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Sent: Monday, May 17, 2021 11:57 AM
To: Gielniewski, Margaret
Cc: Krueger, Sarah E - DNR; Fitzpatrick, William - DNR; Dombrowski, Frank J; Abigail Small; Korpela, Adrienne/MKE
Subject: Marinette - Focused Alternatives Array Tech Memo
Attachments: WPSC_USEPA_Marinette_Alt Array Tech Memo 210517.pdf

Margaret,

On behalf of Frank Dombrowski of WPSC, attached is the Focused Remedial Alternatives Array Technical Memo (Alternatives Array) for the WPSC Marinette MGP. During our May 11, 2020 call, you mentioned that high-level costs would also be helpful for USEPA when reviewing this Alternatives Array. We are in the process of developing high-level cost estimates for each of the four alternatives identified in this Alternatives Array and will provide costs in a subsequent email later this week.

Please feel free to contact Frank Dombrowski with any questions or concerns with the content of this document.

Kind Regards,

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TECHNICAL MEMORANDUM

To: Frank Dombrowski, WEC Business Services LLC
From: Abby Small and Marcus Byker, Ramboll
Re: Focused Remedial Alternatives Array
Former Marinette Manufactured Gas Plant Site
Marinette, Wisconsin
Wisconsin Public Service Corporation
Chicago, IL
The Peoples Gas Light and Coke Company
CERCLIS ID – WIN00050995

May 17, 2021

INTRODUCTION

BACKGROUND AND PURPOSE

On behalf of Wisconsin Public Service Corporation (WPSC), Ramboll has prepared this Focused Remedial Alternatives Array Technical Memorandum (Memo) to address source material at the WPSC Marinette Former Manufactured Gas Plant (MGP) Superfund Alternative Site (SAS) located in Marinette County, Wisconsin (Site).

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The United States Environmental Protection Agency (USEPA) selected a remedy for the Site in the *Record of Decision (ROD) - Wisconsin Public Service Corporation Marinette Former Manufactured Gas Plant Site Marinette, Wisconsin* (USEPA, 2017). WPSC performed a preliminary design investigation (PDI) in accordance with the USEPA-approved *PDI Work Plan, Revision 2* (Ramboll, 2020) to collect additional data required to adequately design the USEPA-selected remedy. The initial PDI field activities were conducted in April through July 2020. Source material was identified at the property boundary with the adjacent Fincantieri Marinette Marine-owned property. Access negotiations with Fincantieri Marinette Marine Corp. (MMC) are ongoing. Once the access agreement is in place, further source material delineation will be conducted in accordance with the June 24, 2020 *PDI Work Plan – Addendum* (WPSC, 2020).

The PDI findings collected to date identified significant site constraints beyond those known during the USEPA-approved Feasibility Study (FS) (NRT, 2017). In addition, the PDI identified greater volumes of source material impacts adjacent to critical infrastructure and potential expansion of remedy onto MMC (pending future investigation). Therefore, a post PDI evaluation of the source material remedy is warranted. No changes to the 2017 ROD (USEPA, 2017) selected non-source soil, soil vapor, and sediment remedies are warranted.

This document provides the rationale for evaluating the remedial alternatives for source material areas based on the modified site understanding identified during the PDI and identifies the proposed source material alternatives that will be further evaluated as part of a forthcoming Focused FS.

In previous regulatory submittals, the Site was divided into two remediation zones: Boom Landing Zone and wastewater treatment plant (WWTP) Zone, separated by the Canadian National (CN) railroad. Based on the results of the PDI, the Site has been subdivided into five source zones: WWTP South Zone, WWTP North Zone, Mann Street and CN Railroad Zone, Boom Landing Zone, and the MMC Zone. These zones are presented on Figure 1. The remedial source zones were developed based on property ownership, and site-specific constraints that may influence the scope of remedial action (RA) and are further discussed below.

SUMMARY OF ROD

The 2017 ROD (USEPA, 2017) identified USEPA's-selected remedy to address MGP-related impacts at the Site. The ROD also promulgated Applicable or Relevant and Appropriate Requirements (ARARs) pertaining to the selected remedy, Remedial Action Objectives (RAOs), and Constituents of Concern (COCs) along with applicable Remedial Goals (RGs). The ROD also provided a site-specific definition of principal threat waste. The following subsections provide an overview of key elements of the ROD.

Applicable or Relevant and Appropriate Requirements

A summary of ARAR pertaining to the USEPA-selected remedy is provided as Attachment 1.

Remedial Action Objectives

Provided below is a summary of the six RAOs established for the Site.

- **Soil/Soil Vapor:**

- **RAO-1:** Prevent human exposure, including dermal contact and incidental ingestion, of particulates and vapor to dense non-aqueous phase liquid (DNAPL)-saturated soil and subsurface soil containing MGP related contaminants greater than RGs.

- **Groundwater:**

- **RAO-2:** Prevent human exposure, including dermal contact, incidental ingestion and inhalation (as a result of vapor intrusion), of groundwater containing MGP residuals exceeding RGs.
- **RAO-3:** Restore groundwater to RGs for MGP-related contaminants within a reasonable timeframe.
- **RAO-4:** Minimize, to the extent practicable, the potential for migration of groundwater with MGP-related constituents above the RGs to surface water.

- **Sediment:**

- **RAO-5:** Demonstrate the reactive core mat (RCM) remains effective at preventing non-aqueous phase liquid (NAPL) from migrating into the Menominee River, and that at least six inches of clean sand remains over areas with remaining MGP-residuals.
- **Non-Time Critical Removal Action (NTCRA) RAO:** Remove NAPL and polyaromatic hydrocarbons (PAH)-contaminated sediments that have the potential to affect human health and ecological receptors. The NTCRA RAO was satisfied, to the extent practicable, as part of the NTCRA activities.

Constituents of Concern and Remediation Goals

The RGs for soil and groundwater that were finalized by USEPA in the ROD (USEPA, 2017) are provided in Table A.

Table A –Remediation Goals

Soil		Groundwater	
Constituent of Concern	Remediation Goal (mg/kg)	Constituent of Concern	Remediation Goal (µg/L)
Ethylbenzene	37	Benzene	5
Benzo(a)pyrene	2.11	Ethylbenzene	700
Naphthalene	26	Benzo(a)pyrene	0.2
		Benzo(b)fluoranthene	0.2
		Chrysene	0.2
		Naphthalene	100

Principal Threat Waste Definition

Following issuance of the ROD, WPSC and USEPA exchanged correspondence to clarify the site-specific definition of Principal Threat Waste and other key terms in the ROD. The conclusion of that correspondence is detailed in Section 2 of the *PDI Work Plan, Revision 2* (Ramboll, 2020). 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.
- Highly adsorbed phase concentrations of COCs exceeding a lifetime incremental cancer risk (CR) of 10^{-3} or a hazard index (HI) of 10 under applicable, industrial land use assumptions.

ROD-selected Remedy

USEPA selected and modified Alternative 3 as defined by the final version of the *FS Report – Revision 3* (NRT, 2017) and as presented in the ROD (USEPA, 2017). This remedy included excavation and offsite disposal of accessible source material in Boom Landing and on WWTP property, installation/maintenance of horizontal engineered barriers over affected surficial soil, one-time placement of in situ treatment reagents in excavation backfill to promote natural attenuation of affected groundwater, effectiveness monitoring of the RCM and residual sand cover, and institutional controls to manage potential remaining risks associated with soil, groundwater, soil gas, and sediment.

EFFICACY OF ROD FOLLOWING REVIEW OF PDI DATA

WPSC reviewed the key elements of the ROD to evaluate if ROD modifications were warranted considering information gathered in PDI activities completed to date. The results of the PDI activities do not indicate a modification is needed for the following components of the ROD.

- ARARs
- RAOs
- COCs and related RGs
- Principal Threat Waste Definition
- Selected remedies for non-source surface soil, sediment or soil vapor.

The results of the PDI activities completed to date did indicate the potential need to modify the ROD-selected remedy to excavate accessible source material in the Boom Landing and WWTP areas. Also, considering that the groundwater remedy included a one-time application of chemical oxidant in the base of excavations prior to backfilling, the groundwater remedy may need to be modified in consideration of a potential change to the source area remedy. Additional details on PDI findings and how these findings informed this evaluation are provided herein.

SUMMARY OF PDI ACTIVITIES TO DATE

This section provides a basic overview of the PDI activities conducted to date relevant to the potential modification of the source material remedy. A full description of investigation activities and results will be provided in a forthcoming PDI Evaluation Report to be submitted once delineation activities are completed on the MM Property.

PDI ACTIVITIES

The field investigation took place between April 2020 and July 2020 and included the following activities.

Utility Clearance and Locate

Prior to subsurface investigation activities, subsurface utility clearance was conducted to identify subsurface structures and utilities. Features identified during the survey were marked with paint, flags, or stakes. Existing underground utilities in the vicinity of the Site, including storm water, sanitary, water, electric, communications, and gas, are depicted on Figure 2. The utilities in the vicinity of the Site include the following:

- **WWTP Process Piping** – Significant process piping associated with the City WWTP runs throughout the project area primarily in the WWTP South Zone. The exact locations and depth of the process lines could not be identified during the PDI. Based on documentation provided by the WWTP, known process piping in the vicinity of the originally proposed remediation zone includes:
 - Running northwest-southeast along the face the of the aeration basin:
 - One 16" ductile iron return activated sludge line
 - One 6" ductile iron final clarifier scum line
 - One 6" ductile iron waste activated sludge line
 - One 10" ductile iron high pressure air line
 - Running east-west between the primary clarifiers and the Headworks Building or the Chemical and Solids Handling Building
 - Multiple various diameter natural gas lines
 - One 6" ductile iron primary sludge line
 - Multiple various diameter ductile iron or copper non-potable water lines
 - One 4" ductile iron drain line
 - Two 2" polyvinyl chloride phosphorus removal chemical lines
 - One 30" ductile iron raw wastewater line
 - One 8" ductile iron supernatant line

The locations of most of these pipes could not be located during the PDI for the following reasons:

- Reliable utility records on the wastewater treatment property were not available. The drawings provided by the WWTP did not identify piping location dimensions or depths and the WWTP staff were unable to identify specific piping locations.
- The effectiveness of ground penetrating radar (GPR) was limited because:
 - The fill material was of a heterogenous nature.
 - The utilities were generally located below the water table.
 - The known depths of utilities were generally greater than six feet below ground surface (bgs) beyond the depth limitations of GPR.
- Active electromagnetic pipe location in which a locating frequency is directly applied to the aboveground portion of the target utility was also unsuccessful likely due to the presence of rubber gaskets or other non-conductive material preventing the frequency from travelling the length of the pipe.
- The effluent storm and sanitary sewers gravity drain into the Menomonee River located at the northern boundary of the Site. The Menomonee River stage was multiple feet above the pipe inverts and the storm and sanitary sewer manholes were filled with water. As such, sewer inverts could not be visually located from the surface and the traceable rodder and the robotic crawler could not be safely inserted into the pipes through the manholes.

Following discussion with the USEPA and the Wisconsin Department of Natural Resources (WDNR), it was determined that boring installation could not proceed safely in the WWTP South Zone due to the unknown location of the process piping. For these same reasons, intrusive activities as part of the remedy in the WWTP South Zone are not feasible.

Additional utilities at the Site include:

- **Effluent Sanitary Sewer Line** – The clean effluent from the WWTP is discharged to the Menomonee River via a 48” reinforced concrete effluent sanitary sewer pipe. This pipe runs north-south on the western side of the WWTP North Source Zone, across Mann Street and through the western portion of Boom Landing. The pipe invert is approximately 10 feet bgs.
- **Influent Sanitary Sewer Lines** – Two influent sanitary sewers cross the proposed remediation area. One line runs from the Fish Shack building on Boom Landing across Mann Street to a manhole just north of the CN Railroad. An influent sewer combines with an additional influent line running from the northwest at Mann Street before crossing the WWTP North Zone to the east of the effluent sanitary sewer. The influent sanitary sewer that bisects the WWTP North Zone is a 30” reinforced concrete pipe located approximately 11 to 14 feet below ground surface. A second influent sanitary sewer line runs east-west along the northern boundary of the WWTP at Mann Street before turning to the southeast.
- **Storm Sewers** – A storm sewer runs along the southern edge of Mann Street north of the railroad before turning north and bisecting the Boom Landing Property where it discharges into the Menomonee River. A second storm sewer from the MMC facility joins this storm sewer at Boom Landing. Surface water run-off from Boom Landing is also collected in storm sewer inlets located in the Boom Landing parking lot.
- **Water** – The City of Marinette maintains the water utilities in the vicinity of the Site. A water main runs east-west beneath Mann Street. A north-south lateral services the Fish Shack in the Boom Landing Zone.

- **Electric** - WPSC maintains electric utilities in the vicinity of the Site. An overhead electric line runs parallel to the railroad track along Mann Street. A second pair of overhead electric lines run northwest-southeast across Mann Street through the southern portion of the Boom Landing Zone. In Boom Landing, underground electric lines run along the western and eastern boundaries of the parking lot providing power to light poles around the perimeter of the parking lot. Underground electric lines also bisect the parking area east to west to supply power to the Fish Shack. Underground electric lines are also present in the WWTP North and South Zones running between the primary clarifiers, Headwork Building and Service Building and to supply a light pole in the center of the WWTP.
- **Natural Gas** – WPSC also maintains natural gas lines in the vicinity of the Site. A natural gas line runs northwest-southeast across the WWTP South zone between the vehicle storage building and the service building. A natural gas line also runs underneath Mann Street.

Despite using all available non-intrusive locate technologies during four separate mobilizations over the course of a 3-week period, one soil boring did contact and penetrate the effluent sanitary sewer pipe for the City of Marinette. This sewer pipe was not able to be accurately located due to constraints summarized previously. No staff were injured during this utility strike and WPSC coordinated and paid for repair of the sewer. This incident demonstrates the challenges of accurately locating and working around critical utilities on the Site.

Source Area Delineation

In the WWTP North and Boom Landing Source Zones, additional borings were advanced surrounding the initial historical source material areas to define the horizontal and vertical extent of source material. Additional step-out borings were advanced until a perimeter boring did not meet the definition of principle threat waste/source material.

In total, 36 borings were collected in the Boom Landing Zone, and 28 borings were advanced in the WWTP North Zone, as shown on Figure 1. Delineation borings were completed by Cascade Drilling, LP using sonic drilling methods. Each boring was advanced approximately ½ to 1 foot into competent bedrock. At each boring location, visual logging of soil properties and potential impacts were noted and two to three samples were collected at the most notable field observations of potential MGP-affected soils and below the potential MGP-affected soils to document vertical extent at that location.

Boom Landing PDI Results

Oil-wetted/oil-coated material was observed in 19 of the 36 borings in the Boom Landing Zone primarily within the extents of the historic slough. Oil-wetted/oil-coated material was identified in four borings (O1, Q1, PCON-B, and N1) located along the property boundary with MMC and within 20 feet of the building located on MMC. Further delineation onto the MMC Property is proposed in 2021 in accordance with the *PDI Work Plan – Addendum* (WPSC, 2020). Oil-wetted/oil-coated material does not extend west to the effluent sanitary sewer but may be present adjacent to the effluent storm sewer. Oil-wetted/oil-coated material is also present adjacent to the Fish Shack and around the various utility lines serving the Fish Shack.

Samples from 10 of the 36 soil borings recorded a CR greater than 10^{-3} or a HI greater than 10. All locations that exceeded a CR of 10^{-3} or HI of 10 were co-located with oil-wetted or oil-coated material. The extent of oil-wetted/oil-coated material is larger than the extent of CR or HI exceedances as nine of the borings with oil-wetted/oil-coated observations did not exceed a CR of 10^{-3} or a HI of 10.

The observed oil-wetted/oil-coated material and CR/HI exceedances was encountered between 4.5 and 14.5 feet bgs. With two exceptions (P3 and Q2) oil-wetted/oil-coated material did not extend all the way to

bedrock and was generally vertically limited by the presence of a silt/clay layer. Due to the silt/clay layer, between one and 6.5 feet of non-visually impacted material sands and clays were observed between the oil-wetted/oil-coated material and bedrock. At P3 and Q2, oil-wetted/oil-coated material extended to the top of bedrock.

WWTP North Zone

PDI borings were logged continuously at 28 soil borings in the WWTP North Zone. Geology is similar to the Boom Landing Zone consisting of 7.7 to 18 feet of unlithified fine and silty sands intermixed with fill from previous excavation and filling activities associated with various construction projects. The silty sands overlie a discontinuous layer of finer silts and clay varying in thickness from approximately 0 to 6 feet. Due to higher surface elevation in the WWTP North Zone, the depth to bedrock ranges from 14.5 to 19.5 feet bgs.

Oil-wetted/oil-coated material was observed in 17 of the 28 PDI borings in the WWTP North Zone primarily within the extents of the historic slough. Oil-wetted/oil-coated material extends approximately 40 feet to the west of the slough on both sides of the effluent and influent sanitary sewer lines that bisect the WWTP North Zone. The oil-wetted/oil-coated material was delineated to the west and east by a line of soil borings as shown on Figure 1. As noted above, additional delineation to the south could not be completed as at least ten WWTP process pipes were identified on drawings running between the primary clarifiers and the Headworks and Chemical and Solids Handling Buildings but could not be field located. Additional delineation to the north could not be completed due to the presence of the railroad and a utility corridor running beneath Mann Street.

Samples from 3 of the 28 soil borings recorded a CR greater than 10^{-3} or a HI greater than 10. The three exceedances were co-located with oil-wetted or oil-coated material. Similar to the Boom Landing Zone, the extent of oil-wetted/oil-coated material is larger than the extent of CR or HI exceedances as 14 of the borings with oil-wetted/oil-coated observations did not exceed a CR of 10^{-3} or a HI of 10.

The observed oil-wetted/oil-coated material was encountered between 5.0 and 15.5 feet below ground surface. With two exceptions (boring I4 and JCON-D), the oil-wetted/oil-coated material did not extend to bedrock and was generally vertically limited by the presence of the silt/clay layer. Due to the silt/clay layer, between one and 6.5 feet of non-visually impacted material sands and clays were observed between the oil-wetted/oil-coated material and bedrock.

Groundwater Evaluation

Five temporary monitoring wells (Figure 3) were installed adjacent to co-located soil delineation borings. In the WWTP North and Boom Landing Zone, one temporary well was installed in each area at the soil boring location that contained the most significant field observations (visual) of MGP-affected soil. In the Boom Landing Zone, a second well (MW-TCONB) was installed in the center of the transect, located immediately downgradient (north) of the field-delineated source area. In the WWTP North Zone, a second well (MW-J1) was installed as far north as feasible given the presence of the railroad and overhead utilities.

Groundwater at the five PDI wells has been gauged and sampled four times since installation in May 2020. The depth to groundwater has ranged from 2.0 to 6.8 feet bgs in this time period. The ground surface slopes downwards towards the river and the shallower depth to groundwater was observed at MW-TCONB in the northern portion of Boom Landing due to the surface sloping.

Measurable NAPL has not been observed in any of the monitoring wells; however, trace NAPL has been identified at MW-G2 and MW-O3. Exceedances of the Groundwater RGs have been identified at wells MW-FCOND, MW-G2, MW-J1, and MW-O3. Benzene, ethylbenzene, naphthalene, benzo(a)pyrene,

benzo(b)fluoranthene, and chrysene have been detected at concentrations greater than the Groundwater RGs in at least one of these wells. Groundwater RG exceedances have not been identified at MW-TCONB located 50 feet downgradient of the Boom Landing Source Zone.

Additional PDI Fieldwork

Additional investigation activities were conducted that are not directly relevant to the potential source material remedy modification including:

- Unmanned Aerial Vehicle Survey
- Forensic Sampling
- Geotechnical Evaluation
- Horizontal Barrier Extent Evaluation
- Horizontal Barrier Condition Survey
- Groundwater Microbial Testing
- Waste Characterization Sampling

These components of the PDI are not directly relevant to the potential source material remedy modification and are not further discussed herein. A full description of investigation activities and results will be provided in a forthcoming PDI Evaluation Report to be submitted once delineation activities are completed on the MMC Property.

BASIS OF CHANGE IN SOURCE MATERIAL REMEDY

As noted above, based on the PDI no changes are proposed to the USEPA-selected remedy for non-source soil impacts, groundwater, sediment or soil vapor. Modification of the source material remedy is proposed based on the following key factors:

- **Utilities**
 - The utility network is complex and not well defined. In the WWTP South Zone, the exact location of the WWTP process piping could not be identified. In the WWTP North Zone, the extent of source material has expanded to the east and west side of the WWTP effluent sewer. Excavation to a depth 15.5 feet adjacent to the effluent pipe will be complex, particularly as shallow bedrock generally precludes traditional cantilevered sheet piling.
- **Dewatering**
 - Due to the high groundwater elevations, relatively high hydraulic conductivity and proximity to the Menomonee River, significant dewatering will be needed for excavation alternatives. Significant cost and effort will be associated with this dewatering effort including the need for pretreatment and discharge to the publicly owned treatment works.
- **Railroad**
 - The WWTP South Zone extends up to the CN Railroad. Excavation adjacent to the railroad may require enhanced shoring elements and will require offsets to stay out of the zone of influence, reducing the volume of removal possible adjacent to the CN Railroad. The CN-required offset would likely reduce the net benefit of source material in the WWTP North Source Area.

- **MMC Building and Property**

- The Boom Landing Source Zone has expanded adjacent to the MMC building, representing additional shoring/excavation stability concerns.
- Pending additional delineation, additional remedial action may be required on the MMC property. Site access and security concerns may limit allowable remedial action in this Zone. Additional constraints related to property owner use may also be identified and will need to be considered once the delineation is completed. For purposes of this Focused Remedial Alternatives Array Technical Memorandum, it is assumed source material on MMC is approximately 6,400 square feet, at depths consistent with Boom Landing Source Zones. It is further assumed MMC will agree to a source material remedy consistent with the Boom Landing Source Zone.

- **Impact of Inaccessible Areas**

- There are two potential source areas (WWTP South Zone, and CN Railroad and Mann Street Zone) along with smaller areas of potentially inaccessible source material adjacent to utility lines that are likely to be inaccessible to intrusive action.
- Groundwater sampling trends, NAPL gauging, and conceptual site model do not support that MGP-impacts would migrate beyond current delineation.
- Over time, it is possible that dissolved-phase impacts (associated with inaccessible areas) may migrate locally to more conductive remediated areas prior to attenuation controlling migration beyond current delineation.

- **Expansion of Source Zones**

- As noted on Table 1, the total volume of accessible source material has increased from approximately 9,500 cubic yards (CY) estimated during the 2017 FS to 25,500 CY based on the initial results of the PDI. Based on the increased volume of source material, the feasibility of other alternatives such as in situ solidification/stabilization (ISS) should be considered. Other remedial options were included in the 2017 FS and were not carried forward into remedial alternatives based on the cost-effectiveness to mobilize for relatively small volumes of material compared to excavation. With the increased volume, remedies such as ISS are more cost-effective than excavation with the same overall effectiveness to meet the RAOs.

DEVELOPMENT OF SOURCE REMEDIAL TARGET ZONE

Source material has been divided into five categories of source remedial target zones: WWTP South Zone, WWTP North Zone, Mann Street and CN Railroad Zone, Boom Landing Zone, and the MMC Zone. Areas were developed based on the magnitude of impacts present, property ownership, and site-specific constraints that may influence the scope of RA. Remedial areas are illustrated on Figure 1. Details of remedial investigation and PDI results, site-specific constraints, and the resulting estimated remedial volumes for each remedial zone are presented in Table 1.

DEVELOPMENT AND SCREENING OF REMEDIAL ALTERNATIVES

GENERAL RESPONSE ACTIONS

General response actions (GRAs) were identified in the Multi-Site FS Support Document (Integritys, 2010) and the original FS (NRT, 2017) which describes actions that may potentially satisfy the RAOs for most conditions resulting from historic MGP operations. For this document, each GRA was evaluated based on its potential

ability to achieve the RAOs for source material. The results of this comparative evaluation are provided in Table 2.

SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS

The technology type and process options that may potentially satisfy the RAOs for most MGP sites were identified in Tables 2A through 2D in the Multi-Site FS Support Document (Integrays, 2010) and in Table 4-1 of the original FS (NRT, 2017). As indicated in the Multi-Site FS Support Document, each of the respective technology types and process options for each GRA were evaluated based on the following criteria in the order listed:

- **Implementability:** This criterion addresses the technical and administrative feasibility of implementing the technology as well as the availability of contractors and materials, the potential constraints (on site and off site), the difficulties monitoring the effectiveness of the process option, and agency coordination or permits.
- **Effectiveness:** This criterion evaluates the ability of a technology to achieve the RAOs and to provide long-term protection of human health and the environment. Potential short-term impacts to human health and the environment, and the reliability of the technology are also evaluated as part of this criterion.
- **Cost:** This criterion utilizes engineering judgment to develop relative estimated costs of each technology for a given RAO. The cost estimates are qualitative (low, moderate, and high) at this stage of the screening process.

The initial screening of technologies to address source material is presented on Tables 3. At this stage of screening, cost alone was not necessarily considered a primary criterion for eliminating a technology type or process option. Cost considerations will be weighed more heavily as part of the detailed analysis of remedial alternatives included in the forthcoming focused FS Report.

ASSEMBLE AND DOCUMENT REMEDIAL ALTERNATIVES

In accordance with the USEPA Remedial Investigation and FS (RI/FS) guidance document (USEPA, 1988), the general response actions and process options retained through the screening process are combined to form alternatives, to holistically address potential risks from source material. The two key principles used as a guide for this process are:

- Developing alternatives that generally satisfy the RAOs presented in the ROD.
- Developing alternatives that represent a broad range of potential remedial approaches.

Based on the results of the preliminary screening of remedial technologies, four remedial alternatives were assembled (Table 4). The assembled remedial alternatives presented in Table 4 will be included for detailed analysis as part of the forthcoming focused FS Report. Descriptions for each of the alternatives presented on Table 4 are presented below. It should be noted, the remedial option for the non-source soil, soil vapor and sediment are consistent with the remedial alternatives evaluated in the ROD based on the 2017 FS.

Alternative 1

Consistent with National Oil and Hazardous Substances Pollution Contingency Plan requirements, a No Further Action alternative is considered. Alternative 1 does not include remediation or monitoring to minimize potential exposures to source material 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 5 years for Alternative 1.

Alternative 2

Alternative 2 includes the following components:

- Maintenance of existing direct-contact barriers and installation of new direct-contact barriers, as required, over inaccessible source material (including the WWTP South Zone, and CN Railroad and Mann Street Zone). Direct-contact barriers to consist of a minimum of 4 feet of non-impacted soil, or asphalt or concrete pavement.
- Institutional controls to manage potential risks associated with remaining inaccessible source material.
- In Situ Geochemical Stabilization (ISGS) of accessible oil-coated/oil-wetted material in the WWTP North Zone, Boom Landing, and MMC Zone. ISGS is consistent with ROD expectations for groundwater remediation as the permanganate component of the ISGS solution is an effective chemical oxidant to address dissolved-phase impacts. Investigation on the MMC Zone has not yet been completed. Alternate remedial technologies may be recommended in the forthcoming Focused Feasibility Study depending on the type and magnitude of impacts observed, physical constraints and property-owner constraints affecting remedy implementation.

Alternative 3

Alternative 3 includes the following components:

- Maintenance of existing direct-contact barriers and installation of new direct-contact barriers, as required, over inaccessible source material (including the WWTP South Zone, and CN Railroad and Mann Street Zone). Direct-contact barriers to consist of a minimum of 4 feet of non-impacted soil, or asphalt or concrete pavement.
- Institutional controls to manage potential risks associated with remaining inaccessible source material.
- ISS of accessible oil-coated/oil-wetted material in the WWTP North Zone and Boom Landing Zone.
- ISGS of accessible oil-coated/oil-wetted material in the MMC Zone. ISGS is consistent with ROD expectations for groundwater remediation as the permanganate component of the ISGS solution is an effective chemical oxidant to address dissolved-phase impacts.

Alternative 4

Alternative 4 includes the following components:

- Maintenance of existing direct-contact barriers and installation of new direct-contact barriers, as required, over affected inaccessible source material (including the WWTP South Zone, and CN Railroad and Mann Street Zone). Direct-contact barriers to consist of a minimum of 4 feet of non-impacted soil, or asphalt or concrete pavement.
- Institutional controls to manage potential risks associated with remaining inaccessible source material.
- Excavation of accessible oil-coated/oil-wetted material in the WWTP North Zone and Boom Landing Zone. Consistent with the ROD, a one-time placement of oxidant would be placed in excavation backfill.
- ISGS of accessible oil-coated/oil-wetted material in the MMC Zone.

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USEPA, 2017. *Record of Decision, Wisconsin Public Service Corporation Marinette Former Manufactured Gas Plant Site Marinette, Wisconsin*. September.

Wisconsin Public Service Corporation (WPSC), 2020. *Preliminary Design Investigation Work Plan – Addendum, Marinette Former Manufactured Gas Plant Site, Marinette, Wisconsin*. June.

ATTACHMENTS

TABLES

Table 1	Source Material Remedial Zone Identification and Estimated Volumes of Affected Soil
Table 2	Initial Assessment of General Response Actions for Source Material
Table 3	Screening of Technology Process Options for Source Material
Table 4	Summary of Assembled Alternatives

FIGURES

Figure 1	Source Area Zones With PDI Sampling Results
Figure 2	Utilities Map
Figure 3	Monitoring Well Locations

ATTACHMENTS

Attachment 1	ARAR Table
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TABLES

TABLE 1 - SOURCE MATERIAL REMEDIAL ZONE IDENTIFICATION AND ESTIMATED VOLUMES
FOCUSED ALTERNATIVES ARRAY TECHNICAL MEMORANDUM
WISCONSIN PUBLIC SERVICE CORPORATION
FORMER MARINETTE MANUFACTURED GAS PLANT
BRRTS# 02-38-00047 USEPA# WIN00050995

ZONE	REMEDIAL AND PREDESIGN INVESTIGATION FINDINGS		CONSTRAINTS	ASSUMED SURFACE AREA (SF)	ASSUMED IMPACTED DEPTH (feet bgs)	ESTIMATED SOURCE VOLUME (CY)	ESTIMATED NON-SOURCE VOLUME (CY)
	SOURCE MATERIAL	GROUNDWATER					
WWTP South Zone <i>(includes inaccessible source material adjacent to the aeration basin and area further north that was inaccessible to investigation)</i>	<ul style="list-style-type: none"> During the RI, weathered tar and strong odors observed in two test pits adjacent to the aeration basin from approximately 5.5-9 feet bgs. During the PDI, delineation borings could not be safely advanced due to the presence of underground WWTP process piping. 	<ul style="list-style-type: none"> Exceedances in the shallow aquifer at MW304 for Groundwater RGs L (benzene and naphthalene). In 2019 and 2020 at MW304, located on the upgradient side of the WWTP South Zone, results range from non-detect (4/2019) to 266 ug/L (10/2020) for benzene and non-detect (4/2019) to 172 ug/L (10/2020) for naphthalene. Since installation of well MW-FCOIND in May 2020, located just downgradient of the WWTP South Zone, results range from 387 (10/2020) to 1,320 ug/L (5/2020) for benzene and 1,520 ug/L (7/2020) to 3,850 ug/L (5/2020) for naphthalene. 	<ul style="list-style-type: none"> Property is owned by the City of Marinette and serves as City's WWTP. Site is secured via fencing and access is limited to WWTP personnel. The WWTP is expected to remain into the reasonably foreseeable future Significant process piping associated with the City WWTP runs throughout the WWTP South Zone. The exact locations of the WWTP process piping could not be located during the PDI because reliable utility records on the WWTP were not available and site conditions limited the effectiveness of a variety of utility locate technologies. Underground electric, gas and storm sewers were also identified in this zone. 	18,350		Investigation was precluded by dense network of City WWTP process piping which precluded PDI activities. No assumptions of depth or volume provided	
WWTP North Zone <i>(outside WWTP fence line)</i>	<ul style="list-style-type: none"> During the RI, oil-coated material identified in two soil borings from 8-15.5 feet bgs. During the PDI, oil-wetted/oil-coated material observed in 17 of 28 PDI borings primarily within the extents of the historic slough between 5-15.5 feet bgs. Samples from 3 of the 28 soil borings recorded a cumulative CR greater than 10⁻³ or a noncancer HI greater than 10. The three exceedances were co-located with oil-wetted or oil-coated material. 	<ul style="list-style-type: none"> Exceedances in the shallow aquifer at MW-J1 and MW-G2 for Groundwater RGs (benzene, naphthalene and benzo(b)fluoranthene at MW J1 and benzene, ethylbenzene, naphthalene, benzo(a)pyrene, benzo(b)fluoranthene and chrysene at MW-G2). 	<ul style="list-style-type: none"> Property is owned by the City of Marinette. This zone is located outside the WWTP fence line and is covered with compacted gravel. It is currently rented by the City to a third party for use as a parking lot. A 48" reinforced concrete effluent sanitary sewer and a 30" reinforced concrete influent sanitary sewer run north-south bisecting the WWTP North Zone. Invert elevation of the 48" sewer is 10 feet bgs and invert elevation of the 30" sewer is approximately 14 feet bgs. Overhead electrical lines are present along the northern boundary. Zone is also constrained to the north by the CN railroad. To the south, the zone is constrained by WWTP security fencing and an additional influent sanitary sewer running east-west. 	25,250	5-15.5	9,900	4,700
Mann Street and CN Railroad Zone	<ul style="list-style-type: none"> In October 2013, the City of Marinette completed utility maintenance and road improvements on Mann Street between the WWTP and Boom Landing. During these activities, approximately 187 tons of fill material with visual observations of MGP residuals was excavated from water and sewer lines that crossed the former slough. No RI or PDI soil borings have been advanced in this zone due to the presence of the railroad and the utility corridor running beneath Mann Street. 	<ul style="list-style-type: none"> No wells installed in this zone. 	<ul style="list-style-type: none"> Canadian National operates an active rail line on the south side of this Zone. Multiple utilities include two storm sewers, a water main, and overhead electrical lines run east-west through this zone. Storm and sanitary sewers also run north-south between the WWTP and Boom Landing through this area. Offsets and absence of work in the Zone of influence will likely reduce the volume of material accessible for removal in this area. 	10,300		Investigation was precluded by presence of CN Railroad and dense network of utilities beneath Mann Street.	
Boom Landing Zone	<ul style="list-style-type: none"> During the RI, oil-wetted/oil-coated material was identified in five soil boring locations. During the PDI, oil-wetted/oil-coated material observed in 19 of 36 borings within fill material from approximately 4.5-14.5 feet bgs. Samples from 10 of the 36 soil borings recorded a cumulative CR greater than 10⁻³ or a noncancer HI greater than 10. All locations that exceeded a CR of 10⁻³ or HI of 10 were co-located with oil-wetted or oil-coated material. The oil-wetted/oil-coated material and CR/HI exceedances was identified primarily within the extents of the historic slough extending east to the property boundary with Marinette Marine and within 20 feet of the building located on the Marinette Marine property. 	<ul style="list-style-type: none"> At MW-03, located within the Boom Landing Source Zone, exceedances of the Groundwater RGs include benzene, ethylbenzene, naphthalene, and benzo(b)fluoranthene. At MW-TCONB, located approximately 50 feet downgradient of the oil-wetted/oil-coated material observed in the Boom Landing Zone, no exceedances of the Groundwater RGs were identified during the four sampling events conducted in 2020 and 2021. 	<ul style="list-style-type: none"> Property is owned by the City of Marinette and serves as a boat launch and parking lot. Construction to be conducted in non-peak boating season (November to March). Clean effluent from the WWTP is discharged to the Menomonee River via a 48" reinforced concrete sanitary sewer with invert elevation of approximately 10 feet bgs that runs along the western boundary of the Boom Landing Zone. A storm sewer effluent line also bisects the Boom Landing Zone. Underground electric lines run north-south along the eastern and western boundaries of the Boom Landing Zone. Parallel Overhead electric lines are present in the south portion of the zone. A fish cleaning station and restroom building is present in the center portion of the Boom Landing Zone. Electric, sanitary sewer and water utilities supply the fish cleaning station. 	39,000	4.5-14.5	14,500	6,500
MMC Zone¹	<ul style="list-style-type: none"> No borings have been advanced to date on the MMC Property. During the PDI, oil-wetted/oil-coated material was observed in four borings (O1, Q1, PCON-B, and N1) along the property boundary between Boom Landing and MMC from 5.5-10 feet bgs. Oil-wetted/oil-coated material along the property boundary were observed within fill material and silt. Further PDI is proposed in 2021 on MMC property. For the purposes of this alternatives array, it is assumed that the four initial delineation borings presented in the June 24, 2020 PDI Work Plan Addendum will contain source material and will be delineated by a single round of contingent step-out borings. The actual extents of source material in the MMC Zone are unknown and will be determined via the proposed PDI. 	<ul style="list-style-type: none"> No wells are located in the MMC Zone. At MW310, located along the boundary between the MMC Zone and the Boom Landing Zone, no exceedances of the Groundwater RGs were identified during the four sampling events conducted in 2019 and 2020 at this location. 	<ul style="list-style-type: none"> Underground storm sewer and underground electric utilities present in MMC Zone. Warehouse building present to the north of potential oil-wetted/oil-coated material. Property is owned by Fincantieri Marinette Marine Corporation. Access is limited by property owner and includes substantial security limitations. Further discussion with Property Owner is required to discuss other potential constraints. 	6,400	5.5-10	1,100	1,400

Notes:

1 - Surface of zone is assumed at 6,400 square feet and assumes delineation is achieved with first level of step out boring provided in June 24, 2020 PDI Work Plan Addendum. Depth of impact in MMC Zone is assumed to be comparable with depth of impact in adjacent Boom Landing borings.

- bgs - below ground surface
- CN - Canadian National
- CR - cancer risk
- CY - cubic yards
- FS - feasibility study
- HI - hazard index
- MMC - Fincantieri Marinette Marine Corporation
- NA - not applicable
- PID - Photoionization Detector
- PDI - pre-design investigation
- PPM - parts per million
- ROD - Record of Decision
- RG - Remediation Goal
- RI - remedial investigation
- SF - square feet
- ug/L - micrograms per liter
- WWTP - wastewater treatment plant

SUMMARY CRITERIA	ASSUMED SURFACE AREA (SF)	ASSUMED IMPACTED DEPTH (feet bgs)	ESTIMATED SOURCE VOLUME (CY)	ESTIMATED NON-SOURCE VOLUME (CY)
Totals (Post PDI Estimates)	99,300		25,500	12,600
Totals (ROD-Assumptions based on FS)	44,000	NA	9,500	10,200
Percent Change [(PDI Total-FS Total)/FS Total]	126%		168%	24%

**TABLE 2 - INITIAL ASSESSMENT OF GENERAL RESPONSE ACTIONS FOR SOURCE MATERIAL
FOCUSED ALTERNATIVES ARRAY TECHNICAL MEMORANDUM
WISCONSIN PUBLIC SERVICE CORPORATION
FORMER MARINETTE MANUFACTURED GAS PLANT
BRRTS# 02-38-000047 USEPA# WIN00050995**

General Response Action	Remedial Technology	Process Option	Carry Forward for Screening?	Rationale
Soil - Source Material				
No Action	None	No Action	Yes	Retained for baseline comparison purposes in accordance with CERCLA.
Institutional Controls	Physical, Land Use, and/or Legislative restrictions	Deed Restriction, site fences, other physical restriction	Yes	Process option could be implemented as the primary soil remedy or as a component of a more comprehensive soil remedy to achieve RAOs. Retained for further screening.
Containment	Horizontal Engineered Surface Barriers	Soil, asphalt, concrete, or geosynthetic covers	Yes	Process option could successfully achieve the RAOs by preventing potential exposure to affected soil. Retained for further screening.
In Situ Approaches	Physical/Chemical Treatment	In Situ Stabilization/Solidification	Yes	Could potentially achieve the RAOs. Site constraints such as presence of utilities and quality of fill material may complicated implementation. Retained for further screening.
		Soil Vapor Extraction (SVE)	No	Not an adequate technology to address oil-wetted/oil-coated material. Not retained for further screening.
		In Situ Thermal Treatment	Yes	This process option may be effective at achieving RAOs. Retained for further screening.
	Chemical Treatment	Chemical Oxidants (including ozone, hydrogen peroxide, permanganate, and persulfate)	No	Not an adequate technology to address oil-wetted/oil-coated material. Not retained for further screening.
		In Situ Geochemical Stabilization	Yes	Could potentially achieve RAOs or prevent future dissolved phase impacts to address MGP-affected soil where other constraints are present. May be applicable for areas of limited site access. Retained for further screening.
Ex Situ Approaches	Excavation	Off-site Disposal	Yes	May achieve the RAOs, however, site limitations (i.e., critical infrastructure, utilities) complicate implementation. Retained for further screening.
		On-site Treatment and On-site Disposal	No	May achieve RAOs, however, site limitations (i.e., critical infrastructure, utilities) complicate implementation. On-site treatment further complicates implementation. Not retained for further screening.
		On-site Treatment and Off-site Disposal	No	May achieve RAOs, however, site limitations (i.e., critical infrastructure, utilities) complicate implementation. On-site treatment as primary remedy is not required as MGP waste is exempt as characteristically hazardous, and is readily accepted at Subtitle D landfills. Not retained for further screening.

Notes:

■ = Shading indicates the process option was eliminated based on the screening evaluation presented in this table.
 CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
 IC = institutional control
 RAO = remedial action objective

TABLE 3 - SCREENING OF REMEDIAL TECHNOLOGY PROCESS OPTIONS FOR SOURCE MATERIAL
FOCUSED ALTERNATIVES ARRAY TECHNICAL MEMORANDUM
WISCONSIN PUBLIC SERVICE CORPORATION
FORMER MARINETTE MANUFACTURED GAS PLANT
BRRTS# 02-38-000047 USEPA# WIN00050995

General Response Action	Remedial Technology	Process Option	Description of Process Option	Effectiveness	Implementability	Relative Cost	Carry Forward for Additional Screening?	Rationale
SOIL - SOURCE MATERIAL								
No Action	None	No Action	<ul style="list-style-type: none"> No additional action. 	<ul style="list-style-type: none"> Will not achieve the RAOs in the foreseeable future. 	<ul style="list-style-type: none"> Easily implementable as there is no remedy to implement. 	No Cost	Yes	Retained for baseline comparison purposes in accordance with CERCLA.
Institutional Controls	Physical, Land Use, or Legislative Restrictions	Environmental Covenants and Deed Restrictions	<ul style="list-style-type: none"> Prohibit or restrict use of the site so that development or excavation are not allowed without proper controls. 	<ul style="list-style-type: none"> Minimal potential short-term exposure risk. Administratively effective and reliable; relies on local government action to establish, enforce, and restrict potential future exposure. Effective at reducing exposure to impacted soil. No reduction in volume of contaminants. 	<ul style="list-style-type: none"> Easy implementation. Administratively implementable. 	Low	Yes	Process alternative meets effectiveness and implementation criteria. May be implemented as the primary soil remedy in inaccessible areas or as a component of a more comprehensive remedy to achieve RAOs.
Containment	Horizontal Engineered Surface Barriers	Soil, aggregate, asphalt, concrete, or geosynthetic covers	<ul style="list-style-type: none"> Soil, aggregate, asphalt, concrete, or geosynthetic caps used for creating a physical barrier separating impacted soil from the surface receptors. Geosynthetic caps provide redundancy, impermeability, and allow for vegetative cover. Asphalt and concrete caps are relatively impermeable and allow for vehicular loadings. 	<ul style="list-style-type: none"> Technology does not reduce the volume of affected soil, but does minimize exposure to affected soil. Also effective in preventing continued migration of contaminants from soil to groundwater due to precipitation if cap is impervious. 	<ul style="list-style-type: none"> Capping material composition may degrade, deteriorate, or be damaged intentionally or unintentionally. Requires monitoring of cap integrity Technology has been used extensively and is relatively easy to implement unless barrier penetrations are required for utilities, etc. Technology is well suited to address shallow non-source impacts as well as deep source impacts in inaccessible areas 	Low to Moderate	Yes	Process alternative meets effectiveness and implementation criteria. May be implemented as the primary soil remedy in inaccessible areas or as a component of a more comprehensive remedy to achieve RAOs. If selected, this process option would likely require implementation of an institutional control to maintain cap integrity and provide guidance for future soil remedial
In Situ Approaches	Physical/Chemical Treatment	In Situ Stabilization/Solidification	<ul style="list-style-type: none"> Mobility and/or toxicity of contaminants is reduced by physical bonding/chemical reactions. Most common technique for solidification is blending cement and other reagents with impacted soil/groundwater to produce a monolithic mass resistant to leaching. Methods for delivery include auger, injection, and mechanical mixing. 	<ul style="list-style-type: none"> Effective for weathered coal tar, PAHs, PVCs, and metals. Requires additional reagent where high percentage of free product present, highly heterogeneous soil, or in soil with high peat content. Can be overcome through mix design or pre-excavation of peat. At this site, can likely treat a larger footprint of material than can be achieved with excavation because it is less effected by water management and shoring offset constraints. Contaminants become immobilized by stabilization/solidification methods but "weathering" or deterioration may release contaminants in the future. This can be overcome by a cover over the ISS monolith that protects the ISS monolith from freeze-thaw cycles 	<ul style="list-style-type: none"> Implementation affected by obstructions and may require pre-excavation of material/debris. Generally not affected by high groundwater tables and does not require shoring needed for excavation-based remedies. Dense network of utilities on site will slow production and may require alternate mixing requirements (excavator mixing or jet grouting) Requires monitoring of stabilized soil to verify optimal mixture is met and performance is achieved. Most reagents and additives are widely available. Air quality controls need to be implemented to monitor potential emissions and dust. Typically requires large batch plant which requires dedicated staging area and ability to connect piping from staging areas to all treatment areas. With the multiple distinct work areas, locating the batch plant without affecting flow of traffic on CN railroad, and Mann Street will be difficult. 	Moderate to High	Yes	Process alternative meets implementation and effectiveness criteria. Process option may encounter implementation challenges due to the presence of utilities and distinct work areas.

TABLE 3 - SCREENING OF REMEDIAL TECHNOLOGY PROCESS OPTIONS FOR SOURCE MATERIAL
FOCUSED ALTERNATIVES ARRAY TECHNICAL MEMORANDUM
WISCONSIN PUBLIC SERVICE CORPORATION
FORMER MARINETTE MANUFACTURED GAS PLANT
BRRTS# 02-38-000047 USEPA# WIN00050995

General Response Action	Remedial Technology	Process Option	Description of Process Option	Effectiveness	Implementability	Relative Cost	Carry Forward for Additional Screening?	Rationale
In Situ Approaches (continued)	Physical/Chemical Treatment	In Situ Thermal Treatment	<ul style="list-style-type: none"> The temperature of the subsurface is increased through installation of thermal wells, steam injection, or electric resistance technologies. Increased subsurface temperature removes contaminants through steam stripping and volatilization. Can be used to reduce the mobility of source material. An SVE or multiphase extraction system is used to extract the contaminants for separation and treatment. 	<ul style="list-style-type: none"> Moderately effective for tar saturated soil, PVOCs, and PAHs above the water table. Limited to moderately effective for PAHs in saturated soil, unless significant dewatering is performed in conjunction with thermal conductive heating. Treatment has been used to mobilize residual oils, coal tars, and other DNAPL, which can be removed using multiphase extraction. Soil type, contaminant characteristics, concentrations, geology, and hydrogeology can significantly impact duration of implementation and effectiveness of remedial option. Can be operated to remove or treat the volatile fraction, resulting in a thermally-solidified asphalt-like material with reduced contaminant flux. 	<ul style="list-style-type: none"> This technique requires large energy input. Heating of shallow soil typically requires thermal insulation on ground surface. Requires minimum soil moisture content of approximately 5%. Monitoring of air and groundwater beyond the perimeter must occur to verify the contaminants are not mobilizing out of the treatment zone or leaching. Implementation in multiple distinct work areas with connection to a central power control unit will be challenging, without affecting flow of traffic on CN railroad, and Mann Street. Thermal compatibility studies will be needed to ensure that high heat does not degrade utilities (including fittings/gaskets). Given the absence of avail bile information on location of utilities, this study would be fundamentally flawed resulting in high risk of negative impact to buried utilities. Buried metal probes and high temperatures require extra safety precautions (e.g., security fencing, video surveillance, motion sensors, and automated electrical system deactivation when security measures are breached, etc.). Vapor extraction design must consider other preferential paths for released vapors (utility corridors) to prevent inadvertent migration. 	High	No	Dense network of utilities of unknown type would be at significant risk of failure when heated to near 100 degrees Celsius for several months. Further, the network of power, control, and monitoring infrastructure would be challenging to implement given the distinct work areas. The high water table would result in the need to select in-situ thermal solidification approach to heating. This approach would remove volatile fraction and leave PAHs in a thermal-solidified form. Both In situ geochemical stabilization and in situ solidification/stabilization can achieve similar end points with higher degree of confidence at lower costs. Process alternative not retained for further screening.
	Chemical Treatment	In Situ Geochemical Stabilization (ISGS)	<ul style="list-style-type: none"> ISGS solution containing permanganate is mixed on site and injected into the aquifer through wells or direct-push injection points. The solution oxidizes contaminants while migrating within the aquifer while reacting with contaminants to create a stable mineral crust around NAPL surfaces. Mineral crust byproduct further oxidizes NAPL within stabilized area. 	<ul style="list-style-type: none"> Effectiveness is controlled by ability to achieve adequate distribution of injections into NAPL-bearing lenses. Effectiveness is obtained through an oxidized crust on NAPL and general reduction in aquifer transmissivity, which combined with the oxidized crust, can reduce dissolved-phase flux from NAPL body. Technology results NAPL to be stabilized in place with minimal surface impacts (temporary injection points). Crust longevity is dependent on changes in geochemistry and requires a mineralogy assay to determine effectiveness Mineralized shell reduces potential discharge of NAPL and byproducts to groundwater, allowing natural-attenuation to more effectively treat downgradient areas. Effectiveness monitoring typically completed through post-injection soil sampling and groundwater monitoring. Given the limited mobility of source material impacts observed at the site combined with the limited dissolved phase impacts radiating from source areas, this technology may provide long-term assurances that that impacts will remain immobile and dissolve phase impacts will improve. 	<ul style="list-style-type: none"> Extensive understanding of subsurface conditions required to understand potential reactions and injection distribution. Ground disturbance is similar to direct-push boring methods. There is no need to interconnect injection points, resulting in greater flexibility in field execution to adapt to surface or subsurface obstructions. This is particularly beneficial at the site, given the multiple property owners and road/rail road crossings Requires handling, storage, distribution, and safety precautions for large quantities of reactive chemicals. Injection solution must be mixed on-site immediately prior to injection to prevent formation of gel. Requires location of utilities prior to implementation. May require multiple mobilizations if remedial objectives are not achieved. 	Moderate	Yes	This technology meets the effectiveness and implementation criteria. The technology is able to address oil-coated/oil-wetted soil and is particularly effective where constraints such as densely spaced utilities (which are locatable) or surface improvements would limit ability to treat with other methods.

TABLE 3 - SCREENING OF REMEDIAL TECHNOLOGY PROCESS OPTIONS FOR SOURCE MATERIAL
FOCUSED ALTERNATIVES ARRAY TECHNICAL MEMORANDUM
WISCONSIN PUBLIC SERVICE CORPORATION
FORMER MARINETTE MANUFACTURED GAS PLANT
BRRTS# 02-38-000047 USEPA# WIN00050995

General Response Action	Remedial Technology	Process Option	Description of Process Option	Effectiveness	Implementability	Relative Cost	Carry Forward for Additional Screening?	Rationale
Ex Situ Approaches	Excavation	Off-site Disposal	<ul style="list-style-type: none"> Impacted soil is excavated. The soil is staged or directly loaded into trucks and disposed. Virgin soil or stone is often used to backfill the excavation. 	<ul style="list-style-type: none"> Effective for a wide range of contaminants. Moderate potential short-term exposure risk (construction worker and community exposures). Technology does not treat the soil or groundwater. The impacted material is removed and disposed at permitted facility. Highly effective and predictable timetable. Subsurface structures or above ground structures (access limitations) may make this technology less effective. 	<ul style="list-style-type: none"> Limited to availability of space for staging and handling of soil material and water treatment system, if needed. Air quality controls need to be implemented to monitor potential emissions and dust. Requires erosion and access controls during construction for managing fugitive emissions, soil, and public access. Earth retention systems will be needed to support nearby structures or utilities. Given the presence of source impacts on bedrock, there are significant challenges in shoring design. There is a general need to dewater over 10 feet of saturated thickness to achieve target removal depths. Management of dewatering systems in a way that does not negatively effect the stability of adjacent critical infrastructure is a significant implementation challenge. 	Moderate to High	Yes	Process alternative meets implementation and effectiveness criteria. This process option may encounter implementation challenges where development and utilities exist. In addition, there are significant implementation challenges to remove affected soil at depths greater than the water table due to dewatering and stability considerations. Retained for further screening.

Notes:
 = Shading indicates the remedial technology was eliminated based on the screening evaluation presented in this table.
 CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
 PAH = polycyclic aromatic hydrocarbon
 PVOC = petroleum volatile organic compound
 RAO = remedial action objective

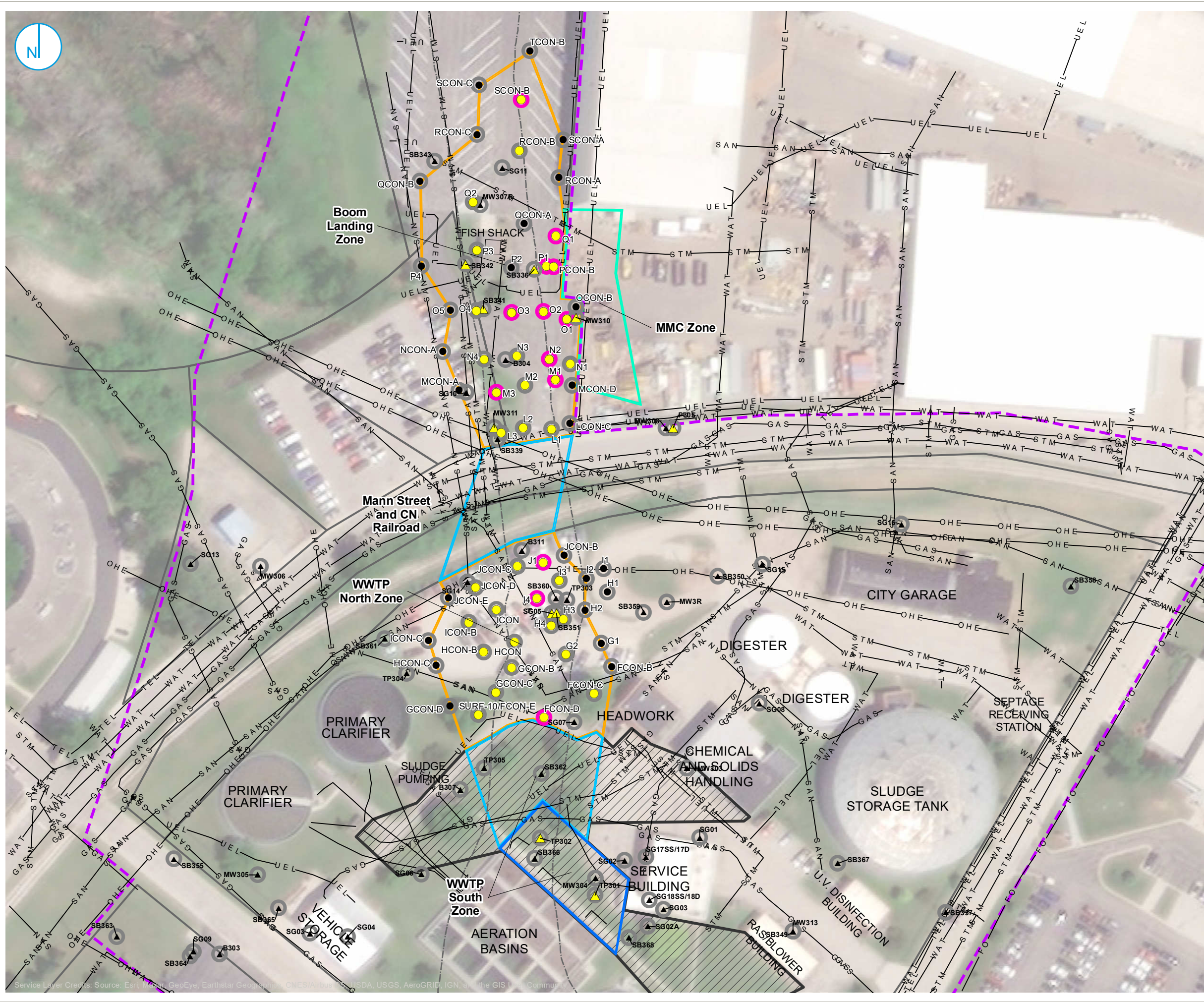
**TABLE 4 - SUMMARY OF ASSEMBLED ALTERNATIVES
 FOCUSED ALTERNATIVES ARRAY TECHNICAL MEMORANDUM
 WISCONSIN PUBLIC SERVICE CORPORATION
 FORMER MARINETTE MANUFACTURED GAS PLANT
 BRRTS# 02-38-000047 USEPA# WIN00050995**

General Response Action	Remedial Technology	Retained Process Option	Alternative 1	Alternative 2	Alternative 3	Alternative 4
SOIL - Inaccessible Source Material (WWTP South Zone, CN Railroad and Mann Street Zone)						
No Action	None	No Additional Action	X			
Institutional Controls	Physical, Land Use, and/or Legislative Restrictions	Environmental Covenant and Deed Restrictions		X	X	X
Containment	Horizontal Engineered Surface Barrier	Soil, asphalt, concrete or geosynthetic covers		X	X	X
SOIL - Accessible Source Material (WWTP North Zone and Boom Landing Zone)						
No Action	None	No Additional Action	X			
Institutional Controls	Physical, Land Use, and/or Legislative Restrictions	Environmental Covenant and Deed Restrictions		X	X	
In Situ Approaches	Chemical Oxidation	Geochemical Stabilization		X		
Ex Situ Approaches	Excavation	Offsite Disposal				X
In Situ Approaches	Physical/Chemical Treatment	In Situ Stabilization/Solidification			X	
SOIL - Accessible Source Material (MMC Zone)						
No Action	None	No Additional Action	X			
Institutional Controls	Physical, Land Use, and/or Legislative Restrictions	Environmental Covenant and Deed Restrictions		X	X	X
In Situ Approaches	Chemical Oxidation	Geochemical Stabilization		X ¹	X ¹	X ¹

Notes:
 1 - Investigation on MMC Zone has not yet been completed. Alternate remedial technologies may be recommended in the forthcoming Focused Feasibility Study depending on the type and magnitude of impacts observed, physical constraints and property-owner constraints affecting remedy implementation.

MMC - Fincantieri Marinette Marine Corporation
 WWTP - wastewater treatment plant

FIGURES



- 2020 PDI LOCATION - OIL-WETTED/OIL-COATED MATERIAL
- 2020 PDI LOCATION - NO OIL-WETTED/OIL COATED MATERIAL
- ▲ HISTORICAL LOCATION WITH OIL-WETTED/OIL-COATED MATERIAL
- ▲ HISTORICAL LOCATION WITH NO OBSERVATION OF OIL-WETTED/OIL-COATED MATERIAL
- HI>10 OR CR>1E-3
- HI<10 AND CR<1E-3

- TEL COMMUNICATIONS
- FO FIBER OPTIC
- GAS GAS
- OHE OVERHEAD ELECTRIC
- SAN SANITARY SEWER
- STM STORM SEWER
- UEL UNDERGROUND ELECTRIC
- UNDERGROUND PIPELINE
- WAT WATER
- FORMER SLOUGH/ LOG RUN
- ACCESSIBLE SOURCE MATERIAL AREA
- MMC INVESTIGATION PENDING ACCESS
- AREA INACCESSIBLE TO INVESTIGATION - MAY CONTAIN SOURCE MATERIAL BASED ON POST PDI CONCEPTUAL SITE MODEL
- INACCESSIBLE SOURCE MATERIAL AREA
- PROCESS PIPING CORRIDOR
- APPROXIMATE EXTENT OF UPLAND SITE
- PARCEL BOUNDARY (MARINETTE COUNTY, ACCESSED 7/16/2018)

Notes:
 CR - CANCER RISK
 HI - HAZARD INDEX
 MMC - FINCIANTIERI MARINETTE MARINE CORPORATION
 PDI - PRELIMINARY DESIGN INVESTIGATION
 WWTP - WASTEWATER TREATMENT PLAN
 UTILITIES FROM TERRATEC ENGINEERING LLC, WSPC MARINETTE FORMER MGP SITE PLAT OF SURVEY DATED 09/17/2020.

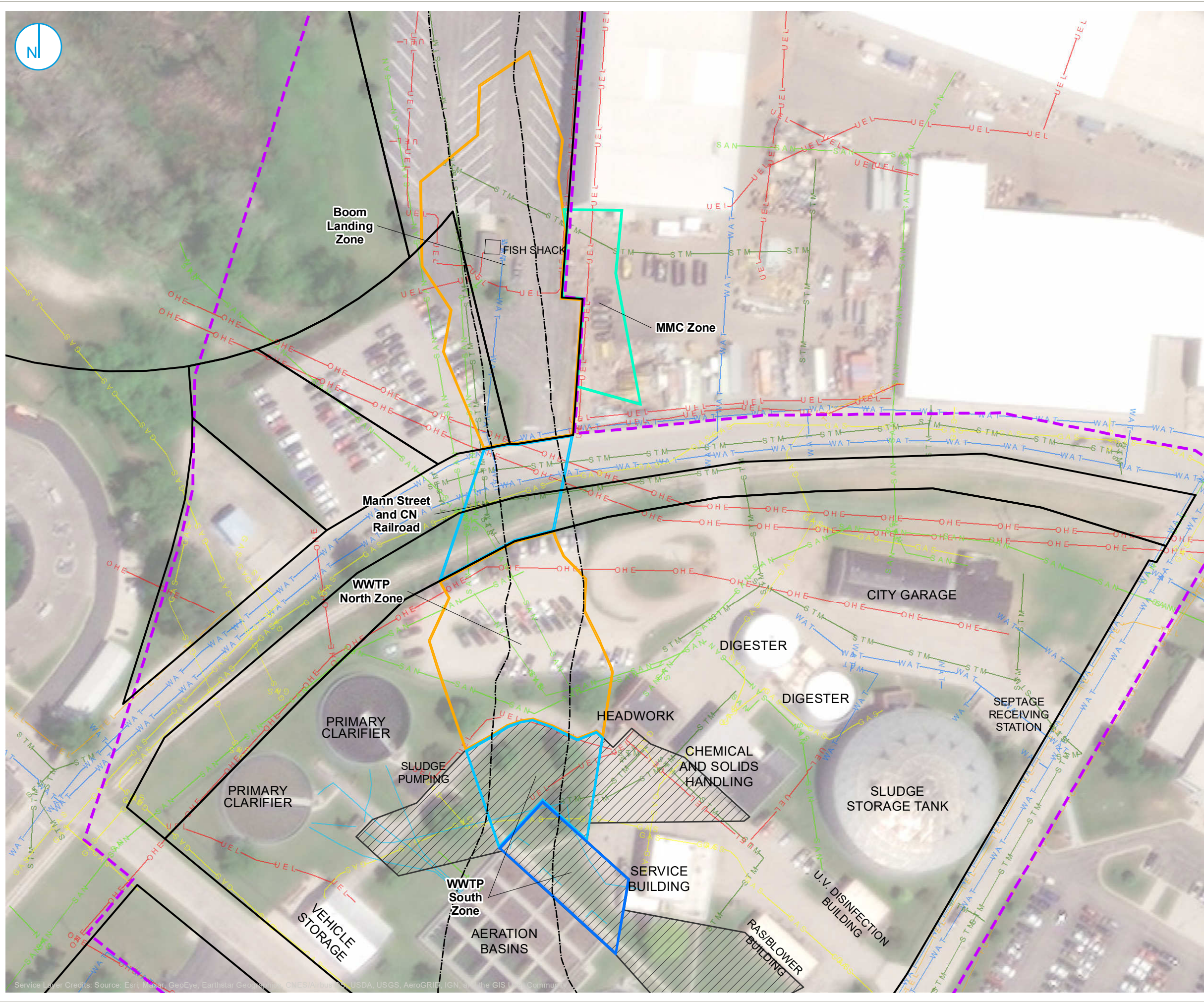


SOURCE AREA REMEDIAL TARGET ZONES WITH PDI SAMPLING RESULTS

FOCUSED REMEDIAL ALTERNATIVES ARRAY
 WSPC MARINETTE FORMER MGP SITE
 MARINETTE, WISCONSIN

FIGURE 1





- TEL COMMUNICATIONS
- FO FIBER OPTIC
- GAS GAS
- OHE OVERHEAD ELECTRIC
- SAN SANITARY SEWER
- STM STORM SEWER
- UEL UNDERGROUND ELECTRIC
- UNDERGROUND PIPELINE
- WAT WATER

- FORMER SLOUGH/ LOG RUN
- ACCESSIBLE SOURCE MATERIAL AREA
- MMC INVESTIGATION PENDING ACCESS
- AREA INACCESSIBLE TO INVESTIGATION - MAY CONTAIN SOURCE MATERIAL BASED ON POST PDI CONCEPTUAL SITE MODEL
- INACCESSIBLE SOURCE MATERIAL AREA
- PROCESS PIPING CORRIDOR
- APPROXIMATE EXTENT OF UPLAND SITE
- PARCEL BOUNDARY (MARINETTE COUNTY, ACCESSED 7/16/2018)

Notes:
 MMC - FINCANTIERI MARINETTE MARINE CORPORATION
 PDI - PRELIMINARY DESIGN INVESTIGATION
 WWTP - WASTEWATER TREATMENT PLANT
 UTILITIES FROM TERRATEC ENGINEERING LLC,
 WSPC MARINETTE FORMER MGP SITE PLAT OF SURVEY DATED 09/17/2020.



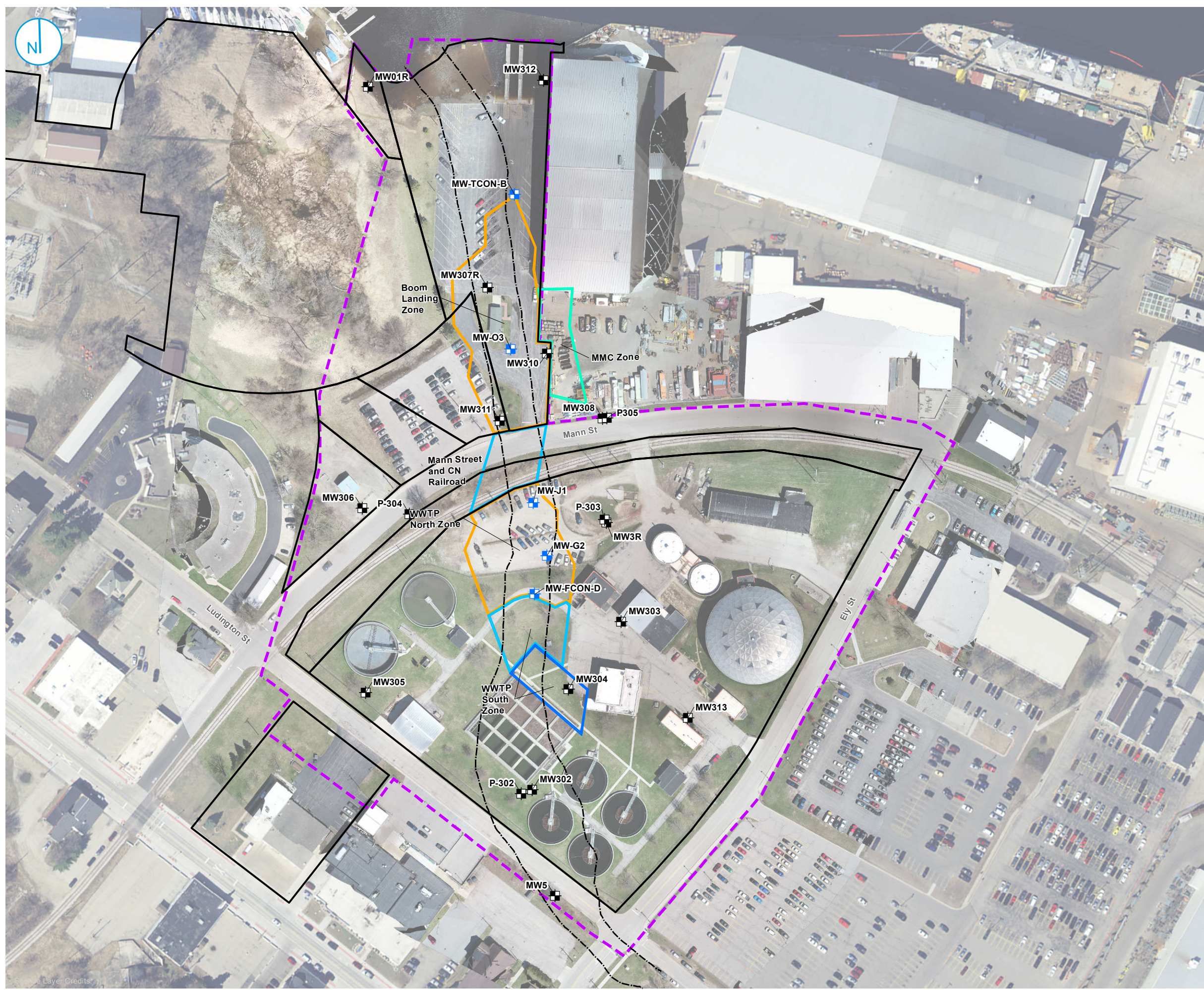
UTILITIES MAP

FOCUSED REMEDIAL ALTERNATIVES ARRAY
 WSPC MARINETTE FORMER MGP SITE
 MARINETTE, WISCONSIN

FIGURE 2



Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



- PDI MONITORING WELL LOCATION
- HISTORICAL MONITORING WELL LOCATION
- FORMER SLOUGH/ LOG RUN
- ▭ PARCEL BOUNDARY (MARINETTE COUNTY, ACCESSED 7/16/2018)
- ▭ APPROXIMATE EXTENT OF UPLAND SITE
- ▭ ACCESSIBLE SOURCE MATERIAL AREA
- ▭ MMC INVESTIGATION PENDING ACCESS
- ▭ AREA INACCESSIBLE TO INVESTIGATION - MAY CONTAIN SOURCE MATERIAL BASED ON POST PDI CONCEPTUAL SITE MODEL
- ▭ INACCESSIBLE SOURCE MATERIAL AREA

Notes:
 MMC - FINCANTIERI MARINETTE MARINE CORPORATION
 PDI - PRELIMINARY DESIGN INVESTIGATION
 WWTP - WASTEWATER TREATMENT PLANT



MONITORING WELL LOCATIONS

FOCUSED REMEDIAL ALTERNATIVES ARRAY
 WSPC MARINETTE FORMER MGP SITE
 MARINETTE, WISCONSIN

FIGURE 3



ATTACHMENT 1
ARAR TABLE

Table 1 - Applicable or Relevant and Appropriate Requirements, and To Be Considered Guidance/Criteria for USEPA ROD-selected Remedy WISCONSIN PUBLIC SERVICE CORPORATION - FORMER MARINETTE MANUFACTURED GAS PLANT SITE

Chemical-Specific ARARs/TBC

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
FEDERAL				
Groundwater	Groundwater Quality Standards	40 CFR Part 141 – Safe Drinking Water Act of 1974	Relevant and Appropriate	The National Primary Drinking Water Regulations establish health-based standards for public drinking water systems [maximum contaminant levels (MCLs)]. MCLs are legally enforceable federal drinking water standards and relevant and appropriate to groundwater.
WISCONSIN				
Soil	Soil Cleanup Standards	Wis. Admin. § NR 720: Soil Cleanup Standards	Applicable	Soil Cleanup Standards are legally applicable to soil, preferred method for determining RCLs outlined based on EPA soil screening values and 10-6 for individual compounds and 10-5 for cumulative risk, alternate RCLs can be developed with input from WDNR.
Groundwater	Groundwater Quality Standards	Wis. Admin. § NR 140.01 and § NR 140.12: Groundwater Quality	Applicable	NR 140 Groundwater Quality Standards are legally applicable to all groundwater, regardless of groundwater use <ul style="list-style-type: none"> o Generally, NR 140 PALs are the groundwater cleanup goal for all sites, however, flexible closure requirements in NR 726 may be used to set ESs as the primary ROD goal, provided that an adequate source control action is conducted and groundwater monitoring shows a stable or receding plume everywhere groundwater is monitored, including source and NAPL areas.
		Wis. Admin. § NR 726.05(4), §NR 726.05(6), § NR 726.05(7), and § NR 726.05(8), Case Closure	Relevant and Appropriate	NR 726 Case Closure Cleanup requirements are relevant and appropriate
Soil Gas/Indoor Air – Chemical Specific	Indoor Air Quality and Vapor Migration	Wis. Admin. § NR 720 Soil Cleanup Standards	Applicable	NR 720: Soil Cleanup Standards are legally applicable.
		Wis. Admin. § NR 726.05(4), §NR 726.05(6), § NR 726.05(7), and § NR 726.05(8), Case Closure	Relevant and Appropriate	NR 726 Cleanup for Closure is relevant and appropriate <ul style="list-style-type: none"> o Indoor Air Quality Standards are used to develop Vapor Action Levels for MGP COCs in indoor air and Vapor Risk Screening Levels for MGP COCs in sub slab and soil gas, and in groundwater. o Actions must be taken to ensure soil and groundwater are remediated such that indoor air from vapor intrusion is addressed; the rule also requires vapor mitigation systems for occupied building if needed to address an immediate threat. o Note: Guidance (which would be a TBC) is planned to allow avoiding vapor mitigation systems in vacant buildings with VI issues provided a continuing obligation (CO) is put in place to require the RP to notify WDNR if the building use changes and possibly install a system.
Sediment	Surface Water Quality Standards	Wis. Admin. § NR 105.04 to §NR 105.07, § NR 105.10: Surface Water Quality Criteria and Secondary Values for Toxic Substances	TBC	Surface Water Quality Standards. Refer to: https://dnr.wi.gov/topic/SurfaceWater/standards.html
Surface Water	Surface Water Quality Standards		Applicable	Surface Water Quality Standards for the MGP-related COCs at the site are applicable to monitoring of surface water as part of evaluation of the existing cap.



**Table 1 - Applicable or Relevant and Appropriate Requirements, and To Be Considered Guidance/Criteria for USEPA ROD-selected Remedy
WISCONSIN PUBLIC SERVICE CORPORATION - FORMER MARINETTE MANUFACTURED GAS PLANT SITE**

Location-Specific ARARs

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
FEDERAL				
Reactive Core Mat and Residual Sand Cover	Clean Water Act (CWA) (Section 401 and 404)	40 CFR 121, 230; & 33 CFR 320, 323, 325 and 328	Potentially Applicable if future contingent sediment remedial action is required	Regulates the discharge of dredge and fill materials into waters of the United States. Potentially applicable, if future contingent sediment remedial action is required.
WISCONSIN				
Boom Landing Zone	Navigable Water Ways Requirements	Wis. Stat § 30.12; Wis. Stat. § 30.195, § 30.20: Navigable Waters, Harbors and Navigation Wis. Stat § 281.15, §281.16 § 281.17, § 281.31,281.33, 281.34: Water and Sewage Wis. Admin. § NR 328.35 and § NR 328.38: Shore Erosion Control Structures in Navigable Waterways Wis. Admin. § NR 341.035; § NR 341.05; § NR 341.06 § NR 341.07§ NR 341.08: Grading on the Bank of Navigable Waterway	Potentially Applicable Potentially Applicable Potentially Applicable Potentially Applicable	Should soil excavation or other remedial activities impact the bank of the Menomonee River, Navigable Water Ways Requirements will apply.



**Table 1 - Applicable or Relevant and Appropriate Requirements, and To Be Considered Guidance/Criteria for USEPA ROD-selected Remedy
WISCONSIN PUBLIC SERVICE CORPORATION - FORMER MARINETTE MANUFACTURED GAS PLANT SITE**

Soil Action-Specific ARARs

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
FEDERAL				
<i>NONE IDENTIFIED</i>				
WISCONSIN				
Wastewater Discharges to POTW	Surface Water Effluent Standards, Criteria, and Limitations	Wis. Stat. § 281.15, § 281.16, § 281.17: Water and Sewage	Applicable	Surface water quality effluent standards, criteria and limitations are Applicable where dewatering during soil excavation may necessitate discharge to the Menomonee River. Discharge to POTW is an offsite action, and any pretreatment requirements would need to be met.
		Wis. Stat § 283: Pollution Discharge Elimination, Subchapter III Standards: Effluent Limitations		
		Wis. Admin. § NR 106.06, § NR 106 Subchapter V, § NR 106 Subchapter VI: Procedures for Calculating Water Quality Based Effluent Limitations for Point Source Discharges to Surface Waters		
		Wis. Admin. § NR 200.22- Application for Discharge Permits and Water Quality Standards Variances		
		Wis. Admin. §NR 207.03 to § NR 207.05: Water Quality Antidegradation		
		Wis. Admin. §NR 218.05 to § NR 218.11: Method and Manner for Sampling		
		Wis. Admin. § NR 219.04: Analytical Test Methods and Procedures		
Site Disturbance	Storm Water Runoff Requirements	Wis. Stat § NR 281.33: Water and Sewage Wis. Admin. § NR 216.46 and § NR 216.47: Storm water Discharge Permits Wis. Admin. § NR 151.015 or § NR 151.01: Runoff Management	Applicable	All are Applicable. Storm water runoff requirements apply during excavation activities at sites equal to or greater than one acre that may result in discharge of storm water to the Menomonee River.
Site Disturbance In-Situ Treatment of Soil Soil that generates vapors	Air Emissions Requirements, Criteria, Limitations	Wis. Admin. § NR 415.04(1), § NR 415.04(2Xa), § NR 415.04(2) b - Control of Particulate Emissions	Applicable	Air emission requirements will be applicable during soil excavation and blending activities that generate fugitive dust and/or vapors. Air emission requirements will be applicable to in-situ treatment alternatives that involve the generation of vapors.
		Wis. Admin. § NR 419.07 - Control of Organic Compound Emissions		
		Wis. Admin § NR 429.03 - Malodorous Emissions and Open Burning		
		Wis. Admin. §NR 445.07, § NR 445.09- Control of Hazardous Pollutants		



Table 1 - Applicable or Relevant and Appropriate Requirements, and To Be Considered Guidance/Criteria for USEPA ROD-selected Remedy WISCONSIN PUBLIC SERVICE CORPORATION - FORMER MARINETTE MANUFACTURED GAS PLANT SITE

Groundwater Action-Specific ARARs

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
FEDERAL				
<i>NONE IDENTIFIED</i>				
WISCONSIN				
All Groundwater Alternatives	Groundwater Monitor Well Requirements	Wis. Admin. § NR 141.055 to NR 141.31: Groundwater Monitor Well Requirements	Applicable	Groundwater monitoring is required to demonstrate the effectiveness of any groundwater remedy on reducing concentrations of MGP COCs.
		Wis. Stat. § NR 28527: Air Pollution	Applicable	
In-Situ Chemical or Thermal Treatment	Air Emissions Requirements, Criteria, Limitations	Wis. Admin. § NR 415.04(1), § NR 415.04(2)(a), § NR 415.04(2)(b)- Control of Particulate Emissions	Applicable	Air Emission requirements, criteria and limitations will be applicable during remediation activities that generate vapors during injection, vapor recovery, and/or treatment of pumped groundwater.
		Wis. Admin. § NR 419.05(2); NR 419.07 (2)(a) and NR 419.07 (2)(b) - Control of Organic Compound Emissions	Applicable	
		Wis. Admin. § NR 429.03 - Malodorous Emissions and Open Burning	Applicable	
		Wis. Admin. §NR 431.03- Control of Visible Emissions	Applicable	
		Wis. Admin. §NR 445.07(1), §NR 445.09(1) to §NR	Applicable	
In-Situ Chemical Treatment	Injection Well Requirements	Wis. Stat. § 815.09 and § 815.10: Injection Wells	Applicable	Substantive requirements of the injection well regulation are applicable for in-situ chemical treatment via injection of fluids.
In-Situ Enhanced Bioremediation		Wis. Admin. § NR 140 Groundwater Quality, Subchapter III Evaluation and Response Procedures:	Applicable	

All Media Action-Specific ARARs

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
FEDERAL				
<i>NONE IDENTIFIED</i>				
WISCONSIN				
All Media – Chemical Specific	Laboratory Certification Requirement	Wis. Admin. § NR 149: Laboratory Certification and Registration Wis. Admin. § NR 299.04: Water Quality Certification	Applicable	Applicable. Any sampling during design and implementation must meet these requirements
Remediation Standards, Requirements, and Initiatives	Remedy selection, design, implementation and operation and maintenance requirements	Wis. Admin. §NR 724.13 §NR 724.17; § NR 724.19, Remedial and Interim Action Design, Implementation, Operation, Maintenance and Monitoring Requirements	Applicable	Applicable. The remedial action documents provide standards and requirements for remediation of contamination sites in Wisconsin. NR 722 is very similar to the NCP for remedy evaluation and selection.



**Table 1 - Applicable or Relevant and Appropriate Requirements, and To Be Considered Guidance/Criteria for USEPA ROD-selected Remedy
WISCONSIN PUBLIC SERVICE CORPORATION - FORMER MARINETTE MANUFACTURED GAS PLANT SITE**

Other Non-ARAR Requirements (Full Compliance is Required)

ALTERNATIVE COMPONENT	REQUIREMENT, CRITERIA, STANDARD, LIMIT	CITATION	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
FEDERAL			
<i>NONE IDENTIFIED</i>			
WISCONSIN			
Institutional Controls – any media	Notification for Residual Contamination and Continuing Obligation (CO) Requirements	Wis. Admin. § NR 725.05, § NR 725.07, and §NR 726.06 to § NR 726.15	Should WI CO responsibilities be used as additional ICs, then the rule requirements are applicable. To be enforceable, WDNR must issue an approval of a remedial action type plan with enforceable requirements for the continuing obligations. Enforcing COs at properties not controlled by the RP could be an issue.



**Table 1 - Applicable or Relevant and Appropriate Requirements, and To Be Considered Guidance/Criteria for USEPA ROD-selected Remedy
WISCONSIN PUBLIC SERVICE CORPORATION - FORMER MARINETTE MANUFACTURED GAS PLANT SITE**

To Be Considered Standards, Guidance, and Initiatives

STANDARD, GUIDELINE, INITIATIVE	CITATION	RELATIONSHIP BETWEEN TBC AND ALTERNATIVE COMPONENT
FEDERAL		
<i>NONE IDENTIFIED</i>		
WISCONSIN		
Soil Cleanup Standards	WDNR Guidance Document: “Soil Residual Contaminant Level Determinations Using the U.S. EPA Regional Screening Level Web Calculator” (WDNR PUBL-WR-890, January 23, 2014) WDNR Guidance Document: “RR Program’s RCL Spreadsheet Update” (WDNR-RR-052c, December 2015)	These documents provide guidance on applying the U.S. EPA Screening Level Web Calculator to Wisconsin soils to calculate soil cleanup standards.
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.
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.
Remediation Standards, Requirements, and Initiatives	Wisconsin’s Initiative for Sustainable Remediation and Redevelopment in the State of Wisconsin, A Practical Guide to Green and Sustainable Remediation in the State of Wisconsin. (WDNR Pub-RR-911, January 2012)	The Guide to Green and Sustainable Remediation provides guidance on implementing the US. EPA’s Superfund Green Remediation Strategy (September 2010) at cleanup sites in Wisconsin.
Sediment Quality Guidelines	WDNR Guidance Document: “Wisconsin Consensus-Based Sediment Quality Guidelines (WDNR PUBL-WT-732, December 2003)	This document provides guidelines on developing sediment cleanup levels that are protective of benthic macroinvertebrate species.
Vapor Intrusion Guidance	WDNR Guidance Document: “Addressing Vapor Intrusion at Remediation & Redevelopment Sites in Wisconsin” (WDNR PUBL-RR-800, December 2010). WDNR Guidance Document: “Addressing Vapor Intrusion at Remediation & Redevelopment Sites in Wisconsin” (WDNR PUBL-RR-800) Update (July 2012) WDNR Guidance Document: “Sub-slab Vapor Sampling Procedures” (WDNR PUBL-RR-986, July 2014).	These documents provide guidance on the investigation and remediation of the vapor intrusion pathway at contamination sites in Wisconsin and the basis for calculating Indoor Air Vapor Action Levels and Vapor Risk Screening Levels. Also provided is guidance on how vapor intrusion is addressed through continuing obligations applied at case closure at contaminated sites in Wisconsin.
Institutional Controls (Continuing Obligations) Requirements	WDNR Guidance Document: “Guidance on Case Closure and the Requirements for Managing Continuing Obligations” (WDNR PUBL-RR- 606, April 2014): WDNR Guidance Document: “DNR Case Closure Continuing Obligations: Vapor Intrusion” (WDNR PUBL-RR-042, Aug 2015)	These documents provide guidance on which vapor intrusion continuing obligations should be selected when preparing for case closure.

Acronyms

ARARs: Applicable or Relevant and Appropriate Requirements

MGP COCs: Manufactured Gas Plant Compounds of Concern

WPDES: Wisconsin Pollution Discharge Elimination System

CO: Continuing Obligation

Wis. Stat.: Wisconsin Statute

WDNR: Wisconsin Department of Natural Resources

Wis. Admin: Wisconsin Administrative Code



From: Marcus D Byker <Marcus.Byker@ramboll.com>
Sent: Wednesday, May 19, 2021 7:47 AM
To: Gielniewski, Margaret
Cc: Krueger, Sarah E - DNR; Fitzpatrick, William - DNR; Dombrowski, Frank J; Abigail Small; Korpela, Adrienne/MKE
Subject: RE: Marinette - Focused Alternatives Array Tech Memo

Margaret,

On behalf of Frank Dombrowski of WPSC, below is a table that provides order of magnitude costs for each alternative included in the Focused Remedial Alternatives Array Technical Memo for the WPSC Marinette MGP. Given these the factors identified in the table notes, these costs should not be considered feasibility-study-level costs. That withstanding, these costs may be useful to convey the relative differences in costs between the alternatives.

Summary of Estimated Order of Magnitude Costs for the Assembled Remedial Alternatives - Source Areas Wisconsin Public Service Corporation - Former Marinette Manufactured Gas Plant Site

Remedial Alternative	Order of Magnitude Cost
Alternative 1 - No Further Action	\$0
Alternative 2 - ISGS in MMC, Boom Landing and WWTP North Zones, Engineered Barriers/Institutional Controls in WWTP South Zone	\$3.7M - \$ 4.4M
Alternative 3 - ISS in Boom Landing and WWTP North Zones, ISGS in MMC Zone, Engineered Barriers/Institutional Controls in WWTP South Zone	\$5.0M - \$6.0M
Alternative 4 - Excavation in Boom Landing and WWTP North Zones, ISGS in MMC Zone, Engineered Barriers/ Institutional Controls in WWTP South Zone	\$7.8M - \$9.3M

Notes:

This table presents a summary of estimated order of magnitude costs for discussion purposes only. These costs should not be considered Feasibility Study-level cost estimates, and the costs included in the forthcoming Focused Feasibility Study will differ from the above estimates. These costs also include unsupported assumptions regarding the extent of impacts on the MMC property. Pending access, additional investigation will be completed on MMC property to delineated extent and inform future cost estimating efforts. Remedial extents and options will be reviewed with third party property owners (City of Marinette and MMC) to evaluate site-specific constraints with respect to offsets from critical infrastructure, property use, and long term continuing obligations. That withstanding, the above costs may be useful to convey the relative difference in costs between the four alternatives included in the Focused Alternatives Array Technical Memorandum.

Please feel free to contact Frank Dombrowski with any questions or concerns with the above.

Kind Regards,

Marcus D. Byker, PE
Managing Engineer

M 616-340-8982
marcus.byker@ramboll.com

From: Marcus D Byker
Sent: Monday, May 17, 2021 12:57 PM
To: Gielniewski, Margaret <gielniewski.margaret@epa.gov>
Cc: Krueger, Sarah E - DNR <sarah.krueger@wisconsin.gov>; Fitzpatrick, William - DNR <William.Fitzpatrick@wisconsin.gov>; Dombrowski, Frank J (frank.dombrowski@wecenergygroup.com) <frank.dombrowski@wecenergygroup.com>; Abigail Small (ASMALL@ramboll.com) <ASMALL@ramboll.com>; Korpela, Adrienne/MKE <adrienne.korpela@jacobs.com>
Subject: Marinette - Focused Alternatives Array Tech Memo

Margaret,

On behalf of Frank Dombrowski of WPSC, attached is the Focused Remedial Alternatives Array Technical Memo (Alternatives Array) for the WPSC Marinette MGP. During our May 11, 2020 call, you mentioned that high-level costs would also be helpful for USEPA when reviewing this Alternatives Array. We are in the process of developing high-level cost estimates for each of the four alternatives identified in this Alternatives Array and will provide costs in a subsequent email later this week.

Please feel free to contact Frank Dombrowski with any questions or concerns with the content of this document.

Kind Regards,

Marcus D. Byker, PE

Managing Engineer

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