

PROJECT
BASELINE WATER QUALITY
CRITERIA REPORT
KINGS FOREST STAGE 1
NEW SOUTH WALES

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SYNOPSIS This document constitutes the Baseline Water Quality Criteria Report for the Kings Forest Stage 1 Development located at Kings Forest, New South Wales. It describes the baseline surface and groundwater quality conditions at the site and establishes site-specific water quality criteria for the Kings Forest Development.

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SUMMARY

Project 28 Pty Ltd commissioned Gilbert & Sutherland Pty Ltd (G&S) to undertake a baseline water quality monitoring program for the purpose of establishing site-specific water quality criteria for the Kings Forest development site, located at Kings Forest, New South Wales (the 'Site'). This report summarises the results of the baseline water quality monitoring program conducted from May to October 2019 including:

- Eight rounds of groundwater monitoring at 20 groundwater bores, recording groundwater levels and in-situ readings at each location and recovering water samples from 10 of those bores to be sent for laboratory analysis of a comprehensive range of parameters.
- Eight rounds of surface water monitoring at 10 locations, recording in-situ readings at each location and recovering water samples for laboratory analysis of a comprehensive range of parameters.
- Production of a status report following each monitoring event.

This report provides a statistical analysis of the data collected during monitoring and provides site-specific water quality criteria to be adopted for the Kings Forest Development.

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DRAWING NO.	DESCRIPTION
12017_001	Baseline monitoring locations
12017_002	Round 1 (15 & 16 May 2019) groundwater elevation
12017_003	Round 2 (4 & 5 June 2019) groundwater elevation
12017_004	Round 3 (26 & 27 June 2019) groundwater elevation
12017_005	Round 4 (17 & 18 July 2019) groundwater elevation
12017_006	Round 5 (6 & 8 August 2019) groundwater elevation
12017_007	Round 6 (27 & 28 August 2019) groundwater elevation
12017_008	Round 7 (17 & 18 September 2019) groundwater elevation
12017_009	Round 8 (8 & 10 November 2019) groundwater elevation

GLOSSARY

TERM	MEANING
ANZECC Guidelines	Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2000
Australian Height Datum (AHD)	National reference for relative height measurement in Australia
BCD	Department of Planning, Industry and Environment – Biodiversity and Conservation Division
BOM	Bureau of Meteorology
DPIE	Department of Planning, Industry and Environment
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
Groundwater	Water contained in interconnected bores located below the water table in confined or unconfined aquifers
LOR	Limit of Reporting
mBGL	Metres below ground level
pH	The degree of acidity or alkalinity measured on a scale of 0 to 14 with 7 as neutral. From 0 to 7 is acidic; from 7 to 14 is alkaline
QA/QC	Quality Assurance/ Quality Control
SWL	Standing Water Level
WQO	Water Quality Objective

1 Introduction

Project 28 Pty Ltd commissioned Gilbert & Sutherland Pty Ltd (G&S) to undertake a baseline water quality monitoring program for the purpose of establishing site-specific water quality criteria for the Kings Forest development site located at Kings Forest, New South Wales (the 'Site'). This report summarises the results of the baseline water quality monitoring program conducted from May to October 2019, including:

- Eight rounds of groundwater monitoring at 20 groundwater bores, recording groundwater levels and in-situ readings at each location and recovering water samples from 10 of those bores to be sent for laboratory analysis of a comprehensive range of parameters.
- Eight rounds of surface water monitoring at 10 locations including in-situ readings and recovering water samples for laboratory analysis of a comprehensive range of parameters.
- Production of a status report following each monitoring event.

This report provides a statistical analysis of the data collected during monitoring and provides site-specific water quality criteria to be adopted for the Kings Forest Development.

1.1 Site description

The Kings Forest Development is located off Depot road, Kings Forest, New South Wales. The site location is shown on Drawing No. 12017_001 with the extent of works currently proposed at the site shown on Drawing 12066_001 (Drawings in Appendix 1).

The site is located within the catchment area of Cudgen Creek and is predominantly drained in an easterly direction by Blacks Creek, which traverses the site from west to east. Runoff from the site also enters Cudgen Creek under Old Bogangar Road to the north and via the lowlands adjacent to the southern boundary of the site.

Drainage from the north-eastern portion of the site flows into a coastal wetland as defined under State Environmental Planning Policy No. 14 – Coastal

Wetlands (i.e. a SEPP14 wetland), prior to discharging from the Kings Forest site.

The site has been selectively cleared. A large portion of the site was historically used as a pine plantation which has since been harvested and removed. There are a number of dams, dwellings and farm sheds on the subject land.

A review of aerial photographs of the site, confirmed by site inspection, indicates the site has been extensively disturbed by previous clearing, agricultural use, grazing and silvicultural activities.

1.2 Relevant approval conditions

Baseline water quality monitoring was conducted at the site in response to Condition 37 of Major Project Approval 08_0194. Condition 37 requires that sufficient monitoring be commenced at the site prior to issue of the first Construction Certificate in accordance with relevant Environmental Management Plans.

1.3 Relevant management plans

The extent of works currently proposed at the site is shown on Drawing 12066_001. Specifications for the baseline water quality monitoring program as relevant to the identified works areas was undertaken with reference to the following management plans and specifications;

- Groundwater Management Plan, Kings Forest, Stage 1 Project Application, Kings Forest, New South Wales, Revision 2, July 2012
- Overall Water Management Plan, Kings Forest, Stage 1 Project Application, Kings Forest, New South Wales, Revision 4, July 2012
- Position Paper – Environmental Risk in Respect of Groundwater, Surface Water and Hazards, Revision 2, October 2016
- Position Paper – Groundwater Conditions at the Proposed Service Station Site, Precinct 1, Kings Forest, NSW, Revision 2, October 2016 and
- Position Paper – Site Based Management Plan & Environmental Protection Plan, Kings Forest Service Station, Kings Forest, NSW, Revision 5, December 2016.
- JWA 2020 Wallum Sedge Frog Management Plan

2 Review of relevant water quality guidelines

2.1 ANZECC Guidelines

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)¹ (the 'ANZECC Guidelines') provide water quality objectives for natural and semi-natural water resources. The Guidelines are based on the principles of Ecologically Sustainable Development (ESD) and provide guidance for the protection of existing and future environmental values for relevant water bodies.

Whilst the ANZECC Guidelines focuses on the protection of surface water environments, they are also designed to be applied to groundwater. The guiding principle is that groundwater should be managed in such a way that when it comes to the surface (through seepages etc) it will not compromise the environmental values of surface waters with which it interacts.

The ANZECC Guidelines also provide methodologies for establishing site specific water quality criteria when appropriate data is available. For sites that have been subject to historical disturbance and where existing site water quality does not meet the ANZECC Guideline values, the document provides a methodology for determining site-specific water quality criteria. For reference purposes, the ANZECC Guideline water quality criteria for parameters relevant to the Kings Forest site are outlined in Table 2.1.1. Section 4 provides a comparison of these reference criteria with data collected from the Kings Forest site.

2.2 Tweed Shire Council Guidelines

The Tweed River Water Quality Objectives (herein referred to as the TSC water quality criteria)² were developed for NSW rivers and estuaries to provide guideline levels to assist water quality planning and management. The TSC water quality criteria comprise community-based environmental values

Table 2.1.1 ANZECC water quality criteria

Parameter	ANZECC Guideline water quality criteria
pH	6.5-8
Turbidity	<50 mg/L
Dissolved Oxygen	>6 mg/L
Chlorophyll-a	<5 µg/L
Total Nitrogen	<0.5 mg/L
Nitrite+Nitrate NOx	<0.02 mg/L
Nitrate	<0.7 mg/L
Total Phosphorus	<0.05 mg/L
Aluminium	<0.055 mg/L
Manganese	<1.9 mg/L
Arsenic	<0.024 mg/L
Cadmium	<0.0002 mg/L
Copper	<0.0014 mg/L
Lead	<0.0034 mg/L
Nickel	<0.011 mg/L
Zinc	<0.008 mg/L
Ammonium	<0.002 mg/L

and their associated national criteria drawn from the ANZECC Guidelines. For waterways affected by urban development, the TSC water quality criteria are aimed at the protection of aquatic ecosystems, maintaining visual amenity and supporting secondary and/or primary contact recreation.

The TSC water quality criteria selects relevant water quality indicators and related numerical criteria (default trigger values) from the ANZECC Guidelines 2000, relevant to assessing and monitoring the health of aquatic ecosystems. These criteria, as they originated from the ANZECC Guideline water quality criteria, are applicable to both surface water and groundwater.

In accordance with the Major Project Approval No. MP08_0194, Kings Forest Stage 1 (and associated Mods 1 to 8), the criteria identified in Table 2.2.1 (on the following page) are reproduced from the

¹ Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1, 2000
<<https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf>>

² <https://www.environment.nsw.gov.au/ieo/Tweed/report-02.htm>

TSC water quality criteria³ and represent the water quality criteria for surface waters for the Tweed River catchment.

Table 2.2.1 TSC water quality criteria for the Tweed River catchment

Parameter	Interim criteria
pH	Freshwater 6.5-8.5 Estuary 7-8.5
Dissolved oxygen	80 – 110% saturation
Turbidity	0.5-10 NTU
Chlorophyll-a	<4 µg/L
Total Nitrogen	<0.3 mg/L
Total Phosphorus	<0.03 mg/L

Section 4 provides a comparison of the Tweed River catchment water quality criteria with the data collected from the Kings Forest site.

2.3 Site-specific water quality criteria

Surface and groundwater quality monitoring has been monitored sporadically at the site since February 2008. Preliminary analysis of this data indicated that in many instances the existing site water quality does not meet the ANZECC or TSC water quality criteria and (in the instance of pH) the site contains ecosystems that are dependent on maintaining these existing conditions.⁴

The Kings Forest development has the potential to impact upon populations of Wallum Sedge Frog (WSF) occurring both on the site and in adjacent habitat if appropriate management strategies are not pursued.

WSF depend upon specific habitat requirements for breeding, particularly with respect to water quality, as identified in the Wallum Sedge Frog Management Plan (WSFMP, JWA, October 2018, Rev 14).

Altered water quality during the construction and operational phases of the development can lead to the degradation of the WSF habitat. Specifically, the WSF is dependent on freestanding waterbodies, with acidic conditions (i.e. a pH of less than 7). In general, the acidity of waterbodies within WSF communities ranges between 3.6 and 6.0 (Meyer *et al.* 2006).⁵ However, the WSFMP (JWA, 2018, Rev 14) proposes the performance target of a stable pH between 4.0 and 5.5 for the Site in order to maintain the preferred conditions for the WSF community.

In circumstances where existing site conditions do not meet the criteria set by overarching Guidelines, it is appropriate to undertake a baseline water quality monitoring program and establish site-specific water quality criteria that will ensure the existing conditions at the site are maintained for the protection of ecosystems both on and downstream of the site. The following section provides the methodology for the baseline water quality monitoring program and the data analysis undertaken to establish site specific water quality criteria.

³ <https://www.environment.nsw.gov.au/ieo/Tweed/report-02.htm>

⁴ Wallum Sedge Frog Management Plan, Kings Forest, prepared for Project 28 Pty Ltd, October 2018, Revision 14 –

requirement to maintain certain pH levels for ecosystem protection (target criteria listed at page 83, Table 13: WSF Monitoring Program, water quality monitoring)

⁵ Section 7.2.1 (ii), pg 30, Wallum Sedge Frog Management Plan, Oct 2018, JWA Pty Ltd.

3 Methodology

The baseline water quality monitoring program comprised of eight rounds of surface water and groundwater monitoring between May and October 2019 on the dates listed below:

Table 3.1.1 Dates of monitoring events

Monitoring round	Date
1	15 & 16 May 2019
2	4 & 5 June 2019
3	26 & 27 June 2019
4	17 & 18 July 2019
5	6 & 8 August 2019
6	27 & 28 August 2019
7	17 & 18 September 2019
8	8 & 10 October 2019

Monitoring was conducted with reference to the following G&S plans and specifications:

- Groundwater Management Plan, Kings Forest, Stage 1 Project Application, Kings Forest, New South Wales, Revision 2, July 2012
- Overall Water Management Plan, Kings Forest, Stage 1 Project Application, Kings Forest, New South Wales, Revision 4, July 2012
- Position Paper – Environmental Risk in Respect of Groundwater, Surface Water and Hazards, Revision 2, October 2016
- Position Paper – Groundwater Conditions at the Proposed Service Station Site, Precinct 1, Kings Forest, NSW, Revision 2, October 2016 and
- Position Paper – Site Based Management Plan & Environmental Protection Plan, Kings Forest Service Station, Kings Forest, NSW, Revision 5, December 2016.

To better understand the on-site water quality, consideration was given to rainfall recorded prior to each monitoring event. Rainfall is recorded by Australian Bureau of Meteorology (BOM) at the nearest bureau station at Kingscliff (Woram Place) NSW (Station number 058137) located 3.8 km from the site. Table 3.1.2 provides the monthly rainfall totals relevant to the monitoring period. Table 3.1.3 provides the rainfall (in mm)

recorded seven days prior to each monitoring event.

Table 3.1.2 Monthly rainfall totals relevant to the monitoring program (recorded at Kingscliff (Woram Place NSW Station number 058137))

Month (2019)	Rainfall total (mm)
April	112.3
May	75.2
June	92.54
July	33.42
August	25.4
September	7.5
October	31.5

Table 3.1.3 Rainfall (mm) prior to each monitoring event (recorded at Kingscliff (Woram Place NSW Station number 058137))

Monitoring round	Date	Rainfall (mm)
1	10/05/2019	0
	11/05/2019	0.4
	12/05/2019	0
	13/05/2019	4.0
	14/05/2019	7.4
	15/05/2019	0.1
	16/05/2019	4.0
2	30/05/2019	0
	31/05/2019	0
	1/06/2019	-*
	2/06/2019	5*
	3/06/2019	0.2
	4/06/2019	0
	5/06/2019	0
3	21/05/2019	1.0
	22/05/2019	0
	23/06/2019	0
	24/06/2019	0
	25/06/2019	28.0
	26/06/2019	26.8
	27/06/2019	12.6
4	12/07/2019	0
	13/07/2019	0

	14/07/2019	0
	15/07/2019	0
	16/07/2019	0
	17/07/2019	0
	18/07/2019	0
5	2/07/2019	1.0
	3/07/2019	2.8
	4/07/2019	0
	5/07/2019	0
	6/07/2019	0
	7/07/2019	0
	8/07/2019	0
6	22/08/2019	0
	23/08/2019	1.6
	24/08/2019	0
	25/08/2019	0
	26/08/2019	0
	27/08/2019	9.6
	28/08/2019	0
7	12/09/2019	0
	13/09/2019	0
	14/09/2019	0
	15/09/2019	0
	16/09/2019	0
	17/09/2019	0
	18/09/2019	4.2
8	04/10/2019	0
	05/10/2019	0
	06/10/2019	0
	07/10/2019	0
	08/10/2019	0
	09/10/2019	0
	10/10/2019	1.4

Note* rainfall data collected from 01-02/06/19, total recorded in 02/06/19

It can be seen from the Tables above that the monitoring period has successfully captured a range of rainfall conditions at the site including monitoring during a large rainfall and runoff event (June 2019) and also monitoring following low rainfall conditions (September 2019).

All surface water and groundwater samples were tested *in situ* for pH, dissolved oxygen (DO), temperature, turbidity, electrical conductivity (EC) and oxidation-reduction potential (ORP) using a Yeo-Kal multi-parameter water quality analyser.

In addition to *in situ* tests, samples were collected in appropriate laboratory-prepared sample containers and forwarded to ALS Laboratory for analysis of the following parameters:

- total nitrogen (TN), soluble nitrogen, nitrogen oxide (NO_x), total kjeldahl nitrogen (TKN), nitrite (NO₂) & nitrate (NO₃) (mg L⁻¹);
- total phosphorus (TP) & soluble phosphorous (mg L⁻¹);
- calcium (Ca);
- magnesium (Mg);
- sodium (Na);
- potassium bicarbonate (K/HCO₃);
- bicarbonate (HCO₃);
- carbonate (CO₃);
- total & dissolved iron (Fe);
- total & dissolved aluminium (Al);
- dissolved manganese (Mn);
- chloride (Cl);
- sulfate (SO₄);
- ammonium (NH₄);
- colour;
- total acidity (titratable);
- total alkalinity;
- arsenic (As);
- cadmium (Cd);
- copper (Cu);
- lead (Pb);
- nickel (Ni);
- zinc (Zn);and
- faecal coliforms.

3.1 Monitoring locations

The 20 groundwater bores and 10 surface water monitoring locations are depicted on Drawing 12017_001 (Appendix 1). Of the 10 surface water locations, three of them are located off site in the

receiving environment of Cudgen Creek (one upstream location and two downstream locations). The remaining seven are located in various drainage features around the development site.

Table 3.1.1 Groundwater bore depth

Bore ID	Depth (NSL) m
BH1	5.2
BH2	5.3
BH3	5.5
BH4	1.8
BH5	5.4
GW091	4.35
GW092	3
GW093	3
GW094	3
GW095	3
GW097	2.2
GW098	3
GW099	3
GW0910	3
GW0911	2.5
GW0912	3
GW0913	3
TSCGW10	Unknown
TSCGW16	Unknown

3.2 Surface water sampling

Surface water samples were collected from each monitoring location using an extendable bailer. Care was taken to minimise disturbance to sediment and/or vegetation within the waterbody during sampling at each location.

3.3 Groundwater sampling

Groundwater was extracted from each piezometer via a Geotech Geopump™ Series I 0-350 rpm peristaltic pump and disposable low-density polyethylene (LDPE) tubing. In accordance with G&S' groundwater sampling procedure,

groundwater was purged from the subject borehole until stabilisation was observed in the relevant in-situ parameters. Groundwater samples for laboratory analysis were collected after purging and stabilisation.

3.4 Determining baseline water quality criteria

A 'baseline' is typically determined from a period of monitoring prior to a development or activity that is representative of the environment prior to an impact occurring. Various management plans⁶ for the Kings Forest development require the establishment of a 'baseline' condition for the groundwater and surface water environment at the Site. This baseline condition can then be used as a benchmark to assess the impact of the development on the receiving environment, assess emerging trends and determine the need for remedial actions should the potential for impacts be identified.

The results obtained from the baseline monitoring program described herein were used to establish appropriate site-specific water quality criteria to be adopted for future monitoring within the Kings Forest Stage 1 development.

Analysis of the data set was undertaken with reference to the ANZECC Guideline proposed methodology for deriving site-specific guideline values for physical and chemical stressors and toxicants. The ANZECC Guidelines recommend that site-specific water quality criteria for physical and chemical stressors be derived and used instead of regional default guideline values (DGVs). The general approach recommended for deriving guideline values is to;

1. Determine the existing ecosystem condition and required level of protection.
2. Define the baseline or 'reference' condition for the site ideally based on appropriate site-specific data.
3. Depending on existing ecosystem condition and required level of protection, define trigger values choosing either a conservative percentile value (e.g. 80th percentile value) to

⁶ The Groundwater Management Plan (GMP), the Stormwater Management Plan (SWMP) and the Overall Water

Management Plan (OWMP), and any subsequent updated versions of those plans.

improve water quality, or a less conservative percentile (e.g. 90th percentile) to maintain water quality.

4 Baseline water quality conditions

The following section contains a description of water quality recorded at the site during the baseline monitoring program and provides a comparison of results with the TSC and ANZECC Guideline water quality criteria, where available.

4.1 Surface water baseline condition

Surface waters at the site exhibit varying characteristics and have been grouped in three broad categories as follows;

- Fresh – On-site agricultural drains
- Brackish – Blacks Creek (tributary to Cudgen Creek)
- Saline – Cudgen Creek (downstream and upstream of proposed development areas).

The surface water quality for each category is described in further detail in this section, with a tabular summary of the surface water monitoring data included in Appendix 2.

4.1.1 In-situ parameters in surface water

The in-situ data obtained from surface water locations was analysed within the categories listed in Section 4.1 above. Table 4.1.1.1 identifies the TSC and ANZECC Guidelines and compares the in-situ data range collected during the baseline monitoring.

Table 4.1.1.1 In-situ surface water results comparison with TSC and ANZECC Guidelines

Type	Site data range	TSC guideline	ANZECC Guideline
pH			
Fresh	4.8-7.2	6.5-8.5	6.5-8
Brackish	4.8-6.5	6.5-8.5	6.5-8
Saline	5.1-6.6	7-8.5	6.5-8
Turbidity (NTU)			
Fresh	5.1-126.4	0.5-10	<50
Brackish	4-79.5	0.5-10	<50
Saline	0-18	0.5-10	<50

Table 4.1.1.1 In-situ surface water results comparison with TSC and ANZECC Guidelines

Type	Site data range	TSC guideline	ANZECC Guideline
Dissolved Oxygen (DO)			
Fresh	22.77-107.74% 2.3-10.2	80-110%	>6 mg/L
Brackish	41.2-97.52% 4.1-8.6	80-110%	>6 mg/L
Saline	66.48-96.07% 6.4-9.2	80-110%	>6 mg/L
Electrical conductivity (EC) (µs/cm)			
Fresh	105-545	NG*	NG*
Brackish	145-6,945	NG*	NG*
Saline	4,916-97,400	NG*	NG*

NG*: No guidelines provided

Table 4.1.1.1 shows that in most instances the site data range is below the ANZECC Guidelines but falls primarily within the TSC range for the majority of the in-situ parameters. In summary:

- pH values were generally more acidic than the TSC and ANZECC Guidelines.
- Turbidity values were generally higher than the TSC and ANZECC Guidelines.
- DO was highly variable.
- EC was highly variable across the site.

4.1.2 Nutrients in surface water

Nutrients were relatively consistent throughout the monitoring period and within the surface water categories identified in Section 4.1. Table 4.1.2.1 identifies the TSC and ANZECC Guidelines for total nitrogen (TN) and total phosphorus (TP) and compares the guideline water quality criteria against the range identified for TN and TP in fresh, brackish and saline surface waters at the site.

Table 4.1.2.1 Nutrient surface water results comparison with TSC and ANZECC Guidelines

Type	Data range	TSC guideline	ANZECC Guideline
Total Nitrogen (TN) (mg/L)			
Fresh	0.6-3.3	<0.3	<0.5
Brackish	0.7-1.1	<0.3	<0.5
Saline	0.25-1.1	<0.3	<0.5
Total Phosphorus (TP) (mg/L)			
Fresh	0.01-0.36	<0.03	<0.06
Brackish	0.005-0.04	<0.03	<0.06
Saline	0.005-0.13	<0.03	<0.06

It can be seen from the table that in most instances the site data range for TN exceeded the ANZECC and TSC Guideline. For TP, the majority of results were below the TSC and ANZECC Guideline maximums although exceedances were recorded.

4.1.3 Metals in surface water

Metals results were analysed within the surface water categories identified in Section 4.1. The TSC Guidelines provide criteria for Al and Fe and defer to the ANZECC Guidelines criteria for other metals. Table 4.1.3.1 identifies the available guidelines for iron (Fe) and aluminium (Al) which are the main metals of interest for this site. Where guidelines are available a discussion has been included for arsenic (As), cadmium (Cd), Lead (Pb), nickel (Ni), zinc (Zn) and copper (Cu).

Table 4.1.3.1 Metal surface water results compared with TSC and ANZECC Guidelines water quality criteria

Type	Data range	TSC guideline	ANZECC Guideline
Aluminium (Al) (mg/L)			
Fresh	0.13-1.23	NG*	<0.055
Brackish	0.15-0.8	NG*	<0.055
Saline	0.03-0.7	NG*	<0.055
Iron (Fe) (mg/L)			
Fresh	1.44-12.4	NG*	NG*

Table 4.1.3.1 Metal surface water results compared with TSC and ANZECC Guidelines water quality criteria

Type	Data range	TSC guideline	ANZECC Guideline
Brackish	1.91-5.03	NG*	NG*
Saline	0.09-0.83	NG*	NG*

NG*: No guidelines provided

In summary;

- No guidelines values for metals are provided in the TSC water quality criteria for the protection of aquatic ecosystems.
- Al values exceeded the ANZECC Guideline in most instances.
- Whilst not itemized in Table 4.1.3.1 the site data for arsenic, cadmium, arsenic, cadmium, lead and nickel were in most instances below the laboratory's limit of reporting (<LOR) or below the ANZECC Guideline maximum.
- The ANZECC Guideline for copper is 0.0014 mg/L. The majority of the results obtained from the site were less than the LOR or compliant with the guideline. However, for fresh and saline waters, the maximum range for the dataset exceeded the ANZECC Guideline.
- The ANZECC Guideline criteria for zinc is 0.008 mg/L. The maximum range for fresh, brackish and saline surface waters exceeded the ANZECC Guideline.

4.2 Groundwater baseline condition

Water quality monitoring was completed at 20 groundwater monitoring locations (Drawing 12017_001). In-situ readings were retrieved from all 20 monitoring locations, and laboratory analysis was conducted at 10 of the monitoring locations.

Groundwater was characterised by location, noting difference in geology and landform. This resulted in two categories of groundwater as follows:

- Precinct 1
- Precinct 5

The groundwater quality for each category is described in further detail in this section, with a tabular summary of the groundwater monitoring data included in Appendix 2.

4.2.1 Insitu parameters in groundwater

The insitu results obtained from groundwater monitoring at the site were analysed within the categories listed in Section 4.2 above.

Table 4.2.1.1 Groundwater insitu results comparison with TSC and ANZECC Guidelines

Type	Data range	TSC guideline	ANZECC Guideline
pH			
Precinct 1	3.04-5.45	6.5-8.5	6.5-8
Precinct 5	2.27-6.63	6.5-8.5	6.5-8
Electrical conductivity (EC) ($\mu\text{S}/\text{cm}$)			
Precinct 1	30.7-853	NG*	NG*
Precinct 5	0.4-632	NG*	NG*

NG*: No guidelines provided

The pH range in Precinct 1 and in Precinct 5 was below the TSC and the ANZECC Guidelines. The TSC and ANZECC Guidelines do not provide water quality criteria for EC.

4.2.2 Nutrients in groundwater

Nutrients were relatively consistent throughout the monitoring period and within the groundwater categories identified in Section 4.2. Results for total nitrogen and total phosphorus are discussed below as primary nutrients and where applicable, compared to the water quality criteria recommended in the ANZECC Guidelines and the TSC water quality criteria. Samples from two groundwater bores in Precinct 1 and eight groundwater bores in Precinct 5 were submitted for laboratory analysis.

Table 4.2.2.1 Groundwater nutrient results comparison with TSC and ANZECC Guidelines

Type	Data range	TSC guideline	ANZECC Guideline
Total Nitrogen (TN) (mg/L)			
Precinct 1	0.6-3.2	<0.3	<0.5
Precinct 5	0.3-2.8	<0.3	<0.5
Total Phosphorus (TP) (mg/L)			

Table 4.2.2.1 Groundwater nutrient results comparison with TSC and ANZECC Guidelines

Type	Data range	TSC guideline	ANZECC Guideline
Precinct 1	0.01-0.5	<0.03	<0.06
Precinct 5	0.005-0.13	<0.03	<0.06

The majority of TN and TP results exceeded both the TSC and ANZECC Guideline values indicating that the existing conditions at the site are outside of the range identified within the Guidelines.

4.2.3 Metals in groundwater

Metals results were analysed within the categories identified in Section 4.2. The TSC Guidelines provide criteria for Al and Fe and defer to the ANZECC Guideline criteria for other metals. Table 4.2.3.1 identifies the available guidelines for iron (Fe) and aluminium (Al) which are the main metals of interest for this site. Where guidelines are available a discussion has been included for arsenic (As), cadmium (Cd), Lead (Pb), nickel (Ni), zinc (Zn) and copper (Cu).

Table 4.2.3.1 Groundwater metals results compared with TSC and ANZECC Guidelines

Type	Data range	TSC guideline	ANZECC Guideline
Aluminium (Al) (mg/L)			
Precinct 1	0.36-2.18	NG*	<0.055
Precinct 5	0.06-0.93	NG*	<0.055
Iron (Fe) (mg/L)			
Precinct 1	0.11-2.52	NG*	NG*
Precinct 5	0.025-1.58	NG*	NG*

NG*: No guidelines provided

In summary, there were no guidelines values for metals under the TSC water quality criteria for the protection of aquatic ecosystems.

For Precinct 1, the maximum results range for Al in groundwater exceeded the ANZECC Guidelines.

The Fe results for Precinct 1 were primarily within the TSC guidelines but exceeded the ANZECC

Guidelines. The Fe results for groundwater in Precinct 5 were compliant with the TSC guideline.

The ANZECC Guidelines provide recommendations for most metals however, the results for arsenic, cadmium, lead and nickel were either below the laboratory limit of reporting (<LOR) or the range was primarily within the recommended criteria.

The ANZECC Guideline for copper is 0.0014 mg/L. The maximum range for both Precinct 1 and 5 exceeded the ANZECC Guideline.

The ANZECC Guideline for Zinc is 0.008 mg/L. The range for both Precinct 1 and 5 exceeded the Guideline value.

4.2.4 Piper and Durov diagrams

Piper and Durov diagrams were created using the groundwater data gathered through the monitoring period in order to categorise the groundwater at the site. The diagrams are included in Appendix 7.

The Piper diagram shows a close cation-anion grouping with the majority of the monitoring locations falling within a sodium-chloride water type, with the exception of GW091, which tends towards a calcium-chloride water type. GW091 is the most southern monitoring location for this monitoring period and located in sandy soil.

The Durov diagram is used to graphically illustrate the cation and anion grouping, as well as display the pH and total dissolved solids (TDS). Similar to the Piper diagram, the Durov diagram suggests similar ion balances. TDS results are grouped together, with the exception of BH4 showing an outlying value.

4.3 Groundwater levels

On each monitoring occasion the groundwater elevation in metres Australian Height Datum (mAHD) was recorded. The following table provides the range of groundwater elevation in each bore.

Drawings 12017_002 to 009, included within Appendix 1, show the groundwater contours over the monitoring period and depict any changes in flow direction.

Throughout the monitoring period groundwater flowed in a south westerly direction within Precinct

5. For Precinct 1 groundwater flow was in an easterly direction towards Cudgen Creek.

Appendix 4 provides data on the groundwater elevation in mAHD for the site.

Table 4.3.1 Groundwater elevation

Bore ID	Min elevation (mAHD)	Max elevation (mAHD)
BH1	4.62	5.33
BH2	4.50	5.32
BH3	4.04	4.58
BH4	4.80	5.58
BH5	4.67	5.33
GW091	1.83	3.28
GW092	3.53	4.77
GW093	3.83	4.62
GW094	4.34	5.14
GW095	1.68	2.52
GW097	2.55	3.37
GW098	3.47	4.02
GW099	4.48	5.32
GW0910	4.44	5.35
GW0911	4.54	5.49
GW0912	4.71	5.65
GW0913	4.79	5.93
TSCGW10	3.67	4.49
TSCGW16	3.60	4.39

4.4 Impact of rainfall

The sampling period from May to October 2019 captured a range of rainfall conditions from a low of 7.5mm recorded for the month of September 2019 up to 112.3mm in April 2019 (just prior to the commencement of monitoring).

The following table summarises the relationship between the key parameters monitored at the site and large rainfall events recorded during the monitoring program, most notably the 92.54mm recorded in June 2019.

The relationship between rainfall and water quality for a selection of these parameters is provided in Appendix 6.

Table 4.4.1 Impact of rainfall on key water quality parameters

Parameter	SW response to rainfall	GW response to rainfall
Level	NA	Gradual increase in groundwater level over the course of monitoring program. No notable response in levels following rainfall events.
pH	No notable response to rainfall.	No clear relationship between rainfall and pH.
EC	No clear relationship. Influence of rain masked by tidal nature of most locations	No clear relationship between rainfall and pH.
DO	No clear relationship. Influence of rain masked by tidal nature of most locations.	NA
Turbidity	No notable response to rainfall.	NA
Cations	No clear relationship. Influence of rain masked by tidal nature of most locations.	No notable response following rainfall.
Anions	No clear relationship. Influence of rain masked by tidal nature of most locations.	No notable response following rainfall.
Nitrogen suite	No clear relationship between rainfall and TN. Slight increase in soluble N following rainfall. Increase in Nitrate following rain. No clear relationship between rainfall and Ammonium.	TN and soluble N decreases immediately following rain, then increases before returning to typical levels. No clear relationship between rainfall and Ammonium
Phosphorus suite	No clear response in TP following rain. Slight increase in soluble P following rainfall.	No clear response in TP following rain. Slight increase in soluble P following rainfall
Iron	Decreases immediately following rainfall events but quickly returns to pre-rainfall levels.	No notable response following rainfall.
Aluminium	Increases following rainfall events but quickly returns to pre-rainfall levels.	No notable response following rainfall.
Arsenic, Cadmium	No response following rainfall.	No notable response following.
Total acidity	No notable response to rainfall. Influence likely to be masked by tidal nature of most SW locations.	Increases during rainfall events. Decreases following rain then returns to typical levels.
Faecal coliforms	Increase in coliforms during rainfall events. Quickly returns to pre-rainfall levels.	Increase in coliforms during rainfall events. Quickly returns to pre-rainfall levels.

5 Site-specific water quality criteria

The analysis provided in the previous section demonstrated that the overarching water quality criteria provided in the TSC and ANZECC Guidelines cannot be directly applied to the Kings Forest Development. In many cases, the baseline conditions at the site include concentrations of parameters in excess of the ANZECC Guideline and the Tweed Water Quality values. In this instance, the ANZECC Guidelines recommend the establishment of site-specific water quality criteria determined in accordance with the methodology described in Section 2 above.

Robust, statistically defensible⁷ baseline conditions can be derived from using the current data set. Site-specific water quality criteria, derived from the 80th percentile value, are appropriate water quality criteria for future monitoring. By using site specific criteria, any potential impacts will be identified in a timely manner, minimizing the chance for harm to groundwater or the environment.

5.1 Required level of protection

The ANZECC Guidelines recognise three categories of ecosystem condition, with a level of protection ascribed to each:

1. High conservation/ecological value systems
2. Slightly to moderately disturbed systems
3. Highly disturbed systems.

Based on the guidance provided in Section 3.1.1 of the ANZECC Guidelines, the ecosystem condition that best describes the majority of the site is *slightly to moderately disturbed systems*. The condition of areas of the site that have not been subject to disturbance and the ultimate receiving environment of Cudgen Creek would be best described as 'slightly to moderately disturbed systems'. This is defined by the Guideline as:

'Ecosystems in which aquatic biological diversity may have been adversely affected to

a relatively small but measurable degree by human activity. The biological communities remain in a healthy condition and ecosystem integrity is largely retained. Typically, freshwater systems would have slightly to moderately cleared catchments and/or reasonably intact riparian vegetation; marine systems would largely intact habitats and associated biological communities. Slightly-moderately disturbed systems could include rural streams receiving runoff from land disturbed to carrying degrees by grazing or pastoralism, or marine ecosystems lying immediately adjacent to metropolitan areas.'

Large areas of the site have been subject to historic disturbance including previous clearing, agricultural use, grazing and silvicultural activities. These areas are best described as '*highly disturbed systems*' which are described by the Guideline as;

'...measurably degraded ecosystems of lower ecological value. Examples of highly disturbed systems would be some shipping ports and sections of harbours serving coastal cities, urban streams receiving road and stormwater runoff, or rural streams receiving runoff from intensive horticulture.'

For this type of ecosystem, the ANZECC Guidelines recommend that site-specific water quality criteria for physical and chemical stressors be derived and used instead of regional default guideline values (DGVs). The general approach recommended for deriving guideline values is to:

1. Determine the existing ecosystem condition and required level of protection.
2. Define the baseline or 'reference' condition for the site ideally based on appropriate site-specific data.
3. Depending on existing ecosystem condition and required level of protection, define trigger values choosing either a conservative percentile value (e.g. 80th percentile value) to improve water quality, or a less conservative percentile (e.g. 90th percentile) to maintain water quality.

In this instance the more conservative 80th percentile value has been adopted to determine

⁷ This requires at least 8 rounds of data incorporating seasonal variation in accordance with NWQMS (2000)

Australian Guidelines for Water Quality Monitoring and Reporting.

the site-specific criteria. The ANZECC Guidelines recommend that water quality criteria for slightly to moderately disturbed systems also be applied to highly disturbed ecosystems where possible.⁸

5.2 Surface water quality criteria

Site specific surface water quality criteria have been calculated upon completion of the baseline monitoring program. Table 5.2.1 identifies the upper water quality criteria limits for surface water for a range of indicators.

Table 5.2.1 Surface water quality criteria

Parameter	Site specific surface water criteria
<i>Saline (SW1, SW2, SW6, and SW9)</i>	
pH	5.66-6.3
Electrical Conductivity	<38,700 $\mu\text{s/cm}$
Dissolved Oxygen	>7.10 mg/L
Turbidity	<3.1 mg/L
Total Nitrogen	<0.5 mg/L
Total Phosphorus	<0.03 mg/L
Iron (total)	<0.41 mg/L
Aluminium (total)	<0.22 mg/L
Chlorophyll-a	<6 $\mu\text{g/L}$
Litter and gross pollutants	No man-made material <5 mm in any dimension
Oil and/or grease	No visible film, no detectable odour
<i>Brackish (SW5)</i>	
pH	5.34-6.14
Electrical Conductivity	<4,008.6 $\mu\text{s/cm}$
Dissolved Oxygen	>4.87 mg/L
Turbidity	<23.76 mg/L
Total Nitrogen	<1 mg/L
Total Phosphorus	<0.04 mg/L
Iron (total)	<4.40 mg/L
Aluminium (total)	<0.36 mg/L
Chlorophyll-a	<6 $\mu\text{g/L}$
Litter and gross pollutants	No man-made material <5 mm in any dimension

Table 5.2.1 Surface water quality criteria

Parameter	Site specific surface water criteria
Oil and/or grease	No visible film, no detectable odour
<i>Fresh (SW3, SW4, SW7, SW8 and SW10)</i>	
pH	5.23-6.66
Electrical Conductivity	<230.4 $\mu\text{s/cm}$
Dissolved Oxygen	>2.91 mg/L
Turbidity	<32.54 mg/L
Total Nitrogen	<1.46 mg/L
Total Phosphorus	<0.14 mg/L
Iron (total)	<6.57 mg/L
Aluminium (total)	<0.68 mg/L
Chlorophyll-a	<6 $\mu\text{g/L}$
Litter and gross pollutants	No man-made material <5 mm in any dimension
Oil and/or grease	No visible film, no detectable odour

The water quality characteristics of the monitoring locations vary across the site. It has been identified that there are three main overarching characteristics; saline, brackish and fresh water. The saline monitoring locations are located in the Cudgen Creek and include monitoring locations SW1, SW2, SW6, and SW9. The monitoring location classified as brackish is SW5, located in Blacks Creek. This salinity levels recorded at SW5 categorise the location as fresh to brackish water, and therefore the location is segregated from the others and site-specific water quality criteria are applied. The remainder of the surface water monitoring locations (SW3, SW4, SW7, SW8 and SW10) are classified as fresh water and site-specific water quality criteria are applied.

It is noted that the WSFMP (JWA, 2018, Rev 14) recommends a stable pH of between 4.0 to 5.5 for the protection of WSF communities. When interpreting pH results against the site-specific water quality criteria, consideration must also be made to the preferred water quality conditions of WSF communities.

⁸ Page 3.1-22 ANZECC Guidelines 2000.

5.3 Groundwater quality criteria

Site specific groundwater quality criteria have been calculated upon completion of the baseline monitoring program. Table 5.3.1 identifies the upper criteria limits for surface water for a range of indicators.

Table 5.3.1 Groundwater quality criteria

Parameter	Site specific groundwater criteria
<i>Precinct 1</i>	
pH	3.5-4.33
Electrical Conductivity	<339.4 μ S/cm
Total Nitrogen	<3 mg/L
Total Phosphorus	<0.34 mg/L
Iron (total)	<1.02 mg/L
Aluminium (total)	<1.89 mg/L
<i>Precinct 5</i>	
pH	3.59-4.47
Electrical Conductivity	<131 μ S/cm
Total Nitrogen	<1.3 mg/L
Total Phosphorus	<0.05 mg/L
Iron (total)	<0.45 mg/L
Aluminium (total)	<0.52 mg/L

The groundwater monitoring bores included in Precinct 1 are BH1, BH2, BH3, BH4 and BH5. These monitoring bores are within an area of different topography and geology from the rest of the development site and have different results for the analysed parameters. It is therefore been deemed appropriate to apply site specific groundwater quality criteria for these monitoring bores in Precinct 1.

The groundwater monitoring bores in Precinct 5 (TSCGW16, TSCGW10, GW091, GW092, GW093, GW094, GW095, GW096, GW097, GW098, GW099, GW0910, GW0911, GW0912, GW0913) showed a number of similarities in the monitoring data. Therefore, site-specific groundwater quality criteria for Precinct 5 are applied.

5.4 Interpreting results against water quality criteria

When interpreting compliance with the adopted water quality criteria, it is essential to acknowledge that the values of water quality indicators vary naturally and that not all of this variation is ecologically important⁹.

It is important to note that when using the 80th percentiles to establish water quality criteria the probability of a single observation exceeding the 80th percentile is 20%. Thus, the probability of a Type 1 error (or the risk of triggering a false alarm) for this method of setting water quality criteria is 20%.

It is recommended that the recording of a single result that exceeds the criteria should not automatically be deemed as a 'non-compliance'. Rather, the water quality criteria are designed to be used as a tool to prompt additional investigations or observations of the parameter in question to ascertain whether an adverse trend may be emerging and if so, allow early detection of the cause of the trend. The findings of such site investigations should be used to determine whether a non-compliance has occurred.

⁹ Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1, 2000, Section 3.1, Page 21.

6 Conclusions and recommendations

This report summarises the results of the baseline water quality monitoring program conducted at the Kings Forest development site from May to October 2019 and establishes site specific water quality criteria to be adopted for the site throughout its development. Adoption of these site-specific criteria will allow for development impacts to be detected and, in conjunction with the site's environmental management plans, help to protect ecosystems both on and downstream of the site.

It is recommended that:

- the following suite of analytes be monitored throughout development of the Kings Forest site in accordance with the specifications of the relevant management plans.
 - In-situ for pH, dissolved oxygen (DO), temperature, turbidity, electrical conductivity (EC) and oxidation-reduction potential (ORP)
 - total nitrogen (TN), soluble nitrogen, nitrogen oxide (NO_x), total kjeldahl nitrogen (TKN), nitrite (NO₂) & nitrate (NO₃) (mg L⁻¹);
 - total phosphorus (TP) & soluble phosphorous (mg L⁻¹);
 - calcium (Ca);
 - magnesium (Mg);
 - sodium (Na);
 - potassium bicarbonate (K/HCO₃);
 - bicarbonate (HCO₃);
 - carbonate (CO₃);
 - total & dissolved iron (Fe);
 - total & dissolved aluminium (Al);
 - dissolved manganese (Mn);
 - chloride (Cl);
 - sulfate (SO₄);
 - ammonium (NH₄);
 - colour;
 - total acidity (titratable);
 - total alkalinity;
 - arsenic (As);
 - cadmium (Cd);
 - copper (Cu);
 - lead (Pb);
 - nickel (Ni);
 - zinc (Zn); and
 - faecal coliforms.
- The site-specific criteria detailed in this report be adopted for the Kings Forest development.
- The relevant site management plans be updated to include these criteria.
- Monitoring at the site should be conducted in accordance with the relevant management plans.
- Results of monitoring should be compared to the site-specific criteria following each monitoring round.
- Results of monitoring should also be compared to the Tweed Catchment Water Quality Objectives¹⁰ to ensure compliance with the Project Approval (Condition 21[5]).
- Consideration be given to the preferred water quality conditions of WSF communities when interpreting pH results against the site-specific water quality criteria, noting that the WSFMP (JWA, 2018, Rev 14) recommends a stable pH of between 4.0 to 5.5 for the protection of WSF communities.
- When interpreting compliance with the adopted water quality criteria, it is essential to acknowledge that the values of water quality indicators vary naturally and that not all of this variation is ecologically important¹¹.
- It is important to note that when using the 80th percentiles to establish water quality criteria the probability of a single observation exceeding the 80th percentile is 20%. Thus, the probability of a Type 1 error (or the risk of triggering a false alarm) for this method of setting water quality criteria is 20%.

¹⁰ <https://www.environment.nsw.gov.au/ieo/Tweed/report-02.htm>

¹¹ Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1, 2000, Section 3.1, Page 21.

- It is recommended that the recording of a single result that exceeds the criteria should not automatically be deemed as a 'non-compliance'. Rather, the water quality criteria are designed to be used as a tool to prompt additional investigations or observations of the parameter in question to ascertain whether an adverse trend may be emerging and if so, allow early detection of the cause of the trend. The findings of such site investigations should be used to determine whether a non-compliance has occurred.
- The site's Overall Water Management Plan and Summary of Management Plans have been updated to reflect the outcomes of the Baseline Monitoring Program. For reference, the Surface Water Quality Monitoring and Management table that is common to both of these plans is included in Appendix 7. Each of the recommendations contained in this report are included in the management plans to ensure they are implemented on site.

7 Limitations of reporting

Gilbert & Sutherland Pty Ltd has made every effort to ensure that the information provided in this report is accurate. The interpretation of scientific data, however, involves professional judgment, and as such is open to error.

In recognising the potential for errors in scientific interpretation, Gilbert & Sutherland Pty Ltd does not guarantee that the information is totally accurate or complete and clients are advised not to rely solely on this information when making commercial decisions. Any representation, statement, opinion or advice, expressed or

implied is made in good faith and on the basis that the authors, Gilbert & Sutherland Pty Ltd, their agents or employees are not liable (whether by reason of lack of care or otherwise) to any person for any damage or loss whatsoever which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in respect of any representation, statement or advice referred to above.

Furthermore, this information should not be relied upon by any persons other than the client for whom this information was compiled. This information reflects the specific brief and the budget of the client concerned, who enjoys an individual tolerance of risk.

8 Appendix 1 – Drawings

9 Appendix 2 – Surface water results and analysis

Surface water in-situ results

SW Insitu pH											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Unit	Date	pH Unit	pH Unit	pH Unit	pH Unit	pH Unit	pH Unit	pH Unit	pH Unit	pH Unit	pH Unit
Round 1	16/05/2019	5.83	6.18	5.95	6.01	5.86		5.93	5.45	6.56	
Round 2	5/06/2019	6.33	5.79	5.1	5.08	4.79		4.78	4.87	6.56	
Round 3	27/06/2019	5.29	5.93	5.24	5.14	5.15		5.09	4.89	5.53	
Round 4	18/07/2019	5.91	5.83	5.68	5.6	5.63		5.22	5.41	5.92	
Round 5	6/08/2019	6.25	6.13	6.67	6.62	6.49	5.13	7.23	6.94	6.14	5.98
Round 6	27/08/2019	6.13	5.24	6.33	6.19	6.16	5.91	6.38	6.29	5.65	6.48
Round 7	17/09/2019	5.68	5.24	6.29	6.16	6.02	5.97	6.3	6.24	6.1	6.18
Round 8	10/10/2019	6.57	6.43	6.71	6.57	6.12	6.05	6.64	6.92	6.63	6.87
Min		5.29	5.24	5.1	5.08	4.79	5.13	4.78	4.87	5.53	5.98
Max		6.57	6.43	6.71	6.62	6.49	6.05	7.23	6.94	6.63	6.87
10th percentile		5.563	5.24	5.198	5.122	5.042	5.364	4.997	4.884	5.614	6.04
20th percentile		5.74	5.46	5.416	5.324	5.342	5.598	5.142	5.098	5.758	6.1
80th percentile		6.298	6.16	6.534	6.418	6.144	6.002	6.536	6.668	6.56	6.636
90th percentile		6.402	6.255	6.682	6.585	6.259	6.026	6.817	6.926	6.581	6.753
median		6.02	5.88	6.12	6.085	5.94	5.94	6.115	5.845	6.12	6.33

SW Insitu Electrical Conductivity											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Unit	Date	µs/cm	µs/cm	µs/cm	µs/cm	µs/cm	µs/cm	µs/cm	µs/cm	µs/cm	µs/cm
Round 1	16/05/2019	12540	21900	178	141	1170		545	490	31440	
Round 2	5/06/2019	20220	43910	192	182	614		133	146	49690	
Round 3	27/06/2019	12410	9740	136	129	145		105	153	97400	
Round 4	18/07/2019	4916	13250	185	181	273		135	126	21490	
Round 5	6/08/2019	6689	16520	172	159	295	7118	128	128	44080	176
Round 6	27/08/2019	11560	13070	244	250	480	11570	190	159	28570	251
Round 7	17/09/2019	23440	42320	208	215	5901	26300	117	125	56370	210
Round 8	10/10/2019	27260	28130	278	329	6945	21850	152	190	33270	294
Min		4916	9740	136	129	145	7118	105	125	21490	176
Max		27260	43910	278	329	6945	26300	545	490	97400	294
10th percentile		6157.1	12071	161.2	137.4	234.6	8453.6	113.4	125.7	26446	186.2
20th percentile		8637.4	13142	174.4	148.2	281.8	9789.2	121.4	126.8	29718	196.4
80th percentile		22152	36644	229.6	236	4008.6	23630	174.8	177.6	53698	268.2
90th percentile		24586	42797	254.2	273.7	6214.2	24965	296.5	280	68679	281.1
median		12475	19210	188.5	181.5	547	16710	134	149.5	38675	230.5

SW Insitu Temperature											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Unit	Date	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Round 1	16/05/2019	23.32	21.52	18.21	17.81	21.45		18.16	17.64	23.51	
Round 2	5/06/2019	16.02	17.21	14.72	15.62	15.52		14.62	14.24	18.61	
Round 3	27/06/2019	17.94	17.55	15.66	15.9	16.38		16.29	15.61	19.16	
Round 4	18/07/2019	16.5	17.27	12.92	12.53	15.13		12.61	11.53	17.21	
Round 5	6/08/2019	18.28	17.66	16.04	16.46	18.04	19.51	14.74	14.81	19.56	19.94
Round 6	27/08/2019	21.81	20.12	19.68	18.47	19.37	20.37	21.28	21.79	21.79	19.55
Round 7	17/09/2019	20.47	21.19	20.8	20.35	20.42	21.85	19.31	20	20.93	20.41
Round 8	10/10/2019	24.02	24.21	20.21	21.18	23.97	25.38	21.54	20.53	26.04	20.51
Min		16.02	17.21	12.92	12.53	15.13	19.51	12.61	11.53	17.21	19.55
Max		24.02	24.21	20.8	21.18	23.97	25.38	21.54	21.79	26.04	20.51
10th percentile		16.356	17.252	14.18	14.693	15.403	19.768	14.017	13.427	18.19	19.667
20th percentile		17.076	17.382	15.096	15.732	15.864	20.026	14.668	14.468	18.83	19.784
80th percentile		22.716	21.388	19.998	19.598	21.038	23.262	20.492	20.318	22.822	20.45
90th percentile		23.53	22.327	20.387	20.599	22.206	24.321	21.358	20.908	24.269	20.48
median		19.375	18.89	17.125	17.135	18.705	21.11	17.225	16.625	20.245	20.175

SW Insitu Redox Potential											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Unit	Date	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
Round 1	16/05/2019	551	518	555	561	558		564	541	503	
Round 2	5/06/2019	571	649	678	675	706		687	692	563	
Round 3	27/06/2019	441	509	483	489	487		469	491	417	
Round 4	18/07/2019	391	476	481	485	469		511	500	413	
Round 5	6/08/2019	460	480	443	448	459	400	498	486	471	371
Round 6	27/08/2019	394	435	408	335	365	418	365	391	412	408
Round 7	17/09/2019	409	452	406	417	446	438	297	376	413	402
Round 8	10/10/2019	405	419	388	360	412	449	408	386	402	384
Min		391	419	388	335	365	400	297	376	402	371
Max		571	649	678	675	706	449	687	692	563	408
10th percentile		393.1	430.2	400.6	352.5	397.9	405.4	344.6	383	409	374.9
20th percentile		398.4	441.8	406.8	382.8	425.6	410.8	382.2	388	412.4	378.8
80th percentile		514.6	514.4	526.2	532.2	529.6	442.4	542.8	524.6	490.2	404.4
90th percentile		557	557.3	591.9	595.2	602.4	445.7	600.9	586.3	521	406.2
median		425	478	462	466.5	464	428	483.5	488.5	415	393

SW Insitu Dissolved Oxygen (DO)											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	7.79	8.22	10.16	10.27	8.62		9.93	10.23	7.24	
Round 2	5/06/2019	8.22	6.4	4.44	2.55	4.11		2.52	2.41	6.66	
Round 3	27/06/2019	9.11	7.24	6.02	5.66	5.58		5.11	6.62	7.51	
Round 4	18/07/2019	9.22	8.08	5.3	3.2	4.72		2.55	2.73	7.97	
Round 5	6/08/2019	8.71	7.65	5.75	2.82	6.07	8.2	2.31	2.63	7.18	6.7
Round 6	27/08/2019	7.94	7.55	6.59	2.14	5.1	7.88	5.2	5.14	6.99	7.52
Round 7	17/09/2019	7.8	6.88	6.77	2.99	5.68	7.42	3.17	4.84	7.2	5.04
Round 8	10/10/2019	7.82	7.04	4.14	4.92	5.82	6.96	4.19	4.13	7.22	6.05
Min		7.79	6.4	4.14	2.14	4.11	6.96	2.31	2.41	6.66	5.04
Max		9.22	8.22	10.16	10.27	8.62	8.2	9.93	10.23	7.97	7.52
10th percentile		7.797	6.736	4.35	2.427	4.537	7.098	2.457	2.564	6.891	5.343
20th percentile		7.808	6.944	4.784	2.658	4.872	7.236	2.532	2.67	7.066	5.646
80th percentile		8.95	7.908	6.698	5.364	5.97	8.008	5.164	6.028	7.402	7.028
90th percentile		9.143	8.122	7.787	7.043	6.835	8.104	6.619	7.703	7.648	7.274
median		8.08	7.395	5.885	3.095	5.63	7.65	3.68	4.485	7.21	6.375

SW insitu dissolved oxygen											
Sample ID:		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Unit	Date	% sat	% sat	% sat	% sat	% sat	% sat	% sat	% sat	% sat	% sat
Round 1	16/05/2019	91.36	93.12	107.74	108.01	97.52		105.19	107.21	85.22	
Round 2	5/06/2019	83.28	66.48	43.74	25.61	41.2		24.77	23.5	71.2	
Round 3	27/06/2019	96.07	75.74	60.52	57.19	56.96		52.07	66.48	81.93	
Round 4	18/07/2019	94.36	84.03	50.19	30.04	46.92		23.98	25.05	82.79	
Round 5	6/08/2019	92.49	80.21	58.28	28.84	64.14	89.28	22.77	25.96	78.25	73.58
Round 6	27/08/2019	90.46	83.21	71.99	22.81	55.37	87.28	58.64	58.54	79.61	81.94
Round 7	17/09/2019	86.56	77.44	75.62	33.1	62.97	84.6	34.37	53.21	80.63	55.87
Round 8	10/10/2019	92.93	83.96	45.71	55.37	69.1	84.83	47.49	45.89	89.07	67.19
Min		83.28	66.48	43.74	22.81	41.2	84.6	22.77	23.5	71.2	55.87
Max		96.07	93.12	107.74	108.01	97.52	89.28	105.19	107.21	89.07	81.94
10th percentile		85.576	72.962	45.119	24.77	45.204	84.669	23.617	24.585	76.135	59.266
20th percentile		88.12	76.42	47.502	26.902	50.3	84.738	24.296	25.414	78.794	62.662
80th percentile		93.788	84.002	74.168	56.462	67.116	88.08	56.012	63.304	84.248	76.924
90th percentile		94.873	86.757	85.256	72.436	77.626	88.68	72.605	78.699	86.375	79.432
median		91.925	81.71	59.4	31.57	59.965	86.055	40.93	49.55	81.28	70.385

SW Insitu Turbidity											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Unit	Date	NTU	NTU	NTU	NTU	NTU	NTU	NTU	NTU	NTU	NTU
Round 1	16/05/2019	18	16.4	24.3	41.8	79.5		93.5	27.5	-0.2	
Round 2	5/06/2019	0	0.8	6	10.9	8.1		25.7	23.5	0.7	
Round 3	27/06/2019	1.2	3	34.1	17.8	17.1		30.2	26.2	14.1	
Round 4	18/07/2019	0.8	2.2	9.1	2.8	4		6.7	15.2	1.2	
Round 5	6/08/2019	0.9	2.1	5.1	3.4	9.9	3	17	26.5	2.3	10.2
Round 6	27/08/2019	2.2	2.1	6.3	30	27.8	2.1	23.1	17.5	3	8.8
Round 7	17/09/2019	2.1	2.8	6.7	37.2	17.7	2.9	77.9	8.8	2.3	28.5
Round 8	10/10/2019	3.1	3.1	44.1	81.3	14.6	5.7	126.4	22.1	3.5	113.4
Min		0	0.8	5.1	2.8	4	2.1	6.7	8.8	-0.2	8.8
Max		18	16.4	44.1	81.3	79.5	5.7	126.4	27.5	14.1	113.4
10th percentile		0.56	1.71	5.73	3.22	6.87	2.34	13.91	13.28	0.43	9.22
20th percentile		0.84	2.1	6.12	6.4	8.82	2.58	19.44	16.12	0.9	9.64
80th percentile		2.74	3.06	30.18	39.96	23.76	4.08	87.26	26.38	3.3	62.46
90th percentile		7.57	7.09	37.1	53.65	43.31	4.89	103.37	26.8	6.68	87.93
median		1.65	2.5	7.9	23.9	15.85	2.95	27.95	22.8	2.3	19.35

Surface water laboratory results

	Less than the laboratory limit of reporting (LOR)
	Approximate value

Total Nitrogen as N											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	0.25	0.25	0.8	1	0.8		0.6	0.9	0.25	
Round 2	5/06/2019	0.6	1.1	1	0.9	0.8		0.7	0.8	0.5	
Round 3	27/06/2019	0.4	0.6	1.3	1.1	1		1.2	1.5	0.4	
Round 4	18/07/2019	0.4	0.5	1.4	1.2	0.9		0.8	0.9	0.25	
Round 5	8/06/2019	0.3	0.25	0.9	0.9	1	0.5	0.8	1.1	0.25	1.4
Round 6	27/08/2019	0.4	0.5	1	1.5	0.9	0.4	0.7	1.2	1	1
Round 7	17/09/2019	0.25	0.25	1.6	1.2	0.7	0.25	0.8	1.5	0.25	1.4
Round 8	10/10/2019	0.25	0.5	3	1	1.1	0.9	1	3.1	0.25	3.3
Min		0.25	0.25	0.8	0.9	0.7	0.25	0.6	0.8	0.25	1
Max		0.6	1.1	3	1.5	1.1	0.9	1.2	3.1	1	3.3
10th percentile		0.25	0.25	0.87	0.9	0.77	0.295	0.67	0.87	0.25	1.12
20th percentile		0.25	0.25	0.94	0.94	0.8	0.34	0.7	0.9	0.25	1.24
80th percentile		0.4	0.56	1.52	1.2	1	0.66	0.92	1.5	0.46	2.16
90th percentile		0.46	0.75	2.02	1.29	1.03	0.78	1.06	1.98	0.65	2.73
median		0.35	0.5	1.15	1.05	0.9	0.45	0.8	1.15	0.25	1.4

Soluble Nitrogen as N											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.1	0.1	0.1	0.1	0.1		0.1	0.1	0.1	
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	
Round 1	16/05/2019	0.25	0.25	0.7	0.8	0.8		0.6	0.6	0.25	
Round 2	5/06/2019	0.6	0.25	0.8	0.9	0.9		0.7	0.7	0.25	
Round 3	27/06/2019	0.4	0.5	0.8	0.7	0.6		0.6	0.8	0.5	
Round 4	18/07/2019	0.4	0.5	1.4	1.2	0.9		0.8	0.9	0.25	
Round 5	8/06/2019	0.3	0.25	0.9	0.7	0.6	0.5	0.6	0.5	0.25	1.2
Round 6	27/08/2019	0.4	0.5	0.9	1	0.8	0.4	0.6	0.7	0.8	0.8
Round 7	17/09/2019	0.25	0.25	0.9	0.8	0.7	0.25	0.4	1	0.25	0.8
Round 8	10/10/2019	0.25	0.25	1.6	0.5	0.7	0.25	0.4	1	0.25	1.8
Min		0.25	0.25	0.7	0.5	0.6	0.25	0.4	0.5	0.25	0.8
Max		0.6	0.5	1.6	1.2	0.9	0.5	0.8	1	0.8	1.8
10th percentile		0.25	0.25	0.77	0.64	0.6	0.25	0.4	0.57	0.25	0.8
20th percentile		0.25	0.25	0.8	0.7	0.64	0.25	0.48	0.64	0.25	0.8
80th percentile		0.4	0.5	1.2	0.96	0.86	0.44	0.66	0.96	0.4	1.44
90th percentile		0.46	0.5	1.46	1.06	0.9	0.47	0.73	1	0.59	1.62
median		0.35	0.25	0.9	0.8	0.75	0.325	0.6	0.75	0.25	1

Nitrite + Nitrate as N											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	0.09	0.07	0.02	0.005	0.005		0.005	0.005	0.04	
Round 2	5/06/2019	0.04	0.03	0.07	0.005	0.02		0.01	0.005	0.01	
Round 3	27/06/2019	0.11	0.06	0.19	0.08	0.05		0.04	0.03	0.04	
Round 4	18/07/2019	0.06	0.54	0.79	0.26	0.12		0.03	0.005	0.07	
Round 5	8/06/2019	0.03	0.07	0.41	0.04	0.04	0.2	0.02	0.02	0.02	0.71
Round 6	27/08/2019	0.03	0.06	0.28	0.005	0.01	0.05	0.005	0.005	0.05	0.28
Round 7	17/09/2019	0.02	0.005	0.02	0.005	0.08	0.02	0.005	0.005	0.005	0.005
Round 8	10/10/2019	0.005	0.03	0.01	0.01	0.02	0.03	0.01	0.01	0.02	0.005
Min		0.005	0.005	0.01	0.005	0.005	0.02	0.005	0.005	0.005	0.005
Max		0.11	0.54	0.79	0.26	0.12	0.2	0.04	0.03	0.07	0.71
10th percentile		0.0155	0.0225	0.017	0.005	0.0085	0.023	0.005	0.005	0.0085	0.005
20th percentile		0.024	0.03	0.02	0.005	0.014	0.026	0.005	0.005	0.014	0.005
80th percentile		0.078	0.07	0.358	0.064	0.068	0.11	0.026	0.016	0.046	0.452
90th percentile		0.096	0.211	0.524	0.134	0.092	0.155	0.033	0.023	0.056	0.581
median		0.035	0.06	0.13	0.0075	0.03	0.04	0.01	0.005	0.03	0.1425

Total Kjeldahl Nitrogen as N											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	
Round 1	16/05/2019	0.25	0.25	0.8	1	0.8		0.6	0.9	0.25	
Round 2	5/06/2019	0.6	1.1	0.9	0.9	0.8		0.7	0.8	0.5	
Round 3	27/06/2019	0.3	0.5	1.1	1	1		1.2	1.5	0.4	
Round 4	18/07/2019	0.3	0.25	0.7	0.9	0.9		0.8	0.9	0.25	
Round 5	8/06/2019	0.3	0.25	0.5	0.9	1	0.3	0.8	1.1	0.25	0.7
Round 6	27/08/2019	0.4	0.4	0.7	1.5	0.9	0.4	0.7	1.2	0.9	0.7
Round 7	17/09/2019	0.25	0.25	1.6	1.2	0.6	0.25	0.8	1.5	0.25	1.4
Round 8	10/10/2019	0.25	0.5	3	1	1.1	0.9	1	3.1	0.25	3.3
Min		0.25	0.25	0.5	0.9	0.6	0.25	0.6	0.8	0.25	0.7
Max		0.6	1.1	3	1.5	1.1	0.9	1.2	3.1	0.9	3.3
10th percentile		0.25	0.25	0.64	0.9	0.74	0.265	0.67	0.87	0.25	0.7
20th percentile		0.25	0.25	0.7	0.9	0.8	0.28	0.7	0.9	0.25	0.7
80th percentile		0.36	0.5	1.4	1.12	1	0.6	0.92	1.5	0.46	2.16
90th percentile		0.46	0.68	2.02	1.29	1.03	0.75	1.06	1.98	0.62	2.73
median		0.3	0.325	0.85	1	0.9	0.35	0.8	1.15	0.25	1.05

Nitrite as N											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	0.005	0.005	0.005	0.005	0.005		0.005	0.005	0.005	
Round 2	5/06/2019	0.005	0.005	0.02	0.005	0.005		0.005	0.005	0.005	
Round 3	27/06/2019	0.005	0.005	0.005	0.005	0.005		0.005	0.005	0.005	
Round 4	18/07/2019	0.005	0.005	0.06	0.01	0.005		0.005	0.005	0.005	
Round 5	8/06/2019	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Round 6	27/08/2019	0.005	0.005	0.02	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Round 7	17/09/2019	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Round 8	10/10/2019	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Min		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Max		0.005	0.005	0.06	0.01	0.005	0.005	0.005	0.005	0.005	0.005
10th percentile		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
20th percentile		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
80th percentile		0.005	0.005	0.02	0.005	0.005	0.005	0.005	0.005	0.005	0.005
90th percentile		0.005	0.005	0.032	0.0065	0.005	0.005	0.005	0.005	0.005	0.005
median		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005

Nitrate as N											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	0.09	0.07	0.02	0.005	0.005		0.005	0.005	0.04	
Round 2	5/06/2019	0.04	0.03	0.05	0.005	0.02		0.01	0.005	0.01	
Round 3	27/06/2019	0.11	0.06	0.19	0.08	0.05		0.04	0.03	0.04	
Round 4	18/07/2019	0.06	0.54	0.73	0.25	0.12		0.03	0.005	0.07	
Round 5	8/06/2019	0.03	0.07	0.41	0.04	0.04	0.2	0.02	0.02	0.02	0.71
Round 6	27/08/2019	0.03	0.06	0.26	0.005	0.01	0.05	0.005	0.005	0.05	0.28
Round 7	17/09/2019	0.02	0.005	0.02	0.005	0.08	0.02	0.005	0.005	0.005	0.005
Round 8	10/10/2019	0.005	0.03	0.01	0.01	0.02	0.03	0.01	0.01	0.02	0.005
Min		0.005	0.005	0.01	0.005	0.005	0.02	0.005	0.005	0.005	0.005
Max		0.11	0.54	0.73	0.25	0.12	0.2	0.04	0.03	0.07	0.71
10th percentile		0.0155	0.0225	0.017	0.005	0.0085	0.023	0.005	0.005	0.0085	0.005
20th percentile		0.024	0.03	0.02	0.005	0.014	0.026	0.005	0.005	0.014	0.005
80th percentile		0.078	0.07	0.35	0.064	0.068	0.11	0.026	0.016	0.046	0.452
90th percentile		0.096	0.211	0.506	0.131	0.092	0.155	0.033	0.023	0.056	0.581
median		0.035	0.06	0.12	0.0075	0.03	0.04	0.01	0.005	0.03	0.1425

Total Phosphorus as P											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	0.025	0.025	0.02	0.02	0.005		0.02	0.06	0.025	
Round 2	5/06/2019	0.1	0.13	0.05	0.03	0.01		0.05	0.06	0.05	
Round 3	27/06/2019	0.02	0.02	0.07	0.04	0.04		0.14	0.11	0.02	
Round 4	18/07/2019	0.005	0.025	0.04	0.02	0.02		0.13	0.05	0.025	
Round 5	8/06/2019	0.005	0.025	0.04	0.06	0.04	0.06	0.1	0.1	0.025	0.01
Round 6	27/08/2019	0.005	0.01	0.05	0.08	0.03	0.005	0.09	0.13	0.025	0.04
Round 7	17/09/2019	0.025	0.025	0.15	0.06	0.01	0.025	0.11	0.11	0.025	0.1
Round 8	10/10/2019	0.025	0.025	0.36	0.04	0.02	0.025	0.14	0.29	0.025	0.23
Min		0.005	0.01	0.02	0.02	0.005	0.005	0.02	0.05	0.02	0.01
Max		0.1	0.13	0.36	0.08	0.04	0.06	0.14	0.29	0.05	0.23
10th percentile		0.005	0.017	0.034	0.02	0.0085	0.011	0.041	0.057	0.0235	0.019
20th percentile		0.005	0.022	0.04	0.024	0.01	0.017	0.066	0.06	0.025	0.028
80th percentile		0.025	0.025	0.118	0.06	0.036	0.039	0.136	0.122	0.025	0.152
90th percentile		0.0475	0.0565	0.213	0.066	0.04	0.0495	0.14	0.178	0.0325	0.191
median		0.0225	0.025	0.05	0.04	0.02	0.025	0.105	0.105	0.025	0.07

Soluble Phosphorus as P											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	0.025	0.025	0.02	0.01	0.005		0.02	0.03	0.025	
Round 2	5/06/2019	0.025	0.025	0.02	0.02	0.005		0.03	0.03	0.025	
Round 3	27/06/2019	0.02	0.02	0.04	0.02	0.02		0.06	0.06	0.02	
Round 4	18/07/2019	0.005	0.025	0.02	0.02	0.005		0.08	0.06	0.025	
Round 5	8/06/2019	0.005	0.025	0.02	0.01	0.01	0.005	0.06	0.05	0.025	0.02
Round 6	27/08/2019	0.005	0.005	0.03	0.02	0.01	0.005	0.07	0.06	0.025	0.02
Round 7	17/09/2019	0.025	0.025	0.03	0.005	0.005	0.025	0.01	0.04	0.025	0.03
Round 8	10/10/2019	0.025	0.025	0.27	0.01	0.005	0.025	0.09	0.1	0.025	0.1
Min		0.005	0.005	0.02	0.005	0.005	0.005	0.01	0.03	0.02	0.02
Max		0.025	0.025	0.27	0.02	0.02	0.025	0.09	0.1	0.025	0.1
10th percentile		0.005	0.0155	0.02	0.0085	0.005	0.005	0.017	0.03	0.0235	0.02
20th percentile		0.005	0.022	0.02	0.01	0.005	0.005	0.024	0.034	0.025	0.02
80th percentile		0.025	0.025	0.036	0.02	0.01	0.025	0.076	0.06	0.025	0.058
90th percentile		0.025	0.025	0.109	0.02	0.013	0.025	0.083	0.072	0.025	0.079
median		0.0225	0.025	0.025	0.015	0.005	0.015	0.06	0.055	0.025	0.025

Calcium											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		1	1	1	1	1	1	1	1	1	1
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	93	160	6	6	9		4	3	217	
Round 2	5/06/2019	140	365	5	5	9		4	3	412	
Round 3	27/06/2019	92	65	4	4	3		2	3	66	
Round 4	18/07/2019	41	92	4	5	7		4	2	154	
Round 5	8/06/2019	59	120	6	5	7	58	4	3	351	5
Round 6	27/08/2019	69	79	6	7	8	71	3	3	181	6
Round 7	17/09/2019	162	294	8	10	50	186	4	2	408	8
Round 8	10/10/2019	191	194	8	12	53	148	4	4	232	8
Min		41	65	4	4	3	58	2	2	66	5
Max		191	365	8	12	53	186	4	4	412	8
10th percentile		53.6	74.8	4	4.7	5.8	61.9	2.7	2	127.6	5.3
20th percentile		63	84.2	4.4	5	7	65.8	3.4	2.4	164.8	5.6
80th percentile		153.2	254	7.2	8.8	33.6	163.2	4	3	385.2	8
90th percentile		170.7	315.3	8	10.6	50.9	174.6	4	3.3	409.2	8
median		92.5	140	6	5.5	8.5	109.5	4	3	224.5	

Magnesium											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		1	1	1	1	1	1	1	1	1	1
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	240	453	6	5	12		3	3	584	
Round 2	5/06/2019	422	1040	5	4	13		3	3	1190	
Round 3	27/06/2019	239	182	3	3	3		2	3	183	
Round 4	18/07/2019	96	240	4	4	6		3	3	417	
Round 5	8/06/2019	146	318	5	4	8	164	3	3	910	5
Round 6	27/08/2019	192	222	5	5	9	197	3	3	527	5
Round 7	17/09/2019	449	890	6	6	121	529	3	3	1230	6
Round 8	10/10/2019	519	522	5	6	124	402	4	4	633	6
Min		96	182	3	3	3	164	2	3	183	5
Max		519	1040	6	6	124	529	4	4	1230	6
10th percentile		131	210	3.7	3.7	5.1	173.9	2.7	3	346.8	5
20th percentile		164.4	229.2	4.4	4	6.8	183.8	3	3	461	5
80th percentile		438.2	742.8	5.6	5.6	77.8	452.8	3	3	1078	6
90th percentile		470	935	6	6	121.9	490.9	3.3	3.3	1202	6
median		239.5	385.5	5	4.5	10.5	299.5	3	3	608.5	5.5

Sodium											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		1	1	1	1	1		1	1	1	
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	
Round 1	16/05/2019	2030	3740	26	26	75		19	20	5070	
Round 2	5/06/2019	3690	8240	26	25	95		18	21	9760	
Round 3	27/06/2019	2020	1570	19	18	20		15	22	1580	
Round 4	18/07/2019	770	2020	26	26	37		20	20	3450	
Round 5	8/06/2019	1290	2850	28	27	48	1380	20	22	8220	27
Round 6	27/08/2019	1700	1980	32	27	58	1740	19	20	4670	30
Round 7	17/09/2019	3770	7740	32	33	1000	4300	21	23	10600	34
Round 8	10/10/2019	4460	4620	32	36	1050	3450	21	26	5480	36
Min		770	1570	19	18	20	1380	15	20	1580	27
Max		4460	8240	32	36	1050	4300	21	26	10600	36
10th percentile		1134	1857	23.9	22.9	31.9	1488	17.1	20	2889	27.9
20th percentile		1454	1996	26	25.4	41.4	1596	18.4	20	3938	28.8
80th percentile		3738	6492	32	30.6	638	3790	20.6	22.6	9144	34.8
90th percentile		3977	7890	32	33.9	1015	4045	21	23.9	10012	35.4
median		2025	3295	27	26.5	66.5	2595	19.5	21.5	5275	32

Potassium											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		1	1	1	1	1		1	1	1	
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	
Round 1	16/05/2019	80	141	2	3	4		1	2	194	
Round 2	5/06/2019	129	326	2	2	5		1	2	370	
Round 3	27/06/2019	74	58	3	2	2		3	3	58	
Round 4	18/07/2019	31	75	2	2	3		2	2	129	
Round 5	8/06/2019	46	98	2	2	3	48	1	2	306	2
Round 6	27/08/2019	61	72	3	3	3	62	0.5	2	168	3
Round 7	17/09/2019	138	271	5	3	38	163	1	2	376	5
Round 8	10/10/2019	161	171	9	3	40	128	1	4	207	9
Min		31	58	2	2	2	48	0.5	2	58	2
Max		161	326	9	3	40	163	3	4	376	9
10th percentile		41.5	67.8	2	2	2.7	52.2	0.85	2	107.7	2.3
20th percentile		52	73.2	2	2	3	56.4	1	2	144.6	2.6
80th percentile		134.4	231	4.2	3	24.8	142	1.6	2.6	344.4	6.6
90th percentile		144.9	287.5	6.2	3	38.6	152.5	2.3	3.3	371.8	7.8
median		77	119.5	2.5	2.5	3.5	95	1	2	200.5	

Bicarbonate Alkalinity as CaCO3											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		1	1	1	1	1	1	1	1	1	1
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	25	48	36	22	23		20	9	74	
Round 2	5/06/2019	26	87	28	17	16		16	12	107	
Round 3	27/06/2019	5	10	13	6	5		8	4	15	
Round 4	18/07/2019	4	26	27	14	22		15	13	46	
Round 5	8/06/2019	5	31	35	23	23	6	22	16	90	38
Round 6	27/08/2019	11	22	54	42	34	15	10	14	61	42
Round 7	17/09/2019	26	86	45	48	33	38	21	12	118	46
Round 8	10/10/2019	3	55	44	47	47	25	26	18	51	48
Min		3	10	13	6	5	6	8	4	15	38
Max		26	87	54	48	47	38	26	18	118	48
10th percentile		3.7	18.4	22.8	11.6	12.7	8.7	9.4	7.5	36.7	39.2
20th percentile		4.4	23.6	27.4	15.2	18.4	11.4	12	10.2	48	40.4
80th percentile		25.6	73.6	44.6	45	33.6	30.2	21.6	15.2	100.2	46.8
90th percentile		26	86.3	47.7	47.3	37.9	34.1	23.2	16.6	110.3	47.4
median		8	39.5	35.5	22.5	23	20	18	12.5	67.5	44

Total Alkalinity as CaCO3											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		1	1	1	1	1	1	1	1	1	1
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	25	48	36	22	23		20	9	74	
Round 2	05/06/2019	26	87	28	17	16		16	12	107	
Round 3	27/06/2019	5	10	13	6	5		8	4	15	
Round 4	18/07/2019	4	26	27	14	22		15	13	46	
Round 5	06/08/2019	5	31	35	23	23	6	22	16	90	38
Round 6	27/08/2019	11	22	54	42	34	15	10	14	61	42
Round 7	17/09/2019	26	86	45	48	33	38	21	12	118	46
Round 8	10/10/2019	3	55	44	47	47	25	26	18	51	48
Min		3	10	13	6	5	6	8	4	15	38
Max		26	87	54	48	47	38	26	18	118	48
10th percentile		3.7	18.4	22.8	11.6	12.7	8.7	9.4	7.5	36.7	39.2
20th percentile		4.4	23.6	27.4	15.2	18.4	11.4	12	10.2	48	40.4
80th percentile		25.6	73.6	44.6	45	33.6	30.2	21.6	15.2	100.2	46.8
90th percentile		26	86.3	47.7	47.3	37.9	34.1	23.2	16.6	110.3	47.4
median		8	39.5	35.5	22.5	23	20	18	12.5	67.5	44

Total Iron											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	0.26	0.48	3.29	5.31	5.03		6.41	4.25	0.37	
Round 2	5/06/2019	0.09	0.25	2.02	2.24	2.75		4.78	4.51	0.29	
Round 3	27/06/2019	0.18	0.65	1.85	1.58	1.91		1.96	2.58	0.79	
Round 4	18/07/2019	0.23	0.40	1.67	2.24	3.94		5.18	2.53	0.41	
Round 5	8/06/2019	0.13	0.52	1.44	2.54	3.21	0.20	6.68	3.88	0.31	1.72
Round 6	27/08/2019	0.28	0.34	1.81	12.70	4.70	0.32	5.68	4.47	0.40	1.96
Round 7	17/09/2019	0.24	0.16	6.89	9.73	2.01	0.39	7.88	3.63	0.12	6.33
Round 8	10/10/2019	0.29	0.24	12.40	5.74	2.96	0.83	9.86	6.39	0.32	12
Min		0.09	0.16	1.44	1.58	1.91	0.2	1.96	2.53	0.12	1.72
Max		0.29	0.65	12.4	12.7	5.03	0.83	9.86	6.39	0.79	12
10th percentile		0.118	0.216	1.601	2.042	1.98	0.236	3.934	2.565	0.239	1.792
20th percentile		0.15	0.244	1.726	2.24	2.306	0.272	4.94	3	0.298	1.864
80th percentile		0.272	0.504	5.45	8.134	4.396	0.566	7.4	4.494	0.406	8.598
90th percentile		0.283	0.559	8.543	10.621	4.799	0.698	8.474	5.074	0.524	10.299
median		0.235	0.37	1.935	3.925	3.085	0.355	6.045	4.065	0.345	4.145

Dissolved Iron											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	0.09	0.18	1.98	3.15	1.9		2.22	2.72	0.08	
Round 2	5/06/2019	0.025	0.07	1.16	1.51	1.82		2.78	2.31	0.025	
Round 3	27/06/2019	0.025	0.35	1.05	1.03	1.22		1.09	1.9	0.39	
Round 4	18/07/2019	0.13	0.19	0.87	1.46	1.65		3.19	1.58	0.06	
Round 5	8/06/2019	0.025	0.08	0.84	1.33	1.3	0.025	3.43	1.63	0.025	0.84
Round 6	27/08/2019	0.025	0.08	1	5.11	1.73	0.06	2.48	2.04	0.06	1.09
Round 7	17/09/2019	0.025	0.025	2.65	4.29	0.59	0.09	1.47	1.62	0.025	3.24
Round 8	10/10/2019	0.025	0.025	5.2	1.52	0.47	0.16	2.14	1.46	0.025	5.6
Min		0.025	0.025	0.84	1.03	0.47	0.025	1.09	1.46	0.025	0.84
Max		0.13	0.35	5.2	5.11	1.9	0.16	3.43	2.72	0.39	5.6
10th percentile		0.025	0.025	0.861	1.24	0.554	0.0355	1.356	1.544	0.025	0.915
20th percentile		0.025	0.043	0.922	1.382	0.842	0.046	1.738	1.596	0.025	0.99
80th percentile		0.064	0.186	2.382	3.834	1.784	0.118	3.026	2.202	0.072	4.184
90th percentile		0.102	0.238	3.415	4.536	1.844	0.139	3.262	2.433	0.173	4.892
median		0.025	0.08	1.105	1.515	1.475	0.075	2.35	1.765	0.0425	2.165

[illegible]

Total Cadmium											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	0.00005	0.00005	0.00005	0.00005	0.00005		0.00005	0.00005	0.00005	
Round 2	5/06/2019	0.00005	0.00025	0.00005	0.00005	0.00005		0.00005	0.00005	0.00025	
Round 3	27/06/2019	0.00005	0.00005	0.00005	0.00005	0.00005		0.00005	0.00005	0.00005	
Round 4	18/07/2019	0.00005	0.00005	0.00005	0.00005	0.00005		0.00005	0.00005	0.00005	
Round 5	8/06/2019	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00025	0.00005
Round 6	27/08/2019	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Round 7	17/09/2019	0.00005	0.00025	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00025	0.00005
Round 8	10/10/2019	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Min		0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Max		0.00005	0.00025	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00025	0.00005
10th percentile		0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
20th percentile		0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
80th percentile		0.00005	0.00017	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00025	0.00005
90th percentile		0.00005	0.00025	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00025	0.00005
median		0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005

Total Copper											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.001	0.001	0.001	0.001	0.001	0.0001	0.001	0.001	0.001	0.001
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	0.0005	0.001	0.0005	0.0005	0.0005		0.002	0.0005	0.002	
Round 2	5/06/2019	0.0005	0.0025	0.001	0.002	0.001		0.002	0.0005	0.011	
Round 3	27/06/2019	0.0005	0.0005	0.001	0.001	0.0005		0.003	0.001	0.0005	
Round 4	18/07/2019	0.0005	0.0005	0.0005	0.0005	0.0005		0.0005	0.0005	0.0005	
Round 5	8/06/2019	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.002	0.0005	0.0025	0.0005
Round 6	27/08/2019	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Round 7	17/09/2019	0.0005	0.0025	0.001	0.0005	0.0005	0.0005	0.001	0.0005	0.0025	0.001
Round 8	10/10/2019	0.0005	0.0005	0.002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Min		0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Max		0.0005	0.0025	0.002	0.002	0.001	0.0005	0.003	0.001	0.011	0.001
10th percentile		0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
20th percentile		0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
80th percentile		0.0005	0.0019	0.001	0.0008	0.0005	0.0005	0.002	0.0005	0.0025	0.0007
90th percentile		0.0005	0.0025	0.0013	0.0013	0.00065	0.0005	0.0023	0.00065	0.00505	0.00085
median		0.0005	0.0005	0.00075	0.0005	0.0005	0.0005	0.0015	0.0005	0.00125	0.0005

Total Lead											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	0.0005	0.0005	0.0005	0.0005	0.0005		0.0005	0.0005	0.0005	
Round 2	5/06/2019	0.0005	0.0025	0.0005	0.0005	0.0005		0.0005	0.0005	0.0025	
Round 3	27/06/2019	0.0005	0.0005	0.0005	0.0005	0.0005		0.0005	0.0005	0.0005	
Round 4	18/07/2019	0.0005	0.0005	0.0005	0.0005	0.0005		0.0005	0.0005	0.0005	
Round 5	8/06/2019	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0025	0.0005
Round 6	27/08/2019	0.0005	0.0005	0.0005	0.0005	0.002	0.0005	0.0005	0.0005	0.0005	0.0005
Round 7	17/09/2019	0.0005	0.0025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0025	0.0005
Round 8	10/10/2019	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Min		0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Max		0.0005	0.0025	0.0005	0.0005	0.002	0.0005	0.0005	0.0005	0.0025	0.0005
10th percentile		0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
20th percentile		0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
80th percentile		0.0005	0.0017	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0025	0.0005
90th percentile		0.0005	0.0025	0.0005	0.0005	0.00095	0.0005	0.0005	0.0005	0.0025	0.0005
median		0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005

Total Nickel											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	0.002	0.0005	0.0005	0.0005	0.0005		0.0005	0.0005	0.0005	
Round 2	5/06/2019	0.004	0.0025	0.001	0.001	0.0005		0.0005	0.002	0.0025	
Round 3	27/06/2019	0.002	0.0005	0.0005	0.0005	0.0005		0.0005	0.0005	0.001	
Round 4	18/07/2019	0.005	0.003	0.0005	0.001	0.0005		0.0005	0.0005	0.003	
Round 5	8/06/2019	0.006	0.003	0.0005	0.0005	0.0005	0.005	0.0005	0.0005	0.0025	0.0005
Round 6	27/08/2019	0.003	0.002	0.0005	0.001	0.0005	0.002	0.0005	0.0005	0.0005	0.0005
Round 7	17/09/2019	0.0005	0.0025	0.0005	0.0005	0.0005	0.001	0.0005	0.0005	0.0025	0.0005
Round 8	10/10/2019	0.002	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Min		0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Max		0.006	0.003	0.001	0.001	0.0005	0.005	0.0005	0.002	0.003	0.0005
10th percentile		0.00155	0.0005	0.0005	0.0005	0.0005	0.00065	0.0005	0.0005	0.0005	0.0005
20th percentile		0.002	0.0007	0.0005	0.0005	0.0005	0.0008	0.0005	0.0005	0.0005	0.0005
80th percentile		0.0046	0.0028	0.0005	0.001	0.0005	0.0032	0.0005	0.0005	0.0025	0.0005
90th percentile		0.0053	0.003	0.00065	0.001	0.0005	0.0041	0.0005	0.00095	0.00265	0.0005
median		0.0025	0.00225	0.0005	0.0005	0.0005	0.0015	0.0005	0.0005	0.00175	0.0005

Total Zinc											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	0.009	0.0025	0.009	0.0025	0.007		0.0025	0.0025	0.0025	
Round 2	5/06/2019	0.017	0.013	0.02	0.0025	0.012		0.01	0.008	0.013	
Round 3	27/06/2019	0.011	0.005	0.014	0.009	0.006		0.018	0.012	0.008	
Round 4	18/07/2019	0.033	0.017	0.0025	0.007	0.0025		0.0025	0.0025	0.014	
Round 5	8/06/2019	0.035	0.017	0.0025	0.006	0.01	0.035	0.0025	0.0025	0.013	0.0025
Round 6	27/08/2019	0.012	0.008	0.0025	0.0025	0.0025	0.009	0.0025	0.0025	0.006	0.0025
Round 7	17/09/2019	0.0025	0.013	0.005	0.0025	0.0025	0.0025	0.0025	0.0025	0.013	0.0025
Round 8	10/10/2019	0.007	0.006	0.03	0.0025	0.0025	0.0025	0.0025	0.008	0.0025	0.021
Min		0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Max		0.035	0.017	0.03	0.009	0.012	0.035	0.018	0.012	0.014	0.021
10th percentile		0.00565	0.00425	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
20th percentile		0.0078	0.0054	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0039	0.0025
80th percentile		0.0266	0.0154	0.0176	0.0066	0.0088	0.0194	0.007	0.008	0.013	0.0099
90th percentile		0.0336	0.017	0.023	0.0076	0.0106	0.0272	0.0124	0.0092	0.0133	0.01545
median		0.0115	0.0105	0.007	0.0025	0.00425	0.00575	0.0025	0.0025	0.0105	0.0025

Chloride											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		1	1	1	1	1	1	1	1	1	1
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	4350	7130	41	44	149		31	35	10200	
Round 2	5/06/2019	6690	15200	36	36	168		24	33	17200	
Round 3	27/06/2019	3790	2950	25	23	30		20	37	2900	
Round 4	18/07/2019	1450	3900	35	36	65		30	29	6880	
Round 5	8/06/2019	2350	5030	35	36	75	399	27	32	13600	8
Round 6	27/08/2019	3480	4030	42	43	113	3490	28	31	8990	40
Round 7	17/09/2019	7260	13500	46	48	1810	8150	26	34	18000	46
Round 8	10/10/2019	8110	8390	52	59	1920	6480	32	43	10100	55
Min		1450	2950	25	23	30	399	20	29	2900	8
Max		8110	15200	52	59	1920	8150	32	43	18000	55
10th percentile		2080	3615	32	32.1	54.5	1326.3	22.8	30.4	5686	17.6
20th percentile		2802	3952	35	36	69	2253.6	24.8	31.4	7724	27.2
80th percentile		7032	11456	44.4	46.4	1153.2	7148	30.6	36.2	15760	49.6
90th percentile		7515	14010	47.8	51.3	1843	7649	31.3	38.8	17440	52.3
median		4070	6080	38.5	39.5	131	4985	27.5	33.5	10150	43

Sulfate as SO4											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		1	1	1	1	1	1	1	1	1	1
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	640	968	7	7	25		6	3	1450	
Round 2	5/06/2019	1000	2550	10	10	34		5	3	2870	
Round 3	27/06/2019	545	443	9	15	13		8	7	441	
Round 4	18/07/2019	242	507	10	13	19		5	3	837	
Round 5	8/06/2019	380	686	9	9	20	399	5	2	2030	8
Round 6	27/08/2019	493	535	7	3	15	517	5	1	1210	8
Round 7	17/09/2019	946	1930	6	2	259	1190	4	0.5	2460	7
Round 8	10/10/2019	1490	1210	0.5	7	230	824	2	1	1440	0.5
Min		242	443	0.5	2	13	399	2	0.5	441	0.5
Max		1490	2550	10	15	259	1190	8	7	2870	8
10th percentile		338.6	487.8	4.35	2.7	14.4	434.4	3.4	0.85	718.2	2.45
20th percentile		425.2	518.2	6.4	4.6	16.6	469.8	4.4	1	986.2	4.4
80th percentile		978.4	1642	9.6	11.8	151.6	970.4	5.6	3	2288	8
90th percentile		1147	2116	10	13.6	238.7	1080.2	6.6	4.2	2583	8
median		592.5	827	8	8	22.5	670.5	5	2.5	1445	7.5

Ammonium											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	0.17	0.06	0.22	0.06	0.12		0.18	0.03	0.1	
Round 2	5/06/2019	0.22	0.07	0.17	0.02	0.06		0.13	0.005	0.07	
Round 3	27/06/2019	0.26	0.16	0.05	0.02	0.02		0.02	0.02	0.13	
Round 4	18/07/2019	0.11	0.07	0.07	0.05	0.05		0.12	0.02	0.06	
Round 5	8/06/2019	0.08	0.07	0.03	0.03	0.005	0.12	0.15	0.005	0.03	0.05
Round 6	27/08/2019	0.24	0.14	0.05	0.03	0.04	0.15	0.1	0.005	0.07	0.04
Round 7	17/09/2019	0.11	0.05	0.005	0.12	0.05	0.05	0.005	0.005	0.08	0.005
Round 8	10/10/2019	0.03	0.05	0.41	0.12	0.02	0.09	0.03	0.14	0.06	0.46
Min		0.03	0.05	0.005	0.02	0.005	0.05	0.005	0.005	0.03	0.005
Max		0.26	0.16	0.41	0.12	0.12	0.15	0.18	0.14	0.13	0.46
10th percentile		0.065	0.05	0.0225	0.02	0.0155	0.062	0.0155	0.005	0.051	0.0155
20th percentile		0.092	0.054	0.038	0.024	0.02	0.074	0.024	0.005	0.06	0.026
80th percentile		0.232	0.112	0.2	0.096	0.056	0.132	0.142	0.026	0.092	0.214
90th percentile		0.246	0.146	0.277	0.12	0.078	0.141	0.159	0.063	0.109	0.337
median		0.14	0.07	0.06	0.04	0.045	0.105	0.11	0.0125	0.07	0.045

Colour (True)											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		1	1	1	1	1	1	1	1	1	1
Unit	Date	PCU	PCU	PCU	PCU	PCU	PCU	PCU	PCU	PCU	PCU
Round 1	16/05/2019	20	45	170	250	180		150	230	20	
Round 2	5/06/2019	3	10	120	200	150		120	230	8	
Round 3	27/06/2019	5	95	130	150	170		150	250	120	
Round 4	18/07/2019	5	40	100	250	220		200	350	20	
Round 5	8/06/2019	3	25	130	250	150	10	150	230	13	100
Round 6	27/08/2019	7	18	130	550	150	12	130	350	17	130
Round 7	17/09/2019	3	5	130	150	100	10	97	150	2	130
Round 8	10/10/2019	5	13	600	100	150	60	130	200	13	500
Min		3	5	100	100	100	10	97	150	2	100
Max		20	95	600	550	220	60	200	350	120	500
10th percentile		3	8.5	114	135	135	10	113.1	185	6.2	109
20th percentile		3	11.2	124	150	150	10	124	212	10	118
80th percentile		6.2	43	154	250	176	31.2	150	310	20	278
90th percentile		10.9	60	299	340	192	45.6	165	350	50	389
median		5	21.5	130	225	150	11	140	230	15	130

Acidity as CaCO3											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		1	1	1	1	1	1	1	1	1	1
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	16/05/2019	8	12	8	11	11		12	11	11	
Round 2	5/06/2019	7	23	4	4	4		2	3	28	
Round 3	27/06/2019	5	6	5	9	10		6	17	6	
Round 4	18/07/2019	5	4	3	2	2		4	4	5	
Round 5	8/06/2019	4	5	1	2	3	7	1	3	10	0.5
Round 6	27/08/2019	3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Round 7	17/09/2019	10	13	7	11	13	11	12	9	9	7
Round 8	10/10/2019	3	5	4	5	5	7	2	5	9	7
Min		3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Max		10	23	8	11	13	11	12	17	28	7
10th percentile		3	2.95	0.85	1.55	1.55	2.45	0.85	2.25	3.65	0.5
20th percentile		3.4	4.4	1.8	2	2.4	4.4	1.4	3	5.4	0.5
80th percentile		7.6	12.6	6.2	10.2	10.6	8.6	9.6	10.2	10.6	7
90th percentile		8.6	16	7.3	11	11.6	9.8	12	12.8	16.1	7
median		5	5.5	4	4.5	4.5	7	3	4.5	9	3.75

Faecal Coliforms											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		1	1	1	1	1	1	1	1	1	1
Unit	Date	CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL
Round 1	16/05/2019	89	57	540	5800	56		110	26	38	
Round 2	5/06/2019	20	30	150	90	58		55	60	27	
Round 3	27/06/2019	24	450	1200	2300	1800		7000	300	660	
Round 4	18/07/2019	0.5	31	420	39	530		82	78	33	
Round 5	8/06/2019	1	50	1100	53	81	18	110	240	15	2300
Round 6	27/08/2019	82	61	1100	210	24	48	200	58	41	4700
Round 7	17/09/2019	39	44	550	320	65	42	160	290	160	600
Round 8	10/10/2019	35	15	960	50	80	40	340	18	48	2000
Min		0.5	15	150	39	24	18	55	18	15	600
Max		89	450	1200	5800	1800	48	7000	300	660	4700
10th percentile		0.85	25.5	339	46.7	46.4	24.6	73.9	23.6	23.4	1020
20th percentile		8.6	30.4	468	51.2	56.8	31.2	93.2	38.8	29.4	1440
80th percentile		64.8	59.4	1100	1508	350.4	44.4	284	270	115.2	3260
90th percentile		84.1	177.7	1130	3350	911	46.2	2338	293	310	3980
median		29.5	47	755	150	72.5	41	135	69	39.5	2150

SW Total algal cell count											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		5	5	5	5	5	5	5	5	5	5
Unit	Date	cells/ml	cells/ml	cells/ml	cells/ml	cells/ml	cells/ml	cells/ml	cells/ml	cells/ml	cells/ml
Round 1	16/05/2019	200	175	875	1140	800		100	1940	75	
Round 2	5/06/2019	10	51	912	350	450		4200	1200	10	
Round 3	27/06/2019	10	25	3920	1300	567		1320	1500	75	
Round 4	18/07/2019	125	250	1120	200	6320		875	2140	300	
Round 5	8/06/2019	175	255	800	785	8020	210	3860	1900	425	1140
Round 6	27/08/2019	275	25	400	975	8750	175	10100	3240	100	850
Round 7	17/09/2019	10	10	1480	1450	295	46	5270	8960	260	2480
Round 8	10/10/2019	1280	25	2530	625	19700	375	3070	3350	125	714
Min		10	10	400	200	295	46	100	1200	10	714
Max		1280	255	3920	1450	19700	375	10100	8960	425	2480
10th percentile		10	20.5	680	305	403.5	84.7	642.5	1410	55.5	754.8
20th percentile		10	25	830	460	496.8	123.4	1053	1660	75	795.6
80th percentile		245	220	2110	1236	8458	276	4842	3306	284	1676
90th percentile		576.5	251.5	2947	1345	12035	325.5	6719	5033	337.5	2078
median		150	38	1016	880	3560	192.5	3465	2040	112.5	995

Total Anions											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		1	1	1	1	1	1	1	1	1	1
Unit	Date	meq/L 0.01	meq/L 0.01	meq/L 0.01	meq/L 0.01	meq/L 0.01	meq/L 0.01	meq/L 0.01	meq/L 0.01	meq/L 0.01	meq/L 0.01
Round 1	16/05/2019	136	222	2.02	1.83	5.18		1.4	1.23	319	
Round 2	5/06/2019	210	484	1.78	1.56	5.77		1.1	1.23	547	
Round 3	27/06/2019	118	92.6	1.15	1.08	1.22		0.89	1.27	91.3	
Round 4	18/07/2019	46	121	1.73	1.56	2.67		1.25	1.14	212	
Round 5	8/06/2019	74.3	157	1.87	1.66	2.99		1.3	1.26	428	
Round 6	27/08/2019	109	125	2.41	2.11	4.18	110	1.09	1.18	280	2.13
Round 7	17/09/2019	225	423	2.32	2.35	57.1	255	1.24	1.2	561	2.36
Round 8	10/10/2019	260	263	2.34	2.75	59.9	200	1.46	1.59	316	2.51
Min		46	92.6	1.15	1.08	1.22	110	0.89	1.14	91.3	2.13
Max		260	484	2.41	2.75	59.9	255	1.46	1.59	561	2.51
10th percentile		65.81	112.48	1.556	1.416	2.235	128	1.03	1.168	175.79	2.176
20th percentile		88.18	122.6	1.75	1.56	2.798	146	1.094	1.188	239.2	2.222
80th percentile		219	359	2.332	2.254	36.568	233	1.36	1.266	499.4	2.45
90th percentile		235.5	441.3	2.361	2.47	57.94	244	1.418	1.366	551.2	2.48
median		127	189.5	1.945	1.745	4.68	200	1.245	1.23	317.5	2.36

Total Cations											
Client sample ID (1st):		SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
Limit of reporting		1	1	1	1	1	1	1	1	1	1
Unit	Date	meq/L 0.01	meq/L 0.01	meq/L 0.01	meq/L 0.01	meq/L 0.01	meq/L 0.01	meq/L 0.01	meq/L 0.01	meq/L 0.01	meq/L 0.01
Round 1	16/05/2019	115	212	1.98	1.92	4.8		1.3	1.32	284	
Round 2	5/06/2019	206	470	1.84	1.72	5.78		1.26	1.36	552	
Round 3	27/06/2019	114	88	1.35	1.28	1.32		0.99	1.43	88.6	
Round 4	18/07/2019	44.2	114	1.71	1.76	2.53		1.37	1.27	195	
Round 5	8/06/2019	72.2	159	1.98	1.8	3.17		1.34	1.4	458	
Round 6	27/08/2019	94.8	110	2.23	2.01	3.82	97	1.22	1.32	260	2.09
Round 7	17/09/2019	212	432	2.41	2.5	56.9	244	1.38	1.4	592	2.5
Round 8	10/10/2019	250	258	2.43	2.74	59.5	194	1.47	1.76	307	2.69
Min		44.2	88	1.35	1.28	1.32	97	0.99	1.27	88.6	2.09
Max		250	470	2.43	2.74	59.5	244	1.47	1.76	592	2.69
10th percentile		63.8	103.4	1.602	1.588	2.167	116.4	1.151	1.305	163.08	2.172
20th percentile		81.24	111.6	1.762	1.736	2.786	135.8	1.236	1.32	221	2.254
80th percentile		209.6	362.4	2.338	2.304	36.452	224	1.376	1.418	514.4	2.614
90th percentile		223.4	443.4	2.416	2.572	57.68	234	1.407	1.529	564	2.652
median		114.5	185.5	1.98	1.86	4.31	194	1.32	1.38	295.5	2.5

10 Appendix 3 – Groundwater results and analysis

Groundwater in-situ results

GW In-situ pH											
Client sample ID (1st):	TSCGW16	GW094	GW097	GW091	GW092	GW098	GW0912	GW0910	BH4	BH3	BH2
Unit	pH Unit	pH Unit	pH Unit	pH Unit	pH Unit	pH Unit	pH Unit	pH Unit	pH Unit	pH Unit	pH Unit
Round 1	15/05/2019	4.28	3.89	4.44	5.18	4.02	3.88	3.45	3.77	3.83	4.35
Round 2	5/06/2019	3.86	3.34	3.66	4.21	3.29	3.07	2.91	3.14	3.35	3.04
Round 3	26/06/2019	3.96	3.39	4.2	5.03	3.82	3.58	3.33	3.61	3.83	4.01
Round 4	17/07/2019	4.9	3.73	4.12	5.24	4.03	3.72	3.53	3.71	4.05	4.18
Round 5	8/08/2019	4.7	4.11	4.43	5.36	4.03	3.33	3.62	3.81	3.93	3.7
Round 6	28/08/2019	4.28	3.99	4.19	5.06	3.71	3.61	3.2	3.39	3.8	3.87
Round 7	18/09/2019	4.47	4.13	4.43	5.3	3.88	3.66	3.44	3.62	4.02	4.04
Round 8	10/10/2019	4.28	4.06	4.21	5.04	3.6	3.69	3.27	3.64	4.25	4.22
Min		3.86	3.34	3.66	4.21	3.29	3.07	2.91	3.14	3.35	3.5
Max		4.9	4.13	4.44	5.36	4.03	3.93	3.63	3.61	4.25	4.22
10th percentile		3.93	3.515	3.982	4.784	3.507	3.413	3.315	3.665	3.313	3.722
20th percentile		4.088	3.646	4.148	5.034	3.644	3.568	3.228	3.478	3.812	3.898
80th percentile		4.608	4.09	4.43	5.276	4.026	3.816	3.552	3.746	4.038	4.316
90th percentile		4.76	4.116	4.433	5.318	4.03	3.895	3.623	3.782	4.2	4.316
median		4.28	3.94	4.205	5.12	3.85	3.65	3.385	3.63	3.93	4.04

GW In-situ Electrical Conductivity																			
Client sample ID (1st):	TSCGW16	GW094	GW097	GW091	GW092	GW098	GW0912	GW0910	BH4	BH3	BH2	BH5	BH1	GW099	GW0911	TSCGW10	GW093	GW095	GW0913
Unit	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm
Round 1	15/05/2019	94	71	60	55	43	49	114	83	121	108	276	853	90	276	853	113	55	58
Round 2	5/06/2019	131	78	58	77	78	82	121	108	124	132	314	383	96	62	493	77	68	0.4
Round 3	26/06/2019	125	111	57	78	73	78	114	124	132	132	314	469	113	57	469	73	200	359
Round 4	17/07/2019	125	115	64	75	74	79	117	124	131	124	393	383	113	63	430	78	132	91
Round 5	8/08/2019	118	92	63	75	73	66	114	131	140	131	295	88	59	374	374	72	59	51
Round 6	28/08/2019	129	97	76	93	99	82	140	156	131	156	318	100	72	369	83	68	68	122
Round 7	18/09/2019	103	59	51	72	67	56	113	112	112	112	293	72	48	290	62	35	35	387
Round 8	10/10/2019	105	85	75	107	102	80	157	142	133	142	332	113	80	30.7	632	119	82	106
Min		94	59	51	55	43	49	113	90	113	90	276	853	90	276	853	113	55	58
Max		131	115	75	107	102	82	157	156	157	156	853	113	80	30.7	632	119	82	106
10th percentile		100.3	67.4	55.2	66.9	59.8	53.9	113.7	102.6	109.6	109.6	287.9	66.9	54.3	212.21	59.9	47	200	359
20th percentile		103.8	73.8	57.4	73.2	69.4	60	114	109.6	114	109.6	293.8	78.4	57.4	321.6	66	57.4	217.12	460
80th percentile		127.4	105.4	70.6	87.4	90.6	81.2	133.6	138	145.1	138	368.6	113	68.4	483.4	81	73.6	410.4	554.2
90th percentile		129.6	112.2	75	97.2	99.9	82	145.1	146.2	145.1	146.2	368.6	113	68.4	483.4	81	73.6	410.4	554.2
median		121.5	88.5	61.5	77.5	75.5	78.5	119	127.5	119	127.5	316	113	74.4	512.5	592.1	114.8	94	115.7

GW Insitu Temperature														
Client sample ID (1st):	TSCGW16	GW094	GW097	GW091	GW092	GW098	GW0912	GW0910	BH4	BH3	BH2	BH5	BH1	GW099
Unit	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Round 1	15/05/2019	20.11	20.03	20.24	21.99	22.86	23.45	22.65	21.71	24.84	23.71	23.51	21.98	22.24
Round 2	5/06/2019	18.56	18.34	21.16	21.31	20.54	21.39	20.11	19.01	21.99	21.64	20.98	21.07	20.3
Round 3	26/06/2019	18.82	18.14	19.82	20.14	20.6	20.81	19.12	18.36	21.8	21.23	20.93	20.96	19.35
Round 4	17/07/2019	17.14	16.72	20.32	20.06	20.32	20.41	19.96	17.61	22.1	21.28	20.52	20.86	19.56
Round 5	8/08/2019	17.8	18.15	20.32	21.71	20.51	21.32	19.44	18.54	20.98	21.12	20.55	20.46	19.39
Round 6	28/08/2019	18.57	19.27	21.39	21.1	20.86	20.74	19.83	17.98	21.04	20.6	20.99	20.24	18.4
Round 7	18/09/2019	18.76	19.73	21.43	21.16	21.18	21.41	20.57	19.5	20.85	21.07	20.45	21.99	19.01
Round 8	10/10/2019	22.44	22.16	23.7	23.04	23.51	23.64	21.71	21.36	21.47	21.26	21.04	21.1	22.06
Min		17.14	16.72	19.82	20.06	20	20.41	19.12	17.61	20.85	20.6	19.9	20.55	18.4
Max		22.44	22.18	23.7	23.04	23.51	23.64	22.65	21.71	24.84	23.71	23.51	22.24	22.06
10th percentile		17.602	17.714	20.114	20.116	20.357	20.641	19.444	17.869	20.941	20.929	19.97	20.767	18.766
20th percentile		18.104	18.144	20.272	20.524	20.522	20.768	19.596	18.132	21.004	21.09	20.18	20.908	19.016
80th percentile		19.594	19.91	21.414	21.878	22.188	22.634	21.254	20.616	22.056	21.456	21.016	21.628	20.152
90th percentile		20.809	20.675	22.111	22.305	23.055	23.507	21.992	21.465	22.922	22.261	21.781	21.983	21.004
median		18.665	18.805	20.74	21.235	20.73	21.355	20.035	18.775	21.635	21.245	20.725	21.03	20.885

GW Insitu Redox Potential														
Client sample ID (1st):	TSCGW16	GW094	GW097	GW091	GW092	GW098	GW0912	GW0910	BH4	BH3	BH2	BH5	BH1	GW099
Unit	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
Round 1	15/05/2019	332	482	604	600	629	599	574	626	338	601	522	365	389
Round 2	5/06/2019	374	535	600	637	642	626	621	644	506	664	611	491	472
Round 3	26/06/2019	175	416	446	451	508	448	448	512	228	342	281	196	503
Round 4	17/07/2019	123	286	416	406	457	447	438	402	290	460	319	231	352
Round 5	8/08/2019	120	240	411	433	461	453	415	448	292	451	318	268	352
Round 6	28/08/2019	251	316	436	451	461	459	388	440	333	507	411	325	304
Round 7	18/09/2019	256	361	447	432	490	441	385	447	348	519	403	366	395
Round 8	10/10/2019	217	360	480	489	503	425	360	420	233	454	315	264	420
Min		120	240	411	406	457	425	360	402	228	436	315	231	352
Max		374	535	604	637	642	626	621	644	506	664	611	491	472
10th percentile		122.1	272.2	414.5	424.2	459.8	436.2	377.5	414.6	231.5	446.5	317.1	254.1	215.6
20th percentile		143.8	298	424	432.4	461	443.4	386.2	428	255.8	452.2	318.4	265.6	357.2
80th percentile		301.6	455.6	552	555.6	580.6	543	523.6	580.4	344	568.2	477.6	365.6	486.4
90th percentile		344.6	497.9	601.2	611.1	632.9	607.1	588.1	631.4	395.4	619.9	548.7	403.5	522.6
median		234	355.5	446.5	451	495.5	454.5	426.5	447.5	312.5	483.5	372.5	303	274

GW Insitu Redox Potential																				
Client sample ID (1st):	Date	TSCGW16	GW094	GW097	GW091	GW092	GW098	GW0912	GW0910	BH4	BH3	BH2	BH5	BH1	GW099	GW0911	TSCGW10	GW093	GW095	GW0913
Unit		mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV	mV
Round 1	15/05/2019	332	492	604	600	629	599	574	626	338	601	522	385	389	552	347	496	432	579	636
Round 2	5/06/2019	374	535	646	637	642	626	621	644	506	664	641	491	472	552	398	447	485	611	667
Round 3	26/06/2019	175	406	451	508	508	456	448	512	228	436	342	281	186	503	97	373	406	476	487
Round 4	17/07/2019	123	286	416	457	457	447	438	402	231	460	352	319	240	352	160	182	254	430	484
Round 5	8/08/2019	120	240	411	433	461	453	441	448	292	451	318	268	244	352	178	185	286	333	484
Round 6	28/08/2019	251	316	436	451	461	459	388	440	333	507	378	413	325	378	245	223	360	377	424
Round 7	18/09/2019	256	381	447	432	460	441	385	447	348	519	403	366	308	386	395	198	366	424	420
Round 8	10/10/2019	217	350	480	489	503	425	380	420	233	454	315	284	224	420	260	155	369	474	413
Min		120	240	411	406	457	425	360	402	231	454	315	231	196	352	97	135	254	333	413
Max		374	535	604	637	642	626	621	644	506	664	641	491	472	552	398	496	485	611	687
10th percentile		122.1	272.2	414.5	424.2	459.8	436.2	377.5	414.6	231.5	446.5	317.1	254.1	215.6	352	144.1	149	276.4	363.8	417.9
20th percentile		163.8	298	424	432.4	461	443.4	386.2	428	255.8	453.2	318.4	265.6	230.4	357.2	167.2	165.8	315.6	395.8	442
80th percentile		301.6	455.6	552	555.6	580.6	543	523.6	580.4	344	568.2	477.6	365.6	356.6	486.4	312.2	417.4	421.6	537.8	577.6
90th percentile		344.6	497.9	601.2	611.1	632.9	607.1	588.1	631.4	395.4	619.9	548.7	403.5	413.9	522.6	362.3	461.7	447.9	588.6	651.3
median		234	355.5	465.5	451	496.5	454.5	447.5	312.5	312.5	483.5	372.5	303	274	395	231	210.5	367.5	452	484.5

Groundwater laboratory results

	Less than the laboratory limit of reporting (LOR)
	Approximate value

Total Nitrogen as N (TKN + NOx)											
Client sample ID (1st):		BH3	BH4	GW0910	GW098	GW092	GW091	GW097	TSCGW16	GW0912	GW094
Limit of reporting		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	15/05/2019	0.8	2.5	0.9	0.7	0.7	0.8	0.7	1.8	0.6	1.3
Round 2	4/06/2019	0.6	3.2	0.8	0.6	0.7	0.9	0.8	2.2	0.7	1.2
Round 3	26/06/2019	0.6	3.2	1	0.8	0.9	1.3	0.7	2	0.8	1.3
Round 4	17/07/2019	0.9	1.1	0.8	0.6	0.7	0.9	0.3	2.1	0.3	0.4
Round 5	8/08/2019	0.7	3.1	1.2	0.7	1.8	0.9	1.6	2.8	0.7	1.8
Round 6	28/08/2019	0.7	2.8	1.1	0.7	0.8	0.9	0.9	2	0.6	1.1
Round 7	18/09/2019	0.8	3	1.1	0.6	0.8	0.8	0.8	2.4	0.5	1.1
Round 8	8/10/2019	0.9	2.8	1.1	1	0.9	0.7	0.7	1.9	0.8	1
Min		0.6	1.1	0.8	0.6	0.7	0.7	0.3	1.8	0.3	0.4
Max		0.9	3.2	1.2	1	1.8	1.3	1.6	2.8	0.8	1.8
10th percentile		0.6	2.08	0.8	0.6	0.7	0.77	0.58	1.87	0.44	0.82
20th percentile		0.64	2.62	0.84	0.6	0.7	0.8	0.7	1.94	0.54	1.04
80th percentile		0.86	3.16	1.1	0.76	0.9	0.9	0.86	2.32	0.76	1.3
90th percentile		0.9	3.2	1.13	0.86	1.17	1.02	1.11	2.52	0.8	1.45
median		0.75	2.9	1.05	0.7	0.8	0.9	0.75	2.05	0.65	1.15

Filtered Total Nitrogen as N											
Client sample ID (1st):		BH3	BH4	GW0910	GW098	GW092	GW091	GW097	TSCGW16	GW0912	GW094
Limit of reporting		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	15/05/2019	0.7	1.6	0.8	0.7	0.7	0.8	0.7	1.7	0.5	1.1
Round 2	4/06/2019	0.6	1.8	0.9	0.7	0.8	1	0.7	1.9	0.7	1.1
Round 3	26/06/2019	0.2	1.5	0.5	0.3	0.3	0.4	0.3	2	0.4	0.6
Round 4	17/07/2019	0.6	1.1	0.8	0.6	0.7	0.8	0.1	2	0.2	0.4
Round 5	8/08/2019	0.6	1.3	1.1	0.6	1.8	0.8	1.7	2.5	0.6	1.6
Round 6	28/08/2019	0.6	1.3	1	0.6	0.7	0.8	0.7	1.9	0.4	0.9
Round 7	18/09/2019	0.7	2.2	1	0.6	0.8	0.7	0.8	2.2	0.5	1
Round 8	8/10/2019	0.6	1.6	0.9	0.5	0.7	0.7	0.6	1.6	0.4	0.8
Min		0.2	1.1	0.5	0.3	0.3	0.4	0.1	1.6	0.2	0.4
Max		0.7	2.2	1.1	0.7	1.8	1	1.7	2.5	0.7	1.6
10th percentile		0.48	1.24	0.71	0.44	0.58	0.61	0.24	1.67	0.34	0.54
20th percentile		0.6	1.3	0.8	0.54	0.7	0.7	0.42	1.78	0.4	0.68
80th percentile		0.66	1.72	1	0.66	0.8	0.8	0.76	2.12	0.56	1.1
90th percentile		0.7	1.92	1.03	0.7	1.1	0.86	1.07	2.29	0.63	1.25
median		0.6	1.55	0.9	0.6	0.7	0.8	0.7	1.95	0.45	0.95

Nitrite plus Nitrate as N (NOx)											
Client sample ID (1st):		BH3	BH4	GW0910	GW098	GW092	GW091	GW097	TSCGW16	GW0912	GW094
Limit of reporting		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	15/05/2019	0.17	0.08	0.04	0.04	0.04	0.23	0.03	0.01	0.01	0.01
Round 2	4/06/2019	0.05	0.05	0.025	0.025	0.025	0.34	0.025	0.025	0.025	0.025
Round 3	26/06/2019	0.03	0.05	0.005	0.02	0.04	0.22	0.005	0.005	0.03	0.12
Round 4	17/07/2019	0.01	0.05	0.005	0.005	0.005	0.18	0.02	0.005	0.06	0.07
Round 5	8/08/2019	0.02	0.005	0.18	0.005	0.96	0.2	0.93	0.49	0.005	0.47
Round 6	28/08/2019	0.01	0.005	0.005	0.005	0.005	0.21	0.005	0.005	0.005	0.03
Round 7	18/09/2019	0.04	0.025	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Round 8	8/10/2019	0.03	0.005	0.03	0.005	0.02	0.13	0.005	0.03	0.005	0.005
Min		0.01	0.005	0.005	0.005	0.005	0.05	0.005	0.005	0.005	0.005
Max		0.17	0.08	0.18	0.05	0.96	0.34	0.93	0.49	0.06	0.47
10th percentile		0.01	0.005	0.005	0.005	0.005	0.106	0.005	0.005	0.005	0.0085
20th percentile		0.014	0.005	0.005	0.005	0.011	0.15	0.005	0.005	0.005	0.016
80th percentile		0.046	0.05	0.046	0.034	0.046	0.226	0.042	0.042	0.042	0.1
90th percentile		0.086	0.059	0.089	0.043	0.323	0.263	0.314	0.182	0.053	0.225
median		0.03	0.0375	0.0275	0.0125	0.0325	0.205	0.0225	0.0175	0.0175	0.04

Total Kjeldahl Nitrogen											
Client sample ID (1st):		BH3	BH4	GW0910	GW098	GW092	GW091	GW097	TSCGW16	GW0912	GW094
Limit of reporting		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	15/05/2019	0.6	2.4	0.9	0.7	0.7	0.6	0.7	1.8	0.6	1.3
Round 2	4/06/2019	0.6	3.2	0.8	0.6	0.7	0.6	0.8	2.2	0.7	1.2
Round 3	26/06/2019	0.6	3.2	1	0.8	0.9	1.1	0.7	2	0.8	1.2
Round 4	17/07/2019	0.9	1.1	0.8	0.6	0.7	0.7	0.3	2.1	0.2	0.3
Round 5	8/08/2019	0.6	1.3	0.9	0.6	0.8	0.6	0.8	2	0.6	1.1
Round 6	28/08/2019	0.7	2.8	1.1	0.7	0.8	0.7	0.9	2	0.6	1.1
Round 7	18/09/2019	0.8	3	1.1	0.6	0.8	0.8	0.8	2.4	0.5	1.1
Round 8	8/10/2019	0.9	2.8	1.1	1	0.9	0.6	0.7	1.9	0.8	1
Min		0.6	1.1	0.8	0.6	0.7	0.6	0.3	1.8	0.2	0.3
Max		0.9	3.2	1.1	1	0.9	1.1	0.9	2.4	0.8	1.3
10th percentile		0.6	1.24	0.8	0.6	0.7	0.6	0.58	1.87	0.41	0.79
20th percentile		0.6	1.74	0.84	0.6	0.7	0.6	0.7	1.94	0.54	1.04
80th percentile		0.86	3.12	1.1	0.76	0.86	0.76	0.8	2.16	0.76	1.2
90th percentile		0.9	3.2	1.1	0.86	0.9	0.89	0.83	2.26	0.8	1.23
median		0.65	2.8	0.95	0.65	0.8	0.65	0.75	2	0.6	1.1

Nitrite as N											
Client sample ID (1st):		BH3	BH4	GW0910	GW098	GW092	GW091	GW097	TSCGW16	GW0912	GW094
Limit of reporting		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	15/05/2019	0.005	0.025	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Round 2	4/06/2019	0.005	0.25	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Round 3	26/06/2019	0.005	0.025	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Round 4	17/07/2019	0.005	0.025	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Round 5	8/08/2019	0.005	0.025	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Round 6	28/08/2019	0.005	0.025	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Round 7	18/09/2019	0.005	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Round 8	8/10/2019	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Min		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Max		0.005	0.25	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
10th percentile		0.005	0.019	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
20th percentile		0.005	0.025	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
80th percentile		0.005	0.025	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
90th percentile		0.005	0.0925	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
median		0.005	0.025	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005

Nitrate as N											
Client sample ID (1st):		BH3	BH4	GW0910	GW098	GW092	GW091	GW097	TSCGW16	GW0912	GW094
Limit of reporting		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	15/05/2019	0.17	0.08	0.04	0.04	0.04	0.23	0.03	0.01	0.01	0.01
Round 2	4/06/2019	0.05	0.25	0.025	0.025	0.025	0.34	0.025	0.025	0.025	0.025
Round 3	26/06/2019	0.03	0.05	0.005	0.02	0.04	0.22	0.005	0.005	0.03	0.12
Round 4	17/07/2019	0.01	0.05	0.005	0.005	0.005	0.18	0.02	0.005	0.06	0.07
Round 5	8/08/2019	0.02	0.05	0.18	0.005	0.96	0.2	0.93	0.49	0.005	0.47
Round 6	28/08/2019	0.01	0.05	0.005	0.005	0.005	0.21	0.005	0.005	0.005	0.03
Round 7	18/09/2019	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Round 8	8/10/2019	0.03	0.005	0.03	0.005	0.02	0.13	0.005	0.03	0.005	0.005
Min		0.01	0.005	0.005	0.005	0.005	0.05	0.005	0.005	0.005	0.005
Max		0.17	0.25	0.18	0.05	0.96	0.34	0.93	0.49	0.06	0.47
10th percentile		0.01	0.0365	0.005	0.005	0.005	0.106	0.005	0.005	0.005	0.0085
20th percentile		0.014	0.05	0.005	0.005	0.011	0.15	0.005	0.005	0.005	0.016
80th percentile		0.046	0.068	0.046	0.034	0.046	0.226	0.042	0.042	0.042	0.1
90th percentile		0.086	0.131	0.089	0.043	0.323	0.263	0.314	0.182	0.053	0.225
median		0.03	0.05	0.0275	0.0125	0.0325	0.205	0.0225	0.0175	0.0175	0.04

Total Phosphorus as P											
Client sample ID (1st):		BH3	BH4	GW0910	GW098	GW092	GW091	GW097	TSCGW16	GW0912	GW094
Limit of reporting		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Unit	Date	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Round 1	15/05/2019	0.06	0.5	0.05	0.03	0.005	0.06	0.05	0.02	0.005	0.04
Round 2	4/06/2019	0.02	0.36	0.005	0.005	0.005	0.09	0.07	0.03	0.005	0.02
Round 3	26/06/2019	0.01	0.26	0.005	0.005	0.005	0.12	0.05	0.02	0.005	0.005
Round 4	17/07/2019	0.02	0.17	0.005	0.005	0.005	0.13	0.04	0.04	0.03	0.05
Round 5	8/08/2019	0.01	0.34	0.005	0.005	0.005	0.12	0.06	0.03	0.005	0.02
Round 6	28/08/2019	0.02	0.36	0.005	0.02	0.02	0.11	0.09	0.03	0.005	0.03
Round 7	18/09/2019	0.02	0.32	0.005	0.005	0.005	0.1	0.06	0.03	0.005	0.03
Round 8	8/10/2019	0.03	0.33	0.005	0.01	0.005	0.08	0.04	0.02	0.005	0.01
Min		0.01	0.17	0.005	0.005	0.005	0.06	0.04	0.02	0.005	0.005
Max		0.06	0.5	0.05	0.03	0.02	0.13	0.09	0.04	0.03	0.05
10th percentile		0.01	0.233	0.005	0.005	0.005	0.074	0.04	0.02	0.005	0.0085
20th percentile		0.014	0.284	0.005	0.005	0.005	0.084	0.044	0.02	0.005	0.014
80th percentile		0.026	0.36	0.005	0.016	0.005	0.12	0.066	0.03	0.005	0.036
90th percentile		0.039	0.402	0.0185	0.023	0.0095	0.123	0.076	0.033	0.0125	0.043
median		0.02	0.335	0.005	0.005	0.005	0.105	0.055	0.03	0.005	0.02