



AN ALLETE COMPANY

## Former Superior Manufactured Gas Plant Site



Upland DRAFT RAOR Update  
December 7, 2020



# Agenda

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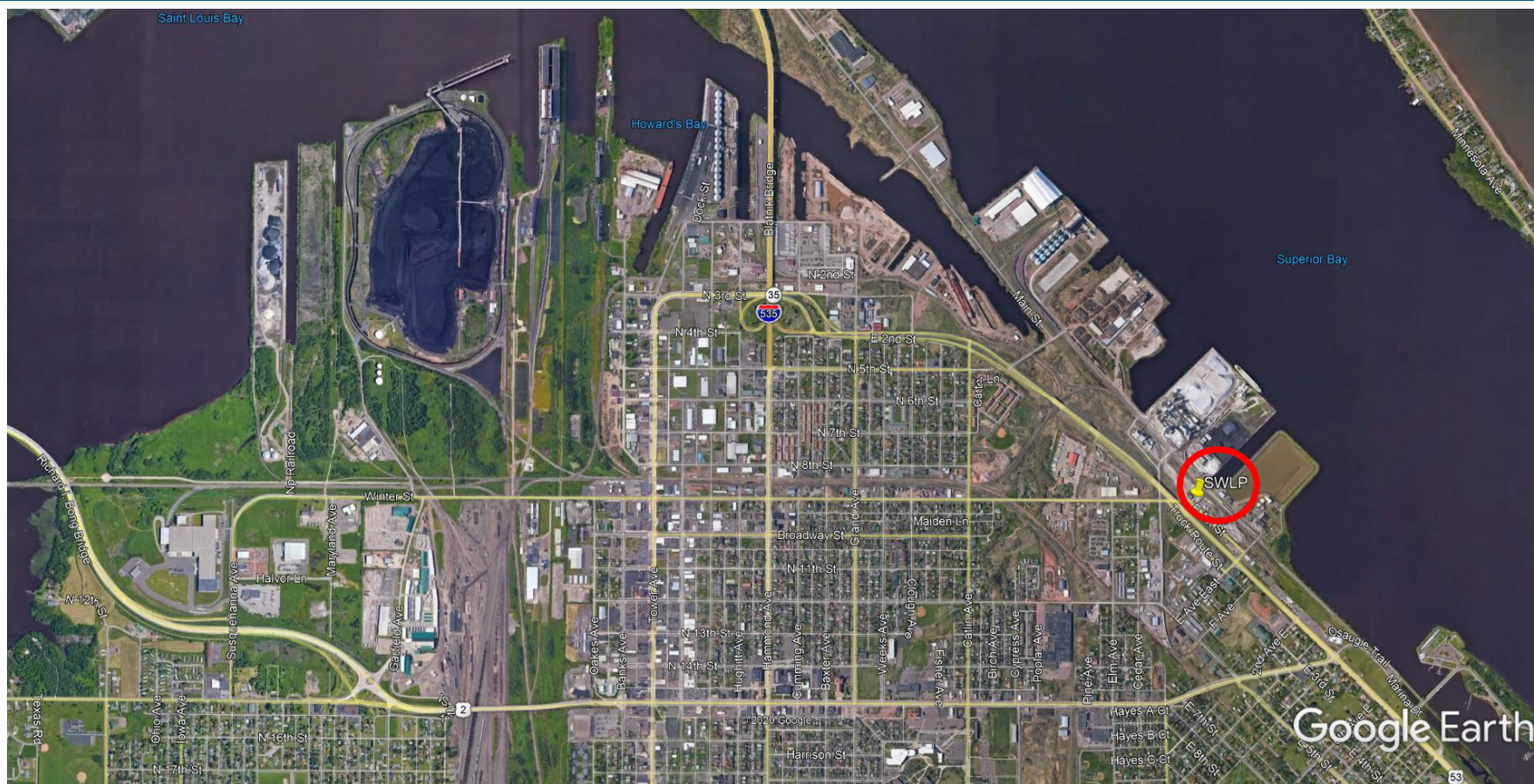
- ◆ Introductions
- ◆ Former MGP Upland Area Site Overview
- ◆ WDNR Comment Themes on Upland RAOR
  - ▶ Remedial Action Objectives (RAOs)
  - ▶ PDI Results
  - ▶ Excavation Remedy
  - ▶ Air-Sparge Remedy
  - ▶ Performance Monitoring
- ◆ Next Steps
- ◆ Schedule

# Round Table Introductions

# Former MGP Upland Area Site Overview



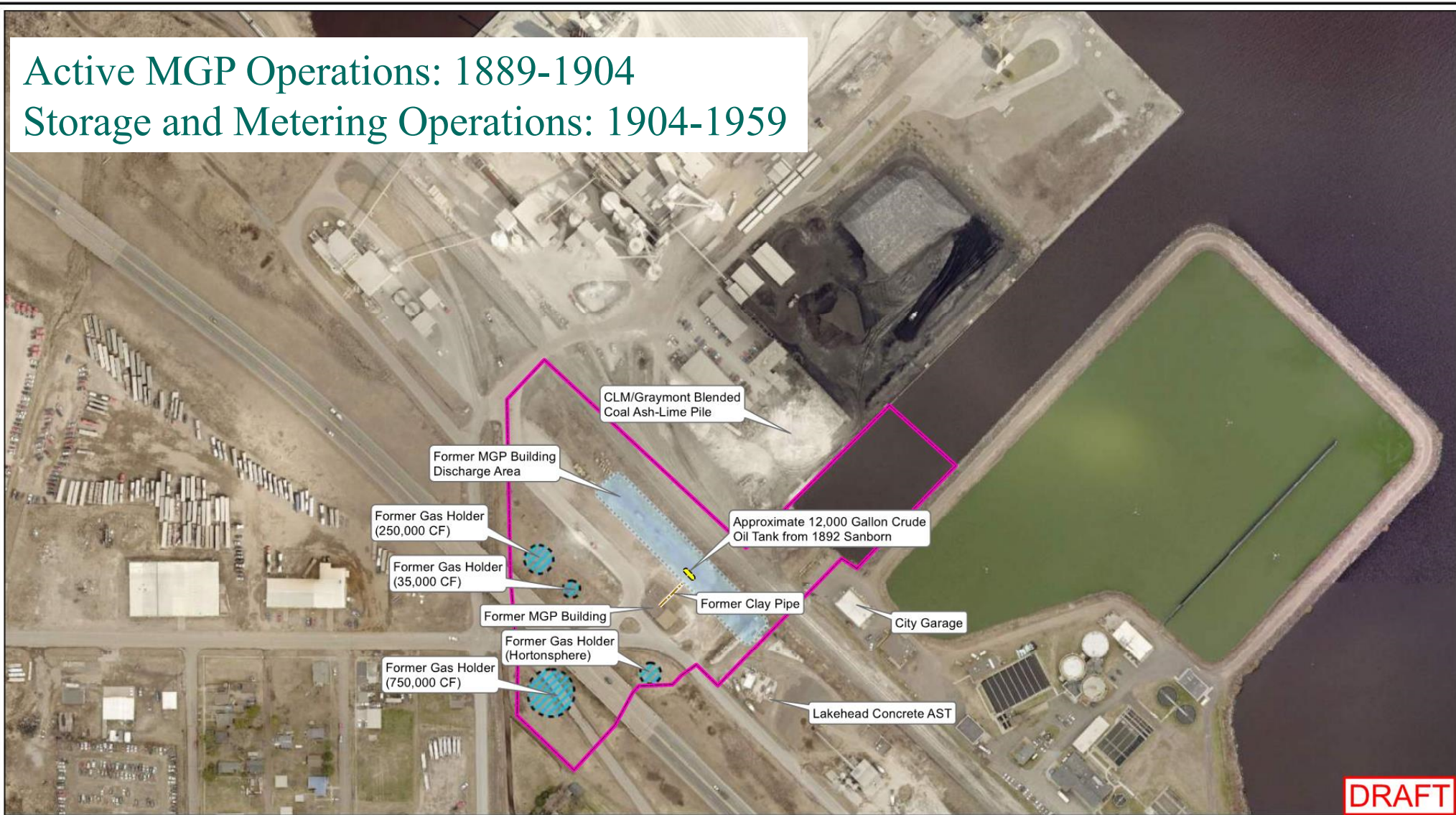
# Former MGP Location





# Active MGP Operations: 1889-1904

## Storage and Metering Operations: 1904-1959



**DRAFT**

- NOTES:**
1. 2016 - 3" resolution air photo from Douglas County.
  2. Horizontal coordinate system: NAD 1983 Douglas County, units in feet.
  3. Pond from Chart of Harbor at Duluth, Minn. and Superior, Wis. / Prepared Under the Direction of Major W.L. Fisk, USACE
  4. Former 12,000 Gallon Crude Oil Tank from 1892 Sanborn.

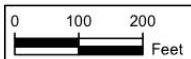
- LEGEND**
- Former 12,000 Gallon Crude Oil Tank
  - Approximate Site Boundary
  - Former Clay Pipe
  - Former MGP Building Discharge Area
  - Former Gas Holders



SUPERIOR WATER, LIGHT & POWER

**FIGURE 2-2**  
 HISTORICAL PLANT LAYOUT  
 REMEDIAL ACTION OPTIONS REPORT  
 SUPERIOR, WISCONSIN

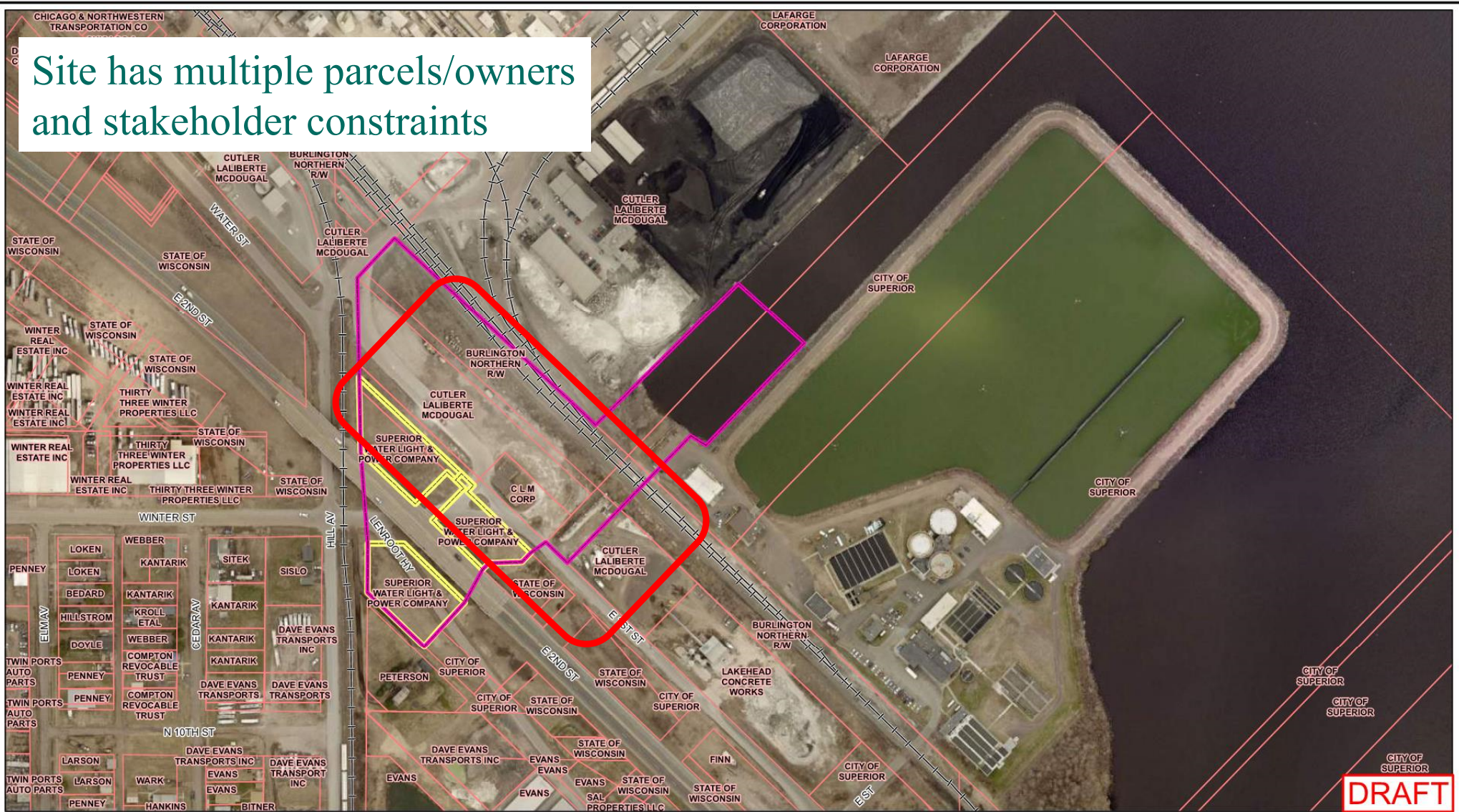
This drawing is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only.



Date: NOVEMBER 2020	Revision Date:
Drawn By: DAT	Checked By: HLH
Project: 18S024	



Site has multiple parcels/owners and stakeholder constraints



- NOTES:**
1. 2016 - 3" resolution air photo from Douglas County.
  2. Horizontal coordinate system: NAD 1983 Douglas County, units in feet.
  3. Parcels supplied by Douglas County GIS.

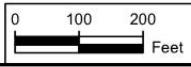
**LEGEND**

- Owned by Superior Water, Light & Power
- Railroad
- Tax Parcel
- Approximate Site Boundary



<b>SUPERIOR WATER, LIGHT &amp; POWER</b>		
<b>FIGURE 2-1</b>		
PROPERTY OWNERSHIP REMEDIAL ACTION OPTIONS REPORT SUPERIOR, WISCONSIN		
Date: NOVEMBER 2020	Revision Date:	
Drawn By: DAT	Checked By: HLH	Project: 18S024

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# Remedial Action Objectives (RAOs)

# RAOR – Remedial Action Objectives

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- ◆ RAO 1: Address industrial direct contact concerns with shallow soils in select areas at the Site.
- ◆ RAO 2: Address subsurface source materials in select areas to reduce contaminant mass to levels that result in a stable or decreasing groundwater plume.
- ◆ RAO 3: Address residual groundwater impacts over time by monitored natural attenuation (MNA) until the plume has stabilized.

**Do we have agreement on RAOs?**

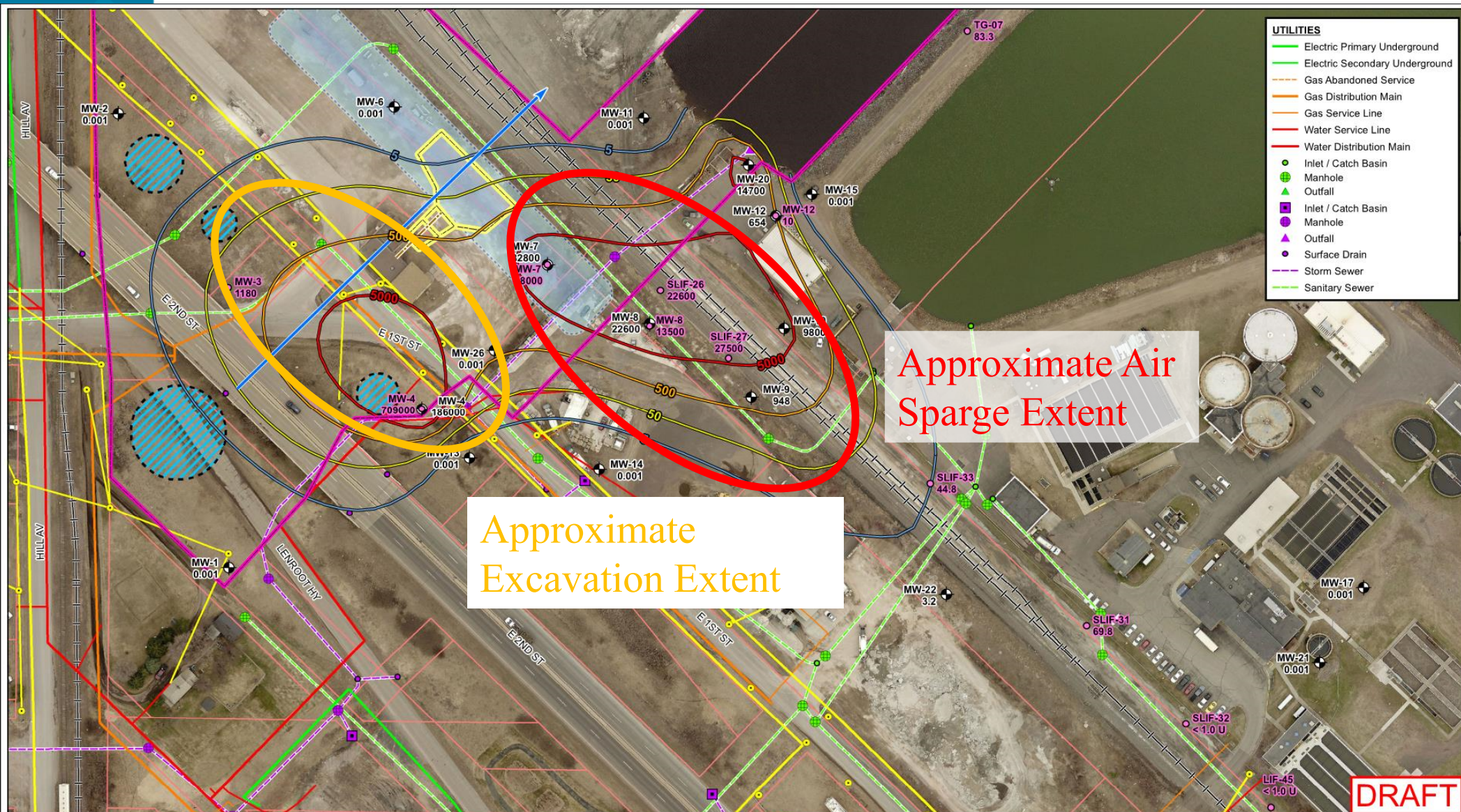
# RAOR – Remedial Action Objectives

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- ◆ **Comment 3:** *The draft RAOR does not evaluate remedial action options for contamination beneath the City of Superior Wastewater Treatment Plant (WWTP) or the BNSF railroad tracks downgradient of the area where active remedial action is proposed in the RAOR. Remedial action options are necessary for all areas of contamination at the site.*
  
- ◆ **Comment 3 Response:**
  - ▶ The WWTP area has isolated soil-GW impact of *de minimis* mass, which is off site and from construction fill activities.
  - ▶ AS/Bio provides better access than excavation beneath BNSF tracks.
  - ▶ Groundwater plume reduction will occur downgradient (e.g. SLIF-31, MW-20) with source removal. Attainment of GW RAO is considered in the Remedial Options.



# Benzene in GW



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# RAOR – Remedial Action Objectives

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- ◆ **Comment 7:** *The RAOR proposes concentrations of 100mg/kg for benzene, naphthalene, and benzo(a)pyrene as clean- up goals for the excavation. The DNR does not understand the basis of the 100mg/kg goal and will evaluate the remedial action using the Wis. Adm. Code ch. NR720 RCLs for both direct contact and the soil to groundwater pathway.*
  
- ◆ **Comment 7 Response:**
  - ▶ To clarify, shallow soils greater than the direct contact RCL will be excavated to remove the direct contact concerns.
  - ▶ In addition, deeper excavation to the 100 mg/kg threshold is the first part of the treatment train; followed by biosparging to further reduce COCs in soil-GW.
  - ▶ The soil-GW pathway will be further addressed by MNA and institutional controls.

# RAOR – Remedial Action Objectives

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- ◆ **Comment 6:** *The DNR is unsure how the proposed remedial action will address soil contamination above the water table and below the proposed excavation for remediation of the direct contact risk. Even if the air sparging reduces the benzene concentration in groundwater, contamination above the water table will continue to act as a source of contamination to groundwater in the future. Following remedial action, confirmation soil samples and ongoing groundwater monitoring, potentially much longer than the 2 years estimated by Foth, will be needed to demonstrate the soil to groundwater contaminant pathway is not complete and any remaining contamination will not pose a threat to groundwater quality.*
- ◆ **Comment 6 Response:** The sparge remedy relies on bioremediation via the introduction of oxygen into the subsurface. Sparging will provide oxygen above and below the water table and will enhance biodegradation of contaminants migrating to groundwater.

# RAOR – Remedial Action Objectives

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- ◆ **Comment 8:** *The DNR believes the timeframes listed in Appendix B for operation and maintenance for remedial options 2, 3, and 5 are unrealistic and may be skewing the results of the analysis of remedial action options. The DNR feels the 2-year estimate for active remedial action using air sparging may be overly optimistic due to concerns expressed in this letter. The DNR also considers the 40 and 80-year monitoring for options 2 and 4 to be unrealistic, based on typical monitoring at other sites in Wisconsin.*
- ◆ **Comment 8 Response:** The timeframes for Options 2 and 4 are based upon the estimated time to reach the groundwater RAO for these remedies due to remaining source mass. Expressing a shorter timeframe would not achieve long-term remedial objectives.

Evaluation conducted with 30 year time frames for Options 2 and 4

# PDI Results



# RAOR – PDI Results

- ◆ **Comment 2:** *The results of the Pre-Design Investigation (PDI) are not fully presented in the RAOR. If, as suggested during our conference call on November 19, 2020, a PDI investigation report is not going to be submitted to the DNR, the RAOR should contain soil boring logs, sampling methodology, discrepancies from the PDI plan, and comparison of the PDI results to the former site investigation activities. Additionally, the RAOR should include interpretation of the results of the PDI and any other site investigation information that is required in Wis. Adm. Code ch. NR716 for documentation of site investigation activities. The results of the PDI and analysis of the results are necessary to evaluate remedial action options for the areas of the site where the PDI was conducted.*
- ◆ **Comment 2 Response:** Section 7 of the approved PDI WP stated data would be incorporated into RAOR as necessary and remainder of data provided in the RD.
  - ▶ PDI data provided in the draft RAOR:
    - ◆ Updated Section 2.1 and 2.3
    - ◆ Updated soil, GW, and geologic cross section figures
    - ◆ Updated Site Model (App A) and Data (App B)
  - ▶ Drafted Boring Logs, Field Notes, and Abandonment Logs in Final RAOR
  - ▶ Summary of work plan deviations
  - ▶ PDI Data are considered in Options Analysis

# RAOR – Remedial Options

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- ◆ **Remedial Option 1** – No Further Remedial Action
- ◆ **Remedial Option 2** – Soil Excavation with Off-site Disposal and Groundwater Monitored Natural Attenuation
- ◆ **Remedial Option 3** – Targeted Soil Excavation with Off-site Disposal, Bio/Air Sparging Soil and Groundwater, and Groundwater Monitored Natural Attenuation
- ◆ **Remedial Option 4** – Targeted Soil Excavation with Off-site Disposal, Activated Carbon Injection for Soil and Groundwater, and Groundwater Monitored Natural Attenuation
- ◆ **Remedial Option 5** – Targeted Soil Excavation with Off-site Disposal, In-situ Chemical Oxidation for Soil and Groundwater, and Groundwater Monitored Natural Attenuation

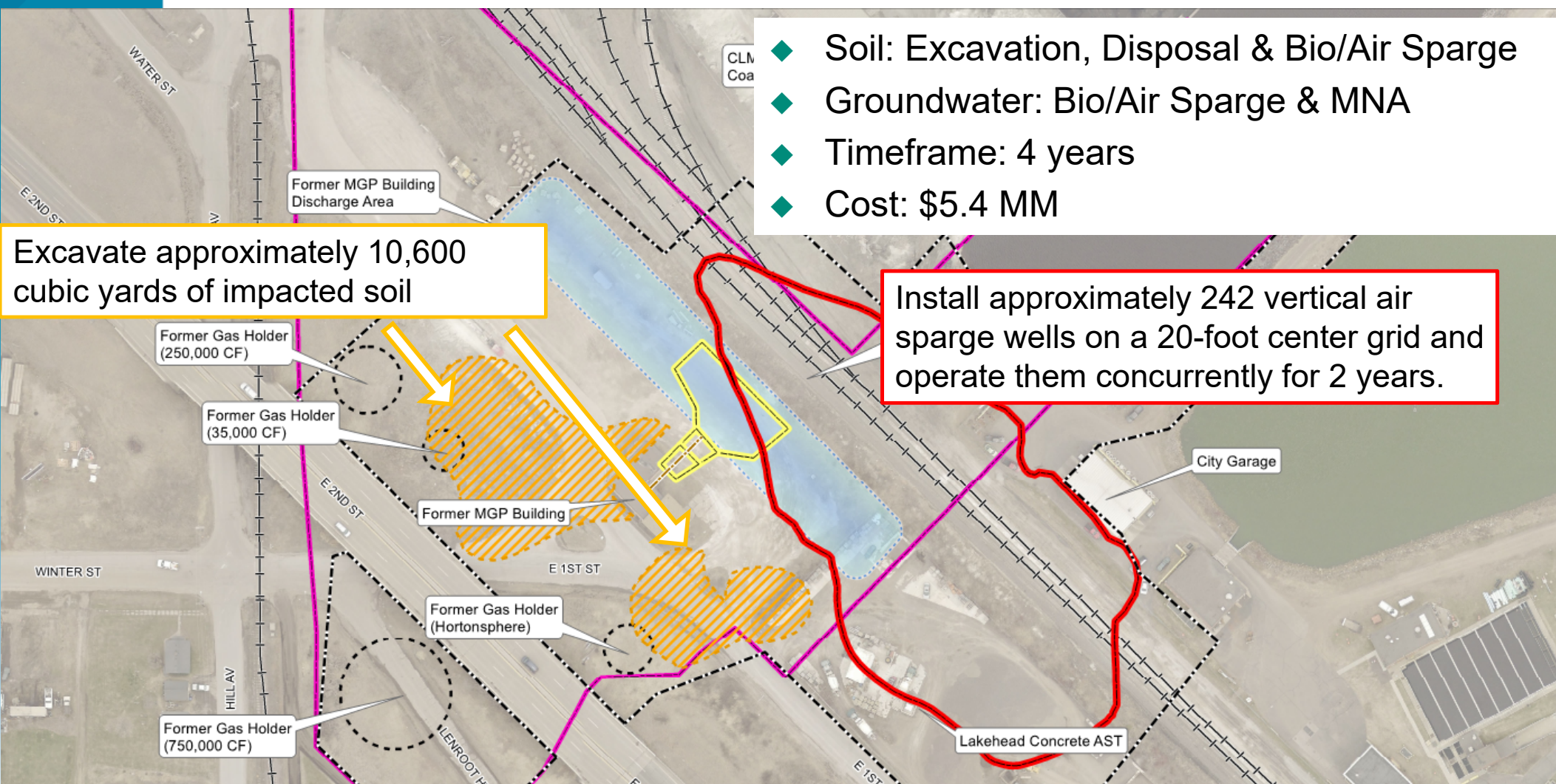


# RAOR – Evaluation Criteria

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- ◆ **Long-term Effectiveness** – Meet RAOs through permanent mass removal of contaminants.
- ◆ **Short-term Effectiveness** – Manage risk to workers and stakeholders during active remedy. Achieve short-term mass reduction.
- ◆ **Implementability** – Evaluate disruptions to stakeholders and site accessibility for construction of options.
- ◆ **Restoration Time Frame** – Time to achieve RAOs and site closure depends on residual contaminant mass at Site.
- ◆ **Cost** – Utility rate-payers will bear remedial cost so cost sensitivity is high.

# RAOR - 2020 Preferred Option 3



# RAOR – Preferred Option 3

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- ◆ Excavation (10,600 cy):
  - ▶ Soils > shallow direct contact RCL – Addresses RAO 1
  - ▶ Targeted excavation to Miller Creek clay near former holders and Hortonsphere to 100 mg/kg– Addresses RAO 2
- ◆ Bio/Air Sparge (~242 vertical wells):
  - ▶ Model estimates 2 yrs – Addresses RAOs 2 and 3
  - ▶ Biodegradation is primary pathway. Physical stripping is secondary pathway.
  - ▶ Covers historic discharge area, “B-31” area, RR corridor – least disruptive of active options.
- ◆ Groundwater Performance Monitoring
  - ▶ Estimated 4 yrs – Addresses RAO 3

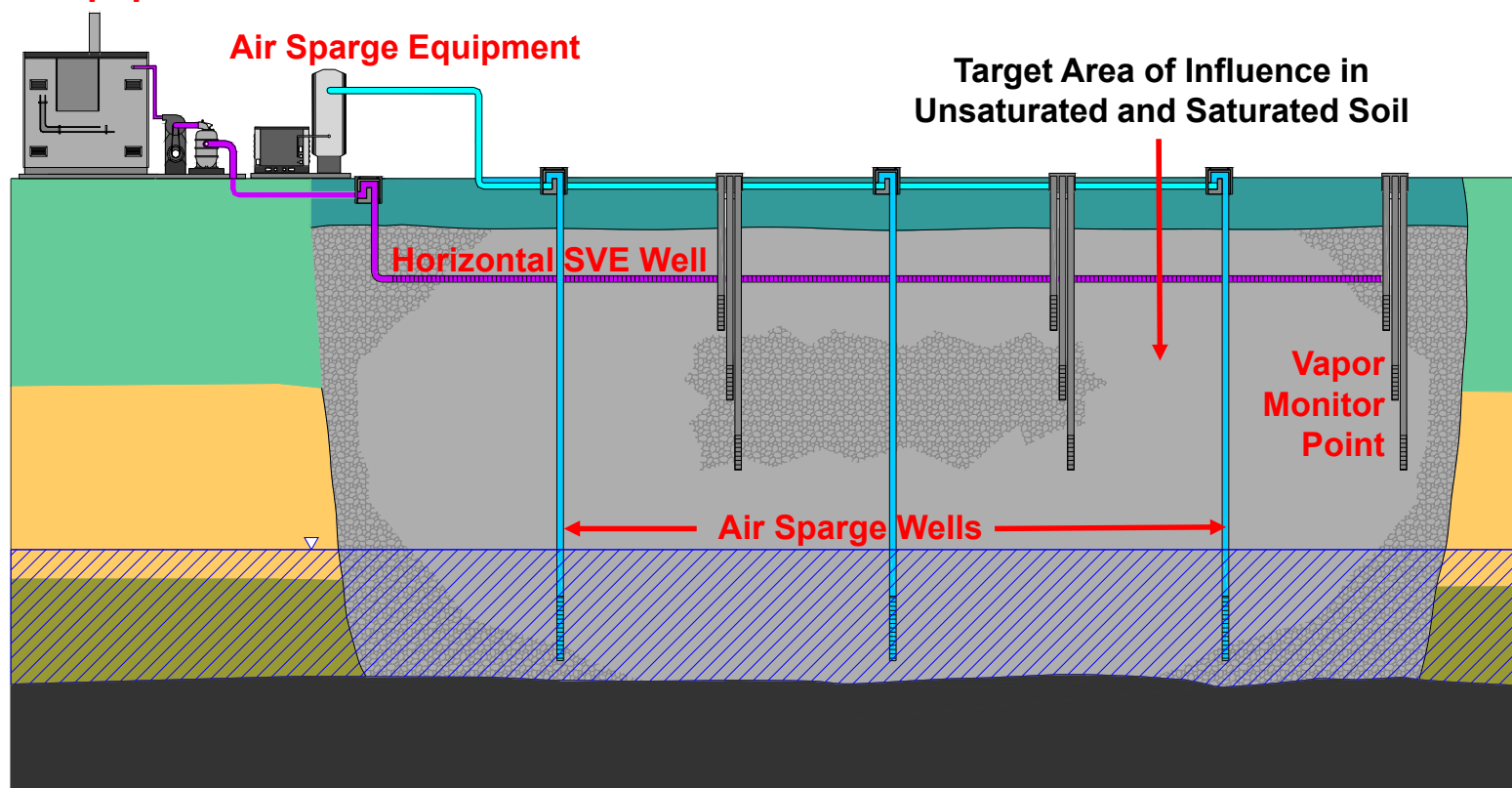
# RAOR – Preferred Option 3, continued

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- ◆ Remediation and Monitoring: 2021 to 2025
- ◆ Preferred Option 3 satisfies all 3 RAOs
- ◆ Short-term risk managed through active operational monitoring and control plan.
- ◆ Long-term risk managed through biological and physical removal.
- ◆ Institutional Controls are consistent with current and future site use and exposure risk:
  - ▶ Industrial use of site will continue
  - ▶ Shallow groundwater is not a drinking water source
  - ▶ No human or biological groundwater receptors

# SVE Schematic

## SVE Equipment



# Excavation Remedy



# RAOR – Excavation

◆ **Comment 11:** *Section 4.2.3 of the RAOR does not specify the depth of excavation in the area of the former Horton sphere. Monitoring well MW-4, which has the highest benzene found in groundwater at the site, is screened approximately 4 feet below the top of the Miller Creek formation clay. Additionally, very high concentrations of BETX and PAHs were detected in soil at depth in the area of the former gas holders. Excavation near the former gas holders and Horton sphere should extend to a depth to reduce the contaminant concentrations of these significant source areas to the extent practicable. The DNR also recommends the proposed excavation area near the Horton sphere and the other former gas holders be backfilled and compacted with a low permeability material and potentially capped with an impermeable cap following excavation to limit hydraulic head that could promote migration of any remaining contamination.*

◆ **Comment 11 Response:**

- ▶ Estimated depth of excavation is 15 ft near the former holders and Horton sphere.
- ▶ The excavation prism was modeled to capture D-C exceedances for benzene, B(a)P, and naphthalene in the top 4 feet, and also 100 mg/kg at depth for those three compounds.
- ▶ Backfill, compaction, and surface restoration will be addressed in the RD and will consider surface leaching to groundwater of residual contaminants.



# Air Sparge/Bio Remedy

# RAOR – Air/Bio Sparge Remedy

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- ◆ **Comment 4:** *The proposed air sparging area is composed of fill on top of Miller Creek formation clay. The DNR is concerned the heterogeneity of the fill material will cause preferential air flow resulting in an inefficient remedial action and is requesting an evaluation of the applicability of air sparging in this environment. To what extent have the soil and fill been characterized to show suitability for an air sparging option?*
  
- ◆ **Comment 4 Response:**
  - ▶ The PDI data confirmed that aerobic and anaerobic degraders are present in site, favoring a bioremediation approach.
  - ▶ Transfer of dissolved oxygen during biosparging in the permeable sand, gravel, and woody fill is less sensitive to geology than if the remedy was focused solely on air stripping. Well screens can be set and operated to target hot spots.
  - ▶ Air flow is expected to follow similar conductive paths as groundwater.
  - ▶ SVE would capture air before reaching the surface.

# RAOR – Air/Bio Sparge Remedy

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- ◆ **Comment 5:** *The RAOR does not specify the anticipated depths of the proposed air sparge system. If the air sparge system is to be installed in the fill material and soil above the Miller Creek formation this will leave high concentrations of contamination in groundwater that may not benefit from the air sparge system. Many of the site monitoring wells exhibiting high groundwater contaminant concentrations are screened within Miller Creek clay.*
- ◆ **Comment 5 Response:** The Miller Creek Clay is a hydraulic barrier. Benzene in Miller Creek soil was shown to be minimal compared to concentrations in oily/woody fill materials. Wells screened partly in the Miller Creek are not indicative of actual Miller Creek groundwater concentrations or total benzene mass .

# RAOR – Air/Bio Sparge Remedy

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- ◆ **Comment 9:** *The first order decay rate included in Appendix A of the RAOR calculated by Foth appears to assume homogeneous soil conditions and a perfect distribution of oxygen throughout the sparge area. There appear to be many opportunities for short circuiting of air flow to utilities as well as preferential air pathways through heterogeneous fill material that may make oxygen distribution difficult.*
- ◆ **Comment 9 Response:** Assumed degradation rates are conservatively low and initial benzene concentrations are conservatively high to account for uncertainty. In RD/RA additional considerations are given to distribution of oxygen over the sparge area. The SVE system design will address short circuiting concerns.

# RAOR – Air/Bio Sparge Remedy

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- ◆ **Comment 10:** *The first order decay rate calculated by Foth in Appendix A of the RAOR is for benzene only and not for all contaminants of concern at the site. Benzene is easily volatilized and bioremediated in comparison to other VOCs and especially PAHs. The timeframe for volatilization and bioremediation of the source area for all contaminants of concern utilizing air sparging and bioremediation may be significant.*
- ◆ **Comment 10 Response:** Air sparge model can also be evaluated for naphthalene and benzo(a)pyrene although benzene is the critical driver for remediation. MNA decay rates for naphthalene and benzo(a)pyrene are also provided in Appendix A.

# Performance Monitoring

# RAOR – Monitoring

- ◆ **Comment 1:** *The RAOR describes the proposal to utilize air sparging to remediate the area of elevated benzene and polynuclear aromatic hydrocarbon (PAH) contamination northeast of the former manufactured gas plant (MGP). The DNR is concerned that the use of air sparging without a soil vapor extraction system will lead to uncontrolled vapor migration to receptors including sewer lines and other utility corridors as well as buildings in the area of the remedial action. Some of the nearby buildings include the City of Superior Garage and wastewater treatment plant (WWTP), Lakehead Concrete buildings, buildings on the CLM properties to the northwest and southeast of the former MGP, as well as the building on the former MGP site itself. The concentrations of VOCs in the area of proposed air sparging are such that potential vapor migration induced by the air sparging may be a significant human health risk and potentially a serious safety risk. A plan to recover soil gas in the area of the air sparging and a plan to monitor soil gas, utility corridors, and buildings will be necessary prior to the DNR approving an air sparging option.*
- ◆ **Comment 1 Response:** Experience at other sites over a 30-year period shows vapor emissions from biosparging can be controlled effectively without SVE. As a contingency, SVE will be included in Option 3. The updated RAOR will describe the RD/RA air monitoring approach.



# RAOR – Monitoring

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- ◆ **Comment 12:** *Currently, there are no groundwater monitoring wells in the area of the former gas holders. MW-3 is abandoned and there are no other wells between the former gas holders and the plume associated with the MGP area of contamination. Groundwater monitoring at the location of the former gas holders will be necessary to determine the effectiveness of the remedial actions. An assessment of the monitoring well network will be necessary to ensure the locations being monitored are appropriate for the site during and following remedial action.*
- ◆ **Comment 12 Response:** MW-3 and MW-4 were sampled during the PDI but will be removed during excavation. SWLP agrees that the groundwater monitoring well network should be evaluated for both the integrity of existing MWs and to optimize performance monitoring. A performance monitoring plan is part of the RD scope.

# RAOR – Monitoring

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- ◆ **Comment 13:** *The DNR requests a draft groundwater and soil gas monitoring plan be submitted along with a final RAOR in order for the DNR to evaluate if the level of monitoring is adequate and appropriate for the proposed remedial action. The draft monitoring plan should detail monitoring needs during remedy implementation and post-remedial action in order to assess effectiveness of the remedy.*
- ◆ **Comment 13 Response:** In accordance with NR724.09, these plans will be provided as components of the RD. The updated RAOR will describe the anticipated RD/RA air monitoring approach.

# Next Steps and Schedule

# Next Steps

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- ❑ Agreement on RAOs
- ❑ Agreement on Option 3 w/ SVE modification
- ❑ Agreement to incorporate Monitoring and Air plans in RD
- ❑ Provide updated RAOR to DNR by 12/11
  - ❑ Highlight PDI conclusions in Section 2
  - ❑ Add boring logs and notes to App C
  - ❑ Incorporate Option 3 modifications
    - ❑ Clarify Excavation depth and extent
    - ❑ Add SVE to Option

# Upland Project RD/RA Schedule

Task		RAOR Approval	Upland Design and Contracting (at 60%)	Upland Design Approval	Upland Remedial Construction	Air Sparge Operation	Upland Site Monitoring	Site Closure
2020	Nov							
	Dec							
2021	Jan							
	Feb							
	Mar							
	Apr							
	May							
	Jun							
	Jul							
	Aug							
	Sep							
	Oct							
	Nov							
	Dec							
2022								
2023								
2024								
2025								



**Schedule a Follow-up Call**

**Questions?**

