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**APPENDIX H**

Data Validation Reports

**BOEING PLANT 2 WATER QUALITY  
SAMPLES – AUGUST 2014 THROUGH FEBRUARY 2015**

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## DATA VALIDATION REPORT

*Boeing Plant 2 Water Quality Samples - August 2014 through February 2015*

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### 1.0 Introduction

Data validation was performed on the following water samples:

Sample ID	Sample Date/Time	Laboratory Sample IDs	Analyses
BP2WQ-0413	08/05/14 09:45	YW64A	PCBs
BP2WQ-0414	08/05/14 10:02	YW64B	PCBs
BP2WQ-0416	08/05/14 10:40	YV13A / YV13B / 1408116-06	PCBs, total mercury, and dissolved metals
BP2WQ-0418	08/05/14 11:17	YV84A	PCBs
BP2WQ-0419	08/05/14 11:30	YW64C	PCBs
BP2WQ-0422	08/06/14 09:24	YW98A	PCBs
BP2WQ-0423	08/06/14 09:43	YW98B	PCBs
BP2WQ-0427	08/06/14 11:04	YW98C	PCBs
BP2WQ-0434	08/07/14 10:52	YV52A / YV52E / 1408188-06	PCBs, total mercury, and dissolved metals
BP2WQ-0436	08/07/14 11:32	YV52B / YV52F / 1408188-08	PCBs, total mercury, and dissolved metals
BP2WQ-0437	08/07/14 11:32	YV52C / YV52G / 1408188-09	PCBs, total mercury, and dissolved metals
BP2WQ-0438	08/07/14 12:26	YV52D	PCBs and total mercury
BP2WQ-0439	08/07/14 12:30	YV52H / 1408188-10	Dissolved metals
BP2WQ-0454	08/09/14 10:08	YV84B / YV84C / 1408232-01	PCBs, total mercury, and dissolved metals
BP2WQ-0485	09/24/14 14:16	ZB75A / ZB75B	PCBs, total and dissolved mercury
BP2WQ-0490	09/24/14 19:35	ZC12I / ZC12J / 1409629-01	PCBs, total mercury, and dissolved metals
BP2WQ-0492	09/26/14 18:50	ZC25A / ZC25C	PCBs, total and dissolved mercury
BP2WQ-0498	10/23/14 19:20	ZH25A / ZH25D	PCBs, total and dissolved mercury
BP2WQ-0501	10/25/14 21:00	ZH52A / ZH52C	PCBs, total and dissolved mercury
BP2WQ-0502	10/30/14 01:20	ZH52A / ZH52C / 1410736-09	PCBs, total mercury, and dissolved metals
BP2WQ-0504	11/01/14 13:18	ZI21A / ZI21B / 1410813-22	PCBs, total mercury, and dissolved metals
BP2WQ-0517	12/03/14 17:40	ZL08A / ZL08B / 1411089-11	PCBs, total mercury, and dissolved metals
BP2WQ-0519	12/05/14 13:50	ZN47A / ZN47C / 1412182-09	PCBs, total mercury, and dissolved metals
BP2WQ-0543	09/26/14 13:23	ZN78A / ZN78B / 1412205-01	PCBs, total mercury, and dissolved metals
BP2WQ-0559	10/02/14 12:45	ZC15A / ZC15B / 1409696-17	PCBs, total mercury, and dissolved metals
BP2WQ-0582	10/09/14 10:04	ZD27A / ZD27B / 1410123-01	PCBs, total mercury, and dissolved metals
BP2WQ-0607	10/13/14 12:50	ZF18A / ZF18B / 1410414-02	PCBs, total mercury, and dissolved metals
BP2WQ-0627	10/23/14 11:06	ZH25B / ZH25E / 1410678-02	PCBs, total mercury, and dissolved metals
BP2WQ-0636	10/23/14 16:53	ZH25C / ZH25F / 1410678-11	PCBs, total mercury, and dissolved metals
BP2WQ-0656	10/25/14 13:00	ZH52B / ZH52D	PCBs, total and dissolved mercury
BP2WQ-0657	10/27/14 19:54	ZH71A / ZH71B / 1410736-01	PCBs, total mercury, and dissolved metals
BP2WQ-0688	11/04/14 14:21	ZJ13A / ZJ13B / 1411089-04	PCBs, total mercury, and dissolved metals
BP2WQ-0702	11/07/14 13:30	ZJ74A / ZJ74B / 1411266-01	PCBs, total mercury, and dissolved metals
BP2WQ-0717	12/04/14 13:19	ZN47B / ZN47D / 1412182-01	PCBs, total mercury, and dissolved metals

Sample ID	Sample Date/Time	Laboratory Sample IDs	Analyses
BP2WQ-0722	12/04/14 14:27	ZO24A	PCBs
BP2WQ-0733	12/06/14 12:56	ZP32A	PCBs
BP2WQ-0734	12/06/14 12:27	ZO52A	PCBs
BP2WQ-0736	12/06/14 12:56	ZN77A / ZN77B / 1412205-14	PCBs, total mercury, and dissolved metals
BP2WQ-0739	12/06/14 14:06	ZP32B	PCBs
BP2WQ-0740	12/06/14 14:18	ZP32C	PCBs
BP2WQ-0764	12/10/14 13:48	ZP54A / ZP54B / 1412314-24	PCBs, total mercury, and dissolved metals
BP2WQ-0775	12/12/14 10:59	ZP84A / ZP84B 1412430-12	PCBs, total mercury, and dissolved metals
BP2WQ-0777	12/12/14 11:17	ZQ69A	PCBs
BP2WQ-0814	02/17/15 12:57	ZW83A / ZW83I / 1502533-09	PCBs, total mercury, and dissolved metals
BP2WQ-0817	02/17/15 13:30	ZY11A	PCBs
BP2WQ-0822	02/18/15 12:34	ZW95A / ZW95I / 1502533-01	PCBs, total mercury, and dissolved metals
BP2WQ-0825	02/18/15 12:15	ZY11B	PCBs
TSCA-GAC-1	10/28/14 15:20	ZH74A	PCBs
TSCA-GAC-2	10/30/14	410563-01	PCBs
TSCA-GAC-3	11/04/14	411038-01	PCBs
TSCA-GAC-4	11/05/14	411065-01	PCBs

With three exceptions, PCB and total and dissolved mercury analyses were performed by Analytical Resources, Inc (ARI) in Tacoma Washington. PCB analyses for three samples, TSCA-GAC-2, TSCA-GAC-3, and TSCA-GAC-4, were performed by Friedman & Bruya (FB) in Seattle Washington. Dissolved metals (except mercury) analyses were performed by Eurofins Frontier Global Sciences (FGS) in Bothell Washington.

Validation: A summary validation was performed for these analyses. Validation was performed by Cari Saylor. Data qualifiers are summarized in section 6.0 of this report.

Analytical methods: Table 6 of the QAPP specifies the following analytical method:

Analysis	Method
Polychlorinated biphenyls	EPA 8082
Mercury	EPA 7471A
ICPMS Metals	EPA 6020

The analyses were performed with the following methods: The most recent version of the method for PCB (8082A) was used. The water version of the mercury method (7470A) was used. The ICPMS metals were analyzed by EPA 200.8. The method substitutions were considered acceptable.

Sample Receipt: Sample chain-of-custodies were reviewed. All requested analyses were performed.

The cooler receipt temperatures measured at upon receipt at the laboratory ranged from 1.6 to 14.8 °C. No qualifiers are assigned due to the temperatures outside the target range of 2 to 6 °C because the PCB, Metals, TOC, and total solids analytes are not highly susceptible to degradation and the samples were refrigerated at the laboratory.

Sample number transcription: Sample IDs in the electronic data deliverable (EDD) were compared to the chain-of-custody for each sample. ARI sample IDs matched the chain of custody with one minor exception: Sample BP2WQ-0485 was reported with an extra dash (as BP2-WQ-0485). In most cases, FGS included both the bottle ID and sampleIDs in the report, and these values matched the chain of custodies. However, the sample IDs of three samples contained slight differences between the ARI and FGS chain of custodies: one sample

contained an extra space (BP2 WQ-0607), and two samples were missing the 2 (BPWQ-0627 and BPWQ-0636) on the FGS chain of custodies. The three FB sample IDs matched the chain of custodies. The sample IDs used throughout this report include corrections for these minor issues.

## 2.0 PCB Analyses - ARI

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and MS duplicate (MSD) must be analyzed one per twenty samples and a regional reference material (RRM) must be analyzed one per fifty samples. In addition, surrogate compounds must be measured in each field and quality control sample. Field quality control sample requirements include field duplicates and rinse blanks once per sampling round.

Each batch included a method blank, LCS, and appropriate surrogates. All but three batches (ZB75, ZJ74, and ZW95) also contained a LCSD. One field duplicate (BP2WQ-0436) and one rinse blank (BP2WQ-0438) were also analyzed. No qualifiers are added based on the lack of MS/MSD and RRM samples.

Holding times: Water samples must be extracted within 7 days of collection. Extracts must be analyzed within 40 days of extraction. Extraction holding times were exceeded in the following samples:

Sample ID	Days, Sample to Extraction	Days, Extraction to Analysis
BP2WQ-0413	11	2
BP2WQ-0414	11	2
BP2WQ-0419	11	2
BP2WQ-0422	13	1
BP2WQ-0423	13	1
BP2WQ-0427	13	1
BP2WQ-0504	18	1
BP2WQ-0733	11	1
BP2WQ-0739	11	1
BP2WQ-0740	11	1
BP2WQ-0764	8	1
BP2WQ-0777	12	7
BP2WQ-0817	11	3
BP2WQ-0825	10	3

Results in these samples are qualified as estimated.

Instrument calibration: Data usability criteria for calibrations include minimum correlation coefficients ( $R^2$ ) of 0.990 or maximum RSDs of  $\pm 20\%$  for each initial calibration, and maximum % differences of  $\pm 25\%$  for each continuing calibration. Calibration data were not available for batch ZH74. All remaining initial calibration compound RSDs were within 20%. Remaining continuing calibration % differences were within  $\pm 25\%$  with the following exceptions:

Lab SDG	Standard ID	Aroclor peak	Difference (%)
YV52	08/11/2014 11:24 ZB35	Aroclor 1254-3	-31.8
YW98	08/20/2014 20:22 ZB35	Aroclor 1260-1	25.3
ZD27	10/04/2014 14:53 ZB35	Aroclor 1016-2	-26.6

Lab SDG	Standard ID	Aroclor peak	Difference (%)
ZD27	10/04/2014 16:55 ZB35	Aroclor 1016-2	-26.9
ZE31	10/11/2014 15:09 ZB35	Aroclor 1016-2	-29.5
ZH25	10/22/2014 14:41 ZB35	Aroclor 1242-4	33.5
ZH71	10/29/2014 14:42 ZB5	Aroclor 1242-4	36.8
ZH71	10/29/2014 14:42 ZB35	Aroclor 1242-4	39.8
ZJ13	11/06/2014 09:21 ZB5	Aroclor 1260-1	36.2
ZJ13	11/06/2014 09:21 ZB5	Aroclor 1260-2	28.6
ZJ13	11/06/2014 09:21 ZB5	Aroclor 1260-3	37.1
ZJ13	11/06/2014 09:21 ZB5	Aroclor 1260-4	33.7
ZJ13	11/06/2014 09:21 ZB5	Aroclor 1260-5	27.3
ZJ13	11/06/2014 17:55 ZB35	Aroclor 1016-3	25.7
ZN47	12/08/2014 07:10 ZB5	Aroclor 1016-3	28.5
ZN47	12/08/2014 07:10 ZB5	Aroclor 1016-4	34.6
ZN47	12/08/2014 12:19 ZB5	Aroclor 1016-4	30.7

In each case, either the average % difference was below 25% or no positive results were associated with the high instrument response, and no qualifiers are required.

Laboratory and field blank results: Criteria for blanks are that analyte concentrations must be below the RL, or below 10% of the lowest associated sample concentration. These criteria were met.

Surrogate recoveries: QAPP control limits were 34-141%. Surrogate recoveries were within QAPP and laboratory control limits.

LCS recoveries: QAPP control limits were 37-116%. LCS recoveries were within QAPP and laboratory control limits.

LCS/LCSD RPDs: QAPP control limits were 50%. RPDs were within QAPP and laboratory control limits with one exception:

QC ID	Analyte	RPD	Lab Control Limit
YV52LCSD	Aroclor 1260	31.6	30

This RPD was slightly outside the laboratory control limit and well within the QAPP control limit. No qualifiers are assigned.

Field duplicate: No compounds were detected in the field duplicate or its parent sample, showing good agreement.

Reporting limits: RLs for various aroclors were elevated above the target reporting limit of 0.01 ug/L due to chromatographic overlap with other aroclors as follows:.

Sample ID	Analyte	Reported RL (ug/L)	SL (ug/L)
BP2WQ-0416	Aroclor 1248	0.012 Y	0.03
BP2WQ-0418	Aroclor 1248	0.012 Y	0.03
BP2WQ-0413	Aroclor 1248	0.012 Y	0.03
BP2WQ-0734	Aroclor 1248	0.075 Y	0.03
BP2WQ-0764	Aroclor 1232	0.025 BY	0.03

The four samples with elevated Aroclor 1248 reporting limits also contained detected aroclors and the impact on the total PCB value was minimal.

The sample with an elevated Aroclor 1232 reporting limit was associated with a method blank containing low level interferences in the Aroclor 1232 range. Because the sample reporting limit was below the screening level, no further action was required.

No qualifiers are assigned on the basis of elevated reporting limits.

Laboratory narrative and qualifiers: Various results are flagged Y to indicate elevated reporting limits. These results are qualified "UY" to clarify that the Aroclor was not detected. No additional qualifiers are assigned based on a review of the laboratory narrative.

Overall assessment: With one exception, documentation was found to be clear and complete. Calibration data demonstrate acceptable instrument performance. Laboratory control sample results demonstrate acceptable accuracy and precision. Fourteen samples were estimated due to exceeded holding time criteria.

PCB data are acceptable for use as qualified.

### 3.0 PCB Analyses - FB

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and MS duplicate (MSD) must be analyzed one per twenty samples and a regional reference material (RRM) must be analyzed one per fifty samples. In addition, surrogate compounds must be measured in each field and quality control sample. Field quality control sample requirements include field duplicates and rinse blanks once per sampling round.

Each batch included a method blank, LCS, LCS duplicate (LCSD) and appropriate surrogates. No qualifiers are added based on the lack of remaining QA/QC samples.

Holding times: Water samples must be extracted within 7 days of collection. Extracts must be analyzed within 40 days of extraction. These criteria were met.

Instrument calibration: No calibration data were provided and could not be reviewed.

Laboratory blank results: Criteria for blanks are that analyte concentrations must be below the RL, or below 10% of the lowest associated sample concentration. These criteria were met.

Surrogate recoveries: QAPP control limits were 34-141%. Surrogate recoveries were within QAPP and laboratory control limits.

LCS recoveries: QAPP control limits were 37-116%. LCS recoveries were within QAPP and laboratory control limits.

LCS/LCSD RPDs: QAPP control limits were 50%. RPDs were within QAPP and laboratory control limits with one exception:

QC ID	Analyte	RPD	Lab Control Limit
411038 LCS/LCSD	Aroclor 1016	30	20

This RPD was outside the laboratory control limit and well within the QAPP control limit.

Additionally, Aroclor 1016 was not detected in the associated sample. No qualifiers are assigned.

Reporting limits: Reporting limits met the target level of 0.01 ug/L.

Laboratory narrative and qualifiers: No additional qualifiers are assigned based on a review of the laboratory narrative.

Overall assessment: Documentation met requirements for summary validation. Surrogate and laboratory control sample results demonstrate acceptable accuracy and precision.

PCB data are acceptable for use as reported.

#### **4.0 Total and Dissolved Mercury Analyses**

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and MS duplicate (MSD) or laboratory duplicate must be analyzed one per twenty samples. Field quality control sample requirements include field duplicates, filter blanks and rinse blanks once per sampling round.

Each batch included a method blank and LCS. Nineteen of the twenty-two total mercury SDGs also included a MS and laboratory duplicate. Nineteen of the twenty-two dissolved mercury SDGs also included a MS and laboratory duplicate. Field quality control samples included a total and dissolved mercury field duplicate (BP2WQ-0437), a total mercury rinse blank (BP2WQ-0438), and a dissolved mercury filter blank (BP2WQ-0439). Frequency requirements were met.

Holding times: Total or dissolved mercury samples must be analyzed within 28 days of collection. Samples were analyzed within the holding time.

Instrument calibration: Functional guidelines criterion for calibration verifications is a maximum % difference of  $\pm 15\%$ . QAPP criterion for calibration verifications is  $\pm 20\%$ . These criteria were met.

Laboratory and field blank results: Criteria for calibration and method blanks are that analyte concentrations must be below the RL, or below 10% of the lowest associated sample concentration. No contamination was detected in the method, calibration or field blanks.

LCS recoveries: QAPP control limits were 80-120%. LCS recoveries were within QAPP and laboratory control limits.

MS recoveries: QAPP control limits were 80-120%. MS recoveries were within QAPP and laboratory control.

Laboratory duplicate RPDs: QAPP control limits were  $<20\%$ . For duplicates with concentrations above five times the reporting limit, RPDs were within QAPP and laboratory control limits. For duplicates with concentrations below five times the reporting limit, absolute differences were within the reporting limit.

Field duplicate: No mercury was detected in the field duplicate or its parent sample, showing good agreement.

Reporting limits: The QAPP specifies target reporting limits of 0.020 ug/L. This limit was met.

Laboratory narrative and qualifiers: No additional qualifiers are assigned based on a review of the laboratory narrative.

Overall assessment: Documentation was found to be clear and complete. Calibration data demonstrate acceptable instrument performance. Quality control sample results demonstrate acceptable accuracy and precision.

Total and dissolved mercury data are acceptable for use as reported.

## 5.0 Dissolved Metals Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and MS duplicate (MSD) or laboratory duplicate must be analyzed one per twenty samples. Field quality control sample requirements include one field duplicate and one filter blank per sampling round.

Each batch included a method blank, LCS, LCSD, MS and MSD. Field quality control samples included a field duplicate (BP2WQ-0437) and rinse blank (BP2WQ-0438), meeting frequency requirements.

Holding times: Total or dissolved metals samples must be analyzed within 180 days of collection. Samples were analyzed within the holding time.

Instrument calibration: Functional guidelines and QAPP criterion for calibration verifications is a maximum % difference of  $\pm 10\%$ . The following calibration verifications were outside this criterion:

Lab SDG	Standard ID	Analyte	Recovery (%)	Control Limit (%)
1410813	4K07006-CCV4	Chromium	89.9	90-110

Because this recovery is within control limits when rounded off to the same number of significant figures as the published control limits, it is considered acceptable and no qualifiers are assigned.

Laboratory and field blank results: Criteria for calibration and method blanks are that analyte concentrations must be below the RL, or below 10% of the lowest associated sample concentration. Contamination was detected in the method blanks and reported calibration blanks as follows:

Lab SDG	Blank ID	Analyte	Concentration (ug/L)	RL (ug/L)
1408116	4H07002-CCB1	Zinc	0.54	0.49
1408116	4H07002-ICB1	Zinc	0.60	0.49
1408116	F408082-BLK1	Silver	0.013 J	0.020
1408116	F408082-BLK1	Zinc	0.84 QB-10	0.49
1408188	BP2WQ-0439	Lead	0.09 J	0.394
1408188	F408104-BLK1	Silver	0.013 J	0.020
1408188	F408121-BLK1	Silver	0.004 J	0.020
1408232	F408121-BLK1	Silver	0.004 J	0.020
1409577	F409308-BLK1	Silver	0.005 J	0.020

Lab SDG	Blank ID	Analyte	Concentration (ug/L)	RL (ug/L)
1409629	F409308-BLK1	Silver	0.005 J	0.020
1409696	F409348-BLK1	Silver	0.004 J	0.020
1410123	F410043-BLK1	Silver	0.027 QB-10	0.020
1410281	4J13007-CCB1	Silver	0.025	0.020
1410281	F410123-BLK1	Silver	0.008 QB-02 J	0.020
1410414	F410188-BLK1	Silver	0.005 J	0.020
1410678	F410339-BLK1	Silver	0.011 J	0.020
1410736	F410382-BLK1	Silver	0.004 J	0.020
1410813	F410440-BLK1	Silver	0.012 J	0.020
1411089	F411074-BLK1	Silver	0.014 J	0.020
1411089	F411109-BLK1	Silver	0.006 J	0.020
1411266	F411109-BLK1	Silver	0.006 J	0.020
1412314	F411343-CCB1	Silver	0.023	0.020

Sample results below five times the associated blank level should be considered not detected, and are qualified "U". Sample results between five and ten times the associated blank level are qualified as estimated. Sample results above ten times the associated blank level are considered unaffected.

LCS recoveries: QAPP control limits were 80-120%. LCS recoveries were within QAPP and laboratory control limits.

Lab SDG	QC ID	Analyte	% Recovery	Lab Control Limit
1502533	F502241-BSD1	Cadmium	84.8	85 - 115

This recovery is within the QAPP control limit, and no qualifiers are assigned.

MS recoveries: QAPP control limits were 75-125%. MS recoveries were within QAPP and laboratory control limits with the following exceptions:

Lab SDG	QC ID	Analyte	% Recovery	Lab Control Limit
1502533	BP2WQ-0822 MS1	Dissolved Copper	72.9	70 - 130
1502533	BP2WQ-0822 MS2	Dissolved Zinc	56.6	70 - 130
1502533	BP2WQ-0822 MSD1	Dissolved Copper	74.5	70 - 130

The zinc and copper results in sample BP2WQ-0822 are qualified as estimated.

LCS/LCSD RPDs: QAPP control limits were <20%. RPDs were within QAPP and laboratory control limits.

MS/MSD RPDs: QAPP control limits were <20%. RPDs were within QAPP and laboratory control limits with one exception:

Lab SDG	QC ID	Analyte	RPD	Lab Control Limit
1502533	BP2WQ-0822 MSD2	Dissolved Zinc	39.7	20

The zinc result in sample BP2WQ-0822 is qualified as estimated.

MS/MSD RPDs: QAPP control limits were <20%. RPDs were within QAPP and laboratory control limits with one exception:

Lab SDG	QC ID	Analyte	RPD	Lab Control Limit
1502533	BP2WQ-0822 MSD2	Dissolved Zinc	39.7	20

The zinc result in sample BP2WQ-0822 is qualified as estimated.

Field duplicate variability: Field duplicate concentrations were within +/- two times the reporting limit where concentrations were below five times the reporting limit. No concentrations were detected above five times the reporting limit.

Reporting limits: The QAPP target reporting limits range from 0.1 to 4.0 ug/L. These limits were met with the following exceptions:

Sample ID	Analyte	Reported RL (ug/L)	Target RL (ug/L)
BP2WQ-0439	Dissolved Cadmium	0.197	0.1
BP2WQ-0439	Dissolved Chromium	0.99	0.5
BP2WQ-0439	Dissolved Copper	0.99	0.5
BP2WQ-0437	Dissolved Lead	0.394	0.1
BP2WQ-0436	Dissolved Lead	0.394	0.1
BP2WQ-0439	Dissolved Zinc	4.93	4

In each case, the reported RL is below the screening level. No qualifiers are assigned on the basis of elevated reporting limits.

Laboratory narrative and qualifiers: No additional qualifiers are assigned based on a review of the laboratory narrative.

Overall assessment: With resubmissions, documentation was found to be clear and complete. With minor exceptions, calibration results demonstrate acceptable instrument performance and quality control sample results demonstrate acceptable accuracy and precision. Results were qualified due to blank contamination, and MS/MSD recoveries and RPDs.

Dissolved metals data are acceptable for use as qualified.

## 6.0 Qualifier Summary Table

Client ID	Analyte(s)	Qualifier	Reason
Polychlorinated Biphenyl Analyses - ARI			
BP2WQ-0413	Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242	UJ	Hold time exceeded
BP2WQ-0413	Aroclor 1248	UJY	Hold time exceeded, Clarification of Y flag
BP2WQ-0413	Aroclor 1254, Aroclor 1260	J	Hold time exceeded
BP2WQ-0414	Aroclor 1254, Aroclor 1260	J	Hold time exceeded
BP2WQ-0414	All except Aroclor 1254, Aroclor 1260	UJ	Hold time exceeded
BP2WQ-0416	Aroclor 1248	UY	Clarification of Y flag
BP2WQ-0418	Aroclor 1248	UY	Clarification of Y flag
BP2WQ-0419	All	UJ	Hold time exceeded
BP2WQ-0422	Aroclor 1254, Aroclor 1260	J	Hold time exceeded
BP2WQ-0422	All except Aroclor 1254, Aroclor 1260	UJ	Hold time exceeded
BP2WQ-0423	All except Aroclor 1254, Aroclor 1260	UJ	Hold time exceeded
BP2WQ-0423	Aroclor 1254, Aroclor 1260	J	Hold time exceeded
BP2WQ-0427	All except Aroclor 1254, Aroclor 1260	UJ	Hold time exceeded
BP2WQ-0427	Aroclor 1254, Aroclor 1260	J	Hold time exceeded

Client ID	Analyte(s)	Qualifier	Reason
BP2WQ-0504	All	UJ	Hold time exceeded
BP2WQ-0733	All	UJ	Hold time exceeded
BP2WQ-0734	Aroclor 1248	UY	Clarification of Y flag
BP2WQ-0739	All	UJ	Hold time exceeded
BP2WQ-0740	All	UJ	Hold time exceeded
BP2WQ-0764	All	UJ	Hold time exceeded
BP2WQ-0777	All	UJ	Hold time exceeded
BP2WQ-0817	Aroclor 1254	J	Hold time exceeded
BP2WQ-0817	All except Aroclor 1254	UJ	Hold time exceeded
BP2WQ-0825	All except Aroclor 1254	UJ	Hold time exceeded
BP2WQ-0825	Aroclor 1254	J	Hold time exceeded
<b>Dissolved Metals Analyses</b>			
BP2WQ-0416	Dissolved lead, dissolved silver, dissolved zinc	U	Blank Contamination
BP2WQ-0434	Dissolved lead, dissolved silver	U	Blank Contamination
BP2WQ-0436	Dissolved silver	U	Blank Contamination
BP2WQ-0437	Dissolved silver	U	Blank Contamination
BP2WQ-0454	Dissolved silver	U	Blank Contamination
BP2WQ-0485	Dissolved silver	U	Blank Contamination
BP2WQ-0490	Dissolved silver	J	Blank Contamination
BP2WQ-0492	Dissolved silver	U	Blank Contamination
BP2WQ-0502	Dissolved silver	U	Blank Contamination
BP2WQ-0504	Dissolved silver	U	Blank Contamination
BP2WQ-0519	Dissolved lead	U	Blank Contamination
BP2WQ-0543	Dissolved silver	U	Blank Contamination
BP2WQ-0559	Dissolved silver	U	Blank Contamination
BP2WQ-0582	Dissolved silver	U	Blank Contamination
BP2WQ-0607	Dissolved silver	U	Blank Contamination
BP2WQ-0627	Dissolved silver	U	Blank Contamination
BP2WQ-0636	Dissolved lead, dissolved silver	U	Blank Contamination
BP2WQ-0657	Dissolved silver	U	Blank Contamination
BP2WQ-0688	Dissolved lead, dissolved silver	U	Blank Contamination
BP2WQ-0702	Dissolved lead, dissolved silver	U	Blank Contamination
BP2WQ-0717	Dissolved lead	U	Blank Contamination
BP2WQ-0736	Dissolved lead	U	Blank Contamination
BP2WQ-0764	Dissolved lead	U	Blank Contamination
BP2WQ-0775	Dissolved lead	U	Blank Contamination
BP2WQ-0814	Dissolved lead	U	Blank Contamination
BP2WQ-0814	Dissolved zinc	J	Low MS recovery, high MS/D RPD
BP2WQ-0822	Dissolved copper	J	Low MS/MSD recoveries
BP2WQ-0822	Dissolved zinc	J	Low MS recovery, high MS/D RPD

## 7.0 Abbreviations and Definitions

DV Qualifier	Definition
U	The material was analyzed for, but was not detected above the level of the associated value.
UY	The reporting limit was elevated due to chromatographic overlap with related compounds. The material was analyzed for, but was not detected above the level of the associated value.
J	The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.

<u>DV Qualifier</u>	<u>Definition</u>
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
UJ	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The sample result is rejected. The presence or absence of the analyte cannot be verified and data are not usable.
R1	This sample result has been rejected in favor of a more accurate and/or precise result. The other result should be used.

<u>Abbreviation</u>	<u>Definition</u>
ARI	Analytical Resources, Inc
DV	Data validation
FB	Friedman & Bruya
FGS	Eurofins Frontier Global Sciences
ICPMS	Inductively coupled plasma, mass spectroscopy
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
MS	Matrix spike
MSD	Matrix spike duplicate
NA	Not Applicable
RPD	Relative percent difference
RRM	Regional reference material
RSD	Relative standard deviations
SRM	Standard reference material

## 8.0 References

*USEPA Contract Laboratory Program National Functional Guidelines For Superfund Organic Methods Data Review*, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, June 2008, USEPA-540-R-008-01.

*USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Superfund Data Review*, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, January 2010, USEPA-540-R-10-011.

*Water Quality Monitoring, Quality Assurance Project Plan, Duwamish Sediment Other Area and Southwest Bank Corrective Measure and Habitat Project, Boeing Plant 2*. Prepared by AMEC Environment & Infrastructure Inc., et al. Prepared for: The Boeing Company, December 2012.

**BOEING PLANT 2**

**PERIMETER SEDIMENT DATA –  
JULY THROUGH SEPTEMBER 2014**

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## DATA VALIDATION REPORT

### *Boeing Plant 2–Perimeter Sediment Data, July through September 2014*

Prepared for:  
AMEC Foster Wheeler  
3500 188th Street SW, Ste 601  
Lynnwood, WA 98037-4763

June 11, 2015

### 1.0 Introduction

Data validation was performed on the following sediment data:

Sample ID	Sample Date/Time	Lab ID	Analyses
SD-PER301-0714	07/14/14 08:46	YR74A	PCBs, Metals, TOC, TS
SD-PER302-0714	07/14/14 09:37	YR74B	PCBs, Metals, TOC, TS
SD-PER303-0714	07/14/14 10:22	YR74C	PCBs, Metals, TOC, TS
SD-PER304-0714	07/14/14 12:56	YR74E	PCBs, Metals, TOC, TS
SD-PER305-0714	07/14/14 13:29	YR74F	PCBs, Metals, TOC, TS
SD-PER306-0714	07/14/14 14:47	YR74O	PCBs, Metals, TOC, TS
SD-PER307-0714	07/15/14 08:52	YR74H	PCBs, Metals, TOC, TS
SD-PER308-0714	07/15/14 10:24	YR74J	PCBs, Metals, TOC, TS
SD-PER309-0714	07/15/14 10:57	YR74K	PCBs, Metals, TOC, TS
SD-PER311-0714	07/15/14 12:26	YR74L	PCBs, Metals, TOC, TS
SD-PER312-0714	07/14/14 11:05	YR74D	PCBs, Metals, TOC, TS
SD-PER313-0714	07/14/14 14:08	YR74G	PCBs, Metals, TOC, TS
SD-PER327-0714	07/15/14 09:35	YR74I	PCBs, Metals, TOC, TS
SD-PER401-0714	07/15/14 13:06	YR74M	PCBs, Metals, TOC, TS
SD-PER402-0714	07/15/14 13:48	YR74N	PCBs, Metals, TOC, TS
SD-PER403-0714	07/15/14 14:30	YR74P	PCBs, Metals, TOC, TS
SD-PER404-0714	07/14/14 08:28	YR89A	PCBs, Metals, TOC, TS
SD-PER405-0714	07/14/14 09:06	YR89B	PCBs, Metals, TOC, TS
SD-PER406-0714	07/14/14 09:44	YR89C	PCBs, Metals, TOC, TS
SD-PER426-0714	07/14/14 10:15	YR89D	PCBs, Metals, TOC, TS
SD-PER508-0914	09/10/14 09:01	YZ45A	PCBs, Metals, TOC, TS
SD-PER509-0914	09/10/14 09:47	YZ45B	PCBs, Metals, TOC, TS
SD-PER504-0914	09/10/14 10:25	YZ45C	PCBs, Metals, TOC, TS
SD-PER510-0914	09/10/14 11:49	YZ45D	PCBs, Metals, TOC, TS
SD-PER511-0914	09/10/14 12:31	YZ45E	PCBs, Metals, TOC, TS
SD-PER505-0914	09/10/14 13:09	YZ45F	PCBs, Metals, TOC, TS
SD-PER525-0914	09/10/14 13:44	YZ45G	PCBs, Metals, TOC, TS
SD-PER501-0914	09/10/14 11:08	YZ45H	PCBs, Metals, TOC, TS
SD-PER502-0914	09/10/14 12:12	YZ45I	PCBs, Metals, TOC, TS
SD-PER503-0914	09/10/14 13:15	YZ45J	PCBs, Metals, TOC, TS
SD-PER513-0914	09/10/14 14:54	YZ45K	PCBs, Metals, TOC, TS
SD-PER312-0914	09/11/14 07:30	YZ87A	PCBs, Metals, TOC, TS
SD-PER303-0914	09/11/14 08:20	YZ87B	PCBs, Metals, TOC, TS
SD-PER305-0914	09/11/14 08:57	YZ87C	PCBs, Metals, TOC, TS

Sample ID	Sample Date/Time	Lab ID	Analyses
SD-PER313-0914	09/11/14 09:44	YZ87D	PCBs, Metals, TOC, TS
SD-PER512-0914	09/11/14 11:38	YZ87E	PCBs, Metals, TOC, TS
SD-PER507-0914	09/11/14 12:19	YZ87F	PCBs, Metals, TOC, TS
SD-PER506-0914	09/11/14 13:14	YZ87G	PCBs, Metals, TOC, TS
SD-PER518-0914	09/11/14 14:21	YZ87H	PCBs, Metals, TOC, TS
SD-PER515-0914	09/12/14 07:50	ZA01A	PCBs, Metals, TOC, TS
SD-PER516-0914	09/12/14 08:35	ZA01B	PCBs, Metals, TOC, TS
SD-PER517-0914	09/12/14 09:22	ZA01C	PCBs, Metals, TOC, TS
SD-PER514-0914	09/12/14 10:46	ZA01D	PCBs, Metals, TOC, TS
SD-PER301-0914	09/12/14 12:27	ZA01E	PCBs, Metals, TOC, TS
SD-PER302-0914	09/12/14 13:10	ZA01F	PCBs, Metals, TOC, TS
SD-PER304-0914	09/12/14 13:46	ZA01G	PCBs, Metals, TOC, TS
SD-PER306-0914	09/14/14 07:42	ZA31A	PCBs, Metals, TOC, TS
SD-PER307-0914	09/15/14 08:17	ZA31B	PCBs, Metals, TOC, TS
SD-PER327-0914	09/15/14 08:58	ZA31C	PCBs, Metals, TOC, TS
SD-PER308-0914	09/15/14 09:49	ZA31D	PCBs, Metals, TOC, TS
SD-PER106-0914	09/15/14 11:43	ZA31E	PCBs, Metals, TOC, TS
SD-PER126-0914	09/15/14 12:38	ZA31F	PCBs, Metals, TOC, TS
SD-PER101-0914	09/15/14 13:42	ZA31G	PCBs, Metals, TOC, TS
SD-PER309-0914	09/16/14 07:35	ZA46A	PCBs, Metals, TOC, TS
SD-PER310-0914	09/16/14 08:19	ZA46B	PCBs, Metals, TOC, TS
SD-PER311-0914	09/16/14 09:12	ZA46C	PCBs, Metals, TOC, TS
SD-PER201-0914	09/16/14 10:10	ZA46D	PCBs, Metals, TOC, TS
SD-PER102-0914	09/16/14 12:53	ZA46E	PCBs, Metals, TOC, TS
SD-PER104-0914	09/16/14 13:30	ZA46F	PCBs, Metals, TOC, TS
SD-PER105-0914	09/16/14 14:13	ZA46G	PCBs, Metals, TOC, TS
SD-PER103-0914	09/17/14 07:48	ZA66A	PCBs, Metals, TOC, TS
SD-PER206-0914	09/17/14 08:48	ZA66B	PCBs, Metals, TOC, TS
SD-PER203-0914	09/17/14 10:12	ZA66C	PCBs, Metals, TOC, TS
SD-PER209-0914	09/17/14 10:53	ZA66D	PCBs, Metals, TOC, TS
SD-PER212-0914	09/17/14 11:55	ZA66E	PCBs, Metals, TOC, TS
SD-PER213-0914	09/17/14 12:36	ZA66F	PCBs, Metals, TOC, TS
SD-PER204-0914	09/17/14 13:42	ZA66G	PCBs, Metals, TOC, TS
SD-PER401-0914	09/19/14 07:30	ZB07A	PCBs, Metals, TOC, TS
SD-PER404-0914	09/19/14 08:16	ZB07B	PCBs, Metals, TOC, TS
SD-PER402-0914	09/19/14 09:19	ZB07C	PCBs, Metals, TOC, TS
SD-PER403-0914	09/19/14 09:51	ZB07D	PCBs, Metals, TOC, TS
SD-PER202-0914	09/19/14 11:53	ZB07E	PCBs, Metals, TOC, TS
SD-PER205-0914	09/19/14 12:44	ZB07F	PCBs, Metals, TOC, TS
SD-PER207-0914	09/19/14 13:36	ZB07G	PCBs, Metals, TOC, TS
SD-PER405-0914	09/22/14 08:06	ZB22A	PCBs, Metals, TOC, TS
SD-PER406-0914	09/22/14 08:54	ZB22B	PCBs, Metals, TOC, TS
SD-PER426-0914	09/22/14 09:44	ZB22C	PCBs, Metals, TOC, TS
SD-PER211-0914	09/22/14 10:26	ZB22D	PCBs, Metals, TOC, TS
SD-PER210-0914	09/22/14 12:20	ZB22E	PCBs, Metals, TOC, TS
SD-PER230-0914	09/22/14 12:53	ZB22F	PCBs, Metals, TOC, TS
SD-PER208-0914	09/25/14 00:00	ZC17A	PCBs, Metals, TOC, TS

Analyses were performed by Analytical Resources, Inc. in Tukwila, Washington.

Validation: A summary validation was performed for these analyses. Validation was performed by Cari Saylor. Data qualifiers are summarized in section 5.0 of this report.

Analytical methods: Table 1 and table 2 of the QAPP specify the following analytical methods:

Analysis	Method
Polychlorinated Biphenyls (PCBs)	EPA 8082 with 3665B/3660B cleanups
Metals(except mercury)	EPA 6010
Mercury	EPA 7471A
Total Organic Carbon (TOC)	EPA 9060
Total Solids (TS)	160.1

These methods were used with the following exceptions: The most recent versions of the methods for PCB (8082A) and metals (6010C) were used. Arsenic was analyzed by method 200.8. Total organic carbon analyses were performed by Plumb, 1981, and total solids analyses were performed by EPA method 2540B. These are considered acceptable substitutions. Additionally, PCB cleanups included silica gel in addition to the specified sulfur and acid.

Sample Receipt: Sample chain-of-custodies were reviewed. Requested analyses were performed.

The cooler receipt temperatures measured at upon receipt at the laboratory were outside the recommended range of 2 to 6° in the most samples due to insufficient time to cool between shipping and arrival at the laboratory.

Five samples with elevated cooler temperatures were not delivered to the laboratory the same day, including:

SDG	SampleID(s)	Cooler Temp (°C)	Sample Receipt time
YR89	SD-PER404-0714 SD-PER405-0714 SD-PER406-0714 SD-PER426-0714	13.6	7/16 12:45
ZA31	SD-PER306-0914	8.9	9/15 16:00

The PCB results reported in these samples are qualified as estimated. The metals, TOC, and total solids results in each of these samples are considered unaffected because these analytes are not highly susceptible to degradation and the samples were refrigerated at the laboratory.

Sample number transcription: Sample IDs in the electronic data deliverable (EDD) were compared to the chain-of-custody for each sample. Sample IDs matched the chain of custody.

## 2.0 PCB Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and MS duplicate (MSD) must be analyzed one per twenty samples and a regional reference material (RRM) must be analyzed one per fifty samples. In addition, surrogate compounds must be measured in each field and quality control sample. These frequencies were met.

Field quality control sample requirements include field duplicates at a 10% frequency. Seven field duplicates were analyzed, achieving a frequency of 9.5%.

Holding times: Refrigerated sediment samples must be extracted within 14 days of collection. Frozen sediment samples must be extracted within 1 year of collection. Extracts must be analyzed within 40 days of extraction. These holding times were met.

Instrument calibration: Data usability criteria for calibrations include minimum correlation coefficients ( $R^2$ ) of 0.990 or maximum RSDs of  $\pm 20\%$  for each initial calibration, and maximum % differences of  $\pm 25\%$  for each continuing calibration. These criteria were met with the following exceptions:

Analyte	Analysis Date/Time/Column	Individual % Difference	Average Absolute % Difference
Aroclor-1242-2	07/24 12:58 ZB35	-27.2	11.8
Aroclor-1248-3	09/19 17:06 ZB35	59.4	29.2
Aroclor-1016-1	09/19 17:28 ZB5	32.7	25.3
Aroclor-1016-2	10/03 15:52 ZB35	-27.2	9.7
Aroclor-1016-2	10/03 19:55 ZB35	-27.0	9.3
Aroclor-1016-2	10/03 23:18 ZB35	-26.2	8.8
Aroclor-1016-2	10/07 13:12 ZB35	-25.8	8.6
Aroclor-1016-2	10/07 20:11 ZB35	-27.2	9.2

Detected Aroclor 1248 results in samples SD-PER504-0914, SD-PER508-0914, and SD-PER509-0914 associated with the 09/19 17:06 ZB35 standard are qualified as estimated. Aroclor 1016 was not detected in samples associated with the 09/19 17:28 ZB5 standard and no qualifiers are necessary. For the remaining individual % difference outliers, the average % difference for all quantitation peaks in the Aroclor was less than 25% and no qualifiers are required.

Laboratory blank results: Criteria for blanks are that analyte concentrations must be below the RL, or below 10% of the lowest associated sample concentration. These criteria were met.

Surrogate recoveries: QAPP control limits were 34-141%. Surrogate recoveries were within QAPP and laboratory control limits with the following exceptions:

Sample ID	Surrogate	% Recovery	Lab Control Limit
PSR ZB22	Tetrachlorometaxylene	43.2	44 – 120
PSR ZB07	Tetrachlorometaxylene	43.2	44 – 120

No qualifiers are necessary because these are quality control samples.

LCS recoveries: QAPP control limits were 37-116%. LCS recoveries were within QAPP and laboratory control limits.

RRM recoveries: RRM Aroclor 1260 results ranged from 86 to 100 ug/kg. All of the SRMs were within the advisory limits of 38-167%.

MS recoveries: QAPP control limits were 37-116%. Recoveries were within QAPP and laboratory control limits with the following exceptions

QC ID	Analyte	% Recovery	Lab Control Limit
SD-PER308-0914 MS	Aroclor 1260	131	58-120
SD-PER510-0914 SD	Aroclor 1260	50.5	58-120
SD-PER308-0914 SD	Aroclor 1260	47.6	58-120

In sample SD-PER308-0914, the MS recovery is outside both the QAPP and laboratory limits, and the Aroclor 1260 result is qualified as estimated.

MS/MSD RPDs: QAPP control limits were 50%. RPDs were within QAPP and laboratory control limits with the following exception:

QC ID	Analyte	RPD	Lab Control Limit
SD-PER308-0914 MSD	Aroclor 1260	70.0	30

The Aroclor 1260 result in sample the native sample is qualified as estimated.

Field duplicate RPDs: Field duplicate RPDs were below 50% where the concentrations were above five times the reporting limit with the following exceptions:

FD ID / Sample ID	Analyte	FD Result (ug/kg)	Sample Result (ug/kg)	RPD
SD-PER327-0914 / SD-PER307-0914	Aroclor 1254	64	25	87.6
SD-PER426-0914 / SD-PER406-0914	Aroclor 1260	91	49	60.0

These analytes are qualified as estimated in the field duplicates and parent samples.

Field duplicate concentrations were within +/- two times the reporting limit where concentrations were below five times the reporting limit with the following exceptions:

FD ID	Analyte	FD Result (ug/kg)	Sample Result (ug/kg)	RL
SD-PER327-0914 / SD-PER307-0914	Aroclor 1248	32	12	3.8
SD-PER327-0914 / SD-PER307-0914	Aroclor 1260	28	15	3.8

These analytes are qualified as estimated in the field duplicate and parent sample

Multiple reported results: Unless quality control results warrant the rejection of one result, multiple reported results are evaluated according to the following guidelines

- (1) If both results are non-detects, the lower reporting limit was selected.
- (2) If one result was not detected and the other detected, the detection was selected.
- (3) If both results were detections, the following additional criteria were applied:
  - (a) If one result was off-scale and one was on-scale, the on-scale result was selected.
  - (b) If associated QC results indicated high bias, the lower concentration result was selected.
  - (c) If associated QC results indicated no, low, or mixed biases, the higher concentration result was selected.

This approach is conservative, and is considered most protective of the environment. The results not selected as the best result to report are qualified R1, rejected due to the availability of better results.

Samples with dilutions were reduced to a single result.

Laboratory flags: The Aroclor 1248 result in sample SD-PER211-0914 is flagged Y to indicate an elevated reporting limit. This result is qualified "UY" to clarify that the aroclor was not detected. Aroclor 1254 results in samples SD-PER301-0714, SD-PER304-0714, and SD-PER327-0714, were flagged "P" to indicate the dual column RPD exceeded 40%. These results are qualified as estimated.

Reporting limits: The RL for Aroclor 1248 in sample SD-PER211-0914 was elevated above 20 ug/Kg due to chromatographic overlap with other aroclors. This sample also contained detected aroclors and the impact on the total PCB value was minimal. No qualifiers are assigned on the basis of elevated reporting limits.

Overall assessment: Documentation was found to be clear and complete. Calibration data demonstrate acceptable instrument performance. Laboratory control sample results demonstrate acceptable accuracy and precision. Multiple analysis results were reduced to the most appropriate to use. Results were estimated due to elevated cooler receipt temperatures, high continuing calibration results, MS recoveries, MS/MSD variability, field duplicate variability, and dual column variability.

Except for data replaced by another result, PCB data are acceptable for use as qualified.

### 3.0 Metals Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and laboratory duplicate must be analyzed one per twenty samples. These frequencies were met.

Field quality control sample requirements include field duplicates at a 10% frequency. Seven field duplicates were analyzed, achieving a frequency of 9.5%.

Holding times: Total or dissolved mercury samples must be analyzed within 28 days of collection. Other metals samples must be analyzed within 180 days. These criteria were met.

Instrument calibration: Functional guidelines criteria for calibration verifications is a maximum % difference of +10% for ICP metals and +15% for mercury. QAPP criterion for calibration verifications is +10% for ICP metals and +20% for mercury. Criteria for calibration blanks are that analyte concentrations must be between the negative RL and the positive RL. Functional guidelines criterion for detection limit standard recovery is 70-130%, and the QAPP specifies this standard must be within one RL of the true value. These criteria were met for all calibration verifications and blanks.

The chromium detection limit standard recovery in SDG ZA01 was slightly above the 70-130% criteria at 133%. Chromium results in the SDG were sufficiently above the reporting limit, and no qualifiers are required. Remaining detection limit standard recoveries were within 70-130%.

Laboratory blank results: Criteria for method blanks are that analyte concentrations must be below the PQL, or below 10% of the lowest associated sample concentration. No contamination was detected in the method blanks.

LCS recoveries: QAPP control limits were 80-120%. LCS recoveries were within QAPP and laboratory control limits.

SRM recoveries: SRM concentrations were within the advisory range with one exception:

QC ID	Analyte	Concentration (mg/kg)	Certified Value (mg/kg)	Advisory Range (mg/kg)
YR74 SRM	Arsenic	75.2	182	151-214

All arsenic results in batch YR74 are qualified as estimated.

MS recoveries: QAPP control limits were 75-125%. Functional guidelines criteria for both ICP metals and mercury are 75-125%. MS recoveries were within QAPP and laboratory control limits.

Laboratory duplicate RPDs: QAPP control limits were <20%. For duplicates with concentrations above five times the reporting limit, RPDs were within QAPP and laboratory control limits with one exception:

QC ID	Analyte	RPD	Lab Control Limit
SD-PER309-0914 LR	Copper	26.2	20

This result is qualified as estimated in the native sample.

For sample/duplicate pairs with concentrations below five times the reporting limit, absolute differences were within two times the reporting limit.

Field duplicate RPDs: Field duplicate RPDs were below 20% where the concentrations were above five times the reporting limit with the following exceptions:

FD ID	Analyte	FD Result (mg/kg)	Sample Result (mg/kg)	RPD
SD-PER126-0914 / SD-PER106-0914	Arsenic	12.1	9.8	21.0
SD-PER327-0914 / SD-PER307-0914	Arsenic	10.2	6.9	38.6
SD-PER327-0914 / SD-PER307-0914	Copper	43.6	33.2	27.1
SD-PER327-0914 / SD-PER307-0914	Zinc	98	75	26.6
SD-PER426-0714 / SD-PER406-0714	Chromium	45.6	28.4	46.5
SD-PER426-0714 / SD-PER406-0714	Zinc	135	84	46.6
SD-PER525-0914 / SD-PER505-0914	Chromium	36	51	34.5

These analytes are qualified as estimated in the field duplicates and parent samples.

Field duplicate concentrations were within +/- two times the reporting limit where concentrations were below five times the reporting limit with one exception:

FD ID	Analyte	FD Result (mg/kg)	Sample Result (mg/kg)	RL (mg/kg)
SD-PER426-0714 / SD-PER406-0714	Lead	33	14	4

This analyte is qualified as estimated in the field duplicate and parent sample.

Reporting limits: Some RLs were elevated above QAPP levels due to dry weight calculation or sample dilution:

Analyte	QAPP specified RL (mg/kg)	Highest Reported RL (mg/kg)	SMS SQS (mg/kg)
Cadmium	0.2	0.6	5.1
Mercury	0.025	0.04	0.41
Silver	0.3	0.9	6.1

Each elevated RL was below the screening level and the impact on data use is minimal. No qualifiers are assigned on the basis of elevated reporting limits.

Overall assessment: Documentation was found to be clear and complete. Calibration data demonstrate acceptable instrument performance. Method blank, LCS, and MS results demonstrate acceptable accuracy. Data were estimated based on SRM recoveries and laboratory and field duplicate variability.

Metals data are acceptable for use as qualified.

#### 4.0 General Chemistry Analyses

Quality control analysis frequencies: For total organic carbon, a method blank, SRM, and LCS were analyzed in each batch. Five of the eight batches also included a MS and laboratory triplicate. For total solids, each batch included a method blank and laboratory triplicate. One batch also included a second laboratory triplicate. Quality control samples were sufficient to evaluate precision and accuracy as appropriate for the method.

Field quality control sample requirements include field duplicates at a 10% frequency. Seven field duplicates were analyzed, achieving a frequency of 9.5%.

Holding times: Holding times are as follows:

Analysis	Holding time if refrigerated	Holding time if frozen
TOC	28 days	6 months
Total Solids	14 days	6 months

Samples were analyzed within the holding times.

Instrument calibration: Instrument calibration criteria are as follows:

Analysis	Criteria
TOC	Initial calibration $R^2 > 0.990$ Continuing calibration recovery within 90-110%
Total Solids	Calibration mass within $\pm 0.1$ g

These criteria were met.

Laboratory blank results: Criteria for method blanks are that analyte concentrations must be below the PQL, or below 10% of the lowest associated sample concentration. This criterion was met for all method blanks.

LCS recoveries: Control limits were 75-125% for TOC. These criteria were met.

SRM results: Control limits were 80-120% for TOC. These criteria were met.

MS recoveries: Control limits were 75-125% for TOC. These criteria were met with the following exceptions:

QC ID	Analyte	% Recovery	Lab Control Limit
SD-PER508-0914 MS	Total Organic Carbon	63.0	75 - 125
SD-PER404-0714 MS	Total Organic Carbon	52.1	75 - 125
SD-PER312-0914 MS	Total Organic Carbon	67.4	75 - 125

These TOC results are qualified as estimated in the native samples.

Laboratory duplicate and triplicate results: Control limits were 20% for TOC and total solids. These criteria were met.

Field duplicate results: TOC and total solids field duplicate RPDs were below 25% with the following exceptions:

FD ID	Analyte	FD Result (%)	Sample Result (%)	RPD
SD-PER126-0914 / SD-PER106-0914	Total Organic Carbon	2.35	1.4	50.7
SD-PER327-0714 / SD-PER307-0714	Total Organic Carbon	0.886	1.51	52.1
SD-PER327-0914 / SD-PER307-0914	Total Organic Carbon	2.45	1.84	28.4
SD-PER426-0914 / SD-PER406-0914	Total Organic Carbon	1.9	0.975	64.3
SD-PER525-0914 / SD-PER505-0914	Total Organic Carbon	1.47	2.73	60.0

These results are qualified as estimated in the field duplicate and parent sample.

Overall assessment: Documentation was found to be clear and complete. Calibration data indicate acceptable performance. Method blank, LCS, and SRM results demonstrate acceptable laboratory accuracy. Laboratory triplicates demonstrate acceptable laboratory precision. Sample results were qualified based on matrix spike recoveries and field duplicate variability.

General chemistry results are acceptable for use as qualified.

## 5.0 Qualifier Summary Table

Client ID	Analyte(s)	Qualifier	Reason
<b>PCB Analyses</b>			
SD-PER211-0914	Aroclor 1248	UY	Clarification of Y flag
SD-PER211-0914	Aroclor 1254, Aroclor 1260	R1	Another result available
SD-PER211-0914 DL	All except Aroclor 1254, Aroclor 1260	R1	Another result available
SD-PER301-0714	Aroclor 1254	J	High dual column RPD
SD-PER304-0714	Aroclor 1254	J	High dual column RPD
SD-PER306-0914	Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242	UJ	High cooler receipt temperature
SD-PER306-0914	Aroclor 1248, Aroclor 1254, Aroclor 1260	J	High cooler receipt temperature
SD-PER307-0914	Aroclor 1248, Aroclor 1260	J	High FD Difference
SD-PER307-0914	Aroclor 1254	J	High FD RPD
SD-PER308-0914	Aroclor 1260	J	High MS/MSD RPD, high MS Recovery
SD-PER327-0714	Aroclor 1254	J	High dual column RPD
SD-PER327-0914	Aroclor 1248, Aroclor 1260	J	High FD Difference
SD-PER327-0914	Aroclor 1254	J	High FD RPD
SD-PER401-0914	Aroclor 1248, Aroclor 1254, Aroclor 1260	R1	Another result available
SD-PER401-0914 DL	Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242	R1	Another result available
SD-PER404-0714	Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242	UJ	High cooler receipt temperature
SD-PER404-0714	Aroclor 1248, Aroclor 1254, Aroclor 1260	J	High cooler receipt temperature
SD-PER405-0714	Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242	UJ	High cooler receipt temperature
SD-PER405-0714	Aroclor 1248, Aroclor 1254, Aroclor 1260	J	High cooler receipt temperature
SD-PER406-0714	Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242	UJ	High cooler receipt temperature
SD-PER406-0714	Aroclor 1248, Aroclor 1254, Aroclor 1260	J	High cooler receipt temperature
SD-PER406-0914	Aroclor 1260	J	High FD RPD
SD-PER426-0714	Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242	UJ	High cooler receipt temperature
SD-PER426-0714	Aroclor 1248, Aroclor 1254, Aroclor 1260	J	High cooler receipt temperature
SD-PER426-0914	Aroclor 1260	J	High FD RPD
SD-PER504-0914	Aroclor 1248	J	High CCV % Difference
SD-PER508-0914	Aroclor 1248	J	High CCV % Difference
SD-PER509-0914	Aroclor 1248	J	High CCV % Difference
<b>Metals Analyses</b>			
SD-PER106-0914	Arsenic	J	High FD RPD
SD-PER126-0914	Arsenic	J	High FD RPD
SD-PER301-0714	Arsenic	UJ	Low SRM recovery

Client ID	Analyte(s)	Qualifier	Reason
SD-PER302-0714	Arsenic	UJ	Low SRM recovery
SD-PER303-0714	Arsenic	UJ	Low SRM recovery
SD-PER304-0714	Arsenic	UJ	Low SRM recovery
SD-PER305-0714	Arsenic	UJ	Low SRM recovery
SD-PER306-0714	Arsenic	UJ	Low SRM recovery
SD-PER307-0714	Arsenic	UJ	Low SRM recovery
SD-PER307-0914	Arsenic, Copper, Zinc	J	High FD RPD
SD-PER308-0714	Arsenic	UJ	Low SRM recovery
SD-PER309-0714	Arsenic	UJ	Low SRM recovery
SD-PER309-0914	Copper	J	High lab duplicate RPD
SD-PER311-0714	Arsenic	UJ	Low SRM recovery
SD-PER312-0714	Arsenic	UJ	Low SRM recovery
SD-PER313-0714	Arsenic	UJ	Low SRM recovery
SD-PER327-0914	Arsenic, Copper, Zinc	J	High FD RPD
SD-PER401-0714	Arsenic	UJ	Low SRM recovery
SD-PER402-0714	Arsenic	UJ	Low SRM recovery
SD-PER403-0714	Arsenic	UJ	Low SRM recovery
SD-PER406-0714	Chromium, Zinc	J	High FD RPD
SD-PER406-0714	Lead	J	High FD Difference
SD-PER426-0714	Chromium, Zinc	J	High FD RPD
SD-PER426-0714	Lead	J	High FD Difference
SD-PER505-0914	Chromium	J	High FD RPD
SD-PER525-0914	Chromium	J	High FD RPD
General Chemistry Analyses			
SD-PER106-0914	Total Organic Carbon	J	High FD RPD
SD-PER126-0914	Total Organic Carbon	J	High FD RPD
SD-PER307-0714	Total Organic Carbon	J	High FD RPD
SD-PER307-0914	Total Organic Carbon	J	High FD RPD
SD-PER312-0914	Total Organic Carbon	J	Low MS recovery
SD-PER327-0714	Total Organic Carbon	J	High FD RPD
SD-PER327-0914	Total Organic Carbon	J	High FD RPD
SD-PER404-0714	Total Organic Carbon	J	Low MS recovery
SD-PER406-0914	Total Organic Carbon	J	High FD RPD
SD-PER426-0914	Total Organic Carbon	J	High FD RPD
SD-PER505-0914	Total Organic Carbon	J	High FD RPD
SD-PER508-0914	Total Organic Carbon	J	Low MS recovery
SD-PER525-0914	Total Organic Carbon	J	High FD RPD

## 6.0 Abbreviations and Definitions

DV Qualifier	Definition
U	The material was analyzed for, but was not detected above the level of the associated value.
UY	The reporting limit was elevated due to chromatographic overlap with related compounds. The material was analyzed for, but was not detected above the level of the associated value.
J	The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
UJ	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The sample result is rejected. The presence or absence of the analyte cannot be verified and data are not usable.
R1	This sample result has been rejected in favor of a more accurate and/or precise result. The other result should be used.

<u>Abbreviation</u>	<u>Definition</u>
DV	Data validation
LCS	Laboratory control sample
MS	Matrix spike
MSD	Matrix spike duplicate
NA	Not Applicable
RL	Reporting limit
RPD	Relative percent difference
RRM	Regional reference material
RSD	Relative standard deviations
SRM	Standard reference material

## 7.0 References

*USEPA Contract Laboratory Program National Functional Guidelines For Superfund Organic Methods Data Review*, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, June 2008, USEPA-540-R-008-01.

*USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Superfund Data Review*, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, January 2010, USEPA-540-R-10-011.

*Construction and Post-Construction Sediment Monitoring Quality Assurance Project Plan, Duwamish Sediment Other Area and Southwest Bank Corrective Measure and Habitat Project, Boeing Plant 2*. Prepared by AMEC Environment & Infrastructure Inc., et al. Prepared for: The Boeing Company, December 2012

*South Shoreline Subsurface Environmental Characterization Quality Assurance Project Plan, Duwamish Sediment Other Area and Southwest Bank Corrective Measure and Habitat Project, Boeing Plant 2*. Prepared by AMEC Environment & Infrastructure Inc., et al. Prepared for: The Boeing Company, June 2013

**BOEING PLANT 2 SEDIMENT SAMPLES:**

**JORGENSEN BACKFILL –  
NOVEMBER 2014 AND MARCH 2015**

**POST-CONSTRUCTION CONFIRMATION CORE –  
OCTOBER 2014 THROUGH FEBRUARY 2015**

**POST-CONSTRUCTION PERIMETER SEDIMENT MONITORING –  
FEBRUARY AND MARCH 2015**

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## DATA VALIDATION REPORT

### *Boeing Plant 2 Sediment Samples:*

*Jorgensen Backfill - November 2014 and March 2015*

*Post-construction Confirmation Core - October 2014 through February 2015*

*Post-construction Perimeter Sediment Monitoring - February and March 2015*

Prepared for:

AMEC Foster Wheeler  
3500 188th Street SW, Ste 601  
Lynnwood, WA 98037-4763

June 11, 2015

### 1.0 Introduction

Data Validation was performed on the following sediment samples:

Sample ID	Sample Date/Time	Lab Sample ID	Analyses
<b>Jorgensen Backfill Samples</b>			
SD-JOR01-1114	11/24/14 11:21	ZM12D	PCBs, Metals, TOC and TS
SD-JOR02-1114	11/24/14 12:42	ZM12E	PCBs, Metals, TOC and TS
SD-JOR03-1114	11/24/14 14:07	ZM12F	PCBs, Metals, TOC and TS
SD-JOR04-1114	11/24/14 10:41	ZM12C	PCBs, Metals, TOC and TS
SD-JOR05-1114	11/24/14 08:42	ZM12A	PCBs, Metals, TOC and TS
SD-JOR06-1114	11/24/14 10:02	ZM12B	PCBs, Metals, TOC and TS
SD-JOR01-0315	03/06/15 14:43	ZZ32F	PCBs, Metals, TOC and TS
SD-JOR02-0315	03/06/15 14:07	ZZ32E	PCBs, Metals, TOC and TS
SD-JOR03-0315	03/06/15 13:15	ZZ32D	PCBs, Metals, TOC and TS
SD-JOR04-0315	03/06/15 11:13	ZZ32C	PCBs, Metals, TOC and TS
SD-JOR05-0315	03/06/15 09:54	ZZ32B	PCBs, Metals, TOC and TS
SD-JOR06-0315	03/06/15 08:57	ZZ32A	PCBs, Metals, TOC and TS
SD JOR 03 R2	03/17/15 08:23	AB03A	PCBs, Metals, TOC and TS
<b>Post-construction Confirmation Core Samples</b>			
SD-PCC009-A	11/25/14 11:19	ZM46A	PCBs, Metals, TOC and TS
SD-PCC009-B	11/25/14 11:19	ZM46B	PCBs, Metals, TOC and TS
SD-PCC009-C	11/25/14 11:19	ZM46C	PCBs, Metals, TOC and TS
SD-PCC-010-A	11/12/14 12:06	ZK51A	PCBs, Metals, TOC and TS
SD-PCC-010-B	11/12/14 12:06	ZK51B	PCBs, Metals, TOC and TS
SD-PCC-010-C	11/12/14 12:06	ZK51C	PCBs, Metals, TOC and TS
SD-PCC011-A	10/10/14 15:01	ZE56A	PCBs, Metals, TOC and TS
SD-PCC011-B	10/10/14 15:01	ZE56B	PCBs, Metals, TOC and TS
SD-PCC015-A	01/07/15 12:49	R75A	PCBs, Metals, TOC and TS
SD-PCC015-B	01/07/15 12:49	R75B	PCBs, Metals, TOC and TS
SD-PCC015-C	01/07/15 12:49	R75C	PCBs, Metals, TOC and TS

Sample ID	Sample Date/Time	Lab Sample ID	Analyses
SD-PCC016-A	02/20/15 11:15	ZX23A	PCBs, Metals, TOC and TS
SD-PCC016-B	02/20/15 11:15	ZX23B	PCBs, Metals, TOC and TS
SD-PCC016-C	02/20/15 11:15	ZX23C	PCBs, Metals, TOC and TS
SD-PCC016-D	02/20/15 11:15	ZX23D	PCBs, Metals, TOC and TS
SD-PCC017-A	02/20/15 10:32	ZX23E	PCBs, Metals, TOC and TS
SD-PCC017-B	02/20/15 10:32	ZX23F	PCBs, Metals, TOC and TS
SD-PCC017-C	02/20/15 10:32	ZX23G	PCBs, Metals, TOC and TS
SD-PCC017-D	02/20/15 10:32	ZX23H	PCBs, Metals, TOC and TS
SD-PCC017-E	02/20/15 10:32	ZX23I	PCBs, Metals, TOC and TS
SD-PCC018-A	02/18/15 13:26	ZW91A	PCBs, Metals, TOC and TS
SD-PCC018-B	02/18/15 13:26	ZW91B	PCBs, Metals, TOC and TS
SD-PCC018-C	02/18/15 13:26	ZW91C	PCBs, Metals, TOC and TS
SD-PCC018-D	02/18/15 13:26	ZW91D	PCBs, Metals, TOC and TS
SD-PCC018-E	02/18/15 13:26	ZW91E	PCBs, Metals, TOC and TS
SD-PCC018-F	02/18/15 13:26	ZW91F	PCBs, Metals, TOC and TS
SD-PCC019-A	02/18/15 13:01	ZW91G	PCBs, Metals, TOC and TS
SD-PCC019-B	02/18/15 13:01	ZW91H	PCBs, Metals, TOC and TS
SD-PCC019-C	02/18/15 13:01	ZW91I	PCBs, Metals, TOC and TS
SD-PCC019-D	02/18/15 13:01	ZW91J	PCBs, Metals, TOC and TS
SD-PCC019-E	02/18/15 13:01	ZW91K	PCBs, Metals, TOC and TS
SD-PCC019-F	02/18/15 13:01	ZW91L	PCBs, Metals, TOC and TS
SD-PCC020-A	02/18/15 12:18	ZW91M	PCBs, Metals, TOC and TS
SD-PCC020-B	02/18/15 12:18	ZW91N	PCBs, Metals, TOC and TS
SD-PCC020-C	02/18/15 12:18	ZW91O	PCBs, Metals, TOC and TS
SD-PCC020-D	02/18/15 12:18	ZW91P	PCBs, Metals, TOC and TS
SD-PCC020-E	02/18/15 12:18	ZW91Q	PCBs, Metals, TOC and TS
SD-PCC021-A	02/17/15 11:43	ZW78A	PCBs, Metals, TOC and TS
SD-PCC021-B	02/17/15 11:43	ZW78B	PCBs, Metals, TOC and TS
SD-PCC021-C	02/17/15 11:43	ZW78C	PCBs, Metals, TOC and TS
SD-PCC021-D	02/17/15 11:43	ZW78D	PCBs, Metals, TOC and TS
SD-PCC021-E	02/17/15 11:43	ZW78E	PCBs, Metals, TOC and TS
SD-PCC021-F	02/17/15 11:43	ZW78F	PCBs, Metals, TOC and TS
SD-PCC022-A	02/17/15 10:34	ZW79A	PCBs, Metals, TOC and TS
SD-PCC022-B	02/17/15 10:34	ZW79B	PCBs, Metals, TOC and TS
SD-PCC022-C	02/17/15 10:34	ZW79C	PCBs, Metals, TOC and TS
SD-PCC022-D	02/17/15 10:34	ZW79D	PCBs, Metals, TOC and TS
SD-PCC022-E	02/17/15 10:34	ZW79E	PCBs, Metals, TOC and TS
SD-PCC022-F	02/17/15 10:34	ZW79F	PCBs, Metals, TOC and TS
SD-PCC023-A	02/17/15 13:20	ZW78G	PCBs, Metals, TOC and TS
SD-PCC023-B	02/17/15 13:20	ZW78H	PCBs, Metals, TOC and TS
SD-PCC023-C	02/17/15 13:20	ZW78I	PCBs, Metals, TOC and TS
SD-PCC023-D	02/17/15 13:20	ZW78J	PCBs, Metals, TOC and TS
SD-PCC023-E	02/17/15 13:20	ZW78K	PCBs, Metals, TOC and TS
SD-PCC023-F	02/17/15 13:20	ZW78L	PCBs, Metals, TOC and TS
SD-PCC024-A	02/17/15 09:57	ZW78M	PCBs, Metals, TOC and TS
SD-PCC024-B	02/17/15 09:57	ZW78N	PCBs, Metals, TOC and TS
SD-PCC024-C	02/17/15 09:57	ZW78O	PCBs, Metals, TOC and TS
SD-PCC024-D	02/17/15 09:57	ZW78P	PCBs, Metals, TOC and TS
SD-PCC024-E	02/17/15 09:57	ZW78Q	PCBs, Metals, TOC and TS
SD-PCC024-F	02/17/15 09:57	ZW78R	PCBs, Metals, TOC and TS
SD-PCC-210-A	11/12/14 12:20	ZK51D	PCBs, Metals, TOC and TS
SD-PCC-210-B	11/12/14 12:20	ZK51E	PCBs, Metals, TOC and TS

Sample ID	Sample Date/Time	Lab Sample ID	Analyses
SD-PCC-210-C	11/12/14 12:20	ZK51F	PCBs, Metals, TOC and TS
Post-construction Perimeter Sediment Monitoring Samples			
SD-PER101-0315	03/16/15 13:33	AA70F	PCBs, Metals, TOC and TS
SD-PER102-0315	03/17/15 11:25	AB02C	PCBs, Metals, TOC and TS
SD-PER103-0315	03/17/15 10:42	AB02B	PCBs, Metals, TOC and TS
SD-PER104-0315	03/17/15 09:15	AB02A	PCBs, Metals, TOC and TS
SD-PER105-0315	03/17/15 14:09	AB02E	PCBs, Metals, TOC and TS
SD-PER106-0315	03/19/15 13:36	AB51E	PCBs, Metals, TOC and TS
SD-PER126-0315	03/19/15 14:09	AB51F	PCBs, Metals, TOC and TS
SD-PER201-0315	03/16/15 12:45	AA70E	PCBs, Metals, TOC and TS
SD-PER202-0315	03/17/15 12:37	AB02D	PCBs, Metals, TOC and TS
SD-PER203-0315	03/16/15 14:19	AA70G	PCBs, Metals, TOC and TS
SD-PER204-0315	03/18/15 08:27	AB25A	PCBs, Metals, TOC and TS
SD-PER205-0315	03/18/15 10:31	AB25C	PCBs, Metals, TOC and TS
SD-PER206-0315	03/18/15 09:12	AB25B	PCBs, Metals, TOC and TS
SD-PER207-0315	03/18/15 11:08	AB25D	PCBs, Metals, TOC and TS
SD-PER208-0315	03/19/15 08:52	AB51A	PCBs, Metals, TOC and TS
SD-PER209-0315	03/18/15 12:11	AB25E	PCBs, Metals, TOC and TS
SD-PER210-0315	03/18/15 13:14	AB25F	PCBs, Metals, TOC and TS
SD-PER211-0315	03/19/15 12:48	AB51D	PCBs, Metals, TOC and TS
SD-PER212-0315	03/19/15 10:42	AB51B	PCBs, Metals, TOC and TS
SD-PER213-0315	03/19/15 11:18	AB51C	PCBs, Metals, TOC and TS
SD-PER230-0315	03/18/15 13:54	AB25G	PCBs, Metals, TOC and TS
SD-PER301-0315	03/09/15 14:52	ZZ56E	PCBs, Metals, TOC and TS
SD-PER302-0315	03/09/15 15:54	ZZ56F	PCBs, Metals, TOC and TS
SD-PER303-0315	02/26/15 14:23	ZX96F	PCBs, Metals, TOC and TS
SD-PER304-0315	02/27/15 10:37	ZY25C	PCBs, Metals, TOC and TS
SD-PER305-0315	02/27/15 09:37	ZY25B	PCBs, Metals, TOC and TS
SD-PER306-0315	02/27/15 12:24	ZY25D	PCBs, Metals, TOC and TS
SD-PER307-0315	03/09/15 11:25	ZZ56B	PCBs, Metals, TOC and TS
SD-PER308-0315	03/09/15 10:03	ZZ56A	PCBs, Metals, TOC and TS
SD-PER309-0315	03/09/15 13:17	ZZ56D	PCBs, Metals, TOC and TS
SD-PER310-0315	02/27/15 13:27	ZY25E	PCBs, Metals, TOC and TS
SD-PER311-0315	02/27/15 14:06	ZY25F	PCBs, Metals, TOC and TS
SD-PER312-0315	02/26/15 13:05	ZX96E	PCBs, Metals, TOC and TS
SD-PER313-0315	02/27/15 08:50	ZY25A	PCBs, Metals, TOC and TS
SD-PER327-0315	03/09/15 12:36	ZZ56C	PCBs, Metals, TOC and TS
SD-PER401-0315	02/25/15 11:11	ZX79A	PCBs, Metals, TOC and TS
SD-PER402-0315	02/25/15 13:25	ZX79B	PCBs, Metals, TOC and TS
SD-PER403-0315	02/25/15 14:14	ZX79C	PCBs, Metals, TOC and TS
SD-PER404-0315	02/26/15 08:53	ZX96A	PCBs, Metals, TOC and TS
SD-PER405-0315	02/26/15 09:41	ZX96B	PCBs, Metals, TOC and TS
SD-PER406-0315	02/26/15 11:29	ZX96C	PCBs, Metals, TOC and TS
SD-PER426-0315	02/26/15 12:04	ZX96D	PCBs, Metals, TOC and TS
SD-PER501-0315	03/20/15 10:00	AB63A	PCBs, Metals, TOC and TS
SD-PER502-0315	03/20/15 10:25	AB63B	PCBs, Metals, TOC and TS
SD-PER503-0315	03/20/15 10:35	AB63C	PCBs, Metals, TOC and TS
SD-PER504-0315	03/16/15 10:59	AA70D	PCBs, Metals, TOC and TS
SD-PER505-0315	03/16/15 09:24	AA70B	PCBs, Metals, TOC and TS
SD-PER506-0315	03/13/15 12:52	AA46E	PCBs, Metals, TOC and TS
SD-PER507-0315	03/13/15 11:05	AA46D	PCBs, Metals, TOC and TS
SD-PER508-0315	03/11/15 14:35	ZZ80C	PCBs, Metals, TOC and TS

Sample ID	Sample Date/Time	Lab Sample ID	Analyses
SD-PER509-0315	03/12/15 11:15	AA04C	PCBs, Metals, TOC and TS
SD-PER510-0315	03/11/15 12:55	ZZ80A	PCBs, Metals, TOC and TS
SD-PER511-0315	03/16/15 08:45	AA70A	PCBs, Metals, TOC and TS
SD-PER512-0315	03/12/15 10:03	AA04B	PCBs, Metals, TOC and TS
SD-PER513-0315	03/11/15 13:33	ZZ80B	PCBs, Metals, TOC and TS
SD-PER514-0315	03/13/15 13:20	AA46F	PCBs, Metals, TOC and TS
SD-PER515-0315	03/13/15 08:29	AA46A	PCBs, Metals, TOC and TS
SD-PER516-0315	03/13/15 09:10	AA46B	PCBs, Metals, TOC and TS
SD-PER517-0315	03/13/15 10:27	AA46C	PCBs, Metals, TOC and TS
SD-PER518-0315	03/12/15 09:22	AA04A	PCBs, Metals, TOC and TS
SD-PER525-0315	03/16/15 09:55	AA70C	PCBs, Metals, TOC and TS

Please note: The November 24, 2014 and March 6, 2015 Jorgensen Backfill samples utilized the same sampleIDs. For clarity, suffixes of "-1114" or "-0315" have been added to these sampleIDs throughout this report.

Analyses were performed by Analytical Resources, Inc. in Tukwila, Washington.

Validation: A summary validation was performed for these analyses. Validation was performed by Cari Sayler. Data qualifiers are summarized in section 5.0 of this report.

Analytical methods: Table 1 and table 2 of the QAPP specify the following analytical methods:

Analysis	Method
Polychlorinated Biphenyls	EPA 8082 with 3665B/3660B cleanups
Metals(except mercury)	EPA 6010
Mercury	EPA 7471A
Total Organic Carbon	EPA 9060
Total Solids	160.1

These following methods were used: The most recent version of the methods for PCB (8082A) was used. ICP metals were analyzed by method 200.8 or 6010C. Total Organic Carbon (TOC) analyses were performed by Plumb, 1981, and total solids analyses were performed by EPA method 2540G. These are considered acceptable substitutions. Additionally, PCB cleanups included silica gel in addition to the specified sulfur and acid cleanups.

Sample Receipt: Sample chain-of-custodies and sample log-in documentation were reviewed. All requested analyses were performed.

The cooler receipt temperatures measured at upon receipt at the laboratory ranged from 2.3 to 13.6 °C. No qualifiers are assigned due to the temperatures outside the target range of 2 to 6 because the PCB, Metals, TOC, and total solids analytes are not highly susceptible to degradation and the samples were refrigerated or frozen at the laboratory.

Sample number transcription: Sample IDs in the electronic data deliverable (EDD) were compared to the chain-of-custody for each sample. All sample IDs matched the chain of custody. As noted above where identical sampleIDs were used for the Jorgensen Backfill samples, suffixes of "-1114" or "-0315" have been added.

## 2.0 PCB Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and MS duplicate (MSD) must be analyzed one per twenty samples and a regional reference material (RRM) must be analyzed one per fifty samples. In addition, surrogate compounds must be measured in each field and quality control sample. These frequencies were met.

Field quality control sample requirements include field duplicates at a 10% frequency for the post-excavation bank samples only. No field duplicates were required for the Jorgensen Backfill samples. Five field duplicates were analyzed with the post-construction perimeter sediment samples and three field duplicates were analyzed with the initial round of post-construction confirmation core samples. No qualifiers are assigned based on field QC frequency requirements.

Holding times: Refrigerated sediment samples must be extracted within 14 days of collection. Frozen sediment samples must be extracted within 1 year of collection. Extracts must be analyzed within 40 days of extraction. These holding times were met.

Instrument calibration: Data usability criteria for calibrations include minimum correlation coefficients ( $R^2$ ) of 0.990 or maximum RSDs of  $\pm 20\%$  for each initial calibration, and maximum % differences of  $\pm 25\%$  for each continuing calibration. These criteria were met with the following exceptions:

Lab SDG	Standard ID	Aroclor peak	Difference (%)
ZM46	11/30/14 00:30 ZB5	Aroclor 1016-4	25.9
ZM46	11/30/14 05:54 ZB5	Aroclor 1016-4	26.1
ZX23	02/22/15 23:00 ZB5	Aroclor 1260-5	25.4
AB03	04/04/15 02:34 ZB5	Aroclor 1260-1	25.5
AB03	04/04/15 10:04 ZB5	Aroclor 1260-1	30.4
AB03	04/04/15 13:17 ZB5	Aroclor 1260-1	27.2
AB51/AB63	04/06/15 17:57 ZB5	Aroclor 1260-1	33.7
AB51/AB63	04/06/15 17:57 ZB5	Aroclor 1260-2	27.1

Aroclor 1016 was not detected in the associated samples, and no qualifiers are required. The average percent difference for Aroclor 1260 is within limits for all standards except for the 4/6/15 17:57 standard, which had an average % difference of 25.1%. According to the laboratory narrative, the sample results associated with this standard was quantitated from the ZB35 column and no qualifiers are assigned.

Laboratory blank results: Criteria for blanks are that analyte concentrations must be below the RL, or below 10% of the lowest associated sample concentration. Contamination was detected in one method blank at a level below the RL as follows:

Blank ID	Analyte	Concentration (ug/kg)	RL (ug/kg)
ZX79/ZY25/ZX96 MB	Aroclor 1254	3.8J	4.0

Aroclor 1254 was not detected in the associated samples at a level below five times the blank amount. Aroclor 1254 concentrations in associated samples between five and ten times the blank level are qualified as estimated. Aroclor 1254 concentrations in associated samples above ten times the blank level are considered unaffected.

Surrogate recoveries: QAPP control limits were 34-141%. Surrogate recoveries were within QAPP and laboratory control limits.

LCS recoveries: QAPP control limits were 37-116%. LCS recoveries were within QAPP and laboratory control limits with the following exceptions:

QC ID	Analyte	% Recovery	Lab Control Limit
ZR75LCSD	Aroclor 1016	127	56 - 120
ZR75LCSD	Aroclor 1260	140	58 - 124

Positive results in the associated samples are qualified as estimated.

RRM recoveries: RRM Aroclor 1260 results ranged from 91 to 130 ug/kg. All of the SRMs were within the advisory limits of 38-167%.

MS recoveries: QAPP control limits were 37-116%. Control limits do not apply when the native concentration exceeds four times the amount spiked. Remaining MS recoveries were within QAPP and laboratory control limits.

MS/MSD RPDs: QAPP control limits were 50%. RPDs were within QAPP and laboratory control limits.

Field duplicate variability: Field duplicate RPDs were below 50% where the concentrations were above five times the reporting limit with the following exceptions:

FD ID	Analyte	FD Result (ug/kg)	Sample Result (ug/kg)	RPD
SD-PCC-210-A / SD-PCC-010-A	Aroclor 1254	14	47	108
SD-PCC-210-A / SD-PCC-010-A	Aroclor 1260	13	28	73.2

These analytes are qualified as estimated in the field duplicates and parent samples.

Field duplicate concentrations were within +/- two times the reporting limit where concentrations were at or below five times the reporting limit.

Multiple reported results: Unless quality control results warrant the rejection of one result, multiple reported results are evaluated according to the following guidelines

- (1) If both results are non-detects, the lower reporting limit was selected.
- (2) If one result was not detected and the other detected, the detection was selected.
- (3) If both results were detections, the following additional criteria were applied:
  - (a) If one result was off-scale and one was on-scale, the on-scale result was selected.
  - (b) If associated QC results indicated high bias, the lower concentration result was selected.
  - (c) If associated QC results indicated no, low, or mixed biases, the higher concentration result was selected.

This approach is conservative, and is considered most protective of the environment. The results not selected as the best result to report are qualified R1, rejected due to the availability of better results. Samples with dilutions were reduced to a single result.

Laboratory flags: Various results are flagged Y to indicate elevated reporting limits. These results are qualified "UY" to clarify that the Aroclor was not detected. Various results were

flagged P to indicate the dual column RPD exceeded 40%. These results are qualified as estimated.

Reporting limits: RLs for various aroclors were elevated above 20 ug/Kg due to chromatographic overlap with other aroclors and/or non-target analytes. With one exception, these samples also contained detected aroclors and the impact on the total PCB value was minimal.

Sample ID	Analyte	Reported RL (ug/kg)	Screening Level (ug/kg)
SD-PCC011-B	Aroclor 1232	190 Y	130

Further evaluation of this result was performed. The individual non-target peaks in or near the Aroclor 1232 retention time windows included varying retention time shifts and widely varying instrument responses. No aroclor pattern was discernible in the sample chromatogram, and the results do not meet the criteria for detected aroclors. Additionally, in the opinion of this reviewer, the reported elevated RL is overly conservative and the sample chromatogram and quantitation report demonstrate the absence of Aroclor above a level of 51 ug/kg. This assessment is based on 3 of the 4 non-target peaks on the ZB5 column.

No qualifiers are assigned on the basis of elevated reporting limits.

Overall assessment: Documentation was found to be clear and complete. Calibration data demonstrate acceptable instrument performance. Surrogate, and SRM and MS/MSD results demonstrate acceptable accuracy and precision. Multiple analysis results were reduced to the most appropriate to use. Results were estimated due to blank contamination, LCS recoveries, field duplicate variability and dual column variability.

Except for data replaced by another result, PCB data are acceptable for use as qualified.

### 3.0 Metals Analyses

Quality control analysis frequencies: The QAPP specifies that the following quality control samples be analyzed one per analytical batch or one per twenty samples, whichever is more frequent: method blank, and laboratory control sample (LCS). A matrix spike (MS) and laboratory duplicate must be analyzed one per twenty samples. These frequencies were met.

Field quality control sample requirements include field duplicates at a 10% frequency for the post-excavation bank samples only. No field duplicates were required for the Jorgensen Backfill samples. Five field duplicates were analyzed with the post-construction perimeter sediment samples and three field duplicates were analyzed with the initial round of post-construction confirmation core samples. No qualifiers are assigned based on field QC frequency requirements.

Holding times: Total or dissolved mercury samples must be analyzed within 28 days of collection. Other metals samples must be analyzed with 180 days. These criteria were met.

Instrument calibration: Functional guidelines criteria for calibration verifications is a maximum % difference of  $\pm 10\%$  for ICP metals and  $\pm 15\%$  for mercury. QAPP criterion for calibration verifications is  $\pm 10\%$  for ICP metals and  $\pm 20\%$  for mercury. Criteria for calibration blanks are that analyte concentrations must be between the negative RL and the positive RL. Functional guidelines criterion for detection limit standard recovery is 70-130%, and the QAPP specifies

this standard must be within one RL of the true value. These criteria were met with one exception:

Lab SDG	Standard ID	Analyte	Recovery (%)
ZM12	CR-2 (Closing DL standard)	Copper	133.5

No associated results were below two times the RL for copper, and no qualifiers are required.

Laboratory blank results: The criterion for method blanks is that analyte concentrations must be below the PQL, or below 10% of the lowest associated sample concentration. This criterion was met.

LCS recoveries: QAPP control limits were 80-120%. LCS recoveries were within QAPP and laboratory control limits.

SRM recoveries: SRM concentrations were within the advisory range.

MS recoveries: QAPP control limits were 75-125% for ICP metals and 80-120% for mercury. Functional guidelines criteria for both ICP metals and mercury are 75-125%. MS recoveries are not evaluated when the native concentration exceeds four times the spike amount. The remaining MS recoveries were within QAPP and laboratory control limits with the following exceptions:

QC ID	Analyte	% Recovery	Lab Control Limit
SD-PCC015-A MS	Copper	189	75 - 125
SD-PER208-0315 MS	Mercury	128	75 - 125
SD-PER515-0315 MS	Mercury	136	75 - 125

These analytes are qualified as estimated in the native sample.

Laboratory duplicate RPDs: QAPP control limits were <20%. For duplicates with concentrations above five times the reporting limit, RPDs were within QAPP and laboratory control limits with the following exceptions:

QC ID	Analyte	RPD	Lab Control Limit
SD JOR 03 R2 LR	Arsenic	23.7	20
SD-PCC015-A LR	Arsenic	85.7	20
SD-PCC015-A LR	Copper	23.2	20
SD-PCC015-A LR	Zinc	45.3	20
SD-PCC016-A LR	Copper	27.6	20
SD-JOR06-0315 LR	Chromium	43.8	20

These analytes are qualified as estimated in the native sample.

For sample/duplicate pairs with concentrations below five times the reporting limit, absolute differences were within the reporting limit.

Field duplicate variability: Field duplicate RPDs were below 20% where the concentrations were above five times the reporting limit with the following exceptions:

FD ID	Analyte	FD Result (mg/kg)	Sample Result (mg/kg)	RPD
SD-PCC-210-A / SD-PCC-010-A	Arsenic	2.6	4.6	55.6
SD-PCC-210-A / SD-PCC-010-A	Chromium	14	17.5	22.2
SD-PCC-210-A / SD-PCC-010-A	Copper	14	19.2	31.3
SD-PCC-210-A / SD-PCC-010-A	Zinc	35	43	20.5
SD-PER426-0315 / SD-PER406-0315	Lead	17	23	30.0
SD-PER525-0315 / SD-PER505-0315	Chromium	21.2	17.1	21.4

These analytes are qualified as estimated in the field duplicates and parent samples.

Field duplicate concentrations were within +/- two times the reporting limit where concentrations were at or below five times the reporting limit.

Reporting limits: Some RLs were elevated above QAPP levels due to dry weight calculation or sample dilution:

Analyte	Highest Reported RL (mg/kg)	QAPP specified RL (mg/kg)	SMS SQS (mg/kg)
Cadmium	0.3	0.2	5.1
Lead	3	2	450
Silver	0.9	0.3	6.1
Mercury	0.030	0.025	0.41

Each elevated RL was below the screening level and the impact on data use is minimal. No qualifiers are assigned on the basis of elevated reporting limits.

Overall assessment: Documentation was found to be clear and complete. Calibration data demonstrate acceptable instrument performance. Method blank, LCS, and SRM results demonstrate acceptable laboratory accuracy. Results were estimated based on MS recovery and lab and field duplicate variability.

Metals data are acceptable for use as qualified.

## 4.0 General Chemistry Analyses

Quality control analysis frequencies: For total organic carbon, a method blank, SRM, and LCS were analyzed in each batch. Ten of the nineteen batches also included a MS and a laboratory triplicate. For total solids, each batch included a method blank, one batch included a laboratory duplicate and nine of the fifteen batches included a laboratory triplicate. Quality control samples were sufficient to evaluate overall precision and accuracy as appropriate for the method.

Field quality control sample requirements include field duplicates at a 10% frequency for the post-excavation bank samples only. No field duplicates were required for the Jorgensen Backfill samples. Five field duplicates were analyzed with the post-construction perimeter sediment samples and three field duplicates were analyzed with the initial round of post-construction confirmation core samples. No qualifiers are assigned based on field QC frequency requirements.

Holding times: Holding times are as follows:

Analysis	Holding time if refrigerated	Holding time if frozen
TOC	28 days	6 months
Total Solids	14 days	6 months

Samples were analyzed within the holding times.

Instrument calibration: Instrument calibration criteria are as follows:

Analysis	Criteria
TOC	Initial calibration $R^2 > 0.990$ Continuing calibration recovery within 90-110%
Total Solids	Calibration mass within $\pm 0.1$ g

These criteria were met.

Laboratory blank results: Criteria for method blanks are that analyte concentrations must be below the PQL, or below 10% of the lowest associated sample concentration. This criterion was met for all method blanks.

LCS recoveries: Control limits were 75-125% for TOC. These criteria were met.

SRM results: Control limits were 80-120% for TOC. These criteria were met with the following exception:

QC ID	Analyte	% Recovery	Lab Control Limit
SRM032615_0258	Total Organic Carbon	120.7	80 - 120
SRM030915_1146	Total Organic Carbon	121.4	80 - 120

The total organic carbon results are qualified as estimated in the associated samples.

MS recoveries: Control limits were 75-125% for TOC. These criteria were met with the following exceptions:

QC ID	Analyte	% Recovery	Lab Control Limit
SD-PCC015-A MS	Total Organic Carbon	66.6	75 - 125
SD-PER518-0315 MS	Total Organic Carbon	48.5	75 - 125
SD JOR 03 R2 MS	Total Organic Carbon	65.6	75 - 125
SD-JOR06-0315 MS	Total Organic Carbon	138.5	75 - 125

The total organic carbon results are qualified as estimated in native samples.

Laboratory triplicate results: Control limits were 20% for TOC and total solids. These criteria were met with the following exception:

QC ID	Analyte	RSD	Lab Control Limit
SD-PCC015-A LT	Total Organic Carbon	40.6	20.0
SD-PCC022-F LT	Total Organic Carbon	20.6	20.0

The total organic carbon results are qualified as estimated in native samples.

Field duplicate variability: Field duplicate RPDs were below 25% where the concentrations were above five times the reporting limit with the following exceptions:

FD ID / Sample ID	Analyte	FD Result (%)	Sample Result (%)	RPD
SD-PCC-210-A / SD-PCC-010-A	Total Organic Carbon	1.12	5.4	131
SD-PCC-210-B / SD-PCC-010-B	Total Organic Carbon	4.44	1.26	112
SD-PCC-210-C / SD-PCC-010-C	Total Organic Carbon	2.84	1.11	87.6

These analytes are qualified as estimated in the field duplicates and parent samples.

Field duplicate concentrations were within +/- two times the reporting limit where concentrations were at or below five times the reporting limit.

Overall assessment: Documentation was found to be clear and complete. Calibration data indicate acceptable performance. Method blank and LCS results demonstrate acceptable laboratory accuracy. Data were estimated based on laboratory triplicate and field duplicate variability, and MS and SRM recoveries.

General chemistry results are acceptable for use as qualified.

## 5.0 Qualifier Summary Table

Client ID	Analyte(s)	Qualifier	Reason
SD-JOR01-1114	Aroclor 1248, Aroclor 1254, Aroclor 1260	R1	Another result available
SD-JOR01-1114 DL	Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242	R1	Another result available
SD-JOR04-0315	Aroclor 1260	J	High dual column RPD
SD-JOR04-1114	Aroclor 1248	UY	Clarification of Y flag
SD-JOR05-0315	Aroclor 1260	J	High dual column RPD
SD-JOR05-1114	Aroclor 1248, Aroclor 1254, Aroclor 1260	R1	Another result available
SD-JOR05-1114 DL	Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242	R1	Another result available
SD-PCC009-A	Aroclor 1242	UY	Clarification of Y flag
SD-PCC009-C	Aroclor 1232	UY	Clarification of Y flag
SD-PCC-010-A	Aroclor 1248	UY	Clarification of Y flag
SD-PCC-010-A	Aroclor 1254, Aroclor 1260	J	High FD RPD
SD-PCC011-B	Aroclor 1232	UY	Clarification of Y flag
SD-PCC015-A	Aroclor 1260	J	High LCSD recovery
SD-PCC020-A	Aroclor 1248	UY	Clarification of Y flag
SD-PCC020-B	Aroclor 1248	UY	Clarification of Y flag
SD-PCC022-A	Aroclor 1248	UY	Clarification of Y flag
SD-PCC024-A	Aroclor 1248	UY	Clarification of Y flag
SD-PCC024-B	Aroclor 1248	UY	Clarification of Y flag
SD-PER106-0315	Aroclor 1248	J	High dual column RPD
SD-PER208-0315	Aroclor 1248, Aroclor 1254, Aroclor 1260	R1	Another result available
SD-PER208-0315 DL	Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242	R1	Another result available
SD-PER209-0315	Aroclor 1248	J	High dual column RPD
SD-PER210-0315	Aroclor 1260	J	High dual column RPD
SD-PER303-0315	Aroclor 1260	J	High dual column RPD
SD-PER305-0315	Aroclor 1248, Aroclor 1260	J	High dual column RPD
SD-PER307-0315	Aroclor 1254	J	High dual column RPD
SD-PER309-0315	Aroclor 1254	J	High dual column RPD
SD-PER313-0315	Aroclor 1248, Aroclor 1260	J	High dual column RPD
SD-PER313-0315	Aroclor 1254	J	Blank Contamination
SD-PER327-0315	Aroclor 1254	J	High dual column RPD
SD-PER402-0315	Aroclor 1254	J	Blank Contamination

Client ID	Analyte(s)	Qualifier	Reason
SD-PER402-0315	Aroclor 1260	J	High dual column RPD
SD-PER403-0315	Aroclor 1260	J	High dual column RPD
SD-PER405-0315	Aroclor 1248	UY	Clarification of Y flag
SD-PER405-0315	Aroclor 1254	J	Blank Contamination, high dual column RPD
SD-PER501-0315	Aroclor 1248, Aroclor 1254, Aroclor 1260	R1	Another result available
SD-PER501-0315 DL	Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242	R1	Another result available
SD-PER512-0315	Aroclor 1248	UY	Clarification of Y flag
SD-PER512-0315	Aroclor 1260	J	High dual column RPD
SD-PER518-0315	Aroclor 1248	UY	Clarification of Y flag
SD-PER518-0315	Aroclor 1260	J	High dual column RPD
SD JOR 03 R2	Arsenic	J	High lab duplicate RPD
SD-JOR06-0315	Chromium	J	High lab duplicate RPD
SD-PCC-010-A	Arsenic, Chromium, Copper, Zinc	J	High FD RPD
SD-PCC015-A	Arsenic, Zinc	J	High lab duplicate RPD
SD-PCC015-A	Copper	J	High MS recovery, high lab duplicate RPD
SD-PCC016-A	Copper	J	High lab duplicate RPD
SD-PER208-0315	Mercury	J	High MS recovery
SD-PER406-0315	Lead	J	High FD RPD
SD-PER505-0315	Chromium	J	High FD RPD
SD-PER515-0315	Mercury	J	High MS recovery
SD JOR 03 R2	Total Organic Carbon	J	Low MS recovery
SD-JOR06-0315	Total Organic Carbon	J	High MS recovery
SD-PCC-010-A	Total Organic Carbon	J	High FD RPD
SD-PCC-010-B	Total Organic Carbon	J	High FD RPD
SD-PCC-010-C	Total Organic Carbon	J	High FD RPD
SD-PCC015-A	Total Organic Carbon	J	High lab triplicate RPD, low MS recovery
SD-PCC022-F	Total Organic Carbon	J	High lab triplicate RPD
SD-PER301-0315	Total Organic Carbon	J	High SRM recovery
SD-PER302-0315	Total Organic Carbon	J	High SRM recovery
SD-PER303-0315	Total Organic Carbon	J	High SRM recovery
SD-PER309-0315	Total Organic Carbon	J	High SRM recovery
SD-PER312-0315	Total Organic Carbon	J	High SRM recovery
SD-PER404-0315	Total Organic Carbon	J	High SRM recovery
SD-PER405-0315	Total Organic Carbon	J	High SRM recovery
SD-PER406-0315	Total Organic Carbon	J	High SRM recovery
SD-PER426-0315	Total Organic Carbon	J	High SRM recovery
SD-PER506-0315	Total Organic Carbon	J	High SRM recovery
SD-PER507-0315	Total Organic Carbon	J	High SRM recovery
SD-PER509-0315	Total Organic Carbon	J	High SRM recovery
SD-PER512-0315	Total Organic Carbon	J	High SRM recovery
SD-PER514-0315	Total Organic Carbon	J	High SRM recovery
SD-PER515-0315	Total Organic Carbon	J	High SRM recovery
SD-PER516-0315	Total Organic Carbon	J	High SRM recovery
SD-PER517-0315	Total Organic Carbon	J	High SRM recovery
SD-PER518-0315	Total Organic Carbon	J	High SRM recovery, low MS recovery

## 6.0 Abbreviations and Definitions

DV Qualifier	Definition
U	The material was analyzed for, but was not detected above the level of the associated value.
UY	The reporting limit was elevated due to chromatographic overlap with related compounds. The material was analyzed for, but was not detected above the level of the associated value.
J	The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
UJ	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The sample result is rejected. The presence or absence of the analyte cannot be verified and data are not usable.
R1	This sample result has been rejected in favor of a more accurate and/or precise result. The other result should be used.

Abbreviation	Definition
ARI	Analytical Resources, Inc.
DV	Data validation
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
MS	Matrix spike
MSD	Matrix spike duplicate
NA	Not Applicable
RL	Reporting limit
RPD	Relative percent difference
RRM	Regional reference material
RSD	Relative standard deviations
SRM	Standard reference material

## 7.0 References

*USEPA Contract Laboratory Program National Functional Guidelines For Superfund Organic Methods Data Review*, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, June 2008, USEPA-540-R-008-01.

*USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Superfund Data Review*, Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency, January 2010, USEPA-540-R-10-011.

Construction and Post-Construction Sediment Monitoring Quality Assurance Project Plan, Duwamish Sediment Other Area and Southwest Bank Corrective Measure and Habitat Project, Boeing Plant 2. Prepared by AMEC Environment & Infrastructure Inc., et al. Prepared for: The Boeing Company, June 2013