Appendix B
Lab Results

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Hill Laboratories
BETTER TESTING BETTER RESULTS

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Hamilton 3240, New Zealand

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ANALYSIS REPORT

Client:	Pattle Delamore Partners Limited	**Lab No:**	1580378	SUPv1
Contact:	Leena Khong	**Date Registered:**	07-May-2016	
	C/- Pattle Delamore Partners Limited	**Date Reported:**	16-May-2016	
	PO Box 9528	**Quote No:**	76345	
	Newmarket	**Order No:**		
	Auckland 1149	**Client Reference:**	A02951700	
		Submitted By:	G Sheridan	

Sample Type: Aqueous

Sample Name:		SW1 06-May-2016 10:25 am	SW2 06-May-2016 1:00 pm		
Lab Number:		1580378.1	1580378.2		
Individual Tests					
Sum of Anions	meq/L	1.835 ± 0.060	2.002 ± 0.063	-	-
Sum of Cations	meq/L	2.03 ± 0.12	2.19 ± 0.13	-	-
pH	pH Units	7.2 ± 0.2	7.2 ± 0.2	-	-
Total Alkalinity	g/m³ as $CaCO_3$	40.6 ± 1.8	51.0 ± 2.2	-	-
Bicarbonate	g/m³ at 25°C	49.4 ± 2.7	62.1 ± 3.2	-	-
Total Hardness	g/m³ as $CaCO_3$	51.2 ± 2.5	55.0 ± 2.6	-	-
Electrical Conductivity (EC)	mS/m	20.7 ± 0.5	21.8 ± 0.5	-	-
Total Suspended Solids	g/m³	5.0 ± 2.1	10.2 ± 2.5	-	-
Total Antimony	g/m³	0.00044 ± 0.00026	< 0.00021 ± 0.00014	-	-
Total Boron	g/m³	0.0439 ± 0.0071	0.0552 ± 0.0085	-	-
Dissolved Calcium	g/m³	13.30 ± 0.84	13.70 ± 0.86	-	-
Dissolved Magnesium	g/m³	4.37 ± 0.30	5.05 ± 0.34	-	-
Total Mercury	g/m³	< 0.00008 ± 0.000053	< 0.00008 ± 0.000053	-	-
Dissolved Potassium	g/m³	3.16 ± 0.24	2.49 ± 0.19	-	-
Dissolved Sodium	g/m³	21.3 ± 2.3	23.6 ± 2.6	-	-
Chloride	g/m³	26.1 ± 1.7	23.3 ± 1.5	-	-
Nitrite-N	g/m³	0.0118 ± 0.0022	0.0025 ± 0.0014	-	-
Nitrate-N	g/m³	0.268 ± 0.034	0.132 ± 0.017	-	-
Nitrate-N + Nitrite-N	g/m³	0.279 ± 0.034	0.134 ± 0.017	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³	0.829 ± 0.080	0.276 ± 0.068	-	-
Dissolved Reactive Phosphorus	g/m³	0.0125 ± 0.0032	0.0045 ± 0.0027	-	-
Sulphate	g/m³	12.81 ± 0.85	15.18 ± 0.98	-	-
Chemical Oxygen Demand (COD)	g O_2/m³	12.0 ± 4.8	15.0 ± 5.2	-	-
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn					
Total Arsenic	g/m³	< 0.0011 ± 0.00074	< 0.0011 ± 0.00074	-	-
Total Cadmium	g/m³	< 0.000053 ± 0.000036	< 0.000053 ± 0.000036	-	-
Total Chromium	g/m³	0.00056 ± 0.00036	< 0.00053 ± 0.00036	-	-
Total Copper	g/m³	0.00299 ± 0.00046	0.00240 ± 0.00043	-	-
Total Lead	g/m³	0.000369 ± 0.000077	0.000136 ± 0.000074	-	-
Total Nickel	g/m³	0.00210 ± 0.00043	0.00248 ± 0.00046	-	-
Total Zinc	g/m³	0.153 ± 0.013	0.0154 ± 0.0015	-	-

The reported uncertainty is an expanded uncertainty with a level of confidence of approximately 95 percent (i.e. two standard deviations, calculated using a coverage factor of 2). Reported uncertainties are calculated from the performance of typical matrices, and do not include variation due to sampling.

For further information on uncertainty of measurement at Hill Laboratories, refer to the technical note on our website: www.hill-laboratories.com/files/Intro_To_UOM.pdf, or contact the laboratory.

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level	0.000053 - 0.0011 g/m^3	1-2
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
Total Digestion	Boiling nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-2
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1-2
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-2
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-2
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field.	0.1 pH Units	1-2
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-2
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D 22nd ed. 2012.	3 g/m^3	1-2
Total Antimony	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00021 g/m^3	1-2
Total Boron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0053 g/m^3	1-2
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-2
Total Mercury	Bromine Oxidation followed by Atomic Fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m^3	1-2
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-2
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-2
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl^- E (modified from continuous flow analysis) 22nd ed. 2012.	0.5 g/m^3	1-2
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m^3	1-2
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-2
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m^3	1-2

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colorimetry. Discrete Analyser. APHA 4500-P E (modified from manual analysis) 22nd ed. 2012.	0.004 g/m^3	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B 22nd ed. 2012.	0.5 g/m^3	1-2
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m^3	1-2

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Ara Heron BSc (Tech)
Client Services Manager - Environmental Division

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BETTER TESTING BETTER RESULTS

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ANALYSIS REPORT

Client:	Pattle Delamore Partners Limited	**Lab No:**	1585552	SUPv1
Contact:	Leena Khong	**Date Registered:**	18-May-2016	
	C/- Pattle Delamore Partners Limited	**Date Reported:**	25-May-2016	
	PO Box 9528	**Quote No:**	76345	
	Newmarket	**Order No:**		
	Auckland 1149	**Client Reference:**	A02951800	
		Submitted By:	G Sheridan	

Sample Type: Aqueous

Sample Name:		SW1 17-May-2016	SW2 17-May-2016		
Lab Number:		1585552.1	1585552.2		
Individual Tests					
Sum of Anions	meq/L	1.913 ± 0.063	1.672 ± 0.053	-	-
Sum of Cations	meq/L	1.89 ± 0.11	1.660 ± 0.094	-	-
pH	pH Units	7.2 ± 0.2	7.5 ± 0.2	-	-
Total Alkalinity	g/m³ as $CaCO_3$	36.6 ± 1.7	40.0 ± 1.8	-	-
Bicarbonate	g/m³ at 25°C	44.6 ± 2.4	48.6 ± 2.6	-	-
Total Hardness	g/m³ as $CaCO_3$	47.6 ± 2.3	41.0 ± 2.0	-	-
Electrical Conductivity (EC)	mS/m	20.9 ± 0.5	18.0 ± 0.4	-	-
Total Suspended Solids	g/m³	4.2 ± 2.1	4.0 ± 2.1	-	-
Total Antimony	g/m³	0.00034 ± 0.00021	0.00028 ± 0.00018	-	-
Total Boron	g/m³	0.0299 ± 0.0055	0.0534 ± 0.0083	-	-
Dissolved Calcium	g/m³	13.04 ± 0.82	10.71 ± 0.68	-	-
Dissolved Magnesium	g/m³	3.66 ± 0.25	3.47 ± 0.24	-	-
Total Mercury	g/m³	< 0.00008 ± 0.000053	< 0.00008 ± 0.000053	-	-
Dissolved Potassium	g/m³	2.86 ± 0.22	1.96 ± 0.15	-	-
Dissolved Sodium	g/m³	19.9 ± 2.2	18.2 ± 2.0	-	-
Chloride	g/m³	28.0 ± 1.8	20.1 ± 1.3	-	-
Nitrite-N	g/m³	0.0081 ± 0.0018	0.0021 ± 0.0014	-	-
Nitrate-N	g/m³	0.443 ± 0.055	0.158 ± 0.020	-	-
Nitrate-N + Nitrite-N	g/m³	0.452 ± 0.055	0.160 ± 0.020	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³	0.376 ± 0.070	0.234 ± 0.068	-	-
Dissolved Reactive Phosphorus	g/m³	0.0060 ± 0.0028	0.0040 ± 0.0027	-	-
Sulphate	g/m³	17.3 ± 1.1	14.08 ± 0.92	-	-
Chemical Oxygen Demand (COD)	g O_2/m³	12.5 ± 4.8	13.5 ± 5.0	-	-
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn					
Total Arsenic	g/m³	< 0.0011 ± 0.00074	< 0.0011 ± 0.00074	-	-
Total Cadmium	g/m³	< 0.000053 ± 0.000036	< 0.000053 ± 0.000036	-	-
Total Chromium	g/m³	0.00065 ± 0.00036	< 0.00053 ± 0.00036	-	-
Total Copper	g/m³	0.00249 ± 0.00043	0.00163 ± 0.00039	-	-
Total Lead	g/m³	0.000290 ± 0.000076	0.000213 ± 0.000075	-	-
Total Nickel	g/m³	0.00215 ± 0.00044	0.00131 ± 0.00039	-	-
Total Zinc	g/m³	0.0822 ± 0.0067	0.0155 ± 0.0015	-	-

The reported uncertainty is an expanded uncertainty with a level of confidence of approximately 95 percent (i.e. two standard deviations, calculated using a coverage factor of 2). Reported uncertainties are calculated from the performance of typical matrices, and do not include variation due to sampling.

For further information on uncertainty of measurement at Hill Laboratories, refer to the technical note on our website: www.hill-laboratories.com/files/Intro_To_UOM.pdf, or contact the laboratory.

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Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level	0.000053 - 0.0011 g/m^3	1-2
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
Total Digestion	Boiling nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-2
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1-2
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-2
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-2
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field.	0.1 pH Units	1-2
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-2
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D 22nd ed. 2012.	3 g/m^3	1-2
Total Antimony	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00021 g/m^3	1-2
Total Boron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0053 g/m^3	1-2
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-2
Total Mercury	Bromine Oxidation followed by Atomic Fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m^3	1-2
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-2
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-2
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl^- E (modified from continuous flow analysis) 22nd ed. 2012.	0.5 g/m^3	1-2
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m^3	1-2
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-2
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m^3	1-2
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colorimetry. Discrete Analyser. APHA 4500-P E (modified from manual analysis) 22nd ed. 2012.	0.004 g/m^3	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B 22nd ed. 2012.	0.5 g/m^3	1-2
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m^3	1-2

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental

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BETTER TESTING BETTER RESULTS

R J Hill Laboratories Ltd
1 Clyde Street,
Private Bag 3205,
Hamilton 3240, NEW ZEALA

Job No: **158 5552**
Date Recv: 18-May-16 05:33
Received by: Jennifer Singlewood

Client
Name: Pattle Delamore Partners Limited 59
Address: PO Box 9528, Newmarket
Auckland 1149
Phone: 09 523 6900 Fax: 09 523 6901
Client Reference: ~~A0295100~~ A0295100
Quote No: 76345 Order No:

Primary Contact Leena Khong 220393
Submitted By Leena Khong 220393
Charge To Pattle Delamore Partners Limited 59

Results To ☑ Mail Primary Contact ☑ Mail Submitter
☐ Fax Results
☑ Email Results Hamish.Sheridan@

Office use Job: 3115855526

Sent to Hill Laboratories
☐ Please tick if you require COC to be emailed back
Date & Time: 3:00pm 17-5-16
Name: Hamish Sheridan
Signature:

Received at Hill Laboratories
Date & Time: 18/5 12:43pm
Name: Jen Singlewood
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen Temp: 9.2
☐ Sample & Analysis details checked
Signature:

Priority ☐ Low ☐ Normal ☑ High
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)
NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 5 working days following the day of receipt of the samples at the laboratory.

Quoted Sample Types
Requested Reporting Date:

Surface Water (SW)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	SW1	17-5-16	SW	landfill metals(low) + TSS TRW, COD, ORP anions/cations
2	SW2	17-5-16	SW	landfill metals(low), TSS, TRW, COD, ORP, anions/cations
3				
4				
5				
6				
7				
8				
9				
10				

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BETTER TESTING BETTER RESULTS

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Web

Job Information Summary

Client:	Pattle Delamore Partners Limited	**Lab No:**	1585552
Contact:	Leena Khong	**Date Registered:**	18-May-2016 12:47 pm
	C/- Pattle Delamore Partners Limited	**Priority:**	High
	PO Box 9528	**Quote No:**	76345
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	A02951800
		Add. Client Ref:	
		Submitted By:	G Sheridan
		Charge To:	Pattle Delamore Partners Limited
		Target Date:	25-May-2016 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	SW1 17-May-2016	Surface Water	UP1L, S250, N100, FN100	Anion / Cation profile, dissolved metals trace level; Total Suspended Solids; Chemical Oxygen Demand (COD), High range Hach; Total Mercury; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Antimony; Total Boron; Total Kjeldahl Nitrogen (TKN); Dissolved Reactive Phosphorus
2	SW2 17-May-2016	Surface Water	UP1L, S250, N100, cFN100	Anion / Cation profile, dissolved metals trace level; Total Suspended Solids; Chemical Oxygen Demand (COD), High range Hach; Total Mercury; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Antimony; Total Boron; Total Kjeldahl Nitrogen (TKN); Dissolved Reactive Phosphorus

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level	0.000053 - 0.0011 g/m^3	1-2
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
Total Digestion	Boiling nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-2
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1-2
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-2
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-2
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field.	0.1 pH Units	1-2
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not > 500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-2

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D 22nd ed. 2012.	3 g/m³	1-2
Total Antimony	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00021 g/m³	1-2
Total Boron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0053 g/m³	1-2
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-2
Total Mercury	Bromine Oxidation followed by Atomic Fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m³	1-2
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-2
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-2
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl^- E (modified from continuous flow analysis) 22nd ed. 2012.	0.5 g/m³	1-2
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-2
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-2
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m³	1-2
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colorimetry. Discrete Analyser. APHA 4500-P E (modified from manual analysis) 22nd ed. 2012.	0.004 g/m³	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B 22nd ed. 2012.	0.5 g/m³	1-2
Chemical Oxygen Demand (COD), High range Hach	Dichromate/sulphuric acid digestion, colorimetry. Screen Level method. APHA 5220 D 22nd ed. 2012.	40 g O_2/m³	1-2

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ANALYSIS REPORT

Client:	Pattle Delamore Partners Limited	**Lab No:**	1591585	SUPv1
Contact:	Leena Khong	**Date Registered:**	30-May-2016	
	C/- Pattle Delamore Partners Limited	**Date Reported:**	07-Jun-2016	
	PO Box 9528	**Quote No:**	76345	
	Newmarket	**Order No:**		
	Auckland 1149	**Client Reference:**	A02951800	
		Submitted By:	Jennifer Leslie	

Sample Type: Aqueous

Sample Name:		SW1 27-May-2016	SW2 27-May-2016		
Lab Number:		1591585.1	1591585.2		
Individual Tests					
Sum of Anions	meq/L	2.205 ± 0.068	2.442 ± 0.073	-	-
Sum of Cations	meq/L	2.23 ± 0.12	2.27 ± 0.14	-	-
pH	pH Units	7.1 ± 0.2	7.1 ± 0.2	-	-
Total Alkalinity	g/m³ as $CaCO_3$	43.0 ± 1.9	56.9 ± 2.4	-	-
Bicarbonate	g/m³ at 25°C	52.4 ± 2.8	69.3 ± 3.6	-	-
Total Hardness	g/m³ as $CaCO_3$	58.8 ± 2.9	52.9 ± 2.6	-	-
Electrical Conductivity (EC)	mS/m	24.2 ± 0.5	26.6 ± 0.6	-	-
Total Suspended Solids	g/m³	5.2 ± 2.1	12.0 ± 2.6	-	-
Total Antimony	g/m³	0.00036 ± 0.00022	0.00025 ± 0.00016	-	-
Total Boron	g/m³	0.0290 ± 0.0054	0.0495 ± 0.0078	-	-
Dissolved Calcium	g/m³	16.4 ± 1.1	15.00 ± 0.94	-	-
Dissolved Magnesium	g/m³	4.32 ± 0.30	3.75 ± 0.26	-	-
Total Mercury	g/m³	< 0.00008 ± 0.000053	< 0.00008 ± 0.000053	-	-
Dissolved Potassium	g/m³	3.42 ± 0.26	3.59 ± 0.27	-	-
Dissolved Sodium	g/m³	22.2 ± 2.4	25.7 ± 2.8	-	-
Chloride	g/m³	26.3 ± 1.7	23.7 ± 1.5	-	-
Nitrite-N	g/m³	0.0104 ± 0.0020	0.0194 ± 0.0031	-	-
Nitrate-N	g/m³	0.726 ± 0.089	0.301 ± 0.039	-	-
Nitrate-N + Nitrite-N	g/m³	0.736 ± 0.089	0.321 ± 0.039	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³	0.596 ± 0.074	4.58 ± 0.25	-	-
Dissolved Reactive Phosphorus	g/m³	0.0050 ± 0.0028	0.166 ± 0.025	-	-
Sulphate	g/m³	26.5 ± 1.7	28.7 ± 1.8	-	-
Chemical Oxygen Demand (COD)	g O_2/m³	15.0 ± 5.2	28.0 ± 7.7	-	-
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn					
Total Arsenic	g/m³	0.00129 ± 0.00074	0.00194 ± 0.00074	-	-
Total Cadmium	g/m³	< 0.000053 ± 0.000036	< 0.000053 ± 0.000036	-	-
Total Chromium	g/m³	0.00109 ± 0.00037	0.00148 ± 0.00038	-	-
Total Copper	g/m³	0.00391 ± 0.00053	0.00315 ± 0.00048	-	-
Total Lead	g/m³	0.000415 ± 0.000078	0.000267 ± 0.000075	-	-
Total Nickel	g/m³	0.00388 ± 0.00059	0.00271 ± 0.00048	-	-
Total Zinc	g/m³	0.1169 ± 0.0094	0.0229 ± 0.0020	-	-

The reported uncertainty is an expanded uncertainty with a level of confidence of approximately 95 percent (i.e. two standard deviations, calculated using a coverage factor of 2). Reported uncertainties are calculated from the performance of typical matrices, and do not include variation due to sampling.

For further information on uncertainty of measurement at Hill Laboratories, refer to the technical note on our website: www.hill-laboratories.com/files/Intro_To_UOM.pdf, or contact the laboratory.

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level	0.000053 - 0.0011 g/m^3	1-2
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
Total Digestion	Boiling nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-2
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1-2
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-2
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-2
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field.	0.1 pH Units	1-2
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-2
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D 22nd ed. 2012.	3 g/m^3	1-2
Total Antimony	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00021 g/m^3	1-2
Total Boron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0053 g/m^3	1-2
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-2
Total Mercury	Bromine Oxidation followed by Atomic Fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m^3	1-2
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-2
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-2
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl^- E (modified from continuous flow analysis) 22nd ed. 2012.	0.5 g/m^3	1-2
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m^3	1-2
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-2
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m^3	1-2
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colorimetry. Discrete Analyser. APHA 4500-P E (modified from manual analysis) 22nd ed. 2012.	0.004 g/m^3	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B 22nd ed. 2012.	0.5 g/m^3	1-2
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m^3	1-2

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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ANALYSIS REPORT

Client:	Pattle Delamore Partners Limited	**Lab No:**	1596409	SUPv1
Contact:	Leena Khong	**Date Registered:**	08-Jun-2016	
	C/- Pattle Delamore Partners Limited	**Date Reported:**	14-Jun-2016	
	PO Box 9528	**Quote No:**	76345	
	Newmarket	**Order No:**		
	Auckland 1149	**Client Reference:**	A02951800	
		Submitted By:	G Sheridan	

Sample Type: Aqueous

Sample Name:		SW1 07-Jun-2016	SW2 07-Jun-2016		
Lab Number:		1596409.1	1596409.2		
Individual Tests					
Sum of Anions	meq/L	3.29 ± 0.11	2.817 ± 0.086	-	-
Sum of Cations	meq/L	3.21 ± 0.17	2.89 ± 0.16	-	-
pH	pH Units	7.2 ± 0.2	7.5 ± 0.2	-	-
Total Alkalinity	g/m³ as $CaCO_3$	55.5 ± 2.4	59.5 ± 2.5	-	-
Bicarbonate	g/m³ at 25°C	67.6 ± 3.5	72.3 ± 3.7	-	-
Total Hardness	g/m³ as $CaCO_3$	87.1 ± 4.1	73.4 ± 3.5	-	-
Electrical Conductivity (EC)	mS/m	35.6 ± 0.8	30.6 ± 0.7	-	-
Total Suspended Solids	g/m³	5.1 ± 2.1	17.3 ± 3.2	-	-
Total Antimony	g/m³	< 0.00021 ± 0.00014	< 0.00021 ± 0.00014	-	-
Total Boron	g/m³	0.0377 ± 0.0064	0.0421 ± 0.0069	-	-
Dissolved Calcium	g/m³	22.6 ± 1.5	19.0 ± 1.2	-	-
Dissolved Magnesium	g/m³	7.43 ± 0.50	6.31 ± 0.43	-	-
Total Mercury	g/m³	< 0.00008 ± 0.000053	< 0.00008 ± 0.000053	-	-
Dissolved Potassium	g/m³	3.83 ± 0.29	3.26 ± 0.24	-	-
Dissolved Sodium	g/m³	31.4 ± 3.4	30.8 ± 3.3	-	-
Chloride	g/m³	40.0 ± 2.5	29.5 ± 1.9	-	-
Nitrite-N	g/m³	0.0083 ± 0.0018	0.0068 ± 0.0017	-	-
Nitrate-N	g/m³	0.474 ± 0.058	0.254 ± 0.032	-	-
Nitrate-N + Nitrite-N	g/m³	0.483 ± 0.058	0.261 ± 0.032	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³	0.773 ± 0.078	0.647 ± 0.075	-	-
Dissolved Reactive Phosphorus	g/m³	< 0.004 ± 0.0027	0.0095 ± 0.0030	-	-
Sulphate	g/m³	49.0 ± 3.0	37.3 ± 2.3	-	-
Chemical Oxygen Demand (COD)	g O_2/m³	14.5 ± 5.2	17.5 ± 5.7	-	-
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn					
Total Arsenic	g/m³	< 0.0011 ± 0.00074	0.00153 ± 0.00074	-	-
Total Cadmium	g/m³	< 0.000053 ± 0.000036	< 0.000053 ± 0.000036	-	-
Total Chromium	g/m³	< 0.00053 ± 0.00036	0.00092 ± 0.00036	-	-
Total Copper	g/m³	0.00155 ± 0.00039	0.00201 ± 0.00041	-	-
Total Lead	g/m³	0.000170 ± 0.000074	0.000259 ± 0.000075	-	-
Total Nickel	g/m³	0.00590 ± 0.00079	0.00436 ± 0.00063	-	-
Total Zinc	g/m³	0.0966 ± 0.0078	0.0287 ± 0.0025	-	-

The reported uncertainty is an expanded uncertainty with a level of confidence of approximately 95 percent (i.e. two standard deviations, calculated using a coverage factor of 2). Reported uncertainties are calculated from the performance of typical matrices, and do not include variation due to sampling.

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SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level	0.000053 - 0.0011 g/m^3	1-2
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
Total Digestion	Boiling nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-2
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1-2
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-2
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-2
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field.	0.1 pH Units	1-2
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-2
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D 22nd ed. 2012.	3 g/m^3	1-2
Total Antimony	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00021 g/m^3	1-2
Total Boron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0053 g/m^3	1-2
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-2
Total Mercury	Bromine Oxidation followed by Atomic Fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m^3	1-2
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-2
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-2
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl^- E (modified from continuous flow analysis) 22nd ed. 2012.	0.5 g/m^3	1-2
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m^3	1-2
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-2
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m^3	1-2
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colorimetry. Discrete Analyser. APHA 4500-P E (modified from manual analysis) 22nd ed. 2012.	0.004 g/m^3	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B 22nd ed. 2012.	0.5 g/m^3	1-2
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m^3	1-2

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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ANALYSIS REPORT

Client:	Pattle Delamore Partners Limited	**Lab No:**	1602528	SUPv1
Contact:	Leena Khong	**Date Registered:**	18-Jun-2016	
	C/- Pattle Delamore Partners Limited	**Date Reported:**	23-Jun-2016	
	PO Box 9528	**Quote No:**	76345	
	Newmarket	**Order No:**		
	Auckland 1149	**Client Reference:**	A02951800	
		Submitted By:	G Sheridan	

Sample Type: Aqueous

Sample Name:		SW1 17-Jun-2016	SW2 17-Jun-2016		
Lab Number:		1602528.1	1602528.2		
Individual Tests					
Sum of Anions	meq/L	3.036 ± 0.097	2.684 ± 0.082	-	-
Sum of Cations	meq/L	3.27 ± 0.19	2.92 ± 0.17	-	-
pH	pH Units	7.1 ± 0.2	7.2 ± 0.2	-	-
Total Alkalinity	g/m³ as $CaCO_3$	51.6 ± 2.2	58.4 ± 2.5	-	-
Bicarbonate	g/m³ at 25°C	62.8 ± 3.3	71.1 ± 3.7	-	-
Total Hardness	g/m³ as $CaCO_3$	81.7 ± 3.8	72.2 ± 3.4	-	-
Electrical Conductivity (EC)	mS/m	33.7 ± 0.7	29.0 ± 0.6	-	-
Total Suspended Solids	g/m³	4.7 ± 2.1	7.1 ± 2.2	-	-
Total Antimony	g/m³	< 0.00021 ± 0.00014	< 0.00021 ± 0.00014	-	-
Total Boron	g/m³	0.0355 ± 0.0061	0.0505 ± 0.0079	-	-
Dissolved Calcium	g/m³	20.4 ± 1.3	17.9 ± 1.2	-	-
Dissolved Magnesium	g/m³	7.51 ± 0.51	6.67 ± 0.45	-	-
Total Mercury	g/m³	< 0.00008 ± 0.000053	< 0.00008 ± 0.000053	-	-
Dissolved Potassium	g/m³	3.53 ± 0.26	3.09 ± 0.23	-	-
Dissolved Sodium	g/m³	35.4 ± 3.8	32.2 ± 3.5	-	-
Chloride	g/m³	42.7 ± 2.6	29.8 ± 1.9	-	-
Nitrite-N	g/m³	0.0067 ± 0.0017	0.0031 ± 0.0014	-	-
Nitrate-N	g/m³	0.373 ± 0.046	0.169 ± 0.021	-	-
Nitrate-N + Nitrite-N	g/m³	0.379 ± 0.046	0.172 ± 0.021	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³	0.600 ± 0.074	0.345 ± 0.069	-	-
Dissolved Reactive Phosphorus	g/m³	< 0.004 ± 0.0027	0.0060 ± 0.0028	-	-
Sulphate	g/m³	37.1 ± 2.3	31.9 ± 2.0	-	-
Chemical Oxygen Demand (COD)	g O_2/m³	12.5 ± 4.8	12.5 ± 4.8	-	-
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn					
Total Arsenic	g/m³	< 0.0011 ± 0.00074	0.00112 ± 0.00074	-	-
Total Cadmium	g/m³	< 0.000053 ± 0.000036	< 0.000053 ± 0.000036	-	-
Total Chromium	g/m³	0.00087 ± 0.00036	0.00089 ± 0.00036	-	-
Total Copper	g/m³	0.00172 ± 0.00039	0.00150 ± 0.00039	-	-
Total Lead	g/m³	0.000178 ± 0.000074	< 0.00011 ± 0.000074	-	-
Total Nickel	g/m³	0.00619 ± 0.00083	0.00356 ± 0.00056	-	-
Total Zinc	g/m³	0.1139 ± 0.0092	0.0232 ± 0.0020	-	-

The reported uncertainty is an expanded uncertainty with a level of confidence of approximately 95 percent (i.e. two standard deviations, calculated using a coverage factor of 2). Reported uncertainties are calculated from the performance of typical matrices, and do not include variation due to sampling.

For further information on uncertainty of measurement at Hill Laboratories, refer to the technical note on our website: www.hill-laboratories.com/files/Intro_To_UOM.pdf, or contact the laboratory.

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level	0.000053 - 0.0011 g/m^3	1-2
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
Total Digestion	Boiling nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-2
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1-2
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-2
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-2
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field.	0.1 pH Units	1-2
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-2
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D 22nd ed. 2012.	3 g/m^3	1-2
Total Antimony	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00021 g/m^3	1-2
Total Boron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0053 g/m^3	1-2
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-2
Total Mercury	Bromine Oxidation followed by Atomic Fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m^3	1-2
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-2
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-2
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl^- E (modified from continuous flow analysis) 22nd ed. 2012.	0.5 g/m^3	1-2
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m^3	1-2
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-2
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m^3	1-2
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colorimetry. Discrete Analyser. APHA 4500-P E (modified from manual analysis) 22nd ed. 2012.	0.004 g/m^3	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B 22nd ed. 2012.	0.5 g/m^3	1-2
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m^3	1-2

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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