



Transport
Roads & Maritime
Services

Oxley Highway to Kempsey Upgrade Project **Construction water quality monitoring report - 22 July 2015 to 21 January 2016**



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1 Introduction

1.1 The project

On behalf of the Australian and NSW governments, Roads and Maritime Services (Roads and Maritime) is currently constructing the Oxley Highway to Kempsey Pacific Highway Upgrade (the project). The project is 37 kilometres in length, commencing 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:

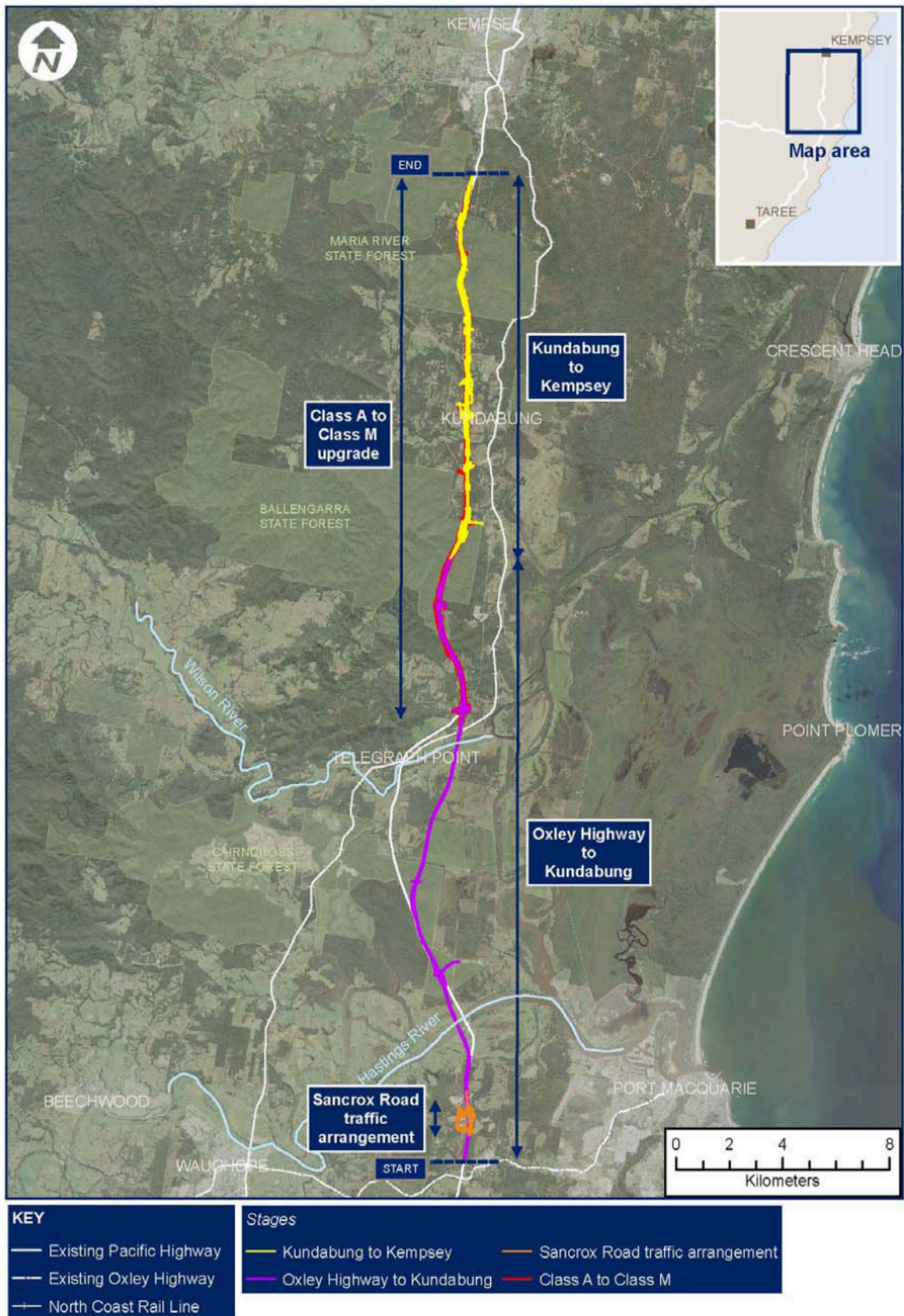
- Stage 1 - The Sancrox Traffic Arrangement works located about two kilometres north of the Oxley Highway / Pacific Highway intersection.
- Stage 2 - Kundabung to Kempsey Stage consisting of about 14 kilometres of dual carriageway, commencing north of Barrys Creek near Kundabung (chainage 24,000) and 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 third construction period between 22 July 2015 and 21 January 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 (Fisheries and Aquaculture) 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 affect 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 inline 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.

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 this or the previous reporting period. Further detail is provided in Section 3.7.

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 from the rest areas

Site no.	Chainage	Reason for site selection
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) Nickel (Ni)	mg/L	Laboratory measurement

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

2.3 Water quality analysis

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

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

Similarly, analysis of groundwater is undertaken both in the field and off-site by an accredited NATA laboratory as the parameter dictates (refer to Section 2.2). Automated data loggers (Hobo) have been installed at 26 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 – Farrowells 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 July 2015 to 21 January 2016 was mixed with four of the six monthly records at the Port Macquarie Airport Bureau of Meteorology monitoring station characterised as above average to well above average. September, November, December 2015 and January 2016 were the wettest months with September and December being at least two times the historical monthly averages. August 2015 was a particularly dry month with rainfall well below historical monthly averages. 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 the project during the monitoring period. Works on each of the stages included (see further detail on groundwater in Section 3.9)

- Stage 1 – Earthworks concluded early during the monitoring period, with finishing works, including paving, in progress extensively across the site. Landscaping and rehabilitation works were completed with the site entering a maintenance and defect rectification period. Sancrox Traffic Arrangement works were opened to traffic on 30 November 2015. Landscaped areas with established cover of less than 70 per cent retained the 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. Culvert and bridge works continued at or in the vicinity of all waterway crossings on Stage 2. Some 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 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 3 (March 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, SW8, SW9, SW11 and SW12. On all occasions, with the exception of one event at SW9 and two events at SW11, were in response to naturally low flows. The exception at SW9 was due to a coffer-dam arrangement in place while specific bridge works were in progress. At SW11, on two occasions in August, a coffer-dam and pump-around operation was in progress while finishing works on the culvert were completed.
- SW8a was dry on 12 occasions during the monitoring period. On only three occasions were all sampling points connected. At all other times SW8b persisted as an isolated pond. On this basis, comparison between 80th and 20th percentiles at SW8a and downstream locations (ie SW8b, SW8c) do not always adequately represent any potential impacts associated with construction.
- 80th and 20th percentile trigger values have generally been established from 24 sampling events up to and including the month subject to analysis (consistent with ANZECC requirements). However, due to the frequency of metal analysis during pre-construction and prevailing dry conditions during the first construction period, the trigger values have been derived from fewer samples for some waterway ie SW2 and 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 has 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									
				August 2015					September 2015				
				SW1a derived trigger values*			SW1b	SW1c	SW1a derived trigger values*			SW1b	SW1c
				Std dev	80 th %	20 th %	Median	Median	Std dev	80 th %	20 th %	Median	Median
Temperature	°C	-2-50	NA	4.3	22.4	15.2	14.2	13.9	4.3	22.4	15.5	16.5	17.0
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	474	1167	180	1495	975	442	1092	180	530	529
Dissolved oxygen (DO)	%	0-200	85-110	26	62	8	76	39	28	70	8	87	85
pH		0-14	6.5-8	0.4	6.9	6.3	7.1	7.2	0.4	6.9	6.2	6.7	6.9
Turbidity	NTU	0-600	6-50	33	49	17	19	32	31	45	18	49	91
Total suspended solids (TSS)	mg/L	5	-	13	23	5	8	16	10	19	5	5	12
Aluminium (Al)	mg/L	0.01	0.055"	0.64	0.44	0.02	0.01	0.01	0.63	0.44	0.03	0.13	0.09
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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	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	0.002	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.002
Iron (Fe)	mg/L	0.05	ID	7.60	9.30	0.66	0.13	0.22	7.59	9.30	0.69	0.27	0.36
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	0.416	0.660	0.025	0.166	0.303	0.420	0.660	0.022	0.085	0.102
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	0.002	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	0.045	0.016	0.007	0.008	0.008	0.045	0.016	0.008	0.006	0.013
Total Nitrogen (TN)	mg/L	0.1	0.5	0.3	0.9	0.4	0.6	1.1	0.2	0.9	0.5	1.0	1.0
Total Phosphorous (TP)	mg/L	0.01	0.05	0.03	0.04	0.02	0.04	0.07	0.03	0.04	0.01	0.03	0.05

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

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

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

ID – Insufficient representative data (ANZECC).

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

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results									
				October 2015					November 2015				
				SW1a derived trigger values*			SW1b	SW1c	SW1a derived trigger values*			SW1b	SW1c
				Std dev	80 th %	20 th %	Median	Median	Std dev	80 th %	20 th %	Median	Median
Temperature	°C	-2-50	NA	4.3	22.4	15.5	20.1	20.0	4.1	21.4	15.5	20.1	24.9
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	411	993	174	997	839	379	737	183	437	508
Dissolved oxygen (DO)	%	0-200	85-110	27	70	10	68	55	26	70	15	75	84
pH		0-14	6.5-8	0.5	6.9	6.2	6.9	7.4	0.4	6.8	6.1	6.7	6.7
Turbidity	NTU	0-600	6-50	31	45	18	27	62	18	43	20	33	35
Total suspended solids (TSS)	mg/L	5	-	10	17	5	7	6	5	13	5	5	12
Aluminium (Al)	mg/L	0.01	0.055"	0.63	0.39	0.03	0.18	0.11	0.65	0.50	0.03	0.37	0.13
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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	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	0.002	0.001	0.001	0.002	0.001	0.002	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	7.59	9.30	0.69	0.82	0.34	7.48	6.29	0.69	0.71	0.43
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	0.416	0.694	0.026	0.532	0.490	0.418	0.703	0.026	0.150	0.118
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	0.002	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	0.045	0.016	0.007	0.006	0.010	0.045	0.020	0.007	0.007	0.008
Total Nitrogen (TN)	mg/L	0.1	0.5	0.2	0.9	0.5	0.8	0.6	0.2	0.9	0.5	0.8	0.8
Total Phosphorous (TP)	mg/L	0.01	0.05	0.03	0.04	0.01	0.03	0.05	0.02	0.03	0.01	0.03	0.03

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

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

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

ID – Insufficient representative data (ANZECC).

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

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results									
				December 2015					January 2016				
				SW1a derived trigger values*			SW1b	SW1c	SW1a derived trigger values*			SW1b	SW1c
				Std dev	80 th %	20 th %	Median	Median	Std dev	80 th %	20 th %	Median	Median
Temperature	°C	-2-50	NA	3.7	21.2	15.5	24.1	25.8	3.7	21.1	15.5	22.4	22.6
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	325	702	183	792	1104	253	662	207	658	744
Dissolved oxygen (DO)	%	0-200	85-110	25	70	20	61	65	25	69	20	55	75
pH		0-14	6.5-8	0.4	6.8	6.1	7.0	7.0	0.4	6.9	6.2	6.9	7.2
Turbidity	NTU	0-600	6-50	19	49	26	61	121	19	52	26	49	73
Total suspended solids (TSS)	mg/L	5	-	5	13	5	19	36	5	12	5	7	18
Aluminium (Al)	mg/L	0.01	0.055"	0.65	0.50	0.03	0.06	0.01	0.65	0.62	0.04	0.34	0.31
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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	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	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	7.39	6.29	0.72	0.21	0.72	8.47	10.78	0.71	0.86	0.42
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	0.416	0.754	0.026	0.280	0.354	0.466	0.908	0.022	0.362	0.331
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	0.002	0.002	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	0.045	0.020	0.005	0.008	0.014	0.045	0.020	0.006	0.006	0.008
Total Nitrogen (TN)	mg/L	0.1	0.5	0.8	0.9	0.4	2.3	1.6	0.8	0.9	0.4	0.5	0.6
Total Phosphorous (TP)	mg/L	0.01	0.05	0.03	0.04	0.01	0.06	0.1	0.03	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 3-4 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2015				September 2015				October 2015			
				SW2b*			SW2a	SW2b*			SW2a	SW2b*			SW2a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	5.9	26.7	16.4	12.7	5.9	26.7	16.0	20.1	5.8	26.2	16.2	20.7
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	319	1026	441	512	335.9	1070.6	441.2	526	315	958	480	518
Dissolved oxygen (DO)	%	0-200	85-110	32	96	53	28	33.6	100.5	53.4	52	34	99	45	21
pH		0-14	6.5-8	1.1	6.6	4.5	6.3	1.2	6.6	4.0	6.0	1.3	6.6	3.7	5.9
Turbidity (NTU)	NTU	0-600	6-50	17	38	10	22	16.5	34.5	10.0	22	16	34	11	15
Total suspended solids (TSS)	mg/L	5	-	10	21	5	10	10.0	20.8	5.0	5	10	21	5	5
Aluminium (Al)	mg/L	0.01	0.055 [†]	8.11	0.37	0.02	0.02	7.75	0.44	0.02	0.04	7.58	0.41	0.02	0.08
Arsenic (As)	mg/L	0.001	0.024	0.008	0.002	0.001	0.001	0.008	0.002	0.001	0.001	0.008	0.002	0.001	0.001
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0003	0.0001	0.0001	0.0001	0.0003	0.0001	0.0001	0.0001	0.0003	0.0001	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.001	0.014	0.001	0.001	0.001	0.013	0.001	0.001	0.001	0.013	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.016	0.002	0.001	0.001	0.016	0.002	0.001	0.001	0.015	0.002	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	49.87	7.16	0.47	0.62	47.70	6.61	0.64	0.71	46.79	4.82	0.68	1.025
Lead (Pb)	mg/L	0.001	0.0034	0.007	0.001	0.001	0.001	0.007	0.001	0.001	0.001	0.007	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	1.827	2.112	0.210	0.488	1.865	2.704	0.232	0.675	1.845	3.292	0.239	0.108
Mercury (Hg)	mg/L	0.0001	0.0006	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.176	0.006	0.002	0.001	0.168	0.007	0.002	0.002	0.164	0.007	0.002	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	0.072	0.020	0.006	0.006	0.068	0.025	0.006	0.006	0.067	0.024	0.006	0.010
Total Nitrogen (TN)	mg/L	0.1	0.5	1.2	1.9	0.7	1.6	0.9	1.7	0.6	0.8	0.9	1.6	0.4	0.8
Total Phosphorous (TP)	mg/L	0.01	0.05	0.22	0.14	0.03	0.05	0.22	0.14	0.03	0.06	0.22	0.14	0.03	0.04

* 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	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2015				December 2015				January 2016			
				SW2b*			SW2a	SW2b*			SW2a	SW2b*			SW2a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	5.5	25.7	18.3	20.4	5.0	24.9	18.3	21.8	4.4	24.5	18.3	23.1
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	306	925	420	372	276	925	514	533	293	925	484	402
Dissolved oxygen (DO)	%	0-200	85-110	35	101	35	17	34	101	44	11	35	96	26	7
pH		0-14	6.5-8	1.3	6.6	3.7	6.1	1.3	6.6	3.7	6.4	1.3	6.6	3.7	6.7
Turbidity (NTU)	NTU	0-600	6-50	14	38	12	17	14	35	12	15	13	32	12	20
Total suspended solids (TSS)	mg/L	5	-	10	20	5	5	7	18	5	5	8	18	5	8
Aluminium (Al)	mg/L	0.01	0.055"	7.44	0.29	0.02	0.09	0.23	0.24	0.02	0.03	0.20	0.21	0.02	0.035
Arsenic (As)	mg/L	0.001	0.024	0.007	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	0.0002	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	0.013	0.001	0.001	0.011	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.015	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	45.72	4.47	0.72	2.09	2.62	4.47	0.84	0.95	2.57	4.47	0.97	1.73
Lead (Pb)	mg/L	0.001	0.0034	0.006	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	1.827	3.148	0.247	0.307	1.638	2.728	0.300	0.574	1.653	2.728	0.300	0.539
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	0.161	0.006	0.002	0.002	0.003	0.006	0.002	0.0015	0.003	0.005	0.002	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	0.066	0.022	0.006	0.005	0.012	0.019	0.005	0.005	0.010	0.018	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.5	0.9	1.7	0.4	0.8	0.6	1.5	0.4	0.8	0.5	1.5	0.4	0.6
Total Phosphorous (TP)	mg/L	0.01	0.05	0.22	0.14	0.03	0.06	0.06	0.12	0.03	0.04	0.06	0.13	0.03	0.07

* 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	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2015				September 2015				October 2015			
				SW3a*			SW3b	SW3a*			SW3b	SW3a*			SW3b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.4	26.9	18.4	16.7	4.5	26.9	17.9	19.2	4.4	26.8	17.9	24.0
Electrical conductivity (EC)	uS/cm	0-8000	-	1968	8000	8000	8000	1968	8000	8000	8000	1968	8000	8000	8000
Dissolved oxygen (DO)	%	0-200	80-110	10	100	87	93	10	101	88	96	11	101	87	87
pH		0-14	7.0-8.5	0.3	7.3	6.8	7.5	0.3	7.3	6.9	7.5	0.3	7.3	6.9	7.4
Turbidity (NTU)	NTU	0-600	0.5-10	57	47	11	9	57	48	13	36	57	48	14	11
Total suspended solids (TSS)	mg/L	5		29	36	5	5	30	40	5	11	30	39	5	5
Aluminium (Al)	mg/L	0.01	ID	0.09	0.10	0.01	0.06	0.08	0.10	0.01	0.10	0.08	0.10	0.02	0.08
Arsenic (As)	mg/L	0.001	ID	0.004	0.010	0.001	0.006	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.006
Cadmium (Cd)	mg/L	0.0001	0.0055	0.0004	0.0010	0.0001	0.0006	0.0004	0.0010	0.0001	0.0010	0.0004	0.0010	0.0001	0.0006
Chromium (Cr)	mg/L	0.001	0.0274	0.004	0.010	0.001	0.006	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.006
Copper (Cu)	mg/L	0.001	0.0013	0.004	0.010	0.001	0.006	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.006
Iron (Fe)	mg/L	0.05	ID	0.20	0.50	0.05	0.28	0.20	0.50	0.05	0.10	0.20	0.50	0.05	0.28
Lead (Pb)	mg/L	0.001	0.0044	0.004	0.010	0.001	0.006	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.006
Manganese (Mn)	mg/L	0.001	ID	0.025	0.046	0.018	0.031	0.025	0.046	0.018	0.019	0.024	0.046	0.020	0.031
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	0.006	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.006
Silver (Ag)	mg/L	0.001	0.0014	0.004	0.010	0.001	0.006	0.004	0.010	0.001	0.010	0.004	0.010	0.001	0.006
Zinc (Zn)	mg/L	0.005	0.015	0.022	0.050	0.005	0.028	0.022	0.050	0.005	0.050	0.022	0.050	0.005	0.028
Total Nitrogen (TN)	mg/L	0.1	0.3	0.3	0.6	0.2	0.2	0.3	0.6	0.2	0.2	0.3	0.6	0.2	0.2
Total Phosphorous (TP)	mg/L	0.01	0.03	0.04	0.08	0.04	0.10	0.04	0.08	0.04	0.05	0.04	0.07	0.04	0.04

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

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

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

ID – Insufficient representative data (ANZECC).

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

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2015				December 2015				January 2016			
				SW3a*			SW3b	SW3a*			SW3b	SW3a*			SW3b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.0	25.1	17.9	23.5	3.6	24.9	17.9	25.0	3.5	24.8	17.9	24.9
Electrical conductivity (EC)	uS/cm	0-8000	-	2045	8000	8000	8000	2045	8000	8000	8000	1634	8000	8000	8000
Dissolved oxygen (DO)	%	0-200	80-110	11	100	84	76	11	99	80	81	10	96	78	80
pH		0-14	7.0-8.5	0.3	7.3	6.8	7.0	0.3	7.3	6.9	7.5	0.3	7.3	6.8	7.0
Turbidity (NTU)	NTU	0-600	0.5-10	57	47	13	18	57	47	12	11	24	38	12	14
Total suspended solids (TSS)	mg/L	5		31	39	5	5	31	39	5	5	18	26	5	5
Aluminium (Al)	mg/L	0.01	ID	0.09	0.10	0.02	0.17	0.10	0.10	0.01	0.01	0.10	0.10	0.01	0.03
Arsenic (As)	mg/L	0.001	ID	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001	0.004	0.006	0.001	0.002
Cadmium (Cd)	mg/L	0.0001	0.0055	0.0004	0.0010	0.0001	0.0001	0.0004	0.0010	0.0001	0.0001	0.0004	0.0005	0.0001	0.0001
Chromium (Cr)	mg/L	0.001	0.0274	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001	0.004	0.005	0.001	0.001
Copper (Cu)	mg/L	0.001	0.0013	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001	0.004	0.006	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.19	0.50	0.05	0.22	0.18	0.42	0.05	0.05	0.17	0.39	0.05	0.13
Lead (Pb)	mg/L	0.001	0.0044	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001	0.004	0.005	0.001	0.001
Manganese (Mn)	mg/L	0.001	ID	0.024	0.047	0.020	0.036	0.024	0.049	0.026	0.051	0.023	0.049	0.028	0.034
Mercury (Hg)	mg/L	0.0001	0.0004	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.07	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001	0.004	0.005	0.001	0.001
Silver (Ag)	mg/L	0.001	0.0014	0.004	0.010	0.001	0.001	0.004	0.010	0.001	0.001	0.004	0.009	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.015	0.021	0.050	0.005	0.005	0.019	0.050	0.005	0.005	0.018	0.028	0.005	0.006
Total Nitrogen (TN)	mg/L	0.1	0.3	0.3	0.6	0.2	0.5	0.3	0.6	0.2	0.2	0.2	0.6	0.2	0.2
Total Phosphorous (TP)	mg/L	0.01	0.03	0.05	0.09	0.04	0.06	0.05	0.09	0.02	0.02	0.04	0.08	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 3-8 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results								
				SW5b pre construction trigger values*			SW5b median values					
				Std dev	80 th %	20 th %	August 2015	September 2015	October 2015	November 2015	December 2015	January 2016
Temperature	°C	-2-50	No data	5.4	27.3	19.3	18.9	20.1	28.7	25.2	26.2	25.0
Electrical conductivity (EC)	uS/cm	0-8000	No data	446	1042	490	704	1779	2499	696	1154	1249
Dissolved oxygen (DO)	%	0-200	No data	28	115	67	63	110	89	79	38	21
pH		0-14	No data	0.8	5.6	4.2	5.7	5.7	6.8	6.5	7.2	6.8
Turbidity (NTU)	NTU	0-600	No data	172	50	6	14	9	10	13	23	12
Total suspended solids	mg/L	5	-	313	279	8	10	6	7	5	5	8
Aluminium (Al)	mg/L	0.01	0.055"	1.13	1.97	0.42	0.04	0.04	0.01	0.07	0.03	0.01
Arsenic (As)	mg/L	0.001	0.024	0.003	0.004	0.001	0.001	0.002	0.001	0.001	0.004	0.002
Cadmium (Cd)	mg/L	0.0001	0.0002	0.0004	0.0007	0.0001	0.0001	0.0001	0.0001	0.0002	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	0.002	0.001
Copper (Cu)	mg/L	0.001	0.0014	0.002	0.004	0.002	0.001	0.002	0.001	0.002	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	5.55	4.49	0.31	0.74	0.15	0.17	0.24	0.30	0.10
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	1.181	3.310	1.175	1.022	4.605	0.882
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	0.001	0.003	0.001	0.010	0.001	0.004
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	0.075	0.027	0.005	0.018	0.005	0.013
Total Nitrogen (TN)	mg/L	0.1	No data	4.4	5.3	0.4	0.7	1.6	0.9	1.0	1.4	0.5
Total Phosphorous (TP)	mg/L	0.01	No data	0.59	0.16	0.02	0.03	0.02	0.04	0.02	0.06	0.03

* 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	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2015				September 2015				October 2015			
				SW6a*			SW6b	SW6a*			SW6b	SW6a*			SW6b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.3	27.3	18.4	17.9	4.4	27.3	18.1	19.8	4.3	26.4	18.1	24.0
Electrical conductivity (EC)	uS/cm	0-8000	-	3510	8000	214	8000	3510	8000	214	8000	3510	8000	214	8000
Dissolved oxygen (DO)	%	0-200	80-110	14	98	76	107	14	99	76	100	14	99	76	85
pH		0-14	7.0-8.5	0.4	7.3	6.6	7.0	0.4	7.1	6.5	6.9	0.3	7.0	6.5	6.9
Turbidity (NTU)	NTU	0-600	0.5-10	20	30	7	10	20	24	8	13	20	24	10	13
Total suspended solids (TSS)	mg/L	5		18	16	5	5	18	16	5	5	18	16	5	5
Aluminium (Al)	mg/L	0.01	ID	0.17	0.23	0.01	0.01	0.17	0.16	0.01	0.01	0.17	0.16	0.01	0.03
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	0.18	0.44	0.05	0.12	0.18	0.44	0.05	0.05	0.18	0.44	0.05	0.05
Lead (Pb)	mg/L	0.001	0.0044	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	ID	0.037	0.089	0.029	0.130	0.047	0.094	0.032	0.149	0.052	0.153	0.036	0.152
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	0.002	0.007	0.005	0.005	0.002	0.007	0.005	0.006	0.002	0.007	0.005	0.008
Total Nitrogen (TN)	mg/L	0.1	0.3	0.2	0.5	0.3	0.2	0.2	0.5	0.2	0.2	0.2	0.5	0.2	0.2
Total Phosphorous (TP)	mg/L	0.01	0.03	0.03	0.06	0.02	0.02	0.03	0.06	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 3-10 Construction surface water quality results by waterway (cont)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2015				December 2015				January 2016			
				SW6a*			SW6b	SW6a*			SW6b	SW6a*			SW6b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	3.7	24.4	18.1	23.8	3.6	24.7	18.1	26.6	3.6	24.9	18.1	25.3
Electrical conductivity (EC)	uS/cm	0-8000	-	3544	8000	214	2089	3510	8000	223	1380	3498	8000	268	459
Dissolved oxygen (DO)	%	0-200	80-110	14	99	79	77	14	98	74	85	14	98	72	70
pH		0-14	7.0-8.5	0.3	7.0	6.5	6.6	0.4	7.1	6.5	7.2	0.4	7.1	6.6	6.9
Turbidity (NTU)	NTU	0-600	0.5-10	19	22	10	19	15	22	10	21	12	20	10	26
Total suspended solids (TSS)	mg/L	5		16	14	5	6	5	11	5	9	3	7	5	12
Aluminium (Al)	mg/L	0.01	ID	0.17	0.24	0.01	0.22	0.17	0.23	0.02	0.09	0.16	0.23	0.03	0.16
Arsenic (As)	mg/L	0.001	ID	0.000	0.002	0.001	0.001	0.000	0.002	0.001	0.001	0.000	0.002	0.001	0.002
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	0.22	0.45	0.05	0.33	0.21	0.45	0.05	0.51	0.20	0.45	0.15	0.73
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	0.053	0.153	0.035	0.087	0.054	0.153	0.032	0.044	0.057	0.153	0.025	0.027
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	0.002	0.007	0.005	0.005	0.006	0.007	0.005	0.006	0.006	0.007	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.3	0.3	0.7	0.2	0.7	0.2	0.6	0.2	0.5	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	0.02	0.03	0.01	0.03	0.02	0.03	0.01	0.04

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

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

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

ID – Insufficient representative data (ANZECC).

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

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2015				September 2015				October 2015			
				SW6c*			SW6d	SW6c*			SW6d	SW6c*			SW6d
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.8	27.6	17.2	16.1	4.8	27.1	17.3	18.9	4.6	25.9	17.2	23.9
Electrical conductivity (EC)	uS/cm	0-8000	-	3520	8000	164	8000	3575	8000	170	8000	3520	8000	164	8000
Dissolved oxygen (DO)	%	0-200	80-110	11	94	79	104	11	96	81	100	10	95	80	81
pH		0-14	7.0-8.5	0.2	6.8	6.5	7.0	0.2	6.8	6.5	6.9	0.2	6.8	6.5	6.9
Turbidity (NTU)	NTU	0-600	0.5-10	93	22	9	8	92	21	9	10	93	22	10	11
Total suspended solids (TSS)	mg/L	5		51	12	5	5	50	12	5	5	51	12	5	5
Aluminium (Al)	mg/L	0.01	ID	0.19	0.19	0.01	0.01	0.19	0.14	0.01	0.02	0.19	0.14	0.01	0.01
Arsenic (As)	mg/L	0.001	ID	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.002
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	0.002	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.17	0.43	0.05	0.12	0.18	0.43	0.05	0.05	0.18	0.43	0.05	0.05
Lead (Pb)	mg/L	0.001	0.0044	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	ID	0.033	0.085	0.026	0.121	0.039	0.097	0.027	0.137	0.046	0.120	0.027	0.155
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	0.006	0.003	0.006	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.3	0.2	0.5	0.2	0.2	0.2	0.5	0.2	0.2	0.2	0.5	0.2	0.2
Total Phosphorous (TP)	mg/L	0.01	0.03	0.04	0.05	0.02	0.01	0.04	0.05	0.02	0.01	0.04	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 3-12 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2015				December 2015				January 2016			
				SW6c*			SW6d	SW6c*			SW6d	SW6c*			SW6d
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.0	24.2	17.2	22.6	4.0	24.3	17.2	26.5	4.1	24.5	17.2	26.5
Electrical conductivity (EC)	uS/cm	0-8000	-	3576	8000	164	1164	3516	8000	164	1053	3502	8000	234	357
Dissolved oxygen (DO)	%	0-200	80-110	9	95	82	78	11	95	76	76	11	95	75	77
pH		0-14	7.0-8.5	0.2	6.8	6.6	6.7	0.2	6.8	6.6	7.1	0.2	7.0	6.6	6.9
Turbidity (NTU)	NTU	0-600	0.5-10	93	25	11	25	17	22	11	19	15	23	11	21
Total suspended solids (TSS)	mg/L	5		51	12	5	9	6	11	5	8	5	9	5	12
Aluminium (Al)	mg/L	0.01	ID	0.19	0.19	0.01	0.19	0.19	0.19	0.01	0.07	0.18	0.19	0.03	0.18
Arsenic (As)	mg/L	0.001	ID	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.000	0.001	0.001	0.002
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	0.18	0.43	0.05	0.31	0.17	0.43	0.05	0.44	0.17	0.44	0.12	0.48
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	0.047	0.120	0.027	0.045	0.047	0.120	0.027	0.035	0.048	0.120	0.023	0.018
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	0.007	0.003	0.006	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.3	0.2	0.5	0.2	0.6	0.2	0.5	0.2	0.4	0.2	0.4	0.2	0.5
Total Phosphorous (TP)	mg/L	0.01	0.03	0.03	0.03	0.02	0.02	0.01	0.03	0.02	0.03	0.01	0.03	0.02	0.06

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

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

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

ID – Insufficient representative data (ANZECC).

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

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2015				September 2015				October 2015			
				SW7a*			SW7b	SW7a*			SW7b	SW7a*			SW7b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	3.9	22.4	15.9	12.8	4.1	22.4	14.7	16.2	4.0	21.7	14.7	20.0
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	45	207	135	210	47	212	135	277	41	207	135	248
Dissolved oxygen (DO)	%	0-200	85-110	29	95	34	62	27	95	50	79	21	95	60	60
pH		0-14	6.5-8	0.6	7.5	6.3	7.3	0.5	7.4	6.3	6.8	0.5	7.3	6.3	6.7
Turbidity (NTU)	NTU	0-600	6-50	15	33	10	10	15	33	10	38	15	33	8	25
Total suspended solids (TSS)	mg/L	5	-	7	15	5	6	7	11	5	5	3	8	5	5
Aluminium (Al)	mg/L	0.01	0.055 ^u	0.44	0.23	0.05	0.05	0.44	0.23	0.05	0.11	0.44	0.26	0.06	0.14
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	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	2.27	0.82	0.34	0.41	2.28	0.82	0.34	0.28	2.26	0.82	0.38	0.57
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	0.944	0.164	0.017	0.089	0.945	0.127	0.017	0.076	0.943	0.157	0.021	0.152
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.002	0.006	0.005	0.015	0.002	0.006	0.005	0.010	0.002	0.006	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.5	0.2	0.5	0.2	0.2	0.2	0.5	0.1	0.8	0.2	0.5	0.1	0.5
Total Phosphorous (TP)	mg/L	0.01	0.05	0.01	0.03	0.01	0.01	0.01	0.03	0.01	0.02	0.01	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.

^u for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

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

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2015				December 2015				January 2016			
				SW7a*			SW7b	SW7a*			SW7b	SW7a*			SW7b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	3.5	20.8	14.7	19.8	3.4	20.5	14.7	21.1	3.4	20.5	14.7	21.0
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	38	199	140	176	39	203	140	225	36	203	145	177
Dissolved oxygen (DO)	%	0-200	85-110	16	95	65	76	21	95	54	43	21	95	53	65
pH		0-14	6.5-8	0.5	7.3	6.4	6.8	0.5	7.4	6.5	7.1	0.4	7.4	6.8	6.8
Turbidity (NTU)	NTU	0-600	6-50	14	40	10	40	15	40	9	17	14	32	9	22
Total suspended solids (TSS)	mg/L	5	-	3	5	5	6	3	5	5	5	1	5	5	8
Aluminium (Al)	mg/L	0.01	0.055 ^u	0.44	0.37	0.06	0.49	0.45	0.37	0.05	0.06	0.44	0.41	0.06	0.24
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	2.26	0.82	0.37	0.52	2.25	0.87	0.38	0.84	0.25	0.82	0.37	0.40
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.946	0.115	0.021	0.060	0.946	0.124	0.021	0.215	0.052	0.081	0.019	0.043
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.002	0.005	0.005	0.005	0.001	0.005	0.005	0.005	0.001	0.005	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.5	0.2	0.5	0.1	0.8	0.2	0.5	0.2	0.3	0.2	0.5	0.2	0.3
Total Phosphorous (TP)	mg/L	0.01	0.05	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.02	0.03	0.03	0.01	0.03

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

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

^u for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

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

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results									
				August 2015					September 2015				
				SW8a derived trigger values*			SW8b	SW8c	SW8a derived trigger values*			SW8b	SW8c
				Std dev	80 th %	20 th %	Median	Median	Std dev	80 th %	20 th %	Median	Median
Temperature	°C	-2-50	NA	1.8	20.6	17.8	14.0	13.3	1.8	20.6	17.8	17.6	15.3
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	47	176	104	251	206	47	176	104	362	275
Dissolved oxygen (DO)	%	0-200	85-110	37	98	17	43	57	37	98	17	65	64
pH		0-14	6.5-8	0.3	6.2	5.8	6.2	7.0	0.3	6.2	5.8	5.9	6.3
Turbidity	NTU	0-600	6-50	8	32	17	11	13	8	32	17	38	191
Total suspended solids (TSS)	mg/L	5	-	3	6	5	7	6	3	6	5	7	12
Aluminium (Al)	mg/L	0.01	0.055"	0.46	1.19	0.41	0.04	0.11	0.46	1.19	0.41	0.04	0.09
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	0.002	0.002
Iron (Fe)	mg/L	0.05	ID	0.16	0.45	0.15	0.46	0.09	0.16	0.45	0.15	0.28	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	0.031	0.053	0.005	0.420	0.028	0.031	0.053	0.005	0.400	0.043
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	0.008	0.009	0.004	0.009	0.005	0.009	0.011
Total Nitrogen (TN)	mg/L	0.1	0.5	0.1	0.4	0.2	0.2	0.1	0.1	0.4	0.2	1.7	1.3
Total Phosphorous (TP)	mg/L	0.01	0.05	0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.03

* 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									
				October 2015					November 2015				
				SW8a derived trigger values*			SW8b	SW8c	SW8a derived trigger values*			SW8b	SW8c
				Std dev	80 th %	20 th %	Median	Median	Std dev	80 th %	20 th %	Median	Median
Temperature	°C	-2-50	NA	1.8	20.6	17.8	19.6	19.1	1.6	20.6	18.3	18.4	20.5
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	47	176	104	429	261	43	165	104	137	180
Dissolved oxygen (DO)	%	0-200	85-110	37	98	17	61	54	36	98	17	88	93
pH		0-14	6.5-8	0.3	6.2	5.8	5.9	6.2	0.5	6.4	5.8	6.5	6.4
Turbidity	NTU	0-600	6-50	8	32	17	15	20	9	36	18	36	45
Total suspended solids (TSS)	mg/L	5	-	3	6	5	5	12	3	6	5	5	6
Aluminium (Al)	mg/L	0.01	0.055"	0.46	1.19	0.41	0.04	0.08	0.46	1.08	0.28	0.26	0.36
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	0.45	0.15	0.44	0.05	0.16	0.40	0.10	0.12	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	0.031	0.053	0.005	0.377	0.038	0.029	0.028	0.005	0.014	0.013
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	0.008	0.011	0.004	0.008	0.005	0.013	0.005
Total Nitrogen (TN)	mg/L	0.1	0.5	0.1	0.4	0.2	0.3	0.1	0.1	0.4	0.2	0.5	0.5
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									
				December 2015					January 2016				
				SW8a derived trigger values*			SW8b	SW8c	SW8a derived trigger values*			SW8b	SW8c
				Std dev	80 th %	20 th %	Median	Median	Std dev	80 th %	20 th %	Median	Median
Temperature	°C	-2-50	NA	1.6	20.6	18.3	18.8	21.6	1.6	20.5	18.4	20.7	21.9
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	43	165	104	199	205	47	187	104	205	231
Dissolved oxygen (DO)	%	0-200	85-110	36	98	17	37	48	37	98	17	75	78
pH		0-14	6.5-8	0.5	6.4	5.8	6.6	6.8	0.5	6.7	5.8	6.5	6.7
Turbidity	NTU	0-600	6-50	9	36	18	44	48	10	36	18	50	20
Total suspended solids (TSS)	mg/L	5	-	3	6	5	5	8	3	6	5	8	5
Aluminium (Al)	mg/L	0.01	0.055"	0.46	1.08	0.28	0.08	0.15	0.46	1.00	0.23	0.16	0.10
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	0.40	0.10	0.14	0.47	0.16	0.38	0.09	0.12	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	0.029	0.028	0.005	0.100	0.059	0.027	0.016	0.005	0.044	0.016
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	0.006	0.004	0.008	0.005	0.042	0.006
Total Nitrogen (TN)	mg/L	0.1	0.5	0.1	0.4	0.2	0.2	0.2	0.1	0.4	0.2	0.2	0.2
Total Phosphorous (TP)	mg/L	0.01	0.05	0.01	0.02	0.01	0.02	0.01	0.01	0.02	0.01	0.03	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											
				August 2015				September 2015				October 2015			
				SW9b*			SW9a	SW9b*			SW9a	SW9b*			SW9a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.0	22.3	15.3	13.0	4.2	22.3	14.4	15.0	3.9	21.6	14.4	18.6
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	83	305	127	331	80	295	127	307	72	286	127	224
Dissolved oxygen (DO)	%	0-200	85-110	34	92	16	92	29	92	43	80	22	92	58	63
pH		0-14	6.5-8	0.3	6.9	6.4	7.1	0.3	7.0	6.4	6.9	0.3	6.9	6.4	6.8
Turbidity (NTU)	NTU	0-600	6-50	10	31	13	21	11	31	10	14	11	31	9	22
Total suspended solids (TSS)	mg/L	5	-	4	10	5	15	4	7	5	5	3	6	5	6
Aluminium (Al)	mg/L	0.01	0.055"	0.32	0.30	0.02	0.08	0.32	0.25	0.02	0.06	0.32	0.39	0.04	0.24
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	0.002	0.001	0.002	0.001	0.002	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.99	0.98	0.41	0.45	0.98	0.98	0.41	0.61	0.97	0.98	0.47	0.61
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	0.397	0.332	0.012	0.027	0.397	0.332	0.012	0.069	0.399	0.242	0.012	0.064
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	0.004	0.006	0.005	0.019	0.004	0.005	0.005	0.028	0.004	0.006	0.005	0.041
Total Nitrogen (TN)	mg/L	0.1	0.5	0.3	0.8	0.2	0.3	0.3	0.6	0.2	0.2	0.2	0.5	0.2	0.3
Total Phosphorous (TP)	mg/L	0.01	0.05	0.03	0.05	0.01	0.02	0.02	0.03	0.01	0.02	0.01	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 3-19 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2015				December 2015				January 2016			
				SW9b*			SW9a	SW9b*			SW9a	SW9b*			SW9a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	3.5	20.1	14.4	19.9	3.4	20.1	14.4	21.0	3.5	20.6	14.4	21.3
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	73	286	116	120	71	286	130	206	67	286	141	204
Dissolved oxygen (DO)	%	0-200	85-110	18	93	63	92	22	92	52	38	23	92	45	72
pH		0-14	6.5-8	0.3	6.9	6.6	6.7	0.4	6.9	6.6	6.8	0.4	7.0	6.7	7.1
Turbidity (NTU)	NTU	0-600	6-50	13	35	10	47	13	35	10	15	12	34	10	20
Total suspended solids (TSS)	mg/L	5	-	3	6	5	7	3	6	5	5	1	5	5	5
Aluminium (Al)	mg/L	0.01	0.055"	0.32	0.49	0.04	0.44	0.32	0.49	0.05	0.15	0.31	0.49	0.05	0.14
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	0.002	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	0.98	0.98	0.43	0.39	0.91	0.86	0.43	0.38	0.20	0.75	0.43	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	0.403	0.223	0.011	0.011	0.348	0.130	0.011	0.026	0.066	0.069	0.011	0.047
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	0.005	0.004	0.005	0.005	0.007	0.004	0.005	0.005	0.019
Total Nitrogen (TN)	mg/L	0.1	0.5	0.2	0.6	0.2	0.4	0.2	0.5	0.2	0.3	0.1	0.4	0.3	0.3
Total Phosphorous (TP)	mg/L	0.01	0.05	0.0	0.0	0.0	0.01	0.09	0.03	0.01	0.02	0.09	0.03	0.01	0.04

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

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

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

ID – Insufficient representative data (ANZECC).

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

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2015				September 2015				October 2015			
				SW10b*			SW10a	SW10b*			SW10a	SW10b*			SW10a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.6	23.0	14.5	12.5	4.8	22.7	13.9	14.2	4.3	21.9	13.9	18.1
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	71	276	178	369	82	314	178	384	92	351	178	375
Dissolved oxygen (DO)	%	0-200	85-110	28	79	24	50	26	79	35	59	25	79	39	51
pH		0-14	6.5-8	0.3	6.8	6.2	6.8	0.3	6.8	6.2	6.7	0.4	6.9	6.2	6.6
Turbidity (NTU)	NTU	0-600	6-50	15	38	16	16	28	54	16	134	81	56	16	20
Total suspended solids (TSS)	mg/L	5	-	5	11	5	8	5	14	5	11	63	14	5	5
Aluminium (Al)	mg/L	0.01	0.055 [*]	0.38	0.23	0.05	0.07	0.38	0.20	0.05	0.06	0.38	0.21	0.05	0.12
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	0.0002	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	0.76	1.11	0.58	0.48	0.32	1.00	0.50	0.35	0.33	0.91	0.48	0.46
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.157	0.280	0.022	0.082	0.117	0.271	0.026	0.143	0.116	0.271	0.026	0.192
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.002	0.006	0.005	0.005	0.002	0.006	0.005	0.006	0.002	0.007	0.005	0.013
Total Nitrogen (TN)	mg/L	0.1	0.5	0.3	0.8	0.3	0.4	0.3	0.8	0.3	0.5	0.3	0.8	0.3	0.5
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.04	0.02	0.02	0.02	0.04	0.02	0.03	0.02	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 3-21 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2015				December 2015				January 2016			
				SW10b*			SW10a	SW10b*			SW10a	SW10b*			SW10a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	3.8	20.3	13.9	20.0	3.7	20.3	13.9	21.1	4.0	21.0	13.9	21.3
Electrical conductivity (EC)	µS/cm	0-8000	125-2200	96	351	165	174	92	351	171	252	85	351	175	241
Dissolved oxygen (DO)	%	0-200	85-110	17	81	47	77	23	81	39	30	25	81	31	34
pH		0-14	6.5-8	0.3	6.9	6.3	6.6	0.4	7.0	6.4	6.9	0.4	7.1	6.6	7.2
Turbidity (NTU)	NTU	0-600	6-50	80	56	17	40	80	55	18	26	81	50	17	19
Total suspended solids (TSS)	mg/L	5	-	63	12	5	10	63	12	5	8	63	10	5	6
Aluminium (Al)	mg/L	0.01	0.055 [*]	0.38	0.23	0.06	0.58	0.38	0.23	0.06	0.09	0.35	0.23	0.06	0.14
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	0.91	0.48	0.69	0.38	1.03	0.48	1.12	0.34	0.90	0.46	1.02
Lead (Pb)	mg/L	0.001	0.0034	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Manganese (Mn)	mg/L	0.001	1.9	0.119	0.271	0.020	0.019	0.119	0.271	0.020	0.198	0.088	0.143	0.018	0.071
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.000	0.000	0.000	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Silver (Ag)	mg/L	0.001		0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.005	0.008	0.002	0.007	0.005	0.005	0.003	0.007	0.005	0.014	0.003	0.007	0.005	0.005
Total Nitrogen (TN)	mg/L	0.1	0.5	0.3	0.8	0.3	0.6	0.3	0.7	0.3	0.5	0.3	0.7	0.4	0.5
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	0.07

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

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

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

ID – Insufficient representative data (ANZECC).

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

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2015				September 2015				October 2015			
				SW11b*			SW11a	SW11b*			SW11a	SW11b*			SW11a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.9	24.2	16.9	21.0	4.9	24.2	16.9	15.8	4.8	22.5	16.2	19.0
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	115	263	105	2404	115	263	105	249	133	396	121	461
Dissolved oxygen (DO)	%	0-200	85-110	31	99	38	86	31	99	38	98	18	101	76	78
pH		0-14	6.5-8	0.5	6.7	5.6	6.6	0.5	6.7	5.6	7.2	0.6	6.8	5.6	7.3
Turbidity (NTU)	NTU	0-600	6-50	30	68	19	8	30	68	19	70	28	73	25	55
Total suspended solids (TSS)	mg/L	5	-	6	16	5	10	6	16	5	5	6	14	5	14
Aluminium (Al)	mg/L	0.01	0.055"	0.68	0.77	0.04	0.02	0.68	0.77	0.04	0.23	0.65	0.59	0.07	0.18
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	0.0004	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	0.000	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	0.003	0.001	0.002	0.001	0.002
Iron (Fe)	mg/L	0.05	ID	0.74	1.42	0.29	0.09	0.74	1.42	0.29	0.20	0.76	1.42	0.23	0.16
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	0.095	0.171	0.041	0.182	0.095	0.171	0.041	0.031	0.099	0.171	0.027	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	0.000	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	0.012	0.005	0.011	0.005	0.012	0.005	0.006	0.004	0.012	0.005	0.008
Total Nitrogen (TN)	mg/L	0.1	0.5	0.6	1.1	0.4	1.1	0.6	1.1	0.4	0.9	0.3	0.8	0.4	0.6
Total Phosphorous (TP)	mg/L	0.01	0.05	0.05	0.07	0.01	0.01	0.05	0.07	0.01	0.07	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 3-23 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2015				December 2015				January 2016			
				SW11b*			SW11a	SW11b*			SW11a	SW11b*			SW11a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.6	22.3	16.2	21.1	4.0	22.0	16.2	21.7	4.4	22.2	16.2	22.3
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	136	396	104	175	190	473	121	642	209	504	132	680
Dissolved oxygen (DO)	%	0-200	85-110	16	102	83	90	11	101	85	82	15	106	87	102
pH		0-14	6.5-8	0.6	6.8	5.8	6.0	0.6	7.0	6.0	7.2	0.6	7.2	6.1	7.5
Turbidity (NTU)	NTU	0-600	6-50	28	78	30	83	29	78	25	20	29	77	23	23
Total suspended solids (TSS)	mg/L	5	-	6	14	5	5	6	13	5	6	5	11	5	5
Aluminium (Al)	mg/L	0.01	0.055"	0.67	0.77	0.12	0.65	0.67	0.77	0.18	0.16	0.67	0.59	0.17	0.16
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	0.001	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	0.002	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.73	1.28	0.23	0.34	0.47	1.09	0.18	0.19	0.43	0.87	0.16	0.13
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	0.101	0.170	0.023	0.109	0.075	0.161	0.023	0.027	0.074	0.122	0.021	0.016
Mercury (Hg)	mg/L	0.0001	0.0006	0.0000	0.0001	0.0001	0.0001	0.000	0.000	0.000	0.0001	0.0000	0.0001	0.0001	0.0001
Nickel (Ni)	mg/L	0.001	0.011	0.000	0.001	0.001	0.004	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	0.004	0.012	0.005	0.011	0.004	0.012	0.005	0.005	0.003	0.011	0.005	0.008
Total Nitrogen (TN)	mg/L	0.1	0.5	0.3	0.9	0.4	1.0	0.3	0.8	0.4	0.5	0.3	0.8	0.4	0.8
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 3-24 Construction surface water quality results by waterway (cont.)

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2015				September 2015				October 2015			
				SW12a*			SW12b	SW12a*			SW12b	SW12a*			SW12b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	4.2	22.1	15.7	12.6	4.4	22.1	15.0	15.7	4.0	21.5	15.0	18.9
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	72	240	107	334	74	277	127	317	79	297	127	310
Dissolved oxygen (DO)	%	0-200	85-110	22	69	21	62	24	70	21	49	25	72	21	36
pH		0-14	6.5-8	0.5	6.6	5.7	6.3	0.5	6.5	5.7	6.3	0.5	6.4	5.7	6.2
Turbidity (NTU)	NTU	0-600	6-50	15	44	18	14	30	49	18	26	33	52	18	28
Total suspended solids (TSS)	mg/L	5	-	6	14	5	5	6	13	5	5	6	14	5	8
Aluminium (Al)	mg/L	0.01	0.055 ^u	0.54	0.71	0.09	0.06	0.55	0.71	0.08	0.04	0.54	0.71	0.09	0.08
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	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.41	1.31	0.54	0.54	0.42	1.22	0.36	0.51	0.41	1.22	0.36	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	0.075	0.194	0.058	0.136	0.073	0.183	0.054	0.224	0.074	0.186	0.054	0.372
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	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001	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	0.006	0.015	0.006	0.005	0.006	0.015	0.006	0.006	0.006	0.015	0.006	0.011
Total Nitrogen (TN)	mg/L	0.1	0.5	0.3	1.0	0.4	0.3	0.3	0.8	0.4	0.4	0.3	0.8	0.4	0.4
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.04	0.02	0.01	0.02	0.05	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.

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

^u for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

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

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2015				December 2015				January 2016			
				SW12a*			SW12b	SW12a*			SW12b	SW12a*			SW12b
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	3.6	20.5	14.9	20.0	3.5	20.5	15.0	21.4	3.8	20.5	15.0	21.8
Electrical conductivity (EC)	µS/cm	0-8000	125-2200	79	297	134	147	78	297	134	187	75	297	143	194
Dissolved oxygen (DO)	%	0-200	85-110	23	72	22	51	23	72	25	21	23	71	25	34
pH		0-14	6.5-8	0.5	6.4	5.8	6.0	0.6	6.6	5.8	6.4	0.6	6.7	6.0	6.1
Turbidity (NTU)	NTU	0-600	6-50	32	52	19	38	32	65	19	28	32	65	20	42
Total suspended solids (TSS)	mg/L	5	-	6	13	5	5	6	14	5	11	6	14	5	16
Aluminium (Al)	mg/L	0.01	0.055 ^u	0.55	0.83	0.08	0.95	0.60	0.84	0.08	0.26	0.53	0.83	0.11	0.22
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	0.001	0.002	0.001	0.001	0.000	0.001	0.001	0.002	0.000	0.001	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.41	1.15	0.34	0.84	0.36	1.06	0.35	1.26	0.39	1.15	0.54	0.54
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	0.076	0.184	0.045	0.035	0.066	0.175	0.040	0.205	0.075	0.184	0.050	0.098
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	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.002	0.001	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	0.006	0.015	0.005	0.005	0.006	0.013	0.005	0.005	0.005	0.011	0.005	0.006
Total Nitrogen (TN)	mg/L	0.1	0.5	0.2	0.8	0.4	0.8	0.2	0.8	0.4	0.6	0.2	0.9	0.4	0.6
Total Phosphorous (TP)	mg/L	0.01	0.05	0.01	0.03	0.02	0.02	0.02	0.04	0.02	0.05	0.02	0.04	0.02	0.06

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

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

^u for pH >6.5. Insufficient data for pH <6.5.

ID – Insufficient representative data (ANZECC).

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

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				August 2015				September 2015				October 2015			
				SW13b*			SW13a	SW13b*			SW13a	SW13b*			SW13a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	3.8	21.9	16.0	14.0	3.9	21.4	14.8	15.1	3.8	21.3	14.8	18.5
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	111	346	110	329	129	358	110	463	141	395	110	469
Dissolved oxygen (DO)	%	0-200	85-110	18	73	36	84	18	73	34	86	16	73	45	68
pH		0-14	6.5-8	0.6	6.6	5.8	6.6	0.4	6.6	5.8	6.5	0.3	6.5	5.8	6.6
Turbidity (NTU)	NTU	0-600	6-50	81	59	30	78	46	63	30	94	50	72	27	47
Total suspended solids (TSS)	mg/L	5	-	32	20	5	20	8	17	5	5	8	16	5	8
Aluminium (Al)	mg/L	0.01	0.055"	0.52	1.01	0.09	0.11	0.51	0.72	0.09	0.06	0.50	0.72	0.09	0.06
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	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.33	1.28	0.58	0.58	0.34	1.08	0.47	0.15	0.36	1.08	0.45	0.14
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	0.075	0.154	0.034	0.074	0.063	0.154	0.034	0.078	0.064	0.157	0.041	0.088
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	0.013	0.013	0.006	0.021	0.013	0.013	0.006	0.021	0.013	0.013	0.006	0.016
Total Nitrogen (TN)	mg/L	0.1	0.5	0.3	1.0	0.6	1.1	0.3	1.0	0.6	1.2	0.3	1.0	0.7	0.4
Total Phosphorous (TP)	mg/L	0.01	0.05	0.04	0.05	0.02	0.04	0.02	0.05	0.02	0.02	0.02	0.04	0.02	0.01

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

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

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

ID – Insufficient representative data (ANZECC).

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

Parameter	Unit	LOR / probe limit	ANZECC default trigger value	Results											
				November 2015				December 2015				January 2016			
				SW13b*			SW13a	SW13b*			SW13a	SW13b*			SW13a
				Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median	Std dev	80 th %	20 th %	Median
Temperature	°C	-2-50	NA	3.6	20.9	14.8	20.9	3.4	20.5	14.8	21.1	3.8	20.8	14.8	22.6
Electrical conductivity (EC)	uS/cm	0-8000	125-2200	134	395	124	316	129	395	144	375	122	395	213	381
Dissolved oxygen (DO)	%	0-200	85-110	15	71	43	71	17	71	36	48	17	67	34	74
pH		0-14	6.5-8	0.3	6.3	5.8	6.2	0.4	6.4	5.8	6.6	0.4	6.4	5.8	6.9
Turbidity (NTU)	NTU	0-600	6-50	50	82	30	46	49	82	37	69	28	69	37	40
Total suspended solids (TSS)	mg/L	5	-	9	16	5	7	8	18	5	10	6	16	5	5
Aluminium (Al)	mg/L	0.01	0.055"	0.52	1.00	0.09	0.75	0.52	1.00	0.09	0.2	0.513	1.002	0.096	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	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.001
Iron (Fe)	mg/L	0.05	ID	0.37	1.16	0.45	0.78	0.36	1.21	0.53	0.42	0.38	1.26	0.69	0.75
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	0.066	0.157	0.037	0.058	0.073	0.180	0.037	0.091	0.077	0.185	0.037	0.084
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	0.001
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	0.013	0.012	0.005	0.008	0.008	0.010	0.005	0.018	0.008	0.010	0.005	0.009
Total Nitrogen (TN)	mg/L	0.1	0.5	0.3	0.9	0.7	1.1	0.3	1.0	0.7	1.1	0.3	1.0	0.7	1.0
Total Phosphorous (TP)	mg/L	0.01	0.05	0.02	0.04	0.02	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.

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 below average to well above average rainfall across the entire project and broader region. Two of the six months were 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, SW8, SW9, 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 and SW6a/b. 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, SW8 and SW11. At SW1, SW8 and SW11 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 well within the default trigger values for low land rivers presented in the ANZECC guidelines. One exception occurred at SW11a on 25 August 2015 where the downstream value was marginally above the ANZECC default trigger value and six times higher than the upstream level. Sampling points were not connected at the time of sampling and recent wet weather had resulted in freshwater flows upstream, but not into the downstream sampling point.

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 and SW11. SW2a, SW5b, SW9b, SW10a and SW12b were below the 20th percentile trigger values for between one and four 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 SW6 and SW9 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 persisted throughout much of the monitoring period. At SW1, SW12 and SW13, it was noted that these waterways persistent with little to no flow during periods when upstream and downstream variability was recorded. At SW10, a waterway pump-around operation in progress at the time of sampling (18 December 2015) is considered to be the primary

cause for the difference between upstream and downstream DO levels. Subsequent sampling events saw a return to consistent levels between upstream and downstream. 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 sampling for this and the previous construction periods, pH levels were above the calculated 80th percentile levels for all months. In all but two 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. At SW8b while there was a difference of pH 0.8 between SW8c, both sample locations persisted as isolated ponds and were located more than 500 metres apart.

It is considered that pH variability within all waterways across the project was unrelated to construction during the monitoring period. Rainfall is considered to be the predominant factor affecting pH.

- Turbidity – Calculated median values for SW1b, SW1c, SW6b, SW7b, SW8b, SW8c, SW9a, SW10a, SW11a and SW13a 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 SW1, SW6, SW8, SW11 and SW13, upstream values for individual events were comparable to those recorded downstream.

At SW1b and SW1c turbidity levels during individual sampling events were typically elevated when compared to the upstream reference point. As discussed in previous monitoring reports, the catchment for SW1 includes a number of industrial activities (ie quarry operations and a heavy machinery sales and servicing business) in addition to the project and it is considered likely that all are contributing to the elevated downstream turbidity levels. 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.

For the January SW6b exceedance, the elevated level recorded on 6 January 2016 (that was primarily responsible for the monthly exceedance) while higher than the upstream result was considered to be attributable to wind and wave action on the downstream side of the coffer dam unrelated to the project. These two sample points are no longer directly connected and can be influenced by environmental factors eg wind, tide, rainfall, recreational activities, in different ways.

For the 29 September 2015 exceedance at SW8c, a specific failure of environmental controls was not observed and the waterway was not connected to the SW8b sampling location. However, it was noted that scour rock had recently been placed as a culvert lining. It is considered that fines in this material may have contributed to the elevated

turbidity during the sampling event. Subsequent sampling events saw turbidity levels generally return to more “normal” conditions

At SW11a on 18 September 2015, a high intensity rain event was recorded that exceeded the design capacity of the erosion and sediment controls. Despite this, erosion and sediment controls within the project corridor at this location were found to be insufficient, contributing to the elevated turbidity recorded downstream. Levels both upstream and downstream exceeded the ANZECC guideline upper limit default trigger values. However, the level recorded downstream was in excess of two-times that recorded upstream. The Environment Protection Authority was informed of the incident and additional information was provided at their request regarding what follow up actions were taken. The area was subsequently inspected during the November 2015 Environmental Review Group meeting, and all present noted good improvement in the controls in this area.

At SW13a, multiple events during August and September 2015 had turbidity levels substantially greater downstream than those recorded upstream at the same time. While the two sampling points were connected during each monitoring event, water movement was observed to be very slow and there was no obvious inflow of dirty water from the project site.

- 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.

Impacts attributable to construction for all waterways are considered negligible.

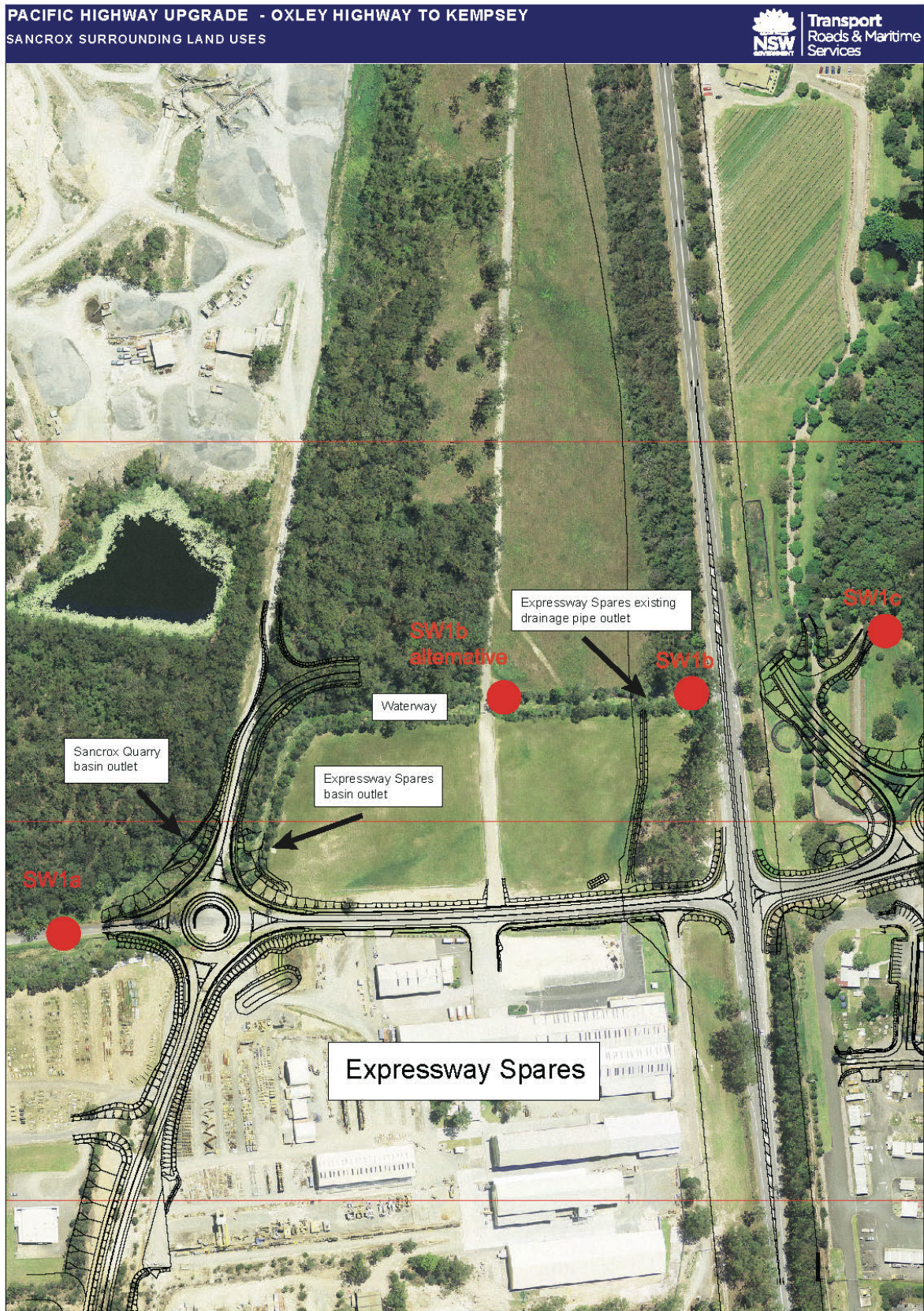
- Total petroleum hydrocarbons (TPH) – Sampling for TPH following the observed presence of oil and grease was undertaken at SW10b (upstream sampling location) on one occasion. The catchment for SW10 includes rural properties and runoff directly from the Pacific Highway. Despite the visual observation, laboratory analysis returned TPH results below the limit of laboratory reporting. It is considered most likely that visible oil and grease at the time of sampling was attributable to highway runoff directly from the existing bridge. Weather conditions leading up to the sampling event were dry which tends to lead to a build-up of oil and grease, and other debris, on existing road surfaces and is washed from the road during first flush.
- 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. 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, SW11 and SW13 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 – As discussed above, the monitoring points at SW1 are considered to be influenced by a number of surrounding industrial activities, unsealed access tracks and the construction of the Sancrox Interchange (Figure 3-1). Two of the industrial land uses in the area have sediment basins and all have exposed surfaces, hardstand areas, unsealed car parks and unsealed access roads that discharge to the drainage line (between the up and downstream monitoring points) where the monitoring is conducted. Despite this, Ferrovial Agroman continued to identify areas where their sediment controls could be improved to minimise sediment laden water runoff. In November 2015 the Sancrox Traffic Arrangement Works opened to traffic. At the time, extensive landscaping had been completed, but some areas were identified as deficient and lacked established vegetation cover (ie greater than 70 per cent). Efforts since have included further seeding, placement of jute mesh and maintenance of establishing cover-crop and native vegetation. It should be noted that work by the Stage 3 contractor within the main corridor between SW1b and SW1c commenced at around the same time as the Stage 1 opened to traffic.
- SW2a – As indicated in section 3.5, while the source of the Salvinia outbreak remains unknown, Roads and Maritime and the Stage 3 construction contractor have taken responsibility for the treatment. This treatment commenced in January 2016.
- SW11 – Deficiencies in erosion and sediment controls have been observed within the project corridor both at the time of water quality monitoring and during other routine inspections. Roads and Maritime and the McConnell Dowell Joint Venture continue to collaborate to achieve better environmental outcomes. Activities undertaken since the poor results have included improvements to in-line erosion and sediment controls and where possible the early establishment of permanent landscaping and associated maintenance. Where ever possible the installation for permanent landscaping and water quality basins has progressed and will continue to be a priority during subsequent construction monitoring 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.
- GW06 was dry when monitored in December 2014 and believed destroyed prior to the subsequent sampling event in February 2015.
- GW07 had insufficient water to sample during the July 2015 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 three out of four occasions during this construction monitoring period (ie August 2015, September 2015 and January 2016).
- GW09 has either been dry or contained insufficient water to sample during all construction monitoring events.
- 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 has since been destroyed by construction (August 2015)
- GW20, GW24, GW27 and GW28 had insufficient water to sample during August 2015
- GW20 and GW25 had insufficient water to sample during January 2016
- GW01, GW02, GW04, GW06, GW09, GW10, GW11, GW13, GW14, GW16 and GW19 have been destroyed by construction either during this or the previous construction monitoring periods.
- All metals analysed for the July 2015 and November 2015 monitoring events were for total metals. Previous monitoring events analysed dissolved metals with the exception of iron and manganese. It is not possible to determine a relationship between concentrations over time when comparing total and dissolved metals. However, Roads and Maritime having identified this issue have instructed the laboratory to analyse both total and dissolved metals for all future monitoring events. This instruction took effect for events from January 2016 onward.

3.8 Summary of groundwater results

Table 3-28 to Table 3-41 present data collected manually during the construction period 22 July 2015 to 21 January 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 July 2015. This report presents data from monitoring undertaken between August 2015 and January 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	
			20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16
Dissolved Aluminium	mg/L	0.01	4.24	4.6			<0.01*	<0.01*	18.6		0.03	0.03	1.44	<0.01
Dissolved Arsenic	mg/L	0.001	0.007	0.008			0.0034	0.0046	0.007		0.003	0.003	0.002	<0.001
Dissolved Cadmium	mg/L	0.0001	0.001	0.001			<0.01*	<0.01*	0.0003		<0.001*	<0.001*	<0.0001	0.0001
Dissolved Chromium	mg/L	0.001	0.001	0.001			<0.01*	<0.01*	0.014		0.012	0.012	0.002	<0.001
Dissolved Copper	mg/L	0.001	0.043	0.063			<0.01*	<0.01*	0.071		0.007	0.007	0.022	0.001
Total Iron	mg/L	0.05	7.01	10.84			42.54	59.28	21.4		53.7	149.8	4.92	7.97
Dissolved Lead	mg/L	0.001	0.021	0.03			<0.01*	<0.01*	0.099		<0.001*	<0.001*	0.085	<0.001
Total Manganese	mg/L	0.001	0.472	0.487			0.458	0.482	0.312		0.252	0.483	0.311	1.22
Mercury	mg/L	0.0001												<0.0001
Dissolved Nickel	mg/L	0.001	0.033	0.035			0.0032	0.0038	0.012		0.0048	0.0132	0.013	0.017
Dissolved Silver	mg/L	0.001	<0.001*	<0.001*			<0.001*	<0.001*	<0.001		<0.001*	<0.001*	<0.001	<0.001
Dissolved Zinc	mg/L	0.005	0.522	0.553			0.0074	0.0086	0.081		0.013	0.013	0.028	0.013
EC laboratory	uS/cm		5166	5982			383.6	468.8	914		967	1292	725	1080
Total Nitrogen	mg/L		0.35	1.00			1.08	2.04			1.2	1.9		0.5
Total Phosphorus	mg/L		0.04	0.12			0.196	0.424			0.30	0.62		0.07
Ammonia	mg/L		0.03	0.03			0.272	0.506			0.07	0.17		0.02
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹													96
Chloride	mg/L		1427	1919			27	37.2			194	325		226
Nitrate									3.96				0.03	0.10
Sulphate	mg/L		105	258			14.4	29.4			99	149		85
Calcium	mg/L		7.86	10.23			14.28	18.66			33.1	58.0		36
Magnesium	mg/L		109.3	136.2			12.18	16.92			37	76		38
Potassium	mg/L		6.17	7.23			4.85	6.044			6.17	13.84		1
Sodium	mg/L		741	874			38.48	54.38			97	337		127

* No variation established between sampling events.

+ Analysis of all metals for November 2015 event is for "total" metals despite otherwise indicated in table.

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

Parameter	Unit	LOR	GW04		Results		GW05		Results		GW07^		Results	
			20 th per#	80 th per#	Nov 15	Jan 16	20 th per#	80 th per#	Nov 15	Jan 16	20 th per#	80 th per#	Nov 15	Jan 16
Dissolved Aluminium	mg/L	0.01	<0.01*	<0.01*			<0.01*	<0.01*	1.28	<0.01			71.7	1.70
Dissolved Arsenic	mg/L	0.001	0.0034	0.0046			0.006	0.010	0.003	0.001			0.012	<0.001
Dissolved Cadmium	mg/L	0.0001	<0.001*	<0.001*			<0.001*	<0.001*	0.0005	<0.0001			0.0004	<0.0001
Dissolved Chromium	mg/L	0.001	0.002	0.002			<0.001*	<0.001*	0.003	<0.001			0.042	0.002
Dissolved Copper	mg/L	0.001	<0.001*	<0.001*			<0.001*	<0.001*	0.046	<0.001			7.39	0.020
Total Iron	mg/L	0.05	66.3	93.3			158	510	46.8	92.7	38.3	38.3	31.3	7.07
Dissolved Lead	mg/L	0.001	<0.001*	<0.001*			<0.001*	<0.001*	0.044	<0.001			0.154	<0.001
Total Manganese	mg/L	0.001	0.410	0.540			0.799	0.980	0.744	1.43			0.254	0.030
Mercury	mg/L	0.0001								<0.0001				<0.0001
Dissolved Nickel	mg/L	0.001	0.0018	0.0042			0.004	0.01	0.003	0.017			0.024	<0.001
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	0.010	0.014			0.019	0.019	0.039	0.040			0.174	0.106
EC laboratory	uS/cm		3212	4922			6598	7294	7510	6590	168	168	184	169
Total Nitrogen	mg/L		1.4	2.7			2.6	5.5		2.7	1.4	1.4		0.7
Total Phosphorus	mg/L		0.38	1.40			1.60	3.18		0.97	0.2	0.2		0.10
Ammonia	mg/L		0.18	0.98			0.80	0.89		0.49	0.07	0.07		<0.01
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹									245				16
Chloride	mg/L		1089	1309			1468	1564		1250	38	38		32
Nitrate									0.17	0.12			<0.01	0.24
Sulphate	mg/L		40	65			1055	1171		1200	4.7	4.7		8
Calcium	mg/L		34.7	54.9			170	232		179	37.6	37.6		1
Magnesium	mg/L		68	107			273	367		247	16.9	16.9		1
Potassium	mg/L		14.2	24.7			35.4	56.34		36	5.25	5.25		<1
Sodium	mg/L		511	701			973	1045		907	26.2	26.2		32

* No variation established between sampling events.

+ Analysis of all metals for November 2015 event is for "total" metals despite otherwise indicated in table.

^ Based on one record only.

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

Parameter	Unit	LOR	GW08		Results		GW09		Results		GW010		Results	
			20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16
Dissolved Aluminium	mg/L	0.01			20.5		0.23 [^]	0.23 [^]			1 [^]	1 [^]		
Dissolved Arsenic	mg/L	0.001			0.004		<0.001 [^]	<0.001 [^]			0.001 [^]	0.001 [^]		
Dissolved Cadmium	mg/L	0.0001			0.0001		0.002 [^]	0.002 [^]			<0.001 [^]	<0.001 [^]		
Dissolved Chromium	mg/L	0.001			0.018		0.001 [^]	0.001 [^]			0.003 [^]	0.003 [^]		
Dissolved Copper	mg/L	0.001			0.082		0.218 [^]	0.218 [^]			0.02 [^]	0.02 [^]		
Total Iron	mg/L	0.05			10.7		8.47	9.49			115.1	194.5		
Dissolved Lead	mg/L	0.001			0.108		<0.001 [^]	<0.001 [^]			0.001 [^]	0.001 [^]		
Total Manganese	mg/L	0.001			0.037		0.85 [^]	0.85 [^]			0.013 [^]	0.013 [^]		
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001			0.003		0.061 [^]	0.061 [^]			0.002 [^]	0.002 [^]		
Dissolved Silver	mg/L	0.001			<0.001		<0.001 [^]	<0.001 [^]			<0.001 [^]	<0.001 [^]		
Dissolved Zinc	mg/L	0.005			0.074		0.063 [^]	0.063 [^]			0.007 [^]	0.007 [^]		
EC laboratory	uS/cm				730						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					0.02									
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.

+ Analysis of all metals for November 2015 event is for "total" metals despite otherwise indicated in table.

[^] Based on one record only.

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

Parameter	Unit	LOR	GW11		Results		GW12		Results		GW013		Results	
			20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16
Dissolved Aluminium	mg/L	0.01	0.26	0.56			0.02	0.02	2.54	<0.01	0.02	0.03		
Dissolved Arsenic	mg/L	0.001	<0.001*	<0.001*			0.029	0.030	0.024	0.004	0.002	0.004		
Dissolved Cadmium	mg/L	0.0001	0.0022	0.0028			<0.001*	<0.001*	0.0003	0.0001	<0.001*	<0.001*		
Dissolved Chromium	mg/L	0.001	0.001	0.001			<0.001*	<0.001*	0.003	<0.001	0.001	0.001		
Dissolved Copper	mg/L	0.001	0.1818	0.2292			<0.001*	<0.001*	0.043	<0.001	<0.001*	<0.001*		
Total Iron	mg/L	0.05	46.8	219.3			185	283	74.6	101	41.5	60.4		
Dissolved Lead	mg/L	0.001	<0.001*	<0.001*			<0.001*	<0.001*	0.069	<0.001	<0.001*	<0.001*		
Total Manganese	mg/L	0.001	0.791	1.623			5.07	7.14	3.79	4.75	0.217	0.249		
Mercury	mg/L	0.0001								<0.0001				
Dissolved Nickel	mg/L	0.001	0.0626	0.0884			0.003	0.003	0.006	0.011	0.003	0.003		
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	0.0788	0.0992			0.028	0.034	0.034	0.027	0.014	0.023		
EC laboratory	uS/cm		2904	7650			3314	6962	1740	1510	207	305		
Total Nitrogen	mg/L		0.56	1			1.3	1.7		3.0	1.6	1.7		
Total Phosphorus	mg/L		0.08	0.70			0.08	0.19		0.14	0.41	0.59		
Ammonia	mg/L		0.03	0.13			0.82	0.93		0.90	0.32	0.50		
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹									25				
Chloride	mg/L		581	1422			394	781		159	25	36		
Nitrate									1.24	0.05				
Sulphate	mg/L		448	1263			1284	3267		478	14	26		
Calcium	mg/L		30.8	120.4			85.9	148.8		29	3.70	4.36		
Magnesium	mg/L		58.1	189.4			137	233		61	8.23	9.23		
Potassium	mg/L		14.4	20.8			14.2	21.0		10	6.19	8.58		
Sodium	mg/L		427	1013			313	481		168	28.8	41.2		

* No variation established between sampling events.

+ Analysis of all metals for November 2015 event is for "total" metals despite otherwise indicated in table.

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

Parameter	Unit	LOR	GW14		Results		GW15		Results		GW017		Results	
			20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16
Dissolved Aluminium	mg/L	0.01	4.07	4.29			0.01	0.01	1.01	<0.01			2.95	0.01
Dissolved Arsenic	mg/L	0.001	0.001	0.001			0.020	0.021	0.014	0.008			0.004	0.001
Dissolved Cadmium	mg/L	0.0001	<0.001*	<0.001*			<0.001*	<0.001*	0.0001	<0.0001			0.0003	<0.0001
Dissolved Chromium	mg/L	0.001	<0.001*	<0.001*			<0.001*	<0.001*	0.001	<0.001			0.004	<0.001
Dissolved Copper	mg/L	0.001	0.114	0.200			<0.001*	<0.001*	0.03	<0.001			0.012	<0.001
Total Iron	mg/L	0.05	2.05	3.40			8.13	10.30	3.38	5.40			4.66	8.64
Dissolved Lead	mg/L	0.001	0.001	0.001			<0.001*	<0.001*	0.169	<0.001			0.061	<0.001
Total Manganese	mg/L	0.001	0.757	0.759			2.85	2.99	2.06	3.58			0.245	0.272
Mercury	mg/L	0.0001								<0.0001				<0.0001
Dissolved Nickel	mg/L	0.001	0.028	0.029			0.003	0.003	0.006	0.004			0.004	0.002
Dissolved Silver	mg/L	0.001	<0.001*	<0.001*			<0.001*	<0.001*	<0.001	<0.001			<0.001	<0.001
Dissolved Zinc	mg/L	0.005	0.130	0.146			0.007	0.007	0.026	0.015			0.046	0.022
EC laboratory	uS/cm		7480	8074			3768	3798	3850	3690			4080	3840
Total Nitrogen	mg/L		0.7	0.9			0.43	0.96		0.6				0.6
Total Phosphorus	mg/L		0.02	0.03			0.07	0.09		0.10				0.11
Ammonia	mg/L		0.08	0.10			0.07	0.10		0.05				0.02
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹									268				382
Chloride	mg/L		2386	3480			990	1559		888				799
Nitrate									0.02	0.05			0.09	0.05
Sulphate	mg/L		166	215			136	206		141				419
Calcium	mg/L		106	127			62.3	71.5		56				163
Magnesium	mg/L		165	195			115	123		118				190
Potassium	mg/L		2.67	3.12			8.80	9.14		10				9
Sodium	mg/L		1048	1216			532	557		539				370

* No variation established between sampling events.

+ Analysis of all metals for November 2015 event is for "total" metals despite otherwise indicated in table.

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

Parameter	Unit	LOR	GW018		Results		GW19		Results		GW20		Results	
			20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16
Dissolved Aluminium	mg/L	0.01	<0.01*	<0.01*	2.18	<0.01	<0.01^	<0.01^						
Dissolved Arsenic	mg/L	0.001	0.007	0.008	0.009	0.002	0.001^	0.001^						
Dissolved Cadmium	mg/L	0.0001	<0.001*	<0.001*	0.0003	<0.0001	<0.001^	<0.001^						
Dissolved Chromium	mg/L	0.001	0.001	0.001	0.001	<0.001	<0.001^	<0.001^						
Dissolved Copper	mg/L	0.001	<0.001*	<0.001*	0.021	0.001	0.013^	0.013^						
Total Iron	mg/L	0.05	5.76	9.92	4.34	4.01	18.1	48.4						
Dissolved Lead	mg/L	0.001	<0.001*	<0.001*	0.085	<0.001	<0.001^	<0.001^						
Total Manganese	mg/L	0.001	1.64	1.83	1.58	1.60	0.636^	0.636^						
Mercury	mg/L	0.0001												
Dissolved Nickel	mg/L	0.001	0.003	0.005	0.003	0.002	0.015^	0.015^						
Dissolved Silver	mg/L	0.001	<0.001*	<0.001*	<0.001	<0.001	<0.001^	<0.001^						
Dissolved Zinc	mg/L	0.005	0.011	0.015	0.04	0.007	0.057^	0.057^						
EC laboratory	uS/cm		1652	1658	1730	1720	746	1371						
Total Nitrogen	mg/L		0.6	0.7		0.4	1.6	1.7						
Total Phosphorus	mg/L		0.15	0.15		0.02	0.24	0.38						
Ammonia	mg/L		0.20	0.22		0.08	0.1	0.28						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹					587								
Chloride	mg/L		101	109		80	90	98						
Nitrate					0.02	0.19								
Sulphate	mg/L		150	154		170	46	143						
Calcium	mg/L		166	185		220	34.8	124.9						
Magnesium	mg/L		61.9	62.1		62	22.7	55.8						
Potassium	mg/L		7.65	8.02		6	7.74	8.23						
Sodium	mg/L		100.0	108.3		104	91.1	100.8						

* No variation established between sampling events.

+ Analysis of all metals for November 2015 event is for "total" metals despite otherwise indicated in table.

^ Based on one record only.

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

Parameter	Unit	LOR	GW21^		Results		GW022		Results		GW23		Results	
			20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16
Dissolved Aluminium	mg/L	0.01	0.05	0.05	6.33	0.17	0.05^	0.05^	83.1	1.26	0.05	0.19	215	0.45
Dissolved Arsenic	mg/L	0.001	0.002	0.002	0.004	0.008	<0.01^	<0.01^	0.022	0.001	0.001	0.001	0.04	<0.001
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	0.0001	<0.0001	<0.001^	<0.001^	<0.0001	<0.0001	<0.001*	<0.001*	0.0007	<0.0001
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	0.003	0.001	<0.001^	<0.001^	0.023	0.001	<0.001*	<0.001*	0.063	0.001
Dissolved Copper	mg/L	0.001	0.048	0.048	0.169	0.003	0.01^	0.01^	0.131	0.012	0.009	0.009	0.071	0.010
Total Iron	mg/L	0.05	43.2	43.2	7.31	22.0	199	217	49	24.0	21.9	35.8	83.2	33.0
Dissolved Lead	mg/L	0.001	<0.001	<0.001	0.066	0.001	<0.001^	<0.001^	0.109	<0.001	<0.001*	<0.001*	0.22	<0.001
Total Manganese	mg/L	0.001	0.358	0.358	0.481	0.652	0.011^	0.011^	0.147	0.064	0.458	0.642	1.69	0.592
Dissolved Mercury	mg/L	0.0001				<0.0001				<0.0001				<0.0001
Dissolved Nickel	mg/L	0.001	0.144	0.144	0.005	0.004	<0.001^	<0.001^	0.009	<0.001	0.003	0.006	0.021	0.002
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001^	<0.001^	<0.001	<0.001	<0.001*	<0.001*	<0.001	<0.001
Dissolved Zinc	mg/L	0.005	0.122	0.122	0.08	0.059	0.084^	0.084^	1.06	0.139	0.069	0.239	0.531	0.206
EC laboratory	uS/cm		1750	1750	562	828	872	2056	410	348	417	624	245	246
Total Nitrogen	mg/L		2.6	2.6		1.1	2.4	2.6		1.3	0.5	0.8		1.2
Total Phosphorus	mg/L		0.39	0.39		0.19	0.56	0.89		0.15	0.43	1.096		0.62
Ammonia	mg/L					<0.01	0.08	0.08		<0.01	0.03	0.04		0.01
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹					333				10				10
Chloride	mg/L		178	178		41	201	475		68	55.4	86		40
Nitrate	mg/L				0.12	0.03			0.07	0.06			1.14	0.04
Sulphate	mg/L		326	326		<1	52	154		21	51	87		28
Calcium	mg/L		29.3	29.3		35	22.5	27.5		<1	28.8	45.6		2
Magnesium	mg/L		28.2	28.2		18	42.3	56.5		<1	17	23		3
Potassium	mg/L		10.3	10.3		4	17.5	18.3		<1	5.56	5.93		1
Sodium	mg/L		310	310		145	154.8	331.9		72	54.0	87.6		42

* No variation established between sampling events.

+ Analysis of all metals for November 2015 event is for "total" metals despite otherwise indicated in table.

^ Based on one record only.

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

Parameter	Unit	LOR	GW24		Results		GW025		Results		GW26		Results	
			20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16
Dissolved Aluminium	mg/L	0.01	0.19 [^]	0.19	11.2	0.29	0.05 [^]	0.05 [^]					7.77	0.19
Dissolved Arsenic	mg/L	0.001	0.002 [^]	0.002	0.004	0.001	0.001 [^]	0.001 [^]					0.004	<0.001
Dissolved Cadmium	mg/L	0.0001	<0.001 [^]	<0.001	<0.0001	0.0002	0.001 [^]	0.001 [^]					0.001	0.0010
Dissolved Chromium	mg/L	0.001	<0.001 [^]	<0.001	0.016	0.001	<0.001 [^]	<0.001 [^]					0.056	0.001
Dissolved Copper	mg/L	0.001	0.428 [^]	0.428	0.862	2.87	0.066 [^]	0.066 [^]					1.8	2.19
Total Iron	mg/L	0.05	34.2	98.5	10.6	22.4	89.0	103.3			41.3	41.3	3.28	6.64
Dissolved Lead	mg/L	0.001	<0.001 [^]	<0.001	0.062	<0.001	0.001 [^]	0.001 [^]					0.092	<0.001
Total Manganese	mg/L	0.001	0.172 [^]	0.172	0.062	0.090	0.902 [^]	0.902 [^]					0.141	0.157
Mercury	mg/L	0.0001				<0.0001								<0.0001
Dissolved Nickel	mg/L	0.001	0.028 [^]	0.028	0.011	0.008	0.016 [^]	0.016 [^]					0.062	0.019
Dissolved Silver	mg/L	0.001	<0.001 [^]	<0.001	<0.001	<0.001	<0.001 [^]	<0.001 [^]					<0.001	<0.001
Dissolved Zinc	mg/L	0.005	0.13 [^]	0.13	0.061	0.072	0.15 [^]	0.15 [^]					0.268	0.382
EC laboratory	uS/cm		5530 [^]	5530 [^]	410	622	805 [^]	805 [^]			494	494	997	951
Total Nitrogen	mg/L		1.2 [^]	1.2 [^]		2.3	0.9 [^]	0.9 [^]			1.4	1.4		0.5
Total Phosphorus	mg/L		4.6 [^]	4.6 [^]			0.12 [^]	0.12 [^]			0.18	0.18		0.14
Ammonia	mg/L		0.04 [^]	0.04 [^]		<0.01	0.14 [^]	0.14 [^]			0.1	0.1		<0.01
Phosphate	mg/L					0.63								
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹					6								27
Chloride	mg/L		1686 [^]	1686 [^]		164	235 [^]	235 [^]			136	136		271
Nitrate					<0.01	<0.01							0.04	<0.01
Sulphate	mg/L		151 [^]	151 [^]		31	18 [^]	18 [^]			18	18		12
Calcium	mg/L		42.5	160.6		2	2.55 [^]	2.55 [^]			2.09	2.09		3
Magnesium	mg/L		29.35	96.59		6	14.8 [^]	14.8 [^]			7.07	7.07		13
Potassium	mg/L		7.2	12.5		1	17 [^]	17 [^]			12.8	12.8		5
Sodium	mg/L		206.7	593.9		107	130 [^]	130 [^]			78.9	78.9		169

* No variation established between sampling events.

+ Analysis of all metals for November 2015 event is for "total" metals despite otherwise indicated in table.

[^] Based on one record only.

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

Parameter	Unit	LOR	GW27		Results		GW028		Results		GW29		Results	
			20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16
Dissolved Aluminium	mg/L	0.01	<0.01 [^]	<0.01 [^]	3.27	0.02			22.7	2.09	3.21 [^]	3.21 [^]	35.8	1.06
Dissolved Arsenic	mg/L	0.001	0.001 [^]	0.001 [^]	0.002	0.001			0.007	<0.001	0.014 [^]	0.014 [^]	0.009	<0.001
Dissolved Cadmium	mg/L	0.0001	<0.001 [^]	<0.001 [^]	<0.0001	0.0001			0.0005	0.0003	0.001 [^]	0.001 [^]	0.0006	0.0001
Dissolved Chromium	mg/L	0.001	<0.001 [^]	<0.001 [^]	0.008	<0.001			0.025	0.002	0.006 [^]	0.006 [^]	0.022	0.001
Dissolved Copper	mg/L	0.001	0.002 [^]	0.002 [^]	0.039	0.352			2.17	2.87	0.017 [^]	0.017 [^]	0.116	0.015
Total Iron	mg/L	0.05	6.61	10.20	5.3	14.8	65.3	65.3	17.1	11.3	109	110	19.5	19.4
Dissolved Lead	mg/L	0.001	<0.001 [^]	<0.001 [^]	0.115	<0.001			0.157	<0.001	0.009 [^]	0.009 [^]	0.079	<0.001
Total Manganese	mg/L	0.001	0.492 [^]	0.492 [^]	0.447	0.975			0.099	0.098	0.571 [^]	0.571 [^]	0.26	0.306
Mercury	mg/L	0.0001				<0.0001				<0.0001				<0.0001
Dissolved Nickel	mg/L	0.001	0.006 [^]	0.006 [^]	0.012	0.022			0.014	0.004	0.031 [^]	0.031 [^]	0.044	0.007
Dissolved Silver	mg/L	0.001	<0.001 [^]	<0.001 [^]	<0.001	<0.001			<0.001	<0.001	<0.001 [^]	<0.001 [^]	<0.001	<0.001
Dissolved Zinc	mg/L	0.005	0.026 [^]	0.026 [^]	0.049	0.041			0.106	0.313	5.25 [^]	5.25 [^]	0.788	0.310
EC laboratory	uS/cm		567	746	544	660	2140	2140	223	235	291	539	211	205
Total Nitrogen	mg/L		0.3	0.7		0.6	2.6	2.6		1.5	2.6	4.8		1.9
Total Phosphorus	mg/L		0.14	0.22		0.36	0.92	0.92		0.30	0.63	1.07		0.40
Ammonia	mg/L		0.04	0.06		0.04	0.06	0.06		0.05	0.05	0.06		0.02
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹					45				15				16
Chloride	mg/L		80	81		128	34	34		41	45	63		33
Nitrate					0.21	0.05			0.02	<0.01			0.03	0.04
Sulphate	mg/L		41	64		61	5.9	5.9		18	35.9	123.7		22
Calcium	mg/L		18.3	25.6		30	5.75	5.75		2	7.2	13.9		<1
Magnesium	mg/L		8.3	9.6		12	6.83	6.83		3	23.1	34.0		2
Potassium	mg/L		4.34	6.24		5	10.5	10.5		2	13.9	20.3		2
Sodium	mg/L		60.2	60.3		78	33.1	33.1		44	133	231		39

* No variation established between sampling events.

+ Analysis of all metals for November 2015 event is for "total" metals despite otherwise indicated in table.

[^] Based on one record only.

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

Parameter	Unit	LOR	GW30		Results		GW		Results		GW		Results	
			20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16	20 th per [#]	80 th per [#]	Nov 15	Jan 16
Dissolved Aluminium	mg/L	0.01	2.34	2.60	7.49	0.17								
Dissolved Arsenic	mg/L	0.001	0.002	0.003	0.008	<0.001								
Dissolved Cadmium	mg/L	0.0001	0.001	0.001	<0.0001	0.0001								
Dissolved Chromium	mg/L	0.001	<0.001*	<0.001*	0.006	<0.001								
Dissolved Copper	mg/L	0.001	2.09	2.23	1.69	0.650								
Total Iron	mg/L	0.05	36.9	115.6	6.32	19.3								
Dissolved Lead	mg/L	0.001	<0.001*	<0.001*	0.057	<0.001								
Total Manganese	mg/L	0.001	3.21	3.58	0.305	0.485								
Mercury	mg/L	0.0001				<0.0001								
Dissolved Nickel	mg/L	0.001	0.161	0.172	0.016	0.018								
Dissolved Silver	mg/L	0.001	<0.001*	<0.001*	<0.001	<0.001								
Dissolved Zinc	mg/L	0.005	0.813	0.859	0.098	0.236								
EC laboratory	uS/cm		4436	4934	1020	1420								
Total Nitrogen	mg/L		1.8	2.0		1.7								
Total Phosphorus	mg/L		0.52	0.55		0.32								
Ammonia	mg/L		0.04	0.05		<0.01								
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹					9								
Chloride	mg/L		1219	1390		355								
Nitrate					0.41	0.34								
Sulphate	mg/L		158	167		102								
Calcium	mg/L		11.5	12.3		2								
Magnesium	mg/L		79.9	90.3		11								
Potassium	mg/L		13.2	14.2		2								
Sodium	mg/L		687	760		263								

* No variation established between sampling events.

+ Analysis of all metals for November 2015 event is for "total" metals despite otherwise indicated in table.

Table 3-38 Construction groundwater level – manual record

Borehole reference	Top of casing RL (mAHD)	Depth of water level					
		Pre-construction		Construction			
		20 th per	80 th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016
GW01 (mTOC)	20.11	4.41	4.93	Destroyed	Destroyed	Destroyed	Destroyed
GW01 (mAHD)		15.18	15.70				
GW02 (mTOC)	3.57	1.95	2.96	Not taken	1.84	1.47	Destroyed
GW02 (mAHD)		0.61	1.62				
GW03 (mTOC)	2.64	0.81	2.08	Not taken	0.27	0.25	0.32
GW03 (mAHD)		0.58	1.81				
GW04 (mTOC)	1.69	1.11	2.21	Destroyed	Destroyed	Destroyed	Destroyed
GW04 (mAHD)		-0.52	0.58				
GW05 (mTOC)	1.24	0.81	1.55	Not taken	0.16	0.25	0.34
GW05 (mAHD)		-0.31	0.43				
GW06 (mTOC)	20.1	5.36	5.85	Destroyed	Destroyed	Destroyed	Destroyed
GW06 (mAHD)		14.25	14.74				
GW07 (mTOC)	15.98	2.86	5.19	Not taken	5.6	5.36	4.41
GW07 (mAHD)		10.79	13.12				
GW08 (mTOC)	19.09	6.94	6.94	Dry	Dry	7.05	Dry
GW08 (mAHD)		12.15	12.15				
GW09 (mTOC)	17.57	8.05	8.66	Destroyed	Destroyed	Destroyed	Destroyed
GW09 (mAHD)		8.91	9.52				
GW10 (mTOC)	15.38	3.34	7.27	Destroyed	Destroyed	Destroyed	Destroyed
GW10 (mAHD)		8.11	12.04				
GW11 (mTOC)	1.591	1.49	2.45	Destroyed	Destroyed	Destroyed	Destroyed
GW11 (mAHD)		-0.86	0.10				
GW12 (mTOC)	1.573	0.74	1.68	Not taken	0.2	0.23	0.31
GW12 (mAHD)		-0.20	0.83				
GW13 (mTOC)	2.04	1.44	2.05	Destroyed	Destroyed	Destroyed	Destroyed
GW13 (mAHD)		-0.01	0.60				
GW14 (mTOC)	5.656	2.60	3.43	Destroyed	Destroyed	Destroyed	Destroyed
GW14 (mAHD)		2.23	3.06				
GW15 (mTOC)	13.79	10.01	10.32	Not taken	9.9	9.74	8.95

Borehole reference	Top of casting RL (mAHD)	Depth of water level					
		Pre-construction		Construction			
		20 th per	80 th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016
GW15 (mAHD)		3.47	3.78				
GW16 (mTOC)	14.14	8.13	8.13	Destroyed	Destroyed	Destroyed	Destroyed
GW16 (mAHD)		6.01	6.01				
GW17 (mTOC)	59.47	Dry	Dry	Not taken	11.82	11.54	11.5
GW17 (mAHD)		Dry	Dry				
GW18 (mTOC)	96.71	33.98	34.04	Not taken	32.78	33.9	33.86
GW18 (mAHD)		62.67	62.73				
GW19 (mTOC)	51.81	7.53	9.46	Destroyed	Destroyed	Destroyed	Destroyed
GW19 (mAHD)		42.35	44.28				
GW20 (mTOC)	87.18	Dry	Dry	Dry	33.15	Dry	Dry
GW20 (mAHD)		Dry	Dry				
GW21 (mTOC)	51.29	4.65	5.79	Not taken	4.76	2.23	2.82
GW21 (mAHD)		45.50	46.64				
GW22 (mTOC)	17.27	4.64	5.28	Not taken	2.29	1.42	1.67
GW22 (mAHD)		11.99	12.63				
GW23 (mTOC)	39.22	15.93	15.99	Not taken	16.7	17.2	17.14
GW23 (mAHD)		23.23	23.29				
GW24 (mTOC)	26.09	6.25	7.78	Dry	Dry	6.5	7.16
GW24 (mAHD)		18.31	19.84				
GW25 (mTOC)	61.72	11.53	12.35	Not taken	13.08	Dry	Dry
GW25 (mAHD)		49.37	50.19				
GW26 (mTOC)	54.56	14.17	14.98	Not taken	15.1	14.1	13.81
GW26 (mAHD)		39.58	40.39				
GW27 (mTOC)	74.33	27.45	27.66	Dry	29.25	29.17	26.67
GW27 (mAHD)		46.67	46.88				
GW28 (mTOC)	54.65	8.45	9.40	Dry	Dry	8.76	9.1
GW28 (mAHD)		45.25	46.20				
GW29 (mTOC)	45.11	2.97	8.82	Not taken	6.88	5.89	7.37
GW29 (mAHD)		36.29	42.14				
GW30 (mTOC)	41.49	3.16	4.59	Not taken	2.95	3.12	4.59
GW30 (mAHD)		36.90	38.33				

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

Borehole reference	Electrical conductivity (uS/cm)					
	Pre-construction		Construction			
	20 th per	80 th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016
GW01	5062	5502	Destroyed	Destroyed	Destroyed	Destroyed
GW02	293	656	662	589	817	Destroyed
GW03	1009	1283	959	729	679	866
GW04	3027	5520	Destroyed	Destroyed	Destroyed	Destroyed
GW05	5970	6728	6025	5010	6	4975
GW06	1359	8204	Destroyed	Destroyed	Destroyed	Destroyed
GW07	172	230	1578	189	173	138
GW08	No record	No record	Dry	Insufficient water	656	Insufficient water
GW09	1981	2536	Destroyed	Destroyed	Destroyed	Destroyed
GW10	443	780	Destroyed	Destroyed	Destroyed	Destroyed
GW11	1296	5880	Destroyed	Destroyed	Destroyed	Destroyed
GW12	2467	4460	1376	1265	1457	1199
GW13	186	295	Destroyed	Destroyed	Destroyed	Destroyed
GW14	6312	7068	Destroyed	Destroyed	Destroyed	Destroyed
GW15	3600	3740	3333	2957	3275	2782
GW16	No record	No record	Destroyed	Destroyed	Destroyed	Destroyed
GW17	No record	No record	3555	3151	3454	2888
GW18	1588	1648	1513	1469	1518	1337
GW19	554	602	Destroyed	Destroyed	Destroyed	Destroyed
GW20	No record	No record	Insufficient water	Insufficient water	Insufficient water	Insufficient water
GW21	1861	2426	731	833	490	666
GW22	842	5484	478	403	345	273
GW23	415	726	230	288	216	192
GW24	509	974	Insufficient water	Insufficient water	358	464
GW25	476	965	548	Insufficient water	Insufficient water	Insufficient water
GW26	1083	1337	1060	Insufficient water	871	732
GW27	535	737	Insufficient water	Insufficient water	464	491
GW28	181	225	Insufficient water	Insufficient water	202	Insufficient water
GW29	222	299	202	187	191	171

Borehole reference	Electrical conductivity (uS/cm)					
	Pre-construction		Construction			
	20 th per	80 th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016
GW30	1750	3800	1075	1062	854	1072

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

Borehole reference	pH					
	Pre-construction		Construction			
	20 th per	80 th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016
GW01	4.1	4.5	Destroyed	Destroyed	Destroyed	Destroyed
GW02	6.2	6.5	5.9	6.4	7.0	Destroyed
GW03	6.0	6.5	6.8	6.3	7.5	6.5
GW04	6.0	6.3	Destroyed	Destroyed	Destroyed	Destroyed
GW05	6.2	6.6	6.7	6.7	7.0	6.2
GW06	3.6	5.0	Destroyed	Destroyed	Destroyed	Destroyed
GW07	5.6	5.9	6.0	5.6	6.8	6.1
GW08	No record	No record	Insufficient water	Insufficient water	6.0	Insufficient water
GW09	4.1	5.6	Destroyed	Destroyed	Destroyed	Destroyed
GW10	5.7	6.3	Destroyed	Destroyed	Destroyed	Destroyed
GW11	4.9	5.2	Destroyed	Destroyed	Destroyed	Destroyed
GW12	5.8	6.0	3.8	3.8	6.0	6.0
GW13	5.3	5.8	Destroyed	Destroyed	Destroyed	Destroyed
GW14	4.4	6.1	Destroyed	Destroyed	Destroyed	Destroyed
GW15	6.2	6.4	6.1	625.0	6.2	5.9
GW16	No record	No record	Destroyed	Destroyed	Destroyed	Destroyed
GW17	No record	No record	6.4	6.4	6.5	6.3
GW18	6.5	6.7	67.3	6.7	6.8	6.8
GW19	6.1	6.4	Destroyed	Destroyed	Destroyed	Destroyed
GW20	No record	No record	Insufficient water	Insufficient water	Insufficient water	Insufficient water
GW21	6.2	6.3	6.8	6.3	7.5	6.9
GW22	6.0	6.3	6.3	5.9	5.5	5.8
GW23	5.8	6.2	6.0	5.4	5.5	6.5

Borehole reference	pH					
	Pre-construction		Construction			
	20 th per	80 th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016
GW24	4.5	5.3	Insufficient water	Insufficient water	5.7	7.5
GW25	4.7	5.0	4.7	Insufficient water	Insufficient water	Insufficient water
GW26	5.5	5.9	5.3	Insufficient water	5.3	5.4
GW27	6.0	6.2	Insufficient water	Insufficient water	5.8	5.7
GW28	5.3	5.7	Insufficient water	Insufficient water	5.2	Insufficient water
GW29	5.4	5.9	5.7	5.8	5.4	5.8
GW30	4.3	5.0	5.0	5.2	5.6	5.2

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

Borehole reference	Temperature					
	Pre-construction		Construction			
	20 th per	80 th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016
GW01	20.1	20.9	Destroyed	Destroyed	Destroyed	Destroyed
GW02	19.0	21.2	18.4	17.6	20.1	Destroyed
GW03	18.5	21.3	16.2	16.9	18.9	21.1
GW04	18.6	20.3	Destroyed	Destroyed	Destroyed	Destroyed
GW05	17.4	18.9	15.8	16.0	17.3	20.1
GW06	18.5	19.8	Destroyed	Destroyed	Destroyed	Destroyed
GW07	18.5	19.5	19.5	19.6	19.9	20.2
GW08	No record	No record	Insufficient water	Insufficient water	20.3	Insufficient water
GW09	18.3	18.5	Destroyed	Destroyed	Destroyed	Destroyed
GW10	18.2	19.5	Destroyed	Destroyed	Destroyed	Destroyed
GW11	18.2	19.6	Destroyed	Destroyed	Destroyed	Destroyed
GW12	18.0	20.5	14.3	15.5	18.4	20.7
GW13	19.1	20.0	Destroyed	Destroyed	Destroyed	Destroyed
GW14	19.2	20.0	Destroyed	Destroyed	Destroyed	Destroyed
GW15	19.4	20.2	19.9	20.6	20.7	20.5
GW16	No record	No record	Destroyed	Destroyed	Destroyed	Destroyed

Borehole reference	Temperature					
	Pre-construction		Construction			
	20th per	80th per	Aug 2015	Sep 2015	Nov 2015	Jan 2016
GW17	No record	No record	19.3	19.4	19.7	19.9
GW18	19.9	20.5	19.0	19.2	19.8	20.8
GW19	19.5	20.2	Destroyed	Destroyed	Destroyed	Destroyed
GW20	No record	No record	Insufficient water	Insufficient water	Insufficient water	Insufficient water
GW21	18.8	20.3	18.8	18.5	18.6	19.9
GW22	17.6	20.2	18.2	17.2	18.3	20.6
GW23	19.0	19.6	18.5	18.7	18.9	19.4
GW24	18.3	19.0	Insufficient water	Insufficient water	18.7	18.8
GW25	19.9	20.5	18.5	Insufficient water	Insufficient water	Insufficient water
GW26	19.1	20.6	19.2	Insufficient water	20.1	20.2
GW27	19.3	20.5	Insufficient water	Insufficient water	19.7	19.9
GW28	19.5	22.6	Insufficient water	Insufficient water	20	Insufficient water
GW29	18.4	19.9	18.5	18.7	18.6	19.2
GW30	19.4	20.0	18.6	18.6	19.1	19.9

3.9 Discussion of groundwater results

Construction activity at the time of the first monitoring event (ie 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 most recent monitoring period (ie August 2015 to January 2016) the majority of major earthworks (ie deep cuts and high fill embankments) across the project have been completed. Activities during this period with potential to affect groundwater included:

- Pre-loading and work on fill embankments at GW02, GW03 and GW04
- Completion of cut depth and finalising road formation levels at GW06
- Completion of cut depth and finalising road formation levels at GW07
- Finalising fill embankment / formation levels at GW08, GW09 and GW10
- Finalising fill embankment / formation levels at GW11
- Finalising fill embankment / formation levels at GW12, GW13 and GW14
- Continued progress on cuttings in the vicinity of GW17 to GW22 with nearly all approaching requisite depths
- Finalising fill embankment / formation levels at GW23 with some concrete paving completed along the main corridor
- Completion of cut depth and finalising road formation levels at GW25 and GW26
- Substantial progress on large cutting near GW27 and GW28 with depth nearing final levels
- Finalising fill embankment / formation levels at GW29
- Completion of cut depth and finalising road formation levels at GW30

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 logger sites as of January 2016, 11 record a steep rise in level following significant rain events. At other times, smaller fluctuations are present. These are also considered likely in response to less significant events (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 period 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.
- Laboratory analysed parameters show considerable variability for a number of analytes between sampling events (note, comparison between November 2015 and earlier 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 not considered inconsistent with pre-construction results. Other laboratory analysed parameters continue to show similar levels across all pre-construction and construction monitoring events.

- Manually recorded pH and temperature records are generally consistent with levels recorded during the pre-construction and previous construction reporting periods. pH at GW12 dropped substantially (ie became quite acid) during the August and September 2015 monitoring events, but corrected to levels consistent with trend during subsequent November 2015 and January 2016 monitoring events.
- 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). One exception occurred at GW05 for the November 2015 in-field monitoring event. This appears to be an error attributable to the monitoring unit, as laboratory results for the same event do 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 pH, 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:

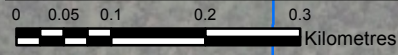
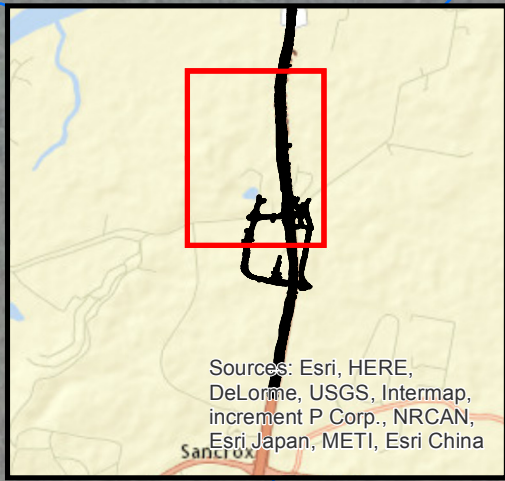
- Ensuring laboratory analysis is consistent with pre-construction and earlier construction monitoring eg total and dissolved metals to be analysed and reported where necessary. Note, Roads and Maritime having identified this issue and have instructed the laboratory to analyse both total and dissolved metals for all future monitoring events. This instruction took effect for events from December 2015 onward.
- Continued monitoring of groundwater depth at GW08 during subsequent monitoring events.
- Close monitoring of pH levels at GW12 to determine whether acidic conditions correspond to periods of low rainfall, or whether construction activities may contribute to conditions at this location.

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. It appears GW06 has been installed incorrectly and will need to be re-established. GW02 and GW16 have not yet been installed, although will be installed very soon. Monitoring is due to commence at these new boreholes in May 2016.

Terms and acronyms

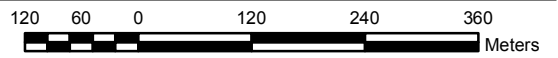
Term	Meaning
CEMP	Construction environmental management plan
Director General	Director General of the NSW Department of Planning and Environment (or delegate)
DPI (Fishing and Aquaculture)	The Department of Primary Industry (Fishing and Aquaculture)
EA	Environmental Assessment
EMS	Environmental management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

Appendix A – Site locality maps



Legend

- Groundwater Monitoring Locations
- Surface Water Monitoring Locations
- Watercourse
- Road Design
- LGA Boundaries



**Pacific Highway Upgrade
Oxley Highway to Kempsey**



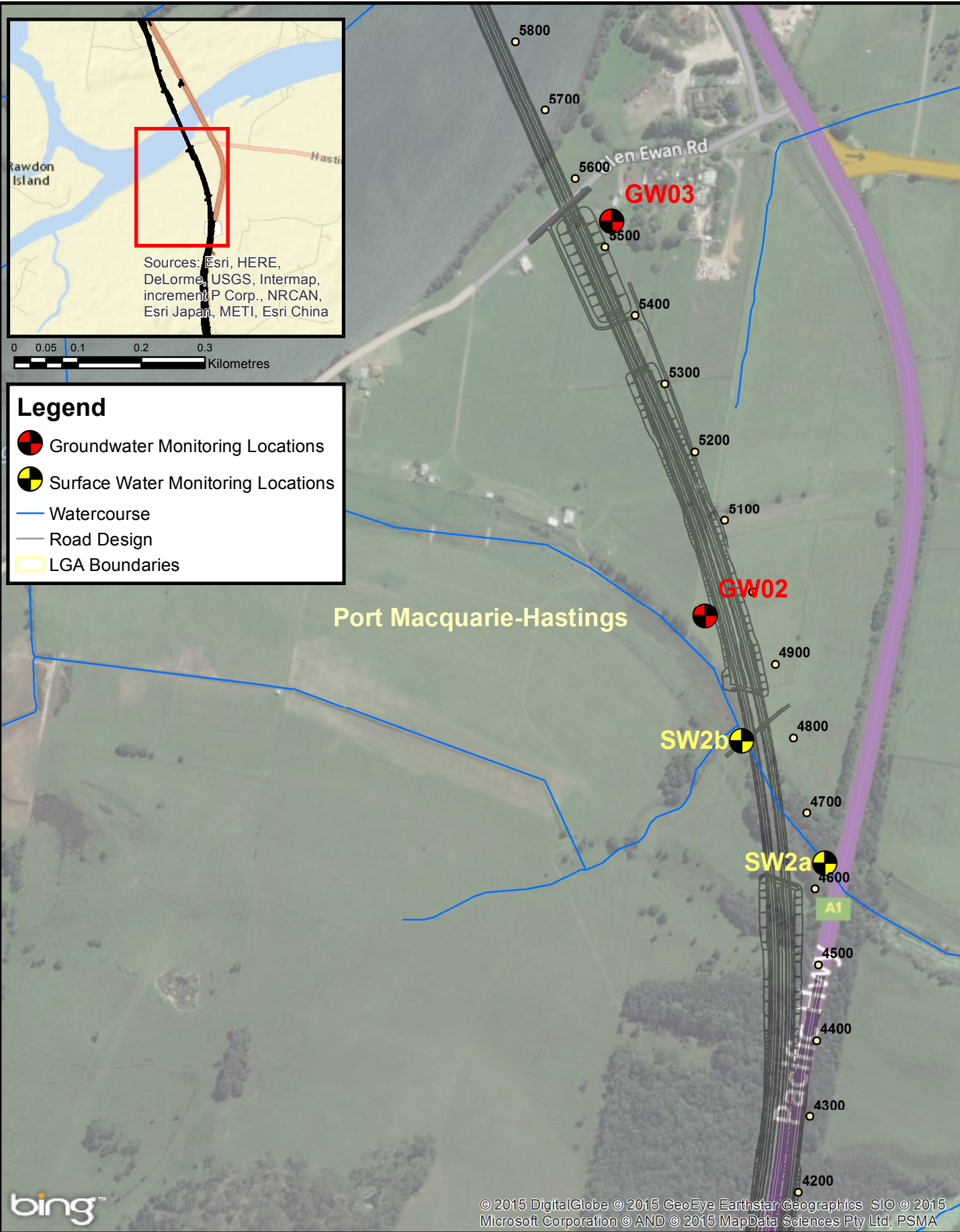
Surface & groundwater monitoring locations

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Legend

-  Groundwater Monitoring Locations
-  Surface Water Monitoring Locations
-  Watercourse
-  Road Design
-  LGA Boundaries

Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China

0 0.05 0.1 0.2 0.3 Kilometres



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120 60 0 120 240 360 Meters



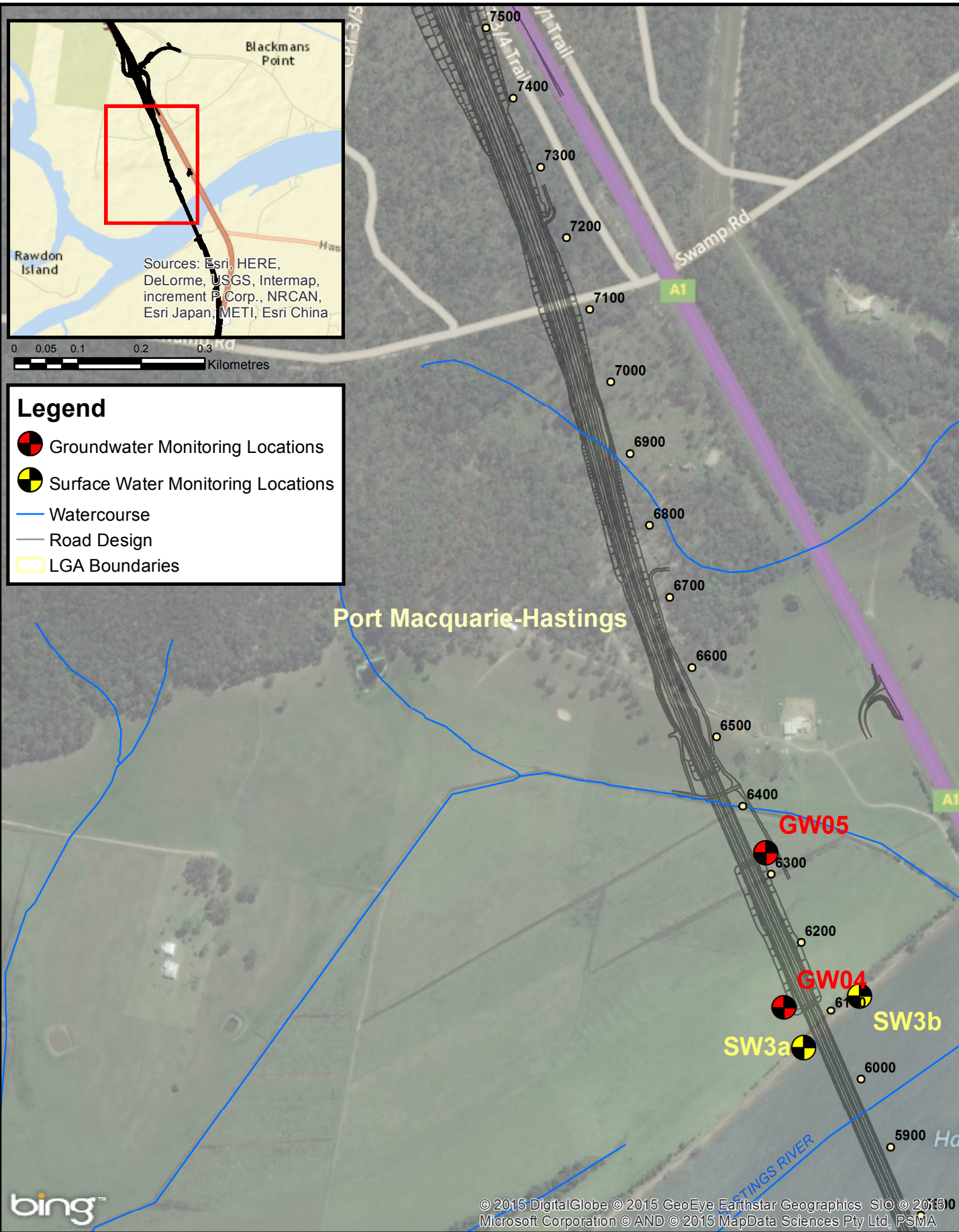
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Surface & groundwater monitoring locations

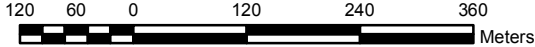
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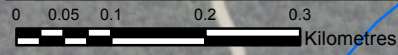
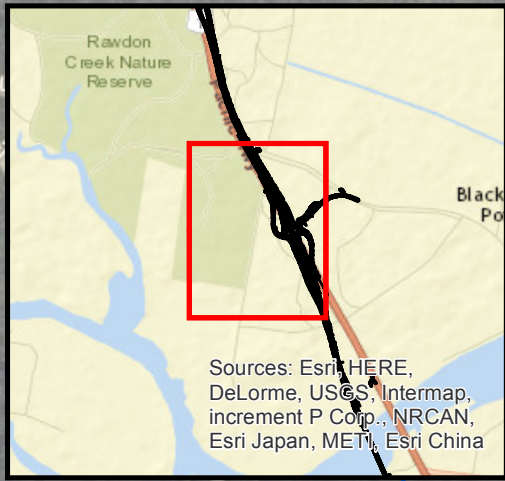
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Surface & groundwater monitoring locations

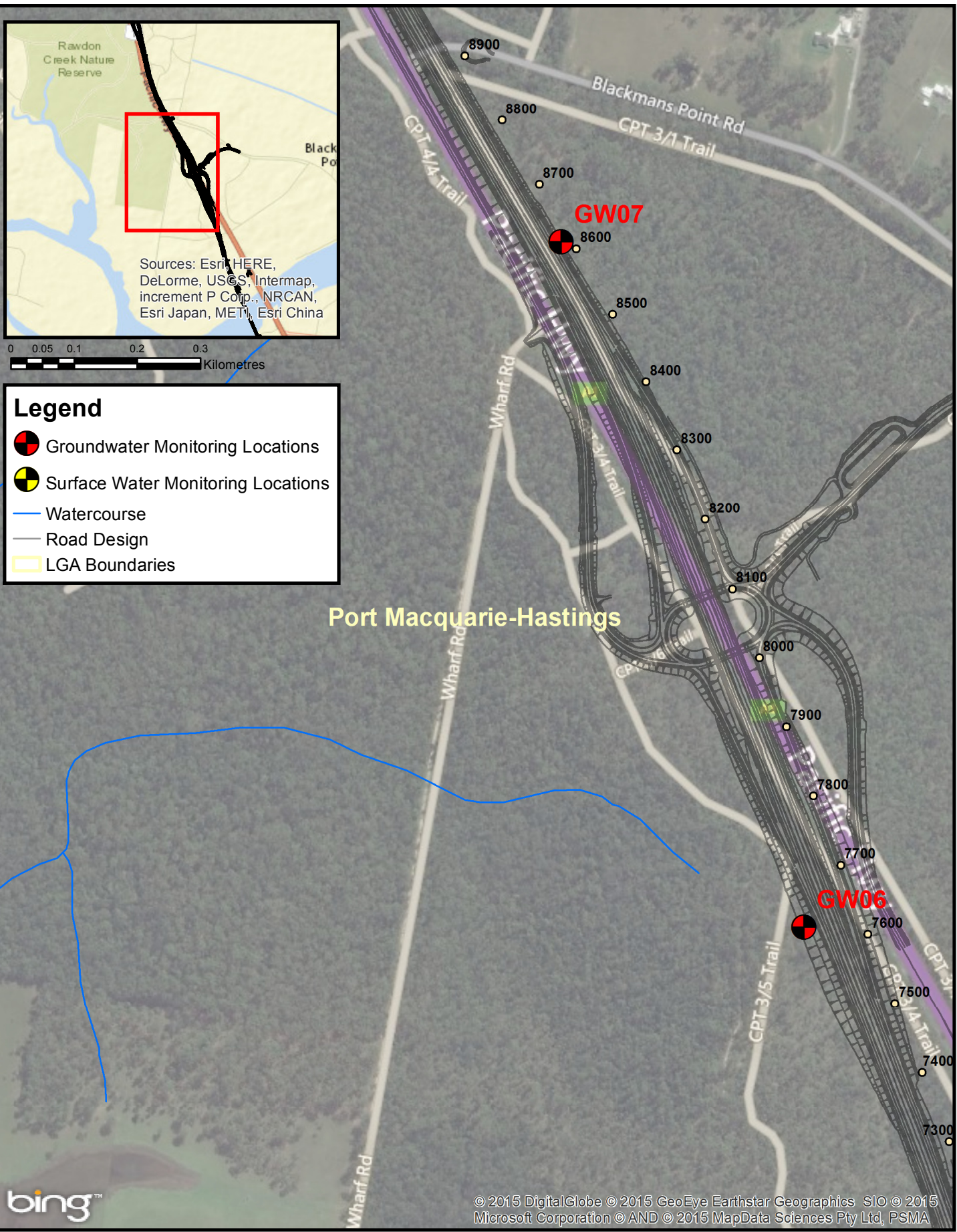
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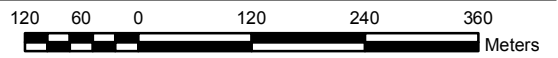
Legend

- Groundwater Monitoring Locations
- Surface Water Monitoring Locations
- Watercourse
- Road Design
- LGA Boundaries

Port Macquarie-Hastings



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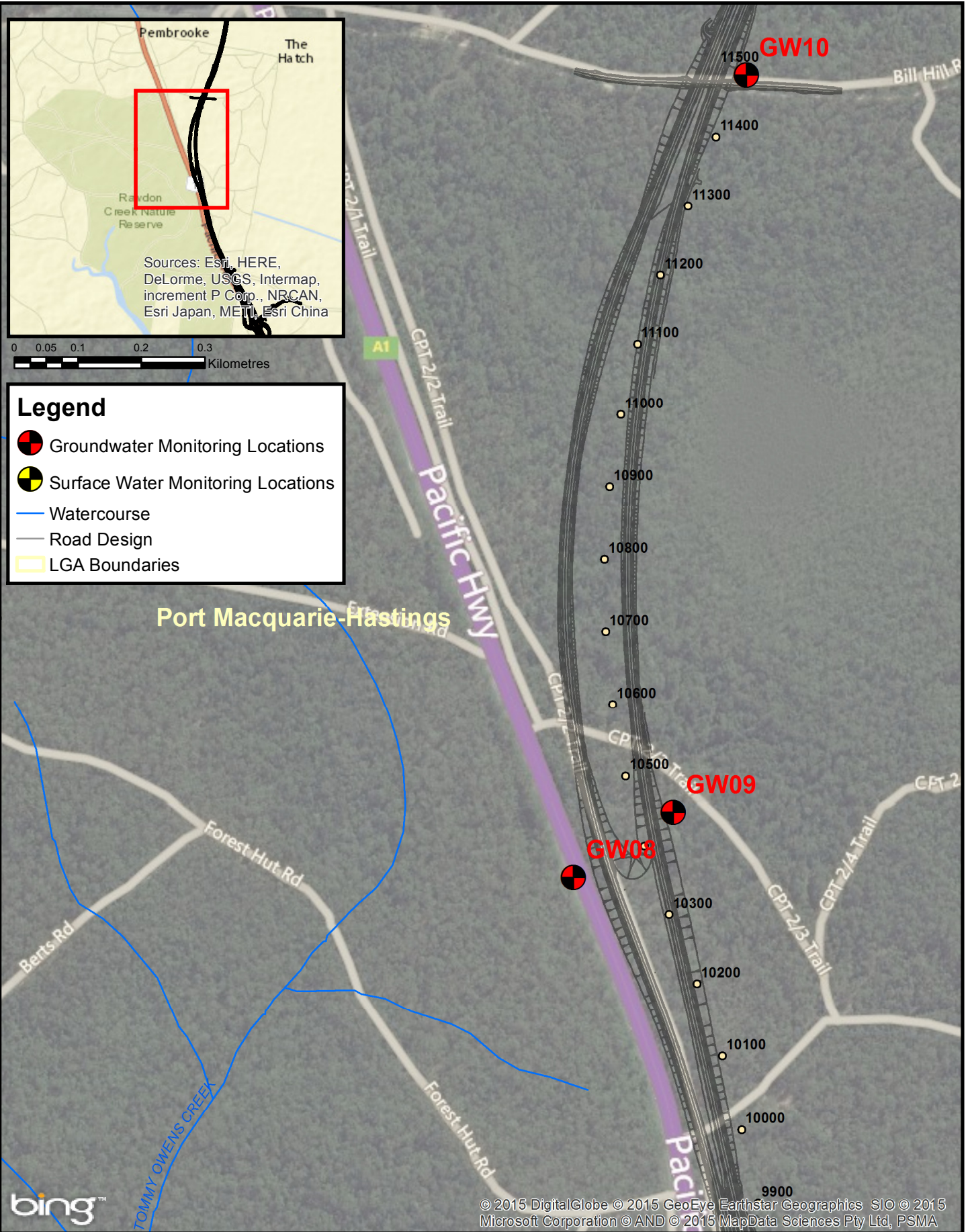
Surface & groundwater monitoring locations

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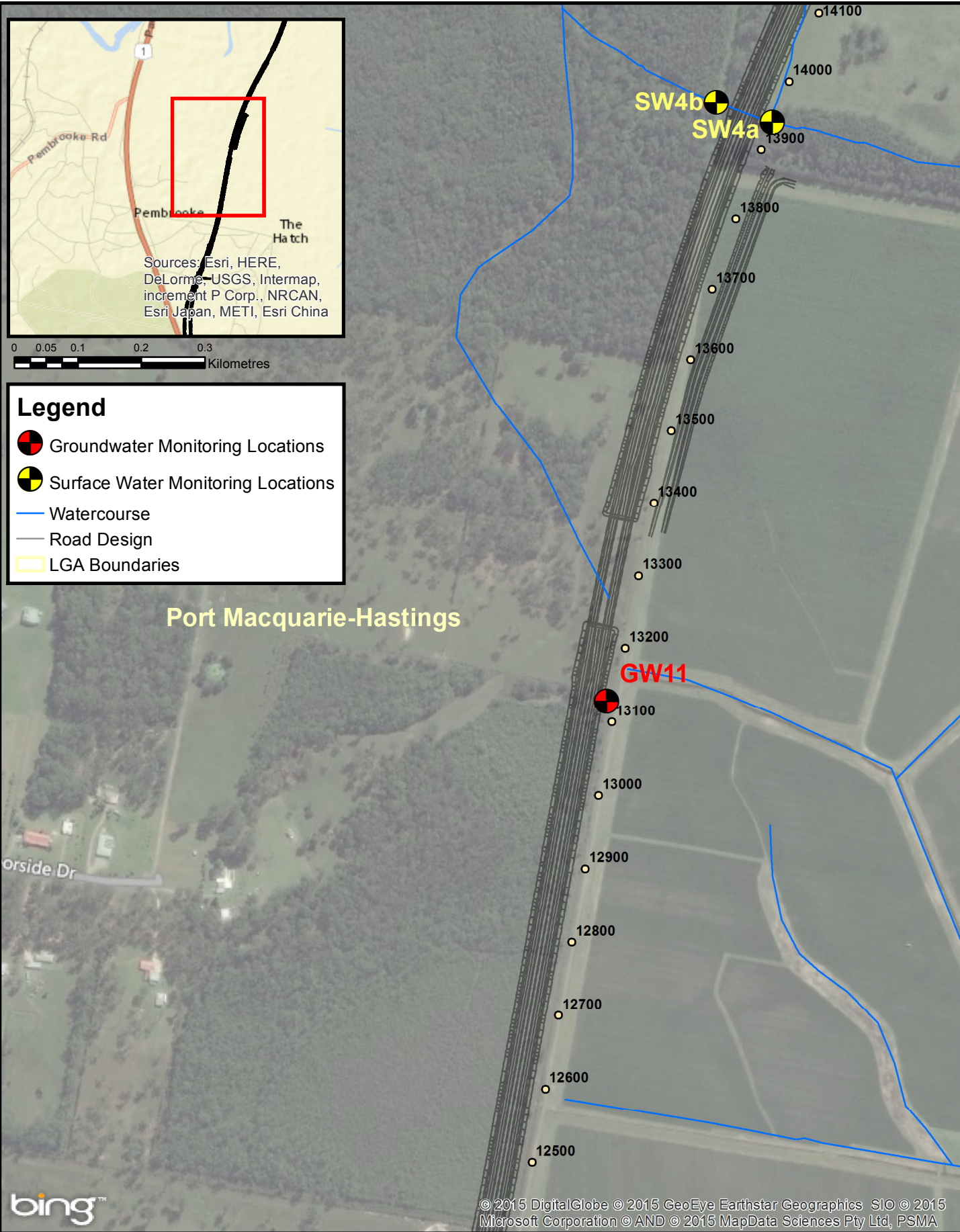
Surface & groundwater monitoring locations

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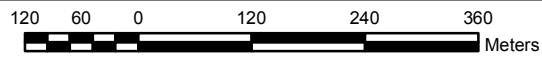
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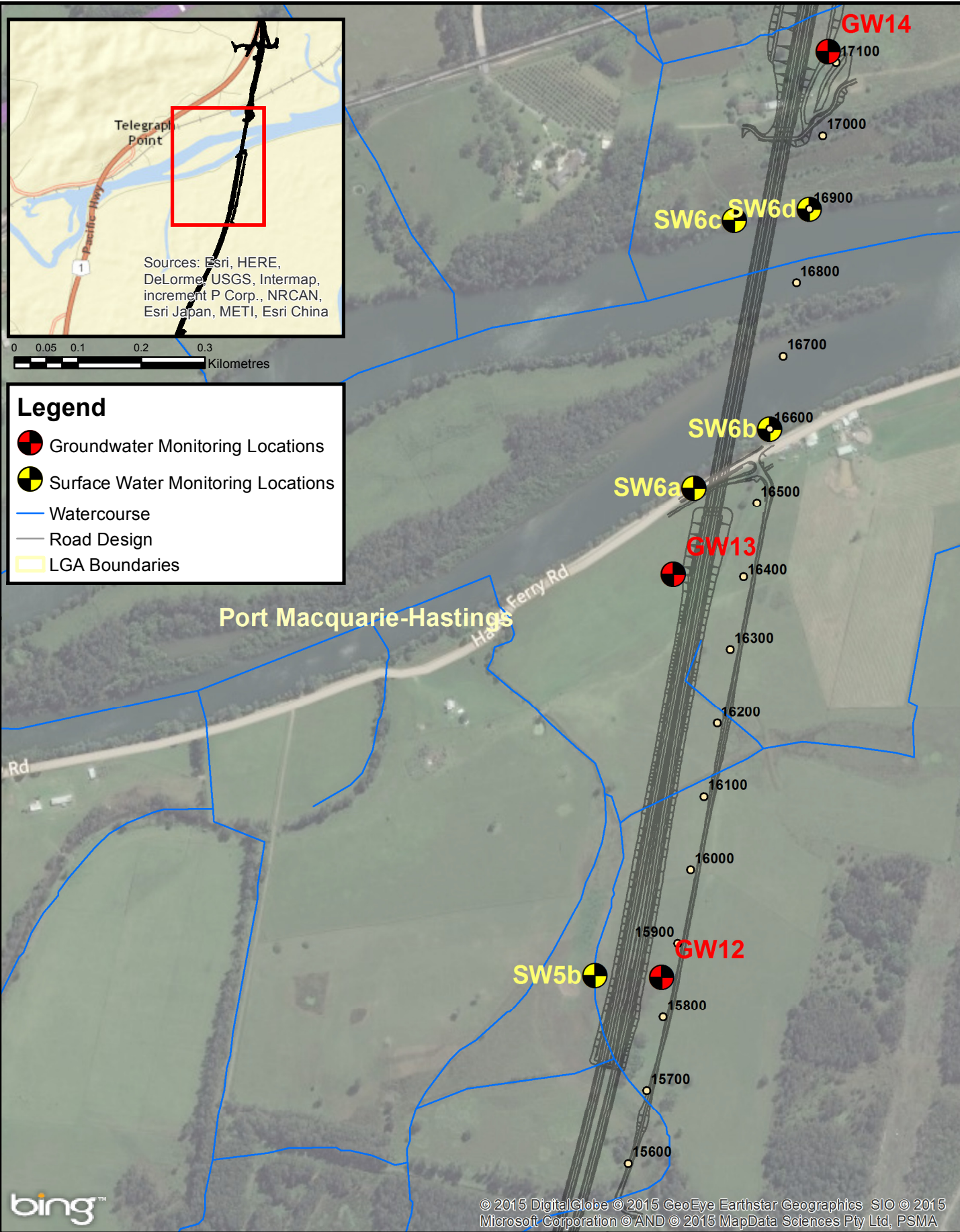
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Surface & groundwater monitoring locations

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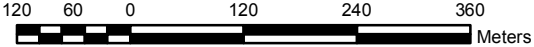
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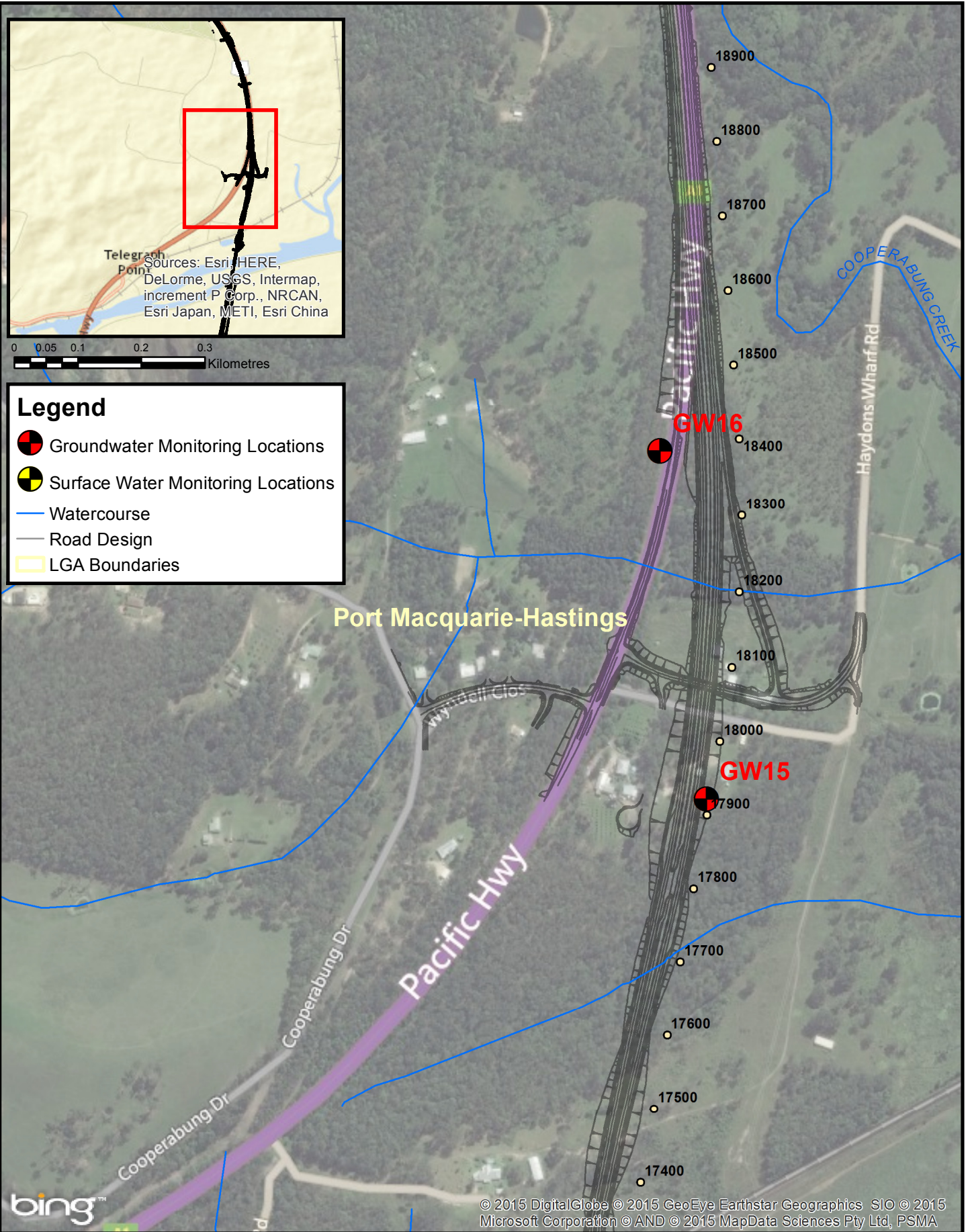
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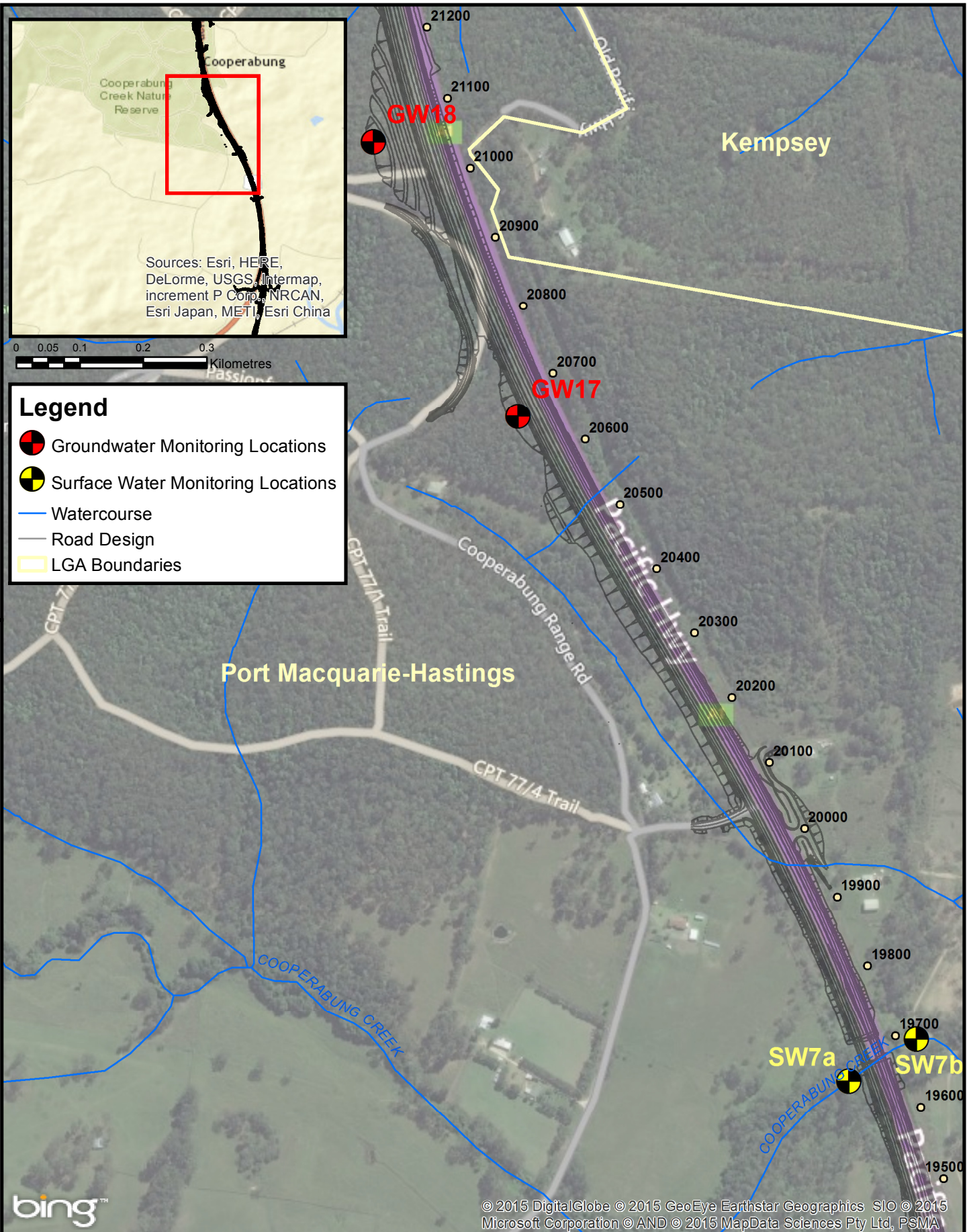
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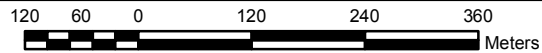
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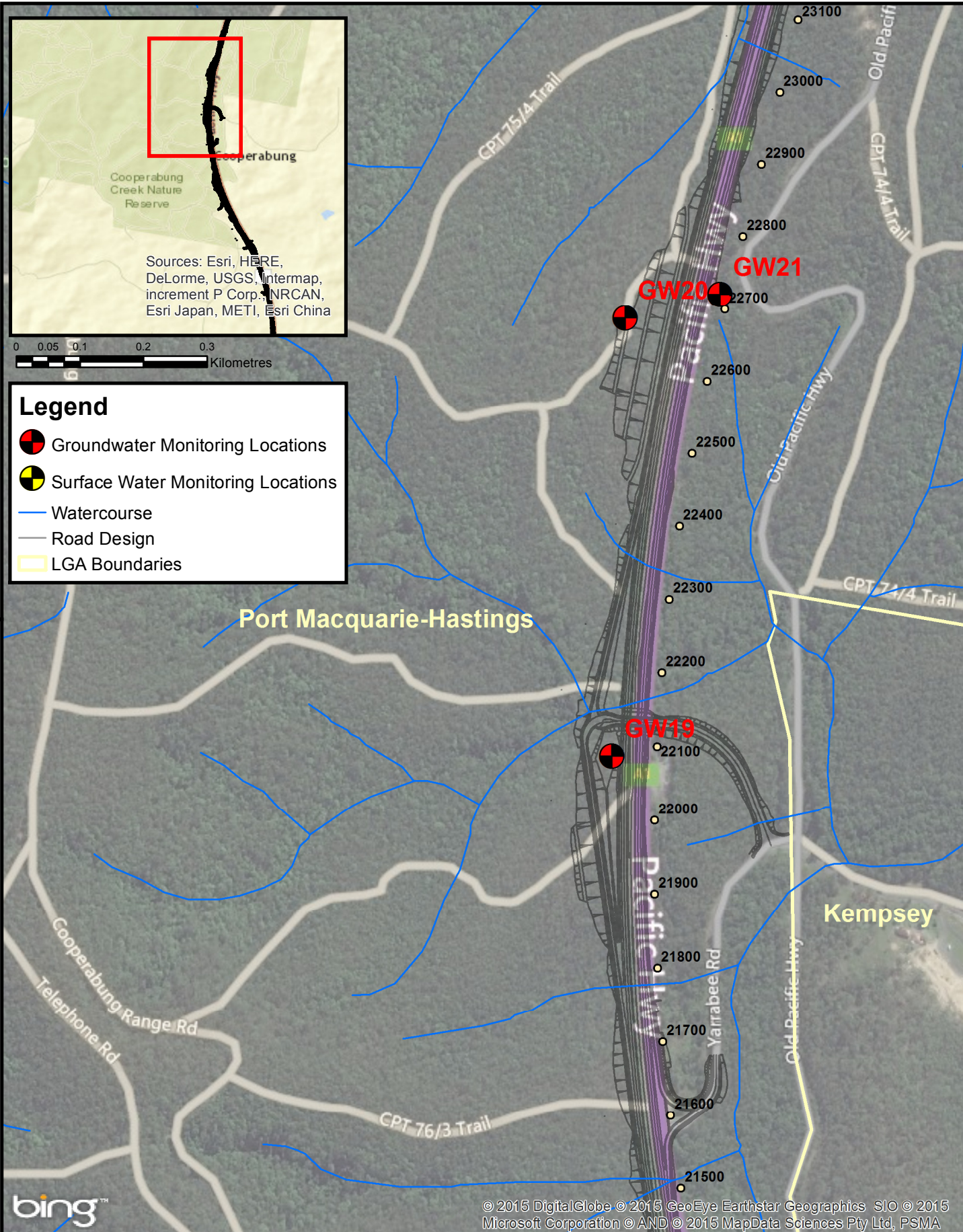
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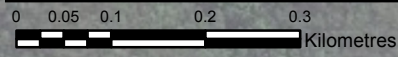
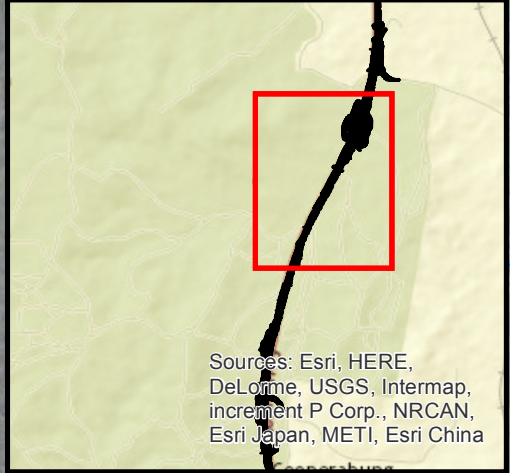
Surface & groundwater monitoring locations

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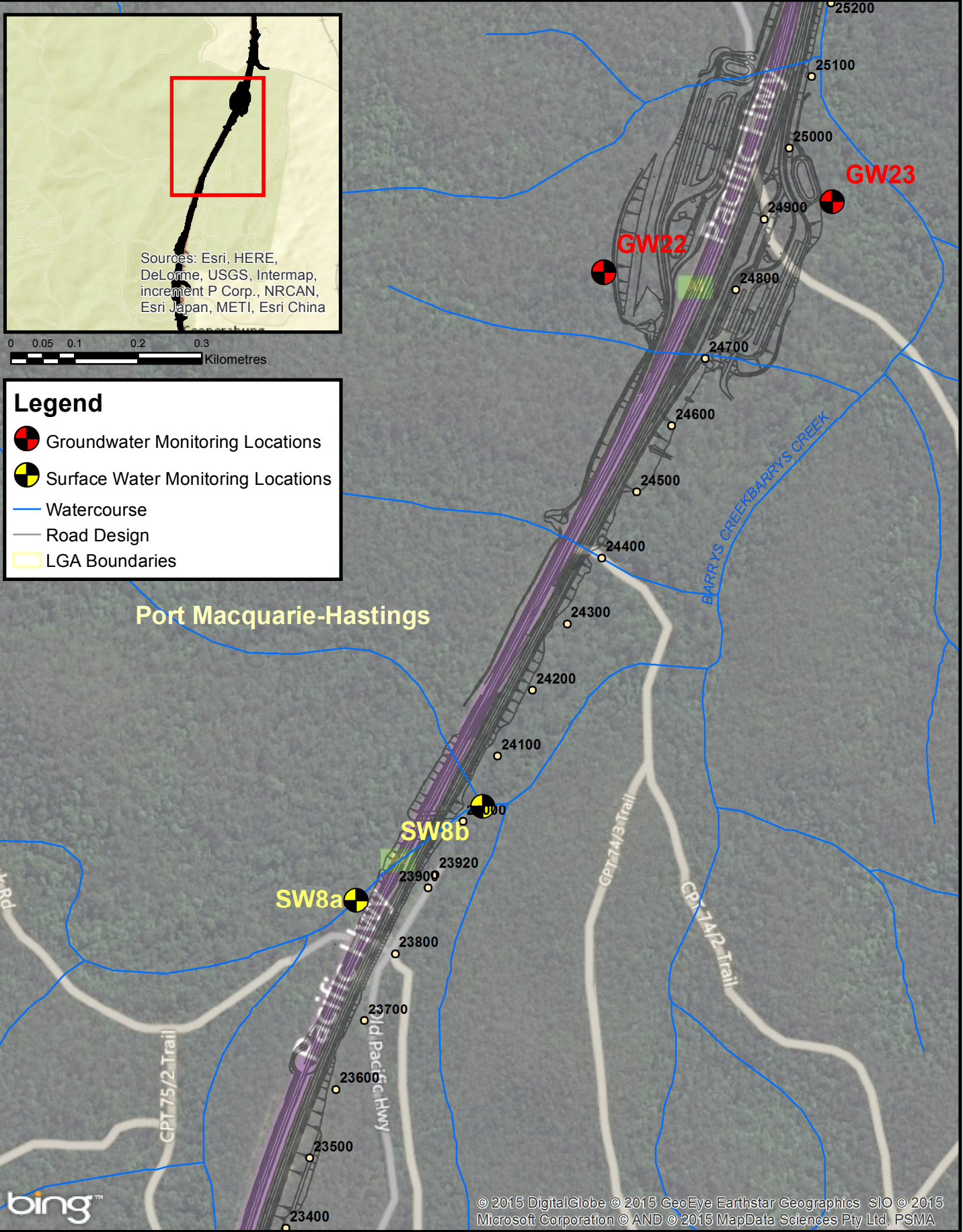
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Legend

- Groundwater Monitoring Locations
- Surface Water Monitoring Locations
- Watercourse
- Road Design
- LGA Boundaries

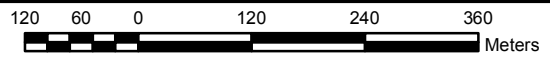


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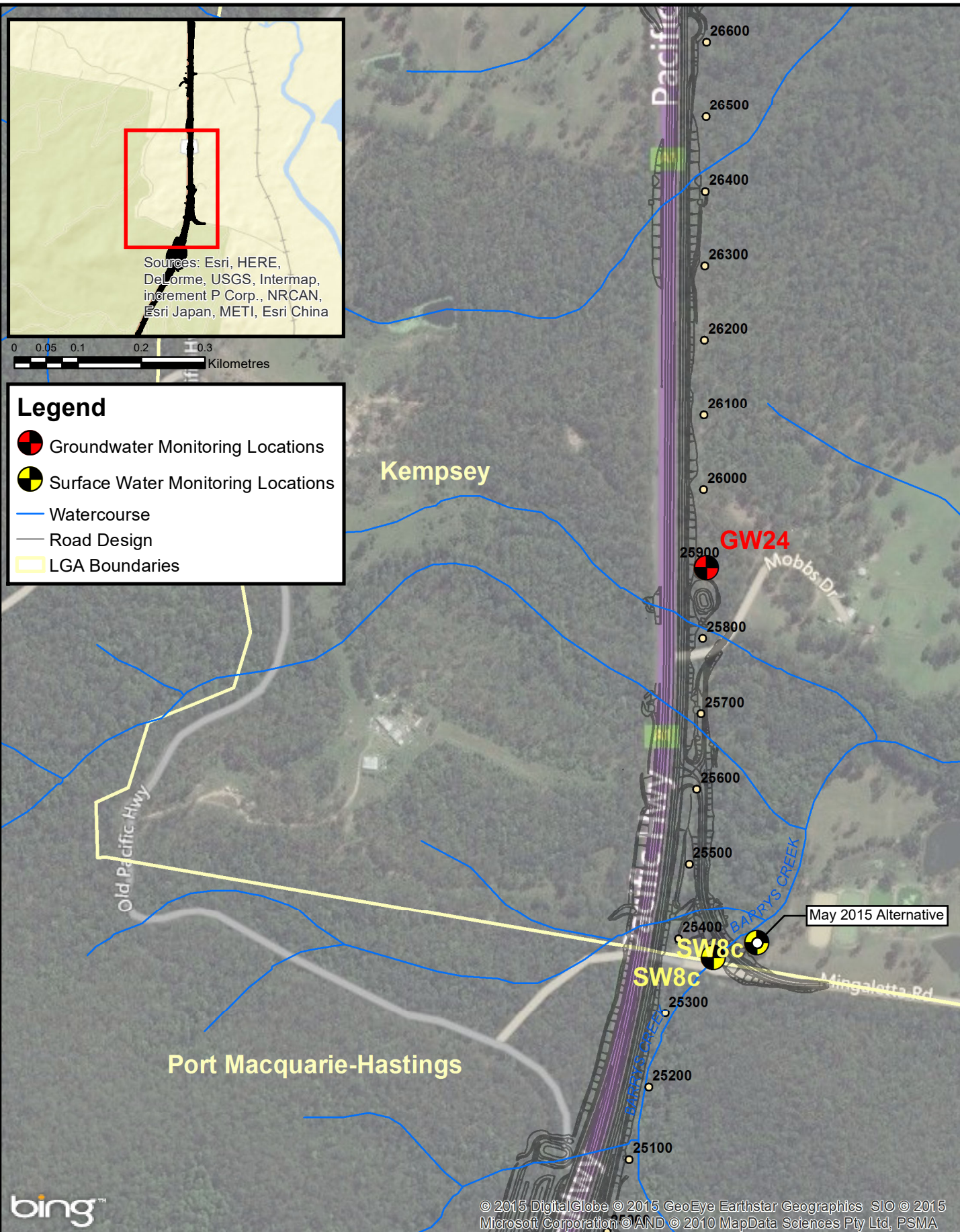
Surface & groundwater monitoring locations

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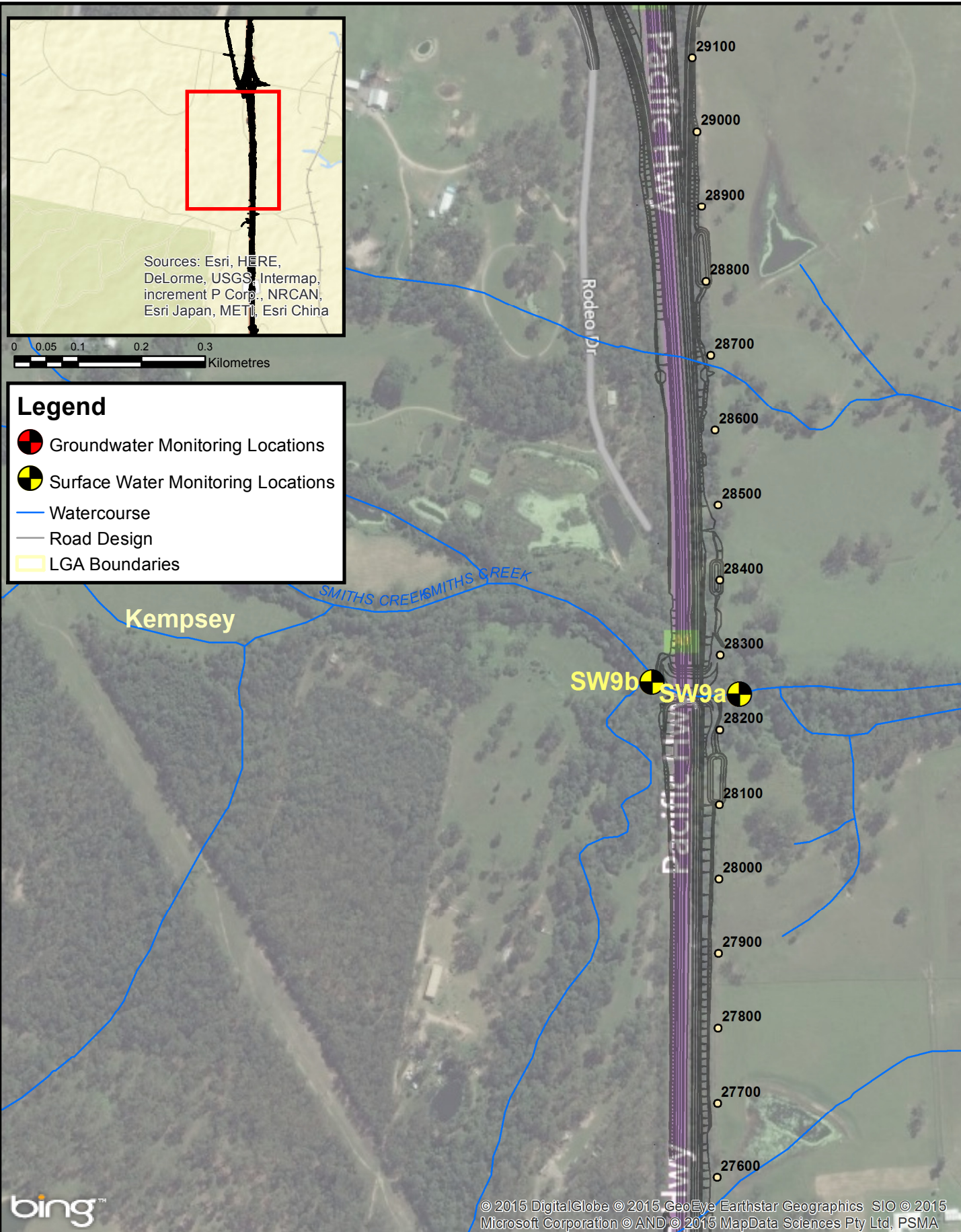
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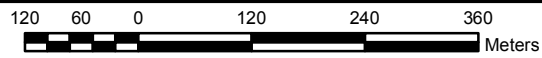
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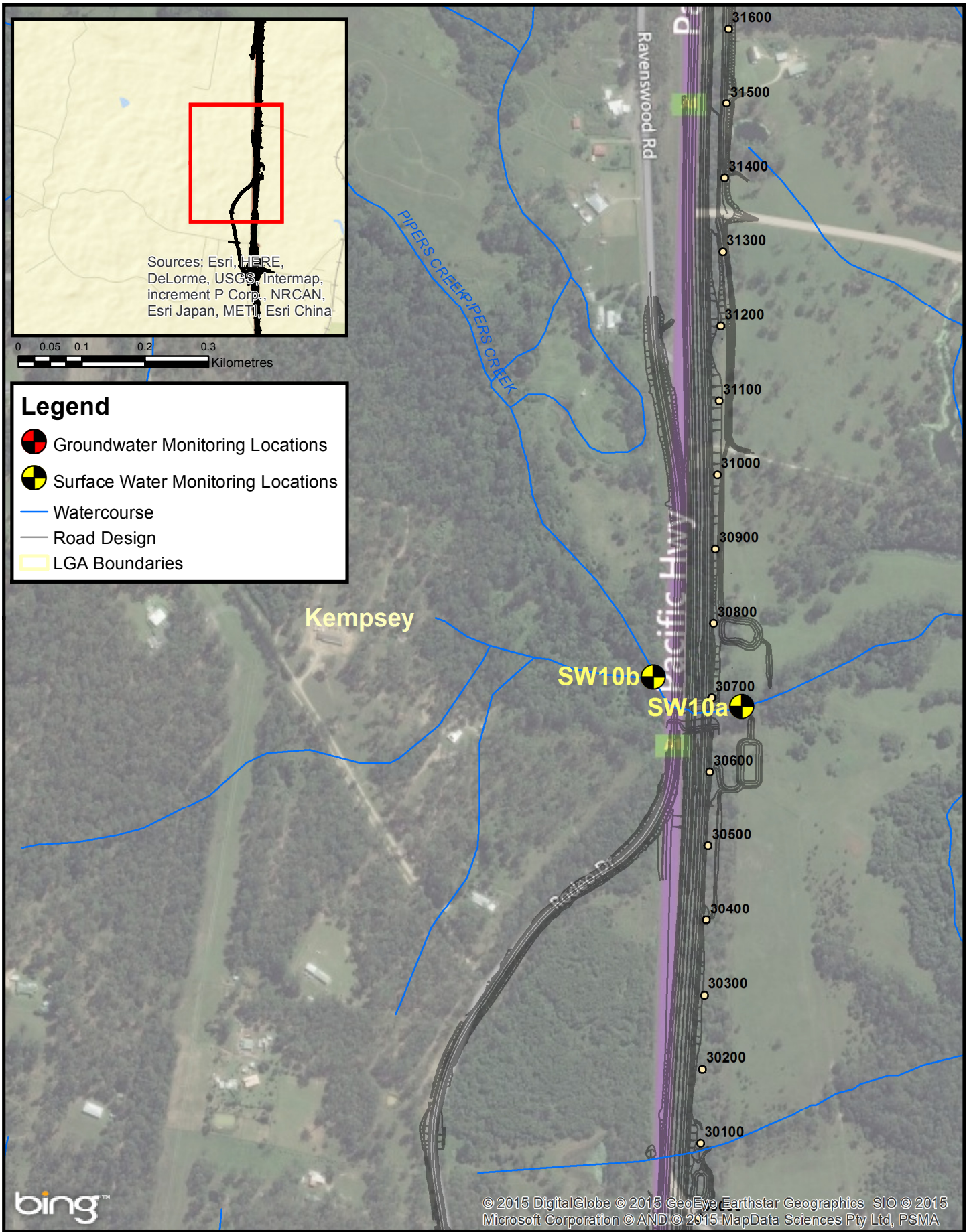
Surface & groundwater monitoring locations

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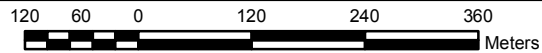
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Legend

-  Groundwater Monitoring Locations
-  Surface Water Monitoring Locations
-  Watercourse
-  Road Design
-  LGA Boundaries

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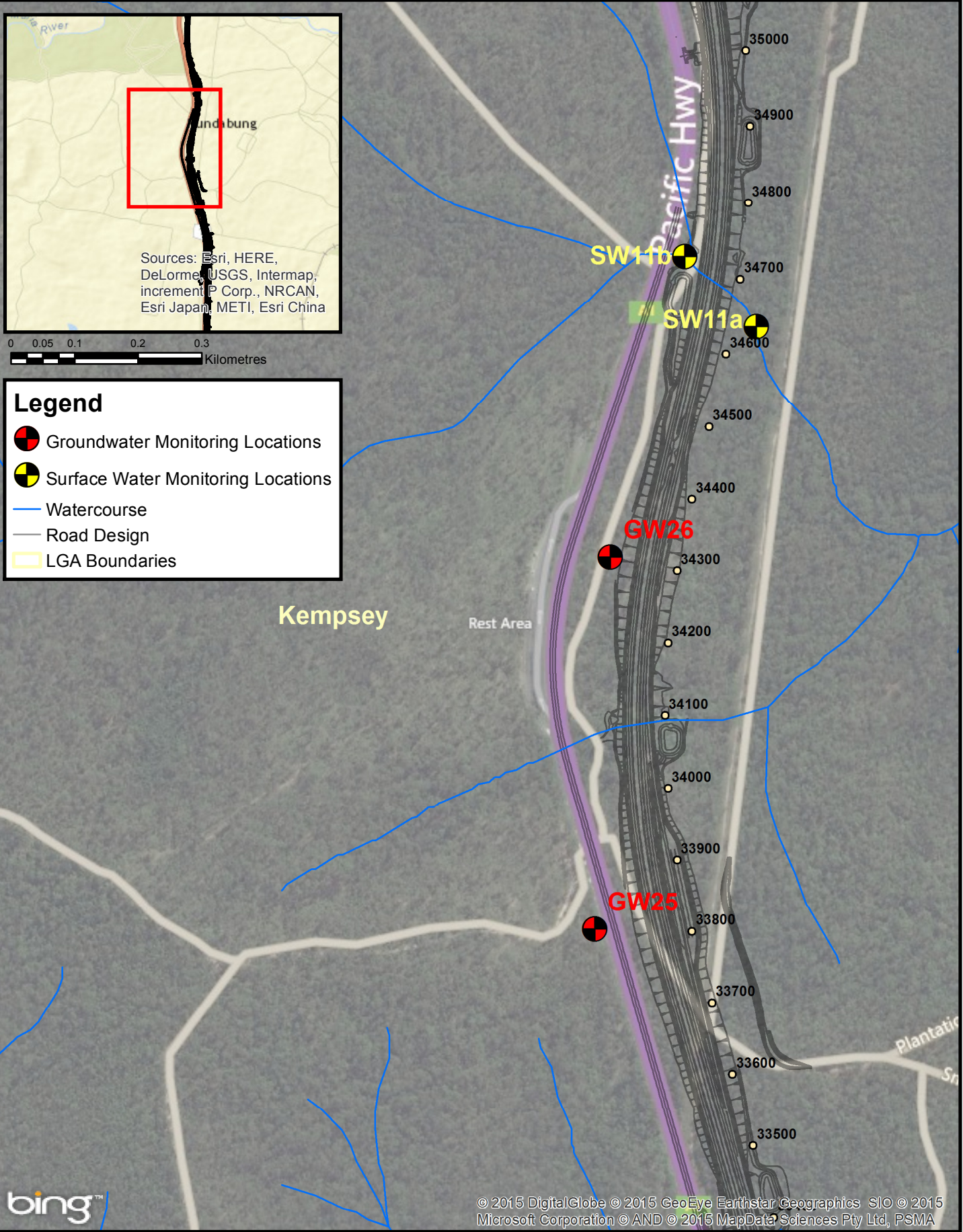
Surface & groundwater monitoring locations

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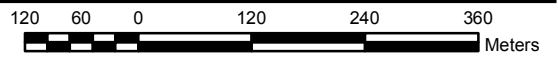
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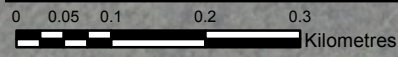


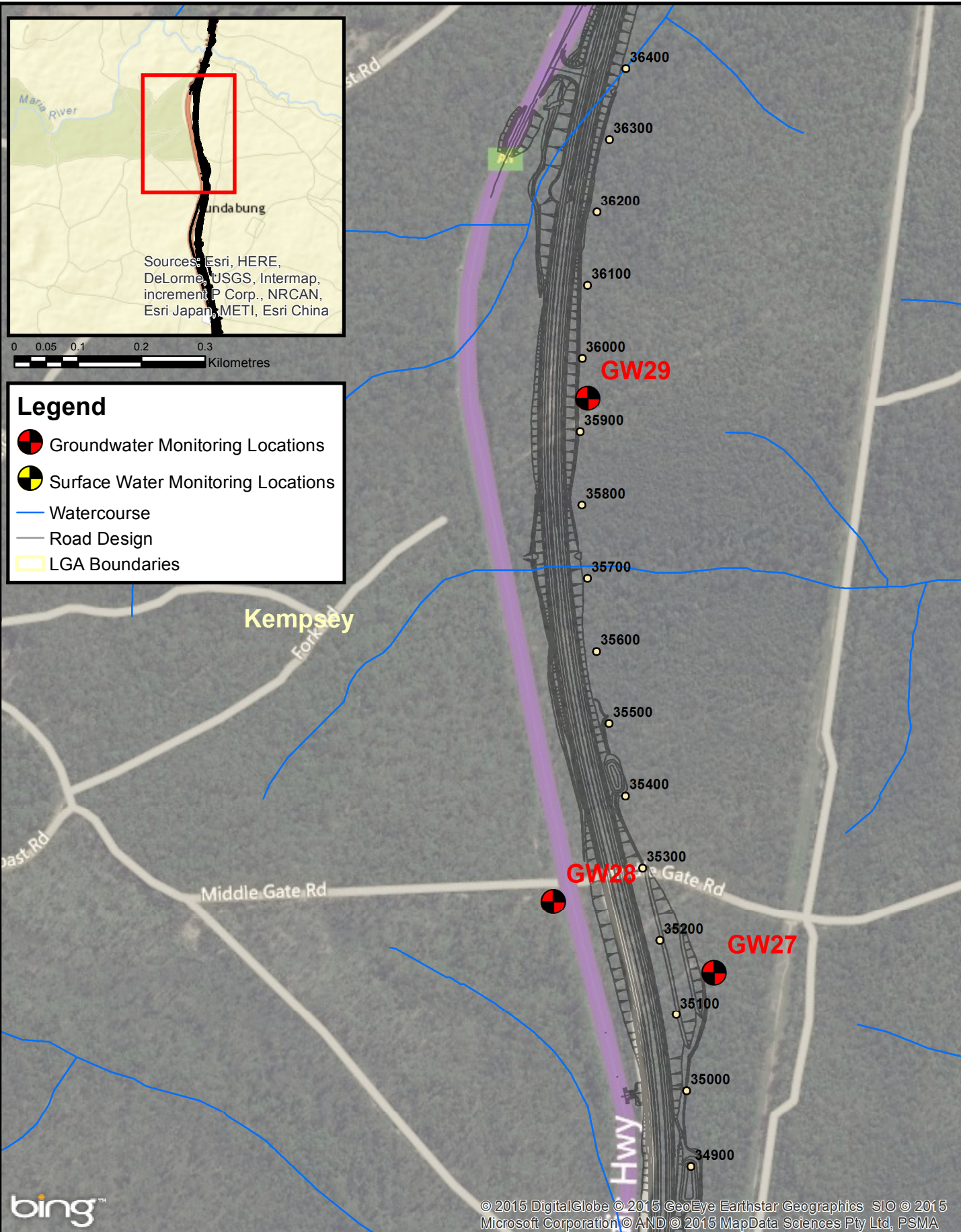
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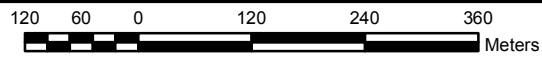
- Groundwater Monitoring Locations
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Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China





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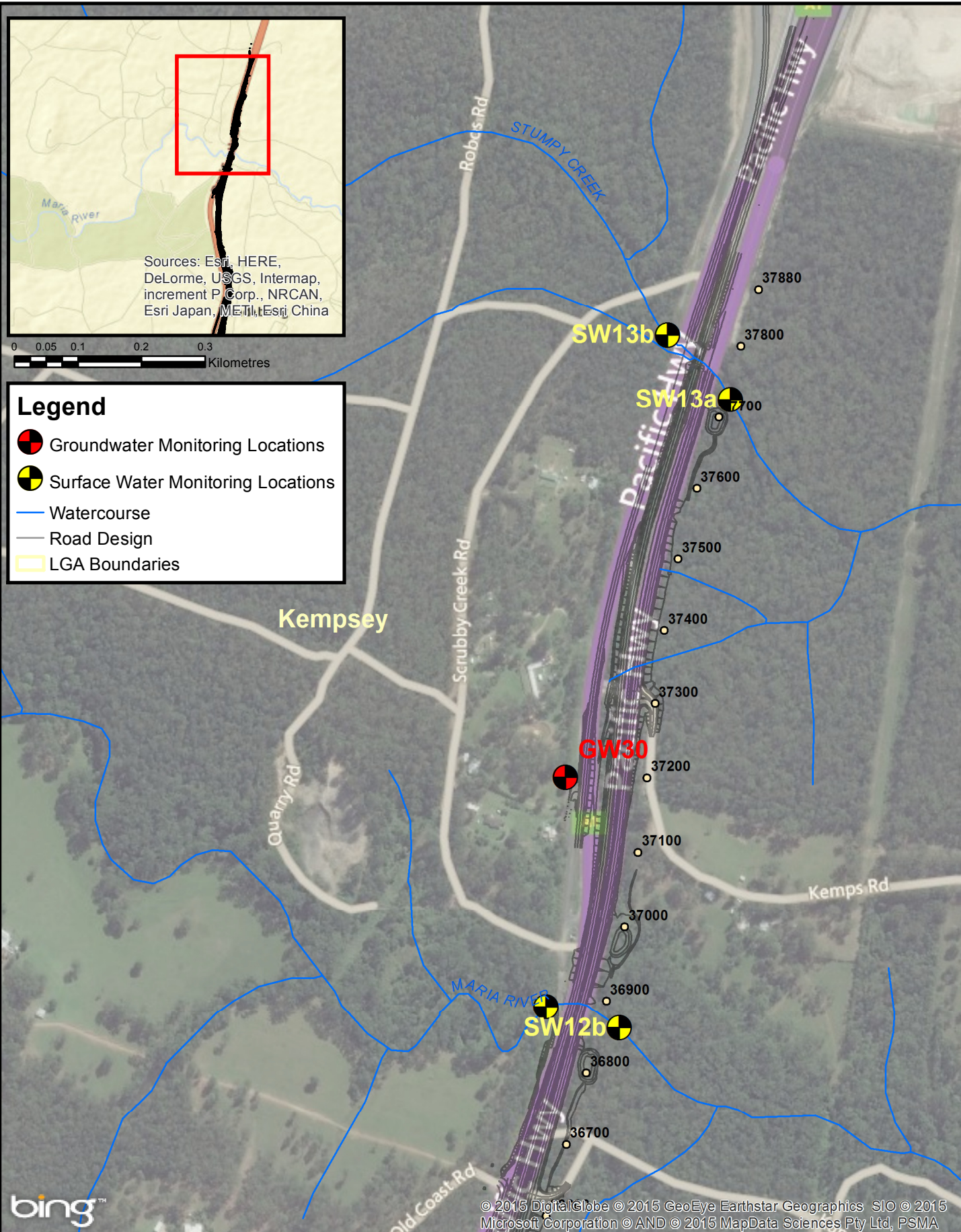
Surface & groundwater monitoring locations

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Appendix B – Rainfall records

Port Macquarie Airport rainfall records from July 2015 to January 2016

Day of month	July 2015	August 2015	September 2015	October 2015	November 2015	December 2015	January 2016
1		0	0	0	2.6	0.2	0
2		0.2	0	0	0.6	0.2	0
3		0	11.4	0	5.2	25.2	0
4		0	0	0	7.8	0	1.8
5		0	1.4	0	39.2	0	81.4
6		0	1.6	0	9.6	0	8.6
7		0	0	0	0	0	3.6
8		0	0.2	0.4	12.2	0	0
9		0	0	1.4	2.4	0	0
10		0	0	0	0	13	0
11		0	0	0	0	0	0
12		0	0	0.2	0.2	0	0
13		0	0	0.4	0	0	0
14		0	0	1.4	9	0	0
15		0	0	8.2	86.4	0	0.6
16		1.8	0	0	1.2	0	17.4
17		0.2	0	0	0	34.8	2.4
18		0	23	0	0	0	0
19		0	10.8	0	0	0	0
20		0	9.6	0	0	0	0
21		0	0.6	0	0	0	0
22	0.6	0	3.4	0.4	0.6	38.2	0
23	0	0.2	1	11.8	1.4	86	
24	0.4	19.8	0.8	1.8	0	34.8	
25	4.2	2.4	9.8	0	0	2	
26	0	0	61.2	0	0	0	
27	0	0	0	23.6	0	5.6	
28	0	0	0	6.6	0.2	0	
29	0	0	0	0	1.8	7.6	
30	0	0	0	0	0.2	0	
31	0	0		0		0	
Highest Daily	5.2	19.8	61.2	23.6	86.4	86.0	81.4
Monthly Total	12.2	24.6	134.8	56.2	180.6	247.6	173.6

Statistics for all years												
Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	158.7	167.8	165	144	121.6	135.9	66.2	64.1	63.3	72.6	159.8	110.6
Median	138	153.5	156.2	112	78.1	138	67.4	35.8	52.8	58.8	142.4	99.2

Telegraph Point rainfall records from July 2015 to January 2016

Day of month	July 2015	August 2015	September 2015	October 2015	November 2015	December 2015	January 2016
1		0	0	0	1.8	0	0
2		0	0	0	0.8	3	0
3		0	8.8	0	0	12.7	0
4		0	0	0	9.6	0	26.4
5		0	1.4	0	60.2	0	33.8
6		0	4	0	21.2	0	17.9
7		0	0	0	0	0	0.1
8		0	0	1.6	21.6	0	0.2
9		0	0	0	4.7	0	0
10		0	0	0	0	20.6	0
11		0	0	0	0	0	0
12		0	0	4.5	0	0	0
13		0	0	2.6	0	0	1.5
14		0	0	51	13.2	0	0
15		0	0	16.6	111	0	0
16		0	0	0	0.8	0	13.5
17		0	0.6	0	0	15	0
18		0	23.4	0	0	0	0
19		0	5.4	0	0	0	0
20		0	8.6	0	0	0	0
21		0	6.4	0	0	0	0
22	0	0	1.4	1	0.7	4	0
23	0	0	0.4	8.9	0.4	65.4	
24	0.4	17.8	0	0.6	0	23.8	
25	3.8	2.4	4	0	0	26	
26	0	0	23.2	0	0	0	
27	0	0	0	15.7	0	0.8	
28	0	0	0	2.6	0.2	0.1	
29	0	0	0	0	0	1	
30	0	0	0	0	7.7	0	
31	0	0		0		0	
Highest Daily	3.8	17.8	23.4	51	111	65.4	33.8
Monthly Total	7	20.2	87.6	105.1	253.9	172.4	151.6

Statistics for all years												
Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	138.7	176	165.4	128	105.7	107.1	67.7	57.7	60.5	83.6	109.8	114.6
Median	115.9	148.6	148.8	85.6	60.2	72.7	37	25.9	43.5	55.3	90.4	95.8

Kempsey airport rainfall records from July 2015 to January 2016

Day of month	July 2015	August 2015	September 2015	October 2015	November 2015	December 2015	January 2016
1			0	0	1	0	0
2			0	0	0.4	10.4	0
3			5	0	1.6	21.8	0
4		0	0.2	0	36	0	5.4
5		0	0.2	0	47	0	2
6		0	8.6	0	10.6	0	8.6
7		0	0	0	0.2	0	0
8		0	0	0	16.4	0	0
9		0	0	0.4	8.4	0	0
10		0	0	0	0	40.2	0
11		0	0	0	0	0.2	0
12		0	0	1.2	0	0	0
13		0	0	0	0	0	0.2
14		0	0	71.6	15	0	0
15		0	0	4.4	17.4	0	0
16		0	1.6	0	0.4	0	10.6
17		0	2.2	0	0.2	19.2	0.6
18		0	22.6	0.2	0	0	0
19		0	2.2	0.2	0	0	0
20		0	14.2	0	0	0	0
21		0	5	0	0	0	0
22	0.8	0	0.6	0.8	0.6	0	
23	0	0	0.6	4.2	0.2	42	
24	0.2	11.8	0	0.2	0	29.8	
25	2.2	5.6	1	0	0	21.4	
26	0	0.2	9.4	0	0	0	
27	0	0	0	5.8	0	8.4	
28	0.2	0.4	0	2.6	0	0.2	
29	0	0.2	0	0	1.2	0	
30	0	0	0	0	0.2	0	
31		0		0		0	
Highest Daily	2.6	11.8	22.6	71.6	47	42	20
Monthly Total	9	18.2	73.4	91.6	156.8	193.6	76.6

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

Sancrox site weather station rainfall records from July 2015 to January 2016

Day of month	July 2015	August 2015	September 2015	October 2015	November 2015	December 2015	January 2016
1		0	0	0	0.4	0.6	0
2		0	7	0	5.6	19.4	0
3		0	0	0	10.4	0.2	2.6
4		0	2.2	0	28.2	0	95.4
5		0	2.4	0	8.4	0	9
6		0	0	0	0	0	2
7		0	0.2	0.4	15.6	0	0
8		0	0	0.6	0.8	0	0.2
9		0	0	0.2	0	18.6	0.2
10		0	0	0	0	0.2	0
11		0	0	0	0.2	0	0
12		0	0	0	0	0	0
13		0	0	11.4	9.4	0	0
14		0	0	38.2	62.6	0	1.2
15		1	0	0.2	1.6	0	14.4
16		0	0	0	0	26.6	3
17		0	27.2	0	0	0.2	0.2
18		0	13.6	0	0	0	0
19		0	7.8	0	0	0	0
20		0	3.6	0	0	0	0
21		0	3.2	2.2	1.2	113	0
22	0.2	0	1.6	7.2	0.4	76.6	20.8
23	0.2	19.6	0.6	2	0	32	
24	3.6	1.8	5.4	0.2	0	1.4	
25	0	0	59	0	0	0.2	
26	0	0	0	25.6	0	8.8	
27	0	0.2	0.2	5.6	0	0	
28	0	0	0	0.2	2.6	2	
29	0	0	0	0	0.2	0.2	
30	0	0	0	0	0	0	
31	0	0		2.6		0	

Telegraph Point site weather station rainfall records from July 2015 to January 2016

Day of month	July 2015	August 2015	September 2015	October 2015	November 2015	December 2015	January 2016
1		0.2	0.2	0	1	2.4	0
2		0	7.4	0	1.6	11.4	0
3		0	0	0	9.8	0	12
4		0	0.4	0	50.2	0	30.8
5		0	6.2	0	17.6	0	28.2
6		0	3	0	0	0	0
7		0	0.2	0	30.2	0	0
8		0	0	1.6	1.2	0	0
9		0	0	0	0.2	20.4	0
10		0	0	0	0	0	0.2
11		0	0	2.8	0.2	0	0
12		0	0	0	0	0	0
13		0	0	10.6	12	0	0
14		0	0	6.6	54.4	0	0.6
15		0	0	0	0.4	0	14
16		0	0.2	0	0	13.8	1.2
17		0	27.2	0.2	0	0.2	0
18		0.2	9.2	0	0	0	0
19		0	5.4	0	0	0	0
20		0	3.4	0	0	0	0
21		0	0.8	2.8	0.4	10.2	0
22	0.2	0.2	1.6	9.4	0.6	54.4	
23	0.4	11	0	0.2	0	32.6	
24	4	2	3.6	0	0	8	
25	0.2	0.6	40.2	0	0	0.2	
26	0	0	0	13.6	0	3.8	
27	0	0	0	2.2	0	0	
28	0	0	0	0.2	4.8	1	
29	0	0	0.2	0	1	0.2	
30	0.2	0	0	0	0.2	0	
31	0	0		1.4		0	

Kundabung site weather station rainfall records from July 2015 to January 2016

Day of month	July 2015	August 2015	September 2015	October 2015	November 2015	December 2015	January 2016
1		0	0	0	1.4	2.8	0
2		0	7	0	1.4	11	0
3		0.2	0	0	44	0	10.4
4		0	0.4	0	33.4	1.2	28.4
5		0	5	0	16	0	11.2
6		0	0.2	0	0.2	0	0
7		0	0.2	0	11.8	0	0
8		0	0	1.4	1.6	0	0
9		0	0	0.2	0	5.4	0.4
10		0	0	0	0	0.2	0
11		0.2	0	1.4	0.2	0	0
12		0	0	1.2	0	0	0
13		0	0	22.8	25.6	0	0
14		0	0	25.2	27	0	0
15		0	0.2	0	0.6	0	12
16		0	0.4	0	0	9	0.4
17		0.2	22.4	0	0	0	0
18		0	5.8	0	0	0	0
19		0	10	0	0	0	0
20		0	1	0	0	0	0
21		0	0.6	2.6	0.8	9.4	0
22	0	0	16.2	4	0	43.4	16.8
23	0.4	8.6	0	0.4	8.4	37.6	
24	2.4	1.2	5	0	0.2	13	
25	0.2	0.2	24.4	0	0	0	
26	0	0.2	0.2	3.2	0	1	
27	0.2	0.6	0	0.8	0	0.2	
28	0	0.2	0	0	7.8	1	
29	0	0	0	0	1	0	
30	0	0	0	0	0	0	
31	0	0		1		0	

Appendix C – Surface water quality sampling results

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

No.	Parameter	Unit	11/08/15 (D)			25/08/15 (W)			18/09/15 (W)			26/09/15 (W)			28/09/15 (D)			12/10/15 (D)			15/10/15 (W)		
			SW1a [#] (US)	SW1b (US)	SW1c [#] (DS)	SW1a (US)	SW1b (US)	SW1c (DS)	SW1a (US)	SW1b (US)	SW1c (DS)	SW1a (US)	SW1b (US)	SW1c (DS)	SW1a (US)	SW1b (US)	SW1c (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)	SW1a (US)	SW1b (US)	SW1c (DS)
1	Temperature	°C	10	13	11	15	16	17	16	17	18	16	16	17	15	15	16	17	20	20	20	20	22
2	Electrical conductivity (EC)	uS/cm	1047	1746	627	650	1244	1322	284	532	529	222	331	377	311	530	619	737	1132	1262	177	311	465
3	Dissolved oxygen (DO)	%	30	80	42	46	72	36	85	94	86	76	87	85	52	82	70	17	45	43	52	68	58
4	pH		6.5	7.1	7.5	6.0	7.1	6.9	6.2	7.9	6.9	6.8	6.7	6.7	6.2	6.6	7.3	6.1	6.6		7.5	6.9	7.4
5	Turbidity (NTU)	NTU	38	6	14	26	31	50	90	392	362	31	49	91	21	33	46	67	27	25	40	63	80
6	Total suspended solids (TSS)	mg/L	10	<5	12	5	10	19	26	365	79	<5	5	12	<5	<5	<5	14	12	6	<5	7	13
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L	<0.01	<0.01	<0.01	0.02	0.01	<0.01	0.21	0.06	0.05				0.33	0.2	0.12	0.06	0.05	<0.01	0.59	0.31	0.2
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	0.002	<0.001	<0.001	<0.001
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<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	0.003	0.002				<0.001	0.001	0.001	<0.001	<0.001	<0.001	0.001	0.001	0.002
13	Iron (Fe)	mg/L	<0.05	0.18	0.16	0.39	0.08	0.28	0.25	<0.05	0.12				0.64	0.48	0.6	0.77	1.12	0.25	0.81	0.51	0.42
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	0.89	0.181	0.16	0.29	0.151	0.446	0.023	0.078	0.08				0.028	0.092	0.124	0.564	1.02	0.914	0.02	0.044	0.065
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	0.002	<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	0.016	<0.005	<0.005	0.046	0.01	0.011	0.012	<0.005	0.013				0.007	0.006	0.012	0.008	0.006	0.006	<0.005	<0.005	0.014
20	Total Nitrogen (TN)	mg/L	0.2	0.2	0.9	0.4	0.9	1.2	0.7	2	1.3	0.6	1	1	0.4	0.7	0.6	0.4	0.5	0.6	0.7	0.8	0.6
21	Total Phosphorous (TP)	mg/L	0.12	0.07	0.08	<0.01	0.01	0.06	0.04	0.26	0.14	0.03	0.03	0.05	0.01	0.01	0.04	0.01	<0.01	0.05	0.08	0.04	0.05
22	C6 - C10 Fraction	ug/L			<20																		
23	>C10 - C16 Fraction	ug/L			<100																		
24	>C16 - C34 Fraction	ug/L			330																		
25	>C34 - C40 Fraction	ug/L			380																		

[#] - 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	23/10/15 (W)			6/11/15 (W)			9/11/15 (W)			19/11/15 (D)			3/12/15 (W)			10/12/15 (W)			18/12/15 (D)		
			SW1a (US)	SW1b (US)	SW1c (DS)	SW1a (US)	SW1b (US)	SW1c (DS)	SW1a (US)	SW1b (US)	SW1c (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)	SW1a [#] (US)	SW1b (US)	SW1c (DS)	SW1a [#] (US)	SW1b (US)	SW1c (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)
1	Temperature	°C	19	21	19	20	20	25	20	20	23	20	22	25	21	21	22	22	24	26	23	25	26
2	Electrical conductivity (EC)	uS/cm	679	997	839	242	413	508	270	437	496	220	921	1009	832	792	869	399	685	1104	471	957	1260
3	Dissolved oxygen (DO)	%	30	86	55	66	75	94	63	69	84	15	78	71	21	61	40	26	47	65	24	88	84
4	pH		6.8	7.2	7.4	6.1	6.5	6.6	6.5	6.7	6.7	6.6	6.9	7.0	6.4	7.0	6.9	6.5	6.9	7.0	7.7	7.7	7.8
5	Turbidity (NTU)	NTU	44	14	62	38	43	53	27	33	35	32	15	19	76	61	121	43	215	93	71	60	166
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	<5	12	<5	7	14	<5	<5	<5	6	12	36	<5	52	23	13	19	56
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L				1.23	0.58	0.2				0.22	0.15	0.06	0.07	0.08	<0.01				0.04	0.03	0.01
9	Arsenic (As)	mg/L				<0.001	<0.001	<0.001				0.001	<0.001	<0.001	<0.001	<0.001	0.001				<0.001	<0.001	<0.001
10	Cadmium (Cd)	mg/L				<0.0001	<0.0001	<0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				<0.0001	<0.0001	<0.0001
11	Chromium (Cr)	mg/L				<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001
12	Copper (Cu)	mg/L				0.002	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				1.15	0.82	0.42				3.53	0.6	0.44	3.89	0.28	1.31				4.27	0.13	0.12
14	Lead (Pb)	mg/L				<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001
15	Manganese (Mn)	mg/L				0.034	0.039	0.046				0.579	0.261	0.19	0.532	0.293	0.547				0.663	0.266	0.161
16	Mercury (Hg)	mg/L				<0.0001	<0.0001	<0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				<0.0001	<0.0001	<0.0001
17	Nickel (Ni)	mg/L				<0.001	<0.001	<0.001				0.001	<0.001	<0.001	<0.001	<0.001	0.002				<0.001	<0.001	0.001
18	Silver (Ag)	mg/L				<0.001	<0.001	<0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				<0.001	<0.001	<0.001
19	Zinc (Zn)	mg/L				0.046	0.008	0.01				<0.005	<0.005	<0.005	<0.005	0.01	<0.005				<0.005	<0.005	0.022
20	Total Nitrogen (TN)	mg/L	0.9	1.4	0.6	0.9	1.1	0.8	1	0.8	0.9	0.9	0.7	0.8	4.7	2.8	3.3	0.6	2	1.6	0.3	2.3	1
21	Total Phosphorous (TP)	mg/L	0.02	0.03	0.06	0.03	0.03	0.05	0.02	0.01	0.03	<0.01	0.05	<0.01	0.04	0.03	0.08	0.09	0.08	0.03	<0.01	<0.01	0.06
22	C6 - C10 Fraction	ug/L	19	21	19	20	20	25	20	20	23	20	22	25	21	21	22	22	24	26	23	25	26
23	>C10 - C16 Fraction	ug/L	679	997	839	242	413	508	270	437	496	220	921	1009	832	792	869	399	685	1104	471	957	1260
24	>C16 - C34 Fraction	ug/L	30	86	55	66	75	94	63	69	84	15	78	71	21	61	40	26	47	65	24	88	84
25	>C34 - C40 Fraction	ug/L	6.8	7.2	7.4	6.1	6.5	6.6	6.5	6.7	6.7	6.6	6.9	7.0	6.4	7.0	6.9	6.5	6.9	7.0	7.7	7.7	7.8

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

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

No.	Parameter	Unit	6/01/16 (W)			14/01/16 (D)			16/01/16 (W)			SW1a [#]			SW1b [#]			SW1c [#]					
			SW1a (US)	SW1b (US)	SW1c (DS)	SW1a [#] (US)	SW1b [#] (US)	SW1c [#] (DS)	SW1a (US)	SW1b (US)	SW1c (DS)	SW1a [#] (US)	SW1b (US)	SW1c (DS)	SW1a [#] (US)	SW1b (US)	SW1c (DS)	SW1a (US)	SW1b [#] (US)	SW1c [#] (DS)			
1	Temperature	°C	22	22	22	23	28	27	20	20	23												
2	Electrical conductivity (EC)	uS/cm	121	464	434	488	1053	1132	261	658	744												
3	Dissolved oxygen (DO)	%	78	83	80	4	55	65	30	52	75												
4	pH		6.9	7.1	7.2	7.4	6.9	7.2	6.3	6.7	6.8												
5	Turbidity (NTU)	NTU	57	49	60	19	17	73	27	56	103												
6	Total suspended solids (TSS)	mg/L	<5	7	8	15	<5	18	12	17	34												
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L	0.67	0.66	0.61	0.13	0.01	<0.01															
9	Arsenic (As)	mg/L	0.001	<0.001	<0.001	0.003	<0.001	<0.001															
10	Cadmium (Cd)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001															
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001															
12	Copper (Cu)	mg/L	0.001	<0.001	0.001	<0.001	<0.001	<0.001															
13	Iron (Fe)	mg/L	0.76	0.7	0.68	26	1.02	0.16															
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001															
15	Manganese (Mn)	mg/L	0.016	0.028	0.021	1.47	0.695	0.641															
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001															
17	Nickel (Ni)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001															
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001															
19	Zinc (Zn)	mg/L	0.006	<0.005	0.007	0.007	0.007	0.009															
20	Total Nitrogen (TN)	mg/L	1	1	1	1	0.4	0.4	0.5	0.5	0.6												
21	Total Phosphorous (TP)	mg/L	0.04	0.02	0.04	0.04	0.02	0.16	0.01	0.02	0.04												
22	C6 - C10 Fraction	ug/L																					
23	>C10 - C16 Fraction	ug/L																					
24	>C16 - C34 Fraction	ug/L																					
25	>C34 - C40 Fraction	ug/L																					

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

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

No.	Parameter	Unit	11/08/15 (D)		25/08/15 (W)		18/09/15 (W)		26/09/15 (W)		28/09/15 (D)		12/10/15 (D)		15/10/15 (W)		23/10/15 (W)		6/11/15 (W)	
			SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a* (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)
1	Temperature	°C	9.5	11.1	15.9	20.4	20.1	19.6	15.6	16.4	21.4	19.9	22.4	24.5	20.7	25.2	19.9	19.9	20.4	21.9
2	Electrical conductivity (EC)	uS/cm	452	1208	571	1235	883	1317	316	951	526	766	531	908	510	881	518	831	342	652
3	Dissolved oxygen (DO)	%	36	50	20	64	107	121	51	79	52	86	41	65	21	89	20	26	17	53
4	pH		6.3	4.0	6.3	3.6	6.4	3.4	6.0	3.8	5.7	3.5	5.8	3.4	6.2	3.7	5.9	4.0	6.0	6.2
5	Turbidity (NTU)	NTU	15	7	29	19	55	15	22	17	18	8	15	11	12	12	23	19	17	54
6	Total suspended solids (TSS)	mg/L	6	14	13	18	18	18	<5	6	<5	<5	<5	<5	6	8	<5	9	7	12
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.02	0.15	0.02	0.26	0.01	0.46			0.07	0.34	0.09	0.23	0.07	0.19			0.11	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			0.02	<0.001
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.002			<0.001	0.001	0.001	<0.001	<0.001	<0.001			<0.001	<0.001
13	Iron (Fe)	mg/L	0.71	3.39	0.53	2.5	0.57	4.89			0.85	1.41	1.04	1.04	1.01	0.81			2.65	1.56
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	0.089	5.93	0.886	5.19	1.28	4.61			0.07	2.64	0.162	3.58	0.054	2.86			0.424	1.41
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	0.004	0.001	0.006	0.002	0.007			0.002	0.006	0.002	0.005	0.001	0.003			0.002	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
19	Zinc (Zn)	mg/L	0.006	0.017	<0.005	0.02	0.005	0.026			0.006	0.029	0.014	0.019	<0.005	0.012			<0.005	<0.005
20	Total Nitrogen (TN)	mg/L	2.4	0.4	0.8	0.7	1.6	1.3	0.8	0.8	0.6	0.3	0.8	0.2	0.8	0.2	0.7	0.3	1.1	1.5
21	Total Phosphorous (TP)	mg/L	0.04	0.04	0.05	0.05	0.1	0.13	0.06	0.04	0.05	0.03	0.04	0.02	0.04	<0.01	0.06	0.03	0.09	0.06

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

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

No.	Parameter	Unit	9/11/15 (W)		19/11/15 (D)		3/12/15 (W)		10/12/15 (W)		18/12/15 (D)		6/01/16 (W)		14/01/16 (D)		16/01/16 (W)		SW2a (DS)	SW2b (US)
			SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)	SW2a (DS)	SW2b (US)		
1	Temperature	°C	20.8	21.6	19.8	22.4	21.8	21.7	23.2	24.7	21.3	21.9	23.6	23.2	23.1	26.2	21.8	21.2		
2	Electrical conductivity (EC)	uS/cm	524	558	372	374	504	505	533	566	581	623	481	257	402	480	398	487		
3	Dissolved oxygen (DO)	%	23	42	9	54	9	12	62	46	11	4	53	42	4	26	7	9		
4	pH		6.1	5.9	6.1	5.9	5.9	6.4	6.4	6.7	7.0	7.2	7.0	6.8	6.7	6.6	6.4	6.5		
5	Turbidity (NTU)	NTU	18	48	17	17	14	33	15	30	21	26	28	27	9	39	20	31		
6	Total suspended solids (TSS)	mg/L	5	15	<5	<5	<5	12	<5	16	8	22	12	32	6	10	8	26		
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L			0.06	0.02	0.03	0.03			0.02	<0.01	0.02	0.08	0.05	<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				
10	Cadmium (Cd)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
11	Chromium (Cr)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
12	Copper (Cu)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	0.001	<0.001	<0.001				
13	Iron (Fe)	mg/L			1.52	1.1	1.18	1.32			0.71	6.49	0.2	1.81	3.25	3.23				
14	Lead (Pb)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
15	Manganese (Mn)	mg/L			0.19	0.326	0.191	0.547			0.957	1.36	0.818	0.138	0.259	0.536				
16	Mercury (Hg)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
17	Nickel (Ni)	mg/L			0.002	0.002	0.001	0.002			0.002	0.001	0.002	0.001	0.001	0.001				
18	Silver (Ag)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
19	Zinc (Zn)	mg/L			<0.005	<0.005	<0.005	<0.005			0.005	0.005	<0.005	<0.005	<0.005	<0.005				
20	Total Nitrogen (TN)	mg/L	0.8	1.4	0.7	1.1	0.8	1.5	0.9	1.8	0.8	0.6	0.6	1.5	0.7	1.5	0.6	1.4		
21	Total Phosphorous (TP)	mg/L	0.06	0.08	<0.01	0.04	0.04	0.07	0.04	0.1	0.03	0.03	0.2	0.2	0.07	0.13	0.04	0.14		

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

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

No.	Parameter	Unit	11/08/15 (D)		25/08/15 (W)		18/09/15 (W)		26/09/15 (W)		28/09/15 (D)		12/10/15 (D)		15/10/15 (W)		23/10/15 (W)		6/11/15 (W)	
			SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)
1	Temperature	°C	15.4	15.4	17.9	17.9	20.3	20.3	17.8	17.8	19.3	19.2	24.8	24.1	24.5	24.0	22.3	22.4	23.6	23.8
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	93	93	92	111	109	100	96	101	95	72	70	95	87	92	95	86	92
4	pH		7.4	7.6	7.1	7.4	7.4	7.5	7.4	7.5	7.3	7.4			7.4	7.4	7.1	7.3	6.9	7.1
5	Turbidity (NTU)	NTU	16	10	6	7	94	54	29	21	50	36	14	9	26	11	32	20	10	15
6	Total suspended solids (TSS)	mg/L	6	<5	<5	<5	59	41	<5	<5	38	11	<5	<5	14	<5	<5	<5	<5	<5
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	<0.10	<0.10	<0.01	<0.01	<0.10	<0.10			<0.10	<0.10	<0.10	<0.10	0.04	0.05			0.04	0.03
9	Arsenic (As)	mg/L	<0.010	<0.010	0.001	0.002	<0.010	<0.010			<0.010	<0.010	<0.010	<0.010	0.002	<0.001			<0.001	<0.001
10	Cadmium (Cd)	mg/L	<0.0010	<0.0010	<0.0001	<0.0001	<0.0010	<0.0010			<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001			<0.0001	<0.0001
11	Chromium (Cr)	mg/L	<0.010	<0.010	<0.001	<0.001	<0.010	<0.010			<0.010	<0.010	<0.010	<0.010	<0.001	<0.001			<0.001	<0.001
12	Copper (Cu)	mg/L	<0.010	<0.010	<0.001	<0.001	<0.010	<0.010			<0.010	<0.010	<0.010	<0.010	<0.001	<0.001			<0.001	<0.001
13	Iron (Fe)	mg/L	<0.50	<0.50	<0.05	<0.05	<0.10	<0.10			<0.10	<0.10	<0.50	<0.50	<0.05	<0.05			0.08	0.07
14	Lead (Pb)	mg/L	<0.010	<0.010	<0.001	<0.001	<0.010	<0.010			<0.010	<0.010	<0.010	<0.010	<0.001	<0.001			<0.001	<0.001
15	Manganese (Mn)	mg/L	0.032	0.028	0.032	0.034	0.024	0.022			0.02	0.016	0.028	0.024	0.036	0.038			0.05	0.045
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	<0.010	<0.010	<0.001	<0.001	<0.010	<0.010			<0.010	<0.010	<0.010	<0.010	<0.001	<0.001			<0.001	<0.001
18	Silver (Ag)	mg/L	<0.010	<0.010	0.001	<0.001	<0.010	<0.010			<0.010	<0.010	<0.010	<0.010	<0.001	<0.001			<0.001	<0.001
19	Zinc (Zn)	mg/L	<0.050	<0.050	<0.005	<0.005	<0.050	<0.050			<0.050	<0.050	<0.050	<0.050	<0.005	<0.005			<0.005	<0.005
20	Total Nitrogen (TN)	mg/L	0.3	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	0.2	<0.2	<0.2	<0.2	<0.2	0.2	0.2	0.2	0.4
21	Total Phosphorous (TP)	mg/L	0.04	0.04	0.11	0.15	0.07	0.05	0.04	0.03	0.05	0.05	0.04	0.04	0.06	0.02	0.03	0.04	0.16	0.1

Note - Elevated turbidity for 18 September, 26 September and 28 September 2015 sampling events attributable to wind and wave action, and long-shore currents close to shore at time of sampling.

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

No.	Parameter	Unit	9/11/15 (W)		19/11/15 (D)		3/12/15 (W)		10/12/15 (W)		18/12/15 (D)		6/01/16 (W)		14/01/16 (D)		16/01/16 (W)		SW3a (US)	SW3b (DS)
			SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)	SW3a (US)	SW3b (DS)		
1	Temperature	°C	23.8	23.5	22.1	22.1	23.3	23.3	25.3	25.0	25.7	25.6	24.9	24.9	26.4	26.6	24.9	24.9		
2	Electrical conductivity (EC)	uS/cm	8000	8000	4532	4482	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000		
3	Dissolved oxygen (DO)	%	75	76	77	70	82	81	86	89	78	79	81	84	81	80	78	77		
4	pH		6.8	7.0	6.6	6.8	7.1	7.3	7.3	7.5	7.3	7.7	6.9	7.3	6.8	7.0	6.8	7.0		
5	Turbidity (NTU)	NTU	26	18	31	31	17	11	15	11	9	9	32	37	15	14	18	11		
6	Total suspended solids (TSS)	mg/L	<5	<5	5	6	<5	<5	<5	<5	<5	<5	<5	10	<5	<5	<5	<5		
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L			0.3	0.31	<0.01	<0.01			<0.01	<0.01	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	0.003	0.003	<0.001	<0.001				
10	Cadmium (Cd)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
11	Chromium (Cr)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
12	Copper (Cu)	mg/L			0.001	0.001	0.003	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
13	Iron (Fe)	mg/L			0.38	0.37	<0.05	<0.05			<0.05	<0.05	0.19	0.19	0.08	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				
15	Manganese (Mn)	mg/L			0.028	0.026	0.058	0.057			0.046	0.045	0.037	0.035	0.035	0.033				
16	Mercury (Hg)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
17	Nickel (Ni)	mg/L			0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
18	Silver (Ag)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
19	Zinc (Zn)	mg/L			<0.005	<0.005	<0.005	<0.005			<0.005	<0.005	<0.005	<0.005	<0.005	0.007				
20	Total Nitrogen (TN)	mg/L	0.5	0.5	0.7	0.7	<0.2	<0.2	0.2	0.5	<0.2	<0.2	0.5	0.5	0.4	0.2	<0.2	<0.2		
21	Total Phosphorous (TP)	mg/L	0.08	0.06	0.02	0.05	<0.02	<0.02	0.03	0.09	<0.02	<0.02	0.08	0.04	0.03	0.03	<0.02	<0.02		

Note - Elevated turbidity for 9 November and 19 November 2015 and 6 January 2016 sampling events attributable to wind and wave action, and long-shore currents close to shore at time of sampling.

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

No.	Parameter	Unit	11/08/15 (D)	25/08/15 (W)	18/09/15 (W)	26/09/15 (W)	28/09/15 (D)	12/10/15 (D)	15/10/15 (W)	23/10/15 (W)	6/11/15 (W)
			SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)
1	Temperature	°C	19.3	18.5	20.1	18.6	25.3	28.7	30.0	20.9	27.8
2	Electrical conductivity (EC)	uS/cm	574	833	1913	1733	1779	2729	2166	2499	689
3	Dissolved oxygen (DO)	%	74	52	110	71	152	89	97	37	70
4	pH		5.9	5.5	5.7	5.3	7.0		6.8	6.9	6.7
5	Turbidity (NTU)	NTU	18	10	7	12	9	10	10	16	17
6	Total suspended solids (TSS)	mg/L	<5	14	6	<5	10	7	8	<5	<5
7	Total Petroleum Hydrocarbons	mg/L									
8	Aluminium (Al)	mg/L	0.02	0.06	0.06		0.02	<0.01	<0.01		0.1
9	Arsenic (As)	mg/L	<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		0.0002
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	<0.001	0.001		0.003	<0.001	<0.001		0.002
13	Iron (Fe)	mg/L	0.34	1.14	0.24		0.05	0.08	0.25		0.09
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001		<0.001
15	Manganese (Mn)	mg/L	0.521	1.84	4.5		2.12	1.21	1.14		1.89
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	0.001	0.002		0.004	0.001	<0.001		0.017
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001		<0.001
19	Zinc (Zn)	mg/L	0.112	0.038	0.032		0.021	<0.005	<0.005		0.031
20	Total Nitrogen (TN)	mg/L	0.7	0.6	0.6	18.4	1.6	1.1	0.8	0.9	2
21	Total Phosphorous (TP)	mg/L	0.04	0.02	0.02	0.02	0.02	0.04	0.03	0.04	0.04

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

No.	Parameter	Unit	9/11/15 (W)	19/11/15 (D)	3/12/15 (W)	10/12/15 (W)	18/12/15 (D)	6/01/16 (W)	14/01/16 (D)	16/01/16 (W)	
			SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)	SW5b (DS)
1	Temperature	°C	22.3	25.2	24.7	26.2	27.0	25.0	26.4	22.6	
2	Electrical conductivity (EC)	uS/cm	1006	696	1003	1154	1249	1017	1249	1457	
3	Dissolved oxygen (DO)	%	85	79	38	55	28	101	7	21	
4	pH		6.5	6.4	6.9	7.2	7.7	7.1	6.8	6.7	
5	Turbidity (NTU)	NTU	13	8	23	15	38	8	12	21	
6	Total suspended solids (TSS)	mg/L	13	<5	<5	<5	7	8	<5	9	
7	Total Petroleum Hydrocarbons	mg/L									
8	Aluminium (Al)	mg/L		0.03	0.04		0.01	<0.01	<0.01		
9	Arsenic (As)	mg/L		<0.001	0.004		0.003	0.002	0.001		
10	Cadmium (Cd)	mg/L		<0.0001	<0.0001		<0.0001	<0.0001	<0.0001		
11	Chromium (Cr)	mg/L		<0.001	0.003		<0.001	<0.001	<0.001		
12	Copper (Cu)	mg/L		0.001	<0.001		<0.001	<0.001	<0.001		
13	Iron (Fe)	mg/L		0.39	0.41		0.18	0.07	0.12		
14	Lead (Pb)	mg/L		<0.001	<0.001		<0.001	<0.001	<0.001		
15	Manganese (Mn)	mg/L		0.154	4.94		4.27	0.364	1.4		
16	Mercury (Hg)	mg/L		<0.0001	<0.0001		<0.0001	<0.0001	<0.0001		
17	Nickel (Ni)	mg/L		0.003	0.001		<0.001	0.006	<0.001		
18	Silver (Ag)	mg/L		<0.001	<0.001		<0.001	<0.001	<0.001		
19	Zinc (Zn)	mg/L		0.005	<0.005		<0.005	0.021	<0.005		
20	Total Nitrogen (TN)	mg/L	1	0.5	1.2	1.9	1.4	0.5	0.6	0.5	
21	Total Phosphorous (TP)	mg/L	0.02	<0.01	0.05	0.1	0.06	0.01	0.03	0.03	

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

No.	Parameter	Unit	11/08/15 (D)		25/08/15 (W)		18/09/15 (W)		26/09/15 (W)		28/09/15 (D)		12/10/15 (D)		15/10/15 (W)		23/10/15 (W)		6/11/15 (W)	
			SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)
1	Temperature	°C	15.7	16.3	18.2	19.5	20.1	19.8	17.4	17.7	19.6	20.1	25.5	24.0	23.8	24.8	23.5	24.0	23.9	23.8
2	Electrical conductivity (EC)	uS/cm	7728	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	3969	5436
3	Dissolved oxygen (DO)	%	99	104	109	110	106	100	95	91	98	102	76	79	85	92	92	85	89	91
4	pH		7.1	7.1	7.1	7.0	7.1	7.0	6.5	6.7	7.0	6.9			7.1	7.0	7.0	6.8	7.0	6.7
5	Turbidity (NTU)	NTU	7	11	7	9	10	11	9	13	8	15	11	12	9	13	11	14	12	14
6	Total suspended solids (TSS)	mg/L	13	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	7	6
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.02	0.01	<0.01	<0.01	<0.01	<0.01			0.02	0.01	0.04	0.04	<0.01	<0.01			0.07	0.05
9	Arsenic (As)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	0.001	<0.001	<0.001	<0.001			<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	0.19	0.18	0.09	0.06	<0.05	<0.05			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05			0.34	0.18
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001
15	Manganese (Mn)	mg/L	0.154	0.122	0.152	0.137	0.167	0.158			0.176	0.14	0.181	0.178	0.159	0.125			0.072	0.14
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	0.006	0.005	0.006	0.005	<0.005	0.006			<0.005	<0.005	0.007	0.01	<0.005	<0.005			<0.005	<0.005
20	Total Nitrogen (TN)	mg/L	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.1	0.1	0.2	0.5	0.3	0.2	0.2	0.2	0.3	0.4
21	Total Phosphorous (TP)	mg/L	0.08	0.03	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.01	0.02	<0.01	0.01	0.03	0.02	0.03	0.02

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

No.	Parameter	Unit	9/11/15 (W)		19/11/15 (D)		3/12/15 (W)		10/12/15 (W)		18/12/15 (D)		6/01/16 (W)		14/01/16 (D)		16/01/16 (W)		SW6a (US)	SW6b (DS)
			SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)	SW6a (US)	SW6b (DS)		
1	Temperature	°C	23.8	23.2	24.4	24.8	25.1	25.3	26.5	26.6	26.4	27.3	24.7	24.2	26.6	27.2	24.8	25.3		
2	Electrical conductivity (EC)	uS/cm	2159	2089	693	602	725	1380	504	811	778	1568	286	497	307	459	340	456		
3	Dissolved oxygen (DO)	%	70	68	62	77	70	59	95	87	83	85	83	65	77	74	73	70		
4	pH		6.5	6.6	6.2	6.4	7.0	6.9	7.3	7.2	7.8	7.6	7.1	6.9	6.9	6.9	6.8	6.7		
5	Turbidity (NTU)	NTU	14	19	22	26	17	22	14	18	14	21	18	42	19	18	26	26		
6	Total suspended solids (TSS)	mg/L	<5	12	<5	<5	5	9	<5	<5	9	13	6	12	<5	8	9	13		
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L			0.3	0.38	0.1	0.12			0.05	0.05	0.11	0.2	0.12	0.12				
9	Arsenic (As)	mg/L			<0.001	0.001	0.002	0.001			0.002	0.001	<0.001	0.001	0.002	0.002				
10	Cadmium (Cd)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
11	Chromium (Cr)	mg/L			0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
12	Copper (Cu)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	0.001	<0.001				
13	Iron (Fe)	mg/L			0.87	0.47	0.44	0.57			0.43	0.45	0.38	0.79	0.54	0.67				
14	Lead (Pb)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
15	Manganese (Mn)	mg/L			0.105	0.034	0.039	0.059			0.016	0.029	0.01	0.03	0.018	0.024				
16	Mercury (Hg)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
17	Nickel (Ni)	mg/L			<0.001	<0.001	0.002	<0.001			<0.001	<0.001	<0.001	0.001	<0.001	0.001				
18	Silver (Ag)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
19	Zinc (Zn)	mg/L			<0.005	<0.005	0.037	0.006			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005				
20	Total Nitrogen (TN)	mg/L	0.9	0.7	0.9	0.7	0.4	0.5	0.5	0.5	0.4	0.3	0.5	0.5	0.4	0.4	0.3	0.4		
21	Total Phosphorous (TP)	mg/L	0.03	0.03	<0.01	<0.01	0.03	0.03	0.08	0.04	0.02	0.01	0.04	0.04	0.02	0.04	0.02	0.03		

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

No.	Parameter	Unit	11/08/15 (D)		25/08/15 (W)		18/09/15 (W)		26/09/15 (W)		28/09/15 (D)		12/10/15 (D)		15/10/15 (W)		23/10/15 (W)		6/11/15 (W)	
			SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)	SW6c (US)	SW6d (DS)
1	Temperature	°C	14.7	14.8	17.4	17.5	19.6	19.8	17.7	17.6	19.1	18.9	24.3	23.9	23.9	23.9	23.6	23.8	24.1	23.8
2	Electrical conductivity (EC)	uS/cm	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	2886	4045
3	Dissolved oxygen (DO)	%	105	104	102	104	103	102	91	91	100	100	81	81	73	80	84	90	87	88
4	pH		6.8	7.1	6.7	6.9	6.8	6.9	6.5	6.8	6.7	6.9			6.7	7.0	6.6	6.8	6.6	6.9
5	Turbidity (NTU)	NTU	8	8	9	8	11	10	7	7	11	11	11	9	11	13	13	11	21	17
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	9	9
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.01	0.01	<0.01	<0.01	<0.01	0.02			0.01	0.01	0.04	<0.01	<0.01	<0.01			0.15	0.09
9	Arsenic (As)	mg/L	<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
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	0.002			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001
13	Iron (Fe)	mg/L	0.17	0.18	<0.05	<0.05	<0.05	<0.05			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05			0.32	0.23
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	0.117	0.113	0.124	0.128	0.144	0.137			0.134	0.137	0.173	0.17	0.137	0.139			0.044	0.058
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	0.006	0.005	<0.005	<0.005	<0.005	0.006			<0.005	<0.005	0.006	<0.005	<0.005	<0.005			<0.005	<0.005
20	Total Nitrogen (TN)	mg/L	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	<0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.4	0.3
21	Total Phosphorous (TP)	mg/L	0.02	0.01	<0.01	<0.01	0.02	0.01	<0.01	<0.01	0.02	0.04	0.02	0.02	<0.01	0.01	0.02	0.02	0.03	0.02

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

No.	Parameter	Unit	9/11/15 (W)		19/11/15 (D)		3/12/15 (W)		10/12/15 (W)		18/12/15 (D)		6/01/16 (W)		14/01/16 (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	°C	21.8	22.0	22.6	22.6	24.7	25.1	26.3	26.5	26.9	27.1	24.3		27.4	27.6	25.2	25.4		
2	Electrical conductivity (EC)	uS/cm	1141	1164	394	360	836	773	1009	1053	1339	1272	291		340	333	376	381		
3	Dissolved oxygen (DO)	%	75	78	69	68	62	63	75	76	77	83	80		78	80	74	74		
4	pH		6.7	6.7	6.6	6.6	6.8	6.9	7.0	7.1	7.2	7.6	7.1		7.0	7.0	6.7	6.7		
5	Turbidity (NTU)	NTU	45	42	26	25	17	17	19	19	17	29	23		20	20	22	21		
6	Total suspended solids (TSS)	mg/L	16	12	7	<5	<5	8	<5	<5	10	24	8	12	12	13	9	8		
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L			0.28	0.28	0.11	0.08			0.06	0.05	0.13	0.17	0.12	0.18				
9	Arsenic (As)	mg/L			0.001	<0.001	0.002	0.002			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				
11	Chromium (Cr)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
12	Copper (Cu)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	0.001	<0.001	<0.001	<0.001	<0.001				
13	Iron (Fe)	mg/L			0.39	0.38	0.46	0.45			0.43	0.42	0.42	0.41	0.52	0.54				
14	Lead (Pb)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
15	Manganese (Mn)	mg/L			0.032	0.032	0.044	0.041			0.03	0.028	0.016	0.015	0.023	0.021				
16	Mercury (Hg)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
17	Nickel (Ni)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
18	Silver (Ag)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
19	Zinc (Zn)	mg/L			<0.005	<0.005	<0.005	<0.005			<0.005	0.008	<0.005	<0.005	<0.005	<0.005				
20	Total Nitrogen (TN)	mg/L	0.8	0.8	0.6	0.6	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.8	0.4	0.4	0.2	0.5		
21	Total Phosphorous (TP)	mg/L	0.04	0.04	<0.01	<0.01	0.02	0.02	0.04	0.03	0.02	0.03	0.02	0.06	0.02	0.03	0.02	0.1		

Table 14 SW7 – Cooperabung Creek (Chainage 19660)

No.	Parameter	Unit	11/08/15 (D)		25/08/15 (W)		18/09/15 (W)		26/09/15 (W)		28/09/15 (D)		12/10/15 (D)		15/10/15 (W)		23/10/15 (W)		6/11/15 (W)	
			SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)
1	Temperature	°C	10.2	11.1	14.4	14.5	15.6	17.5	14.0	14.5	15.1	16.2	18.4	20.0	19.2	20.2	19.1	19.4	19.7	20.1
2	Electrical conductivity (EC)	uS/cm	199	198	207	221	200	363	246	277	194	214	220	248	176	218	213	366	150	176
3	Dissolved oxygen (DO)	%	71	66	67	59	76	80	79	79	79	78	43	60	60	66	41	58	91	94
4	pH		7.8	7.4	7.8	7.2	7.5	6.8	6.7	6.6	7.1	7.0			6.9	6.7	6.9	6.7	6.9	6.9
5	Turbidity (NTU)	NTU	7	9	6	11	7	41	28	38	12	12	11	9	22	25	8	27	44	46
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	6	<5	12	<5	<5	<5	<5	<5	<5	12	6	<5	<5	<5	6
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.06	0.05	0.05	0.05	0.03	0.03			0.16	0.18	0.06	0.03	0.3	0.25			0.69	0.81
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	0.002	0.001	0.002			<0.001	<0.001	<0.001	<0.001	<0.001	0.001			<0.001	<0.001
13	Iron (Fe)	mg/L	0.43	0.39	0.45	0.42	0.37	0.18			0.41	0.38	0.66	0.58	0.64	0.55			0.61	0.65
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	0.043	0.081	0.053	0.096	0.071	0.099			0.039	0.052	0.147	0.224	0.073	0.08			0.027	0.036
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	<0.005	<0.005	<0.005	0.024	0.006	0.014			<0.005	<0.005	0.006	<0.005	<0.005	<0.005			<0.005	<0.005
20	Total Nitrogen (TN)	mg/L	<0.1	<0.1	0.3	0.3	0.1	1	0.7	0.8	0.2	0.3	0.2	0.3	0.5	0.5	0.3	0.6	0.6	0.8
21	Total Phosphorous (TP)	mg/L	<0.01	<0.01	<0.01	<0.01	0.01	0.01	0.03	0.03	0.03	0.02	0.02	0.01	0.02	0.02	0.01	0.02	0.03	0.03

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

No.	Parameter	Unit	9/11/15 (W)		19/11/15 (D)		3/12/15 (W)		10/12/15 (W)		18/12/15 (D)		6/01/16 (W)		14/01/16 (D)		16/01/16 (W)		SW7a (US)	SW7b (DS)
			SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)	SW7a (US)	SW7b (DS)		
1	Temperature	°C	19.4	19.5	19.4	19.8	20.7	21.0	21.9	22.4	20.4	21.1	20.5	20.7	23.5	24.1	20.7	21.0		
2	Electrical conductivity (EC)	uS/cm	149	169	152	198	194	225	189	213	209	266	111	114	164	177	171	206		
3	Dissolved oxygen (DO)	%	79	76	82	74	46	43	45	49	20	31	97	94	71	65	58	54		
4	pH		6.8	6.8	6.6	6.5	6.9	6.8	7.3	7.1	7.7	7.5	7.3	7.1	6.8	6.8	6.9	6.8		
5	Turbidity (NTU)	NTU	38	40	28	28	13	16	11	17	10	28	53	56	22	22	21	21		
6	Total suspended solids (TSS)	mg/L	<5	7	5	6	<5	<5	<5	<5	<5	16	<5	<5	<5	8	5	19		
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L			0.14	0.17	0.14	0.07			0.03	0.04	0.36	0.34	0.15	0.13				
9	Arsenic (As)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
10	Cadmium (Cd)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
11	Chromium (Cr)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
12	Copper (Cu)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	0.001	<0.001	<0.001	<0.001				
13	Iron (Fe)	mg/L			0.35	0.38	0.86	0.7			1.27	0.97	0.34	0.31	0.48	0.48				
14	Lead (Pb)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
15	Manganese (Mn)	mg/L			0.024	0.084	0.108	0.118			0.207	0.312	0.01	0.014	0.035	0.071				
16	Mercury (Hg)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
17	Nickel (Ni)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
18	Silver (Ag)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
19	Zinc (Zn)	mg/L			<0.005	<0.005	<0.005	<0.005			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005				
20	Total Nitrogen (TN)	mg/L	0.6	0.9	0.4	0.4	0.2	0.2	0.2	0.3	0.3	0.4	0.7	0.6	0.3	0.3	0.3	0.2		
21	Total Phosphorous (TP)	mg/L	0.04	0.05	<0.01	<0.01	0.01	0.02	0.02	0.02	<0.01	<0.01	0.06	0.03	0.02	0.02	0.14	0.09		

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

No.	Parameter	Unit	10-11/08/15 (D)			25/08/15 (W)			18/09/15 (W)			26/09/15 (W)			28/09/15 (D)			12/10/15 (D)			15/10/15 (W)		
			SW8a (US)	SW8b [#] (DS)	SW8c (DS)	SW8a (US)	SW8b [#] (DS)	SW8c (DS)	SW8a (US)	SW8b [#] (DS)	SW8c (DS)	SW8a [#] (US)	SW8b [#] (DS)	SW8c (DS)	SW8a (US)	SW8b [#] (DS)	SW8c (DS)	SW8a (US)	SW8b [#] (DS)	SW8c (DS)	SW8a (US)	SW8b [#] (DS)	SW8c (DS)
1	Temperature	°C	DNS	12.4	12.0	DNS	15.6	14.5		18.6	15.3	DNS	15.4	16.3	DNS	17.6	15.0	DNS	20.0	17.5	DNS	19.6	19.1
2	Electrical conductivity (EC)	uS/cm		243	217		259	195		313	325		362	275		505	251		378	239		479	261
3	Dissolved oxygen (DO)	%		45	84		40	31		71	70		65	64		60	57		77	52		61	54
4	pH			6.3	7.3		6.1	6.8		6.8	6.5		5.6	6.3		5.9	6.3			6.2		5.7	6.1
5	Turbidity (NTU)	NTU		9	17		14	8		38	211		96	191		12	68		10	11		21	322
6	Total suspended solids (TSS)	mg/L		<5	6		8	6		12	56		7	12		<5	<5		12	<5		<5	30
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L		0.04	0.11		0.04	0.1		0.04	0.03					0.03	0.14		0.06	0.04		0.02	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
10	Cadmium (Cd)	mg/L		<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001					<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001
11	Chromium (Cr)	mg/L		<0.001	0.001		<0.001	<0.001		<0.001	<0.001					<0.001	<0.001		<0.001	<0.001		<0.001	<0.001
12	Copper (Cu)	mg/L		<0.001	<0.001		<0.001	<0.001		0.002	0.002					<0.001	<0.001		<0.001	<0.001		<0.001	<0.001
13	Iron (Fe)	mg/L		0.29	0.07		0.63	0.1		0.45	<0.05					0.1	0.08		0.69	<0.05		0.19	<0.05
14	Lead (Pb)	mg/L		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001					<0.001	<0.001		<0.001	<0.001		<0.001	<0.001
15	Manganese (Mn)	mg/L		0.306	0.009		0.534	0.046		0.606	0.06					0.193	0.026		0.559	0.024		0.195	0.051
16	Mercury (Hg)	mg/L		<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001					<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001
17	Nickel (Ni)	mg/L		<0.001	<0.001		<0.001	<0.001		0.001	0.001					<0.001	<0.001		<0.001	<0.001		<0.001	<0.001
18	Silver (Ag)	mg/L		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001					<0.001	<0.001		<0.001	<0.001		<0.001	<0.001
19	Zinc (Zn)	mg/L		0.009	<0.005		0.006	0.012		0.011	0.011					0.006	0.01		0.011	0.008		<0.005	0.013
20	Total Nitrogen (TN)	mg/L		<0.1	<0.1		0.3	0.1		0.5	1.9		1.7	1.3		3	0.4		0.2	<0.1		1.3	1
21	Total Phosphorous (TP)	mg/L		<0.01	<0.01		<0.01	<0.01		0.01	0.05		0.02	0.03		<0.01	<0.01		<0.01	<0.01		<0.01	0.03

- Sample location persisting as an isolated pond.

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

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

No.	Parameter	Unit	23/10/15 (W)			6/11/15 (W)			9/11/15 (W)			19/11/15 (D)			3/12/15 (W)			10/12/15 (W)			18/12/15 (D)		
			SW8a (US)	SW8b [#] (DS)	SW8c (DS)	SW8a (US)	SW8b (DS)	SW8c (DS)	SW8a (US)	SW8b (DS)	SW8c [#] (DS)	SW8a (US)	SW8b (DS)	SW8c (DS)	SW8a (US)	SW8b [#] (DS)	SW8c (DS)	SW8a (US)	SW8b [#] (DS)	SW8c (DS)	SW8a (US)	SW8b [#] (DS)	SW8c (DS)
1	Temperature	°C	DNS	18.5	20.7	18.6	18.9	20.5	18.3	18.4	19.5	18.4	18.0	21.0	DNS	18.6	21.1	DNS	20.8	21.6	DNS	18.8	24.4
2	Electrical conductivity (EC)	uS/cm		429	264	141	160	180	125	135	152	128	137	189		193	205		204	203		199	229
3	Dissolved oxygen (DO)	%		60	64	98	94	98	87	88	93	77	55	85		37	48		40	42		32	57
4	pH			6.2	6.4	7.2	6.7	6.4	7.1	6.5	6.3	6.5	6.1	6.5		6.2	6.8		6.6	6.3		7.4	7.0
5	Turbidity (NTU)	NTU		15	20	37	37	53	36	36	45	27	31	43		56	48		44	73		23	16
6	Total suspended solids (TSS)	mg/L		<5	12	<5	<5	6	<5	<5	10	<5	<5	6		<5	<5		<5	8		6	12
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L				0.29	0.22	0.52				0.23	0.3	0.19		0.11	0.21					0.04	0.09
9	Arsenic (As)	mg/L				<0.001	<0.001	<0.001				<0.001	<0.001	<0.001		<0.001	<0.001					<0.001	<0.001
10	Cadmium (Cd)	mg/L				<0.0001	<0.0001	<0.0001				<0.0001	<0.0001	<0.0001		<0.0001	<0.0001					<0.0001	<0.0001
11	Chromium (Cr)	mg/L				<0.001	<0.001	<0.001				<0.001	<0.001	<0.001		<0.001	<0.001					<0.001	<0.001
12	Copper (Cu)	mg/L				<0.001	<0.001	<0.001				<0.001	<0.001	<0.001		<0.001	<0.001					<0.001	<0.001
13	Iron (Fe)	mg/L				0.12	0.1	0.26				0.08	0.13	0.1		0.12	0.12					0.15	0.82
14	Lead (Pb)	mg/L				<0.001	<0.001	<0.001				<0.001	<0.001	<0.001		<0.001	<0.001					<0.001	<0.001
15	Manganese (Mn)	mg/L				0.005	0.011	0.015				0.003	0.016	0.01		0.087	0.011					0.113	0.106
16	Mercury (Hg)	mg/L				<0.0001	<0.0001	<0.0001				<0.0001	<0.0001	<0.0001		<0.0001	<0.0001					<0.0001	<0.0001
17	Nickel (Ni)	mg/L				<0.001	<0.001	<0.001				<0.001	<0.001	<0.001		<0.001	<0.001					<0.001	<0.001
18	Silver (Ag)	mg/L				<0.001	<0.001	<0.001				<0.001	<0.001	<0.001		<0.001	<0.001					<0.001	<0.001
19	Zinc (Zn)	mg/L				<0.005	0.009	<0.005				<0.005	0.017	<0.005		<0.005	<0.005					<0.005	0.007
20	Total Nitrogen (TN)	mg/L		0.3	<0.1	0.3	0.6	0.5	0.4	0.5	0.5	0.3	0.3	0.4		0.2	0.2		0.3	0.3		0.2	<0.1
21	Total Phosphorous (TP)	mg/L		<0.01	<0.01	0.02	0.02	0.02	0.02	0.15	0.01	<0.01	0.02	<0.01		0.02	0.01		0.02	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 18 SW8 – Barrys Creek (Chainage 23775 to 25325) cont.

No.	Parameter	Unit	6/01/16 (W)			14/01/16 (D)			16/01/16 (W)			SW8a [#]			SW8b [#]			SW8c [#]					
			SW8a (US)	SW8b (DS)	SW8c (DS)	SW8a (US)	SW8b (DS)	SW8c (DS)	SW8a (US)	SW8b (DS)	SW8c (DS)	SW8a (US)	SW8b (DS)	SW8c (DS)	SW8a (US)	SW8b (DS)	SW8c (DS)	SW8a (US)	SW8b (DS)	SW8c (DS)			
1	Temperature	°C	20.3	20.7	21.4	19.6	24.4	24.3	DNS	19.0	21.9												
2	Electrical conductivity (EC)	uS/cm	186	191	207	239	285	231		205	237												
3	Dissolved oxygen (DO)	%	90	75	86	6	84	78		32	72												
4	pH		6.9	6.8	6.9	6.7	6.1	6.7		6.5	6.5												
5	Turbidity (NTU)	NTU	47	50	36	17	147	16		41	20												
6	Total suspended solids (TSS)	mg/L	<5	<5	<5	8	54	<5		8	<5												
7	Total Petroleum Hydrocarbons	mg/L																					
8	Aluminium (Al)	mg/L	0.24	0.28	0.11	0.08	0.03	0.08															
9	Arsenic (As)	mg/L	<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															
11	Chromium (Cr)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001															
12	Copper (Cu)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001															
13	Iron (Fe)	mg/L	0.16	0.19	0.12	0.05	0.05	0.09															
14	Lead (Pb)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001															
15	Manganese (Mn)	mg/L	0.006	0.013	0.022	0.014	0.075	0.01															
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001															
17	Nickel (Ni)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001															
18	Silver (Ag)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001															
19	Zinc (Zn)	mg/L	<0.005	0.028	<0.005	<0.005	0.056	0.007															
20	Total Nitrogen (TN)	mg/L	0.5	0.5	0.5	<0.1	0.2	0.2		0.2	0.2												
21	Total Phosphorous (TP)	mg/L	<0.01	0.03	0.02	0.02	0.02	<0.01		0.07	0.08												

[#] - 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 14 January 2016 sampling event, but not connected with SW8c.

Table 19 SW9 – Smiths Creek (Chainage 28300)

No.	Parameter	Unit	10/08/15 (D)		25/08/15 (W)		18/09/15 (W)		26/09/15 (W)		28/09/15 (D)		12/10/15 (D)		15/10/15 (W)		23/10/15 (W)		6/11/15 (W)	
			SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)
1	Temperature	°C	9.8	9.9	16.2	14.6	15.0	14.4	15.5	14.3	13.9	14.2	17.3	17.2	18.6	18.5	20.2	19.1	19.9	19.9
2	Electrical conductivity (EC)	uS/cm	295	294	366	296	338	288	307	285	304	301	342	301	165	158	224	220	120	120
3	Dissolved oxygen (DO)	%	94	67	90	76	80	74	56	59	90	57	83	43	63	64	37	34	107	105
4	pH		7.0	7.0	7.3	7.1	6.9	7.1	6.9	6.9	6.9	6.7	6.8	6.6	6.5	6.5	6.8	6.9	6.7	6.8
5	Turbidity (NTU)	NTU	10	9	32	9	29	8	11	11	14	8	22	9	45	34	16	15	47	47
6	Total suspended solids (TSS)	mg/L	<5	<5	24	6	<5	<5	<5	<5	<5	<5	6	<5	12	9	<5	<5	6	<5
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.09	0.08	0.07	0.05	0.05	0.04			0.06	0.06	0.04	0.05	0.43	0.41			0.67	0.63
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	0.002	0.002			<0.001	0.006	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001
13	Iron (Fe)	mg/L	0.58	0.58	0.32	0.82	0.63	0.67			0.59	0.6	0.67	0.77	0.55	0.51			0.47	0.45
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	0.029	0.034	0.024	0.074	0.105	0.063			0.033	0.039	0.099	0.143	0.029	0.029			0.011	0.01
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	0.002	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	0.03	<0.005	0.008	<0.005	0.033	<0.005			0.023	<0.005	0.069	0.005	0.012	0.007			<0.005	<0.005
20	Total Nitrogen (TN)	mg/L	<0.1	0.2	0.5	0.3	0.2	0.2	0.4	0.4	0.1	0.2	0.3	0.4	0.7	0.6	0.3	0.4	0.2	0.6
21	Total Phosphorous (TP)	mg/L	<0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.03	<0.01	0.01	0.02	0.02	0.03	0.02	0.02	0.02	0.01	0.02

Note – Waterway pump-around operation in progress at the time of sampling on 10 August 2015.

Note – Sample points present at isolated sampling points due to presents of coffer dam on 25 August and 18 September 2015.

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

No.	Parameter	Unit	9/11/15 (W)		19/11/15 (D)		3/12/15 (W)		10/12/15 (W)		18/12/15 (D)		6/01/16 (W)		14/01/16 (D)		16/01/16 (W)		SW9a (DS)	SW9b (US)
			SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)	SW9a (DS)	SW9b (US)		
1	Temperature	°C	19.0	19.0	20.1	20.0	20.4	20.4	21.0	21.0	21.8	21.4	21.1	21.1	24.5	24.1	21.3	21.0		
2	Electrical conductivity (EC)	uS/cm	110	110	140	137	205	202	206	203	235	234	172	172	206	198	204	199		
3	Dissolved oxygen (DO)	%	92	87	87	91	49	46	38	38	28	22	72	72	80	60	34	39		
4	pH		6.6	6.7	6.8	6.9	6.8	6.8	6.8	6.8	7.9	8.2	7.2	7.3	7.1	7.2	6.8	6.9		
5	Turbidity (NTU)	NTU	50	50	35	36	17	17	15	16	13	14	20	20	41	19	20	15		
6	Total suspended solids (TSS)	mg/L	7	9	9	6	<5	<5	<5	<5	7	6	<5	<5	18	<5	<5	<5		
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L			0.21	0.22	0.19	0.12			0.1	0.14	0.16	0.13	0.11	0.13				
9	Arsenic (As)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	0.001	<0.001	<0.001				
10	Cadmium (Cd)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
11	Chromium (Cr)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
12	Copper (Cu)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
13	Iron (Fe)	mg/L			0.3	0.3	0.66	0.67			0.09	0.91	0.55	0.5	0.63	0.73				
14	Lead (Pb)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
15	Manganese (Mn)	mg/L			0.011	0.011	0.03	0.05			0.022	0.122	0.017	0.018	0.077	0.066				
16	Mercury (Hg)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
17	Nickel (Ni)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
18	Silver (Ag)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
19	Zinc (Zn)	mg/L			<0.005	<0.005	0.009	<0.005			<0.005	<0.005	0.014	<0.005	0.023	0.006				
20	Total Nitrogen (TN)	mg/L	0.7	0.7	0.4	0.4	0.3	0.3	0.4	0.4	0.3	0.4	0.4	0.4	0.3	0.3	0.3	0.3		
21	Total Phosphorous (TP)	mg/L	0.02	0.04	<0.01	<0.01	0.02	0.02	0.03	0.03	<0.01	0.49	0.02	0.02	0.04	0.07	0.09	0.08		

Note – Waterway pump-around operation in progress at the time of sampling on 14 January 2016.

Table 21 SW10 – Pipers Creek (Chainage 30700)

No.	Parameter	Unit	10/08/15 (D)		25/08/15 (W)		18/09/15 (W)		26/09/15 (W)		28/09/15 (D)		12/10/15 (D)		15/10/15 (W)		23/10/15 (W)		6/11/15 (W)	
			SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)
1	Temperature	°C	9.8	9.4	15.2	13.6	15.1	14.1	14.2	14.0	14.0	14.1	17.8	16.8	18.1	18.1	20.4	19.2	20.3	20.2
2	Electrical conductivity (EC)	uS/cm	372	371	365	369	393	339	309	303	384	394	418	410	284	257	375	368	175	175
3	Dissolved oxygen (DO)	%	40	42	60	41	63	72	59	59	51	54	56	48	51	58	43	35	86	87
4	pH		6.7	6.8	6.9	7.3	6.8	6.8	6.7	7.0	6.3	6.7	6.6	6.8	6.4	6.4	6.8	7.0	6.6	6.7
5	Turbidity (NTU)	NTU	16	18	16	17	9	62	141	112	134	113	13	13	417	417	20	18	47	50
6	Total suspended solids (TSS)	mg/L	<5	<5	10	7	<5	15	11	7	11	10	<5	6	205	322	<5	6	8	6
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.05	0.06	0.08	0.06	0.02	0.04			0.1	0.17	0.06	0.06	0.18	0.21			0.9	0.73
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	0.54	0.46	0.42	0.5	0.28	0.29			0.42	0.49	0.61	0.67	0.3	0.22			0.81	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	0.076	0.097	0.087	0.142	0.19	0.27			0.096	0.111	0.181	0.169	0.202	0.12			0.017	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			0.001	<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	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			0.006	0.006	0.018	0.005	0.008	0.007			<0.005	<0.005
20	Total Nitrogen (TN)	mg/L	0.2	0.2	0.5	0.4	0.3	0.8	0.8	0.7	0.5	0.4	0.5	0.4	1	1.4	0.4	0.4	0.6	0.8
21	Total Phosphorous (TP)	mg/L	0.02	0.02	0.02	0.02	0.02	0.03	0.05	0.04	0.03	0.03	0.02	0.03	0.08	0.11	0.02	0.03	0.02	0.02

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

No.	Parameter	Unit	9/11/15 (W)		19/11/15 (D)		3/12/15 (W)		10/12/15 (W)		18/12/15 (D)		6/01/16 (W)		14/01/16 (D)		16/01/16 (W)		SW10a (DS)	SW10b (US)
			SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a ¹ (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)	SW10a (DS)	SW10b (US)		
1	Temperature	°C	20.0	19.9	19.6	19.4	21.0	21.0	21.1	21.1	22.2	22.4	21.2	22.1	25.5	25.1	21.3	22.1		
2	Electrical conductivity (EC)	uS/cm	174	174	162	163	248	245	252	249	314	312	241	237	240	236	262	258		
3	Dissolved oxygen (DO)	%	75	72	77	74	25	19	30	22	43	14	56	62	34	26	10	16		
4	pH		6.5	6.4	6.8	6.8	6.6	6.8	6.9	6.9	7.7	7.7	7.3	7.3	7.2	7.3	6.8	6.8		
5	Turbidity (NTU)	NTU	40	39	36	44	26	23	12	12	26	49	19	19	15	21	20	16		
6	Total suspended solids (TSS)	mg/L	10	14	10	<5	8	11	<5	<5	11	28	11	<5	6	6	6	10		
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L			0.25	0.23	0.12	0.15			0.05	0.1	0.19	0.11	0.09	0.09				
9	Arsenic (As)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
10	Cadmium (Cd)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
11	Chromium (Cr)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
12	Copper (Cu)	mg/L			0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
13	Iron (Fe)	mg/L			0.56	0.49	0.93	1.01			1.3	1.62	0.94	0.9	1.1	1.12				
14	Lead (Pb)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
15	Manganese (Mn)	mg/L			0.02	0.022	0.162	0.143			0.234	0.312	0.039	0.035	0.102	0.09				
16	Mercury (Hg)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
17	Nickel (Ni)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
18	Silver (Ag)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
19	Zinc (Zn)	mg/L			<0.005	<0.005	<0.005	0.012			0.022	0.014	<0.005	<0.005	0.005	0.012				
20	Total Nitrogen (TN)	mg/L	0.9	0.8	0.6	0.7	0.4	0.5	0.7	0.5	0.5	0.5	0.6	0.6	0.4	0.5	0.5	0.4		
21	Total Phosphorous (TP)	mg/L	0.03	0.03	<0.01	<0.01	0.03	0.03	0.04	0.03	0.03	0.04	0.03	0.02	0.07	0.03	0.1	0.09		

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

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

No.	Parameter	Unit	10/08/15 (D)		25/08/15 (W)		18/09/15 (W)		26/09/15 (W)		28/09/15 (D)		12/10/15 (D)		15/10/15 (W)		23/10/15 (W)		6/11/15 (W)	
			SW11a [#] (DS)	SW11b [#] (US)	SW11a [#] (DS)	SW11b [#] (US)	SW11a [#] (DS)	SW11b [#] (US)	SW11a [#] (DS)	SW11b [#] (US)	SW11a [#] (DS)	SW11b [#] (US)	SW11a (DS)	SW11b (US)	SW11a (DS)	SW11b (US)	SW11a (DS)	SW11b (US)	SW11a (DS)	SW11b (US)
1	Temperature	°C		9.1	21.0	16.5	15.8	15.9	15.9	17.4	14.2	17.0	17.6	19.3	19.0	19.8	20.0	20.1	21.0	22.2
2	Electrical conductivity (EC)	uS/cm		505	2404	410	166	134	249	286	316	298	490	484	458	167	461	466	175	85
3	Dissolved oxygen (DO)	%		108	86	65	105	104	98	102	87	98	78	91	70	83	81	83	115	109
4	pH			7.1	6.6	6.4	6.8	6.7	7.2	7.1	7.2	7.0	7.4	7.2	6.5	6.6	7.3	7.3	6.0	6.4
5	Turbidity (NTU)	NTU		6	8	127	163	79	70	67	63	58	28	27	204	83	55	46	92	91
6	Total suspended solids (TSS)	mg/L		<5	10	25	42	15	<5	10	<5	8	8	<5	22	13	14	5	5	<5
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L		0.02	0.02	0.06	0.25	0.37			0.21	0.24	0.19	0.21	0.16	0.52			0.92	1.55
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
10	Cadmium (Cd)	mg/L		<0.0001	0.0004	<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
12	Copper (Cu)	mg/L		<0.001	0.001	<0.001	0.003	0.003			0.002	0.002	0.002	0.001	0.002	0.003			<0.001	<0.001
13	Iron (Fe)	mg/L		0.12	0.09	0.13	0.2	0.26			0.19	0.18	0.2	0.18	0.11	0.43			0.46	0.72
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
15	Manganese (Mn)	mg/L		0.08	0.182	0.173	0.037	0.046			0.024	0.023	0.016	0.009	0.053	0.03			0.126	0.022
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
17	Nickel (Ni)	mg/L		<0.001	0.002	0.001	<0.001	<0.001			0.001	<0.001	<0.001	<0.001	<0.001	<0.001			0.004	<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
19	Zinc (Zn)	mg/L		0.009	0.011	0.01	0.007	0.01			<0.005	<0.005	<0.005	<0.005	0.01	0.012			0.013	<0.005
20	Total Nitrogen (TN)	mg/L		0.2	1.1	0.9	1.5	0.9	0.9	0.9	0.9	1	0.6	0.7	0.6	0.6	0.4	0.4	1	0.4
21	Total Phosphorous (TP)	mg/L		<0.01	<0.01	0.03	0.07	0.04	0.12	0.15	0.02	0.02	0.03	0.02	0.02	0.03	0.01	0.02	0.03	0.03

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

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

No.	Parameter	Unit	9/11/15 (W)		19/11/15 (D)		3/12/15 (W)		10/12/15 (W)		18/12/15 (D)		6/01/16 (W)		14/01/16 (D)		16/01/16 (W)		SW11a (DS)	SW11b (US)
			SW11a [#] (DS)	SW11b [#] (US)	SW11a [#] (DS)	SW11b [#] (US)	SW11a [#] (DS)	SW11b [#] (US)	SW11a (DS)	SW11b [#] (US)	SW11a (DS)	SW11b (US)	SW11a (DS)	SW11b (US)	SW11a (DS)	SW11b (US)	SW11a (DS)	SW11b (US)		
1	Temperature	°C	21.1	20.9	21.7	25.5	22.0	21.8	21.7	22.2	21.6	22.8	22.3	25.9	25.4	27.2	21.5	21.7		
2	Electrical conductivity (EC)	uS/cm	111	92	267	255	476	503	642	548	857	842	562	297	680	683	732	703		
3	Dissolved oxygen (DO)	%	88	97	90	91	81	95	82	71	82	101	102	130	110	136	100	108		
4	pH		6.0	6.3	6.2	5.7	7.1	6.9	7.2	6.8	8.4	8.3	7.5	7.0	7.8	7.6	7.3	7.3		
5	Turbidity (NTU)	NTU	83	79	43	44	47	42	17	27	20	21	26	42	16	16	23	25		
6	Total suspended solids (TSS)	mg/L	19	14	<5	6	6	12	<5	<5	6	6	<5	8	<5	<5	5	5		
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L			0.38	0.52	0.26	0.28			0.06	0.06	0.1	0.37	0.21	0.18				
9	Arsenic (As)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
10	Cadmium (Cd)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
11	Chromium (Cr)	mg/L			<0.001	0.002	<0.001	0.004			<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	0.002	<0.001	0.001				
13	Iron (Fe)	mg/L			0.22	0.45	0.26	0.35			0.11	0.11	0.11	0.37	0.15	0.14				
14	Lead (Pb)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
15	Manganese (Mn)	mg/L			0.092	0.033	0.033	0.074			0.02	0.025	0.026	0.045	0.005	0.02				
16	Mercury (Hg)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
17	Nickel (Ni)	mg/L			0.003	<0.001	0.002	0.002			0.001	0.001	0.002	0.002	0.002	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				
19	Zinc (Zn)	mg/L			0.009	<0.005	<0.005	<0.005			<0.005	<0.005	0.007	<0.005	0.008	<0.005				
20	Total Nitrogen (TN)	mg/L	1	1.1	0.8	0.5	0.6	0.7	0.5	0.5	0.5	0.5	1.3	0.7	0.8	0.8	0.5	0.6		
21	Total Phosphorous (TP)	mg/L	0.02	0.03	<0.01	<0.01	0.01	0.01	<0.01	0.01	0.02	<0.01	<0.01	0.02	<0.01	<0.01	0.08	0.03		

Table 25 SW12 – Maria River (Chainage 36850)

No.	Parameter	Unit	10/08/15 (D)		25/08/15 (W)		18/09/15 (W)		26/09/15 (W)		28/09/15 (D)		12/10/15 (D)		15/10/15 (W)		23/10/15 (W)		6/11/15 (W)	
			SW12a [#] (US)	SW12b [#] (DS)	SW12a [#] (US)	SW12b [#] (DS)	SW12a [#] (US)	SW12b [#] (DS)	SW12a [#] (US)	SW12b [#] (DS)	SW12a [#] (US)	SW12b [#] (DS)	SW12a [#] (US)	SW12b [#] (DS)	SW12a [#] (US)	SW12b [#] (DS)	SW12a [#] (US)	SW12b [#] (DS)	SW12a [#] (US)	SW12b [#] (DS)
1	Temperature	°C	9.4	10.2	16.1	15.1	15.3	15.7	15.6	16.9	13.7	14.3	16.9	17.8	18.2	18.9	20.2	20.3	20.4	20.5
2	Electrical conductivity (EC)	uS/cm	337	338	281	329	198	318	298	317	306	301	314	335	235	306	297	310	132	135
3	Dissolved oxygen (DO)	%	41	46	59	79	90	55	85	49	51	34	41	36	75	47	49	22	64	73
4	pH		6.2	6.1	6.6	6.4	6.1	6.3	7.5	6.9	6.1	6.0	6.1	6.0	6.4	6.2	7.2	6.8	6.6	6.2
5	Turbidity (NTU)	NTU	9	16	43	12	142	14	102	26	70	36	11	21	107	32	51	28	42	38
6	Total suspended solids (TSS)	mg/L	<5	5	16	<5	28	7	<5	<5	6	<5	<5	8	21	8	10	11	<5	<5
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.09	0.06	0.08	0.05	0.06	0.03			0.07	0.05	0.05	0.04	0.12	0.12			1.03	1.33
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	0.002	<0.001			0.002	<0.001	<0.001	<0.001	0.002	<0.001			<0.001	<0.001
13	Iron (Fe)	mg/L	0.42	0.63	0.3	0.45	0.2	0.6			0.23	0.41	0.77	0.64	0.26	0.53			0.88	0.97
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	0.133	0.142	0.215	0.129	0.058	0.257			0.092	0.19	0.195	0.429	0.088	0.315			0.031	0.027
16	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<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	<0.005	0.005	0.015	0.005	0.016	<0.005			0.01	0.006	0.005	0.009	0.015	0.012			<0.005	<0.005
20	Total Nitrogen (TN)	mg/L	0.3	0.3	0.8	0.3	1.2	0.4	0.8	0.4	0.4	0.4	0.4	0.4	0.6	0.4	0.4	0.3	0.8	0.8
21	Total Phosphorous (TP)	mg/L	0.02	0.01	0.03	0.01	0.06	0.02	0.05	0.02	0.03	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02

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

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

No.	Parameter	Unit	9/11/15 (W)		19/11/15 (D)		3/12/15 (W)		10/12/15 (W)		18/12/15 (D)		6/01/16 (W)		14/01/16 (D)		16/01/16 (W)		SW12a (US)	SW12b (DS)
			SW12a (US)	SW12b (DS)	SW12a (US)	SW12b (DS)	SW12a (US)	SW12b (DS)	SW12a [#] (US)	SW12b [#] (DS)	SW12a [#] (US)	SW12b [#] (DS)	SW12a (US)	SW12b (DS)	SW12a [#] (US)	SW12b [#] (DS)	SW12a [#] (US)	SW12b [#] (DS)		
1	Temperature	°C	19.7	19.7	20.0	20.0	20.8	21.4	21.4	21.4	21.3	21.7	22.7	21.8	24.4	28.4	20.3	21.4		
2	Electrical conductivity (EC)	uS/cm	165	172	147	147	187	187	132	171	188	203	163	160	172	201	196	194		
3	Dissolved oxygen (DO)	%	38	41	43	51	27	24	42	21	17	5	40	34	14	60	20	5		
4	pH		5.8	5.8	6.3	6.0	6.7	6.4	6.2	6.2	7.8	7.3	6.7	6.8	6.9	6.1	6.4	6.1		
5	Turbidity (NTU)	NTU	28	28	38	38	75	49	62	28	38	27	23	42	20	43	54	33		
6	Total suspended solids (TSS)	mg/L	14	12	<5	<5	15	12	14	6	10	11	14	10	12	56	11	16		
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L			0.59	0.57	0.43	0.36			0.17	0.15	0.42	0.31	0.38	0.12				
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				
10	Cadmium (Cd)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
11	Chromium (Cr)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
12	Copper (Cu)	mg/L			<0.001	<0.001	<0.001	0.002			<0.001	<0.001	0.001	<0.001	<0.001	<0.001				
13	Iron (Fe)	mg/L			0.74	0.71	0.69	1.11			0.99	1.4	0.96	0.83	1.04	0.25				
14	Lead (Pb)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
15	Manganese (Mn)	mg/L			0.051	0.042	0.141	0.165			0.173	0.245	0.115	0.085	0.124	0.111				
16	Mercury (Hg)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
17	Nickel (Ni)	mg/L			<0.001	0.001	0.002	0.002			0.001	0.001	0.001	0.001	0.001	<0.001				
18	Silver (Ag)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
19	Zinc (Zn)	mg/L			<0.005	<0.005	0.006	<0.005			<0.005	<0.005	<0.005	<0.005	<0.005	0.007				
20	Total Nitrogen (TN)	mg/L	0.9	0.8	0.7	0.7	0.8	0.6	0.8	0.7	0.9	0.6	1	0.9	0.9	0.4	0.7	0.6		
21	Total Phosphorous (TP)	mg/L	0.02	0.03	<0.01	<0.01	0.04	0.08	0.06	0.05	0.04	0.02	0.04	0.04	0.05	0.09	0.06	0.06		

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

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

No.	Parameter	Unit	10/08/15 (D)		25/08/15 (W)		18/09/15 (W)		26/09/15 (W)		28/09/15 (D)		12/10/15 (D)		15/10/15 (W)		23/10/15 (W)		6/11/15 (W)	
			SW13a (DS)	SW13b (US)	SW13a (DS)	SW13b (US)	SW13a (DS)	SW13b (US)	SW13a (DS)	SW13b (US)	SW13a (DS)	SW13b (US)	SW13a [#] (DS)	SW13b [#] (US)	SW13a (DS)	SW13b (US)	SW13a (DS)	SW13b (US)	SW13a (DS)	SW13b (US)
1	Temperature	°C	10.2	9.2	17.8	16.0	15.1	15.1	16.6	15.6	12.7	13.7	17.0	17.1	18.5	18.1	19.6	18.6	25.4	21.2
2	Electrical conductivity (EC)	uS/cm	288	222	370	437	316	334	463	426	555	533	611	514	453	375	469	449	316	216
3	Dissolved oxygen (DO)	%	92	66	76	37	87	63	86	62	58	35	96	77	54	43	68	57	79	69
4	pH		7.0	6.5	6.3	5.7	6.5	6.2	6.7	6.6	6.2	5.9	6.6	6.0	6.5	6.1	6.8	6.5	6.2	6.1
5	Turbidity (NTU)	NTU	38	31	119	45	146	80	94	67	37	53	9	16	98	140	47	44	84	99
6	Total suspended solids (TSS)	mg/L	<5	<5	35	17	38	16	<5	<5	<5	9	<5	5	15	26	8	9	7	6
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L	0.15	0.11	0.06	0.09	0.09	0.1			0.02	0.02	0.01	<0.01	0.1	0.08			0.53	0.7
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	0.002	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	0.89	1.33	0.26	1.28	0.14	0.35			0.15	0.23	0.17	0.77	0.11	0.16			0.46	0.57
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	0.018	0.039	0.129	0.26	0.043	0.114			0.112	0.209	0.065	0.186	0.11	0.137			0.056	0.033
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	0.006	0.036	0.048	0.015	0.011			0.026	0.011	0.014	0.014	0.018	0.013			0.01	0.005
20	Total Nitrogen (TN)	mg/L	0.8	0.6	1.4	1.8	1.2	1.1	1.4	0.7	0.5	1.2	0.2	0.6	1.3	0.9	0.4	0.8	1.1	0.6
21	Total Phosphorous (TP)	mg/L	0.02	0.02	0.05	0.05	0.05	0.04	0.02	0.03	<0.01	0.01	<0.01	<0.01	0.03	0.04	0.01	0.02	0.02	0.02

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

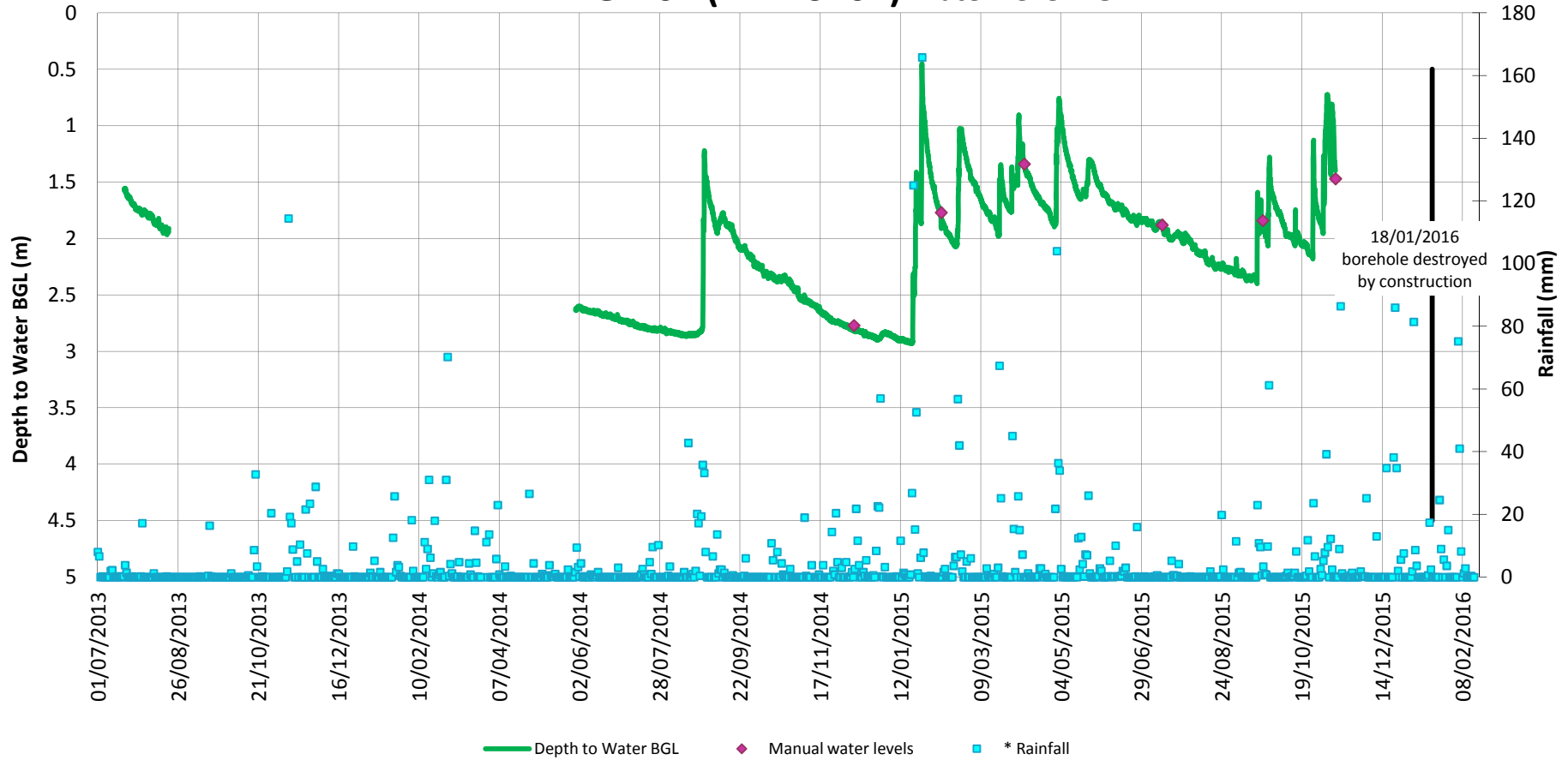
Table 28 SW13 – Stumpy Creek (Chainage 37700 to 37750) cont.

No.	Parameter	Unit	9/11/15 (W)		19/11/15 (D)		3/12/15 (W)		10/12/15 (W)		18/12/15 (D)		6/01/16 (W)		14/01/16 (D)		16/01/16 (W)		SW13a (DS)	SW13b (US)
			SW13a (DS)	SW13b (US)	SW13a (DS)	SW13b (US)	SW13a (DS)	SW13b (US)	SW13a (DS)	SW13b (US)	SW13a (DS)	SW13b (US)	SW13a (DS)	SW13b (US)	SW13a [#] (DS)	SW13b [#] (US)	SW13a (DS)	SW13b (US)		
1	Temperature	°C	20.9	20.0	20.7	20.1	21.5	20.2	21.1	20.7	20.3	21.1	22.6	21.9	27.3	25.8	20.7	20.9		
2	Electrical conductivity (EC)	uS/cm	333	240	148	143	375	319	301	267	385	345	388	329	381	212	365	304		
3	Dissolved oxygen (DO)	%	65	42	71	64	65	29	45	30	48	33	84	43	74	34	73	19		
4	pH		6.2	5.9	5.7	5.8	6.6	6.2	6.4	6.0	7.9	7.6	7.0	6.6	6.9	6.4	6.7	6.3		
5	Turbidity (NTU)	NTU	46	42	45	38	69	49	100	72	61	61	61	36	13	45	40	50		
6	Total suspended solids (TSS)	mg/L	17	15	<5	<5	8	9	32	19	10	8	8	6	<5	12	5	16		
7	Total Petroleum Hydrocarbons	mg/L																		
8	Aluminium (Al)	mg/L			0.97	1.14	0.19	0.2			0.12	0.07	0.14	0.17	0.07	0.18				
9	Arsenic (As)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	0.001	<0.001				
10	Cadmium (Cd)	mg/L			<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
11	Chromium (Cr)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
12	Copper (Cu)	mg/L			0.001	<0.001	0.001	0.001			<0.001	<0.001	<0.001	<0.001	<0.001	0.001				
13	Iron (Fe)	mg/L			1.09	1.18	0.46	1.25			0.38	0.81	0.36	0.82	1.13	1.64				
14	Lead (Pb)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
15	Manganese (Mn)	mg/L			0.059	0.058	0.107	0.246			0.074	0.185	0.066	0.138	0.102	0.253				
16	Mercury (Hg)	mg/L			0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001				
17	Nickel (Ni)	mg/L			<0.001	<0.001	0.002	0.001			0.001	<0.001	0.001	<0.001	0.001	0.001				
18	Silver (Ag)	mg/L			<0.001	<0.001	<0.001	<0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
19	Zinc (Zn)	mg/L			<0.005	<0.005	0.011	<0.005			0.024	0.008	<0.005	<0.005	0.012	0.01				
20	Total Nitrogen (TN)	mg/L	1.2	0.8	0.8	0.8	1.3	0.8	1.1	1.1	1	0.7	1	0.7	0.6	0.8	1	1		
21	Total Phosphorous (TP)	mg/L	0.01	0.02	<0.01	<0.01	0.02	0.02	0.04	0.04	0.01	0.02	0.01	0.01	0.02	0.06	0.06	0.08		

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

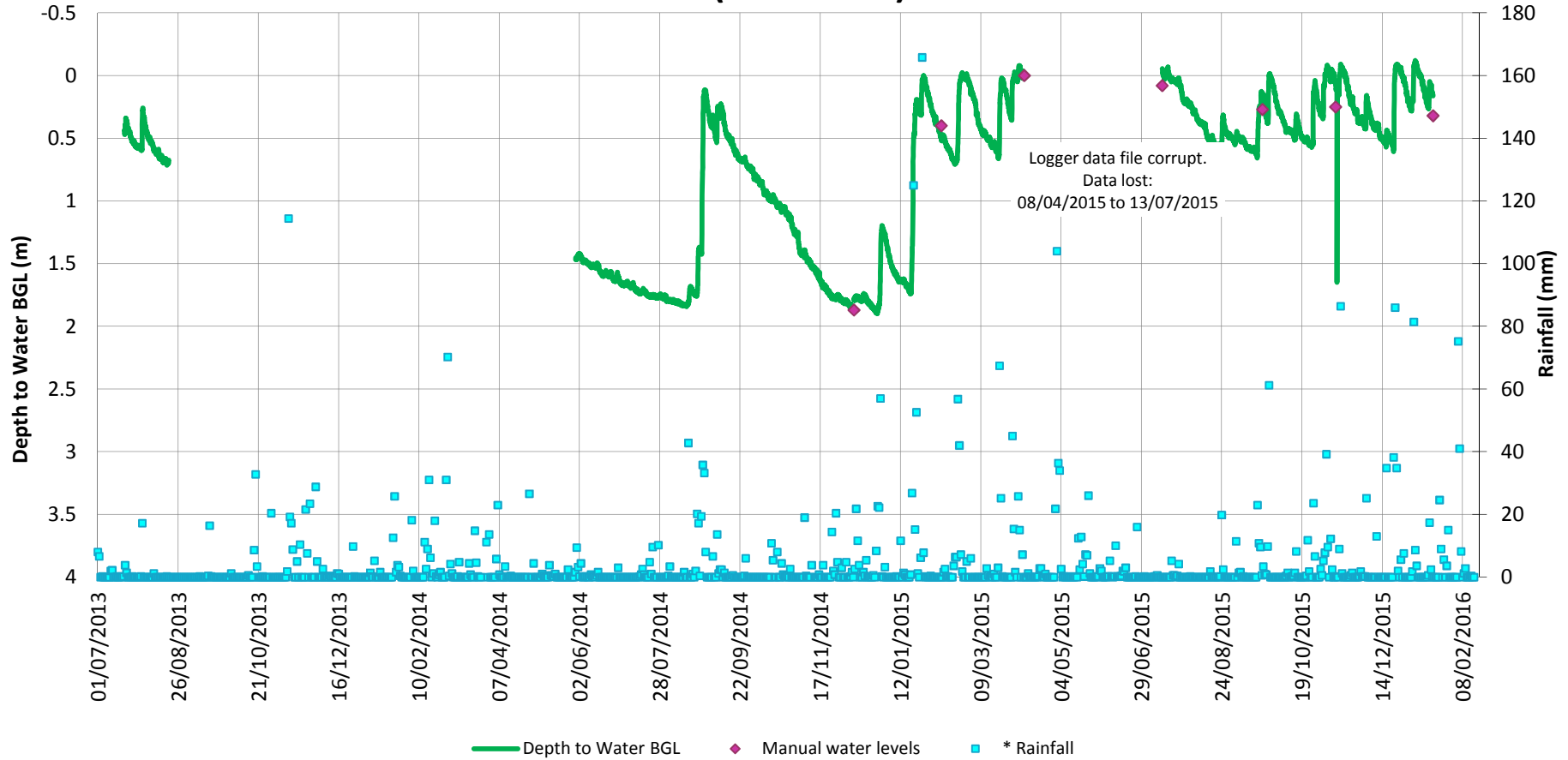
Appendix D – Borehole water level data plots

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



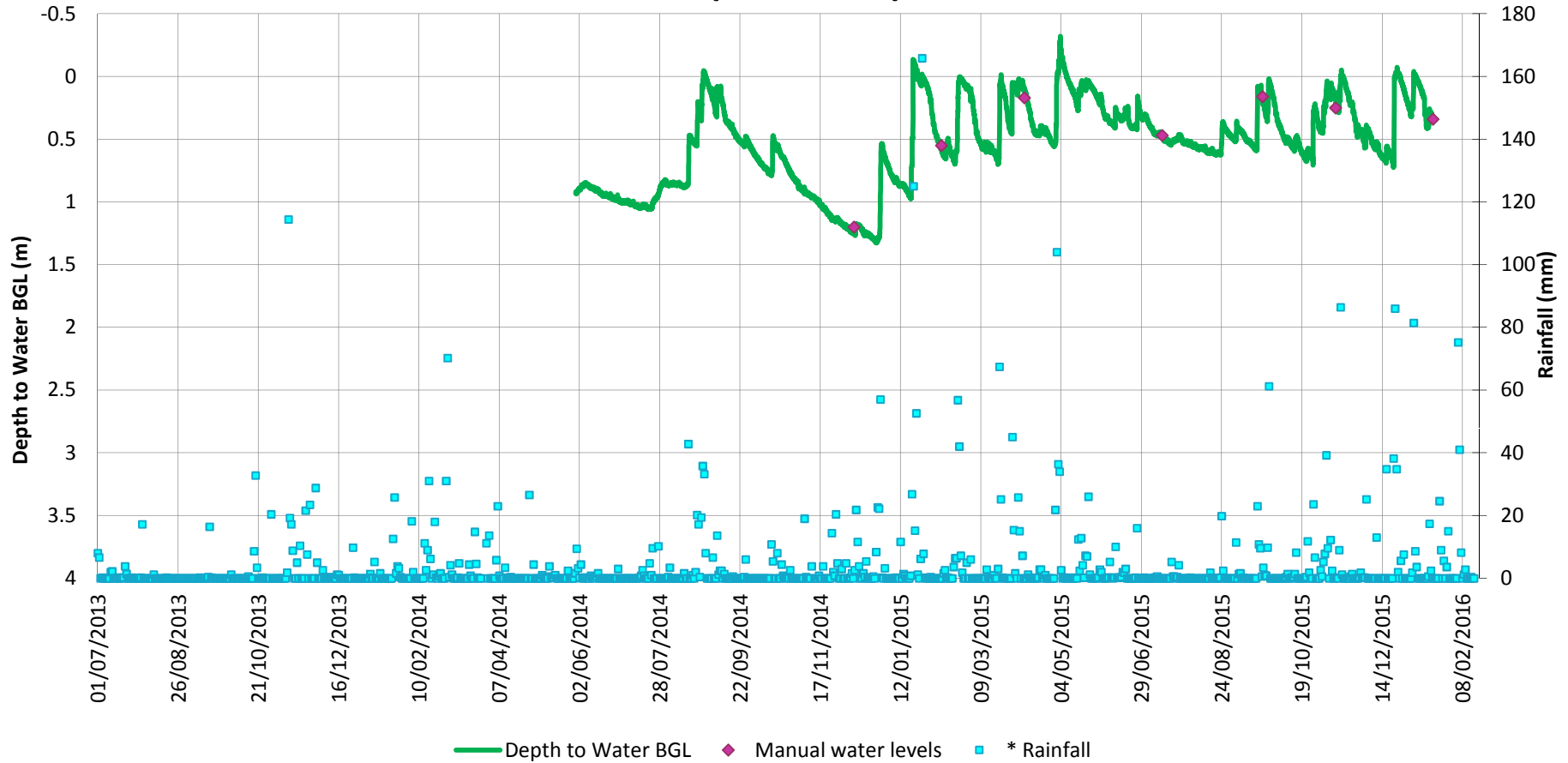
Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10283850	
Date	18/01/2016		BH ID	A-BH3102	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-1
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

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



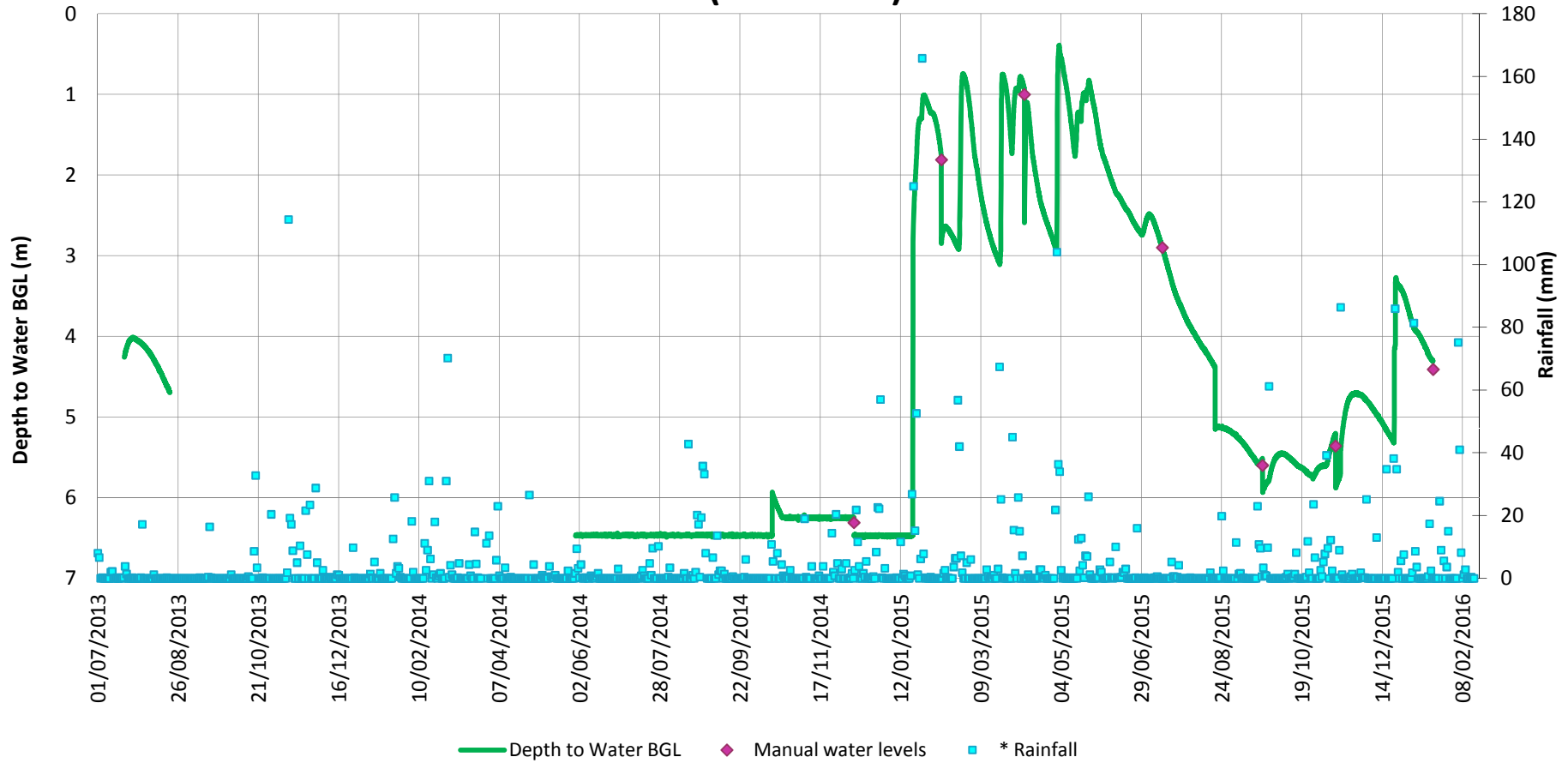
Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10229626	
Date	18/01/2016		BH ID	A-BH3103	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-2
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

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



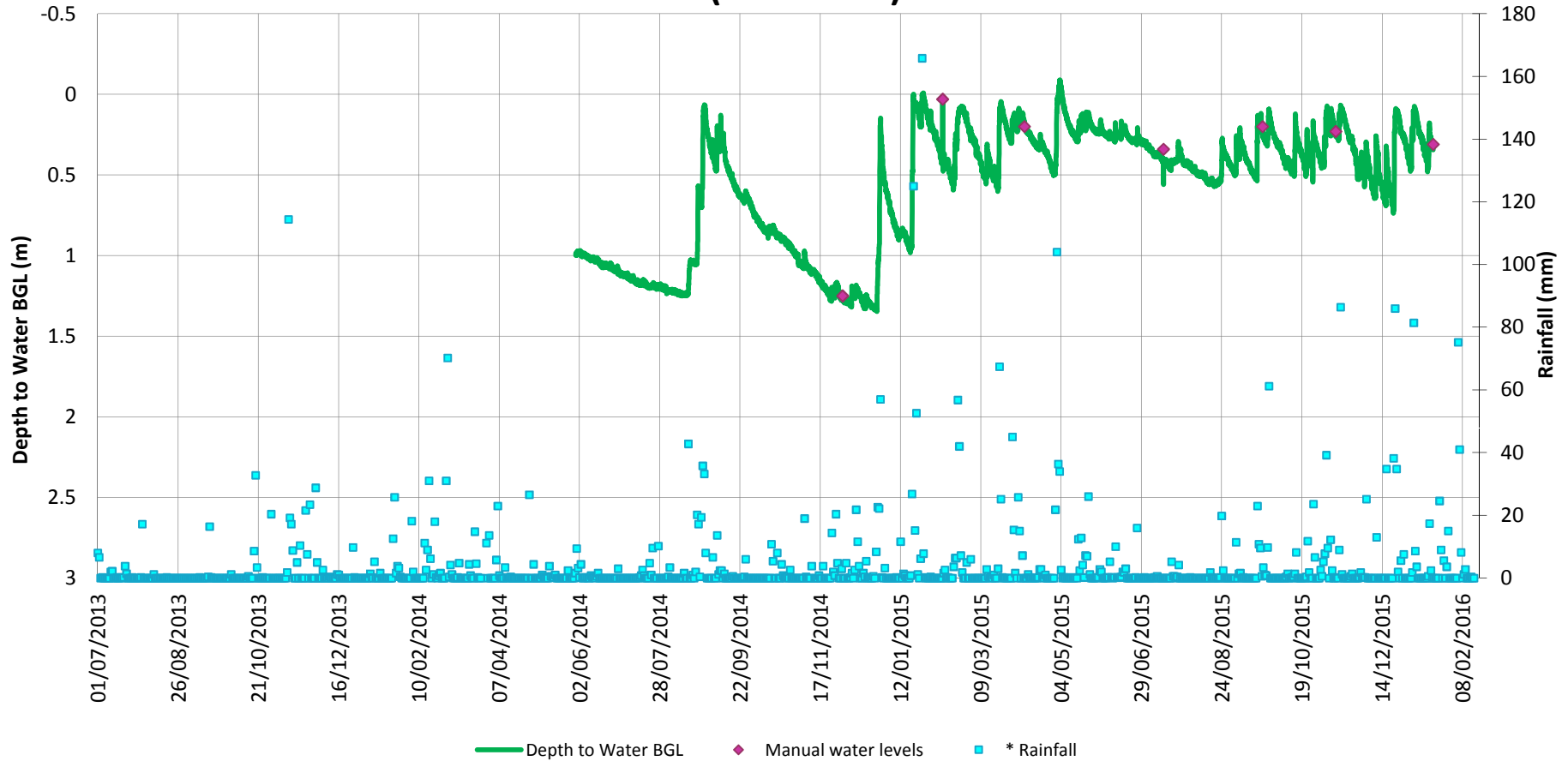
Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262196	
Date	18/01/2016		BH ID	A-BH3105	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-3
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

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



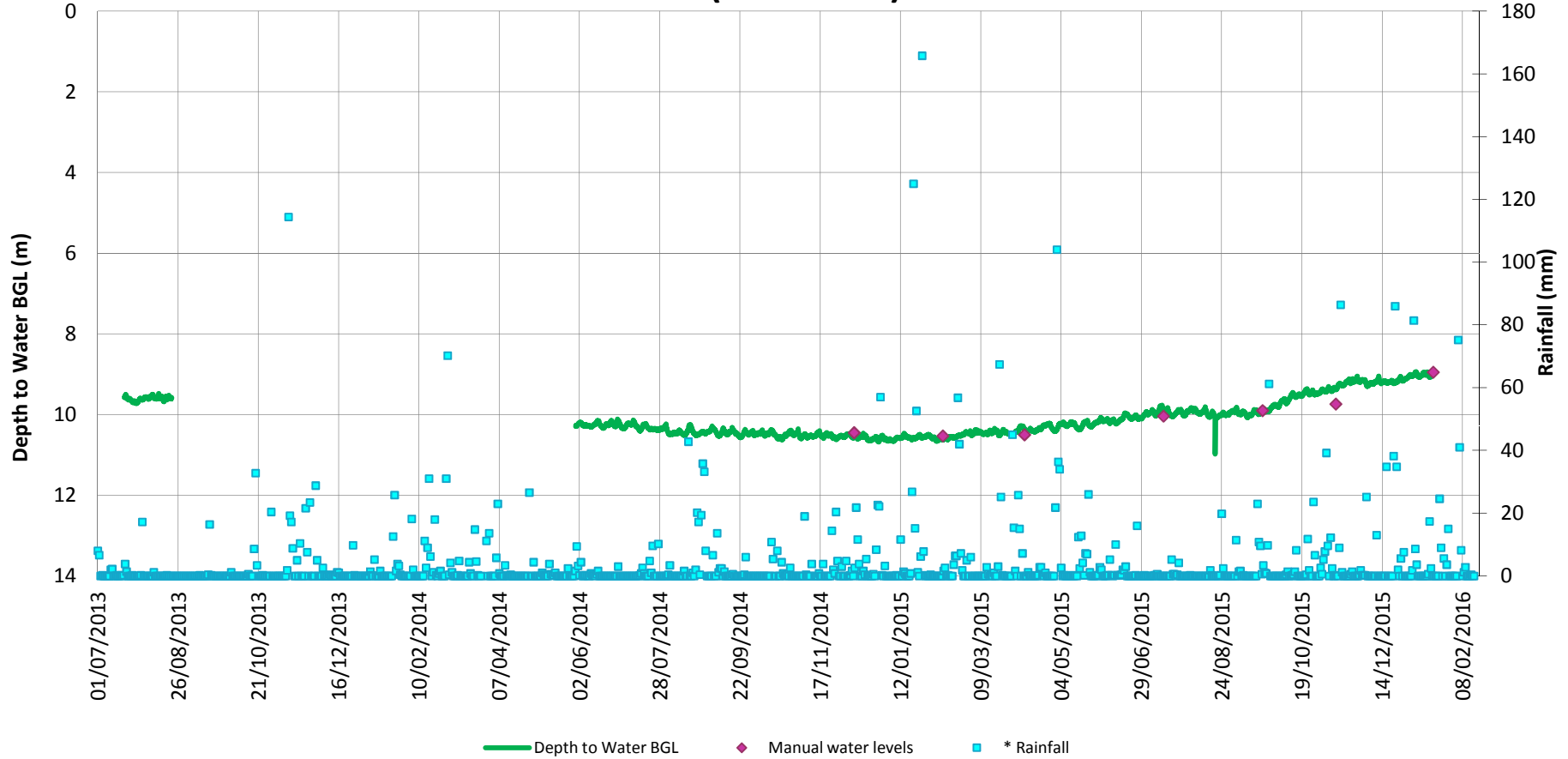
Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10229627	
Date	18/01/2016		BH ID	A-BH3107	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-4
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2015)					

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	
Date	18/01/2016		BH ID	B-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 GW15 (B-BH3108) Water Level BGL

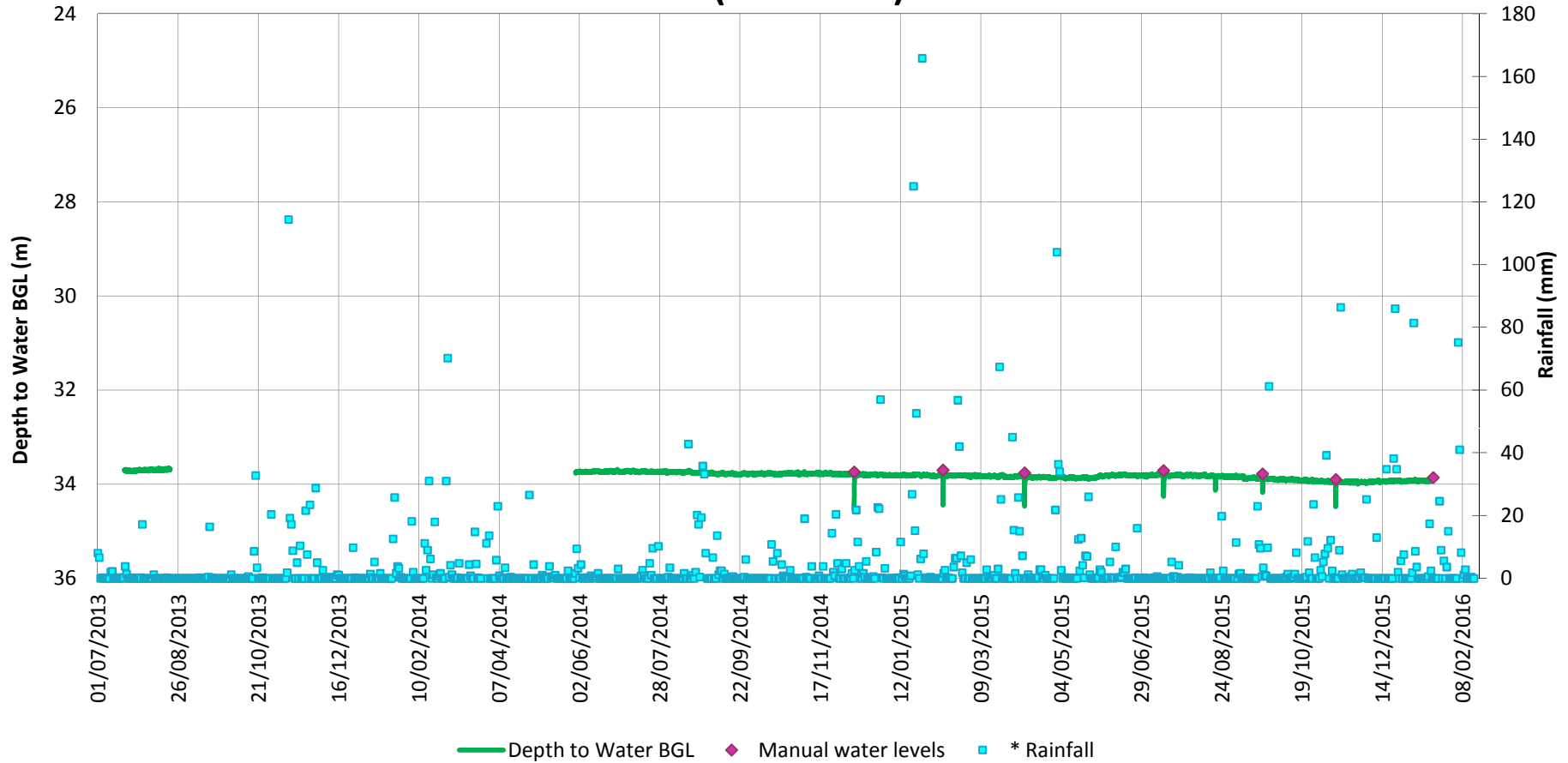


Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10238352	
Date	18/01/2016		BH ID	B-BH3108	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-6

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

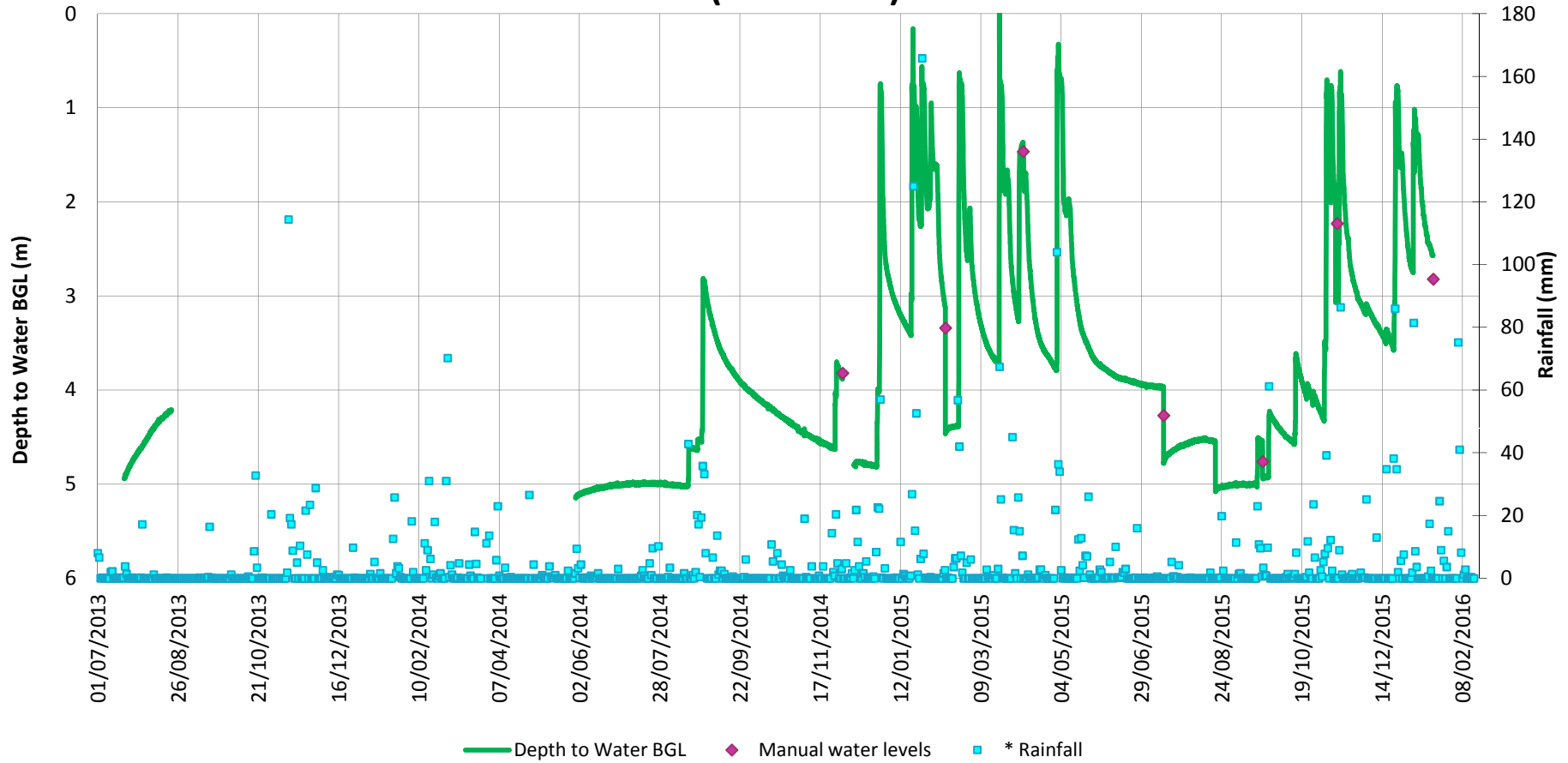
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)

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



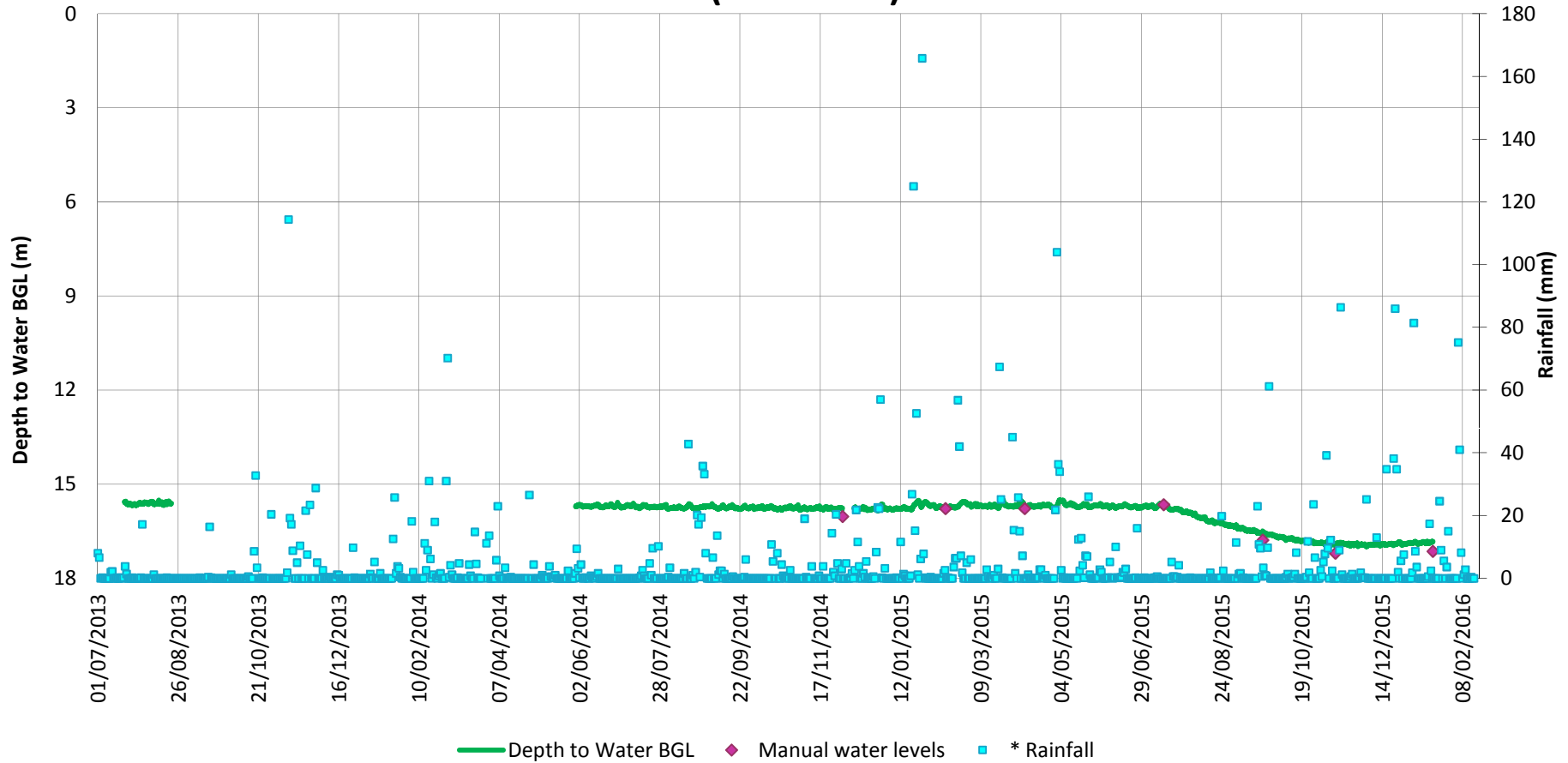
Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262195	
Date	18/01/2016		BH ID	C-BH3102	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-7
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

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



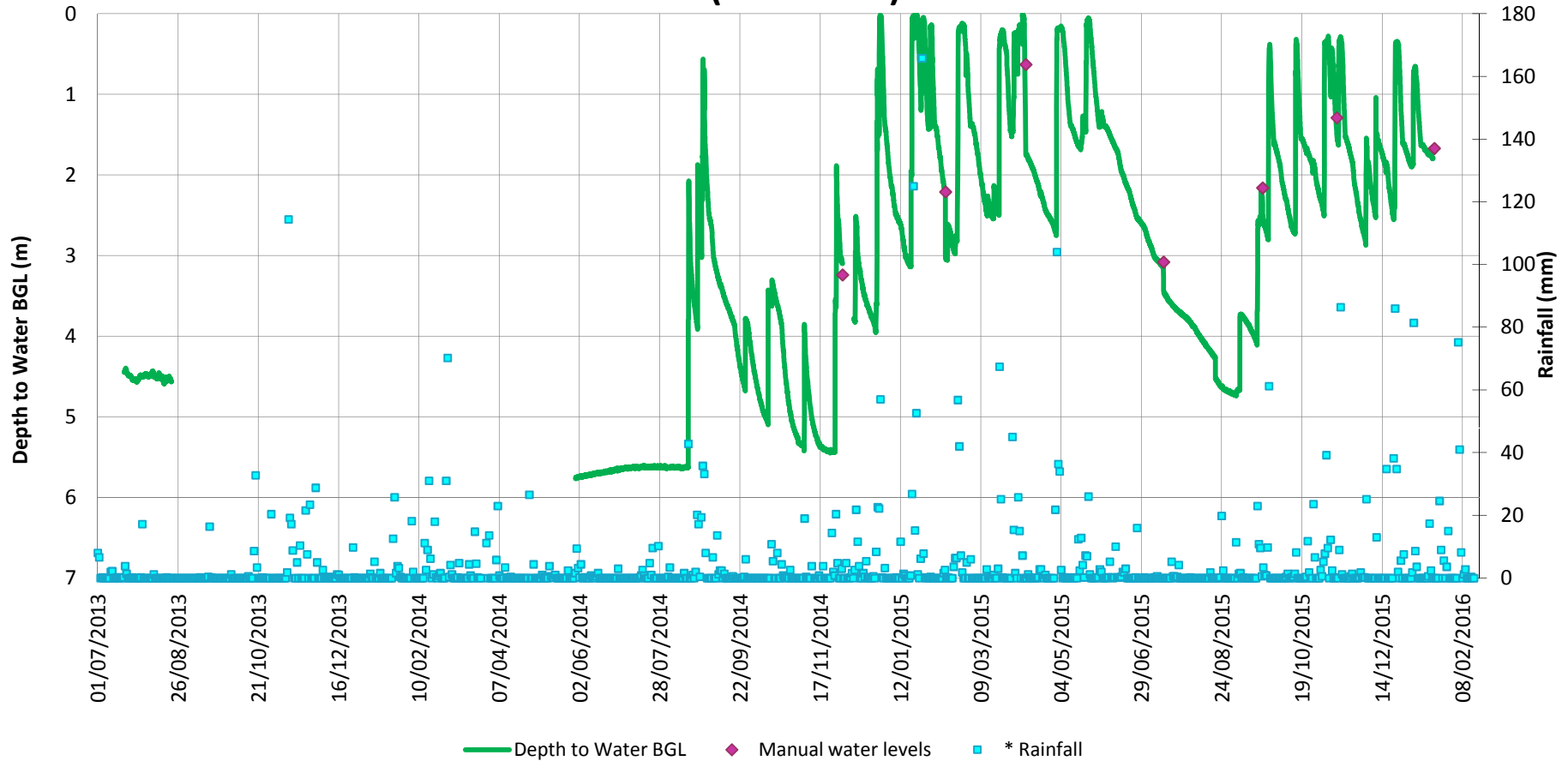
Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10280416	
Date	18/01/2016		BH ID	C-BH3105	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-8
Groundwater sample taken at time of manual water levels			BGL = below ground level (existing)		
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)					

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



Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10280407	
Date	18/01/2016		BH ID	C-BH3107	
			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 GW23 (C-BH3106) Water Level BGL

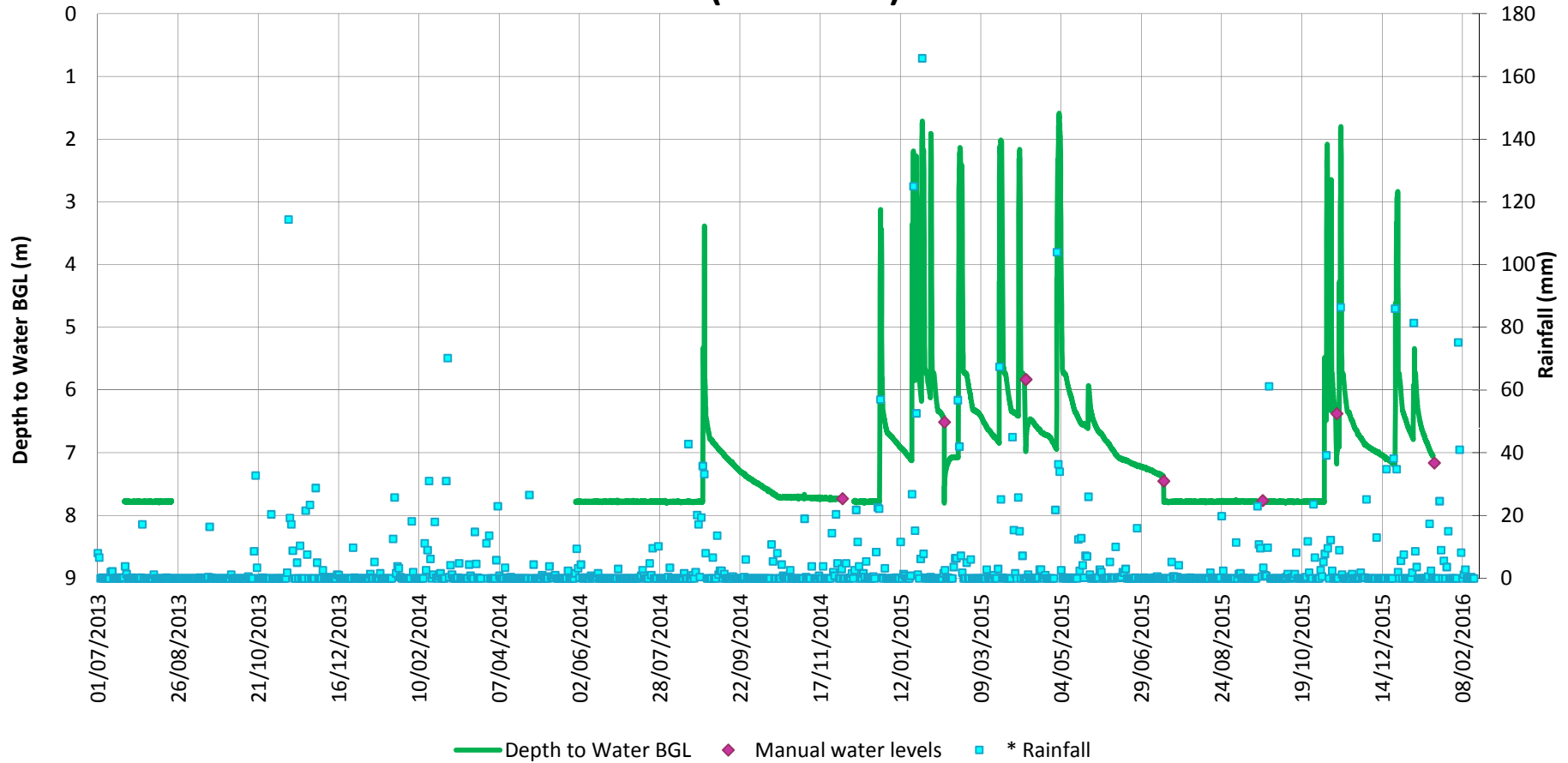


Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262202	
Date	19/01/2016		BH ID	C-BH3106	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-10

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 GW24 (C-BH3108) Water Level BGL

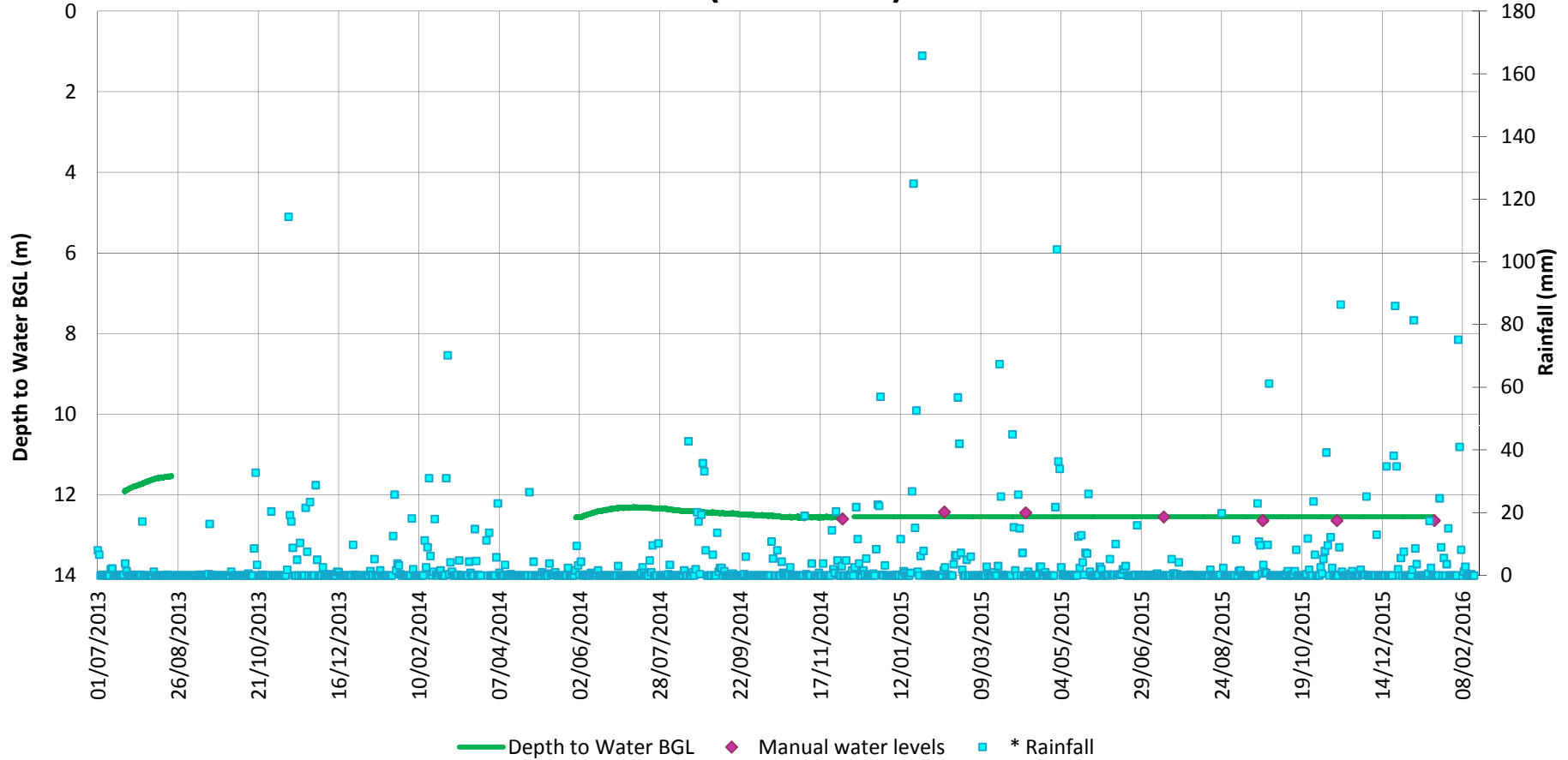


Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262197	
Date	19/01/2016		BH ID	C-BH3108	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-16

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 GW25 (D-BH3101) Water Level BGL

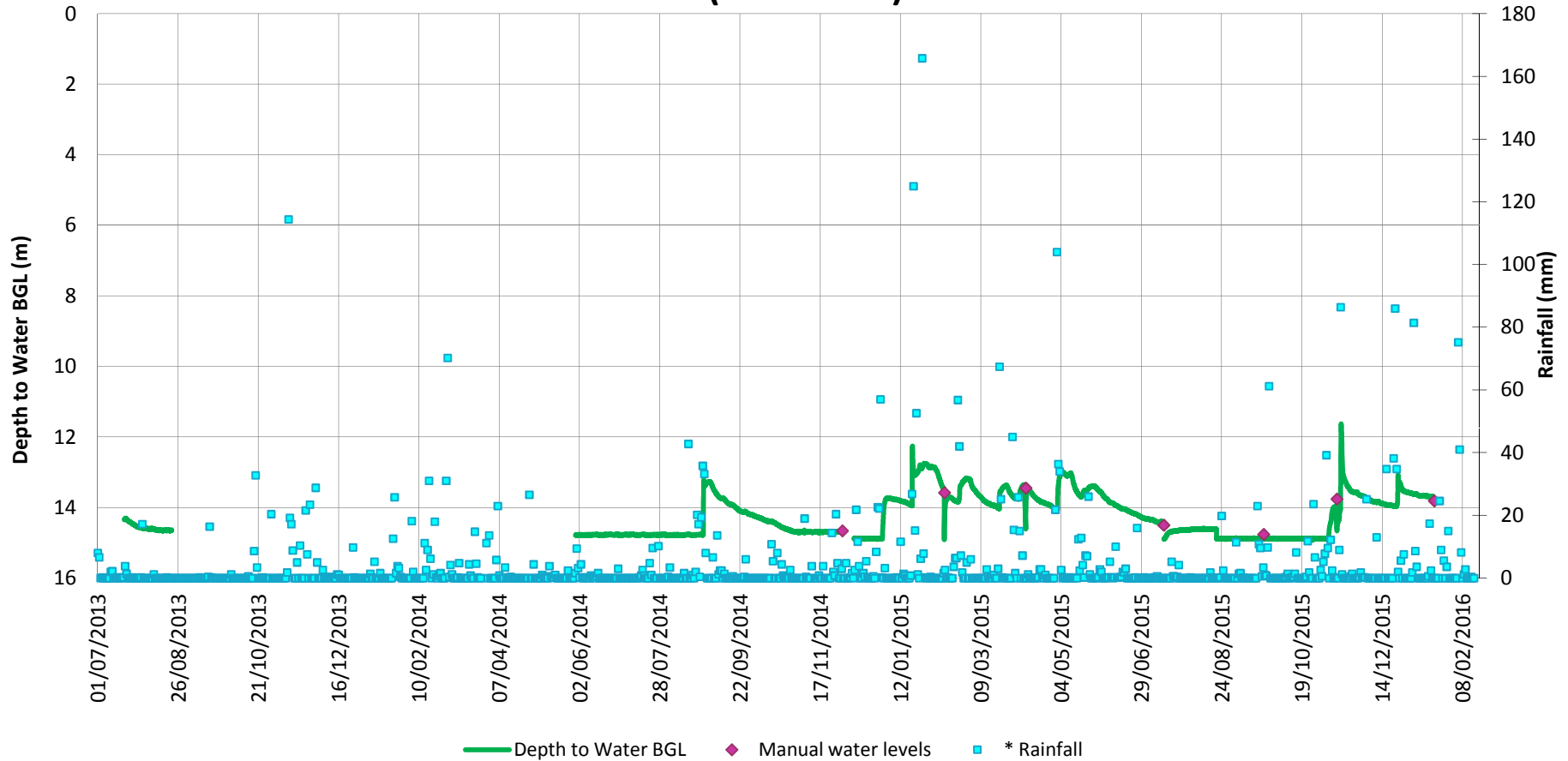


Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262203	
Date	19/01/2016		BH ID	D-BH3101	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-12

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 GW26 (D-BH3106) Water Level BGL

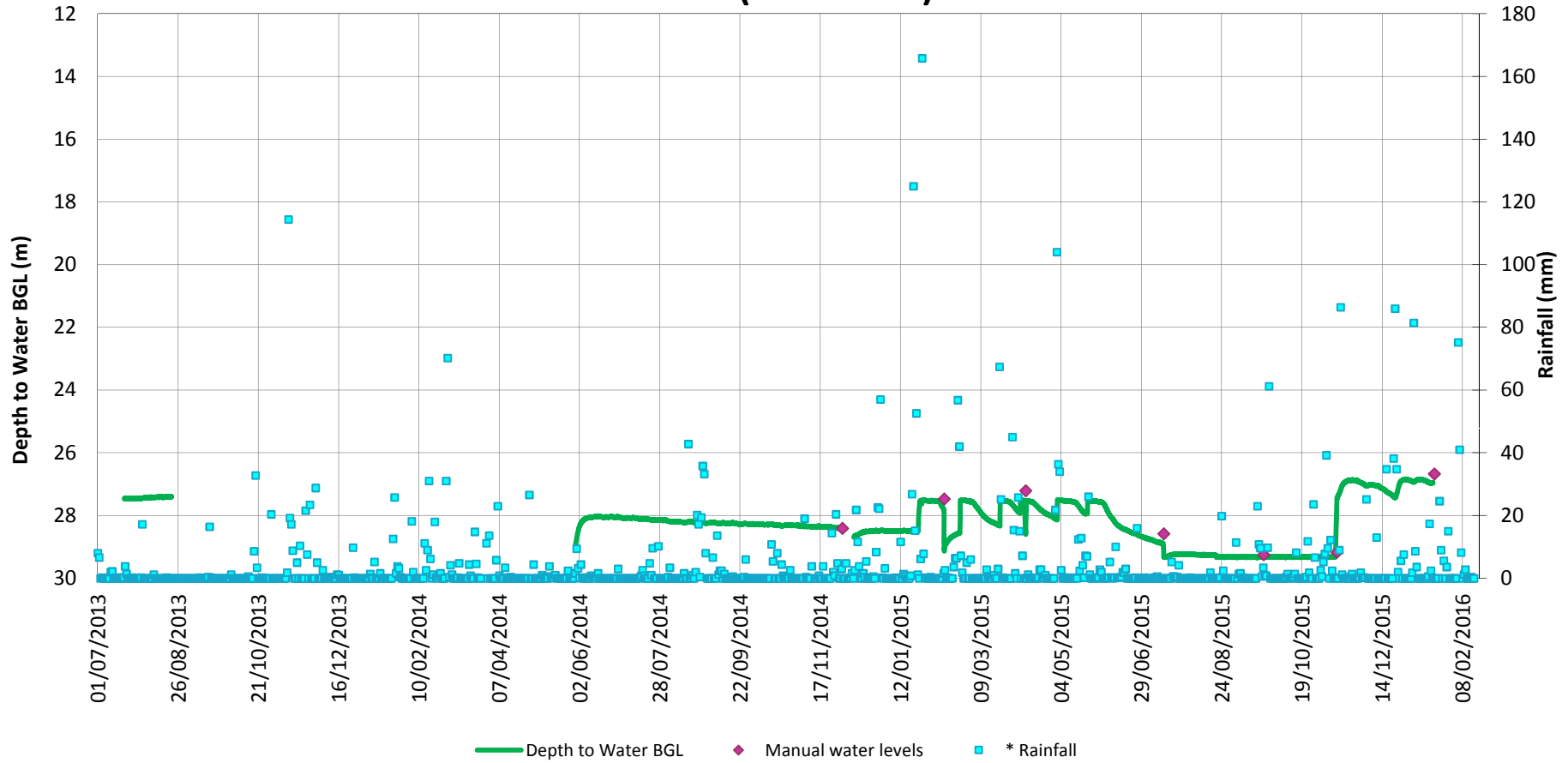


Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262194	
Date	19/01/2016		BH ID	D-BH3106	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-13

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

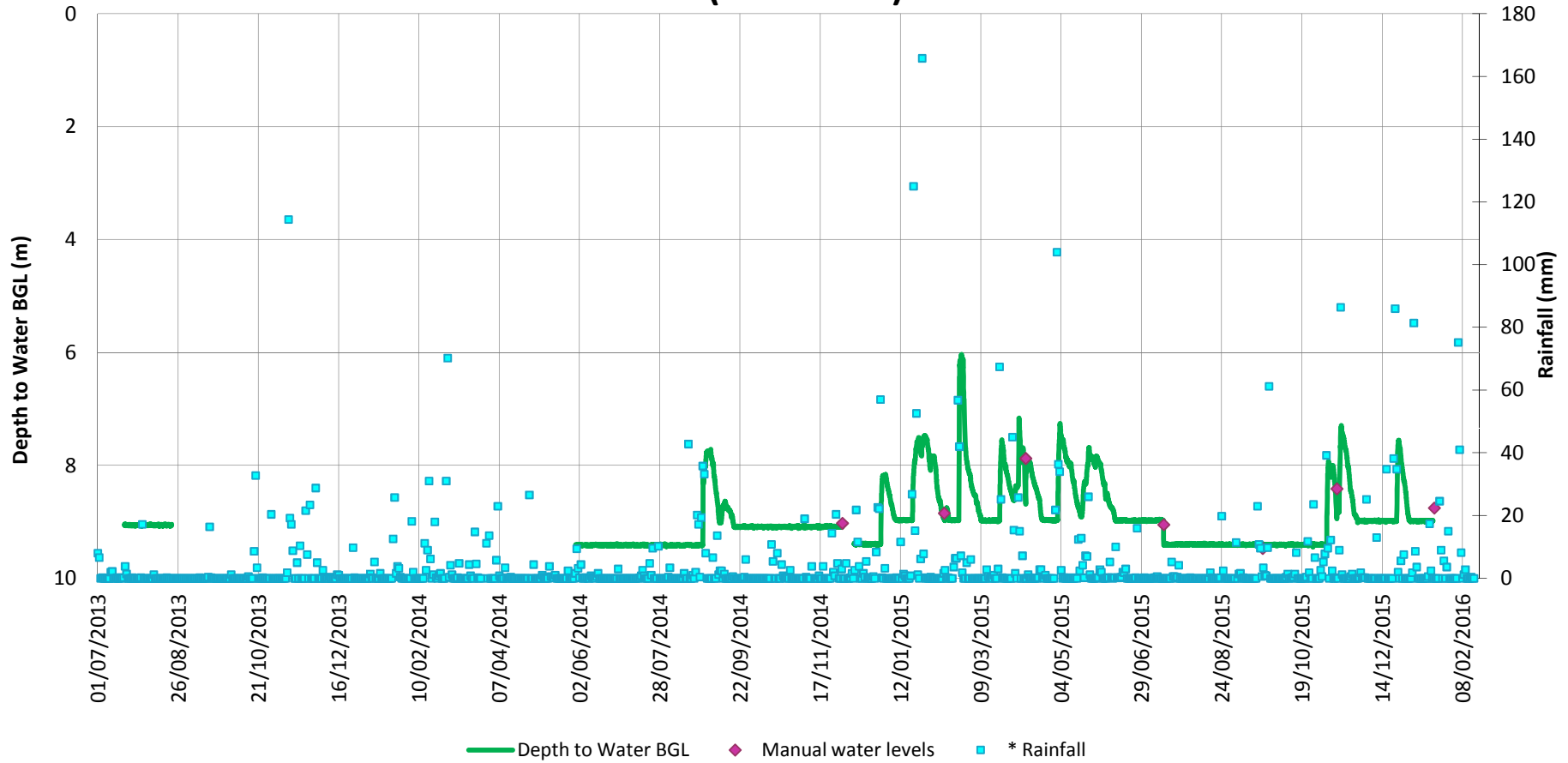
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)

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



Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262200	
Date	19/01/2016		BH ID	D-BH3102	
			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 GW28 (D-BH3103) Water Level BGL

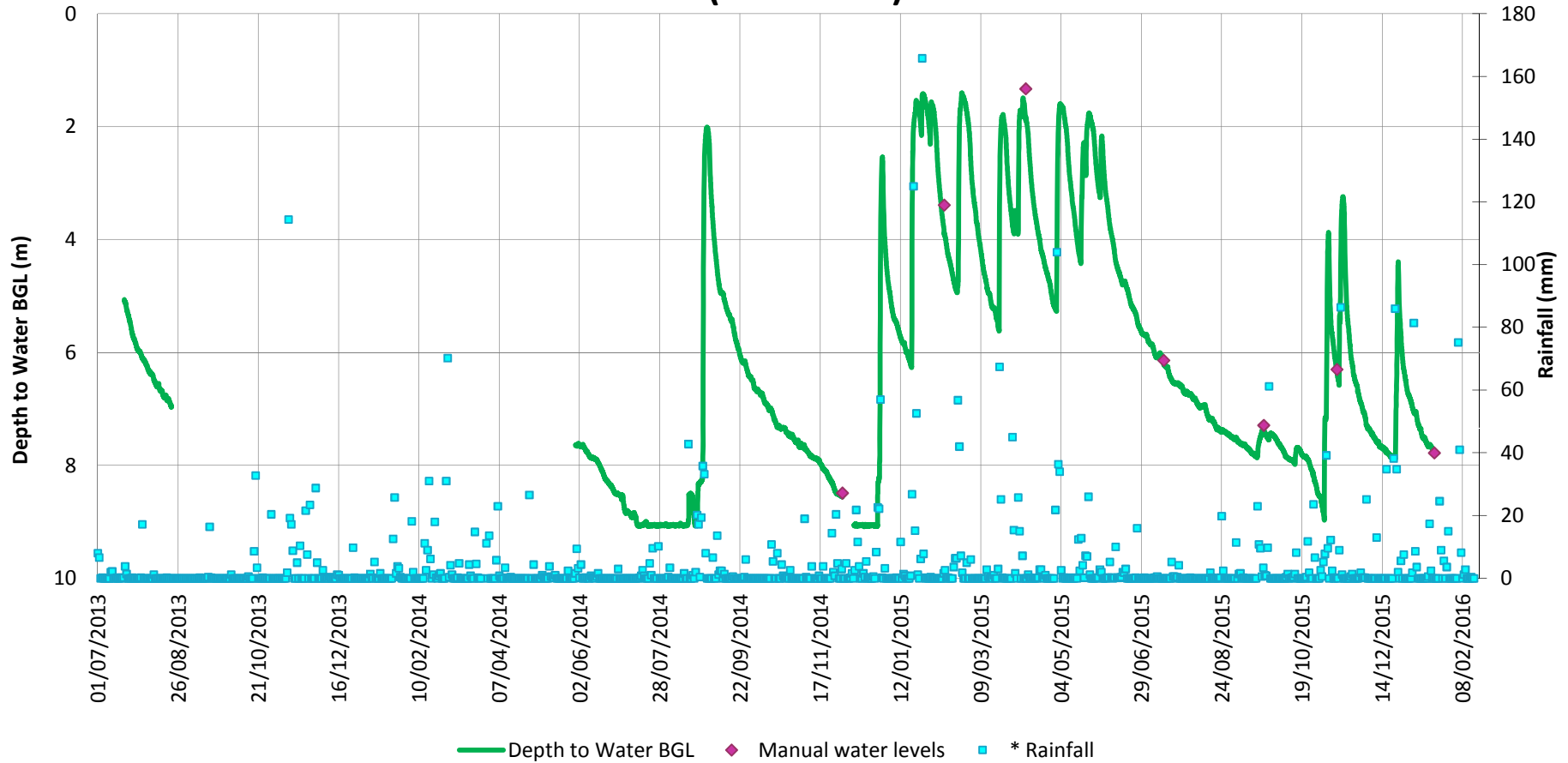


Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262205	
Date	19/01/2016		BH ID	D-BH3103	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-14

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

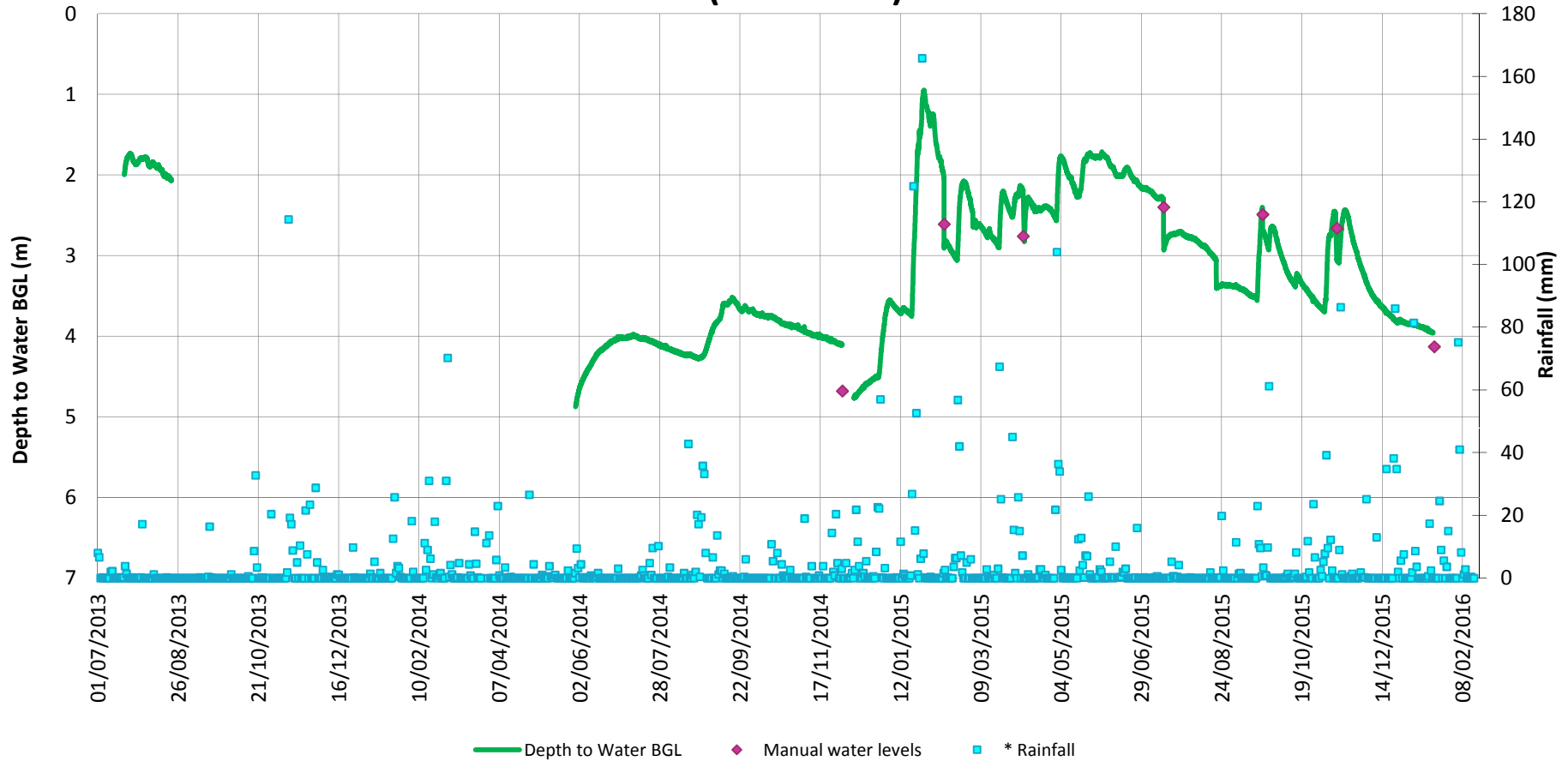
* Rainfall data sourced from Bureau of Meteorology (BoM) Port Macquarie Airport AWS (Stn 060139, BoM, 2016)

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



Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262201	
Date	19/01/2016		BH ID	D-BH3104	
			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 GW30 (D-BH3105) Water Level BGL



Drawn	KF	 Transport Roads & Maritime Services	Client	RMS	
Approved	MD		Instrument	HOBO Water Level Data Logger sn10262193	
Date	19/01/2016		BH ID	D-BH3105	
			Project	Pacific Hwy (HW10) Oxley Hwy to Kempsey	Figure no: B-17

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

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

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					
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 and November 2015 events are for "total" metals despite otherwise indicated in table.

Note – GW01 groundwater monitoring bore destroyed by construction prior to April 2015 sampling 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						
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 and November 2015 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						
Dissolved Aluminium	mg/L	0.01	<0.01	0.02	<0.01	0.24	1.44	<0.01						
Dissolved Arsenic	mg/L	0.001	<0.001	<0.001	<0.001	0.006	0.002	<0.001						
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0002	<0.0001	0.0001						
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001						
Dissolved Copper	mg/L	0.001	0.005	0.005	0.005	0.010	0.022	0.001						
Total Iron	mg/L	0.05	35.7	11.3	3.73	17.4	4.92	7.97						
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.085	<0.001						
Total Manganese	mg/L	0.001	1.13	0.947	0.141	1.34	0.311	1.22						
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						
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Dissolved Zinc	mg/L	0.005	0.01	0.019	0.015	0.028	0.028	0.013						
EC laboratory	uS/cm		1290	939	519	1040	725	1080						
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						
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 and November 2015 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					
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 and November 2015 events are for "total" metals despite otherwise indicated in table.

Note – GW04 groundwater monitoring bore destroyed by construction prior to July 2015 sampling 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						
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 and November 2015 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					
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 and November 2015 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				Jan 16						
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*								
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 and November 2015 events are for "total" metals despite otherwise indicated in table.

Note – GW08 had insufficient water to collect a sample during January 2016 sampling event.

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					
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 and November 2015 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.

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					
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 and November 2015 events are for "total" metals despite otherwise indicated in table.

Note – GW10 groundwater monitoring bore destroyed by construction prior to July 2015 sampling 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						
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													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		7	118	273									
Chloride	mg/L		2076	966	140									
Nitrate			0.02	0.01	<0.01	0.02								
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 and November 2015 events are for "total" metals despite otherwise indicated in table.

Note – GW11 groundwater monitoring bore destroyed by construction following July 2015 sampling 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					
Dissolved Aluminium	mg/L	0.01	0.01	0.01	<0.01	2.33	2.54	<0.01					
Dissolved Arsenic	mg/L	0.001	0.004	0.003	0.002	0.077	0.024	0.004					
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0005	0.0003	0.0001					
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	0.006	0.003	<0.001					
Dissolved Copper	mg/L	0.001	<0.001	<0.001	<0.001	0.016	0.043	<0.001					
Total Iron	mg/L	0.05	344	191	169	135	74.6	101					
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.003	0.069	<0.001					
Total Manganese	mg/L	0.001	8.61	4.85		4.97	3.79	4.75					
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					
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					
Dissolved Zinc	mg/L	0.005	0.02	0.018	0.029	0.040	0.034	0.027					
EC laboratory	uS/cm		4020	2860	2470	2600	1740	1510					
Total Nitrogen	mg/L		3.8	2.0	1.08			3.0					
Total Phosphorus	mg/L		0.70	0.20	0.15			0.14					
Ammonia	mg/L		1.58	1.48	1.05			0.90					
Phosphate	mg/L												
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		74	83	56			25					
Chloride	mg/L		354	281	230			159					
Nitrate			<0.01	<0.10*	<0.01	1.53	1.24	0.05					
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 and November 2015 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					
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												
Bicarbonate / 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 and November 2015 events are for "total" metals despite otherwise indicated in table.

Note – GW13 groundwater monitoring bore destroyed by construction following February 2015 sampling 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					
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												
Bicarbonate / 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 and November 2015 events are for "total" metals despite otherwise indicated in table.

Note – GW14 groundwater monitoring bore destroyed by construction following February 2015 sampling 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						
Dissolved Aluminium	mg/L	0.01	0.02	0.02	0.01	0.47	1.01	<0.01						
Dissolved Arsenic	mg/L	0.001	0.01	0.008	0.005	0.026	0.014	0.008						
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	<0.0001	0.0001	<0.0001						
Dissolved Chromium	mg/L	0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001						
Dissolved Copper	mg/L	0.001	0.008	0.002	0.002	0.012	0.03	<0.001						
Total Iron	mg/L	0.05	7.28	6.61	5.02	3.98	3.38	5.40						
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.002	0.169	<0.001						
Total Manganese	mg/L	0.001	2.55	2.21	2.00	1.94	2.06	3.58						
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						
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Dissolved Zinc	mg/L	0.005	0.021	0.016	0.020	0.022	0.026	0.015						
EC laboratory	uS/cm		3760	3740	3660	3760	3850	3690						
Total Nitrogen	mg/L		0.26	--	0.28			0.6						
Total Phosphorus	mg/L		0.09	0.05	0.08			0.10						
Ammonia	mg/L		0.05	--	0.07			0.05						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		260	239	244			268						
Chloride	mg/L		981	1086	1000			888						
Nitrate			<0.01	<0.01	<0.01	<0.01	0.02	0.05						
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 and November 2015 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						
Dissolved Aluminium	mg/L	0.01			0.01	1.16	2.95	0.01						
Dissolved Arsenic	mg/L	0.001			<0.001	0.002	0.004	0.001						
Dissolved Cadmium	mg/L	0.0001			<0.001	0.0002	0.0003	<0.0001						
Dissolved Chromium	mg/L	0.001			<0.001	0.002	0.004	<0.001						
Dissolved Copper	mg/L	0.001			0.001	0.006	0.012	<0.001						
Total Iron	mg/L	0.05			19.9	1.73	4.66	8.64						
Dissolved Lead	mg/L	0.001			<0.001	0.003	0.061	<0.001						
Total Manganese	mg/L	0.001			0.561	0.238	0.245	0.272						
Mercury	mg/L	0.0001			<0.00001			<0.0001						
Dissolved Nickel	mg/L	0.001			0.005	0.003	0.004	0.002						
Dissolved Silver	mg/L	0.001			<0.001	<0.001	<0.001	<0.001						
Dissolved Zinc	mg/L	0.005			0.026	0.046	0.046	0.022						
EC laboratory	uS/cm				3680	4150	4080	3840						
Total Nitrogen	mg/L				0.55			0.6						
Total Phosphorus	mg/L				0.30			0.11						
Ammonia	mg/L				0.02			0.02						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹				560			382						
Chloride	mg/L				770			799						
Nitrate					<0.01	0.10	0.09	0.05						
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 and November 2015 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						
Dissolved Aluminium	mg/L	0.01	0.02	0.03	<0.01	0.63	2.18	<0.01						
Dissolved Arsenic	mg/L	0.001	0.006	0.005	0.005	0.011	0.009	0.002						
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0020	0.0003	<0.0001						
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001						
Dissolved Copper	mg/L	0.001	0.008	0.004	0.003	0.034	0.021	0.001						
Total Iron	mg/L	0.05	5.26	5.57	5.76	2.40	4.34	4.01						
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.012	0.085	<0.001						
Total Manganese	mg/L	0.001	2.00	1.80	1.80	1.58	1.58	1.60						
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						
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Dissolved Zinc	mg/L	0.005	0.022	0.014	0.022	0.040	0.04	0.007						
EC laboratory	uS/cm		1690	1690	1660	1700	1730	1720						
Total Nitrogen	mg/L		0.46	--	0.37			0.4						
Total Phosphorus	mg/L		0.09	0.06	0.08			0.02						
Ammonia	mg/L		0.14	0.18	0.12			0.08						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		676	645	684			587						
Chloride	mg/L		96	95	98			80						
Nitrate			0.02	<0.01	<0.01	2.02	0.02	0.19						
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 and November 2015 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						
Dissolved Aluminium	mg/L	0.01	0.02	0.14	0.04									
Dissolved Arsenic	mg/L	0.001	0.002	<0.001	0.001									
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001									
Dissolved Chromium	mg/L	0.001	<0.001	0.001	0.001									
Dissolved Copper	mg/L	0.001	0.043	0.01	0.013									
Total Iron	mg/L	0.05	24.7	83.6	22.0									
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001									
Total Manganese	mg/L	0.001	0.865	0.319	0.162									
Mercury	mg/L	0.0001	<0.00001	0.00002	<0.00001									
Dissolved Nickel	mg/L	0.001	0.016	0.006	0.007									
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001									
Dissolved Zinc	mg/L	0.005	0.056	0.016	0.024									
EC laboratory	uS/cm		634	435	734									
Total Nitrogen	mg/L		0.5	1.1	0.64									
Total Phosphorus	mg/L		0.14	0.64	0.40									
Ammonia	mg/L		0.03	<0.02	0.01									
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		96	40	201									
Chloride	mg/L		126	64	73									
Nitrate			<0.01	<0.01	<0.01									
Sulphate	mg/L		22	57										
Calcium	mg/L		3.36	3.37	4.08									
Magnesium	mg/L		10.2	9.21	5.9									
Potassium	mg/L		6.15	10.6	6.69									
Sodium	mg/L		114	79.3	157									

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

Note – GW19 groundwater monitoring bore destroyed by construction following April 2015 sampling 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					
Dissolved Aluminium	mg/L	0.01			0.01								
Dissolved Arsenic	mg/L	0.001			<0.001								
Dissolved Cadmium	mg/L	0.0001			<0.001								
Dissolved Chromium	mg/L	0.001			<0.001								
Dissolved Copper	mg/L	0.001			0.003								
Total Iron	mg/L	0.05			17.5								
Dissolved Lead	mg/L	0.001			<0.001								
Total Manganese	mg/L	0.001			1.10								
Mercury	mg/L	0.0001			<0.00001								
Dissolved Nickel	mg/L	0.001			0.065								
Dissolved Silver	mg/L	0.001			<0.001								
Dissolved Zinc	mg/L	0.005			0.696								
EC laboratory	uS/cm												
Total Nitrogen	mg/L												
Total Phosphorus	mg/L												
Ammonia	mg/L												
Phosphate	mg/L												
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹				167								
Chloride	mg/L				150								
Nitrate													
Sulphate	mg/L												
Calcium	mg/L				82.0								
Magnesium	mg/L				94.4								
Potassium	mg/L				17.0								
Sodium	mg/L				137								

* Analysis of all metals for July and November 2015 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.

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					
Dissolved Aluminium	mg/L	0.01	0.36	0.03	0.02	12.2	6.33	0.17					
Dissolved Arsenic	mg/L	0.001	0.008	0.002	0.002	0.011	0.004	0.008					
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0010	0.0001	<0.0001					
Dissolved Chromium	mg/L	0.001	0.004	<0.001	<0.001	0.011	0.003	0.001					
Dissolved Copper	mg/L	0.001	0.021	<0.001	0.026	0.126	0.169	0.003					
Total Iron	mg/L	0.05	159	86.6	19.3	35.8	7.31	22.0					
Dissolved Lead	mg/L	0.001	0.01	<0.001	<0.001	0.049	0.066	0.001					
Total Manganese	mg/L	0.001	1.00	0.979	0.557	0.577	0.481	0.652					
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					
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					
Dissolved Zinc	mg/L	0.005	0.022	0.009	0.056	1.16	0.08	0.059					
EC laboratory	uS/cm		1050	714	748	730	562	828					
Total Nitrogen	mg/L		3.1	2.2	1.22			1.1					
Total Phosphorus	mg/L		0.55	0.42	0.19			0.19					
Ammonia	mg/L		<0.02	<0.02	0.13			<0.01					
Phosphate	mg/L												
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		376	292	346			333					
Chloride	mg/L		101	54	58			41					
Nitrate	mg/L		0.01	<0.01	<0.01	0.14	0.12	0.03					
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 and November 2015 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						
Dissolved Aluminium	mg/L	0.01	0.16	0.62	2.34	87.2	83.1	1.26						
Dissolved Arsenic	mg/L	0.001	0.001	0.001	0.001	0.074	0.022	0.001						
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0005	<0.0001	<0.0001						
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	0.002	0.023	0.023	0.001						
Dissolved Copper	mg/L	0.001	0.018	0.014	0.019	0.236	0.131	0.012						
Total Iron	mg/L	0.05	96.9	101	110	66.2	49	24.0						
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.086	0.109	<0.001						
Total Manganese	mg/L	0.001	0.232	0.252	0.261	0.632	0.147	0.064						
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						
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Dissolved Zinc	mg/L	0.005	0.048	0.022	0.050	2.33	1.06	0.139						
EC laboratory	uS/cm		501	325	296	470	410	348						
Total Nitrogen	mg/L		2.3	2.5	1.85			1.3						
Total Phosphorus	mg/L		0.37	0.39	0.35			0.15						
Ammonia	mg/L		<0.02	<0.02	0.02			<0.01						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		18	19	15			10						
Chloride	mg/L		128	72	71			68						
Nitrate	mg/L		0.01	<0.01	<0.01	0.05	0.07	0.06						
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 and November 2015 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						
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													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		32	11	9			10						
Chloride	mg/L		62	45	44			40						
Nitrate	mg/L		<0.01	0.01	<0.01	0.06	1.14	0.04						
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 and November 2015 events are for "total" metals despite otherwise indicated in table.

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						
Dissolved Aluminium	mg/L	0.01	0.07	0.27	0.26	24.6	11.2	0.29						
Dissolved Arsenic	mg/L	0.001	0.003	<0.001	<0.001	0.010	0.004	0.001						
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0010	<0.0001	0.0002						
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	0.001	0.043	0.016	0.001						
Dissolved Copper	mg/L	0.001	0.087	1.52	0.353	5.09	0.862	2.87						
Total Iron	mg/L	0.05	92.5	23.8	34.2	35.6	10.6	22.4						
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.021	0.062	<0.001						
Total Manganese	mg/L	0.001	0.366	0.132	0.145	0.180	0.062	0.090						
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						
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Dissolved Zinc	mg/L	0.005	0.06	0.074	0.063	0.235	0.061	0.072						
EC laboratory	uS/cm			595	558	840	410	622						
Total Nitrogen	mg/L			1.3	1.10			2.3						
Total Phosphorus	mg/L			0.3	0.365									
Ammonia	mg/L			0.09	0.02			<0.01						
Phosphate	mg/L							0.63						
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		32	<5	<5			6						
Chloride	mg/L		136	154	150			164						
Nitrate				<0.01	<0.01	<0.50	<0.01	<0.01						
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 and November 2015 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				Jan 16						
			Dec 14	Feb 15	Apr 15	Jul 15*	Nov 15*								
Dissolved Aluminium	mg/L	0.01	0.20	0.14	0.05	10.7									
Dissolved Arsenic	mg/L	0.001	<0.001	<0.001	<0.001	0.004									
Dissolved Cadmium	mg/L	0.0001	0.001	0.001	<0.001	0.0014									
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	0.007									
Dissolved Copper	mg/L	0.001	0.156	0.351	0.095	0.129									
Total Iron	mg/L	0.05	30.5	17.6	17.7	8.38									
Dissolved Lead	mg/L	0.001	0.006	0.005	<0.001	0.012									
Total Manganese	mg/L	0.001	2.23	0.929	0.308	0.298									
Mercury	mg/L	0.0001	<0.00001	<0.00001	<0.00001										
Dissolved Nickel	mg/L	0.001	0.035	0.018	0.005	0.027									
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001									
Dissolved Zinc	mg/L	0.005	0.388	0.306	0.074	0.144									
EC laboratory	uS/cm			967	449	467									
Total Nitrogen	mg/L			0.8	1.09										
Total Phosphorus	mg/L			0.05	0.11										
Ammonia	mg/L			0.18	0.19										
Phosphate	mg/L														
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		<5	<5	7										
Chloride	mg/L		523	269	120										
Nitrate				0.12	0.03	0.04									
Sulphate	mg/L		20	25											
Calcium	mg/L		2.98	1.67	1.02										
Magnesium	mg/L		25.7	12.2	4.86										
Potassium	mg/L		10.0	9.9	8.67										
Sodium	mg/L		250	150	79.3										

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

Note – GW25 had insufficient water to collect a sample during November 2015 and January 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						
Dissolved Aluminium	mg/L	0.01	<0.01	0.04	0.21	55.2	7.77	0.19						
Dissolved Arsenic	mg/L	0.001	0.002	<0.001	<0.001	0.013	0.004	<0.001						
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0034	0.001	0.0010						
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	0.001	0.023	0.056	0.001						
Dissolved Copper	mg/L	0.001		0.23	1.01	38.6	1.8	2.19						
Total Iron	mg/L	0.05	26.2	43.6	11.5	16.5	3.28	6.64						
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.045	0.092	<0.001						
Total Manganese	mg/L	0.001	0.928	0.972	0.300	0.488	0.141	0.157						
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						
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Dissolved Zinc	mg/L	0.005	0.165	0.178	0.179	0.779	0.268	0.382						
EC laboratory	uS/cm			896	750	1190	997	951						
Total Nitrogen	mg/L			1	0.57			0.5						
Total Phosphorus	mg/L			0.23	0.135			0.14						
Ammonia	mg/L			0.03	0.01			<0.01						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹			26	34			27						
Chloride	mg/L		281	250	220			271						
Nitrate				0.01	<0.01	<0.01	0.04	<0.01						
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 and November 2015 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						
Dissolved Aluminium	mg/L	0.01	<0.01	0.02	0.02	20.3	3.27	0.02						
Dissolved Arsenic	mg/L	0.001	0.003	<0.001	<0.001	0.021	0.002	0.001						
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0016	<0.0001	0.0001						
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	<0.001	0.063	0.008	<0.001						
Dissolved Copper	mg/L	0.001	0.012	0.053	0.084	2.70	0.039	0.352						
Total Iron	mg/L	0.05	21.2	20.5	6.08	37.3	5.3	14.8						
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.045	0.115	<0.001						
Total Manganese	mg/L	0.001	2.66	1.33	0.403	0.950	0.447	0.975						
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						
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Dissolved Zinc	mg/L	0.005	0.020	0.066	0.021	0.420	0.049	0.041						
EC laboratory	uS/cm			514	353	438	544	660						
Total Nitrogen	mg/L			0.8	0.64			0.6						
Total Phosphorus	mg/L			0.31	0.17			0.36						
Ammonia	mg/L			0.05	0.04			0.04						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		231	51	50			45						
Chloride	mg/L		139	76	65			128						
Nitrate				0.09	0.08	0.26	0.21	0.05						
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 and November 2015 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						
Dissolved Aluminium	mg/L	0.01	0.11		0.09	47.7	22.7	2.09						
Dissolved Arsenic	mg/L	0.001	0.002		<0.001	0.023	0.007	<0.001						
Dissolved Cadmium	mg/L	0.0001	<0.001		<0.001	0.0035	0.0005	0.0003						
Dissolved Chromium	mg/L	0.001	0.001		<0.001	0.085	0.025	0.002						
Dissolved Copper	mg/L	0.001			0.545	23.0	2.17	2.87						
Total Iron	mg/L	0.05	22.6		51.9	53.0	17.1	11.3						
Dissolved Lead	mg/L	0.001	<0.001		<0.001	0.056	0.157	<0.001						
Total Manganese	mg/L	0.001	0.226		0.202	0.312	0.099	0.098						
Mercury	mg/L	0.0001	0.00001		<0.00001			<0.0001						
Dissolved Nickel	mg/L	0.001	0.015		0.003	0.047	0.014	0.004						
Dissolved Silver	mg/L	0.001	<0.001		<0.001	<0.001	<0.001	<0.001						
Dissolved Zinc	mg/L	0.005	0.052		0.019	0.280	0.106	0.313						
EC laboratory	uS/cm				199	235	223	235						
Total Nitrogen	mg/L				0.80			1.5						
Total Phosphorus	mg/L				0.40			0.30						
Ammonia	mg/L				0.02			0.05						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		31		14			15						
Chloride	mg/L		40		45			41						
Nitrate					<0.01	<0.01	0.02	<0.01						
Sulphate	mg/L		51					18						
Calcium	mg/L		4.56		3.55			2						
Magnesium	mg/L		11.1		7.27			3						
Potassium	mg/L		6.63		9.23			2						
Sodium	mg/L		50.2		36.2			44						

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

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						
Dissolved Aluminium	mg/L	0.01	0.16	0.72	0.78	29.4	35.8	1.06						
Dissolved Arsenic	mg/L	0.001	0.004	0.002	0.002	0.017	0.009	<0.001						
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0010	0.0006	0.0001						
Dissolved Chromium	mg/L	0.001	<0.001	0.002	0.003	0.021	0.022	0.001						
Dissolved Copper	mg/L	0.001	0.014	0.022	0.017	0.154	0.116	0.015						
Total Iron	mg/L	0.05	187	5.29	3.98	18.8	19.5	19.4						
Dissolved Lead	mg/L	0.001	<0.001	0.001	<0.001	0.047	0.079	<0.001						
Total Manganese	mg/L	0.001	3.29	0.089	0.099	0.289	0.26	0.306						
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						
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Dissolved Zinc	mg/L	0.005	0.069	0.103	0.087	1.47	0.788	0.310						
EC laboratory	uS/cm		274	145	158	195	211	205						
Total Nitrogen	mg/L		5.5%	0.7	0.68			1.9						
Total Phosphorus	mg/L		1.23%	0.1	0.085			0.40						
Ammonia	mg/L		0.03	<0.02	0.09			0.02						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		46	17	23			16						
Chloride	mg/L		46	27	29			33						
Nitrate			0.01	0.01	0.1	0.64	0.03	0.04						
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 and November 2015 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						
Dissolved Aluminium	mg/L	0.01	1.36	0.06	0.05	6.79	7.49	0.17						
Dissolved Arsenic	mg/L	0.001	0.001	0.002	0.002	0.022	0.008	<0.001						
Dissolved Cadmium	mg/L	0.0001	<0.001	<0.001	<0.001	0.0010	<0.0001	0.0001						
Dissolved Chromium	mg/L	0.001	<0.001	<0.001	0.001	0.007	0.006	<0.001						
Dissolved Copper	mg/L	0.001	0.175	0.009	0.01	0.127	1.69	0.650						
Total Iron	mg/L	0.05	16.8	6.37	17.3	9.16	6.32	19.3						
Dissolved Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.005	0.057	<0.001						
Total Manganese	mg/L	0.001	1.10	0.162	0.187	0.168	0.305	0.485						
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						
Dissolved Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Dissolved Zinc	mg/L	0.005	0.310	0.018	0.029	0.068	0.098	0.236						
EC laboratory	uS/cm		2820	435	511	677	1020	1420						
Total Nitrogen	mg/L		0.6	0.6	0.88			1.7						
Total Phosphorus	mg/L		0.11	0.06	0.10			0.32						
Ammonia	mg/L		0.03	<0.02	0.11			<0.01						
Phosphate	mg/L													
Bicarbonate / Alkalinity	mg CaCO ₃ /L ⁻¹		<5	120	95			9						
Chloride	mg/L		798	39	76			355						
Nitrate			0.24	<0.01	0.12	0.03	0.41	0.34						
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 and November 2015 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
GW01 (mTOC)	20.11	5.65	5.02	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW01 (mAHD)									
GW02 (mTOC)	3.57	3.17	1.77	1.34	1.88	Not taken	1.84	1.47	Destroyed
GW02 (mAHD)									
GW03 (mTOC)	2.64	2.29	0.64	0.2	0.08	Not taken	0.27	0.25	0.32
GW03 (mAHD)									
GW04 (mTOC)	1.69	2.37	0.96	0.43	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW04 (mAHD)									
GW05 (mTOC)	1.24	1.79	0.55	0.17	0.47	Not taken	0.16	0.25	0.34
GW05 (mAHD)									
GW06 (mTOC)	20.1	Dry	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW06 (mAHD)									
GW07 (mTOC)	15.98	6.79 (dry)	1.81	1.0	Dry	Not taken	5.6	5.36	4.41
GW07 (mAHD)									
GW08 (mTOC)	19.09	8.58	7.97	4.6	13.28	Dry	Dry	7.05	Dry
GW08 (mAHD)									
GW09 (mTOC)	17.57	Dry	Dry	Dry	8.54	Destroyed	Destroyed	Destroyed	Destroyed
GW09 (mAHD)									
GW10 (mTOC)	15.38	7.31	2.74	5.69	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW10 (mAHD)									
GW11 (mTOC)	1.591	2.99	Not taken	1.55	1.13	Destroyed	Destroyed	Destroyed	Destroyed
GW11 (mAHD)									
GW12 (mTOC)	1.573	1.60	0.38	0.2	0.34	Not taken	0.2	0.23	0.31
GW12 (mAHD)									
GW13 (mTOC)	2.04	2.08	0.98	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW13 (mAHD)									
GW14 (mTOC)	5.656	3.92	2.60	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW14 (mAHD)									
GW15 (mTOC)	13.79	10.45	10.63	10.5	10.04	Not taken	9.9	9.74	8.95

Borehole reference	Top of casing RL (mAHD)	Depth of water level							
		Construction							
		Dec 14	Feb 15	Apr 2015	July 2015	Aug 2015	Sep 2015	Nov 2015	Jan 2016
GW15 (mAHD)									
GW16 (mTOC)	14.14	Dry	Dry	Dry	Dry	Destroyed	Destroyed	Destroyed	Destroyed
GW16 (mAHD)									
GW17 (mTOC)	59.47	Dry	Dry	12.72	11.66	Not taken	11.82	11.54	11.5
GW17 (mAHD)									
GW18 (mTOC)	96.71	34.09	33.70	33.76	33.71	Not taken	32.78	33.9	33.86
GW18 (mAHD)									
GW19 (mTOC)	51.81	9.45	6.28	5.59	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW19 (mAHD)									
GW20 (mTOC)	87.18	Dry	32.80 (dry)	32.83	33.08	Dry	33.15	Dry	Dry
GW20 (mAHD)									
GW21 (mTOC)	51.29	4.19	3.34	1.65	4.27	Not taken	4.76	2.23	2.82
GW21 (mAHD)									
GW22 (mTOC)	17.27	3.37	2.34	0.76	3.21	Not taken	2.29	1.42	1.67
GW22 (mAHD)									
GW23 (mTOC)	39.22	16.29	15.98	15.91	15.99	Not taken	16.7	17.2	17.14
GW23 (mAHD)									
GW24 (mTOC)	26.09	8.05	3.51	6.15	7.45	Dry	Dry	6.5	7.16
GW24 (mAHD)									
GW25 (mTOC)	61.72	13.04	12.30	12.32	12.55	Not taken	13.08	Dry	Dry
GW25 (mAHD)									
GW26 (mTOC)	54.56	15.00	13.58	13.45	14.5	Not taken	15.1	14.1	13.81
GW26 (mAHD)									
GW27 (mTOC)	74.33	28.41	27.47	27.21	28.58	Dry	29.25	29.17	26.67
GW27 (mAHD)									
GW28 (mTOC)	54.65	9.37	9.02	8.05	9.05	Dry	Dry	8.76	9.1
GW28 (mAHD)									
GW29 (mTOC)	45.11	8.49	3.39	1.33	5.73	Not taken	6.88	5.89	7.37
GW29 (mAHD)									
GW30 (mTOC)	41.49	5.14	2.61	2.76	2.86	Not taken	2.95	3.12	4.59
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
GW01	446	202	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW02	31600	16400	25700	Not taken	662	589	817	Destroyed
GW03	118	85000	57400	Not taken	959	729	679	866
GW04	450	294	356	Not taken	Destroyed	Destroyed	Destroyed	Destroyed
GW05	737	666	768	Not taken	6025	5010	6	4975
GW06	Dry	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW07	Dry	20300	272	Not taken	1578	189	173	138
GW08	47700	140	47900	Not taken	Dry	Insufficient water	656	Insufficient water
GW09	Dry	Dry	Insufficient water	Not taken	Destroyed	Destroyed	Destroyed	Destroyed
GW10	46300	39000	65900	Not taken	Destroyed	Destroyed	Destroyed	Destroyed
GW11	845	416	112	Not taken	Destroyed	Destroyed	Destroyed	Destroyed
GW12	399	271	273	Not taken	1376	1265	1457	1199
GW13	39100	22400	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW14	340	308	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW15	371	359	410	Not taken	3333	2957	3275	2782
GW16	Dry	Dry	Insufficient water	Not taken	Destroyed	Destroyed	Destroyed	Destroyed
GW17	Dry	Dry	415	Not taken	3555	3151	3454	2888
GW18	162	155	182	Not taken	1513	1469	1518	1337
GW19	60000	40900	83700	Not taken	Destroyed	Destroyed	Destroyed	Destroyed
GW20	Dry	Dry	Insufficient water	Not taken	Insufficient water	Insufficient water	Insufficient water	Insufficient water
GW21	100400	67100	82200	Not taken	731	833	490	666
GW22	50200	31300	33700	Not taken	478	403	345	273
GW23	54100	14300	21700	Not taken	230	288	216	192
GW24	54000	55500	62900	Not taken	Insufficient water	Insufficient water	358	464
GW25	158	90100	49600	Not taken	548	Insufficient water	Insufficient water	Insufficient water
GW26	87800	84500	83100	Not taken	1060	Insufficient water	871	732
GW27	87200	47200	39100	Not taken	Insufficient water	Insufficient water	464	491
GW28	28400	Dry	22000	Not taken	Insufficient water	Insufficient water	202	Insufficient water
GW29	26800	14100	17500	Not taken	202	187	191	171

Borehole reference	Electrical conductivity (uS/cm)							
	Construction							
	Dec 14	Feb 15	Apr 2015	Jul 2015	Aug 2015	Sep 2015	Nov 2015	Jan 2016
GW30	257	39400	56900	Not taken	1075	1062	854	1072

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
GW01	4.4	5.4	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW02	Not recorded	5.7	6.3	6.9	5.9	6.4	7.0	Destroyed
GW03	6.5	6.2	6.8	6.6	6.8	6.3	7.5	6.5
GW04	6.5	6.2	6.5	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW05	6.8	6.5	6.6	7.0	6.7	6.7	7.0	6.2
GW06	Dry	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW07	Dry	5.9	6.0	Dry	6.0	5.6	6.8	6.1
GW08	6.3	5.7	6.0	Insufficient water	Insufficient water	Insufficient water	6.0	Insufficient water
GW09	Dry	Dry	Dry	Insufficient water	Destroyed	Destroyed	Destroyed	Destroyed
GW10	6.7	5.5	5.6	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW11	5.3	6.1	6.6	7.0	Destroyed	Destroyed	Destroyed	Destroyed
GW12	6.4	6.0	6.2	6.0	3.8	3.8	6.0	6.0
GW13	6.3	6.0	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW14	7.6	6.9	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW15	6.5	6.3	6.4	6.2	6.1	625.0	6.2	5.9
GW16	Dry	Dry	Dry	Dry	Destroyed	Destroyed	Destroyed	Destroyed
GW17	Dry	Dry	6.8	6.5	6.4	6.4	6.5	6.3
GW18	6.7	6.9	6.9	6.8	67.3	6.7	6.8	6.8
GW19	6.1	5.6	6.4	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW20	Dry	Dry	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water
GW21	6.8	6.9	6.9	6.6	6.8	6.3	7.5	6.9
GW22	5.7	5.7	5.6	6.9	6.3	5.9	5.5	5.8
GW23	5.7	5.0	5.4	5.6	6.0	5.4	5.5	6.5

Borehole reference	pH							
	Construction							
	Dec 14	Feb 15	Apr 2015	Jul 2015	Aug 2015	Sep 2015	Nov 2015	Jan 2016
GW24	5.9	4.8	4.9	5.2	Insufficient water	Insufficient water	5.7	7.5
GW25	6.0	4.6	5.1	5.1	4.7	Insufficient water	Insufficient water	Insufficient water
GW26	6.3	5.5	5.3	5.3	5.3	Insufficient water	5.3	5.4
GW27	7.1	6.2	6.2	Insufficient water	Insufficient water	Insufficient water	5.8	5.7
GW28	6.2	Dry	5.3	Insufficient water	Insufficient water	Insufficient water	5.2	Insufficient water
GW29	6.0	5.5	5.7	5.8	5.7	5.8	5.4	5.8
GW30	4.6	6.1	Instrument error	5.8	5.0	5.2	5.6	5.2

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
GW01	18.9	21.1	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW02	18.5	21.9	21.4	18.5	18.4	17.6	20.1	Destroyed
GW03	19.0	22.7	20.8	16.8	16.2	16.9	18.9	21.1
GW04	18.7	22.3	21.2	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW05	17.3	20.1	19.5	16.3	15.8	16.0	17.3	20.1
GW06	Dry	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW07	Dry	21.7	22.1	Insufficient water	19.5	19.6	19.9	20.2
GW08	20.2	21.6	20.0	Insufficient water	Insufficient water	Insufficient water	20.3	Insufficient water
GW09	Dry	Dry	Insufficient water	Insufficient water	Destroyed	Destroyed	Destroyed	Destroyed
GW10	19.0	20.6	20.3	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW11	18.3	20.4	22.0	17.5	Destroyed	Destroyed	Destroyed	Destroyed
GW12	18.1	21.5	21.1	15.6	14.3	15.5	18.4	20.7
GW13	18.2	21.4	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW14	18.2	20.6	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW15	18.8	20.5	20.3	19.8	19.9	20.6	20.7	20.5
GW16	Dry	Dry	Insufficient water	Insufficient water	Destroyed	Destroyed	Destroyed	Destroyed

Borehole reference	Temperature Construction							
	Dec 14	Feb 15	Apr 2015	Jul 2015	Aug 2015	Sep 2015	Nov 2015	Jan 2016
GW17	Dry	Dry	19.7	19.2	19.3	19.4	19.7	19.9
GW18	18.5	20.2	19.7	18.8	19.0	19.2	19.8	20.8
GW19	18.8	19.6	20.1	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
GW20	Dry	Dry	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water	Insufficient water
GW21	18.9	19.8	20.8	18.8	18.8	18.5	18.6	19.9
GW22	18.3	20.3	21.0	18.3	18.2	17.2	18.3	20.6
GW23	19.1	19.2	18.9	18.3	18.5	18.7	18.9	19.4
GW24	21.8	19.7	19.7	18.5	Insufficient water	Insufficient water	18.7	18.8
GW25	21.0	21.1	19.6	19.4	18.5	Insufficient water	Insufficient water	Insufficient water
GW26	22.7	20.3	19.9	18.8	19.2	Insufficient water	20.1	20.2
GW27	19.6	20.4	19.2	Insufficient water	Insufficient water	Insufficient water	19.7	19.9
GW28	21.6	Dry	19.5	18.6	Insufficient water	Insufficient water	20	Insufficient water
GW29	18.3	19.6	20.3	Insufficient water	18.5	18.7	18.6	19.2
GW30	18.4	20.2	20.5	19.0	18.6	18.6	19.1	19.9



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