Conceptual Site Models and Data Collection:

A Case Study

WorleyParsons

resources & energy

THE CITY OF CALGARY

Proudly serving a great city

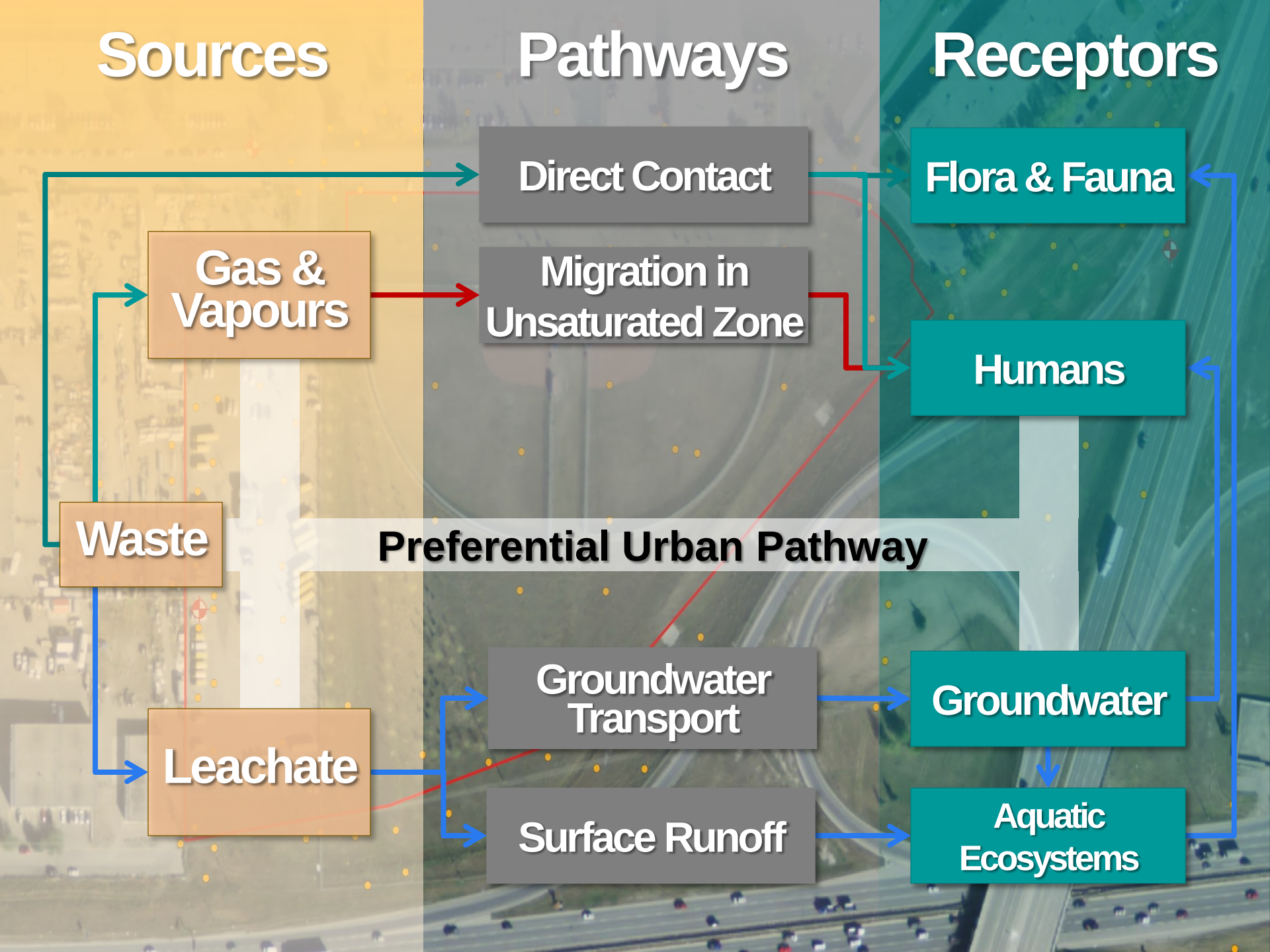
Data Collection /Analysis

Conceptual Site Model

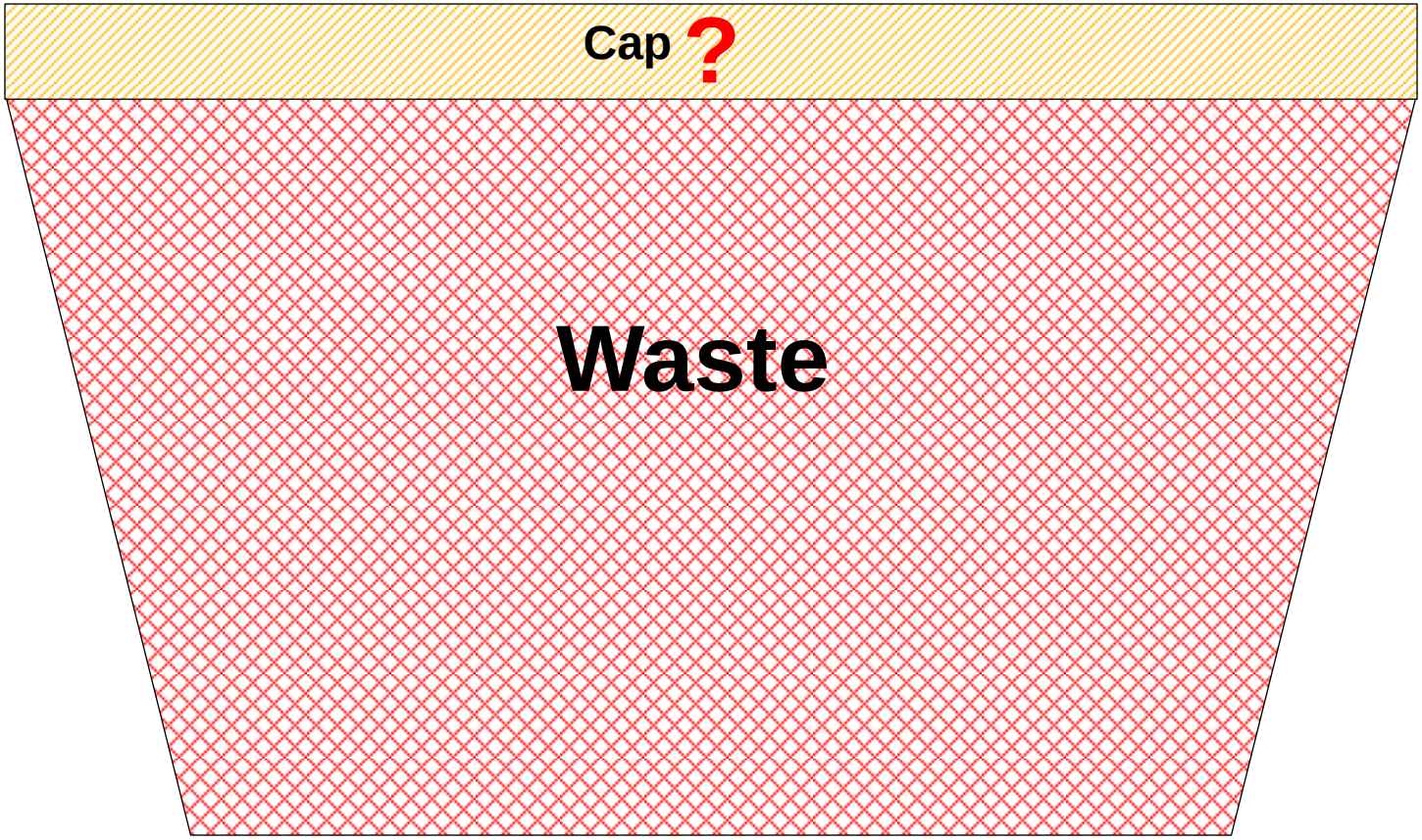
A Case Study

Does the data tell us what we need to know?

How do we know what we need to know?

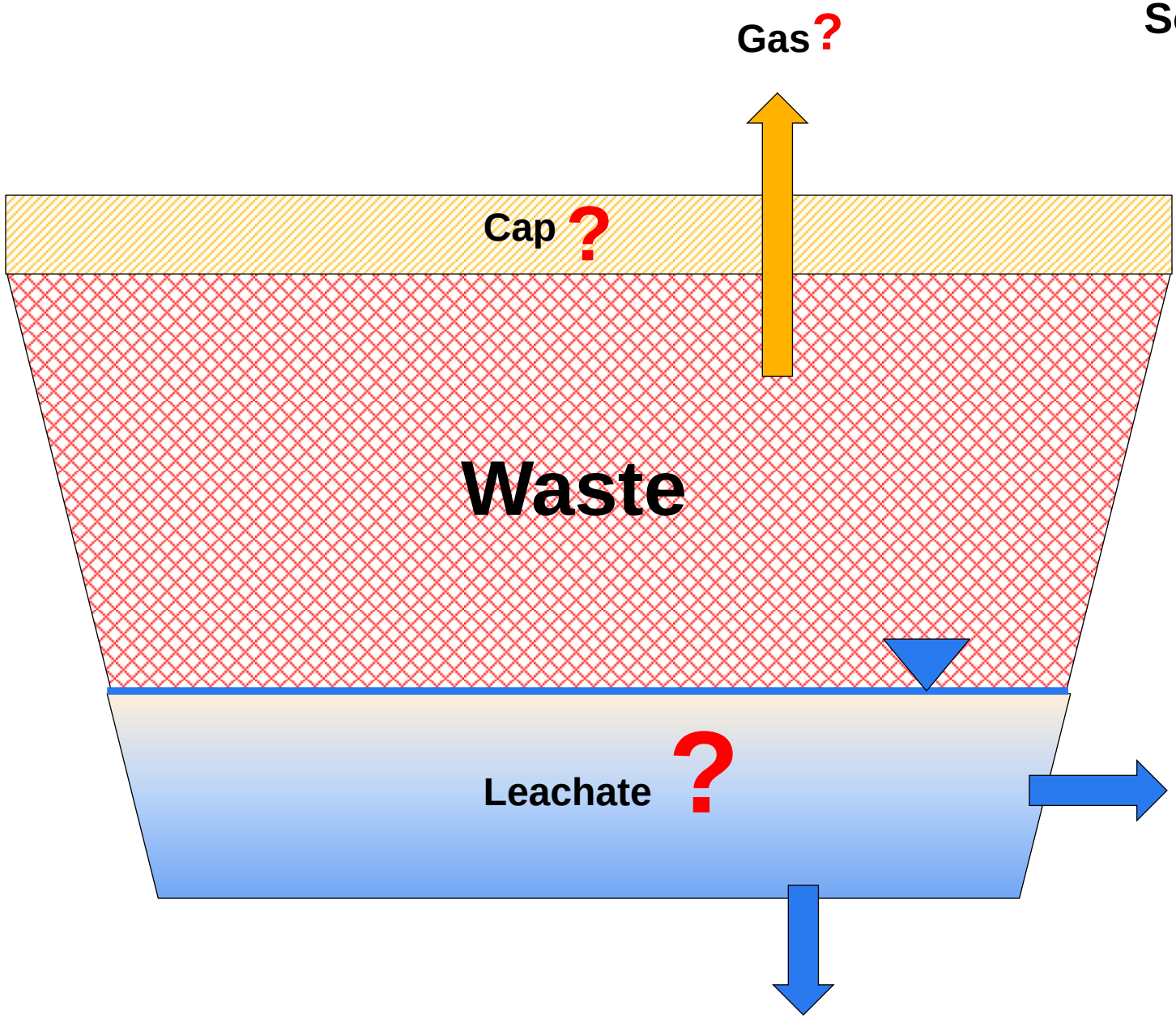

Sources
Pathways
Receptors
Direct Contact
Flora & Fauna
Gas & Vapours
Migration in Unsaturated Zone
Humans
Waste
Preferential Urban Pathway
Groundwater Transport
Groundwater
Leachate
Surface Runoff
Aquatic Ecosystems

Sources



Sources

Sources

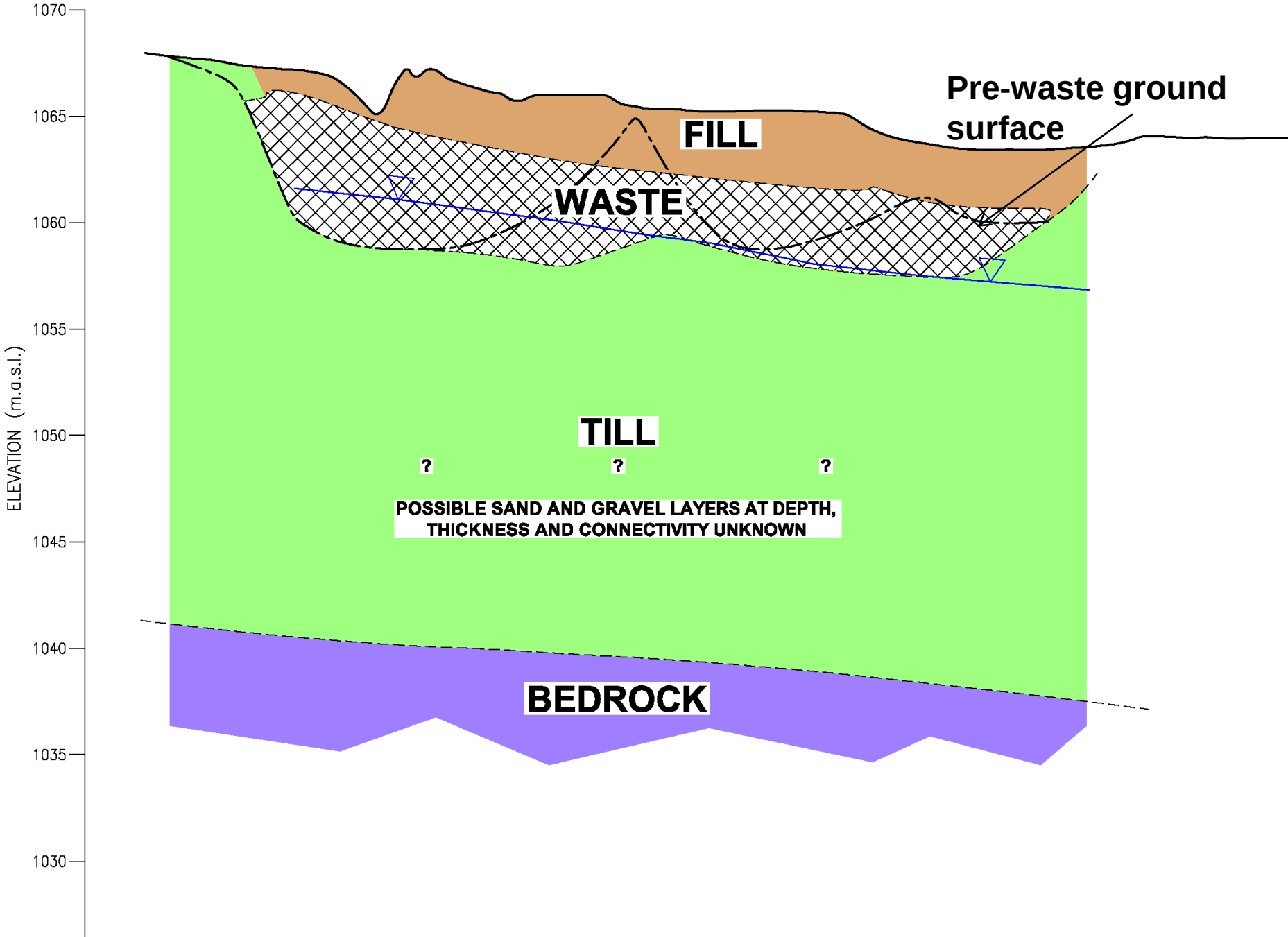


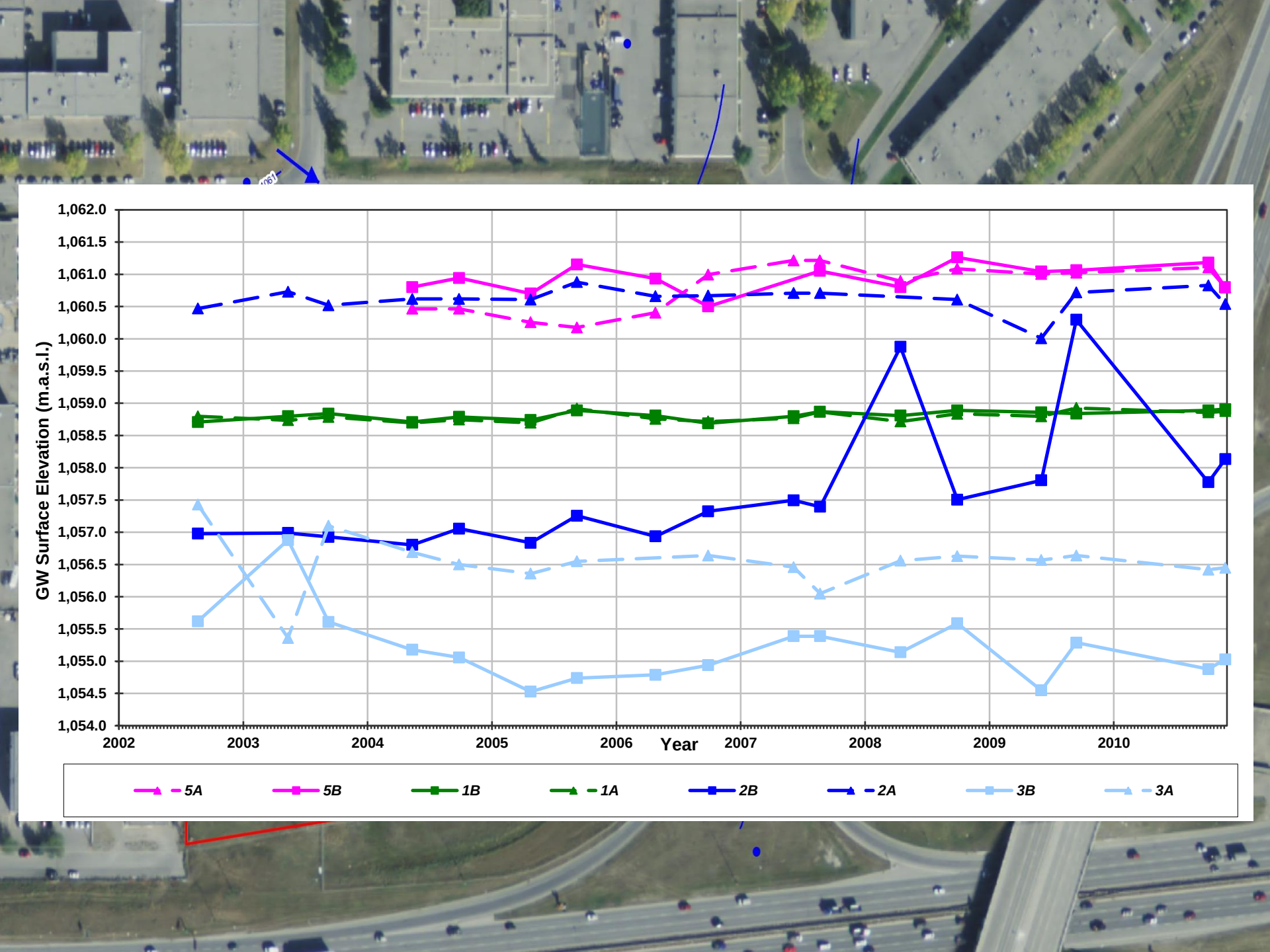
Receptors

- Flora & Fauna
- Humans
- Groundwater
- Aquatic Ecosystems

Exposure Pathway	Current Users	Future Users	Adjacent Users	Groundwater Users	Construction Workers	Flora and Fauna	Aquatic Ecosystems
Contact with cap	✓ ?	?			✓	✓	
Contact with waste		?			✓		
Inhalation indoors		?	✓				
Inhalation outdoors	✓ ?	?	✓ ?				
Contact with groundwater				✓	✓		
Consumption of groundwater				✓ ?			
Contact with surface water					✓	✓ ?	✓ ?


Migration Pathways
Vapour Migration in Unsaturated Zone
Preferential Pathways
Groundwater Transport
Surface Runoff


1070
1065
1060
1055
1050
1045
1040
1035
1030
ELEVATION (m.a.s.l.)
Pre-waste ground surface
FILL
WASTE
TILL
?
?
?
POSSIBLE SAND AND GRAVEL LAYERS AT DEPTH, THICKNESS AND CONNECTIVITY UNKNOWN
BEDROCK

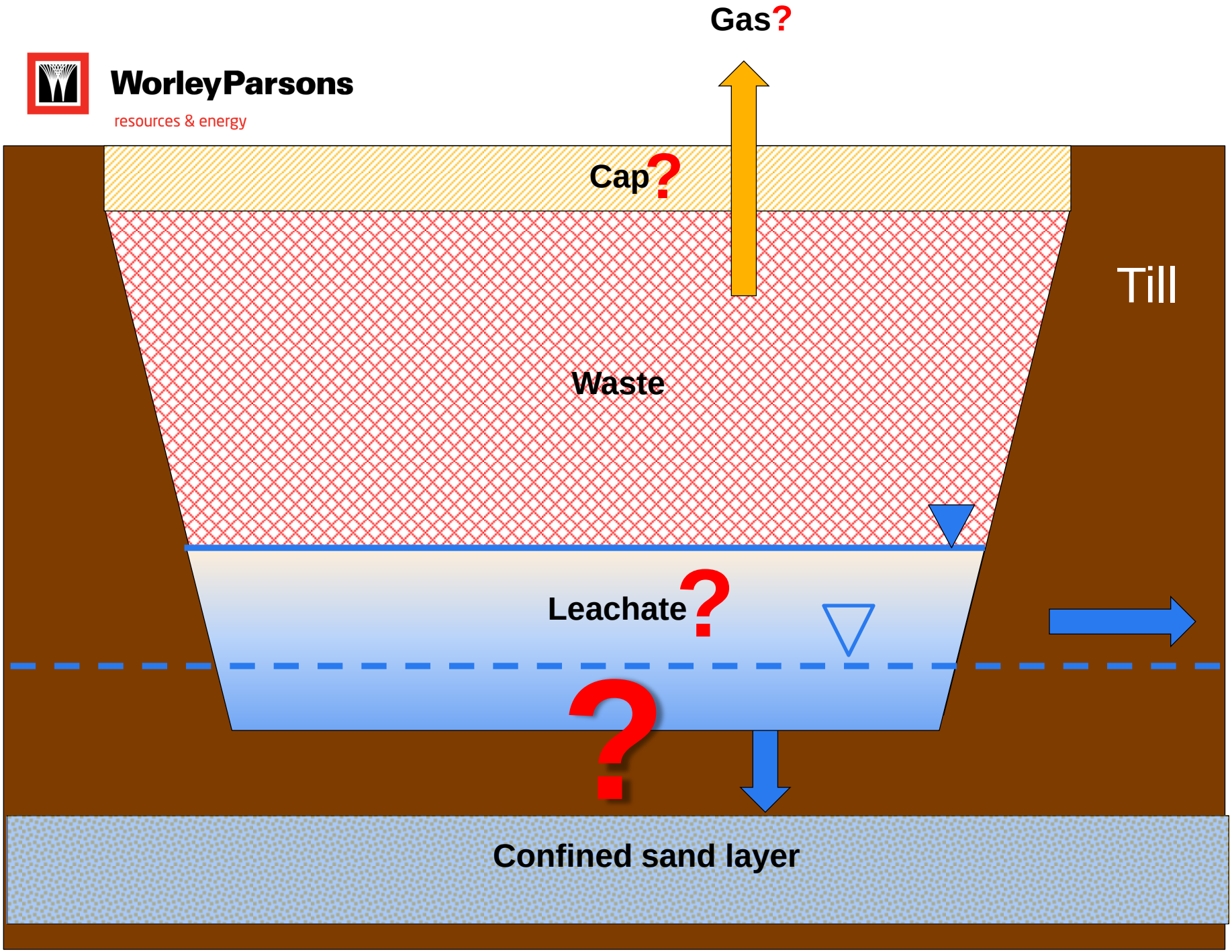

GW Surface Elevation (m.a.s.l.)
1,062.0
1,061.5
1,061.0
1,060.5
1,060.0
1,059.5
1,059.0
1,058.5
1,058.0
1,057.5
1,057.0
1,056.5
1,056.0
1,055.5
1,055.0
1,054.5
1,054.0
2002
2003
2004
2005
2006
Year
2007
2008
2009
2010
5A
5B
1B
1A
2B
2A
3B
3A

How many zones?

Flow direction and chemistry?

Interaction between zones?

Well	Screen Length (m)	Screened Horizon	Water Level?	Chemistry?	Flow Direction ?
4A	3	Waste/Till	X	✓ ?	X
1A	3	Sand	✓	✓	X
1B	3	Sand	✓	✓	
2A	3	Till/Sand	✓ ?	✓ ?	✓ ?
3A	3	Till/Sand	✓ ?	✓ ?	
5A	4	Sand/Till	✓ ?	✓ ?	
5B	2	Till (Bedrock??)	✓ ?	✓ ?	X
2B	6	Till	X	X	X
3B	9	Till	X	X	X
4B	9	Till	X	X	X


Gas?
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Cap?
Till
Waste
Leachate?
?
Confined sand layer

Sources

Migration Pathways

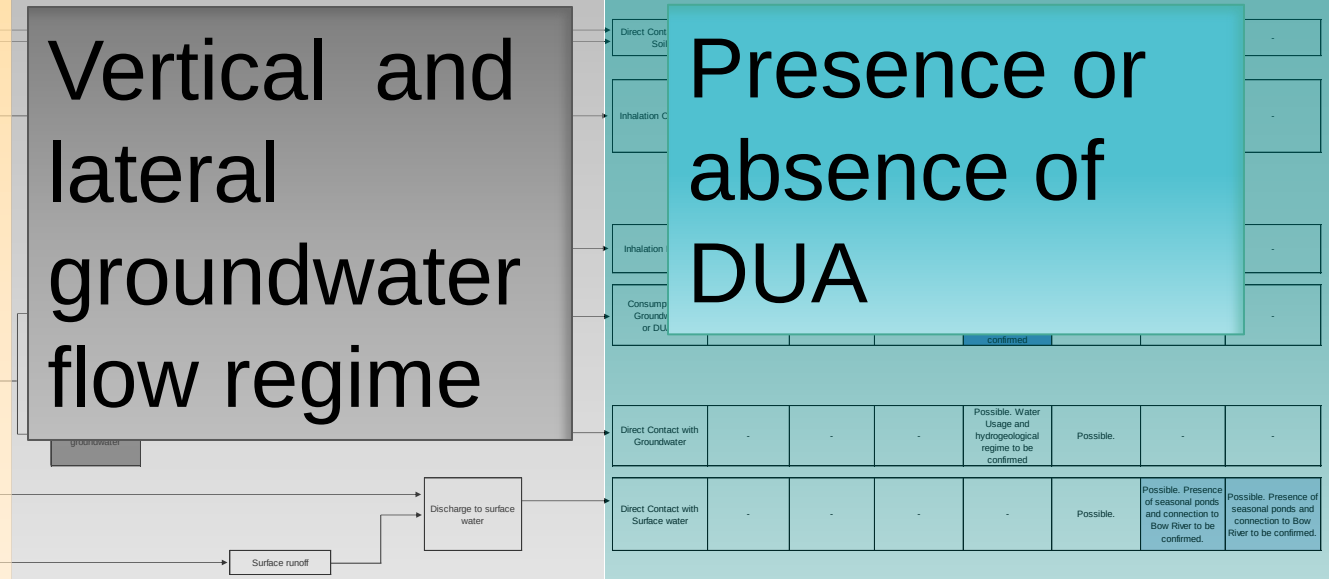
Exposure Pathways & Receptors

Composition of cap material

Composition of leachate

Vertical and lateral groundwater flow regime

Presence or absence of DUA



Objectives

Determine composition of cap material

Determine composition of leachate

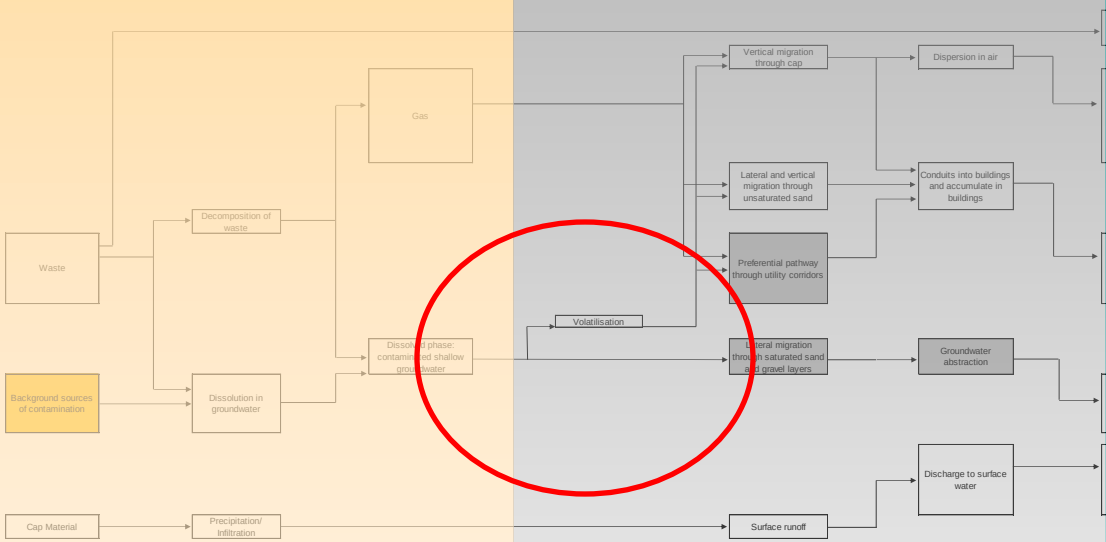
Characterize Groundwater Flow Regime

Identify potential DUAs

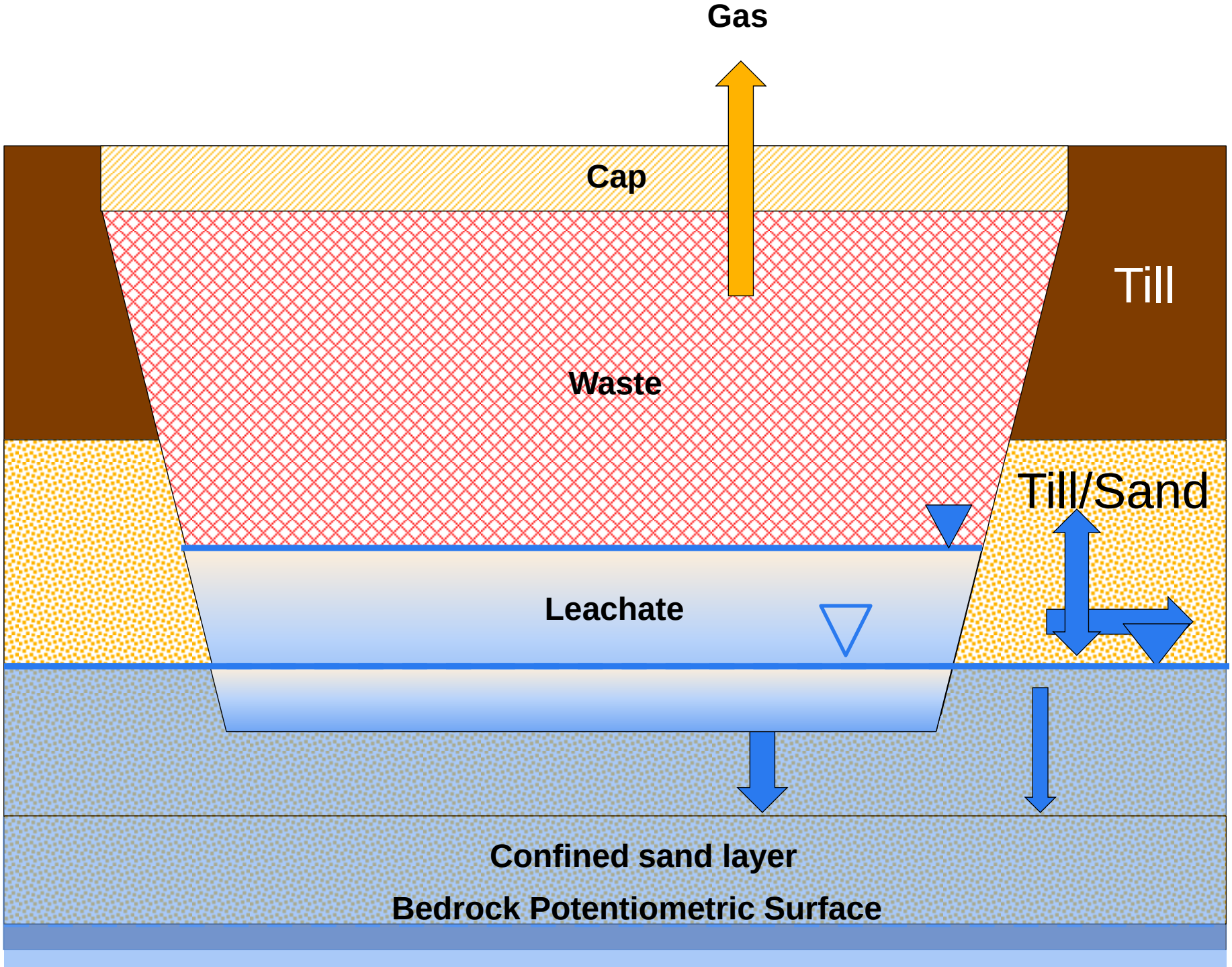
Sources

Migration Pathways

Exposure Pathways & Receptors



Direct contact with waste	Concentrations below applicable guidelines	-	-	-	Possible.	Possible. Rooting depths not confirmed	-
Inhalation outdoors	Possible. Gas and vapours released through cap. Volatile compounds reported. Risk Assessment required.	Possible. Gas and vapours released through cap. Volatile compounds reported. Risk Assessment required.	Possible. Depends on future land use	-	Possible.	-	-
Inhalation indoors	-	Methane detected through floor cracks in buildings to north east. Risk assessment required.	Possible. Depends on future land use	-	-	-	-
Direct contact with shallow groundwater	-	-	-	Unlikely, water use in the area is likley from bedrock aquifer but should be confirmed	Possible.	-	-
Direct contact with surface water	-	-	-	-	Possible.	Possible. Presence of seasonal ponds and ecological receptors to be confirmed.	Possible. Presence of seasonal ponds and ecological receptors to be confirmed.

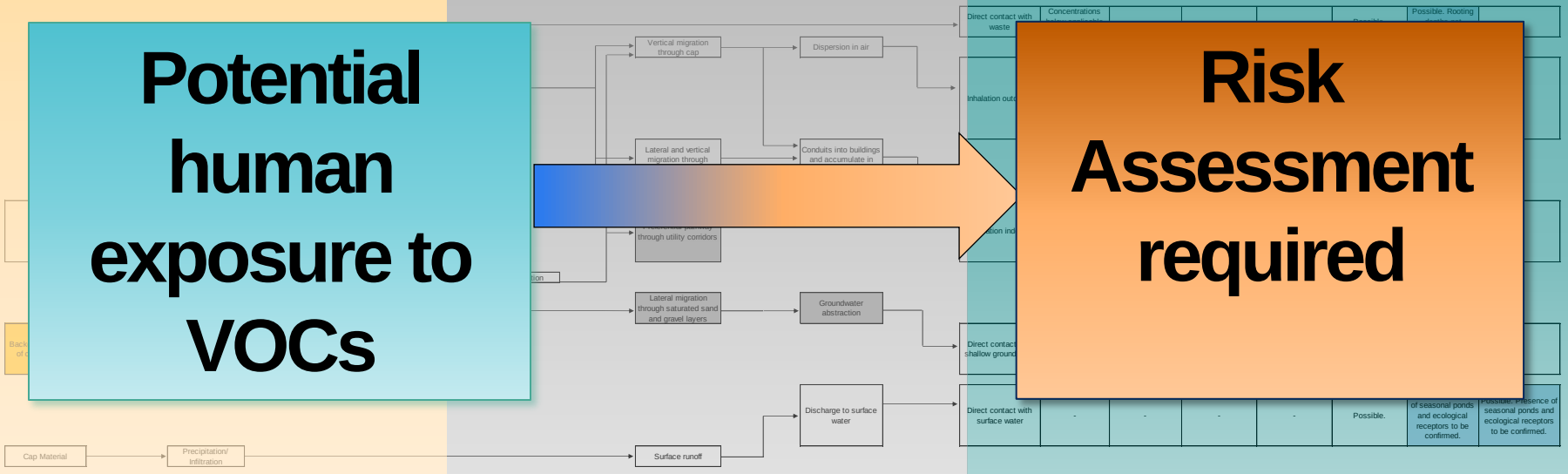

Gas
Cap
Till
Waste
Till/Sand
Leachate
Confined sand layer
Bedrock Potentiometric Surface

Sources

Migration Pathways

Exposure Pathways & Receptors

Potential human exposure to VOCs



Risk Assessment required

The Conceptual Site Model….

…and data collection.


What is the question?

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Thank You

Merci

Salamat

Gracias

Danke

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