Final Focused Feasibility Study Report

South Menomonee Canal, Milwaukee Estuary AOC
Milwaukee, Wisconsin

EPA GLAES II Contract
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Executive Summary

This Focused Feasibility Study (FFS) report develops and presents a recommended remedial alternative for the South Menomonee Canal (SMC) Project Area within the Milwaukee Estuary Area of Concern (AOC) in Milwaukee, Wisconsin. The U.S. Environmental Protection Agency (EPA) Great Lakes National Program Office (GLNPO) and project partners (Wisconsin Department of Natural Resources [WDNR], Milwaukee County Parks, City of Milwaukee, Milwaukee Metropolitan Sewerage District, and We Energies) have selected Alternative 3A as the recommended alternative to address contaminated sediment in the SMC. Alternative 3A addresses sediment with contaminant of concern (COC) concentrations exceeding cleanup goals (CUGs) through dredging, placing a residual sand cover in dredged areas, capping in areas where contaminated sediment cannot be feasibly removed, and capping contaminated sediment below an elevation of 552.5 feet North American Vertical Datum of 1988 (NAVD88). Dredged sediment will be transported to and placed in a dredged material management facility (DMMF) to be constructed in Milwaukee Bay adjacent to the existing confined disposal facility. The recommended alternative will achieve the site-specific remedial action objectives (RAOs) by reducing the mass, volume, and concentrations of COCs in sediment, reducing risks to human health and the environment from exposure to COCs in sediment, and maintaining depth requirements within the authorized federal navigation channel (FNC). It will also maintain depth requirements for recreational vessel use.

The purpose of the FFS process is to develop and evaluate remedial alternatives and support selection of a remedy that is protective of human health and the environment. The remedy will contribute to the eventual removal of beneficial use impairment (BUIs) and delisting of the Milwaukee Estuary AOC.

The FFS includes the following:

- A conceptual site model summarizing physical site characteristics, nature and extent of contamination, historical and ongoing sources of contamination, recontamination potential, and exposure pathways and receptors.
- Site-specific RAOs and development of remediation target areas (RTAs).
- Identification and screening of remedial technologies.
- Description of remedial alternatives.
- Comparative analysis of the alternatives against seven evaluation criteria.
- Identification and rationale for a recommended remedial alternative.

The following site-specific RAOs for the SMC include remedial goals to improve the portion of the AOC where the project is located, and support removing BUIs and delisting the AOC:

- Reduce the mass, volumes, and concentrations of COCs in the sediment. This will be achieved by addressing sediment with COCs exceeding the CUGs, thereby reducing exposure and risk to ecological and human receptors. The remediation of contaminated sediment in the project area will make progress towards eliminating sediment-related BUIs.
- Reduce risks to human health and the environment from exposure to COCs in sediment. This will largely be accomplished by supporting the removal of BUIs through remediation of sediment with COC concentrations above the CUGs.
- Maintain depth requirements within the authorized FNC portion of the SMC.

RTAs were developed using three different screening level scenarios to provide flexibility in developing remedial alternatives for the SMC and facilitate sediment disposal planning for the overall Milwaukee Estuary AOC. The three screening level scenarios are based on EPA and project partner agreement as follows:

- Probable Effect Concentrations (PECs) provided in the WDNR's *Wisconsin Consensus-based Sediment Quality Guidelines* (CBSQGs) (WDNR 2003) for polycyclic aromatic hydrocarbons (PAHs) and metals (chromium, lead and mercury), and 1 milligram per kilogram (mg/kg) for polychlorinated biphenyls (PCBs)
- 3 times the PEC values for PAHs and metals and 1 mg/kg for PCBs
- 3 times PECs for PAHs and metals and 3 mg/kg for PCBs

Representative remedial technologies were identified and screened. Remedial technologies that remained following screening were assembled into the five remedial alternatives summarized in Exhibit ES-1. Each conceptual remedial alternative used a common set of technologies, and they primarily differ from each other with respect to the screening levels used to establish the RTAs. Within each RTA, sediment that can be feasibly removed will be dredged, and isolation or stabilization technologies will be applied to the sediment with COC concentrations exceeding CUGs that remain in place. Alternative 3A was developed because of concerns about AOC-wide estimated dredge volumes exceeding the DMMF capacity. Alternative 3A has the same RTA as Alternative 3 but reduces dredge volume by establishing a maximum sediment removal elevation. The reduction in dredge volume for Alternative 3A results in additional areas requiring capping.

Exhibit ES-1. Conceptual Remedial Alternatives for the South Menomonee Canal Project Area

Alternative	Alternative Description
1	No Action
2	Remediate sediment with COC concentrations greater than the PECs for total PAHs or metals or greater than 1 mg/kg total PCBs: dredge (estimated total dredgeable volume of 125,000 cubic yards [CY]) and cap the sediment that cannot be removed (estimated 11 acres)
3	Remediate sediment with COC concentrations greater than the 3 times PECs for total PAHs or metals or greater than 1 mg/kg total PCBs: dredge (estimated total dredgeable volume of 98,000 CY) and cap the sediment that cannot be removed (estimated 9 acres)
3A	Remediate sediment with the same COC concentrations as Alternative 3 above a maximum dredge elevation of 552.5 feet NAVD88: dredge (estimated total dredgeable volume of 73,000 CY) and cap the sediment that cannot be removed (estimated 12 acres)
4	Remediate sediment with COC concentrations greater than the 3 times PECs for total PAHs or metals or greater than 3 mg/kg total PCBs: dredge (estimated total dredgeable volume of 58,000 CY) and cap the sediment that cannot be removed (estimated 5 acres)

Each remedial alternative, except for Alternative 1 (No Action) meets the threshold criterion (compliance with environmental laws and standards). Alternative 2 has the greatest long-term effectiveness because it is based on the most conservative (lowest) set of CUGs, results in the greatest reduction of mass, volume, and concentration of COCs in sediment, and leaves the least contamination in place. Alternatives 3, 3A, and 4 have progressively lower reductions in COC mass and volume or smaller cover areas compared to Alternative 2. Alternative 4 has the greatest short-term effectiveness because the remedy would impact the smallest area. Alternative 4 is the most implementable from a technical standpoint because it requires the least amount of DMMF capacity. Alternatives 2 and 3 may not be implementable because of DMMF capacity constraints. Alternative 3A was developed to reduce the dredge volume and improve implementability of an alternative that has the same CUGs as Alternative 3. The other construction, implementation, and administrative challenges are similar for Alternatives 2, 3, 3A, and 4. The restoration time frames are similar for all alternatives. Alternative 4 has the lowest estimated cost ($18.7 million [M]). Alternatives 3A, 3, and 2 are progressively more costly ($24.1M, $25.6M and $33.4M, respectively).

Alternative 3A was selected as the recommended alternative based on evaluation of dredged material volume estimates for disposal in the DMMF and consideration of project costs on an AOC-wide basis. Dredged material volume estimates for Alternatives 2 and 3 exceed the available DMMF capacity. Alternative 3A provides a similar level of protectiveness to Alternative 3 and reduces dredge volume by establishing a maximum sediment removal elevation throughout the SMC. The recommended alternative will be further refined during remedial design.

The recommended alternative will be further refined during remedial design. The recommended alternative was the subject of public outreach efforts accomplished during four separate public informational meetings held in 2023 and 2024. This Final FFS Report was prepared in consideration of public comments received.

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Acronyms and Abbreviations

Acronym	Definition
§	Section
1x	one time
3D	three-dimensional
AOC	area of concern
BRRTS	Bureau for Remediation and Redevelopment Tracking System
BUI	beneficial use impairment
CAD	AutoCAD® computer software
CBSQG	Consensus-Based Sediment Quality Guideline
COC	contaminant of concern
Cr	chromium
CSM	conceptual site model
CSO	combined sewer overflow
CUG	cleanup goal
CY	cubic yard(s)
DMMF	dredged materials management facility
EPA	U.S. Environmental Protection Agency
ERP	environmental remediation project
EVS	Earth Volumetric Studio
FFS	focused feasibility study
FNC	Federal Navigation Channel
GIS	geographic information system
GLLA	Great Lakes Legacy Act

Acronym	**Definition**
GLNPO	Great Lakes National Program Office
GLWQA	Great Lakes Water Quality Agreement
gpd	gallons per day
Hg	mercury
I-	Interstate
IGLD	International Great Lakes Datum
LUST	leaking underground storage tank
LWD	low water datum
M	Million(s)
mg/kg	milligram(s) per kilogram
MMSD	Milwaukee Metropolitan Sewerage District
NAVD88	North American Vertical Datum of 1988
PAH	polycyclic aromatic hydrocarbon
Pb	lead
PCB	polychlorinated biphenyl
PEC	probable effect concentration
RAETM	Remedial Alternatives Evaluation Technical Memorandum
RAO	remedial action objective
RAP	remedial action plan
RCRA	Resource Conservation and Recovery Act
RTA	remediation target area
SMC	South Menomonee Canal
SSP	steel sheet pile
SWAC	surface weighted average concentration

Acronym	Definition
TM	technical memorandum
TOC	total organic carbon
TSCA	Toxic Substances Control Act
USACE	U.S. Army Corps of Engineers
WDNR	Wisconsin Department of Natural Resources
WEPCO	Wisconsin Electric Power Company
WPDES	Wisconsin Pollutant Discharge Elimination System
WWTP	wastewater treatment plant

1. Introduction

This Focused Feasibility Study (FFS) Report summarizes site conditions, remedial action objectives (RAOs), remediation target areas (RTAs), remedial technology screening, and remedial alternatives development and evaluation, and presents a recommended remedial alternative for the South Menomonee Canal (SMC) within the Milwaukee Estuary Area of Concern (AOC) in Milwaukee, Wisconsin. In accordance with Task Order Number 68HE0520F0069 under Contract Number 68HE0519D00007, Jacobs[1] prepared this FFS with the Great Lakes National Program Office (GLNPO) as part of the Great Lakes Legacy Act (GLLA) work. This evaluation also aligns with the process outlined in Wisconsin Administrative Code Section (§)NR 722.07 for the selection of remedial alternatives. The Milwaukee Estuary AOC includes portions of three watersheds along the Milwaukee River, Menomonee River, and Kinnickinnic River, as well as the inner and outer Milwaukee Harbor ("Milwaukee Bay"), two former industrial canals, and the nearshore areas of Lake Michigan (Figure 1-1).

The SMC Project Area is approximately 0.9 miles in length and has a surface area of about 17.6 acres. The SMC extends from the confluence with the Menomonee River west to the end of the canal near 13th Street; the small section of the Burnham Canal included in the SMC Project Area starts near its confluence with the SMC and extends to a position just west of the Interstate (I)-43 bridge (Figure 1-1). The western portion of the Burnham Canal is being managed as a Superfund Alternative Site and is not part of the SMC Project Area.

This document consists of the following sections:

- Section 1 provides an introduction and summarizes the regional setting within the Milwaukee Estuary AOC, project background and beneficial use impairments (BUIs), general site and background information for the SMC, and the most recent site investigations and their associated reports.
- Section 2 presents the conceptual site model (CSM) for the SMC, including descriptions of physical site conditions, the nature and extent of contamination, historical and ongoing sources of contamination, recontamination potential, and potential exposure pathways and receptors.
- Section 3 provides an overview of how RAOs are developed for remedial actions to be conducted in the Milwaukee Estuary AOC for GLNPO in partnership with nonfederal sponsors as part of the GLLA work. Site-specific RAOs, threshold screening levels, and development of RTAs for the SMC are also presented.
- Section 4 summarizes the results of the remedial technology screening for the SMC to focus remedial alternatives development on only those technologies most applicable to the site and presents the conceptual remedial alternatives that are further developed in Section 5.
- Section 5 describes five remedial alternatives for the SMC, including the No Action alternative.
- Section 6 presents the detailed analysis of alternatives; the evaluation criteria are described first, followed by an analysis of the individual alternatives relative to the evaluation criteria and comparative analysis between alternatives.
- Section 7 presents the Recommended Alternative, as discussed with project partners.
- Section 8 presents the reference documents cited in this FFS Report.

[1] On December 15, 2017, CH2M HILL Companies Ltd. and its subsidiaries including CH2M HILL, Inc. became part of Jacobs.

1.1 Purpose

The purpose of the FFS process is to develop and evaluate remedial alternatives and support selection of a remedy that is protective of human health and the aquatic environment. The remedy will contribute to the eventual removal of BUIs and delisting of the Milwaukee Estuary AOC.

The FFS task constitutes the third of three tasks completed for the SMC. The first task established RAOs and general response actions, identified and screened remedial technologies, and presented the conceptual remedial alternatives. The second task was the remedial alternatives evaluation in which the remedial alternatives were further developed to support cost estimates and alternatives were analyzed individually and against each other. Results were documented in the *Remedial Alternatives Evaluation Technical Memorandum* (RAETM) for the SMC (Jacobs 2023a).

The third task consists of completing this Final FFS Report, which includes the recommended remedial alternative. A Draft Final FFS Report was completed in September 2023 (Jacobs 2023b). This Final FFS Report incorporates information relevant to four public information meetings that were held after completion of the Draft Final FFS Report, review comments received relevant to the Draft Final FFS Report, and changes relevant to compliance with Section 508 of the 1973 Rehabilitation Act (29 United States Code [U.S.C.] 794d).

The FFS for the SMC was developed during the same timeframe as FFSs for other project areas within the Milwaukee Estuary AOC including the Milwaukee River Downtown Reach, the Milwaukee River Floodplains Reach, the Kinnickinnic River, and Milwaukee Bay. The remediation strategies and approaches for all project areas are being coordinated to the degree possible to achieve overall program objectives.

1.2 Milwaukee Estuary Area of Concern Background

The Milwaukee Estuary was identified as an AOC in 1987, by the International Joint Commission constituted to manage lakes and river systems along the border between Canada and the United States under the Great Lakes Water Quality Agreement (GLWQA) signed by both countries in 1972. The Milwaukee Estuary AOC has a long history of ecological degradation and pollution. Under the GLWQA, the first Milwaukee Estuary Remedial Action Plan (RAP) was completed in 1991 (WDNR 1991). Historical discharges from point and non-point sources near to and/or upstream of the AOC resulted in sediment in the AOC waterways being contaminated with various pollutants, including metals, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs). The RAP is updated periodically, most recently in June 2022 (WDNR 2022b).

The following 11 BUIs are assigned for the Milwaukee Estuary AOC with 7 (indicated by ***bold italics*** and an asterisk [*]) of the BUIs specific to contaminated sediment:

- ***Restrictions on fish and wildlife consumption****
- Eutrophication or undesirable algae
- ***Degradation of fish and wildlife populations****
- Beach closings (recreational restrictions)
- ***Fish tumors or other deformities****
- ***Bird or animal deformities or reproduction problems****
- ***Degradation of benthos****
- Degradation of phytoplankton and zooplankton populations

- ***Restriction on dredging activities****
- ***Loss of fish and wildlife habitat****
- Degradation of aesthetics (U.S. Environmental Protection Agency [EPA] approved removal of this BUI as of September 8, 2021)[2]

Impacted sediment can be toxic to bottom-dwelling benthic organisms as they feed. Fish, piscivorous birds and mammals, and humans may be exposed to bioaccumulative chemicals, such as mercury and PCBs, via diet. Impacted sediment also has the potential to be resuspended and transported downstream by high flow conditions, seiche effects, and vessels.

1.3 South Menomonee Canal Project Area Features and Background

The SMC Project Area is composed of former shipping canals that were cut to the south of the Menomonee River, extending the region's access to ship traffic. The area surrounding the SMC is predominantly commercial/industrial and has been the site of fuel and coal supply companies, granaries, tanneries, cement suppliers, iron and metal companies, railroad yards, and rail lines (Anchor QEA 2021b).

The SMC shares similar site elements as the Menomonee River, such as the following:

- Similar shoreline features
- Federal navigation channel (FNC) authorized by the U.S. Army Corps of Engineers (USACE)
- No known plans for future navigational dredging
- Presence of elevated levels of site contaminants of concern (COCs) in buried sediment (Section 2.4) and potential, ongoing sources of contamination (Section 2.5)

The configuration of the main stem of the SMC has been relatively consistent over time; however, the shoreline has changed as historical slips and connecting channels were created and subsequently infilled. Presently, there are no slips off the SMC; all the historical slips were reclaimed (infilled) by the 1970s. The Lake Ferry Express currently uses the canal for overwintering and storage. In the mid-1980s, the portion west of 11th Street in the Burnham Canal (not part of the SMC Project Area) was declared to be non-navigable (for federal purposes), to allow for construction of the 11th Street Bridge, which is a street-level fixed bridge that blocks ship traffic (Anchor QEA 2021b). An inoperable railroad swing bridge is located just east of the I-43/I-94 overpass.

Jacobs conducted a shoreline survey at the SMC in 2020 (Jacobs 2021b), documenting the visible portions of structures above the water line for shoreline construction type and structural condition. The structural condition evaluation did not provide a quantitative assessment of structural stability, particularly with respect to potential removal of sediment at the foot of constructed walls. The general criteria used to classify bulkhead conditions were as follows:

- Excellent – No significant defects – slight imperfections may exist
- Good – Minor deterioration or defects evident
- Fair – Sound structure with clear evidence of deterioration

[2] A letter addressed to Wisconsin Department of Natural Resources (WDNR) from GLNPO dated September 8, 2021, approved WDNR's request to remove the *Degradation of Aesthetics* BUI for the Milwaukee Estuary AOC (EPA 2021). Although various factors historically combined to limit recreational use and diminish the scenic value of the waters within the AOC boundaries (visible debris, trash, floating oil and grease, concrete-lined reaches, and overdevelopment on shorelines), many federal and state water quality regulations, local initiatives, and volunteer programs were implemented to reduce pollution and improve water quality throughout the AOC.

- Marginal – Moderate deterioration
- Poor – Serious deterioration in some portions of the structure
- Very Poor – Extensive deterioration

SMC's shoreline consists primarily of steel sheet pile (SSP) bulkheads that comprise approximately 11,367 feet, or about 73 percent, of the SMC shoreline (Figures 1-2A through 1-2D). The SSP bulkheads are mostly in the good to excellent condition categories, except for a portion of the bulkhead near the western end of the channel, which was classified as poor. A few sections of reinforced concrete walls range from excellent to fair condition and portions of riprap, timber wall, and natural shoreline are also present. Figures 1-2A through 1-2D include summary information for the shoreline materials and condition.

The shoreline within the SMC Project Area has features such as floating docks, removable docks, and walkways that extend from the bulkhead. Other shoreline features include docking bollards, utility crossings, and boat bumpers/fenders. Several areas of the shoreline show evidence of erosion. A relatively large erosive condition is evident adjacent to the Wisconsin Electric Power Company (WEPCO) Valley Power Plant[3] cooling water discharge point. Discharge is reportedly accomplished using two outfalls located immediately west of I-43/I-94 overpass on the north shore as shown on Figure 1-2B (We Energies 2021). This discharge of non-contact cooling water is evident with the erosion of the bulkhead wall on the southern portion of the canal beneath the I-43/I-94 overpass.

The 2020 shoreline survey observed and noted seven storm sewer outfalls and one combined sewer overflow (CSO) outfall, with four of the outfalls measuring between 2 and 2.5 feet in diameter; storm sewers are presumably linked to roof drains, road and parking areas, or walkways of the adjacent properties. Sewer locations either identified during the survey and/or present based on locational information from the Milwaukee Metropolitan Sewerage District (MMSD) are included on Figures 1-2A through 1-2D.

Within the SMC Project Area, the FNC has an authorized depth of -21 feet low water datum (LWD)[4]. The FNC starts at the western end of the canal (Figure 1-2A), extending eastward and then north to the confluence with the Menomonee River. The former FNC in the small section of the Burnham Canal included in the SMC Project Area was deauthorized in 2014 (USACE 2016) but continued to show on various maps (Figures in this document are updated). Text in the 100% Final Site Investigation Report (Anchor QEA 2021b) indicated that the FNC within the SMC may be deauthorized entirely or reauthorized to a shallower depth for current uses (possibly to 562 feet North American Vertical Datum of 1988 [NAVD88]).

USACE has performed maintenance dredging twice in the past 30 years. In 1987, the entire SMC was dredged, and 308,656 cubic yards (CY) of sediment were removed. In 1993, the eastern portion of the SMC was dredged, and 108,067 CY of sediment were removed between the South 6th Street Bridge and the confluence with the Menomonee River. Additional maintenance dredging is not currently planned for the SMC (Anchor QEA 2021b).

The southern portion of the canal, west of the Milwaukee Estuary AOC project agreement boundary and west of the I-43/I-94 overpass (Figure 1-1), is the location of a separate remediation site, referred to as the Burnham Canal Superfund Alternative Site. Partial remediation and filling of the canal and upland

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[3] WEPCO doing business as We Energies.

[4] The LWD for Lake Michigan is established at an elevation of 577.5 feet International Great Lakes Datum (IGLD) or 578 feet NAVD88 (USACE 1992). NAVD88 is used as the vertical datum for all the Milwaukee Estuary AOC project areas (including the SMC Project Area). All elevation data reported relative to IGLD 1985 have been converted as follows: NAVD88 = 0.5 feet + IGLD 1985.

portions were completed in 2020 and 2021 by a private, responsible party. Remediation activities included targeted dredging of sediment with relatively higher contaminant concentrations ("hot spot" removal), removal of upland soil, installation of 3 to 4 feet of cover and settlement material, verification and confirmation sampling, and a final work inspection conducted in August 2021 (WDNR 2022a). Ongoing work in this area is being funded by EPA through the Great Lakes Restoration Initiative and implemented by the MMSD in collaboration with Wisconsin Department of Natural Resources (WDNR) (MMSD 2022c). The project area has now been filled with sand and gravel fill and will undergo wetland restoration (MMSD 2022c).

1.4 Recent Site Investigations and Documents

In 2011, sediment sampling was performed in the SMC by USACE that included the collection of 5-foot core composite samples from five shoaled areas. The objective of the sampling was to support disposal determinations for maintenance dredging activities.

Beginning in 2019, a remedial investigation for the purposes of delineating the nature and extent of contaminants was performed by Anchor QEA on behalf of WDNR and EPA GLNPO (Anchor QEA 2021b) in preparation for FFS activities. In 2020, Anchor QEA conducted additional sediment sampling and multiple surveys that included collection of multibeam bathymetry, side-scan sonar, and LiDAR survey datasets. In October 2020, Jacobs performed a qualitative SMC shoreline assessment on behalf of GLNPO (Jacobs 2021b). The qualitative assessment only included the visible portion of the shoreline structures above the waterline and did not provide a structural assessment to thoroughly evaluate stability of the structures, particularly with respect to potential removal of sediment at the foot of the bulkhead walls.

Both Anchor QEA and Jacobs performed additional sampling and evaluation in the SMC in 2021, based on Jacobs' review of the sediment analytical data collected to date as part of the SMC Data Gap Evaluation Memorandum ("Data Gap TM"; Jacobs 2021a). As a result of the data gap evaluation, Anchor QEA collected samples from 10 sediment coring locations in August 2021, and analyzed the samples for PCBs, PAHs, and metals; a subset of samples was analyzed for physical parameters (Anchor QEA 2021b). Jacobs performed geotechnical sampling at four sediment coring locations in the SMC in fall of 2021, as reported in the Final *2021 Geotechnical Sediment Sampling Technical Memorandum* (Jacobs 2022). Individual sediment samples were analyzed for some combination of the following parameters: moisture content, organic content, Atterberg limits, grain size, triaxial shear, consolidation, unconfined compression, and specific gravity (Jacobs 2022).

2. Conceptual Site Model

The CSM summarizes the physical characteristics of the SMC, describes the nature and extent of contamination, and identifies potential sources of contamination, migration pathways, and potential receptors. The CSM is visually depicted on Figure 2-1, which shows spatial relationships between potential sources, contaminant transport pathways, receiving waters, and potential receptors.

2.1 Hydrology and Bathymetry

The river hydrology within the larger Milwaukee Estuary AOC project area is a complex system influenced by a combination of Lake Michigan water elevations, river flow rates, and volumes. The Milwaukee Estuary also receives water from Lake Michigan during periodic seiche events. Lake Michigan oscillates between its western and eastern shores as a result of strong winds or atmospheric pressure changes because it is essentially an enclosed system. Because wind and/or atmospheric conditions are almost never static, seiche events are almost always occurring on Lake Michigan. When water is pushed toward the western shore of Lake Michigan, it flows upstream into the various Milwaukee Estuary AOC rivers (Figure 1-1).

A significant amount of non-contact cooling water is discharged into the SMC by the WEPCO Valley Power Plant via two outfalls (Outfalls 003 and 004) as shown by one symbol on Figure 1-2B (We Energies 2021). Per We Energies' permit application:

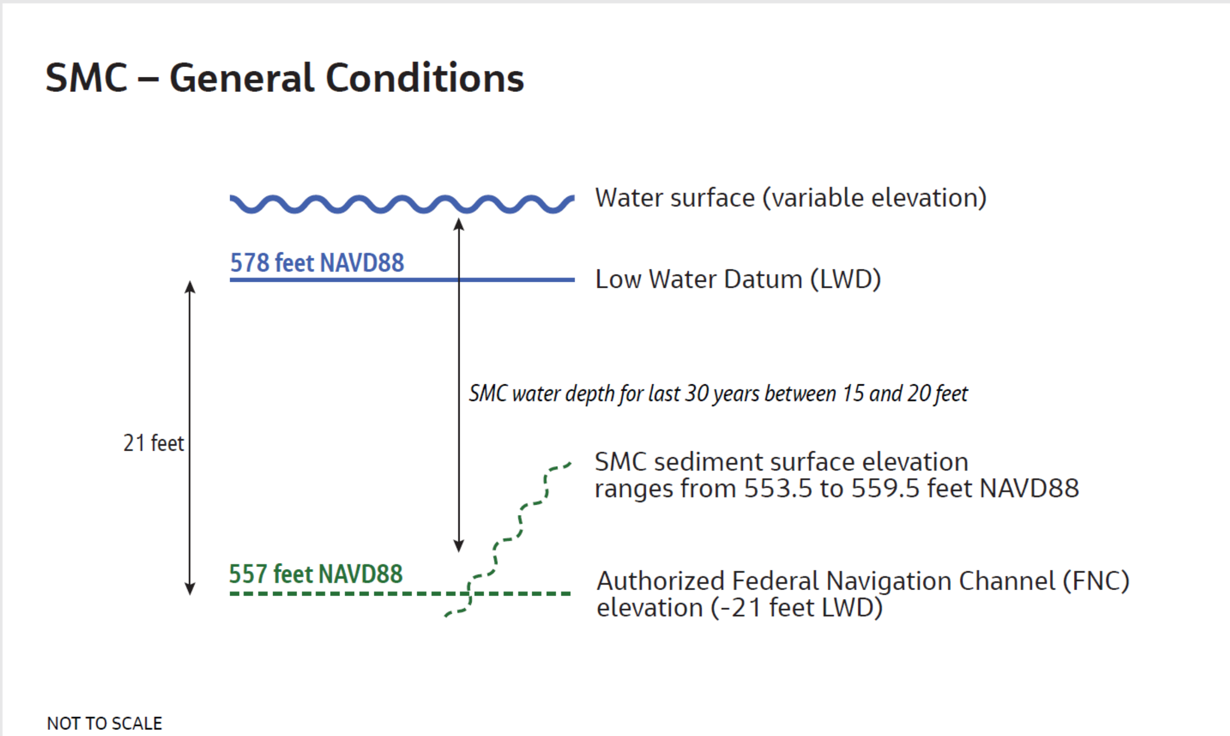
> "Outfalls 003 and 004 recirculate once through non-contact cooling water to the water intakes, located on the Menomonee River. These outfalls are used to prevent icing of the water intake structures in winter, for thermal treatments to control invasive species macroinvertebrates (zebra and quagga mussels), and to backwash the intake screens to flush plugging from biofouling or debris." (We Energies 2021).

The WEPCO Valley Power Plant discharges an estimated 99.9 percent of the water removed from the Menomonee River to the SMC (We Energies 2021), with the Water Use Individual Permit #6127 allowing 176,000,000 gallons per day (gpd) (WDNR 2021b), resulting in an estimated discharge volume of at least 100,000,000 gpd.

There is minimal inflow to the SMC, as inflow is composed of stormwater and CSOs; water levels within the SMC are dictated largely by those in the Menomonee River, including seiche effects from Lake Michigan. The Menomonee River itself exhibits flash-flow patterns characterized by rapid fluctuation in-water levels. The highest discharge rates observed in the Menomonee River occur after the spring snowmelt (March through June) and the lowest discharge rates are observed during the late summer and fall (July to October) (CH2M 2019a).

Bathymetric and hydrologic features specific to the SMC Project Area are summarized in Exhibit 2-1.

Exhibit 2-1. SMC Project Area Established Elevations (NAVD88)



Over approximately the past 30 years, the reported water depths within the SMC have ranged between 15 and 20 feet (Anchor QEA 2021b). Multibeam bathymetry data collected in fall 2020 indicate that bed elevations in the SMC range between 555.5 to 557.5 feet NAVD88 from the confluence with the Menomonee River to the I-43 overpass. West of the overpass, bed elevations decrease to 553.5 feet NAVD88 over approximately 800 feet before increasing to nearly 559.5 feet NAVD88 (Anchor QEA 2021b).

2.2 Sediment Characteristics

The physical characteristics of material sampled in the SMC in 2019, 2020, 2021, and 2022 (see Section 1.4) are summarized herein. In general, the term “native material” is used to represent the relatively firm, relatively compacted glacial material in place before more recent deposition of loose sediment, generally referred to herein as “soft sediment”. Geotechnical samples of both the soft sediment and native material were collected throughout the project area. Native material was not encountered at all locations.

The soft sediment within the SMC was described as soft, plastic (liquid limit tests greater than 50), moist, clayey silt (73 to 97 percent fines) with trace sand, organic material, and anthropogenic debris overlying a native material of grey silty clay with trace shells and of soft to medium stiffness (Anchor QEA 2021b). Sediment samples collected from the confluence with Menomonee River had higher sand content (33 to 51 percent) with low plasticity compared to samples from other areas of the SMC. In addition, one shallow sediment sample collected approximately halfway between I-94 and South 6th Street had the highest sand content of 93 percent from a depth of 6.4 to 6.9 feet below sediment surface (Jacobs 2022).

Samples collected from the native material typically contain only trace amounts of sand and gravel. Atterberg limits of the native material samples indicate the material is elastic silt or lean clay based on the

Unified Soil Classification System classification. Specific gravity for the sediment samples averaged 2.5, whereas specific gravity of native material averaged 2.7. Native material was encountered beneath soft sediment in 25 boring locations, and the resultant top of native material surface elevations are summarized as follows (Anchor 2021a, 2021b; Jacobs 2022):

- Minimum elevation = 540.5 feet NAVD88
- Maximum elevation = 562.3 feet NAVD88
- Average elevation = 551.8 feet NAVD88

Sediment overlying native material exhibited a higher content of organic materials such as plant roots or wood in the upper several feet recovered. The total organic carbon (TOC) content of soft sediment samples ranged from 3.1 percent to 23.6 percent. TOC of the underlying native material, where encountered and sampled, was typically less than that of the overlying sediment.

Oily sheen was observed in 7 of the 37 cores within a depth range of 0.5 to 10.3 feet below the sediment surface (Anchor QEA 2021b; Jacobs 2022). Odors were noted during processing of seven of the cores. Sheen and odor observations were co-located with elevated photoionization detector readings.

2.3 Habitat

The shoreline for the SMC is almost entirely manmade, vertical SSP or concrete walls; present habitat features support minimal vegetation or animal life. The SMC region is surrounded by a heavily urbanized area dominated by industrial land uses and the aquatic portion of the canal is notably void of habitat features. A narrow band of trees and shrubs is present along some of the shoreline length in the SMC Project Area; the band provides minimal wildlife habitat, but several heron species do use the canal shorelines for foraging (Dow 2018), and potential disturbance to these areas during remedial action should be avoided. The tree-lined portions of shoreline do contribute some large and coarse woody debris to the aquatic environment that may serve as fish cover and loafing habitat for turtles and waterfowl. Woody debris is evident in both aerial photographs and side-scan sonar images, especially in the western half of the SMC Project Area (CH2M 2019b).

Habitat mapping by the University of Wisconsin-Milwaukee using side-scan sonar also shows the presence of large and small wood, mixed rock habitat, and boulder habitat or riprap (UWM 2021; Dow 2018). During sampling of 308 points using a variety of equipment between 2016 and 2019, the U.S. Fish and Wildlife Service Aquatic Invasive Species Early Detection Team captured 58 species of fish in the lower Milwaukee Estuary AOC (EPA 2020). The University of Wisconsin-Milwaukee Habitat Maps Research Project reports that habitat in the SMC supports largemouth bass, pumpkinseed, bluegill, channel catfish, yellow bullhead, common carp, and round goby (UWM 2021).

2.4 Nature and Extent of Contamination

Recent investigations within the SMC, except for the 2011 USACE data, included characterization of the following COCs: PCBs, PAHs, and select metals (including arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc). As reported in the Data Gap TM (Jacobs 2021a), the 2011 USACE analytical data were not used for nature and extent delineation because of the large sampling intervals and compositing procedures used during the sampling scheme and therefore are not discussed further.

The total PAHs and metals concentrations in sediment were compared to the Probable Effect Concentrations (PECs), which are the recommended thresholds for evaluating sediment COC concentrations as discussed in the WDNR's *Wisconsin Consensus-based Sediment Quality Guidelines* (CBSQGs) (WDNR 2003). Detected concentrations were also compared to values corresponding to 3 times and 5 times the PECs to identify more highly impacted locations. PCB concentrations were compared to 1 milligram per kilogram (mg/kg), 3 mg/kg, and 5 mg/kg threshold levels. PCB concentrations were also compared to the 50 mg/kg Toxic Substances Control Act (TSCA) threshold. The complete data set is provided in Appendix A, which includes color coding to denote whether results exceed the threshold levels. The comparisons indicate that sediment in the SMC contains elevated concentrations of PCBs[5], metals, and PAHs[6].

Several metals exceed the PEC-based threshold levels, including chromium, mercury, lead, nickel, arsenic, cadmium, copper, and zinc. Chromium, mercury, and lead exhibit the greatest magnitude and frequency of PEC exceedances (Appendix A). The other metals, where concentrations exceed the PEC, are typically less than 3 times the PEC. Appendix B provides an analysis confirming that PEC exceedances of other metals in the SMC are co-located with elevated concentrations of chromium, mercury, lead, total PCBs, or total PAHs. Therefore, the FFS uses the exceedance extent of the following constituents as the basis for developing RTAs: total PCBs, total PAHs, chromium, lead, and mercury.

The surface[7] sediment in the SMC is less contaminated than the subsurface sediment. Subsurface sediment has larger-magnitude threshold level exceedances extending from the western extent of the canal to the confluence with the Menomonee River. Figure 2-2A identifies surface and subsurface locations with exceedances of the threshold levels for total PAHs, total PCBs, chromium, lead, or mercury. The top panel illustrates the surface results, and the bottom panel presents the maximum subsurface result at each location.

The distribution of PCBs in surface and subsurface sediment is illustrated on Figure 2-2B. PCBs greater than the 50 mg/kg TSCA threshold were not observed. PCB concentrations in surface sediment are lower than the 1 mg/kg threshold level except at nine locations that are predominantly in the western end of the SMC. PCBs in surface sediment did not exceed the 3 mg/kg threshold level. Subsurface sediment with PCB concentrations exceeding the 5 mg/kg threshold level is present at four locations spread throughout the canal.

Figure 2-2C presents the distribution of total PAHs in surface and subsurface sediment. The surface sediment PAH concentrations are predominantly between the PEC (22.8 mg/kg) and 3 times the PEC threshold throughout the SMC. Three locations had total PAH concentrations that exceeded the 3 times or 5 times PEC threshold levels. The highest total PAH concentrations in the subsurface sediment (that is, those exceeding the 3 times PEC or greater) are generally observed between the western end of the canal and South 6th Street; three locations between South 6th Street and the Menomonee River have PAH concentrations exceeding the 3 times PEC threshold level.

The surface and subsurface distributions of chromium, lead, and mercury (the maximum observed detected value for the subsurface samples) are presented on Figures 2-2D, 2-2E, and 2-2F, respectively. Similar to the organic contaminants, the surface sediment metals concentrations are frequently below the PECs. Locations where one or more metals exceed the PEC in the surface sediment are generally between the western end of the canal and the intersection with South 6th Street; an exception is the sampling location on the southeastern bank of the canal where the channel turns north toward the Menomonee

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5 Total PCBs are calculated as the sum of detected Aroclors. Nondetected results are reported as the maximum reporting limit for the individual Aroclors.

6 Total PAHs are calculated as the sum of 18 PAH compounds. Nondetected results are included in sums as 1/2 of the reporting limit. Where all PAH compounds are nondetected, the sum is reported as the maximum reporting limit for the individual PAHs included in the sum.

7 The "surface" interval consists of the 0 to 1 foot interval in most samples in the SMC, with a small number of samples truncating at a shallower depth of 0.4 to 0.5 foot (Appendix A).

River. At this location chromium and mercury both exceed the 3 times their PEC threshold levels. Subsurface PEC exceedances for metals are present throughout the entire SMC, with chromium and mercury typically exhibiting a greater frequency and magnitude of exceedance (Figures 2-2D and 2-2F) relative to lead (Figure 2-2E). Subsurface sediment in the western end and in the middle of the SMC generally has higher concentrations of chromium, lead, and mercury than the eastern end.

Figures 2-3A through 2-3C present more detailed surface and subsurface sediment COC information relative to the 1 time, 3 times, and 5 times threshold levels, as well as to the 1 mg/kg, 3 mg/kg, and 5 mg/kg thresholds for PCBs. The concentration and elevation information presented in this figure set was incorporated into computer modeling that was used to develop RTAs and the associated volumes (see Section 3.2).

2.5 Historical and Potential Ongoing Sources

Potential contaminant sources to the SMC are presented here as a component of the CSM, with a general depiction of potential source types shown on Figure 2-1. Review of historical data in the WDNR's Bureau for Remediation and Redevelopment Tracking System (BRRTS) revealed more specific potential sources on sites adjacent to the SMC. In addition, Jacobs reviewed current industrial, stormwater, and construction discharge permits in the public record. Figure 2-4 indicates the locations of potential sources of contamination to the SMC. The following subsections note potential sources of contaminants to the SMC using several categories:

- Potential Point Sources
- Potential Non-Point Sources
- WDNR Remediation and Redevelopment Sites
- Upstream Sites

Additional detail is provided in the *Evaluation of Potential for Recontamination of Sediment Report* (Recontamination Report) (WNDR 2022a), which was prepared by WDNR and the other nonfederal sponsors to support the Milwaukee Estuary AOC remediation planning activities.

2.5.1 Potential Point Sources

Both shorelines of the SMC were historically developed to support industrial, commercial, and municipal uses. Many of the facilities that once operated with discharges to the canal either ceased operations or were demolished. By the 1970s, all former boat slips on the SMC had been reclaimed, roads replaced previous railroads and spurs (for example, South 11th Street), and I-43/I-94 was constructed (Anchor QEA 2021b). The SMC and shoreline features were generally unchanged from 1970s to between 1980 and 2012. However, the historical point source discharges (mostly via permitted or nonpermitted industrial sewers) resulted in sediment being contaminated with various pollutants including metals, PCBs, PAHs, chlorinated solvent compounds, and petroleum-related compounds (for example, gasoline, diesel, or fuel oil).

Point sources of pollution have discrete discharges, usually from a pipe or outfall. Major reductions in point source activity were accomplished with the advent of the Clean Water Act and the subsequent regulation and permitting of all outfalls. Discharges from pipes or outfalls are regulated under the Wisconsin Pollutant Discharge Elimination System (WPDES) permitting program. As of fall 2021, six WPDES permits were active within the SMC (Table 2-1). Modernized operations, monitoring, and control of discharged water quality reduce the potential contaminant load at currently active industrial and municipal outfalls.

The MMSD holds the WPDES permit for combined sewer discharge. In the vicinity of the SMC, the storm sewer and sanitary sewer systems are commonly combined, with the resultant flow being conveyed in a set of combined sewers to an MMSD wastewater treatment plant (WWTP). However, during periods of heavy rain, the capacity of the WWTP is sometimes exceeded and the CSOs may enter the canal, but usually in only very limited locations. CSOs contain common urban pollutants from stormwater runoff as well as from residential, commercial, and industrial users of the WWTP. Figure 2-4 shows the locations of numerous CSO outfalls along the SMC.

The number and volume of CSOs that negatively impact the water quality in the estuary has decreased significantly with the completion of the "deep tunnel" project in 1994 (MMSD 2022a). Between 1994 and 2021, MMSD has captured and treated more than 98.5 percent of the stormwater and wastewater that has entered the regional sewer system totaling over two trillion gallons (MMSD 2022a). Over that same period, the annual overflow of untreated stormwater and wastewater released through the CSOs to area waterways during periods of heavy precipitation ranged between 1,500 gallons and 4.4 billion gallons (MMSD 2022a). Furthermore, CSO discharges are 90 to 95 percent stormwater and groundwater (MMSD 2022a).

WPDES Permit Number WI-0000931 (Table 2-1) allows non-contact cooling water from the WEPCO Valley Power Plant to be discharged from two outfalls shown on Figure 1-2B. The discharge occurring at this location, although composed of non-contact water, is expected to vary significantly from the ambient temperature of the SMC, which likely influences biological conditions in the canal at this location.

2.5.2 Potential Non-Point Sources

Most of the land adjacent to the SMC is currently occupied by buildings, parking lots or structures, and other paved areas typical of an urban environment. Present-day aerial photographs indicate that grassed areas have replaced demolished buildings in several parcels. During precipitation events, the majority of stormwater is conveyed into the combined sewer system with a limited amount flowing over land and entering surface water as a non-point source.

Areas with surface or subsurface soil contamination, or contaminated buildings or infrastructure, are potential non-point sources of contaminant loads during and after precipitation events until such time that those sites are remediated. Releases to the watershed and sediment environments that are associated with urban runoff may include PCBs, PAHs, or metals. Potential sources of contamination include:

- Construction or environmentally contaminated sites
- Paved or other impermeable surfaces
- Bulk soil or materials storage piles
- Bank soil erosion
- Surface spills
- Atmospheric deposition of airborne contaminants

A previous study conducted in the Milwaukee area concluded that the primary source of PAHs to sediment in urban area waterways are worn particles of coal-tar-based pavement sealants that are transported by stormwater runoff from parking lots (Baldwin et al. 2016). A recent research study to determine "the distribution and potential health effects of aerially deposited PAHs in soil within the urban core of metropolitan Milwaukee" suggests that aerial deposition is another source of PAHs to urban waterway sediment. The research was conducted at 27 areas in Milwaukee parks that were evaluated as being undisturbed for at least 80 years. The study concluded that "diffuse multiple point source [air] emissions contribute equally to PAH deposition throughout the area" (Siemering and Thiboldeaux 2020). Surface soil (0 to 7 centimeters) sampling locations were chosen specifically to only represent aerial deposition;

concentrations of several individual PAHs in the sampled areas exceed their respective WDNR residual contaminant limits per Wisconsin Administrative Code §NR720 for soil cleanup standards. According to the Recontamination Report, the City of Milwaukee banned coal-tar sealants using a substitute ordinance in 2017, at least in part because of the research study (WDNR 2022a).

The potential for unpermitted discharges or spills exists in urban waterways, especially those with transportation hubs or where significant waste hauling and management activities occur like SMC where significant waste hauling and management activities occur. Potential non-point sources of contamination associated with remediation and/or redevelopment near the SMC are addressed through applicable stormwater and erosion control requirements.

2.5.3 Wisconsin Department of Natural Resources Remediation and Redevelopment Sites

Jacobs used publicly available data from WDNR to identify several types of historical and current industrial facilities. A review of remediation sites adjacent to the SMC on the WDNR BRRTS sites map (WDNR 2021a) identified the presence of multiple historical and current potential sources of metals (for example, arsenic, chromium, and lead), chlorinated and non-chlorinated solvents, and petroleum compounds (for example, gasoline, diesel, and fuel oil) contamination (Figure 2-4).

Table 2-2 lists WDNR BRRTS sites near the SMC. The BRRTS sites are classified as either open or closed environmental remediation project (ERP) or closed leaking underground storage tank (LUST) sites adjacent to the SMC. The potential discharge of contaminated groundwater from nearby sites or from hazardous material spills can represent an additional potential source to the surface water. Impacted media at each of these sites may include soil, groundwater, and/or vapor. WDNR regulates remedial actions and monitoring at ERP and LUST sites. Because of the proximity of the sites to the SMC, each could have contributed historically to the contamination of the SMC sediment.

The WDNR Recontamination Report summarizes completed and planned remedial activities for the Burnham Canal Superfund Alternative Site as described in Section 1.3 (WDNR 2022a). The remedial actions already conducted at the Burnham Canal (removal, several feet of capping, and confirmation sampling) indicate that this area is unlikely to recontaminate other areas to be addressed in the SMC (WDNR 2022a).

2.5.4 Upstream Sites

Upstream pollution sources are not relevant to the SMC as it is a canal that is truncated on the west. However, there may be some inflow into the SMC during periodic seiche events, but this is unlikely to be a significant contributor to contamination in the SMC.

2.6 Contaminant Release Mechanisms and Potential Transport Pathways

Figure 2-1 shows a general depiction of contaminant release mechanisms for the SMC. Permitted and historically unpermitted discharges and overland flow transport particulate and dissolved contaminants directly to surface water. CSOs may occur during large precipitation events. Groundwater impacted by contaminants may upwell through the sediment and discharge to surface water. PCBs, PAHs, and metals in these releases tend to adsorb to fine-grained sediment and organic material and may be incorporated into the sediment. Deposition and accumulation of relatively cleaner sediment over time results in the gradual burial of historical contamination.

The contaminated sediment in the canal bed can be resuspended by currents under high flow conditions, or by propeller wash, keel drag (friction between the keel of a vessel and the sediment surface) or in-water construction activities. Resuspended sediment can be transported and redeposited in downstream areas. Seiche effects may also play a minor role in resuspending contaminated solid particles and redepositing them some distance upstream. Impacted sediment may also release dissolved-phase chemicals into the surface water that is then transported within the project area or from one area to another (for example, from the SMC to the Menomonee River and then to the outer Milwaukee Harbor/Milwaukee Bay).

2.7 Recontamination Potential

The potential for recontamination of the SMC Project Area is considered to be low. Potential recontamination sources include point source discharges, non-point sources, or releases from former industrial or commercial sites. Recontamination potential from sources upstream of SMC is not applicable to this canal setting.

Information included on Figures 2-2A-F and 2-3A-C indicates that surface sediment in the SMC is comparatively less contaminated than the subsurface sediment. The presence of comparatively cleaner sediment at the surface indicates that the contaminant sources have diminished over time.

As discussed in Section 2.5, major reductions in point source activity were achieved by the Clean Water Act and the associated regulation and permitting of outfalls under WPDES. Many of the facilities that once operated with discharges to the canal have either ceased operations or have been demolished. Further, the number and volume of sanitary sewage and CSOs that negatively impact the water quality in the estuary has decreased significantly since 1994; between 1994 and 2021, MMSD has captured and treated more than 98 percent of the stormwater and wastewater entering regional sewer system (MMSD 2022a).

Non-point source runoff may continue to transport COCs to the SMC, but the potential for this is considered to be minimal. This is because the bank and soil erosion sources adjacent to the SMC are minimal, 73 percent of the SMC shorelines are developed and dominated by SSP, and concrete bulkhead walls are in mostly good to excellent condition (see Section 1.3). Recontamination potential from former industrial or commercial sites as identified in Section 2.5.3 is low because of permitted monitoring of point sources and various additional WDNR requirements for investigation and mitigation of these sites. Remediation efforts at historically contaminated sites (for example, the Burnham Canal Superfund Alternative Site) are ongoing. The implemented control measures have succeeded in reducing the amount of contaminant loading from entering the system (WDNR 2022a).

2.8 Potential Receptors

As previously stated, 7 of the 11 BUIs in the Milwaukee Estuary AOC are related to contaminated sediment. The main receptors include benthic invertebrates and higher trophic-level organisms, including fish, some wildlife (piscivorous mammals and birds), and humans (Figure 2-1).

Benthic invertebrates live and feed in direct contact with sediment, pore water, and surface water and the contaminants present in these environmental media. Bottom-dwelling organisms form the base of the aquatic food web and are exposed to impacted sediment through the direct contact and ingestion pathways.

Fish serve as prey to piscivorous birds, mammals, and humans. Fish are exposed to contaminants in surface water via gill exchange and diets that include benthic organisms and smaller fish that feed on benthic organisms. This results in bioaccumulation in fish: fish tissue concentrations increase as smaller species are eaten by larger predatory species over time. Piscivorous birds and mammals are primarily exposed to bioaccumulative chemicals, such as mercury and PCBs in surface water and sediment, via diet when they consume prey (invertebrates and fish) that is in direct contact with such chemicals. Humans are also potential receptors of the contaminants through the consumption of fish or when exposed to contaminants in the water and sediment of the SMC during recreational activities.

3. Remedial Action Objectives and Remediation Target Areas

RAOs are statements that describe the overall goals that remedial action should achieve to provide adequate protection of human health and the environment while meeting regulatory requirements. GLNPO applies the following general RAOs to the remedial actions conducted as part of the GLLA:

- Reduction of exposure to COCs in sediment and pore water
- Reduction of COCs in biota
- Reduction of sediment-related toxicity
- Improvement of biota and biological communities
- Improvement in habitat quality
- Remediation of sediment contamination based on volume, area, and/or mass basis

Screening levels are COC concentrations that are used to develop RTAs that include areas and volumes of media (sediment) targeted for active remediation. After a preferred alternative is recommended, quantitative cleanup goals (CUGs) will be established for the project using site-specific screening levels as a starting point.

3.1 Site-specific Remedial Action Objectives

The site-specific RAOs for the SMC include remedial goals to improve environmental quality in the portion of the AOC where the project is located, and to support removing BUIs and delisting the AOC. Because the SMC is a tributary to the Menomonee River and the BUIs associated with contaminated sediment are identical for both areas, the RAOs for SMC are similar to those developed for the Menomonee and Milwaukee Rivers FFS (CH2M 2019a). In addition, both the Menomonee River and the SMC have currently authorized FNC status although deauthorization has been discussed for both areas (Anchor QEA 2021b).

The following site-specific RAOs have been established for the SMC:

- Support removal of BUIs within the Milwaukee Estuary AOC by reducing the mass, volumes, and concentrations of COCs in the sediment. This will be achieved by addressing sediment with COCs exceeding the CUGs, thereby reducing exposure and risk to ecological and human receptors. The remediation of contaminated sediment in the project area will make progress towards eliminating the following sediment-related BUIs:
  - Restrictions on fish and wildlife consumption
  - Degradation of fish and wildlife populations
  - Fish tumors or other deformities
  - Bird or animal deformities or reproduction problems
  - Degradation of benthos
  - Restrictions on dredging activities
  - Loss of fish and wildlife habitat

  Evaluation of the pre- and post-remediation status for these listed BUIs will be included in RAP Updates for the Milwaukee Estuary AOC completed outside of this project.
- Reduce risks to human health and the environment from exposure to COCs in sediment. This will largely be accomplished by supporting the removal of BUIs through remediation of sediment with COC concentrations above the CUGs.
- Maintain depth requirements within the authorized FNC portions of the SMC.

3.2 Screening Levels and Remediation Target Areas

Sediment screening levels were selected in consultation with EPA and WDNR with the goal of consistent application across the various sediment project areas within the Milwaukee Estuary AOC (Menomonee River, Milwaukee River Downtown Reach, SMC, Kinnickinnic River, and Milwaukee Bay). Screening levels for total PAHs and metals (chromium, lead, and mercury) are based on PECs defined in the WDNR's CBSQG (WDNR 2003), as well as values based on 3 times the PECs. Screening levels for total PCBs are 1 mg/kg and 3 mg/kg.

RTAs were developed using three different screening level scenarios to provide flexibility in developing remedial alternatives for the SMC and to facilitate planning for the overall Milwaukee Estuary AOC. The three screening level scenarios are based on EPA and project partner agreement as follows:

- PECs for PAHs and metals and 1 mg/kg PCBs
- 3 times PECs for PAHs and metals and 1 mg/kg PCBs
- 3 times PECs for PAHs and metals and 3 mg/kg PCBs

The RTAs for the three screening level scenarios are presented on Figures 3-1 through 3-3. The RTAs for each scenario were developed using the computer application Earth Volumetric Studio (EVS) v2021.12.2 by CTech. The software uses advanced volumetric gridding, geostatistical analysis, and visualization tools with integrated graphical user interfaces and modular analysis to model and visualize chemical, geological, and physical data. EVS' integrated geostatistical tools provide quantitative evaluation of input data and allow for model outputs to be used in other programs such as geographic information systems (GIS) or AutoCAD (CAD) for data presentation and estimation of quantities for remedial action.

Sediment sample data sets used for the EVS modeling include:

- 2015 and 2017 site investigation sampling performed by CH2M HILL on behalf of GLNPO (CH2M 2019a)
- 2019 and 2020 site investigation sampling performed by Anchor QEA on behalf of WDNR (Anchor QEA 2021b)
- 2021 data gap sampling performed by Anchor QEA on behalf of WDNR (Anchor QEA 2021a)

Physical data including river boundary, sediment surface elevation, and interpolated native material surface elevation were used to define the lateral and vertical extents of the model domain. The lateral extents of the model represent the project area extent as digitized from aerial imagery. The most recent (2020) bathymetric survey was used to represent the top model surface. Native material elevations were obtained from sediment boring logs, input into GIS, and kriged using the "Topo to Raster" tool to develop the bottom model surface representative of native material.

The horizontal and vertical distribution of COC concentrations was evaluated by interpolating analytical data using geostatistical three-dimensional (3D) kriging in EVS. The model analyzes the spatial distribution and number of field data points, constructs a multidimensional variogram which is a best fit to the data set being analyzed, and then performs kriging in the model domain.

An iterative process was used to calibrate the model results to ensure that each model honored the input data set used to generate the model. Each COC data set was kriged at each of the respective screening levels. The kriging for each COC was performed individually and then model results were combined in EVS to produce a 3D model shape with screening level exceedances for each of the three screening level scenarios. Each of the 3D model shape outputs for each COC at each respective screening level was reviewed visually to verify appropriate inclusion of sample points within the 3D model output. Each 3D model shape output was then reviewed to confirm whether it accurately interpolated between sample points and sufficiently extended horizontally and vertically. If these conditions were not met, this process was repeated for several iterations using different grid, data processing, and kriging settings to select the optimal model settings to best fit the analytical data.

Following the development of the 3D model shape outputs for each COC, the applicable outputs were then merged to create a combined COC 3D model shape (PCBs, metals, and PAHs) representing each remedial alternative that was then imported into MicroStation V8i PowerGEOPAK Select Series10 CAD software for further processing. The additional processing performed within CAD included accounting for the effects of dredge offsets adjacent to the shoreline and bridge piers (assumed to be 10 feet) and utility crossings (assumed to be 15 feet[8]). A typical side slope of 3:1 was also applied to all dredging areas from the top of sediment elevation at the offset to the target dredge elevation. Following implementation of dredge offsets and side slopes, an overdredge allowance of 0.5 foot was implemented to accommodate for variability in sediment removal by dredging. The CAD-modified 3D shapefile with offsets, side slopes, and overdredge allowance accounted for was then used to estimate the volume of sediment that would require dredging, and to identify contaminated sediment areas that may require in-place management because of requisite shoreline offsets and side slopes.

The estimated contaminated sediment volumes associated with each modeled scenario are summarized in Table 3-1. Note that the remediation removal volume estimated quantities are based on modeled results of screening level exceedances with modifications as previously described; however, actual dredge volumes may change during the remedial design phase of the project because of additional information and engineering considerations pertaining to shorelines, in-water structures, and utilities. In addition, the IGLD 1985 is in the process of being revised and will be replaced by IGLD 2020 (NOAA 2022). As part of this process, the LWD and authorized elevation for the FNC may also be revised, with current proposals indicating a lowering by 1 foot (NOAA 2022). The changes to the IGLD and the LWD are anticipated to be implemented by 2027. Any changes to the dredging elevations and volumes for FNC in the SMC in response to the IGLD update will be incorporated during the remedial design.

It should be noted that the Table 3-1 quantities were updated after the RAETM for the SMC (Jacobs 2023a) because remedial Alternative 3A quantities were refined to incorporate a maximum dredge elevation as described in Sections 4 and 5.

[8] The use of 15-foot setbacks for utilities is a standard industry practice for this stage in a project. The setback requirements will be further refined during remedial design.

4. Remedial Technology Screening and Conceptual Alternatives Development

This section describes the identification and screening of potentially applicable remedial technologies and process options based on the RAOs and RTAs for the SMC, and introduces the concepts used for identifying conceptual remedial alternatives.

4.1 Remedial Technology Screening

The technologies and process options identified for screening are presented in Table 4-1. The objective of technology screening is to retain the best technology types and process options and streamline the development and evaluation of remedial alternatives. There are multiple process options associated with some of the technologies included in the table. The remedial technologies were evaluated using the qualitative screening criteria of effectiveness, implementability, and relative cost.[9] The last column in Table 4-1 provides a summary screening comment for each remedial technology and process option.

Each technology screening criterion considered the following:

- **Effectiveness:** Key considerations include:
  - The extent the technology and/or process option would be protective of human health and the environment and meet the RAOs.
  - The level of treatment and removal that could be achieved.
  - The extent to which the technology and process option has been demonstrated at similar sites.

  Protection of human health and the environment refers to the effectiveness of the technology in reducing the toxicity and mobility of contaminants in the sediment or in meeting RAOs. Level of treatment and removal refers to the degree to which the technology reduces contaminant mass.
- **Implementability:** Refers to the feasibility and/or availability of a given process option for this project area. Feasibility is further assessed based on technical and/or administrative considerations. Technical feasibility refers to the ability to adequately treat and remove the COCs given site-specific conditions. Certain options may be able to address the COCs but cannot be implemented because of factors like space limitations or unacceptable subsurface conditions. Administrative feasibility refers to the ability to meet factors such as local and state permitting requirements or regulatory reviews for approval. Potential permit requirements are listed in Appendix C of this document. Availability refers to factors such as the geographic location of the site and the extent to which the remedial option is commercially available.
- **Relative Costs:** Table 4-1 presents relative differences in cost magnitude (low, moderate, or high) taking into consideration anticipated capital and operations and maintenance costs. As such, cost considerations are provided for general assessment and were not used singly for technology screening decisions unless substantial cost differences are identified that would immediately preclude further consideration.

[9] These evaluation criteria are used for the technology screen only; additional evaluation criteria are used in Section 6 to evaluate the conceptual remedial alternatives.

Based on the evaluations performed for the SMC and WDNR's disposal alternatives evaluation (WDNR 2020a), the following technologies were retained for further evaluation as components of remedial alternatives as summarized in Table 4-1:

- No Action (required and retained for comparison to other technologies)
- Sediment Removal
- Residuals Management
- Sediment Disposal
- Sediment Dewatering
- Sediment Containment
- In Situ Treatment
- Ex Situ Treatment

4.2 Conceptual Remedial Alternatives

The conceptual remedial alternatives were developed using a common set of technologies, and they primarily differ from each other with respect to the screening levels used to establish the RTAs. Within each RTA, sediment that can be feasibly removed will be dredged and isolation or stabilization technologies will be applied to the sediment with COC concentrations exceeding CUGs that remain in place. The extent and characteristics of the material that remains in place after dredging is different for each screening level scenario.

Alternative 3A was developed based on discussions with project partners because of concerns about AOC-wide estimated dredge volumes exceeding the DMMF capacity. Alternative 3A was developed to provide a sub-alternative that reduces dredge volume by establishing a maximum sediment removal elevation throughout the project area. Similar sub-alternatives were not developed for Alternatives 2 or 4 because the sediment removal volume associated with Alternative 2 exceeds DMMF capacity when factoring in the removal quantities for the remaining AOC project areas, and the PCB screening level for Alternative 4 exceeded an acceptable level of protectiveness.

The alternatives that were further developed and evaluated are shown in Exhibit 4-1.

Exhibit 4-1. Conceptual Remedial Alternatives for the South Menomonee Canal Project Area

Alternative	Alternative Description
1	No Action
2	Remediate sediment with COC concentrations greater than the PECs for total PAHs or metals or greater than 1 mg/kg total PCBs: dredge (estimated total dredgeable volume of 125,000 CY) and cap the sediment that cannot be removed (estimated 11 acres)
3	Remediate sediment with COC concentrations greater than the 3 times PECs for total PAHs or metals or greater than 1 mg/kg total PCBs: dredge (estimated total dredgeable volume of 98,000 CY) and cap the sediment that cannot be removed (estimated 9 acres)
3A	Remediate sediment with the same COC concentrations as Alternative 3 above a maximum dredge elevation of 552.5 feet NAVD88: dredge (estimated total dredgeable volume of 73,000 CY) and cap the sediment that cannot be removed (estimated 12 acres)
4	Remediate sediment with COC concentrations greater than the 3 times PECs for total PAHs or metals or greater than 3 mg/kg total PCBs: dredge (estimated total dredgeable volume of 58,000 CY) and cap the sediment that cannot be removed (estimated 5 acres)

Two-dimensional representations of the RTAs for each of these alternatives (except for No Action) are presented on Figures 3-1 through 3-3, respectively. Details regarding the associated RTA volumes and the estimated volumes that are accessible are provided in Table 3-1. The estimated removal volumes and areas account for areas where dredging extent will be limited by setback and side slope requirements. Additional aspects of the remediation that were addressed during alternatives development and evaluation are:

- Considerations for sediment with COC concentrations above screening levels remaining within the area of the shoreline offsets and side slopes that cannot be removed without additional analysis of structural stability or installation of additional supporting structure(s) to assure the remedy is protective and safe to implement.
- The remedy for the FNC (approximately 4,570 lineal feet) within the SMC Project Area cannot interfere with navigation; it is assumed that USACE will require at least 3 feet of clearance below the authorized FNC elevation to the final remediation surface based on previous communications during development of alternatives for the Menomonee River (CH2M 2019a). To achieve the USACE required 3 feet of clearance it is assumed that sediment removal will be required to 3.5 to 4.5 feet below the FNC elevation for the application of sand cover (3.5 feet) or cap (4.5 feet) based on the following:
  - 1 foot of overdredge allowance beyond the authorized depth
  - 2 feet of clearance from the final remediation surface per USACE recommendations for navigation channels
  - 0.5 to 1.5 foot of depth for the application of the residual sand cover or cap, respectively

Additional detail regarding the remedial alternatives is provided in Section 5.

5. Remedial Alternatives Description

The remedial technologies and process options that remain after screening (see Table 4-1) are incorporated into the following remedial alternatives: Alternative 1 (No Action) and Alternatives 2, 3, 3A, and 4, which are shown in map view on Figures 5-1 through 5-4, respectively. The figures include the locations of bridges and utility corridors, areas identified for shoreline stabilization, dredging extents and the cap extents for Alternatives 2 through 4. Figure 5-5 shows example profiles for sediment removal and sediment cap and cover placement.

Dredging in the SMC is constrained by various site conditions, including the bulkhead walls, bridges, utility crossings, and other infrastructure elements. Remedial design for removal of contaminated sediment adjacent to these in-water structures and utilities will require additional information and engineering considerations to address structural stability during and following the remedial action. Other technologies (for example, capping) likely will be needed to manage the material remaining in place in these areas.

Documentation of shoreline construction types and respective qualitative conditions are included in the *As-built Shoreline Bulkhead Structure and Utility Review for the Downtown and South Menomonee Canal Reaches* (Jacobs 2021c) and in the Final *South Menomonee Canal Shoreline Assessment Technical Memorandum* (Jacobs 2021b). The shoreline assessment included visual observation of above-water natural or constructed shoreline materials and qualitative notation of structural conditions, critical structures, utility crossings, and sewer outfalls; however, it does not provide structural evaluations related to performing construction activities adjacent to the existing bulkhead system or in-water structures.

Available records associated with constructed bulkhead details (such as construction material types and specifications, construction dates, and an assigned “condition” on the observation date) were provided by the City of Milwaukee. Information was provided for 6 of the 14 SMC parcels (42 percent). Records for all six SMC parcels included information about design aspects for bulkhead stability analysis, but most of the plans did not address the full length of the bulkhead within the parcel. Design information is available for approximately 2,800 feet of bulkheads (22 percent of the total SMC bulkhead length). None of the data included geotechnical or subsurface information. The quantity and quality of data provided for the SMC limits the understanding of current bulkhead conditions.

The lack of high-quality bulkhead data is a limiting factor for optimizing sediment removal design, resulting in an assumption at the FFS stage for extensive capping of offsets from bulkheaded shorelines (10 feet), utilities (15 feet), and associated side slopes to the depth of removal. Capping will be required unless engineering evaluations can be performed as part of the remedial design. Guidance on post-capping best practices will be developed as part of the remedial design. Preventing bulkhead movement during proposed sediment removal is a critical factor for the success of the project and should be continually discussed with all stakeholders during each phase of the project. These discussions should consider the impact of bulkhead movement on existing facilities, methods of mitigating the anticipated bulkhead movement during construction, sequencing of dredging operations, and imposing limits on the vertical and horizontal extent of sediment removal and possible replacement of dredged material with aggregate.

Capping could be employed in non-navigational areas where sediment cannot be removed because of existing structures or below the required clearance depth in the authorized FNC. Capping is effective in rapidly decreasing COC concentrations in the surface sediment. In situ stabilization could be considered for treating sediment adjacent to bulkheads where shoreline stability is a concern and additional structural stability of the shoreline is desired. Natural recovery processes such as sediment deposition and accumulation may continue to reduce surface sediment COC concentrations in areas not targeted for active remediation.

WDNR's cost analysis of dredging and disposal of dredged material into the planned DMMF indicated preferred technologies for various sediment removal and disposal projects within the Milwaukee Estuary AOC (WDNR 2020). The analysis indicated hydraulic dredging with DMMF disposal is the most cost-effective alternative. WDNR performed an alternatives analysis to evaluate costs associated with the disposal of impacted sediment from the Milwaukee Estuary AOC at an existing landfill versus disposal at the DMMF (WDNR 2020). The analysis showed that construction and operation of the DMMF is the most cost-effective disposal alternative compared to landfill disposal. The planned DMMF is located in the Milwaukee Bay Project Area, approximately 2.3 miles from the downstream end of the SMC (Figure 1-1). Design, permitting, and construction of the DMMF is ongoing by project partners including the MMSD, City of Milwaukee, Port of Milwaukee, WDNR, and We Energies with anticipated DMMF construction starting in late 2023 or early 2024 (MMSD 2022b). The DMMF is anticipated to be owned and operated by the Port of Milwaukee (Foth 2018).

Table 5-1 summarizes the estimated quantities for sediment removal, residual cover, capping, shoreline and utility reinforcement, and water treatment for the alternatives described in the sections that follow. The details and assumptions for each alternative are the basis for the cost estimates that are provided in Appendix D. Additional specificity for each element (for example, means and methods, equipment sizes and numbers, and production rates) will be developed during the remedial design. Additional process options may be evaluated during remedial design.

5.1 Alternative 1: No Action

The No Action alternative is included in the alternatives for comparison purposes. Under Alternative 1, no remedial actions are conducted to control exposure to contaminated sediment. Existing fish consumption advisories likely remain in place and BUIs are not addressed through sediment remediation. Natural degradation of contaminants is not likely to occur at a measurable rate or within a reasonable time period, although contaminated sediment may be gradually buried over time by deposition of sediment at urban background concentrations.

5.2 Alternative 2

Alternative 2 addresses sediment with COC concentrations greater than the PECs for total PAHs or metals (chromium, lead, mercury) or greater than 1 mg/kg for total PCBs. Alternative 2 assumes the lowest cleanup concentrations of the three alternatives and therefore has the largest removal area, removal volume, and capped area (Figure 5-1 and Table 5-1). Alternative 2 has an RTA of 21 acres with an estimated sediment removal volume of 125,000 CY, of which 59,000 CY will be hydraulically dredged and 66,000 CY will be mechanically dredged. Dredged sediment will be transported by pipeline to the DMMF. An estimated 97,000 CY of sediment[10] with COC concentrations exceeding the CUGs across approximately 11 acres will be capped near bridges, utility crossings, and shoreline structures. The in-water work during remedial action is estimated to take approximately 5 months.

[10] Modeled volume (222,000 CY) minus removal volume (125,000 CY) (Table 3-1).

5.2.1 Sediment Removal

Sediment with COC concentrations that exceed CUGs will be removed wherever possible. Sediment removal will be accomplished using both hydraulic and mechanical methods. The staging area(s) to be used for processing debris and staging cap and cover material will be identified during remedial design, with the goal of locating the staging area as near as possible to the work area(s). Figure 5-5 shows conceptual dredge plans for sediment removal and post-dredge cap or cover placement across the canal. The need for scour protection will be determined during remedial design.

5.2.1.1 Hydraulic Dredging

It is assumed that hydraulic dredging will be used wherever possible to remove the SMC sediment because it is expected to:

- Be more efficient and cost effective in the SMC than mechanical dredging
- Minimize turbidity during the dredging process
- Reduce impacts to dredging operations because of bridge openings
- Reduce impacts to commercial and recreational vessel traffic

Sediment is loosened by a hydraulic cutter and removed by suction along with adjacent water into a leak-tight, high-density polyethylene pipeline; the sediment slurry is then pumped through the pipeline directly to the DMMF. Sediment removal using hydraulic dredging methods at sites with similar physical characteristics is typically conducted using an 8- to 14-inch swinging ladder cutter suction dredge to remove the sediment to the specified depths. However, additional specialty hydraulic dredge options are available without cutterheads such as plain suction, pneumatic submersible pumps, and diver-assisted hand-held hydraulic suction, which may be used in more sensitive areas near critical structures like utilities.

The depth attainable with the hydraulic dredge depends on several factors including the size of the ladder, lift cylinder, width of the hull, and length of the hull. An operational evaluation was completed to determine the optimal cutter suction dredge or combination thereof. The evaluation considered depth of water within the SMC, depth of sediment removal, production rates, and the volume of water generated. A combination of an 8-inch, 12-inch, and 14-inch diameter cutter suction dredges is deemed to be most cost effective for this project area.

Approximately 18,000 lineal feet of pipeline for each dredge will be required for Alternative 2 hydraulic pumping operations, starting at the western extent of removal in the SMC and ending at the DMMF, including an estimated six pumping booster stations. As the work progresses from upstream to downstream, the pipeline will be shortened, and booster pump stations relocated as required.

Turbidity control, such as a silt or bubble curtain, may be implemented to prevent migration of suspended sediment. Continuous upstream and downstream turbidity monitoring may be required during dredging.

5.2.1.1 Mechanical Dredging

For mechanical dredging, a crane or excavator is placed on a floating barge. An environmental bucket that minimizes the loss of sediment and entrained water is used to remove sediment to the specified dredge cut elevation. The dredged material is placed in a scow for transport to the upland staging area. Turbidity controls and turbidity monitoring are used to minimize transport of resuspended sediment away from the project area.

Mechanical dredging will be used to remove sediment that cannot be readily accessed with the hydraulic dredge due to the depth limitations of the hydraulic dredge relative to the surface water elevation at the time of dredging. Approximately 66,000 CY of sediment is deeper than -30 feet LWD and is assumed to require mechanical dredge removal. Sediment removed by mechanical dredging can be transported to an upland staging area for screening or screened at the dredge barge prior to being slurried and pumped to the DMMF.

5.2.2 Residuals Management - Sand Cover

In areas where the full vertical extent of contamination above the CUGs is removed, a 0.5-foot-thick residual sand cover is placed on the post-dredge surface (Figure 5-5). Clean sand is used to reduce the mobility of dredging residuals and lower residual COC concentrations in post-dredge surface sediment. The sand cover may also accelerate re-establishment of benthic communities disrupted during the dredging activities. Sand placement methods will be selected to provide a controlled application by either casting or directly placing the sand to avoid displacement or significant penetration into the underlying sediment. Means to verify the final thickness of the residual sand cover will be specified in the remedial design documents.

Approximately 12,000 CY of sand (assuming an average placement thickness of 0.75 feet to achieve a minimum 0.5-foot cover thickness) will be needed to provide residual cover over the post-dredge surface of approximately 10 acres. It is assumed that the sand will be obtained at an offsite source, but particle size segregation and washing, if determined to be feasible from treatability study results, may also provide an opportunity for beneficially reusing the coarse fraction of dredged material for residual cover.

The final elevation of the cover will not exceed the USACE requirements for working in the FNC or the pre-dredge sediment elevations, so there will be no net decrease in the cross-sectional flow area of the river. Therefore, cover placement will not negatively impact susceptibility to flooding or reduce conveyance within the canal.

5.2.3 Sediment Transport, Dewatering, and Disposal

All hydraulically- and mechanically-dredged sediment will be pumped downstream in a pipeline for management and disposal at the DMMF. The pipeline will be submerged in the water in some areas to minimize navigational disruption to the waterways. The hydraulic pipeline will be monitored during pumping to assure rapid and appropriate repairs of leaks or other malfunctions. The pipeline will surface at booster pumps located on barges and at the DMMF.

The hydraulically dredged sediment, which typically contains up to 90 percent water by weight, will be passively dewatered by settling and evaporation within the DMMF. The sediment may be treated with an appropriate dose of coagulant, flocculant, or combination thereof to aid suspended sediment sedimentation rates. Chemical dosing will be determined based on the results of a sediment treatability study.

A temporary water treatment system will be constructed near the DMMF for the treatment of supernatant water from the DMMF before discharge to Lake Michigan under a WPDES permit. The treatment process required to meet the WPDES permit requirements will be developed during the treatability study and remedial design but are expected to consist of an ultra-high capacity clarifier, metals precipitation, sand filters, bag filters, and granular activated carbon treatment system.

It is assumed that the DMMF will be designed to provide sufficient settling time for hydraulically pumped sediment. The minimum residence time required will be finalized based on the results of the treatability study.

Excess free water generated from mechanical dredging will be pumped from the scows to temporary storage tanks. Free water from gravity drainage, decontamination activities, and storm events at the upland staging area also will be collected and pumped to the temporary storage tanks.

5.2.4 Particle Size Segregation and Washing

If feasible, particle size segregation for sediment removed during dredging operations may be considered for the SMC Project Area. Grain size data indicate that sediment in the SMC Project Area contains a minimal amount of sand (average of 17 percent sand by weight for all samples collected in the project area) that may be suitable for beneficial reuse as sand cover within the Milwaukee Estuary AOC or for other purposes. Vibrating screens, hydrocyclones, and wash bars would be used to separate sand from the fine-grained fraction, allowing disposal of only fine-grained material with higher COC concentrations in the DMMF.

Particle size segregation and washing would require water as part of the process. Reusing the treated water for washing purposes reduces the need for handling and treatment of additional water at the DMMF. The benefits of reusing sand as cover material may outweigh the disadvantages of acquiring and transporting large volumes of sand. An additional benefit of reusing the coarser fraction of dredged sediment is a reduction in the amount of material that requires DMMF disposal, thereby reducing DMMF capacity requirements.

The feasibility and cost effectiveness of particle size segregation will be further investigated as part of the 2023 treatability study and during the remedial design. Washing and testing will be performed to confirm that chemical concentrations of the segregated sand meet project requirements for reuse. For the purposes of the FFS, it is conservatively assumed that particle size segregation will not be feasible, and all hydraulically-pumped sediment will be placed in the DMMF.

5.2.5 Sediment Containment - Cap

Sediment capping will be implemented in areas where contaminated sediment cannot be feasibly dredged (see Section 5.2.1). Caps will be designed to isolate the underlying contaminated sediment and resist erosion from river flows and propeller wash. The conceptual cap profile shown in Figure 5-5 represents an area that requires no shoreline stabilization. The dredging extents are offset 10 feet from the shoreline and assume dredging at 3:1 side slopes. Caps would be placed in the 10-foot offset zones and on the side slopes to isolate contaminated sediment that cannot be feasibly dredged.

Institutional controls may be employed in conjunction with caps; these may include navigational, anchoring or future dredging restrictions. Such controls minimize the potential for cap disturbance and exposure of underlying sediment contamination. The material specifications, thicknesses, and placement methods will be determined during the remedial design. It is estimated that 31,000 CY of cap (18 inches of thickness assumed) across 11 acres will be required to cover sediment left in place adjacent to bulkheaded shorelines and utility corridors, in stabilized or reinforced shoreline areas, and beneath dredged side slopes. Institutional controls and long-term monitoring and maintenance requirements for caps will be discussed further with project partners during remedial design.

5.2.6 Confirmation Sampling and Other Verification Activities

Post-dredging sediment confirmation sampling is anticipated to be required in areas not designated for capping. Results of confirmation sampling will be used to assess the success of dredging in reducing COC concentrations below CUGs in accordance with the post-dredge management plan developed during design. The final thicknesses of the residual sand cover and caps will be verified using sampling methods such as coring or collection pan testing. A post-remediation bathymetric survey also will be performed to confirm final post-remediation elevations. The specific confirmation sampling and verification approaches will be documented in the appropriate remedial design document, such as a Construction Quality Assurance/Construction Quality Control plan and the associated field sampling plans.

5.2.7 Debris Removal and Disposal

The types and amount of debris in the SMC have not been quantified; however, a significant amount of debris may be present because of historical waterfront uses and the urban setting. Side-scan sonar and magnetometer surveys will be conducted during remedial design to quantify and locate large debris that will require removal. Debris will be removed using mechanical means. The size of debris that can be removed will be limited by the lift capacity of the mechanical equipment that the contractor has onsite. Additional costs to the project will be incurred if the contractor is required to mobilize additional larger equipment or perform diver-assisted removal. For the purposes of estimating disposal volumes and costs, it is assumed that debris will be transported to and disposed of in the DMMF. Debris management and disposal, including identification of potential recycling opportunities, will be addressed further in remedial design.

5.3 Alternative 3

Alternative 3 addresses sediment with COC concentrations greater than 3 times the PECs for total PAHs or metals (chromium, lead, mercury) or greater than 1 mg/kg for total PCBs. Alternative 3 (Figure 5-2) has the mid-sized RTA of 17 acres as compared to Alternatives 2 and 4. Remedial activities for Alternative 3, including dredge offsets and 3:1 side slopes, are identical to those described for Alternative 2, except the quantities are different as summarized in Table 5-1. The sediment removal volume is 98,000 CY. Sediment removal deeper than -30 feet LWD is not required for Alternative 3. An estimated 71,000 CY of sediment[11] with COC concentrations exceeding the CUGs across approximately 9 acres will be capped near bridges, utility crossings and shoreline structures. Alternative 3 in-water remedial action work is assumed to take approximately 4 months (1 month less than the Alternative 2 estimate).

5.4 Alternative 3A

Alternative 3A addresses sediment as described in Alternative 3, with the addition of implementing a maximum sediment removal elevation of 552.5 feet NAVD88 (4.5 feet below the authorized FNC elevation). The deeper sediment with COC concentrations exceeding CUGs will be capped. The Alternative 3A RTA (Figure 5-3) is identical to Alternative 3 RTA (Figure 5-2); however, the removal volume is lower. Remedial activities for Alternative 3A are identical to those described for the other alternatives, except for implementation of the maximum removal elevation. The RTA for Alternative 3A covers 17 acres with a removal volume of 73,000 CY (25,000 lower compared to Alternative 3). An estimated 96,000 CY of sediment[12] across approximately 12 acres will be capped near bridges, utility crossings and shoreline structures (25,000 fewer CY and 3 acres more than Alternative 3). Sediment removal deeper than -30 feet LWD is not required for Alternative 3A. In-water remedial action work is assumed to take approximately 4 months.

As noted in Section 3.2, the IGLD is in the process of being revised, likely resulting in the LWD and FNC being lowered by 1 foot, but not until 2027 (USACE 2022). A lowering of the FNC by 1 foot would

[11] Modeled volume (169,000 CY) minus removal volume (98,000 CY) (Table 3-1).
[12] Modeled volume (169,000 CY) minus removal volume (73,000 CY) (Table 3-1).

potentially result in additional volume to be removed for Alternative 3A; changes to the dredging elevations and volumes in response to the IGLD update will be incorporated during the remedial design.

5.5 Alternative 4

Alternative 4 addresses sediment with COC concentrations greater than 3 times the PECs for total PAHs or metals (chromium, lead, mercury) or greater than 3 mg/kg for total PCBs. Alternative 4 has the smallest RTA (10 acres) (Figure 5-4) compared to Alternatives 2, 3, and 3A. Remedial activities for Alternative 4 are identical to those described for Alternative 2, except the quantities are different as summarized in Table 5-1. The estimated sediment removal volume is 58,000 CY. Sediment removal deeper than 30 feet below LWD is not required for Alternative 4. Approximately 32,000 CY of sediment[13] with COC concentrations exceeding the CUGs and located across approximately 5 acres will be capped near bridges, utility crossings and shoreline structures. In-water remedial action work is assumed to take approximately 3 months (versus 4 months for Alternatives 3 and 3A and 5 months for Alternative 2).

[13] Modeled volume (90,000 CY) minus removal volume (58,000 CY) (Table 3-1).

6. Detailed Analysis of Alternatives

6.1 Evaluation Criteria

The remedial alternatives developed in Section 5 were evaluated using the criteria described herein to support selection of a recommended remedy. The criteria provide the basis for comparing expected alternative performance and are used to identify the advantages and disadvantages of each alternative and trade-offs between alternatives. The evaluation criteria consider both EPA's nine criteria for evaluating remedial alternatives in feasibility studies[14] and WDNR's evaluation criteria for selecting remedial actions.[15] The criteria are divided into three groups: threshold, balancing, and modifying criteria, summarized as follows:

- **Threshold Criteria**
  - Compliance with environmental laws and standards
- **Balancing Criteria**
  - Long-term effectiveness
  - Short-term effectiveness
  - Implementability
  - Restoration time frame
  - Cost
- **Modifying Criteria**
  - Project partner acceptance

6.1.1 Threshold Criteria

Threshold criteria must be met by an alternative for it to be eligible for selection as a remedial action. The single threshold criterion is compliance with environmental laws and standards. To be eligible for selection, an alternative must meet applicable federal, state, and local regulations, or justification must be provided that a waiver is appropriate.

Compliance with applicable federal, state, and local regulations is one of the statutory requirements of remedy selection. Applicable regulations are cleanup standards, standards of control, and other substantive environmental statutes or regulations. Applicable requirements address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a site. The assessment of this criterion describes how the alternative complies with applicable federal, state, and local regulations or presents the rationale for waiving an applicable requirement. The identification of potentially applicable regulations and associated permits relative to the remedial alternatives is summarized in Appendix C.

6.1.2 Balancing Criteria

Unlike the threshold criteria, the balancing criteria weigh the trade-offs between alternatives. A low rating for one balancing criterion can be compensated for by a high rating for another criterion. The five

[14] 40 Code of Federal Regulation § 300.430 (e)(9)(iii)
[15] WDNR Chapter NR 722.07(4) and NR 722.09 (2)

balancing criteria described in the following subsections are used to identify the advantages and disadvantages of each alternative and weigh the trade-offs between alternatives.

6.1.2.1 Long-term Effectiveness

This criterion considers the degree to which an alternative will protect human health and the environment over time. Long-term effectiveness considers the ability of the alternative to achieve RAOs and contribute to BUI removal. It includes evaluation of the amount of residual contamination anticipated to be left in place, the adequacy and reliability of long-term controls in preventing exposure to any residual contamination that is left in place, and the potential for recontamination following the remedial action. Long-term effectiveness also evaluates the expected performance of the alternative in response to extreme storm events and climate change.

6.1.2.2 Short-term Effectiveness

The short-term effectiveness criterion assesses potential adverse impacts on public health, safety, welfare, and the environment during the construction and implementation of the alternative. It considers protection of workers during the remedial action, protection of community during the remedial action, and environmental impacts of the remedial action. It also considers the time until the RAOs are achieved.

6.1.2.3 Implementability

This criterion considers both technical and administrative feasibility of the alternative. The technical feasibility evaluation considers the ease of implementation, reliability, constructability, availability of goods and services needed for its implementation materials, and identifies potential difficulties and constraints associated with onsite construction or offsite disposal and treatment. The administrative feasibility evaluation considers the activities and time needed to obtain necessary licenses, permits or approvals, the need for institutional controls, and degree of coordination with other agencies.

6.1.2.4 Restoration Time Frame

The restoration time frame criterion considers the time required to restore trees, vegetation, and habitat that was cleared or disturbed to access work areas and conduct the remedial action.

6.1.2.5 Cost

Cost encompasses the design, engineering, construction, and operations and maintenance costs incurred over the life of the project. The assessment of this criterion is based on the estimated capital costs, annual operations and maintenance costs, and total present worth of the costs for each alternative. Present worth is a method of evaluating expenditures that occur over different lengths of time. This allows costs for remedial alternatives to be compared by discounting the costs to the year in which the alternative is implemented. The present worth of a project represents the amount of money, which if invested in the initial year of the remedy and disbursed as needed, would be sufficient to cover the costs associated with the remedial action. These estimated costs are expected to provide an accuracy of plus 50 percent to minus 30 percent. Appendix D provides a breakdown of the cost estimate for each alternative that is described in Section 5.

The cost range applies only to the alternatives as they are described and does not account for changes in the scope of the alternatives. Selection of specific technologies or processes to configure remedial alternatives is intended not to limit flexibility during remedial design but to provide a basis for preparing cost estimates. The specific details of the remedial actions and cost estimates are refined during the remedial design.

6.1.3 Modifying Criterion

The modifying criterion is project partner acceptance. This criterion will be evaluated after the project partners have reviewed and provided comments on the remedial alternatives and associated individual and comparative alternative analyses. Project partner acceptance will be considered when selecting the recommended alternative, which will be presented in the FFS Report.

6.2 Alternatives Analysis

Alternatives 1 through 4 were evaluated using the threshold and balancing evaluation criteria. Evaluation results for each criterion are summarized in Table 6-1. The differences in alternatives arise from differences in the CUGs and associated areas and volumes of each RTA, rather than from different remediation approaches. Key findings of the alternatives analysis are as follows:

- Alternatives 2, 3, 3A, and 4 can be designed to comply with applicable federal, state, and local regulations, and therefore meet the threshold criterion.
- Alternative 2 has the greatest long-term effectiveness because it is based on the most conservative (lowest) set of CUGs. It results in the greatest reduction of mass, volume, and concentration of COCs in sediment and leaves the least contamination in place compared to Alternatives 3, 3A and 4.
- Alternative 4 has the greatest short-term effectiveness because the remedy would impact the smallest area and take the shortest timeframe to complete. However, because identical remedial action elements must be completed for Alternatives 2, 3, 3A, and 4, the remedy implementation timeframe does not vary much between alternatives. It is estimated that Alternative 4 will require one less month to complete compared to Alternative 3 and 3A, and two less months to complete compared to Alternative 2. Short-term effectiveness does not apply to Alternative 1.
- Alternative 4 is the most implementable from a technical standpoint because it requires the least amount of DMMF capacity. Alternatives 2 and 3 may not be implementable because of DMMF capacity constraints. Alternative 3A was developed to reduce the dredge volume and improve implementability of an alternative that has the same CUGs as Alternative 3. All of the alternatives (except Alternative 1) include capping and therefore will require agency coordination and approval; Alternative 4 has the smallest cap area (5 acres) and Alternative 3A has the greatest cap area (12 acres). The other construction, implementation, and administrative challenges are similar for Alternatives 2, 3, 3A, and 4.
- The restoration time frames are similar for Alternatives 2, 3, 3A, and 4.
- Alternative 4 has the lowest estimated cost ($18.7M). Alternatives 3A, 3, and 2 are progressively more costly ($24.1M, $25.5M, and $33.4M, respectively).

7. Recommended Alternative

The project partners have identified Alternative 3A as the recommended alternative for the SMC Project Area. Alternative 3A addresses sediment with COC concentrations exceeding CUGs (3 times PECs for PAHs and metals and 1 mg/kg for PCBs) through dredging, placing residual sand cover in dredged areas, capping in areas where contaminated sediment cannot be feasibly removed, and capping contaminated sediment below a maximum dredge elevation of 552.5 feet NAVD88. The dredging and capping components of Alternative 3A are shown on Figure 7-1A through 7-1C. The recommended alternative will achieve the site-specific RAOs by reducing the mass, volume, and concentrations of COCs in sediment, reducing risks to human health and the environment from exposure to COCs in sediment, and maintaining depth requirements within the authorized FNC and outside the FNC for recreational vessel use. The remedy will contribute to the eventual removal of BUIs and delisting of the Milwaukee Estuary AOC.

The CUGs for Alternative 3 are recommended for application in all AOC project areas (except for the Floodplains Reach). Alternative 3A was selected for the SMC based on evaluation of dredged material volume estimates for disposal within the DMMF and consideration of project costs on an AOC-wide basis. Alternative 3A provides a similar level of protectiveness and has a similar cost to Alternative 3 but reduces dredge volume by establishing a maximum sediment removal elevation throughout the SMC, which helps the dredge volume for the overall AOC-project fit within the DMMF. The maximum dredge elevation of 552.5 feet NAVD88 is 4.5 feet below the authorized FNC elevation and was selected to achieve the USACE required 3 feet of clearance below the authorized elevation. The estimated cost of recommended alternative 3A is $24.1M.

The recommended alternative will be further refined during remedial design. A decision framework will be developed to identify and prioritize areas for additional sediment removal if sufficient DMMF capacity and project resources are available. Areas where maintaining a cap is expected to be challenging will be identified, and institutional controls and long-term monitoring and maintenance requirements for caps will be discussed further with project partners.

Existing and projected post-remedy surface-weighted average concentrations (SWACs) for COCs in surface sediment were calculated for Alternative 3A to confirm its protectiveness. The SWAC methodology and results are further described in Appendix E. The SWACs are summarized on Exhibit 7-1. The calculations indicate that post-remediation SWACs (after residual sand cover placement and cap construction) are lower than existing conditions, Alternative 3 CUGs, and PECs for each COC.

Exhibit 7-1. SMC Project Area - Surface-Weighted Average Concentrations (mg/kg) for Pre- and Post-Remediation Scenarios – Alternative 3A

Surface-Weighted Average Concentrations (mg/kg) for	PCB	PAH	Chromium	Lead	Mercury
PEC	0.67	22.8	110	130	1.1
Alternative 3 CUGs	1	68.4	330	390	3.3
Existing	0.48	26	36	81	0.25
Post-Remedy	0.06	6	20	34	0.13

The recommended alternative was the subject of public outreach efforts accomplished during four public informational meetings held on the following dates: November 02, 2023; February 15, 2024; April 25, 2024; and June 14, 2024. These meetings were conducted to share information regarding the FFS recommended alternatives and to answer questions regarding the reports and the AOC-wide project. Questions posed at the meetings or posted to an online website were summarized into a Frequently Asked Questions document included as Appendix F to this Final FFS Report.

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Tables

Table 2-1. Summary of Permitted Discharges - South Menomonee Canal

Milwaukee Estuary Area of Concern, Milwaukee Wisconsin

Site Name	Site Address	Permit Type	Permit Identification	Permittee	Permit Status
Milwaukee Metro Sewerage District Combined	Multiple discharge points	Municipal Separate Storm Sewer System Construction	0036820	Milwaukee Metro Sewerage District Combined	6 - Permit Coverage Granted
Wisconsin Electric Power Company Valley Power Plant	1035 West Canal Street	Municipal Separate Storm Sewer System Construction	0000931	Wisconsin Electric Power Company Valley Power Plant	6 - Permit Coverage Granted
Buzzi Unicem - Milwaukee Terminal Expansion	643 West Canal Street	Stormwater Construction	S067831	Buzzi Unicem United States of America	6 - Permit Coverage Granted
Miller Compressing Company	1640 West Bruce Street	Stormwater - Industrial	S058831 - Storm Water Scrap Recycling	Alter Trading Corporation	6 - Permit Coverage Granted
Mid-City Foundry	1521 Bruce Street	Stormwater - Industrial	S066666 - Storm Water No Exposure	Mid-City Foundry	9 - No Exposure Certification
We Valley Power Plant	1035 West Canal Street	Stormwater - Industrial	S067857 - Storm Water Industrial Tier 2 Permit	We Valley Power Plant	6 - Permit Coverage Granted

Sources:

Wisconsin Pollutant Discharge Elimination System main page - downloaded Municipal and Industrial Permittees (accessed April 2021)

Search Construction

Search Industrial

Search Municipal

Table 2-2. Summary of Bureau of Remediation and Redevelopment Tracking System Sites - South Menomonee Canal

Milwaukee Estuary Area of Concern, Milwaukee Wisconsin

Figure Identification	Wisconsin Department of Natural Resources Bureau for Remediation and Redevelopment Tracking System Number	Site Location	Site Address	Bureau for Remediation and Redevelopment Tracking Site, Site Status and Type	Impacted Material	Substance Type	Contamination Type
01	241246029	Miller Compressing Company	1640 West Bruce Street	Open ERP	Soil, GW, Vapor, Sediment	Chlorinated Solvents, VOCs, Petroleum - Unknown Type, PCBs, PAHs	VOC, PCB, Petroleum
02	241552940	Miller Compressing (Burnham Canal) (Alternative Superfund)	1640 West Bruce Street	Open ERP	Soil, GW, Vapor, Sediment	PAHs, Lead	Petroleum, Metals
03	241540548	Stockyard GP-5 Area	1301 West Canal Street	Closed ERP	Soil	Gasoline	Petroleum
04	341267386	AL Gebhardt Company Incorporated	1228 West Bruce Street	Closed LUST	Soil, GW	Diesel Fuel	Petroleum
05	341284515	Balco Metals – Former	1135 West Canal Street	Closed LUST	Soil, GW	Gasoline, PAHs, Chlorinated Solvents, Metals	Petroleum, VOC, Metals
06	241537174	Wisconsin Electric Power Company	1135 West Canal Street	Closed ERP	Soil, GW	VOCs, PAHs	VOC, Petroleum
07	241001055	Wisconsin Electric Power Company Valley Plant	1035 West Canal Street	Closed ERP	Soil, GW, Vapor	Petroleum - Unknown Type (12,000 gallons Aboveground Storage Tank)	Petroleum
08	241171795	Didion Grains	920 West Bruce Street	Open ERP	Soil, GW	Diesel Fuel	Petroleum
09	341559620	Canadian Pacific - Burnham Yard Office Underground Storage Tank	504 South Layton Boulevard	Closed LUST	Soil, GW, Vapor	Fuel Oil	Petroleum
10	241523714	Blackhawk Tannery - Former	1000 West Bruce Street	Closed ERP	Soil, GW	Diesel Fuel	Petroleum
11	341216611	Mandella Box Company	929 West Bruce Street	Closed LUST	Soil, GW	Gasoline	Petroleum
12	341002499	City Oil Company	840 West Virginia Street	Closed LUST	Soil, GW	Diesel Fuel	Petroleum
13	241455148	We Energies	841 West Canal Street	Closed ERP	Soil	Metals (Arsenic, Lead), Petroleum - Unknown Type (Benzene)	Metals, Petroleum
14	0241585377	South Menomonee Canal	South 6th Street Bridge	Open ERP	Sediment	Metals, PAHs	Metals, Petroleum
15	241219376	Soccer Field	143 South 6th Street	Closed ERP	Soil, GW	Arsenic, Metals, PAHs	Metals, Petroleum
16	241560199	Reed Street Yards, Former	432 West Freshwater Way	Open ERP	Soil, GW, Vapor	VOCs, PAHs, Arsenic, Lead, Salt, Petroleum - Unknown Type, Non-chlorinated Solvents, Trichloroethylene	VOC, Petroleum, Metals, Food
17	241586338	Reed Street Yards, Former	360 West Freshwater Way	Open ERP	Soil, GW, Vapor	VOCs, PAHs, Arsenic, Lead, Salt, Petroleum - Unknown Type, Non-chlorinated Solvents, Trichloroethylene	VOC, Petroleum, Metals, Food
18	241560195	Reed Street Yards, Former	330 West Freshwater Way	Open ERP	Soil, GW, Vapor	VOCs, PAHs, Arsenic, Lead, Salt, Petroleum - Unknown Type, Non-chlorinated Solvents, Trichloroethylene	VOC, Petroleum, Metals, Food
19	241523115	Morton Salt	501 West Canal Street	Closed ERP	Soil, GW	Arsenic, Chromium, Lead, PAHs, VOC - Benzene, Other (Chloride)	Metals, Petroleum, VOC, Other
20	241522932	Harley-Davidson Museum	400 and 401 West Canal Street	Closed ERP	Soil, GW	PAHs	Petroleum

Figure Identification	Wisconsin Department of Natural Resources Bureau for Remediation and Redevelopment Tracking System Number	Site Location	Site Address	Bureau for Remediation and Redevelopment Tracking Site, Site Status and Type	Impacted Material	Substance Type	Contamination Type
21	341222233	Milwaukee City South Sewage Yard Office - 2	126 North 6th Street	Closed LUST	Soil, GW	Petroleum - Unknown type	Petroleum
22	341004240	Milwaukee City South Sewage Yard Office	126 North 6th Street	Closed LUST	Soil, GW	Gasoline; Petroleum - Unknown Type (Fuel Oil); Engine Waste Oil (Waste Oil)	Petroleum
23	341448791	Milwaukee City South Sewage Yard Office	126 North 6th Street	Closed LUST	Soil, GW	Gasoline; Petroleum - Unknown Type (Fuel Oil); Engine Waste Oil (Waste Oil)	Petroleum
24	341004307	Building and Bridges Field Headquarters	142 North 6th Street	Closed LUST	Soil, GW	Gasoline	Petroleum
25	241563694	Milwaukee Metropolitan Sewage District	260 West Seeboth Street	Open ERP	Soil	Petroleum - Unknown Type, PCB, PAHs	PCB, Petroleum

Source: Wisconsin Department of Natural Resources (WDNR). 2021. Brownfields: Redevelopment Opportunities. RR Site Maps. Accessed October 2021.

ERP = environmental remediation project

GW = groundwater

LUST = leaking underground storage tank

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

VOC = volatile organic compound

Table 3-1. Estimated Remedial Alternative Quantities - South Menomonee Canal

Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin

Remedial Alternative	Modeled Volume[a] (cubic yards)	Removal Volume[b] (cubic yards)	Non-Removal Volume[c] (cubic yards)
Alternative 2 PCBs >1 mg/kg, or metals (Cr, Pb, Hg), or PAHs >PEC	222,000	125,000	97,000
Alternative 3 PCBs >1 mg/kg, or metals (Cr, Pb, Hg) or PAHs >3xPEC	169,000	98,000	71,000
Alternative 3A PCBs >1 mg/kg, or metals (Cr, Pb, Hg) or PAHs >3xPEC	169,000	73,000	96,000
Alternative 4 PCBs >3 mg/kg, or metals (Cr, Pb, Hg) or PAHs >3xPEC	90,000	58,000	32,000

Source:

Wisconsin Department of Natural Resources (WDNR). 2003. *Wisconsin Consensus-based Sediment Quality Guidelines. Recommendations for Use and Application, Interim Guidance RR-088.* December.

[a] Environmental Visualization System modeled volume greater than remedial action level concentrations including overburden and 0.5 foot of overdredge allowance.

[b] Estimated quantity of target remediation volume accessible for removal through dredging and/or excavation.

[c] Estimated quantity of target remediation volume not readily accessible for removal due to shoreline and utility offsets and associated 3:1 sideslope.

> = greater than
3x = 3 times
Cr = chromium
Hg = mercury
mg/kg = milligram(s) per kilogram
PAH = polycyclic aromatic hydrocarbon
Pb = lead
PCB = polychlorinated biphenyl
PEC = Probable Effect Concentration for Cr, Hg, PAHs from WDNR 2003.

Table 4-1. Remedial Technologies Screening Summary – South Menomonee Canal
Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin

Remedial Technologies	Process Options	Description	Screening Criterion Effectiveness	Screening Criterion Implementability	Screening Criterion Relative Cost	Screening Comment
No Action	None	No further actions to address contaminated sediment.	Some natural recovery may occur as contaminants of concern (COCs) slowly biodegrade over time and/or are covered by clean sediment; however, no monitoring would be performed to assess these changes. If implemented alone, does not meet the remedial action objectives (RAOs) for the project.	Not applicable.	None	Required for comparison.
Natural Recovery	Monitored Natural Recovery	Allow naturally occurring physical, chemical, and biological processes to reduce the bioavailability and/or toxicity of COCs to acceptable levels. Burial of contaminated sediment by cleaner sediment is occurring given the lower surface and near surface COC concentrations compared to concentrations in subsurface sediment and quiescent conditions conducive to deposition of suspended sediment.	Some natural recovery may occur as COCs slowly biodegrade over time. The South Menomonee Canal (SMC) appears to be a net depositional area where contaminated subsurface sediment is buried by cleaner sediment. The conceptual site model indicates that recontamination potential is low.	Easily implementable if monitoring is administratively feasible. Requires additional data collection and interpretation to estimate net sedimentation rates within the SMC. Analytical data indicate that surface and near surface COC concentrations are lower than subsurface concentrations and that the quality of newly deposited sediment is comparable to urban background conditions within the project area. May also require institutional controls.	Low	Not retained for further evaluation because there is currently no mechanism for funding the monitoring component.
Sediment Removal	Dredging	Dredging removes sediment either through hydraulic or mechanical methods. The dredge location and elevation are controlled by global positioning system-integrated software for real-time positioning. Hydraulic dredging removes sediment with hydraulic suction to a specified dredge-cut elevation. Common hydraulic dredges include cutterhead, plain suction, pneumatic submersible pumps, and diver-assisted hand-held hydraulic suctions. Sediment is then pumped through a pipeline to a staging area or disposal site for dewatering and processing. Mechanical dredging uses a clamshell bucket operated from a crane or excavator on a floating barge or the shoreline to remove the sediment to a specified dredge-cut elevation. Dredged sediment is typically placed in barges for transport to a staging area or disposal site.	Effective. Contaminated sediment is removed from the canal, eliminating the direct contact human exposure and the fish/benthic community exposure pathways. Suspended solids that are released during the dredging activities can be minimized using engineering controls. May disrupt the fish/benthic community initially but provides a cleaner sediment surface for recolonization.	Implementable. Requires permits. Limitations may include removal of sediment adjacent to shorelines and other in-water structures, which may require the addition of shoreline stabilization or reinforcement before, during, or following dredging activities, and low clearance for bridge crossings. For hydraulic dredging, constant monitoring of the pipeline for leaks and water treatment for a relatively large volume of water from the dredged sediment are needed. The dredged sediment can be readily transported through a pipeline to the dredged materials management facility (DMMF) with limited impacts to waterway traffic and therefore requires less coordination with waterway users. This option typically generates fewer sediment residuals than mechanical dredge methods and may not require active turbidity control (e.g., silt curtains). The presence of debris can severely reduce production rate. The depth of water influences the size of hydraulic dredge and its efficiency during dredging operations. For mechanical dredging, barge transport of dredged sediment is limited by various obstructions around bridges and would affect waterway traffic and require more coordination with the waterway users. Debris has a relatively smaller impact on production rate for mechanical dredging than for hydraulic dredging. It typically generates more sediment residuals than hydraulic dredging and requires implementation of mechanical dredge best management practices (BMPs) and active turbidity control (e.g., silt curtains). Generates a relatively small volume of water to be treated.	Moderate to High	Dredging is retained for further evaluation in conjunction with sediment disposal technologies. Hydraulic dredging is expected to be more efficient and cost effective than mechanical dredging in the SMC because of the complexities associated with barge transport under numerous bridge crossings with low clearances in waterways with multiple users, leading to longer project duration and higher costs. Mechanical dredging may be used in some circumstances such as removal of Toxic Substance Control Act (TSCA)-level sediment (if encountered), debris, or sediment that cannot be accessed with a hydraulic dredge.

Remedial Technologies	Process Options	Description	Screening Criterion Effectiveness	Screening Criterion Implementability	Screening Criterion Relative Cost	Screening Comment
Residuals Management	Residual Management Cover	After sediment removal, a 6-inch cover layer of clean sand is placed over the residual material to reduce the COC concentrations to which biota are exposed. This clean cover layer is not a cap because it is expected to mix with the dredge residuals rather than to isolate the underlying sediment. Placement of a cover layer can effectively reduce the residual COC concentrations in areas where sufficient COC mass has been removed.	Can effectively reduce the residual COC concentrations in areas where sediment has been removed. However, may require additional dredging to enable clean layer placement to be below the authorized depth of the federal navigation channel (FNC). Provides cleaner surface for the biota, facilitating replenishment of the benthic community.	Easily implementable. Needs verification to confirm that the required thickness of clean cover material is placed. Insufficient material may be ineffective.	Low to Moderate	Retained for further evaluation in conjunction with sediment removal technologies.
Sediment Disposal	Offsite Disposal – DMMF	The DMMF planned for the Milwaukee Estuary Area of Concern (AOC) is an in-water facility designed for containment of contaminated dredged sediment that provides control of potential releases of COCs to the environment. Dredged sediment is placed directly into the DMMF for disposal prior to dewatering.	Effective. The engineering controls implemented in the DMMF provide control of potential releases of COCs to the environment. Verification of engineering controls may be required to confirm containment of COCs.	Implementable, but requires permitting through the U.S. Army Corps of Engineers (USACE). It is assumed that TSCA-level or non-aqueous phase liquid (NAPL)-impacted sediment will not be allowed for disposal in the DMMF. Available capacity in the proposed DMMF and removal volumes from multiple project areas within the AOC need further evaluation.	Low to Moderate. Expected to be less expensive than offsite disposal due to savings on stabilization, transportation, and disposal fees.	Currently retained for further evaluation. The proposed DMMF is currently in the design phase. Requires close coordination with the United States Environmental Protection Agency, Wisconsin Department of Natural Resources (WDNR), USACE, and Port of Milwaukee; and requires federal and non-federal sponsors. Volume of sediment to be removed from the AOC collectively is currently being evaluated.
Sediment Disposal	Offsite Disposal – Subtitle C or Subtitle D Landfill	Disposal of dewatered sediment at an offsite facility. Characterization data collected to date demonstrates that sediment within the SMC is non-hazardous under the Resource Conservation and Recovery Act (RCRA) and does not have polychlorinated biphenyl (PCB) concentrations greater than the 50 milligrams per kilogram (mg/kg) TSCA threshold (which would require disposal in a Subtitle C landfill) allowing SMC sediment to be permanently disposed in a Subtitle D landfill approved for special waste disposal.	Effective. Would permanently remove COC mass from the project site.	Local landfills within the project vicinity are approved for special waste disposal of sediment with less than 50 mg/kg PCBs and non-hazardous waste levels of other COCs. The acceptability of the sediment by the offsite disposal facility would need to be evaluated in greater detail during remedial design; disposal requirements for emerging contaminants are uncertain.	Moderate	Retained for further evaluation specific to handling TSCA-level sediment, if encountered, which would be removed to an upland dewatering area for eventual offsite disposal in an approved landfill.
Sediment Dewatering	Dewatering: DMMF Disposal	Pumping of dredged sediment at a low solids concentration directly to the DMMF. The sediment is passively dewatered by settling of solids and evaporation of overlying water. Remaining free water on top is treated and discharged to Lake Michigan under a Wisconsin Pollutant Discharge Elimination System permit. Requires an onsite wastewater plant of sufficient capacity to allow for continuous dredging operations and prevent accumulation of large quantities of water in the DMMF.	Sediment slurry is pumped as a controlled flow from the hydraulic dredge to the DMMF facility through submerged pipes that do not interfere with waterway traffic. Dependent on the discharge criteria and the efficiency of the treatment processes. Removes COCs and turbidity before discharging into Lake Michigan. An effluent monitoring system is required to monitor the discharge concentrations.	Easily implementable and cost effective. Extended dewatering duration and effective water treatment system are essential for uninterrupted dredging operations. Water treatment for a relatively large volume of water from the dredged sediment needed. Typically requires treatability testing to select reagent and mix to improve sediment dewatering and for design of water treatment system.	Moderate to High	Retained for further evaluation as hydraulic dredging and pipeline transport to the DMMF is the likely to be used on an AOC-wide basis.
Sediment Dewatering	Dewatering: Upland Management and Disposal	Excess free water generated from mechanical removal of sediment is pumped from watertight scow barges to a storage tank, then treated and discharged. Dredged sediment is then offloaded to a staging pad where it dewaters by gravity drainage and stabilized as needed for transport and upland disposal. Water is then physically and chemically treated to remove suspended solids and COCs before being discharged back into the canal or to the publicly owned treatment works (dependent on permitting).	Dependent on the discharge criteria and the efficiency of the water treatment processes. An effluent monitoring system is required to monitor the discharge concentrations.	Limited by availability of upland staging areas for equipment and drying and transloading of sediment.	Moderate to High	Retained for further evaluation as offsite landfill disposal may be used in some circumstances such as removal of TSCA-level sediment (if encountered).

Remedial Technologies	Process Options	Description	Screening Criterion Effectiveness	Screening Criterion Implementability	Screening Criterion Relative Cost	Screening Comment
Sediment Containment	Cap	Place one or more layers of clean material over the surface of contaminated sediment to isolate the sediment left in place and reduce COC flux to the environment. A cap could be constructed in areas along the shoreline where sediment cannot be removed due to stability concerns, or in other areas that cannot be accessed for dredging. Amendments that enhance sequestration or degradation of COCs could be added to the cap if needed to inhibit COC migration. Provides long-term risk reduction to human and ecological receptors.	Can be effective if cap remains in place. Isolates the COCs from human and ecological receptors and prevents resuspension of contaminated sediment. Regular cap inspection and maintenance are required to address eroded or disturbed areas. The cap dimensions and materials need to be carefully designed to avoid head cutting and scouring effects. May provide habitat for benthic organisms and fish species pending cap materials used. Treatability testing may be needed to support design of an active (amended) cap, which would reduce contaminant flux by increasing sorptive capacity and/or by enhancing degradation. Long-term effectiveness is dependent on cap thickness, material selection, and maintenance.	Installation implementable for areas with PCB concentrations below TSCA levels. Installation within the FNC requires the cap surface to be 3 feet below the authorized FNC elevation. Requires permits. May disrupt the existing dock areas and waterway users. Will require long-term monitoring and institutional controls. Requires staging areas for cap material close to the remediation location. Cap extents must be mapped and reported in applicable WDNR databases. Most materials and equipment are readily available. Slower construction may be necessary for active caps to reduce placement variability of layers containing reactive materials.	Low to Moderate. Long-term costs include periodic monitoring of the cap and cap maintenance as required. Costs for active capping would be moderate to high.	Retained for further evaluation for areas where dredging is not implementable and PCB concentrations are below TSCA levels. There may be challenges to implementability due to low clearance near bridges, preventing use of mechanical equipment needed for the installation.
In Situ Treatment	Activated Carbon	This technology involves mixing activated carbon (e.g., granular activated carbon, SediMite, or other amendment) into surficial sediment to adsorb hydrophobic organic contaminants and reduce contaminant bioavailability. Carbon amendments can be mixed into the sediment using mechanical methods or natural biological activity (bioturbation).	Effective for reducing bioavailability of hydrophobic organic contaminants but may not be effective for metals. Long-term effectiveness and permanence are uncertain.	Implementable in areas with PCB concentrations below TSCA levels outside of the FNC. Amendments can be placed using conventional equipment. Can be used to treat areas under bridges or against bulkheads where other technologies would be difficult to implement. Would require staging areas for stockpiling materials. May require additional institutional controls and long-term monitoring.	Moderate to high, depending on area to be treated.	Not retained for further evaluation. Long-term effectiveness and permanence are uncertain and long-term monitoring and maintenance would be needed.
In Situ Treatment	Fixation/ Stabilization	Involves applying or mixing of an amendment into sediment through mechanical means (using augers, for instance) to immobilize COCs by physically binding or enclosing the sediment within a stabilized mass or chemically treating these to become immobile.	In situ treatment technologies can achieve immediate risk reduction by reducing the bioavailability and mobility of a range of organic and metal COCs in environmentally sensitive environments or in areas where sediment removal or capping are not implementable.	Implementable with limitations. Requires permits. Can be implemented at discrete depth intervals to target a specific layer of impacted sediment. May allow for management of contaminated sediment adjacent to retaining and support structures, which are often aged and require structural analysis and support prior to dredging or removal activities. Requires bench-scale testing for selecting the suitable stabilization/ solidification amendment. May require a protective surface structure (such as rip rap or articulated mat) depending on the strength of treated sediment and erosional forces present. Requires staging area for the storage and preparation of stabilization/solidification amendment.	Moderate to High	Retained for further evaluation. Implementing in situ stabilization measures in areas with low clearance may be complex. Stabilization measures require erosion protection, long-term monitoring and cannot be implemented within the FNC. May be considered for application near bulkheads to protect shoreline stability.
Ex Situ Treatment	Sediment Stabilization/ Solidification	Dewatered sediment is mixed with an additive (fly ash, Portland cement) to decrease the leachability of COCs and meet transportation and disposal requirements.	Effective as a secondary dewatering technology for sediment following passive dewatering techniques. Can improve the chemical and physical properties of the sediment for disposal.	Requires mixing amendments into the sediment following excavation and passive dewatering prior to disposal. Typically requires pilot testing for selecting the suitable stabilization/solidification amendment. After stabilization/solidification, sediment will be loaded into trucks for offsite disposal.	Moderate	Retained for further consideration for dredged material to be transported to an upland disposal facility (including TSCA-level sediment, if encountered).
Ex Situ Treatment	Particle Size Segregation and Washing	Vibrating or fixed screens, hydrocyclones, or gravity separation used to segregate particle sizes in sediment allowing separate disposal of fine-grained material with higher COC concentrations.	Effective. Can be a good source of fill materials for beneficial reuse if sufficient quantity of sand and/or gravel exists within sediment to be removed.	Easily implemented along with hydraulic dredging. Requires staging area for implementation. The quantity of sand and/or gravel that exists within the dredged sediment to be evaluated for cost effectiveness. Pilot/bench-scale testing is required.	Moderate	Retained for further evaluation to reduce the volume of material requiring disposal in DMMF. Minimizing the amount of waste requiring disposal in the DMMF can decrease the amount of space consumed and facilitates the effective management of contaminated sediment from other project areas in AOC.
Ex Situ Treatment	Sediment Washing	PCBs sorbed onto fine soil particles are separated from bulk soil in an aqueous-based system based on particle size. Wash water may be augmented with a basic leaching agent, surfactant, pH adjustment, or chelating agent to help remove organics.	Considered a transfer technology in that the COCs are not destroyed but transferred to another media. Consequently, the resulting concentrated sediment must be disposed of appropriately. Varying concentrations and mix of COCs at the site create a complex washing solution.	Requires sediment excavation, pilot/bench-scale testing. Equipment and utility requirements are substantial.	High	Not retained for further evaluation due to implementability and cost concerns.

Table 4-1 Acronyms:

AOC = area of concern

BMP = best management practice

COC = contaminant of concern

DMMF = dredged materials management facility

FNC = federal navigation channel

mg/kg = milligram(s) per kilogram

NAPL = non-aqueous phase liquid

PCB = polychlorinated biphenyl

RAO = Remedial Action Objective

RCRA = Resource Conservation and Recovery Act

SMC = South Menomonee Canal

TSCA = Toxic Substance Control Act

USACE = U.S. Army Corps of Engineers

WDNR = Wisconsin Department of Natural Resources

Table 5-1. Conceptual Alternatives Summary - South Menomonee Canal
Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin

Element No.	Conceptual Alternative Element	Alternative 1 No Action	Alternative 2 Total PCBs >1 mg/kg, or metals (Cr, Pb, Hg) or Total PAHs >PEC	Alternative 3 Total PCBs >1 mg/kg, or metals (Cr, Pb, Hg) or Total PAHs >3xPEC	Alternative 3A Total PCBs >1 mg/kg, or metals (Cr, Pb, Hg) or Total PAHs >3xPEC	Alternative 4 Total PCBs >3 mg/kg, or metals (Cr, Pb, Hg) or Total PAHs >3xPEC
1	**Remedial Target Area** - Area (acres)	Not applicable	21	17	17	10
	Remedial Target Area - Removal Volume (cubic yards)[a]	Not applicable	125,000	98,000	73,000	58,000
2	**Non-TSCA Sediment Removal** - Portion of hydraulic removal volume (cubic yards)	Not applicable	59,000	98,000	73,000	58,000
	Non-TSCA Sediment Removal - Portion of mechanical removal volume (cubic yards)	Not applicable	66,000	0	0	0
	Non-TSCA Sediment Removal - Estimated dewatered (supernatant) volume for treatment[b] (gallons)	Not applicable	110,000,000	87,000,000	65,000,000	55,000,000
3	**TSCA Sediment Removal**[c]	Not applicable	0	0	0	0
4	**Cap** - Area (acres)	Not applicable	11	9	12	5
	Cap - Capping Material Volume (cubic yards)	Not applicable	31,000	25,000	34,000	14,000
5	**Residual Management Cover** - Area (acres)	Not applicable	10	8	5	5
	Residual Management Cover - Residual Cover Material Volume (cubic yards)	Not applicable	12,000	10,000	6,000	6,000

Source: *Wisconsin Department of Natural Resources (WDNR). 2003. Wisconsin Consensus-based Sediment Quality Guidelines. Recommendations for Use and Application, Interim Guidance RR-088*. December.

[a] Estimated quantity of target remediation volume accessible for removal through dredging and/or excavation.

[b] Includes pipeline transport to DMMF with dewatering and supernatant treatment at DMMF location, treated with temporary onsite water treatment plant and discharged to the river under Wisconsin Pollutant Discharge Elimination System discharge permit.

[c] There was no TSCA-level concentration (> 50 mg/kg) sediment encountered in the South Menomonee Canal Project Area - sediment removal for this type of material is not needed.

> = greater than
3x = 3 times
Cr = chromium
DMMF = dredged materials management facility
FNC = federal navigational channel
Hg = mercury
mg/kg = milligram(s) per kilogram
PAH = polycyclic aromatic hydrocarbon
Pb = lead
PCB = polychlorinated biphenyl
PEC = Probable Effect Concentration (per WDNR 2003)
TSCA = Toxic Substance Control Act

Table 6-1. Remedial Alternative Evaluation Summary – South Menomonee Canal

Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin

Criterion	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 3A	Alternative 4
1. Threshold Criterion Compliance with applicable federal, state, and local regulations.	No remedial action; therefore, not applicable.	Multiple permits would be required (see Appendix C). Alternative can be designed to comply with applicable regulations.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
2(a). Balancing Criterion: Long-Term Effectiveness Ability to achieve remedial action objectives (RAOs) and contribute to beneficial use impairment (BUI) removal, amount of residual contamination[a] anticipated to be left in place, adequacy and reliability of long-term controls, potential for recontamination, expected performance in response to extreme storm events and climate change.	RAOs not likely to be met within a reasonable time frame. Would not contribute to removal of BUIs.	Sediment removal and the residual cover layer reliably and permanently reduce the mass, volume, and concentrations of contaminants of concern (COCs) in sediment, thereby reducing exposure and risk to ecological and human receptors and contributing to the removal of BUIs. Capping contaminated sediments that cannot be cost-effectively removed, eliminates exposure and risk by isolating contaminants in the undredged inventory. Disposal of contaminated sediment in the dredged materials management facility (DMMF) or in a permitted offsite landfill eliminates all exposure pathways. Alternative 2 would be implemented to maintain depth requirements in the federal navigation channel (FNC). Alternative 2 has the greatest long-term effectiveness because the largest area (21 acres) is covered with a cap or residual cover layer compared to Alternatives 3 and 4 and the lowest concentrations of COCs remain in place. As discussed in Section 2.7, recontamination potential from other sources is also low. Alternative 2 can be designed to withstand extreme storm events and be resilient in response to climate change.	Alternative 3 uses the same approaches to achieve RAOs and contribute to BUI removal as Alternative 2. However, Alternative 3 has less long-term effectiveness than Alternative 2 because a smaller area (17 acres) would be covered with a cap or residual cover layer following dredging and sediment with higher metals (chromium, lead and mercury) and polycyclic aromatic hydrocarbon (PAH) concentrations would remain in place compared to Alternative 2.	Alternative 3A uses the same approaches to achieve RAOs and contribute to BUI removal as Alternatives 2 and 3. Although the remediation target areas (RTAs) for Alternatives 3 and 3A are identical (17 acres), a maximum dredge elevation of 552.5 North American Vertical Datum of 1988 (NAVD88) would be used and deeper sediment with COC concentrations exceeding cleanup goals (CUGs) would remain in place beneath a cap.	Alternative 4 uses the same approaches to achieve RAOs and contribute to BUI removal as Alternatives 2 and 3. However, Alternative 4 has less long-term effectiveness than Alternatives 2 and 3 because a smaller area (10 acres) would be covered with a cap or residual cover layer following dredging, sediment with higher polychlorinated biphenyl (PCB) concentrations would remain in place compared to Alternatives 2, 3, and 3A. Sediment with higher metals (chromium, lead and mercury), PAH, and PCB concentrations would remain in place compared to Alternative 2.
2(b). Balancing Criterion: Short-Term Effectiveness Potential adverse impacts on public health, safety, welfare and the environment during construction and implementation; protection of the community during remedial action, environmental impacts of the remedial action, and time until RAOs are achieved.	No remedial action; therefore, not applicable.	(Estimated in-water remedial action time = 5 months). Potential adverse impacts on public health, safety, welfare and the environment during construction and implementation include the following: ▪ Reduced public access to the canal and shoreline ▪ Increased vessel and vehicular traffic ▪ Increased emissions from vehicles and other construction equipment ▪ Increased noise ▪ Odors and dust from the upland staging area where mechanically dredged sediments are stockpiled and processed for offsite disposal. ▪ Potential risk to workers from accidents or exposure to COCs ▪ Temporary destruction of the benthic community in dredged and capped areas ▪ Potential environmental impacts from suspended sediment during dredging ▪ Potential environmental impacts from leaks in the pipeline transporting hydraulically dredged sediment to the DMMF Engineering and operational controls will be used to reduce and manage impacts during remedy construction and implementation. Plans will be developed during remedial design to establish requirements for air quality monitoring, noise monitoring, health and safety, waste management, traffic safety, and other activities. Turbidity monitoring and controls will be used to manage potential environmental impacts from sediment resuspension during dredging. The magnitude of the impacts is related to the duration of the remedial action. RAOs will be achieved when remedy construction is complete.	(Estimated in-water remedial action time = 4 months). Potential adverse impacts are the same as those for Alternative 2; however, the duration of the remedial action will be somewhat shorter because less sediment would be dredged and capped. The benthic community would be temporarily destroyed over a slightly smaller area for Alternative 3 (17 acres) compared to Alternative 2 (21 acres). RAOs will be achieved when remedy construction is complete, which will be sooner than for Alternative 2.	(Estimated in-water remedial action time = 4 months). Potential adverse impacts are the same as those for Alternatives 2 and 3. The area of impact to the benthic community would be the same as Alternative 3. RAOs will be achieved when remedy construction is complete, which will be sooner than for Alternative 2.	(Estimated in-water remedial action time = 3 months). Potential adverse impacts are the same as those for Alternative 2; however, the benthic community would be temporarily destroyed over a smaller area for Alternative 4 (10 acres) compared to Alternatives 2 and 3 because less sediment will be dredged and capped. RAOs will be achieved when remedy construction is complete, which is estimated to be sooner than for Alternatives 2, 3, and 3A.

Criterion	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 3A	Alternative 4
2(c). Balancing Criterion: Implementability Technical feasibility, including ease of implementation, reliability, constructability, availability of goods and services, and potential difficulties or constraint associated with construction or disposal; and administrative feasibility, including activities and time needed to obtain permits and approvals, the need for institutional controls, and degree of coordination with other agencies.	Easily implementable because no remedial action would be taken.	The remediation methods associated with this alternative (except in situ stabilization) have been implemented at numerous other sites and have been proven to be constructible and reliable. In situ stabilization to increase sediment strength and bearing capacity is more challenging to implement. All goods and services are expected to be readily available. Potential difficulties and constraints associated with this alternative include: ▪ Limitations on DMMF capacity for disposal of dredged sediment ▪ Limited access for construction equipment near and under bridges ▪ Protection of utility corridors that cross the canal ▪ Bulkhead stability ▪ Limited availability of upland staging areas for processing mechanically dredged sediments A range of permits and approvals are required for implementing this alternative as detailed in Appendix C. This alternative requires extensive coordination with other agencies and parties including the project partners (U.S. Environmental Protection Agency, WDNR, the City of Milwaukee, Milwaukee County, Milwaukee Metropolitan Sewerage District), the Port of Milwaukee, U.S. Army Corps of Engineers, and affected property owners and businesses. Institutional controls will be discussed further with project partners during remedial design.	Same considerations as Alternative 2, but more implementable than Alternative 2 because the volume of dredged sediment is lower and therefore disposal requires less DMMF capacity. Cap area requiring agency coordination and approval is less than Alternative 2.	Same considerations as Alternative 2, but more implementable than Alternative 2 or 3 because the volume of dredged sediment is lower and therefore disposal requires less DMMF capacity. Cap area requiring agency coordination and approval is greater than Alternatives 2 and 3.	Same considerations as Alternative 2, but more implementable than Alternatives 2, 3, and 3A because the volume of dredged sediment is lower and therefore disposal requires less DMMF capacity. Cap area requiring agency coordination and approval is less than Alternatives 2, 3, and 3A. In addition, dredging and capping is required around fewer bridges compared to Alternatives 2, 3, and 3A (e.g., S. 6th Street Bridge and I-43 Bridge).
2(d). Balancing Criterion: Restoration Time Frame	No remedial action; therefore, not applicable.	The benthic community is expected to naturally recolonize the dredged and capped surface within several months after the remedy has been completed. Upland staging and laydown areas will be restored to the pre-remedy condition during demobilization.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
2(e). Balancing Criterion: Total Cost[b] (As Estimated)	$0	$33,392,000	$25,460,000	$24,139,000	$18,711,000
3. Modifying Criterion: Project Partner Acceptance[c]	[c]	[c]	[c]	[c]	[c]

Source: Wisconsin Department of Natural Resources (WDNR). 2003. *Wisconsin Consensus-based Sediment Quality Guidelines. Recommendations for Use and Application, Interim Guidance RR-088.* December.

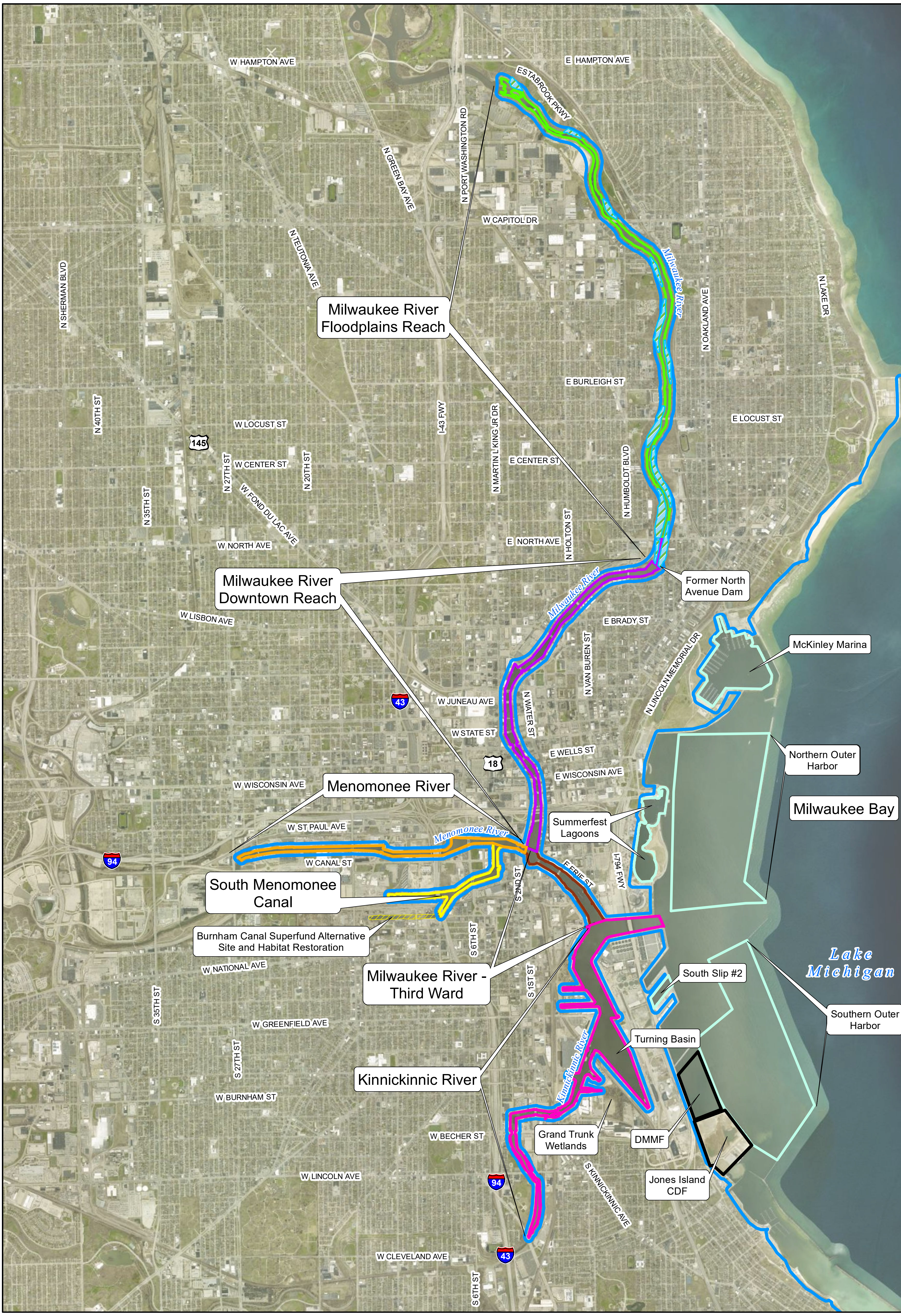
[a] "Residual contamination" and "contaminated sediment" for each alternative is defined as sediment with COC concentrations above the screening levels for that alternative.

[b] Total cost is detailed in Appendix D to this document.

[c] Evaluated after the project partners reviewed and provided comments on the remedial alternatives and associated individual and comparative alternative analyses. Project partner acceptance was considered when selecting the recommended alternative.

BUI = beneficial use impairment
COC = contaminant of concern
CUGs = clean up goals
DMMF = dredged materials management facility
FNC = federal navigation channel
NAVD88 = North American Vertical Datum of 1988
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
RAO = Remedial Action Objective
RTA = remedial target area
WDNR = Wisconsin Department of Natural Resources

Figures



LEGEND

- Floodplain Area Boundary
- Milwaukee Bay
- Menomonee River
- Kinnickinnic River
- Milwaukee River Downtown
- Milwaukee River Floodplain
- Milwaukee River - Third Ward
- South Menomonee Canal
- Greater Milwaukee GLLA Project Agreement boundary

N

0 1500 3000
Feet

Notes:
1. CDF = confined disposal facility; DMMF = dredged materials management facility; GLLA = Great Lakes Legacy Act
2. 2022 Aerial Photography provided by Esri ArcGIS Online World Imagery.

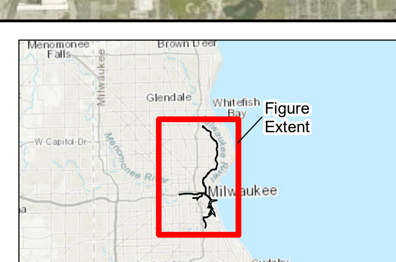


Figure 1-1 Regional Features
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

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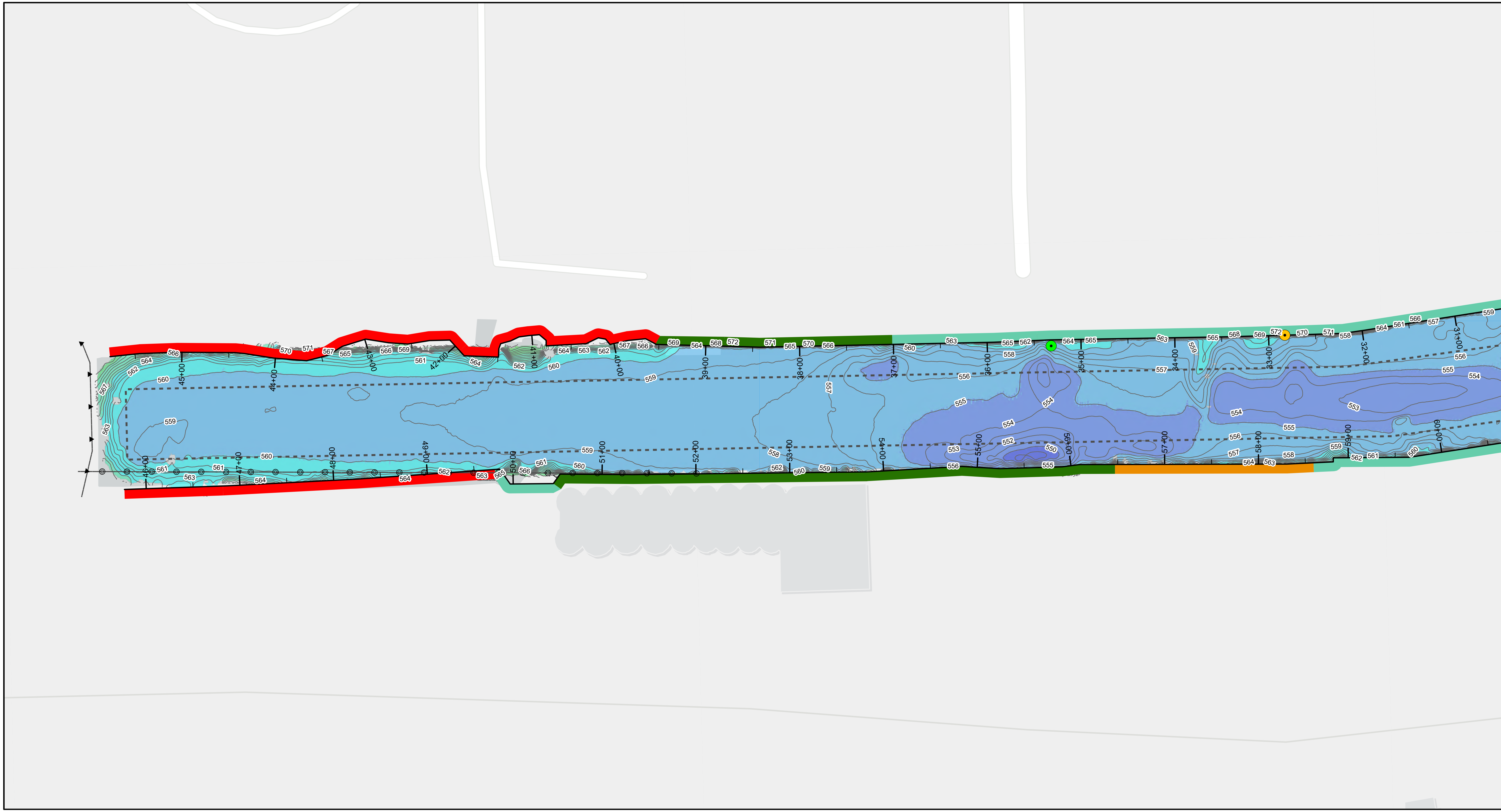


LEGEND

- MS4 Industrial Outfall
- Storm Sewer Outfall
- Federal Navigation Channel

Utilities

- Fiber Optic
- Sanitary Sewer

Condition Level

- Excellent
- Good
- Marginal
- Poor

Bathymetry (feet)

- Bathymetric Contour

Elevation (feet)

- 545 - 550
- 551 - 555
- 556 - 560
- 561 - 565
- 566 - 570
- 571 - 575
- 576 - 580

0 50 100
Feet

Notes:
1. Base map source: Esri ArcGIS Online Gray Base Map
2. MS4 = Municipal Separate Storm Sewer System
3. Horizontal Datum: North American Datum 1983 (NAD83)
4. Vertical Datum: North American Vertical Datum of 1988 (NAVD88). Bathymetric contour and shading were generated from hydrographic survey data collected by Seaworks (2020).

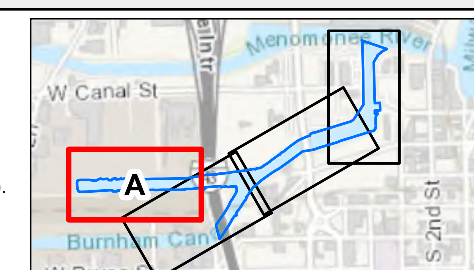
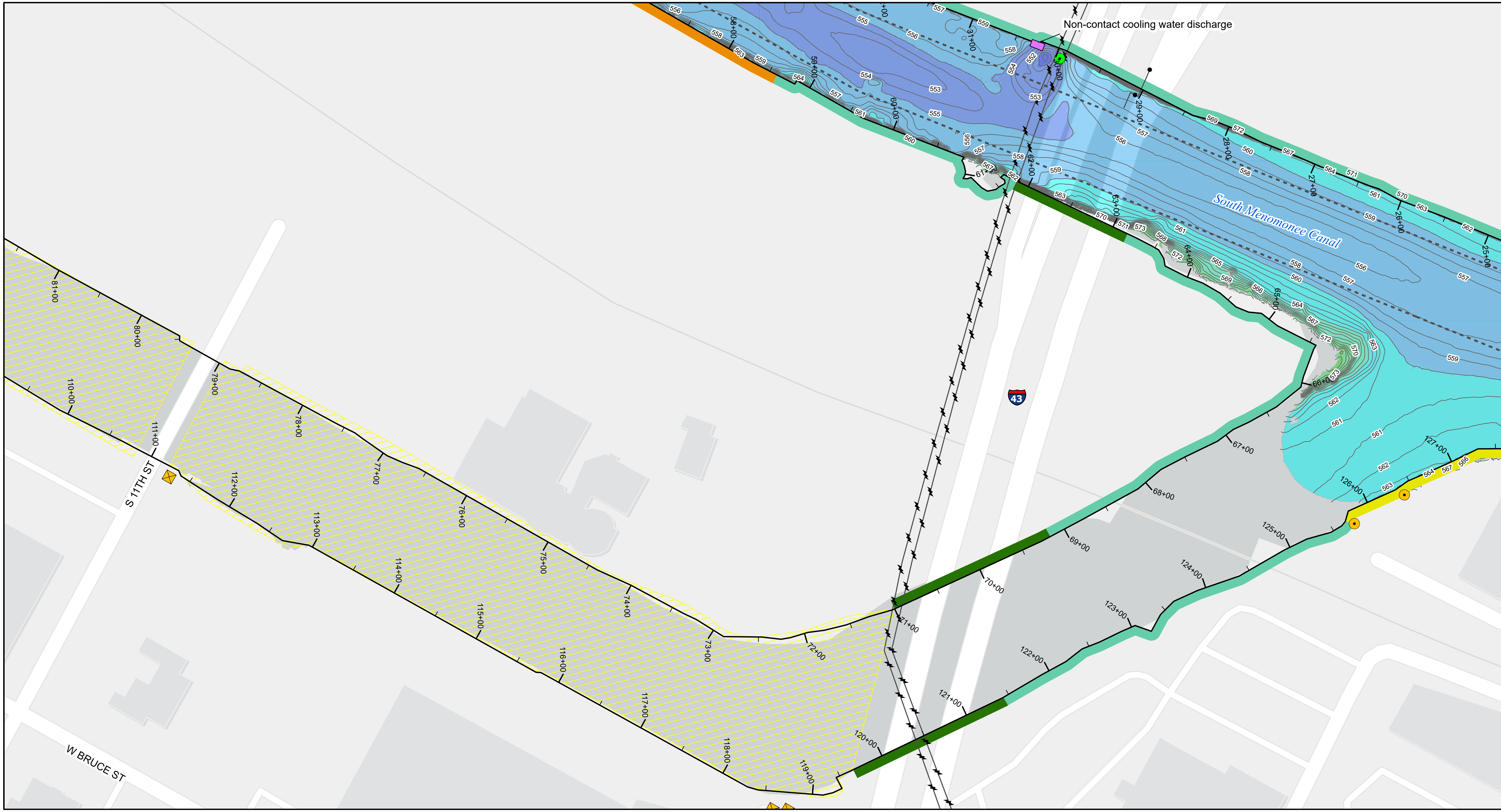


Figure 1-2A
Site Features - South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs



LEGEND

- MS4 Industrial Outfall
- Combined Sewer Outfall
- Storm Sewer Outfall
- Non-contact cooling water discharge
- Burnham Canal Sediment Cover and Wetland Restoration Project
- Federal Navigation Channel

0 50 100
Feet

Utilities

- Electric
- Water Line

Condition Level

- Excellent
- Good
- Fair
- Marginal

Bathymetry (feet)

- Bathymetric Contour

Elevation (feet)

- 545 - 550
- 551 - 555
- 556 - 560
- 561 - 565
- 566 - 570
- 571 - 575
- 576 - 580

Notes:

1. Base map source: Esri ArcGIS Online Gray Base Map
2. MS4 = Municipal Separate Storm Sewer System
3. Horizontal Datum: North American Datum 1983 (NAD83)
4. Vertical Datum: North American Vertical Datum of 1988 (NAVD88). Bathymetric contour and shading were generated from hydrographic survey data collected by Seaworks (2020).

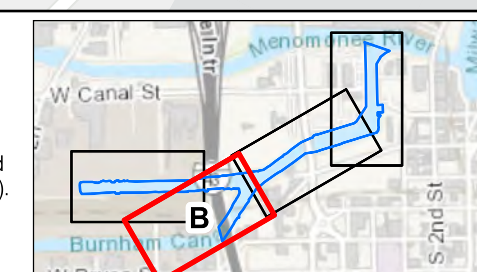


Figure 1-2B
Site Features - South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs

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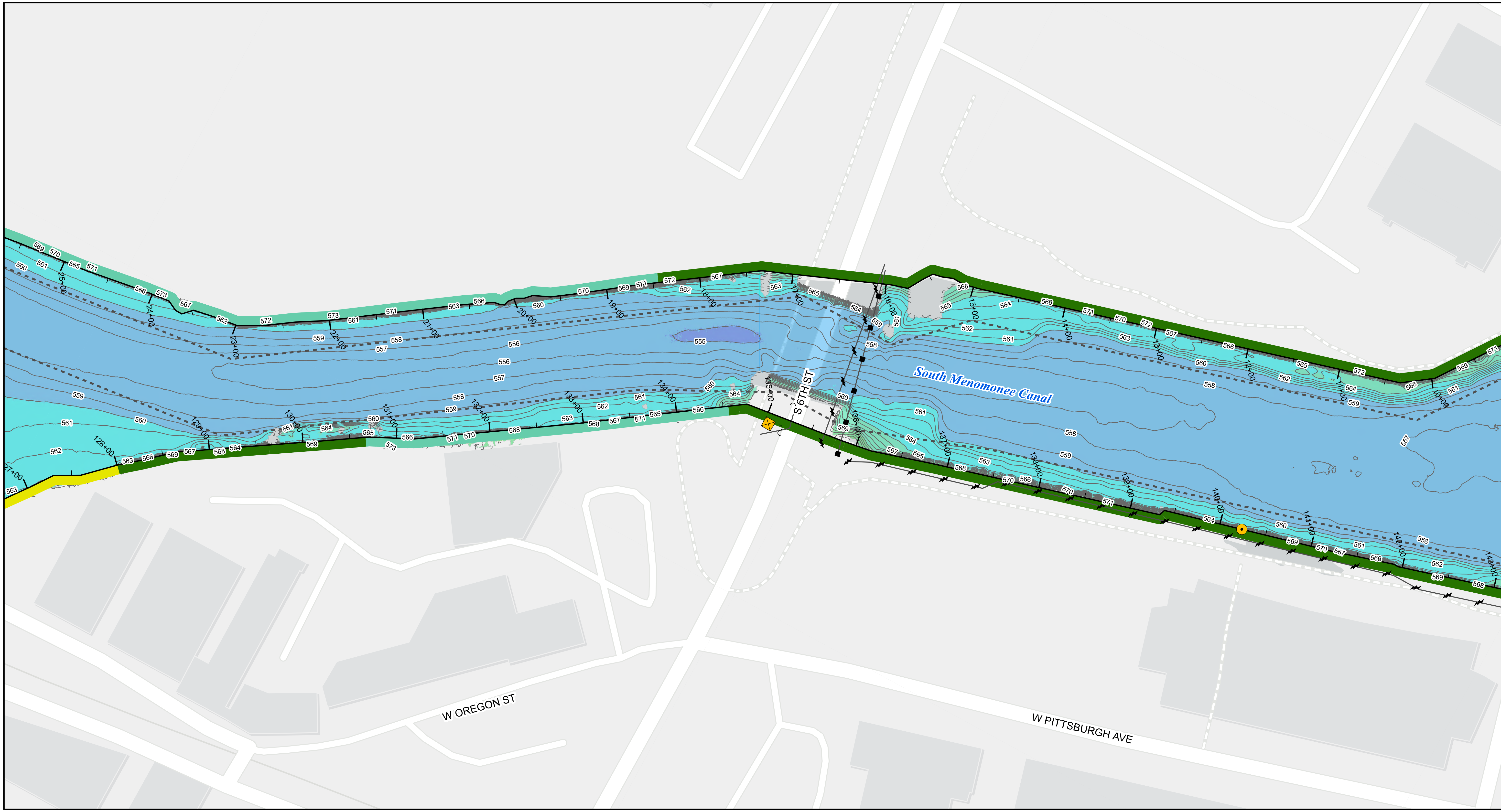

LEGEND

- Combined Sewer Outfall
- Storm Sewer Outfall
- Federal Navigation Channel

Utilities

- Electric
- Gas
- Storm Sewer

Condition Level

- Excellent
- Good
- Fair

Bathymetry (feet)

- Bathymetric Contour

Elevation (feet)

- 545 - 550
- 551 - 555
- 556 - 560
- 561 - 565
- 566 - 570
- 571 - 575

0 50 100
Feet

Notes:
1. Base map source: Esri ArcGIS Online Gray Base Map
2. Horizontal Datum: North American Datum 1983 (NAD83)
3. Vertical Datum: North American Vertical Datum of 1988 (NAVD88). Bathymetric contour and shading were generated from hydrographic survey data collected by Seaworks (2020).

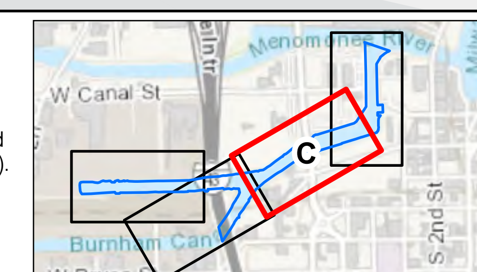

Figure 1-2C
Site Features - South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs

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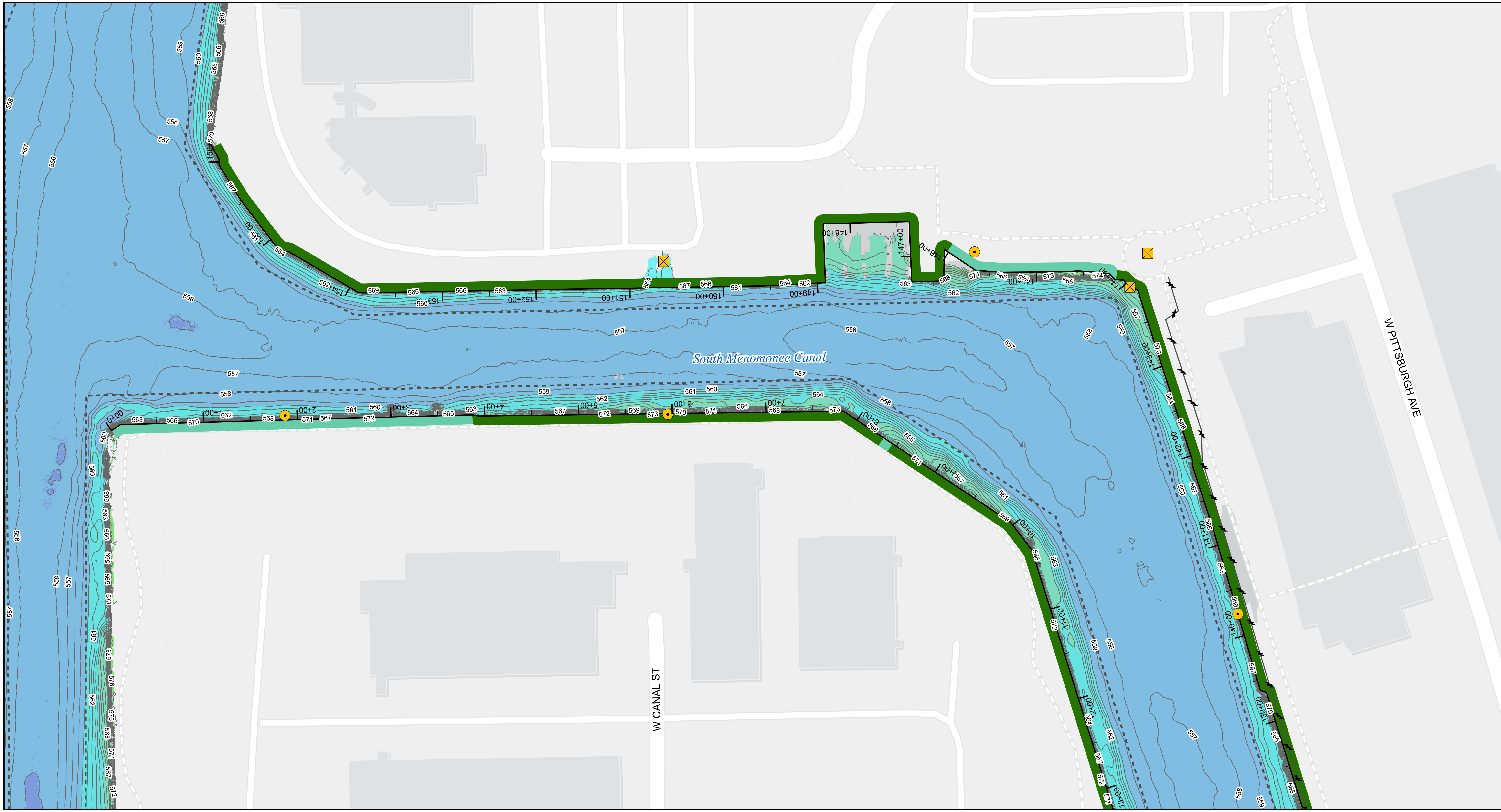

LEGEND

- Combined Sewer Outfall
- Storm Sewer Outfall
- Federal Navigation Channel

Utilities

- Electric

Condition Level

- Excellent
- Good

Bathymetry (feet)

- Bathymetric Contour

Elevation (feet)

- 545 - 550
- 551 - 555
- 556 - 560
- 561 - 565
- 566 - 570
- 571 - 575

0 50 100
Feet

Notes:

1. Base map source: Esri ArcGIS Online Gray Base Map
2. Horizontal Datum: North American Datum 1983 (NAD83)
3. Vertical Datum: North American Vertical Datum of 1988 (NAVD88). Bathymetric contour and shading were generated from hydrographic survey data collected by Seaworks (2020).

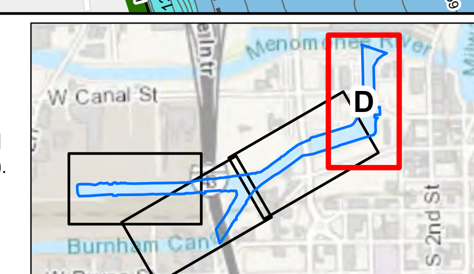

Figure 1-2D
Site Features - South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs

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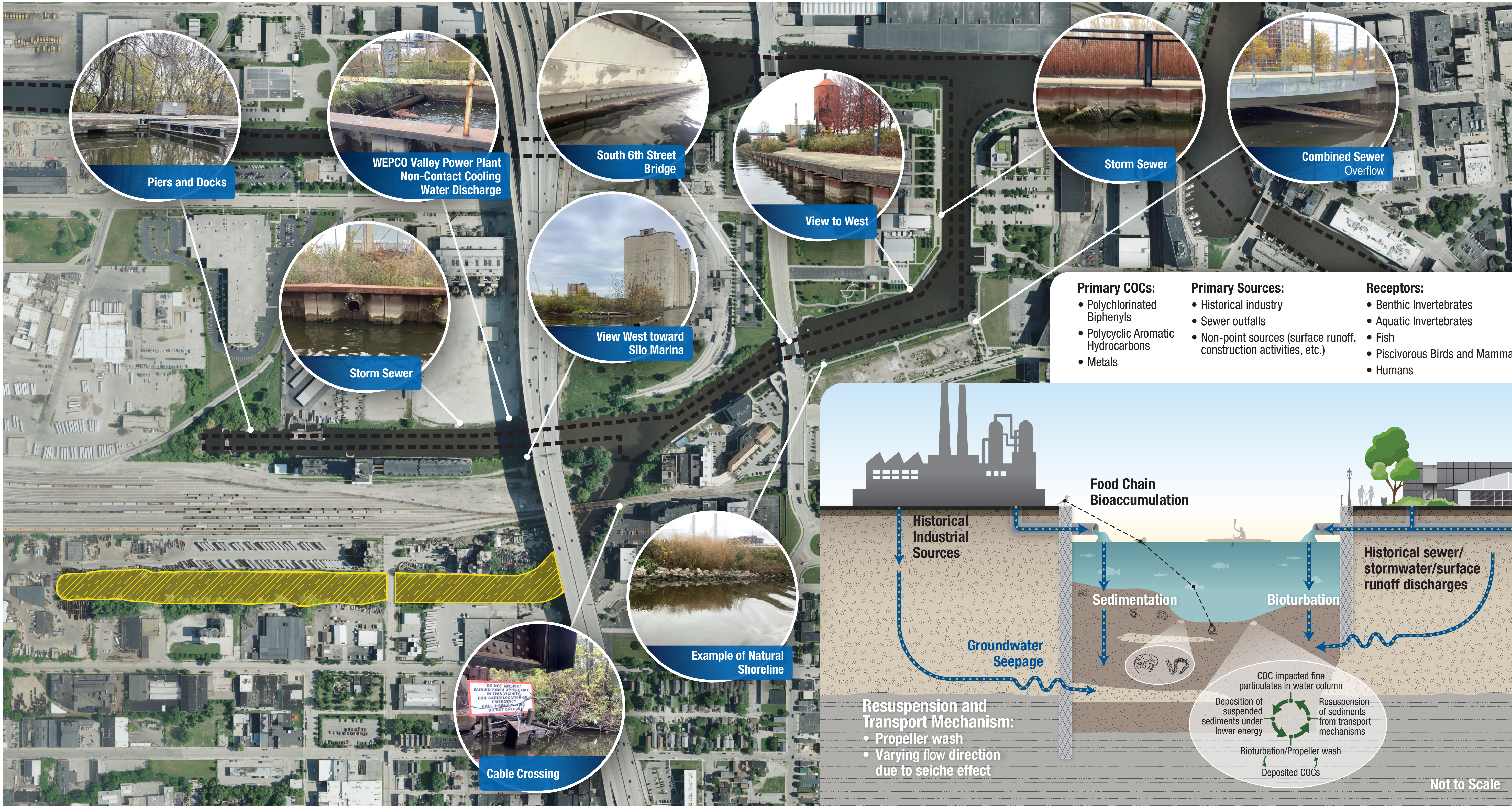


Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community | © 2021 Microsoft Corporation, © 2021 Maxar, © CNES (2021) Distribution Airbus DS

Map Legend

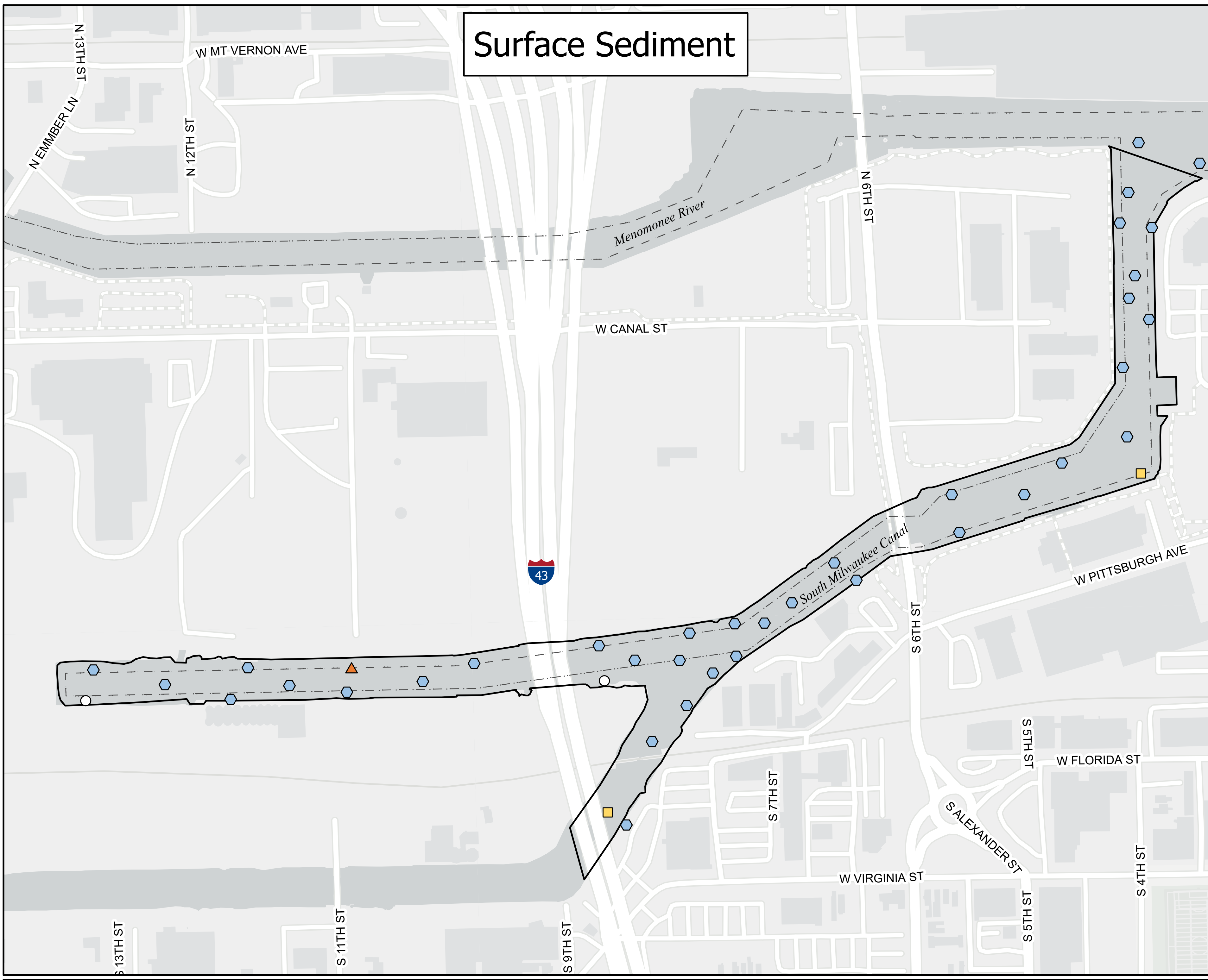
- Burnham Canal Sediment Cover and Wetland Restoration Project
- Federal Navigation Channel

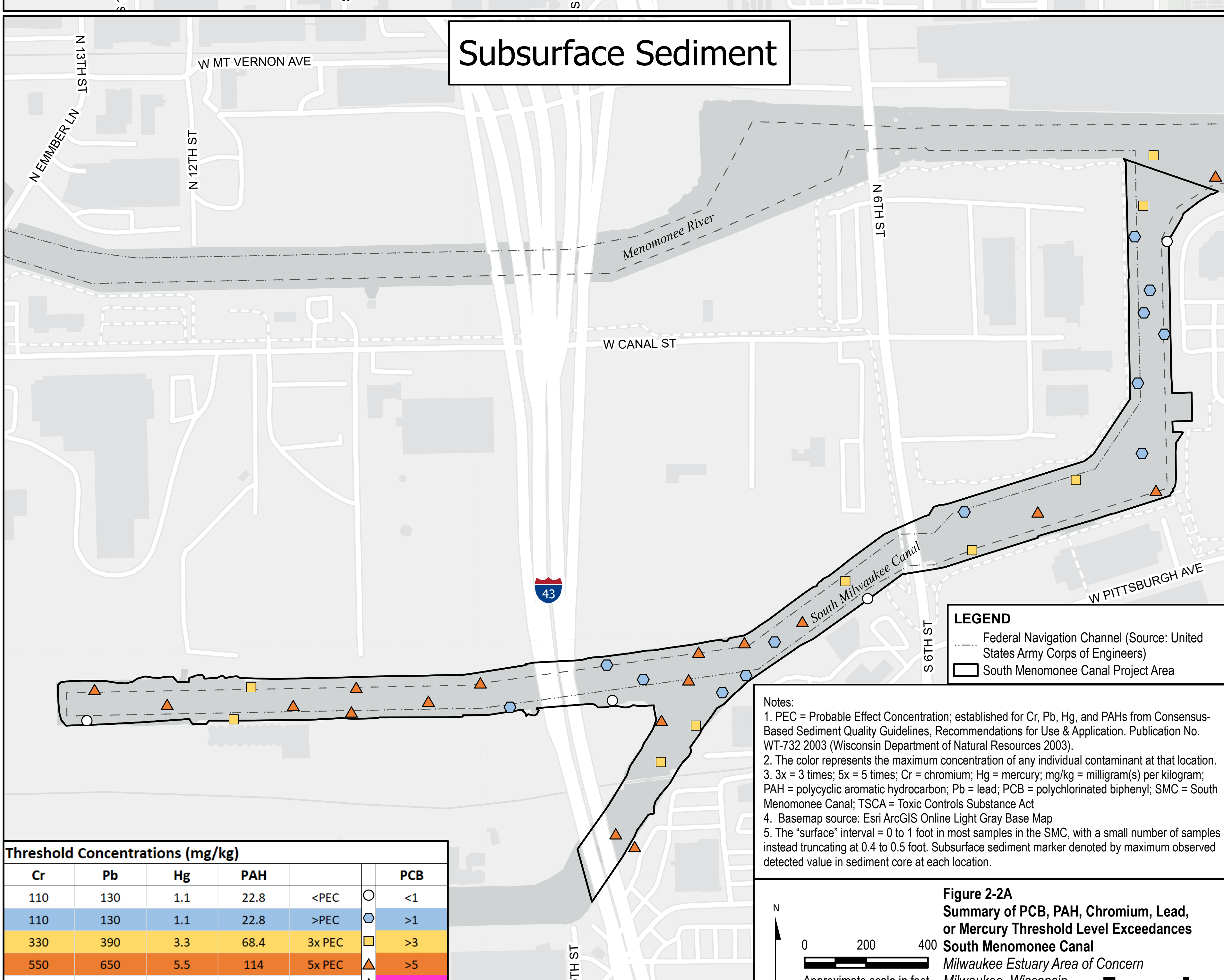
Inset Legend

- Sand and Gravel Seams
- Fill and Soil
- Compacted Native Material (Low Permeability, Dense Clays and Silts)
- Soft Sediment (Clays and silts rich in organics)
- Potential Pathways for Contaminants of Concern (**COCs**)

Figure 2-1
Conceptual Site Model
South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs





LEGEND

Federal Navigation Channel (Source: United States Army Corps of Engineers)

South Menomonee Canal Project Area

Threshold Concentrations (mg/kg)

Cr	Pb	Hg	PAH			PCB
110	130	1.1	22.8	<PEC	○	<1
110	130	1.1	22.8	>PEC	⬡	>1
330	390	3.3	68.4	3x PEC	□	>3
550	650	5.5	114	5x PEC	△	>5
					◇	>50 (TSCA)

Notes:
1. PEC = Probable Effect Concentration; established for Cr, Pb, Hg, and PAHs from Consensus-Based Sediment Quality Guidelines, Recommendations for Use & Application. Publication No. WT-732 2003 (Wisconsin Department of Natural Resources 2003).
2. The color represents the maximum concentration of any individual contaminant at that location.
3. 3x = 3 times; 5x = 5 times; Cr = chromium; Hg = mercury; mg/kg = milligram(s) per kilogram; PAH = polycyclic aromatic hydrocarbon; Pb = lead; PCB = polychlorinated biphenyl; SMC = South Menomonee Canal; TSCA = Toxic Controls Substance Act
4. Basemap source: Esri ArcGIS Online Light Gray Base Map
5. The "surface" interval = 0 to 1 foot in most samples in the SMC, with a small number of samples instead truncating at 0.4 to 0.5 foot. Subsurface sediment marker denoted by maximum observed detected value in sediment core at each location.

N

0 200 400

Approximate scale in feet

Figure 2-2A
Summary of PCB, PAH, Chromium, Lead, or Mercury Threshold Level Exceedances
South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs

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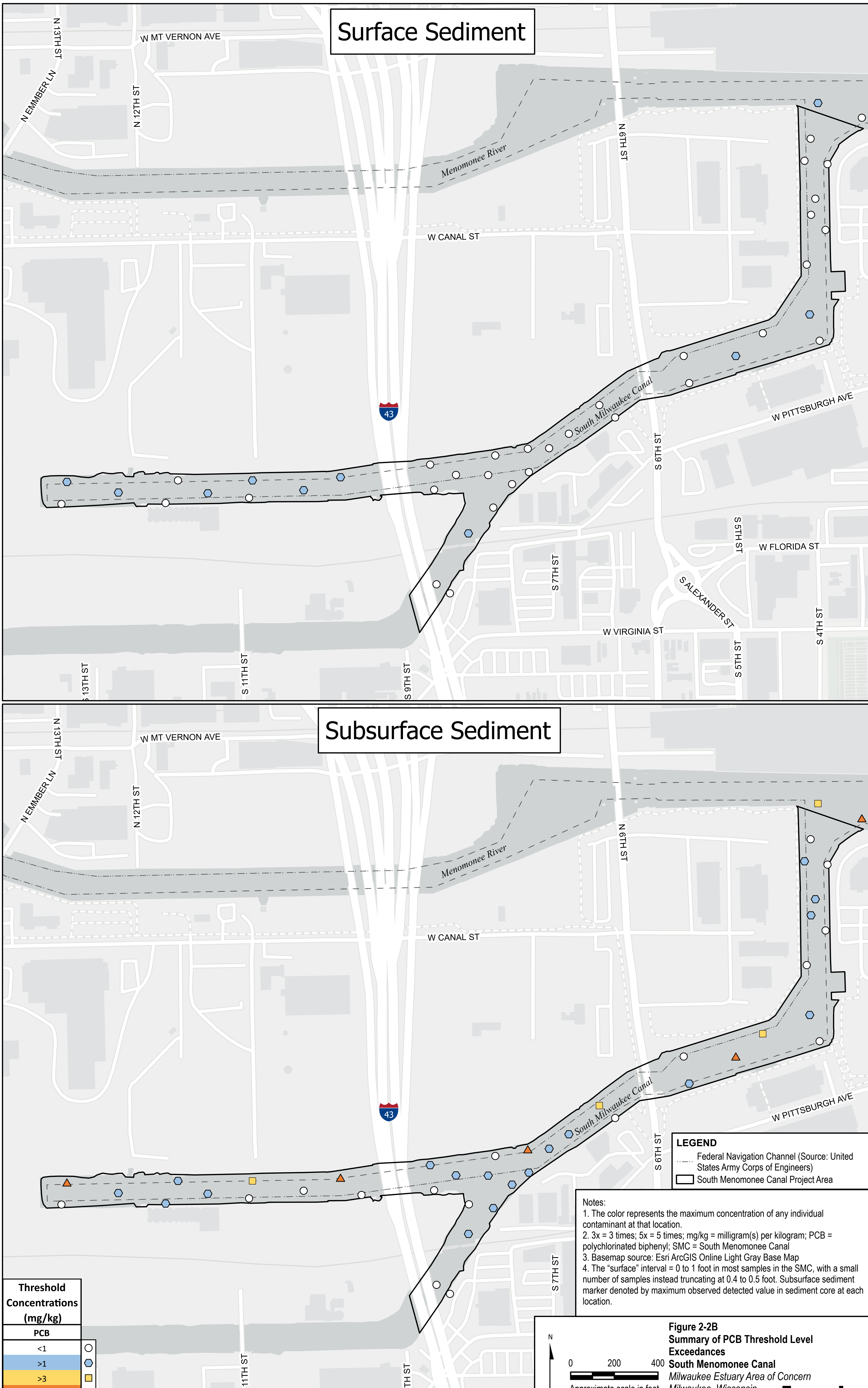

LEGEND

Federal Navigation Channel (Source: United States Army Corps of Engineers)

South Menomonee Canal Project Area

Notes:

1. The color represents the maximum concentration of any individual contaminant at that location.
2. 3x = 3 times; 5x = 5 times; mg/kg = milligram(s) per kilogram; PCB = polychlorinated biphenyl; SMC = South Menomonee Canal
3. Basemap source: Esri ArcGIS Online Light Gray Base Map
4. The "surface" interval = 0 to 1 foot in most samples in the SMC, with a small number of samples instead truncating at 0.4 to 0.5 foot. Subsurface sediment marker denoted by maximum observed detected value in sediment core at each location.

Figure 2-2B
Summary of PCB Threshold Level Exceedances
South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs

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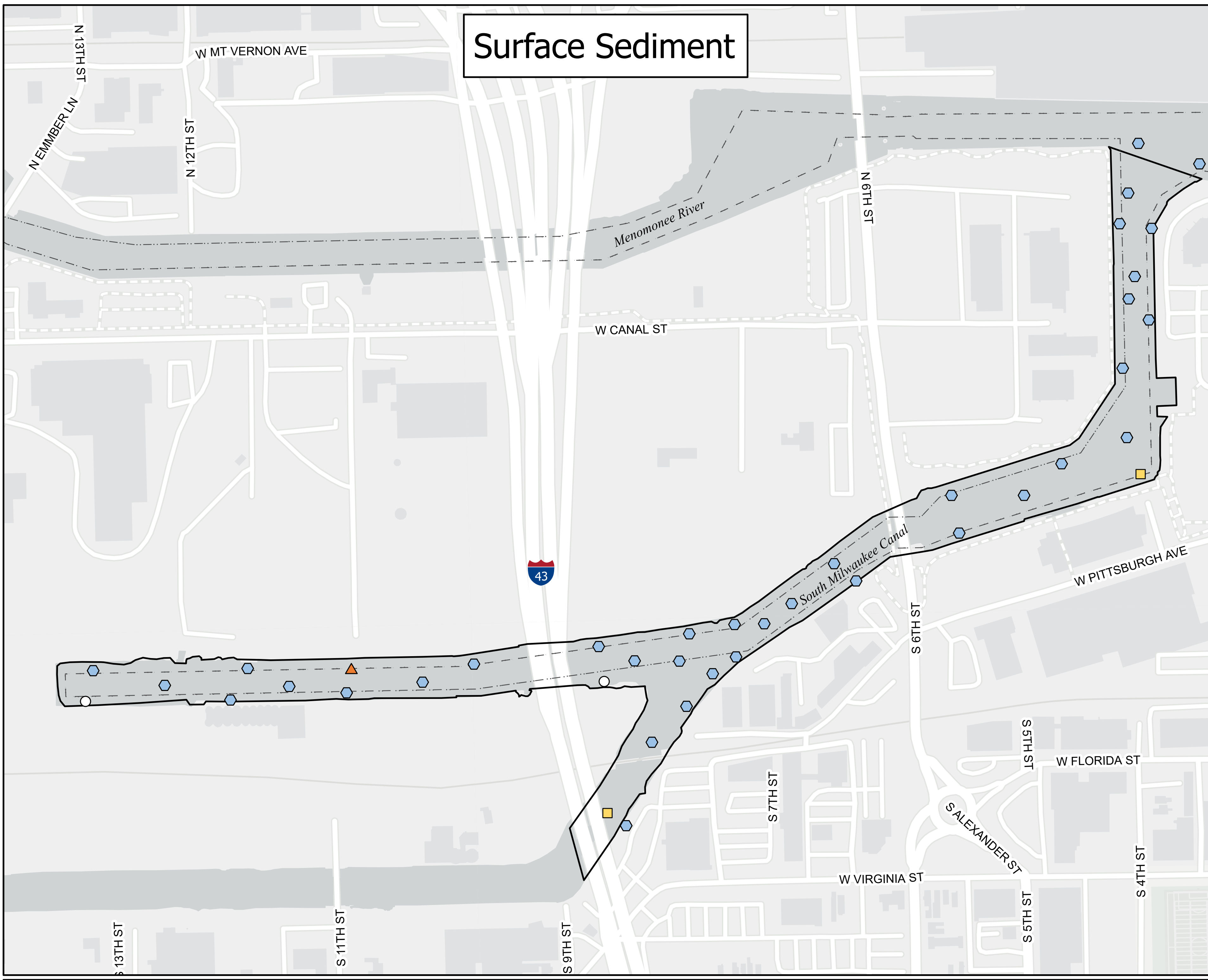
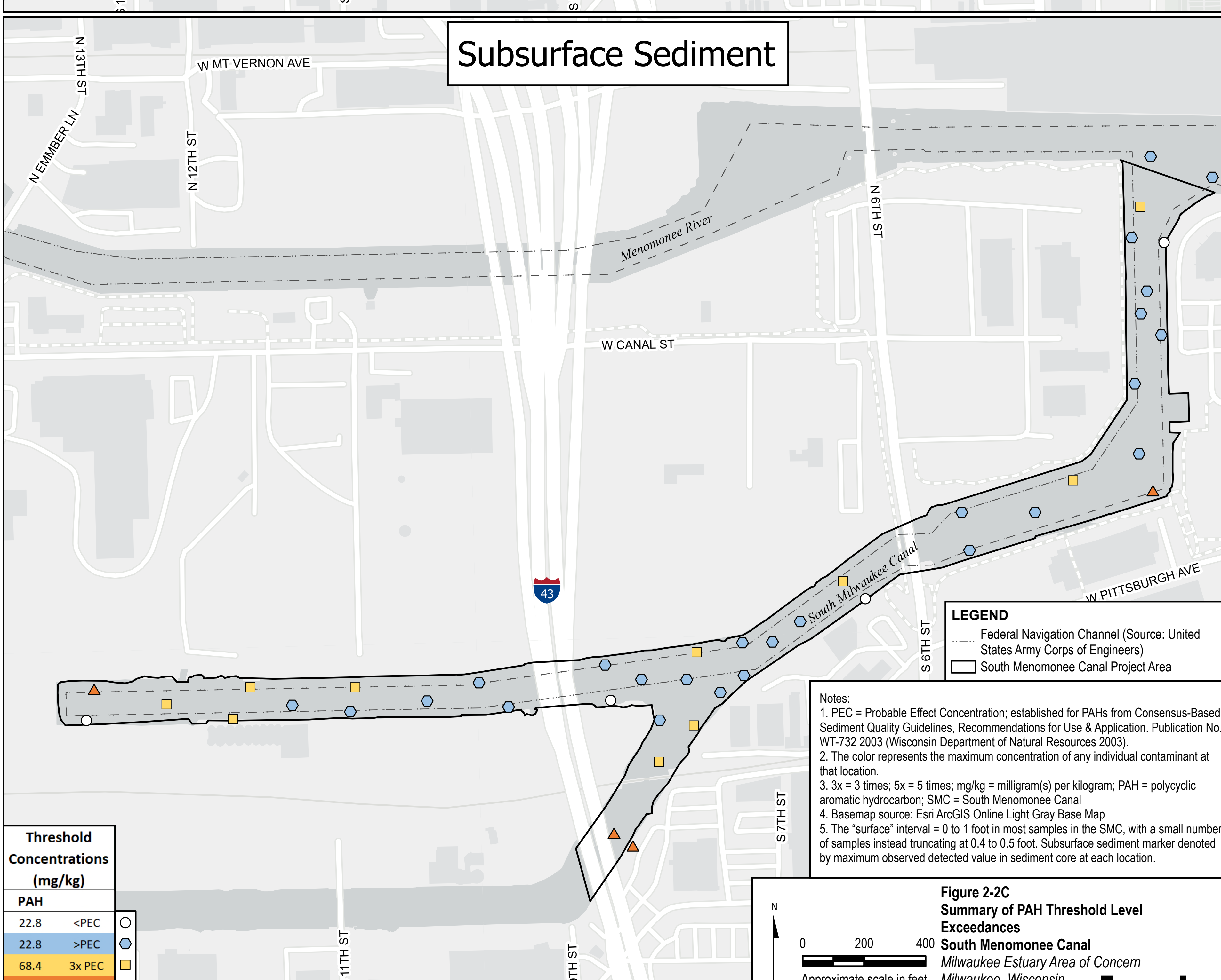
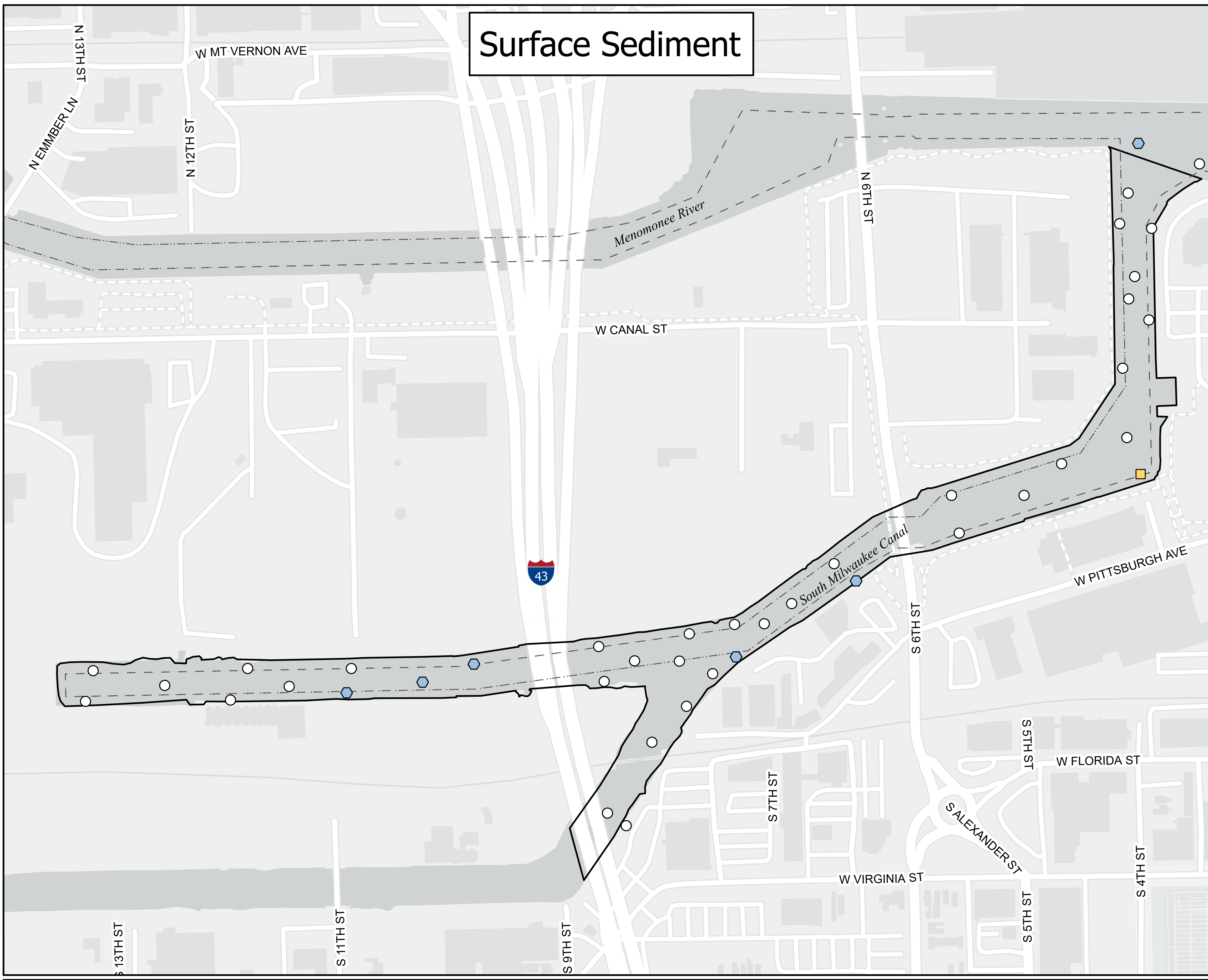


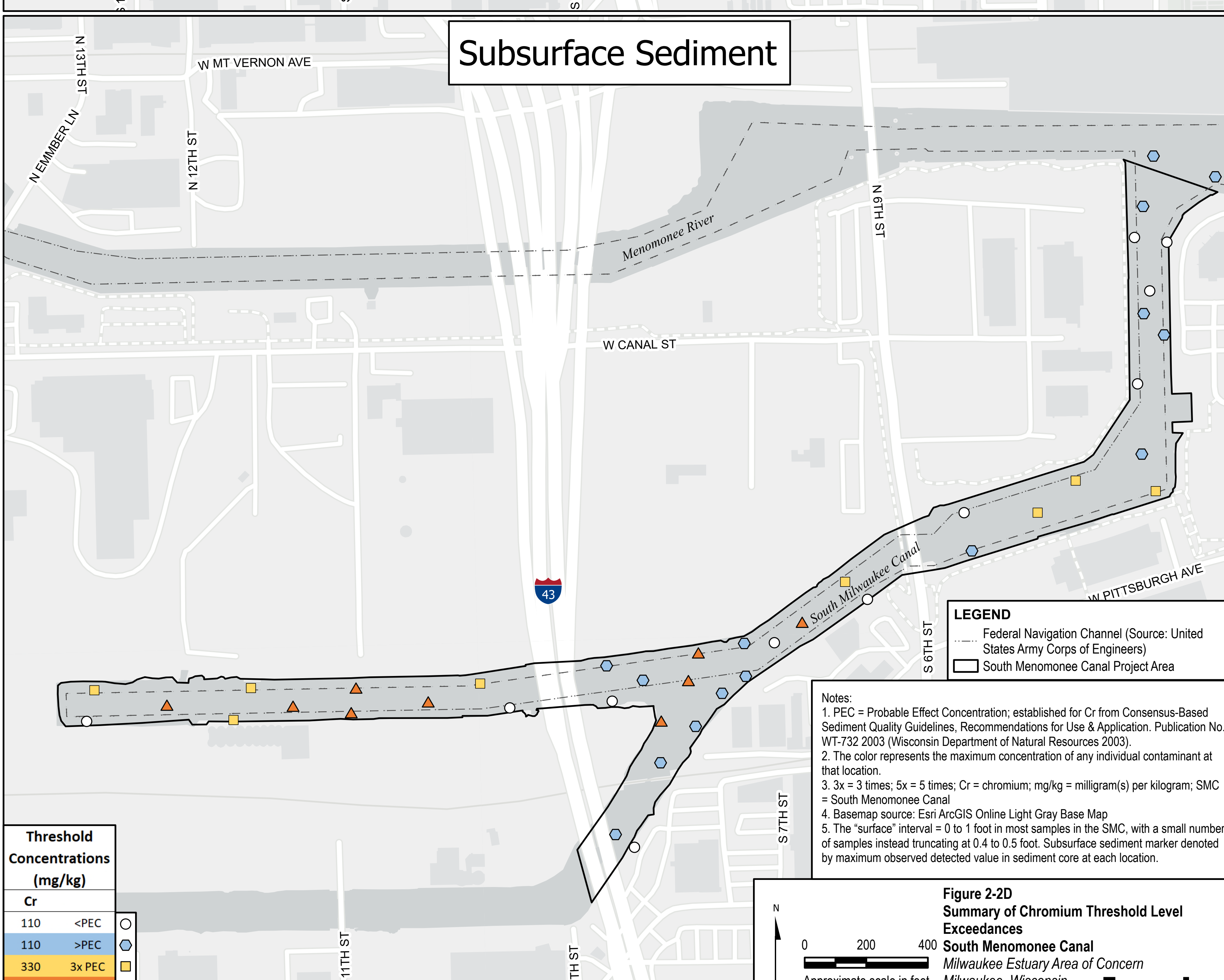


Notes:
1. PEC = Probable Effect Concentration; established for PAHs from Consensus-Based Sediment Quality Guidelines, Recommendations for Use & Application. Publication No. WT-732 2003 (Wisconsin Department of Natural Resources 2003).
2. The color represents the maximum concentration of any individual contaminant at that location.
3. 3x = 3 times; 5x = 5 times; mg/kg = milligram(s) per kilogram; PAH = polycyclic aromatic hydrocarbon; SMC = South Menomonee Canal
4. Basemap source: Esri ArcGIS Online Light Gray Base Map
5. The "surface" interval = 0 to 1 foot in most samples in the SMC, with a small number of samples instead truncating at 0.4 to 0.5 foot. Subsurface sediment marker denoted by maximum observed detected value in sediment core at each location.

Figure 2-2C
Summary of PAH Threshold Level Exceedances
South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs





LEGEND

Federal Navigation Channel (Source: United States Army Corps of Engineers)

South Menomonee Canal Project Area

Threshold Concentrations (mg/kg)		
Cr		
110	<PEC	○
110	>PEC	⬡
330	3x PEC	□
550	5x PEC	△

Notes:
1. PEC = Probable Effect Concentration; established for Cr from Consensus-Based Sediment Quality Guidelines, Recommendations for Use & Application. Publication No. WT-732 2003 (Wisconsin Department of Natural Resources 2003).
2. The color represents the maximum concentration of any individual contaminant at that location.
3. 3x = 3 times; 5x = 5 times; Cr = chromium; mg/kg = milligram(s) per kilogram; SMC = South Menomonee Canal
4. Basemap source: Esri ArcGIS Online Light Gray Base Map
5. The "surface" interval = 0 to 1 foot in most samples in the SMC, with a small number of samples instead truncating at 0.4 to 0.5 foot. Subsurface sediment marker denoted by maximum observed detected value in sediment core at each location.

N

0 200 400

Approximate scale in feet

Figure 2-2D
Summary of Chromium Threshold Level Exceedances
South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs

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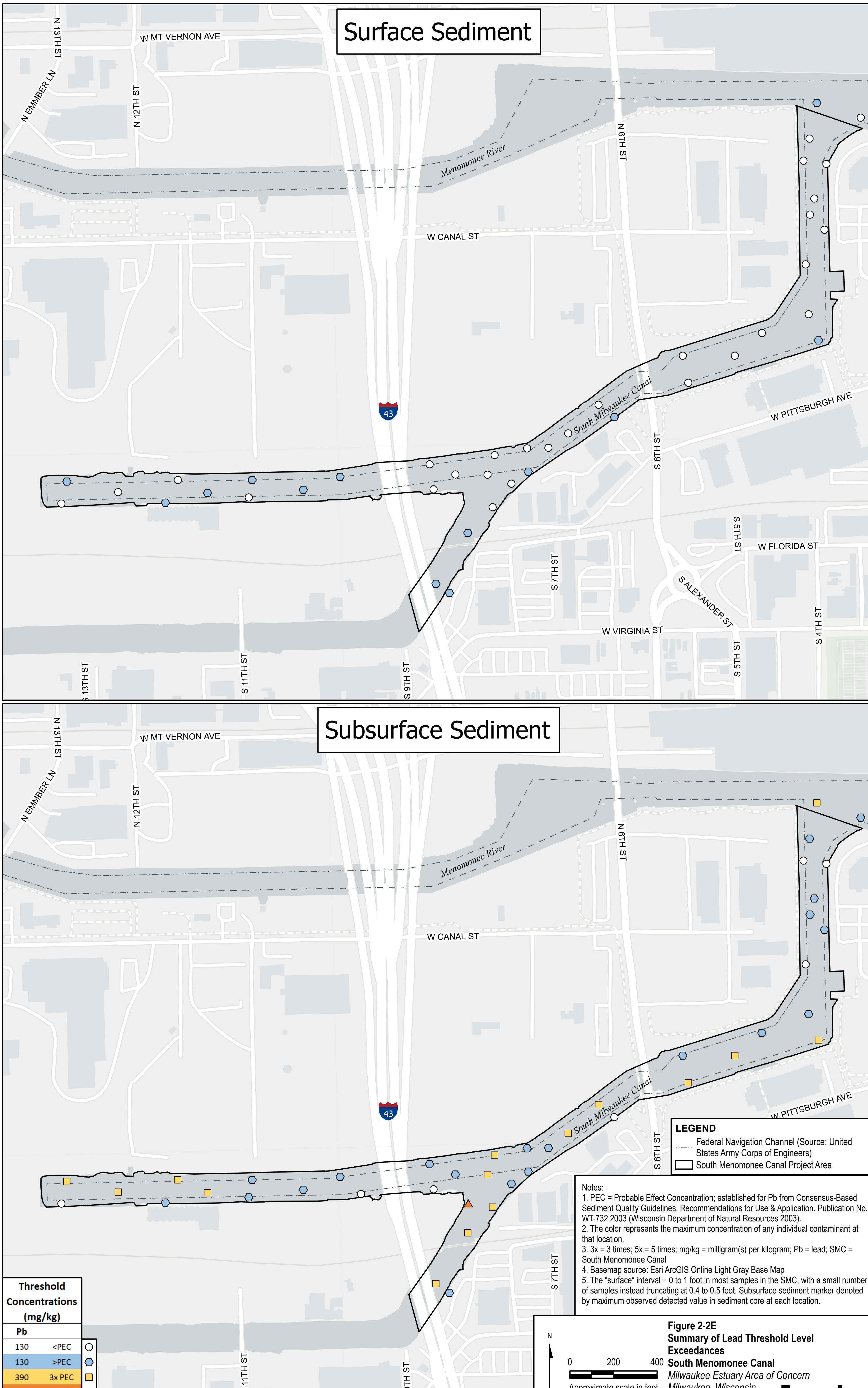

Figure 2-2E
Summary of Lead Threshold Level Exceedances
South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs

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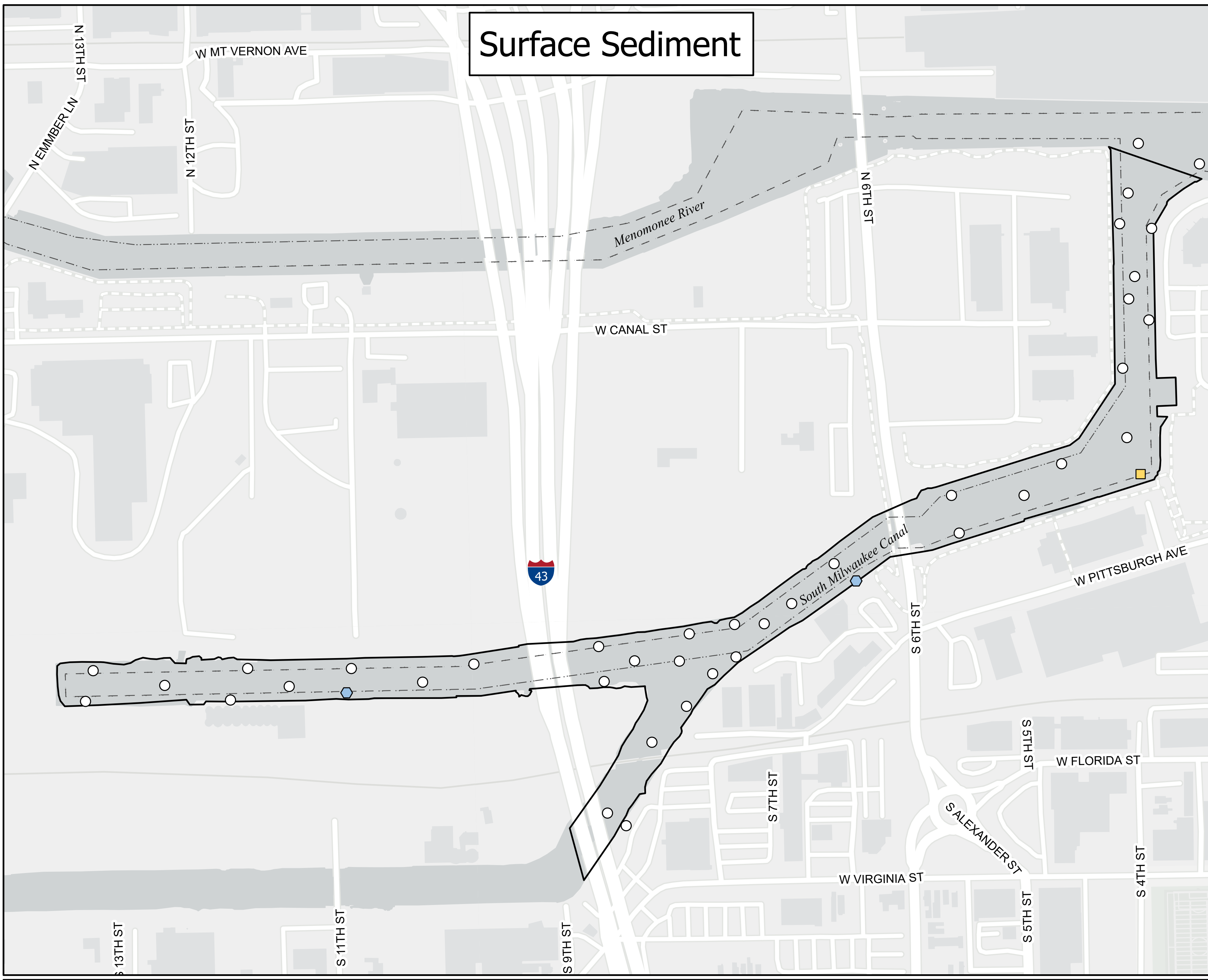

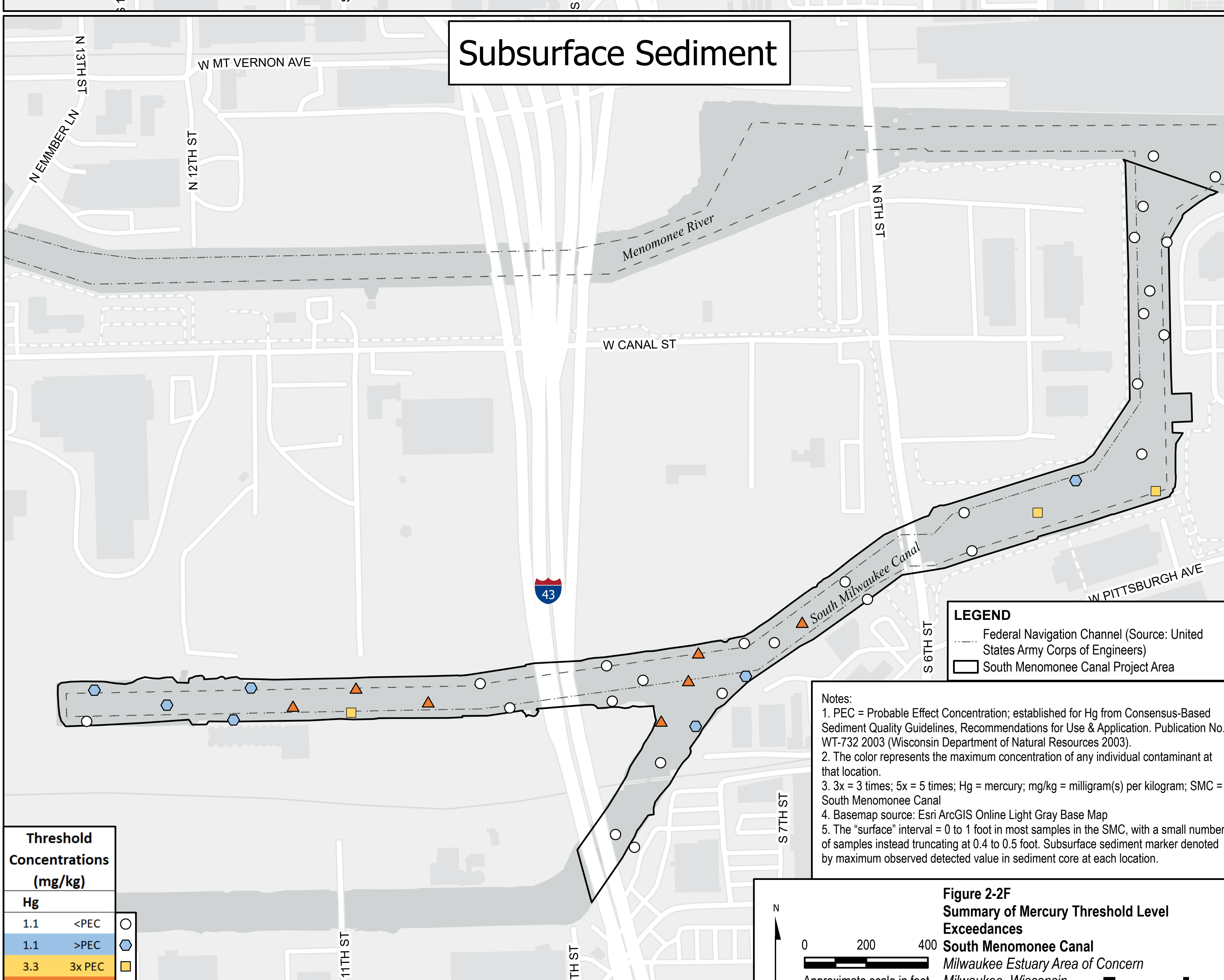

LEGEND

- Federal Navigation Channel (Source: United States Army Corps of Engineers)
- South Menomonee Canal Project Area

Threshold Concentrations (mg/kg)		
Hg		
1.1	<PEC	○
1.1	>PEC	⬡
3.3	3x PEC	□
5.5	5x PEC	△

Notes:
1. PEC = Probable Effect Concentration; established for Hg from Consensus-Based Sediment Quality Guidelines, Recommendations for Use & Application. Publication No. WT-732 2003 (Wisconsin Department of Natural Resources 2003).
2. The color represents the maximum concentration of any individual contaminant at that location.
3. 3x = 3 times; 5x = 5 times; Hg = mercury; mg/kg = milligram(s) per kilogram; SMC = South Menomonee Canal
4. Basemap source: Esri ArcGIS Online Light Gray Base Map
5. The "surface" interval = 0 to 1 foot in most samples in the SMC, with a small number of samples instead truncating at 0.4 to 0.5 foot. Subsurface sediment marker denoted by maximum observed detected value in sediment core at each location.

Figure 2-2F
Summary of Mercury Threshold Level Exceedances
South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs

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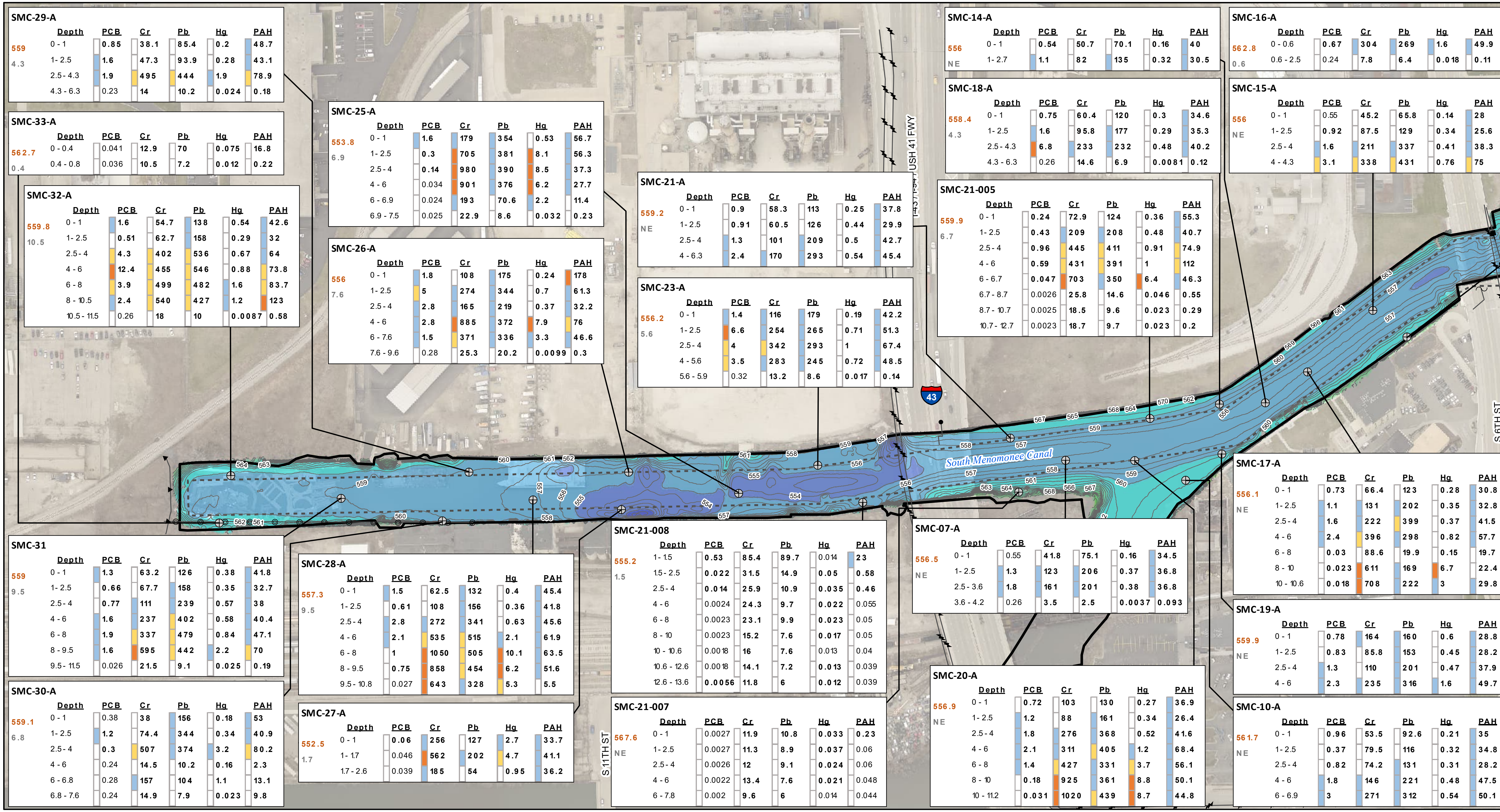


SMC-29-A
Mudline Elevation: 559 — Native Material Depth: 4.3

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.85	38.1	85.4	0.2	48.7
1 - 2.5	1.6	47.3	93.9	0.28	43.1
2.5 - 4.3	1.9	495	444	1.9	78.9
4.3 - 6.3	0.23	14	10.2	0.024	0.18

SMC-33-A
Mudline Elevation: 562.7 — Native Material Depth: 0.4

Depth	PCB	Cr	Pb	Hg	PAH
0 - 0.4	0.041	12.9	70	0.075	16.8
0.4 - 0.8	0.036	10.5	7.2	0.012	0.22

SMC-32-A
Mudline Elevation: 559.8 — Native Material Depth: 10.5

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.6	54.7	138	0.54	42.6
1 - 2.5	0.51	62.7	158	0.29	32
2.5 - 4	4.3	402	536	0.67	64
4 - 6	12.4	455	546	0.88	73.8
6 - 8	3.9	499	482	1.6	83.7
8 - 10.5	2.4	540	427	1.2	123
10.5 - 11.5	0.26	18	10	0.0087	0.58

SMC-25-A
Mudline Elevation: 553.8 — Native Material Depth: 6.9

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.6	179	354	0.53	56.7
1 - 2.5	0.3	705	381	8.1	56.3
2.5 - 4	0.14	980	390	8.5	37.3
4 - 6	0.034	901	376	6.2	27.7
6 - 6.9	0.024	193	70.6	2.2	11.4
6.9 - 7.5	0.025	22.9	8.6	0.032	0.23

SMC-26-A
Mudline Elevation: 556 — Native Material Depth: 7.6

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.8	108	175	0.24	178
1 - 2.5	5	274	344	0.7	61.3
2.5 - 4	2.8	165	219	0.37	32.2
4 - 6	2.8	885	372	7.9	76
6 - 7.6	1.5	371	336	3.3	46.6
7.6 - 9.6	0.28	25.3	20.2	0.0099	0.3

SMC-21-A
Mudline Elevation: 559.2 — Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.9	58.3	113	0.25	37.8
1 - 2.5	0.91	60.5	126	0.44	29.9
2.5 - 4	1.3	101	209	0.5	42.7
4 - 6.3	2.4	170	293	0.54	45.4

SMC-23-A
Mudline Elevation: 556.2 — Native Material Depth: 5.6

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.4	116	179	0.19	42.2
1 - 2.5	6.6	254	265	0.71	51.3
2.5 - 4	4	342	293	1	67.4
4 - 5.6	3.5	283	245	0.72	48.5
5.6 - 5.9	0.32	13.2	8.6	0.017	0.14

SMC-14-A
Mudline Elevation: 556 — Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.54	50.7	70.1	0.16	40
1 - 2.7	1.1	82	135	0.32	30.5

SMC-16-A
Mudline Elevation: 562.8 — Native Material Depth: 0.6

Depth	PCB	Cr	Pb	Hg	PAH
0 - 0.6	0.67	304	269	1.6	49.9
0.6 - 2.5	0.24	7.8	6.4	0.018	0.11

SMC-18-A
Mudline Elevation: 558.4 — Native Material Depth: 4.3

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.75	60.4	120	0.3	34.6
1 - 2.5	1.6	95.8	177	0.29	35.3
2.5 - 4.3	6.8	233	232	0.48	40.2
4.3 - 6.3	0.26	14.6	6.9	0.0081	0.12

SMC-15-A
Mudline Elevation: 556 — Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.55	45.2	65.8	0.14	28
1 - 2.5	0.92	87.5	129	0.34	25.6
2.5 - 4	1.6	211	337	0.41	38.3
4 - 4.3	3.1	338	431	0.76	75

SMC-21-005
Mudline Elevation: 559.9 — Native Material Depth: 6.7

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.24	72.9	124	0.36	55.3
1 - 2.5	0.43	209	208	0.48	40.7
2.5 - 4	0.96	445	411	0.91	74.9
4 - 6	0.59	431	391	1	112
6 - 6.7	0.047	703	350	6.4	46.3
6.7 - 8.7	0.0026	25.8	14.6	0.046	0.55
8.7 - 10.7	0.0025	18.5	9.6	0.023	0.29
10.7 - 12.7	0.0023	18.7	9.7	0.023	0.2

SMC-17-A
Mudline Elevation: 556.1 — Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.73	66.4	123	0.28	30.8
1 - 2.5	1.1	131	202	0.35	32.8
2.5 - 4	1.6	222	399	0.37	41.5
4 - 6	2.4	396	298	0.82	57.7
6 - 8	0.03	88.6	19.9	0.15	19.7
8 - 10	0.023	611	169	6.7	22.4
10 - 10.6	0.018	708	222	3	29.8

SMC-19-A
Mudline Elevation: 559.9 — Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.78	164	160	0.6	28.8
1 - 2.5	0.83	85.8	153	0.45	28.2
2.5 - 4	1.3	110	201	0.47	37.9
4 - 6	2.3	235	316	1.6	49.7

SMC-10-A
Mudline Elevation: 561.7 — Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.96	53.5	92.6	0.21	35
1 - 2.5	0.37	79.5	116	0.32	34.8
2.5 - 4	0.82	74.2	131	0.31	28.2
4 - 6	1.8	146	221	0.48	47.5
6 - 6.9	3	271	312	0.54	50.1

SMC-20-A
Mudline Elevation: 556.9 — Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.72	103	130	0.27	36.9
1 - 2.5	1.2	88	161	0.34	26.4
2.5 - 4	1.8	276	368	0.52	41.6
4 - 6	2.1	311	405	1.2	68.4
6 - 8	1.4	427	331	3.7	56.1
8 - 10	0.18	925	361	8.8	50.1
10 - 11.2	0.031	1020	439	8.7	44.8

SMC-07-A
Mudline Elevation: 556.5 — Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.55	41.8	75.1	0.16	34.5
1 - 2.5	1.3	123	206	0.37	36.8
2.5 - 3.6	1.8	161	201	0.38	36.8
3.6 - 4.2	0.26	3.5	2.5	0.0037	0.093

SMC-21-008
Mudline Elevation: 555.2 — Native Material Depth: 1.5

Depth	PCB	Cr	Pb	Hg	PAH
1 - 1.5	0.53	85.4	89.7	0.014	23
1.5 - 2.5	0.022	31.5	14.9	0.05	0.58
2.5 - 4	0.014	25.9	10.9	0.035	0.46
4 - 6	0.0024	24.3	9.7	0.022	0.055
6 - 8	0.0023	23.1	9.9	0.023	0.05
8 - 10	0.0023	15.2	7.6	0.017	0.05
10 - 10.6	0.0018	16	7.6	0.013	0.04
10.6 - 12.6	0.0018	14.1	7.2	0.013	0.039
12.6 - 13.6	0.0056	11.8	6	0.012	0.039

SMC-21-007
Mudline Elevation: 567.6 — Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.0027	11.9	10.8	0.033	0.23
1 - 2.5	0.0027	11.3	8.9	0.037	0.06
2.5 - 4	0.0026	12	9.1	0.024	0.06
4 - 6	0.0022	13.4	7.6	0.021	0.048
6 - 7.8	0.002	9.6	6	0.014	0.044

SMC-31
Mudline Elevation: 559 — Native Material Depth: 9.5

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.3	63.2	126	0.38	41.8
1 - 2.5	0.66	67.7	158	0.35	32.7
2.5 - 4	0.77	111	239	0.57	38
4 - 6	1.6	237	402	0.58	40.4
6 - 8	1.9	337	479	0.84	47.1
8 - 9.5	1.6	595	442	2.2	70
9.5 - 11.5	0.026	21.5	9.1	0.025	0.19

SMC-28-A
Mudline Elevation: 557.3 — Native Material Depth: 9.5

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.5	62.5	132	0.4	45.4
1 - 2.5	0.61	108	156	0.36	41.8
2.5 - 4	2.8	272	341	0.63	45.6
4 - 6	2.1	535	515	2.1	61.9
6 - 8	1	1050	505	10.1	63.5
8 - 9.5	0.75	858	454	6.2	51.6
9.5 - 10.8	0.027	643	328	5.3	5.5

SMC-30-A
Mudline Elevation: 559.1 — Native Material Depth: 6.8

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.38	38	156	0.18	53
1 - 2.5	1.2	74.4	344	0.34	40.9
2.5 - 4	0.3	507	374	3.2	80.2
4 - 6	0.24	14.5	10.2	0.16	2.3
6 - 6.8	0.28	157	104	1.1	13.1
6.8 - 7.6	0.24	14.9	7.9	0.023	9.8

SMC-27-A
Mudline Elevation: 552.5 — Native Material Depth: 1.7

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.06	256	127	2.7	33.7
1 - 1.7	0.046	562	202	4.7	41.1
1.7 - 2.6	0.039	185	54	0.95	36.2

LEGEND

- Analytical Sample Location
- Federal Navigation Channel
- South Menomonee Canal Project Area
- Storm Sewer
- Water Line

Bathymetry (feet)
- Bathymetric Contour

Elevation (feet)
- 576 - 580
- 571 - 575
- 566 - 570
- 561 - 565
- 556 - 560
- 551 - 555
- 545 - 550

Utilities
- Electric
- Fiber Optic
- Gas
- Sanitary Sewer

N

0 100 200
Approximate scale in feet

Analytical Results Table Format

Location ID

Mudline Elevation

Native Material Depth

Depth	PCBs (mg/kg)	Metals (mg/kg)	PAHs (mg/kg)
Sample interval (ft bss)	<1	<PEC	<PEC
	1 - 3	>PEC	>PEC
	3 - 5	>3xPEC	>3xPEC
	5 - 50	>5xPEC	>5xPEC
	>50		

Bold values represent results above the detection limit

"-" = COC was not sampled/analyzed

NE = Native Material Not Encountered

Notes:
1. Basemap: Milwaukee County 2020 Aerial Orthophotography captured April 2020.
2. Horizontal Datum: North American Datum 1983 (NAD83)
3. Vertical Datum: North American Vertical Datum of 1988 (NAVD88). Bathymetric contour and shading were generated from hydrographic survey data collected by Seaworks (2020).
4. PEC values were obtained from the Consensus-Based Sediment Quality Guidelines, Recommendations for Use & Application. Publication No. WT-732 2003 (Wisconsin Department of Natural Resources 2003).
5. 3x = 3 times; 5x = 5 times; COC = Contaminant of Concern; Cr = chromium; ft bss = feet below sediment surface; Hg = mercury; mg/kg = milligram(s) per kilogram; NE = not encountered; Pb = lead; PAH = polycyclic aromatic hydrocarbon; PCB = polychlorinated biphenyl; PEC= Probable effects concentration

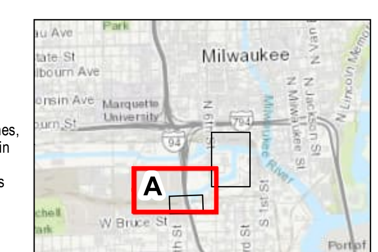
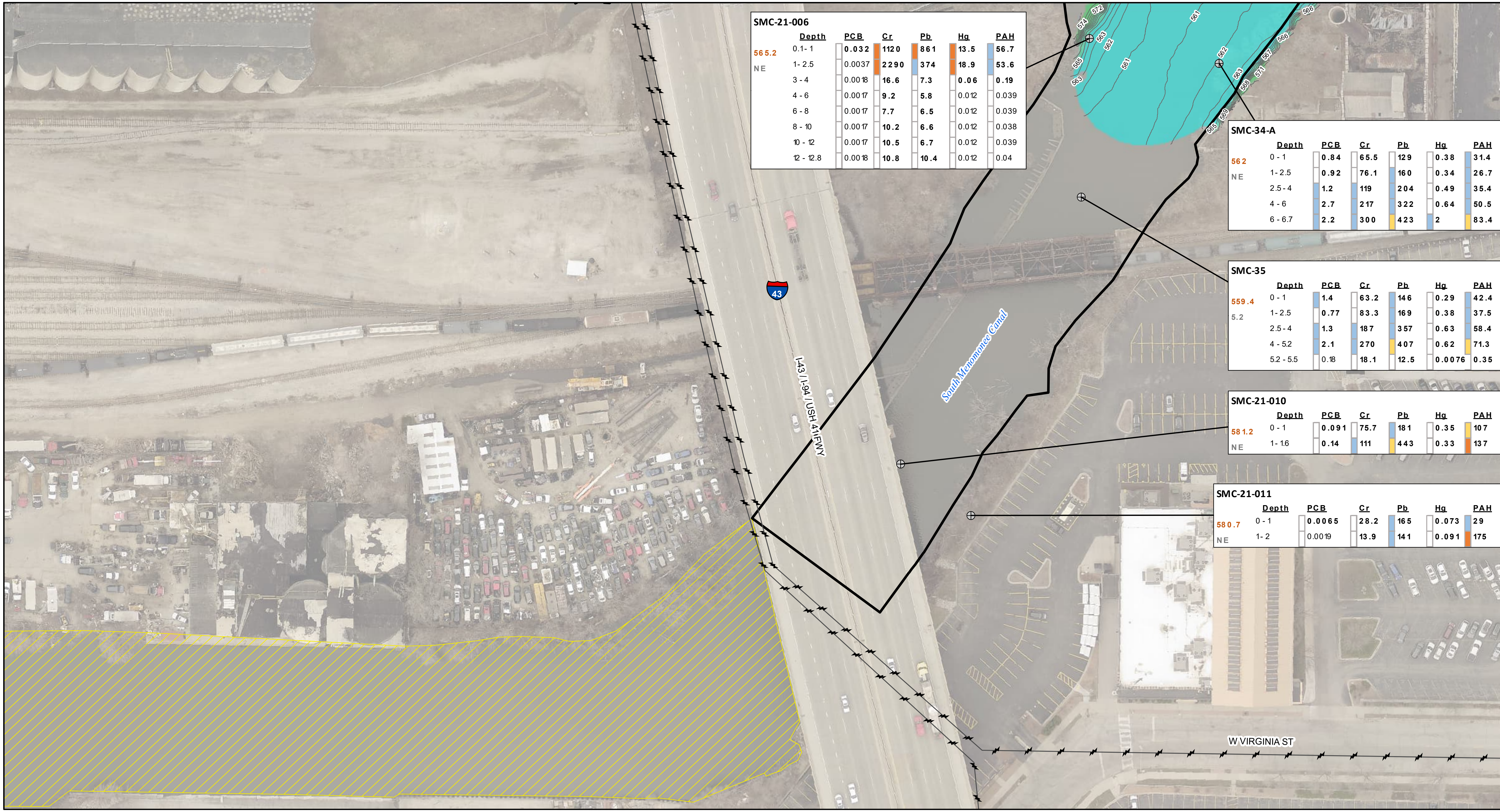


Figure 2-3A
Analytical Results Summary
South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs



SMC-21-006

	Depth	PCB	Cr	Pb	Hg	PAH
565.2	0.1 - 1	**0.032**	**1120**	**861**	**13.5**	**56.7**
NE	1 - 2.5	0.0037	**2290**	**374**	**18.9**	**53.6**
	3 - 4	0.0018	**16.6**	**7.3**	**0.06**	**0.19**
	4 - 6	0.0017	**9.2**	**5.8**	0.012	0.039
	6 - 8	0.0017	**7.7**	**6.5**	0.012	0.039
	8 - 10	0.0017	**10.2**	**6.6**	0.012	0.038
	10 - 12	0.0017	**10.5**	**6.7**	0.012	0.039
	12 - 12.8	0.0018	**10.8**	**10.4**	0.012	0.04

SMC-34-A

	Depth	PCB	Cr	Pb	Hg	PAH
562	0 - 1	**0.84**	**65.5**	**129**	**0.38**	**31.4**
NE	1 - 2.5	**0.92**	**76.1**	**160**	**0.34**	**26.7**
	2.5 - 4	**1.2**	**119**	**204**	**0.49**	**35.4**
	4 - 6	**2.7**	**217**	**322**	**0.64**	**50.5**
	6 - 6.7	**2.2**	**300**	**423**	**2**	**83.4**

SMC-35

	Depth	PCB	Cr	Pb	Hg	PAH
559.4	0 - 1	**1.4**	**63.2**	**146**	**0.29**	**42.4**
5.2	1 - 2.5	**0.77**	**83.3**	**169**	**0.38**	**37.5**
	2.5 - 4	**1.3**	**187**	**357**	**0.63**	**58.4**
	4 - 5.2	**2.1**	**270**	**407**	**0.62**	**71.3**
	5.2 - 5.5	0.18	**18.1**	**12.5**	**0.0076**	**0.35**

SMC-21-010

	Depth	PCB	Cr	Pb	Hg	PAH
581.2	0 - 1	**0.091**	**75.7**	**181**	**0.35**	**107**
NE	1 - 1.6	**0.14**	**111**	**443**	**0.33**	**137**

SMC-21-011

	Depth	PCB	Cr	Pb	Hg	PAH
580.7	0 - 1	**0.0065**	**28.2**	**165**	**0.073**	**29**
NE	1 - 2	0.0019	**13.9**	**141**	**0.091**	**175**

N

0 40 80

Approximate scale in feet

LEGEND

- Analytical Sample Location
- Burnham Canal Sediment Cover and Wetland Restoration Project
- South Menomonee Canal Project Area

Utilities

- Electric

Bathymetry (feet)

- Bathymetric Contour

Elevation (feet)

- 576 - 580
- 571 - 575
- 566 - 570
- 561 - 565

Analytical Results Table Format

Location ID				
Mudline Elevation		PCBs (mg/kg)	Metals (mg/kg)	PAHs (mg/kg)
	Depth			
Native Material Depth		<1	<PEC	<PEC
	Sample interval (ft bss)	1 - 3	>PEC	>PEC
		3 - 5	>3xPEC	>3xPEC
		5 - 50	>5xPEC	>5xPEC
		>50		

Bold values represent results above the detection limit

"-" = COC was not sampled/analyzed

NE = Native Material Not Encountered

Notes:

1. Basemap: Milwaukee County 2020 Aerial Orthophotography captured April 2020.
2. Horizontal Datum: North American Datum 1983 (NAD83)
3. Vertical Datum: North American Vertical Datum of 1988 (NAVD88). Bathymetric contour and shading were generated from hydrographic survey data collected by Seaworks (2020).
4. PEC values were obtained from the Consensus-Based Sediment Quality Guidelines, Recommendations for Use & Application. Publication No. WT-732 2003 (Wisconsin Department of Natural Resources 2003).
5. 3x = 3 times; 5x = 5 times; COC = Contaminant of Concern; Cr = chromium; ft bss = feet below sediment surface; Hg = mercury; mg/kg = milligram(s) per kilogram; NE = not encountered; Pb = lead; PAH = polycyclic aromatic hydrocarbon; PCB = polychlorinated biphenyl; PEC= Probable effects concentration

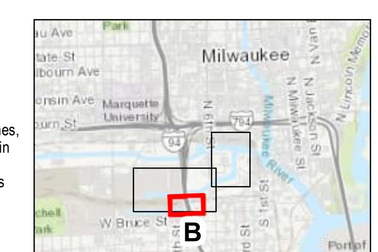
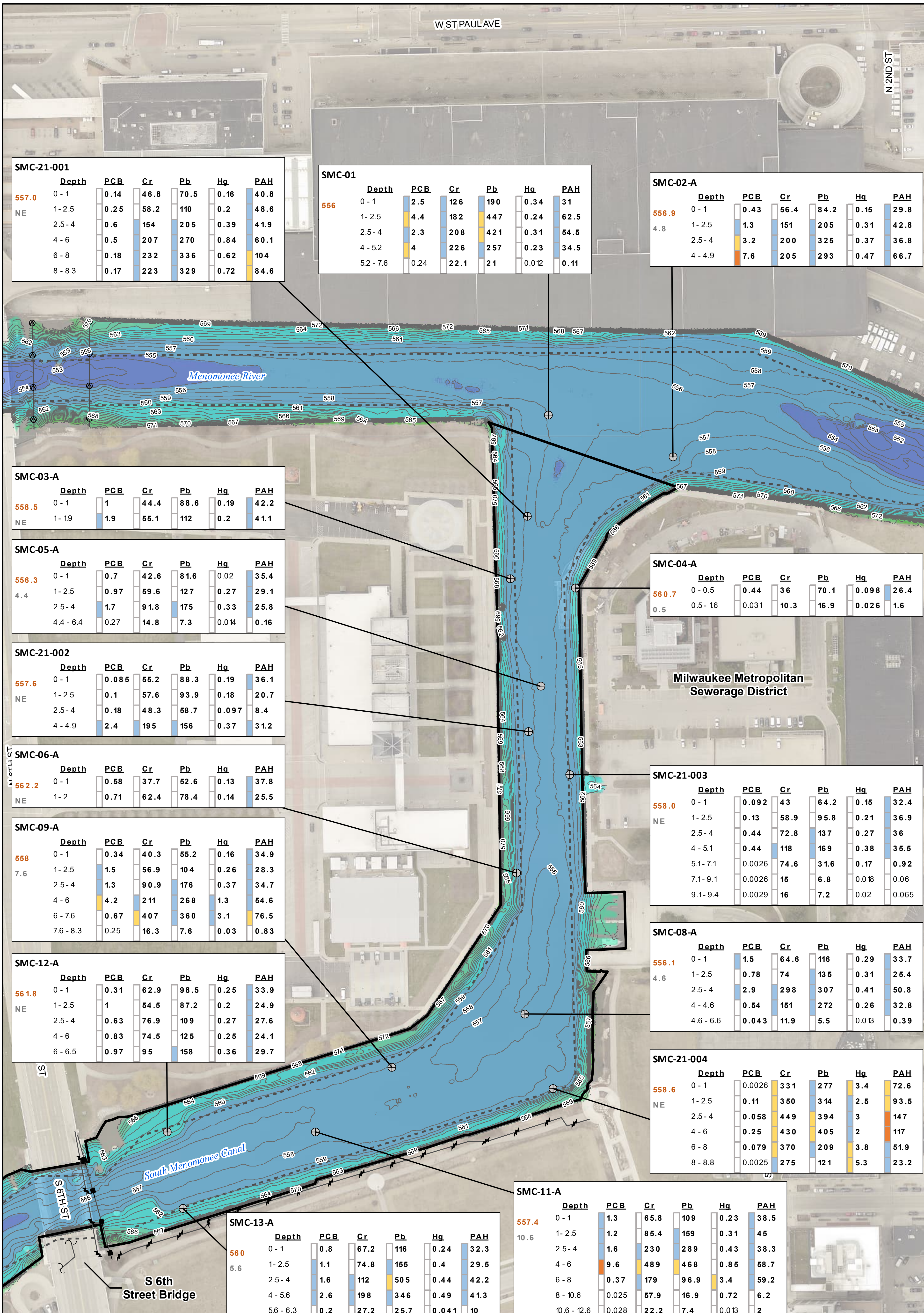


Figure 2-3B
Analytical Results Summary
South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs



SMC-21-001 (Mudline Elevation 557.0; Native Material Depth NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.14	46.8	70.5	0.16	40.8
1 - 2.5	0.25	58.2	110	0.2	48.6
2.5 - 4	0.6	154	205	0.39	41.9
4 - 6	0.5	207	270	0.84	60.1
6 - 8	0.18	232	336	0.62	104
8 - 8.3	0.17	223	329	0.72	84.6

SMC-01 (Mudline Elevation 556)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	2.5	126	190	0.34	31
1 - 2.5	4.4	182	447	0.24	62.5
2.5 - 4	2.3	208	421	0.31	54.5
4 - 5.2	4	226	257	0.23	34.5
5.2 - 7.6	0.24	22.1	21	0.012	0.11

SMC-02-A (Mudline Elevation 556.9; Native Material Depth 4.8)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.43	56.4	84.2	0.15	29.8
1 - 2.5	1.3	151	205	0.31	42.8
2.5 - 4	3.2	200	325	0.37	36.8
4 - 4.9	7.6	205	293	0.47	66.7

SMC-03-A (Mudline Elevation 558.5; Native Material Depth NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1	44.4	88.6	0.19	42.2
1 - 1.9	1.9	55.1	112	0.2	41.1

SMC-05-A (Mudline Elevation 556.3; Native Material Depth 4.4)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.7	42.6	81.6	0.02	35.4
1 - 2.5	0.97	59.6	127	0.27	29.1
2.5 - 4	1.7	91.8	175	0.33	25.8
4.4 - 6.4	0.27	14.8	7.3	0.014	0.16

SMC-21-002 (Mudline Elevation 557.6; Native Material Depth NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.085	55.2	88.3	0.19	36.1
1 - 2.5	0.1	57.6	93.9	0.18	20.7
2.5 - 4	0.18	48.3	58.7	0.097	8.4
4 - 4.9	2.4	195	156	0.37	31.2

SMC-06-A (Mudline Elevation 562.2; Native Material Depth NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.58	37.7	52.6	0.13	37.8
1 - 2	0.71	62.4	78.4	0.14	25.5

SMC-09-A (Mudline Elevation 558; Native Material Depth 7.6)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.34	40.3	55.2	0.16	34.9
1 - 2.5	1.5	56.9	104	0.26	28.3
2.5 - 4	1.3	90.9	176	0.37	34.7
4 - 6	4.2	211	268	1.3	54.6
6 - 7.6	0.67	407	360	3.1	76.5
7.6 - 8.3	0.25	16.3	7.6	0.03	0.83

SMC-12-A (Mudline Elevation 561.8; Native Material Depth NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.31	62.9	98.5	0.25	33.9
1 - 2.5	1	54.5	87.2	0.2	24.9
2.5 - 4	0.63	76.9	109	0.27	27.6
4 - 6	0.83	74.5	125	0.25	24.1
6 - 6.5	0.97	95	158	0.36	29.7

SMC-04-A (Mudline Elevation 560.7; Native Material Depth 0.5)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 0.5	0.44	36	70.1	0.098	26.4
0.5 - 1.6	0.031	10.3	16.9	0.026	1.6

SMC-21-003 (Mudline Elevation 558.0; Native Material Depth NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.092	43	64.2	0.15	32.4
1 - 2.5	0.13	58.9	95.8	0.21	36.9
2.5 - 4	0.44	72.8	137	0.27	36
4 - 5.1	0.44	118	169	0.38	35.5
5.1 - 7.1	0.0026	74.6	31.6	0.17	0.92
7.1 - 9.1	0.0026	15	6.8	0.018	0.06
9.1 - 9.4	0.0029	16	7.2	0.02	0.065

SMC-08-A (Mudline Elevation 556.1; Native Material Depth 4.6)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.5	64.6	116	0.29	33.7
1 - 2.5	0.78	74	135	0.31	25.4
2.5 - 4	2.9	298	307	0.41	50.8
4 - 4.6	0.54	151	272	0.26	32.8
4.6 - 6.6	0.043	11.9	5.5	0.013	0.39

SMC-21-004 (Mudline Elevation 558.6; Native Material Depth NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.0026	331	277	3.4	72.6
1 - 2.5	0.11	350	314	2.5	93.5
2.5 - 4	0.058	449	394	3	147
4 - 6	0.25	430	405	2	117
6 - 8	0.079	370	209	3.8	51.9
8 - 8.8	0.0025	275	121	5.3	23.2

SMC-11-A (Mudline Elevation 557.4; Native Material Depth 10.6)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.3	65.8	109	0.23	38.5
1 - 2.5	1.2	85.4	159	0.31	45
2.5 - 4	1.6	230	289	0.43	38.3
4 - 6	9.6	489	468	0.85	58.7
6 - 8	0.37	179	96.9	3.4	59.2
8 - 10.6	0.025	57.9	16.9	0.72	6.2
10.6 - 12.6	0.028	22.2	7.4	0.013	2

SMC-13-A (Mudline Elevation 560; Native Material Depth 5.6)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.8	67.2	116	0.24	32.3
1 - 2.5	1.1	74.8	155	0.4	29.5
2.5 - 4	1.6	112	505	0.44	42.2
4 - 5.6	2.6	198	346	0.49	41.3
5.6 - 6.3	0.2	27.2	25.7	0.041	10

LEGEND

- Analytical Sample Location
- Federal Navigation Channel
- South Menomonee Canal Project Area

Utilities

- Electric
- Gas
- Storm Sewer
- Utility Identified during Menomonee and Milwaukee River FFS

Bathymetry (feet)

- Bathymetric Contour

Elevation (feet)

- 576 - 580
- 571 - 575
- 566 - 570
- 561 - 565
- 556 - 560
- 551 - 555
- 545 - 550

0 75 150

Approximate scale in feet

N

Analytical Results Table Format

Location ID

Mudline Elevation

Native Material Depth

Depth	PCBs (mg/kg)	Metals (mg/kg)	PAHs (mg/kg)
	<1	<PEC	<PEC
Sample interval (ft bss)	1 - 3	>PEC	>PEC
	3 - 5	>3xPEC	>3xPEC
	5 - 50	>5xPEC	>5xPEC
	>50		

Bold values represent results above the detection limit

"-" = COC was not sampled/analyzed

NE = Native Material Not Encountered

Notes:

1. Basemap: Milwaukee County 2020 Aerial Orthophotography captured April 2020.
2. Horizontal Datum: North American Datum 1983 (NAD83)
3. Vertical Datum: North American Vertical Datum of 1988 (NAVD88). Bathymetric contour and shading were generated from hydrographic survey data collected by Seaworks (2020).
4. PEC values were obtained from the Consensus-Based Sediment Quality Guidelines, Recommendations for Use & Application. Publication No. WT-732 2003 (Wisconsin Department of Natural Resources 2003).
5. 3x = 3 times; 5x = 5 times; COC = Contaminant of Concern; Cr = chromium; ft bss = feet below sediment surface; Hg = mercury; mg/kg = milligram(s) per kilogram; NE = not encountered; Pb = lead; PAH = polycyclic aromatic hydrocarbon; PCB = polychlorinated biphenyl; PEC = Probable effects concentration

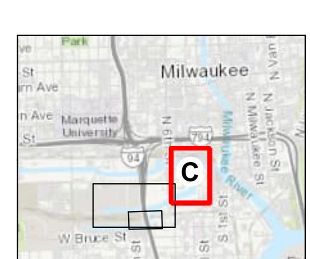
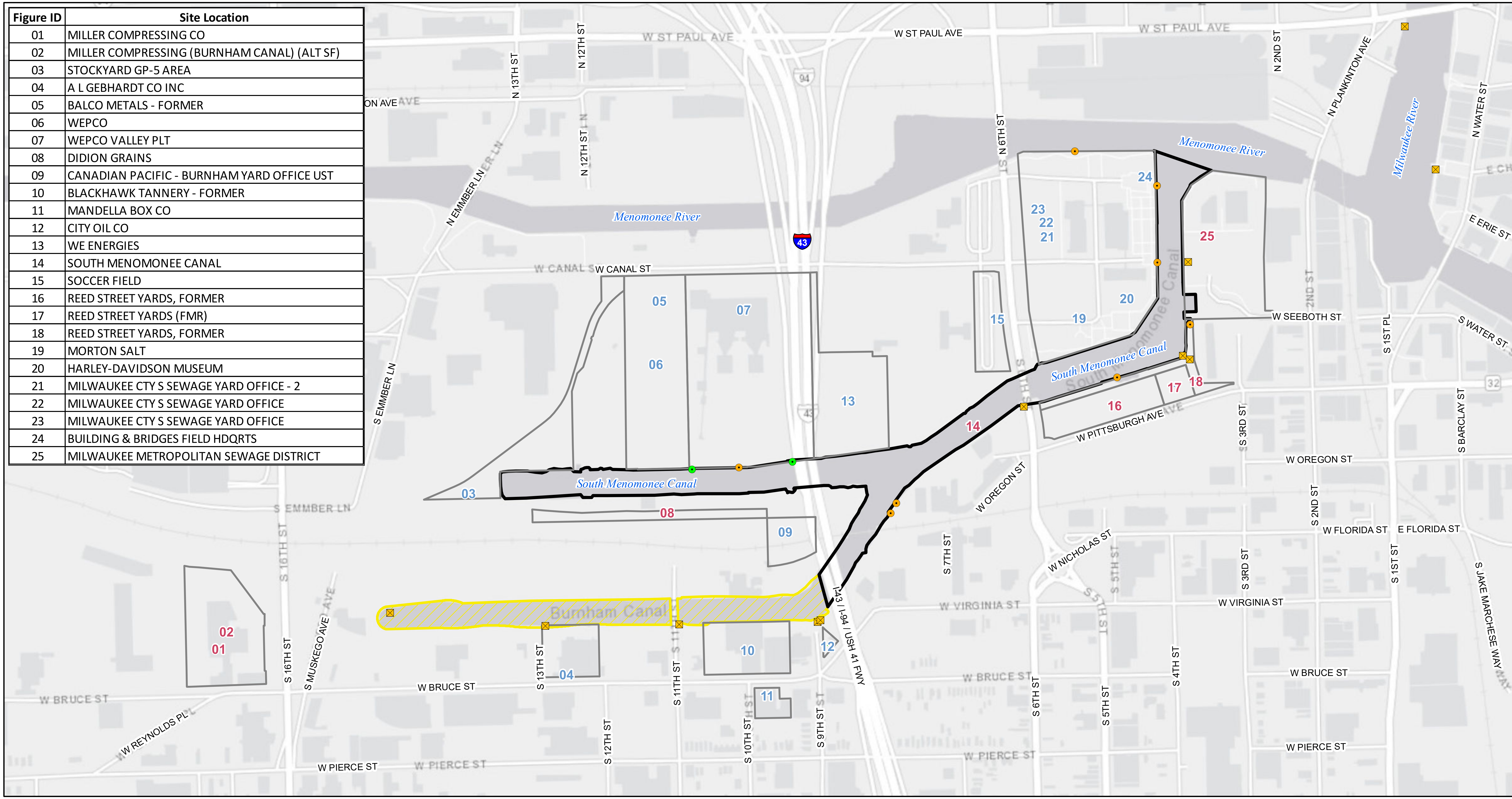


Figure 2-3C
Analytical Results Summary
South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Figure ID	Site Location
01	MILLER COMPRESSING CO
02	MILLER COMPRESSING (BURNHAM CANAL) (ALT SF)
03	STOCKYARD GP-5 AREA
04	A L GEBHARDT CO INC
05	BALCO METALS - FORMER
06	WEPCO
07	WEPCO VALLEY PLT
08	DIDION GRAINS
09	CANADIAN PACIFIC - BURNHAM YARD OFFICE UST
10	BLACKHAWK TANNERY - FORMER
11	MANDELLA BOX CO
12	CITY OIL CO
13	WE ENERGIES
14	SOUTH MENOMONEE CANAL
15	SOCCER FIELD
16	REED STREET YARDS, FORMER
17	REED STREET YARDS (FMR)
18	REED STREET YARDS, FORMER
19	MORTON SALT
20	HARLEY-DAVIDSON MUSEUM
21	MILWAUKEE CTY S SEWAGE YARD OFFICE - 2
22	MILWAUKEE CTY S SEWAGE YARD OFFICE
23	MILWAUKEE CTY S SEWAGE YARD OFFICE
24	BUILDING & BRIDGES FIELD HDQRTS
25	MILWAUKEE METROPOLITAN SEWAGE DISTRICT



LEGEND

- MS4 Industrial Outfall
- Combined Sewer Outfall - MS4 Municipal
- Storm Sewer Outfall
- Burnham Canal Sediment Cover and Wetland Restoration Project
- South Menomonee Canal Project Area
- BRRTS Site Boundary
- 01 Open BRRTS Site Identification Number
- 03 Closed BRRTS Site Identification Number

N

0 250 500

Approximate scale in feet

Notes:
1. Base map source: Esri ArcGIS Online Gray Base Map
2. Parcel data provided by The MCLIO dated December 21, 2020.
3. BRRTS = WDNR Bureau for Remediation and Redevelopment Tracking System; MS4 = Municipal Separate Storm Sewer System; WDNR = Wisconsin Department of Natural Resources

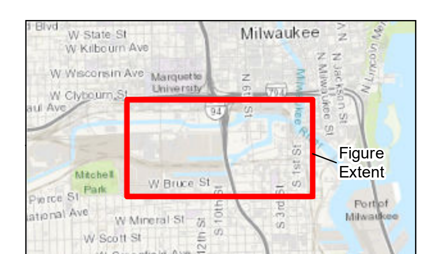
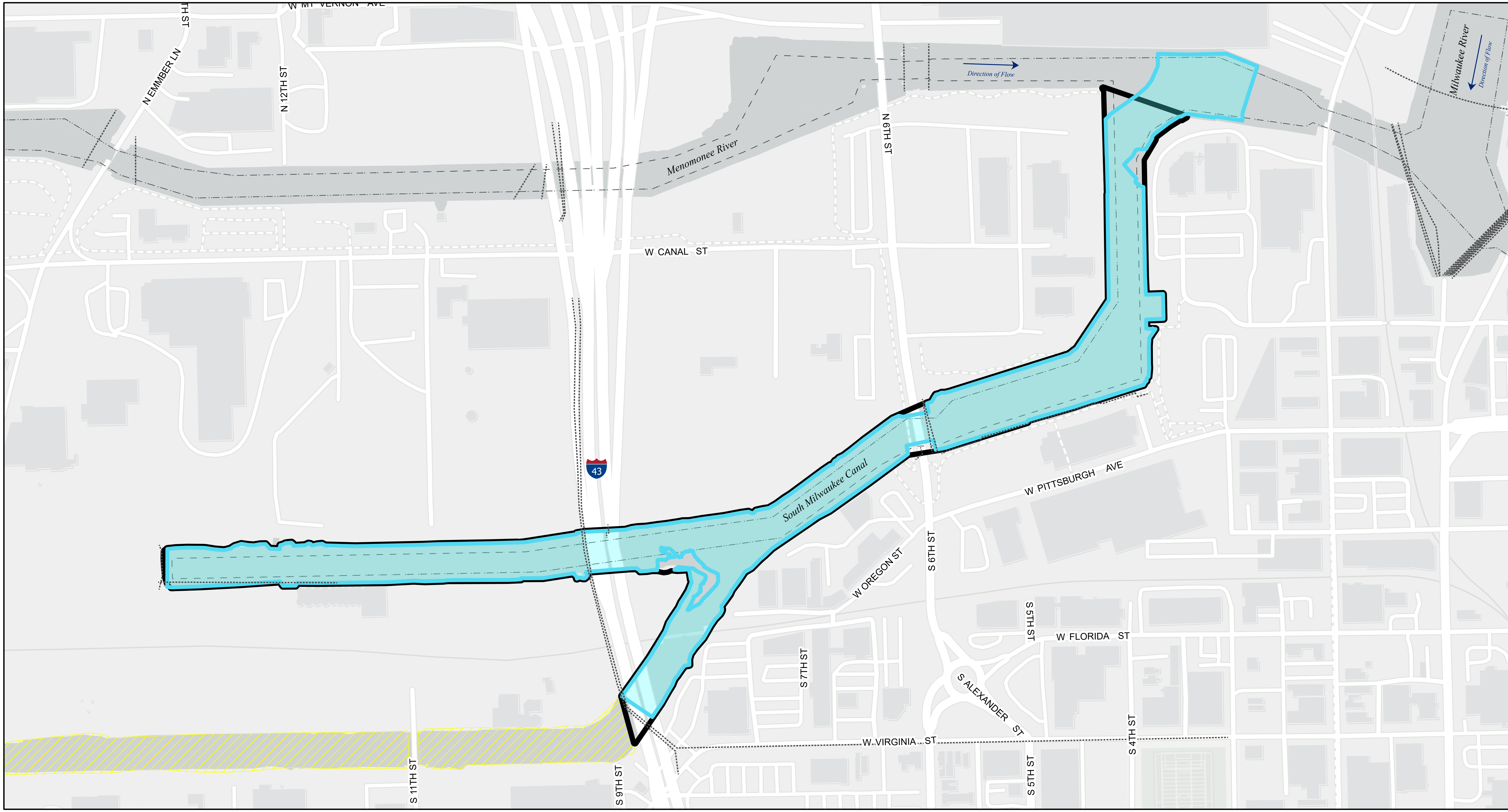


Figure 2-4
Potential Sources
South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

\\Dc1vs01\gisproj\E\EPA\681867_MKERiverDownstream\MapFiles\2022\Misc\Figure2-4_Potential_Sources_SMC_508.mxd AESPEJO (9/4/2024)

Jacobs



LEGEND

- Utilities
- Federal Navigation Channel (Source: USACE)
- Burnham Canal Sediment Cover and Wetland Restoration Project
- Remediation Target Area - Alternative 2
- South Menomonee Canal Project Area

N

0 175 350

Approximate scale in feet

Notes:

1. Basemap source: Esri ArcGIS Online Light Gray Base Map
2. Cr = chromium; Hg = mercury; mg/kg = milligram(s) per kilogram; PAH = polycyclic aromatic hydrocarbon; Pb = lead; PCB = polychlorinated biphenyl; PECs = Probable Effects Concentrations from Consensus-Based Sediment Quality Guidelines, Recommendations for Use & Application, Publication No. WT-732 2003 (Wisconsin Department of Natural Resources 2003); USACE = United States Army Corps of Engineers

Figure 3-1

Remediation Target Areas - South Menomonee Canal

Alternative 2 - Total PCBs > 1 mg/kg; or Metals (Cr, Hg, or Pb) or Total PAHs > PECs

Milwaukee Estuary Area of Concern

Milwaukee, Wisconsin

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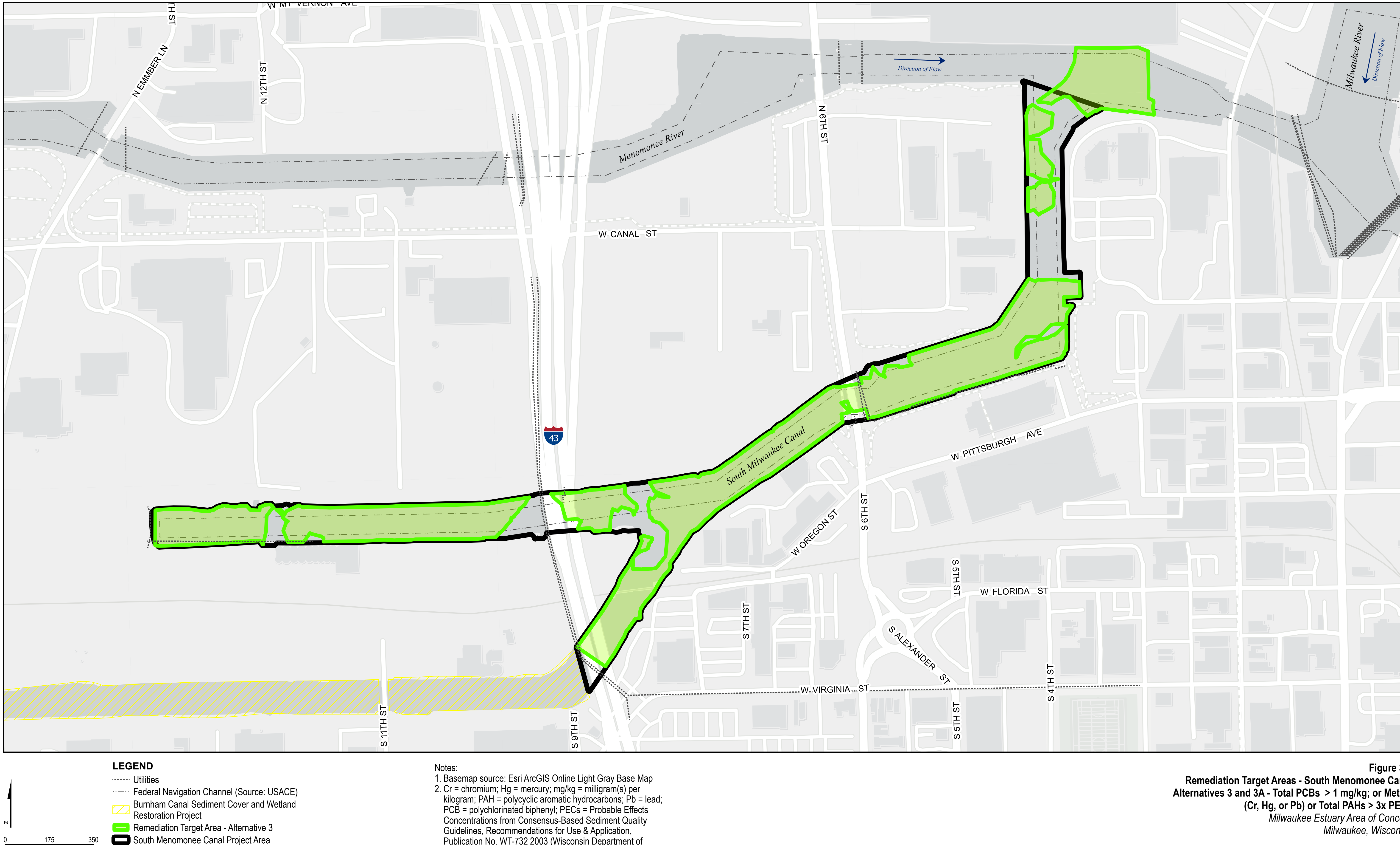
Jacobs



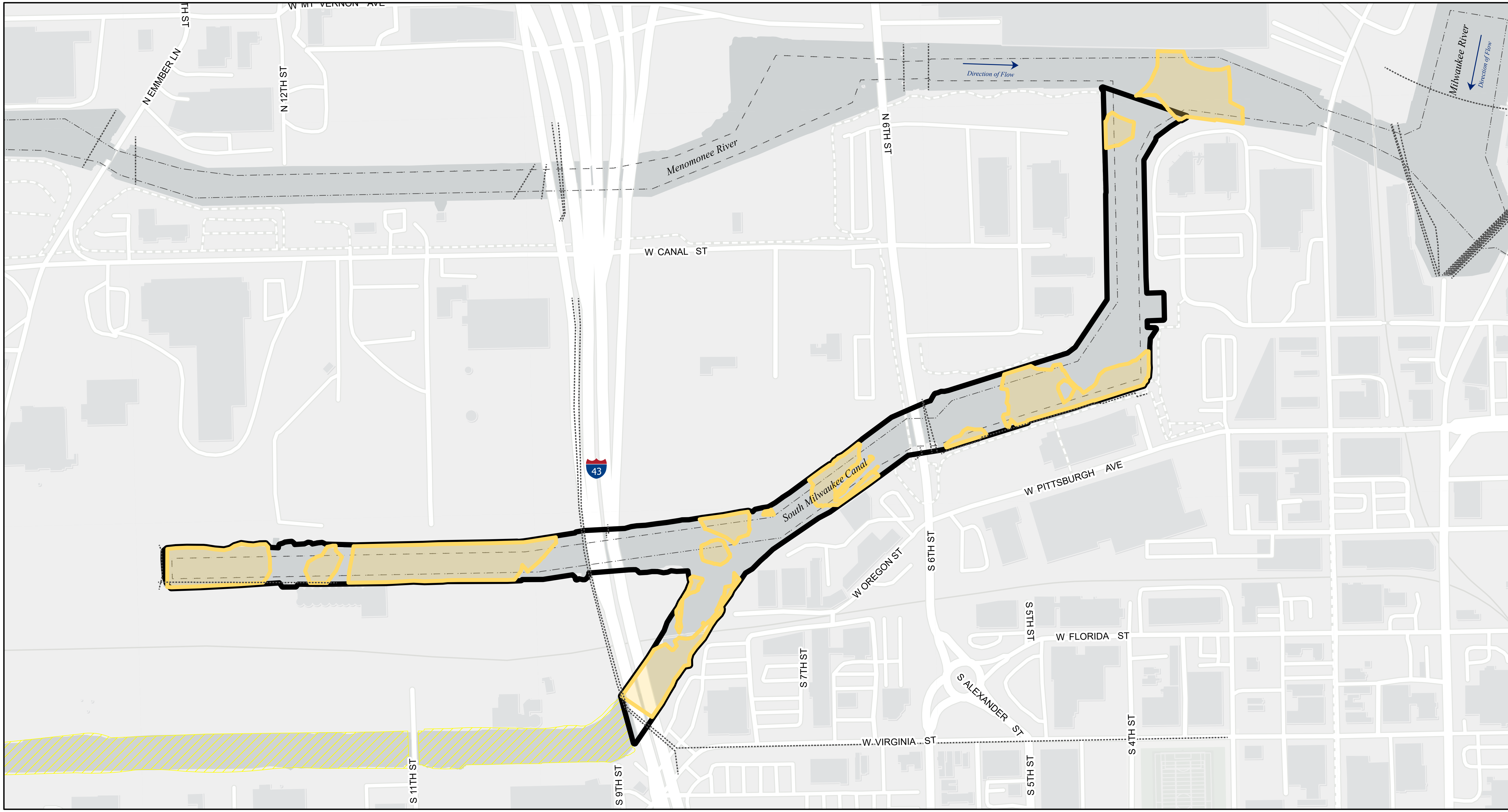
LEGEND

- Utilities
- Federal Navigation Channel (Source: USACE)
- Burnham Canal Sediment Cover and Wetland Restoration Project
- Remediation Target Area - Alternative 3
- South Menomonee Canal Project Area

Notes:

1. Basemap source: Esri ArcGIS Online Light Gray Base Map
2. Cr = chromium; Hg = mercury; mg/kg = milligram(s) per kilogram; PAH = polycyclic aromatic hydrocarbons; Pb = lead; PCB = polychlorinated biphenyl; PECs = Probable Effects Concentrations from Consensus-Based Sediment Quality Guidelines, Recommendations for Use & Application, Publication No. WT-732 2003 (Wisconsin Department of Natural Resources 2003); USACE = United States Army Corps of Engineers

Figure 3-2
Remediation Target Areas - South Menomonee Canal
Alternatives 3 and 3A - Total PCBs > 1 mg/kg; or Metals (Cr, Hg, or Pb) or Total PAHs > 3x PECs
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin



N

0 175 350

Approximate scale in feet

LEGEND

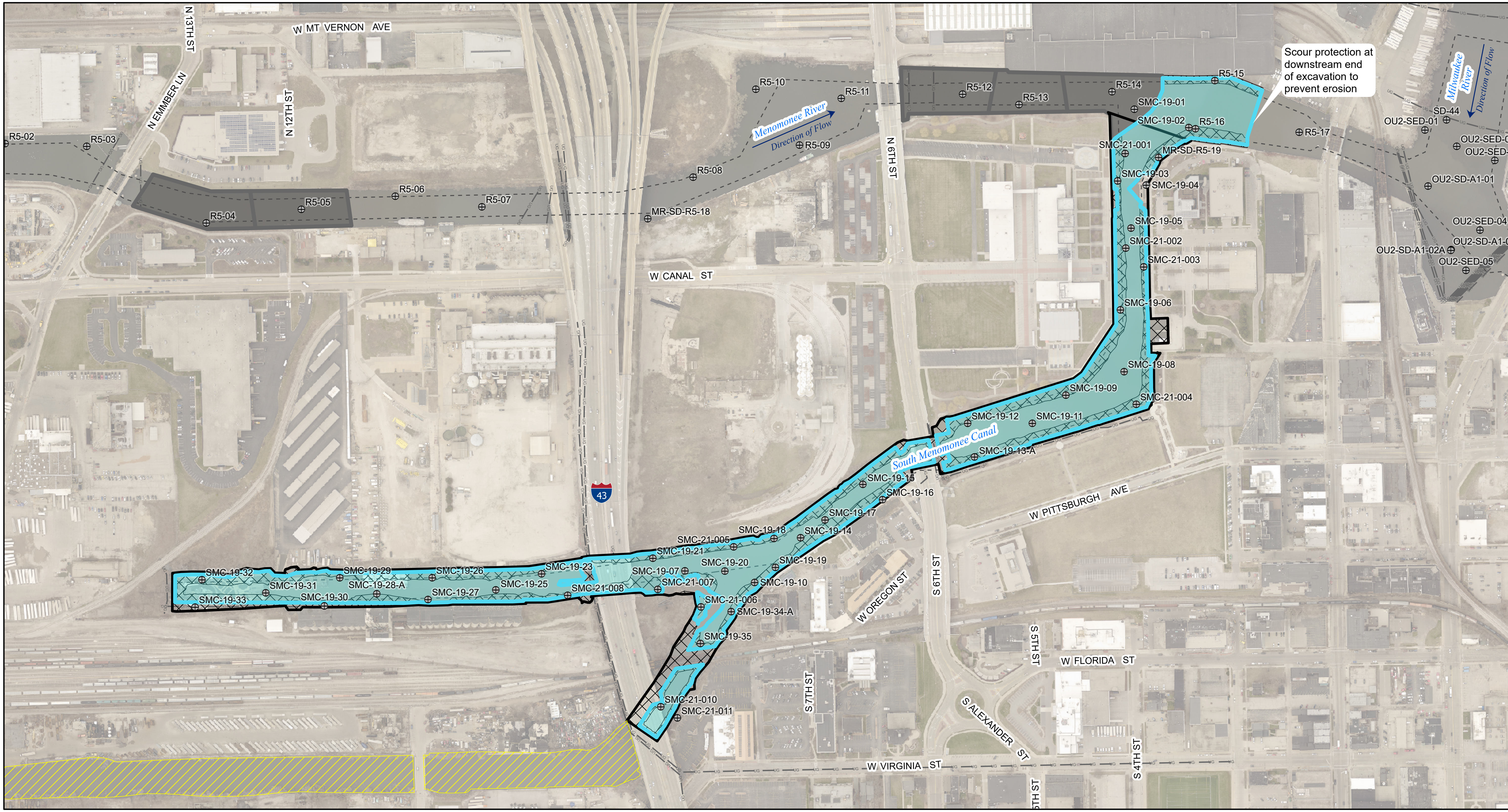
- Utilities
- Federal Navigation Channel (Source: USACE)
- Burnham Canal Sediment Cover and Wetland Restoration Project
- Remediation Target Area - Alternative 4
- South Menomonee Canal Project Area

Notes:

1. Basemap source: Esri ArcGIS Online Light Gray Base Map
2. Cr = chromium; Hg = mercury; mg/kg = milligram(s) per kilogram; PAH = polycyclic aromatic hydrocarbons; Pb = lead; PCB = polychlorinated biphenyl; PECs = Probable Effects Concentrations from Consensus-Based Sediment Quality Guidelines, Recommendations for Use & Application, Publication No. WT-732 2003 (Wisconsin Department of Natural Resources 2003); USACE = United States Army Corps of Engineers

Figure 3-3
Remediation Target Areas - South Menomonee Canal Alternative 4 - Total PCBs > 3 mg/kg; or Metals (Cr, Hg, or Pb) or Total PAHs > 3x PECs
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs



LEGEND

- Analytical Sample Location
- Underground Utility
- Federal Navigation Channel (Source: U.S. Army Corps of Engineers)
- South Menomonee Canal Project Area
- Sediment Dredge Extent
- Cap Extent
- Burnham Canal Sediment Cover and Wetland Restoration Project
- Menomonee River Recommended Alternative Extent (Alternative 5 per CH2M HILL, Inc. 2019. *Focused Feasibility Study, Menomonee and Milwaukee Rivers, Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin.* May.)

N

0 175 350

Approximate scale in feet

Note:
1. 2020 Aerial Photography provided by The Milwaukee County Land Information Office.

Figure 5-1
South Menomonee Canal Site Features - Alternative 2 Conceptual Layout
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs

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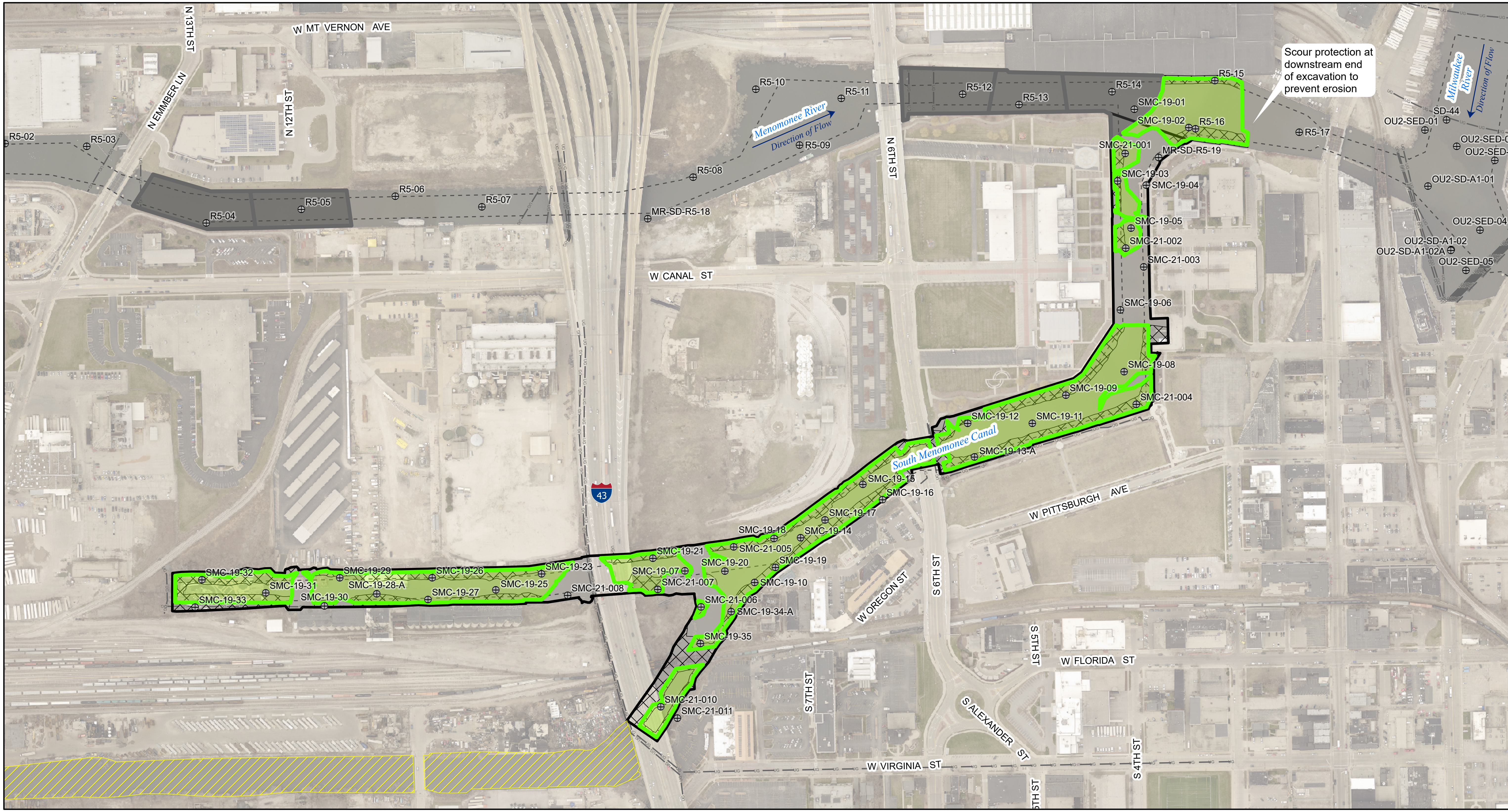


LEGEND

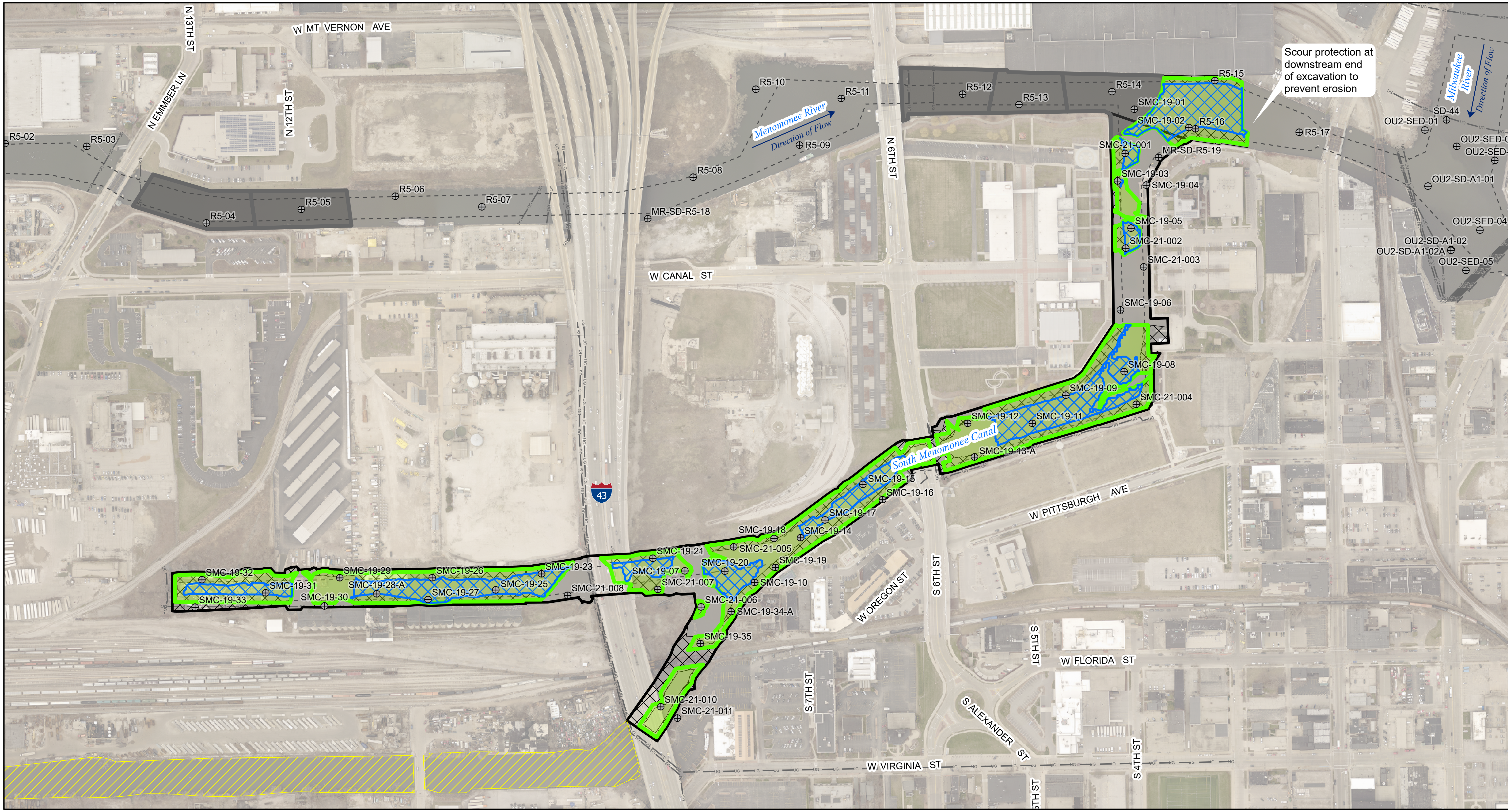
- Analytical Sample Location
- Underground Utility
- Federal Navigation Channel (Source: U.S. Army Corps of Engineers)
- South Menomonee Canal Project Area
- Sediment Dredge Extent
- Cap Extent
- Burnham Canal Sediment Cover and Wetland Restoration Project
- Menomonee River Recommended Alternative Extent (Alternative 5 per CH2M HILL, Inc. 2019. *Focused Feasibility Study, Menomonee and Milwaukee Rivers, Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin.* May.)

Note:
1. 2020 Aerial Photography provided by The Milwaukee County Land Information Office.

Figure 5-2
South Menomonee Canal Site Features - Alternative 3 Conceptual Layout
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs

\\dc1vs01\GISProj\E\EPA\681867_MKERiverDownstream\ProDocs\2022\Figure5-X_SMC_Alt_Details_Conceptual_Layouts_508.aprx-Figure5-2_SMC_Alt3_Details_508 STOLZRC (9/3/2024)



LEGEND

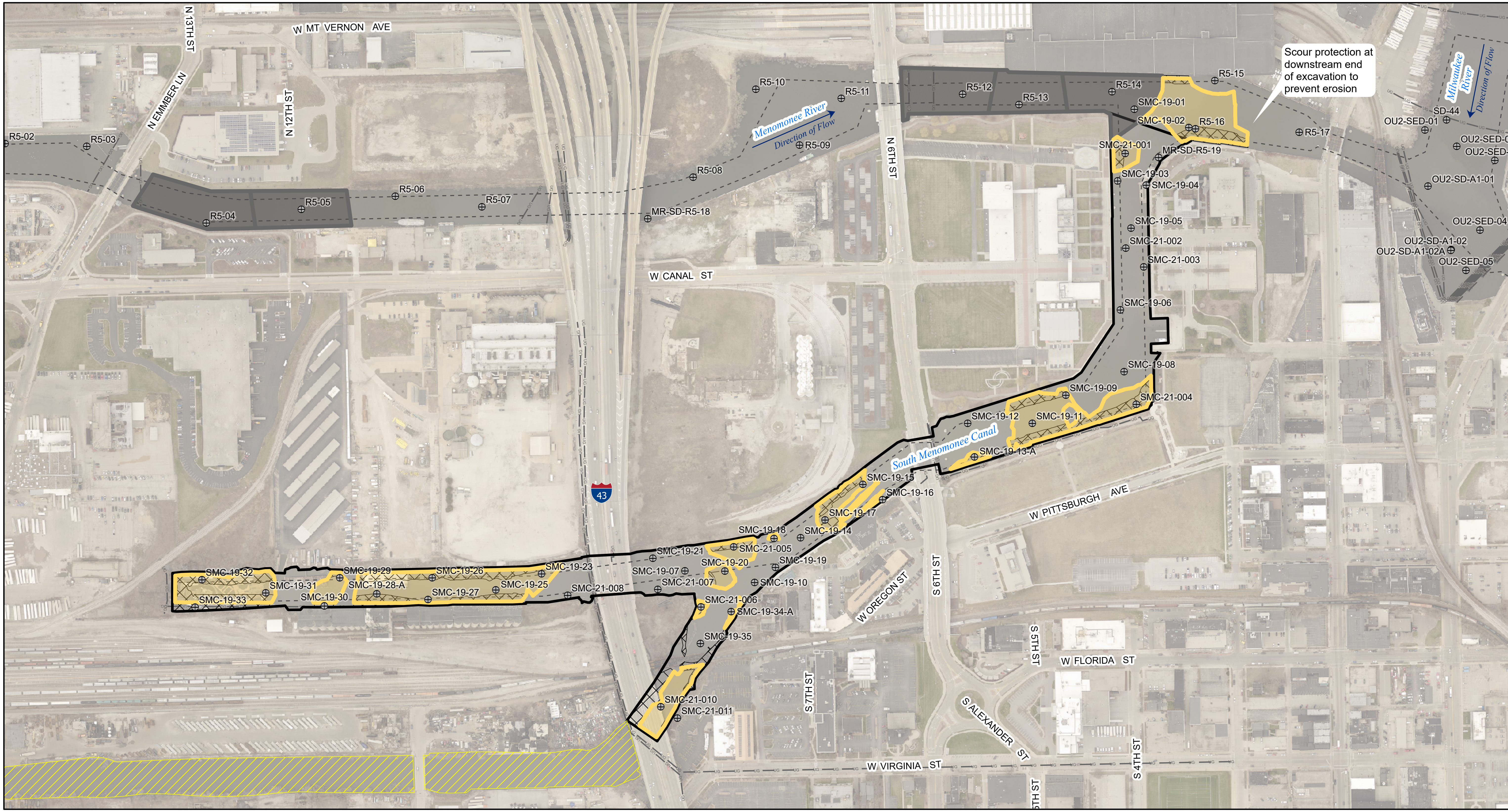
- Analytical Sample Location
- Underground Utility
- Federal Navigation Channel (Source: U.S. Army Corps of Engineers)
- South Menomonee Canal Project Area
- Additional Cap Extent for Alternative 3A
- Sediment Dredge Extent
- Cap Extent
- Burnham Canal Sediment Cover and Wetland Restoration Project
- Menomonee River Recommended Alternative Extent (Alternative 5 per CH2M HILL, Inc. 2019. *Focused Feasibility Study, Menomonee and Milwaukee Rivers, Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin.* May.)

Note:
1. 2020 Aerial Photography provided by The Milwaukee County Land Information Office.

Figure 5-3
South Menomonee Canal Site Features - Alternative 3A Conceptual Layout
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

\\dc1vs01\GISProj\E\EPA\681867_MKERiverDownstream\ProDocs\2022\Figure5-X_SMC_Alt_Details_Conceptual_Layouts_508.aprx-Figure5-3_SMC_Alt3A_Details_508 STOLZRC (9/3/2024)

Jacobs



LEGEND

- Analytical Sample Location
- Underground Utility
- Federal Navigation Channel (Source: U.S. Army Corps of Engineers)
- South Menomonee Canal Project Area
- Sediment Dredge Extent
- Cap Extent
- Burnham Canal Sediment Cover and Wetland Restoration Project
- Menomonee River Recommended Alternative Extent (Alternative 5 per CH2M HILL, Inc. 2019. *Focused Feasibility Study, Menomonee and Milwaukee Rivers, Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin.* May.)

N

0 175 350

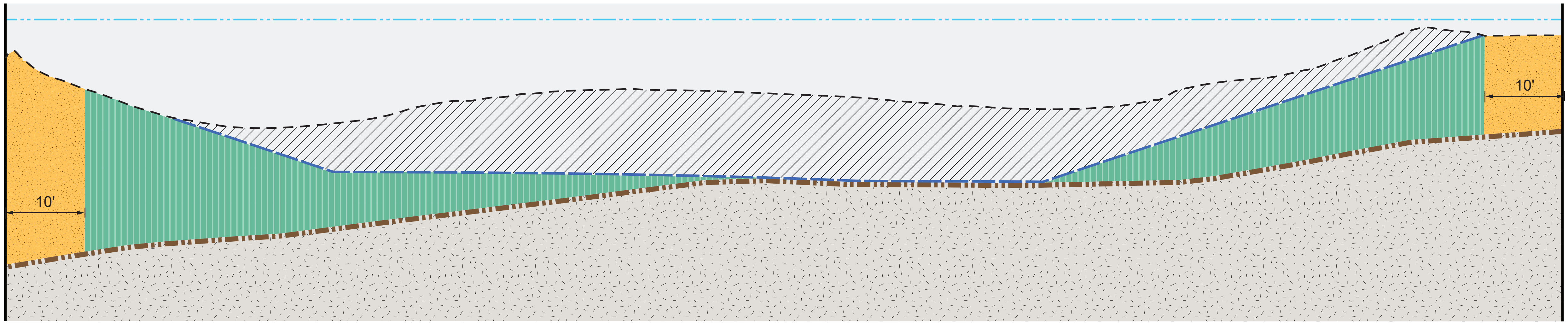
Approximate scale in feet

Note:
1. 2020 Aerial Photography provided by The Milwaukee County Land Information Office.

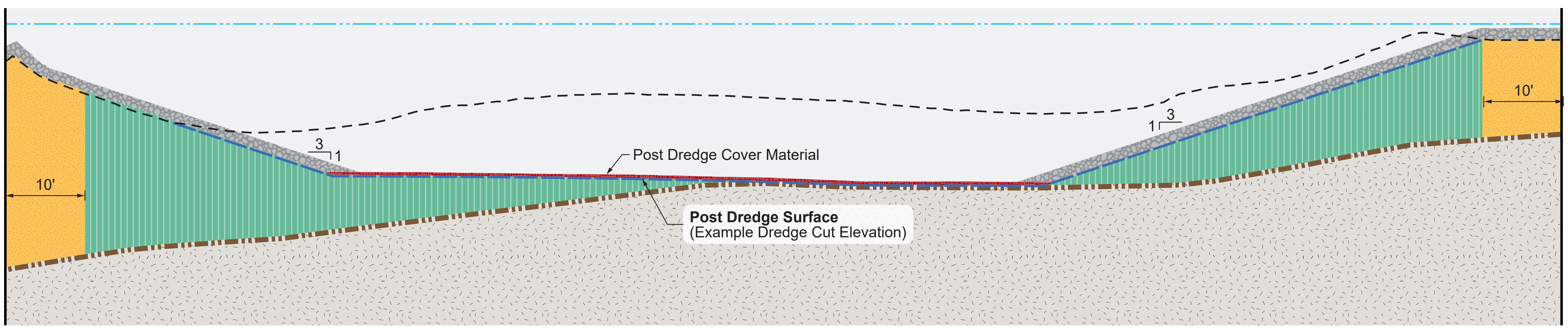
Figure 5-4
South Menomonee Canal Site Features - Alternative 4 Conceptual Layout
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs

\\dc1vs01\GISProj\E\EPA\681867_MKERiverDownstream\ProDocs\2022\Figure5-X_SMC_Alt_Details_Conceptual_Layouts_508.aprx-Figure5-4_SMC_Alt4_Details_508 STOLZRC (9/3/2024)



Conceptual Sediment Removal Profile



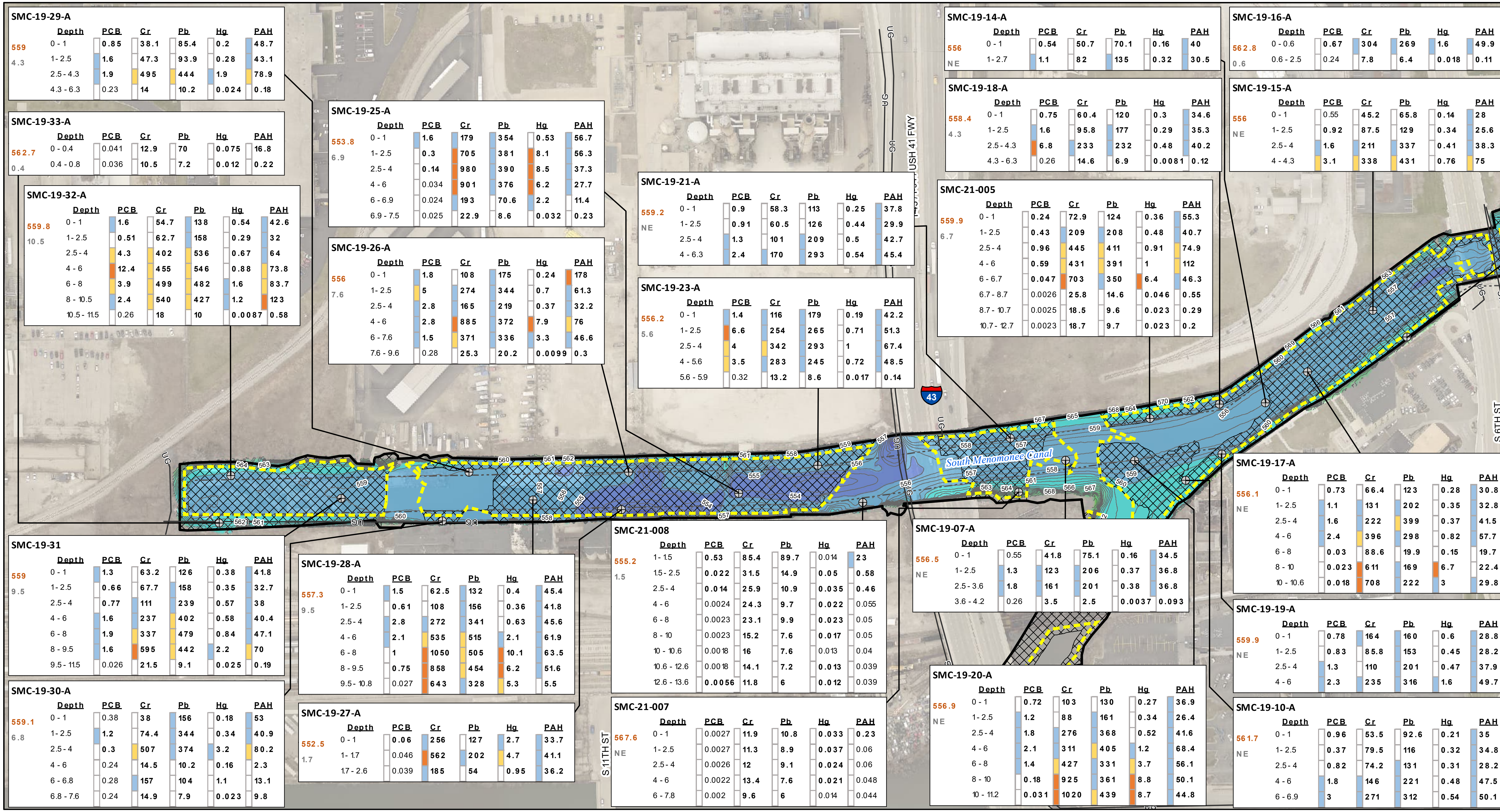
Post Dredge Conceptual Sediment Cap and Cover Placement

Legend

- Proposed Dredging
- Shoreline and Utility Offset/No Dredge Zone
- Non-Dredged Sediment
- Post Dredge Cover Material
- Cap
- Native Material
- Conceptual Top of Native Material
- Approximate Water Elevation
- Top of Sediment
- Example Dredge Cut Elevation

Notes:
Not to Scale

Figure 5-5
South Menomonee Canal Project Area
Conceptual Sediment Removal and Cap Profiles
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin



SMC-19-29-A (Mudline elevation 559; native material depth 4.3)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.85	38.1	85.4	0.2	48.7
1 - 2.5	1.6	47.3	93.9	0.28	43.1
2.5 - 4.3	1.9	495	444	1.9	78.9
4.3 - 6.3	0.23	14	10.2	0.024	0.18

SMC-19-33-A (562.7; 0.4)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 0.4	0.041	12.9	70	0.075	16.8
0.4 - 0.8	0.036	10.5	7.2	0.012	0.22

SMC-19-32-A (559.8; 10.5)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.6	54.7	138	0.54	42.6
1 - 2.5	0.51	62.7	158	0.29	32
2.5 - 4	4.3	402	536	0.67	64
4 - 6	12.4	455	546	0.88	73.8
6 - 8	3.9	499	482	1.6	83.7
8 - 10.5	2.4	540	427	1.2	123
10.5 - 11.5	0.26	18	10	0.0087	0.58

SMC-19-25-A (553.8; 6.9)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.6	179	354	0.53	56.7
1 - 2.5	0.3	705	381	8.1	56.3
2.5 - 4	0.14	980	390	8.5	37.3
4 - 6	0.034	901	376	6.2	27.7
6 - 6.9	0.024	193	70.6	2.2	11.4
6.9 - 7.5	0.025	22.9	8.6	0.032	0.23

SMC-19-26-A (556; 7.6)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.8	108	175	0.24	178
1 - 2.5	5	274	344	0.7	61.3
2.5 - 4	2.8	165	219	0.37	32.2
4 - 6	2.8	885	372	7.9	76
6 - 7.6	1.5	371	336	3.3	46.6
7.6 - 9.6	0.28	25.3	20.2	0.0099	0.3

SMC-19-21-A (559.2; NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.9	58.3	113	0.25	37.8
1 - 2.5	0.91	60.5	126	0.44	29.9
2.5 - 4	1.3	101	209	0.5	42.7
4 - 6.3	2.4	170	293	0.54	45.4

SMC-19-23-A (556.2; 5.6)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.4	116	179	0.19	42.2
1 - 2.5	6.6	254	265	0.71	51.3
2.5 - 4	4	342	293	1	67.4
4 - 5.6	3.5	283	245	0.72	48.5
5.6 - 5.9	0.32	13.2	8.6	0.017	0.14

SMC-19-14-A (556; NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.54	50.7	70.1	0.16	40
1 - 2.7	1.1	82	135	0.32	30.5

SMC-19-16-A (562.8; 0.6)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 0.6	0.67	304	269	1.6	49.9
0.6 - 2.5	0.24	7.8	6.4	0.018	0.11

SMC-19-18-A (558.4; 4.3)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.75	60.4	120	0.3	34.6
1 - 2.5	1.6	95.8	177	0.29	35.3
2.5 - 4.3	6.8	233	232	0.48	40.2
4.3 - 6.3	0.26	14.6	6.9	0.0081	0.12

SMC-19-15-A (556; NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.55	45.2	65.8	0.14	28
1 - 2.5	0.92	87.5	129	0.34	25.6
2.5 - 4	1.6	211	337	0.41	38.3
4 - 4.3	3.1	338	431	0.76	75

SMC-21-005 (559.9; 6.7)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.24	72.9	124	0.36	55.3
1 - 2.5	0.43	209	208	0.48	40.7
2.5 - 4	0.96	445	411	0.91	74.9
4 - 6	0.59	431	391	1	112
6 - 6.7	0.047	703	350	6.4	46.3
6.7 - 8.7	0.0026	25.8	14.6	0.046	0.55
8.7 - 10.7	0.0025	18.5	9.6	0.023	0.29
10.7 - 12.7	0.0023	18.7	9.7	0.023	0.2

SMC-19-17-A (556.1; NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.73	66.4	123	0.28	30.8
1 - 2.5	1.1	131	202	0.35	32.8
2.5 - 4	1.6	222	399	0.37	41.5
4 - 6	2.4	396	298	0.82	57.7
6 - 8	0.03	88.6	19.9	0.15	19.7
8 - 10	0.023	611	169	6.7	22.4
10 - 10.6	0.018	708	222	3	29.8

SMC-19-31 (559; 9.5)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.3	63.2	126	0.38	41.8
1 - 2.5	0.66	67.7	158	0.35	32.7
2.5 - 4	0.77	111	239	0.57	38
4 - 6	1.6	237	402	0.58	40.4
6 - 8	1.9	337	479	0.84	47.1
8 - 9.5	1.6	595	442	2.2	70
9.5 - 11.5	0.026	21.5	9.1	0.025	0.19

SMC-19-28-A (557.3; 9.5)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.5	62.5	132	0.4	45.4
1 - 2.5	0.61	108	156	0.36	41.8
2.5 - 4	2.8	272	341	0.63	45.6
4 - 6	2.1	535	515	2.1	61.9
6 - 8	1	1050	505	10.1	63.5
8 - 9.5	0.75	858	454	6.2	51.6
9.5 - 10.8	0.027	643	328	5.3	5.5

SMC-21-008 (555.2; 1.5)

Depth	PCB	Cr	Pb	Hg	PAH
1 - 1.5	0.53	85.4	89.7	0.014	23
1.5 - 2.5	0.022	31.5	14.9	0.05	0.58
2.5 - 4	0.014	25.9	10.9	0.035	0.46
4 - 6	0.0024	24.3	9.7	0.022	0.055
6 - 8	0.0023	23.1	9.9	0.023	0.05
8 - 10	0.0023	15.2	7.6	0.017	0.05
10 - 10.6	0.0018	16	7.6	0.013	0.04
10.6 - 12.6	0.0018	14.1	7.2	0.013	0.039
12.6 - 13.6	0.0056	11.8	6	0.012	0.039

SMC-19-07-A (556.5; NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.55	41.8	75.1	0.16	34.5
1 - 2.5	1.3	123	206	0.37	36.8
2.5 - 3.6	1.8	161	201	0.38	36.8
3.6 - 4.2	0.26	3.5	2.5	0.0037	0.093

SMC-19-19-A (559.9; NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.78	164	160	0.6	28.8
1 - 2.5	0.83	85.8	153	0.45	28.2
2.5 - 4	1.3	110	201	0.47	37.9
4 - 6	2.3	235	316	1.6	49.7

SMC-19-30-A (559.1; 6.8)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.38	38	156	0.18	53
1 - 2.5	1.2	74.4	344	0.34	40.9
2.5 - 4	0.3	507	374	3.2	80.2
4 - 6	0.24	14.5	10.2	0.16	2.3
6 - 6.8	0.28	157	104	1.1	13.1
6.8 - 7.6	0.24	14.9	7.9	0.023	9.8

SMC-19-27-A (552.5; 1.7)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.06	256	127	2.7	33.7
1 - 1.7	0.046	562	202	4.7	41.1
1.7 - 2.6	0.039	185	54	0.95	36.2

SMC-21-007 (567.6; NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.0027	11.9	10.8	0.033	0.23
1 - 2.5	0.0027	11.3	8.9	0.037	0.06
2.5 - 4	0.0026	12	9.1	0.024	0.06
4 - 6	0.0022	13.4	7.6	0.021	0.048
6 - 7.8	0.002	9.6	6	0.014	0.044

SMC-19-20-A (556.9; NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.72	103	130	0.27	36.9
1 - 2.5	1.2	88	161	0.34	26.4
2.5 - 4	1.8	276	368	0.52	41.6
4 - 6	2.1	311	405	1.2	68.4
6 - 8	1.4	427	331	3.7	56.1
8 - 10	0.18	925	361	8.8	50.1
10 - 11.2	0.031	1020	439	8.7	44.8

SMC-19-10-A (561.7; NE)

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.96	53.5	92.6	0.21	35
1 - 2.5	0.37	79.5	116	0.32	34.8
2.5 - 4	0.82	74.2	131	0.31	28.2
4 - 6	1.8	146	221	0.48	47.5
6 - 6.9	3	271	312	0.54	50.1

LEGEND

- Analytical Sample Location
- Federal Navigation Channel
- Sediment Dredge Extent
- Cap Extent
- South Menomonee Canal Project Area
- UG — Underground Utility

Bathymetry (feet)
- Bathymetric Contour

Elevation (feet): 576 - 580; 571 - 575; 566 - 570; 561 - 565; 556 - 560; 551 - 555; 545 - 550

N

0 — 100 — 200
Approximate scale in feet

Analytical Results Table Format

Location ID

Mudline Elevation

Native Material Depth

Depth	PCBs (mg/kg)	Metals (mg/kg)	PAHs (mg/kg)
	<1	<PEC	<PEC
Sample interval (ft bss)	1 - 3	>PEC	>PEC
	3 - 5	>3xPEC	>3xPEC
	5 - 50	>5xPEC	>5xPEC
	>50		

Bold values represent results above the detection limit

"-" = COC was not sampled/analyzed

NE = Native Material Not Encountered

Notes:
1. Basemap: Milwaukee County 2020 Aerial Orthophotography captured April 2020.
2. Horizontal Datum: North American Datum 1983 (NAD83)
3. Vertical Datum: North American Vertical Datum of 1988 (NAVD88). Bathymetric contour and shading were generated from hydrographic survey data collected by Seaworks (2020).
4. PEC values were obtained from the Consensus-Based Sediment Quality Guidelines, Recommendations for Use & Application. Publication No. WT-732 2003 (Wisconsin Department of Natural Resources 2003).
5. 3x = 3 times; 5x = 5 times; COC = Contaminant of Concern; Cr = chromium; FFS = Focused Feasibility Study; ft bss = feet below sediment surface; Hg = mercury; mg/kg = milligram(s) per kilogram; NE = not encountered; PAH = polycyclic aromatic hydrocarbon; Pb = lead; PCB = polychlorinated biphenyl; PEC = Probable effects concentration

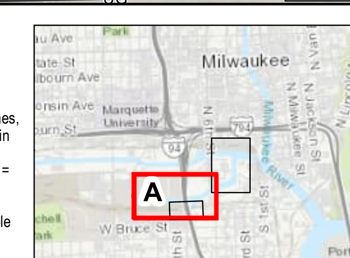


Figure 7-1A
Recommended Remedial Alternative
South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

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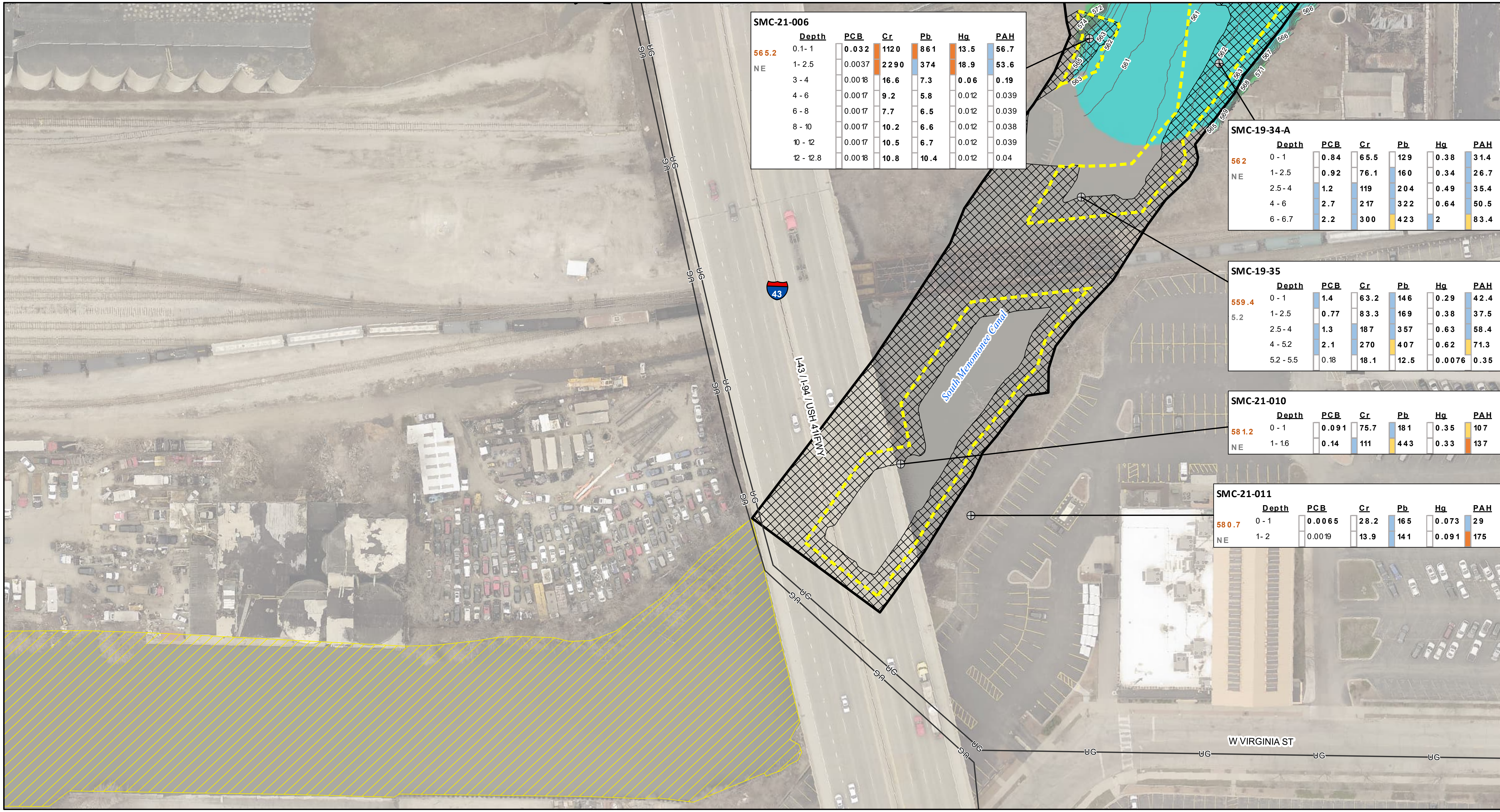
\\Dc1vs01\gisproj\E\EPA\681867_MKERiverDownstream\MapFiles\2023\FFS_SMC\Figure7-1A_SMC_Analytical_508.mxd AESPEJO (9/4/2024)



SMC-21-006

	Depth	PCB	Cr	Pb	Hg	PAH
565.2	0.1 - 1	0.032	1120	861	13.5	56.7
NE	1 - 2.5	0.0037	2290	374	18.9	53.6
	3 - 4	0.0018	16.6	7.3	0.06	0.19
	4 - 6	0.0017	9.2	5.8	0.012	0.039
	6 - 8	0.0017	7.7	6.5	0.012	0.039
	8 - 10	0.0017	10.2	6.6	0.012	0.038
	10 - 12	0.0017	10.5	6.7	0.012	0.039
	12 - 12.8	0.0018	10.8	10.4	0.012	0.04

SMC-19-34-A

	Depth	PCB	Cr	Pb	Hg	PAH
562	0 - 1	0.84	65.5	129	0.38	31.4
NE	1 - 2.5	0.92	76.1	160	0.34	26.7
	2.5 - 4	1.2	119	204	0.49	35.4
	4 - 6	2.7	217	322	0.64	50.5
	6 - 6.7	2.2	300	423	2	83.4

SMC-19-35

	Depth	PCB	Cr	Pb	Hg	PAH
559.4	0 - 1	1.4	63.2	146	0.29	42.4
5.2	1 - 2.5	0.77	83.3	169	0.38	37.5
	2.5 - 4	1.3	187	357	0.63	58.4
	4 - 5.2	2.1	270	407	0.62	71.3
	5.2 - 5.5	0.18	18.1	12.5	0.0076	0.35

SMC-21-010

	Depth	PCB	Cr	Pb	Hg	PAH
581.2	0 - 1	0.091	75.7	181	0.35	107
NE	1 - 1.6	0.14	111	443	0.33	137

SMC-21-011

	Depth	PCB	Cr	Pb	Hg	PAH
580.7	0 - 1	0.0065	28.2	165	0.073	29
NE	1 - 2	0.0019	13.9	141	0.091	175

N

0 40 80
Approximate scale in feet

LEGEND

- Analytical Sample Location
- Burnham Canal Sediment Cover and Wetland Restoration Project
- Sediment Dredge Extent
- Cap Extent
- South Menomonee Canal Project Area
- UG — Underground Utility

Bathymetry (feet)

- Bathymetric Contour

Elevation (feet)

- 576 - 580
- 571 - 575
- 566 - 570
- 561 - 565

Analytical Results Table Format

Location ID				
Mudline Elevation	Depth	PCBs (mg/kg)	Metals (mg/kg)	PAHs (mg/kg)
Native Material Depth		<1	<PEC	<PEC
	Sample interval (ft bss)	1 - 3	>PEC	>PEC
		3 - 5	>3xPEC	>3xPEC
		5 - 50	>5xPEC	>5xPEC
		>50		

Bold values represent results above the detection limit

"-" = COC was not sampled/analyzed

NE = Native Material Not Encountered

Notes:

1. Basemap: Milwaukee County 2020 Aerial Orthophotography captured April 2020.
2. Horizontal Datum: North American Datum 1983 (NAD83)
3. Vertical Datum: North American Vertical Datum of 1988 (NAVD88). Bathymetric contour and shading were generated from hydrographic survey data collected by Seaworks (2020).
4. PEC values were obtained from the Consensus-Based Sediment Quality Guidelines, Recommendations for Use & Application. Publication No. WT-732 2003 (Wisconsin Department of Natural Resources 2003).
5. 3x = 3 times; 5x = 5 times; COC = Contaminant of Concern; Cr = chromium; FFS = Focused Feasibility Study; ft bss = feet below sediment surface; Hg = mercury; mg/kg = milligram(s) per kilogram; NE = not encountered; PAH = polycyclic aromatic hydrocarbon; Pb = lead; PCB = polychlorinated biphenyl; PEC = Probable effects concentration

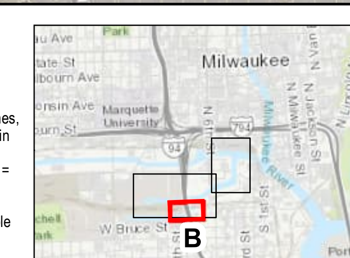


Figure 7-1B
Recommended Remedial Alternative
South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

\\Dc1vs01\gisproj\E\EPA\681867_MKERiverDownstream\MapFiles\2023\FFS_SMC\Figure7-1B_SMC_Analytical_508.mxd AESPEJO (9/4/2024)

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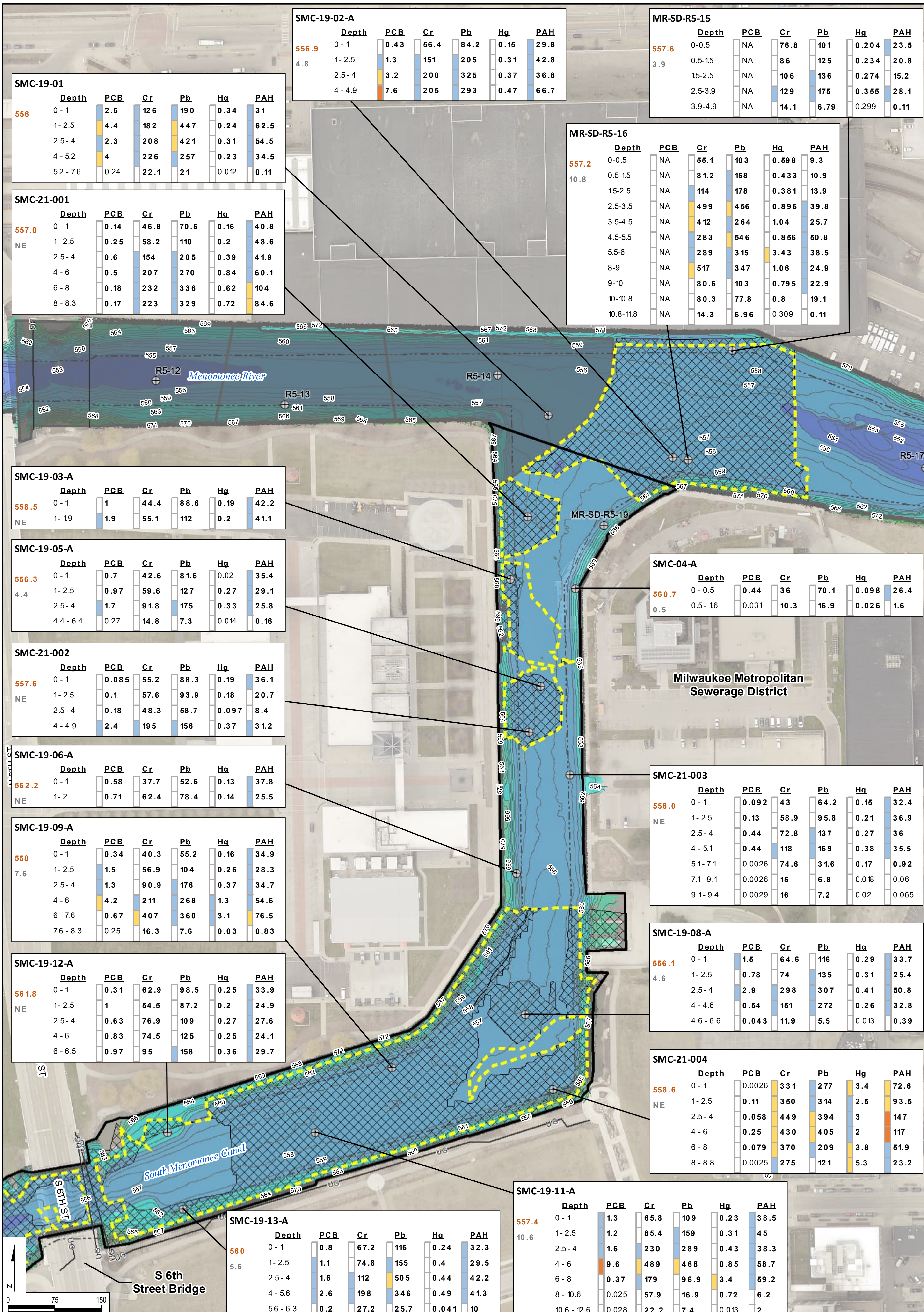

SMC-19-02-A — Mudline Elevation: 556.9; Native Material Depth: 4.8

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.43	56.4	84.2	0.15	29.8
1 - 2.5	1.3	151	205	0.31	42.8
2.5 - 4	3.2	200	325	0.37	36.8
4 - 4.9	7.6	205	293	0.47	66.7

MR-SD-R5-15 — Mudline Elevation: 557.6; Native Material Depth: 3.9

Depth	PCB	Cr	Pb	Hg	PAH
0-0.5	NA	76.8	101	0.204	23.5
0.5-1.5	NA	86	125	0.234	20.8
1.5-2.5	NA	106	136	0.274	15.2
2.5-3.9	NA	129	175	0.355	28.1
3.9-4.9	NA	14.1	6.79	0.299	0.11

SMC-19-01 — Mudline Elevation: 556

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	2.5	126	190	0.34	31
1 - 2.5	4.4	182	447	0.24	62.5
2.5 - 4	2.3	208	421	0.31	54.5
4 - 5.2	4	226	257	0.23	34.5
5.2 - 7.6	0.24	22.1	21	0.012	0.11

MR-SD-R5-16 — Mudline Elevation: 557.2; Native Material Depth: 10.8

Depth	PCB	Cr	Pb	Hg	PAH
0-0.5	NA	55.1	103	0.598	9.3
0.5-1.5	NA	81.2	158	0.433	10.9
1.5-2.5	NA	114	178	0.381	13.9
2.5-3.5	NA	499	456	0.896	39.8
3.5-4.5	NA	412	264	1.04	25.7
4.5-5.5	NA	283	546	0.856	50.8
5.5-6	NA	289	315	3.43	38.5
8-9	NA	517	347	1.06	24.9
9-10	NA	80.6	103	0.795	22.9
10-10.8	NA	80.3	77.8	0.8	19.1
10.8-11.8	NA	14.3	6.96	0.309	0.11

SMC-21-001 — Mudline Elevation: 557.0; Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.14	46.8	70.5	0.16	40.8
1 - 2.5	0.25	58.2	110	0.2	48.6
2.5 - 4	0.6	154	205	0.39	41.9
4 - 6	0.5	207	270	0.84	60.1
6 - 8	0.18	232	336	0.62	104
8 - 8.3	0.17	223	329	0.72	84.6

SMC-19-03-A — Mudline Elevation: 558.5; Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1	44.4	88.6	0.19	42.2
1 - 1.9	1.9	55.1	112	0.2	41.1

SMC-19-05-A — Mudline Elevation: 556.3; Native Material Depth: 4.4

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.7	42.6	81.6	0.02	35.4
1 - 2.5	0.97	59.6	127	0.27	29.1
2.5 - 4	1.7	91.8	175	0.33	25.8
4.4 - 6.4	0.27	14.8	7.3	0.014	0.16

SMC-04-A — Mudline Elevation: 560.7; Native Material Depth: 0.5

Depth	PCB	Cr	Pb	Hg	PAH
0 - 0.5	0.44	36	70.1	0.098	26.4
0.5 - 1.6	0.031	10.3	16.9	0.026	1.6

SMC-21-002 — Mudline Elevation: 557.6; Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.085	55.2	88.3	0.19	36.1
1 - 2.5	0.1	57.6	93.9	0.18	20.7
2.5 - 4	0.18	48.3	58.7	0.097	8.4
4 - 4.9	2.4	195	156	0.37	31.2

SMC-19-06-A — Mudline Elevation: 562.2; Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.58	37.7	52.6	0.13	37.8
1 - 2	0.71	62.4	78.4	0.14	25.5

SMC-21-003 — Mudline Elevation: 558.0; Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.092	43	64.2	0.15	32.4
1 - 2.5	0.13	58.9	95.8	0.21	36.9
2.5 - 4	0.44	72.8	137	0.27	36
4 - 5.1	0.44	118	169	0.38	35.5
5.1 - 7.1	0.0026	74.6	31.6	0.17	0.92
7.1 - 9.1	0.0026	15	6.8	0.018	0.06
9.1 - 9.4	0.0029	16	7.2	0.02	0.065

SMC-19-09-A — Mudline Elevation: 558; Native Material Depth: 7.6

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.34	40.3	55.2	0.16	34.9
1 - 2.5	1.5	56.9	104	0.26	28.3
2.5 - 4	1.3	90.9	176	0.37	34.7
4 - 6	4.2	211	268	1.3	54.6
6 - 7.6	0.67	407	360	3.1	76.5
7.6 - 8.3	0.25	16.3	7.6	0.03	0.83

SMC-19-08-A — Mudline Elevation: 556.1; Native Material Depth: 4.6

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.5	64.6	116	0.29	33.7
1 - 2.5	0.78	74	135	0.31	25.4
2.5 - 4	2.9	298	307	0.41	50.8
4 - 4.6	0.54	151	272	0.26	32.8
4.6 - 6.6	0.043	11.9	5.5	0.013	0.39

SMC-19-12-A — Mudline Elevation: 561.8; Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.31	62.9	98.5	0.25	33.9
1 - 2.5	1	54.5	87.2	0.2	24.9
2.5 - 4	0.63	76.9	109	0.27	27.6
4 - 6	0.83	74.5	125	0.25	24.1
6 - 6.5	0.97	95	158	0.36	29.7

SMC-21-004 — Mudline Elevation: 558.6; Native Material Depth: NE

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.0026	331	277	3.4	72.6
1 - 2.5	0.11	350	314	2.5	93.5
2.5 - 4	0.058	449	394	3	147
4 - 6	0.25	430	405	2	117
6 - 8	0.079	370	209	3.8	51.9
8 - 8.8	0.0025	275	121	5.3	23.2

SMC-19-11-A — Mudline Elevation: 557.4; Native Material Depth: 10.6

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	1.3	65.8	109	0.23	38.5
1 - 2.5	1.2	85.4	159	0.31	45
2.5 - 4	1.6	230	289	0.43	38.3
4 - 6	9.6	489	468	0.85	58.7
6 - 8	0.37	179	96.9	3.4	59.2
8 - 10.6	0.025	57.9	16.9	0.72	6.2
10.6 - 12.6	0.028	22.2	7.4	0.013	2

SMC-19-13-A — Mudline Elevation: 560; Native Material Depth: 5.6

Depth	PCB	Cr	Pb	Hg	PAH
0 - 1	0.8	67.2	116	0.24	32.3
1 - 2.5	1.1	74.8	155	0.4	29.5
2.5 - 4	1.6	112	505	0.44	42.2
4 - 5.6	2.6	198	346	0.49	41.3
5.6 - 6.3	0.2	27.2	25.7	0.041	10

LEGEND

- Analytical Sample Location
- Federal Navigation Channel
- Sediment Dredge Extent
- Cap Extent
- South Menomonee Canal Project Area
- Menomonee River Recommended Alternative Extent (Alternative 5 per CH2M HILL, Inc. 2019. *Focused Feasibility Study, Menomonee and Milwaukee Rivers, Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin.* May.)
- UG — Underground Utility

Bathymetry (feet)

- Bathymetric Contour

Elevation (feet)

- 576 - 580
- 571 - 575
- 566 - 570
- 561 - 565
- 556 - 560
- 551 - 555
- 545 - 550

Analytical Results Table Format

Location ID

Mudline Elevation

Native Material Depth

Depth	PCBs (mg/kg)	Metals (mg/kg)	PAHs (mg/kg)
	<1	<PEC	<PEC
Sample interval (ft bss)	1 - 3	>PEC	>PEC
	3 - 5	>3xPEC	>3xPEC
	5 - 50	>5xPEC	>5xPEC
	>50		

Bold values represent results above the detection limit

"-" = COC was not sampled/analyzed

NE = Native Material Not Encountered

Notes:

1. Basemap: Milwaukee County 2020 Aerial Orthophotography captured April 2020.
2. Horizontal Datum: North American Datum 1983 (NAD83)
3. Vertical Datum: North American Vertical Datum of 1988 (NAVD88). Bathymetric contour and shading were generated from hydrographic survey data collected by Seaworks (2020).
4. PEC values were obtained from the Consensus-Based Sediment Quality Guidelines, Recommendations for Use & Application. Publication No. WT-732 2003 (Wisconsin Department of Natural Resources 2003).
5. 3x = 3 times; 5x = 5 times; COC = Contaminant of Concern; Cr = chromium; FFS = Focused Feasibility Study; ft bss = feet below sediment surface; Hg = mercury; mg/kg = milligram(s) per kilogram; NE = not encountered; PAH = polycyclic aromatic hydrocarbon; Pb = lead; PCB = polychlorinated biphenyl; PEC = Probable effects concentration

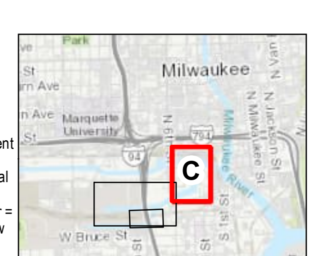

Figure 7-1C
Recommended Remedial Alternative
South Menomonee Canal
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

\\dc1vs01\gisproj\E\EPA\681867_MKERiverDownstream\MapFiles\2023\FFS_SMC\Figure7-1C_SMC_Analytical_508.mxd AESPEJO (9/5/2024)

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Appendix A
South Menomonee Canal Sediment Analytical Results Summary

Appendix A
South Menomonee Canal Sediment Analytical Results Summary
Focused Feasibility Study, Milwaukee Estuary AOC, Milwaukee, Wisconsin

				Analyte Group	PCB										PAH							
				Analyte	Total PCB	Aroclor 1260	Aroclor 1254	Aroclor 1268	Aroclor 1221	Aroclor 1232	Aroclor 1248	Aroclor 1016	Aroclor 1262	Aroclor 1242	Total PAH	2-Methyl naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) anthracene	Benzo(a)pyrene	Benzo(b)-fluoranthene
				Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				WI CBSQG PEC	1										22.8							
				WI CBSQG PEC 3x	3										68.4							
				WI CBSQG PEC 5x	5										114							
				TSCA	50																	
Location code	Sample ID	Start Depth	End Depth	Date	Total PCB mg/kg	Aroclor 1260 mg/kg	Aroclor 1254 mg/kg	Aroclor 1268 mg/kg	Aroclor 1221 mg/kg	Aroclor 1232 mg/kg	Aroclor 1248 mg/kg	Aroclor 1016 mg/kg	Aroclor 1262 mg/kg	Aroclor 1242 mg/kg	Total PAH mg/kg	2-Methyl naphthalene mg/kg	Acenaphthene mg/kg	Acenaphthylene mg/kg	Anthracene mg/kg	Benzo(a) anthracene mg/kg	Benzo(a) pyrene mg/kg	Benzo(b)-fluoranthene mg/kg
SMC-19-01	SMC01a	0	1	11/6/2019	**2.5**	**0.338** J	**0.789**	0.34 U	0.47 U	0.56 U	0.41 U	0.34 U	0.47 U	**1.33**	**31**	**0.27**	**0.42**	**0.0885**	**0.831**	**2.34**	**2.13**	**3.6**
SMC-19-01	SMC01b	1	2.5	11/6/2019	**4.4**	**0.412** J	**1.12**	0.3 U	0.41 U	0.49 U	0.36 U	0.3 U	0.41 U	**2.82**	**62.5** J	**1.08**	**0.607**	**0.134**	**1.9**	**5.57**	**4.16**	**5.78**
SMC-19-01	SMC01c	2.5	4	11/6/2019	**2.3**	**0.335** J	**0.777**	0.27 U	0.38 U	0.46 U	0.34 U	0.27 U	0.38 U	**1.16**	**54.5**	**4.35**	**0.48**	**0.186**	**1.37**	**3.92**	**3.28**	**5.7**
SMC-19-01	SMC01d	4	5.2	11/6/2019	**4**	**0.333** J	**0.904**	0.29 U	0.4 U	0.48 U	0.35 U	0.29 U	0.4 U	**2.79**	**34.5**	**0.396**	**0.362**	**0.0873**	**0.949**	**2.63**	**2.25**	**3.64**
SMC-19-01	SMC01e	5.2	7.6	11/6/2019	0.24 U	0.28 U	0.47 U	0.28 U	0.39 U	0.47 U	0.34 U	0.28 U	0.39 U	0.36 U	**0.11** J	**0.00227** J	**0.00164** J-	**0.001** J-	**0.00342** J-	**0.00443** J-	**0.00276** J-	**0.00905** J-
SMC-19-03	SMC03a	0	1	11/22/2019	**1**	**0.179** J	**0.487** J	0.46 U	0.64 U	0.77 U	0.56 U	0.46 U	0.64 U	**0.333** J	**42.2** J	**0.101** J	**0.128**	**0.0642** J	**0.421**	**2.77**	**3.48**	**5.59**
SMC-19-03	SMC03b	1	1.9	11/22/2019	**1.9**	**0.515** J	**0.94**	0.4 U	0.56 U	0.67 U	0.49 U	0.4 U	0.56 U	**0.47** J	**41.1** J	**0.183**	**0.16**	**0.0588** J	**0.431**	**2.81**	**3.47**	**5.4**
SMC-19-05	SMC05a	0	1	11/6/2019	**0.7**	0.44 U	**0.437** J	0.44 U	0.61 U	0.73 U	0.53 U	0.44 U	0.61 U	**0.267** J	**35.4** J	**0.103**	**0.108**	**0.0651** J	**0.51**	**2.52**	**2.69**	**4.89**
SMC-19-05	SMC05b	1	2.5	11/6/2019	**0.97**	**0.161** J	**0.443** J	0.36 U	0.5 U	0.6 U	0.44 U	0.36 U	0.5 U	**0.362** J	**29.1** J	**0.196**	**0.144**	**0.0669** J	**0.572**	**2.16**	**2.2**	**4.27**
SMC-19-05	SMC05c	2.5	4	11/6/2019	**1.7**	**0.219** J	**0.603**	0.33 U	0.46 U	0.55 U	0.4 U	0.33 U	0.46 U	**0.858**	**25.8**	**0.179**	**0.152**	**0.0549**	**0.468**	**1.85**	**1.89**	**3.6**
SMC-19-05	SMC05d	4.4	6.4	11/6/2019	0.27 U	0.32 U	0.54 U	0.32 U	0.45 U	0.54 U	0.4 U	0.32 U	0.45 U	0.41 U	**0.16** J	**0.00327** J	**0.00274** J-	**0.00176** J-	**0.0065** J-	**0.0064** J-	**0.00519** J-	**0.0149** J-
SMC-19-08	SMC08a	0	1	11/5/2019	**1.5**	**0.422**	**0.72**	0.045 U	0.063 U	0.076 U	0.056 U	0.045 U	0.063 U	**0.381**	**33.7**	**0.206**	**0.11**	**0.0624**	**0.371**	**2.11**	**2.53**	**4.76**
SMC-19-08	SMC08b	1	2.5	11/5/2019	**0.78**	**0.136**	**0.296**	0.041 U	0.057 U	0.068 U	0.05 U	0.041 U	0.057 U	**0.348**	**25.4**	**0.223**	**0.109**	**0.058**	**0.423**	**1.65**	**1.86**	**3.45**
SMC-19-08	SMC08c	2.5	4	11/5/2019	**2.9**	**0.43**	**0.811**	0.072 U	0.1 U	0.12 U	0.088 U	0.072 U	0.1 U	**1.61**	**50.8**	**0.573**	**0.493**	**0.11**	**1.03**	**3.96**	**3.21**	**5.92**
SMC-19-08	SMC08d	4	4.6	11/5/2019	**0.54**	**0.0751**	**0.227**	0.031 U	0.044 U	0.052 U	0.038 U	0.031 U	0.044 U	**0.241**	**32.8**	**0.553**	**0.347**	**0.076**	**0.913**	**2.58**	**1.97**	**3.01**
SMC-19-08	SMC08e	4.6	6.6	11/5/2019	**0.043**	0.031 U	0.051 U	0.031 U	0.043 U	0.051 U	0.038 U	0.031 U	0.043 U	**0.0428** J	**0.39** J	**0.063**	0.018 U	**0.00378** J	**0.015** J	**0.0182**	**0.0149** J	**0.0311**
SMC-19-09	SMC09a	0	1	11/22/2019	**0.34**	0.56 U	**0.341** J	0.56 U	0.78 U	0.93 U	0.68 U	0.56 U	0.78 U	0.71 U	**34.9** J	0.13 U	**0.0701** J	**0.0462** J	**0.2**	**1.72**	**2.74**	**5.26**
SMC-19-09	SMC09b	1	2.5	11/22/2019	**1.5**	**0.343** J	**0.731**	0.41 U	0.57 U	0.69 U	0.5 U	0.41 U	0.57 U	**0.434** J	**28.3**	**0.171**	**0.106**	**0.0604**	**0.309**	**1.85**	**2.43**	**3.72**
SMC-19-09	SMC09c	2.5	4	11/22/2019	**1.3**	**0.173** J	**0.54** J	0.39 U	0.54 U	0.65 U	0.47 U	0.39 U	0.54 U	**0.54** J	**34.7** J	**0.169**	**0.135**	**0.058**	**0.425**	**2.31**	**2.87**	**4.24**
SMC-19-09	SMC09d	4	6	11/22/2019	**4.2**	**0.426** J	**1.28**	0.32 U	0.44 U	0.53 U	0.39 U	0.32 U	0.44 U	**2.52**	**54.6**	**0.853**	**0.511**	**0.131**	**1.25**	**4.08**	**3.48**	**5.95**
SMC-19-09	SMC09e	6	7.6	11/22/2019	**0.67**	0.33 U	**0.345** J	0.33 U	0.45 U	0.54 U	0.4 U	0.33 U	0.45 U	**0.327** J	**76.5**	**1.68**	**0.723**	**0.267**	**2.18**	**5.83**	**4.94**	**6.92**
SMC-19-09	SMC09f	7.6	8.3	11/22/2019	0.25 U	0.29 U	0.49 U	0.29 U	0.41 U	0.49 U	0.36 U	0.29 U	0.41 U	0.37 U	**0.83** J	**0.0162**	**0.0406**	**0.00384** J	**0.0247**	**0.0445**	**0.0357**	**0.0567**
SMC-19-11	SMC11a	0	1	11/5/2019	**1.3**	**0.34**	**0.617**	0.047 U	0.065 U	0.078 U	0.058 U	0.047 U	0.065 U	**0.343**	**38.5**	**0.207**	**0.181**	**0.0716**	**0.746**	**2.62**	**2.86**	**4.77**
SMC-19-11	SMC11b	1	2.5	11/5/2019	**1.2**	**0.241**	**0.429**	0.039 U	0.054 U	0.065 U	0.048 U	0.039 U	0.054 U	**0.481**	**45** J	**0.408**	**0.411**	**0.101**	**1.03**	**3.52**	**3.13**	**5.2**
SMC-19-11	SMC11c	2.5	4	11/5/2019	**1.6**	**0.25**	**0.505**	0.038 U	0.053 U	0.063 U	0.047 U	0.038 U	0.053 U	**0.861**	**38.3**	**0.339**	**0.263**	**0.0975**	**0.692**	**3.05**	**2.74**	**4.69**
SMC-19-11	SMC11d	4	6	11/5/2019	**9.6**	**0.722**	**1.95**	0.32 U	0.45 U	0.54 U	0.4 U	0.32 U	0.45 U	**6.89**	**58.7**	**0.786**	**0.715**	**0.122**	**1.45**	**4.74**	**3.15**	**6.12**
SMC-19-11	SMC11e	6	8	11/5/2019	**0.37**	**0.0304** J	**0.127**	0.034 U	0.048 U	0.057 U	0.042 U	0.034 U	0.048 U	**0.217**	**59.2**	**1.36**	**0.773**	**0.198**	**1.87**	**4.46**	**2.93**	**4.99**
SMC-19-11	SMC11f	8	10.6	11/5/2019	0.025 U	0.03 U	0.05 U	0.03 U	0.041 U	0.05 U	0.036 U	0.03 U	0.041 U	0.038 U	**6.2** J	**0.14**	**0.0829**	**0.0277** J	**0.204**	**0.494**	**0.309**	**0.533**
SMC-19-11	SMC11g	10.6	12.6	11/5/2019	0.028 U	0.033 U	0.056 U	0.033 U	0.047 U	0.056 U	0.041 U	0.033 U	0.047 U	0.043 U	**2** J	**0.0212**	**0.0163** J	**0.00696** J	**0.0349**	**0.128**	**0.128**	**0.25**
SMC-19-13-A	SMC13a	0	1	11/22/2019	**0.8**	0.52 U	**0.516** J	0.52 U	0.72 U	0.86 U	0.63 U	0.52 U	0.72 U	**0.287** J	**32.3** J	**0.191**	**0.155**	**0.0601** J	**0.387**	**2.08**	**2.64**	**4.31**
SMC-19-13-A	SMC13b	1	2.5	11/22/2019	**1.1**	0.38 U	**0.532** J	0.38 U	0.53 U	0.64 U	0.47 U	0.38 U	0.53 U	**0.532** J	**29.5**	**0.363**	**0.255**	**0.0684**	**0.505**	**2.02**	**2.41**	**3.74**
SMC-19-13-A	SMC13c	2.5	4	11/22/2019	**1.6**	0.36 U	**0.703**	0.36 U	0.5 U	0.6 U	0.44 U	0.36 U	0.5 U	**0.924**	**42.2**	**0.449**	**0.33**	**0.0754**	**0.704**	**3.01**	**3.28**	**5.71**
SMC-19-13-A	SMC13d	4	5.6	11/22/2019	**2.6**	**0.141** J	**0.845**	0.36 U	0.5 U	0.6 U	0.44 U	0.36 U	0.5 U	**1.57**	**41.3**	**0.519**	**0.515**	**0.112**	**0.928**	**2.46**	**3.01**	**4.24**
SMC-19-13-A	SMC13e	5.6	6.3	11/22/2019	**0.2**	0.32 U	0.53 U	0.32 U	0.44 U	0.53 U	0.39 U	0.32 U	0.44 U	**0.196** J	**10**	**0.0689**	**0.224**	**0.0636**	**0.289**	**0.782**	**0.613**	**0.912**
SMC-19-16	SMC16a	0	0.6	11/7/2019	**0.67**	0.43 U	**0.238** J	0.43 U	0.59 U	0.71 U	0.52 U	0.43 U	0.59 U	**0.428** J	**49.9** J	**0.698** J-	**0.449**	**0.131**	**1.77**	**3.99**	**3.06**	**4.15**
SMC-19-16	SMC16b	0.6	2.5	11/7/2019	0.24 U	0.29 U	0.48 U	0.29 U	0.4 U	0.48 U	0.35 U	0.29 U	0.4 U	0.37 U	**0.11** J	**0.00219** J-	**0.0102**	**0.00163** J	**0.016**	**0.00313** J	**0.00133** J	**0.00535** J
SMC-19-17	SMC17a	0	1	11/5/2019	**0.73**	**0.151**	**0.3**	0.048 U	0.066 U	0.08 U	0.058 U	0.048 U	0.066 U	**0.276**	**30.8**	**0.194**	**0.107**	**0.0698**	**0.33**	**1.9**	**2.32**	**4.49**
SMC-19-17	SMC17b	1	2.5	11/5/2019	**1.1**	**0.193**	**0.393**	0.043 U	0.06 U	0.072 U	0.053 U	0.043 U	0.06 U	**0.485**	**32.8**	**0.477**	**0.186**	**0.0841**	**0.434**	**2.45**	**2.48**	**4.48**
SMC-19-17	SMC17c	2.5	4	11/5/2019	**1.6**	**0.269**	**0.546**	0.034 U	0.047 U	0.056 U	0.041 U	0.034 U	0.047 U	**0.745**	**41.5**	**0.547**	**0.416**	**0.103**	**0.911**	**2.96**	**2.68**	**5.01**
SMC-19-17	SMC17d	4	6	11/5/2019	**2.4**	**0.294**	**0.719**	0.065 U	0.091 U	0.11 U	0.08 U	0.065 U	0.091 U	**1.42**	**57.7**	**0.943**	**0.931**	**0.132**	**2.04**	**4.73**	**2.94**	**4.74**
SMC-19-17	SMC17e	6	8	11/5/2019	**0.03**	0.028 U	0.047 U	0.028 U	0.039 U	0.047 U	0.034 U	0.028 U	0.039 U	**0.0296** J	**19.7**	**0.455**	**0.273**	**0.0668**	**0.646**	**1.31**	**0.911**	**1.48**
SMC-19-17	SMC17f	8	10	11/5/2019	**0.023**	0.029 U	0.048 U	0.029 U	0.04 U	0.048 U	0.035 U	0.029 U	0.04 U	**0.0225** J	**22.4**	**0.367**	**0.218**	**0.0643**	**0.915**	**1.66**	**1**	**1.45**
SMC-19-17	SMC17g	10	10.6	11/5/2019	**0.018**	0.027 U	0.046 U	0.027 U	0.038 U	0.046 U	0.033 U	0.027 U	0.038 U	**0.0182** J	**29.8**	**0.551**	**0.355**	**0.102**	**0.858**	**2.11**	**1.64**	**2.28**
SMC-19-18	SMC18a	0	1	11/25/2019	**0.75**	0.41 U	**0.497** J	0.41 U	0.57 U	0.68 U	0.5 U	0.41 U	0.57 U	**0.249** J	**34.6** J	**0.168**	**0.112**	**0.0812** J	**0.296**	**2.22**	**3.1**	**5.28**
SMC-19-18	SMC18b	1	2.5	11/25/2019	**1.6**	**0.132** J	**0.745**	0.39 U	0.55 U	0.66 U	0.48 U	0.39 U	0.55 U	**0.723**	**35.3** J	**0.572**	**0.231**	**0.0539** J	**0.456**	**2.32**	**2.79**	**4.42**
SMC-19-18	SMC18c	2.5	4.3	11/25/2019	**6.8**	**0.397** J	**1.29**	0.29 U	0.4 U	0.48 U	0.35 U	0.29 U	0.4 U	**5.12**	**40.2** J	**0.648**	**0.516**	**0.057** J	**0.873**	**2.92**	**2.68**	**4.08**
SMC-19-18	SMC18d	4.3	6.3	11/25/2019	0.26 U	0.31 U	0.52 U	0.31 U	0.43 U	0.52 U	0.38 U	0.31 U	0.43 U	0.4 U	**0.12** J	**0.00297** J	0.0035 U	**0.00189** J	**0.0132**	**0.00416**	**0.00386**	**0.00936**
SMC-19-19	SMC19a	0	1	11/25/2019	**0.78**	0.37 U	**0.391** J	0.37 U	0.52 U	0.62 U	0.45 U	0.37 U	0.52 U	**0.391** J	**28.8**	**0.277**	**0.172**	**0.0641**	**0.385**	**2.12**	**2.44**	**3.86**
SMC-19-19	SMC19b	1	2.5	11/25/2019	**0.83**	0.36 U	**0.436** J	0.36 U	0.5 U	0.59 U	0.44 U	0.36 U	0.5 U	**0.396** J	**28.2**	**0.442**	**0.164**	**0.042**	**0.374**	**1.98**	**2.36**	**3.81**
SMC-19-19	SMC19c	2.5	4	11/25/2019	**1.3**	0.36 U	**0.544** J	0.36 U	0.5 U	0.6 U	0.44 U	0.36 U	0.5 U	**0.746**	**37.9**	**0.702**	**0.237**	**0.055**	**0.529**	**2.61**	**3.11**	**4.66**
SMC-19-19	SMC19d	4	6	11/25/2019	**2.3**	**0.16** J	**0.819**	0.32 U	0.45 U	0.53 U	0.39 U	0.32 U	0.45 U	**1.3**	**49.7** J	**0.635** J	**0.558**	**0.06**	**1.17**	**3.79**	**3.76**	**5.2**
SMC-19-20	SMC20a	0	1	11/5/2019	**0.72**	**0.162**	**0.29**	0.045 U	0.063 U	0.076 U	0.056 U	0.045 U	0.063 U	**0.268**	**36.9**	**0.2**	**0.132**	**0.0615**	**0.351**	**2.57**	**2.61**	**4.64**
SMC-19-20	SMC20b	1	2.5	11/5/2019	**1.2**	**0.22**	**0.478**	0.039 U	0.054 U	0.065 U	0.047 U	0.039 U	0.054 U	**0.476**	**26.4**	**0.37**	**0.136**	**0.0509**	**0.384**	**1.93**	**1.91**	**3.17**
SMC-19-20	SMC20c	2.5	4	11/5/2019	**1.8**	**0.287**	**0.59**	0.038 U	0.053 U	0.064 U	0.047 U	0.038 U	0.053 U	**0.916**	**41.6**	**0.497**	**0.368**	**0.086**	**0.797**	**2.89**	**2.86**	**4.78**
SMC-19-20	SMC20d	4	6	11/5/2019	**2.1**	**0.331**	**0.681**	0.033 U	0.045 U	0.055 U	0.04 U	0.033 U	0.045 U	**1.11**	**68.4**	**0.971**	**1.11**	**0.185**	**1.99**	**4.92**	**3.54**	**5.83**
SMC-19-20	SMC20e	6	8	11/5/2019	**1.4**	**0.212**	**0.489**	0.03 U	0.041 U	0.049 U	0.036 U	0.03 U	0.041 U	**0.731**	**56.1**	**1.29**	**0.789**	**0.167**	**1.75**	**3.97**	**2.8**	**4.42**
SMC-19-20	SMC20f	8	10	11/5/2019	**0.18**	0.033 U	**0.029** J	0.033 U	0.045 U	0.054 U	0.04 U	0.033 U	0.045 U	**0.15**	**50.1**	**1.29**	**0.614**	**0.182**	**1.57**	**3.4**	**2.74**	**4.19**
SMC-19-20	SMC20g	10	11.2	11/5/2019	**0.031**	0.033 U	0.055 U	0.033 U	0.046 U	0.055 U	0.041 U	0.033 U	0.046 U	**0.0314** J	**44.8**	**1.42**	**0.54**	**0.156**	**1.32**	**3.48**	**2.43**	**3.19**
SMC-19-21	SMC21a	0	1	11/25/2019	**0.9**	0.41 U	**0.575** J	0.41 U	0.58 U	0.69 U	0.51 U	0.41 U	0.58 U	**0.322** J	**37.8**	**0.427**	**0.151**	**0.0493**	**0.409**	**2.44**	**3.19**	**4.96**
SMC-19-21	SMC21b	1	2.5	11/25/2019	**0.91**	0.38 U	**0.422** J	0.38 U	0.53 U	0.63 U	0.46 U	0.38 U	0.53 U	**0.485** J	**29.9**	**0.626**	**0.167**	**0.0527**	**0.407**	**2.17**	**2.54**	**4.17**
SMC-19-21	SMC21c	2.5	4	11/25/2019	**1.3**	0.39 U	**0.563** J	0.39 U	0.54 U	0.65 U	0.48 U	0.39 U	0.54 U	**0.736**	**42.7**	**0.679**	**0.256**	**0.0621**	**0.583**	**2.92**	**3.62**	**5.57**

Appendix A
South Menomonee Canal Sediment Analytical Results Summary
Focused Feasibility Study, Milwaukee Estuary AOC, Milwaukee, Wisconsin

				Analyte Group	PAH											Metals							
				Analyte	Benzo(e)pyrene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenzo(a,h)a nthracene	Fluoranthene	Fluorene	Indeno(1,2,3-Cd)Pyrene	Naphthalene	Phenanthrene	Pyrene	Chromium	Mercury	Lead	Nickel	Arsenic	Cadmium	Copper	Zinc
				Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				WI CBSQG PEC												110	1.1	130	49	33	5	150	460
				WI CBSQG PEC 3x												330	3.3	390	147	99	15	450	1380
				WI CBSQG PEC 5x												550	5.5	650	245	165	25	750	2300
				TSCA																			
Location code	Sample ID	Start Depth	End Depth	Date	Benzo(e)pyrene mg/kg	Benzo(g,h,i) perylene mg/kg	Benzo(k) fluoranthene mg/kg	Chrysene mg/kg	Dibenzo(a,h)a nthracene mg/kg	Fluoranthene mg/kg	Fluorene mg/kg	Indeno(1,2,3-Cd)Pyrene mg/kg	Naphthalene mg/kg	Phenanthrene mg/kg	Pyrene mg/kg	Chromium mg/kg	Mercury mg/kg	Lead mg/kg	Nickel mg/kg	Arsenic mg/kg	Cadmium mg/kg	Copper mg/kg	Zinc mg/kg
SMC-19-01	SMC01a	0	1	11/6/2019	1.65	1.32	1.24	2.26	0.201	5.47	0.597	1.28	0.264	2.65	4.37	126 J	0.34	190 J	16.6 J	4.6	2.9 J	85.7 J	244 J
SMC-19-01	SMC01b	1	2.5	11/6/2019	3.06	2.34	1.8	5.56	0.514 J	10.2	0.992	2.06	0.919	6.85	8.93	182 J	0.24	447 J	25.2 J	6.1	3.5 J	85.3 J	245 J
SMC-19-01	SMC01c	2.5	4	11/6/2019	2.83	2	1.8	3.64	0.357	8.05	0.917	1.77	2.34	5.03	6.52	208 J	0.31	421 J	24.5 J	7.3	5 J	91.2 J	294 J
SMC-19-01	SMC01d	4	5.2	11/6/2019	1.79	1.4	1.29	2.64	0.235	6.64	0.52	1.38	0.361	3.06	4.86	226 J	0.23	257 J	23.1 J	6.8	4.4 J	77.8 J	241 J
SMC-19-01	SMC01e	5.2	7.6	11/6/2019	0.00565 J-	0.00994 J-	0.00299 J-	0.00949 J-	0.00199 J-	0.016 J-	0.00549 J-	0.00463 J-	0.00353	0.0106 J-	0.0111 J-	22.1 J	0.012 U	21 J	15.7 J	2	0.43 J	18.8 J	59.2 J
SMC-19-03	SMC03a	0	1	11/22/2019	2.81	3.28	1.51	4.1	0.602	6.63	0.247	2.61	0.135	2.59	5.12	44.4 J	0.19	88.6	15.7	6.2	1.4 J	83.5	298
SMC-19-03	SMC03b	1	1.9	11/22/2019	2.72	2.84	1.54	3.65	0.543	6.23	0.296	2.31	0.238	2.69	5.57	55.1 J	0.2	112	16.3	6.2	1.6 J	98.7	303
SMC-19-05	SMC05a	0	1	11/6/2019	2.42	2.05	2.24	2.82	0.276	5.99	0.214	1.94	0.133	1.95	4.47	42.6 J	0.02 U	81.6 J	18.2 J	4	1.1 J	82.3 J	305 J
SMC-19-05	SMC05b	1	2.5	11/6/2019	1.87	1.47	1.37	2.22	0.213	4.89	0.293	1.45	0.219	1.86	3.67	59.6 J	0.27	127 J	18.3 J	4.9	1.8 J	91.5 J	286 J
SMC-19-05	SMC05c	2.5	4	11/6/2019	1.57	1.31	1.24	2.03	0.206	4.43	0.255	1.31	0.168	1.68	3.45	91.8 J	0.33	175 J	18.4 J	5	2.5 J	120 J	329 J
SMC-19-05	SMC05d	4.4	6.4	11/6/2019	0.0075 J-	0.0108 J-	0.0061 J-	0.0132 J-	0.00351 J-	0.0223 J-	0.01 J-	0.00651 J-	0.00506	0.0161 J-	0.0165 J-	14.8 J	0.014 U	7.3 J	15.6 J	1.2 J	0.2 J	15.1 J	45.3 J
SMC-19-08	SMC08a	0	1	11/5/2019	2.24	2.73	1.29	2.9	0.445	5.46	0.193	2.37	0.158	1.83	3.96	64.6 J+	0.29	116 J	21.2	5.1	1.1	136	365
SMC-19-08	SMC08b	1	2.5	11/5/2019	1.63	1.96	0.963	2.16	0.353	3.92	0.195	1.79	0.203	1.52	2.95	74 J+	0.31	135 J	23.2	5.4	1.3	137	371
SMC-19-08	SMC08c	2.5	4	11/5/2019	2.69	2.91	1.68	3.59	0.597	9.24	0.67	2.63	0.56	4.06	6.91	298 J+	0.41	307 J	31.5	10	5.3	114	346
SMC-19-08	SMC08d	4	4.6	11/5/2019	1.88	1.64	0.77	3.02	0.411	5.19	0.483	1.17	0.574	3.39	4.79	151 J+	0.26	272 J	21.9	7.7	2	54.9	168
SMC-19-08	SMC08e	4.6	6.6	11/5/2019	0.0158 J	0.0209	0.00937 J	0.0214	0.019 U	0.0482	0.0108 J	0.0154 J	0.0235	0.0182	0.0401	11.9 J+	0.013 U	5.5 J	11.1	1.2 J	0.038 U	13	39.9
SMC-19-09	SMC09a	0	1	11/22/2019	2.62	3.04	1.29	3.27	0.531	5.09	0.16	2.43	0.109 J	1.79	4.42	40.3 J	0.16	55.2	17.7	6.6	1.2 J	70.2	323
SMC-19-09	SMC09b	1	2.5	11/22/2019	2	2.1	1.25	2.7	0.41	4.03	0.203	1.73	0.177	1.7	3.39	56.9 J	0.26	104	16.6	6.3	1.8 J	117	317
SMC-19-09	SMC09c	2.5	4	11/22/2019	2.23	2.1	1.48	3.31	0.445 J	5.3	0.261	1.8	0.216	2.3	5.01	90.9 J	0.37	176	21.1	9	3.5 J	151	409
SMC-19-09	SMC09d	4	6	11/22/2019	2.73	2.2	1.46	5.09	0.546	8.97	0.865	1.81	0.862	5.34	8.47	211 J	1.3	268	24.2	13.4	3.5 J	114	348
SMC-19-09	SMC09e	6	7.6	11/22/2019	3.09	2.47	1.89	6.85	0.66	12	1.49	2.03	2.77	9.07	11.6	407 J	3.1	360	37.5	24.9	8.9 J	125	458
SMC-19-09	SMC09f	7.6	8.3	11/22/2019	0.0392	0.0221	0.0203	0.0528	0.00582 J	0.139	0.0462	0.0183	0.0183	0.143	0.104	16.3 J	0.03	7.6	10.8	3.5	0.71 J	13.2	45.7
SMC-19-11	SMC11a	0	1	11/5/2019	2.52	2.74	1.37	3.44	0.518	5.86	0.356	2.6	0.188	2.68	4.74	65.8 J+	0.23	109 J	22.2	5.6	0.97	166	417
SMC-19-11	SMC11b	1	2.5	11/5/2019	2.51	2.68	1.64	3.34	0.431 J	7.41	0.504 J	2.37	0.356	3.95	5.98	85.4 J+	0.31	159 J	24.4	6.3	1.8	144	375
SMC-19-11	SMC11c	2.5	4	11/5/2019	2.33	2.25	1.55	3	0.379	6.29	0.433	2.01	0.289	2.75	5.16	230 J+	0.43	289 J	29.6	8.8	3.3	147	485
SMC-19-11	SMC11d	4	6	11/5/2019	2.81	2.45	1.79	4.48	0.48	11.1	0.976	2.17	0.894	5.55	8.88	489 J+	0.85	468 J	40.7	12.3	8.2	160	502
SMC-19-11	SMC11e	6	8	11/5/2019	2.4	2.1	1.58	4.4	0.418	10.6	1.34	1.82	2.19	7.07	8.66	179 J+	3.4	96.9 J	28.8	12.3	1.8	52.3	196
SMC-19-11	SMC11f	8	10.6	11/5/2019	0.271	0.23	0.165	0.423	0.0451	1.03	0.156	0.202	0.313	0.82	0.781	57.9 J+	0.72	16.9 J	15.3	3.6	0.038 U	20.6	74.2
SMC-19-11	SMC11g	10.6	12.6	11/5/2019	0.118	0.123	0.0735	0.163	0.0176 J	0.323	0.0312	0.104	0.0196	0.138	0.254	22.2 J+	0.013 U	7.4 J	19.4	1.4 J	0.04 U	18.3	50.6
SMC-19-13-A	SMC13a	0	1	11/22/2019	2.32	2.09	1.54	2.98	0.428	4.89	0.285	1.8	0.289	1.91	3.95	67.2 J	0.24	116	22.2	8.1	1.9 J	126	390
SMC-19-13-A	SMC13b	1	2.5	11/22/2019	1.95	1.53	1.32	2.79	0.348	4.02	0.399	1.36	0.501	2.24	3.72	74.8 J	0.4	155	21.9	17.3	2.4 J	127	345
SMC-19-13-A	SMC13c	2.5	4	11/22/2019	2.49	1.92	1.76	3.64	0.448	6.09	0.508	1.74	0.388	3.25	6.44	112 J	0.44	505	22 J	9	3.7	173 J	419 J
SMC-19-13-A	SMC13d	4	5.6	11/22/2019	2.29	1.86	1.25	3.71	0.44	6.79	0.793	1.54	0.564	4.27	5.98	198 J	0.49	346	22.3	10.6	4.1 J	121	399
SMC-19-13-A	SMC13e	5.6	6.3	11/22/2019	0.391	0.269	0.285	0.783	0.0757	1.71	0.149	0.256	0.162	1.27	1.66	27.2 J	0.041	25.7	15.3 J	5.4	0.92	23.3 J	76.1 J
SMC-19-16	SMC16a	0	0.6	11/7/2019	2.67	2.37	1.89	3.51	0.525	8.1	0.757	1.83	2.3	4.73	6.97	304 J	1.6	269 J	33.4 J	34.2 J	7 J	135 J	611 J
SMC-19-16	SMC16b	0.6	2.5	11/7/2019	0.00391 J	0.00388 J	0.0091 U	0.00637 J	0.0069 U	0.0125	0.00404 J	0.00197 J	0.00428 J	0.0157	0.0123	7.8 J	0.018	6.4 J	10.5 J	2.4 J	0.43 J	12.4 J	40.3 J
SMC-19-17	SMC17a	0	1	11/5/2019	2.16	2.11	1.33	2.86	0.31	4.97	0.201	2.02	0.199	1.74	3.52	66.4 J+	0.28	123 J	25.3	6.3	0.81	140	426
SMC-19-17	SMC17b	1	2.5	11/5/2019	2.18	2.06	1.48	2.56	0.34	5.07	0.293	1.92	0.365	2.07	3.85	131 J+	0.35	202 J	27.8	7.5	2.2	191	443
SMC-19-17	SMC17c	2.5	4	11/5/2019	2.12	1.85	1.21	3.13	0.358	7.7	0.634	1.79	0.511	3.54	6.05	222 J+	0.37	399 J	29.7	12	5.9	204	498
SMC-19-17	SMC17d	4	6	11/5/2019	2.48	1.61	1.3	4.23	0.414	10.7	1.33	1.53	1.66	7.56	8.43	396 J+	0.82	298 J	30.5	14.2	3.4	100	291
SMC-19-17	SMC17e	6	8	11/5/2019	0.759	0.612	0.537	1.26	0.132	3.23	0.454	0.562	1.69	2.72	2.6	88.6 J+	0.15	19.9 J	20.3	5.7	0.035 U	24.6	83.2
SMC-19-17	SMC17f	8	10	11/5/2019	0.739	0.578	0.467	1.33	0.122	3.4	0.445	0.518	2.64	3.21	3.26	611 J+	6.7	169 J	20.3	41.7	0.42	58.9	232
SMC-19-17	SMC17g	10	10.6	11/5/2019	1.17	0.948	0.817	1.78	0.199	4.04	0.627	0.878	4.71	3.41	3.29	708 J+	3	222 J	18.1	59.2	0.33	55	209
SMC-19-18	SMC18a	0	1	11/25/2019	2.6	1.87	1.48	3.25	0.413	5.81	0.221	1.72	0.176	1.96	3.88	60.4	0.3 J	120	20.9 J	9.9	1.9 J	179	441 J
SMC-19-18	SMC18b	1	2.5	11/25/2019	2.26	1.91	1.59	3.04	0.403	5.16	0.403	1.59	0.497	2.56	5.08	95.8	0.29 J	177	22.9 J	11.2	2.6 J	164	392 J
SMC-19-18	SMC18c	2.5	4.3	11/25/2019	1.97	1.68	1.29	3.18	0.389	6.52	0.742	1.41	0.505	4.16	6.6	233	0.48 J	232	27.5 J	12.5	3.1 J	84.4	270 J
SMC-19-18	SMC18d	4.3	6.3	11/25/2019	0.00543	0.00788	0.0049 U	0.00827	0.0036 U	0.0151	0.00694	0.00399	0.00766	0.0129	0.0128	14.6	0.0081 J	6.9	15.2 J	4.2	0.6 J	15	46.5 J
SMC-19-19	SMC19a	0	1	11/25/2019	1.86	1.72	1.05	2.6	0.362	3.82	0.282	1.44	0.326	1.93	4.09	164	0.6 J	160	18.8 J	17.2	1.9 J	169	346 J
SMC-19-19	SMC19b	1	2.5	11/25/2019	1.91	1.46	1.28	2.5	0.336	3.71	0.297	1.3	0.441	1.99	3.85	85.8	0.45 J	153	20.8 J	9.7	2.1 J	150	377 J
SMC-19-19	SMC19c	2.5	4	11/25/2019	2.45	1.98	1.56	3.38	0.438	5.42	0.406	1.72	0.544	2.75	5.35	110	0.47 J	201	23.3 J	10.8	3.6 J	189	449 J
SMC-19-19	SMC19d	4	6	11/25/2019	2.5	2.13	1.65	3.78	0.5 J	7.98	0.787	1.84	0.711 J	5.23	7.41	235	1.6 J	316	25.8 J	17	3.5 J	165	424 J
SMC-19-20	SMC20a	0	1	11/5/2019	2.4	3.35	1.74	3.08	0.416	5.7	0.216	2.86	0.206	2	4.39	103 J	0.27	130 J	24.4 J	9.5 J	0.72	184 J	488 J
SMC-19-20	SMC20b	1	2.5	11/5/2019	1.67	2.07	1.19	2.06	0.291	4.01	0.241	1.77	0.311	1.75	3.13	88 J	0.34	161 J	24.5 J	6.9 J	1.5	201 J	456 J
SMC-19-20	SMC20c	2.5	4	11/5/2019	2.4	2.62	1.71	3.36	0.438	6.73	0.538	2.35	0.435	3.39	5.4	276 J	0.52	368 J	32.4 J	12.4 J	4.8	202 J	575 J
SMC-19-20	SMC20d	4	6	11/5/2019	3.21	3.14	1.99	4.9	0.582	13	1.57	2.57	1.34	7.89	9.68	311 J	1.2	405 J	31.9 J	12.5 J	5.6	212 J	488 J
SMC-19-20	SMC20e	6	8	11/5/2019	2.41	2.25	1.62	3.99	0.493	10.4	1.31	1.83	2.06	6.73	7.82	427 J	3.7	331 J	31.1 J	32.1 J	2.5	106 J	355 J
SMC-19-20	SMC20f	8	10	11/5/2019	2.17	2.21	1.51	3.49	0.437	8.16	1.17	1.93	2.4	6.03	6.57	925 J	8.8	361 J	32.6 J	70.7 J	1.9	134 J	511 J
SMC-19-20	SMC20g	10	11.2	11/5/2019	1.91	2.01	1.07	3.06	0.383	7.32	1.04	1.75	2.37	5.41	5.9	1020 J	8.7	439 J	35.2 J	83.1 J	1.4	147 J	578 J
SMC-19-21	SMC21a	0	1	11/25/2019	2.58	2.33	1.55	3.51	0.484	5.39	0.285	1.97	0.36	2.31	5.39	58.3	0.25 J	113	17.8 J	8.1	1.8 J	165	428 J
SMC-19-21	SMC21b	1	2.5	11/25/2019	2	1.45	1.11	2.69	0.353	3.93	0.307	1.35	0.488	2.12	4	60.5	0.44 J	126	18.7 J	7.4	2.1 J	134	347 J
SMC-19-21	SMC21c	2.5	4	11/25/2019	2.81	2.15	1.61	3.97	0.511	6.03	0.427	1.94	0.52	3	6.06	101	0.5 J	209	25.2 J	11	3.8 J	217	482 J

Appendix A
South Menomonee Canal Sediment Analytical Results Summary
Focused Feasibility Study, Milwaukee Estuary AOC, Milwaukee, Wisconsin

				Analyte Group	Metals																Physical Parameters								
				Analyte	Silver	Barium	Selenium	Aluminum	Iron	Manganese	Potassium	Sodium	Thallium	Antimony	Beryllium	Cobalt	Calcium	Cyanide	Magnesium	Vanadium	TOC	Gravel	Sand	Coarse Sand	Medium Sand	Fine Sand	Silt	Clay	Fines
				Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%	%	%	%
				WI CBSQG PEC					40000	1100				25															
				WI CBSQG PEC 3x					120000	3300				75															
				WI CBSQG PEC 5x					200000	5500				125															
				TSCA																									
Location code	Sample ID	Start Depth	End Depth	Date	Silver mg/kg	Barium mg/kg	Selenium mg/kg	Aluminum mg/kg	Iron mg/kg	Manganese mg/kg	Potassium mg/kg	Sodium mg/kg	Thallium mg/kg	Antimony mg/kg	Beryllium mg/kg	Cobalt mg/kg	Calcium mg/kg	Cyanide mg/kg	Magnesium mg/kg	Vanadium mg/kg	TOC mg/kg	Gravel %	Sand %	Coarse Sand %	Medium Sand %	Fine Sand %	Silt %	Clay %	Fines %
SMC-19-01	SMC01a	0	1	11/6/2019																	**51400**	**3.5**	**41.3**	**2.6**	**8.4**	**30.3**	**31.1**	**24.1**	**55.2**
SMC-19-01	SMC01b	1	2.5	11/6/2019																	**94100**	**0.7**	**50.8**	**1.6**	**9.8**	**39.4**	**25**	**23.5**	**48.5**
SMC-19-01	SMC01c	2.5	4	11/6/2019																	**67700**	**6.9**	**46.4**	**1.9**	**10.5**	**34**	**18.2**	**28.5**	**46.7**
SMC-19-01	SMC01d	4	5.2	11/6/2019																	**82900**	**6**	**32.6**	**1.9**	**8.5**	**22.2**	**31.2**	**30.2**	**61.4**
SMC-19-01	SMC01e	5.2	7.6	11/6/2019																	**60700**	0 U	**4.4**	0 U	**2.8**	**1.6**	**43**	**52.6**	**95.6**
SMC-19-03	SMC03a	0	1	11/22/2019																	**62500**								
SMC-19-03	SMC03b	1	1.9	11/22/2019																	**76100**								
SMC-19-05	SMC05a	0	1	11/6/2019																	**76000**								
SMC-19-05	SMC05b	1	2.5	11/6/2019																	**71300**								
SMC-19-05	SMC05c	2.5	4	11/6/2019																	**53300**								
SMC-19-05	SMC05d	4.4	6.4	11/6/2019																	**60300**								
SMC-19-08	SMC08a	0	1	11/5/2019																	**73300**								
SMC-19-08	SMC08b	1	2.5	11/5/2019																	**54500**								
SMC-19-08	SMC08c	2.5	4	11/5/2019																	**65500**								
SMC-19-08	SMC08d	4	4.6	11/5/2019																	**110000**								
SMC-19-08	SMC08e	4.6	6.6	11/5/2019																	**60900**								
SMC-19-09	SMC09a	0	1	11/22/2019																	**67200**								
SMC-19-09	SMC09b	1	2.5	11/22/2019																	**58700**								
SMC-19-09	SMC09c	2.5	4	11/22/2019																	**56500**								
SMC-19-09	SMC09d	4	6	11/22/2019																	**70700**								
SMC-19-09	SMC09e	6	7.6	11/22/2019																	**108000**								
SMC-19-09	SMC09f	7.6	8.3	11/22/2019																	**61000**								
SMC-19-11	SMC11a	0	1	11/5/2019																	**70900**								
SMC-19-11	SMC11b	1	2.5	11/5/2019																	**72800**								
SMC-19-11	SMC11c	2.5	4	11/5/2019																	**80000**								
SMC-19-11	SMC11d	4	6	11/5/2019																	**99300**								
SMC-19-11	SMC11e	6	8	11/5/2019																	**87800**								
SMC-19-11	SMC11f	8	10.6	11/5/2019																	**75500**								
SMC-19-11	SMC11g	10.6	12.6	11/5/2019																	**61700**								
SMC-19-13-A	SMC13a	0	1	11/22/2019																	**42500**								
SMC-19-13-A	SMC13b	1	2.5	11/22/2019																	**55000**								
SMC-19-13-A	SMC13c	2.5	4	11/22/2019																	**54300**								
SMC-19-13-A	SMC13d	4	5.6	11/22/2019																	**82400**								
SMC-19-13-A	SMC13e	5.6	6.3	11/22/2019																	**54600**								
SMC-19-16	SMC16a	0	0.6	11/7/2019																	**98700**								
SMC-19-16	SMC16b	0.6	2.5	11/7/2019																	**73400**								
SMC-19-17	SMC17a	0	1	11/5/2019																	**66900**								
SMC-19-17	SMC17b	1	2.5	11/5/2019																	**55400**								
SMC-19-17	SMC17c	2.5	4	11/5/2019																	**78000**								
SMC-19-17	SMC17d	4	6	11/5/2019																	**101000**								
SMC-19-17	SMC17e	6	8	11/5/2019																	**51200**								
SMC-19-17	SMC17f	8	10	11/5/2019																	**85700**								
SMC-19-17	SMC17g	10	10.6	11/5/2019																	**58500**								
SMC-19-18	SMC18a	0	1	11/25/2019																	**70000**								
SMC-19-18	SMC18b	1	2.5	11/25/2019																	**61400**								
SMC-19-18	SMC18c	2.5	4.3	11/25/2019																	**83900**								
SMC-19-18	SMC18d	4.3	6.3	11/25/2019																	**59400**								
SMC-19-19	SMC19a	0	1	11/25/2019																	**70600**								
SMC-19-19	SMC19b	1	2.5	11/25/2019																	**76200**								
SMC-19-19	SMC19c	2.5	4	11/25/2019																	**76400**								
SMC-19-19	SMC19d	4	6	11/25/2019																	**77900**								
SMC-19-20	SMC20a	0	1	11/5/2019																	**70900**								
SMC-19-20	SMC20b	1	2.5	11/5/2019																	**83500**								
SMC-19-20	SMC20c	2.5	4	11/5/2019																	**80400**								
SMC-19-20	SMC20d	4	6	11/5/2019																	**102000**								
SMC-19-20	SMC20e	6	8	11/5/2019																	**133000**								
SMC-19-20	SMC20f	8	10	11/5/2019																	**107000**								
SMC-19-20	SMC20g	10	11.2	11/5/2019																	**111000**								
SMC-19-21	SMC21a	0	1	11/25/2019																	**75400**								
SMC-19-21	SMC21b	1	2.5	11/25/2019																	**79500**								
SMC-19-21	SMC21c	2.5	4	11/25/2019																	**96600**								

Appendix A
South Menomonee Canal Sediment Analytical Results Summary
Focused Feasibility Study, Milwaukee Estuary AOC, Milwaukee, Wisconsin

				Analyte Group	PCB										PAH							
				Analyte	Total PCB	Aroclor 1260	Aroclor 1254	Aroclor 1268	Aroclor 1221	Aroclor 1232	Aroclor 1248	Aroclor 1016	Aroclor 1262	Aroclor 1242	Total PAH	2-Methyl naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) anthracene	Benzo(a)pyrene	Benzo(b)-fluoranthene
				Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				WI CBSQG PEC	1										22.8							
				WI CBSQG PEC 3x	3										68.4							
				WI CBSQG PEC 5x	5										114							
				TSCA	50																	
Location code	Sample ID	Start Depth	End Depth	Date	Total PCB mg/kg	Aroclor 1260 mg/kg	Aroclor 1254 mg/kg	Aroclor 1268 mg/kg	Aroclor 1221 mg/kg	Aroclor 1232 mg/kg	Aroclor 1248 mg/kg	Aroclor 1016 mg/kg	Aroclor 1262 mg/kg	Aroclor 1242 mg/kg	Total PAH mg/kg	2-Methyl naphthalene mg/kg	Acenaphthene mg/kg	Acenaphthylene mg/kg	Anthracene mg/kg	Benzo(a) anthracene mg/kg	Benzo(a) pyrene mg/kg	Benzo(b)-fluoranthene mg/kg
SMC-19-21	SMC21d	4	6.3	11/25/2019	**2.4**	**0.13** J	**0.864**	0.39 U	0.54 U	0.65 U	0.48 U	0.39 U	0.54 U	**1.36**	**45.4**	**0.685**	**0.338**	**0.0592**	**0.717**	**3.17**	**3.63**	**5.63**
SMC-19-25	SMC25a	0	1	11/5/2019	**1.6**	**0.264**	**0.567**	0.038 U	0.052 U	0.063 U	0.046 U	0.038 U	0.052 U	**0.766**	**56.7**	**1.06**	**0.932**	**0.106**	**1.64**	**4.05**	**3.73**	**5.35**
SMC-19-25	SMC25b	1	2.5	11/5/2019	**0.3**	**0.0264** J	**0.0661**	0.04 U	0.055 U	0.066 U	0.048 U	0.04 U	0.055 U	**0.207**	**56.3** J	**1.6**	**0.699**	**0.25**	**1.67**	**4**	**3.19**	**4.41**
SMC-19-25	SMC25c	2.5	4	11/5/2019	**0.14**	0.043 U	**0.0386** J	0.043 U	0.06 U	0.072 U	0.053 U	0.043 U	0.06 U	**0.101**	**37.3**	**1.38**	**0.538**	**0.18**	**1.2**	**2.86**	**1.84**	**3.01**
SMC-19-25	SMC25d	4	6	11/5/2019	0.034 U	0.04 U	0.067 U	0.04 U	0.055 U	0.067 U	0.049 U	0.04 U	0.055 U	0.051 U	**27.7**	**1.51**	**0.371**	**0.13**	**0.94**	**2.07**	**1.35**	**1.96**
SMC-19-25	SMC25e	6	6.9	11/5/2019	0.024 U	0.029 U	0.048 U	0.029 U	0.04 U	0.048 U	0.035 U	0.029 U	0.04 U	0.037 U	**11.4**	**0.625**	**0.406**	**0.0424**	**0.472**	**0.635**	**0.398**	**0.633**
SMC-19-25	SMC25f	6.9	7.5	11/5/2019	0.025 U	0.03 U	0.049 U	0.03 U	0.041 U	0.049 U	0.036 U	0.03 U	0.041 U	0.038 U	**0.23** J	**0.0181**	**0.0273** J-	**0.00241** J-	**0.00672** J-	**0.0038** J-	**0.00278** J-	**0.00805** J-
SMC-19-26	SMC26a	0	1	11/7/2019	**1.8**	**0.207** J	**0.562**	0.27 U	0.37 U	0.44 U	0.33 U	0.27 U	0.37 U	**1.07**	**178** J	**7.09** J-	**4.42**	**0.244**	**10.2**	**14.7**	**7.88**	**12**
SMC-19-26	SMC26b	1	2.5	11/7/2019	**5**	**0.473** J	**1.29**	0.37 U	0.51 U	0.62 U	0.45 U	0.37 U	0.51 U	**3.27**	**61.3** J	**1.63** J-	**0.718**	**0.142**	**1.37**	**4.36**	**3.05**	**5.57**
SMC-19-26	SMC26c	2.5	4	11/7/2019	**2.8**	**0.278** J	**0.752**	0.29 U	0.41 U	0.49 U	0.36 U	0.29 U	0.41 U	**1.73**	**32.2** J	**1.27** J-	**0.515**	**0.0895**	**0.734**	**1.51**	**1.12**	**2.46**
SMC-19-26	SMC26d	4	6	11/7/2019	**2.8**	**0.164** J	**1.22**	0.42 U	0.59 U	0.7 U	0.52 U	0.42 U	0.59 U	**1.38**	**76** J	**2.22** J-	**0.944**	**0.238**	**2.25**	**5.76**	**3.87**	**7.08**
SMC-19-26	SMC26e	6	7.6	11/7/2019	**1.5**	0.32 U	**0.617**	0.32 U	0.44 U	0.53 U	0.39 U	0.32 U	0.44 U	**0.846**	**46.6** J	**1.75** J-	**0.605**	**0.159**	**1.36**	**3.19**	**2.18**	**3.82**
SMC-19-26	SMC26f	7.6	9.6	11/7/2019	0.28 U	0.33 U	0.56 U	0.33 U	0.46 U	0.56 U	0.41 U	0.33 U	0.46 U	0.43 U	**0.3** J	**0.0118** J-	**0.00947** J-	**0.00167** J-	**0.00498** J-	**0.0139** J-	**0.0066** J-	**0.0228** J-
SMC-19-28-A	SMC28a	0	1	11/5/2019	**1.5**	**0.499**	**0.766**	0.045 U	0.062 U	0.074 U	0.055 U	0.045 U	0.062 U	**0.263**	**45.4**	**0.416**	**0.199**	**0.0796**	**0.549**	**3.18**	**3.53**	**5.65**
SMC-19-28-A	SMC28b	1	2.5	11/5/2019	**0.61**	**0.111**	**0.223**	0.038 U	0.053 U	0.063 U	0.046 U	0.038 U	0.053 U	**0.278**	**41.8**	**0.457**	**0.311**	**0.0734**	**0.859**	**3.08**	**3.08**	**4.74**
SMC-19-28-A	SMC28c	2.5	4	11/5/2019	**2.8**	**0.283**	**0.651**	0.073 U	0.1 U	0.12 U	0.089 U	0.073 U	0.1 U	**1.9**	**45.6**	**0.811**	**0.609**	**0.11**	**1.16**	**3.71**	**2.44**	**4.23**
SMC-19-28-A	SMC28d	4	6	11/5/2019	**2.1**	**0.284**	**0.678**	0.038 U	0.053 U	0.064 U	0.047 U	0.038 U	0.053 U	**1.13**	**61.9**	**1.79**	**1.27**	**0.226**	**2.02**	**4**	**3.23**	**5.24**
SMC-19-28-A	SMC28e	6	8	11/5/2019	**1**	**0.197**	**0.525**	0.041 U	0.057 U	0.069 U	0.05 U	0.041 U	0.057 U	**0.305**	**63.5**	**2.78**	**0.977**	**0.277**	**2.26**	**4.17**	**3.06**	**5.04**
SMC-19-28-A	SMC28f	8	9.5	11/5/2019	**0.75**	**0.156**	**0.383**	0.04 U	0.055 U	0.066 U	0.048 U	0.04 U	0.055 U	**0.213**	**51.6**	**2.08**	**0.672**	**0.3**	**1.55**	**3.79**	**2.81**	**4.06**
SMC-19-28-A	SMC28g	9.5	10.8	11/5/2019	0.027 U	0.032 U	0.054 U	0.032 U	0.045 U	0.054 U	0.039 U	0.032 U	0.045 U	0.041 U	**5.5** J	**0.257**	**0.146**	**0.0259**	**0.202**	**0.356** J	**0.212** J-	**0.323** J
SMC-19-29	SMC29a	0	1	11/6/2019	**0.85**	**0.16** J	**0.48** J	0.41 U	0.57 U	0.69 U	0.5 U	0.41 U	0.57 U	**0.206** J	**48.7** J	**0.784**	**0.156**	**0.0881** J	**0.661**	**3.36**	**3.72**	**6.7**
SMC-19-29	SMC29b	1	2.5	11/6/2019	**1.6**	**0.457** J	**0.845**	0.41 U	0.57 U	0.69 U	0.5 U	0.41 U	0.57 U	**0.343** J	**43.1**	**2.57**	**0.346**	**0.105**	**0.67**	**2.83**	**2.94**	**5.75**
SMC-19-29	SMC29c	2.5	4.3	11/6/2019	**1.9**	**0.3** J	**1.06**	0.42 U	0.58 U	0.69 U	0.51 U	0.42 U	0.58 U	**0.577** J	**78.9**	**1.99**	**1.23**	**0.252**	**2.57**	**6.06**	**3.3**	**7.19**
SMC-19-29	SMC29d	4.3	6.3	11/6/2019	0.23 U	0.28 U	0.46 U	0.28 U	0.38 U	0.46 U	0.34 U	0.28 U	0.38 U	0.35 U	**0.18** J	**0.00459** J-	**0.00322** J-	**0.00329** J-	**0.00574** J-	0.0034 UJ	**0.00785** J-	**0.0163** J-
SMC-19-30	SMC30a	0	1	11/6/2019	0.38 U	0.45 U	0.75 U	0.45 U	0.63 U	0.75 U	0.55 U	0.45 U	0.63 U	0.58 U	**53**	**0.213**	**0.239**	**0.1**	**0.694**	**3.91**	**3.8**	**6.85**
SMC-19-30	SMC30b	1	2.5	11/6/2019	**1.2**	**0.282** J	**0.62**	0.34 U	0.47 U	0.56 U	0.41 U	0.34 U	0.47 U	**0.263** J	**40.9**	**0.259**	**0.672**	**0.0632**	**0.888**	**3.1**	**2.73**	**4.84**
SMC-19-30	SMC30c	2.5	4	11/6/2019	**0.3**	0.45 U	**0.3** J	0.45 U	0.63 U	0.75 U	0.55 U	0.45 U	0.63 U	0.58 U	**80.2** J	**1.64**	**1.03**	**0.574** J	**2.36**	**7.35**	**4.12**	**7.61**
SMC-19-30	SMC30d	4	6	11/6/2019	0.24 U	0.29 U	0.48 U	0.29 U	0.4 U	0.48 U	0.35 U	0.29 U	0.4 U	0.36 U	**2.3** J	**0.0478**	**0.0423**	**0.014** J	**0.0796**	**0.164**	**0.0937**	**0.181**
SMC-19-30	SMC30e	6	6.8	11/6/2019	0.28 U	0.34 U	0.56 U	0.34 U	0.47 U	0.56 U	0.41 U	0.34 U	0.47 U	0.43 U	**13.1**	**0.378**	**0.179**	**0.0696**	**0.461**	**0.971**	**0.663**	**1.05**
SMC-19-30	SMC30f	6.8	7.6	11/6/2019	0.24 U	0.29 U	0.48 U	0.29 U	0.4 U	0.48 U	0.35 U	0.29 U	0.4 U	0.37 U	**9.8**	**0.32**	**0.361**	**0.341**	**0.52**	**0.718**	**0.563**	**0.698**
SMC-19-31	SMC31a	0	1	11/4/2019	**1.3**	**0.409**	**0.57**	0.045 U	0.062 U	0.074 U	0.055 U	0.045 U	0.062 U	**0.273**	**41.8**	**0.22**	**0.13**	**0.0798**	**0.401**	**2.92**	**3.17**	**6.42**
SMC-19-31	SMC31b	1	2.5	11/4/2019	**0.66**	**0.128**	**0.232**	0.04 U	0.056 U	0.067 U	0.049 U	0.04 U	0.056 U	**0.297**	**32.7**	**0.226**	**0.149**	**0.0657**	**0.46**	**2.39**	**2.6**	**4.47**
SMC-19-31	SMC31c	2.5	4	11/4/2019	**0.77**	**0.217** J	**0.236**	0.037 U	0.051 U	0.061 U	0.045 U	0.037 U	0.051 U	**0.32**	**38**	**0.397**	**0.214**	**0.0951**	**0.529**	**2.61**	**2.79**	**5.47**
SMC-19-31	SMC31d	4	6	11/4/2019	**1.6**	**0.365** J	**0.565**	0.039 U	0.054 U	0.065 U	0.048 U	0.039 U	0.054 U	**0.706**	**40.4**	**0.425**	**0.301**	**0.112**	**0.707**	**2.75**	**2.8**	**5.21**
SMC-19-31	SMC31e	6	8	11/4/2019	**1.9**	**0.299**	**0.716**	0.039 U	0.054 U	0.064 U	0.047 U	0.039 U	0.054 U	**0.896**	**47.1**	**0.705**	**0.539**	**0.136**	**1.04**	**3.63**	**2.97**	**5.75**
SMC-19-31	SMC31f	8	9.5	11/4/2019	**1.6**	**0.223** J-	**0.595**	0.038 U	0.052 U	0.063 U	0.046 U	0.038 UJ	0.052 U	**0.754**	**70**	**1.72**	**1.33**	**0.237**	**2.26**	**4.93**	**3.28**	**6.97**
SMC-19-31	SMC31g	9.5	11.5	11/4/2019	0.026 U	0.031 U	0.052 U	0.031 U	0.043 U	0.052 U	0.038 U	0.031 U	0.043 U	0.04 U	**0.19** J	**0.00957** J-	**0.0155** J-	**0.00193** J-	**0.00482** J-	0.0068 UJ	**0.00515** J-	**0.015** J-
SMC-19-32	SMC32a	0	1	11/6/2019	**1.6**	**0.412** J	**0.896**	0.44 U	0.61 U	0.73 U	0.53 U	0.44 U	0.61 U	**0.291** J	**42.6**	**0.276**	**0.201**	**0.109**	**0.487**	**2.9**	**3.23**	**5.85**
SMC-19-32	SMC32b	1	2.5	11/6/2019	**0.51**	0.3 U	**0.269** J	0.3 U	0.42 U	0.51 U	0.37 U	0.3 U	0.42 U	**0.236** J	**32**	**0.382**	**0.338**	**0.0853**	**0.65**	**2.42**	**2.11**	**3.99**
SMC-19-32	SMC32c	2.5	4	11/6/2019	**4.3**	**0.466** J	**1.28**	0.42 U	0.58 U	0.7 U	0.51 U	0.42 U	0.58 U	**2.54**	**64**	**0.627**	**0.624**	**0.167**	**1.29**	**4.25**	**4**	**7.67**
SMC-19-32	SMC32d	4	6	11/6/2019	**12.4**	**1.05**	**2.85**	0.43 U	0.6 U	0.72 U	0.53 U	0.43 U	0.6 U	**8.47**	**73.8**	**0.79**	**0.61**	**0.176**	**1.63**	**5.44**	**4.58**	**8.85**
SMC-19-32	SMC32e	6	8	11/6/2019	**3.9**	**0.42** J	**1.36**	0.38 U	0.52 U	0.63 U	0.46 U	0.38 U	0.52 U	**2.16**	**83.7**	**2.14**	**1.99**	**0.285**	**2.76**	**6.53**	**3.94**	**7.9**
SMC-19-32	SMC32f	8	10.5	11/6/2019	**2.4**	**0.393** J	**1.14**	0.37 U	0.52 U	0.62 U	0.45 U	0.37 U	0.52 U	**0.889**	**123**	**2.36**	**2.35**	**0.28**	**3.78**	**11.1**	**7.44**	**11.9**
SMC-19-32	SMC32g	10.5	11.5	11/6/2019	0.26 U	0.3 U	0.51 U	0.3 U	0.42 U	0.51 U	0.37 U	0.3 U	0.42 U	0.39 U	**0.58** J	**0.00708** J	**0.151**	**0.00461** J	**0.0211**	0.018 U	**0.00691** J	**0.016** J
SMC-19-34-A	SMC34a	0	1	11/22/2019	**0.84**	0.41 U	**0.454** J	0.41 U	0.57 U	0.68 U	0.5 U	0.41 U	0.57 U	**0.386** J	**31.4**	**0.268**	**0.164**	**0.0691**	**0.418**	**2.19**	**2.75**	**4.21**
SMC-19-34-A	SMC34b	1	2.5	11/22/2019	**0.92**	0.36 U	**0.52** J	0.36 U	0.5 U	0.6 U	0.44 U	0.36 U	0.5 U	**0.4** J	**26.7**	**0.303**	**0.137**	**0.0539**	**0.349**	**1.81**	**2.31**	**3.7**
SMC-19-34-A	SMC34c	2.5	4	11/22/2019	**1.2**	0.35 U	**0.722**	0.35 U	0.49 U	0.59 U	0.43 U	0.35 U	0.49 U	**0.527** J	**35.4**	**0.398**	**0.201**	**0.0878**	**0.477**	**2.33**	**2.97**	**5.03**
SMC-19-34-A	SMC34d	4	6	11/22/2019	**2.7**	**0.258** J	**1.05**	0.36 U	0.5 U	0.6 U	0.44 U	0.36 U	0.5 U	**1.43**	**50.5**	**0.603**	**0.512**	**0.101**	**0.988**	**3.63**	**3.86**	**5.61**
SMC-19-34-A	SMC34e	6	6.7	11/22/2019	**2.2**	**0.121** J	**0.809**	0.31 U	0.43 U	0.52 U	0.38 U	0.31 U	0.43 U	**1.26**	**83.4**	**1.06**	**0.918**	**0.159**	**2.01**	**5.97**	**4.93**	**8.51**
SMC-19-35	SMC35a	0	1	11/25/2019	**1.4**	**0.223** J	**0.866**	0.45 U	0.62 U	0.74 U	0.54 U	0.45 U	0.62 U	**0.322** J	**42.4**	**0.237**	**0.179**	**0.0653**	**0.496**	**3.04**	**3.82**	**5.8**
SMC-19-35	SMC35b	1	2.5	11/25/2019	**0.77**	0.39 U	**0.385** J	0.39 U	0.54 U	0.64 U	0.47 U	0.39 U	0.54 U	**0.385** J	**37.5**	**0.396**	**0.248**	**0.0524**	**0.573**	**2.9**	**3.27**	**4.75**
SMC-19-35	SMC35c	2.5	4	11/25/2019	**1.3**	0.36 U	**0.675**	0.36 U	0.5 U	0.6 U	0.44 U	0.36 U	0.5 U	**0.636**	**58.4**	**0.615**	**0.669**	**0.0846**	**1.33**	**4.41**	**4.32**	**6.32**
SMC-19-35	SMC35d	4	5.2	11/25/2019	**2.1**	**0.122** J	**0.804**	0.31 U	0.44 U	0.52 U	0.38 U	0.31 U	0.44 U	**1.15**	**71.3**	**0.672**	**1.18**	**0.0749**	**1.84**	**5.18**	**4.87**	**7.1**
SMC-19-35	SMC35e	5.2	5.5	11/25/2019	0.18 U	0.21 U	0.35 U	0.21 U	0.29 U	0.35 U	0.26 U	0.21 U	0.29 U	0.27 U	**0.35** J	**0.00528**	**0.00473** J-	**0.00103** J-	**0.00573** J-	**0.0184**	**0.0229**	**0.036**
SMC-19-02	SMC02a	0	1	9/29/2020	**0.43**	**0.0507** J	**0.182**	0.12 U	0.12 U	0.06 U	0.12 U	0.12 U	0.06 U	**0.197**	**29.8** J	**0.0644** J	**0.099** J	0.15 U	**0.294**	**2.19**	**2.19**	**3.9**
SMC-19-02	SMC02b	1	2.5	9/29/2020	**1.3**	**0.233**	**0.383**	0.087 U	0.087 U	0.044 U	0.087 U	0.087 U	0.044 U	**0.725**	**42.8** J	**0.275**	**0.35**	**0.0909** J	**0.912**	**3.67**	**2.8**	**4.88**
SMC-19-02	SMC02c	2.5	4	9/29/2020	**3.2**	**0.536**	**0.931**	0.16 U	0.16 U	0.078 U	0.16 U	0.16 U	0.078 U	**1.75**	**36.8**	**0.293**	**0.354**	**0.112**	**0.796**	**3.35**	**2.36**	**3.67**
SMC-19-02	SMC02d	4	4.9	9/29/2020	**7.6**	**0.915**	**1.99**	0.62 U	0.62 U	0.31 U	0.62 U	0.62 U	0.31 U	**4.7**	**66.7**	**0.878**	**1.64**	**0.16**	**2.04**	**5.76**	**4.02**	**6.52**
SMC-19-04	SMC04a	0	0.5	9/29/2020	**0.44**	**0.0851**	**0.227**	0.1 U	0.1 U	0.052 U	0.1 U	0.1 U	0.052 U	**0.124**	**26.4** J	**0.0595** J	**0.0878** J	**0.0536** J	**0.287**	**1.93**	**1.91**	**3.6**
SMC-19-04	SMC04b	0.5	1.6	9/29/2020	0.031 U	0.031 U	0.062 U	0.062 U	0.062 U	0.031 U	0.062 U	0.062 U	0.031 U	0.031 U	**1.6** J	**0.0244**	**0.0541**	**0.00878** J	**0.0776**	**0.119**	**0.0786**	**0.117**
SMC-19-06	SMC06a	0	1	9/25/2020	**0.58**	**0.0707** J	**0.271**	0.12 U	0.12 U	0.059 U	0.12 U	0.12 U	0.059 U	**0.242**	**37.8** J	**0.0879** J	**0.104** J	**0.0713** J	**0.322**	**2.48**	**2.76**	**5.02**

Appendix A

South Menomonee Canal Sediment Analytical Results Summary

Focused Feasibility Study, Milwaukee Estuary AOC, Milwaukee, Wisconsin

Location code	Sample ID	Start Depth	End Depth	Date	Benzo(e)pyrene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-Cd)Pyrene	Naphthalene	Phenanthrene	Pyrene	Chromium	Mercury	Lead	Nickel	Arsenic	Cadmium	Copper	Zinc
				Analyte Group	PAH											Metals							
				Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				WI CBSQG PEC												110	1.1	130	49	33	5	150	460
				WI CBSQG PEC 3x												330	3.3	390	147	99	15	450	1380
				WI CBSQG PEC 5x												550	5.5	650	245	165	25	750	2300
				TSCA																			
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SMC-19-21	SMC21d	4	6.3	11/25/2019	**2.77**	**1.95**	**1.92**	**4.09**	**0.482**	**6.51**	**0.582**	**1.81**	**0.554**	**3.59**	**6.96**	**170**	**0.54** J	**293**	**28** J	**12.6**	**4.7** J	**209**	**499** J
SMC-19-25	SMC25a	0	1	11/5/2019	**2.98**	**3.12**	**1.34**	**3.94**	**0.54**	**9.82**	**1.04**	**2.79**	**0.754**	**5.75**	**7.79**	**179** J	**0.53**	**354** J	**33.6** J	**10.4** J	**7.3**	**205** J	**405** J
SMC-19-25	SMC25b	1	2.5	11/5/2019	**2.59**	**2.54**	**1.43**	**4.16**	**0.512** J	**9.64**	**1.3**	**2.28**	**1.92**	**6.41**	**7.71**	**705** J	**8.1**	**381** J	**42.9** J	**71** J	**2.7**	**246** J	**655** J
SMC-19-25	SMC25c	2.5	4	11/5/2019	**1.48**	**1.38**	**0.833**	**2.41**	**0.279**	**6.04**	**0.996**	**1.24**	**1.55**	**5.18**	**4.92**	**980** J	**8.5**	**390** J	**47.5** J	**82.9** J	**0.96**	**233** J	**720** J
SMC-19-25	SMC25d	4	6	11/5/2019	**1.05**	**1.05**	**0.656**	**1.68**	**0.214**	**4.31**	**0.762**	**0.895**	**1.65**	**3.74**	**3.38**	**901** J	**6.2**	**376** J	**40.6** J	**70.3** J	**0.61**	**181** J	**595** J
SMC-19-25	SMC25e	6	6.9	11/5/2019	**0.327**	**0.312**	**0.188**	**0.616**	**0.0584**	**1.62**	**0.604**	**0.244**	**0.479**	**2.39**	**1.38**	**193** J	**2.2**	**70.6** J	**16.7** J	**15.3** J	0.034 U	**43.8** J	**147** J
SMC-19-25	SMC25f	6.9	7.5	11/5/2019	**0.00617** J-	**0.00901** J-	**0.00193** J-	**0.0105** J-	0.0034 UJ	**0.0196** J-	**0.0224** J-	**0.00401** J-	**0.0237**	**0.0413** J-	**0.016** J-	**22.9** J	**0.032**	**8.6** J	**20.8** J	**1.5** J	0.035 U	**19.7** J	**62.6** J
SMC-19-26	SMC26a	0	1	11/7/2019	**4.62**	**3.06**	**3.51**	**11**	**0.828**	**31.7**	**6.03**	**3.27**	**3.7**	**30.6**	**23.4**	**108** J	**0.24**	**175** J	**22** J	**9.7** J	**3.8** J	**356** J	**274** J
SMC-19-26	SMC26b	1	2.5	11/7/2019	**3.01**	**2.04**	**2.44**	**4.02**	**0.334**	**12.8**	**1.07**	**1.8**	**1.11**	**5.89**	**9.98**	**274** J	**0.7**	**344** J	**37.9** J	**20.8** J	**7.2** J	**222** J	**401** J
SMC-19-26	SMC26c	2.5	4	11/7/2019	**1.41**	**0.794**	**1.11**	**2.14**	**0.201**	**7.42**	**0.688**	**0.55**	**0.866**	**3.46**	**5.85**	**165** J	**0.37**	**219** J	**26.5** J	**13.6** J	**4.5** J	**128** J	**252** J
SMC-19-26	SMC26d	4	6	11/7/2019	**3.43**	**2.68**	**2.68**	**5.39**	**0.499**	**14.1**	**1.58**	**2.44**	**2.14**	**7.98**	**10.7**	**885** J	**7.9**	**372** J	**48.2** J	**82.5** J	**3.8** J	**274** J	**825** J
SMC-19-26	SMC26e	6	7.6	11/7/2019	**1.95**	**1.51**	**1.42**	**3.34**	**0.282**	**8.52**	**1.14**	**1.4**	**1.99**	**5.48**	**6.47**	**371** J	**3.3**	**336** J	**49.6** J	**42.6** J	**6.5** J	**156** J	**521** J
SMC-19-26	SMC26f	7.6	9.6	11/7/2019	**0.0126** J-	**0.0151** J-	**0.00682** J-	**0.0213** J-	**0.00206** J-	**0.0567** J-	**0.0123** J-	**0.00887** J-	**0.0117**	**0.036** J-	**0.0418** J-	**25.3** J	**0.0099** J	**20.2** J	**21.3** J	**2** J	**1** J	**25.4** J	**76.4** J
SMC-19-28-A	SMC28a	0	1	11/5/2019	**3.06**	**3.35**	**1.89**	**4.02**	**0.527**	**7.11**	**0.32**	**3.05**	**0.35**	**2.7**	**5.41**	**62.5** J	**0.4**	**132** J	**22.3** J	**5.9** J	**0.79**	**267** J	**524** J
SMC-19-28-A	SMC28b	1	2.5	11/5/2019	**2.59**	**2.75**	**1.74**	**3.51**	**0.434**	**6.66**	**0.442**	**2.44**	**0.383**	**3.03**	**5.2**	**108** J	**0.36**	**156** J	**26.5** J	**9.9** J	**0.89**	**233** J	**470** J
SMC-19-28-A	SMC28c	2.5	4	11/5/2019	**2.5**	**1.78**	**1.24**	**3.32**	**0.334**	**8.95**	**0.862**	**1.5**	**0.684**	**4.28**	**7.11**	**272** J	**0.63**	**341** J	**37.3** J	**16.4** J	**4.3**	**257** J	**447** J
SMC-19-28-A	SMC28d	4	6	11/5/2019	**3.03**	**2.42**	**1.76**	**4.45**	**0.525**	**10.9**	**1.61**	**2.24**	**1.77**	**6.7**	**8.69**	**535** J	**2.1**	**515** J	**59.8** J	**44.2** J	**6.9**	**227** J	**643** J
SMC-19-28-A	SMC28e	6	8	11/5/2019	**2.87**	**2.09**	**1.63**	**4.68**	**0.463**	**10.6**	**1.75**	**1.91**	**2.6**	**7.86**	**8.46**	**1050** J	**10.1**	**505** J	**61.3** J	**101** J	**2.1**	**305** J	**1010** J
SMC-19-28-A	SMC28f	8	9.5	11/5/2019	**2.24**	**1.8**	**1.07**	**3.96**	**0.405**	**8.21**	**1.35**	**1.64**	**2.1**	**6.74**	**6.82**	**858** J	**6.2**	**454** J	**58.7** J	**87.5** J	**2.1**	**282** J	**864** J
SMC-19-28-A	SMC28g	9.5	10.8	11/5/2019	**0.175** J-	**0.17** J-	**0.104** J-	**0.286** J	**0.0417** J-	**0.813**	**0.237**	**0.147** J-	**0.288**	**1.14**	**0.616** J	**643** J	**5.3**	**328** J	**42.8** J	**64.3** J	**0.71** J	**202** J	**643** J
SMC-19-29	SMC29a	0	1	11/6/2019	**3.23**	**2.52**	**2.99**	**3.85**	**0.367**	**8.12**	**0.329**	**2.52**	**0.597**	**2.71**	**6.02**	**38.1** J	**0.2**	**85.4** J	**17.5** J	**4.8**	**1.1** J	**126** J	**401** J
SMC-19-29	SMC29b	1	2.5	11/6/2019	**2.5**	**1.89**	**1.75**	**2.9**	**0.28**	**6.29**	**0.569**	**1.84**	**1.39**	**3.57**	**4.91**	**47.3** J	**0.28**	**93.9** J	**18** J	**5.1**	**1.3** J	**183** J	**403** J
SMC-19-29	SMC29c	2.5	4.3	11/6/2019	**3.03**	**3.09**	**1.27**	**5.7**	**0.578**	**15.1**	**1.84**	**2.5**	**1.93**	**9.57**	**11.7**	**495** J	**1.9**	**444** J	**107** J	**43.7**	**8.4** J	**179** J	**633** J
SMC-19-29	SMC29d	4.3	6.3	11/6/2019	**0.0106** J-	**0.0129** J-	**0.00301** J-	**0.014** J-	**0.00163** J-	**0.0294** J-	**0.0069** J-	**0.00739** J-	**0.00655** J-	**0.0195** J-	**0.0255** J-	**14** J	**0.024**	**10.2** J	**15.9** J	**1.8**	**0.56** J	**17.7** J	**67.2** J
SMC-19-30	SMC30a	0	1	11/6/2019	**3.34**	**4.7**	**1.72**	**4.27**	**0.699**	**8.3**	**0.363**	**4.12**	**0.23**	**3.06**	**6.4**	**38** J	**0.18**	**156** J	**19.1** J	**5**	**1.2** J	**104** J	**419** J
SMC-19-30	SMC30b	1	2.5	11/6/2019	**2.23**	**2.92**	**1.05**	**3.15**	**0.465**	**6.38**	**0.659**	**2.5**	**0.285**	**3.63**	**5.12**	**74.4** J	**0.34**	**344** J	**21.4** J	**8.7**	**2** J	**179** J	**433** J
SMC-19-30	SMC30c	2.5	4	11/6/2019	**3.11**	**3.02**	**1.33**	**6.61**	**0.679**	**13.5**	**1.75**	**2.74**	**1.85**	**9.94**	**11**	**507** J	**3.2**	**374** J	**47.7** J	**82**	**7.9** J	**221** J	**677** J
SMC-19-30	SMC30d	4	6	11/6/2019	**0.0901**	**0.094**	**0.0392**	**0.148**	**0.0151** J	**0.418**	**0.0379**	**0.0747**	**0.0663**	**0.36**	**0.334**	**14.5** J	**0.16**	**10.2** J	**15.2** J	**2**	**0.51**	**17.1**	**66.7** J
SMC-19-30	SMC30e	6	6.8	11/6/2019	**0.511**	**0.525**	**0.209**	**0.97**	**0.0992**	**2.24**	**0.311**	**0.448**	**0.47**	**1.74**	**1.81**	**157** J	**1.1**	**104** J	**20.8** J	**21.2**	**0.95** J	**89.6** J	**234** J
SMC-19-30	SMC30f	6.8	7.6	11/6/2019	**0.168**	**0.587**	**0.402**	**0.633**	**0.5**	**1.03**	**0.436**	**0.596**	**0.316**	**0.76**	**0.848**	**14.9** J	**0.023**	**7.9** J	**15.8** J	**1.3** J	**0.51**	**15.3**	**52.9** J
SMC-19-31	SMC31a	0	1	11/4/2019	**2.9**	**3.47**	**1.31**	**3.48**	**0.575**	**6.39**	**0.214**	**3.19**	**0.238**	**1.92**	**4.8**	**63.2** J	**0.38**	**126** J	**21.5** J	**5.2** J	**0.8** J	**237** J	**502** J
SMC-19-31	SMC31b	1	2.5	11/4/2019	**2.17**	**2.58**	**1.04**	**2.72**	**0.489**	**5.06**	**0.217**	**2.29**	**0.253**	**1.65**	**3.88**	**67.7** J	**0.35**	**158** J	**24.6** J	**6.3** J	**1.5** J	**200** J	**468** J
SMC-19-31	SMC31c	2.5	4	11/4/2019	**2.46**	**2.7**	**1.36**	**3.13**	**0.573**	**5.65**	**0.304**	**2.48**	**0.382**	**2.13**	**4.72**	**111** J	**0.57**	**239** J	**28** J	**8.4** J	**3.2** J	**272** J	**592** J
SMC-19-31	SMC31d	4	6	11/4/2019	**2.45**	**2.63**	**1.58**	**3.22**	**0.536**	**6.38**	**0.45**	**2.46**	**0.364**	**2.61**	**5.37**	**237** J	**0.58**	**402** J	**38.3** J	**12.7** J	**6.2** J	**302** J	**719** J
SMC-19-31	SMC31e	6	8	11/4/2019	**2.52**	**2.58**	**1.16**	**3.21**	**0.607**	**7.92**	**0.701**	**2.46**	**0.568**	**3.64**	**6.96**	**337** J	**0.84**	**479** J	**41.2** J	**18.9** J	**8.5** J	**256** J	**638** J
SMC-19-31	SMC31f	8	9.5	11/4/2019	**3.01**	**2.54**	**1.77**	**5.42**	**0.679**	**12**	**1.66**	**2.38**	**1.83**	**8.11**	**9.84**	**595** J	**2.2**	**442** J	**50** J	**53.3** J	**5.6** J	**281** J	**646** J
SMC-19-31	SMC31g	9.5	11.5	11/4/2019	**0.00892** J-	**0.0106** J-	0.0095 UJ	**0.0145** J-	0.0071 UJ	**0.0239** J-	**0.0116** J-	**0.0056** J-	**0.00937** J-	**0.0184** J-	**0.0186** J-	**21.5** J	**0.025**	**9.1** J	**21.2** J	**2** J	0.038 U	**19.7** J	**62.2** J
SMC-19-32	SMC32a	0	1	11/6/2019	**2.91**	**3.52**	**1.69**	**3.52**	**0.551**	**6.45**	**0.245**	**3.1**	**0.36**	**2.13**	**5.03**	**54.7** J	**0.54**	**138** J	**23.5** J	**5.5**	**2.2**	**259**	**560** J
SMC-19-32	SMC32b	1	2.5	11/6/2019	**1.79**	**2**	**0.996**	**2.52**	**0.344**	**5.1**	**0.392**	**1.82**	**0.507**	**2.43**	**4.17**	**62.7** J	**0.29**	**158** J	**20.1** J	**6.6**	**2**	**163**	**440** J
SMC-19-32	SMC32c	2.5	4	11/6/2019	**3.6**	**3.37**	**1.69**	**4.78**	**0.611**	**12.2**	**0.79**	**3.08**	**0.552**	**4.96**	**9.77**	**402** J	**0.67**	**536** J	**48.3** J	**16.4**	**11.8**	**197**	**579** J
SMC-19-32	SMC32d	4	6	11/6/2019	**4.1**	**4.15**	**2.21**	**5.56**	**0.797**	**13.3**	**0.862**	**4.08**	**0.665**	**5.04**	**11**	**455** J	**0.88**	**546** J	**42.8** J	**14.7**	**11.1**	**209**	**614** J
SMC-19-32	SMC32e	6	8	11/6/2019	**3.48**	**3.15**	**1.72**	**6.3**	**0.695**	**14.5**	**1.87**	**2.92**	**2.2**	**9.33**	**12**	**499** J	**1.6**	**482** J	**47.8** J	**35.5**	**8.4**	**187**	**645** J
SMC-19-32	SMC32f	8	10.5	11/6/2019	**5.75**	**5.59**	**2.62**	**9.19**	**0.952**	**20.9**	**2.21**	**3.81**	**3.31**	**13**	**16.1**	**540** J	**1.2**	**427** J	**42.5** J	**36.9**	**6.8**	**176**	**605** J
SMC-19-32	SMC32g	10.5	11.5	11/6/2019	**0.01** J	**0.0122** J	0.025 U	**0.0169** J	0.018 U	**0.0637**	**0.0501**	**0.00618** J	**0.00721** J	**0.128**	**0.0446**	**18** J	**0.0087** J	**10** J	**19.8** J	**1.3** J	**0.67**	**18.2**	**63.5** J
SMC-19-34-A	SMC34a	0	1	11/22/2019	**2.18**	**1.7**	**1.51**	**3.06**	**0.393**	**4.39**	**0.284**	**1.53**	**0.323**	**2.06**	**3.91**	**65.5** J	**0.38**	**129**	**18.7** J	**7.6**	**2**	**154** J	**350** J
SMC-19-34-A	SMC34b	1	2.5	11/22/2019	**1.87**	**1.37**	**1.29**	**2.55**	**0.32**	**3.63**	**0.254**	**1.25**	**0.281**	**1.76**	**3.48**	**76.1** J	**0.34**	**160**	**21.6** J	**9**	**2.6**	**158** J	**381** J
SMC-19-34-A	SMC34c	2.5	4	11/22/2019	**2.36**	**1.69**	**1.44**	**3.25**	**0.396**	**4.9**	**0.341**	**1.54**	**0.366**	**2.35**	**5.32**	**119** J	**0.49**	**204**	**22.3** J	**11.2**	**3.7**	**173** J	**428** J
SMC-19-34-A	SMC34d	4	6	11/22/2019	**2.86**	**2.05**	**2.07**	**4.55**	**0.523**	**7.91**	**0.788**	**1.89**	**0.657**	**4.77**	**7.12**	**217** J	**0.64**	**322**	**27.3** J	**14.3**	**3.4**	**184** J	**501** J
SMC-19-34-A	SMC34e	6	6.7	11/22/2019	**3.71**	**2.09**	**2.23**	**6.45**	**0.58**	**15.5**	**1.48**	**1.89**	**1.79**	**10.1**	**14**	**300** J	**2**	**423**	**31.4** J	**29.3**	**5**	**151** J	**467** J
SMC-19-35	SMC35a	0	1	11/25/2019	**3.1**	**2.33**	**1.74**	**4.08**	**0.516**	**6.07**	**0.324**	**2.08**	**0.29**	**2.46**	**5.78**	**63.2**	**0.29** J	**146**	**21.4** J	**9.7**	**2.1** J	**174**	**534** J
SMC-19-35	SMC35b	1	2.5	11/25/2019	**2.53**	**1.85**	**1.36**	**3.44**	**0.437**	**5.56**	**0.412**	**1.68**	**0.452**	**2.59**	**4.97**	**83.3**	**0.38** J	**169**	**20.2** J	**9.5**	**2.3** J	**177**	**457** J
SMC-19-35	SMC35c	2.5	4	11/25/2019	**3.06**	**2.02**	**2.17**	**4.79**	**0.537**	**9.31**	**0.982**	**1.94**	**0.731**	**6.27**	**8.83**	**187**	**0.63** J	**357**	**24.8** J	**13.7**	**4.1** J	**203**	**514** J
SMC-19-35	SMC35d	4	5.2	11/25/2019	**3.44**	**2.73**	**2.55**	**5.6**	**0.658**	**11.2**	**1.48**	**2.39**	**0.799**	**8.18**	**11.4**	**270**	**0.62** J	**407**	**28.6** J	**16.8**	**5.4** J	**141**	**485** J
SMC-19-35	SMC35e	5.2	5.5	11/25/2019	**0.0213**	**0.0245**	**0.01**	**0.0363**	**0.00469**	**0.0494** J-	**0.00593** J-	**0.0152**	**0.0035**	**0.0387** J-	**0.0488** J-	**18.1**	**0.0076** J	**12.5**	**14.9** J	**4.7**	**0.5** J	**19.5**	**42.6** J
SMC-19-02	SMC02a	0	1	9/29/2020	**2.06**	**1.92**	**1.03**	**2.9**	**0.354**	**4.72**	**0.168**	**1.76**	**0.0955** J	**2.01**	**3.99**	**56.4** J	**0.15** J	**84.2**	**18.2** J	**6.3**	**1.6**	**65.8** J	**295**
SMC-19-02	SMC02b	1	2.5	9/29/2020	**2.15**	**1.89**	**1.36**	**3.93**	**0.405**	**7.34**	**0.493**	**1.86**	**0.273**	**3.75**	**6.34**	**151** J	**0.31** J	**205**	**19** J	**7.2**	**3**	**102** J	**344**
SMC-19-02	SMC02c	2.5	4	9/29/2020	**1.83**	**1.57**	**1.22**	**3.14**	**0.349**	**6.58**	**0.477**	**1.55**	**0.279**	**3.24**	**5.59**	**200** J	**0.37** J	**325**	**23.8** J	**8.6**	**5.5**	**132** J	**394**
SMC-19-02	SMC02d	4	4.9	9/29/2020	**2.5**	**2.06**	**1.4**	**5.79**	**0.502**	**11.9**	**1.51**	**2.01**	**0.728**	**8.05**	**9.25**	**205** J	**0.47** J	**293**	**23.1** J	**8.1**	**4.5**	**83.3** J	**253**
SMC-19-04	SMC04a	0	0.5	9/29/2020	**1.81**	**1.65**	**0.977**	**2.66**	**0.302**	**4.13**	**0.158**	**1.54**	**0.0834** J	**1.77**	**3.43**	**36** J	**0.098** J	**70.1**	**17.9** J	**8.9**	**1.8**	**81.7** J	**280**
SMC-19-04	SMC04b	0.5	1.6	9/29/2020	**0.0604**	**0.0518**	**0.032**	**0.106**	**0.0131** J	**0.256**	**0.0292**	**0.0466**	**0.0257**	**0.276**	**0.221**	**10.3** J	**0.026** J	**16.9**	**10.3** J	**8.7**	**0.5**	**13.4** J	**51.9**
SMC-19-06	SMC06a	0	1	9/25/2020	**2.69**	**2.8**	**1.56**	**3.76**	**0.439**	**6.09**	**0.193**	**2.44**	**0.129** J	**2.25**	**4.62**	**37.7** J	**0.13** J	**52.6** J	**17.4** J	**4.5**	**0.72**	**62.4** J	**300** J

Appendix A

South Menomonee Canal Sediment Analytical Results Summary

Focused Feasibility Study, Milwaukee Estuary AOC, Milwaukee, Wisconsin

				Analyte Group	Metals																Physical Parameters								
				Analyte	Silver	Barium	Selenium	Aluminum	Iron	Manganese	Potassium	Sodium	Thallium	Antimony	Beryllium	Cobalt	Calcium	Cyanide	Magnesium	Vanadium	TOC	Gravel	Sand	Coarse Sand	Medium Sand	Fine Sand	Silt	Clay	Fines
				Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%	%	%	%
				WI CBSQG PEC					40000	1100				25															
				WI CBSQG PEC 3x					120000	3300				75															
				WI CBSQG PEC 5x					200000	5500				125															
				TSCA																									
Location code	Sample ID	Start Depth	End Depth	Date	Silver mg/kg	Barium mg/kg	Selenium mg/kg	Aluminum mg/kg	Iron mg/kg	Manganese mg/kg	Potassium mg/kg	Sodium mg/kg	Thallium mg/kg	Antimony mg/kg	Beryllium mg/kg	Cobalt mg/kg	Calcium mg/kg	Cyanide mg/kg	Magnesium mg/kg	Vanadium mg/kg	TOC mg/kg	Gravel %	Sand %	Coarse Sand %	Medium Sand %	Fine Sand %	Silt %	Clay %	Fines %
SMC-19-21	SMC21d	4	6.3	11/25/2019																	**83400**								
SMC-19-25	SMC25a	0	1	11/5/2019																	**157000**								
SMC-19-25	SMC25b	1	2.5	11/5/2019																	**115000**								
SMC-19-25	SMC25c	2.5	4	11/5/2019																	**125000**								
SMC-19-25	SMC25d	4	6	11/5/2019																	**127000**								
SMC-19-25	SMC25e	6	6.9	11/5/2019																	**74100**								
SMC-19-25	SMC25f	6.9	7.5	11/5/2019																	**54300**								
SMC-19-26	SMC26a	0	1	11/7/2019																	**236000**								
SMC-19-26	SMC26b	1	2.5	11/7/2019																	**131000**								
SMC-19-26	SMC26c	2.5	4	11/7/2019																	**117000**								
SMC-19-26	SMC26d	4	6	11/7/2019																	**116000**								
SMC-19-26	SMC26e	6	7.6	11/7/2019																	**133000**								
SMC-19-26	SMC26f	7.6	9.6	11/7/2019																	**59000**								
SMC-19-28-A	SMC28a	0	1	11/5/2019																	**70600**								
SMC-19-28-A	SMC28b	1	2.5	11/5/2019																	**87400**								
SMC-19-28-A	SMC28c	2.5	4	11/5/2019																	**116000**								
SMC-19-28-A	SMC28d	4	6	11/5/2019																	**132000**								
SMC-19-28-A	SMC28e	6	8	11/5/2019																	**132000**								
SMC-19-28-A	SMC28f	8	9.5	11/5/2019																	**139000**								
SMC-19-28-A	SMC28g	9.5	10.8	11/5/2019																	**83400**								
SMC-19-29	SMC29a	0	1	11/6/2019																	**86700**								
SMC-19-29	SMC29b	1	2.5	11/6/2019																	**63900**								
SMC-19-29	SMC29c	2.5	4.3	11/6/2019																	**125000**								
SMC-19-29	SMC29d	4.3	6.3	11/6/2019																	**44700**								
SMC-19-30	SMC30a	0	1	11/6/2019																	**62300**								
SMC-19-30	SMC30b	1	2.5	11/6/2019																	**84500**								
SMC-19-30	SMC30c	2.5	4	11/6/2019																	**151000**								
SMC-19-30	SMC30d	4	6	11/6/2019																	**47400**								
SMC-19-30	SMC30e	6	6.8	11/6/2019																	**79300**								
SMC-19-30	SMC30f	6.8	7.6	11/6/2019																	**56900**								
SMC-19-31	SMC31a	0	1	11/4/2019																	**78500**	0 U	**7**	**0.3**	**2.8**	**3.9**	**55.5**	**37.5**	**93**
SMC-19-31	SMC31b	1	2.5	11/4/2019																	**84900**	0 U	**4.2**	0 U	**2.4**	**1.8**	**54.8**	**41**	**95.8**
SMC-19-31	SMC31c	2.5	4	11/4/2019																	**93900**	0 U	**3.1**	0 U	**1.9**	**1.2**	**49.2**	**47.7**	**96.9**
SMC-19-31	SMC31d	4	6	11/4/2019																	**94200**	0 U	**7.3**	0 U	**3.1**	**4.2**	**38.3**	**54.4**	**92.7**
SMC-19-31	SMC31e	6	8	11/4/2019																	**124000**	**2.2**	**8.6**	**0.9**	**3.5**	**4.2**	**50.2**	**39**	**89.2**
SMC-19-31	SMC31f	8	9.5	11/4/2019																	**122000**	**1.9**	**25.1**	**1.8**	**7.1**	**16.2**	**50**	**23**	**73**
SMC-19-31	SMC31g	9.5	11.5	11/4/2019																	**65000**	0 U	**7.9**	0 U	**3.7**	**4.2**	**31.8**	**60.3**	**92.1**
SMC-19-32	SMC32a	0	1	11/6/2019																	**84700**								
SMC-19-32	SMC32b	1	2.5	11/6/2019																	**70300**								
SMC-19-32	SMC32c	2.5	4	11/6/2019																	**82600**								
SMC-19-32	SMC32d	4	6	11/6/2019																	**91700**								
SMC-19-32	SMC32e	6	8	11/6/2019																	**130000**								
SMC-19-32	SMC32f	8	10.5	11/6/2019																	**113000**								
SMC-19-32	SMC32g	10.5	11.5	11/6/2019																	**47600**								
SMC-19-34-A	SMC34a	0	1	11/22/2019																	**54600**								
SMC-19-34-A	SMC34b	1	2.5	11/22/2019																	**70400**								
SMC-19-34-A	SMC34c	2.5	4	11/22/2019																	**70600**								
SMC-19-34-A	SMC34d	4	6	11/22/2019																	**75500**								
SMC-19-34-A	SMC34e	6	6.7	11/22/2019																	**130000**								
SMC-19-35	SMC35a	0	1	11/25/2019																	**77100**	0 U	**7.8**	**0.1**	**2.2**	**5.5**	**55.4**	**36.8**	**92.2**
SMC-19-35	SMC35b	1	2.5	11/25/2019																	**92600**	**1.2**	**6.3**	**0.2**	**2.3**	**3.8**	**58.1**	**34.4**	**92.5**
SMC-19-35	SMC35c	2.5	4	11/25/2019																	**73500**	0 U	**12.7**	**1.2**	**4.8**	**6.7**	**48.4**	**38.9**	**87.3**
SMC-19-35	SMC35d	4	5.2	11/25/2019																	**79300**	**2.6**	**17.8**	**1.1**	**5.3**	**11.4**	**38.4**	**41.2**	**79.6**
SMC-19-35	SMC35e	5.2	5.5	11/25/2019																	**39900**	**3.6**	**7.5**	**0.4**	**1.8**	**5.3**	**51.5**	**37.4**	**88.9**
SMC-19-02	SMC02a	0	1	9/29/2020																	**78000**								
SMC-19-02	SMC02b	1	2.5	9/29/2020																	**76300**								
SMC-19-02	SMC02c	2.5	4	9/29/2020																	**71700**								
SMC-19-02	SMC02d	4	4.9	9/29/2020																	**97200**								
SMC-19-04	SMC04a	0	0.5	9/29/2020																	**122000**								
SMC-19-04	SMC04b	0.5	1.6	9/29/2020																	**53500**								
SMC-19-06	SMC06a	0	1	9/25/2020																	**65400**								

Appendix A
South Menomonee Canal Sediment Analytical Results Summary
Focused Feasibility Study, Milwaukee Estuary AOC, Milwaukee, Wisconsin

				Analyte Group	PCB										PAH							
				Analyte	Total PCB	Aroclor 1260	Aroclor 1254	Aroclor 1268	Aroclor 1221	Aroclor 1232	Aroclor 1248	Aroclor 1016	Aroclor 1262	Aroclor 1242	Total PAH	2-Methyl naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) anthracene	Benzo(a)pyrene	Benzo(b)-fluoranthene
				Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				WI CBSQG PEC	1										22.8							
				WI CBSQG PEC 3x	3										68.4							
				WI CBSQG PEC 5x	5										114							
				TSCA	50																	
Location code	Sample ID	Start Depth	End Depth	Date	Total PCB mg/kg	Aroclor 1260 mg/kg	Aroclor 1254 mg/kg	Aroclor 1268 mg/kg	Aroclor 1221 mg/kg	Aroclor 1232 mg/kg	Aroclor 1248 mg/kg	Aroclor 1016 mg/kg	Aroclor 1262 mg/kg	Aroclor 1242 mg/kg	Total PAH mg/kg	2-Methyl naphthalene mg/kg	Acenaphthene mg/kg	Acenaphthylene mg/kg	Anthracene mg/kg	Benzo(a) anthracene mg/kg	Benzo(a) pyrene mg/kg	Benzo(b)-fluoranthene mg/kg
SMC-19-06	SMC06b	1	2	9/25/2020	0.71	0.0921	0.236	0.061 U	0.061 U	0.031 U	0.061 U	0.061 U	0.031 U	0.379	25.5 J	0.21	0.278	0.0429 J	0.54	2.11	1.64	2.48
SMC-19-07	SMC07a	0	1	9/29/2020	0.55 U	0.53 U	1.1 U	1.1 U	1.1 U	0.53 U	1.1 U	1.1 U	0.53 U	0.53 U	34.5 J	0.13	0.101 J	0.069 J	0.319	2.42	2.52	4.69
SMC-19-07	SMC07b	1	2.5	9/29/2020	1.3	0.45 U	0.538 J	0.9 U	0.9 U	0.45 U	0.9 U	0.9 U	0.45 U	0.762	36.8 J	0.522	0.241	0.0825 J	0.698	2.98	2.54	4.17
SMC-19-07	SMC07c	2.5	3.6	9/29/2020	1.8	0.35 U	0.611 J	0.7 U	0.7 U	0.35 U	0.7 U	0.7 U	0.35 U	1.15	36.8	0.496	0.331	0.089	0.798	3.26	2.34	4.08
SMC-19-07	SMC07d	3.6	4.2	9/29/2020	0.26 U	0.25 U	0.51 U	0.51 U	0.51 U	0.25 U	0.51 U	0.51 U	0.25 U	0.25 U	0.093 J	0.0065 U	0.0065 U	0.00167 J	0.00193 J	0.00384 J	0.0065 U	0.00629 J
SMC-19-10	SMC10a	0	1	9/29/2020	0.96	0.49 U	0.642 J	0.99 U	0.99 U	0.49 U	0.99 U	0.99 U	0.49 U	0.321 J	35 J	0.179	0.123	0.0706 J	0.383	2.64	2.68	4.65
SMC-19-10	SMC10b	1	2.5	9/29/2020	0.37	0.47 U	0.93 U	0.93 U	0.93 U	0.47 U	0.93 U	0.93 U	0.47 U	0.374 J	34.8 J	0.241	0.177	0.0792 J	0.501	2.82	2.65	4.33
SMC-19-10	SMC10c	2.5	4	9/29/2020	0.82	0.41 U	0.409 J	0.82 U	0.82 U	0.41 U	0.82 U	0.82 U	0.41 U	0.409 J	28.2 J	0.367	0.162	0.0737 J	0.409	2.23	2.06	3.51
SMC-19-10	SMC10d	4	6	9/29/2020	1.8	0.43 U	0.646 J	0.86 U	0.86 U	0.43 U	0.86 U	0.86 U	0.43 U	1.12 J	47.5	0.557	0.378	0.117	0.901	4.04	2.98	5.89
SMC-19-10	SMC10e	6	6.9	9/29/2020	3	0.26 J	0.948	0.74 U	0.74 U	0.37 U	0.74 U	0.74 U	0.37 U	1.75	50.1	0.577	0.578	0.0982	1.26	4.25	2.81	5.5
SMC-19-12	SMC12a	0	1	9/29/2020	0.31	0.51 U	1 U	1 U	1 U	0.51 U	1 U	1 U	0.51 U	0.306 J	33.9 J	0.174	0.133	0.0796 J	0.386	2.47	2.6	4.53
SMC-19-12	SMC12b	1	2.5	9/29/2020	1	0.45 U	0.741 J	0.9 U	0.9 U	0.45 U	0.9 U	0.9 U	0.45 U	0.27 J	24.9 J	0.194	0.117	0.0755 J	0.34	2.01	1.96	3.26
SMC-19-12	SMC12c	2.5	4	9/29/2020	0.63	0.112 J	0.232 J	0.089 UJ	0.089 UJ	0.045 UJ	0.089 UJ	0.089 U	0.045 UJ	0.281 J	27.6 J	0.157	0.135	0.0488 J	0.372	2.39	2.16	3.56
SMC-19-12	SMC12d	4	6	9/29/2020	0.83	0.42 U	0.395 J	0.83 U	0.83 U	0.42 U	0.83 U	0.83 U	0.42 U	0.437	24.1 J	0.2	0.138	0.0637 J	0.339	1.9	1.8	3.09
SMC-19-12	SMC12e	6	6.5	9/29/2020	0.97	0.4 U	0.416 J	0.79 U	0.79 U	0.4 U	0.79 U	0.79 U	0.4 U	0.554	29.7 J	0.218	0.161	0.0716 J	0.415	2.49	2.21	3.86
SMC-19-14	SMC14a	0	1	9/25/2020	0.54	0.0675 J	0.276	0.12 U	0.12 U	0.059 U	0.12 U	0.12 U	0.059 U	0.197	40 J	0.162	0.119 J	0.0848 J	0.347	2.7	2.94	5.37
SMC-19-14	SMC14b	1	2.7	9/25/2020	1.1	0.178	0.411	0.09 U	0.09 U	0.045 U	0.09 U	0.09 U	0.045 U	0.497	30.5 J	0.421	0.18	0.0848 J	0.434	2.41	2.2	3.69
SMC-19-15	SMC15a	0	1	9/29/2020	0.55 U	0.53 U	1.1 U	1.1 U	1.1 U	0.53 U	1.1 U	1.1 U	0.53 U	0.53 U	28 J	0.0694 J	0.0733 J	0.0585 J	0.225	1.77	2.1	4.16
SMC-19-15	SMC15b	1	2.5	9/29/2020	0.92	0.45 U	0.563 J	0.9 U	0.9 U	0.45 U	0.9 U	0.9 U	0.45 U	0.36 J	25.6 J	0.293	0.161	0.0638 J	0.4	1.98	1.87	3.15
SMC-19-15	SMC15c	2.5	4	9/29/2020	1.6	0.42 U	0.645 J	0.83 U	0.83 U	0.42 U	0.83 U	0.83 U	0.42 U	0.916	38.3	0.86	0.358	0.103	0.79	3.16	2.45	4.12
SMC-19-15	SMC15d	4	4.3	9/29/2020	3.1	0.36 U	0.8	0.71 U	0.71 U	0.36 U	0.71 U	0.71 U	0.36 U	2.26	75 J	0.912	0.7	0.159 J	1.54	6.59	4.79	6.47
SMC-19-23	SMC23a	0	1	9/29/2020	1.4	0.34 U	0.454 J	0.67 U	0.67 U	0.34 U	0.67 U	0.67 U	0.34 U	0.991	42.2	2.13	0.445	0.113	0.899	3.15	2.3	4.67
SMC-19-23	SMC23b	1	2.5	9/29/2020	6.6	0.347 J	1.18	0.69 U	0.69 U	0.35 U	0.69 U	0.69 U	0.35 U	5.03	51.3	0.958	0.659	0.155	1.12	4.17	2.52	5.15
SMC-19-23	SMC23c	2.5	4	9/29/2020	4	0.298 J	1.21	0.75 U	0.75 U	0.37 U	0.75 U	0.75 U	0.37 U	2.52	67.4	1.59	0.751	0.192	1.52	5.77	2.49	6.57
SMC-19-23	SMC23d	4	5.6	9/29/2020	3.5	0.272 J	1.09	0.68 U	0.68 U	0.34 U	0.68 U	0.68 U	0.34 U	2.12	48.5	1.15	0.54	0.117	1.23	3.28	1.99	4.58
SMC-19-23	SMC23e	5.6	5.9	9/29/2020	0.32 U	0.31 U	0.63 U	0.63 U	0.63 U	0.31 U	0.63 U	0.63 U	0.31 U	0.31 U	0.14 J	0.0029 J	0.0148	0.00295 J	0.00505 J	0.00337 J	0.008 U	0.00671 J
SMC-19-27	SMC27a	0	1	9/25/2020	0.06	0.037 U	0.073 U	0.073 U	0.073 U	0.037 U	0.073 U	0.073 U	0.037 U	0.0604	33.7	1.45	0.56	0.163	1.11	2.87	1.59	2.4
SMC-19-27	SMC27b	1	1.7	9/25/2020	0.046 U	0.045 U	0.091 U	0.091 U	0.091 U	0.045 U	0.091 U	0.091 U	0.045 U	0.045 U	41.1	1.56	0.655	0.195	1.38	3.47	1.92	2.71
SMC-19-27	SMC27c	1.7	2.6	9/25/2020	0.039 U	0.039 U	0.077 U	0.077 U	0.077 U	0.039 U	0.077 U	0.077 U	0.039 U	0.039 U	36.2	1.55	0.592	0.191	1.21	2.9	1.59	2.29
SMC-19-33	SMC33a	0	0.4	9/25/2020	0.041 U	0.041 UJ	0.082 UJ	0.082 UJ	0.082 UJ	0.041 UJ	0.082 UJ	0.082 UJ	0.041 UJ	0.041 UJ	16.8 J	0.213	0.106	0.0382 J	0.295	1.21	1.09	2.03
SMC-19-33	SMC33b	0.4	0.8	9/25/2020	0.036 U	0.035 U	0.071 U	0.071 U	0.071 U	0.035 U	0.071 U	0.071 U	0.035 U	0.035 U	0.22 J	0.0047 J	0.0967	0.00244 J	0.00565 J	0.005 J	0.00446 J	0.0109
SMC-21-001	SMC-21-001-00-01-210821	0	1	8/21/2021	0.14	0.053	0.0078 U	0.0035 U	0.0092 U	0.0064 U	0.082	0.0085 U	0.0092 U	0.0038 U	40.8	0.12 U	0.15 U	0.17 J	0.32 J	2.3	2.7	5.4
SMC-21-001	SMC-21-001-01-2.5-210821	1	2.5	8/21/2021	0.25	0.1	0.0062 U	0.0028 U	0.0073 U	0.005 U	0.15	0.0067 U	0.0072 U	0.003 U	48.6	0.098 U	0.17 J	0.16 J	0.51	3.3	3.4	6
SMC-21-001	SMC-21-001-2.5-04-210821	2.5	4	8/21/2021	0.6	0.12	0.0053 U	0.0024 U	0.0063 U	0.0043 U	0.48	0.0058 U	0.0063 U	0.0026 U	41.9	0.17 U	0.31 J	0.16 U	0.76	2.9	3	4.3
SMC-21-001	SMC-21-001-04-06-210821	4	6	8/21/2021	0.5	0.093	0.0048 U	0.0022 U	0.0057 U	0.0039 U	0.41	0.0052 U	0.0056 U	0.0023 U	60.1	0.36	0.76	0.3 J	1.5	4.3	3.6	5.7
SMC-21-001	SMC-21-001-06-08-210821	6	8	8/21/2021	0.18	0.052	0.0043 U	0.0019 U	0.0051 U	0.0035 U	0.13	0.0047 U	0.0051 U	0.0021 U	104	0.76	0.94	0.6	2.9	7.5	6.2	9
SMC-21-001	SMC-21-001-08-8.3-210821	8	8.3	8/21/2021	0.17	0.054	0.0043 U	0.0019 U	0.0051 U	0.0035 U	0.12	0.0047 U	0.0051 U	0.0021 U	84.6	0.64	0.72	0.42	2.4	6.3	4.6	7.4
SMC-21-002	SMC-21-002-00-01-210821	0	1	8/21/2021	0.085	0.028	0.0077 U	0.0034 U	0.0091 U	0.0062 U	0.057	0.0083 U	0.009 U	0.0037 U	36.1	0.12 U	0.15 U	0.11 J	0.32 J	2	2.6	4.8
SMC-21-002	SMC-21-002-01-2.5-210821	1	2.5	8/21/2021	0.1	0.019	0.0047 U	0.0021 U	0.0055 U	0.0038 U	0.082	0.0051 U	0.0055 U	0.0023 U	20.7	0.059 U	0.11 J	0.092 J	0.27	1.3	1.5	2.4
SMC-21-002	SMC-21-002-2.5-04-210821	2.5	4	8/21/2021	0.18	0.031	0.0032 U	0.0015 U	0.0038 U	0.0026 U	0.15	0.0035 U	0.0038 U	0.0016 U	8.4	0.021 U	0.065 J	0.049 J	0.16	0.59	0.57	0.92
SMC-21-002	SMC-21-002-04-4.9-210821	4	4.9	8/21/2021	2.4	0.19	0.0034 U	0.0015 U	0.004 U	0.0028 U	2.2	0.0037 U	0.004 U	0.0017 U	31.2	0.18 J	0.27	0.12 J	0.69	2.3	2.1	2.8
SMC-21-003	SMC-21-003-00-01-210821	0	1	8/21/2021	0.092	0.04	0.0076 U	0.0034 U	0.0089 U	0.0061 U	0.052	0.0082 U	0.0089 U	0.0037 U	32.4	0.12 U	0.15 U	0.12 J	0.26 J	1.7	2.3	4.1
SMC-21-003	SMC-21-003-01-2.5-210821	1	2.5	8/21/2021	0.13	0.045	0.0072 U	0.0032 U	0.0085 U	0.0059 U	0.083	0.0078 U	0.0085 U	0.0035 U	36.9	0.11 U	0.14 U	0.13 J	0.36 J	2.1	2.6	4.8
SMC-21-003	SMC-21-003-2.5-04-210821	2.5	4	8/21/2021	0.44	0.15	0.0053 U	0.0024 U	0.0063 U	0.0043 U	0.29	0.0058 U	0.0062 U	0.0026 U	36	0.053 J	0.16 J	0.16 J	0.44	2.3	2.5	4.6
SMC-21-003	SMC-21-003-04-5.1-210821	4	5.1	8/21/2021	0.44	0.092	0.0048 U	0.0022 U	0.0057 U	0.0039 U	0.35	0.0052 U	0.0057 U	0.0024 U	35.5	0.096 J	0.2 J	0.19 J	0.52	2.4	2.4	4.3
SMC-21-003	SMC-21-003-5.1-7.1-210821	5.1	7.1	8/21/2021	0.0026 U	0.0041 U	0.0043 U	0.0019 U	0.0051 U	0.0035 U	0.0034 U	0.0046 U	0.005 U	0.0021 U	0.92	0.014 U	0.017 U	0.013 U	0.022 J	0.07	0.048 J	0.066
SMC-21-003	SMC-21-003-7.1-9.1-210821	7.1	9.1	8/21/2021	0.0026 U	0.0042 U	0.0044 U	0.002 U	0.0052 U	0.0036 U	0.0036 U	0.0048 U	0.0052 U	0.0022 U	0.06 U	0.014 U	0.017 U	0.013 U	0.015 U	0.027 U	0.026 U	0.015 U
SMC-21-003	SMC-21-003-9.1-9.4-210821	9.1	9.4	8/21/2021	0.0029 U	0.0046 U	0.0048 U	0.0022 U	0.0057 U	0.0039 U	0.0039 U	0.0052 U	0.0057 U	0.0024 U	0.065 U	0.015 U	0.018 U	0.014 U	0.017 U	0.029 U	0.028 U	0.016 U
SMC-21-004	SMC-21-004-00-01-210821	0	1	8/21/2021	0.0026 U	0.0042 U	0.0044 U	0.002 U	0.0052 U	0.0036 U	0.0035 U	0.0047 U	0.0051 U	0.0021 U	72.6	0.67	0.69	0.47	1.9	6	4.2	6.2
SMC-21-004	SMC-21-004-G-00-01-210821	0	1	8/21/2021																		
SMC-21-004	SMC-21-004-01-2.5-210821	1	2.5	8/21/2021	0.11	0.023	0.0046 U	0.002 U	0.0054 U	0.0037 U	0.084	0.005 U	0.0054 U	0.0022 U	93.5	0.87	0.83	0.58	2.4	7.2	5.5	8.4
SMC-21-004	SMC-21-004-G-01-2.5-210821	1	2.5	8/21/2021																		
SMC-21-004	SMC-21-004-2.5-04-210821	2.5	4	8/21/2021	0.058	0.013 J	0.0048 U	0.0022 U	0.0057 U	0.0039 U	0.045	0.0052 U	0.0056 U	0.0024 U	147	1.4 J	1.3 J	0.91 J	3.5	10	10	11
SMC-21-004	SMC-21-004-G-2.5-04-210821	2.5	4	8/21/2021																		
SMC-21-004	SMC-21-004-04-06-210821	4	6	8/21/2021	0.25	0.042	0.0049 U	0.0022 U	0.0058 U	0.004 U	0.21	0.0053 U	0.0057 U	0.0024 U	117	1.3	1	0.65	3.2	8.2	6.4	10
SMC-21-004	SMC-21-004-G-04-06-210821	4	6	8/21/2021																		
SMC-21-004	SMC-21-004-06-08-210821	6	8	8/21/2021	0.079	0.019	0.0043 U	0.0019 U	0.005 U	0.0035 U	0.06	0.0046 U	0.005 U	0.0021 U	51.9	0.69	0.61	0.39	1.5	3.9	2.7	3.9
SMC-21-004	SMC-21-004-G-06-08-210821	6	8	8/21/2021																		
SMC-21-004	SMC-21-004-08-8.8-210821	8	8.8	8/21/2021	0.0025 U	0.0041 U	0.0043 U	0.0019 U	0.005 U	0.0035 U	0.0034 U	0.0046 U	0.005 U	0.0021 U	23.2	0.36	0.29	0.18	0.67	1.7	1.2	1.7
SMC-21-004	SMC-21-004-G-08-8.8-210821	8	8.8	8/21/2021																		
SMC-21-005	SMC-21-005-00-01-210820	0	1	8/20/2021	0.24	0.24	0.0061 U	0.0027 U	0.0072 U	0.005 U	0.0049 U	0.0066 U	0.0072 U	0.003 U	55.3	0.098 U	0.2 J	0.25 J	0.59	3.3	4	7.3

Appendix A
South Menomonee Canal Sediment Analytical Results Summary
Focused Feasibility Study, Milwaukee Estuary AOC, Milwaukee, Wisconsin

				Analyte Group	PAH											Metals							
				Analyte	Benzo(e)pyrene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenzo(a,h)a nthracene	Fluoranthene	Fluorene	Indeno(1,2,3-Cd)Pyrene	Naphthalene	Phenanthrene	Pyrene	Chromium	Mercury	Lead	Nickel	Arsenic	Cadmium	Copper	Zinc
				Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				WI CBSQG PEC												110	1.1	130	49	33	5	150	460
				WI CBSQG PEC 3x												330	3.3	390	147	99	15	450	1380
				WI CBSQG PEC 5x												550	5.5	650	245	165	25	750	2300
				TSCA																			
Location code	Sample ID	Start Depth	End Depth	Date	Benzo(e)pyrene mg/kg	Benzo(g,h,i) perylene mg/kg	Benzo(k) fluoranthene mg/kg	Chrysene mg/kg	Dibenzo(a,h)a nthracene mg/kg	Fluoranthene mg/kg	Fluorene mg/kg	Indeno(1,2,3-Cd)Pyrene mg/kg	Naphthalene mg/kg	Phenanthrene mg/kg	Pyrene mg/kg	Chromium mg/kg	Mercury mg/kg	Lead mg/kg	Nickel mg/kg	Arsenic mg/kg	Cadmium mg/kg	Copper mg/kg	Zinc mg/kg
SMC-19-06	SMC06b	1	2	9/25/2020	1.25	1.22	0.819	2.28	0.235	4.32	0.347	1.12	0.178	2.76	3.64	62.4 J	0.14 J	78.4 J	9.3 J	3.1	1.2	120 J	159 J
SMC-19-07	SMC07a	0	1	9/29/2020	2.37	2.23	1.29	3.45	0.409	5.78	0.18	2.07	0.138	2.04	4.33	41.8 J	0.16 J	75.1	18 J	7.2	1.4	93.4 J	391
SMC-19-07	SMC07b	1	2.5	9/29/2020	2.11	1.78	1.32	3.52	0.374	6.06	0.381	1.74	0.418	2.82	5.04	123 J	0.37 J	206	24.4 J	9.3	3.7	212 J	470
SMC-19-07	SMC07c	2.5	3.6	9/29/2020	1.85	1.49	1.02	3.21	0.335	6.38	0.51	1.48	0.444	3.25	5.47	161 J	0.38 J	201	19.2 J	12.9	4	129 J	337
SMC-19-07	SMC07d	3.6	4.2	9/29/2020	0.0247	0.005 J	0.00159 J	0.007	0.0065 U	0.00743	0.0065 U	0.00315 J	0.0065 U	0.00396 J	0.00646 J	3.5 J	0.0037 J	2.5	3.4 J	1.2	0.15	3.7 J	23.9
SMC-19-10	SMC10a	0	1	9/29/2020	2.38	2.09	1.35	3.41	0.405	5.78	0.213	2.01	0.178	2.04	4.43	53.5 J	0.21	92.6	18.7 J	6.7	1.9	152 J	433
SMC-19-10	SMC10b	1	2.5	9/29/2020	2.19	1.97	1.26	3.24	0.396	5.67	0.278	1.89	0.289	2.34	4.45	79.5 J	0.32	116	20.2 J	8.1	2.3	194 J	429
SMC-19-10	SMC10c	2.5	4	9/29/2020	1.77	1.43	1.05	2.7	0.307	4.42	0.268	1.43	0.34	2.01	3.68	74.2 J	0.31	131	21.3 J	7.3	2.7	153 J	387
SMC-19-10	SMC10d	4	6	9/29/2020	2.38	1.92	1.37	3.95	0.426	8.64	0.576	1.93	0.509	3.82	7.14	146 J	0.48	221	25.3 J	10.9	4.2	237 J	481
SMC-19-10	SMC10e	6	6.9	9/29/2020	2.13	1.66	1.2	4.28	0.387	9.34	0.764	1.65	0.745	5.16	7.71	271 J	0.54	312	26.9 J	14.6	6	168 J	493
SMC-19-12	SMC12a	0	1	9/29/2020	2.34	1.95	1.34	3.31	0.384	5.48	0.229	1.91	0.211	2.09	4.27	62.9 J	0.25	98.5	20 J	6.5	2.1	176 J	434
SMC-19-12	SMC12b	1	2.5	9/29/2020	1.73	1.26	0.891	2.41	0.273	3.71	0.193	1.24	0.296	1.68	3.29	54.5 J	0.2	87.2	16.4 J	6.1	1.7	143 J	311
SMC-19-12	SMC12c	2.5	4	9/29/2020	1.78	1.68	0.964	2.35	0.297	4.2	0.208	1.53	0.261	1.8	3.68	76.9 J	0.27	109	19	6.7	1.9	184	380
SMC-19-12	SMC12d	4	6	9/29/2020	1.58	1.15	0.959	2.37	0.251	3.74	0.222	1.18	0.223	1.69	3.21	74.5 J	0.25	125	21.5 J	7.3	2.6	134 J	354
SMC-19-12	SMC12e	6	6.5	9/29/2020	1.99	1.34	1.22	2.78	0.293	4.83	0.263	1.4	0.204	2.04	3.96	95 J	0.36	158	22.5 J	8.8	3.5	170 J	432
SMC-19-14	SMC14a	0	1	9/25/2020	2.83	2.88	1.6	3.98	0.482	6.33	0.202	2.57	0.185	2.2	5.01	50.7 J	0.16 J	70.1 J	18.6 J	5.3	0.83	94.7 J	353 J
SMC-19-14	SMC14b	1	2.7	9/25/2020	1.9	1.77	1.14	2.9	0.338	4.6	0.273	1.65	0.359	2.09	4.11	82 J	0.32 J	135 J	22.1 J	6.7	2.4	170 J	387 J
SMC-19-15	SMC15a	0	1	9/29/2020	2.06	2.07	1.01	2.77	0.349	4.27	0.127 J	1.86	0.0976 J	1.5	3.44	45.2 J	0.14	65.8	20.8	7	1.2	94.4	404
SMC-19-15	SMC15b	1	2.5	9/29/2020	1.62	1.53	0.939	2.31	0.28	3.91	0.253	1.42	0.37	1.81	3.24	87.5 J	0.34	129	20.7	7.9	2	154	374
SMC-19-15	SMC15c	2.5	4	9/29/2020	1.97	1.74	1.09	3.27	0.357	6.33	0.514	1.66	0.605	3.35	5.53	211 J	0.41	337	27.6	11.4	7.8	232	482
SMC-19-15	SMC15d	4	4.3	9/29/2020	4.48	3.09	1.62	6.45	0.621	13.6	0.998	2.31	1.07	6.29	13.3	338 J	0.76	431	28.6	11.8	8.6	151	397
SMC-19-23	SMC23a	0	1	9/29/2020	1.83	1.4	0.919	3.43	0.317	7.25	0.659	1.38	1.37	4.12	5.79	116 J	0.19	179	20.3	8.4	3.5	177	303
SMC-19-23	SMC23b	1	2.5	9/29/2020	2.17	1.64	1.18	4.19	0.366	10.2	0.903	1.51	0.833	5.17	8.38	254 J	0.71	265	27.5	13.5	6.2	134	315
SMC-19-23	SMC23c	2.5	4	9/29/2020	2.24	1.45	1.2	5.87	0.36	13.6	1.27	1.37	1.65	8.71	10.8	342 J	1	293	32.1	30.6	5.7	116	348
SMC-19-23	SMC23d	4	5.6	9/29/2020	1.77	1.24	0.941	4.19	0.303	10.3	0.879	1.19	1.02	6.29	7.46	283 J	0.72	245	29	22.7	5.3	117	306
SMC-19-23	SMC23e	5.6	5.9	9/29/2020	0.00556 J	0.00618 J	0.008 U	0.00688 J	0.008 U	0.0189	0.011	0.00317 J	0.00507 J	0.0229	0.0155	13.2 J	0.017	8.6	15.7	3.8	0.56	16.9	64.9
SMC-19-27	SMC27a	0	1	9/25/2020	1.21	0.963	0.679	2.64	0.233	5.51	0.805	0.912	1.36	4.38	4.91	256 J	2.7 J	127 J	17.9 J	36	1.2	137 J	286 J
SMC-19-27	SMC27b	1	1.7	9/25/2020	1.38	1.15	0.803	3.12	0.275	6.58	1.01	1.09	1.94	5.83	6.02	562 J	4.7 J	202 J	30.6 J	66.1	1.6	159 J	480 J
SMC-19-27	SMC27c	1.7	2.6	9/25/2020	1.19	0.906	0.679	2.75	0.222	5.85	0.935	0.87	2.03	5.3	5.12	185 J	0.95 J	54 J	21 J	17	0.64	50.7 J	176 J
SMC-19-33	SMC33a	0	0.4	9/25/2020	1.02	0.916	0.608	1.59	0.179	2.66	0.147	0.851	0.148	1.6	2.08	12.9 J	0.075 J	70 J	11.4 J	6.3	0.74	40.4 J	189 J
SMC-19-33	SMC33b	0.4	0.8	9/25/2020	0.0085 U	0.00655 J	0.0018 J	0.00925	0.0085 U	0.016	0.01	0.00448 J	0.00348 J	0.0164	0.0129	10.5 J	0.012 J	7.2 J	11.1 J	2.6	0.26	15.8 J	56.6 J
SMC-21-001	SMC-21-001-00-01-210821	0	1	8/21/2021	3	3	1.7 J-	4	0.72	6.8	0.2 J	2.8	0.1 U	2.2	5.3	46.8 J	0.16 J	70.5 J	24.7	6.9	1.3	71.1 J	369
SMC-21-001	SMC-21-001-01-2.5-210821	1	2.5	8/21/2021	3.2	3.4	1.7 J-	4.6	0.81	8	0.29 J	3.2	0.08 U	2.9	6.9	58.2 J	0.2 J	110 J	26.3	7.3	1.7	103 J	383
SMC-21-001	SMC-21-001-2.5-04-210821	2.5	4	8/21/2021	2.5 J	2.6	2	3.8	0.62 J	7.1	0.36 J	2.1	0.14 U	3.1	6.2	154 J	0.39 J	205 J	24.5	8.4	3.9	160 J	401
SMC-21-001	SMC-21-001-04-06-210821	4	6	8/21/2021	3.2	3	1.8 J-	5.3	0.9	10	1	2.8	0.39	6.1	9.1	207 J	0.84 J	270 J	36.4	12.5	5.6	120 J	401
SMC-21-001	SMC-21-001-06-08-210821	6	8	8/21/2021	5.9	5.5	2.7 J-	9.4	1.5	19	1.5	4.6	0.64	9.5	16	232 J	0.62 J	336 J	51.5	19.3	12.1	150 J	430
SMC-21-001	SMC-21-001-08-8.3-210821	8	8.3	8/21/2021	4.4	4.1	2.6 J-	7.7	1.2	16	1.3	3.7	0.57	7.5	13	223 J	0.72 J	329 J	51.3	19.2	10.3	139 J	430
SMC-21-002	SMC-21-002-00-01-210821	0	1	8/21/2021	2.5	3.2	1.3	3.5	0.67	5.4	0.17 J	2.9	0.099 U	1.7	4.7	55.2 J	0.19 J	88.3 J	27	7.7	1.6	97.4 J	424
SMC-21-002	SMC-21-002-01-2.5-210821	1	2.5	8/21/2021	1.4	1.7	0.87	1.9	0.45	3.1	0.17 J	1.4	0.048 U	1.2	2.8	57.6 J	0.18 J	93.9 J	15.1	4.8	1.7	77.9	234
SMC-21-002	SMC-21-002-2.5-04-210821	2.5	4	8/21/2021	0.51	0.58	0.27 J-	0.77	0.14	1.4	0.077 J	0.51	0.021 J	0.59	1.2	48.3 J	0.097	58.7 J	8.3	2.6	1	33.2	124
SMC-21-002	SMC-21-002-04-4.9-210821	4	4.9	8/21/2021	1.7	1.9	1.2	2.7	0.52	5.3	0.39	1.6	0.2 J	2.7	4.5	195 J	0.37 J	156 J	18	5.8	3.3	66.5	226
SMC-21-003	SMC-21-003-00-01-210821	0	1	8/21/2021	2.4 J	3.1	1.5	3	0.66	4.5	0.15 J	2.6	0.099 U	1.6	4.2	43 J	0.15 J	64.2 J	26.5	6.8	1.1	65.7	351
SMC-21-003	SMC-21-003-01-2.5-210821	1	2.5	8/21/2021	2.6	3.3	1.2	3.5	0.78	5.5	0.16 J	2.9	0.093 U	1.9	4.9	58.9 J	0.21 J	95.8 J	26.9	7.6	1.6	126	433
SMC-21-003	SMC-21-003-2.5-04-210821	2.5	4	8/21/2021	2.4	2.8	1.2 J-	3.4	0.67	5.8	0.22	2.6	0.068 J	2	4.6	72.8	0.27	137	25.8	7.7	2.4	131	405
SMC-21-003	SMC-21-003-04-5.1-210821	4	5.1	8/21/2021	2.2	2.3	1.2 J-	3.2	0.63	5.9	0.33	2.2	0.12 J	2.2	5.1	118 J	0.38 J	169 J	23.2	7.3	3.2	108	360
SMC-21-003	SMC-21-003-5.1-7.1-210821	5.1	7.1	8/21/2021	0.12 U	0.036 J	0.028 J	0.074	0.037 U	0.14	0.012 J	0.035 J	0.047 J	0.098	0.14	74.6	0.17	31.6	14.4	6.1	0.38	22.4	100
SMC-21-003	SMC-21-003-7.1-9.1-210821	7.1	9.1	8/21/2021	0.12 U	0.013 U	0.018 U	0.033 U	0.038 U	0.016 U	0.012 U	0.029 U	0.012 U	0.016 U	0.014 U	15	0.018 U	6.8	15.4	2.2	0.23	14.3	49.9
SMC-21-003	SMC-21-003-9.1-9.4-210821	9.1	9.4	8/21/2021	0.13 U	0.014 U	0.019 U	0.036 U	0.041 U	0.017 U	0.013 U	0.032 U	0.013 U	0.017 U	0.015 U	16	0.02 U	7.2	17	2	0.23	15.5	50.9
SMC-21-004	SMC-21-004-00-01-210821	0	1	8/21/2021	3.6	3.2	2.1	6.7	0.97	13	1.2	2.9	0.91	6.9	11	331	3.4	277	45.1	37.4	9.5	109	521
SMC-21-004	SMC-21-004-G-00-01-210821	0	1	8/21/2021																			
SMC-21-004	SMC-21-004-01-2.5-210821	1	2.5	8/21/2021	5.2	4.7	2.4	8.7	1.4	17	1.3	4.1	1.1	7.8	14	350	2.5	314	89.7	35.8	11.9	163	601
SMC-21-004	SMC-21-004-G-01-2.5-210821	1	2.5	8/21/2021																			
SMC-21-004	SMC-21-004-2.5-04-210821	2.5	4	8/21/2021	11	9.6	3.6	14	2.5	23	1.9	6.2	1.7	12	23	449	3	394	121	39	13.6	199	729
SMC-21-004	SMC-21-004-G-2.5-04-210821	2.5	4	8/21/2021																			
SMC-21-004	SMC-21-004-04-06-210821	4	6	8/21/2021	6.1	5.8	2.9	11	1.7	22	1.7	5.3	1.6	10	18	430	2	405	141	39	14.7	221	741
SMC-21-004	SMC-21-004-G-04-06-210821	4	6	8/21/2021																			
SMC-21-004	SMC-21-004-06-08-210821	6	8	8/21/2021	2.2	2.1	1.4	4.4	0.64	9.7	0.88	2	0.97	5.6	8.3	370	3.8	209	46	26.5	3.7	106	453
SMC-21-004	SMC-21-004-G-06-08-210821	6	8	8/21/2021																			
SMC-21-004	SMC-21-004-08-8.8-210821	8	8.8	8/21/2021	0.98	0.9	0.57	1.9	0.29	4.3	0.45	0.84	0.47	2.8	3.6	275	5.3	121	24.9	20.6	2.3	61.1	325
SMC-21-004	SMC-21-004-G-08-8.8-210821	8	8.8	8/21/2021																			
SMC-21-005	SMC-21-005-00-01-210820	0	1	8/20/2021	3.8	4.5	2	5.2	1.1	8.7	0.27 J	4.2	0.13 J	2.7	7	72.9	0.36	124	26.7	8.2	2.2	213	553

Appendix A
South Menomonee Canal Sediment Analytical Results Summary
Focused Feasibility Study, Milwaukee Estuary AOC, Milwaukee, Wisconsin

				Analyte Group	Metals																Physical Parameters								
				Analyte	Silver	Barium	Selenium	Aluminum	Iron	Manganese	Potassium	Sodium	Thallium	Antimony	Beryllium	Cobalt	Calcium	Cyanide	Magnesium	Vanadium	TOC	Gravel	Sand	Coarse Sand	Medium Sand	Fine Sand	Silt	Clay	Fines
				Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%	%	%	%
				WI CBSQG PEC					40000	1100				25															
				WI CBSQG PEC 3x					120000	3300				75															
				WI CBSQG PEC 5x					200000	5500				125															
				TSCA																									
Location code	Sample ID	Start Depth	End Depth	Date	Silver mg/kg	Barium mg/kg	Selenium mg/kg	Aluminum mg/kg	Iron mg/kg	Manganese mg/kg	Potassium mg/kg	Sodium mg/kg	Thallium mg/kg	Antimony mg/kg	Beryllium mg/kg	Cobalt mg/kg	Calcium mg/kg	Cyanide mg/kg	Magnesium mg/kg	Vanadium mg/kg	TOC mg/kg	Gravel %	Sand %	Coarse Sand %	Medium Sand %	Fine Sand %	Silt %	Clay %	Fines %
SMC-19-06	SMC06b	1	2	9/25/2020																	**31000**								
SMC-19-07	SMC07a	0	1	9/29/2020																	**87100**								
SMC-19-07	SMC07b	1	2.5	9/29/2020																	**109000**								
SMC-19-07	SMC07c	2.5	3.6	9/29/2020																	**79000**								
SMC-19-07	SMC07d	3.6	4.2	9/29/2020																	**43700**								
SMC-19-10	SMC10a	0	1	9/29/2020																	**67800**	0 U	**10.6**	0 U	**3.9**	**6.7**	**54.5**	**34.9**	**89.4**
SMC-19-10	SMC10b	1	2.5	9/29/2020																	**81400**	0 U	**9.8**	0 U	**2.1**	**7.7**	**55.7**	**34.5**	**90.2**
SMC-19-10	SMC10c	2.5	4	9/29/2020																	**65200**	0 U	**7.6**	0 U	**1.7**	**5.9**	**51.5**	**40.9**	**92.4**
SMC-19-10	SMC10d	4	6	9/29/2020																	**77800**	0 U	**22.9**	0 U	**6.3**	**16.6**	**35.5**	**41.6**	**77.1**
SMC-19-10	SMC10e	6	6.9	9/29/2020																	**78200**	0 U	**20.2**	0 U	**4.3**	**15.9**	**43.5**	**36.3**	**79.8**
SMC-19-12	SMC12a	0	1	9/29/2020																	**50300**								
SMC-19-12	SMC12b	1	2.5	9/29/2020																	**82500**								
SMC-19-12	SMC12c	2.5	4	9/29/2020																	**62600**								
SMC-19-12	SMC12d	4	6	9/29/2020																	**62200**								
SMC-19-12	SMC12e	6	6.5	9/29/2020																	**65300**								
SMC-19-14	SMC14a	0	1	9/25/2020																	**91100**								
SMC-19-14	SMC14b	1	2.7	9/25/2020																	**85200**								
SMC-19-15	SMC15a	0	1	9/29/2020																	**55100**								
SMC-19-15	SMC15b	1	2.5	9/29/2020																	**67400**								
SMC-19-15	SMC15c	2.5	4	9/29/2020																	**85800**								
SMC-19-15	SMC15d	4	4.3	9/29/2020																	**87300**								
SMC-19-23	SMC23a	0	1	9/29/2020																	**189000**								
SMC-19-23	SMC23b	1	2.5	9/29/2020																	**94700**								
SMC-19-23	SMC23c	2.5	4	9/29/2020																	**56200**								
SMC-19-23	SMC23d	4	5.6	9/29/2020																	**105000**								
SMC-19-23	SMC23e	5.6	5.9	9/29/2020																	**32600**								
SMC-19-27	SMC27a	0	1	9/25/2020																	**123000**								
SMC-19-27	SMC27b	1	1.7	9/25/2020																	**101000**								
SMC-19-27	SMC27c	1.7	2.6	9/25/2020																	**64500**								
SMC-19-33	SMC33a	0	0.4	9/25/2020																	**82500**								
SMC-19-33	SMC33b	0.4	0.8	9/25/2020																	**51700**								
SMC-21-001	SMC-21-001-00-01-210821	0	1	8/21/2021																	**62700**								
SMC-21-001	SMC-21-001-01-2.5-210821	1	2.5	8/21/2021																	**58200**								
SMC-21-001	SMC-21-001-2.5-04-210821	2.5	4	8/21/2021																	**52800** J-								
SMC-21-001	SMC-21-001-04-06-210821	4	6	8/21/2021																	**60600** J-								
SMC-21-001	SMC-21-001-06-08-210821	6	8	8/21/2021																	**82600** J-								
SMC-21-001	SMC-21-001-08-8.3-210821	8	8.3	8/21/2021																	**88800** J-								
SMC-21-002	SMC-21-002-00-01-210821	0	1	8/21/2021																	**65800** J-								
SMC-21-002	SMC-21-002-01-2.5-210821	1	2.5	8/21/2021																	**27500** J-								
SMC-21-002	SMC-21-002-2.5-04-210821	2.5	4	8/21/2021																	**4560**								
SMC-21-002	SMC-21-002-04-4.9-210821	4	4.9	8/21/2021																	**28600** J-								
SMC-21-003	SMC-21-003-00-01-210821	0	1	8/21/2021																	**79000** J-								
SMC-21-003	SMC-21-003-01-2.5-210821	1	2.5	8/21/2021																	**61500** J-								
SMC-21-003	SMC-21-003-2.5-04-210821	2.5	4	8/21/2021																	**56100**								
SMC-21-003	SMC-21-003-04-5.1-210821	4	5.1	8/21/2021																	**41500** J-								
SMC-21-003	SMC-21-003-5.1-7.1-210821	5.1	7.1	8/21/2021																	**49800**								
SMC-21-003	SMC-21-003-7.1-9.1-210821	7.1	9.1	8/21/2021																	**48900**								
SMC-21-003	SMC-21-003-9.1-9.4-210821	9.1	9.4	8/21/2021																	**49400**								
SMC-21-004	SMC-21-004-00-01-210821	0	1	8/21/2021																	**81000**								
SMC-21-004	SMC-21-004-G-00-01-210821	0	1	8/21/2021																		**3.5**	**20.8**	**1.5**	**5**	**14.3**	**56.2**	**19.5**	**75.7**
SMC-21-004	SMC-21-004-01-2.5-210821	1	2.5	8/21/2021																	**98500**								
SMC-21-004	SMC-21-004-G-01-2.5-210821	1	2.5	8/21/2021																		0 U	**21.6**	**1.2**	**4.8**	**15.6**	**54.1**	**24.3**	**78.4**
SMC-21-004	SMC-21-004-2.5-04-210821	2.5	4	8/21/2021																	**135000**								
SMC-21-004	SMC-21-004-G-2.5-04-210821	2.5	4	8/21/2021																		0 U	**19.8**	**0.7**	**3.1**	**16**	**68.7**	**11.5**	**80.2**
SMC-21-004	SMC-21-004-04-06-210821	4	6	8/21/2021																	**144000**								
SMC-21-004	SMC-21-004-G-04-06-210821	4	6	8/21/2021																		0 U	**18.4**	**2.4**	**2.6**	**13.4**	**64.4**	**17.2**	**81.6**
SMC-21-004	SMC-21-004-06-08-210821	6	8	8/21/2021																	**82200**								
SMC-21-004	SMC-21-004-G-06-08-210821	6	8	8/21/2021																		0 U	**20.1**	**0.7**	**2.9**	**16.5**	**48.4**	**31.5**	**79.9**
SMC-21-004	SMC-21-004-08-8.8-210821	8	8.8	8/21/2021																	**60000**								
SMC-21-004	SMC-21-004-G-08-8.8-210821	8	8.8	8/21/2021																		0 U	**14.5**	**0.5**	**2.3**	**11.7**	**53.7**	**31.8**	**85.5**
SMC-21-005	SMC-21-005-00-01-210820	0	1	8/20/2021																	**49300**								

Appendix A
South Menomonee Canal Sediment Analytical Results Summary
Focused Feasibility Study, Milwaukee Estuary AOC, Milwaukee, Wisconsin

				Analyte Group	PCB										PAH							
				Analyte	Total PCB	Aroclor 1260	Aroclor 1254	Aroclor 1268	Aroclor 1221	Aroclor 1232	Aroclor 1248	Aroclor 1016	Aroclor 1262	Aroclor 1242	Total PAH	2-Methyl naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) anthracene	Benzo(a)pyrene	Benzo(b)-fluoranthene
				Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				WI CBSQG PEC	1										22.8							
				WI CBSQG PEC 3x	3										68.4							
				WI CBSQG PEC 5x	5										114							
				TSCA	50																	
Location code	Sample ID	Start Depth	End Depth	Date	Total PCB mg/kg	Aroclor 1260 mg/kg	Aroclor 1254 mg/kg	Aroclor 1268 mg/kg	Aroclor 1221 mg/kg	Aroclor 1232 mg/kg	Aroclor 1248 mg/kg	Aroclor 1016 mg/kg	Aroclor 1262 mg/kg	Aroclor 1242 mg/kg	Total PAH mg/kg	2-Methyl naphthalene mg/kg	Acenaphthene mg/kg	Acenaphthylene mg/kg	Anthracene mg/kg	Benzo(a) anthracene mg/kg	Benzo(a) pyrene mg/kg	Benzo(b)-fluoranthene mg/kg
SMC-21-005	SMC-21-005-G-00-01-210820	0	1	8/20/2021																		
SMC-21-005	SMC-21-005-01-2.5-210820	1	2.5	8/20/2021	**0.43**	**0.073 J**	0.0047 UJ	0.0021 UJ	0.0056 UJ	0.0038 UJ	**0.36 J**	0.0051 U	0.0055 UJ	0.0023 UJ	**40.7**	**0.12 J**	**0.29**	**0.2 J**	**0.65**	**2.8**	**2.9**	**4.5**
SMC-21-005	SMC-21-005-G-01-2.5-210820	1	2.5	8/20/2021																		
SMC-21-005	SMC-21-005-2.5-04-210820	2.5	4	8/20/2021	**0.96**	**0.11 J**	0.0046 UJ	0.0021 UJ	0.0055 UJ	0.0038 UJ	**0.85 J**	0.005 U	0.0054 UJ	0.0023 UJ	**74.9**	**0.29 J**	**0.65**	**0.37**	**1.3**	**4.9**	**4.9**	**8.1**
SMC-21-005	SMC-21-005-G-2.5-04-210820	2.5	4	8/20/2021																		
SMC-21-005	SMC-21-005-04-06-210820	4	6	8/20/2021	**0.59**	**0.13 J**	0.0045 UJ	0.002 UJ	0.0053 UJ	0.0036 UJ	**0.46 J**	0.0049 U	0.0053 UJ	0.0022 UJ	**112**	**0.45**	**0.96**	**0.49**	**2.6**	**8.1**	**7**	**11**
SMC-21-005	SMC-21-005-G-04-06-210820	4	6	8/20/2021																		
SMC-21-005	SMC-21-005-06-6.7-210820	6	6.7	8/20/2021	**0.047**	**0.014 J**	0.0048 UJ	0.0022 UJ	0.0057 UJ	0.0039 UJ	**0.033 J**	0.0052 U	0.0056 UJ	0.0024 UJ	**46.3**	**0.49**	**0.43**	**0.29**	**1.1**	**3.2**	**2.7**	**3.9**
SMC-21-005	SMC-21-005-6.7-8.7-210820	6.7	8.7	8/20/2021	0.0026 U	0.0041 UJ	0.0044 UJ	0.002 UJ	0.0051 UJ	0.0035 UJ	0.0035 UJ	0.0047 U	0.0051 UJ	0.0021 UJ	**0.55**	0.014 U	0.017 U	0.013 U	0.015 U	**0.038 J**	**0.033 J**	**0.052 J**
SMC-21-005	SMC-21-005-G-6.7-8.7-210820	6.7	8.7	8/20/2021																		
SMC-21-005	SMC-21-005-8.7-10.7-210820	8.7	10.7	8/20/2021	0.0025 U	0.0039 UJ	0.0042 UJ	0.0019 UJ	0.0049 UJ	0.0034 UJ	0.0033 UJ	0.0045 U	0.0049 UJ	0.002 UJ	**0.29**	0.013 U	0.016 U	0.012 U	0.014 U	0.025 U	0.024 U	**0.02 J**
SMC-21-005	SMC-21-005-G-8.7-10.7-210820	8.7	10.7	8/20/2021																		
SMC-21-005	SMC-21-005-10.7-12.7-210820	10.7	12.7	8/20/2021	0.0023 U	0.0037 UJ	0.0039 UJ	0.0017 UJ	0.0046 UJ	0.0031 UJ	0.0031 UJ	0.0042 U	0.0045 UJ	0.0019 UJ	**0.2**	0.012 U	0.015 U	0.011 U	0.013 U	0.023 U	0.022 U	0.013 U
SMC-21-005	SMC-21-005-G-10.7-12.7-210820	10.7	12.7	8/20/2021																		
SMC-21-006	SMC-21-006-0.1-01-210821	0.1	1	8/21/2021	**0.032**	**0.01 J**	0.0056 UJ	0.0025 UJ	0.0066 UJ	0.0045 UJ	**0.022 J**	0.0061 U	0.0065 UJ	0.0027 UJ	**56.7**	**0.4**	**0.51**	**0.31**	**1.1**	**3.9**	**3.4**	**5**
SMC-21-006	SMC-21-006-01-2.5-210821	1	2.5	8/21/2021	0.0037 U	0.0059 UJ	0.0063 UJ	0.0028 UJ	0.0074 UJ	0.0051 UJ	0.005 UJ	0.0068 U	0.0074 UJ	0.0031 UJ	**53.6**	**0.63**	**0.57**	**0.55**	**1.3**	**3.4**	**2.7**	**4**
SMC-21-006	SMC-21-006-03-04-210821	3	4	8/21/2021	0.0018 U	0.0028 UJ	0.003 UJ	0.0013 UJ	0.0035 UJ	0.0024 UJ	0.0024 UJ	0.0032 U	0.0035 UJ	0.0014 UJ	**0.19**	0.0096 U	0.011 U	0.0087 U	0.01 U	0.018 U	0.017 U	0.0098 U
SMC-21-006	SMC-21-006-04-06-210821	4	6	8/21/2021	0.0017 U	0.0028 UJ	0.0029 UJ	0.0013 UJ	0.0034 UJ	0.0024 UJ	0.0023 UJ	0.0032 U	0.0034 UJ	0.0014 UJ	0.039 U	0.0093 U	0.011 U	0.0085 U	0.01 U	0.018 U	0.017 U	0.0095 U
SMC-21-006	SMC-21-006-06-08-210821	6	8	8/21/2021	0.0017 U	0.0028 UJ	0.0029 UJ	0.0013 UJ	0.0034 UJ	0.0024 UJ	0.0023 UJ	0.0032 U	0.0034 UJ	0.0014 UJ	0.039 U	0.0094 U	0.011 U	0.0085 U	0.01 U	0.018 U	0.017 U	0.0096 U
SMC-21-006	SMC-21-006-08-10-210821	8	10	8/21/2021	0.0017 U	0.0027 UJ	0.0028 UJ	0.0013 UJ	0.0033 UJ	0.0023 UJ	0.0023 UJ	0.0031 U	0.0033 UJ	0.0014 UJ	0.038 U	0.0091 U	0.011 U	0.0083 U	0.0098 U	0.017 U	0.016 U	0.0093 U
SMC-21-006	SMC-21-006-10-12-210821	10	12	8/21/2021	0.0017 U	0.0027 UJ	0.0029 UJ	0.0013 UJ	0.0034 UJ	0.0023 UJ	0.0023 UJ	0.0031 U	0.0034 UJ	0.0014 UJ	0.039 U	0.0092 U	0.011 U	0.0084 U	0.0099 U	0.017 U	0.017 U	0.0094 U
SMC-21-006	SMC-21-006-12-12.8-210821	12	12.8	8/21/2021	0.0018 U	0.0028 UJ	0.003 UJ	0.0013 UJ	0.0035 UJ	0.0024 UJ	0.0024 UJ	0.0032 U	0.0035 UJ	0.0014 UJ	0.04 U	0.0095 U	0.011 U	0.0086 U	0.01 U	0.018 U	0.017 U	0.0097 U
SMC-21-007	SMC-21-007-00-01-210821	0	1	8/21/2021	0.0027 U	0.0043 UJ	0.0046 UJ	0.002 UJ	0.0054 UJ	0.0037 UJ	0.0036 UJ	0.0049 U	0.0053 UJ	0.0022 UJ	**0.23**	0.015 U	0.017 U	0.013 U	0.016 U	0.027 U	0.026 U	0.015 U
SMC-21-007	SMC-21-007-01-2.5-210821	1	2.5	8/21/2021	0.0027 U	0.0043 UJ	0.0046 UJ	0.002 UJ	0.0054 UJ	0.0037 UJ	0.0037 UJ	0.005 U	0.0054 UJ	0.0022 UJ	0.06 U	0.015 U	0.018 U	0.013 U	0.016 U	0.028 U	0.027 U	0.015 U
SMC-21-007	SMC-21-007-2.5-04-210821	2.5	4	8/21/2021	0.0026 U	0.0041 U	0.0043 U	0.0019 U	0.0051 U	0.0035 U	0.0034 U	0.0047 U	0.005 U	0.0021 U	0.06 U	0.014 U	0.017 U	0.013 U	0.015 U	0.026 U	0.025 U	0.014 U
SMC-21-007	SMC-21-007-04-06-210821	4	6	8/21/2021	0.0022 U	0.0034 U	0.0036 U	0.0016 U	0.0043 U	0.0029 U	0.0029 U	0.0039 U	0.0042 U	0.0018 U	0.048 U	0.011 U	0.014 U	0.01 U	0.012 U	0.022 U	0.021 U	0.012 U
SMC-21-007	SMC-21-007-06-7.8-210821	6	7.8	8/21/2021	0.002 U	0.0031 UJ	0.0033 UJ	0.0015 UJ	0.0039 UJ	0.0027 UJ	0.0027 UJ	0.0036 U	0.0039 UJ	0.0016 UJ	0.044 U	0.011 U	0.013 U	0.0096 U	0.011 U	0.02 U	0.019 U	0.011 U
SMC-21-008	SMC-21-008-01-1.5-210821	1	1.5	8/21/2021	**0.53**	**0.18**	0.0032 U	0.0014 U	0.0038 U	0.0026 U	**0.35**	0.0035 U	0.0038 U	0.0016 U	**23**	**0.16 J**	**0.17**	**0.11 J**	**0.5**	**1.7**	**1.5**	**2.7**
SMC-21-008	SMC-21-008-1.5-2.5-210821	1.5	2.5	8/21/2021	**0.022**	**0.008 J**	0.0044 U	0.002 U	0.0052 U	0.0036 U	**0.014 J**	0.0048 U	0.0051 U	0.0021 U	**0.58**	0.014 U	0.017 U	0.013 U	0.015 U	**0.035 J**	**0.039 J**	**0.054 J**
SMC-21-008	SMC-21-008-G-1.5-2.5-210821	1.5	2.5	8/21/2021																		
SMC-21-008	SMC-21-008-2.5-04-210821	2.5	4	8/21/2021	**0.014**	0.0041 U	0.0043 U	0.0019 U	0.0051 U	0.0035 U	**0.014**	0.0046 U	0.005 U	0.0021 U	**0.46**	0.014 U	0.017 U	0.013 U	0.015 U	**0.03 J**	**0.027 J**	**0.051 J**
SMC-21-008	SMC-21-008-G-2.5-04-210821	2.5	4	8/21/2021																		
SMC-21-008	SMC-21-008-04-06-210821	4	6	8/21/2021	0.0024 U	0.0038 U	0.004 U	0.0018 U	0.0048 U	0.0033 U	0.0032 U	0.0044 U	0.0047 U	0.002 U	0.055 U	0.013 U	0.016 U	0.012 U	0.014 U	0.025 U	0.024 U	0.013 U
SMC-21-008	SMC-21-008-G-04-06-210821	4	6	8/21/2021																		
SMC-21-008	SMC-21-008-06-08-210821	6	8	8/21/2021	0.0023 U	0.0037 U	0.0039 U	0.0017 U	0.0046 U	0.0032 U	0.0031 U	0.0042 U	0.0046 U	0.0019 U	0.05 U	0.013 U	0.015 U	0.011 U	0.014 U	0.024 U	0.023 U	0.013 U
SMC-21-008	SMC-21-008-G-06-08-210821	6	8	8/21/2021																		
SMC-21-008	SMC-21-008-08-10-210821	8	10	8/21/2021	0.0023 U	0.0036 U	0.0038 U	0.0017 U	0.0045 U	0.0031 U	0.0031 U	0.0041 U	0.0045 U	0.0019 U	0.05 U	0.012 U	0.015 U	0.011 U	0.013 U	0.023 U	0.022 U	0.013 U
SMC-21-008	SMC-21-008-G-08-10-210821	8	10	8/21/2021																		
SMC-21-008	SMC-21-008-10-10.6-210821	10	10.6	8/21/2021	0.0018 U	0.0028 U	0.0029 U	0.0013 U	0.0035 U	0.0024 U	0.0024 U	0.0032 U	0.0035 U	0.0014 U	0.04 U	0.0094 U	0.011 U	0.0086 U	0.01 U	0.018 U	0.017 U	0.0097 U
SMC-21-008	SMC-21-008-10.6-12.6-210821	10.6	12.6	8/21/2021	0.0018 U	0.0028 U	0.0029 U	0.0013 U	0.0035 U	0.0024 U	0.0023 U	0.0032 U	0.0034 U	0.0014 U	0.039 U	0.0094 U	0.011 U	0.0086 U	0.01 U	0.018 U	0.017 U	0.0096 U
SMC-21-008	SMC-21-008-G-10.6-12.6-210821	10.6	12.6	8/21/2021																		
SMC-21-008	SMC-21-008-12.6-13.6-210821	12.6	13.6	8/21/2021	**0.0056**	0.0028 U	0.0029 U	0.0013 U	0.0034 U	0.0024 U	**0.0056 J**	0.0032 U	0.0034 U	0.0014 U	0.039 U	0.0093 U	0.011 U	0.0085 U	0.01 U	0.018 U	0.017 U	0.0096 U
SMC-21-008	SMC-21-008-G-12.6-13.6-210821	12.6	13.6	8/21/2021																		
SMC-21-010	SMC-21-010-00-01-210811	0	1	8/11/2021	**0.091**	**0.028**	0.0064 U	0.0029 U	0.0076 U	0.0052 U	**0.063**	0.0069 U	0.0075 U	0.0031 U	**107**	0.2 U	**0.76 J**	**0.33 J**	**1.8**	**6.9**	**7.8**	**13**
SMC-21-010	SMC-21-010-01-1.6-210811	1	1.6	8/11/2021	**0.14**	**0.031**	0.0043 U	0.0019 U	0.0051 U	0.0035 U	**0.11**	0.0047 U	0.0051 U	0.0021 U	**137**	**0.22 J**	**1.3**	**0.42**	**2.8**	**10**	**10**	**13**
SMC-21-011	SMC-21-011-00-01-210811	0	1	8/11/2021	**0.0065**	**0.0065 J**	0.0032 U	0.0014 U	0.0038 U	0.0026 U	0.0026 U	0.0035 U	0.0038 U	0.0016 U	**29**	**0.074 J**	**0.32**	**0.1 J**	**0.8**	**2.3**	**1.9**	**2.4**
SMC-21-011	SMC-21-011-01-02-210811	1	2	8/11/2021	0.0019 U	0.003 U	0.0032 U	0.0014 U	0.0037 U	0.0026 U	0.0025 U	0.0034 U	0.0037 U	0.0016 U	**175**	**0.74 J**	**2.7**	**0.53 J**	**5.7 J**	**13 J**	**11 J**	**14 J**

Appendix A

South Menomonee Canal Sediment Analytical Results Summary

Focused Feasibility Study, Milwaukee Estuary AOC, Milwaukee, Wisconsin

				Analyte Group	PAH											Metals							
				Analyte	Benzo(e)pyrene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-Cd)Pyrene	Naphthalene	Phenanthrene	Pyrene	Chromium	Mercury	Lead	Nickel	Arsenic	Cadmium	Copper	Zinc
				Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				WI CBSQG PEC												110	1.1	130	49	33	5	150	460
				WI CBSQG PEC 3x												330	3.3	390	147	99	15	450	1380
				WI CBSQG PEC 5x												550	5.5	650	245	165	25	750	2300
				TSCA																			
Location code	Sample ID	Start Depth	End Depth	Date	Benzo(e)pyrene mg/kg	Benzo(g,h,i) perylene mg/kg	Benzo(k) fluoranthene mg/kg	Chrysene mg/kg	Dibenzo(a,h)anthracene mg/kg	Fluoranthene mg/kg	Fluorene mg/kg	Indeno(1,2,3-Cd)Pyrene mg/kg	Naphthalene mg/kg	Phenanthrene mg/kg	Pyrene mg/kg	Chromium mg/kg	Mercury mg/kg	Lead mg/kg	Nickel mg/kg	Arsenic mg/kg	Cadmium mg/kg	Copper mg/kg	Zinc mg/kg
SMC-21-005	SMC-21-005-G-00-01-210820	0	1	8/20/2021																			
SMC-21-005	SMC-21-005-01-2.5-210820	1	2.5	8/20/2021	2.5	2.5	1.6	3.4	0.66	7.1	0.34	2.4	0.14 J	2.6	6	209	0.48	208	28.5	10	4.7	142	388
SMC-21-005	SMC-21-005-G-01-2.5-210820	1	2.5	8/20/2021																			
SMC-21-005	SMC-21-005-2.5-04-210820	2.5	4	8/20/2021	4.4	4.5	2.6	6.2	1.2	14	0.78	4.3	0.24 J	5.2	11	445	0.91	411	45.6	14	10.9	161	558
SMC-21-005	SMC-21-005-G-2.5-04-210820	2.5	4	8/20/2021																			
SMC-21-005	SMC-21-005-04-06-210820	4	6	8/20/2021	6.2	5.7	3.9	9.9	1.8	21	1.4	5.6	0.7	9.4	16	431	1	391	37.9	22.5	5.9	116	473
SMC-21-005	SMC-21-005-G-04-06-210820	4	6	8/20/2021																			
SMC-21-005	SMC-21-005-06-6.7-210820	6	6.7	8/20/2021	2.2	2.2	1.4	3.8	0.67	8.6	0.73	2	0.91	4.9	6.8	703	6.4	350	36.2	75.2	4.3	136	554
SMC-21-005	SMC-21-005-6.7-8.7-210820	6.7	8.7	8/20/2021	0.12 U	0.032 J	0.017 J	0.045 J	0.037 U	0.087	0.011 U	0.029 U	0.011 U	0.041 J	0.071	25.8	0.046	14.6	20.2	3	0.35	18.2	66.7
SMC-21-005	SMC-21-005-G-6.7-8.7-210820	6.7	8.7	8/20/2021																			
SMC-21-005	SMC-21-005-8.7-10.7-210820	8.7	10.7	8/20/2021	0.11 U	0.013 J	0.017 U	0.031 U	0.035 U	0.034 J	0.011 U	0.027 U	0.011 U	0.019 J	0.029 J	18.5	0.023 J	9.6	19.2	2.2	0.22	16	60.8
SMC-21-005	SMC-21-005-G-8.7-10.7-210820	8.7	10.7	8/20/2021																			
SMC-21-005	SMC-21-005-10.7-12.7-210820	10.7	12.7	8/20/2021	0.1 U	0.011 U	0.015 U	0.029 U	0.033 U	0.014 J	0.01 U	0.026 U	0.01 U	0.014 U	0.012 J	18.7	0.023 J	9.7	21.3	2.2	0.2	16.2	61.8
SMC-21-005	SMC-21-005-G-10.7-12.7-210820	10.7	12.7	8/20/2021																			
SMC-21-006	SMC-21-006-0.1-01-210821	0.1	1	8/21/2021	2.7	2.8	1.6	4.6	0.78	11	0.85	2.6	0.75	6.1	8.3	1120	13.5	861	32.6	52	2.1	199	627
SMC-21-006	SMC-21-006-01-2.5-210821	1	2.5	8/21/2021	2.5	2.4	1.4	4.4	0.69	9.7	0.99	2.1	1.5	6.7	8.1	2290	18.9	374	35.6	73.6	2.2	145	652
SMC-21-006	SMC-21-006-03-04-210821	3	4	8/21/2021	0.08 U	0.0086 U	0.012 U	0.022 U	0.026 U	0.017 J	0.0078 U	0.02 U	0.0078 U	0.017 J	0.018 J	16.6	0.06	7.3	10.8	3.6	0.24	11.4	64.2
SMC-21-006	SMC-21-006-04-06-210821	4	6	8/21/2021	0.078 U	0.0084 U	0.012 U	0.022 U	0.025 U	0.01 U	0.0076 U	0.019 U	0.0076 U	0.01 U	0.0092 U	9.2	0.012 U	5.8	11.5	3.4	0.14	10.6	54.8
SMC-21-006	SMC-21-006-06-08-210821	6	8	8/21/2021	0.078 U	0.0084 U	0.012 U	0.022 U	0.025 U	0.01 U	0.0077 U	0.019 U	0.0076 U	0.01 U	0.0092 U	7.7	0.012 U	6.5	9.5	3.2	0.18	11.6	52.5 J
SMC-21-006	SMC-21-006-08-10-210821	8	10	8/21/2021	0.076 U	0.0082 U	0.011 U	0.021 U	0.024 U	0.01 U	0.0074 U	0.019 U	0.0074 U	0.01 U	0.009 U	10.2	0.012 U	6.6	12.2	3.8	0.18	11.2	54.5 J
SMC-21-006	SMC-21-006-10-12-210821	10	12	8/21/2021	0.077 U	0.0083 U	0.011 U	0.021 U	0.025 U	0.01 U	0.0075 U	0.019 U	0.0075 U	0.01 U	0.0091 U	10.5	0.012 U	6.7	12.6	3.1	0.15	11.9	47.9 J
SMC-21-006	SMC-21-006-12-12.8-210821	12	12.8	8/21/2021	0.079 U	0.0085 U	0.012 U	0.022 U	0.025 U	0.01 U	0.0078 U	0.02 U	0.0077 U	0.011 U	0.0094 U	10.8	0.012 U	10.4	12.8	3.4	0.16	13.1	48.5 J
SMC-21-007	SMC-21-007-00-01-210821	0	1	8/21/2021	0.12 U	0.013 U	0.018 U	0.034 U	0.039 U	0.016 U	0.012 U	0.03 U	0.012 U	0.016 U	0.014 J	11.9	0.033	10.8	74.5	2.9	0.3	18.6	64.2 J
SMC-21-007	SMC-21-007-01-2.5-210821	1	2.5	8/21/2021	0.12 U	0.013 U	0.018 U	0.034 U	0.039 U	0.016 U	0.012 U	0.03 U	0.012 U	0.016 U	0.015 U	11.3	0.037	8.9	14.1	2.9	0.29	16.9	55.7 J
SMC-21-007	SMC-21-007-2.5-04-210821	2.5	4	8/21/2021	0.12 U	0.012 U	0.017 U	0.032 U	0.037 U	0.015 U	0.011 U	0.029 U	0.011 U	0.015 U	0.014 U	12	0.024 J	9.1	14.4	2.9	0.29	16.6	61 J
SMC-21-007	SMC-21-007-04-06-210821	4	6	8/21/2021	0.096 U	0.01 U	0.014 U	0.027 U	0.031 U	0.013 U	0.0094 U	0.024 U	0.0093 U	0.013 U	0.011 U	13.4	0.021 J	7.6	15.2	3.8	0.19	12.8	52 J
SMC-21-007	SMC-21-007-06-7.8-210821	6	7.8	8/21/2021	0.088 U	0.0095 U	0.013 U	0.024 U	0.028 U	0.012 U	0.0086 U	0.022 U	0.0086 U	0.012 U	0.01 U	9.6	0.014 U	6	11.1	2.6	0.13	9.9	34.7 J
SMC-21-008	SMC-21-008-01-1.5-210821	1	1.5	8/21/2021	1.4	1.5	0.73	2.2	0.36	3.6	0.24	1.4	0.15 J	1.5	3.1	85.4	0.014 U	89.7	11.9	6.3	1.3	47.9	143 J
SMC-21-008	SMC-21-008-1.5-2.5-210821	1.5	2.5	8/21/2021	0.12 U	0.045 J	0.019 J	0.043 J	0.038 U	0.078	0.012 U	0.037 J	0.012 U	0.038 J	0.073	31.5 J	0.05	14.9	22.5	3.3	0.37	19.7	75.5
SMC-21-008	SMC-21-008-G-1.5-2.5-210821	1.5	2.5	8/21/2021																			
SMC-21-008	SMC-21-008-2.5-04-210821	2.5	4	8/21/2021	0.12 U	0.03 J	0.017 U	0.04 J	0.037 U	0.063	0.011 U	0.029 U	0.011 U	0.027 J	0.05 J	25.9 J	0.035	10.9	22.3	2.7	0.26	18	70
SMC-21-008	SMC-21-008-G-2.5-04-210821	2.5	4	8/21/2021																			
SMC-21-008	SMC-21-008-04-06-210821	4	6	8/21/2021	0.11 U	0.012 U	0.016 U	0.03 U	0.035 U	0.014 U	0.011 U	0.027 U	0.011 U	0.015 U	0.013 U	24.3 J	0.022 J	9.7	22.2	2.6	0.22	17.2	66.5
SMC-21-008	SMC-21-008-G-04-06-210821	4	6	8/21/2021																			
SMC-21-008	SMC-21-008-06-08-210821	6	8	8/21/2021	0.1 U	0.011 U	0.016 U	0.029 U	0.033 U	0.014 U	0.01 U	0.026 U	0.01 U	0.014 U	0.012 U	23.1 J	0.023 J	9.9	21.6	2.3	0.22	17.3	69
SMC-21-008	SMC-21-008-G-06-08-210821	6	8	8/21/2021																			
SMC-21-008	SMC-21-008-08-10-210821	8	10	8/21/2021	0.1 U	0.011 U	0.015 U	0.028 U	0.033 U	0.014 U	0.01 U	0.026 U	0.01 U	0.014 U	0.012 U	15.2 J	0.017 J	7.6	15.2	3.2	0.19	13.8	51.1
SMC-21-008	SMC-21-008-G-08-10-210821	8	10	8/21/2021																			
SMC-21-008	SMC-21-008-10-10.6-210821	10	10.6	8/21/2021	0.079 U	0.0085 U	0.012 U	0.022 U	0.025 U	0.01 U	0.0077 U	0.02 U	0.0077 U	0.011 U	0.0093 U	16 J	0.013 U	7.6	16.1	6.2	0.13	14.5	48.8
SMC-21-008	SMC-21-008-10.6-12.6-210821	10.6	12.6	8/21/2021	0.078 U	0.0084 U	0.012 U	0.022 U	0.025 U	0.01 U	0.0077 U	0.019 U	0.0076 U	0.01 U	0.0093 U	14.1 J	0.013 J	7.2	14.5	5.6	0.13	13.4	45.9
SMC-21-008	SMC-21-008-G-10.6-12.6-210821	10.6	12.6	8/21/2021																			
SMC-21-008	SMC-21-008-12.6-13.6-210821	12.6	13.6	8/21/2021	0.078 U	0.0084 U	0.012 U	0.022 U	0.025 U	0.01 U	0.0076 U	0.019 U	0.0076 U	0.01 U	0.0092 U	11.8 J	0.012 J	6	12.2	3.8	0.098	11	39
SMC-21-008	SMC-21-008-G-12.6-13.6-210821	12.6	13.6	8/21/2021																			
SMC-21-010	SMC-21-010-00-01-210811	0	1	8/11/2021	6.7	6.5	4.7	10	1.4	19	0.8 J	5.9	0.17 U	7	14	75.7	0.35 J-	181 J+	24.8	7.5	2	152 J	560
SMC-21-010	SMC-21-010-01-1.6-210811	1	1.6	8/11/2021	7.2	9	5.2	12	2.2	22	1.3	8.1	0.3	13	19	111	0.33 J-	443 J+	23.4	7.8	2.3	172 J	544
SMC-21-011	SMC-21-011-00-01-210811	0	1	8/11/2021	1.3	1.7	0.83	2.3	0.35	4.6	0.36	1.3	0.14 J	3.9	4.3	28.2	0.073 J-	165 J+	20.8	7.3	1.2	47.5 J	188
SMC-21-011	SMC-21-011-01-02-210811	1	2	8/11/2021	7.3 J	7.1 J	5.2 J	12 J	1.9	32	2.8	6.9 J	1.1	26	25	13.9	0.091 J-	141	15.9	5.2	0.47	40.3 J	143

Appendix A
South Menomonee Canal Sediment Analytical Results Summary
Focused Feasibility Study, Milwaukee Estuary AOC, Milwaukee, Wisconsin

				Analyte Group	Metals																Physical Parameters								
				Analyte	Silver	Barium	Selenium	Aluminum	Iron	Manganese	Potassium	Sodium	Thallium	Antimony	Beryllium	Cobalt	Calcium	Cyanide	Magnesium	Vanadium	TOC	Gravel	Sand	Coarse Sand	Medium Sand	Fine Sand	Silt	Clay	Fines
				Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%	%	%	%
				WI CBSQG PEC					40000	1100				25															
				WI CBSQG PEC 3x					120000	3300				75															
				WI CBSQG PEC 5x					200000	5500				125															
				TSCA																									
Location code	Sample ID	Start Depth	End Depth	Date	Silver mg/kg	Barium mg/kg	Selenium mg/kg	Aluminum mg/kg	Iron mg/kg	Manganese mg/kg	Potassium mg/kg	Sodium mg/kg	Thallium mg/kg	Antimony mg/kg	Beryllium mg/kg	Cobalt mg/kg	Calcium mg/kg	Cyanide mg/kg	Magnesium mg/kg	Vanadium mg/kg	TOC mg/kg	Gravel %	Sand %	Coarse Sand %	Medium Sand %	Fine Sand %	Silt %	Clay %	Fines %
SMC-21-005	SMC-21-005-G-00-01-210820	0	1	8/20/2021																		**1.4**	**6.6**	**0.5**	**1**	**5.1**	**61**	**31**	**92**
SMC-21-005	SMC-21-005-01-2.5-210820	1	2.5	8/20/2021																	**61700**								
SMC-21-005	SMC-21-005-G-01-2.5-210820	1	2.5	8/20/2021																		**6.9**	**29.9**	**3.3**	**7.7**	**18.9**	**43.1**	**20.1**	**63.2**
SMC-21-005	SMC-21-005-2.5-04-210820	2.5	4	8/20/2021																	**75400**								
SMC-21-005	SMC-21-005-G-2.5-04-210820	2.5	4	8/20/2021																		**6.1**	**27.9**	**3.4**	**4.8**	**19.7**	**29.9**	**36.1**	**66**
SMC-21-005	SMC-21-005-04-06-210820	4	6	8/20/2021																	**56500**								
SMC-21-005	SMC-21-005-G-04-06-210820	4	6	8/20/2021																		0 U	**27.4**	**1.2**	**4.9**	**21.3**	**42.8**	**29.8**	**72.6**
SMC-21-005	SMC-21-005-06-6.7-210820	6	6.7	8/20/2021																	**48000**								
SMC-21-005	SMC-21-005-6.7-8.7-210820	6.7	8.7	8/20/2021																	**47700**								
SMC-21-005	SMC-21-005-G-6.7-8.7-210820	6.7	8.7	8/20/2021																		0 U	**5.9**	0 U	**2.1**	**3.8**	**39.3**	**54.8**	**94.1**
SMC-21-005	SMC-21-005-8.7-10.7-210820	8.7	10.7	8/20/2021																	**25700**								
SMC-21-005	SMC-21-005-G-8.7-10.7-210820	8.7	10.7	8/20/2021																		0 U	**3.7**	0 U	**0.9**	**2.8**	**55**	**41.3**	**96.3**
SMC-21-005	SMC-21-005-10.7-12.7-210820	10.7	12.7	8/20/2021																	**30100**								
SMC-21-005	SMC-21-005-G-10.7-12.7-210820	10.7	12.7	8/20/2021																		0 U	**4.6**	0 U	**1.7**	**2.9**	**49.1**	**46.3**	**95.4**
SMC-21-006	SMC-21-006-0.1-01-210821	0.1	1	8/21/2021																	**73700**								
SMC-21-006	SMC-21-006-01-2.5-210821	1	2.5	8/21/2021																	**81800**								
SMC-21-006	SMC-21-006-03-04-210821	3	4	8/21/2021																	**28900**								
SMC-21-006	SMC-21-006-04-06-210821	4	6	8/21/2021																	**23700**								
SMC-21-006	SMC-21-006-06-08-210821	6	8	8/21/2021																	**19100**								
SMC-21-006	SMC-21-006-08-10-210821	8	10	8/21/2021																	**22700**								
SMC-21-006	SMC-21-006-10-12-210821	10	12	8/21/2021																	**27300**								
SMC-21-006	SMC-21-006-12-12.8-210821	12	12.8	8/21/2021																	**28400**								
SMC-21-007	SMC-21-007-00-01-210821	0	1	8/21/2021																	**50800**								
SMC-21-007	SMC-21-007-01-2.5-210821	1	2.5	8/21/2021																	**61600**								
SMC-21-007	SMC-21-007-2.5-04-210821	2.5	4	8/21/2021																	**60000**								
SMC-21-007	SMC-21-007-04-06-210821	4	6	8/21/2021																	**46500**								
SMC-21-007	SMC-21-007-06-7.8-210821	6	7.8	8/21/2021																	**36400**								
SMC-21-008	SMC-21-008-01-1.5-210821	1	1.5	8/21/2021																	**29800**								
SMC-21-008	SMC-21-008-1.5-2.5-210821	1.5	2.5	8/21/2021																	**37800**								
SMC-21-008	SMC-21-008-G-1.5-2.5-210821	1.5	2.5	8/21/2021																		0 U	**5.4**	0 U	**1.8**	**3.6**	**33.7**	**60.9**	**94.6**
SMC-21-008	SMC-21-008-2.5-04-210821	2.5	4	8/21/2021																	**40700**								
SMC-21-008	SMC-21-008-G-2.5-04-210821	2.5	4	8/21/2021																		0 U	**3.8**	0 U	**1.1**	**2.7**	**34.8**	**61.4**	**96.2**
SMC-21-008	SMC-21-008-04-06-210821	4	6	8/21/2021																	**27100**								
SMC-21-008	SMC-21-008-G-04-06-210821	4	6	8/21/2021																		0 U	**2.1**	0 U	**0.7**	**1.4**	**38.2**	**59.7**	**97.9**
SMC-21-008	SMC-21-008-06-08-210821	6	8	8/21/2021																	**29900**								
SMC-21-008	SMC-21-008-G-06-08-210821	6	8	8/21/2021																		0 U	**2**	0 U	**0.7**	**1.3**	**47.1**	**50.9**	**98**
SMC-21-008	SMC-21-008-08-10-210821	8	10	8/21/2021																	**44600**								
SMC-21-008	SMC-21-008-G-08-10-210821	8	10	8/21/2021																		0 U	**10.7**	**0.4**	**2.2**	**8.1**	**51.1**	**38.2**	**89.3**
SMC-21-008	SMC-21-008-10-10.6-210821	10	10.6	8/21/2021																	**23100**								
SMC-21-008	SMC-21-008-10.6-12.6-210821	10.6	12.6	8/21/2021																	**35500**								
SMC-21-008	SMC-21-008-G-10.6-12.6-210821	10.6	12.6	8/21/2021																		0 U	**30**	0 U	**1.9**	**28.1**	**39.8**	**30.2**	**70**
SMC-21-008	SMC-21-008-12.6-13.6-210821	12.6	13.6	8/21/2021																	**26800**								
SMC-21-008	SMC-21-008-G-12.6-13.6-210821	12.6	13.6	8/21/2021																		0 U	**35.2**	0 U	**1.5**	**33.7**	**44.7**	**20.1**	**64.8**
SMC-21-010	SMC-21-010-00-01-210811	0	1	8/11/2021																	**91400** J-								
SMC-21-010	SMC-21-010-01-1.6-210811	1	1.6	8/11/2021																	**60000** J-								
SMC-21-011	SMC-21-011-00-01-210811	0	1	8/11/2021																	**57200** J-								
SMC-21-011	SMC-21-011-01-02-210811	1	2	8/11/2021																	**58400** J-								

Appendix A
South Menomonee Canal Sediment Analytical Results Summary
Focused Feasibility Study, Milwaukee Estuary AOC, Milwaukee, Wisconsin

Notes:

Wisconsin Consensus-based Sediment Quality Guidelines (WI CBSQG) Probable Effects Concentrations (PECs) or PCB threshold levels are used for comparative purposes to evaluate the data.
Blue shading = results greater than 1 mg/kg PCB threshold level or greater than PEC
Gold shading = results greater than 3 mg/kg PCB threshold level or 3x PEC
Orange shading = results greater than 5 mg/kg PCB threshold level or 5x PEC
Pink shading = results greater than TSCA concentration (50 mg/kg)
a blank cell for a given sample location for a given analyte or test means that the analysis or test has not been completed at the indicated sample location
ft = foot or feet
ID = identification
J = Estimated
mg/kg = milligram(s) per kilogram
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
R = rejected
TOC = total organic carbon
TSCA = Toxic Substances Control Act
U = Nondetect

Appendix B
Technical Memorandum: Focused List of Metals to Delineate the Nature and Extent of Sediment Contamination

Subject	**Focused List of Metals to Delineate the Nature and Extent of Sediment Contamination**
Project Name	Milwaukee Estuary Area of Concern, City of Milwaukee, Milwaukee County, Wisconsin Task Order 68HE0520F0069, Contract No. 68HE0519D00007
From	Jacobs
Date	October 20, 2022

1. Introduction

This technical memorandum presents the rationale for using a focused list of metals (chromium, lead, and mercury) along with total polychlorinated biphenyls (PCBs) and total polycyclic aromatic hydrocarbons (PAHs) to delineate the nature and extent of contamination and establish remedial target areas (RTAs) in the focused feasibility studies (FFSs) for the Milwaukee Estuary Area of Concern (AOC). The work herein was completed for the U.S. Environmental Protection Agency (EPA) Great Lakes National Program Office by Jacobs[1], in accordance with Task Order 68HE0520F0069 under Contract No. 68HE0519D00007. Jacobs is preparing FFS documents for in-channel sediment for the Milwaukee River Downtown Reach and for portions of three additional project areas including the South Menomonee Canal, the Kinnickinnic (KK) River, and the Milwaukee Bay (MKE Bay). The data from these project areas and two additional project areas (Menomonee River and Milwaukee River Third Ward) were evaluated (Figure 1). Data from the Floodplains Reach Project Area are not included in this memorandum because a different approach was used to describe the nature and extent of contamination and delineate RTAs.

2. Data Evaluation Methods and Results

Previous documents prepared for the Milwaukee Estuary AOC reported that a subset of metals tended to exhibit more exceedances relative to screening values. For example, the *Focused Feasibility Study Report, Menomonee and Milwaukee Rivers* (CH2M 2019a) reported that in the Menomonee River and in the downstream end of the Milwaukee River (currently referred to as the Downtown Reach Project Area), cadmium, chromium, lead and mercury frequently exceeded their respective Probable Effect Concentration (PEC)[2] values, and lead and chromium exhibited the greatest frequency and magnitude of exceedance. The *Site Characterization Report, Milwaukee River Downstream Sediments* documented that in the Milwaukee River Downtown Reach, chromium, lead, and mercury most frequently exceeded their respective PEC values (CH2M 2019b). The *100% Final Site Investigation Report, Characterization of Sediments in South Menomonee Canal* (Anchor QEA 2021) concluded that lead, chromium, and copper were the metals with the greatest number of PEC exceedances.

[1] On December 15, 2017, CH2M HILL Companies Ltd. and its subsidiaries including CH2M HILL, Inc. became part of Jacobs.

[2] PECs from the Wisconsin Consensus-based Sediment Quality Guidelines or PCB screening levels are used for comparative purposes to evaluate the data.

This evaluation considers the AOC-wide sediment FFS data set that covers six project areas. Metals with corresponding PECs included in the data set are chromium, mercury, lead, nickel, arsenic, cadmium, copper, zinc, iron, manganese, and antimony.

Iron, manganese, and antimony were not included in this analysis. Antimony was not widely analyzed, and where the data are available, the concentrations do not exceed the antimony PEC. Iron and manganese were not analyzed in all investigations; where analyzed, PEC exceedances were limited to seven samples in the KK River (Table 1). Five of the iron or manganese PEC exceedances were in surface sediment samples collected along the KK River shoreline during the Solvay Coke Remedial Investigation (Arcadis 2016); PAH concentrations also exceeded the PEC in four of these samples. The remaining two samples were collected by the U.S. Army Corps of Engineers as part of the 2020 investigation of the KK federal navigation channel and the exceedances occur at 5 to 7 feet and 9 to 11.4 feet below the sediment surface (bss).

The co-occurrence of what is termed herein as the five primary chemicals of concern (COCs) (total PCBs, total PAHs, chromium, mercury, and lead) and the other nonprimary metals (arsenic, cadmium, copper, nickel, and zinc) was evaluated using the following stepwise process:

1. An exceedance factor was calculated for each COC in each sample by dividing the COC concentration by the corresponding PEC or the 1 milligram per kilogram (mg/kg) threshold level for PCBs.
2. The maximum exceedance factor was selected for each sample for the nonprimary metals (arsenic, cadmium, copper, nickel, and zinc).
3. The maximum exceedance factor was selected for each sample for the primary metals (chromium, lead, and mercury).
4. The maximum exceedance factor for the nonprimary metals was plotted against the maximum exceedance factor for the primary metals for each sample (Figure 2).

The plot shown on Figure 2 is divided into four quadrants where gridlines representing exceedance factors of 1 for primary and nonprimary metals intersect:

- Upper left quadrant: Samples plotting in this quadrant have a PEC exceedance for a nonprimary metal, but not for a primary metal.
- Upper right quadrant: Samples plotting in this quadrant have co-located PEC exceedances for primary and nonprimary metals.
- Lower left quadrant: Samples plotting in this quadrant have no PEC exceedances for primary or nonprimary metals.
- Lower right quadrant: Samples plotting in this quadrant have a PEC exceedance for a primary metal but not for a nonprimary metal.

Information on Figure 2 illustrates that a relatively small number of samples fall into the upper left quadrant (approximately 40 samples out of nearly 2,500 samples included in this evaluation). These are samples where PEC exceedances of a nonprimary metal are not co-located with an exceedance of a primary metal.

The analysis was then expanded to also include total PAHs and total PCBs as follows:

1. The maximum exceedance factor was determined for the five primary COCs for each sample (chromium, lead, mercury, total PCBs, and total PAHs).
2. The maximum exceedance factor for the nonprimary metals was plotted against the maximum exceedance factor for the five primary COCs for each sample (Figure 3).

As shown on Figure 3, the addition of total PAHs and total PCBs to the analysis reduces the number of samples plotting in the upper left quadrant to six. These samples are summarized in Table 2. Nickel, cadmium, copper, or zinc nominally exceed the PEC in these samples, with exceedance factors ranging from approximately 1.1 to 1.3.

3. Conclusion

The evaluation presented in this memorandum demonstrates that designation of chromium, lead, and mercury as primary COCs (along with total PAHs and total PCBs) is an appropriate and protective means of delineating RTAs for each of the five sediment project areas within the Milwaukee Estuary AOC. PEC exceedances of nonprimary metals are either not significant within the AOC (iron and manganese) or are predominantly co-located with chromium, lead, or mercury PEC exceedances (arsenic, cadmium, copper, nickel, and zinc). When co-occurrence with total PCBs and total PAHs is also considered, there are only six samples with nonprimary metal PEC exceedances that are not co-located with a primary COC PEC or PCB threshold level exceedance, and the PEC exceedance factors in these cases are all less than two.

4. References

Anchor QEA. 2021. *100% Final Site Investigation Report, Characterization of Sediments in South Menomonee Canal, Milwaukee, Wisconsin.* Prepared for Wisconsin Department of Natural Resources and U.S. Environmental Protection Agency Great Lakes National Program Office; EPA GLRI Grant No. GL-00E02392. August.

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CH2M HILL, Inc. (CH2M). 2019b. *Final Site Characterization Report, Milwaukee River Downstream Sediments, Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin.* Prepared for U.S. Environmental Protection Agency Great Lakes National Program Office. Task Order No. 0029/Contract No. EP-R5-11-09. December.

Tables

Table 1. Summary of Iron and Manganese Results Exceeding PECs
Milwaukee Estuary AOC, Milwaukee, Wisconsin

Reach	Investigation	Location Code	Sample ID	Start Depth (feet)	End Depth (feet)	Date	Total PCB mg/kg	Total PAH mg/kg	Metals: Chromium mg/kg	Metals: Mercury mg/kg	Metals: Lead mg/kg	Metals: Nickel mg/kg	Metals: Arsenic mg/kg	Metals: Cadmium mg/kg	Metals: Copper mg/kg	Metals: Zinc mg/kg	Metals: Iron mg/kg	Metals: Manganese mg/kg	Metals: Antimony mg/kg
						WI CBSQG PEC	1	22.8	110	1.1	130	49	33	5	150	460	40000	1100	25
						WI CBSQG PEC 3x	3	68.4	330	3.3	390	147	99	15	450	1380	120000	3300	75
						WI CBSQG PEC 5x	5	114	550	5.5	650	245	165	25	750	2300	200000	5500	125
						TSCA	50												
Kinnickinnic River	Solvay Coke RI Report	P-3	P-3-0.0/0.0	0	0	11/7/2013		72.8	24	0.14 J	160			2.1		650	52000 J		
Kinnickinnic River	Solvay Coke RI Report	P-4	P-4-0.0/0.0	0	0	11/7/2013		37.7	23	0.42 J	51			2.6		410	100000 J		
Kinnickinnic River	Solvay Coke RI Report	P-1	P-1-0.0/0.0	0	0	11/7/2013		26.2	48	0.14 J	110			0.65		120	470000 J		
Kinnickinnic River	Solvay Coke RI Report	P-2	P-2-0.0/0.0	0	0	11/7/2013		32	250	1.1 J	1200			3.8		1000	450000 J		
Kinnickinnic River	Solvay Coke RI Report	P-4A	P-4A-0.0/0.0	0	0	11/7/2013		1.3	78	0.0062 J	3.5			0.043 J		13	400000 J		
Kinnickinnic River	2020 USACE KK River Navigation Channel	MKE-FNC09	MKE-NAV20-09-5-7	5	7	10/6/2020	0.25	2.3	120	0.49	260	24	9.1	4.1	58	310	98000	590	
Kinnickinnic River	2020 USACE KK River Navigation Channel	MKE-FNC45	MKE-NAV20-45-9-11.4	9	11.4	10/15/2020	0.005 U	0.0077	23	0.026 J	10	21	2.1	0.2	14	53	29000	1600	

Notes:
Wisconsin Consensus-based Sediment Quality Guidelines (WI CBSQG) Probable Effects Concentrations (PECs) or PCB threshold levels are used for comparative purposes to evaluate the data.
Aroclors and total PCBs from Solvay Coke RI Report not included due to discrepancies in source data
Blue shading = results greater than 1 mg/kg PCB screening level value or greater than PEC
Gold shading = results greater than 3 mg/kg PCB screening level value or 3x PEC
Orange shading = results greater than 5 mg/kg PCB screening level value or 5x PEC
Pink shading = results greater than TSCA concentration (50 mg/kg)
3x = 3 times
5x = 5 times
ID = identification
J = Estimated
KK = Kinnickinnic
mg/kg = milligram(s) per kilogram
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
R = rejected
RI = Remedial Investigation
TOC = total organic carbon
TSCA = Toxic Substances Control Act
U = Nondetect
USACE = United States Army Corps of Engineers

Table 2. Summary of Samples with Non-Co-Located Exceedances of Non-Primary Metals
Milwaukee Estuary AOC, Milwaukee, Wisconsin

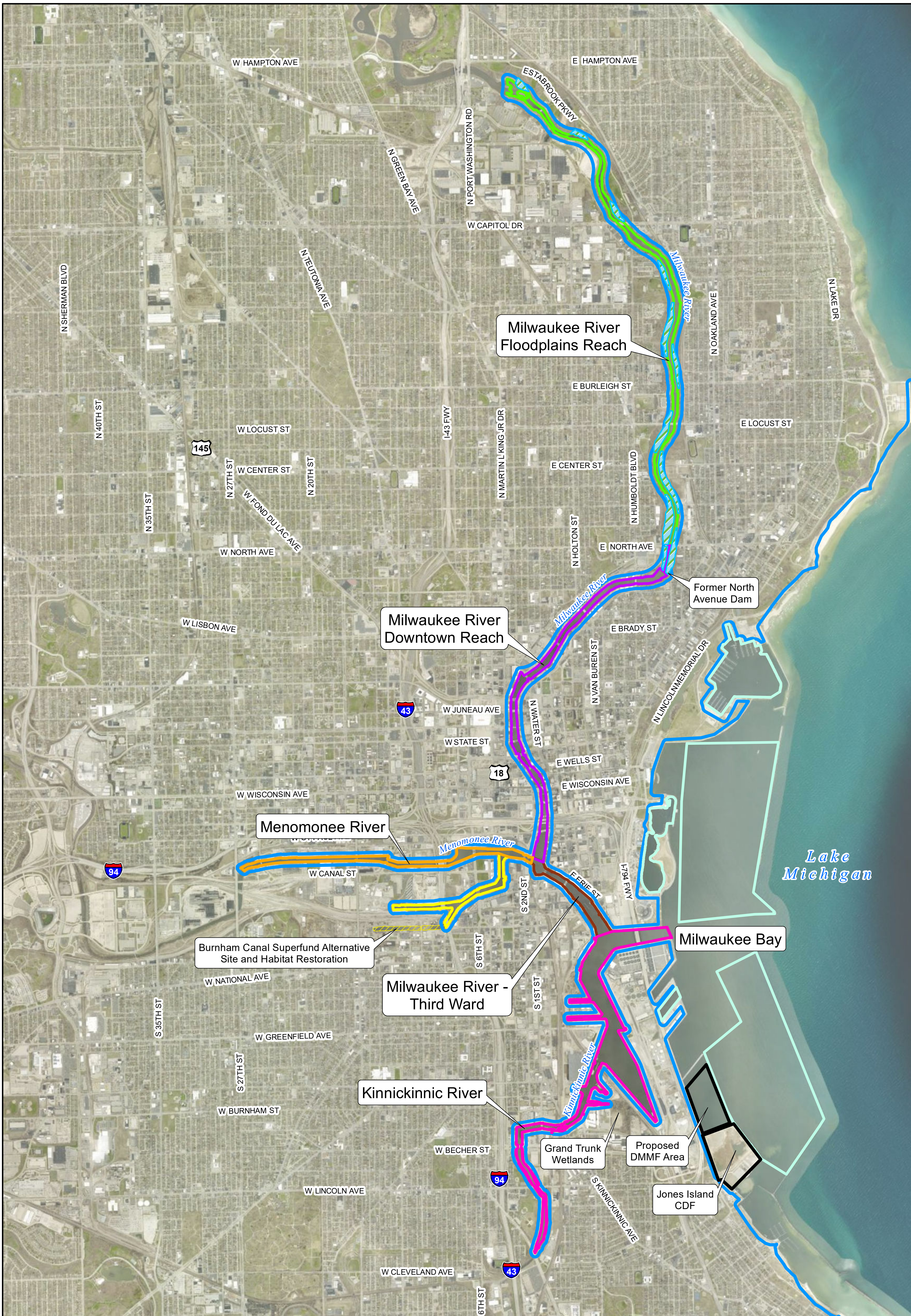
Reach	Investigation	Location Code	Sample ID	Start Depth (feet)	End Depth (feet)	Date	Total PCB mg/kg		Total PAH mg/kg		Metals: Chromium mg/kg		Metals: Mercury mg/kg		Metals: Lead mg/kg		Metals: Nickel mg/kg		Metals: Arsenic mg/kg		Metals: Cadmium mg/kg		Metals: Copper mg/kg		Metals: Zinc mg/kg	
						WI CBSQG PEC	1		22.8		110		1.1		130		49		33		5		150		460	
						WI CBSQG PEC 3x	3		68.4		330		3.3		390		147		99		15		450		1380	
						WI CBSQG PEC 5x	5		114		550		5.5		650		245		165		25		750		2300	
						TSCA	50																			
Kinnickinnic River	2021 WDNR FFS Data Gap	KKR-21-060	KKR-21-060-07-09-210820	7	9	8/20/2021	0.0025	U	**5.6**		**14.8**	J	**0.2**		**54.8**		**11**		**3.5**		**0.34**		**170**		**170**	
Kinnickinnic River	2020 WDNR Kinnickinnic Sediment Characterization	KKR-20-002	KKR-20-002-C-01-03-200916	1	3	9/16/2020	**0.062**		**20.8**		**20**	J-	**0.054**		**37**		**11**	J	**4.2**		**5.2**		**27**	J	**240**	
Kinnickinnic River	2020 USACE KK River Navigation Channel	MKE-FNC16	MKE-NAV20-16-00-01	0	1	10/5/2020	0.0065	U	**0.1**		**77**		0.027	U	**16**		**59**		**6.9**		**0.33**		**170**		**200**	
Menomonee River	2015 GLNPO Menomonee River Site Characterization	R5-11	MR-SD-R5-11-0.0/0.5	0	0.5	11/3/2015	**0.33**		**12.2**		**61.4**		**0.245**	J	**117**		**31.2**		**6.92**	J	2.69	U	**120**		**499**	
Milwaukee Bay	2020 WDNR Milwaukee Bay Sediment Characterization	MKE-20-108	MKE-20-108-C-00-01-200922	0	1	9/22/2020	**0.014**		**4.5**		**33**	J	**0.045**	J-	**30.8**		**52.5**		**10**		**0.34**		**86.5**		**123**	
South Menomonee Canal	2021 WDNR FFS Data Gap	SMC-21-007	SMC-21-007-00-01-210821	0	1	8/21/2021	0.0027	U	**0.23**		**11.9**		**0.033**		**10.8**		**74.5**		**2.9**		**0.3**		**18.6**		**64.2**	J

Notes:

Wisconsin Consensus-based Sediment Quality Guidelines (WI CBSQG) Probable Effects Concentrations (PECs) or PCB screening levels are used for comparative purposes to evaluate the data.

Blue shading = results greater than 1 mg/kg PCB screening level value or greater than PEC
Gold shading = results greater than 3 mg/kg PCB screening level value or 3x PEC
Orange shading = results greater than 5 mg/kg PCB screening level value or 5x PEC
Pink shading = results greater than TSCA concentration (50 mg/kg)
3x = 3 times
5x = 5 times
FFS = Focus Feasibility Study
GLNPO = Great Lakes National Program Office
ID = identification
J = Estimated
KK = Kinnickinnic
mg/kg = milligram(s) per kilogram
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
R = rejected
TOC = total organic carbon
TSCA = Toxic Substances Control Act
U = Nondetect
USACE = United States Army Corps of Engineers
WDNR = Wisconsin Department of Natural Resources

Figures



LEGEND

- Floodplain Area Boundary
- Milwaukee Bay
- Menomonee River
- Kinnickinnic River
- Milwaukee River Downtown
- Milwaukee River Floodplain
- Milwaukee River - Third Ward
- South Menomonee Canal
- Greater Milwaukee GLLA Project Agreement boundary

N

0 1500 3000
Feet

Notes:
1. CDF = confined disposal facility; DMMF = dredged materials management facility; GLLA = Great Lakes Legacy Act
2. 2022 Aerial Photography provided by Esri ArcGIS Online World Imagery.

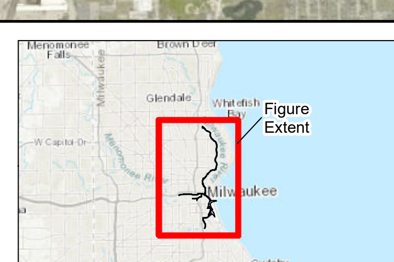
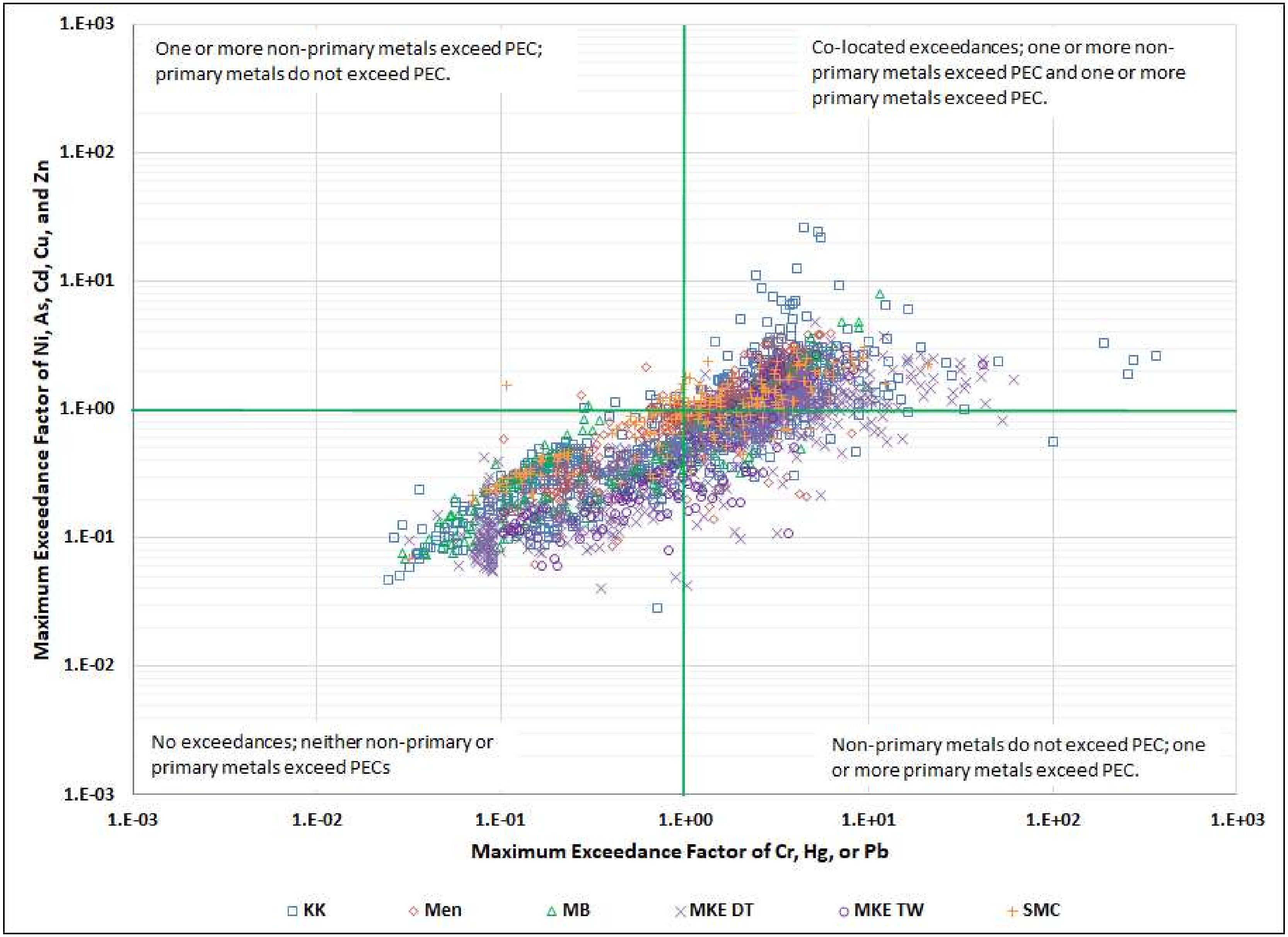


Figure 1
Regional Features
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs

\\dc1vs01\GISProj\E\EPA\681867_MKERiverDownstream\MapFiles\2022\Floodplain\Figure1-1_Milwaukee_Estuary_AOC_Regional_Features.mxd jhansen1 (9/11/2023)



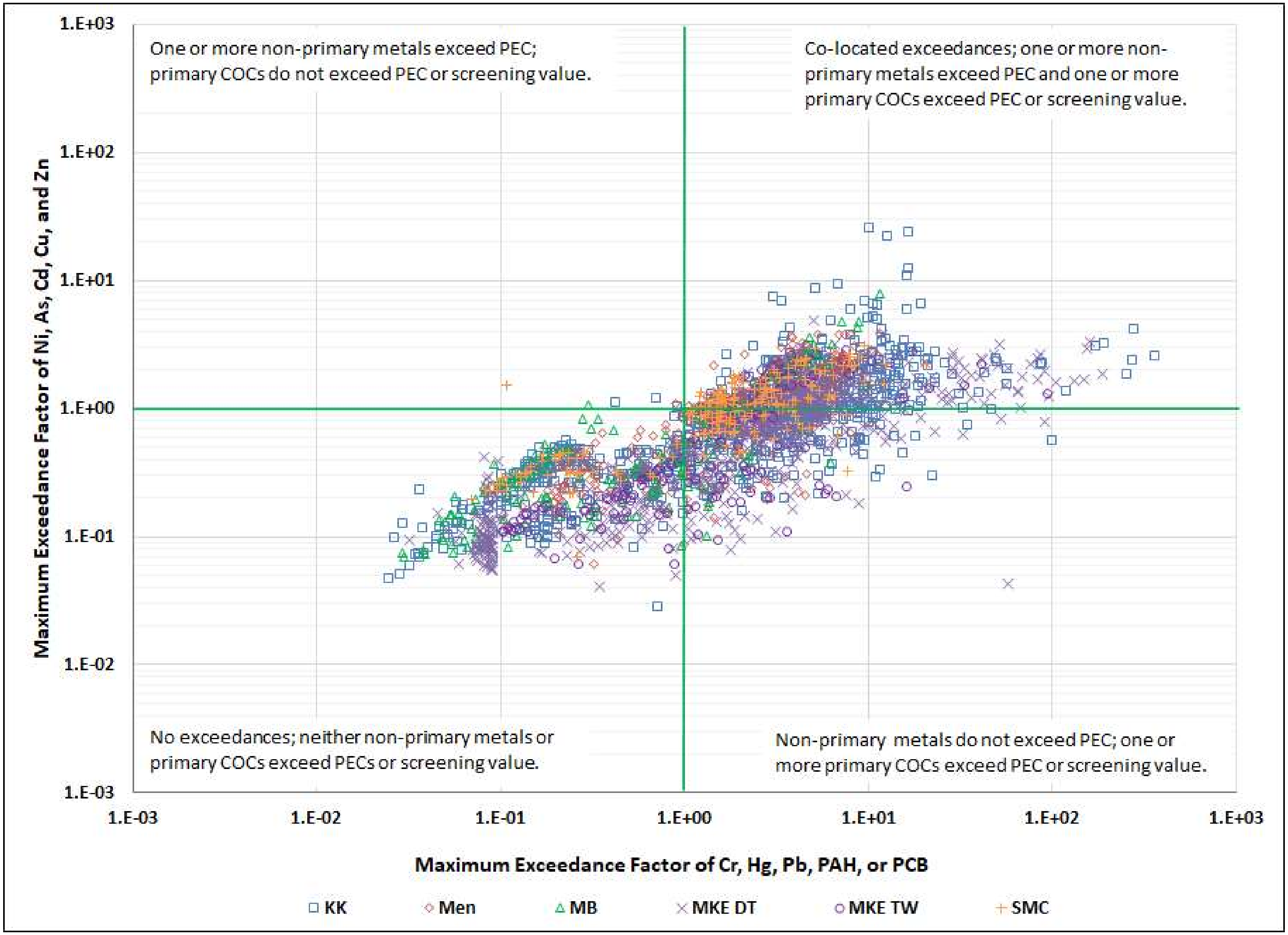
Notes:

KK – Kinnickinnic River
Men – Menomonee River
MB – Milwaukee Bay
MKE DT – Milwaukee River – Downtown
MKE TW – Milwaukee River – Third Ward
PEC – Probable Effect Concentration
SMC – South Menomonee Canal

As – arsenic
Cd – cadmium
Cr – chromium
Cu – copper
Hg – mercury
Ni – nickel
Pb – lead
Zn - zinc

Figure 2
Exceedance Factors: Non-Primary Metals vs. Primary Metals
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs



Notes:
COC – chemical of concern
KK – Kinnickinnic River
Men – Menomonee River
MB – Milwaukee Bay
MKE DT – Milwaukee River – Downtown
MKE TW – Milwaukee River – Third Ward
PEC – Probable Effect Concentration
SMC – South Menomonee Canal

As – arsenic
Cd – cadmium
Cr – chromium
Cu – copper
Hg – mercury
Ni – nickel
PAH – polycyclic aromatic hydrocarbon
Pb – lead
PCB – polychlorinated biphenyl
Zn - zinc

Figure 3
Exceedance Factors: Non-Primary Metals vs. Primary COCs
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs

Appendix C
Overview of Applicable Federal, State, and Local Permitting Requirements

Appendix C. Overview of Applicable Federal, State, and Local Permitting Requirements – South Menomonee Canal

Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin

Permit/Approval	Requirement/Purpose	Applicability to Project
Clean Water Act (CWA) Section 404 33 U.S. Code (USC) 1344 33 Code of Federal Regulations (CFR) 320 Rivers and Harbors Act of 1899 Section 10	Requires a permit from U.S. Army Corps of Engineers (USACE) for discharge of dredged or fill material into waters of the United States.	A CWA permit is anticipated to be required. Nationwide Permit (NWP) 38 – Cleanup of Hazardous and Toxic Waste (covers "specific activities required to effect the containment stabilization, or removal of hazardous or toxic waste materials that are performed, ordered or sponsored by a government agency with established legal or regulatory authority (USACE 2021). It is anticipated that project activities will be covered under NWP 38 as they are intended to contain or remove hazardous materials and the activities are sponsored by the U.S. Environmental Protection Agency (EPA). A preconstruction notification (PCN) will be required to gain coverage under NWP 38. If USACE determines that project activities are not able to be covered under NWP 38, an individual permit would be required.
CWA Section 401 Wisconsin Department of Natural Resources (WDNR's) NR 299 – Water Quality Certification (WQC)	Provides states with the authority to issue water quality certifications (WQCs) to ensure that federal agencies will not issue permits or licenses that violate the water quality standards of the state.	WQC is anticipated to be required. It is anticipated that the project will be covered under NWP 38. WDNR has conditionally issued WQC for projects authorized by NWP 38. It is anticipated that the project will meet the applicable state 401 WQC conditions.
Endangered Species Act of 1973, Section 7 Consultation 16 USC 1531 50 CFR 200	Requires that Federal agencies ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify critical habitat.	Informal consultation with U.S. Fish and Wildlife Service is anticipated to be required as part of the CWA 404 permit authorization.
Fish and Wildlife Coordination Act 16 USC 661 et seq. Wisconsin Endangered Resources Review NR 27 – Endangered and Threatened Species	Requires consultation when a modification of a stream or other water body is proposed or authorized and requires protection of fish and wildlife from adverse effects of site action.	Consultation with the WDNR is anticipated to be required as part of the CWA 404 permit authorization.
Section 106 Concurrence National Historical Preservation Act of 1966 36 CFR Part 65 36 CFR 800	No activity is authorized under any NWP, which may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.	Consultation with the Wisconsin State Historic Preservation Office is anticipated be required as part of the CWA 404 permit authorization.
Section 408 Authorization to Alter USACE Civil Works Projects 33 USC 408	Requires that alterations to any USACE federally authorized Civil Works project be reviewed and approved before being undertaken.	A Section 408 permit is anticipated to be required. Construction and operation of a temporary water treatment plant for the Great Lakes Legacy Act sediment remediation project is anticipated to occur within a portion of the existing USACE dredged materials disposal facility (DMDF) because of the proximity to the future dredged materials management facility (DMMF), where dredged sediment will be disposed.

Permit/Approval	Requirement/Purpose	Applicability to Project
Wisconsin Statutes Chapter 30 - Navigable Waters, Harbors, and Navigation NR 345 – Dredging in Navigable Waterways	Establish procedures and limitations for exempt activities, general permits, and individual permits for removal of material from the beds of navigable waterways within Wisconsin.	A Lake or Stream Dredging Individual Permit is anticipated to be required. Applicable for activities including dredging and placement of structures (such as fill material, sheet pilings, coffer dams) on the bed of a river and placement of residual sand cover. Dredged material will contain contaminants at concentrations equal to or greater than the PEC concentration as published in WDNR (2003); if so, the discharge from the dredging activities would not qualify for exemptions or coverage under a general permit.
40 CFR 761.77 NR 700 – Investigation and Remediation of Environmental Contamination	TSCA sediment removal and disposal would be implemented under the WDNR One Cleanup Program Memorandum of Agreement (RR-786) dated November 2014.	The process allows for the approval of the remediation under WDNR lead and oversight, in coordination with the EPA, under state authority for the pathways addressed under the NR 700 rules series. Remediation performed under the requirements of NR 700 would be seen as equivalent to a TSCA cleanup for the environmental pathways addressed under the NR 700 rules series.
NR 216 – Storm Water Discharge Permit Construction Site Storm Water Runoff General Permit (Permit Number WI-S067831-6)	Wisconsin Pollutant Discharge Elimination System (WPDES) stormwater general permit authorizing stormwater discharge(s) from construction sites of one acre or more of land disturbance.	Coverage under the Wisconsin Construction Site Storm Water Runoff General Permit (WPDES Permit Number WI-S067831-6 is anticipated to be required. Applicable to stormwater runoff or other discharged water during construction activities that will disturb ≥1 acre.
WPDES Individual Discharge Permit	Individual (site-specific) permit authorizing discharge from dredging operations where carriage water or interstitial water from sediment dredging projects will be discharged to surface water.	An individual WPDES discharge permit is anticipated to be required. This permit applies for point source discharge of carriage and/or interstitial water to waters of the state from mechanical or hydraulic dredging operations that target sediment contaminants greater than the probable effect concentration (PEC) for sediment toxicity listed in the Consensus Based Sediment Quality Guidelines (WDNR 2003).
Federal Coastal Zone Management Act of 1972 16 USC 1451 et seq. Wisconsin Coastal Management Program (WCMP)	An applicant for a federal permit affecting any land, water use, or natural resource in the coastal zone must provide a consistency certification. The project proponent must certify that activities will comply with the approved policies of the WCMP and be conducted in a manner consistent with the policies.	A federal consistency determination is anticipated to be required. The Milwaukee Estuary AOC project area boundary is within the Wisconsin coastal zone (WCMP 2022).
Local Notice to Mariners 33 CFR 165 - Notification	Establishes procedures for controlled access areas and regulated navigation areas.	The notification is anticipated to be required. Applicable to in-water work being performed in waterways with commercial and/or recreational usage while project activities occur. Project is within the jurisdiction of U.S. Coast Guard District 9.

Sources:

U.S. Army Corps of Engineers (USACE). 2021. Nationwide Permits. 38 – Cleanup of Hazardous and Toxic Waste. Accessed October 18, 2022. https://www.mvp.usace.army.mil/Portals/57/docs/regulatory/NWPs/2021/NWP%2038%20terms%20and%20conditions%202021.pdf?ver=QtThnf6ZPFepxqlnjVbESQ%3d%3d

Wisconsin Coastal Management Program (WCMP). 2022. About Us. Accessed October 18, 2022. https://doa.wi.gov/Pages/LocalGovtsGrants/CoastalManagement.aspx

Wisconsin Department of Natural Resources (WDNR). 2003. *Wisconsin Consensus-based Sediment Quality Guidelines. Recommendations for Use and Application,* Interim Guidance RR-088. December.

Note:

The overview of permitting requirements included in this appendix is preliminary and may change during detailed design. Additional permits that are not listed here may be identified during detailed design.

≥ = greater or equal to

CFR = Code of Federal Regulations

CWA = Clean Water Act

DMDF = USACE's dredged materials disposal facility

DMMF = proposed dredged materials management facility to support the Milwaukee Estuary Area of Concern project

NHPA = National Historic Preservation Act

NWP = Nationwide Permit

PCN = pre-construction notification

PEC = Probable Effects Concentration per WDNR 2003

USC = U.S. Code

USACE = U.S. Army Corps of Engineers

WCMP = Wisconsin Coastal Management Program

WDNR = Wisconsin Department of Natural Resources

WPDES = Wisconsin Pollutant Discharge Elimination System

WQC = Water Quality Certification

Appendix D
Estimated Costs

Appendix D
Estimated Costs
(Removed)

Appendix E
Surface-weighted Average Concentration (SWAC) Evaluation

Jacobs

Appendix E
Technical Memorandum

Subject	**South Menomonee Canal Project Area: Surface-weighted Average Concentration (SWAC) Methodology and Results Summary**
Project Name	Milwaukee Estuary Area of Concern, City of Milwaukee, Milwaukee County, Wisconsin Task Order 68HE0520F0069, Contract No. 68HE0519D00007
From	Jacobs
Date	August 2023

Surface-weighted average concentrations (SWACs) were calculated to evaluate existing and post-remediation conditions in the South Menomonee Canal (SMC) Project Area within the Milwaukee Estuary Area of Concern (AOC) for the recommended Alternative 3A, which is described in Section 7 of the Focused Feasibility Study (FFS). The SWAC evaluation was performed to confirm the protectiveness of the recommended alternative. SWAC values representing the SMC Project Area were calculated for two scenarios for select contaminants of concern (COCs) (polychlorinated biphenyls [PCBs], polycyclic aromatic hydrocarbons [PAHs], chromium, lead, and mercury). SWAC calculations were performed using the three-dimensional (3D) contaminant model developed in Earth Volumetric Studio (EVS) software that was used to define remediation target areas (RTAs) for each remedial alternative (FFS Section 3.2). Several advantages unique to using the 3D EVS model surfaces for estimating the post-remedy SWAC values include:

- Incorporation of COC concentrations representing the residual sediment at the 3:1 side slopes from shoreline and in-water structure setbacks.
- Incorporation of residual sediment COC concentrations intersected when dredging to the maximum dredge elevation.

Two EVS 3D model surfaces of concentration data for each COC were exported from EVS into ArcGIS to calculate SWAC values representing the following:

- COC concentrations of the upper 0.5 feet of the existing sediment surface to represent existing sediment conditions.
- COC concentrations for the upper 0.5 feet of the Alternative 3A post-dredge surface with overdredge allowance to represent post-remedy conditions.

ArcGIS was then used for converting the 3D model concentration surfaces into a gridded network of 10-foot cells within the project area boundary, thereby creating an equally weighted COC concentration for each grid cell. The concentration values assigned to the 10-foot cells was averaged using the geometric center of each cell for calculation of the project area SWAC value.

For the purposes of calculating the Alternative 3A post-remedy SWAC value, several modifications to the exported EVS 3D model surface concentrations were required to account for the application of post-dredge residual sand cover and isolation cap materials within the RTA.

Cells located within the portion of the RTA designated for isolation cap (Figure 7-1) were assigned a cell value equal to the COC laboratory detection limit. Cells within the RTA boundary designated for post-dredge residual sand cover following sediment removal were assigned a cell value equal to a 1:1 ratio of the COC laboratory detection limit to represent a 6-inch residual sand cover and sediment surface concentrations representative of post-dredge conditions, thereby assuming a post-dredge surface dilution factor of 50 percent following residual sand cover placement. Cells outside of the RTA where remediation is not required (where concentrations are < cleanup goals [CUGs]) used existing sediment surface COC concentrations.

Exhibit E-1 summarizes the calculated SWAC values for the SMC Project Area sediment for existing conditions and post-remediation conditions after implementation of Alternative 3A. As indicated in Exhibit E-1, post-remediation SWAC values are less than the existing condition (pre-remediation), the CUGs, and probable effect concentrations (PECs).

Figures E1 through E5 present existing and post-remedy surface sediment concentrations of the gridded network of 10-foot cells. Further evaluation of post-remedy surface sediment COC concentrations will be performed to identify individual areas where post-remediation cell concentrations exceed CUGs in the SMC Project Area. Locations of cell concentrations with CUG exceedances will be further evaluated and prioritized for additional capping or sediment removal if sufficient dredged materials management facility (DMMF) capacity and project resources are available.

Exhibit E-1. South Menomonee Canal - Surface Weighted Average Concentrations[a] for Existing and Post-Remediation Scenarios – Alternative 3A

Relevant Standards	**PCB**	**PAH**	**Chromium**	**Lead**	**Mercury**
PEC	0.67	22.8	110	130	1.1
CUG	1	68.4	330	390	3.3
SWAC Values	**PCB**	**PAH**	**Chromium**	**Lead**	**Mercury**
SWAC Values: Existing Condition	0.48	26	36	81	0.25
SWAC Values: Post-Remedy	0.06	6	20	34	0.13

[a] Values reported in milligrams per kilogram.

CUG = Clean up Goal

PAH = polycyclic aromatic hydrocarbon

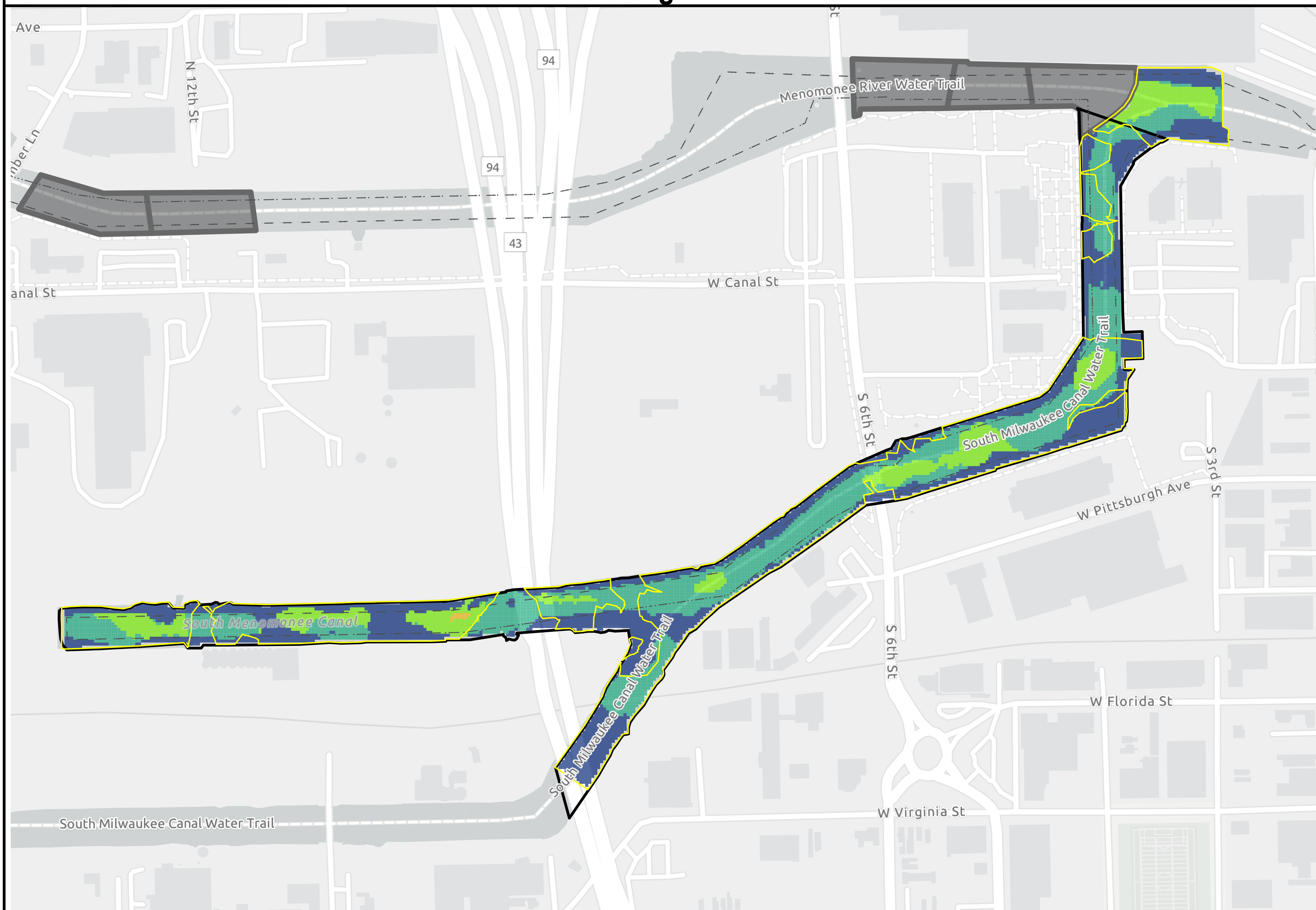
PCB = polychlorinated biphenyl

PC = Probable Effect Concentration

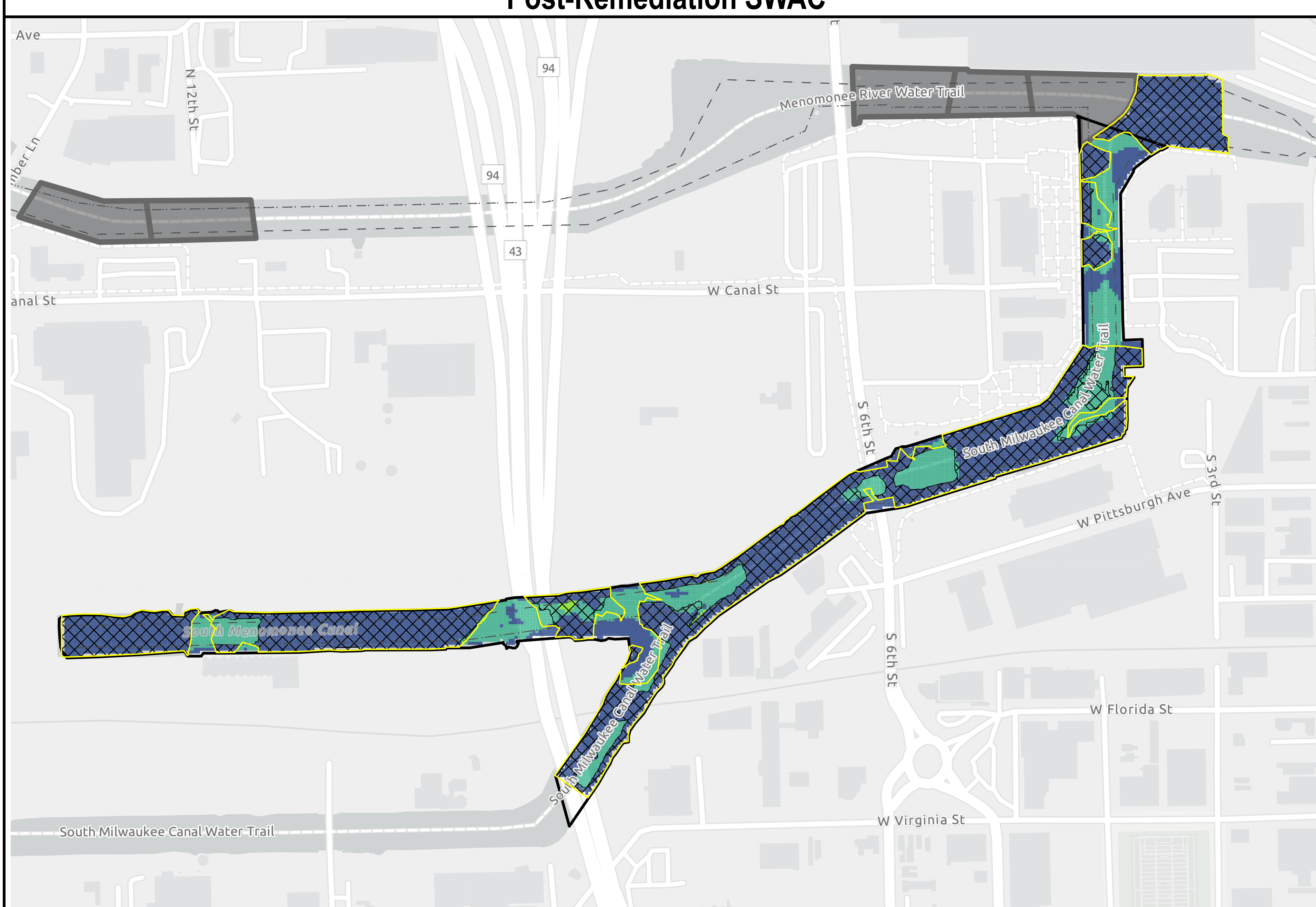
SWAC = surface-weighted average concentration

Figures

Existing SWAC



Post-Remediation SWAC



LEGEND

- Federal Navigation Channel (Source: United States Army Corps of Engineers)
- Remedial Target Area
- Cap Extents
- South Menomonee Canal Project Area
- Menomonee River Recommended Alternative Extent (Alternative 5 per CH2M HILL, Inc. 2019. *Focused Feasibility Study, Menomonee and Milwaukee Rivers, Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin*. May.)

PCB Concentrations (mg/kg)

- < 0.059
- 0.059 - 1
- 1 - 3
- 3 - 5
- > 5

N

0 450
Approximate scale in feet

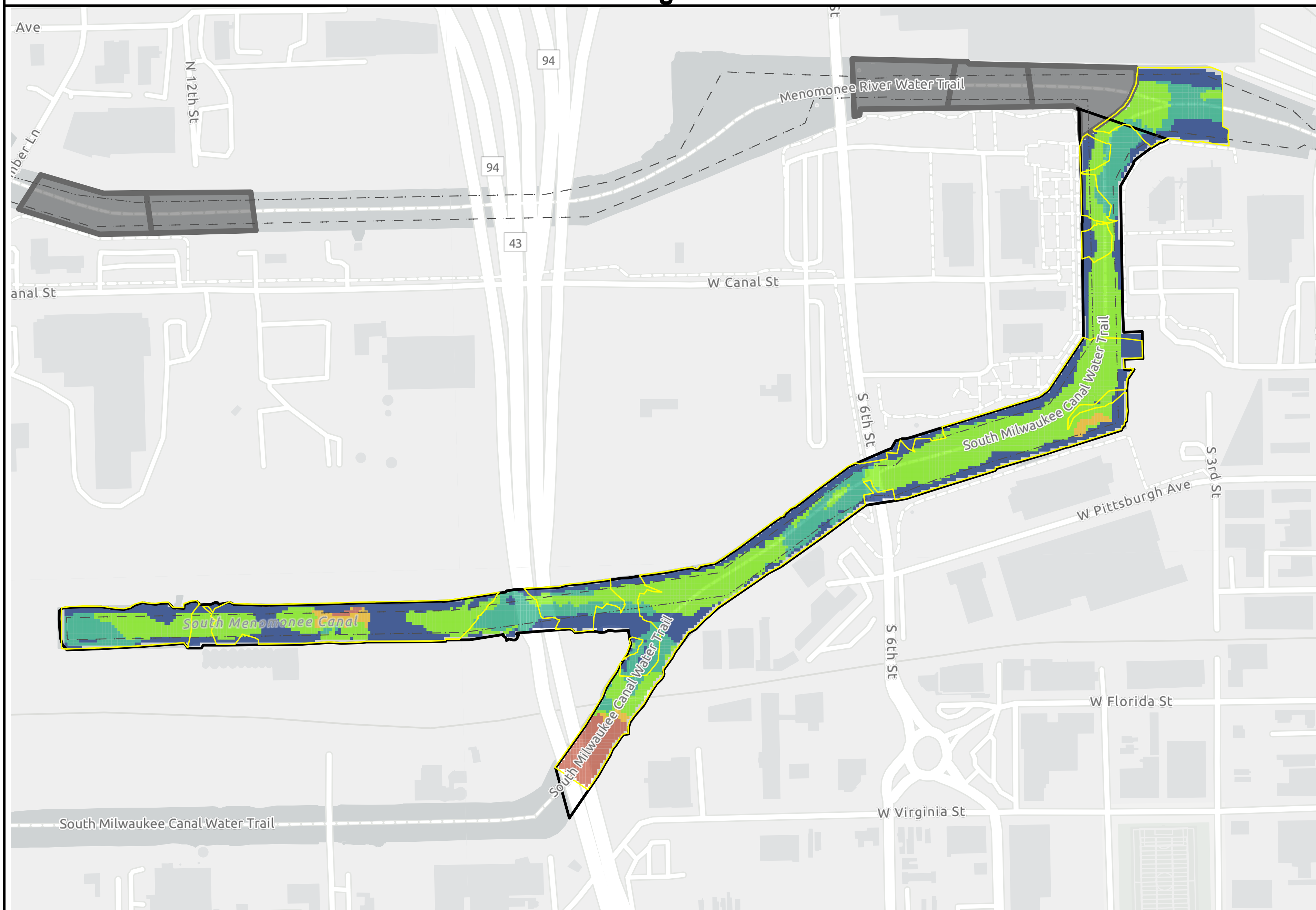
Notes:
1. Basemap source: Esri ArcGIS Online Light Gray Base Map
2. PCB = polychlorinated biphenyl; mg/kg = milligrams per kilogram; SWAC = Surface Weighted Average Concentration

Figure E1
Alternative 3A - PCB SWAC Summary
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

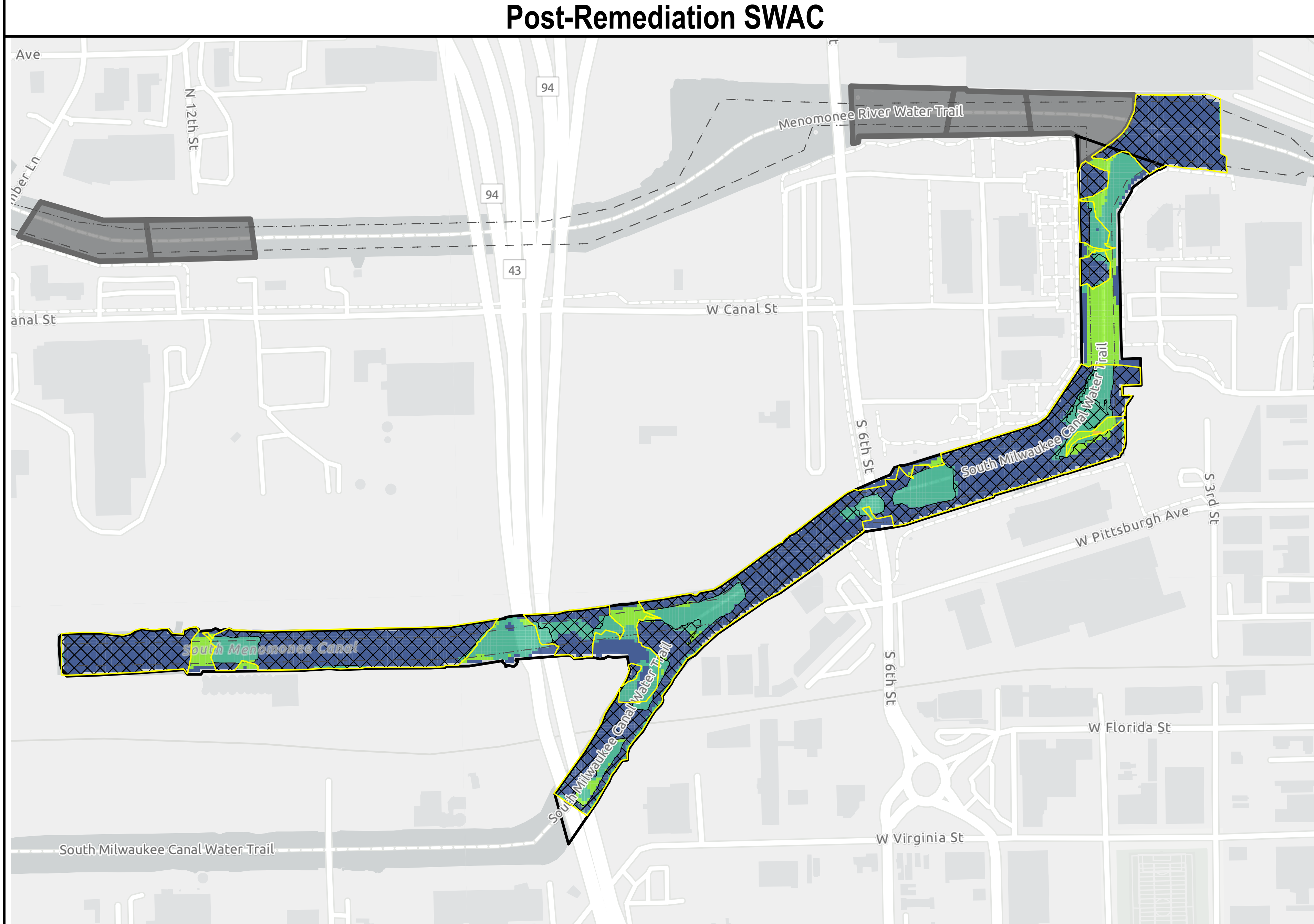
Jacobs

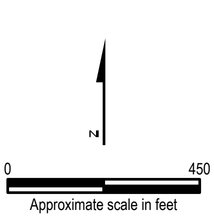
\\dc1vs01\GISProj\E\EPA\681867_MKERiverDownstream\ProDocs\2023\FFS_SMC_Appendix_E\FFS_SMC_Appendix_E.aprx-Figure E1 - SMC PCB SWAC jhansen1 (8/18/2023)

Existing SWAC



Post-Remediation SWAC





LEGEND

- Federal Navigation Channel (Source: United States Army Corps of Engineers)
- Remedial Target Area
- Cap Extents
- South Menomonee Canal Project Area
- Menomonee River Recommended Alternative Extent (Alternative 5 per CH2M HILL, Inc. 2019. *Focused Feasibility Study, Menomonee and Milwaukee Rivers, Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin.* May.)

PAH Concentrations (mg/kg)

- < 0.015
- 0.015 - 22.8
- 22.8 - 68.4
- 68.4 - 114
- > 114

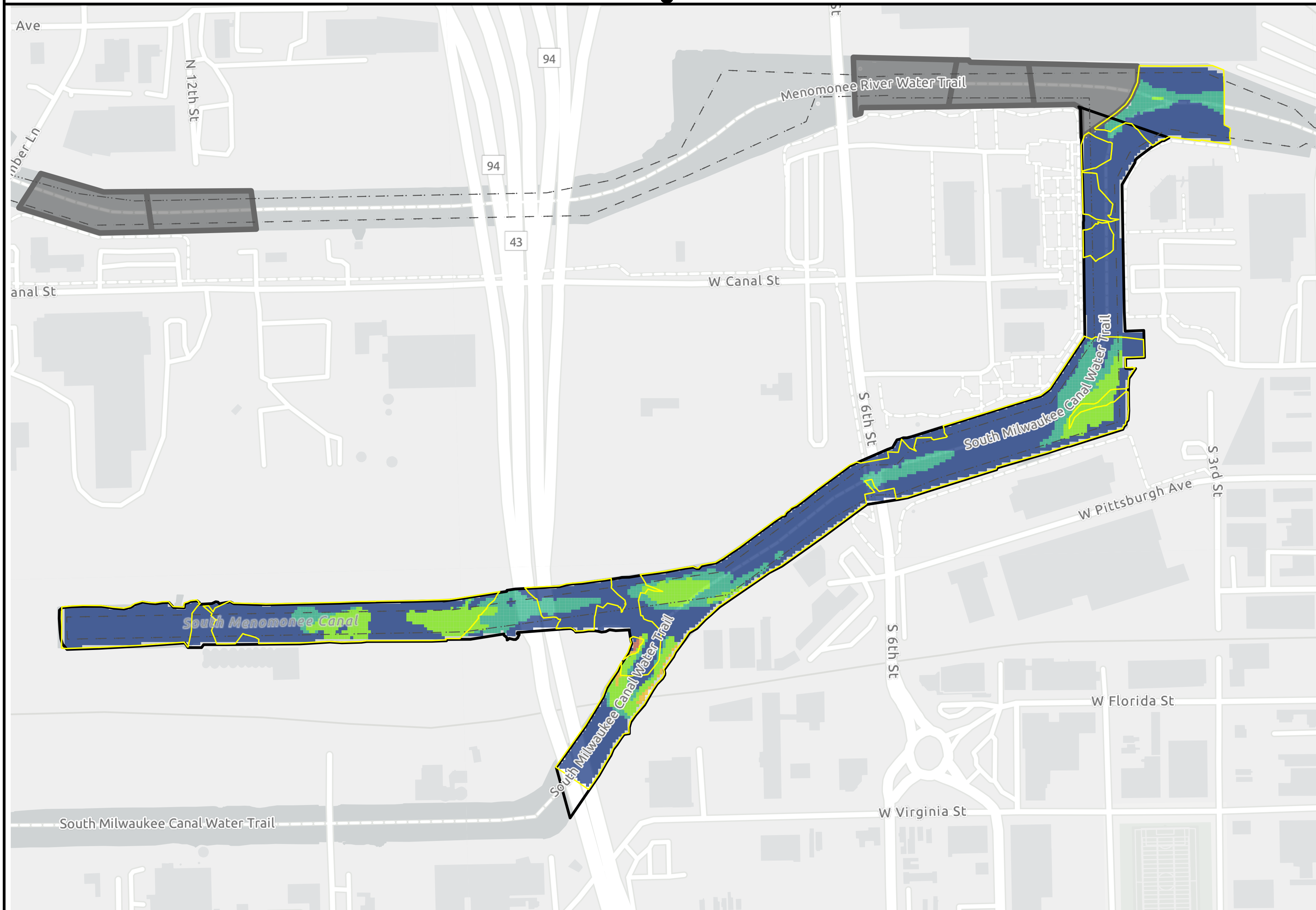
Notes:
1. Basemap source: Esri ArcGIS Online Light Gray Base Map
2. PAH = polycyclic aromatic hydrocarbons; mg/kg = milligrams per kilogram; SWAC = Surface Weighted Average Concentration

Figure E2
Alternative 3A - PAH SWAC Summary
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

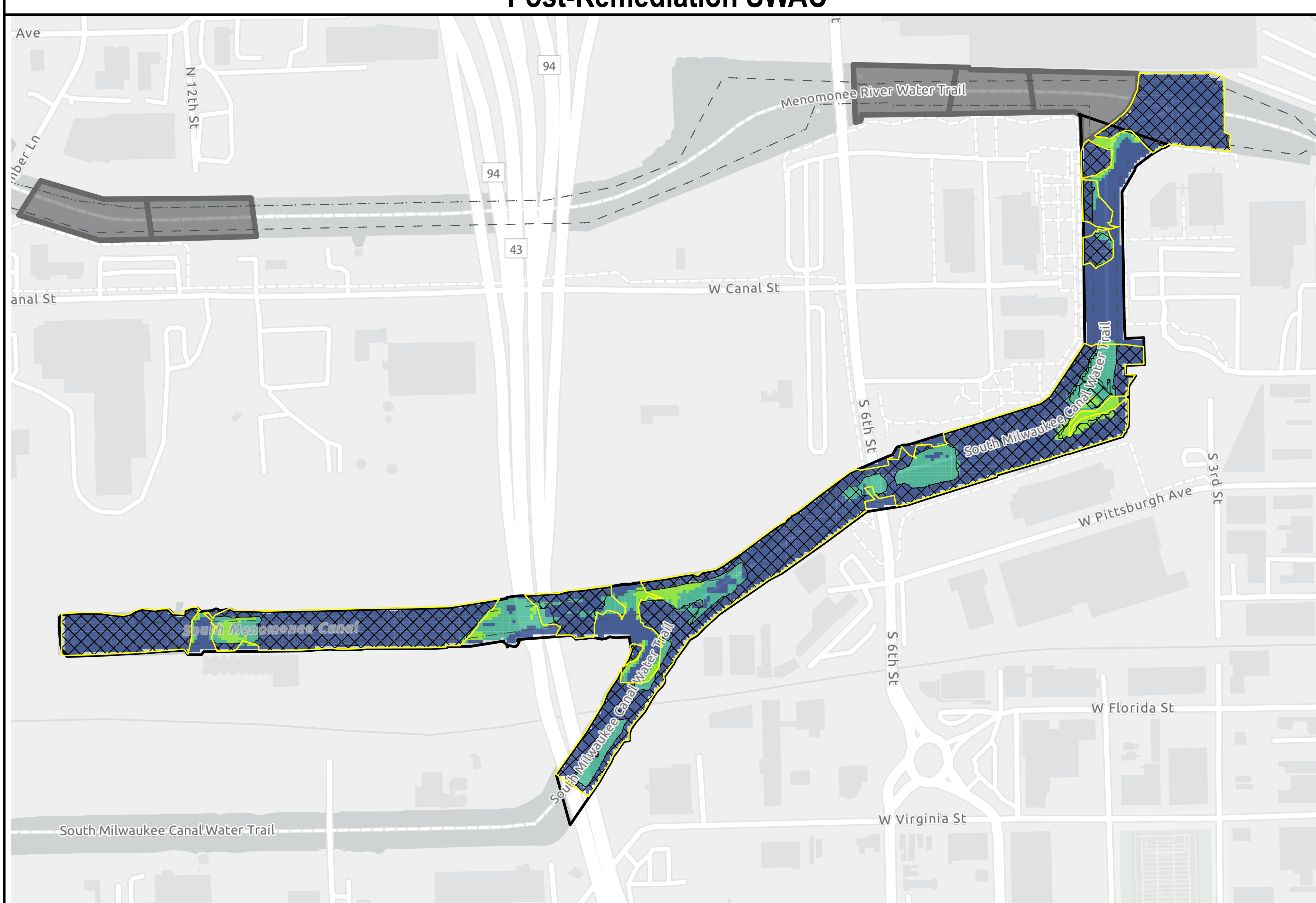
\\dc1vs01\GISProj\E\EPA\681867_MKERiverDownstream\ProDocs\2023\FFS_SMC_Appendix_E\FFS_SMC_Appendix_E.aprx-Figure E2 - SMC PAH SWAC jhansen1 (8/18/2023)

Jacobs

Existing SWAC



Post-Remediation SWAC



LEGEND

- Federal Navigation Channel (Source: United States Army Corps of Engineers)
- Remedial Target Area
- Cap Extents
- South Menomonee Canal Project Area
- Menomonee River Recommended Alternative Extent (Alternative 5 per CH2M HILL, Inc. 2019. *Focused Feasibility Study, Menomonee and Milwaukee Rivers, Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin.* May.)

Chromium Concentrations (mg/kg)

- < 0.28
- 0.28 - 110
- 110 - 330
- 330 - 550
- > 550

N

0 450

Approximate scale in feet

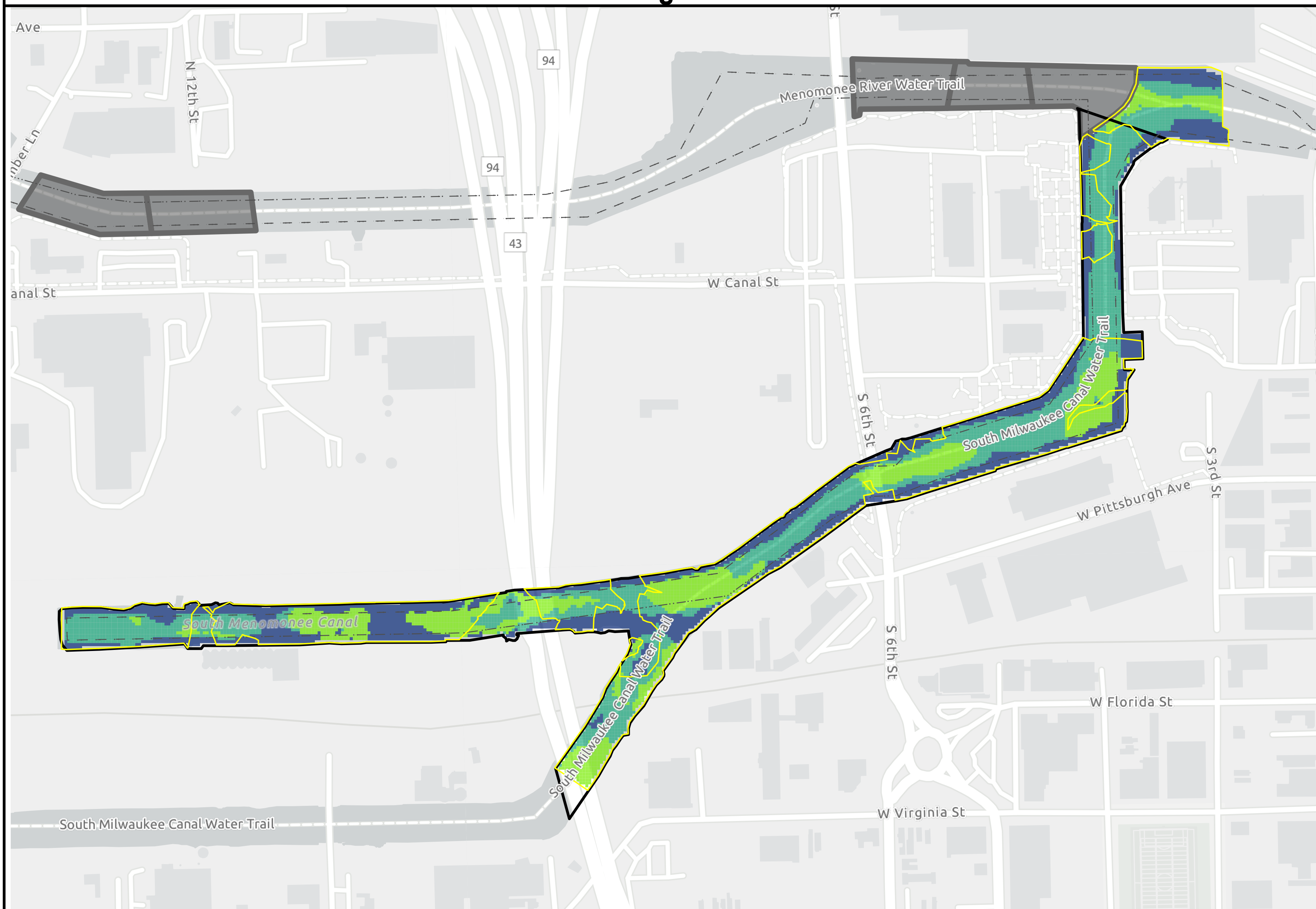
Notes:
1. Basemap source: Esri ArcGIS Online Light Gray Base Map
2. mg/kg = milligrams per kilogram; SWAC = Surface Weighted Average Concentration

Figure E3
Alternative 3A - Chromium SWAC Summary
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

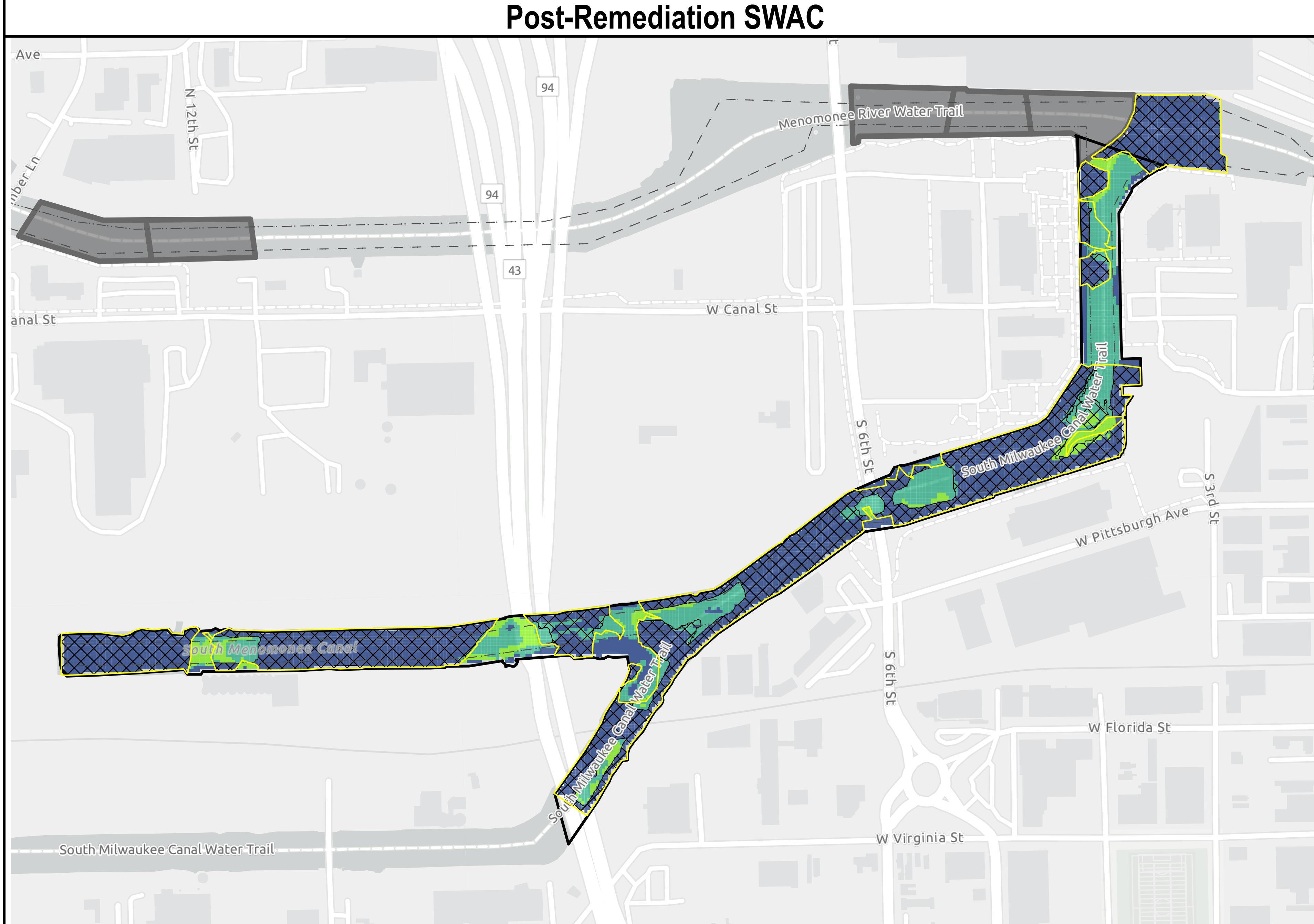
Jacobs

\\dc1vs01\GISProj\E\EPA\681867_MKERiverDownstream\ProDocs\2023\FFS_SMC_Appendix_E\FFS_SMC_Appendix_E.aprx-Figure E3 - SMC Chromium SWAC jhansen1 (8/18/2023)

Existing SWAC



Post-Remediation SWAC



LEGEND

- Federal Navigation Channel (Source: United States Army Corps of Engineers)
- Remedial Target Area
- Cap Extents
- South Menomonee Canal Project Area
- Menomonee River Recommended Alternative Extent (Alternative 5 per CH2M HILL, Inc. 2019. *Focused Feasibility Study, Menomonee and Milwaukee Rivers, Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin.* May.)

Lead Concentrations (mg/kg)

- < 0.60
- 0.60 - 130
- 130 - 390
- 390 - 650
- > 650

N

0 450

Approximate scale in feet

Notes:

1. Basemap source: Esri ArcGIS Online Light Gray Base Map
2. mg/kg = milligrams per kilogram; SWAC = Surface Weighted Average Concentration

Figure E4

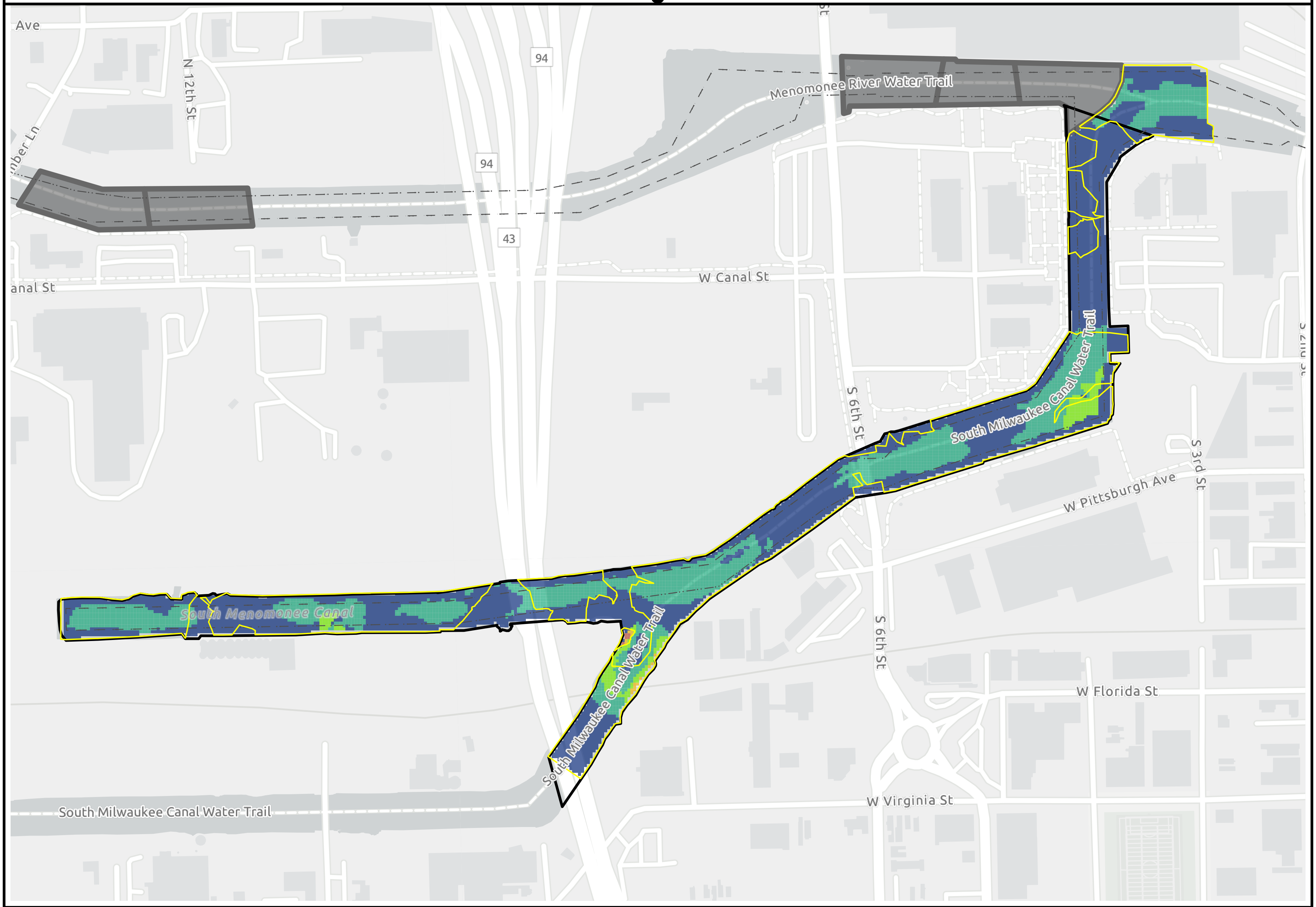
Alternative 3A - Lead SWAC Summary

Milwaukee Estuary Area of Concern

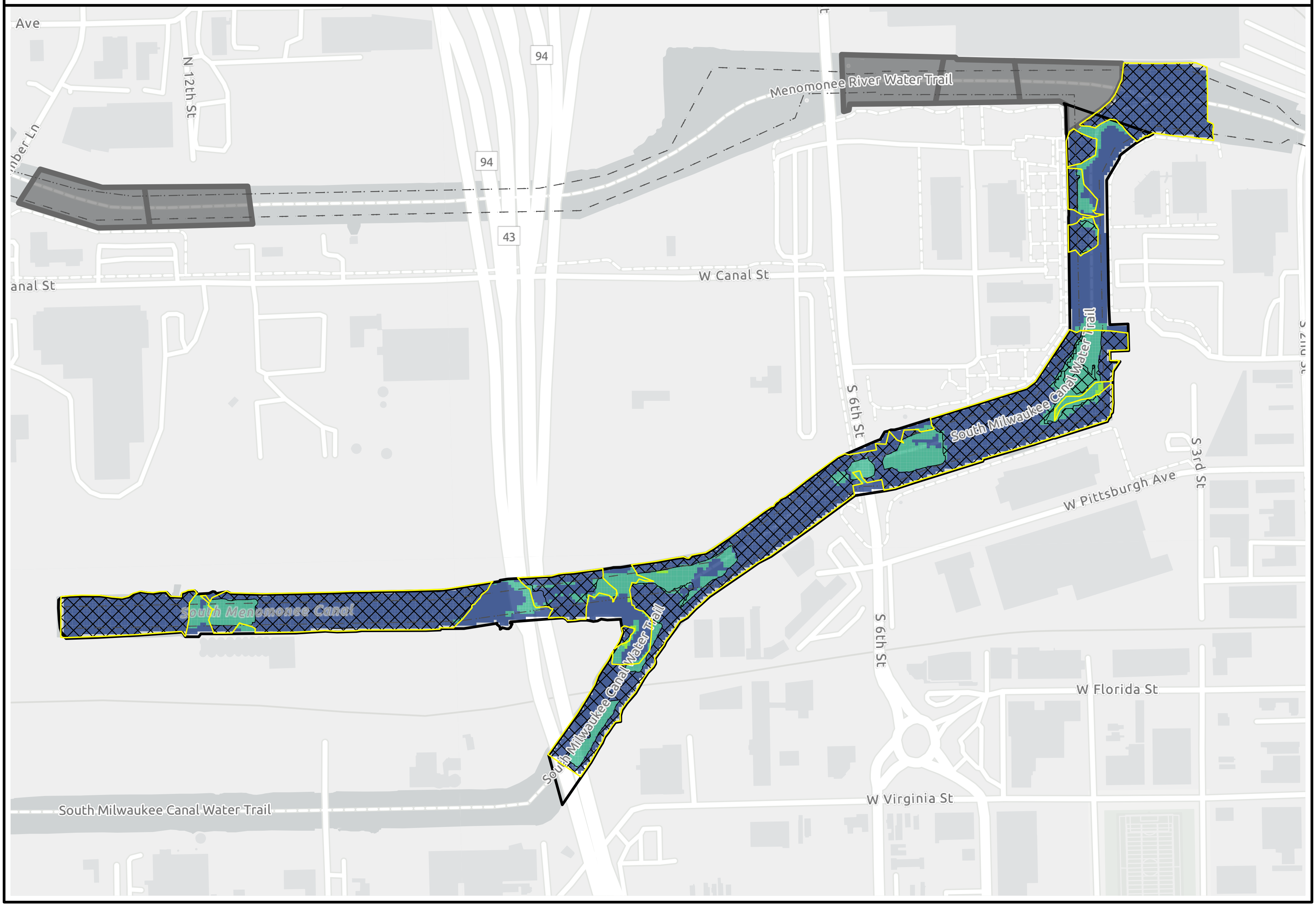
Milwaukee, Wisconsin

Jacobs

Existing SWAC



Post-Remediation SWAC



LEGEND

- Federal Navigation Channel (Source: United States Army Corps of Engineers)
- Remedial Target Area
- Cap Extents
- South Menomonee Canal Project Area
- Menomonee River Recommended Alternative Extent (Alternative 5 per CH2M HILL, Inc. 2019. *Focused Feasibility Study, Menomonee and Milwaukee Rivers, Milwaukee Estuary Area of Concern, Milwaukee, Wisconsin.* May.)

Mercury Concentrations (mg/kg)

- 0 - 0.077
- 0.077 - 1.1
- 1.1 - 3.3
- 3.3 - 5.5
- >5.5

N

0 450

Approximate scale in feet

Notes:
1. Basemap source: Esri ArcGIS Online Light Gray Base Map
2. mg/kg = milligrams per kilogram; SWAC = Surface Weighted Average Concentration

Figure E5
Alternative 3A - Mercury SWAC Summary
Milwaukee Estuary Area of Concern
Milwaukee, Wisconsin

Jacobs

\\dc1vs01\GISProj\E\EPA\681867_MKERiverDownstream\ProDocs\2023\FFS_SMC_Appendix_E\FFS_SMC_Appendix_E.aprx-Figure E5 - SMC Mercury SWAC jhansen1 (8/18/2023)

Appendix F
Frequently Asked Questions

Milwaukee Estuary Contaminated Sediment Cleanup Public Outreach Meetings: Frequently Asked Questions (FAQ)

This document summarizes questions and comments received in association with the public meetings held on November 2, 2023; February 15, 2024; April 25, 2024; and June 13, 2024. Additional information such as posters and technical details describing the contaminated sediment cleanup project are included in the Focused Feasibility Study Report. Please visit the Waterway Restoration Partnership website.

FAQ1: Will the sediment churned up during dredging be a problem downstream /elsewhere in the water?

Construction best management practices (BMPs) will be used during dredging to minimize the impacts from disturbing the sediment. Turbidity curtains will be used around the dredge areas to contain resuspended sediment, and monitoring will be conducted to confirm effectiveness and make modifications to the curtain if needed.

FAQ2: What are the general features of the Dredged Materials Management Facility construction, how is leakage of contamination into the lake prevented once material has been placed inside, and how long will the sediment be in the containment facility?

The Dredged Materials Management Facility (DMMF) has a design life of 100 years and will be a steel structure with an inner and outer wall. The walls will be tied together with steel tie rods and the space between the walls will be filled with aggregate (rock). In addition to the steel walls, there will also be another wall in the middle of the structure which will be 2.5 to 3-feet thick. That center wall, called a soil-mix wall, will be impermeable and will not allow water or contaminants to pass through. Sediment placed in the DMMF will permanently remain there. Sediment will not be filtered or amended in the facility. There will be a temporary water treatment facility during this cleanup project that will treat water that is currently inside the DMMF and precipitation that falls onto the DMMF.

FAQ3: Have fish consumption advisory posters been installed at public fishing locations along the river and Lake Michigan?

Fish consumption signage has been installed at various locations along the Milwaukee River from Lincoln Park to the former North Avenue Dam. Partners are working to identify the best locations for installing additional signs throughout the project areas. The signs provide information that was developed in collaboration with Wisconsin Department of Natural Services (WDNR) and the Wisconsin Department of Health Services (DHS).

For additional information on fish consumption advisories, please visit the Wisconsin Department of Natural Resources.

FAQ4: During the actual "dredging" will there be foul odors in the air? Is there an airborne risk for workers and residential neighbors?

None of the contaminants found in the project areas are expected to produce odors during dredging or excavation. Some of the dredged sediment may contain decaying organic matter that has a distinctive odor. Best management practices (BMPs) will be used during construction to mitigate odors and dust.

FAQ5: Will the Milwaukee River be restored to conditions making the waters safe for swimming as a recreation?

The river and floodplains remedial actions are intended to address the Milwaukee Estuary Area of Concern (AOC) beneficial use impairments (BUIs) that are specific to legacy contaminants such as heavy metals, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). The remedial actions are not designed to address other water quality issues such as bacterial or viral contaminants that could affect safe swimming.

FAQ6: How will the funding of this project, including the habitat projects, be impacted by this being an election year?

Funding has already been appropriated and approved by congress for this project. Currently no impact on federal funding is anticipated.

FAQ7: Regarding the resuspension of sediment from propeller wash, how deep does dredging need to occur to not allow propeller wash?

The depth of influence of propeller wash is vessel-specific and will be evaluated as part of the design. Areas that are dredged and susceptible to propeller wash will be designed to be protective through adequate depths and placement of a cover material to minimize the risk of resuspension.

FAQ8: Has the amount of water displaced by the dredging been evaluated against the flow rate of the river?

A stream gauge located at Jones Island in Milwaukee, Wisconsin measures the flow of water in the Milwaukee River as it enters Lake Michigan. The main source of water to the river is precipitation, including snowmelt and storms. There are several tributaries that feed into the Milwaukee River, including the Menomonee River and the Kinnickinnic River. Seasonal trends show that flow is typically highest in the spring and lowest in the winter. The year over year average measured at the Jones Island gauge is approximately 3,000 cubic feet per second (cfs) with the maximum measured peak flow of 22,000 cfs. The anticipated flow rate for the dredging activities is 20 to 30 cfs, so only a small fraction of the total flow.

FAQ9: What happens to the water after entering into the Dredged Materials Management Facility?

The solids settle within the Dredged Materials Management Facility and the water is removed and treated through a temporary water treatment plant to meet the State of Wisconsin discharge criteria. Treated water is then likely discharged to Lake Michigan. Testing is performed to confirm discharge criteria is being met.

FAQ10: How far will the hydraulic dredges be from the Dredged Materials Management Facility?

The farthest dredge from the Dredged Materials Management Facility (DMMF) will be 3.9 miles. Booster pumps will be used along the pipeline route to facilitate pumping the sediment to the DMMF. Much of the pipeline route will be submerged to avoid conflict with vessel traffic.

FAQ11: What is comprised of the sand layer? Can it survive turbulent storms?

The specific composition of the sand layer will be determined during remedial design. The sand layer is not intended to be an immobile engineered cap, and some movement may occur during large storms. However, engineered caps will be used where contaminated sediment is left in place.

FAQ12: What are the dredging depths?

The dredge depths are designed to remove contaminants which vary in depth across the project area and will be finalized during remedial design.

FAQ13: Are there plans to monitor the ecosystem afterwards?

The Milwaukee River Area of Concern (AOC) has 11 beneficial use impairments (BUIs), 7 of which are related to contaminated sediment. The Remedial Action Plan for the AOC includes a range of actions and monitoring processes for tracking the effectiveness of remedial measures and confirming the restoration of beneficial uses. The sediment remediation projects will contribute to the overall efforts to remove the BUIs and de-list the AOC.

FAQ14: What are the potential wildlife impacts that could be caused by the Dredged Materials Management Facility construction?

A waterfowl study was completed for the existing CDF facility. The area contains mostly migratory species that do not reside in the area permanently, which decreases the potential impact.

FAQ15: Will there be opportunities for hands-on activities and models for the community?

There is a potential to include hands-on activities in forthcoming public engagement activities.

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FAQ16: There is a historic wall on the Pleasant Valley Park side of the river. Will this feature be preserved during the construction?

The historic wall located within Gordon Park, associated with the former bath house, has been noted as a structure of cultural significance. Currently the area of remediation is not anticipated to interfere with the structure.

FAQ17: Have we engineered the Dredged Materials Management Facility to capture natural and unnatural surges?

The DMMF was designed for a range of water levels, wind and wave events, ice, rainfall, and climate change.

Have a question? Looking for a general project overview?

Check out this Fact Sheet for more information including project partner contact information.