NAPL Characterization and Mobility Memorandum

We are pleased to provide a NCG website link to the Newtown Creek RI report approved by USEPA.

https://newtowncreek.com/resources/ri-report

We know that that CAG members are interested in learning more about the comprehensive and thorough nature of the nonaqueous phase liquid (NAPL) characterization and mobility work done under the approved USEPA workplan. We studied NAPL because it's a contaminant. And we studied its mobility to determine whether it could impact the remedy. We look forward to presenting at an upcoming CAG meeting. USEPA reviewed and approved of the work plans and did so after considering NYSDEC and NYCDEP comments. USEPA had a representative on board the sampling boat and requested split samples for independent correlation. Appendix C of the Remedial Investigation (RI) Study Report (AQEA 2023) provides a detailed explanation of NAPL investigation and evaluation throughout the OU-1 Study Area conducted during the RI and Part 1 of the Feasibility Study (FS). NAPL mobility was further evaluated in parts of the Study Area not included in Part 1 during Part 2 of the FS and the results are presented in the *Feasibility Study Nonaqueous Phase Liquid Data Evaluation Report* (FS NAPL DER; AQEA 2022).

A summary of the NAPL characterization and mobility work performed during the RI/FS is provided below.

NAPL Characterization:

In Phase 1 of the RI, the NAPL investigation focused on characterization of sediment core samples as well as characteristics of surface sediment grab samples. As stated in the RI work plan *"Surface sediment samples will be collected for two purposes: 1) to characterize the chemical nature of the surface sediments; and 2) to support the benthic macroinvertebrate community survey"*.

During Phase 1, there was no requirement in the Field Sampling & Analysis Plan (FASP) to perform shake testing on grab surface samples or subsurface core samples. Shake tests were performed on 5 samples because they exhibited a yellow coating on the sample spoon, which corresponded to where oil-wetted or oil-coated sediments were observed on the core sample.

Based on the results of Phase 1 of the RI, USEPA considered the potential presence and extent of sheen and NAPL in sediment and native material to be a data gap to be addressed during Phase 2 of the RI. Phase 2 of the RI was designed to more fully evaluate NAPL presence and extent. Testing was carried out using a combination of shake testing and visual observations. Results are provided in the table at the end of this memorandum. The broader objectives of Phase 2 of the RI included:

- *"During Phase 2 of the RI, data were collected to evaluate and delineate the extent of NAPL in sediment and native material"* (Appendix C, Section 1.1, AQEA 2023).

- *"Objectives of the Phase 2 NAPL investigation included additional characterization of Phase 1 locations where NAPL presence was confirmed and Phase 1 USEPA-identified locations where NAPL might be present"* (Appendix C, Section 1.1, AQEA 2023).

Part 1 of the FS Field Program aimed to further delineate and understand NAPL in OU-1 as noted within Section 1.1 of RI Appendix C: "*additional data were collected to refine the delineation of NAPL in select portions of the Study Area and to evaluate the mobility of NAPL in sediment and native material in creek mile [CM] 0 – 2"* (AQEA 2023). In addition, *The NAPL distribution refinement program collected data to refine the delineation of three limited areas where a relatively greater magnitude of NAPL was observed (i.e., Category 2/3 Areas). Identification of the three areas was based on the results of Phase 2 of the RI…"* (Appendix C, Section 1.1, AQEA 2023).

The RI NAPL evaluation and delineation were based on the results of the RI/FS field investigations where over 200 surface sediment grabs and more than 200 cores were evaluated. However, the sheen and NAPL dataset continues to grow as the project progresses through the FS and pre-design investigation phases and as additional sediment investigations are performed. Since the development of the RI Report (Anchor QEA 2023), additional sheen and NAPL observation data were collected in CM 0 – 2 and East Branch during the sediment characterization study (SCS) and treatability study pre-design investigation (TS PDI) field investigations, respectively. Because these data were collected after the RI Report was prepared, they were not included in the RI Report. However, sheen and NAPL observations in samples collected during these investigations are consistent with the types and distributions of sheen and NAPL observations made during the RI and have not found additional significant NAPL (i.e., Category 2/3 Areas). The results of these investigations will be included in subsequent NAPL evaluations and reports.

NAPL Mobility:

The FS NAPL mobility program was designed specifically to evaluate whether migration of NAPL via advection is possible under observed field conditions present in the Study Area. During Part 1 of the FS, data were collected to "*assess the extent to which NAPL located in CM 0 – 2 sediments and native material, where present, may be mobile*" (Appendix C, Section 1.1, AQEA 2023). A data summary report (DSR) was included on the USEPA-approved RI Report as Appendix Bii.

Additional data for NAPL mobility testing was collected from sediments and native material upstream of CM 0 – 2 and the tributaries during Part 2 of the FS. Overall, NAPL mobility testing was performed on samples collected from 33 sampling stations in the Study Area. More than 90 samples underwent Stage 1 and/or Stage 2 NAPL mobility testing in a laboratory. These samples were selected because they were judged to be the samples that had the highest probability to contain mobile NAPL. After Stage 2 testing, only one sample needed to proceed to Stage 3 testing and evaluation to determine if the NAPL at that location was potentially mobile under field conditions. The Stage 3 data evaluation included methods presented in *ASTM E3282-21a: Standard Guide for NAPL Mobility and Migration in Sediments – Evaluation Metrics* (ASTM 2021).

Based on the results of the laboratory testing, the FS NAPL mobility program demonstrated that NAPL within the Study Area sediment and native material is immobile and cannot migrate via advection under the test conditions and at the locations sampled, except for results at station NC069SC, which indicated that NAPL at that location was mobile under the conservative laboratory test conditions (with hydraulic gradients 2 to 100 times stronger than the maximum observed in the field). A Stage 3 data evaluation was performed to assess the potential for NAPL present at station NC069SC to be mobile under field conditions and move upward through the overlying material. The results of the data evaluation support the interpretation that NAPL at station NC069SC is immobile under field conditions.

The complete NAPL mobility results for the entire creek (FS Part 1 and FS Part 2) are presented in the FS NAPL Mobility DER (Anchor QEA 2022).

Throughout Phase 1 and Phase 2 of the RI and Part 1 and Part 2 of the FS, NAPL extent and mobility have been studied in great detail within the surface sediment, subsurface sediment, and native material. Additional NAPL evaluation will occur during Remedy Design as necessary and as directed by the USEPA. We look forward to sharing the basis for these conclusions at an upcoming CAG meeting.

A table of the samples collected during the RI/FS is provided at the end of this memorandum.

References:

Anchor QEA, 2020a. *Feasibility Study Field Sampling Program Data Summary Report Part 2.* Remedial Investigation/Feasibility Study, Newtown Creek. April 2020.

Anchor QEA, 2020b. *Sediment Characterization Study Data Summary Report.* Newtown Creek Early Action Focused Feasibility Study. May 2020.

Anchor QEA, 2022. Feasibility Study Nonaqueous Phase Liquid Mobility Data Evaluation Report. Remedial Investigation/Feasibility Study, Newtown Creek. March 2022.

Anchor QEA, 2023. *Remedial Investigation Report*. Remedial Investigation/Feasibility Study, Newtown Creek. March 2023.

ASTM, 2021. ASTM E3282-21a: Standard Guide for NAPL Mobility and Migration in Sediments – Evaluation Metrics. November 2021.

NRT, 2020. *Treatability Study Pre-Design Investigation Data Summary Report.* Remedial Investigation/Feasibility Study, Newtown Creek. November 2020.

Summary of RI/FS NAPL Testing Data (Field Observations/Testing; Laboratory NAPL Mobility Testing)

Reports/Analyses	Program & Field Data Collection Dates	Surface Sediment Grabs or Sediment Cores		Observation/Test		Data Source
		Type	Number	Type	Number	
RI (AQEA 2023)	National Grid (2009-2010)	Subsurface Core	42	Visual Observations	450	RI Appendix C, Table C3-8
	Phase 1 RI (Oct. 2011 - Sept. 2013)	Surface Grab	185	--	--	RI Appendix C, Table C2-1a
				Visual Observations	185	RI Appendix C, Table C-A-1
		Subsurface Core	142	--	--	RI Appendix C, Table C2-1b
				Visual Observations	745	RI Appendix C, Table C-A-3
				Shake Tests	5	RI Appendix C, Section 2.1.1; Table C3-6
	Phase 2 RI (May 2014 – Dec. 2015)	Surface Grab	237	--	--	RI Appendix C, Table C2-1a
				Visual Observations	237 (1)	RI Appendix C, Table C3-3
	Part 1 of FS (May 2017 – Apr. 2018)	Subsurface Core	208 (2)(3)	--	--	RI Appendix C, Table C2-1b
				Visual Observations	1588	RI Appendix C, Table C3-5
				Shake Tests	793	RI Appendix C, Tables C3-5 & C3-6
		Core Samples for NAPL Mobility	28 (4)	Centrifuge (Stage 1 NAPL Mobility)	28	RI Appendix C, Table C4-1
FS	Part 2 of FS (Apr. 2018 - Oct. 2019)	Surface Grab	4	Visual Observations	4	FS Field Sampling Program Data Summary Report Part 2; Attachment B Table B3-2 (AQEA 2020a)
		Core Samples for NAPL Mobility	53	Centrifuge (Stage 1 NAPL Mobility)	53	FS NAPL DER, Table 4-2 (AQEA 2022)
			10	Flexible Wall Permeameter (Stage 2 NAPL Mobility)	10	FS NAPL DER, Table 4-4 (AQEA 2022)
			1	Stage 3 Evaluation	1	FS NAPL DER, Table 5-3 (AQEA 2022)
	Sediment Characterization Study (SCS; Summer 2019)	Surface Grab	404	Visual Observations	404	SCS Data Summary Report, Attachment B Table B1-1 (AQEA 2020b)
		Subsurface Core	38	Visual Observations	185	SCS Data Summary Report, Attachment B Table B2-5 (AQEA 2020b)
				Shake Tests	124	SCS Data Summary Report, Attachment B Table B2-5 (AQEA 2020b)

Reports/Analyses	Program & Field Data Collection Dates	Surface Sediment Grabs or Sediment Cores		Observation/Test		Data Source
		Type	Number	Type	Number	
FS	Treatability Study Pre-Design Investigation (TS PDI; Fall 2019)	Surface Grab	4	Visual Observations	4	TS PDI Data Summary Report, Attachment B1-2 (NRT 2020)
		Subsurface Core	37	Visual Observations	168	TS PDI Data Summary Report, Attachment B2-5 (NRT 2020)
				Shake Tests	107	TS PDI Data Summary Report, Attachment B2-5 (NRT 2020)
Observation/Testing Summary for All Sediment Samples in the Study Area				Visual Observations	3970	
				Shake Tests	1029	
				Centrifuge Stage 1 Testing	81	
				Flexible Wall Permeameter Stage 2 Testing	10	
				Stage 3 Evaluation	1	

Notes:

1 – Includes 194 samples from Phase 2 of the RI and 43 samples from Part 1 of the FS.

2 – Includes 16 Phase 1 RI frozen archive cores processed using Phase 2 RI methodologies.

3 – Includes 165 cores from Phase 2 of the RI and 43 cores from Part 1 of the FS.

4 – NAPL mobility samples in Part 1 of the FS were taken from CM 0-2 (rest of creek sampled in Part 2 of the FS). None of the 28 samples tested exhibited NAPL mobility under the conservative laboratory conditions used for centrifuge testing.