Record of Decision

Wisconsin Public Service Corporation
Manitowoc Former Manufactured Gas Plant Site
Manitowoc, Wisconsin

EPA ID: WIN000509949

United States Environmental Protection Agency, Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604

September 2018

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Record of Decision – Wisconsin Public Service Corporation Manitowoc Former Manufactured Gas Plant Site

This Record of Decision (ROD) documents the soil and groundwater source control remedy that the United States Environmental Protection Agency (EPA), in consultation with the Wisconsin Department of Natural Resources, selected for the first Operable Unit (OU 1) of the Wisconsin Public Service Corporation (WPSC) Manitowoc Former Manufactured Gas Plant (MGP) Superfund Alternative Site (WPSC Manitowoc MGP Site, or Site) in Manitowoc, Wisconsin. Future RODs will address Site river sediment (OU 2) and groundwater (OU 3).

The ROD is organized into three parts. Part I contains the *Declaration*, Part II contains the *Decision Summary*, and Part III contains the *Responsiveness Summary,* which addresses the public comments EPA received in response to the Proposed Plan for cleanup of OU 1.

Acronyms and Definitions

§ NR	Wisconsin Administrative Code pertaining to the Department of Natural Resources
µg/L	Micrograms per liter (also equals parts per million)
µg/kg	Micrograms per kilogram (also equals parts per billion)
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
BaP	Benzo(a)pyrene
BERA	Baseline Ecological Risk Assessment
BLRA	Baseline Risk Assessment
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act (also known as Superfund)
CDI	Chronic Daily Intake
CFR	Code of Federal Regulations
City	City of Manitowoc
CO	Continuing Obligation
COC	Contaminant of Concern
CWG	Carbureted Water Gas
CY or Yd^3	Cubic Yards
DNAPL	Dense Non-Aqueous Phase Liquid
ELCR	Excess Lifetime Cancer Risk
EPA	United States Environmental Protection Agency
FS	Feasibility Study
ft	feet
ft^3	Cubic Feet
GIS	Geographic Information System
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
ICs	Institutional Controls
M	Million
MCL	Maximum Contaminant Level
mg/kg	Milligrams per kilogram
MGC	Manitowoc Gas Company
MGP	Manufactured Gas Plant
NAPL	Non-aqueous Phase Liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NR 140	Wisconsin NR 140 Groundwater Enforcement Standard
NRT	Natural Resource Technology, now O'Brien Gere, technical contractor to WPSC
O&M	Operation and Maintenance
OU	Operable Unit

PAHs	Polycyclic Aromatic Hydrocarbons
PRP	Potentially Responsible Party
PVOC	Petroleum Volatile Organic Compounds
RAO	Remedial Action Objectives
ROD	Record of Decision
RD	Remedial Design
RfD	Reference Dose
RG	Remediation Goal
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SEMS	Superfund Enterprise Management System
SF	Slope Factor
TBC	To-be Considered
USACE	United States Army Corps of Engineers
WAC	Wisconsin Administrative Code
WDNR	Wisconsin Department of Natural Resources
WF&L	Wisconsin Fuel and Light
WPSC	Wisconsin Public Service Corporation

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Record of Decision

Part I. Declaration

1.1 Site Name and Location

Wisconsin Public Service Corporation Manitowoc Former Manufactured Gas Plant Superfund Alternative Site ("WPSC Manitowoc MGP Site"), Manitowoc, Wisconsin

Superfund Enterprise Management System (SEMS) ID# WIN000509949

The WPSC Manitowoc MGP Site consists of three Operable Units (OU). Operable Unit 1 (OU1) addresses MGP soil and groundwater source area contaminants, OU2 addresses Manitowoc River sediment, and OU3 addresses groundwater.

1.2 Statement of Basis and Purpose

This Record of Decision (ROD) presents EPA's selected remedy for soil and groundwater source control at the WPSC Manitowoc MGP Superfund Alternative Site, which was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document addresses source area MGP waste in soil and groundwater, and is the first of three planned decision documents for the site. EPA anticipates that a second decision document will present a remedy for Manitowoc River sediment and a third decision document will present a final groundwater remedy.

This decision is based on the information contained in the Administrative Record for the WPSC Manitowoc MGP Site. The Administrative Record Index (see Appendix A) identifies each of the items comprising the Administrative Record upon which the selection of the remedial action is based. The Administrative Record file is available for review at the Manitowoc Public Library in Manitowoc, Wisconsin, and at the EPA Region 5 Records Center in Chicago, Illinois. Information on the Site can also be found at Wisconsin Department of Natural Resources' (WDNR's) Green Bay Office in Green Bay, Wisconsin.

The State of Wisconsin (Wisconsin DNR) has indicated concurrence with the selected remedy. EPA will place the State's concurrence letter into the Site Administrative Record upon receipt.

1.3 Assessment of Site

EPA has determined that the response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

1.4 Description of Selected Remedy for OU 1

EPA, in consultation with WDNR, has selected Alternative 3a to effectively treat non-aqueous phase liquid (NAPL) and polycyclic aromatic hydrocarbon (PAH)-contaminated soil and groundwater. The NAPL constitutes a principal threat waste since it acts as a reservoir for migration of contaminants to groundwater and sediment, while PAHs are a low-level threat waste that present low risk in the event of a release.

Alternative 3a consists of:

- *in-situ* stabilization (ISS) of highly-contaminated soil located in the Chicago Street and Winter Zones;
- maintaining existing and/or installing new (as required) direct contact barriers (such as paved parking lots and roadways) on top of surface soil that exceeds residential cleanup standards in all Site zones;
- a one-time placement of oxidizing compounds at the interface of highly-contaminated groundwater and soil (called *in-situ* chemical oxidation or ISCO);
- continued operation of an existing groundwater extraction well until a final groundwater remedy is selected; and
- the use of institutional controls (ICs) to restrict future land use to prevent human exposures to contamination remaining at the site, prevent interference with remedial components, and to help prevent future soil vapor intrusion risks.

The selected remedy is estimated to cost $7.2 million (M), which includes an estimated capital cost of $6.2M, an estimated present-worth operation and maintenance (O&M) cost of $0.9M.

1.5 Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements (ARAR) to the remedial action (unless justified by a waiver), is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

This remedy also satisfies the statutory preference for treatment as a principal element of the remedy in that the selected remedy uses treatment to reduce the toxicity, mobility, and/or volume of hazardous substances, pollutants, or contaminants in soil and groundwater. Because this remedy only addresses source-area contamination and will result in hazardous substances, pollutants, or contaminants remaining on-Site above levels that allow for unlimited use and unrestricted exposure, EPA will conduct statutory reviews every five years after initiation of the remedial action until a remedy is selected and implemented that would allow for unlimited use and unrestricted exposure. This will ensure that the remedy is, or will be, protective of human health and the environment.

1.6 ROD Data Certification Checklist

The following information is included in the Decision Summary (Part 2) of this ROD, while additional information can be found in the Site Administrative Record file:

- Chemicals of concern (COCs) and their respective concentrations (see Part 2.7 Site Contaminants of Concern);
- Baseline risk represented by the COCs (see Part 2.7 - Summary of Site Risks under *Summary of the Human Health Risk Assessment*)
- Remediation goals (i.e., cleanup goals) established for the COCs and the basis for the goals (see Part *2.8 Remedial Action Objectives* and Part 2.9 – *Remediation Goals*);
- How source materials constituting principal threats are addressed (see Part 2.12 - *Principal Threat Wastes*);
- Current and reasonably anticipated future land use assumptions used in the Human Health Risk Assessment and this ROD (see Part 2.5 – *Site Characteristics*);
- Potential land use that will be available at the Site as a result of the Selected Remedy (see Part 2.8 *Remedial Action Objectives*);
- Estimated capital, lifetime O&M, and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected (see Part 2.10 – *Description of Alternatives*); and
- Key factor(s) that led to selecting the remedy (see Part 2.11 - *2.11 Comparative Analysis of* Alternatives).

1.7 Authorizing Signature

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Douglas Ballotti, Acting Director
Superfund Division
U.S. EPA - Region 5

9/21/2018
Date

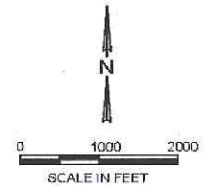
Part II. Decision Summary

2.1 Site Name, Location, and Brief Description

The nearly 2-acre WPSC Manitowoc MGP Site is in Manitowoc, Manitowoc County, Wisconsin (Figure 1), about 40 miles south of Green Bay, Wisconsin. The SEMS identification number is WIN000509949. EPA, as the lead agency, divided the site into three OUs, with OU1 addressing MGP source area contaminants, OU2 addressing river sediment, and OU3 addressing groundwater. WDNR is the support agency.

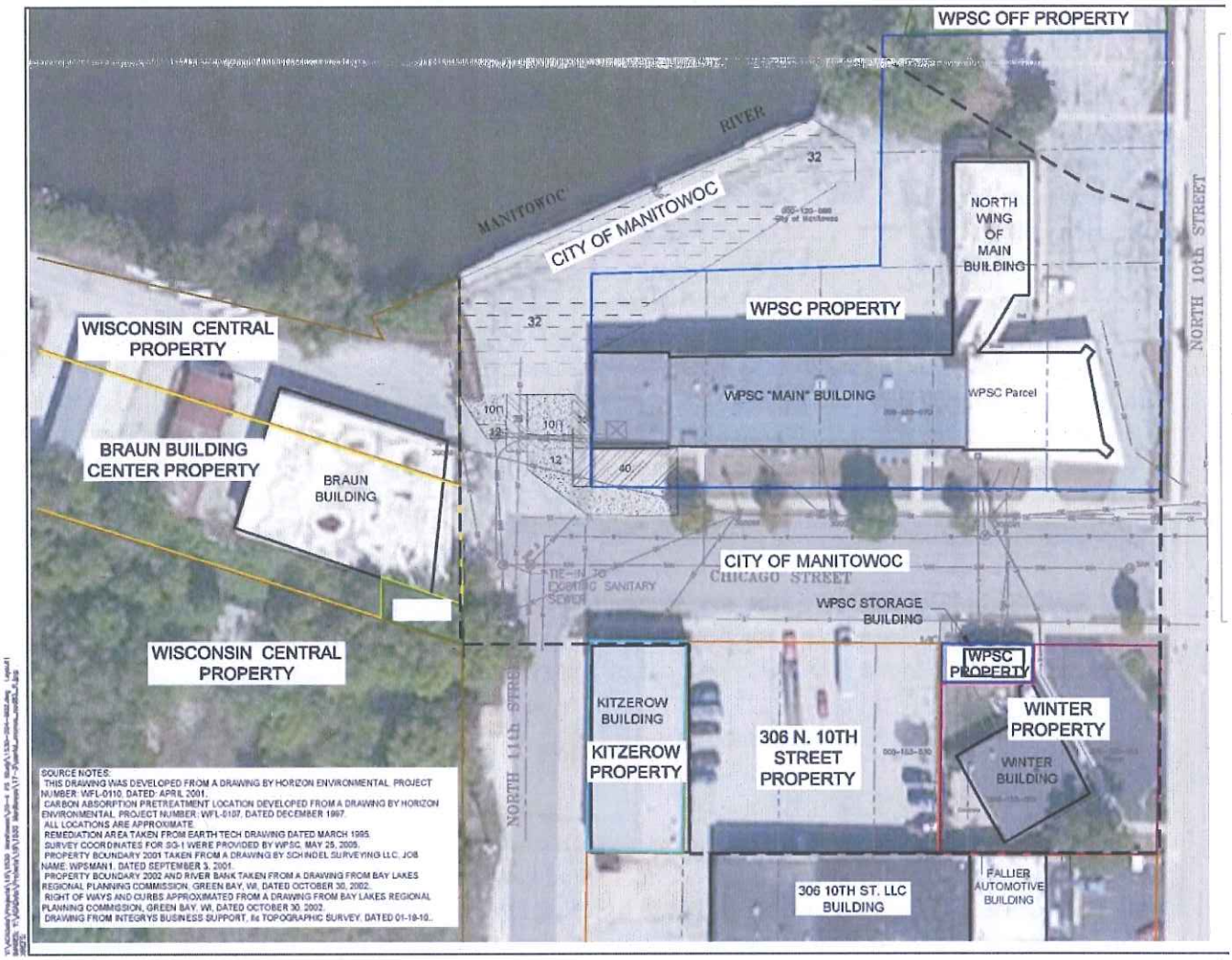
The Site consists of the 1.1-acre, WPSC-owned former Manitowoc MGP facility located at 402 North Tenth Street, which is bounded on the northwest by property owned by the City of Manitowoc (City) and the Manitowoc River; on the north by additional WPSC-owned parcels ("WPSC off-property"); on the east by North Tenth Street; on the south by Chicago Street; and on the west by North Eleventh Street (Figure 2, next page). The site area is zoned for multiple uses, including industrial and general business use.

Figure 1. Site Location Map



SOURCES: ESRI, DELORME, NAVTEI , TOMTOM, INTERMAP, IPC, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, ESRI

Figure 2. Site Property Boundaries



A multi-tenant office building (the "Main Building") occupies much of the WPSC MGP property, with the areas north, east and west covered by asphalt and the south area mostly covered with grass. The top floor of the Main Building is set up for office space, but is unoccupied, except for the top floor of the north wing of the Main Building, which is currently leased by an accounting firm. The bottom floor is used mainly for WPSC vehicle storage and it also contains previously-installed groundwater treatment system equipment. The former MGP structures were located mostly on the WPSC MGP property when operating, although a former gas holder was located to the south on the Winter property (Figure 2).

The City owns property between the WPSC property's north property line and the river (triangular-shaped property shown in Figure 2, above). The property located west of the subject property and on the west side of Eleventh Street along the river is owned by Canadian National Railroad and referred to as the Wisconsin Central Railroad Property to be consistent with previous site-related documents. This property is of interest to the City for redevelopment and the City is performing a Brownfields assessment prior to deciding whether or not to purchase the property.

The Braun Building Center, Inc. is located south of Wisconsin Central Railroad property and it uses the railroad property to store lumber for its pre-fabricated building manufacturing business.

Other site area properties include the Kitzerow property (see Figure 2, parcel on the west), the 306 N. Tenth Street property (parcels in middle), the Winter property, now owned by WPSC (parcel on the east), and a small parcel owned by WPSC along the south side of Chicago Street. The Winter Building and the WPSC Storage Building on the Winter Property will be razed once the lease of occupancy expires in December 2018. These properties are all zoned for commercial and heavy industrial use.

The Manitowoc River is approximately 400 feet across and is adjacent to the former MGP facility, and is utilized as a turning basin for large cargo ships. A sheet pile wall exists adjacent to the City Property and steep banks exist on both the north and west ends of the wall. There is no obvious location to easily access the river and only a limited distance out into the river is possible for wading. At approximately 60 feet from the shoreline, water depths are known to be more than 21 feet, the project depth within the U.S. Army Corps of Engineers (USACE) navigation channel.

Much of the upland portion of the Site is covered with pavement and buildings with a slope toward the Manitowoc River. Other site features include 28 monitoring wells and piezometers, plus the one pumping well installed as part of a previously-installed treatment system.

2.2 Site History and Enforcement Activities

Site History

MGPs were industrial facilities that were found in every sizable town or city in the U.S. from the 1820s to right after World War Two. 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 the war, and most ceased operations by the 1960s and were torn down. Typically, the aboveground structures, such as buildings, tar/oil storage tanks, and storage sheds, were demolished and the foundations were backfilled, leaving hardly any visible traces of the former operations. Belowground structures such as traces of underground piping and storage tanks, along with residual contaminants, were often left behind.

The former WPSC Manitowoc MGP facility was constructed by the Manitowoc Gas Company (MGC) between 1901 and 1906 and was operated through 1947, first by MGC until it was sold to and operated by the Wisconsin Fuel and Light Company (WF&L). MGC and WF&L both used the carbureted water gas (CWG) process to manufacture gas for fuel and lighting, which 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 large gas holders prior to distribution.

After the Manitowoc facility ceased operating, WF&L removed the above-ground MGP components and constructed the Main Building for their use. In 2001, WPSC purchased the property from WF&L.

History of Enforcement Actions

WPSC and WDNR addressed site contamination under the state's voluntary remediation program for several years before EPA became the lead agency. In 2006, WPSC signed an Administrative Order on Consent (AOC) with EPA. Under the 2006 AOC, WPSC agreed to prepare and perform a remedial investigation (RI) and feasibility study (FS) at six former MGP sites located in Manitowoc, Marinette, Green Bay, Two Rivers, Stevens Point, and Oshkosh, Wisconsin. The AOC entered the six sites into the Superfund Alternative Site Approach, which addresses eligible contaminated sites by following the requirements of Superfund law and the NCP without listing the site on the National Priorities List (NPL).

2.3 Community Participation

Since 2008, EPA conducted community interviews, created a community involvement plan, updated the information repository, revised the site's web page, and maintained a postal mailing list and email group. Although there was very little public interest in this site, EPA was ready to respond to inquiries from citizens and local officials. In summer 2018, EPA notified the public of the proposed plan for source area cleanup via a fact sheet, web page update, and a newspaper ad. EPA made the RI and FS Reports and the Proposed Plan available to the public in the site's Administrative Record file and information repository at the Manitowoc Public Library. These documents, along with other site-related material, can be found at the library and on the site's web page www.epa.gov/superfund/wpsc-manitowoc.

EPA published a notice of availability of the RI and FS Reports and Proposed Plan in the Manitowoc *Herald Times Reporter* on July 21, 2018 and announced that the public comment period on the Proposed Plan would run from July 23 to August 22, 2018. EPA indicated that it would accept public comments that were mailed, emailed, and faxed. The agency received comments from five community members and from WPSC and WDNR. Comments and responses can be found in Part III, the *Responsiveness Summary*.

2.4 Scope and Role of Response Action

This ROD addresses OU1, source area MGP contaminants in soil and groundwater, and will be the first decision document for the WPSC Manitowoc MGP Site. EPA anticipates that a second decision document will present a remedy for Manitowoc River sediment (OU2) and a third and final decision document will present a final groundwater remedy (OU3) once the source area contaminants have been addressed and are no longer a source of contamination to the sediment or groundwater.

2.5 Site Characteristics

The WPSC Manitowoc MGP Site is located along the southern bank of the Manitowoc River in Manitowoc, Wisconsin (Figures 1 and 2), which is on the western shore of Lake Michigan.

Area land use is mainly business or commercial and industrial, although some recreational fishing is done from the City property at the river. Single and multi-family dwellings may be located in general business districts, but they are not allowed in commercial or industrial areas.

The site contains topographic features related to the floodplains and bluffs of the river. The banks of the river are steep woody slopes and/or sheet pile walls and some of the site area is within the 100-year floodplain. Generally, the site area is flat with a mild slope towards the river. The nearsurface- geology of the Manitowoc area is characterized by poorly permeable glacial lake deposits of sand, silt, and clay that range up to 150 feet thick. Stratified sand and gravel alluvial deposits also occur along the river. Dolomite bedrock underlies the glacial soils around Manitowoc at depths between 50 and 200 feet below ground surface. At the site, the stratigraphy consists of three to ten feet of fill material (sand, silt and clay) overlying the glacial lake deposits that lie on top of the dolomite bedrock, which is found at a depth of 55 and 65 feet, depending on surface elevation.

There are two groundwater units present at the site - the glacial sand layer and the dolomite bedrock, which are separated by a continuous clay layer. Local groundwater flow is mostly influenced by water levels in the Manitowoc River and by the previously-installed on-Site pumping well. Depth to groundwater across the site is variable (between 5 and 22 feet) due to changes in surface elevation. Flow is generally north towards or into the Manitowoc River.

The City of Manitowoc receives municipal water from intake pipes located two miles off-shore in Lake Michigan as well as an underground standby well located about 3 miles from the site.

No documented wetlands were identified at the site and a review of the Natural Heritage Inventory Database identified of no federally-protected bird or fish species within a mile of the site. The severity of soil disturbance documented at the site over the last 50 years suggest that there are no historical or archeological features on the former MGP site as well.

Conceptual Site Model

A conceptual site model (CSM) describes potential contaminant sources, transport mechanisms, potentially exposed populations, exposure pathways, and routes of exposure at contaminated sites. A CSM was developed for the WPSC Manitowoc MGP Site based on site characteristics and results from the RI investigations and tells the story of how and where the MGP contaminants moved and what impacts such movement may have had upon human health and the environment (figures 4 and 5).

The media of concern at the site include soil, river sediment, and groundwater. As described in the CSM, EPA considers PAHs and petroleum volatile organic compounds (PVOCs) to be the primary contaminants of concern (COCs) at the site. Data show that human exposure via direct contact to or ingestion of PAH-contaminated soil and groundwater 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.

Soil Investigation

A total of 132 soil samples were collected and analyzed from 33 soil borings, one test pit, and from soil derived from six piezometers and four groundwater monitoring well installations. The lateral extent of MGP-impacted soil generally coincides with remaining former MGP structures still beneath the WPSC (100,000 ft^3 gas holder) and Winter properties (300,000 ft^3 gas holder, gas purifier and condenser). PAHs are most frequently found in soil samples and PVOCs were less frequently found but are generally collocated with elevated PAH levels. Visual observations noted oil-coated or oil-wetted soil samples.

Nine PAHs are found to exceed commercial/industrial soil screening levels (SLs). Naphthalene, benzo(a)pyrene, and benzo(a)anthracene were most frequently found, with naphthalene exceeding its SL (17 milligrams per kilogram (mg/kg) or parts per million (ppm)) in 27 samples, benzo(a)pyrene exceeding its SL in 24 samples, and benzo(a)anthracene exceeding its SL (3 mg/kg) in 14 samples.

Benzene, ethylbenzene, 1,2,4-trimethylbenzene, and xylene were the four PVOCs that exceeded industrial screening levels (SLs). Of the 132 soil samples analyzed for benzene and ethylbenzene, seven exceeded the benzene SL of 5 mg/kg and ten exceeded the ethylbenzene SL of 25 mg/kg. Of the 110 soil samples analyzed for 1,2,4-trimethylbenzene, six exceeded the industrial SL of 240 mg/kg, and of the 41 samples analyzed for xylene, one exceeded the industrial SL of 2,500 mg/kg.

Total cyanide and total lead exceeded industrial SLs for inorganic compounds in one instance each at SLs of 1,200 mg/kg and 800 mg/kg respectively.

When compared to residential screening levels, reported concentrations in surface soils from the WPSC Property exceeded the RSLs for seven PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and chrysene. Risk from surface soils at the WPSC Property calculated using the ratio method for a residential scenario along with the maximum observed concentrations yieleded a cumulative cancer risk estimate of $5x10^{-4}$ (driven by benzo[a]pyrene), which is above EPA's target risk range. Calculations using the mean concentrations yieled a cumulative cancer risk estimate of $2x10^{-4}$, which is also above EPA's target risk range.

When surficial soil concentrations were compared to residential screening levels at the Winter Property, concentrations exceeded RSLs for eight PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, chrysene and naphthalene. The maximum cumulative cancer risk yieleded estimates of $2x10^{-3}$ for the maximum and $4x10^{-4}$ based on the mean, with both estimates being driven by benxo(a)pyrene.

Groundwater Investigation

Quarterly groundwater monitoring was done for the first year following installation of additional wells in 2009 and 2012. Outside of these quarterly monitoring periods, sampling was completed on a semi-annual basis for a total of 371 groundwater samples.

Of the samples collected from 27 wells and analyzed for VOCs, benzene, ethylbenzene, 1,2,4-trimethylbenzene, and xylene exceeded groundwater SLs in seven, two, four, and two wells, respectively.

Of the samples collected from 24 wells sampled for PAHs, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene exceeded groundwater SLs in 20, 18, 19, 19, 23, and 21 wells, respectively.

Arsenic and manganese exceeded groundwater SLs in two and six wells, respectively.

Groundwater samples were also evaluated for certain geochemical parameters to determine whether conditions in the aquifers are favorable for natural attenuation of the COCs. Results were inconclusive and further geochemical investigation is necessary. Results will be presented later as OU3.

Soil Gas Investigation

Vapor intrusion into buildings is commonly investigated when volatile contaminants are present either in groundwater and/or the subsurface soil near or beneath a building. The concern is the potential for VOCs, such as benzene, to be transferred into the spaces between soil particles (e.g. soil gas or soil vapor) beneath the building, which can then be transferred to the inside of the building through crack in the foundations, floors, or at junctions where utilities enter the building. Vapor intrusion can lead to chemicals contaminating indoor air, which can cause a health concern at elevated concentrations. Vapor intrusion is not a concern for chemicals that are not volatile, such as most metals and heavier organic chemicals such as most PAHs.

Four soil gas sampling events were completed during the RI from 2012-14. Soil gas samples were collected outside of buildings or beneath buildings where visual observations of MGP residuals (occurrence of NAPL as visual observations of oil-wetted or oil-coated media) were known to be present. Forty-two soil vapor probes were installed at 22 locations, including outside and inside buildings, and at various depths, to estimate attenuation effects in the soil column. Elevated concentrations of contaminants in soil gas were found around the Winter Building; therefore, EPA requires WPSC to conduct annual indoor air monitoring to make sure the occupants of the building are not breathing in contaminated air. Results from the indoor air sampling events show that no indoor air contamination is present. Of the 132 soil gas samples taken and analyzed, 27 exceeded the industrial SLs for naphthalene, 24 exceeded for benzo(a)pyrene, and 14 exceeded for benzo(a)anthracene.

Surface Water and Sediment Investigation

Surface water and sediment sampling data will be presented in OU2 documents, but in general, MGP waste such as tar containing PAHs is suspected to be present in river sediment near the former MGP properties.

2.6 Current and Potential Future Site and Resource Uses

The land use around the former MGP facility currently is used for commercial and industrial purposes; however, under general business zoning, the land can be used for residential purposes. Although the City of Manitowoc has interest in redeveloping its riverfront in this prime, downtown area, land-use will likely remain commercial/industrial into the future as WPSC owns the former MGP property and the Winter property. Presently, the City is conducting a Brownfields assessment on the railroad property and may purchase the property for commercial/recreational redevelopment.

Groundwater is not being used because the city derives its water supply mainly from Lake Michigan. Groundwater will be more fully addressed as OU3.

2.7 Summary of Site Risks

The following section establishes the basis for taking action at the WPSC Manitowoc MGP Site and briefly summarizes the relevant portions of the Human Health Risk Assessment (HHRA) and Baseline Ecological Risk Assessment (BERA), both found as appendices in the 2014 RI Report. The extent of contamination is depicted in Tables 1 (below) and 2 (next page).

Site Contaminants of Concern (COCs)

EPA identified PAHs, including naphthalene, benzo(a)pyrene, benzo(b)fluoranthene and chrysene, PVOCs, including benzene and ethylbenzene, and the inorganic material cyanide as COCs in soil at the Site. Based on past investigations and results from the RI, the source of the PAH and PVOC contamination is the manufacture of gas processes undertaken at the WPSC Manitowoc MGP facilities, which operated from the 1900s through 1947. The COCs were also spread from the upland MGP facility into the Manitowoc River and have leached into the groundwater beneath the site.

Table 1. Summary of Soil COCs

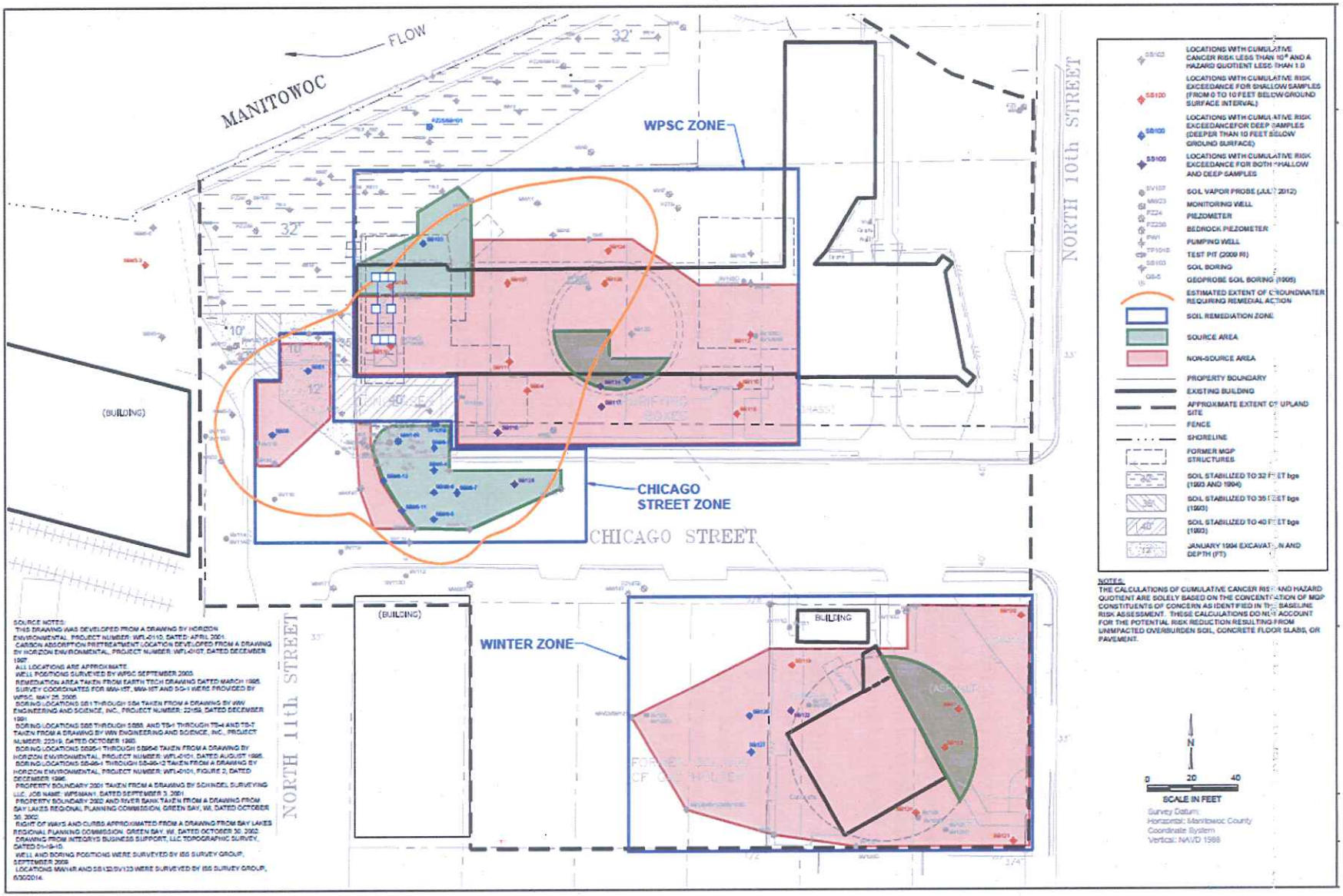
PAHs	**PVOCs**	**Inorganics/Metals**
Benz[a]anthracene	Benzene	Cyanide, Total
Benzo[a]pyrene	Ethylbenzene	Lead, Total
Benzo[b]fluoranthene	1,2,4-Trimethylbenzene	
Benzo[k]fluoranthene	Xylene, o	
Chrysene	Xylenes, m+ p	
Dibenz[a, h]anthracene	Total Xylenes	
Indeno[1,2,3-cd]pyrene		
Naphthalene		
1-Methylnaphthalene		
2-Methylnaphthalene		

Table 2. Summary of Groundwater COCs

PAHs	PAHs Continued	PVOCs	Inorganics/ Metals
Acenaphthene	Dibenz(a,h)anthracene	Benzene	Arsenic, Dissolved
Acenaphthylene	Fluoranthene	Ethylbenzene	Manganese, Dissolved
Anthracene	Fluorene	1,2,4-Trimethylbenzene	
Benzo(a)anthracene	Indeno(1,2,3-cd)pyrene	1,3,5-Trimethylbenzene	
Benzo(a)pyrene	Naphthalene	Toluene	
Benzo(b)fluoranthene	Phenanthrene	Xylene, o	
Benzo(ghi)perylene	Pyrene	Xylenes, m + p	
Benzo(k)fluoranthene	1-Methylnaphthalene	Total Xylenes	
Chrysene			
2-Methylnaphthalene			

Figure 3, next page, depicts the extent of COCs in soil and groundwater at the Site. The areas shaded green show the extent of NAPL source area contamination and the red shaded areas show the extent of PAH contamination in soil. The orange outline shows the estimated source area groundwater plume extent. Full extent of groundwater requiring remediation will be determined in the Remedial Investigation for OU3.

Figure 3. Estimated Extent of Source Areas Requiring Remedial Action



Conceptual Site Model (CSM)

The media of concern at the site include soil, groundwater, and river sediment. As described in the CSM, EPA considers PAHs and petroleum volatile organic compounds (PVOCs) to be the primary contaminants of concern (COCs) at the site. Data show that human exposure via direct contact to or ingestion of PAH-contaminated soil and groundwater 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. PAH-contaminated soil and groundwater both can lead to PAH exposure to future site workers. The targeted remediation areas at the site are source areas of soil and groundwater contaminants exceeding human health risk criteria (see figures 4 and 5, next pages.)

Identification of Potentially Exposed Populations

Populations were identified that could be exposed to contaminants through a variety of activities consistent with current and potential future uses of the Site. The HHRA evaluated potential exposures of human receptors to COCs in soil, groundwater, and soil gas. Risks and hazards were characterized on an exposure area-specific basis for residents and commercial/industrial workers based on current and reasonably anticipated future land use.

Risks for future industrial or commercial workers include:

- Incidental ingestion of soil (surface and subsurface).
- Dermal contact with soil (surface and subsurface) as a result of soil disturbance.
- Inhalation of vapors as a result of vapor intrusion from MGP residuals in soil and groundwater into commercial/industrial buildings on the Site.
- Ingestion of groundwater.
- Dermal contact with groundwater.

Risks for construction workers include:

- Incidental ingestion of soil (surface and total) 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.

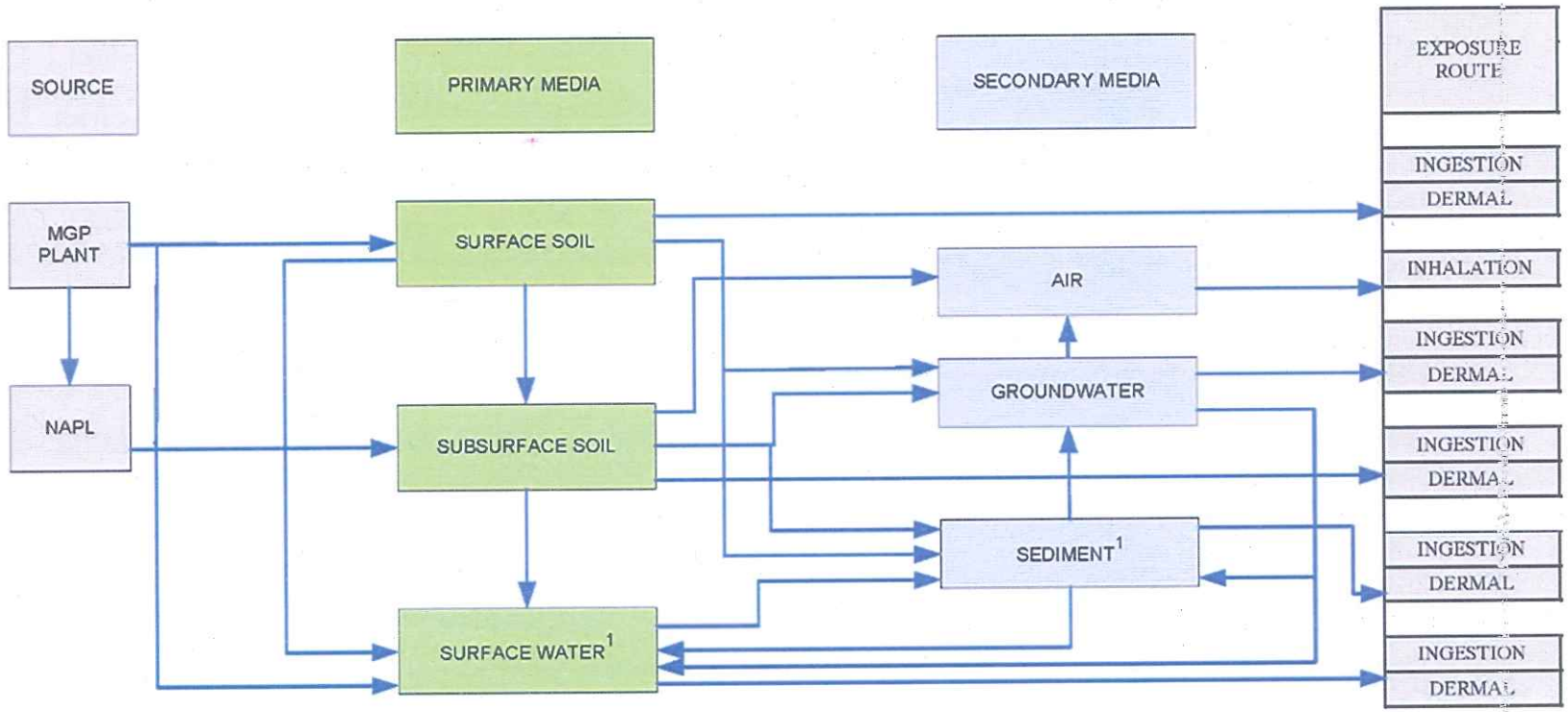
Risks for recreational visitors include:

- Incidental ingestion of surface soil.
- Dermal contact with surface soil.

Risks for residents, under a hypothetical future land-use scenario, include:

- 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.
- Ingestion of groundwater.
- Dermal contact with groundwater.

Figure 4a. Conceptual Site Model Chart for the WPSC Manitowoc 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.

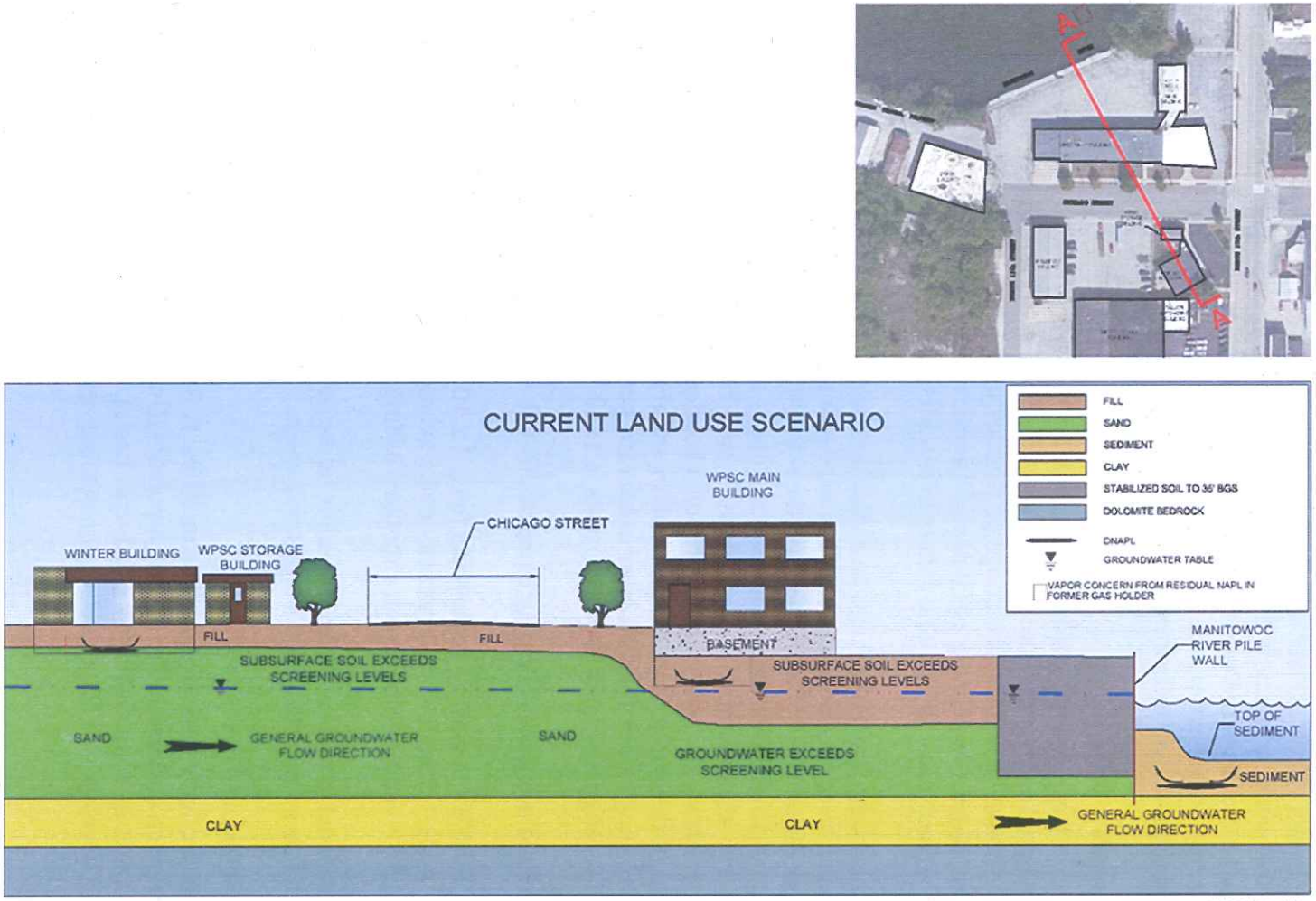
[1] A qualitative exposure assessment found this pathway to be incomplete or insignificant under current and future scenarios. Refer to Section 2.3.4 Potential Exposure to Surface Water and Sediment of the BLRA for the details of this assessment.

Figure 4b. Conceptual Site Model Chart for the WPSC Manitowoc Former MGP Site, Continued

	EXPOSURE ROUTE	INDUSTRIAL, COMMERCIAL WORKER	CONSTRUCTION WORKER	RESIDENTIAL	RECREATIONAL	BIRDS	MAMMALS	FISH	BENTHIC INVERTEBRATES
Surface Soil	INGESTION	Δ	Δ	●	○	○	○	N/A	N/A
	DERMAL	Δ	Δ	●	○	○	○	N/A	N/A
Air	INHALATION	Δ	Δ	●	○	○	○	N/A	N/A
Ground-water	INGESTION	●	Δ	●	○	○	○	N/A	N/A
	DERMAL	●	Δ	●	○	○	○	N/A	N/A
Soil Sub-Surface	INGESTION	●	Δ	●	○	○	○	N/A	N/A
	DERMAL	●	Δ	●	○	○	○	N/A	N/A
Sediment	INGESTION	○	○	○	○	Δ	○	Δ	Δ
	DERMAL	○	○	○	○	Δ	○	Δ	Δ
Surface Water	INGESTION	○	○	○	○	○	○	○	○
	DERMAL	○	○	○	○	○	○	○	○

Notes: Δ= pathway partially complete
●= pathway incomplete or insignificant under current land use—potentially complete under hypothetical future land use scenario
○= pathway incomplete

Figure 5. Visual Conceptual Site Model



Toxicity Assessment

A toxicity assessment determines whether exposure to COCs may result in adverse health effects in humans and the relationship between the magnitude of exposure (dose) and incidence and/or severity of adverse effects (response). For risk assessment purposes, chemicals are generally separated into categories based on whether the chemical exhibits carcinogenic or noncarcinogenic health effects. As appropriate, a chemical may be evaluated separately for both effects. Noncancer effects are evaluated using a reference dose (RfD), which is the dose below which adverse health effects are not expected. Carcinogenic effects are assessed using the cancer slope factor (SF), which is typically expressed in units of mg/kg-day. The SF represents an upper bound estimate on the increased cancer risk. SFs are generally accompanied by a weight of evidence descriptor, which expresses the confidence as to whether a specific chemical is known or suspected to cause cancer in humans.

Cancer Assessment

Potential cancer effects are expressed as the probability that an individual will develop cancer over a lifetime based on the exposure assumptions described in Section G.1.b. The cancer SF is a plausible upper bound estimate of carcinogenic potency used to calculate cancer risk from exposure to carcinogens by relating estimates of lifetime average chemical intake to incremental probability of an individual developing cancer over a lifetime.

For carcinogenic compounds, risk is given as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a carcinogen. Values are expressed as "excess lifetime cancer risk" (ELCR) because the risk would be in addition to the risk of developing cancer from other causes such as smoking or exposure to too much sun. ELCRs are often expressed in scientific notation (e.g., $1x10^{-6}$); an ELCR of $1x10^{-6}$ indicates that an individual experiencing the reasonable maximum chemical exposure estimate has an extra 1 in 1 million chances of developing cancer as a result of site-related exposure. The chance of an individual developing cancer from all other causes has been estimated to be as high as 1 in 3. EPA's target risk range for site-related exposures is $1x10^{-4}$ to $1x10^{-6}$ ELCR.

ELCR is calculated using the following equation: ELCR = CDI x SF

where: ELCR = a unitless probability (e.g., 2×10^{-5})
CDI = chronic daily chemical intake averaged over 70 years (mg/kg-day)
SF = cancer slope factor, expressed as $(mg/kg\text{-}day)^{-1}$.

A COC is considered to present a current and/or future potential unacceptable risk if the calculated ELCR is greater than EPA's target risk range.

Noncancer Assessment

Noncancer health effects were evaluated using RfDs. A RfD is an estimate of a daily oral exposure for a given duration to the human population (including susceptible subgroups) that is likely to be without an appreciable risk of adverse health effects over a lifetime. Chronic RfDs are specifically developed to be protective against long-term exposure to COCs.

For non-carcinogens, EPA calculates a hazard quotient (HQ) for each COC. The HQ is the ratio of the estimated exposure level to a chemical compound over a specified period of time to a RfD of the same substance that may cause deleterious health effects over the same exposure period. The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a RfD derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a HQ. An HQ>1 indicates that site-related exposures may present a risk to human health.

The HQ is calculated as follows: $HQ = CDI/RfD$

where: CDI = Chronic daily intake
RfD = reference dose

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, sub-chronic, or short-term).

Risk Characterization

Risk characterization integrates the information from the exposure assessment and toxicity assessment, using a combination of qualitative and quantitative information. Risk characterization involves estimating the magnitude of the potential adverse health effects associated with the COCs. It also involves making judgments about the nature of the human health threat to the defined receptor populations. The risk characterization combines the results of the dose-response (toxicity assessment) and exposure assessment to calculate cancer risks and noncancer health hazards. In accordance with EPA's guidelines, this assessment assumes that the effects of all contaminants are additive through a specific pathway within an exposure scenario.

EPA's goal of protection for cancer risk is $1x10^{-6}$, and risks greater than $1x10^{-4}$ typically will require remedial action. The potential for noncancer health effects is estimated by comparing the average daily dose of a chemical for adult, adolescent, and child with the RfD for the specific route of exposure (e.g., oral). The ratio of the intake (average daily dose, or ADD) to reference dose (ADD/RfD) for an individual chemical is the HQ. When an RfD is available for the chemical, these ratios are calculated for each chemical that elicits a noncancer health effect. Typically, chemical-specific HQs are summed to calculate an HI value for each exposure pathway. EPA's goal of protection for noncancer health effects is an HI equal to 1. When the HI exceeds 1, there may be a concern for health effects.

This approach can result in a situation where HI values exceed 1 even though no chemical-specific HQs exceed 1 (i.e., adverse systemic health effects would be expected to occur only if the receptor were exposed to several contaminants simultaneously). In this case, chemicals are segregated by similar effect on a target organ, and a separate HI value for each effect/target organ is calculated. If any of the separate HI values exceed 1, adverse, noncancer health effects are possible. It is important to note, however, that an HI exceeding 1 does not predict a specific disease.

Summary of the HHRA

The human health risk assessment (HHRA) component of the baseline risk assessment (BLRA) evaluated current land uses and exposure pathways and hypothetical future land-use scenarios of the site. Site-specific conditions, such as access (or lack thereof) to various media, or presence of NAPL, are also considered in the assessment. Because this Proposed Plan addresses only source area contaminants, the discussion below will focus on risks associated with the source areas. The risks posed by the other areas will be discussed and addressed in future decision documents.

Calculated human health risks by medium and property is presented in Table 3, below. Exposure routes for soils is through dermal contact and ingestion. Human health risks to contaminated groundwater are presented as inhalation resulting from vapor intrusion (soil gas and indoor air).

Table 3. Calculated Human Health Risks by Medium and Property

Surface Soils (0-2 ft)	Industrial/ Commercial	Residential	Surface Soils (0-2 ft)	Industrial/ Commercial	Residential
Near WPSC Bldg.	ELCR: $4x10^{-5}$ HI: <1	ELCR: $5x10^{-4}$ HI: <1	Near Winter Bldg.	ELCR: $1x10^{-4}$ HI: 0.4	ELCR: $4x10^{-4}$ HI: 0.2
Total Soils (0-10 ft)	Industrial/ Commercial	Residential	Total Soils (0-10 ft)	Industrial/ Commercial	Residential
Near WPSC Bldg.	ELCR: $6x10^{-4}$ HI: 4	ELCR: $9x10^{-3}$ HI: <1	Near Winter Bldg.	ELCR: $2x10^{-4}$ HI: <1	ELCR: $2x10^{-3}$ HI: 18
Soil Vapor Exterior Samples	Industrial/ Commercial	Residential	Soil Vapor Exterior Samples	Industrial/ Commercial	Residential
WPSC Bldg. and Utilities	ELCR: $2x10^{-5}$ HI: 1	ELCR: $1x10^{-4}$ HI: 5	Braun Bldg.	ELCR: $<1x10^{-6}$ HI: <1	ELCR: $<1x10^{-6}$ HI: <1
Winter Bldg.	ELCR: $1x10^{-1}$ HI: 2,000	ELCR: $7x10^{-1}$ HI: 10,000	Fallier Auto. Bldg.	ELCR: $<1x10^{-6}$ HI: <1	ELCR: $1x10^{-4}$ HI: 2
Kitzerow Bldg.	ELCR: $<1x10^{-6}$ HI: <1	ELCR: $<1x10^{-6}$ HI: <1	WPSC Storage	ELCR: $<1x10^{-6}$ HI: <1	ELCR: $<1x10^{-6}$ HI: <1
Soil Vapor Sub-slab	Industrial/ Commercial	Residential	Indoor Air	Industrial/ Commercial	Residential
WPSC Bldg.	ELCR: $2x10^{-2}$ HI: 400	ELCR: $9x10^{-2}$ HI: 2,000	Winter Bldg.	ELCR: $1x10^{-6}$ HI: <1	ELCR: $7x10^{-6}$ HI: <1

Notes: ELCR = Excess Lifetime Cancer Risk HI = Hazard Index
ELCR and HI presented are maximum exposure risk values.
Yellow highlighting indicates that the ELCR is greater than $1x10^{-4}$ or the noncancer hazard index is above 1.

In addition to the table above, there are multiple exceedances of residential drinking water standards at the WPSC and Winter properties, which are presented in Table 4, below. After addressing source area contaminants, WPSC will conduct a RI to determine the remaining impacts to groundwater and associated risks, and EPA will select a final groundwater remedy that addresses those risks.

Table 4. Groundwater Exceedances of Residential Drinking Water Standards

Analyte	**Maximum Detected Values (in µg/L)**	**RSL Tapwater (in µg/L)**	**MCL (in µg/L)**	**WI NR 140 ES (in µg/L)**
PAHs				
Acenaphthene	5,150	400		
Acenaphthylene	79,400	400		
Anthracene	30,500	1,300		3,000
Benzo(a)anthracene	14,300	0.029		
Benzo(a)pyrene	11,300	0.0029	0.2	0.2
Benzo(b)fluoranthene	10,900	0.029		0.2
Benzo(ghi)perylene	9,200	87		250
Benzo(k)fluoranthene	13,300	0.29		
Chrysene	21,100	2.9		0.2
Dibenz(a,h)anthracene	2,030	0.0029		
Fluoranthene	45,200	630		400
Fluorene	27,000	220		400
Indeno(1,2,3-cd)pyrene	5.1	0.029		
1-Methylnaphthalene	150,000	0.97		
2-Methylnaphthalene	245,000	27		
Naphthalene	799,000	0.14		100
Phenanthrene	84,600	1,300		3,000
Pyrene	47,400	87		250
VOCs				
Benzene	470	0.39	5	5
Ethylbenzene	1,650	1.3	700	700
Toluene	1,370	860	1,000	800
1,2,4-Trimethylbenzene	675	15		480
1,3,5-Trimethylbenzene	194	87		480
Xylene, o	1,190	190		
Xylenes, m + p	2,210	190		
Total Xylenes	5,450	190	10,000	2,000
Inorganics				
Arsenic, Dissolved	19.5	0.045	3	3
Manganese, Dissolved	817	320		16

Notes: MCL= Maximum Contaminant Level RSL= Regional Screening Level
WI NR 140 ES= Wisconsin Chapter NR 140 Enforcement Standard
µg/L= micrograms per liter

Conclusions of the HHRA

Soil: The lateral extent of MGP-affected soil generally coincides with remaining former MGP structures on both the WPSC and Winter Properties. PAHs are the most frequent category of constituents detected above applicable screening levels. PVOC detections above applicable screening levels are less frequent than elevated PAH detections and are generally collocated with elevated PAH detections. Soil exceedances are closely associated with visual observations of oil-coated or oil-wetted soil. Most of the Site impacts are associated with the former 100,000 ft^3 and 300,000 ft^3 gas holders and Chicago Street directly south of the former purifier and condenser.

Groundwater: The BLRA evaluation calculated cumulative human health risks to potential exposure to site groundwater. Groundwater at the Site does not currently pose a risk to human receptors because is not used as a drinking water source and there are no production wells within the delineated plume. Drinking water for the City of Manitowoc comes from Lake Michigan and, as necessary, supplemented by a well that is not affected by the Site. There is no city ordinance restricting the installation drinking water wells; therefore, under the hypothetical future residential land use scenario, there is a potential for ingestion of affected groundwater. This situation would only occur if the hypothetical future resident were to install a potable water well rather than relying on potable water provided by the City of Manitowoc.

The BLRA also considered potential risk to construction workers who may excavate soil and potentially contact groundwater. Dermal exposure and incidental ingestion of groundwater during construction activities are potential exposure pathways since groundwater depth is relatively shallow and ranges from 5-22 feet below ground surface (bgs). If future construction in the area entails workers having direct physical contact with groundwater or associated vapors in excavations at or below the water table, there would be some potential for risks above the risk management range, as product has been observed in at least one well (MW-14). Contact with groundwater is likely to be very limited because of safety considerations other than those relating to chemical exposure, but potential risks should be managed appropriately.

Soil Gas: Vapor intrusion into buildings is commonly investigated when contamination is present either in groundwater and/or the subsurface soil near or beneath a building. The concern is the potential for VOCs, such as benzene, to be transferred into the spaces between soil particles (e.g. soil gas or soil vapor) beneath the building, which can then be transferred to the inside of the building through crack in the foundations, floors, or at junctions where utilities enter the building. Vapor intrusion can lead to chemicals contaminating indoor air, which can cause a health concern at elevated concentrations. Vapor intrusion is not a concern for chemicals that are not volatile, such as most metals and heavier organic chemicals such as PAHs.

Four soil gas sampling events were completed during the RI from 2012-14. Soil gas samples were collected outside of buildings or beneath buildings where visual observations of MGP residuals were known to be present. The conclusions of the BLRA are summarized below.

Under the WPSC Building:

- Sub-slab samples collected beneath the WPSC building indicated risks within the risk management range under an industrial scenario, but above the risk management range for a hypothetical future residential scenario.

For deeper samples, risks were estimated to be above the risk management range for both an industrial and a hypothetical future residential scenario.
Sub-slab samples are considered more indicative of potential indoor air concentrations than the deeper samples and risks for these sub-slab samples were within the risk management range for the current industrial use.

Adjacent to the WPSC Building:

- Subsurface exterior soil vapor samples near the WPSC building, including utility corridors, and samples near the Fallier automotive building were associated with risks within the risk management range for the industrial scenario, but above the range for a hypothetical future residential scenario.

Kitzerow, Braun, and WPSC Storage Buildings:

- Subsurface exterior soil vapor samples near the Kitzerow, Braun, and WPSC storage buildings indicated all estimated risks under an industrial or hypothetical future residential scenario were within or below the risk management range.

Winter Building:

- Subsurface exterior soil vapor samples near the Winter building indicated risks above the risk management range under either an industrial or a hypothetical future residential scenario. An evaluation of the indoor air of the Winter building provided evidence that subsurface soil vapors are not intruding into the indoor air of the existing building, so the vapor intrusion pathway is incomplete. Annual indoor air sampling at the Winter Building will continue until it is vacated (December 2018) to confirm that indoor air quality continues to be below applicable screening levels.

The BLRA determined that risks from soil gas or indoor air are within the risk management range for current industrial land use. Annual sampling completed in 2015, 2016, and 2017 demonstrate the VI pathway is incomplete at the Winter Building.

Summary of the Baseline Ecological Risk Assessment (BERA)

Results of the BERA will be presented and discussed in the sediment cleanup decision document.

Basis for Taking Action

It is EPA's current judgment that the selected remedy identified in this ROD is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

2.8 Remedial Action Objectives

Remedial action objectives (RAOs) describe goals that the proposed remedial action is expected to accomplish. RAOs for the site were developed to protect human health and environmental receptors from unacceptable risk resulting from the soil and groundwater source materials at the site. The RAOs are listed below:

- RAO-1 – Prevent current and future human exposure to COCs in soils at levels that present a carcinogenic risk greater than $1x10^{-6}$ ELCR or a non-carcinogenic hazard quotient greater than 1 to current and future construction/utility work and residential/industrial/commercial uses.
- RAO-2 – Minimize current and future migration of COCs from soil to groundwater.
- RAO-3 – Stabilize or reduce the migration of COCs into groundwater by conducting source-control measures.
- RAO-4 – Prevent human exposure to indoor air (resulting from soil gas/vapors caused by MGP source material, MGP-impacted soil, and/or MGP-impacted groundwater) at levels greater than $1x10^{-6}$ ELCR or a non-carcinogenic hazard quotient greater than 1.

2.9 Remediation Goals

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. Remediation Goals 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. For ecological receptors, RBCs correspond to a target HQ of 1. RBCs for ecological receptors represent a risk range based on "No Observed Adverse Effects Level" and "Lowest Observed Adverse Effects Level" risk estimates for each receptor group.

Soil Remediation Goals

The proposed Remediation Goals (RGs) for soil are generally based on EPA default exposure parameters and factors representing reasonable maximum exposure conditions for long-term/chronic exposures for ELCR of $1x10^{-6}$ with a corresponding hazard quotient of 1 under a hypothetical residential and industrial exposure scenario. Remediation of general business areas to residential RGs will result in unrestricted use and unrestricted exposures. Remediation to industrial RGs in industrial/commercial areas will be protective only if there are corresponding controls to prevent residential land use, unless additional remedial action is undertaken. As specified by Wisconsin DNR's Update to RR-890 and RCL Spreadsheet (Wisconsin DNR, June 2014), certain EPA default exposure parameters were modified to match current Wisconsin DNR requirements (Tables 5 and 6, next page).

Groundwater Remediation Goals

The selected groundwater RG will eliminate the migration of NAPL into groundwater following remedial action implementation. Final groundwater RGs will be selected in the OU3 ROD after evaluation of post-OU1 remedy groundwater conditions.

Table 5. Soil Remediation Goals for Industrial/Commercial Areas

PAHs	Industrial Soil Screening Level	PVOCs	Industrial Soil Screening Level
Benz[a]anthracene	2,100 µg/kg	Benzene	5,400 µg/kg
Benzo[a]pyrene	210 µg/kg	Ethylbenzene	27,000 µg/kg
Benzo[b]fluoranthene	2,100 µg/kg	1,2,4-Trimethylbenzene	219,000 µg/kg
Benzo[k]fluoranthene	21,000 µg/kg	Xylene, 0	434,000 µg/kg
Chrysene	210,000 µg/kg	Xylenes, m + p	2,500,000 µg/kg
Dibenz[a, h]anthracene	210 µg/kg	Total Xylenes	2,700,000 µg/kg
Indeno[1,2,3-cd]pyrene	2,100 µg/kg		
Naphthalene	18,000 µg/kg	**Inorganics**	
1-Methylnaphthalene	53,000 µg/kg	Cyanide, Total	1,000,000 µg/kg
2-Methylnaphthalene	2,200,000 µg/kg	Lead, Total	800,000 µg/kg

Note: µg/kg = micrograms per kilogram (parts per million)

Table 6. Soil Remediation Goals for General Business/Hypothetical Future Residential Areas

PAHs	Residential Soil Screening Level	PVOCs	Residential Soil Screening Level
Benz[a]anthracene	150 µg/kg	Benzene	1,100 µg/kg
Benzo[a]pyrene	15 µg/kg	Ethylbenzene	5,400 µg/kg
Benzo[b]fluoranthene	150 µg/kg	1,2,4-Trimethylbenzene	62,000 µg/kg
Benzo[k]fluoranthene	15,000 µg/kg	Xylene, 0	434,000 µg/kg
Chrysene	15,000 µg/kg	Xylenes, m + p	388,000 µg/kg
Dibenz[a, h]anthracene	15 µg/kg	Total Xylenes	400,000 µg/kg
Indeno[1,2,3-cd]pyrene	150 µg/kg		
Naphthalene	3,600 µg/kg	**Inorganics**	
1-Methylnaphthalene	1,600 µg/kg	Cyanide, Total	78,000 µg/kg
2-Methylnaphthalene	230,000 µg/kg	Lead, Total	400,000 µg/kg

2.10 Description of Alternatives

CERCLA mandates that remedial actions must be protective of human health and the environment, be cost-effective, and use permanent solutions and alternative treatment technologies or resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants at a Site. CERCLA § 121(d), 42 U.S.C. § 9621(d), further specifies that a remedial action must require a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA § 121(d)(4), 42 U.S.C. § 9621(d)(4).

Seven alternatives were developed and evaluated for addressing the current and potential risks to human health or the environment. Detailed information about the remedial alternatives are provided in the FS Report (NRT 2018). The seven alternatives are:

Alternative 1 – No Action
Estimated Capital Cost: $0
Estimated Annual Operation and Maintenance (O&M) Cost: $0
Estimated Periodic Cost: $20,000 (every five years)
Estimated Total Present Worth: $50,000
Estimated Remedial Action Construction Timeframe: none – no construction would occur

Summary:

Regulations governing the Superfund program require that the "no action" alternative be evaluated generally to establish a baseline for comparison. Under this alternative, EPA would take no additional action to prevent exposure to site contaminants and NAPL in soils and contaminated groundwater would remain in place at the site. There would be periodic costs associated with five-year reviews, since the NCP requires five-year reviews as long as hazardous substances remain at the site at concentrations that do not allow for unlimited use and unrestricted exposure.

Alternative 2 – ISS in Chicago Street Zone, ICs
Estimated Capital Cost: $2,300,000
Estimated Annual Operation and Maintenance (O&M) Cost: $900,000
Estimated Periodic Cost: $88,000
Estimated Total Present Worth: $3,300,000
Estimated Remedial Action Construction Timeframe: 3-5 months

Summary:

ISS of Chicago Street Zone; maintenance of existing direct contact barriers and installation of new direct contact barriers, as required, over affected surficial soil in all zones; continued operation of groundwater pump and treat system for a defined period after ISS, monitoring of groundwater contaminant concentrations to evaluate the effectiveness of soil cleanup, and ICs to manage remaining risks associated with soil, groundwater, and vapor intrusion. A final groundwater remedy will be selected at a later date.

Alternative 2a– ISS in Chicago Street Zone, ISCO for Groundwater, ICs
Estimated Capital Cost: $2,600,000
Estimated Annual Operation and Maintenance (O&M) Cost: $900,000
Estimated Periodic Cost: $88,000
Estimated Total Present Worth: $3,600,000
Estimated Remedial Action Construction Timeframe: 3-5 months

Alternative 2a is identical to Alternative 2 with the addition of a one-time application through injection of oxidizing chemicals (ISCO) to reduce remaining groundwater impacts following source treatment.

Soil Summary:

ISS of Chicago Street Zone: Alternatives 2 and 2a include ISS of source material located beneath Chicago Street and North 11th Street.

The ISS process involves blending impacted soil with amendments (cement, bentonite, ground granulated blast furnace slag, etc.), to encapsulate and immobilize COCs. ISS will inhibit contact of the immobilized source material with groundwater.

The estimated surface area of source material to be treated using ISS in the Chicago Street Zone is approximately 2,200 square feet and is located between 14 feet below grade and 41 feet below grade, resulting in an estimated 2,200 cubic yards of material requiring ISS. There are implementation challenges associated with ISS of discrete zones below the ground surface, so the upper portion of the soil column may also be treated using ISS. For cost estimating, it was assumed that ISS would commence at 5 feet bgs and extends to approximately 41 feet bgs, bringing the total volume of stabilized material to approximately 3,000 cubic yards.

Non-source material with COCs above industrial RGs in the Chicago Street Zone is located under an active roadway at depths greater than 10 feet bgs and is not accessible for human exposure. Potential future risk resulting from the unlikely exposure to non-source material in the Chicago Street Zone will be managed through ICs.

Horizontal Engineered Surface Barriers: The Site is in an area with many surface improvements, including paved parking lots and paved roadways. Alternatives 2 and 2a will involve monitoring and maintaining existing surface barriers, which currently mitigate potential exposure to surficial soil containing COCs above the residential RGs. In areas of the Site where human exposure to surficial soil containing COCs above the residential RGs is not currently limited by an existing barrier, a barrier will be installed.

Conceptually, barrier installation would consist of excavating the top two feet of affected soil, disposing of excavated soil off-site, and backfilling the excavation with 18 inches of clean fill and six inches of clean topsoil. Alternative barrier approaches, including gravel or asphalt as backfill, will be evaluated during the remedial design phase.

Approximately 6,100 square feet of barrier will be installed, which will involve excavation and off-site disposal of approximately 350 cubic yards of soil. Both existing surface improvement as well as newly installed barriers will be regularly inspected and maintained based on the requirements of a Cover Monitoring and Maintenance Plan, to be developed during the remedial design. Modification to the existing and newly installed barriers will be managed through a Soil Management Plan and corresponding ICs.

Groundwater Summary

Monitoring: Alternatives 2 and 2a will involve groundwater monitoring following ISS. The existing pump and treat system at PW1 will be operated for a minimum period to allow for removal and treatment of one pore water volume in the affected area. Groundwater monitoring will continue and a final groundwater remedy will be selected at a later date.

ISS creates a low permeability zone that isolates source material and will force groundwater flow changes. A review of the existing well network remaining after remedial action will be performed to ascertain if additional wells will be required to adequately evaluate and monitor COCs in groundwater due to groundwater flow impacts from the ISS.

It is also assumed that groundwater use controls using the WDNR's Geographic Information System (GIS) Registry will be implemented to restrict groundwater use until the final groundwater cleanup standards are achieved.

Groundwater Treatment for 2a: Alternative 2a is identical to Alternative 2 with the addition of a one-time application of ISCO through injection to address groundwater contamination following source treatment. Chemical oxidation was selected due to its ability to rapidly degrade high concentrations of dissolved-phased COCs likely to remain present following ISS.

Institutional Controls for Soil, Groundwater, and Indoor Air: Following ISS of source material within the Chicago Street Zone and installation of horizontal engineered barriers throughout the Site, potential risks resulting from exposure to remaining soil, groundwater, and vapor intrusion will be managed through ICs. The boundary for institutional controls will be based on delineation of MGP-COCs on affected parcels to residential RGs.

WDNR's GIS Registry will be used to implement ICs; however, alternate continuing obligation (CO) mechanisms, including deed restrictions, may be considered as part of the remedial design. 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)]. WPSC owns the WPSC Property and Winter Property, and has authority to implement and enforce ICs on these properties.

State 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.

Approximately 1.48 acres will be subject to restrictions using the WDNR GIS Registry. The properties subject to restriction are owned by a variety of entities, as summarized in Table 6, below.

Table 6. Properties Requiring Institutional Controls

Property Name	Current Land Use	Current Zoning	Approximate Area Subject to ICs
City of Manitowoc	Right-of-way and Roadway	Heavy Industrial	0.50 Acres
WPSC Property	Storage	General Business	0.52 Acres
Winter Property	Business (until December 2018)	Heavy Industrial	0.30 Acres
306 N. 10th St. Property	Parking Lot	Heavy Industrial	0.16 Acres

Specific restrictions that will likely be included on the Wisconsin GIS Registry for these properties will include the following:

Soil - Any subsurface activity must be conducted in accordance with a Soil Management Plan to ensure proper management of subsurface soil disturbed through future site development, utility repairs, and other intrusive activities.

Indoor Air through Vapor Intrusion - Vapor intrusion risks must be reassessed should any of the following conditions be satisfied: modification of land use; construction of a new building; modification to existing buildings that may negatively affect the vapor intrusion pathway. In additional annual indoor air sampling at the Winter Building will continue until it is vacated (December 2018) to confirm that indoor air quality continues to be below applicable screening levels.

Groundwater – Construction of potable water wells and consumption of groundwater will be prohibited until the groundwater is restored to drinking water standards.

An Institutional Control Implementation Plan will be developed to detail land-use restrictions and will document procedures for effectively implementing the institutional control.

Alternatives 3– ISS in Chicago Street and Winter Zones, Barriers, ICs
Estimated Capital Cost: $5,900,000
Estimated Annual Operation and Maintenance (O&M) Cost: $900,000
Estimated Periodic Cost: $75,000
Estimated Total Present Worth: $6,900,000
Estimated Remedial Action Construction Timeframe: 4-7 months

Summary:
ISS of Chicago Street Zone and Winter Zone; maintenance of existing direct contact barriers and installation of new direct contact barriers, as required, over affected surficial soil in all zones above residential screening levels; continued operation of groundwater pump and treat system for a defined period after ISS, monitoring of groundwater contaminant concentrations to evaluate the effectiveness of soil cleanup, and institutional controls to manage remaining potential risks associated with soil, groundwater, and vapor intrusion. A final groundwater remedy will be selected at a later date.

Alternative 3a is identical to Alternative 3 with the addition of a one-time application of in-situ chemical oxidation to promote cleanup of remaining groundwater contamination following soil source treatment. Alternatives 3 and 3a will include many of the same concepts as Alternative 2, above. The elements unique to and/or significantly different in Alternatives 3 and 3a are described in detail below.

Alternative 3a– ISS in Chicago Street and Winter Zones, Barriers, ISCO, ICs
Estimated Capital Cost: $6,200,000
Estimated Annual Operation and Maintenance (O&M) Cost: $900,000
Estimated Periodic Cost: $75,000
Estimated Total Present Worth: $7,200,000
Estimated Remedial Action Construction Timeframe: 4-7 months

Soil Summary
ISS of Winter Zone: The Winter Building parcel was sold to WPSC in December 2015. A stipulation in the property sale was that Mr. Winter would continue business operations in the building until approximately 2017, which was extended until December 2018.

After Mr. Winter's occupancy of the building ends, WPSC will implement remedial action. The building on the Winter Building area is centered on the former 300,000 cubic foot gas holder, which appears to be intact beneath ground surface. During RI activities, drill refusal likely indicating Gas Holder Bottom was identified at approximately 6 to 8 feet bgs. Soil borings contain some indication of source material in the form of residual NAPL in the bottom 1.5-foot interval of the holder. In addition, suspected crystalline naphthalene was identified in the 12-14 ft bgs interval of SB122, located immediately outside the western edge of the holder.
As part of Alternatives 3 and 3a, source material and soil with COCs above industrial RGs will be treated using ISS. For the $1x10^{-6}$ RG scenario, ISS is anticipated over a 14,500-square foot area to an estimated average depth of 45 feet below grade resulting in an estimated volume of 24,000 cubic yards.

It is not effective or practical to implement ISS in areas with significant obstructions or debris. The Winter Building and adjacent WPSC storage building would be demolished and the parcels would be pre-excavated to remove any building footings and other debris prior to remedial action implementation. In addition, the gas holder foundation itself would be demolished and removed from the Site. If source material is discovered on the gas holder bottom during pre-excavation activities, the source material will be removed from the Site for off-site landfill disposal.

Additional material may be removed from Site and disposed of off-site for the purpose of managing swell and to allow for placement of an estimated five feet of clean backfill to support future redevelopment.

Remaining areas with surficial soils above residential screening levels will receive horizontal engineered barriers to mitigate risk.

Groundwater Summary

Enhanced Groundwater Treatment: Alternative 3a is identical to Alternative 3 with the addition of a one-time application of ISCO through injection to promote cleanup of remaining groundwater contamination, prior to selection of a final groundwater remedy, and is described in Alternative 2a.

Alternative 4 –Multi-Zone In-Situ Thermal Treatment, Barriers, ICs
Estimated Capital Cost: $12,800,000
Estimated Annual Operation and Maintenance (O&M) Cost: $900,000
Estimated Periodic Cost: $76,000
Estimated Total Present Worth: $13,800,000
Estimated Remedial Action Construction Timeframe: 6-12 months

Summary:

In-situ thermal treatment of WPSC Zone Source Area, Chicago Street Zone, and Winter Zone;

maintenance of existing direct contact barriers and installation of new direct contact barriers, as required, over affected surficial soil in all zones; continued operation of groundwater pump and treat system for a defined period after treatment; monitoring groundwater; and ICs to manage remaining potential risks associated with soil, groundwater, and vapor intrusion.

Alternative 4 will include many of the same concepts presented in Alternatives 2 and 3. Only components unique to and/or significantly different in implementation are described below.

Treatment Summary

In-situ Thermal Treatment of WPSC Source, Chicago Street, and Winter Zone: In-situ thermal treatment involves increasing the temperature of the subsurface to enhance source material recovery, thermally destroy source material, or thermally solidify source material in-situ. Based on the high permeability of the soil, depth of contamination, and potential issues with subsidence/settling of soil beneath the WPSC building, adjacent Chicago Street, and other adjacent surface improvements, target temperature will be limited to 100 degrees Celsius. The proposed approach has been used at similar MGP sites and is often referred to as In-Situ Thermochemical Solidification. This approach would remove volatile and mobile components of the source area, and thereby reduce mobility and prevent further contaminant migration. The increased subsurface temperature would convert the more recalcitrant COCs to a solidified mass within the soil pore spaces, in a material similar to asphalt. This material would remain in place but is expected to be immobile and not leach appreciable amounts of COCs into groundwater.

Consideration must be given to increased subsurface temperatures on the subsurface infrastructure. Increasing the subsurface temperature to 100 degrees Celsius will often exceed the working temperature for common subsurface utility materials and utilities may need to be relocated as part of the project.
In addition, a suitable method to install wells inside the WPSC building will be identified during the RD. The ceiling clearance in the basement level of this building precluded use of a standard direct push drill rig as part of the RI investigation.

The potential inability to install thermal wells in preferred location in these the WPSC Zone represents an implementability challenge that could negatively affect the effectiveness of treatment. WPSC would implement remedial action in the Winter Zone by starting with pre-excavation of the gas holder.

It is estimated to take approximately 90 days of heating to achieve target temperature and approximately 90 additional days to meet the remedial objectives.

Success of remedial action will be determined through collection of soil samples within the treatment zone for comparison against industrial RGs for volatile constituents. Concentration of PAHs and the corresponding visual observation with sample will be recorded. After thermal treatment, equipment and subsurface wells and monitoring points would be abandoned.

Alternative 5–Excavation and Disposal, Barriers, ISCO of Source Materials, and ICs
Estimated Capital Cost: $13,900,000
Estimated Annual Operation and Maintenance (O&M) Cost: $900,000
Estimated Periodic Cost: $73,000
Estimated Total Present Worth: $14,900,000
Estimated Remedial Action Construction Timeframe: 4-6 months

Summary:

Excavation and offsite disposal of source material in Chicago Street Zone and source material and soil in Winter Zone; ISCO of source material in the WPSC Zone Source Area (both soil and groundwater); maintenance of existing direct contact barriers and installation of new direct contact barriers, as required, over affected surficial soil in all zones; continued operation of groundwater pump and treat system for a defined period after excavation; a one-time application of ISCO to address remaining groundwater impacts following source removal. Monitoring groundwater, and institutional controls to manage remaining potential risks associated with soil, groundwater, and vapor intrusion.

Treatment Summary

In-situ Chemical Oxidation of the WPSC Source Area: Alternative 5 involves introduction of chemical oxidants. For Alternative 5, ISCO is applied to degrade source material COCs in both soil and groundwater to inert or less toxic compounds. ISCO to address affected soil can be achieved through chemical injection at this Site; however, injection would be complicated and limited by the existence of physical obstructions in the subsurface. Note, chemical oxidation is an aqueous reaction and most effective on dissolved phase constituents; it is relatively ineffective on phase separated material or dense NAPL (DNAPL).

Chemical oxidants must come into and remain in contact with dissolved phase mass for the technology to be most effective in substantially reducing or degrading contaminant mass.

Injection activities would occur continuously for approximately six months to reduce source material and COCs to meet the RAOs. Confirmation samples will be collected throughout the horizontal and vertical extent of the treatment zone to verify the success of the chemical oxidation activities. The goal of ISCO of WPSC Zone is to oxidize source material such that it is no longer mobile.

Enhanced Groundwater Treatment

This Alternative also includes a one-time application of ISCO through injection to promote cleanup of remaining groundwater contamination.

Off-site Disposal of Soils

Excavation and Off-Site Disposal of Soils in Chicago Street and Winter Zones: Alternative 5 will involve excavation and off-site disposal of source material and soil containing COCs above RGs in the Chicago Street Zone and Winter Zone. Excavation below the water table is required and temporary shoring and dewatering will likely be necessary to support the proposed excavation activities. Constructability issues related to limited surface area of soil requiring excavation, proximity of the buildings, granular soil, and depth of excavations extending to 41 feet bgs will severely complicate excavation within the Chicago Street Zone.

Similar constructability issues are present in the Winter Zone, where excavation up to 44 feet bgs may be required to meet RGs. As a result, it is assumed that shallow excavation will be accomplished from the ground surface using an excavator.

Once the depth of excavation has exceeded the reach of the excavator, a crane equipped with a clamshell bucket would be used to continue excavation activities to the target depth. It is estimated that planning, site preparation, and excavation and backfilling activities using this approach will take approximately six months.

The success of remedial action will be determined by post-excavation samples, surveying the horizontal and vertical extent of the excavation, and comparing the extent of excavation against the soil cleanup goals.

2.11 Comparative Analysis of Alternatives

EPA uses nine criteria to evaluate remedial alternatives for the cleanup of a site. These nine criteria are categorized into three groups: threshold, balancing, and modifying. The threshold criteria must be met for an alternative to be eligible for selection. The threshold criteria are overall protection of human health and the environment and compliance with ARARs.

- Overall Protection of Human Health and the Environment - This criterion describes how the alternative as a whole achieves and maintains protection of human health and the environment.
- Compliance with ARARs - This criterion assesses how the alternative complies with ARARs unless a waiver is provided, in which case this criterion describes why the waiver is justified.

The balancing criteria are used to weigh major tradeoffs among alternatives. The five balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; short-term effectiveness; implementability; and cost.

- Long-Term Effectiveness and Permanence - This criterion evaluates the long-term effectiveness of alternatives in maintaining protection of human health and the environment after RAOs have been achieved.
- Reduction of Toxicity, Mobility, and Volume through Treatment - This criterion evaluates the anticipated performance of the specific treatment technologies an alternative may employ.
- Short-Term Effectiveness - This criterion assesses the effectiveness of the alternative in protecting human health and the environment during the construction and implementation of a remedy until RAOs have been met. This criterion also evaluates the time required to implement and achieve the RAOs.
- Implementability - This criterion assesses the technical and administrative feasibility of the alternative as well as the availability of goods and services required to implement the remedy.
- Cost - This criterion assesses the capital and O&M costs of each alternative. In addition, the present worth of annualized costs associated with each alternative is calculated using a discount rate of 7 percent before taxes and after inflation. Costs are compared on a present-worth basis.
  The level of detail in these cost estimates is appropriate for evaluating among alternatives, but the estimates are not intended for use in budgetary planning.

The modifying criteria are state acceptance and community acceptance.

- State Acceptance – This criterion reflects comments from all Wisconsin agencies with an interest in the Site.
- Community Acceptance - This criterion reflects the community's apparent preferences and/or concerns regarding the alternatives.

The following is a comparative analysis of the remedial alternatives other than the No Further Action Alternative.

Overall Protectiveness of Human Health and the Environment

Alternative 1 does not meet the requirement for overall protection of human health and the environment. Potential risks to human health will remain due to the presence of source material and MGP-affected media. As a result, Alternative 1 will not achieve RAOs. Further, this alternative will not implement ICs, monitoring programs, or contingencies to ensure that human health and the environment will be protected.

All other alternatives will provide overall protection of human health and the environment by eliminating, reducing, or controlling risk through treatment, engineering controls, and/or ICs. Alternatives 2 and 2a will provide a moderate to high degree of protection. Alternatives 3 and 3a will provide a high degree of protection. Alternatives 4 and 5 will provide a moderate degree of protection.

Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as ARARs, unless ARARs are waived under CERCLA section 121(d)(4). Compliance with ARARs addresses whether a remedy will meet all of the ARARs or provides a basis for invoking a waiver.

The NCP defines applicable requirements as:

> "…those clean-up 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. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable."

The NCP defines relevant and appropriate requirements as:

> "...those clean-up 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 sufficiently similar to those encountered 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 relevant and appropriate."

In addition to ARARs, EPA may identify other relevant information, criteria, or guidance to be considered (TBC). TBCs may not be legally binding or enforceable but may be useful for consideration when developing remedial alternatives. Both ARARs and TBCs may be chemical-specific, location-specific, or action-specific. Appendix B summarizes preliminary federal and state ARARs and TBCs. ARARs and TBCs may be modified until a Record of Decision (ROD) is issued and may be reexamined during the five-year review process.
Alternative 1 would not meet ARARs related to soil, soil gas, and groundwater standards. Alternatives 2, 2a, 3, 3a, 4, and 5 will comply with chemical-specific, location-specific, and action-specific ARARs.

Long-Term Effectiveness and Permanence

Alternative 1 may not provide effective protection of human health and the environment over time. The COCs in soil and groundwater will not naturally attenuate, there will be no monitoring provided to determine if protective levels are reached, and no ICs are implemented to provide protection.

Alternatives 2 and 2a will provide a moderate to high degree of long-term effectiveness and permanent control of potential human health risks from exposure to source material and soil with COCs above RGs through ISS of some source material; installation and/or maintenance of horizontal direct-contact barriers; restriction of land use and intrusive activities; and, for 2a exclusively, a one-time injection of oxidizing compounds to address COCs in groundwater.

Alternatives 3 and 3a will provide a high degree of long-term effectiveness and permanent control of potential human health risks from exposure to soil source material with COCs above RGs through ISS of source material; installation and/or maintenance of horizontal direct-contact barriers; restriction of land use and intrusive activities. Alternative 3a is an interim groundwater measure and will reduce the high concentrations of groundwater source material. A final groundwater remedy will be needed to achieve final groundwater remedial action objectives.

Alternative 4 will provide a moderate degree of long-term effectiveness and permanence through thermal treatment to extract or thermally destruct volatile contaminants and thermally solidify non-volatile contaminants. Thermal treatment is not effective at removal or destruction of non-volatile constituents, such as the high-molecular weight PAHs present at the site.

Alternative 5 will provide a high degree of long-term effectiveness and permanence through the removal of accessible source material and disposal at an off-site facility.

The deep depths of excavation, granular nature of soil, and constraints of adjacent buildings have the potential to limit the removal of additional material if discovered during the remedial action.

Reduction of Toxicity, Mobility, and Volume

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternative 1 does not include treatment. Source material, soil, and groundwater will naturally attenuate, but attenuation alone is unlikely to reduce concentrations below RGs in a reasonable timeframe. In addition, risk from exposures to hazardous materials is not reduced, as Alternative 1 does not involve any engineering or administrative controls. As a result, this alternative will not achieve any of the RAOs.

Alternatives 2 and 2a will provide a moderate degree of reduction through in-situ treatment at the Chicago Street Zone, which is the area of the Site with the highest potential mobility and toxicity. Both alternatives will also rely on engineering and administrative controls to manage remaining lower-threat risks. Alternatives 2 and 2a rely more-heavily on engineering and administrative controls to mitigate risks compared to Alternatives 3, 3a, and 4. Alternatives 3, 3a, and 4 provide a high degree of reduction through treatment. Alternative 5 provides no treatment to reduce contaminant toxicity, mobility and volume, just relocates contamination elsewhere.

Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and achieve RAOs; and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.

Alternative 1 would have no effect during remedy implementation. Alternatives 2, 2a, 3, and 3a provide a high degree of short-term effectiveness because it is estimated to take six months to perform ISS activities and to obtain and implement necessary ICs. Closure of Chicago Street and the northern portion of North 11th Street is likely for six months to allow for utility relocation, completion of ISS treatment, and restoration activities. This represents a significant short-term impact to nearby businesses. Alternatives 4 and 5 share a similar impact to those streets for similar duration.

Alternative 4 provides a moderate degree of short-term effectiveness, because in addition to the three to six months for utility relocation and pre-excavation work, there will be an advancement of 200 borings for heating elements and vapor/liquid phase extraction points and then at least six months of operation of the heating and extraction system.

Alternative 5 provides a low degree of short-term effectiveness because it requires deep soil excavation, which will create potential for direct contact exposure, fugitive volatile emissions, and nuisance odors.

Transporting affected soil to a landfill creates a short-term impact to the community due to increased truck traffic, noise, and potential for increased accidents. Installation of shoring will be necessary to excavate to necessary depths.

Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Alternative 1 would be implementable, though it does not address the Site risks.

Alternatives 2, 2a, 3, and 3a are easily implementable with the degree of implementability decreasing from 2 to 2a to 3 to 3a due to larger areas to be addressed and groundwater components being added.

Alternatives 4 and 5 have low degrees of implementability in comparison to the other Alternatives. Alternative 4 involves installation of over 200 soil borings to install heater wells, extraction wells, and for various monitoring points. Some of these points would have to be installed at an angle or horizontally to allow for treatment beneath the WPSC Main Building. Also, this work would involve pre-excavation down to 10 feet below grade and all subsurface utilities would have to be relocated so as not be damaged by the heat. Alternative 5 would require the deepest excavations below the water table, which is challenging to implement. Also, chemical oxidation to address source material beneath the WPSC Building add to the challenge.

Cost

The estimated total costs for each alternative are FS-level cost estimates that have an expected accuracy of +50% to -30%. A 7% discount factor was used to calculate present worth costs. This is done to help compare annual O&M and five-year review costs as a single amount of money that, if invested in the base year and disbursed as needed, would be sufficient to cover all costs associated with the remedial action over its planned life. This is consistent with EPA guidance for cost estimates. Costs for the alternatives range from zero to $14,900,000 as listed in Table 7, below.

Alternative 1 is expected to cost $50,000 for performing the Five-Year Review. Alternative 2 is estimated to cost $3.3M and Alternative 2a is estimated to cost $3.6M. Alternative 3 is estimated to cost $6.9M and Alternative 3a is estimated to cost $7.2M. Alternative 4 is estimated to cost $13.8M. Alterative 5 is estimated to cost $14.9M.

Table 7: Cost and Timeframes of Alternatives

	Alt. 1	Alt. 2	Alt. 2a	Alt. 3	Alt. 3a	Alt. 4	Alt. 5
Capital Costs	$0	$2.3M	$2.6M	$5.9M	$6.2M	$12.8M	$13.9M
Annual O&M Costs/ LT Costs	$50K	$988K	$988K	$975K	$975K	$976K	$973K
Total Present Worth Costs	$50K	$3.3M	$3.6M	$6.9M	$7.2M	$13.8M	$14.9M
Construction/ Implementation/Meet RAOs	None	6 mos.	6 mos.	6+mos.	6+mos.	12 mos.	12 mos.

*Alt.=Alternative *O&M=Operation and Maintenance *LT=Long-term (30-year analysis period)
*M=Million *K=Thousand *Mos.=Months

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

State Acceptance

Wisconsin DNR has indicated concurrence with the selection of Alternative 3a. The state concurrence letter will be added to the AR upon receipt.

Community Acceptance

The community provided comments during the public comment period, which ran from July 23 through August 22, 2018. Some commenters indicated support for the selected remedy, one commenter suggested no remedial action was needed, while others highlighted the importance of coordinating with nearby property owners to perform the remedial action due to presence of utility corridors and street closures (see *Responsiveness Summary*).

2.12 Principal Threat Wastes

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP §300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. Source materials are those that include or contain hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water or air, or act as a source for direct exposure.

The principal threat waste at the WPSC Manitowoc MGP Site is NAPL because the toxicity of the material poses a risk if exposure should occur and serves as a source to soil and groundwater contamination, as defined in *A Guide to Principal Threat and Low-Level Threat Wastes*, Office of Solid Waste and Emergency Response 9380.3-06FS, November 1991. The selected remedy treats the principal threat waste, including NAPL in soil and groundwater using ISS, and treats NAPL and highly contaminated groundwater with ISCO.

2.13 Selected Remedy

Based on consideration of the requirements of CERCLA, the detailed analysis of the remedial alternatives, and public comments, EPA has selected **Alternative 3a**.

The following subsections provide EPA's rationale for the Selected Remedy and a description of its anticipated scope, how the remedy will be implemented, and its expected outcomes.

Summary of Rationale for the Selected Remedy

The Selected Remedy is protective of human health and the environment, complies with ARARs, and provides the best balance of tradeoffs among the balancing criteria.

It reduces risks within a reasonable time frame and provides for long-term reliability of the soil remedy. It will achieve substantial risk reduction by implementing ISS in both areas with the most contaminated soils and through installation of new and maintenance of existing horizontal engineered barriers on top of soil that exceeds residential cleanup standards.

Risk to groundwater is addressed with the interim remedy of in-situ groundwater source treatment and institutional controls. A final groundwater remedy to achieve final groundwater remedial action objectives will be selected in the future.

Although the Selected Remedy presents greater costs than Alternatives 2, 2a and 3, Alternative 3a achieves higher post-construction risk reduction for human receptors and will achieve RAOs in the shortest amount of time. The Selected Remedy ensures that the preference for treatment is achieved for the source area.

Expected Outcomes of Selected Remedy

The intent of the Selected Remedy is to be protective of human health and the environment by reducing risks from the following: direct contact with, and ingestion of, soil and groundwater. The Selected Remedy will actively address contaminated source soil and groundwater within the Site, thereby reducing the risk of exposure to contaminant concentrations in those media, which will significantly reduce human health risks at the Site.

2.14 Statutory Determinations

Under CERCLA §121 and the NCP §300.430(f)(5)(ii), the EPA must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

Protection of Human Health and the Environment

Alternative 3a will protect human health and the environment by implementing ISS to stabilize and sequester COCs in soil in both major source zones (Chicago Street and Winter Zones); the maintenance of existing and installation of new (as required), direct contact barriers such as pavement, over impacted surficial soil in all zones; institutional and engineering controls to prevent exposure to contaminated soil and groundwater; and a one-time injection of in-situ oxidizers to the groundwater downgradient of the solidified soils to achieve a reduction of COCs.

Compliance with ARARs

The selected remedy will comply with all chemical-, location-, and action-specific ARARs.

Long-Term Effectiveness and Permanence

Alternative 3a will provide long-term effectiveness and permanent control of potential human health risk from exposure to soil source material with COCs above RGs by treating source material in the Chicago Street and the Winter Zones using ISS, maintaining existing and installing new horizontal direct contract barriers throughout the Site, restricting land use to industrial, and restricting intrusive activities.

It is expected that ISS, enhanced with a one-time injection of oxidizing compounds to the groundwater, as an interim groundwater measure, will reduce the flux of remaining contaminants into the dissolved phase and foster groundwater cleanup to achieve reduction in COCs.

Near-term risks resulting from affected groundwater will be managed through ICs and the effectiveness of the ICs will be documented through regular monitoring of groundwater quality with downgradient wells. The conditions of the WDNR GIS Registry are maintained for a property, regardless of future changes in ownership. A final groundwater remedy will be selected at a later date.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Preferred Alternative 3a will involve ISS treatment of an estimated 2,200 cubic yards of source material from the Chicago Street Zone, thereby significantly reducing the mobility of the most toxic soil source contamination at the Site through treatment.
In addition, source material in the Chicago Street Zone is collocated with the well with the highest historic concentrations of benzene and naphthalene (MW14). Treatment of source material will remove the primary source contributing to the dissolved-phase groundwater plume, thereby reducing contaminant mobility. Up to an additional 24,000 cubic yards of ISS treatment will irreversibly reduce the potential for future exposure to subsurface MGP-residuals in the Winter Zone. One-time application of in-situ chemical oxidizers will foster groundwater cleanup and a reduction in COCs.

The Superfund law indicates preference for treatment as a principal element of a CERCLA cleanup action. The EPA generally views source material as a principal threat waste. Accessible source material that is the primary contributor to the dissolved-phase groundwater plume will be treated through ISS and through a one-time ISCO treatment, until a final groundwater remedy is selected.

Risks in soil and groundwater will also be mitigated through administrative and engineering controls, until a final groundwater remedy is selected. Therefore, Alternative 3a will satisfy the statutory preference for treatment as a principal element of the preferred cleanup plan.

Short-Term Effectiveness

As described above, Alternative 3a will result in manageable short-term impacts to the community during implementation.

Implementability

As described above, Alternative 3a is technically and administratively implementable.

Cost-Effectiveness

The present worth cost of the Preferred Alternative 3 is $7,200,000.

The selected interim action is cost-effective because it represents a reasonable value for the money to be spent. The NCP requires that "a remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (See the NCP at 40 CFR §300.430(f)(1)(ii)(D)).

In evaluating this requirement, EPA evaluated the overall effectiveness of the alternative that satisfied the threshold criteria (i.e. was both protective of human health and the environment and ARAR-compliant) by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, or volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost effectiveness. The relationship of the overall effectiveness of the Selected Remedy was determined to be proportional to its cost and hence the remedy represents a reasonable value for the money to be spent.

Preference for Treatment as a Principal Element

By treating the contaminated soil and groundwater using in-situ stabilization and injection of oxidizing chemicals into groundwater, Alternative 3a satisfies the statutory preference for remedies that employ treatment as a principal element. See Figure 6 on the next page to see areas to be remediated.

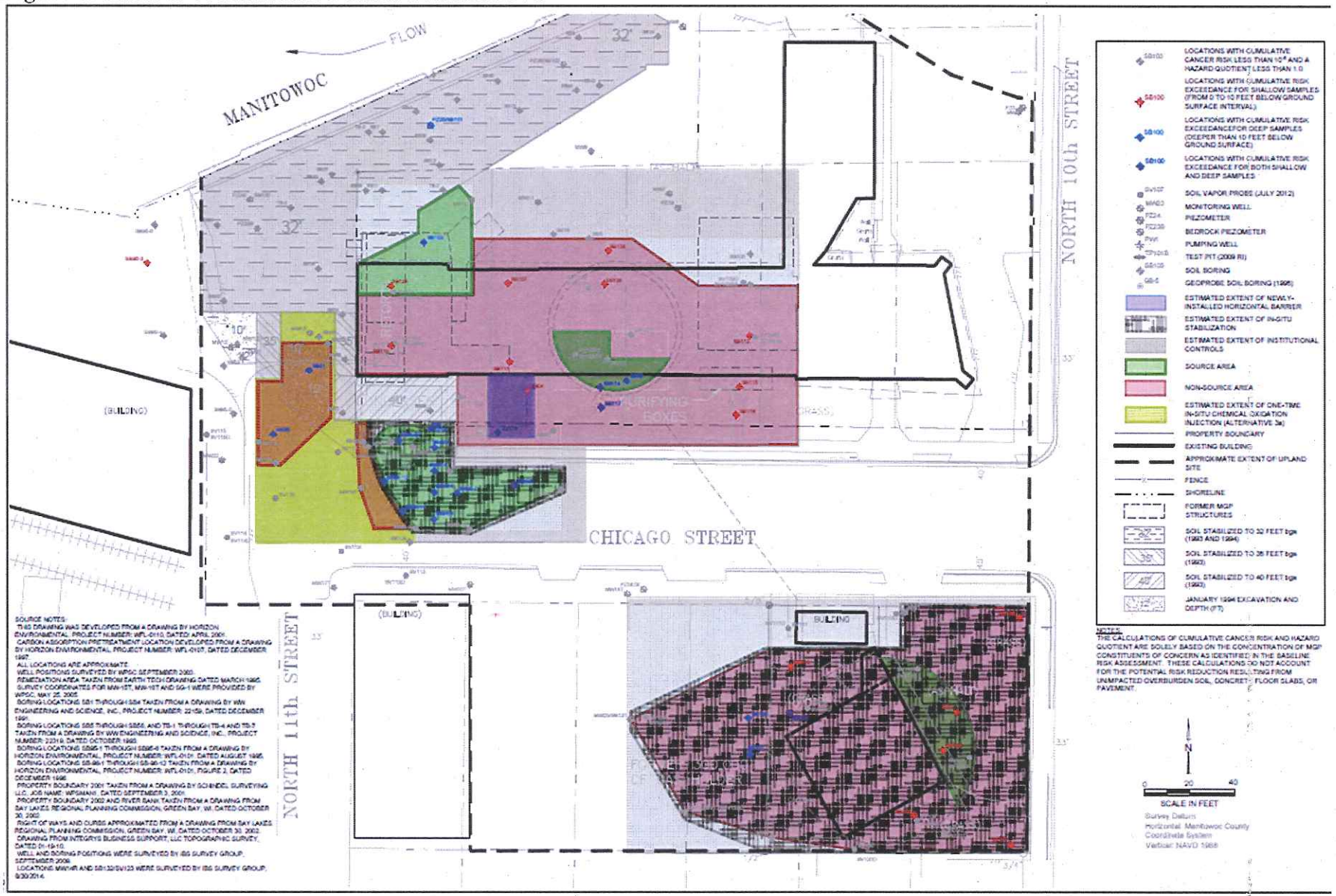
Documentation of Significant Changes

The Proposed Plan for the source area for the WPSC Manitowoc MGP Site was released for public comment on July23, 2018 and ran through August 22, 2018. The Proposed Plan identified Alternative 3a as the preferred alternative for the Site. During the public comment period, comments were submitted by Wisconsin DNR that stated that the source soil control component of the remedy should be cleaned up to residential standards within areas of general business zoning, since those areas may be used for residential and industrial/commercial uses. The significant change to Alternative 3a will be that the grassy areas surrounding the WPSC property, an area zoned for general business, with soil above residential screening levels, will require additional horizontal engineered barriers to prevent exposure risk. The areas to receive additional horizontal engineered barriers is anticipated to be less than 0.5 acres in area, and should not exceed the estimated cost of the selected remedy by the plus 50% or minus 30% contingencies. If the costs are outside of the estimated range, EPA will properly document that decision in accordance with Agency guidance through an Explanation of Significant Differences.

Five-Year Review Requirements

CERCLA §121(c) and the NCP §300.430(f)(5)(iii)(C) provide the statutory and legal bases for conducting five-year reviews. Because this remedy will result in hazardous substances, pollutants, or contaminants in groundwater and soil to remain on-site above levels that allow for unrestricted use and unrestricted exposure, periodic reviews of the remedy will be conducted within five years after initiation of the remedial action, and each five years subsequent, to ensure that the remedy is, or will be, protective of human health and the environment.

Figure 6. Areas to be Remediated Under Alternative 3a



Part III. Responsiveness Summary

In accordance with CERCLA Section 117, 42 U.S.C. Section 9617, EPA released the Proposed Plan and Administrative Record for public comment on July 23, 2018 and the public comment period ran through August 22, 2018 to allow interested parties to comment on the Proposed Plan.

EPA is not required to reprint the comments of the commenter verbatim and may paraphrase where appropriate. In this responsiveness summary, EPA has included large segments of the original comments. However, persons wishing to see the full text of the comment should refer to the commenter's submittal to EPA, which has been included in the Administrative Record. The comments EPA received are shown below in normal text and EPA's response is shown in italics.

3.1 Stakeholder Comments and Lead Agency Responses

EPA received several written public comments on the Proposed Plan. Summarized comments are found below.

Comments from Residents

1. Comments in Support for the Remedy.

EPA received comments from four community members in support of Alternative 3a.

However, two of the community members expressed concern for damage and disturbance to area businesses and residences and propose "generous compensation".

> EPA Response: *EPA acknowledges your support for this remedy. With regards to area disturbance, the remedy will be implemented in a very specific area of Manitowoc located between 10th Street and 11th Street and between the Manitowoc River and the property on the south-east side of Chicago Street and 10th Street. EPA will work with the City, WPSC, and local property owners to minimize impact of street closures, estimated to last up to six months, while the remedy is implemented. Under CERCLA (the Superfund Law), EPA does not have federal funds to provide compensation for businesses or residences as a result of remedial work. Nor can EPA require the PRP to provide compensation. However, CERCLA does not prevent an injured landowner from seeking compensation under other laws that may be available for damage to their properties.*

2. Comments in Support of Another Remedy.

EPA received one comment in support of Alternative 1. The community member states, "I think enough has been done. I fully support Alternative #1."

EPA Response: *Thank you for your comment. Alternative 1 is presented as a baseline for which all other alternatives are compared. Alternative 1 does not achieve the remedial action objectives and is not protective of human health and the environment; therefore, it cannot be selected as the final source control remedy for this site.*

Comments from Wisconsin DNR

EPA received several comments from Wisconsin DNR. Below are the paraphrased comments and EPA's responses.

3. Site Risks Regarding Previously Stabilized Area Adjacent to the Bulkhead Wall
The basis for remediation of OU1 source areas are human health risks and the basis for remediation of OU2 sediments will include ecological risks. Based on existing data, the area previously stabilized through in-situ solidification adjacent to the sheet pile retaining wall may contain pockets of untreated MGP-residuals, including NAPL. Piezometer (PZ-25) was installed in one of these pockets.

This plan does not address the ecological risks to the Manitowoc River from potential seepage of unsolidified MGP residuals through gaps/overlaps in the sheet pile wall or from future damage to the wall, which may result in the release of the MGP residuals. As previously commented by DNR, the FS for sediment cleanup of this site should include the provision for additional cleanup of upland soil adjacent to the bulkhead and shore that are discovered during the sediment portion of cleanup, as necessary, to address the unacceptable risks to human health and ecological receptors. The general integrity of the wall should also be evaluated during the sediment portion of the cleanup. It is unclear when the wall was inspected last and what its current condition is.

The City has been purchasing property along the Manitowoc River with intent to offer public access. The City of Manitowoc should be consulted regarding future property use. Risks should be minimized if future construction is to occur on North 11th Street and property adjacent to the Manitowoc River turning basin.

EPA Response: *The basis for this decision is human health risks. It is anticipated that ecological risks will drive sediment remediation because depth to river bottom is more than 10 feet deep next to the upland portion of the Site, and it is not anticipated that people can wade at that depth.*

EPA is aware that there are MGP residuals in PZ-25, within previously solidified area next to the bulkhead wall. EPA has communicated to WPSC that this area may need to be addressed as part of OU2 sediments. Included in OU2 will be the assessment of integrity of the wall and potential risks if the wall were to fail.

The anticipated future land use of the WPSC-owned property is commercial/industrial. The selected interim remedy assumes continued commercial/industrial use at these two properties, and there is an associated institutional control. As the site owner, WPSC will largely determine the future land uses, unless they choose to sell the property.

The bulk of the area that will receive ISS is owned by WPSC. WPSC owns their Main Building as well as the Winter Property. ISS will also be conducted in the streets and rights-of-way. The EPA will work with the City of Manitowoc to determine their perspective on future land use. Land adjacent to the WPSC-owned properties can be redeveloped by the City.

4. Requirements for Horizontal Engineered Surface Barriers for Direct Contact
Wisconsin Administrative Code Chapter (WAC Ch.) NR 720 direct contact soil residual contaminant levels (RCLs) apply to soils from 0-4 feet bgs. For areas not covered by concrete, soil excavation to 2 feet bgs and replacement with clean fill will not eliminate the need for remediation or a performance standard for case closure under WAC Ch.NR 726.
Unless it can be demonstrated that the soil from 2-4 feet bgs is below soil RCLs for the specified land use, and the soil to groundwater pathway for areas exceeding the DNR's groundwater protection RCLs has been addressed.

EPA Response: *EPA understands the requirements of NR 720 and NR 726. The selected remedy was altered to include additional horizontal engineered barriers at the WPSC property and other areas zoned for general business that may have future residential uses and have soil contamination above residential risk range. This additional work, along with proper institutional controls, should result in compliance with the soil requirements of NR 720 and NR 726. The groundwater components of NR 726 will be reviewed and addressed during the final groundwater record of decision, along with EPA's Safe Drinking Water Act requiring groundwater contaminants to be cleaned up to maximum contaminant levels (MCLs) and State Safe Drinking Water Standards.*

5. Requirements for Cleanup to Industrial Standards for Case Closure under WAC Ch. NR 726.
Under WAC Ch. NR 726, cleanup to industrial standards is not appropriate for the WPSC property, which is zoned for general business use. Cleanup to industrial standards may be appropriate for the Winter and Chicago Street Zones if land use is defined as industrial per WAC § NR 700.03.

Whether a remedial goal will meet the NR 720 industrial or non-industrial soil RCLs depends on land use, and may necessitate maintenance or an existing, or the construction of a new, protective horizontal barrier, as well as application of institutional controls in the form of continuing obligations (COs). Once appropriate land use cleanup standards are established and achieved, and remediation actions completed, COs will be implemented as needed.

EPA Response: *It is EPA's understanding that General Business zoning can have residential and commercial/industrial uses; therefore, horizontal engineered barriers will be needed to cover areas exceeding residential screening levels that are not addressed through ISS (in general business areas only).*

EPA has selected Alternative 3a as the source control remedy because it includes the use of ISS, horizontal engineered barriers, and ICs for soil. The remedial design will further delineate the areas that the remedial actions will be applied to. ICs will be put in place to restrict use to intended use only, based on zoning, and to be protective of human health and the environment.

Comments from WPSC

6. Inconsistencies between Proposed Plan and Approved FS
EPA received the following consistency comments from WPSC:

- WPSC will NOT demolish the WPSC Service Building for any of the alternatives.

WPSC will demolish the WPSC storage building and Winter building located on the southside of Chicago Street. WPSC may demolish these two buildings prior to implementing source-control remedial action. If they do so, they will do so in a way that prevents migration of contaminants.

- Excavations will not be backfilled to grade after subsurface structure demolition. In areas where ISS is to be performed, backfill will not occur until after ISS is complete.
- For Alternatives 2a and 3a as presented in EPA's July 23, 2018 Proposed Plan, it was stated that WPSC will perform a one-time placement of oxidizing materials at the interface of soil and groundwater following excavation activities.
  The alternatives as presented in the FS Rev. 3 and in Alternative 3a as presented in this ROD, WPSC will perform a one-time injection of oxidizing materials (ISCO) to treat groundwater.
- The proposed plan introduction does not describe the ISS component of the remedy as presented in the FS.
- The RAOs stated in the proposed plan are inconsistent with those presented in the approved FS.

EPA Response: *EPA acknowledges the first four points and has corrected the ROD text to match the FS Rev. 3.*

The Administrative Record does not substantiate that the groundwater RAOs presented in the FS Rev. 3 could be achieved with the proposed remedial actions; thus, the RAOs were adjusted. The selected groundwater remedy is an interim, not a final remedial action for groundwater. It will be measured against the RAOs in the proposed plan and ROD. A final groundwater remedial action is anticipated for future proposal and selection to achieve the groundwater RAOs presented in the FS Rev. 3. At that time, the AR will need to substantiate that the final groundwater remedy selected can achieve the groundwater RAO in the FS. Rev. 3 within a reasonable timeframe.

Comments from the City of Manitowoc

7. Communication with the City.
The City of Manitowoc requests that EPA keep them notified of the project since this area is slated for potential redevelopment.

EPA Response: *EPA will work closely with the City of Manitowoc throughout the cleanup process. Particularly, EPA will need City input during the design and implementation of this remedy. In addition, EPA will keep the City informed of the progress for the selection of the sediment and final groundwater remedies. EPA will also need input from area business owners that may be impacted from this remedy. They will also be part of the design and implementation process.*

8. Consideration for bio-remediation as an alternative.
The City of Manitowoc wonders why bio-remediation alternatives were not considered.

EPA Response: *An array of alternatives was considered for site remediation. It was determined that bio-remediation would not achieve remedial action objectives in a reasonable timeframe.*

9. Work in the rights-of-way requires City Permits.
The City understand that remedial action would likely extend to the adjacent rights-of-way and may require the relocation of public utilities.

As such, prior to conducting work in the rights-of-way, the City will require WPSC to obtain all applicable Right-Of-Way excavation permits from the City to allow the City Engineering Department and Manitowoc Public Utilities (water and electric) to oversee the work. In particular, it is the City's preference that soil stabilization activities in the rights-of-way terminate no less than nine feet below current ground surface and that the disturbed utilities be restored to their current locations and orientations.

EPA Response: *Remedial action work selected under Superfund (CERCLA, section 121) does not require federal, state, or local permits; however, all substantive permit requirements must and will be met. Also, the EPA and WPSC will work closely with the City to make sure utilities are relocated to desired depths, locations, and orientations.*

10. Future Redevelopment Opportunities.
The City of Manitowoc has concerns regarding redevelopment opportunities at the Winter property. They request that the Winter property be left in a state that would have the potential for cost-effective redevelopment, as redevelopment would be unlikely if the cost to develop on top of the ISS monolith is above average. Also, once the Winter building is razed and ISS is implemented, how will the site be finished (gravel? hard surface like concrete or asphalt? top soil and grass landscaping?).

EPA Response: *Presently, the Winter property is owned by WPSC. The selected remedy requires the Winter property to be remediated to residential cleanup standards and restored to current conditions. EPA can help facilitate discussions between the City and WPSC about the City's interest in redevelopment; however, the cleanup, as selected in this ROD, is the requirement under Superfund law.*

The details regarding how the Winter Property will be restored after ISS has not yet been determined. Those details will be prepared in a draft design. As discussed in the response to City of Manitowoc Comment #1, EPA will work with the City to understand and consider their input as the cleanup is designed and implemented.

Appendix A – Administrative Record Index

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR THE
WPSC MANITOWOC MGP SITE
MANITOWOC, MANITOWOC COUNTY, WISCONSIN
ORIGINAL
JULY 17, 2018

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	918152	7/25/07	Natural Resource Technology, Inc.	File	Completion Report	383
2	930642	10/23/14	Natural Resource Technology, Inc.	File	Remedial Investigation Report (Revision 0) (No Appendices)	302
3	941840	3/29/18	Paulson, R., Wisconsin Public Service Corporation	Gielniewski, M., U.S. EPA	Submittal of Feasibility Study Report Rev 3 & Response to US EPA's Feb 23, 2018 Comments on Data Required to Select the Proposed Remedy of Monitored Natural Attention for Groundwater (w/Attachment)	614
4	941842	5/2/18	Gielniewski, M., U.S. EPA	Paulson, R., Wisconsin Public Service Corporation	Letter Re: Review of Response to Comments Letter (RTC) & Feasibility Study Report Rev 3	2
5	941841	5/17/18	Paulson, R., Wisconsin Public Service Corporation	Gielniewski, M., U.S. EPA	Letter Re: Response to Comments - U.S. EPA Review Dated May 2, 2018 of Response to Comment Letter (RTC) & Feasibility Study Report Rev 3 (W/Attachments)	60
6	941053	7/1/18	U.S. EPA	File	Proposed Plan for Cleanup of Operable Unit #1, Wisconsin Public Service Corporation Manitowoc Manufactured, Gas Plant Superfund Alternative Site, Manitowoc, Wisconsin	45

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR THE
WPSC MANITOWOC MGP SITE
MANITOWOC, MANITOWOC COUNTY, WISCONSIN

UPDATE 1
SPETEMBER 21, 2018
SEMS ID: 943637

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	943638	8/14/18	U.S. EPA	Resident	Public Comments	3
2	941498	8/21/18	WDNR	Pastor, S., U.S. EPA	Letter re: Wisconsin Department of Natural Resources Remediation and Redevelopment Program Comments on the Proposed Plan for Cleanup of Operable Unit #1	2
3	943639	8/22/18	Paulson, R., U.S. EPA	Gielniewski, M., U.S. EPA	Letter re: Proposed Plan for Cleanup of Opearble Unit #1	2

Appendix B – ARARs Tables

Chemical-Specific ARARs

Chemical-specific ARARs are generally health- or risk-based standards, defining concentration limits for environmental media or discharges. These requirements may be used to set cleanup levels for COC in environmental media.

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	RELEVANT ALTERNATIVES	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
FEDERAL					
Groundwater	Groundwater Quality Standards	Alternatives 1-5	40 CFR Part 141 – Safe Drinking Water Act of 1974	Applicable	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	Alternatives 1-5	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	Alternatives 1-5	Wis. Admin. § NR 140: Groundwater Quality	Applicable	NR 140 Groundwater Quality Standards are legally applicable to all groundwater, regardless of groundwater use 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: 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	Alternatives 1-5	Wis. Admin. § NR 720 Soil Cleanup Standards	Applicable	NR 720: Soil Cleanup Standards are legally applicable.
			Wis. Admin. § NR 726 Case Closure	Relevant and Appropriate	NR 726 Cleanup for Closure is relevant and appropriate 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.

Location-Specific ARARs

Location-specific ARARs are based on the Site's characteristics or location, including natural Site features such as wetlands, floodplains, and endangered or threatened species and habitats. Location-specific ARARs may also apply to man-made features, such as cultural resource areas.

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	RELEVANT ALTERNATIVES	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
FEDERAL					
NONE IDENTIFIED					
WISCONSIN					
NONE IDENTIFIED					

Action-Specific ARARs

Action-specific ARARs are technology-based or activity-based limits used to guide implementation of the remedial action or guide how remedial waste may be handled.

Soil Action-Specific ARARs

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	RELEVANT ALTERNATIVES	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
FEDERAL					
NONE IDENTIFIED					
WISCONSIN					
Wastewater Discharges to POTW	Surface Water Effluent Standards, Criteria, and Limitations	Alternative 5	Wis. Stat. § 281.15, § 281.16, § 281.17: Water and Sewage	Applicable	Discharge to POTW is an offsite action, and any pretreatment requirements would need to be met.
Wastewater Discharges to Manitowoc River	Surface Water Effluent Standards, Criteria, and Limitations	Alternative 5	Wis. Stat. § 283: Pollution Discharge Elimination Subchapter III Standards: Effluent Limitations	Applicable	Surface water quality effluent standards, criteria and limitations are Applicable where dewatering during soil remediation or extraction of groundwater may necessitate discharge to the Manitowoc River. Any discharge to the Manitowoc River would need to comply with the substantive requirements.
			Wis. Adrnin. § NR 102: Water Quality Standards for Wisconsin Surface Waters		
			Wis. Adrnin. § NR 105: Surface Water Quality Criteria and Secondary Values for Toxic Substances	Applicable	Surface water quality effluent standards, criteria and limitations are Applicable where dewatering during soil remediation or extraction of groundwater may necessitate discharge to the Manitowoc River. Any discharge to the Manitowoc River would need to comply with the substantive requirements.
			Wis. Admin. § NR 106.06, § NR 106 Subchapter V, § NR 106 Subchapter VI: Procedures for Calculating Water Quality Based Effluent Limitations	Applicable	

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	RELEVANT ALTERNATIVES	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
			for Point Source Discharges to Surface Waters		
			Wis. Admin. § NR 200.22 - Application for Discharge Permits and Water Quality Standards Variances	Applicable	
			Wis. Admin. § NR 207.03 to § NR 207.05: Water Quality Antidegradation	Applicable	
			Wis. Admin. § NR 218.05 to § NR 218.11: Method and Manner for Sampling	Applicable	
			Wis. Admin. § NR 219.04: Analytical Test Methods and Procedures	Applicable	
Site Disturbance	Storm Water Runoff Requirements	Alternatives 2-5	Wis. Stat. § 283: Pollution Discharge Elimination	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 Manitowoc River.
			Wis. Admin. § NR 216: Storm water Discharge Permits	Applicable	
			Wis. Admin. § NR 151: Runoff Management	Applicable	
Site Disturbance In-Situ	Air Emissions Requirements, Criteria, Limitations	Alternatives 2-5	Wis. Admin. § 415 - Control of Particulate Emissions	Applicable	Air emission requirements will be applicable during soil excavation and blending activities that generate fugitive dust and/or vapors

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	RELEVANT ALTERNATIVES	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
Treatment of Soil Soil that generates vapors			Wis. Admin. § 419 - Control of Organic Compound Emissions	Applicable	Air emission requirements will be applicable to in-situ treatment alternatives that involve the generation of vapors.
			Wis. Admin. § 429 - Malodorous Emissions and Open Burning	Applicable	
			Wis. Admin. § 431 - Control of Visible Emissions	Applicable	
			Wis. Admin. § 445 - Control of Hazardous Pollutants	Applicable	
In-Situ Treatment - injection of Fluids	Injection Well Requirements	Alterative 5	Wis. Stat. § 281: Water and Sewage	Applicable	Substantive requirements of the injection well regulation are applicable for in-situ treatment via injection of fluids.
			Wis. Admin. § NR 815: Injection Wells	Applicable	
Soil Excavation	Waste Disposal	Alternatives 2-5	Wis. Admin. § NR 718 Management of Solid Wastes Excavated During Response Actions	Applicable	Substantive requirements that relate to the generation and onsite management of the disposal of excavated soils deemed waste are applicable.

Groundwater Action-Specific ARARs

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	RELEVANT ALTERNATIVES	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
FEDERAL					
NONE IDENTIFIED					
WISCONSIN					
All Groundwater Alternatives	Groundwater Monitor Well Requirements	Alternatives 2-5	Wis. Stat. § 281: Water and Sewage	Applicable	Groundwater monitoring is required to demonstrate the effectiveness of any groundwater remedy on reducing concentrations of MGP COCs.
			Wis. Admin. § NR 141: Groundwater Monitor Well Requirements	Applicable	
In-Situ Chemical or Thermal Treatment	Air Emissions Requirements, Criteria, Limitations	Alternatives 4 and 5	Wis. Stat.§ 285: Air Pollution	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. § 415- Control of Particulate Emissions	Applicable	
			Wis. Admin. § 419 - Control of Organic Compound Emissions	Applicable	
			Wis. Admin. § 429.03 - Malodorous Emissions and Open Burning	Applicable	
			Wis. Admin. § 43 1 - Control of Visible Emissions	Applicable	
			Wis. Admin. § 445 - Control of Hazardous Pollutants	Applicable	
In-Situ Chemical Treatment In-Situ Enhanced Bioremediation	Injection Well Requirements	Alterative 5	Wis. Stat. § 281: Water and Sewage	Applicable	Substantive requirements of the injection well regulation are applicable for in-situ chemical treatment via injection of fluids.
			Wis. Admin. § NR 815: Injection Wells	Applicable	
			Wis. Admin. § NR 140: Groundwater Quality	Applicable	

All Media Action-Specific ARARs

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	RELEVANT ALTERNATIVES	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
FEDERAL					
NONE IDENTIFIED					
WISCONSIN					
All Media – Chemical Specific	Laboratory Certification Requirement	Alternatives 2-5	Wis. Admin. § NR 149: Laboratory Certification and Registration Wis. Admin. § NR 299.01(4): 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	Alternatives 1-5	Wis. Admin. § NR 724: 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.

Other Non-ARAR Requirements (Full Compliance is Required)

ALTERNATIVE COMPONENT	REQUIREMENT, CRITERIA, STANDARD, LIMIT	RELEVANT ALTERNATIVES	CITATION	Relationship between requirement, criteria, standard and/or limit and Alternative Component and other Comments
FEDERAL				
NONE IDENTIFIED				
WISCONSIN				
Institutional Controls – any media	Continuing Obligation (CO) Requirements	Alternatives 2-5	Wis. Admin. § NR 725 and 726	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.

To Be Considered Standards, Guidance, and Initiatives

STANDARD, GUIDELINE, INITIATIVE	RELEVANT ALTERNATIVES	CITATION	Relationship between TBC and Alternative Component
FEDERAL			
NONE IDENTIFIED			
WISCONSIN			
Soil Cleanup Standards	Alternatives 2-5	• 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-052,)	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	Alternatives 2-5	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	Alternatives 2-5	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	Alternatives 2-5	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.
Vapor Intrusion Guidance	Alternatives 2-5	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	Alternatives 2-5	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
WDNR: Wisconsin Department of Natural Resources
Wis. Stat.: Wisconsin Statute
WPDES: Wisconsin Pollution Discharge Elimination System
CO: Continuing Obligation
MGP COCs: Manufactured Gas Plant Compounds of Concern
Wis. Admin: Wisconsin Administrative Code