

QUALITY CONTROL REPORT

Work Order	: ES1704401	Page	: 1 of 7
Client	: LOW ECOLOGICAL SERVICES	Laboratory	: Environmental Division Sydney
Contact	: MR JEREMY SNOWDON-JAMES	Contact	: Customer Services ES
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Project	: INTERMIN WHITE RANGE	Date Samples Received	: 24-Feb-2017
Order number	: ----	Date Analysis Commenced	: 24-Feb-2017
C-O-C number	: ----	Issue Date	: 02-Mar-2017
Sampler	: JEREMY SNOWDON-JAMES		
Site	: ----		
Quote number	: SY/874/14		
No. of samples received	: 5		
No. of samples analysed	: 5		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ashesh Patel	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 768644)									
EW1700834-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	5.69	5.63	1.06	0% - 20%
ES1704401-001	TAILS	EA005-P: pH Value	----	0.01	pH Unit	8.07	8.11	0.494	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 768645)									
EW1700834-002	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	140	140	0.00	0% - 20%
ES1704401-001	TAILS	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	423	423	0.00	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 768647)									
EW1700834-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	1	1	0.00	No Limit
		ED037-P: Total Alkalinity as CaCO ₃	----	1	mg/L	1	1	0.00	No Limit
ES1704401-001	TAILS	ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	164	165	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO ₃	----	1	mg/L	164	165	0.00	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA (QC Lot: 768476)									
ES1704313-005	Anonymous	ED041G: Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	993	975	1.88	0% - 20%
ES1704313-018	Anonymous	ED041G: Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	30	29	0.00	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 768477)									
ES1704313-005	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	8240	8250	0.104	0% - 20%
ES1704313-018	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	396	393	0.583	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 771547)									
ES1704040-018	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	279	275	1.36	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	286	285	0.362	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	1000	1010	0.972	0% - 20%



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED093F: Dissolved Major Cations (QC Lot: 771547) - continued									
ES1704040-018	Anonymous	ED093F: Potassium	7440-09-7	1	mg/L	131	133	1.35	0% - 20%
ES1704420-004	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	69	68	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	47	47	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	166	166	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	38	38	0.00	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 771548)									
ES1704279-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.026	0.028	6.77	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.035	0.038	8.34	0% - 20%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.034	0.031	9.44	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.141	0.148	4.44	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.064	0.067	4.98	0% - 50%
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.09	<0.05	55.6	No Limit
ES1704420-004	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.303	0.304	0.449	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.439	0.445	1.20	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.003	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.56	0.56	0.00	0% - 50%
EG035F: Dissolved Mercury by FIMS (QC Lot: 771549)									
ES1704401-001	TAILS	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
WN1700762-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EK025SF: Free CN by Segmented Flow Analyser (QC Lot: 769240)									
ES1704401-001	TAILS	EK025SF: Free Cyanide	----	0.004	mg/L	0.004	0.004	0.00	No Limit

Page : 4 of 7
 Work Order : ES1704401
 Client : LOW ECOLOGICAL SERVICES
 Project : INTERMIN WHITE RANGE



Sub-Matrix: **WATER**

				<i>Laboratory Duplicate (DUP) Report</i>					
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Method: Compound</i>	<i>CAS Number</i>	<i>LOR</i>	<i>Unit</i>	<i>Original Result</i>	<i>Duplicate Result</i>	<i>RPD (%)</i>	<i>Recovery Limits (%)</i>
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 769238)									
EN1700710-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.00	No Limit
ES1704401-001	TAILS	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	0.008	0.008	0.00	No Limit
EK028SF: Weak Acid Dissociable CN by Segmented Flow Analyser (QC Lot: 769239)									
ES1704401-001	TAILS	EK028SF: Weak Acid Dissociable Cyanide	----	0.004	mg/L	0.005	0.005	0.00	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 768646)									
ES1704401-001	TAILS	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.4	0.4	0.00	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
						LCS	Low	High	
EA010P: Conductivity by PC Titrator (QCLot: 768645)									
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	2000 µS/cm	101	95	113	
ED037P: Alkalinity by PC Titrator (QCLot: 768647)									
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	98.6	81	111	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 768476)									
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	104	82	122	
ED045G: Chloride by Discrete Analyser (QCLot: 768477)									
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	95.4	81	127	
				<1	1000 mg/L	102	81	127	
ED093F: Dissolved Major Cations (QCLot: 771547)									
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	80	114	
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	100	90	116	
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	95.4	82	120	
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.9	85	113	
EG020F: Dissolved Metals by ICP-MS (QCLot: 771548)									
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	95.2	85	114	
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	94.8	85	115	
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	95.9	82	110	
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	92.8	84	110	
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	95.2	85	111	
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	92.6	82	112	
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	93.3	81	111	
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	93.6	83	111	
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	94.3	82	110	
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	91.5	82	112	
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	90.2	85	115	
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	97.8	83	109	
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	96.0	81	117	
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	93.8	85	115	
EG035F: Dissolved Mercury by FIMS (QCLot: 771549)									
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	98.7	83	105	
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 769240)									
EK025SF: Free Cyanide	----	0.004	mg/L	<0.004	0.2 mg/L	100	88	128	
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 769238)									



Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
Method: Compound	CAS Number	LOR	Unit		Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
				Result		LCS	Low	High
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 769238) - continued								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	105	73	133
EK028SF: Weak Acid Dissociable CN by Segmented Flow Analyser (QCLot: 769239)								
EK028SF: Weak Acid Dissociable Cyanide	----	0.004	mg/L	<0.004	0.2 mg/L	107	93	127
EK040P: Fluoride by PC Titrator (QCLot: 768646)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	100	82	116

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: WATER				Matrix Spike (MS) Report			
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
					MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 768476)							
ES1704313-005	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 768477)							
ES1704313-005	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	# Not Determined	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 771548)							
ES1704401-001	TAILS	EG020A-F: Arsenic	7440-38-2	1 mg/L	96.1	70	130
		EG020A-F: Beryllium	7440-41-7	1 mg/L	104	70	130
		EG020A-F: Barium	7440-39-3	1 mg/L	99.0	70	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	97.1	70	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	85.7	70	130
		EG020A-F: Cobalt	7440-48-4	1 mg/L	98.9	70	130
		EG020A-F: Copper	7440-50-8	1 mg/L	96.6	70	130
		EG020A-F: Lead	7439-92-1	1 mg/L	92.0	70	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	99.7	70	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	98.9	70	130
		EG020A-F: Vanadium	7440-62-2	1 mg/L	92.8	70	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	100	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 771549)							
ES1704279-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	79.6	70	130
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 769240)							
ES1704401-001	TAILS	EK025SF: Free Cyanide	----	0.2 mg/L	95.8	70	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 769238)							

Page : 7 of 7
 Work Order : ES1704401
 Client : LOW ECOLOGICAL SERVICES
 Project : INTERMIN WHITE RANGE



Sub-Matrix: **WATER**

				<i>Matrix Spike (MS) Report</i>			
				<i>Spike</i>	<i>SpikeRecovery(%)</i>	<i>Recovery Limits (%)</i>	
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Method: Compound</i>	<i>CAS Number</i>	<i>Concentration</i>	<i>MS</i>	<i>Low</i>	<i>High</i>
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 769238) - continued							
ES1704401-001	TAILS	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	93.8	70	130
EK028SF: Weak Acid Dissociable CN by Segmented Flow Analyser (QCLot: 769239)							
ES1704401-001	TAILS	EK028SF: Weak Acid Dissociable Cyanide	----	0.2 mg/L	83.9	70	130
EK040P: Fluoride by PC Titrator (QCLot: 768646)							
ES1704401-001	TAILS	EK040P: Fluoride	16984-48-8	5 mg/L	109	70	130