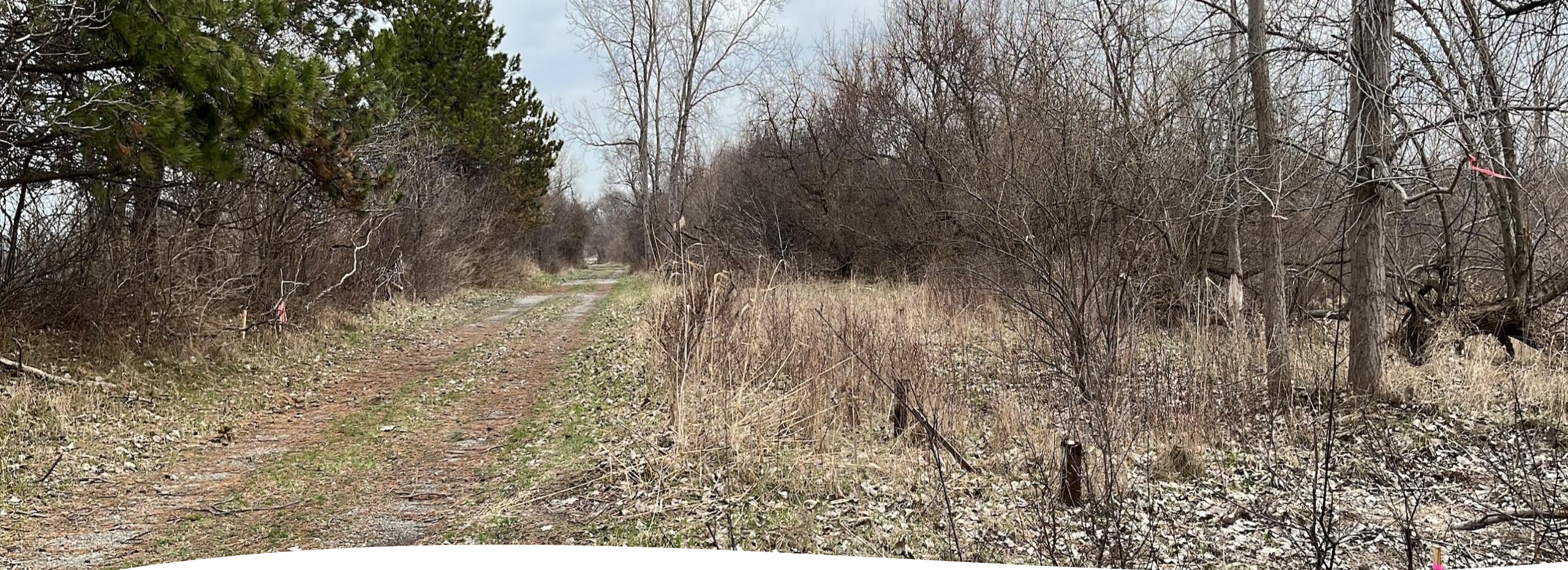




Point Hennepin Update

March 2025



Agenda

- Review Phase I Approach
- PZ-11 Hydraulic Evaluation
- Q4 Sampling Results
- Summary and Path Forward



Phase I Approach

- Channel hydraulic evaluation and close data gap
 - Deployed transducers on 7/8.
Removed 10/11
- Evaluate COC concentrations at the perimeter of the island in areas of higher priority.
Monitoring 10 piezometers quarterly
 - PZ-01S/D, PZ-02S/D, PZ-03S/D, PZ-08S/D, and PZ-09S/D sampled.
 - Q3 2024 - event completed in July
 - Q4 2024 - event completed in October and presented herein
 - Q1 2025 – completed in early March
- Evaluate biological and geochemical conditions

PZ-11 HYDRAULIC EVALUATION

Hydraulic Data Analysis and Interpretation

- Lines of evidence approach
- Water elevations, specific conductivity, and lithology in combination with co-located HPT/EC data, were used to assess potential groundwater flux to the river.

Surface Water Response

GW levels **mimic** SW fluctuations
No GW/SW correlation

Hydraulic Connection
No Hydraulic Connection

Horizontal Hydraulic Gradients

Gradients **outward** toward river
Gradients **inward** towards island

Potential GW flux to river
No potential GW flux to river

Groundwater Levels vs Surface Water Levels

GW levels > SW levels
GW levels < SW levels

Potential GW flux to river
No potential GW flux to river

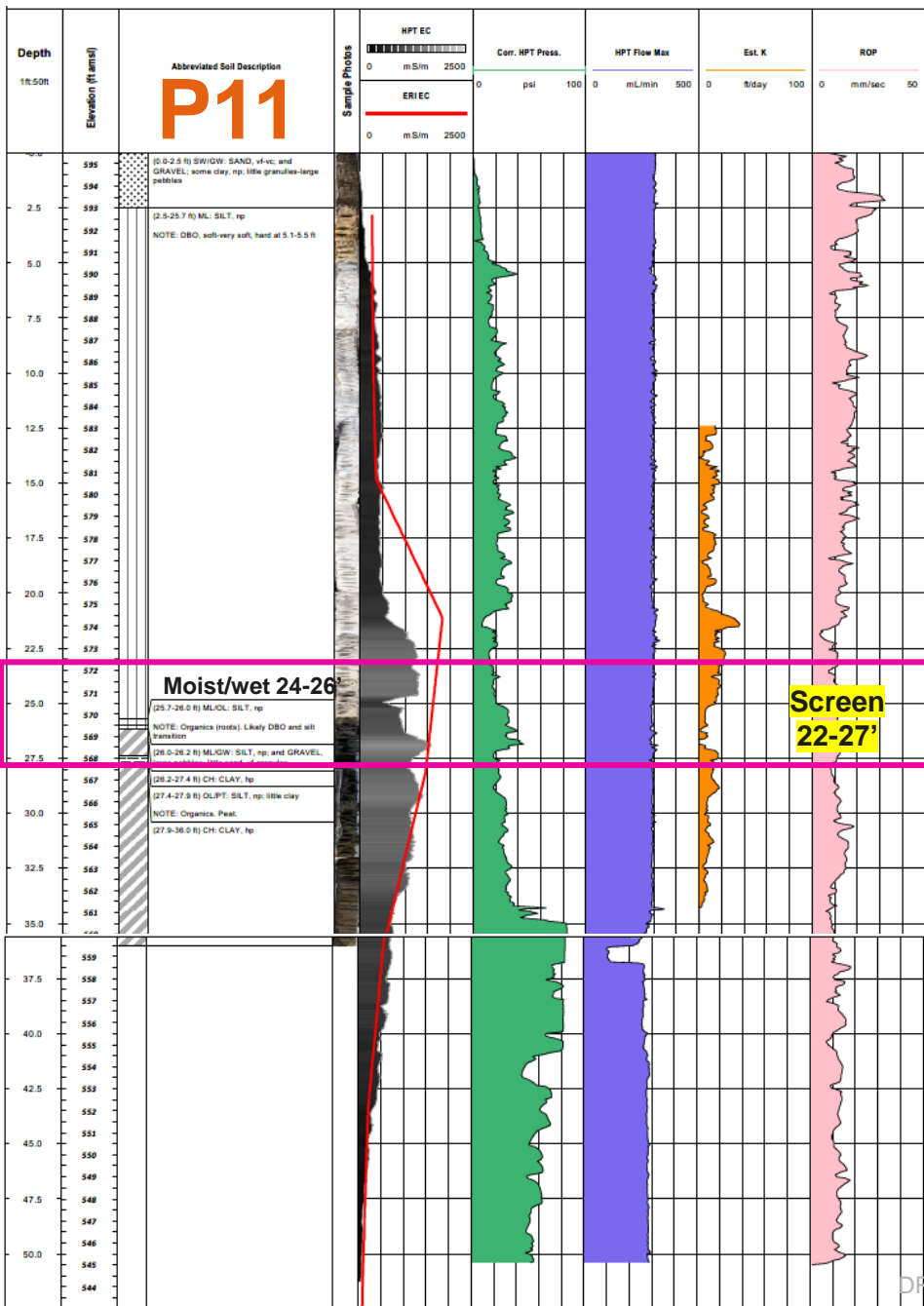
Specific Conductivity and Temperature

High SC and decreasing temps
Low SC and no temp fluctuations

Potential GW flux and hydraulic connection
Unlikely GW flux potential and hydraulic connection

PZ-11 is located along the channel on the south end of island

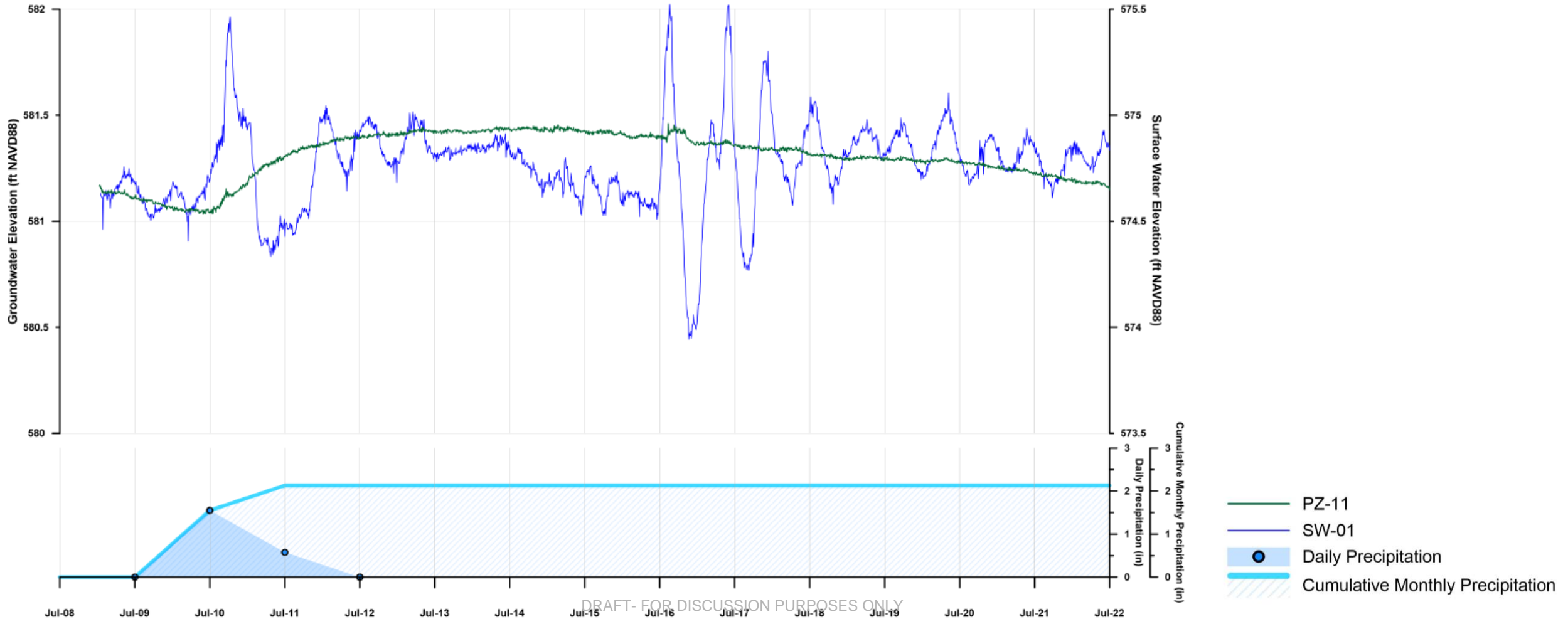




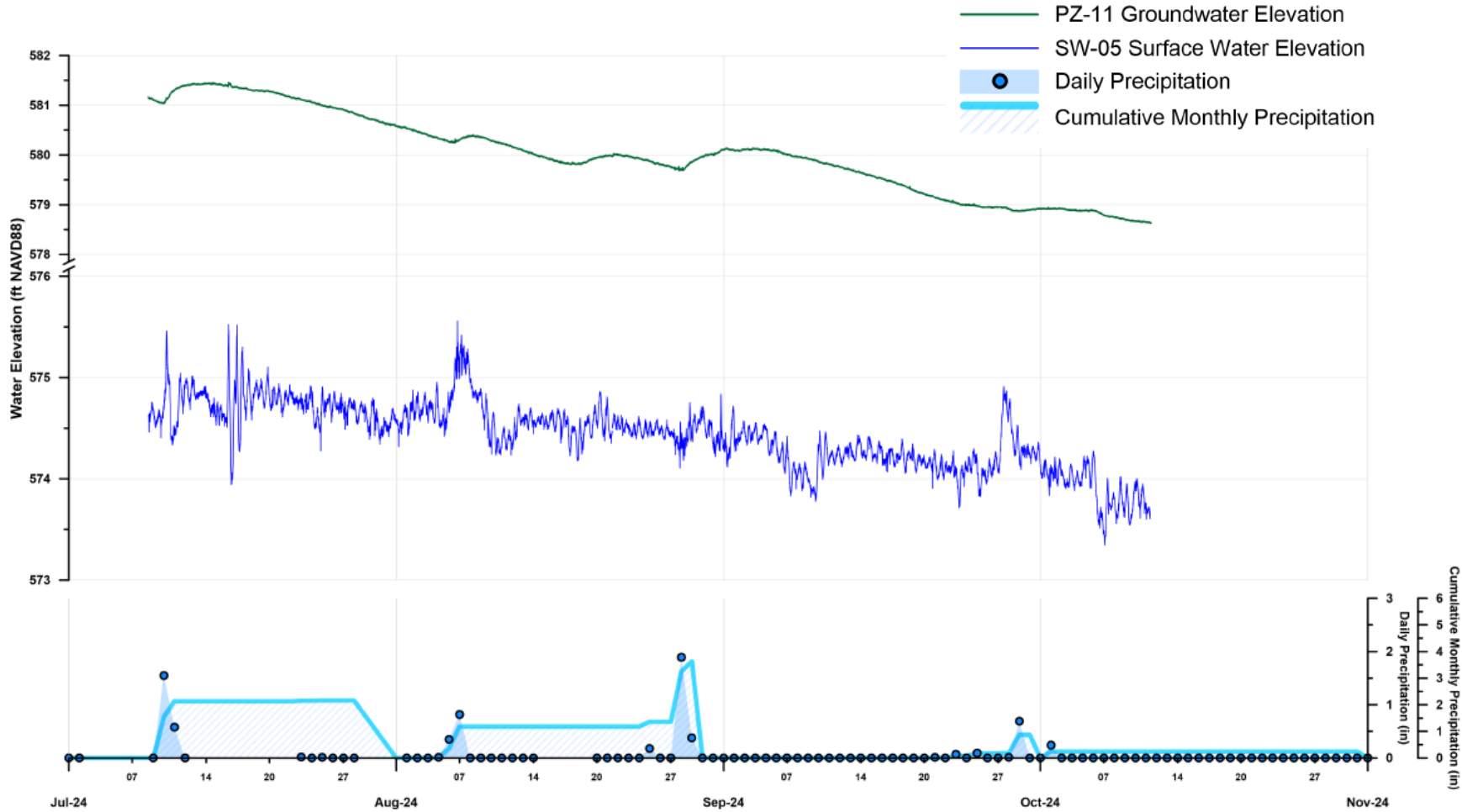
Depth (feet)	Recovery (inches)	PID (ppm)	Soil Symbol	USCS Classification	SOIL DESCRIPTION	WELL CONSTRUCTION DETAILS
-2						PZ-11 Stick up (3 ft)
0			SW		(0.0-1.0) SAND, very fine to medium, subangular to subround; some silt, no plasticity, rapid dilatancy; little very coarse sand to large pebbles, angular to subround; poorly sorted; dry; brown (10YR 5/3). Note: Roots and sticks present.	2" PVC Sch 40 Casing (0 to 27 ft)
2	27	NM	ML		(1.0-4.8) SILT, non-plastic, rapid dilatancy; well sorted; very soft; wet; very pale brown (10YR 8/2). Note: Distiller Blow-Off;	Sand Backfill (0 to 0.5 ft)
4						
6	44	NM		ML	(4.8-27.6) SILT, non-plastic, rapid dilatancy; very soft; well sorted; wet; white (10YR 8/1). Note: Distiller Blow-Off.	Bentonite Pellets (0.5 to 20 ft)
8						
10	48	NM				
12						
14	48	NM				
16						
18	48	NM				
20						Sand Pack K+E#0 (20 to 27 ft)
22	48	NM				
24						2" Stainless Steel Screen slot size 0.010" (22 to 27 ft)
26	48	NM			(27.6-28.0) SILT; some clay, low to medium plasticity, slow dilatancy; very soft; moist to wet; black (10YR 2/1). Note: Organics, peat.	
28				ML	End of boring at 28.0' bgs.	

PZ-11

- Diurnal response in river
- Little to no hydraulic connection between PZ-11 and river










PZ-11

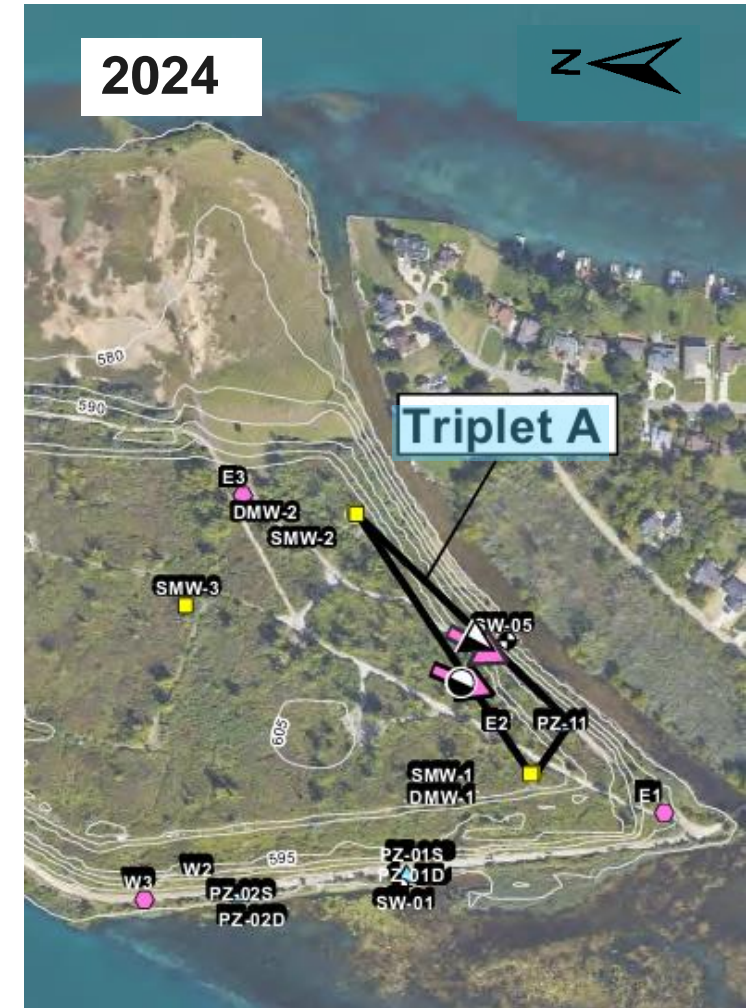


- Water levels consistently above river surface water elevation

Horizontal Hydraulic Gradient – PZ-11

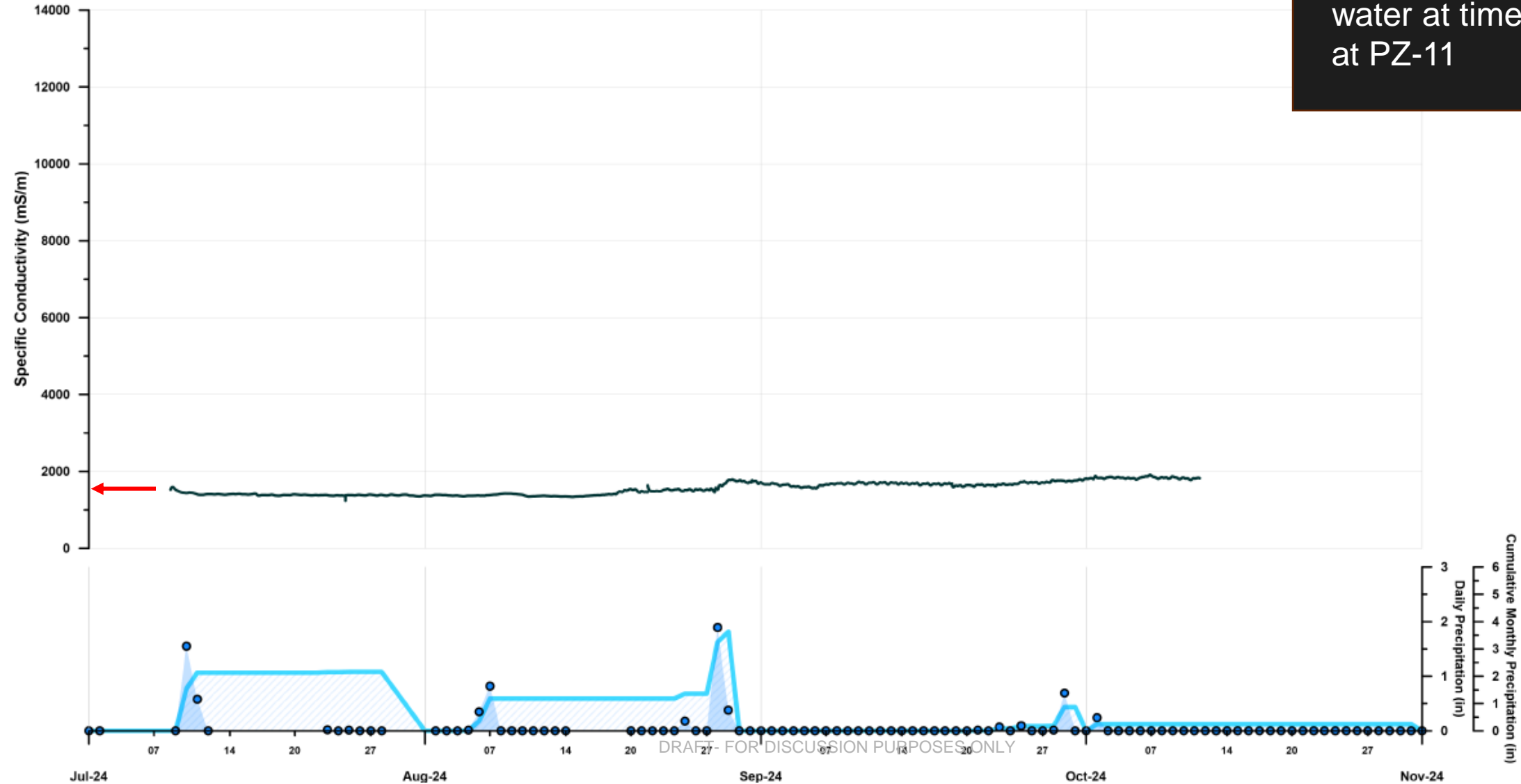
- Summer (July 2024) and Fall (October 2024): Gradient not toward the adjacent channel, gradient toward the west/south

-  SHALLOW TRIPLETS
-  JULY GRADIENT
-  OCTOBER GRADIENT
-  OUTWARD GRADIENT
-  INWARD GRADIENT
-  LARGE ARROW - HYDRAULIC GRADIENTS MAGNITUDE E-02
-  SMALL ARROW - HYDRAULIC GRADIENTS MAGNITUDE E-03

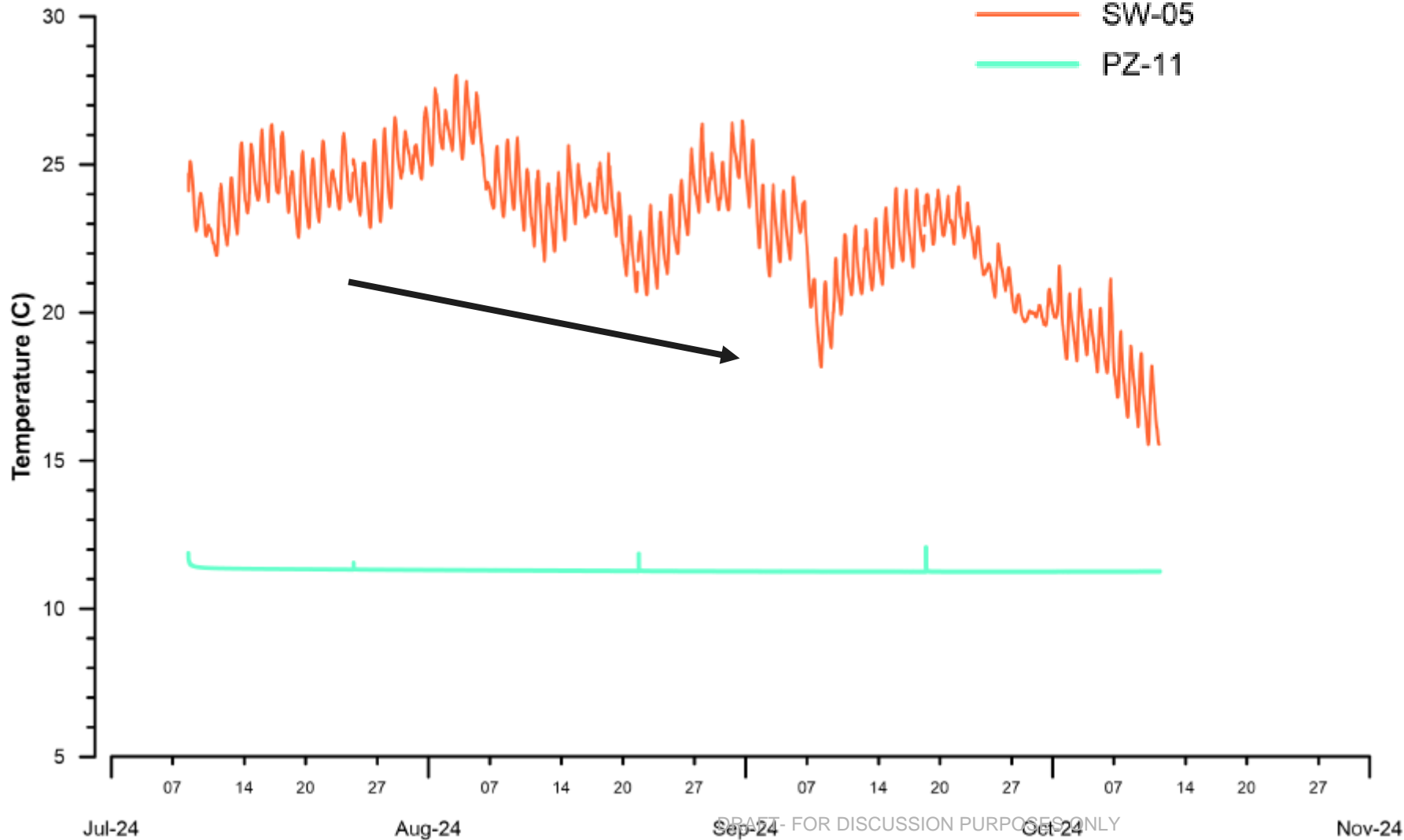


PZ-11

- PZ-11 low SC
- Variation over time may indicate mixing with surface water at times – not present at PZ-11



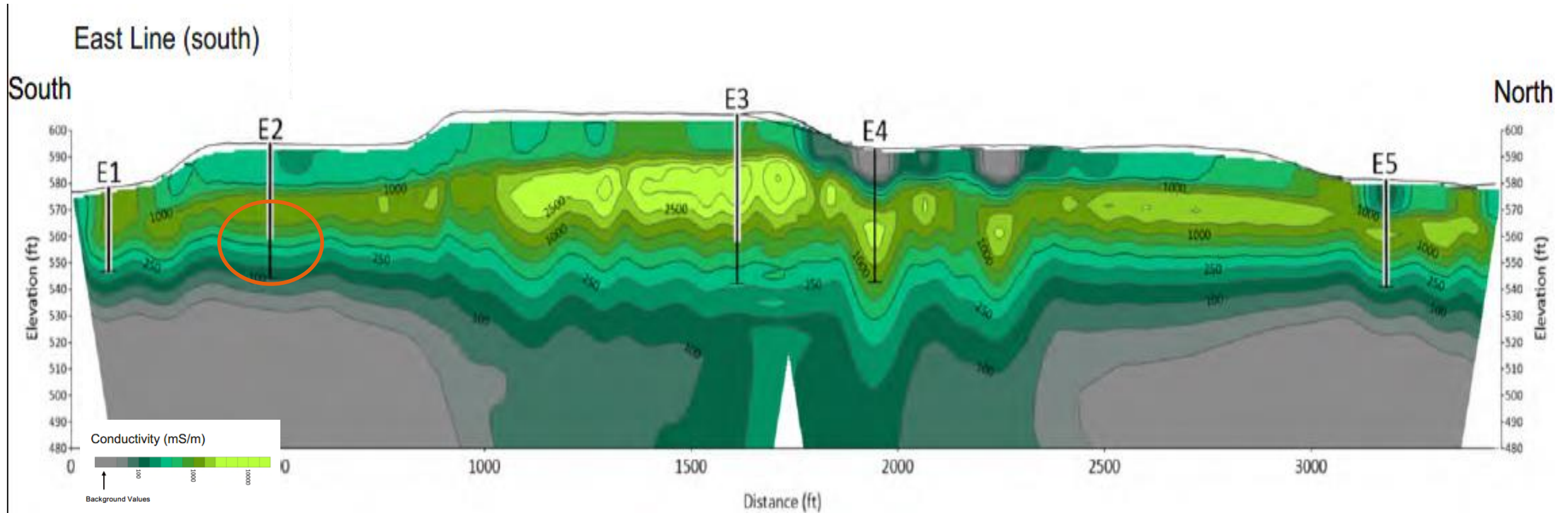
PZ-11



- Surface water temperatures decrease over the monitoring period
- PZ-11 shows no temperature fluctuation over the monitoring period
- May indicate a lack of hydraulic connection

Correlation with Geophysics

- No in-channel geophysics at PZ-11
- Correlates with on shore geophysics



PZ-11 Lines of Evidence

Little/no hydraulic connection to river



Horizontal hydraulic gradient to the west/south, not toward the adjacent channel



Groundwater levels above river elevations



Low specific conductivity; No temperature decrease



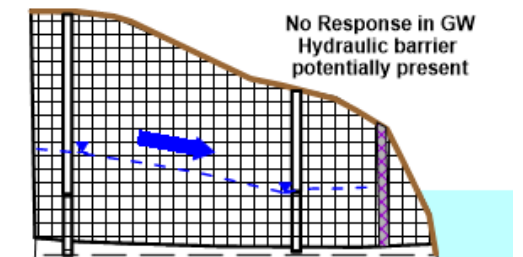
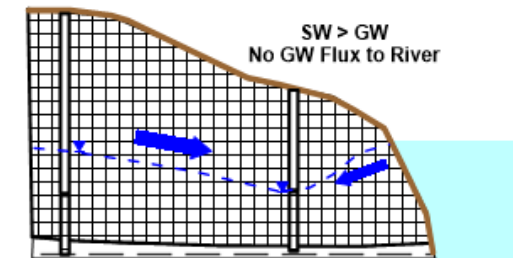
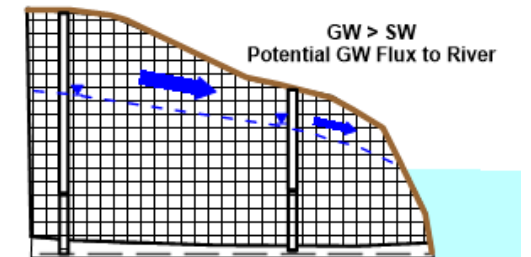
Correlation with on shore geophysics

Lower Priority

Priority Matrix

Piezometer	Shallow (S) Deep (D)	GW Elevation Consistently Above/Near SW Elevation	SW Response Observed in GW	Consistant Outward Horizontal Hydraulic Gradient	Specific Conductivity Mid-High	Temperature Increasing	Overall Priority
PZ-01	S	Orange	Black	Orange	Black	Orange	Orange
	D	Orange	Black	Orange	Black	Orange	
PZ-02	S	Orange	Black	Orange	Black	Orange	Orange
	D	Orange	Black	Orange	Black	Orange	
PZ-03	S	Orange	Black	Orange	Black	Orange	Orange
	D	Orange	Black	Orange	Black	Orange	
PZ-04	S	Black	Black	Orange	Black	Black	Black
	D	Black	Black	Orange	Black	Black	
PZ-05	S	Black	Orange	Black	Orange	Black	Black
	D	Black	Orange	Black	Orange	Black	
PZ-06	S	Black	Orange	Black	Orange	Black	Black
	D	Black	Orange	Black	Orange	Black	
PZ-07	S	Black	Black	Orange	Black	Black	Black
	D	Black	Black	Orange	Black	Black	
PZ-08	S	Orange	Black	Orange	Black	Orange	Orange
	D	Orange	Black	Orange	Black	Orange	
PZ-09	S	Orange	Black	Orange	Black	Orange	Orange
	D	Orange	Black	Orange	Black	Orange	
PZ-10	S	Orange	Black	Orange	Black	Orange	Black
	D	Orange	Black	Orange	Black	Orange	
PZ-11	S	Orange	Black	Orange	Black	Orange	Black
Legend		Potential GW flux to river	Hydraulic Connection	Potential GW flux to river	Potential GW flux to river and hydraulic connection	Potential GW flux to river/hydraulic connection	Higher Priority
		No potential GW flux to river	No hydraulic connection	No potential GW flux to river	Unlikely GW flux potential or hydraulic connection	Unlikely GW flux potential or hydraulic connection	Lower Priority

Lithology, geophysics correlation, and gradient magnitude were also considered in overall priority



Q4 2024 SAMPLING RESULTS

Basis for Sampling Locations

Higher Priority
Response to surface water visible in groundwater data
Consistent outward gradient
Consistent GW levels higher than SW
Higher K zones; Higher estimated potential GW flux

Lower Priority
Limited or no response to SW in GW
Inward gradient or seasonal/low outward gradient
SW seasonally higher than GW levels
Lower K zones; Lower potential GW flux



VOCs

- Detections but no FAV or GSI exceedances of VOCs for Q3 2024
- One GSI exceedance of VOCs for Q4 2024
- Elevated RLs in PZ-03D, will work with lab on lowering RLs during subsequent sampling

BOLD = GSI criteria exceedance
Underline = FAV exceedance
 All concentration units are $\mu\text{g/L}$
 ND = non-detect
 Not Bold = detect < criteria

Criteria	GSI	FAV
Vinyl chloride	1.0	<u>17000</u>



Samples were collected at wells at the perimeter of the island, samples were not collected where groundwater may be discharging to the river. Exceedances of GSI criteria at the perimeter do not indicate a GSI compliance concern. It informs the development of the GSI compliance approach and next steps for data collection.

SVOCs

BOLD = GSI criteria exceedance

Underline = FAV exceedance

All concentration units are $\mu\text{g/L}$

ND = non-detect

Not Bold = detect < criteria

J = estimated concentration less than the quantitation limit

**No FAV
Exceedances**



Criteria	GSI	FAV
Bis(2-chloroethyl)ether (Bis2ce)	1.0	--
3 & 4 Methylphenol (3&4MePh)	30	<u>450</u>
Phenanthrene	2.0	<u>11</u>
Phenol	450	<u>6800</u>
Bis(2-ethylhexyl)phthalate (Bis2ehp)	14	<u>285</u>

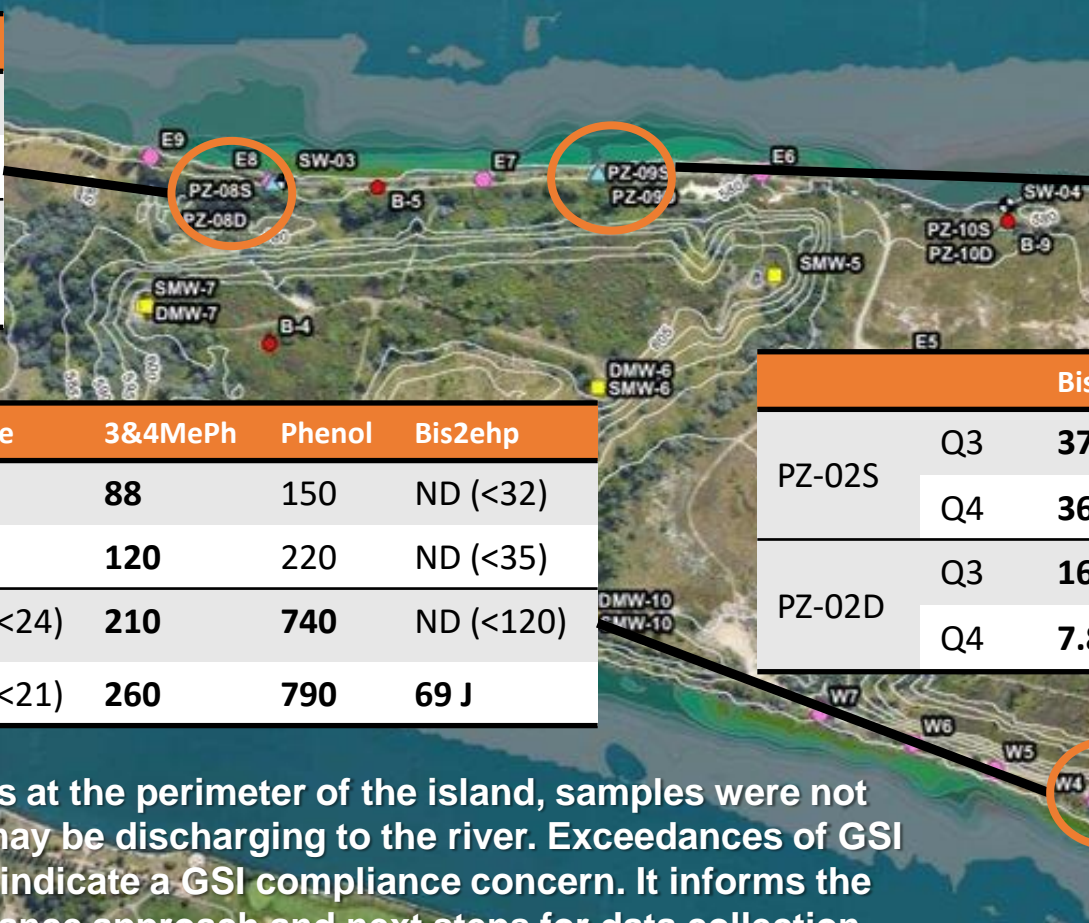
		Bis2CE	Phenanthrene
PZ-08S	Q3	25	2.4 J
	Q4	16	2.2 J
PZ-08D	Q3	ND (<9.6)	ND (<19)
	Q4	ND (<10)	ND (<21)

		Bis2ce	3&4MePh
PZ-09S	Q3	9	56
	Q4	6.6	24
PZ-09D	Q3	ND (<0.96)	ND (<4.8)
	Q4	ND (<1.0)	ND (<5.0)

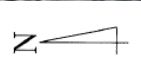
		Bis2ce	3&4MePh	Phenol	Bis2ehp
PZ-03S	Q3	110	88	150	ND (<32)
	Q4	120	120	220	ND (<35)
PZ-03D	Q3	ND (<24)	210	740	ND (<120)
	Q4	ND (<21)	260	790	69 J

		Bis2ce	3&4MePh
PZ-02S	Q3	37	65 J
	Q4	36	120
PZ-02D	Q3	16	12
	Q4	7.8	7.4 J

		Bis2ce
PZ-01S	Q3	26
	Q4	32
PZ-01D	Q3	24
	Q4	7.3



Samples were collected at wells at the perimeter of the island, samples were not collected where groundwater may be discharging to the river. Exceedances of GSI criteria at the perimeter do not indicate a GSI compliance concern. It informs the development of the GSI compliance approach and next steps for data collection.





pH and Un-ionized Ammonia

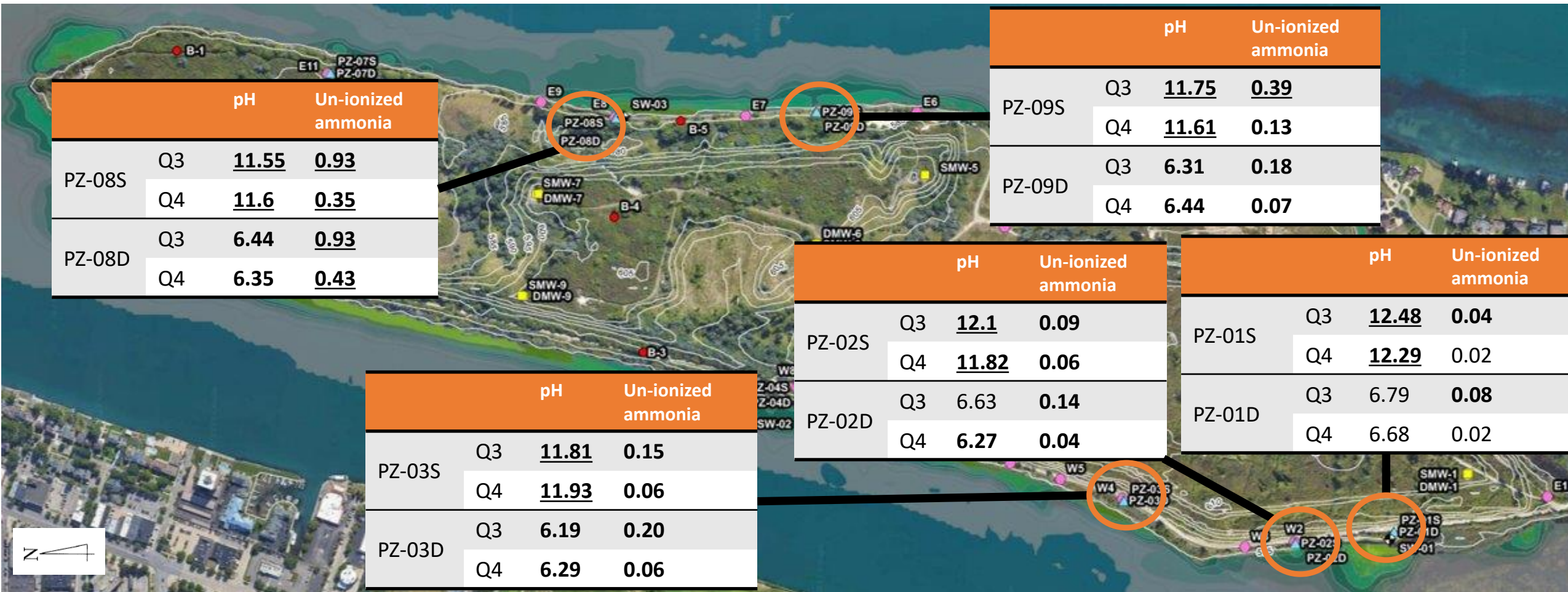
Criteria	GSI	FAV
pH	6.5-9	<u>>9</u>
Un-ionized ammonia	0.029	<u>0.32</u>

BOLD = GSI criteria exceedance (outside 6.5-9 range)

Underline = FAV exceedance

Un-ionized Ammonia concentration units mg/L

Currently assessing the best data source for temperature and pH of the Detroit River – updating pH and temp data could change exceedances of un-ionized ammonia, but does not change overall compliance approach for un-ionized ammonia. Current pH used is from Arcadis US, Inc., Request for a Site-Specific Final Acute Value for Un-ionized Ammonia in the Detroit River at Point Hennepin Memo. January 17, 2008



Samples were collected at wells at the perimeter of the island, samples were not collected where groundwater may be discharging to the river. Exceedances of GSI criteria at the perimeter do not indicate a GSI compliance concern. It informs the development of the GSI compliance approach and next steps for data collection.

Chloride

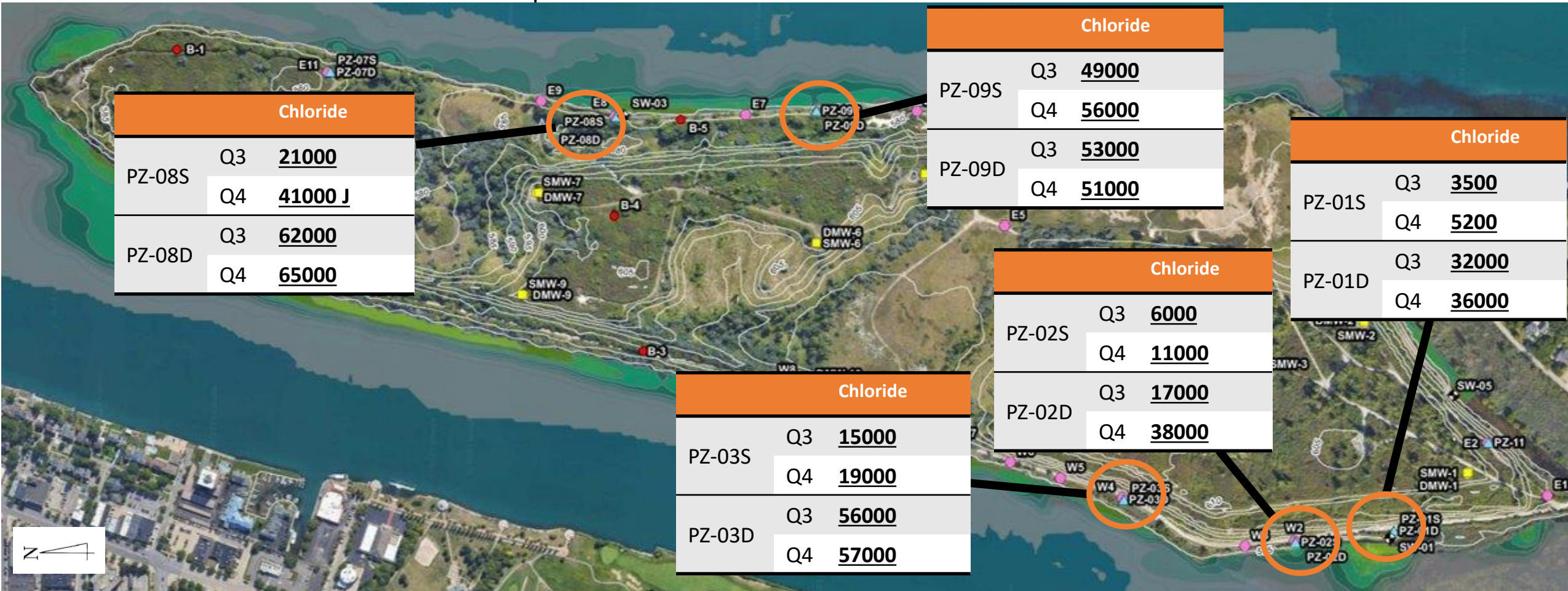
BOLD = GSI criteria exceedance

Underline = FAV exceedance

All concentration units are mg/L

J = estimated concentration less than the quantitation limit

Criteria	GSI	FAV
Chloride	50	<u>640</u>



Samples were collected at wells at the perimeter of the island, samples were not collected where groundwater may be discharging to the river. Exceedances of GSI criteria at the perimeter do not indicate a GSI compliance concern. It informs the development of the GSI compliance approach and next steps for data collection.

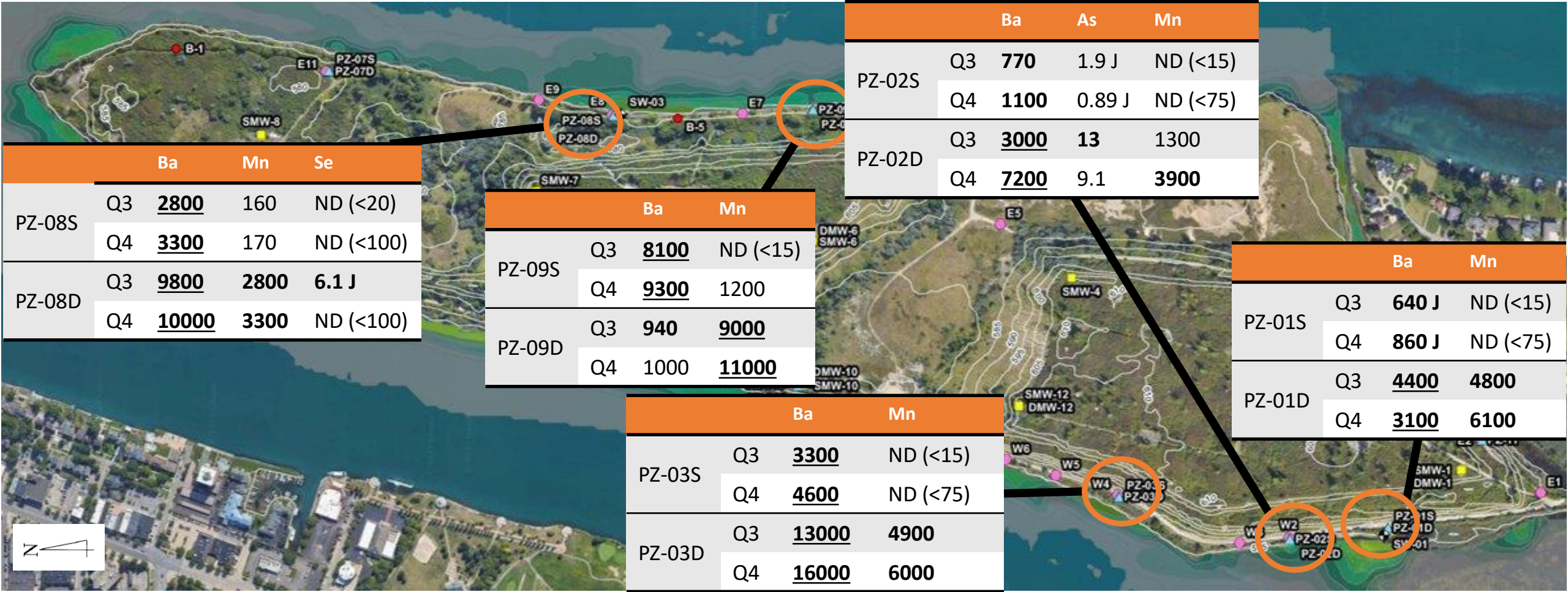


Metals -Total

Criteria	GSI	FAV*
Arsenic (As)	10	<u>680</u>
Barium (Ba)	440	<u>2500</u>
Manganese (Mn)	1300	<u>8500</u>
Selenium (Se)	5	<u>120</u>

*A hardness value of 100 mg/L and a pH of 7.8 were used in calculations, as applicable

BOLD = GSI criteria exceedance
Underline = FAV exceedance
 ND = Non-detect
 Not Bold = detect < or = to criteria
 NA = not applicable
 J = estimated concentration less than the quantitation limit
 All concentration units are µg/L



		Ba	Mn	Se
PZ-08S	Q3	<u>2800</u>	160	ND (<20)
	Q4	<u>3300</u>	170	ND (<100)
PZ-08D	Q3	<u>9800</u>	2800	6.1 J
	Q4	<u>10000</u>	3300	ND (<100)

		Ba	Mn
PZ-09S	Q3	<u>8100</u>	ND (<15)
	Q4	<u>9300</u>	1200
PZ-09D	Q3	940	<u>9000</u>
	Q4	1000	<u>11000</u>

		Ba	Mn
PZ-03S	Q3	<u>3300</u>	ND (<15)
	Q4	<u>4600</u>	ND (<75)
PZ-03D	Q3	<u>13000</u>	4900
	Q4	<u>16000</u>	6000

		Ba	As	Mn
PZ-02S	Q3	770	1.9 J	ND (<15)
	Q4	1100	0.89 J	ND (<75)
PZ-02D	Q3	<u>3000</u>	13	1300
	Q4	<u>7200</u>	9.1	3900

		Ba	Mn
PZ-01S	Q3	640 J	ND (<15)
	Q4	860 J	ND (<75)
PZ-01D	Q3	<u>4400</u>	4800
	Q4	<u>3100</u>	6100

Samples were collected at wells at the perimeter of the island, samples were not collected where groundwater may be discharging to the river. Exceedances of GSI criteria at the perimeter do not indicate a GSI compliance concern. It informs the development of the GSI compliance approach and next steps for data collection.

Metals -Dissolved

Criteria	GSI	FAV*
Chromium (Cr)	11	<u>32</u>
Lead (Pb)	14	<u>240</u>
Mercury (Hg)	0.0013	<u>2.8</u>
Nickel (Ni)	52	<u>940</u>

*A hardness value of 100 mg/L and a pH of 7.8 were used in calculations, as applicable

BOLD = GSI criteria exceedance

Underline = FAV exceedance

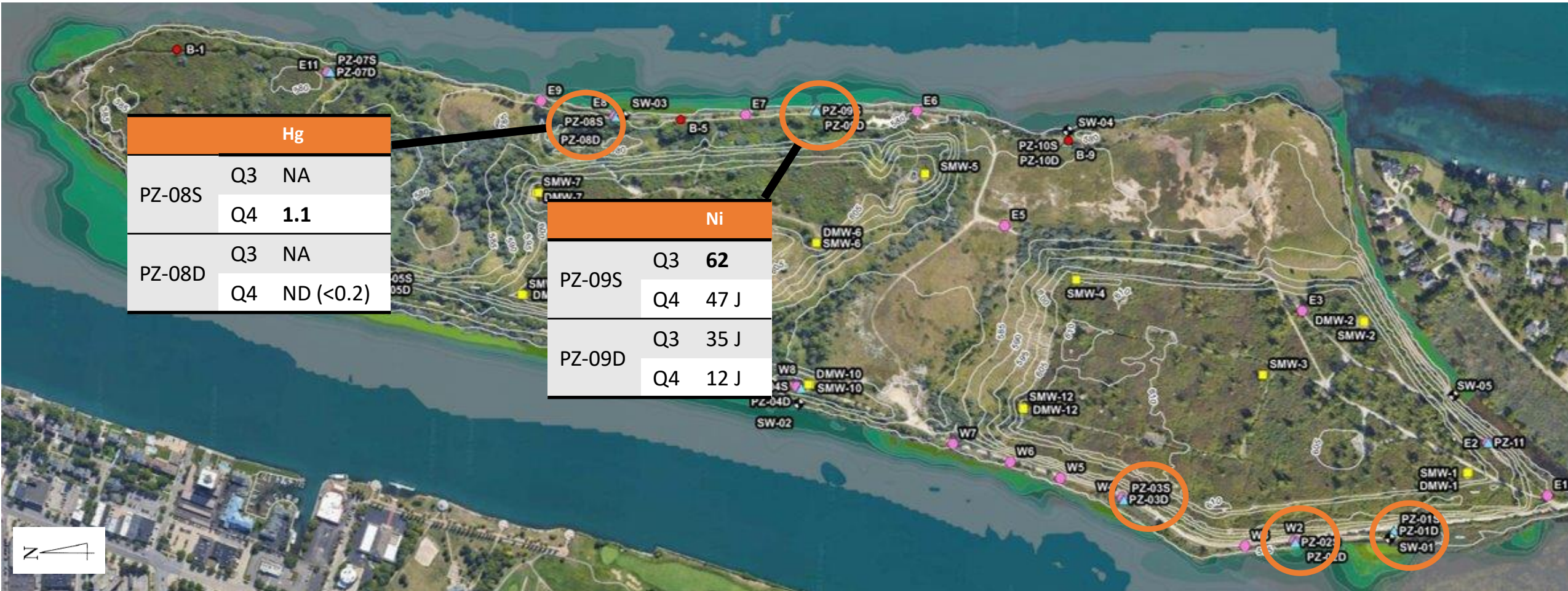
ND = Non-detect

Not Bold = detect < or = to criteria

NA = not applicable

J = estimated concentration less than the quantitation limit

All concentration units are µg/L



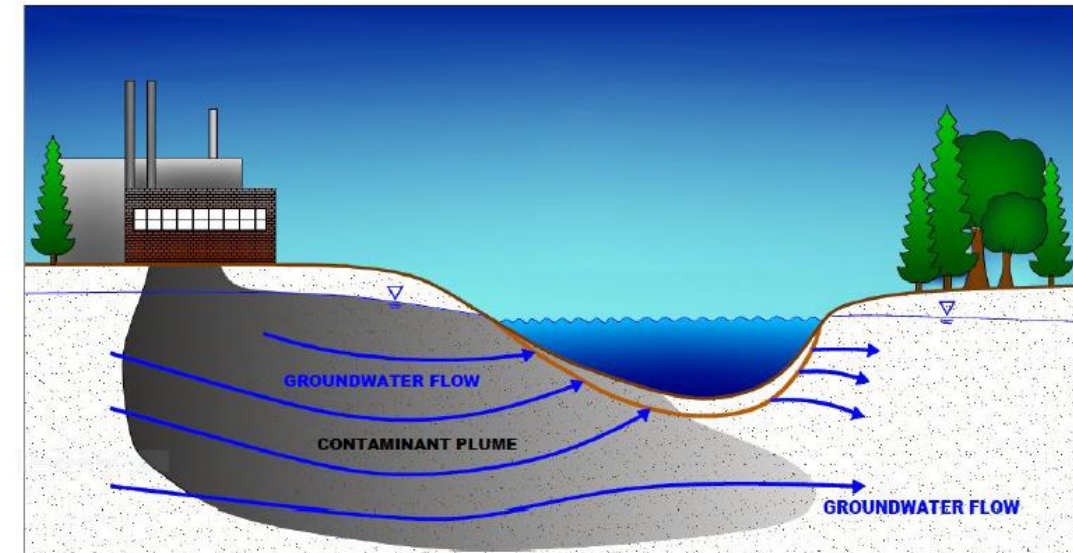
Samples were collected at wells at the perimeter of the island, samples were not collected where groundwater may be discharging to the river. Exceedances of GSI criteria at the perimeter do not indicate a GSI compliance concern. It informs the development of the GSI compliance approach and next steps for data collection.

GSI Compliance Approach

- Potential GSI compliance approaches may include (but are not limited to):
 - ★ **Mixing zones** for COCs that are not bioaccumulative and do not exceed the final acute value for aquatic life;
 - ★ **Alternative monitoring points** designed to measure COCs in groundwater that is venting at the GSI;
 - **Ecological assessments** to evaluate the likelihood of adverse ecological effects as a result of exposure of aquatic life and/or wildlife to COCs in venting GW;
 - ★ **Modeling assessments** to determine compliance with the GSI pathway using scientifically valid modeling approaches that are calibrated and verified with site-specific field data;
 - ★ **Natural attenuation** demonstration in accordance with published reference documents;
 - ★ **Technical Impracticability** is the inability to achieve certain requirements based on engineering feasibility / reliability, cost, and risk-based considerations;
 - ★ **Passive or active remediation** where treatment is required to reduce concentrations of COCs to below applicable GSI criteria prior to groundwater venting to surface water.
- Samples were collected at wells at the perimeter of the island, samples were not collected where groundwater may be discharging to the river. Exceedances of GSI criteria at the perimeter do not indicate a GSI compliance concern. It informs the development of the GSI compliance approach and next steps for data collection.

GROUNDWATER-SURFACE WATER INTERFACE PATHWAY COMPLIANCE OPTIONS

REMEDIATION AND REDEVELOPMENT DIVISION
RESOURCE MATERIALS



Adapted from US EPA, Proceedings of the Groundwater/Surface-Water Interactions Workshop, EPA/542/R-00/007, July 2000

**EGLE GSI TAPs Team Input
will be critical during the
development of Phase 2**

SUMMARY AND PATH FORWARD

Summary

- Hydraulic evaluation of the channel on the south side of the island resulted in a lower priority area
- From the samples that were collected at inland monitoring wells (not collected where groundwater may be discharging to the river):
 - Limited exceedances of FAV criteria for un-ionized ammonia
 - Currently assessing the best data source for temperature and pH of the Detroit River – updating pH and temp data could change exceedances of un-ionized ammonia, but does not change overall compliance approach for un-ionized ammonia
 - Elevated pH limited to shallow interval
 - Hg detected at one location at PZ-08S in Q4 – need to confirm this result.
 - Manganese, chloride, and barium exceedances similar to Q3 data.

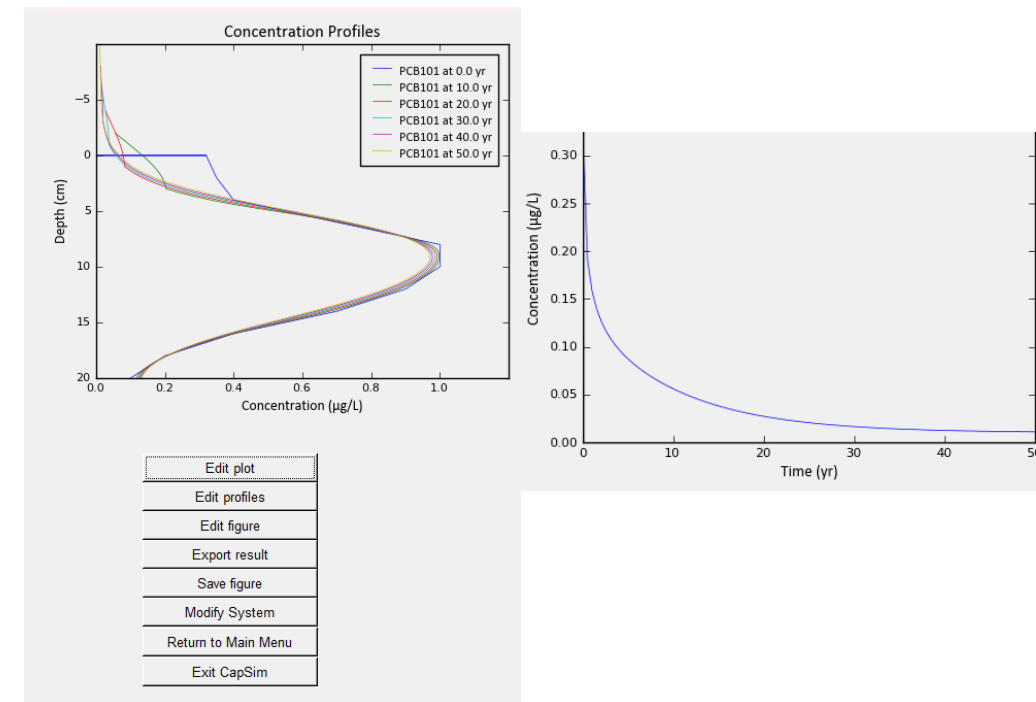
Natural Attenuation Modelling

- Potential approach for barium, chloride, and manganese
- Anticipate using CapSIM model to simulate 1D horizontal flow from the shoreline to the river
- Simulation of natural attenuation processes by incorporating key mechanisms, such as advection, diffusion, dispersion (with corrections for tortuosity), and biogeochemical interactions in both the groundwater and solid phases
- Sensitivity analysis would be conducted to provide insight into how the simulated base scenario varies with adjustments to key parameters



CapSIM

CapSIM is a model for contaminant fate and transport. It has been widely-applied to evaluate remedial options, including natural attenuation.



Examples for Illustration Purposes

Biostimulation – Sulfate Addition

- The assimilative consumption of trivalent nitrogen (ammonium and un-ionized ammonia) by indigenous microbial populations appears to be consuming and controlling nitrogen concentrations in most of the monitor wells at the site
- Dissolved sulfate levels maybe be limiting the indigenous microbes from consuming trivalent nitrogen (as ammonium and un-ionized ammonia)
- At PZ-08S, PZ-08D and PZ-09S dissolved sulfate concentrations are below the level required to support the activity of sulfate reducing microbes (which can consume nitrogen via assimilative pathways)
- Assessing if a bench scale study can be performed to evaluate the viability of the indigenous microbial populations to respond to the addition of sulfate to stimulate their activity, growth and consumption of nitrogen
 - Site water and soil/mineral matrix would be needed to complete the bench scale testing
 - Sulfate addition may reduce dissolved chloride and metals in groundwater, which can also be evaluated during the bench scale study



Path Forward

- Quarterly monitoring will continue Q2 2025 to evaluate trends. Looking to confirm isolated Hg detection.
- Evaluation of next steps:
 - Natural attenuation modeling for chloride, barium, mercury, and manganese
 - Evaluating biostimulation as a potential option for addressing un-ionized ammonia, chloride, and metals
 - Potential alternate GSI sampling
- Pausing isotopic evaluation of native or anthropogenic nitrogen sources – we have the information required to evaluate GSI compliance path forward.