

Oxley Highway to Kempsey Upgrade Project **Construction water quality monitoring report - 22 July 2016 to 21 January 2017**



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1 Introduction

1.1 The project

On behalf of the Australian and NSW governments, Roads and Maritime Services (Roads and Maritime) is currently constructing the Oxley Highway to Kempsey Pacific Highway Upgrade (the project). The project is 37 kilometres in length, commencing about 700 metres north of the Oxley Highway interchange and continuing northwards to tie in with the dual carriageways of the Kempsey to Eungai Pacific Highway Upgrade. The project involves the duplication of the existing highway, except for sections in the vicinity of the Hastings River and Wilsons River that deviate from the existing highway, and a bypass of Telegraph Point. The existing highway will be retained wherever possible for use as a service road or local road connection. Figure 1-1 shows the location of the project.

Roads and Maritime will construct and open the project in stages. The stages of the project are:

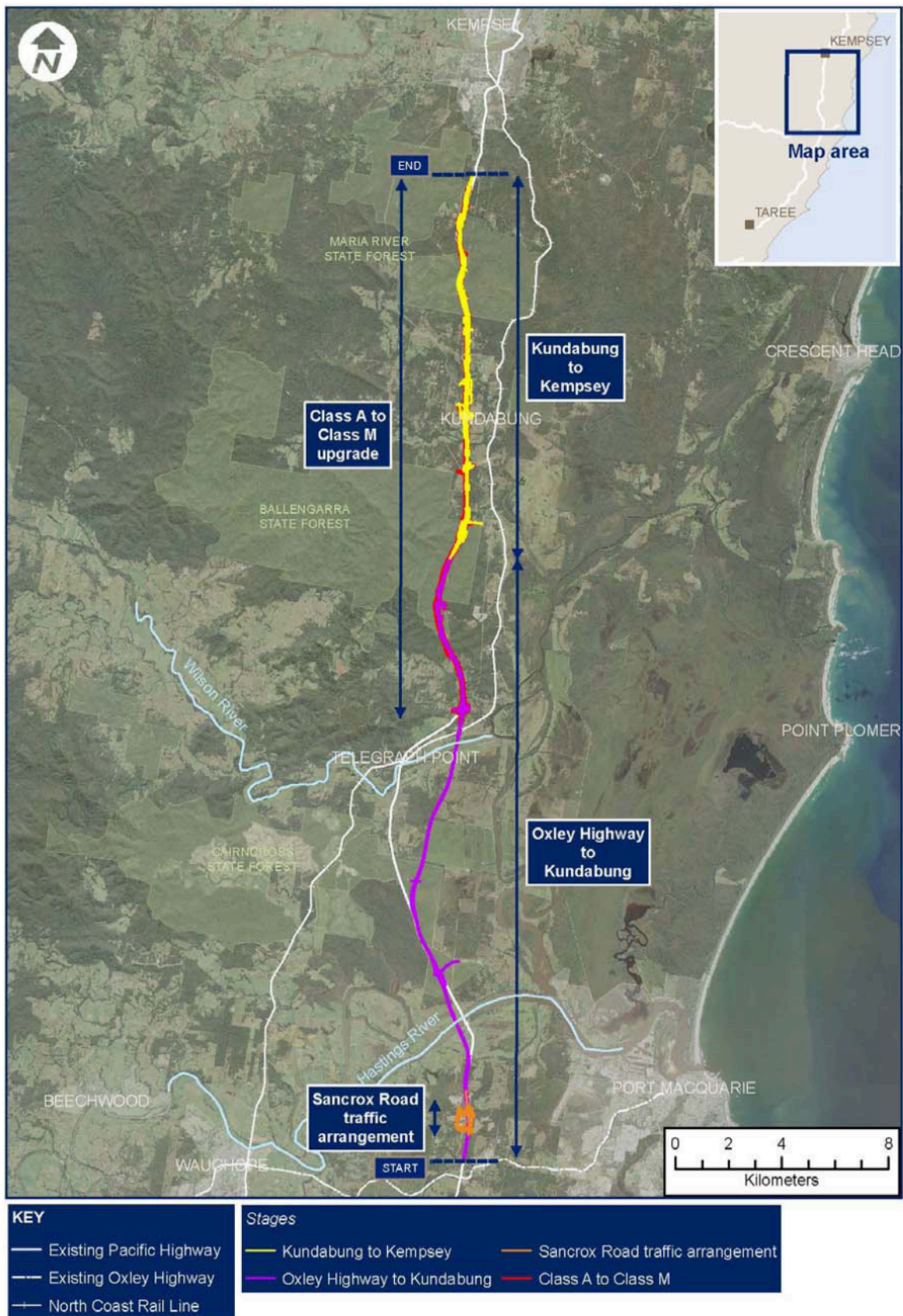
- Stage 1 - The Sancrox Traffic Arrangement works located about two kilometres north of the Oxley Highway / Pacific Highway intersection. This section of the project opened to traffic on 30 November 2015
- Stage 2 - Kundabung to Kempsey Stage consisting of about 14 kilometres of dual carriageway, commencing north of Barrys Creek near Kundabung (chainage 24,000) and connecting to the Kempsey Bypass at Stumpy Creek (Chainage 37,800)
- Stage 3 - Oxley Highway to Kundabung Stage consisting of about 24 kilometres of dual carriageway, commencing just north of the Oxley Highway / Pacific Highway intersection (chainage 700) and connecting with the Kundabung to Kempsey stage just north of Barrys Creek (chainage 24,000).

1.2 Project approval

On 8 December 2006, the project was declared by the then Minister for Planning to be a project to which Part 3A of the *Environmental Planning and Assessment Act 1979* applies. An environmental assessment was prepared and placed on public exhibition for 30 days between September and October 2010. Following consideration of submissions made during the exhibition period, the submissions report, including changes to the proposal following consideration of submissions, was submitted to the Minister for Planning and Infrastructure seeking approval. Approval of the project was granted on 8 February 2012, subject to a number of Conditions of Approval (MCoA). At the request of Roads and Maritime, the Minister has since modified the approval on two occasions.

Under MCoA B17, Roads and Maritime must prepare and implement a Water Quality Monitoring Program (WQMP) to monitor the impacts of the project on surface and groundwater quality and resources and wetlands, during construction and operation. The WQMP was prepared in consultation with the EPA, DPI (Fishing and Aquaculture) and NOW, and was submitted to the Department of Planning and Infrastructure for approval on 11 February 2014. The plan was subsequently approved on 5 March 2014.

Figure 1-1 Location of Oxley Highway to Kempsey project



1.3 Purpose of this report

The WQMP developed in response to MCoA B17 outlines various pre-construction, construction and post-construction surface and groundwater quality monitoring and assessment requirements. This report addresses the fifth construction period between 22 July 2016 and 21 January 2017 of surface and groundwater quality monitoring requirements outlined in Chapter 4 and Chapter 5 of the WQMP, which include, but are not limited to:

- Undertaking surface and groundwater quality sampling monthly and at other intervals throughout construction
- Collecting and analysing representative surface water samples for chemical, physical and nutrient properties during dry and wet-weather conditions
- Collecting and analysing representative groundwater samples for chemical, physical and nutrient properties, and major cations and anions at nominated intervals
- Comparing upstream and downstream surface water sampling results to evaluate and determine whether any changes and/or impacts on water quality might be attributable to construction
- Evaluate trends in groundwater conditions through an analysis of measured results gathered during pre-construction and construction, and determine any changes and/or impacts that might be attributable to construction
- Reviewing surface and ground water quality monitoring results to evaluate the potential for surface and groundwater interactions where a change in an established historical trend suggests an influence
- Providing results of sampling to relevant stakeholders including the DP&E, DPI (Fishing) and NOW
- Accumulating further data to provide a basis for construction and post-construction monitoring result comparison.

2 Methodology

The approved method for surface and groundwater quality monitoring is outlined in detail in the WQMP. The following sections are a summary of key elements of that program.

2.1 Monitoring sites

The project traverses either through or near a number of water dependent ecosystems including major rivers, creeks, tributaries, SEPP 14 wetlands and endangered ecological communities. Surface and groundwater quality monitoring sites were selected to ensure potential impacts on these systems from the project could be identified early and where necessary measures to remedy any impacts implemented.

2.1.1 Surface water monitoring sites

Table 2-1 lists the 27 surface water quality monitoring locations and the reason for site selection. Appendix A includes a series of maps that show the location of each monitoring site relative to the project alignment. The WQMP identified 30 locations for sampling of which SW4a, SW4b and SW5a are no longer subject to the program. These sites were removed from the regular sample regime as they rarely hold or carry water, generally only limited to the immediate effect of surface flows during a rain event. The remaining 27 site are considered sufficiently diverse in terms of location, condition, type and suitability for the protection of nearby sensitive water depended ecosystems / land uses.

Table 2-1 Surface water quality monitoring locations

Site no.	Chainage	Waterway name	Position relative to project	Reason for site selection
SW1a	2500	Unnamed tributary of Fernbank Creek	Upstream / West	Industrial land use upstream
SW1b	2600	Unnamed tributary of Fernbank Creek	Upstream / West	Industrial land use upstream
SW1c	2650	Unnamed tributary of Fernbank Creek	Downstream / East	Industrial land use upstream
SW2a	4620	Fernbank Creek	Downstream / East	EEC / ASS
SW2b	4800	Fernbank Creek	Upstream / West	EEC / ASS
SW3a	6040	Northern bank of Hastings River	Upstream / West	Major river with oyster leases downstream
SW3b	6080	Northern bank of Hastings River	Downstream / East	Major river with oyster leases downstream
SW5b	15820	Unnamed tributary of Wilson River	Downstream / West	EEC / ASS
SW6a	16460	South bank of Wilson River	Upstream / West	Major river / SEPP 14 / Floodplain / ASS

Site no.	Chainage	Waterway name	Position relative to project	Reason for site selection
SW6b	16600	South bank of Wilson River	Downstream / East	Major river / SEPP 14 / Floodplain / ASS
SW6c	16830	North bank of Wilson River	Upstream / West	Major river / SEPP 14 / Floodplain / ASS
SW6d	16840	North bank of Wilson River	Downstream / East	Major river / SEPP 14 / Floodplain / ASS
SW7a	19660	Cooperabung Creek	Upstream / West	EEC / Giant Barred Frog habitat
SW7b	19660	Cooperabung Creek	Downstream / East	EEC / Giant Barred Frog habitat
SW8a	23775	Barrys Creek	Upstream / West	EEC / Giant Barred Frog habitat
SW8b	24000	Barrys Creek	Downstream / East	EEC / Giant Barred Frog habitat
SW8c	25325	Barrys Creek	Downstream / East	EEC / Giant Barred Frog habitat
SW9a	28300	Smiths Creek	Downstream / East	EEC / Giant Barred Frog habitat
SW9b	28300	Smiths Creek	Upstream / West	EEC / Giant Barred Frog habitat
SW10a	30700	Pipers Creek	Downstream / East	EEC / Giant Barred Frog habitat
SW10b	30700	Pipers Creek	Upstream / West	EEC / Giant Barred Frog habitat
SW11a	34650	Unnamed drainage line	Downstream / East	Downhill of significant cut site / potential ASR
SW11b	34700	Unnamed drainage line	Upstream / West	Downhill of significant cut site / potential ASR
SW12a	36850	Maria River	Upstream / West	Major river / EEC / Giant Barred Frog habitat
SW12b	36850	Maria River	Downstream / East	Major river / EEC / Giant Barred Frog habitat
SW13a	37700	Stumpy Creek	Downstream / East	Major creek / EEC
SW13b	37750	Stumpy Creek	Upstream / West	Major creek / EEC

Surface water quality monitoring of a spring fed dam on private property (known as tipping dam) that had the potential to be affected during construction was also proposed in the WQMP. As noted in the pre-construction surface water quality monitoring report (June 2015) Roads and Maritime's construction partner for Stage 2 (K2K) and the property owner

reached an agreement to use the resource during construction. The dam was enlarged and water is being used for construction purposes. The dam and surrounding land will be restored in-line with the agreement established between the two parties. Monitoring of water levels during construction as outlined in section 4.2 to the WQMP has therefore not been undertaken or proposed.

2.1.2 Groundwater monitoring sites

Further detail is provided in Section 3.7. Of the 13 damaged during previous reporting periods, 11 have been reinstated in the lead up to monitoring in August 2016.

Table 2-2 lists the 30 groundwater quality monitoring locations and the reason for site selection. Appendix A includes a series of maps that show the location of each monitoring site relative to the project alignment. A number of these monitoring sites have been directly affected by construction (ie top of casing damaged by earthworks) during previous reporting periods. Further detail is provided in Section 3.7. Of the 13 damaged during previous reporting periods, 11 have been reinstated in the lead up to monitoring in August 2016.

Table 2-2 Groundwater quality monitoring locations

Site no.	Chainage	Reason for site selection
GW01	3020	Category A Cut
GW02	5000	Floodplain / ASS / significant embankment
GW03	5500	Floodplain / ASS / significant embankment
GW04	6140	Floodplain / ASS / significant embankment
GW05	6350	Floodplain / ASS / significant embankment
GW06	7620	Category A Cut
GW07	8640	Category A Cut / significant earthworks for intersection / no existing groundwater information in this location
GW08	10360	Category A Cut / no existing groundwater information in this location
GW09	10440	Category A Cut
GW10	11460	Confirm Cut Category B / near EEC & GDE
GW11	13100	Floodplain / near existing groundwater users / near EEC & GDE
GW12	15830	Floodplain / ASS / near EEC & GDE
GW13	16400	Floodplain / ASS / near EEC & GDE / significant embankment
GW14	17080	SEPP 14 / floodplain / significant embankment / ASS / EEC / GDE
GW15	17920	Category A Cut / nearby existing groundwater users
GW16	18390	Category A Cut / near existing groundwater users / near ASS
GW17	20680	Category A Cut
GW18	21050	Category A Cut
GW19	22000	Confirm Cut Category B / near EEC
GW20	22620	Category A Cut
GW21	22620	Category A Cut (and will assist with modelling)
GW22	24800	Significant cut / acid sulfate rock expected in this location / capture impacts from the rest areas
GW23	24800	Significant cut / acid sulfate rock expected in this location / capture impacts

Site no.	Chainage	Reason for site selection
		from the rest areas
GW24	25900	Cluster of private bores to the east of the highway / next to a cut
GW25	33800	Category A Cut
GW26	34300	Category B Cut
GW27	35150	Category A Cut
GW28	35280	Category A Cut
GW29	35900	Category A Cut
GW30	37160	Category A Cut/ near existing groundwater user

2.2 Monitoring parameters

Surface water quality monitoring parameters have been selected with reference to:

- Roads and Maritime Guideline for Construction Water Quality Monitoring (RTA undated)
- The Australian guidelines for water quality monitoring and reporting (ANZECC Monitoring Guidelines) (ANZECC/ARMCANZ 2000b)
- The parameters included in earlier monitoring programs within the region (eg by the Port Macquarie Hastings Council and by the Kempsey Bypass Alliance).

For groundwater, the standard water quality parameters were selected from Appelo & Postma (1993), Driscoll (1989) and Sterrett (2007).

Table 2-3 lists the monitoring parameters that form the basis of the surface and groundwater water monitoring program and identifies whether measurement is taken in the field or by a NATA accredited laboratory off site.

Table 2-3 Water quality monitoring parameters

Parameter type	Surface (SW) or groundwater (GW)	Parameter	Unit of measurement	Analysis method
Chemical properties	SW and GW	pH	Scale 0 to 14	Field measurement
	SW	Dissolved oxygen (DO)	%	Field measurement
	SW and GW	Total petroleum hydrocarbons	ug/L	Field visual assessment / laboratory measurement
	SW and GW	Trace metals: Aluminum (Al) Arsenic (As) Cadmium (Cd) Chromium (Cr) Copper (Cu) Iron (Fe) Lead (Pb) Manganese (Mn) Mercury (Hg)	mg/L	Laboratory measurement

		Nickel (Ni) Silver (Ag) Zinc (Zn)		
Physical properties	SW	Electrical conductivity (EC)	uS/cm	Field measurement
	GW	Electrical conductivity (EC)	uS/cm	Field measurement / laboratory analysis
	SW and GW	Temperature	°C	Field measurement
	SW	Turbidity	NTU	Field measurement
	SW	Total suspended solids	mg/L	Laboratory measurement
Nutrients	SW and GW	Total nitrogen (TN)	mg/L	Laboratory measurement
	SW and GW	Total phosphorous (TP)	mg/L	Laboratory measurement
Nutrients	GW	Ammonia (NH ₄) Phosphate (PO ₄)	mg/L	Laboratory measurement
Major anions	GW	Bicarbonate (HCO ⁻) Chloride (Cl ⁻) Nitrate (NO ₃ ⁻) Sulfate (SO ₄ ²⁻)	mg/L	Laboratory measurement
Major cations	GW	Calcium (Ca ²⁺) Magnesium (Mg ²⁺) Potassium (K ⁺) Sodium (Na ⁺)	mg/L	Laboratory measurement
Groundwater levels	GW	Groundwater levels	Metres below top of casing (mTOC)	Field measurement

2.3 Water quality analysis

Section 2.2 noted that the analysis of water quality depending on the parameter subject to investigation is undertaken in one of two ways. Some physical and chemical properties due to their rapid degradation with time are analysed in the field. This analysis has been performed with the use of a Yeo-Kal Model 615 Water Quality Analyser on surface waters. The instrument is factory calibrated annually, with in-field calibration checked / undertaken at regular intervals, typically monthly and/or prior to each sampling event.

ALS NATA accredited Sydney laboratory operations undertake all off-site surface water quality analysis. Samples are collected on-site in ALS supplied sample bottles, refrigerated and transported to the ALS Warabrook depot for dispatch to Sydney. Chain of custody documentation is produced and updated during the collection, transport and analysis stages of the process.

Similarly, analysis of groundwater is undertaken both in the field and off-site by an accredited NATA laboratory as the parameter dictates (refer to Section 2.2). Automated data loggers (Hobo) have been installed and/or replaced at 27 groundwater monitoring sites to recorded groundwater levels below ground at 30 minute intervals. One barometric air pressure data logger has also been installed, enabling the correction of water levels across the monitoring

site to local atmospheric conditions. In-field dip level monitoring is also undertaken on a two monthly basis.

In-field parameters are analysed using a DKK-TOA Model WQC-24 multi parameter water quality meter. The presence of hydrocarbons for both surface and groundwater are undertaken on a visual basis in the first instance. Where found to be present a sample is collected and sent for laboratory analysis.

ALS NATA accredited Sydney laboratory operations have performed off-site groundwater sample analysis during this reporting period. Chain of custody documentation is produced and updated during the collection, transport and analysis stages of the process.

2.4 Monitoring frequency and duration

2.4.1 Surface water

During the construction surface water quality monitoring phase, sampling of all parameters except trace metals, are required for one dry event and as required two wet-weather events per month. Further monitoring of trace metals are required for one dry weather event and as required one wet weather event per month. A wet-weather event has been defined as 10 millimetres of rainfall within a 24-hour period. Sampling for a wet-weather event commences within 24 hours of the cessation of that event.

2.4.2 Groundwater

During the construction groundwater quality monitoring phase, sampling of in-field parameters are required on a monthly basis, or every two months where a groundwater level logger is in place. Monitoring of anions, cations, ammonia and phosphate are to be monitored on one occasion in the first quarter and then on an annual basis thereafter. All other laboratory analysed parameters shall be monitored on a monthly basis for the first three months and then on a three monthly basis if no impact is detected. If an impact is detected (ie levels outside of trigger values that are inconsistent with historical trends), this monitoring would be reinstated to a monthly basis.

The requirements for ongoing construction and post-construction monitoring are detailed in the WQMP and will be outlined in subsequent construction and post-construction surface water quality monitoring reports.

2.5 Rainfall records

During this construction monitoring period rainfall records were obtained through three Bureau of Meteorology weather stations including:

- Kempsey Airport (Station number – 59007)
- Telegraph Point – Farrawells Road (Station number – 60031)
- Port Macquarie Airport (Station number – 60139).

Rainfall records for these stations are attached at Appendix B and include the period between July 2016 and January 2017.

Site based weather stations have also been established for the project at three locations including:

- Kundabung – Port Macquarie
- Telegraph Point – Port Macquarie

- Sancrox – Port Macquarie.

These stations have been established at various times during pre-construction and construction. These stations have been used during the construction phase of the project to determine the need for wet-weather monitoring and ongoing water quality reporting. Records from these sites for the monitoring period are also attached and Appendix B.

3 Results

3.1 Prevailing climatic conditions

Rainfall during the reporting period 22 July 2016 to 21 January 2017 was mixed with rainfall records at the Port Macquarie Airport Bureau of Meteorology monitoring station characterised as either well above or well below average. July, September, November, December and January were well below average with rainfall ranging between two and 10 times below the historical monthly averages. August was two and a half times above the average. October was about average, or slightly above. A summary of daily / monthly rainfall for the three Bureau of Meteorology weather stations within the Port Macquarie / Kempsey area and three project weather stations referred to in Section 2.5 are provided at Appendix B.

3.2 Summary of construction activities

Construction activity with the potential to impact on surface and groundwater quality was in progress extensively across Stage 2 and Stage 3 of project during the monitoring period. Work on each of the stages included (see further detail on groundwater in Section 3.9):

- Stage 1 – Sancrox Traffic Arrangement Works opened to traffic on 30 November 2015. There were no construction works during the reporting period. Landscaping across Stage 1 has established well with the site considered stable and presenting limited potential to influence surface water quality within SW1. The Stage 1 Environment Protection Licence was surrendered on 30 November 2016.
- Stage 2 – Earthworks were in progress across the entire site during the monitoring period and included achieving final levels on deep cuts and fill embankments. Substantial progress was also made on a number of bridge and culvert structures. Mainline paving progressed in areas to the north and south and facilitated two interim traffic switches. Permanent landscaping and rehabilitation work continued with a number of areas entering a maintenance phase. All waterways and groundwater resources on Stage 2 had the potential to be influenced by construction during the reporting period.
- Stage 3 – Earthworks, including deep cuts and high fill embankments, progressed in a number of areas across the entire Stage 3 site during the reporting period. Culvert and bridge works were also in progress or being finalised at or near all waterway crossings. Major crossings of the Hastings River and Wilsons River were completed with paving and road furniture remaining outstanding. Substantial progress on mainline paving was made during the reporting period that allowed important traffic switches to occur, particularly between Sancrox and Fernbank Creek. All waterways and groundwater resources on Stage 3 had the potential to be influenced by construction during the reporting period.

Further detail on all construction activities undertaken during the reporting period is provided in the Oxley Highway to Kempsey – Construction Compliance Tracking Report 5 (March 2017).

3.3 Limitations of surface water results

A number of factors have influenced either the continuity or completeness of water quality results obtained during the monitoring period and the extent in some circumstances to which they are suitable for upstream and downstream comparison. Relevant considerations include:

- Waterway conditions at times were such that where sampling was undertaken following wet weather events (ie an event greater than 10 millimetres in 24 hours), particularly

where only a marginal event occurred, no visible response within some waterways was observed ie no subsequent flow and/or connection between upstream and downstream sampling locations

- Some freshwater streams were observed to be isolated ponds, or completely dry, at different times during sampling. Waterways affected included SW1, SW2, SW5, SW7, SW8, SW12 and SW13. On all occasions this was in response to naturally low flows.
- SW2a and SW2b were dry on three and six occasions, respectively.
- SW5b was dry on three occasions with water levels too low on a further three occasions to obtain in-field measurements. On these three occasions only laboratory bottled samples were collected.
- SW7a was dry on three occasions with the water level too low on a further occasion to obtain an in-field sample. On this occasion only a laboratory bottled sample was collected. On this basis, comparison between 80th and 20th percentiles at SW7a and downstream location (ie SW7b) do not always adequately represent any potential impacts associated with construction.
- SW8a was dry on 13 occasions during the monitoring period. On only one occasion were all sampling points connected. At all other times SW8b persisted as an isolated pond. On this basis, comparison between 80th and 20th percentiles at SW8a and downstream locations (ie SW8b, SW8c) do not always adequately represent any potential impacts associated with construction.
- 80th and 20th percentile trigger values have generally been established from 24 sampling events up to and including the month subject to analysis (consistent with ANZECC requirements). However, due to the frequency of metal analysis during pre-construction and prevailing dry conditions during subsequent construction monitoring periods, the trigger values have been derived from fewer samples for SW8. This anomaly will be resolved progressively during subsequent reporting periods as the number of samples analysed for metals reaches and exceeds 24 events.
- While construction on Stage 3 technically commenced during November 2014, samples collected up until January 2015 at SW5b have been used to supplement pre-construction data. Rainfall during the pre-construction period was sporadic and below average leading to a prolonged period where samples were unable to be collected for SW5b (ie water absent from sample location). As works with the ability to affected water quality at SW5b were not in progress until late January 2015, data collected up until this time has been used for pre-construction / construction comparison purposes. Notwithstanding this, only eight samples analysed for metals were taken during the extended pre-construction period. Other parameters were measured on up to 18 occasions.
- Sheet piling in the Wilsons River to create a coffer-dam was completed in May 2015. The completion of this work effectively closed the south branch of the river and restricted all tidal and flood water movements to the northern branch (via sample points SW6c and SW6d). Sampling points SW6a and SW6b therefore did not provide an effective correlation between upstream and downstream conditions up to and including the 18 August 2016 monitoring event. However, following this sampling event, the coffer dam was removed allowing water movement between upstream and downstream to return to near normal / pre-construction condition.

3.4 Summary of surface water results

Table 3-1 to Table 3-27 represent an aggregate summary of water quality results by waterway for upstream and downstream sampling locations. In accordance with the WQMP, 80th and 20th percentiles for upstream sample locations form the trigger values for median

downstream results. Appendix C includes all monitoring results for this construction period. Full laboratory reports for all sampling events are available on request.

Table 3-1 Construction surface water quality results by waterway

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results									
				August 2016					September 2016				
				SW1a derived trigger values*			SW1b	SW1c	SW1a derived trigger values*			SW1b	SW1c
				Std dev	80 th %	20 th %	Median	Median	Std dev	80 th %	20 th %	Median	Median
Temperature	°C	-2-50	NA	4.1	22.5	14.6	13.7	15.4	4.1	22.5	14.2	15.0	17.1
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	287	656	187	794	1138	284	656	187	1128	1071
Dissolved oxygen (DO)	%	0-200	85-110	27	73	16	90	92	27	73	19	82	80
pH		0-14	6.5-8	0.4	6.9	6.5	7.0	7.1	0.4	6.9	6.4	7.1	7.3
Turbidity	NTU	0-600	6-50	25	59	26	25	30	25	59	26	15	87
Total suspended solids (TSS)	mg/L	5	-	11	15	5	5	5	11	15	5	12	41
Aluminium (Al)	mg/L	0.01	0.055"	0.55	0.62	0.03	0.36	0.29	0.55	0.62	0.03	0.01	0.02
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0004
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	7.29	3.67	0.33	0.35	0.29	7.27	3.67	0.48	0.10	0.11
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.417	0.613	0.022	0.053	0.037	0.417	0.613	0.022	0.172	0.302
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.002
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.012	0.010	0.005	0.006	0.005	0.009	0.010	0.005	0.005	0.034
Total Nitrogen (TN)	mg/L	0.1	0.5	0.9	0.9	0.3	0.3	0.6	0.9	0.8	0.3	0.2	0.6
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.04	0.01	0.01	0.03	0.02	0.04	0.01	0.02	0.24

* Trigger values derived from 24 sampling events up to and including the month indicated.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

" for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-2 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results									
				October 2016					November 2016				
				SW1a derived trigger values*			SW1b	SW1c	SW1a derived trigger values*			SW1b	SW1c
				Std dev	80 th %	20 th %	Median	Median	Std dev	80 th %	20 th %	Median	Median
Temperature	°C	-2-50	NA	4.1	22.0	14.2	15.7	16.1	3.8	21.2	14.2	19.9	20.1
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	303	656	187	837	984	293	726	238	700	718
Dissolved oxygen (DO)	%	0-200	85-110	26	73	19	68	62	25	64	19	65	71
pH		0-14	6.5-8	0.3	6.9	6.4	7.4	7.7	0.3	6.8	6.4	7.0	7.4
Turbidity	NTU	0-600	6-50	24	54	24	110	72	32	59	27	120	194
Total suspended solids (TSS)	mg/L	5	-	12	20	5	21	21	16	23	5	27	49
Aluminium (Al)	mg/L	0.01	0.055"	0.55	0.62	0.02	0.02	0.02	0.56	0.41	0.02	0.03	0.02
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.002
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.002	0.002	0.000	0.001	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	7.27	3.67	0.40	0.08	0.05	7.25	4.04	0.40	0.21	0.06
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.410	0.613	0.028	0.318	0.108	0.406	0.613	0.040	0.330	0.136
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.002	0.000	0.001	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.014	0.010	0.005	0.005	0.011	0.014	0.011	0.005	0.005	0.028
Total Nitrogen (TN)	mg/L	0.1	0.5	0.3	0.6	0.2	0.3	0.6	0.3	0.6	0.2	0.3	0.6
Total Phosphorous (TP)	mg/L	0.01	0.05	0.01	0.02	0.01	0.02	0.12	0.02	0.02	0.01	0.02	0.05

* Trigger values derived from 24 sampling events up to and including the month indicated.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

" for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-3 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results									
				December 2016					January 2017				
				SW1a derived trigger values*			SW1b	SW1c	SW1a derived trigger values*			SW1b	SW1c
				Std dev	80 th %	20 th %	Median	Median	Std dev	80 th %	20 th %	Median	Median
Temperature	°C	-2-50	NA	3.6	21.1	14.2	22.7	22.9	3.7	21.2	14.2	22.6	22.6
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	275	785	357	796	713	246	772	357	879	1013
Dissolved oxygen (DO)	%	0-200	85-110	22	53	19	57	58	22	53	22	53	41
pH		0-14	6.5-8	0.3	6.8	6.4	7.0	7.2	0.3	6.8	6.4	7.2	7.1
Turbidity	NTU	0-600	6-50	33	63	27	46	99	52	99	27	17	14
Total suspended solids (TSS)	mg/L	5	-	13	20	5	11	19	16	20	5	5	6
Aluminium (Al)	mg/L	0.01	0.055"	0.53	0.17	0.01	0.03	0.03	0.53	0.17	0.01	0.01	0.01
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.002	0.000	0.001	0.001	0.002	0.002
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.002
Iron (Fe)	mg/L	0.05	ID	7.30	4.04	0.24	0.21	0.10	7.36	1.75	0.15	0.24	0.06
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.403	0.595	0.051	0.404	0.230	0.399	0.489	0.051	0.317	0.533
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.002
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.012	0.011	0.005	0.005	0.007	0.012	0.011	0.005	0.008	0.016
Total Nitrogen (TN)	mg/L	0.1	0.5	0.3	0.6	0.2	0.4	0.7	0.3	0.6	0.3	0.2	0.2
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.02	0.01	0.02	0.06	0.02	0.02	0.01	0.01	0.01

* Trigger values derived from 24 sampling events up to and including the month indicated.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

" for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-4 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2016				September 2016				October 2016			
				SW2b*			SW2a	SW2b*			SW2a	SW2b*			SW2a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.7	22.5	13.5	12.8	4.7	22.5	13.5	16.3	4.4	22.0	13.5	16.0
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	159	719	479	482	172	736	479	591	246	795	483	670
Dissolved oxygen (DO)	%	0-200	85-110	19	45	7	77	19	45	7	79	40	51	7	53
pH		0-14	6.5-8	0.3	6.8	6.3	7.1	0.3	6.8	6.4	7.2	0.4	7.0	6.4	7.6
Turbidity (NTU)	NTU	0-600	6-50	42	50	19	15	43	50	15	7	43	52	16	27
Total suspended solids (TSS)	mg/L	5	-	27	45	9	5	27	45	9	6	44	56	11	7
Aluminium (Al)	mg/L	0.01	0.055*	0.12	0.17	0.01	0.05	0.12	0.12	0.01	0.01	0.08	0.07	0.01	0.03
Arsenic (As)	mg/L	0.001	0.024	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	5.84	6.89	0.94	0.23	5.89	6.89	0.76	0.34	5.90	6.89	0.76	0.40
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	1.589	2.752	0.533	0.059	1.375	2.656	0.448	0.080	1.077	2.316	0.448	0.278
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.005	0.004	0.001	0.001	0.005	0.004	0.001	0.001	0.005	0.002	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.007	0.014	0.005	0.009	0.007	0.010	0.005	0.005	0.006	0.007	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.5	1.0	1.6	0.6	0.5	1.0	1.6	0.6	0.4	1.3	2.7	0.6	0.7
Total Phosphorous (TP)	mg/L	0.01	0.05	0.19	0.26	0.08	0.02	0.19	0.26	0.08	0.02	0.20	0.43	0.10	0.03

* Trigger values derived from 24 sampling events up to and including the month indicated.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

* for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-5 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2016				December 2016				January 2017			
				SW2b*			SW2a	SW2b*			SW2a	SW2b*			SW2a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.3	22.0	13.5	19.8	4.3	22.0	13.5	22.5	4.3	22.0	13.5	-
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	246	902	498	722	246	902	498	947	246	902	498	-
Dissolved oxygen (DO)	%	0-200	85-110	42	60	10	56	42	60	10	82	42	60	10	-
pH		0-14	6.5-8	0.4	7.0	6.4	7.4	0.4	7.0	6.4	7.8	0.4	7.0	6.4	-
Turbidity (NTU)	NTU	0-600	6-50	43	53	16	31	43	53	16	14	43	53	16	-
Total suspended solids (TSS)	mg/L	5	-	45	65	11	9	45	65	11	10	45	65	11	-
Aluminium (Al)	mg/L	0.01	0.055"	0.04	0.02	0.01	0.01	0.04	0.02	0.01	0.02	0.04	0.02	0.01	-
Arsenic (As)	mg/L	0.001	0.024	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.001	0.001	0.002	0.001	-
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	-
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	-
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	-
Iron (Fe)	mg/L	0.05	ID	5.95	6.89	0.63	0.28	5.95	6.89	0.63	0.18	5.95	6.89	0.63	-
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	-
Manganese (Mn)	mg/L	0.001	1.9	0.982	2.010	0.448	1.144	0.982	2.010	0.448	0.410	0.982	2.010	0.448	-
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	-
Nickel (Ni)	mg/L	0.001	0.011	0.005	0.002	0.001	0.002	0.005	0.002	0.001	0.002	0.005	0.002	0.001	-
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	-
Zinc (Zn)	mg/L	0.005	0.008	0.002	0.006	0.005	0.005	0.002	0.006	0.005	0.005	0.002	0.006	0.005	-
Total Nitrogen (TN)	mg/L	0.1	0.5	1.4	3.2	0.7	0.9	1.4	3.2	0.7	1.2	1.4	3.2	0.7	-
Total Phosphorous (TP)	mg/L	0.01	0.05	0.20	0.45	0.10	0.015	0.20	0.45	0.10	0.05	0.20	0.45	0.10	-

* Trigger values derived from 24 sampling events up to and including the month indicated.

Note -SW2a was dry for all monitoring events in January 2017.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

ID – Insufficient representative data (ANZECC).

Table 3-6 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2016				September 2016				October 2016			
				SW3a*			SW3b	SW3a*			SW3b	SW3a*			SW3b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.3	25.5	17.4	15.7	4.4	25.5	17.3	17.7	4.2	25.1	17.3	20.9
Electrical conductivity (EC)	uS/cm	0-8000	-	2008	8000	8000	8000	1928	8000	8000	8000	1928	8000	8000	8000
Dissolved oxygen (DO)	%	0-200	80-110	8	93	79	99	8	94	81	94	7	94	81	86
pH		0-14	7.0-8.5	0.3	7.5	6.9	7.5	0.3	7.5	6.9	7.6	0.4	7.6	6.9	7.8
Turbidity (NTU)	NTU	0-600	0.5-10	49	20	8	32	49	19	8	5	49	21	7	36
Total suspended solids (TSS)	mg/L	5		27	8	5	8	27	8	5	5	27	10	5	12
Aluminium (Al)	mg/L	0.01	ID	0.10	0.10	0.01	0.20	0.10	0.10	0.01	0.01	0.10	0.10	0.01	0.10
Arsenic (As)	mg/L	0.001	ID	0.004	0.010	0.001	0.002	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.010
Cadmium (Cd)	mg/L	0.0001	0.0055	0.0004	0.0010	0.0001	0.0001	0.0004	0.0010	0.0001	0.0001	0.0004	0.0010	0.0001	0.0010
Chromium (Cr)	mg/L	0.001	0.0274	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.010
Copper (Cu)	mg/L	0.001	0.0013	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.010
Iron (Fe)	mg/L	0.05	ID	0.19	0.50	0.05	0.20	0.19	0.50	0.05	0.05	0.20	0.50	0.05	0.50
Lead (Pb)	mg/L	0.001	0.0044	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.010
Manganese (Mn)	mg/L	0.001	ID	0.015	0.037	0.018	0.024	0.015	0.037	0.018	0.030	0.014	0.037	0.018	0.033
Mercury (Hg)	mg/L	0.0001	0.0004	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.07	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.010
Silver (Ag)	mg/L	0.001	0.0014	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.010
Zinc (Zn)	mg/L	0.005	0.015	0.021	0.050	0.005	0.006	0.021	0.050	0.005	0.006	0.021	0.050	0.005	0.050
Total Nitrogen (TN)	mg/L	0.1	0.3	0.3	0.5	0.2	0.5	0.3	0.5	0.2	0.2	0.3	0.5	0.2	0.3
Total Phosphorous (TP)	mg/L	0.01	0.03	0.03	0.05	0.02	0.05	0.03	0.05	0.02	0.02	0.03	0.07	0.02	0.05

* Trigger values derived from 24 sampling events up to and including the month indicated.

Note – Since April 2014 the upper limit of Electrical Conductivity (EC) is 8000 uS/cm due to in-field equipment range limitations.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

ID – Insufficient representative data (ANZECC).

Table 3-7 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2016				December 2016				January 2017			
				SW3a*			SW3b	SW3a*			SW3b	SW3a*			SW3b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.1	24.8	17.3	23.9	4.1	24.8	17.1	25.1	4.4	25.0	17.3	26.8
Electrical conductivity (EC)	uS/cm	0-8000	-	1928	8000	8000	8000	1928	8000	8000	8000	1928	8000	8000	8000
Dissolved oxygen (DO)	%	0-200	80-110	7	95	82	96	7	95	82	88	7	96	82	92
pH		0-14	7.0-8.5	0.3	7.7	7.1	7.6	0.3	7.7	7.3	7.5	0.3	7.7	7.3	7.4
Turbidity (NTU)	NTU	0-600	0.5-10	49	20	6	5	50	19	6	10	50	21	6	17
Total suspended solids (TSS)	mg/L	5		27	10	5	5	27	9	5	17	27	9	5	5
Aluminium (Al)	mg/L	0.01	ID	0.10	0.10	0.01	0.10	0.09	0.10	0.01	0.10	0.09	0.10	0.01	0.06
Arsenic (As)	mg/L	0.001	ID	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.006
Cadmium (Cd)	mg/L	0.0001	0.0055	0.0004	0.0010	0.0001	0.0010	0.0004	0.0010	0.0001	0.0010	0.0004	0.0010	0.0001	0.0006
Chromium (Cr)	mg/L	0.001	0.0274	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.006
Copper (Cu)	mg/L	0.001	0.0013	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.006
Iron (Fe)	mg/L	0.05	ID	0.20	0.50	0.05	0.30	0.21	0.50	0.05	0.30	0.21	0.50	0.05	0.28
Lead (Pb)	mg/L	0.001	0.0044	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.006
Manganese (Mn)	mg/L	0.001	ID	0.015	0.037	0.017	0.010	0.015	0.037	0.015	0.013	0.014	0.035	0.014	0.012
Mercury (Hg)	mg/L	0.0001	0.0004	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0002
Nickel (Ni)	mg/L	0.001	0.07	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.006
Silver (Ag)	mg/L	0.001	0.0014	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.006
Zinc (Zn)	mg/L	0.005	0.015	0.022	0.050	0.005	0.050	0.022	0.050	0.005	0.050	0.022	0.050	0.005	0.036
Total Nitrogen (TN)	mg/L	0.1	0.3	0.3	0.5	0.2	0.5	0.3	0.5	0.2	0.5	0.3	0.5	0.2	0.5
Total Phosphorous (TP)	mg/L	0.01	0.03	0.03	0.05	0.02	0.05	0.03	0.05	0.02	0.05	0.03	0.05	0.03	0.05

* Trigger values derived from 24 sampling events up to and including the month indicated.

Note – Since April 2014 the upper limit of Electrical Conductivity (EC) is 8000 uS/cm due to in-field equipment range limitations.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

ID – Insufficient representative data (ANZECC).

Table 3-8 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results								
				SW5b pre construction trigger values*			SW5b median values					
				Std dev	80 th %	20 th %	August 2016	September 2016	October 2016	November 2016	December 2016	January 2017
Temperature	°C	-2-50	No data	5.4	27.3	19.3	17.1	17.0	22.7	29.5	-	-
Electrical conductivity (EC)	uS/cm	0-8000	No data	446	1042	490	436	616	832	916	-	-
Dissolved oxygen (DO)	%	0-200	No data	28	115	67	50	4	63	124	-	-
pH		0-14	No data	0.8	5.6	4.2	6.9	7.0	7.8	8.2	-	-
Turbidity (NTU)	NTU	0-600	No data	172	50	6	11	13	18	25	-	-
Total suspended solids	mg/L	5	-	313	279	8	5	5	8	16	93	-
Aluminium (Al)	mg/L	0.01	0.055 [“]	1.13	1.97	0.42	0.13	0.01	0.03	0.02	0.03	-
Arsenic (As)	mg/L	0.001	0.024	0.003	0.004	0.001	0.001	0.001	0.002	0.003	0.005	-
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0004	0.0007	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	-
Chromium (Cr)	mg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	-
Copper (Cu)	mg/L	0.001	0.0014	0.002	0.004	0.002	0.001	0.001	0.002	0.001	0.001	-
Iron (Fe)	mg/L	0.05	ID	5.55	4.49	0.31	0.65	0.47	0.27	0.15	0.39	-
Lead (Pb)	mg/L	0.001	0.0034	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	-
Manganese (Mn)	mg/L	0.001	1.9	1.097	3.086	1.652	0.626	1.370	1.125	1.215	1.995	-
Mercury (Hg)	mg/L	0.0001	0.0006	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	-
Nickel (Ni)	mg/L	0.001	0.011	0.008	0.015	0.005	0.001	0.001	0.001	0.001	0.001	-
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	-
Zinc (Zn)	mg/L	0.005	0.008	0.126	0.269	0.043	0.010	0.012	0.007	0.005	0.011	-
Total Nitrogen (TN)	mg/L	0.1	No data	4.4	5.3	0.4	0.4	0.8	2.1	4.0	11.1	-
Total Phosphorous (TP)	mg/L	0.01	No data	0.59	0.16	0.02	0.03	0.04	0.10	0.22	1.01	-

* Trigger values are typically derived from 24 sampling events up to and including the month indicated. However, this is not the case for SW5b due to the general absence of water during the pre-construction monitoring period. The pre-construction period was extended to 20 January 2015 to facilitate the inclusion of additional pre-construction results. While work was in progress more broadly across the project, there was no work in the vicinity of the sampling point with the potential to influence results.

Note – Water too shallow during December 2016 sampling event to obtain a field measurement. Waterbody dry during January 2017.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

“ for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-9 Construction surface water quality results by waterway (cont)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2016				September 2016				October 2016			
				SW6a*			SW6b	SW6a*			SW6b	SW6a*			SW6b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.6	26.4	17.1	15.8	4.7	26.4	17.1	18.0	4.4	25.4	17.1	21.2
Electrical conductivity (EC)	uS/cm	0-8000	-	2993	5634	300	460	2998	5634	300	521	3496	7844	300	8000
Dissolved oxygen (DO)	%	0-200	80-110	9	91	76	89	8	92	77	97	7	91	78	84
pH		0-14	7.0-8.5	0.3	7.3	6.7	6.9	0.3	7.3	6.8	7.3	0.3	7.3	6.8	7.2
Turbidity (NTU)	NTU	0-600	0.5-10	22	22	12	45	22	21	12	9	23	21	8	8
Total suspended solids (TSS)	mg/L	5		9	11	5	16	9	11	5	5	9	11	5	5
Aluminium (Al)	mg/L	0.01	ID	0.18	0.30	0.01	0.45	0.18	0.30	0.01	0.16	0.18	0.30	0.01	0.01
Arsenic (As)	mg/L	0.001	ID	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0055	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.0274	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0013	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.22	0.44	0.05	0.42	0.21	0.44	0.05	0.34	0.21	0.44	0.05	0.05
Lead (Pb)	mg/L	0.001	0.0044	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	ID	0.059	0.155	0.017	0.045	0.059	0.140	0.017	0.016	0.052	0.106	0.017	0.096
Mercury (Hg)	mg/L	0.0001	0.0004	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.07	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.015	0.006	0.006	0.005	0.005	0.007	0.007	0.005	0.005	0.007	0.007	0.005	0.006
Total Nitrogen (TN)	mg/L	0.1	0.3	0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.3	0.2	0.5	0.2	0.2
Total Phosphorous (TP)	mg/L	0.01	0.03	0.03	0.04	0.01	0.04	0.03	0.04	0.01	0.01	0.02	0.04	0.01	0.02

* Trigger values derived from 24 sampling events up to and including the month indicated.

Note – Since April 2014 the upper limit of Electrical Conductivity (EC) is 8000 uS/cm due to in-field equipment range limitations.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

ID – Insufficient representative data (ANZECC).

Table 3-10 Construction surface water quality results by waterway (cont)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2016				December 2016				January 2017			
				SW6a*			SW6b	SW6a*			SW6b	SW6a*			SW6b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.4	25.4	17.1	24.7	4.4	25.5	17.1	26.6	4.7	26.3	17.1	27.3
Electrical conductivity (EC)	uS/cm	0-8000	-	3670	8000	331	8000	3568	8000	471	8000	3537.7	8000	485	8000
Dissolved oxygen (DO)	%	0-200	80-110	7	91	82	92	8	91	80	77	8.5	92	80	82
pH		0-14	7.0-8.5	0.3	7.3	6.9	7.3	0.3	7.3	6.9	7.1	0.2	7.3	6.9	7.0
Turbidity (NTU)	NTU	0-600	0.5-10	23	19	6	6	23	14	5	5	23.6	13	5	7
Total suspended solids (TSS)	mg/L	5		9	11	5	5	7	10	5	5	7.4	8	5	5
Aluminium (Al)	mg/L	0.01	ID	0.18	0.30	0.01	0.01	0.18	0.23	0.01	0.01	0.18	0.23	0.01	0.01
Arsenic (As)	mg/L	0.001	ID	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0055	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.0274	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0013	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.21	0.44	0.05	0.05	0.19	0.43	0.05	0.05	0.19	0.41	0.05	0.05
Lead (Pb)	mg/L	0.001	0.0044	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	ID	0.045	0.105	0.017	0.115	0.046	0.107	0.017	0.105	0.046	0.109	0.018	0.113
Mercury (Hg)	mg/L	0.0001	0.0004	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0002
Nickel (Ni)	mg/L	0.001	0.07	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.015	0.007	0.007	0.005	0.006	0.008	0.012	0.005	0.006	0.006	0.010	0.005	0.008
Total Nitrogen (TN)	mg/L	0.1	0.3	0.2	0.5	0.2	0.2	0.2	0.6	0.2	0.2	0.2	0.6	0.2	0.5
Total Phosphorous (TP)	mg/L	0.01	0.03	0.02	0.03	0.01	0.02	0.02	0.03	0.01	0.02	0.0	0.04	0.01	0.05

* Trigger values derived from 24 sampling events up to and including the month indicated.

Note – Since April 2014 the upper limit of Electrical Conductivity (EC) is 8000 uS/cm due to in-field equipment range limitations.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

ID – Insufficient representative data (ANZECC).

Table 3-11 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2016				September 2016				October 2016			
				SW6c*			SW6d	SW6c*			SW6d	SW6c*			SW6d
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.9	26.6	16.2	15.1	5.0	26.6	16.2	17.9	4.7	25.4	16.2	21.1
Electrical conductivity (EC)	uS/cm	0-8000	-	3095	6151	306	335	3095	6151	306	415	3577	8000	306	8000
Dissolved oxygen (DO)	%	0-200	80-110	9	84	75	85	9	85	76	101	9	88	77	85
pH		0-14	7.0-8.5	0.2	7.1	6.7	6.8	0.2	7.1	6.7	7.3	0.2	7.1	6.7	7.2
Turbidity (NTU)	NTU	0-600	0.5-10	21	23	13	26	21	22	13	8	22	22	10	5
Total suspended solids (TSS)	mg/L	5		8	9	5	10	8	9	5	5	8	9	5	5
Aluminium (Al)	mg/L	0.01	ID	0.16	0.26	0.01	0.51	0.16	0.26	0.01	0.13	0.16	0.26	0.01	0.01
Arsenic (As)	mg/L	0.001	ID	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0055	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.0274	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0013	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.20	0.46	0.05	0.42	0.19	0.46	0.05	0.25	0.19	0.46	0.05	0.05
Lead (Pb)	mg/L	0.001	0.0044	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	ID	0.049	0.117	0.020	0.028	0.049	0.107	0.014	0.012	0.044	0.096	0.014	0.095
Mercury (Hg)	mg/L	0.0001	0.0004	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.07	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.015	0.003	0.006	0.005	0.005	0.003	0.006	0.005	0.005	0.003	0.006	0.005	0.008
Total Nitrogen (TN)	mg/L	0.1	0.3	0.2	0.6	0.2	0.5	0.2	0.5	0.2	0.2	0.3	0.5	0.2	0.2
Total Phosphorous (TP)	mg/L	0.01	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.01	0.02	0.03	0.02	0.02

* Trigger values derived from 24 sampling events up to and including the month indicated.

Note – Since April 2014 the upper limit of Electrical Conductivity (EC) is 8000 uS/cm due to in-field equipment range limitations.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

ID – Insufficient representative data (ANZECC).

Table 3-12 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2016				December 2016				January 2016			
				SW6c*			SW6d	SW6c*			SW6d	SW6c*			SW6d
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.7	25.4	16.2	24.7	4.8	25.7	16.2	26.6	5.1	26.7	16.2	27.7
Electrical conductivity (EC)	uS/cm	0-8000	-	3730	8000	332	8000	3624	8000	409	8000	3571	8000	503	8000
Dissolved oxygen (DO)	%	0-200	80-110	9	93	77	88	9	93	78	76	8	93	80	79
pH		0-14	7.0-8.5	0.2	7.1	6.7	7.0	0.2	7.1	6.7	6.9	0.2	7.1	6.8	7.1
Turbidity (NTU)	NTU	0-600	0.5-10	22	19	7	5	23	16	6	6	23	16	6	7
Total suspended solids (TSS)	mg/L	5		8	7	5	5	8	6	5	5	8	6	5	5
Aluminium (Al)	mg/L	0.01	ID	0.16	0.26	0.01	0.01	0.16	0.22	0.01	0.01	0.17	0.22	0.01	0.01
Arsenic (As)	mg/L	0.001	ID	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.002	0.000	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0055	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.0274	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0013	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.19	0.46	0.05	0.05	0.20	0.46	0.05	0.05	0.20	0.45	0.05	0.05
Lead (Pb)	mg/L	0.001	0.0044	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	ID	0.036	0.094	0.014	0.109	0.038	0.097	0.014	0.105	0.040	0.102	0.014	0.113
Mercury (Hg)	mg/L	0.0001	0.0004	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0002
Nickel (Ni)	mg/L	0.001	0.07	0.000	0.001	0.001	0.002	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.015	0.004	0.008	0.005	0.042	0.004	0.009	0.005	0.010	0.004	0.012	0.005	0.007
Total Nitrogen (TN)	mg/L	0.1	0.3	0.3	0.6	0.2	0.2	0.2	0.5	0.2	0.2	0.2	0.5	0.2	0.5
Total Phosphorous (TP)	mg/L	0.01	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.04	0.02	0.05

* Trigger values derived from 24 sampling events up to and including the month indicated.

Note – Since April 2014 the upper limit of Electrical Conductivity (EC) is 8000 uS/cm due to in-field equipment range limitations.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

ID – Insufficient representative data (ANZECC).

Table 3-13 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2016				September 2016				October 2016			
				SW7a*			SW7b	SW7a*			SW7b	SW7a*			SW7b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	3.8	21.8	14.4	13.0	3.8	21.8	14.4	14.8	3.8	21.8	14.4	17.0
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	35	203	139	181	35	204	143	216	42	208	143	321
Dissolved oxygen (DO)	%	0-200	85-110	23	89	45	91	23	89	45	72	22	89	43	41
pH		0-14	6.5-8	0.4	7.6	6.9	7.5	0.4	7.6	6.9	7.0	0.4	7.6	6.9	7.0
Turbidity (NTU)	NTU	0-600	6-50	17	35	12	25	17	32	12	7	17	32	10	5
Total suspended solids (TSS)	mg/L	5	-	2	6	5	5	2	6	5	5	2	6	5	5
Aluminium (Al)	mg/L	0.01	0.055*	0.27	0.32	0.03	0.35	0.26	0.32	0.03	0.10	0.27	0.32	0.03	0.03
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.22	0.78	0.38	0.33	0.22	0.78	0.38	0.44	0.22	0.78	0.43	0.27
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.051	0.099	0.022	0.023	0.051	0.099	0.022	0.045	0.052	0.107	0.022	0.208
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.018	0.006	0.005	0.005	0.018	0.006	0.005	0.005	0.018	0.006	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.5	0.2	0.4	0.1	0.3	0.2	0.4	0.1	0.2	0.2	0.4	0.1	0.2
Total Phosphorous (TP)	mg/L	0.01	0.05	0.03	0.03	0.01	0.02	0.03	0.03	0.01	0.01	0.03	0.03	0.01	0.01

Trigger values derived from 24 sampling events up to and including the month indicated.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

* for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-14 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2016				December 2016				January 2017			
				SW7a*			SW7b	SW7a*			SW7b	SW7a*			SW7b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	3.6	21.3	14.4	19.6	3.5	21.2	14.3	22.2	3.5	21.2	14.3	23.3
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	43	227	167	287	42	231	177	471	42	231	177	604
Dissolved oxygen (DO)	%	0-200	85-110	24	85	39	52	26	84	38	75	26	84	38	87
pH		0-14	6.5-8	0.4	7.6	7.1	7.0	0.3	7.7	7.3	6.9	0.3	7.7	7.3	6.8
Turbidity (NTU)	NTU	0-600	6-50	17	24	9	12	14	23	9	7	14	23	9	9
Total suspended solids (TSS)	mg/L	5	-	2	7	5	5	3	8	5	5	3	8	5	5
Aluminium (Al)	mg/L	0.01	0.055 [”]	0.27	0.31	0.03	0.03	0.25	0.26	0.03	0.03	0.25	0.26	0.03	0.01
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.002	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.23	0.83	0.43	0.56	0.63	0.85	0.48	0.10	0.63	0.85	0.48	0.12
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.071	0.107	0.022	0.294	0.128	0.136	0.022	0.101	0.128	0.136	0.022	0.271
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.002	0.000	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.018	0.006	0.005	0.005	0.017	0.007	0.005	0.023	0.017	0.007	0.005	0.021
Total Nitrogen (TN)	mg/L	0.1	0.5	0.2	0.4	0.1	0.1	0.2	0.5	0.1	0.2	0.2	0.5	0.1	0.2
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.03	0.01	0.01	0.03	0.03	0.01	0.01	0.03	0.03	0.01	0.01

Trigger values derived from 24 sampling events up to and including the month indicated. However, samples from SW7a were unable to be collected at any time during January 2017 due to the absence of water. Therefore, trigger values for January 2017 were derived from 24 sampling events up to and including December 2016.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

[”] for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-15 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results									
				August 2016					September 2016				
				SW8a derived trigger values*			SW8b	SW8c	SW8a derived trigger values*			SW8b	SW8c
				Std dev	80 th %	20 th %	Median	Median	Std dev	80 th %	20 th %	Median	Median
Temperature	°C	-2-50	NA	2.4	20.4	16.3	15.5	14.1	2.4	20.4	16.3	16.3	15.9
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	78	251	119	165	210	78	251	119	190	305
Dissolved oxygen (DO)	%	0-200	85-110	35	98	21	43	81	35	98	21	33	37
pH		0-14	6.5-8	0.5	6.7	5.9	6.4	6.5	0.5	6.7	5.9	5.9	6.0
Turbidity	NTU	0-600	6-50	11	36	18	30	16	11	36	18	15	6
Total suspended solids (TSS)	mg/L	5	-	2	5	5	5	5	2	5	5	5	7
Aluminium (Al)	mg/L	0.01	0.055"	0.45	0.95	0.08	0.58	0.56	0.45	0.95	0.08	0.41	0.07
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.16	0.38	0.05	0.23	0.24	0.16	0.38	0.05	0.19	0.08
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.025	0.028	0.005	0.012	0.008	0.025	0.028	0.005	0.028	0.038
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.003	0.007	0.005	0.008	0.005	0.003	0.007	0.005	0.006	0.006
Total Nitrogen (TN)	mg/L	0.1	0.5	0.1	0.4	0.2	0.3	0.2	0.1	0.4	0.2	0.1	0.1
Total Phosphorous (TP)	mg/L	0.01	0.05	0.01	0.02	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01

* Trigger values typically derived from 24 sampling events up to and including the month indicated. However, due to the absence of water at SW8a during pre-construction and the previous reporting period, a fewer number of events have been used to derive 80th and 20th percentile trigger values for metals.

Note – Due to the absence of water at SW8a during all sampling events during the monitoring period, with the exception of August 2016, trigger values for all subsequent months have been derived from 24 samples up to and including August 2016.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

" for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-16 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results									
				October 2016					November 2016				
				SW8a derived trigger values*			SW8b	SW8c	SW8a derived trigger values*			SW8b	SW8c
				Std dev	80 th %	20 th %	Median	Median	Std dev	80 th %	20 th %	Median	Median
Temperature	°C	-2-50	NA	2.4	20.4	16.3	15.4	15.9	2.4	20.4	16.3	19.4	18.8
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	78	251	119	264	335	78	251	119	312	335
Dissolved oxygen (DO)	%	0-200	85-110	35	98	21	55	19	35	98	21	44	43
pH		0-14	6.5-8	0.5	6.7	5.9	6.6	6.3	0.5	6.7	5.9	6.5	6.2
Turbidity	NTU	0-600	6-50	11	36	18	12	19	11	36	18	29	14
Total suspended solids (TSS)	mg/L	5	-	2	5	5	5	5	2	5	5	7	5
Aluminium (Al)	mg/L	0.01	0.055"	0.45	0.95	0.08	0.05	0.04	0.45	0.95	0.08	0.03	0.06
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.16	0.38	0.05	0.31	0.25	0.16	0.38	0.05	0.19	0.31
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.025	0.028	0.005	0.128	0.323	0.025	0.028	0.005	0.163	0.212
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.002
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.003	0.007	0.005	0.007	0.007	0.003	0.007	0.005	0.009	0.008
Total Nitrogen (TN)	mg/L	0.1	0.5	0.1	0.4	0.2	0.1	0.2	0.1	0.4	0.2	0.3	0.2
Total Phosphorous (TP)	mg/L	0.01	0.05	0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01

* Trigger values typically derived from 24 sampling events up to and including the month indicated. However, due to the absence of water at SW8a during pre-construction and the previous reporting period, a fewer number of events have been used to derive 80th and 20th percentile trigger values for metals.

Note 1 – Due to the absence of water at SW8a during all sampling events with the exception of August 2016, trigger values for all subsequent months have been derived from 24 samples up to and including August 2016.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

" for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-17 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results									
				December 2016					January 2017				
				SW8a derived trigger values*			SW8b	SW8c	SW8a derived trigger values*			SW8b	SW8c
				Std dev	80 th %	20 th %	Median	Median	Std dev	80 th %	20 th %	Median	Median
Temperature	°C	-2-50	NA	2.4	20.4	16.3	21.9	21.8	2.4	20.4	16.3	22.1	21.5
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	78	251	119	311	345	78	251	119	301	383
Dissolved oxygen (DO)	%	0-200	85-110	35	98	21	26	20	35	98	21	43	21
pH		0-14	6.5-8	0.5	6.7	5.9	6.5	6.3	0.5	6.7	5.9	6.9	6.3
Turbidity	NTU	0-600	6-50	11	36	18	24	5	11	36	18	14	8
Total suspended solids (TSS)	mg/L	5	-	2	5	5	8	8	2	5	5	5	5
Aluminium (Al)	mg/L	0.01	0.055"	0.45	0.95	0.08	0.08	0.04	0.45	0.95	0.08	0.03	0.01
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.002	0.001	0.000	0.001	0.001	0.002	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.16	0.38	0.05	0.88	1.04	0.16	0.38	0.05	0.96	1.28
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.025	0.028	0.005	0.252	0.436	0.025	0.028	0.005	0.271	0.752
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.003	0.007	0.005	0.007	0.026	0.003	0.007	0.005	0.007	0.011
Total Nitrogen (TN)	mg/L	0.1	0.5	0.1	0.4	0.2	0.3	0.1	0.1	0.4	0.2	0.2	0.1
Total Phosphorous (TP)	mg/L	0.01	0.05	0.01	0.02	0.01	0.02	0.01	0.01	0.02	0.01	0.02	0.01

* Trigger values typically derived from 24 sampling events up to and including the month indicated. However, due to the absence of water at SW8a during pre-construction and the previous reporting period, a fewer number of events have been used to derive 80th and 20th percentile trigger values for metals.

Note 1 – Due to the absence of water at SW8a during all sampling events with the exception of August 2016, trigger values for all subsequent months have been derived from 24 samples up to and including August 2016.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

" for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-18 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2016				September 2016				October 2016			
				SW9b*			SW9a	SW9b*			SW9a	SW9b*			SW9a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	3.8	21.3	14.5	12.6	3.9	21.3	14.0	14.2	3.9	21.1	14.0	14.5
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	47	235	151	175	46	235	168	226	51	242	168	285
Dissolved oxygen (DO)	%	0-200	85-110	28	90	28	92	28	90	28	83	27	90	33	42
pH		0-14	6.5-8	0.4	7.3	6.9	6.9	0.4	7.3	6.8	6.8	0.3	7.3	6.9	7.3
Turbidity (NTU)	NTU	0-600	6-50	12	29	13	23	11	23	13	14	12	23	10	8
Total suspended solids (TSS)	mg/L	5	-	1	6	5	5	1	5	5	5	1	5	5	5
Aluminium (Al)	mg/L	0.01	0.055"	0.24	0.47	0.05	0.69	0.24	0.47	0.05	0.13	0.24	0.47	0.05	0.09
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.29	0.80	0.45	0.43	0.30	0.77	0.42	0.32	0.31	0.77	0.39	0.42
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.085	0.147	0.011	0.010	0.086	0.147	0.011	0.014	0.086	0.147	0.011	0.067
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.005	0.007	0.005	0.007	0.005	0.007	0.005	0.006	0.005	0.007	0.005	0.007
Total Nitrogen (TN)	mg/L	0.1	0.5	0.1	0.4	0.2	0.3	0.1	0.4	0.2	0.2	0.1	0.4	0.2	0.2
Total Phosphorous (TP)	mg/L	0.01	0.05	0.09	0.06	0.02	0.02	0.09	0.06	0.02	0.01	0.02	0.05	0.02	0.01

* Trigger values derived from 24 sampling events up to and including the month indicated.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

" for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-19 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2016				December 2016				January 2017			
				SW9b*			SW9a	SW9b*			SW9a	SW9b*			SW9a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	3.6	20.1	14.0	18.9	3.7	20.1	14.0	24.8	4.0	21.0	14.0	21.5
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	53	244	168	255	54	255	174	675	72	265	174	718
Dissolved oxygen (DO)	%	0-200	85-110	28	90	30	46	29	88	25	72	32	88	18	35
pH		0-14	6.5-8	0.3	7.3	6.9	7.1	0.3	7.3	6.8	6.7	0.3	7.2	6.8	6.9
Turbidity (NTU)	NTU	0-600	6-50	13	32	10	53	13	32	8	32	13	32	8	14
Total suspended solids (TSS)	mg/L	5	-	1	5	5	8	2	6	5	13	2	6	5	5
Aluminium (Al)	mg/L	0.01	0.055"	0.24	0.35	0.05	0.08	0.22	0.16	0.05	0.03	0.22	0.13	0.04	0.02
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.003
Iron (Fe)	mg/L	0.05	ID	0.31	0.77	0.39	0.63	1.19	0.85	0.40	0.26	1.34	1.31	0.41	0.67
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.089	0.171	0.011	0.146	0.093	0.205	0.011	0.661	0.333	0.212	0.011	0.481
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.002
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.005	0.008	0.005	0.011	0.005	0.014	0.005	0.009	0.005	0.014	0.005	0.006
Total Nitrogen (TN)	mg/L	0.1	0.5	0.1	0.4	0.2	0.4	0.1	0.4	0.2	1.0	0.2	0.5	0.2	0.4
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.03	0.01	0.01	0.03	0.05	0.01	0.04	0.09	0.1	0.0	0.01

* Trigger values derived from 24 sampling events up to and including the month indicated.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

" for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-20 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2016				September 2016				October 2016			
				SW10b*			SW10a	SW10b*			SW10a	SW10b*			SW10a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.3	22.3	14.2	12.4	4.4	22.3	14.2	14.3	4.3	22.1	14.2	15.7
Electrical conductivity (EC)	µS/cm	0-8000	125-2200	117	412	193	223	115	412	216	268	118	412	216	397
Dissolved oxygen (DO)	%	0-200	85-110	25	81	26	87	25	81	26	71	22	81	39	49
pH		0-14	6.5-8	0.4	7.4	6.8	6.8	0.4	7.4	6.8	6.8	0.4	7.4	6.8	7.2
Turbidity (NTU)	NTU	0-600	6-50	19	47	16	45	19	47	16	15	20	47	16	10
Total suspended solids (TSS)	mg/L	5	-	5	12	5	5	5	12	5	5	4	12	5	5
Aluminium (Al)	mg/L	0.01	0.055"	0.28	0.27	0.04	0.56	0.28	0.27	0.04	0.19	0.29	0.27	0.04	0.05
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.35	1.02	0.39	0.48	0.35	1.02	0.39	0.61	0.34	1.02	0.46	0.63
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.107	0.266	0.018	0.014	0.108	0.266	0.018	0.034	0.104	0.207	0.018	0.105
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.003	0.008	0.005	0.005	0.003	0.008	0.005	0.007	0.003	0.008	0.005	0.006
Total Nitrogen (TN)	mg/L	0.1	0.5	0.2	0.6	0.4	0.4	0.2	0.6	0.3	0.3	0.2	0.6	0.3	0.2
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.01	0.02	0.03	0.02	0.01

* Trigger values derived from 24 sampling events up to and including the month indicated.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

" for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-21 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2016				December 2016				January 2017			
				SW10b*			SW10a	SW10b*			SW10a	SW10b*			SW10a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.0	21.7	14.2	20.3	4.2	21.7	14.2	27.2	4.3	22.0	14.2	22.8
Electrical conductivity (EC)	µS/cm	0-8000	125-2200	117	412	216	351	125	464	216	452	132	484	216	483
Dissolved oxygen (DO)	%	0-200	85-110	20	81	40	60	21	81	39	66	23	81	37	12
pH		0-14	6.5-8	0.4	7.4	6.9	7.1	0.3	7.4	6.9	7.2	0.3	7.3	6.9	7.1
Turbidity (NTU)	NTU	0-600	6-50	20	47	15	15	51	49	15	36	51	51	15	16
Total suspended solids (TSS)	mg/L	5	-	4	12	5	5	4	12	5	10	5	12	5	5
Aluminium (Al)	mg/L	0.01	0.055 [†]	0.29	0.27	0.03	0.03	0.27	0.18	0.02	0.02	0.27	0.18	0.02	0.01
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.33	1.02	0.47	0.48	0.34	1.02	0.43	0.45	0.29	0.84	0.39	0.59
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.110	0.269	0.018	0.160	0.119	0.294	0.023	0.267	0.128	0.294	0.023	0.535
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.003	0.010	0.005	0.006	0.003	0.010	0.005	0.006	0.003	0.008	0.005	0.018
Total Nitrogen (TN)	mg/L	0.1	0.5	0.2	0.6	0.3	0.3	0.2	0.6	0.3	0.4	0.2	0.6	0.3	0.3
Total Phosphorous (TP)	mg/L	0.01	0.05	0.01	0.03	0.01	0.01	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.04

* Trigger values derived from 24 sampling events up to and including the month indicated.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

[†] for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-22 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2016				September 2016				October 2016			
				SW11b*			SW11a	SW11b*			SW11a	SW11b*			SW11a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.7	24.1	15.6	13.0	4.6	23.4	15.6	17.3	4.7	23.4	15.3	15.5
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	668	1712	283	574	657	1712	313	704	699	1823	313	2037
Dissolved oxygen (DO)	%	0-200	85-110	16	104	84	90	16	106	84	108	23	106	79	76
pH		0-14	6.5-8	0.7	7.7	6.4	6.8	0.7	7.7	6.5	7.1	0.6	7.7	6.5	7.7
Turbidity (NTU)	NTU	0-600	6-50	16	41	16	30	16	39	15	20	16	36	14	3
Total suspended solids (TSS)	mg/L	5	-	3	8	5	5	3	8	5	5	3	8	5	5
Aluminium (Al)	mg/L	0.01	0.055"	0.57	0.52	0.05	0.79	0.57	0.52	0.05	0.09	0.58	0.52	0.03	0.01
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.32	0.55	0.07	0.37	0.32	0.55	0.07	0.12	0.32	0.55	0.06	0.05
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.071	0.117	0.023	0.039	0.069	0.111	0.023	0.061	0.068	0.111	0.024	0.054
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.002	0.002	0.001	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.008	0.010	0.005	0.018	0.008	0.010	0.005	0.005	0.008	0.009	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.5	0.3	0.8	0.3	0.8	0.3	0.8	0.3	0.6	0.4	0.8	0.3	0.2
Total Phosphorous (TP)	mg/L	0.01	0.05	0.14	0.02	0.01	0.02	0.14	0.02	0.01	0.01	0.14	0.02	0.01	0.01

* Trigger values derived from 24 sampling events up to and including the month indicated.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

" for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-23 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2016				December 2016				January 2017			
				SW11b*			SW11a	SW11b*			SW11a	SW11b*			SW11a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.3	22.4	15.3	19.1	4.4	22.4	15.3	23.3	4.4	22.3	15.3	22.0
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	684	1823	382	1159	707	1950	448	2028	738	2030	448	2334
Dissolved oxygen (DO)	%	0-200	85-110	19	102	73	72	23	101	68	55	25	98	48	51
pH		0-14	6.5-8	0.6	7.7	6.5	7.6	0.6	7.7	6.7	7.4	0.6	7.6	6.7	7.4
Turbidity (NTU)	NTU	0-600	6-50	16	33	11	6	11	29	6	6	11	26	6	6
Total suspended solids (TSS)	mg/L	5	-	4	8	5	5	4	8	5	5	3	7	5	5
Aluminium (Al)	mg/L	0.01	0.055"	0.59	0.50	0.02	0.02	0.54	0.32	0.02	0.01	0.55	0.32	0.01	0.01
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.33	0.55	0.06	0.07	0.32	0.42	0.05	0.06	0.32	0.42	0.05	0.05
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.069	0.122	0.026	0.116	0.119	0.167	0.030	0.170	0.119	0.186	0.033	0.111
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.002	0.002	0.001	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.008	0.008	0.005	0.009	0.008	0.009	0.005	0.007	0.008	0.009	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.5	0.4	0.7	0.2	0.2	0.2	0.6	0.2	0.3	0.2	0.4	0.2	0.4
Total Phosphorous (TP)	mg/L	0.01	0.05	0.14	0.01	0.01	0.01	0.14	0.01	0.01	0.01	0.00	0.01	0.01	0.01

* Trigger values derived from 24 sampling events up to and including the month indicated.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

" for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-24 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2016				September 2016				October 2016			
				SW12a*			SW12b	SW12a*			SW12b	SW12a*			SW12b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.2	22.2	14.2	12.9	4.2	22.2	14.2	16.5	4.3	22.2	13.9	16.0
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	44	233	168	229	46	236	177	283	50	285	186	303
Dissolved oxygen (DO)	%	0-200	85-110	22	48	16	55	22	50	16	56	22	50	16	36
pH		0-14	6.5-8	0.5	7.0	6.3	6.3	0.5	7.0	6.3	6.1	0.4	7.0	6.4	6.7
Turbidity (NTU)	NTU	0-600	6-50	28	65	23	26	29	65	22	9	30	58	13	8
Total suspended solids (TSS)	mg/L	5	-	11	14	6	5	11	14	6	5	11	13	5	5
Aluminium (Al)	mg/L	0.01	0.055 [†]	0.33	0.57	0.04	0.61	0.33	0.57	0.04	0.21	0.32	0.50	0.02	0.05
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.36	0.97	0.28	0.54	0.35	0.97	0.28	0.73	0.35	1.01	0.45	0.46
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.077	0.206	0.055	0.031	0.076	0.198	0.055	0.064	0.078	0.209	0.063	0.139
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.004	0.009	0.005	0.007	0.003	0.007	0.005	0.005	0.002	0.007	0.005	0.006
Total Nitrogen (TN)	mg/L	0.1	0.5	0.2	0.8	0.5	0.4	0.2	0.8	0.5	1.0	0.2	0.7	0.5	0.4
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.05	0.02	0.02	0.02	0.05	0.02	0.04	0.02	0.05	0.02	0.01

* Trigger values derived from 24 sampling events up to and including the month indicated.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

[†] for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-25 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2016				December 2016				January 2017			
				SW12a*			SW12b	SW12a*			SW12b	SW12a*			SW12b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.0	21.5	13.9	19.3	4.1	21.5	13.9	24.7	4.1	21.4	13.9	21.9
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	48	285	196	298	48	285	196	317	49	285	187	391
Dissolved oxygen (DO)	%	0-200	85-110	22	55	16	32	20	55	20	22	21	53	17	23
pH		0-14	6.5-8	0.4	7.2	6.4	6.9	0.4	7.2	6.4	6.9	0.4	7.1	6.4	6.9
Turbidity (NTU)	NTU	0-600	6-50	30	55	11	13	28	40	11	25	18	30	11	27
Total suspended solids (TSS)	mg/L	5	-	11	12	5	6	5	11	5	13	3	9	5	11
Aluminium (Al)	mg/L	0.01	0.055"	0.33	0.57	0.03	0.04	0.30	0.42	0.03	0.02	0.30	0.40	0.02	0.02
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.002	0.000	0.001	0.001	0.002	0.001	0.002	0.001	0.005
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.240	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.33	1.00	0.46	0.57	0.43	1.06	0.46	1.57	0.47	1.18	0.46	3.84
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.119	0.206	0.055	0.282	0.116	0.221	0.074	0.301	0.120	0.231	0.074	0.451
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.002	0.007	0.005	0.005	0.002	0.007	0.005	0.005	0.002	0.007	0.005	0.011
Total Nitrogen (TN)	mg/L	0.1	0.5	0.1	0.6	0.4	0.5	0.6	0.6	0.4	1.0	0.6	0.7	0.4	0.9
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.04	0.01	0.01	0.02	0.05	0.01	0.06	0.02	0.05	0.01	0.06

* Trigger values derived from 24 sampling events up to and including the month indicated.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

" for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-26 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2016				September 2016				October 2016			
				SW13b*			SW13a	SW13b*			SW13a	SW13b*			SW13a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.0	21.8	14.4	12.9	4.1	21.8	14.2	15.0	4.2	21.8	13.8	15.0
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	79	313	173	207	77	313	190	361	75	306	190	431
Dissolved oxygen (DO)	%	0-200	85-110	18	64	30	77	18	63	30	103	17	63	34	79
pH		0-14	6.5-8	0.5	7.0	6.1	6.3	0.5	7.0	6.1	6.5	0.4	6.9	6.2	7.2
Turbidity (NTU)	NTU	0-600	6-50	15	54	35	37	16	54	31	11	16	50	16	8
Total suspended solids (TSS)	mg/L	5	-	7	15	5	5	7	15	5	7	6	15	5	5
Aluminium (Al)	mg/L	0.01	0.055"	0.42	0.71	0.06	1.21	0.42	0.71	0.06	0.31	0.42	0.71	0.06	0.05
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.40	1.21	0.60	0.79	0.39	1.17	0.60	0.76	0.37	1.17	0.60	0.28
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.084	0.238	0.060	0.035	0.081	0.219	0.060	0.046	0.084	0.219	0.058	0.027
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.002
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.009	0.010	0.005	0.007	0.003	0.009	0.005	0.008	0.002	0.008	0.005	0.007
Total Nitrogen (TN)	mg/L	0.1	0.5	0.4	0.9	0.6	1.2	0.4	0.9	0.6	1.8	0.4	0.8	0.6	1.2
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.05	0.02	0.01	0.02	0.05	0.02	0.01	0.02	0.05	0.02	0.01

* Trigger values derived from 24 sampling events up to and including the month indicated.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

" for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

Table 3-27 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2016				December 2016				January 2017			
				SW13b*			SW13a	SW13b*			SW13a	SW13b*			SW13a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	3.7	20.8	13.8	18.5	3.6	20.8	13.8	22.6	3.5	20.6	13.8	21.5
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	75	311	190	381	73	312	202	538	74	316	202	685
Dissolved oxygen (DO)	%	0-200	85-110	16	65	36	56	16	65	36	47	14	65	40	42
pH		0-14	6.5-8	0.4	6.9	6.2	7.1	0.4	7.0	6.2	7.0	0.4	6.9	6.2	7.1
Turbidity (NTU)	NTU	0-600	6-50	16	50	16	42	18	53	16	17	17	43	14	16
Total suspended solids (TSS)	mg/L	5	-	6	14	5	11	5	14	5	10	4	9	5	5
Aluminium (Al)	mg/L	0.01	0.055"	0.42	0.71	0.06	0.11	0.39	0.58	0.05	0.10	0.40	0.58	0.03	0.13
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.002
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.002	0.002	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.37	1.17	0.60	0.54	0.38	1.20	0.58	0.64	0.38	1.20	0.58	0.81
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.084	0.219	0.058	0.099	0.081	0.219	0.060	0.092	0.077	0.172	0.060	0.076
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.002	0.000	0.001	0.001	0.003	0.000	0.001	0.001	0.004
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.002	0.007	0.005	0.014	0.002	0.008	0.005	0.024	0.002	0.009	0.005	0.020
Total Nitrogen (TN)	mg/L	0.1	0.5	0.4	0.8	0.6	0.6	0.4	0.8	0.5	2.3	0.4	0.9	0.5	3.6
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.04	0.01	0.01	0.02	0.05	0.01	0.02	0.02	0.04	0.01	0.01

* Trigger values derived from 24 sampling events up to and including the month indicated.

Colour red - Represents the calculated median result being either above the 80th percentile or below the 20th percentile at the downstream sampling location.

" for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

3.5 Discussion of surface water results

Nearly all waterways had at least one parameter for one or more monthly results that fell either above or below calculated upstream 80th and 20th percentile values. While construction works at different times during the reporting period were in close proximity to all waterways, this level of variability remained typical of results experienced during pre-construction monitoring. Observations made during site monitoring suggest some elevated parameter levels (eg turbidity) in some waterways was attributable to construction. At other times, impacts were considered to be unrelated to the project. Therefore, the following general and specific observations can be made:

- The monitoring period can be characterised by a mixture of average to well below average rainfall across the entire project and broader region. Five of the seven months encompassing the monitoring period (July 2016 to January 2017) were well below average. While most waterways were continuous (ie a connection between upstream and downstream sampling points was maintained) there were exceptions on one or more occasions at a number of waterways. Exceptions occurred at SW1, SW2, SW7, SW8, SW9, SW12 and SW13 that were observed to be isolated ponds at different times during the monitoring period.
- Electrical conductivity – Calculated median values were below or above the calculated upstream 80th and 20th percentile trigger value on one or more occasions for all waterways during the monitoring period with the exception of SW9. On review of individual sampling events where calculated monthly medians fall outside of 80th or 20th percentile trigger values, the individual results are typically consistent between upstream and downstream samples. Exceptions to this include individual results at SW1, SW2, SW7, SW8, SW12 and SW13. At all sampling locations (with the exception of SW2) the greater differences coincide with no visible flow or sample points persisting as isolated ponds. At SW2, the difference coincided with SW2b being dry and a sample unable to be collected for direct upstream comparison. For all freshwater waterways, with the exception of SW11, the calculated median values were within the default trigger values for low land rivers presented in the ANZECC guidelines. At SW11, during January 2017, levels for both upstream and downstream were slightly above the default trigger values for low land rivers presented in the ANZECC guidelines.

Impacts attributable to construction for all waterways are considered negligible to minor.

- Dissolved oxygen – Calculated median values were below or above the calculated upstream 80th and 20th percentile trigger value on one or more occasions for all waterways during the monitoring period with the exception of SW9. SW5b, SW6d, SW7b, SW8c, SW10a and SW11a were below the 20th percentile trigger values for between one and three months during the monitoring period. While 80th percentile trigger values were exceeded on a number of occasions (on between one and four occasions), particularly at SW1, SW2 and SW13. In all instances, with the exception of one record at SW5b, levels were below the upper limit default trigger value for low land rivers presented in the ANZECC guidelines.

On review of individual sampling events where calculated monthly medians fall outside of 80th or 20th percentile trigger values, the individual results for SW3 and SW6 were typically consistent between upstream and downstream samples. At SW2 and SW5b, these locations routinely persist as standing water where water level, rather than flow, is very dependent on rainfall. These locations have also been observed to have algae outbreaks that trigger substantial fluctuations in dissolved oxygen levels from month to month. At the remaining waterways, it was noted that these waterways persistent with little to no flow, or on occasions were present as isolated ponds, during periods when

upstream and downstream variability was recorded.

Impacts attributable to construction are considered negligible.

- pH – Calculated median values were generally within, or close to, the calculated upstream 80th and 20th percentile trigger values for the majority of waterways throughout the six-month monitoring period. Exceptions in most instances were minor, with differences ranging between pH 0.1 and 0.5. In all but one instance (SW5b – November 2016), pH levels were within the default trigger value for low land rivers present in the ANZECC guidelines.

There were more substantial exceptions at SW5b when comparing pre-construction results. During pre-construction SW5b exhibited quite acidic conditions, which appear to correlate to low and below average rainfall. During this monitoring period, while rainfall was consistently at or below average, and water level generally low, a high concentration of algae observed during many of the sampling events may have contributed to the elevated pH levels. The one exception in November 2016 was 0.2 pH above the default trigger value for low land rivers present in the ANZECC guidelines.

When comparing all other exceptions, individual sampling events generally show consistent pH levels between upstream and downstream sampling locations.

It is considered that pH variability within all waterways across the project was unrelated to construction during the monitoring period. Rainfall, or persistent periods without rain, are considered to be the predominant factors affecting pH.

- Turbidity – Calculated median values for SW1b, SW1c, SW3b, SW6b, SW6d and SW9a exceeded calculated 80th percentile values on one or more occasions during the monitoring period. A number of these exceedances were also above the ANZECC upper limit default trigger value for the respective waterway type.

At SW1b and SW1c turbidity levels during individual sampling events were typically elevated when compared to the upstream reference point. As discussed in previous monitoring reports, the catchment for SW1 includes a number of industrial activities (ie quarry operations and a heavy machinery sales and servicing business) in addition to the project and it is considered likely that all are contributing to the elevated downstream turbidity levels. During September 2016, one elevated record at SW1c was considered largely attributable to upstream culvert pump around operations in progress while works progress on the new culvert floor. Roads and Maritime and its construction partner have continued efforts to minimising any impacts attributable to the project. This is discussed further in section 3.6.

At SW3b, SW6b and SW6d, while there were individual sampling events where turbidity levels were higher downstream and upstream, in all instances the differences were observed to be attributable to localised environmental conditions unrelated to the project. Both the Hastings River and Wilsons River, in particular the Hastings River, can be heavily effected close to shore by tidal current, wind and wave action. Elevated levels at these waterways during August and October 2016 were due to one or a combination of these factors. There were no observed impacts attributable to the project.

Observations made during the November sampling events at SW9 (all showed elevated levels downstream compared to upstream) noted that the waterway had little to no signs of flow between upstream and downstream, and that the water levels were particular low. On one occasion during November 2016 the sampling points persisted as isolated ponds following a recent pump around operation. While works were in progress on waterway bridge piers through the temporary rock platform during sampling events, there were no

obvious signs that the construction activity had caused the elevated turbidity levels downstream.

- Nitrogen and phosphorus – Calculated median values were generally within the calculated upstream 80th and 20th percentile trigger values for the majority of waterways throughout the six-month monitoring period. Exceptions in all waterways, other than some in SW1, SW2, SW5 and SW13, were of a minor nature with levels generally consistent between upstream and downstream for individual sampling events. Where variability was observed between upstream and downstream, it generally coincided with the two sampling point persisting as isolated ponds.

Higher levels and increased variability was recorded at SW1, SW2, SW5 and SW13. Broader land use practices eg industry and agriculture, are considered likely to be the major influences on nitrogen and phosphorus in these and other waterway experiencing elevated levels. Impacts attributable to construction are considered negligible.

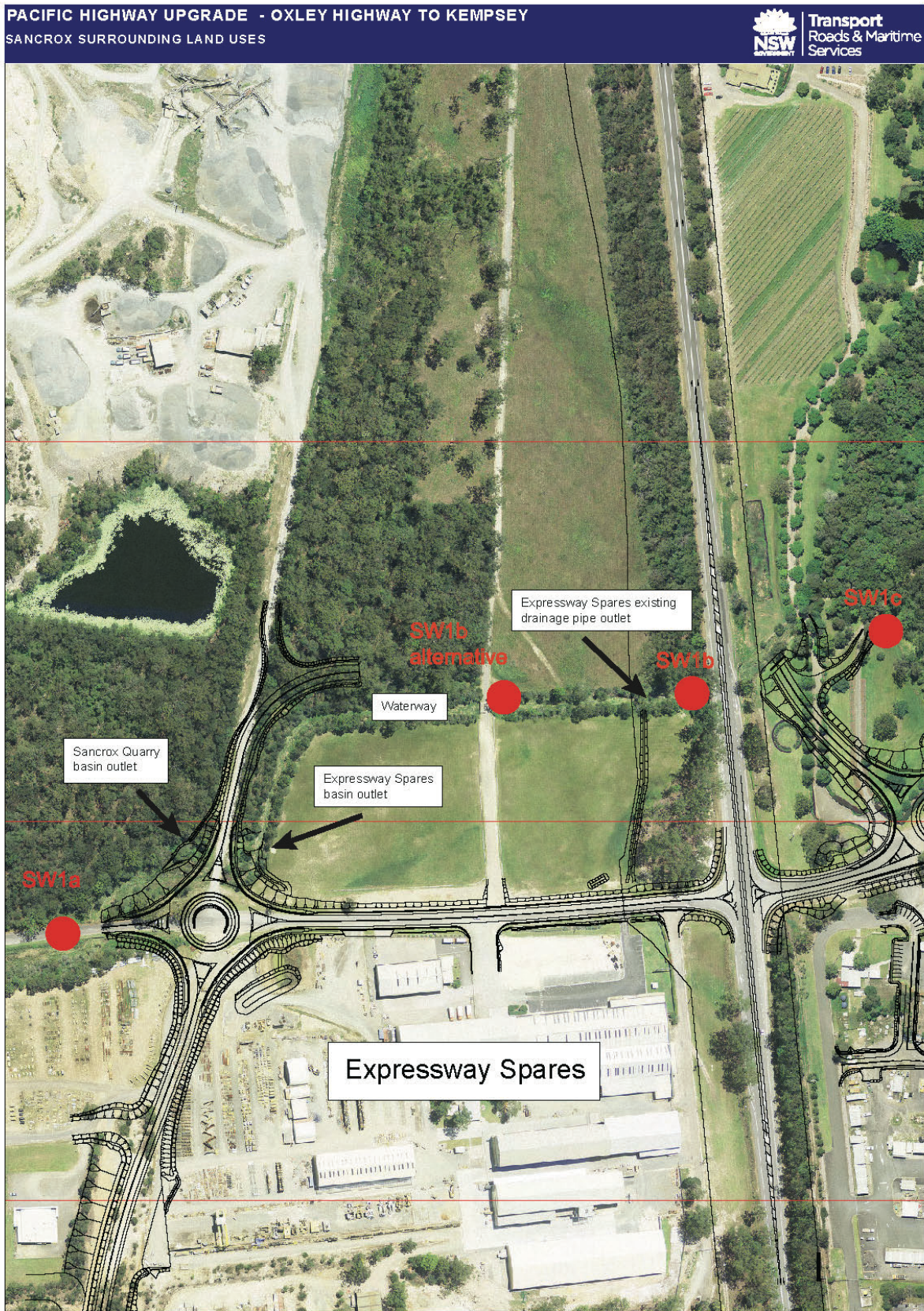
- Total petroleum hydrocarbons (TPH) – Sampling for TPH following the observed presence of oil and grease was undertaken at SW1b (upstream sampling location) on two occasions (8 September and 16 December 2016). The catchment for SW1 includes rural properties and yard associated with an industrial premises. Despite the visual observations, laboratory analysis returned TPH results below the limit of laboratory reporting in both instances.
- Metals – Analysis of metals showed limited variation in levels for nearly all sampling locations and analytes. Exceptions included aluminium, iron, magnesium and zinc at some waterways, which showed substantial variability. Comparatively low or elevated levels were generally experienced concurrently both upstream and downstream for individual monitoring events. Where clear differences between upstream and downstream locations were recorded, this typically coincided with monitoring locations persisting as isolated ponds or standing water with limited to no flow. The results were not inconsistent with the variability and levels experienced during the pre-construction and previous construction monitoring periods. None of the elevated or low metal parameters are considered likely to be attributable to construction related activities (eg exposure of acid sulfate material).

3.6 Project response to surface water quality results

Impacts on water quality attributable to the project were generally considered to be negligible during the monitoring period. However, elevated turbidity levels at SW1 downstream monitoring sites were on occasions considered in part or largely attributable to project activities. This is generally considered the result of previously trapped sediment in the downstream sampling pond being stirred up during minor rain events. In response, Roads and Maritime and its construction partners continue to review and implement management measures to minimise the likelihood of future reoccurrences. These include, but are not limited to:

- Review water quality results during environmental review group meetings
- Review and amend where necessary progressive erosion and sediment control plans to minimise the potential for impacts on this waterway. It should be noted that the Stage 3 contractor is well advanced with construction on the main alignment in this area meaning that project related risks will progressively reduce.

Figure 3-1 Location of Stage 1 works and surrounding land uses



Note: Roads and Maritime relocated SW1b sampling point in August 2015 due to proximity to construction works. Alternative location is shown on above figure for information.

3.7 Limitations of groundwater results

A number of factors have influenced the continuity and completeness of groundwater quality results obtained during this and previous monitoring periods and the extent to which they can be analysed for trends. Relevant considerations include:

- There is insufficient historical (pre-construction) data to allow for the development of 80th and 20th percentile trigger values in accordance with ANZECC guidelines. The minimum number of samples to develop site-specific trigger values is 24 (eg generally a period of two years). With the exception of groundwater level and temperature, most analytes were sampled on three or less occasions.
- Manually recorded electrical conductivity levels during August and September 2016 are considered unreliable due to an error with the monitoring equipment and the recorded units of measurement. This issue was rectified for October 2016 and subsequent sampling events.
- GW04, GW05, GW07, GW09, GW11, GW12, GW14, GW19, GW20, GW22, GW23 and GW27 were not accessible for between one and five monitoring events during this reporting period due to restricted access attributable to construction.
- GW06 was dry when monitored in December 2014 and believed destroyed prior to the subsequent sampling event in February 2015. The borehole was re-established prior to June 2016 and monitoring recommenced.
- GW07, GW08, GW09, GW10, GW16, GW19, GW20, GW24, GW25 and GW28 had insufficient water to sample for between one and five occasions during the reporting period.
- GW08 has no pre-construction water quality data to facilitate the development of trends between pre, during and post construction. GW08 also had insufficient water for a sample on four out of five occasions during the reporting period.
- GW09 has been dry, contained insufficient water to sample, or had no access due to construction during all construction monitoring events. The site was also destroyed in August 2015 and reinstated prior to June 2016 sampling event.
- GW13 and GW14 were destroyed by construction prior to April 2015 and reinstated for monitoring prior to June 2016 monitoring event.
- GW16, GW17 and GW20 were not sampled during the pre-construction period and, with the exception of GW17, were largely dry during this and previous construction monitoring periods. GW20 was sampled on one occasion in April 2015 for laboratory parameters only due to the limited depth of water. GW16 was destroyed by construction prior to August 2015 monitoring event and restored prior to December 2016 sampling event. However, since then has had insufficient water to collect a sample.
- GW01, GW02, GW04, GW06, GW09, GW10, GW11, GW13, GW14, GW16 and GW19 were destroyed by construction during previous construction monitoring periods. All, but GW02 and GW16, were reinstated prior to July 2016 sampling event. GW02 and GW16 were reinstated prior to the September and December 2016 sampling events, respectively.
- Laboratory analysis was conducted for various parameters on either one or two occasions for GW01 to GW07, GW10 to GW15, GW17 to GW18, GW21 to GW22, GW24, GW26 to GW27, GW29 and GW30 only. As indicated previously, all other boreholes had insufficient water to take a sample, were dry, or not accessible due to construction staging.
- Laboratory analysis was not conducted during October 2016 as scheduled.

- All metals analysed for the August 2016 monitoring event were for total metals only. Previous monitoring events (with the exception of July 2015, November 2015 and April 2016) analysed dissolved metals with the exception of iron and manganese. Roads and Maritime had previously identified this issue and had instructed the laboratory to analyse both total and dissolved metals for all future monitoring events (this occurred prior to January 2016). However, a staff change at the laboratory, and failure to implement the instruction, has resulted in only total metals being analysed for the August 2016 monitoring event. Roads and Maritime has again provided an instruction to the laboratory to analyse all future samples for both total and dissolved metals

3.8 Summary of groundwater results

Table 3-28 to Table 3-41 present data collected manually during the construction period 22 July 2016 to 21 January 2017 with reference to the pre-construction data reported in the Oxley Highway to Kempsey Groundwater Pre-construction Report, April 2014 (note, the previous report contained monitoring data up until July 2016). This report presents data from monitoring undertaken between August 2016 and January 2017). Groundwater levels captured automatically (as noted in section 2.3) have been graphed with corresponding rainfall data from the Bureau of Meteorology and presented in Appendix D.

Appendix E presents cumulative construction groundwater quality monitoring results since December 2014. These tables will be developed further over time with the inclusion of subsequent construction and post-construction monitoring data and allow for the identification of any long-term trends.

Table 3-28 Construction groundwater monitoring results by borehole

Parameter	Unit	LOR	GW01		Results		GW02		Results		GW03		Results	
			20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16
Dissolved Aluminium	mg/L	0.01	4.24	4.6	54.6	<0.01	<0.01*	<0.01*	DNS	0.01	0.03	0.03	1.72	<0.01
Dissolved Arsenic	mg/L	0.001	0.007	0.008	0.016	<0.001	0.0034	0.0046		<0.001	0.003	0.003	0.007	<0.001
Dissolved Cadmium	mg/L	0.0001	0.001	0.001	0.0288	0.0034	<0.01*	<0.01*		0.0001	<0.001*	<0.001*	0.0002	<0.0001
Dissolved Chromium	mg/L	0.001	0.001	0.001	0.068	<0.001	<0.01*	<0.01*		<0.001	0.012	0.012	0.003	<0.001
Dissolved Copper	mg/L	0.001	0.043	0.063	0.379	0.003	<0.01*	<0.01*		0.004	0.007	0.007	0.011	0.004
Total Iron	mg/L	0.05	7.01	10.84	75.2	16.7	42.54	59.28		4.1	53.7	149.8	29.7	21.7
Dissolved Lead	mg/L	0.001	0.021	0.03	0.047	<0.001	<0.01*	<0.01*		<0.001	<0.001*	<0.001*	0.002	<0.001
Total Manganese	mg/L	0.001	0.472	0.487	1.81	1.02	0.458	0.482		0.543	0.252	0.483	1.76	1.47
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.033	0.035	0.036	0.02	0.0032	0.0038		0.013	0.0048	0.0132	0.026	0.045
Dissolved Silver	mg/L	0.001	<0.001*	<0.001*	<0.001	<0.001	<0.001*	<0.001*		<0.001	<0.001*	<0.001*	<0.001	<0.001
Dissolved Zinc	mg/L	0.005	0.522	0.553	0.398	0.045	0.0074	0.0086		0.062	0.013	0.013	0.044	0.04
EC laboratory	uS/cm		5166	5982	8050	7650	384	469		969	967	1292	1460	1700
Total Nitrogen	mg/L		0.35	1.00			1.08	2.04			1.2	1.9		
Total Phosphorus	mg/L		0.04	0.12			0.196	0.424			0.30	0.62		
Ammonia	mg/L		0.03	0.03			0.272	0.506			0.07	0.17		
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹													
Chloride	mg/L		1427	1919			27	37.2			194	325		
Nitrate					0.24	0.32				5.88			0.12	0.03
Sulphate	mg/L		105	258			14.4	29.4			99	149		
Calcium	mg/L		7.86	10.23			14.28	18.66			33.1	58.0		
Magnesium	mg/L		109.3	136.2			12.18	16.92			37	76		
Potassium	mg/L		6.17	7.23			4.85	6.044			6.17	13.84		
Sodium	mg/L		741	874			38.48	54.38			97	337		

* No variation established between sampling events.

Note: Analysis of all metals for August 2016 event is for "total" metals despite otherwise indicated in table.

DNS – Did Not Sample

Table 3-29 Construction groundwater monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW04		Results		GW05		Results		GW07^		Results	
			20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16
Dissolved Aluminium	mg/L	0.01	<0.01*	<0.01*	86.7	DNS	<0.01*	<0.01*	2.72	DNS			DNS	0.13
Dissolved Arsenic	mg/L	0.001	0.0034	0.0046	0.059		0.006	0.010	0.003					<0.001
Dissolved Cadmium	mg/L	0.0001	<0.001*	<0.001*	0.0004		<0.001*	<0.001*	0.0007					<0.0001
Dissolved Chromium	mg/L	0.001	0.002	0.002	0.17		<0.001*	<0.001*	0.005					<0.001
Dissolved Copper	mg/L	0.001	<0.001*	<0.001*	0.152		<0.001*	<0.001*	0.05					2
Total Iron	mg/L	0.05	66.3	93.3	173		158	510	64.6		38.3	38.3		12.7
Dissolved Lead	mg/L	0.001	<0.001*	<0.001*	0.07		<0.001*	<0.001*	0.002					<0.001
Total Manganese	mg/L	0.001	0.410	0.540	1.58		0.799	0.980	0.645					0.072
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.0018	0.0042	0.129		0.004	0.01	0.006					0.002
Dissolved Silver	mg/L	0.001	<0.001*	<0.001*	<0.001		<0.001*	<0.001*	<0.001					<0.001
Dissolved Zinc	mg/L	0.005	0.010	0.014	1.73		0.019	0.019	0.055					0.029
EC laboratory	uS/cm		3212	4922	1130		6598	7294	7320		168	168		182
Total Nitrogen	mg/L		1.4	2.7			2.6	5.5			1.4	1.4		
Total Phosphorus	mg/L		0.38	1.40			1.60	3.18			0.2	0.2		
Ammonia	mg/L		0.18	0.98			0.80	0.89			0.07	0.07		
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹													
Chloride	mg/L		1089	1309			1468	1564			38	38		
Nitrate					0.04				0.62					<0.01
Sulphate	mg/L		40	65			1055	1171			4.7	4.7		
Calcium	mg/L		34.7	54.9			170	232			37.6	37.6		
Magnesium	mg/L		68	107			273	367			16.9	16.9		
Potassium	mg/L		14.2	24.7			35.4	56.34			5.25	5.25		
Sodium	mg/L		511	701			973	1045			26.2	26.2		

* No variation established between sampling events.

^ Based on one record only.

Note: Analysis of all metals for August 2016 event is for "total" metals despite otherwise indicated in table.

DNS – Did Not Sample

Table 3-30 Construction groundwater monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW08		Results		GW09		Results		GW010		Results	
			20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16
Dissolved Aluminium	mg/L	0.01			DNS	DNS	0.23 [^]	0.23 [^]	DNS	DNS	1 [^]	1 [^]	DNS	DNS
Dissolved Arsenic	mg/L	0.001					<0.001 [^]	<0.001 [^]			0.001 [^]	0.001 [^]		
Dissolved Cadmium	mg/L	0.0001					0.002 [^]	0.002 [^]			<0.001 [^]	<0.001 [^]		
Dissolved Chromium	mg/L	0.001					0.001 [^]	0.001 [^]			0.003 [^]	0.003 [^]		
Dissolved Copper	mg/L	0.001					0.218 [^]	0.218 [^]			0.02 [^]	0.02 [^]		
Total Iron	mg/L	0.05					8.47	9.49			115.1	194.5		
Dissolved Lead	mg/L	0.001					<0.001 [^]	<0.001 [^]			0.001 [^]	0.001 [^]		
Total Manganese	mg/L	0.001					0.85 [^]	0.85 [^]			0.013 [^]	0.013 [^]		
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001					0.061 [^]	0.061 [^]			0.002 [^]	0.002 [^]		
Dissolved Silver	mg/L	0.001					<0.001 [^]	<0.001 [^]			<0.001 [^]	<0.001 [^]		
Dissolved Zinc	mg/L	0.005					0.063 [^]	0.063 [^]			0.007 [^]	0.007 [^]		
EC laboratory	uS/cm										270 [^]	270 [^]		
Total Nitrogen	mg/L										1.1 [^]	1.1 [^]		
Total Phosphorus	mg/L										0.11 [^]	0.11 [^]		
Ammonia	mg/L										<0.02 [^]	<0.02 [^]		
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹													
Chloride	mg/L										52 [^]	52 [^]		
Nitrate														
Sulphate	mg/L										9.4 [^]	9.4 [^]		
Calcium	mg/L						20.45	59.86			46.1	127.0		
Magnesium	mg/L						54.8	108.9			22.1	48.6		
Potassium	mg/L						5.57	11.59			9.42	16.01		
Sodium	mg/L						478	698			69.0	120.8		

* No variation established between sampling events.

[^] Based on one record only.

Note: Analysis of all metals for August 2016 event is for "total" metals despite otherwise indicated in table.

DNS – Did Not Sample

Table 3-31 Construction groundwater monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW11		Results		GW12		Results		GW013		Results	
			20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16
Dissolved Aluminium	mg/L	0.01	0.26	0.56	2.24	0.04	0.02	0.02		<0.01	0.02	0.03	1.93	0.02
Dissolved Arsenic	mg/L	0.001	<0.001*	<0.001*	0.009	0.001	0.029	0.030		0.001	0.002	0.004	0.107	0.006
Dissolved Cadmium	mg/L	0.0001	0.0022	0.0028	<0.0001	<0.0001	<0.001*	<0.001*		<0.0001	<0.001*	<0.001*	<0.0001	<0.0001
Dissolved Chromium	mg/L	0.001	0.001	0.001	0.007	<0.001	<0.001*	<0.001*		<0.001	0.001	0.001	0.004	<0.001
Dissolved Copper	mg/L	0.001	0.1818	0.2292	0.018	0.041	<0.001*	<0.001*		<0.001	<0.001*	<0.001*	0.007	0.004
Total Iron	mg/L	0.05	46.8	219.3	7.19	6.96	185	283		130	41.5	60.4	57.4	10.6
Dissolved Lead	mg/L	0.001	<0.001*	<0.001*	0.004	<0.001	<0.001*	<0.001*		<0.001	<0.001*	<0.001*	0.002	<0.001
Total Manganese	mg/L	0.001	0.791	1.623	0.107	0.097	5.07	7.14		4.81	0.217	0.249	0.238	0.165
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.0626	0.0884	0.01	0.008	0.003	0.003		0.004	0.003	0.003	0.003	<0.001
Dissolved Silver	mg/L	0.001	<0.001*	<0.001*	<0.001	<0.001	<0.001*	<0.001*		<0.001	<0.001*	<0.001*	<0.001	<0.001
Dissolved Zinc	mg/L	0.005	0.0788	0.0992	0.389	0.3	0.028	0.034		0.039	0.014	0.023	0.043	0.03
EC laboratory	uS/cm		2904	7650	1760	1760	3314	6962		2140	207	305	209	238
Total Nitrogen	mg/L		0.56	1			1.3	1.7			1.6	1.7		
Total Phosphorus	mg/L		0.08	0.70			0.08	0.19			0.41	0.59		
Ammonia	mg/L		0.03	0.13			0.82	0.93			0.32	0.50		
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹													
Chloride	mg/L		581	1422			394	781			25	36		
Nitrate					0.22	0.39				0.52			0.09	0.41
Sulphate	mg/L		448	1263			1284	3267			14	26		
Calcium	mg/L		30.8	120.4			85.9	148.8			3.70	4.36		
Magnesium	mg/L		58.1	189.4			137	233			8.23	9.23		
Potassium	mg/L		14.4	20.8			14.2	21.0			6.19	8.58		
Sodium	mg/L		427	1013			313	481			28.8	41.2		

* No variation established between sampling events.

Note: Analysis of all metals for August 2016 event is for "total" metals despite otherwise indicated in table.

DNS – Did Not Sample

Table 3-32 Construction groundwater monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW14		Results		GW15		Results		GW017		Results	
			20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16
Dissolved Aluminium	mg/L	0.01	4.07	4.29	6.62	8.49	0.01	0.01	1.67	0.45			0.84	<0.01
Dissolved Arsenic	mg/L	0.001	0.001	0.001	0.006	0.006	0.020	0.021	0.025	0.024			0.003	<0.001
Dissolved Cadmium	mg/L	0.0001	<0.001*	<0.001*	0.0014	0.0008	<0.001*	<0.001*	0.0002	0.0001			0.0002	<0.0001
Dissolved Chromium	mg/L	0.001	<0.001*	<0.001*	0.001	<0.001	<0.001*	<0.001*	0.002	<0.001			0.002	<0.001
Dissolved Copper	mg/L	0.001	0.114	0.200	0.313	0.188	<0.001*	<0.001*	0.05	0.038			0.006	<0.001
Total Iron	mg/L	0.05	2.05	3.40	41.7	46.9	8.13	10.30	4.39	4.95			3.82	8.1
Dissolved Lead	mg/L	0.001	0.001	0.001	0.009	0.012	<0.001*	<0.001*	0.006	0.003			0.002	<0.001
Total Manganese	mg/L	0.001	0.757	0.759	5.86	3.96	2.85	2.99	2.6	1.84			0.202	0.198
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.028	0.029	0.247	0.292	0.003	0.003	0.006	0.005			0.003	0.002
Dissolved Silver	mg/L	0.001	<0.001*	<0.001*	<0.001	<0.001	<0.001*	<0.001*	<0.001	<0.001			<0.001	<0.001
Dissolved Zinc	mg/L	0.005	0.130	0.146	1.07	0.806	0.007	0.007	0.033	0.028			0.04	0.02
EC laboratory	uS/cm		7480	8074	21000	20800	3768	3798	3640	3540			3770	3600
Total Nitrogen	mg/L		0.7	0.9			0.43	0.96						
Total Phosphorus	mg/L		0.02	0.03			0.07	0.09						
Ammonia	mg/L		0.08	0.10			0.07	0.10						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹													
Chloride	mg/L		2386	3480			990	1559						
Nitrate					0.48	0.05			0.03	0.03			0.02	0.18
Sulphate	mg/L		166	215			136	206						
Calcium	mg/L		106	127			62.3	71.5						
Magnesium	mg/L		165	195			115	123						
Potassium	mg/L		2.67	3.12			8.80	9.14						
Sodium	mg/L		1048	1216			532	557						

* No variation established between sampling events.

Note: Analysis of all metals for August 2016 event is for "total" metals despite otherwise indicated in table.

DNS – Did Not Sample

Table 3-33 Construction groundwater monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW018		Results		GW19		Results		GW20		Results	
			20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16
Dissolved Aluminium	mg/L	0.01	<0.01*	<0.01*	0.94	<0.01	<0.01^	<0.01^	DNS	DNS			DNS	DNS
Dissolved Arsenic	mg/L	0.001	0.007	0.008	0.004	0.001	0.001^	0.001^						
Dissolved Cadmium	mg/L	0.0001	<0.001*	<0.001*	<0.0001	<0.0001	<0.001^	<0.001^						
Dissolved Chromium	mg/L	0.001	0.001	0.001	0.001	<0.001	<0.001^	<0.001^						
Dissolved Copper	mg/L	0.001	<0.001*	<0.001*	0.012	<0.001	0.013^	0.013^						
Total Iron	mg/L	0.05	5.76	9.92	2.12	2.97	18.1	48.4						
Dissolved Lead	mg/L	0.001	<0.001*	<0.001*	0.004	<0.001	<0.001^	<0.001^						
Total Manganese	mg/L	0.001	1.64	1.83	1.53	1.2	0.636^	0.636^						
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.003	0.005	0.005	0.004	0.015^	0.015^						
Dissolved Silver	mg/L	0.001	<0.001*	<0.001*	<0.001	<0.001	<0.001^	<0.001^						
Dissolved Zinc	mg/L	0.005	0.011	0.015	0.028	0.007	0.057^	0.057^						
EC laboratory	uS/cm		1652	1658	1780	1670	746	1371						
Total Nitrogen	mg/L		0.6	0.7			1.6	1.7						
Total Phosphorus	mg/L		0.15	0.15			0.24	0.38						
Ammonia	mg/L		0.20	0.22			0.1	0.28						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹													
Chloride	mg/L		101	109			90	98						
Nitrate					0.08	0.15								
Sulphate	mg/L		150	154			46	143						
Calcium	mg/L		166	185			34.8	124.9						
Magnesium	mg/L		61.9	62.1			22.7	55.8						
Potassium	mg/L		7.65	8.02			7.74	8.23						
Sodium	mg/L		100.0	108.3			91.1	100.8						

* No variation established between sampling events.

^ Based on one record only.

Note: Analysis of all metals for August 2016 event is for "total" metals despite otherwise indicated in table.

DNS – Did Not Sample

Table 3-34 Construction groundwater monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW21^		Results		GW022		Results		GW23		Results	
			20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16
Dissolved Aluminium	mg/L	0.01	0.05	0.05	2.78	0.06	0.05 [^]	0.05 [^]	DNS	DNS	0.05	0.19	45.7	0.23
Dissolved Arsenic	mg/L	0.001	0.002	0.002	0.011	0.004	<0.01 [^]	<0.01 [^]			0.001	0.001	0.008	0.001
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	0.0001	<0.0001	<0.001 [^]	<0.001 [^]			<0.001 [*]	<0.001 [*]	0.0002	<0.0001
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	0.006	0.002	<0.001 [^]	<0.001 [^]			<0.001 [*]	<0.001 [*]	0.014	0.001
Dissolved Copper	mg/L	0.001	0.048	0.048	0.062	0.069	0.01 [^]	0.01 [^]			0.009	0.009	0.051	0.013
Total Iron	mg/L	0.05	43.2	43.2	9.67	16.8	199	217			21.9	35.8	15.6	14.2
Dissolved Lead	mg/L	0.001	<0.001	<0.001	0.006	<0.001	<0.001 [^]	<0.001 [^]			<0.001 [*]	<0.001 [*]	0.031	<0.001
Total Manganese	mg/L	0.001	0.358	0.358	0.322	0.406	0.011 [^]	0.011 [^]			0.458	0.642	0.391	0.402
Dissolved Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.144	0.144	0.006	0.003	<0.001 [^]	<0.001 [^]			0.003	0.006	0.007	0.002
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001 [^]	<0.001 [^]			<0.001 [*]	<0.001 [*]	<0.001	<0.001
Dissolved Zinc	mg/L	0.005	0.122	0.122	0.073	0.037	0.084 [^]	0.084 [^]			0.069	0.239	0.168	0.064
EC laboratory	uS/cm		1750	1750	811	1090	872	2056			417	624	286	293
Total Nitrogen	mg/L		2.6	2.6			2.4	2.6			0.5	0.8		
Total Phosphorus	mg/L		0.39	0.39			0.56	0.89			0.43	1.096		
Ammonia	mg/L						0.08	0.08			0.03	0.04		
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹													
Chloride	mg/L		178	178			201	475			55.4	86		
Nitrate	mg/L				0.13	0.29							0.05	0.04
Sulphate	mg/L		326	326			52	154			51	87		
Calcium	mg/L		29.3	29.3			22.5	27.5			28.8	45.6		
Magnesium	mg/L		28.2	28.2			42.3	56.5			17	23		
Potassium	mg/L		10.3	10.3			17.5	18.3			5.56	5.93		
Sodium	mg/L		310	310			154.8	331.9			54.0	87.6		

* No variation established between sampling events.

[^] Based on one record only.

Note: Analysis of all metals for August 2016 event is for "total" metals despite otherwise indicated in table.

DNS – Did Not Sample

Table 3-35 Construction groundwater monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW24		Results		GW025		Results		GW26		Results	
			20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16
Dissolved Aluminium	mg/L	0.01	0.19 [^]	0.19	21.2	0.15	0.05 [^]	0.05 [^]	DNS	DNS			21.1	0.02
Dissolved Arsenic	mg/L	0.001	0.002 [^]	0.002	0.007	<0.001	0.001 [^]	0.001 [^]					0.006	<0.001
Dissolved Cadmium	mg/L	0.0001	<0.001 [^]	<0.001	0.0004	<0.0001	0.001 [^]	0.001 [^]					0.002	0.0011
Dissolved Chromium	mg/L	0.001	<0.001 [^]	<0.001	0.024	<0.001	<0.001 [^]	<0.001 [^]					0.015	<0.001
Dissolved Copper	mg/L	0.001	0.428 [^]	0.428	3.12	0.202	0.066 [^]	0.066 [^]					7.45	7.78
Total Iron	mg/L	0.05	34.2	98.5	42.9	69.2	89.0	103.3			41.3	41.3	8.62	13.9
Dissolved Lead	mg/L	0.001	<0.001 [^]	<0.001	0.018	<0.001	0.001 [^]	0.001 [^]					0.026	<0.001
Total Manganese	mg/L	0.001	0.172 [^]	0.172	0.318	0.332	0.902 [^]	0.902 [^]					0.289	0.322
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.028 [^]	0.028	0.023	0.003	0.016 [^]	0.016 [^]					0.032	0.019
Dissolved Silver	mg/L	0.001	<0.001 [^]	<0.001	<0.001	<0.001	<0.001 [^]	<0.001 [^]					<0.001	<0.001
Dissolved Zinc	mg/L	0.005	0.13 [^]	0.13	0.444	0.069	0.15 [^]	0.15 [^]					0.413	0.28
EC laboratory	uS/cm		5530 [^]	5530 [^]	690	453	805 [^]	805 [^]			494	494	776	785
Total Nitrogen	mg/L		1.2 [^]	1.2 [^]			0.9 [^]	0.9 [^]			1.4	1.4		
Total Phosphorus	mg/L		4.6 [^]	4.6 [^]			0.12 [^]	0.12 [^]			0.18	0.18		
Ammonia	mg/L		0.04 [^]	0.04 [^]			0.14 [^]	0.14 [^]			0.1	0.1		
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹													
Chloride	mg/L		1686 [^]	1686 [^]			235 [^]	235 [^]			136	136		
Nitrate					0.02	0.32							<0.01	<0.01
Sulphate	mg/L		151 [^]	151 [^]			18 [^]	18 [^]			18	18		
Calcium	mg/L		42.5	160.6			2.55 [^]	2.55 [^]			2.09	2.09		
Magnesium	mg/L		29.35	96.59			14.8 [^]	14.8 [^]			7.07	7.07		
Potassium	mg/L		7.2	12.5			17 [^]	17 [^]			12.8	12.8		
Sodium	mg/L		206.7	593.9			130 [^]	130 [^]			78.9	78.9		

* No variation established between sampling events.

[^] Based on one record only.

Note: Analysis of all metals for August 2016 event is for "total" metals despite otherwise indicated in table.

DNS – Did Not Sample

Table 3-36 Construction groundwater monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW27		Results		GW028		Results		GW29		Results	
			20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16
Dissolved Aluminium	mg/L	0.01	<0.01 [^]	<0.01 [^]	33.3	DNS			DNS	DNS	3.21 [^]	3.21 [^]	64.4	0.47
Dissolved Arsenic	mg/L	0.001	0.001 [^]	0.001 [^]	0.024						0.014 [^]	0.014 [^]	0.026	0.001
Dissolved Cadmium	mg/L	0.0001	<0.001 [^]	<0.001 [^]	0.0005						0.001 [^]	0.001 [^]	0.0016	<0.0001
Dissolved Chromium	mg/L	0.001	<0.001 [^]	<0.001 [^]	0.105						0.006 [^]	0.006 [^]	0.038	<0.001
Dissolved Copper	mg/L	0.001	0.002 [^]	0.002 [^]	4.25						0.017 [^]	0.017 [^]	0.433	0.039
Total Iron	mg/L	0.05	6.61	10.20	92.8		65.3	65.3			109	110	39.8	124
Dissolved Lead	mg/L	0.001	<0.001 [^]	<0.001 [^]	0.084						0.009 [^]	0.009 [^]	0.099	<0.001
Total Manganese	mg/L	0.001	0.492 [^]	0.492 [^]	1.8						0.571 [^]	0.571 [^]	0.937	1.73
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.006 [^]	0.006 [^]	0.064						0.031 [^]	0.031 [^]	0.082	0.002
Dissolved Silver	mg/L	0.001	<0.001 [^]	<0.001 [^]	<0.001						<0.001 [^]	<0.001 [^]	<0.001	<0.001
Dissolved Zinc	mg/L	0.005	0.026 [^]	0.026 [^]	0.341						5.25 [^]	5.25 [^]	3.37	0.044
EC laboratory	uS/cm		567	746	593		2140	2140			291	539	201	240
Total Nitrogen	mg/L		0.3	0.7			2.6	2.6			2.6	4.8		
Total Phosphorus	mg/L		0.14	0.22			0.92	0.92			0.63	1.07		
Ammonia	mg/L		0.04	0.06			0.06	0.06			0.05	0.06		
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹													
Chloride	mg/L		80	81			34	34			45	63		
Nitrate					0.03								0.33	1.09
Sulphate	mg/L		41	64			5.9	5.9			35.9	123.7		
Calcium	mg/L		18.3	25.6			5.75	5.75			7.2	13.9		
Magnesium	mg/L		8.3	9.6			6.83	6.83			23.1	34.0		
Potassium	mg/L		4.34	6.24			10.5	10.5			13.9	20.3		
Sodium	mg/L		60.2	60.3			33.1	33.1			133	231		

* No variation established between sampling events.

[^] Based on one record only.

Note: Analysis of all metals for August 2016 event is for "total" metals despite otherwise indicated in table.

DNS – Did Not Sample

Table 3-37 Construction groundwater monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW30		Results		GW06		Results		GW		Results	
			20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16	20 th per [#]	80 th per [#]	Aug 16	Dec 16
Dissolved Aluminium	mg/L	0.01	2.34	2.60	31.4	0.6			39.9	19.3				
Dissolved Arsenic	mg/L	0.001	0.002	0.003	0.01	0.001			0.024	0.018				
Dissolved Cadmium	mg/L	0.0001	0.001	0.001	0.0001	0.0002			0.0002	0.0004				
Dissolved Chromium	mg/L	0.001	<0.001*	<0.001*	0.021	<0.001			0.013	0.001				
Dissolved Copper	mg/L	0.001	2.09	2.23	1.29	1.41			0.028	0.048				
Total Iron	mg/L	0.05	36.9	115.6	26	32.2			27	24.1				
Dissolved Lead	mg/L	0.001	<0.001*	<0.001*	0.017	<0.001			0.093	0.032				
Total Manganese	mg/L	0.001	3.21	3.58	1.01	1.1			0.861	0.56				
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.161	0.172	0.059	0.061			0.028	0.032				
Dissolved Silver	mg/L	0.001	<0.001*	<0.001*	<0.001	<0.001			<0.001	<0.001				
Dissolved Zinc	mg/L	0.005	0.813	0.859	0.372	0.291			0.479	0.488				
EC laboratory	uS/cm		4436	4934	1880	2280			5810	6340				
Total Nitrogen	mg/L		1.8	2.0										
Total Phosphorus	mg/L		0.52	0.55										
Ammonia	mg/L		0.04	0.05										
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹													
Chloride	mg/L		1219	1390										
Nitrate					0.01	0.07			0.03	0.12				
Sulphate	mg/L		158	167										
Calcium	mg/L		11.5	12.3										
Magnesium	mg/L		79.9	90.3										
Potassium	mg/L		13.2	14.2										
Sodium	mg/L		687	760										

* No variation established between sampling events.

Note: Analysis of all metals for August 2016 event is for "total" metals despite otherwise indicated in table.

Note: There have been no pre-construction or construction results for GW06 prior to August 2016.

Table 3-38 Construction groundwater level – manual record

Borehole reference	Top of casing RL (mAHD)	Depth of water level										
		Pre-construction		Construction								
		20 th per	80 th per	Aug 2016	Sep 2016	Oct 2016	Dec 2016	Jan 2017				
GW01 (mTOC)	20.11	4.41	4.93	6.1	6.17	6.27	6.31	6.22				
GW01 (mAHD)		15.18	15.70									
GW02 (mTOC)	3.57	1.95	2.96	Destroyed	2.93	3.10	3.46	3.84				
GW02 (mAHD)		0.61	1.62									
GW03 (mTOC)	2.64	0.81	2.08	0.62	0.47	0.58	0.80	1.52				
GW03 (mAHD)		0.58	1.81									
GW04 (mTOC)	1.69	1.11	2.21	1.34	1.26	1.41	No access	No access				
GW04 (mAHD)		-0.52	0.58									
GW05 (mTOC)	1.24	0.81	1.55	0.61	0.45	0.49	No access	No access				
GW05 (mAHD)		-0.31	0.43									
GW06 (mTOC)	20.1	5.36	5.85	2.26	2.06	2.23	2.26	2.25				
GW06 (mAHD)		14.25	14.74									
GW07 (mTOC)	15.98	2.86	5.19	6.67	5.46	No access	5.79	6.02				
GW07 (mAHD)		10.79	13.12									
GW08 (mTOC)	19.09	6.94	6.94	8.07	Dry	Dry	Dry	8.26				
GW08 (mAHD)		12.15	12.15									
GW09	17.57	8.05	8.66	No access	No access	No access	Dry	Dry				

Borehole reference	Top of casting RL (mAHD)	Depth of water level															
		Pre-construction		Construction													
		20 th per	80 th per	Aug 2016	Sep 2016	Oct 2016	Dec 2016	Jan 2017									
(mTOC)																	
GW09 (mAHD)		8.91	9.52														
GW10 (mTOC)	15.38	3.34	7.27	Dry	Dry	Dry	Dry	Dry									
GW10 (mAHD)		8.11	12.04														
GW11 (mTOC)	1.591	1.49	2.45	4.33	No access	No access	4.42	4.60									
GW11 (mAHD)		-0.86	0.10														
GW12 (mTOC)	1.573	0.74	1.68	No access	0.60	0.60	0.90	1.41									
GW12 (mAHD)		-0.20	0.83														
GW13 (mTOC)	2.04	1.44	2.05	1.43	1.49	1.37	1.72	1.82									
GW13 (mAHD)		-0.01	0.60														
GW14 (mTOC)	5.656	2.60	3.43	1.51	1.39	No access	2.42	2.65									
GW14 (mAHD)		2.23	3.06														
GW15 (mTOC)	13.79	10.01	10.32	9.13	9.03	9.41	9.85	10.08									
GW15 (mAHD)		3.47	3.78														
GW16 (mTOC)	14.14	8.13	8.13	Destroyed	Destroyed	Destroyed	Dry	Dry									
GW16 (mAHD)		6.01	6.01														
GW17 (mTOC)	59.47	Dry	Dry	11.32	11.18	11.47	11.52	11.74									
GW17 (mAHD)		Dry	Dry														

Borehole reference	Top of casting RL (mAHD)	Depth of water level										
		Pre-construction		Construction								
		20 th per	80 th per	Aug 2016	Sep 2016	Oct 2016	Dec 2016	Jan 2017				
GW18 (mTOC)	96.71	33.98	34.04	33.63	33.55	33.51	33.49	33.46				
GW18 (mAHD)		62.67	62.73									
GW19 (mTOC)	51.81	7.53	9.46	No access	Dry	Dry	Dry	No access				
GW19 (mAHD)		42.35	44.28									
GW20 (mTOC)	87.18	Dry	Dry	No access	32.83	Dry	Dry	Dry				
GW20 (mAHD)		Dry	Dry									
GW21 (mTOC)	51.29	4.65	5.79	3.31	3.19	4.02	4.22	4.56				
GW21 (mAHD)		45.50	46.64									
GW22 (mTOC)	17.27	4.64	5.28	No access	No access	No access	No access	No access				
GW22 (mAHD)		11.99	12.63									
GW23 (mTOC)	39.22	15.93	15.99	16.75	No access	17.62	16.61	16.66				
GW23 (mAHD)		23.23	23.29									
GW24 (mTOC)	26.09	6.25	7.78	7.47	7.38	7.73	7.72	Dry				
GW24 (mAHD)		18.31	19.84									
GW25 (mTOC)	61.72	11.53	12.35	Dry	Dry	Dry	Dry	Dry				
GW25 (mAHD)		49.37	50.19									
GW26 (mTOC)	54.56	14.17	14.98	14.30	13.96	14.55	14.51	14.56				
GW26		39.58	40.39									

Borehole reference	Top of casing RL (mAHD)	Depth of water level										
		Pre-construction		Construction								
		20 th per	80 th per	Aug 2016	Sep 2016	Oct 2016	Dec 2016	Jan 2017				
(mAHD)												
GW27 (mTOC)	74.33	27.45	27.66	28.59	No access	28.88	No access	No access				
GW27 (mAHD)		46.67	46.88									
GW28 (mTOC)	54.65	8.45	9.40	9.40	9.05	Dry	9.33	Dry				
GW28 (mAHD)		45.25	46.20									
GW29 (mTOC)	45.11	2.97	8.82	8.10	8.46	8.75	8.72	8.32				
GW29 (mAHD)		36.29	42.14									
GW30 (mTOC)	41.49	3.16	4.59	5.58	4.90	5.20	5.20	5.83				
GW30 (mAHD)		36.90	38.33									

Table 3-39 Construction groundwater monitoring (EC) – manual record

Borehole reference	Electrical conductivity (uS/cm)										
	Pre-construction		Construction								
	20 th per	80 th per	Aug 2016	Sep 2016	Oct 2016	Dec 2016	Jan 2017				
GW01	5062	5502	-0.1	5.701	5504	5660	740.1				
GW02	293	656	Destroyed	0.771	1186	486	988				
GW03	1009	1283	37.1	1.297	1551	1525	1422				
GW04	3027	5520	49.2	0.735	1829	No access	No access				
GW05	5970	6728	76.1	5.896	4594	No access	No access				
GW06	1359	8204	47.1	5.070	5241	4314	6079				
GW07	172	230	Insufficient	0.141	No access	175	242.4				
GW08	No record	No record	Insufficient	Insufficient	Insufficient	Insufficient	737.0				
GW09	1981	2536	No access	No access	No access	Insufficient	Insufficient				

Borehole reference	Electrical conductivity (uS/cm)										
	Pre-construction		Construction								
	20 th per	80 th per	Aug 2016	Sep 2016	Oct 2016	Dec 2016	Jan 2017				
GW10	443	780	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient				
GW11	1296	5880	0.9	No access	No access	1383	2089				
GW12	2467	4460	No access	0.022	1713	1609	1971				
GW13	186	295	5.5	0.218	357	234.8	236.8				
GW14	6312	7068	16807	17.467	No access	8707	19353				
GW15	3600	3740	3142	2.160	2621	7244	3503				
GW16	No record	No record	Destroyed	Destroyed	Destroyed	Insufficient	Insufficient				
GW17	No record	No record	3218	3.109	2758	2302	3428				
GW18	1588	1648	1473	1.415	1496	1427	1646				
GW19	554	602	No access	Insufficient	Insufficient	Insufficient	No access				
GW20	No record	No record	No access	0.833	Insufficient	Insufficient	Insufficient				
GW21	1861	2426	668	0.486	777	901	1172				
GW22	842	5484	No access	No access	No access	No access	No access				
GW23	415	726	244	No access	283	262	332				
GW24	509	974	52.8	0.557	409.1	264.1	Insufficient				
GW25	476	965	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient				
GW26	1083	1337	599	0.664	423.5	632	786				
GW27	535	737	463.4	No access	539	No access	No access				
GW28	181	225	Insufficient	229.6	Insufficient	Insufficient	Insufficient				
GW29	222	299	184	412.1	258.7	225.3	202.6				
GW30	1750	3800	1495	1897	1697	1405	2274				

Table 3-40 Construction groundwater monitoring (pH) – manual record

Borehole reference	pH										
	Pre-construction		Construction								
	20 th per	80 th per	Aug 2016	Sep 2016	Oct 2016	Dec 2016	Jan 2017				
GW01	4.1	4.5	6.6	6.6	5.9	6.0	6.1				
GW02	6.2	6.5	Destroyed	7.8	6.5	6.2	6.6				
GW03	6.0	6.5	6.1	7.6	5.8	5.7	6.5				

Borehole reference	pH										
	Pre-construction		Construction								
	20 th per	80 th per	Aug 2016	Sep 2016	Oct 2016	Dec 2016	Jan 2017				
GW04	6.0	6.3	7.7	8.3	5.9	No access	No access				
GW05	6.2	6.6	7.1	6.5	6.3	No access	No access				
GW06	3.6	5.0	4.4	5.1	4.2	3.2	3.8				
GW07	5.6	5.9	Insufficient	5.9	No access	4.9	5.4				
GW08	No record	No record	Insufficient	Insufficient	Insufficient	Insufficient	5.9				
GW09	4.1	5.6	No access	No access	No access	Insufficient	Insufficient				
GW10	5.7	6.3	Insufficient	insufficient	Insufficient	Insufficient	Insufficient				
GW11	4.9	5.2	6.6	No access	No access	4.8	5.3				
GW12	5.8	6.0	No access	4.5	5.4	5.3	5.7				
GW13	5.3	5.8	7.0	5.7	5.4	4.9	5.8				
GW14	4.4	6.1	3.1	3.0	No access	3.2	3.9				
GW15	6.2	6.4	5.8	5.7	5.9	5.9	5.9				
GW16	No record	No record	Destroyed	Destroyed	Destroyed	Insufficient	Insufficient				
GW17	No record	No record	6.5	7.1	5.9	5.7	5.8				
GW18	6.5	6.7	7.5	7.9	6.4	6.2	7.4				
GW19	6.1	6.4	No access	Insufficient	Insufficient	Insufficient	No access				
GW20	No record	No record	No access	8.0	Insufficient	Insufficient	Insufficient				
GW21	6.2	6.3	7.1	7.9	5.9	6.0	6.3				
GW22	6.0	6.3	No access	No access	No access	No access	No access				
GW23	5.8	6.2	7.0	No access	5.7	5.9	8.2				
GW24	4.5	5.3	7.5	8.0	6.6	7.1	Insufficient				
GW25	4.7	5.0	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient				
GW26	5.5	5.9	6.6	6.2	5.0	4.7	6.8				
GW27	6.0	6.2	7.1	No access	6.3	No access	No access				
GW28	5.3	5.7	Insufficient	6.2	Insufficient	Insufficient	Insufficient				
GW29	5.4	5.9	7.4	6.5	5.8	5.5	6.4				
GW30	4.3	5.0	7.5	5.5	4.8	4.4	5.8				

Table 3-41 Construction groundwater monitoring (temperature) – manual record

Borehole reference	Temperature										
	Pre-construction		Construction								
	20th per	80th per	Aug 2016	Sep 2016	Oct 2016	Dec 2016	Jan 2017				
GW01	20.1	20.9	20.5	19.7	20	23.5	22.2				
GW02	19.0	21.2	Destroyed	18.3	18.7	20.8	21.0				
GW03	18.5	21.3	24.4	16.5	16.7	19.4	20.9				
GW04	18.6	20.3	19.8	17.7	17.6	No access	No access				
GW05	17.4	18.9	18.0	17.5	16.9	No access	No access				
GW06	18.5	19.8	21.2	18.5	18.5	21.9	23.5				
GW07	18.5	19.5	Insufficient	20.1	No access	20.1	21				
GW08	No record	No record	Insufficient	Insufficient	Insufficient	Insufficient	20.3				
GW09	18.3	18.5	No access	No access	No access	Insufficient	Insufficient				
GW10	18.2	19.5	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient				
GW11	18.2	19.6	20.4	No access	No access	20.4	20.4				
GW12	18.0	20.5	No access	17.3	18.1	22	23.7				
GW13	19.1	20.0	18.7	21.1	18.8	21.8	23.5				
GW14	19.2	20.0	17.6	18.5	No access	20.6	22.2				
GW15	19.4	20.2	19.8	20.1	20.2	20.7	21.5				
GW16	No record	No record	Destroyed	Destroyed	Destroyed	Insufficient	Insufficient				
GW17	No record	No record	19.6	19.4	19.3	20.4	20.2				
GW18	19.9	20.5	19.1	19.2	19.3	20.5	20.1				
GW19	19.5	20.2	No access	Insufficient	Insufficient	Insufficient	No access				
GW20	No record	No record	No access	19.4	Insufficient	Insufficient	Insufficient				
GW21	18.8	20.3	18.7	18.3	18.3	19.3	20.5				
GW22	17.6	20.2	No access	No access	No access	No access	No access				
GW23	19.0	19.6	18.6	No access	18.6	19.5	20.4				
GW24	18.3	19.0	19.8	19.3	19.4	21.3	Insufficient				
GW25	19.9	20.5	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient				
GW26	19.1	20.6	18.7	18.9	19.4	20.6	21.0				
GW27	19.3	20.5	18.3	No access	19.7	No access	No access				
GW28	19.5	22.6	Insufficient	19.3	Insufficient	Insufficient	Insufficient				
GW29	18.4	19.9	17.7	19.0	18.8	19.8	19.8				

Borehole reference	Temperature										
	Pre-construction		Construction								
	20th per	80th per	Aug 2016	Sep 2016	Oct 2016	Dec 2016	Jan 2017				
GW30	19.4	20.0	19	19.4	19.1	19.7	20.5				

3.9 Discussion of groundwater results

Construction activity at the time of the first construction monitoring event in April 2015 was limited. Activity across the majority of the project at that time was largely limited to vegetation clearing, topsoil removal and minor earthworks (eg water quality basins), and is considered unlikely to have directly or indirectly affect groundwater resources.

Construction activity at the time of the second monitoring event (ie to July 2015) had progressed with a number of large cut and fill operations progressing. During the August 2015 to January 2016 monitoring period the majority of major earthworks (ie deep cuts and high fill embankments) across the project had been completed.

During the period between January 2016 to July 2016 construction efforts focused in many areas on achieving final design levels both in fills and cuts, bridge structures and some paving operations. The Cooperabung Range, in the vicinity of GW18, remained the one cut on the project where a substantial amount of earthworks were required to achieve the final design levels.

During this monitoring period (ie July 2016 to January 2017) construction efforts have been focused on paving operations with a number of traffic switches occurring on both Stage 2 and Stage 3 of the project. In many areas all earthworks have been completed, structures finished and final landscaping in a maintenance phase. Earthworks to accommodate the southbound carriageway through the Cooperabung Range remains outstanding. These bulk earthworks are expected to be completed during the first half of 2017.

Considering these factors, the following observations can be made:

- Logged data shows that groundwater level has a variable response to rainfall events across monitoring sites. Of twenty-one accessible data loggers which provided recent data, eight were responsive to significant recent rainfall events. These rainfall events included 70.6mm on 3 August 2016, 53.6mm on 4 August 2016, 12.2mm on 5 August 2016, 32.4mm on 9 to 13 November 2016 and 31.4mm on 6 to 7 December 2016. Six of the loggers had variable response to rainfall events, while seven of the loggers were unresponsive. Other smaller scale fluctuations in groundwater levels are present in most boreholes, which likely reflect variability in the groundwater table from less significant events. It is noted that the depth to groundwater may also fluctuate with changes to drainage and other site specific factors. (see Appendix D).
- No major changes to groundwater levels were observed during the reporting period. While some boreholes at times were dry, the low or dry conditions in these boreholes appear to coincided with prevailing dry atmospheric conditions rather than the stage of construction. Previous recommendations to closely monitor levels at GW8 and GW15 show a return to levels consistent with longer term trends.
- Laboratory analysed parameters continue to show variability for a number of analytes between sampling events eg Aluminium, Iron, Manganese, Copper (at GW07 only) and Nitrate (at GW02 only). However, this is generally not considered inconsistent with pre-construction and/or during construction results. Note, comparison between July 2015, November 2015, April 2016 and August 2016 and other results for a number of metal parameters are not in all instances possible due to the nature of analysis ie total metals verses dissolve metals).

Other laboratory analysed parameters continue to show similar levels across all pre-construction and construction monitoring events.

- Manually recorded pH records show some variability across all sampling locations. pH appears to vary within a range of up to 2 pH and more often is slightly acidic rather than alkaline. Higher levels of variability have occurred at GW07 (between 4.9 and 7.5), GW14

(between 3 to 7.6) and GW30 (between 4.4 to 7.5), since construction monitoring commenced. However, the lower level extremes are not inconsistent with individual results recorded prior to and the early stages of construction.

- Manually recorded temperature records are generally consistent with levels recorded during the pre-construction and previous construction reporting periods. Subtle temperature movements either up or down tend to reflect seasonal changes rather than potential impacts from construction.
- Manually recorded electric conductivity show a high level of alignment between pre-construction and levels recorded at nearly all sites during the current reporting period. GW14 remains an exception with a high level of variability between sample events.

3.10 Project response to groundwater quality results

Considering the generally consistent results (in particular for EC, temperature, groundwater depth, and a number of the laboratory analysed parameters) onsite management actions / interventions are not proposed at this time. Recommendations for subsequent monitoring would include:

- Ensuring laboratory analysis is consistent with pre-construction and earlier construction monitoring eg total and dissolved metals to be analysed and reported where necessary. As indicated in Section 3.7, Roads and Maritime had previously identified this issue and had instructed the laboratory to analyse both total and dissolved metals for all future monitoring events (this occurred prior to January 2016 and again in September 2016). However, staff changes at the laboratory, and failure to implement the instructions on two separate occasions, resulted in only total metals being analysed for the April 2016 and August 2016 monitoring events. Roads and Maritime has again provided an instruction to the laboratory to analyse all future samples for both total and dissolved metals. This was resolved for the subsequent December 2016 monitoring event.
- Closely monitor Copper and Nitrate levels at GW07 and GW02, respectively.
- Continue to closely monitor metal parameters and pH at GW29 during subsequent monitoring events.
- Close monitoring of pH levels at GW07, GW14 and GW30 to determine whether acidic conditions correspond to periods of low rainfall, or whether construction activities may contribute to conditions at this location.
- Continue to closely monitor electrical conductivity at GW14 and review future laboratory results to determine whether there has been a consistent change to electrical conductivity at the monitoring site.

Terms and acronyms

Term	Meaning
CEMP	Construction environmental management plan
Director General	Director General of the NSW Department of Planning and Environment (or delegate)
DPI (Fishing)	The Department of Primary Industry (Fishing) (formally “Department of Primary Industry (Fishing and Aquaculture)”))
EA	Environmental Assessment
EMS	Environmental management system
EPA	Environmental Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
ER	Environmental Representative
K2K	Kundabung to Kempsey stage of the Oxley Highway to Kempsey project
MCoA	The Department of Planning and Infrastructure Ministers Condition of Approval
Minister, the	Minister for Planning and Environment (formerly “Minister for Planning and Infrastructure”)
NOW	The NSW Office of Water
OH2K	Oxley Highway to Kempsey, also referred to as the project
OH2Ku	Oxley Highway to Kundabung stage of the Oxley Highway to Kempsey project
OEH	Office of Environment and Heritage
P&E	The Department of Planning and the Environment (formerly P&I)
P&I	The Department of Planning and Infrastructure
project, the	Oxley Highway to Kempsey Pacific Highway Upgrade
Roads and Maritime	Roads and Maritime Services
SoC	Revised statement of commitments (March 2011)
Stage 1	Sancrox Traffic Arrangement works
Stage 2	Kundabung to Kempsey stage of the Oxley Highway to Kempsey project
Stage 3	Oxley Highway to Kundabung stage of the Oxley Highway to Kempsey project

Appendix A – Site locality maps

Appendix B – Rainfall records

Port Macquarie Airport rainfall records from July 2016 to January 2017

Day of month	July 2016	August 2016	September 2016	October 2016	November 2016	December 2016	January 2017
1	0	0	0	0	1	0.2	0
2	0	0	1.4	0	12	1.6	5.8
3	0	70.6	0.2	0	0	1.6	6.6
4	0	53.6	0	0.6	0	0	3.6
5	2.8	12.2	2.2	0	0	0	13.4
6	0.2	0.2	0	0	0	29.8	1.2
7	0	0	0	0	0	1.6	0.8
8	0	0	4.2	0	0	0	0.4
9	5.2	0	0	0	2.6	13	0
10	0	0	0.4	0	14.6	1.6	0
11	0	0	0.8	7	0	0	0
12	0.2	0	0	0	14	0	0
13	0	0	0	0	1.2	0	0
14	0	0	1.8	29	0	0	0
15	0	0.4	5.8	0	0.2	0	32.4
16	0	0	6	0	0	3.2	0
17	3.6	0	0	0	0	1.8	0
18	0.2	0	0	11.6	0	0	0
19	0	0	0.8	0	0	0	0.2
20	0.6	0	0	0	0	0	0.4
21	3.6	0	3.6	4	0	0.6	12.2
22	0.2	0	2.4	3.8	0	0	0.2
23	0	4.4	0	11.2	0	0	0
24	0	11.2	0	0	0	0	0
25	0	12.8	0	0	0.2	0	1.4
26	0	0	0	0	0	0	0.8
27	0	9	0	0	0	0	0.2
28	0	1	0	3.6	0	0	4.4
29	0	0	0.2	8.8	0	0	0
30	0	0	0	0	5.2	0	0
31	0	0		3.4		0	0
Highest Daily	5.2	70.6	6	29	14.6	29.8	32.4
Monthly Total	16.6	175.4	29.8	83	51	55	84

Statistics for all years												
Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	158.7	167.8	158.1	142.5	116.2	136.6	64	69.2	61.8	73.1	154.8	108
Median	138	153.5	153.9	112.8	69.6	138.8	66.1	38.1	47.2	58.9	137.5	97.5

Telegraph Point rainfall records from July 2016 to January 2017

Day of month	July 2016	August16	September 2016	October 2016	November 2016	December 2016	January 2017
1	0	0	0	0	2.4	0.6	0
2	0	0	1.4	0	0	3.2	5.3
3	0	88.4	1.8	0	0	2.4	7.6
4	0	70.6	0	0.6	0	3.6	3
5	2.8	6	2	0	0	0	2.4
6	0	0	0	0	0	11.2	0.1
7	0	0	0	0	0	1.6	1.6
8	0	0	2	0	0	0.3	0
9	3.5	0	0	0.2	3.2	4	0
10	0	0	0	0	9.3	0	2.4
11	0	0	0	3.5	0	0	0
12	0	0	0	0	8	0	0
13	0	0	0	0	0	0	0
14	0	0	1	12.2	0	0	0
15	0	0	2.2	0.4	0	0	33.4
16	0	0	5.5	0	0	1.4	0
17	3	0	0	11.2	0	2.3	0.2
18	1.3	0	0.2	0	0	0.4	0
19	0	0	0	0	0	0	0.8
20	1.3	0	0	0	0	0	0.5
21	3.2	0	3.4	4.7	0	0	8.6
22	0	0	1.2	1.7	0	0.4	0
23	0	3.6	0	7.5	0	0	0
24	0	10.5	0	0	0	0	0
25	0	10.1	0	0	0	0	0
26	0	0	0	0	0	0	0.6
27	0	2.8	0	0	0	0	0.4
28	0	0.8	0	4.8	0	0	3.1
29	0	0	0	5.3	0	0	0
30	0	0	0	0.3	3.6	0	0
31	0	0		2.2		0	0
Highest Daily	3.5	88.4	5.5	12.2	9.3	11.2	33.4
Monthly Total	15.1	192.8	20.7	54.6	26.5	31.4	70

Statistics for all years												
Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	138.7	175.8	164.2	128	104.8	108.7	67.2	59	60.2	83.4	109	113.9
Median	115.9	148.9	148.8	88.3	60	73.1	36.4	25.9	42.9	54.6	89.3	95.2

Kempsey airport rainfall records from July 2016 to January 2017

Day of month	July 2016	August 2016	September 2016	October2016	November 2016	Dcember2016	January 2017
1	0	0	0	0	0.6	0.2	0
2	0	0	1	0	20.6	1.8	3
3	0	37	1.2	0	0	0	8.8
4	0	93	0.2	0	0	0.4	1
5	7.4	2.8	0.4	0	0	0	1.2
6	0	0	0	0	0	6.2	0.4
7	0	0	0	0	0	7.6	4
8	0	0.2	0.2	0	0	0	0.2
9	2.2	0	0.2	0	1.8	1.6	0.2
10	0	0.2	0.2	0	10.2	0	0
11	0.2	0.2	0	8.4	0	0	0
12	0.2	0.2	0	0	3.4	0	4
13	0	0	0	0	3	0	0
14	0	0	3.6	1.8	0	0	0
15	0	0	0	0.2	0	0	10.6
16	0	0	8.8	0	0	0.4	1.6
17	1.6	0	0	0	0	0.4	0
18	0.2	0	0.8	1.8	0	6.4	0
19	0	0	1.4	0	0	0.2	0.2
20	1.8	0.2	0	0	0	0	0.2
21	0.8	0	4	4.6	0	0	10.6
22	0.2	0	1	0.8	0	0	0
23	0.2	3.8	0	15.2	0	0	0
24	0	19	0	0	0	0	0
25	0	10.6	0.4	0	0	0	0
26	0	0.4	0	0	0	0	2.2
27	0	0.2	0	0	0	0	1
28	0	0	0	0.6	0	0	0
29	0	0	0	26.6	2.8	0	0
30	0	0	0.6	0.2	9.8	0	0
31	0	0		1.6		0	0
Highest Daily	7.4	93	8.8	26.6	20.6	7.6	10.6
Monthly Total	14.8	167.8	24	61.8	52.2	25.2	49.2

Statistics for all years												
Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean												
Median												

Sancrox site weather station rainfall records from July 2016 to January 2017

Day of month	July 2016	August 2016	September 2016	October 2016	November 2016	December 2016	January 2017
1		0	0.8	0	9.6	1.2	5.6
2		59	0.8	0	0	1.8	8.8
3		62.6	0	0.4	0	0	5.6
4		6.4	0.2	0	0	0	8.6
5		0	0	0	0	33.8	0.6
6		0	0.2	0	0	1.8	0.4
7		0	4.6	0	0	0.6	0
8		0	0	0	1.4	16	0
9		0	0.4	0	10.8	1.2	0
10		0	1	5	0	0	0
11		0	0.2	0	13.2	0	0
12		0	0	0	0.2	0	0
13		0	0.6	20.2	0	0	0
14		0	4.6	0.6	0.2	0	23.2
15		0	5.6	0.2	0	1.8	0
16		0	0.2	0	0	2.8	0
17		0	0	7.2	0	0	0
18		0	0.4	0.2	0	0.2	0
19		0	0.2	0	0	0	0.6
20		0	2.8	4.4	0	0.4	9.6
21		0	2	3.2	0	0.2	0
22	1	4.4	0.2	8.2	0	0	0
23	0.2	9.2	0	0	0	0	
24	0.2	10.8	0	0	0	0	
25	0.2	0	0	0	0	0	
26	0	4.6	0	0	0	0	
27	0	1.8	0	3	0	0	
28	0	0.2	0	3	0	0	
29	0	0	0	0	5.6	0	
30	0.2	0	0	2.6	0.2	0	
31	0	0		0.8		0	

Telegraph Point site weather station rainfall records from July 2016 to January 2017

Day of month	July 2016	August 2016	September 2016	October 2016	November 2016	December 2016	January 2017
1		0	1	0	9.8	0.6	4.4
2		87.4	1.8	0	0	1.8	7
3		78	0	0.4	0	3.6	1.6
4		4.8	0	0	0	0	0.8
5		0	0	0	0	11.2	0
6		0	0	0	0	1.6	2.6
7		0	3.2	0	0	0	1.4
8		0.2	0.6	0	1.6	2.4	0
9		0	0.4	0	7.8	0.2	0
10		0.2	0.4	2.8	0.2	0	0
11		0	0	0	7.4	0	1
12		0.2	0	0	0.2	0	0
13		0	0.8	15.6	0	0	0
14		0.6	3.2	3	0	0	28.4
15		0	6.8	0	0	1	0.2
16		0	0	0	0	1.6	0
17		0	0	12.2	0	0.6	0
18		0.2	1	0	0	0.2	0
19		0	0	0.2	0	0	1.6
20		0	3.2	6.4	0	0.4	8
21		0	1.6	2.8	0	0	0
22	0	3.2	0	8.6	0	0.2	0
23	0	10.6	0	0.2	0	0	
24	0	10.4	0	0	0	0	
25	0	0.2	0	0	0	0	
26	0	3.4	0	0	0	0	
27	0	0.6	0	3.2	0	0	
28	0	0	0	5.8	0	0	
29	0.2	0	0	0	4	0	
30	0.2	0	0	1.6	1.2	0	
31	0	0		3.8		0	

Kundabung site weather station rainfall records from July 2016 to January 2017

Day of month	July 2016	August 2016	September 2016	October 2016	November 2016	December 2016	January 2016
1		0	0.8	0	13.6	1	4.2
2		58	1.6	0	0	0	6.4
3		88.2	0	0	0	1.4	1.8
4		6.2	0	0	0	0	0.4
5		0	0	0	0	25.2	0
6		0	0	0	0	3.2	13.6
7		0.2	0.8	0	0	0.2	2.4
8		0	0.4	0	0.6	1.6	0
9		0	0.2	0	6.6	0.2	0
10		1.4	0	3	0	0	0
11		0.4	0	0	6.8	0	0
12		0	0	0	0.2	0	0
13		0.2	1.4	10.4	0	0	0
14		0	0.6	0.6	0	0	23.4
15		0	6.6	0	0	0.2	0.8
16		0	0.2	0	0	2	0
17		0	0.4	14.2	0	20.6	0
18		0	3	0.4	0	0.4	0
19		0	0.2	0	0	0.2	1.4
20		0	3.6	4.6	0	3	9.2
21		0	1	2.2	0	0	0.2
22	0	3	0	11.6	0	0	
23	0	16.8	0	0	0	0	
24	0	9.2	0.2	0	0	0	
25	0	0.2	0	0	0	0	
26	0	1.6	0	0	0	0	
27	0	0.6	0	0.8	0	0	
28	0	0.2	0.2	18	1.8	0	
29	0.2	0	0.2	0.2	7.2	0	
30	0	0	0.2	2	0	0	
31	0	0.8		2		0	

Appendix C – Surface water quality sampling results

Table 1 SW1 – Unnamed tributary or Fernbank Creek (Chainage 2500 to 2650)

No.	Parameter	Unit	05/08/16 (W)			18/08/16 (D)			25/08/16 (W)			8/09/16 (D)			13/10/16 (D)			14/10/16 (W)			18/10/16 (W)		
			SW1a (US)	SW1b (US)	SW1c (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)
1	Temperature	°C	13	14	14	12	12	15	14	14	15	15	15	17	15	16	16	15	16	16	15	15	16
2	Electrical conductivity (EC)	uS/cm	191	519	572	573	1218	1527	393	794	1138	647	1128	1071	1111	1422	1207	572	694	961	599	837	984
3	Dissolved oxygen (DO)	%	86	90	92	17	83	114	77	90	80	26	82	80	31	63	39	42	70	72	38	68	62
4	pH		6.4	6.8	7.1	6.8	7.3	7.7	6.6	7.0	6.8	6.4	7.1	7.3	6.9	7.4	7.7	6.8	7.5	7.7	6.4	7.1	7.2
5	Turbidity (NTU)	NTU	28	25	30	36	4	3	21	27	64	44	15	87	47	16	7	23	172	131	50	110	72
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	9	<5	<5	5	7	34	12	12	41	10	<5	<5	<5	36	29	24	21	21
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L	1.38	0.7	0.57	0.03	<0.01	<0.01				0.03	<0.01	0.02	<0.01	<0.01	<0.01	0.04	0.02	0.02			
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				<0.0001	<0.0001	0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	0.001	<0.001	<0.001	0.002	<0.001	0.002	0.002			
13	Iron (Fe)	mg/L	0.95	0.58	0.52	1.66	0.12	<0.05				1.89	0.1	0.11	0.12	0.09	<0.05	0.56	0.07	<0.05			
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
15	Manganese (Mn)	mg/L	0.009	0.016	0.024	0.267	0.09	0.05				0.448	0.172	0.302	0.267	0.572	0.096	0.09	0.064	0.12			
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			
17	Nickel (Ni)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	0.002	<0.001	<0.001	0.001	<0.001	<0.001	0.002			
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
19	Zinc (Zn)	mg/L	0.007	0.006	0.005	<0.005	<0.005	<0.005				0.007	<0.005	0.034	0.06	0.005	0.012	0.012	0.005	0.01			
20	Total Nitrogen (TN)	mg/L	0.6	0.6	0.7	0.3	0.3	0.3	0.3	0.2	0.6	0.4	0.2	0.6	0.2	0.3	0.5	0.4	0.4	0.6	0.2	0.2	1.5
21	Total Phosphorous (TP)	mg/L	0.02	0.01	0.03	<0.01	<0.01	0.06	0.02	0.02	0.03	0.02	0.02	0.24	<0.01	<0.01	0.04	0.02	0.08	0.13	0.02	0.02	0.12

[#] - No obvious movement of water at sampling point or sampling location persisting as an isolated pond.

Table 2 SW1 – Unnamed tributary or Fernbank Creek (Chainage 2500 to 2650) Cont.

No.	Parameter	Unit	2/11/16 (W)			10/11/16 (W)			17/11/16 (D)			6/12/16 (W)			9/12/16 (W)			16/12/16 (D)			3/01/17 (W)		
			SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)
1	Temperature	°C	18	20	20	19	19	20	19	21	20	23	25	25	22	23	23	21	21	22	23	23	23
2	Electrical conductivity (EC)	uS/cm	508	506	711	503	700	718	828	941	1023	419	796	713	313	554	619	757	892	1090	523	902	943
3	Dissolved oxygen (DO)	%	49	65	71	28	49	53	5	82	72	37	69	61	39	57	58	9	33	43	24	53	37
4	pH		6.4	7.0	7.4	6.5	7.0	7.2	6.3	7.1	7.4	6.6	7.1	7.3	6.5	6.9	6.9	6.4	7.0	7.2	6.8	7.2	7.0
5	Turbidity (NTU)	NTU	42	193	213	152	120	194	67	9	9	60	53	125	29	46	99	98	11	8	238	64	98
6	Total suspended solids (TSS)	mg/L	7	31	70	67	27	49	18	<5	6	<5	11	19	17	18	48	20	10	12	57	14	38
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L	0.04	0.05	0.03				0.02	<0.01	<0.01	0.11	0.05	0.05				<0.01	<0.01	<0.01	0.05	0.01	<0.01
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001				<0.001	<0.001	0.002	<0.001	<0.001	<0.001				<0.001	<0.001	0.002	<0.001	0.002	0.002
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	0.001	0.001	0.001				<0.001	<0.001	<0.001	<0.001	<0.001	0.002
13	Iron (Fe)	mg/L	0.66	0.12	0.05				4.35	0.29	0.07	0.3	0.13	0.14				0.33	0.29	0.05	0.14	0.09	0.06
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
15	Manganese (Mn)	mg/L	0.139	0.084	0.108				0.55	0.576	0.164	0.056	0.072	0.122				0.402	0.736	0.338	0.154	0.296	0.718
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
17	Nickel (Ni)	mg/L	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	0.001	<0.001	<0.001				<0.001	<0.001	0.001	<0.001	<0.001	0.002
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
19	Zinc (Zn)	mg/L	0.014	<0.005	0.047				<0.005	<0.005	0.008	0.013	<0.005	0.008				0.009	<0.005	<0.005	0.007	0.009	0.027
20	Total Nitrogen (TN)	mg/L	0.3	0.3	0.6	1.8	0.4	1.2	0.6	0.3	0.5	0.5	0.5	0.9	0.5	0.4	0.7	0.7	0.4	0.4	1	0.5	0.7
21	Total Phosphorous (TP)	mg/L	<0.01	0.03	0.05	0.08	0.02	0.08	<0.01	<0.01	<0.01	0.03	0.03	0.06	0.02	0.02	0.06	0.08	<0.01	0.02	0.06	0.02	0.05

[#] - No obvious movement of water at sampling point or sampling location persisting as an isolated pond.

Table 3 SW1 – Unnamed tributary or Fernbank Creek (Chainage 2500 to 2650) Cont.

No.	Parameter	Unit	8/01/17 (W)			9/01/17 (D)			SW1a (US)	SW1b (US)	SW1c (DS)	SW1a (US)	SW1b (US)	SW1c (DS)	SW1a (US)	SW1b (US)	SW1c (DS)	SW1a (US)	SW1b (US)	SW1c (DS)	SW1a (US)	SW1b (US)	SW1c (DS)
			SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)															
1	Temperature	°C	21	22	22	22	23	23															
2	Electrical conductivity (EC)	uS/cm	696	844	1013	794	879	1040															
3	Dissolved oxygen (DO)	%	19	53	41	23	70	47															
4	pH		6.7	7.1	7.1	6.8	7.2	7.3															
5	Turbidity (NTU)	NTU	101	17	14	113	9	10															
6	Total suspended solids (TSS)	mg/L	15	<5	6	13	<5	<5															
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L				<0.01	<0.01	<0.01															
9	Arsenic (As)	mg/L				<0.001	<0.001	0.001															
10	Cadmium (Cd)	mg/L				<0.0001	<0.0001	<0.0001															
11	Chromium (Cr)	mg/L				<0.001	<0.001	<0.001															
12	Copper (Cu)	mg/L				<0.001	<0.001	<0.001															
13	Iron (Fe)	mg/L				0.18	0.39	0.06															
14	Lead (Pb)	mg/L				<0.001	<0.001	<0.001															
15	Manganese (Mn)	mg/L				0.231	0.338	0.347															
16	Mercury (Hg)	mg/L				<0.0001	<0.0001	<0.0001															
17	Nickel (Ni)	mg/L				<0.001	<0.001	<0.001															
18	Silver (Ag)	mg/L				<0.001	<0.001	<0.001															
19	Zinc (Zn)	mg/L				<0.005	0.006	<0.005															
20	Total Nitrogen (TN)	mg/L	0.4	0.2	0.2	0.3	0.2	0.2															
21	Total Phosphorous (TP)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01															

[#] - No obvious movement of water at sampling point or sampling location persisting as an isolated pond.

Table 4 SW2 – Fernbank Creek (Chainage 4620 to 4800)

No.	Parameter	Unit	05/08/16 (W)		18/08/16 (D)		25/08/16 (W)		8/09/16 (D)		13/10/16 (D)		14/10/16 (W)		18/10/16 (W)		2/11/16 (W)		10/11/16 (W)	
			SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a [#] (DS)	SW2b [#] (US)	SW2a [#] (DS)	SW2b [#] (US)	SW2a [#] (DS)	SW2b [#] (US)	SW2a [#] (DS)	SW2b [#] (US)	SW2a [#] (DS)	SW2b [#] (US)	SW2a [#] (DS)	SW2b [#] (US)	SW2a (DS)	SW2b (US)
1	Temperature	°C	12.7	13.7	13.8	12.4	12.8	11.5	16.3	16.9	16.0	16.7	16.2	17.6	15.5	17.8	19.4	24.9	DNS	19.2
2	Electrical conductivity (EC)	uS/cm	291	277	482	636	511	543	591	873	673	1303	670	1086	566	927	709	885		941
3	Dissolved oxygen (DO)	%	77	66	94	45	60	25	79	38	57	155	53	138	5	96	74	36		17
4	pH		6.6	6.4	7.1	6.5	7.2	6.8	7.2	6.7	7.7	7.6	7.6	7.4	7.0	6.9	7.5	7.0		7.0
5	Turbidity (NTU)	NTU	27	12	15	19	9	9	7	9	27	21	27	21	10	53	37	52		47
6	Total suspended solids (TSS)	mg/L	<5	<5	8	12	<5	26	6	15	7	157	10	168	<5	41	9	10		16
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.08	0.06	0.02	<0.01			0.01	<0.01	0.02	<0.01	0.03	0.02			0.01	<0.01		
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	0.002	<0.001	0.002			<0.001	0.001		
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
13	Iron (Fe)	mg/L	0.24	1.02	0.22	0.61			0.34	0.69	0.44	2.14	0.36	2.61			0.26	0.55		
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
15	Manganese (Mn)	mg/L	0.044	0.153	0.074	0.597			0.08	0.128	0.276	1.49	0.28	3.89			0.188	2.73		
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
17	Nickel (Ni)	mg/L	0.001	0.001	<0.001	<0.001			<0.001	0.001	0.001	0.002	0.001	0.005			<0.001	<0.001		
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
19	Zinc (Zn)	mg/L	<0.005	0.006	0.012	0.005			<0.005	<0.005	<0.005	<0.005	<0.005	0.011			<0.005	<0.005		
20	Total Nitrogen (TN)	mg/L	0.7	0.6	0.5	1	0.4	0.6	0.4	1.2	0.7	5.3	0.6	3.3	0.8	3.2	0.9	1.2		1.8
21	Total Phosphorous (TP)	mg/L	0.05	0.14	0.02	0.1	0.02	0.08	0.02	0.07	<0.01	0.61	0.03	0.33	0.08	0.42	0.02	0.1		0.11

Note - No obvious movement of water between sampling points at any stage during the monitoring period.

DNS –Sample not collected due to insufficient water depth. Sample unable to be collected on 10 November 2016 due to extensive vegetation cover in waterway.

Table 5 SW2 – Fernbank Creek (Chainage 4620 to 4800) Cont.

No.	Parameter	Unit	17/11/16 (D)		6/12/16 (W)		9/12/16 (W)		16/12/16 (D)		3/01/17 (W)		8/01/17 (W)		9/01/17 (D)		SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	
			SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)					
1	Temperature	°C	20.2	25.0	26.6	DNS	22.5	DNS	21.9	DNS	DNS	DNS	DNS	DNS	DNS						
2	Electrical conductivity (EC)	uS/cm	735	991	947		946		968												
3	Dissolved oxygen (DO)	%	38	113	300		75		82												
4	pH		7.3	7.1	8.9		7.5		7.8												
5	Turbidity (NTU)	NTU	24	47	28		14		14												
6	Total suspended solids (TSS)	mg/L	8	69	<5		10		10												
7	Total Petroleum Hydrocarbons	mg/L																			
8	Aluminium (Al)	mg/L	<0.01	<0.01	0.02				0.02												
9	Arsenic (As)	mg/L	0.002	0.001	0.001				0.001												
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001				<0.0001												
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001				<0.001												
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001				<0.001												
13	Iron (Fe)	mg/L	0.3	0.17	0.18				0.17												
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001				<0.001												
15	Manganese (Mn)	mg/L	2.1	1.35	0.535				0.285												
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001				<0.0001												
17	Nickel (Ni)	mg/L	0.002	<0.001	0.002				0.002												
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001				<0.001												
19	Zinc (Zn)	mg/L	<0.005	<0.005	<0.005				<0.005												
20	Total Nitrogen (TN)	mg/L	0.9	3.9	1.2		1		1.2												
21	Total Phosphorous (TP)	mg/L	<0.01	0.46	0.05		0.05		<0.01												

Note - No obvious movement of water between sampling points at any stage during the monitoring period.

DNS –Sample not collected due to insufficient water depth.

Table 6 SW3 – Hastings River north bank (Chainage 6040 to 6080)

No.	Parameter	Unit	05/08/16 (W)		18/08/16 (D)		25/08/16 (W)		8/09/16 (D)		13/10/16 (D)		14/10/16 (W)		18/10/16 (W)		2/11/16 (W)		10/11/16 (W)	
			SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)
1	Temperature	°C	13.8	13.7	18.1	18.5	15.7	15.7	17.8	17.7	21.0	20.9	21.2	21.0	21.0	20.8	24.2	23.9	23.9	23.8
2	Electrical conductivity (EC)	uS/cm	1340	1201	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
3	Dissolved oxygen (DO)	%	106	103	92	99	82	83	94	94	85	86	85	84	88	87	99	96	86	86
4	pH		7.0	7.1	7.4	7.5	7.5	7.5	7.5	7.6	7.8	7.8	7.8	7.8	7.5	7.5	7.7	7.7	7.5	7.5
5	Turbidity (NTU)	NTU	84	71	18	32	5	6	10	5	22	86	21	36	6	6	8	6	6	5
6	Total suspended solids (TSS)	mg/L	21	8	<5	21	<5	<5	<5	<5	19	47	<5	12	<5	<5	<5	<5	6	6
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.38	0.38	0.02	0.02			<0.01	<0.01	<0.10	<0.10	<0.10	<0.10			<0.10	<0.10		
9	Arsenic (As)	mg/L	<0.001	<0.001	0.001	0.002			0.001	0.001	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010		
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010		
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010		
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010		
13	Iron (Fe)	mg/L	0.34	0.34	<0.05	<0.05			<0.05	<0.05	<0.50	<0.50	<0.50	<0.50			<0.10	<0.10		
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010		
15	Manganese (Mn)	mg/L	0.016	0.015	0.035	0.032			0.027	0.03	0.031	0.031	0.038	0.034			0.012	<0.010		
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
17	Nickel (Ni)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010		
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010		
19	Zinc (Zn)	mg/L	<0.005	0.006	0.005	<0.005			<0.005	0.006	<0.050	<0.050	<0.050	<0.050			<0.050	<0.050		
20	Total Nitrogen (TN)	mg/L	1	1	0.4	0.4	<0.5	<0.5	<0.2	<0.2	<0.2	0.3	<0.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
21	Total Phosphorous (TP)	mg/L	0.07	0.06	<0.02	0.03	<0.05	<0.05	<0.02	0.02	<0.02	0.04	0.06	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Note: Elevated turbidity levels for a number of sampling events appeared attributable to factors unrelated to construction eg flood water, and wind, wave and long-shore water movement.

Table 7 SW3 – Hastings River north bank (Chainage 6040 to 6080) cont.

No.	Parameter	Unit	17/11/16 (D)		6/12/16 (W)		9/12/16 (W)		16/12/16 (D)		3/01/17 (W)		8/01/17 (W)		9/01/17 (D)		SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)
			SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)				
1	Temperature	°C	24.5	24.5	28.8	29.3	25.5	25.1	23.3	23.3	26.2	26.1	27.0	26.8	27.6	27.7				
2	Electrical conductivity (EC)	uS/cm	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000				
3	Dissolved oxygen (DO)	%	98	96	92	92	87	88	83	86	82	83	93	92	102	99				
4	pH		7.6	7.6	7.4	7.5	7.4	7.4	7.5	7.5	7.3	7.4	7.3	7.3	7.3	7.4				
5	Turbidity (NTU)	NTU	6	5	9	10	10	22	6	6	22	10	14	17	14	28				
6	Total suspended solids (TSS)	mg/L	<5	<5	10	18	6	17	<5	<5	28	<5	<5	<5	<5	14				
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	<0.10	<0.10	<0.01	<0.10			<0.10	<0.10	<0.10	<0.10			<0.01	<0.01				
9	Arsenic (As)	mg/L	<0.010	<0.010	0.002	<0.010			<0.010	<0.010	<0.010	<0.010			0.001	0.001				
10	Cadmium (Cd)	mg/L	<0.0010	<0.0010	<0.0001	<0.0010			<0.0010	<0.0010	<0.0010	<0.0010			<0.0001	<0.0001				
11	Chromium (Cr)	mg/L	<0.010	<0.010	<0.001	<0.010			<0.010	<0.010	<0.010	<0.010			<0.001	<0.001				
12	Copper (Cu)	mg/L	<0.010	<0.010	0.001	<0.010			<0.010	<0.010	<0.010	<0.010			<0.001	0.001				
13	Iron (Fe)	mg/L	<0.50	<0.50	<0.05	<0.10			<0.50	<0.50	<0.50	<0.50			<0.05	<0.05				
14	Lead (Pb)	mg/L	<0.010	<0.010	<0.001	<0.010			<0.010	<0.010	<0.010	<0.010			<0.001	<0.001				
15	Manganese (Mn)	mg/L	0.015	0.01	0.014	0.016			<0.010	<0.010	0.015	0.013			0.012	0.011				
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	0.0001	0.0002			<0.0001	<0.0001				
17	Nickel (Ni)	mg/L	<0.010	<0.010	<0.001	<0.010			<0.010	<0.010	<0.010	<0.010			0.001	<0.001				
18	Silver (Ag)	mg/L	<0.010	<0.010	<0.001	<0.010			<0.010	<0.010	<0.010	<0.010			<0.001	<0.001				
19	Zinc (Zn)	mg/L	<0.050	<0.050	0.02	<0.050			<0.050	<0.050	<0.050	<0.050			0.006	0.022				
20	Total Nitrogen (TN)	mg/L	0.5	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5				
21	Total Phosphorous (TP)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				

Note: Elevated turbidity levels for a number of sampling events appeared attributable to factors unrelated to construction eg flood water, and wind, wave and long-shore water movement.

Table 8 SW5 – Unnamed tributary of the Wilson River (Chainage 15820)

No.	Parameter	Unit	05/08/16 (W)	18/08/16 (D)	25/08/16 (W)	8/09/16 (D)	13/10/16 (D)	14/10/16 (W)	18/10/16 (W)	2/11/16 (W)	10/11/16 (W)
			SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)
1	Temperature	°C	16.9	22.1	17.1	17.0	20.5	22.7	27.6	29.5	26.3
2	Electrical conductivity (EC)	uS/cm	169	436	609	616	856	832	801	828	916
3	Dissolved oxygen (DO)	%	63	50	48	4	40	63	96	124	58
4	pH		6.2	7.0	6.9	7.0	7.8	7.8	7.7	8.2	7.7
5	Turbidity (NTU)	NTU	17	10	11	13	18	23	14	19	69
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	8	13	7	<5	34
7	Total Petroleum Hydrocarbons	mg/L									
8	Aluminium (Al)	mg/L	0.2	0.05		0.01	0.02	0.03		0.02	
9	Arsenic (As)	mg/L	<0.001	<0.001		0.001	0.002	0.002		0.002	
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001		<0.0001	
11	Chromium (Cr)	mg/L	<0.001	<0.001		<0.001	<0.001	<0.001		<0.001	
12	Copper (Cu)	mg/L	<0.001	<0.001		<0.001	<0.001	0.002		<0.001	
13	Iron (Fe)	mg/L	0.54	0.76		0.47	0.28	0.25		0.14	
14	Lead (Pb)	mg/L	<0.001	<0.001		<0.001	<0.001	<0.001		<0.001	
15	Manganese (Mn)	mg/L	0.091	1.16		1.37	1.32	0.93		1.13	
16	Mercury (Hg)	mg/L	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001		<0.0001	
17	Nickel (Ni)	mg/L	<0.001	<0.001		<0.001	<0.001	<0.001		0.001	
18	Silver (Ag)	mg/L	<0.001	<0.001		<0.001	<0.001	<0.001		<0.001	
19	Zinc (Zn)	mg/L	0.015	0.005		0.012	0.008	<0.005		0.005	
20	Total Nitrogen (TN)	mg/L	0.4	0.7	0.4	0.8	2.1	2	2.1	1.9	4
21	Total Phosphorous (TP)	mg/L	0.03	0.04	0.01	0.04	0.1	0.14	0.1	0.05	0.22

Note - Elevated turbidity on a number of occasions appears attributable to wading bird activity.

DNS –Sample not collected due to insufficient water depth.

Table 9 SW5 – Unnamed tributary of the Wilson River (Chainage 15820) cont.

No.	Parameter	Unit	17/11/16 (D)	6/12/16 (W)	9/12/16 (W)	16/12/16 (D)	3/01/17 (W)	8/01/17 (W)	9/01/17 (D)		
			SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)
1	Temperature	°C	31.6				DNS	DNS	DNS		
2	Electrical conductivity (EC)	uS/cm	1011								
3	Dissolved oxygen (DO)	%	128								
4	pH		8.2								
5	Turbidity (NTU)	NTU	25								
6	Total suspended solids (TSS)	mg/L	16	93	98	30					
7	Total Petroleum Hydrocarbons	mg/L									
8	Aluminium (Al)	mg/L	0.02	0.04		0.02					
9	Arsenic (As)	mg/L	0.004	0.004		0.006					
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001		<0.0001					
11	Chromium (Cr)	mg/L	<0.001	<0.001		<0.001					
12	Copper (Cu)	mg/L	0.001	<0.001		<0.001					
13	Iron (Fe)	mg/L	0.16	0.36		0.42					
14	Lead (Pb)	mg/L	<0.001	<0.001		<0.001					
15	Manganese (Mn)	mg/L	1.3	1.59		2.4					
16	Mercury (Hg)	mg/L	<0.0001	<0.0001		<0.0001					
17	Nickel (Ni)	mg/L	<0.001	0.001		0.001					
18	Silver (Ag)	mg/L	<0.001	<0.001		<0.001					
19	Zinc (Zn)	mg/L	<0.005	0.008		0.014					
20	Total Nitrogen (TN)	mg/L	7.6	10.6	11.1	14.9					
21	Total Phosphorous (TP)	mg/L	0.23	0.84	1.01	1.25					

Note 1 - Elevated turbidity on a number of occasions appears attributable to wading bird activity.

Note 2 – Infield samples were not collected on 6, 9 and 16 December 2016 due to insufficient water depth for field probe.

DNS –Sample not collected due to insufficient water depth.

Table 10 SW6 – Wilson River south bank (Chainage 16460 to 16600)

No.	Parameter	Unit	05/08/16 (W)		18/08/16 (D)		25/08/16 (W)		8/09/16 (D)		13/10/16 (D)		14/10/16 (W)		18/10/16 (W)		2/11/16 (W)		10/11/16 (W)	
			SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)
1	Temperature	°C	14.6	13.7	17.2	18.2	15.4	15.8	18.1	18.0	21.2	21.2	20.9	20.7	22.0	21.6	25.3	24.6	24.9	24.7
2	Electrical conductivity (EC)	uS/cm	704	508	345	365	393	460	480	521	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
3	Dissolved oxygen (DO)	%	78	89	90	93	82	82	98	97	86	81	85	84	89	90	91	92	87	86
4	pH		6.4	6.5	6.9	6.9	6.9	6.9	7.3	7.3	7.4	7.4	7.2	7.2	6.9	6.9	7.3	7.3	7.1	7.1
5	Turbidity (NTU)	NTU	41	55	40	45	23	45	9	9	6	15	5	8	7	7	5	6	5	4
6	Total suspended solids (TSS)	mg/L	6	10	16	16	12	36	<5	<5	<5	15	<5	<5	<5	<5	<5	<5	<5	<5
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.53	0.69	0.3	0.21			0.11	0.16	<0.01	<0.01	<0.01	<0.01			<0.01	<0.01		
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	0.001	<0.001			<0.001	<0.001		
13	Iron (Fe)	mg/L	0.41	0.52	0.36	0.32			0.28	0.34	<0.05	<0.05	<0.05	<0.05			<0.05	<0.05		
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
15	Manganese (Mn)	mg/L	0.045	0.047	0.039	0.043			0.018	0.016	0.094	0.094	0.105	0.098			0.096	0.103		
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
17	Nickel (Ni)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	0.001		
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
19	Zinc (Zn)	mg/L	0.006	<0.005	<0.005	<0.005			0.024	<0.005	<0.005	<0.005	0.016	0.006			0.005	0.007		
20	Total Nitrogen (TN)	mg/L	0.7	0.8	0.5	0.5	0.4	0.5	0.3	0.3	<0.2	<0.2	0.8	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2
21	Total Phosphorous (TP)	mg/L	0.04	0.05	0.03	0.04	0.02	0.04	0.01	<0.01	<0.02	<0.02	0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

Note – Coffey dam removal in progress during August 2016.

Table 11 SW6 – Wilson River south bank (Chainage 16460 to 16600) cont.

No.	Parameter	Unit	17/11/16 (D)		6/12/16 (W)		9/12/16 (W)		16/12/16 (D)		3/01/17 (W)		8/01/17 (W)		9/01/17 (D)		SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)
			SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)				
1	Temperature	°C	25.8	25.9	28.7	29.9	26.5	26.6	26.2	26.1	27.9	28.0	27.2	26.7	27.8	27.3				
2	Electrical conductivity (EC)	uS/cm	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000				
3	Dissolved oxygen (DO)	%	90	95	93	94	82	77	65	69	72	73	83	82	92	88				
4	pH		7.3	7.3	7.1	7.2	6.9	6.9	7.0	7.1	7.0	7.0	7.1	7.1	6.9	7.0				
5	Turbidity (NTU)	NTU	7	8	8	5	5	5	6	8	9	10	5	7	5	6				
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	<5	<5	10	<5	<5	<5	<5	<5	<5	<5				
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	<0.01	<0.01	<0.01	<0.01			<0.01	<0.01	<0.01	<0.01			<0.01	<0.01				
9	Arsenic (As)	mg/L	<0.001	<0.001	0.001	0.001			0.001	0.001	0.001	0.001			0.001	0.001				
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001				
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
13	Iron (Fe)	mg/L	<0.05	<0.05	<0.05	<0.05			<0.05	<0.05	<0.05	<0.05			<0.05	<0.05				
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
15	Manganese (Mn)	mg/L	0.138	0.127	0.111	0.096			0.107	0.113	0.114	0.116			0.107	0.11				
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	0.0002	0.0002			<0.0001	<0.0001				
17	Nickel (Ni)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	0.001	0.001			<0.001	<0.001				
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
19	Zinc (Zn)	mg/L	<0.005	<0.005	0.021	0.007			0.019	<0.005	0.007	0.007			0.011	0.009				
20	Total Nitrogen (TN)	mg/L	0.2	0.2	0.4	0.5	0.9	<0.2	<0.2	0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.5				
21	Total Phosphorous (TP)	mg/L	<0.01	<0.02	0.04	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	0.08				

Table 12 SW6 – Wilson River north bank (Chainage 16830 to 16840)

No.	Parameter	Unit	05/08/16 (W)		18/08/16 (D)		25/08/16 (W)		8/09/16 (D)		13/10/16 (D)		14/10/16 (D)		18/10/16 (D)		2/11/16 (W)		10/11/16 (W)	
			SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)
1	Temperature	°C	13.8	13.9	16.5	16.4	15.2	15.1	17.9	17.9	21.1	21.1	21.0	21.0	22.6	21.5	25.2	24.4	24.8	24.7
2	Electrical conductivity (EC)	uS/cm	139	151	421	422	316	335	392	415	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
3	Dissolved oxygen (DO)	%	98	97	84	83	89	85	102	101	84	85	85	85	93	89	93	91	87	87
4	pH		6.7	6.7	6.7	6.8	6.9	6.9	7.3	7.3	7.2	7.4	7.0	7.2	6.5	7.0	7.1	7.3	7.0	7.0
5	Turbidity (NTU)	NTU	52	55	18	21	16	26	9	8	7	6	7	5	5	5	6	5	5	4
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	10	6	18	6	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.6	0.72	0.35	0.3			0.11	0.13	0.01	<0.01	<0.01	<0.01			<0.01	<0.01		
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
13	Iron (Fe)	mg/L	0.34	0.37	0.46	0.46			0.22	0.25	<0.05	<0.05	<0.05	<0.05			<0.05	<0.05		
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
15	Manganese (Mn)	mg/L	0.011	0.012	0.047	0.043			0.01	0.012	0.094	0.091	0.1	0.098			0.095	0.093		
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
17	Nickel (Ni)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	0.001		
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
19	Zinc (Zn)	mg/L	<0.005	<0.005	0.008	0.005			<0.005	<0.005	0.005	0.008	0.006	0.008			0.014	0.018		
20	Total Nitrogen (TN)	mg/L	0.8	0.8	0.5	0.5	0.2	0.5	0.2	0.2	0.2	0.2	<0.2	<0.2	<0.2	<0.2	0.6	<0.2	<0.2	<0.2
21	Total Phosphorous (TP)	mg/L	0.03	0.04	0.03	0.02	0.02	0.02	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

Table 13 SW6 – Wilson River north bank (Chainage 16830 to 16840) cont.

No.	Parameter	Unit	17/11/16 (D)		6/12/16 (W)		9/12/16 (W)		16/12/16 (D)		3/01/17 (W)		8/01/17 (W)		9/01/17 (D)		SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)
			SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)				
1	Temperature	°C	26.6	25.1	29.7	29.5	26.9	26.6	26.4	26.3	27.6	27.7	27.4	27.4	28.5	28.1				
2	Electrical conductivity (EC)	uS/cm	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000				
3	Dissolved oxygen (DO)	%	93	88	94	95	78	76	67	64	73	74	79	79	87	88				
4	pH		6.8	7.0	6.9	7.1	6.7	6.8	6.9	6.9	6.9	7.0	6.9	7.1	7.0	7.1				
5	Turbidity (NTU)	NTU	7	6	8	13	8	6	6	6	5	7	7	6	6	7				
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	<5	<5	<5	8	<5	<5	<5	<5	<5	<5				
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	<0.01	<0.01	<0.01	<0.01			<0.01	0.01	<0.01	<0.01			<0.01	<0.01				
9	Arsenic (As)	mg/L	<0.001	<0.001	0.001	0.002			<0.001	0.001	0.001	0.001			<0.001	<0.001				
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001				
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	0.001	<0.001	<0.001			<0.001	<0.001				
13	Iron (Fe)	mg/L	<0.05	<0.05	<0.05	<0.05			<0.05	<0.05	<0.05	<0.05			<0.05	<0.05				
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
15	Manganese (Mn)	mg/L	0.116	0.124	0.109	0.115			0.09	0.095	0.123	0.119			0.091	0.106				
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	0.0002	0.0002			<0.0001	<0.0001				
17	Nickel (Ni)	mg/L	<0.001	0.002	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
19	Zinc (Zn)	mg/L	0.016	0.066	0.008	0.008			0.018	0.012	0.015	0.008			0.011	<0.005				
20	Total Nitrogen (TN)	mg/L	0.2	0.2	0.3	0.2	0.2	0.2	0.4	1.3	<0.2	<0.2	<0.5	<0.5	<0.5	<0.5				
21	Total Phosphorous (TP)	mg/L	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05				

Table 14 SW7 – Cooperabung Creek (Chainage 19660)

No.	Parameter	Unit	05/08/16 (W)		18/08/16 (D)		25/08/16 (W)		8/09/16 (D)		13/10/16 (D)		14/10/16 (W)		18/10/16 (W)		2/11/16 (W)		10/11/16 (W)		
			SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a [#] (US)	SW7b [#] (DS)	SW7a [#] (US)	SW7b [#] (DS)	SW7a [#] (US)	SW7b [#] (DS)	SW7a [#] (US)	SW7b [#] (DS)	SW7a [#] (US)	SW7b [#] (DS)	
1	Temperature	°C	13.9	13.9	12.8	13.0	12.5	12.6	14.7	14.8	16.5	16.8	15.6	17.0	17.8	18.2	19.6	19.6	19.5	19.3	
2	Electrical conductivity (EC)	uS/cm	120	133	182	181	204	261	204	216	230	252	248	321	249	339	231	250	251	287	
3	Dissolved oxygen (DO)	%	101	99	93	91	83	84	73	72	38	31	38	41	47	41	46	52	30	38	
4	pH		6.9	6.9	7.7	7.5	7.7	7.5	7.1	7.0	7.8	7.0	7.5	7.0	7.5	6.6	7.5	7.4	7.4	7.0	
5	Turbidity (NTU)	NTU	47	47	24	19	24	25	7	7	6	3	8	7	11	5	11	12	10	12	
6	Total suspended solids (TSS)	mg/L	<5	<5	8	<5	9	8	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
7	Total Petroleum Hydrocarbons	mg/L																			
8	Aluminium (Al)	mg/L	0.64	0.43	0.28	0.26			0.14	0.1	0.03	0.02	0.03	0.03			0.06	0.04			
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001			
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001			
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001			
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001			
13	Iron (Fe)	mg/L	0.36	0.27	0.38	0.38			0.47	0.44	0.68	0.29	0.66	0.24			0.56	0.52			
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001			
15	Manganese (Mn)	mg/L	0.012	0.019	0.018	0.027			0.028	0.045	0.083	0.28	0.121	0.136			0.07	0.064			
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001			
17	Nickel (Ni)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001			
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001			
19	Zinc (Zn)	mg/L	<0.005	<0.005	<0.005	<0.005			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			0.009	0.005			
20	Total Nitrogen (TN)	mg/L	0.5	0.5	0.1	0.1	0.2	0.3	<0.1	0.2	0.3	<0.1	0.4	0.4	0.2	0.2	0.3	0.3	0.2	0.1	
21	Total Phosphorous (TP)	mg/L	0.03	0.02	0.02	0.02	0.02	0.02	<0.01	<0.01	<0.01	<0.01	0.02	0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.11	<0.01

[#] - Sampling points present as isolated ponds.

DNS – Sample not collected due to insufficient water depth.

Table 15 SW7 – Cooperabung Creek (Chainage 19660) cont.

No.	Parameter	Unit	17/11/16 (D)		6/12/16 (W)		9/12/16 (W)		16/12/16 (D)		3/01/17 (W)		8/01/17 (W)		9/01/17 (D)		SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)
			SW7a [#] (US)	SW7b [#] (DS)	SW7a [#] (US)	SW7b [#] (DS)	SW7a [#] (US)	SW7b [#] (DS)	SW7a [#] (US)	SW7b [#] (DS)	SW7a [#] (US)	SW7b [#] (DS)	SW7a [#] (US)	SW7b [#] (DS)	SW7a [#] (US)	SW7b [#] (DS)				
1	Temperature	°C	20.6	21.8	23.4	22.8	21.4	22.2		21.8	DNS	23.6	DNS	21.6	DNS	23.3				
2	Electrical conductivity (EC)	uS/cm	225	308	226	494	268	421		471		560		604		605				
3	Dissolved oxygen (DO)	%	17	71	21	99	16	75		63		87		60		103				
4	pH		7.4	6.6	7.3	6.0	7.4	6.9		6.9		6.8		6.9		6.8				
5	Turbidity (NTU)	NTU	9	4	19	28	19	7		6		8		11		9				
6	Total suspended solids (TSS)	mg/L	6	<5	10	9	20	5	6	<5		<5		<5		<5				
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.02	0.01	0.02	0.04			0.03	0.02		<0.01				<0.01				
9	Arsenic (As)	mg/L	0.001	<0.001	0.002	<0.001			0.002	<0.001		<0.001				<0.001				
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		<0.0001				<0.0001				
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		<0.001				<0.001				
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	0.001			0.002	0.002		0.001				<0.001				
13	Iron (Fe)	mg/L	1.04	0.6	2.61	<0.05			2.96	0.15		0.13				0.11				
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		<0.001				<0.001				
15	Manganese (Mn)	mg/L	0.321	0.524	0.567	0.045			0.32	0.156		0.397				0.144				
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		0.0001				<0.0001				
17	Nickel (Ni)	mg/L	0.002	0.001	<0.001	0.002			<0.001	<0.001		0.001				<0.001				
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		<0.001				<0.001				
19	Zinc (Zn)	mg/L	0.005	<0.005	<0.005	0.028			0.012	0.017		0.036				<0.005				
20	Total Nitrogen (TN)	mg/L	0.2	0.1	0.7	0.6	1	0.2	0.6	0.2		0.2		0.2		0.1				
21	Total Phosphorous (TP)	mg/L	<0.01	<0.01	0.05	0.01	0.09	0.01	0.02	<0.01		<0.01		<0.01		<0.01				

[#] - Sampling points present as isolated ponds.

Note – Insufficient water depth at SW7a on 16 December 2016 to obtain in-field water quality measurement.

DNS – Sample not collected due to insufficient water depth. Sample unable to be collected on 10 November 2016 due to extensive vegetation cover in waterway.

Table 16 SW8 – Barrys Creek (Chainage 23775 to 25325)

No.	Parameter	Unit	05/08/16 (W)			18/08/16 (D)			25/08/16 (W)			8/09/16 (D)			13/10/16 (D)			14/10/16 (W)			18/10/16 (W)		
			SW8a (US)	SW8b [#] (DS)	SW8c (DS)	SW8a [#] (US)	SW8b [#] (DS)	SW8c [#] (DS)	SW8a [#] (US)	SW8b [#] (DS)	SW8c [#] (DS)	SW8a [#] (US)	SW8b [#] (DS)	SW8c [#] (DS)	SW8a [#] (US)	SW8b [#] (DS)	SW8c [#] (DS)	SW8a [#] (US)	SW8b [#] (DS)	SW8c [#] (DS)	SW8a [#] (US)	SW8b [#] (DS)	SW8c [#] (DS)
1	Temperature	°C	14.1	14.6	14.1	14.2	16.4	13.7	13.7	15.5	14.8	DNS	16.3	15.9	DNS	16.7	16.4	DNS	15.4	15.9	DNS	15.4	15.4
2	Electrical conductivity (EC)	uS/cm	120	124	132	292	165	239	368	194	210		190	305		264	372		273	335		264	328
3	Dissolved oxygen (DO)	%	105	91.3	96	51	43.1	60	44	32.5	81		33.3	37		59.1	15		55.1	19		39.4	22
4	pH		6.8	6.4	6.4	6.4	6.4	6.5	6.0	6.1	6.5		5.9	6.0		6.8	6.3		6.6	6.8		6.5	6.3
5	Turbidity (NTU)	NTU	33	30	35	8	23.4	16	24	31	16		14.6	6		8	3		12	19		16.1	24
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	<5	<5	6	<5	<5		<5	7		<5	6		<5	<5		<5	<5
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L	1.01	0.41	0.95	0.06	0.75	0.16					0.41	0.07		0.04	0.01		0.05	0.07			
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					<0.001	<0.001		<0.001	<0.001		<0.001	<0.001			
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001					<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001			
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					<0.001	<0.001		<0.001	<0.001		<0.001	<0.001			
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					<0.001	<0.001		<0.001	<0.001		<0.001	<0.001			
13	Iron (Fe)	mg/L	0.42	0.18	0.37	<0.05	0.28	0.1					0.19	0.08		0.3	0.31		0.31	0.18			
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					<0.001	<0.001		<0.001	<0.001		<0.001	<0.001			
15	Manganese (Mn)	mg/L	0.006	0.008	0.01	0.009	0.016	0.006					0.028	0.038		0.116	0.429		0.14	0.216			
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001					<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001			
17	Nickel (Ni)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					<0.001	<0.001		<0.001	<0.001		<0.001	<0.001			
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					<0.001	<0.001		<0.001	<0.001		<0.001	<0.001			
19	Zinc (Zn)	mg/L	<0.005	0.007	<0.005	0.005	0.008	0.005					0.006	0.006		0.009	0.007		<0.005	0.006			
20	Total Nitrogen (TN)	mg/L	0.4	0.4	0.5	<0.1	0.3	0.2	<0.1	0.2	<0.1		0.1	<0.1		0.1	<0.1		0.5	0.4		0.1	0.2
21	Total Phosphorous (TP)	mg/L	0.02	0.01	0.02	<0.01	0.02	<0.01	<0.01	0.02	<0.01		<0.01	0.01		<0.01	<0.01		<0.01	<0.01		0.01	<0.01

[#] - Sample location persisting as an isolated pond.

DNS (Did not sample) – Sample not taken due to absence of sufficient water to collect sample.

Table 17 SW8 – Barrys Creek (Chainage 23775 to 25325) cont.

No.	Parameter	Unit	2/11/16 (W)			10/11/16 (W)			17/11/16 (D)			6/12/16 (W)			9/12/16 (W)			16/12/16 (D)			3/01/17 (W)		
			SW8a [#] (US)	SW8b [#] (DS)	SW8c [#] (DS)	SW8a [#] (US)	SW8b [#] (DS)	SW8c [#] (DS)	SW8a [#] (US)	SW8b [#] (DS)	SW8c [#] (DS)	SW8a [#] (US)	SW8b [#] (DS)	SW8c [#] (DS)	SW8a [#] (US)	SW8b [#] (DS)	SW8c [#] (DS)	SW8a [#] (US)	SW8b [#] (DS)	SW8c [#] (DS)	SW8a [#] (US)	SW8b [#] (DS)	SW8c [#] (DS)
1	Temperature	°C	DNS	19.9	18.2	DNS	18.0	23.2	DNS	19.4	18.8	DNS	24.2	24.1	DNS	21.9	21.8	DNS	21.8	21.6	DNS	22.5	21.7
2	Electrical conductivity (EC)	uS/cm		312	249		260	335		316	360		275	338		311	345		312	365		312	383
3	Dissolved oxygen (DO)	%		22.9	44		43.6	43		48.9	20		26.2	20		19.2	64		29.0	13		42.6	15
4	pH			6.6	6.4		6.5	6.2		6.0	6.0		6.5	6.3		6.3	6.5		6.7	6.1		6.9	6.0
5	Turbidity (NTU)	NTU		678	68		29	14		12	4		51	73		24	5		17	4		13	8
6	Total suspended solids (TSS)	mg/L		100	<5		7	<5		<5	<5		21	52		8	<5		7	8		<5	<5
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L		0.03	0.1					0.02	0.01		0.11	0.06					0.04	0.02		0.03	<0.01
9	Arsenic (As)	mg/L		<0.001	<0.001					<0.001	<0.001		0.002	<0.001					0.002	<0.001		0.002	<0.001
10	Cadmium (Cd)	mg/L		<0.0001	<0.0001					<0.0001	<0.0001		<0.0001	<0.0001					<0.0001	<0.0001		<0.0001	<0.0001
11	Chromium (Cr)	mg/L		<0.001	<0.001					<0.001	<0.001		<0.001	<0.001					<0.001	<0.001		<0.001	<0.001
12	Copper (Cu)	mg/L		<0.001	<0.001					<0.001	<0.001		<0.001	<0.001					0.001	0.001		0.001	<0.001
13	Iron (Fe)	mg/L		0.14	0.1					0.23	0.52		1	0.25					0.75	1.83		1.2	1.37
14	Lead (Pb)	mg/L		<0.001	<0.001					<0.001	<0.001		<0.001	<0.001					<0.001	<0.001		<0.001	<0.001
15	Manganese (Mn)	mg/L		0.172	0.032					0.153	0.391		0.318	0.302					0.186	0.57		0.381	0.875
16	Mercury (Hg)	mg/L		<0.0001	<0.0001					<0.0001	<0.0001		<0.0001	<0.0001					<0.0001	<0.0001		0.0001	<0.0001
17	Nickel (Ni)	mg/L		<0.001	<0.001					0.001	0.002		<0.001	0.001					<0.001	0.001		<0.001	0.001
18	Silver (Ag)	mg/L		<0.001	<0.001					<0.001	<0.001		<0.001	<0.001					<0.001	<0.001		<0.001	<0.001
19	Zinc (Zn)	mg/L		0.005	0.008					0.013	0.008		0.007	0.04					0.006	0.012		0.008	0.015
20	Total Nitrogen (TN)	mg/L		0.4	0.4		0.1	<0.1		0.3	0.2		0.4	0.4		0.3	<0.1		0.3	<0.1		0.4	0.1
21	Total Phosphorous (TP)	mg/L		0.07	<0.01		<0.01	<0.01		<0.01	<0.01		0.04	0.02		0.02	<0.01		<0.01	<0.01		<0.01	<0.01

- Sample location persisting as an isolated pond.

DNS (Did not sample) – Sample not taken due to absence of sufficient water to collect sample.

Table 18 SW8 – Barrys Creek (Chainage 23775 to 25325) cont.

No.	Parameter	Unit	8/01/17 (W)			9/01/17 (D)			SW8a (US)	SW8b (DS)	SW8c [#] (DS)	SW8a (US)	SW8b (DS)	SW8c (DS)	SW8a (US)	SW8b [#] (DS)	SW8c (DS)	SW8a (US)	SW8b [#] (DS)	SW8c (DS)	SW8a (US)	SW8b [#] (DS)	SW8c (DS)
			SW8a [#] (US)	SW8b [#] (DS)	SW8c [#] (DS)	SW8a [#] (US)	SW8b [#] (DS)	SW8c [#] (DS)															
1	Temperature	°C	DNS	21.5	21.0	DNS	22.1	21.5															
2	Electrical conductivity (EC)	uS/cm		300	380		301	389															
3	Dissolved oxygen (DO)	%		29	21		44	22															
4	pH			6.6	6.3		6.9	6.5															
5	Turbidity (NTU)	NTU		14	8		15	7															
6	Total suspended solids (TSS)	mg/L		<5	<5		<5	<5															
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L					0.03	<0.01															
9	Arsenic (As)	mg/L					0.002	<0.001															
10	Cadmium (Cd)	mg/L					<0.0001	<0.0001															
11	Chromium (Cr)	mg/L					<0.001	<0.001															
12	Copper (Cu)	mg/L					<0.001	<0.001															
13	Iron (Fe)	mg/L					0.72	1.18															
14	Lead (Pb)	mg/L					<0.001	<0.001															
15	Manganese (Mn)	mg/L					0.161	0.629															
16	Mercury (Hg)	mg/L					<0.0001	<0.0001															
17	Nickel (Ni)	mg/L					<0.001	<0.001															
18	Silver (Ag)	mg/L					<0.001	<0.001															
19	Zinc (Zn)	mg/L					<0.005	0.007															
20	Total Nitrogen (TN)	mg/L		0.2	<0.1		0.2	<0.1															
21	Total Phosphorous (TP)	mg/L		<0.01	<0.01		<0.01	<0.01															

[#] - Sample location persisting as an isolated pond.

DNS (Did not sample) – Sample not taken due to absence of sufficient water to collect sample.

Table 19 SW9 – Smiths Creek (Chainage 28300)

No.	Parameter	Unit	05/08/16 (W)		18/08/16 (D)		25/08/16 (W)		8/09/16 (D)		13/10/16 (D)		14/10/16 (W)		18/10/16 (W)		2/11/16 (W)		10/11/16 (W)	
			SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)
1	Temperature	°C	13.3	13.3	11.5	11.5	12.6	12.8	14.2	14.1	15.3	14.6	14.5	14.4	14.2	14.8	16.9	17.1	22.2	19.7
2	Electrical conductivity (EC)	uS/cm	97	97	175	175	197	189	226	220	280	260	286	268	285	262	251	235	255	245
3	Dissolved oxygen (DO)	%	99	100	92	90	89	91	83	85	45	41	42	43	38	41	40	38	46	31
4	pH		6.8	6.8	7.1	7.1	6.9	6.9	6.8	6.8	7.3	7.2	7.4	7.4	6.9	6.9	7.0	7.0	7.1	7.2
5	Turbidity (NTU)	NTU	42	42	23	23	20	20	14	13	8	7	8	7	9	7	79	47	53	27
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	33	<5	<5	<5
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	1.04	0.7	0.33	0.09			0.13	0.12	0.09	0.05	0.08	0.05			0.1	0.06		
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
13	Iron (Fe)	mg/L	0.5	0.38	0.35	0.24			0.32	0.35	0.43	0.41	0.41	0.4			0.52	0.58		
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
15	Manganese (Mn)	mg/L	0.009	0.006	0.01	0.009			0.014	0.011	0.07	0.038	0.063	0.056			0.093	0.064		
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
17	Nickel (Ni)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
19	Zinc (Zn)	mg/L	<0.005	<0.005	0.009	0.008			0.006	<0.005	0.008	0.006	0.005	0.009			0.006	0.014		
20	Total Nitrogen (TN)	mg/L	0.5	0.5	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.4	0.3	0.2	0.2
21	Total Phosphorous (TP)	mg/L	0.02	0.02	0.02	0.03	0.05	0.02	0.01	0.01	<0.01	<0.01	0.01	0.02	0.04	0.02	0.02	0.01	0.01	0.01

Table 20 SW9 – Smiths Creek (Chainage 28300) cont.

No.	Parameter	Unit	17/11/16 (D)		6/12/16 (W)		9/12/16 (W)		16/12/16 (D)		3/01/17 (W)		8/01/17 (W)		9/01/17 (D)		SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)
			SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)				
1	Temperature	°C	18.9	19.5	29.0	24.7	24.8	24.0	21.3	20.5	22.4	23.8	21.5	21.7	21.4	22.0				
2	Electrical conductivity (EC)	uS/cm	284	251	675	250	516	267	2245	264	750	344	718	369	616	362				
3	Dissolved oxygen (DO)	%	69	45	72	18	79	51	12	7	28	5	46	4	35	6				
4	pH		7.1	6.9	6.7	7.1	7.0	6.8	6.5	6.5	6.9	6.8	6.9	6.9	7.1	7.1				
5	Turbidity (NTU)	NTU	27	19	43	13	32	45	28	9	13	26	14	24	18	20				
6	Total suspended solids (TSS)	mg/L	8	6	13	9	12	11	19	7	<5	14	<5	<5	<5	<5				
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.05	0.04	0.04	0.05			<0.01	0.05	<0.01	0.03			0.02	0.02				
9	Arsenic (As)	mg/L	<0.001	0.001	<0.001	0.001			0.001	0.002	<0.001	0.003			0.001	0.003				
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001				
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
12	Copper (Cu)	mg/L	<0.001	<0.001	0.001	<0.001			<0.001	<0.001	<0.001	<0.001			0.005	<0.001				
13	Iron (Fe)	mg/L	0.74	0.77	0.06	1.29			0.46	6.48	0.58	2.75			0.75	3.66				
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
15	Manganese (Mn)	mg/L	0.198	0.211	0.102	0.216			1.22	0.218	0.686	1.46			0.276	1.06				
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001				
17	Nickel (Ni)	mg/L	<0.001	<0.001	0.001	<0.001			<0.001	<0.001	0.002	0.001			0.001	<0.001				
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
19	Zinc (Zn)	mg/L	0.016	0.008	0.007	0.015			0.01	0.018	0.006	0.006			<0.005	0.008				
20	Total Nitrogen (TN)	mg/L	0.5	0.3	1.9	0.7	0.6	0.5	1	0.4	0.4	1.3	0.6	0.6	0.3	0.6				
21	Total Phosphorous (TP)	mg/L	<0.01	<0.01	0.02	0.05	0.04	0.08	0.08	0.12	<0.01	0.1	<0.01	0.03	<0.01	0.03				

Note 1 – Sample points present as isolated ponds on 3 January 2017.

Note 2 – Pump around operations either in progress or affecting water level on 9 and 16 December 2016.

Table 21 SW10 – Pipers Creek (Chainage 30700)

No.	Parameter	Unit	05/08/16 (W)		18/08/16 (D)		25/08/16 (W)		8/09/16 (D)		13/10/16 (D)		14/10/16 (W)		18/10/16 (W)		2/11/16 (W)		10/11/16 (W)	
			SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)
1	Temperature	°C	12.9	13.0	11.2	11.2	12.4	12.2	14.3	15.0	16.2	15.9	15.7	15.8	15.5	15.3	18.7	18.1	24.1	21.6
2	Electrical conductivity (EC)	uS/cm	111	117	223	224	270	271	268	264	368	359	397	371	415	381	336	300	351	338
3	Dissolved oxygen (DO)	%	95	96	80	79	87	90	71	76	51	53	49	48	44	40	60	38	94	54
4	pH		6.6	6.6	7.0	7.0	6.8	6.9	6.8	6.8	7.2	7.4	7.4	7.5	6.8	6.9	7.1	7.0	7.3	7.2
5	Turbidity (NTU)	NTU	45	46	19	19	46	43	15	15	7	8	10	8	11	51	41	41	15	17
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	9	12	<5	<5	<5	<5	<5	<5	6	18	10	10	<5	<5
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.76	0.83	0.35	0.18			0.19	0.15	0.05	0.03	0.04	0.05			0.04	0.05		
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
13	Iron (Fe)	mg/L	0.46	0.56	0.5	0.37			0.61	0.6	0.65	0.62	0.61	0.56			0.34	0.44		
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
15	Manganese (Mn)	mg/L	0.008	0.01	0.02	0.017			0.034	0.037	0.077	0.084	0.132	0.084			0.088	0.158		
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
17	Nickel (Ni)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
19	Zinc (Zn)	mg/L	<0.005	<0.005	<0.005	0.005			0.007	0.007	<0.005	<0.005	0.006	<0.005			0.005	<0.005		
20	Total Nitrogen (TN)	mg/L	0.7	0.6	0.4	0.5	0.4	0.3	0.3	0.3	0.2	0.4	0.8	0.3	0.2	0.5	0.4	0.4	0.3	0.4
21	Total Phosphorous (TP)	mg/L	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	<0.01	<0.01	0.01	0.02	0.01	0.02	0.01	0.02	<0.01	<0.01

Note 1 – Sample points connected on all occasions, but with no obvious flow between 8 September 2016 and 9 January 2017.

Table 22 SW10 – Pipers Creek (Chainage 30700) cont.

No.	Parameter	Unit	17/11/16 (D)		6/12/16 (W)		9/12/16 (W)		16/12/16 (D)		3/01/17 (W)		8/01/17 (W)		9/01/17 (W)		SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)
			SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a ¹ (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)				
1	Temperature	°C	20.3	20.1	29.9	25.3	27.2	24.5	22.9	22.2	24.2	23.8	22.5	22.0	22.8	22.4				
2	Electrical conductivity (EC)	uS/cm	396	388	452	447	446	458	469	485	483	483	478	511	483	515				
3	Dissolved oxygen (DO)	%	33	40	66	27	88	51	16	24	5	16	12	26	17	36				
4	pH		6.9	6.9	7.2	7.1	7.2	7.3	7.0	7.0	6.9	7.0	7.1	7.1	7.2	7.3				
5	Turbidity (NTU)	NTU	8	13	107	267	36	64	11	21	16	19	11	33	20	53				
6	Total suspended solids (TSS)	mg/L	<5	<5	24	21	10	13	9	11	10	5	<5	9	<5	16				
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.02	0.02	0.02	0.02			0.02	0.02	0.01	0.02			0.01	<0.01				
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	0.001	0.001			0.001	<0.001				
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001				
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
13	Iron (Fe)	mg/L	0.62	0.8	0.3	0.35			0.59	0.47	0.62	0.52			0.55	0.26				
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
15	Manganese (Mn)	mg/L	0.232	0.294	0.214	0.326			0.319	0.33	0.656	0.394			0.414	0.292				
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001				
17	Nickel (Ni)	mg/L	0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	0.001			<0.001	<0.001				
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
19	Zinc (Zn)	mg/L	0.007	0.011	0.006	<0.005			<0.005	<0.005	0.03	<0.005			<0.005	0.014				
20	Total Nitrogen (TN)	mg/L	0.2	0.3	0.6	0.7	0.4	0.6	0.3	0.6	0.9	0.8	0.3	0.4	0.2	0.4				
21	Total Phosphorous (TP)	mg/L	<0.01	0.03	0.03	0.05	0.04	0.03	<0.01	0.02	0.04	0.02	<0.01	<0.01	0.04	<0.01				

Note 1 – Sample points connected on all occasions, but with no obvious flow between 8 September 2016 and 9 January 2017.

Table 23 SW11 – Unnamed drainage line (Chainage 34650 to 34700)

No.	Parameter	Unit	05/08/16 (W)		18/08/16 (D)		25/08/16 (W)		8/09/16 (D)		13/10/16 (D)		14/10/16 (W)		18/10/16 (W)		2/11/16 (W)		10/11/16 (W)	
			SW11a [#] (DS)	SW11b [#] (US)	SW11a (DS)	SW11b (US)	SW11a (DS)	SW11b (US)	SW11a [#] (DS)	SW11b [#] (US)	SW11a [#] (DS)	SW11b [#] (US)	SW11a [#] (DS)	SW11b [#] (US)	SW11a [#] (DS)	SW11b [#] (US)	SW11a [#] (DS)	SW11b [#] (US)	SW11a [#] (DS)	SW11b [#] (US)
1	Temperature	°C	13.0	13.0	11.8	9.7	13.7	16.8	17.3	18.8	16.0	17.1	15.5	15.2	15.3	15.4	19.0	20.4	21.8	24.5
2	Electrical conductivity (EC)	uS/cm	143	136	574	491	605	222	704	679	2037	1993	2062	1704	2031	1115	746	665	1159	1165
3	Dissolved oxygen (DO)	%	101	103	87	82	90	103	108	121	79	61	76	48	75	38	72	82	88	96
4	pH		6.2	6.4	7.1	6.8	6.8	6.5	7.1	6.8	7.7	7.6	7.9	7.7	7.4	7.1	7.6	7.6	7.6	7.4
5	Turbidity (NTU)	NTU	41	41	18	16	30	38	20	14	3	3	3	14	4	17	32	28	5	6
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	13	8	<5	5	<5	<5	<5	6	<5	8	19	20	<5	<5
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	1.32	1.71	0.26	0.14			0.09	0.05	0.01	<0.01	<0.01	0.03			0.02	0.02		
9	Arsenic (As)	mg/L	<0.001	<0.001	0.001	<0.001			<0.001	<0.001	<0.001	0.001	<0.001	<0.001			0.001	<0.001		
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			0.001	0.009		
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
13	Iron (Fe)	mg/L	0.53	0.7	0.21	0.3			0.12	0.18	<0.05	<0.05	<0.05	0.05			<0.05	0.21		
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
15	Manganese (Mn)	mg/L	0.022	0.017	0.056	0.09			0.061	0.116	0.056	0.085	0.052	0.099			0.078	0.027		
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
17	Nickel (Ni)	mg/L	<0.001	<0.001	0.002	0.002			0.001	0.001	<0.001	0.002	<0.001	0.002			0.002	0.001		
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
19	Zinc (Zn)	mg/L	0.006	<0.005	0.03	0.01			<0.005	0.005	<0.005	<0.005	<0.005	<0.005			0.012	<0.005		
20	Total Nitrogen (TN)	mg/L	0.7	0.7	1.8	1	0.8	0.3	0.6	0.4	0.2	0.4	0.2	0.2	0.2	0.2	0.4	0.5	0.2	0.2
21	Total Phosphorous (TP)	mg/L	0.08	<0.01	<0.01	<0.01	0.02	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.02	0.02	<0.01	<0.01

Note 1 – Sample points connected on all occasions, but with no obvious flow between 8 September 2016 and 9 January 2017.

Table 24 SW11 – Unnamed drainage line (Chainage 34650 to 34700) cont.

No.	Parameter	Unit	17/11/16 (D)		6/12/16 (W)		9/12/16 (W)		16/12/16 (D)		3/01/17 (W)		8/01/17 (W)		9/01/17 (D)		SW11a (DS)	SW11b (US)	SW11a (DS)	SW11b (US)
			SW11a [#] (DS)	SW11b [#] (US)	SW11a (DS)	SW11b (US)	SW11a [#] (DS)	SW11b [#] (US)	SW11a [#] (DS)	SW11b [#] (US)	SW11a [#] (DS)	SW11b [#] (US)	SW11a (DS)	SW11b (US)	SW11a (DS)	SW11b (US)				
1	Temperature	°C	19.1	21.4	23.3	24.6	23.5	27.3	22.5	21.9	23.3	23.2	21.7	22.2	22.0	22.4				
2	Electrical conductivity (EC)	uS/cm	1432	1362	2028	1763	1992	1816	2207	2195	2248	2049	2334	2036	2344	2099				
3	Dissolved oxygen (DO)	%	69	72	55	36	67	87	46	42	53	49	51	33	49	47				
4	pH		7.3	7.3	7.5	7.1	7.4	7.4	7.3	7.3	7.4	7.3	7.4	7.2	7.4	7.4				
5	Turbidity (NTU)	NTU	6	5	5	12	7	6	6	5	6	7	6	8	6	7				
6	Total suspended solids (TSS)	mg/L	<5	<5	5	5	<5	<5	8	6	<5	<5	<5	<5	<5	<5				
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.01	0.01	<0.01	0.02			<0.01	<0.01	<0.01	<0.01			<0.01	<0.01				
9	Arsenic (As)	mg/L	<0.001	0.003	0.001	0.001			0.001	0.001	0.001	0.001			<0.001	<0.001				
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001				
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
13	Iron (Fe)	mg/L	0.09	0.12	0.07	0.08			<0.05	0.05	<0.05	<0.05			<0.05	<0.05				
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
15	Manganese (Mn)	mg/L	0.154	0.161	0.189	0.558			0.15	0.245	0.116	0.2			0.106	0.195				
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001				
17	Nickel (Ni)	mg/L	0.001	0.002	0.001	0.001			0.001	<0.001	0.001	0.001			<0.001	<0.001				
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
19	Zinc (Zn)	mg/L	0.006	<0.005	0.008	0.007			<0.005	0.017	<0.005	<0.005			<0.005	0.005				
20	Total Nitrogen (TN)	mg/L	0.2	0.2	0.4	0.3	0.3	0.4	0.3	0.2	0.4	0.3	0.3	0.2	0.8	0.3				
21	Total Phosphorous (TP)	mg/L	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01				

Note 1 – Sample points connected on all occasions, but with no obvious flow between 8 September 2016 and 9 January 2017.

Table 25 SW12 – Maria River (Chainage 36850)

No.	Parameter	Unit	05/08/16 (W)		18/08/16 (D)		25/08/16 (W)		8/09/16 (D)		13/10/16 (D)		14/10/16 (W)		18/10/16 (W)		2/11/16 (W)		10/11/16 (W)	
			SW12a (US)	SW12b (DS)	SW12a (US)	SW12b (DS)	SW12a (US)	SW12b (DS)	SW12a (US)	SW12b (DS)	SW12a (US)	SW12b (DS)	SW12a [#] (US)	SW12b (DS)	SW12a (US)	SW12b (DS)	SW12a (US)	SW12b (DS)	SW12a (US)	SW12b (DS)
1	Temperature	°C	13.0	13.0	11.1	11.3	12.1	12.9	14.8	16.5	15.1	17.0	14.5	16.0	14.1	15.7	16.8	18.6	22.7	22.0
2	Electrical conductivity (EC)	uS/cm	123	123	231	229	252	273	283	283	293	303	298	310	291	303	179	287	206	298
3	Dissolved oxygen (DO)	%	83	84	32	45	38	55	46	56	41	40	36	36	35	36	55	32	51	37
4	pH		6.3	6.3	6.4	6.4	6.5	6.3	6.4	6.1	7.0	6.7	7.3	7.0	6.7	6.4	7.1	6.9	7.3	7.3
5	Turbidity (NTU)	NTU	26	26	11	11	26	30	8	9	7	8	10	8	11	8	29	12	17	13
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	8	9	6	<5	<5	5	<5	<5	5	<5	7	<5	6	6
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.94	0.98	0.36	0.24			0.2	0.21	0.06	0.05	0.08	0.05			0.07	0.05		
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	0.001	<0.001			0.001	0.001		
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	0.001	<0.001			0.002	<0.001		
13	Iron (Fe)	mg/L	0.48	0.5	0.65	0.58			0.7	0.73	0.65	0.49	0.62	0.42			0.3	0.62		
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
15	Manganese (Mn)	mg/L	0.018	0.019	0.057	0.042			0.076	0.064	0.09	0.136	0.127	0.141			0.079	0.19		
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
17	Nickel (Ni)	mg/L	<0.001	<0.001	<0.001	<0.001			0.001	<0.001	<0.001	0.001	0.002	0.001			<0.001	0.001		
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
19	Zinc (Zn)	mg/L	<0.005	<0.005	0.007	0.008			0.005	0.005	0.007	<0.005	0.005	0.007			0.01	<0.005		
20	Total Nitrogen (TN)	mg/L	0.6	0.6	0.5	0.4	0.3	0.4	0.3	1	0.5	0.4	0.5	0.4	0.4	0.3	0.4	0.4	0.6	0.5
21	Total Phosphorous (TP)	mg/L	0.02	0.01	0.01	0.02	0.02	0.02	0.01	0.04	<0.01	<0.01	0.02	0.02	0.02	0.01	0.04	0.01	0.04	0.01

Note – Sample points present as isolated ponds on all occasions with the exception of 5 and 25 August 2016.

Table 26 SW12 – Maria River (Chainage 36850) cont.

No.	Parameter	Unit	17/11/16 (D)		6/12/16 (W)		9/12/16 (W)		16/12/16 (D)		3/01/17 (W)		8/01/17 (W)		9/01/17 (D)		SW12a (US)	SW12b (DS)	SW12a (US)	SW12b (DS)
			SW12a (US)	SW12b (DS)	SW12a (US)	SW12b (DS)	SW12a (US)	SW12b (DS)	SW12a (US)	SW12b (DS)	SW12a (US)	SW12b (DS)	SW12a (US)	SW12b (DS)	SW12a (US)	SW12b (DS)				
1	Temperature	°C	17.7	19.3	24.1	24.7	23.7	25.1	21.9	23.1	22.7	22.7	21.0	21.2	21.1	21.9				
2	Electrical conductivity (EC)	uS/cm	226	316	218	312	215	317	233	345	224	393	185	387	194	391				
3	Dissolved oxygen (DO)	%	15	7	20	22	36	37	13	13	6	6	12	23	17	32				
4	pH		6.8	6.7	6.9	6.9	7.0	7.0	6.9	6.8	6.9	6.8	6.8	6.9	7.0	7.0				
5	Turbidity (NTU)	NTU	11	24	21	25	9	24	9	38	16	26	30	27	20	27				
6	Total suspended solids (TSS)	mg/L	8	14	9	16	10	12	12	13	11	22	6	11	6	9				
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.03	0.02	0.05	0.02			0.02	0.02	0.01	0.02			0.03	0.01				
9	Arsenic (As)	mg/L	0.002	0.002	0.002	0.001			0.003	0.002	0.002	0.004			0.002	0.005				
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001				
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
12	Copper (Cu)	mg/L	<0.001	<0.001	0.002	0.479			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
13	Iron (Fe)	mg/L	1.02	0.52	2.06	1.6			1.1	1.54	1.6	4.46			1.44	3.22				
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
15	Manganese (Mn)	mg/L	0.59	0.374	0.236	0.299			0.218	0.303	0.297	0.544			0.227	0.358				
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001				
17	Nickel (Ni)	mg/L	0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
19	Zinc (Zn)	mg/L	0.005	<0.005	0.006	<0.005			<0.005	<0.005	<0.005	<0.005			0.008	0.017				
20	Total Nitrogen (TN)	mg/L	0.6	0.7	1.1	1	3.3	0.9	0.8	1	1.2	1.4	0.6	0.9	0.4	0.7				
21	Total Phosphorous (TP)	mg/L	<0.01	<0.01	0.07	0.07	0.05	0.06	0.06	0.06	0.1	0.1	0.03	0.06	0.01	0.03				

Note – Sample points present as isolated ponds on all occasions with the exception of 5 and 25 August 2016.

Table 27 SW13 – Stumpy Creek (Chainage 37700 to 37750)

No.	Parameter	Unit	05/08/16 (W)		18/08/16 (D)		25/08/16 (W)		8/09/16 (D)		13/10/16 (D)		14/10/16 (W)		14/10/16 (W)		2/11/16 (W)		10/11/16 (W)	
			SW13a [#] (DS)	SW13b [#] (US)	SW13a (DS)	SW13b (US)	SW13a (DS)	SW13b (US)	SW13a [#] (DS)	SW13b [#] (US)	SW13a [#] (DS)	SW13b [#] (US)	SW13a [#] (DS)	SW13b [#] (US)	SW13a [#] (DS)	SW13b [#] (US)	SW13a [#] (DS)	SW13b [#] (US)	SW13a [#] (DS)	SW13b [#] (US)
1	Temperature	°C	12.9	12.9	10.7	10.9	13.2	13.5	15.0	14.6	16.4	15.1	15.0	14.1	13.8	14.3	17.0	17.7	19.9	20.4
2	Electrical conductivity (EC)	uS/cm	117	111	207	172	263	242	361	248	431	300	440	283	427	313	381	313	326	265
3	Dissolved oxygen (DO)	%	86	86	75	51	77	70	103	54	83	54	79	37	74	44	56	45	59	69
4	pH		6.2	6.1	6.3	6.2	6.3	6.3	6.5	6.1	7.2	6.8	7.5	6.9	6.9	6.5	7.0	6.7	7.2	7.0
5	Turbidity (NTU)	NTU	37	34	17	17	39	35	11	14	7	10	8	11	18	24	42	41	46	52
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	8	15	7	7	<5	<5	<5	<5	6	8	11	7	11	13
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	1.74	1.44	0.67	0.53			0.31	0.38	0.05	0.06	0.04	0.06			0.15	0.08		
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
11	Chromium (Cr)	mg/L	0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
12	Copper (Cu)	mg/L	<0.001	<0.001	0.001	0.001			0.001	0.002	<0.001	<0.001	0.001	0.001			0.001	0.001		
13	Iron (Fe)	mg/L	0.78	0.62	0.79	0.8			0.76	0.96	0.28	0.46	0.27	0.43			0.31	0.26		
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
15	Manganese (Mn)	mg/L	0.024	0.022	0.046	0.061			0.046	0.125	0.025	0.049	0.029	0.057			0.068	0.063		
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		
17	Nickel (Ni)	mg/L	<0.001	<0.001	<0.001	<0.001			0.001	<0.001	0.002	<0.001	<0.001	<0.001			0.002	<0.001		
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001		
19	Zinc (Zn)	mg/L	<0.005	<0.005	0.008	0.005			0.008	0.005	0.008	0.007	0.006	<0.005			0.022	0.011		
20	Total Nitrogen (TN)	mg/L	0.8	0.8	2.3	0.6	1.2	0.6	1.8	0.5	1.9	0.6	1.2	0.5	0.7	0.6	2.3	0.5	0.6	0.6
21	Total Phosphorous (TP)	mg/L	0.01	0.01	0.01	0.02	0.02	0.02	<0.01	0.01	<0.01	<0.01	0.01	0.02	0.01	0.03	0.01	<0.01	<0.01	<0.01

Note - Sample points persisting as isolated ponds or with no obvious flow on all occasions with the exception of 5 August 2016.

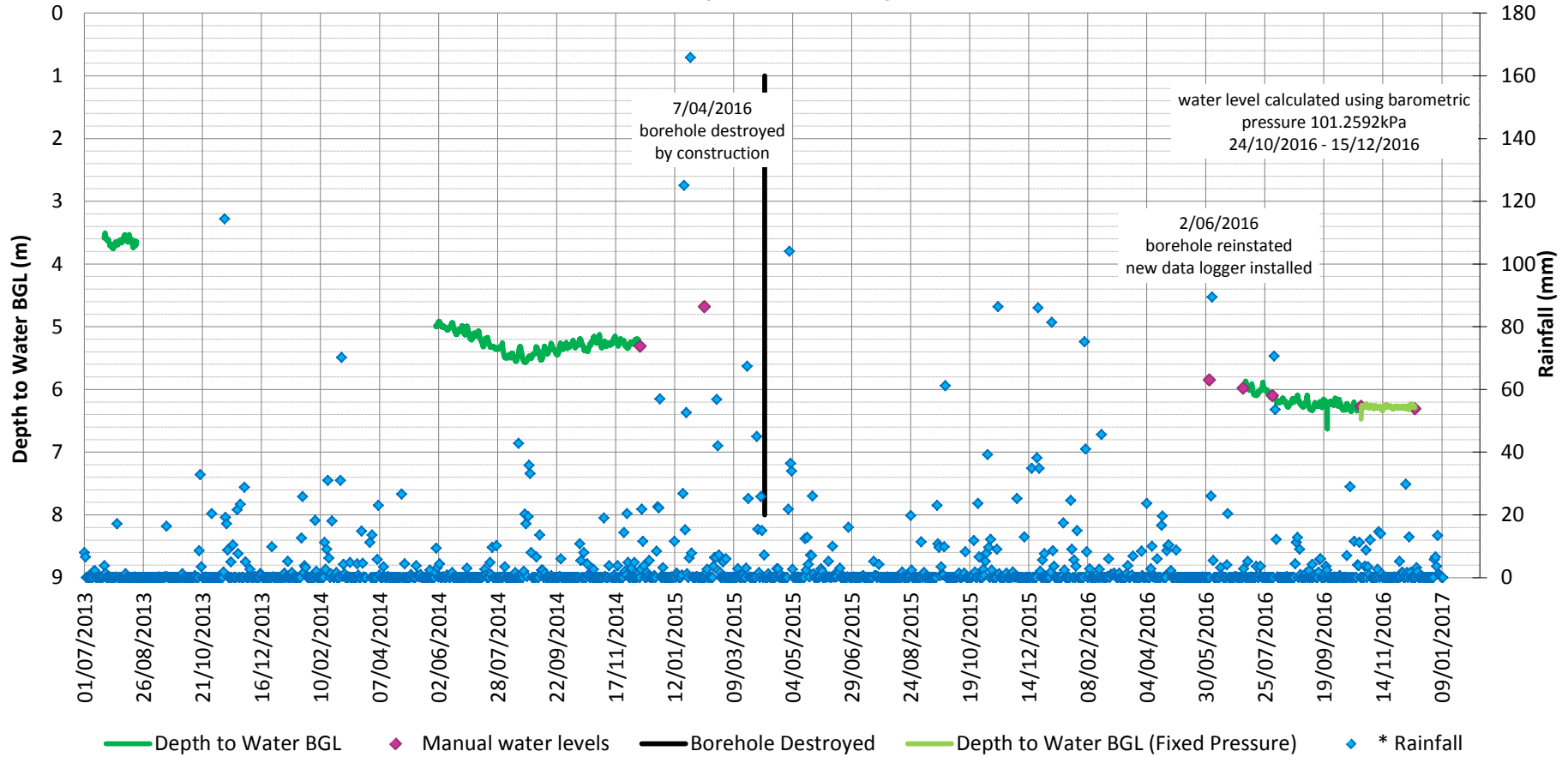
Table 28 SW13 – Stumpy Creek (Chainage 37700 to 37750) cont.


No.	Parameter	Unit	17/11/16 (D)		6/12/16 (W)		9/12/16 (W)		16/12/16 (D)		3/01/17 (W)		8/01/17 (W)		9/01/17 (D)		SW13a (DS)	SW13b (US)	SW13a (DS)	SW13b (US)
			SW13a [#] (DS)	SW13b [#] (US)	SW13a (DS)	SW13b (US)	SW13a [#] (DS)	SW13b [#] (US)	SW13a [#] (DS)	SW13b [#] (US)	SW13a [#] (DS)	SW13b [#] (US)	SW13a (DS)	SW13b (US)	SW13a [#] (DS)	SW13b [#] (US)				
1	Temperature	°C	18.5	18.1	22.6	22.7	23.2	21.6	22.6	21.2	22.5	22.1	20.9	20.6	21.5	20.6				
2	Electrical conductivity (EC)	uS/cm	438	331	422	220	538	309	591	312	505	292	685	321	689	321				
3	Dissolved oxygen (DO)	%	41	63	47	51	49	33	26	52	18	35	47	42	42	47				
4	pH		7.1	6.7	7.0	7.0	7.0	6.7	7.0	6.9	7.0	6.7	7.1	6.8	7.2	6.9				
5	Turbidity (NTU)	NTU	10	34	61	69	17	22	9	18	8	17	19	16	16	15				
6	Total suspended solids (TSS)	mg/L	<5	<5	23	23	10	9	<5	7	<5	<5	<5	<5	<5	<5				
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.06	0.03	0.15	0.09			0.04	0.01	0.04	0.02			0.22	0.02				
9	Arsenic (As)	mg/L	<0.001	<0.001	0.001	<0.001			<0.001	<0.001	0.001	<0.001			0.002	0.001				
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001				
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
12	Copper (Cu)	mg/L	<0.001	<0.001	0.002	0.001			<0.001	<0.001	<0.001	<0.001			0.001	<0.001				
13	Iron (Fe)	mg/L	0.76	0.67	0.47	0.38			0.81	1.28	0.99	1.24			0.63	0.98				
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
15	Manganese (Mn)	mg/L	0.129	0.112	0.078	0.094			0.106	0.087	0.121	0.134			0.031	0.094				
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001				
17	Nickel (Ni)	mg/L	0.002	<0.001	0.003	<0.001			0.003	<0.001	0.002	<0.001			0.005	0.001				
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001				
19	Zinc (Zn)	mg/L	0.006	0.005	0.038	0.013			0.01	<0.005	0.006	0.011			0.034	0.006				
20	Total Nitrogen (TN)	mg/L	0.5	0.4	4.6	1	2.3	0.8	1	0.5	0.8	0.7	3.6	1	4.3	0.4				
21	Total Phosphorous (TP)	mg/L	<0.01	<0.01	0.08	0.05	0.02	0.02	<0.01	0.06	<0.01	<0.01	0.09	<0.01	0.01	<0.01				

Note - Sample points persisting as isolated ponds or with no obvious flow on all occasions with the exception of 5 August 2016.

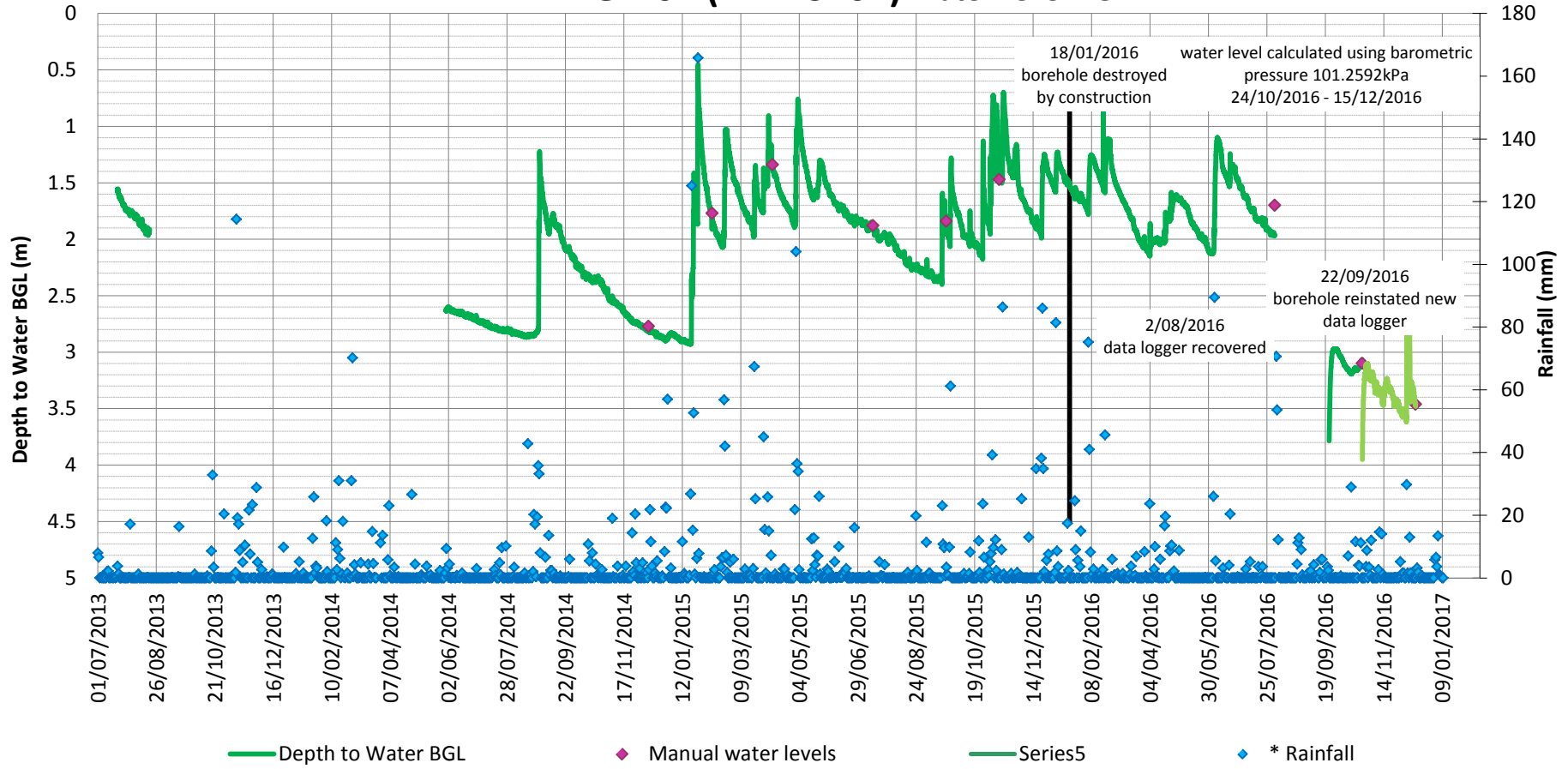
Appendix D – Borehole water level data plots

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW01 (A-BH3101) Water Level BGL



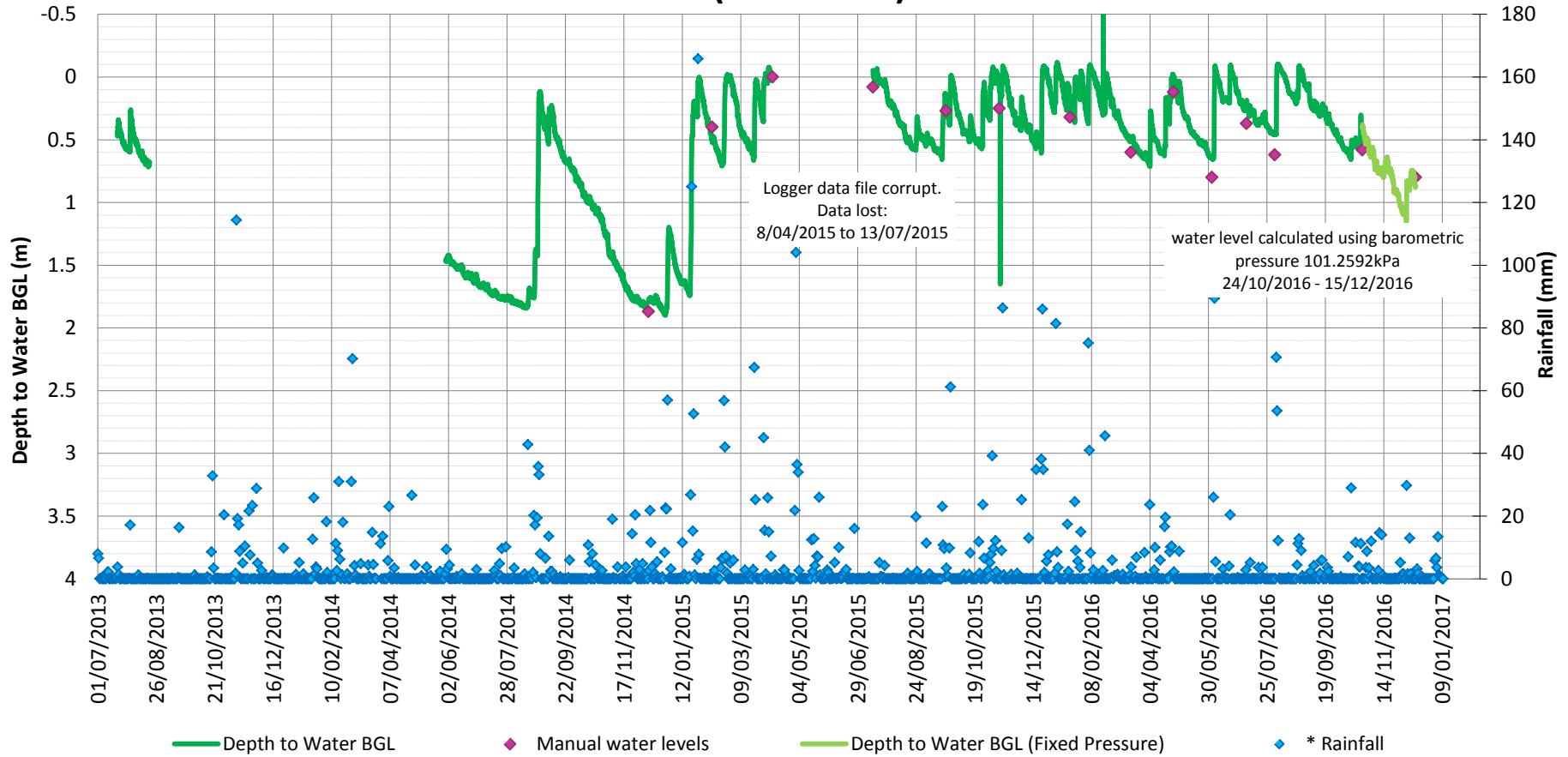
Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10886270	
Date	14/12/2016		BH ID	A-BH3101	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-1
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW02 (A-BH3102) Water Level BGL



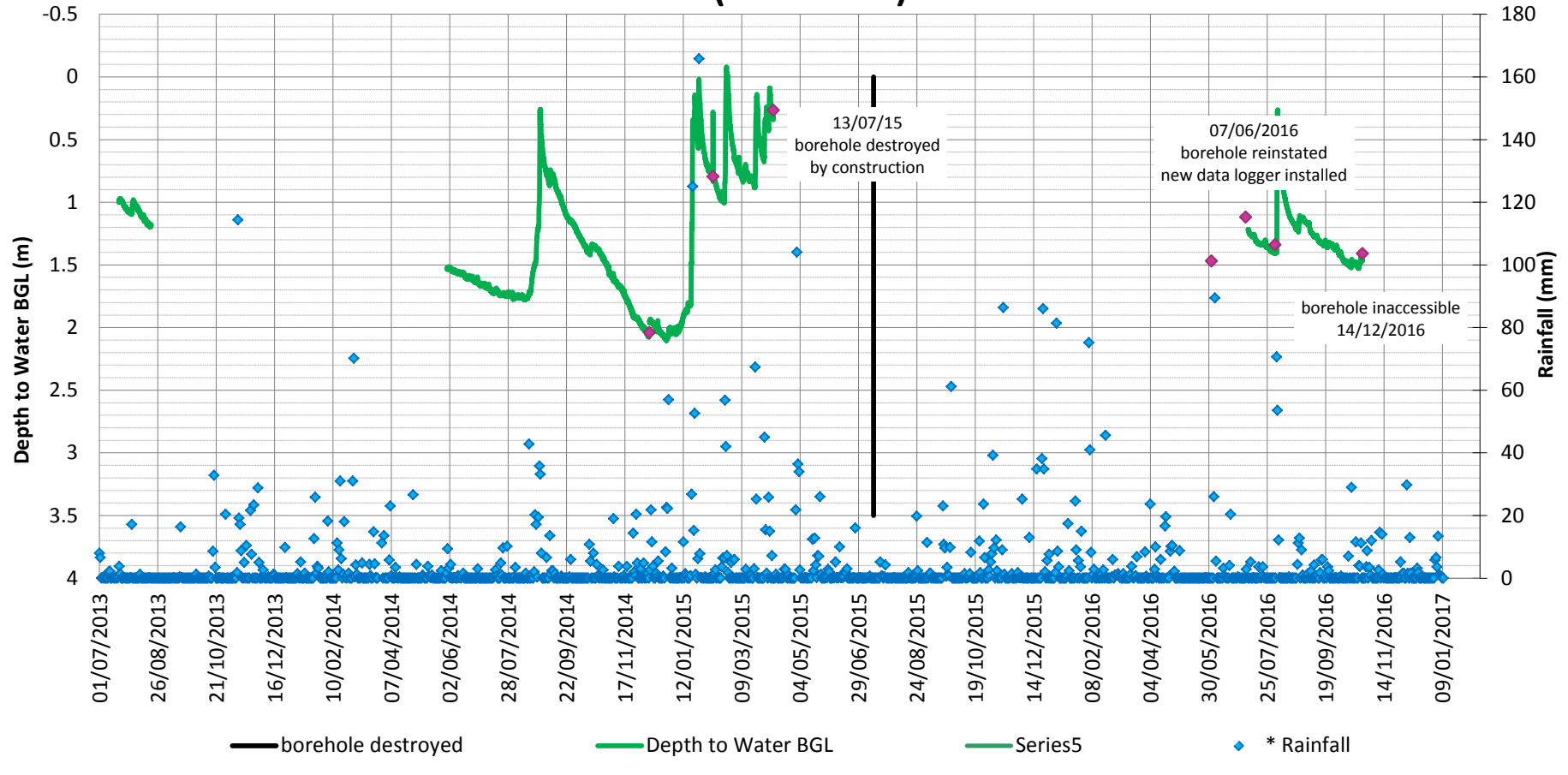
Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10283850	
Date	14/12/2016		BH ID	A-BH3102	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-2
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					


HW10 Pacific Hwy; Oxley Hwy to Kempsey GW03 (A-BH3103) Water Level BGL



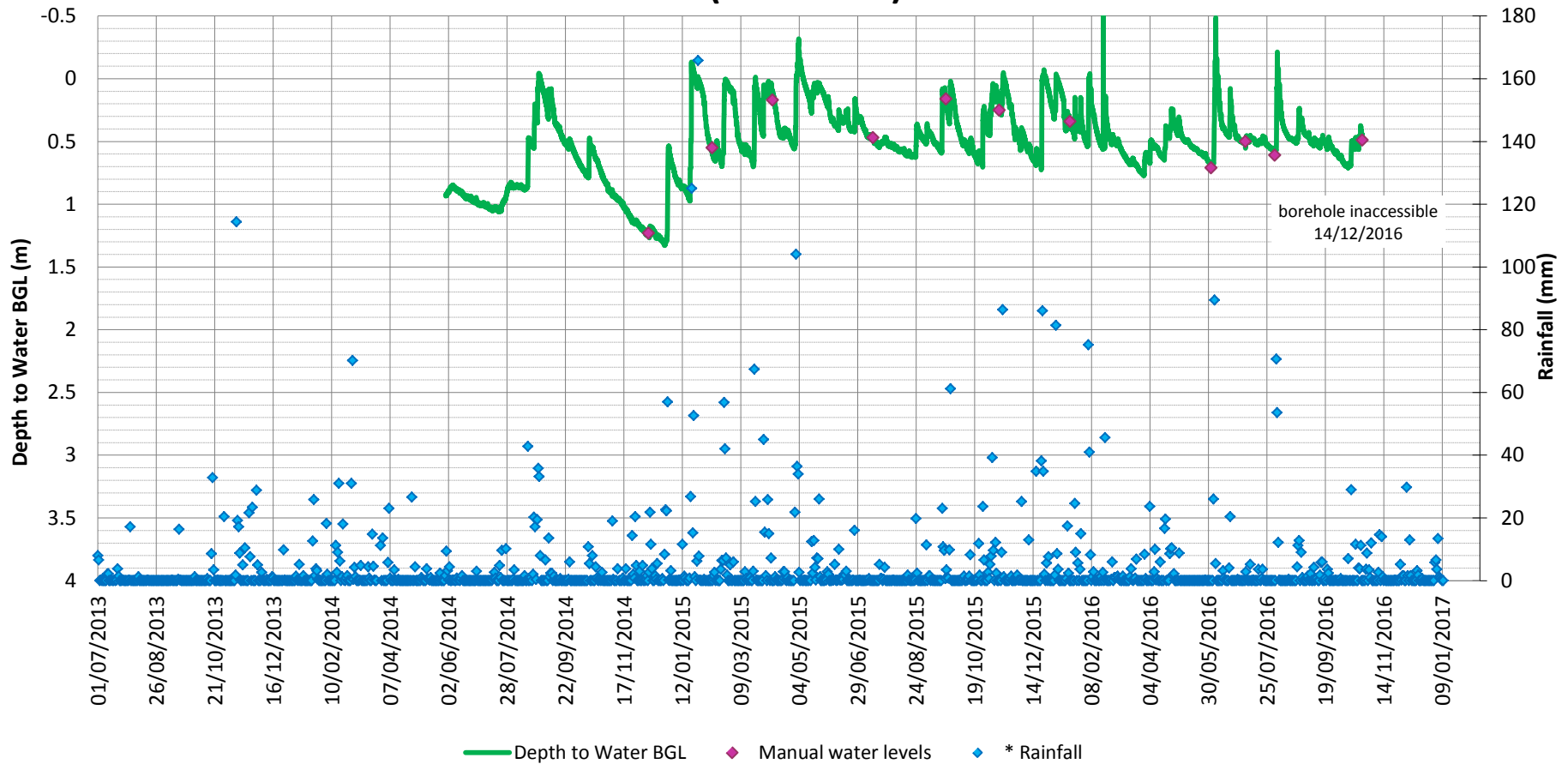
Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10229626	
Date	14/12/2016		BH ID	A-BH3103	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-3
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW04 (A-BH3104) Water Level BGL



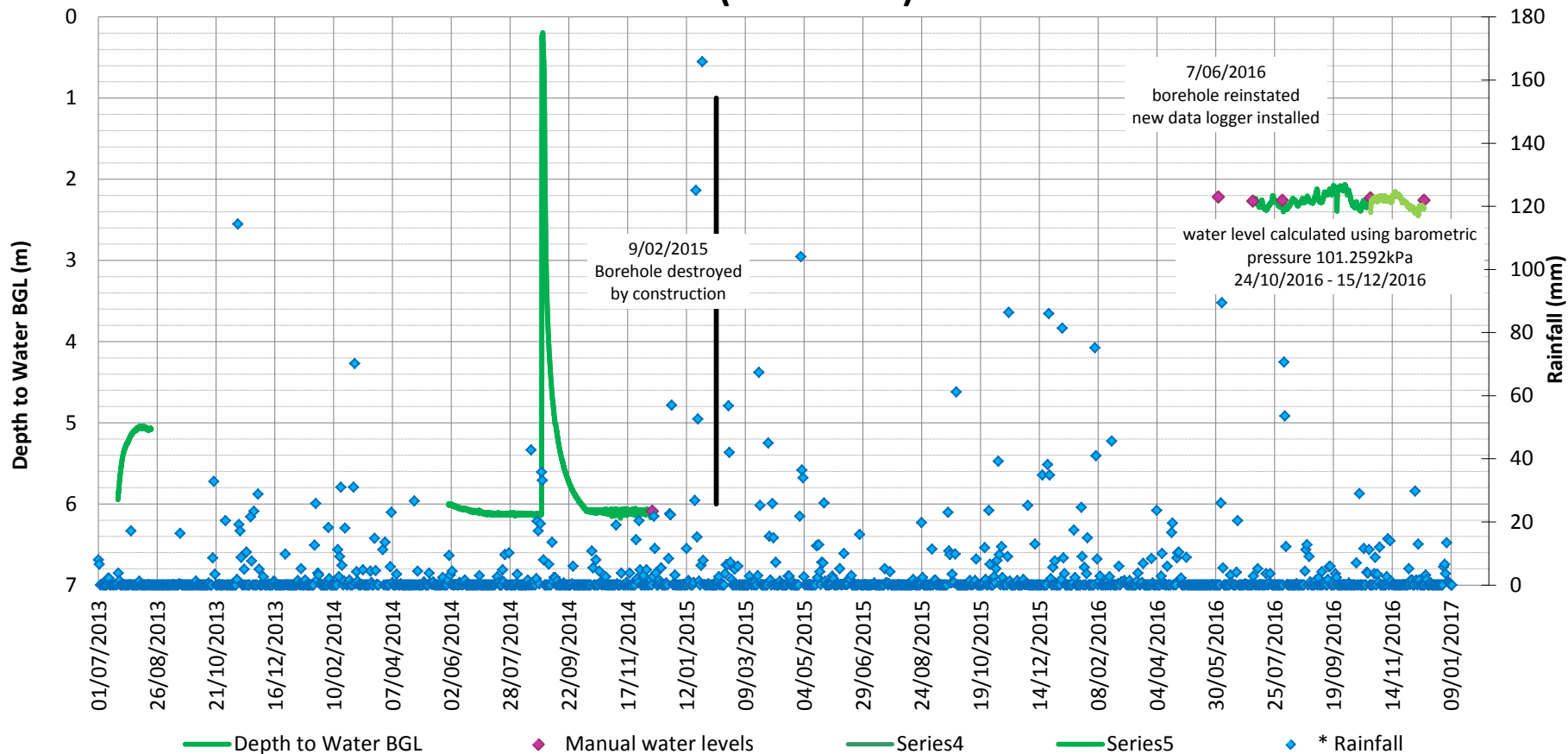
Drawn	GD		Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn 10932422	
Date	14/12/2016		BH ID	A-BH3104	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-4
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW05 (A-BH3105) Water Level BGL



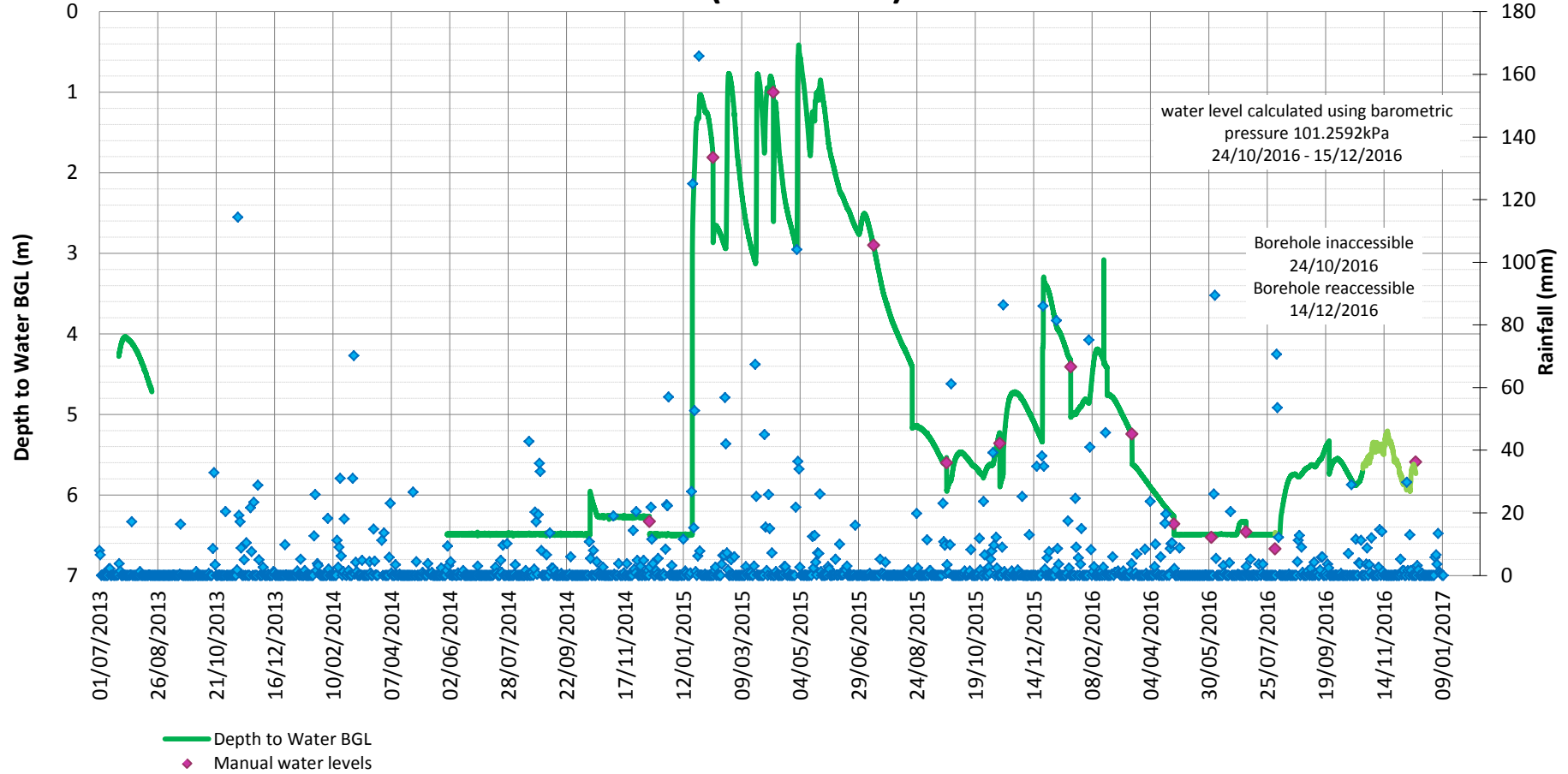
Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262196	
Date	14/12/2016		BH ID	A-BH3105	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-5
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW06 (A-BH3106) Water Level BGL



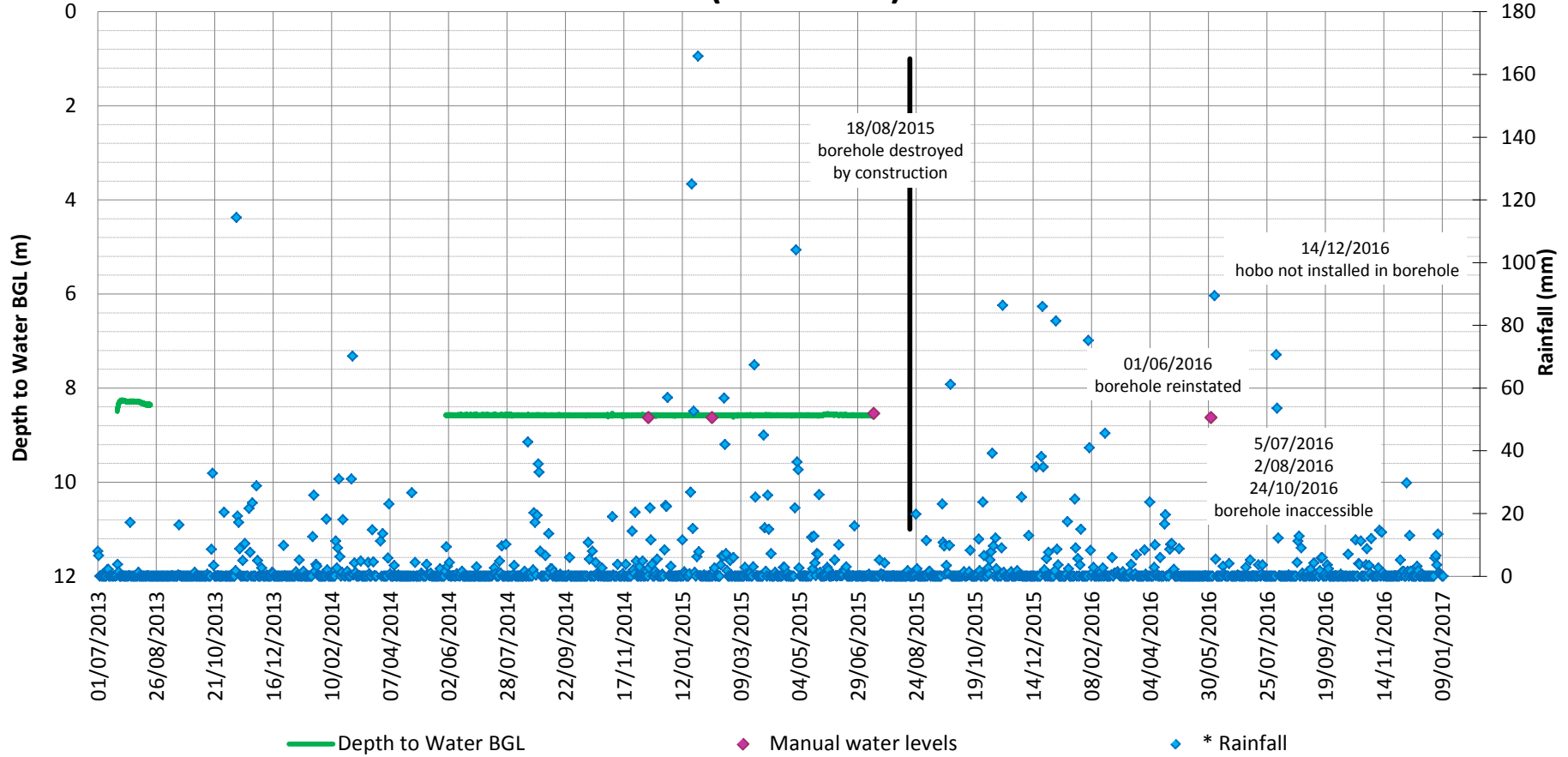
Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10932418	
Date	14/12/2016		BH ID	A-BH3106	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-6
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW07 (A-BH3107) Water Level BGL



Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10229627	
Date	14/12/2016		BH ID	A-BH3107	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-7
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW09 (B-BH3102) Water Level BGL

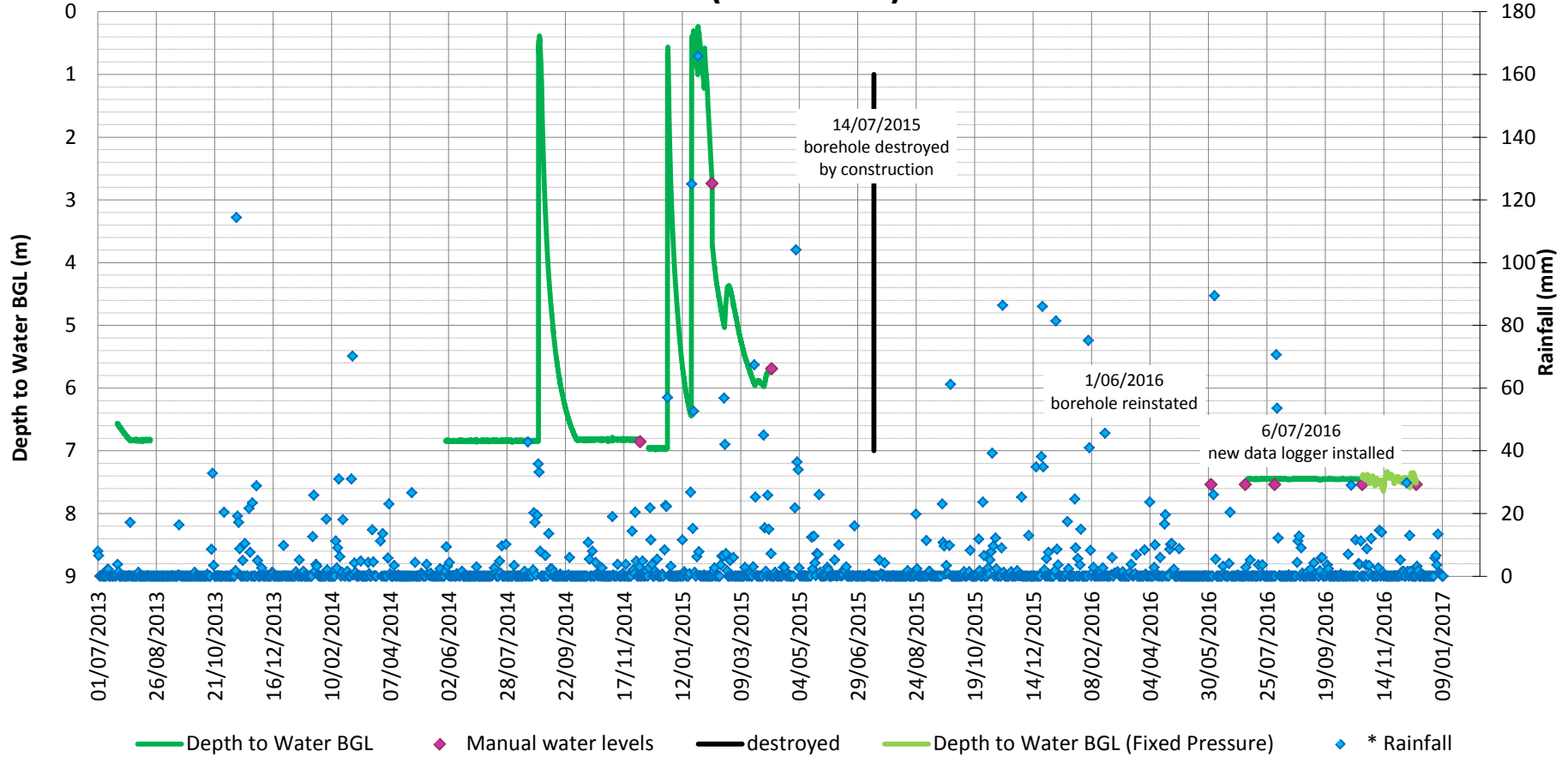


Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	Figure no: B-8
Approved	MD		Instrument	HOBO Water Level Data Logger sn 10262198	
Date	14/12/2016		BH ID	B-BH3102	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	

Groundwater sample taken at time of manual water levels BGL = below ground level (existing)

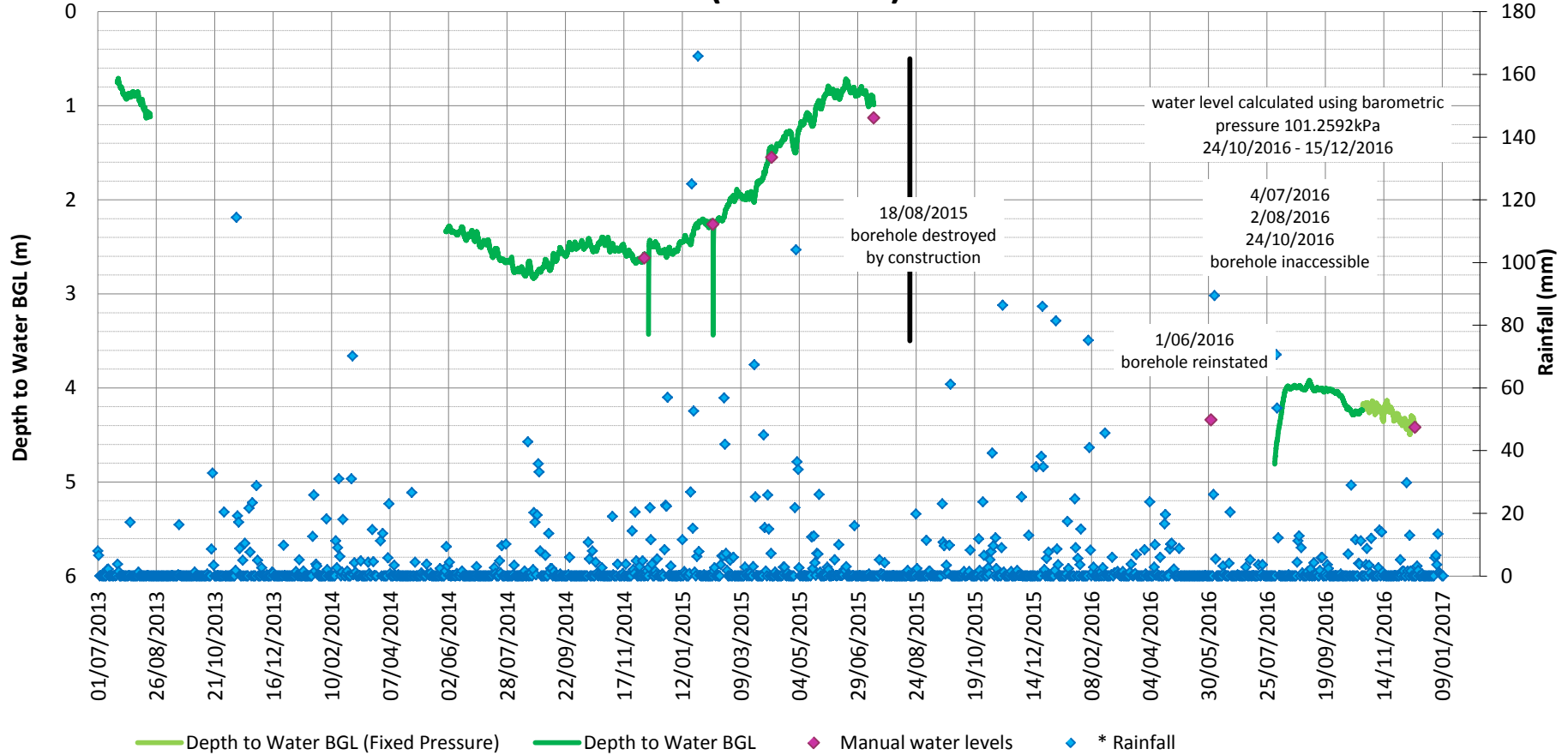
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW10 (B-BH3103) Water Level BGL



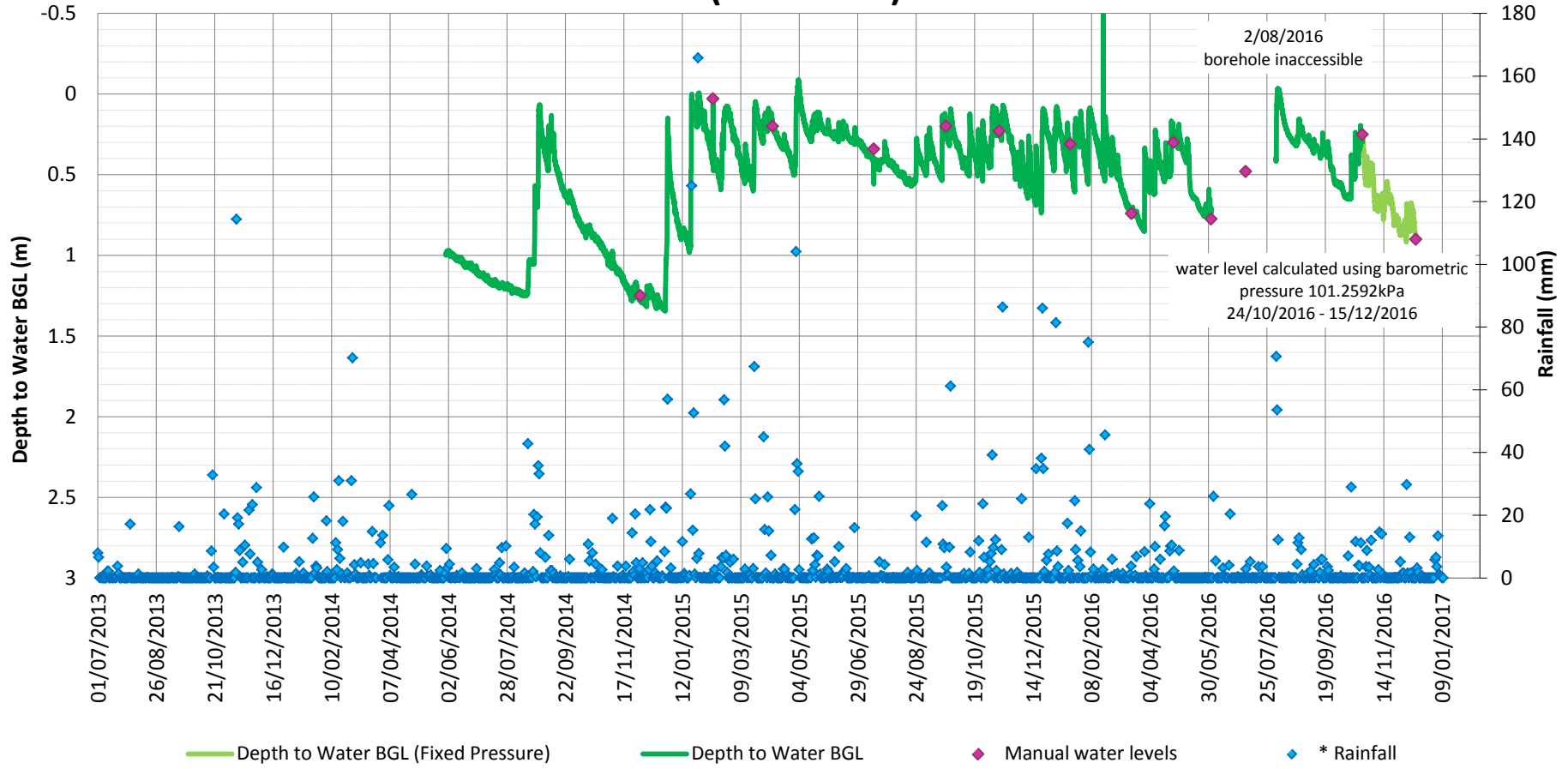
Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10238337	
Date	15/12/2016		BH ID	B-BH3103	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-9
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW11 (B-BH3104) Water Level BGL



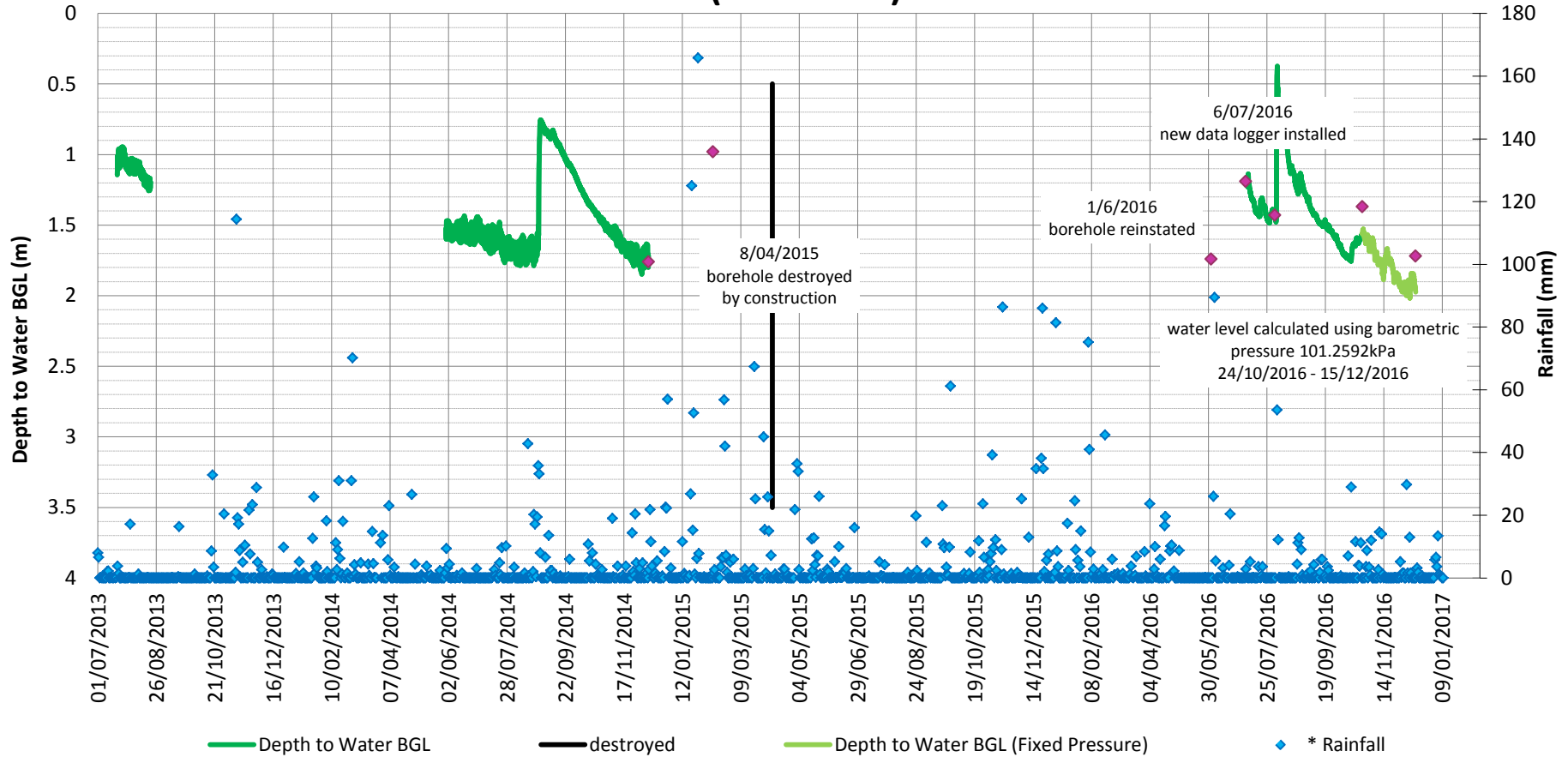
Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10224040	
Date	14/12/2016		BH ID	B-BH3104	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-10
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					


HW10 Pacific Hwy; Oxley Hwy to Kempsey GW12 (B-BH3105) Water Level BGL



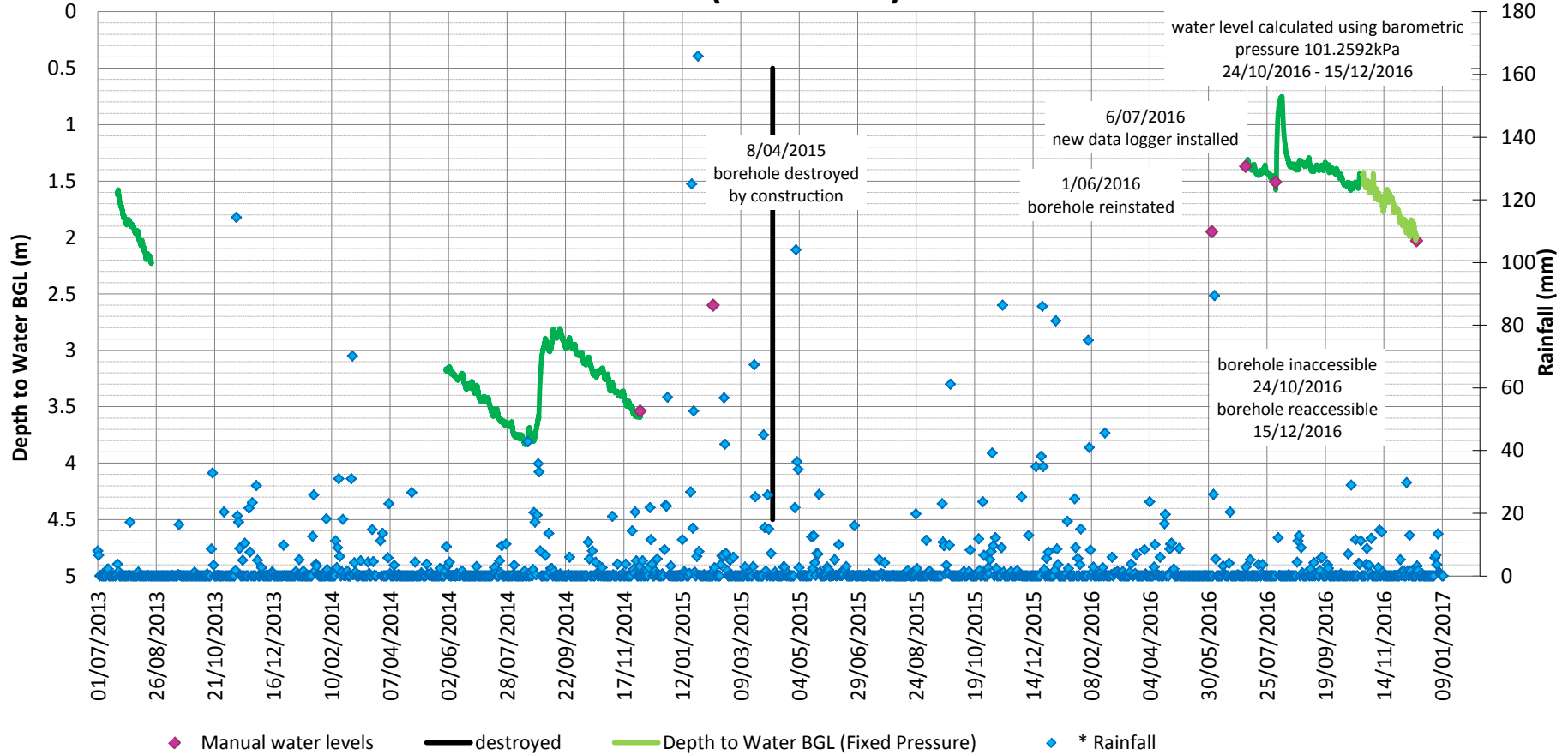
Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262196	
Date	14/12/2016		BH ID	B-BH3105	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-11
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW13 (B-BH3106) Water Level BGL



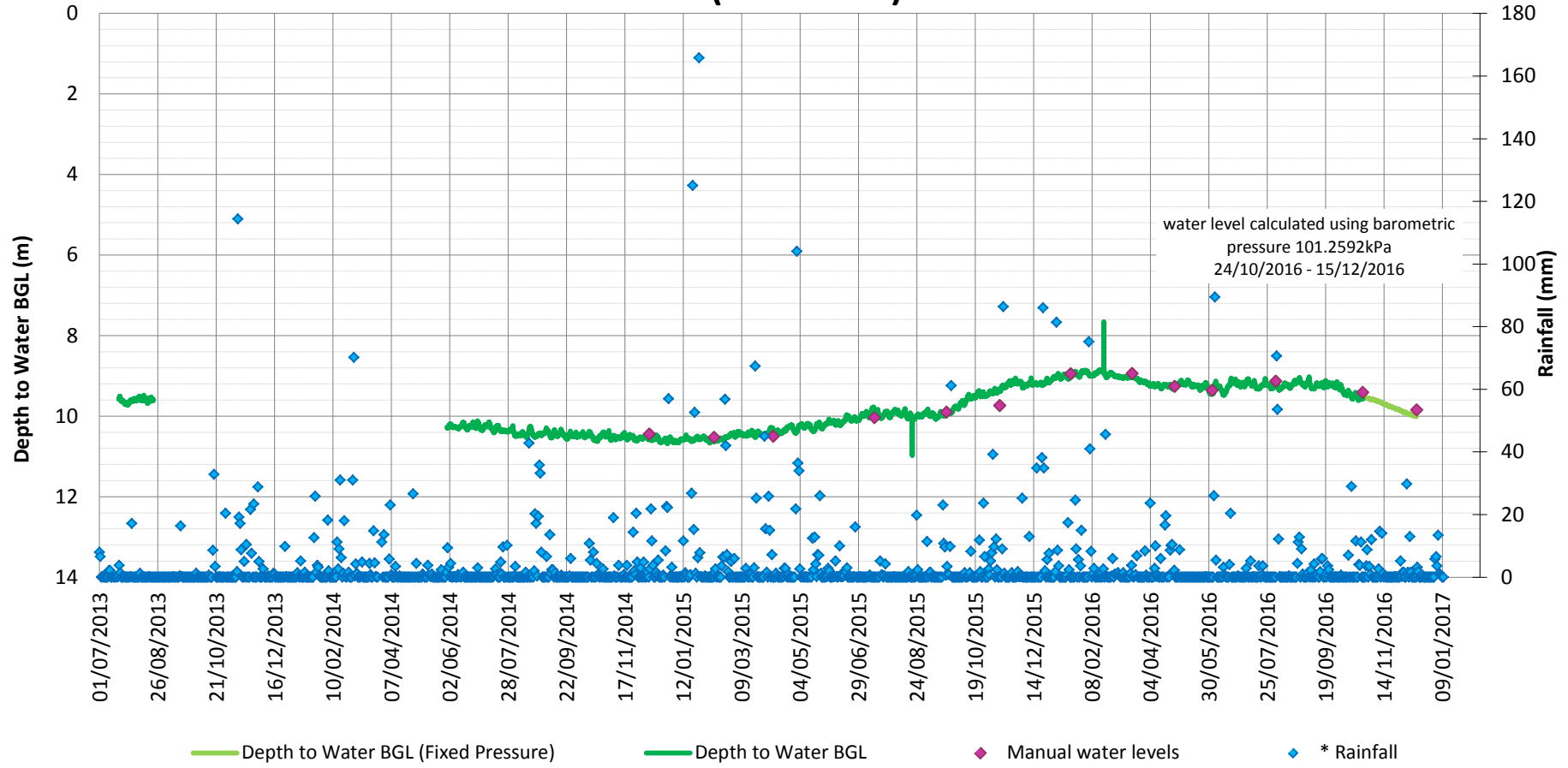
Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10932416	
Date	14/12/2016		BH ID	B-BH3106	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-12
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW14 (B-BH3107) Water Level BGL



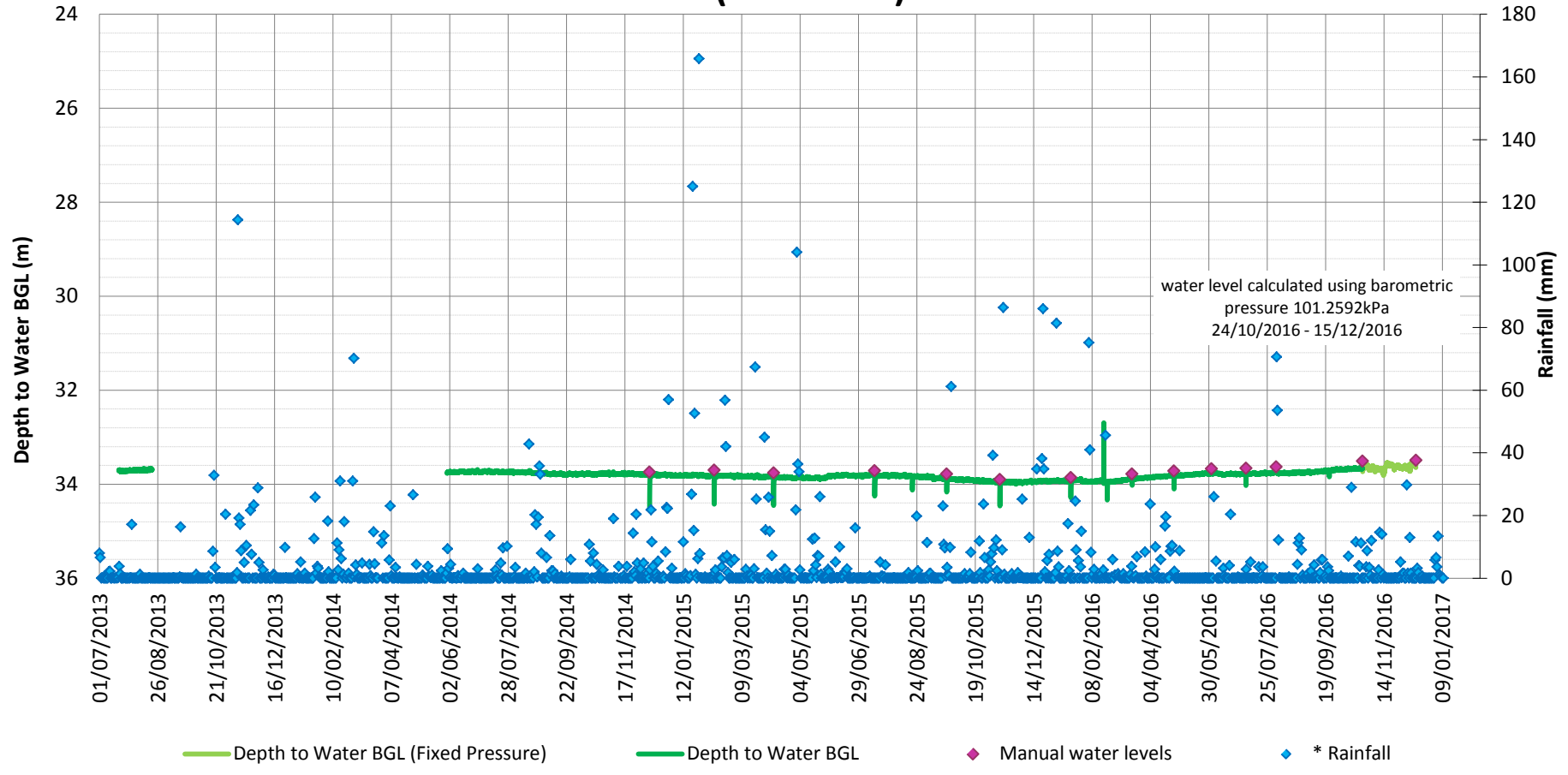
Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10932419	
Date	15/12/2016		BH ID	B-BH3107	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-13
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW15 (B-BH3108) Water Level BGL



Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10238352	
Date	15/12/2016		BH ID	B-BH3108	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-14
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW18 (C-BH3102) Water Level BGL

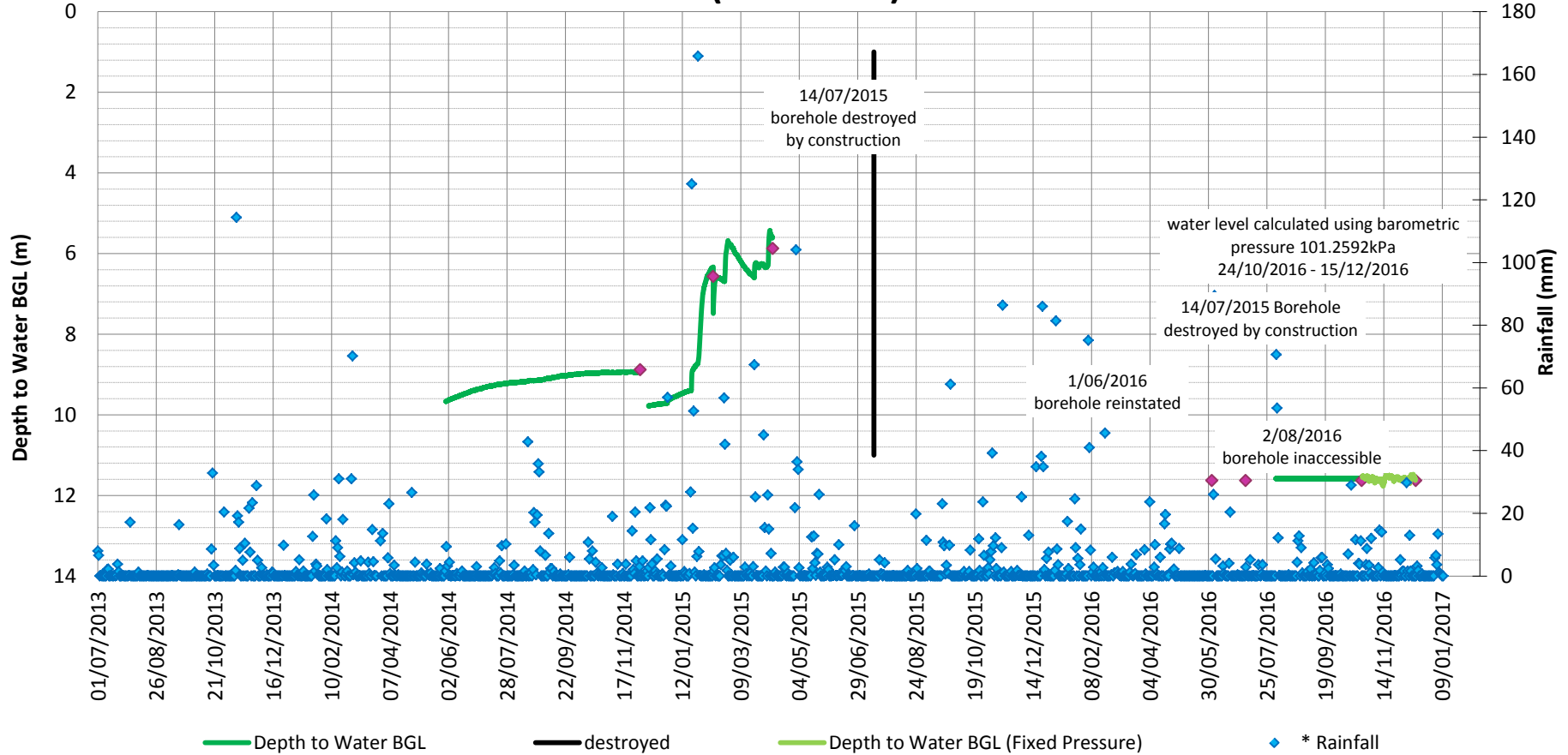


Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262195	
Date	14/12/2016		BH ID	C-BH3102	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-15

Groundwater sample taken at time of manual water levels BGL = below ground level (existing)

* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW19 (C-BH3103) Water Level BGL

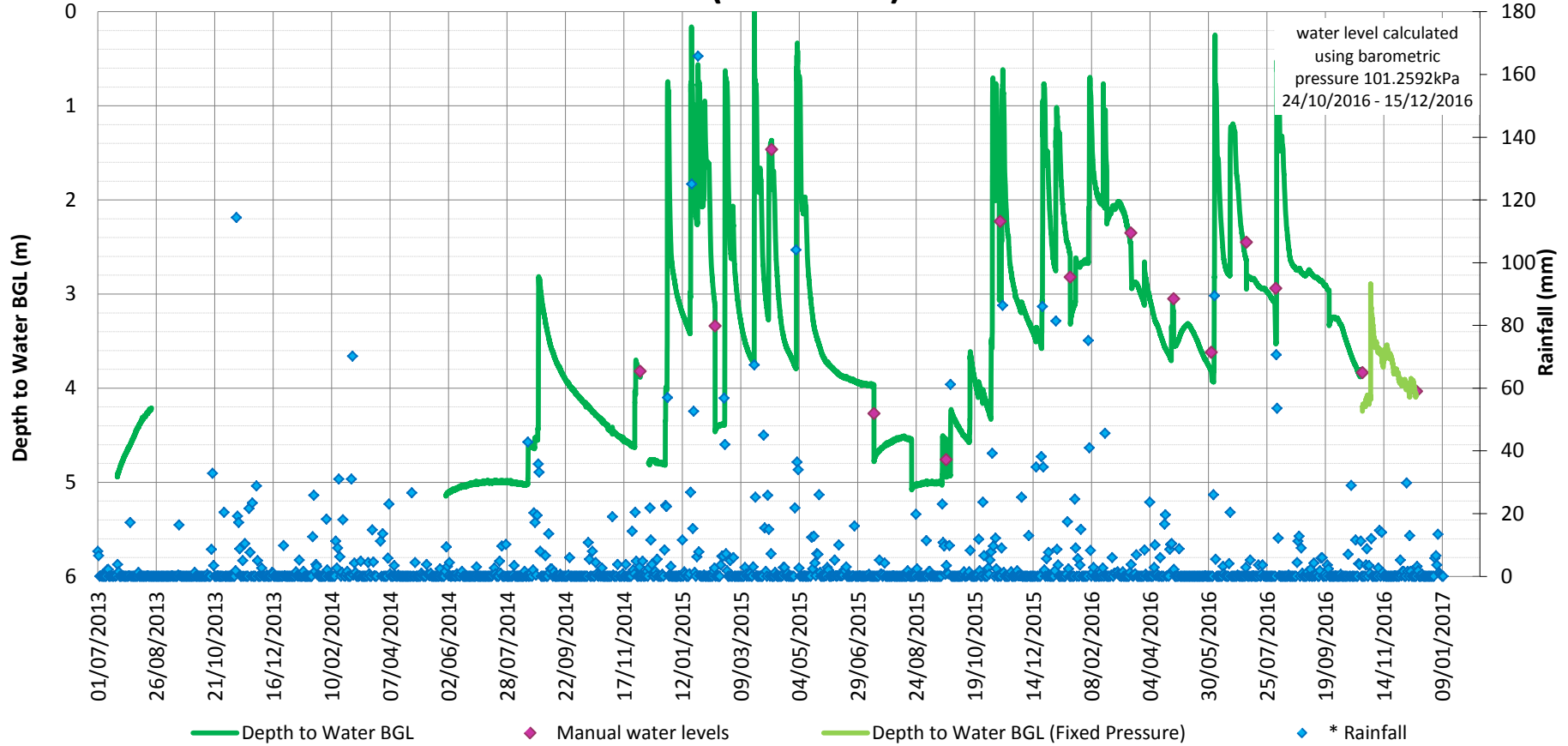


Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger	
Date	14/12/2016		BH ID	C-BH3103	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-16

Groundwater sample taken at time of manual water levels BGL = below ground level (existing)

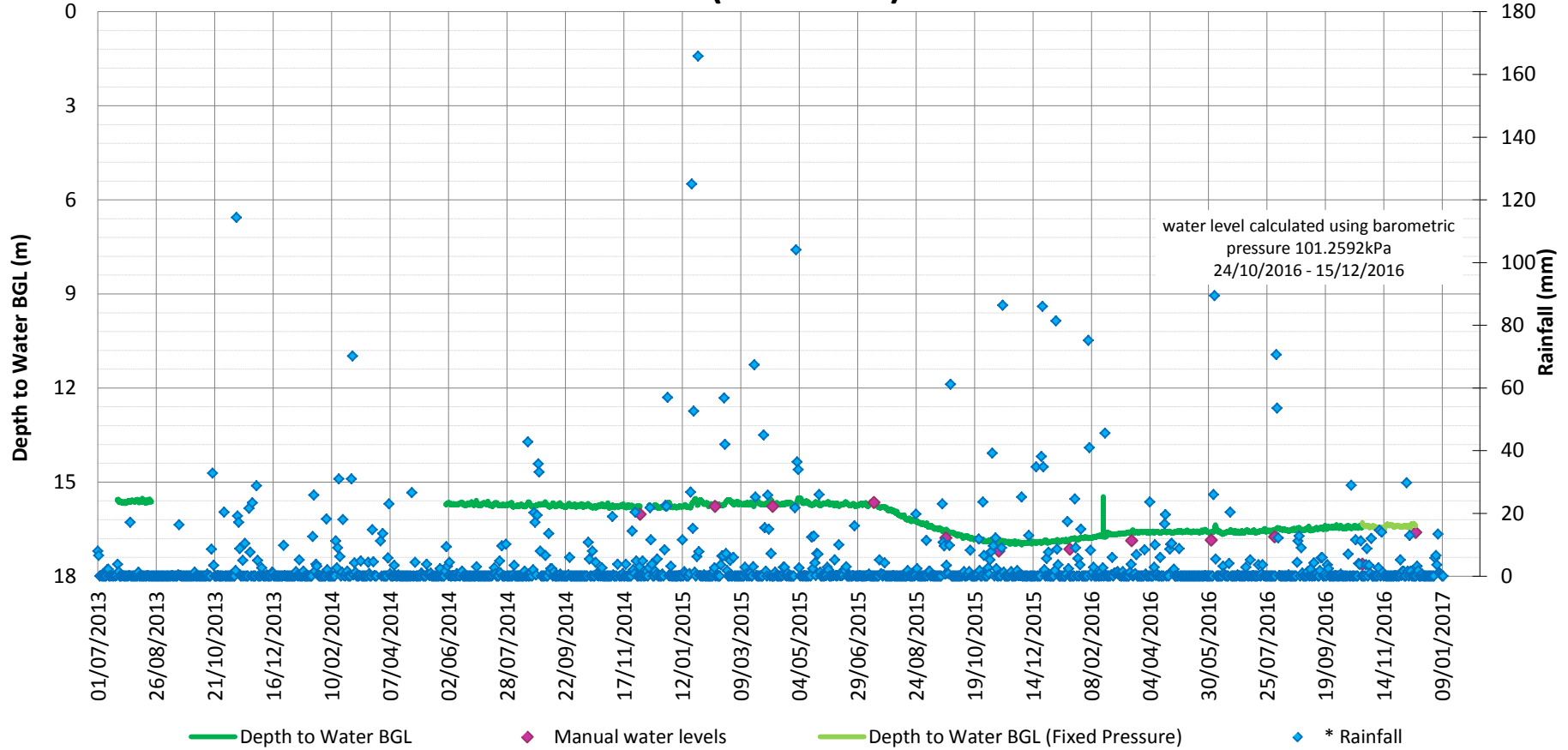
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW21 (C-BH3105) Water Level BGL



Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10280416	
Date	15/12/2016		BH ID	C-BH3105	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-17
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW22 (C-BH3107) Water Level BGL

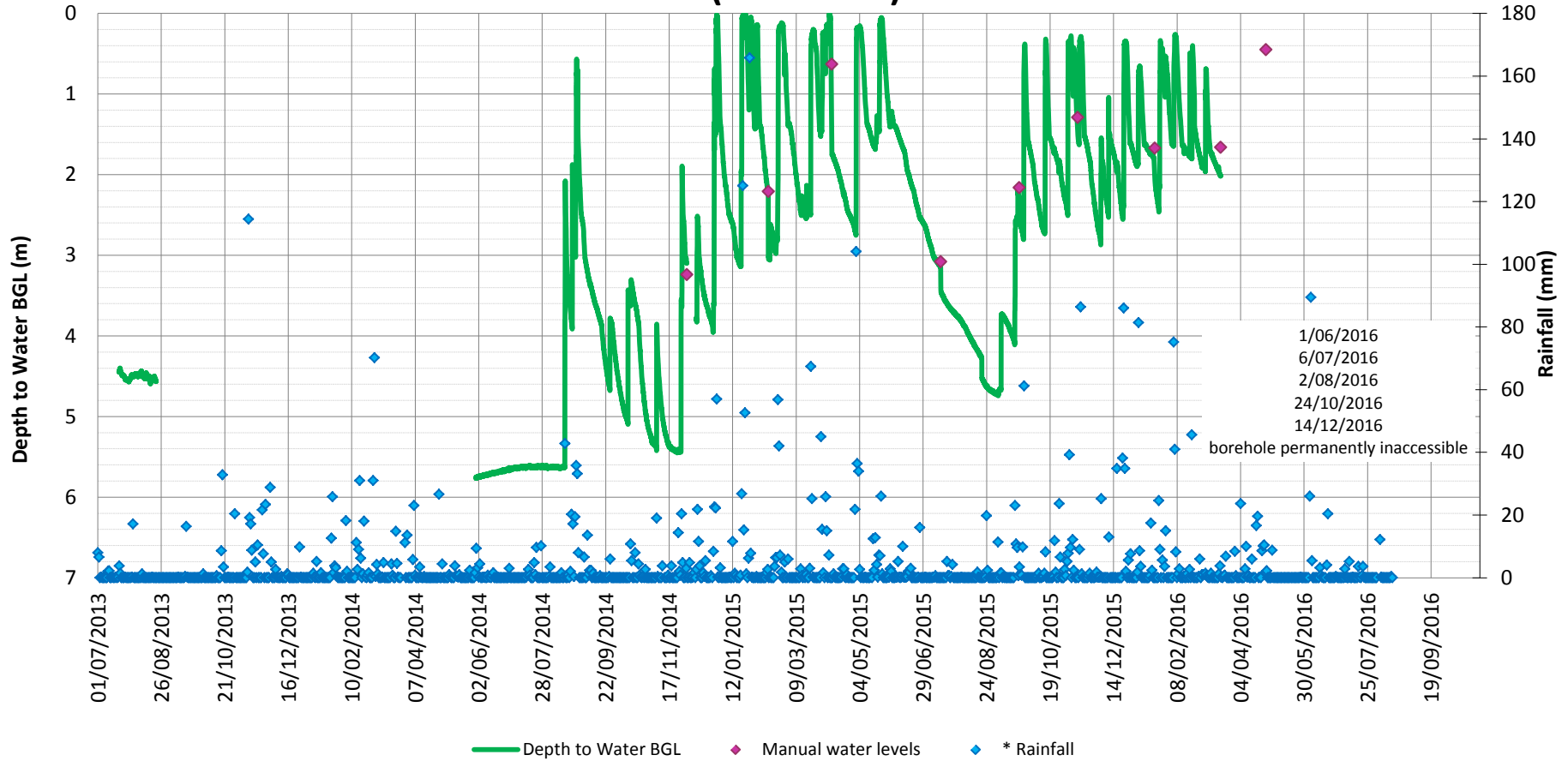


Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10280407	
Date	14/12/2016		BH ID	C-BH3107	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-18

Groundwater sample taken at time of manual water levels BGL = below ground level (existing)

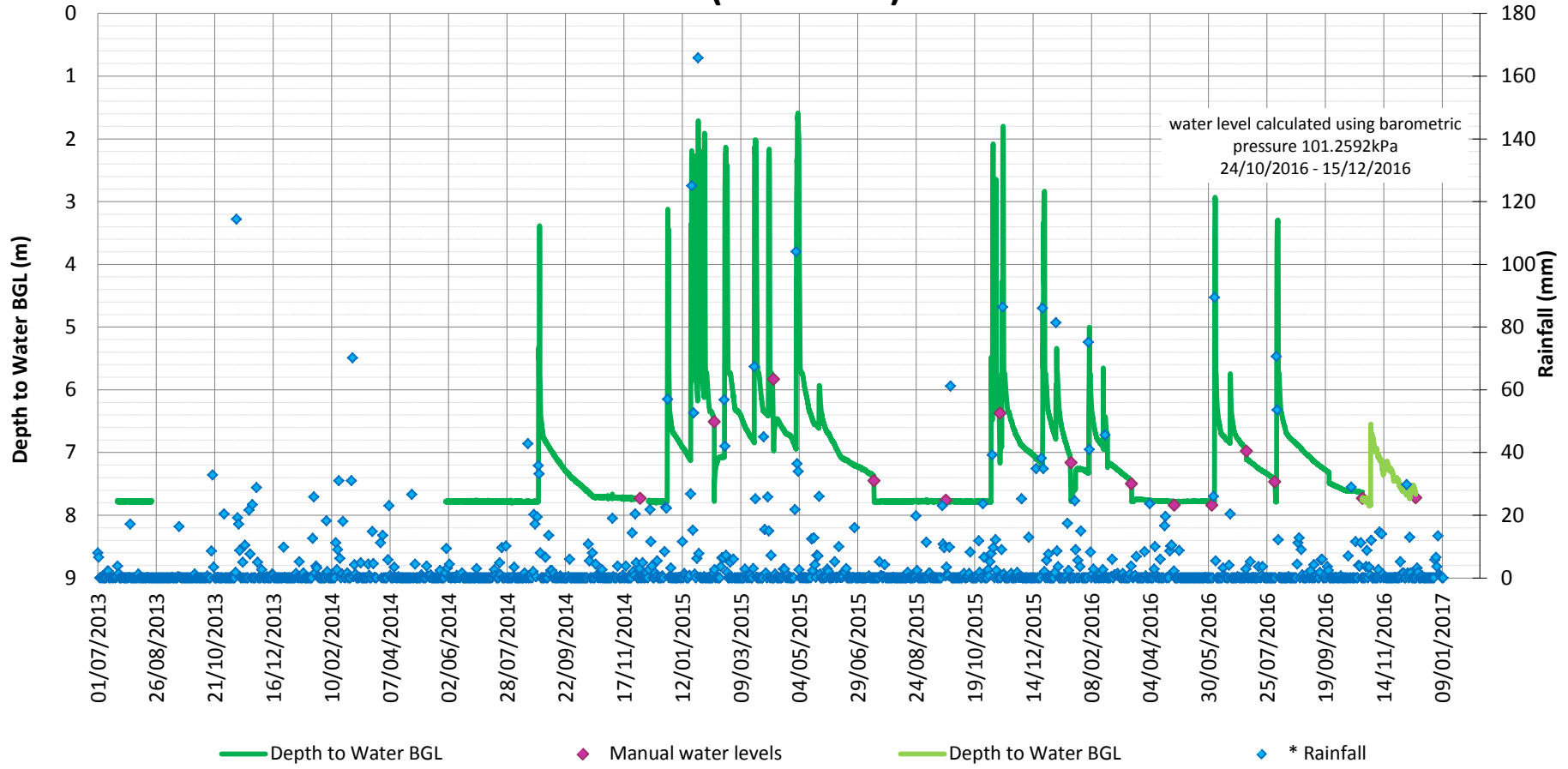
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW23 (C-BH3106) Water Level BGL



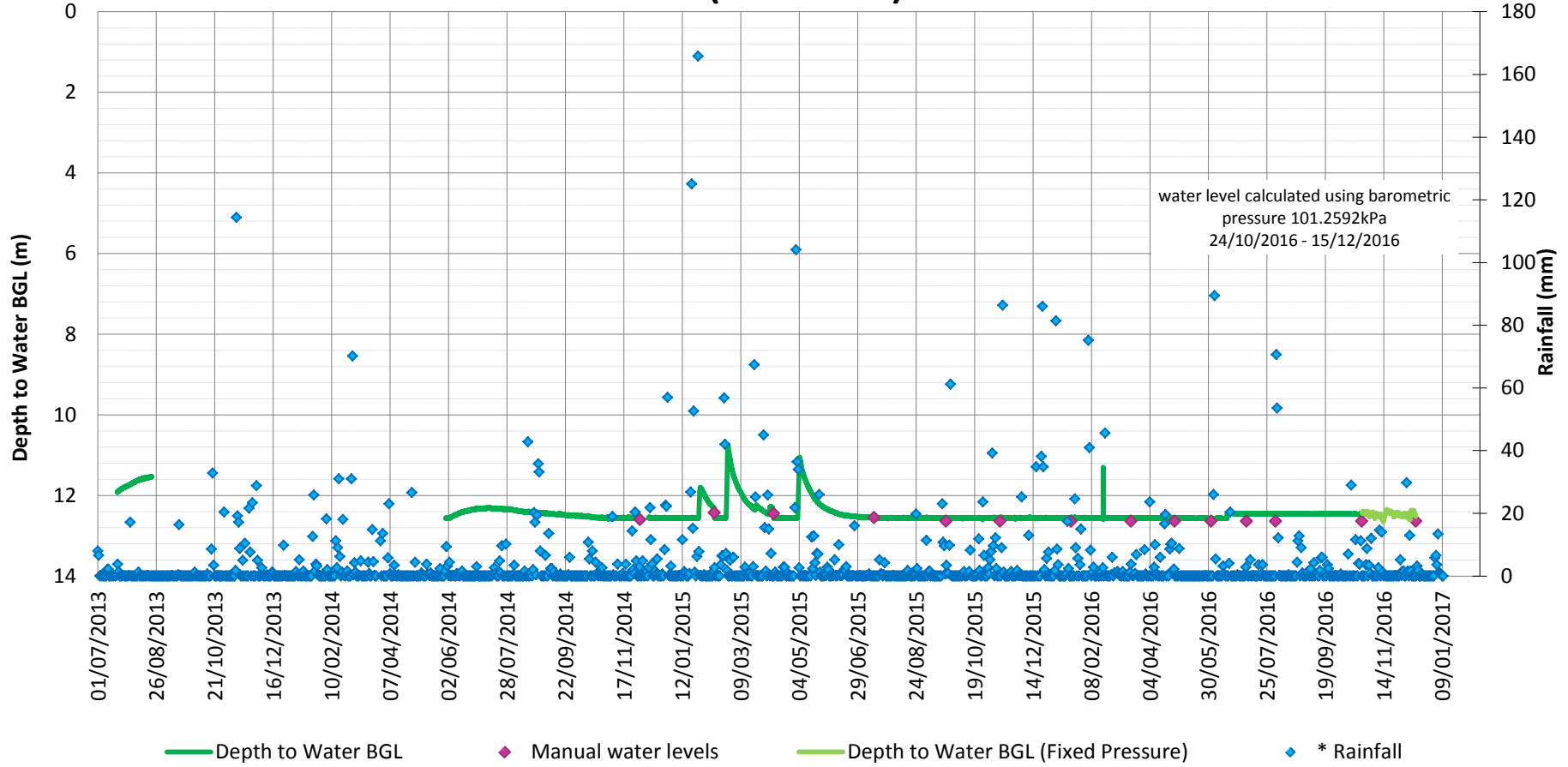
Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262202	
Date	14/12/2016		BH ID	C-BH3106	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-19
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW24 (C-BH3108) Water Level BGL



Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262197	
Date	14/12/2016		BH ID	C-BH3108	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-20
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW25 (D-BH3101) Water Level BGL

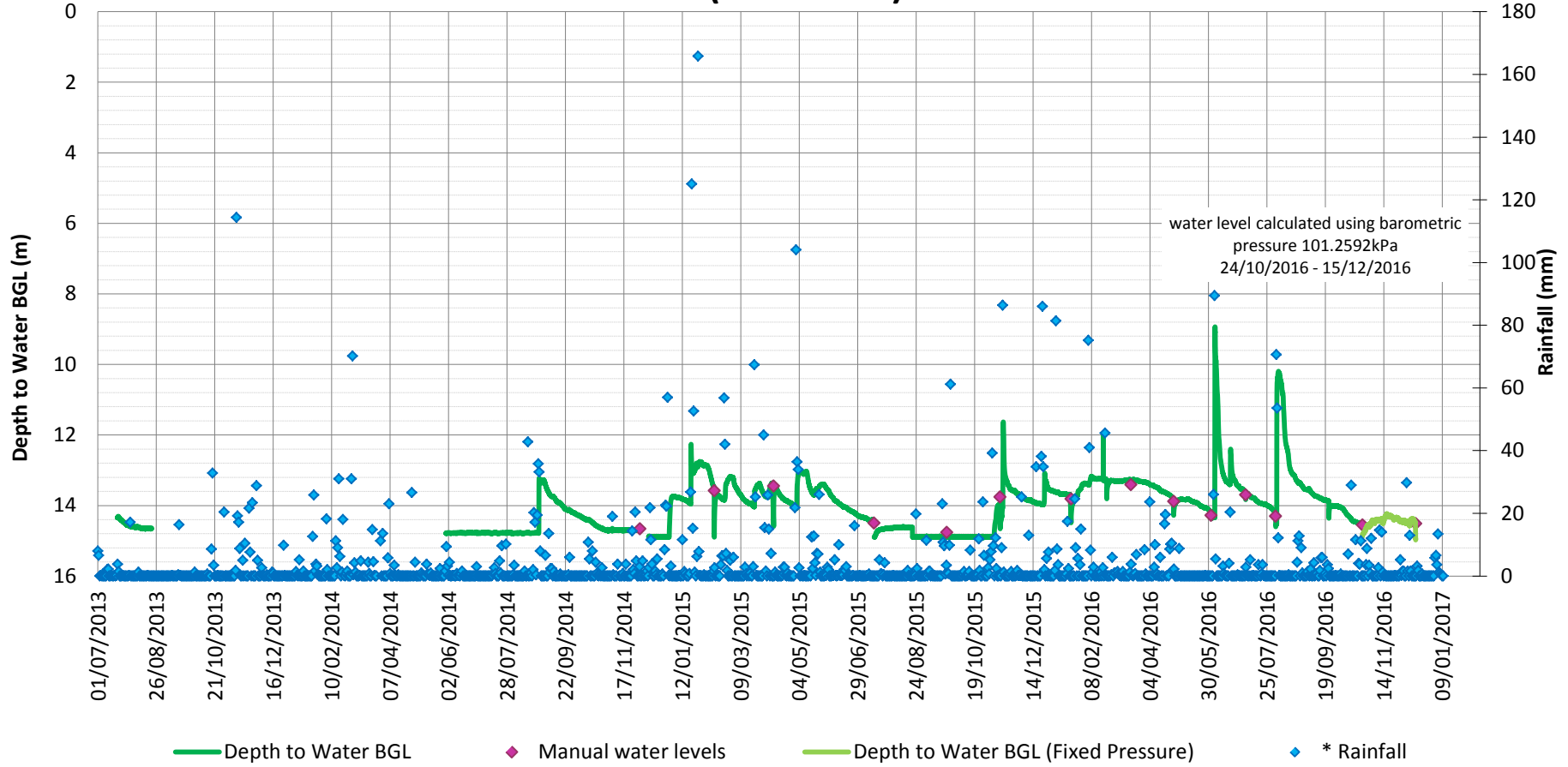


Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262203	
Date	14/12/2016		BH ID	D-BH3101	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-21

Groundwater sample taken at time of manual water levels BGL = below ground level (existing)

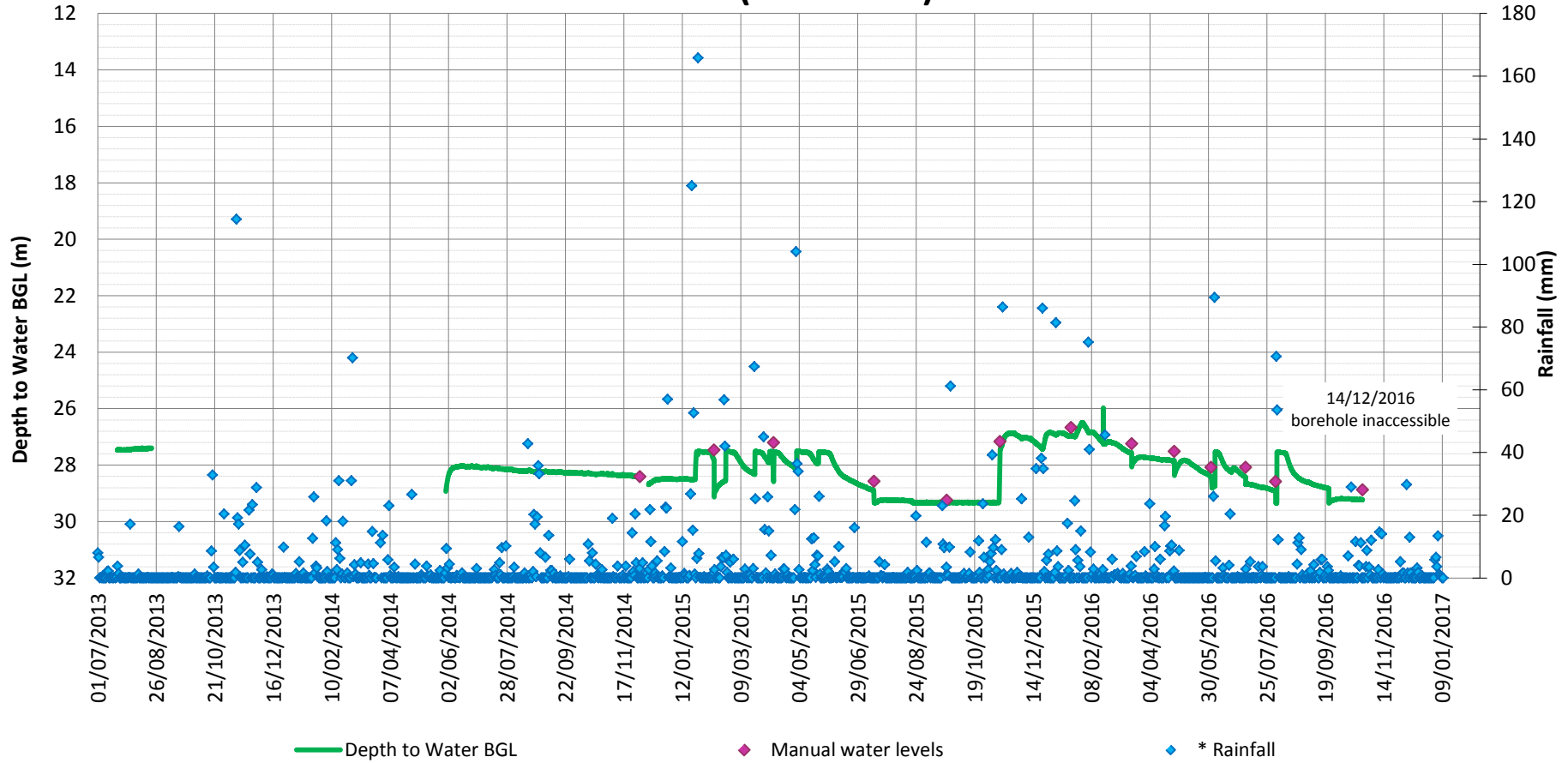
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW26 (D-BH3106) Water Level BGL



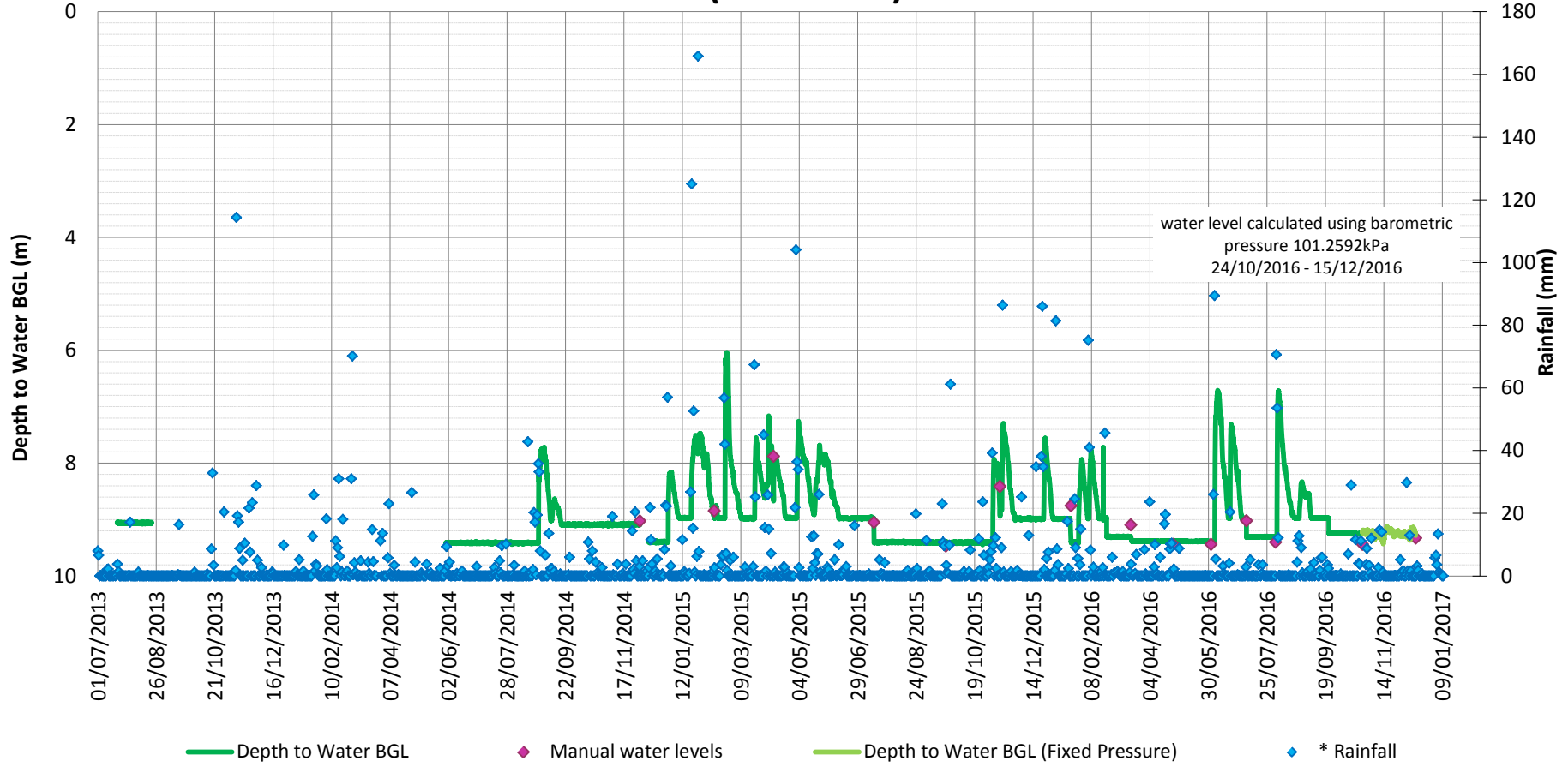
Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262194	
Date	14/12/2016		BH ID	D-BH3106	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-22
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW27 (D-BH3102) Water Level BGL



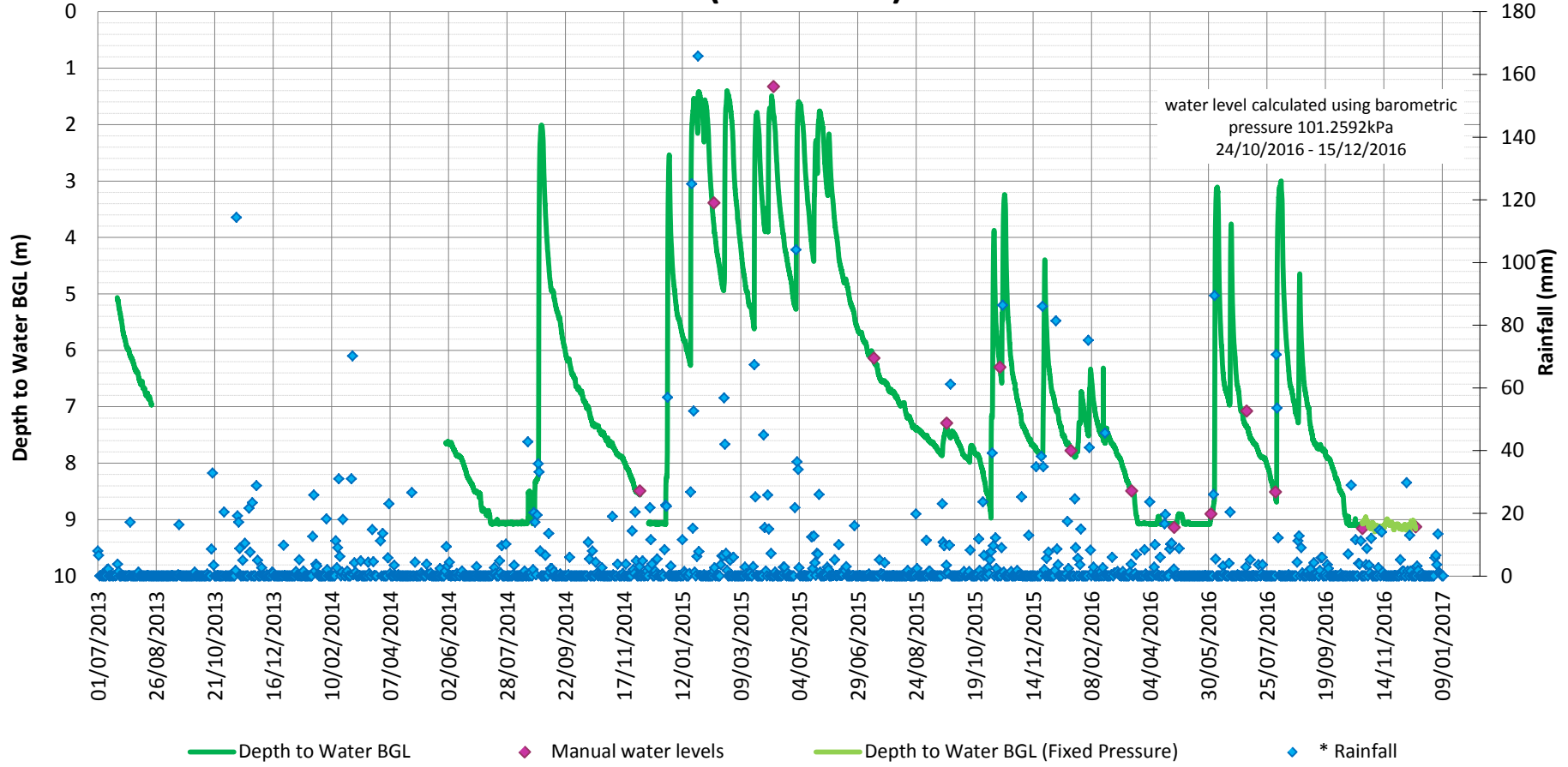
Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262200	
Date	14/12/2016		BH ID	D-BH3102	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-23
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW28 (D-BH3103) Water Level BGL



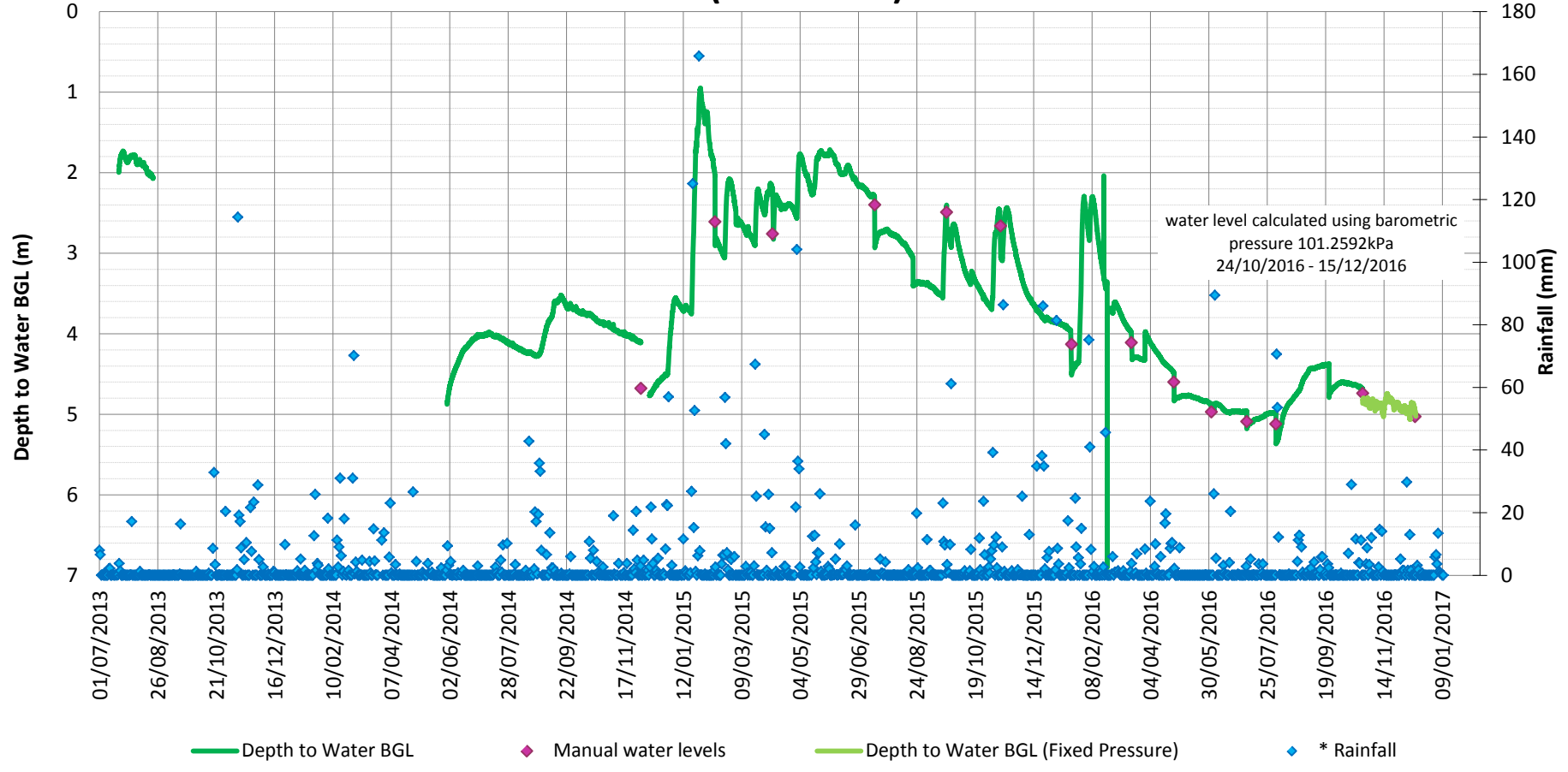
Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262205	
Date	14/12/2016		BH ID	D-BH3103	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-24
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW29 (D-BH3104) Water Level BGL



Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262201	
Date	14/12/2016		BH ID	D-BH3104	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-25
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

HW10 Pacific Hwy; Oxley Hwy to Kempsey GW30 (D-BH3105) Water Level BGL



Drawn	GD	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262193	
Date	14/12/2016		BH ID	D-BH3105	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-26
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

Appendix E – Cumulative construction groundwater results

Table 1 Cumulative construction groundwater quality monitoring results by borehole

Parameter	Unit	LOR	GW01		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01	2.51	0.1							54.6	<0.01		
Dissolved Arsenic	mg/L	0.001	0.008	0.002							0.016	<0.001		
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001							0.0288	0.0034		
Dissolved Chromium	mg/L	0.001	<0.001	<0.001							0.068	<0.001		
Dissolved Copper	mg/L	0.001	0.037	0.009							0.379	0.003		
Total Iron	mg/L	0.05	2.27	1.8							75.2	16.7		
Dissolved Lead	mg/L	0.001	0.026	0.002							0.047	<0.001		
Total Manganese	mg/L	0.001	0.247	0.052							1.81	1.02		
Mercury	mg/L	0.0001	<0.00001	0.00001										
Dissolved Nickel	mg/L	0.001	0.025	0.005							0.036	0.02		
Dissolved Silver	mg/L	0.001	<0.001	<0.001							<0.001	<0.001		
Dissolved Zinc	mg/L	0.005	0.347	0.118							0.398	0.045		
EC laboratory	uS/cm		4400	2170							8050	7650		
Total Nitrogen	mg/L		0.38	0.5										
Total Phosphorus	mg/L		0.05	0.07										
Ammonia	mg/L		0.02	<0.02										
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		7	13										
Chloride	mg/L		1307	489										
Nitrate			0.08	0.25							0.24	0.32		
Sulphate	mg/L		159	274										
Calcium	mg/L		4.41	1.28										
Magnesium	mg/L		87.4	21.7										
Potassium	mg/L		5.78	3.2										
Sodium	mg/L		692	370										

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW01 groundwater monitoring bore destroyed by construction prior to April 2015 sampling event. Re-installation prior to August 2016 monitoring event.

Table 2 Cumulative construction groundwater quality monitoring results by borehole

Parameter	Unit	LOR	GW02		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01	<0.01	0.03	0.01	17.2	18.6				0.01			
Dissolved Arsenic	mg/L	0.001	0.003	<0.001	<0.001	0.007	0.007				<0.001			
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0032	0.0003				0.0001			
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	0.011	0.014				<0.001			
Dissolved Copper	mg/L	0.001	0.001	0.004	0.003	0.069	0.071				0.004			
Total Iron	mg/L	0.05	15.9	8.65	31.9	15.7	21.4				4.1			
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.009	0.099				<0.001			
Total Manganese	mg/L	0.001	0.477	0.088	0.073	0.216	0.312				0.543			
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001									
Dissolved Nickel	mg/L	0.001	0.003	0.004	0.003	0.009	0.012				0.013			
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001			
Dissolved Zinc	mg/L	0.005	0.007	0.026	0.012	0.050	0.081				0.062			
EC laboratory	uS/cm		345	178	231	852	914				969			
Total Nitrogen	mg/L		2.7	1.0	0.48									
Total Phosphorus	mg/L		0.37	0.23	0.35									
Ammonia	mg/L		1.54	0.12	0.02									
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		123	34	23									
Chloride	mg/L		27	24	52									
Nitrate			0.11	0.04	0.07	0.26	3.96				5.88			
Sulphate	mg/L		7.7	8.4										
Calcium	mg/L		14.8	6.07	8.57									
Magnesium	mg/L		9.62	4.01	5.82									
Potassium	mg/L		4.09	1.89	7.53									
Sodium	mg/L		36.5	21.5	32.9									

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW02 groundwater monitoring bore destroyed by construction prior to January 2016 sampling event. The monitoring bore was reinstated in September 2016

Table 3 Cumulative construction groundwater quality monitoring results by borehole

Parameter	Unit	LOR	GW03		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01	<0.01	0.02	<0.01	0.24	1.44	<0.01	0.35	1.72	<0.01			
Dissolved Arsenic	mg/L	0.001	<0.001	<0.001	<0.001	0.006	0.002	<0.001	<0.001	0.007	<0.001			
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0002	<0.0001	0.0001	0.0023	0.0002	<0.0001			
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.001	0.003	<0.001			
Dissolved Copper	mg/L	0.001	0.005	0.005	0.005	0.010	0.022	0.001	0.027	0.011	0.004			
Total Iron	mg/L	0.05	35.7	11.3	3.73	17.4	4.92	7.97	1.88	29.7	21.7			
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.085	<0.001	<0.001	0.002	<0.001			
Total Manganese	mg/L	0.001	1.13	0.947	0.141	1.34	0.311	1.22	0.647	1.76	1.47			
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001			<0.0001						
Dissolved Nickel	mg/L	0.001	0.012	0.013	0.007	0.017	0.013	0.017	0.022	0.026	0.045			
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Dissolved Zinc	mg/L	0.005	0.01	0.019	0.015	0.028	0.028	0.013	0.085	0.044	0.04			
EC laboratory	uS/cm		1290	939	519	1040	725	1080	1420	1460	1700			
Total Nitrogen	mg/L		0.7	0.6	0.59			0.5						
Total Phosphorus	mg/L		0.37	0.11	0.14			0.07						
Ammonia	mg/L		0.17	0.10	0.02			0.02						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		147	118	120			96						
Chloride	mg/L		254	163	74			226						
Nitrate			0.02	0.02	<0.01	0.22	0.03	0.10	0.03	0.12	0.03			
Sulphate	mg/L		102	80				85						
Calcium	mg/L		30.8	27.4	42.1			36						
Magnesium	mg/L		39.9	24.5	15.4			38						
Potassium	mg/L		3.49	2.93	2.47			1						
Sodium	mg/L		164	105	38.6			127						

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Table 4 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW04		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 15	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01	<0.01	0.01	<0.01						86.7			
Dissolved Arsenic	mg/L	0.001	<0.001	<0.001	0.001						0.059			
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001						0.0004			
Dissolved Chromium	mg/L	0.001	0.001	0.002	0.002						0.17			
Dissolved Copper	mg/L	0.001	0.005	0.002	0.003						0.152			
Total Iron	mg/L	0.05	106	28.6	24.4						173			
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001						0.07			
Total Manganese	mg/L	0.001	0.632	0.409	0.486						1.58			
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001									
Dissolved Nickel	mg/L	0.001	0.002	0.004	0.007						0.129			
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001						<0.001			
Dissolved Zinc	mg/L	0.005	<0.005	0.017	0.016						1.73			
EC laboratory	uS/cm		4190	3050	3170						1130			
Total Nitrogen	mg/L		1.5	0.9	0.88									
Total Phosphorus	mg/L		0.52	0.11	0.12									
Ammonia	mg/L		0.34	0.16	0.13									
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		319	176	206									
Chloride	mg/L		1148	858	900									
Nitrate			0.01	0.01	0.04						0.04			
Sulphate	mg/L		44	29										
Calcium	mg/L		44.2	25.2	29.6									
Magnesium	mg/L		83.7	48.7	62.1									
Potassium	mg/L		21.8	11.2	10.4									
Sodium	mg/L		627	456	506									

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW04 groundwater monitoring bore destroyed by construction prior to July 2015 sampling event. Re-installed prior to August 2016 monitoring event.

Table 5 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW05		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 15	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01	0.01	0.02	<0.01	6.72	1.28	<0.01		2.72				
Dissolved Arsenic	mg/L	0.001	<0.001	<0.001	<0.001	0.005	0.003	0.001		0.003				
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0008	0.0005	<0.0001		0.0007				
Dissolved Chromium	mg/L	0.001	<0.001	0.001	<0.001	0.010	0.003	<0.001		0.005				
Dissolved Copper	mg/L	0.001	0.01	0.003	0.001	0.047	0.046	<0.001		0.05				
Total Iron	mg/L	0.05	111	66.2	59.4	69.3	46.8	92.7		64.6				
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.005	0.044	<0.001		0.002				
Total Manganese	mg/L	0.001	0.944	1.15	1.02	0.726	0.744	1.43		0.645				
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001			<0.0001						
Dissolved Nickel	mg/L	0.001	0.004	0.012	0.008	0.008	0.003	0.017		0.006				
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001				
Dissolved Zinc	mg/L	0.005	0.015	0.020	0.022	0.055	0.039	0.040		0.055				
EC laboratory	uS/cm		7260	6910	6890	7320	7510	6590		7320				
Total Nitrogen	mg/L		3.1	1.8	1.42			2.7						
Total Phosphorus	mg/L		9.43	1.03	1.35			0.97						
Ammonia	mg/L		0.82		0.71			0.49						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		558	397	460			245						
Chloride	mg/L		2494	1654	1500			1250						
Nitrate			0.10	0.07	0.1	0.26	0.17	0.12		0.62				
Sulphate	mg/L		2032	1305				1200						
Calcium	mg/L		96.6	148	161			179						
Magnesium	mg/L		281	228	268			247						
Potassium	mg/L		21.9	31	34.4			36						
Sodium	mg/L		999	914	1010			907						

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Table 6 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW06		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 15	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01									39.9	19.3		
Dissolved Arsenic	mg/L	0.001									0.024	0.018		
Dissolved Cadmium	mg/L	0.0001									0.0002	0.0004		
Dissolved Chromium	mg/L	0.001									0.013	0.001		
Dissolved Copper	mg/L	0.001									0.028	0.048		
Total Iron	mg/L	0.05									27	24.1		
Dissolved Lead	mg/L	0.001									0.093	0.032		
Total Manganese	mg/L	0.001									0.861	0.56		
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001									0.028	0.032		
Dissolved Silver	mg/L	0.001									<0.001	<0.001		
Dissolved Zinc	mg/L	0.005									0.479	0.488		
EC laboratory	uS/cm										5810	6340		
Total Nitrogen	mg/L													
Total Phosphorus	mg/L													
Ammonia	mg/L													
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹													
Chloride	mg/L													
Nitrate											0.03	0.12		
Sulphate	mg/L													
Calcium	mg/L													
Magnesium	mg/L													
Potassium	mg/L													
Sodium	mg/L													

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW06 had insufficient water to collect a sample during December 2014 and believed destroyed soon after. Monitoring borehole reinstalled prior to August 2016 monitoring event.

Table 7 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW07											
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01		0.2	0.08		71.7	1.70			0.13			
Dissolved Arsenic	mg/L	0.001		<0.001	<0.001		0.012	<0.001			<0.001			
Dissolved Cadmium	mg/L	0.0001		<0.001	<0.001		0.0004	<0.0001			<0.0001			
Dissolved Chromium	mg/L	0.001		0.002	<0.001		0.042	0.002			<0.001			
Dissolved Copper	mg/L	0.001		0.001	0.004		7.39	0.020			2			
Total Iron	mg/L	0.05		26.7	13.2		31.3	7.07			12.7			
Dissolved Lead	mg/L	0.001		<0.001	<0.001		0.154	<0.001			<0.001			
Total Manganese	mg/L	0.001		0.124	0.125		0.254	0.030			0.072			
Mercury	mg/L	0.0001		<0.00001	<0.00001			<0.0001						
Dissolved Nickel	mg/L	0.001		0.002	<0.001		0.024	<0.001			0.002			
Dissolved Silver	mg/L	0.001		<0.001	<0.001		<0.001	<0.001			<0.001			
Dissolved Zinc	mg/L	0.005		0.005	0.011		0.174	0.106			0.029			
EC laboratory	uS/cm			212	238		184	169			182			
Total Nitrogen	mg/L			0.7	0.45			0.7						
Total Phosphorus	mg/L			0.16	0.22			0.10						
Ammonia	mg/L			<0.02	0.01			<0.01						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹			36	45			16						
Chloride	mg/L			35	38			32						
Nitrate				<0.01	<0.01		<0.01	0.24			<0.01			
Sulphate	mg/L			9.5				8						
Calcium	mg/L			22.6	10.2			1						
Magnesium	mg/L			9.09	4.0			1						
Potassium	mg/L			2.92	1.75			<1						
Sodium	mg/L			30.8	46.3			32						

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW07 had insufficient water to collect a sample during December 2014, July 2015, April 16 and August 2016 sampling events.

Table 8 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW08		Results								
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16		
Dissolved Aluminium	mg/L	0.01	0.02	0.12	1.21	72.9	20.5						
Dissolved Arsenic	mg/L	0.001	0.001	<0.001	<0.001	0.028	0.004						
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0024	0.0001						
Dissolved Chromium	mg/L	0.001	<0.001	0.001	0.003	0.082	0.018						
Dissolved Copper	mg/L	0.001	<0.001	0.004	0.002	0.114	0.082						
Total Iron	mg/L	0.05	139	52.1	78.6	75.4	10.7						
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.063	0.108						
Total Manganese	mg/L	0.001	0.452	0.125	0.089	0.158	0.037						
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001								
Dissolved Nickel	mg/L	0.001	0.002	0.005	<0.001	0.015	0.003						
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Dissolved Zinc	mg/L	0.005	<0.005	0.063	0.017	0.291	0.074						
EC laboratory	uS/cm			1530	435	528	730						
Total Nitrogen	mg/L			1.6	2.90	0.06							
Total Phosphorus	mg/L			0.27	0.55								
Ammonia	mg/L			0.05	0.04								
Phosphate	mg/L												
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹			37	26								
Chloride	mg/L		264	400	120								
Nitrate				0.02	0.02	0.06	0.02						
Sulphate	mg/L		11	24									
Calcium	mg/L		108	23.2	18.3								
Magnesium	mg/L		50	22.8	12.0								
Potassium	mg/L		17.2	9.61	8.88								
Sodium	mg/L		229	264	72.3								

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW08 had insufficient water to collect a sample during January, April and August 2016 sampling events.

Table 9 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	Results											
			GW09 Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01												
Dissolved Arsenic	mg/L	0.001												
Dissolved Cadmium	mg/L	0.0001												
Dissolved Chromium	mg/L	0.001												
Dissolved Copper	mg/L	0.001												
Total Iron	mg/L	0.05												
Dissolved Lead	mg/L	0.001												
Total Manganese	mg/L	0.001												
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001												
Dissolved Silver	mg/L	0.001												
Dissolved Zinc	mg/L	0.005												
EC laboratory	uS/cm													
Total Nitrogen	mg/L													
Total Phosphorus	mg/L													
Ammonia	mg/L													
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹													
Chloride	mg/L													
Nitrate														
Sulphate	mg/L													
Calcium	mg/L													
Magnesium	mg/L													
Potassium	mg/L													
Sodium	mg/L													

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW09 groundwater monitoring bore destroyed by construction following the July 2015 sampling event. Prior to this, the bore contained insufficient water to obtain a sample. Re-installation undertaken prior to August 2016 monitoring event, however the site was not accessible due to construction.

Table 10 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW10		Results								
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16		
Dissolved Aluminium	mg/L	0.01	0.17	0.54	0.80								
Dissolved Arsenic	mg/L	0.001	0.002	0.004	0.007								
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001								
Dissolved Chromium	mg/L	0.001	0.002	0.004	0.005								
Dissolved Copper	mg/L	0.001	0.087	0.014	0.112								
Total Iron	mg/L	0.05	74.1	23.8	75.4								
Dissolved Lead	mg/L	0.001	<0.001	0.001	0.002								
Total Manganese	mg/L	0.001	0.22	0.15	0.271								
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001								
Dissolved Nickel	mg/L	0.001	0.003	0.003	0.003								
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001								
Dissolved Zinc	mg/L	0.005	0.007	0.018	0.028								
EC laboratory	uS/cm			419	590								
Total Nitrogen	mg/L			0.8	2.11								
Total Phosphorus	mg/L			0.09	0.55								
Ammonia	mg/L			<0.02	0.01								
Phosphate	mg/L												
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		71	15	52								
Chloride	mg/L		70	106	150								
Nitrate				<0.01	<0.01								
Sulphate	mg/L		5.5	7									
Calcium	mg/L		28.6	9.38	17.5								
Magnesium	mg/L		10.9	7.11	16.4								
Potassium	mg/L		5.64	3.9	9.59								
Sodium	mg/L		66.1	63.4	107								

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW10 groundwater monitoring bore destroyed by construction prior to July 2015 sampling event. Re-installation completed prior to August 2016 monitoring event. However, insufficient water to collect sample.

Table 11 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW11		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01	0.96	0.01	0.01	0.62				2.24	0.04			
Dissolved Arsenic	mg/L	0.001	0.003	<0.001	0.001	0.004				0.009	0.001			
Dissolved Cadmium	mg/L	0.0001	0.002	<0.001	<0.001	0.0007				<0.0001	<0.0001			
Dissolved Chromium	mg/L	0.001	<0.001	0.001	<0.001	0.002				0.007	<0.001			
Dissolved Copper	mg/L	0.001	0.126	0.039	0.018	0.039				0.018	0.041			
Total Iron	mg/L	0.05	14	14.5	16.0	1.79				7.19	6.96			
Dissolved Lead	mg/L	0.001	0.003	<0.001	<0.001	0.003				0.004	<0.001			
Total Manganese	mg/L	0.001	1.80	0.735	0.069	0.117				0.107	0.097			
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001									
Dissolved Nickel	mg/L	0.001	0.157	0.043	0.003	0.012				0.01	0.008			
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001			
Dissolved Zinc	mg/L	0.005	0.136	0.045	0.021	0.064				0.389	0.3			
EC laboratory	uS/cm		8510	4370	1040	2390				1760	1760			
Total Nitrogen	mg/L		0.7	--	0.56									
Total Phosphorus	mg/L		0.10	0.03	0.075									
Ammonia	mg/L		0.19	0.07	0.02									
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		7	118	273									
Chloride	mg/L		2076	966	140									
Nitrate			0.02	0.01	<0.01	0.02				0.22	0.39			
Sulphate	mg/L		1889	928										
Calcium	mg/L		94.7	62.6	8.50									
Magnesium	mg/L		272	103	9.14									
Potassium	mg/L		14.1	12.6	6.05									
Sodium	mg/L		1240	669	200									

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW11 groundwater monitoring bore destroyed by construction following July 2015 sampling event. Re-installation completed prior to August 2016 monitoring event.

Table 12 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW12		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01	0.01	0.01	<0.01	2.33	2.54	<0.01	0.51		<0.01			
Dissolved Arsenic	mg/L	0.001	0.004	0.003	0.002	0.077	0.024	0.004	0.028		0.001			
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0005	0.0003	0.0001	0.0032		<0.0001			
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	0.006	0.003	<0.001	0.003		<0.001			
Dissolved Copper	mg/L	0.001	<0.001	<0.001	<0.001	0.016	0.043	<0.001	0.381		<0.001			
Total Iron	mg/L	0.05	344	191	169	135	74.6	101	49.2		130			
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.003	0.069	<0.001	<0.001		<0.001			
Total Manganese	mg/L	0.001	8.61	4.85		4.97	3.79	4.75	3.74		4.81			
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001			<0.0001						
Dissolved Nickel	mg/L	0.001	0.004	0.009	0.007	0.005	0.006	0.011	0.012		0.004			
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001			
Dissolved Zinc	mg/L	0.005	0.02	0.018	0.029	0.040	0.034	0.027	0.118		0.039			
EC laboratory	uS/cm		4020	2860	2470	2600	1740	1510	1440		2140			
Total Nitrogen	mg/L		3.8	2.0	1.08			3.0						
Total Phosphorus	mg/L		0.70	0.20	0.15			0.14						
Ammonia	mg/L		1.58	1.48	1.05			0.90						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		74	83	56			25						
Chloride	mg/L		354	281	230			159						
Nitrate			<0.01	<0.10*	<0.01	1.53	1.24	0.05	0.26		0.52			
Sulphate	mg/L		1865	1342				478						
Calcium	mg/L		64.2	68.3	62.3			29						
Magnesium	mg/L		217	103	104			61						
Potassium	mg/L		10.6	11.6	11.0			10						
Sodium	mg/L		488	281	264			168						

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW12 groundwater monitoring bore not accessible due to construction in August 2016.

Table 13 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW013		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01	0.02	0.01							1.93	0.02		
Dissolved Arsenic	mg/L	0.001	<0.001	<0.001							0.107	0.006		
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001							<0.0001	<0.0001		
Dissolved Chromium	mg/L	0.001	<0.001	0.001							0.004	<0.001		
Dissolved Copper	mg/L	0.001	0.004	0.003							0.007	0.004		
Total Iron	mg/L	0.05	76.9	13.7							57.4	10.6		
Dissolved Lead	mg/L	0.001	<0.001	<0.001							0.002	<0.001		
Total Manganese	mg/L	0.001	0.358	0.114							0.238	0.165		
Mercury	mg/L	0.0001	<0.00001	<0.00001										
Dissolved Nickel	mg/L	0.001	<0.001	0.001							0.003	<0.001		
Dissolved Silver	mg/L	0.001	<0.001	<0.001							<0.001	<0.001		
Dissolved Zinc	mg/L	0.005	0.007	0.014							0.043	0.03		
EC laboratory	uS/cm		300	247							209	238		
Total Nitrogen	mg/L		1.4	0.7										
Total Phosphorus	mg/L		4.21	0.33										
Ammonia	mg/L		0.38	0.23										
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		62	40										
Chloride	mg/L		39	24										
Nitrate			0.01	<0.01							0.09	0.41		
Sulphate	mg/L		22	34										
Calcium	mg/L		4.48	10.1										
Magnesium	mg/L		7	2.54										
Potassium	mg/L		3.89	2.8										
Sodium	mg/L		40.6	32.3										

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW13 groundwater monitoring bore destroyed by construction following February 2015 sampling event. Re-installation completed prior to August 2016 monitoring event.

Table 14 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW14		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01	0.05	0.03							6.62	8.49		
Dissolved Arsenic	mg/L	0.001	<0.001	<0.001							0.006	0.006		
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001							0.0014	0.0008		
Dissolved Chromium	mg/L	0.001	<0.001	0.001							0.001	<0.001		
Dissolved Copper	mg/L	0.001	0.024	0.008							0.313	0.188		
Total Iron	mg/L	0.05	0.79	0.37							41.7	46.9		
Dissolved Lead	mg/L	0.001	<0.001	<0.001							0.009	0.012		
Total Manganese	mg/L	0.001	0.279	0.171							5.86	3.96		
Mercury	mg/L	0.0001	<0.00001	0.00001										
Dissolved Nickel	mg/L	0.001	0.003	0.002							0.247	0.292		
Dissolved Silver	mg/L	0.001	<0.001	<0.001							<0.001	<0.001		
Dissolved Zinc	mg/L	0.005	0.018	0.019							1.07	0.806		
EC laboratory	uS/cm		3690	3230							21000	20800		
Total Nitrogen	mg/L		0.7	1.1										
Total Phosphorus	mg/L		0.03	0.06										
Ammonia	mg/L		0.03	0.04										
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		506	461										
Chloride	mg/L		833	700										
Nitrate			0.22	0.38							0.48	0.05		
Sulphate	mg/L		284	286										
Calcium	mg/L		141	138										
Magnesium	mg/L		32.9	23.9										
Potassium	mg/L		2.76	3.32										
Sodium	mg/L		610	509										

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW14 groundwater monitoring bore destroyed by construction following February 2015 sampling event. Re-installation completed prior to August 2016 monitoring event.

Table 15 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW15		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01	0.02	0.02	0.01	0.47	1.01	<0.01	0.75	1.67	0.45			
Dissolved Arsenic	mg/L	0.001	0.01	0.008	0.005	0.026	0.014	0.008	0.021	0.025	0.024			
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	<0.0001	0.0001	<0.0001	0.0002	0.0002	0.0001			
Dissolved Chromium	mg/L	0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	0.001	0.002	<0.001			
Dissolved Copper	mg/L	0.001	0.008	0.002	0.002	0.012	0.03	<0.001	0.056	0.05	0.038			
Total Iron	mg/L	0.05	7.28	6.61	5.02	3.98	3.38	5.40	3.84	4.39	4.95			
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.002	0.169	<0.001	0.002	0.006	0.003			
Total Manganese	mg/L	0.001	2.55	2.21	2.00	1.94	2.06	3.58	2.59	2.6	1.84			
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001			<0.0001						
Dissolved Nickel	mg/L	0.001	0.003	0.003	0.003	0.003	0.006	0.004	0.006	0.006	0.005			
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Dissolved Zinc	mg/L	0.005	0.021	0.016	0.020	0.022	0.026	0.015	0.065	0.033	0.028			
EC laboratory	uS/cm		3760	3740	3660	3760	3850	3690	3280	3640	3540			
Total Nitrogen	mg/L		0.26	--	0.28			0.6						
Total Phosphorus	mg/L		0.09	0.05	0.08			0.10						
Ammonia	mg/L		0.05	--	0.07			0.05						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		260	239	244			268						
Chloride	mg/L		981	1086	1000			888						
Nitrate			<0.01	<0.01	<0.01	<0.01	0.02	0.05	0.77	0.03	0.03			
Sulphate	mg/L		149	164				141						
Calcium	mg/L		30.2	47.7	51.7			56						
Magnesium	mg/L		105	99.3	110			118						
Potassium	mg/L		5.30	8.87	8.54			10						
Sodium	mg/L		507	527	549			539						

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Table 16 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW017		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01			0.01	1.16	2.95	0.01	2.12	0.84	<0.01			
Dissolved Arsenic	mg/L	0.001			<0.001	0.002	0.004	0.001	0.003	0.003	<0.001			
Dissolved Cadmium	mg/L	0.0001			<0.001	0.0002	0.0003	<0.0001	0.0005	0.0002	<0.0001			
Dissolved Chromium	mg/L	0.001			<0.001	0.002	0.004	<0.001	0.003	0.002	<0.001			
Dissolved Copper	mg/L	0.001			0.001	0.006	0.012	<0.001	0.03	0.006	<0.001			
Total Iron	mg/L	0.05			19.9	1.73	4.66	8.64	5.18	3.82	8.1			
Dissolved Lead	mg/L	0.001			<0.001	0.003	0.061	<0.001	0.003	0.002	<0.001			
Total Manganese	mg/L	0.001			0.561	0.238	0.245	0.272	0.225	0.202	0.198			
Mercury	mg/L	0.0001			<0.00001			<0.0001						
Dissolved Nickel	mg/L	0.001			0.005	0.003	0.004	0.002	0.004	0.003	0.002			
Dissolved Silver	mg/L	0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Dissolved Zinc	mg/L	0.005			0.026	0.046	0.046	0.022	0.057	0.04	0.02			
EC laboratory	uS/cm				3680	4150	4080	3840	3550	3770	3600			
Total Nitrogen	mg/L				0.55			0.6						
Total Phosphorus	mg/L				0.30			0.11						
Ammonia	mg/L				0.02			0.02						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹				560			382						
Chloride	mg/L				770			799						
Nitrate					<0.01	0.10	0.09	0.05	0.2	0.02	0.18			
Sulphate	mg/L							419						
Calcium	mg/L				165			163						
Magnesium	mg/L				171			190						
Potassium	mg/L				9.85			9						
Sodium	mg/L				355			370						

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Table 17 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW018		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01	0.02	0.03	<0.01	0.63	2.18	<0.01	1.46	0.94	<0.01			
Dissolved Arsenic	mg/L	0.001	0.006	0.005	0.005	0.011	0.009	0.002	0.009	0.004	0.001			
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0020	0.0003	<0.0001	0.0002	<0.0001	<0.0001			
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.002	0.001	<0.001			
Dissolved Copper	mg/L	0.001	0.008	0.004	0.003	0.034	0.021	0.001	0.049	0.012	<0.001			
Total Iron	mg/L	0.05	5.26	5.57	5.76	2.40	4.34	4.01	5.51	2.12	2.97			
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.012	0.085	<0.001	0.008	0.004	<0.001			
Total Manganese	mg/L	0.001	2.00	1.80	1.80	1.58	1.58	1.60	1.49	1.53	1.2			
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001									
Dissolved Nickel	mg/L	0.001	0.002	0.002	0.002	0.002	0.003	0.002	0.004	0.005	0.004			
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Dissolved Zinc	mg/L	0.005	0.022	0.014	0.022	0.040	0.04	0.007	0.041	0.028	0.007			
EC laboratory	uS/cm		1690	1690	1660	1700	1730	1720	1550	1780	1670			
Total Nitrogen	mg/L		0.46	--	0.37			0.4						
Total Phosphorus	mg/L		0.09	0.06	0.08			0.02						
Ammonia	mg/L		0.14	0.18	0.12			0.08						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		676	645	684			587						
Chloride	mg/L		96	95	98			80						
Nitrate			0.02	<0.01	<0.01	2.02	0.02	0.19	0.02	0.08	0.15			
Sulphate	mg/L		168	157				170						
Calcium	mg/L		115	186	199			220						
Magnesium	mg/L		56.6	49.2	55			62						
Potassium	mg/L		4.48	6.15	6.56			6						
Sodium	mg/L		97.7	98.9	101			104						

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Table 18 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW19		Results								
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16		
Dissolved Aluminium	mg/L	0.01	0.02	0.14	0.04								
Dissolved Arsenic	mg/L	0.001	0.002	<0.001	0.001								
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001								
Dissolved Chromium	mg/L	0.001	<0.001	0.001	0.001								
Dissolved Copper	mg/L	0.001	0.043	0.01	0.013								
Total Iron	mg/L	0.05	24.7	83.6	22.0								
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001								
Total Manganese	mg/L	0.001	0.865	0.319	0.162								
Mercury	mg/L	0.0001	<0.00001	0.00002	<0.00001								
Dissolved Nickel	mg/L	0.001	0.016	0.006	0.007								
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001								
Dissolved Zinc	mg/L	0.005	0.056	0.016	0.024								
EC laboratory	uS/cm		634	435	734								
Total Nitrogen	mg/L		0.5	1.1	0.64								
Total Phosphorus	mg/L		0.14	0.64	0.40								
Ammonia	mg/L		0.03	<0.02	0.01								
Phosphate	mg/L												
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		96	40	201								
Chloride	mg/L		126	64	73								
Nitrate			<0.01	<0.01	<0.01								
Sulphate	mg/L		22	57									
Calcium	mg/L		3.36	3.37	4.08								
Magnesium	mg/L		10.2	9.21	5.9								
Potassium	mg/L		6.15	10.6	6.69								
Sodium	mg/L		114	79.3	157								

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW19 groundwater monitoring bore destroyed by construction following April 2015 sampling event. Re-installation completed prior to August 2016 monitoring event. However, access in August 2016 not available at the time of sampling due to construction.

Table 19 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW20		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01			0.01									
Dissolved Arsenic	mg/L	0.001			<0.001									
Dissolved Cadmium	mg/L	0.0001			<0.001									
Dissolved Chromium	mg/L	0.001			<0.001									
Dissolved Copper	mg/L	0.001			0.003									
Total Iron	mg/L	0.05			17.5									
Dissolved Lead	mg/L	0.001			<0.001									
Total Manganese	mg/L	0.001			1.10									
Mercury	mg/L	0.0001			<0.00001									
Dissolved Nickel	mg/L	0.001			0.065									
Dissolved Silver	mg/L	0.001			<0.001									
Dissolved Zinc	mg/L	0.005			0.696									
EC laboratory	uS/cm													
Total Nitrogen	mg/L													
Total Phosphorus	mg/L													
Ammonia	mg/L													
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹				167									
Chloride	mg/L				150									
Nitrate														
Sulphate	mg/L													
Calcium	mg/L				82.0									
Magnesium	mg/L				94.4									
Potassium	mg/L				17.0									
Sodium	mg/L				137									

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW20 had insufficient water to collect a sample during all but the April 2015 sampling event. Site not accessible during April and August 2016 sampling events due to restrictions in place from construction work.

Table 20 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW21		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01	0.36	0.03	0.02	12.2	6.33	0.17	4.76	2.78	0.06			
Dissolved Arsenic	mg/L	0.001	0.008	0.002	0.002	0.011	0.004	0.008	0.009	0.011	0.004			
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0010	0.0001	<0.0001	0.0003	0.0001	<0.0001			
Dissolved Chromium	mg/L	0.001	0.004	<0.001	<0.001	0.011	0.003	0.001	0.005	0.006	0.002			
Dissolved Copper	mg/L	0.001	0.021	<0.001	0.026	0.126	0.169	0.003	0.251	0.062	0.069			
Total Iron	mg/L	0.05	159	86.6	19.3	35.8	7.31	22.0	7.02	9.67	16.8			
Dissolved Lead	mg/L	0.001	0.01	<0.001	<0.001	0.049	0.066	0.001	0.008	0.006	<0.001			
Total Manganese	mg/L	0.001	1.00	0.979	0.557	0.577	0.481	0.652	0.323	0.322	0.406			
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001			<0.0001						
Dissolved Nickel	mg/L	0.001	0.009	0.003	0.003	0.018	0.005	0.004	0.014	0.006	0.003			
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Dissolved Zinc	mg/L	0.005	0.022	0.009	0.056	1.16	0.08	0.059	0.146	0.073	0.037			
EC laboratory	uS/cm		1050	714	748	730	562	828	912	811	1090			
Total Nitrogen	mg/L		3.1	2.2	1.22			1.1						
Total Phosphorus	mg/L		0.55	0.42	0.19			0.19						
Ammonia	mg/L		<0.02	<0.02	0.13			<0.01						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		376	292	346			333						
Chloride	mg/L		101	54	58			41						
Nitrate	mg/L		0.01	<0.01	<0.01	0.14	0.12	0.03	0.03	0.13	0.29			
Sulphate	mg/L		54	1.8				<1						
Calcium	mg/L		39.9	38.8	43.8			35						
Magnesium	mg/L		50.3	26.9	14.2			18						
Potassium	mg/L		39.1	18.6	9.83			4						
Sodium	mg/L		220	147	127			145						

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Table 21 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW022		Results								
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16		
Dissolved Aluminium	mg/L	0.01	0.16	0.62	2.34	87.2	83.1	1.26	2.11				
Dissolved Arsenic	mg/L	0.001	0.001	0.001	0.001	0.074	0.022	0.001	0.004				
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0005	<0.0001	<0.0001	<0.0001				
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	0.002	0.023	0.023	0.001	0.003				
Dissolved Copper	mg/L	0.001	0.018	0.014	0.019	0.236	0.131	0.012	0.036				
Total Iron	mg/L	0.05	96.9	101	110	66.2	49	24.0	1.37				
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.086	0.109	<0.001	0.002				
Total Manganese	mg/L	0.001	0.232	0.252	0.261	0.632	0.147	0.064	0.038				
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001			<0.0001					
Dissolved Nickel	mg/L	0.001	<0.001	<0.001	0.001	0.018	0.009	<0.001	0.008				
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
Dissolved Zinc	mg/L	0.005	0.048	0.022	0.050	2.33	1.06	0.139	0.309				
EC laboratory	uS/cm		501	325	296	470	410	348	562				
Total Nitrogen	mg/L		2.3	2.5	1.85			1.3					
Total Phosphorus	mg/L		0.37	0.39	0.35			0.15					
Ammonia	mg/L		<0.02	<0.02	0.02			<0.01					
Phosphate	mg/L												
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		18	19	15			10					
Chloride	mg/L		128	72	71			68					
Nitrate	mg/L		0.01	<0.01	<0.01	0.05	0.07	0.06	0.24				
Sulphate	mg/L		24	21				21					
Calcium	mg/L		12.7	9.04	11.8			<1					
Magnesium	mg/L		16.1	15.4	23.7			<1					
Potassium	mg/L		11.6	12.5	9.13			<1					
Sodium	mg/L		104	65.2	72.9			72					

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note: Site no longer accessible (from September 2016) due to permanent fencing arrangements. Site not accessible during April and August 2016 sampling events due to restrictions in place from construction work.

Table 22 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW23		Results								
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*			
Dissolved Aluminium	mg/L	0.01	0.07	0.18	0.49	0.04	215	0.45	45.7	0.23			
Dissolved Arsenic	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.04	<0.001	0.008	0.001			
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	<0.0001	0.0007	<0.0001	0.0002	<0.0001			
Dissolved Chromium	mg/L	0.001	0.001	<0.001	0.002	<0.001	0.063	0.001	0.014	0.001			
Dissolved Copper	mg/L	0.001	0.021	0.003	0.019	0.001	0.071	0.010	0.051	0.013			
Total Iron	mg/L	0.05	77.2	55.5	53.2	0.21	83.2	33.0	15.6	14.2			
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.22	<0.001	0.031	<0.001			
Total Manganese	mg/L	0.001	1.75	0.863	0.713	0.076	1.69	0.592	0.391	0.402			
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001			<0.0001					
Dissolved Nickel	mg/L	0.001	0.007	0.001	<0.001	<0.001	0.021	0.002	0.007	0.002			
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Dissolved Zinc	mg/L	0.005	0.123	0.037	0.035	0.050	0.531	0.206	0.168	0.064			
EC laboratory	uS/cm		542	205	177	230	245	246	286	293			
Total Nitrogen	mg/L		0.6	1.1	1.41			1.2					
Total Phosphorus	mg/L		0.45	0.49	0.90			0.62					
Ammonia	mg/L		<0.02	<0.02	0.02			0.01					
Phosphate	mg/L												
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		32	11	9			10					
Chloride	mg/L		62	45	44			40					
Nitrate	mg/L		<0.01	0.01	<0.01	0.06	1.14	0.04	0.05	0.04			
Sulphate	mg/L		137	12				28					
Calcium	mg/L		88.1	41.5	35.6			2					
Magnesium	mg/L		35	18.9	17.7			3					
Potassium	mg/L		9.65	8.94	6.70			1					
Sodium	mg/L		77.6	35.9	34.5			42					

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Table 23 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	Results									Dec 16				
			GW24 Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16					
Dissolved Aluminium	mg/L	0.01	0.07	0.27	0.26	24.6	11.2	0.29	63.2	21.2	0.15					
Dissolved Arsenic	mg/L	0.001	0.003	<0.001	<0.001	0.010	0.004	0.001	0.012	0.007	<0.001					
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0010	<0.0001	0.0002	0.0008	0.0004	<0.0001					
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	0.001	0.043	0.016	0.001	0.06	0.024	<0.001					
Dissolved Copper	mg/L	0.001	0.087	1.52	0.353	5.09	0.862	2.87	1.51	3.12	0.202					
Total Iron	mg/L	0.05	92.5	23.8	34.2	35.6	10.6	22.4	115	42.9	69.2					
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.021	0.062	<0.001	0.052	0.018	<0.001					
Total Manganese	mg/L	0.001	0.366	0.132	0.145	0.180	0.062	0.090	0.5	0.318	0.332					
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001			<0.0001								
Dissolved Nickel	mg/L	0.001	0.007	0.011	0.008	0.025	0.011	0.008	0.027	0.023	0.003					
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001					
Dissolved Zinc	mg/L	0.005	0.06	0.074	0.063	0.235	0.061	0.072	1.18	0.444	0.069					
EC laboratory	uS/cm			595	558	840	410	622	763	690	453					
Total Nitrogen	mg/L			1.3	1.10			2.3								
Total Phosphorus	mg/L			0.3	0.365											
Ammonia	mg/L			0.09	0.02			<0.01								
Phosphate	mg/L							0.63								
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		32	<5	<5			6								
Chloride	mg/L		136	154	150			164								
Nitrate				<0.01	<0.01	<0.50	<0.01	<0.01	0.04	0.02	0.32					
Sulphate	mg/L		37	26				31								
Calcium	mg/L		7.57	1.69	1.75			2								
Magnesium	mg/L		12.6	6.71	7.63			6								
Potassium	mg/L		10.1	5.48	5.97			1								
Sodium	mg/L		100	94.4	99.5			107								

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Table 24 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW025		Results								
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16		
Dissolved Aluminium	mg/L	0.01	0.20	0.14	0.05	10.7							
Dissolved Arsenic	mg/L	0.001	<0.001	<0.001	<0.001	0.004							
Dissolved Cadmium	mg/L	0.0001	0.001	0.001	<0.001	0.0014							
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	0.007							
Dissolved Copper	mg/L	0.001	0.156	0.351	0.095	0.129							
Total Iron	mg/L	0.05	30.5	17.6	17.7	8.38							
Dissolved Lead	mg/L	0.001	0.006	0.005	<0.001	0.012							
Total Manganese	mg/L	0.001	2.23	0.929	0.308	0.298							
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001								
Dissolved Nickel	mg/L	0.001	0.035	0.018	0.005	0.027							
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001							
Dissolved Zinc	mg/L	0.005	0.388	0.306	0.074	0.144							
EC laboratory	uS/cm			967	449	467							
Total Nitrogen	mg/L			0.8	1.09								
Total Phosphorus	mg/L			0.05	0.11								
Ammonia	mg/L			0.18	0.19								
Phosphate	mg/L												
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		<5	<5	7								
Chloride	mg/L		523	269	120								
Nitrate				0.12	0.03	0.04							
Sulphate	mg/L		20	25									
Calcium	mg/L		2.98	1.67	1.02								
Magnesium	mg/L		25.7	12.2	4.86								
Potassium	mg/L		10.0	9.9	8.67								
Sodium	mg/L		250	150	79.3								

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW25 had insufficient water to collect a sample during November 2015, January 2016, April 2016 and August 2016 sampling events.

Table 25 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW26		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01	<0.01	0.04	0.21	55.2	7.77	0.19	5.37	21.1	0.02			
Dissolved Arsenic	mg/L	0.001	0.002	<0.001	<0.001	0.013	0.004	<0.001	0.002	0.006	<0.001			
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0034	0.001	0.0010	0.0017	0.002	0.0011			
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	0.001	0.023	0.056	0.001	0.01	0.015	<0.001			
Dissolved Copper	mg/L	0.001		0.23	1.01	38.6	1.8	2.19	4.04	7.45	7.78			
Total Iron	mg/L	0.05	26.2	43.6	11.5	16.5	3.28	6.64	2.3	8.62	13.9			
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.045	0.092	<0.001	0.005	0.026	<0.001			
Total Manganese	mg/L	0.001	0.928	0.972	0.300	0.488	0.141	0.157	0.196	0.289	0.322			
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001			<0.0001						
Dissolved Nickel	mg/L	0.001	0.021	0.016	0.013	0.056	0.062	0.019	0.026	0.032	0.019			
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Dissolved Zinc	mg/L	0.005	0.165	0.178	0.179	0.779	0.268	0.382	0.308	0.413	0.28			
EC laboratory	uS/cm			896	750	1190	997	951	1050	776	785			
Total Nitrogen	mg/L			1	0.57			0.5						
Total Phosphorus	mg/L			0.23	0.135			0.14						
Ammonia	mg/L			0.03	0.01			<0.01						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹			26	34			27						
Chloride	mg/L		281	250	220			271						
Nitrate				0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01			
Sulphate	mg/L		32	11				12						
Calcium	mg/L		38.2	18.4	4.70			3						
Magnesium	mg/L		46.5	57.4	20.5			13						
Potassium	mg/L		12.6	14.6	6.87			5						
Sodium	mg/L		229	153	131			169						

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Table 26 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	Results											
			GW27 Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01	<0.01	0.02	0.02	20.3	3.27	0.02	2.9	33.3				
Dissolved Arsenic	mg/L	0.001	0.003	<0.001	<0.001	0.021	0.002	0.001	0.005	0.024				
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0016	<0.0001	0.0001	0.0001	0.0005				
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	0.063	0.008	<0.001	0.008	0.105				
Dissolved Copper	mg/L	0.001	0.012	0.053	0.084	2.70	0.039	0.352	0.89	4.25				
Total Iron	mg/L	0.05	21.2	20.5	6.08	37.3	5.3	14.8	8.41	92.8				
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.045	0.115	<0.001	0.007	0.084				
Total Manganese	mg/L	0.001	2.66	1.33	0.403	0.950	0.447	0.975	1.5	1.8				
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001			<0.0001						
Dissolved Nickel	mg/L	0.001	0.008	0.011	0.005	0.039	0.012	0.022	0.027	0.064				
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
Dissolved Zinc	mg/L	0.005	0.020	0.066	0.021	0.420	0.049	0.041	0.069	0.341				
EC laboratory	uS/cm			514	353	438	544	660	736	593				
Total Nitrogen	mg/L			0.8	0.64			0.6						
Total Phosphorus	mg/L			0.31	0.17			0.36						
Ammonia	mg/L			0.05	0.04			0.04						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		231	51	50			45						
Chloride	mg/L		139	76	65			128						
Nitrate				0.09	0.08	0.26	0.21	0.05	0.01	0.03				
Sulphate	mg/L		55	73				61						
Calcium	mg/L		71.1	25.4	10.3			30						
Magnesium	mg/L		18.5	8.8	4.55			12						
Potassium	mg/L		7.35	7.48	4.37			5						
Sodium	mg/L		90.5	52.6	55.1			78						

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Table 27 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW028		Results									
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16			
Dissolved Aluminium	mg/L	0.01	0.11		0.09	47.7	22.7	2.09						
Dissolved Arsenic	mg/L	0.001	0.002		<0.001	0.023	0.007	<0.001						
Dissolved Cadmium	mg/L	0.0001	<0.001		<0.001	0.0035	0.0005	0.0003						
Dissolved Chromium	mg/L	0.001	0.001		<0.001	0.085	0.025	0.002						
Dissolved Copper	mg/L	0.001			0.545	23.0	2.17	2.87						
Total Iron	mg/L	0.05	22.6		51.9	53.0	17.1	11.3						
Dissolved Lead	mg/L	0.001	<0.001		<0.001	0.056	0.157	<0.001						
Total Manganese	mg/L	0.001	0.226		0.202	0.312	0.099	0.098						
Mercury	mg/L	0.0001	0.00001		<0.00001			<0.0001						
Dissolved Nickel	mg/L	0.001	0.015		0.003	0.047	0.014	0.004						
Dissolved Silver	mg/L	0.001	<0.001		<0.001	<0.001	<0.001	<0.001						
Dissolved Zinc	mg/L	0.005	0.052		0.019	0.280	0.106	0.313						
EC laboratory	uS/cm				199	235	223	235						
Total Nitrogen	mg/L				0.80			1.5						
Total Phosphorus	mg/L				0.40			0.30						
Ammonia	mg/L				0.02			0.05						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		31		14			15						
Chloride	mg/L		40		45			41						
Nitrate					<0.01	<0.01	0.02	<0.01						
Sulphate	mg/L		51					18						
Calcium	mg/L		4.56		3.55			2						
Magnesium	mg/L		11.1		7.27			3						
Potassium	mg/L		6.63		9.23			2						
Sodium	mg/L		50.2		36.2			44						

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW28 had insufficient water to collect a sample during April and August 2016 sampling events.

Table 28 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW29		Results								
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16		
Dissolved Aluminium	mg/L	0.01	0.16	0.72	0.78	29.4	35.8	1.06	301	64.4	0.47		
Dissolved Arsenic	mg/L	0.001	0.004	0.002	0.002	0.017	0.009	<0.001	0.092	0.026	0.001		
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0010	0.0006	0.0001	0.0054	0.0016	<0.0001		
Dissolved Chromium	mg/L	0.001	<0.001	0.002	0.003	0.021	0.022	0.001	0.158	0.038	<0.001		
Dissolved Copper	mg/L	0.001	0.014	0.022	0.017	0.154	0.116	0.015	1.23	0.433	0.039		
Total Iron	mg/L	0.05	187	5.29	3.98	18.8	19.5	19.4	139	39.8	124		
Dissolved Lead	mg/L	0.001	<0.001	0.001	<0.001	0.047	0.079	<0.001	0.352	0.099	<0.001		
Total Manganese	mg/L	0.001	3.29	0.089	0.099	0.289	0.26	0.306	2.36	0.937	1.73		
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001			<0.0001					
Dissolved Nickel	mg/L	0.001	0.007	0.007	0.010	0.037	0.044	0.007	0.254	0.082	0.002		
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001		
Dissolved Zinc	mg/L	0.005	0.069	0.103	0.087	1.47	0.788	0.310	16.2	3.37	0.044		
EC laboratory	uS/cm		274	145	158	195	211	205	253	201	240		
Total Nitrogen	mg/L		5.5%	0.7	0.68			1.9					
Total Phosphorus	mg/L		1.23%	0.1	0.085			0.40					
Ammonia	mg/L		0.03	<0.02	0.09			0.02					
Phosphate	mg/L												
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		46	17	23			16					
Chloride	mg/L		46	27	29			33					
Nitrate			0.01	0.01	0.1	0.64	0.03	0.04	0.15	0.33	1.09		
Sulphate	mg/L		28	6.4				22					
Calcium	mg/L		36.3	0.74	0.77			<1					
Magnesium	mg/L		85.1	1.77	2.05			2					
Potassium	mg/L		39.9	2.08	1.95			2					
Sodium	mg/L		67.4	24.3	29.2			39					

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Table 29 Cumulative construction groundwater quality monitoring results by borehole (cont.)

Parameter	Unit	LOR	GW30		Results								
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*	Aug 16*	Dec 16		
Dissolved Aluminium	mg/L	0.01	1.36	0.06	0.05	6.79	7.49	0.17	17.2	31.4	0.6		
Dissolved Arsenic	mg/L	0.001	0.001	0.002	0.002	0.022	0.008	<0.001	0.007	0.01	0.001		
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0010	<0.0001	0.0001	0.0002	0.0001	0.0002		
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	0.001	0.007	0.006	<0.001	0.008	0.021	<0.001		
Dissolved Copper	mg/L	0.001	0.175	0.009	0.01	0.127	1.69	0.650	0.801	1.29	1.41		
Total Iron	mg/L	0.05	16.8	6.37	17.3	9.16	6.32	19.3	16	26	32.2		
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.005	0.057	<0.001	0.006	0.017	<0.001		
Total Manganese	mg/L	0.001	1.10	0.162	0.187	0.168	0.305	0.485	0.378	1.01	1.1		
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001			<0.0001					
Dissolved Nickel	mg/L	0.001	0.067	0.004	0.004	0.006	0.016	0.018	0.024	0.059	0.061		
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Dissolved Zinc	mg/L	0.005	0.310	0.018	0.029	0.068	0.098	0.236	0.173	0.372	0.291		
EC laboratory	uS/cm		2820	435	511	677	1020	1420	1290	1880	2280		
Total Nitrogen	mg/L		0.6	0.6	0.88			1.7					
Total Phosphorus	mg/L		0.11	0.06	0.10			0.32					
Ammonia	mg/L		0.03	<0.02	0.11			<0.01					
Phosphate	mg/L												
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		<5	120	95			9					
Chloride	mg/L		798	39	76			355					
Nitrate			0.24	<0.01	0.12	0.03	0.41	0.34	0.02	0.01	0.07		
Sulphate	mg/L		232	32				102					
Calcium	mg/L		3.37	15.6	5.74			2					
Magnesium	mg/L		31.9	3.58	3.73			11					
Potassium	mg/L		6.59	1.96	6.33			2					
Sodium	mg/L			78.2	105			263					

* Analysis of all metals for July 2015, November 2015, April 2016 and August 2016 events are for "total" metals despite otherwise indicated in table.

Table 30 Cumulative construction groundwater level – manual record

Borehole reference	Top of casting RL (mAHD)	Depth of water level Construction													
		Dec 14	Feb 15	Apr 2015	July 2015	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016	
GW01 (mTOC)	20.11	5.65	5.02	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	5.85	5.98
GW01 (mAHD)															
GW02 (mTOC)	3.57	3.17	1.77	1.34	1.88	Not taken	1.84	1.47	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW02 (mAHD)															
GW03 (mTOC)	2.64	2.29	0.64	0.2	0.08	Not taken	0.27	0.25	0.32	Not taken	0.6	0.12	0.8	0.37	
GW03 (mAHD)															
GW04 (mTOC)	1.69	2.37	0.96	0.43	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	1.47	1.12
GW04 (mAHD)															
GW05 (mTOC)	1.24	1.79	0.55	0.17	0.47	Not taken	0.16	0.25	0.34	Not taken	Not taken	Not taken	0.71	0.50	
GW05 (mAHD)															
GW06 (mTOC)	20.1	Dry	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	2.22	2.27
GW06 (mAHD)															
GW07 (mTOC)	15.98	6.79 (dry)	1.81	1.0	Dry	Not taken	5.6	5.36	4.41	Not taken	5.37	6.36	6.65	6.46	
GW07 (mAHD)															
GW08 (mTOC)	19.09	8.58	7.97	4.6	13.28	Dry	Dry	7.05	Dry	7.52	8.3	Dry	Dry	8.07	
GW08 (mAHD)															

Borehole reference	Top of casting RL (mAHD)	Depth of water level Construction												
		Dec 14	Feb 15	Apr 2015	July 2015	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016
GW09 (mTOC)	17.57	Dry	Dry	Dry	8.54	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Dry	Not taken
GW09 (mAHD)														
GW10 (mTOC)	15.38	7.31	2.74	5.69	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Dry	Dry
GW10 (mAHD)														
GW11 (mTOC)	1.591	2.99	Not taken	1.55	1.13	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	4.34	Not taken
GW11 (mAHD)														
GW12 (mTOC)	1.573	1.60	0.38	0.2	0.34	Not taken	0.2	0.23	0.31	Not taken	0.74	0.3	0.9	0.48
GW12 (mAHD)														
GW13 (mTOC)	2.04	2.08	0.98	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	1.74	1.19
GW13 (mAHD)														
GW14 (mTOC)	5.656	3.92	2.60	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	1.95	1.37
GW14 (mAHD)														
GW15 (mTOC)	13.79	10.45	10.63	10.5	10.04	Not taken	9.9	9.74	8.95	Not taken	8.94	9.26	9.36	6.83
GW15 (mAHD)														
GW16 (mTOC)	14.14	Dry	Dry	Dry	Dry	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW16 (mAHD)														

Borehole reference	Top of casting RL (mAHD)	Depth of water level													
		Construction													
		Dec 14	Feb 15	Apr 2015	July 2015	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016	
GW17 (mTOC)	59.47	Dry	Dry	12.72	11.66	Not taken	11.82	11.54	11.5	Not taken	11.46	11.5	11.5	11.19	
GW17 (mAHD)															
GW18 (mTOC)	96.71	34.09	33.70	33.76	33.71	Not taken	32.78	33.9	33.86	Not taken	33.78	33.72	33.67	33.66	
GW18 (mAHD)															
GW19 (mTOC)	51.81	9.45	6.28	5.59	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Dry	Dry	
GW19 (mAHD)															
GW20 (mTOC)	87.18	Dry	32.80 (dry)	32.83	33.08	Dry	33.15	Dry	Dry	Dry	Not taken	Not taken	Not taken	Not taken	
GW20 (mAHD)															
GW21 (mTOC)	51.29	4.19	3.34	1.65	4.27	Not taken	4.76	2.23	2.82	Not taken	2.72	3.42	3.99	2.82	
GW21 (mAHD)															
GW22 (mTOC)	17.27	3.37	2.34	0.76	3.21	Not taken	2.29	1.42	1.67	Not taken	1.66	0.45	Not taken	Not taken	
GW22 (mAHD)															
GW23 (mTOC)	39.22	16.29	15.98	15.91	15.99	Not taken	16.7	17.2	17.14	Not taken	16.87	Not taken	16.85	Not taken	
GW23 (mAHD)															
GW24 (mTOC)	26.09	8.05	3.51	6.15	7.45	Dry	Dry	6.5	7.16	Not taken	7.5	7.84	Dry	6.18	
GW24 (mAHD)															

Borehole reference	Top of casting RL (mAHD)	Depth of water level													
		Construction													
		Dec 14	Feb 15	Apr 2015	July 2015	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016	
GW25 (mTOC)	61.72	13.04	12.30	12.32	12.55	Not taken	13.08	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
GW25 (mAHD)															
GW26 (mTOC)	54.56	15.00	13.58	13.45	14.5	Not taken	15.1	14.1	13.81	Not taken	14.41	13.88	14.28	13.70	
GW26 (mAHD)															
GW27 (mTOC)	74.33	28.41	27.47	27.21	28.58	Dry	29.25	29.17	26.67	Not taken	27.24	27.52	28.08	28.08	
GW27 (mAHD)															
GW28 (mTOC)	54.65	9.37	9.02	8.05	9.05	Dry	Dry	8.76	9.1	Not taken	9.44	Dry	Dry	9.02	
GW28 (mAHD)															
GW29 (mTOC)	45.11	8.49	3.39	1.33	5.73	Not taken	6.88	5.89	7.37	Not taken	8.08	8.73	8.49	6.87	
GW29 (mAHD)															
GW30 (mTOC)	41.49	5.14	2.61	2.76	2.86	Not taken	2.95	3.12	4.59	Not taken	4.57	5.06	5.43	5.55	
GW30 (mAHD)															

Table 31 Cumulative construction groundwater level – manual record (cont.)

Borehole reference	Top of casting RL (mAHD)	Depth of water level													
		Construction													
		Aug 16	Sep 16	Oct 16	Dec 16	Jan 17									
GW01 (mTOC)	20.11	6.1	6.17	6.27	6.31	6.22									
GW01 (mAHD)															

Borehole reference	Top of casting RL (mAHD)	Depth of water level												
		Construction												
		Aug 16	Sep 16	Oct 16	Dec 16	Jan 17								
GW02 (mTOC)	3.57	Destroyed	2.93	3.10	3.46	3.84								
GW02 (mAHD)														
GW03 (mTOC)	2.64	0.62	0.47	0.58	0.80	1.52								
GW03 (mAHD)														
GW04 (mTOC)	1.69	1.34	1.26	1.41	No access	No access								
GW04 (mAHD)														
GW05 (mTOC)	1.24	0.61	0.45	0.49	No access	No access								
GW05 (mAHD)														
GW06 (mTOC)	20.1	2.26	2.06	2.23	2.26	2.25								
GW06 (mAHD)														
GW07 (mTOC)	15.98	6.67	5.46	No access	5.79	6.02								
GW07 (mAHD)														
GW08 (mTOC)	19.09	8.07	Dry	Dry	Dry	8.26								
GW08 (mAHD)														
GW09 (mTOC)	17.57	No access	No access	No access	Dry	Dry								
GW09 (mAHD)														
GW10 (mTOC)	15.38	Dry	Dry	Dry	Dry	Dry								
GW10 (mAHD)														

Borehole reference	Top of casting RL (mAHD)	Depth of water level													
		Construction													
		Aug 16	Sep 16	Oct 16	Dec 16	Jan 17									
GW11 (mTOC)	1.591	4.33	No access	No access	4.42	4.60									
GW11 (mAHD)															
GW12 (mTOC)	1.573	No access	0.60	0.60	0.90	1.41									
GW12 (mAHD)															
GW13 (mTOC)	2.04	1.43	1.49	1.37	1.72	1.82									
GW13 (mAHD)															
GW14 (mTOC)	5.656	1.51	1.39	No access	2.42	2.65									
GW14 (mAHD)															
GW15 (mTOC)	13.79	9.13	9.03	9.41	9.85	10.08									
GW15 (mAHD)															
GW16 (mTOC)	14.14	Destroyed	Destroyed	Destroyed	Dry	Dry									
GW16 (mAHD)															
GW17 (mTOC)	59.47	11.32	11.18	11.47	11.52	11.74									
GW17 (mAHD)															
GW18 (mTOC)	96.71	33.63	33.55	33.51	33.49	33.46									
GW18 (mAHD)															
GW19 (mTOC)	51.81	No access	Dry	Dry	Dry	No access									
GW19 (mAHD)															

Borehole reference	Top of casting RL (mAHD)	Depth of water level													
		Construction													
		Aug 16	Sep 16	Oct 16	Dec 16	Jan 17									
GW20 (mTOC)	87.18	No access	32.83	Dry	Dry	Dry									
GW20 (mAHD)															
GW21 (mTOC)	51.29	3.31	3.19	4.02	4.22	4.56									
GW21 (mAHD)															
GW22 (mTOC)	17.27	No access	No access	No access	No access	No access									
GW22 (mAHD)															
GW23 (mTOC)	39.22	16.75	No access	17.62	16.61	16.66									
GW23 (mAHD)															
GW24 (mTOC)	26.09	7.47	7.38	7.73	7.72	Dry									
GW24 (mAHD)															
GW25 (mTOC)	61.72	Dry	Dry	Dry	Dry	Dry									
GW25 (mAHD)															
GW26 (mTOC)	54.56	14.30	13.96	14.55	14.51	14.56									
GW26 (mAHD)															
GW27 (mTOC)	74.33	28.59	No access	28.88	No access	No access									
GW27 (mAHD)															
GW28 (mTOC)	54.65	9.40	9.05	Dry	9.33	Dry									
GW28 (mAHD)															

Borehole reference	Top of casting RL (mAHD)	Depth of water level Construction													
		Aug 16	Sep 16	Oct 16	Dec 16	Jan 17									
GW29 (mTOC)	45.11	8.10	8.46	8.75	8.72	8.32									
GW29 (mAHD)															
GW30 (mTOC)	41.49	5.58	4.90	5.20	5.20	5.83									
GW30 (mAHD)															

Table 32 Cumulative construction groundwater monitoring (EC) – manual record

Borehole reference	Electrical conductivity (uS/cm) Construction												
	Dec 14	Feb 15	Apr 2015	Jul 2015	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016
GW01	446	202	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	5619	6750
GW02	31600	16400	25700	Not taken	662	589	817	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW03	118	85000	57400	Not taken	959	729	679	866	1267	1167	1149	1192	1125
GW04	450	294	356	Not taken	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	1035	791
GW05	737	666	768	Not taken	6025	5010	6	4975	6283	Not taken	Not taken	6138	5963
GW06	Dry	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	4732	4629
GW07	Dry	20300	272	Not taken	1578	189	173	138	179	150.6	210	Insufficient	171
GW08	47700	140	47900	Not taken	Dry	Insufficient	656	Insufficient	733	493.4	Insufficient	Insufficient	732
GW09	Dry	Dry	Insufficient	Not taken	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient	Not taken
GW10	46300	39000	65900	Not taken	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient	Dry
GW11	845	416	112	Not taken	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	1622	Not taken
GW12	399	271	273	Not taken	1376	1265	1457	1199	1421	1556	1352	1495	1371
GW13	39100	22400	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	173	216
GW14	340	308	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	1897	17820
GW15	371	359	410	Not taken	3333	2957	3275	2782	3394	3194	3180	3093	3306
GW16	Dry	Dry	Insufficient	Not taken	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed

Borehole reference	Electrical conductivity (uS/cm)												
	Construction												
	Dec 14	Feb 15	Apr 2015	Jul 2015	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016
			water										
GW17	Dry	Dry	415	Not taken	3555	3151	3454	2888	3480	3250	8	3355	3246
GW18	162	155	182	Not taken	1513	1469	1518	1337	1543	1510	3	1527	1476
GW19	60000	40900	83700	Not taken	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient	Insufficient
GW20	Dry	Dry	Insufficient	Not taken	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Not taken	Not taken	Not taken
GW21	100400	67100	82200	Not taken	731	833	490	666	9	1038	404	1343	584
GW22	50200	31300	33700	Not taken	478	403	345	273	336	194	637	Not taken	Not taken
GW23	54100	14300	21700	Not taken	230	288	216	192	275	281	Not taken	308	Not taken
GW24	54000	55500	62900	Not taken	Insufficient	Insufficient	358	464	336	235	624	Insufficient	378
GW25	158	90100	49600	Not taken	548	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Dry
GW26	87800	84500	83100	Not taken	1060	Insufficient	871	732	878	420	871	425	500
GW27	87200	47200	39100	Not taken	Insufficient	Insufficient	464	491	536	588	611	625	339
GW28	28400	Dry	22000	Not taken	Insufficient	Insufficient	202	Insufficient	140	Insufficient	Insufficient	Insufficient	213
GW29	26800	14100	17500	Not taken	202	187	191	171	191	212	221	220	218
GW30	257	39400	56900	Not taken	1075	1062	854	1072	438	778	1124	1360	401

Table 33 Cumulative construction groundwater monitoring (EC) – manual record (cont.)

Borehole reference	Electrical conductivity (uS/cm)				
	Construction				
	Aug 16	Sep 16	Oct 16	Dec 16	Jan 17
GW01	-0.1	5.704	5504	5660	740.1
GW02	Destroyed	0.774	1186	486	988
GW03	37.1	4.297	1551	1525	1422
GW04	49.2	0.735	1829	No access	No access
GW05	76.1	5.896	4594	No access	No access
GW06	47.1	5.070	5241	4314	6079
GW07	Insufficient	0.144	No access	175	242
GW08	Insufficient	Insufficient	Insufficient	Insufficient	737

Borehole reference	Electrical conductivity (uS/cm)													
	Construction													
	Aug 16	Sep 16	Oct 16	Dec 16	Jan 17									
GW09	No access	No access	No access	Insufficient	Insufficient									
GW10	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient									
GW11	0.9	No access	No access	1383	2089									
GW12	No access	0.022	1713	1609	1971									
GW13	5.5	0.218	357	234.8	236.8									
GW14	16807	17.467	No access	8707	19353									
GW15	3142	2.160	2621	7244	3503									
GW16	Destroyed	Destroyed	Destroyed	Insufficient	Insufficient									
GW17	3218	3.109	2758	2302	3428									
GW18	1473	1.415	1496	1427	1646									
GW19	No access	Insufficient	Insufficient	Insufficient	No access									
GW20	No access	0.833	Insufficient	Insufficient	Insufficient									
GW21	668	0.486	777	901	1172									
GW22	No access	No access	No access	No access	No access									
GW23	244	No access	283	262	332									
GW24	52.8	0.557	409.1	264.1	Insufficient									
GW25	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient									
GW26	599	0.664	423.5	632	786									
GW27	463.4	No access	539	No access	No access									
GW28	Insufficient	229.6	Insufficient	Insufficient	Insufficient									
GW29	184	412.1	258.7	225.3	202.6									
GW30	1495	1897	1697	1405	2274									

Table 34 Cumulative construction groundwater monitoring (pH) – manual record

Borehole reference	pH Construction												
	Dec 14	Feb 15	Apr 2015	Jul 2015	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016
GW01	4.4	5.4	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	6.8	7.5
GW02	Not recorded	5.7	6.3	6.9	5.9	6.4	7.0	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW03	6.5	6.2	6.8	6.6	6.8	6.3	7.5	6.5	16.16	5.8	6.3	6.8	8.4
GW04	6.5	6.2	6.5	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	6.7	7.5
GW05	6.8	6.5	6.6	7.0	6.7	6.7	7.0	6.2	6.2	Not taken	Not taken	6.9	7.1
GW06	Dry	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	4.2	4.5
GW07	Dry	5.9	6.0	Dry	6.0	5.6	6.8	6.1	5.4	5.6	5.7	Insufficient	7.5
GW08	6.3	5.7	6.0	Insufficient	Insufficient	Insufficient	6.0	Insufficient	5.2	5.4	Insufficient	Insufficient	5.8
GW09	Dry	Dry	Dry	Insufficient	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient	Not taken
GW10	6.7	5.5	5.6	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient	Dry
GW11	5.3	6.1	6.6	7.0	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	5.7	Not taken
GW12	6.4	6.0	6.2	6.0	3.8	3.8	6.0	6.0	5.9	5.6	4.9	5.7	4.1
GW13	6.3	6.0	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	6.4	6.7
GW14	7.6	6.9	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	3.7	3
GW15	6.5	6.3	6.4	6.2	6.1	625.0	6.2	5.9	6.1	6	5.9	6.6	5.8
GW16	Dry	Dry	Dry	Dry	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW17	Dry	Dry	6.8	6.5	6.4	6.4	6.5	6.3	6.3	6	5.9	6.4	6.9
GW18	6.7	6.9	6.9	6.8	67.3	6.7	6.8	6.8	6.7	6.5	6.3	7.7	7.5
GW19	6.1	5.6	6.4	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient	Insufficient
GW20	Dry	Dry	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Not taken	Not taken	Not taken	Not taken
GW21	6.8	6.9	6.9	6.6	6.8	6.3	7.5	6.9	6.6	6.3	6.2	6.4	6.7
GW22	5.7	5.7	5.6	6.9	6.3	5.9	5.5	5.8	5.5	5.7	5.7	Not taken	Not taken
GW23	5.7	5.0	5.4	5.6	6.0	5.4	5.5	6.5	5.3	5.6	Not taken	5.9	Not taken
GW24	5.9	4.8	4.9	5.2	Insufficient	Insufficient	5.7	7.5	5.5	5.8	6.5	Insufficient	7.2
GW25	6.0	4.6	5.1	5.1	4.7	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Dry
GW26	6.3	5.5	5.3	5.3	5.3	Insufficient	5.3	5.4	5.3	5	5	5.7	7.1
GW27	7.1	6.2	6.2	Insufficient	Insufficient	Insufficient	5.8	5.7	6.3	6.3	6.3	6.4	8
GW28	6.2	Dry	5.3	Insufficient	Insufficient	Insufficient	5.2	Insufficient	5.9	Insufficient	Insufficient	Insufficient	6.9
GW29	6.0	5.5	5.7	5.8	5.7	5.8	5.4	5.8	5.8	5.9	6.6	6.6	8.7

Borehole reference	pH Construction												
	Dec 14	Feb 15	Apr 2015	Jul 2015	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016
GW30	4.6	6.1	Instrument error	5.8	5.0	5.2	5.6	5.2	5.9	5.1	5.4	6	5.6

Table 35 Cumulative construction groundwater monitoring (pH) – manual record (cont.)

Borehole reference	pH Construction												
	Aug 16	Sep 16	Oct 16	Dec 16	Jan 17								
GW01	6.6	6.6	5.9	6.0	6.1								
GW02	Destroyed	7.8	6.5	6.2	6.6								
GW03	6.1	7.6	5.8	5.7	6.5								
GW04	7.7	8.3	5.9	No access	No access								
GW05	7.1	6.5	6.3	No access	No access								
GW06	4.4	5.1	4.2	3.2	3.8								
GW07	Insufficient	5.9	No access	4.9	5.4								
GW08	Insufficient	Insufficient	Insufficient	Insufficient	5.9								
GW09	No access	No access	No access	Insufficient	Insufficient								
GW10	Insufficient	insufficient	Insufficient	Insufficient	Insufficient								
GW11	6.6	No access	No access	4.8	5.3								
GW12	No access	4.5	5.4	5.3	5.7								
GW13	7.0	5.7	5.4	4.9	5.8								
GW14	3.1	3.0	No access	3.2	3.9								
GW15	5.8	5.7	5.9	5.9	5.9								
GW16	Destroyed	Destroyed	Destroyed	Insufficient	Insufficient								
GW17	6.5	7.1	5.9	5.7	5.8								
GW18	7.5	7.9	6.4	6.2	7.4								
GW19	No access	Insufficient	Insufficient	Insufficient	No access								
GW20	No access	8.0	Insufficient	Insufficient	Insufficient								
GW21	7.1	7.9	5.9	6.0	6.3								
GW22	No access	No access	No access	No access	No access								

Borehole reference	pH												
	Construction												
	Aug 16	Sep 16	Oct 16	Dec 16	Jan 17								
GW23	7.0	No access	5.7	5.9	8.2								
GW24	7.5	8.0	6.6	7.1	Insufficient								
GW25	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient								
GW26	6.6	6.2	5.0	4.7	6.8								
GW27	7.1	No access	6.3	No access	No access								
GW28	Insufficient	6.62	Insufficient	Insufficient	Insufficient								
GW29	7.4	6.5	5.8	5.5	6.4								
GW30	7.5	5.5	4.8	4.4	5.8								

Table 36 Construction groundwater monitoring (temperature) – manual record

Borehole reference	Temperature													
	Construction													
	Dec 14	Feb 15	Apr 2015	Jul 2015	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jun 2016	
GW01	18.9	21.1	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	19.4	19.9
GW02	18.5	21.9	21.4	18.5	18.4	17.6	20.1	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW03	19.0	22.7	20.8	16.8	16.2	16.9	18.9	21.1	23.3	21.1	20.5	18	15.3	
GW04	18.7	22.3	21.2	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	20.3	18.3
GW05	17.3	20.1	19.5	16.3	15.8	16.0	17.3	20.1	23	Not taken	Not taken	19.1	17.2	
GW06	Dry	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	20.9	19.5
GW07	Dry	21.7	22.1	Insufficient	19.5	19.6	19.9	20.2	20.9	19.7	21.8	Insufficient	19.4	
GW08	20.2	21.6	20.0	Insufficient	Insufficient	Insufficient	20.3	Insufficient	20.2	20.8	Insufficient	Insufficient	18.8	
GW09	Dry	Dry	Insufficient	Insufficient	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient	Not taken
GW10	19.0	20.6	20.3	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient	Dry
GW11	18.3	20.4	22.0	17.5	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	20.2	Not taken
GW12	18.1	21.5	21.1	15.6	14.3	15.5	18.4	20.7	21.6	20.3	21.1	17.7	16	
GW13	18.2	21.4	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	21	18.9
GW14	18.2	20.6	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	20.5	19.2
GW15	18.8	20.5	20.3	19.8	19.9	20.6	20.7	20.5	20.8	20.8	21	20	20.3	
GW16	Dry	Dry	Insufficient	Insufficient	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW17	Dry	Dry	19.7	19.2	19.3	19.4	19.7	19.9	19.9	19.3	22.7	19.4	19.1	

Borehole reference	Temperature Construction												
	Dec 14	Feb 15	Apr 2015	Jul 2015	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jun 2016
GW18	18.5	20.2	19.7	18.8	19.0	19.2	19.8	20.8	19.7	19.7	21.4	18.9	18.7
GW19	18.8	19.6	20.1	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient	Insufficient
GW20	Dry	Dry	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Not taken	Not taken	Not taken
GW21	18.9	19.8	20.8	18.8	18.8	18.5	18.6	19.9	21.3	20.6	20.2	19.4	18.2
GW22	18.3	20.3	21.0	18.3	18.2	17.2	18.3	20.6	21.8	22.2	21.2	Not taken	Not taken
GW23	19.1	19.2	18.9	18.3	18.5	18.7	18.9	19.4	19.4	19.7	Not taken	18.5	Not taken
GW24	21.8	19.7	19.7	18.5	Insufficient	Insufficient	18.7	18.8	19.2	19.4	19.1	Insufficient	18.1
GW25	21.0	21.1	19.6	19.4	18.5	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient	Dry
GW26	22.7	20.3	19.9	18.8	19.2	Insufficient	20.1	20.2	20	20.2	19.7	14.3	19
GW27	19.6	20.4	19.2	Insufficient	Insufficient	Insufficient	19.7	19.9	20.3	19.7	19.3	28.1	19
GW28	21.6	Dry	19.5	18.6	Insufficient	Insufficient	20	Insufficient	23.4	Insufficient	Insufficient	Insufficient	18.7
GW29	18.3	19.6	20.3	Insufficient	18.5	18.7	18.6	19.2	19.3	19.8	19	18.8	18.8
GW30	18.4	20.2	20.5	19.0	18.6	18.6	19.1	19.9	20.2	20.1	20.2	19.8	18.8

Table 37 Construction groundwater monitoring (temperature) – manual record (cont.)

Borehole reference	Temperature Construction													
	Aug 16	Sep 16	Oct 16	Dec 16	Jan 17									
GW01	20.5	19.7	20	23.5	22.2									
GW02	Destroyed	18.3	18.7	20.8	21.0									
GW03	24.4	16.5	16.7	19.4	20.9									
GW04	19.8	17.7	17.6	No access	No access									
GW05	18.0	17.5	16.9	No access	No access									
GW06	21.2	18.5	18.5	21.9	23.5									
GW07	Insufficient	20.1	No access	20.1	21									
GW08	Insufficient	Insufficient	Insufficient	Insufficient	20.3									
GW09	No access	No access	No access	Insufficient	Insufficient									
GW10	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient									
GW11	20.4	No access	No access	20.4	20.4									
GW12	No access	17.3	18.1	22	23.7									

Borehole reference	Temperature Construction												
	Aug 16	Sep 16	Oct 16	Dec 16	Jan 17								
	GW13	18.7	21.1	18.8	21.8								
GW14	17.6	18.5	No access	20.6	22.2								
GW15	19.8	20.1	20.2	20.7	21.5								
GW16	Destroyed	Destroyed	Destroyed	Insufficient	Insufficient								
GW17	19.6	19.4	19.3	20.4	20.2								
GW18	19.1	19.2	19.3	20.5	20.1								
GW19	No access	Insufficient	Insufficient	Insufficient	No access								
GW20	No access	19.4	Insufficient	Insufficient	Insufficient								
GW21	18.7	18.3	18.3	19.3	20.5								
GW22	No access	No access	No access	No access	No access								
GW23	18.6	No access	18.6	19.5	20.4								
GW24	19.8	19.3	19.4	21.3	Insufficient								
GW25	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient								
GW26	18.7	18.9	19.4	20.6	21.0								
GW27	18.3	No access	19.7	No access	No access								
GW28	Insufficient	19.3	Insufficient	Insufficient	Insufficient								
GW29	17.7	19.0	18.8	19.8	19.8								
GW30	19	19.4	19.1	19.7	20.5								

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