21 March 2018

Amec Foster Wheeler Project No.: WX18132

Public Services and Procurement Canada
167 Lombard Avenue
Winnipeg, MB
R3B 0V3

Attn: Mr. Kenton Thiessen

Re: Hazardous Materials Sampling
St. Andrews Lock and Dam Gates
St. Andrews, Manitoba

Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) was retained by Public Services and Procurement Canada (PSPC) to perform hazardous materials sampling for the St. Andrews Lock & Dam (SALD) Lock Gate Replacement project.

In accordance with the terms of reference (TOR), a Hazardous Materials Survey was to be conducted as part of the services provided. The TOR for these services are as follows:

- Review existing documentation and investigate the existing lock gates and areas that will be affected by the project for presence of designated substances and hazardous materials in locations that would be affected by the work of gate replacement, including those that may require special procedures for waste disposal.
- Identify where sampling and testing will be required to confirm presence or absence of these substances and to confirm method of handling associated wastes, including a cost estimate for effecting this testing.

This letter summarizes the sampling and analysis conducted under Call-Up No. - ET025-I72880/001/PWZ Amendment 2 issued by PSPC on October 13, 2017. The purpose of the sampling and analysis is to confirm the presence of absence of hazardous materials and identify where special procedures and disposal are required for materials to be removed.

Methodology

Amec Foster Wheeler attended the site location on 18 January 2018. Mr. Alex Fullerton and Ms. Alyssa Smith of Amec Foster Wheeler attended the Site to conduct sampling of select materials. The materials sampled included timbers associated to the lock gates for gate timbers above and below the water line for pentachlorophenol and polycyclic aromatic hydrocarbon (PAH) analysis.

In an attempt to obtain representative samples and not affect the stability of the gates the samples were obtained from both gates and at heights that would represent the different conditions the timbers are subjected to. One set of samples was taken at the approximately 1.5 m above the ice level on the upstream side of the lower and upper gates. The samples were

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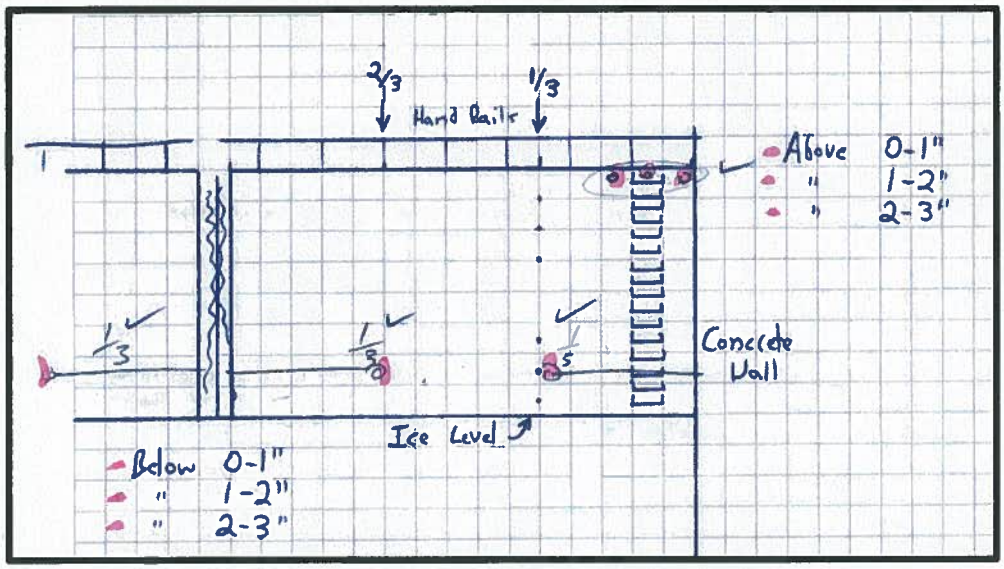
taken at the 1/3rd and 2/3rd width on one timber and at the 1/3rd width on another timber on the opposite gate. These represented the condition of timbers regularly subjected to being under water. Another set of samples was taken in the timber above the water level. Due to safety considerations these samples were taken at the top of the fixed ladder on the gate where the technician could be securely harnessed while collecting the sample. This is illustrated on Figure



1 which is a copy of the field note sketch taken during sampling.

Figure 1 - Sampling Locations

Holes were drilled and the sample collected using apparatus as shown in Photo 1.

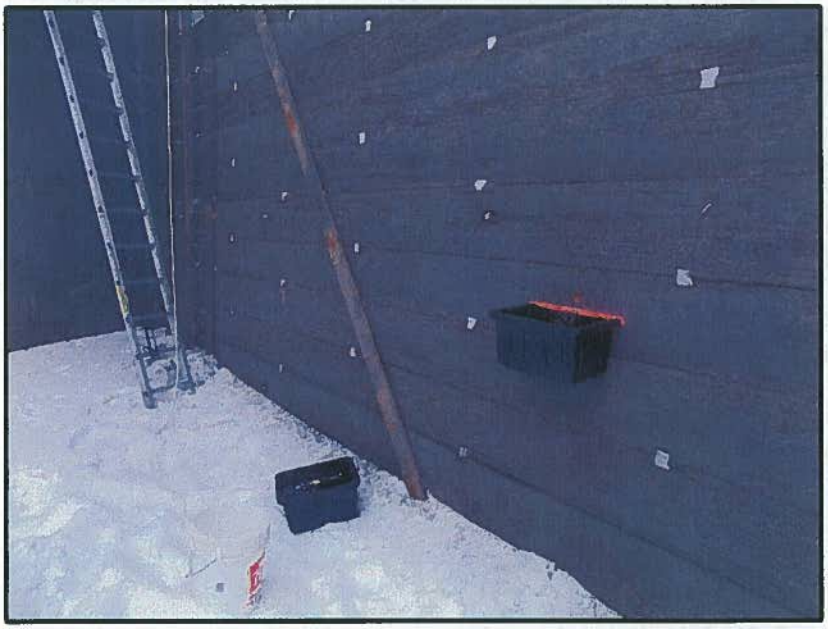


Photo 1 Sampling Apparatus

Samples of timber were collected from the lack gates for pentachlorophenol (PCP) and polycyclic aromatic hydrocarbon (PAH) analysis. A total of three samples were collected above the water line and three below the water line. The water line is defined as the level in the locks during periods of normal operation.

Timber samples were collected by drilling 25 mm diameter holes into the timbers to a specified depth. Holes were made from 0 to 25 mm, 25 to 50 mm and 50 to 75 mm. To achieve the volume of sample media required by the analytical method used, multiple holes were made and composite samples were created from three holes for each sample (at the specified depths).

Paint samples were collected by scraping paint from the railings on top of the lock gates and metal hardware on the face of the gates for lead analysis. An attempt was made to avoid scraping of the underlying metal substrate as the metal substrate may affect the sample results for lead. The analysis included total lead and toxicity characteristic leaching procedure (TCLP) analysis. Due the high sample volume required for TCLP analysis, relatively large areas of painted surfaces were scraped.

Representative photographs are presented in Appendix A.

Laboratory Analysis

The laboratory analytical results for the six samples of timbers identified level of PCP below the laboratory method detection limit of 0.030 mg/kg for all samples collected.

Laboratory analysis was conducted for a total of sixteen PAHs compounds. Most parameters were reported below the laboratorymethod detection limit. For the purpose of disposal, the PAH compounds of interest are generally benzo(a)pyrene and naphthalene. The sample of timber collected above the water line at a depth of 0 to 25 mm was the only sample above the detection limit for these parameters of interest. The reported concentration was 0.056 mg/kg for benzo(a)pyrene.

Two samples of paint were collected from the railings above the downstream lock gate and from the steel jacket metal reinforcement on the end of lock gate. Both samples were submitted for total and TCLP analysis. The sample results indicated concentrations of 1.87 and 22.2 mg/kg respectively for total lead. TCLP samples results were below the analytical method detection limit of 0.5 mg/L.

The laboratory analytical results are summarized in Table 1 and Table 2 below. The laboratory analytical report is provided in Appendix B.

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TABLE 1: LABORATORY ANALYTICAL RESULTS
Pentachlorophenol (PCP) and polycyclic aromatic hydrocarbon (PAHs)

Parameter	Samples Above Water Line			Samples Below Water Line		
	Sample 2047643-1	Sample 2047643-2	Sample 2047643-3	Sample 2047643-4	Sample 2047643-5	Sample 2047643-6
	0 to 25 mm depth	25 to 50 mm depth	50 to 75 mm depth	0 to 25 mm depth	25 to 50 mm depth	50 to 75 mm depth
Pentachlorophenol	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
PAH Compounds						
Acenaphthene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthylene	<0.014	<0.010	<0.010	<0.010	<0.010	<0.010
Anthracene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benz(a)anthracene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a)pyrene	<0.010	<0.010	<0.010	**0.056**	<0.010	<0.010
Benzo(b&j)fluoranthene	<0.010	<0.010	<0.010	**0.153**	<0.010	0.010
Benzo(g,h,i)perylene	<0.010	<0.010	<0.010	**0.043**	<0.010	<0.010
Benzo(k)fluoranthene	<0.010	<0.010	<0.010	**0.046**	**0.015**	<0.010
Chrysene	<0.010	<0.010	**0.046**	**0.101**	**0.047**	**0.067**
Dibenz(a,h)anthracene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoranthene	<0.010	<0.010	<0.010	**0.161**	<0.015	<0.017
Fluorene	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(1,2,3-c,d)pyrene	<0.010	<0.010	<0.010	0.051	<0.010	<0.010
Naphthalene	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Phenanthrene	<0.011	**0.013**	**0.013**	**0.194**	<0.023	**0.026**
Pyrene	<0.010	<0.010	<0.010	**0.114**	**0.011**	**0.012**
d10-Acenaphthene	**89.5**	**86.3**	**68.6**	**74.2**	**71.6**	**60.5**
d12-Chrysene	**97.3**	**110.1**	**92.9**	**92**	**94.4**	**79.6**
d10-Phenanthrene	**96.4**	**99.1**	**83.3**	**84.7**	**87**	**76.5**

Bolded sample results indicated those reported above the detection limit

TABLE 2: LABORATORY ANALYTICAL RESULTS Total Lead and toxicity characteristic leaching procedure (TCLP)		
Parameter	**Sample 2047643-7**	**Sample 2047643-8**
	Lock metal paint	Lock Railing Paint
Total Lead	22.2 mg/kg	1.87 mg/kg
TCLP	<0.50 mg/L	<0.50 mg/L

Discussions and Recommendations

The acceptance of waste materials at landfills in Manitoba is subject to the individual facility's operating license issued under the Manitoba Environment Act. In preparation of this report, Amec Foster Wheeler contacted MidCanada Environmental Services to confirm their acceptance criteria for heavy timbers. In accordance with their license, they may accept waste with a concentration of up to 72 parts per million (ppm) of benzopyrene and up to 22 ppm of naphthalene. The concentrations reported for benzopyrene and naphthalene in all samples analysed were below these thresholds. In addition, the PCP analysis conducted on all samples analysed were below the detection limit of 0.030 mg/kg for PCP. Amec Foster Wheeler did not consult with other landfill operators and it must be noted that acceptance criteria may vary for different facilities.

Depending on the procedure and precautions used, the removal of timbers could result in worker exposure to PCP or PAHs. The contractor(s) involved in this work should develop safe work procedures which may include the use of personal protective equipment. The precautions required will depend on the disturbance of the timbers. Where minimal disturbance is planned such as the removal of fasteners, minimal precautions would be anticipated in addition to typical construction safety requirements. Where disturbance such as saw cutting is planned, it is anticipated that precautions could include dust control procedures and personal protective equipment which may include respiratory, eye and dermal protection.

Lead was used extensively for pigmentation, sealing, and as a drying agent in oil based paints up until the early 1950's. Exterior paints typically contained up to 60% lead by weight. The United States Department of Housing and Urban Development (the U.S. HUD) guideline of 1 milligram per square centimetre (mg/cm^2), 0.5 percent lead by weight, or 5,000 mg/kg or 5,000 ppm lead is used in the United States as a guideline for determining whether the use of safety precautions would be required during operations that create lead dust or fumes. The US HUD values are typically used or referenced in accepted industry or regulatory guidelines for construction related purposes. Currently, there are no Federal or Manitoba Provincial guidelines to reference for this purpose.

For the purposes of this targeted sampling where occupation exposures are considered during demolition activities, Amec Foster Wheeler defines lead-containing paint (LCP) as a surface coating containing greater than 5000 mg/kg of lead. Based on sampling and analysis conducted, the paint coatings sampled are not considered lead containing as defined in this report.

In the event that painted surfaces are to be heated such as from grinding or torch cutting, specific precautions may be required which could include respiratory protection as lead is present in the paint coatings sampled. It is not anticipated that special precautions would be required where simple disassembly is conducted.

Closure

Based on sampling and laboratory analysis conducted, no special waste disposal is anticipated for the timbers or painted metals surfaces associated with the dam gates. Depending on the level of disturbance of the timbers and painted surfaces, precaution to protect workers may be required.

If you require any additional information I please contact the undersigned.

Regards,

Paul Houle, CRSP, EP, P.Mgr., MBA
Senior Hazardous Materials Specialist
Health, Safety & Environment Services

Reviewed by:

Patrick Campbell, B.Sc., EP, CRSP
Senior Associate Environmental Scientist
Health, Safety & Environment Services

Cc: Eric-Lorne Blais, Amec Foster Wheeler

APPENDIX A
SITE PHOTOGRAPHS

Photo 1: View of St. Andrew Lock and Dam downstream gates near St. Andrews, Manitoba (Site). Photo taken on 15 June 2017.

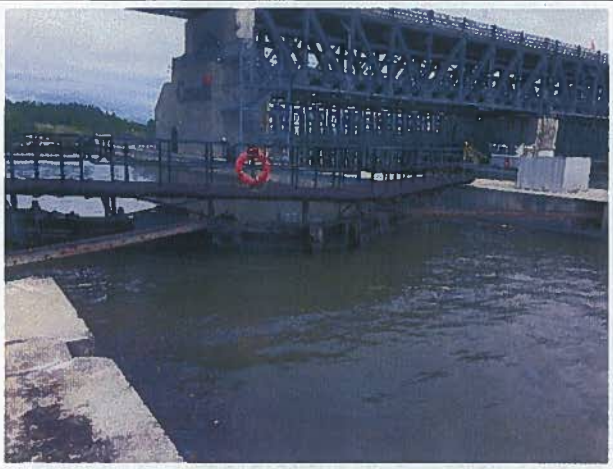

Photo 2: View of upstream side gates. Photo taken on 15 July 2017.

Photo 3: View of upstream side gates. Photo taken on 18 January 2018.

Photo 4: View of timbers on the downstream gate. Photo taken on 18 January 2018. Arrow shows location where 'lock metal paint' sample was collected.

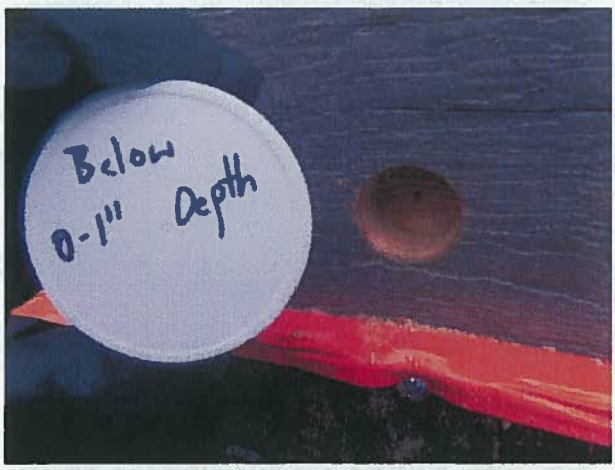

Photo 5: Sample location 1 on downstream gate, collected below the water line, 0 to 25 mm depth.

Photo 6: View of upper timber sampling locations on the downstream gate.

St. Andrews Lock and Dam, St. Andrews, Manitoba	Photo Date: 15 June 2017 and 18 January 2018	Project No.: WX18162	Figure 1

Photo 7: View of gate rail paint sampling location 8 collected from downstream gate.

Photo 8: View of railing located on concrete structure past the downstream gate. Gate appeared to be finished with a galvanized or very thin powder coat finish. No sample collected.

Photo 9: View of walking platform on downstream lock gates.

Photo 10: Walking platform also shown in Photo 9. Note that little to no paint is present on the platform as indicate by arrow at failed sampling location.

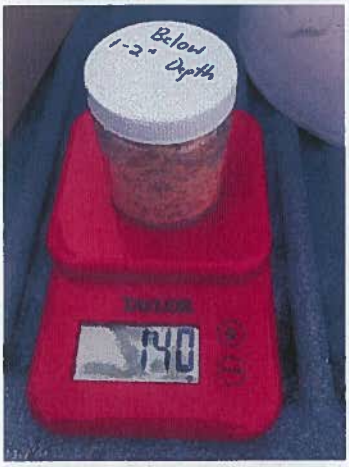

Photo 11: View of wood shavings in sample jar.

Photo 12: View of locks downstream of gates.

St. Andrews Lock and Dam, St. Andrews, Manitoba	Photo Date: 18 January 2018	Project No.: WX18162	Figure 2

APPENDIX B
LABORATORY ANALYTICAL REPORT

AMEC Foster Wheeler Inc. -
Earth&Environmental (Winnipeg)
ATTN: ALEX FULLERTON
440 Dovercourt Drive
Winnipeg MB R3Y 1G4

Date Received: 22-JAN-18
Report Date: 02-FEB-18 12:35 (MT)
Version: FINAL

Client Phone: 204-594-3032

Certificate of Analysis

Lab Work Order #: L2047643

Project P.O. #: NOT SUBMITTED
Job Reference: WX18162.3000 SALD
C of C Numbers:
Legal Site Desc:

Hua Wo
Chemistry Laboratory Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2047643-1 BELOW 0-1" DEPTH							
Sampled By: CLIENT on 18-JAN-18							
Matrix: WOOD							
Miscellaneous Parameters							
% Moisture	25.3		0.50	%		24-JAN-18	R3943967
PAH List - Tissue							
Acenaphthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Acenaphthylene	<0.014	DLCI	0.014	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Fluoranthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Fluorene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Naphthalene	<0.050		0.050	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Phenanthrene	<0.011	DLCI	0.011	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Pyrene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benz(a)anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(k)fluoranthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(a)pyrene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Chrysene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Dibenz(a,h)anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Surrogate: d10-Acenaphthene	89.5		50-150	%	31-JAN-18	01-FEB-18	R3951389
Surrogate: d10-Phenanthrene	96.4		50-150	%	31-JAN-18	01-FEB-18	R3951389
Surrogate: d12-Chrysene	97.3		50-150	%	31-JAN-18	01-FEB-18	R3951389
Pentachlorophenol							
Pentachlorophenol	<0.030		0.030	mg/kg	24-JAN-18	25-JAN-18	R3945074
Surrogate: 2,4,6-Tribromophenol	67.3		50-130	%	24-JAN-18	25-JAN-18	R3945074
L2047643-2 BELOW 1-2" DEPTH							
Sampled By: CLIENT on 18-JAN-18							
Matrix: WOOD							
Miscellaneous Parameters							
% Moisture	46.3		0.50	%		24-JAN-18	R3943967
PAH List - Tissue							
Acenaphthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Acenaphthylene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Fluoranthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Fluorene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Naphthalene	<0.050		0.050	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Phenanthrene	0.013		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Pyrene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benz(a)anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(k)fluoranthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(a)pyrene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Chrysene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Dibenz(a,h)anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Surrogate: d10-Acenaphthene	86.3		50-150	%	31-JAN-18	01-FEB-18	R3951389
Surrogate: d10-Phenanthrene	99.1		50-150	%	31-JAN-18	01-FEB-18	R3951389
Surrogate: d12-Chrysene	110.1		50-150	%	31-JAN-18	01-FEB-18	R3951389
Pentachlorophenol							
Pentachlorophenol	<0.030		0.030	mg/kg	24-JAN-18	25-JAN-18	R3945074

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2047643-2 BELOW 1-2" DEPTH							
Sampled By: CLIENT on 18-JAN-18							
Matrix: WOOD							
Pentachlorophenol							
Surrogate: 2,4,6-Tribromophenol	75.2		50-130	%	24-JAN-18	25-JAN-18	R3945074
L2047643-3 BELOW 2-3" DEPTH							
Sampled By: CLIENT on 18-JAN-18							
Matrix: WOOD							
Miscellaneous Parameters							
% Moisture	48.2		0.50	%		24-JAN-18	R3943967
PAH List - Tissue							
Acenaphthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Acenaphthylene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Fluoranthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Fluorene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Naphthalene	<0.050		0.050	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Phenanthrene	0.013		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Pyrene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benz(a)anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(k)fluoranthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(a)pyrene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Chrysene	0.046		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Dibenz(a,h)anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Surrogate: d10-Acenaphthene	68.6		50-150	%	31-JAN-18	01-FEB-18	R3951389
Surrogate: d10-Phenanthrene	83.3		50-150	%	31-JAN-18	01-FEB-18	R3951389
Surrogate: d12-Chrysene	92.9		50-150	%	31-JAN-18	01-FEB-18	R3951389
Pentachlorophenol							
Pentachlorophenol	<0.030		0.030	mg/kg	24-JAN-18	25-JAN-18	R3945074
Surrogate: 2,4,6-Tribromophenol	80.3		50-130	%	24-JAN-18	25-JAN-18	R3945074
L2047643-4 ABOVE 0-1" DEPTH							
Sampled By: CLIENT on 18-JAN-18							
Matrix: WOOD							
Miscellaneous Parameters							
% Moisture	15.2		0.50	%		24-JAN-18	R3943967
PAH List - Tissue							
Acenaphthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Acenaphthylene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Fluoranthene	0.161		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Fluorene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Naphthalene	<0.050		0.050	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Phenanthrene	0.194		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Pyrene	0.114		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benz(a)anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(b&j)fluoranthene	0.153		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(k)fluoranthene	0.046		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(g,h,i)perylene	0.043		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(a)pyrene	0.056		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Chrysene	0.101		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Dibenz(a,h)anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Indeno(1,2,3-c,d)pyrene	0.051		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2047643-4 ABOVE 0-1" DEPTH							
Sampled By: CLIENT on 18-JAN-18							
Matrix: WOOD							
PAH List - Tissue							
Surrogate: d10-Acenaphthene	74.2		50-150	%	31-JAN-18	01-FEB-18	R3951389
Surrogate: d10-Phenanthrene	84.7		50-150	%	31-JAN-18	01-FEB-18	R3951389
Surrogate: d12-Chrysene	92.0		50-150	%	31-JAN-18	01-FEB-18	R3951389
Pentachlorophenol							
Pentachlorophenol	<0.030		0.030	mg/kg	24-JAN-18	25-JAN-18	R3945074
Surrogate: 2,4,6-Tribromophenol	83.0		50-130	%	24-JAN-18	25-JAN-18	R3945074
L2047643-5 ABOVE 1-2" DEPTH							
Sampled By: CLIENT on 18-JAN-18							
Matrix: WOOD							
Miscellaneous Parameters							
% Moisture	17.1		0.50	%		24-JAN-18	R3943967
PAH List - Tissue							
Acenaphthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Acenaphthylene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Fluoranthene	<0.015	DLQ	0.015	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Fluorene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Naphthalene	<0.050		0.050	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Phenanthrene	<0.023	DLQ	0.023	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Pyrene	0.011		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benz(a)anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(k)fluoranthene	0.015		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(a)pyrene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Chrysene	0.047		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Dibenz(a,h)anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Surrogate: d10-Acenaphthene	71.6		50-150	%	31-JAN-18	01-FEB-18	R3951389
Surrogate: d10-Phenanthrene	87.0		50-150	%	31-JAN-18	01-FEB-18	R3951389
Surrogate: d12-Chrysene	94.4		50-150	%	31-JAN-18	01-FEB-18	R3951389
Pentachlorophenol							
Pentachlorophenol	<0.030		0.030	mg/kg	24-JAN-18	25-JAN-18	R3945074
Surrogate: 2,4,6-Tribromophenol	75.1		50-130	%	24-JAN-18	25-JAN-18	R3945074
L2047643-6 ABOVE 2-3" DEPTH							
Sampled By: CLIENT on 18-JAN-18							
Matrix: WOOD							
Miscellaneous Parameters							
% Moisture	19.6		0.50	%		24-JAN-18	R3943967
PAH List - Tissue							
Acenaphthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Acenaphthylene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Fluoranthene	<0.017	DLQ	0.017	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Fluorene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Naphthalene	<0.050		0.050	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Phenanthrene	0.026		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Pyrene	0.012		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benz(a)anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(b&j)fluoranthene	0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(k)fluoranthene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2047643-6 ABOVE 2-3" DEPTH							
Sampled By: CLIENT on 18-JAN-18							
Matrix: WOOD							
PAH List - Tissue							
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Benzo(a)pyrene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Chrysene	0.067		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Dibenz(a,h)anthracene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg wwt	31-JAN-18	01-FEB-18	R3951389
Surrogate: d10-Acenaphthene	60.5		50-150	%	31-JAN-18	01-FEB-18	R3951389
Surrogate: d10-Phenanthrene	76.5		50-150	%	31-JAN-18	01-FEB-18	R3951389
Surrogate: d12-Chrysene	79.6		50-150	%	31-JAN-18	01-FEB-18	R3951389
Pentachlorophenol							
Pentachlorophenol	<0.030		0.030	mg/kg	24-JAN-18	25-JAN-18	R3945074
Surrogate: 2,4,6-Tribromophenol	90.1		50-130	%	24-JAN-18	25-JAN-18	R3945074
L2047643-7 LOCK METAL PAINT BELOW							
Sampled By: CLIENT on 18-JAN-18							
Matrix: PAINT							
Lead In Paint							
Metals							
Lead (Pb)	22.2		0.20	mg/kg	24-JAN-18	24-JAN-18	R3944548
Leachable lead by TCLP							
Leachate prep TCLP							
1st Preliminary pH	9.15		0.10	pH		30-JAN-18	R3947539
2nd Preliminary pH	2.78		0.10	pH		30-JAN-18	R3947539
Extraction Solution Initial pH	4.91		0.10	pH		30-JAN-18	R3947539
Final pH	4.89		0.10	pH		30-JAN-18	R3947539
Total Metals by ICP-MS							
Lead (Pb)-Leachable	<0.50		0.50	mg/L	31-JAN-18	31-JAN-18	R3947860
L2047643-8 LOCK RAILING PAINT							
Sampled By: CLIENT on 18-JAN-18							
Matrix: PAINT							
Lead In Paint							
Metals							
Lead (Pb)	1.87		0.20	mg/kg	24-JAN-18	24-JAN-18	R3944548
Leachable lead by TCLP							
Leachate prep TCLP							
1st Preliminary pH	8.28		0.10	pH		30-JAN-18	R3947539
2nd Preliminary pH	1.44		0.10	pH		30-JAN-18	R3947539
Extraction Solution Initial pH	4.91		0.10	pH		30-JAN-18	R3947539
Final pH	4.94		0.10	pH		30-JAN-18	R3947539
Total Metals by ICP-MS							
Lead (Pb)-Leachable	<0.50		0.50	mg/L	31-JAN-18	31-JAN-18	R3947860

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLCI	Detection Limit Raised: Chromatographic Interference due to co-elution.
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
MET-200.2-MS-WP	Soil	Metals	EPA 200.2/6020A

Samples for analysis are homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve, and a representative subsample of the dry material is weighed. The sample is then digested by block digester (EPA 200.2). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may become "environmentally available." By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

MET-TCLP-MS-WP	Waste	Total Metals by ICP-MS	U.S. EPA 200.8-T

Total Metals by ICP-MS: This analysis is carried out using sample preparation procedures adapted from Standard Methods for the examination of Water and Wastewater Method 3030E and analytical procedures adapted from U.S EPA Method 200.8 for analyis of metals by inductively coupled-mass spectrometery.

PAH-TMB-GCMS-CL	Tissue	PAH List - Tissue	EPA 3570/8270-GC/MS

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3570 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure uses a mechanical shaking technique to extract a subsample of the vegetation/animal tissue with a 1:1 mixture of dichloromethane and acetone. The extract is then cleaned-up with Alumina/Silica Gel long column, and then solvent exchanged to toluene. The final extract is analyzed by capillary column gas chromatography with mass spectrometric detection (GC/MS). Surrogate recoveries may not be reported in cases where interferences from the sample matrix prevent accurate quantitation. Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PCP-ED	Soil	Pentachlorophenol	EPA 8270-GC/MS

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 8270, published by the United States Environmental Protection Agency (EPA). The extraction procedure is an in-house developed solid-liquid shake extraction using dichloromethane. The extract is concentrated and derivatized with acetic anhydride to form pentachlorophenol acetate. The final extract is analysed by capillary column gas chromatography with mass spectrometric detection (GC/MS).

PREP-MOISTURE-ED	Soil	% Moisture	Oven dry 105C-Gravimetric

The weighed portion of soil is placed in a 105ºC oven to dry to a constant weight; the drying time will vary based on the moisture content of the soil. The dried soil weight is then used to calculate % moisture.

Reference: ASTM D2974-00.

PREP-TCLP-INORG-WP	Waste	Leachate prep TCLP	EPA SW846 1311

The TCLP leachate method is used to characterize material based on the ability of contaminants to partition or leach into a simulated landfill solution. The leachate is designed to determine the mobility of contaminants present in liquid, solid and multiple phase samples under acidic conditions. This method may be applied to liquid samples, multiple phase samples and solid materials.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: AMEC Foster Wheeler Inc. - Earth&Environmental (Winnipeg)
440 Dovercourt Drive
Winnipeg MB R3Y 1G4
Contact: ALEX FULLERTON

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-MS-WP	**Soil**							
Batch R3944548								
WG2704316-4 CRM		**PACS-3**						
Lead (Pb)			94.9		%		70-130	24-JAN-18
WG2704316-5 CRM		**CANMET TILL-1**						
Lead (Pb)			94.8		%		70-130	24-JAN-18
WG2704316-2 LCS								
Lead (Pb)			98.6		%		80-120	24-JAN-18
WG2704316-1 MB								
Lead (Pb)			<0.20		mg/kg		0.2	24-JAN-18
PCP-ED	**Soil**							
Batch R3945074								
WG2704014-3 DUP		**L2047643-2**						
Pentachlorophenol		<0.030	<0.030	RPD-NA	mg/kg	N/A	50	25-JAN-18
WG2704014-2 LCS								
Pentachlorophenol			72.5		%		60-130	25-JAN-18
WG2704014-1 MB								
Pentachlorophenol			<0.010		mg/kg		0.01	25-JAN-18
Surrogate: 2,4,6-Tribromophenol			71.9		%		50-130	25-JAN-18
PREP-MOISTURE-ED	**Soil**							
Batch R3943967								
WG2703845-2 LCS								
% Moisture			99.9		%		90-110	24-JAN-18
WG2703845-1 MB								
% Moisture			<0.50		%		0.5	24-JAN-18
PAH-TMB-GCMS-CL	**Tissue**							
Batch R3951389								
WG2709721-1 LCS								
Acenaphthene			91.5		%		50-150	01-FEB-18
Acenaphthylene			93.9		%		50-150	01-FEB-18
Anthracene			93.7		%		50-150	01-FEB-18
Fluoranthene			96.8		%		50-150	01-FEB-18
Fluorene			97.6		%		50-150	01-FEB-18
Naphthalene			91.1		%		50-150	01-FEB-18
Phenanthrene			96.8		%		50-150	01-FEB-18
Pyrene			93.7		%		50-150	01-FEB-18
Benz(a)anthracene			90.1		%		50-150	01-FEB-18
Benzo(b&j)fluoranthene			87.1		%		50-150	01-FEB-18
Benzo(k)fluoranthene			99.9		%		50-150	01-FEB-18

ALS Environmental

Quality Control Report

Workorder: L2047643 Report Date: 02-FEB-18

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-GCMS-CL	**Tissue**							
Batch R3951389								
WG2709721-1 LCS								
Benzo(g,h,i)perylene			106.7		%		50-150	01-FEB-18
Benzo(a)pyrene			95.7		%		50-150	01-FEB-18
Chrysene			97.4		%		50-150	01-FEB-18
Dibenz(a,h)anthracene			99.9		%		50-150	01-FEB-18
Indeno(1,2,3-c,d)pyrene			87.6		%		50-150	01-FEB-18
WG2709721-2 MB								
Acenaphthene			<0.010		mg/kg wwt		0.01	01-FEB-18
Acenaphthylene			<0.010		mg/kg wwt		0.01	01-FEB-18
Anthracene			<0.010		mg/kg wwt		0.01	01-FEB-18
Fluoranthene			<0.010		mg/kg wwt		0.01	01-FEB-18
Fluorene			<0.010		mg/kg wwt		0.01	01-FEB-18
Naphthalene			<0.050		mg/kg wwt		0.05	01-FEB-18
Phenanthrene			<0.010		mg/kg wwt		0.01	01-FEB-18
Pyrene			<0.010		mg/kg wwt		0.01	01-FEB-18
Benz(a)anthracene			<0.010		mg/kg wwt		0.01	01-FEB-18
Benzo(b&j)fluoranthene			<0.010		mg/kg wwt		0.01	01-FEB-18
Benzo(k)fluoranthene			<0.010		mg/kg wwt		0.01	01-FEB-18
Benzo(g,h,i)perylene			<0.010		mg/kg wwt		0.01	01-FEB-18
Benzo(a)pyrene			<0.010		mg/kg wwt		0.01	01-FEB-18
Chrysene			<0.010		mg/kg wwt		0.01	01-FEB-18
Dibenz(a,h)anthracene			<0.010		mg/kg wwt		0.01	01-FEB-18
Indeno(1,2,3-c,d)pyrene			<0.010		mg/kg wwt		0.01	01-FEB-18
Surrogate: d10-Acenaphthene			94.0		%		50-150	01-FEB-18
Surrogate: d10-Phenanthrene			96.5		%		50-150	01-FEB-18
Surrogate: d12-Chrysene			86.8		%		50-150	01-FEB-18
MET-TCLP-MS-WP	**Waste**							
Batch R3947860								
WG2707997-2 LCS								
Lead (Pb)-Leachable			97.0		%		80-120	31-JAN-18
WG2707997-1 MB								
Lead (Pb)-Leachable			<0.050		mg/L		0.05	31-JAN-18

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.