Exponent®

Baseline Risk Assessment (Revision 2):

The Peoples Gas Light and Coke Company Willow Street, Division Street, and North Station Operable Units 2 (River), Cook County, Chicago, Illinois

USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

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Acronyms and Abbreviations

ARA	adjacent river area
ARAR	applicable or relevant and appropriate requirement
BLRA	baseline risk assessment
BMI	benthic macroinvertebrate
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAWS	Chicago Area Waterway System
COC	constituent of concern
COPC	constituent of potential concern
CSM	conceptual site model
EcoCAT	Ecological Compliance Assessment Tool
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
ERA	ecological risk assessment
ERAGS	Ecological Risk Assessment Guidance for Superfund
ESB	equilibrium partitioning sediment benchmark
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
IBI	index of biotic integrity
IDNR	Illinois Department of Natural Resources
Illinois EPA	Illinois Environmental Protection Agency
MGP	manufactured gas plant
MRWD	Metropolitan Water Reclamation District
NAPL	nonaqueous-phase liquid
NCP	National Contingency Plan
OBG	O'Brien & Gere Engineers, Inc.
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyls
Peoples	Peoples Gas Light and Coke Company
PVOC	petroleum volatile organic chemical
QC	quality control
RAF	risk assessment framework
RI	remedial investigation
RSL	regional screening level
SL	screening level
SLERA	screening level ecological risk assessment
SSWP	site-specific work plan
SUM-TU	sum of toxic units
TACO	Tiered Approach to Corrective Action Objectives
TO	target organ
TPAH	total polycyclic aromatic hydrocarbons
UCL	upper confidence limit

UTL	upper tolerance limit
VOC	volatile organic compound

1 Introduction

This report presents the baseline risk assessment (BLRA) performed by Exponent for The Peoples Gas Light and Coke Company's (Peoples') North Branch Site (the Site), for the North Branch of the Chicago River areas. The Site is composed of three separate former manufactured gas plant (MGP) sites (Willow Street, Division Street, and North Station). The U.S. Environmental Protection Agency (EPA) has separated each Site into two operable units (OUs), which include OU1, upland and groundwater portions of the former MGPs, and OU2, the river portion of the former MGPs. EPA made this change in naming convention recently, in an email to Peoples dated July 11, 2018. This BLRA, is specifically performed for OU2 of each North Branch of the Chicago River area. Previously, the river area adjacent to the three former MGPs (Willow Street, Division Street, and North Station) had been referred to as the adjacent river area (ARA), but throughout this BLRA the term OU2 is used rather than ARA. This BLRA was performed in conformance with the risk assessment framework (RAF) developed for Peoples. The RAF (Exponent 2007) addresses both human health and ecological risk assessments (HHRA and ERA) and was approved by the EPA in December 2007. RAF addenda were prepared to address changes in human health screening levels (SLs) and vapor intrusion (VI) assessment guidelines since the RAF was developed in 2007. The most current RAF addendum (Revision 6) was issued in August 2017 (Exponent 2017). The RAF and RAF addendum (Revision 6) were used as guidelines for developing the BLRA for the Site.

The RAF (including the addenda) was developed in accordance with EPA risk assessment guidance and provides a common framework used in conjunction with information obtained during the development of the EPA-approved site-specific work plans (SSWPs) for each OU and the remedial investigation (RI) report (Revision 2) being performed by O'Brien & Gere Engineers, Inc. (OBG). The RAF incorporates an adaptive management approach, so that experience from work completed at other sites will inform subsequent site-specific evaluations.

1.1 Scope of Baseline Risk Assessment

This BLRA evaluates both potential human health and ecological risks associated with exposure to surface water and sediments from the North Branch of the Chicago River in OU2 areas.

The human health risk assessment (HHRA) component of this BLRA addresses potential risks to people that may use the North Branch of the Chicago River for recreational purposes. Both recreational and construction worker receptors could be exposed to surface waters as a result of their activities, so risks are assessed for both of these receptors. Because of the depth of the surface water in the river in OU2 (i.e., greater than 3.5 ft), the assessment of potential human exposure and risks to sediment in the river is addressed qualitatively, except for construction workers. Due to the depth of the water, it was considered unlikely that recreational receptors would ever contact river sediments in OU2. For construction workers a quantitative assessment of risk to sediment in OU2 was performed under the assumption that sediments are dredged from the river, which would result in some construction worker contact with the sediments.

The ecological risk assessment (ERA) focuses on addressing potential ecological receptor risks associated with the North Branch of the Chicago River surface water and sediments. The risks to benthic invertebrates that live in the surface water and surficial sediment of the river have been addressed quantitatively through a conservative screening assessment of the surface water and sediment data. Risks to other ecological receptors (fish and aquatic wildlife) are addressed qualitatively.

A site-specific application of the multi-site conceptual site model (CSM) human and ecological exposure pathway was developed specifically for the North Branch of the Chicago River using the methods discussed in the multi-site RAF (Exponent 2007). A habitat assessment was conducted during preparation of the SSWP for each site (Willow/Hawthorne, Division Street Station, and North Station), which documented both the condition of the North Branch of the Chicago River within OU2 and the upland terrestrial habitat (Attachment 1a, b, and c). The North Branch of the Chicago River provides recreational opportunities for the residents of Chicago and habitat for aquatic ecological receptors. For this reason, the BLRA focuses on addressing potential exposures to human and ecological receptors associated with MGP-related constituents in the surface water and sediment of the North Branch of the Chicago River and the potential risks associated with those exposures.

An important aspect of this BLRA is consideration of ambient sediment conditions, meaning conditions present in the surface water and sediments unrelated to former MGP operations. Upstream ambient surface water and sediment data specifically for the North Branch of the Chicago River were collected before the RI was completed to establish ambient conditions in the North Branch of the Chicago River. Based on the results of an ambient sediment investigation conducted on the North Branch of the Chicago River directly upstream of the North Branch of the Chicago River MGP sites, it is known that sediments of the Chicago River system are highly polluted by activities unrelated to former MGP operations. For example, the ambient sediment conditions of the North Branch of the Chicago River exceed, by orders of magnitude, the ecological screening-level sediment benchmarks normally used to address risk to aquatic receptors associated with total polycyclic aromatic hydrocarbon (TPAH) and metals concentrations in sediments. In addition, aquatic toxicity testing of the ambient sediments in the North Branch of the Chicago River revealed that they were moderately toxic to sensitive ecological receptors (i.e., benthic invertebrates) based on the TPAH and metals concentrations. For this reason, the BLRA for the North Branch of the Chicago River also compares the surface water and sediment data to the North Branch of the Chicago River ambient sediment data to put the analyte concentrations detected in OU2 surface water and sediment samples in perspective.

Also, considering the ambient TPAH sediment concentrations were found to be moderately toxic to benthic invertebrates based on the sediment toxicity testing, other less direct lines of evidence such as toxicity modeling for TPAH was not performed as part of the ERA. However, for analytes that were not elevated in ambient sediment samples (e.g., benzene, toluene, ethylbenzene, and xylenes, or BTEX), toxicity modeling was performed in the ERA for investigative sediment samples collected in each OU2 area to evaluate whether sediments of the North Branch Chicago River would be potentially toxic to benthic invertebrates.

For purposes of this BLRA (Revision 2), surface water and sediment data collected during the RI within OU2 were used to complete the BLRA (Revision 2). The exposure pathways

applicable for further evaluation within the BLRA within OU2 for human and ecological receptors are the similar among OU2 areas and so one holistic CSM was developed. However, the risk for human and ecological receptors is discussed separately for each OU2 area (Willow Street, Division Street, and North Station) because the concentrations of analytes are somewhat different within surface water and sediment within each area of OU2.

1.2 Overview of the Baseline Risk Assessment

An overview of the risk assessment process was provided in the RAF (Figure 2 of RAF, Exponent 2007). Initial steps included a site-specific land-use survey and an evaluation of ecological habitat in applicable terrestrial and aquatic environments. These activities were used to refine the site-specific CSM included in the planning documents (e.g., SSWP) and define RI report data needs. Additional information gathered during the development of the RI report was used to further refine the CSM as the first step of the BLRA.

This BLRA includes the following sections:

- Section 2, *Refined Site-Specific Conceptual Site Model*
- Section 3, *Data Evaluation and Preparation for Risk Evaluation*
- Section 4, *Human Health Risk Assessment*
- Section 5, *Ecological Risk Assessment*
- Section 6, *Summary and Conclusions*
- Section 7, *References*.

2 Refined Site-Specific Conceptual Site Model

During development of the SSWPs for the three North Branch MGP sites, site-specific CSMs were developed. As additional data became available during the RI completed for each site, the CSMs were updated. Considering the information gathered for OU2 for the three MGP sites, one holistic refined CSM was developed, which is reflected in Figure 1 of this report. Figure 1 is a matrix that shows the different exposure pathways that are potentially complete under current and potential future site conditions for each receptor. For purposes of developing the CSM, it was assumed that the North Branch Chicago River would continue to be used in a similar way as it is today, which includes a combination of commercial shipping and a mix of recreational uses such as power boating, kayaking, and canoeing. The North Branch Chicago River has been used increasingly for recreational purposes in the past decade due to the valued ecosystem services[1] the river provides to the local community, and this BLRA factors the recreational use of the river into the CSM. Figures 2, 3, and 4 provide pictorial representations of the same information with the added benefit that they provide a depiction of pertinent site features of OU2 that help to reinforce and further explain why certain exposure pathways are potentially complete or are incomplete.

The refined site-specific CSM matrix considers the primary MGP-related constituents (constituents of potential concern [COPCs]), potential transport mechanisms discussed in Section 5.3.1 of the RI report, and the relevant human and ecological receptors appropriate for the North Branch of the Chicago River OU (Figure 1). Within the North Branch of the Chicago River OU, human and ecological receptors may be exposed to constituents in environmental media in OU2 where MGP-related contamination has been documented to occur in sediments. The following subsections describe potential MGP-related constituents and present elements of the refined site-specific CSM. If there are differences in potential exposure to a given environmental media within OU2, these differences are discussed in this section.

2.1 MGP-Related Constituents

The MGP-related constituents of potential concern (COPCs) considered at each of the MGP sites have been the same (Table 1 of the RAF, Exponent 2007), and as more information becomes available through the RI process, beginning with the preparation of the Site Specific Work Plan (SSWP) the list of COPCs is tailored. The site-specific list of COPCs evaluated, by medium, is discussed in Section 3.3 of the RI report, and a tailored listed for each OU2 area is presented below. It should be noted that while MGP-related constituents are defined in the 2007 RAF, all chemicals measured as part of the RI report are evaluated within this BLRA whether they are considered MPG-related COPCs or not. For example, PCBs are not considered MGP-related COPCs, but PCBs were evaluate due to their known presence in the Willow Street OU2 area due to upland OU1 influences from operations unrelated to the former MGP facility.

[1] U.S. EPA definition of ecosystem services: “Ecosystem services are the outputs of functioning ecosystems that contribute to human well-being now or have the potential to contribute in the future” (U.S. EPA 2016a).

OU2	Media	Site-Specific COPCs by OU2 Area
Willow Street	Sediment	Petroleum volatile organic compounds (PVOCs), PAHs, PCBs, phenols, total cyanide, aluminum, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, and zinc
	Surface Water	PVOCs, PAHs, PCBs, phenols, available cyanide, aluminum, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, vanadium, and zinc
Division Street	Sediment	PVOCs, PAHs, phenols, total cyanide, aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, silver, vanadium, and zinc
	Surface Water	PVOCs, PAHs, phenols, available cyanide, aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, vanadium, and zinc
North Station	Sediment	PVOCs, PAHs, phenols, total cyanide, aluminum, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, and zinc
	Surface Water	PVOCs, PAHs, phenols, available cyanide, aluminum, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, and zinc

2.2 Media of Potential Concern

The media of potential concern associated with OU2 include the following:

- Surface water
- Sediment

These are both considered media of potential concern and will be evaluated further as part of this BLRA to assess whether the potential risk to human health and the environment within the North Branch of the Chicago River OU2 are at levels that would warrant further risk management responses.

2.3 Potential Exposure Pathways—Human Health

Under current and likely future land-use conditions in OU2, the potential human receptors and the associated exposure pathways are as follows:

- Recreational users
  - Incidental ingestion of surface water
  - Dermal contact with surface water
- Construction workers

- Dermal contact and incidental ingestion of surface water associated with maintenance/construction activities in OU2 (e.g., diving inspections of infrastructure such as bridge piers, or sheet pile walls)
- Dermal contact and incidental ingestion of sediment associated with maintenance/construction activities that disturb deep subsurface sediment in OU2 (e.g., dredging operations to keep the channel navigable, or diving operation to inspect submerged infrastructure)

The applicability of each of these receptors is addressed in the following subsections by medium.

2.3.1 Potential Surface Water and Sediment Exposure in OU2

Consistent with the RAF, a site-specific evaluation of the potential for exposure of human receptors to surface water and sediment in OU2 was performed based on the data collected during the RI and the use of OU2. The following describes the general conditions, surface water, and sediment within OU2.

2.3.1.1 Willow Street and Division Street OU2 Areas

As described in the RI report, the North Branch of the Chicago River within the Willow Street and Division Street OU2 area typically has water depths ranging from 6 to 11 ft. Access to the river is limited within OU2, because the banks of the river are constrained by dock walls or sheet-pile walls. There are no shallow-water areas that can be used for recreational purposes, such as wading and swimming, in OU2. The water in OU2 is too deep to wade (i.e., greater than 3.5 ft), and the sediment in the canal is soft and would not support the weight of a human, even if the water level were to drop below 3.5 ft in the future. For this reason, exposure of recreational users to the river sediment was not considered a complete exposure pathway. However, to address potential future exposures of construction workers if the sediments were disturbed during maintenance operations within the river, a quantitative evaluation of the risk associated with sediment exposure was performed as part of the BLRA.

Barges may be moored within OU2 to unload scrap metal at the General Iron facility. A recreational boat launch for small watercraft (i.e., a kayak rental facility) is located within the turning basin in this portion of OU2. Considering that the river in and close to OU2 is used for boating, exposure to surface water was evaluated in the BLRA for recreational users based on a quantitative comparison to risks calculated assuming use as residential drinking water. Based on the use of the canal (i.e., boating), there would be limited potential for direct exposure to the surface water within OU2.

2.3.1.2 North Station OU2

Within the North Station OU2 area is the North Branch Canal of the North Branch of the Chicago River. The North Branch Canal, or Ogden’s Canal, is manmade and was completed in 1857 through a clay excavation project. When originally constructed, it was 50 ft wide and 10 ft deep, allowing crafts navigating the river to avoid going around the bend on the west side of

Goose Island. The canal is approximately 100 ft wide today, with water depths ranging from 1.5 to 15 ft. Typical water depths in the majority of the North Station OU2 range from 6 to 10 ft. There is limited access to the canal within OU2 because the banks of the canal are constrained by dock walls or sheet pile walls. There are no accessible shallow water areas that can be used for recreational purposes, such as wading and swimming, in OU2. The depth of the water in OU2 is too deep to wade (i.e., greater than 3.5 ft) other than in a very small area that is generally inaccessible due to the steepness of the rock armored bank it is located adjacent to (see Figure 5).[2] In addition, the sediment in the canal is soft and would not support the weight of a human, even if the water level were to drop below 3.5 ft in the future in other areas of the canal. For these reasons, exposure of recreational users to the canal sediment was not considered a complete exposure pathway. However, to address potential future exposures to construction workers if the sediments were disturbed during maintenance operations along the canal, a quantitative evaluation of the risk associated with sediment exposure was performed similar to the other OU2 areas.[3]

The nearest area in which to moor boats within OU2 is just downstream of the Upland OU1 area, at the condominium complex located directly south of the LaSalle-Chestnut parcel. There is a private dock at this location, where local residents can moor boats. Considering that the canal in OU2 is used for boating, exposure to surface water in OU2 was evaluated in the BLRA for recreational users.

2.4 Potential Exposure Pathways—Ecological Receptors

This section evaluates the potential exposure pathways for ecological receptors as presented in the Generalized CSM. A Site-specific evaluation of the Generalized CSM exposure pathways has been used to develop the ecological component of the North Branch of the Chicago River OU CSM. For the North Station within OU2, an initial CSM for the ERA was developed as part of SSWP Rev 1 based on the results of the qualitative habitat assessment conducted on July 19, 2011. For the Willow/Hawthorne within OU2, an initial CSM for the ERA was developed as part of SSWP Rev 2 based on the results of the qualitative habitat assessment conducted on March 19, 2009. Site conditions have not changed since the original CSM figure was developed, so the ecological component of the CSM (refer to Figure 1) did not require further refinement. The results of the habitat assessment are summarized in Section 5.1, and the habitat assessment for each OU is provided in Attachments 1a, 1b, and 1c.

Based on the results of the habitat assessments, OU2 of the North Branch of the Chicago River provides some limited ecological habitat for aquatic receptors. The details of the ecological CSM for OU2 have not changed since the initial habitat assessments were completed. In

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[2] The area on the east bank of the OU2 area (near PCA-10NOS) where water depths are less than 3.5 ft is inaccessible and very small in size (i.e., approximately 375 ft^2) with approximate dimensions of 5 ft wide by 75 ft long). In addition, the sediments in this area are soft and not conducive for wading. For these reasons further assessment of exposure to these sediments was not considered necessary.

[3] While recreational user exposure to sediments are not expected in this small area of North Station OU2, the risks quantitatively evaluated for construction workers are used for informational purposes to put into perspective the potential risks associated with occasional contact with sediment by recreational users.

summary, OU2 provides no habitat for aquatic mammals due to the engineered nature of the banks. OU2 provides limited habitat for aquatic birds, such as geese and other waterfowl species due to the lack of nesting and foraging habitat. Diving piscivorous (fish-eating) bird species have been observed on the North Branch of the Chicago River and may forage for fish in OU2. OU2 would be expected to provide habitat for both fish and benthic invertebrates, but the habitat conditions for fish and benthic invertebrates of the North Branch of the Chicago River are rated as fair, as documented in the Metropolitan Water Reclamation District (MRWD) of Greater Chicago Report (MWRD 2014 Report No. 14-55) which provides observations made at specific sampling stations monitored in the river. Monitoring station No. 46 at Grand Avenue is located nearest OU2. The fair habitat conditions were typical for other stations along the river and are associated with river conditions unrelated to the former MGP facility and include the channelized nature of the banks, limited river flow, limited instream cover (e.g., vegetation and bottom structure), and excess siltation.

As discussed in Section 1.1, considering these ambient conditions of the North Branch of the Chicago River upstream of the North Branch of the Chicago River OU, an assessment beyond a screening level ERA (SLERA), such as an effects-based evaluation of ecological risk to fish and benthic invertebrates for OU2, would not be informative, because ambient conditions are already known to be somewhat toxic to benthic invertebrates. For this reason, the ERA for OU2 begins with a SLERA and then identifies whether exposures of benthic invertebrates and fish to MGP-related constituents in surface water and sediment depart from ambient river conditions.

3 Data Evaluation and Preparation for Risk Evaluation

This section describes the procedures used to prepare the environmental data for risk evaluation, including (but not limited to) grouping by medium and by depths to consider various potential exposure scenarios. At EPA's request, a "normalized" sample was created for all media at sample locations where a field duplicate sample was collected. Specifically, the maximum value detected in the parent and duplicate samples (i.e., the parent-duplicate pair) for each analyte was used to create the normalized sample for each parent-duplicate pair. For example, if the parent sample had a lead concentration of 30 mg/kg lead and the duplicate sample had a lead concentration of 40 mg/kg; the normalized sample would be assigned a lead concentration of 40 mg/kg. The detailed process used to create the normalized samples is described in detail in the RI report, Section 3.10.

3.1 Surface Water Data Preparation

3.1.1 Willow Street OU2

In December 2011 and November 2012, 12 surface water samples were collected, consisting of four ambient locations with duplicate samples and four site-related samples. The ambient samples were taken in a reach of the River that is not affected by the former MGP sites but has been influenced by the general urban Chicago environment and best represents the ambient conditions near the Site. Site-related samples were collected at four locations to assess water quality within OU2. The data from these two areas (ambient and OU2) were evaluated separately in the BLRA. For the HHRA, metals data for unfiltered samples (i.e., total metals) were used preferentially over filtered samples (i.e., dissolved metals). Concentrations from unfiltered samples more closely represent actual human exposures, because if they are exposed to surface water (e.g., while boating), the water would be in an unfiltered state. For purposes of the ERA, the dissolved and total metals data were both assessed. However, the dissolved metal results are the preferred dataset for comparisons with surface water ecological benchmarks, because these data more accurately reflect the bioavailable fraction of metals to ecological receptors. This is discussed in more detail in Section 5.1.

The RI surface-water data were considered of sufficient quality for risk assessment, with additional detail on data validation provided in the RI. No data were considered unusable.

3.1.2 Division Street OU2

In December 2011 and November 2012, 12 surface water samples were collected, consisting of four ambient sampling locations with duplicate samples and four site-related samples. As discussed above, the ambient samples were taken in a reach of the North Branch of the Chicago River that is not affected by the former MGP sites. Site-related samples were collected at four

locations to assess water quality within OU2. The data from these two areas (ambient and OU2) were evaluated separately in the BLRA.

The RI surface-water data were considered of sufficient quality for risk assessment. No data were considered unusable.

3.1.3 North Station OU2

In November 2012, eight surface water samples were collected, consisting of four ambient and four site-related samples. As discussed above, the ambient samples were taken in a reach of the North Branch of the Chicago River that is not affected by the former MGP sites. Site-related samples were collected at four locations to assess water quality within OU2. The data from these two areas (ambient and OU2) were evaluated separately in the BLRA.

The RI surface-water data were considered of sufficient quality for risk assessment. No data were considered unusable.

3.2 Sediment Data Preparation

3.2.1 Ambient Reach of the North Branch of the Chicago River

In 2011, an ambient sediment investigation was performed upstream of the North Branch MGP site to characterize ambient sediment quality in the North branch of the Chicago River. During the ambient area sediment investigation, 20 ambient locations were sampled for a total of 51 ambient sediment samples. These ambient sediment data were used to characterize ambient conditions in the river and compared to sediment quality in OU2. These 20 locations were specifically selected represent ambient conditions within the area upstream of the MGP sites, which were not influenced by the former MGP operations. The 20 location were selected as to avoid point sources (e.g., storm sewer outfalls) of contamination. There were another nine samples collected in the ambient area to characterize potential point sources (e.g., storm sewer outfalls) within the ambient area, but these samples were not used to characterize general ambient conditions.

The ambient sediment data was segregated into surface (0–0.5 ft) and subsurface (>0.5 ft) depth intervals for purposes of the BLRA.[4] A single sediment sample was collected from 0–1 ft and was used in the analysis of both surface and subsurface sediment data as it spanned both surface and subsurface depth intervals.

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[4] In the RI report, surface sediments are referred to as sediment samples collected from the 0–1.5 ft depth interval. This depth interval was specifically used to compare to ambient concentration limits developed for the 0–1.5 ft depth interval specifically for PAHs to evaluate whether the sediments are similar to or depart from ambient conditions. However, for the BLRA, the top surface layer of sediments sampled during the RI (i.e., 0–0.5 ft depth interval) is used to evaluate surface conditions because this layer represents the bioactive zone where ecological receptors, such as benthic macroinvertebrates, live. Below the top 0.5 ft of sediment, ecological receptors will not normally live, so there is a specific biological reason for using this surface layer in the BLRA.

All the ambient sediment data were considered of sufficient quality for risk assessment.

3.2.2 Willow Street OU2

All Willow Street OU2 sediment data available (collected in 2012 and 2013) from the RI were included for evaluation in the risk assessment. The sediment data from 47 locations in OU2 were used to evaluate sediment quality adjacent to the Site. Sample depths ranged from 0–0.5 ft to 22.5–24.5 ft. The data were segregated into surface and subsurface depth intervals in the same manner as ambient sediments. A small number of nondetect results were rejected and excluded from analysis in this BLRA. Specifically, the rejected data were five results for 2-methylphenol, two results for 3- and 4-methylphenol, one result for acenaphthylene, and two results for dibenz[a,h]anthracene. All other RI sediment data were considered of sufficient quality for risk assessment, with additional detail on data validation provided in the RI.

3.2.3 Division Street OU2

All Division Street OU2 sediment data available (collected in 2012 and 2013) from the RI were included for evaluation in the risk assessment. The sediment data from 88 locations in OU2 were used to evaluate sediment quality adjacent to the Site. Sample depths ranged from 0–0.5 ft to 23.5–24.5 ft. The data were segregated into surface and subsurface depth intervals in the same manner as discussed previously for ambient sediments. A small number of nondetect results were rejected and excluded from analysis in this BLRA. Specifically, the rejected data were one result for dibenz(a,h)anthracene, 2 results for 2,4-dimethylphenol, 26 results for 2-methylphenol, 15 results for 3- and 4-methylphenol, and 18 results for phenol. All other RI sediment data were considered of sufficient quality for risk assessment, with additional detail on data validation provided in the RI.

3.2.4 North Station OU2

All North Station OU2 sediment data available (collected in 2013) from the RI were included for evaluation in the risk assessment. The sediment data from 34 locations in OU2 were used to evaluate sediment quality adjacent to the Site. Sample depths ranged from 0–0.5 ft to 21.5–22.5 ft. The data were segregated into surface and subsurface depth intervals in the same manner as discussed previously for ambient sediments. For one shallower sample (PCA-4NOS, 0.5–1.5 ft), three nondetect phenol results were rejected. These three rejected results were excluded from the sediment data set. Additionally, for four deeper samples (PCA-25NOS, PCA-28NOS, PCA-29NOS, and PCA-29NOS, all at depths 17.5 ft or greater), multiple nondetect results for individual polycyclic aromatic hydrocarbons (PAHs) were rejected. However, detected individual PAH results for all these same samples were found to be acceptable. As a conservative measure, the rejected individual PAH nondetect results were included in the total PAH sum to avoid a low biasing of the sum of total PAH concentrations. All other RI sediment data were considered of sufficient quality for risk assessment.

4 Human Health Risk Assessment

This section provides the results of the HHRA component of the BLRA. The assessment evaluated the potential risks to humans from MGP constituents in the OU2 areas through consideration of site-specific exposure scenarios designed to the conditions in the North Branch Chicago River. The HHRA portion of the BLRA addresses potential risk under both current and potential future land-use conditions in OU2. Consistent with the RAF and the RAF addendum (Revision 6), the HHRA includes a site-specific exposure evaluation to address how people may become exposed to chemical constituents in the surface water and sediment of the North Branch of the Chicago River. This includes a site-specific evaluation of the recreational use of the river and a site-specific evaluation of a construction worker scenario. The construction worker evaluation accounts for such site-specific conditions as nonaqueous-phase liquid (NAPL) in the subsurface sediments. While there are no planned construction activities within OU2, risks associated with a construction worker scenario were addressed quantitatively by assessing the risk associated with a generic construction project that included excavating sediments as part of the hypothetical construction project. A summary of the receptors and pathways evaluated is presented in the CSM Figures 1 through 4. A summary of the COPC screening results and associated risk estimates by area within OU2 are presented in Table 1a. The risk tables referenced in the HHRA are found exclusively on the BLRA Backup CD. The risk tables include the quality control (QC) information necessary to check the risk calculations.

As the first step in the HHRA, the analytical data was screened based on EPA risk assessment guidance (U.S. EPA 1989, 1991) and what is known about current and potential future uses of the Site. The goal of the screening process is to identify whether constituents exist within the media at the ambient and OU2 areas at concentrations that may warrant further evaluation (i.e., COPCs) and to focus further evaluation on the specific constituents most likely to be associated with potential human toxicity. This screening step is performed by comparing the maximum concentration of a chemical in a medium to its medium SL. If the maximum concentration of a chemical exceeds its SL, then it is retained as a COPC for further evaluation in the HHRA. The specific SLs used are described in each medium-specific section (i.e., Sections 4.1, and 4.2). It should be noted that the SLs are sometimes not risk-based values and so are not used for performing risk calculations. The methods used to perform human health risk calculations are described below.

Consistent with the RAF addendum (Revision 6, Exponent 2017) for noncarcinogenic chemicals, an additional evaluation was performed to check whether exposure to the multiple chemicals identified within the Upland OUs would result in exceedance of the cumulative noncancer risk target (i.e., a hazard index [HI] of 1) even if no one chemical noncancer hazard quotient (HQ) exceeded the noncancer risk target of 1. For simplicity, all detected analytes were evaluated within the BLRA to perform this additional noncancer risk evaluation, meaning the noncancer risks presented in this BLRA are for all detected analytes, not just for the identified COPC. So if the calculated noncancer risk is 1 or less for the scenario presented in the risk assessment, then it is known that the cumulative noncancer risk from all detected chemicals is not resulting in a noncancer risk greater than 1. If the sum of the HQs for the receptor for the specific medium (i.e., sediment or surface water) resulted in an HI exceeding 1 only as a result

of summing individual HQs less than 1, then the HI by target organ (TO) system (e.g., nervous system) would be calculated to determine whether the TO system HI was still above 1. However, in the case of this BLRA, that condition did not occur, and so a TO evaluation did not need to be performed.

Risk estimates were calculated using a simple ratio method based on regional screening levels (RSLs) updated May 2019 and the target risk incorporated into the RSLs (U.S. EPA 2019). For example, if a cancer-based RSL for a chemical is 10 mg/kg based on a target risk of 1×10^{-6}, then a site concentration of 20 mg/kg would be associated with a 2×10^{-6} cancer risk. Similarly, if a noncancer-based RSL for a chemical is 10 mg/kg based on a target HQ of 1, then a site concentration of 20 mg/kg would be associated with an HQ of 2. This approach is equivalent to doing a complete risk calculation using all the exposure parameters and toxicity factors used in the RSLs.

For the generic construction worker scenario, the EPA Risk Calculator was used to calculate a set of site-specific construction worker RSLs for sediments.[5] The ratio method described above was used with the site-specific construction worker RSLs to estimate risks to construction workers. The exposure assumptions are described in detail in Attachment 2. The exposure duration for the site-specific construction worker scenario was assumed to be 1 year, and the exposure frequency was assumed to include 30 days of exposure to soil from excavation and backfilling activities. It should be noted that the generic construction worker scenario would overestimate exposure and risk where intrusive excavation work did not occur (e.g., construction activities did not include excavation of sediments from OU2). However, the generic construction worker scenario could potentially underestimate risks if the construction project were to include much more intrusive work than assumed. The exposure assumptions described above (i.e., 1 year and 30 days) were selected to mirror the assumptions used by the Illinois Environmental Protection Agency (Illinois EPA) to develop their construction worker soil SLs, as these had been vetted through a formal risk-based process tailored for Illinois. There are no formal sediment RSLs, but as specified in RAF addendum (Revision 6), a site-specific evaluation of construction risk is to be performed for sediments. In the case of the OU2 areas, it was assumed that the sediment would be wet when excavated, and so the site-specific RSLs developed took that condition into consideration, along with the site-specific characteristics of the sediments (e.g., total organic carbon content and water filled porosity). The specific assumptions used to calculate the site-specific construction worker RSLs are presented in Attachment 2.

For risk assessment purposes, estimates of expected long-term average exposure point concentrations (EPCs) are typically represented by the upper confidence limit (UCL) of the arithmetic mean (U.S. EPA 1989). Because the UCL of the arithmetic mean typically falls between the mean and the maximum, risks were estimated initially using the mean and maximum for each data set. If the calculation of a UCL of the arithmetic mean would provide additional clarification as to the level of potential risk, and adequate data were available, then

[5] The site-specific construction worker RSLs incorporate the latest toxicity information available from EPA and construction worker exposure assumptions, and so are used for purposes of performing construction worker risk calculations rather than the TACO construction worker soil SLs. Some of the TACO construction worker soil SLs are also not risk-based and so are inappropriate for performing risk calculations.

the UCL of the arithmetic mean calculation would be performed. For this assessment, UCLs were calculated for surface sediments and all sediments (i.e., sediments collected at all depth intervals) for each OU2 area using ProUCL software version 5.1 (U.S. EPA 2016b), because the initial calculated risks using the mean and maximum concentrations demonstrated that the UCL of the arithmetic mean would provide additional clarification concerning the potential risk (refer to Attachments 3a1 and 3a2 [Willow Street], Attachments 3b1 and 3b2 [Division Street] and Attachments 3c1 and 3c2 [North Station]).

Although the determination of a target risk level is ultimately a decision to be made by risk managers, the findings presented here are compared with the range of risk levels cited in EPA's National Contingency Plan (NCP) (U.S. EPA 1990), which EPA describes as the "blueprint for the Superfund law." The NCP (40 CFR 300.430 [e] [2]) states, "For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6} using information on the relationship between dose and response." Illinois EPA, in the Tiered Approach to Corrective Action Objectives (TACO) (35 IAC, Part 742), considers the same values to be a risk management range. A later EPA memo states that "where the cumulative site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4} and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts." The memo goes on to state:

> A risk manager may also decide that a baseline risk level less than 10^{-4} is unacceptable due to site-specific reasons, and that remedial action is warranted … Other chemical-specific ARARs [Applicable or Relevant and Appropriate Requirements] may also be used to determine whether a site warrants remediation. (U.S. EPA 1991)

TACO further specifies that when the target cancer risk ranges from 1 in 1,000,000 (10^{-6}) to 1 in 10,000 (10^{-4}) at the point of human exposure, or a target HQ is greater than 1 at the point of human exposure, then further evaluation is warranted (Illinois EPA 2013). TACO, however, does require that institutional controls be placed on property where remediation objectives are based on assumptions that include a cancer risk greater than 1 in 1,000,000; a target HQ greater than 1; engineered barriers; exclusion of exposure routes; industrial/commercial property use; a diffusion only mode of contaminant transport for the indoor inhalation pathway; use of an indoor inhalation building control technology; for the indoor inhalation route, the presence of a building with a full concrete slab-on-grade or full concrete basement floor and walls; or any combination of the above.

Within the risk characterization sections that follow for surface water and sediments, the risks are compared to the risk management criteria presented above, which include the cancer risk range of 10^{-6} to 10^{-4} and the noncancer risk criterion of a HI of less than 1. If the cancer risk is not above the upper end of the risk range and the noncancer HI is less than 1, then the risks are referred to as being within the risk management criteria. If the cancer risk is above the upper end of the risk range <u>or</u> the noncancer HI is greater than 1, then the risks are referred to as not being within the risk management criteria. If the cancer risk is below the lower end of the risk range and the noncancer HI is less than one, then the risks are referred to as being below the risk management criteria.

4.1 Surface Water

Surface water data were screened against groundwater SLs available in the RAF addendum (Revision 6) for Illinois multi-site MGPs. No surface water SLs are available specifically for a recreational use or a construction worker exposure scenario, and so the groundwater SLs were used as a conservative screen for contact and incidental ingestion of North Branch of the Chicago River surface water. The groundwater SLs are considered conservatively low as a screening tool for surface water, because the groundwater SLs were derived to be protective of domestic use of groundwater for drinking and bathing; people are not expected to drink the water in the Chicago River. The screening assessment was performed separately for all three OU2 areas. As noted before, the assessment was completed on all detected chemicals within an OU2 area and not just on COPCs.

The surface water data was segregated by OU2 area and used to address two different potential exposure scenarios:

- Recreational user contact with and incidental ingestion of surface water while performing recreational boating such as with stand-up paddle boards, kayaks, or canoes.
- Construction worker contact with surface water during construction and maintenance activities, such as diving operations to inspect and construct bridges below the water surface.

The risks were calculated using the most current tapwater RSLs developed by EPA and summarized in the RAF addendum (Revision 6) and using both maximum and arithmetic mean average surface water concentrations as the EPCs. Considering that the tapwater RSLs that the surface water risks were based on were developed for ingestion of drinking water and use of water for bathing and washing clothes on a daily basis by residents, the risks presented for each OU2 area are orders of magnitude higher than the actual risks that would occur due to the limited exposure to surface water either a recreational user or construction worker would have. For example, a typical recreational or worker scenario would assume significantly less exposure than the residential scenario used to derive the tapwater RSLs. Exposure inputs used to develop the residential tapwater RSLs include an assumed ingestion rate of 2 L/day of water. In contrast, for recreational exposures, a study of incidental ingestion of surface water during kayaking or canoeing found an ingestion rate of 0.011 L/hour (U.S. EPA 2011). If a typical recreational exposure duration is assumed to be 4 hours, that would yield an incidental ingestion of surface water of 0.044 L/day, which is just 2% of (or 45 times lower than) the volume of water assumed for the residential drinking-water scenario. Similarly, the residential criteria assume ingestion of water 350 days/year, whereas for a typical recreational visitor or worker, an exposure frequency of about 30 days/year would be much more applicable. Therefore, this equates to the exposures for a recreational or worker exposure scenario being lower by an additional factor of 10. Furthermore, the residential tapwater RSLs include risks associated with full-body dermal exposures and inhalation during activities such as showering, which would not likely be applicable to either recreational or worker exposure to the North Branch Chicago River surface water due to the nature of the activities. Thus, risks associated with surface water exposure for a typical recreational visitor or worker would be expected to be over 100 times lower than that

predicted using the tapwater RSLs. For this reason, the risk presented based on the tapwater RSLs in the following subsection should be considered very conservative in nature.

The results of the surface water risk assessment are summarized by OU2 area in Table 1a and by OU2 area below. The surface water risks within OU2 were also compared to the risks associated with surface water contact in the upstream ambient area of the North Branch of the Chicago River, as this provides a point of comparison to an area unaffected by former MGP activities.

4.1.1 Ambient Area – Recreational User and Construction Worker Scenarios

When surface water concentrations in the ambient samples were conservatively screened against groundwater SLs, there were exceedances for benzo(a)anthracene, benzo(a)pyrene, and dissolved arsenic (Table 1a and 2a).

The list of samples and analytes upon which the risk calculations were based can be found in Table 2a, and the locations of the samples are presented in Figure 7 of the RI report. Risks calculated using the ratio method with the tapwater RSLs as a point of reference for a recreational and construction worker scenario yielded a maximum cumulative cancer risk estimate of 2×10^{-5} and an average cumulative cancer risk estimate of 1×10^{-5}, which are within the risk management range. For these two scenarios, a maximum noncancer HI of 0.3 and an average noncancer HI of 0.2 were estimated, which are less than the nonhazard risk criterion of 1 (Table 1a and 4a on CD). These results indicate that estimated potential risks would be within the risk management criteria (i.e., within the risk management range for cancer risks and below an HI for noncancer risks) if recreational users were exposed to the surface water during recreational boating (e.g., kayaking) or if construction workers were exposed to surface water during a future construction project within the ambient area which led to incidental dermal contact with or ingestion of surface water. As discussed above, considering that the tapwater RSLs that the surface water risks were based on were developed for daily ingestion of drinking water and use of water for bathing and washing clothes these risks are likely orders of magnitude higher than the actual risks that would occur due to the limited exposure to surface water either receptor would have. For this reason, the actual risks are estimated to be below the risk management criteria.

4.1.2 Willow Street – Recreational User and Construction Worker Scenario

When surface water concentrations in the Willow Street OU2 were conservatively screened against groundwater SLs, there were exceedances for benzo(a)pyrene, naphthalene, dissolved arsenic, and total arsenic (Table 1a and 3a).

The list of samples and analytes upon which the risk calculations were based can be found in Table 3a, and the locations of the samples are presented in Figure 8A of the RI report. Risks calculated using the ratio method with the tapwater RSLs as a point of reference for a recreational and construction worker scenario yielded a maximum cumulative cancer risk estimate of 5×10^{-5} and an average cumulative cancer risk estimate of 2×10^{-5}, which are within

the risk management range. For these two scenarios, a maximum noncancer HI of 1.0 and an average Noncancer HI of 0.3 were estimated, which are equal to or less than the nonhazard risk criterion of 1 (Table 1a and 3a on CD). These results indicate that estimated potential risks would be within the risk management criteria if recreational users were exposed to the surface water during recreational boating (e.g., kayaking) or if construction workers were exposed to surface water during a future construction project within the Willow Street OU2 that led to incidental dermal contact with or ingestion of surface water. As discussed previously, considering that the tapwater RSLs that the surface water risks were based on were developed for ingestion of drinking water and use of water for bathing and washing clothes on a daily basis, these risks are likely orders of magnitude higher than the actual risks that would occur due to the limited exposure to surface water either receptor would have. For this reason, the actual risks are estimated to be below the risk management criteria.

4.1.3 Division Street – Recreational User and Construction Worker Scenario

When surface water concentrations in the Division Street OU2 were conservatively screened against groundwater SLs, there were exceedances for benzo(a)anthracene, benzo(a)pyrene, and dissolved arsenic (Table 1a and 4a on CD).

The list of samples and analytes upon which the risk calculations were based can be found in Table 4a, and the locations of the samples are presented in Figure 8B of the RI report. Risks calculated using the ratio method with the tapwater RSLs as a point of reference for a recreational and construction worker scenario yielded a maximum cumulative cancer risk estimate of 2×10^{-5} and an average cumulative cancer risk estimate of 1×10^{-5}, which are within the risk management range. For these two scenarios, a maximum noncancer HI of 0.2 and an average noncancer HI of 0.1 were estimated, which are below the nonhazard risk criterion of 1 (Table 1a and 4a on CD). These results indicate that estimated potential risks would be within the risk management criteria if recreational users were exposed to the surface water during recreational boating (e.g., kayaking) or if construction workers were exposed to surface water during a future construction project within the Division Street OU2 that led to incidental dermal contact with or ingestion of surface water. As mention for the other OU2 area, considering that the tapwater RSLs that the surface water risks were based on were developed for ingestion of drinking water and use of water for bathing and washing clothes on a daily basis, these risks are likely orders of magnitude higher than the actual risks that would occur due to the limited exposure to surface water either receptor would have. For this reason, the actual risks are estimated to be below the risk management criteria.

4.1.4 North Station – Recreational User and Construction Worker Scenario

When surface water concentrations in the North Station OU2 were conservatively screened against groundwater SLs, there were exceedances for benzo(a)anthracene, benzo(a)pyrene, and total arsenic (Table 1a and 5a on CD).

The list of samples and analytes upon which the risk calculations were based can be found in Table 5a, and the locations of the samples are presented in Figure 8C of the RI report. Risks calculated using the ratio method with the tapwater RSLs as a point of reference for a recreational and construction worker scenario yielded a maximum cumulative cancer risk estimate of 3×10^{-5} and an average cumulative cancer risk estimate of 2×10^{-5}, which are within the risk management range. For these two scenarios, a maximum noncancer HI of 0.4 and an average noncancer HI of 0.3 were estimated, which are below the nonhazard risk criterion of 1 (Table 1a and 5a on CD). These results indicate that estimated potential risks would be within the risk management criteria if recreational users were exposed to the surface water during recreational boating (e.g., kayaking) or if construction workers were exposed to surface water during a future construction project within the North Station OU2 that led to incidental dermal contact with or ingestion of surface water. As mentioned for the other OU2 areas, considering that the tapwater RSLs that the surface water risks were based on were developed for ingestion of drinking water and use of water for bathing and washing clothes on a daily basis, these risks are likely orders of magnitude higher than the actual risks that would occur due to the limited exposure to surface water either receptor would have. For this reason, the actual risks are estimated to be below the risk management criteria.

4.2 Sediment

There are no available sediment SLs, but as described previously, construction worker soil SLs were used as a surrogate set of sediment SLs. This is consistent with the construction workers sediment screening approach for construction workers presented in the RAF addendum (Revision 6). The construction worker soil SLs are selected using a process described in detail in the RAF addendum (Revision 6)[6] and do not necessarily represent a risk-based concentration limit. The risk estimates presented later within this section are estimated using risk-based concentration limits in all cases.

EPA does not have construction worker soil RSLs, so the construction worker TACO values were used as the first tier in the hierarchy for the construction worker soil SLs (refer to Table 5 in the RAF addendum [Revision 6]; Exponent 2017). The TACO construction worker SLs were derived using exposure assumptions more applicable to construction projects. For example, the exposure frequency for derivation of the construction worker TACO values is 30 days/year and the exposure duration is 1 year. The first step in each construction worker risk evaluation is an SL evaluation using the appropriate construction-worker SL for each analyte. The lowest of the available construction worker TACO criteria (ingestion or inhalation routes) was used as the construction worker SL.

If a TACO construction worker value was not available, then a non-TACO value was derived using the 2017 Illinois EPA guidelines for construction workers.[7] Non-TACO values are

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[6] The RAF addendum (Revision 6) was issued in August 2017. Since that time, four revisions of the RSLs have been published by EPA, in November 2017, May 2018, November 2018, and May 2019. As a result of these four revisions, there were no updates to the RSLs necessary for the MGP-related constituents evaluated in this BLRA.

[7] Illinois Environmental Protection Agency Tiered Approach to Corrective Action Objectives: http://www.epa.illinois.gov/topics/cleanup-programs/taco/index

developed using provisional toxicity values provided by Illinois EPA and are not promulgated soil standards within Illinois. The selection of construction worker non-TACO values followed the same scheme as that developed for TACO values (i.e., the lowest of the available ingestion- and inhalation-based values was selected).

For screening soil arsenic concentrations, the Illinois-specific background concentration for soils in the metropolitan area, 13.0 mg/kg, was used, as recommended by Illinois EPA in TACO (Illinois EPA 2013) and incorporated into the RAF addendum (Revision 6) (Exponent 2017). Additionally, if a risk-based concentration exceeds either the soil saturation concentration or the ceiling limit of 100,000 mg/kg, the appropriate lower value replaced the risk-based concentration as the SL. However, risks estimated using the ratio method (described above) are based on the most current toxicity value available, as reflected in the risk-based RSLs.

Lead is treated as a special case in the screening assessment. Currently, EPA is updating the screening process for lead in soil; however, the update has not been issued yet. In the interim, we have used the TACO construction worker SL of 700 mg/kg as the SL for sediments. EPA requested that the maximum lead concentration in soil be used for purposes of the screening assessment, and so we have adopted this convention for this BLRA.

As an initial step in the sediment screening process, the sediment data was segregated by OU2 area and then into two groupings to address two different potential construction worker scenarios:

- Surface sediments (0–0.5 ft) to address sediment exposure for construction projects not requiring intrusive activities into the sediment but which may result in sediment contact (e.g., diving inspections).
- All sediment within an OU2 area to address the potential for contact to sediment as a result of intrusive sediment work, such as related to excavation of sediment for bridge installation or utility repair.

The results of the construction worker screening assessment are summarized in Tables 6 through 13, and the results of the risk assessment for the sediments in each OU2 area are described below by depth interval. As noted in Section 2, recreational users are not expected to be exposed to sediment because of the depth of water in OU2; therefore, no risk evaluation for contact with sediments was considered necessary for recreational users of OU2. However, a qualitative assessment of potential risk associated with fish consumption from the Chicago River is included to address this potential exposure pathway.

4.2.1 Ambient Area – Construction Worker Scenario

Surface and subsurface sediments were screened against the construction worker SLs to put the COPCs that are present in the North Branch of the Chicago River unrelated to the former MGP activities in perspective. This is presented before the OU2 area screening and risk assessment to provide an appropriate point of comparison to the COPCs identified in each OU2 area, because some of the COPCs are similar.

When surface sediment concentrations in the ambient area were screened against construction worker SLs, there were exceedances for benzo(a)pyrene, naphthalene, chromium, and lead (Table 6). When subsurface sediment concentrations in the ambient area were screened against construction worker SLs, this same list of COPCs were identified (Table 7).

4.2.2 Willow Street OU2 – Construction Worker Scenario

4.2.2.1 Surface Sediments

When surface sediment concentrations in the Willow Street OU2 area were screened against construction worker SLs, there were exceedances for naphthalene, polychlorinated biphenyls (PCBs), and lead (Table 1a and 8).

The list of samples and analytes upon which the risk calculations were based can be found in Table 8a, and the locations of the samples are presented in Figure 8A of the RI report. Risks calculated using the ratio method for a construction worker scenario, along with the UCL[8] of the arithmetic mean concentration, yielded a cumulative cancer risk estimate of 2×10^{-7}, which is below the risk management range. For the construction worker scenario, a noncancer HI of 0.4 was estimated, which is below the nonhazard risk criterion of 1 (Table 1a and 8a on CD). These results indicate that estimated potential risks would be within the risk management criteria if construction workers were exposed to surface sediments during a future construction project that included digging activities.

Lead was selected as a COPC in this OU2 area, but the arithmetic average lead concentration in surface sediments is 513 mg/kg (Table 8), which is below the 700 mg/kg screening criterion for construction workers. For this reason, lead exposure is not expected to pose a health concern to construction workers.

4.2.2.2 All Sediments

When sediment concentrations at all depth intervals in the Willow Street OU2 area were screened against construction worker SLs, there were exceedances for benzene, ethylbenzene, toluene, o-xylene, m+p-xylenes, xylenes, total, 1-methylnaphthalene, 2-methylnaphthalene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, 1,2,4-trimethylbenzene, PCBs, chromium, iron, lead, and mercury (Table 1a and 9).

The list of samples and analytes upon which the risk calculations were based can be found in Table 9a, and the locations of the samples are presented in Figure 8A of the RI report. Risks

[8] Because the UCL of the arithmetic mean typically falls between the mean and the maximum, risks were estimated initially using the mean and maximum for each data set. Because the calculation of a UCL of the arithmetic mean would provide additional clarification as to the level of potential risk, and adequate data was available to calculate the UCLs, the initial risk estimates were refined by using the UCL of the arithmetic mean to calculate the risk estimates for this scenario.

calculated using the ratio method for a construction worker scenario, along with the UCL[9] of the arithmetic mean concentration, yielded a cumulative cancer risk estimate of 5×10^{-7}, which is below the risk management range. For the construction worker scenario, a noncancer HI of 1 was estimated, which is equal the nonhazard risk criterion of 1 (Table 1a and 9a on CD). These results indicate that estimated potential risks would be within the risk management criteria if construction workers were exposed to all sediments during a future construction project that included digging activities. However, MGP residuals (i.e., NAPL) have been observed in subsurface sediments (>0.5 ft), and direct contact with these residuals would pose a potential risk to construction workers above the risk management range if they were to encounter residuals while performing intrusive activities.

Lead was selected as a COPC in this OU2 area, but the arithmetic average lead concentration in surface sediments is 567 mg/kg (Table 9), which is below the 700 mg/kg screening criterion for construction workers. For this reason, lead exposure is not expected to pose a health concern to construction workers.

4.2.3 Division Street OU2 – Construction Worker Scenario

4.2.3.1 Surface Sediments

When surface sediment (0–0.5 ft) concentrations in the Division Street OU2 area were screened against construction worker SLs, there were exceedances for naphthalene, arsenic, chromium, and lead (Table 1a and 10 on CD).

The list of samples and analytes upon which the risk calculations were based can be found in Table 10a, and the locations of the samples are presented in Figure 8B of the RI report. Risks calculated using the ratio method for a construction worker scenario, along with the UCL[10] of the arithmetic mean concentration, yielded a cumulative cancer risk estimate of 9×10^{-8}, which is below the risk management range. For the construction worker scenario, a noncancer HI of 0.4 was estimated, which is below the nonhazard risk criterion of 1 (Table 1a and 10a on CD). These results indicate that estimated potential risks would be within the risk management criteria if construction workers were exposed to surface sediments during a future construction project that included digging activities.

Lead was selected as a COPC in this OU2 area, but the arithmetic average lead concentration in surface sediments is 392 mg/kg (Table 10), which is below the 700 mg/kg screening criterion

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[9] Because the UCL of the arithmetic mean typically falls between the mean and the maximum, risks were estimated initially using the mean and maximum for each data set. Because the calculation of a UCL of the arithmetic mean would provide additional clarification as to the level of potential risk, and adequate data was available to calculate the UCLs, the initial risk estimates were refined by using the UCL of the arithmetic mean to calculate the risk estimates for this scenario.

[10] Because the UCL of the arithmetic mean typically falls between the mean and the maximum, risks were estimated initially using the mean and maximum for each data set. Because the calculation of a UCL of the arithmetic mean would provide additional clarification as to the level of potential risk, and adequate data was available to calculate the UCLs, the initial risk estimates were refined by using the UCL of the arithmetic mean to calculate the risk estimates for this scenario.

for construction workers. For this reason, lead exposure is not expected to pose a health concern to construction workers.

4.2.3.2 All Sediments

When sediment concentrations at all depth intervals in the Division Street OU2 area were screened against construction worker SLs, there were exceedances for benzene, ethylbenzene, toluene, xylenes[11], 2-methylnaphthalene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, arsenic, cadmium, chromium, and lead (Table 1a and 11 on CD).

The list of samples and analytes upon which the risk calculations were based can be found in Table 11a, and the locations of the samples are presented in Figure 8B of the RI report. Risks calculated using the ratio method for a construction worker scenario, along with the UCL[12] of the arithmetic mean concentration, yielded a cumulative cancer risk estimate of 2×10^{-7}, which is below the risk management range. For the construction worker scenario, a noncancer HI of 0.8 was estimated, which is below the nonhazard risk criterion of 1 (Table 1a and 11a on CD). These results indicate that estimated potential risks would be within the risk management criteria if construction workers were exposed to all sediments during a future construction project that included digging activities. However, MGP residuals (i.e., NAPL) have been observed in subsurface sediments (>0.5 ft), and direct contact with these residuals would pose a potential risk to construction workers above the risk management range if they were to encounter residuals while performing intrusive activities.

Lead was selected as a COPC in this OU2 area, but the arithmetic average lead concentration in surface sediments is 415 mg/kg (Table 11), which is below the 700 mg/kg screening criterion for construction workers. For this reason, lead exposure is not expected to pose a health concern to construction workers.

4.2.4 North Station OU2 – Construction Worker Scenario

4.2.4.1 Surface Sediments

When surface sediment concentrations in the North Station OU2 area were screened against construction worker SLs, there were exceedances for benzo(a)pyrene (Table 1a and 12 on CD).

The list of samples and analytes upon which the risk calculations were based can be found in Table 12a, and the locations of the samples are presented in Figure 8C of the RI report. Risks

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[11] Unless otherwise specified, xylene refers to xylenes, total.

[12] Because the UCL of the arithmetic mean typically falls between the mean and the maximum, risks were estimated initially using the mean and maximum for each data set. Because the calculation of a UCL of the arithmetic mean would provide additional clarification as to the level of potential risk, and adequate data was available to calculate the UCLs, the initial risk estimates were refined by using the UCL of the arithmetic mean to calculate the risk estimates for this scenario.

calculated using the ratio method for a construction worker scenario, along with the UCL[13] of the arithmetic mean concentration, yielded a cumulative cancer risk estimate of 3×10^{-8}, which is below the risk management range. For the construction worker scenario, a noncancer HI of 0.6 was estimated, which is below the nonhazard risk criterion of 1 (Table 1a and 12a on CD). These results indicate that estimated potential risks would be within the risk management criteria if construction workers were exposed to surface sediments during a future construction project that included digging activities.[14]

4.2.4.2 All Sediments

When sediment concentrations at all depth intervals in the North Station OU2 area were screened against construction worker SLs, there were exceedances for benzene, ethylbenzene, xylenes, benzo(a)pyrene, naphthalene, chromium, and lead (Table 1a and 13 on CD).

The list of samples and analytes upon which the risk calculations were based can be found in Table 13a, and the locations of the samples are presented in Figure 8C of the RI report. Risks calculated using the ratio method for a construction worker scenario, along with the UCL[15] of the arithmetic mean concentration, yielded a cumulative cancer risk estimate of 1×10^{-7}, which is below the risk management range. For the construction worker scenario, a noncancer HI of 0.8 was estimated, which is below the nonhazard risk criterion of 1 (Table 1a and 13a on CD). These results indicate that estimated potential risks would be within the risk management criteria if construction workers were exposed to all sediments during a future construction project that included digging activities. However, MGP residuals (i.e., NAPL) have been observed in subsurface sediments (>0.5 ft), and direct contact with these residuals would pose a potential risk to construction workers above the risk management range if they were to encounter residuals while performing intrusive activities.

Lead was selected as a COPC in this OU2 area, but the arithmetic average lead concentration in surface sediments is 537 mg/kg (Table 13), which is below the 700 mg/kg screening criterion for construction workers. For this reason, lead exposure is not expected to pose a health concern to construction workers.

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[13] Because the UCL of the arithmetic mean typically falls between the mean and the maximum, risks were estimated initially using the mean and maximum for each data set. Because the calculation of a UCL of the arithmetic mean would provide additional clarification as to the level of potential risk, and adequate data was available to calculate the UCLs, the initial risk estimates were refined by using the UCL of the arithmetic mean to calculate the risk estimates for this scenario.

[14] As mentioned in Section 2.3.1.2, there is a very small area (i.e., approximately 375 ft^2) area within the canal where water levels are less than 3.5 ft. However, the sediments in this area are inaccessible and soft and so not conducive for wading. For these reasons, exposure to these sediments is highly unlikely. While recreational user exposure to sediments are not expected within this OU2 area, the risks quantitatively evaluated for construction workers indicate that occasional exposure to surface sediments in this OU2 area would not pose potential risks to recreational users.

[15] Because the UCL of the arithmetic mean typically falls between the mean and the maximum, risks were estimated initially using the mean and maximum for each data set. Because the calculation of a UCL of the arithmetic mean would provide additional clarification as to the level of potential risk, and adequate data was available to calculate the UCLs, the initial risk estimates were refined by using the UCL of the arithmetic mean to calculate the risk estimates for this scenario.

4.2.5 All OU2 Areas – Recreational User Scenario

As discussed in Section 2, the water depth in OU2 is typically 9–10 ft, so recreational users would not contact sediments even if they fell out of their recreational water craft (e.g., kayak or paddle board) while recreating on the North Branch of the Chicago River. For this reason, no quantitative risk assessment of recreational user exposure to sediments as a result of incidental sediment contact or ingestion in OU2 was considered necessary.

While not a common occurrence, local residents could foreseeably fish while they are recreating on the North Branch of the Chicago River within OU2. The presence of the MGP-related constituents identified in the sediment, which include PAHs and BTEX, would not be expected to pose a health concern to recreational users consuming fish from OU2. This is primarily because, as described in detail in the RAF, these COPCs do not bioaccumulate in fish, and so they would not be in significant concentrations in fish tissue. However, cadmium and mercury within all OU2 areas, and PCBs, specifically in the Willow Street OU2 area, are known to bioaccumulate in fish; therefore, fish consumption could pose an unacceptable risk to recreational users if they were to consume the fish on a regular basis. However, as noted before, the presence of these other COPC (cadmium, mercury, and PCBs) in the OU2 areas does not appear to be related to the former MGP activities. The cadmium and mercury concentrations are comparable to ambient conditions upstream of OU2; therefore, the potential risk associated with consuming fish contaminated with these COPC is not specific to OU2. The presence of PCBs within the Willow Street OU2 area appears to be related to a the AFS Parcel (formerly A. Finkl Parcel) that had been contaminated with PCBs due to activities that occurred after the MGP operations in the Upland OU1 area ended. This parcel, as described in Section 1.9.1 of the RI report, was remediated to remove PCB soil contamination that resulted from activities unrelated to the former MGP facility. It is anticipated that PCBs are present in sediments even in ambient areas too, but PCBs are not an MGP-related COPC and so were not analyzed as part of the ambient investigation or the other OU2 investigations.

4.3 Uncertainties

Because risk characterization serves as a bridge between risk assessment and risk management, it is important that major assumptions, scientific judgments, and estimates of uncertainties be described in the assessment. Risk assessment methods are designed to be conservative to address the uncertainties associated with each step in the risk assessment process. Thus, “true” risks at the Site are likely to be less than risks estimated using standard risk assessment methods.

Key factors in this risk assessment likely to result in underestimates or overestimates of potential risks for the Site include the following:

- **Exposure Estimates—**Nearly all the exposure parameters used in this assessment were default or highly conservative values. Many of these are expected to overestimate exposures that would occur within each OU2 area. Additionally, the multiplication of several inputs that each overestimate true exposures results in “compounded conservatism.”

During the RI, field duplicate samples were collected for QC purposes to evaluate the variability in chemical results for each medium associated with sample collection and laboratory analysis. At EPA's request, a "normalized" sample was created from each parent-duplicate pair using the maximum value of the two measurements. Use of the maximum value may bias the results high.

As discussed in detail in Section 4.1 Surface Water, the use of the tapwater RSL to estimate risks associated with surface water exposures for recreational users and construction workers to the North Branch Chicago River will overestimate the actual surface water risks. This is because the water exposure factors used to develop the tapwater RSLs (i.e., ingestion rate, exposure frequency, and skin surface area contacting water) for domestic water use are higher in all three cases than what would be applicable for recreational user or construction worker exposure to surface water of the North Branch Chicago River. It is likely that the surface water risks estimated in this report for recreational users and construction workers using the tapwater RSLs likely overestimate actual surface water exposures and risk by more than a factor of 100.

Characterization of construction worker exposures to sediments is not well documented, so there is a great deal of uncertainty whether the level of exposure estimated is realistic or not. It was conservatively assumed in this assessment that construction workers would contact sediments 30 day during a construction project. Considering most construction projects use mechanical means to move sediments, it is unlikely that construction workers would have contact with sediments. Therefore, the sediment risks estimated in this report for construction workers likely overestimate actual exposures and risk.

- **Toxicity Values—**Methods for developing toxicity values for use in risk assessment are designed to be conservative. As a result, risks estimated using EPA-derived toxicity factors are likely to over- rather than underestimate risk. For example, use of EPA's cancer slope factors for carcinogens, which are based on the assumption that any exposure to a carcinogen is associated with some risk of cancer, is likely to overestimate risks. EPA has stated in its guidelines for cancer risk assessment that "the linearized multistage procedure leads to a plausible upper limit to the risk that is consistent with proposed mechanisms of carcinogenesis … The true value of the risk is unknown, and may be as low as zero" (51 Fed. Reg. 185:33992, 33998 [1986]). As a result, actual Site risks related to exposures to carcinogens in Site media are unlikely to be underestimated and are likely to be substantially overestimated by the procedures applied in this risk assessment. However, given the uncertainties regarding individual exposure patterns and sensitivities, actual risk for an individual may be higher or lower than the calculated estimate. Use of studies conducted in animals dosed at high levels to derive toxicity values may also overestimate risks in human populations exposed at much lower levels. Uncertainty factors are used in the derivation

of reference doses to be health-protective, accounting for limitations in available data and extrapolation from experimental conditions to exposure conditions of concern. As a result, risk estimates based on EPA-derived toxicity factors are likely to over- rather than underestimate risk.

For the screening assessment, if an EPA RSL was not available, a TACO criterion was selected (Illinois EPA 2013). Unlike EPA RSLs, TACO criteria have not been updated since 2007. Therefore, for some chemicals, current toxicity values may not have been incorporated into the screening assessment, introducing some uncertainty. However, risks were calculated for each detected analyte whether they were above a TACO screening criterion or not, and only the most current RSLs or site-specific RSLs in the case of the construction worker sediment exposure scenario that incorporate the most current toxicity values were used to perform the risk calculations. Thus, the uncertainty in the TACO screening criteria is not expected to influence the accuracy of the risk calculations performed.

- **Chemicals without Toxicity Values—**For three compounds detected at the Site (acenaphthylene, benzo[g,h,i]perylene, and phenanthrene), there are no toxicity values and thus no published SLs. However, values were available for structurally similar chemicals, which were used as surrogates. Specifically, in screening for COPCs, SLs for acenaphthene were used for acenaphthylene, values for pyrene were used for benzo[g,h,i]perylene, and values for anthracene were used for phenanthrene. Because of the availability of values for structurally similar surrogate chemicals, the lack of toxicity values for these chemicals is unlikely to be a significant source of uncertainty for this assessment.

5 Ecological Risk Assessment

This section documents the results of the ERA component of the BLRA. As noted in Section 2.4 of this BLRA, based on the results of the habitat assessment, under current conditions there are complete exposure pathways that require further evaluation in an ERA, due to the available aquatic habitat in OU2 afforded by the North Branch of the Chicago River. In addition, based on the likely future conditions in the OU2 areas, no changes are anticipated that would increase or decrease the potential for ecological receptor exposure in the aquatic environment. Therefore, based on the guidelines provided in Ecological Risk Assessment Guidance for Superfund (ERAGS) Section 1.2, a quantitative screening level ecological risk assessment (SLERA) of the OU2 areas is considered necessary due to current and probable future OU2 conditions (U.S. EPA 1997). The emphasis of the SLERA was on addressing potential risk to benthic invertebrates that live in the surficial sediments of the North Branch of the Chicago River, as they are a sensitive group of ecological receptors because they rely on sediment for their habitat. However, a qualitative assessment of potential risks to other ecological receptors such as fish and fish-eating birds that have been observed in OU2 are also evaluated in the ERA.

5.1 Screening Level Problem Formulation

A site-specific evaluation of the multi-site CSM ecological exposure pathways has been considered for each of the OU2 areas, using the methods discussed in the multi-site RAF (Exponent 2007). As the first step in the SL problem formulation, a habitat assessment was conducted in each OU2 area (see Attachment 1a [Willow Street], 1b [Division Street], and 1c [North Station]). The ecological habitat assessment documented both the condition of the North Branch of the Chicago River within OU2 and the upland terrestrial habitat within OU1. The North Branch of the Chicago River provides habitat for aquatic ecological receptors within OU2. Based on the habitat assessments performed, the primary wildlife species that use the North Branch of the Chicago River in the OU2 area include avian receptors such as Canada geese, herring gulls, and cormorants. Because the riparian habitat is limited by the channelized nature of the North Branch of the Chicago River within OU2 and the depth of the water in the channel, there is little habitat for aquatic mammals, and most foraging by avian species has to be performed by diving.

As part of the RI report, an Ecological Compliance Assessment Tool (EcoCAT) report was run on July 17, 2018, to update past reports (refer to Appendix A4 of the RI report). The EcoCAT report was run to determine whether any special status species were located in the OU2 area. Two special status species were identified as potentially being in the OU2 area: the banded killifish and the black-crowned night-heron (refer to Appendix A4 of the RI report for the species profiles). The banded killifish is unlikely to be present in the North Branch of the Chicago River. According to the Illinois Department of Natural Resources (IDNR) profile for this small minnow sized fish species, “The banded killifish may be found in clear, glacial lakes that have much aquatic vegetation in Lake County.” So considering its habitat preference for clear glacial lakes with ample vegetation, it would unlikely occur in the OU2 area. The black-crowned night-heron typically nests in colonies in trees or marshes (referred to as a

rookery) often with other heron species. The rookery will normally be located where there is minimal chance of human disturbance. They also feed on fish by wading into shallow waters. Considering that there is neither habitat for a rookery nor shallow water feeding in the OU2 area, the black-crowned night-heron is not expected to frequent the OU2 area. Therefore, these two special status species are not considered further in the ERA.

During the RI investigation, OBG performed a qualitative benthic macroinvertebrate (BMI) survey of the surface sediment investigation (refer to Table 10 of the RI report). In the OU2 areas, the dominant group of BMI observed was freshwater oligochaetes (worms). Other BMI observed include midge larvae, freshwater mussels, and isopods. Based on a fish and habitat survey conducted in 2012 by the MWRD of Greater Chicago (MWRD 2012, Report No. 14-55), there are a wide variety of BMI and fish species in the North Branch of the Chicago River at Station No. 46 located just downstream of OU2 near the Grand Avenue. This station had an index of biotic integrity (IBI) score of fair in 2012, which was the typical score at most stations. The dominant fish species present at this station was gizzard shad, which is an important forage species for many fish eating birds. Other species present at Station No. 46 in 2012 included common carp, golden shiner, green sunfish, and largemouth bass.

Considering that the North Brach Chicago River provides habitat for fish, BMI, and aquatic wildlife species, the ERA for OU2 focuses on addressing potential exposures to these ecological receptors associated with MGP-related constituents in the surface water and sediment of the North Branch of the Chicago River and the potential risks associated with those exposures. Screening evaluations were performed for surface water and sediments to address whether there are COPCs in each medium that require further evaluation in the ERA.

In addition, an important aspect of this ERA is consideration of ambient sediment conditions, meaning conditions present in the surface water and sediments unrelated to former MGP operations. Upstream ambient surface water and sediment data specifically for the North Branch of the Chicago River were collected to establish ambient conditions in the North Branch of the Chicago River. Based on the results of an ambient sediment investigation conducted on the North Branch of the Chicago River directly upstream of the North Branch of the Chicago River MGP sites, it is known that sediments of the Chicago River system are highly polluted by activities unrelated to former MGP operations. For example, the ambient sediment conditions of the North Branch of the Chicago River exceed, by orders of magnitude, the ecological screening-level sediment benchmarks normally used to address risk to aquatic receptors associated with sediments. In addition, aquatic toxicity testing of the ambient sediments in the North Branch of the Chicago River revealed that they were moderately toxic to sensitive ecological receptors (i.e., benthic invertebrates). For this reason, the ERA for each OU2 area of the North Branch of the Chicago River also compares the surface water and sediment data to the North Branch of the Chicago River ambient sediment data as another point of comparison to put the analyte concentrations detected in OU2 surface water and sediment samples in perspective.

5.2 Surface Water Screening Evaluation and Risk Characterization

The surface water of the North Branch of the Chicago River is used as drinking water by aquatic wildlife and provides habitat for fish and aquatic invertebrates. The surface water criteria used to perform this ecological screening assessment were obtained from the final RAF. EPA approved the surface water ecological benchmarks presented in the final RAF in their comment letter dated December 20, 2007. The ecological surface water SLs provided in the RAF were applied according to the hierarchy presented in the RAF and are summarized in Table 14. In addition to the ecological surface water SLs from the RAF, the data were also compared to the Chicago Area Waterway System (CAWS) ecological SLs too, which are also summarized in Table 8 of the RI and Tables 2 through 5. Certain metals have ecological surface water SLs that are hardness dependent. For this reason, these SLs were adjusted to the average hardness (204 mg/L $CaCO_3$ equivalent) of the North Branch of the Chicago River derived from the RI surface water quality data (refer to Section 4.5 and Table 8 of the RI report for hardness information). The derivation of the hardness dependent SLs are provided in Attachment 4. If a hardness dependent surface water SL was exceeded, then the sample-specific hardness was also evaluated, and the analysis document in Attachment 4.

The concentrations of each analyte were compared to their respective ecological surface water SL in the ambient area and by OU2 area and the results are summarized below. Each OU2 evaluation provides a comparison to ambient conditions to put the OU2 exceedances in perspective.

5.2.1 Willow Street OU2

Surface-water samples were collected at four locations in the ambient reach of the river upstream of OU2 to characterize ambient surface-water quality conditions (Table 2). Surface-water samples were also collected at four locations within the Willow Street OU2 area, in the river adjacent to upland OU1 (Table 3). Two rounds of sampling were performed at each location. Within the ambient area, duplicate samples were collected during each round of sampling.

No petroleum volatile organic chemicals (PVOCs) or phenols were detected in any of the surface-water samples (ambient or OU2), and the detection limits for each sample were well below the available ecological benchmarks. PCB results for all samples were below the reporting limit for all results at a level above the ecological benchmark.

A number of the PAHs and metals analyzed for in surface water were detected in both ambient and OU2 surface-water samples.

No ecological CAWS surface water SLs were exceeded in the ambient or Willow Street OU2 area.

Benzo(a)anthracene and benzo(a)pyrene exceeded their respective ecological surface water SL in one or more surface water samples in both the ambient and Willow Street OU2 area. This

observation would indicate there is a potential ecological concern associated with benzo(a)anthracene and benzo(a)pyrene analyte concentrations in surface water. However, benzo(a)anthracene exceeded its ecological SL *only in two ambient* samples in 2011 (Table 2) and was below the ecological SL within the Willow Street OU2 area (Table 3). Benzo(a)pyrene exceeded its ecological SL in fifteen of sixteen ambient samples in 2011 and 2012; it also exceeded its ecological SL in three 2011 OU2 samples and one 2012 OU2 sample. Surface water data collected in the OU2 and ambient area are presented in RI report Table 8. The average and maximum concentrations for benzo(a)pyrene in the ambient and Willow Street OU2 area samples are summarized in the table below.

Analyte	Ecological Surface Water SL	2011/2012 Ambient Average	2011/2012 Ambient Max	2011/2012 OU2 Average	2011/2012 OU2 Max
Benzo(a)pyrene (µg/L)	0.014	0.023	0.046	0.020	0.031

µg/L – micrograms per liter
Note: only detected concentrations were used to develop the averages.

The average and maximum concertation of benzo(a)pyrene in surface water was slightly higher in ambient samples than in OU2 samples. This is an indication that there is no incremental effect on surface water quality from the Willow Street OU1 area within the OU2 area.

No dissolved metals exceeded ecological SLs during the 2011 surface water sampling event. Dissolved metals are most appropriate for direct comparison to the ecological benchmark values. According to EPA guidance, the dissolved concentration of metals in surface water more closely approximates the bioavailable fraction of a metal in the water column (U.S.EPA 1993).

It should be noted that the samples collected for analysis of inorganics in 2011 were filtered and submitted for dissolved constituents, while those collected in 2012 were not filtered and were submitted as whole samples for analysis of total inorganic constituents. Analyzing the whole samples is a more conservative approach, because the results are normally higher than filtered sample results.

Total aluminum exceeded its ecological surface water SL (87 µg/L) in all ambient samples during the 2012 sampling event (276–355 µg/L). This observation would indicate there is a potential ecological concern associated with aluminum in ambient surface water. Note that total aluminum was not detected in any 2012 OU2 samples; however, the reporting limit for the 2012 OU2 samples was elevated above the ecological SL. Furthermore, the total aluminum reporting limit for the OU2 samples was less than the concentrations of total aluminum in the 2012 ambient samples. Therefore, total aluminum concentrations in 2012 ambient samples exceeded concentrations in OU2 samples. This is an indication that there is no incremental effect on surface water from the former MGP Site within the OU2 area.

No other constituents exceeded ecological benchmarks in either sampling event.

In summary, the COPC concentrations measured in surface water are either below their respective ecological surface water SL (predominant finding), or if above the ecological SL, which would represent a condition of potential concern to ecological receptors, they are below or comparable to ambient conditions. For this reason, the surface-water quality within the Willow Street OU2 area does not pose an exposure concern to aquatic ecological receptors that departs from ambient conditions for the river.

5.2.2 Division Street OU2

Similar to the Willow OU2 area, surface-water samples were collected at four locations in the ambient reach of the river upstream of OU2 to characterize ambient surface-water quality conditions (Table 2). Surface-water samples were also collected at four locations within the Division Street OU2 area, in the river adjacent to upland OU1 (Table 4). Two rounds of sampling were performed at each location. Within the ambient area duplicate samples were collected during each round of sampling.

No PVOCs or phenols were detected in any of the surface-water samples (ambient or OU2), and the detection limits for each sample were well below the available ecological surface water SLs.

A number of the PAHs and metals analyzed for in surface water were detected in both ambient and OU2 surface-water samples.

No ecological CAWS surface water SLs were exceeded in the ambient or the Division Street OU2 area.

Benzo(a)anthracene and benzo(a)pyrene exceeded their respective ecological surface water SLs in some ambient samples (Table 2) and Division Street OU2 (Table 4) samples during the sampling events. This observation would indicate there is a potential ecological concern associated with benzo(a)anthracene and benzo(a)pyrene analyte concentrations in surface water. Division Street OU2 area and ambient surface-water sample data are presented in RI report Table 8. A summary of the average and maximum concentrations of investigative samples for these two PAHs in ambient and Division Street OU2 area samples are presented in the table below.

Analyte	Ecological Surface Water SL	2011/2012 Ambient Average	2011/2012 Ambient Max	2011/2012 OU2 Average	2011/2012 OU2 Max
Benzo(a)anthracene (µg/L)	0.025	0.018	0.033	0.030	0.067
Benzo(a)pyrene (µg/L)	0.014	0.023	0.046	0.027	0.061
Total aluminum	87	314	355	279	279

µg/L – micrograms per liter
Note: only detected concentrations were used to develop the averages.

For both PAHs, concentrations in surface water were slightly higher in OU2 samples than in ambient samples during this one sampling event but do not represent a significant departure from ambient conditions. As discussed in the sediment screening evaluation (next section), the PAH concentrations in surface sediments of the North Branch of the Chicago River, both in the ambient and OU2 areas, are well above ecological sediment SLs. For this reason, detection of PAHs in surface water above ecological surface water SLs is somewhat expected. However, the exceedances do not indicate exposures to aquatic ecological receptors that would depart significantly from ambient conditions.

Aluminum and lead were the only metals detected in surface water at concentrations above an ecological surface water SL in the OU2 area. This observation would indicate there is a potential ecological concern associated with aluminum and lead in surface water. While one dissolved lead concentration was initially above the average hardness-based ecological surface water SL, when the sample-specific hardness was evaluated, the lead concentration did not exceed the more appropriate sample-specific hardness-based ecological SL and so was not considered further (refer to Attachment 4).

Total aluminum exceeded its ecological SL (87 µg/L) in the ambient and OU2 surface-water samples. The highest concentration of total aluminum (355 µg/L) was detected in the ambient reach of the river, and as summarized in the table above, the average concentration of total aluminum in ambient samples was greater than that in the OU2 samples. In fact, there was only one sample in the Division Street OU2 area where aluminum was detected. Aluminum was not detected in the other samples, but the detection limit was above the ecological surface water SL. Therefore, while aluminum is elevated in surface waters of the river, the concentration of aluminum detected in the OU2 area would not present exposure to aquatic ecological receptors above ambient conditions.

In summary, the COPC concentrations measured in surface water are either below their respective ecological surface water SL (predominant finding), or if above the ecological SL, which would represent a condition of potential concern to ecological receptors, they are comparable to ambient conditions. For this reason, the surface-water quality within the Division Street OU2 area does not pose an exposure concern to aquatic ecological receptors that departs from ambient conditions for the North Branch of the Chicago River.

5.2.3 North Station OU2

Similar to the other two OU2 areas, surface-water samples were collected at four locations in the ambient reach of the river upstream of the former MGP sites to characterize ambient surface-water quality conditions (Table 2). Two rounds of ambient samples were collected and samples were collected in duplicate. Four surface-water samples were also collected at the North Station OU2 area, in the river adjacent to the upland North Station OU1 area (Table 5).

No PVOCs or phenols were detected in any of the surface-water samples (ambient or OU2), and the detection limits for each sample were well below the available ecological surface water SLs.

A number of the PAHs and metals analyzed for in surface water were detected in both ambient and OU2 surface-water samples.

No ecological CAWS surface water SLs were exceeded in the ambient or the North Station OU2 area.

Benzo(a)anthracene and benzo(a)pyrene exceeded their respective ecological surface water SL, in some ambient and North Station OU2 samples during the sampling event (Table 5). This observation would indicate there is a potential ecological concern associated with benzo(a)anthracene and benzo(a)pyrene analyte concentrations in surface water. Benzo(a)pyrene also exceeded its ecological SL in fifteen of sixteen ambient samples collected during the event (Table 2). North Station OU2 area and ambient surface-water sample data are presented in RI report Table 8. A summary of the average and maximum concentrations of investigative samples for these two PAHs in ambient and North Station OU2 area samples are presented in the table below.

Analyte	Ecological Surface Water SL	2011/2012 Ambient Average	2011/2012 Ambient Max	2012 OU2 Average	2012 OU2 Max
Benzo(a)anthracene (µg/L)	0.025	0.018	0.033	0.026	0.042
Benzo(a)pyrene (µg/L)	0.014	0.023	0.046	0.023	0.038
Total aluminum (µg/L)	87	314	355	297	317

µg/L – micrograms per liter
Note: only detected concentrations were used to develop the averages.

For both PAHs, maximum and average concentrations in surface water were generally comparable between OU2 samples and the ambient samples during this one sampling. As discussed in the sediment screening evaluation (next section), the PAH concentrations in surface sediments of the North Branch of the Chicago River, both in the ambient and OU2 areas, are well above ecological sediment SLs. For this reason, detection of PAHs in surface water above ecological surface water SLs is somewhat expected. However, the exceedances do not indicate exposures to aquatic ecological receptors that would depart significantly from ambient conditions.

Aluminum was the only metal detected in surface water at concentrations above an ecological surface water SL. This observation would indicate there is a potential ecological concern associated with aluminum in surface water. Total cadmium was not detected in any samples. However, the detection limit in two OU2 samples (1 µg/L in SWS-10NOS and SWS-4NOS) was elevated above the ecological benchmark (0.46 µg/L).

Total aluminum exceeded its ecological SL (87 µg/L) in the ambient and OU2 surface-water samples. The highest concentration of total aluminum (355 µg/L) was detected in the ambient reach of the river, and as summarized in the table above, the average and maximum concentration of total aluminum in ambient samples was greater than that in the OU2 samples. Therefore, while aluminum is elevated in surface waters of the river, the concentrations of

aluminum in the OU2 area would not present exposure to aquatic ecological receptors above ambient conditions.

In summary, the COPC concentrations measured in surface water are either below their respective ecological surface water SL (predominant finding), or if above the ecological SL, which would represent a condition of potential concern to ecological receptors, they are comparable to ambient conditions. For this reason, the surface-water quality within the North Station OU2 area does not pose an exposure concern to aquatic ecological receptors that departs from ambient conditions for the North Branch of the Chicago River.

5.3 Sediment Screening Evaluation and Risk Characterization

As discussed in Section 3.7 of the RI report, a sediment investigation of approximately 1.2 miles of the North Branch of the Chicago River was performed upstream of the three former MGP sites to characterize ambient conditions of the river unrelated to former MGP activities. Details of the ambient sediment investigation and results were provided in Enclosure B of the Step I Data Evaluation, Revision 2 (Appendix E1 of the RI report). Based on the results of the ambient investigation, it was determined that the ambient conditions (unrelated to former MGP operations) upstream of the North Branch of the Chicago River sites present a significant risk to ecological receptors. As discussed in the multi-site RAF, the aquatic ecological receptors most sensitive to MGP-related sediment contamination are the benthic invertebrates that colonize the upper surface layer of sediments, referred to as the biologically active zone. The biologically active zone is generally fairly thin in a river such as the Chicago River and likely is no deeper than the top 6 in. of sediment beneath the surface-water/sediment interface. The ambient investigation revealed that the total PAH-13 (TPAH-13)[16] and metals concentrations in the ambient reach of the river are already, in some cases, orders of magnitude (i.e., 10 to 100 times) greater than the ecological sediment SLs normally used at MGP sites enrolled in the multi-site program to select COPCs in sediment at a site. In addition, the number of exceedances of TPAH-13 and many of the metals in the ambient area also indicate a widespread distribution of these exceedances in this area rather than localized contamination. There were also lesser numbers of exceedances of specific ecological sediment SLs for volatile organic compound (VOCs), toluene and total xylenes, in surface ambient sediments.

As part of the ambient investigation, toxicity testing performed with a benthic invertebrate species (*Hyalella azteca*) using ambient surface sediments showed that the ambient sediments were moderately toxic to benthic invertebrates based on TPAH and metals concentrations. Considering the ambient TPAH sediments concentrations were found to be moderately toxic to benthic invertebrates based on the sediment toxicity testing, other less direct lines of evidence such as toxicity modeling using EPA's published equilibrium partitioning sediment benchmarks (ESBs) method for TPAH (U.S. EPA 2003) was not performed as part of the ERA. Rather, concentrations of TPAH found in ambient and investigative sediment samples were determined

[16] The list of 13 PAHs that make up the TPAH-13 concentration is as follows: acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene. The concentration of these thirteen PAHs are summed together to create the TPAH-13 concentration in each sample.

to be potentially toxic to benthic invertebrates based on the sediment toxicity testing of the ambient sediment and considering that the TPAH toxicity thresholds for other MGP sites in the Multi-site MGP program were determined to be consistently below the ambient TPAH concentration limits for the North Branch Chicago River. However, for analytes that were not elevated in ambient sediment samples (i.e., BTEX), toxicity modeling (U.S. EPA 2008) was performed in the ERA for investigative sediment samples collected in each OU2 area to evaluate whether BTEX in the sediments of the North Branch Chicago River could be potentially toxic to benthic invertebrates. Based on these circumstances, the approach used for evaluating the risk implications of sediments of each OU2 area within the ERA is threefold:

1. A standard SLERA is performed to document which chemicals exceed ecological sediment SLs. Those chemicals that exceed ecological sediment SLs are considered COPCs.
2. When BTEX are selected as COPCs based on the screening assessment, sediment toxicity modeling is performed to determine whether BTEX would pose a potential risk to benthic invertebrates.
3. Further evaluation is performed to determine whether sensitive ecological receptors, such as benthic invertebrates, are exposed to COPCs that represent a departure from ambient sediment conditions.

5.3.1 Ecological Sediment Screening Levels

Aquatic receptors (e.g., benthic invertebrates, fish, and fish-eating birds) vary in the degree to which they might be exposed to analytes in sediments. Benthic invertebrates have the highest potential for exposure because they live in or on the surface sediments and could come into contact with analytes on a continuous basis. The rationale for this was discussed in detail in the RAF document (Exponent 2007). As described in Section 2.3.3 of the RAF, an evaluation of risks to benthic invertebrates is included at each site under investigation for the following reasons:

- Benthic organisms spend most of their life within a very small area; other aquatic species and wildlife tend to range over larger areas and thus experience less exposure than benthic invertebrates.
- Benthic organisms are in direct contact with potentially contaminated sediments and surface/pore waters; fish, small mammals, and aquatic bird species contact these media incidentally. For example, the main exposure to fish is associated with foraging on benthic invertebrates or resting on the bottom.
- Benthic invertebrates have less developed metabolic systems that do not metabolize PAHs (Hahn et al. 1994) or metals as readily as higher-level organisms (e.g., fish and waterfowl).

Benthic invertebrates are present on or in the sediments and serve as a prey base for fish. As they are intimately associated with sediments, benthic invertebrates can be exposed to chemicals

present in the sediments. Because they are important in the river system, and because of their potential for exposure, benthic invertebrates are evaluated in further detail to assess the potential for ecological risks of MGP residuals within OU2.

A screening-level ecological evaluation of sediments was performed to select a list of MGP-related constituents that would be evaluated further in the BLRA. The following sources of sediment screening values were used to perform the initial ecological screening assessment in accordance with a hierarchy provided by EPA:

1. MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Arch. Environ. Contam. Toxicol. 39:20–31.
2. Di Toro, D.M., and J.A. McGrath. 2000. Technical basis for narcotic chemicals and polycyclic aromatic hydrocarbon criteria. II. Mixtures and sediments. Environ. Toxicol. Chem. 19:1971–1982.
3. Fuchsman, P.C. 2003. Modification of the equilibrium partitioning approach for volatile organic compounds in sediment. Environ. Toxicol. Chem. 22:1532–1534.
4. Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects with ranges of chemical concentrations in marine and estuarine sediments. Environ. Manage. 19:81–97.
5. Persaud, D., R. Jaagumagi, and A. Hayton. 1993. Guidelines for the protection and management of aquatic sediment quality in Ontario. Ontario Ministry of Environment and Energy.

For the purposes of MGP sites being evaluated in freshwater aquatic environments in Illinois, the first two tiers of the EPA hierarchy were considered sufficient for use in the screening assessment. The other three criteria either do not add sufficiently new benchmarks to those provided by the two earlier tiers or, like the Long et al. (1995) source, are based predominantly on marine, not freshwater, aquatic toxicity data.

For the mixture of PAHs detected within sediment samples, the total PAH criterion provided by the first tier of sediment ecological benchmarks (i.e., MacDonald et al. 2000) was used to account for the combined effects of the PAH mixture. While there are individual criteria for some of the PAHs, these were not applied, because the total PAH sediment benchmarks are considered to represent the toxicity of the mixture of PAHs, which is known to cause narcotic effects on benthic invertebrates. The total PAH sediment benchmarks were developed based on the sum of the same specific list of 13 PAHs mentioned before that are used to develop the TPAH-13 values for each sediment sample. The first two tiers of the hierarchy were used as they are applicable to freshwater systems like the North Branch of the Chicago River. Together, these two sources provide a list of sediment ecological benchmarks for nearly all the MGP-related constituents to be evaluated in the sediment screening evaluation. The hierarchy of sediment ecological benchmarks is provided in Table 15 along with the selected SL for each analyte. Where an ecological sediment SL was not available for a particular analyte this is noted in Table 15.

For the sediment screening evaluation, a sample-by-sample comparison was performed for each analyte having an ecological benchmark (refer to Tables 7A and 7B in the RI report). The results of the screening assessment are summarized further and described for the ambient area and each OU2 area in Sections 5.3.3 through 5.3.6.

5.3.2 Evaluation of Departure from Ambient Conditions

Ambient concentration limit values (i.e., upper tolerance limits or UTLs) were developed for toluene, TPAH-13, and metals using the ambient investigations sediment data. The details of all but the toluene UTL are discussed in Appendix E1 of the RI report.[17] These UTLs are used to gauge whether particular sample locations in the OU2 areas are above ambient condition limits. It should be noted that these UTLs cannot be used as a bright line to determine whether a specific sample location is above ambient conditions, because exceedances of the UTL of one or more constituents does not necessarily indicate the average condition in the OU2 area departs from ambient conditions. For example, when comparing the *ambient* UTLs to the *ambient dataset* itself, there were exceedances of the *ambient* UTLs for toluene, TPAH-13, aluminum, arsenic, barium, chromium, copper, lead, manganese, nickel, silver, and vanadium in surface sediments of the *ambient* reach of the River. This example screening analysis is used to illustrate that just because there are exceedances of the ambient UTL in an OU2 area does not necessarily indicate the chemical concentrations significantly depart from ambient area conditions. If the ambient UTLs were a perfect indicator of ambient conditions, then there should be no exceedances of ambient UTLs in the ambient area of the North Branch of the Chicago River. To address more holistically whether sediments are different between the ambient area and a specific OU2 area, statistical comparisons of the mean concentrations were also performed to provide a better indication of whether average conditions within an OU2 area depart form ambient conditions.

The results of the comparisons of ambient data to the data in each OU2 area are summarized following the ecological screening assessment for each OU2 area (refer to Sections 5.3.4.3, 5.3.5.3, and 5.3.6.3).

5.3.3 Ambient Area

To put the ecological sediment SL exceedances in each OU2 area in perspective, the exceedances of ecological sediment SLs and ambient UTLs in the ambient area are discussed first before the discussion of the OU2 specific sediment screening assessments.

5.3.3.1 Surface Sediment

When surface sediment concentrations in the ambient reach of the North Branch of the Chicago River were screened against ecological benchmark SLs, there were exceedances for toluene, xylenes, TPAH-13, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc (Table

[17] Toluene was the only VOC consistently detected in ambient sediment samples and sometimes above its ecological sediment SL. For this reason, a UTL was developed for toluene separately from the UTLs provided in Appendix E1 of the RI report. Documentation of the toluene UTL calculation is provided in Attachment 5.

6). These exceedances of these sediment screening levels along with sediment toxicity testing of the ambient surface sediments indicated that the ambient surface sediments pose a risk to sensitive ecological receptors, such as benthic invertebrates. As discussed previously, when comparing the ambient UTLs to the ambient surface sediment dataset, there were one or more exceedances of the UTLs for toluene, TPAH-13, aluminum, copper, manganese, nickel, and vanadium in the ambient reach of the river. This reinforces the fact that the ambient UTLs cannot be used as a bright line to characterize ambient conditions in surface sediments of the North Branch of the Chicago River.

5.3.3.2 Subsurface Sediment

When subsurface sediment concentrations in the ambient reach of the North Branch of the Chicago River were screened against ecological benchmark SLs, there were exceedances for TPAH-13, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc (Table 7).[18] These exceedances of these sediment SLs, along with sediment toxicity testing of the ambient surface sediments, indicated that the ambient subsurface sediments pose a risk to sensitive ecological receptors, such as benthic invertebrates. When comparing the UTLs to the ambient dataset itself, there were exceedances of the UTLs for TPAH-13, aluminum, arsenic, barium, cadmium, chromium, lead, mercury, nickel, selenium, silver, vanadium, and zinc in subsurface sediments of the ambient reach of the river. Also, the number of exceedances was generally greater for a number of the metals, thus reinforcing the fact that the ambient UTLs cannot be used as a bright line to characterize ambient conditions in subsurface sediments of the North Branch of the Chicago River.

5.3.4 Willow Street OU2

5.3.4.1 Surface Sediments

When surface sediment concentrations in the Willow Street OU2 area were screened against ecological benchmark SLs, there were exceedances for toluene, xylenes, TPAH-13, PCBs, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc (Table 8). For this reason, the surface sediments pose a potential ecological risk to sensitive aquatic ecological receptors, such as benthic invertebrates, due to the many COPCs identified based on the screening assessment and the magnitude of the exceedances. However, based on further ecological risk analysis of the toluene and xylene data using toxicity modeling, these two COPCs were determined not to pose a concern to sensitive BMI even though they are elevated above ambient concentrations and so are not considered further.[19] Other than for the occurrence of nickel and

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[18] It should be noted that only one subsurface sediment sample was analyzed for BTEX, so the ambient area was not well characterized in the subsurface for these PVOCs. For this reason, it is not known what the subsurface ambient conditions are for PVOCs for the North Branch of the Chicago River.

[19] Further ecological risk evaluation of BTEX was performed using EPA's published equilibrium partitioning sediment benchmarks (ESBs) method for nonionic chemicals (U.S. EPA 2008). This method calculates the sum of toxic units (SUM-TU) for each of the four compounds, and samples with a SUM-TU greater than 1 have the potential to pose a risk to sensitive BMI. Based on this evaluation, no surface sediment samples were identified as potentially posing an ecological risk to BMI associated specifically with BTEX within the Willow Street OU2 area, because the SUM-TU was less than 1 (refer to Attachment 6, Table 6-1).

PCBs in the Willow Street OU2 area, the concentrations of the remaining COPCs appear to be comparable to the ambient conditions of the North Branch of the Chicago River. The comparison of the ambient dataset to the Willow Street OU2 surface sediment conditions for these remaining COPCs is discussed in more detail in the Section 5.3.4.3.

Nickel was determined to be slightly elevated above ambient conditions in the Willow Street OU2 area (i.e., within a factor of 1.4 fold of ambient conditions on average). Its presence does not appear to be related to the former MGP site. Currently the Willow Street Upland OU1 area is used as a scrap metal recycling center, so the presence of slightly elevated nickel concentrations in surface sediments in this area may be associated with this current land use activity. Subsurface sediment nickel concentrations were not elevated in the Willow Street OU2 area. Nonetheless, the ecological risks associated with nickel in the surface sediment are still comparable to ambient conditions considering the small difference in average sediment concentrations between the two areas (ambient and OU2).

For PCBs, there is no ambient data available for the North Branch of the Chicago River other than for the most upstream sediment samples collected within the Willow Street OU2 area. However, the PCB concentrations in the upstream samples collected during the RI are lower than in many of the samples collected in other areas of the Willow Street OU2 area, so there appears to be elevated concentrations of PCBs within this OU2 area unrelated to ambient conditions. The likely source is the past activities on the AFS Parcel (formerly A. Finkl Parcel), which is part of Upland OU1. This parcel, as described in Section 1.9.1 of the RI report, was remediated to remove PCB soil contamination that resulted from activities unrelated to the former MGP facility. Concentrations of PCBs in sediments of the Willow Street OU2 area are orders of magnitude above the ecological sediment SL and PCBs effectively bioconcentrate and biomagnify through aquatic food chains. The maximum concentration of total PCBs in sediment in the surface sediments was 67.8 mg/kg, and average surface sediment total PCB concentrations were 7.15 mg/kg, while the ecological sediment SL is 0.0598 mg/kg. These concentrations of PCBs are expected to pose a potential ecological risk to sensitive ecological receptors and so would be considered a constituent of concern (COC) within the Willow Street OU2 area. However, as discussed above, the presence of the PCBs in the Willow Street OU2 area is not related to the former MGP operations but rather to other industrial activities that occurred in the adjacent Willow Street OU1 area on the AFS Parcel.

5.3.4.2 Subsurface Sediments

While subsurface sediments are not accessible to ecological receptors under current conditions, a screening-level assessment was performed to address potential ecological risks if these sediments were to become accessible in the future due to construction activities or maintenance dredging of the North Branch of the Chicago River. When subsurface sediment concentrations in the Willow Street OU2 area were screened against ecological sediment SLs, there were exceedances for BTEX, TPAH-13, PCBs, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc (Table 16). For this reason, if the subsurface sediments become accessible in the future, they would pose a potential ecological risk to sensitive aquatic ecological receptors, such as benthic invertebrates, due to the many COPCs identified based on the screening assessment and the magnitude of the exceedances. However, other than for the occurrence of

exceedances of BTEX,[20] TPAH-13, and PCBs in some of the sediment samples, the concentrations of the other COPCs appear to be comparable to the ambient conditions of the North Branch of the Chicago River. The comparison of the ambient conditions to the Willow Street OU2 conditions in subsurface sediments is discussed in more detail in the Section 5.3.4.3 following the discussion of the BTEX and PCBs risks.

There are numerous exceedances of the ecological sediment SLs for BTEX in subsurface sediments of the Willow Street OU2 area, and the average concentration of each of these PVOCs were over 10 times above their respective ecological sediment SLs. For this reason, these analytes would also pose an ecological risk that departs from ambient subsurface sediment conditions in the North Branch of the Chicago River. However, as will be discussed in the next subsection, the departures of these PVOCs from ambient conditions in the subsurface sediments appear to be co-located with occurrences of exceedances of the ecological sediment SL for TPAH-13, and the TPAH-13 sediment SL exceedances are much more numerous than the BTEX ecological sediment SL exceedances. For example, there were 71 exceedances of the ethylbenzene sediment SL as compared to 278 exceedances of the TPAH-13 sediment SL. In addition, the average TPAH-13 concentration in subsurface sediments is over 200 times greater than its ecological sediment SL. Therefore, considering these two factors the TPAH-13 concentrations in subsurface sediments pose a greater ecological concern that these PVOCs in the Willow Street OU2 area. Based on further evaluation of the BTEX concentrations using toxicity modeling, there were 10 samples that would pose an ecological risk to sensitive BMI, but all other subsurface sediments were not predicted to pose an ecological concern based on their BTEX concentrations.[21] Considering this additional evaluation, BTEX pose an ecological concern only in localized subsurface locations within the Willow Street OU2 area.[22]

Similar to the surface conditions within the Willow Street OU2 area, PCB concentrations in the subsurface sediments are orders of magnitude above its ecological sediment SL, posing a potential ecological risk to sensitive ecological receptors, and so would be considered a COC within the Willow Street OU2 area. The maximum concentration of total PCBs in subsurface sediment was 123 mg/kg, and average surface sediment total PCB concentrations were 11.6 mg/kg, compared to an ecological sediment SL of 0.0598 mg/kg. This puts the average concentration of PCBs in the subsurface sediments at approximately 200 times its ecological sediment SL. Considering PCBs' ability to bioconcentrate and biomagnify through aquatic food chains, the PCBs would be the COC of primary concern within the subsurface sediments of the

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[20] It should be noted that only one subsurface sediment sample was analyzed for BTEX, so the ambient area was not well characterized in the subsurface for these PVOCs. For this reason, it is not known what the subsurface ambient conditions are for PVOCs for the North Branch of the Chicago River.

[21] Further ecological risk evaluation of BTEX was performed using the ESBs method. Based on this evaluation, 10 subsurface sediment samples were identified as potentially posing an ecological risk to BMI within the Willow Street OU2 area, because the SUM-TU were greater than 1 (refer to Attachment 6, Table 6-1). As shown on Table 6-1 in Attachment 6, seven of these samples are co-located with TPAH-13 concentrations above the ambient UTL for TPAH-13. The other three sediment samples have TPAH-13 concentrations below its ambient UTL, and these samples have BTEX SUM-TU just slightly above 1 (each has a SUM-TU value of 2).

[22] Within this area MGP residuals (i.e., NAPL) have been detected in subsurface sediments in isolated locations, and so TPAH-13 and BTEX are considered to pose a risk to BMI if they are exposed to NAPL in subsurface sediments.

Willow Street OU2 area. However, as discussed previously, the presence of the PCBs in the Willow Street OU2 area is not related to the former MGP operations but rather to other industrial activities that occurred in the adjacent Willow Street OU1 area on the AFS Parcel.

5.3.4.3 Comparison to Ambient Conditions[23]

The surface and subsurface sediment data for TPAH-13, metals, and cyanide collected in the ambient reach of the river and the Willow Street OU2 area were compared to determine whether average concentrations within the Willow Street OU2 area were higher than ambient conditions (RI report, Appendix E1, Enclosure C). In addition, surface and subsurface sediment samples were compared to TPAH-13 criteria and metals UTLs that were developed based on the ambient investigation sediment data to determine localized areas of the river adjacent to the upland OU1 area that potentially had sediment quality exceeding ambient conditions (refer to RI report Tables 7A and 7B). TPAH-13 and metals are discussed separately, because the source of TPAH-13 and the metals UTL exceedances do not appear to be related to one another. The TPAH-13 exceedances potentially could be related to the former MGP facility operations, but the metals exceedances do not appear to be related to the former MGP facility operations, because they are generally not co-located with the TPAH-13 exceedances within the Willow Street OU2 area. This lack of a relationship between TPAH-13 and metals exceedances was discussed in detail in Section 4.4.9 of the RI report. For the TPAH-13 exceedances, an initial forensic evaluation was performed to address whether the PAHs in the samples were more likely related to an MGP source or to ambient conditions (RI report, Appendix E7). The ecological risk implications of the sediment quality within the Willow Street OU2 area are discussed in comparison to the ambient conditions.

Surface sediments – TPAH-13 – The average TPAH-13 surface sediment concentration in the Willow OU2 area was not significantly higher than the ambient reach of the river (refer to RI report, Appendix E1, Enclosure C). While this was the case, the individual sample results above the TPAH-13 UTL were evaluated to identify localized areas that potentially depart from ambient conditions. None of the 92 surface sediment samples within the Willow Street OU2 area had TPAH-13 concentrations above the ambient surface sediment TPAH-13 UTL (i.e., 342 mg/kg). As discussed previously, the surface layer of sediment (0–0.5 ft) is considered the biologically active zone that BMI colonize. The results demonstrate that the TPAH-13 concentrations in surface sediments (0–0.5 ft) in the Willow Street OU2 area are not elevated above ambient conditions and pose no incremental ecological risk above ambient.

Subsurface sediment – TPAH-13 – Similar to surface sediments, the average TPAH-13 subsurface sediment concentration in the Willow Street OU2 area was not significantly higher than the ambient reach of the river (refer to RI report, Appendix E1, Enclosure C). While this was the case, some of the TPAH-13 sediment concentrations in individual subsurface samples were elevated above the TPAH-13 UTL and so are discussed for informational purposes. In

[23] It should be noted that the comparisons to ambient conditions presented in this section are based on statistical comparisons where surface sediment is defined as the top 1.5 ft of sediment and sediments deeper than 1.5 ft are defined as subsurface sediments. The number of the UTL exceedances presented in this section is reflecting information presented in the RI report. References in this section to the most surficial sediments (0–0.5 ft) are discussed because it's the biologically active zone where BMI may live.

subsurface sediments, 32 samples had TPAH-13 concentrations above the subsurface sediment TPAH-13 UTL (i.e., 410 mg/kg). The sediment samples with the subsurface UTL exceedances were located in sediment cores at depths of 3.5 ft and deeper (see Table7B in the RI report). The maximum TPAH-13 sediment concentration (12,900 mg/kg) was detected in PCA-15WHS at 15.5–16.5 ft, and tar-like material was observed at this location. The second-highest TPAH-13 concentration (5,120 mg/kg) was detected in PCA-9WHS at 12.5–13.5 ft, but no tar-like material was observed at this location. Both these results were above the UTL and above the maximum TPAH-13 subsurface sediment concentration (803 mg/kg) detected in the ambient reach of the river. An initial forensic evaluation of the PAHs in these samples indicates that they appear to be MGP related, based on their PAH fingerprint (refer to RI report, Appendix E7). Four of the sediment samples were above the subsurface sediment TPAH-13 UTL but much lower than the maximum subsurface sediment concentration detected in ambient sediments (i.e., PCA-20WHS 14.5–15.5 ft, PCA-20WHS 15.5–16.5 ft, PCA-29WHS 9.5–10.5 ft, and PCA-44WHS 6.5–8.5 ft). However, based on an initial forensic evaluation, the PAHs in these four samples appear to be MGP related, based on their PAH fingerprint (refer to RI report, Appendix E7). NAPL or a tar-like substance was not observed in these four samples. Considering this evaluation of subsurface sediment in the Willow Street OU2 area, there are specific sediment samples that depart from ambient conditions and appear, based on the initial forensic evaluation, to be related to former MGP activities. As discussed in Section 5.3.4.2, these sediments would pose a risk to sensitive ecological receptors if they were exposed in the future at the sediment surface.

Surface sediment – Metals and Cyanide – The average metal and cyanide surface sediment concentrations in the Willow Street OU2 area were not significantly higher than the ambient reach of the river, other than for nickel (refer to RI report, Appendix E1, Enclosure C). Nickel had numerous exceedances (13) of its ambient UTL. As discussed in Section 4.4.9 of the RI report, this metal did not appear to be related to the former MGP operations. If it was related to the former MGP operations, it would be co-located with TPAH-13 UTL exceedances, and there would be roughly the same number of UTL exceedances for this metal and TPAH-13, which is not the case. As was summarized above, there were no TPAH-13 UTL exceedances in the surface sediments of the site.

Considering these results, the surface sediments in the Willow Street OU2 area do depart from ambient conditions, based on nickel results, and so do present a level of exposure to ecological receptors above ambient conditions. However, the elevated exposure associated with this metal does not appear to be related to the former MGP operations. In addition, the incremental exposure above ambient conditions for nickel within the Willow Street OU2 area would be within a factor of two, considering the average concentrations of this metal in both areas (ambient and OU2 area).

Subsurface sediment – Metals and Cyanide – The average metal subsurface sediment concentrations in the Willow Street OU2 area were not significantly higher than the ambient reach of the river, other than for aluminum (refer to RI report, Appendix E1, Enclosure C). Aluminum had six exceedances (6 of 183 samples) of its ambient UTL. As discussed above for surface sediments, this metal does not appear to be related to the former MGP operations. A statistical comparison of cyanide concentration could not be performed due to the limited

ambient sample size for this analyte. Average cyanide concentrations in the Willow Street OU2 area were slightly higher than the ambient area (i.e., within a factor of two).

Considering these results, the subsurface sediments within the Willow Street OU2 area do depart from ambient conditions based on aluminum and possibly cyanide concentrations, and so do present a level of exposure to ecological receptors above ambient conditions. However, the elevated exposure associated with this aluminum and cyanide does not appear to be related to the former MGP operations. In addition, the incremental exposure above ambient conditions for aluminum and cyanide within the Willow Street OU2 area would be within a factor of two considering the average concentrations of these analysts in both areas (ambient and OU2).

5.3.5 Division Street OU2

5.3.5.1 Surface Sediments

When surface sediment concentrations in the Division Street OU2 area were screened against ecological sediment SLs, there were exceedances for BTEX, TPAH-13, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc (Table 10). For this reason, the surface sediments pose an ecological risk to sensitive aquatic ecological receptors, such as benthic invertebrates, due to the many COPCs identified based on the screening assessment and the magnitude of the exceedances. However, other than for the occurrence of an isolated detect of benzene and ethylbenzene in OU2, the concentrations of the other COPCs appear to be comparable to the ambient conditions of the North Branch of the Chicago River. The comparison of the ambient conditions to the OU2 conditions is discussed in more detail in the Section 5.3.5.3.

Benzene and ethylbenzene were detected above their ecological sediment SLs in a single surface sediment out of 90 sediment samples. This single exceedance of each analyte would not pose a significant risk to sensitive aquatic ecological receptors due to the localized nature of the single exceedance. The average concentrations of these analytes within OU2 are also below the ecological screening criterion, which indicates an average condition that does not pose a risk to sensitive ecological receptors. In addition, the samples with benzene and ethylbenzene concentrations were not predicted to pose a risk to BMI based on the toxicity modeling (i.e., Sum-TU calculations) that were performed even though their concentrations are elevated above ambient concentrations. The main ecological risks to sensitive ecological receptors would be associated with the other COPCs, such as TPAH-13, which, as discussed in the Section 5.3.5.3, are comparable in concentration to the OU2 concentrations.

5.3.5.2 Subsurface Sediments

Similar to the Willow Street OU2 area, a future scenario was evaluated for the Division Street OU2 area to address the potential risks associated with the subsurface sediments if they were to become the sediment surface as a result of construction or dredging within the North Branch of the Chicago River. When subsurface sediment concentrations in the Division Station OU2 area were screened against ecological sediment SLs, there were exceedances for BTEX, TPAH-13, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc (Table 17). For this

reason, if the subsurface sediments become accessible in the future, they would pose an ecological risk to sensitive aquatic ecological receptors, such as benthic invertebrates, due to the many COPCs identified based on the screening assessment and the magnitude of the exceedances. However, other than for the occurrence of BTEX[24] and TPAH-13 in the Division Street OU2 area, the concentrations of the other COPCs appear to be comparable to the ambient conditions of the North Branch of the Chicago River. The comparison of the ambient conditions to the Division Street OU2 area conditions is discussed in more detail in the next Section 5.3.5.3 following the discussion of the BTEX risks.

There are numerous exceedances of the ecological sediment SLs for BTEX in subsurface sediments of the Division Street OU2 area, and the average concentration of three of these PVOCs (i.e., benzene, ethylbenzene, and xylenes) were over 10 times above the ecological sediment SL. For this reason, these three analytes would also pose an ecological risk that departs from ambient subsurface sediment conditions in the North Branch of the Chicago River.[25] However, as will be discussed in the next subsection, the departures of these PVOCs from ambient conditions in the subsurface sediments of the Division Street OU2 area appear to be co-located with TPAH-13 exceedances of its ecological sediment SL, and the TPAH-13 exceedances are much more numerous than for the BTEX ecological sediment SLs. For example, there were 52 exceedances of the xylenes sediment SL as compared to 414 exceedances of the TPAH-13 sediment SL. In addition, the average TPAH-13 concentration in subsurface sediments is over 100 times greater than its ecological sediment SL. Therefore, considering these two factors, the TPAH-13 concentrations pose a greater ecological concern that these PVOCs within the Division Street OU2 area. In addition, as discussed previously, further ecological risk evaluation of BTEX was performed using ESB methodology. Based on this evaluation, four subsurface sediment samples were identified as potentially posing an ecological risk to BMI within the Division Street OU2 area, because the SUM-TU was greater than 1 (Refer to Attachment 6, Table 6-1). As shown on Table 6-1 in Attachment 6, three of these samples are co-located with TPAH-13 concentrations that are higher than the ambient UTL for TPAH-13. The other sediment sample has a TPAH-13 concentration below its ambient UTL, and this sample has a BTEX SUM-TU just slightly above 1 (a value of 2). Considering this additional evaluation, BTEX pose an ecological concern only in localized subsurface locations within the Division Street OU2 area.[26]

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[24] It should be noted that only one subsurface sediment sample was analyzed for BTEX, so the ambient area was not well characterized in the subsurface for these PVOCs. For this reason, it is not known what the subsurface ambient conditions are for PVOCs for the North Branch of the Chicago River.

[25] As discussed in the ambient conditions subsection, while toluene was elevated in some samples over ambient conditions, as determined based on surface sediment conditions, the concentration of toluene in subsurface sediment is well below the ambient UTL on average and so more consistent with ambient conditions.

[26] Within this area MGP residuals (i.e., NAPL) have been detected in subsurface sediments in isolated locations, and so TPAH-13 and BTEX are considered to pose a risk to BMI if they are exposed to NAPL in subsurface sediments.

5.3.5.3 Comparison to Ambient Conditions[27]

The surface and subsurface sediment data for TPAH-13, metals, and cyanide collected in the ambient reach of the river and the Division Street OU2 area were compared to determine whether average concentrations within the Division Street OU2 area were higher than ambient conditions (RI report, Appendix E1, Enclosure C). In addition, surface and subsurface sediment samples were compared to TPAH-13 criteria and metals UTLs that were developed based on the ambient investigation sediment data to determine localized areas of the river adjacent to the upland OU1 area that potentially had sediment quality exceeding ambient conditions (refer to RI report Tables 7A and 7B), TPAH-13 and metals are discussed separately, because the source of TPAH-13 and metals UTL exceedances do not appear to be related to one another. The TPAH-13 exceedances potentially could be related to the former MGP facility operations, but the metals exceedances do not appear to be related to the former MGP facility operations, because they are generally not co-located with the TPAH-13 exceedances within the Division Street OU2 area. This lack of a relationship between TPAH-13 and metals exceedances was discussed in detail in Section 4.4.9 of the RI report. For the TPAH-13 exceedances, an initial forensic evaluation was performed to address whether the PAHs in the samples were more likely related to an MGP source or to ambient conditions (RI report, Appendix E7). The ecological risk implications of the sediment quality within the Division Street OU2 area are discussed in comparison to the ambient conditions.

Surface sediments – TPAH-13 – The average TPAH-13 surface sediment concentration in the Division OU2 area was not significantly higher than the ambient reach of the river (RI report, Appendix E1, Enclosure C). While this was the case, the individual sample results above the TPAH-13 UTL were evaluated to identify localized areas that potentially depart from ambient conditions. One of the 90 surface sediment samples within the Division Street OU2 area had TPAH-13 concentrations above the ambient surface sediment TPAH-13 UTL (i.e., 342 mg/kg). In sample STA-21DSS-RVT (0–0.5 ft), the TPAH-13 concentration was 386 mg/kg, which is slightly over the UTL. An initial forensic evaluation of the PAHs in this sample indicates that they do not appear to be MGP related, based on their PAH fingerprint (refer to RI report, Appendix E7). As discussed previously, the surface layer of sediment (0–0.5 ft) is considered the biologically active zone that BMI colonize. These results demonstrate that the TPAH-13 concentrations in surface sediments (0–0.5 ft) in the Division Street OU2 area are not elevated above ambient conditions and pose no incremental ecological risk above ambient.

Subsurface sediment – TPAH-13 – Similar to surface sediments, the average TPAH-13 subsurface sediment concentration in the Division Street OU2 area was not significantly higher than the ambient reach of the river (refer to RI report, Appendix A1). While this was the case, some of the TPAH-13 sediment concentrations in individual subsurface samples were elevated above the TPAH-13 UTL and so are discussed for informational purposes. In subsurface sediments, 18 samples had TPAH-13 concentrations above the subsurface sediment TPAH-13 UTL (i.e., 410 mg/kg). The sediment samples with the subsurface UTL exceedances were

[27] It should be noted that the comparisons to ambient conditions presented in this section are based on statistical comparisons where surface sediment is defined as the top 1.5 ft of sediment and sediments deeper than 1.5 ft are defined as subsurface sediments. The number of the UTL exceedances presented in this section is reflecting information presented in the RI report. References in this section to the most surficial sediments (0–0.5 ft) are discussed because it's the biologically active zone where BMI may live.

located at depths ranging from 0.5 ft and deeper (see Tables 7B in the RI report). The maximum TPAH-13 sediment concentration (23,409 mg/kg) was detected in STA-24DSS at 2.5–3.5 ft, and oil coated and wetted sediment was observed at this location. The second-highest TPAH-13 concentration (10,508 mg/kg) was detected in STA-24DSS at 5.5–6.5 ft, and oil coated and wetted sediment was observed at this location. Both these results were above the UTL and above the maximum TPAH-13 subsurface sediment concentration (803 mg/kg) detected in the ambient reach of the river. An initial forensic evaluation of the PAHs in a surface sample from this boring (STA-24DSS at 0–0.5 ft) indicates the PAHs at this location appear to be MGP related, based on their PAH fingerprint (refer to RI report, Appendix E7). Five of the sediment samples were above the subsurface sediment TPAH-13 UTL, but much lower than the maximum subsurface sediment concentration detected in ambient sediments (i.e., STA-36DSS 15.5–16.5 ft, STA-45DSS MOB 4.5–6.5 ft, STA-8DSS 10.5–11.5 ft, STA-72DSS 19.5–20.5 ft, and STA-6DSS 12.5–13.5 ft). However, based on an initial forensic evaluation and field observations (e.g., MGP-like odor), the PAHs in these five samples appear to be MGP related, based on their PAH fingerprint or the PAH fingerprint of a sample located near it in the same boring (refer to RI report, Appendix E7).[28] Considering this evaluation of subsurface sediment in the Division Street OU2 area, there are specific sediment samples that depart from ambient conditions and appear, based on the initial forensic evaluation, to be related to former MGP activities. As discussed in Section 5.3.5.2, these sediments would pose a risk to sensitive ecological receptors if they were exposed in the future at the sediment surface.

Surface sediment – Metals and Cyanide – The average metal and cyanide surface sediment concentrations in the Division Street OU2 area were not significantly higher than the ambient reach of the river, other than for silver (refer to RI report, Appendix E1, Enclosure C). Silver had 10 exceedances of its ambient UTL. As discussed in Section 4.4.9 of the RI report, this metal did not appear to be related to the former MGP operations. If it was related to the former MGP operations, it would be co-located with TPAH-13 UTL exceedances, and there would be roughly the same number of UTL exceedances for this metal and TPAH-13, which is not the case. As was summarized above, there is only one TPAH-13 UTL exceedance in the surface sediments of the Division Street OU2 area.

Considering these results, the surface sediments in the Division Street OU2 area do depart from ambient conditions, based on silver results and so do present a level of exposure to ecological receptors above ambient conditions. However, the elevated exposure associated with this metal does not appear to be related to the former MGP operations. In addition, the incremental exposure above ambient conditions for silver within the Division Street OU2 area would be within a factor of two, considering the average concentrations of this metal in both areas (ambient and OU2 area).

Subsurface sediment – Metals and Cyanide – The average metal subsurface sediment concentrations in the Division Street OU2 area were not significantly higher than the ambient reach of the river for those analytes that could be evaluated (refer to RI report, Appendix E1, Enclosure C). Considering these results, the subsurface sediments metals concentrations within

[28] Not all samples were available for forensic evaluation when the initial evaluation was performed. For those samples not originally evaluated (i.e., STA-8DSS 10.5–11.5 ft), a sample in another depth interval from the same boring was used to infer that the PAHs were from a potential MGP source.

the Division Street OU2 area do not appear to depart from ambient conditions and so do not present a level of exposure to ecological receptors above ambient conditions.

5.3.6 North Station OU2

5.3.6.1 Surface Sediments

When surface sediment concentrations in the North Station OU2 area were screened against ecological sediment SLs, there were exceedances for toluene, TPAH-13, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc (Table 12). For this reason, the surface sediments pose an ecological risk to sensitive aquatic ecological receptors, such as benthic invertebrates, due to the many COPCs identified based on the screening assessment and the magnitude of the exceedances. However, the concentrations of these COPCs appear to be comparable to the ambient conditions of the North Branch of the Chicago River. The comparison of the ambient conditions to the North Station OU2 area conditions is discussed in more detail in the Section 5.3.6.3.

5.3.6.2 Subsurface Sediments

Similar to the other two OU2 areas, a future scenario was evaluated for the North Station OU2 area to address the potential risks associated with the subsurface sediments if they were to become the sediment surface as a result of construction or dredging within the North Branch of the Chicago River. When subsurface sediment concentrations in the North Station OU2 area were screened against ecological sediment SLs, there were exceedances for BTEX, TPAH-13, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc (Table 18). For this reason, if the subsurface sediments become accessible in the future, they would pose an ecological risk to sensitive aquatic ecological receptors, such as benthic invertebrates, due to the many COPCs identified based on the screening assessment and the magnitude of the exceedances. However, other than for the occurrence of benzene, ethylbenzene, xylenes,[29] and TPAH-13 in the North Station OU2 area, the concentrations of the other COPCs appear to be comparable to the ambient conditions of the North Branch of the Chicago River. The comparison of the ambient conditions to the North Station OU2 area conditions is discussed in more detail in the next section following the discussion of the benzene, ethylbenzene, and xylenes risks.

There are numerous exceedances of the ecological sediment screening levels for benzene, ethylbenzene, and xylenes in subsurface sediments of the North Station OU2 area. The average concentrations of these three PVOCs were 4–12 times above the ecological sediment SL and above ambient conditions in the North Branch Chicago River. For this reason, these three analytes would also pose an ecological risk that departs from ambient subsurface sediment conditions in the North Branch of the Chicago River. However, as will be discussed in the next subsection, the departures of these PVOCs from ambient conditions in the subsurface sediments

[29] It should be noted that only one subsurface sediment sample was analyzed for BTEX, so the ambient area was not well characterized in the subsurface for these PVOCs. For this reason, it is not known what the subsurface ambient conditions are for PVOCs for the North Branch of the Chicago River.

appear to be co-located with occurrences of exceedances of the ecological sediment SL for TPAH-13, and the TPAH-13 exceedances are much more numerous than the benzene, ethylbenzene, and xylenes ecological sediment SL exceedances. For example, there were 45 exceedances of the xylenes sediment SL as compared to 155 exceedances of the TPAH-13 sediment SL. In addition, the average TPAH-13 concentration in subsurface sediments is over approximately 50 times greater than its ecological sediment SL. Therefore, considering these two factors the TPAH-13 concentrations pose a greater ecological concern than the PVOC sediment concentrations within the North Station OU2. In addition, as discussed previously, further ecological risk evaluation of the benzene, ethylbenzene, and xylenes sediment SL exceedances were performed using ESB methodology. Based on this evaluation, no subsurface sediment samples analyzed for benzene, ethylbenzene, and xylenes were identified as potentially posing an ecological risk to BMI within the North Station OU2 area, because the SUM-TU was less than 1 (refer to Attachment 6, Table 6-1).[30]

5.3.6.3 Comparison to Ambient Conditions[31]

The surface and subsurface sediment data for TPAH-13, metals, and cyanide collected in the ambient reach of the North Branch of the Chicago River and the North Station OU2 area were compared to determine whether average concentrations within the OU2 area were higher than ambient conditions (RI report, Appendix E1, Enclosure C). In addition, surface and subsurface sediment samples were compared to TPAH-13 and metals UTLs criteria that were developed based on the ambient investigation sediment data to determine localized areas within the North Branch OU2 that potentially had sediment quality exceeding ambient conditions (refer to RI report, Tables 7A and 7B). TPAH-13 and metals are discussed separately, because the source of TPAH-13 and the metals UTL exceedances do not appear to be related to one another. The TPAH-13 exceedances potentially could be related to the former MGP facility operations, but the metals exceedances do not appear to be related to the former MGP facility operations, because they are generally not co-located with the TPAH-13 exceedances. This lack of a relationship between TPAH-13 and metals exceedances was discussed in detail in Section 4.4.9 of the RI report. For the TPAH-13 exceedances, an initial forensic evaluation was performed to address whether the PAHs in the samples were more likely related to an MGP source or to ambient conditions (RI report, Appendix E7). The ecological risk implications of the sediment quality within the OU2 area are discussed in comparison to the ambient conditions.

Surface Sediment – TPAH-13 – The average TPAH-13 surface sediment concentration in the North Station OU2 area was not significantly higher than the ambient reach of the river (refer to RI report, Appendix E1, Enclosure C). While this was the case, the individual sample results

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[30] While no sediment samples analyzed for benzene, ethylbenzene, and xylenes were estimated to potentially pose an ecological risk to BMI within the North Station OU2 area, MGP residuals (i.e., NAPL) were detected in isolated locations within this area. It is known that MGP residuals typically have elevated concentrations of these BTEX compounds and TPAH-13 that would pose an adverse risk to BMI if they became exposed to the NAPL.

[31] It should be noted that the comparisons to ambient conditions presented in this section are based on statistical comparisons where surface sediment is defined as the top 1.5 ft of sediment and sediments deeper than 1.5 ft are defined as subsurface sediments. The number of the UTL exceedances presented in this section is reflecting information presented in the RI report. References in this section to the most surficial sediments (0–0.5 ft) are discussed because it's the biologically active zone where BMI may live.

above the TPAH-13 UTL were evaluated to identify localized areas that potentially depart from ambient conditions. Only 2 of 65 surface sediment samples had TPAH-13 concentrations above the surface sediment TPAH-13 UTL (i.e., 342 mg/kg). Both these samples were not collected in the surface layer of sediment (0–0.5 ft), which is considered the biologically active zone that BMI colonize. Rather, these samples were located in the near-surface sediment (0.5–1.5 ft) layer; TPAH-13 concentrations in the biologically active zone (0–0.5 ft) were below the ambient UTL at all locations sampled. In addition, the concentrations of TPAH-13 in the two near-surface sediment samples (PCA-1NOS and PCA-6ANOS) are 528 mg/kg and 538 mg/kg, respectively, which is below the maximum ambient surface sediment concentration (725 mg/kg). Finally, based on an initial forensic evaluation, the PAHs in these two samples do not appear to be MGP related based on their PAH fingerprint (refer to RI report, Appendix E7). The results demonstrate that the TPAH-13 concentrations in surface sediments (0–0.5 ft) in the North Station OU2 area are not elevated above ambient conditions and pose no incremental ecological risk above ambient.

Subsurface Sediment – TPAH-13 – Similar to surface sediments, the average TPAH-13 subsurface sediment concentration in the North Station OU2 area was not significantly higher than the ambient reach of the river (refer to RI report, Appendix E1, Enclosure C). While this was the case, some of the TPAH-13 sediment concentrations in individual subsurface samples were elevated above the TPAH-13 UTL and so are discussed for informational purposes. In subsurface sediments, 4 samples had TPAH-13 concentrations above the subsurface sediment TPAH-13 UTL (i.e., 410 mg/kg). The sediment samples with the subsurface UTL exceedances were located at depths of 8.5 ft and deeper (see Table 7B in the RI report). The maximum TPAH-13 sediment concentration (2,330 mg/kg) was detected in PCA-32NOS at 8.5–10.5 ft, and tar-like material was observed at this location. The second-highest TPAH-13 concentration (1,380 mg/kg) was detected in PCA-19NOS at 11.5–12.5 ft, but no tar-like material was observed at this location. Both these results were above the UTL and the maximum TPAH-13 subsurface sediment concentration (803 mg/kg) detected in the ambient reach of the river. An initial forensic evaluation of the PAHs in these samples indicates that they appear to be MGP related, based on their PAH fingerprint (refer to RI report, Appendix E7). Two of the sediment samples at PCA-20NOS, located at depths of 12.5 and 13.5 ft, were above the subsurface sediment TPAH-13 UTL, at 468 mg/kg and 553 mg/kg, respectively, but below the maximum subsurface sediment concentration detected in ambient sediments. However, based on an initial forensic evaluation, the PAHs in these two samples appear to be MGP related based on their PAH fingerprint (refer to RI report, Appendix E7). In addition, there were no visual observations of tar-like material in these two samples.

Considering this evaluation of subsurface sediment in the North Station OU2 area, there are specific sediment samples that depart from ambient conditions and appear, based on the initial forensic evaluation, to be related to former MGP activities. As discussed in Section 5.3.6.2, these sediments would pose a risk to sensitive ecological receptors if they were exposed in the future at the sediment surface.

Surface Sediment – Metals and Cyanide – The average metal and cyanide surface sediment concentrations within the North Station OU2 area were not significantly higher than the ambient reach of the river, other than for aluminum and silver (refer to RI report, Appendix E1, Enclosure C). Both aluminum and silver had numerous exceedances (28 and 22, respectively) of

their respective ambient UTL. As discussed in Section 4.4.9 of the RI report, these metals do not appear to be related to the former MGP operations. If they were related to the former MGP operations, they would be co-located with TPAH-13 UTL exceedances, and there would be roughly the same number of UTL exceedances for both these metals and TPAH-13, which is not the case. As was summarized above, there were only two TPAH-13 UTL exceedances in the surface sediments of the North Station OU2 area and neither of these exceedances is likely due to the former MGP operations, based on the results of the PAH forensic evaluation.

Considering these results, the surface sediments (0–0.5 ft) in the North Station OU2 area do depart from ambient conditions, based on both aluminum and silver results, and so do present a level of exposure to ecological receptors above ambient conditions. However, the elevated exposure associated with these metals does not appear to be related to the former MGP operations. In addition, the incremental exposure above ambient conditions for aluminum and silver within the North Station OU2 area would be within a factor of two, considering the average concentrations of these metals in both areas (ambient and OU2 areas).[32]

Subsurface Sediment – Metals and Cyanide – The average metal and cyanide subsurface sediment concentrations in the North Station OU2 area were not significantly higher than the ambient reach of the river, other than for aluminum (refer to RI report, Appendix E1, Enclosure C). Aluminum had numerous exceedances (49 of 120 samples) of its ambient UTL. As discussed above for surface sediments, this metal does not appear to be related to the former MGP operations. A statistical comparison of cyanide concentrations could not be performed due to the limited ambient sample size (n=2) for this analyte. Average cyanide subsurface sediment concentrations in the North Station OU2 area were slightly higher than the ambient area (i.e., within a factor of two based on the geometric mean) but lower than the average cyanide concentrations in ambient surface sediments, where the sample size was much higher (n=20).

Considering these results, the subsurface sediments at the North Station OU2 area do depart from ambient conditions based on aluminum concentrations and so do present a level of exposure to ecological receptors above ambient conditions. However, the elevated exposure associated with this metal does not appear to be related to the former MGP operations. In addition, the incremental exposure above ambient conditions for aluminum within the OU2 area would be within a factor of two considering the average concentrations of this metal in both areas (ambient and OU2).

[32] It should be noted that there are no available ecological sediment SLs for aluminum or silver, so no ecological effects based evaluation of these metals could be performed in this ERA.

6 Summary and Conclusions

The BLRA for the North Branch Site (the Site) for the North Branch of the Chicago River areas was performed by Exponent in conformance with the RAF and RAF addenda and the results of the RI provided by OBG. EPA has segregated each site into two OUs, which include OU1, the upland and groundwater portions of the former MGPs, and OU2, the river portion of the former MGPs. This BLRA is specifically performed for OU2 of each North Branch of the Chicago River area. The BLRA evaluates both potential human health and ecological risk associated with the Site. The HHRA component of this assessment addresses potential risks to human receptors in OU2. The ERA component documents the potential ecological risks in OU2.

The HHRA portion of the BLRA addresses potential risk under both current and potential future land-use conditions in OU2. Consistent with the RAF and the RAF addendum (Revision 6), the HHRA includes a site-specific exposure evaluation to address how people may become exposed to chemical constituents in the surface water and sediment of the North Branch of the Chicago River. This includes a site-specific evaluation of the recreational use of the river and a site-specific evaluation of a construction worker scenario. The construction worker evaluation accounts for such site-specific conditions as NAPL in the subsurface sediments.

The surface water and sediment risk assessment relied on both previously collected sediment data (i.e., pre-remedial RI sediment data) collected within OU2 or in an upstream ambient section of the river unaffected by former MGP operations and the surface water and sediment data collected during the RI. The adjacent OU1 areas, as discussed above, are the upland areas adjacent to the North Branch of the Chicago River that will be addressed in separate BLRA.

The following offers summaries and conclusions of the HHRA and the ERA for OU2.

6.1 Summary and Conclusions of the Human Health Assessment

To evaluate the potential risks to humans from MGP constituents, an assessment was conducted using data provided by OBG. Specifically, data were evaluated for surface water and sediments. A summary of the receptors and pathways evaluated is presented in Figures 1 through 4, and a summary of the COPC screening results and a brief summary of the results of the HHRA is provided in Table 1a. Table 1a provides a summary of risks by OU2 area (Willow Street, Division Street, and North Station). This table also summarizes the COCs, if any, in an OU2 area based on the results of the HHRA. COCs are analytes found to significantly contribute to a risk in a particular area that was estimated to be above the risk management criteria (i.e., cancer risk $>1\times10^{-4}$ or HI of 1).

As the first step in the HHRA, a screening of the analytical data was conducted based on EPA risk assessment guidance and on what is known about current and potential future uses of the Site to identify COPCs that warrant further evaluation.

For each exposure scenario (e.g., construction worker), risks were calculated using a simple ratio method based on the RSLs and the target risk incorporated into the RSLs. For example, if a cancer-based RSL for a chemical is 10 mg/kg based on a target risk of 1×10^{-6}, then a site concentration of 20 mg/kg would be associated with a 2×10^{-6} cancer risk. Similarly, if a noncancer-based RSL for a chemical is 10 mg/kg based on a target HQ of 1, then a Site concentration of 20 mg/kg would be associated with an HQ of 2. This approach is equivalent to doing a complete risk calculation using all the exposure parameters and toxicity factors used in the RSLs.[33]

Although the determination of a target risk level is ultimately a decision to be made by risk managers, the findings presented here are compared with the range of risk levels cited in EPA's NCP (U.S. EPA 1990), which EPA describes as the "blueprint for the Superfund law." The NCP (40 CFR 300.430 [e] [2]) states, "For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6} using information on the relationship between dose and response." Illinois EPA, in the Illinois TACO (35 IAC, Part 742), considers the same values to be a risk management range. A later EPA memo states that "where the cumulative site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4} and the noncarcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts." The memo goes on to state, "A risk manager may also decide that a baseline risk level less than 10^{-4} is unacceptable due to site-specific reasons, and that remedial action is warranted … Other chemical-specific ARARs may also be used to determine whether a site warrants remediation" (U.S. EPA 1991). TACO further specifies that when the target cancer risk ranges between 1 in 1,000,000 (10^{-6}) and 1 in 10,000 (10^{-4}) at the point of human exposure, or a target HQ is greater than 1 at the point of human exposure, then further evaluation is warranted (Illinois EPA 2013).

6.1.1 Surface Water

Surface water data were screened against groundwater SLs available in the RAF addendum (Revision 6) for Illinois multi-site MGPs. No surface water SLs are available specifically for a recreational use or a construction worker exposure scenario, and so the groundwater SLs were used as a conservative screen for contact and incidental ingestion of North Branch of the Chicago River surface water. The groundwater SLs are considered conservatively low as a screening tool for surface water, because the groundwater SLs were derived to be protective of domestic use of groundwater for drinking and bathing; people would never intentionally drink the water in the Chicago River. The screening assessment was performed separately for all three

[33] Consistent with the RAF addendum (Revision 6, Exponent 2017) for noncarcinogenic chemicals, an additional evaluation was performed to check whether exposure to the multiple chemicals identified in an OU2 area would result in exceedance of the cumulative noncancer risk target (i.e., an HI of 1) even if no one chemical exceeded the noncancer risk target of 1. For simplicity, all detected analytes were evaluated in the BLRA to perform this additional noncancer risk evaluation, meaning the noncancer risks presented in this BLRA are for all detected analytes not just for the chemicals identified as COPCs. So if the calculated noncancer risk is 1 or less for the scenario presented in the risk assessment, then it is known that the cumulative noncancer risk from all detected chemicals is not resulting in a noncancer risk great than 1.

OU2 areas. As noted before, the assessments were completed on all detected chemicals within an OU2 area and not just on COPCs.

The results of the surface water risk assessment are summarized by OU2 area in Table 1a and collectively for OU2 as a whole below, because the risks are very similar among the three OU2 areas. The surface water risks within OU2 were also compared to the risks associated with surface water contact in the upstream ambient area of the North Branch of the Chicago River, as this provides a point of comparison to an area unaffected by former MGP activities.

6.1.1.1 OU2 Surface Water Exposure and Risk Summary

The surface water data was segregated by OU2 area and used to address two different potential exposure scenarios.

- Recreational user contact with and incidental ingestion of surface water while performing recreational boating such as with stand up paddle boards, kayaks or canoes.
- Construction worker contact with surface water during construction and maintenance activities performed, such as diving operations to inspect and construct bridges below the water surface.

The risks were calculated using the most current tapwater RSLs developed by EPA and summarized in the RAF addendum (Revision 6) and using both maximum and arithmetic mean average surface water concentrations as the EPCs.

- Risks associated with surface water exposure were within the risk management criteria within each OU2 area even under the assumption that the Chicago River was used as a source of drinking water and used for bathing. However, considering that neither recreational users nor construction workers would have such use for the surface water, and more likely would only incidentally contact or ingest a small amount of surface water occasionally, the actual risk to both recreational users and construction workers are expected to be below the risk management criteria. In addition, no sheens have been observed on the surface of the water that would indicate an episodic release of MPG residuals that would not be captured by routine surface water sampling and the risk calculations presented herein.
- The risks associated with the ambient area of the North Branch of the Chicago River located upstream of OU2 were similar to the risk calculate for each OU2 area. This demonstrates that much of the risks evaluated within the OU2 area are a result of ambient conditions of the North Branch of the Chicago River and not something necessarily associated with former MGP activities within OU2.

6.1.2 Sediment

Surface and subsurface sediments were screened against construction worker soil SLs available from Illinois EPA for the construction worker scenario. These soil SLs are used because there are sediment-specific SLs available for sediments. This approach is also consistent with the RAF addendum (Revision 6). The screening assessment was performed for all three OU2 areas. As noted before, the assessments were completed on all detected chemicals within an OU2 area and not just on COPCs. For the recreational user scenario, the risks associated with sediment exposure were addressed in a qualitative manner because, based on the exposure assessment, it was determined that water depths in OU2 were too deep for recreational users to become exposed to sediments.

The results of the sediment risk assessment are summarized by OU2 area in Table 1a and collectively for OU2 as a whole below, because the risks are very similar among the three areas.

6.1.2.1 OU2 Sediment Exposure and Risk Summary

The sediment data was segregated by OU2 area and then into two groupings to address two different potential construction worker scenarios.

- Surface sediments (0–0.5 ft) to address sediment exposure for construction projects not requiring intrusive activities into the sediment but which may result in sediment contact (e.g., diving inspections).
- All sediment within an OU2 area to address the potential for contact to sediment as a result of intrusive sediment work, such as related to excavation of sediment for bridge installation or utility repair.

Potential risks were evaluated separately for each OU2 area and by each sediment depth described above. The risks were calculated using site-specific construction worker RSLs developed using EPA's online RSL calculator, considering the sediment conditions in OU2, and using UCLs of the arithmetic mean as the EPCs.

- Risks associated with surface sediment exposure were below the risk management criteria for the construction worker scenario within each OU2 area. This means that risk levels are below a level of regulatory concern. In addition, there is no NAPL present in surface sediment within OU2 that would present a special consideration for construction worker exposure.
- Risks associated with subsurface sediment exposure were below the risk management criteria for the construction worker scenario within each OU2 area. This means that risk levels are below a level of regulatory concern based on average sediment exposures. However, in each OU2 area there are isolated locations where NAPL is present in subsurface sediment, which would present a special concern if construction workers were exposed to the material. The NAPL is typically located at depth greater than 6 ft below the surface water/sediment interface. Depending upon the nature of the construction project and the NAPL present, subsurface sediment exposure in

these isolated areas could result in risks to construction workers above the risk management range.

- Currently there is no sediment exposure to recreational users of the North Branch of the Chicago River, because the water depth in OU2 is typically greater than 6–7 ft in most areas and much deeper in many areas. So even if someone were to fall out of their watercraft (e.g., kayak) they would not contact sediment.[34]
- Within OU2 there are specific metals (cadmium and mercury) and PCBs in sediments that can bioconcentrate in fish. If recreational users fish within OU2 and consume the fish they catch, fish consumption could pose a potential health concern depending upon how many fish meals they eat each year. However, these COPCs in sediment are present in OU2 unrelated to the former MGP activities in OU2. The metals are associated with ambient sediment conditions, and the PCBs specific too the Willow Street OU2 area appears to be related to a specific property within OU2.

6.2 Summary and Conclusions of the Ecological Risk Assessment

The ERA focuses on addressing potential ecological receptor risks associated with the North Branch of the Chicago River surface water and sediments. The risks to benthic invertebrates that live in the surface water and surficial sediment of the river have been addressed quantitatively through a conservative screening assessment of the surface water and sediment data. Risks to other ecological receptors (fish and aquatic wildlife) are addressed qualitatively.

An ecological habitat assessment was conducted during preparation of the SSWP for each MGP site (Willow Street, Division Street, and North Station), which documented both the condition of the North Branch of the Chicago River within OU2 and the upland terrestrial habitat within OU1. The North Branch of the Chicago River provides habitat for aquatic ecological receptors within OU2. For this reason, the ERA for OU2 focuses on addressing potential exposures to ecological receptors associated with MGP-related constituents in the surface water and sediment of the North Branch of the Chicago River and the potential risks associated with those exposures.

An important aspect of this ERA is consideration of ambient sediment conditions, meaning conditions present in the surface water and sediments unrelated to former MGP operations. Upstream ambient surface water and sediment data specifically for the North Branch of the Chicago River were collected before the RI was completed to establish ambient conditions in

[34] As mentioned in Sections 2.3.1.2 and Section 4.2.4, there is a very small area (i.e., approximately 375 ft^2) area within the canal of North Station OU2 where water levels are less than 3.5ft. However, the sediments in this area are inaccessible and soft and so not conducive for wading. For these reasons exposure to these sediments are highly unlikely. While recreational user exposure to sediments are not expected within this OU2 area, the risks quantitatively evaluated for construction workers indicate that occasional exposure to surface sediments in this OU2 area would not pose a potential risks to recreational users.

the North Branch of the Chicago River. Based on the results of an ambient sediment investigation conducted on the North Branch of the Chicago River directly upstream of the North Branch of the Chicago River MGP sites, it is known that sediments of the Chicago River system are highly polluted by activities unrelated to former MGP operations. For example, the ambient sediment conditions of the North Branch of the Chicago River exceed, by orders of magnitude, the ecological screening-level sediment benchmarks normally used to address risk to aquatic receptors associated with TPAH and metals concentrations in sediments. In addition, aquatic toxicity testing of the ambient sediments in the North Branch of the Chicago River revealed that they were moderately toxic to sensitive ecological receptors (i.e., benthic invertebrates) based on the TPAH and metals concentrations. For this reason, the ERA for the North Branch of the Chicago River also compares the surface water and sediment data to the North Branch of the Chicago River ambient sediment data as another point of comparison to put the analyte concentrations detected in OU2 surface water and sediment samples in perspective.

Also, considering the ambient TPAH sediment concentrations were found to be moderately toxic to benthic invertebrates based on the sediment toxicity testing, other less direct lines of evidence such as toxicity modeling for TPAH was not performed as part of the ERA. However, for analytes that were not elevated in ambient sediment samples (e.g., BTEX), toxicity modeling was performed in the ERA for investigative sediment samples collected in each OU2 area to evaluate whether sediments of the North Branch Chicago River would be potentially toxic to benthic invertebrates.

6.2.1 Surface Water

Surface water samples were screened against ecological surface water SLs obtained from the RAF as well as the applicable CAWS ecological SL values. These ecological surface water SLs were developed to be protective to sensitive aquatic invertebrate and fish species. The ecological screening assessment was performed for all three OU2 areas. A chemical that exceeded an ecological surface water SL was considered a COPC. For those chemicals selected as COPCs, an important additional part of this ERA was to determine whether the COPCs were present within the OU2 area above ambient or background conditions. While COPCs may pose an ecological concern, if they are within ambient concentration limits, they do not pose a level of risk above ambient or background conditions. This information is important for risk managers to be aware of as they decide whether remedial action is required for areas posing a potential risk to ecological receptors.

The results of the surface water exposure and risk assessment are summarized by OU2 area in Table 1b, and because the results of the surface water evaluation are somewhat similar between the ambient area and the three OU2 areas, the results are discussed collectively. Any important differences specific to a particular OU2 area are noted here:

- Within the ambient area, benzo(a)anthracene, benzo(a)pyrene, and total aluminum were identified as COPCs because they exceeded the ecological surface water SL provided in the RAF. There were no exceedances of CAWS ecological SLs.

- One or more of the ambient COPCs were also identified as COPCs within each of the OU2 areas. The concentrations of these COPCs in the OU2 areas were similar to ambient conditions, and so none of these COPCs was considered COC for this reason.
- Within the Division Street OU2 area, lead was identified as an additional COPC in surface water because of a single exceedance of its ecological SL. However, when the lead SL was adjusted for the sample-specific hardness of the water sample for which the exceedance occurred, it no longer exceeded the lead surface water SL.

Based on the results of the surface water screening assessment, surface water quality within each OU2 area is considered similar to ambient conditions, and no COCs were identified in surface water.

6.2.2 Sediment

Surface and subsurface sediments were screened against ecological sediment SLs that were agreed upon with EPA when developing the first ERA for an Illinois MGP site in the Multi-Site Program (i.e., South Plant). These ecological sediment SLs were developed to be protective to sensitive BMI that live in the surface sediments. The top six inches of sediment is considered the biologically active zone were BMI can live. Below this surficial layer, not enough oxygen exists for BMI to live. The ecological screening assessment was performed for all three OU2 areas. A chemical that exceeded an ecological sediment SL was considered a COPC. For specific COPCs that were not elevated in ambient sediment samples (i.e., BTEX), additional toxicity modeling was performed for investigative sediment samples collected in each OU2 area to evaluate whether BTEX in the sediments of the North Branch Chicago River could be potentially toxic to benthic invertebrates. For those chemicals selected as COPCs, known to be elevated well above ecological SLs in the ambient area, and considered potentially toxic to benthic invertebrates (i.e., TPAH and select metals), an important additional part of this ERA was to determine whether they were present within the OU2 area above ambient or background conditions. While COPCs may pose an ecological concern, if they are within ambient concentration limits, they do not pose a level of risk above ambient or background conditions. This information is important for risk managers to be aware of as they decide whether remedial action is required for areas posing a potential risk to ecological receptors.

The results of the sediment exposure and risk assessment are summarized by OU2 area in Table 1b and below, because the risks are somewhat different between the three areas.

6.2.2.1 OU2 Sediment Exposure and Risk Summary

The sediment data was segregated by OU2 area and then into two groupings to address two different potential ecological exposure scenarios:

- Surface sediments (0–0.5 ft) to address sediment exposure to BMI living in the bioactive zone of the Chicago River. This scenario represents current conditions.

- Subsurface sediment (>0.5 ft) to address potential future sediment exposure to BMI under the assumption that these sediments become surface sediments as a result of dredging or construction activities within the Chicago River.

Potential ecological risks were evaluated separately for each OU2 area and by each sediment depth described above. The risks were based on a sample-by-sample comparison to the ecological sediment SLs and ambient concentration limits (referred to as UTLs). In certain instances where COPCs were considered potentially MGP related (e.g., BTEX) and were above ambient conditions, further evaluation of the samples was performed to determine whether they were predicted to pose an ecological concern to BMI. In other cases where there were clear departures from ambient conditions (e.g., PCBs and TPAHs) that based on past experience would pose ecological concerns, the risk associated with these COPCs were addressed semi quantitatively.

6.2.2.2 Surface Sediments

Ambient Area – Within the upstream ambient area of the North Branch of the Chicago River, there were a number of ecological COPCs identified in surface sediments, including toluene, xylenes, TPAH-13, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc. The concentrations of the COPCs were above the ecological sediment SLs, in some cases by over 100-fold, at concentrations known to be toxic to BMI. For example, the maximum concentration of TPAH-13 in the ambient sediments was above sediment concentrations estimated to be toxic to BMI, based on experience gained at other sites where site-specific sediment toxicity testing was performed with PAH contaminated sediments. In addition, sediment toxicity testing with the ambient sediments indicated that the ambient sediments were moderately toxic to BMI. A correlation evaluation performed on the data indicated that both the metals and the PAHs may be causing the toxicity associated with the ambient sediments.

Willow Street OU2 – Within the Willow Street OU2 area the ecological COPCs identified in surface sediments included toluene, xylenes, TPAH-13, PCB, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc. For this reason, the surface sediments pose an ecological risk to sensitive aquatic ecological receptors, such as benthic invertebrates, due to the many COPCs identified based on the screening assessment and the magnitude of the exceedances. However, other than for the occurrence of nickel and PCBs within the Willow Street OU2 area, occurrences of the other COPCs appear to be comparable to the ambient conditions of the North Branch of the Chicago River.

Nickel was determined to be slightly elevated above ambient conditions in the Willow Street OU2 area, but its presence does not appear to be related to the former MGP site. Nonetheless, the ecological risks associated with nickel in surface sediment would still be comparable to ambient conditions considering the small difference in average sediment concentrations between the two areas (ambient and OU2).

PCBs concentrations in the Willow OU2 area are at concentrations that would pose an ecological concern to a wide range of ecological receptors due to their ability to bioconcentration and biomagnify through aquatic food chains. The presence of PCBs in the Willow Street OU2 area may be related to the former Finkl parcel located within the Willow

Street OU1 area, which was remediated due to the presence of PCB contaminated soils. The presence of PCBs in the Willow Street OU2 area does not appear to be related to former MGP activities.

Therefore, other than for PCBs, no ecological COCs were identified in surface sediments within this area.

Division Street OU2 – Within the Division Street OU2 area, the ecological COPCs identified in surface sediments included BTEX, TPAH-13, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc. For this reason, the surface sediments pose an ecological risk to sensitive aquatic ecological receptors, such as benthic invertebrates, due to the many COPCs identified based on the screening assessment and the magnitude of the exceedances. However, other than for the occurrence of an isolated detect of benzene and ethylbenzene in the Division Street OU2 area, occurrences of the other COPCs appear to be comparable to the ambient conditions of the North Branch of the Chicago River. Benzene and ethylbenzene were detected above their ecological sediment SLs in a single surface sediment sample out of 90 sediment samples. Also, these concentrations were not estimated to pose a risk to the sensitive aquatic ecological receptors.

Therefore, no ecological COCs were identified in surface sediments within this area.

North Station OU2 – Within the North Station OU2 area, the ecological COPCs identified in surface sediments included toluene, TPAH-13, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc. For this reason, the surface sediments pose an ecological risk to sensitive aquatic ecological receptors, such as benthic invertebrates, due to the many COPCs that were identified based on the screening assessment and the magnitude of the exceedances. However, the occurrences of these COPCs in the North Station OU2 area appear to be comparable to the ambient conditions of the North Branch of the Chicago River.

Therefore, no ecological COCs were identified in surface sediments within this area.

6.2.2.3 Subsurface sediments

Ambient Area – Within the upstream ambient area of the North Branch of the Chicago River, there were a number of ecological COPCs identified in subsurface sediments, including TPAH-13, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc. Similar to surface sediments in this area, the concentrations of the COPCs were above the ecological sediment SLs, in some cases by over 100-fold, at concentrations known to be toxic to BMI. For example, the maximum concentration of TPAH-13 in the ambient sediments was above sediment concentrations estimated to be toxic to BMI, based on experience gained at other sites where site-specific sediment toxicity testing was performed with PAH contaminated sediments. In addition, sediment toxicity testing with the ambient sediments indicated that the ambient sediments were moderately toxic to BMI. Correlation evaluation performed on the data indicated that both the metals and the PAHs may be causing the toxicity associated with the ambient sediments. In addition, when comparing the UTLs to the ambient dataset itself, there were exceedances of the UTLs for TPAH-13 and many metals in subsurface sediments of the ambient reach of the river. Also, the number of exceedances was generally greater for a number

of the metals, thus reinforcing the fact that the ambient UTLs for subsurface sediments cannot be used as a bright line to characterize ambient conditions in subsurface sediments of the North Branch of the Chicago River.[35]

Willow Street OU2 – Within the Willow Street OU2 area, the ecological COPCs identified in subsurface sediments included BTEX, TPAH-13, PCBs, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc. For this reason, the subsurface sediments pose an ecological risk to sensitive aquatic ecological receptors, such as benthic invertebrates, due to the many COPCs identified based on the screening assessment and the magnitude of the exceedances. However, other than for the occurrences of BTEX, TPAH-13, and PCBs, the occurrences of the other COPCs within the Willow Street OU2 area appear to be comparable to the ambient conditions of the North Branch of the Chicago River.

There are 32 subsurface sediment samples with TPAH-13 concentrations that exceed ambient conditions within the Willow Street OU2 area, and most of these samples are at depths greater than 6 ft. Many of these appear to be MGP related due to a forensic evaluation that was performed to identify the potential source of the PAHs. There are also 10 subsurface sediment samples at depths of 5.5 ft or greater that were estimated to pose a potential ecological concern to BMI due to their BTEX concentrations. Most of these samples are co-located with TPAH-13 concentrations exceeding ambient conditions too. In addition, within this area MGP residuals (i.e., NAPL) have been detected in subsurface sediments in isolated locations, and so TPAH-13 and BTEX are considered to pose a risk to BMI if they are exposed to NAPL in subsurface sediments.

Similar to surface sediments, PCB concentrations in the subsurface sediment of the Willow OU2 area are at concentrations that would pose an ecological concern to a wide range of ecological receptors due to their ability to bioconcentration and biomagnify through aquatic food chains. The presence of PCBs in the Willow Street OU2 area may be related to the former Finkl parcel located within the Willow Street OU1 area, which was remediated due to the presence of PCB contaminated soils. The presence of PCBs in the Willow Street OU2 area does not appear to be related to former MGP activities.

Considering these results BTEX, TPAH-13, and PCBs were identified as ecological COCs within subsurface sediments in this area.

Division Street OU2 – Within the Division Street OU2 area, the ecological COPCs identified in subsurface sediments included BTEX, TPAH-13, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc. For this reason, the subsurface sediments pose an ecological risk to sensitive aquatic ecological receptors, such as benthic invertebrates, due to the many COPCs identified based on the screening assessment and the magnitude of the exceedances. However, other than for the occurrences of BTEX and TPAH-13, the occurrences of the other COPC within the Division Street OU2 area appear to be comparable to the ambient conditions of the North Branch of the Chicago River.

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[35] It should be noted that only one subsurface sediment sample was analyzed for BTEX, so the ambient area was not well characterized in the subsurface for these PVOCs. For this reason, it is not known what the subsurface ambient conditions are for PVOCs for the North Branch of the Chicago River.

There are 18 subsurface sediment samples with TPAH-13 concentrations that exceed ambient conditions within the Division Street OU2 area, and most of these samples are at depths greater than 6 ft. Many of these appear to be MGP related due to a forensic evaluation that was performed to identify the potential source of the PAHs. There are also four subsurface sediment samples at depths of 2.5 ft or greater that were estimated to pose a potential ecological concern to BMI due to their BTEX concentrations. Most of these samples are co-located with TPAH-13 concentrations exceeding ambient conditions too. In addition, within this area MGP residuals (i.e., NAPL) have been detected in subsurface sediments in isolated locations, and so TPAH-13 and BTEX are considered to pose a risk to BMI if they are exposed to NAPL in subsurface sediments.

Considering these results BTEX and TPAH-13 were identified as ecological COCs within subsurface sediments in this area.

North Station OU2 – Within the North Station OU2 area, the ecological COPCs identified in subsurface sediments included BTEX, TPAH-13, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc. For this reason, the subsurface sediment pose an ecological risk to sensitive aquatic ecological receptors, such as benthic invertebrates, due to the many COPCs identified based on the screening assessment and the magnitude of the exceedances. However, other than for the occurrences of BTEX and TPAH-13, the occurrences of the other COPCs in the North Station OU2 area appear to be comparable to the ambient conditions of the North Branch of the Chicago River.

There are four subsurface sediment samples with TPAH-13 concentrations that exceed ambient conditions within the North Station OU2 area, and most of these samples are at depths greater than 6 ft. Some of these appear to be MGP related due to a forensic evaluation that was performed to identify the potential source of the PAHs. Based on further analysis of the BTEX sediment samples concentrations exceeding ecological SLs, none of these samples were predicted to be toxic to BMI based on their BTEX concentrations. However, within this area MGP residuals (i.e., NAPL) have been detected in subsurface sediments in isolated locations, and so TPAH-13 and BTEX are considered to pose a risk to BMI if they are exposed to NAPL in subsurface sediments.

Considering these results, BTEX and TPAH-13 were identified as ecological COCs within subsurface sediments in this area.

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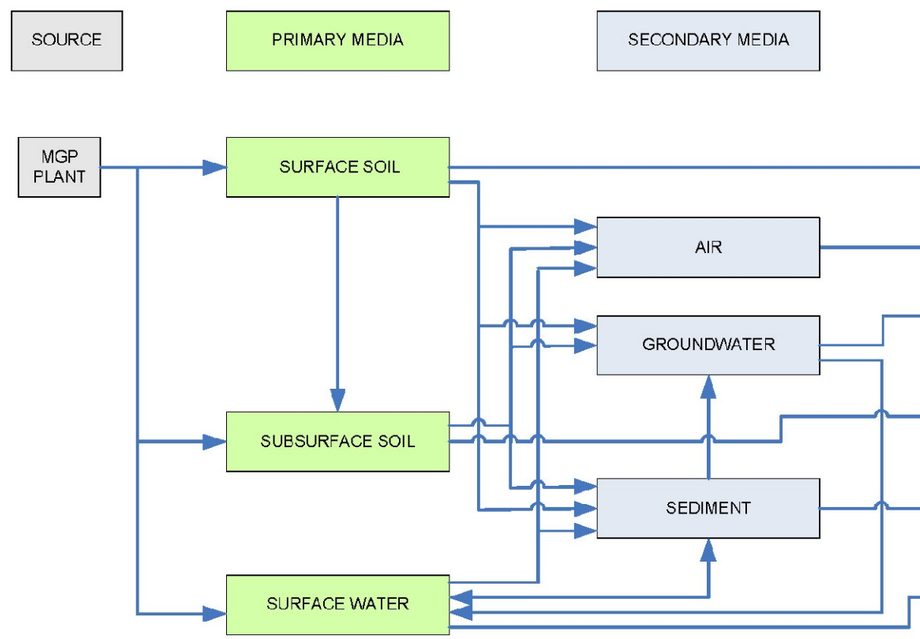
Figures



EXPOSURE ROUTE	HUMAN RECEPTORS				ECOLOGICAL RECEPTORS			
	INDUSTRIAL/ COMMERCIAL WORKER	CONSTRUCTION WORKER	RECREATIONAL	RESIDENTIAL	BIRDS	MAMMALS	FISH	BENTHIC INVERTEBRATES
INGESTION*	NA	NA	NA	NA	NA	NA	NA	NA
DERMAL*	NA	NA	NA	NA	NA	NA	NA	NA
INHALATION	○	○	○	○	○	○	NA	NA
INGESTION*	NA	NA	NA	NA	NA	NA	NA	NA
DERMAL*	NA	NA	NA	NA	NA	NA	NA	NA
INGESTION*	NA	NA	NA	NA	NA	NA	NA	NA
DERMAL*	NA	NA	NA	NA	NA	NA	NA	NA
INGESTION	○	●	○	○	●	○	●	●
DERMAL	○	●	○	○	●	○	●	●
INGESTION	○	●	●	○	●	○	●	●
DERMAL	○	●	●	○	●	○	●	●

LEGEND

● Pathway potentially complete and warrants further evaluation within the Baseline Risk Assessment. The level of evaluation will depend upon site conditions.

○ Pathway not complete or considered insignificant. No further evaluation is recommended unless warranted based on site-specific conditions.

NA Not Applicable

NOTES

* Surface soil, subsurface soil, and groundwater exposure routes not considered here, but will be evaluated as separate operable units.

The arrows linking different media are used to convey which media can potentially affect another media via different potential transport mechanisms. Refer to Section 5.3.1 of the RI Report for more details about the potential transport mechanism(s) that may be applicable for each medium evaluated.

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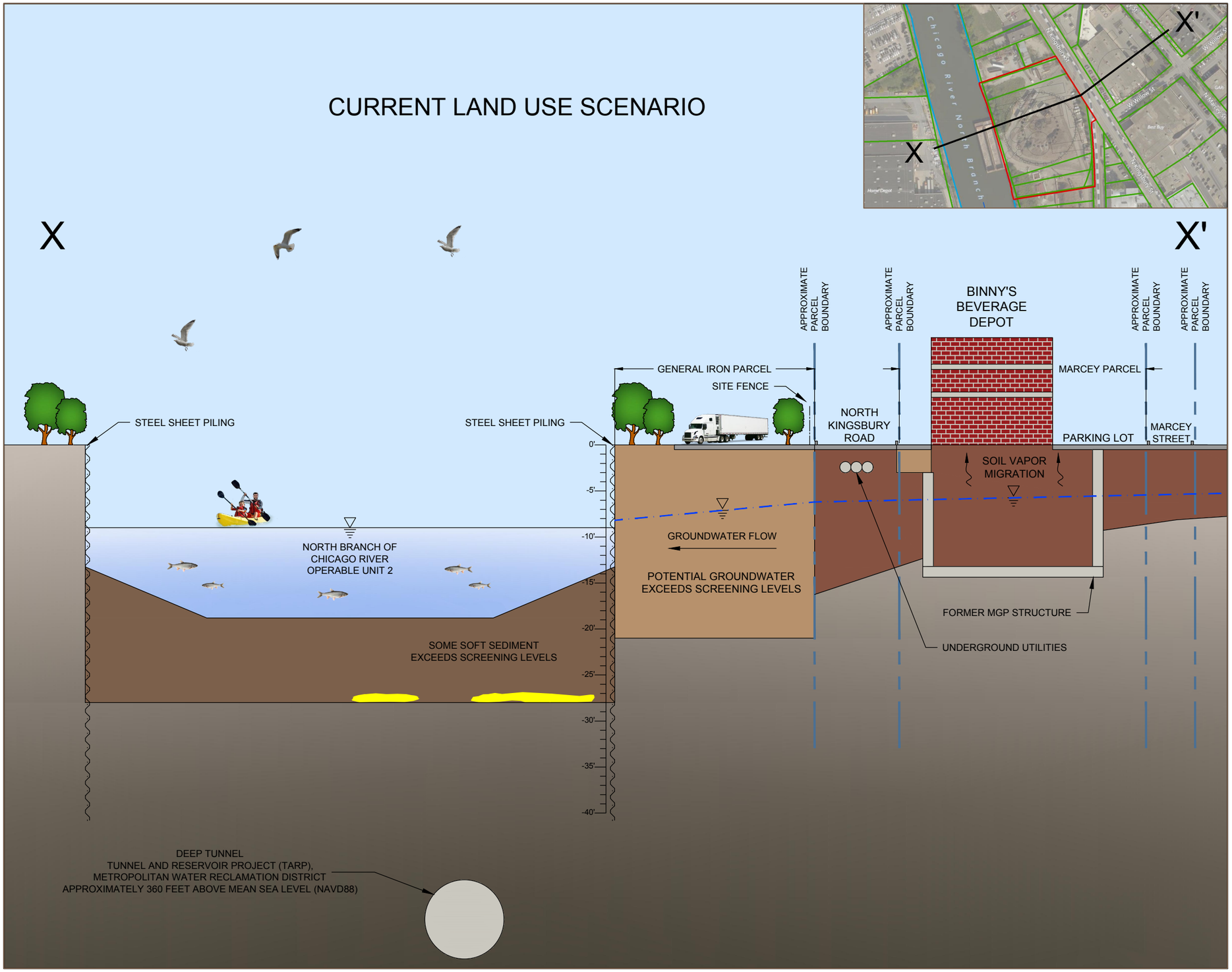
REMEDIAL INVESTIGATION REPORT
NORTH BRANCH SEDIMENT INVESTIGATION
CHICAGO, ILLINOIS

SITE-SPECIFIC CONCEPTUAL SITE MODEL

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 2



N

- CITY OF CHICAGO PARCEL
- APPROXIMATE BOUNDARY OF OPERABLE UNIT
- OPERABLE UNIT ADJACENT RIVER AREA
- CROSS SECTION LINE
- APPROXIMATE PRIOR REMEDIAL EXCAVATION AREA
- FILL
- NATIVE MATERIAL (CLAY)
- SOFT SEDIMENT
- ASPHALT PAVEMENT
- ESTIMATED LOCATION OF NAPL OR OIL-COATED / OIL-WETTED SEDIMENT
- GROUNDWATER TABLE/ WATER LEVEL

SOURCE: PROPERTY LINE INFORMATION OBTAINED FROM COOK COUNTY, ILLINOIS 1:1200-SCALE PARCEL DIGITAL DATA SET, VERSION 1.0. JUNE 2012. OPERABLE UNIT BOUNDARY PROVIDED BY BURNS & MCDONNEL, PROJECT NUMBER 51893, DATED SEPTEMBER 21,2009

REMEDIAL INVESTIGATION REPORT
NORTH BRANCH SEDIMENT INVESTIGATION
CHICAGO, IL

WILLOW STREET
GRAPHICAL CONCEPTUAL SITE MODEL

NOT TO SCALE

AUGUST 2018

O'BRIEN & GERE ENGINEERS, INC.

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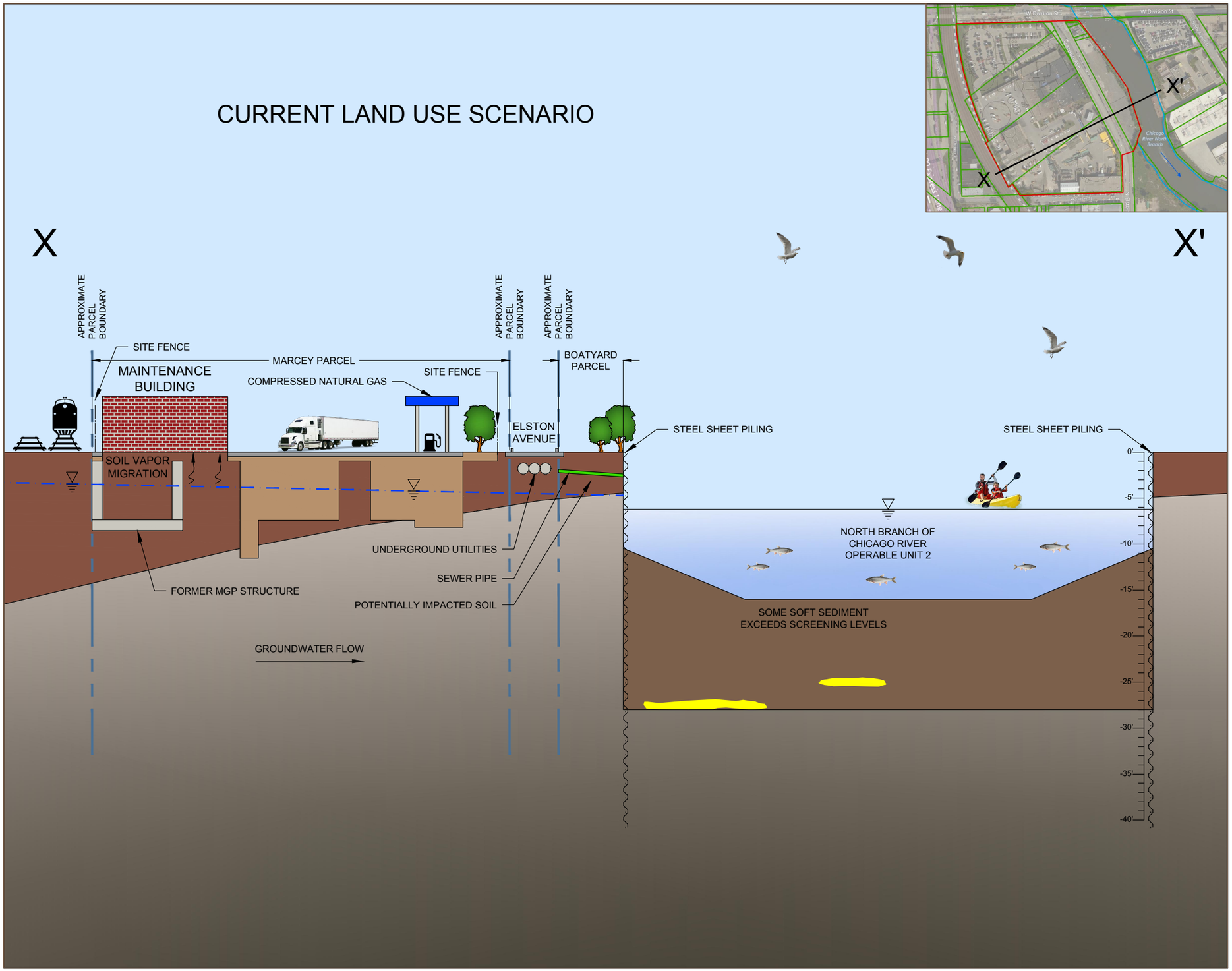
I:\WBS.31060\67862.2034-WBS - PGL\Docs\DWG\Sheets\Figure 24B - Division CSM.dwg



N

- CITY OF CHICAGO PARCEL
- APPROXIMATE BOUNDARY OF OPERABLE UNIT
- OPERABLE UNIT ADJACENT RIVER AREA
- CROSS SECTION LINE
- APPROXIMATE PRIOR REMEDIAL EXCAVATION AREA
- FILL
- NATIVE MATERIAL (CLAY)
- SOFT SEDIMENT
- ASPHALT PAVEMENT
- ESTIMATED LOCATION OF NAPL OR OIL-COATED / OIL-WETTED SEDIMENT
- GROUNDWATER TABLE/ WATER LEVEL

SOURCE: PROPERTY LINE INFORMATION OBTAINED FROM COOK COUNTY, ILLINOIS 1:1200-SCALE PARCEL DIGITAL DATA SET, VERSION 1.0, JUNE 2012. OPERABLE UNIT BOUNDARY PROVIDED BY BURNS & MCDONNEL, PROJECT NUMBER 51893, DATED SEPTEMBER 21,2009

REMEDIAL INVESTIGATION REPORT
NORTH BRANCH SEDIMENT INVESTIGATION
CHICAGO, IL

DIVISION STREET
GRAPHICAL CONCEPTUAL SITE MODEL

NOT TO SCALE

AUGUST 2018

O'BRIEN & GERE ENGINEERS, INC.

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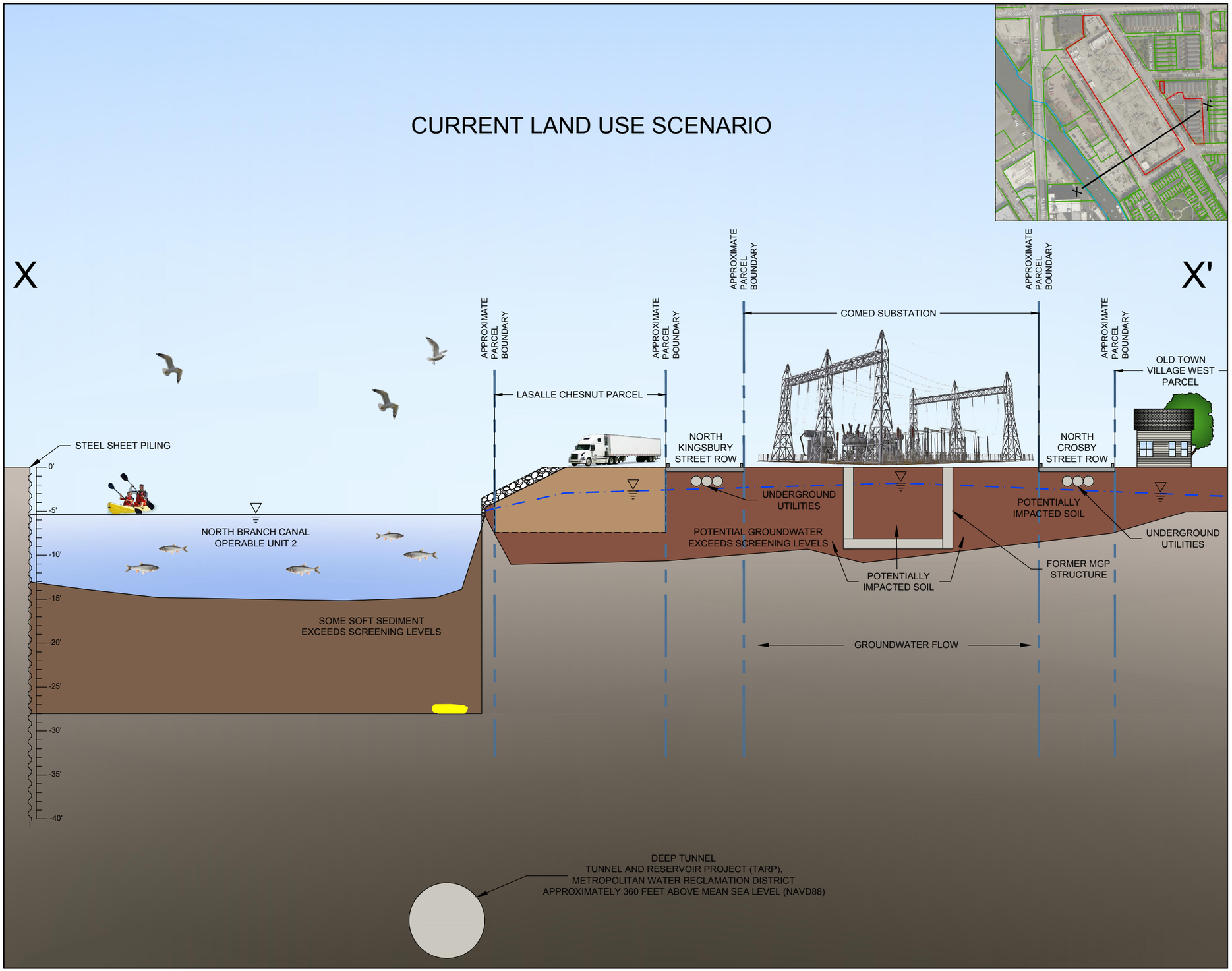
I:\WBS.31060\67862.2034-WBS - PGL\Docs\DWG\Sheets\Figure 24C - North Branch CSM.dwg



N

- CITY OF CHICAGO PARCEL
- APPROXIMATE BOUNDARY OF OPERABLE UNIT
- OPERABLE UNIT ADJACENT RIVER AREA
- CROSS SECTION LINE
- RIP RAP
- APPROXIMATE PRIOR REMEDIAL EXCAVATION AREA
- FILL
- NATIVE MATERIAL (CLAY)
- SOFT SEDIMENT
- ESTIMATED LOCATION OF NAPL OR OIL-COATED / OIL-WETTED SEDIMENT
- GROUNDWATER TABLE/ WATER LEVEL

SOURCE: PROPERTY LINE INFORMATION OBTAINED FROM COOK COUNTY, ILLINOIS 1:1200-SCALE PARCEL DIGITAL DATA SET, VERSION 1.0, JUNE 2012. OPERABLE UNIT BOUNDARY PROVIDED BY BURNS & MCDONNEL, PROJECT NUMBER 51893, DATED SEPTEMBER 21,2009

REMEDIAL INVESTIGATION REPORT
NORTH BRANCH SEDIMENT INVESTIGATION
CHICAGO, IL

NORTH STATION
GRAPHICAL CONCEPTUAL SITE MODEL

NOT TO SCALE

AUGUST 2018

O'BRIEN & GERE ENGINEERS, INC.

Y:\GIS\Projects\20\2034\MXD\N_BranchSed\RI_REV2\Figure 5_North Station Small Potentially Wadeable.mxd 7/18/2019 10:53:35 AM GalarnMC

- SEDIMENT SAMPLING LOCATION, 2013
- APPROXIMATE AREA LESS THAN 3.5 FEET BELOW SURFACE WATER
- APPROXIMATE BOUNDARY OF OPERABLE UNIT 1 (UPLAND OU)
- APPROXIMATE BOUNDARY OF OPERABLE UNIT 2 (ADJACENT RIVER AREA)

REMEDIAL INVESTIGATION REPORT
NORTH BRANCH SEDIMENT INVESTIGATION
CHICAGO, ILLINOIS

NORTH STATION SMALL POTENTIALLY WADEABLE AREA OF CANAL

O'BRIEN & GERE ENGINEERS, INC.

Tables

Note: Electronic versions of all tables are provided on the CD in the BLRA Back-up Folder.

Note: Tables in the List of Tables shaded in gray are found exclusively on the CD.

Table 1a. Summary of human health screening results and risk estimates by exposure scenario for North Branch Site Baseline Risk Assessment (Revision 2)

The Peoples Gas Light and Coke Company

Willow Street, Division Street and North Station Operable Units 2 (River)

The North Branch Site, Cook County, Chicago, IL

USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

	Construction Worker		Recreational User		Table Cross References
	Constituents of Potential Concern (COPC)[a]		Constituents of Potential Concern (COPC)[a]		
	Cancer Risk	Non-cancer Risk	Cancer Risk	Non-cancer Risk	
Surface Water - Dermal contact and incidental ingestion routes of potential exposure					
Ambient	Benzo(a)anthracene, Benzo(a)pyrene, and Dissolved Arsenic		Benzo(a)anthracene, Benzo(a)pyrene, and Dissolved Arsenic		Table 2
Maximum	2.E–05	0.3	2.E–05	0.3	Table 2a
Average	1.E-05	0.2	1.E-05	0.2	
Willow Street	Benzo(a)pyrene, Naphthalene, Dissolved Arsenic, and Total Arsenic.		Benzo(a)pyrene, Naphthalene, Dissolved Arsenic, and Total Arsenic.		Table 3
Maximum	5.E–05	1	5.E–05	1	Table 3a
Average	2.E–05	0.3	2.E–05	0.3	
Division Street	Benzo(a)anthracene, Benzo(a)pyrene, and Dissolved Arsenic		Benzo(a)anthracene, Benzo(a)pyrene, and Dissolved Arsenic		Table 4
Maximum	2.E–05	0.2	2.E–05	0.2	Table 4a
Average	1.E-05	0.1	1.E-05	0.1	
North Station	Benzo(a)anthracene, Benzo(a)pyrene, and Total Arsenic		Benzo(a)anthracene, Benzo(a)pyrene, and Total Arsenic		Table 5
Maximum	3.E-05	0.4	3.E-05	0.4	Table 5a
Average	2.E-05	0.3	2.E-05	0.3	
Surface Sediment (0–0.5 ft) - Dermal contact and incidental ingestion routes of potential exposure					
Willow Street	Naphthalene, PCBs, and Lead		Not Applicable		Table 8
Average (UCL)	2.E–07	0.4			Table 8a
Division Street	Naphthalene, Arsenic, Chromium, and Lead		Not Applicable		Table 10
Average (UCL)	9.E-08	0.4			Table 10a
North Station	Benzo(a)pyrene		Not Applicable		Table 12
Average (UCL)	3.E-08	0.6			Table 12a
All Sediment (all depths intervals) - Dermal contact and incidental ingestion routes of potential exposure					
Willow Street[b]	Benzene, Ethylbenzene, Toluene, O-Xylene, M+P-Xylenes, Xylenes, Total, 1-Methylnaphthalene, 2-Methylnaphthalene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenz(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Naphthalene, 1,2,4-Trimethylbenzene, PCBs, Chromium, Iron, Lead, and Mercury		Not Applicable		Table 9
Average (UCL)	5.E–07	1			Table 9a
Division Street[b]	Benzene, Ethylbenzene, Toluene, Xylenes[c], 2-Methylnaphthalene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenz(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Naphthalene, Arsenic, Cadmium, Chromium, and Lead		Not Applicable		Table 11
Average (UCL)	2.E-07	0.8			Table 11a
North Station[b]	Benzene, Ethylbenzene, Xylenes, Benzo(a)pyrene, Naphthalene, Chromium, and Lead		Not Applicable		Table 13
Average (UCL)	1.E-07	0.8			Table 13a

Notes: This table provides a summary of the constituents of potential concern (COPC) by medium (e.g., sediment) and exposure scenario (i.e., construction worker and recreational user) and the cumulative cancer and noncancer risk estimates associated with the COPC in each medium. Cancer risk estimates are shaded in green, while noncancer risk estimates are shaded in rose. All cumulative risk estimates are reported to one significant digit following EPA risk assessment guidance. Those COPC considered chemicals of concern (COC) are also summarized in this table (see explanation below).

COPC are chemicals that have a maximum concentration in an environmental medium (e.g., soil) which exceeds a risk-based screening level (SL). The SLs were developed using a target cancer risk of 1×10^{-6} or a target noncancer risk (defined by a hazard quotient) of 1.0. Generic SLs are not available for sediments or surface water exposures. The soil SLs were used as a surrogate set of SLs for the construction worker exposure scenarios. Recreation user exposure is not assessed because the water depth precludes sediment exposure for recreational users. For the surface water exposure scenario, SLs based on residential exposure assumptions for domestic water use are used for selecting COPC for both construction worker and recreational users exposure scenarios. Once classified as a COPC based on the SL, COPC are evaluated further in the risk assessment to determine whether they pose an unacceptable risk based on site-specific conditions. The risk estimates for COPC are calculated using the site data (not the maximum concentration used to perform the initial screen) and determine whether a COPC is classified as a chemical of concern (COC). A COC is a chemical that contributes substantially to a cumulative risk estimate that is above either of the regulatory risk criteria set by EPA (i.e., cumulative cancer risk $>1x10^{-4}$ or a cumulative non-cancer risk >1). Any COPC that has a risk above one of these criteria is defined as a COC. However, an individual chemical may be considered a COC even if its cancer risk is $<1x10^{-4}$ or its noncancer risk is <1 if it contributes substantially to a cumulative risk estimate that is above a regulatory risk criteria. Refer to the text of the BLRA for more details on the selection of COCs.

Footnotes:

[a] **Bold COPC are those that are considered a COC based on the results of the risk assessment.**

[b] **MGP residuals (i.e., NAPL) have been observed in subsurface sediments in this area, and direct contact with these residuals would pose a potential risk to human receptors above the risk management range if they were to encounter residuals as a result of intrusive activities.**

[c] Unless otherwise specified xylene refers to xylenes, total.

Table 1b. Summary of ecological screening results for North Branch Site areas Baseline Risk Assessment (Revision 2)

The Peoples Gas Light and Coke Company

Willow Street, Division Street and North Station Operable Units 2 (River)

The North Branch Site, Cook County, Chicago, IL

USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

	Ecological Receptors (Benthic Invertebrates and Fish)
	Constituents of Potential Concern (COPC)[a]
Surface Sediment (0–0.5 ft) - Within the biologically active zone	
Ambient	Toluene, Xylenes, TPAH-13, Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, and Zinc.
Willow Street	Toluene, Xylenes, TPAH-13, **PCB**, Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, and Zinc.
Division Street	Benzene, Ethylbenzene, Toluene, Xylenes, TPAH-13, Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, and Zinc.
North Station	Toluene, TPAH-13, Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, and Zinc.
Subsurface Sediment (>0.5 ft) - Below the biologically active zone and evaluated for informational purposes	
Ambient	TPAH-13, Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, and Zinc.
Willow Street[b]	**Benzene, Ethylbenzene, Toluene, Xylenes, TPAH-13, PCB,** Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, and Zinc.
Division Street[b]	**Benzene, Ethylbenzene, Toluene, Xylenes, TPAH-13**, Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, and Zinc.
North Station[b]	**Benzene, Ethylbenzene, Toluene, Xylenes, TPAH-13**, Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, and Zinc.
Surface Water	
Ambient	Benzo(a)anthracene, Benzo(a)pyrene, and Total Aluminum.
Willow Street	Benzo(a)pyrene
Division Street	Benzo(a)anthracene, Benzo(a)pyrene, Total Aluminum, and Dissolved Lead.
North Station	Benzo(a)anthracene, Benzo(a)pyrene, and Total Aluminum.

Notes: This table provides a summary of the constituents of potential concern (COPC) by medium (e.g., sediment) by area. COPC are chemicals that have a maximum concentration in an environmental medium (e.g., sediment) which exceeds an ecological risk-based screening level (SL). A constituent of concern (COC) is a chemical that based on the results of the ecological risk assessment (ERA) poses a concern to sensitive ecological receptors. For subsurface sediments, the COPC highlighted as COC would only pose a concern if the subsurface sediments are exposed at the sediment -surface water interface in the future. Under current conditions, subsurface sediments do not pose a concern to ecological receptors, because they are below the biologically active zone where ecological receptors live and feed.

Footnotes:

[a] **Bold COPC are those that are considered a COC based on the results of the ecological risk assessment. COCs are analytes that both pose a concern to ecological receptors and depart from ambient conditions within the North Branch of the Chicago River.**

[b] COC identified in this area are due to the presence of MGP-residuals at depth and are primarily localized in discrete areas where there are exceedances of the TPAH-13 ambient concentration limit. Refer to the text of the ERA and the RI report for more details.

Table 2. Human health and ecological screening assessment: Surface water – Ambient Reach of the North Branch of the Chicago River
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances							Criterion Concentrations						
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Tap-water RSL	MCL	State of Illinois Groundwater QS, TACO or Non-TACO SL	CAWS Human Health & Threshold SL	RAF Selected Eco SL	North Branch CAWS Aquatic SL - Chronic	North Branch CAWS Aquatic SL - Acute	Tap-water RSL	MCL	State of Illinois Groundwater QS, TACO or Non-TACO SL	CAWS Human Health & Threshold SL	RAF Selected Eco SL	North Branch CAWS Aquatic SL - Chronic	North Branch CAWS Aquatic SL - Acute
BTEX	Toluene	2	16	2.04	3.1	0	0	0		0	0	0	1100	1000	1000		253	600	2000
PAH	Acenaphthene	16	16	0.00857	0.014	0		0		0	0	0	530		420		38	62	120
	Acenaphthylene	8	16	0.00849	0.011	0		0		0	0	0	530		210		4840	15	190
	Anthracene	14	16	0.0105	0.015	0		0	0	0	0	0	1800		2100	35000	0.035	0.53	0.66
	Benzo(a)anthracene	16	16	0.0182	0.033	2		0	0	2			0.03		0.13	0.16	0.025		
	Benzo(a)pyrene	16	16	0.0228	0.046	3	0	0	13	15			0.025	0.2	0.2	0.016	0.014		
	Benzo(b)fluoranthene	16	16	0.0217	0.038	0		0	0	0			0.25		0.18	0.16	9.07		
	Benzo(g,h,i)perylene	16	16	0.0218	0.042	0		0		0			120		210		7.64		
	Benzo(k)fluoranthene	16	16	0.0269	0.054	0		0	0				2.5		0.17	1.6			
	Chrysene	16	16	0.0358	0.067	0		0	0				25		12	16			
	Dibenz(a,h)anthracene	9	16	0.00594	0.0097	0		0	0	0			0.025		0.3	0.016	5		
	Fluoranthene	16	16	0.0643	0.11	0		0	0	0	0	0	800		280	120	1.9	1.8	4.3
	Fluorene	12	16	0.00827	0.015	0		0	0	0	0	0	290		280	4500	19	16	59
	Indeno(1,2,3-cd)pyrene	15	16	0.0158	0.031	0		0	0	0			0.25		0.43	0.16	4.31		
	Naphthalene	1	16	0.063	0.063	0		0		0	0	0	0.17		140		13	68	510
	Phenanthrene	16	16	0.0326	0.055	0		0		0	0	0	1800		210		3.6	3.7	46
	Pyrene	16	16	0.0551	0.091	0		0	0	0			120		210	3500	0.3		
Metal	Aluminum, Dissolved	1	4	15.4	15.4	0		0		0			20000		3500		87		
	Aluminum, Total	3	7	314	355	0		0		3			20000		3500		87		
	Antimony, Dissolved	4	4	0.345	0.38	0	0	0		0			7.8	6	6		80		
	Arsenic, Dissolved	8	8	0.769	0.97	8	0	0		0	0	0	0.052	10	10		150	150	340
	Barium, Dissolved	8	8	24.2	24.5	0	0	0		0			3800	2000	2000		220		
	Barium, Total	8	8	18.3	19	0	0	0		0			3800	2000	2000		220		
	Chromium, Dissolved	8	8	0.405	0.5	0	0	0		0	0	0	22000	100	100		133	133	1020
	Chromium, Total	1	8	1.1	1.1	0	0	0		0	0	0	22000	100	100		155	155	3230
	Copper, Dissolved	8	8	3.76	5.2	0	0	0		0	0	0	800	1300	650		16.5	17.5	27.8
	Copper, Total	8	8	4	4.3	0	0	0		0	0	0	800	1300	650		17.2	18.1	29
	Iron, Dissolved	4	4	50.5	62.2	0		0		0	0	0	14000		5000		1000	1000	1000
	Iron, Total	7	7	324	369	0		0		0			14000		5000		1000		
	Lead, Dissolved	8	8	0.44	0.67	0	0	0		0	0	0	15	15	7.5		5.42	34.2	163
	Lead, Total	8	8	1.51	2.2	0	0	0		0	0	0	15	15	7.5		7.89	49.7	237
	Manganese, Dissolved	4	4	16.2	17.3	0		0			0	0	430		150			3030	7210
	Manganese, Total	7	7	15.5	16.9	0		0			0	0	430		150			2350	5570
	Nickel, Dissolved	8	8	3.76	5	0		0		0	0	0	390		100		95	9.1	151
	Nickel, Total	8	8	4.25	4.5	0		0		0	0	0	390		100		95	9.1	151
	Selenium, Total	7	8	0.486	0.51	0	0	0	0	0	0	0	100	50	50	1000	5	1000	1000
	Vanadium, Dissolved	4	4	0.388	0.45	0		0		0			86		49		12		
	Zinc, Dissolved	8	8	22.6	31.9	0		0		0	0	0	6000		5000		216	57.2	219
	Zinc, Total	8	8	22.8	24.1	0		0		0	0	0	6000		5000		219	58	224

Notes: This table summarizes the results of the human health and ecological screening assessment for surface water. Summary statistics are provided for chemicals detected in at least one sample within the OU2 area. The table summarizes the number of exceedances of each available criterion concentration, which are screening levels (SLs). All data and SLs are reported in units of µg/L. An exceedance count of 0 means there was no exceedance in the OU2 area for the SL. An empty cell indicates an SL was not available for the analyte. A chemical that exceeds an SL is considered a constituent of potential concern (COPC) that requires further evaluation in the Baseline Risk Assessment (BLRA) and is shaded in yellow. Surface water samples for metals were analyzed either before filtering, which represents a total result, or after filtering, which represents a dissolved sample result. Both total and dissolved surface water data were compared to the same groundwater SLs. Where there were surface water SLs available for both dissolved and total metals, the appropriate SL was compared to the surface water data.

Groundwater SLs were used to screen surface water concentrations for human health. The Illinois groundwater SLs (State of Illinois Groundwater Quality Standards [QS], Illinois Tiered Approach to Corrective Action Objectives [TACO], or Non-TACO SLs) and regional screening levels (RSLs) are those provided in the multi-site risk assessment framework (RAF) addendum (Revision 6) (Exponent 2017). These screening values are current, being based on a review of the May 2018 update to the RSLs published by the U.S. Environmental Protection Agency (EPA). Note that the Federal maximum contaminant limit (MCL) presented in the RAF addendum (Revision 6) is incorporated by default as part of the other two tapwater SLs and so is not repeated to avoid redundancy.

The Chicago Area Waterway System (CAWS) SLs, which provide both human health and ecological surface water SLs, were developed from the CAWS standards and criteria as follows:
CAWS standards for the North Branch of the Chicago River are found in or calculated from Illinois EPA Admin. Code 35, Subtitle C, Chapter I, Part 302 as follows:

a. Human Health Water Quality Standard (302.407 f.)
b. Acute Aquatic Toxicity Standards (Sections 302.407 e.)
c. Chronic Aquatic Toxicity standards (Section 302.407 e.)

CAWS "other toxic substance" criteria derived from Illinois EPA Admin. Code 35, Subtitle C, Chapter I, Part 302.407 as follows:

a. Acute Aquatic Toxicity criterion (AATC) (Sections 302.612–618 or 302.621)
b. Chronic Aquatic Toxicity criterion (CATS) (Section 302.407 e., 302.627, or 320.630)
c. Wild and Domestic Animal Protection Criterion (WDAPC) (Section 302.633)
d. Human Threshold Criterion (HTC) (Section 302.642–648)
e. Human Nonthreshold Criterion (HNC) (Section 302.651–658)

Legend:
BTEX - benzene, toluene, ethylbenzene, and xylene
CAWS - Chicago Area Waterway System
SL - screening level
MCL - maximum contaminant level
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
QS - quality standard
RAF - risk assessment framework
RSL - regional screening level
TACO - Illinois Tiered Approach to Corrective Action Objectives
VOC - Volatile Organic Compound
µg/L - micrograms per liter

Illinois EPA has derived other toxic substances criteria in 2013 that can be found at http://www.epa.illinois.gov/topics/water-quality/standards/derived-criteria/index. These standards and criteria were combined to generate the SLs used on this table. Hardness-dependent dissolved metal SLs were based on the average hardness of the waters of the North Branch of the Chicago River.

The RAF selected ecological (Eco) SLs are summarized in Table 14 of the BLRA.

Table 3. Human health and ecological screening assessment: Surface water – Willow Street OU2

Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances							Criterion Concentrations						
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Tap-water RSL	MCL	State of Illinois Groundwater QS, TACO or Non-TACO SL	CAWS Human Health & Threshold SL	RAF Selected Eco SL	North Branch CAWS Aquatic SL - Chronic	North Branch CAWS Aquatic SL - Acute	Tap-water RSL	MCL	State of Illinois Groundwater QS, TACO or Non-TACO SL	CAWS Human Health & Threshold SL	RAF Selected Eco SL	North Branch CAWS Aquatic SL - Chronic	North Branch CAWS Aquatic SL - Acute
PAH	Acenaphthene	7	8	0.00767	0.0096	0		0		0	0	0	530		420		38	62	120
	Anthracene	3	8	0.0078	0.0097	0		0	0	0	0	0	1800		2100	35000	0.035	0.53	0.66
	Benzo(a)anthracene	7	8	0.0165	0.023	0		0	0	0			0.03		0.13	0.16	0.025		
	Benzo(a)pyrene	7	8	0.0196	0.031	3	0	0	4	4			0.025	0.2	0.2	0.016	0.014		
	Benzo(b)fluoranthene	7	8	0.0187	0.028	0		0	0	0			0.25		0.18	0.16	9.07		
	Benzo(g,h,i)perylene	7	8	0.0188	0.03	0		0		0			120		210		7.64		
	Benzo(k)fluoranthene	7	8	0.025	0.043	0		0	0				2.5		0.17	1.6			
	Chrysene	7	8	0.0319	0.048	0		0	0				25		12	16			
	Dibenz(a,h)anthracene	3	8	0.00463	0.0059	0		0	0	0			0.025		0.3	0.016	5		
	Fluoranthene	8	8	0.0605	0.091	0		0	0	0	0	0	800		280	120	1.9	1.8	4.3
	Fluorene	5	8	0.00568	0.0069	0		0	0	0	0	0	290		280	4500	19	16	59
	Indeno(1,2,3-cd)pyrene	6	8	0.0147	0.021	0		0	0	0			0.25		0.43	0.16	4.31		
	Naphthalene	1	8	6	6	1		0		0	0	0	0.17		140		13	68	510
	Phenanthrene	7	8	0.027	0.037	0		0		0	0	0	1800		210		3.6	3.7	46
	Pyrene	7	8	0.047	0.064	0		0	0	0			120		210	3500	0.3		
Metal	Aluminum, Dissolved	4	4	20.5	22.7	0		0		0			20000		3500		87		
	Antimony, Dissolved	4	4	0.32	0.33	0	0	0		0			7.8	6	6		80		
	Arsenic, Dissolved	4	4	0.688	0.71	4	0	0		0	0	0	0.052	10	10		150	150	340
	Arsenic, Total	1	4	1.1	1.1	1	0	0		0			0.052	10	10		150		
	Barium, Dissolved	4	4	24.1	24.4	0	0	0		0			3800	2000	2000		220		
	Barium, Total	4	4	19.4	19.7	0	0	0		0			3800	2000	2000		220		
	Chromium, Dissolved	4	4	0.385	0.4	0	0	0		0	0	0	22000	100	100		133	133	1020
	Copper, Dissolved	4	4	2.85	3.3	0	0	0		0	0	0	800	1300	650		16.5	17.5	27.8
	Copper, Total	4	4	3.82	4	0	0	0		0	0	0	800	1300	650		17.2	18.1	29
	Iron, Dissolved	4	4	67.1	69	0		0		0	0	0	14000		5000		1000	1000	1000
	Lead, Dissolved	4	4	0.455	0.52	0	0	0		0	0	0	15	15	7.5		5.42	34.2	163
	Lead, Total	4	4	1.95	3.7	0	0	0		0	0	0	15	15	7.5		7.89	49.7	237
	Manganese, Dissolved	4	4	15.8	16.1	0		0			0	0	430		150			3030	7210
	Manganese, Total	4	4	22.2	23.6	0		0			0	0	430		150			2350	5570
	Nickel, Dissolved	4	4	2.8	3.4	0		0		0	0	0	390		100		95	9.1	151
	Nickel, Total	4	4	2.82	3	0		0		0	0	0	390		100		95	9.1	151
	Selenium, Total	1	4	0.85	0.85	0	0	0	0	0	0	0	100	50	50	1000	5	1000	1000
	Vanadium, Dissolved	4	4	0.402	0.48	0		0		0			86		49		12		
	Zinc, Dissolved	4	4	17.4	17.6	0		0		0	0	0	6000		5000		216	57.2	219
	Zinc, Total	4	4	26.7	29.3	0		0		0	0	0	6000		5000		219	58	224

Notes: This table summarizes the results of the human health and ecological screening assessment for surface water. Summary statistics are provided for chemicals detected in at least one sample within the OU2 area. The table summarizes the number of exceedances of each available criterion concentration, which are screening levels (SLs). All data and SLs are reported in units of µg/L. An exceedance count of 0 means there was no exceedance in the OU2 area for the SL. An empty cell indicates an SL was not available for the analyte. A chemical that exceeds an SL is considered a constituent of potential concern (COPC) that requires further evaluation in the Baseline Risk Assessment (BLRA) and is shaded in yellow. Surface water samples for metals were analyzed either before filtering, which represents a total result, or after filtering, which represents a dissolved sample result. Both total and dissolved surface water data were compared to the same groundwater SLs. Where there were surface water SLs available for both dissolved and total metals, the appropriate SL was compared to the surface water data.

Groundwater SLs were used to screen surface water concentrations for human health. The Illinois groundwater SLs (State of Illinois Groundwater Quality Standards [QS], Illinois Tiered Approach to Corrective Action Objectives [TACO], or Non-TACO SLs) and regional screening levels (RSLs) are those provided in the multi-site risk assessment framework (RAF) addendum (Revision 6) (Exponent 2017). These screening values are current, being based on a review of the May 2018 update to the RSLs published by the U.S. Environmental Protection Agency (EPA). Note that the Federal maximum contaminant limit (MCL) presented in the RAF addendum (Revision 6) is incorporated by default as part of the other two tapwater SLs and so is not repeated to avoid redundancy.

The Chicago Area Waterway System (CAWS) SLs, which provide both human health and ecological surface water SLs, were developed from the CAWS standards and criteria as follows:
CAWS standards for the North Branch of the Chicago River are found in or calculated from Illinois EPA Admin. Code 35, Subtitle C, Chapter I, Part 302 as follows:

a. Human Health Water Quality Standard (302.407 f.)
b. Acute Aquatic Toxicity Standards (Sections 302.407 e.)
c. Chronic Aquatic Toxicity standards (Section 302.407 e.)

CAWS "other toxic substance" criteria derived from Illinois EPA Admin. Code 35, Subtitle C, Chapter I, Part 302.407 as follows:

a. Acute Aquatic Toxicity criterion (AATC) (Sections 302.612–618 or 302.621)
b. Chronic Aquatic Toxicity criterion (CATS) (Section 302.407 e., 302.627, or 320.630)
c. Wild and Domestic Animal Protection Criterion (WDAPC) (Section 302.633)
d. Human Threshold Criterion (HTC) (Section 302.642–648)
e. Human Nonthreshold Criterion (HNC) (Section 302.651–658)

Legend:
BTEX - benzene, toluene, ethylbenzene, and xylene
CAWS - Chicago Area Waterway System
SL - screening level
MCL - maximum contaminant level
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
QS - quality standard
RAF - risk assessment framework
RSL - regional screening level
TACO - Illinois Tiered Approach to Corrective Action Objectives
VOC - Volatile Organic Compound

Illinois EPA has derived other toxic substances criteria in 2013 that can be found at http://www.epa.illinois.gov/topics/water-quality/standards/derived-criteria/index. These standards and criteria were combined to generate the SLs used on this table. Hardness-dependent dissolved metal SLs were based on the average hardness of the waters of the North Branch of the Chicago River.

The RAF selected ecological (Eco) SLs are summarized in Table 14 of the BLRA.

Table 4. Human health and ecological screening assessment: Surface water – Division Street OU2

Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances							Criterion Concentrations						
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Tap-water RSL	MCL	State of Illinois Groundwater QS, TACO or Non-TACO SL	CAWS Human Health & Threshold SL	RAF Selected Eco SL	North Branch CAWS Aquatic SL - Chronic	North Branch CAWS Aquatic SL - Acute	Tap-water RSL	MCL	State of Illinois Groundwater QS, TACO or Non-TACO SL	CAWS Human Health & Threshold SL	RAF Selected Eco SL	North Branch CAWS Aquatic SL - Chronic	North Branch CAWS Aquatic SL - Acute
PAH	Acenaphthene	8	8	0.011	0.017	0		0		0	0	0	530		420		38	62	120
	Acenaphthylene	4	8	0.0119	0.017	0		0		0	0	0	530		210		4840	15	190
	Anthracene	8	8	0.0142	0.023	0		0	0	0	0	0	1800		2100	35000	0.035	0.53	0.66
	Benzo(a)anthracene	8	8	0.0301	0.067	2		0	0	3			0.03		0.13	0.16	0.025		
	Benzo(a)pyrene	8	8	0.0274	0.061	3	0	0	4	6			0.025	0.2	0.2	0.016	0.014		
	Benzo(b)fluoranthene	8	8	0.0348	0.083	0		0	0	0			0.25		0.18	0.16	9.07		
	Benzo(g,h,i)perylene	8	8	0.0278	0.061	0		0		0			120		210		7.64		
	Benzo(k)fluoranthene	8	8	0.028	0.056	0		0	0				2.5		0.17	1.6			
	Chrysene	8	8	0.0418	0.08	0		0	0				25		12	16			
	Dibenz(a,h)anthracene	5	8	0.0079	0.014	0		0	0	0			0.025		0.3	0.016	5		
	Fluoranthene	8	8	0.0909	0.16	0		0	0	0	0	0	800		280	120	1.9	1.8	4.3
	Fluorene	8	8	0.0116	0.016	0		0	0	0	0	0	290		280	4500	19	16	59
	Indeno(1,2,3-cd)pyrene	8	8	0.0197	0.046	0		0	0	0			0.25		0.43	0.16	4.31		
	Naphthalene	3	8	0.00637	0.0071	0		0		0	0	0	0.17		140		13	68	510
	Phenanthrene	8	8	0.0515	0.1	0		0		0	0	0	1800		210		3.6	3.7	46
	Pyrene	8	8	0.0782	0.15	0		0	0	0			120		210	3500	0.3		
Metal	Aluminum, Total	1	4	279	279	0		0		1			20000		3500		87		
	Antimony, Dissolved	1	1	0.34	0.34	0	0	0		0			7.8	6	6		80		
	Arsenic, Dissolved	4	4	0.688	0.72	4	0	0		0	0	0	0.052	10	10		150	150	340
	Barium, Dissolved	4	4	23.4	23.7	0	0	0		0			3800	2000	2000		220		
	Barium, Total	4	4	19	19.9	0	0	0		0			3800	2000	2000		220		
	Chromium, Dissolved	4	4	0.412	0.46	0	0	0		0	0	0	22000	100	100		133	133	1020
	Chromium, Total	1	4	1.2	1.2	0	0	0		0	0	0	22000	100	100		155	155	3230
	Copper, Dissolved	4	4	2.95	3.2	0	0	0		0	0	0	800	1300	650		16.5	17.5	27.8
	Copper, Total	4	4	3.75	4.3	0	0	0		0	0	0	800	1300	650		17.2	18.1	29
	Iron, Dissolved	1	1	40.6	40.6	0		0		0	0	0	14000		5000		1000	1000	1000
	Iron, Total	3	4	286	326	0		0		0			14000		5000		1000		
	Lead, Dissolved	4	4	1.84	5.5	0	0	0		1	0	0	15	15	7.5		5.42	34.2	163
	Lead, Total	4	4	2.4	3.3	0	0	0		0	0	0	15	15	7.5		7.89	49.7	237
	Manganese, Dissolved	1	1	16.2	16.2	0		0			0	0	430		150			3030	7210
	Manganese, Total	4	4	14.2	15.3	0		0			0	0	430		150			2350	5570
	Nickel, Dissolved	4	4	2.75	3.7	0		0		0	0	0	390		100		95	9.1	151
	Nickel, Total	4	4	3.75	3.9	0		0		0	0	0	390		100		95	9.1	151
	Selenium, Total	1	4	0.44	0.44	0	0	0	0	0	0	0	100	50	50	1000	5	1000	1000
	Vanadium, Dissolved	1	1	0.44	0.44	0		0		0			86		49		12		
	Zinc, Dissolved	4	4	28.2	30.4	0		0		0	0	0	6000		5000		216	57.2	219
	Zinc, Total	4	4	24.4	25.9	0		0		0	0	0	6000		5000		219	58	224

Notes: This table summarizes the results of the human health and ecological screening assessment for surface water. Summary statistics are provided for chemicals detected in at least one sample within the OU2 area. The table summarizes the number of exceedances of each available criterion concentration, which are screening levels (SLs). All data and SLs are reported in units of µg/L. An exceedance count of 0 means there was no exceedance in the OU2 area for the SL. An empty cell indicates an SL was not available for the analyte. A chemical that exceeds an SL is considered a constituent of potential concern (COPC) that requires further evaluation in the Baseline Risk Assessment (BLRA) and is shaded in yellow. Surface water samples for metals were analyzed either before filtering, which represents a total result, or after filtering, which represents a dissolved sample result. Both total and dissolved surface water data were compared to the same groundwater SLs. Where there were surface water SLs available for both dissolved and total metals, the appropriate SL was compared to the surface water data.

Groundwater SLs were used to screen surface water concentrations for human health. The Illinois groundwater SLs (State of Illinois Groundwater Quality Standards [QS], Illinois Tiered Approach to Corrective Action Objectives [TACO], or Non-TACO SLs) and regional screening levels (RSLs) are those provided in the multi-site risk assessment framework (RAF) addendum (Revision 6) (Exponent 2017). These screening values are current, being based on a review of the May 2018 update to the RSLs published by the U.S. Environmental Protection Agency (EPA). Note that the Federal maximum contaminant limit (MCL) presented in the RAF addendum (Revision 6) is incorporated by default as part of the other two tapwater SLs and so is not repeated to avoid redundancy.

The Chicago Area Waterway System (CAWS) SLs, which provide both human health and ecological surface water SLs, were developed from the CAWS standards and criteria as follows:
CAWS standards for the North Branch of the Chicago River are found in or calculated from Illinois EPA Admin. Code 35, Subtitle C, Chapter I, Part 302 as follows:

a. Human Health Water Quality Standard (302.407 f.)
b. Acute Aquatic Toxicity Standards (Sections 302.407 e.)
c. Chronic Aquatic Toxicity standards (Section 302.407 e.)

CAWS "other toxic substance" criteria derived from Illinois EPA Admin. Code 35, Subtitle C, Chapter I, Part 302.407 as follows:

a. Acute Aquatic Toxicity criterion (AATC) (Sections 302.612–618 or 302.621)
b. Chronic Aquatic Toxicity criterion (CATS) (Section 302.407 e., 302.627, or 320.630)
c. Wild and Domestic Animal Protection Criterion (WDAPC) (Section 302.633)
d. Human Threshold Criterion (HTC) (Section 302.642–648)
e. Human Nonthreshold Criterion (HNC) (Section 302.651–658)

Illinois EPA has derived other toxic substances criteria in 2013 that can be found at http://www.epa.illinois.gov/topics/water-quality/standards/derived-criteria/index. These standards and criteria were combined to generate the SLs used on this table. Hardness-dependent dissolved metal SLs were based on the average hardness of the waters of the North Branch of the Chicago River.

The RAF selected ecological (Eco) SLs are summarized in Table 14 of the BLRA.

Legend:
BTEX - benzene, toluene, ethylbenzene, and xylene
CAWS - Chicago Area Waterway System
SL - screening level
MCL - maximum contaminant level
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
QS - quality standard
RAF - risk assessment framework
RSL - regional screening level
TACO - Illinois Tiered Approach to Corrective Action Objectives
VOC - Volatile Organic Compound
µg/L - micrograms per liter

Table 5. Human health and ecological screening assessment: Surface water – North Station OU2
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances							Criterion Concentrations						
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Tap-water RSL	MCL	State of Illinois Groundwater QS, TACO or Non-TACO SL	CAWS Human Health & Threshold SL	RAF Selected Eco SL	North Branch CAWS Aquatic SL - Chronic	North Branch CAWS Aquatic SL - Acute	Tap-water RSL	MCL	State of Illinois Groundwater QS, TACO or Non-TACO SL	CAWS Human Health & Threshold SL	RAF Selected Eco SL	North Branch CAWS Aquatic SL - Chronic	North Branch CAWS Aquatic SL - Acute
PAH	Acenaphthene	4	4	0.00688	0.0091	0		0		0	0	0	530		420		38	62	120
	Acenaphthylene	1	4	0.006	0.006	0		0		0	0	0	530		210		4840	15	190
	Anthracene	4	4	0.00857	0.012	0		0	0	0	0	0	1800		2100	35000	0.035	0.53	0.66
	Benzo(a)anthracene	4	4	0.0258	0.042	1		0	0	2			0.03		0.13	0.16	0.025		
	Benzo(a)pyrene	4	4	0.0225	0.038	1	0	0	2	3			0.025	0.2	0.2	0.016	0.014		
	Benzo(b)fluoranthene	4	4	0.0315	0.055	0		0	0	0			0.25		0.18	0.16	9.07		
	Benzo(g,h,i)perylene	4	4	0.024	0.04	0		0		0			120		210		7.64		
	Benzo(k)fluoranthene	4	4	0.0222	0.036	0		0	0				2.5		0.17	1.6			
	Chrysene	4	4	0.0355	0.055	0		0	0				25		12	16			
	Dibenz(a,h)anthracene	4	4	0.00578	0.01	0		0	0	0			0.025		0.3	0.016	5		
	Fluoranthene	4	4	0.0782	0.11	0		0	0	0	0	0	800		280	120	1.9	1.8	4.3
	Fluorene	2	4	0.00515	0.0055	0		0	0	0	0	0	290		280	4500	19	16	59
	Indeno(1,2,3-cd)pyrene	4	4	0.0162	0.028	0		0	0	0			0.25		0.43	0.16	4.31		
	Naphthalene	4	4	0.00867	0.011	0		0		0	0	0	0.17		140		13	68	510
	Phenanthrene	4	4	0.024	0.034	0		0		0	0	0	1800		210		3.6	3.7	46
	Pyrene	4	4	0.0645	0.097	0		0	0	0			120		210	3500	0.3		
Metal	Aluminum, Total	3	4	297	317	0		0		3			20000		3500		87		
	Arsenic, Total	2	4	1.25	1.4	2	0	0		0			0.052	10	10		150		
	Barium, Total	4	4	19.1	19.4	0	0	0		0			3800	2000	2000		220		
	Chromium, Total	4	4	1.42	1.7	0	0	0		0	0	0	22000	100	100		155	155	3230
	Copper, Total	4	4	4.3	4.9	0	0	0		0	0	0	800	1300	650		17.2	18.1	29
	Iron, Total	4	4	333	353	0		0		0			14000		5000		1000		
	Lead, Total	4	4	2.45	2.8	0	0	0		0	0	0	15	15	7.5		7.89	49.7	237
	Manganese, Total	4	4	17.2	18.2	0		0			0	0	430		150			2350	5570
	Nickel, Total	4	4	3.95	4.4	0		0		0	0	0	390		100		95	9.1	151
	Selenium, Total	3	4	0.593	0.85	0	0	0	0	0	0	0	100	50	50	1000	5	1000	1000
	Vanadium, Total	2	4	1.25	1.3	0		0		0			86		49		12		
	Zinc, Total	4	4	25.9	28.1	0		0		0	0	0	6000		5000		219	58	224

Notes: This table summarizes the results of the human health and ecological screening assessment for surface water. Summary statistics are provided for chemicals detected in at least one sample within the OU2 area. The table summarizes the number of exceedances of each available criterion concentration, which are screening levels (SLs). All data and SLs are reported in units of µg/L. An exceedance count of 0 means there was no exceedance in the OU2 area for the SL. An empty cell indicates an SL was not available for the analyte. A chemical that exceeds an SL is considered a constituent of potential concern (COPC) that requires further evaluation in the Baseline Risk Assessment (BLRA) and is shaded in yellow. Surface water samples for metals were analyzed either before filtering, which represents a total result, or after filtering, which represents a dissolved sample result. Both total and dissolved surface water data were compared to the same groundwater SLs. Where there were surface water SLs available for both dissolved and total metals, the appropriate SL was compared to the surface water data.

Groundwater SLs were used to screen surface water concentrations for human health. The Illinois groundwater SLs (State of Illinois Groundwater Quality Standards [QS], Illinois Tiered Approach to Corrective Action Objectives [TACO], or Non-TACO SLs) and regional screening levels (RSLs) are those provided in the multi-site risk assessment framework (RAF) addendum (Revision 6) (Exponent 2017). These screening values are current, being based on a review of the May 2018 update to the RSLs published by the U.S. Environmental Protection Agency (EPA). Note that the Federal maximum contaminant limit (MCL) presented in the RAF addendum (Revision 6) is incorporated by default as part of the other two tapwater SLs and so is not repeated to avoid redundancy.

The Chicago Area Waterway System (CAWS) SLs, which provide both human health and ecological surface water SLs, were developed from the CAWS standards and criteria as follows:
CAWS standards for the North Branch of the Chicago River are found in or calculated from Illinois EPA Admin. Code 35, Subtitle C, Chapter I, Part 302 as follows:

a. Human Health Water Quality Standard (302.407 f.)
b. Acute Aquatic Toxicity Standards (Sections 302.407 e.)
c. Chronic Aquatic Toxicity standards (Section 302.407 e.)

CAWS "other toxic substance" criteria derived from Illinois EPA Admin. Code 35, Subtitle C, Chapter I, Part 302.407 as follows:

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b. Chronic Aquatic Toxicity criterion (CATS) (Section 302.407 e., 302.627, or 320.630)
c. Wild and Domestic Animal Protection Criterion (WDAPC) (Section 302.633)
d. Human Threshold Criterion (HTC) (Section 302.642–648)
e. Human Nonthreshold Criterion (HNC) (Section 302.651–658)

Illinois EPA has derived other toxic substances criteria in 2013 that can be found at http://www.epa.illinois.gov/topics/water-quality/standards/derived-criteria/index. These standards and criteria were combined to generate the SLs used on this table. Hardness-dependent dissolved metal SLs were based on the average hardness of the waters of the North Branch of the Chicago River.

Legend:
BTEX - benzene, toluene, ethylbenzene, and xylene
CAWS - Chicago Area Waterway System
SL - screening level
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PCB - polychlorinated biphenyl
QS - quality standard
RAF - risk assessment framework
RSL - regional screening level
TACO - Illinois Tiered Approach to Corrective Action Objectives
VOC - Volatile Organic Compound

Table 6. Human health and ecological screening assessment: Surface sediment – Ambient Reach of the North Branch of the Chicago River

Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	Construction Worker SL	95% UTL, Surface[1]	Ecological SL	Construction Worker SL	95% UTL, Surface[1]
BTEX	Benzene	6	20	0.0282	0.0522	0	0		0.308	2.2	
	Ethylbenzene	8	20	0.0364	0.0673	0	0		0.459	58	
	Toluene	20	20	0.499	3.63	7	0	1	0.383	42	2.6
	Xylene, o	11	20	0.0632	0.251		0			6.5	
	Xylenes, m + p	11	20	0.107	0.318		0			6.4	
	Xylenes, Total	11	20	0.17	0.569	1	0		0.465	5.6	
PAH	Acenaphthene	20	20	2.36	11.6		0			100000	
	Acenaphthylene	19	20	1.23	3.21		0			61200	
	Anthracene	20	20	5.81	31.9		0			100000	
	Benzo(a)anthracene	20	20	12.4	58.3		0			170	
	Benzo(a)pyrene	20	20	10.4	48.1		3			17	
	Benzo(b)fluoranthene	20	20	12.6	60		0			170	
	Benzo(g,h,i)perylene	20	20	6.32	32.2		0			61200	
	Benzo(k)fluoranthene	20	20	5.68	26.3		0			1700	
	Chrysene	20	20	11.6	52.7		0			17000	
	Fluoranthene	20	20	32	159		0			82000	
	Fluorene	20	20	3.1	12.6		0			82000	
	Indeno(1,2,3-cd)pyrene	20	20	5.33	26.8		0			170	
	Naphthalene	16	20	2.48	8.01		7			1.8	
	Phenanthrene	20	20	25.1	128		0			61200	
	Pyrene	20	20	26.9	132		0			61000	
	TPAH-13	20	20	151	725	2		1	1.6		342
VOC	1,2,4-Trimethylbenzene	11	20	0.226	0.45		0			219	
	1,3,5-Trimethylbenzene	8	20	0.178	0.295		0			182	
Phenol	3 & 4-Methylphenol	8	20	1.13	4.12		0			100000	
Metal	Aluminum, Total	20	20	8910	16800		0	1		100000	16100
	Antimony, Total	19	20	3.86	11.5		0	0		82	13
	Arsenic, Total	20	20	11.1	29.6	8	0	0	9.79	61	30
	Barium, Total	20	20	256	498		0	0		14000	555
	Cadmium, Total	20	20	27.7	101	19	0	0	0.99	200	133
	Chromium, Total	20	20	248	736	19	1	0	43.4	690	829
	Copper, Total	20	20	389	1180	19	0	1	31.6	8200	1050
	Iron, Total	20	20	23800	71400		0	0		100000	71400
	Lead, Total	20	20	411	717	19	2	0	35.8	700	863
	Manganese, Total	20	20	354	883		0	1		4100	690
	Mercury, Total	20	20	2.08	8.1	18	0	0	0.18	61	10

Table 6. Human health and ecological screening assessment: Surface sediment – Ambient Reach of the North Branch of the Chicago River
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	Construction Worker SL	95% UTL, Surface[1]	Ecological SL	Construction Worker SL	95% UTL, Surface[1]
	Nickel, Total	20	20	78.9	227	19	0	1	22.7	4100	190
	Selenium, Total	20	20	3.13	4.8		0	0		1000	5
	Silver, Total	20	20	6.95	14.8		0	0		1000	18
	Vanadium, Total	20	20	30.8	71.5		0	1		1400	70
	Zinc, Total	20	20	917	1930	19	0	0	121	61000	2110
Cyanide	Cyanide, Total	20	20	2.28	12.9		0	0		4100	13

Notes: This table summarizes the results of the human health and ecological screening assessment for sediments. Summary statistics are provided for chemicals detected in at least one sample within the OU2 area. The table summarizes the number of exceedances of each available criterion concentration, which are screening levels (SLs). All data and SLs are reported in units of mg/kg. An exceedance count of 0 means there was no exceedance in the OU2 area for the SL. An empty cell indicates an SL was not available for the analyte. A chemical that exceeds an SL is considered a constituent of potential concern (COPC) that requires further evaluation in the Baseline Risk Assessment (BLRA) and is shaded in yellow.

The ecological SL for sediments are summarized in Table 15 of the BLRA. The construction worker SLs for soil presented in Table 5 of the RAF Addendum (Revision 6) were used as surrogate screening levels for sediments.

[1] Represents an ambient background criterion used to assess whether the analyte is above North Branch Chicago River ambient conditions. The ambient background criterion is not used to select COPCs, as it is not a risk-based value. Rather, the comparison to this criterion is provided for informational purposes to evaluate whether the OU2 area sediments are representative of ambient conditions or not. For TPAH-13, separate criteria were developed for surface and subsurface sediment.

Legend:
SL - Screening Level
mg/kg - micrograms per kilogram
BTEX - Benzene, Toluene, Ethylbenzene and Xylene
PAH - Polycyclic Aromatic Hydrocarbon
PCB - Polychlorinated Biphenyl
VOC - Volatile Organic Compound
RAF - Risk Assessment Framework
RSL - Regional screening level
95% UTL - 95 percent upper tolerance limit
TPAH- 13 - Total PAH sum of 13 select PAHs

Table 7. Human health and ecological screening assessment: Subsurface sediment – Ambient Reach of the North Branch of the Chicago River

Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	Construction Worker SL	95% UTL, Subsurface[1]	Ecological SL	Construction Worker SL	95% UTL, Subsurface[1]
BTEX	Benzene	1	1	0.0132	0.0132	0	0		0.308	2.2	
	Ethylbenzene	1	1	0.021	0.021	0	0		0.459	58	
	Toluene	1	1	0.334	0.334	0	0	0	0.383	42	2.6
	Xylene, o	1	1	0.0332	0.0332		0			6.5	
	Xylenes, m + p	1	1	0.0701	0.0701		0			6.4	
	Xylenes, Total	1	1	0.103	0.103	0	0		0.465	5.6	
PAH	Acenaphthene	31	32	5.22	28		0			100000	
	Acenaphthylene	31	32	4.12	10		0			61200	
	Anthracene	31	32	11.4	53.2		0			100000	
	Benzo(a)anthracene	31	32	18.6	50.7		0			170	
	Benzo(a)pyrene	31	32	14.9	39.1		11			17	
	Benzo(b)fluoranthene	31	32	15.6	49		0			170	
	Benzo(g,h,i)perylene	31	32	7	23.7		0			61200	
	Benzo(k)fluoranthene	31	32	6.87	20.1		0			1700	
	Chrysene	31	32	17.2	47.4		0			17000	
	Fluoranthene	32	32	38.6	155		0			82000	
	Fluorene	31	32	6.33	38.4		0			82000	
	Indeno(1,2,3-cd)pyrene	31	32	5.8	19.9		0			170	
	Naphthalene	31	32	3.75	20.6		21			1.8	
	Phenanthrene	32	32	35.2	172		0			61200	
	Pyrene	32	32	37.5	126		0			61000	
	TPAH(13)	32	32	212	803	31		1	1.6		410
VOC	1,2,4-Trimethylbenzene	1	1	0.137	0.137		0			219	
	1,3,5-Trimethylbenzene	1	1	0.116	0.116		0			182	
Metal	Aluminum, Total	32	32	10300	16200		0	1		100000	16100
	Antimony, Total	31	32	4.18	9.4		0	0		82	13
	Arsenic, Total	32	32	25.5	46.1	26	0	12	9.79	61	30
	Barium, Total	32	32	385	738		0	5		14000	555
	Cadmium, Total	32	32	28.9	185	29	0	2	0.99	200	133
	Chromium, Total	32	32	474	2120	3	4	4	43.4	690	829
	Copper, Total	32	32	377	798	31	0	0	31.6	8200	1050
	Iron, Total	32	32	26900	50700		0	0		100000	71400
	Lead, Total	32	32	664	1190	3	16	9	35.8	700	863
	Manganese, Total	32	32	372	603		0	0		4100	690
	Mercury, Total	32	32	6.66	23.5	3	0	5	0.18	61	10
	Nickel, Total	32	32	76.4	205	31	0	1	22.7	4100	190

Table 7. Human health and ecological screening assessment: Subsurface sediment – Ambient Reach of the North Branch of the Chicago River
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	Construction Worker SL	95% UTL, Subsurface[1]	Ecological SL	Construction Worker SL	95% UTL, Subsurface[1]
	Selenium, Total	32	32	3.77	6.7		0	5		1000	5
	Silver, Total	31	32	10.7	25		0	5		1000	18
	Vanadium, Total	32	32	47.8	165		0	3		1400	70
	Zinc, Total	32	32	1440	2990	3	0	5	121	61000	2110
Cyanide	Cyanide, Total	3	3	0.593	0.76		0	0		4100	13

Notes: This table summarizes the results of the human health and ecological screening assessment for sediments. Summary statistics are provided for chemicals detected in at least one sample within the OU2 area. The table summarizes the number of exceedances of each available criterion concentration, which are screening levels (SLs). All data and SLs are reported in units of mg/kg. An exceedance count of 0 means there was no exceedance in the OU2 area for the SL. An empty cell indicates an SL was not available for the analyte. A chemical that exceeds an SL is considered a constituent of potential concern (COPC) that requires further evaluation in the Baseline Risk Assessment (BLRA) and is shaded in yellow.

The ecological SL for sediments are summarized in Table 15 of the BLRA. The construction worker SLs for soil presented in Table 5 of the RAF Addendum (Revision 6) were used as surrogate screening levels for sediments.

[1] Represents an ambient background criterion used to assess whether the analyte is above North Branch Chicago River ambient conditions. The ambient background criterion is not used to select COPCs, as it is not a risk-based value. Rather, the comparison to this criterion is provided for informational purposes to evaluate whether the OU2 area sediments are representative of ambient conditions or not. For TPAH-13, separate criteria were developed for surface and subsurface sediment.

Legend:
SL - Screening Level
mg/kg - micrograms per kilogram
BTEX - Benzene, Toluene, Ethylbenzene and Xylene
PAH - Polycyclic Aromatic Hydrocarbon
PCB - Polychlorinated Biphenyl
VOC - Volatile Organic Compound
RAF - Risk Assessment Framework
RSL - Regional screening level
95% UTL - 95 percent upper tolerance limit
TPAH- 13 - Total PAH sum of 13 select PAHs

Table 8. Human health and ecological screening assessment: Surface sediment – Willow Street OU2

Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	Construction Worker SL	95% UTL, Surface[1]	Ecological SL	Construction Worker SL	95% UTL, Surface[1]
BTEX	Benzene	23	48	0.0482	0.164	0	0		0.308	2.2	
	Ethylbenzene	31	48	0.0622	0.208	0	0		0.459	58	
	Toluene	48	48	0.879	6.95	32	0	3	0.383	42	2.6
	Xylenes, Total	31	48	0.256	0.983	5	0		0.465	5.6	
PAH	2-Methylnaphthalene	48	48	0.607	2.55		0			816	
	Acenaphthene	48	48	0.97	3.08		0			100000	
	Acenaphthylene	42	48	0.708	2.86		0			61200	
	Anthracene	48	48	2.47	7.4		0			100000	
	Benzo(a)anthracene	48	48	5.39	15.7		0			170	
	Benzo(a)pyrene	48	48	5.59	15.5		0			17	
	Benzo(b)fluoranthene	48	48	6.12	16.1		0			170	
	Benzo(g,h,i)perylene	48	48	3.27	10.7		0			61200	
	Benzo(k)fluoranthene	48	48	4.32	12.1		0			1700	
	Chrysene	48	48	6.6	18.5		0			17000	
	Dibenz(a,h)anthracene	47	48	1.1	3.47		0			17	
	Fluoranthene	48	48	14.6	43.7		0			82000	
	Fluorene	48	48	1.25	4.58		0			82000	
	Indeno(1,2,3-cd)pyrene	48	48	2.91	9.22		0			170	
	Naphthalene	48	48	0.848	2.83		4			1.8	
	Phenanthrene	48	48	9.92	35.6		0			61200	
	Pyrene	48	48	10.6	30.6		0			61000	
	TPAH(13)	48	48	69.3	207	48		0	1.6		342
VOC	1,2,4-Trimethylbenzene	41	48	0.135	0.468		0			219	
	1,3,5-Trimethylbenzene	31	48	0.0667	0.16		0			182	
Phenol	3 & 4-Methylphenol	27	48	1.3	6.62		0			100000	
	Phenol	4	48	1.26	3.35		0			61000	
PCB	PCB, Total	48	48	7.15	67.8	48	48		0.0598	1	
Metal	Aluminum, Total	48	48	7650	13300		0	0		100000	16100
	Antimony, Total	45	48	3.3	18.5		0	1		82	13
	Arsenic, Total	48	48	7.28	15.3	6	0	0	9.79	61	30
	Barium, Total	48	48	285	551		0	0		14000	555
	Cadmium, Total	48	48	16.8	57.6	48	0	0	0.99	200	133
	Chromium, Total	48	48	199	687	48	0	0	43.4	690	829
	Copper, Total	48	48	301	668	48	0	0	31.6	8200	1050
	Iron, Total	48	48	22700	32400		0	0		100000	71400
	Lead, Total	48	48	513	1390	48	6	2	35.8	700	863
	Manganese, Total	48	48	353	593		0	0		4100	690

Table 8. Human health and ecological screening assessment: Surface sediment – Willow Street OU2
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	Construction Worker SL	95% UTL, Surface[1]	Ecological SL	Construction Worker SL	95% UTL, Surface[1]
	Mercury, Total	48	48	1.42	5	48	0	0	0.18	61	10
	Nickel, Total	48	48	97.6	221	48	0	2	22.7	4100	190
	Selenium, Total	47	48	2.14	4.2		0	0		1000	5
	Silver, Total	48	48	6.95	17.9		0	0		1000	18
	Vanadium, Total	48	48	37.1	216		0	4		1400	70
	Zinc, Total	48	48	984	2310	48	0	2	121	61000	2110
Cyanide	Cyanide, Total	35	48	1.52	4.5		0	0		4100	13

Notes: This table summarizes the results of the human health and ecological screening assessment for sediments. Summary statistics are provided for chemicals detected in at least one sample within the OU2 area. The table summarizes the number of exceedances of each available criterion concentration, which are screening levels (SLs). All data and SLs are reported in units of mg/kg. An exceedance count of 0 means there was no exceedance in the OU2 area for the SL. An empty cell indicates an SL was not available for the analyte. A chemical that exceeds an SL is considered a constituent of potential concern (COPC) that requires further evaluation in the Baseline Risk Assessment (BLRA) and is shaded in yellow.

The ecological SL for sediments are summarized in Table 15 of the BLRA. The construction worker SLs for soil presented in Table 5 of the RAF Addendum (Revision 6) were used as surrogate screening levels for sediments.

[1] Represents an ambient background criterion used to assess whether the analyte is above North Branch Chicago River ambient conditions. The ambient background criterion is not used to select COPCs, as it is not a risk-based value. Rather, the comparison to this criterion is provided for informational purposes to evaluate whether the OU2 area sediments are representative of ambient conditions or not. For TPAH-13, separate criteria were developed for surface and subsurface sediment.

Legend:
SL - Screening Level
mg/kg - micrograms per kilogram
BTEX - Benzene, Toluene, Ethylbenzene and Xylene
PAH - Polycyclic Aromatic Hydrocarbon
PCB - Polychlorinated Biphenyl
VOC - Volatile Organic Compound
RAF - Risk Assessment Framework
RSL - Regional screening level
95% UTL - 95 percent upper tolerance limit
TPAH- 13 - Total PAH sum of 13 select PAHs

Table 9. Human health screening assessment: All sediment – Willow Street OU2

Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Construction Worker SL	95% UTL, Surface[1]	95% UTL, Subsurface[1]	Construction Worker SL	95% UTL, Surface[1]	95% UTL, Subsurface[1]
BTEX	Benzene	192	288	3.99	272	34			2.2		
	Ethylbenzene	213	288	12.5	762	10			58		
	Toluene	252	288	1.36	112	1	16	16	42	2.6	2.6
	Xylene, o	13	13	34.7	200	8			6.5		
	Xylenes, m + p	13	13	71.3	418	12			6.4		
	Xylenes, Total	217	275	4.7	222	33			5.6		
PAH	1-Methylnaphthalene	14	14	392	2280	4			394		
	2-Methylnaphthalene	329	344	52.9	3770	5			816		
	Acenaphthene	327	344	27.4	1400	0			100000		
	Acenaphthylene	251	343	5.27	328	0			61200		
	Anthracene	334	344	16.5	785	0			100000		
	Benzo(a)anthracene	331	344	10.8	409	3			170		
	Benzo(a)pyrene	333	344	9.84	456	32			17		
	Benzo(b)fluoranthene	321	344	6.78	182	1			170		
	Benzo(g,h,i)perylene	318	344	4.94	235	0			61200		
	Benzo(k)fluoranthene	328	344	6.38	248	0			1700		
	Chrysene	335	344	11.8	414	0			17000		
	Dibenz(a,h)anthracene	262	342	1.39	45.6	2			17		
	Fluoranthene	338	344	23.3	839	0			82000		
	Fluorene	326	344	13.3	726	0			82000		
	Indeno(1,2,3-cd)pyrene	305	344	4.35	212	1			170		
	Naphthalene	331	344	118	13000	162			1.8		
	Phenanthrene	342	344	46.1	2310	0			61200		
	Pyrene	338	344	26.8	1160	0			61000		
VOC	1,2,4-Trimethylbenzene	262	288	4.69	255	1			219		
	1,3,5-Trimethylbenzene	227	288	1.8	81.6	0			182		
	Isopropylbenzene	13	13	9.32	43.3	0			78.2		
	n-Butylbenzene	12	13	5.15	17	0			108		
	n-Propylbenzene	13	13	4.09	17.9	0			264		
	sec-Butylbenzene	11	13	0.435	1.19	0			145		
	Styrene	13	13	7.98	51.9	0			430		
	tert-Butylbenzene	4	13	2.54	7.35	0			183		
SVOC	Dibenzofuran	13	13	12.6	61.4	0			816		
Phenol	3 & 4-Methylphenol	125	273	0.983	6.62	0			100000		
	Phenol	7	275	0.91	3.35	0			61000		
PCB	PCB, Total	218	275	10.6	123	181			1		
Metal	Aluminum, Total	275	275	11000	18000	0	6	6	100000	16100	16100
	Antimony, Total	241	275	3.61	33.1	0	3	3	82	13	13
	Arsenic, Total	275	275	15.6	45.1	0	33	33	61	30	30
	Barium, Total	275	275	322	669	0	15	15	14000	555	555
	Cadmium, Total	242	275	32.4	160	0	1	1	200	133	133
	Chromium, Total	275	275	360	1840	45	26	26	690	829	829
	Copper, Total	275	275	329	1420	0	1	1	8200	1050	1050

Table 9. Human health screening assessment: All sediment – Willow Street OU2
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Construction Worker SL	95% UTL, Surface[1]	95% UTL, Subsurface[1]	Construction Worker SL	95% UTL, Surface[1]	95% UTL, Subsurface[1]
	Iron, Total	275	275	24800	174000	1	1	1	100000	71400	71400
	Lead, Total	275	275	567	2210	104	51	51	700	863	863
	Manganese, Total	275	275	360	810	0	2	2	4100	690	690
	Mercury, Total	275	275	4.02	152	1	13	13	61	10	10
	Nickel, Total	275	275	110	323	0	48	48	4100	190	190
	Selenium, Total	271	275	2.72	17.8	0	5	5	1000	5	5
	Silver, Total	248	275	11.2	28.8	0	59	59	1000	18	18
	Vanadium, Total	272	275	64.4	502	0	69	69	1400	70	70
	Zinc, Total	275	275	1270	3540	0	54	54	61000	2110	2110
Cyanide	Cyanide, Total	205	275	3.75	48.4	0	12	12	4100	13	13

Notes: This table summarizes the results of the human health screening assessment for sediments. Summary statistics are provided for chemicals detected in at least one sample within the OU2 area. The table summarizes the number of exceedances of each available criterion concentration, which are screening levels (SLs). All data and SLs are reported in units of mg/kg. An exceedance count of 0 means there was no exceedance in the OU2 area for the SL. An empty cell indicates an SL was not available for the analyte. A chemical that exceeds an SL is considered a constituent of potential concern (COPC) that requires further evaluation in the Baseline Risk Assessment (BLRA) and is shaded in yellow.

The ecological SL for sediments are summarized in Table 15 of the BLRA. The construction worker SLs for soil presented in Table 5 of the RAF Addendum (Revision 6) were used as surrogate screening levels for sediments.

[1] Represents an ambient background criterion used to assess whether the analyte is above North Branch Chicago River ambient conditions. The ambient background criterion is not used to select COPCs, as it is not a risk-based value. Rather, the comparison to this criterion is provided for informational purposes to evaluate whether the OU2 area sediments are representative of ambient conditions or not. For TPAH-13, separate criteria were developed for surface and subsurface sediment.

Legend:
SL - Screening Level
mg/kg - micrograms per kilogram
BTEX - Benzene, Toluene, Ethylbenzene and Xylene
PAH - Polycyclic Aromatic Hydrocarbon
PCB - Polychlorinated Biphenyl
VOC - Volatile Organic Compound
RAF - Risk Assessment Framework
RSL - Regional screening level
95% UTL - 95 percent upper tolerance limit
TPAH- 13 - Total PAH sum of 13 select PAHs

Table 10. Human health and ecological screening assessment: Surface sediment – Division Street OU2

Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	Construction Worker SL	95% UTL, Surface[1]	Ecological SL	Construction Worker SL	95% UTL, Surface[1]
BTEX	Benzene	12	90	0.159	1.06	1	0		0.308	2.2	
	Ethylbenzene	23	90	0.244	3.78	1	0		0.459	58	
	Toluene	88	90	0.175	1.5	6	0	0	0.383	42	2.6
	Xylenes, Total	9	90	0.242	0.884	1	0		0.465	5.6	
PAH	2-Methylnaphthalene	81	85	0.878	32.5		0			816	
	Acenaphthene	90	90	1.09	40.6		0			100000	
	Acenaphthylene	70	90	0.601	4.12		0			61200	
	Anthracene	90	90	1.56	20.3		0			100000	
	Benzo(a)anthracene	90	90	3.45	13.5		0			170	
	Benzo(a)pyrene	90	90	4.03	15		0			17	
	Benzo(b)fluoranthene	90	90	5.38	27.2		0			170	
	Benzo(g,h,i)perylene	90	90	2.4	9.24		0			61200	
	Benzo(k)fluoranthene	90	90	2.53	9.54		0			1700	
	Chrysene	90	90	4.35	16.1		0			17000	
	Dibenz(a,h)anthracene	90	90	0.761	3.19		0			17	
	Fluoranthene	90	90	8.97	39.2		0			82000	
	Fluorene	90	90	0.779	14.5		0			82000	
	Indeno(1,2,3-cd)pyrene	90	90	2.1	7.99		0			170	
	Naphthalene	85	90	1.08	31.8		7			1.8	
	Phenanthrene	90	90	5.51	60.7		0			61200	
	Pyrene	90	90	7.5	39.3		0			61000	
	TPAH(13)	90	90	49.7	386	90		1	1.6		342
VOC	1,2,4-Trimethylbenzene	43	90	0.0914	1.49		0			219	
	1,3,5-Trimethylbenzene	14	90	0.312	3.78		0			182	
Phenol	3 & 4-Methylphenol	65	88	0.381	1.01		0			100000	
	Phenol	14	88	0.14	0.259		0			61000	
Metal	Aluminum, Total	1	1	11700	11700		0	0		100000	16100
	Antimony, Total	1	1	1.9	1.9		0	0		82	13
	Arsenic, Total	90	90	9.18	106	10	1	1	9.79	61	30
	Barium, Total	90	90	259	706		0	1		14000	555
	Beryllium, Total	87	89	0.714	1.2		0			410	
	Cadmium, Total	90	90	16.6	96.6	89	0	0	0.99	200	133
	Chromium, Total	90	90	242	7570	90	1	1	43.4	690	829
	Copper, Total	90	90	281	596	90	0	0	31.6	8200	1050
	Iron, Total	1	1	21400	21400		0	0		100000	71400
	Lead, Total	90	90	392	3360	90	4	4	35.8	700	863
	Manganese, Total	1	1	322	322		0	0		4100	690
	Mercury, Total	90	90	1.56	8.4	90	0	0	0.18	61	10
	Nickel, Total	90	90	76.7	221	90	0	2	22.7	4100	190
	Selenium, Total	87	90	2.64	4		0	0		1000	5
	Silver, Total	90	90	11	29.8		0	10		1000	18
	Vanadium, Total	1	1	15.2	15.2		0	0		1400	70
	Zinc, Total	90	90	925	2340	89	0	1	121	61000	2110

Table 10. Human health and ecological screening assessment: Surface sediment – Division Street OU2
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	Construction Worker SL	95% UTL, Surface[1]	Ecological SL	Construction Worker SL	95% UTL, Surface[1]
Cyanide	Cyanide, Total	66	90	1.56	13.9		0	1		4100	13

Notes: This table summarizes the results of the human health and ecological screening assessment for sediments. Summary statistics are provided for chemicals detected in at least one sample within the OU2 area. The table summarizes the number of exceedances of each available criterion concentration, which are screening levels (SLs). All data and SLs are reported in units of mg/kg. An exceedance count of 0 means there was no exceedance in the OU2 area for the SL. An empty cell indicates an SL was not available for the analyte. A chemical that exceeds an SL is considered a constituent of potential concern (COPC) that requires further evaluation in the Baseline Risk Assessment (BLRA) and is shaded in yellow.

The ecological SL for sediments are summarized in Table 15 of the BLRA. The construction worker SLs for soil presented in Table 5 of the RAF Addendum (Revision 6) were used as surrogate screening levels for sediments.

[1] Represents an ambient background criterion used to assess whether the analyte is above North Branch Chicago River ambient conditions. The ambient background criterion is not used to select COPCs, as it is not a risk-based value. Rather, the comparison to this criterion is provided for informational purposes to evaluate whether the OU2 area sediments are representative of ambient conditions or not. For TPAH-13, separate criteria were developed for surface and subsurface sediment.

Legend:
SL - Screening Level
mg/kg - micrograms per kilogram
BTEX - Benzene, Toluene, Ethylbenzene and Xylene
PAH - Polycyclic Aromatic Hydrocarbon
PCB - Polychlorinated Biphenyl
VOC - Volatile Organic Compound
RAF - Risk Assessment Framework
RSL - Regional screening level
95% UTL - 95 percent upper tolerance limit
TPAH- 13 - Total PAH sum of 13 select PAHs

Table 11. Human health screening assessment: All sediment – Division Street OU2

Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Construction Worker SL	95% UTL, Surface[1]	95% UTL, Subsurface[1]	Construction Worker SL	95% UTL, Surface[1]	95% UTL, Subsurface[1]
BTEX	Benzene	144	440	3.42	186	23			2.2		
	Ethylbenzene	171	440	12.9	1020	6			58		
	Toluene	375	440	0.605	106	2	4	4	42	2.6	2.6
	Xylenes, Total	158	440	7.87	444	18			5.6		
PAH	2-Methylnaphthalene	465	525	17	1790	1			816		
	Acenaphthene	487	546	13.8	2060	0			100000		
	Acenaphthylene	370	546	2.19	215	0			61200		
	Anthracene	519	546	8.2	976	0			100000		
	Benzo(a)anthracene	516	546	5.96	525	3			170		
	Benzo(a)pyrene	515	546	6.06	536	18			17		
	Benzo(b)fluoranthene	496	546	4.9	291	1			170		
	Benzo(g,h,i)perylene	489	546	3.34	317	0			61200		
	Benzo(k)fluoranthene	510	546	3.76	271	0			1700		
	Chrysene	521	545	6.39	457	0			17000		
	Dibenz(a,h)anthracene	446	545	0.787	23.2	1			17		
	Fluoranthene	527	546	13.9	1330	0			82000		
	Fluorene	487	546	6.15	688	0			82000		
	Indeno(1,2,3-cd)pyrene	479	546	2.64	199	1			170		
	Naphthalene	494	546	49.6	11200	126			1.8		
	Phenanthrene	538	546	23.2	2900	0			61200		
	Pyrene	530	546	16.2	1960	0			61000		
VOC	1,2,4-Trimethylbenzene	287	440	1.97	157	0			219		
	1,3,5-Trimethylbenzene	174	440	1.33	98.9	0			182		
Phenol	3 & 4-Methylphenol	242	427	0.413	2.25	0			100000		
	Phenol	59	424	0.361	11.1	0			61000		
Metal	Aluminum, Total	6	6	12100	14500	0	0	0	100000	16100	16100
	Antimony, Total	4	6	2.82	5.5	0	0	0	82	13	13
	Arsenic, Total	442	442	11.3	118	2	9	9	61	30	30
	Barium, Total	442	442	259	909	0	11	11	14000	555	555
	Beryllium, Total	434	436	0.782	1.5	0			410		
	Cadmium, Total	380	442	33.5	212	1	14	14	200	133	133
	Chromium, Total	442	442	296	7570	46	33	33	690	829	829
	Copper, Total	442	442	293	2470	0	1	1	8200	1050	1050
	Iron, Total	6	6	23200	29300	0	0	0	100000	71400	71400
	Lead, Total	442	442	415	3360	81	59	59	700	863	863
	Manganese, Total	6	6	328	438	0	0	0	4100	690	690
	Mercury, Total	440	442	1.96	41.4	0	6	6	61	10	10

Table 11. Human health screening assessment: All sediment – Division Street OU2
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Construction Worker SL	95% UTL, Surface[1]	95% UTL, Subsurface[1]	Construction Worker SL	95% UTL, Surface[1]	95% UTL, Subsurface[1]
	Nickel, Total	442	442	94.5	330	0	50	50	4100	190	190
	Selenium, Total	438	442	2.63	5	0	0	0	1000	5	5
	Silver, Total	367	442	14.6	36.7	0	138	138	1000	18	18
	Vanadium, Total	6	6	17.5	32	0	0	0	1400	70	70
	Zinc, Total	436	442	1020	6110	0	35	35	61000	2110	2110
Cyanide	Cyanide, Total	322	441	3	44.2	0	11	11	4100	13	13

Notes: This table summarizes the results of the human health screening assessment for sediments. Summary statistics are provided for chemicals detected in at least one sample within the OU2 area. The table summarizes the number of exceedances of each available criterion concentration, which are screening levels (SLs). All data and SLs are reported in units of mg/kg. An exceedance count of 0 means there was no exceedance in the OU2 area for the SL. An empty cell indicates an SL was not available for the analyte. A chemical that exceeds an SL is considered a constituent of potential concern (COPC) that requires further evaluation in the Baseline Risk Assessment (BLRA) and is shaded in yellow.

The construction worker SLs for soil presented in Table 5 of the RAF Addendum (Revision 6) were used as surrogate screening levels for sediments.

[1] Represents an ambient background criterion used to assess whether the analyte is above North Branch Chicago River ambient conditions. The ambient background criterion is not used to select COPCs, as it is not a risk-based value. Rather, the comparison to this criterion is provided for informational purposes to evaluate whether the OU2 area sediments are representative of ambient conditions or not. For TPAH-13, separate criteria were developed for surface and subsurface sediment.

Legend:
SL - Screening Level
mg/kg - micrograms per kilogram
BTEX - Benzene, Toluene, Ethylbenzene and Xylene
PAH - Polycyclic Aromatic Hydrocarbon
PCB - Polychlorinated Biphenyl
VOC - Volatile Organic Compound
RAF - Risk Assessment Framework
RSL - Regional screening level
95% UTL - 95 percent upper tolerance limit
TPAH- 13 - Total PAH sum of 13 select PAHs

Table 12. Human health and ecological screening assessment: Surface sediment – North Station OU2

Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	Construction Worker SL	95% UTL, Surface[1]	Ecological SL	Construction Worker SL	95% UTL, Surface[1]
BTEX	Benzene	4	33	0.0628	0.168	0	0		0.308	2.2	
	Ethylbenzene	7	33	0.0463	0.108	0	0		0.459	58	
	Toluene	29	33	0.153	0.527	4	0	0	0.383	42	2.6
	Xylenes, Total	2	33	0.155	0.174	0	0		0.465	5.6	
PAH	2-Methylnaphthalene	33	33	0.257	4.06		0			816	
	Acenaphthene	33	33	0.956	18.6		0			100000	
	Acenaphthylene	33	33	0.764	16.4		0			61200	
	Anthracene	33	33	1.65	23		0			100000	
	Benzo(a)anthracene	33	33	3.11	20.5		0			170	
	Benzo(a)pyrene	33	33	3.58	22.8		2			17	
	Benzo(b)fluoranthene	33	33	4.82	23.6		0			170	
	Benzo(g,h,i)perylene	33	33	1.55	8.98		0			61200	
	Benzo(k)fluoranthene	33	33	1.66	8.73		0			1700	
	Chrysene	33	33	3.8	21.5		0			17000	
	Dibenz(a,h)anthracene	33	33	0.384	1.89		0			17	
	Fluoranthene	33	33	7.16	41.2		0			82000	
	Fluorene	33	33	0.844	13.6		0			82000	
	Indeno(1,2,3-cd)pyrene	33	33	1.39	8.21		0			170	
	Naphthalene	33	33	0.189	1.42		0			1.8	
	Phenanthrene	33	33	5.3	54.9		0			61200	
	Pyrene	33	33	6.5	42.7		0			61000	
	TPAH(13)	33	33	40.3	285	33		0	1.6		342
VOC	1,2,4-Trimethylbenzene	16	33	0.119	0.523		0			219	
	1,3,5-Trimethylbenzene	9	33	0.0522	0.089		0			182	
Phenol	3 & 4-Methylphenol	23	33	0.247	0.444		0			100000	
	Phenol	5	33	0.22	0.262		0			61000	
Metal	Aluminum, Total	33	33	13000	19100		0	10		100000	16100
	Antimony, Total	18	33	1.73	2.9		0	0		82	13
	Arsenic, Total	33	33	8.22	15.1	9	0	0	9.79	61	30
	Barium, Total	33	33	252	364		0	0		14000	555
	Cadmium, Total	33	33	19.9	67.1	33	0	0	0.99	200	133
	Chromium, Total	33	33	167	430	31	0	0	43.4	690	829
	Copper, Total	33	33	356	693	33	0	0	31.6	8200	1050
	Iron, Total	33	33	22900	41900		0	0		100000	71400
	Lead, Total	33	33	329	624	33	0	0	35.8	700	863
	Manganese, Total	33	33	332	461		0	0		4100	690
	Mercury, Total	33	33	1.43	4.4	33	0	0	0.18	61	10

Table 12. Human health and ecological screening assessment: Surface sediment – North Station OU2
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	Construction Worker SL	95% UTL, Surface[1]	Ecological SL	Construction Worker SL	95% UTL, Surface[1]
	Nickel, Total	33	33	69.5	162	33	0	0	22.7	4100	190
	Selenium, Total	33	33	3.09	5.9		0	1		1000	5
	Silver, Total	32	33	12.5	26.1		0	7		1000	18
	Vanadium, Total	33	33	22.5	33		0	0		1400	70
	Zinc, Total	33	33	1010	1650	33	0	0	121	61000	2110
Cyanide	Cyanide, Total	32	33	1.55	3.5		0	0		4100	13

Notes: This table summarizes the results of the human health and ecological screening assessment for sediments. Summary statistics are provided for chemicals detected in at least one sample within the OU2 area. The table summarizes the number of exceedances of each available criterion concentration, which are screening levels (SLs). All data and SLs are reported in units of mg/kg. An exceedance count of 0 means there was no exceedance in the OU2 area for the SL. An empty cell indicates an SL was not available for the analyte. A chemical that exceeds an SL is considered a constituent of potential concern (COPC) that requires further evaluation in the Baseline Risk Assessment (BLRA) and is shaded in yellow.

The ecological SL for sediments are summarized in Table 15 of the BLRA. The construction worker SLs for soil presented in Table 5 of the RAF Addendum (Revision 6) were used as surrogate screening levels for sediments.

[1] Represents an ambient background criterion used to assess whether the analyte is above North Branch Chicago River ambient conditions. The ambient background criterion is not used to select COPCs, as it is not a risk-based value. Rather, the comparison to this criterion is provided for informational purposes to evaluate whether the OU2 area sediments are representative of ambient conditions or not. For TPAH-13, separate criteria were developed for surface and subsurface sediment.

Legend:
SL - Screening Level
mg/kg - micrograms per kilogram
BTEX - Benzene, Toluene, Ethylbenzene and Xylene
PAH - Polycyclic Aromatic Hydrocarbon
PCB - Polychlorinated Biphenyl
VOC - Volatile Organic Compound
RAF - Risk Assessment Framework
RSL - Regional screening level
95% UTL - 95 percent upper tolerance limit
TPAH- 13 - Total PAH sum of 13 select PAHs

Table 13. Human health screening assessment: All sediment – North Station OU2

Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Construction Worker SL	95% UTL, Surface[1]	95% UTL, Subsurface[1]	Construction Worker SL	95% UTL, Surface[1]	95% UTL, Subsurface[1]
BTEX	Benzene	70	185	1.23	10.1	14			2.2		
	Ethylbenzene	76	185	5.09	59.2	1			58		
	Toluene	120	185	0.126	1.3	0	0	0	42	2.6	2.6
	Xylenes, Total	80	185	4.23	33.1	15			5.6		
PAH	2-Methylnaphthalene	195	207	11.9	481	0			816		
	Acenaphthene	193	206	5.97	274	0			100000		
	Acenaphthylene	149	205	1.46	28.4	0			61200		
	Anthracene	190	205	4.56	160	0			100000		
	Benzo(a)anthracene	185	206	3.8	86.8	0			170		
	Benzo(a)pyrene	193	206	3.63	69.1	7			17		
	Benzo(b)fluoranthene	182	206	3.33	57.2	0			170		
	Benzo(g,h,i)perylene	175	205	1.69	24.1	0			61200		
	Benzo(k)fluoranthene	191	206	2.05	36.2	0			1700		
	Chrysene	191	206	4.24	87	0			17000		
	Dibenz(a,h)anthracene	155	205	0.455	7.59	0			17		
	Fluoranthene	197	208	7.38	145	0			82000		
	Fluorene	186	205	3.56	138	0			82000		
	Indeno(1,2,3-cd)pyrene	173	205	1.39	19.9	0			170		
	Naphthalene	198	206	15.8	585	60			1.8		
	Phenanthrene	203	208	12.8	456	0			61200		
	Pyrene	198	208	8.7	229	0			61000		
VOC	1,2,4-Trimethylbenzene	124	185	2.73	30	0			219		
	1,3,5-Trimethylbenzene	99	185	0.921	8.22	0			182		
Phenol	3 & 4-Methylphenol	99	185	0.29	1.19	0			100000		
	Phenol	22	184	0.366	2.46	0			61000		
Metal	Aluminum, Total	185	185	14700	30300	0	77	77	100000	16100	16100
	Antimony, Total	126	185	2.54	14.3	0	1	1	82	13	13
	Arsenic, Total	184	185	13.6	58.6	0	15	15	61	30	30
	Barium, Total	185	185	274	753	0	4	4	14000	555	555
	Cadmium, Total	165	185	37.1	182	0	5	5	200	133	133
	Chromium, Total	185	185	324	2130	30	18	18	690	829	829
	Copper, Total	185	185	364	3700	0	2	2	8200	1050	1050
	Iron, Total	185	185	24700	47500	0	0	0	100000	71400	71400
	Lead, Total	185	185	537	15300	46	32	32	700	863	863

Table 13. Human health screening assessment: All sediment – North Station OU2
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances			Criterion Concentrations		
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Construction Worker SL	95% UTL, Surface[1]	95% UTL, Subsurface[1]	Construction Worker SL	95% UTL, Surface[1]	95% UTL, Subsurface[1]
	Manganese, Total	185	185	350	791	0	2	2	4100	690	690
	Mercury, Total	185	185	2.26	19.7	0	8	8	61	10	10
	Nickel, Total	185	185	90.4	246	0	12	12	4100	190	190
	Selenium, Total	185	185	3	5.9	0	3	3	1000	5	5
	Silver, Total	159	185	15.2	41.5	0	64	64	1000	18	18
	Vanadium, Total	184	185	23.9	65.3	0	0	0	1400	70	70
	Zinc, Total	185	185	1170	3070	0	26	26	61000	2110	2110
Cyanide	Cyanide, Total	148	185	3.93	55.3	0	12	12	4100	13	13

Notes: This table summarizes the results of the human health screening assessment for sediments. Summary statistics are provided for chemicals detected in at least one sample within the OU2 area. The table summarizes the number of exceedances of each available criterion concentration, which are screening levels (SLs). All data and SLs are reported in units of mg/kg. An exceedance count of 0 means there was no exceedance in the OU2 area for the SL. An empty cell indicates an SL was not available for the analyte. A chemical that exceeds an SL is considered a constituent of potential concern (COPC) that requires further evaluation in the Baseline Risk Assessment (BLRA) and is shaded in yellow.

The construction worker SLs for soil presented in Table 5 of the RAF Addendum (Revision 6) were used as surrogate screening levels for sediments.

[1] Represents an ambient background criterion used to assess whether the analyte is above North Branch Chicago River ambient conditions. The ambient background criterion is not used to select COPCs, as it is not a risk-based value. Rather, the comparison to this criterion is provided for informational purposes to evaluate whether the OU2 area sediments are representative of ambient conditions or not. For TPAH-13, separate criteria were developed for surface and subsurface sediment.

Legend:
SL - Screening Level
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BTEX - Benzene, Toluene, Ethylbenzene and Xylene
PAH - Polycyclic Aromatic Hydrocarbon
PCB - Polychlorinated Biphenyl
VOC - Volatile Organic Compound
RAF - Risk Assessment Framework
RSL - Regional screening level
95% UTL - 95 percent upper tolerance limit
TPAH- 13 - Total PAH sum of 13 select PAHs

Table 14. Surface water ecological benchmark hierarchy and selected screening levels
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Screening Criteria			USEPA06B	USEPA03A
Analyte	Units	Y/N	Source	Value	U.S. EPA National Water Quality Criteria – Freshwater Criterion Continuous Concentration	U.S. EPA 2003 Region 5 RCRA Water Ecological Screening Levels
PVOCs						
Benzene	µg/L	Yes	ESL	114		114
Ethylbenzene	µg/L	Yes	ESL	14		14
Toluene	µg/L	Yes	ESL	253		253
Xylene isomers (total)	µg/L	Yes	ESL	27		27
1,3,5-Trimethylbenzene	µg/L	No				
2,4,6-Trimethylbenzene	µg/L	No				
Semivolatile Organic Compounds						
PAHs						
Acenaphthene	µg/L	Yes	ESL	38		38
Acenaphthylene	µg/L	Yes	ESL	4840		4840
Anthracene	µg/L	Yes	ESL	0.035		0.035
Benz[a]anthracene	µg/L	Yes	ESL	0.025		0.025
Benzo[b]fluoranthene	µg/L	Yes	ESL	9.07		9.07
Benzo[k]fluoranthene	µg/L	No				
Benzo[a]pyrene	µg/L	Yes	ESL	0.014		0.014
Benzo[ghi]perylene	µg/L	Yes	ESL	7.64		7.64
Chrysene	µg/L	No				
Dibenz[a,h]anthracene	µg/L	Yes	(see note)	5		5
Fluoranthene	µg/L	Yes	ESL	1.9		1.9
Fluorene	µg/L	Yes	ESL	19		19
Indeno[1,2,3-cd]pyrene	µg/L	Yes	ESL	4.31		4.31
Naphthalene	µg/L	Yes	ESL	13		13
Phenanthrene	µg/L	Yes	ESL	3.6		3.6
Pyrene	µg/L	Yes	ESL	0.3		0.3
2-Methylnaphthalene	µg/L	Yes	ESL	330		330
Phenols						
2,4-Dimethylphenol	µg/L	Yes	ESL	100		100
2-Methylphenol	µg/L	Yes	ESL	67		67
4-Methylphenol	µg/L	Yes	ESL	25		25
Phenol	µg/L	Yes	ESL	180		180

Table 14. Surface water ecological benchmark hierarchy and selected screening levels
Baseline Risk Assessment (Revision 2)

The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Screening Criteria			USEPA06B	USEPA03A
Analyte	Units	Y/N	Source	Value	U.S. EPA National Water Quality Criteria – Freshwater Criterion Continuous Concentration	U.S. EPA 2003 Region 5 RCRA Water Ecological Screening Levels
Inorganics						
Aluminum	µg/L	Yes	FW-CCC	87	87	
Antimony	µg/L	Yes	ESL	80		80
Arsenic	µg/L	Yes	FW-CCC	150	150	148
Barium	µg/L	Yes	ESL	220		220
Cadmium	µg/L	Yes	FW-CCC	0.25	0.25	0.15
Chromium, trivalent	µg/L	Yes	FW-CCC	74	74	42
Copper	µg/L	Yes	FW-CCC	9	9.0	1.58
Cyanide	µg/L	Yes	FW-CCC	5.2	5.2	5.2
Iron	µg/L	Yes	FW-CCC	1000	1000	
Lead	µg/L	Yes	FW-CCC	2.5	2.5	1.17
Manganese	µg/L	No				
Mercury	µg/L	Yes	FW-CCC	0.77	0.77	0.0013
Nickel	µg/L	Yes	FW-CCC	52	52	28.9
Selenium	µg/L	Yes	FW-CCC	5	5.0	5.0
Silver	µg/L	Yes	ESL	0.12		0.12
Vanadium	µg/L	Yes	ESL	12		12
Zinc	µg/L	Yes	FW-CCC	120	120	65.7

Note: The value for dibenz[a,h]anthracene is from Texas Surface Water Quality Standards (referred by Dan Mazur, EPA Region 5).
U.S. EPA 2006 criteria for metals are based on a dissolved basis. U.S. EPA 2003 criteria are based on a whole basis except for select metals, which are dissolved (cadmium, chromium, copper, lead, nickel, and zinc).

ESL - Region 5 RCRA water ecological screening levels (U.S.EPA 2003)
FW-CCC - national recommended water quality criteria–freshwater criterion continuous concentration (U.S. EPA 2006)
PAH - polycyclic aromatic hydrocarbon
PVOC - petroleum volatile organic compound

Table 15. Sediment ecological benchmark hierarchy and selected screening levels
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Screening Criteria			MacDonald et al. 2000		DiToro/McGrath 2000
Analyte	Units	Y/N	Source	Value	TEC Consensus-Based Threshold Effect Concentrations	PEC Consensus-based Probable Effect Concentrations	EQP-SQG Narcotic Chemicals and PAH Criteria
PVOCs							
Benzene	µg/kg	Yes	EQP-SQG	308			308
Ethylbenzene	µg/kg	Yes	EQP-SQG	459			459
Toluene	µg/kg	Yes	EQP-SQG	383			383
Xylene isomers (total)	µg/kg	Yes	EQP-SQG	465			465
1,3,5-Trimethylbenzene	µg/kg	No		NA			
1,2,4-Trimethylbenzene	µg/kg	No		NA			
Semivolatile Organic Compounds							
PAHs							
Total PAHs	µg/kg	Yes	TEC	1610	1610	22800	
Acenaphthene	µg/kg	Yes	EQP-SQG	396			396
Acenaphthylene	µg/kg	Yes	EQP-SQG	365			365
Anthracene	µg/kg	Yes	TEC	57.2	57.2	845	479
Benz[a]anthracene	µg/kg	Yes	TEC	108	108	1050	677
Benzo[b]fluoranthene	µg/kg	Yes	EQP-SQG	788			788
Benzo[k]fluoranthene	µg/kg	Yes	EQP-SQG	791			791
Benzo[a]pyrene	µg/kg	Yes	TEC	150	150	1450	777
Benzo[ghi]perylene	µg/kg	Yes	EQP-SQG	882			882
Chrysene	µg/kg	Yes	TEC	166	166	1290	679
Dibenz[a,h]anthracene	µg/kg	Yes	TEC	33	33		904
Fluoranthene	µg/kg	Yes	TEC	423	423	2230	570
Fluorene	µg/kg	Yes	TEC	77.4	77.4	536	434
Indeno[1,2,3-cd]pyrene	µg/kg	Yes	EQP-SQG	899			899
Naphthalene	µg/kg	Yes	TEC	176	176	561	311
Phenanthrene	µg/kg	Yes	TEC	204	204	1170	480
Pyrene	µg/kg	Yes	TEC	195	195	1520	562
2-Methylnaphthalene	µg/kg	Yes	EQP-SQG	360			360
Phenols							
2,4-Dimethylphenol	µg/kg	No		NA			
2-Methylphenol	µg/kg	No		NA			
4-Methylphenol	µg/kg	No		NA			
Phenol	µg/kg	No		NA			

Table 15. Sediment ecological benchmark hierarchy and selected screening levels
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Screening Criteria			MacDonald et al. 2000		DiToro/McGrath 2000
Analyte	Units	Y/N	Source	Value	TEC Consensus-Based Threshold Effect Concentrations	PEC Consensus-based Probable Effect Concentrations	EQP-SQG Narcotic Chemicals and PAH Criteria
Inorganics							
Aluminum	mg/kg	No		NA			
Antimony	mg/kg	No		NA			
Arsenic	mg/kg	Yes	TEC	9.79	9.79	33	
Barium	mg/kg	No		NA			
Cadmium	mg/kg	Yes	TEC	0.99	0.99	4.98	
Chromium	mg/kg	Yes	TEC	43.4	43.4	111	
Copper	mg/kg	Yes	TEC	31.6	31.6	149	
Cyanide, Total	mg/kg	No		NA			
Iron	mg/kg	No		NA			
Lead	mg/kg	Yes	TEC	35.8	35.8	128	
Manganese	mg/kg	No		NA			
Mercury	mg/kg	Yes	TEC	0.18	0.18	1.06	
Nickel	mg/kg	Yes	TEC	22.7	22.7	48.6	
Selenium	mg/kg	No		NA			
Silver	mg/kg	No		NA			
Vanadium	mg/kg	No		NA			
Zinc	mg/kg	Yes	TEC	121	121	459	

Note: PAHs are screened against the Total PAH criteria based on the sum of 13 PAHs. Individual PAHs are not screened against their respective criteria. The screening values for individual PAHs are provided for informational purposes only.

EQP-SQG - narcotic chemicals and PAH criteria (DiToro and McGrath 2000); the values have been normallized to 1% total organic carbon, and reduced by a factor of 21 to account for potential additive effects among 17 PAHs and 4 BTEX
PEC - consensus-based probable effect concentrations (MacDonald et al. 2000)
TEC - consensus-based threshold effect concentrations (MacDonald et al. 2000)
Total PAH - total polycyclic aromatic hydrocarbons defined as 13 specific PAHs as specified in Swartz et al. (1999); the 13 PAHs are shaded gray

Table 16. Ecological screening assessment: Subsurface sediment – Willow Street OU2
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances		Criterion Concentrations	
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	95% UTL, Subsurface[1]	Ecological SL	95% UTL, Subsurface[1]
BTEX	Benzene	169	240	4.53	272	63		0.308	
	Ethylbenzene	182	240	14.6	762	71		0.459	
	Toluene	204	240	1.48	112	68	13	0.383	2.6
	Xylene, o	13	13	34.7	200				
	Xylenes, m + p	13	13	71.3	418				
	Xylenes, Total	186	227	5.44	222	69		0.465	
PAH	1-Methylnaphthalene	14	14	392	2280				
	2-Methylnaphthalene	281	296	61.8	3770				
	Acenaphthene	279	296	31.9	1400				
	Acenaphthylene	209	295	6.18	328				
	Anthracene	286	296	18.8	785				
	Benzo(a)anthracene	283	296	11.7	409				
	Benzo(a)pyrene	285	296	10.6	456				
	Benzo(b)fluoranthene	273	296	6.9	182				
	Benzo(g,h,i)perylene	270	296	5.24	235				
	Benzo(k)fluoranthene	280	296	6.73	248				
	Chrysene	287	296	12.7	414				
	Dibenz(a,h)anthracene	215	294	1.46	45.6				
	Fluoranthene	290	296	24.7	839				
	Fluorene	278	296	15.3	726				
	Indeno(1,2,3-cd)pyrene	257	296	4.62	212				
	Naphthalene	283	296	138	13000				
	Phenanthrene	294	296	52	2310				
	Pyrene	290	296	29.5	1160				
	TPAH(13)	296	296	351	21500	278	32	1.6	410
VOC	1,2,4-Trimethylbenzene	221	240	5.54	255				
	1,3,5-Trimethylbenzene	196	240	2.08	81.6				
	Isopropylbenzene	13	13	9.32	43.3				
	n-Butylbenzene	12	13	5.15	17				
	n-Propylbenzene	13	13	4.09	17.9				
	sec-Butylbenzene	11	13	0.435	1.19				
	Styrene	13	13	7.98	51.9				
	tert-Butylbenzene	4	13	2.54	7.35				
SVOC	Dibenzofuran	13	13	12.6	61.4				
Phenol	3 & 4-Methylphenol	98	225	0.898	3.62				
	Phenol	3	227	0.441	0.564				
PCB	PCB, Total	170	227	11.6	123	164		0.0598	
Metal	Aluminum, Total	227	227	11700	18000		6		16100
	Antimony, Total	196	227	3.68	33.1		2		13
	Arsenic, Total	227	227	17.3	45.1	173	33	9.79	30
	Barium, Total	227	227	330	669		15		555
	Cadmium, Total	194	227	36.3	160	179	1	0.99	133
	Chromium, Total	227	227	394	1840	183	26	43.4	829

Table 16. Ecological screening assessment: Subsurface sediment – Willow Street OU2
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances		Criterion Concentrations	
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	95% UTL, Subsurface[1]	Ecological SL	95% UTL, Subsurface[1]
	Copper, Total	227	227	335	1420	216	1	31.6	1050
	Iron, Total	227	227	25300	174000		1		71400
	Lead, Total	227	227	579	2210	188	49	35.8	863
	Manganese, Total	227	227	361	810		2		690
	Mercury, Total	227	227	4.57	152	188	13	0.18	10
	Nickel, Total	227	227	113	323	227	46	22.7	190
	Selenium, Total	224	227	2.84	17.8		5		5
	Silver, Total	200	227	12.2	28.8		59		18
	Vanadium, Total	224	227	70.3	502		65		70
	Zinc, Total	227	227	1330	3540	183	52	121	2110
Cyanide	Cyanide, Total	170	227	4.21	48.4		12		13

Notes: This table summarizes the results of the ecological screening assessment for sediments. Summary statistics are provided for chemicals detected in at least one sample within the OU2 area. The table summarizes the number of exceedances of each available criterion concentration, which are screening levels (SLs). All data and SLs are reported in units of mg/kg. An exceedance count of 0 means there was no exceedance in the OU2 area for the SL. An empty cell indicates an SL was not available for the analyte. A chemical that exceeds an SL is considered a constituent of potential concern (COPC) that requires further evaluation in the Baseline Risk Assessment (BLRA) and is shaded in yellow.

The ecological SL for sediments are summarized in Table 15 of the BLRA.

[1] Represents an ambient background criterion used to assess whether the analyte is above North Branch Chicago River ambient conditions. The ambient background criterion is not used to select COPCs, as it is not a risk-based value. Rather, the comparison to this criterion is provided for informational purposes to evaluate whether the OU2 area sediments are representative of ambient conditions or not. For TPAH-13, separate criteria were developed for surface and subsurface sediment.

Legend:
SL - Screening Level
mg/kg - micrograms per kilogram
BTEX - Benzene, Toluene, Ethylbenzene and Xylene
PAH - Polycyclic Aromatic Hydrocarbon
PCB - Polychlorinated Biphenyl
VOC - Volatile Organic Compound
RAF - Risk Assessment Framework
RSL - Regional screening level
95% UTL - 95 percent upper tolerance limit
TPAH- 13 - Total PAH sum of 13 select PAHs

Table 17. Ecological screening assessment: Subsurface sediment – Division Street OU2
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances		Criterion Concentrations	
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	95% UTL, Subsurface[1]	Ecological SL	95% UTL, Subsurface[1]
BTEX	Benzene	132	350	3.72	186	47		0.308	
	Ethylbenzene	148	350	14.8	1020	43		0.459	
	Toluene	287	350	0.737	106	24	4	0.383	2.6
	Xylenes, Total	149	350	8.33	444	52		0.465	
PAH	2-Methylnaphthalene	384	440	20.4	1790				
	Acenaphthene	397	456	16.7	2060				
	Acenaphthylene	300	456	2.56	215				
	Anthracene	429	456	9.59	976				
	Benzo(a)anthracene	426	456	6.49	525				
	Benzo(a)pyrene	425	456	6.49	536				
	Benzo(b)fluoranthene	406	456	4.79	291				
	Benzo(g,h,i)perylene	399	456	3.55	317				
	Benzo(k)fluoranthene	420	456	4.03	271				
	Chrysene	431	455	6.81	457				
	Dibenz(a,h)anthracene	356	455	0.793	23.2				
	Fluoranthene	437	456	14.9	1330				
	Fluorene	397	456	7.37	688				
	Indeno(1,2,3-cd)pyrene	389	456	2.76	199				
	Naphthalene	409	456	59.7	11200				
	Phenanthrene	448	456	26.7	2900				
	Pyrene	440	456	18	1960				
	TPAH(13)	453	456	170	23400	414	19	1.6	410
VOC	1,2,4-Trimethylbenzene	244	350	2.3	157				
	1,3,5-Trimethylbenzene	160	350	1.42	98.9				
Phenol	3 & 4-Methylphenol	177	339	0.425	2.25				
	Phenol	45	336	0.419	11.1				
Metal	Aluminum, Total	5	5	12200	14500		0		16100
	Antimony, Total	3	5	3.13	5.5		0		13
	Arsenic, Total	352	352	11.8	118	181	8	9.79	30
	Barium, Total	352	352	259	909		10		555
	Beryllium, Total	347	347	0.8	1.5				
	Cadmium, Total	290	352	38.7	212	275	14	0.99	133
	Chromium, Total	352	352	310	2400	269	32	43.4	829
	Copper, Total	352	352	296	2470	329	1	31.6	1050
	Iron, Total	5	5	23500	29300		0		71400
	Lead, Total	352	352	421	2480	271	55	35.8	863
	Manganese, Total	5	5	330	438		0		690

Table 17. Ecological screening assessment: Subsurface sediment – Division Street OU2
Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances		Criterion Concentrations	
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	95% UTL, Subsurface[1]	Ecological SL	95% UTL, Subsurface[1]
	Mercury, Total	350	352	2.07	41.4	269	6	0.18	10
	Nickel, Total	352	352	99.1	330	351	48	22.7	190
	Selenium, Total	351	352	2.62	5		0		5
	Silver, Total	277	352	15.8	36.7		128		18
	Vanadium, Total	5	5	17.9	32		0		70
	Zinc, Total	346	352	1040	6110	261	34	121	2110
Cyanide	Cyanide, Total	256	351	3.37	44.2		10		13

Notes: This table summarizes the results of the ecological screening assessment for sediments. Summary statistics are provided for chemicals detected in at least one sample within the OU2 area. The table summarizes the number of exceedances of each available criterion concentration, which are screening levels (SLs). All data and SLs are reported in units of mg/kg. An exceedance count of 0 means there was no exceedance in the OU2 area for the SL. An empty cell indicates an SL was not available for the analyte. A chemical that exceeds an SL is considered a constituent of potential concern (COPC) that requires further evaluation in the Baseline Risk Assessment (BLRA) and is shaded in yellow.

The ecological SL for sediments are summarized in Table 15 of the BLRA.

[1] Represents an ambient background criterion used to assess whether the analyte is above North Branch Chicago River ambient conditions. The ambient background criterion is not used to select COPCs, as it is not a risk-based value. Rather, the comparison to this criterion is provided for informational purposes to evaluate whether the OU2 area sediments are representative of ambient conditions or not. For TPAH-13, separate criteria were developed for surface and subsurface sediment.

Legend:
SL - Screening Level
mg/kg - micrograms per kilogram
BTEX - Benzene, Toluene, Ethylbenzene and Xylene
PAH - Polycyclic Aromatic Hydrocarbon
PCB - Polychlorinated Biphenyl
VOC - Volatile Organic Compound
RAF - Risk Assessment Framework
RSL - Regional screening level
95% UTL - 95 percent upper tolerance limit
TPAH- 13 - Total PAH sum of 13 select PAHs

Table 18. Ecological screening assessment: Subsurface sediment – North Station OU2

Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances		Criterion Concentrations	
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	95% UTL, Subsurface[1]	Ecological SL	95% UTL, Subsurface[1]
BTEX	Benzene	66	152	1.3	10.1	36		0.308	
	Ethylbenzene	69	152	5.6	59.2	29		0.459	
	Toluene	91	152	0.118	1.3	2	0	0.383	2.6
	Xylenes, Total	78	152	4.34	33.1	45		0.465	
PAH	2-Methylnaphthalene	162	174	14.3	481				
	Acenaphthene	160	173	6.99	274				
	Acenaphthylene	116	172	1.65	28.4				
	Anthracene	157	172	5.16	160				
	Benzo(a)anthracene	152	173	3.95	86.8				
	Benzo(a)pyrene	160	173	3.64	69.1				
	Benzo(b)fluoranthene	149	173	3	57.2				
	Benzo(g,h,i)perylene	142	172	1.72	24.1				
	Benzo(k)fluoranthene	158	173	2.13	36.2				
	Chrysene	158	173	4.34	87				
	Dibenz(a,h)anthracene	122	172	0.474	7.59				
	Fluoranthene	164	175	7.43	145				
	Fluorene	153	172	4.13	138				
	Indeno(1,2,3-cd)pyrene	140	172	1.39	19.9				
	Naphthalene	165	173	18.8	585				
	Phenanthrene	170	175	14.2	456				
	Pyrene	165	175	9.14	229				
	TPAH(13)	175	176	79.5	2330	155	6	1.6	410
VOC	1,2,4-Trimethylbenzene	108	152	3.12	30				
	1,3,5-Trimethylbenzene	90	152	1.01	8.22				
Phenol	3 & 4-Methylphenol	76	152	0.304	1.19				
	Phenol	17	151	0.407	2.46				
Metal	Aluminum, Total	152	152	15000	30300		67		16100
	Antimony, Total	108	152	2.67	14.3		1		13
	Arsenic, Total	151	152	14.7	58.6	98	15	9.79	30
	Barium, Total	152	152	279	753		4		555
	Cadmium, Total	132	152	41.4	182	124	5	0.99	133
	Chromium, Total	152	152	358	2130	114	18	43.4	829
	Copper, Total	152	152	366	3700	137	2	31.6	1050
	Iron, Total	152	152	25100	47500		0		71400
	Lead, Total	152	152	582	15300	119	32	35.8	863
	Manganese, Total	152	152	354	791		2		690
	Mercury, Total	152	152	2.43	19.7	116	8	0.18	10

Table 18. Ecological screening assessment: Subsurface sediment – North Station OU2

Baseline Risk Assessment (Revision 2)
The Peoples Gas Light and Coke Company
Willow Street, Division Street and North Station Operable Units 2 (River)
The North Branch Site, Cook County, Chicago, IL
USEPA ID: ILD982074759 (Willow), ILD982074783 (Division) and ILD982074775 (North Station)

		Count of Results				Count of Detected Exceedances		Criterion Concentrations	
Class	Analyte	Detect	Total	Mean of Detected	Max of Detected	Ecological SL	95% UTL, Subsurface[1]	Ecological SL	95% UTL, Subsurface[1]
	Nickel, Total	152	152	95	246	152	12	22.7	190
	Selenium, Total	152	152	2.98	5.1		2		5
	Silver, Total	127	152	15.9	41.5		57		18
	Vanadium, Total	151	152	24.1	65.3		0		70
	Zinc, Total	152	152	1210	3070	118	26	121	2110
Cyanide	Cyanide, Total	116	152	4.59	55.3		12		13

Notes: This table summarizes the results of the human health and ecological screening assessment for sediments. Summary statistics are provided for chemicals detected in at least one sample within the OU2 area. The table summarizes the number of exceedances of each available criterion concentration, which are screening levels (SLs). All data and SLs are reported in units of mg/kg. An exceedance count of 0 means there was no exceedance in the OU2 area for the SL. An empty cell indicates an SL was not available for the analyte. A chemical that exceeds an SL is considered a constituent of potential concern (COPC) that requires further evaluation in the Baseline Risk Assessment (BLRA) and is shaded in yellow.

The ecological SL for sediments are summarized in Table 15 of the BLRA.

[1] Represents an ambient background criterion used to assess whether the analyte is above North Branch Chicago River ambient conditions. The ambient background criterion is not used to select COPCs, as it is not a risk-based value. Rather, the comparison to this criterion is provided for informational purposes to evaluate whether the OU2 area sediments are representative of ambient conditions or not. For TPAH-13, separate criteria were developed for surface and subsurface sediment.

Legend:
SL - Screening Level
mg/kg - micrograms per kilogram
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PAH - Polycyclic Aromatic Hydrocarbon
PCB - Polychlorinated Biphenyl
VOC - Volatile Organic Compound
RAF - Risk Assessment Framework
RSL - Regional screening level
95% UTL - 95 percent upper tolerance limit
TPAH- 13 - Total PAH sum of 13 select PAHs

Attachment 1

Site Habitat Assessments

Attachment 1a – Willow Street
Attachment 1b – Division Street
Attachment 1c – North Station

Attachment 1a

Willow Street

CHECKLIST FOR ECOLOGICAL ASSESSMENT/SAMPLING

I. SITE DESCRIPTION

1. Site Name: Willow Street/Hawthorne Avenue Station Former Manufactured Gas Plant (MGP) Site Operable Unit (OU)

   Location: Section 32, Township 40 North, Range 14 East

   County: Cook City: Chicago State: Illinois

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? Approximately 7.4 acres

4. Is this the first site visit? ✓ yes ☐ no. If no, attach trip report of previous site visit(s), if available.

   Date(s) of previous site visit(s): _____

5. Please attach to the checklist USGS topographic map(s) of the site, if available.

   Not provided.

6. Are aerial or other site photographs available? ✓ yes ☐ no. If yes, please attach any available photo(s) to the site map at the conclusion of this section.

   See attached photograph log sheets.

7. The land use on the site is:

50	% Urban
0	% Rural
0	% Residential
50	% Industrial (☐ light ✓heavy)
0	% Agricultural
(*Crops*: _____)	
0	% Recreational
(Describe; note if it is a park, etc.)	
0	% Undisturbed
0	% Other (vacant / abandoned)

The area surrounding the site is: 0.2 mile radius

50	% Urban
0	% Rural
	% Residential
50	% Industrial (☐ light ✓ heavy)
0	% Agricultural
(*Crops*: None)	
0	% Recreational
(Describe; note if it is a park, etc.)	
0	% Undisturbed
0	% Other

8. Has any movement of soil taken place at the site? ✓ yes ☐ no. If yes, please identify the most likely cause of this disturbance:

_____	Agricultural Use	X_____	Heavy Equipment	_____	Mining
_____	Natural Events	_____	Erosion	X_____	Other

Please describe: Site was historically filled and is covered with pavement, gravel, or buildings over most of the surface. Land use is a mixture of commercial and industrial uses and includes a metal scrap processing facility, commercial retail stores, an electrical substation, and natural gas regulating station.

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

No sensitive areas exist on the site or adjacent to the site. The site is located in an urban area of the City of Chicago adjacent to the Chicago River.

Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

General observation made on March 19, 2009.

10. What type of facility is located at the site?

☐ Chemical ☐ Manufacturing ☐ Mixing ☐ Waste disposal

✓ Other (specify) Scrap metals processing facility, Commercial retail, industrial facilities, substation, and natural gas regulating station.

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

MGP-related chemical constituents of potential concern (COPCs) at the site include benzene, polynuclear aromatic hydrocarbons (PAHs), and selected metals detected in soil, sediment, and groundwater samples. Refer to the details provided in the SSWP.

12. Check any potential routes of off-site migration of contaminants observed at the site:

☐ Swales ☐ Depressions ☐ Drainage ditches

☐ Runoff ☐ Windblown particulates ☐ Vehicular traffic

✓ Other (specify) No potential routes of offsite migration observed on site.

13. If known, what is the approximate depth to the water table? Refer to RI report for details- varies across Upland OU.

14. Is the direction of surface runoff apparent from site observations? ✓ yes ☐ no. If yes, to which of the following does the surface runoff discharge: Indicate all that apply.

✓Surface water ☐ Groundwater ✓ Sewer ☐ Collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ✓ yes ☐ no.

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist - Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist - Flowing Systems.

✓ yes (Chicago River located on site) ☐ no

17. Is there evidence of flooding? ☐ yes ✓ no. *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. (Use a blank sheet if additional space is needed for text.)

Site is completely developed with no natural areas of vegetation present onsite.

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☐ yes ✓ no. *If yes, you are required to verify this information with the U.S. Fish and Wildlife Service.* If species' identities are known, please list them next.

Site is completely developed with no natural areas that could provide habitat for threatened and/or endangered species.

20. Record weather conditions at the time this checklist was prepared:

DATE: 3/19/2009

46°F Temperature (°C/°F) 48 °F Normal daily high temperature

North wind; 0–10 mph Wind (direction/speed) None Precipitation (rain, snow)

Mostly sunny Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

On March 19, 2009, an Exponent environmental biologist conducted a habitat assessment on the active urban upland portion of the OU during a site visit to the OU. Observations were made from properties for which there was access on the day of the site visit and public right-of-ways. There was very limited ecological habitat on or adjacent to the upland area of the OU because of the extensive urban development. The upland portion of the site is composed of parcels that are developed, and the ground surface is primarily covered with pavement, gravel, and buildings, with limited vegetation other than some weed species along fence lines and ornamental trees and shrubs growing in medians within parking areas or along grassy median located adjacent to sidewalks. The majority of the OU is composed of a scrap metal processing plant, commercial retail buildings, an electrical substation, and the Peoples Gas natural gas regulating station. No terrestrial ecological receptors were observed onsite during the visit. Representative photographs of the Upland OU environment are attached to this habitat assessment.

A complete habitat assessment of the river portion of the OU could not be completed during this initial visit because of access restrictions to the river. However, during the site reconnaissance, the general condition of the river and riverbank was observed, and initial observations of ecological receptors using the river were made. The river along the OU is constrained by vertical walls, and there is very limited vegetation in the riparian zone. No aquatic vegetation was observed in the river on the day of the site visits. The vegetation present on the banks is limited to deciduous trees that were planted along the edge of the dock wall to create a visual barrier of activities on the General Iron parcel (refer to attached pictures). Waterfowl (mallard ducks, herring gulls, and Canada geese) were observed in the Chicago River, but no other aquatic ecological receptors were observed in the river on the day of the reconnaissance. There is limited nesting habitat for birds on the site or adjacent properties because of the limited vegetation present. The North Branch of the Chicago River is generally 6–11 ft deep, based on the bathymetry data collected in the adjacent river area (ARA) during the RI.

Completed by Michael W. Kierski Affiliation Exponent

Additional Preparers _____

Site Manager_____

Date 3-19-2009

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☐ yes ✓ no. If no, go to Section IIB: Shrub/Scrub.

2. What percentage or area of the site is wooded? (0.0% 0.0 acres). Indicate the wooded area on the site map which is attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.

3. What is the dominant type of vegetation in the wooded area? (Circle one: Evergreen/Deciduous/Mixed) Provide a photograph, if available.

   Dominant plant, if known: _____

4. What is the predominant size of the trees at the site? Use diameter at breast height.

   ☐ 0-6 in. ☐ 6-12 in. ☐ >12 in.

5. Specify type of understory present, if known. Provide a photograph, if available.

   _____

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐ yes ✓no. If no, go to Section IIC: Open Field.

2. What percentage of the site is covered by scrub/shrub vegetation? (0.0% 0.0 acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.

3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph, if available.

4. What is the approximate average height of the scrub/shrub vegetation?

   ☐ 0-2 ft. ☐ 2-5 ft. ☐ >5 ft.

5. Based on site observations, how dense is the scrub/shrub vegetation?

   ☐ Dense ☐ Patchy ☐ Sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☐ yes ✓ no. If yes, please indicate the type below:

   ☐ Prairie/plains ☐ Savannah ☐ Old field ☐ Other (specify) _____

2. What percentage of the site is open field? (0.0 % 0.0 acres). Indicate the open field on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.

4. What is the approximate average height of the dominant plant? _____

5. Describe the vegetation cover: ☐ Dense ☐ Sparse ☐ Patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site, other than woods, scrub/shrub, and open field?
   ☐ yes ✓ no. If yes, identify and describe them below.

   The site does not contain terrestrial habitat as the parcels have been completely covered by gravel, buildings, and/or concrete structures. The limited number of ornamental trees and shrubs planted in isolated areas within the Upland OU do not provide significant ecological habitat.

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.

3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.?

4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

III. AQUATIC HABITAT CHECKLIST – NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site? Not applicable

   ☐ Natural (pond, lake)

   ☐ Artificially created (lagoon, reservoir, canal, impoundment)

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?

   _____

3. If a waterbody is present, what are its known uses (e.g.: recreation, navigation, etc.)?

4. What is the approximate size of the waterbody(ies)? _____acre(s).

5. Is any aquatic vegetation present? ☐ yes ☐ no. If yes, please identify the type of vegetation present is known.

   ☐ Emergent ☐ Submergent ☐ Floating

6. If known, what is the dept of the water? _____

7. What is the general composition of the substrate? Check all that apply.

   ☐ Bedrock ☐ Sand (coarse) ☐ Muck (fine/black)

   ☐ Boulder (> 10 in.) ☐ Silt (fine) ☐ Debris

   ☐ Cobble (2.5–10 in.) ☐ Marl (shells) ☐ Detritus

   ☐ Gravel (0.1–2.5 in.) ☐ Clay (slick) ☐ Concrete

   ☐ Other (specify) _____

8. What is the source of water in the waterbody?

   ☐ River/Stream/Creek ☐ Groundwater ☐ Other (specify)_____

   ☐ Industrial discharge ☐ Surface runoff

9. Is there a discharge from the site to the waterbody? ☐ yes ☐ no. If yes, please describe this discharge and its path.

10. Is there a discharge from the waterbody? ☐ yes ☐ no. If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

☐ River/Steam/Creek	☐ Onsite	☐ Offsite	Distance _____
☐ Groundwater	☐ Onsite	☐ Offsite	
☐ Wetlands	☐ Onsite	☐ Offsite	Distance _____
☐ Impoundment	☐ Onsite	☐ Offsite	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

_____ Area

_____ Depth (average)

_____ Temperature (depth of the water at which the reading was taken) _____

_____ pH

_____ Dissolved oxygen

_____ Salinity

_____ Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth _____, visual)

_____ Other (specify)

12. Describe observed color and area of coloration.

13. Mark the open-water, non-flowing system on the site map attached to his checklist.

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

IV. AQUATIC HABITAT CHECKLIST – FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section 4, Wetland Habitat Checklists.

1. What type(s) of flowing water system(s) is (are) present at the site?

✓ River ☐ Stream ☐ Creek

☐ Dry wash ☐ Arroyo ☐ Brook

☐ Artificially created (ditch, etc.) ☐ Intermittent Stream ☐ Channeling

☐ Other (specify) _____

2. If known, what is the name of the waterbody? North Branch of the Chicago River

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)?

✓ yes ☐ no. If yes, please describe indicators that were observed.

The river is constrained by vertical walls that line the banks. The river has been dramatically altered from its normal course and flow regime.

4. What is the general composition of the substrate? Check all that apply. No observations made.

☐ Bedrock ☐ Sand (coarse) ☐ Muck (fine/black)

☐ Boulder (> 10 in.) ☐ Silt (fine) ☐ Debris

☐ Cobble (2.5–10 in.) ☐ Marl (shells) ☐ Detritus

☐ Gravel (0.1–2.5 in.) ☐ Clay (slick) ☐ Concrete

☐ Other (specify) _____.

5. What is the condition of the bank (e.g., height, slope, extent of vegetation cover)?

The banks are compared of vertical sheet pile or concrete walls.

6. Is the system influenced by tides? ☐ yes ✓no. What information was used to make this determination?

7. Is the flow intermittent? ☐ yes ✓ no. If yes, please note the information that was used in making this determination.

8. Is there a discharge from the site to the waterbody? ✓ yes ☐ no. If yes, please describe the discharge and its path.

Mainly sheet flow from the gravel-covered area at the General Iron facility located adjacent to the river. The majority of the surface water flow is captured by combined storm/sanitary sewer systems that convey the water to the deep tunnel.

9. Is there a discharge from the waterbody? ✓ yes ☐ no. If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on-site or off-site.

There is no nearby discharge point for the Chicago River. The river flows toward the Illinois River.

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected, provide the measurement and the units of measure in the appropriate space below:

No measurements were taken during the site visit. Measurements of the river and water quality were collected during the Remedial Investigation.

_____ Width (ft)

_____ Depth (ft)

_____ Velocity (specify units): _____

_____ Temperature (depth of the water at which the reading was taken _____)

_____ pH

_____ Dissolved oxygen

_____ Salinity

_____ Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth _____)

_____ Other (specify) _____

11. Describe observed color and area of coloration.

12. Is any aquatic vegetation present? ☐ yes ✓ no. If yes, please identify the type of vegetation present, if known.

☐ Emergent ☐ Submergent ☐ Floating

13. Mark the flowing water system on the attached site map.

14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site?

   ☐ yes ✓ no - based on field observations.

   Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

2. Based on the location of the site (e.g., along a waterbody, in a floodplain) and site conditions (e.g., standing water, dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? ☐ yes ✓ no. If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

   ☐ Submergent ☐ Emergent

   ☐ Scrub/Shrub ☐ Wooded

   ☐ Other (specify) _____

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

5. Is standing water present? ☐ yes ☐ no. If yes, is this water: ☐ fresh ☐ brackish. What is the approximate area of the water (sq. ft.) _____. Please complete questions 4, 11, 12 in Checklist III – Aquatic Habitat – Non-Flowing Systems.

6. Is there evidence of flooding at the site? What observations were noted?

   ☐ Buttressing ☐ Water marks ☐ Mud cracks

   ☐ Debris line ☐ Other (describe below)

7. If known, what is the source of the water in the wetland?

   ☐ Steam/River/Creek/Lake/Pond ☐ Groundwater

   ☐ Flooding ☐ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☐ yes ☐ no. If yes, please describe.

9. Is there a discharge from the wetland? ☐ yes ☐ no. If yes, to what waterbody is discharge released?

   ☐ Surface Stream/River ☐ Groundwater ☐ Lake/Pond ☐ Marine

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

    Color (blue/gray, brown, black, mottled) _____
    Water content (dry, wet, saturated/unsaturated) _____

11. Mark the observed wetland area(s) ion the attached site map.

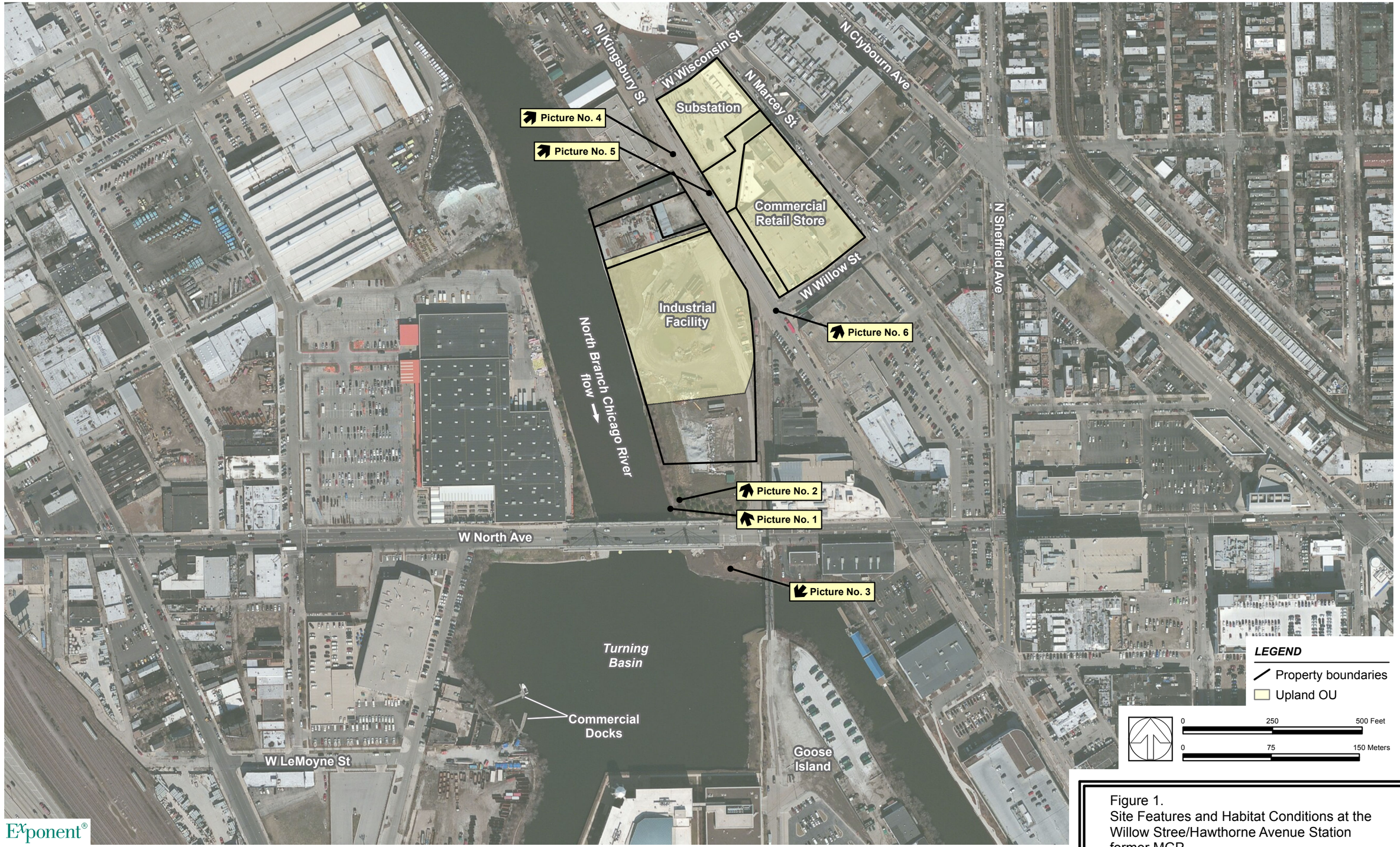


Figure 1.
Site Features and Habitat Conditions at the Willow Stree/Hawthorne Avenue Station former MGP

July 9, 2015 / P:\MY\MY03195.008_CityOfChicago\GIS\projects\WH_basemap.mxd

Willow Street/Hawthorne Avenue Station Manufactured Gas Plant Site
Site Visit Photographs
March 19, 2009

DSC03160

Photograph 1. Looking north from the North Avenue bridge at the North Branch Chicago River. Note how the river is constrained by the vertical sheet-pile walls. The east bank of the adjacent river area (ARA) (right side) is the location of the General Iron facility.

DSC03157

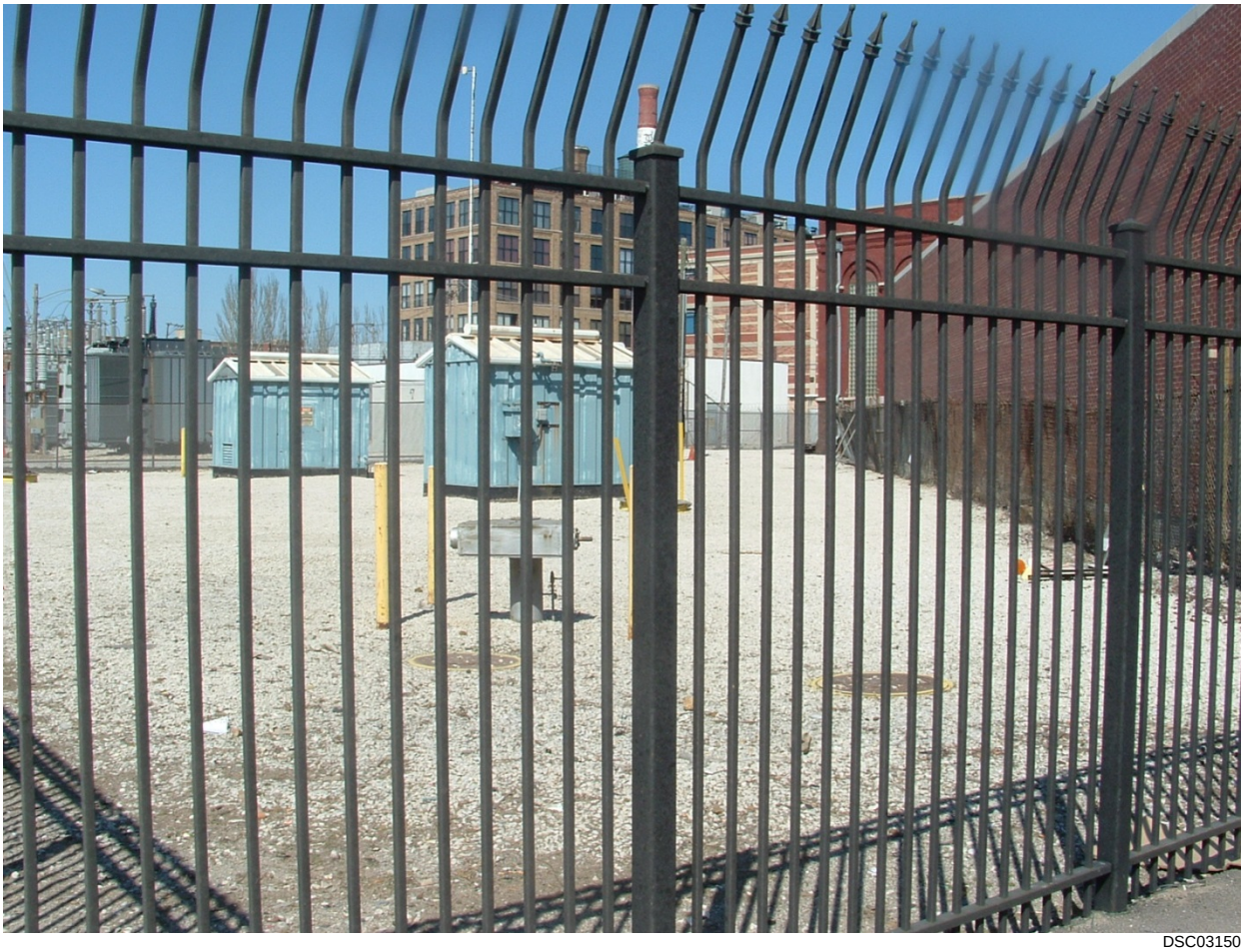
Photograph 2. Looking northeast from the North Avenue bridge at the General Iron facility. In the distance beyond the facility are the commercial retail buildings located within the Upland OU (see close-up in Photograph 6).

DSC03158

Photograph 3. Looking approximately southwest from the North Avenue bridge at the turning basin located downstream of the adjacent river area (ARA). Note the waterfowl loafing in the basin and the commercial docks on the west side of the basin, which are used by a local canoe and kayak business.

DSC03156

Photograph 4. Looking approximately northeast across North Kingsbury Street to the ComEd substation located within the Upland OU. Note the fencing that restricts access to the substation.



DSC03150

Photograph 5. Looking approximately northeast from the sidewalk along North Kingsbury Street at the Peoples Gas natural gas regulating station within the Upland OU. Note the fencing that restricts access to the station.

DSC03155

Photograph 6. Looking approximately northeast across North Kingsbury Street to the largest commercial retail store located within the Upland OU.

Attachment 1b

Division Street

CHECKLIST FOR ECOLOGICAL ASSESSMENT/SAMPLING

I. SITE DESCRIPTION

1. Site Name: Peoples Gas Division Street Station Operable Unit (OU)

   Location: 1111 to 1117 Elston Avenue

   County: Cook City: Chicago State: Illinois

2. Latitude: 41°, 54 min., 8.67 sec., N Longitude: 87°, 39 min., 32.4 sec., W

3. What is the approximate area of the site? 16.3 acres

4. Is this the first site visit? ✓ yes ☐ no. If no, attach trip report of previous site visit(s), if available.

   Date(s) of previous site visit(s): _____

5. Please attach to the checklist USGS topographic map(s) of the site, if available.
   A USGS topographic map of the site is provided as Figure 1 (See attached).

6. Are aerial or other site photographs available? ✓ yes ☐ no. If yes, please attach any available photo(s) to the site map at the conclusion of this section.
   See aerial photograph of site provided in Figure 2 and attached photograph log sheets.

7. The land use on the site is:

   100 % Urban
   0 % Rural
   0 % Residential
   88 % Industrial (✓ light ☐ heavy)
   0 % Agricultural
   (*Crops*: None)
   0 % Recreational
   (Describe; note if it is a park, etc.)
   _____
   _____
   0 % Undisturbed
   12 % Other (vacant / abandoned)

   The area surrounding the site is:
   0.2 mile radius

   100 % Urban
   0 % Rural
   20 % Residential
   60 % Industrial (✓ light ☐ heavy)
   0 % Agricultural
   (*Crops*: None)
   20 % Recreational
   (Describe; note if it is a park, etc.)
   North Branch of the Chicago River is used for
   Commerce and recreational boating
   0 % Undisturbed
   0 % Other

8. Has any movement of soil taken place at the site? ✓ yes ☐ no. If yes, please identify the most likely cause of this disturbance:

_____	Agricultural Use	✓_____	Heavy Equipment	_____	Mining
_____	Natural Events	✓_____	Erosion	_____	Other

Please describe:

Excavation and grading during Installation of steel sheet piling wall along River Bank adjacent to the Bar Parcel. Erosion of gravel lot adjacent to the Chicago River observed in east central portion of the Former Boatyard parcel (see attached photographs).

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

The North Branch of the Chicago River flows through the site from north to south along the east boundary of the Bar and Former Boatyard parcels.

Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

See Figure 2 (attached).

10. What type of facility is located at the site?

☐ Chemical ☐ Manufacturing ☐ Mixing ☐ Waste disposal

✓ Other (specify) The Western Property of the Site is occupied by a Peoples Gas maintenance and office facility. The Eastern Property includes an abandoned bar and grill (Bar Parcel) and a former boat storage yard (Boatyard Parcel) –both are currently vacant.

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

Chemical constituents of potential concern (COPCs) at the site include benzene, polynuclear aromatic hydrocarbons (PAHs) and selected metals detected in soil and groundwater samples. Soil remediation has been performed on the Western Property as described in the "*Remedial Action Completion Report for the Former Division Street Station Manufactured Gas Plant*" (Burns & McDonnell, 2006). For summaries of soil and groundwater COPCs present on the Eastern Properties see the "*Site Investigation – Boatyard Parcel*" (Burns & McDonnell 2000) and the Comprehensive Site Investigation / Remedial Objectives Report (CSI/ROR) for the Boatyard Parcel (Weston 2005). CPOCs present in the Adjacent River Area are described in the *River Sediment Investigation Summary Report for the Former Division Street Station Manufactured Gas Plant* (Burns & McDonnell 2007).

12. Check any potential routes of off-site migration of contaminants observed at the site:

☐ Swales	☐ Depressions	☐ Drainage ditches
✓ Runoff	✓ Windblown particulates	☐ Vehicular traffic

✓ Other (specify) Sheet flow of precipitation east, into the Chicago River and drain pipes observed protruding from the west bank of the River.

13. If known, what is the approximate depth to the water table? Six feet below ground surface (bgs)

14. Is the direction of surface runoff apparent from site observations? ✓ yes ☐ no. If yes, to which of the following does the surface runoff discharge: Indicate all that apply.

✓ Surface water ☐ Groundwater ✓ Sewer ☐ Collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ✓ yes ☐ no.

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist - Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist - Flowing Systems.

✓ yes (approx. distance 0 feet) ☐ no

17. Is there evidence of flooding? ☐ yes ✓ no. *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. (Use a blank sheet if additional space is needed for text.)

Approximately 25 minutes spent identifying flora and fauna. Field guides used for plant and tree identification included: Illinois Department of Natural Resources, 2006, *Forest Trees of Illinois* and Newcomb, Lawrence, 1977 *Newcomb's Wildflower guide.*

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☐ yes ✓ no. *If yes, you are required to verify this information with the U.S. Fish and Wildlife Service.* If species' identities are known, please list them next.

20. Record weather conditions at the time this checklist was prepared:

DATE: October 22, 2008

Mid 50s °F	Temperature (°C/°F)	60 °F	Normal daily high temperature
South, 5 to 10 mph	Wind (direction/speed)	None	Precipitation (rain, snow)
20 %, high Cirrus	Cloud cover		

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

On October 22, 2008, Burns & McDonnell conducted a habitat assessment site visit for the upland portion of the Peoples Gas Division Street OU (the Site). The site includes the Western Property of 14.4 acres that is occupied by a Peoples Gas maintenance and office facility and the Eastern Property. The Western Property is bordered by Division Street on the north, Elston Avenue on the East, railroad tracks and Interstate 90/94 to the west and commercial property to the south. The Western Property is completely developed and is occupied by buildings, parking lots, and landscaped areas. There is limited shrub/scrub habitat on the Western property provided by planted shrubs and bushes along the property perimeter and edges of driveways and walkways. Natural habitat areas are not present on the Western Property.

The Eastern Property is located on an elongated shaped parcel of 1.9 acres at the southeast corner of the intersection of Division Street and Elston Avenue. The irregularly shaped parcel is bordered by the North Branch of the Chicago River on the east and south, Elston Road to the west, and Division Street to the north. The site is owned by the operator of a bar (Bar Parcel) and the City of Chicago (Former Boatyard Parcel). Site access is controlled by an 8-foot tall chain link fence with locked gates.

Currently the Boatyard Parcel is vacant and the Bar Parcel is inactive. The Bar Parcel is occupied by a bar building (brick, metal, and wood) and outdoor patio area that is inactive. The majority of the property ground surface cover, south of the bar area, is a gravel surface and concrete foundations. Trees and upland weedy vegetation were observed adjacent to the Chicago River Bank along the east and south property boundaries and adjacent to the western fence line. A limited riparian habitat on the river bank consists of Wild grape and weedy vegetation on the river bank that provides an understory for trees. A portion of the river bank consists of broken concrete and construction debris and there is no riparian habitat (vegetation) at these locations. The upland areas include a limited amount of shrub/scrub habitat. Areas of wooded and scrub/shrub habitat are indicated on the aerial photograph provided as Figure 2. The habitat site visit did not include observations in the Chicago River as no boat was available during the site walk. An inspection of the Chicago River bank will be conducted in the spring of 2009 using a boat during the Remedial Investigation (RI).

Observed plant species on the Eastern Parcel included

- Goldenrod (*Solidago species*)
- Common Ragweed (*Ambrosia artemisiifolia*)
- Daisy Fleabane (*Erigeron annuus*)
- Queen Anne's Lace (*Daucas carota*)
- Canada Thistle (*Circium rvense*)
- Chicory (*Chicorium intybus*)
- Wild Grape (*Vitis spp.*)
- Box Elder (*Acer Negundo*)
- American Elm (*Ulmas Americana*)
- Staghorn Sumac (*Rhus Typhina*)

Species of birds observed on the Site included an Eastern Meadowlark (*Sturnella magna*), a Herring Gull (*Larus argentatus*), and House Sparrows (*Passer Domesticus*) that were foraging in groundcover and in tree stands.

In general, the Eastern Parcel consisted of a vacant lot with overgrown concrete/gravel surface yards and building foundations, very limited scrub/shrub and wooded areas occupied by common invasive species, weeds and trees. The vacant lot had a low diversity of species and very limited ecological habitat. No sensitive upland habitats exist at the site and the current plan of the City of Chicago is to redevelop the site into an urban riverfront park, which will eliminate the very limited ecological habitat currently present.

Completed by Gordon A. Ferguson Affiliation Burns & McDonnell

Additional Preparers _____

Site Manager Margaret Kelley

Date November 11, 2008

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ✓ yes ☐ no. If no, go to Section IIB: Shrub/Scrub.

2. What percentage or area of the site is wooded? (2.39 % 0.39acres). Indicate the wooded area on the site map which is attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.

Field observations, aerial photographs, and Auto-CAD Software.

3. What is the dominant type of vegetation in the wooded area? (Circle one: Evergreen/**Deciduous**/Mixed) Provide a photograph, if available.

   Dominant plant, if known: Box Elder, Staghorn Sumac, and American Elm.

4. What is the predominant size of the trees at the site? Use diameter at breast height.

   ✓ 0-6 in. ☐ 6-12 in. ☐ >12 in.

5. Specify type of understory present, if known. Provide a photograph, if available.

Understory consists of invasive weeds and vines; Golden Rod, Lesser Burdock, Canadian Thistle and Wild Grape (See Photographs).

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ✓ yes ☐ no. If no, go to Section IIC: Open Field.

2. What percentage of the site is covered by scrub/shrub vegetation? (1.78 % 0.29acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.

Field observations, aerial photographs, and Auto-CAD Software.

3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph, if available.

Wild grape (Vitis, species) and Lessor burdock (Arctium, minus).

4. What is the approximate average height of the scrub/shrub vegetation?

   ☐ 0-2 ft. ✓ 2-5 ft. ☐ >5 ft.

5. Based on site observations, how dense is the scrub/shrub vegetation?

   ☐ Dense ✓ Patchy ☐ Sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ✓ yes ☐ no. If yes, please indicate the type below:

   ☐ Prairie/plains ☐ Savannah ☐ Old field ✓ Other (specify) Gravel yards and weathered concrete foundations (slab type)

2. What percentage of the site is open field? (6.26 % 1.02 acres). Indicate the open field on the site map.
   Open field habitat was observed on the Former Boatyard Parcel (See Figure 2). The remainder of the site is occupied by buildings, parking lots and landscaped areas on the Western Property; plus the wooded and shrub/scrub areas on the Eastern Property.

3. What is/are the dominant plant(s)? Provide a photograph, if available.

Invasive weeds are dominant; Golden rod (Solidago species), Canada thistle (Circium rvense), Queen Anne's lace (Daucas carota), and chicory (Chicorium intybus).

4. What is the approximate average height of the dominant plant? 2.5-feet

5. Describe the vegetation cover: ☐ Dense ☐ Sparse ✓ Patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site, other than woods, scrub/shrub, and open field? ☐ yes ✓ no. If yes, identify and describe them below.

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.

3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.?

One fish was observed jumping in the Chicago River. No mammals observed. Birds were observed that included Herring Gulls, House Sparrows, and a Meadow Lark.

4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

None.

III. AQUATIC HABITAT CHECKLIST – NON-FLOWING SYSTEMS (NONE OBSERVED)

*******NOT APPLICABLE********

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?

   ☐ Natural (pond, lake)

   ☐ Artificially created (lagoon, reservoir, canal, impoundment)

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?

   _____

3. If a waterbody is present, what are its known uses (e.g.: recreation, navigation, etc.)?

4. What is the approximate size of the waterbody(ies)? _____acre(s).

5. Is any aquatic vegetation present? ☐ yes ☐ no. If yes, please identify the type of vegetation present is known.

   ☐ Emergent ☐ Submergent ☐ Floating

6. If known, what is the dept of the water? _____

7. What is the general composition of the substrate? Check all that apply.

   ☐ Bedrock ☐ Sand (coarse) ☐ Muck (fine/black)

   ☐ Boulder (> 10 in.) ☐ Silt (fine) ☐ Debris

   ☐ Cobble (2.5-10 in.) ☐ Marl (shells) ☐ Detritus

   ☐ Gravel (0.1-2.5 in.) ☐ Clay (slick) ☐ Concrete

   ☐ Other (specify) _____

8. What is the source of water in the waterbody?

   ☐ River/Stream/Creek ☐ Groundwater ☐ Other (specify)_____

   ☐ Industrial discharge ☐ Surface runoff

9. Is there a discharge from the site to the waterbody? ☐ yes ☐ no. If yes, please describe this discharge and its path.

10. Is there a discharge from the waterbody? ☐ yes ☐ no. If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

☐ River/Steam/Creek	☐ On-site	☐ Off-site	Distance _____
☐ Groundwater	☐ On-site	☐ Off-site	
☐ Wetlands	☐ On-site	☐ Off-site	Distance _____
☐ Impoundment	☐ On-site	☐ Off-site	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

_____ Area

_____ Depth (average)

_____ Temperature (depth of the water at which the reading was taken) _____

_____ pH

_____ Dissolved oxygen

_____ Salinity

_____ Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth _____, visual)

_____ Other (specify)

12. Describe observed color and area of coloration.

13. Mark the open-water, non-flowing system on the site map attached to his checklist.

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

IV. AQUATIC HABITAT CHECKLIST – FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section 4, Wetland Habitat Checklists.

1. What type(s) of flowing water system(s) is (are) present at the site?

✓ River	☐ Stream	☐ Creek
☐ Dry wash	☐ Arroyo	☐ Brook
☐ Artificially created (ditch, etc.)	☐ Intermittent Stream	☐ Channeling
	☐ Other (specify) _____	

2. If known, what is the name of the waterbody? North Branch of the Chicago River

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)?

☐ yes ☐ no. If yes, please describe indicators that were observed.
(Not Applicable)

4. What is the general composition of the substrate? Check all that apply.

☐ Bedrock	☐ Sand (coarse)	☐ Muck (fine/black)
☐ Boulder (> 10 in.)	✓ Silt (fine)	✓ Debris
☐ Cobble (2.5-10 in.)	☐ Marl (shells)	✓ Detritus
☐ Gravel (0.1-2.5 in.)	✓ Clay (slick)	☐ Concrete
☐ Other (specify) _____		

5. What is the condition of the bank (e.g., height, slope, extent of vegetation cover)?
Banks include gravel and concrete covered with vegetation. Elevation of top of bank is 10 to 12 feet above the River with a bank slope greater than 1:1 (45 degrees).

6. Is the system influenced by tides? ☐ yes ✓ no. What information was used to make this determination?
The Chicago River is an inland freshwater river subject to minimal tidal forces.

7. Is the flow intermittent? ☐ yes ✓ no. If yes, please note the information that was used in making this determination.

8. Is there a discharge from the site to the waterbody? ✓ yes ☐ no. If yes, please describe the discharge and its path.

Sheet flow of surface water run-off flows from the Eastern Property to the east and south into the ARA (Chicago River).

9. Is there a discharge from the waterbody? ✓ yes ☐ no. If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on-site or off-site.

The North Branch of the Chicago River flows south into the main branch of the Chicago River that flows south and then southwest from downtown Chicago.

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected, provide the measurement and the units of measure in the appropriate space below:

No measurements were taken during the site visit because a boat was not available. Measurements of the river and water quality will be collected during the Remedial Investigation in 2009.

_____ Width (ft)

_____ Depth (ft)

_____ Velocity (specify units): _____

_____ Temperature (depth of the water at which the reading was taken _____)

_____ pH

_____ Dissolved oxygen

_____ Salinity

_____ Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth _____)

_____ Other (specify) _____

11. Describe observed color and area of coloration.

The Chicago River has a brownish green color for the entire length of the River flowing past the site. Water is cloudy and turbid in appearance. Appearance is the same upstream of the ARA.

12. Is any aquatic vegetation present? ☐ yes ✓ no. If yes, please identify the type of vegetation present, if known.

☐ Emergent ☐ Submergent ☐ Floating

13. Mark the flowing water system on the attached site map.

See Figure 2.

14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

All observations were made from the River Bank or the Division Street Bridge. Survey for benthic organisms will be conducted during the RI. Herring Gulls and one fish were observed in the Chicago River.

V. WETLAND HABITAT CHECKLIST

*******NOT APPLICABLE********

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site?

   ☐ yes ✓ no

   Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

2. Based on the location of the site (e.g., along a waterbody, in a floodplain) and site conditions (e.g., standing water, dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? ☐ yes ✓ no. If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

   ☐ Submergent ☐ Emergent

   ☐ Scrub/Shrub ☐ Wooded

   ☐ Other (specify) _____

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

5. Is standing water present? ☐ yes ☐ no. If yes, is this water: ☐ fresh ☐ brackish. What is the approximate area of the water (sq. ft.) _____. Please complete questions 4, 11, 12 in Checklist III – Aquatic Habitat – Non-Flowing Systems.

6. Is there evidence of flooding at the site? What observations were noted?

   ☐ Buttressing ☐ Water marks ☐ Mud cracks

   ☐ Debris line ☐ Other (describe below)

7. If known, what is the source of the water in the wetland?

   ☐ Steam/River/Creek/Lake/Pond ☐ Groundwater

   ☐ Flooding ☐ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☐ yes ☐ no. If yes, please describe.

9. Is there a discharge from the wetland? ☐ yes ☐ no. If yes, to what waterbody is discharge released?

☐ Surface Stream/River ☐ Groundwater ☐ Lake/Pond ☐ Marine

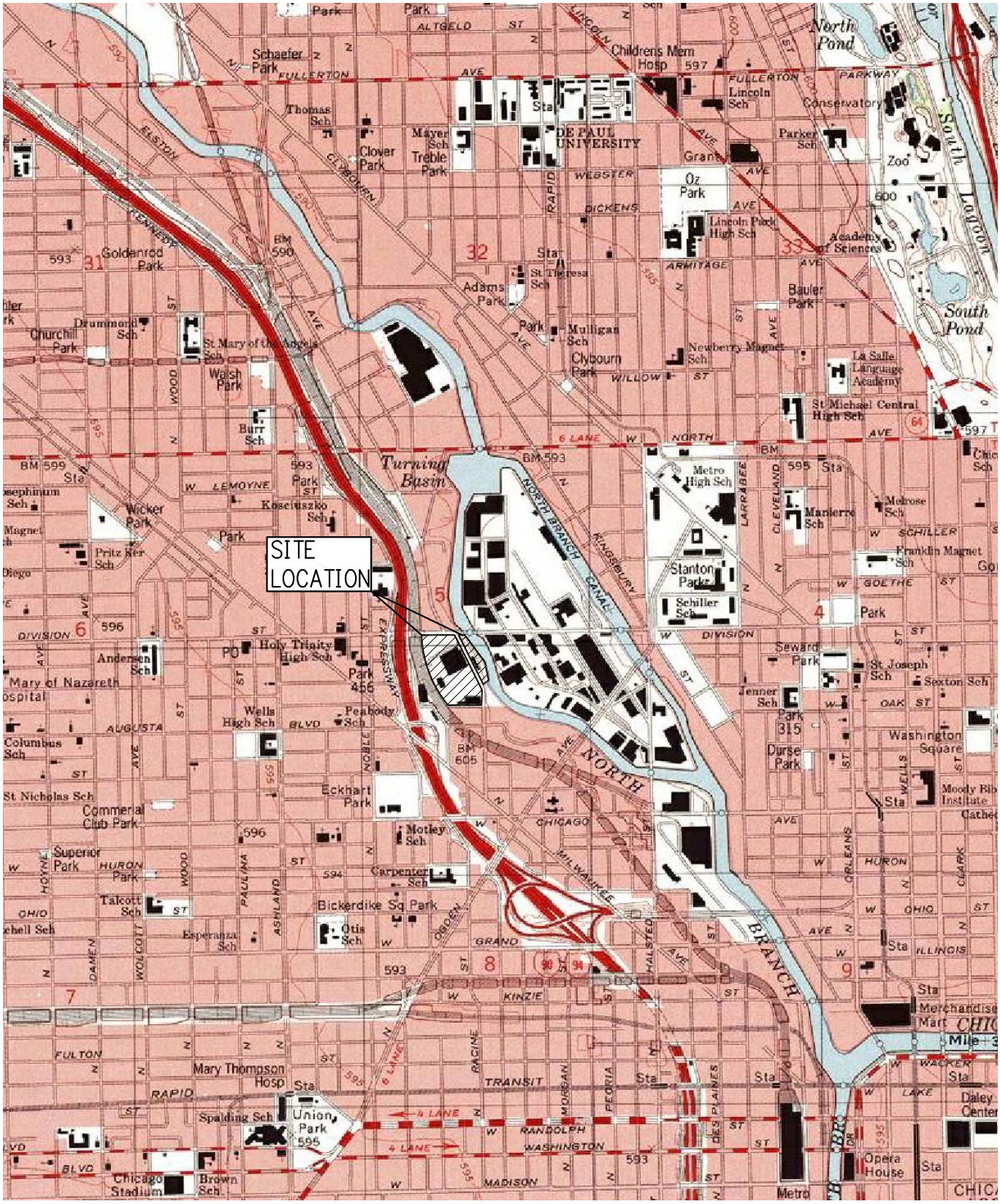
10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) _____

Water content (dry, wet, saturated/unsaturated) _____

11. Mark the observed wetland area(s) ion the attached site map.

N:\Jobs\forms\wprocess\48_Master checklist eco assess.doc



NORTH

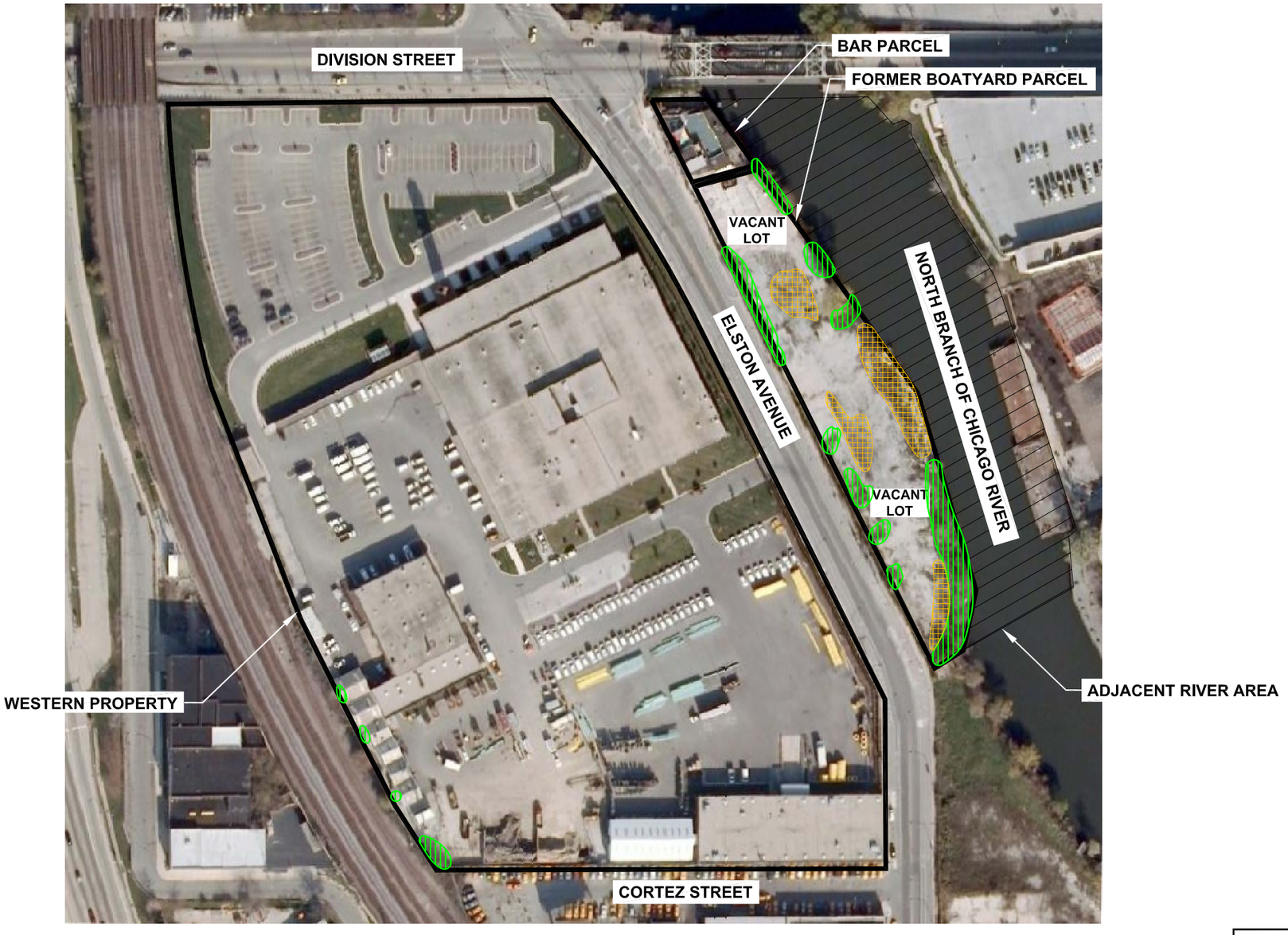
0 2000' 4000'

APPROXIMATE SCALE IN FEET

Burns & McDonnell
SINCE 1898

Figure 1
SITE LOCATION MAP
PEOPLES GAS DIVISION STREET STATION OU
CHECKLIST FOR
ECOLOGICAL ASSESSMENT
CHICAGO, ILLINOIS

I:\PEOPLES GAS\DIVISION BOAT YARD - 44217\MISC\ECOLOGICAL RISK SITE VISIT\FIGURES\SITE LOCATION



LEGEND

- SHRUB/SCRUB AREA
- WOODED AREAS
- AQUATIC HABITAT

N

0 150' 300'

SCALE IN FEET

Burns & McDonnell SINCE 1898

Figure 2
HABITAT LOCATION MAP
PEOPLES GAS DIVISION STREET STATION OU
CHECKLIST FOR
ECOLOGICAL ASSESSMENT
CHICAGO, ILLINOIS

I:\PEOPLES GAS\DIVISION BOAT YARD - 44217\MISC\ECOLOGICAL RISK SITE VISIT\FIGURES\HABITAT_MAP

Photograph 1: Facing East. Parking Area on north end of Western Property.

Photograph 2: Facing west. Parking lot on north side of Peoples Gas Facility.

Photograph 3: Facing northwest. View of Peoples Gas storage yard.

Photograph 4: Facing north. Inactive bar and grill adjacent to Chicago River.

Photograph 5: Facing north. Division Street Bridge and retaining wall.

Photograph 6: Facing southwest from Division Street Bridge; view of northern half of Eastern Property and Chicago River bank.

Photograph 7: Facing southwest from Division Street Bridge; view of Boatyard parcel.

Photograph 8: Facing north from south end of site at MWRD sewer tunnel grate; view of open field and shrub/scrub areas.

Photograph 9: Facing south. Gravel ground cover, open field area, and patchy vegetation.

Photograph 10: Facing south. View of under story in wooded riparian area on river bank. Unknown pipes, presumably for surface water drainage, present along bank approximately 8-feet above water surface.

Photograph 11: Facing east; looking down at erosion rills in gravel on Chicago River Bank.

Photograph 12: Facing northeast. River bank; wild grape and other vegetation covered the bank slopes.

Photograph 13: Facing north across vacant boatyard property toward inactive bar and grill; note gravel ground cover and invasive weedy vegetation.

Photograph 14: Facing east. Adjacent property on east side of Chicago River, south of the Division Street Bridge.

Photograph 15: Facing north. Chicago River upstream of site on the north side of Division Street Bridge.

Photograph 16: Facing east. River banks with sheet pile walls north of Bridge.

Attachment 1c

North Station

CHECKLIST FOR ECOLOGICAL ASSESSMENT/SAMPLING

I. SITE DESCRIPTION

1. Site Name: Former North Station Manufactured Gas Plant (MGP) Site Operable Unit (OU)

   Location: Section 4, Township 39 North, Range 14 East

   County: Cook City: Chicago State: Illinois

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? Approximately 9 acres

4. Is this the first site visit? ✓ yes ☐ no. If no, attach trip report of previous site visit(s), if available.

   Date(s) of previous site visit(s): _____

5. Please attach to the checklist USGS topographic map(s) of the site, if available.

   Not provided.

6. Are aerial or other site photographs available? ✓ yes ☐ no. If yes, please attach any available photo(s) to the site map at the conclusion of this section.

   See attached photograph log sheets.

7. The land use on the site is:

0	% Urban
0	% Rural
0	% Residential
100	% Industrial (☐ light ✓heavy)
0	% Agricultural
(*Crops*: _____)	
0	% Recreational
(Describe; note if it is a park, etc.)	
0	% Undisturbed
0	% Other (vacant / abandoned)

The area surrounding the site is: 0.2 mile radius

0	% Urban
0	% Rural
50	% Residential
50	% Industrial (☐ light ✓ heavy)
0	% Agricultural
(*Crops*: None)	
0	% Recreational
(Describe; note if it is a park, etc.)	
0	% Undisturbed
0	% Other

8. Has any movement of soil taken place at the site? ✓ yes ☐ no. If yes, please identify the most likely cause of this disturbance:

_____ Agricultural Use X_____ Heavy Equipment _____ Mining

_____ Natural Events _____ Erosion X_____ Other

Please describe: Site was historically filled and is covered with gravel over most of the surface. Land use is industrial in nature and includes an electrical substation, equipment storage, and parking areas.

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

No sensitive areas exist on the site or adjacent to the site. The site is located in an urban area of the City of Chicago adjacent to the Chicago River.

Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

General observation made on July 19, 2011.

10. What type of facility is located at the site?

☐ Chemical ☐ Manufacturing ☐ Mixing ☐ Waste disposal

✓ Other (specify) Vacant land, substation, outdoor storage area for construction equipment.

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

Chemical constituents of potential concern (COPCs) at the site include benzene, polynuclear aromatic hydrocarbons (PAHs), and selected metals detected in soil, sediment, and groundwater samples. Refer to the details provided in the SSWP.

12. Check any potential routes of off-site migration of contaminants observed at the site:

☐ Swales ☐ Depressions ☐ Drainage ditches

☐ Runoff ☐ Windblown particulates ☐ Vehicular traffic

✓ Other (specify) No potential routes of offsite migration observed on site.

13. If known, what is the approximate depth to the water table? 3–15 ft below ground surface (bgs)

14. Is the direction of surface runoff apparent from site observations? ☐ yes ✓ no. If yes, to which of the following does the surface runoff discharge: Indicate all that apply.

☐ Surface water ☐ Groundwater ☐ Sewer ☐ Collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ✓ yes ☐ no.

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist - Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist - Flowing Systems.

✓ yes (Chicago River located on site) ☐ no

17. Is there evidence of flooding? ☐ yes ✓ no. *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. (Use a blank sheet if additional space is needed for text.)

Site is completely developed with no natural areas of vegetation present onsite.

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☐ yes ✓ no. *If yes, you are required to verify this information with the U.S. Fish and Wildlife Service.* If species' identities are known, please list them next.

Site is completely developed with no natural areas that could provide habitat for threatened and/or endangered species.

20. Record weather conditions at the time this checklist was prepared:

DATE: 7/19/2011

90°F Temperature (°C/°F) 85 °F Normal daily high temperature

Light and variable 0–5 mph Wind (direction/speed) None Precipitation (rain, snow)

Mostly sunny Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

On July 19, 2011, an Exponent environmental biologist conducted a habitat assessment on the active urban upland portion of the OU during a site visit to the OU. Observations were made from properties for which there was access on the day of the site visit including the Kingsbury Street Parcel and public right-of-ways. There was very limited ecological habitat on or adjacent to the upland area of the OU because of the extensive urban development. The upland portion of the site is composed of parcels that are developed and the ground surface is primarily covered with gravel with limited vegetation other than some weed species and trees growing in isolated patches along fence lines. The majority of the OU is composed of an electrical substation, and other parcels used to store construction equipment. No terrestrial ecological receptors were observed onsite during the visit.

A complete habitat assessment of the river portion of the OU could not be completed during this initial visit because of access restrictions to the river. However, during the site reconnaissance, the general condition of the river and riverbank was observed and initial observations of ecological receptors using the river were made. The river along the OU is constrained by vertical walls or steep rocky banks and there is very limited vegetation in the riparian zone. The vegetation present on the banks is limited to isolated clumps of deciduous trees or weed species along the Division Halsted Parcel (refer to attached pictures). Waterfowl (mallard ducks and Canada geese) were observed in the Chicago River, but no other aquatic ecological receptors were observed in the river on the day of the reconnaissance. There is limited nesting habitat for birds on the site or adjacent properties because of the limited vegetation present. The North Branch of the Chicago River is generally 4–8 ft deep as reported in the Completion Report (NRT 2011). However, in the area of the OU, the center channel of the river is very deep (greater than 10 ft deep) based on elevation information collected at three sediment borings provided in Appendix B of the Completion Report. Reconstruction of a bridge was ongoing just upstream of the OU on the day the reconnaissance was performed.

Completed by Michael W. Kierski Affiliation Exponent

Additional Preparers _____

Site Manager_____

Date 7-19-2011

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☐ yes ✓ no. If no, go to Section IIB: Shrub/Scrub.

2. What percentage or area of the site is wooded? (0.0% 0.0 acres). Indicate the wooded area on the site map which is attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.

3. What is the dominant type of vegetation in the wooded area? (Circle one: Evergreen/Deciduous/Mixed) Provide a photograph, if available.

   Dominant plant, if known: ._____

4. What is the predominant size of the trees at the site? Use diameter at breast height.

   ☐ 0-6 in. ☐ 6-12 in. ☐ >12 in.

5. Specify type of understory present, if known. Provide a photograph, if available.

   _____

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐ yes ✓no. If no, go to Section IIC: Open Field.

2. What percentage of the site is covered by scrub/shrub vegetation? (0.0% 0.0 acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.

3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph, if available.

4. What is the approximate average height of the scrub/shrub vegetation?

   ☐ 0-2 ft. ☐ 2-5 ft. ☐ >5 ft.

5. Based on site observations, how dense is the scrub/shrub vegetation?

   ☐ Dense ☐ Patchy ☐ Sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☐ yes ✓ no. If yes, please indicate the type below:

   ☐ Prairie/plains ☐ Savannah ☐ Old field ☐ Other (specify) _____

2. What percentage of the site is open field? (0.0 % 0.0 acres). Indicate the open field on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.

4. What is the approximate average height of the dominant plant? _____

5. Describe the vegetation cover: ☐ Dense ☐ Sparse ☐ Patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site, other than woods, scrub/shrub, and open field?
   ☐ yes ✓ no. If yes, identify and describe them below.

   The site does not contain terrestrial habitat as the parcels have been completely covered by gravel, buildings, and/or concrete structures.

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.

3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.?

4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

III. AQUATIC HABITAT CHECKLIST – NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site? Not applicable

   ☐ Natural (pond, lake)

   ☐ Artificially created (lagoon, reservoir, canal, impoundment)

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?

   _____

3. If a waterbody is present, what are its known uses (e.g.: recreation, navigation, etc.)?

4. What is the approximate size of the waterbody(ies)? _____acre(s).

5. Is any aquatic vegetation present? ☐ yes ☐ no. If yes, please identify the type of vegetation present is known.

   ☐ Emergent ☐ Submergent ☐ Floating

6. If known, what is the dept of the water? _____

7. What is the general composition of the substrate? Check all that apply.

   ☐ Bedrock ☐ Sand (coarse) ☐ Muck (fine/black)

   ☐ Boulder (> 10 in.) ☐ Silt (fine) ☐ Debris

   ☐ Cobble (2.5–10 in.) ☐ Marl (shells) ☐ Detritus

   ☐ Gravel (0.1–2.5 in.) ☐ Clay (slick) ☐ Concrete

   ☐ Other (specify) _____

8. What is the source of water in the waterbody?

   ☐ River/Stream/Creek ☐ Groundwater ☐ Other (specify)_____

   ☐ Industrial discharge ☐ Surface runoff

9. Is there a discharge from the site to the waterbody? ☐ yes ☐ no. If yes, please describe this discharge and its path.

10. Is there a discharge from the waterbody? ☐ yes ☐ no. If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

☐ River/Steam/Creek	☐ Onsite	☐ Offsite	Distance _____
☐ Groundwater	☐ Onsite	☐ Offsite	
☐ Wetlands	☐ Onsite	☐ Offsite	Distance _____
☐ Impoundment	☐ Onsite	☐ Offsite	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

_____ Area

_____ Depth (average)

_____ Temperature (depth of the water at which the reading was taken) _____

_____ pH

_____ Dissolved oxygen

_____ Salinity

_____ Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth _____, visual)

_____ Other (specify)

12. Describe observed color and area of coloration.

13. Mark the open-water, non-flowing system on the site map attached to his checklist.

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

IV. AQUATIC HABITAT CHECKLIST – FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section 4, Wetland Habitat Checklists.

1. What type(s) of flowing water system(s) is (are) present at the site?

✓ River ☐ Stream ☐ Creek

☐ Dry wash ☐ Arroyo ☐ Brook

☐ Artificially created (ditch, etc.) ☐ Intermittent Stream ☐ Channeling

☐ Other (specify) _____

2. If known, what is the name of the waterbody? North Branch of the Chicago River

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)?

✓ yes ☐ no. If yes, please describe indicators that were observed.

The river is constrained by vertical walls and steep rock lined banks. The river has been dramatically altered from its normal course and flow regime.

4. What is the general composition of the substrate? Check all that apply. No observations made.

☐ Bedrock ☐ Sand (coarse) ☐ Muck (fine/black)

☐ Boulder (> 10 in.) ☐ Silt (fine) ☐ Debris

☐ Cobble (2.5–10 in.) ☐ Marl (shells) ☐ Detritus

☐ Gravel (0.1–2.5 in.) ☐ Clay (slick) ☐ Concrete

☐ Other (specify) _____.

5. What is the condition of the bank (e.g., height, slope, extent of vegetation cover)?

The banks are steep and covered with rock rip rap or have vertical sheet pile walls.

6. Is the system influenced by tides? ☐ yes ✓no. What information was used to make this determination?

7. Is the flow intermittent? ☐ yes ✓ no. If yes, please note the information that was used in making this determination.

8. Is there a discharge from the site to the waterbody? ✓ yes ☐ no. If yes, please describe the discharge and its path.

Mainly sheet flow from the gravel storage yard adjacent to the river. The majority of the surface water flow is captured by combined storm/sanitary sewer systems that convey the water to the deep tunnel.

9. Is there a discharge from the waterbody? ✓ yes ☐ no. If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on-site or off-site.

There is no nearby discharge point for the Chicago River. The river flows towards the Illinois River.

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected, provide the measurement and the units of measure in the appropriate space below:

No measurements were taken during the site visit. Measurements of the river and water quality will be collected during the Remedial Investigation.

_____ Width (ft)

_____ Depth (ft)

_____ Velocity (specify units): _____

_____ Temperature (depth of the water at which the reading was taken _____)

_____ pH

_____ Dissolved oxygen

_____ Salinity

_____ Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth _____)

_____ Other (specify) _____

11. Describe observed color and area of coloration.

12. Is any aquatic vegetation present? ☐ yes ✓ no. If yes, please identify the type of vegetation present, if known.

☐ Emergent ☐ Submergent ☐ Floating

13. Mark the flowing water system on the attached site map.

14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site?

   ☐ yes ✓ no - based on field observations.

   Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

2. Based on the location of the site (e.g., along a waterbody, in a floodplain) and site conditions (e.g., standing water, dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? ☐ yes ✓ no. If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

   ☐ Submergent ☐ Emergent

   ☐ Scrub/Shrub ☐ Wooded

   ☐ Other (specify) _____

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

5. Is standing water present? ☐ yes ☐ no. If yes, is this water: ☐ fresh ☐ brackish. What is the approximate area of the water (sq. ft.) _____. Please complete questions 4, 11, 12 in Checklist III – Aquatic Habitat – Non-Flowing Systems.

6. Is there evidence of flooding at the site? What observations were noted?

   ☐ Buttressing ☐ Water marks ☐ Mud cracks

   ☐ Debris line ☐ Other (describe below)

7. If known, what is the source of the water in the wetland?

   ☐ Steam/River/Creek/Lake/Pond ☐ Groundwater

   ☐ Flooding ☐ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☐ yes ☐ no. If yes, please describe.

9. Is there a discharge from the wetland? ☐ yes ☐ no. If yes, to what waterbody is discharge released?

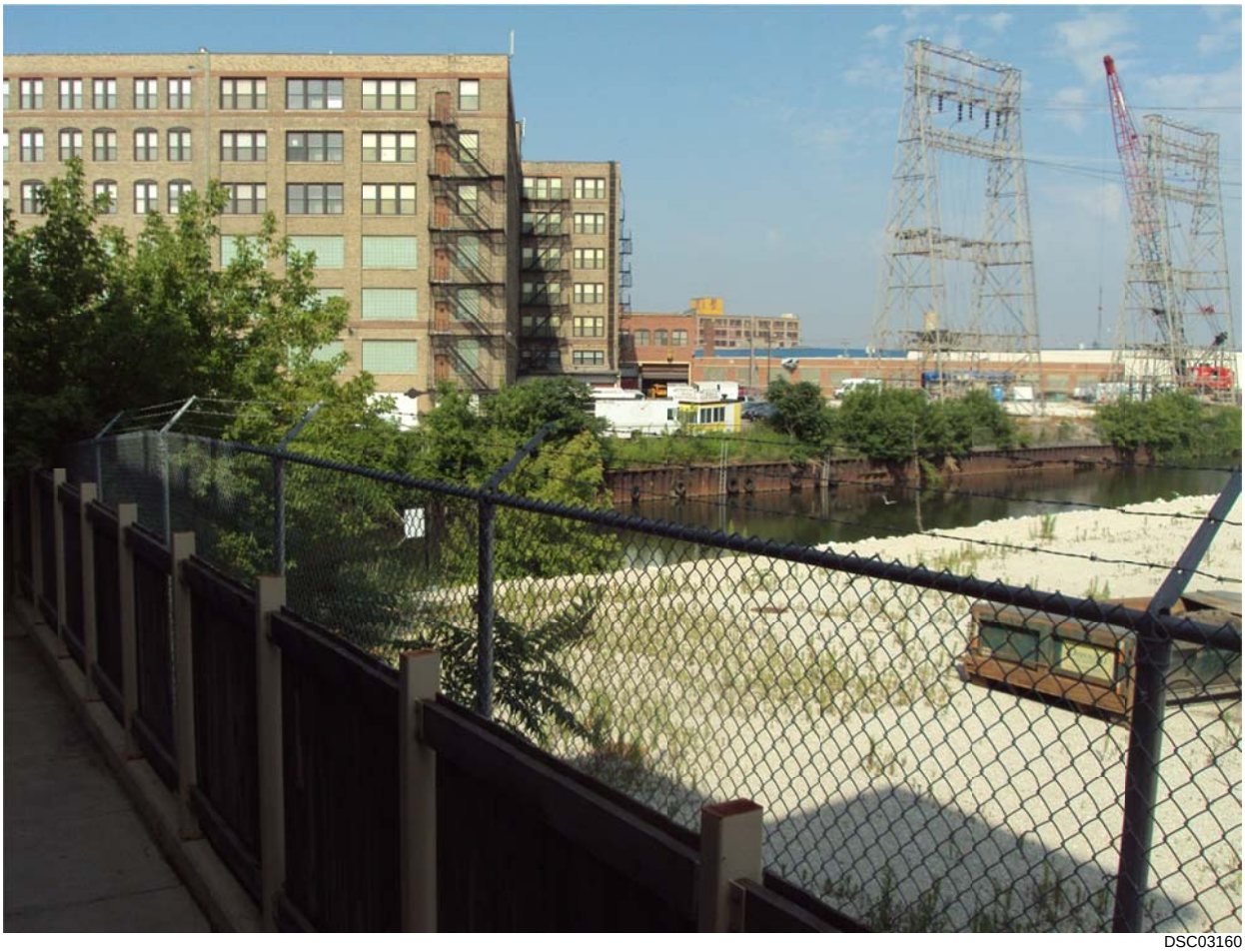
   ☐ Surface Stream/River ☐ Groundwater ☐ Lake/Pond ☐ Marine

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

    Color (blue/gray, brown, black, mottled) _____
    Water content (dry, wet, saturated/unsaturated) _____

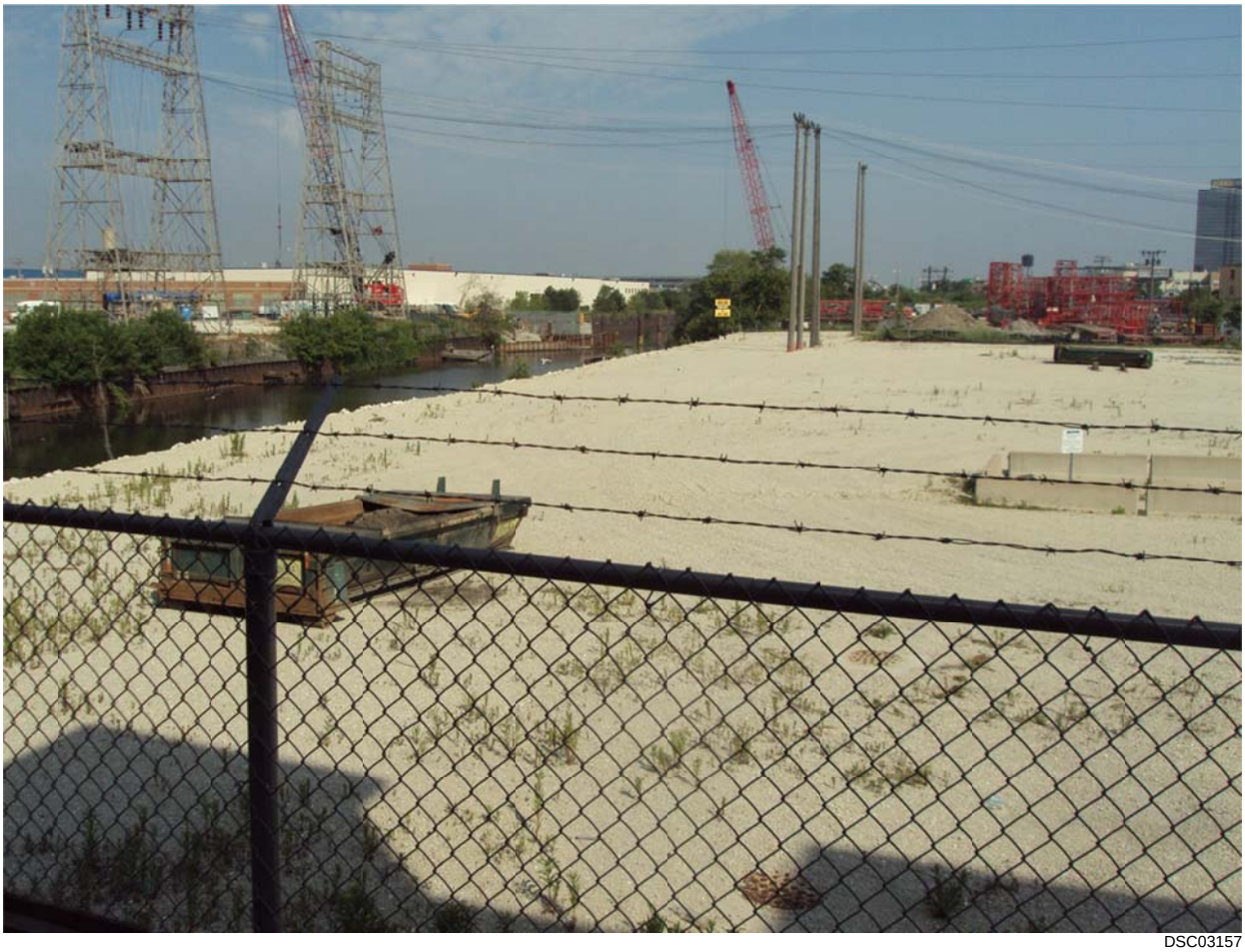
11. Mark the observed wetland area(s) ion the attached site map.

Former North Station Manufactured Gas Plant Site
Site Visit Photographs
July 19, 2011



DSC03160

Photograph 1. Looking west from the neighboring residential property across the south end of the North Station OU to the neighboring commercial property across the North Branch of the Chicago River.



DSC03157

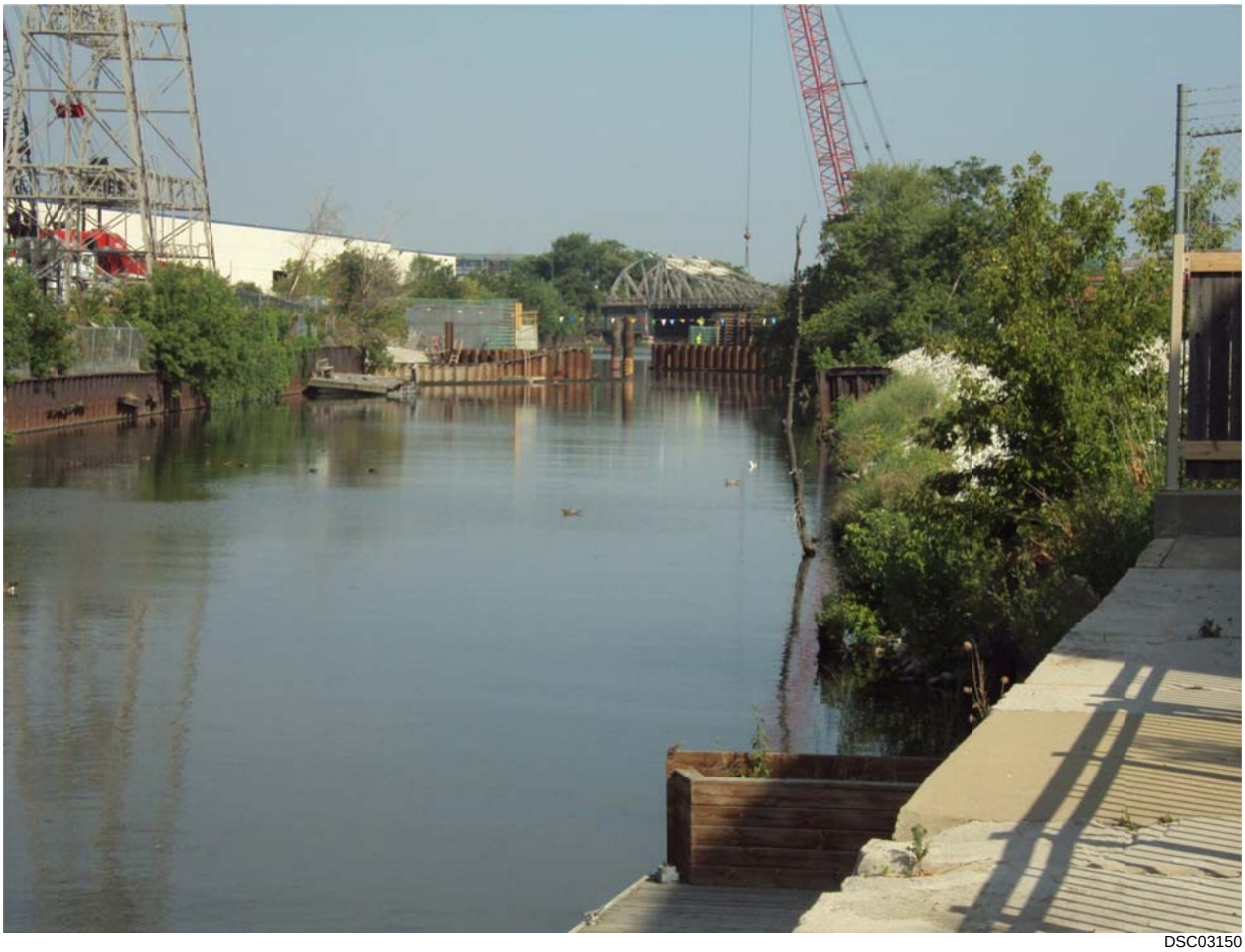
Photograph 2. Looking northwest from the neighboring residential property across the North Station OU. The LaSalle Chestnut parcels are those covered in gravel. The Division Halsted Parcel is used to store construction equipment.

DSC03158

Photograph 3. Looking north from the neighboring residential property across the North Station OU. The Kingsbury parcel is gravel covered and used to park cars. The ComEd Parcel is an electrical substation.

DSC03156

Photograph 4. Looking upstream along the North Branch of the Chicago River toward the North Station OU from the dockwall located at the adjacent residential property.



DSC03150

Photograph 5. Looking upstream along the North Branch of the Chicago River toward the North Station OU from the dockwall located at the adjacent residential property.

DSC03155

Photograph 6. Looking downstream along the North Branch of the Chicago River at the boat dock located at the residential property adjacent to the North Station OU.

Attachment 2

North Branch of the Chicago River Construction Worker Exposure Assumptions and Resultant RSLs (Located on CD)

Attachment 3

Surface and All Sediment UCL Analysis (Located on CD)

Attachment 3a1 – Willow Street – Surface Sediment
Attachment 3a2 – Willow Street – All Sediment
Attachment 3b1 – Division Street – Surface Sediment
Attachment 3b2 – Division Street – All Sediment
Attachment 3c1 – North Station – Surface Sediment
Attachment 3c2 – North Station – All Sediment

Attachment 4

Hardness Adjustment of Surface Water Quality Criteria (Located on CD)

Attachment 5

Ambient UTL for Toluene
(Located on CD)

Attachment 6

SUM-TU BTEX Calculations for Sediment Samples (Located on CD)