Lower Duwamish Waterway Group

Port of Seattle / City of Seattle / King County / The Boeing Company

LOWER DUWAMISH WATERWAY CLAM COLLECTION AND CHEMICAL ANALYSES – QUALITY ASSURANCE PROJECT PLAN– ADDENDUM

FINAL

Prepared for

Lower Duwamish Waterway Group

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TITLE AND APPROVAL PAGE
CLAM COLLECTION AND CHEMICAL ANALYSES
QUALITY ASSURANCE PROJECT PLAN

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Acronyms

AOC	Administrative Order on Consent
cPAH	carcinogenic polycyclic aromatic hydrocarbon
DQI	data quality indicator
DQO	data quality objective
EPA	US Environmental Protection Agency
ID	identification
LDW	Lower Duwamish Waterway
MDL	method detection limit
PAH	polycyclic aromatic hydrocarbon
QA	quality assurance
QAPP	quality assurance project plan
RL	reporting limit
SDG	sample delivery group
TEQ	toxic equivalent

1 Introduction

This quality assurance project plan (QAPP) addendum describes changes to the EPA-approved clam QAPP (Windward 2018), which describes quality assurance (QA) objectives, methods, and procedures for collecting and analyzing clams from the Lower Duwamish Waterway (LDW) for chemical analyses. EPA has requested the analysis of the baseline clam composite tissue samples for polycyclic aromatic hydrocarbons (PAHs) using an ultra-trace method (modified EPA method 1625B). This method is more sensitive than the PAH method in the QAPP (Mod EPA 8270D-SIM).

As described in the *Pre-Design Studies Work Plan* (Windward and Integral 2017) and the clam QAPP, baseline clam tissue data are being collected and analyzed to address the third amendment to the Administrative Order on Consent (AOC) (EPA 2016). The Work Plan presented the data quality objectives (DQOs) and conceptual study design for clam collection and associated chemical analyses (Windward and Integral 2017). The QAPP included these DQOs and presented the detailed study design, including details on project organization, field data collection, laboratory analyses, and data management Windward 2018a). This addendum describes the changes to the QAPP, which are associated only with the analysis of clam tissues for carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by modified EPA method 1625B.

2 Additional cPAH Analysis

The detection frequency for cPAHs in the clam tissue composite samples is provided in Table 2-1. The detection of the individual cPAHs used to calculate the cPAH toxic equivalent (TEQ) ranged from one of seven (14%) to seven of seven (100%) for the clam tissue samples. When an individual cPAH is not detected, the assumption regarding the value of the non-detected cPAH has an impact on the resulting TEQ, particularly when few cPAHs are detected. To evaluate the impact of the non-detected cPAHs, three different non-detect assumptions (i.e., equal to the method detection limit [MDL], equal to ½ MDL, or equal to zero) are presented in Table 2-1.

Table 2-1. cPAH detection frequency and cPAH TEQ values in baseline composite clam tissue samples

Clam Tissue Collection Area	cPAH DF	cPAH TEQ Calculated Using Different Non-Detect Assumptions (µg/kg ww)		
		Non-Detects = MDL	Non-Detects = ½ MDL	Non-Detects = 0
Individual sample results				
C01	5 / 7	6.37 J	5.89 J	5.41 J
C02	6 / 7	7.63 J	7.17 J	6.72 J
C03	4 / 7	3.23 J	2.43 J	1.63 J
C04	5 / 7	3.43 J	2.67 J	1.91 J
C05	7 / 7	11 J	11 J	11 J
C06	4 / 7	3.21 J	2.42 J	1.62 J
C08	4 / 7	3.08 J	2.29 J	1.49 J
C10	1 / 7	2.8	1.92	1.04
C11	6 / 7	5.84 J	5.54 J	5.23 J

cPAH – carcinogenic polycyclic aromatic hydrocarbon
DF – detection frequency
MDL – method detection limit
TEQ – toxic equivalent
ww – wet weight

In order to increase the sensitivity of the cPAH analysis, the archived clam tissue composite samples from clam tissue areas listed in Table 2-1 will be analyzed using an ultra-trace modified EPA method 1625B. This method is expected to achieve an MDL of 0.1 to 0.2 µg/kg ww for tissue (compared with the MDLs of 0.49 to 1.53 µg/kg ww from the clam tissue analyzed using modified EPA 8270D-SIM).

2.1 LABORATORY METHODS

Chemical analyses of clam tissue samples will be performed by SGS-Axys Analytical Services Ltd (SGS-Axys). Analytical methods and sample handling requirements for the cPAH analysis are presented in Table 2-2.

Table 2-2. Analytical method and sample handling requirements for clam tissue

Parameter[a]	Method	Reference	Extraction Method and Solvent	Cleanup	Lab	Container	Preservative	Sample Holding Time
cPAHs	GC/LRMS	Modified EPA 1625B	Soxhlet Extraction DCM	biobead silica base wash/ alumina (optional)	SGS-Axys	aluminum foil (whole clams) glass jar (homogenate)	freeze to ≤ -10°C	1 year to extract; extract within 14 days of thawing; analyze within 40 days of extraction

[a] Individual analytes are benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(j,k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

cPAH - carcinogenic polycyclic aromatic hydrocarbon
DCM – dichloromethane
EPA – US Environmental Protection Agency
GC/LRMS – gas chromatography/low-resolution mass spectrometry
SGS-Axys – SGS-Axys Analytical Services Ltd.

2.2 ANALYTICAL DATA QUALITY OBJECTIVE AND CRITERIA

The laboratory data quality indicators for the cPAH analysis are provided in Table 2-3. The laboratory MDL and reporting limit (RL) values for each individual cPAH compound are provided in Table 2-4.

Table 2-3. Data quality indicators for laboratory analyses

Parameter[a]	Units	Precision[b]	Accuracy[b]		Completeness
			LCS	Spiked Samples	
cPAHs	µg/kg ww	± 35%	50–150%	20–130%	90%

[a] Individual analytes are benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(j,k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

[b] Values listed are performance-based limits provided by SGS-Axys.

cPAH - carcinogenic polycyclic aromatic hydrocarbon
LCS – laboratory control sample
SGS-Axys – SGS-Axys Analytical Services Ltd.
ww – wet weight

Table 2-4. Method detection limits and reporting limit goals for cPAHs in tissue

Analyte	Method	MDL (µg/kg ww)	RL (µg/kg ww)
Benzo(a)anthracene	Mod EPA 1625B	0.07	0.1
Benzo(a)pyrene	Mod EPA 1625B	0.03	0.1
Benzo[b]fluoranthene	Mod EPA 1625B	0.04	0.1
Benzo(j,k)fluoranthene	Mod EPA 1625B	0.11	0.1
Chrysene	Mod EPA 1625B	0.07	0.1
Dibenzo(a,h)anthracene	Mod EPA 1625B	0.06	0.2
Indeno(1,2,3-cd)pyrene	Mod EPA 1625B	0.15	0.2

cPAH – carcinogenic polycyclic aromatic hydrocarbon
EPA – US Environmental Protection Agency
MDL – method detection limit
RL – reporting limit
ww – wet weight

2.2 QUALITY ASSURANCE/QUALITY CONTROL

Project- and method-specific QC measures, such as matrix spikes and matrix spike duplicates or laboratory duplicates, will be analyzed per sample delivery group (SDG) preparatory batch, or per analytical batch as specified in Table 2-5. An SDG is defined as no more than 20 samples. All nine composite tissue samples will be analyzed in one batch.

Table 2-5. Laboratory quality control sample analysis summary

Analysis Type	Initial Calibration	Initial Calibration Verification (second source)	Continuing Calibration Verification	LCS	MS	MSD	Method Blanks	Surrogate Spikes
cPAHs	prior to analysis	after initial calibration	every 10–20 analyses or 12 hours	1 per prep batch	1 per batch or SDG	1 per batch or SDG	1 per prep batch	each sample

cPAH – carcinogenic polycyclic aromatic hydrocarbon
LCS – laboratory control sample
MS – matrix spike
MSD – matrix spike duplicate

3 References

EPA. 2016. Third Amendment to the Administrative Order on Consent for remedial investigation/feasibility study (AOC) for the Lower Duwamish Waterway (LDW), CERCLA-10-2001-0055. US Environmental Protection Agency, Region 10, Olympia, WA.

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