

Conceptual Site Model Enhancement and Performance Monitoring Applications using Multi-level Groundwater Monitoring Systems

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Overview

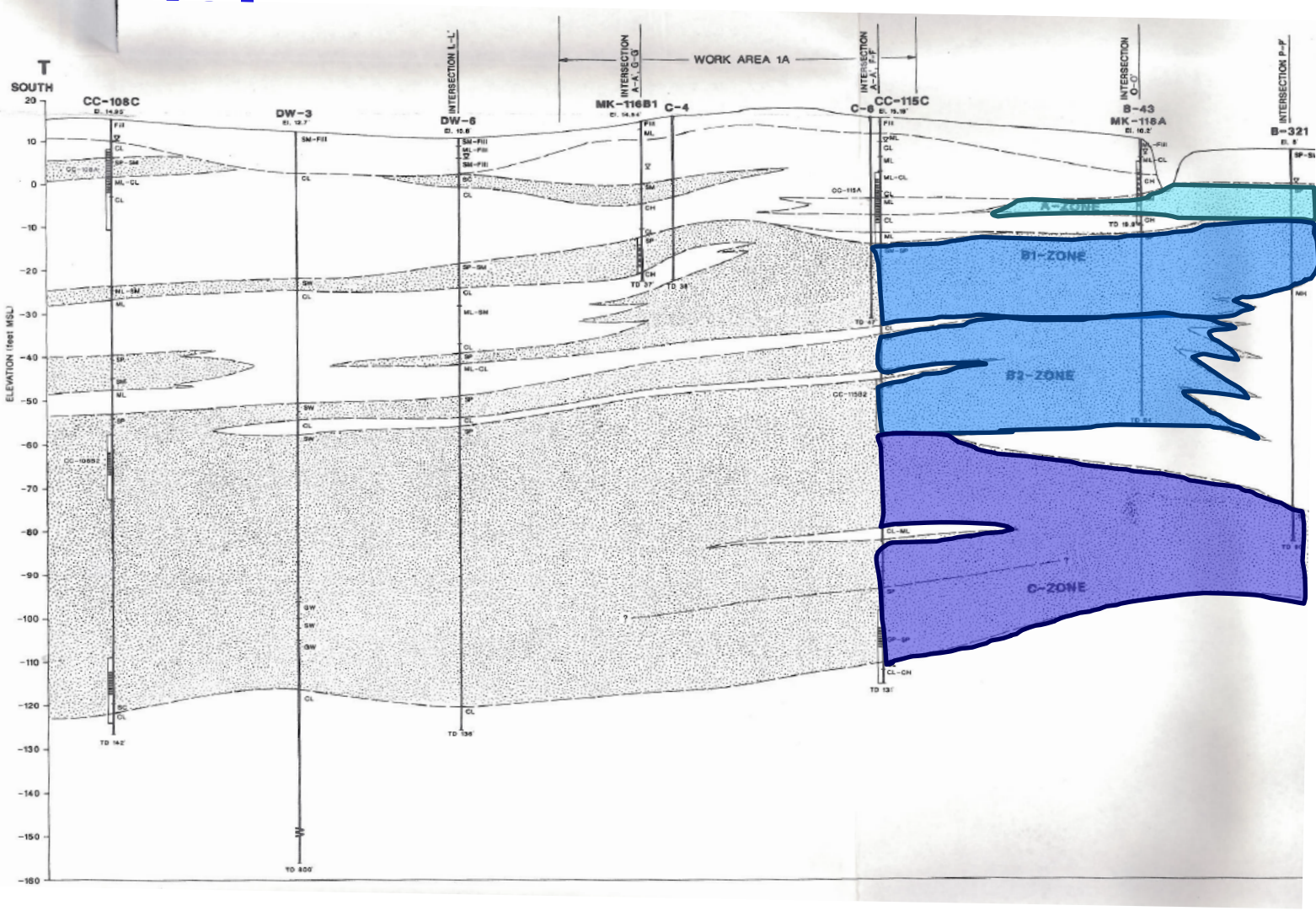
1. Site Background
2. Investigation Objectives
3. Objective-Driven
Approach
4. Findings of Investigation
5. Summary



1. Background – Geologic Setting

- Shallow fill
- Interbedded alluvium
 - Younger alluvium (finer grained)
 - Older alluvium (coarser grained)

1. Background – Legacy Conceptual Site



- A-Zone
- B1-Zone
- B2-Zone
- C-Zone

2. Investigation Objectives

- A. Improve our understanding of stratigraphy.
- B. Establish a network of data points for the study of horizontal and vertical hydraulic gradients.
 - 1. Use hydraulic head profiles to help delineate hydrogeologic units (HGU).
- C. Better define the horizontal and vertical distribution of groundwater contaminants.

3. Objective-Driven Approach

Objective A: Stratigraphy

- Roto-sonic drilling, core logging, and wireline geophysical logging

Objective B: Hydraulic Head Profiles

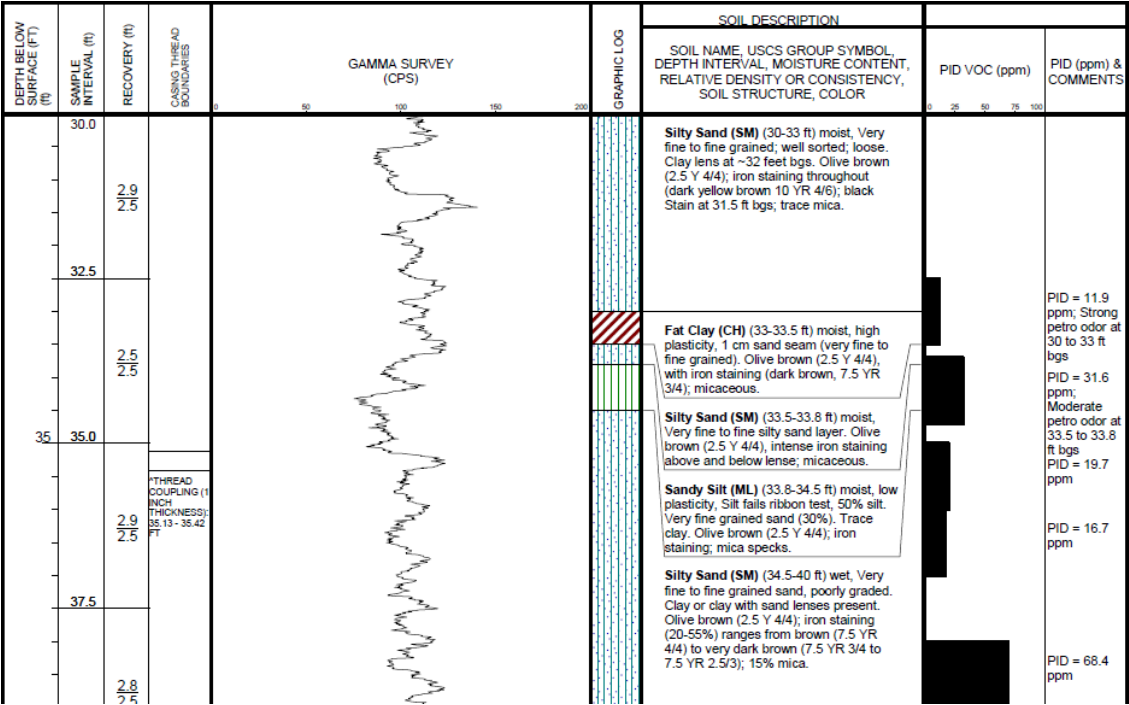
- CMT (Continuous Multichannel Tubing) well installation

Objective C: Contaminant Distribution

- Groundwater sampling of new CMT wells

3.A. Approach – Logging

- Detailed core logs
 - Soil screening with PID (photoionization detector)
- Wireline geophysical logging
 - Natural gamma/total gamma



3.B.C. Approach – CMT Well Installation



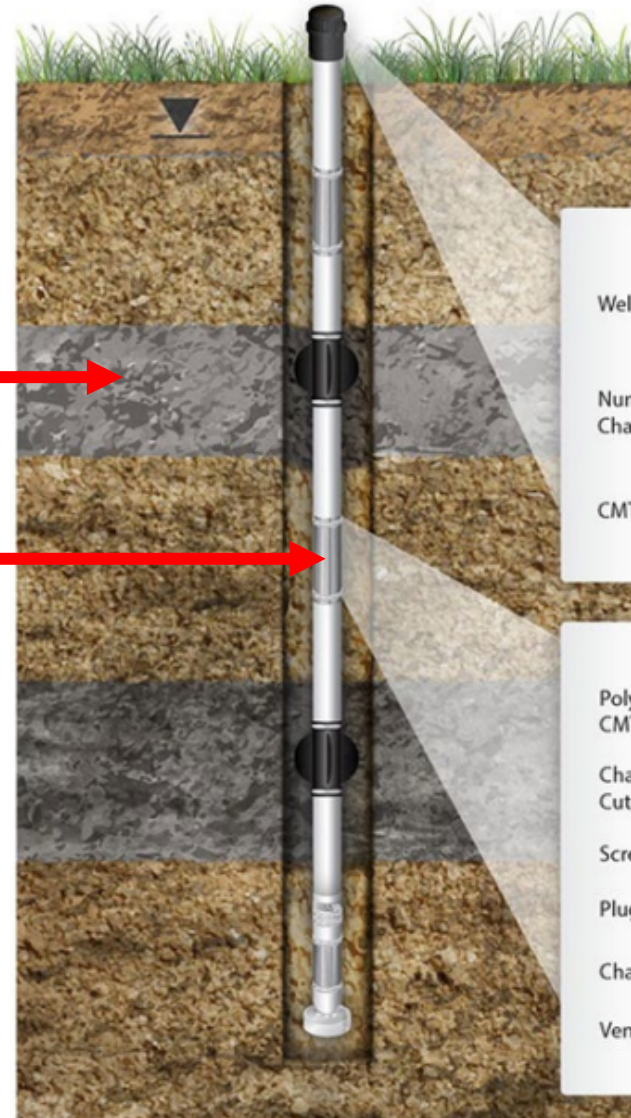
3.B.C. Approach – Multilevel Monitoring Wells

- 4 locations
- 1 CMT system per location
 - 7 ports per system



Bentonite
Seal

Screen



Well Cap

Numbered
Channel

CMT Wellhead

Polyethylene
CMT Tubing

Channel
Cutout

Screen

Plug

Channel Identifier

Vent Hole

Oetiker Clamps

4.A. Findings – CMT Port Depth Selection

Courtesy of Arcadis

CMT-1

CMT-2

CMT-3

CMT-4

0

50

100

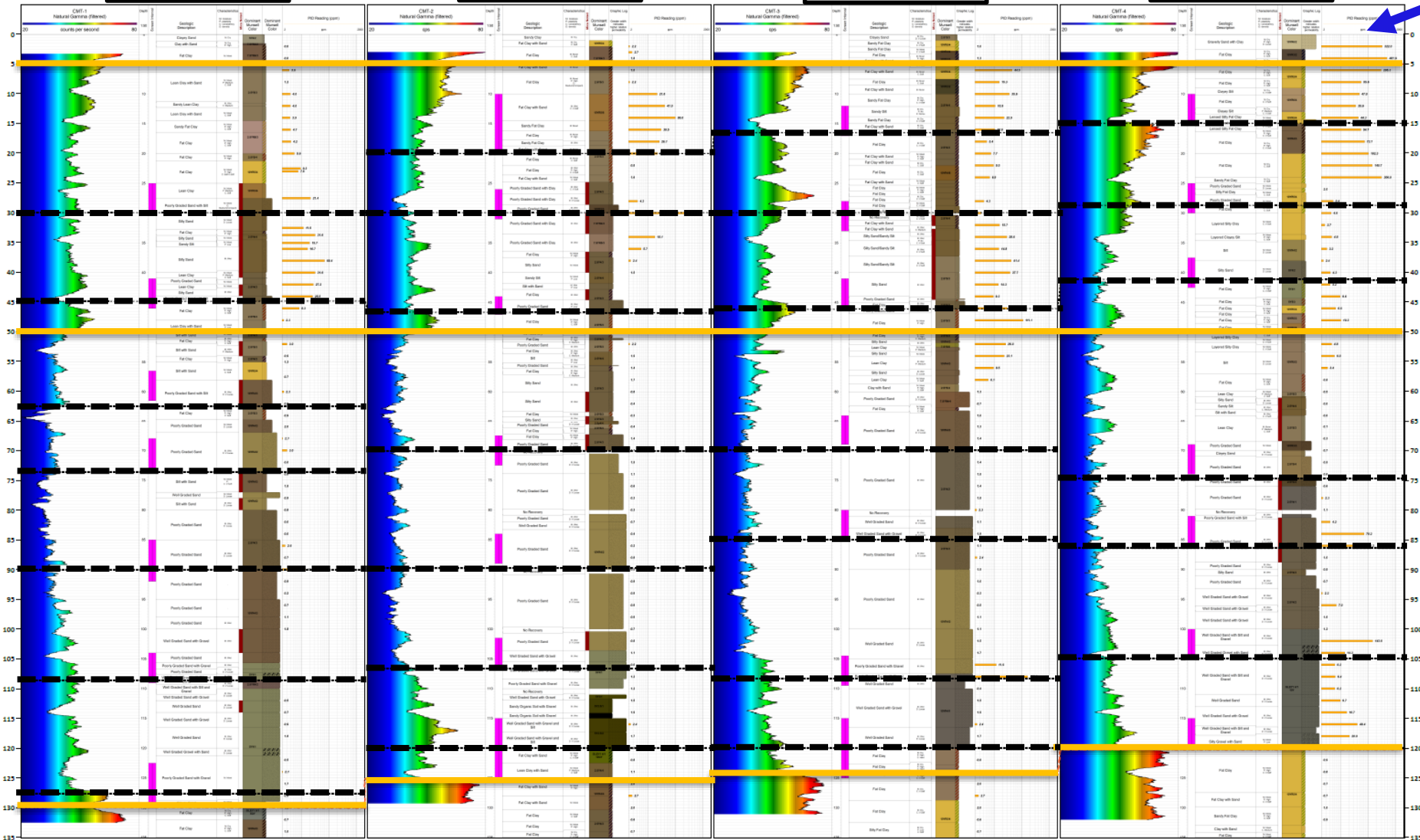
130

Depth (feet)

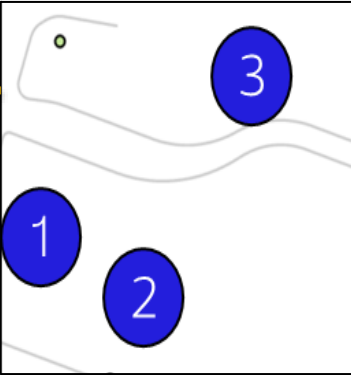
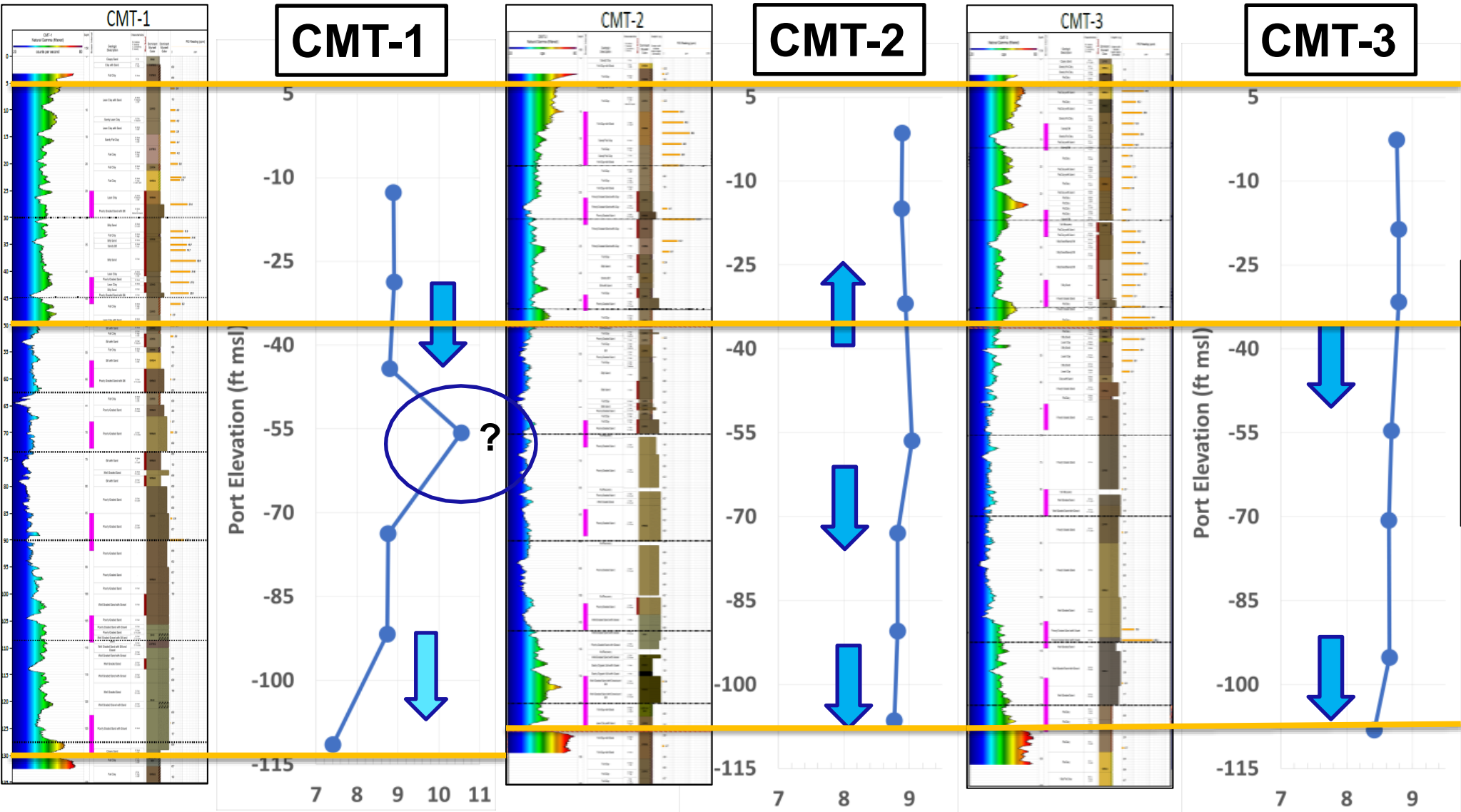
Horizon A

Horizon B

Horizon C

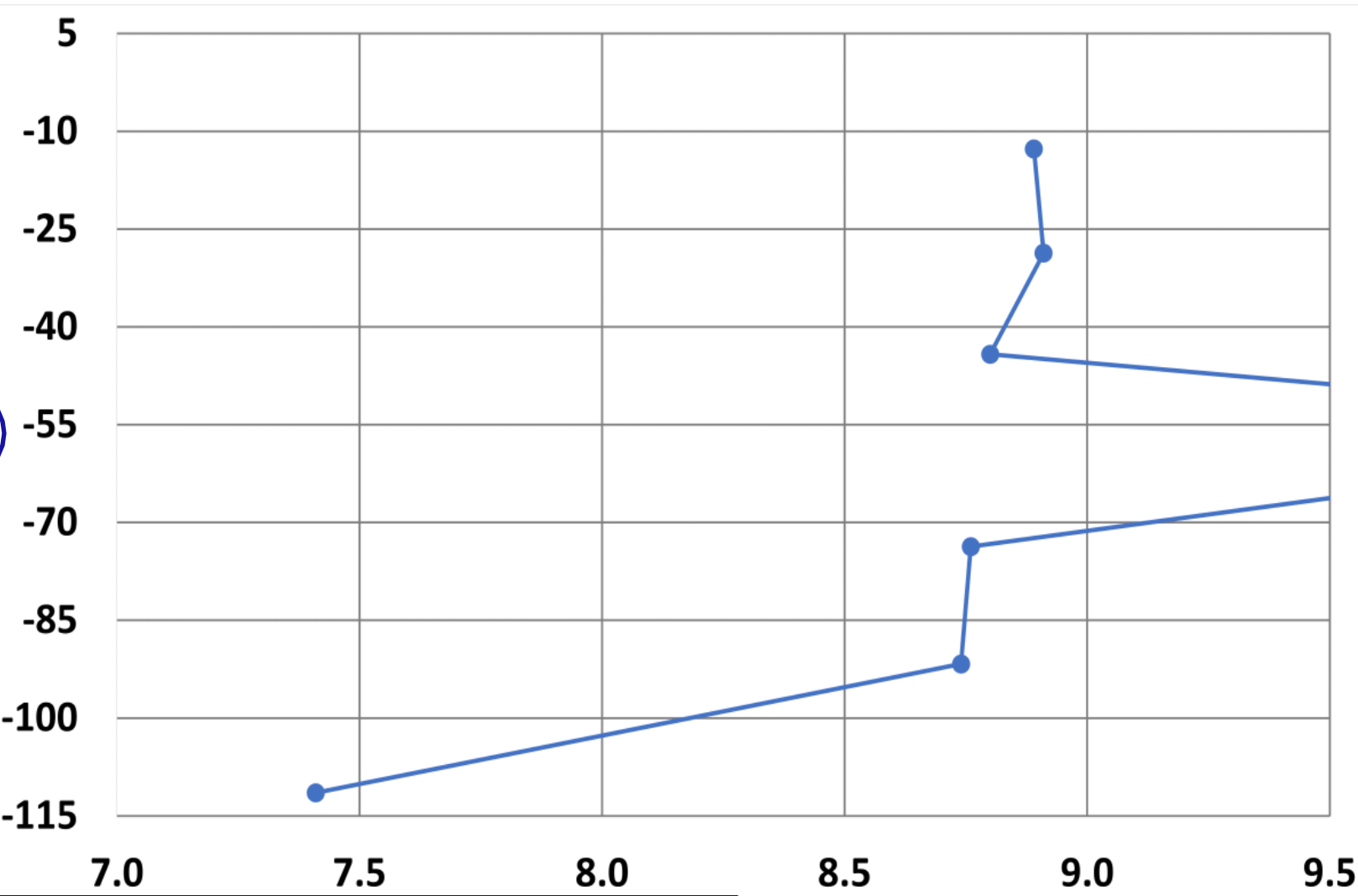
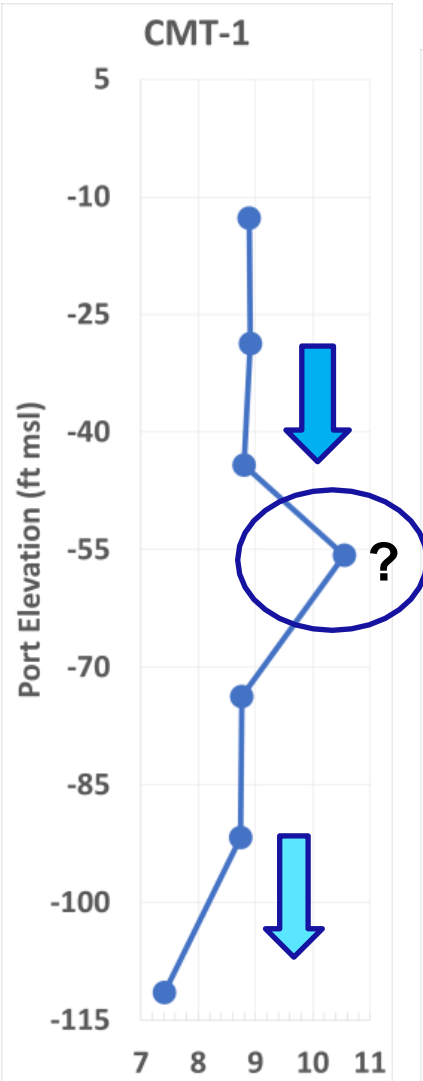
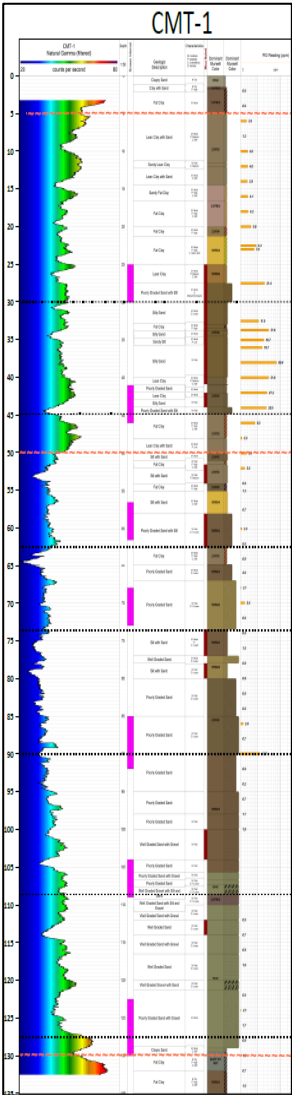


4.B. Findings – Hydrogeology Observations



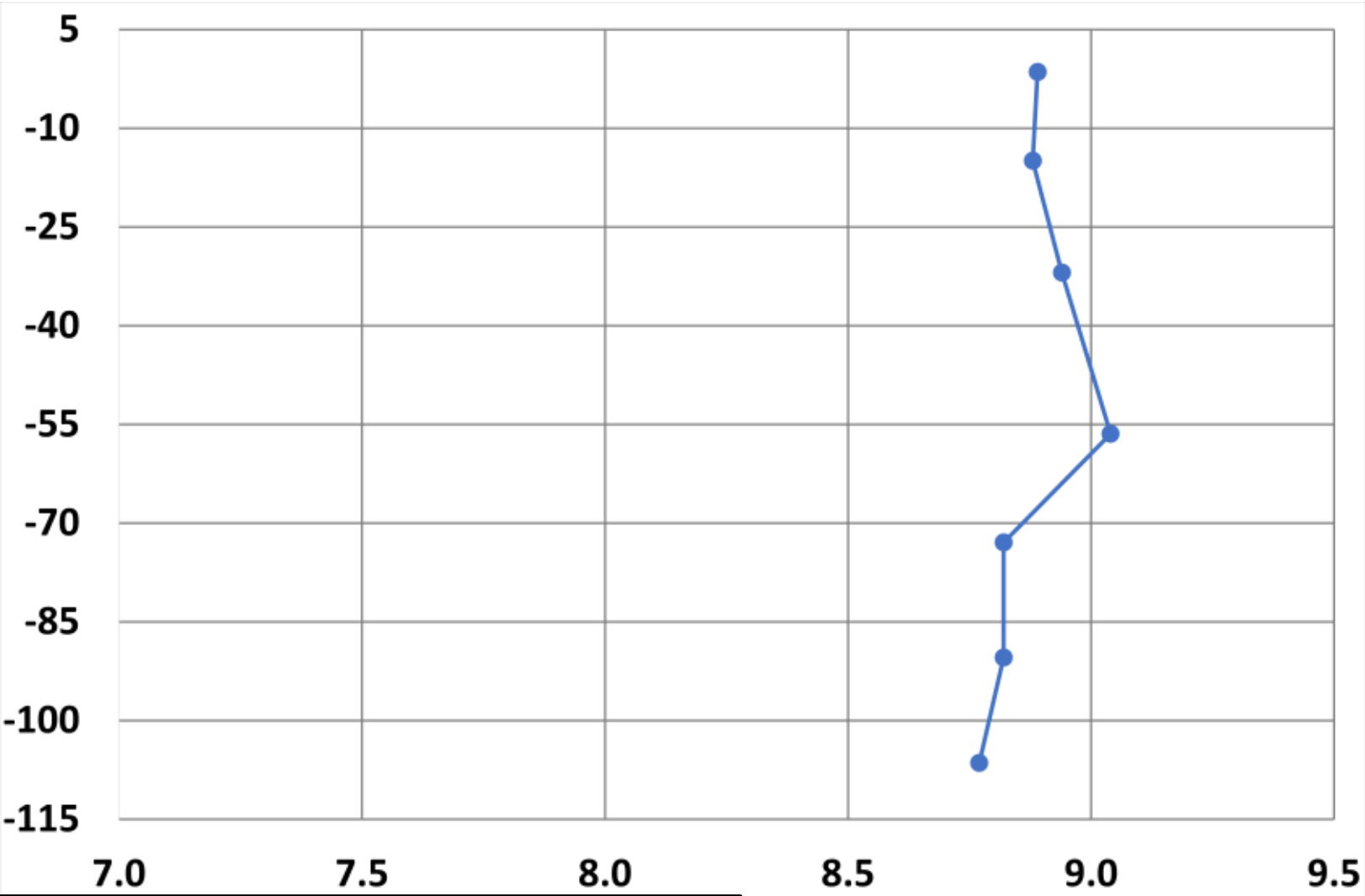
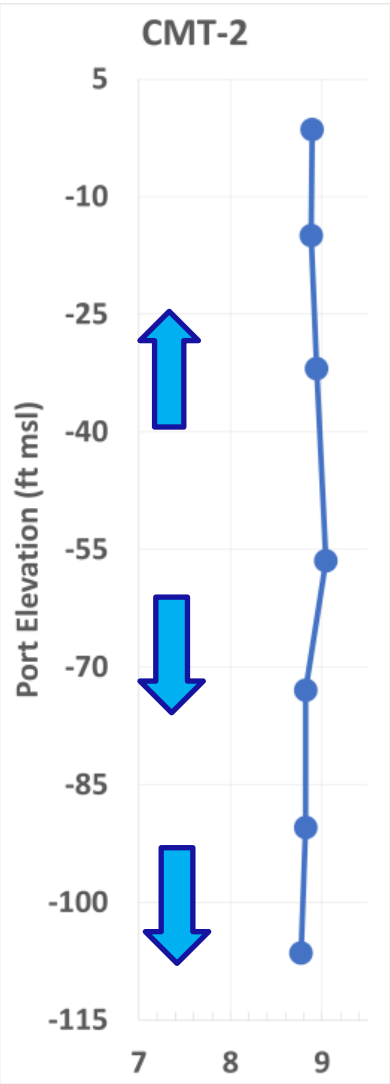
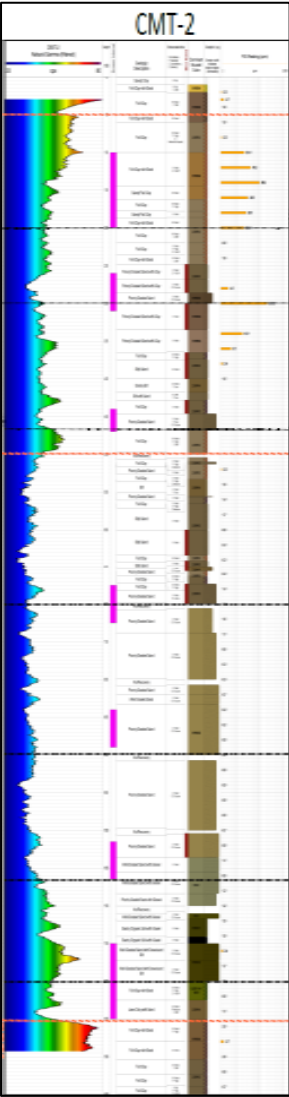
Groundwater Elevation (ft msl)

4.B. Findings – Hydrogeology Observations



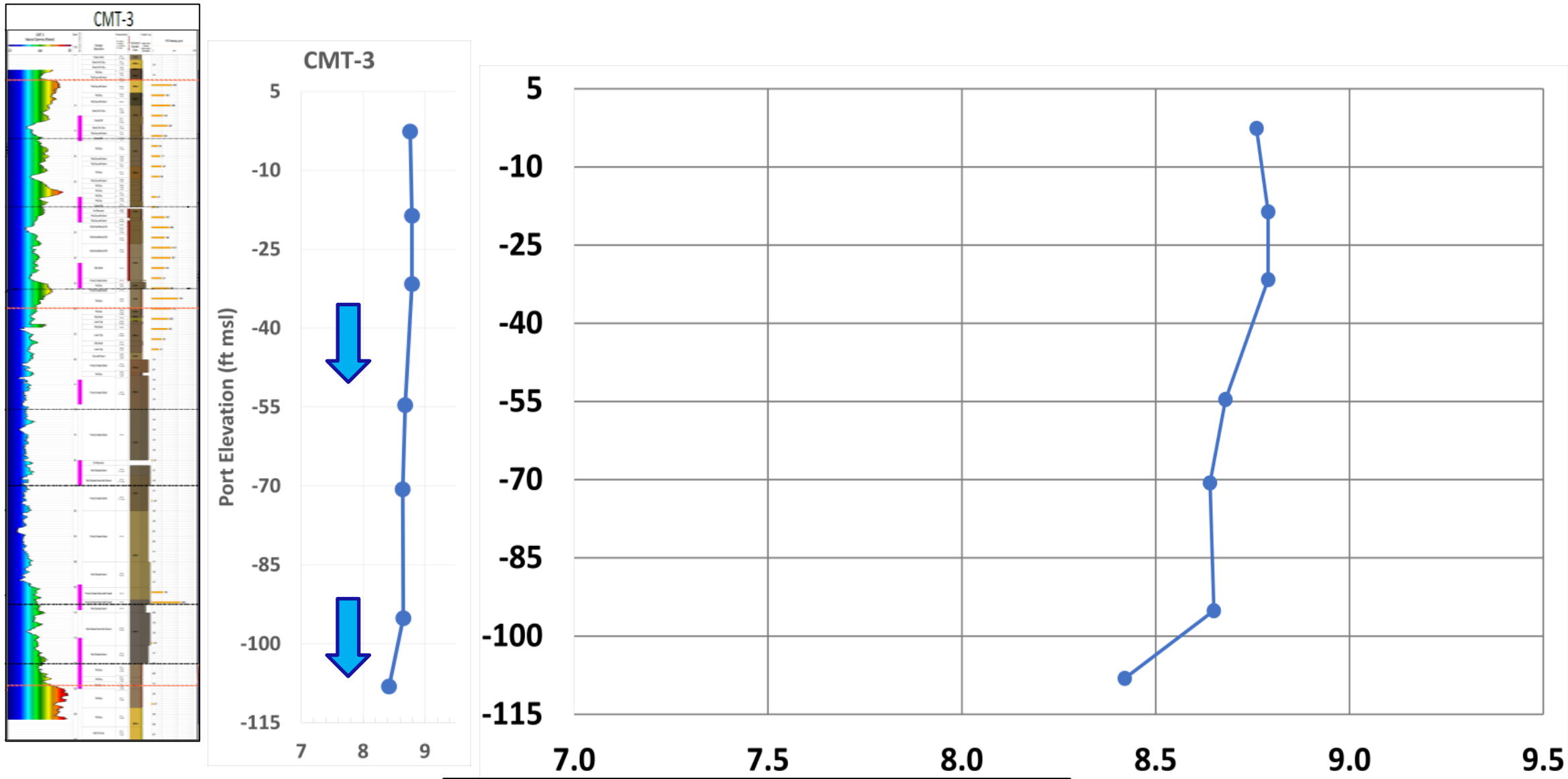
Groundwater Elevation (ft)

4.B. Findings – Hydrogeology Observations



Groundwater Elevation (ft)

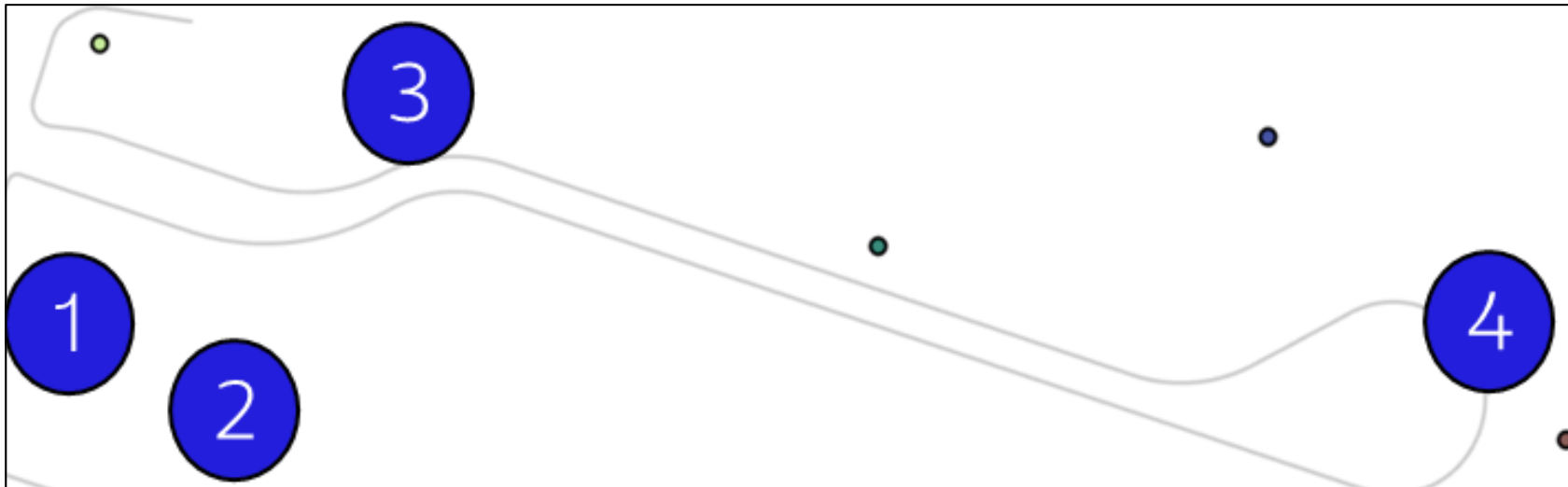
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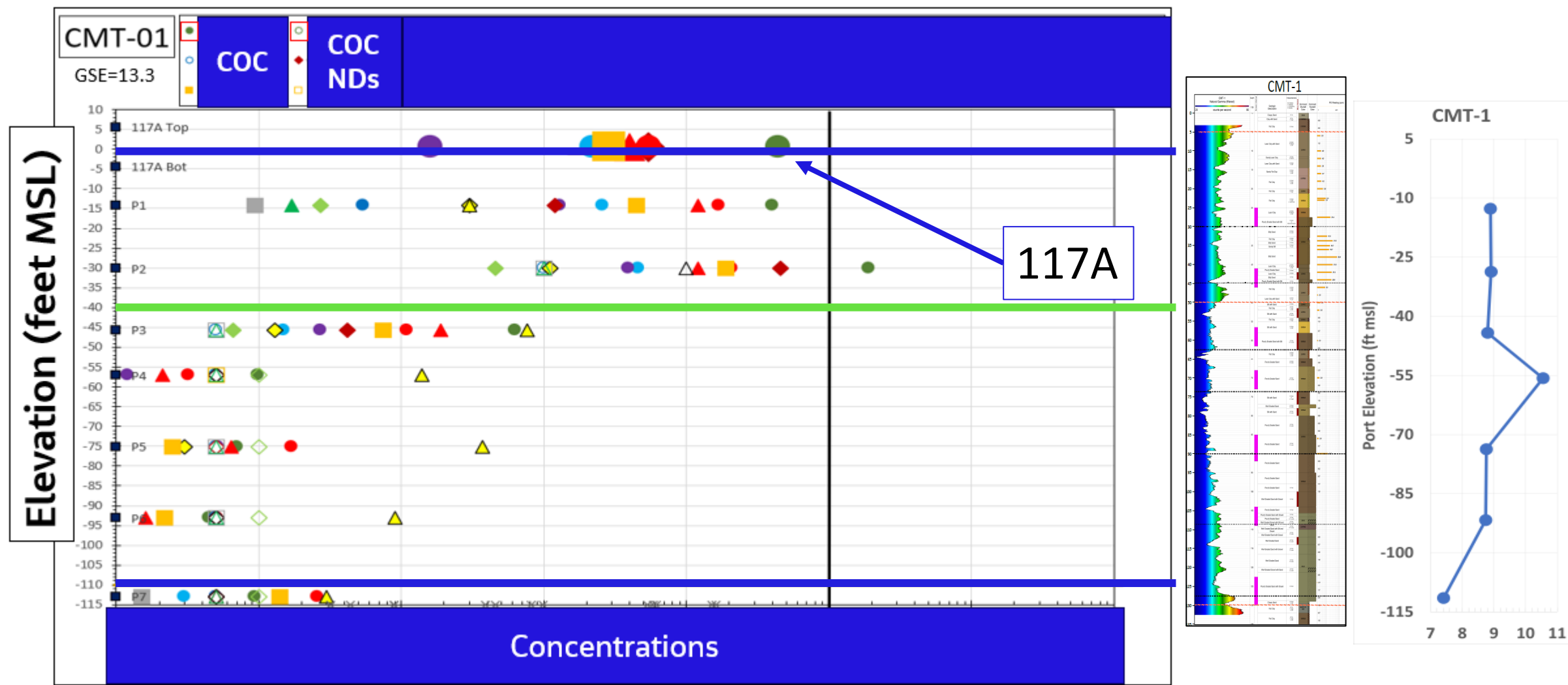
Groundwater Elevation (ft)

4.B. Findings – Hydrogeology Observations

- Refine understanding of vertical component of hydraulic gradients
 - Evaluate temporal behavior
- Path forward:
 - Define hydrogeologic units (HGU)
 - Horizontal gradients

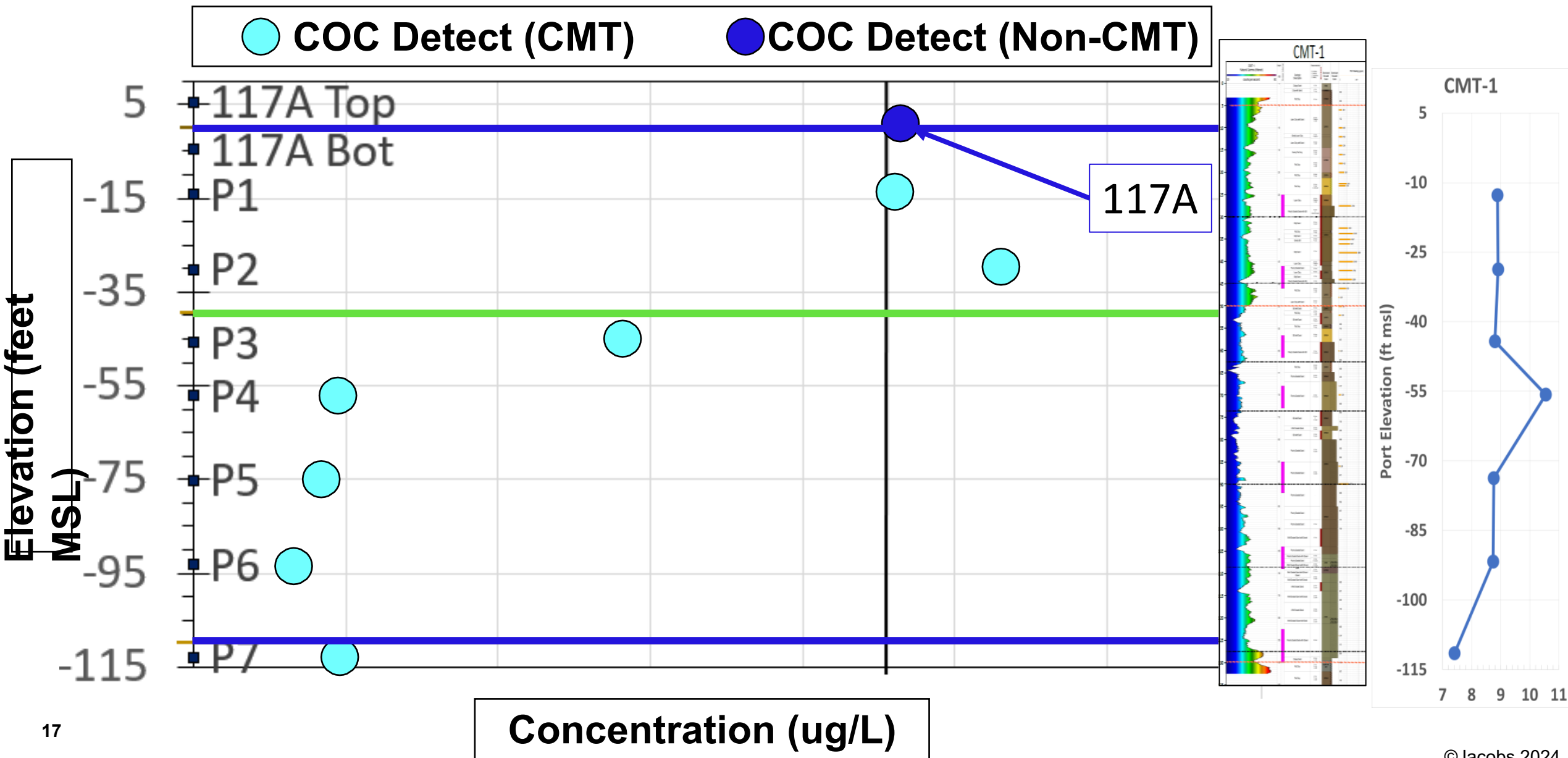


4.C. Findings – Analytical Data



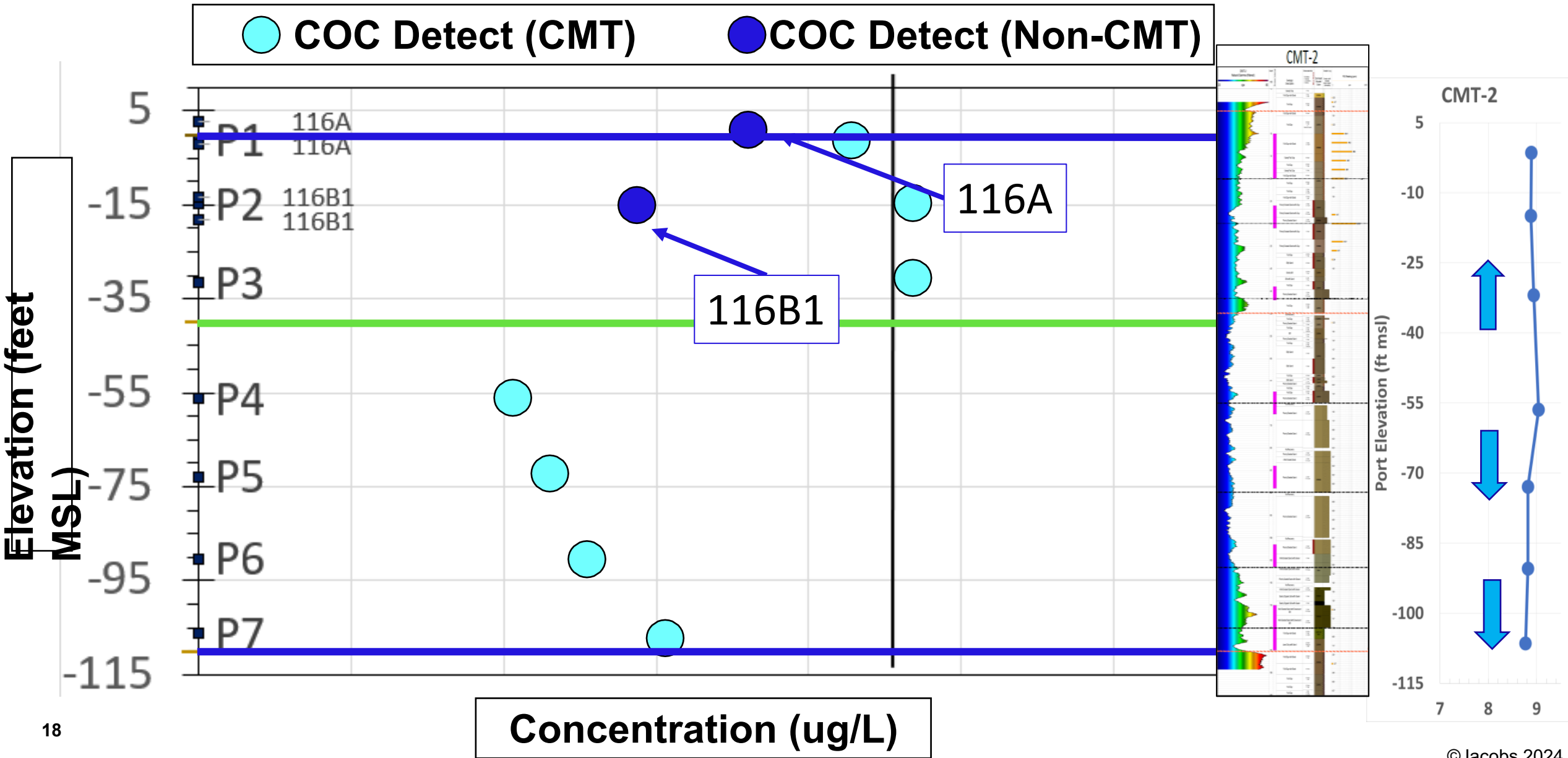
4.C. Findings – Analytical (CMT-1)

GSE=13.3



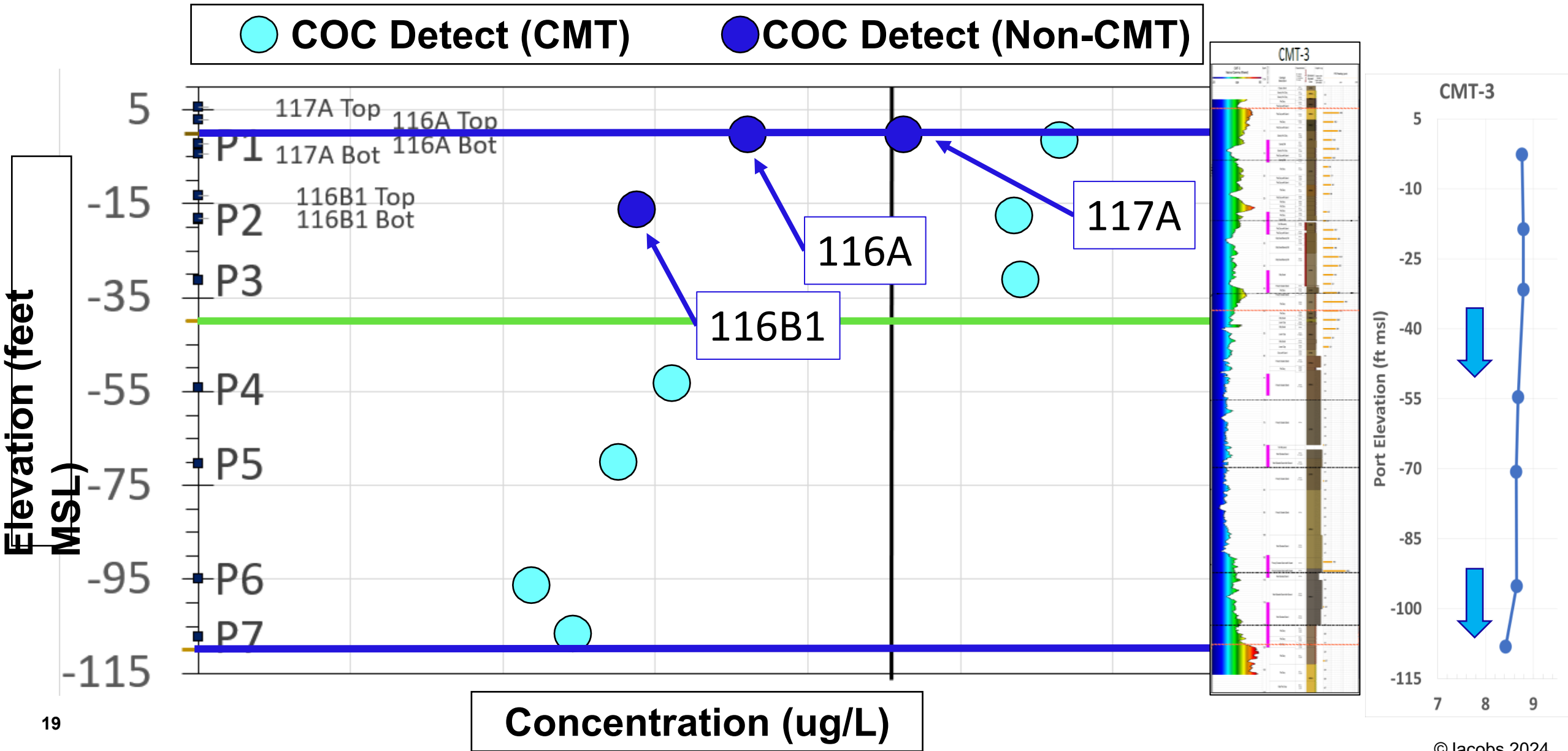
4.C. Findings – Analytical (CMT-2)

GSE=13.7



4.C. Findings – Analytical (CMT-3)

GSE=12.3



5. Summary – Findings

CMT multilevel well systems provide:

1. Ability to target specific zones of interest (“sand stringers”) with small well screen intervals.
2. Depth discrete measurements of the vertical gradient.
 - Key to delineating hydrogeologic units & confining features in a site with complex stratigraphy.
3. Better understanding of the transport and fate of contaminants through the subsurface.

Thank you

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