NAPL Mobility Beneath the Newtown Creek Study Area – Multi-Stage Testing Process and Results for Creek Mile 0 – 2

Michael Gefell

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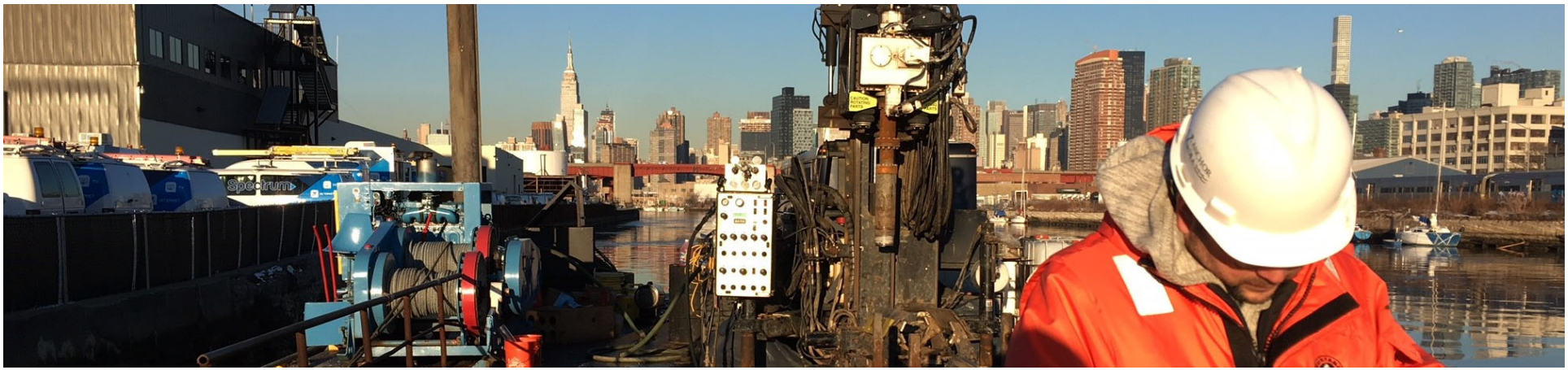
Michael Gefell
Tina Gross
Stuart Messur

Presentation Overview

- Project background
- NAPL mobility assessment objectives
- Staged NAPL mobility testing approach
- Work performed
  - Example core photographs and sample selections
- Results and conclusions



Project Background

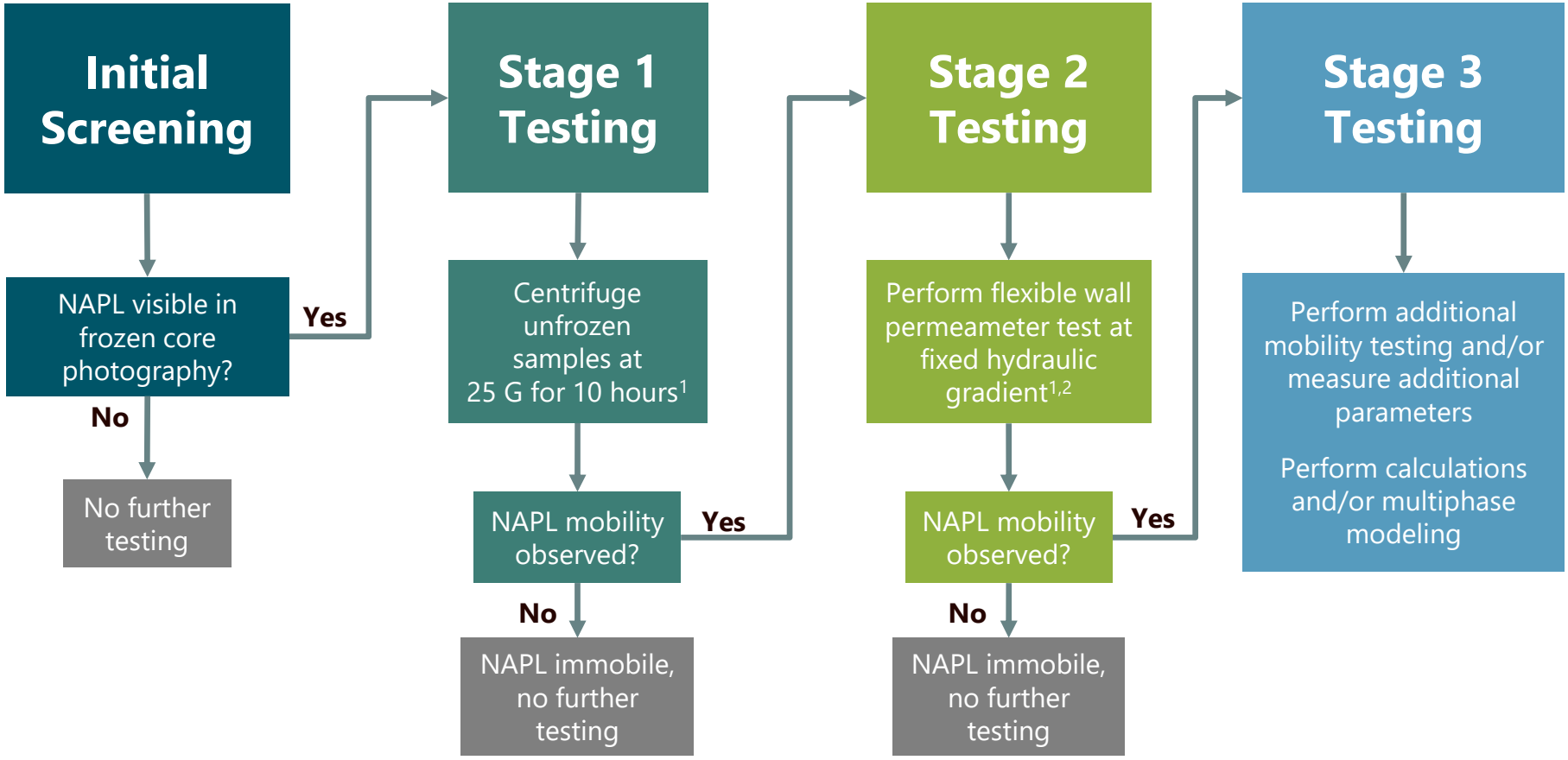
- Urban waterway, 3.8 miles long
- Soft, organic silty sediment overlies firmer native materials, including alluvium and glacial deposits

- NAPL identified in soft sediment and native deposits
  - Previous investigations delineated areas and depth intervals containing NAPL

Objectives of NAPL Mobility Assessment

- Support FS evaluation of remedial technologies and alternatives
- Characterize NAPL mobility in two areas based on previous delineation
  - Potentially mobile
  - Likely immobile

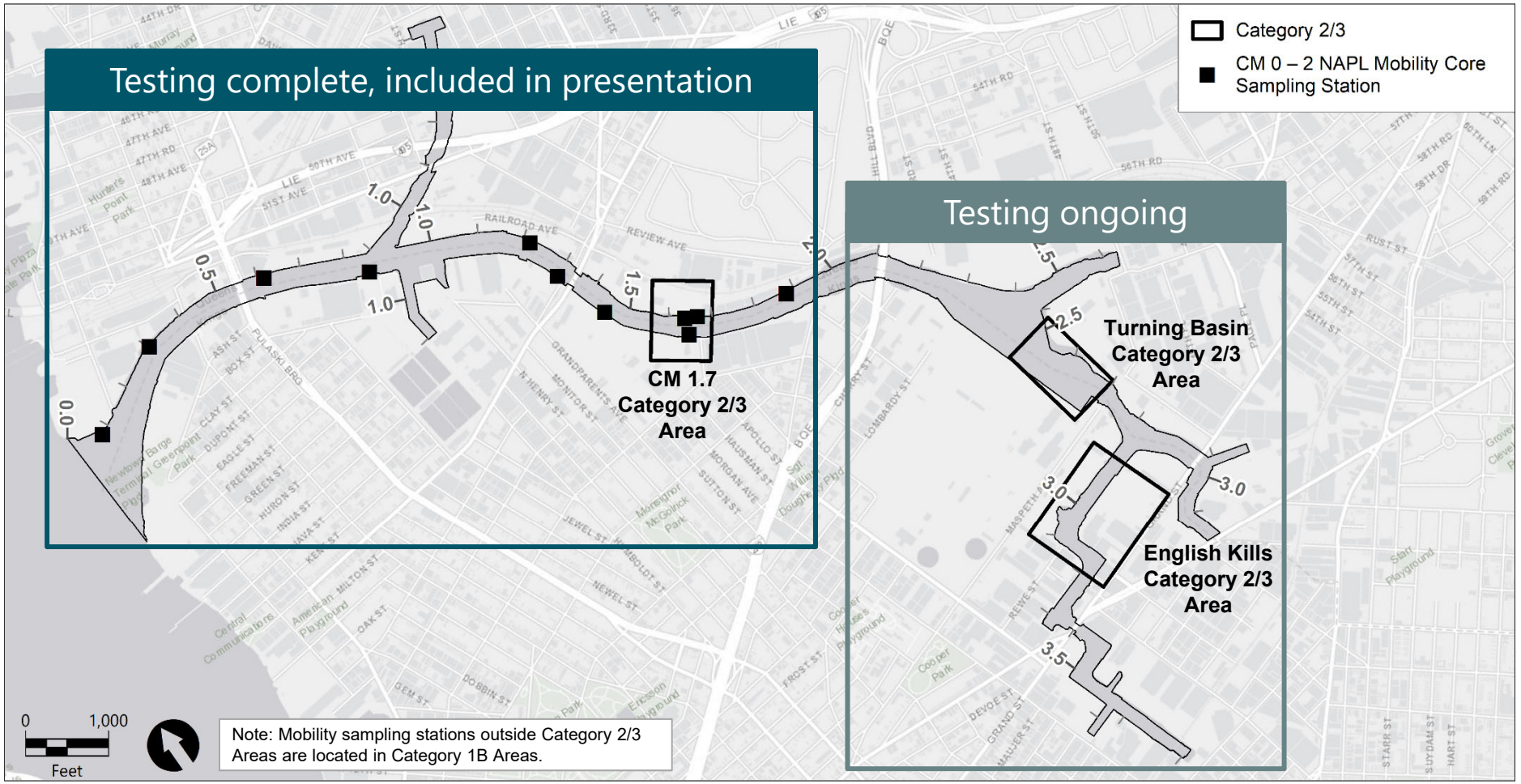
Staged NAPL Mobility Testing



Notes:
1 = Measurements include initial and final pore fluid saturations, total porosity, specific gravity, and dry bulk density by API RP40.
2 = Testing of selected core samples will be performed at a hydraulic gradient between 0.5 and 4.

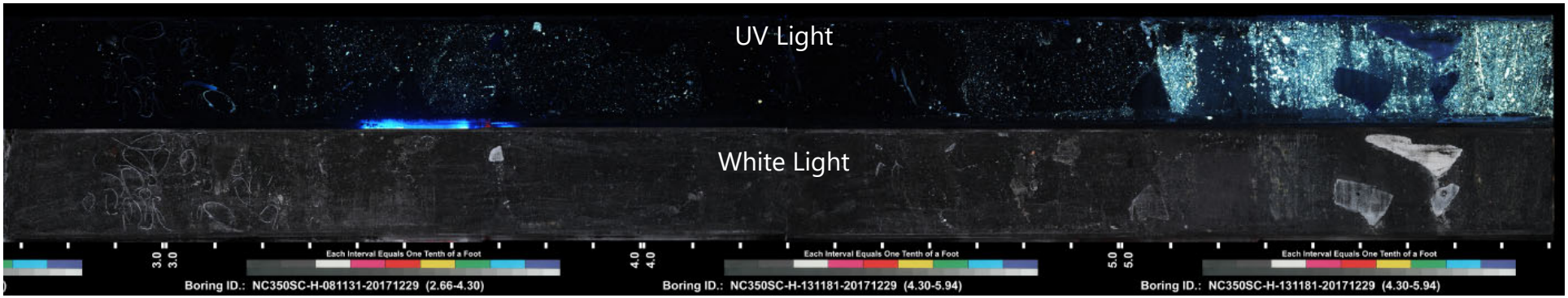
Work Performed

CM 0 – 2 NAPL Mobility Sampling Stations



Initial Screening Identification of Target Depths via Photography

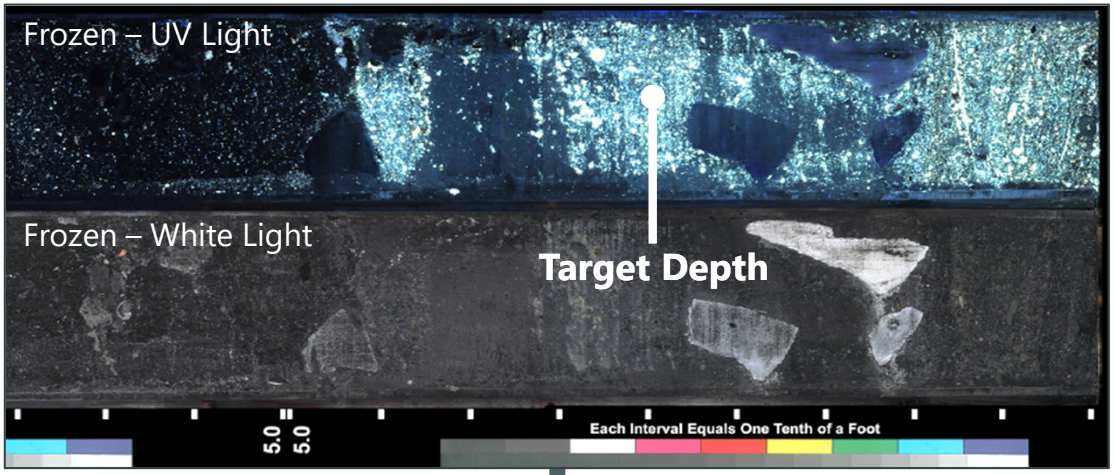
Full length of one frozen core shipped to PTS Laboratories (PTS) on dry ice for photography

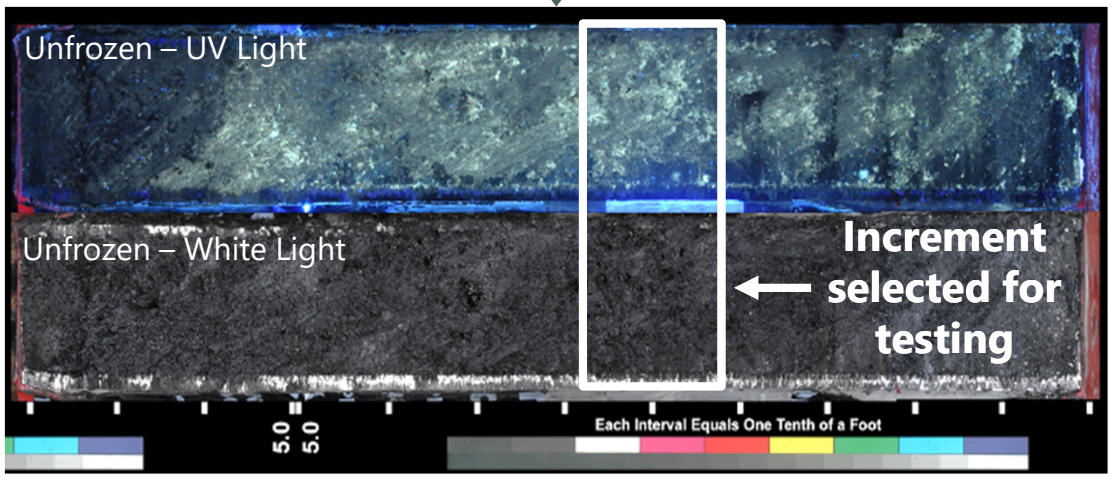


Core slabbed and photographed by PTS

Stage 1 NAPL Mobility Sample Selection

Segments from unfrozen core containing target depths shipped upright to PTS on wet ice





Mobility sample selected from unfrozen core photograph

Stage 1 NAPL Mobility Testing

- Samples centrifuged at 25 times gravity for 10 hours
  - Test gradient (25) more than 100 times stronger than upward hydraulic gradients measured in Study Area (0 to 0.23)
- Laboratory reported the following data
  - Initial and final pore fluid saturations (water and NAPL)
  - Total porosity
  - Dry bulk density
  - Grain density

Stage 2 NAPL Mobility Testing

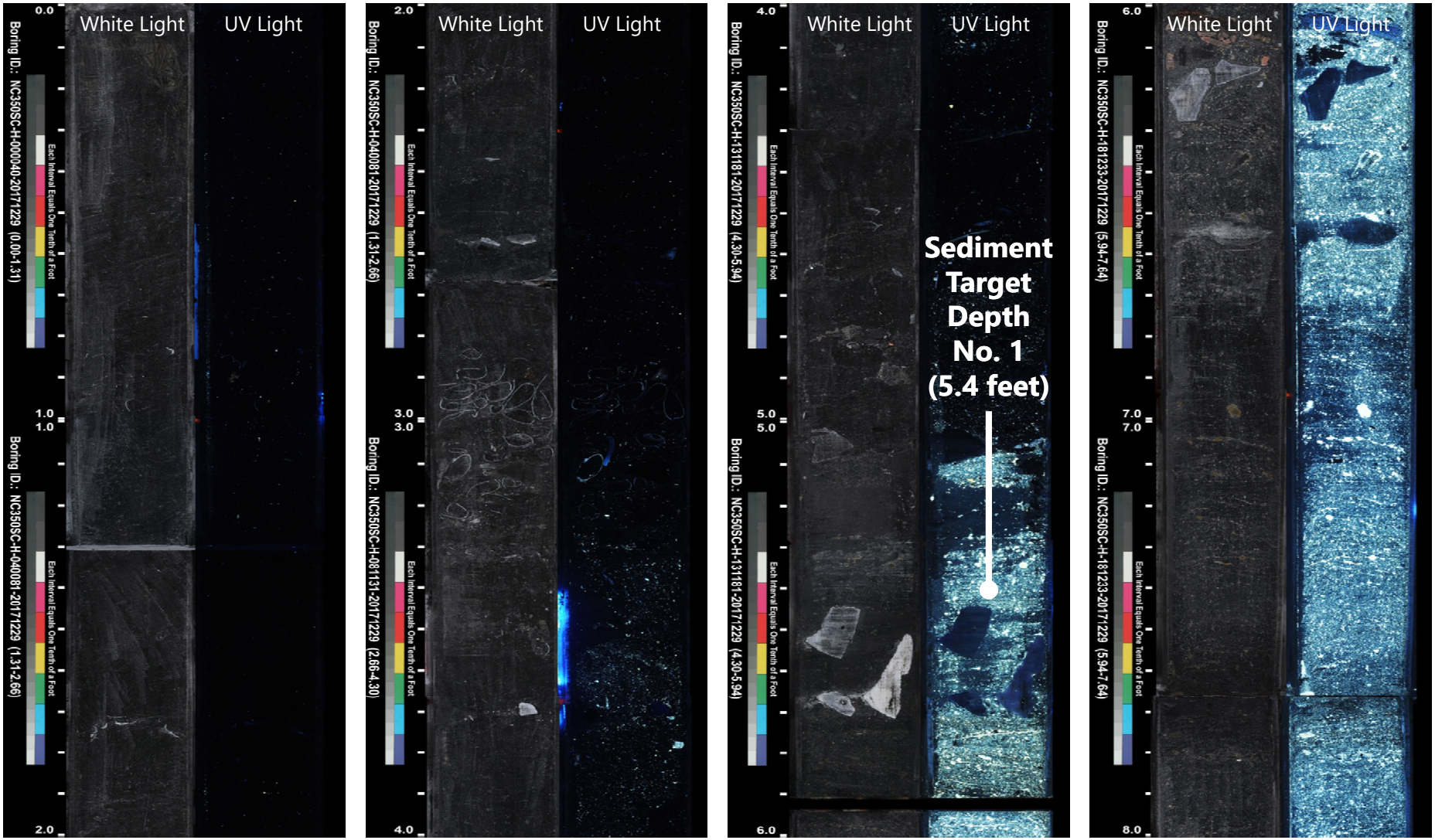
- Performed only if Stage 1 mobility observed
  - Flexible-wall permeameter water-drive test at hydraulic gradients between 0.5 and 4, for periods of days to weeks
  - Physical properties also reported

Stage 3 NAPL Mobility Testing

- Performed only if Stage 2 mobility observed
  - Evaluates potential for NAPL to migrate under field conditions
    - Additional testing of mobility and/or relevant physical parameters
    - Calculations or multi-phase modeling

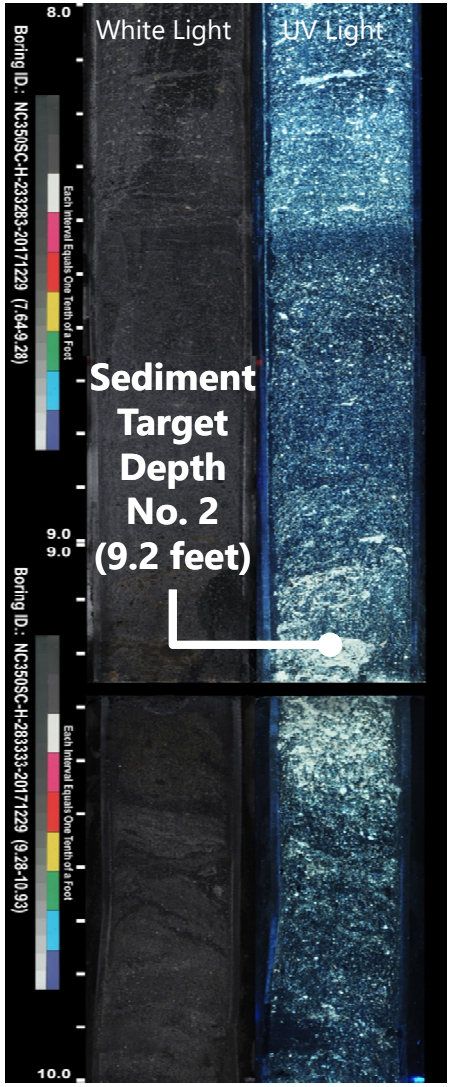
Example Core Photographs and Sample Selections

Example Frozen Core Photographs from 0 to 8 Ft

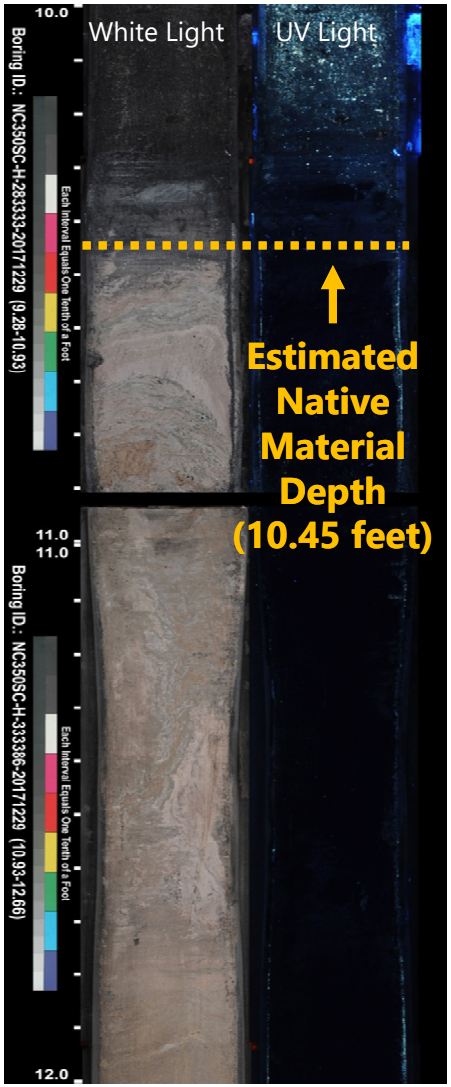


0 to 2 feet | 2 to 4 feet | 4 to 6 feet | 6 to 8 feet

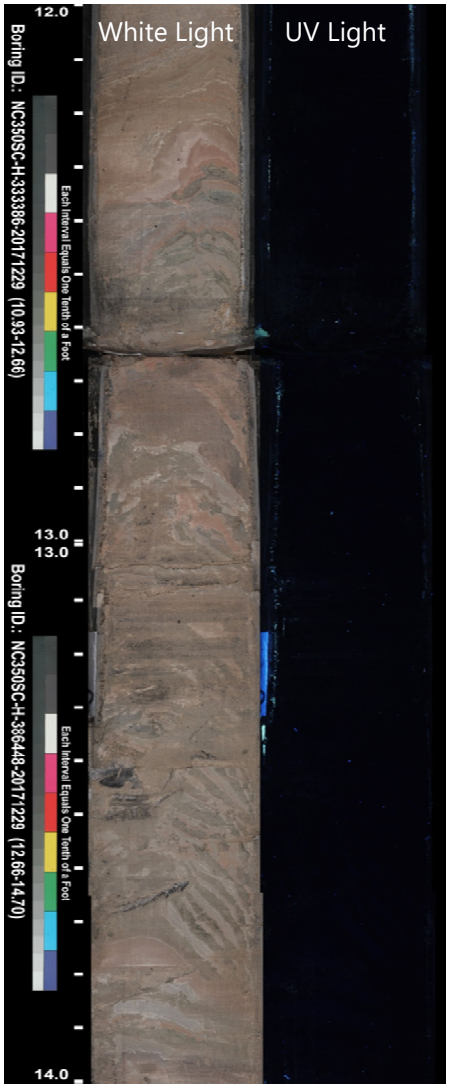
Example Frozen Core Photographs from 8 to 14.7 Ft



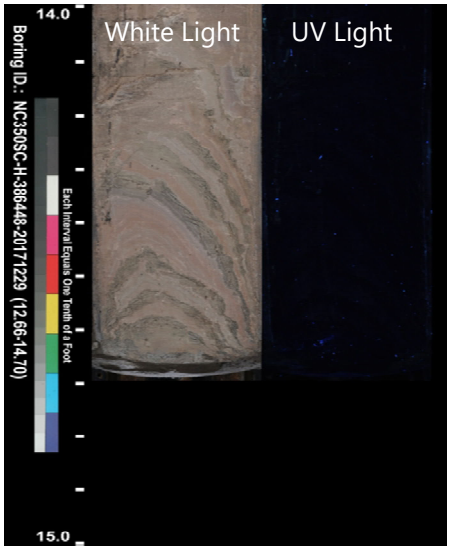
8 to 10 feet



10 to 12 feet



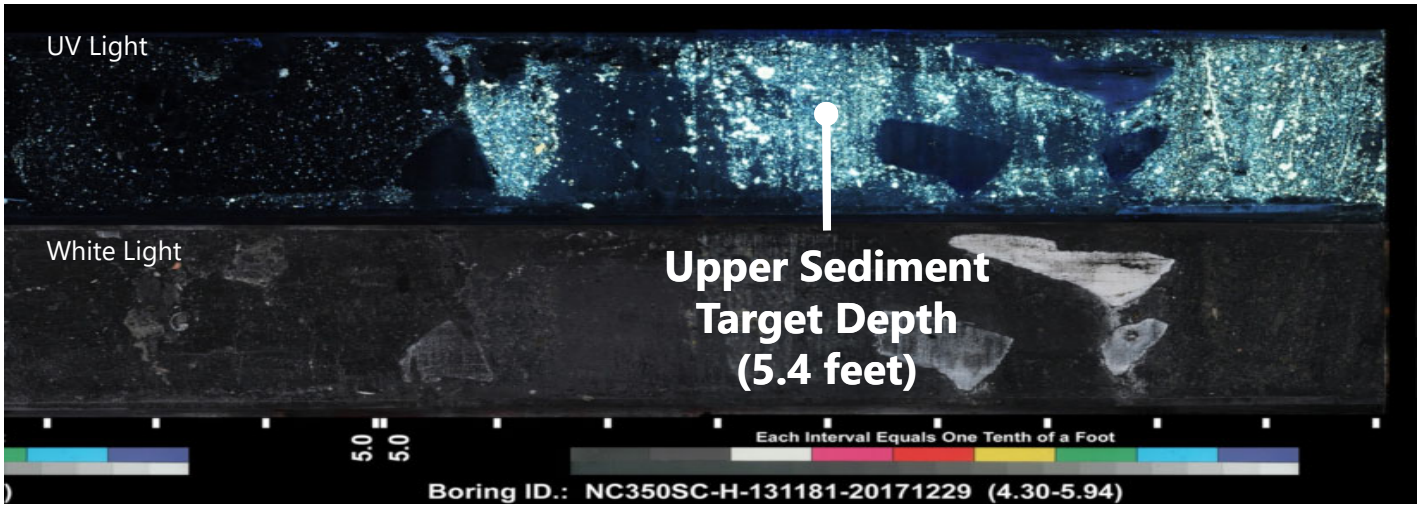
12 to 14 feet



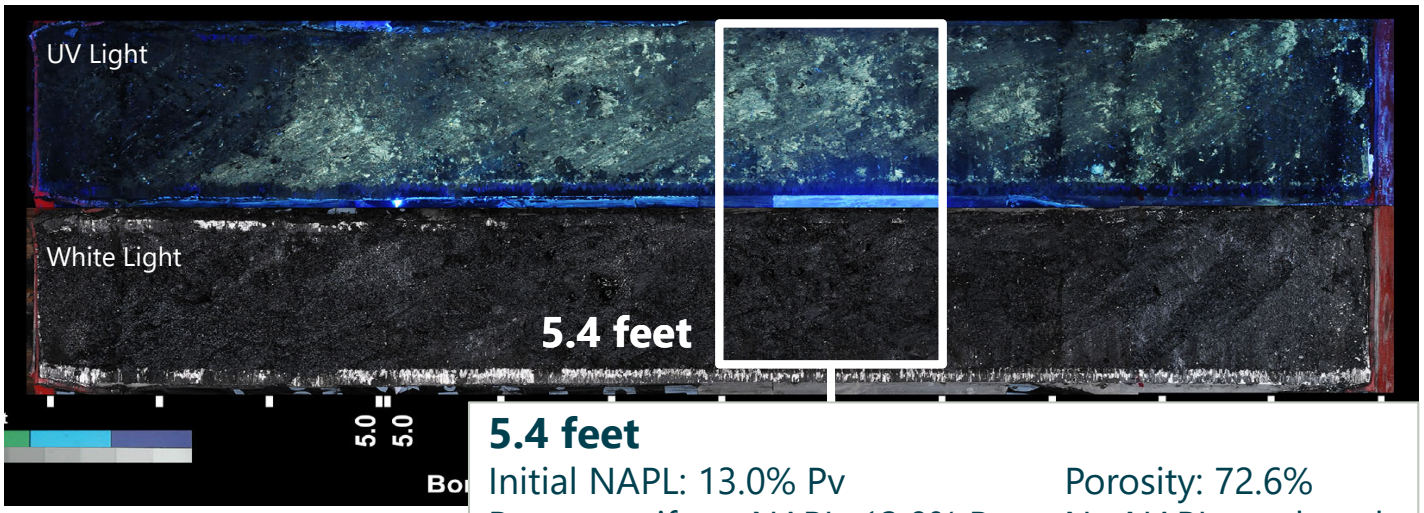
14 to 14.7 feet

Example Frozen and Unfrozen Core Photographs

Upper Sediment Stage 1 Mobility Sample



Frozen –
with Target Depth



Unfrozen –
with Mobility Sample Depth and Results

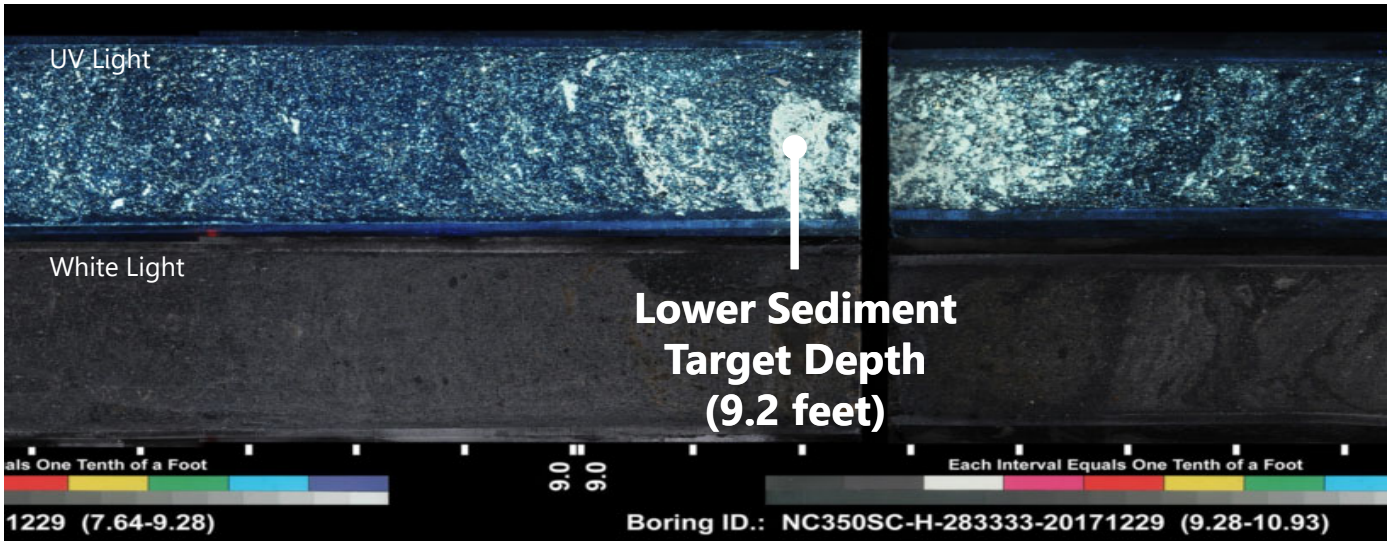
5.4 feet

Initial NAPL: 13.0% Pv
Post-centrifuge NAPL: 13.0% Pv
Porosity: 72.6%
No NAPL produced

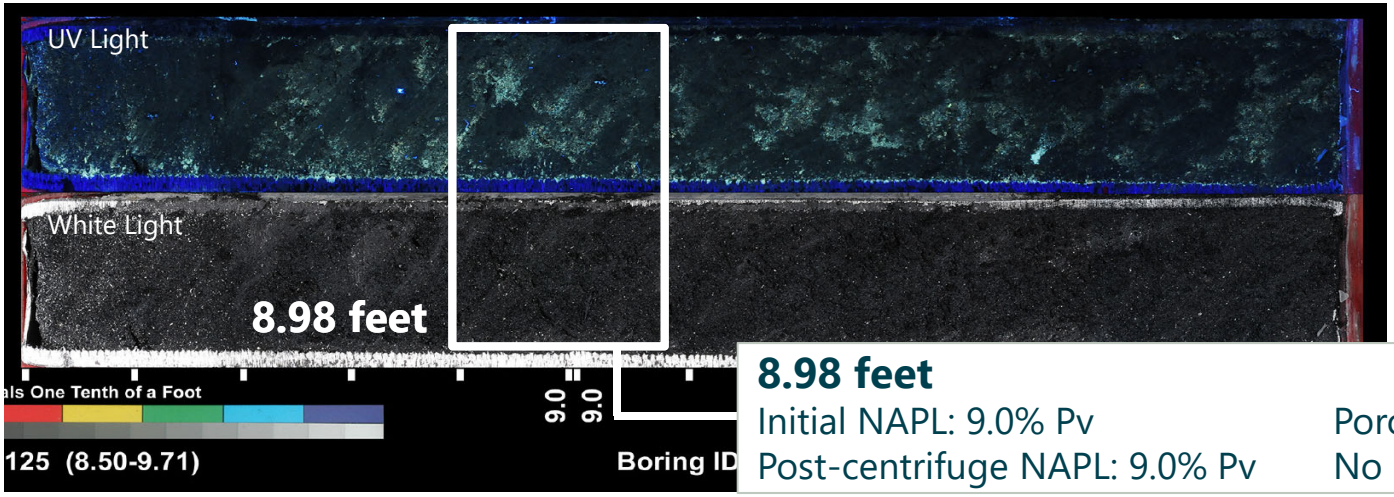
Notes:
NAPL density used to calculate saturations = 0.8600 g/cm^3

Example Frozen and Unfrozen Core Photographs

Lower Sediment Stage 1 Mobility Sample



Frozen –
with Target Depth



Unfrozen –
with Mobility Sample Depth and Results

Notes:
NAPL density used to calculate saturations = 0.8600 g/cm^3

8.98 feet

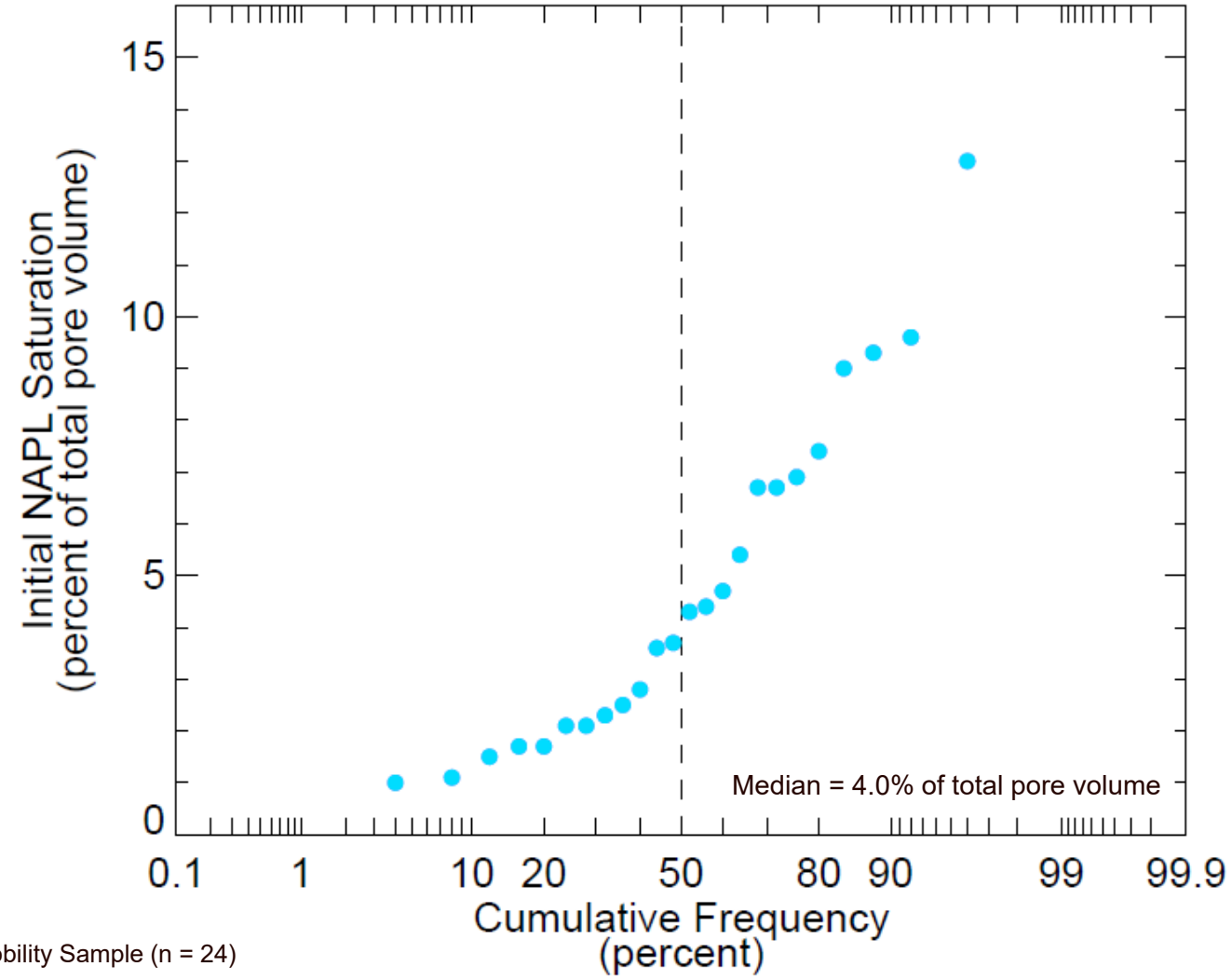
Initial NAPL: 9.0% Pv	Porosity: 52.2%
Post-centrifuge NAPL: 9.0% Pv	No NAPL produced

Results and Conclusions

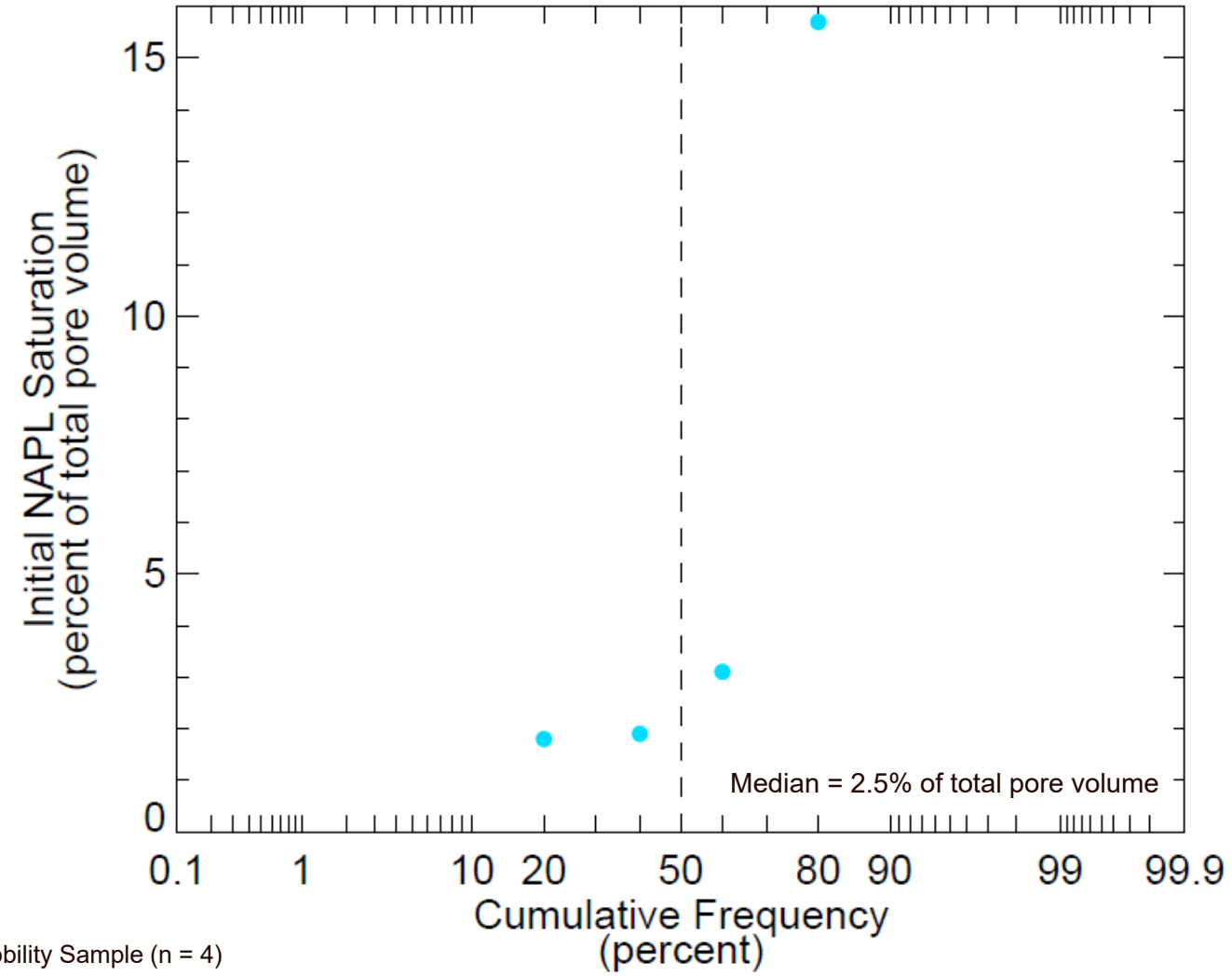
Summary of NAPL Mobility Test Results

- 28 samples from 11 stations tested through Stage 1
  - 24 sediment samples and 4 native material samples
  - No measurable NAPL mobility in any Stage 1 NAPL mobility test
    - Core photographs show NAPL in sediment consists primarily of disconnected droplets of a few mm in diameter or less
- Range of NAPL pore fluid saturations measured
  - Sediment: 1.0% to 13.0% of pore volume
  - Native material: 1.8% to 15.7% of pore volume

NAPL Saturation Results for Sediment



NAPL Saturation Results for Native Material



Conclusions

- Absence of NAPL mobility in sediment and native deposits attributed to low saturations and discontinuity of NAPL
- NAPL in sediment interpreted as oil-particle aggregates, NAPL droplets coated with fine particulate matter
- Absence of NAPL mobility in native deposits consistent with USEPA's test results for nearby Gowanus Canal site
  - USEPA's mobility test results indicated NAPL at Gowanus Canal immobile at or below approximately 20% NAPL saturation

Questions/Discussion