

5 FATE AND TRANSPORT

This section discusses the potential routes of migration and a summary of the overall understanding of site media.

5.1 Baseline Risk Assessment

Exponent prepared a baseline risk assessment (BLRA) using the 2007 RI data and the previously collected soil data. The BLRA is included in Appendix H.

Potential risk from site media were evaluated using the following analytical data sets:

- Groundwater: Data collected between 2007 and 2011.
- Soil: Previously collected soil data, 1998 remedial action data, and the 2007 soil analytical results.
- Sediment: 2007 RI data for the Wisconsin River and Pfiffner Pioneer Park pond.
- Surface water: 2007 RI data for the Wisconsin River and Pfiffner Pioneer Park pond.
- Soil Vapor: Data collected in January and March 2011.

The BLRA was prepared in accordance with the Multi-Site Risk Assessment Framework (RAF) (Exponent, September 2007) and the USEPA-suggested revised sediment hierarchy (provided in USEPA's RAF comments dated December 20, 2007). The BLRA focused on the media and receptors of concern identified in the SSWP (NRT, April 2007) which are also discussed in Appendix H. Screening levels, based on USEPA guidance documents, were used to identify media that presented a potential unacceptable risk to human health and/or ecological receptors present, or reasonably anticipated in a future land use, at the site.

5.2 Refined CSM

The refined CSM was developed using the previously collected soil and groundwater data and the 2007 soil, groundwater, sediment and surface water data and observations. As described in the Multi-Site CSM (September 2007), the CSM is refined as data are generated. The post-RI or refined CSM is included in the baseline risk assessment, Appendix H.

As described in the baseline risk assessment, screening levels for construction workers and recreational use do not exist and were qualitatively based on an unrestricted use and unlimited access (residential land use) exposure scenario.

5.3 Media of Concern

This section incorporates the previously collected data and the 2007 RI data to assess the media that required further assessment and/or were not fully addressed by previous work with respect to public health, welfare or the environment (described in the SSWP (NRT, April 2007) and Completion Report (NRT, June 2006). Results of the BLRA results are highlighted within the discussion.

5.3.1 Soil

5.3.1.1 Surface Soil

Clean surface soil was placed on the WPSC property, extending into Pfiffner Pioneer Park as part of the 1998 remedial action. Additional surface soil sampling was performed in 2007 in portions of Pfiffner Pioneer Park and the parking lot located over the former slough (Section 3.3 and 4.1) to assess the soil quality adjacent to these areas for use in the human health risk assessment.

Surface soil was evaluated using an unrestricted use and unlimited access (represented by the residential exposure) and industrial/commercial land use scenario because standards do not exist for the recreational (current land use) or potential outdoor worker scenarios. The BLRA indicates surface soil at the site is not expected to pose a human health concern under the current land use and is at the low end (i.e., less than 1×10^{-6}) of USEPA's generally acceptable target risk range (1×10^{-4} to 1×10^{-6}) for unrestricted use and unlimited access.

5.3.1.2 Subsurface Soil

Residual concentrations of MGP-residuals were known to be present within the WPSC property, as documented in the remedial action report (NRT, September 1998). Additional subsurface soil sampling was completed in the vicinity of Pfiffner Pioneer Park pond, near the outlet of the former slough and in the parking lot located over the former slough.

Consistent with the previously collected data, borings advanced in the former slough contain isolated and sporadic occurrences of trace tar within the silt layer of the former slough. The silt layer appears to be thicker near the sheet pile wall and slopes to the east, away from the river (Sheet 1). Non-flowable, trace MGP residual was observed in borings at approximately 10-15 feet bgs (Figure 11). Concentrations of

PAHs are elevated throughout the former slough (Figures 9 and 10). These observations, along with the existing physical barrier, suggest the former slough is unlikely a contributing source of contamination to the Wisconsin River sediment.

Soil samples collected at 18 to 20 feet, which is below the base of the former slough (approximately 10-15 feet) indicate the underlying soils sampled are not impacted. Also, dissolved phase MGP residuals would be expected to follow the groundwater gradient to the east, away from river. Monitoring wells immediately downgradient (east) of the sheet pile wall, where trace tar has been observed in the former slough borings, do not indicate the presence of dissolved phase constituents. The groundwater monitoring well network also provides data that indicates the subsoils within the former slough are not a significant source of contamination to the groundwater in the vicinity of the pond.

There are no current human health exposures to subsurface soils. However, depending on the future land use, human health risks may exist due to subsurface soil concentrations. The residential scenario was used to evaluate potential risks to recreational users and the outdoor worker scenario was used to evaluate the construction worker scenario. These are both conservative approaches. Figures 39 and 40 summarize the subsurface soil locations with soil samples reported above the residential and outdoor worker scenarios, respectively, generally related to PAH concentrations and lower end risks associated with benzene. These locations are generally in the vicinity of the former remedial action excavations (Appendix A) or the former slough alignment.

5.3.2 Groundwater

A plume containing organic compounds, as indicated by benzene and naphthalene concentrations, has been delineated extending from the western edge of the former MGP site eastward toward the former Center Point Mall building, which is approximately 350 feet east of the former MGP property boundary (Figures 30 and 31). Both the groundwater flow interpretation and the estimated plume extent are similar to results of previous interpretations. As indicated, the plume for March 2011 is limited to the area around piezometer PZ-12B.

Based on the screening level evaluation, performed in the BLRA, groundwater concentrations would pose a risk to human receptors, if the water were to be used for drinking water. There are no current human health risks because the nearest groundwater well is over 2.5 miles from the site. There are also no groundwater withdrawal points within the defined extent of the plume or in downgradient areas.

MNA indicator parameters generally suggest biodegradation is actively occurring within the plume. Groundwater data also suggest the regional groundwater flow system dominates in the general vicinity of the former Center Point Mall and limits the overall extent of contaminated groundwater migrating from the former MGP site.

5.3.3 Sediment

5.3.3.1 *Wisconsin River Sediment*

Soft sediment deposits within the Wisconsin River consist of thin layers of silt/clay ranging from not present to five inches (near the mouth of the former slough). In general, the soft sediment thickness is sporadic, typically one to two inches. From velocity estimates discussed earlier, this section of the Wisconsin River is neither depositional nor erosional (Section 4.3.1.2). Underlying the soft sediment is sand/gravel river bottom material.

MGP-residuals (viscous/sticky tar) were visually observed at the mouth of the former slough in boring location T3-A1 at a depth of 1.5 to 4.5 feet, in the vicinity of previously observed elevated concentrations (T203A). MGP-residuals were not observed in adjacent boring locations.

Elevated concentrations of PAHs and PVOCs correspond with this interval and are generally co-located. Affected sediment is located near-shore, at the mouth of the former slough (Figure 41). The area of affected sediments is consistent with 2000 sediment investigation results (Appendix A).

The presence of PAHs and PVOCs in river bottom samples does not suggest continued source material, particularly from sporadic observations of MGP-residuals in the former slough, based on the following observations:

- The base of the former slough (Sheet 1), east of the sheet pile wall, is sloped to the east, with an undulating surface and discontinuous presence of MGP-residuals (i.e., non-flowable tar).
- Tar was not observed in borings advanced for PZ-16B and OW-16, immediately adjacent to the Pfiffner Pioneer Park pond and in the vicinity of the Wisconsin River boring (T3-A1) that contained viscous/sticky tar.
- The presence of MGP-residuals at T3-A1 can be attributed to historic inputs from the former slough.
- The occurrence of MGP residuals below the surficial layer in underlying sands and gravels (a more protected/unweathered environment) rather than soft sediments may also explain why the MGP residuals remain.

The BLRA evaluated Wisconsin River sediments for recreational human health users and benthic invertebrates. The risk to human health receptors is expected to be minimal, based on the limited spatial extent of locations with detected MGP-residuals, particularly in wadable areas. Figure 41 provides the zones of exposure based on benthic invertebrates exposed to PAH concentrations and other co-located analytes.

5.3.3.2 Pfiffner Pioneer Park Pond Sediment

Soft sediment deposits within the Pfiffner Pioneer Park pond consist of thicker layers, at least 30 inches, of black sandy sedimentary peat with some silt/clay. Unlike the river sediment, pond sediment contains significant percentages of total organic carbon that may sequester PAHs, making them less bioavailable to benthic organisms.

Visual evidence of MGP-residuals was not observed in the pond. Concentrations of PAHs and lead were generally elevated and to a lesser extent, xylenes. These analytes are consistent with the 2000 sediment investigation.

The BLRA evaluated pond sediments for recreational human health users and benthic invertebrates. The risk to human health receptors was evaluated in a semi-quantitative manner using the residential soil screening risk-based concentrations to evaluate occasional recreational use exposures. This assessment indicates the pond sediment would not pose an unacceptable risk to occasional recreational users.

The pond sediments are likely to cause toxicity to sensitive benthic invertebrates, primarily as a result of exposure to PAHs. Figure 41 provides the zones of exposure based on benthic invertebrates exposed to PAH concentrations and other co-located analytes.

5.3.4 Storm Water and Surface Water

The storm water quality data was similar to previous investigation data and the elevation monitoring confirmed the potential for occasional discharge of Site groundwater to the storm sewer system through known perforated sections. Based on data collected during this investigation, the storm sewer does not appear to present a significant pathway of preferential flow that would further influence groundwater quality at downstream locations.

Surface water adjacent to the former MGP within the Wisconsin River and the Pfiffner Pioneer Park had not been previously assessed. Analytical results in the river and the pond are generally low to

non-detectable (Tables 18 and 19). Constituents detected in the pond surface water may be influenced from affected pond sediment. The influence is likely localized to the pond because concentrations of these constituents are an order of magnitude less in the river surface water. Related risk assessment results include:

- The baseline human health risk assessment indicates the concentrations from the surface water in the river and the pond are not expected to pose a health concern.
- The baseline ecological risk assessment indicates the concentrations from the surface water in the river are not expected to pose a risk. Surface water in the pond may potentially affect sensitive water column benthic invertebrates because of benzo(a)anthracene and benzo(a)pyrene concentrations.

Composite surface water samples provide an indication of potential risk to humans and ecological receptors that can move through the entire water column and do not spend the majority of their life cycle in the vicinity of the river sediments, whereas sediment concentrations are a better indicator of potential risk to the benthic community.

5.3.5 Vapor Intrusion

Soil vapor results indicate benzene exceeded the industrial/commercial screening criteria at two locations near a commercial building without a basement. Five sample points exceeded the residential screening criteria at locations in a commercially zoned area of the city. Based on this evaluation and the screening level risk assessment, MGP-related groundwater contamination is not the source of soil vapors above health-based VI screening values east the Site.

6 SUMMARY AND CONCLUSIONS

6.1 Summary

The results of the RI met the objectives of the SSWP (NRT, April 2007) and provide adequate information to assess the nature and extent of affected media to support the BLRA and the FS. The baseline risk assessment, using the previously collected data and the RI data, has identified the following media of concern:

- Subsurface soils: On the WPSC property, in the vicinity of the former slough, and the eastern boundary of Pfiffner Pioneer Park (Figures 39 and 40) to be addressed for the protection of human health.
- Groundwater plume as shown on Figures 30 and 31 to be addressed for the protection of human health.
- Sediment: Near-shore sediment and underlying sand in the Wisconsin River and soft sediment in Pfiffner Pioneer Park Pond (Figure 41) to be evaluated for the protection of benthic communities.

Soil vapor and storm water results indicate the following:

- Soil Vapor: MGP-related groundwater contamination are not the source of vapors above the health-based screening levels in the mall property east of the site.
- Storm Sewer: Groundwater elevations have been documented to exceed the perforated storm sewer elevations on six occasions during this RI. However, based on the groundwater plume this is not a significant migration pathway.

6.2 Conclusions

The FS can proceed without additional assessment. Groundwater sampling will continue on a semi-annual basis (spring and fall of the year) until a Record of Decision (ROD) has been issued for the site.

6.3 Preliminary Remedial Action Objectives

The remedial action objectives (RAOs) have been developed for the media of concern (subsurface soil, groundwater, and sediments) and receptors identified (Section 6.1) in the FS. The FS RAOs were