MECC | MICHIGAN ENVIRONMENTAL COMPLIANCE CONFERENCE

MIRBCA

Lessons We're Still Learning

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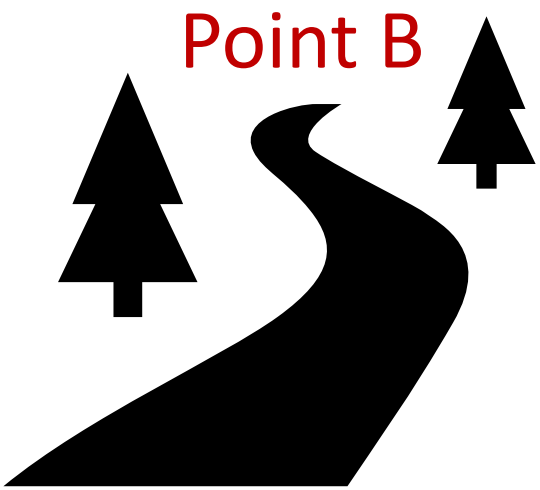
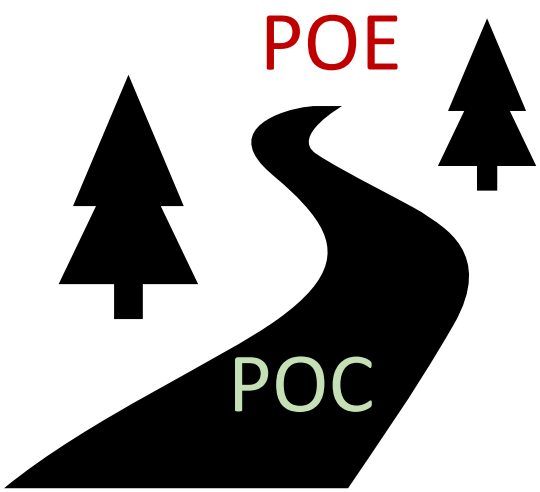
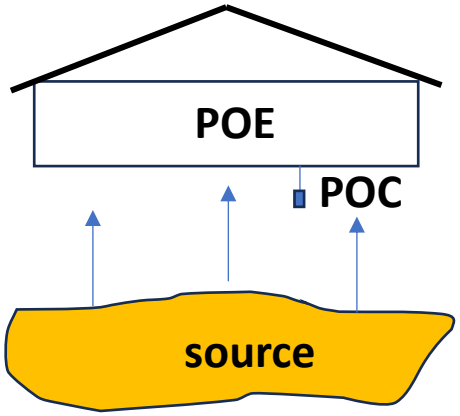
Exposure Pathway

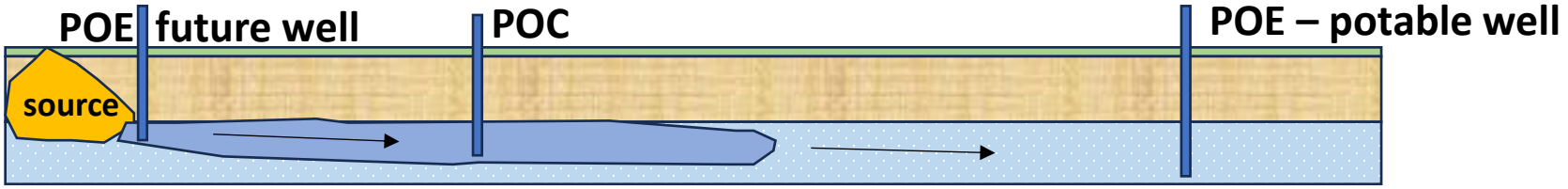




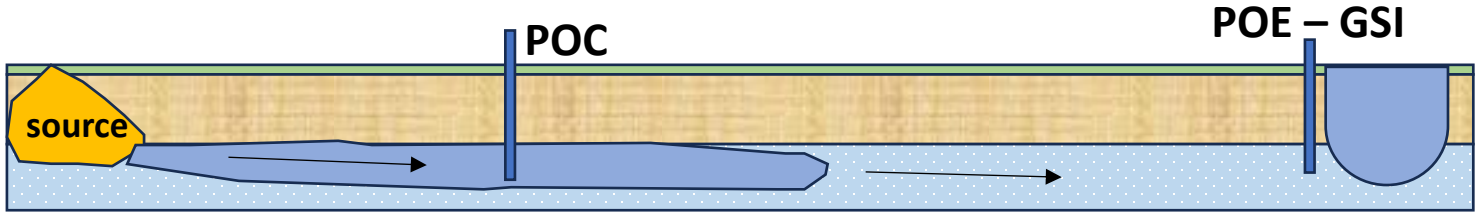
direct contact



VIAP



groundwater protection

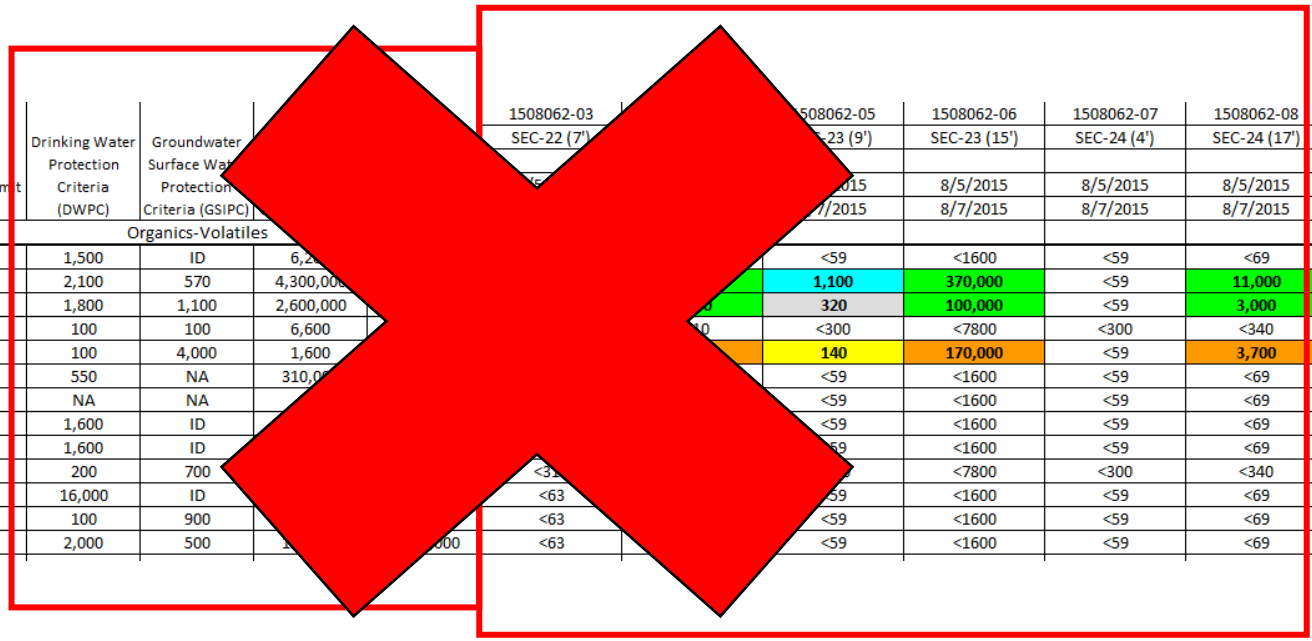


surface water protection

Site Data

Where were these samples collected?

At POE? At POC? At source?



9	Sample Number						1508062-03		1508062-05	1508062-06	1508062-07	1508062-08
10	Sample ID						SEC-22 (7')		-23 (9')	SEC-23 (15')	SEC-24 (4')	SEC-24 (17')
11	Sample Depth											
12	Date Collected			Target Detection Limit	Drinking Water Protection Criteria	Groundwater Surface Wat Protection			015	8/5/2015	8/5/2015	8/5/2015
13	Date Received			(TDL)	(DWPC)	Criteria (GSIPC)			/2015	8/7/2015	8/7/2015	8/7/2015
14	Analyte	Units	Method			Organics-Volatiles						
15	1,1,1,2-Tetrachloroethane	ug/kg dry	8260	100	1,500	ID	6,2		<59	<1600	<59	<69
16	1,2,4-Trimethylbenzene	ug/kg dry	8260	100	2,100	570	4,300,00		1,100	370,000	<59	11,000
17	1,3,5-Trimethylbenzene	ug/kg dry	8260	100	1,800	1,100	2,600,000		320	100,000	<59	3,000
18	Acrylonitrile	ug/kg dry	8260	100	100	100	6,600		<300	<7800	<300	<340
19	Benzene	ug/kg dry	8260	50	100	4,000	1,600		140	170,000	<59	3,700
20	Bromobenzene	ug/kg dry	8260	100	550	NA	310,0		<59	<1600	<59	<69
21	Bromochloromethane	ug/kg dry	8260	NA	NA	NA			<59	<1600	<59	<69
22	Bromodichloromethane	ug/kg dry	8260	100	1,600	ID			<59	<1600	<59	<69
23	Bromoform	ug/kg dry	8260	100	1,600	ID			59	<1600	<59	<69
24	Bromomethane	ug/kg dry	8260	200	200	700		<3		<7800	<300	<340
25	Carbon disulfide	ug/kg dry	8260	250	16,000	ID		<63	59	<1600	<59	<69
26	Carbon tetrachloride	ug/kg dry	8260	50	100	900		<63	<59	<1600	<59	<69
27	Chlorobenzene	ug/kg dry	8260	50	2,000	500	1	000 <63	<59	<1600	<59	<69

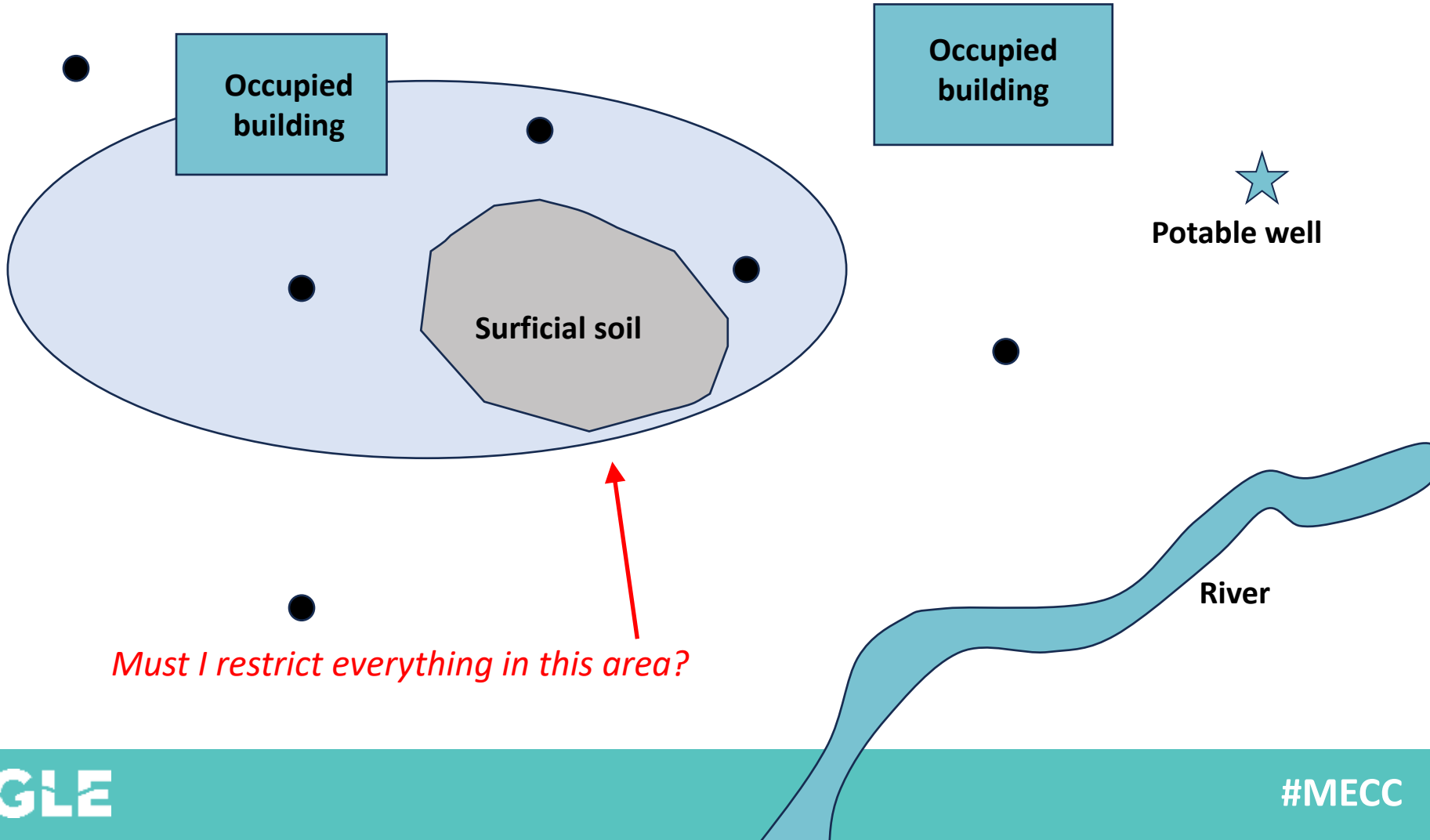
Where are the RBSLs applicable?

At POE? At POC? At source?

Site Assessment

- Extent of contamination and NAPL
- Geology and hydrogeology
- Points of exposure (POEs) and receptors

Extent of contamination relative to Tier 1 RBSLs *(delineation criteria)*



Changing the Question

Old Question

Is there contamination > RBSLs?

New Questions

What is the reasonable exposure scenario?

What concentration represents that scenario?


LUKE!
USE THE FORMS!

Residential vs. Nonresidential

Current use – evaluate actual use

5. Based on the above considerations (1-4), is the VIAP complete for		
Onsite residential current use:	Yes ☐	No ☑
Onsite nonresidential current use:	Yes ☑	No ☐

Future use – must always be **residential** (and not nonresidential) **unless** there's a land use restriction

8. Based on the above considerations (1, 3, 6, 7), is the VIAP complete for		
Onsite residential future use:	Yes ☑	No ☐
Onsite nonresidential future use:	Yes ☐	No ☑

Groundwater Protection

Current use –

Sample **potable wells**

Enter data into Form 16

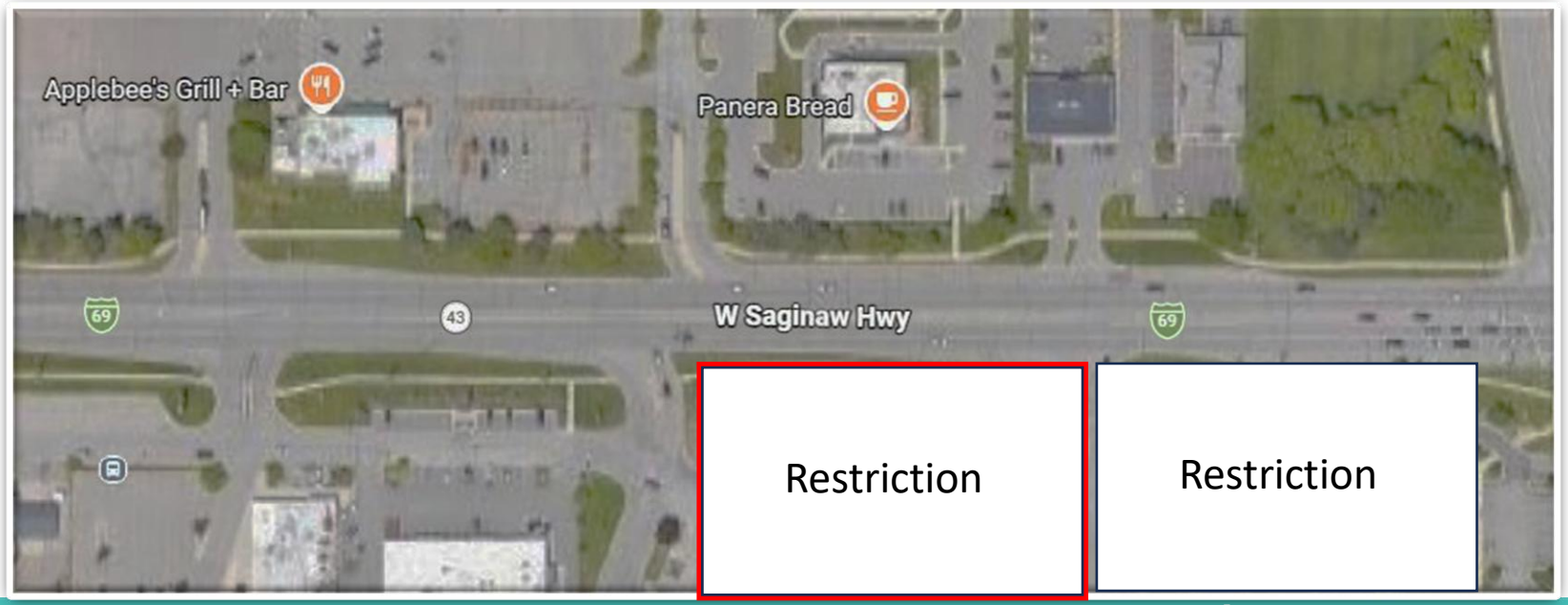
PATHWAYS AND MEDIA FOR EVALUATION	CURRENT USE		
	*C/NC**	Justification for Pathway	Monitoring Points in Exposure Domain for Determining RC**
Groundwater protection pathway	**C**	Complete Form 13(1) to determine if pathway is C/NC	
Soil	*Soil is not recommended to evaluate current use.*		
Groundwater			**Onsite potable well**

GROUNDWATER PROTECTION PATHWAY					
Vadose Zone Soil		C	Groundwater		C
Rep. Conc. POE [µg/kg]	RBSLs POE [µg/kg]	E/NE	Rep. Conc. POE [µg/L]	RBSLs POE [µg/L]	E/NE
			<1	5.00E+00	NE
			<1	7.90E+02	NE
			<1	7.40E+01	NE
			<1	2.80E+02	NE
			<1	6.30E+01	NE
			<1	7.20E+01	NE
			<1	2.30E+02	NE
			<1	2.30E+02	NE
			<1	2.30E+02	NE
			<1	8.60E+03	NE

Groundwater Protection

Future use – Pathway is usually complete (residential)

4. Based on the above considerations, is the GW protection pathway complete for		
Offsite residential future use:	☑ Yes	☐ No
Offsite nonresidential future use:	☐ Yes	☑ No



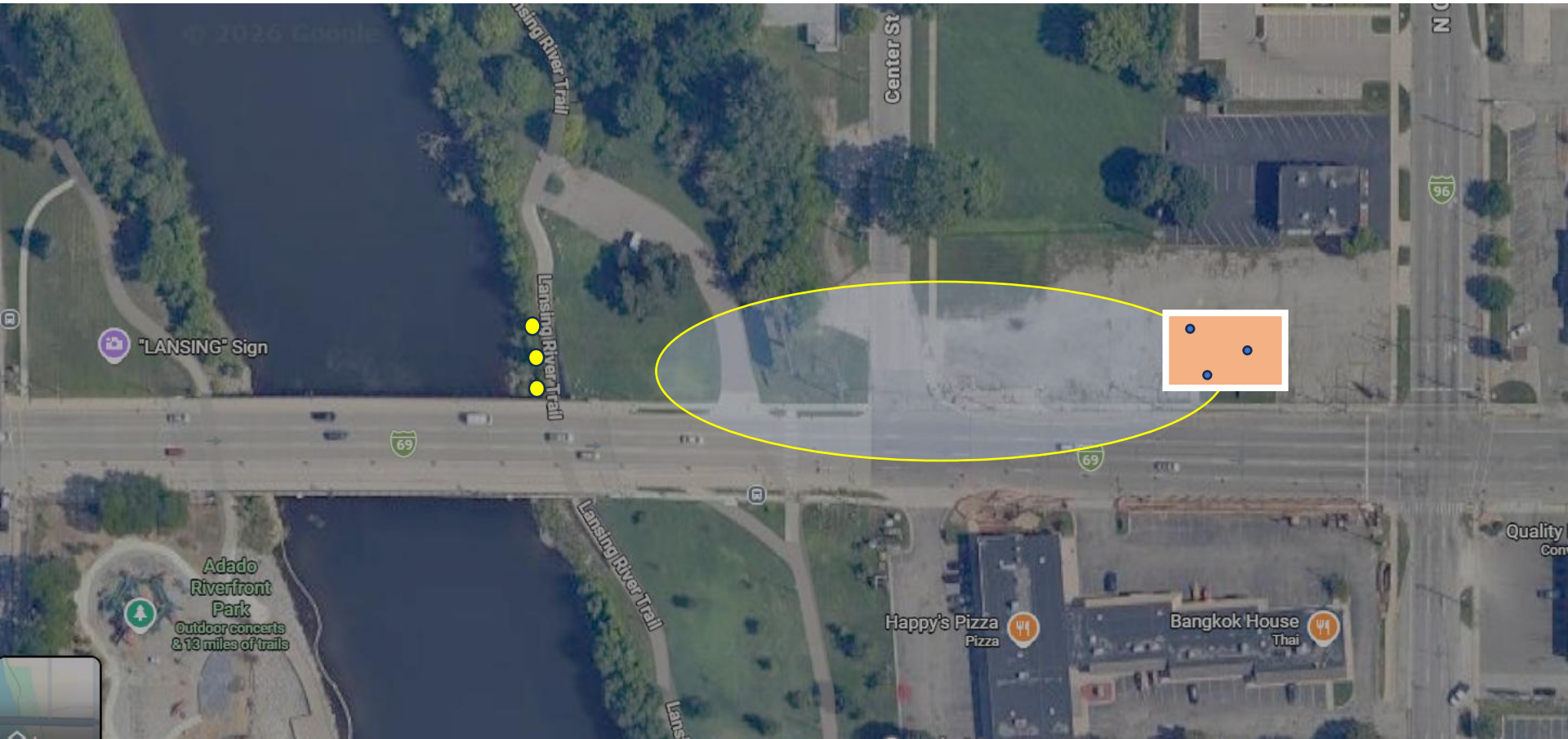
Current use

Surficial soils – not complete

VIAP – **complete** (nonres)

Groundwater protection – not complete

Surface water protection – **complete**



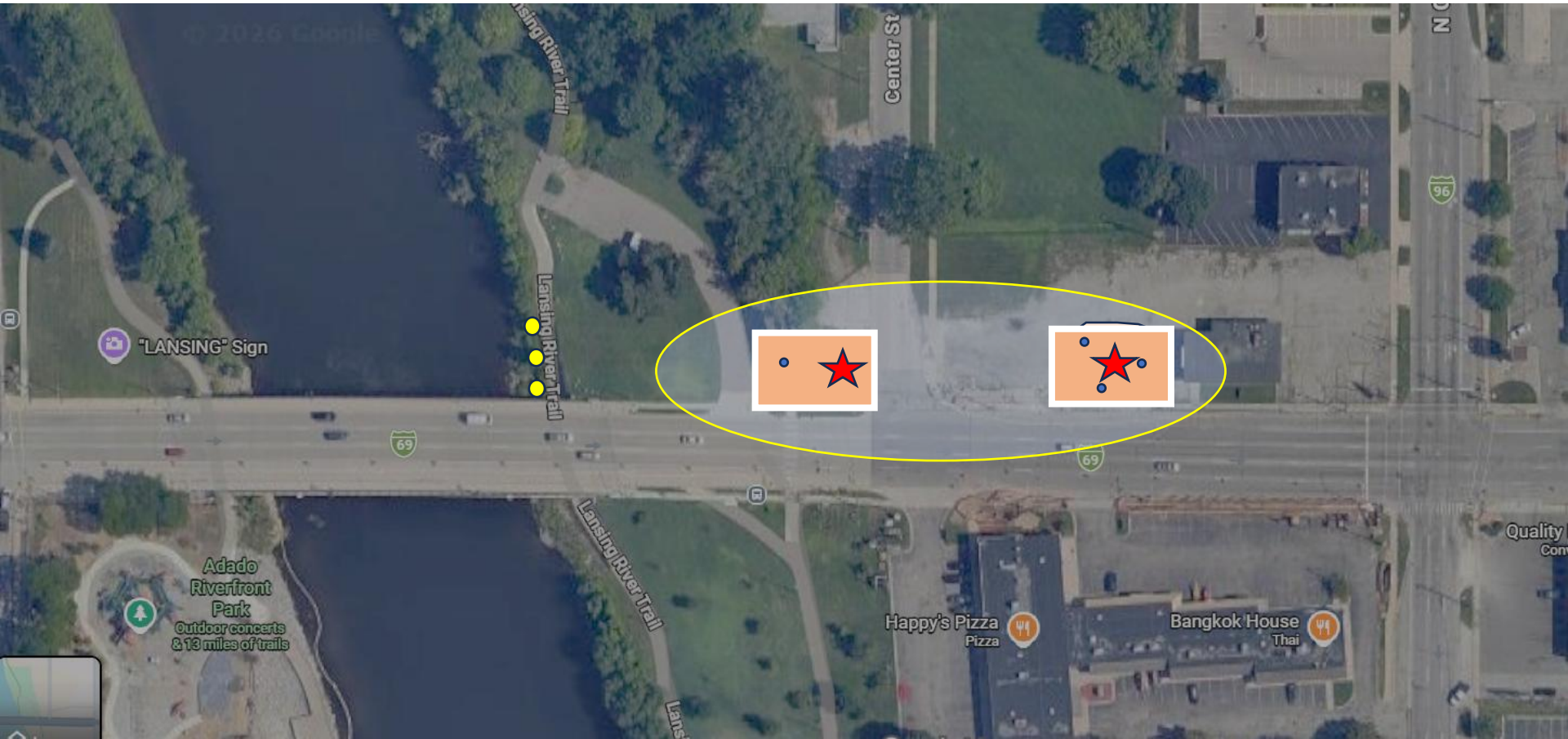
Future use

Surficial soils – **complete** onsite (residential)

VIAP – **complete** onsite (residential), offsite (residential)

Groundwater protection – **complete** onsite (residential), offsite (residential)

Surface water protection – **complete**



MIRBCA REPORT								FORM NO. 15(5) - SUMMARY OF EM
Facility ID number:		Date(s) confirmed release(s) discovered:						
Date form completed:		Form completed by:						
SUMMARY OF EXPOSURE MODEL (COMPLETE ROUTES OF EXPOSURE HIGHLIGHTED)								
EXPOSURE PATHWAYS	ONSITE RECEPTOR				OFFSITE RECEPTOR			
	CURRENT USE		FUTURE USE		CURRENT USE		FUTURE USE	
	Residential	Nonresidential	Residential	Nonresidential	Residential	Nonresidential	Residential	Nonresidential
Surficial soil pathways	NC	NC	C	NC	NC	NC	NC	NC
Volatilization to indoor air	NC	C	C	NC	NC	NC	C	NC
Groundwater protection	NC	NC	C	NC	NC	NC	C	NC
Surface water protection (GSI)	C							
Surface water protection (outfall)	NC							

Notes:
C: Complete pathway
NC: Not complete pathway
BSO: Buildings screen out

MIRBCA REPORT							FORM NO. 16(6) - SUMMARY OF EXCEEDANCES	
Facility ID number:		Date(s) confirmed release(s) discovered:						
Date form completed:		Form completed by:						
SUMMARY OF EXCEEDANCES (EXCEEDANCES FOR COMPLETE ROUTES OF EXPOSURE HIGHLIGHTED)								
EXPOSURE PATHWAYS AND MEDIA OF EVALUATION	ONSITE RECEPTOR				OFFSITE RECEPTOR			
	CURRENT USE		FUTURE USE		CURRENT USE		FUTURE USE	
	Residential	Nonresidential	Residential	Nonresidential	Residential	Nonresidential	Residential	Nonresidential
Surficial soil pathways								
Direct contact (dermal contact and ingestion)			NE					
Ambient air inhalation (vapors)								
Ambient air inhalation (particulates)								
Volatilization to indoor air pathway								
Building 1 - Soil gas		NE						
Building 1 - Groundwater (J&E)								
Building 1 - Groundwater (Sump)			E				E	
Building 1 - Soil								
Building 2 - Soil gas								
Building 2 - Groundwater (J&E)								
Building 2 - Groundwater (Sump)								
Building 2 - Soil								
Groundwater protection pathway								
Soil			E				NE	
Groundwater			E				E	
Surface water protection pathway								
POE at GSI - Soil								
POE at GSI - Groundwater				NE				
POE at outfall - Soil								
POE at outfall - Groundwater								

MIRBCA REPORT **FORM NO. 17(1)**

Facility ID number:	**Date(s) confirmed release(s) discovered:**
Date form completed:	**Form completed by:**

CONCLUSIONS AND RECOMMENDATIONS BASED ON TIER 1 EVALUATION (ONSITE RECEPTORS)

Instructions: *Based on the results of the Tier 1 evaluation (refer to Form 16(6)), discuss each medium, pathway and receptor combination that exceeds the Tier 1 RBSLs. For each exceedance, propose actions to manage the unacceptable risk. Actions can include (i) Tier 2 evaluation, (ii) institutional controls, notices, and restrictions to eliminate the pathway, (iii) monitoring, (iv) others including active remediation, Tier 3, etc. or (v) a combination of these.*

Complete Exposure Pathway for which Representative Concentration Exceeds RBSL	Current/Future Use	Receptor (Residential / Nonresidential)	Medium	Proposed Management Strategy
VIAP	**Future**	**Residential**	**Soil gas, sump**	☑ Tier 2 evaluation ☐ Institutional controls ☐ Monitoring ☐ Other (active remediation, Tier 3, etc. (provide details below)
Groundwater protection	**Future**	**Residential**	**Groundwater, soil**	☑ Tier 2 evaluation ☐ Institutional controls ☐ Monitoring ☐ Other (active remediation, Tier 3, etc. (provide details below)

How do I do a Tier 2 evaluation?

Geotechnical Parameters

Historic releases – use literature values except

hydraulic conductivity

New releases – use site-specific values

At the centerline, for steady-state, the DAF without decay can be obtained by setting $y = 0$, $z = 0$, and $x << vt$, *and* $\lambda = 0$ as:

$$\frac{1}{DAF} = \frac{C(x)}{C_o} = erf\left[\frac{Y}{4\sqrt{\alpha_y x}}\right] \times erf\left[\frac{\delta_{gw}}{2\sqrt{\alpha_z x}}\right] \quad (2)$$

Conclusions

What is the reasonable exposure scenario?

What concentration represents that scenario?