SITE ASSESSMENT AND REMEDIAL ACTION OPTIONS REPORT, CITY OF MARINETTE PROPERTY, 600 MAIN STREET MARINETTE, WISCONSIN 54143 DATED AUGUST 2010.
11. BOOM LANDING SITE WAS DEVELOPED FROM A SURVEY DONE BY WISCONSIN PUBLIC SERVICE BY KJR BOOM LANDING SITE FEATURES DEVELOPED FROM A SURVEY ON 3M/4/12, DRAWING "BOOM LANDING 8_12", THE CHANNEL LIMITS AND PORTIONS OF THE SHORELINE ARE FROM U.S. ARMY CORPS OF ENGINEERS DRAWING "CONDITION OF CHANNEL-SEP. 2008", SHEET 4 OF 4.
12. HORIZONTAL DATUM IS MARINETTE COUNTY COORDINATE SYSTEM, UNITS=US FOOT.
13. SOME OFF-SITE UPLAND FEATURES DIGITIZED FROM BING MAPS AERIAL. © 2012 MICROSOFT CORPORATION.
14. SM-SG 15 IS LOCATED ON TOP OF SHEETPILE WALL EAST OF BOAT RAMP.

Figure 8. Total Areas to be Remediated Under WWTP NSA Alternative 4

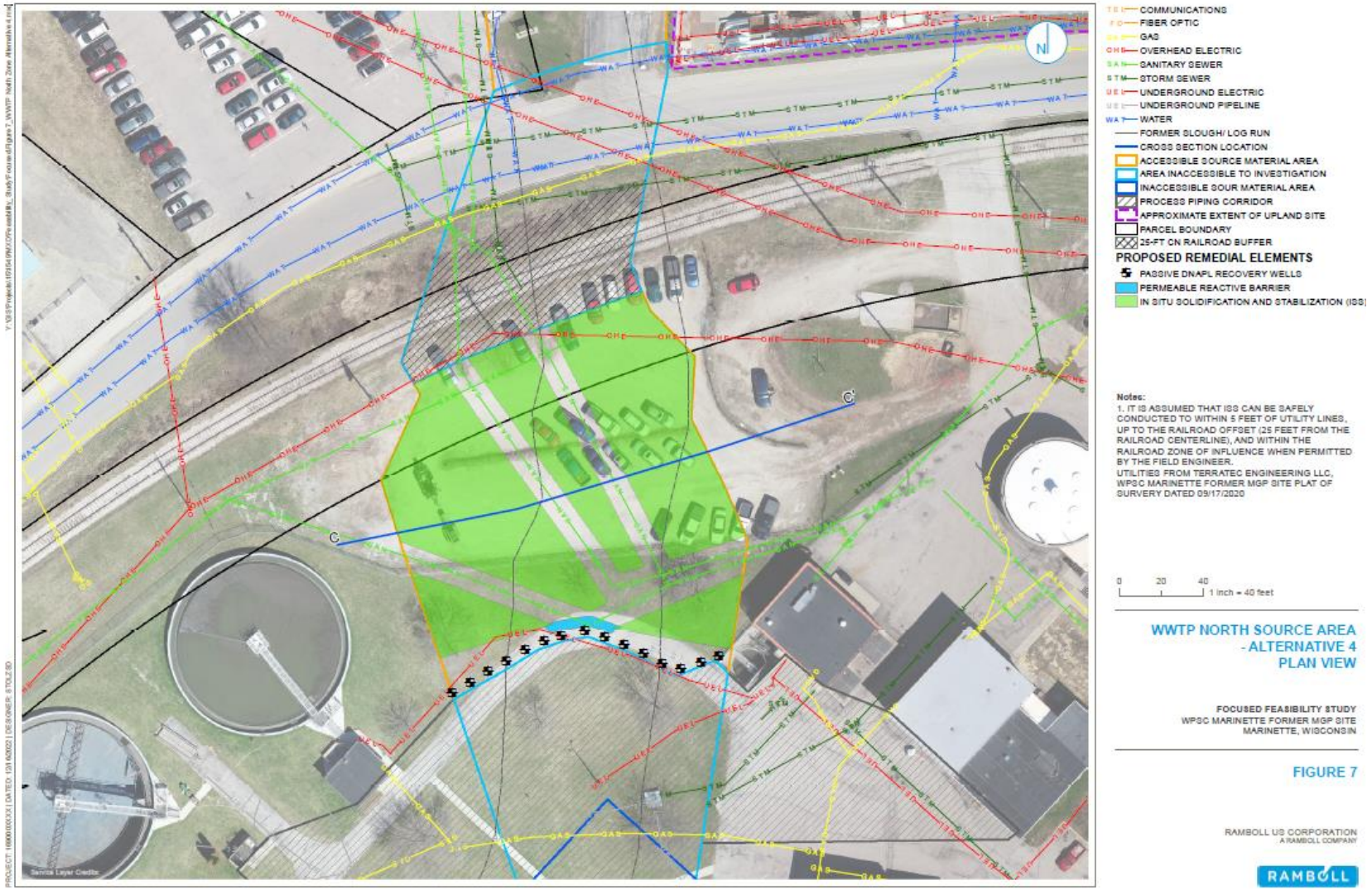


Figure 9: Total Areas to be Remediated Under BLSA Alternative 2

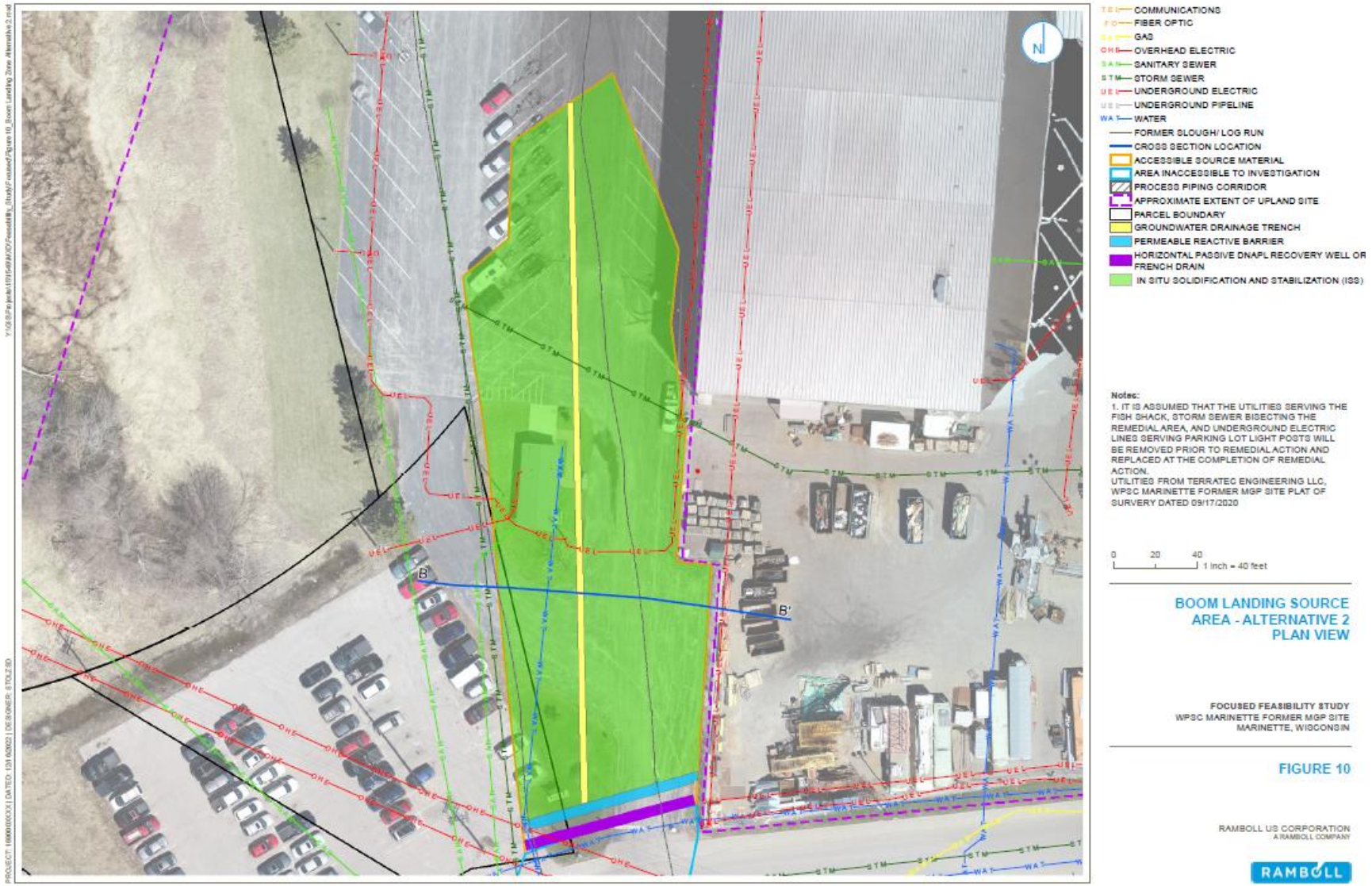


Figure 10: Total Areas to be Remediated Under ISA Alternative 2