

Thursday 10 March 2022

Environmental Engineer & Director

To: [REDACTED]  
Site Engineer, Lendlease  
Tweed Valley Hospital Project

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**Re: Surface Water Quality Monitoring Results and Report for the Tweed Valley Hospital Project**

*Reporting period: 18 January 2021 to 16 February 2021*

**1.0 INTRODUCTION**

Ecoteam is engaged to undertake monthly and event-based surface water monitoring on behalf of Lendlease Building, as part of the main works for the Tweed Valley Hospital Project. This report presents results from the 32<sup>nd</sup> round of monthly sampling. This report satisfies the requirements of the SSD2 conditions. No controlled or uncontrolled releases from the sediment basins occurred during the reporting period.

**2.0 PROJECT AIMS AND SAMPLING OBJECTIVES**

The surface water monitoring objectives for the site are to detect changes during construction in receiving water quality resulting from the project. Stormwater discharges potentially contain increased sediment loads, nutrients, total and dissolved metals, hydrocarbons, or other contaminants such as pesticides. Baseline water quality data was performed on the 19 and 26 November and 19 December 2018 to record water quality conditions under the existing land use prior to construction (Lendlease Building, 2019).

**3.0 WEATHER CONDITIONS**

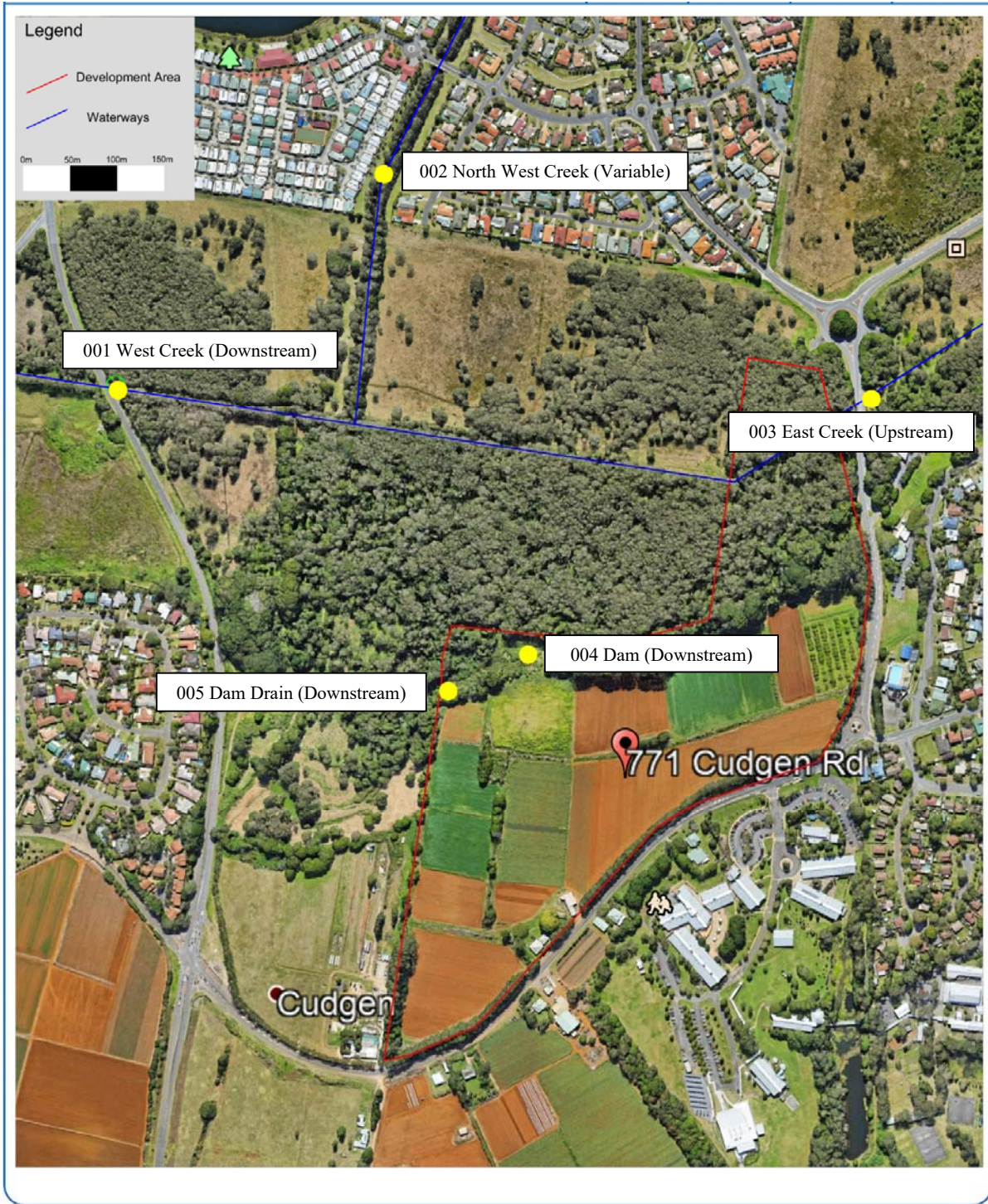
Total rainfall in the period prior to sampling (*18 January 2021 to 16 February 2021*) was 228 mm with the highest 24-hour rainfall occurring on 4 February, being 32.2 mm (Kingscliff BOM Station 058137).

**4.0 SAMPLING LOCATIONS**

Samples were collected from four of the five monthly sampling Sites (001 – 003 and 005). Site 004 has been infilled and has been removed from ongoing sampling rounds. Control samples were also collected and analysed (013 – 015). Sample codes and corresponding sampling locations are shown in **Table 1** and **Figure 1**. Site photos taken on the day of sampling are included in **Appendix A**. During sampling, Site 002 was noted to be flowing North. Therefore, Site 002 will be assessed as a downstream sample site.

**Table 1. Monthly sampling sites, control samples, sample codes and applicable WQOs.**

Sample Codes	Sampling Site Name	Short Name	WQOs
001	West Creek (Downstream)	WC	Estuarine
002	North West Creek (Variable)	NWC	Estuarine
003	East Creek (Upstream)	EC	Freshwater
004	Dam (Downstream)	Dam	Freshwater
005	Dam Drain (Downstream)	DD	Freshwater
013	Trip Blank	Trip	NA
014	Field Blank	Field	NA
015	Field Duplicate	Duplicate	NA



**Figure 1.** Map of monthly sampling sites (Source: Google Earth).

## 5.0 SAMPLING METHODOLOGY

Sampling was undertaken by [REDACTED] on Wednesday 16 February 2022. Weather was fine and sunny. In situ physico-chemical measurements were collected using an AquaTROLL multi-parameter probe and Turbidity was measured using a Turbimeter Plus turbidity meter. Oil and grease were visually assessed. The calibration certificate for the SmarTROLL is included as **Appendix B**. The Turbimeter Plus is calibrated before each sampling round. Water quality samples were collected at 300 mm below the surface where possible. Samples were collected from the bank using an extension pole.

Samples were filtered and preserved on site where necessary, stored on ice and couriered over night to the NATA accredited Envirolab in Sydney. Trip blank samples (013) were sent from Envirolab and transported to all sites, then returned to Envirolab with the field samples. The field blank samples (014) were assessed at Site 001. Duplicate samples (015) were collected at Site 002 and were filtered and preserved as required. Field and trip blanks were filled with deionized water and do not represent water quality from the site. A full list of analytes for the project are included in **Appendix C**.

## 6.0 ASSESSMENT CRITERIA

Water quality results were compared against the Water Quality Objectives (WQO) in the following guidelines.

- *NSW Water Quality Objectives for the Tweed River Catchment for Aquatic Ecosystems* (Tweed 2006) - Trigger criteria for estuaries.
- *Australian and New Zealand guidelines for fresh and marine water quality (ANZECC 2000)* – Trigger values for freshwater (level of protection 95% species).

## 7.0 RESULTS

### 7.1 Physico-chemical Results

In situ physico-chemical sampling results with comparison to WQOs are shown in **Table 2**. There were no surface sheens visible at any sites, therefore oil and grease were not present.

**Table 2. Results of physico-chemical parameters. Results above guidelines are highlighted.**

		Water Quality Objectives (WQOs)		Sample Codes and Results			
Analyte	Units	Estuary	Fresh Water	WC 001 (Down)	NWC 002 (Down)	EC 003 (Up)	DD 005 (Down)
<i>pH</i>		7.0-8.5	6.5-8.5	6.63	6.52	6.59	5.96
<i>Turbidity</i>	<i>NTU</i>	0.5-10	6.0-50	9	24.44	14.84	1.72
<i>Electrical Conductivity (EC)</i>	<i>µS/cm</i>	125-2,200	125-2,200	525.79	323.02	133.53	202.17
<i>Dissolved Oxygen (DO)</i>	<i>% Saturation</i>	80-110	85-110	12.59	16.05	28.7	21.31
<i>Temperature</i>	<i>°C</i>	N/A	N/A	21.57	22.17	21.69	20.52
<i>Oxidation Reduction Potential (ORP)</i>	<i>mV</i>	N/A	N/A	453.5	333.2	586.7	136.9

When compared to the WQOs for freshwater and estuaries:

- pH was outside of the WQO ranges at Sites 001, 002 and 005 this sampling round.
- Turbidity was outside of the WQO ranges at Sites 002 and 005 this sampling round.
- EC was within the WQO ranges at all sampling sites this sampling round.
- DO concentrations were outside of the expected range at all sampling sites this sampling round. DO was outside the range at comparison sites in background sampling.

## 7.2 Laboratory Results

Ammonia, Chlorophyll-a, Filterable Reactive Phosphorous (FRP), Oxides of Nitrogen (NO<sub>x</sub>), Total Nitrogen and Total Phosphorus (TP) were above the WQOs for some sample sites. Aluminium was also outside WQOs. Parameters which exceeded the WQOs are shown in **Table 3**.

The chain of custody form is included in **Appendix D**. A summary of all lab results with comparison to WQOs is included as **Appendix E**. A full copy of the laboratory results is included as **Appendix F**.

**Table 3. Parameters in exceedance of the trigger criteria for sampling conducted 19 July 2021. Results above guidelines are highlighted.**

		Water Quality Objectives (WQOs)								
Analyte	Unit	Estuary	Fresh Water	WC 001 (Down)	NWC 002 (Down)	EC 003 (Up)	DD 005 (Down)	013 Trip	014 Field	015 Duplicate
Ammonia	mg/L	0.015	0.02	0.060	0.078	0.023	0.017	<0.005	<0.005	0.084
Chlorophyll-a	mg/m <sup>3</sup>	4	5	3	2	<2	3	<2	<2	2
Filterable Reactive Phosphorus	mg/L	0.005	0.02	0.01	0.006	0.02	<0.005	<0.005	<0.005	0.006
Oxides of Nitrogen	mg/L	0.015	0.040	0.06	0.3	<0.005	4.1	<0.005	<0.005	0.4
Total Nitrogen	mg/L	0.30	0.35	0.6	1.1	0.6	4.4	<0.1	<0.1	1.1
Total Phosphorus	mg/L	0.030	0.025	0.04	0.05	0.05	0.07	<0.02	<0.02	0.04
Aluminium	µg/L	N/A	55	60	180	310	30	<10	<10	180

When compared to the WQOs for Freshwater and Estuaries:

- Ammonia was above the WQOs at Sites 001, 002 and 003. Ammonia was above the WQOs at comparison sites in background sampling. Ammonia has increased at Sites 001, 002 and 003 and decreased at Site 005 when compared to the previous month.
- Chlorophyll-a was below the WQOs criteria at all sites. Chlorophyll-a results were varied across comparison sites in background sampling. Chlorophyll-a has decreased at Sites 002 and 003 increases at Site 005 and remained the same at Site 001.
- FRP was above the WQOs at Sites 001, 002 and 003. FRP concentrations increased at Site 002, decreased at Site 003, and remained the same at Sites 001 and 005 when compared to last month. FRP results varied across comparison sites in background sampling though were lowest at Site 005.
- NO<sub>x</sub> was above the WQOs criteria at Sites 001, 002 and 005. NO<sub>x</sub> has increased at Sites 001 and 005, decreased at Site 002 and remained the same at Sites 003 when compared to last month.

- TN was above the WQOs criteria at all sites. TN has increased at Site 003, decreased at Sites 002 and 005 and remained the same at Sites 001 when compared to last month. TN was above the WQOs at comparison sites in baseline sampling.
- TP was above the WQOs at all sites. TP has decreased at Sites 001, 002 and 003 and increased at Site 005 when compared to the previous month. TP was above the WQOs at comparison sites in baseline sampling.
- Aluminium was above the WQO at Site 003. This is similar to the previous month. Aluminium has increased at all sites when compared to the previous month. Aluminium has been observed at both upstream and downstream sampling sites during past sampling rounds.
- All other metals were within estuarine and freshwater criteria this month.
- Demeton was analysed and returned non-detectable results.
- TRH (C<sub>10</sub>-C<sub>40</sub>) was not detected at any sample site.


### 8.0 Quality Assurance and Quality Control


- Parameters analysed in the Trip Blank (013) and Field Blank (014) were below the laboratory detection limits for all analytes.
  - The Duplicate Sample (015) was collected at Site 002 and is within acceptable limits for all analytes.
- The laboratory QA/QC is included in the results in **Appendix F**. All laboratory QA/QC was within acceptance criteria. Based on the above, the results are considered acceptable for the purposes of the project.

### 9.0 Summary of Results and Recommendations

- The month had moderate to high rainfall.
- Nutrients (Ammonia, NO<sub>x</sub>, TN, TP and FRP) were high and exceeded some water quality parameters for some sites. This includes upstream and downstream sites in past sampling events. Exceedances in nutrients are therefore considered of natural occurrence.
- Aluminium exceeded WQOs at Site 003 during the month. Metals have been present in upstream and downstream sampling sites in previous sampling rounds. Elevation in metals may be due to pH and redox changes, microbial mineralisation and naturally occurring sediment transportation. Changes in metal concentrations are also likely following heavy rainfall events.
- Elevated nutrients and metals have been observed at all sampling locations including upstream and downstream sites in previous months and during baseline sampling. Therefore, based on the assessment of the January/February water quality data, the Tweed Valley Hospital Project construction activities are unlikely to be adversely impacting the downstream water quality. As such, the current soil and erosion controls implemented on site are considered to be effective.

Kind regards,

  
Environmental Engineer & Director

  
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## Appendix A. Site Photos

A photograph of a creek with a dense growth of tall, green reeds and grasses along the banks. The water is calm and reflects the surrounding vegetation. In the background, a grassy hillside and a clear sky are visible.	<p><b>Site 001 – West Creek (Downstream) (16/02/2022)</b></p>
A photograph of a creek heavily infested with bright green duckweed. The water is almost completely covered by the floating plants. The banks are lined with lush green trees and bushes.	<p><b>Site 002 – North West Creek (Downstream) (16/02/2022)</b></p>
A photograph of a creek with a thick layer of green duckweed on the surface. The water is dark and still, reflecting the surrounding trees and sky. The banks are covered in dense green foliage.	<p><b>Site 003 – East Creek (Upstream) (16/02/2022)</b></p>
A photograph of a small stream flowing through a dense forest. The water is clear and shallow, reflecting the surrounding greenery. The banks are covered in various types of plants and trees.	<p><b>Site 005 – Dam Drain (Downstream) (16/02/2022)</b></p>

## Appendix B. Calibration certificate for AquaTROLL

<b>ThermoFisher</b> SCIENTIFIC  Thermo Fisher Scientific Australia Pty Ltd ABN 52 058 390 917 5 Caribbean Drive Scoresby VIC 3179 Phone: 1 300 735 295 Fax: 03 9763 1169	<b>ELECTROCHEMICAL INSTRUMENT MAINTENANCE &amp; CALIBRATION REPORT</b>	
	Customer: Ecotechnology Australia PTY Ltd Address: 13 Ewing st Lismore NSW 2480  Attention: ██████████	

Make:	In-Situ	Lab.ID/Assett No.	NA	Calibration Date:	27-05-2021
Model:	AquaTroll 400	Customer O/No.	PO-0063	Next Calibration:	05-2022
Serial No:	741219 / 746352	Location:	NA	Call Number:	SV2105240050

Service and Safety Checks	Pass/Fail	Check and Adjust	Pass/Fail
Consult operator regarding performance/problems	Pass	Probes, leads and connectors	Pass
Check general operation, note additional problems	Pass	Keypad / user controls	Pass
Electrical safety if applicable to AS/NZS 3760:2003	N/A	Power supply / battery voltage and condition	Pass
Initialization Procedure	Pass	Probe(s) performance (response slow or acceptable)	Acceptable
Instrument Condition	Pass	Internal and external cleaning	Pass

### Calibration/ Accuracy Tests

Standard Type	Serial Number (if applicable)	Standard Value ± Variation	Displayed Value	Standard Value ± Variation	Displayed Value	Standard Value ± Variation	Displayed Value	Pass/Fail
✓ pH	20945	7.00 ± 0.02	7.00	4.00 ± 0.02	4.00			Pass
✓ mV (pH)		0.0 +/- 30	-7.7	175.5 +/- 30	163.1			Pass
✓ Slope (pH)		-59.1 +/- 3	-56.93					Pass
✓ DO	745063	8.3mg/L @21.5oC	8.27mg/L @21.66oC	0.0	0.03			Pass
ISE								
✓ ORP	20945	234.5mV @22.0oC	234.5 @22.1oC					Pass
✓ Conductivity	746352	1413us/cm	1413us/cm					Pass
TDS								
✓ Temp C	746352	22.5	22.47					Pass

### Reference Instruments Used

Make	Model / Part Number	Serial / Batch Number	Expiry / Reference #
Thermo Scientific	ECBU4BTC1LIT	450/01	Nov 2023
Thermo Scientific	ECBU7BTC1LIT	450/02	Nov 2023
FLUKE	179 True RMS multimeter	91610338	Feb 2022
Thermo Scientific	ECCON1413BT	270/01	Jun 2023
ACR	Zobell A & B (0608/0609)	362211 (A) & 357174 (B)	Oct 2021 (A & B)
TPS	Sodium Sulphite for Zero DO	10640	Aug 2021

### General Comments and Recommendations on Instrument Condition, Location Details and Parts Used in Service

Instrument inspected and noted operation. Refilled pH reference filling solution and replaced reference junction. Cleaned sensors and instrument. Calibrated individual sensor parameters. DO Sensor slope of 1.070123. ORP sensor offset of 5.5mV. Conductivity cell constant:0.979

Issued Maintenance Kit and Reference junction kit.

Engineer's Name ██████████

Date  
27<sup>th</sup> May 2021

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## Appendix C. Full List of Sampling Analytes

### 3.7 Proposed Surface Water Quality Sampling Parameters

A summary of the proposed sampling analytes is provided below:

#### Field

- pH
- Turbidity
- Electrical Conductivity (EC)
- Dissolved Oxygen (DO)
- Temperature
- Oxidation Reduction Potential (ORP)
- Oil and grease

#### Laboratory

- Total Suspended Solids (TSS)
- Total Dissolved Solids (TDS)
- Major Cations & Hardness
- Ammonia
- Chlorophyll-a
- Filterable Reactive Phosphorus
- Nitrate
- Oxides of Nitrogen
- Total Nitrogen
- Total Phosphorus
- Aluminium (pH > 6.5) filtered
- Arsenic (filtered)
- Boron (filtered)
- Cadmium (filtered)
- Chromium (filtered)
- Copper (filtered)
- Cobalt (filtered)
- Lead (filtered)
- Manganese (filtered)
- Mercury (filtered)

- Nickel (filtered)
- Selenium (filtered)
- Silver (filtered)
- Zinc (filtered)
- Benzene
- Toluene
- Ethylbenzene
- Xylene - Total
- Naphthalene
- Total Recoverable Hydrocarbons (TRH)
- Organochlorine Pesticides (OCP)
  - 4,4'-DDE
  - 4,4'-DDT
  - Aldrin
  - g-BHC (Lindane)
  - Chlordane
  - Dieldrin
  - Endosulfan
  - Endrin
  - Heptachlor
  - Toxaphene
- Organophosphorus Pesticides (OPP)
  - Azinphos-methyl
  - Chlorpyrifos
  - Demeton-S
  - Diazinon
  - Dimethoate
  - Fenitrothion
  - Malathion

If a sample returns detectable concentrations of the analytes presented in Table 1, additional analyses may be required to enable comparison against additional trigger criteria or trace potential sources of contaminants. It is cost prohibitive to analyse these parameters unless required.

Table 1 Additional Analysis Requirements

Analyte	Additional Analysis
Total Recoverable Hydrocarbons	TRH Silica-gel Clean-up
Arsenic (filtered)	Arsenic (III) (filtered) Arsenic (V) (filtered)
Chromium (filtered)	Chromium (CrVI) (filtered)





## Appendix D. Chain of Custody Form

Sample information					Tests Required												Comments	
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	TRB/BTEXN	Disolved Metals + low level silver (0.0005 mg/L) OC/OP + toxaphene + dieldrin LOW LEVEL	TSS	TDS	Cations + Hardness	Ammonia	Chlorophyll-a	Phosphate (FRP)	Nitrate	Nox	Total N	Total P	C16+ - AsIII & V HOLD	Provide as much information about the sample as you can
1	001 - WC	300 mm		Water	X	X	X	X	X	X	X	X	X	X	X	X	X	
2	002 - NWC	150 mm		Water	X	X	X	X	X	X	X	X	X	X	X	X	X	
3	003 - EC	300 mm		Water	X	X	X	X	X	X	X	X	X	X	X	X	X	
4	005 - Dam Drain	150 mm		Water	X	X	X	X	X	X	X	X	X	X	X	X	X	
5	013	300 mm		Water	X	X	X	X	X	X	X	X	X	X	X	X	X	
6	014	300 mm		Water	X	X	X	X	X	X	X	X	X	X	X	X	X	
7	015	300 mm		Water	X	X	X	X	X	X	X	X	X	X	X	X	X	
<input type="checkbox"/> Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis																		
Relinquished by (Company): Ecoteam					Received by (Company): <i>EW MD</i>					Lab Use Only								
Print Name: [Redacted]					Print Name: [Redacted]					Job number: <i>289182</i>					Cooling: Ice / Ice pack / None			
Date & Time: 16/02/2022 13:00					Date & Time: [Redacted]					Temperature: <i>16</i>					Security seal: Intact / Broken / None			
Signature: [Redacted]					Signature: [Redacted]					TAT Req - SAME day / 1 / 2 / 3 / 4 / <i>(STD)</i>								

## Appendix E. Summary of Lab Results compared to WQOs

		Water Quality Objectives (WQOs)		Sample Codes							
Analyte	Unit	Estuary	Fresh Water	WC 001	NWC 002	EC 003	DD 005		013 Trip	014 Field	015 Duplicate
Total Suspended Solids (TSS)	mg/L	N/A	N/A	8	8	8	6		<5	<5	8
Total Dissolved Solids (TDS)	mg/L	N/A	N/A	390	260	170	180		<5	<5	280
Major Cations (dissolved) and Hardness											
Sodium	mg/L	N/A	N/A	44	32	14	22		<0.5	<0.5	33
Potassium	mg/L	N/A	N/A	3	2	1	1		<0.5	<0.5	2
Calcium	mg/L	N/A	N/A	32	16	5.4	4		<0.5	<0.5	15
Magnesium	mg/L	N/A	N/A	11	6.8	3	5		<0.5	<0.5	6.4
Hardness mgCaCO <sub>3</sub> /L		N/A	N/A	120	67	24	29		<3	<3	63
Nutrients											
Ammonia	mg/L	0.015	0.02	0.060	0.078	0.023	0.017		<0.005	<0.005	0.084
Chlorophyll-a	mg/m <sup>3</sup>	4	5	3	2	<2	3		<2	<2	2
Filterable Reactive Phosphorus	mg/L	0.005	0.02	0.01	0.006	0.02	<0.005		<0.005	<0.005	0.006
Nitrate	mg/L	N/A	N/A	0.05	0.34	<0.005	4.1		<0.005	<0.005	0.36
Oxides of Nitrogen	mg/L	0.015	0.040	0.06	0.3	<0.005	4.1		<0.005	<0.005	0.4
Total Nitrogen	mg/L	0.30	0.35	0.6	1.1	0.6	4.4		<0.1	<0.1	1.1
Total Phosphorus	mg/L	0.030	0.025	0.04	0.05	0.05	0.07		<0.02	<0.02	0.04
Metals – All metals are Dissolved Metals											
Aluminium	µg/L	N/A	55	60	180	310	30		<10	<10	180
Arsenic	µg/L	N/A	13	<1	<1	1	<1		<1	<1	<1
Boron	µg/L	N/A	370	80	60	20	50		<20	<20	60
Cadmium	µg/L	5.5	0.2	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
Chromium	µg/L	4.4	1.0	<1	<1	<1	<1		<1	<1	<1
Copper	µg/L	1.3	1.4	<1	<1	1	<1		<1	<1	<1
Cobalt	µg/L	1.0	N/A	<1	1	<1	<1		<1	<1	1
Lead	µg/L	4.4	3.4	<1	<1	<1	<1		<1	<1	<1
Manganese	µg/L	N/A	1,900	200	140	45	39		<1	<1	140
Mercury	µg/L	0.4	0.6	<0.05	<0.05	<0.05	<0.05		<0.05	<0.05	<0.05
Nickel	µg/L	70	11	<1	1	1	<1		<1	<1	1
Selenium	µg/L	N/A	11	<1	<1	<1	<1		<1	<1	<1
Zinc	µg/L	15	8.0	6	6	12	5		<1	<1	7
Silver	µg/L	1.4	0.05	<0.05	0.06	<0.05	<0.05		<0.05	<0.05	<0.05

		Water Quality Objectives (WQOs)		Sample Codes							
Analyte	Unit	Estuary	Fresh Water	WC 001	NWC 002	EC 003	DD 005		013 Trip	014 Field	015 Duplicate
<b>Hydrocarbons</b>											
Toluene	mg/L	0.70	0.95	<1	<1	<1	<1		<1	<1	<1
Ethylbenzene	mg/L	N/A	N/A	<1	<1	<1	<1		<1	<1	<1
Xylene	mg/L	N/A	N/A	<1	<1	<1	<1		<1	<1	<1
Naphthalene	mg/L	N/A	0.55	<1	<1	<1	<1		<1	<1	<1
TRH C <sub>6</sub> - C <sub>10</sub>	mg/L	0.07	0.016	<10	<10	<10	<10		<10	<10	<10
TRH C <sub>10</sub> - C <sub>16</sub>	mg/L	N/A	N/A	<50	<50	<50	<50		<50	64	<50
TRH C <sub>16</sub> - C <sub>34</sub>	mg/L	N/A	N/A	<100	<100	<100	<100		<100	<100	<100
TRH >C <sub>34</sub> - C <sub>40</sub>	mg/L	N/A	N/A	<100	<100	<100	<100		<100	<100	<100
TRH C <sub>6</sub> -C <sub>10</sub> less BTEX (F1)	mg/L	N/A	N/A	<10	<10	<10	<10		<10	<10	<10
TRH >C <sub>10</sub> -C <sub>16</sub> less Naphthalene (F2)	mg/L	N/A	N/A	<50	<50	<50	<50		<50	<50	<50
<b>Organochlorine Pesticides (OCP)</b>											
4,4'-DDE	µg/L	N/A	N/A	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
4,4'-DDT	µg/L	N/A	0.01	<0.006	<0.006	<0.006	<0.006		<0.006	<0.006	<0.006
Aldrin	µg/L	N/A	N/A	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
g-BHC	µg/L	N/A	0.2	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Chlordane	µg/L	N/A	0.08	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Dieldrin	µg/L	N/A	N/A	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Endosulfan	µg/L	0.01	0.2	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Endrin	µg/L	0.02	0.008	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Heptachlor	µg/L	N/A	0.09	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Toxaphene	µg/L	N/A	0.2	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
<b>Organophosphorus Pesticides (OPP)</b>											
Azinphos-methyl	µg/L	N/A	0.02	<0.02	<0.02	<0.02	<0.02		<0.02	<0.02	<0.02
Chlorpyrifos	µg/L	0.009	0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Demeton-S	µg/L	N/A	N/A	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Diazinon	µg/L	N/A	0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Dimethoate	µg/L	N/A	0.15	<0.15	<0.15	<0.15	<0.15		<0.15	<0.15	<0.15
Fenitrothion	µg/L	N/A	0.2	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Malathion	µg/L	N/A	0.05	<0.05	<0.05	<0.05	<0.05		<0.05	<0.05	<0.05

## Appendix F. Full Laboratory Results



## CERTIFICATE OF ANALYSIS 289162

### Client Details

<b>Client</b>	Ecoteam
<b>Attention</b>	[REDACTED]
<b>Address</b>	13 Ewing Street, Lismore, NSW, 2480

### Sample Details

<b>Your Reference</b>	<b>SMC009.32 - Tweed Valley Hospital Project</b>
<b>Number of Samples</b>	7 Water
<b>Date samples received</b>	18/02/2022
<b>Date completed instructions received</b>	18/02/2022

### Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.  
 Samples were analysed as received from the client. Results relate specifically to the samples as received.  
 Results are reported on a dry weight basis for solids and on an as received basis for other matrices.  
**Please refer to the last page of this report for any comments relating to the results.**

### Report Details

<b>Date results requested by</b>	25/02/2022
<b>Date of Issue</b>	28/02/2022
<b>Reissue Details</b>	This report replaces R00 created on 25/02/2022 due to: revised report with revised TRH results.
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Accredited for compliance with ISO/IEC 17025 - Testing. <b>Tests not covered by NATA are denoted with *</b>	

#### Results Approved By

[REDACTED] Senior Chemist  
 [REDACTED], Group Technical Manager  
 [REDACTED], Metals Supervisor  
 [REDACTED], LC Supervisor  
 [REDACTED], Development Chemist  
 [REDACTED], Senior Chemist

#### Authorised By

1  
 [REDACTED]  
 [REDACTED], Laboratory Manager



Client Reference: SMC009.32 - Tweed Valley Hospital Project

vTRH(C6-C10)/BTEXN in Water						
Our Reference		289162-1	289162-2	289162-3	289162-4	289162-5
Your Reference	UNITS	001-WC	002 - NWC	003 - EC	005 - Dam Drain	013
Depth		300	150	300	150	300
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
Date analysed	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
TRH C <sub>6</sub> - C <sub>9</sub>	µg/L	<10	<10	<10	<10	<10
TRH C <sub>6</sub> - C <sub>10</sub>	µg/L	<10	<10	<10	<10	<10
TRH C <sub>6</sub> - C <sub>10</sub> less BTEX (F1)	µg/L	<10	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	98	96	97	98	97
Surrogate toluene-d8	%	98	99	97	99	97
Surrogate 4-BFB	%	104	106	102	104	104

vTRH(C6-C10)/BTEXN in Water			
Our Reference		289162-6	289162-7
Your Reference	UNITS	014	015
Depth		300	300
Type of sample		Water	Water
Date extracted	-	21/02/2022	21/02/2022
Date analysed	-	21/02/2022	21/02/2022
TRH C <sub>6</sub> - C <sub>9</sub>	µg/L	<10	<10
TRH C <sub>6</sub> - C <sub>10</sub>	µg/L	<10	<10
TRH C <sub>6</sub> - C <sub>10</sub> less BTEX (F1)	µg/L	<10	<10
Benzene	µg/L	<1	<1
Toluene	µg/L	<1	<1
Ethylbenzene	µg/L	<1	<1
m+p-xylene	µg/L	<2	<2
o-xylene	µg/L	<1	<1
Naphthalene	µg/L	<1	<1
Surrogate Dibromofluoromethane	%	97	97
Surrogate toluene-d8	%	97	97
Surrogate 4-BFB	%	103	103

Client Reference: SMC009.32 - Tweed Valley Hospital Project

svTRH (C10-C40) in Water						
Our Reference		289162-1	289162-2	289162-3	289162-4	289162-5
Your Reference	UNITS	001-WC	002 - NWC	003 - EC	005 - Dam Drain	013
Depth		300	150	300	150	300
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	22/02/2022	22/02/2022	22/02/2022	22/02/2022	22/02/2022
Date analysed	-	25/02/2022	25/02/2022	25/02/2022	25/02/2022	25/02/2022
TRH C <sub>10</sub> - C <sub>14</sub>	µg/L	<50	<50	<50	<50	<50
TRH C <sub>15</sub> - C <sub>28</sub>	µg/L	<100	<100	<100	<100	<100
TRH C <sub>29</sub> - C <sub>36</sub>	µg/L	<100	<100	<100	<100	<100
TRH >C <sub>10</sub> - C <sub>16</sub>	µg/L	<50	<50	<50	<50	<50
TRH >C <sub>10</sub> - C <sub>16</sub> less Naphthalene (F2)	µg/L	<50	<50	<50	<50	<50
TRH >C <sub>16</sub> - C <sub>34</sub>	µg/L	<100	<100	<100	<100	<100
TRH >C <sub>34</sub> - C <sub>40</sub>	µg/L	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	103	115	76	96	110

svTRH (C10-C40) in Water			
Our Reference		289162-6	289162-7
Your Reference	UNITS	014	015
Depth		300	300
Type of sample		Water	Water
Date extracted	-	22/02/2022	22/02/2022
Date analysed	-	25/02/2022	25/02/2022
TRH C <sub>10</sub> - C <sub>14</sub>	µg/L	<50	<50
TRH C <sub>15</sub> - C <sub>28</sub>	µg/L	<100	<100
TRH C <sub>29</sub> - C <sub>36</sub>	µg/L	<100	<100
TRH >C <sub>10</sub> - C <sub>16</sub>	µg/L	<50	<50
TRH >C <sub>10</sub> - C <sub>16</sub> less Naphthalene (F2)	µg/L	<50	<50
TRH >C <sub>16</sub> - C <sub>34</sub>	µg/L	<100	<100
TRH >C <sub>34</sub> - C <sub>40</sub>	µg/L	<100	<100
Surrogate o-Terphenyl	%	108	108

Client Reference: SMC009.32 - Tweed Valley Hospital Project

OCPs in Water - Low Level						
Our Reference		289162-1	289162-2	289162-3	289162-4	289162-5
Your Reference	UNITS	001-WC	002 - NWC	003 - EC	005 - Dam Drain	013
Depth		300	150	300	150	300
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	22/02/2022	22/02/2022	22/02/2022	22/02/2022	22/02/2022
Date analysed	-	23/02/2022	23/02/2022	23/02/2022	23/02/2022	23/02/2022
alpha-BHC	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
HCB	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
beta-BHC	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
gamma-BHC	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
delta-BHC	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Aldrin	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
gamma-Chlordane	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
alpha-Chlordane	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan I	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
pp-DDE	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Dieldrin	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan II	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
pp-DDD	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin Aldehyde	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
pp-DDT	µg/L	<0.006	<0.006	<0.006	<0.006	<0.006
Endosulfan Sulphate	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Methoxychlor	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Surrogate TCMX	%	120	108	113	125	125



OCPs in Water - Low Level			
Our Reference		289162-6	289162-7
Your Reference	UNITS	014	015
Depth		300	300
Type of sample		Water	Water
Date extracted	-	22/02/2022	22/02/2022
Date analysed	-	23/02/2022	23/02/2022
alpha-BHC	µg/L	<0.01	<0.01
HCB	µg/L	<0.01	<0.01
beta-BHC	µg/L	<0.01	<0.01
gamma-BHC	µg/L	<0.01	<0.01
Heptachlor	µg/L	<0.01	<0.01
delta-BHC	µg/L	<0.01	<0.01
Aldrin	µg/L	<0.01	<0.01
Heptachlor Epoxide	µg/L	<0.01	<0.01
gamma-Chlordane	µg/L	<0.01	<0.01
alpha-Chlordane	µg/L	<0.01	<0.01
Endosulfan I	µg/L	<0.01	<0.01
pp-DDE	µg/L	<0.01	<0.01
Dieldrin	µg/L	<0.01	<0.01
Endrin	µg/L	<0.01	<0.01
Endosulfan II	µg/L	<0.01	<0.01
pp-DDD	µg/L	<0.01	<0.01
Endrin Aldehyde	µg/L	<0.01	<0.01
pp-DDT	µg/L	<0.006	<0.006
Endosulfan Sulphate	µg/L	<0.01	<0.01
Methoxychlor	µg/L	<0.01	<0.01
Surrogate TCMX	%	117	114

Client Reference: SMC009.32 - Tweed Valley Hospital Project

OP in water LL ANZECCF/ADWG						
Our Reference		289162-1	289162-2	289162-3	289162-4	289162-5
Your Reference	UNITS	001-WC	002 - NWC	003 - EC	005 - Dam Drain	013
Depth		300	150	300	150	300
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	22/02/2022	22/02/2022	22/02/2022	22/02/2022	22/02/2022
Date analysed	-	23/02/2022	23/02/2022	23/02/2022	23/02/2022	23/02/2022
Dichlorovos	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Dimethoate	µg/L	<0.15	<0.15	<0.15	<0.15	<0.15
Diazinon	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorpyrifos-methyl	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Methyl Parathion	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Malathion	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorpyrifos	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Parathion	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Bromophos ethyl	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Surrogate TCMX	%	120	108	113	125	125

OP in water LL ANZECCF/ADWG			
Our Reference		289162-6	289162-7
Your Reference	UNITS	014	015
Depth		300	300
Type of sample		Water	Water
Date extracted	-	22/02/2022	22/02/2022
Date analysed	-	23/02/2022	23/02/2022
Dichlorovos	µg/L	<0.2	<0.2
Dimethoate	µg/L	<0.15	<0.15
Diazinon	µg/L	<0.01	<0.01
Chlorpyrifos-methyl	µg/L	<0.2	<0.2
Methyl Parathion	µg/L	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2
Malathion	µg/L	<0.05	<0.05
Chlorpyrifos	µg/L	<0.01	<0.01
Parathion	µg/L	<0.01	<0.01
Bromophos ethyl	µg/L	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.02	<0.02
Surrogate TCMX	%	117	114

Client Reference: SMC009.32 - Tweed Valley Hospital Project

Miscellaneous Organics - water						
Our Reference		289162-1	289162-2	289162-3	289162-4	289162-5
Your Reference	UNITS	001-WC	002 - NWC	003 - EC	005 - Dam Drain	013
Depth		300	150	300	150	300
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	22/02/2022	22/02/2022	22/02/2022	22/02/2022	22/02/2022
Date analysed	-	24/02/2022	24/02/2022	24/02/2022	24/02/2022	24/02/2022
Toxaphene*	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Demeton-O	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate <i>p</i> -Terphenyl-d <sub>14</sub>	%	122	112	84	130	130

Miscellaneous Organics - water			
Our Reference		289162-6	289162-7
Your Reference	UNITS	014	015
Depth		300	300
Type of sample		Water	Water
Date prepared	-	22/02/2022	22/02/2022
Date analysed	-	24/02/2022	24/02/2022
Toxaphene*	µg/L	<0.2	<0.2
Demeton-O	µg/L	<0.2	<0.2
Surrogate <i>p</i> -Terphenyl-d <sub>14</sub>	%	114	120

Client Reference: SMC009.32 - Tweed Valley Hospital Project

HM in water - dissolved						
Our Reference		289162-1	289162-2	289162-3	289162-4	289162-5
Your Reference	UNITS	001-WC	002 - NWC	003 - EC	005 - Dam Drain	013
Depth		300	150	300	150	300
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	22/02/2022	22/02/2022	22/02/2022	22/02/2022	22/02/2022
Date analysed	-	22/02/2022	22/02/2022	22/02/2022	22/02/2022	22/02/2022
Aluminium-Dissolved	µg/L	60	180	310	30	<10
Arsenic-Dissolved	µg/L	<1	<1	1	<1	<1
Boron-Dissolved	µg/L	80	60	20	50	<20
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	1	<1	<1
Cobalt-Dissolved	µg/L	<1	1	<1	<1	<1
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Manganese-Dissolved	µg/L	200	140	45	39	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	<1	1	1	<1	<1
Selenium-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	6	6	12	5	<1
Silver-Dissolved	µg/L	<0.05	0.06	<0.05	<0.05	0.2

HM in water - dissolved			
Our Reference		289162-6	289162-7
Your Reference	UNITS	014	015
Depth		300	300
Type of sample		Water	Water
Date prepared	-	22/02/2022	22/02/2022
Date analysed	-	22/02/2022	22/02/2022
Aluminium-Dissolved	µg/L	<10	180
Arsenic-Dissolved	µg/L	<1	<1
Boron-Dissolved	µg/L	<20	60
Cadmium-Dissolved	µg/L	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1
Copper-Dissolved	µg/L	<1	<1
Cobalt-Dissolved	µg/L	<1	1
Lead-Dissolved	µg/L	<1	<1
Manganese-Dissolved	µg/L	<1	140
Mercury-Dissolved	µg/L	<0.05	<0.05
Nickel-Dissolved	µg/L	<1	1
Selenium-Dissolved	µg/L	<1	<1
Zinc-Dissolved	µg/L	<1	7
Silver-Dissolved	µg/L	0.1	<0.05

**Client Reference: SMC009.32 - Tweed Valley Hospital Project**

<b>Metals in Waters - Acid extractable</b>						
Our Reference		289162-1	289162-2	289162-3	289162-4	289162-5
Your Reference	UNITS	001-WC	002 - NWC	003 - EC	005 - Dam Drain	013
Depth		300	150	300	150	300
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/02/2022	24/02/2022	24/02/2022	24/02/2022	24/02/2022
Date analysed	-	25/02/2022	25/02/2022	25/02/2022	25/02/2022	25/02/2022
Phosphorus - Total	mg/L	0.04	0.05	0.05	0.07	<0.02

<b>Metals in Waters - Acid extractable</b>			
Our Reference		289162-6	289162-7
Your Reference	UNITS	014	015
Depth		300	300
Type of sample		Water	Water
Date prepared	-	24/02/2022	24/02/2022
Date analysed	-	25/02/2022	25/02/2022
Phosphorus - Total	mg/L	<0.02	0.04

**Client Reference: SMC009.32 - Tweed Valley Hospital Project**

Cations in water Dissolved						
Our Reference		289162-1	289162-2	289162-3	289162-4	289162-5
Your Reference	UNITS	001-WC	002 - NWC	003 - EC	005 - Dam Drain	013
Depth		300	150	300	150	300
Type of sample		Water	Water	Water	Water	Water
Date digested	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
Date analysed	-	21/02/2022	21/02/2022	21/02/2022	21/02/2022	21/02/2022
Sodium - Dissolved	mg/L	44	32	14	22	<0.5
Potassium - Dissolved	mg/L	3	2	1	1	<0.5
Calcium - Dissolved	mg/L	32	16	5.4	4	<0.5
Magnesium - Dissolved	mg/L	11	6.8	3	5	<0.5
Hardness	mgCaCO <sub>3</sub> /L	120	67	24	29	<3

Cations in water Dissolved			
Our Reference		289162-6	289162-7
Your Reference	UNITS	014	015
Depth		300	300
Type of sample		Water	Water
Date digested	-	21/02/2022	21/02/2022
Date analysed	-	21/02/2022	21/02/2022
Sodium - Dissolved	mg/L	<0.5	33
Potassium - Dissolved	mg/L	<0.5	2
Calcium - Dissolved	mg/L	<0.5	15
Magnesium - Dissolved	mg/L	<0.5	6.4
Hardness	mgCaCO <sub>3</sub> /L	<3	63



Client Reference: SMC009.32 - Tweed Valley Hospital Project

Miscellaneous Inorganics						
Our Reference		289162-1	289162-2	289162-3	289162-4	289162-5
Your Reference	UNITS	001-WC	002 - NWC	003 - EC	005 - Dam Drain	013
Depth		300	150	300	150	300
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	18/02/2022	18/02/2022	18/02/2022	18/02/2022	18/02/2022
Date analysed	-	18/02/2022	18/02/2022	18/02/2022	18/02/2022	18/02/2022
Total Suspended Solids	mg/L	8	8	8	6	<5
Total Dissolved Solids (grav)	mg/L	390	260	170	180	<5
Ammonia as N in water	mg/L	0.060	0.078	0.023	0.017	<0.005
Chlorophyll a	mg/m <sup>3</sup>	3	2	<2	3	<2
Phosphate as P in water	mg/L	0.01	0.006	0.02	<0.005	<0.005
Nitrate as N in water	mg/L	0.05	0.34	<0.005	4.1	<0.005
NOx as N in water	mg/L	0.06	0.3	<0.005	4.1	<0.005
Total Nitrogen in water	mg/L	0.6	1.1	0.6	4.4	<0.1

Miscellaneous Inorganics			
Our Reference		289162-6	289162-7
Your Reference	UNITS	014	015
Depth		300	300
Type of sample		Water	Water
Date prepared	-	18/02/2022	18/02/2022
Date analysed	-	18/02/2022	18/02/2022
Total Suspended Solids	mg/L	<5	8
Total Dissolved Solids (grav)	mg/L	<5	280
Ammonia as N in water	mg/L	<0.005	0.084
Chlorophyll a	mg/m <sup>3</sup>	<2	2
Phosphate as P in water	mg/L	<0.005	0.006
Nitrate as N in water	mg/L	<0.005	0.36
NOx as N in water	mg/L	<0.005	0.4
Total Nitrogen in water	mg/L	<0.1	1.1

**Client Reference: SMC009.32 - Tweed Valley Hospital Project**

<b>Method ID</b>	<b>Methodology Summary</b>
<b>Inorg-018</b>	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180+/-10°C.
<b>Inorg-019</b>	Suspended Solids - determined gravimetrically by filtration of the sample. The samples are dried at 104+/-5°C.
<b>Inorg-055</b>	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
<b>Inorg-055/062/127</b>	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen. Alternatively analysed by combustion and chemiluminescence.
<b>Inorg-057</b>	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
<b>Inorg-060</b>	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
<b>INORG-119</b>	Chlorophyll A based on APHA 10200 H latest edition.
<b>Metals-020</b>	Determination of various metals by ICP-AES.
<b>Metals-021</b>	Determination of Mercury by Cold Vapour AAS.
<b>Metals-022</b>	Determination of various metals by ICP-MS.
<b>Org-020</b>	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
<b>Org-022</b>	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
<b>Org-022/025</b>	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
<b>Org-022/025</b>	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
<b>Org-023</b>	Water samples are analysed directly by purge and trap GC-MS.
<b>Org-023</b>	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

Client Reference: SMC009.32 - Tweed Valley Hospital Project

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			21/02/2022	[NT]	[NT]	[NT]	[NT]	21/02/2022	[NT]
Date analysed	-			21/02/2022	[NT]	[NT]	[NT]	[NT]	21/02/2022	[NT]
TRH C <sub>6</sub> - C <sub>9</sub>	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	99	[NT]
TRH C <sub>6</sub> - C <sub>10</sub>	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	99	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	102	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	98	[NT]	[NT]	[NT]	[NT]	101	[NT]
Surrogate toluene-d8	%		Org-023	98	[NT]	[NT]	[NT]	[NT]	91	[NT]
Surrogate 4-BFB	%		Org-023	103	[NT]	[NT]	[NT]	[NT]	101	[NT]

Client Reference: SMC009.32 - Tweed Valley Hospital Project

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			23/02/2022	[NT]	[NT]	[NT]	[NT]	23/02/2022	[NT]
Date analysed	-			24/02/2022	[NT]	[NT]	[NT]	[NT]	24/02/2022	[NT]
TRH C <sub>10</sub> - C <sub>14</sub>	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	85	[NT]
TRH C <sub>15</sub> - C <sub>28</sub>	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	73	[NT]
TRH C <sub>29</sub> - C <sub>36</sub>	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	98	[NT]
TRH >C <sub>10</sub> - C <sub>16</sub>	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	85	[NT]
TRH >C <sub>16</sub> - C <sub>34</sub>	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	73	[NT]
TRH >C <sub>34</sub> - C <sub>40</sub>	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	98	[NT]
Surrogate o-Terphenyl	%		Org-020	72	[NT]	[NT]	[NT]	[NT]	88	[NT]

Client Reference: SMC009.32 - Tweed Valley Hospital Project

QUALITY CONTROL: OCPs in Water - Low Level					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			22/02/2022	[NT]	[NT]	[NT]	[NT]	22/02/2022	[NT]
Date analysed	-			23/02/2022	[NT]	[NT]	[NT]	[NT]	23/02/2022	[NT]
alpha-BHC	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	100	[NT]
HCB	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	114	[NT]
gamma-BHC	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	113	[NT]
delta-BHC	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	87	[NT]
Heptachlor Epoxide	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	108	[NT]
gamma-Chlordane	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-Chlordane	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	107	[NT]
Dieldrin	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	94	[NT]
Endrin	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	105	[NT]
Endosulfan II	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	108	[NT]
Endrin Aldehyde	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	µg/L	0.006	Org-022	<0.006	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	116	[NT]
Methoxychlor	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	102	[NT]	[NT]	[NT]	[NT]	116	[NT]

Client Reference: SMC009.32 - Tweed Valley Hospital Project

QUALITY CONTROL: OP in water LL ANZECCF/ADWG					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			22/02/2022	[NT]	[NT]	[NT]	[NT]	22/02/2022	[NT]
Date analysed	-			23/02/2022	[NT]	[NT]	[NT]	[NT]	23/02/2022	[NT]
Dichlorovos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	108	[NT]
Dimethoate	µg/L	0.15	Org-022/025	<0.15	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyriphos-methyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Methyl Parathion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	116	[NT]
Fenitrothion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	109	[NT]
Malathion	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	89	[NT]
Chlorpyriphos	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	98	[NT]
Parathion	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	105	[NT]
Bromophos ethyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	113	[NT]
Azinphos-methyl (Guthion)	µg/L	0.02	Org-022/025	<0.02	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	102	[NT]	[NT]	[NT]	[NT]	116	[NT]

Client Reference: SMC009.32 - Tweed Valley Hospital Project

QUALITY CONTROL: Miscellaneous Organics - water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			22/02/2022	[NT]	[NT]	[NT]	[NT]	22/02/2022	[NT]
Date analysed	-			24/02/2022	[NT]	[NT]	[NT]	[NT]	24/02/2022	[NT]
Toxaphene*	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Demeton-O	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Demeton-S	µg/L	5	Org-022/025	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d <sub>14</sub>	%		Org-022/025	79	[NT]	[NT]	[NT]	[NT]	76	[NT]

**Client Reference: SMC009.32 - Tweed Valley Hospital Project**

QUALITY CONTROL: HM in water - dissolved				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			22/02/2022	1	22/02/2022	22/02/2022		22/02/2022	[NT]
Date analysed	-			22/02/2022	1	22/02/2022	22/02/2022		22/02/2022	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	60	[NT]		104	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		100	[NT]
Boron-Dissolved	µg/L	20	Metals-022	<20	1	80	[NT]		97	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	[NT]		100	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		97	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		96	[NT]
Cobalt-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		95	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		103	[NT]
Manganese-Dissolved	µg/L	1	Metals-022	<1	1	200	[NT]		95	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	114	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		97	[NT]
Selenium-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		96	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	6	[NT]		99	[NT]
Silver-Dissolved	µg/L	0.05	Metals-022	<0.05	1	<0.05	[NT]		103	[NT]

QUALITY CONTROL: HM in water - dissolved				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	6	22/02/2022	22/02/2022		[NT]	[NT]
Date analysed	-			[NT]	6	22/02/2022	22/02/2022		[NT]	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	6	<10	<10	0	[NT]	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	[NT]	6	<1	<1	0	[NT]	[NT]
Boron-Dissolved	µg/L	20	Metals-022	[NT]	6	<20	<20	0	[NT]	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	[NT]	6	<0.1	<0.1	0	[NT]	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	[NT]	6	<1	<1	0	[NT]	[NT]
Copper-Dissolved	µg/L	1	Metals-022	[NT]	6	<1	<1	0	[NT]	[NT]
Cobalt-Dissolved	µg/L	1	Metals-022	[NT]	6	<1	<1	0	[NT]	[NT]
Lead-Dissolved	µg/L	1	Metals-022	[NT]	6	<1	<1	0	[NT]	[NT]
Manganese-Dissolved	µg/L	1	Metals-022	[NT]	6	<1	<1	0	[NT]	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	[NT]	6	<0.05	[NT]		[NT]	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	[NT]	6	<1	<1	0	[NT]	[NT]
Selenium-Dissolved	µg/L	1	Metals-022	[NT]	6	<1	<1	0	[NT]	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	[NT]	6	<1	<1	0	[NT]	[NT]
Silver-Dissolved	µg/L	0.05	Metals-022	[NT]	6	0.1	0.1	0	[NT]	[NT]



**Client Reference: SMC009.32 - Tweed Valley Hospital Project**

QUALITY CONTROL: Metals in Waters - Acid extractable					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	289162-4
Date prepared	-			24/02/2022	2	24/02/2022	24/02/2022		24/02/2022	24/02/2022
Date analysed	-			25/02/2022	2	25/02/2022	25/02/2022		25/02/2022	25/02/2022
Phosphorus - Total	mg/L	0.02	Metals-020	<0.02	2	0.05	0.06	18	100	122

**Client Reference: SMC009.32 - Tweed Valley Hospital Project**

QUALITY CONTROL: Cations in water Dissolved				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	289162-2
Date digested	-			21/02/2022	1	21/02/2022	21/02/2022		21/02/2022	21/02/2022
Date analysed	-			21/02/2022	1	21/02/2022	21/02/2022		21/02/2022	21/02/2022
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	44	44	0	107	84
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	3	3	0	88	87
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	32	32	0	90	85
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	11	11	0	96	94
Hardness	mgCaCO <sub>3</sub> /L	3		<3	1	120	120	0	[NT]	[NT]

Client Reference: SMC009.32 - Tweed Valley Hospital Project

QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	289162-2
Date prepared	-			18/02/2022	1	18/02/2022	18/02/2022		18/02/2022	18/02/2022
Date analysed	-			18/02/2022	1	18/02/2022	18/02/2022		18/02/2022	18/02/2022
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	8	8	0	86	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	1	390	360	8	88	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.060	0.055	9	106	97
Chlorophyll a	mg/m <sup>3</sup>	2	INORG-119	<2	1	3	[NT]		89	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	1	0.01	0.01	0	98	104
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.05	0.05	0	101	89
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.06	0.06	0	101	89
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	1	0.6	0.6	0	98	98

## Result Definitions

<b>NT</b>	Not tested
<b>NA</b>	Test not required
<b>INS</b>	Insufficient sample for this test
<b>PQL</b>	Practical Quantitation Limit
<b>&lt;</b>	Less than
<b>&gt;</b>	Greater than
<b>RPD</b>	Relative Percent Difference
<b>LCS</b>	Laboratory Control Sample
<b>NS</b>	Not specified
<b>NEPM</b>	National Environmental Protection Measure
<b>NR</b>	Not Reported

## Quality Control Definitions

<b>Blank</b>	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
<b>Duplicate</b>	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
<b>Matrix Spike</b>	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
<b>LCS (Laboratory Control Sample)</b>	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
<b>Surrogate Spike</b>	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

## Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

## Report Comments

TDS: Results may be slightly exaggerated due to possible presence of colloids (fine clay matter).

Miscellaneous Organics - water - The recovery of LCS and matrix spike cannot be reported due to the fact they are not in the list of analytes requested. However, the non-reported analytes within the LCS and matrix spike had acceptable recoveries.