Transport Roads & Maritime Services

Oxley Highway to Kempsey Upgrade Project

Construction water quality monitoring report - 22 January 2016 to 21 July 2016

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Contents

List of table

List of figures

Appendix A – Site locality maps

Appendix B – Rainfall records

Appendix C – Surface water quality sampling results

Appendix D – Borehole water level data plots

Appendix E – Cumulative construction groundwater results

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 approximately 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:

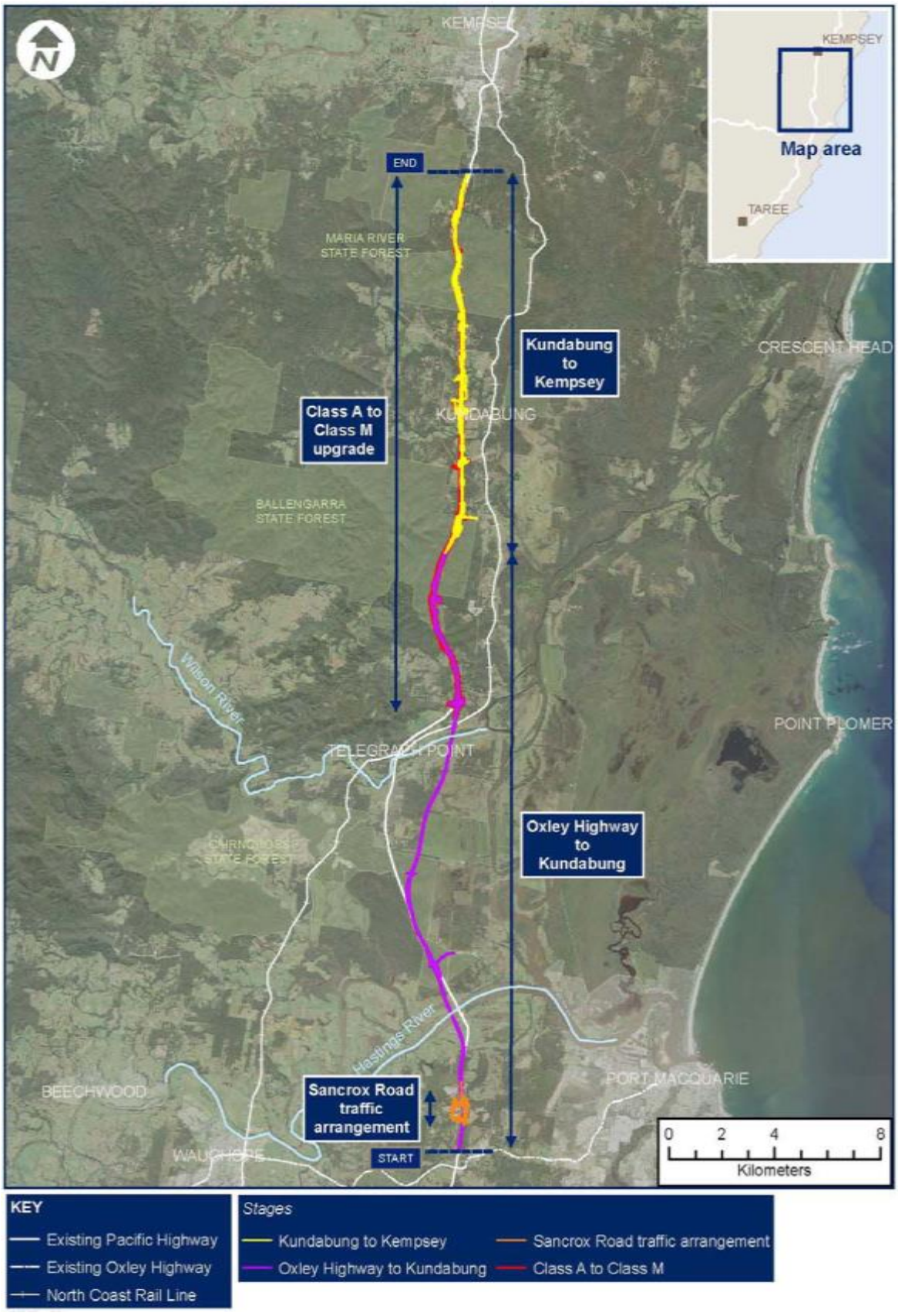
- Stage 1 - The Sancrox Traffic Arrangement works located about two kilometres north of the Oxley Highway / Pacific Highway intersection. This section of the project opened to traffic on 30 November 2015
- Stage 2 - Kundabung to Kempsey Stage consisting of about 14 kilometres of dual carriageway, commencing 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 fourth construction period between 22 January 2016 and 21 July 2016 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 July 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 July 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	^{0}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 (NO3-) Sulfate ($SO4^{2-}$)	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 2015 and January 2016.

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 January 2016 to 21 July 2016 was mixed with rainfall records at the Port Macquarie Airport Bureau of Meteorology monitoring station characterised as either average or well below average. March, May and July were well below average with rainfall ranging between four and 13 times below the historical monthly averages. June was below average and January, February and April were either on historical monthly averages 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. Final surface treatment was completed on the local / ring road component of Stage 1 during March 2016. Work was generally limited during the monitoring period with efforts focused on landscape maintenance and defect rectification. Landscaping across Stage 1 is establishing well with the site presenting limited potential to influence surface water quality within SW1
- Stage 2 – Earthworks were in progress across the entire site during the monitoring period and included progress on deep cuts and fill embankments to near final levels. Culvert and bridge work either continued or were finalised at or in the vicinity of all waterway crossings on Stage 2. Mainline paving commenced in some areas. Permanent landscaping and rehabilitation work was undertaken at key locations across the project. 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, were in progress 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. 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 4 (August 2016).

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 at different times during sampling. Waterways affected included SW1, SW2, SW7, SW8, SW12 and SW13. On all occasions, with the exception of six events at SW2, were in response to naturally low flows. The exceptions at SW2 were due to a rock "plug" installed for a short period of time while piling works were in progress.
- SW8a was dry on eight occasions during the monitoring period. On only three occasions were all sampling points connected. At all other times SW8b persisted as an isolated pond (was also dry on one occasion during March). 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 be 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 no longer provide an effective correlation between upstream and downstream conditions.

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									
				February 2016					March 2016				
				SW1a derived trigger values*			SW1b	SW1c	SW1a derived trigger values*			SW1b	SW1c
				Std dev	80th %	20th %	Median	Median	Std dev	80th %	20th %	Median	Median
Temperature	^{0}C	-2-50	NA	4.0	22.4	15.5	24.6	24.5	3.9	22.5	15.8	22.9	23.0
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	248	662	221	580	618	291	702	221	1576	928
Dissolved oxygen (DO)	%	0-200	85-110	26	67	16	91	81	26	64	14	76	31
pH		0-14	6.5-8	0.4	6.9	6.2	7.1	7.1	0.4	6.8	6.2	7.4	7.5
Turbidity	NTU	0-600	6-50	20	59	26	27	63	20	59	26	15	37
Total suspended solids (TSS)	mg/L	5	-	11	13	5	5	6	12	14	5	7	15
Aluminium (Al)	mg/L	0.01	0.055”	0.73	0.89	0.05	0.67	1.20	0.73	0.89	0.05	0.01	0.01
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	0.0001	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	9.61	15.18	0.71	0.71	0.58	9.10	10.83	0.71	0.15	0.18
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	0.514	1.000	0.018	0.147	0.128	0.512	0.974	0.018	0.440	0.467
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	0.002	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	0.046	0.020	0.006	0.011	0.006	0.011	0.015	0.006	0.005	0.012
Total Nitrogen (TN)	mg/L	0.1	0.5	0.8	0.9	0.4	0.6	0.4	0.8	0.9	0.4	0.3	0.3
Total Phosphorous (TP)	mg/L	0.01	0.05	0.03	0.04	0.01	0.02	0.03	0.03	0.04	0.01	0.01	0.13

* 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									
				April 2016					May 2016				
				SW1a derived trigger values*			SW1b	SW1c	SW1a derived trigger values*			SW1b	SW1c
				Std dev	80th %	20th %	Median	Median	Std dev	80th %	20th %	Median	Median
Temperature	^{0}C	-2-50	NA	2.5	22.5	18.5	20.9	21.2	2.4	22.5	19.2	17.0	18.8
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	292	702	221	1316	979	292	702	221	1094	1321
Dissolved oxygen (DO)	%	0-200	85-110	26	64	16	74	42	24	60	16	76	57
pH		0-14	6.5-8	0.5	7.1	6.2	7.9	7.8	0.5	7.1	6.4	7.2	7.2
Turbidity	NTU	0-600	6-50	19	64	30	19	59	24	64	30	30	66
Total suspended solids (TSS)	mg/L	5	-	12	15	5	5	15	11	15	5	18	36
Aluminium (Al)	mg/L	0.01	0.055”	0.68	0.62	0.04	0.02	0.02	0.63	0.43	0.03	0.08	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	0.0001
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	7.86	5.75	0.33	0.08	0.14	7.88	5.75	0.33	0.27	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	0.495	0.804	0.022	0.122	0.197	0.489	0.804	0.026	0.260	0.642
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	0.012	0.016	0.006	0.007	0.013	0.012	0.016	0.005	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.5	0.9	0.9	0.4	0.5	0.4	0.9	0.9	0.4	0.9	1.1
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.04	0.01	0.02	0.07	0.02	0.04	0.01	0.02	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 3-3 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results									
				June 2016					July 2016				
				SW1a derived trigger values*			SW1b	SW1c	SW1a derived trigger values*			SW1b	SW1c
				Std dev	80th %	20th %	Median	Median	Std dev	80th %	20th %	Median	Median
Temperature	^{0}C	-2-50	NA	2.7	22.5	19.2	16.0	16.0	3.4	22.5	17.7	10.0	11.2
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	295	666	180	826	718	290	666	205	1049	1659
Dissolved oxygen (DO)	%	0-200	85-110	25	64	19	86	75	25	64	19	64	58
pH		0-14	6.5-8	0.4	7.1	6.5	7.0	7.2	0.4	6.9	6.5	7.4	7.4
Turbidity	NTU	0-600	6-50	24	59	28	33	21	25	59	27	5	13
Total suspended solids (TSS)	mg/L	5	-	11	15	5	6	5	11	15	5	5	6
Aluminium (Al)	mg/L	0.01	0.055”	0.51	0.43	0.02	0.08	0.15	0.51	0.43	0.02	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	0.001	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	7.93	5.75	0.21	0.15	0.30	7.64	4.04	0.21	0.38	0.05
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	0.493	0.804	0.026	0.107	0.109	0.466	0.742	0.026	0.156	0.248
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	0.012	0.014	0.005	0.006	0.017	0.012	0.014	0.005	0.005	0.008
Total Nitrogen (TN)	mg/L	0.1	0.5	0.9	0.9	0.4	0.4	0.5	0.9	0.9	0.3	0.1	0.1
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.04	0.01	0.02	0.03	0.02	0.04	0.01	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 3-4 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				February 2016				March 2016				April 2016			
				SW2b*			SW2a	SW2b*			SW2a	SW2b*			SW2a
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	4.2	23.7	19.0	24.0	4.0	23.3	19.7	22.3	3.0	23.3	19.8	20.4
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	298	917	479	415	276	925	486	523	266	892	486	567
Dissolved oxygen (DO)	%	0-200	85-110	34	90	25	22	35	85	11	6	32	64	7	4
pH		0-14	6.5-8	1.3	6.6	3.7	6.5	1.3	6.6	3.7	6.4	1.4	6.7	3.7	7.2
Turbidity (NTU)	NTU	0-600	6-50	13	34	12	44	14	37	12	12	42	49	16	23
Total suspended solids (TSS)	mg/L	5	-	9	18	5	12	17	24	5	12	27	40	7	14
Aluminium (Al)	mg/L	0.01	0.055”	0.20	0.21	0.02	0.02	0.12	0.17	0.01	0.03	0.12	0.17	0.01	0.04
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.002	0.001	0.001	0.001	0.002	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	0.001	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	0.000	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	2.57	4.47	0.95	0.62	4.06	4.79	1.08	4.81	5.26	5.53	1.08	7.135
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.00	0.00	0.00	0.001
Manganese (Mn)	mg/L	0.001	1.9	1.652	2.728	0.309	0.570	1.652	2.728	0.309	1.141	1.62	2.73	0.31	0.885
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	0.004	0.002	0.001	0.002	0.003	0.001	0.001	0.005	0.004	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	0.010	0.018	0.005	0.005	0.007	0.016	0.005	0.005	0.007	0.016	0.005	0.006
Total Nitrogen (TN)	mg/L	0.1	0.5	0.5	1.4	0.4	0.5	0.8	1.5	0.4	0.9	1.0	1.6	0.5	1.3
Total Phosphorous (TP)	mg/L	0.01	0.05	0.05	0.11	0.03	0.05	0.13	0.13	0.03	0.13	0.20	0.20	0.04	0.23

* Trigger values derived from 24 sampling events up to and including the month indicated. However, metals had not been sampled on 24 occasions for the months of August and September 2015. This limitation has been resolved for subsequent months with sampling of metals completed on at least 24 occasions.

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				Results											
	Unit	LOR / probe limit	ANZECC default trigger value	May 2016				June 2016				July 2016			
				SW2b*			SW2a	SW2b*			SW2a	SW2b*			SW2a
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	2.9	23.3	19.7	15.2	3.5	23.3	18.8	15.5	4.2	22.9	17.7	9.0
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	218	808	486	887	175	767	483	684	169	767	483	1028
Dissolved oxygen (DO)	%	0-200	85-110	32	58	7	21	23	50	7	37	22	47	7	55
pH		0-14	6.5-8	1.3	6.8	3.9	7.0	1.0	6.8	6.1	6.7	0.8	6.8	6.1	7.1
Turbidity (NTU)	NTU	0-600	6-50	42	53	17	32	42	53	19	22	42	53	19	8
Total suspended solids (TSS)	mg/L	5	-	27	45	7	15	27	45	9	8	27	45	9	5
Aluminium (Al)	mg/L	0.01	0.055”	0.12	0.17	0.01	0.03	0.12	0.17	0.01	0.05	0.12	0.17	0.01	0.02
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.001	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	0.001
Iron (Fe)	mg/L	0.05	ID	5.78	6.89	0.95	2.81	5.81	6.89	0.95	0.35	5.87	6.89	0.74	0.21
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	1.605	2.752	0.452	0.912	1.572	2.752	0.533	0.136	1.581	2.752	0.533	0.092
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	0.002	0.005	0.004	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	0.007	0.014	0.005	0.005	0.007	0.014	0.005	0.005	0.007	0.014	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.5	1.0	1.6	0.7	1.2	1.0	1.6	0.6	0.4	1.0	1.6	0.6	0.3
Total Phosphorous (TP)	mg/L	0.01	0.05	0.20	0.26	0.04	0.22	0.19	0.26	0.05	0.04	0.19	0.26	0.05	0.01

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

Parameter				Results											
	Unit	LOR / probe limit	ANZECC default trigger value	February 2016				March 2016				April 2016			
				SW3a*			SW3b	SW3a*			SW3b	SW3a*			SW3b
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	3.8	25.1	17.9	26.6	3.7	25.5	18.8	25.7	2.5	25.5	22.2	24.5
Electrical conductivity (EC)	uS/cm	0-8000	-	693	8000	8000	8000	693	8000	8000	8000	693	8000	8000	8000
Dissolved oxygen (DO)	%	0-200	80-110	10	96	78	91	10	95	78	83	10	94	78	84
pH		0-14	7.0-8.5	0.2	7.3	6.9	7.2	0.2	7.3	6.9	7.3	0.3	7.3	6.9	7.6
Turbidity (NTU)	NTU	0-600	0.5-10	18	30	12	13	18	30	9	18	18	30	13	15
Total suspended solids (TSS)	mg/L	5		14	11	5	5	14	10	5	10	14	10	5	6
Aluminium (Al)	mg/L	0.01	ID	0.10	0.10	0.01	0.02	0.10	0.10	0.01	0.06	0.10	0.10	0.01	0.10
Arsenic (As)	mg/L	0.001	ID	0.003	0.002	0.001	0.001	0.004	0.006	0.001	0.006	0.004	0.010	0.001	0.010
Cadmium (Cd)	mg/L	0.0001	0.0055	0.0003	0.0001	0.0001	0.0001	0.0004	0.0005	0.0001	0.0006	0.0004	0.0010	0.0001	0.0010
Chromium (Cr)	mg/L	0.001	0.0274	0.003	0.001	0.001	0.001	0.004	0.005	0.001	0.006	0.004	0.010	0.001	0.010
Copper (Cu)	mg/L	0.001	0.0013	0.003	0.003	0.001	0.001	0.004	0.006	0.001	0.006	0.004	0.010	0.001	0.010
Iron (Fe)	mg/L	0.05	ID	0.15	0.33	0.05	0.06	0.16	0.33	0.05	0.28	0.18	0.46	0.05	0.50
Lead (Pb)	mg/L	0.001	0.0044	0.003	0.001	0.001	0.001	0.004	0.005	0.001	0.006	0.004	0.010	0.001	0.010
Manganese (Mn)	mg/L	0.001	ID	0.023	0.049	0.028	0.015	0.018	0.046	0.026	0.024	0.019	0.045	0.024	0.022
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	0.003	0.001	0.001	0.001	0.004	0.005	0.001	0.006	0.004	0.010	0.001	0.010
Silver (Ag)	mg/L	0.001	0.0014	0.003	0.001	0.001	0.003	0.004	0.005	0.001	0.006	0.004	0.010	0.001	0.010
Zinc (Zn)	mg/L	0.005	0.015	0.017	0.012	0.005	0.006	0.018	0.027	0.005	0.028	0.020	0.050	0.005	0.050
Total Nitrogen (TN)	mg/L	0.1	0.3	0.2	0.4	0.2	0.2	0.2	0.4	0.2	0.2	0.2	0.4	0.2	0.2
Total Phosphorous (TP)	mg/L	0.01	0.03	0.03	0.07	0.02	0.02	0.03	0.07	0.02	0.03	0.03	0.07	0.02	0.03

* 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				Results											
	Unit	LOR / probe limit	ANZECC default trigger value	May 2016				June 2016				July 2016			
				SW3a*			SW3b	SW3a*			SW3b	SW3a*			SW3b
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	2.4	25.5	22.2	20.1	3.1	25.5	21.8	16.5	3.6	25.5	20.4	13.8
Electrical conductivity (EC)	uS/cm	0-8000	-	693	8000	8000	8000	1584	8000	8000	8000	1584	8000	8000	8000
Dissolved oxygen (DO)	%	0-200	80-110	8	94	78	88	7	93	78	81	7	93	78	82
pH		0-14	7.0-8.5	0.3	7.4	6.9	7.7	0.3	7.4	6.9	7.4	0.4	7.5	6.9	8.0
Turbidity (NTU)	NTU	0-600	0.5-10	10	28	11	4	47	26	9	10	47	23	8	4
Total suspended solids (TSS)	mg/L	5		9	7	5	7	27	7	5	5	27	7	5	5
Aluminium (Al)	mg/L	0.01	ID	0.10	0.10	0.01	0.10	0.08	0.10	0.01	0.16	0.08	0.10	0.01	0.01
Arsenic (As)	mg/L	0.001	ID	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.002	0.004	0.010	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0055	0.0004	0.0010	0.0001	0.0010	0.0004	0.0010	0.0001	0.0001	0.0004	0.0010	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.0274	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0013	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.20	0.50	0.05	0.50	0.20	0.50	0.05	0.18	0.20	0.50	0.05	0.05
Lead (Pb)	mg/L	0.001	0.0044	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001
Manganese (Mn)	mg/L	0.001	ID	0.012	0.041	0.021	0.015	0.015	0.040	0.019	0.043	0.014	0.037	0.019	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	0.010	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001
Silver (Ag)	mg/L	0.001	0.0014	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.015	0.022	0.050	0.005	0.050	0.022	0.050	0.005	0.005	0.022	0.050	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.3	0.2	0.4	0.2	0.4	0.3	0.5	0.2	0.3	0.3	0.5	0.2	0.5
Total Phosphorous (TP)	mg/L	0.01	0.03	0.03	0.06	0.02	0.04	0.04	0.07	0.02	0.04	0.04	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 3-8 Construction surface water quality results by waterway (cont.)

Parameter				Results								
	Unit	LOR / probe limit	ANZECC default trigger value	SW5b pre construction trigger values*			SW5b median values					
				Std dev	80th %	20th %	February 2016	March 2016	April 2016	May 2016	June 2016	July 2016
Temperature	^{0}C	-2-50	No data	5.4	27.3	19.3	27.0	24.6	23.6	19.3	18.2	11.6
Electrical conductivity (EC)	uS/cm	0-8000	No data	446	1042	490	1016	1350	1664	2044	325	682
Dissolved oxygen (DO)	%	0-200	No data	28	115	67	27	24	19	40	64	41
pH		0-14	No data	0.8	5.6	4.2	6.9	7.3	7.6	7.4	6.6	7.1
Turbidity (NTU)	NTU	0-600	No data	172	50	6	20	48	77	61	17	5
Total suspended solids	mg/L	5	-	313	279	8	5	12	16	14	6	6
Aluminium (Al)	mg/L	0.01	0.055”	1.13	1.97	0.42	0.03	0.01	0.01	0.01	0.12	0.01
Arsenic (As)	mg/L	0.001	0.024	0.003	0.004	0.001	0.001	0.002	0.002	0.001	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0004	0.0007	0.0001	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	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.002	0.004	0.002	0.002	0.001	0.001	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	5.55	4.49	0.31	0.06	0.11	0.13	0.14	0.44	0.50
Lead (Pb)	mg/L	0.001	0.0034	0.001	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	2.315	4.205	6.275	3.200	0.232	0.073
Mercury (Hg)	mg/L	0.0001	0.0006	0.0001	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	0.008	0.001	0.001	0.001	0.001	0.002
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.126	0.269	0.043	0.016	0.005	0.008	0.005	0.013	0.005
Total Nitrogen (TN)	mg/L	0.1	No data	4.4	5.3	0.4	0.6	1.4	2.1	1.4	0.5	0.2
Total Phosphorous (TP)	mg/L	0.01	No data	0.59	0.16	0.02	0.02	0.09	0.17	0.09	0.02	0.01

* 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.

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				Results											
	Unit	LOR / probe limit	ANZECC default trigger value	February 2016				March 2016				April 2016			
				SW6a*			SW6b	SW6a*			SW6b	SW6a*			SW6b
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	4.0	25.9	18.1	27.3	3.9	26.4	19.1	26.3	2.7	26.4	23.6	25.5
Electrical conductivity (EC)	uS/cm	0-8000	-	3493	8000	288	229	3445	8000	309	3424	3525	8000	309	8000
Dissolved oxygen (DO)	%	0-200	80-110	14	98	75	75	12	98	77	81	11	95	77	82
pH		0-14	7.0-8.5	0.3	7.1	6.7	6.9	0.3	7.1	6.8	7.0	0.3	7.2	6.8	7.3
Turbidity (NTU)	NTU	0-600	0.5-10	5	18	10	23	5	18	10	15	5	18	10	16
Total suspended solids (TSS)	mg/L	5		5	7	5	5	5	7	5	8	5	7	5	5
Aluminium (Al)	mg/L	0.01	ID	0.17	0.26	0.03	0.20	0.17	0.26	0.02	0.05	0.14	0.23	0.02	0.01
Arsenic (As)	mg/L	0.001	ID	0.000	0.002	0.001	0.001	0.000	0.002	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	0.20	0.47	0.15	0.50	0.21	0.50	0.10	0.31	0.22	0.50	0.07	0.06
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	0.060	0.153	0.019	0.015	0.061	0.153	0.017	0.045	0.060	0.153	0.017	0.118
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	0.007	0.005	0.005	0.006	0.007	0.005	0.005	0.006	0.007	0.005	0.006
Total Nitrogen (TN)	mg/L	0.1	0.3	0.2	0.5	0.2	0.3	0.2	0.4	0.2	0.2	0.2	0.4	0.2	0.3
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	0.02	0.03	0.01	0.01

* 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				Results											
	Unit	LOR / probe limit	ANZECC default trigger value	May 2016				June 2016				July 2016			
				SW6a*			SW6b	SW6a*			SW6b	SW6a*			SW6b
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	2.6	26.4	23.6	20.9	3.2	26.4	22.8	16.7	3.8	26.4	20.3	13.0
Electrical conductivity (EC)	uS/cm	0-8000	-	3506	8000	309	8000	3289	7649	300	670	3151	7386	300	603
Dissolved oxygen (DO)	%	0-200	80-110	9	94	77	82	9	92	74	83	9	92	74	82
pH		0-14	7.0-8.5	0.3	7.3	6.8	7.2	0.3	7.2	6.7	6.5	0.3	7.3	6.7	7.2
Turbidity (NTU)	NTU	0-600	0.5-10	6	18	10	7	21	18	12	21	21	18	12	18
Total suspended solids (TSS)	mg/L	5		6	8	5	7	9	9	5	7	8	9	5	7
Aluminium (Al)	mg/L	0.01	ID	0.13	0.15	0.01	0.01	0.16	0.15	0.01	0.42	0.16	0.18	0.0	0.16
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	0.0001	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	0.23	0.46	0.05	0.05	0.22	0.45	0.05	0.47	0.22	0.45	0.05	0.40
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	0.060	0.153	0.017	0.084	0.062	0.156	0.017	0.088	0.061	0.156	0.017	0.042
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	0.002	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	0.007	0.005	0.006	0.006	0.007	0.005	0.014	0.006	0.006	0.005	0.006
Total Nitrogen (TN)	mg/L	0.1	0.3	0.2	0.4	0.2	0.3	0.2	0.5	0.2	0.6	0.2	0.5	0.2	0.4
Total Phosphorous (TP)	mg/L	0.01	0.03	0.02	0.03	0.01	0.02	0.03	0.03	0.01	0.02	0.02	0.03	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 3-11 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				February 2016				March 2016				April 2016			
				SW6c*			SW6d	SW6c*			SW6d	SW6c*			SW6d
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	4.5	25.9	17.2	27.4	4.3	26.6	18.5	26.2	2.9	26.6	22.3	24.8
Electrical conductivity (EC)	uS/cm	0-8000	-	3485	8000	284	247	3439	8000	341	2816	3561	8000	362	8000
Dissolved oxygen (DO)	%	0-200	80-110	12	94	75	79	12	93	74	70	11	85	74	76
pH		0-14	7.0-8.5	0.2	7.0	6.6	6.9	0.2	7.0	6.6	6.9	0.2	7.0	6.6	7.2
Turbidity (NTU)	NTU	0-600	0.5-10	8	23	11	21	8	21	11	15	8	21	11	13
Total suspended solids (TSS)	mg/L	5		3	8	5	5	3	9	5	8	3	9	5	5
Aluminium (Al)	mg/L	0.01	ID	0.18	0.23	0.03	0.18	0.19	0.23	0.02	0.04	0.16	0.21	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	0.17	0.45	0.12	0.50	0.18	0.48	0.09	0.36	0.19	0.48	0.06	0.06
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	0.050	0.120	0.019	0.007	0.051	0.120	0.018	0.045	0.051	0.120	0.022	0.107
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	0.004	0.009	0.005	0.007	0.003	0.006	0.005	0.012	0.003	0.007	0.005	0.009
Total Nitrogen (TN)	mg/L	0.1	0.3	0.2	0.4	0.2	0.3	0.2	0.4	0.2	0.3	0.2	0.4	0.2	0.2
Total Phosphorous (TP)	mg/L	0.01	0.03	0.01	0.03	0.02	0.02	0.01	0.03	0.02	0.03	0.02	0.03	0.01	0.01

* 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											
				May 2016				June 2016				July 2016			
				SW6c*			SW6d	SW6c*			SW6d	SW6c*			SW6d
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	2.7	26.6	22.3	20.3	3.5	26.6	21.6	16.2	4.1	26.6	20.4	12.6
Electrical conductivity (EC)	uS/cm	0-8000	-	3561	8000	362	8000	3355	8000	341	550	3215	8000	341	800
Dissolved oxygen (DO)	%	0-200	80-110	9	84	74	82	8	83	74	83	7	83	75	79
pH		0-14	7.0-8.5	0.2	7.1	6.6	7.1	0.2	7.1	6.7	6.9	0.2	7.1	6.7	7.1
Turbidity (NTU)	NTU	0-600	0.5-10	8	21	11	10	21	23	13	22	21	23	13	14
Total suspended solids (TSS)	mg/L	5		5	9	5	12	8	11	5	8	8	11	5	5
Aluminium (Al)	mg/L	0.01	ID	0.15	0.14	0.01	0.01	0.12	0.16	0.01	0.38	0.13	0.19	0.01	0.18
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	0.0002	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	0.45	0.05	0.05	0.19	0.45	0.05	0.29	0.20	0.48	0.05	0.49
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	0.051	0.120	0.022	0.075	0.050	0.120	0.023	0.044	0.049	0.120	0.026	0.053
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	0.006
Total Nitrogen (TN)	mg/L	0.1	0.3	0.2	0.4	0.2	0.3	0.3	0.6	0.2	0.6	0.2	0.6	0.2	0.4
Total Phosphorous (TP)	mg/L	0.01	0.03	0.02	0.03	0.01	0.01	0.02	0.04	0.02	0.02	0.02	0.04	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 3-13 Construction surface water quality results by waterway (cont.)

Parameter				Results											
	Unit	LOR / probe limit	ANZECC default trigger value	February 2016				March 2016				April 2016			
				SW7a*			SW7b	SW7a*			SW7b	SW7a*			SW7b
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	3.8	20.8	14.7	22.8	3.9	21.8	14.8	22.3	2.7	21.8	18.8	20.9
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	33	203	150	186	32	208	159	214	33	209	159	217
Dissolved oxygen (DO)	%	0-200	85-110	20	88	50	59	20	83	45	45	20	79	42	52
pH		0-14	6.5-8	0.4	7.4	6.8	6.9	0.4	7.5	6.8	7.2	0.4	7.5	6.8	7.8
Turbidity (NTU)	NTU	0-600	6-50	15	28	9	21	15	28	9	15	15	28	11	13
Total suspended solids (TSS)	mg/L	5	-	2	5	5	5	2	5	5	6	2	5	5	5
Aluminium (Al)	mg/L	0.01	0.055”	0.45	0.56	0.06	0.47	0.45	0.56	0.05	0.04	0.44	0.41	0.04	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	0.23	0.68	0.37	0.67	0.23	0.77	0.38	0.72	0.23	0.85	0.38	0.82
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	0.046	0.070	0.017	0.049	0.048	0.081	0.018	0.100	0.051	0.099	0.021	0.161
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	0.001	0.005	0.005	0.011	0.001	0.005	0.005	0.008	0.018	0.006	0.005	0.011
Total Nitrogen (TN)	mg/L	0.1	0.5	0.2	0.5	0.2	0.4	0.2	0.5	0.2	0.2	0.2	0.5	0.2	0.1
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				Results											
	Unit	LOR / probe limit	ANZECC default trigger value	May 2016				June 2016				July 2016			
				SW7a*			SW7b	SW7a*			SW7b	SW7a*			SW7b
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	2.5	21.8	18.9	16.9	2.5	21.8	18.9	16.3	3.1	21.8	17.7	11.2
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	33	209	159	208	34	204	150	144	34	204	150	180
Dissolved oxygen (DO)	%	0-200	85-110	20	79	42	57	22	85	43	87	22	85	43	77
pH		0-14	6.5-8	0.4	7.4	6.8	7.3	0.4	7.4	6.8	7.1	0.4	7.4	6.8	7.4
Turbidity (NTU)	NTU	0-600	6-50	15	28	11	3	17	40	12	47	17	40	12	16
Total suspended solids (TSS)	mg/L	5	-	2	5	5	9	2	5	5	6	1	5	5	5
Aluminium (Al)	mg/L	0.01	0.055”	0.39	0.25	0.03	0.02	0.25	0.22	0.03	0.56	0.25	0.26	0.03	0.25
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	0.23	0.83	0.38	0.90	0.23	0.78	0.38	0.44	0.22	0.78	0.40	0.51
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	0.049	0.099	0.026	0.191	0.049	0.099	0.026	0.037	0.049	0.099	0.026	0.042
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	0.008	0.018	0.006	0.005	0.005	0.018	0.006	0.005	0.006
Total Nitrogen (TN)	mg/L	0.1	0.5	0.2	0.5	0.2	0.2	0.2	0.5	0.2	0.6	0.2	0.5	0.2	0.1
Total Phosphorous (TP)	mg/L	0.01	0.05	0.03	0.03	0.01	0.01	0.03	0.03	0.01	0.04	0.03	0.03	0.01	0.02

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

Parameter				Results									
	Unit	LOR / probe limit	ANZECC default trigger value	February 2016					March 2016				
				SW8a derived trigger values*			SW8b	SW8c	SW8a derived trigger values*			SW8b	SW8c
				Std dev	80th %	20th %	Median	Median	Std dev	80th %	20th %	Median	Median
Temperature	^{0}C	-2-50	NA	1.6	20.6	18.4	21.1	23.7	1.6	20.6	18.4	20.6	23.3
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	58	188	108	213	219	58	188	108	242	274
Dissolved oxygen (DO)	%	0-200	85-110	37	98	16	38	59	37	98	16	38	49
pH		0-14	6.5-8	0.5	6.6	5.8	6.2	6.6	0.5	6.6	5.8	6.1	6.4
Turbidity	NTU	0-600	6-50	11	36	18	50	28	11	36	18	238	25
Total suspended solids (TSS)	mg/L	5	-	2	6	5	5	5	2	6	5	46	6
Aluminium (Al)	mg/L	0.01	0.055”	0.45	0.95	0.19	0.42	0.33	0.45	0.95	0.19	0.06	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	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.16	0.38	0.08	0.20	0.19	0.16	0.38	0.08	0.36	0.09
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	0.028	0.037	0.005	0.020	0.020	0.028	0.037	0.005	0.238	0.019
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	0.004	0.009	0.005	0.117	0.008	0.004	0.009	0.005	0.007	0.005
Total Nitrogen (TN)	mg/L	0.1	0.5	0.1	0.5	0.2	0.4	0.2	0.1	0.5	0.2	0.2	0.1
Total Phosphorous (TP)	mg/L	0.01	0.05	0.01	0.02	0.01	0.04	0.01	0.01	0.02	0.01	0.02	0.04

* 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 few number of events have been used to derive 80th and 20th percentile trigger values.

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									
				April 2016					May 2016				
				SW8a derived trigger values*			SW8b	SW8c	SW8a derived trigger values*			SW8b	SW8c
				Std dev	80th %	20th %	Median	Median	Std dev	80th %	20th %	Median	Median
Temperature	^{0}C	-2-50	NA	1.6	20.6	18.4	19.9	22.4	1.6	20.6	18.4	16.7	19.2
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	58	188	108	259	331	58	188	108	320	337
Dissolved oxygen (DO)	%	0-200	85-110	37	98	16	29	30	37	98	16	33	48
pH		0-14	6.5-8	0.5	6.6	5.8	6.9	6.4	0.5	6.6	5.8	6.4	6.2
Turbidity	NTU	0-600	6-50	11	36	18	55	11	11	36	18	30	2
Total suspended solids (TSS)	mg/L	5	-	2	6	5	7	5	2	6	5	12	6
Aluminium (Al)	mg/L	0.01	0.055”	0.45	0.95	0.19	0.02	0.02	0.45	0.95	0.19	0.01	0.01
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	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.16	0.38	0.08	0.57	0.07	0.16	0.38	0.08	0.15	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	0.028	0.037	0.005	0.298	0.080	0.028	0.037	0.005	0.319	0.095
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	0.004	0.009	0.005	0.013	0.010	0.004	0.009	0.005	0.010	0.017
Total Nitrogen (TN)	mg/L	0.1	0.5	0.1	0.5	0.2	0.1	0.1	0.1	0.5	0.2	0.2	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	0.02	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 few number of events have been used to derive 80th and 20th percentile trigger values.

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									
				June 2016					July 2016				
				SW8a derived trigger values*			SW8b	SW8c	SW8a derived trigger values*			SW8b	SW8c
				Std dev	80th %	20th %	Median	Median	Std dev	80th %	20th %	Median	Median
Temperature	^{0}C	-2-50	NA	1.8	20.5	17.1	17.0	16.0	2.0	20.5	16.8	15.2	13.1
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	58	194	115	171	220	62	215	112	179	247
Dissolved oxygen (DO)	%	0-200	85-110	36	98	17	67	73	36	98	17	43	57
pH		0-14	6.5-8	0.5	6.6	5.8	6.4	6.4	0.5	6.7	5.8	6.5	6.6
Turbidity	NTU	0-600	6-50	11	36	18	30	33	11	36	18	20	8
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”	0.44	0.91	0.12	0.44	0.28	0.45	0.90	0.09	1.46	0.11
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	0.0002	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	0.08	0.20	0.14	0.16	0.37	0.06	0.58	0.07
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	0.027	0.024	0.005	0.047	0.011	0.026	0.032	0.005	0.041	0.004
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	0.004	0.008	0.005	0.005	0.007	0.004	0.008	0.005	0.008	0.010
Total Nitrogen (TN)	mg/L	0.1	0.5	0.1	0.5	0.2	0.3	0.3	0.1	0.5	0.2	0.3	0.1
Total Phosphorous (TP)	mg/L	0.01	0.05	0.01	0.02	0.01	0.02	0.02	0.01	0.02	0.01	0.02	0.02

* 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 few number of events have been used to derive 80th and 20th percentile trigger values.

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											
				February 2016				March 2016				April 2016			
				SW9b*			SW9a	SW9b*			SW9a	SW9b*			SW9a
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	3.9	21.1	14.4	22.8	3.9	21.3	14.4	21.9	2.8	21.3	17.9	20.3
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	60	286	159	183	58	286	166	229	56	260	166	251
Dissolved oxygen (DO)	%	0-200	85-110	22	87	45	62	22	81	41	41	24	75	32	29
pH		0-14	6.5-8	0.3	7.1	6.8	7.0	0.3	7.2	6.8	7.2	0.4	7.3	6.8	7.3
Turbidity (NTU)	NTU	0-600	6-50	13	26	10	18	13	25	10	13	13	25	12	13
Total suspended solids (TSS)	mg/L	5	-	1	6	5	5	1	6	5	6	1	6	5	5
Aluminium (Al)	mg/L	0.01	0.055”	0.31	0.57	0.06	0.32	0.31	0.47	0.05	0.06	0.22	0.39	0.05	0.04
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	0.001	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.17	0.73	0.43	0.73	0.16	0.73	0.47	0.61	0.16	0.75	0.47	0.85
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	0.035	0.056	0.011	0.033	0.047	0.064	0.011	0.121	0.059	0.093	0.012	0.209
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	0.005	0.005	0.007	0.005	0.005	0.005	0.008	0.006	0.006	0.005	0.012
Total Nitrogen (TN)	mg/L	0.1	0.5	0.1	0.4	0.2	0.4	0.1	0.4	0.2	0.3	0.1	0.4	0.2	0.4
Total Phosphorous (TP)	mg/L	0.01	0.05	0.09	0.03	0.01	0.05	0.09	0.04	0.01	0.02	0.09	0.04	0.02	0.02

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				Results											
	Unit	LOR / probe limit	ANZECC default trigger value	May 2016				June 2016				July 2016			
				SW9b*			SW9a	SW9b*			SW9a	SW9b*			SW9a
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	2.5	21.3	18.3	18.4	2.5	21.3	18.3	15.4	3.1	21.3	17.2	11.2
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	51	242	166	262	48	235	136	111	48	235	136	173
Dissolved oxygen (DO)	%	0-200	85-110	24	67	28	77	27	88	28	91	28	88	28	86
pH		0-14	6.5-8	0.4	7.3	6.8	7.2	0.4	7.3	6.8	6.8	0.4	7.3	6.8	7.1
Turbidity (NTU)	NTU	0-600	6-50	13	25	12	6	14	38	13	41	13	38	13	21
Total suspended solids (TSS)	mg/L	5	-	1	6	5	5	1	6	5	5	1	6	5	5
Aluminium (Al)	mg/L	0.01	0.055”	0.21	0.19	0.04	0.02	0.20	0.17	0.04	0.36	0.22	0.30	0.04	0.33
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	0.001	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.28	0.80	0.50	1.58	0.28	0.80	0.47	0.29	0.28	0.80	0.50	0.41
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	0.147	0.013	0.348	0.084	0.147	0.013	0.011	0.084	0.147	0.012	0.012
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	0.006	0.007	0.005	0.015	0.006	0.007	0.005	0.005	0.005	0.006	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.5	0.1	0.4	0.2	0.3	0.1	0.4	0.3	0.6	0.1	0.4	0.2	0.2
Total Phosphorous (TP)	mg/L	0.01	0.05	0.09	0.04	0.02	0.03	0.09	0.05	0.02	0.03	0.09	0.06	0.02	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 3-20 Construction surface water quality results by waterway (cont.)

Parameter				Results											
	Unit	LOR / probe limit	ANZECC default trigger value	February 2016				March 2016				April 2016			
				SW10b*			SW10a	SW10b*			SW10a	SW10b*			SW10a
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	4.3	22.1	13.9	22.8	4.4	22.3	14.0	22.5	3.2	22.3	17.6	21.9
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	70	351	231	256	71	368	238	319	91	394	238	468
Dissolved oxygen (DO)	%	0-200	85-110	23	73	26	51	21	68	26	36	19	61	26	41
pH		0-14	6.5-8	0.3	7.3	6.7	6.9	0.3	7.3	6.7	7.3	0.4	7.4	6.8	7.2
Turbidity (NTU)	NTU	0-600	6-50	81	55	17	44	81	55	17	24	81	62	17	21
Total suspended solids (TSS)	mg/L	5	-	63	12	5	5	63	13	5	10	63	13	5	9
Aluminium (Al)	mg/L	0.01	0.055”	0.38	0.29	0.07	0.24	0.38	0.29	0.06	0.04	0.31	0.23	0.06	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	0.96	0.48	1.23	0.33	1.02	0.48	0.80	0.34	1.02	0.47	0.48
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	0.088	0.142	0.020	0.057	0.086	0.142	0.020	0.118	0.103	0.207	0.023	0.299
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	0.003	0.009	0.005	0.005	0.003	0.007	0.005	0.005	0.003	0.007	0.005	0.011
Total Nitrogen (TN)	mg/L	0.1	0.5	0.3	0.7	0.3	0.6	0.3	0.7	0.4	0.4	0.3	0.8	0.4	0.3
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.02

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				Results											
	Unit	LOR / probe limit	ANZECC default trigger value	May 2016				June 2016				July 2016			
				SW10b*			SW10a	SW10b*			SW10a	SW10b*			SW10a
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	2.8	22.3	18.7	18.9	2.9	22.3	17.6	15.2	3.5	22.3	17.1	11.7
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	106	422	238	523	116	412	176	161	119	421	175	204
Dissolved oxygen (DO)	%	0-200	85-110	19	59	26	64	23	73	26	82	24	76	26	78
pH		0-14	6.5-8	0.4	7.4	6.8	7.2	0.4	7.4	6.7	6.7	0.4	7.4	6.7	7.1
Turbidity (NTU)	NTU	0-600	6-50	81	55	16	16	79	50	16	52	19	49	16	15
Total suspended solids (TSS)	mg/L	5	-	63	12	5	5	63	12	5	11	5	12	5	5
Aluminium (Al)	mg/L	0.01	0.055”	0.31	0.21	0.04	0.01	0.25	0.20	0.04	0.64	0.26	0.22	0.04	1.02
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	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	0.45	0.44	0.35	1.02	0.45	0.51	0.35	1.02	0.44	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	0.103	0.266	0.027	0.217	0.103	0.266	0.025	0.018	0.104	0.266	0.024	0.017
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	0.001	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	0.007	0.005	0.006	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	0.3	0.7	0.4	0.5	0.3	0.8	0.4	0.6	0.2	0.8	0.4	0.1
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.02

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											
				February 2016				March 2016				April 2016			
				SW11b*			SW11a	SW11b*			SW11a	SW11b*			SW11a
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	4.7	23.4	16.2	23.6	4.6	24.1	16.8	23.4	2.9	24.1	19.6	21.0
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	218	602	189	332	384	707	259	1728	631	1064	259	2074
Dissolved oxygen (DO)	%	0-200	85-110	16	106	83	96	16	106	84	97	16	106	84	98
pH		0-14	6.5-8	0.6	7.2	6.4	6.9	0.5	7.3	6.4	7.5	0.6	7.5	6.5	7.9
Turbidity (NTU)	NTU	0-600	6-50	30	77	21	39	30	77	19	13	29	77	22	12
Total suspended solids (TSS)	mg/L	5	-	5	12	5	5	5	13	5	7	5	13	5	5
Aluminium (Al)	mg/L	0.01	0.055”	0.71	0.97	0.12	0.61	0.70	0.59	0.06	0.02	0.52	0.52	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	0.000	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	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.41	0.74	0.14	0.58	0.38	0.70	0.12	0.06	0.35	0.65	0.11	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	0.086	0.125	0.021	0.164	0.072	0.117	0.023	0.061	0.071	0.117	0.024	0.035
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	0.001	0.001	0.006	0.002	0.002	0.001	0.003	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	0.012	0.005	0.016	0.008	0.012	0.005	0.006	0.008	0.011	0.005	0.010
Total Nitrogen (TN)	mg/L	0.1	0.5	0.4	0.9	0.4	1.0	0.4	0.9	0.4	0.3	0.3	0.9	0.4	0.2
Total Phosphorous (TP)	mg/L	0.01	0.05	0.03	0.03	0.01	0.02	0.14	0.03	0.01	0.01	0.14	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 3-23 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				May 2016				June 2016				July 2016			
				SW11b*			SW11a	SW11b*			SW11a	SW11b*			SW11a
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	2.8	24.1	19.6	17.7	3.3	24.1	19.6	15.5	3.8	24.1	18.0	11.5
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	680	1712	276	1814	686	1712	259	275	676	1712	283	588
Dissolved oxygen (DO)	%	0-200	85-110	15	106	87	81	16	106	84	91	16	106	84	86
pH		0-14	6.5-8	0.6	7.7	6.7	7.8	0.7	7.7	6.4	6.1	0.7	7.7	6.4	7.0
Turbidity (NTU)	NTU	0-600	6-50	25	61	16	7	24	47	16	29	22	45	16	14
Total suspended solids (TSS)	mg/L	5	-	3	11	5	8	3	11	5	5	3	9	5	6
Aluminium (Al)	mg/L	0.01	0.055”	0.52	0.43	0.03	0.03	0.51	0.50	0.03	1.23	0.51	0.50	0.03	0.43
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	0.001	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.36	0.54	0.07	0.05	0.32	0.47	0.07	0.62	0.31	0.47	0.07	0.41
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	0.072	0.117	0.023	0.023	0.070	0.117	0.024	0.126	0.070	0.117	0.024	0.128
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	0.004	0.002	0.002	0.001	0.003
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	0.006	0.008	0.010	0.005	0.015	0.008	0.010	0.005	0.010
Total Nitrogen (TN)	mg/L	0.1	0.5	0.3	0.8	0.4	0.4	0.3	0.8	0.4	0.8	0.3	0.8	0.4	0.6
Total Phosphorous (TP)	mg/L	0.01	0.05	0.14	0.03	0.01	0.01	0.13	0.03	0.01	0.02	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 3-24 Construction surface water quality results by waterway (cont.)

Parameter				Results											
	Unit	LOR / probe limit	ANZECC default trigger value	February 2016				March 2016				April 2016			
				SW12a*			SW12b	SW12a*			SW12b	SW12a*			SW12b
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	4.1	21.7	15.0	22.9	4.1	22.2	15.5	22.5	2.7	22.2	17.6	21.0
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	63	297	169	213	62	297	169	220	54	283	169	238
Dissolved oxygen (DO)	%	0-200	85-110	24	61	17	21	24	57	15	29	25	61	16	27
pH		0-14	6.5-8	0.5	6.8	6.1	6.5	0.5	6.9	6.2	7.1	0.5	7.0	6.2	6.8
Turbidity (NTU)	NTU	0-600	6-50	33	72	20	60	37	76	22	33	35	79	28	40
Total suspended solids (TSS)	mg/L	5	-	11	14	5	19	11	16	5	11	11	16	6	9
Aluminium (Al)	mg/L	0.01	0.055”	0.53	0.83	0.11	0.22	0.53	0.68	0.09	0.13	0.36	0.59	0.07	0.02
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.002	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	1.15	0.54	1.22	0.39	1.15	0.37	0.88	0.40	1.07	0.29	1.00
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	0.063	0.174	0.050	0.193	0.063	0.174	0.049	0.182	0.069	0.198	0.055	0.223
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	0.001	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	0.009	0.005	0.007	0.005	0.009	0.005	0.006	0.005	0.011	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.5	0.2	0.8	0.5	0.7	0.2	0.8	0.5	0.4	0.2	0.8	0.5	0.4
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.05	0.02	0.04	0.02	0.05	0.02	0.02	0.02	0.05	0.02	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 3-25 Construction surface water quality results by waterway (cont.)

Parameter				Results											
	Unit	LOR / probe limit	ANZECC default trigger value	May 2016				June 2016				July 2016			
				SW12a*			SW12b	SW12a*			SW12b	SW12a*			SW12b
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	2.6	22.2	18.6	17.2	2.8	22.2	18.6	14.9	3.3	22.2	17.7	11.0
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	55	289	169	265	47	235	164	183	47	232	164	187
Dissolved oxygen (DO)	%	0-200	85-110	23	59	16	29	22	59	16	41	21	52	16	32
pH		0-14	6.5-8	0.5	7.3	6.3	7.1	0.5	7.2	6.3	6.1	0.5	7.2	6.3	6.4
Turbidity (NTU)	NTU	0-600	6-50	30	76	28	55	28	71	26	27	27	65	24	11
Total suspended solids (TSS)	mg/L	5	-	11	14	6	9	10	14	6	10	10	14	6	5
Aluminium (Al)	mg/L	0.01	0.055”	0.34	0.42	0.04	0.02	0.30	0.42	0.04	0.77	0.31	0.48	0.04	0.40
Arsenic (As)	mg/L	0.001	0.024	0.000	0.001	0.001	0.002	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	0.39	1.01	0.28	1.15	0.38	0.97	0.28	0.60	0.36	0.97	0.28	0.89
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	0.074	0.208	0.062	0.220	0.071	0.208	0.076	0.054	0.073	0.208	0.066	0.050
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	0.011	0.005	0.006	0.004	0.009	0.005	0.008	0.004	0.009	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	0.5	0.2	0.8	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	0.03	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 3-26 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				February 2016				March 2016				April 2016			
				SW13b*			SW13a	SW13b*			SW13a	SW13b*			SW13a
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	4.1	21.5	14.8	22.8	4.1	21.8	15.4	22.7	2.7	21.8	17.7	22.1
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	112	395	213	287	106	395	215	341	102	395	223	410
Dissolved oxygen (DO)	%	0-200	85-110	16	65	33	75	16	63	32	55	16	62	30	55
pH		0-14	6.5-8	0.4	6.5	5.9	6.9	0.4	6.6	5.9	6.9	0.5	6.7	6.0	7.0
Turbidity (NTU)	NTU	0-600	6-50	28	69	37	39	25	64	37	50	24	64	43	25
Total suspended solids (TSS)	mg/L	5	-	7	16	5	8	7	16	5	18	7	16	6	8
Aluminium (Al)	mg/L	0.01	0.055”	0.50	1.00	0.10	0.21	0.48	0.78	0.10	0.13	0.45	0.67	0.09	0.11
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	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.41	1.29	0.69	0.51	0.42	1.29	0.62	0.72	0.42	1.26	0.61	0.41
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	0.081	0.195	0.037	0.099	0.087	0.219	0.037	0.165	0.085	0.219	0.041	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	0.002	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	0.008	0.009	0.010	0.005	0.007	0.009	0.010	0.005	0.016
Total Nitrogen (TN)	mg/L	0.1	0.5	0.3	0.9	0.6	0.7	0.3	0.9	0.6	0.7	0.3	1.0	0.7	0.5
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.04	0.02	0.02	0.02	0.05	0.02	0.07	0.02	0.05	0.02	0.02

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											
				May 2016				June 2016				July 2016			
				SW13b*			SW13a	SW13b*			SW13a	SW13b*			SW13a
				Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median	Std dev	80th %	20th %	Median
Temperature	^{0}C	-2-50	NA	2.7	21.8	17.9	17.1	2.8	21.8	17.9	15.5	3.3	21.8	16.8	14.0
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	103	395	223	401	85	331	203	184	83	323	202	248
Dissolved oxygen (DO)	%	0-200	85-110	16	62	30	48	16	63	30	71	16	63	30	74
pH		0-14	6.5-8	0.5	7.0	6.1	7.1	0.5	7.0	6.1	6.1	0.5	7.0	6.1	6.5
Turbidity (NTU)	NTU	0-600	6-50	23	61	40	53	24	59	39	27	18	57	38	11
Total suspended solids (TSS)	mg/L	5	-	7	16	5	8	7	16	5	5	6	15	5	5
Aluminium (Al)	mg/L	0.01	0.055”	0.42	0.46	0.06	0.03	0.35	0.46	0.06	1.15	0.37	0.67	0.06	0.64
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	0.002	0.001	0.001	0.002	0.002	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.41	1.26	0.61	0.28	0.42	1.26	0.61	0.78	0.41	1.26	0.61	1.00
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	0.238	0.057	0.061	0.082	0.238	0.060	0.067	0.082	0.238	0.060	0.059
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	0.009	0.010	0.005	0.014	0.009	0.010	0.005	0.018	0.008	0.010	0.005	0.008
Total Nitrogen (TN)	mg/L	0.1	0.5	0.2	0.9	0.7	0.6	0.2	0.9	0.6	0.6	0.4	0.9	0.6	0.2
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.05	0.02	0.02	0.02	0.05	0.02	0.02	0.02	0.05	0.02	0.02

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. Three of the six months were well below average for the period. Most waterways were continuous (ie a connection between upstream and downstream sampling points was maintained) throughout the monitoring period. Exceptions to this were experienced at SW1, SW2, SW7, SW8, SW11 and SW12 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 SW3. 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 and SW6a/b. At SW1 the greater differences typically coincide with no visible flow or sample points persisting as isolated ponds. For all freshwater waterways the calculated median values were within the default trigger values for low land rivers presented in the ANZECC guidelines. At SW6a/b, the greatest variability occurred following wet weather events. In nearly all instances electrical conductivity was lower upstream than downstream. The differences are considered most likely attributable to the presents of the coffer-dam limiting the effect of tidal flushing at SW6a immediately following heavy rainfall events. Electrical conductivity tends to stabilise between upstream and downstream following a short period of dry conditions and the ability of the waterway to be influenced by tidal flushing.

  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 SW3, SW6, SW8, SW11 and SW12. SW2a, SW5b and SW9 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, particularly SW1 and SW13, in all instance 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 SW7, SW9 and SW10 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 been observed to have algae outbreaks that trigger substantial fluctuations in dissolved oxygen levels from month to month. It should be noted that a Salvinia (*Salvinia molesta*) outbreak at SW2a was in a state of die-back throughout much of the monitoring period following chemical treatment. At SW1

and SW13, it was noted that these waterways persistent with little to no flow during periods when upstream and downstream variability was recorded. With the exception of SW2, the variability recorded within all waterways remains generally consistent with pre-construction conditions.

Impacts attributable to construction are considered negligible.

- pH – Calculated median values were generally within the calculated upstream 80th and 20th percentile trigger values for all waterways throughout the six month monitoring period. However, there were minor exceptions (in most instances between pH 0.1 and 0.5) at nearly all waterways for at least an individual month.

  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 generally low and below average rainfall. Due largely to an increase in rainfall and elevated water levels during the previous construction periods, pH levels were above the calculated 80th percentile levels for all months. In all instances, pH levels at SW5b were within the default trigger values for low land rivers presented 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 the predominant factors affecting pH.

- Turbidity – Calculated median values for SW1c, SW2a, SW5b SW6b, SW7b, SW8b 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. Where calculated median levels exceeded the ANZECC upper limit default trigger value, in all but those recorded at SW1c and SW8b, upstream values for individual events were comparable to those recorded downstream.

  At 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. Roads and Maritime has continued to be proactive in its response to minimising any impacts attributable to the project. This is discussed further in section 3.6.

  An investigation into the elevated sampling event during March 2016 at SW8b found that the erosion and sediment controls had not been installed in accordance with the Progressive Erosion and Sediment Control Plan (PESCP). Due to the fact that the downstream monitoring location persisted as an isolated pond, this water was able to be contained on site and pumped to a sediment basin for treatment. As such, a Category 2 incident was raised and controls rectified immediately. For the April and May 2016 exceedance at SW8b, it was noted that the sampling point persisted as an isolated pond with no connection to upstream flows beyond the construction corridor. It is considered that fines deposited in the waterway scour rock that lines the waterway (from previous wet weather events) mobilise during small rainfall events and take considerable time to settle. There may also be a contribution of sediment from the construction corridor, although erosion and sediment controls are installed and effectively maintained. Extensive landscaping activities commenced and have been completed either side of

Barrys Creek in the vicinity of SW8b. It should be noted that when "normal" waterway conditions persist (ie flow between all sampling points) turbidity levels were generally consistent at all sampling points.

- Nitrogen and phosphorus – Calculated median values were generally within the calculated upstream 80th and 20th percentile trigger values for all waterways throughout the six-month monitoring period. All exceptions 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.

  While broader catchment activities are likely to be impacting nitrogen and phosphorus levels in a number of the waterways, 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 SW1a (upstream sampling location) on one occasion (4 February 2016). The catchment for SW1 includes rural properties and yard associated with an industrial premises. Despite the visual observation, laboratory analysis returned TPH results below the limit of laboratory reporting.

- Metals – Analysis of metals showed limited variation in levels for nearly all sampling locations and analytes. Exceptions included aluminium, iron and magnesium 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

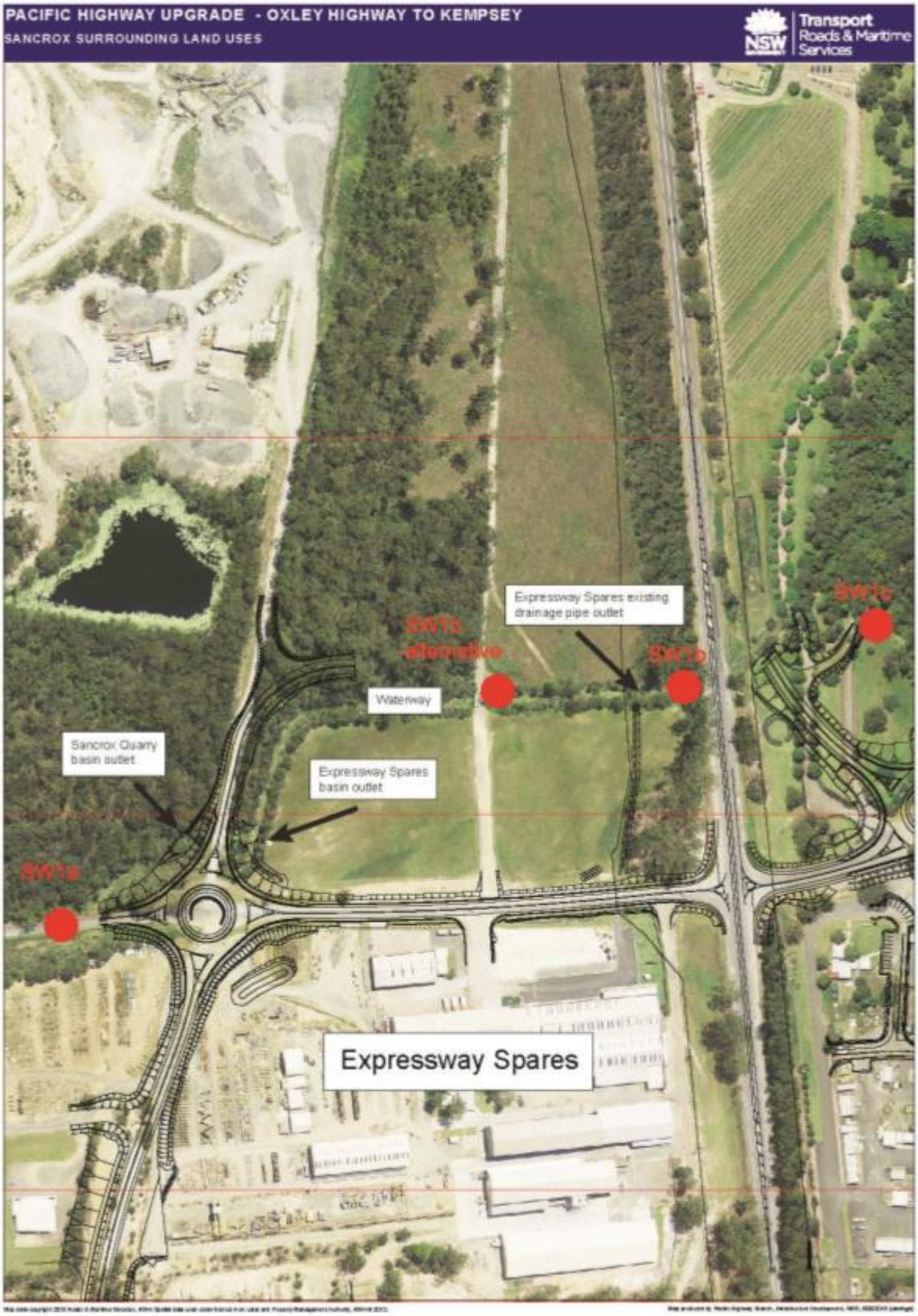
Impacts on water quality attributable to the project were generally considered to be negligible during the monitoring period. However, elevated turbidity levels at SW1 and SW8 downstream monitoring sites were on occasions considered in part or largely attributable to project activities. In response, Roads and Maritime and its construction partners have adopted a number of responses to minimise the likelihood of future reoccurrences. These include, but are not limited to:

- SW1 – Landscaping implemented as part of Stage 1 has generally developed well across the site. The construction contractor for Stage 1 and Roads and Maritime continue to monitor its progress and undertaken maintenance through weed control or replacement plantings where necessary.

  The Stage 3 contractor is also well advanced with construction of the main alignment in this area and service road to Cassegrain Winery. Progressive erosion and sediment control plans continue to be implemented to minimise the potential for impacts on this waterway.

- SW8b – Extensive landscaping activities including the placement of mulch, seeding and tube stock planting has been undertaken on the riparian area of Barrys Creek in proximity to SW8b during July 2016. The establishment of landscaping and monitoring/treatment for weeds will continue during subsequent reporting periods.

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
- GW05 and GW20 were not accessible for three of the four monitoring events during this reporting period due to restricted access attributable to construction. GW22 and GW23 were not accessible on one occasion each for the same reason
- 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 had insufficient water to sample during the June 2016 monitoring event
- 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 two out of four occasions during this construction monitoring period (ie April and June 2016)
- GW09 has either been dry or contained insufficient water to sample during all construction monitoring events. The site was also destroyed in August 2015 and reinstated prior to June 2016 sampling event
- GW10, GW19, GW24, GW25 and GW28 had insufficient water to sample on between one and three occasions during the monitoring period
- 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 has not be reinstated
- 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
- Laboratory analysis was conducted for various parameters on one occasion for GW03, GW12, GW15, GW17, GW18, GW21, GW23, GW24, GW26, GW27, GW29 and GW30 only. As indicated previously, all other boreholes had been damaged by construction during previous reporting periods
- All metals analysed for the April 2016 monitoring event were for total metals only. Previous monitoring events (with the exception of July 2015 and November 2015) 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 April 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

- Subsequent laboratory analysis for water samples was undertaken on 1 August 2016 and will be reported in the next six monthly water quality monitoring report.

3.8 Summary of groundwater results

Table 3-28 to Table 3-41 present data collected manually during the construction period 22 January 2016 to 21 July 2016 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 January 2016). This report presents data from monitoring undertaken between February 2016 and July 2016). 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	
			20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16	
Dissolved Aluminium	mg/L	0.01	4.24	4.6	DNS		<0.01*	<0.01*	DNS		0.03	0.03	0.35	
Dissolved Arsenic	mg/L	0.001	0.007	0.008			0.0034	0.0046			0.003	0.003	<0.001	
Dissolved Cadmium	mg/L	0.0001	0.001	0.001			<0.01*	<0.01*			<0.001*	<0.001*	0.0023	
Dissolved Chromium	mg/L	0.001	0.001	0.001			<0.01*	<0.01*			0.012	0.012	0.001	
Dissolved Copper	mg/L	0.001	0.043	0.063			<0.01*	<0.01*			0.007	0.007	0.027	
Total Iron	mg/L	0.05	7.01	10.84			42.54	59.28			53.7	149.8	1.88	
Dissolved Lead	mg/L	0.001	0.021	0.03			<0.01*	<0.01*			<0.001*	<0.001*	<0.001	
Total Manganese	mg/L	0.001	0.472	0.487			0.458	0.482			0.252	0.483	0.647	
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.033	0.035			0.0032	0.0038			0.0048	0.0132	0.022	
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	0.522	0.553			0.0074	0.0086			0.013	0.013	0.085	
EC laboratory	uS/cm		5166	5982			383.6	468.8			967	1292	1420	
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													0.03	
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 April 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	
			20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16	
Dissolved Aluminium	mg/L	0.01	<0.01*	<0.01*	DNS		<0.01*	<0.01*	DNS				DNS	
Dissolved Arsenic	mg/L	0.001	0.0034	0.0046			0.006	0.010						
Dissolved Cadmium	mg/L	0.0001	<0.001*	<0.001*			<0.001*	<0.001*						
Dissolved Chromium	mg/L	0.001	0.002	0.002			<0.001*	<0.001*						
Dissolved Copper	mg/L	0.001	<0.001*	<0.001*			<0.001*	<0.001*						
Total Iron	mg/L	0.05	66.3	93.3			158	510			38.3	38.3		
Dissolved Lead	mg/L	0.001	<0.001*	<0.001*			<0.001*	<0.001*						
Total Manganese	mg/L	0.001	0.410	0.540			0.799	0.980						
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.0018	0.0042			0.004	0.01						
Dissolved Silver	mg/L	0.001	<0.001*	<0.001*			<0.001*	<0.001*						
Dissolved Zinc	mg/L	0.005	0.010	0.014			0.019	0.019						
EC laboratory	uS/cm		3212	4922			6598	7294			168	168		
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														
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 April 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	
			20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16	
Dissolved Aluminium	mg/L	0.01			DNS		0.23^	0.23^	DNS		1^	1^	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 April 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	
			20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16	
Dissolved Aluminium	mg/L	0.01	0.26	0.56	DNS		0.02	0.02	0.51		0.02	0.03	DNS	
Dissolved Arsenic	mg/L	0.001	<0.001*	<0.001*			0.029	0.030	0.028		0.002	0.004		
Dissolved Cadmium	mg/L	0.0001	0.0022	0.0028			<0.001*	<0.001*	0.0032		<0.001*	<0.001*		
Dissolved Chromium	mg/L	0.001	0.001	0.001			<0.001*	<0.001*	0.003		0.001	0.001		
Dissolved Copper	mg/L	0.001	0.1818	0.2292			<0.001*	<0.001*	0.381		<0.001*	<0.001*		
Total Iron	mg/L	0.05	46.8	219.3			185	283	49.2		41.5	60.4		
Dissolved Lead	mg/L	0.001	<0.001*	<0.001*			<0.001*	<0.001*	<0.001		<0.001*	<0.001*		
Total Manganese	mg/L	0.001	0.791	1.623			5.07	7.14	3.74		0.217	0.249		
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.0626	0.0884			0.003	0.003	0.012		0.003	0.003		
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	0.0788	0.0992			0.028	0.034	0.118		0.014	0.023		
EC laboratory	uS/cm		2904	7650			3314	6962	1440		207	305		
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													
Bicaronate / Alkalinity	mg $CaCO_3/L^{-1}$													
Chloride	mg/L		581	1422			394	781			25	36		
Nitrate									0.26					
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 April 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	
			20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16	
Dissolved Aluminium	mg/L	0.01	4.07	4.29	DNS		0.01	0.01	0.75				2.12	
Dissolved Arsenic	mg/L	0.001	0.001	0.001			0.020	0.021	0.021				0.003	
Dissolved Cadmium	mg/L	0.0001	<0.001*	<0.001*			<0.001*	<0.001*	0.0002				0.0005	
Dissolved Chromium	mg/L	0.001	<0.001*	<0.001*			<0.001*	<0.001*	0.001				0.003	
Dissolved Copper	mg/L	0.001	0.114	0.200			<0.001*	<0.001*	0.056				0.03	
Total Iron	mg/L	0.05	2.05	3.40			8.13	10.30	3.84				5.18	
Dissolved Lead	mg/L	0.001	0.001	0.001			<0.001*	<0.001*	0.002				0.003	
Total Manganese	mg/L	0.001	0.757	0.759			2.85	2.99	2.59				0.225	
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.028	0.029			0.003	0.003	0.006				0.004	
Dissolved Silver	mg/L	0.001	<0.001*	<0.001*			<0.001*	<0.001*	<0.001				<0.001	
Dissolved Zinc	mg/L	0.005	0.130	0.146			0.007	0.007	0.065				0.057	
EC laboratory	uS/cm		7480	8074			3768	3798	3280				3550	
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													
Bicaronate / Alkalinity	mg $CaCO_3/L^{-1}$													
Chloride	mg/L		2386	3480			990	1559						
Nitrate									0.77				0.2	
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 April 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	
			20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16	
Dissolved Aluminium	mg/L	0.01	<0.01*	<0.01*	1.46		<0.01^	<0.01^	DNS				DNS	
Dissolved Arsenic	mg/L	0.001	0.007	0.008	0.009		0.001^	0.001^						
Dissolved Cadmium	mg/L	0.0001	<0.001*	<0.001*	0.0002		<0.001^	<0.001^						
Dissolved Chromium	mg/L	0.001	0.001	0.001	0.002		<0.001^	<0.001^						
Dissolved Copper	mg/L	0.001	<0.001*	<0.001*	0.049		0.013^	0.013^						
Total Iron	mg/L	0.05	5.76	9.92	5.51		18.1	48.4						
Dissolved Lead	mg/L	0.001	<0.001*	<0.001*	0.008		<0.001^	<0.001^						
Total Manganese	mg/L	0.001	1.64	1.83	1.49		0.636^	0.636^						
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.003	0.005	0.004		0.015^	0.015^						
Dissolved Silver	mg/L	0.001	<0.001*	<0.001*	<0.001		<0.001^	<0.001^						
Dissolved Zinc	mg/L	0.005	0.011	0.015	0.041		0.057^	0.057^						
EC laboratory	uS/cm		1652	1658	1550		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													
Bicaronate / Alkalinity	mg $CaCO_3/L^{-1}$													
Chloride	mg/L		101	109			90	98						
Nitrate					0.02									
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 April 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	
			20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16	
Dissolved Aluminium	mg/L	0.01	0.05	0.05	4.76		0.05^	0.05^	2.11		0.05	0.19	DNS	
Dissolved Arsenic	mg/L	0.001	0.002	0.002	0.009		<0.01^	<0.01^	0.004		0.001	0.001		
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	0.0003		<0.001^	<0.001^	<0.0001		<0.001*	<0.001*		
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	0.005		<0.001^	<0.001^	0.003		<0.001*	<0.001*		
Dissolved Copper	mg/L	0.001	0.048	0.048	0.251		0.01^	0.01^	0.036		0.009	0.009		
Total Iron	mg/L	0.05	43.2	43.2	7.02		199	217	1.37		21.9	35.8		
Dissolved Lead	mg/L	0.001	<0.001	<0.001	0.008		<0.001^	<0.001^	0.002		<0.001*	<0.001*		
Total Manganese	mg/L	0.001	0.358	0.358	0.323		0.011^	0.011^	0.038		0.458	0.642		
Dissolved Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.144	0.144	0.014		<0.001^	<0.001^	0.008		0.003	0.006		
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	0.122	0.122	0.146		0.084^	0.084^	0.309		0.069	0.239		
EC laboratory	uS/cm		1750	1750	912		872	2056	562		417	624		
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													
Bicaronate / Alkalinity	mg $CaCO_3/L^{-1}$													
Chloride	mg/L		178	178			201	475			55.4	86		
Nitrate	mg/L				0.03				0.24					
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 April 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	
			20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16	
Dissolved Aluminium	mg/L	0.01	0.19^	0.19	63.2		0.05^	0.05^	DNS				5.37	
Dissolved Arsenic	mg/L	0.001	0.002^	0.002	0.012		0.001^	0.001^					0.002	
Dissolved Cadmium	mg/L	0.0001	<0.001^	<0.001	0.0008		0.001^	0.001^					0.0017	
Dissolved Chromium	mg/L	0.001	<0.001^	<0.001	0.06		<0.001^	<0.001^					0.01	
Dissolved Copper	mg/L	0.001	0.428^	0.428	1.51		0.066^	0.066^					4.04	
Total Iron	mg/L	0.05	34.2	98.5	115		89.0	103.3			41.3	41.3	2.3	
Dissolved Lead	mg/L	0.001	<0.001^	<0.001	0.052		0.001^	0.001^					0.005	
Total Manganese	mg/L	0.001	0.172^	0.172	0.5		0.902^	0.902^					0.196	
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.028^	0.028	0.027		0.016^	0.016^					0.026	
Dissolved Silver	mg/L	0.001	<0.001^	<0.001	0.001		<0.001^	<0.001^					<0.001	
Dissolved Zinc	mg/L	0.005	0.13^	0.13	1.18		0.15^	0.15^					0.308	
EC laboratory	uS/cm		5530^	5530^	763		805^	805^			494	494	1050	
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													
Bicaronate / Alkalinity	mg $CaCO_3/L^{-1}$													
Chloride	mg/L		1686^	1686^			235^	235^			136	136		
Nitrate					0.04								<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 April 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	
			20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16		20th per#	80th per#	Apr 16	
Dissolved Aluminium	mg/L	0.01	<0.01^	<0.01^	2.9				DNS		3.21^	3.21^	301	
Dissolved Arsenic	mg/L	0.001	0.001^	0.001^	0.005						0.014^	0.014^	0.092	
Dissolved Cadmium	mg/L	0.0001	<0.001^	<0.001^	0.0001						0.001^	0.001^	0.0054	
Dissolved Chromium	mg/L	0.001	<0.001^	<0.001^	0.008						0.006^	0.006^	0.158	
Dissolved Copper	mg/L	0.001	0.002^	0.002^	0.89						0.017^	0.017^	1.23	
Total Iron	mg/L	0.05	6.61	10.20	8.41		65.3	65.3			109	110	139	
Dissolved Lead	mg/L	0.001	<0.001^	<0.001^	0.007						0.009^	0.009^	0.352	
Total Manganese	mg/L	0.001	0.492^	0.492^	1.5						0.571^	0.571^	2.36	
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.006^	0.006^	0.027						0.031^	0.031^	0.254	
Dissolved Silver	mg/L	0.001	<0.001^	<0.001^	<0.001						<0.001^	<0.001^	0.002	
Dissolved Zinc	mg/L	0.005	0.026^	0.026^	0.069						5.25^	5.25^	16.2	
EC laboratory	uS/cm		567	746	736		2140	2140			291	539	253	
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													
Bicaronate / Alkalinity	mg $CaCO_3/L^{-1}$													
Chloride	mg/L		80	81			34	34			45	63		
Nitrate					0.01								0.15	
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 April 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		GW		Results		GW		Results	
			20th per#	80th per#	Apr 16		20th per#	80th per#	Nov 15	Jan 16	20th per#	80th per#	Nov 15	Jan 16
Dissolved Aluminium	mg/L	0.01	2.34	2.60	17.2									
Dissolved Arsenic	mg/L	0.001	0.002	0.003	0.007									
Dissolved Cadmium	mg/L	0.0001	0.001	0.001	0.0002									
Dissolved Chromium	mg/L	0.001	<0.001*	<0.001*	0.008									
Dissolved Copper	mg/L	0.001	2.09	2.23	0.801									
Total Iron	mg/L	0.05	36.9	115.6	16									
Dissolved Lead	mg/L	0.001	<0.001*	<0.001*	0.006									
Total Manganese	mg/L	0.001	3.21	3.58	0.378									
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.161	0.172	0.024									
Dissolved Silver	mg/L	0.001	<0.001*	<0.001*	<0.001									
Dissolved Zinc	mg/L	0.005	0.813	0.859	0.173									
EC laboratory	uS/cm		4436	4934	1290									
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													
Bicaronate / Alkalinity	mg $CaCO_3/L^{-1}$													
Chloride	mg/L		1219	1390										
Nitrate					0.02									
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 April 2016 event is for "total" metals despite otherwise indicated in table.

Table 3-38 Construction groundwater level – manual record

Borehole reference	Top of casting RL (mAHD)	Depth of water level										
		Pre-construction		Construction								
		20th per	80th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016
GW01 (mTOC)	20.11	4.41	4.93	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	5.85	5.98
GW01 (mAHD)		15.18	15.70									
GW02 (mTOC)	3.57	1.95	2.96	Not taken	1.84	1.47	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW02 (mAHD)		0.61	1.62									
GW03 (mTOC)	2.64	0.81	2.08	Not taken	0.27	0.25	0.32	Not taken	0.6	0.12	0.8	0.37
GW03 (mAHD)		0.58	1.81									
GW04 (mTOC)	1.69	1.11	2.21	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	1.47	1.12
GW04 (mAHD)		-0.52	0.58									
GW05 (mTOC)	1.24	0.81	1.55	Not taken	0.16	0.25	0.34	Not taken	Not taken	Not taken	0.71	0.50
GW05 (mAHD)		-0.31	0.43									
GW06 (mTOC)	20.1	5.36	5.85	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	2.22	2.27
GW06 (mAHD)		14.25	14.74									
GW07 (mTOC)	15.98	2.86	5.19	Not taken	5.6	5.36	4.41	Not taken	5.37	6.36	6.65	6.46
GW07 (mAHD)		10.79	13.12									
GW08 (mTOC)	19.09	6.94	6.94	Dry	Dry	7.05	Dry	7.52	8.3	Dry	Dry	8.07
GW08 (mAHD)		12.15	12.15									
GW09	17.57	8.05	8.66	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Dry	Not taken

Borehole reference	Top of casting RL (mAHD)	Depth of water level										
		Pre-construction		Construction								
		20th per	80th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016
(mTOC)												
GW09 (mAHD)		8.91	9.52									
GW10 (mTOC)	15.38	3.34	7.27	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Dry	Dry
GW10 (mAHD)		8.11	12.04									
GW11 (mTOC)	1.591	1.49	2.45	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	4.34	Not taken
GW11 (mAHD)		-0.86	0.10									
GW12 (mTOC)	1.573	0.74	1.68	Not taken	0.2	0.23	0.31	Not taken	0.74	0.3	0.9	0.48
GW12 (mAHD)		-0.20	0.83									
GW13 (mTOC)	2.04	1.44	2.05	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	1.74	1.19
GW13 (mAHD)		-0.01	0.60									
GW14 (mTOC)	5.656	2.60	3.43	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	1.95	1.37
GW14 (mAHD)		2.23	3.06									
GW15 (mTOC)	13.79	10.01	10.32	Not taken	9.9	9.74	8.95	Not taken	8.94	9.26	9.36	6.83
GW15 (mAHD)		3.47	3.78									
GW16 (mTOC)	14.14	8.13	8.13	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW16 (mAHD)		6.01	6.01									
GW17 (mTOC)	59.47	Dry	Dry	Not taken	11.82	11.54	11.5	Not taken	11.46	11.5	11.5	11.19
GW17 (mAHD)		Dry	Dry									

Borehole reference	Top of casting RL (mAHD)	Depth of water level										
		Pre-construction		Construction								
		20th per	80th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016
GW18 (mTOC)	96.71	33.98	34.04	Not taken	32.78	33.9	33.86	Not taken	33.78	33.72	33.67	33.66
GW18 (mAHD)		62.67	62.73									
GW19 (mTOC)	51.81	7.53	9.46	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Dry	Dry
GW19 (mAHD)		42.35	44.28									
GW20 (mTOC)	87.18	Dry	Dry	Dry	33.15	Dry	Dry	Dry	Not taken	Not taken	Not taken	Not taken
GW20 (mAHD)		Dry	Dry									
GW21 (mTOC)	51.29	4.65	5.79	Not taken	4.76	2.23	2.82	Not taken	2.72	3.42	3.99	2.82
GW21 (mAHD)		45.50	46.64									
GW22 (mTOC)	17.27	4.64	5.28	Not taken	2.29	1.42	1.67	Not taken	1.66	0.45	Not taken	Not taken
GW22 (mAHD)		11.99	12.63									
GW23 (mTOC)	39.22	15.93	15.99	Not taken	16.7	17.2	17.14	Not taken	16.87	Not taken	16.85	Not taken
GW23 (mAHD)		23.23	23.29									
GW24 (mTOC)	26.09	6.25	7.78	Dry	Dry	6.5	7.16	Not taken	7.5	7.84	Dry	6.18
GW24 (mAHD)		18.31	19.84									
GW25 (mTOC)	61.72	11.53	12.35	Not taken	13.08	Dry	Dry	Dry	Dry	Dry	Dry	Dry
GW25 (mAHD)		49.37	50.19									
GW26 (mTOC)	54.56	14.17	14.98	Not taken	15.1	14.1	13.81	Not taken	14.41	13.88	14.28	13.70
GW26		39.58	40.39									

Borehole reference	Top of casting RL (mAHD)	Depth of water level										
		Pre-construction		Construction								
		20th per	80th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016
(mAHD)												
GW27 (mTOC)	74.33	27.45	27.66	Dry	29.25	29.17	26.67	Not taken	27.24	27.52	28.08	28.08
GW27 (mAHD)		46.67	46.88									
GW28 (mTOC)	54.65	8.45	9.40	Dry	Dry	8.76	9.1	Not taken	9.44	Dry	Dry	9.02
GW28 (mAHD)		45.25	46.20									
GW29 (mTOC)	45.11	2.97	8.82	Not taken	6.88	5.89	7.37	Not taken	8.08	8.73	8.49	6.87
GW29 (mAHD)		36.29	42.14									
GW30 (mTOC)	41.49	3.16	4.59	Not taken	2.95	3.12	4.59	Not taken	4.57	5.06	5.43	5.55
GW30 (mAHD)		36.90	38.33									

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

Borehole reference	Electrical conductivity (uS/cm)										
	Pre-construction		Construction								
	20th per	80th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016
GW01	5062	5502	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	5619	6750
GW02	293	656	662	589	817	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW03	1009	1283	959	729	679	866	1267	1167	1149	1192	1125
GW04	3027	5520	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	1035	791
GW05	5970	6728	6025	5010	6	4975	6283	Not taken	Not taken	6138	5963
GW06	1359	8204	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	4732	4629
GW07	172	230	1578	189	173	138	179	150.6	210	Insufficient water	171

Borehole reference	Electrical conductivity (uS/cm)										
	Pre-construction		Construction								
	20th per	80th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016
GW08	No record	No record	Dry	Insufficient water	656	Insufficient water	733	493	Insufficient water	Insufficient water	732
GW09	1981	2536	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient water	Not taken
GW10	443	780	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient water	Dry
GW11	1296	5880	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	1622	Not taken
GW12	2467	4460	1376	1265	1457	1199	1421	1556	1352	1495	1371
GW13	186	295	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	173	216
GW14	6312	7068	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	1897	17820
GW15	3600	3740	3333	2957	3275	2782	3394	3194	3180	3093	3306
GW16	No record	No record	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW17	No record	No record	3555	3151	3454	2888	3480	3250	8	3355	3246
GW18	1588	1648	1513	1469	1518	1337	1543	1510	3	1527	1476
GW19	554	602	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient water	Insufficient water
GW20	No record	No record	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Not taken	Not taken	Not taken	Not taken
GW21	1861	2426	731	833	490	666	9	1038	404	1343	584
GW22	842	5484	478	403	345	273	336	194	637	Not taken	Not taken
GW23	415	726	230	288	216	192	275	281	Not taken	308	Not taken
GW24	509	974	Insufficient water	Insufficient water	358	464	336	235	624	Insufficient water	378
GW25	476	965	548	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Dry
GW26	1083	1337	1060	Insufficient water	871	732	878	420	871	425	500
GW27	535	737	Insufficient water	Insufficient water	464	491	536	588	611	625	339
GW28	181	225	Insufficient water	Insufficient water	202	Insufficient water	140	Insufficient water	Insufficient water	Insufficient water	213
GW29	222	299	202	187	191	171	191	212	221	220	218
GW30	1750	3800	1075	1062	854	1072	438	778	1124	1360	401

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

Borehole reference	pH										
	Pre-construction		Construction								
	20th per	80th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016
GW01	4.1	4.5	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	6.8	7.5
GW02	6.2	6.5	5.9	6.4	7.0	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW03	6.0	6.5	6.8	6.3	7.5	6.5	16.16	5.8	6.3	6.8	8.4
GW04	6.0	6.3	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	6.7	7.5
GW05	6.2	6.6	6.7	6.7	7.0	6.2	6.2	Not taken	Not taken	6.9	7.1
GW06	3.6	5.0	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	4.2	4.5
GW07	5.6	5.9	6.0	5.6	6.8	6.1	5.4	5.6	5.7	Insufficient water	7.5
GW08	No record	No record	Insufficient water	Insufficient water	6.0	Insufficient water	5.2	5.4	Insufficient water	Insufficient water	5.8
GW09	4.1	5.6	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient water	Not taken
GW10	5.7	6.3	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient water	Dry
GW11	4.9	5.2	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	5.7	Not taken
GW12	5.8	6.0	3.8	3.8	6.0	6.0	5.9	5.6	4.9	5.7	4.1
GW13	5.3	5.8	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	6.4	6.7
GW14	4.4	6.1	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	3.7	3
GW15	6.2	6.4	6.1	625.0	6.2	5.9	6.1	6	5.9	6.6	5.8
GW16	No record	No record	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW17	No record	No record	6.4	6.4	6.5	6.3	6.3	6	5.9	6.4	6.9
GW18	6.5	6.7	67.3	6.7	6.8	6.8	6.7	6.5	6.3	7.7	7.5
GW19	6.1	6.4	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient water	Insufficient water
GW20	No record	No record	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Not taken	Not taken	Not taken	Not taken
GW21	6.2	6.3	6.8	6.3	7.5	6.9	6.6	6.3	6.2	6.4	6.7
GW22	6.0	6.3	6.3	5.9	5.5	5.8	5.5	5.7	5.7	Not taken	Not taken
GW23	5.8	6.2	6.0	5.4	5.5	6.5	5.3	5.6	Not taken	5.9	Not taken
GW24	4.5	5.3	Insufficient water	Insufficient water	5.7	7.5	5.5	5.8	6.5	Insufficient water	7.2

Borehole reference	pH										
	Pre-construction		Construction								
	20th per	80th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016
GW25	4.7	5.0	4.7	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Dry
GW26	5.5	5.9	5.3	Insufficient water	5.3	5.4	5.3	5	5	5.7	7.1
GW27	6.0	6.2	Insufficient water	Insufficient water	5.8	5.7	6.3	6.3	6.3	6.4	8
GW28	5.3	5.7	Insufficient water	Insufficient water	5.2	Insufficient water	5.9	Insufficient water	Insufficient water	Insufficient water	6.9
GW29	5.4	5.9	5.7	5.8	5.4	5.8	5.8	5.9	6.6	6.6	8.7
GW30	4.3	5.0	5.0	5.2	5.6	5.2	5.9	5.1	5.4	6	5.6

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

Borehole reference	Temperature										
	Pre-construction		Construction								
	20th per	80th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016
GW01	20.1	20.9	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	19.4	19. 9
GW02	19.0	21.2	18.4	17.6	20.1	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW03	18.5	21.3	16.2	16.9	18.9	21.1	23.3	21.1	20.5	18	15.3
GW04	18.6	20.3	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	20.3	18.3
GW05	17.4	18.9	15.8	16.0	17.3	20.1	23	Not taken	Not taken	19.1	17.2
GW06	18.5	19.8	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	20.9	19.5
GW07	18.5	19.5	19.5	19.6	19.9	20.2	20.9	19.7	21.8	Insufficient water	19.4
GW08	No record	No record	Insufficient water	Insufficient water	20.3	Insufficient water	20.2	20.8	Insufficient water	Insufficient water	18.8
GW09	18.3	18.5	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient water	Not taken
GW10	18.2	19.5	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient water	Dry
GW11	18.2	19.6	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	20.2	Not taken
GW12	18.0	20.5	14.3	15.5	18.4	20.7	21.6	20.3	21.1	17.7	16

Borehole reference	Temperature										
	Pre-construction		Construction								
	20th per	80th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	Jun 2016	Jul 2016
GW13	19.1	20.0	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	21	18.9
GW14	19.2	20.0	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	20.5	19.2
GW15	19.4	20.2	19.9	20.6	20.7	20.5	20.8	20.8	21	20	20.3
GW16	No record	No record	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW17	No record	No record	19.3	19.4	19.7	19.9	19.9	19.3	22.7	19.4	19.1
GW18	19.9	20.5	19.0	19.2	19.8	20.8	19.7	19.7	21.4	18.9	18.7
GW19	19.5	20.2	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient water	Insufficient water
GW20	No record	No record	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Not taken	Not taken	Not taken	Not taken
GW21	18.8	20.3	18.8	18.5	18.6	19.9	21.3	20.6	20.2	19.4	18.2
GW22	17.6	20.2	18.2	17.2	18.3	20.6	21.8	22.2	21.2	Not taken	Not taken
GW23	19.0	19.6	18.5	18.7	18.9	19.4	19.4	19.7	Not taken	18.5	Not taken
GW24	18.3	19.0	Insufficient water	Insufficient water	18.7	18.8	19.2	19.4	19.1	Insufficient water	18.1
GW25	19.9	20.5	18.5	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Dry
GW26	19.1	20.6	19.2	Insufficient water	20.1	20.2	20	20.2	19.7	14.3	19
GW27	19.3	20.5	Insufficient water	Insufficient water	19.7	19.9	20.3	19.7	19.3	28.1	19
GW28	19.5	22.6	Insufficient water	Insufficient water	20	Insufficient water	23.4	Insufficient water	Insufficient water	Insufficient water	18.7
GW29	18.4	19.9	18.5	18.7	18.6	19.2	19.3	19.8	19	18.8	18.8
GW30	19.4	20.0	18.6	18.6	19.1	19.9	20.2	20.1	20.2	19.8	18.8

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 this most recent monitoring period (ie January 2016 to July 2016), construction efforts have 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, is the one remaining cut on the project where a substantial amount of earthworks are required to achieve the final design levels.

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 the 16 functioning data loggers in operation on the project, two record a steep rise in groundwater level in response to significant rainfall events between April and June 2016. These rainfall events included 23.6 millimetres on 4 April 2016, 36.2 millimetres across two days 18 April to 19 April 2016, 29.2 millimetres across three days 23 April to 25 April 2016 and 120.8 millimetres across three days 4 June to 6 June 2016. Other smaller scale fluctuations in groundwater levels are present in most boreholes, and 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 appear to have coincided with construction works in the vicinity of sampling locations. However, variability noted at GW08 in the previous reporting periods continued. Groundwater level at GW08 ranged between levels recorded prior to construction (ie construction with the potential to impact on water levels within the borehole) and dry. This location is not fitted with an automated depth logger. Ongoing monitoring is necessary to determine the potential for project interference.

  Some variability was also noted at GW15 with the depth to groundwater reducing to its lowest level (ie in July 2016) since records began. This monitoring location is in proximity to a moderately deep cut (ie about six to 10 metres). However, no change to the depth of this cutting has been made since the preceding reporting period. It is noted that the June monthly rainfall record for Telegraph Point showed the monthly total exceeding the historical average by close to three times. Groundwater recharge may have been a contributing factor to the elevated level.
- Laboratory analysed parameters show considerable variability for a number of analytes between sampling events (note, comparison between July 2015, November 2015 and April 2016 and other results for a number of metal parameters are not possible due to the nature of analysis ie total metals verses dissolve metals). However, this is generally not considered inconsistent with pre-construction results.

  Nonetheless, one monitoring site, GW29, appears to show elevated levels of metals across the board when compared with earlier sampling events. Construction activities in the vicinity of GW29 have not changed for some time, so a correlation between construction and the change in water quality conditions is not readily ascertained. It should be noted that other parameters ie pH, EC, temperature, are consistent with

historical trends at the time of sampling.

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

- Manually recorded pH records are generally consistent with levels recorded during the pre-construction and previous construction reporting periods.

  Inconsistencies with historical trends were observed at GW01, GW03, GW07, GW14, GW26, GW17 and GW29 mainly during July 2016. All, but GW14, recorded pH levels between 0.5 and 2 higher than all previous records. The greatest increase was recorded at GW29 with pH reaching 8.7. Earlier records show a previous maximum of pH 6.6.

  At GW14, while pH levels were low compared to historical monitoring events, it should be noted that the borehole was destroyed prior to the April 2015 monitoring event and only reinstated prior to the June 2016 monitoring event. Given the limited number of historical monitoring events (ie four) it is unclear whether these fluctuations were within a normal range for the groundwater resource.

- Manually recorded temperature records are generally consistent with levels recorded during the pre-construction and previous construction reporting periods.

  One exception occurred at GW27 in June 2016 where the temperature rose sharply and well beyond historical records. Air temperature records from Kempsey Airport Bureau of Meteorology weather station in the days leading up to sampling show a consistent ambient air temperature of between 20 and 21 degrees Celsius. It is however noted that July 2016 results show a return to levels consistent with historical trends. The reason for the one-off spike in temperature is unclear.

- Table 3-39 shows considerable variability in electrical conductivity between pre-construction and construction levels. This anomaly was highlighted in Roads and Maritime's pre-construction groundwater report (April 2014) that noted the differences between laboratory results and those collected in the field. It remains unclear why the differences have occurred, but is most likely attributable to in-field monitor calibration. It should be noted that in-field monitoring results during this and the previous reporting period were generally consistent (refer to Table 12 in Appendix E). Exceptions occurred at GW14, GW17, GW18 and GW21 in the February, April or July 2016 in-field monitoring events. The February and April 2016 results appear to be errors attributable to the monitoring unit, as laboratory results for the April event does not reflect the same variability. Variability, as indicated earlier, is not considered attributable to construction.

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). However, a staff change at the laboratory, and failure to implement the instruction, has resulted in only total metals being analysed for the April 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

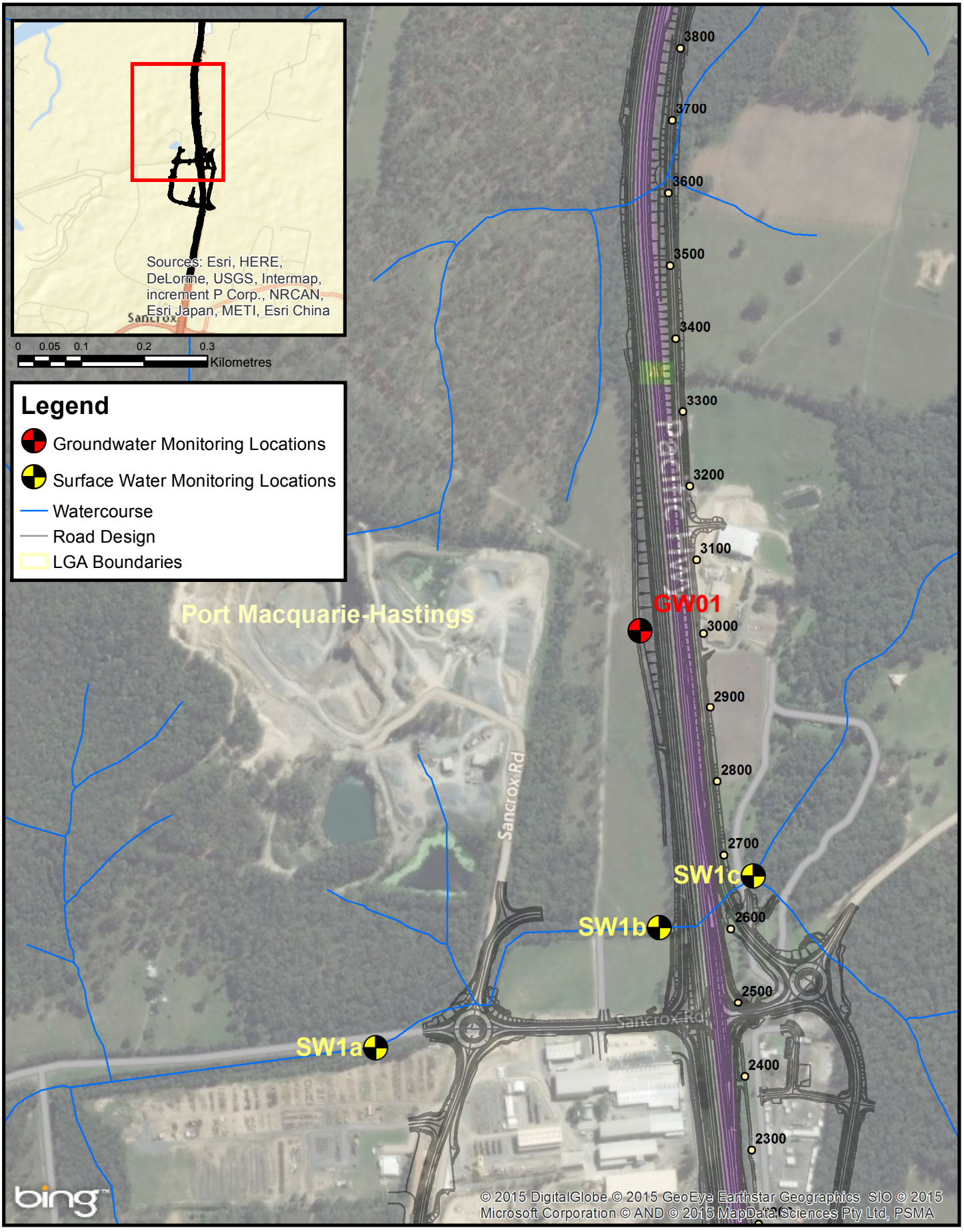
- Closely monitor metal parameters and pH at GW29 during subsequent monitoring events
- Continued monitoring of groundwater depth at GW08 during subsequent monitoring events
- Closely monitor groundwater depth at GW15 during subsequent monitoring events to determine any corresponding response to rainfall events or otherwise
- Close monitoring of pH levels at GW14 to determine whether acidic conditions correspond to periods of low rainfall, or whether construction activities may contribute to conditions at this location
- Closely monitor GW14 electrical conductivity and review future laboratory results to determine whether there has been a consistent change to electrical conductivity at the monitoring site or whether an error with the in-field monitor has occurred.

In addition, and in response to the loss of a number of monitoring boreholes from construction, Roads and Maritime can advise that replacement boreholes for GW01, GW04, GW06, GW09, GW10, GW11, GW13, GW14, and GW19 have now been installed (prior to July 2016 sampling event). Monitoring at these boreholes commenced on 1 August 2016.

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	*Environmental Planning and Assessment Act 1979*
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

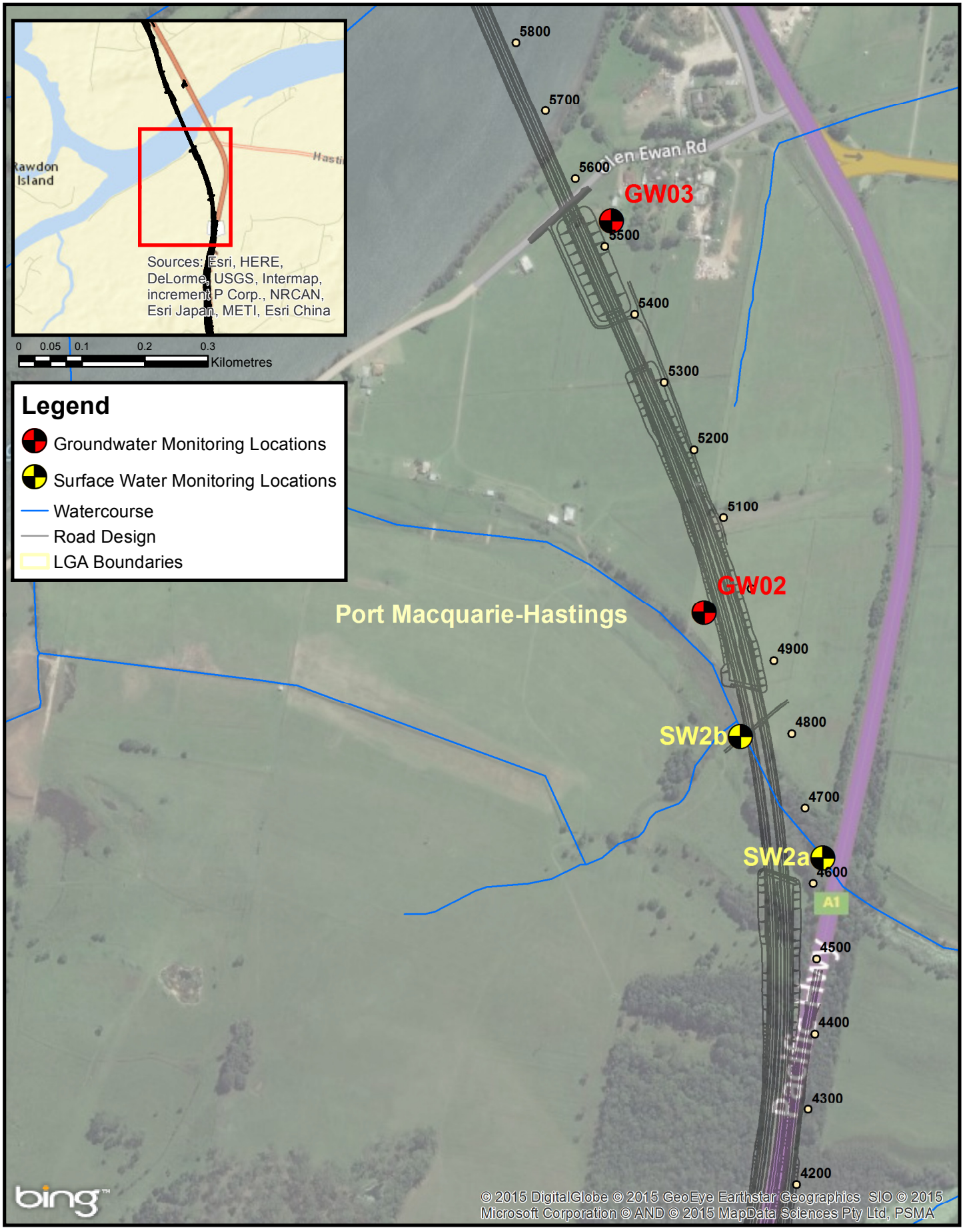
Appendix A – Site locality maps



Pacific Highway Upgrade
Oxley Highway to Kempsey

NSW GOVERNMENT Transport Roads & Maritime Services

	Surface & groundwater monitoring locations
	Drawn By: Stuart Hill
Sheet 1 of 17	Prepared for: Roads and Maritime Services (Hunter)
	Date: 22/04/2015



Pacific Highway Upgrade
Oxley Highway to Kempsey

NSW GOVERNMENT Transport Roads & Maritime Services

	Surface & groundwater monitoring locations
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Sheet 2 of 17	Prepared for: Roads and Maritime Services (Hunter)
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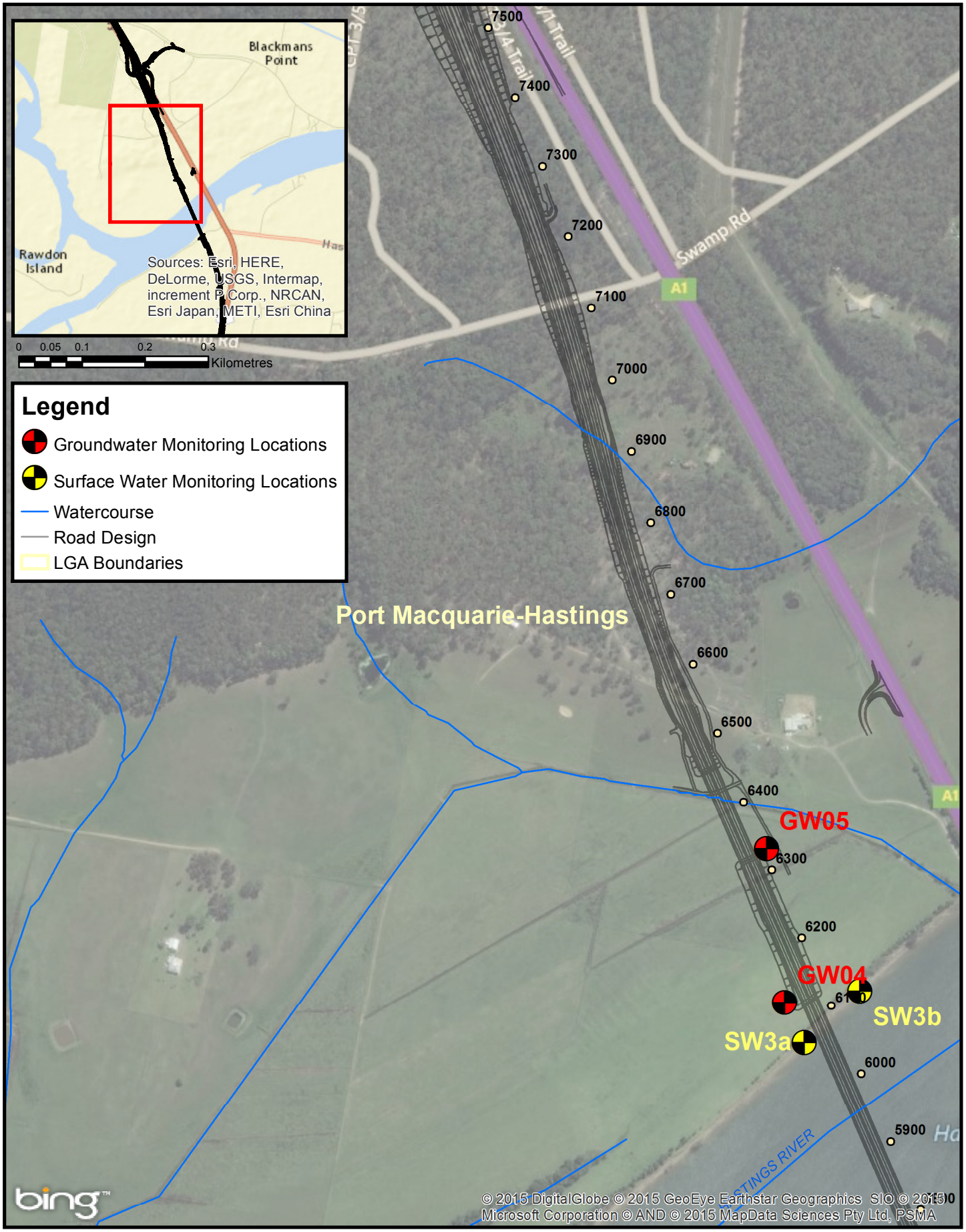
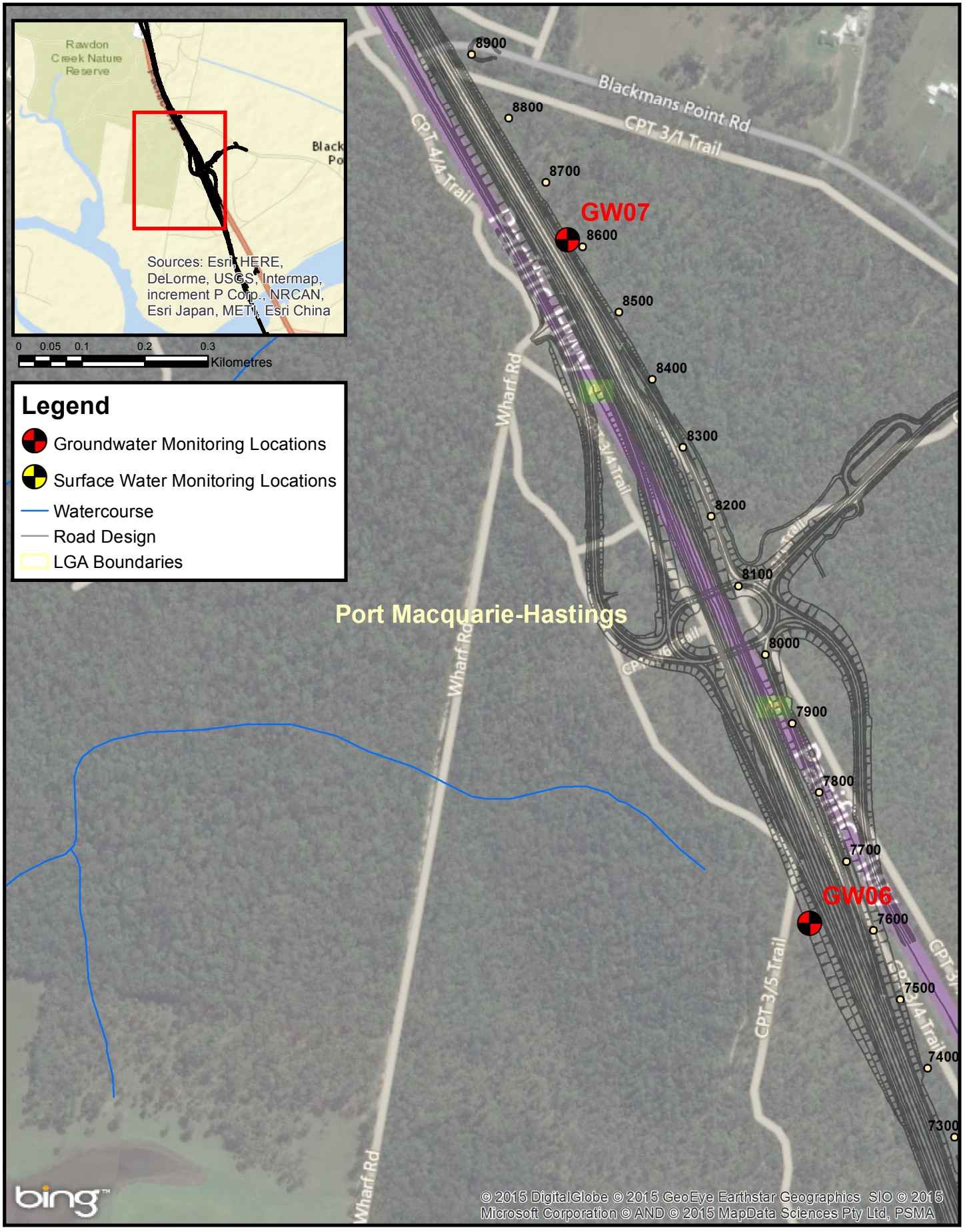


Pacific Highway Upgrade
Oxley Highway to Kempsey

120 60 0 120 240 360
Meters

NSW GOVERNMENT | Transport Roads & Maritime Services

	Surface & groundwater monitoring locations
	Drawn By: Stuart Hill
Sheet 3 of 17	Prepared for: Roads and Maritime Services (Hunter)
	Date: 22/04/2015



Pacific Highway Upgrade
Oxley Highway to Kempsey

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	Surface & groundwater monitoring locations
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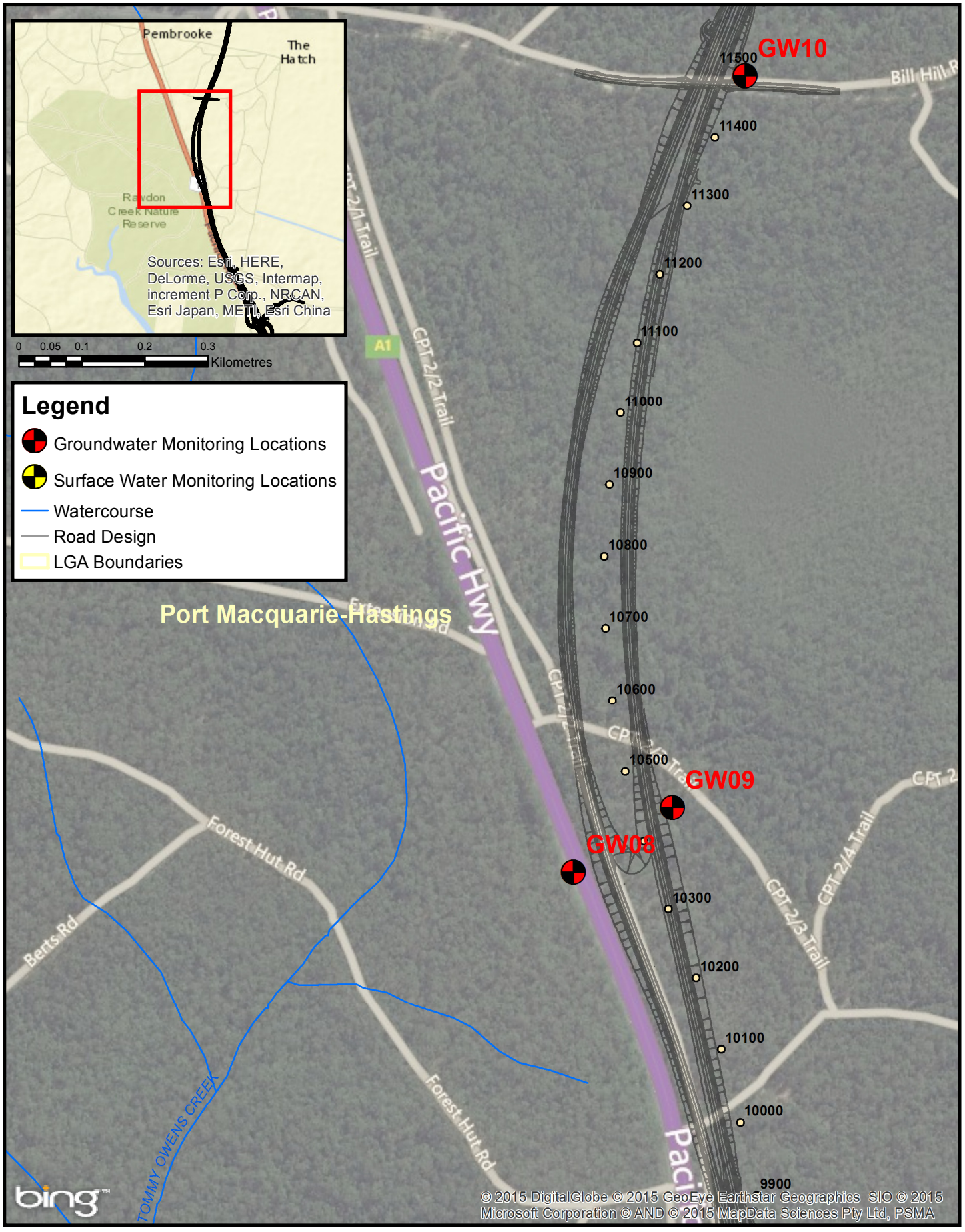
Sheet 4 of 17	Prepared for: Roads and Maritime Services (Hunter)
	Date: 22/04/2015



Pacific Highway Upgrade
Oxley Highway to Kempsey

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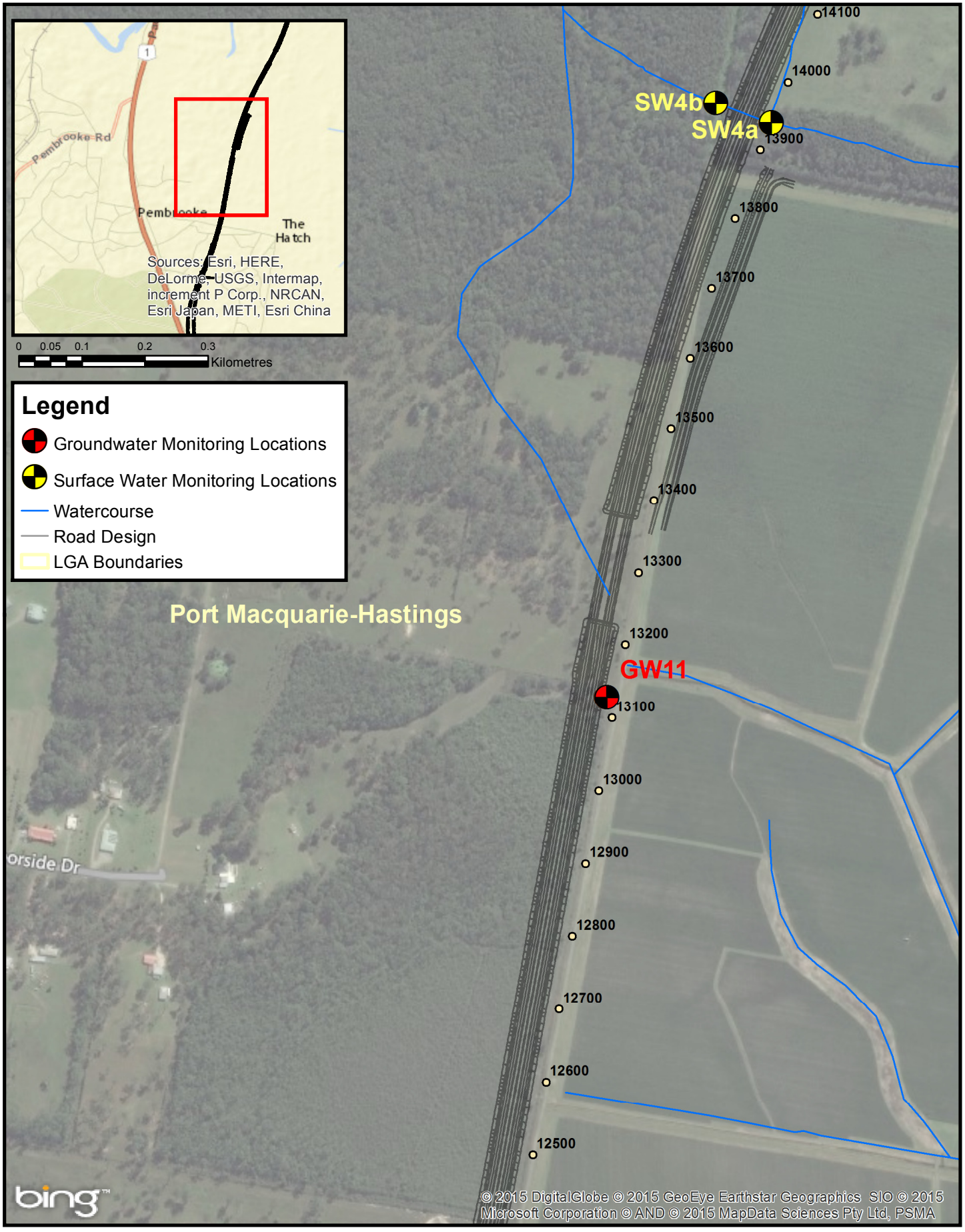
Surface & groundwater monitoring locations

Drawn By: Stuart Hill

Sheet 5 of 17

Prepared for: Roads and Maritime Services (Hunter)

Date: 22/04/2015



Pacific Highway Upgrade
Oxley Highway to Kempsey

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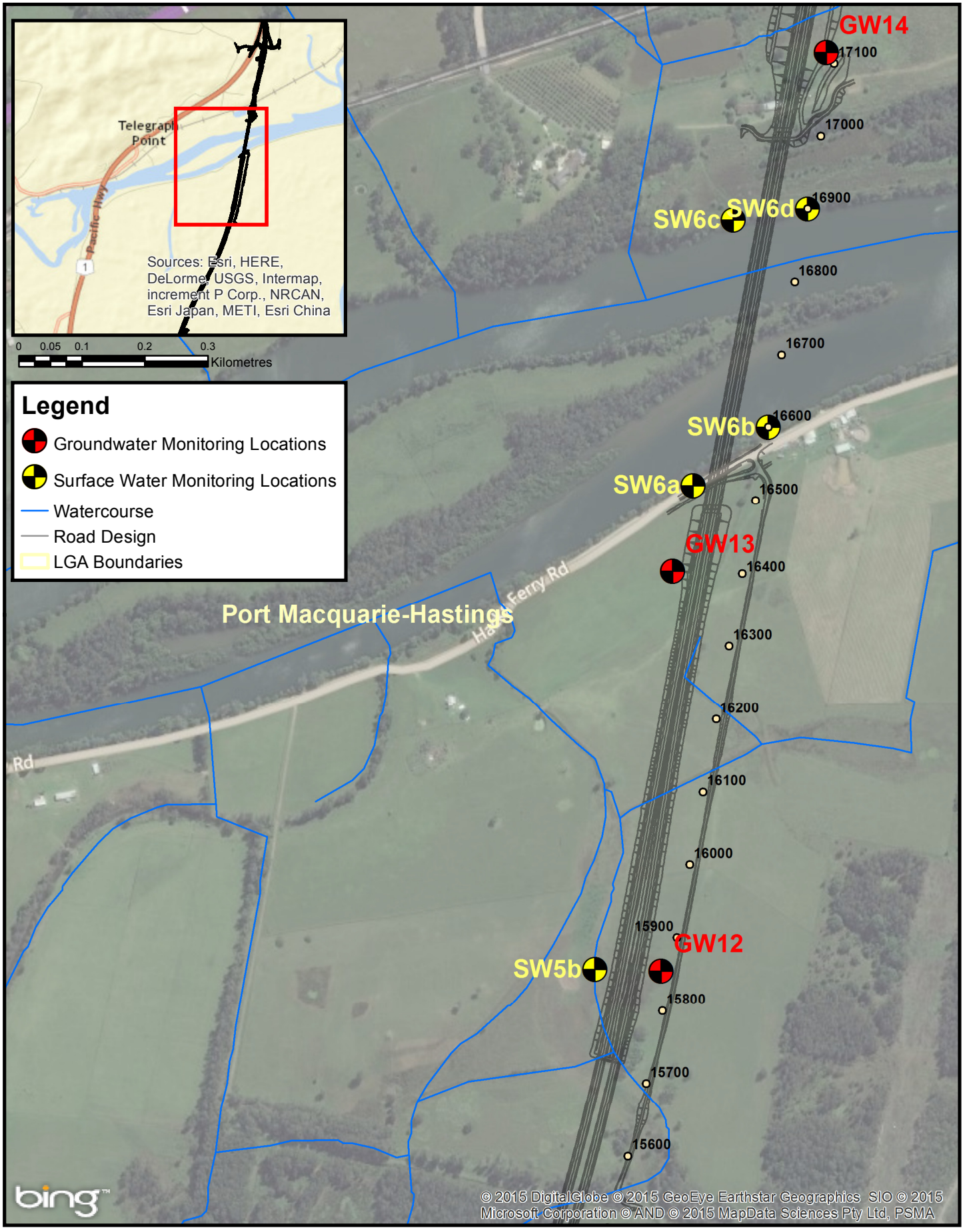
Surface & groundwater monitoring locations

Drawn By: Stuart Hill

Sheet 6 of 17

Prepared for: Roads and Maritime Services (Hunter)

Date: 22/04/2015



Pacific Highway Upgrade
Oxley Highway to Kempsey

NSW GOVERNMENT | Transport Roads & Maritime Services

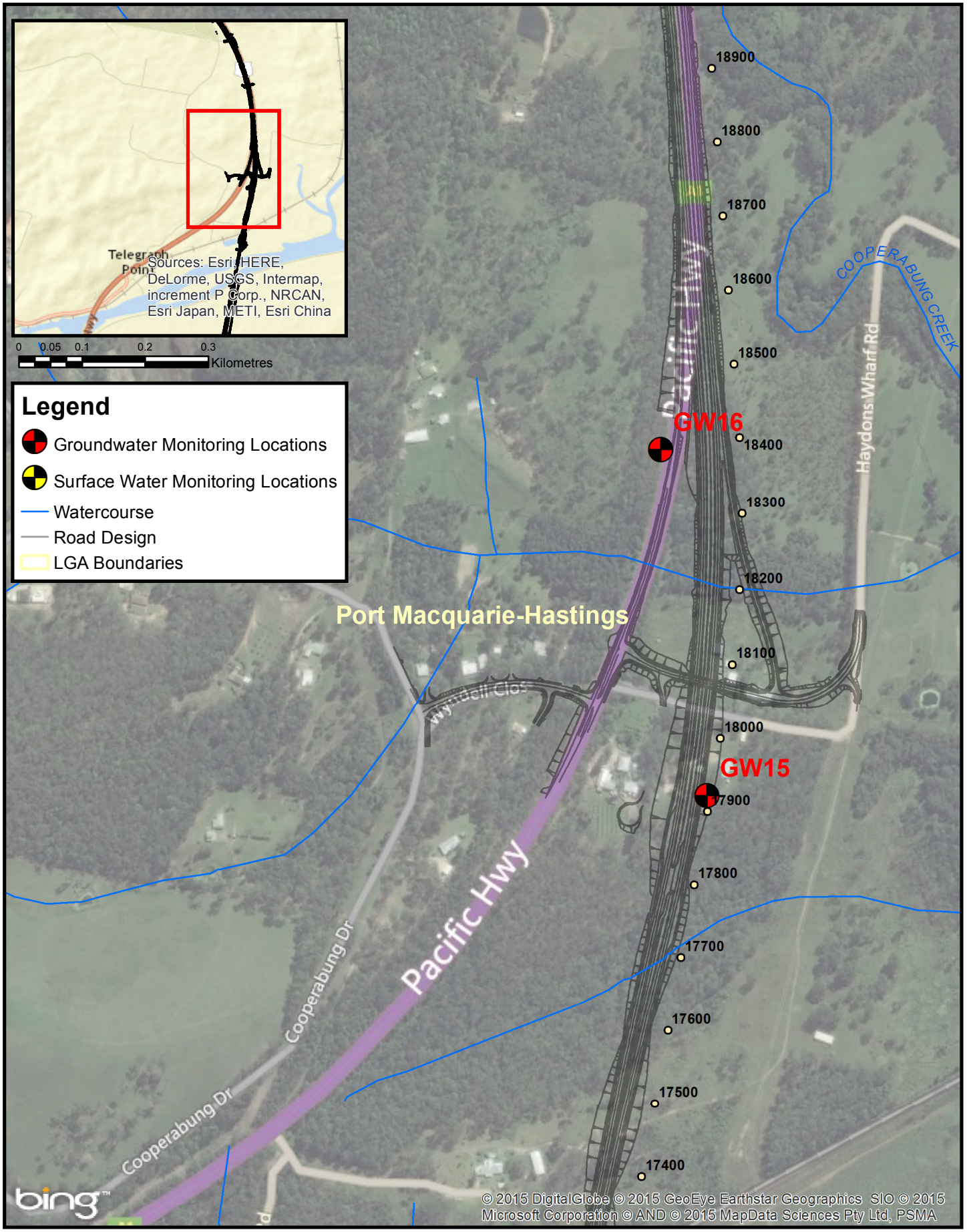
Surface & groundwater monitoring locations

Drawn By: Stuart Hill

Sheet 7 of 17

Prepared for: Roads and Maritime Services (Hunter)

Date: 22/04/2015



Pacific Highway Upgrade
Oxley Highway to Kempsey

NSW GOVERNMENT | Transport Roads & Maritime Services

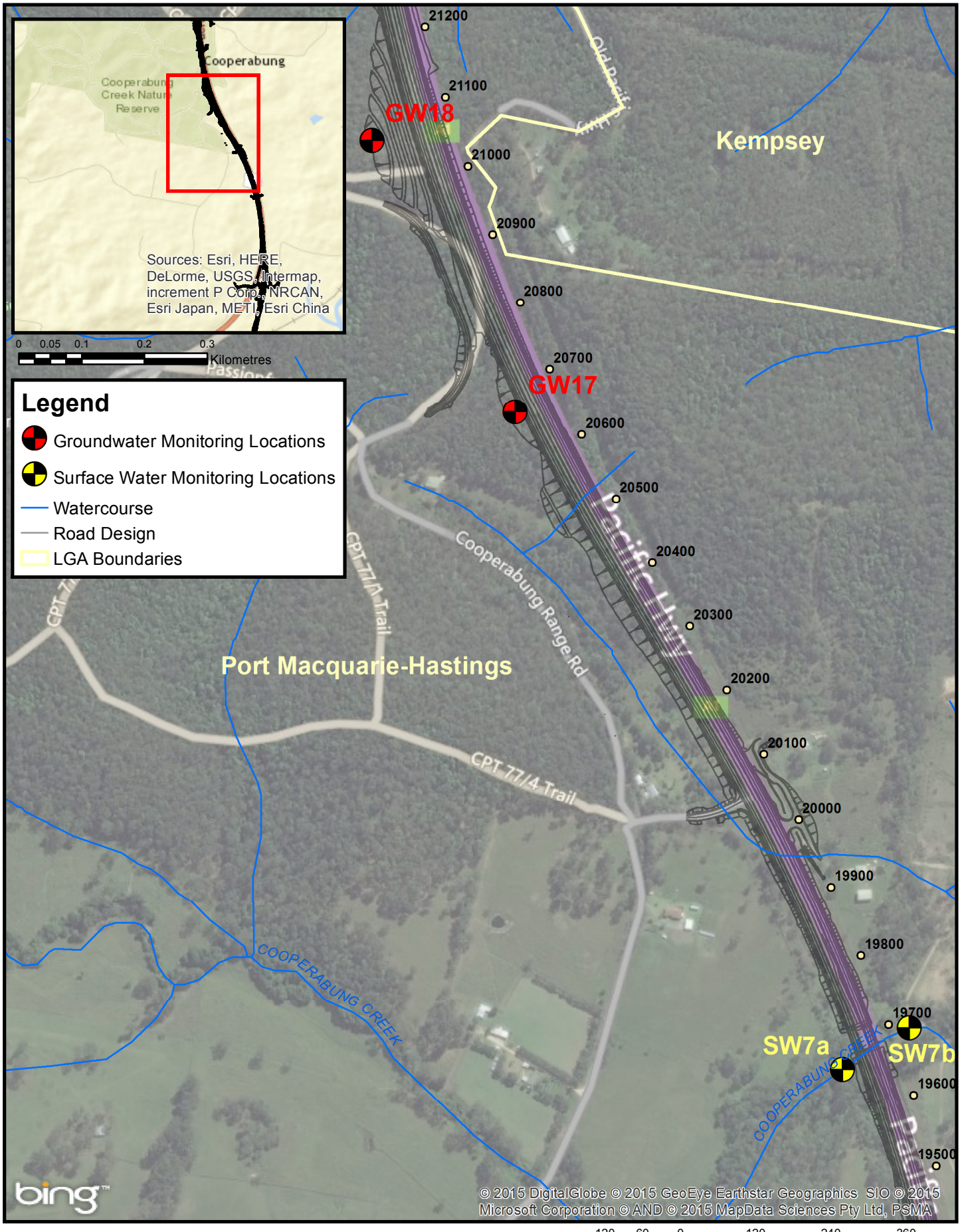
Surface & groundwater monitoring locations

Drawn By: Stuart Hill

Sheet 8 of 17

Prepared for: Roads and Maritime Services (Hunter)

Date: 22/04/2015



Pacific Highway Upgrade
Oxley Highway to Kempsey

NSW GOVERNMENT Transport Roads & Maritime Services

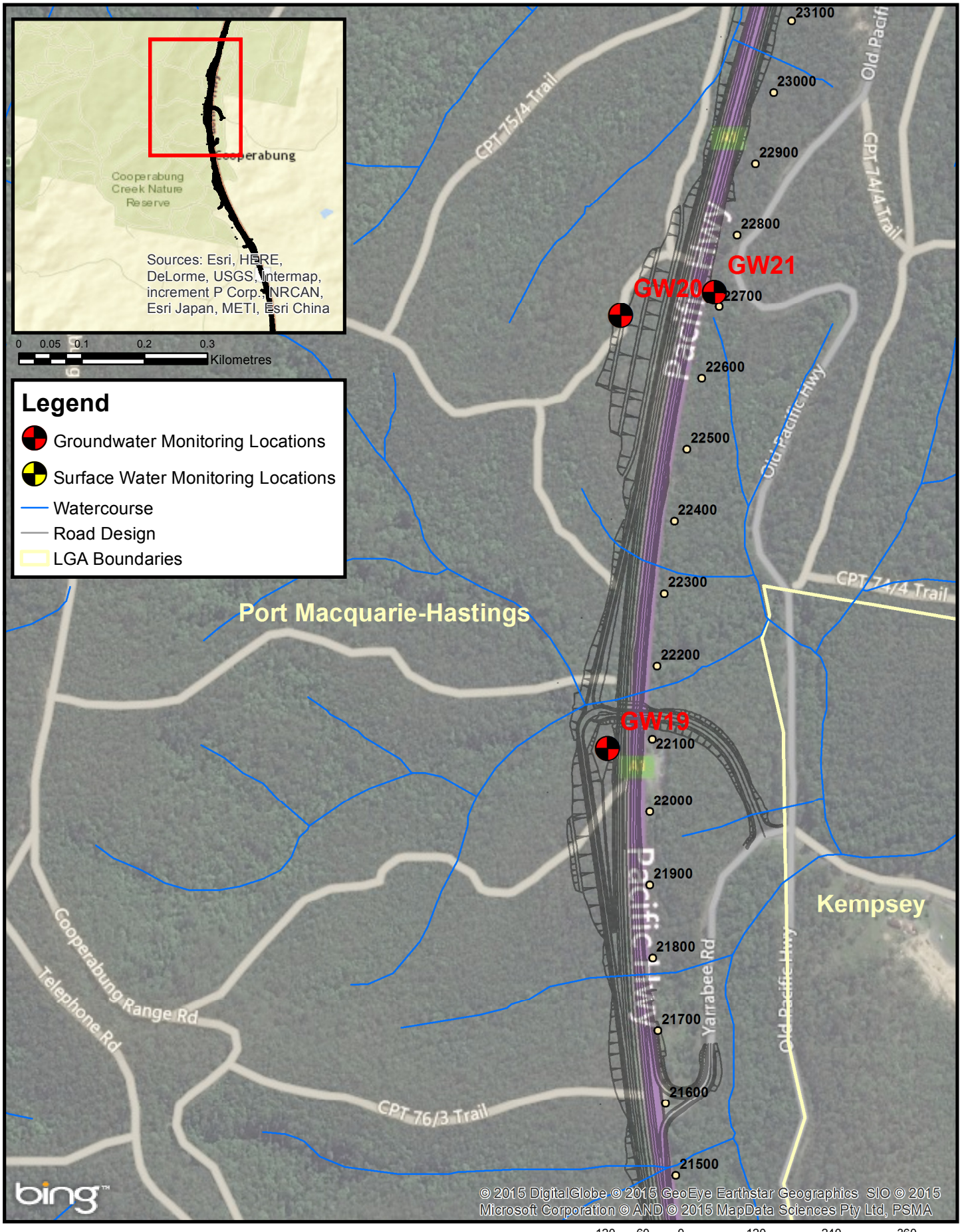
Surface & groundwater monitoring locations

Drawn By: Stuart Hill

Sheet 9 of 17

Prepared for: Roads and Maritime Services (Hunter)

Date: 22/04/2015



Pacific Highway Upgrade
Oxley Highway to Kempsey

NSW GOVERNMENT Transport Roads & Maritime Services

Surface & groundwater monitoring locations

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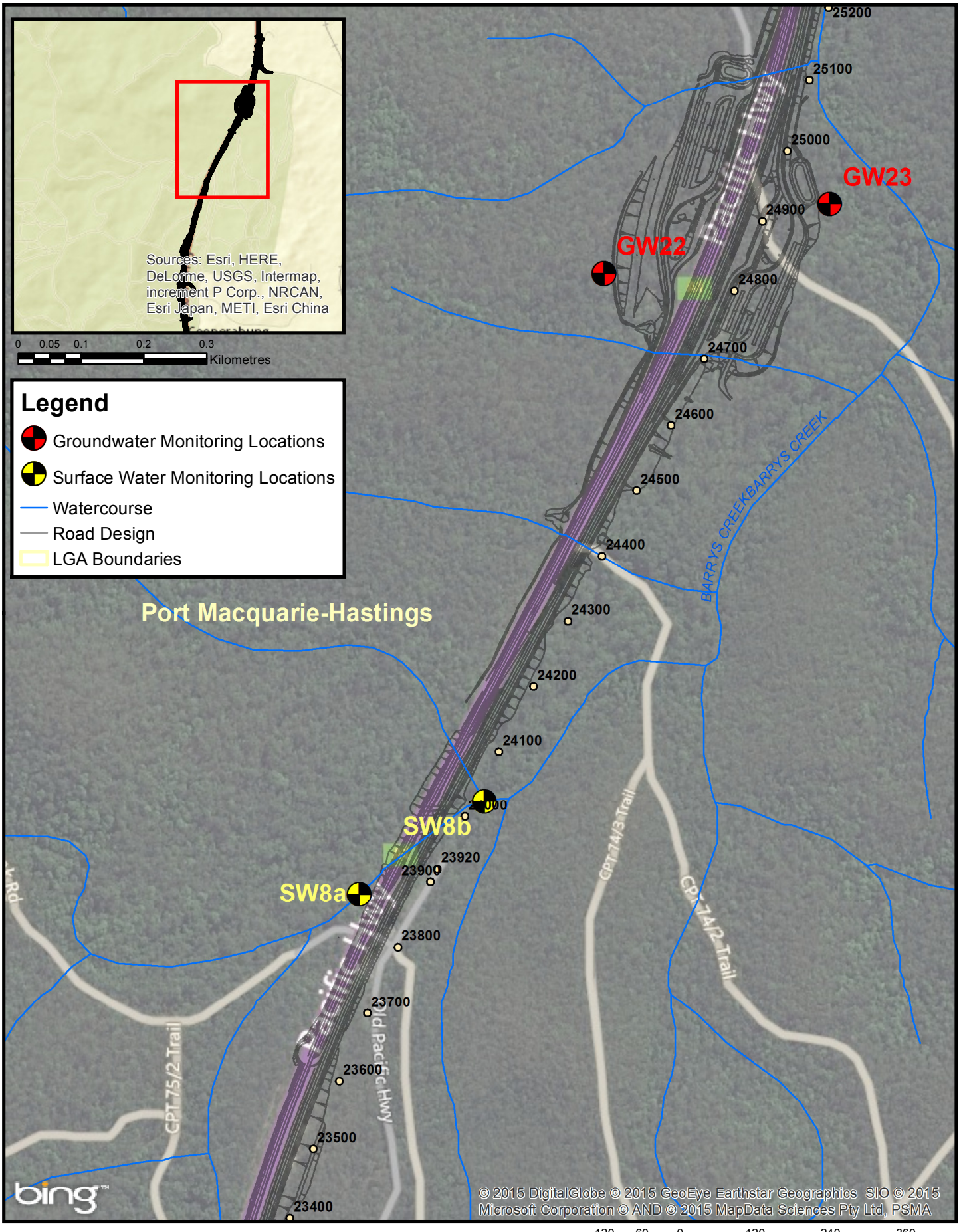
Sheet 10 of 17

Prepared for: Roads and Maritime Services (Hunter)

Date: 22/04/2015



Pacific Highway Upgrade
Oxley Highway to Kempsey

NSW GOVERNMENT Transport Roads & Maritime Services

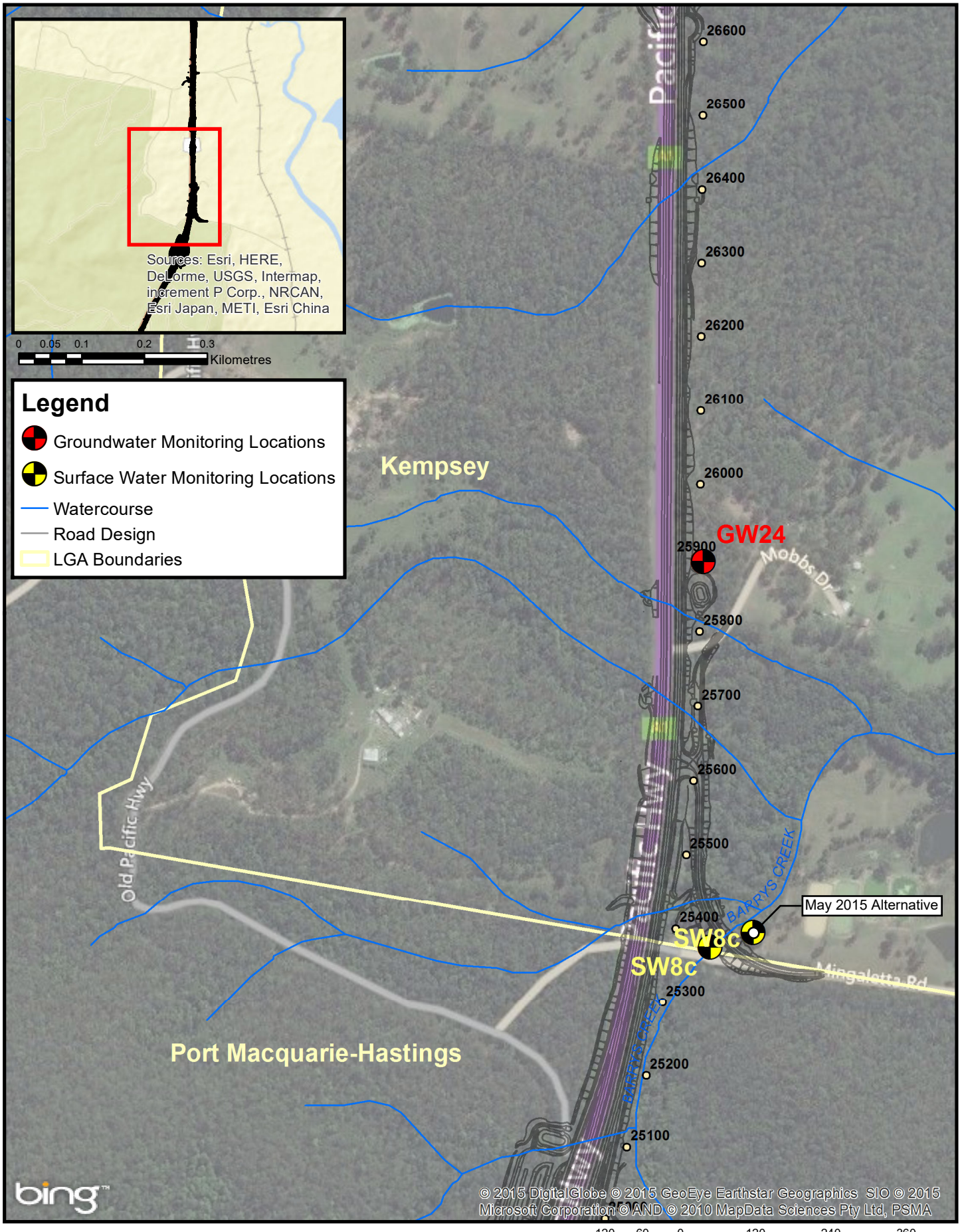
Surface & groundwater monitoring locations

Drawn By: Stuart Hill

Sheet 11 of 17

Prepared for: Roads and Maritime Services (Hunter)

Date: 22/04/2015



Pacific Highway Upgrade
Oxley Highway to Kempsey

NSW GOVERNMENT | Transport Roads & Maritime Services

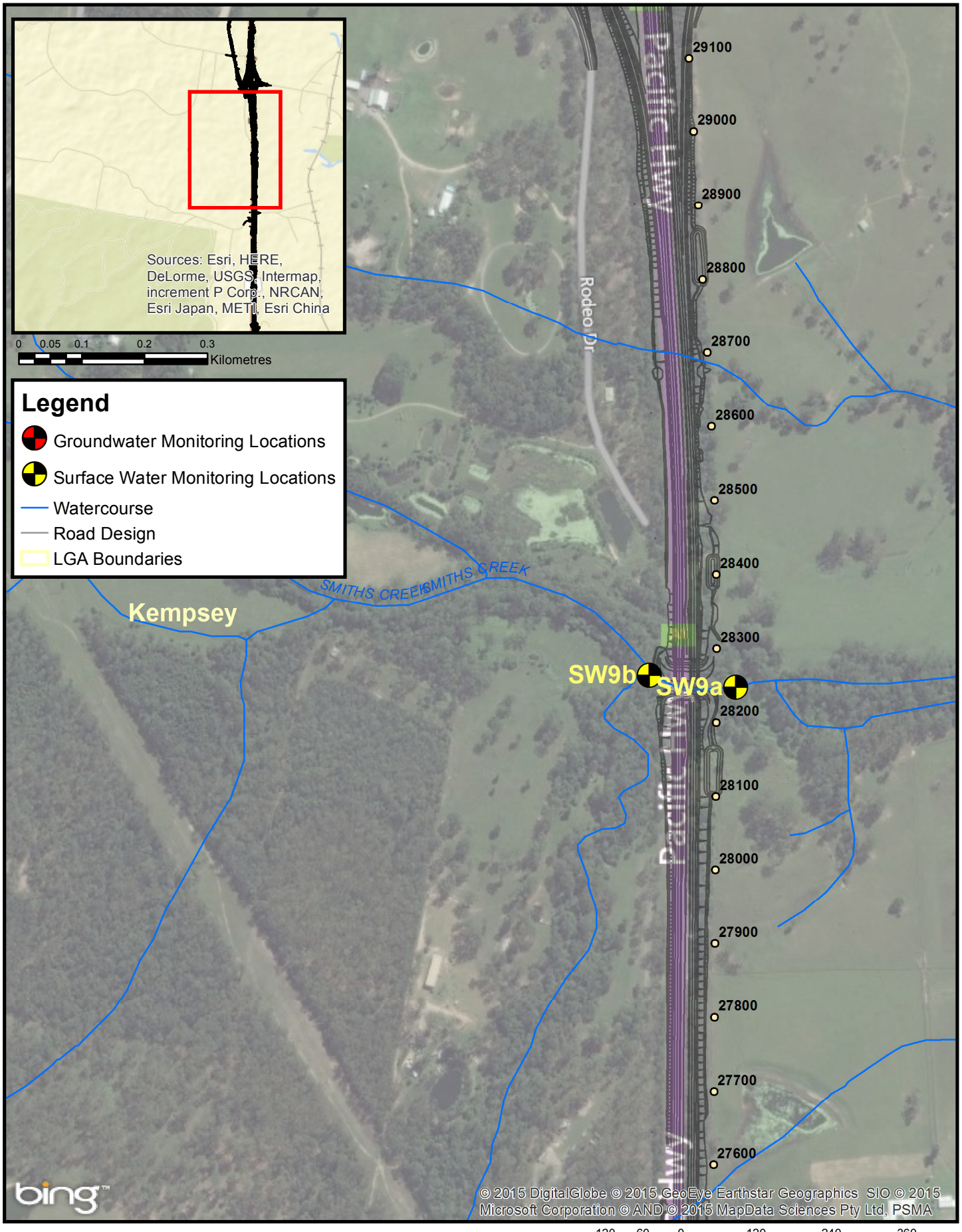
Surface & groundwater monitoring locations

Drawn By: Stuart Hill

Sheet 12 of 17

Prepared for: Roads and Maritime Services (Hunter)

Date: 25/11/2015



Pacific Highway Upgrade
Oxley Highway to Kempsey

NSW GOVERNMENT | Transport Roads & Maritime Services

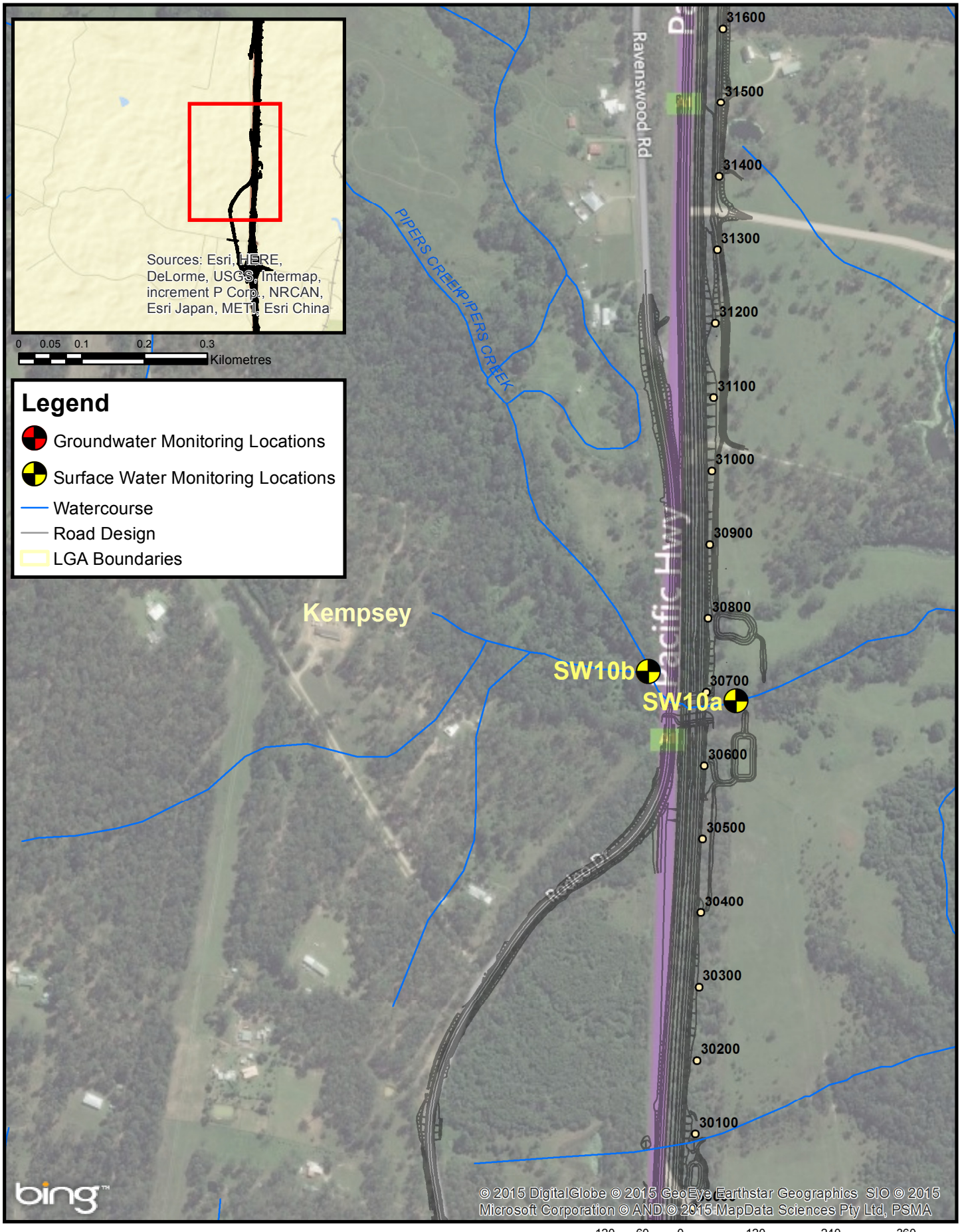
Surface & groundwater monitoring locations

Drawn By: Stuart Hill

Sheet 13 of 17

Prepared for: Roads and Maritime Services (Hunter)

Date: 22/04/2015



Pacific Highway Upgrade
Oxley Highway to Kempsey

NSW GOVERNMENT | Transport Roads & Maritime Services

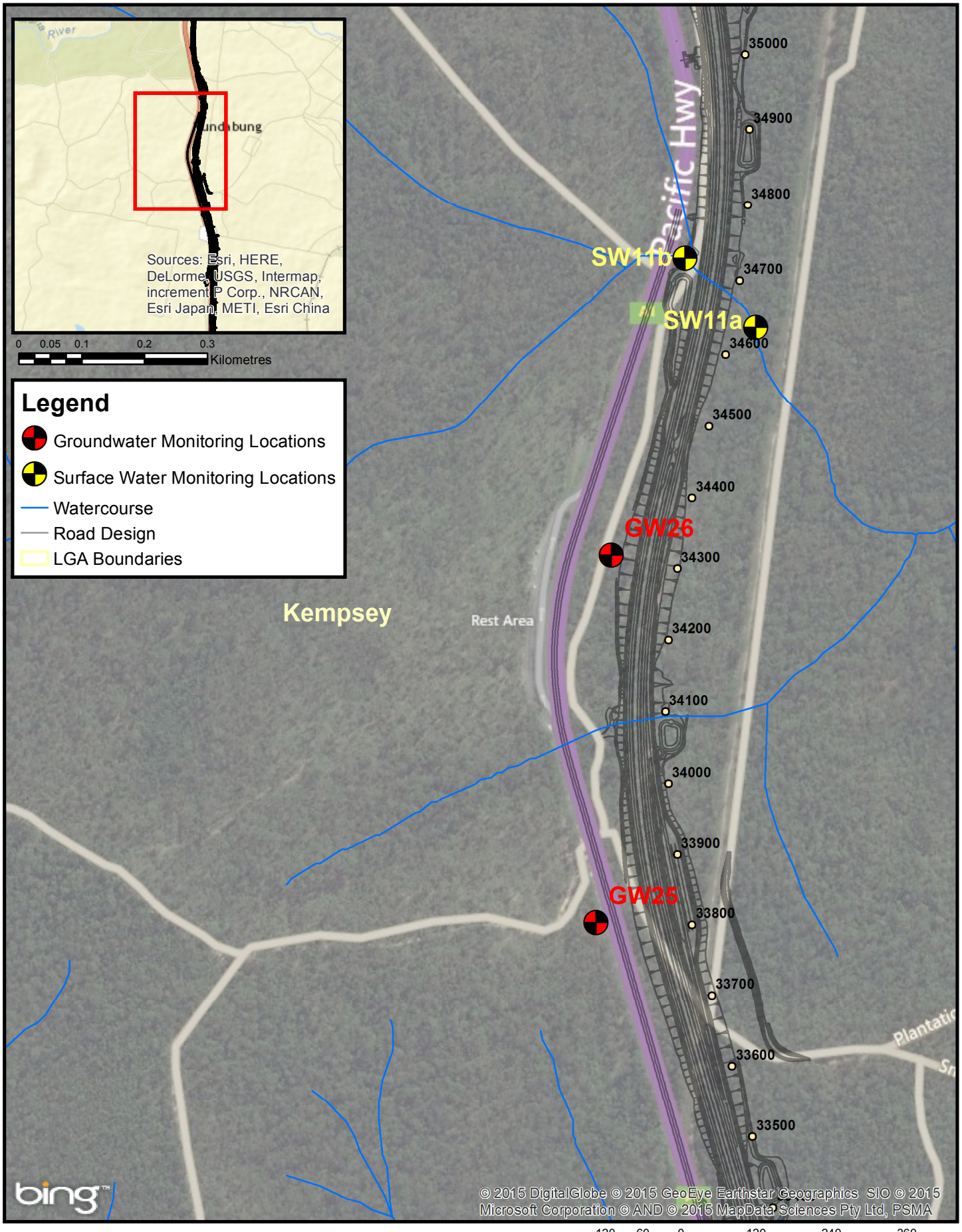
Surface & groundwater monitoring locations

Drawn By: Stuart Hill

Sheet 14 of 17

Prepared for: Roads and Maritime Services (Hunter)

Date: 22/04/2015



Pacific Highway Upgrade
Oxley Highway to Kempsey

NSW GOVERNMENT | Transport Roads & Maritime Services

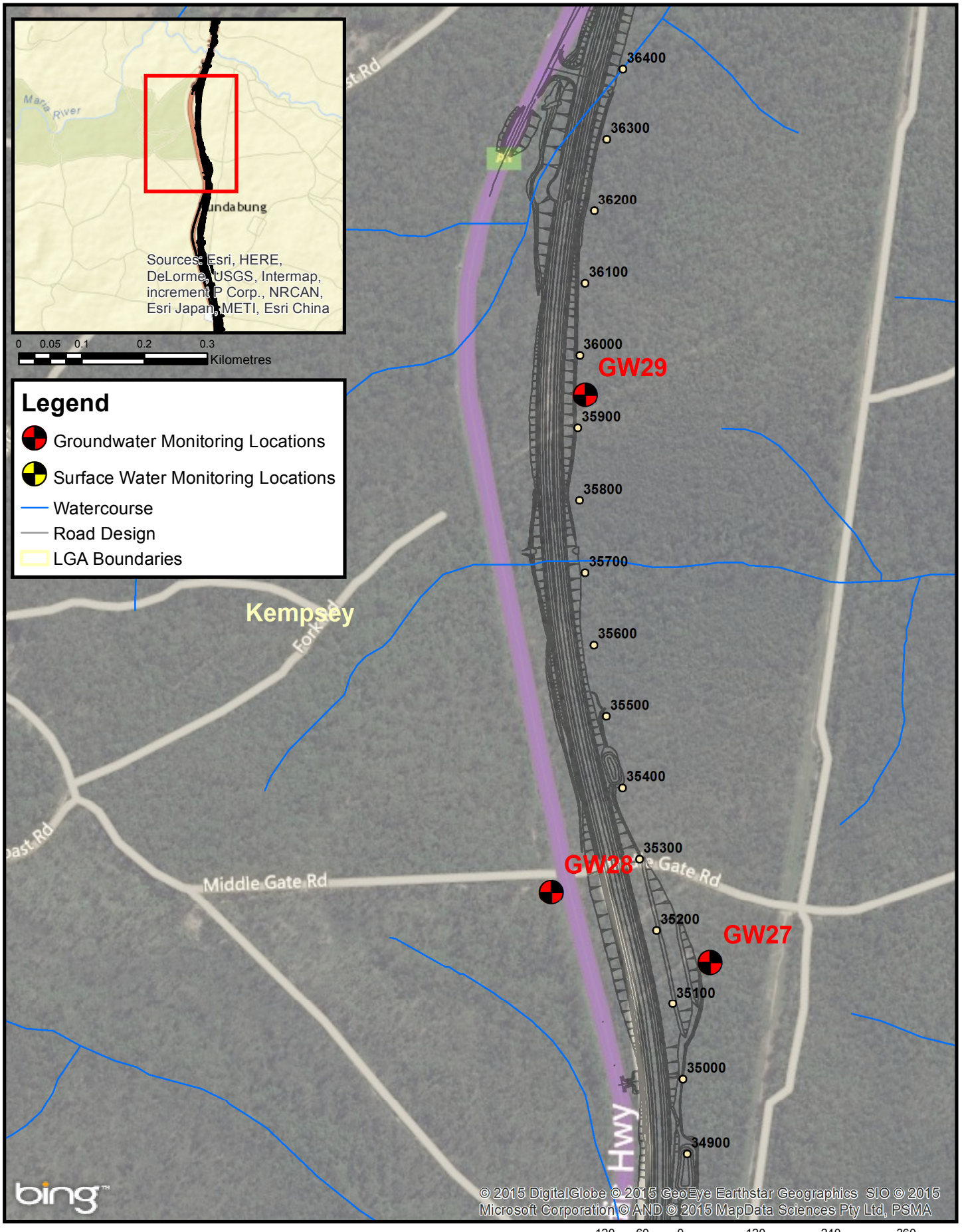
Surface & groundwater monitoring locations

Drawn By: Stuart Hill

Sheet 15 of 17

Prepared for: Roads and Maritime Services (Hunter)

Date: 22/04/2015



Pacific Highway Upgrade
Oxley Highway to Kempsey

NSW GOVERNMENT Transport Roads & Maritime Services

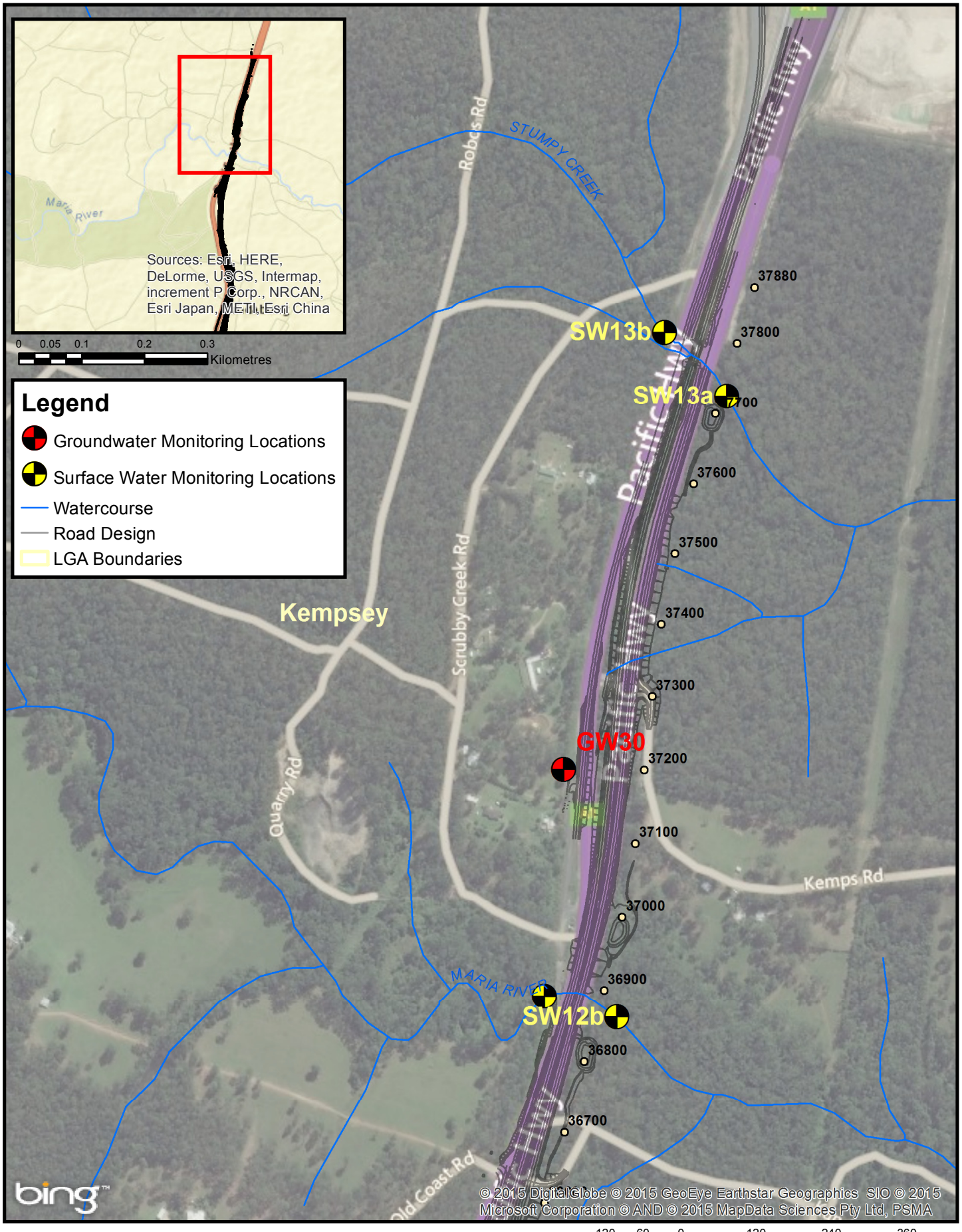
Surface & groundwater monitoring locations

Drawn By: Stuart Hill

Prepared for: Roads and Maritime Services (Hunter)

Date: 22/04/2015

Sheet 16 of 17



Pacific Highway Upgrade
Oxley Highway to Kempsey

NSW GOVERNMENT | Transport Roads & Maritime Services

Surface & groundwater monitoring locations

Drawn By: Stuart Hill

Sheet 17 of 17

Prepared for: Roads and Maritime Services (Hunter)

Date: 22/04/2015

Appendix B – Rainfall records

Port Macquarie Airport rainfall records from January 2016 to July 2016

Day of month	January 2016	February 2016	March 2016	April 2016	May 2016	June 2016	July 2016
1	0	0	1	0	0	0	0
2	0	0	1	0	8.8	0	0
3	0	0		0	0	0	0
4	1.8	0	1.4	23.6	0	26	0
5	81.4	75.2	0.6	0	0	89.4	2.8
6	8.6	41	0.2	0	0	5.4	0.2
7	3.6	8.2	0	0	0	0	0
8	0	0	0	2.8	0	0	0
9	0	1.2	1.4	10	0	0	5.2
10	0	2.8	0	0.2	0	0	0
11	0	0	0	0.6	0	0	0
12	0	0	0	0	0	0	0.2
13	0	0	0	0	0	3.2	0
14	0	0.4	0	6	0	0.8	0
15	0.6	0	0	0	0	0.2	0
16	17.4	0	1.2	0	0	0	0
17	2.4	1.2	3.8	0	0	0	3.6
18	0	0	0.2	16.6	0	0	0.2
19	0	2.6	0	19.6	0	4	0
20	0	0	0.4	0	0	20.4	0.6
21	0	45.6	0.8	0.2	0	0	3.6
22	0	0.2	6.8	0	0	0	0.2
23	24.6	0	0	8.6	0	0	0
24	9	0	0	10.2	0	0	0
25	0	0	0	10.4	0	0	0
26	5.6	0	0	1.8	0	0	0
27	0	0.4	0	2.2	0.2	0.4	0
28	3.6	6	0	0	0	0.2	0
29	15	0	0	0	0	0	0
30	0		8.4	0	0	0	0
31	0		0.6		0		0
Highest Daily	81.4	75.2	8.4	23.6	8.8	89.4	5.2
Monthly Total	173.6	184.8	27.8	112.8	9	150	16.6

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	63.3	72.6	159.8	110.6
Median	138	153.5	153.9	112.8	69.6	138.8	66.1	38.1	52.8	58.8	142.4	99.2

Telegraph Point rainfall records from January 2016 to July 2016

Day of month	January 2016	February 2016	March 2016	April 2016	May 2016	June 2016	July 2016
1	0	0	0.5	0	0	0	0
2	0	0	0	0	9.4	0	0
3	0	0	0.2	0	0	0	0
4	26.4	0	2.2	6.4	0	31.3	0
5	33.8	62.4	0	0	0	206.4	2.8
6	17.9	29.8	0	0	0	0	0
7	0.1	1	0.3	0	0	0	0
8	0.2	0	0	1.1	0	0	0
9	0	0	0	28.7	0	0	3.5
10	0	2.2	0	0.2	0	0	0
11	0	0	0	6.1	0	0	0
12	0	0	0	0	0	0	0
13	1.5	0	0	0	0	2.1	0
14	0	0	0.2	23.5	0	0.4	0
15	0	0.4	0	0.5	0	0.3	0
16	↓	0	1.4	0	0	0	0
17	13.5	0	0.6	0	0	0	3
18	0	0	2.6	7.6	0	0	1.3
19	0	5.4	0.4	32.1	0	6.4	0
20	0	0	0	0	0	28.6	1.3
21	0	26.5	2.6	0	0	0	3.2
22	0	1.2	0.2	0	0	0	0
23	↓	0	0	2.6	0	0	0
24	25.1	0	0	8.2	0	0	0
25	0	0	0	9.2	0	0	0
26	12.5	0	0	4.4	0.2	0	0
27	0	0	0	4.4	0.4	0.6	0
28	3.4	20.7	0	0	0	0.1	0
29	17.2	0	0.5	0	0	0	0
30	0		24.3	0	0	0	0
31	0		0.8		0		0
Highest Daily	33.8	62.4	24.3	32.1	9.4	206.4	3.5
Monthly Total	151.6	149.6	36.8	135	10	276.2	15.1

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	60.5	83.6	109.8	114.6
Median	115.9	148.9	148.8	88.3	60	73.1	36.4	25.9	43.5	55.3	90.4	95.8

Kempsey airport rainfall records from January 2016 to July 2016

Day of month	January 2016	February 2016	March 2016	April 2016	May 2016	June 2016	July 2016
1	0	0	0.6	0	0	0	0
2	0	0	0	0	3.6	0	0
3	0	0	0	0	0	0	0
4	5.4	0	0.6	0	0.2	38.8	0
5	2	17.4	0	0	0.2	210.6	7.4
6	8.6	9	0	0	0	4.6	0
7	0	1.6	0.2	0	0	0	0
8	0	0.2	0	0	0	0	0
9	0	1.2	0.8	7.6	0	0	2.2
10	0	1	0.2	3	0	0	0
11	0	0	0	12.2	0	0	0.2
12	0	0	0	0.2	0	0	0.2
13	0.2	0	0	0	0	1.6	0
14	0	0	0	13	0	0.4	0
15	0	0	0	0	0	0	0
16	10.6	0	0	0	0	0	0
17	0.6	0	0	0.2	0	0	1.6
18	0	0		0.4	0	0	0.2
19	0	7	1.4	0.6	0	5.6	0
20	0	0	0	0.2	0	29.8	1.8
21	0	14.2	0.4	0	0	0.2	0.8
22	0	8.2	0	0	0	0	0.2
23	20	0.2	0	2.2	0	0	0.2
24	3.2	0	0	0.8	0	0	0
25	0	0	0	6.6	0	0	0
26	7.4	0	0	2	0	0	0
27	4.6	0	1.6	1	0	0.2	0
28	3.2	16.8	0	0.2	0	0	0
29	9.8	0	0	0.2	0	0	0
30	0.8		2.8	0	0	0	0
31	0.2		1.6		0		0
Highest Daily	20	17.4	2.8	13	3.6	210.6	7.4
Monthly Total	76.6	76.8	10.2	50.4	4	291.8	14.8

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 January 2016 to July 2016

Day of month	January 2016	February 2016	March 2016	April 2016	May 2016	June 2016	July 2016
1		0	1	0	0	0	0
2		0	0.2	0	11.6	0	0
3		0	0	0	0.2	0.2	0
4		0	7	20.2	0.2	31.4	0.2
5		82.4	0	0.4	0	122	0.6
6		30.6	0.2	0	0	4.8	1
7		1.4	0.2	0	0.2	0	0.4
8		0	0	2.4	0	0	0
9		2.4	2	1.2	0	0	6.4
10		0.2	0	0	0	0	0
11		0	0	0.4	0	0	0
12		0	0	0.2	0	0	0
13		0	0	0	0	1.6	0
14		0	0	8.2	0	2.6	0
15		0	0	0	0	0.2	0
16		0	0	0	0.2	0	0
17		0.8	1.4	0.2	0	0	0
18		0.2	4.2	16.6	0	0.2	0
19		6.2	0.2	26.8	0	5.4	0
20		0	0	0	0	12.8	0
21		48.8	2.6	0.2	0	5.8	0
22	0	0	0.2	0	0	5	0.4
23	20.8	0.2	0	10.4	0	0	
24	14	0	0	14.2	0	0	
25	0	0	0	7.6	0	0	
26	5.8	0	0	10.6	0	0	
27	0	0	0	4.2	0	0.2	
28	9.8	6	0	0	0	0.2	
29	7.4	0.2	0	0	0	0	
30	0.2		5	0	0	0	
31	0		0.4		0		

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

Day of month	January 2016	February 2016	March 2016	April 2016	May 2016	June 2016	July 2016
1		0	1	0.2	0	0.2	0
2		0	0	0.2	8.6	0	0
3		0	0		0	0	0.2
4		0	5.2		0.2	30.8	0.2
5		51.6	0		0	173	2.6
6		24	0	0	0.2	6	0
7		1	0.2	0	0.2	0	0
8		0	0.2	0.8	0.2	0	0
9		1	0.2	20.6	0	0	2.8
10		0.6	0	0	0	0	0
11		0	0	1	0	0.2	0
12		0	0	0.6	0	0	0
13		0	0	0	0	2.2	0
14		0.2	0	3	0	0.2	0
15		0	0	0.4	0.2	0.4	0
16		0	0	0	0.2	0	0
17		1	0	0	0	0	2.8
18		0	3	1.2	0	0	4
19		2.4	0	0.2	0.2	5	0.2
20		0	0	0.2	0	31.8	1.4
21		36.4	1.4	0.2	0	0	2.4
22	0	0	3	0.2	0.2	0	0.2
23	21	0.2	0.2	0.2	0	0	
24	22.4	0	0	0	0	0.2	
25	0	0	0	0.2	0	0	
26	5.6	0	0	0.4	0	0	
27	0.2	0.8	0	0.2	0.2	0.6	
28	7.6	7.2	0	0.6	0.2	0.2	
29	14	0	0	0.6	0	0	
30	0.2		37.4	3	0	0	
31	0		0.2		0		

Kundabung site weather station rainfall records from January to July 2016

Day of month	January 2016	February 2016	March 2016	April 2016	May 2016	June 2016	July 2016
1		0	0	0	0	0	0
2		0	0	21.4	6.4	0	0
3		0	0	0	0	0.2	0
4		0	6.2	0	0	26.6	0.2
5		34.2	0	0	0	173	3.6
6		15.8	0	0	0	6.2	0.2
7		4	0	0	0.2	0	0
8		0	0	0.6	0	0	0
9		0.6	0	3.6	0	0	0.6
10		0	0	7.6	0	0	0
11		0	0	10.8	0	0	0
12		0	0	0.2	0	0	0
13		0	0	0	0	1.8	0.2
14		0	0	9.6	0	0.4	0
15		0	0	0	0.2	0	0
16		0	4.6	0	0	0.2	0
17		1	0.2	0	0	0	1.4
18		0.2	6	2.6	0	0	2.8
19		3.4	0.2	5.4	0	4.6	0
20		0	0	0	0.2	32.2	1
21		31.8	1.4	0	0	0	2.6
22	0	1.8	0.4	0	0	0	0
23	16.8	0	0.2	2.8	0	0	
24	28.8	0	0	1.6	0	0	
25	0.2	0	0	7.4	0	0	
26	19.8	0	0	4.8	0	0	
27	0.2	0.8	0	0.8	0	0	
28	7.8	9	0	0.2	0	0.2	
29	9.6	0	0	0.2	0	0	
30	0		16	0	0	0	
31	0		0.2		0		

Appendix C – Surface water quality sampling results

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

No.	Parameter	Unit	4/02/16 (D)			6/02/16 (W)			22/02/16 (W)			4/03/16 (D)			30/03/16 (W)			04/04/16 (W)			10/04/16 (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	^{0}C	23	25	25	22	23	23	25	25	27	23	24	24	21	22	22	21	22	23	21	21	21
2	Electrical conductivity (EC)	uS/cm	590	1302	1222	108	280	280	175	580	618	609	1194	850	1222	1958	1006	658	756	979	927	1316	1259
3	Dissolved oxygen (DO)	%	6	96	77	91	91	89	48	70	81	10	70	56	15	82	6	43	69	66	21	74	12
4	pH		6.8	7.2	7.3	6.2	6.5	6.7	6.8	7.1	7.1	6.8	7.3	7.5	6.8	7.5	7.5	6.9	7.3	7.3	7.5	7.9	7.8
5	Turbidity (NTU)	NTU	31	10	32	62	58	70	32	27	63	35	18	48	57	11	26	38	85	97	51	17	22
6	Total suspended solids (TSS)	mg/L	24	<5	6	<5	<5	<5	57	33	56	26	6	17	14	7	13	<5	27	38	<5	<5	5
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L	0.09	<0.01	<0.01	2.17	1.32	1.2				0.06	0.01	<0.01	<0.01	<0.01	<0.01	0.05	0.02	0.02			
9	Arsenic (As)	mg/L	0.002	<0.001	<0.001	<0.001	<0.001	<0.001				0.001	<0.001	0.001	<0.001	<0.001	0.003	<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	<0.0001	<0.0001	<0.0001			
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	0.002	<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	<0.001			
13	Iron (Fe)	mg/L	28.2	0.31	0.1	1.54	1.11	1.05				7.98	0.19	0.22	0.1	0.1	0.14	0.15	<0.05	0.15			
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	1.45	0.273	0.236	0.016	0.02	0.019				0.747	0.278	0.171	0.203	0.601	0.762	0.104	0.059	0.179			
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	<0.005	0.01	0.006	0.008	0.012	0.006				0.006	<0.005	0.007	0.006	<0.005	0.017	0.031	0.005	0.009			
20	Total Nitrogen (TN)	mg/L	0.7	0.2	0.2	1	0.7	0.7	0.9	0.6	0.4	0.4	0.2	0.2	0.5	0.3	0.4	0.2	0.6	0.7	0.2	0.2	0.2
21	Total Phosphorous (TP)	mg/L	0.02	<0.01	0.04	0.04	0.02	0.03	0.06	0.02	0.02	0.03	<0.01	0.03	0.02	<0.01	0.23	<0.01	0.03	0.07	<0.01	<0.01	0.05

- 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	14/04/16 (D)			02/05/16 (W)			19/05/16 (D)			6/06/16 (W)			15/06/16 (D)			20/06/16 (W)			01/07/16 (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	^{0}C	20	20	21	19	18	22	15	16	16	16	16	16	13	14	14	16	17	17	10	10	11
2	Electrical conductivity (EC)	uS/cm	882	1562	876	269	556	803	655	1632	1838	126	826	718	386	1258	1341	182	438	527	469	1049	1659
3	Dissolved oxygen (DO)	%	27	78	42	59	77	91	22	75	23	77	86	81	27	87	74	71	78	75	30	64	58
4	pH		7.5	8.0	7.9	6.5	7.1	7.2	6.7	7.4	7.1	6.3	7.0	7.2	6.5	7.3	7.4	6.7	7.0	7.1	6.8	7.4	7.4
5	Turbidity (NTU)	NTU	71	19	59	29	41	90	130	19	41	24	128	21	19	3	9	28	33	50	15	5	13
6	Total suspended solids (TSS)	mg/L	16	<5	15	22	30	64	14	<5	8	<5	59	<5	<5	<5	<5	<5	6	6	<5	<5	6
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L	0.01	<0.01	0.01	0.23	0.14	0.03	0.01	<0.01	<0.01	1.06	0.14	0.28	<0.01	<0.01	<0.01				0.03	<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	0.002	<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	<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				<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	<0.001				<0.001	<0.001	<0.001
13	Iron (Fe)	mg/L	0.07	0.11	0.12	1.34	0.33	0.13	0.95	0.2	0.08	0.82	0.19	0.37	0.06	0.11	0.22				1.59	0.38	<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				<0.001	<0.001	<0.001
15	Manganese (Mn)	mg/L	0.203	0.185	0.214	0.116	0.095	0.164	0.739	0.425	1.12	0.008	0.088	0.046	0.044	0.125	0.171				0.187	0.156	0.248
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				<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	<0.001				<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	0.001	<0.001	<0.001				<0.001	<0.001	<0.001
19	Zinc (Zn)	mg/L	0.01	0.009	0.016	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	0.006	0.029	<0.005	<0.005	<0.005				0.01	<0.005	0.008
20	Total Nitrogen (TN)	mg/L	0.3	0.5	0.4	0.6	0.6	1.5	0.4	1.1	0.6	0.6	1.3	0.7	0.2	<0.1	0.2	0.5	0.4	0.5	0.2	0.1	0.1
21	Total Phosphorous (TP)	mg/L	0.02	<0.01	0.14	0.02	0.02	0.04	0.01	0.02	0.04	0.02	0.08	0.03	0.02	<0.01	0.05	0.02	0.02	0.03	<0.01	<0.01	0.04

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

Table 3 SW2 – Fernbank Creek (Chainage 4620 to 4800)

No.	Parameter	Unit	4/02/16 (D)		6/02/16 (W)		22/02/16 (W)		04/03/16 (D)		30/03/16 (W)		05/04/16 (W)		10/04/16 (W)		14/04/16 (D)		02/05/16 (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	^{0}C	24.0	24.0	22.9	22.1	25.0	23.5	23.0	22.7	21.6	21.3	20.4	19.8	23.2	21.9	19.4	18.9	17.1	16.4
2	Electrical conductivity (EC)	uS/cm	415	699	309	477	512	485	525	551	521	750	546	715	567	792	581	792	631	636
3	Dissolved oxygen (DO)	%	6	3	22	23	33	11	9	4	3	3	4	3	21	16	3	2	14	16
4	pH		6.5	6.5	6.7	6.7	6.3	6.4	6.3	6.5	6.6	6.5	7.2	6.9	7.2	7.3	6.8	6.7	7.0	6.8
5	Turbidity (NTU)	NTU	18	30	51	36	44	22	13	38	11	49	30	75	23	85	15	217	17	51
6	Total suspended solids (TSS)	mg/L	<5	22	12	6	28	38	10	42	13	83	17	52	14	62	10	115	18	50
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.01	<0.01	0.02	0.02			0.01	0.01	0.05	0.02	0.03	0.02			0.04	0.02	0.03	0.01
9	Arsenic (As)	mg/L	0.002	<0.001	<0.001	<0.001			0.001	0.001	0.002	0.003	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	<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
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
13	Iron (Fe)	mg/L	1.03	5.44	0.21	0.64			0.34	7.48	9.27	20.1	6.44	17.1			7.83	15.3	4.67	15.3
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
15	Manganese (Mn)	mg/L	0.763	1.29	0.376	0.283			1.38	1.51	0.902	1.6	0.814	1.95			0.956	2.1	0.972	2.68
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
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	0.026	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	<0.001	<0.001
19	Zinc (Zn)	mg/L	<0.005	0.007	<0.005	<0.005			<0.005	<0.005	<0.005	0.006	0.006	0.008			<0.005	<0.005	<0.005	<0.005
20	Total Nitrogen (TN)	mg/L	0.5	1.4	0.3	1	0.6	1.1	0.6	1.5	1.2	4.2	1.3	2.4	1.2	2.3	1.6	4.2	1.4	1.5
21	Total Phosphorous (TP)	mg/L	0.02	0.1	0.05	0.11	0.05	0.1	0.03	0.2	0.23	0.69	0.23	0.45	0.22	0.46	0.32	0.69	0.33	0.34

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

- Sample points not connected with temporary “plug” in place while working in progress on bridge structure.

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

No.	Parameter	Unit	19/05/16 (D)		6/06/16 (W)		15/06/16 (D)		20/06/16 (W)		01/07/16 (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	^{0}C	13.3	13.3	15.9	15.0	12.1	12.6	15.5	18.6	9.0	8.6								
2	Electrical conductivity (EC)	uS/cm	1142	726	291	237	684	505	765	559	1028	800								
3	Dissolved oxygen (DO)	%	28	25	32	48	37	21	37	57	55	27								
4	pH		7.0	7.1	6.6	6.1	6.8	6.3	6.7	6.1	7.1	6.5								
5	Turbidity (NTU)	NTU	46	89	22	20	16	11	34	32	8	8								
6	Total suspended solids (TSS)	mg/L	12	16	6	8	8	19	8	16	<5	6								
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.02	<0.01	0.07	0.08	0.02	<0.01			0.02	<0.01								
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	0.002	<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								
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	<0.001	<0.001			<0.001	<0.001								
13	Iron (Fe)	mg/L	0.94	0.6	0.35	1.12	0.34	2.06			0.21	0.58								
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	0.851	0.886	0.103	0.529	0.168	1.75			0.092	0.879								
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	<0.001	<0.001	0.002	0.001	0.002	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								
19	Zinc (Zn)	mg/L	<0.005	<0.005	<0.005	0.007	<0.005	0.006			<0.005	<0.005								
20	Total Nitrogen (TN)	mg/L	1	0.9	0.7	0.8	0.4	0.6	0.4	0.6	0.3	0.3								
21	Total Phosphorous (TP)	mg/L	0.11	0.13	0.07	0.21	0.04	0.14	0.04	0.14	0.01	0.03								

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

Table 5 SW3 – Hastings River north bank (Chainage 6040 to 6080)

No.	Parameter	Unit	4/02/16 (D)		6/02/16 (W)		22/02/16 (W)		4/03/16 (D)		30/03/16 (W)		05/04/16 (W)		10/04/16 (W)		14/04/16 (D)		02/05/16 (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	^{0}C	26.6	26.6	24.7	24.6	26.9	26.8	26.0	26.2	25.1	25.1	25.0	24.9	24.7	24.5	23.1	23.1	21.4	21.4
2	Electrical conductivity (EC)	uS/cm	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
3	Dissolved oxygen (DO)	%	95	96	94	91	75	78	86	88	78	79	84	82	93	93	84	84	82	84
4	pH		7.2	7.4	6.9	7.1	6.9	7.2	7.0	7.3	7.1	7.3	7.5	7.6	7.8	7.8	7.2	7.3	7.5	7.5
5	Turbidity (NTU)	NTU	19	18	13	13	18	11	12	27	9	10	16	15	21	24	14	14	6	7
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	34	28	12	14	<5	<5	6	68	<5	6	<5	<5	8	8
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	<0.01	<0.01	0.02	0.02			<0.01	<0.01	<0.10	<0.10	<0.10	<0.10			<0.10	<0.10	<0.10	<0.10
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	<0.001			0.002	0.002	<0.010	<0.010	<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	<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	<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	<0.010	<0.010
13	Iron (Fe)	mg/L	<0.05	<0.05	0.06	0.06			<0.05	<0.05	<0.50	<0.50	<0.50	<0.50			<0.50	<0.50	<0.50	<0.50
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	<0.010	<0.010
15	Manganese (Mn)	mg/L	0.01	0.006	0.023	0.024			0.022	0.019	0.03	0.029	0.018	0.016			0.026	0.027	0.018	0.017
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
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	<0.010	<0.010
18	Silver (Ag)	mg/L	<0.001	0.004	0.001	<0.001			<0.001	<0.001	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010	<0.010	<0.010
19	Zinc (Zn)	mg/L	<0.005	0.007	<0.005	0.005			<0.005	<0.005	<0.050	<0.050	<0.050	<0.050			<0.050	<0.050	<0.050	<0.050
20	Total Nitrogen (TN)	mg/L	0.7	<0.2	<0.2	<0.2	0.4	0.6	0.2	0.2	<0.2	<0.2	0.2	0.2	<0.2	<0.2	<0.1	0.2	<0.2	<0.2
21	Total Phosphorous (TP)	mg/L	<0.02	0.02	<0.02	<0.02	0.08	0.04	0.03	0.03	0.03	<0.02	0.04	0.04	0.02	0.03	0.06	0.03	0.04	0.02

Note: Elevated turbidity at SW3b on 4 March appeared attributable to long-shore water movement. No correlation to construction activities in progress at the time of sampling.

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

No.	Parameter	Unit	19/05/16 (D)		6/06/16 (W)		15/06/16 (D)		20/06/16 (W)		01/07/16 (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	^{0}C	18.9	18.8	15.5	15.4	16.6	16.5	17.9	17.9	13.5	13.8								
2	Electrical conductivity (EC)	uS/cm	8000	8000	721	789	8000	8000	8000	8000	8000	8000								
3	Dissolved oxygen (DO)	%	95	93	97	94	81	81	82	79	82	82								
4	pH		7.9	7.9	6.9	6.9	7.4	7.5	7.3	7.4	7.9	8.0								
5	Turbidity (NTU)	NTU	3	1	249	161	8	10	7	5	8	4								
6	Total suspended solids (TSS)	mg/L	<5	<5	139	80	<5	<5	<5	<5	9	<5								
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	<0.10	<0.10	0.28	0.27	0.04	0.04			0.01	<0.01								
9	Arsenic (As)	mg/L	<0.010	<0.010	<0.001	<0.001	<0.001	0.002			<0.001	<0.001								
10	Cadmium (Cd)	mg/L	<0.0010	<0.0010	<0.0001	0.0001	<0.0001	<0.0001			0.0002	<0.0001								
11	Chromium (Cr)	mg/L	<0.010	<0.010	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001								
12	Copper (Cu)	mg/L	<0.010	<0.010	0.005	<0.001	<0.001	<0.001			<0.001	<0.001								
13	Iron (Fe)	mg/L	<0.50	<0.50	0.28	0.28	0.08	0.07			<0.05	<0.05								
14	Lead (Pb)	mg/L	<0.010	<0.010	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001								
15	Manganese (Mn)	mg/L	0.014	0.012	0.017	0.017	0.074	0.069			0.037	0.033								
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	<0.010	<0.010	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001								
18	Silver (Ag)	mg/L	<0.010	<0.010	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001								
19	Zinc (Zn)	mg/L	<0.050	<0.050	0.007	<0.005	<0.005	<0.005			<0.005	<0.005								
20	Total Nitrogen (TN)	mg/L	<0.5	<0.5	1.5	1.4	0.3	0.3	0.2	0.2	<0.5	<0.5								
21	Total Phosphorous (TP)	mg/L	<0.05	<0.05	0.18	0.14	<0.02	<0.02	0.03	0.04	<0.05	<0.05								

Note - Elevated turbidity on 6 June attributable to flood water.

Table 7 SW5 – Unnamed tributary of the Wilson River (Chainage 15820)

No.	Parameter	Unit	4/02/16 (D) SW5b (DS)	6/02/16 (W) SW5b (DS)	22/02/16 (W) SW5b (DS)	4/03/16 (D) SW5b (DS)	30/03/16 (W) SW5b (DS)	05/04/16 (W) SW5b (DS)	10/04/16 (W) SW5b (DS)	14/04/16 (D) SW5b (DS)	2/05/16 (W) SW5b (DS)
1	Temperature	^{0}C	27.0	20.9	27.0	26.2	23.0	23.6	25.5	22.2	20.9
2	Electrical conductivity (EC)	uS/cm	1669	799	1016	1253	1447	1664	1642	1896	1932
3	Dissolved oxygen (DO)	%	16	59	27	41	8	19	51	17	28
4	pH		6.9	6.6	7.1	7.2	7.5	7.8	7.6	7.5	7.3
5	Turbidity (NTU)	NTU	20	11	20	39	57	77	72	86	89
6	Total suspended solids (TSS)	mg/L	<5	<5	34	10	14	16	24	6	18
7	Total Petroleum Hydrocarbons	mg/L									
8	Aluminium (Al)	mg/L	<0.01	0.04		<0.01	<0.01	<0.01		<0.01	<0.01
9	Arsenic (As)	mg/L	<0.001	<0.001		0.002	0.002	0.002		0.002	0.001
10	Cadmium (Cd)	mg/L	<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
12	Copper (Cu)	mg/L	<0.001	0.002		<0.001	<0.001	<0.001		<0.001	<0.001
13	Iron (Fe)	mg/L	0.07	<0.05		0.1	0.12	0.13		0.13	0.12
14	Lead (Pb)	mg/L	<0.001	<0.001		<0.001	<0.001	<0.001		<0.001	<0.001
15	Manganese (Mn)	mg/L	2.2	2.43		3.99	4.42	7.14		5.41	4.37
16	Mercury (Hg)	mg/L	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001		<0.0001	<0.0001
17	Nickel (Ni)	mg/L	<0.001	0.014		<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
19	Zinc (Zn)	mg/L	0.007	0.025		<0.005	<0.005	0.01		<0.005	<0.005
20	Total Nitrogen (TN)	mg/L	0.5	0.6	0.8	1	1.8	2.1	2.3	1.7	1.3
21	Total Phosphorous (TP)	mg/L	0.02	0.02	0.1	0.04	0.13	0.17	0.21	0.1	0.08

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

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

No.	Parameter	Unit	19/05/16 (D) SW5b (DS)	6/06/16 (W) SW5b (DS)	15/06/16 (D) SW5b (DS)	20/06/16 (W) SW5b (DS)	01/07/16 (D) SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)
1	Temperature	^{0}C	17.6	19.0	15.0	18.2	11.6				
2	Electrical conductivity (EC)	uS/cm	2155	215	499	325	682				
3	Dissolved oxygen (DO)	%	52	64	36	76	41				
4	pH		7.6	5.8	7.0	6.6	7.1				
5	Turbidity (NTU)	NTU	32	17	7	25	5				
6	Total suspended solids (TSS)	mg/L	9	7	5	6	6				
7	Total Petroleum Hydrocarbons	mg/L									
8	Aluminium (Al)	mg/L	<0.01	0.22	0.01		0.01				
9	Arsenic (As)	mg/L	<0.001	<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	0.16	0.42	0.46		0.5				
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001		<0.001				
15	Manganese (Mn)	mg/L	2.03	0.288	0.176		0.073				
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001		<0.0001				
17	Nickel (Ni)	mg/L	<0.001	0.001	0.001		0.002				
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001		<0.001				
19	Zinc (Zn)	mg/L	<0.005	0.021	<0.005		<0.005				
20	Total Nitrogen (TN)	mg/L	1.4	0.6	0.3	0.5	0.2				
21	Total Phosphorous (TP)	mg/L	0.09	0.06	0.02	0.02	<0.01				

Table 9 SW6 – Wilson River south bank (Chainage 16460 to 16600)

No.	Parameter	Unit	4/02/16 (D)		6/02/16 (W)		22/02/16 (W)		4/03/16 (D)		30/03/16 (W)		05/04/16 (W)		10/04/16 (W)		14/04/16 (D)		2/05/16 (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	^{0}C	27.1	27.3	25.4	25.7	28.4	28.9	27.3	27.9	24.9	24.6	25.4	25.5	24.8	26.0	23.8	23.8	21.8	22.4
2	Electrical conductivity (EC)	uS/cm	144	193	161	229	290	422	311	319	4556	6528	7251	8000	7740	8000	8000	8000	7589	8000
3	Dissolved oxygen (DO)	%	94	77	88	75	84	71	78	79	85	83	85	82	93	85	87	80	90	83
4	pH		7.0	6.9	6.6	6.6	7.2	7.0	7.1	7.2	7.0	6.9	7.4	7.3	7.3	7.3	7.2	7.2	7.2	7.1
5	Turbidity (NTU)	NTU	18	23	21	28	16	18	14	17	12	13	13	16	13	12	12	16	3	9
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	31	10	7	9	6	7	11	<5	<5	<5	<5	<5	16	8
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.19	0.13	0.38	0.27			0.1	0.07	0.02	0.02	<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			0.002	0.002	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	<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
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
13	Iron (Fe)	mg/L	0.34	0.41	0.48	0.59			0.52	0.52	0.1	0.1	0.06	0.06			0.07	<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	<0.001	<0.001
15	Manganese (Mn)	mg/L	0.009	0.005	0.008	0.024			0.012	0.006	0.087	0.084	0.128	0.12			0.107	0.116	0.083	0.088
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
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
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
19	Zinc (Zn)	mg/L	0.01	<0.005	0.007	<0.005			<0.005	<0.005	<0.005	<0.005	0.006	0.006			0.007	<0.005	<0.005	<0.005
20	Total Nitrogen (TN)	mg/L	0.3	0.3	0.3	0.2	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.4	0.2	0.4
21	Total Phosphorous (TP)	mg/L	0.03	0.02	0.02	0.02	0.06	0.04	0.05	0.02	<0.01	<0.01	0.02	0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.02

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

No.	Parameter	Unit	19/05/16 (D)		6/06/16 (W)		15/06/16 (D)		20/06/16 (W)		01/07/16 (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	^{0}C	18.2	19.3	17.5	16.7	16.9	16.0	17.0	17.6	13.3	13.0								
2	Electrical conductivity (EC)	uS/cm	8000	8000	206	233	488	918	592	670	457	603								
3	Dissolved oxygen (DO)	%	96	82	91	92	67	72	75	83	81	82								
4	pH		7.3	7.2	6.6	6.5	6.7	6.5	6.9	6.9	7.3	7.2								
5	Turbidity (NTU)	NTU	2	4	118	115	13	21	12	11	12	18								
6	Total suspended solids (TSS)	mg/L	<5	<5	40	45	7	7	<5	6	6	7								
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	<0.01	<0.01	0.67	0.51	0.33	0.33			0.17	0.16								
9	Arsenic (As)	mg/L	<0.001	<0.001	0.002	<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			0.0004	<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	<0.001	0.001			<0.001	<0.001								
13	Iron (Fe)	mg/L	<0.05	<0.05	0.41	0.36	0.45	0.58			0.37	0.4								
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	0.064	0.079	0.027	0.044	0.161	0.131			0.058	0.042								
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	<0.001	<0.001	<0.001	<0.001	<0.001	0.002			<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	0.006	<0.005	0.014	<0.005	0.013			<0.005	0.006								
20	Total Nitrogen (TN)	mg/L	0.2	<0.2	1	1	0.6	0.6	0.6	0.6	0.4	0.4								
21	Total Phosphorous (TP)	mg/L	<0.01	<0.01	0.12	0.1	0.03	0.02	0.03	0.01	0.02	0.02								

Note - Elevated turbidity on 6 June 2016 attributable flood water.

Table 11 SW6 – Wilson River north bank (Chainage 16830 to 16840)

No.	Parameter	Unit	4/02/16 (D)		6/02/16 (W)		22/02/16 (W)		4/03/16 (D)		30/03/16 (W)		05/04/16 (W)		10/04/16 (W)		14/04/16 (D)		2/05/16 (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	^{0}C	27.3	27.4	25.7	25.7	27.6	28.0	27.0	27.1	25.1	25.3	24.9	24.8	24.8	25.1	23.5	23.9	21.4	21.5
2	Electrical conductivity (EC)	uS/cm	245	247	157	157	467	455	342	353	4919	5279	8000	8000	8000	8000	8000	8000	8000	8000
3	Dissolved oxygen (DO)	%	78	79	79	81	61	64	65	65	77	75	77	73	84	84	77	76	81	79
4	pH		6.9	6.9	6.2	6.4	6.9	6.9	7.0	7.1	6.7	6.8	7.1	7.2	7.2	7.3	6.8	7.0	7.0	7.1
5	Turbidity (NTU)	NTU	23	22	20	21	17	18	16	17	13	14	13	19	16	13	13	13	10	15
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	7	7	7	8	9	7	<5	<5	<5	<5	<5	<5	28	19
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.2	0.18	0.24	0.18			0.11	0.06	0.02	0.02	<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			0.002	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	<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
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
13	Iron (Fe)	mg/L	0.53	0.57	0.44	0.42			0.6	0.62	0.11	0.1	0.06	0.07			0.12	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	<0.001	<0.001
15	Manganese (Mn)	mg/L	0.008	0.008	0.006	0.005			0.011	0.012	0.082	0.077	0.112	0.113			0.104	0.101	0.077	0.078
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
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
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
19	Zinc (Zn)	mg/L	0.017	0.008	0.01	<0.005			<0.005	0.019	<0.005	<0.005	0.008	0.008			0.006	0.01	<0.005	<0.005
20	Total Nitrogen (TN)	mg/L	0.9	0.3	0.3	0.2	0.5	0.4	0.2	0.2	0.3	0.4	0.2	0.2	0.1	0.1	0.2	0.3	0.2	0.4
21	Total Phosphorous (TP)	mg/L	0.04	0.02	0.02	0.02	0.03	0.03	0.02	0.02	<0.01	0.04	0.03	0.02	0.09	<0.01	<0.01	<0.01	0.02	0.01

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

No.	Parameter	Unit	19/05/16 (D)		6/06/16 (W)		15/06/16 (D)		20/06/16 (W)		01/07/16 (D)						16/01/16 (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	^{0}C	19.0	19.1	16.2	16.2	15.2	15.3	16.2	16.2	12.6	12.6								
2	Electrical conductivity (EC)	uS/cm	8000	8000	177	154	558	550	663	698	760	800								
3	Dissolved oxygen (DO)	%	87	86	93	92	83	83	82	83	80	79								
4	pH		7.1	7.2	6.6	6.6	6.9	6.9	6.9	6.9	7.2	7.1								
5	Turbidity (NTU)	NTU	4	4	116	134	22	22	13	16	14	14								
6	Total suspended solids (TSS)	mg/L	<5	<5	41	52	16	8	6	6	6	<5								
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	<0.01	<0.01	0.54	0.56	0.18	0.19			0.29	0.18								
9	Arsenic (As)	mg/L	<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	0.0002	0.0002	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	<0.001	<0.001			0.001	<0.001								
13	Iron (Fe)	mg/L	<0.05	<0.05	0.33	0.33	0.27	0.24			0.58	0.49								
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	0.073	0.072	0.029	0.026	0.07	0.061			0.053	0.053								
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	<0.001	<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								
19	Zinc (Zn)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			0.005	0.006								
20	Total Nitrogen (TN)	mg/L	<0.2	<0.2	1.1	1.1	0.6	0.6	0.6	0.6	0.4	0.4								
21	Total Phosphorous (TP)	mg/L	<0.01	<0.01	0.08	0.08	0.07	0.02	0.02	0.02	0.02	0.02								

Note - Elevated turbidity on 6 June 2016 attributable flood water.

Table 13 SW7 – Cooperabung Creek (Chainage 19660)

No.	Parameter	Unit	4/02/16 (D)		6/02/16 (W)		22/02/16 (W)		4/03/16 (D)		30/03/16 (W)		05/04/16 (W)		10/04/16 (W)		14/04/16 (D)		2/05/16 (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	^{0}C	23.5	23.6	21.1	21.1	22.8	22.8	22.8	22.7	21.8	21.8	20.9	20.9	21.8	21.6	20.0	20.3	18.6	18.4
2	Electrical conductivity (EC)	uS/cm	180	186	102	108	183	236	202	212	210	216	211	217	201	208	206	237	189	218
3	Dissolved oxygen (DO)	%	60	59	96	95	53	55	45	47	41	44	37	52	48	55	40	43	50	53
4	pH		6.9	6.9	6.2	6.3	7.1	7.0	7.5	7.4	7.1	7.1	7.7	7.8	8.0	7.9	7.4	7.3	7.3	7.3
5	Turbidity (NTU)	NTU	17	17	64	67	21	21	13	15	14	15	15	13	18	13	12	13	2	2
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	9	13	<5	6	<5	5	<5	<5	<5	<5	<5	<5	11	12
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.09	0.1	0.84	0.84			0.04	0.04	0.03	0.04	0.03	0.03			0.03	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	<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	<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
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
13	Iron (Fe)	mg/L	0.72	0.77	0.57	0.56			0.85	0.81	0.58	0.62	0.75	0.78			0.85	0.86	0.82	0.79
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
15	Manganese (Mn)	mg/L	0.07	0.083	0.012	0.015			0.106	0.114	0.094	0.086	0.158	0.161			0.072	0.16	0.087	0.122
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
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
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
19	Zinc (Zn)	mg/L	0.007	0.016	0.008	0.005			0.006	0.01	<0.005	<0.005	0.006	0.006			0.093	0.016	<0.005	0.01
20	Total Nitrogen (TN)	mg/L	0.2	0.3	0.5	0.4	0.4	0.4	0.1	0.1	0.2	0.3	0.2	0.1	<0.1	0.1	0.2	0.4	<0.1	0.2
21	Total Phosphorous (TP)	mg/L	0.01	0.01	0.03	0.03	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	<0.01

Table 14 SW7 – Cooperabung Creek (Chainage 19660) cont.

No.	Parameter	Unit	19/05/16 (D)		6/06/16 (W)		15/06/16 (D)		20/06/16 (W)		01/07/16 (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	^{0}C	14.6	15.4	16.2	16.3	14.1	14.0	16.3	16.4	11.1	11.2								
2	Electrical conductivity (EC)	uS/cm	191	198	101	107	159	166	120	144	173	180								
3	Dissolved oxygen (DO)	%	53	62	94	94	84	82	87	87	78	77								
4	pH		7.4	7.3	6.7	6.7	7.4	7.2	7.2	7.1	7.5	7.4								
5	Turbidity (NTU)	NTU	4	3	45	47	23	21	61	64	16	16								
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	6	<5	<5	8	9	<5	<5								
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.01	0.01	0.92	0.91	0.12	0.2			0.24	0.25								
9	Arsenic (As)	mg/L	<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								
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	<0.001	<0.001			<0.001	<0.001								
13	Iron (Fe)	mg/L	0.65	1	0.52	0.55	0.3	0.33			0.5	0.51								
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	0.056	0.26	0.017	0.03	0.024	0.044			0.028	0.042								
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	<0.001	<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								
19	Zinc (Zn)	mg/L	0.007	<0.005	<0.005	<0.005	<0.005	<0.005			<0.005	0.006								
20	Total Nitrogen (TN)	mg/L	0.1	<0.1	0.6	0.6	0.3	0.3	0.6	0.7	<0.1	<0.1								
21	Total Phosphorous (TP)	mg/L	<0.01	<0.01	0.05	0.04	0.03	0.02	0.04	0.05	0.02	0.02								

Table 15 SW8 – Barrys Creek (Chainage 23775 to 25325)

No.	Parameter	Unit	4/02/16 (D)			6/02/16 (W)			22/02/16 (W)			4/03/16 (D)			30/03/16 (W)			04-05/04/16 (W)			10/04/16 (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	^{0}C	21.6	21.8	23.7	20.5	20.5	21.3	DNS	21.1	23.8	DNS	DNS	23.7	DNS	20.6	23.0	DNS	19.9	22.4	DNS	20.2	21.5
2	Electrical conductivity (EC)	uS/cm	324	235	340	123	130	176		213	219			264		242	283		259	340		251	331
3	Dissolved oxygen (DO)	%	16	38	53	104	96	100		34	59			65		38	33		29	29		31	30
4	pH		6.4	6.2	6.2	5.9	5.9	6.8		6.6	6.6			6.6		6.1	6.1		6.9	6.1		7.7	6.4
5	Turbidity (NTU)	NTU	19	22	9	50	50	53		64	28			34		238	17		33	9		55	11
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	<5	<5		27	<5			7		46	<5		10	<5		5	<5
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L	0.07	0.26	0.02	0.62	0.57	0.64						0.07		0.06	0.05		0.02	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			
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			
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			
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			
13	Iron (Fe)	mg/L	<0.05	0.13	<0.05	0.29	0.26	0.32						0.1		0.36	0.08		0.51	0.07			
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			
15	Manganese (Mn)	mg/L	0.068	0.032	0.021	0.006	0.008	0.019						0.008		0.238	0.03		0.299	0.059			
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			
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			
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			
19	Zinc (Zn)	mg/L	0.014	0.222	0.009	<0.005	0.011	0.006						<0.005		0.007	0.005		0.017	0.006			
20	Total Nitrogen (TN)	mg/L	0.2	0.3	0.2	0.5	0.5	0.5		0.4	0.2			<0.1		0.2	0.1		<0.1	<0.1		<0.1	<0.1
21	Total Phosphorous (TP)	mg/L	0.03	0.04	0.02	0.01	0.03	0.01		0.04	<0.01			0.01		0.02	0.06		<0.01	0.02		<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 16 SW8 – Barrys Creek (Chainage 23775 to 25325) cont.

No.	Parameter	Unit	14/04/16 (D)			2/05/16 (W)			19/05/16 (D)			6/06/16 (W)			15/06/16 (D)			20/06/16 (W)			01/07/16 (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	^{0}C	DNS	19.8	22.7	DNS	17.9	20.7	DNS	15.5	17.7	16.3	17.0	16.6	16.2	17.0	15.6	16.6	18.1	16.0	13.9	15.2	13.1
2	Electrical conductivity (EC)	uS/cm		280	329		310	333		329	340	118	122	141	204	171	220	232	229	229	268	179	247
3	Dissolved oxygen (DO)	%		18	42		31	44		35	52	97	85	94	41	44	46	86	67	73	24	43.4	57
4	pH			6.2	6.5		6.3	6.1		6.4	6.4	6.6	6.1	6.4	6.5	6.4	6.3	6.6	6.4	6.4	6.6	6.5	6.6
5	Turbidity (NTU)	NTU		107	12		31	2		29	2	31	30	33	9	27	17	34	55	61	6	20.2	8
6	Total suspended solids (TSS)	mg/L		7	<5		14	6		9	<5	<5	<5	<5	<5	<5	<5	<5	<5	9	<5	<5	7
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L		0.02	0.02		0.01	0.01		<0.01	<0.01	0.85	0.66	0.46	0.08	0.21	0.1				0.08	1.46	0.11
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	0.0003	<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	<0.001
13	Iron (Fe)	mg/L		0.63	0.06		0.23	0.05		0.06	0.06	0.34	0.28	0.2	<0.05	0.11	0.07				0.05	0.58	0.07
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		0.296	0.1		0.368	0.093		0.27	0.096	0.024	0.034	0.014	0.005	0.06	0.007				0.034	0.041	0.004
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	<0.001
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				<0.001	<0.001	<0.001
19	Zinc (Zn)	mg/L		0.008	0.014		0.006	0.008		0.014	0.025	<0.005	0.005	0.006	<0.005	0.005	0.008				<0.005	0.008	0.01
20	Total Nitrogen (TN)	mg/L		0.3	0.1		0.2	0.2		0.2	<0.1	0.5	0.6	0.6	0.1	0.3	0.3	0.3	0.3	0.3	<0.1	0.3	<0.1
21	Total Phosphorous (TP)	mg/L		0.02	<0.01		0.01	<0.01		0.02	<0.01	0.03	0.02	0.02	<0.01	0.02	0.02	0.02	0.01	0.02	<0.01	0.02	0.02

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

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

Note – SW8a and SW8b connected during 15 June 2016 sampling event, but not connected with SW8c.

Table 17 SW9 – Smiths Creek (Chainage 28300)

No.	Parameter	Unit	4/02/16 (D)		6/02/16 (W)		22/02/16 (W)		4/03/16 (D)		30/03/16 (W)		04/04/16 (W)		10/04/16 (W)		14/04/16 (D)		2/05/16 (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	^{0}C	23.3	23.2	21.2	21.2	22.8	22.6	22.9	22.6	20.8	20.4	20.6	19.9	19.8	19.6	20.3	19.2	20.6	18.1
2	Electrical conductivity (EC)	uS/cm	218	216	137	134	183	180	211	206	247	233	245	236	253	241	251	243	259	236
3	Dissolved oxygen (DO)	%	47	46	95	95	62	62	53	50	29	25	29	29	20	22	49	17	84	24
4	pH		7.0	7.1	6.9	7.1	7.0	7.2	7.2	7.4	7.1	7.1	7.3	7.5	7.3	7.4	7.7	7.9	7.1	7.1
5	Turbidity (NTU)	NTU	13	12	40	48	18	18	14	13	13	13	12	12	13	16	13	16	4	7
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	9	8	7	7	<5	6	<5	<5	5	<5	<5	<5	<5	5
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.12	0.1	0.52	0.55			0.08	0.11	0.04	0.05	0.04	0.04			0.03	0.02	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
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
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
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
13	Iron (Fe)	mg/L	0.82	0.84	0.63	0.62			0.64	0.66	0.57	0.6	0.78	0.69			0.92	0.78	1.49	1.38
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
15	Manganese (Mn)	mg/L	0.052	0.052	0.013	0.01			0.042	0.042	0.2	0.198	0.17	0.153			0.248	0.205	0.377	0.338
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
17	Nickel (Ni)	mg/L	<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	<0.001
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	<0.001	<0.001
19	Zinc (Zn)	mg/L	0.008	<0.005	<0.005	<0.005			<0.005	<0.005	0.01	0.024	<0.005	<0.005			0.019	0.019	0.009	0.016
20	Total Nitrogen (TN)	mg/L	0.3	0.2	0.5	0.4	0.4	0.4	0.2	0.2	0.3	0.3	0.6	0.2	0.2	0.2	0.4	0.4	0.4	0.4
21	Total Phosphorous (TP)	mg/L	0.02	<0.01	0.1	0.02	0.05	0.06	0.03	0.05	<0.01	<0.01	0.02	0.02	<0.01	0.03	<0.01	0.02	0.04	0.03

Table 18 SW9 – Smiths Creek (Chainage 28300) cont.

No.	Parameter	Unit	19/05/16 (D)		6/06/16 (W)		15/06/16 (D)		20/06/16 (W)		01/07/16 (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	^{0}C	16.1	15.0	15.9	15.9	13.8	13.8	15.4	15.3	11.2	11.2								
2	Electrical conductivity (EC)	uS/cm	265	243	84	84	160	161	111	105	173	173								
3	Dissolved oxygen (DO)	%	70	36	94	94	91	90	84	85	86	86								
4	pH		7.3	7.3	6.5	6.5	6.9	6.9	6.8	6.8	7.1	7.1								
5	Turbidity (NTU)	NTU	7	8	41	41	24	24	47	47	21	21								
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	5	<5	<5	10	8	<5	<5								
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.02	<0.01	0.57	0.78	0.15	0.13			0.33	0.6								
9	Arsenic (As)	mg/L	<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								
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	<0.001	<0.001			<0.001	<0.001								
13	Iron (Fe)	mg/L	1.66	1.5	0.32	0.44	0.26	0.26			0.41	0.55								
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	0.318	0.206	0.011	0.012	0.01	0.009			0.012	0.011								
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	<0.001	<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								
19	Zinc (Zn)	mg/L	0.021	0.007	<0.005	<0.005	<0.005	<0.005			<0.005	0.006								
20	Total Nitrogen (TN)	mg/L	0.2	0.2	0.7	0.7	0.3	0.3	0.6	0.4	0.2	0.2								
21	Total Phosphorous (TP)	mg/L	0.02	0.02	0.03	0.03	0.03	0.02	0.08	0.08	0.04	0.07								

Table 19 SW10 – Pipers Creek (Chainage 30700)

No.	Parameter	Unit	4/02/16 (D)		6/02/16 (W)		22/02/16 (W)		4/03/16 (D)		30/03/16 (W)		04/04/16 (W)		10/04/16 (W)		14/04/16 (D)		2/05/16 (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	^{0}C	23.3	23.1	22.0	21.9	22.8	22.7	23.1	23.1	21.9	21.7	21.9	21.8	20.3	20.2	23.1	21.0	21.4	19.1
2	Electrical conductivity (EC)	uS/cm	281	266	247	238	256	250	257	254	380	394	467	474	468	439	515	474	524	488
3	Dissolved oxygen (DO)	%	25	26	58	58	51	53	30	36	41	50	41	56	27	38	63	45	73	46
4	pH		6.9	7.0	6.7	6.6	7.1	7.3	7.4	7.7	7.2	7.4	7.2	7.4	7.2	7.6	7.6	8.0	7.2	7.2
5	Turbidity (NTU)	NTU	21	20	64	63	44	43	17	18	31	27	21	16	15	18	78	85	11	10
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	19	14	9	12	11	12	<5	<5	9	9	12	12	<5	8
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.09	0.08	0.38	0.37			0.06	0.04	0.01	0.05	0.01	0.01			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			<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	<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
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
13	Iron (Fe)	mg/L	1.41	1.41	1.05	1.08			1.13	1.04	0.46	0.7	0.68	0.75			0.27	0.41	0.58	0.7
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
15	Manganese (Mn)	mg/L	0.081	0.093	0.032	0.026			0.098	0.077	0.138	0.263	0.306	0.322			0.291	0.294	0.211	0.277
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
17	Nickel (Ni)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	0.001	<0.001	0.001	0.002			0.003	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	<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			0.016	0.01	0.006	0.007
20	Total Nitrogen (TN)	mg/L	0.4	0.3	0.6	0.7	0.6	0.5	0.3	0.4	0.5	0.4	0.3	0.4	0.3	1.2	1	0.8	0.6	0.6
21	Total Phosphorous (TP)	mg/L	0.01	0.04	0.02	0.03	0.1	0.03	0.04	0.03	<0.01	<0.01	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02

Table 20 SW10 – Pipers Creek (Chainage 30700) cont.

No.	Parameter	Unit	19/05/16 (D)		6/06/16 (W)		15/06/16 (D)		20/06/16 (W)		01/07/16 (D)						16/01/16 (W)			
			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)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)
1	Temperature	^{0}C	16.3	14.9	15.8	15.8	13.4	13.2	15.2	15.2	11.7	10.5								
2	Electrical conductivity (EC)	uS/cm	521	515	90	96	182	176	161	161	204	204								
3	Dissolved oxygen (DO)	%	56	39	89	88	82	83	81	83	78	78								
4	pH		7.3	7.4	6.5	6.4	6.9	7.0	6.7	6.6	7.1	7.1								
5	Turbidity (NTU)	NTU	22	15	52	49	23	23	60	57	15	17								
6	Total suspended solids (TSS)	mg/L	<5	<5	12	10	<5	<5	11	13	<5	<5								
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	<0.01	<0.01	1.04	1.16	0.24	0.19			1.02	0.33								
9	Arsenic (As)	mg/L	<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	0.0002	<0.0001	<0.0001			<0.0001	0.0003								
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	<0.001	<0.001			<0.001	<0.001								
13	Iron (Fe)	mg/L	0.3	0.27	0.65	0.69	0.36	0.32			0.59	0.56								
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	0.223	0.162	0.018	0.019	0.017	0.014			0.017	0.015								
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	<0.001	<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								
19	Zinc (Zn)	mg/L	<0.005	0.005	0.008	0.01	<0.005	<0.005			0.006	0.006								
20	Total Nitrogen (TN)	mg/L	0.3	0.2	0.8	0.9	0.4	0.3	0.6	0.6	0.1	0.2								
21	Total Phosphorous (TP)	mg/L	0.01	0.01	0.04	0.04	0.02	0.02	0.03	0.03	0.02	0.03								

Note – Sample points present at isolated sampling points due to presents of coffer dam on 18 December 2015.

Table 21 SW11 – Unnamed drainage line (Chainage 34650 to 34700)

No.	Parameter	Unit	4/02/16 (D)		6/02/16 (W)		22/02/16 (W)		4/03/16 (D)		30/03/16 (W)		04/04/16 (W)		10/04/16 (W)		14/04/16 (D)		2/05/16 (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	^{0}C	24.9	25.0	22.1	21.8	23.6	24.3	24.6	24.1	22.1	22.9	22.0	22.0	21.0	21.3	21.0	21.0	19.2	19.4
2	Electrical conductivity (EC)	uS/cm	713	712	256	261	332	741	1388	1397	2068	1758	2069	2043	2081	2026	2074	2075	1718	1682
3	Dissolved oxygen (DO)	%	96	96	99	105	82	70	104	98	89	85	105	115	78	92	98	101	73	88
4	pH		7.0	7.0	6.2	6.4	6.9	6.7	7.5	7.4	7.6	7.3	7.9	7.9	7.7	7.7	8.4	8.4	7.7	7.7
5	Turbidity (NTU)	NTU	15	15	72	76	39	49	12	13	15	35	12	16	12	24	18	22	11	12
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	11	14	6	7	8	15	6	<5	<5	<5	<5	10	10	9
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.03	0.04	1.19	1.72			0.03	0.02	0.01	0.08	0.01	0.02			0.03	0.02	0.04	0.05
9	Arsenic (As)	mg/L	<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	<0.001
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	<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
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
13	Iron (Fe)	mg/L	0.07	0.06	1.08	1.36			0.06	0.07	<0.05	0.11	<0.05	<0.05			<0.05	<0.05	0.05	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
15	Manganese (Mn)	mg/L	0.278	0.302	0.05	0.053			0.086	0.108	0.036	0.131	0.031	0.032			0.039	0.034	0.034	0.073
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
17	Nickel (Ni)	mg/L	0.009	0.011	0.002	0.001			0.003	0.003	0.002	0.002	0.001	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	<0.001	<0.001
19	Zinc (Zn)	mg/L	0.024	0.026	0.008	0.042			0.007	0.005	<0.005	<0.005	<0.005	<0.005			0.015	0.009	0.006	<0.005
20	Total Nitrogen (TN)	mg/L	1.6	1.7	0.7	0.8	1	1.3	0.4	0.3	0.2	0.7	0.2	0.2	0.1	0.2	0.3	0.4	0.4	0.4
21	Total Phosphorous (TP)	mg/L	<0.01	<0.01	0.02	0.01	0.03	0.04	<0.01	<0.01	<0.01	0.69	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01

[#] - Sample points connected but no obvious water movement.

Table 22 SW11 – Unnamed drainage line (Chainage 34650 to 34700) cont.

No.	Parameter	Unit	19/05/16 (D)		6/06/16 (W)		15/06/16 (D)		20/06/16 (W)		01/07/16 (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	^{0}C	16.2	15.8	15.6	15.7	14.1	14.3	15.5	15.5	11.5	11.6								
2	Electrical conductivity (EC)	uS/cm	1909	1921	156	150	505	421	275	323	588	466								
3	Dissolved oxygen (DO)	%	90	92	99	101	77	74	91	94	86	83								
4	pH		7.9	7.9	5.8	5.7	6.7	6.5	6.1	6.2	7.0	6.8								
5	Turbidity (NTU)	NTU	3	4	29	29	17	17	35	32	14	10								
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	<5	<5	79	<5	6	6								
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	<0.01	<0.01	1.8	1.66	0.65	0.48			0.43	0.28								
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	0.002	<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								
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	<0.001	<0.001			<0.001	<0.001								
13	Iron (Fe)	mg/L	<0.05	<0.05	0.85	0.83	0.38	0.5			0.41	0.62								
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	0.012	0.011	0.038	0.033	0.213	0.18			0.128	0.177								
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	0.001	<0.001	<0.001	<0.001	0.007	0.003			0.003	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	0.008	0.008	0.008	0.022	0.01			0.01	0.006								
20	Total Nitrogen (TN)	mg/L	0.3	0.3	0.8	0.8	1.1	0.7	0.4	0.4	0.6	0.3								
21	Total Phosphorous (TP)	mg/L	<0.01	<0.01	0.02	0.02	0.02	0.01	0.01	0.01	<0.01	<0.01								

[#] - Sample points connected but no obvious water movement.

Table 23 SW12 – Maria River (Chainage 36850)

No.	Parameter	Unit	4/02/16 (D)		6/02/16 (W)		22/02/16 (W)		4/03/16 (D)		30/03/16 (W)		04/04/16 (W)		10/04/16 (W)		14/04/16 (D)		2/05/16 (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	^{0}C	23.8	24.4	22.0	22.1	22.7	22.9	22.5	23.3	21.2	21.7	20.7	23.1	19.7	20.6	20.8	21.0	18.9	19.5
2	Electrical conductivity (EC)	uS/cm	238	213	205	196	221	217	200	206	203	233	235	238	230	239	287	237	292	255
3	Dissolved oxygen (DO)	%	8	20	7	25	4	21	11	25	55	33	25	43	30	25	72	27	65	21
4	pH		6.9	6.5	6.6	6.8	6.7	6.5	6.9	6.8	7.6	7.4	6.9	6.7	6.8	6.8	7.9	7.7	7.1	6.9
5	Turbidity (NTU)	NTU	25	51	79	87	63	60	29	31	134	35	39	40	28	33	79	44	68	70
6	Total suspended solids (TSS)	mg/L	6	19	13	18	57	21	16	16	25	6	6	<5	6	9	12	10	13	12
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.2	0.17	0.31	0.27			0.25	0.21	0.01	0.05	0.02	0.02			0.02	0.02	0.03	0.02
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	<0.001			<0.001	0.002	0.001	0.002	0.002	0.001			<0.001	0.001	<0.001	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
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
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
13	Iron (Fe)	mg/L	1.23	1.16	1.54	1.28			0.51	0.84	0.15	0.91	0.43	0.9			0.28	1.1	0.27	1.34
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
15	Manganese (Mn)	mg/L	0.168	0.203	0.202	0.182			0.046	0.203	0.125	0.16	0.225	0.181			0.272	0.264	0.289	0.319
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
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			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	<0.001	<0.001
19	Zinc (Zn)	mg/L	<0.005	0.008	<0.005	<0.005			<0.005	0.007	0.007	<0.005	<0.005	<0.005			0.012	<0.005	0.007	0.006
20	Total Nitrogen (TN)	mg/L	0.6	0.4	0.7	0.9	0.8	0.7	0.5	0.4	0.6	0.4	0.5	0.4	0.4	0.4	0.7	0.8	0.4	0.4
21	Total Phosphorous (TP)	mg/L	0.04	0.04	0.03	0.04	0.06	0.05	0.03	0.03	0.01	0.01	0.06	0.04	0.04	0.02	0.03	0.06	<0.01	<0.01

[#] - Sample location persisting as an isolated pond or no obvious flow.

Table 24 SW12 – Maria River (Chainage 36850) cont.

No.	Parameter	Unit	19/05/16 (D)		6/06/16 (W)		15/06/16 (D)		20/06/16 (W)		01/07/16 (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	^{0}C	14.8	14.9	15.8	15.8	13.5	14.4	14.9	14.9	10.8	11.0								
2	Electrical conductivity (EC)	uS/cm	226	274	120	120	181	183	205	211	189	187								
3	Dissolved oxygen (DO)	%	21	37	77	78	23	33	38	41	17	32								
4	pH		7.5	7.3	6.2	6.1	6.3	6.2	6.2	6.1	6.6	6.4								
5	Turbidity (NTU)	NTU	50	40	24	27	15	14	40	54	14	11								
6	Total suspended solids (TSS)	mg/L	8	<5	6	<5	<5	10	9	12	<5	<5								
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.02	0.01	1.15	1.07	0.55	0.47			0.63	0.4								
9	Arsenic (As)	mg/L	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								
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	<0.001	0.001			<0.001	0.001								
13	Iron (Fe)	mg/L	0.73	0.96	0.64	0.6	0.71	0.6			1.14	0.89								
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	0.213	0.12	0.048	0.046	0.097	0.061			0.072	0.05								
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	<0.001	<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								
19	Zinc (Zn)	mg/L	<0.005	0.005	<0.005	0.006	0.008	0.01			0.005	0.006								
20	Total Nitrogen (TN)	mg/L	0.5	0.3	0.8	0.8	0.5	0.5	0.6	0.5	0.6	0.4								
21	Total Phosphorous (TP)	mg/L	0.08	0.03	0.02	0.03	<0.01	0.42	0.03	0.03	0.05	0.01								

[#] - Sample location persisting as an isolated pond or no obvious flow.

Table 25 SW13 – Stumpy Creek (Chainage 37700 to 37750)

No.	Parameter	Unit	4/02/16 (D)		6/02/16 (W)		22/02/16 (W)		4/03/16 (D)		30/03/16 (W)		04/04/16 (W)		10/04/16 (W)		14/04/16 (D)		2/05/16 (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	^{0}C	24.4	23.4	22.8	21.8	22.5	22.1	23.8	22.6	21.6	21.1	22.5	20.5	20.6	19.8	22.1	20.1	18.3	17.6
2	Electrical conductivity (EC)	uS/cm	460	228	287	203	155	150	288	238	393	272	410	309	380	287	412	281	346	442
3	Dissolved oxygen (DO)	%	75	26	88	62	58	54	54	23	55	37	55	34	43	28	96	34	24	65
4	pH		6.9	6.5	6.9	6.5	6.1	6.2	6.8	6.6	7.0	6.9	7.0	7.0	7.0	6.8	7.4	7.6	6.7	7.2
5	Turbidity (NTU)	NTU	33	47	84	49	39	39	30	48	69	61	19	55	25	46	70	59	97	40
6	Total suspended solids (TSS)	mg/L	5	8	8	<5	15	32	14	20	21	15	<5	<5	8	9	11	10	10	16
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.06	0.29	0.35	0.65			0.18	0.27	0.07	0.18	0.04	0.04			0.17	0.18	0.03	0.03
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	<0.001	<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	<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
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
13	Iron (Fe)	mg/L	0.58	1.76	0.43	1.04			1.12	1.17	0.32	0.65	0.49	0.98			0.32	0.63	0.36	0.53
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
15	Manganese (Mn)	mg/L	0.16	0.233	0.037	0.059			0.217	0.302	0.113	0.148	0.092	0.209			0.06	0.143	0.095	0.287
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
17	Nickel (Ni)	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
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
19	Zinc (Zn)	mg/L	0.006	<0.005	0.009	0.006			0.005	0.006	0.008	0.008	0.009	<0.005			0.023	0.007	0.008	<0.005
20	Total Nitrogen (TN)	mg/L	0.5	0.6	0.8	0.6	0.7	0.7	0.5	0.8	0.8	0.8	0.4	0.8	0.5	1	1.1	1.1	0.6	0.8
21	Total Phosphorous (TP)	mg/L	0.01	0.04	0.03	0.09	0.02	0.02	0.13	0.07	0.01	0.02	0.02	0.03	0.02	0.05	0.02	0.03	0.02	0.05

[#] - Sample location persisting as an isolated pond or without movement at sample locations.

Table 26 SW13 – Stumpy Creek (Chainage 37700 to 37750) cont.

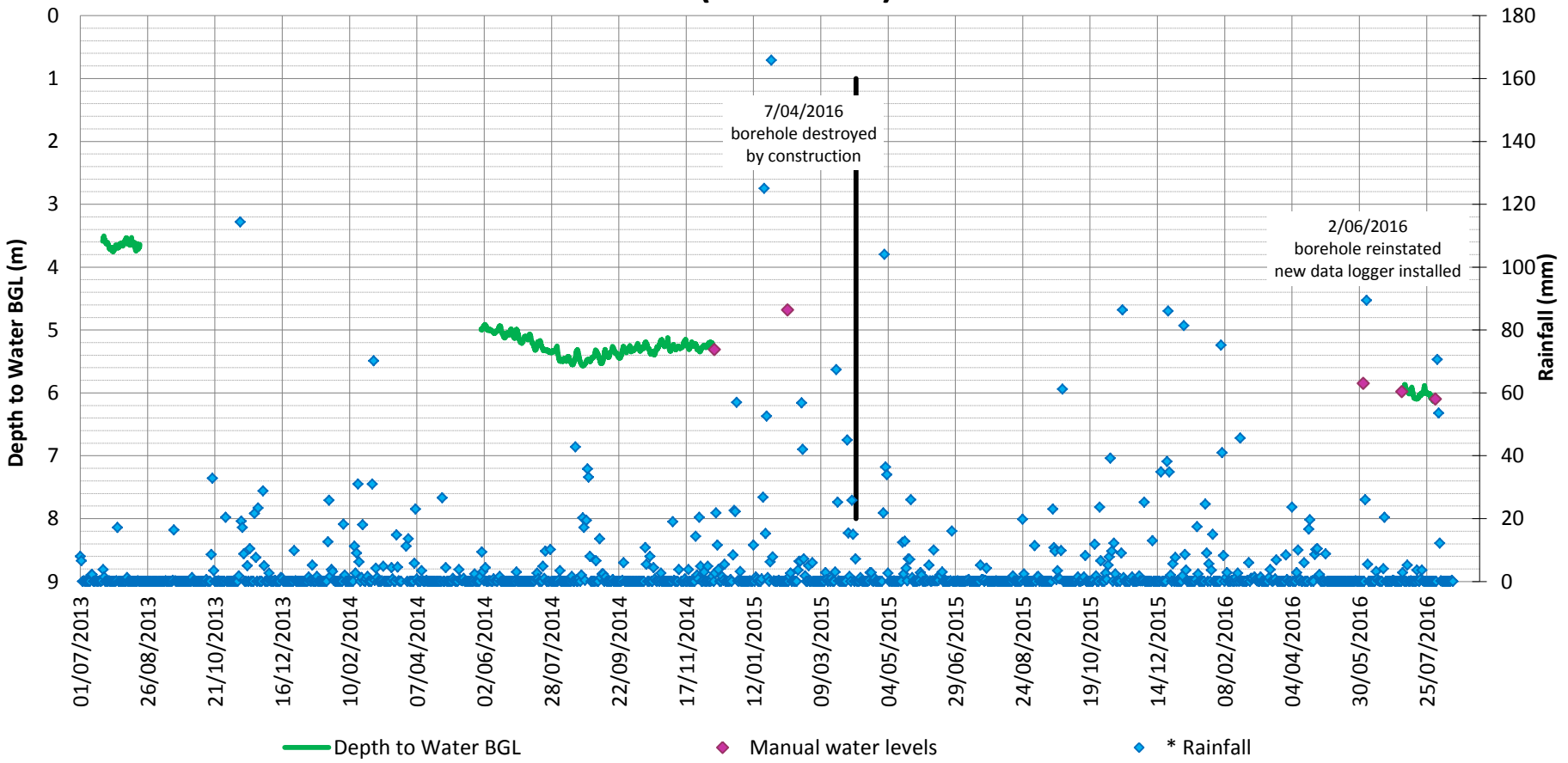
No.	Parameter	Unit	19/05/16 (D)		6/06/16 (W)		15/06/16 (D)		20/06/16 (W)		01/07/16 (D)									
			SW13a[#] (DS)	SW13b[#] (US)	SW13a (DS)	SW13b (US)	SW13a[#] (DS)	SW13b[#] (US)	SW13a[#] (DS)	SW13b[#] (US)	SW13a[#] (DS)	SW13b[#] (US)	SW13a (DS)	SW13b (US)	SW13a[#] (DS)	SW13b[#] (US)	SW13a (DS)	SW13b (US)	SW13a (DS)	SW13b (US)
1	Temperature	^{0}C	16.0	14.9	15.6	15.6	13.0	13.5	15.5	15.3	14.0	11.3								
2	Electrical conductivity (EC)	uS/cm	455	334	120	120	184	174	226	203	248	200								
3	Dissolved oxygen (DO)	%	72	54	80	78	71	51	68	65	74	43								
4	pH		7.6	7.4	5.8	5.8	6.1	6.0	6.4	6.3	6.5	6.2								
5	Turbidity (NTU)	NTU	9	38	27	27	14	13	56	53	11	10								
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	<5	<5	9	8	5	6								
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.02	0.01	1.49	1.36	0.81	0.73			0.64	0.76								
9	Arsenic (As)	mg/L	<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								
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	0.01			0.001	0.002								
13	Iron (Fe)	mg/L	0.2	0.98	0.74	0.7	0.82	0.85			1	1.41								
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	0.026	0.056	0.057	0.061	0.077	0.082			0.059	0.096								
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	<0.001	<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								
19	Zinc (Zn)	mg/L	0.019	0.006	0.027	0.007	0.009	0.009			0.008	0.007								
20	Total Nitrogen (TN)	mg/L	0.5	0.6	0.6	0.9	0.5	0.6	0.6	0.5	0.2	2.5								
21	Total Phosphorous (TP)	mg/L	<0.01	0.01	0.02	0.04	0.02	0.02	0.02	0.02	0.02	0.06								

[#] - Sample location persisting as an isolated pond or without movement at sample locations.

Appendix D – Borehole water level data plots

HW10 Pacific Hwy; Oxley Hwy to Kempsey

GW01 (A-BH3101) Water Level BGL



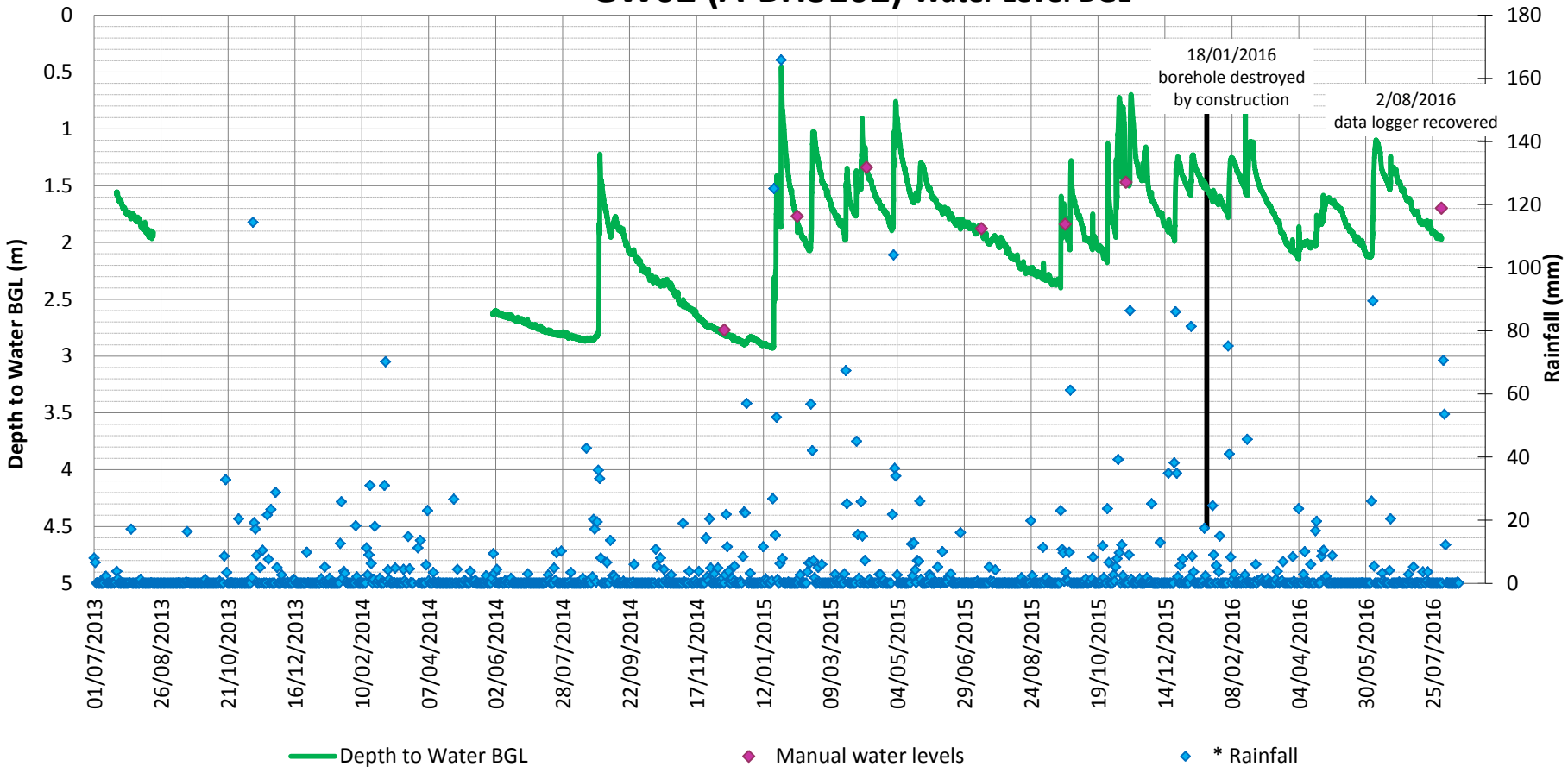
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10886270	
			BH ID	A-BH3101	
Date	2/08/2016		Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-1

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



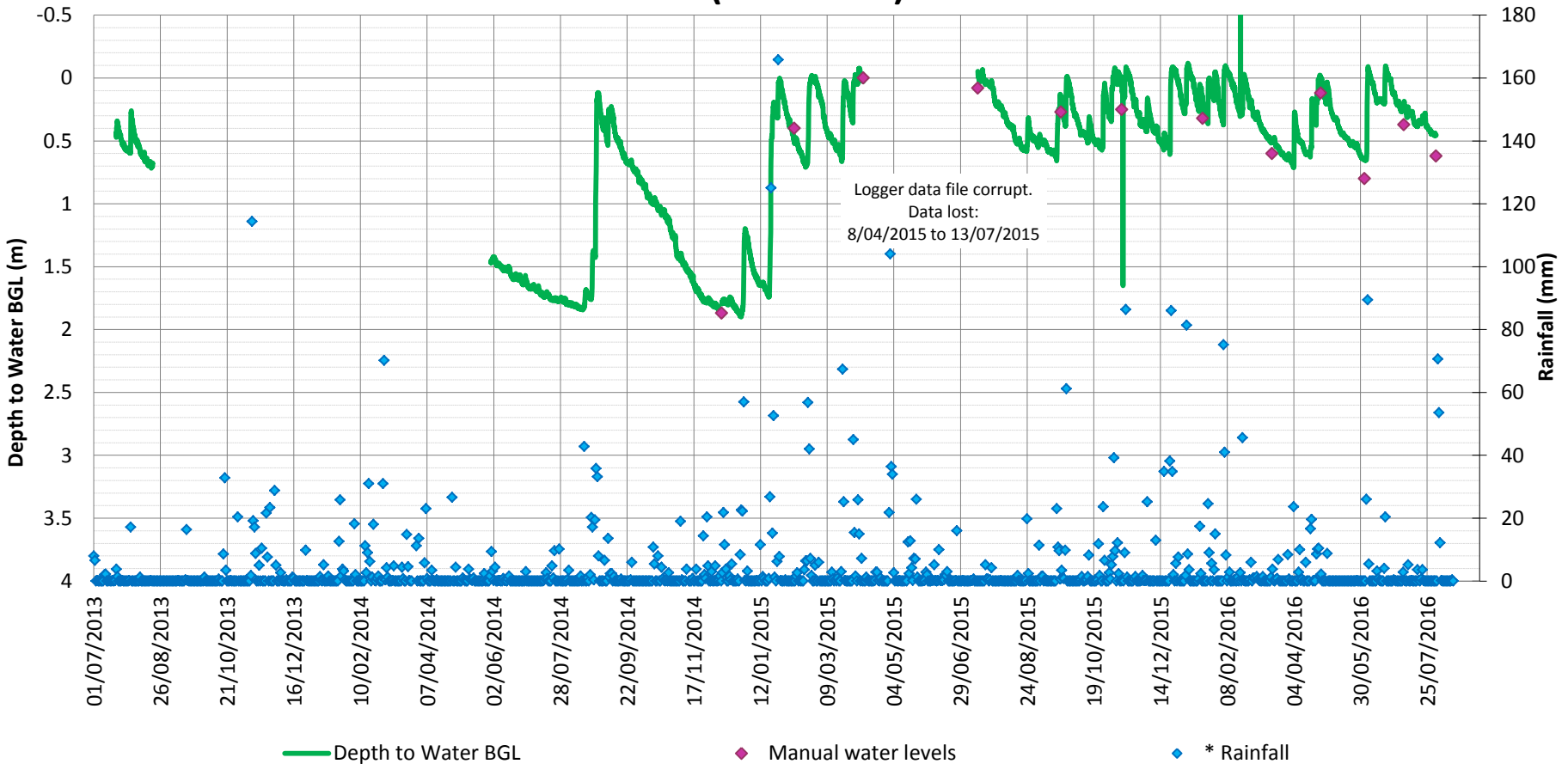
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10283850	
			BH ID	A-BH3102	
Date	2/08/2016		Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-2

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



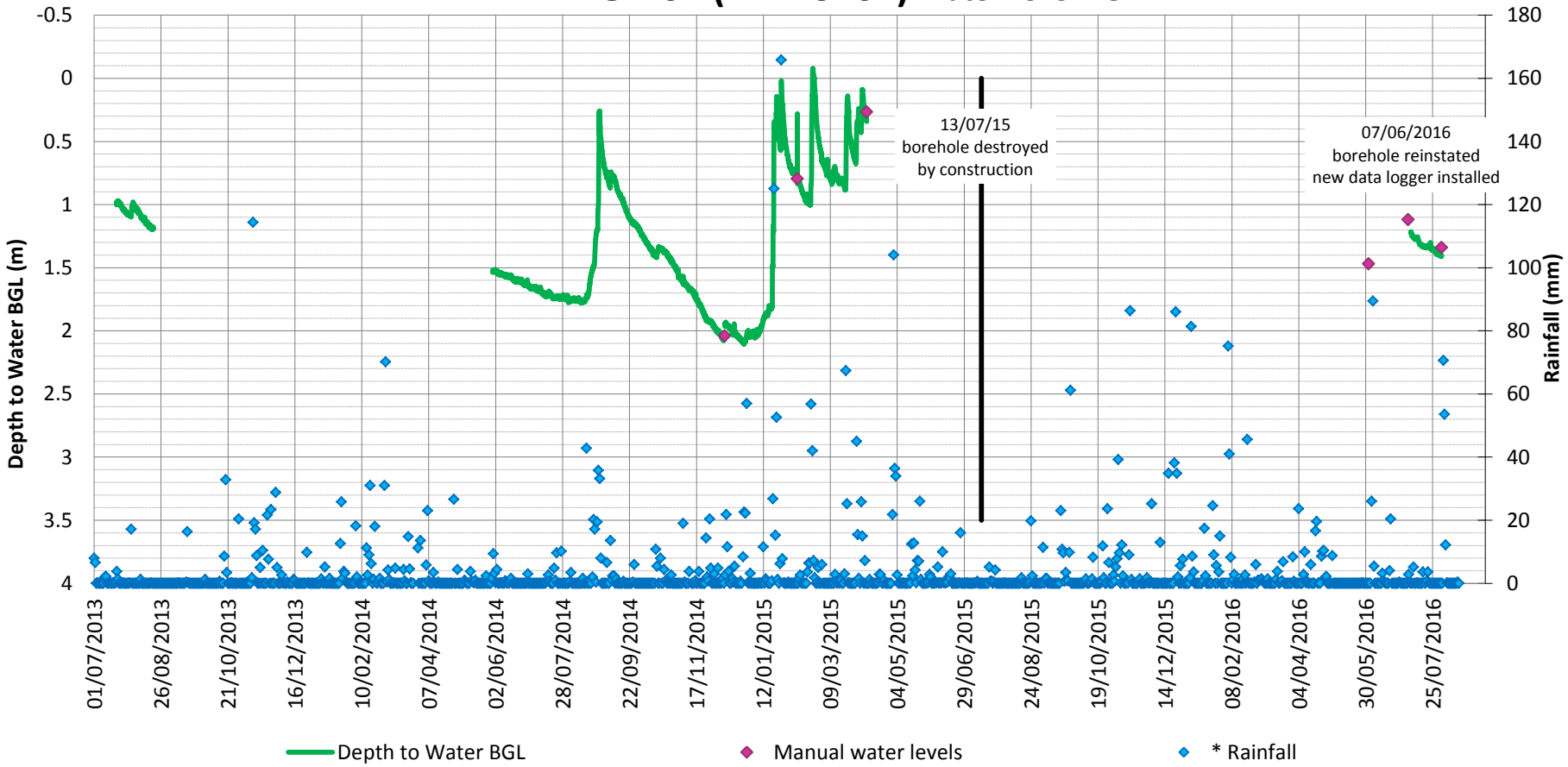
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10229626	
			BH ID	A-BH3103	
Date	2/08/2016		Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-3

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



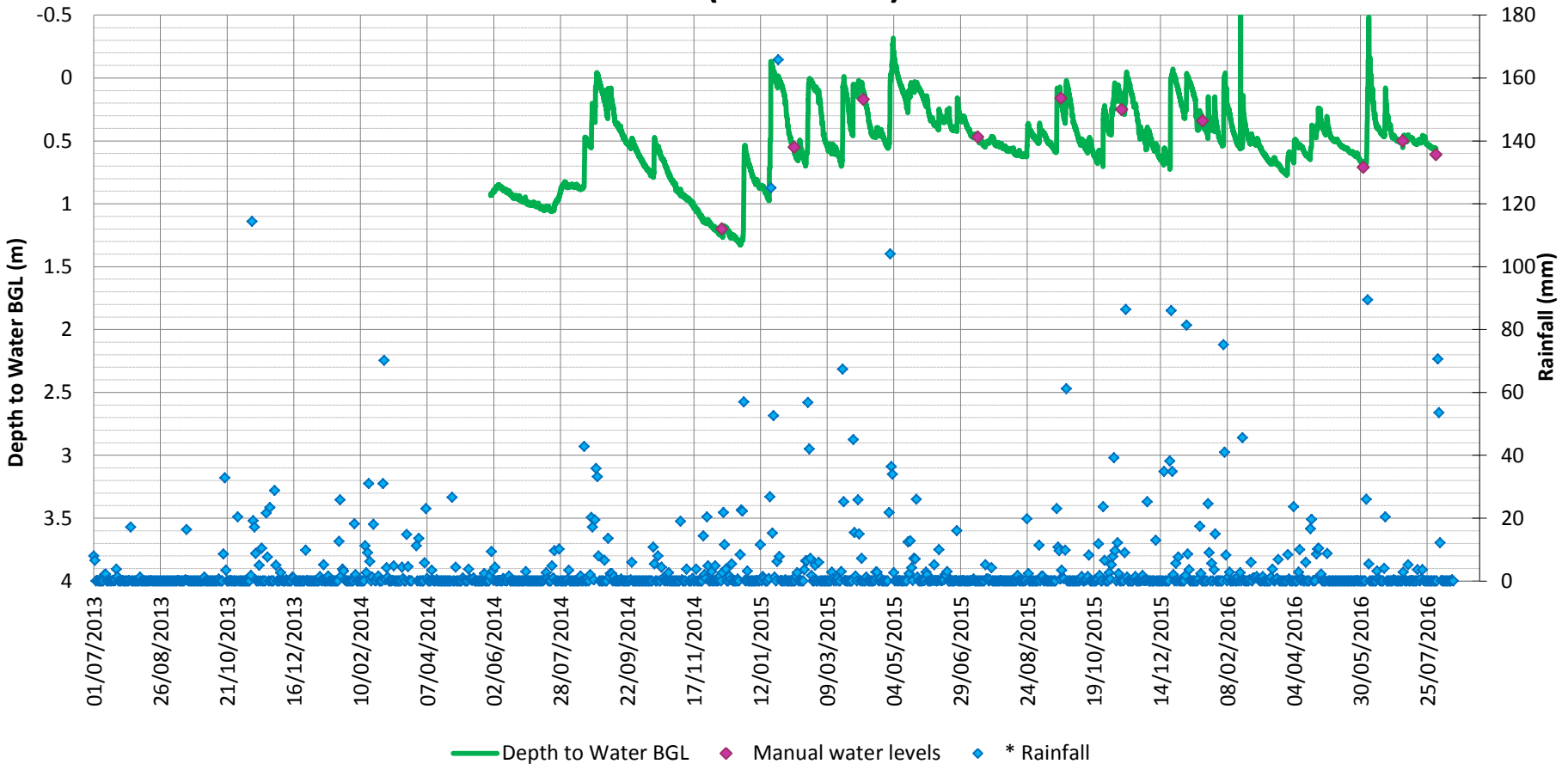
Drawn	KF	NSW GOVERNMENT Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn 10932422	
			BH ID	A-BH3104	
Date	2/08/2016		Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-4

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



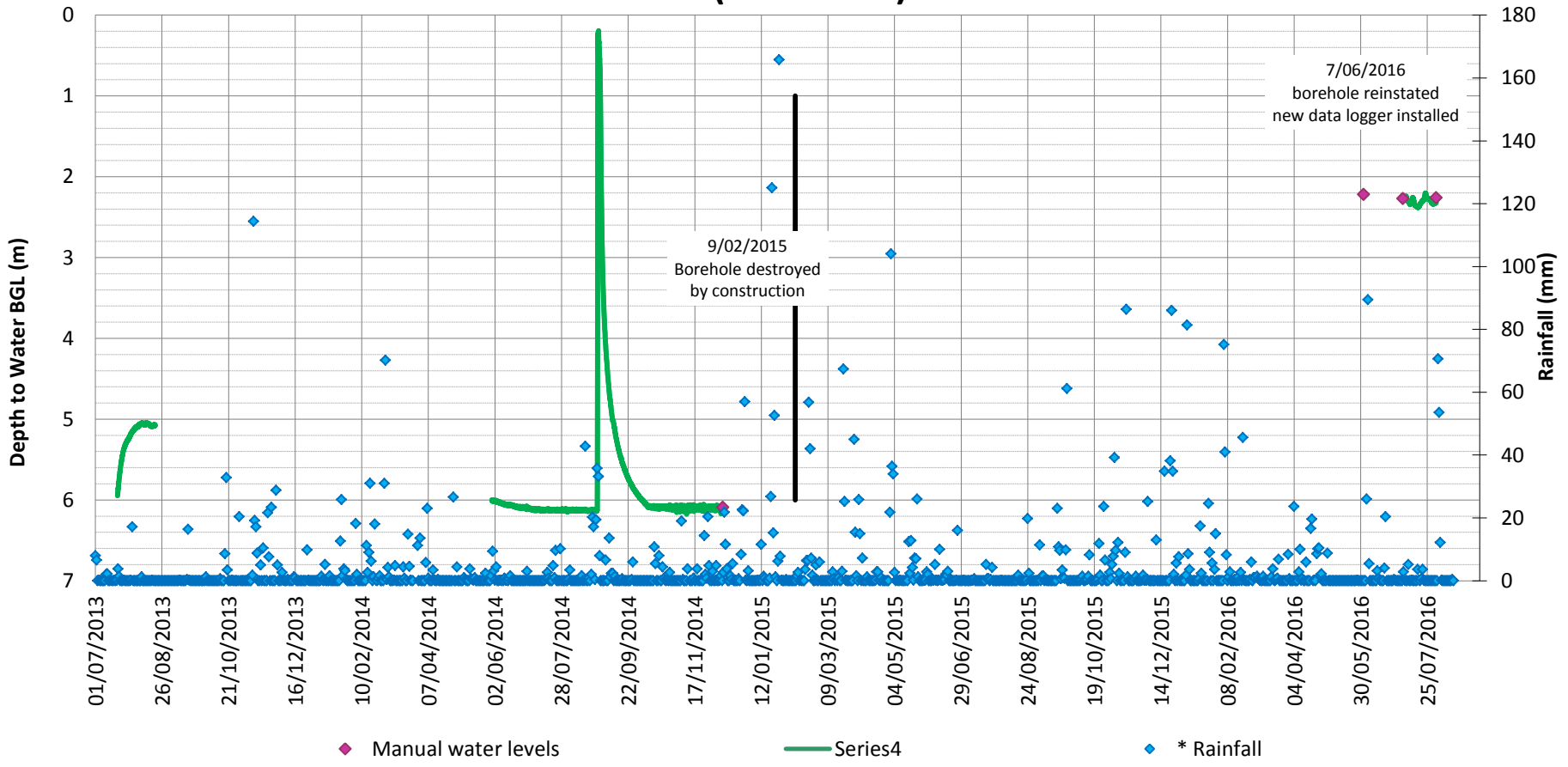
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	**HOBO Water Level Data Logger** sn10262196	
Date	2/08/2016		BH ID	**A-BH3105**	
			Project	**Pacific Hwy (HW10) Oxley Hwy to Kempsey**	Figure no: **B-5**

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



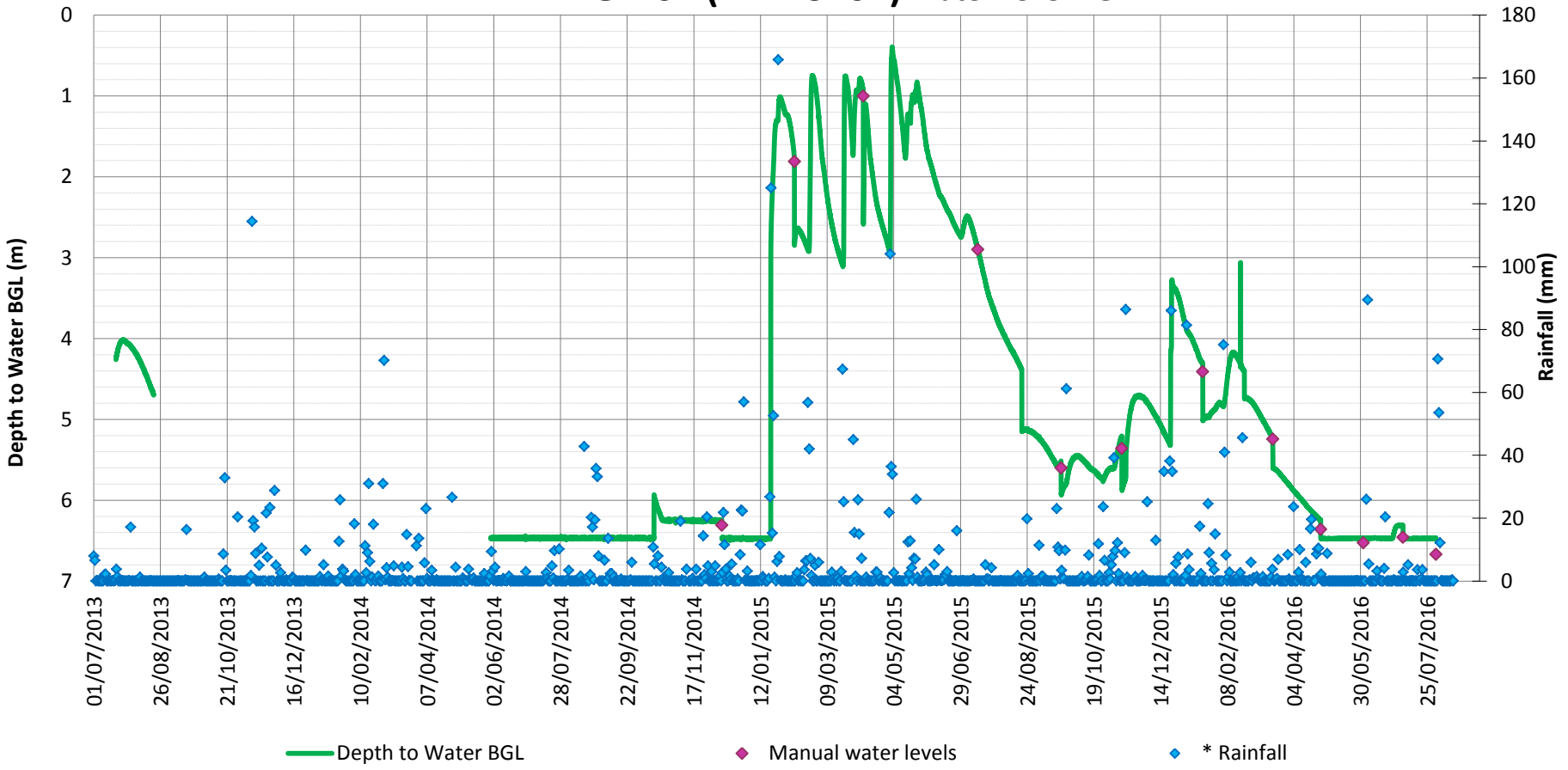
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10932418	
Date	2/08/2016		BH ID	A-BH3106	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-6

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



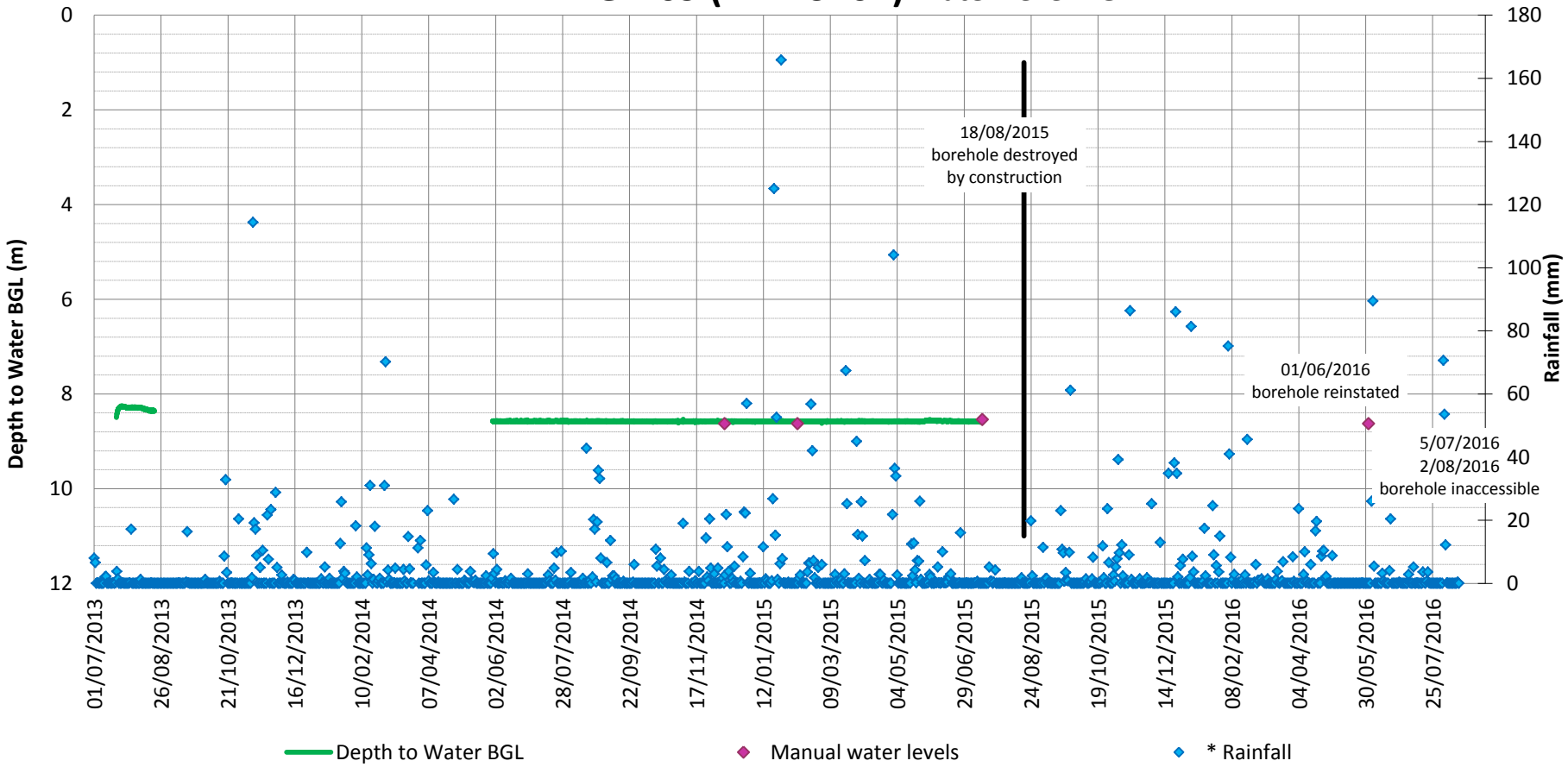
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10229627	
			BH ID	A-BH3107	
Date	2/08/2016		Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-7

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



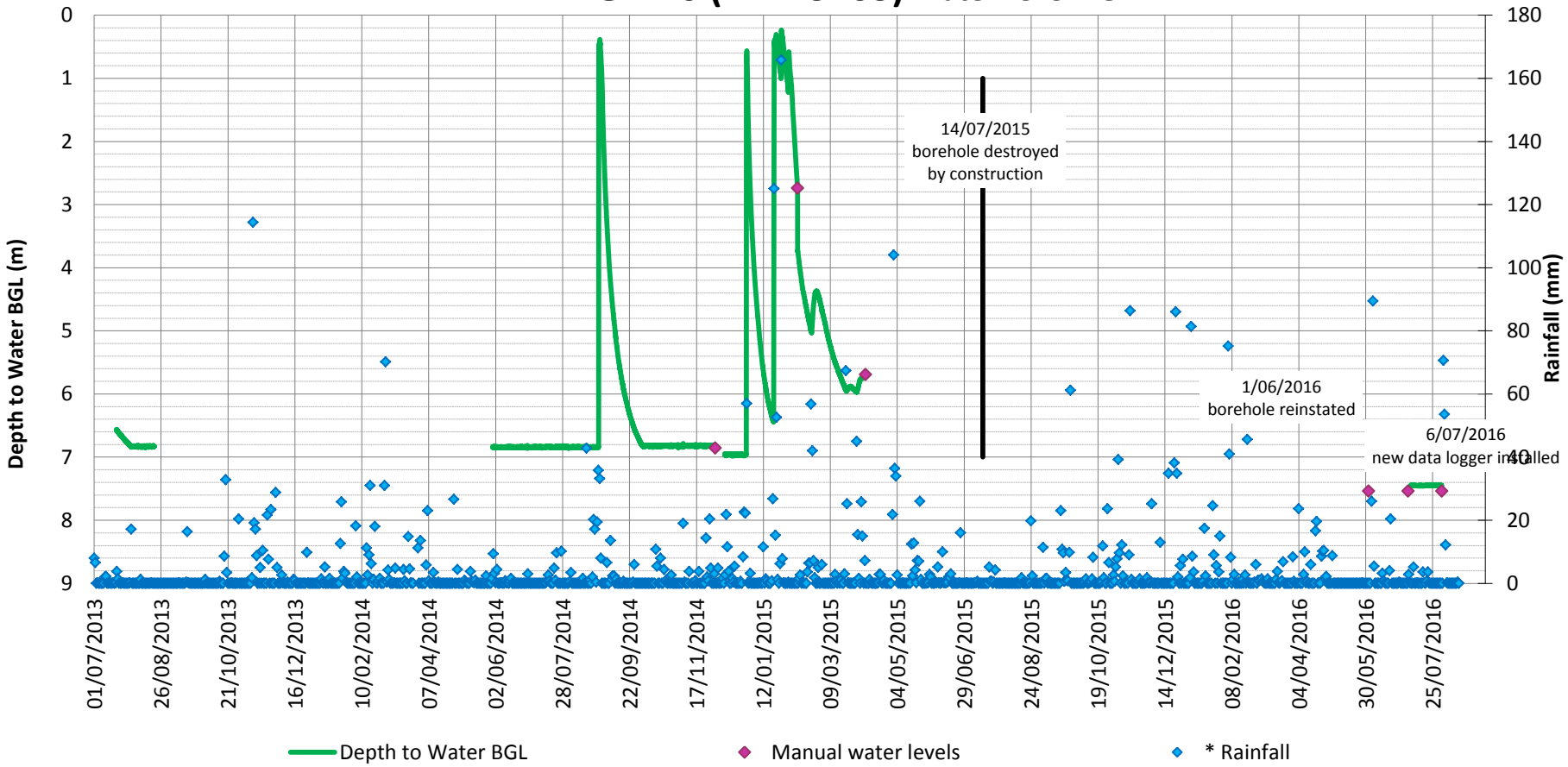
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn 10262198	
			BH ID	B-BH3102	
Date	2/08/2016		Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-8

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



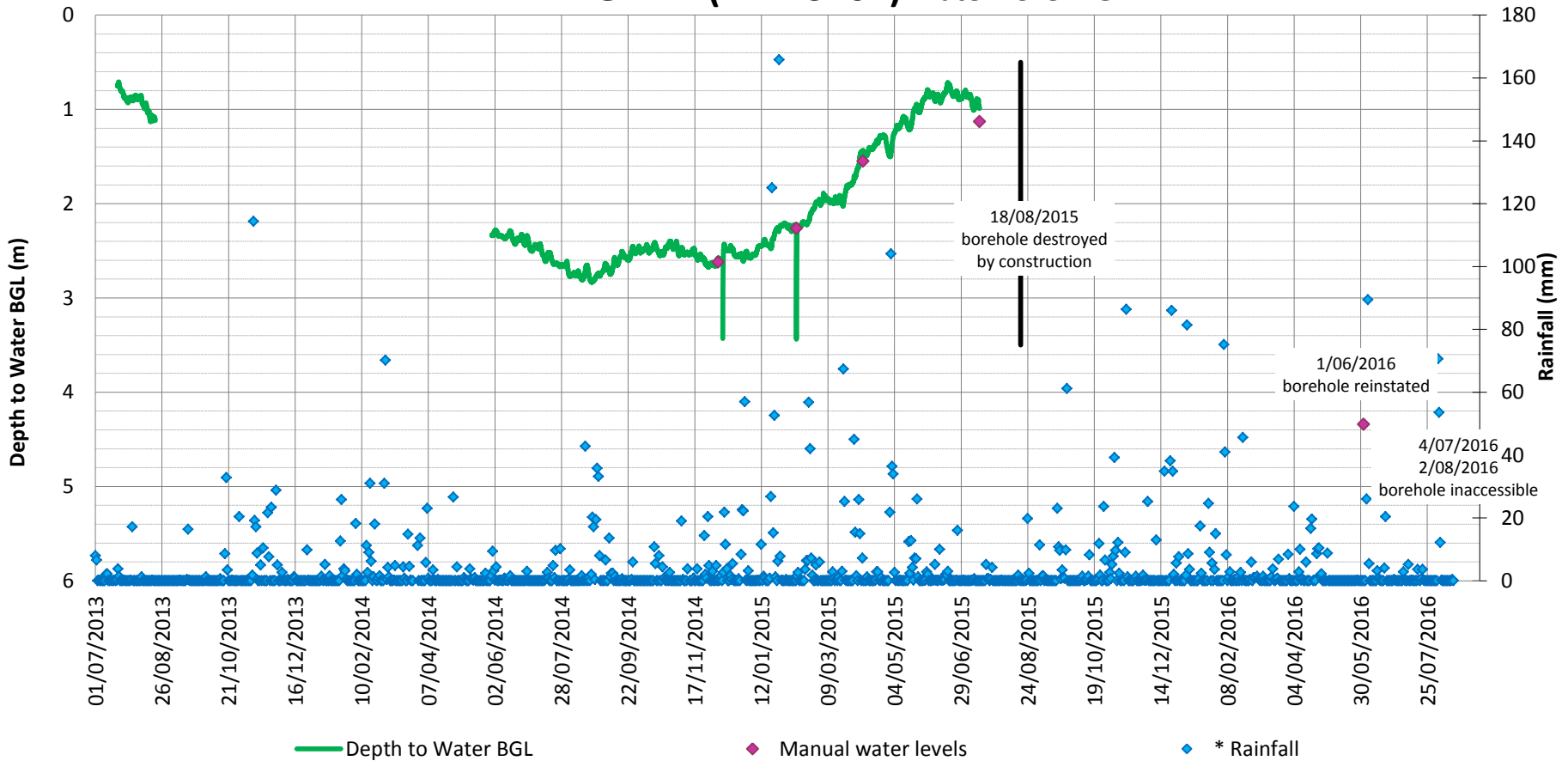
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10238337	
			BH ID	B-BH3103	
Date	2/08/2016		Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-9

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



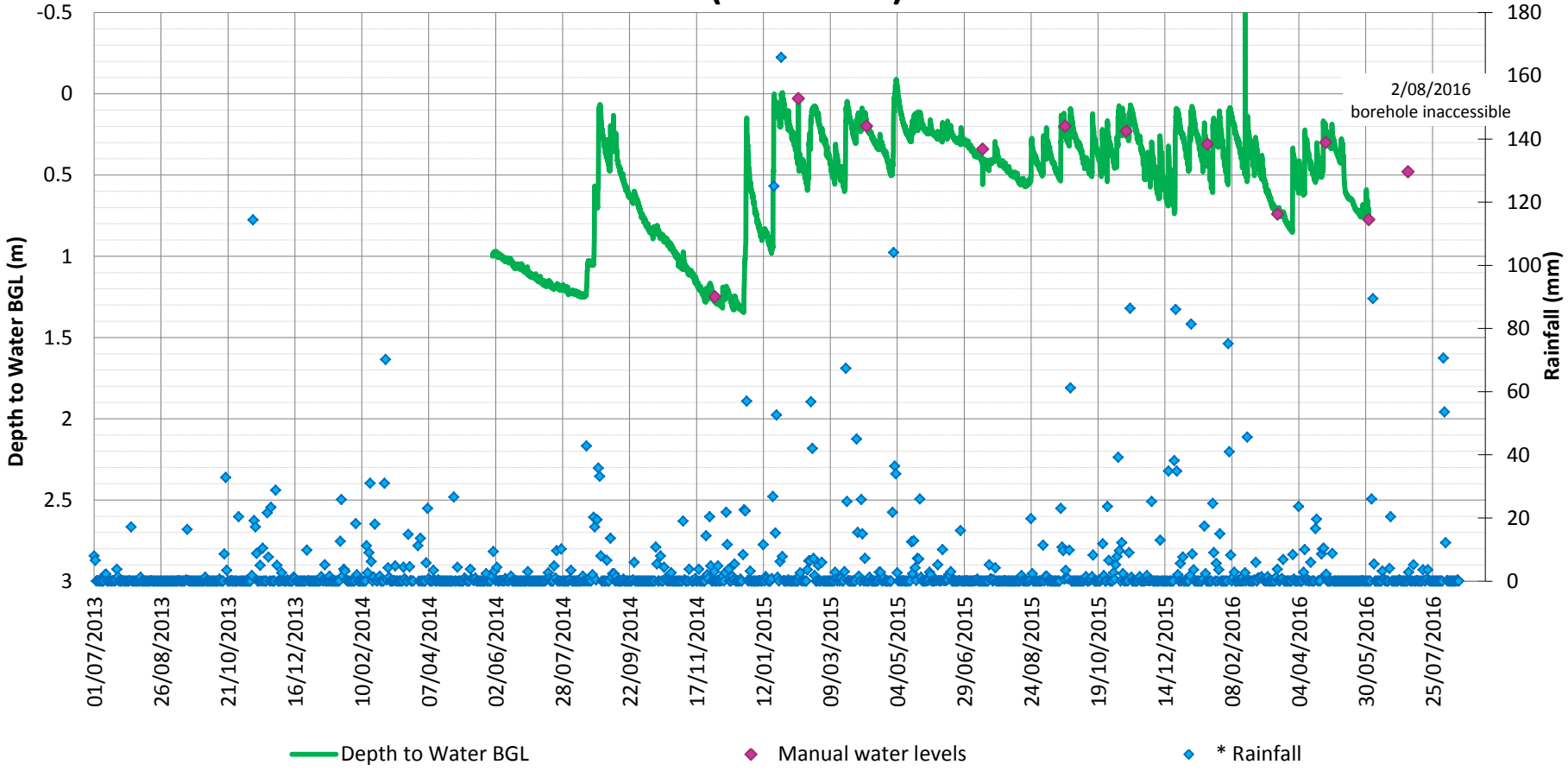
Drawn	KF		Client	RMS	
Approved	MD		Instrument	**HOBO Water Level Data Logger** sn10224040	
			BH ID	**B-BH3104**	
Date	2/08/2016		Project	**Pacific Hwy (HW10) Oxley Hwy to Kempsey**	Figure no: **B-10**

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



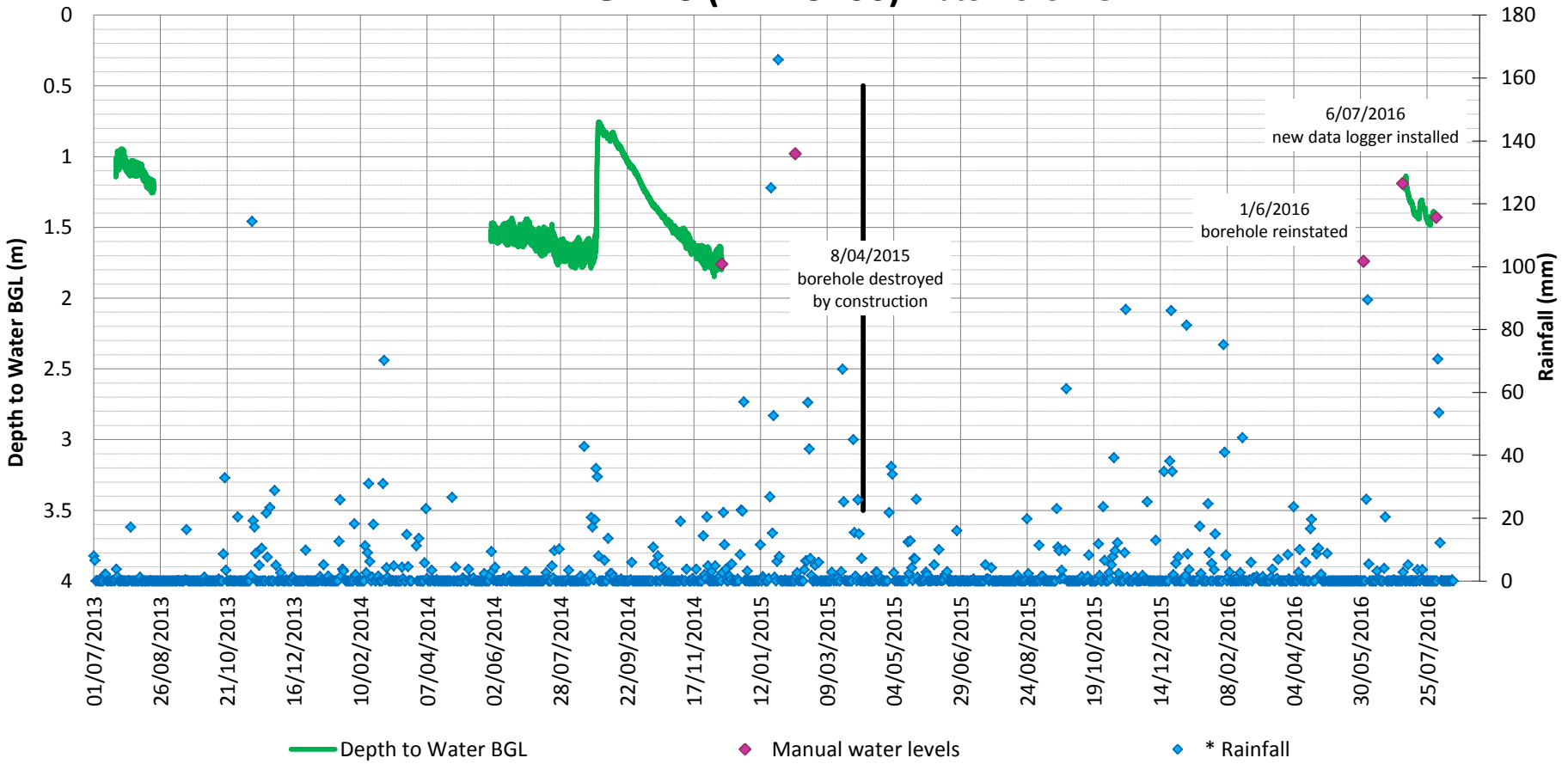
Drawn	KF	Transport Roads & Maritime Services	Client	**RMS**	
Approved	MD		Instrument	**HOBO Water Level Data Logger** sn10262196	
			BH ID	**B-BH3105**	
Date	2/08/2016		Project	**Pacific Hwy (HW10) Oxley Hwy to Kempsey**	Figure no: **B-11**

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



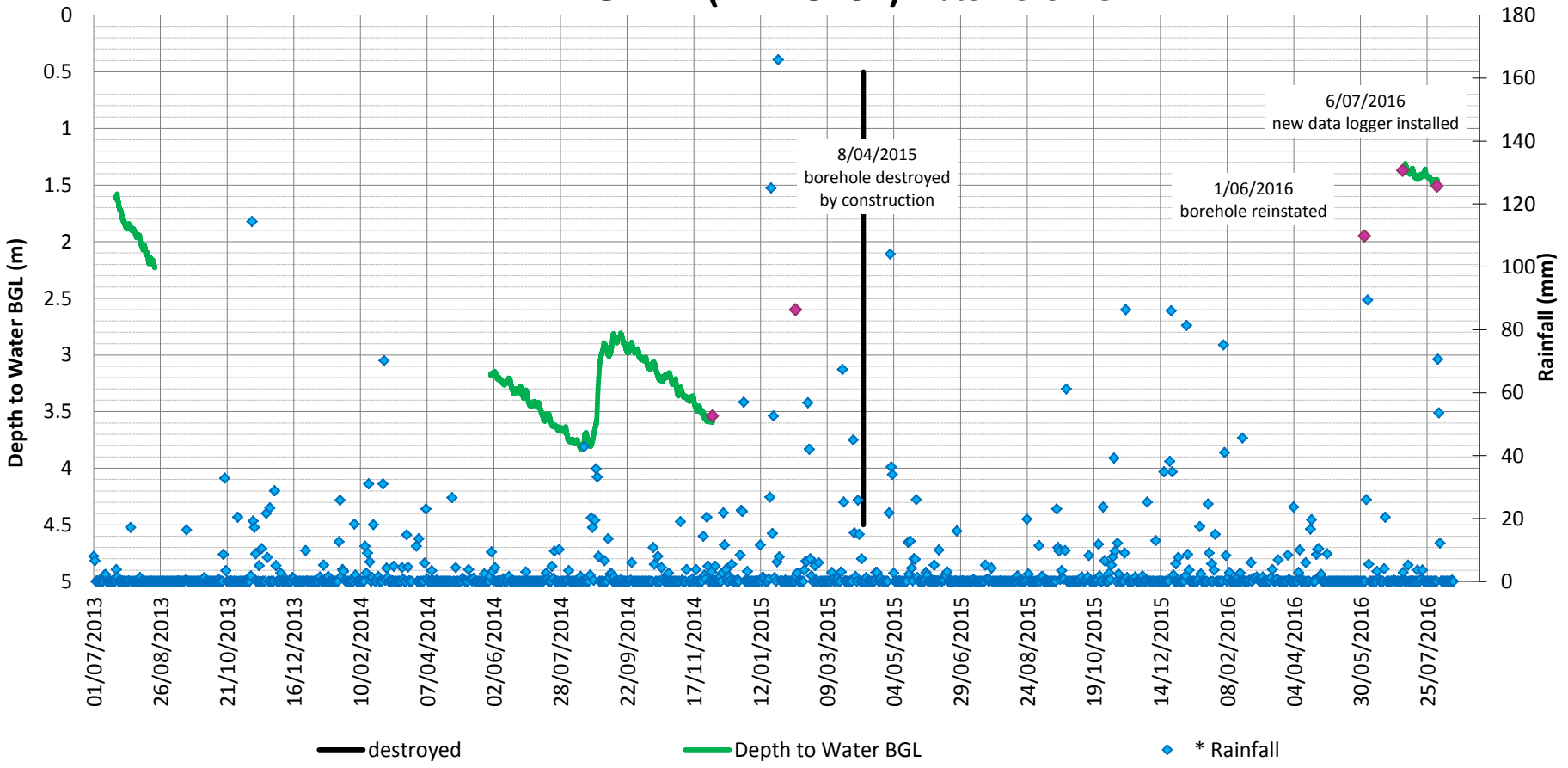
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10932416	
Date	2/08/2016		BH ID	B-BH3106	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-12

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



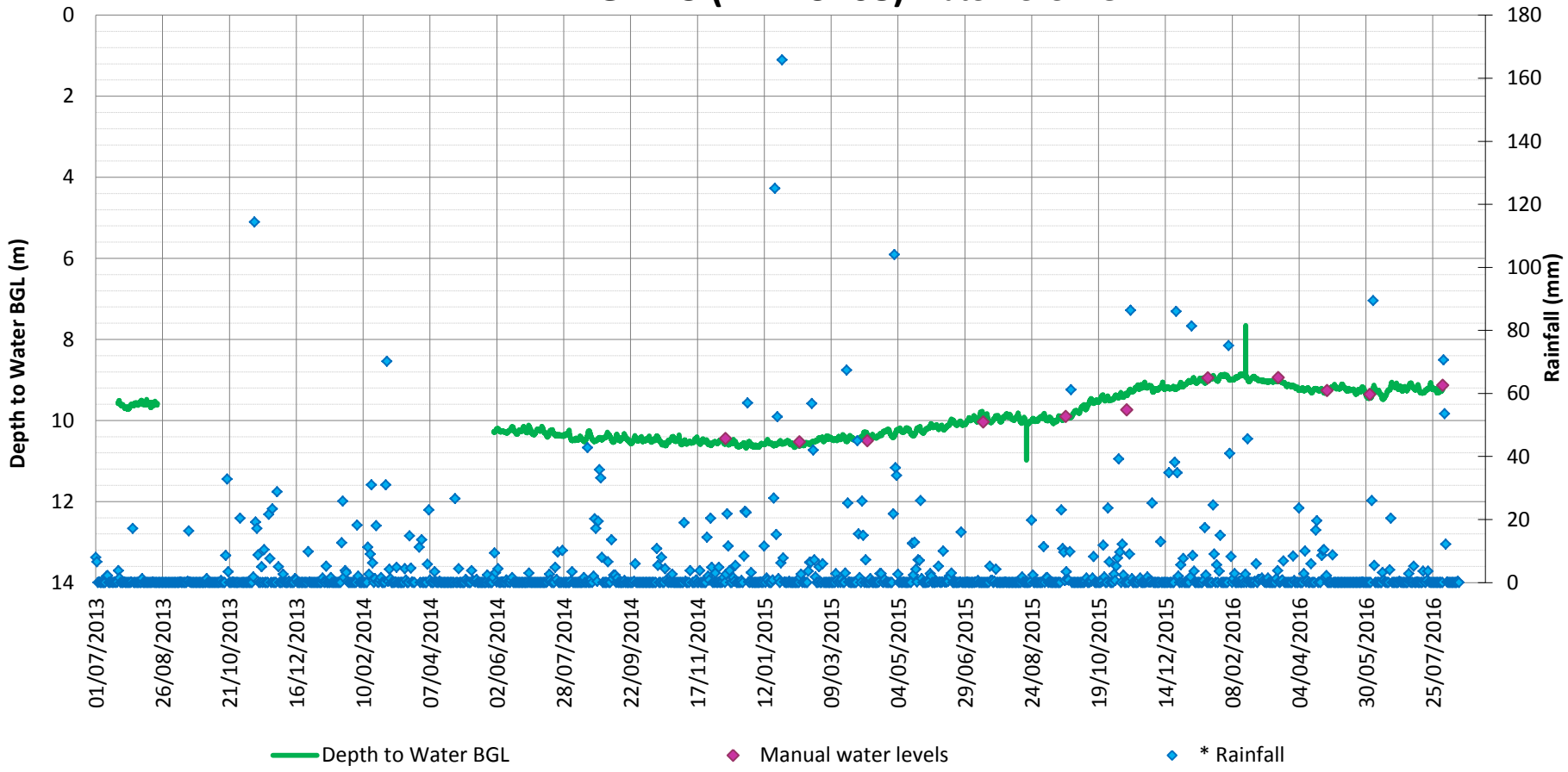
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10932419	
			BH ID	B-BH3107	
Date	2/08/2016		Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-13

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



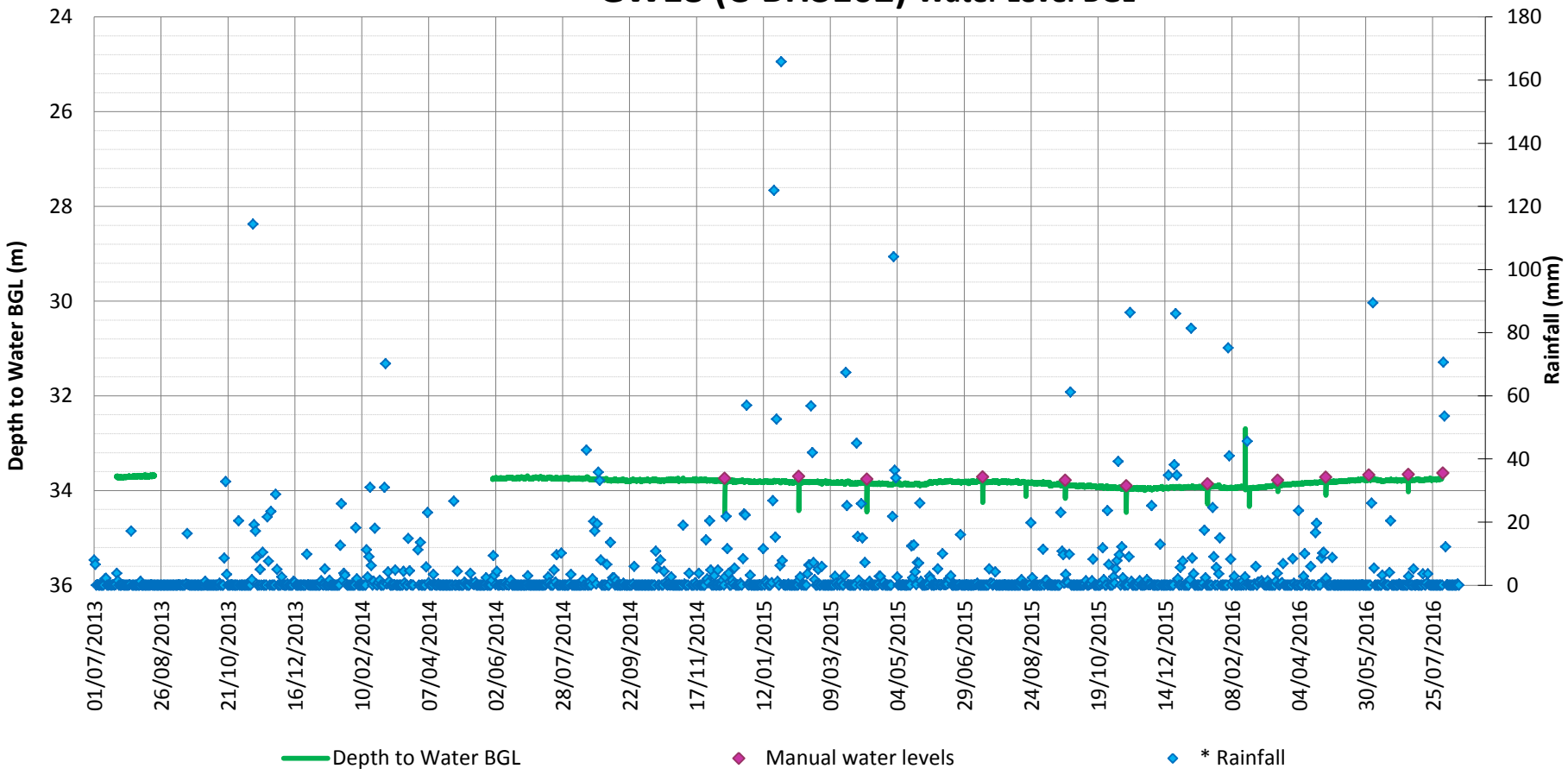
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10238352	
			BH ID	B-BH3108	
Date	2/08/2016		Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-14

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



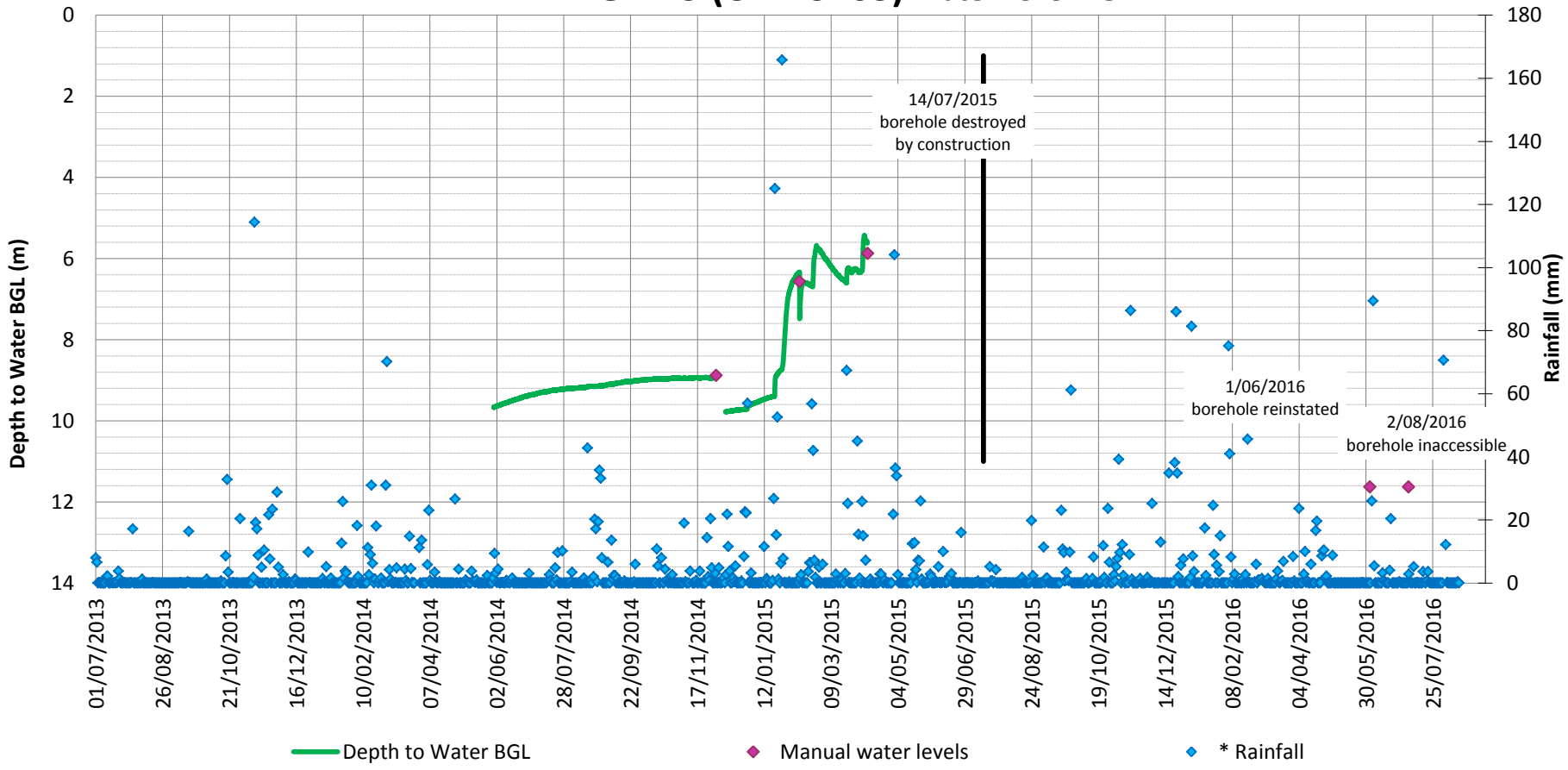
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262195	
			BH ID	C-BH3102	
Date	2/08/2016		Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-15

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



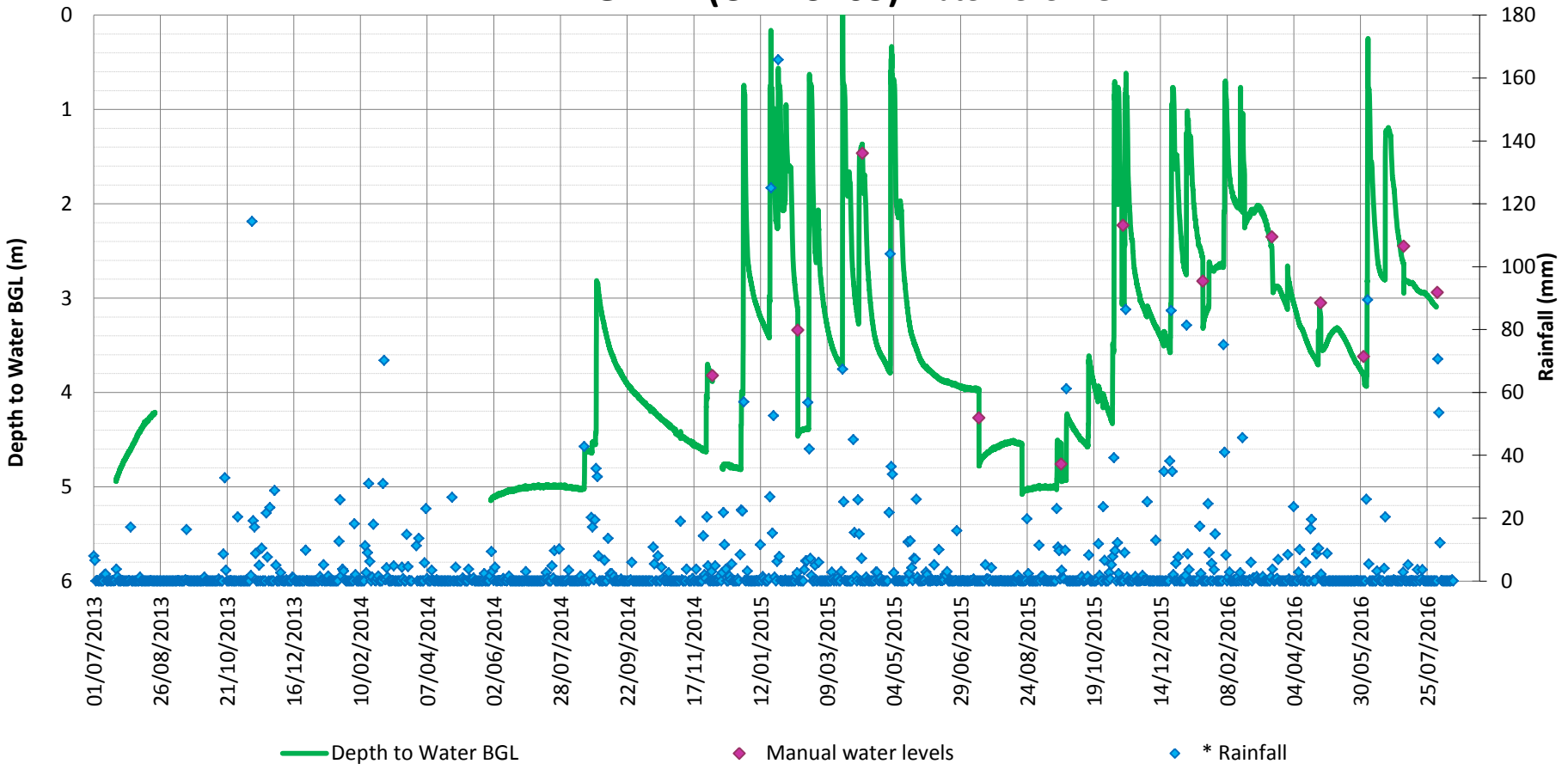
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger	
Date	2/08/2016		BH ID	C-BH3103	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-16

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



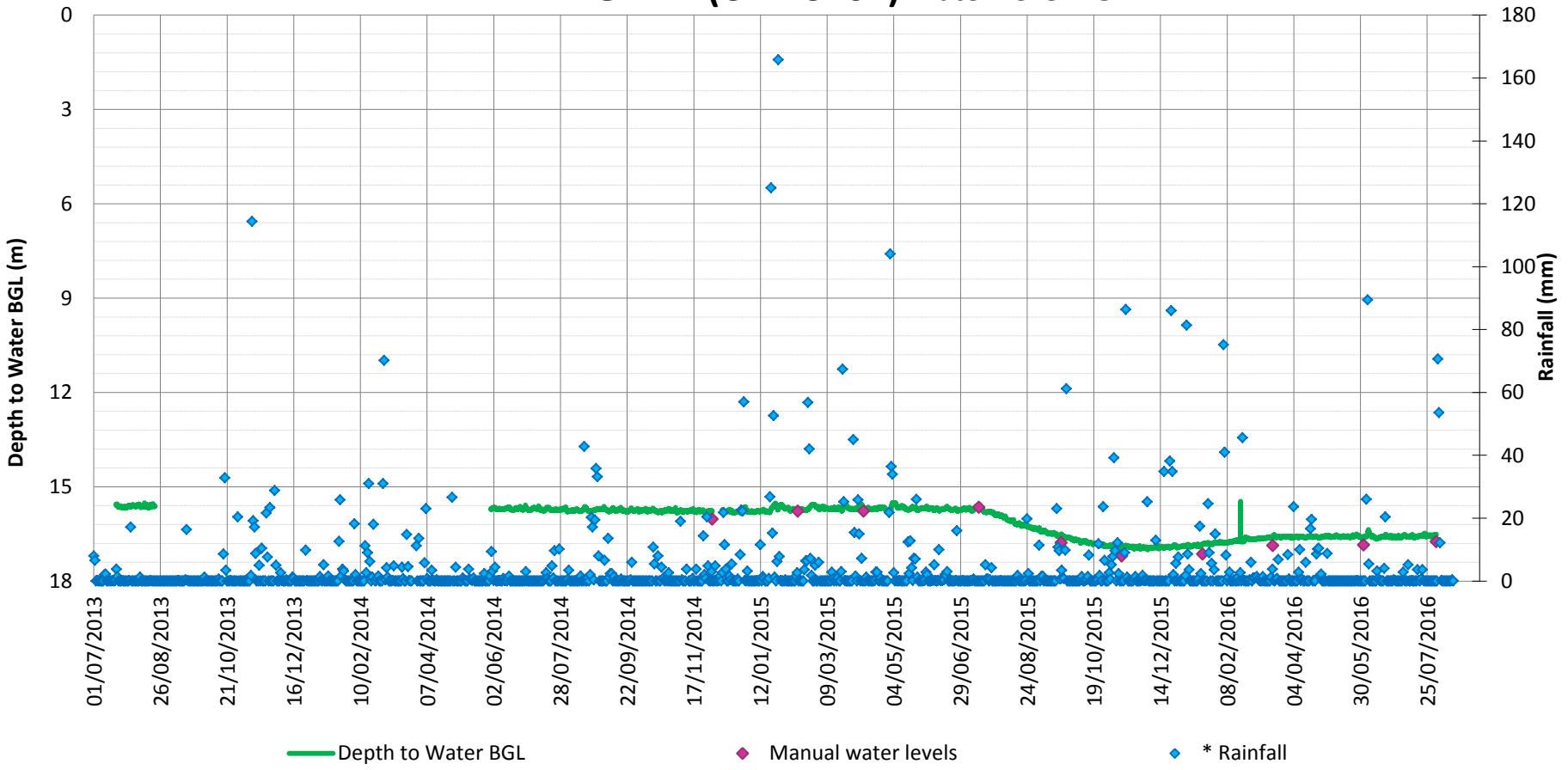
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10280416	
			BH ID	C-BH3105	
Date	2/08/2016		Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-17

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



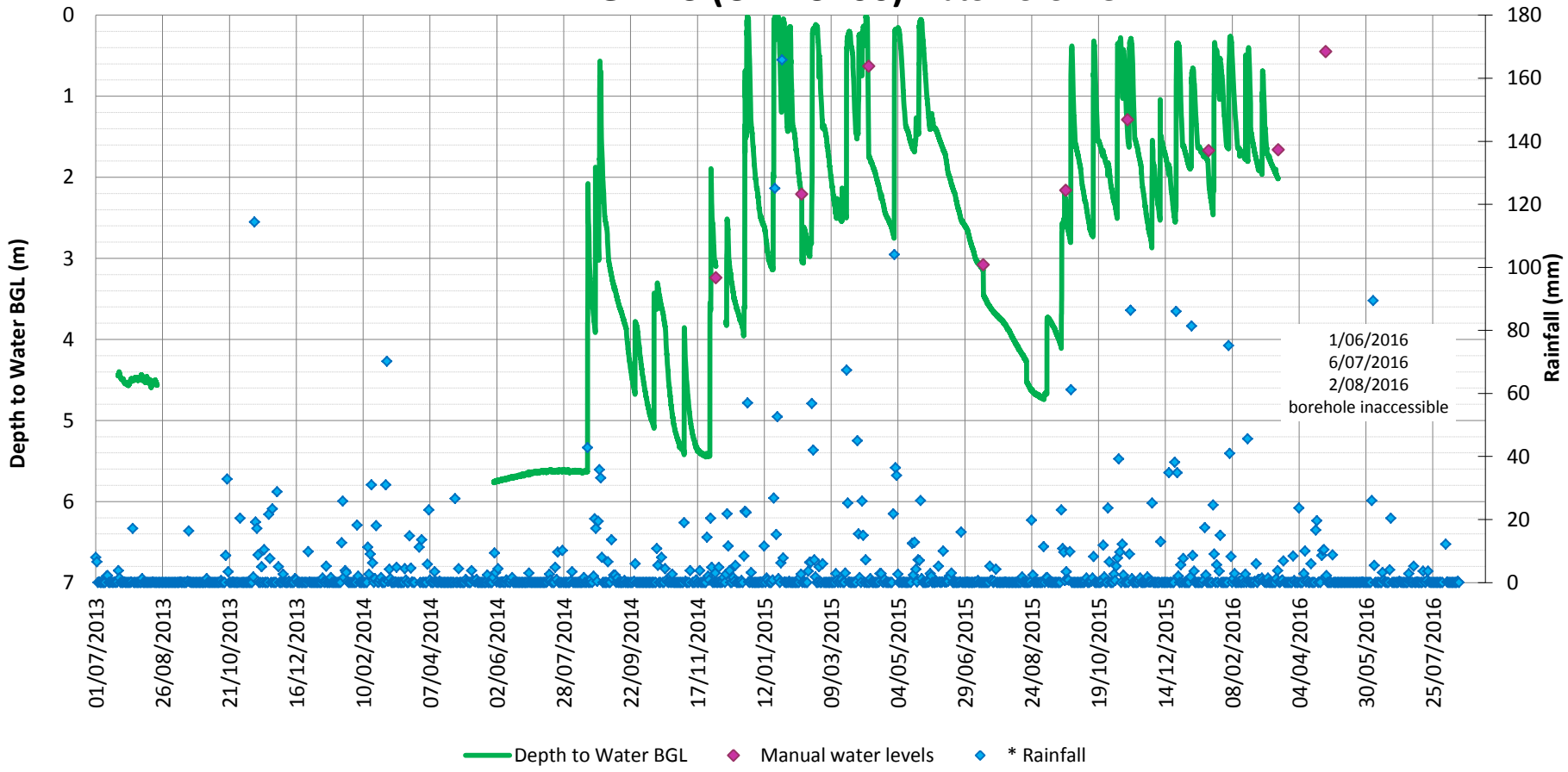
Drawn	KF		Client	RMS	
Approved	MD		Instrument	**HOBO Water Level Data Logger** sn10280407	
			BH ID	**C-BH3107**	
Date	2/08/2016		Project	**Pacific Hwy (HW10) Oxley Hwy to Kempsey**	Figure no: **B-18**

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



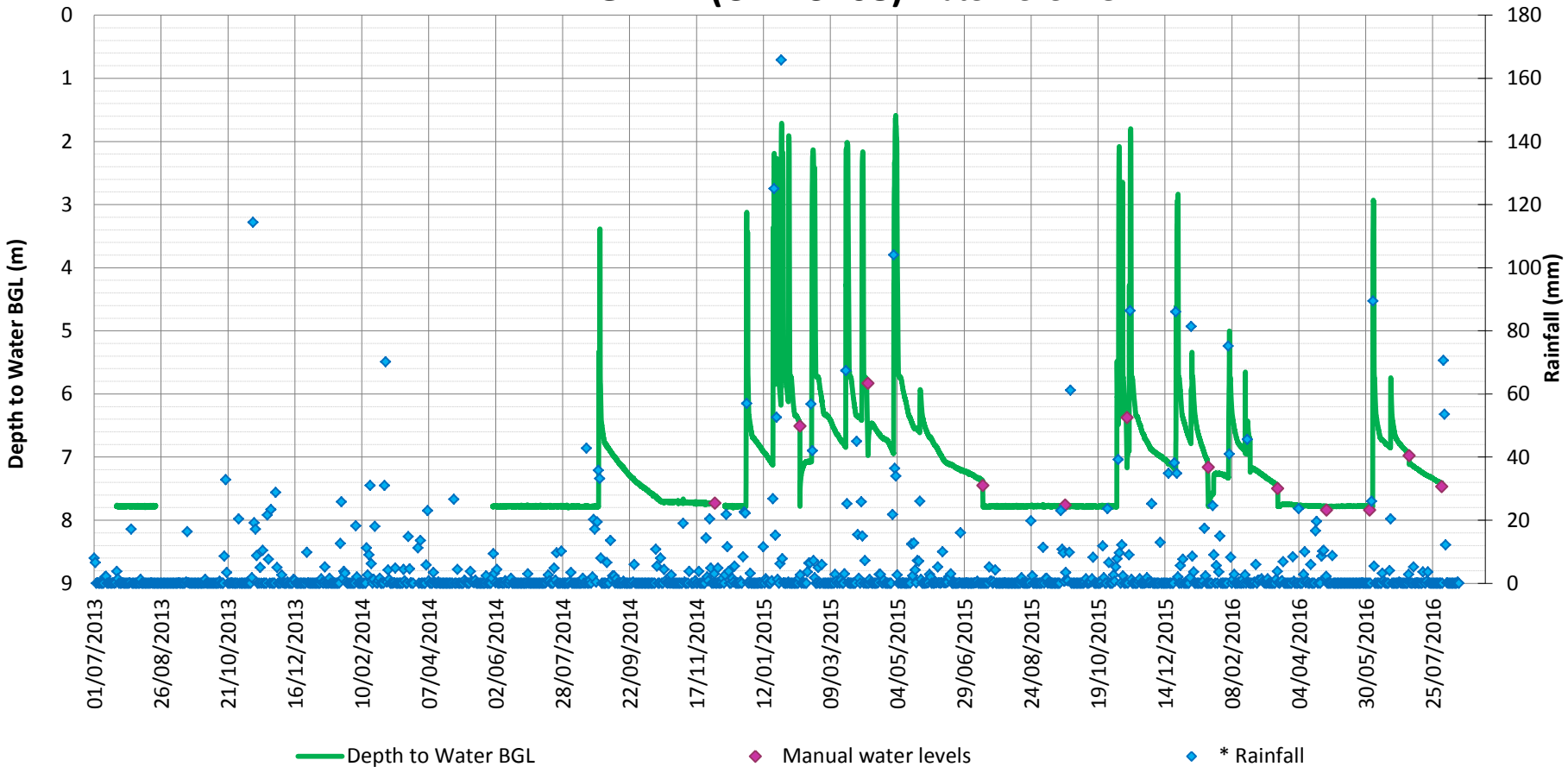
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262202	
			BH ID	C-BH3106	
Date	2/08/2016		Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-19

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



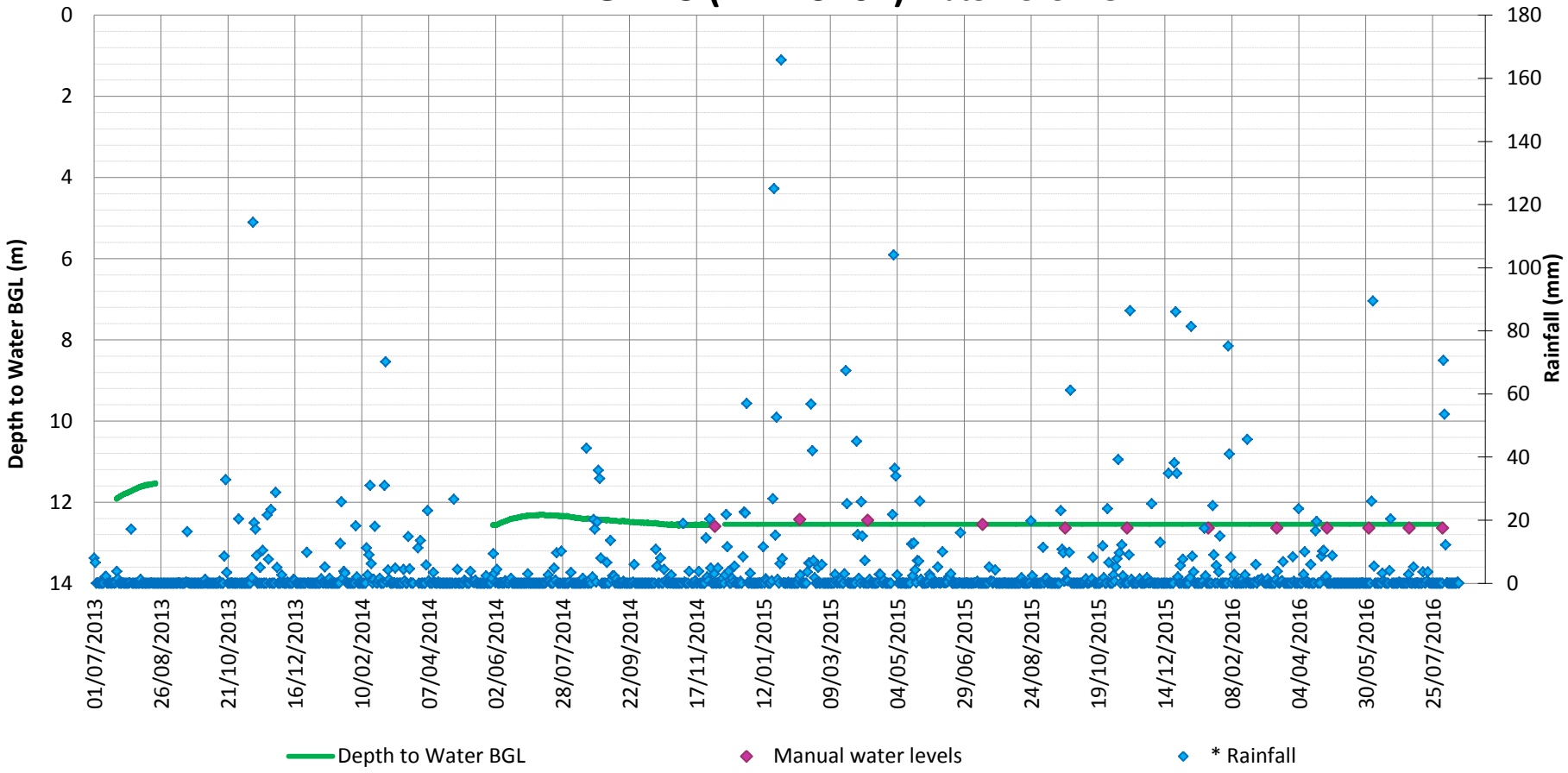
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262197	
Date	2/08/2016		BH ID	C-BH3108	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-20

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



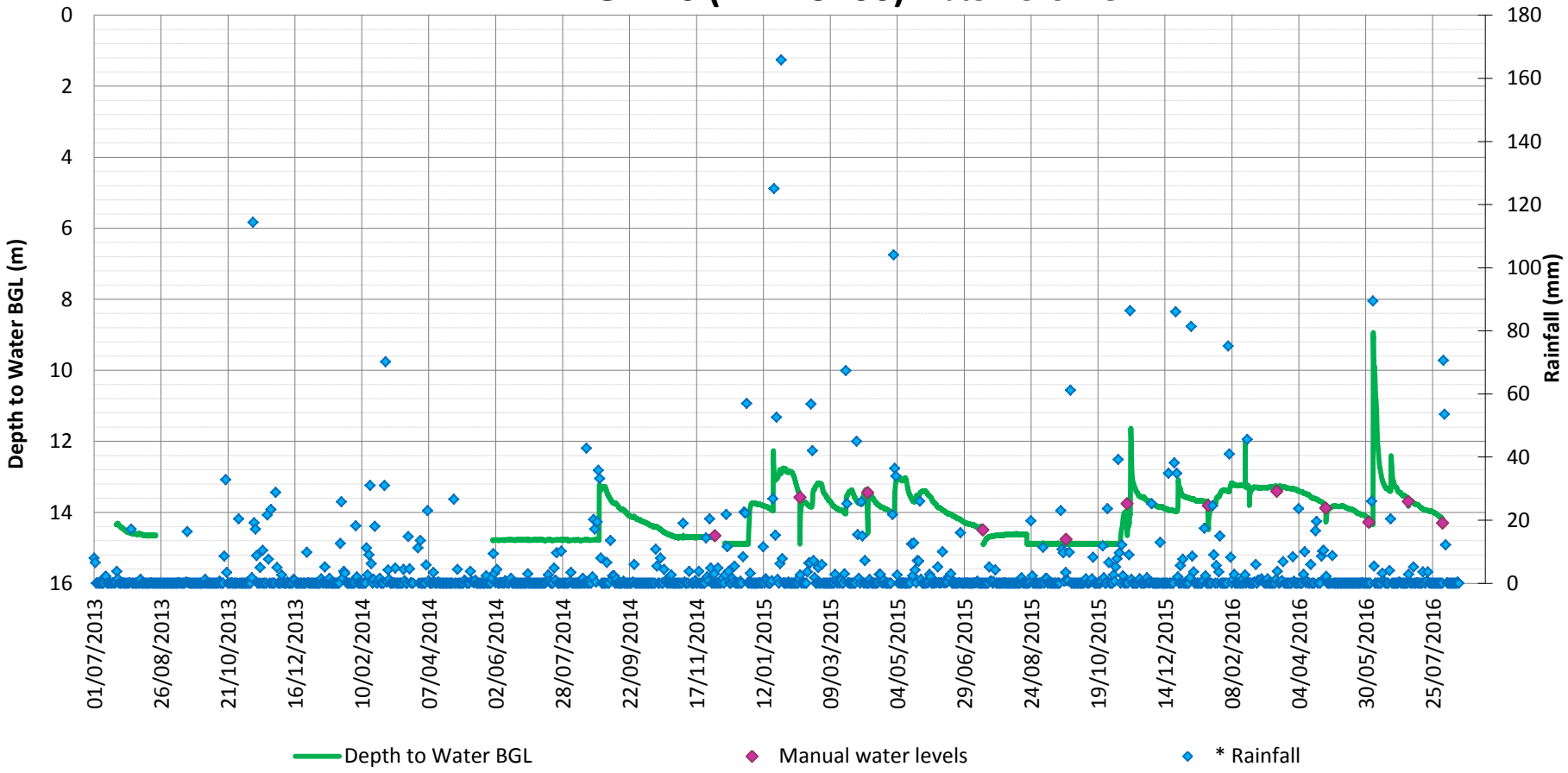
Drawn	KF		Client	RMS	
Approved	MD		Instrument	**HOBO Water Level Data Logger** sn10262203	
Date	2/08/2016		BH ID	D-BH3101	
			Project	**Pacific Hwy (HW10) Oxley Hwy to Kempsey**	Figure no: **B-21**

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



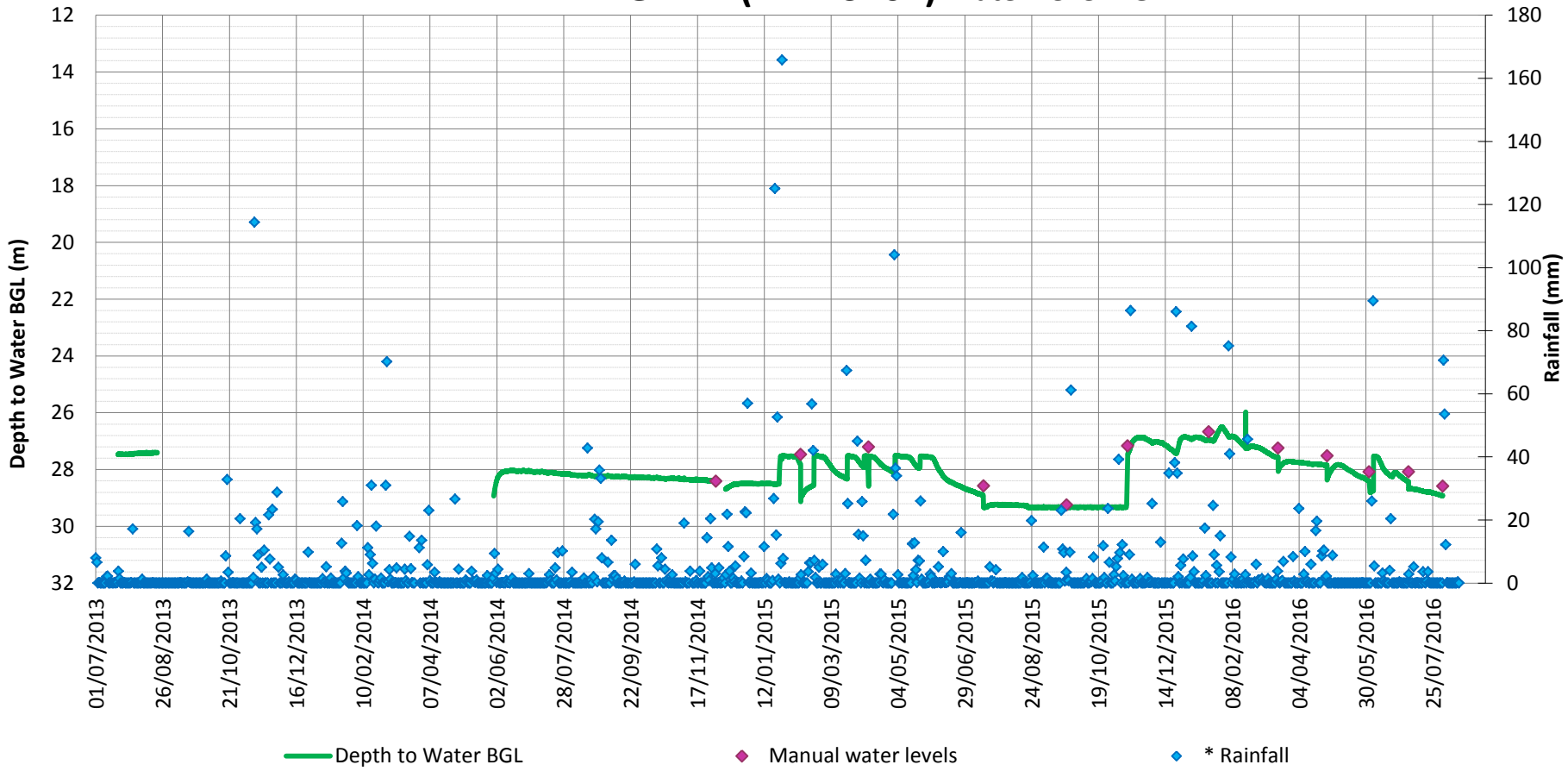
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262194	
			BH ID	D-BH3106	
Date	2/08/2016		Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-22

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



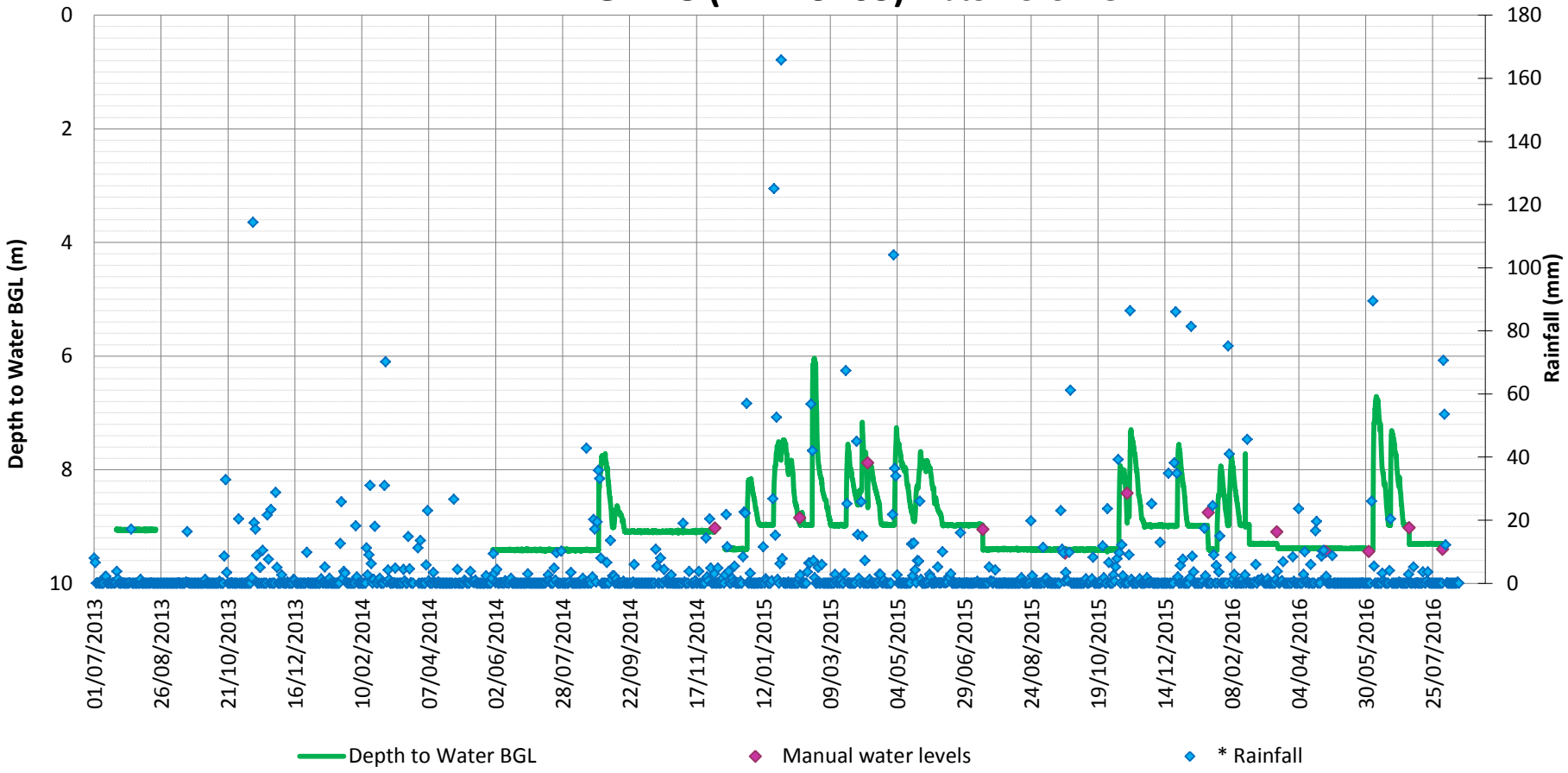
Drawn	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262200	
			BH ID	D-BH3102	
Date	2/08/2016		Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-23

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



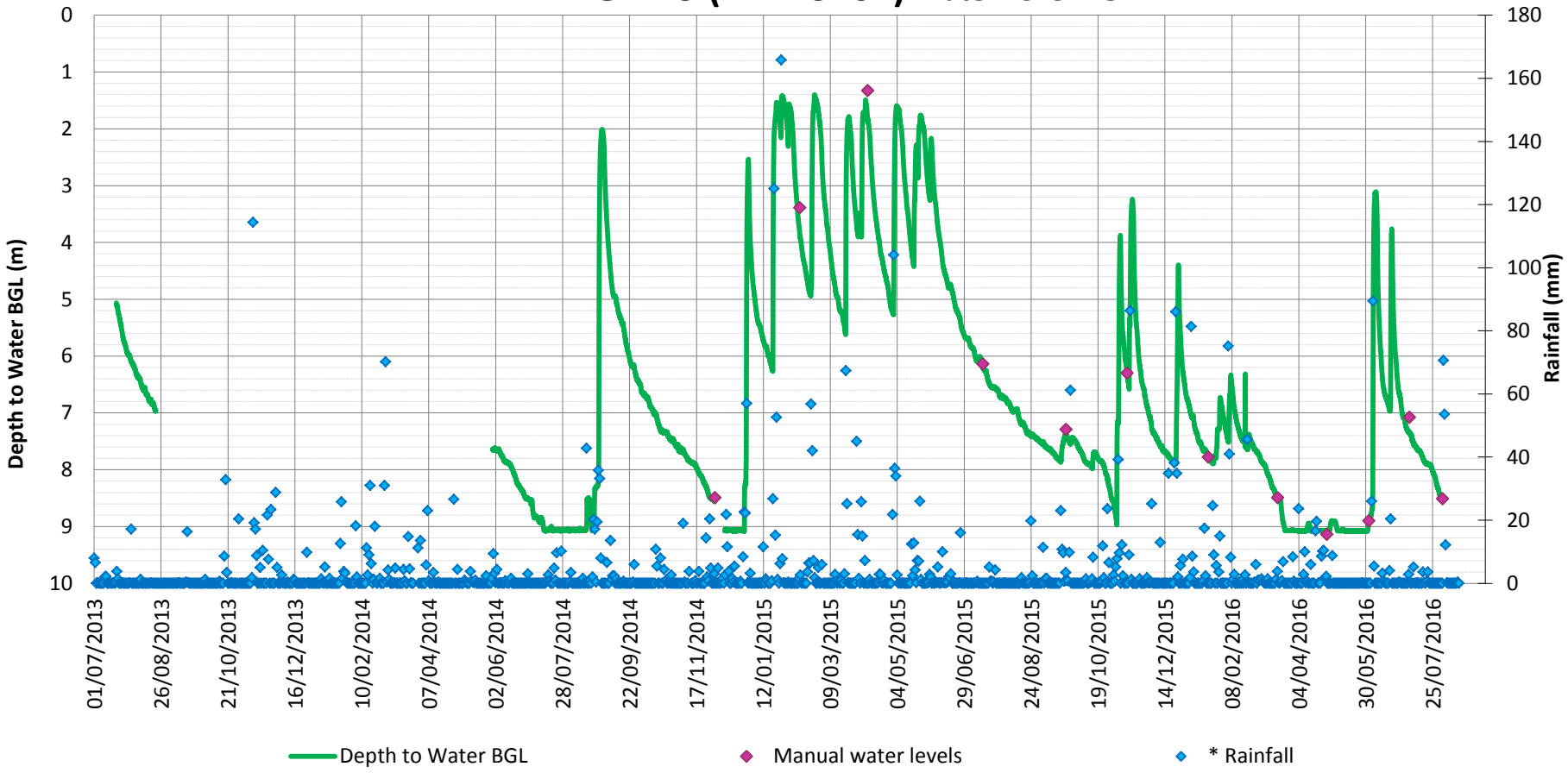
Drawn	KF		Client	RMS	
Approved	MD		Instrument	**HOBO Water Level Data Logger** sn10262205	
Date	2/08/2016		BH ID	D-BH3103	
			Project	**Pacific Hwy (HW10) Oxley Hwy to Kempsey**	Figure no: **B-24**

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



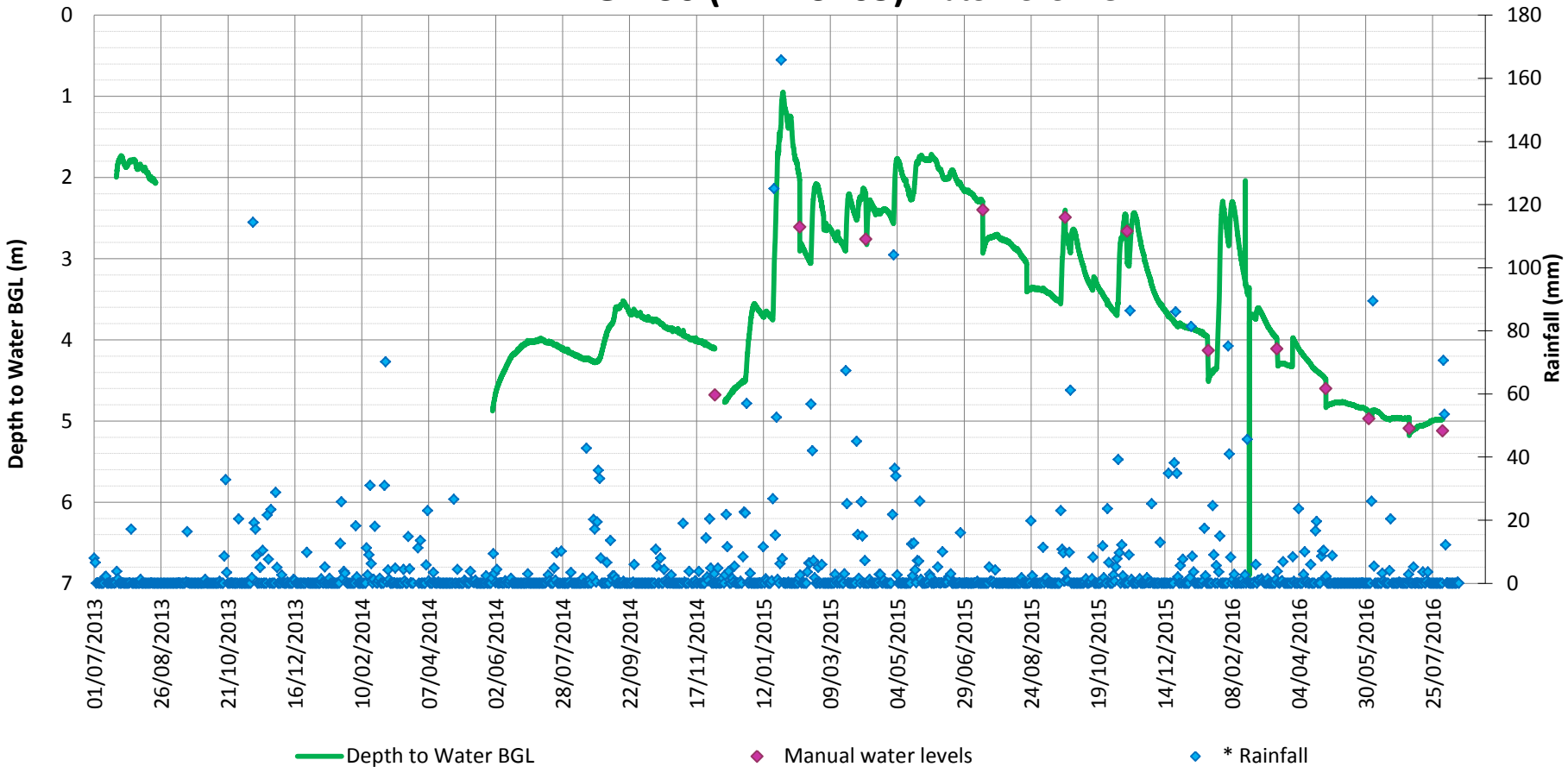
Drawn	KF		Client	RMS	
Approved	MD		Instrument	**HOBO Water Level Data Logger** sn10262201	
Date	2/08/2016		BH ID	D-BH3104	
			Project	**Pacific Hwy (HW10) Oxley Hwy to Kempsey**	Figure no: **B-25**

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	KF	Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262193	
			BH ID	D-BH3105	
Date	2/08/2016		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*					
Dissolved Aluminium	mg/L	0.01	2.51	0.1										
Dissolved Arsenic	mg/L	0.001	0.008	0.002										
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001										
Dissolved Chromium	mg/L	0.001	<0.001	<0.001										
Dissolved Copper	mg/L	0.001	0.037	0.009										
Total Iron	mg/L	0.05	2.27	1.8										
Dissolved Lead	mg/L	0.001	0.026	0.002										
Total Manganese	mg/L	0.001	0.247	0.052										
Mercury	mg/L	0.0001	<0.00001	0.00001										
Dissolved Nickel	mg/L	0.001	0.025	0.005										
Dissolved Silver	mg/L	0.001	<0.001	<0.001										
Dissolved Zinc	mg/L	0.005	0.347	0.118										
EC laboratory	uS/cm		4400	2170										
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										
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 and April 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 planned 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*					
Dissolved Aluminium	mg/L	0.01	<0.01	0.03	0.01	17.2	18.6							
Dissolved Arsenic	mg/L	0.001	0.003	<0.001	<0.001	0.007	0.007							
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0032	0.0003							
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	0.011	0.014							
Dissolved Copper	mg/L	0.001	0.001	0.004	0.003	0.069	0.071							
Total Iron	mg/L	0.05	15.9	8.65	31.9	15.7	21.4							
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.009	0.099							
Total Manganese	mg/L	0.001	0.477	0.088	0.073	0.216	0.312							
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							
Dissolved Silver	mg/L	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							
EC laboratory	uS/cm		345	178	231	852	914							
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							
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 and April 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.

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*					
Dissolved Aluminium	mg/L	0.01	<0.01	0.02	<0.01	0.24	1.44	<0.01	0.35					
Dissolved Arsenic	mg/L	0.001	<0.001	<0.001	<0.001	0.006	0.002	<0.001	<0.001					
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0002	<0.0001	0.0001	0.0023					
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.001					
Dissolved Copper	mg/L	0.001	0.005	0.005	0.005	0.010	0.022	0.001	0.027					
Total Iron	mg/L	0.05	35.7	11.3	3.73	17.4	4.92	7.97	1.88					
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.085	<0.001	<0.001					
Total Manganese	mg/L	0.001	1.13	0.947	0.141	1.34	0.311	1.22	0.647					
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					
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	0.01	0.019	0.015	0.028	0.028	0.013	0.085					
EC laboratory	uS/cm		1290	939	519	1040	725	1080	1420					
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					
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 and April 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*					
Dissolved Aluminium	mg/L	0.01	<0.01	0.01	<0.01									
Dissolved Arsenic	mg/L	0.001	<0.001	<0.001	0.001									
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001									
Dissolved Chromium	mg/L	0.001	0.001	0.002	0.002									
Dissolved Copper	mg/L	0.001	0.005	0.002	0.003									
Total Iron	mg/L	0.05	106	28.6	24.4									
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001									
Total Manganese	mg/L	0.001	0.632	0.409	0.486									
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001									
Dissolved Nickel	mg/L	0.001	0.002	0.004	0.007									
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001									
Dissolved Zinc	mg/L	0.005	<0.005	0.017	0.016									
EC laboratory	uS/cm		4190	3050	3170									
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									
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 and April 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-installation planned 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*					
Dissolved Aluminium	mg/L	0.01	0.01	0.02	<0.01	6.72	1.28	<0.01						
Dissolved Arsenic	mg/L	0.001	<0.001	<0.001	<0.001	0.005	0.003	0.001						
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0008	0.0005	<0.0001						
Dissolved Chromium	mg/L	0.001	<0.001	0.001	<0.001	0.010	0.003	<0.001						
Dissolved Copper	mg/L	0.001	0.01	0.003	0.001	0.047	0.046	<0.001						
Total Iron	mg/L	0.05	111	66.2	59.4	69.3	46.8	92.7						
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.005	0.044	<0.001						
Total Manganese	mg/L	0.001	0.944	1.15	1.02	0.726	0.744	1.43						
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						
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Dissolved Zinc	mg/L	0.005	0.015	0.020	0.022	0.055	0.039	0.040						
EC laboratory	uS/cm		7260	6910	6890	7320	7510	6590						
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						
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 and April 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	GW07 Results											
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*					
Dissolved Aluminium	mg/L	0.01		0.2	0.08		71.7	1.70						
Dissolved Arsenic	mg/L	0.001		<0.001	<0.001		0.012	<0.001						
Dissolved Cadmium	mg/L	0.0001		<0.001	<0.001		0.0004	<0.0001						
Dissolved Chromium	mg/L	0.001		0.002	<0.001		0.042	0.002						
Dissolved Copper	mg/L	0.001		0.001	0.004		7.39	0.020						
Total Iron	mg/L	0.05		26.7	13.2		31.3	7.07						
Dissolved Lead	mg/L	0.001		<0.001	<0.001		0.154	<0.001						
Total Manganese	mg/L	0.001		0.124	0.125		0.254	0.030						
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						
Dissolved Silver	mg/L	0.001		<0.001	<0.001		<0.001	<0.001						
Dissolved Zinc	mg/L	0.005		0.005	0.011		0.174	0.106						
EC laboratory	uS/cm			212	238		184	169						
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						
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 and April 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW07 had insufficient water to collect a sample during December 2014 and July 2015 sampling events.

Table 7 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*					
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 and April 2016 events are for "total" metals despite otherwise indicated in table.

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

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

Parameter	Unit	LOR	GW09 Results											
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 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 and April 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 planned prior to August 2016 monitoring event.

Table 9 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*					
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 and April 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 planned prior to August 2016 monitoring event.

Table 10 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*					
Dissolved Aluminium	mg/L	0.01	0.96	0.01	0.01	0.62								
Dissolved Arsenic	mg/L	0.001	0.003	<0.001	0.001	0.004								
Dissolved Cadmium	mg/L	0.0001	0.002	<0.001	<0.001	0.0007								
Dissolved Chromium	mg/L	0.001	<0.001	0.001	<0.001	0.002								
Dissolved Copper	mg/L	0.001	0.126	0.039	0.018	0.039								
Total Iron	mg/L	0.05	14	14.5	16.0	1.79								
Dissolved Lead	mg/L	0.001	0.003	<0.001	<0.001	0.003								
Total Manganese	mg/L	0.001	1.80	0.735	0.069	0.117								
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								
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001								
Dissolved Zinc	mg/L	0.005	0.136	0.045	0.021	0.064								
EC laboratory	uS/cm		8510	4370	1040	2390								
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													
Bicaronate / Alkalinity	mg $CaCO_3/L^{-1}$		7	118	273									
Chloride	mg/L		2076	966	140									
Nitrate			0.02	0.01	<0.01	0.02								
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 and April 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 planned prior to August 2016 monitoring event.

Table 11 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*					
Dissolved Aluminium	mg/L	0.01	0.01	0.01	<0.01	2.33	2.54	<0.01	0.51					
Dissolved Arsenic	mg/L	0.001	0.004	0.003	0.002	0.077	0.024	0.004	0.028					
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0005	0.0003	0.0001	0.0032					
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	0.006	0.003	<0.001	0.003					
Dissolved Copper	mg/L	0.001	<0.001	<0.001	<0.001	0.016	0.043	<0.001	0.381					
Total Iron	mg/L	0.05	344	191	169	135	74.6	101	49.2					
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.003	0.069	<0.001	<0.001					
Total Manganese	mg/L	0.001	8.61	4.85		4.97	3.79	4.75	3.74					
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					
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	0.02	0.018	0.029	0.040	0.034	0.027	0.118					
EC laboratory	uS/cm		4020	2860	2470	2600	1740	1510	1440					
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													
Bicaronate / 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					
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 and April 2016 events are for "total" metals despite otherwise indicated in table.

Table 12 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*					
Dissolved Aluminium	mg/L	0.01	0.02	0.01										
Dissolved Arsenic	mg/L	0.001	<0.001	<0.001										
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001										
Dissolved Chromium	mg/L	0.001	<0.001	0.001										
Dissolved Copper	mg/L	0.001	0.004	0.003										
Total Iron	mg/L	0.05	76.9	13.7										
Dissolved Lead	mg/L	0.001	<0.001	<0.001										
Total Manganese	mg/L	0.001	0.358	0.114										
Mercury	mg/L	0.0001	<0.00001	<0.00001										
Dissolved Nickel	mg/L	0.001	<0.001	0.001										
Dissolved Silver	mg/L	0.001	<0.001	<0.001										
Dissolved Zinc	mg/L	0.005	0.007	0.014										
EC laboratory	uS/cm		300	247										
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													
Bicaronate / Alkalinity	mg $CaCO_3/L^{-1}$		62	40										
Chloride	mg/L		39	24										
Nitrate			0.01	<0.01										
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 and April 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 planned prior to August 2016 monitoring event.

Table 13 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*					
Dissolved Aluminium	mg/L	0.01	0.05	0.03										
Dissolved Arsenic	mg/L	0.001	<0.001	<0.001										
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001										
Dissolved Chromium	mg/L	0.001	<0.001	0.001										
Dissolved Copper	mg/L	0.001	0.024	0.008										
Total Iron	mg/L	0.05	0.79	0.37										
Dissolved Lead	mg/L	0.001	<0.001	<0.001										
Total Manganese	mg/L	0.001	0.279	0.171										
Mercury	mg/L	0.0001	<0.00001	0.00001										
Dissolved Nickel	mg/L	0.001	0.003	0.002										
Dissolved Silver	mg/L	0.001	<0.001	<0.001										
Dissolved Zinc	mg/L	0.005	0.018	0.019										
EC laboratory	uS/cm		3690	3230										
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													
Bicaronate / Alkalinity	mg $CaCO_3/L^{-1}$		506	461										
Chloride	mg/L		833	700										
Nitrate			0.22	0.38										
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 and April 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 planned prior to August 2016 monitoring event.

Table 14 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*					
Dissolved Aluminium	mg/L	0.01	0.02	0.02	0.01	0.47	1.01	<0.01	0.75					
Dissolved Arsenic	mg/L	0.001	0.01	0.008	0.005	0.026	0.014	0.008	0.021					
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	<0.0001	0.0001	<0.0001	0.0002					
Dissolved Chromium	mg/L	0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	0.001					
Dissolved Copper	mg/L	0.001	0.008	0.002	0.002	0.012	0.03	<0.001	0.056					
Total Iron	mg/L	0.05	7.28	6.61	5.02	3.98	3.38	5.40	3.84					
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.002	0.169	<0.001	0.002					
Total Manganese	mg/L	0.001	2.55	2.21	2.00	1.94	2.06	3.58	2.59					
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					
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	0.021	0.016	0.020	0.022	0.026	0.015	0.065					
EC laboratory	uS/cm		3760	3740	3660	3760	3850	3690	3280					
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													
Bicaronate / 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					
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 and April 2016 events are for "total" metals despite otherwise indicated in table.

Table 15 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*					
Dissolved Aluminium	mg/L	0.01			0.01	1.16	2.95	0.01	2.12					
Dissolved Arsenic	mg/L	0.001			<0.001	0.002	0.004	0.001	0.003					
Dissolved Cadmium	mg/L	0.0001			<0.001	0.0002	0.0003	<0.0001	0.0005					
Dissolved Chromium	mg/L	0.001			<0.001	0.002	0.004	<0.001	0.003					
Dissolved Copper	mg/L	0.001			0.001	0.006	0.012	<0.001	0.03					
Total Iron	mg/L	0.05			19.9	1.73	4.66	8.64	5.18					
Dissolved Lead	mg/L	0.001			<0.001	0.003	0.061	<0.001	0.003					
Total Manganese	mg/L	0.001			0.561	0.238	0.245	0.272	0.225					
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					
Dissolved Silver	mg/L	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					
EC laboratory	uS/cm				3680	4150	4080	3840	3550					
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													
Bicaronate / Alkalinity	mg $CaCO_3/L^{-1}$				560			382						
Chloride	mg/L				770			799						
Nitrate					<0.01	0.10	0.09	0.05	0.2					
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 and April 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	GW018 Results												
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*						
Dissolved Aluminium	mg/L	0.01	0.02	0.03	<0.01	0.63	2.18	<0.01	1.46						
Dissolved Arsenic	mg/L	0.001	0.006	0.005	0.005	0.011	0.009	0.002	0.009						
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0020	0.0003	<0.0001	0.0002						
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.002						
Dissolved Copper	mg/L	0.001	0.008	0.004	0.003	0.034	0.021	0.001	0.049						
Total Iron	mg/L	0.05	5.26	5.57	5.76	2.40	4.34	4.01	5.51						
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.012	0.085	<0.001	0.008						
Total Manganese	mg/L	0.001	2.00	1.80	1.80	1.58	1.58	1.60	1.49						
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						
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	0.022	0.014	0.022	0.040	0.04	0.007	0.041						
EC laboratory	uS/cm		1690	1690	1660	1700	1730	1720	1550						
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														
Bicaronate / 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						
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 and April 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	GW19 Results											
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 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													
Bicaronate / 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 and April 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 planned prior to August 2016 monitoring event.

Table 18 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*					
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													
Bicaronate / 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 and April 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 2016 sampling event due to restrictions in place from construction work.

Table 19 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*					
Dissolved Aluminium	mg/L	0.01	0.36	0.03	0.02	12.2	6.33	0.17	4.76					
Dissolved Arsenic	mg/L	0.001	0.008	0.002	0.002	0.011	0.004	0.008	0.009					
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0010	0.0001	<0.0001	0.0003					
Dissolved Chromium	mg/L	0.001	0.004	<0.001	<0.001	0.011	0.003	0.001	0.005					
Dissolved Copper	mg/L	0.001	0.021	<0.001	0.026	0.126	0.169	0.003	0.251					
Total Iron	mg/L	0.05	159	86.6	19.3	35.8	7.31	22.0	7.02					
Dissolved Lead	mg/L	0.001	0.01	<0.001	<0.001	0.049	0.066	0.001	0.008					
Total Manganese	mg/L	0.001	1.00	0.979	0.557	0.577	0.481	0.652	0.323					
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					
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	0.022	0.009	0.056	1.16	0.08	0.059	0.146					
EC laboratory	uS/cm		1050	714	748	730	562	828	912					
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													
Bicaronate / 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					
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 and April 2016 events are for "total" metals despite otherwise indicated in table.

Table 20 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*					
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													
Bicaronate / 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 and April 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	GW23 Results											
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*					
Dissolved Aluminium	mg/L	0.01	0.07	0.18	0.49	0.04	215	0.45						
Dissolved Arsenic	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.04	<0.001						
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	<0.0001	0.0007	<0.0001						
Dissolved Chromium	mg/L	0.001	0.001	<0.001	0.002	<0.001	0.063	0.001						
Dissolved Copper	mg/L	0.001	0.021	0.003	0.019	0.001	0.071	0.010						
Total Iron	mg/L	0.05	77.2	55.5	53.2	0.21	83.2	33.0						
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.22	<0.001						
Total Manganese	mg/L	0.001	1.75	0.863	0.713	0.076	1.69	0.592						
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						
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Dissolved Zinc	mg/L	0.005	0.123	0.037	0.035	0.050	0.531	0.206						
EC laboratory	uS/cm		542	205	177	230	245	246						
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													
Bicaronate / 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						
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 and April 2016 events are for "total" metals despite otherwise indicated in table.

Note: Site not accessible during April 2016 sampling event due to restrictions in place from construction work.

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

Parameter	Unit	LOR	GW24 Results											
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*					
Dissolved Aluminium	mg/L	0.01	0.07	0.27	0.26	24.6	11.2	0.29	63.2					
Dissolved Arsenic	mg/L	0.001	0.003	<0.001	<0.001	0.010	0.004	0.001	0.012					
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0010	<0.0001	0.0002	0.0008					
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	0.001	0.043	0.016	0.001	0.06					
Dissolved Copper	mg/L	0.001	0.087	1.52	0.353	5.09	0.862	2.87	1.51					
Total Iron	mg/L	0.05	92.5	23.8	34.2	35.6	10.6	22.4	115					
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.021	0.062	<0.001	0.052					
Total Manganese	mg/L	0.001	0.366	0.132	0.145	0.180	0.062	0.090	0.5					
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					
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	0.06	0.074	0.063	0.235	0.061	0.072	1.18					
EC laboratory	uS/cm			595	558	840	410	622	763					
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						
Bicaronate / 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					
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 and April 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	GW025 Results											
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 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													
Bicaronate / 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 and April 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 and April 2016 sampling events.

Table 24 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*					
Dissolved Aluminium	mg/L	0.01	<0.01	0.04	0.21	55.2	7.77	0.19	5.37					
Dissolved Arsenic	mg/L	0.001	0.002	<0.001	<0.001	0.013	0.004	<0.001	0.002					
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0034	0.001	0.0010	0.0017					
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	0.001	0.023	0.056	0.001	0.01					
Dissolved Copper	mg/L	0.001		0.23	1.01	38.6	1.8	2.19	4.04					
Total Iron	mg/L	0.05	26.2	43.6	11.5	16.5	3.28	6.64	2.3					
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.045	0.092	<0.001	0.005					
Total Manganese	mg/L	0.001	0.928	0.972	0.300	0.488	0.141	0.157	0.196					
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					
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	0.165	0.178	0.179	0.779	0.268	0.382	0.308					
EC laboratory	uS/cm			896	750	1190	997	951	1050					
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													
Bicaronate / 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					
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 and April 2016 events are for "total" metals despite otherwise indicated in table.

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

Parameter	Unit	LOR	GW27 Results											
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 16*					
Dissolved Aluminium	mg/L	0.01	<0.01	0.02	0.02	20.3	3.27	0.02	2.9					
Dissolved Arsenic	mg/L	0.001	0.003	<0.001	<0.001	0.021	0.002	0.001	0.005					
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0016	<0.0001	0.0001	0.0001					
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	0.063	0.008	<0.001	0.008					
Dissolved Copper	mg/L	0.001	0.012	0.053	0.084	2.70	0.039	0.352	0.89					
Total Iron	mg/L	0.05	21.2	20.5	6.08	37.3	5.3	14.8	8.41					
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.045	0.115	<0.001	0.007					
Total Manganese	mg/L	0.001	2.66	1.33	0.403	0.950	0.447	0.975	1.5					
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					
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	0.020	0.066	0.021	0.420	0.049	0.041	0.069					
EC laboratory	uS/cm			514	353	438	544	660	736					
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													
Bicaronate / 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					
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 and April 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	GW028 Results											
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*	Jan 16	Apr 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													
Bicaronate / 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 and April 2016 events are for "total" metals despite otherwise indicated in table.

Note – GW28 had insufficient water to collect a sample during April 2016 sampling event.

Table 27 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*					
Dissolved Aluminium	mg/L	0.01	0.16	0.72	0.78	29.4	35.8	1.06	301					
Dissolved Arsenic	mg/L	0.001	0.004	0.002	0.002	0.017	0.009	<0.001	0.092					
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0010	0.0006	0.0001	0.0054					
Dissolved Chromium	mg/L	0.001	<0.001	0.002	0.003	0.021	0.022	0.001	0.158					
Dissolved Copper	mg/L	0.001	0.014	0.022	0.017	0.154	0.116	0.015	1.23					
Total Iron	mg/L	0.05	187	5.29	3.98	18.8	19.5	19.4	139					
Dissolved Lead	mg/L	0.001	<0.001	0.001	<0.001	0.047	0.079	<0.001	0.352					
Total Manganese	mg/L	0.001	3.29	0.089	0.099	0.289	0.26	0.306	2.36					
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					
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002					
Dissolved Zinc	mg/L	0.005	0.069	0.103	0.087	1.47	0.788	0.310	16.2					
EC laboratory	uS/cm		274	145	158	195	211	205	253					
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													
Bicaronate / 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					
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 and April 2016 events are for "total" metals despite otherwise indicated in table.

Table 28 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*					
Dissolved Aluminium	mg/L	0.01	1.36	0.06	0.05	6.79	7.49	0.17	17.2					
Dissolved Arsenic	mg/L	0.001	0.001	0.002	0.002	0.022	0.008	<0.001	0.007					
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0010	<0.0001	0.0001	0.0002					
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	0.001	0.007	0.006	<0.001	0.008					
Dissolved Copper	mg/L	0.001	0.175	0.009	0.01	0.127	1.69	0.650	0.801					
Total Iron	mg/L	0.05	16.8	6.37	17.3	9.16	6.32	19.3	16					
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.005	0.057	<0.001	0.006					
Total Manganese	mg/L	0.001	1.10	0.162	0.187	0.168	0.305	0.485	0.378					
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					
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	0.310	0.018	0.029	0.068	0.098	0.236	0.173					
EC laboratory	uS/cm		2820	435	511	677	1020	1420	1290					
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													
Bicaronate / 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					
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 and April 2016 events are for "total" metals despite otherwise indicated in table.

Table 29 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	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
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	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	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 30 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

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
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 water	171
GW08	47700	140	47900	Not taken	Dry	Insufficient water	656	Insufficient water	733	493.4	Insufficient water	Insufficient water	732
GW09	Dry	Dry	Insufficient water	Not taken	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient water	Not taken
GW10	46300	39000	65900	Not taken	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient water	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 water	Not taken	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
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 water	Insufficient water
GW20	Dry	Dry	Insufficient water	Not taken	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Not taken	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 water	Insufficient water	358	464	336	235	624	Insufficient water	378
GW25	158	90100	49600	Not taken	548	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Dry
GW26	87800	84500	83100	Not taken	1060	Insufficient	871	732	878	420	871	425	500

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							
GW27	87200	47200	39100	Not taken	Insufficient water	Insufficient water	464	491	536	588	611	625	339
GW28	28400	Dry	22000	Not taken	Insufficient water	Insufficient water	202	Insufficient water	140	Insufficient water	Insufficient water	Insufficient water	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 31 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 water	7.5
GW08	6.3	5.7	6.0	Insufficient water	Insufficient water	Insufficient water	6.0	Insufficient water	5.2	5.4	Insufficient water	Insufficient water	5.8
GW09	Dry	Dry	Dry	Insufficient water	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient water	Not taken
GW10	6.7	5.5	5.6	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient water	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

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
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 water	Insufficient water
GW20	Dry	Dry	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	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 water	Insufficient water	5.7	7.5	5.5	5.8	6.5	Insufficient water	7.2
GW25	6.0	4.6	5.1	5.1	4.7	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Dry
GW26	6.3	5.5	5.3	5.3	5.3	Insufficient water	5.3	5.4	5.3	5	5	5.7	7.1
GW27	7.1	6.2	6.2	Insufficient water	Insufficient water	Insufficient water	5.8	5.7	6.3	6.3	6.3	6.4	8
GW28	6.2	Dry	5.3	Insufficient water	Insufficient water	Insufficient water	5.2	Insufficient water	5.9	Insufficient water	Insufficient water	Insufficient water	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
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 32 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	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
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	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	20.9	19.5
GW07	Dry	21.7	22.1	Insufficient water	19.5	19.6	19.9	20.2	20.9	19.7	21.8	Insufficient water	19.4
GW08	20.2	21.6	20.0	Insufficient water	Insufficient water	Insufficient water	20.3	Insufficient water	20.2	20.8	Insufficient water	Insufficient water	18.8
GW09	Dry	Dry	Insufficient water	Insufficient water	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient water	Not taken
GW10	19.0	20.6	20.3	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Insufficient water	Dry
GW11	18.3	20.4	22.0	17.5	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	21	18.9
GW14	18.2	20.6	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 water	Insufficient water	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
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 water	Insufficient water
GW20	Dry	Dry	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Not taken	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

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
					water	water						water	
GW25	21.0	21.1	19.6	19.4	18.5	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Dry
GW26	22.7	20.3	19.9	18.8	19.2	Insufficient water	20.1	20.2	20	20.2	19.7	14.3	19
GW27	19.6	20.4	19.2	Insufficient water	Insufficient water	Insufficient water	19.7	19.9	20.3	19.7	19.3	28.1	19
GW28	21.6	Dry	19.5	18.6	Insufficient water	Insufficient water	20	Insufficient water	23.4	Insufficient water	Insufficient water	Insufficient water	18.7
GW29	18.3	19.6	20.3	Insufficient water	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

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