

Appendix M

Surface Water Specialist
Response

Appendix M-1 Surface Water Specialist Response

Monday, 6 June 2016

Bloomfield Collieries

P.O. Box 4

East Maitland NSW 2323

Attention: John Hindmarsh

Response to Land Owner Concerns
Proposed Extension of Mining at the
Rixs Creek Colliery

1 Background

Mr John Hindmarsh of Rixs Creek Mine (RXC) requested JP Environmental to review expressions of concern from two neighbouring land owners that were submitted to the Department of Planning and Infrastructure regarding the proposed extension of mining at Rixs Creek Mine. The neighbours expressed concern regarding the quality and quantity of runoff entering Deadmans Creek from mining operations at Rixs Creek.

Alistair Bowman is the nearest neighbour owning land downstream in Deadmans Creek catchment. Mr Bowman's concerns are set out below:

1. Future performance: The primary concern was "the potential for unsuitable surface water entering Deadmans Creek".
2. Past performance: Mr Bowmans "experience has been that the current sediment dams that protects Deadmans Creek from surface water run-off from the existing out of pit dump has overflowed on at least three occasions in the last twelve months". Runoff from the mine has been has been a regular subject of discussion with Mine representatives.
3. Request for comfort, i.e. Rixs Creek provide a timetable to for the enlargement of existing dams to operate as sediment settling dams (Dams 16, 17 and 20) to protect Deadmans Gully prior to mining activity moving into this catchment.

Bruce Moxey is the next landowner downstream after Bowman in the Deadmans Creek catchment. Mr Moxey's concerns are:

1. Past performance: The main concern is the quality of the water of runoff from the mine that has occurred in the past.
2. Future performance: That the Mine "might not be able to contain excess water runoff from not only entering our property but the Hunter River", and
3. Impacts on livestock: "Our cattle also have free access to Deadman's Creek and drink from it".

2 Dam Overflows

The capacity of the sediment dams at Rixs Creek Mine was determined in accordance with Managing Urban Stormwater Soils and Construction – Volume 2E Mines and Quarries 2006 (the “Blue Book”), based on an 85th percentile 5 day rainfall event and Type D soils. When operated in accordance with the Blue Book, these dams would be expected to overflow, on average, between one and two times per year.

Using a rule of thumb calculation to estimate the daily rainfall that might cause Dams SD7, SD16, SD17 and SD20 to overflow, the required rainfall is:

Initial Losses	20mm
Ongoing Losses	10mm
<u>Rainfall Excess</u>	<u>15 - 23mm</u> (<i>depends on sediment levels in the dam</i>)
Daily Total	45 - 53mm

A review of the 2015 daily rainfall record for Rixs Creek Mine, referencing the above daily rainfall range indicates that there may have been 3 or 4 overflow events in 2015, and the spillways may have operated for 6 or 7 days. The number of overflows appears consistent with Mr Bowmans observations.

In the Rixs Creek Extension of Mining EIS, the Mine indicated it may either treat and release the clarified water or take the untreated water into the mine water management system. The method adopted could vary from time to time based on a risk assessment of the current water inventory held within the mine. If all water is taken from the sediment dams into the mine water management system, total flow in Deadmans Creek could reduce by up to 90%. If all water was treated and released, Creek flow could be reduced by about 10%.

3 Water Quality

Water quality testing results from monitoring of sediment dams at West Pit and Deadman’s Creek since 2011 are attached.

Water quality results indicate that the runoff collected in the dams from mined and un-mined catchment can contain appreciable levels of sediment i.e. greater than 50mg/l. From observation of historical aerial photographs of West Pit from 2013, 2014 and 2015, most dams in the Deadmans Creek dams are turbid, reflecting the nature of the catchment soils and variable runoff across the catchment rather than any specific activity in the catchment. In December 2015, sediment dams below the advancing overburden dump are quite turbid in the aerial photograph when compared to farm dams to the west and north-west, reflecting the disturbed catchment runoff. In an aerial photograph from the start of 2014 the farm dams to the west and north-west and Dam 16 are very turbid when compared to Dam 17.

The average value of suspended solids results from sampling in Deadman's Creek catchment is lower in 2015 (65 mg/l) when overburden placement commenced, compared to 2011 – 2014 (95 mg/l).

The majority of soils and sub-surface materials in the upper reaches of Deadman's Gully can be classified as Type D soils, which are highly erodible soils containing substantial amounts of colloidal material – clays and fine silts. Rainfall runoff from disturbed land with Type D surface materials is normally quite turbid. It is the clays and fine silts suspended in the water that cause the turbidity. Settled water containing colloidal material remains turbid even when the suspended solids concentration is less than 50mg/l and can remain turbid at levels less than 20mg/l or less. Colloidal material is so small that it will never settle out naturally. Consequently this water required additional treatment before release or must be retained on site.

High turbidity due to colloidal material can make water appear very murky and degraded and is the most likely cause of the land owners concerns about poor water quality. High turbidity can affect the temperature and dissolved oxygen levels of water and limit photosynthesis, adversely impacting aquatic flora and fauna. Deadman's Creek only flows intermittently, with flows generally coinciding with flooding (and turbidity) in the Hunter River. The Creek is considered a low value aquatic environment and high turbidity in water flowing in Deadman's Creek is not considered an environmental risk. However, any water that is released into Deadman's Creek from sediment dams at times other than flood overflows (refer Section 2) should be of low turbidity as it may reach the Hunter River, which holds a much higher value as an aquatic environment.

ANZEC 2000 sets a trigger level of 5 mg/l of dissolved aluminium for stock water. Aluminium levels from water quality monitoring in the Deadman's Creek catchment, and at West Pit normally range between 1 and 5 mg/l, acceptable for stock water. Nevertheless, the aluminium level is higher than normal for most inland waters and warrants further investigation to understand the cause. Notwithstanding the above, the trend of elevated aluminium levels is apparent in the monitoring results from before mining activity commenced in Deadman's Creek catchment.

The monitoring results for aluminium from SD2, SD17 and SD20 were well above ANZECC trigger levels for stock water on 27th April 2015, and SD3 was just over. The issue here is that sustained consumption of water with elevated aluminium levels by stock may lead to nutrient deficiencies. A side issue is that the sediment dams were not re-tested in response to the high aluminium levels, which may indicate an omission in the site TARP. At this stage, scheduled testing will occur in April 2016. Responses to exceedances of trigger levels for aluminium and other heavy metals in water quality results should form part of the TARP plan for the site.

The elevated levels of aluminium detected by monitoring are not due to dissolved aluminium. *"In nature, aluminium exists in the trivalent oxidation state, i.e. Al^{3+} . Its electric charge and the small ionic radius (0.51Å) give Al^{3+} a strong polarising effect*

on adjacent atoms; therefore the element is too reactive to be found free in nature. As a strongly hydrolysing element, Al is practically insoluble in the pH range of 6.5 to 8.5; the solubility is enhanced under acidic pH (pH < 6) or alkaline pH (pH > 8.5) conditions, and/or in the presence of complexing ligands.”¹ The highest levels of aluminium were detected in water between pH 6.8 and 7.4.

Aluminium is highly toxic to plants, and the ongoing health of the vegetation also supports the aluminium detected in the monitoring results is not freely available.

The most likely cause of the measured elevated aluminium levels is that aluminium is adsorbed to colloidal (clay) particles that have passed through the standard filter used in preparation for the total dissolved solids test (TDS). The ratio of TDS to electrical conductivity result regularly departs markedly from the “accepted norm” for the Hunter Valley (about 0.65), indicating that clay particles may be contributing to the mass of the evaporated sample. TDS:EC ratios exceed 1 in 60% of the sample results, and for several of the results the ratio is greater than 6.

4 Clay Toxicology

The clays in Deadman’s Creek catchment would be expected to be a mixture of clay minerals, but predominantly kaolinite. Cracking clays, formed predominantly from smectite (bentonite) may also be found in this area of the Hunter Valley².

Kaolinite and other clays (e.g. bentonite) have been tested and demonstrate “a low toxicity to aquatic species”³, and, “There is no reason to believe kaolin and other clays pose significant toxicological dangers to the environment”. The United States Food and Drug Administration classifies kaolinite and bentonite as “generally recognised as safe”. Bentonite is used in preparation of foods, e.g. clarification of cooking oils. One peer reviewed paper found that, orally taken, kaolin is “practically non-toxic”⁴. The focus of research on adverse health effects appears to be mostly on inhalation by “persons reasonably likely to be exposed in the industrial manufacturing, processing, and use of kaolin”⁵.

There is less literature available specifically dealing with the health effects in cattle from ingesting kaolin; however bentonite is widely used as a stock feed supplement; and kaolin mixtures are used to treat diarrhoea in stock (and humans e.g. Kaomagna). Literature was sighted describing beneficial effects of kaolin fed to pigs and chickens as a food supplement.

Clay particles “can adsorb a variety of toxic substances, bacteria, and viruses from solution or suspension and bind them more or less strongly. In the adsorbed state on the clay surface, the pollutant is probably not toxic, but the possibility exists that the

¹ “Aluminium in drinking water: An overview.” Water SA Vol. 25 No. 1 January 1999; P T Srinivasan, T Viraraghavan and K S Subramanian.

² General Report on the Lands of the Hunter Valley; Land Research Series No.8, CSIRO 1963

³ Environmental Health Criteria 231; Bentonite, Kaolin, and Selected Clay Minerals; World Health Organisation 2005.

⁴ Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984.,p. II-95, Gosselin et al.

⁵<http://toxnet.nlm.nih.gov/cgi-bin/sis/search/a?dbs+hsdb:@term+@DOCNO+630>; TOXNET; Toxicology Data Network; US National Library of Medicine;

pollutant might be released from the clay in the environment of the alimentary tract and thus exert toxic effects. Whether or not such a process might take place would depend on the complex in question, so that no generalities are possible. Information is completely lacking in this area.....⁶". There have been no reports made to Rixs Creek Coal of ill health or loss of condition in the livestock by either of the concerned landholders that have been attributed to clay toxicity.

On balance, ingestion of suspended clays by cattle from mine sediment dam overflows poses little or no risk to the livestock. The water quality results collected by Rixs Creek Mine indicates generally acceptable levels of heavy metals and other toxicants with respect to trigger levels for stock in ANZECC 2000, with the exception of site wide elevated aluminium in results from April 2015. The effect of aluminium appears to be to reduce the ability of livestock to absorb phosphorous i.e. phosphorous deficiency, but this impact is less certain in ruminants. "Where aluminium concentrations in water exceed 5 mg/L, stock intake of phosphorus in the diet should be investigated. Animals, particularly ruminants, may tolerate much higher levels of aluminium as long as there is sufficient phosphorus in the diet to compensate for the effects of aluminium."⁷ Aluminium levels in water quality results regularly exceeded 1 mg/l in runoff in Deadman's Creek before mining, and comparable water quality conditions exist on adjacent farm lands.

5 Sediment Dam Construction Schedule

Sediment dams can be constructed to treat runoff from the immediate catchment that is affected, or to manage the whole of the catchment, including clean and previously rehabilitated areas. From the aerial photograph provided, Rixs Creek Mine appears to have initially adopted the former approach. One reason for adopting this approach is that the required dams are generally smaller and (considered) less expensive to install, however the management approach may become more complicated once additional dams need to be constructed on rehabilitated overburden emplacements.

The Rixs Creek Extension of Mining EIS, in the absence of detailed year by year mine plans, adopted the whole of catchment approach, which leads to larger dams built only once. Based on the EIS mine plans, the required sizes and timing for sediment dams 6&7, 16 and 17 is set out in the Tables below. Sediment Dam 20 was not considered in these Tables as it is a relatively small dam at 4 ML when compared with the included dams. If Rixs Creek chooses to continue building dams for the treatment of the immediate disturbed catchment, then the **Table 1**, **Table 2** and **Table 3** values are moot.

⁶ Drinking Water and Health: Volume 1; National Research Council (US) Safe Drinking Water Committee. Washington (DC) 1977.

⁷ ANZECC 2000 Volume 3; page 9.3–13.

Table 1: Sediment Dams 6 & 7

Year	2017	2020	2023	2026
Catchment	Area (ha)	Area (ha)	Area (ha)	Area (ha)
Clean Catchment	1.3	1.3	1.3	1.3
Mature Rehabilitation:	0	29.03	49.05	64.05
Disturbed Catchment	15.01	14.1	15	0
Total Area	16.31	44.43	65.35	65.35
Required Volume (ML):	3.5	13	16	0

Table 2: Sediment Dam 16

Year	2017	2020	2023	2026
Catchment Type	Area (ha)	Area (ha)	Area (ha)	Area (ha)
Clean Catchment	51.51	51.51	12.23	12.23
Mature Rehabilitation:	0	0	21.27	35.67
Disturbed Catchment	0	13.45	14.4	15.46
Total Area	51.51	64.96	47.9	63.36
Required Volume (ML):	0	12	11	15

Table 3: Sediment Dam 17

Year	2017	2020	2023	2026
Catchment Type	Area (ha)	Area (ha)	Area (ha)	Area (ha)
Clean Catchment	33.3	33.3	1.5	1.5
Mature Rehabilitation:	0	27.1	18.4	43.2
Disturbed Catchment	27.1	0	0	24.5
Total Area		60.4	19.9	69.2
Required Volume (ML):	16.3	0	8	17

6 Conclusion and Recommendations

In response to the landowners concerns:

- The sediment dams on site should be (and are) designed in accordance with the requirements of the Blue Book. The currently installed dams appear to be responding to flooding/rainfall in a manner consistent with Blue Book designs.
- Sediment dams designed and operated in accordance with the Blue Book should pose little risk to the aquatic and environmental values of the Hunter River.
- A timetable of required sediment capacity for “whole of catchment” dams has been provided. It is also possible for smaller dams to be installed to manage only the recently disturbed areas and comply with the Blue Book guidelines. The final dam size and locations be different to **Table 1**, **Table 2** and **Table 3** above but still meet the requirements of the Blue Book.

- On balance, ingestion of suspended clays in water by cattle poses little or no health risk to the animals. Comparable conditions exist on adjacent farm lands. The main clay minerals appear to be non-toxic to humans, and, mainly by extension, animals. Clay adsorption pathways for toxicants and biological contamination are less well understood but this risk is still believed to be low.
- Aluminium levels in runoff water at West Pit and in Deadman's Creek catchment are elevated but generally remain below ANZECC 2000 trigger levels for stock water use. Elevated aluminium levels in drinking water can affect phosphorous uptake by some livestock. The source of aluminium at West Pit and Deadman's Creek catchment should be investigated and understood by Rixs Creek Mine.

Yours Sincerely,

A handwritten signature in blue ink, appearing to read 'John Pola', with a stylized, cursive script.

John Pola
Managing Director

Appendix M-2 Revised Surface Water Specialist Response

1.1 Existing Surface Water Quality

The existing water quality monitoring locations are shown on Figure 1. Water quality monitoring data collected for the Mine since 1999 is summarised in the following sections and presented graphically in Figure 2, Figure 3 and Figure 4. All the monitoring data is attached as **Appendix A**.

The Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) have prepared a guideline for water quality management for use throughout Australia and New Zealand based on the philosophy of ecologically sustainable development (ESD). The guideline is called the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000) and is often referred to as the 'ANZECC guideline'.

The NSW Department of Environment and Heritage issues a booklet titled Using the ANZECC Guidelines and Water Quality Objectives in NSW (DEC, 2006) to assist technical practitioners with applying the ANZECC guidelines in NSW (the NSW guideline).

The NSW guideline defines the 'environmental values' of receiving waters as those values or uses of water that the community believes are important for a healthy ecosystem. The environmental values of the receiving waters of the Hunter River are regarded as:

- Aquatic ecosystem;
- Irrigation water supply;
- Livestock water supply;
- Primary and secondary contact recreation; and
- Visual amenity.

The ANZECC guidelines specify three levels of protection, from stringent to flexible, corresponding to whether the condition of the particular ecosystem is:

- Of high conservation value;
- Slightly to moderately disturbed; or
- Highly disturbed.

The receiving waterways adjacent to the study area are regarded as moderately disturbed.

Rixs Creek Mine is located predominantly within the Singleton Water Source of the HUAWSP. About 6.5% of the Project area falls within the Glennies Water Source. The Report Card for these water sources, issued by the Department of Water and Energy, August 2009 states that for each water source there is:

- Low economic dependence of the local community on water extracted for irrigation relative to other water sources in the region.
- Low risk to instream value from extraction.
- Medium relative instream value within the catchment, although the Glennies Water Source values are generally rated higher than for Singleton.
- The Glennies instream values are more at risk from water extraction; being medium compared to low for Singleton.
- High hydrological stress on the water sources in summer.

The Rixs Creek and the Dead Mans Gully and the upper reaches of Station Creek are ephemeral.

The available long term water quality data Rixs Creek Mine, which include electrical conductivity, total dissolved solids, total suspended solids and pH, was compared to the trigger values extracted from the ANZECC water quality guidelines, shown in **Table 1**. A comparison of the recorded monitoring data at the Project Area with ANZECC trigger values has been undertaken in order to characterise the site water quality. Ecosystem protection trigger values used in the comparison are for Lowland Rivers with a level of protection of 90% of species, provided in Table 1. If ANZECC indicated a range of trigger values, the lowest value has been used for comparison.

Table 1: Fresh Water Quality Trigger Values (ANZECC, 2000)

Parameter	Unit	Trigger Value			
		Irrigation	Stock Water	Ecosystem (Lowland River)	Recreational
pH	pH	6.0 - 9.0	-	6.5 - 8.5 ^{*g}	5.0 - 9.0
EC (25C)	1JS/cm	-	-	125 - 2200 ^{*g}	-
DO (% Saturation)		-	-	85 - 110 ^{*g}	>80
Total Dissolved Solids (TDS)	mg/L	-	2500 ^{*a}	-	1000
Turbidity	NTU	-	-	6 - 50 ^{*g}	-
METALS AND METALLOIDS		-	-	-	-
Aluminium	mg/L	5 ^{*f} , 20 ^{*g}	5 ^{*h}	0.08, ID ^{*e}	0.2
Antimony		-	-	ID	-
Arsenic (AsV)	mg/L	0.1 ^{*f} , 2 ^{*g}	0.5 ^{*h}	0.042 ^{*a, e}	0.05
Beryllium	mg/L	0.1 ^{*f} , 0.5 ^{*g}	-	ID	-
Boron		0.5 ^{*f} , 2 ^{*g}	5 ^{*h}	0.68 ^{*e}	-
Cadmium	mg/L	0.01 ^{*f} , 0.05 ^{*g}	0.01 ^{*h}	0.0004 ^{*e}	0.01
Calcium (Ca)	mg/L	-	1000 ^{*h}	-	-
Chloride as Cl	mg/L	350 ^{*c}	-	-	400
Chromium	mg/L	0.1 ^{*f}	1 ^{*h}	0.006 ^{*e}	0.05
Cobalt	mg/L	-	1 ^{*h}	ID	-
Copper	mg/L	0.2 ^{*f} , 0.5 ^{*g}	1 ^{*a}	0.0018 ^{*e}	1
Iron	mg/L	0.2 ^{*f} , 10 ^{*g}	NST	ID ^{*e}	0.3
Lead	mg/L	2 ^{*f} , 5 ^{*g}	0.1	0.0056 ^{*e}	0.05
Magnesium (Mg)	mg/L		2,000 ^{*b}	-	-
Manganese	mg/L	0.2 ^{*f} , 10 ^{*g}	NST	2.5 ^{*e}	0.1
Nickel	mg/L	0.2 ^{*f} , 2 ^{*g}	1	0.013 ^{*e}	0.1
Sodium {Na}	mg/L	230 ^{*c}	-	-	300
Zinc (Zn)	mg/L	2 ^{*f} , 5 ^{*g}	20	0.015 ^{*e}	5
Mercury	mg/L	0.002 ^{*f, *g}	0.002	0.0019 ^{*e}	0.001
OTHER		-	-	-	-
Ammonia	mg/L	-	-	1.43 ^{*e}	10
Naphthalene	mg/L	-	-	0.037 ^{*e}	-
Nitrate-N	mg/L	-	400 ^{*h}	3.4 ^{*e}	10
Nitrite-N	mg/L	-	30 ^{*h}	-	1
Sulphate as SO ₄	mg/L	-	1000 ^{*h}	-	400
Total nitrogen (Total N)	mg/L	5 ^{*f} , 25 ^{*g}	-	0.5	-
Total phosphorus (Total P)	mg/L	0.05 ^{*f} , 0.8 ^{*g}	-	0.02	-

Notes:

- No Trigger Value recommended

ID - insufficient data to recommend a trigger value

NST Not sufficiently Toxic

*a Dairy cattle

*b Cattle (insufficient information on other livestock)

*c Moderately Tolerant Crops

*d Lowland River

*e Moderately disturbed, adopted trigger based on 90% of species protected

*f Long Term Trigger Value

*g Short Term Trigger Value

*h Low risk, adverse effects not expected.

1.1.1 Clean Water Catchments and Dams

Three clean water dams, CWD1, CWD2 and CWD6 collect runoff from undisturbed land within the Rixs Creek Catchment. The monitoring locations are shown on Figure 1. The assessment of clean water quality is based on analyses of 564 monthly water samples taken from the three dams since 1999, a 17 year data set. The dams are a suitable analogue for the salinity of rainfall runoff, although EC in dams tends to increase during extended dry periods as evaporation removes water.

Table 2: Clean Water Runoff Quality (1999 - 2015)

Statistic	pH	TSS (mg/l)	TDS (mg/l)	EC (µS/cm)
Count	564	564	564	564
Average	7.5	28	182	210
5th %ile	6.6	2	82	120
Median	7.5	28	182	210
95th %ile	8.8	90	340	340
Min	6.0	1	36	54
Max	10.2	340	530	731

Review of Table 2 indicates that the recorded surface water quality at CWD1, CWD2 and CWD6 is:

- Slightly alkaline, with a median pH value of approximately 7.5, and ranging from 6.6 to 8.8. The 95th percentile value is above the ecosystem protection trigger value.
- Fresh, with a median value for electrical conductivity of 210 µS/cm. The range of conductivity values is wider, from 98 to 1,228 µS/cm, as these dams are generally kept almost empty and results will reflect evaporative effects on smaller water bodies.

Review of **Table 6** indicates that the recorded surface water quality at CWD1, CWD2 and CWD6 is:

- Regularly above the ANZECC ecosystem trigger values for aluminium and copper; and occasionally exceeds the trigger value for zinc.
- Above the phosphorous ANZECC trigger value for ecosystem protection on almost all occasions, and regularly above the long term irrigation usage trigger.

The recorded EC values for clean water runoff are plotted on **Figure 2** and the data for pH are plotted on **Figure 3**.

The median value of all site clean water TSS records is 28 mg/l. Examination of **Figure 4** indicates almost all TSS values fall below 100mg/l. The low TSS values do not necessarily correlate with low turbidity as there appears to be a high proportion of colloidal material in the water on the Mine site. The high proportion of colloidal material also impacts the Total Dissolved Solids results such that the relationship between Total Dissolved Solids and EC often can depart markedly from the 0.6 – 0.7 ratio which is normally expected.

1.1.2 Disturbed Catchments (Sediment Dams)

The assessment of water quality of runoff from disturbed catchments across the site is based on analyses of a limited number of samples; 73 in all. The monitoring locations are shown on **Figure 1**. The trends values pH, TSS and EC are plotted on **Figure 2**, **Figure 3** and **Figure 4** for comparison purposes. The disturbed catchments produce water of similar EC and pH, but over the short term generally have higher levels of entrained sediment.

Table 3: Sediment Dam Water Quality (2002 - 2015)

Statistic	pH	TSS (mg/l)	TDS (mg/l)	EC (µS/cm)
Count	73	73	73	73
Average	7.4	175	492	402
5th %ile	6.5	6	120	98
Median	7.4	46	292	202
95th %ile	8.4	586	1,154	1,228
Min	5.7	4	50	77
Max	9.0	3,000	4,480	6,660

Review of **Table 3** indicates that the recorded surface water quality at site sediment dams is:

- Slightly alkaline, with a median pH value of approximately 7.4, and pH ranging from 6.5 to 8.4.
- Fresh, with electrical conductivities ranging from 120 to 340 $\mu\text{S}/\text{cm}$, with a median value of 210 $\mu\text{S}/\text{cm}$.

Review of **Table 6** indicates that the recorded surface water quality in sediment dams is:

- Regularly above the ANZECC ecosystem trigger values for aluminium and copper; and occasionally over the trigger value for copper, manganese, nickel and zinc.
- Above the phosphorous ANZECC trigger value for ecosystem protection on almost all occasions, and regularly above the long term irrigation usage trigger.
- Above the nitrogen ANZECC trigger value for ecosystem protection occasionally.

The average of TSS is 175mg/l, but the median is 46, indicating some infrequent high values have been recorded. The bulk of TSS values fall between 6 mg/l and 586 mg/l. To be of suitable quality to be discharged off site, the TSS would need to be treated to achieve less than 50mg/l to meet Blue Book requirements; otherwise the water would need to be taken into the mine water management system.

Salinity and pH are suitable for direct discharge into the receiving waters (Hunter River) falling well within the normal ranges EC and pH seen in that stream.

1.1.3 Mine Water

The assessment of mine water quality is based on analyses of approximately 642 water samples taken monthly from mine water dams since 1999. The dams are: Dirty Water Dam 1 (DWD1), Dirty Water Dam 2 (DWD2), Dirty Water Dam 3 (DWD3), and Dirty Water Dam 4 (DWD4 - formerly Clean Water Dam 4). The monitoring locations are shown on Figure 1.

Review of **Table 4** indicates that the recorded surface water quality at site mine water management dams is:

- Strongly alkaline, with a median pH value of approximately 8.6, and ranging from 7.9 to 9.3. More than 50% of recorded pH values would be above the adopted trigger value for ecosystem protection.

- Tending to brackish, with the bulk of electrical conductivities ranging from 1,631 to 9,010 $\mu\text{S}/\text{cm}$, with a median value of 5,236 $\mu\text{S}/\text{cm}$. The majority of recorded EC values would be above the adopted trigger value for ecosystem protection.

Review of **Table 6** indicates that the recorded surface water quality in mine water dams is:

- Regularly above the ANZECC ecosystem trigger values for aluminium and copper; and occasionally over the trigger value for zinc.
- Regularly above the phosphorous ANZECC trigger value for ecosystem protection, and regularly above the long term irrigation usage trigger.
- Above the nitrogen ANZECC trigger value for ecosystem protection regularly.
- Suitable only for irrigation of plants with foliage that is tolerant of high sodium and chloride levels in water. Sodium and chloride median values are above trigger levels for recreational usage.

Two distinct EC trends are observed at **Figure 2** Averages of mine water EC readings during an extended dry period from 2003 to 2007 are around 7,000 $\mu\text{S}/\text{cm}$ with occasional forays above 10,000 $\mu\text{S}/\text{cm}$. During average rainfall periods since 2007, the EC value trends at around 4,500 $\mu\text{S}/\text{cm}$. The absence of the dilution effect from fresh water runoff during drought periods contributes to a gradual increase of EC values in mine water at the Mine during extended periods of dry weather due to evaporation and leaching from mine spoil.

Table 4: Mine Water Quality (1999 - 2015)

Statistic	pH	TSS (mg/l)	TDS (mg/l)	EC ($\mu\text{S}/\text{cm}$)
Count	642	642	642	642
Average	8.6	17	3,271	5,236
5th %ile	7.9	1	902	1,631
Median	8.6	17	3,271	5,236
95th %ile	9.3	60	5,480	9,010
Min	6.6	1	430	620
Max	10.3	334	12,825	11,730

Recorded pH values for mine water over the period since 1999 are shown on **Figure 3**. The average mine water pH increased from around 8.1 to 8.8 between 1999 and 2006, and has remained more or less unchanged since with the return to average rainfall conditions.

Rixs Creek Mine does not have a licenced discharge point under the HRSTS, and must contain all mine water on the site, however the quality of the mine water would generally be suitable for discharge under the HRSTS. The EC of the mine water is below 10,000 μ S/cm for 98% of the time. Some 97% of all recorded pH values are less than 9.5, and TSS is below 120mg/l for 98% of the time.

1.1.4 Rixs Creek and Other Streamlines

The assessment of Rixs Creek catchment water quality analysis is based on samples collected from six monitoring stations. The stations are located along Rixs Creek from the Main Northern Railway in the north to Maison Dieu Road to the south. The monitoring locations are shown on Figure 1. Three of the stations are located at the junction of a tributary draining an industrial estate, so that any influences on water quality from this subcatchment can be identified. The trends for recorded pH, TSS and EC are plotted on **Figure 2**, **Figure 3** and **Figure 4** for comparison purposes.

Insufficient data has been collected from the Dead Mans Gully stream line for meaningful comparisons. Data for the Dead Mans Gully dam near the New England Highway indicates similar medians and ranges for pH and TSS. The EC values for this dam indicate the water is noticeably fresher than in Rixs Creek; however the period of data collection spans wet years only.

Review of **Table 5** indicates that the recorded surface water quality in Rixs Creek is:

- Neutral to slightly alkaline, with median pH ranging from 7.1 to 7.8 across the stations. Four out of the six median values are slightly alkaline.
- Generally fresh, however 95th percentile EC values are brackish, reflecting the ephemeral nature of flows in this stream.
- TSS is generally less than 50mg/l. ANZECC Vol.1 Table 3.3.3 indicates the numerical range for turbidity trigger values (6 – 50) for ecosystem protection in a lowland river are similar to the acceptable TSS range. This relationship may not necessarily hold in catchments such as Rixs Creek where there are highly colloidal soils. In these catchments, water with a TSS value of 20mg/l is often highly turbid. Examination of **Figure 4** indicates TSS in the stream line is generally below 100mg/l.

Table 5: Rixs Creek Water Quality (1999 - 2015)

Analyte	Statistic	Sampling Location					
		Railway Underpass	New England Highway	Industrial Estate Tributary	RXC Above Industrial Estate	Below Operation	Maison Dieu Bridge
No Flow Periods	%	75	69	29	32	54	63
pH	Count	165	167	28	25	101	163
	Average	7.0	7.4	7.6	7.4	7.7	7.2
	5th %ile	6.0	6.7	6.9	6.9	7.0	6.5
	Median	7.1	7.4	7.7	7.6	7.8	7.2
	95th %ile	8.2	8.4	8.2	7.9	8.3	7.9
	Min	5.5	6.2	6.6	6.5	6.5	6.0
	Max	9.2	8.5	8.3	8.2	9.6	8.5
TSS (mg/l)	Count	165	167	27	25	100	163
	Average	155	61	65	80	56	132
	5th %ile	6	2	6	7	3	4
	Median	60	24	42	40	23	30
	95th %ile	505	255	192	146	187	429
	Min	2	1	5	5	1	1
	Max	1,880	730	256	596	492	4,110
TDS (mg/l)	Count	165	167	28	25	101	163
	Average	556	1,091	385	596	810	739
	5th %ile	92	263	176	227	212	201
	Median	310	810	341	422	440	490
	95th %ile	3,022	3,243	727	1,398	2,950	2,197
	Min	28	120	114	98	104	70
	Max	3,600	4,740	818	2,980	10,840	4,200
EC (µS/cm)	Count	165	167	28	25	101	163
	Average	746	1,738	489	837	1,248	1,172
	5th %ile	110	370	206	253	279	244
	Median	280	1,300	365	529	610	782
	95th %ile	4,876	4,911	1,231	2,220	4,550	3,648
	Min	75	150	154	187	7	160
	Max	6,130	7,100	1,600	4,370	16,450	6,450

Review of **Table 6** indicates that the recorded surface water quality in Rixs Creek is:

- Regularly above the ANZECC ecosystem trigger values for aluminium and copper; and occasionally over the trigger value for lead.
- Regularly above the phosphorous ANZECC trigger value for ecosystem protection, and regularly above the long term irrigation usage trigger.
- Rarely above the nitrogen ANZECC trigger value for ecosystem protection – once in 25 samples.

Rixs Creek and other local streams are not typical lowland rivers as described in ANZECC 2000, being ephemeral with a significant portion of the flow regime either dry or influenced by groundwater accession. Nevertheless the water quality and quantity remains suitable for stock water, probably the only practical environmental use. The variable water quality provides a wide range of habitats that change over time. Trigger levels for these streams have been adopted in recognition of the variability in flow and quality.

1.1.5 The Hunter River

Electrical conductivity in the Hunter River has been measured regularly since 1994 by the NSW Office of Water (NOW) at Long Point (Station 210134) about 4.0km downstream of the confluence of Rixs Creek. The installation of the station occurred shortly after the commencement of the trial HRSTS in 1993.

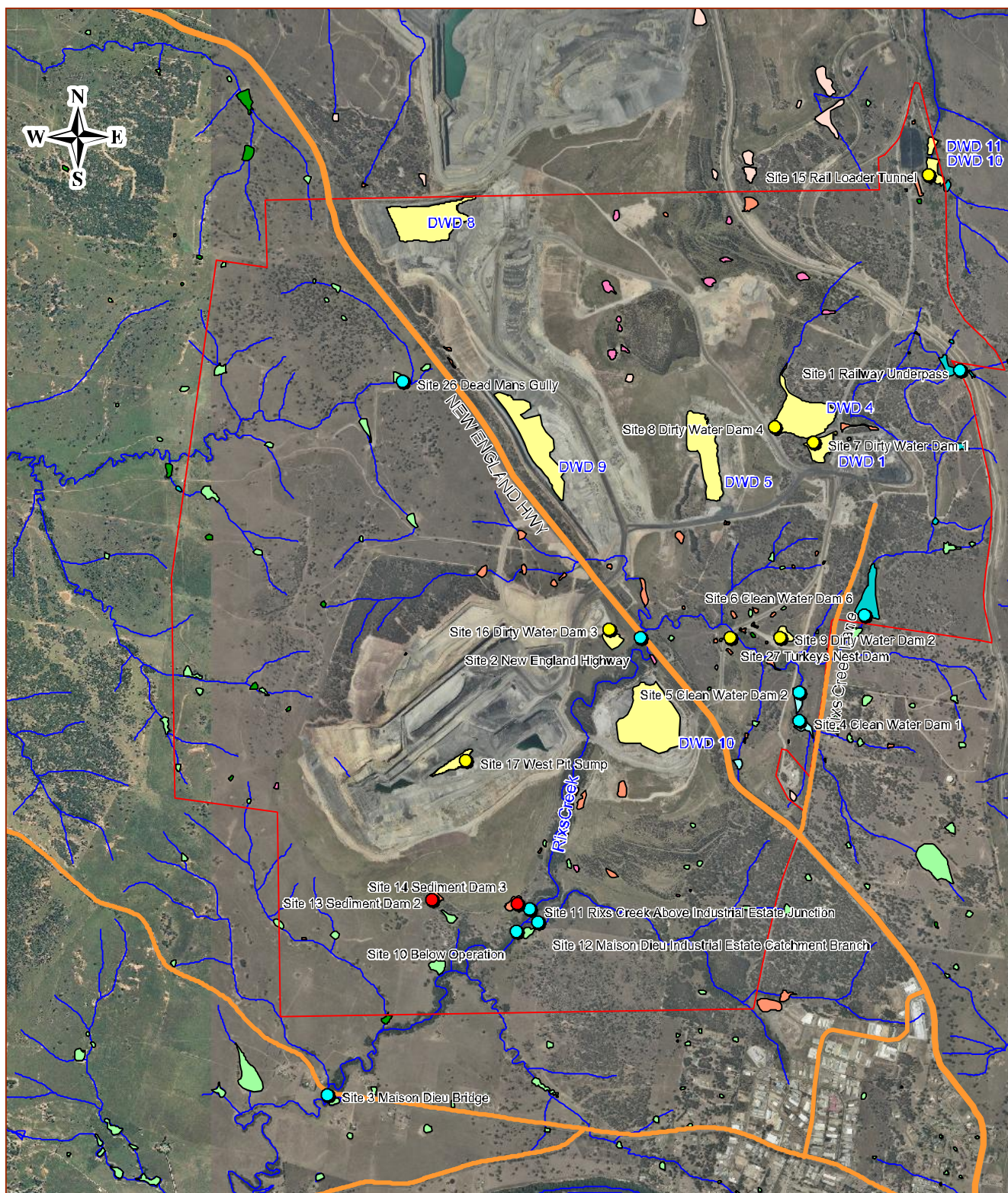
Water quality at Long Point is directly influenced by management of the regulated Hunter River upstream. Irrigation water is normally released into this reach of the Hunter River from Glennies Creek Dam and tends to keep EC low at Long Point. When Glennies Creek Dam is not releasing water, EC trends upwards towards 900 μ S/cm because the main influence then becomes the through-flow from Glenbawn Dam, which is located in the upper reaches of the Hunter River. By the time water from Glenbawn reaches the Long Point station, irrigation abstraction and natural accession of saline ground water has generally increased the salinity to around 800 μ S/cm.

Average daily EC at the Long Point gauging station is 627 μ S/cm, 93% of all results are less than 900 μ S/cm, and about 30% are less than 500 μ S/cm. The majority of data points fall within the range 300 – 900 μ S/cm.

Table 6: Summary of Monitoring results for Major Ions

Site	Analyte	Major Cations										Total Metals										Nutrients									
		Total Alkalinity as CaCO3										Anions										Total Phosphorus									
Sediment Dam Catchments (sites 13, 14, 21, 22, 23, 26)	Count	18	18	18	18	18	18	18	18	18	18	0	18	2	18	0	12	17	13	18	18	17	18	3	18	15	1	0	18	18	18
	Average	68.3	41.3	7.1	7.1	8.7	51.8	7.8	0.6	9.8	<0.001	0.0	0.003	0.1	<0.0001	0.0	0.008	0.007	0.009	0.092	0.005	0.015	0.01	0.21	0.0315	0.060	<0.0001	0.4	0.26	0.27	
	5th %ile	11.0	5.7	2.0	2.0	2.0	14.7	3.9	0.1	0.8	<0.001	0.0	0.002	0.0	<0.0001	0.001	0.002	0.001	0.002	0.031	0.002	0.002	0.01	0.05	0.0060	0.060	<0.0001	0.2	0.00	0.09	
	Median	77.5	14.0	6.0	6.0	7.0	37.5	8.0	0.7	4.0	<0.001	0.0	0.003	0.1	<0.0001	0.003	0.005	0.003	0.004	0.055	0.003	0.006	0.01	0.15	0.0120	0.060	<0.0001	0.5	0.20	0.18	
	95th %ile	126.6	239.7	19.0	19.0	28.9	193.6	11.3	1.3	34.6	<0.001	0.0	0.003	0.2	<0.0001	0.014	0.027	0.021	0.029	0.226	0.017	0.056	0.01	0.60	0.0957	0.060	<0.0001	0.8	0.88	0.79	
	Min	11.0	4.0	2.0	2.0	2.0	13.0	3.0	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.001	0.001	0.001	0.002	0.024	0.001	0.002	0.01	0.04	0.0060	0.060	0.000	0.2	0.00	0.06	
	Max	141.0	249.0	30.0	30.0	34.0	214.0	13.0	1.4	61.8	0.0	0.0	0.003	0.4	0.0	0.017	0.036	0.028	0.068	0.368	0.027	0.084	0.01	0.83	0.1370	0.060	0.0000	0.8	0.88	0.86	
Rixs Creek (sites 1, 2, 3, 10, 11)	Count	25	25	25	25	25	25	25	25	25	0	23	0	25	2	23	25	23	25	25	25	25	25	0	25	25	4	4	25	25	25
	Average	54.08	57.44	11.68	11.68	15.04	87.4	4.6	0.698	5.877	<0.001	0.002	<0.001	0.0679	0.0002	0.002	0.007	0.003	0.011	0.077	0.004	0.009	<0.01	0.312	0.0226	0.053	8E-05	0.272	0.149	0.104	
	5th %ile	23.2	8.4	2.4	2.4	2.8	15	4	0.146	1.71	<0.001	0.001	<0.001	0.0414	0.0001	0.001	0.003	0.001	0.004	0.021	0.002	0.003	<0.01	0.07	0.0092	0.05	2E-05	0.2	0	0.04	
	Median	54	46	8	8	9	73	4	0.64	4.13	<0.001	0.002	<0.001	0.062	0.0002	0.002	0.006	0.002	0.008	0.036	0.003	0.007	<0.01	0.247	0.017	0.05	0.0001	0.3	0.1	0.07	
	95th %ile	78.6	74	17	17	20.6	110	6	1.556	12.48	<0.001	0.003	<0.001	0.1054	0.0002	0.005	0.012	0.006	0.014	0.267	0.008	0.02	<0.01	0.423	0.0532	0.059	0.0001	0.4	0.41	0.252	
	Min	6	3	1	1	2	10	3	0.12	0.78	0	0.001	0	0.033	0.0001	0.001	0.002	0.001	0.003	0.016	0.002	0.003	0	0.048	0.007	0.05	1E-05	0.1	0	0.03	
	Max	115	366	92	92	136	642	9	2.95	16.3	0	0.004	0	0.159	0.0002	0.006	0.014	0.006	0.09	0.648	0.008	0.022	0	2.35	0.057	0.06	0.0001	0.4	0.57	0.43	
Mine Water (sites 7, 8, 9, 15, 16)	Count	21	21	21	21	21	21	21	21	21	13	19	0	21	3	6	18	4	21	21	21	19	21	10	21	8	1	0	21	22	16
	Average	179.7	471.9	31.1	31.1	66.62	478.3	8.381	0.11	0.999	0.0028	0.0027	<0.001	0.0469	0.0001	0.002	0.004	0.002	0.044	0.019	0.003	0.007	0.02	2.504	0.0164	0.07	<0.0001	0.467	2.749	0.166	
	5th %ile	70	238	16	16	21	190	3	0.054	0.12	0.001	0.0019	<0.001	0.028	0.0001	0.001	0.001	0.001	0.007	0.004	0.001	0.002	0.01	0.558	0.0057	0.07	<0.0001	0.3	0.007	0.01	
	Median	188	436	30	30	66	454	8	0.1	0.44	0.003	0.003	<0.001	0.04	0.0001	0.002	0.003	0.002	0.041	0.01	0.003	0.008	0.02	2.21	0.0095	0.07	<0.0001	0.5	1.355	0.05	
	95th %ile	274	751	48	48	105	784	13	0.192	5.5	0.0058	0.0042	<0.001	0.1	0.0002	0.003	0.008	0.004	0.084	0.06	0.004	0.011	0.03	5.57	0.0393	0.07	<0.0001	0.6	4.664	0.628	
	Min	39	125	12	12	16	81	3	0.05	0.03	0.001	0.001	0	0.022	0.0001	0.001	0.001	0.001	0.006	0.004	0.001	0.002	0.01	0.442	0.005	0.07	0	0.3	0	0.01	
	Max	279	820	50	50	112	831	14	0.21	5.89	0.007	0.006	0	0.106	0.0002	0.003	0.021	0.004	0.086	0.08	0.004	0.011	0.03	5.97	0.048	0.07	0	0.8	28.08	0.65	
Clean Water Catchments (sites 4, 5, 6)	Count	12	12	12	12	12	12	12	12	12	12	9	0	12	1	9	12	10	12	12	12	11	12	0	12	12	0	1	12	12	12
	Average	35	12.42	3.583	3.583	3.917	19.33	4.083	0.654	3.28	<0.001	0.0022	<0.001	0.0473	0.0002	0.001	0.004	0.002	0.004	0.049	0.002	0.005	<0.01	0.068	0.032	<0.05	0.001	0.283	0.078	0.096	
	5th %ile	19.3	2.55	2	2	2.55	15.1	3	0.299	0.994	<0.001	0.001	<0.001	0.0383	0.0002	0.001	0.002	0.001	0.002	0.021	0.002	0.002	<0.01	0.049	0.0086	<0.05	0.001	0.2	0	0.031	
	Median	34.5	10	4	4	3.5	18	4	0.6	3.025	<0.001	0.002	<0.001	0.047	0.0002	0.001	0.003	0.002	0.004	0.05	0.002	0.005	<0.01	0.065	0.0115	<0.05	0.001	0.2	0.055	0.09	
	95th %ile	50	32.25	5	5	5.45	25.7	5.45	1.099	6.145	<0.001	0.0036	<0.001	0.0583	0.0002	0.002	0.007	0.003	0.005	0.073	0.003	0.01	<0.01	0.099	0.123	<0.05	0.001	0.445	0.184	0.171	
	Min	16	2	2	2	2	14	3	0.26	0.46	0	0.001	0	0.035	0.0002	0.001	0.001	0.001	0.002	0.017	0.002	0.001	0	0.046	0.008	0	0.001	0.2	0	0.02	
	Max	50	46	5	5	6	29	6	1.17	7.85	0	0.004	0	0.061	0.0002	0.002	0.008	0.003	0.006	0.083	0.003	0.012	0	0.123	0.25	0	0.001	0.5	0.2	0.22	

Notes:
Values shaded yellow indicate a departure outside the adopted ANZECC trigger values set out in Table 1



Existing Water Sample Locations

- Clean
- Contained
- Sediment

2014 Site Dams by Purpose

- Clean
- Containment
- Diversion
- Erosion Control
- Other Operation
- Rural
- Sediment
- Sewage
- Soil Conservation

Roads

- Major Road
- Minor Road

Other

- Project Boundary
- Stream Line

JP Environmental

**Surface Water Study for Rixs Creek
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Figure 1: Water Quality Monitoring Plan - Existing

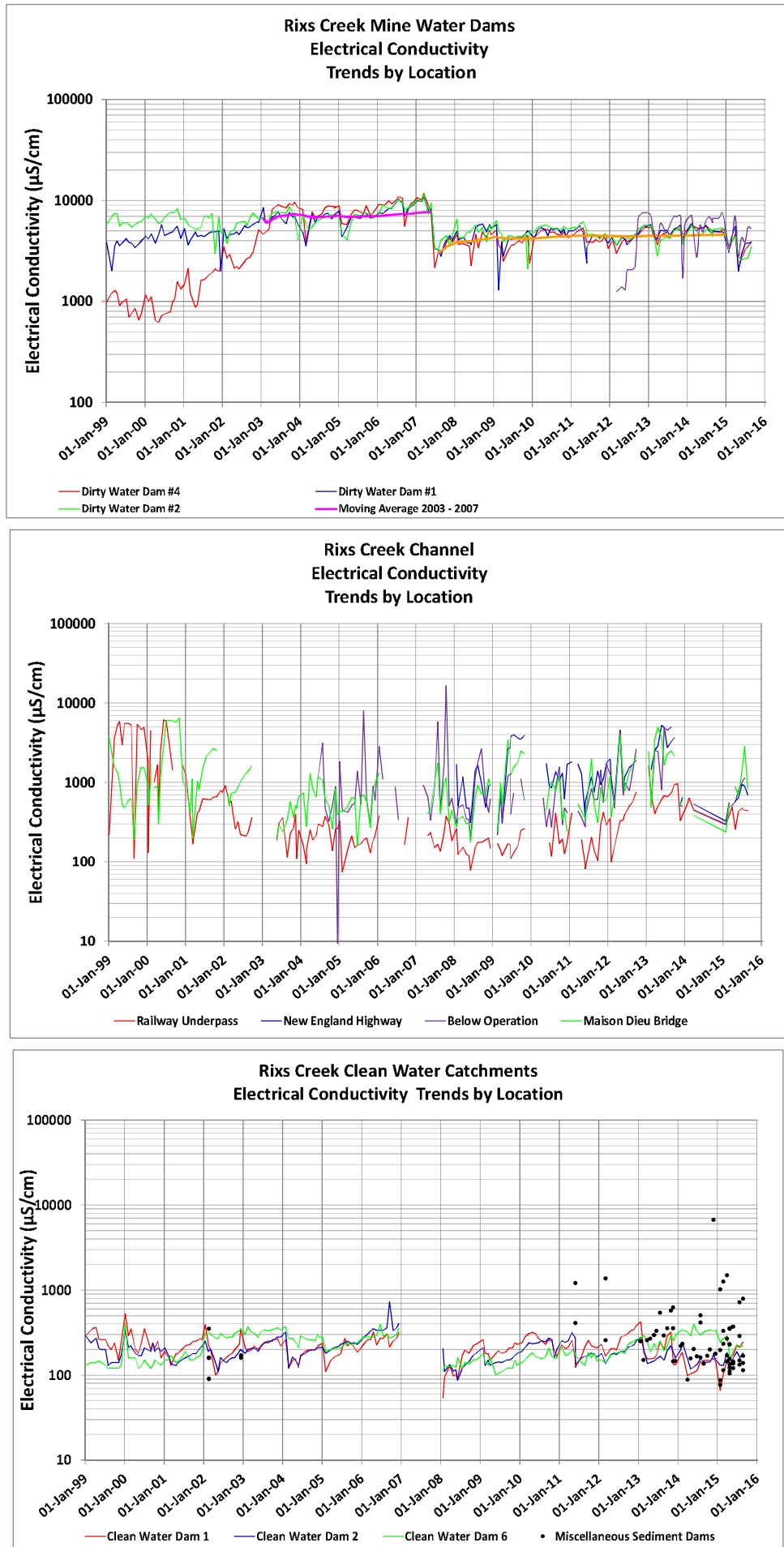


Figure 2: Graphs of Electrical Conductivity Data

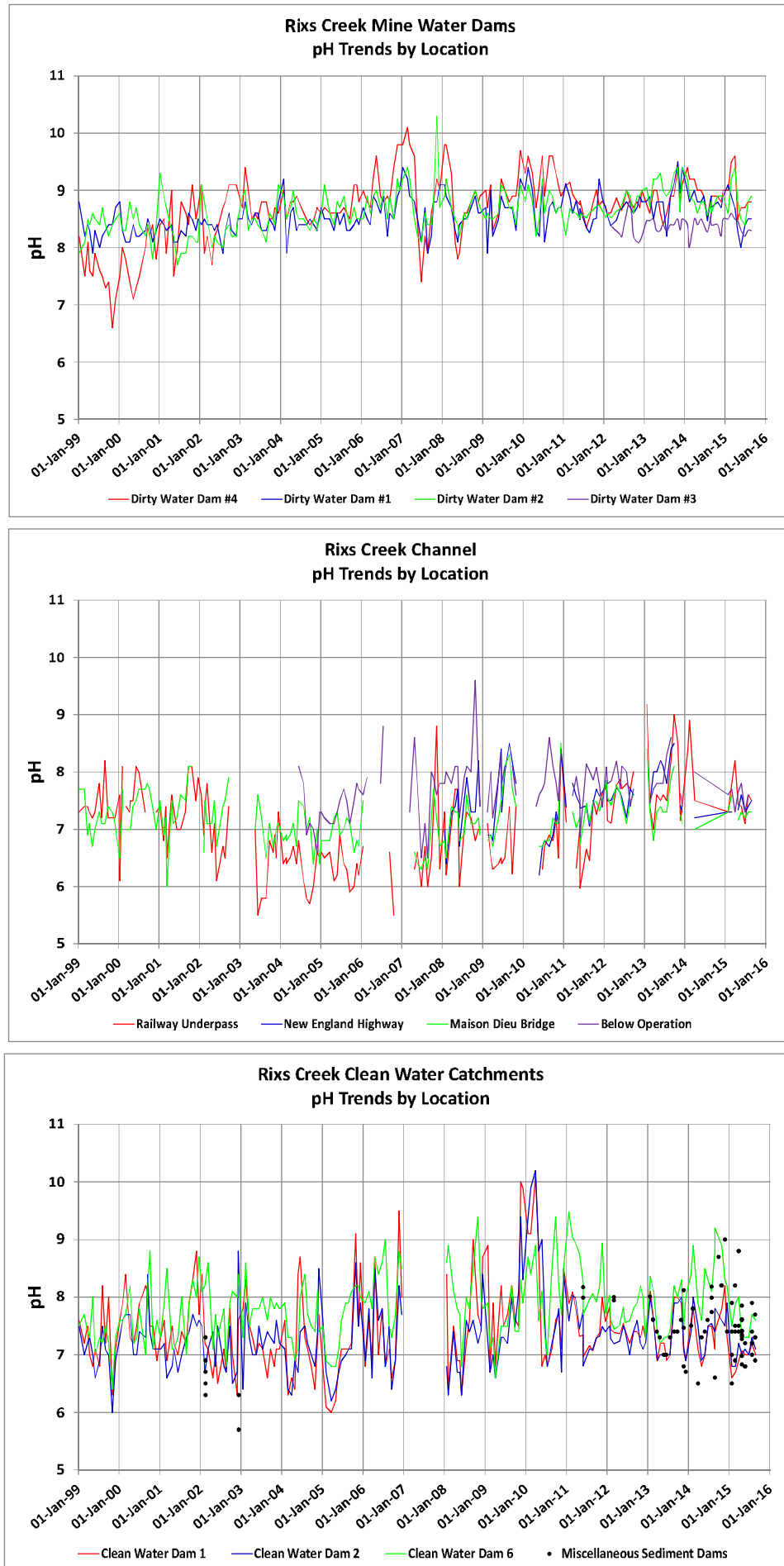


Figure 3: Graphs of pH Data

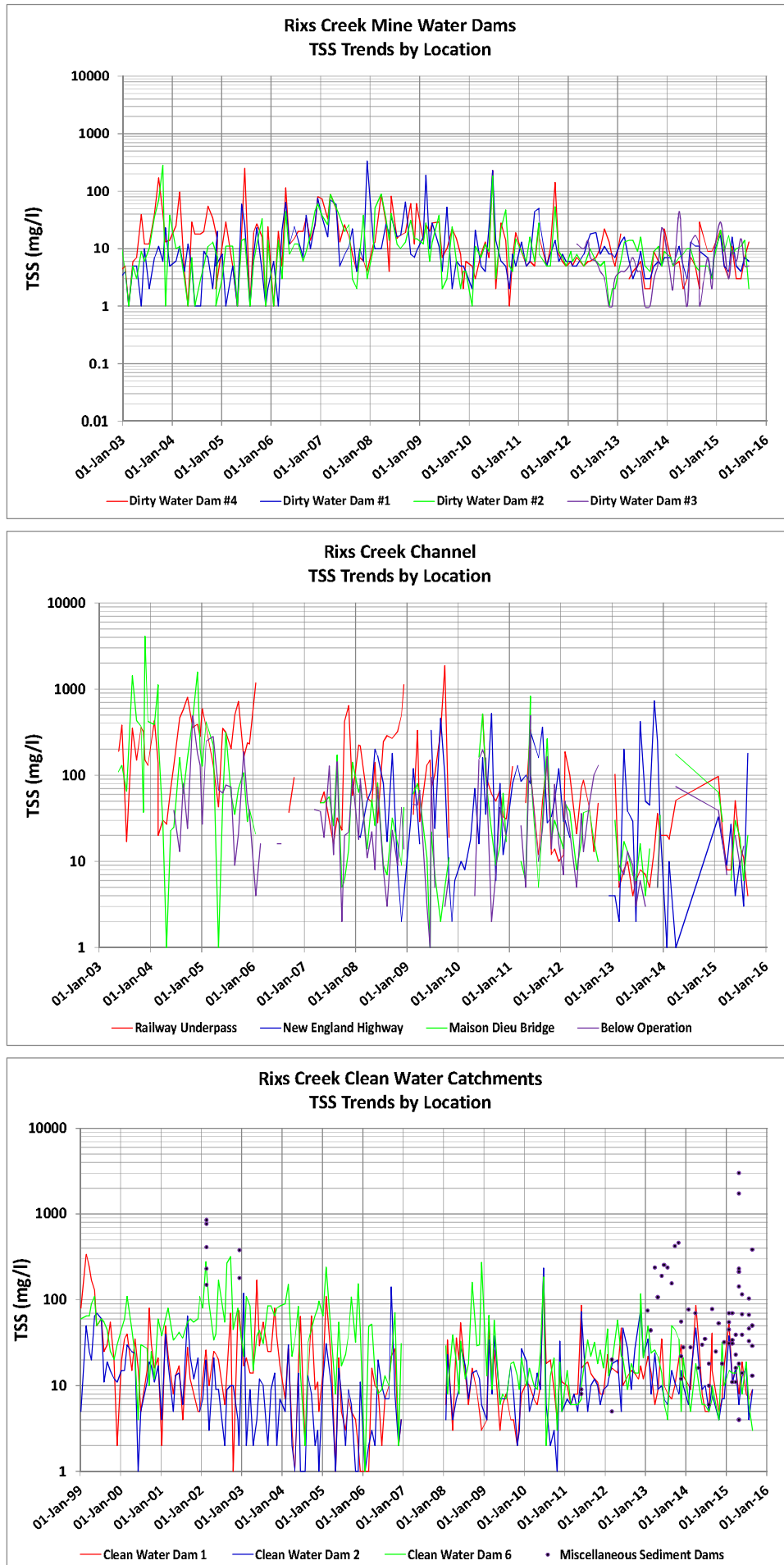


Figure 4: Graphs of Total Suspended Solids Data

2.0 Impact Assessment

2.1 Water Quality

Land disturbance associated with mining has the potential to adversely affect the quality of surface runoff in downstream receiving waters through increased sediment loads. In addition, runoff from active mining areas (including roads, coal stockpiles, etc.) may have increased concentrations of salts and other pollutants compared to natural runoff requires containment to prevent it from adversely affecting the quality of surface runoff in downstream catchments.

External Water Quality

Rixs Creek and the Unnamed Tributary north of Rixs Creek are the streams most likely to be impacted by land disturbance or saline runoff. Using Rixs Creek as an analogue for impacts the following observations are made:

- EC, pH and TSS are consistent at each monitoring location since 1999 with no noticeable trend over that period. Refer **Figure 2**, **Figure 3** and **Figure 4** in **Section 1.1**.
- The observed median value of EC decreases moving downstream, the exception being the New England Highway Station.
- The observed median value of TSS generally decreases moving downstream. This is most likely a response to the increasing salinity of the water.
- pH in Rixs Creek appears to move towards neutral from slightly alkaline after periods of wet weather.

Based on monitoring results, during the period of mining in Pit 2 (South Pit) and Pit 3 (West Pit), mining has moved closer to and then away from the Rixs Creek channel with no apparent effect on stream water quality.

To date there are no observable impacts on external water quality due to the activity of the Mine, and provided existing management systems are maintained, and measures recommended in Section 7 are adopted there is a low risk of impacts on water quality in the surrounding catchment due to ongoing mining operations.

Sediment Management

Water monitoring results indicate that the runoff collected in the dams from mined and un-mined catchment can contain appreciable levels of sediment i.e. greater than 50mg/l. Observation of historical aerial photographs (2008, 2013, 2014 and 2015) of West Pit indicate that both mine sediment dams and offsite farm dams in the Dead Mans and Rixs Creek catchment are very turbid. This is indicative of the nature of the catchment soils rather than any specific activity occurring in the catchment, be it mine disturbance or agriculture.

Based on monitoring results from sediment dams, runoff from disturbed areas (pre-strip and rehabilitation areas) will require treatment to reduce the TSS levels if the water is to be released into downstream catchments without adverse impacts.

Metalloids

ANZECC 2000 sets a trigger level of 5 mg/l of dissolved aluminium for stock water, and the adopted trigger level for ecosystem protection is 0.08 mg/l. All water classes on the Rixs Creek site display elevated levels aluminium. Aluminium levels in runoff from clean and disturbed catchments; and in Rixs Creek, have median values in the range of 3 – 4 mg/l. The median value for aluminium in mine water is about 0.4 mg/l. These results are within the levels considered acceptable for stock watering but well over ecosystem protection trigger values. Notwithstanding the above, the trend of elevated aluminium levels is apparent in the monitoring results from before mining activity commenced in Deadman's Creek catchment. The three clean water catchments which are upstream of any mining activity display similar values for aluminium.

The elevated levels of aluminium detected by monitoring are not due to dissolved aluminium. *"In nature, aluminium exists in the trivalent oxidation state, i.e. Al^{3+} . Its electric charge and the small ionic radius ($0.51\text{\AA}$) give Al^{3+} a strong polarising effect on adjacent atoms; therefore the element is too reactive to be found free in nature. As a strongly hydrolysing element, Al is practically insoluble in the pH range of 6.5 to 8.5; the solubility is enhanced under acidic pH ($pH < 6$) or alkaline pH ($pH > 8.5$) conditions, and/or in the presence of complexing ligands."*¹ The highest levels of aluminium were detected in water between pH 6.8 and 7.4. Aluminium is highly toxic to plants, and the ongoing health of the vegetation indicates that the aluminium detected in the monitoring results is not biologically available.

The cause of the measured elevated aluminium levels, and to a lesser extent copper, manganese, nickel and zinc, is that the metal ions are adsorbed to colloidal (clay) particles which have passed through the standard filter used in the total dissolved solids test (TDS). Examination of the Rixs Creek monitoring results shows that the ratio of TDS to EC regularly departs from the "accepted norm" of about 0.65, indicating that additional material is present in the mass of the evaporated TDS sample, in this case, clay particles. TDS: EC ratios

¹ "Aluminium in drinking water: An overview." Water SA Vol. 25 No. 1 January 1999; P T Srinivasan, T Viraraghavan and K S Subramanian.

exceed 1 in about 60% of the non-standard sample results, and for several of the results the ratio is greater than 6.

There are no adverse impacts expected from the elevated metal levels detected by site water quality monitoring. The metals are adsorbed to clays and are not biologically available whilst water pH levels remain between 6 and 8.5.

3.0 Mitigation Management and Monitoring Measures

3.1 Water Quality

By implementing an effective system of mine water management, the Project will ensure no adverse impact on receiving waters. Key elements of the proposed water management system include:

- Diversion of runoff from undisturbed catchments away from disturbed areas, wherever possible, using surface drains.
- Treatment of runoff from overburden emplacements using sedimentation dams prior to discharge from the site; and
- Runoff from mining areas (including coal stockpiles) will be collected within mine water dams for recycling on site.

3.2 Surface Water Monitoring

Surface water monitoring will continue to be undertaken generally in accordance with the Rixs Creek Environmental Monitoring Plan (EMP), approved by DPE. The EMP specifies that all major dams, both mine water and clean, are monitored on a monthly basis for storage volume, pH, EC, TDS, and TSS. The major ions: sodium, magnesium, potassium, calcium, chloride, sulphate and bicarbonates are sampled annually. The results are reported in the site Annual Environment Management Report. The EMP includes a Trigger Action and Response Plan which documents responses, actions and reporting requirements to abnormal monitoring results or undesirable trends in water quality.

The EMP will be progressively extended to include the additional water storages and regional catchments impacted by the Project. The timing of the additional monitoring would generally correspond to the conceptual mine plan. The existing and proposed monitoring locations are shown in **Figure 5**. A description of the monitoring sites is given in **Table 7**.

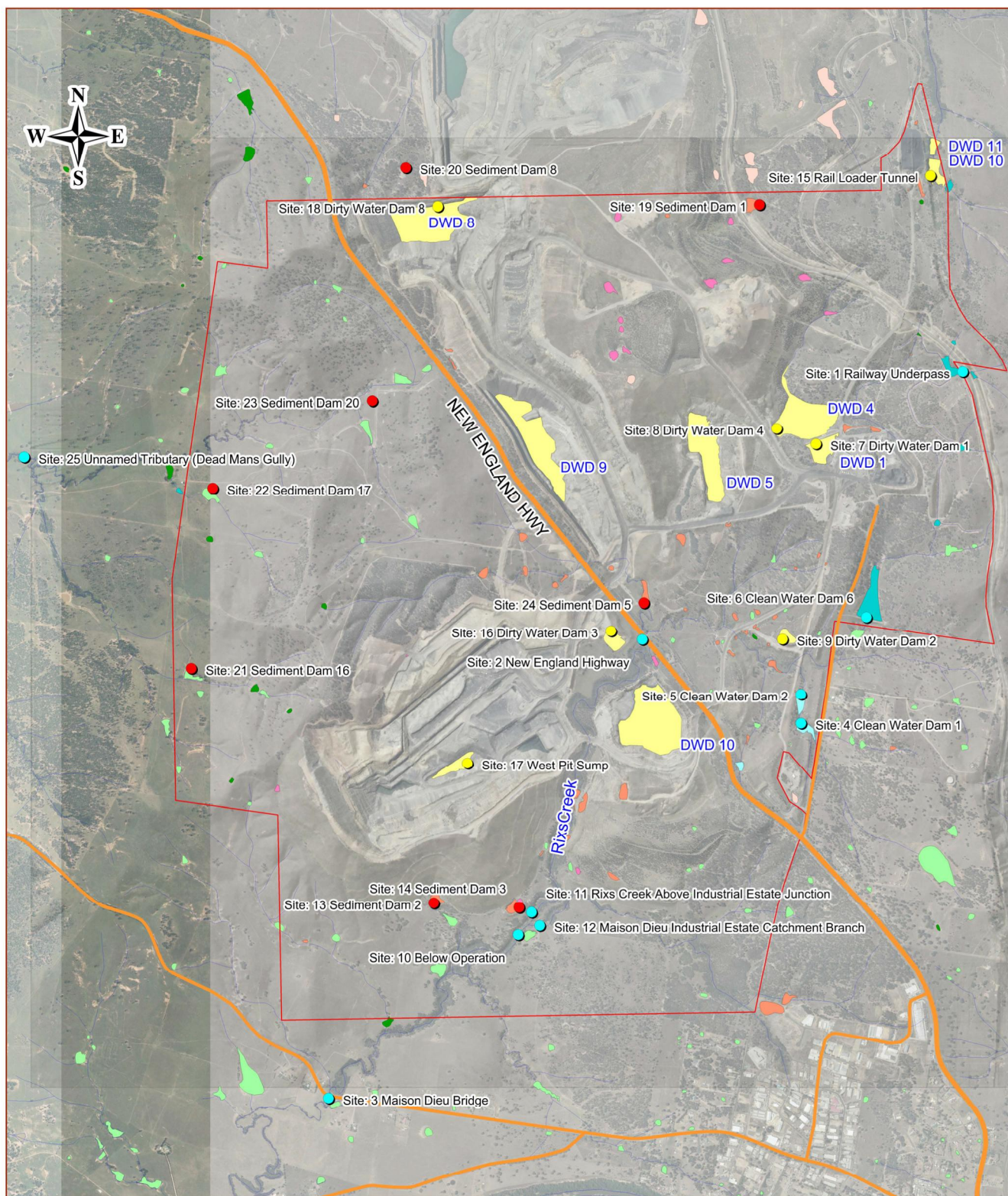
Table 7: Proposed Water Quality Monitoring Plan

Station ID	Type	Parameter	pH, EC, TSS, TDS ²			Major Ions ³
		Frequency	Special ⁴	Quarterly	Monthly	Annual
1	Stream	Rail Underpass		1		1
2	Stream	New England Highway		1		1
3	Stream	Maison Dieu Bridge		1		1
4	Storage	Clean Water Dam 1 (CWD1)		1		
5	Storage	Clean Water Dam 2 (CWD2)		1		
6	Storage	Clean Water Dam 6 (CWD6)		1		
7	Storage	Dirty Water Dam 1			1	1
8	Storage	Dirty Water Dam 4 (CWD4-DWD4)	1		1	1
9	Storage	Dirty Water Dam 2		1		
10	Stream	Site 10 – Below Operation		1		1
11	Stream	Above Industrial Estate Junction	1			1
12	Stream	Maison Dieu Industrial Estate Catchment Branch	1			1
13	Storage	Sediment Dam 2 - Pit 3 West	1			
14	Storage	Sediment Dam 3 - Pit 3 East	1			
15	Storage	Rail Loader Dam	1			
16	Storage	Dirty Water Dam 3		1		
17	Storage	West Pit In-Pit Storage			1	1
18	Storage	North Pit Sump (DWD8)		1		1
19	Storage	Sediment Dam 1 - Pit 1 North East	1			
20	Storage	Sediment Dam 8 - Pit 1 North	1			
21	Storage	Sediment Dam 16 - Pit 3 West	1			
22	Storage	Sediment Dam 17 - Pit 3 West	1			
23	Storage	Sediment Dam 20 - Pit 3 North	1			
24	Storage	Sediment Dam 5 - Pit 1 South	1			
25	Stream	Dead Mans Gully Below Operations			1	1
26	Stream	Dead Mans Gully Highway Dam			1	

² EC – Electrical Conductivity; TSS – Total Suspended Solids; TDS – Total Dissolved Solids.

³ Comprehensive analysis includes major ions AL, As, B, Ba, Be, Ca, CaCO₃, Total Cl, Cd, Co, CO₃, Cu, F, Fe (soluble), HCO₃, Hg, K, Li, Mg, Mn, Na, NH₃, Ni, NO₂, NO₃, OH, P, Pb, Rb, Sb, Se, Si, SO₄ (or S), Sr, Zn

⁴ Special sampling occurs at least annually; or when sufficient runoff is generated to either create appreciable flow in a stream or to cause a spillway to operate. Normal analytes: EC, TSS, Turbidity and TDS. At least one sample annually from at least one active sediment dam on Pit1 and Pit 3 should also be subjected to a comprehensive analysis – see Note 5 above.



Water Sample Locations

- Clean
- Contained (Saline)
- Sediment

2014 Site Dams by Purpose

- Clean
- Containment
- Diversion
- Erosion Control
- Other Operation
- Rural
- Sediment
- Sewage
- Soil Conservation

Roads

- Major Road
- Minor Road

Other

- Project Boundary
- Stream Line

JP Environmental

**Surface Water Study for Rixs Creek
Continuation of Mining**

Figure 5: Water Quality Monitoring Plan - Proposed

Appendix A: Water Quality Monitoring Data

Rixs Creek
Sediment Dams

Miscellaneous Sediment Dams					
Date	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	Location
19-Feb-02	6.3	150	120	160	Dead Mans Gully - Dam (Hwy)
19-Feb-02	6.50	230	60	90	SD 2: Pit 3 - West.
19-Feb-02	6.7	770	120	160	SD 3: Pit 3 - East
19-Feb-02	6.9	850	120	160	Sediment Dam - Hill
19-Feb-02	7.3	410	230	350	Sediment Dam 5 - Highway
12-Dec-02	5.7	180	310	160	Dead Mans Gully - Dam (Hwy)
12-Dec-02	6.3	380	500	170	Sediment Dam - Hill
01-Jun-11	7.99	8	298	411	SD 2: Pit 3 - West.
01-Jun-11	8.17	9	711	1210	SD 3: Pit 3 - East
06-Mar-12	8.0	20	266	256	SD 2: Pit 3 - West.
06-Mar-12	7.94	5	771	1370	SD 3: Pit 3 - East
23-Jan-13	8.01	75	373	249	Dead Mans Gully - Dam (Hwy)
20-Feb-13	7.61	44	292	150	Dead Mans Gully - Dam (Hwy)
26-Mar-13	7.4	238	302	256	Dead Mans Gully - Dam (Hwy)
23-Apr-13	7.3	107	255	269	Dead Mans Gully - Dam (Hwy)
28-May-13	7	190	302	295	Dead Mans Gully - Dam (Hwy)
19-Jun-13	7	254	374	330	Dead Mans Gully - Dam (Hwy)
22-Jul-13	7.3	237	605	540	Dead Mans Gully - Dam (Hwy)
27-Aug-13	7.4	155	571	291	Dead Mans Gully - Dam (Hwy)
26-Sep-13	7.4	424	358	353	Dead Mans Gully - Dam (Hwy)
30-Oct-13	7.6	463	465	571	Dead Mans Gully - Dam (Hwy)
21-Nov-13	6.8	22	272	145	Dead Mans Gully - Dam (Hwy)
21-Nov-13	8.12	12	305	356	SD 2: Pit 3 - West.
21-Nov-13	7.47	56	344	624	SD 3: Pit 3 - East
10-Dec-13	6.7	28	260	147	Dead Mans Gully - Dam (Hwy)
28-Jan-14	7.5	77	650	219	Dead Mans Gully - Dam (Hwy)
13-Feb-14	7.8	28	313	231	Dead Mans Gully - Dam (Hwy)
31-Mar-14	6.5	70	50	88	Dead Mans Gully - Dam (Hwy)
29-Apr-14	7.3	16	164	156	Dead Mans Gully - Dam (Hwy)
29-May-14	7.4	30	124	202	Dead Mans Gully - Dam (Hwy)
25-Jun-14	7.6	35	201	166	Dead Mans Gully - Dam (Hwy)
29-Jul-14	7.74	18	176	161	Dead Mans Gully - Dam (Hwy)
29-Jul-14	8.2	10	264	415	SD 2: Pit 3 - West.
29-Jul-14	8.0	6	236	503	SD 3: Pit 3 - East
29-Aug-14	6.6	78	192	136	Dead Mans Gully - Dam (Hwy)
30-Sep-14	8.7	25	177	168	Dead Mans Gully - Dam (Hwy)
27-Oct-14	8.2	53	187	200	Dead Mans Gully - Dam (Hwy)
27-Nov-14	9	18	4480	6660	Dead Mans Gully - Dam (Hwy)
15-Dec-14	7.4	32	221	177	Dead Mans Gully - Dam (Hwy)
28-Jan-15	6.5	55	146	77	Dead Mans Gully - Dam (Hwy)
28-Jan-15	7.9	70	652	1017	SD16
28-Jan-15	7.4	31	153	197	SD17
28-Jan-15	7.0	45	195	87	SD20
27-Feb-15	6.9	34	161	114	Dead Mans Gully - Dam (Hwy)
27-Feb-15	8.2	70	785	1254	SD16
27-Feb-15	7.5	31	176	233	SD17
27-Feb-15	7.4	11	231	330	SD20
31-Mar-15	7.5	23	226	144	Dead Mans Gully - Dam (Hwy)
31-Mar-15	8.8	39	920	1499	SD16
31-Mar-15	8.8	11	239	268	SD17
31-Mar-15	7.4	16	201	170	SD20
27-Apr-15	6.83	18	178	111	Dead Mans Gully - Dam (Hwy)
27-Apr-15	7.85	3000	2890	354	OOPD - Sed Dam (East)
27-Apr-15	7.27	1730	2300	122	OOPD - Sed Dam (West)
27-Apr-15	7.41	212	703	230	SD 2: Pit 3 - West.
27-Apr-15	7.61	4	220	352	SD 3: Pit 3 - East
27-Apr-15	7.3	4	187	154	SD16
27-Apr-15	7.0	230	1310	104	SD17
27-Apr-15	7.4	212	703	230	SD2
27-Apr-15	7.4	142	873	132	SD20
27-Apr-15	7.6	4	220	352	SD3
27-May-15	6.8	39	134	121	Dead Mans Gully - Dam (Hwy)
27-May-15	7.2	14	303	370	SD16
27-May-15	6.8	68	416	136	SD17
27-May-15	6.8	115	439	144	SD20
28-Jul-15	7	46	250	148	Dead Mans Gully - Dam (Hwy)
28-Jul-15	7.9	33	668	719	SD16
28-Jul-15	7.4	103	1050	132	SD17
28-Jul-15	7.2	67	359	287	SD20
27-Aug-15	6.9	50	203	114	Dead Mans Gully - Dam (Hwy)
27-Aug-15	7.7	13	586	788	SD16
27-Aug-15	7.3	29	911	139	SD17
27-Aug-15	7.3	385	882	168	SD20

Rixs Creek
Clean Water Dams

Date	Clean Water Dam 1				Clean Water Dam 2				Clean Water Dam 6			
	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)
06-Jan-99	7.6	80	190	290	7.5	5	190	290	7.5	60	85	130
26-Feb-99	7.2	340	240	340	7	50	180	240	7.7	65	110	140
26-Mar-99	7.5	240	240	360	7.2	25	160	260	7.4	65	110	140
13-Apr-99	7	170	240	360	7.3	20	160	270	7.3	90	110	140
10-May-99	6.8	130	230	265	7	65	300	207	8	110	320	147
01-Jun-99	7.1	50	340	260	6.6	70	250	200	7	50	370	140
12-Jul-99	6.8	60	180	260	6.9	60	150	200	7.3	60	105	130
04-Aug-99	8.2	25	160	220	7.5	11	100	130	7.2	55	100	120
01-Sep-99	7.2	30	180	200	7.1	19	110	140	7.5	45	100	120
01-Oct-99	8	55	170	240	7	15	110	140	7.2	25	100	120
05-Nov-99	6.3	20	120	150	6	12	110	140	6.4	20	100	120
01-Dec-99	7.1	2	170	240	6.9	11	130	170	7.3	30	100	130
10-Jan-00	7.6	19	340	530	7.3	15	230	340	7.6	45	260	400
04-Feb-00	7.9	35	240	290	7.6	15	150	210	7.6	60	120	160
01-Mar-00	8.4	40	230	350	7.7	30	160	220	7.7	110	120	160
10-Apr-00	7.3	15	150	200	7.7	25	140	180	8.2	45	120	160
10-May-00	7.2	35	140	180	7	24	130	170	7.2	23	120	120
07-Jun-00	7.5	16	170	240	7	1	130	170	7.3	4	100	130
04-Jul-00	7.9	5	220	350	7.4	5	150	210	7.8	30	120	150
29-Aug-00	8.2	15	260	200	7.3	11	220	190	7	27	240	120
18-Sep-00	8.1	80	200	230	8.4	19	200	240	8.2	10	120	130
06-Oct-00	7.5	31	170	210	7.4	17	140	190	8.8	25	120	150
03-Nov-00	7.5	16	180	250	7.1	11	150	210	7.1	12	110	140
06-Dec-00	6.9	21	120	160	7.1	17	140	190	7.6	60	100	130
08-Jan-01	7.3	2	140	190	7.1	4	170	210	7.3	38	120	150
12-Feb-01	7.6	50	140	160	7.2	40	140	170	7.9	60	140	150
05-Mar-01	6.9	23	100	130	6.6	18	110	135	8.5	80	130	170
23-Apr-01	7.5	8	120	180	6.8	5	100	130	7.1	34	110	140
10-May-01	7.2	13	140	180	7.1	13	130	140	7.1	36	140	145
13-Jun-01	7	17	160	200	6.7	14	140	150	7.3	42	120	160
16-Jul-01	7.4	4	170	220	7	6	120	160	8	36	140	190
29-Aug-01	7.2	28	170	230	7.3	65	130	170	7	55	120	150
24-Sep-01	7.9	12	200	250	7.4	22	140	180	7.9	60	120	150
24-Oct-01	8.3	8	190	250	7.7	12	160	180	8.3	55	150	160
30-Nov-01	8.8	5	150	270	7.5	21	90	210	8	60	130	170
19-Dec-01	7.7	5	160	260	7.6	5	150	220	8.7	110	170	190
16-Jan-02	8.4	12	260	390	7.5	7	150	250	8.1	80	220	320
12-Feb-02	7.2	26	200	230	6.7	20	170	190	8.2	280	260	320

Rixs Creek
Clean Water Dams

Date	Clean Water Dam 1				Clean Water Dam 2				Clean Water Dam 6			
	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)
11-Mar-02	7.1	10	160	190	7.1	3	110	200	8.6	90	250	300
23-Apr-02	6.6	25	90	100	7.4	21	110	140	7.1	34	230	270
15-May-02	7	23	70	110	6.8	9	60	110	7.7	40	340	270
06-Jun-02	6.5	20	180	140	7.5	9	160	160	7.3	170	340	310
31-Jul-02	7.1	6	160	160	6.8	2	95	140	7.8	55	360	270
20-Aug-02	6.7	14	280	170	6.7	9	230	150	6.8	270	440	280
23-Sep-02	7.8	70	150	180	7.5	10	85	160	7.9	320	250	280
16-Oct-02	7	1	210	200	6.5	10	95	160	8.1	45	390	310
27-Nov-02	6.3	70	250	230	6.7	4	100	190	8	80	390	330
09-Dec-02	7.6	75	240	350	8.8	2	120	200	8.4	60	430	350
21-Jan-03	7.8	17	210	210	6.4	120	140	180	7.3	22	420	300
14-Feb-03	8.3	21	170	190	7.9	2	120	200	8.6	110	360	370
19-Mar-03	7.5	14	300	200	7.3	9	120	205	7.5	85	370	320
16-Apr-03	7.3	14	260	220	7	2	170	210	7.8	15	450	310
19-May-03	7	170	250	200	7	4	130	190	7.8	38	440	280
11-Jun-03	7.2	29	160	220	7.5	12	130	210	7.8	44	530	320
16-Jul-03	7.1	55	270	240	7.1	10	180	240	8	31	440	340
26-Aug-03	6.6	25	270	240	7.4	2	250	250	7.6	85	340	330
25-Sep-03	7.1	25	340	260	7.3	9	230	250	8	85	460	340
27-Oct-03	6.8	80	320	260	7.2	14	340	270	7.8	65	470	350
13-Nov-03	7.1	37	270	270	7.6	2	190	280	7.9	80	470	360
15-Dec-03	7.1	17	240	220	7.2	7	280	280	7.8	85	490	340
29-Jan-04	7.6	7	200	260	7.1	5	180	320	7.9	90	420	370
26-Feb-04	6.3	27	168	120	6.4	30	132	120	7.3	151	292	270
31-Mar-04	6.6	3	66	148	6.3	2	104	163	7.3	22	290	271
27-Apr-04	6.4	1	42	156	6.9	1	78	150	6.9	34	272	250
27-May-04	8.4	16	184	122	6.7	14	242	130	7.1	84	342	209
16-Jun-04	8.7	64	136	170	7.4	1	138	170	8	14	289	290
29-Jul-04	7.3	2	70	190	7.5	1	120	180	8.4	2	230	270
23-Aug-04	7.1	12	36	197	7.2	13	60	191	7.7	32	286	260
23-Sep-04	6.8	65	148	199	7	8	180	197	7.5	46	412	260
28-Oct-04	6.4	9	54	197	6.8	2	118	199	7.4	66	316	255
20-Nov-04	7.3	11	200	220	7.4	3	140	210	8.1	80	400	300
30-Nov-04	7.7	5	192	223	8.5	1	140	211	7.4	97	280	280
06-Jan-05	6.8	14	190	236	7.6	12	180	213	7.5	65	365	280
02-Feb-05	6.1	110	140	110	6.7	31	140	180	6.9	240	200	190
23-Mar-05	6	19	88	150	6.2	10	88	200	6.8	37	250	200
29-Apr-05	6.2	1	120	165	6.4	1	40	213	6.8	8	150	207

Rixs Creek
Clean Water Dams

Date	Clean Water Dam 1				Clean Water Dam 2				Clean Water Dam 6			
	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)
30-May-05	6.8	21	258	172	6.7	16	200	216	7.1	55	362	213
22-Jun-05	7.1	5	190	180	6.9	8	210	230	7.6	17	330	210
28-Jul-05	7.1	3	60	270	7	2	110	240	7.9	23	330	230
24-Aug-05	7.1	7	90	220	7.1	9	100	250	7.9	39	60	240
19-Sep-05	7.2	5	260	241	7.1	6	180	238	8.1	108	310	230
27-Oct-05	9.1	4	82	210	8.6	1	44	240	8.2	32	300	230
21-Nov-05	7.5	2	140	187	7.5	1	82	230	8.2	155	60	240
08-Dec-05	8.6	1	70	195	7.9	11	130	240	8	45	290	250
19-Jan-06	6.8	1	200	230	6.9	1	220	280	7.9	1	310	280
23-Feb-06	7.6	1	248	260	7.8	2	168	300	8.1	49	332	280
23-Mar-06	6.9	16	170	260	6.6	3	170	330	7.8	52	130	280
19-Apr-06	8.7	10	315	320	8.5	2	315	350	8.7	14	445	280
18-May-06	7	9	208	226	7.6	20	192	335	8.4	8	244	290
22-Jun-06	7.8	2	304	271	7.8	10	284	335	8.6	9	246	393
20-Jul-06	6.8	7	210	270	6.8	7	174	335	9	13	224	285
25-Aug-06	7.1	10	196	305	7.5	7	222	360	7.5	10	269	306
15-Sep-06	6.6	22	150	214	6.4	142	526	731	7.3	20	222	270
20-Oct-06	6.9	27	172	253	6.9	8	236	334	7.7	71	294	285
23-Nov-06	9.5	2	180	275	8.2	2	132	362	8.8	2	268	304
13-Dec-06	8	4	198	316	7.7	4	224	406	8.5	31	421	352
11-Jan-07												
22-Feb-07												
15-Mar-07												
27-Apr-07												
23-May-07												
28-Jun-07												
30-Jul-07												
23-Aug-07												
26-Sep-07												
17-Oct-07												
15-Nov-07												
10-Dec-07												
24-Jan-08	8.4	6	95	54	6.8	4	102	204	8.6	29	150	111
06-Feb-08	6.4	34	49	95	6.3	23	186	110	8.9	8	228	127
25-Mar-08	7.5	3	82	128	7.4	4	80	133	8.1	39	162	126
28-Apr-08	6.9	36	82	98	6.7	7	70	111	7.8	19	72	130
20-May-08	6.9	20	84	101	6.7	9	73	115	7.7	8	106	123
05-Jun-08	6.3	54	50	91	6.3	29	56	87	6.8	33	146	160

Rixs Creek
Clean Water Dams

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17-Jul-08	7.2	14	140	170	7.6	17	120	120	8	12	120	120
13-Aug-08	7.6	6	145	196	7.4	7	127	131	7.8	18	210	140
18-Sep-08	9	16	136	181	7.6	14	82	144	8.5	160	160	135
27-Oct-08	7.7	9	280	220	7.2	15	170	170	9.4	29	280	150
24-Nov-08	7.5	5	170	230	7.4	12	150	180	8	30	200	150
09-Dec-08	8.7	3	162	237	8.4	6	116	188	7.8	273	266	155
29-Jan-09	8.9	4	150	260	7.2	4	140	210	7.9	13	220	180
16-Feb-09	6.7	55	74	180	6.7	34	110	130	7.1	66	150	140
17-Mar-09	7.9	11	120	180	7	8	90	150	7.3	9	130	130
03-Apr-09	6.8	26	160	150	6.6	38	140	130	6.6	58	160	160
26-May-09	8.2	3	110	180	7.3	7	110	140	7.5	6	180	100
17-Jun-09	7.5	6	54	193	7.3	7	82	143	7.5	8	124	105
20-Jul-09	7.7	8	140	180	7.2	7	122	140	7.5	7	192	110
31-Aug-09	8.2	4	130	190	8	17	110	150	8.2	18	210	120
28-Sep-09	7.62	4	134	210	7.49	8	104	150	7.41	19	209	120
29-Oct-09	7.5	2	170	210	8.1	2	150	160	7.4	13	230	120
18-Nov-09	10	4	140	240	9.4	3	110	170	8.3	9	220	150
08-Dec-09	9.9	8	150	230	8.3	27	280	180	7.9	21	220	130
22-Jan-10	9.1	11	190	240	9.4	19	120	190	8.7	10	220	140
17-Feb-10	9.1	10	230	280	9.9	5	210	210	8.4	16	360	150
29-Mar-10	10.1	7	244	310	10.2	8	74	240	8.9	10	160	170
29-Apr-10	8.8	6	208	318	8.8	14	112	233	7.6	9	124	184
28-May-10	6.8	10	170	306	9	9	132	237	8.1	25	138	164
24-Jun-10	7	191	176	271	7.5	235	100	240	7.3	185	98	161
16-Jul-10	6.8	18	122	257	6.8	6	100	253	7	2	179	156
26-Aug-10	7.1	20	174	230	7.2	2	152	247	8.5	13	92	163
27-Sep-10	7.6	9	162	262	7.5	3	144	273	9.4	21	148	206
26-Oct-10	7.7	4	161	249	7.8	1	164	262	8.2	3	153	166
17-Nov-10	7.1	14	138	196	6.7	33	149	159	7.7	19	152	160
09-Dec-10	8.5	11	74	165	8.4	5	161	198	8.5	5	156	158
24-Jan-11	7.89	10	150	226	7.59	7	172	254	9.48	15	135	216
28-Feb-11	8.09	6	153	204	8.03	6	191	242	9.03	6	127	170
25-Mar-11	7.82	8	139	214	7.99	8	159	253	8.94	6	117	176
29-Apr-11	7.32	8	191	256	7.45	5	213	316	8.76	6	159	195
31-May-11	7.34	87	158	151	7.77	15	152	272	8.25	7	149	180
01-Jun-11	6.97	16	148	123	6.81	73	147	134	7.7	10	126	170
28-Jul-11	7.16	19	128	167	7.1	5	121	159	7.96	34	184	140
25-Aug-11	7.07	14	170	213	7.09	10	125	165	8.06	22	193	130

Rixs Creek
Clean Water Dams

Date	Clean Water Dam 1				Clean Water Dam 2				Clean Water Dam 6			
	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)
29-Sep-11	7.29	12	186	255	7.3	12	120	172	7.92	32	180	185
26-Oct-11	7.38	11	173	221	7.32	10	150	182	8.19	18	168	160
21-Nov-11	7.99	8	121	215	7.49	6	102	173	8.94	26	148	182
19-Dec-11	7.58	8	175	210	7.4	9	173	163	7.72	16	311	146
23-Jan-12	7.83	23	182	229	7.5	10	160	178	8.03	46	300	152
02-Feb-12	7.44	14	154	221	7.28	12	101	175	7.6	13	200	146
06-Mar-12	7.39	16	219	168	7.19	18	174	137	7.44	20	280	140
26-Apr-12	7.37	14	130	206	7.24	20	117	177	7.52	58	215	174
28-May-12	7.54	47	151	205	7.5	5	136	181	7.83	22	206	175
12-Jun-12	7.43	10	122	197	7.43	47	163	174	7.56	21	152	182
	7.2	13	228	282	7	27	168	190	7.6	9	230	189
25-Jul-12												
27-Aug-12	7.4	15	185	290	7.4	9	174	189	7.8	18	263	180
26-Sep-12	7.4	14	216	306	7.6	27	172	213	7.9	14	273	226
29-Oct-12	7.3	12	247	338	7.2	53	158	219	8.2	14	300	244
21-Nov-12	7.5	17	227	342	7.1	77	164	226	8	118	251	246
11-Dec-12	7.3	12	251	379	7.2	22	186	250	7.3	21	262	261
23-Jan-13	8.1	22	308	424	8	35	200	276	8.36	50	285	271
20-Feb-13	7.69	14	160	183	7.62	8	154	197	8.13	24	294	292
26-Mar-13	6.9	6	126	155	6.9	24	124	136	7.4	26	214	241
23-Apr-13	7.2	9	126	156	7	9	124	140	7.2	22	177	186
28-May-13	7.2	35	198	158	7	10	106	146	7.3	14	233	235
19-Jun-13	6.9	10	216	172	7	7	169	156	7.3	6	262	203
22-Jul-13	7	8	198	244	7	6	158	167	7.4	4	244	253
27-Aug-13	8	7	179	201	7.9	15	144	150	8.2	50	218	194
26-Sep-13	8	10	244	290	7.9	11	200	196	8	45	278	221
30-Oct-13	7.9	21	201	318	8	8	169	221	8.3	35	251	298
21-Nov-13	7.06	30	138	133	7.14	15	158	184	7.49	5	237	253
10-Dec-13	6.9	13	124	133	6.9	10	139	158	8	21	275	292
28-Jan-14	7.6	10	119	174	7.4	6	133	199	8.4	7	228	331
13-Feb-14	7.8	9	128	184	8	13	134	244	8.9	5	224	344
31-Mar-14	7.1	86	112	98	7.5	47	101	155	7.9	18	256	322
29-Apr-14	6.8	31	108	104	6.9	17	105	118	7.6	10	197	289
29-May-14	7	8	108	108	7	9	114	125	8.5	6	209	397
25-Jun-14	7.5	5	133	112	7.5	10	129	133	8.3	6	189	329
29-Jul-14	7.5	5	116	145	7.54	5	126	156	8.1	5	128	297

Rixs Creek
Clean Water Dams

Date	Clean Water Dam 1				Clean Water Dam 2				Clean Water Dam 6			
	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)
29-Aug-14	7.1	41	156	130	7.4	10	134	141	8.8	7	189	314
29-Aug-14	7.4	15	146	148	7.8	8	141	141	9.2	10	207	323
27-Oct-14	7.8	5	139	148	7.6	4	143	142	8.9	4	229	341
27-Nov-14	8.2	7	136	157	7.5	7	143	173	8.3	32	195	329
15-Dec-14	7.3	17	122	148	7.9	7	125	155	8.2	10	201	340
28-Jan-15	6.6	54	93	66	6.8	38	96	131	7.5	15	134	244
27-Feb-15	6.7	11	124	104	6.8	11	132	129	7.9	14	198	271
31-Mar-15	6.9	16	140	149	7.2	16	143	183	8	14	218	290
27-Apr-15	7.07	8	150	158	7.01	6	154	133	7.32	18	171	154
27-May-15	7	19	185	170	7.1	13	156	156	7.3	8	119	190
30-Jun-15	7	8	191	225	7	16	148	189	7.3	19	190	226
28-Jul-15	7.2	7	249	212	7.3	4	247	160	7.7	6	235	218
27-Aug-15	7	9	269	244	7.1	9	178	181	7.6	3	247	219

340	300	250	Trickle	7.2	50	710	1050	Flow	1170	556	39	8.1	7.3	27	1100	1830	6.7	414	392	440	430	296	460	420	454	338	476	520	646	1290	590	660
40	95	260	Flow	7	730	260	410		1720	236	80	6.9	7.4	13	3130	476	548	660	1160	1080	620	560	434	62	25	556	548	660	70	280	740	740
272	140	258	Flow	6.9	247	258	360		476	236	80	6.9	7.4	13	3130	476	548	660	1160	1080	620	560	434	62	25	556	548	660	238	310	280	740
236	254	832	Nil	7.2	26	832	1630		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	28	1290	660	740
178	190	986	Nil	7.5	1	986	1250		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	1	852	660	740
378	218	1242	Nil	7.3	10	1242	1578		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	23	852	660	740
202	300	1082	Nil	7.9	1	1082	2000		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	25	852	660	740
290	280	1180	Nil	7.4	33	1180	2000		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	25	852	660	740
310	373	1234	Nil	7.3	16	1234	2140		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	25	852	660	740
374	297	1088	Nil	7.5	9	1088	1898		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660
280	138	950	Nil	7.1	27	950	1630	Flow	320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660
420	260	1660	Nil	7.3	4	1660	2750		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660
432	260	1450	Nil	7.2	10	1450	2340		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660
420	328	1480	Nil	7.4	3	1480	2470		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660
190	75	320	Flow	7.1	180	320	460		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660
158	140	442	Flow	6.9	122	442	870		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660
128	213	350	Nil	7.1	1	350	754		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660
296	152	766	Nil	7.2	22	766	1218		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660
260	160	700	Nil	7.4	8	700	1240		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660
290	170	430	Nil	7	41	430	1000		320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660
340	190	610	Nil	7.4	24	610	1110	320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	
690	200	700	Nil	7.3	20	700	1120	320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	
400	130	560	Trickle	6.8	116	560	1000	320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	
28	188	704	Nil	6.9	48	704	1270	320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	
230	210	960	Nil	6.8	2	960	1800	320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	
440	380	1190	Nil	7.3	45	1190	2080	320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	
		874	Nil	7.6	24	874	1660	320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	
			Dry					320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	
			Dry					320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	
			Dry					320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	
			Dry					320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	
			Dry					320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	
			Dry					320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	
			Dry					320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	
			Dry					320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	
			Dry					320	180	24	7.1	7.2	24	320	320	476	520	1160	1080	620	560	434	62	25	556	548	660	159	1290	590	660	

653	445	No	7.4	/	665	896	No	7.6	15	639	1138	Inckle	7.3	6	1650	2850
378	439	Flow	7.5	11	513	698	Flow	7.3	20	630	833					

Rixs Creek
Mine Water Monitoring Data

Date	Dirty Water Dam #1				Dirty Water Dam #2				Dirty Water Dam #3				Dirty Water Dam #4			
	pH	Total Suspended Solid ^s (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)
06-Jan-99	8.8	1	2220	3830	7.9	1	3560	5800					8.2	10	600	990
26-Feb-99	8.2	33	1200	2020	8.1	4	4410	6960					7.5	50	700	1230
26-Mar-99	8.4	3	2240	3590	8.5	4	4750	7490					8.1	130	780	1290
13-Apr-99	8.3	7	2260	3960	8.4	2	4440	7400					7.6	45	610	1210
10-May-99	7.9	2	2410	3560	8.6	4	3820	5600					7.5	50	560	912
01-Jun-99	8.3	11	2470	3800	8.5	4	3950	5990					7.9	18	540	980
12-Jul-99	8	4	2590	4180	8.4	3	3660	6070					7.6	22	690	1060
04-Aug-99	8.2	1	2390	3850	8.7	3	3570	5790					7.5	29	490	700
01-Sep-99	8.3	5	2320	3750	8.4	2	3450	5440					7.3	35	470	770
01-Oct-99	8.4	1	2210	3410	8.2	1	3830	5730					7.4	40	590	850
05-Nov-99	8.4	6	2290	3710	8.4	1	3780	6100					6.6	60	430	660
01-Dec-99	8.7	11	2350	4010	8.5	5	3670	6170					7.1	80	470	760
10-Jan-00	8.8	3	2600	4430	8.6	4	4180	6980					7.5	35	690	1160
04-Feb-00	8.3	20	2540	4160	8.3	5	4170	6690					8	20	650	1010
01-Mar-00	8.1	4	3010	4660	8.3	4	4690	7400					7.8	5	740	1110
10-Apr-00	8.1	7	2270	3790	8.8	7	3970	6540					7.4	50	500	650
10-May-00	8.4	1	2790	4550	8.5	4	3600	5940					7.1	60	430	620
07-Jun-00	8.2	1	3420	5760	8.7	2	3640	6110					7.3	50	440	720
04-Jul-00	8.2	1	2660	4520	8.4	2	4090	6830					7.5	60	460	750
29-Aug-00	8.3	19	3080	4790	8.2	7	4830	7640					8	45	580	790
18-Sep-00	8.5	6	3140	4880	8.4	60	4950	7590					8.4	24	570	990
06-Oct-00	8.4	7	3590	5180	8.2	11	5260	7600					8.2	12	610	1040
03-Nov-00	8.1	2	3600	5560	7.8	13	5280	8320					8.4	3	980	1570
06-Dec-00	8.3	7	2640	4210	8.4	8	4170	6460					7.8	23	780	1330
08-Jan-01	8.5	1	3300	5280	9.3	4	4130	6670					8.4	1	830	1480
12-Feb-01	8.4	17	2200	3620	8.9	20	3630	5790					8.5	11	1250	2120
05-Mar-01	8.3	85	2720	4010	8.7	14	3660	5540					7.9	28	870	1220
23-Apr-01	8.4	7	3050	4880	8.3	18	3230	5220					9	110	530	880
10-May-01	8.1	25	2730	4410	8.2	13	3200	5180					7.5	31	600	930
13-Jun-01	8.1	5	2960	4510	7.7	4	3560	5410					8	38	960	1630
16-Jul-01	8.3	1	2900	4380	7.9	12	4520	7100					8.8	9	1000	1650
29-Aug-01	8.2	13	3050	4790	7.9	11	4310	6700					8.6	28	1170	1840
24-Sep-01	8.6	11	3030	4900	8.2	13	4670	7430					8.4	16	1140	1910
24-Oct-01	8.5	16	3030	4890	8.2	80	1680	2990					9.1	19	1200	2110
30-Nov-01	8.3	11	3220	5000	8.1	14	4270	6820					8.5	100	1150	1980
19-Dec-01	8.5	20	3030	1990	8.1	10	2940	4850					8.7	13	1480	2300
16-Jan-02	8.4	6	3430	5240	9.1	3	3010	4890					9.1	13	2020	3460
12-Feb-02	8.5	14	2600	4200	8.8	4	2240	3750					7.9	11	1670	2680
11-Mar-02	8.4	3	3100	4610	8.5	1	3380	4850					8.2	2	1860	2920
23-Apr-02	8.4	5	2910	4680	8	3	3200	5140					7.7	5	1230	2140
15-May-02	8.3	6	3030	4890	8.2	8	3660	5890					8.2	5	1100	2220
06-Jun-02	8.4	5	2920	4580	8.1	7	3850	6040					8.3	6	1260	2100
31-Jul-02	7.9	1	3460	5620	8	2	3740	6210					8.7	1	1370	2490
20-Aug-02	8.3	1	3540	5370	8.3	1	3650	5650					8.8	4	1630	2650
23-Sep-02	8.6	4	3500	5530	8.4	4	4370	6890					9.1	1	1580	2780

Rixs Creek
Mine Water Monitoring Data

Date	Dirty Water Dam #1				Dirty Water Dam #2				Dirty Water Dam #3				Dirty Water Dam #4			
	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)
16-Oct-02	8.3	4	3670	5760	8.2	16	4750	7500					9.1	9	1800	3050
27-Nov-02	8.2	1	4250	6170	8.2	11	4530	6720					9.1	7	2750	4480
09-Dec-02	8.5	3	4030	6050	8.5	20	4450	6660					9	4	3260	5120
21-Jan-03	8.5	4	3830	8510	8.9	4	4310	6770					8.7	5	2850	4620
14-Feb-03	8.8	1	4070	6000	9	1	4110	6290					9.4	1	3050	4870
19-Mar-03	8.5	5	4010	6210	8.3	5	4180	6610					9	6	3280	5250
16-Apr-03	8.4	5	4530	6780	8.5	3	5050	7490					8.5	7	5620	8170
19-May-03	8.6	1	4650	7150	8.5	9	4990	7640					8.6	39	5740	8700
11-Jun-03	8.6	10	5090	7800	8.4	6	4850	7570					8.5	12	5990	9010
16-Jul-03	8.3	2	4540	6550	8.3	10	5070	7560					8.8	12	6020	8700
26-Aug-03	8.3	7	3880	5900	8.1	35	4890	7450					8.8	40	5460	8440
25-Sep-03	8.5	11	5095	7620	8.6	70	5830	8670					8.5	170	6195	9280
27-Oct-03	8.4	6	4670	6830	8.5	280	5090	7540					8.5	42	6350	9000
13-Nov-03	8.3	23	4800	7110	8.4	1	4740	7120					8.7	13	6400	9610
15-Dec-03	8.8	5	3760	5790	9.1	38	2360	4040					8.6	14	5630	8470
29-Jan-04	9.2	6	2930	4880	8.9	10	4620	7280					9	25	5140	8120
26-Feb-04	7.9	11	2164	3550	8.5	11	3696	5820					8.5	97	2318	3840
31-Mar-04	8.6	4	3610	5600	8.7	3	3120	5100					8.8	4	3770	5880
27-Apr-04	8.7	12	3848	7300	9	1	2862	5520					8.8	1	4320	7690
27-May-04	8.3	5	4072	6000	8.6	7	3910	6030					8.9	29	4496	6670
16-Jun-04	8.4	1	4562	6860	8.5	1	3898	6320					8.8	18	4566	7000
29-Jul-04	8.4	1	4750	7020	8.5	3	4270	6640					8.6	18	4940	7380
23-Aug-04	8.4	9	4734	7280	8.4	5	4146	6810					8.5	20	5428	8400
23-Sep-04	8.5	7	4846	7460	8.3	11	4280	7000					8.4	55	5764	8850
28-Oct-04	8.4	2	4236	6570	8.5	13	4680	7230					8.5	34	5704	8750
30-Nov-04	8.3	20	4970	7240	8.4	7	5390	7050					8.7	14	5950	8790
20-Dec-04	8.3	5	4728	7240	8.3	1	4440	7140					8.7	2	5660	8440
06-Jan-05	8.7	8	5420	7870	8.6	3	4700	7000					8.6	11	6080	8850
02-Feb-05	8.5	1	2560	4380	9.1	11	3510	4620					8.7	29	4620	5880
23-Mar-05	8.5	5	3560	5400	8.6	11	2406	4050					8.6	5	3696	5800
29-Apr-05	8.3	1	4306	6760	8.4	1	3730	6030					8.6	1	4782	7250
30-May-05	8.6	60	4632	7100	8.8	14	4764	7300					8.6	19	5380	8000
22-Jun-05	8.4	26	4960	6750	8.7	15	5070	7200					8.6	250	5100	8070
28-Jul-05	8.6	1	4680	6670	8.9	1	4970	7020					8.7	1	5160	7630
24-Aug-05	8.3	8	5150	7570	8.6	6	5050	7610					8.6	19	5470	7450
19-Sep-05	8.3	23	4990	7460	8.4	12	4880	7500					8.5	27	5800	8870
27-Oct-05	8.4	4	5150	6700	8.7	33	5250	7100					9.1	16	5040	7200
21-Nov-05	8.5	1	4640	6740	8.5	1	4614	6720					9.1	1	5164	7520
08-Dec-05	8.4	2	4930	6920	8.5	14	4840	6830					8.8	24	5330	7960
19-Jan-06	8.7	6	5220	7570	8.5	1	5370	7500					9	1	5910	9210
23-Feb-06	8.5	1	5180	7440	8.9	14	3054	9020					8.8	20	5918	9110
23-Mar-06	8.4	21	5290	7900	8.6	3	5670	8690					8.7	5	6010	9220
19-Apr-06	8.9	64	5120	8350	8.9	44	5370	8340					9.2	114	5460	9940
18-May-06	8.8	12	5030	8370	9	8	4805	8410					9.6	12	5280	9270
22-Jun-06	8.6	24	7390	9400	8.7	12	5610	9340					8.9	15	6110	9950

Rixs Creek
Mine Water Monitoring Data

Date	Dirty Water Dam #1				Dirty Water Dam #2				Dirty Water Dam #3				Dirty Water Dam #4			
	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)
20-Jul-06	8.9	14	5220	10290	9	12	5180	10190					8.8	20	5720	10870
25-Aug-06	8.2	7	5940	9520	8.5	6	5925	9650					8.9	20	6120	10530
15-Sep-06	8.6	38	4035	7040	8.9	9	4535	8050					8.8	34	2980	5540
20-Oct-06	8.5	10	5175	8310	8.5	17	12825	8430					9.4	14	5208	8330
23-Nov-06	8.9	28	5055	8860	9.2	46	5150	9035					9.8	26	5290	9500
13-Dec-06	9	75	5115	9190	9	60	5010	9260					9.8	80	5080	9650
11-Jan-07	9.4	36	5350	9900	9.2	38	4500	10170					9.8	74	5620	10680
22-Feb-07	9.2	16	6100	9800	9.4	26	6300	9920					10.1	33	5900	10240
15-Mar-07	8.9	70	5360	10840	9.2	88	5400	11470					9.8	88	4760	11730
27-Apr-07	8.8	58	5135	7930	8.5	52	4575	7290					9.6	50	2224	8850
23-May-07	8.5	5	4280	8360	8.2	36	4925	9455					8.4	13	3894	7850
28-Jun-07	8.1	8	1734	3300	8.1	20	1808	3300					7.4	26	1020	2150
30-Jul-07	8.7	11	1735	3255	8.6	26	1850	3325					8.2	16	1470	3085
23-Aug-07	7.9	22	1612	2805	8.4	3	2325	4055					7.9	8	1420	3030
26-Sep-07	8.2	4	2065	3740	8.4	2	2495	4315					8.6	4	1930	3410
17-Oct-07	8.8	10	2250	4080	8.8	8	2545	4485					8.8	7	2435	3905
15-Nov-07	8.8	6	2270	4490	10.3	38	1745	3500					9.2	6	2215	4250
10-Dec-07	9.1	334	902	4050	8.7	3	1076	4525					9	4	798	3880
24-Jan-08	9.1	13	2315	4955	8.9	10	3238	6530					9.8	12	2240	4570
06-Feb-08	8.9	10	3815	4110	9.2	51	5480	4310					9.8	13	2925	3695
25-Mar-08	8.7	10	2510	4285	8.7	89	2576	4285					9.3	88	2055	3725
28-Apr-08	8.3	27	2070	3775	8.5	33	2838	4880					8.1	28	1915	3600
20-May-08	8.1	18	3318	3880	8.4	14	3768	4805					7.8	4	2318	3510
05-Jun-08	8.4	36	2180	3645	8.2	41	2695	5110					7.9	82	2080	2265
17-Jul-08	8.5	16	1980	5450	8.6	12	2980	5700					8.6	15	2310	4640
13-Aug-08	8.5	17	3010	5705	8.5	10	2938	4845					8.6	17	2552	3405
18-Sep-08	8.7	65	2810	5840	8.8	13	2565	5390					8.8	19	2395	4870
27-Oct-08	8.9	8	3100	4900	9	31	2400	3900					9	61	2700	4300
24-Nov-08	8.6	7	3200	5800	8.8	15	3040	5600					8.8	12	2700	5100
09-Dec-08	8.6	9	3115	5320	8.7	15	3190	5180					8.9	61	2660	4570
29-Jan-09	8.7	16	3700	5800	8.5	12	3900	6300					9	14	3200	5100
16-Feb-09	7.9	190	850	1300	8.6	28	2800	5000					8.7	26	2000	3600
17-Mar-09	9	10	2400	3900	8.5	6	2900	4700					9.1	20	1900	3300
03-Apr-09	8.2	28	1900	2800	8.5	13	2600	3900					8.3	28	1600	2500
26-May-09	8.5	11	3030	4300	8.6	38	2960	4500					8.6	29	2070	3300
17-Jun-09	8.9	4	2225	4090	9.1	2	6615	4470					9.2	7	1945	3590
20-Jul-09	8.7	53	2595	4300	9	3	2615	4300					9	10	2180	3700
31-Aug-09	8.7	2	2800	4400	8.7	24	2700	4400					8.8	22	2500	4000
28-Sep-09	8.69	6	2810	4300	8.72	6	2800	4400					8.9	15	2500	3800
29-Oct-09	8.3	5	3200	4700	8.4	2	3000	4700					8.9	8	2900	4300
18-Nov-09	8.8	5	3000	5000	8.8	4	3000	2100					9.2	2	2600	4500
08-Dec-09	9.2	4	3400	4800	9.1	4	3300	5000					9.7	6	3200	2400
22-Jan-10	9	2	3100	4200	8.8	1	4000	4800					9.3	5	2900	4400
17-Feb-10	9.4	21	2300	5100	9.1	11	3200	5400					9.6	3	2700	4600
29-Mar-10	9	5	3900	5400	8.8	7	3800	5600					9.3	8	3100	5100

Rixs Creek
Mine Water Monitoring Data

Date	Dirty Water Dam #1				Dirty Water Dam #2				Dirty Water Dam #3				Dirty Water Dam #4			
	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)
29-Apr-10	8.3	4	3300	5200	8.2	12	3445	5720					8.7	13	3066	5110
28-May-10	8.2	23	2505	4470	8.5	9	3340	5625					9.1	7	3035	5165
24-Jun-10	9.1	227	2675	5230	9.2	185	2905	5400					9.6	230	2515	4820
16-Jul-10	8.1	14	2805	5125	8.6	3	2820	5285					8.9	2	2710	4870
26-Aug-10	8.7	6	3100	5315	9	22	3215	5270					9.6	28	2810	4595
27-Sep-10	8.8	5	3300	4770	8.9	47	3555	5100					9.6	14	2945	4550
26-Oct-10	8.6	2	3160	5180	8.6	5	3380	5530					9.3	1	2900	4870
17-Nov-10	8.7	8	2650	4400	8.7	4	3110	5250					9.1	7	2540	4460
09-Dec-10	8.7	5	3080	4990	8.7	15	3180	5200					8.9	19	2530	4310
24-Jan-11	9.12	13	3100	5030	8.22	9	3390	5440					9.08	9	2840	4600
28-Feb-11	8.87	5	3640	5310	8.68	6	3710	5330					9.14	5	3320	4950
25-Mar-11	8.6	6	3510	5640	8.62	16	3700	5820					8.93	6	3140	5130
29-Apr-11	8.82	44	2870	4700	8.6	6	3750	6120					8.82	5	3290	5360
31-May-11	8.49	50	1440	2400	8.51	28	3180	4980					8.75	26	2440	3830
01-Jun-11	8.68	34	2130	3470	8.59	8	2660	4620					8.82	16	2400	3920
28-Jul-11	8.35	5	2650	4590	8.52	5	2650	4600					8.35	5	2260	3850
25-Aug-11	8.26	8	2540	4440	8.61	5	2630	4540					8.52	10	2390	4090
29-Sep-11	8.49	14	2640	4290	8.66	54	2590	4120					8.8	141	2390	3890
26-Oct-11	8.51	6	2780	4490	8.72	9	2860	4520					9.01	8	2580	4050
21-Nov-11	9.2	8	2420	4140	8.75	7	2790	4710					8.74	6	2780	4560
19-Dec-11	8.88	6	2410	3800	8.65	5	2690	4210					8.81	5	2030	3360
23-Jan-12	8.67	6	2710	4290	8.52	9	2910	4550					8.7	6	2430	3930
02-Feb-12	8.56	5	2510	4030	8.61	6	2470	4160					8.6	5	2290	3880
06-Mar-12	8.39	5	2230	3580	8.52	8	2270	3610	8.4	12	745	1250	8.6	7	1810	2990
26-Apr-12	8.48	8	2740	4350	8.64	5	2900	4440	8.3	10	834	1390	8.87	5	2520	3940
28-May-12	8.68	14	2690	4100	8.68	8	2830	4500	8.2	14	900	1320	8.69	6	2720	4150
12-Jun-12	8.68	18	2270	3660	8.74	10	2670	4200	8.2	7	1240	2020	8.65	6	2490	3910
25-Jul-12	8.8	19	2550	4080	9	6	2470	4160	8.6	6	1270	2060	9	7	2500	4080
27-Aug-12	8.7	8	2890	4620	8.9	5	2890	4590	8.8	4	1420	2210	8.8	10	2730	4360
26-Sep-12	8.6	11	2970	4680	8.6	6	3290	5180	8.2	3	4380	6610	8.7	22	2930	4630
29-Oct-12	8.7	8	3490	5340	8.9	1	3470	5450	8.1	1	4960	7440	8.8	13	3370	5010
21-Nov-12	8.9	8	3560	5620	8.9	2	3390	5650	8.1	1	4990	7580	8.7	7	3360	5370
11-Dec-12	8.8	7	3600	5490	9	2	3680	5730	8.2	3	5130	7590	9	5	3500	5450
23-Jan-13	8.81	13	3600	5770	9.05	6	3570	5580	8.5	4	5130	7140	8.76	18	3470	5400
20-Feb-13	8.89	16	2210	4370	8.72	13	3060	4630	8.5	4	3080	4650	8.6 <5		3310	5040
26-Mar-13	8.5	6	2500	4210	9.2	14	1570	2830	8.5	5	2350	4060	9	3	2040	3640
23-Apr-13	8.8	3	2990	5100	9.2	14	2360	3990	8.3	7	3740	5920	9	4	2700	4450
28-May-13	8.8	5	3150	5000	9.3	9	2600	4220	8.3	4	3640	5230	8.6	5	3020	4730
19-Jun-13	8.8	9	3240	5090	9	16	2740	4410	8.4	4	3040	4750	8.4	6	2700	4330
22-Jul-13	8.2	3	3050	4540	8.9	5	2640	4190	8.3	1	3850	5700	8.6	2	2800	4260
27-Aug-13	8.9	3	3140	5180	9	4	3030	5000	8.4	1	4400	6910	8.9	2	3010	5090
26-Sep-13	9.1	5	3340	5350	9.3	9	3230	5190	8.4	3	4510	6910	8.9	9	3290	5270
30-Oct-13	9.5	6	3540	5690	9.4	11	3470	5400	8.5	6	4620	7050	9.4	6	3130	5100
21-Nov-13	8.96	5	2390	4340	8.62	5	2020	3670	8.3	23	906	1700	8.76	5	2240	3860
10-Dec-13	9.4	7	2740	4440	9.4	9	2740	4370	8.5	18	3800	5790	9.1	22	3120	4900

Rixs Creek
Mine Water Monitoring Data

Date	Dirty Water Dam #1				Dirty Water Dam #2				Dirty Water Dam #3				Dirty Water Dam #4			
	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)	pH	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Specific Conductance (µS/cm)
28-Jan-14	9	7	3440	5660	9.2	7	3150	5290	8.4	3	4440	7010	9.4	7	3270	5380
13-Feb-14	8.8	5	3510	5900	8.9	5	3460	5650	8.0	2	4480	7100	9.2	5	3490	5640
31-Mar-14	9	11	2990	5010	8.8	7	3160	5030	8.5	44	1560	2740	9.2	6	3060	5370
29-Apr-14	8.8	5	3310	5360	8.6	8	2650	4410	8.4	4	3650	5640	9	2	3180	5270
29-May-14	8.8	3	3310	5290	8.8	10	2820	4680	8.5	1	3000	4850	9	3	3190	5350
25-Jun-14	8.9	13	3440	5670	8.8	10	3010	5050	8.4	12	4080	6270	8.9	7	3350	5570
29-Jul-14	8.47	11	2670	4980	8.57	5	3190	5280	8.28	17	4670	6870	8.55	5	2860	5280
29-Aug-14	8.9	11	2910	4630	8.8	4	2780	4400	8.6	10	3950	6050	8.9	2	3210	4940
29-Sep-14	8.7	9	3370	5020	8.6	5	3390	5110	8.4	1	4470	6610	8.9	29	3140	4920
27-Oct-14	8.8	7	3170	4870	8.9	5	3230	5250	8.4	7	4230	6720	8.9	9	3270	4920
27-Nov-14	8.7	3	3360	4910	8.9	3	3500	5330	8.2	2	4860	7620	8.8	9	3400	5130
15-Dec-14	8.9	9	2750	4690	8.9	7	2930	4990	8.5	9	3990	6430	9	11	3130	5250
28-Jan-15	9.1	17	1720	3040	8.6	21	2190	3740	8.5	29	2030	3380	9	21	2310	3540
27-Feb-15	8.9	5	2830	4410	9.2	9	2390	3940	8.6	11	2720	4220	9.5	5	2440	3880
31-Mar-15	8.7	4	3380	5560	9.4	17	2640	4430	8.5	3	4380	7000	9.6	3	2780	4630
27-Apr-15	8.3	16	948	1990	8.83	8	1430	2780	8.47	9	1450	2800	8.49	11	1010	2090
27-May-15	8	5	1760	2930	8.5	10	1460	2590	8.3	6	2580	4270	8.7	3	1540	2670
30-Jun-15	8.4	4	2240	3760	8.4	11	1570	2650	8.2	15	2530	3890	8.7	3	1910	3260
28-Jul-15	8.5	7	2460	3790	8.8	14	1670	2700	8.3	5	3700	5450	8.8	7	2260	3510
27-Aug-15	8.5	6	2240	3870	8.9	2	1880	3480	8.3	5	3300	5290	8.8	13	2100	3790

Electrode	Total	Total	Basic Analytes				Alkalinity				Major Anions				Major Cations				Total Metals																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
			1	10	5	1	1	1	1	1	0.05	1	1	1	1	0.5	1	1	1	1	0.01	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	

Nutrient	mg/L	Nutrients				Nitrate	pH	Ionic Balance		
		0.01	0.01	0.01	0.01			0.01	0.01	0.01
		mg/L	mg/L	mg/L	mg/L			mg/L	meq/L	%
0.06	<0.01	0.02	--	0.13	0.52	0.75	--			
<0.01	<0.01	<0.01	<0.01	<0.01	0.43	1.72	--			
0.15	<0.01	<0.01	<0.01	<0.01	0.22					
0.04	<0.01	0.09	0.09	0.05	2.4	5.58	--			
0.03	<0.01	0.08	--	0.26	4.86	4.95	0.86			
<0.01	<0.01	<0.01	<0.01	<0.01	5.75	5.84	0.7			
0.02	<0.01	<0.01	<0.01	0.04						
0.02	<0.01	0.55	0.55	0.07	5.04	4.8	2.53			
0.02	<0.01	0.39	--	0.16	2.93	2.93	--			
0.06	<0.01	0.02	0.02	0.1	6.45	6.53	0.6			
0.03	<0.01	0.07	0.07	0.06						
0.11	<0.01	0.3	0.3	0.06	7.92	7.66	1.7			
0.02	<0.01	0.21	--	0.12	3.35	3.33	0.43			
<0.01	<0.01	<0.01	<0.01	<0.01	4.69	4.72	0.23			
0.01	<0.01	0.01	0.01	0.06						
0.01	<0.01	0.29	0.29	0.05	4.93	5.2	2.69			
0.03	<0.01	0.17	--	0.03	3.32	3.34	0.26			
<0.01	<0.01	<0.01	<0.01	0.1	4.34	4.41	0.82			
0.01	<0.01	0.01	0.01	0.04						
0.02	<0.01	0.33	0.33	0.07	4.35	4.26	1.1			
0.03	<0.01	0.17	--	0.13	3.04	3.04	0.04			
<0.01	<0.01	<0.01	<0.01	<0.01	5.55	5.67	1.08			
0.02	<0.01	0.01	0.01	0.04						
0.03	<0.01	0.07	0.07	0.04	6.06	5.97	0.74			
0.05	<0.01	0.09	--	0.06	1.06	1.14	--			
<0.01	<0.01	<0.01	<0.01	0.12	1.74	1.8	--			
0.15	<0.01	<0.01	<0.01	0.22						
0.14	<0.01	0.03	0.03	0.09	1.48	1.33	--			

Vitamin	Mineral	Protein	Fat	Fiber	pH	Nutrients						Ionic Balance			
						Nutrients						Ionic Balance			
						0.01 mg/L	0.01 mg/L	0.01 mg/L	0.01 mg/L	0.01 mg/L	0.01 %	0.01 meq/L	0.01 meq/L	0.01 %	0.01 %
Vitamin A	0.06	<0.01	0.08	--	0.02	0.02	0.12	0.09	0.09	0.09	0.09	1.21	1.23	--	--
	<0.01	<0.01	<0.01	<0.01	0.12							1.31	1.5	--	--
	0.02	<0.01	<0.01	<0.01	0.09							1.18	1.27	--	--
	0.16	<0.01	0.04	0.04	0.09										
Vitamin B	0.03	<0.01	<0.01	--	0.04	0.04	0.13	0.04	0.13	0.13	0.13	1.53	1.69	--	--
	<0.01	<0.01	<0.01	<0.01	0.13							1.69	1.55	--	--
	0.01	<0.01	<0.01	<0.01	0.04							1.47	1.44	--	--
	0.03	<0.01	0.05	0.05	0.13										
Vitamin C	0.19	0.18	3.07	--	0.23	0.23	0.58	0.01	0.06	0.06	0.06	33.9	36.3	3.48	3.48
	0.07	0.08	4.54	4.62	0.58							40	43.7	4.41	4.41
	0.62	0.08	2.72	2.8	0.01							19.3	20.1	2.16	2.16
	0.27	0.1	1.39	1.49	0.06										
Vitamin D	0.05	0.03	3.29	--	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	42.9	46.1	3.64	3.64
	0.04	0.05	4.07	4.12	0.02							40.7	44.4	4.33	4.33
	0.02	0.01	1.29	1.3	<0.01							27.4	26.8	1.09	1.09
	0.07	0.02	0.45	0.47	<0.01										
Vitamin E	0.11	0.06	1.22	--	0.01	0.01	0.65	0.02	0.06	0.06	0.06	38.3	41.5	3.94	3.94
	0.14	0.08	1.2	1.28	0.65							32.7	35.6	4.21	4.21
	0.14	0.04	0.96	1	0.02							20.3	20.9	1.59	1.59
	<0.01	0.05	0.1	0.15	0.06										
Vitamin K	0.2	<0.01	0.12	--	0.06	0.06	0.18	0.1	0.62	0.09	0.29	2.76	2.83	--	--
	0.09	<0.01	0.06	--	0.18							11.5	11.5	0.07	0.07
	<0.01	<0.01	<0.01	<0.01	0.1							3.65	3.77	1.56	1.56
	<0.01	<0.01	<0.01	<0.01	0.62							12.5	13.7	4.52	4.52
Vitamin P	0.07	<0.01	<0.01	<0.01	0.09	0.09	0.08	0.09	0.09	0.09	0.09	3.34	3.48	2.04	2.04
	0.18	<0.01	0.08	0.08	0.29							3.34	3.48	2.04	2.04
	0.83	<0.01	0.05	--	0.09										
		<0.01	0.05	--	0.09							3.79	3.68	1.56	1.56
Vitamin Q	0.83	<0.01	0.05	--	0.09	0.09	0.42	0.2	0.78	0.78	0.78	3.79	3.68	1.56	1.56
	<0.01	<0.01	<0.01	<0.01	0.42							2.46	2.57	--	--
	0.03	<0.01	<0.01	<0.01	0.2							2.53	2.23	--	--
	0.08	0.02	0.21	0.23	0.78										
Vitamin R	0.09	<0.01	0.06	--	0.18	0.18	0.18	0.18	0.18	0.18	0.18	11.5	11.5	0.07	0.07

Appendix M-3 Catchment Changes

Thursday, 26 October 2017

Bloomfield Collieries

P.O. Box 4

East Maitland NSW 2323

Attention: John Hindmarsh

Response to Comments

Proposed Extension of Mining at Rixs Creek Colliery Rev3

1 Background

Mr Chris Quinn of Rixs Creek Mine (RXC) requested JP Environmental to provide an updated response to a request for information from Department of Planning & Environment regarding the Environmental Impact Assessment (EIS) report "Surface Water Study for Rixs Creek Continuation of Mining" (SWS). The text of the request is:

"Table 20 of the SWS provides information on the expected changes to catchment surface areas over the life of the project. Please also provide a comparison of the catchment changes between the currently approved final landform and proposed final landform for the project".

2 Methodology

Reference EIS Documents for the Currently Approved Mining Operation

Figure 32 from the original EIS is attached to this letter. We note that it is a scanned copy of a hand drawn document and labelled "Not to Scale – for Diagrammatic Purpose Only". Using this document introduces potential errors when estimating areas due to unavoidable distortions from paper stretch, scanning, file conversions and georeferencing. The topographic contours as plotted on Figure 32 vary slightly but noticeably from the contours available from the Department of Finance, Service and Innovation. Line widths in the georeferenced document measure at 10 – 15 metres width. One would hesitate to rely on setting out boundaries off such a document.

Nevertheless, the georeferenced version of Figure 32 is considered adequate for estimating areas. Figure 32 was used as the base to prepare Mapinfo Tables showing areas of final landform, and the contours on the Figure were used to prepare the plots of the final catchments for Rixs Creek, Station Creek and Deadmans Gully.

Figure 32 does not show areas disturbed by fixed infrastructure (CHPP, industrial areas etc.) so Figures A and B and C comparing the approved final landform and the proposed final landform do not include fixed infrastructure so that like can be compared with like.

3 Results and Impacts

Comparison of the Approved Final Landform and the Proposed Final Landform

The footprint of the approved final landform and the proposed final landform can be visually compared by referencing Figures A and B, attached.

The North Pit and the South Pit final landforms have similar shapes and areas in the Approved (Figure A: 558 ha.) and the Proposed (Figure B: 532 ha.) scenarios. Overall the Proposed Final Landform for North & South Pit combined exceeds the currently Approved Final Landform by 26 ha, or 5%.

The Proposed Final Landform for the West Pit Extension, being the main focus of the proposal is significantly larger than the Approved Final Landform.

Table 1: Comparison of Final Landform Areas

Location	Approved Landform Rehabilitation (ha.)	Proposed Landform Rehabilitation (ha.)	Variance (%)
North Pit	379	457	+21
South Pit	109	101	-7
West Pit	127	438	+245
Voids	122	140	+15
TOTAL	737	1136	+54

Catchment loss from the three impacted catchments increases by 38 ha (0.6%) when the Proposed Final Landform is compared to the current Approved Final Landform in Table 2.

Table 2 shows that the areas of the Proposed Final Landform catchments are, for:

- Rixs Creek: 2,495 ha, about 39 ha, or 1.5% less than currently approved.
- Station Creek: 2,466 ha, about 56 ha, or 2.3% more than currently approved.
- Deadmans Creek: 1,261 ha, some 35 ha, or 2.5 less than currently approved.
- The rehabilitated mine voids: 140 ha, or 15% more than currently approved.

Table 2: Comparison of Final Catchment Areas

Scenario	Rixs Creek (ha)	Station Creek (ha)	Deadmans Creek (ha)	Mine Voids (ha) ¹	Total (ha)	Catchment Loss (%)
Undisturbed (1990)	2,562	2,413	1,387 ²	0	6,362	0
Approved Final Landform	2,534	2,410	1,296	122	6,362	1.9
Proposed Final Landform	2,495	2,466	1,261	140	6,362	2.2 ³

¹ Previously this column was headed "Mining Areas" in table 20 of the SWS, and included some fixed infrastructure e.g. CHPP closed catchments & the former underground, totalling about 93 ha.

² Catchment size corrected from 1,402 ha in the SWS.

³ Varies from Table 20 in the SWS, in which ongoing mining was assumed. Here, some fixed infrastructure e.g. CHPP closed catchments & the former underground (which becomes a clean water dam that drains to the Rixs Creek final catchment), are not counted in the Voids column.

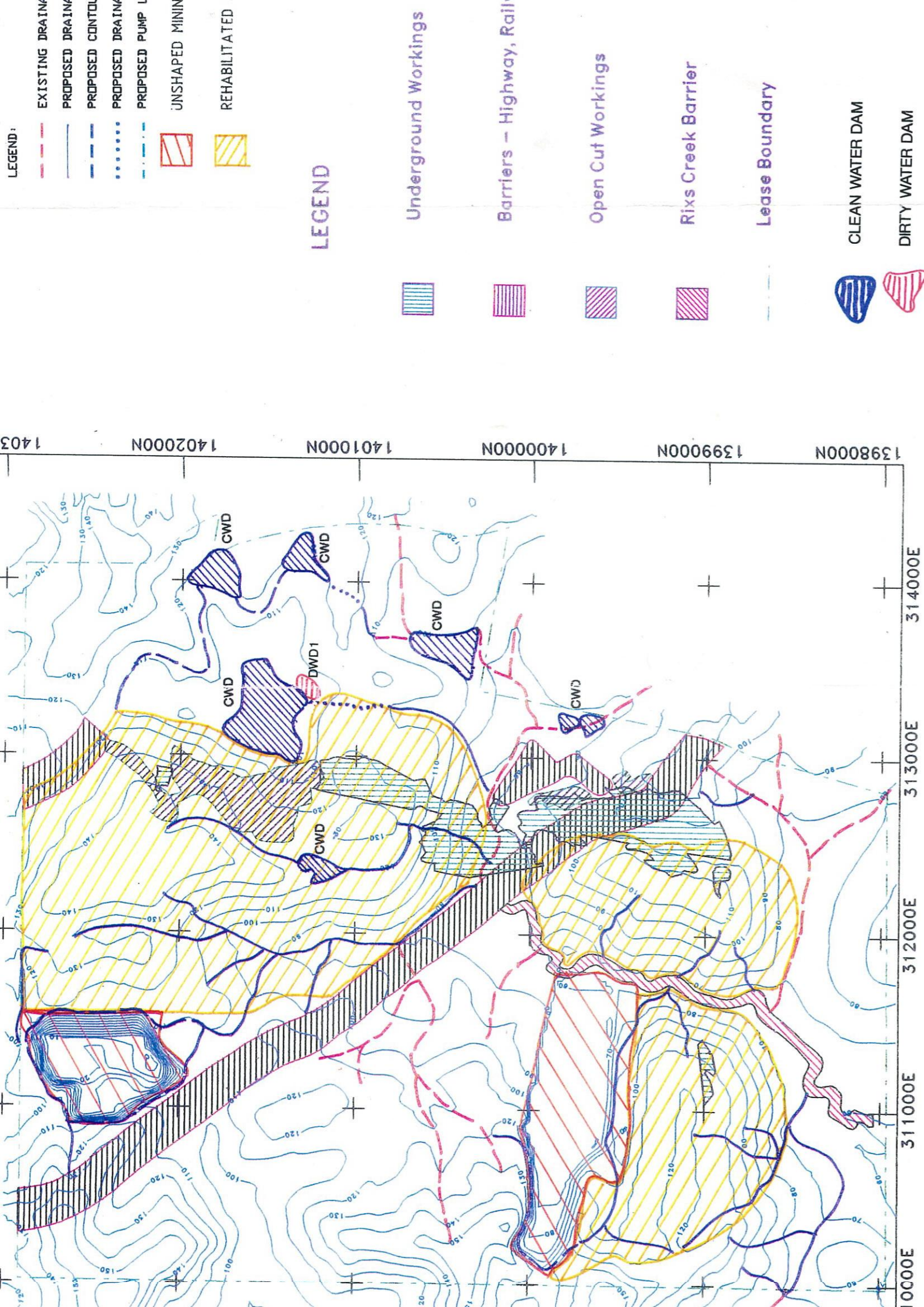
The impacts of the change in catchment area on each of the affected catchments is negligible when comparing the currently Approved Final Landform and the Approved Final Landform. The differences in runoff volume and flood frequency between the Approved and Proposed Landforms would most likely be undetectable. Similarly, the impacts on the hydraulic characteristics of each stream would be negligible, with little if any adjustment in the stream form.

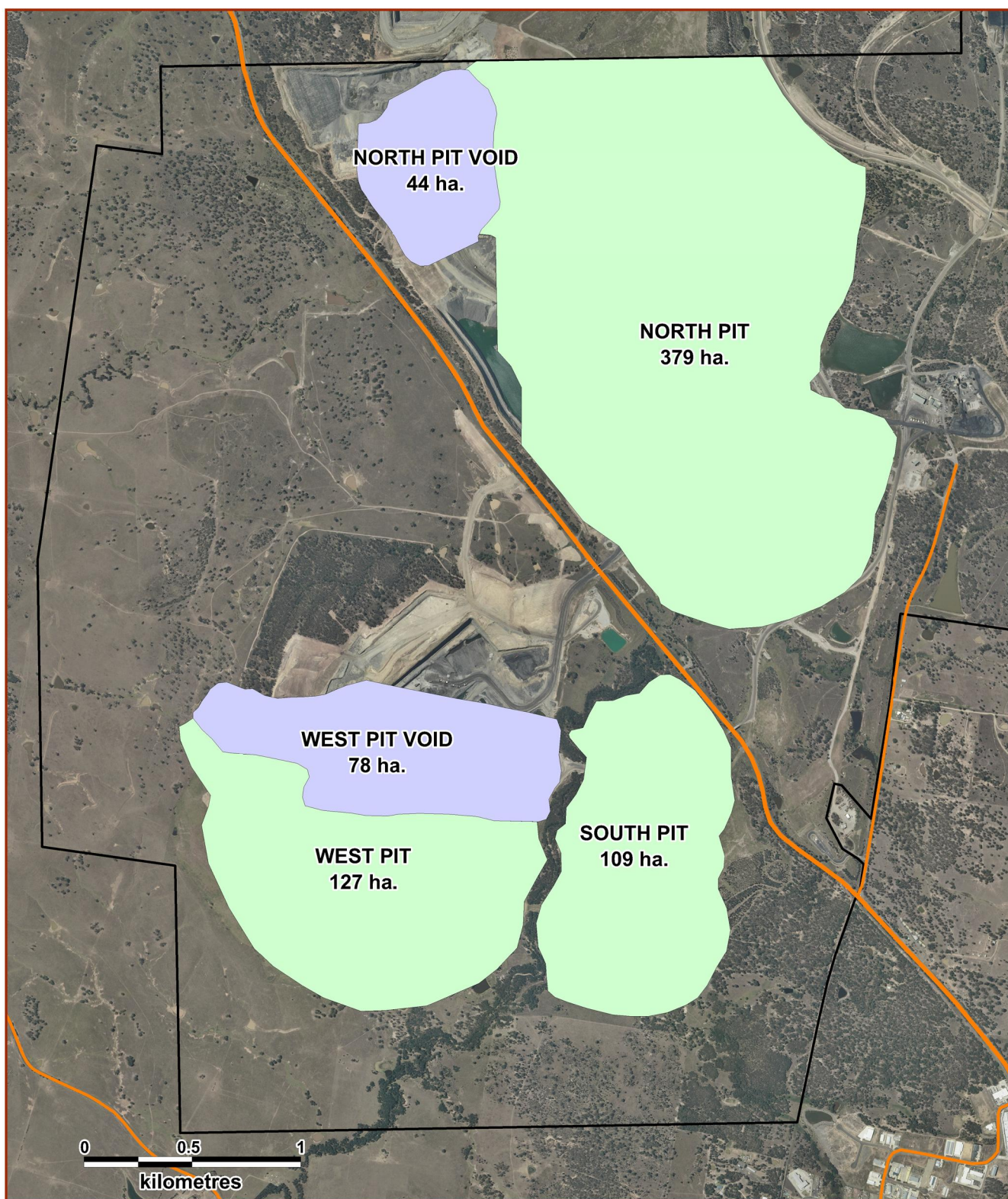
Should you need further assistance with this matter, please do not hesitate to contact me.

Yours Sincerely,

A handwritten signature in blue ink, appearing to read "John Pola", with a stylized flourish at the end.

John Pola
Managing Director





JP Environmental

**Surface Water Study for Rixs Creek
Continuation of Mining**

Figure A : Original Approval : Final Landform Areas (Fixed Infrastructure Excluded)

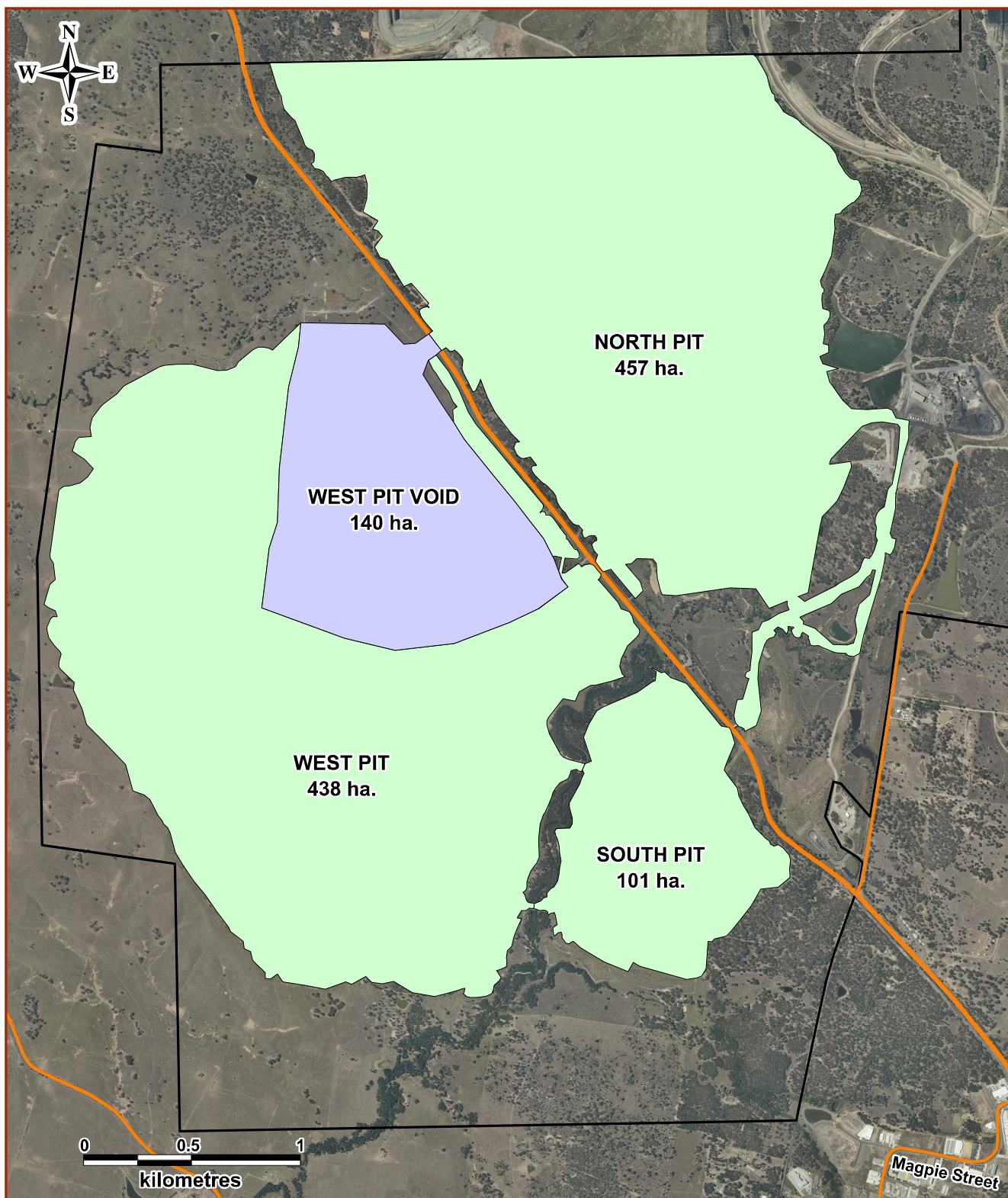
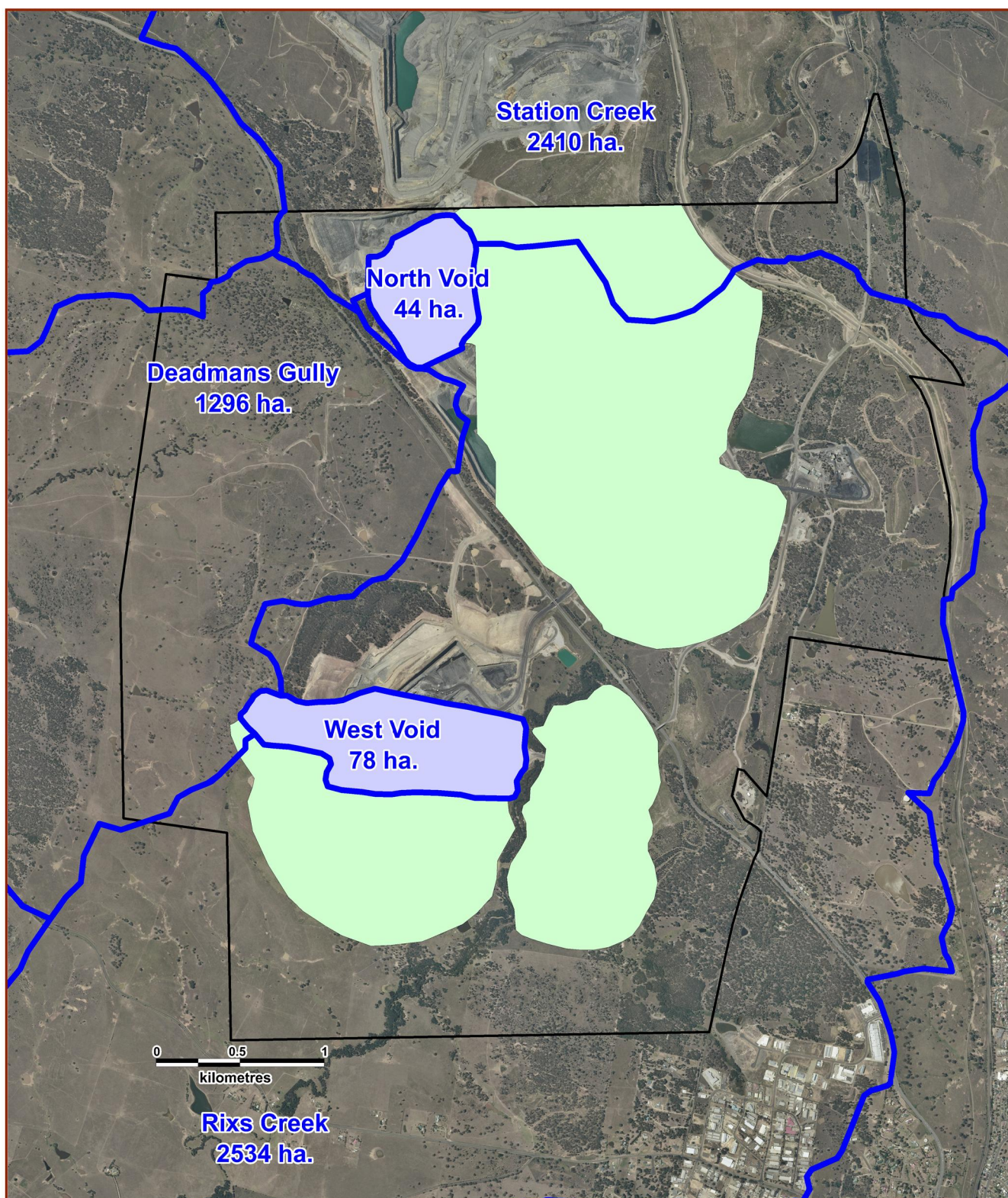


Figure B (Rev3): Proposal : Final Landform Areas (Fixed Infrastructure Excluded)



Final Catchments for Original Consent

 Catchment Boundary

Final Land Use

 Rehabilitation
 Void

Other

 Project Boundary

JP Environmental

**Surface Water Study for Rixs Creek
Continuation of Mining**

Figure C (rev1) : Original Approval : Catchments for Final Landform

Appendix M-4 Aluminium water quality analysis

Rix's Creek Mine

Water Quality Results in West Pit and Deadman's Creek Catchment

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Version	Purpose of Document	Approved by	Reviewed by	Review Date
1.0	Final	D P Janssen	S McSweeney	23/11/17

Approval for issue

Name	Signature	Date
Damien Janssen		23/11/17

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Appendices

Appendix A	Laboratory Water Quality Results
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1 Introduction

1.1 Background

In 2016, Rix's Creek Mine engaged JP Environmental to review surface water quality within the West Pit and Deadman's Creek Catchment following concern raised during exhibition of the Rix's Creek Continuation Project. JP Environmental noted in their report¹ that aluminium levels within surface waters in these areas was elevated and required further investigation as to the source of the elevated level.

JP Environmental also raised concerns that the elevated aluminium levels in the surface waters may impact cattle health.

1.2 Purpose

In 2017, in preparation of the Revised Response to Submissions, Rix's Creek Mine engaged RPS to conduct a specialist review of surface water sample analysis to understand and determine the source of the elevated aluminium levels.

This report presents a discussion of the analytical results used by JP Environmental and the results of extended analysis provided upon request by RPS as part of the specialist review.

2 Assessment of Water Quality Results Reviewed by JP Environmental

2.1 Available Data & Sampling Methodology

The water quality testing results of sediment dams at West Pit and Deadman's Creek extend back to 2011 for the sediment dam to the south of West Pit, Deadman's Gully Dam from 2013, and Sediment Dams 16, 17 and 20, along with Deadman's Gully (the creek itself) from 2015 onwards. These latest locations were associated with the evolving construction of the out-of-pit dump in along the western crest of West Pit.

In terms of field methodology for sample acquisition, depending on the analytes of interest the samples were either directly sampled, or in the case of dissolved metals analysis, field filtration was undertaken with a 0.45 micron sterile disposable filter. The laboratory then analysed for the requested analytes of interest.

As part of the Response to Submissions for the Rix's Creek Continuation project, JP Environmental (2016) prepared a brief report outlining specific concerns with the levels of aluminium in the water quality sampling results. A key recommendation of this report was that Rix's Creek undertake further investigation to better understand the source of aluminium in the samples. We present the outcomes of these further investigations below.

¹ JP Environmental, *Response to Land Owner Concerns Proposed Extension of Mining at Rix's Creek Colliery*, letter report prepared for Bloomfield Collieries, June 2016.

2.2 Assessment of Water Quality Results

A review of the available water quality laboratory results (as utilised in the JP Environmental report) was conducted to better understand the concentrations of aluminium reported, and to gain insight into the cause and implications of the results. On the basis of this review, RPS notes the following:

- The reported aluminium concentrations are for Total Aluminium (not specifically soluble aluminium)
- In relation to the point above, it is worth noting the following comment from the ANZECC 2000 Guideline² document – *“For some metals (e.g. aluminium) the particulate concentration may substantially exceed their dissolved fraction, and it may be possible to introduce errors which overstate dissolved metal toxicity”*.
- It is noted that the pH of the sampled waters ranges between 6.8 and 8.12, and that within this pH range aluminium is practically insoluble. Aluminium solubility is enhanced under acidic pH conditions (pH < 6). On that basis – it is expected that the results of Total Aluminium are dominantly reporting on the particulate concentration.
- It is noted that for the types of concentration levels observed in the results to be representative of dissolved aluminium concentrations only, the acidity levels would need to be down around a pH of 3 (such low pH levels are obviously not observed in the environment around Rix’s Creek, nor observed from any samples at the site).
- On other projects where results do show elevated dissolved aluminium, a correlation with other metals such as dissolved Fe being elevated is typically observed (and accompanied by lower pH conditions). In the samples from Rix’s Creek we can observe the relatively low concentration levels for dissolved Fe, and infer that the dissolved aluminium concentrations would also be expected to be relatively low.
- It was also noted in the sample results that the concentration of Total Suspended Solids (TSS) and aluminium were strongly correlating – that is, the samples with higher TSS were returning much higher concentrations of aluminium – another indication that the results are strongly linked to the particulate concentration, rather than the dissolved fraction – which would be expected in the Total Aluminium results which are conducted on the unfiltered water samples.

On the basis of the water quality analysis results reviewed by JP Environmental and RPS, and the observations outlined above, it seems apparent that the aluminium concentrations reported are for Total Aluminium, and given that the pH range is neutral, it is highly likely that the Total Aluminium concentrations are dominantly comprised of particulate matter (and a very minimal soluble aluminium component). Aluminium is a highly abundant element in the earth’s surface, and it is chemically stable in typical/neutral pH environments, typically complexing as alumino-silicates - a core component of clay materials.

The chemically stable aluminium in clays and suspended solids do not pose a toxicological danger to the environment, and on this basis, it is not anticipated that adverse health effects would occur for either humans or livestock.

² National Water Quality Management Strategy – Paper No. 4, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality (volume 2) Aquatic Ecosystems – Rationale and background Information* (October 2000).

3 Review of Extended Analysis – Dissolved Aluminium

3.1 Assessment of Dissolved Aluminium Results

As part of the assessment of water quality results discussed in Section 2, RPS recommended that a request be made to Australian Laboratory Services (ALS) to provide extended analyte reporting on historical analyses undertaken for Rix's Creek. This provided access to further results to review – in particular the concentration results specifically for dissolved aluminium for the period 2011 to 2016. These additional analysis results are now integrated into Table 1 below (which summarises all the water analysis results to date), and provided in full in Appendix A.

It is noted that the results for dissolved aluminium concentrations between 2011 and 2016 range from below detection limits (<0.01mg/L) up to the highest reading of 1.1mg/L. These concentrations are much more in line with anticipated ranges based on the other environmental indicators – as discussed in Section 2.

The ANZACC 2000³ Guideline document sets a livestock health trigger level of 5 mg/L for dissolved aluminium concentrations in long term/ongoing source drinking water for livestock (with a higher threshold/tolerance in short-term water sources). The guideline also notes that aluminium is usually present in natural waters in concentrations below 1 mg/L.

Based on this information from the guidelines, and the five years of data to date in the Deadman's Creek catchment with long-term dissolved aluminium concentration results typically below 1 mg/L – it is clear that the waters from all sample locations are well below the long-term guideline levels for stock, and can clearly be considered safe for livestock consumption.

4 Conclusions

4.1 Key Findings

Based on the further work completed to investigate and understand the source of aluminium, in particular with the provision of further data from the laboratory from historical sampling runs, we are able to confidently draw the following conclusions:

- The dissolved aluminium concentrations in all samples collected in Deadman's Creek catchment ranged from below detection limits (<0.01 mg/L) up to 1.1 mg/L at its highest, which is typical of dissolved aluminium concentrations in natural waters in a neutral pH range.
- These dissolved aluminium concentrations are well below the ANZACC health guideline value of 5 mg/L for long-term livestock water sources – which confirms that these water sources are consider safe and suitable for livestock consumption.

³ National Water Quality Management Strategy – Paper No. 4, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality (volume 3) Primary Industries – Rationale and background Information* (October 2000).

- The initially reviewed aluminium concentrations represented Total Aluminium, and given that the pH range is neutral, (and now that we have the dissolved aluminium results) we can confirm that the Total Aluminium concentrations are dominantly comprised of particulate matter (and a very minimal soluble aluminium component). Aluminium is a highly abundant element in the earth's surface, and is chemically stable in typical/neutral pH environments, typically complexing as aluminosilicates - a core component of clay materials.
- The chemically stable aluminium in clays and suspended solids in the water do not pose a toxicological danger to the environment, and on this basis, it is not anticipated that adverse health effects would occur for either humans or livestock.

Table 1 West Pit & Deadman's Creek Catchment Water Quality Analysis Results (2011 to 2016)

Site	LOR	Unit	Sediment Dam West Pit - West						Dead Man's Gully (Dam)				Sediment Dam 16		Sediment Dam 17		Sediment Dam 20		Dead Man's Gully (Creek)	
Date			1/06/11	6/03/12	21/11/13	29/07/14	27/04/15	8/06/16	21/11/13	29/07/14	27/04/15	8/06/16	27/04/15	8/06/16	27/04/15	8/06/16	27/04/15	8/06/16	27/04/15	8/06/16
Analytes																				
pH	0.01	pH unit	7.99	8	8.12	8.18	7.41	7.95	6.8	7.74	6.83	7.2	7.32	8.03	6.98	7.93	7.35	7.75	7.24	5.89
Electrical Conductivity - uS/cm	1	uS/cm	411	256	356	415	230	305	145	161	111	114	154	671	104	222	132	153	4240	16500
Total Dissolved Solids - mg/l	10	mg/L	298	266	305	264	703	238	272	176	178	236	187	773	1310	1130	873	700	2240	11900
Total Suspended Solids - mg/l	5	mg/L	8	20	12	10	212	8	22	18	18	78	<5	62	230	48	142	44	8	<5
Total Hardness as CaCO3	1	mg/L	61	44	44	70	36	60	13	21	22	16	31	126	18	31	16	26	790	3950
Alkalinity																				
Hydroxide Alkalinity as CaCO3	1	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	1	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	1	mg/L	124	74	100	137	62	111	11	40	12	22	30	107	25	62	31	50	115	45
Total Alkalinity as CaCO3	1	mg/L	124	74	100	137	62	111	11	40	12	22	30	107	25	62	31	50	115	45
Dissolved Major Anions																				
Silicon	0.05	mg/L	2.61	6.12	12	22.7	114	20.9	21.8	20.2	26.5	31.5	28.4	78.4	226	103	110	66.9	17.3	19.2
Sulphate as SO4	1	mg/L	9	4	18	19	27	6	13	8	6	9	11	59	30	17	29	8	366	3040
Chloride	1	mg/L	40	32	38	39	26	28	27	20	19	15	21	105	16	23	21	13	1070	4290
Dissolved Major Cations																				
Calcium	1	mg/L	8	6	6	10	6	9	2	2	4	3	6	19	4	6	3	4	92	404
Magnesium	1	mg/L	10	7	7	11	5	9	2	4	3	2	4	19	2	4	2	4	136	714
Sodium	1	mg/L	50	33	43	51	29	31	15	22	17	11	16	72	13	26	20	16	642	2720
Potassium	1	mg/L	11	10	13	12	10	12	6	6	5	5	7	8	5	5	4	3	9	18
Dissolved Metals - Fe	0.5	mg/L	0.44	0.85	0.34	0.38	1.23	1.76	0.83	1.37	0.82	3.29	0.66	0.3	0.89	0.5	0.69	0.4	0.17	0.53
Dissolved Metals – Al	0.01	mg/L	0.63	0.48	0.21	0.19	0.68	0.22	0.50	0.26	0.88	0.34	0.62	<0.01	0.96	<0.01	0.79	0.08	0.01	1.10
Total Metals																				
Aluminium	0.01	mg/L	3.45	2.63	4.31	4.02	27.7	3.07	9.74	3.68	4.32	7.52	4.24	20.2	61.8	31.3	29.8	18.6	0.78	1.8
Antimony	0.001	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
Arsenic	0.001	mg/L	0.004	0.003	0.005	0.004	0.006	0.006	0.004	0.003	0.002	0.004	0.001	0.009	0.01	0.007	0.007	0.005	<0.001	<0.001
Beryllium	0.001	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	0.003	0.001	0.002	<0.001	<0.001	0.002
Barium	0.001	mg/L	0.086	0.035	0.048	0.097	0.15	0.085	0.09	0.067	0.054	0.092	0.049	0.242	0.394	0.296	0.145	0.113	0.159	0.122
Cadmium	0.0001	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	0.0008
Cobalt	0.001	mg/L	0.001	<0.001	0.002	0.002	0.009	0.002	0.003	0.001	0.001	0.002	0.002	0.009	0.017	0.009	0.011	0.005	0.002	0.116
Copper	0.001	mg/L	0.002	0.003	0.005	0.003	0.018	0.002	0.007	0.002	0.005	0.006	0.005	0.012	0.036	0.026	0.025	0.015	0.003	0.006
Lead	0.001	mg/L	0.002	0.001	0.002	0.002	0.014	0.002	0.006	0.003	0.002	0.006	0.001	0.012	0.028	0.021	0.017	0.011	<0.001	<0.001

Site	LOR	Unit	Sediment Dam West Pit - West						Dead Man's Gully (Dam)				Sediment Dam 16		Sediment Dam 17		Sediment Dam 20		Dead Man's Gully (Creek)	
Lithium	0.001	mg/L	0.003	0.002	0.003	0.003	0.02	0.002	0.006	0.004	0.004	0.005	0.005	0.017	0.068	0.025	0.022	0.014	0.011	0.054
Manganese	0.001	mg/L	0.064	0.053	0.095	0.047	0.158	0.205	0.05	0.032	0.039	0.06	0.177	0.373	0.368	0.176	0.201	0.093	0.648	6.75
Nickle	0.001	mg/L	0.002	0.002	0.004	0.003	0.013	0.003	0.004	0.002	0.003	0.004	0.003	0.012	0.027	0.018	0.015	0.011	0.003	0.061
Rubidium	0.001	mg/L	0.005	0.004	0.006	0.006	0.037	0.005	0.013	0.005	0.006	0.011	0.007	0.026	0.084	0.039	0.051	0.029	0.003	0.007
Selenium	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium	0.001	mg/L	0.264	0.121	0.179	0.229	0.157	0.174	0.052	0.131	0.037	0.045	0.117	0.466	0.185	0.196	0.111	0.117	2.35	10.7
Zinc	0.005	mg/L	0.006	0.006	0.009	0.01	0.07	0.006	0.029	0.01	0.015	0.018	0.012	0.041	0.137	0.076	0.078	0.047	0.009	0.169
Boron	0.05	mg/L	<0.05	<0.05	0.06	<0.05	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	0.22
Mercury	0.0001	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
Fluoride	0.1	mg/L	0.8	0.5	0.7	0.7	0.4	0.6	0.2	0.4	0.2	0.3	0.2	0.3	0.2	0.6	0.3	0.4	0.3	0.3
Ammonia as N	0.01	mg/L	0.83	<0.01	0.03	0.07	0.08	0.42	0.01	<0.01	0.02	0.13	0.2	0.07	0.06	0.03	0.08	0.03	0.1	1.4
Nitrate as N	0.01	mg/L	<0.01	<0.01	<0.01	0.01	0.02	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	0.04	<0.01	<0.01	0.07
^ Nitrate as N	0.01	mg/L	0.05	<0.01	<0.01	0.55	0.21	0.01	0.51	<0.01	0.03	0.14	0.05	0.62	0.08	0.36	0.09	0.31	0.12	0.15
Nitrite + Nitrate as N	0.01	mg/L	--	<0.01	<0.01	0.56	0.23	0.01	0.52	<0.01	0.03	0.14	0.05	0.62	0.12	0.36	0.13	0.31	0.12	0.22
Total Phosphorus	0.01	mg/L	0.09	0.42	0.2	0.14	0.78	0.16	0.18	0.11	0.12	0.12	0.14	0.34	0.86	0.4	0.36	0.26	0.04	0.11
Ionic Balance																				
Total Anions	0.01	meq/L	3.79	2.46		4.23	2.53	3.13		1.53	0.9	1.05	1.42	6.33	1.58	2.24	1.82	1.53	40.1	185
Total Cations	0.01	meq/L	3.68	2.57		3.93	2.23	2.97		1.54	1.31	0.92	1.5	5.85	1.06	1.89	1.29	1.3	43.9	198
Ionic Balance	0.01	%	1.56	--		3.74	--	2.7		----	--	--	--	3.95	--	--	--	--	4.56	3.25

Appendix A

Laboratory Water Quality Results

CERTIFICATE OF ANALYSIS

Work Order	: ES1111479	Page	: 1 of 8
Amendment	: 2		
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Sydney
Contact	: ALL SINGLETON RESULTS	Contact	: Jennifer Cullen
Address	: PO BOX 3148 SINGLETON NSW, AUSTRALIA 2330	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: sin.als@ensr.aecom.com	E-mail	: jennifer.cullen@alsglobal.com
Telephone	: +61 02 6575 9000	Telephone	: +61 2 8784 8509
Facsimile	: +61 02 6575 9099	Facsimile	: +61 2 8784 8500
Project	: 60165051 (RIXS CK WATERCOURSES - ANNUAL)	QC Level	: NEPM 2013 B3 & ALS QC Standard
Order number	: A1034		
C-O-C number	: ----	Date Samples Received	: 01-JUN-2011
Sampler	: SB, DC	Issue Date	: 21-NOV-2017
Site	: ----		
Quote number	: EN/004/10	No. of samples received	: 15
		No. of samples analysed	: 15

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics
Peter Keyte	Newcastle Manager	Newcastle
Raymond Commodore	Instrument Chemist	Sydney Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

- **20/11/2017: This report has been amended and re-released to allow the reporting of additional analytical data.**
- **EA015 TDS may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				SITE 1 - RAIL UNDERPASS	SITE 2 - NEW ENGLAND HIGHWAY	SITE 3 - MAISON DIEU	SITE 10 - BELOW OPERATION	MAISON DIEU INDUSTRIAL ESTATE CATCHMENT BRANCH
				01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00
Compound	CAS Number	LOR	Unit	ES1111479-001	ES1111479-002	ES1111479-003	ES1111479-004	ES1111479-005
EA005: pH								
pH Value	----	0.01	pH Unit	5.97	6.58	6.73	6.87	6.97
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	82	566	332	375	335
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	5	mg/L	234	450	488	512	516
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	110	76	120	109	69
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	11	56	37	44	45
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	6	37	29	33	38
Total Alkalinity as CaCO3	----	1	mg/L	6	37	29	33	38
ED040F: Dissolved Major Anions								
Silicon	7440-21-3	0.05	mg/L	8.46	3.20	3.45	3.81	4.52
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3	61	37	40	24
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	12	101	56	66	63
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	1	6	5	6	8
Magnesium	7439-95-4	1	mg/L	2	10	6	7	6
Sodium	7440-23-5	1	mg/L	10	85	48	54	47
Potassium	7440-09-7	1	mg/L	4	5	4	4	4
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	1.36	0.59	1.38	4.31	0.26
Iron	7439-89-6	0.05	mg/L	0.78	0.52	1.05	2.95	0.21
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	11.0	5.37	11.9	12.6	16.3
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.001	<0.001	0.002	0.002	0.002



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				SITE 1 - RAIL UNDERPASS	SITE 2 - NEW ENGLAND HIGHWAY	SITE 3 - MAISON DIEU	SITE 10 - BELOW OPERATION	MAISON DIEU INDUSTRIAL ESTATE CATCHMENT BRANCH
				01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00
				ES1111479-001	ES1111479-002	ES1111479-003	ES1111479-004	ES1111479-005
Compound	CAS Number	LOR	Unit					
EG020T: Total Metals by ICP-MS - Continued								
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L	0.062	0.052	0.087	0.086	0.107
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	0.0001	0.0002
Cobalt	7440-48-4	0.001	mg/L	0.003	0.002	0.004	0.004	0.005
Copper	7440-50-8	0.001	mg/L	0.009	0.005	0.010	0.010	0.011
Lead	7439-92-1	0.001	mg/L	0.003	0.003	0.006	0.006	0.006
Lithium	7439-93-2	0.001	mg/L	0.009	0.007	0.011	0.011	0.015
Manganese	7439-96-5	0.001	mg/L	0.050	0.027	0.049	0.050	0.049
Nickel	7440-02-0	0.001	mg/L	0.004	0.003	0.007	0.006	0.008
Rubidium	7440-17-7	0.001	mg/L	0.017	0.009	0.020	0.019	0.022
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium	7440-24-6	0.001	mg/L	0.048	0.223	0.170	0.191	0.137
Zinc	7440-66-6	0.005	mg/L	0.038	0.017	0.046	0.055	0.057
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.06	<0.05	<0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0001	0.0001	0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.1	0.3	0.2	0.2	0.2
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.06	0.03	0.02	0.02	0.03
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.02	0.08	0.39	0.21	0.17
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.13	0.26	0.16	0.12	0.13
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	0.52	4.86	2.93	3.35	3.04
Total Cations	----	0.01	meq/L	0.75	4.95	2.93	3.33	3.04
Ionic Balance	----	0.01	%	----	0.89	----	0.43	0.04



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				ABOVE JUNCTION WITH INDUSTRIAL ESTATE CATCHMENT	SITE 4 - CLEAN WATER DAM 1 (CWD1)	SITE 5 - CLEAN WATER DAM 2 (CWD2)	SITE 6 - CLEAN WATER DAM 6 (CWD6)	DIRTY WATER DAM 1
				01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00
				ES1111479-006	ES1111479-007	ES1111479-008	ES1111479-009	ES1111479-010
Compound	CAS Number	LOR	Unit					
EA005: pH								
pH Value	----	0.01	pH Unit	6.97	6.85	6.81	7.70	8.68
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	376	123	134	170	3470
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	5	mg/L	472	148	147	126	2130
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	103	16	73	10	34
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	39	17	17	30	464
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	10
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	30	16	23	46	196
Total Alkalinity as CaCO3	----	1	mg/L	30	16	23	46	207
ED040F: Dissolved Major Anions								
Silicon	7440-21-3	0.05	mg/L	3.19	3.33	2.71	2.65	1.33
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	44	7	6	13	585
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	64	21	22	12	622
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	4	2	2	4	44
Magnesium	7439-95-4	1	mg/L	7	3	3	5	86
Sodium	7440-23-5	1	mg/L	56	16	18	23	616
Potassium	7440-09-7	1	mg/L	5	4	4	3	10
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.25	0.25	0.26	0.16	<0.01
Iron	7439-89-6	0.05	mg/L	0.28	0.33	0.34	0.26	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	10.0	4.61	4.75	1.43	0.48
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001
Arsenic	7440-38-2	0.001	mg/L	0.001	<0.001	<0.001	<0.001	0.003



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				ABOVE JUNCTION WITH INDUSTRIAL ESTATE CATCHMENT	SITE 4 - CLEAN WATER DAM 1 (CWD1)	SITE 5 - CLEAN WATER DAM 2 (CWD2)	SITE 6 - CLEAN WATER DAM 6 (CWD6)	DIRTY WATER DAM 1
				01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00
				ES1111479-006	ES1111479-007	ES1111479-008	ES1111479-009	ES1111479-010
Compound	CAS Number	LOR	Unit					
EG020T: Total Metals by ICP-MS - Continued								
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L	0.066	0.047	0.051	0.041	0.045
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	0.004	0.002	0.002	<0.001	0.002
Copper	7440-50-8	0.001	mg/L	0.009	0.004	0.003	0.001	0.003
Lead	7439-92-1	0.001	mg/L	0.005	0.002	0.002	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L	0.009	0.004	0.004	0.002	0.064
Manganese	7439-96-5	0.001	mg/L	0.048	0.046	0.049	0.017	0.016
Nickel	7440-02-0	0.001	mg/L	0.005	0.002	0.002	<0.001	0.004
Rubidium	7440-17-7	0.001	mg/L	0.017	0.008	0.008	0.002	0.009
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	0.02
Strontium	7440-24-6	0.001	mg/L	0.198	0.046	0.053	0.075	4.77
Zinc	7440-66-6	0.005	mg/L	0.046	0.025	0.017	0.008	0.008
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	0.0001	0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.3	0.2	0.2	0.5	0.5
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.03	0.05	0.06	0.03	0.19
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	0.18
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.17	0.09	0.08	<0.01	3.07
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.03	0.06	0.02	0.04	0.23
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	3.32	1.06	1.21	1.53	33.9
Total Cations	----	0.01	meq/L	3.34	1.14	1.23	1.69	36.3
Ionic Balance	----	0.01	%	0.26	----	----	----	3.48



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				DIRTY WATER DAM 2	CLEAN WATER DAM 4 (CWD4-DWD4)	SEDIMENT DAM PIT 3 - EAST	SEDIMENT DAM PIT 3 - WEST	RAIL LOADER TUNNEL WATER
				01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00
Compound	CAS Number	LOR	Unit	ES1111479-011	ES1111479-012	ES1111479-013	ES1111479-014	ES1111479-015
EA005: pH								
pH Value	----	0.01	pH Unit	8.59	8.82	7.96	7.99	7.94
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	4620	3920	308	411	1140
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	5	mg/L	2660	2400	176	298	764
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	8	16	15	8	75
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	586	522	39	61	158
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	32	33	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	242	222	81	124	96
Total Alkalinity as CaCO3	----	1	mg/L	274	255	81	124	96
ED040F: Dissolved Major Anions								
Silicon	7440-21-3	0.05	mg/L	1.51	0.96	1.42	2.61	1.12
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	751	671	9	9	238
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	771	683	34	40	163
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	50	36	4	8	17
Magnesium	7439-95-4	1	mg/L	112	105	7	10	28
Sodium	7440-23-5	1	mg/L	784	707	42	50	190
Potassium	7440-09-7	1	mg/L	12	12	9	11	3
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.01	0.02	0.25	0.63	0.16
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.19	0.44	0.21
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.48	0.70	1.33	3.45	5.50
Antimony	7440-36-0	0.001	mg/L	0.003	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.003	0.004	0.003
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				DIRTY WATER DAM 2	CLEAN WATER DAM 4 (CWD4-DWD4)	SEDIMENT DAM PIT 3 - EAST	SEDIMENT DAM PIT 3 - WEST	RAIL LOADER TUNNEL WATER
				01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00	01-JUN-2011 14:00
Compound	CAS Number	LOR	Unit	ES1111479-011	ES1111479-012	ES1111479-013	ES1111479-014	ES1111479-015
EG020T: Total Metals by ICP-MS - Continued								
Barium	7440-39-3	0.001	mg/L	0.038	0.051	0.059	0.086	0.063
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	0.001	0.003
Copper	7440-50-8	0.001	mg/L	0.003	0.003	0.001	0.002	0.006
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	0.002	0.004
Lithium	7439-93-2	0.001	mg/L	0.086	0.075	0.002	0.003	0.008
Manganese	7439-96-5	0.001	mg/L	0.004	0.018	0.024	0.064	0.056
Nickel	7440-02-0	0.001	mg/L	0.004	0.003	0.001	0.002	0.003
Rubidium	7440-17-7	0.001	mg/L	0.011	0.009	0.003	0.005	0.011
Selenium	7782-49-2	0.01	mg/L	0.02	0.01	<0.01	<0.01	<0.01
Strontium	7440-24-6	0.001	mg/L	5.97	3.14	0.138	0.264	0.558
Zinc	7440-66-6	0.005	mg/L	<0.005	0.007	<0.005	0.006	0.048
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.5	0.5	0.6	0.8	0.5
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.05	0.11	0.20	0.83	0.09
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	0.03	0.06	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	3.29	1.22	0.12	0.05	0.06
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	0.01	0.06	0.09	0.18
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	42.9	38.3	2.76	3.79	11.5
Total Cations	----	0.01	meq/L	46.1	41.5	2.83	3.68	11.5
Ionic Balance	----	0.01	%	3.64	3.94	----	1.56	0.07

CERTIFICATE OF ANALYSIS

Work Order	: ES1205289	Page	: 1 of 10
Amendment	: 1		
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Sydney
Contact	: MS SARAH BROWN	Contact	: Jennifer Cullen
Address	: PO BOX 3148 SINGLETON NSW, AUSTRALIA 2330	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: sarah.brown@aecom.com	E-mail	: jennifer.cullen@alsglobal.com
Telephone	: +61 02 6575 9000	Telephone	: +61 2 8784 8509
Facsimile	: +61 02 6575 9099	Facsimile	: +61 2 8784 8500
Project	: 60239918-RIXS CREEK SW ANNUAL 2012	QC Level	: NEPM 2013 B3 & ALS QC Standard
Order number	: A2056		
C-O-C number	: ----	Date Samples Received	: 06-MAR-2012
Sampler	: SB	Issue Date	: 21-NOV-2017
Site	: ----		
Quote number	: EN/004/10	No. of samples received	: 16
		No. of samples analysed	: 16

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 ^ = This result is computed from individual analyte detections at or above the level of reporting

- **EA015: TDS may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**
- **EG020: LCS recoveries for some elements fall outside ALS Dynamic Control Limit. However, they are within the acceptance criteria based on ALS DQO. No further action is required.**
- **EK067G; Spike failed for Total P due to matrix interference**



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics
Raymond Commodore	Instrument Chemist	Sydney Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				SITE 4 CLEAN WATER DAM 1 (CWD1)	SITE 5 CLEAN WATER DAM 2 (CWD2)	SITE 6 CLEAN WATER DAM 6 (CWD6)	DIRTY WATER DAM 1	DIRTY WATER DAM 2
				06-MAR-2012 10:30	06-MAR-2012 10:25	06-MAR-2012 11:40	06-MAR-2012 09:40	06-MAR-2012 09:50
				ES1205289-001	ES1205289-002	ES1205289-003	ES1205289-004	ES1205289-005
Compound	CAS Number	LOR	Unit					
EA005: pH								
pH Value	----	0.01	pH Unit	7.39	7.19	7.44	8.39	8.52
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	168	137	140	3580	3610
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	219	174	280	2230	2270
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	16	18	20	<5	8
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	35	30	33	535	540
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	33	44
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	50	34	50	239	235
Total Alkalinity as CaCO3	----	1	mg/L	50	34	50	272	279
ED040F: Dissolved Major Anions								
Silicon	7440-21-3	0.05	mg/L	7.29	7.85	10.2	0.53	2.15
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3	2	14	681	682
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	24	21	14	721	742
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	4	4	5	46	48
Magnesium	7439-95-4	1	mg/L	6	5	5	102	102
Sodium	7440-23-5	1	mg/L	23	18	18	751	766
Potassium	7440-09-7	1	mg/L	4	4	4	12	12
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.60	0.58	0.72	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L	1.17	1.04	0.97	<0.05	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	1.66	0.46	7.85	0.03	0.28
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	0.003	0.003
Arsenic	7440-38-2	0.001	mg/L	0.002	0.001	0.003	0.003	0.003



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				SITE 4 CLEAN WATER DAM 1 (CWD1)	SITE 5 CLEAN WATER DAM 2 (CWD2)	SITE 6 CLEAN WATER DAM 6 (CWD6)	DIRTY WATER DAM 1	DIRTY WATER DAM 2
				06-MAR-2012 10:30	06-MAR-2012 10:25	06-MAR-2012 11:40	06-MAR-2012 09:40	06-MAR-2012 09:50
				ES1205289-001	ES1205289-002	ES1205289-003	ES1205289-004	ES1205289-005
Compound	CAS Number	LOR	Unit					
EG020T: Total Metals by ICP-MS - Continued								
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L	0.042	0.035	0.056	0.038	0.043
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.002	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.003	0.003	0.006	<0.001	0.001
Lead	7439-92-1	0.001	mg/L	0.001	<0.001	0.003	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L	0.003	0.002	0.006	0.072	0.066
Manganese	7439-96-5	0.001	mg/L	0.024	0.063	0.050	0.004	0.006
Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.003	0.002	0.003
Rubidium	7440-17-7	0.001	mg/L	0.003	0.001	0.012	0.010	0.010
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	0.02	0.02
Strontium	7440-24-6	0.001	mg/L	0.073	0.063	0.075	3.95	4.00
Zinc	7440-66-6	0.005	mg/L	0.013	0.009	0.015	<0.005	<0.005
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.4	0.2	0.3	0.6	0.6
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	<0.01	0.07	0.04
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	0.08	0.05
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	<0.01	4.54	4.07
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	<0.01	4.62	4.12
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.12	0.12	0.13	0.58	0.02
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	1.74	1.31	1.69	40.0	40.7
Total Cations	----	0.01	meq/L	1.80	1.50	1.55	43.7	44.4
Ionic Balance	----	0.01	%	----	----	----	4.41	4.33



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				CLEAN WATER DAM 4 (CWD4-DWD6)	SEDIMENT DAM PIT 3-EAST	SEDIMENT DAM PIT 3- WEST	RAIL LOADER TUNNEL WATER	DIRTY WATER DAM 3 WEST PIT STORAGE
				06-MAR-2012 09:30	06-MAR-2012 13:00	06-MAR-2012 12:45	06-MAR-2012 09:20	06-MAR-2012 10:05
Compound	CAS Number	LOR	Unit	ES1205289-006	ES1205289-007	ES1205289-008	ES1205289-009	ES1205289-010
EA005: pH								
pH Value	----	0.01	pH Unit	8.60	8.14	8.00	8.17	8.38
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	2990	381	256	1210	1250
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	1810	271	266	711	745
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	7	10	20	9	12
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	437	63	44	215	260
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	34	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	207	81	74	141	87
Total Alkalinity as CaCO3	----	1	mg/L	242	81	74	141	87
ED040F: Dissolved Major Anions								
Silicon	7440-21-3	0.05	mg/L	1.80	4.90	6.12	0.78	2.61
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	507	26	4	249	352
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	614	53	32	160	145
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	38	7	6	30	30
Magnesium	7439-95-4	1	mg/L	83	11	7	34	45
Sodium	7440-23-5	1	mg/L	612	52	33	214	203
Potassium	7440-09-7	1	mg/L	10	10	10	4	4
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.05	0.39	0.48	0.08	0.02
Iron	7439-89-6	0.05	mg/L	0.07	0.66	0.85	0.12	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.36	1.31	2.63	0.44	0.40
Antimony	7440-36-0	0.001	mg/L	0.002	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.003	0.001	<0.001
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				CLEAN WATER DAM 4 (CWD4-DWD6)	SEDIMENT DAM PIT 3-EAST	SEDIMENT DAM PIT 3- WEST	RAIL LOADER TUNNEL WATER	DIRTY WATER DAM 3 WEST PIT STORAGE
				06-MAR-2012 09:30	06-MAR-2012 13:00	06-MAR-2012 12:45	06-MAR-2012 09:20	06-MAR-2012 10:05
				ES1205289-006	ES1205289-007	ES1205289-008	ES1205289-009	ES1205289-010
Compound	CAS Number	LOR	Unit					
EG020T: Total Metals by ICP-MS - Continued								
Barium	7440-39-3	0.001	mg/L	0.052	0.045	0.035	0.028	0.056
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	0.002	0.003	<0.001	0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.001	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L	0.048	0.002	0.002	0.007	0.025
Manganese	7439-96-5	0.001	mg/L	0.010	0.034	0.053	0.051	0.014
Nickel	7440-02-0	0.001	mg/L	0.001	0.002	0.002	<0.001	0.002
Rubidium	7440-17-7	0.001	mg/L	0.007	0.003	0.004	0.002	0.002
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium	7440-24-6	0.001	mg/L	2.59	0.161	0.121	0.834	0.854
Zinc	7440-66-6	0.005	mg/L	<0.005	0.010	0.006	<0.005	<0.005
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.5	0.4	0.5	0.6	0.5
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.14	<0.01	<0.01	<0.01	<0.01
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	0.08	<0.01	<0.01	<0.01	0.02
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	1.20	<0.01	<0.01	<0.01	0.17
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	1.28	<0.01	<0.01	<0.01	0.19
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.65	0.10	0.42	0.62	0.02
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	32.7	3.65	2.46	12.5	13.2
Total Cations	----	0.01	meq/L	35.6	3.77	2.57	13.7	14.1
Ionic Balance	----	0.01	%	4.21	1.56	----	4.52	3.55



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				SITE 1- RAIL UNDERPASS	SITE 2- NEW ENGLAND HIGHWAY	SITE 3 - MAISON DIEU	SITE 10 - BELOW OPERATION	MAISON DIEU INDUSTRIAL ESTATE CATCHMENT BRANCH
				06-MAR-2012 12:10	06-MAR-2012 11:20	06-MAR-2012 11:05	06-MAR-2012 13:15	06-MAR-2012 13:30
Compound	CAS Number	LOR	Unit	ES1205289-011	ES1205289-012	ES1205289-013	ES1205289-014	ES1205289-015
EA005: pH								
pH Value	----	0.01	pH Unit	7.11	7.51	7.42	7.84	7.75
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	157	586	652	477	551
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	387	414	442	384	496
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	100	17	38	22	39
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	40	87	116	78	100
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	57	79	71	69	72
Total Alkalinity as CaCO3	----	1	mg/L	57	79	71	69	72
ED040F: Dissolved Major Anions								
Silicon	7440-21-3	0.05	mg/L	17.4	7.46	8.18	8.03	8.74
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	7	61	56	44	28
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	12	103	137	85	125
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	6	10	15	10	17
Magnesium	7439-95-4	1	mg/L	6	15	19	13	14
Sodium	7440-23-5	1	mg/L	19	92	94	70	82
Potassium	7440-09-7	1	mg/L	4	4	5	4	4
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.94	0.43	0.49	0.45	0.48
Iron	7439-89-6	0.05	mg/L	1.66	1.09	1.13	1.04	0.95
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	12.0	1.83	3.59	5.86	1.68
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.004	0.002	0.002	0.003	0.001



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				SITE 1- RAIL UNDERPASS	SITE 2- NEW ENGLAND HIGHWAY	SITE 3 - MAISON DIEU	SITE 10 - BELOW OPERATION	MAISON DIEU INDUSTRIAL ESTATE CATCHMENT BRANCH
				06-MAR-2012 12:10	06-MAR-2012 11:20	06-MAR-2012 11:05	06-MAR-2012 13:15	06-MAR-2012 13:30
Compound	CAS Number	LOR	Unit	ES1205289-011	ES1205289-012	ES1205289-013	ES1205289-014	ES1205289-015
EG020T: Total Metals by ICP-MS - Continued								
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L	0.099	0.056	0.073	0.070	0.076
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	0.006	<0.001	0.001	0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.014	0.002	0.004	0.006	0.004
Lead	7439-92-1	0.001	mg/L	0.004	<0.001	0.002	0.002	0.001
Lithium	7439-93-2	0.001	mg/L	0.009	0.006	0.005	0.007	0.003
Manganese	7439-96-5	0.001	mg/L	0.297	0.035	0.068	0.033	0.030
Nickel	7440-02-0	0.001	mg/L	0.008	0.002	0.003	0.004	0.003
Rubidium	7440-17-7	0.001	mg/L	0.017	0.003	0.006	0.009	0.003
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium	7440-24-6	0.001	mg/L	0.147	0.234	0.364	0.264	0.247
Zinc	7440-66-6	0.005	mg/L	0.037	0.007	0.015	0.020	0.015
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.2	0.4	0.3	0.3	0.3
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	0.06	<0.01	<0.01
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	0.02	<0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.02	<0.01	<0.01
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.43	0.08	0.10	0.11	0.11
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	1.62	5.75	6.45	4.69	5.55
Total Cations	----	0.01	meq/L	1.72	5.84	6.53	4.72	5.67
Ionic Balance	----	0.01	%	----	0.70	0.60	0.23	1.08



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

**ABOVE JUNCTION
WITH INDUSTRIAL
ESTATE CATCHMENT**

Client sampling date / time

06-MAR-2012 13:40

Compound	CAS Number	LOR	Unit	ES1205289-016	----	----	----	----
EA005: pH								
pH Value	----	0.01	pH Unit	7.87	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	451	----	----	----	----
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	400	----	----	----	----
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	23	----	----	----	----
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	72	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	66	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	66	----	----	----	----
ED040F: Dissolved Major Anions								
Silicon	7440-21-3	0.05	mg/L	7.55	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	46	----	----	----	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	73	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	9	----	----	----	----
Magnesium	7439-95-4	1	mg/L	12	----	----	----	----
Sodium	7440-23-5	1	mg/L	66	----	----	----	----
Potassium	7440-09-7	1	mg/L	4	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.44	----	----	----	----
Iron	7439-89-6	0.05	mg/L	1.14	----	----	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	5.27	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	0.002	----	----	----	----



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

**ABOVE JUNCTION
WITH INDUSTRIAL
ESTATE CATCHMENT**

Client sampling date / time

06-MAR-2012 13:40

Compound	CAS Number	LOR	Unit	ES1205289-016	----	----	----	----
EG020T: Total Metals by ICP-MS - Continued								
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L	0.060	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	0.005	----	----	----	----
Lead	7439-92-1	0.001	mg/L	0.002	----	----	----	----
Lithium	7439-93-2	0.001	mg/L	0.007	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	0.027	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.003	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	0.008	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	0.228	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.020	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.3	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.10	----	----	----	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	4.34	----	----	----	----
Total Cations	----	0.01	meq/L	4.41	----	----	----	----
Ionic Balance	----	0.01	%	0.82	----	----	----	----

CERTIFICATE OF ANALYSIS

Work Order	: ES1325441	Page	: 1 of 10
Amendment	: 1		
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Sydney
Contact	: MS SARAH BROWN	Contact	: Barbara Hanna
Address	: PO BOX 3148	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
	: SINGLETON NSW, AUSTRALIA 2330		
E-mail	: sarah.brown@aecom.com	E-mail	: Barbara.Hanna@alsglobal.com
Telephone	: +61 02 6575 9000	Telephone	: +61 2 8784 8555
Facsimile	: +61 02 6575 9099	Facsimile	: +61 2 8784 8555
Project	: 60309876 RIXS CREEK SW ANNUAL	QC Level	: NEPM 2013 B3 & ALS QC Standard
Order number	: A3616		
C-O-C number	: ----	Date Samples Received	: 21-NOV-2013
Sampler	: SL	Issue Date	: 21-NOV-2017
Site	: ----		
Quote number	: EN/004/13	No. of samples received	: 18
		No. of samples analysed	: 18

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Raymond Commodore	Instrument Chemist	Sydney Inorganics



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

- **EA015: TDS may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**
- **This report has been amended following the**
- **This report has been amended following the addition of dissolved aluminium.**



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				SW1 - SITE 4 CLEAN WATER DAM 1 (CWD1)	SW2 - SITE 5 CLEAN WATER DAM 2 (CWD2)	SW3 - SITE 7 CLEAN WATER DAM 6 (CWD6)	SW4 - SITE 8 DIRTY WATER DAM (DWD1)	SW5 - SITE 9 DIRTY WATER DAM 2 (DWD2)
				21-NOV-2013 09:45	21-NOV-2013 09:30	21-NOV-2013 12:30	21-NOV-2013 09:00	21-NOV-2013 09:15
				ES1325441-001	ES1325441-002	ES1325441-003	ES1325441-004	ES1325441-005
Compound	CAS Number	LOR	Unit					
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.06	7.14	7.49	8.76	8.96
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	133	184	253	3860	4340
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	138	158	237	2240	2390
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	30	15	<5	<5	<5
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	13	17	33	479	490
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	39	59
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	22	35	37	174	137
Total Alkalinity as CaCO3	----	1	mg/L	22	35	37	214	196
ED040T: Total Major Anions								
Silicon	7440-21-3	0.05	mg/L	7.54	5.32	12.3	1.70	1.84
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	14	16	46	732	820
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	15	23	23	658	752
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	2	2	5	37	28
Magnesium	7439-95-4	1	mg/L	2	3	5	94	102
Sodium	7440-23-5	1	mg/L	14	21	29	710	831
Potassium	7440-09-7	1	mg/L	4	6	4	12	14
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.36	0.20	0.29	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L	0.44	0.58	0.74	<0.05	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	2.99	2.41	3.97	0.12	0.25
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	0.004	0.005
Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.004	0.006	0.003



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW1 - SITE 4 CLEAN WATER DAM 1 (CWD1)	SW2 - SITE 5 CLEAN WATER DAM 2 (CWD2)	SW3 - SITE 7 CLEAN WATER DAM 6 (CWD6)	SW4 - SITE 8 DIRTY WATER DAM (DWD1)	SW5 - SITE 9 DIRTY WATER DAM 2 (DWD2)
Client sampling date / time				21-NOV-2013 09:45	21-NOV-2013 09:30	21-NOV-2013 12:30	21-NOV-2013 09:00	21-NOV-2013 09:15	
Compound	CAS Number	LOR	Unit	ES1325441-001	ES1325441-002	ES1325441-003	ES1325441-004	ES1325441-005	
EG020T: Total Metals by ICP-MS - Continued									
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Barium	7440-39-3	0.001	mg/L	0.050	0.049	0.061	0.034	0.030	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0002	0.0001	0.0002	
Cobalt	7440-48-4	0.001	mg/L	0.001	0.001	0.002	<0.001	<0.001	
Copper	7440-50-8	0.001	mg/L	0.003	0.003	0.004	0.001	0.004	
Lead	7439-92-1	0.001	mg/L	0.002	0.002	0.002	<0.001	<0.001	
Lithium	7439-93-2	0.001	mg/L	0.004	0.004	0.004	0.072	0.084	
Manganese	7439-96-5	0.001	mg/L	0.050	0.044	0.083	0.007	0.006	
Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.003	0.003	0.003	
Rubidium	7440-17-7	0.001	mg/L	0.005	0.004	0.006	0.010	0.010	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	0.02	0.03	
Strontium	7440-24-6	0.001	mg/L	0.061	0.080	0.123	4.07	3.07	
Zinc	7440-66-6	0.005	mg/L	0.012	0.009	0.011	<0.005	<0.005	
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	0.2	0.2	0.4	0.4	0.4	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.15	0.02	0.01	0.62	0.02	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	0.08	0.01	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	<0.01	2.72	1.29	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	<0.01	2.80	1.30	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.22	0.09	0.04	0.01	<0.01	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				SW6 - SITE 6 CLEAN WATER DAM 4 (CWD4-DWD4)	SW7 - SEDIMENT DAM PIT 3 EAST	SW8 - SEDIMENT DAM PIT 3 WEST	SW9 - RAIL LOADER TUNNEL WATER	SW10 - DIRTY WATER DAM 3
				21-NOV-2013 08:50	21-NOV-2013 14:20	21-NOV-2013 14:05	21-NOV-2013 08:30	21-NOV-2013 11:00
Compound	CAS Number	LOR	Unit	ES1325441-006	ES1325441-007	ES1325441-008	ES1325441-009	ES1325441-010
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.62	8.25	8.12	7.94	8.31
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	3670	491	356	1370	1700
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	2020	297	305	771	906
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	12	5	23
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	464	50	44	231	166
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	28	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	194	102	100	156	137
Total Alkalinity as CaCO3	----	1	mg/L	222	102	100	156	137
ED040T: Total Major Anions								
Silicon	7440-21-3	0.05	mg/L	2.09	3.75	12.0	2.39	4.69
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	681	30	18	282	283
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	631	66	38	157	266
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	29	5	6	33	12
Magnesium	7439-95-4	1	mg/L	95	9	7	36	33
Sodium	7440-23-5	1	mg/L	672	63	43	211	310
Potassium	7440-09-7	1	mg/L	13	11	13	7	5
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	0.24	0.21	0.06	<0.01
Iron	7439-89-6	0.05	mg/L	<0.05	0.84	0.34	0.10	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.21	0.92	4.31	1.04	1.70
Antimony	7440-36-0	0.001	mg/L	0.003	<0.001	<0.001	<0.001	0.002
Arsenic	7440-38-2	0.001	mg/L	0.004	0.004	0.005	0.003	0.002



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				SW6 - SITE 6 CLEAN WATER DAM 4 (CWD4-DWD4)	SW7 - SEDIMENT DAM PIT 3 EAST	SW8 - SEDIMENT DAM PIT 3 WEST	SW9 - RAIL LOADER TUNNEL WATER	SW10 - DIRTY WATER DAM 3
				21-NOV-2013 08:50	21-NOV-2013 14:20	21-NOV-2013 14:05	21-NOV-2013 08:30	21-NOV-2013 11:00
				ES1325441-006	ES1325441-007	ES1325441-008	ES1325441-009	ES1325441-010
Compound	CAS Number	LOR	Unit					
EG020T: Total Metals by ICP-MS - Continued								
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L	0.033	0.063	0.048	0.106	0.035
Cadmium	7440-43-9	0.0001	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.002	<0.001	0.002
Copper	7440-50-8	0.001	mg/L	0.003	0.002	0.005	0.002	0.004
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.002	<0.001	0.001
Lithium	7439-93-2	0.001	mg/L	0.064	0.002	0.003	0.006	0.036
Manganese	7439-96-5	0.001	mg/L	0.014	0.080	0.095	0.060	0.011
Nickel	7440-02-0	0.001	mg/L	0.003	0.002	0.004	0.001	0.003
Rubidium	7440-17-7	0.001	mg/L	0.008	0.002	0.006	0.003	0.008
Selenium	7782-49-2	0.01	mg/L	0.01	<0.01	<0.01	<0.01	0.02
Strontium	7440-24-6	0.001	mg/L	2.45	0.213	0.179	1.07	1.63
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.009	0.011	0.007
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.06	0.07	<0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.4	0.5	0.7	0.5	0.8
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.14	0.07	0.03	0.07	0.21
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	0.04	<0.01	<0.01	<0.01	0.05
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.96	<0.01	<0.01	0.12	2.22
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	1.00	<0.01	<0.01	0.12	2.27
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.02	0.09	0.20	0.04	0.04



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				SW11 - DEAD MAN'S GULLY	SW12 - TURKEY'S NEST DAM	SW13 - SITE 1 RAIL UNDERPASS	SW14 - SITE 2 NEW ENGLAND HIGHWAY	SW15 - SITE 3 MAISON DIEU
				21-NOV-2013 10:30	21-NOV-2013 10:00	21-NOV-2013 11:30	21-NOV-2013 14:45	21-NOV-2013 12:45
Compound	CAS Number	LOR	Unit	ES1325441-011	ES1325441-012	ES1325441-013	ES1325441-014	ES1325441-015
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.80	7.78	7.15	7.41	7.25
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	145	1600	330	519	522
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	272	883	277	387	375
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	22	<5	36	<5	<5
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	13	126	49	50	48
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	11	39	44	54	52
Total Alkalinity as CaCO3	----	1	mg/L	11	39	44	54	52
ED040T: Total Major Anions								
Silicon	7440-21-3	0.05	mg/L	21.8	2.10	15.3	14.5	13.8
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	13	289	58	70	65
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	27	281	34	77	85
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	2	16	8	5	6
Magnesium	7439-95-4	1	mg/L	2	21	7	9	8
Sodium	7440-23-5	1	mg/L	15	297	39	77	77
Potassium	7440-09-7	1	mg/L	6	5	3	5	6
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.50	<0.01	0.12	0.32	0.37
Iron	7439-89-6	0.05	mg/L	0.83	<0.05	0.18	0.64	0.67
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	9.74	0.38	6.71	4.68	5.63
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.004	<0.001	0.003	0.003	0.003



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				SW11 - DEAD MAN'S GULLY	SW12 - TURKEY'S NEST DAM	SW13 - SITE 1 RAIL UNDERPASS	SW14 - SITE 2 NEW ENGLAND HIGHWAY	SW15 - SITE 3 MAISON DIEU
				21-NOV-2013 10:30	21-NOV-2013 10:00	21-NOV-2013 11:30	21-NOV-2013 14:45	21-NOV-2013 12:45
Compound	CAS Number	LOR	Unit	ES1325441-011	ES1325441-012	ES1325441-013	ES1325441-014	ES1325441-015
EG020T: Total Metals by ICP-MS - Continued								
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L	0.090	0.022	0.054	0.049	0.050
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	0.003	<0.001	0.002	0.002	0.002
Copper	7440-50-8	0.001	mg/L	0.007	0.001	0.006	0.007	0.007
Lead	7439-92-1	0.001	mg/L	0.006	<0.001	0.003	0.003	0.003
Lithium	7439-93-2	0.001	mg/L	0.006	0.016	0.007	0.009	0.009
Manganese	7439-96-5	0.001	mg/L	0.050	0.004	0.100	0.039	0.036
Nickel	7440-02-0	0.001	mg/L	0.004	<0.001	0.004	0.004	0.004
Rubidium	7440-17-7	0.001	mg/L	0.013	0.002	0.012	0.007	0.008
Selenium	7782-49-2	0.01	mg/L	0.01	<0.01	<0.01	<0.01	<0.01
Strontium	7440-24-6	0.001	mg/L	0.052	1.08	0.151	0.298	0.265
Zinc	7440-66-6	0.005	mg/L	0.029	<0.005	0.018	0.016	0.021
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	0.05	0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.2	0.3	0.4	0.4	0.3
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.01	0.02	0.03	0.02	0.03
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	0.01	0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.51	2.00	0.22	<0.01	0.07
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.52	2.01	0.22	<0.01	0.07
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.18	<0.01	0.06	0.04	0.06



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

				SW16 - SITE 10 BELOW OPERATION	SW17 - MAISON DIEU INDUSTRIAL ESTATE CATCHMENT BRANCH	SW18 - ABOVE JUNCTION WITH INDUSTRIAL ESTATE CATCHMENT	----	----
Client sampling date / time				21-NOV-2013 13:45	21-NOV-2013 13:15	21-NOV-2013 13:30	----	----
Compound	CAS Number	LOR	Unit	ES1325441-016	ES1325441-017	ES1325441-018	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.62	7.68	7.63	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	502	425	523	----	----
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	379	347	364	----	----
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	----	----
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	45	40	45	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	54	54	55	----	----
Total Alkalinity as CaCO3	----	1	mg/L	54	54	55	----	----
ED040T: Total Major Anions								
Silicon	7440-21-3	0.05	mg/L	14.0	14.3	13.4	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	66	25	75	----	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	77	84	69	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	5	6	5	----	----
Magnesium	7439-95-4	1	mg/L	8	6	8	----	----
Sodium	7440-23-5	1	mg/L	74	54	78	----	----
Potassium	7440-09-7	1	mg/L	5	4	6	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.41	0.25	0.29	----	----
Iron	7439-89-6	0.05	mg/L	0.66	0.30	0.67	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	4.13	5.62	3.57	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				SW16 - SITE 10 BELOW OPERATION	SW17 - MAISON DIEU INDUSTRIAL ESTATE CATCHMENT BRANCH	SW18 - ABOVE JUNCTION WITH INDUSTRIAL ESTATE CATCHMENT	----	----
				21-NOV-2013 13:45	21-NOV-2013 13:15	21-NOV-2013 13:30	----	----
Compound	CAS Number	LOR	Unit	ES1325441-016	ES1325441-017	ES1325441-018	----	----
EG020T: Total Metals by ICP-MS - Continued								
Arsenic	7440-38-2	0.001	mg/L	0.003	0.002	0.002	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Barium	7440-39-3	0.001	mg/L	0.043	0.057	0.041	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
Cobalt	7440-48-4	0.001	mg/L	0.001	0.002	0.001	----	----
Copper	7440-50-8	0.001	mg/L	0.006	0.006	0.006	----	----
Lead	7439-92-1	0.001	mg/L	0.002	0.002	0.002	----	----
Lithium	7439-93-2	0.001	mg/L	0.008	0.006	0.009	----	----
Manganese	7439-96-5	0.001	mg/L	0.030	0.025	0.028	----	----
Nickel	7440-02-0	0.001	mg/L	0.003	0.004	0.003	----	----
Rubidium	7440-17-7	0.001	mg/L	0.006	0.008	0.006	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Strontium	7440-24-6	0.001	mg/L	0.298	0.180	0.327	----	----
Zinc	7440-66-6	0.005	mg/L	0.013	0.020	0.013	----	----
Boron	7440-42-8	0.05	mg/L	0.05	<0.05	<0.05	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.4	0.3	0.4	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.01	0.02	0.01	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.01	0.01	0.01	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.01	0.01	0.01	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.06	0.04	0.04	----	----

CERTIFICATE OF ANALYSIS

Work Order	: ES1416611	Page	: 1 of 15
Amendment	: 1		
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Sydney
Contact	: ALL SINGLETON RESULTS	Contact	: Client Services
Address	: PO BOX 3148 SINGLETON NSW, AUSTRALIA 2330	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: sin.als@ensr.aecom.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 6575 9000	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 6575 9099	Facsimile	: +61-2-8784 8500
Project	: 60309876 RIXS CREEK SW ANNUAL	QC Level	: NEPM 2013 B3 & ALS QC Standard
Order number	: 60309876		
C-O-C number	: ----	Date Samples Received	: 29-JUL-2014
Sampler	: SL, JA	Issue Date	: 21-NOV-2017
Site	: ----		
Quote number	: EN/004/14	No. of samples received	: 18
		No. of samples analysed	: 18

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Alison Graham	Supervisor - Inorganic	Newcastle - Inorganics
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

- **Ionic Balance out of acceptable limits due to analytes not quantified in this report.**
- **TDS by method EA-015 may bias high for sample ID 'SW11' due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**
- **This report has been amended following the**
- **This report has been amended following the addition of dissolved aluminium as per client at 20/11/2017.**



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				SW1	SW2	SW3	SW4	SW5
				29-JUL-2014 09:35	29-JUL-2014 09:25	29-JUL-2014 13:00	29-JUL-2014 09:00	29-JUL-2014 09:10
Compound	CAS Number	LOR	Unit	ES1416611-001	ES1416611-002	ES1416611-003	ES1416611-004	ES1416611-005
EA005: pH								
pH Value	----	0.01	pH Unit	7.50	7.54	8.10	8.47	8.57
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	145	156	297	4980	5280
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	116	126	128	2670	3190
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	11	<5
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	24	24	50	785	710
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	25	50
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	37	48	63	416	306
Total Alkalinity as CaCO3	----	1	mg/L	37	48	63	441	356
ED040T: Total Major Anions								
Silicon as SiO2	14464-46-1	0.1	mg/L	11.5	9.7	8.4	3.6	2.7
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	13	10	40	825	918
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	12	14	27	804	857
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	3	3	7	54	60
Magnesium	7439-95-4	1	mg/L	4	4	8	158	136
Sodium	7440-23-5	1	mg/L	17	18	41	916	1010
Potassium	7440-09-7	1	mg/L	4	5	4	17	17
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	----	0.25	0.10	<0.01	0.01
Iron	7439-89-6	0.05	mg/L	2.40	1.71	0.13	<0.05	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	1.27	1.03	0.33	0.19	0.16
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	0.002	0.003
Arsenic	7440-38-2	0.001	mg/L	0.002	0.001	0.002	0.003	0.003
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				SW1	SW2	SW3	SW4	SW5
				29-JUL-2014 09:35	29-JUL-2014 09:25	29-JUL-2014 13:00	29-JUL-2014 09:00	29-JUL-2014 09:10
Compound	CAS Number	LOR	Unit	ES1416611-001	ES1416611-002	ES1416611-003	ES1416611-004	ES1416611-005
EG020T: Total Metals by ICP-MS - Continued								
Barium	7440-39-3	0.001	mg/L	0.042	0.055	0.049	0.052	0.051
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0002	<0.0001	0.0001
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.001	<0.001	0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L	0.002	0.002	0.001	0.088	0.084
Manganese	7439-96-5	0.001	mg/L	0.030	0.048	0.017	0.056	0.007
Nickel	7440-02-0	0.001	mg/L	0.001	0.001	0.002	0.003	0.004
Rubidium	7440-17-7	0.001	mg/L	0.002	0.002	<0.001	0.010	0.009
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium	7440-24-6	0.001	mg/L	0.078	0.086	0.121	4.06	6.88
Zinc	7440-66-6	0.005	mg/L	<0.005	0.006	<0.005	<0.005	<0.005
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.2	0.2	0.4	0.5	0.5
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.02	<0.01	<0.01	0.36	0.06
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	0.03	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	<0.01	1.06	0.92
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	<0.01	1.09	0.92
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.06	0.05	0.02	0.01	<0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	1.35	1.56	2.85	48.7	50.4
Total Cations	----	0.01	meq/L	1.32	1.39	2.89	56.0	58.6
Ionic Balance	----	0.01	%	----	----	----	6.96	7.45
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				SW1	SW2	SW3	SW4	SW5
				29-JUL-2014 09:35	29-JUL-2014 09:25	29-JUL-2014 13:00	29-JUL-2014 09:00	29-JUL-2014 09:10
Compound	CAS Number	LOR	Unit	ES1416611-001	ES1416611-002	ES1416611-003	ES1416611-004	ES1416611-005
EP080/071: Total Petroleum Hydrocarbons - Continued								
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	91.9	88.1	94.3	95.1	93.7
Toluene-D8	2037-26-5	0.1	%	111	104	108	104	105
4-Bromofluorobenzene	460-00-4	0.1	%	103	98.0	102	101	101



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				SW6	SW7	SW8	SW9	SW10
				29-JUL-2014 08:50	29-JUL-2014 11:10	29-JUL-2014 10:55	29-JUL-2014 08:30	29-JUL-2014 10:00
Compound	CAS Number	LOR	Unit	ES1416611-006	ES1416611-007	ES1416611-008	ES1416611-009	ES1416611-010
EA005: pH								
pH Value	----	0.01	pH Unit	8.55	7.99	8.18	8.22	8.28
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	5280	503	415	1770	6870
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	2860	236	264	1010	4670
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	6	10	6	----
Suspended Solids (SS)	----	5	mg/L	----	----	----	----	17
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	759	63	70	316	1200
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	32	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	398	125	137	248	854
Total Alkalinity as CaCO3	----	1	mg/L	431	125	137	248	854
ED040T: Total Major Anions								
Silicon as SiO2	14464-46-1	0.1	mg/L	2.3	4.0	22.7	3.8	7.8
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	884	27	19	341	1360
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	839	67	39	218	1020
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	55	7	10	41	98
Magnesium	7439-95-4	1	mg/L	151	11	11	52	231
Sodium	7440-23-5	1	mg/L	962	74	51	298	1250
Potassium	7440-09-7	1	mg/L	18	12	12	5	18
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	0.10	0.19	0.31	0.01
Iron	7439-89-6	0.05	mg/L	<0.05	0.49	0.38	0.30	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.12	0.51	4.02	0.41	0.06
Antimony	7440-36-0	0.001	mg/L	0.002	<0.001	<0.001	<0.001	0.002
Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.004	0.006	0.003

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID		SW6	SW7	SW8	SW9	SW10			
Client sampling date / time				29-JUL-2014 08:50		29-JUL-2014 11:10		29-JUL-2014 10:55		29-JUL-2014 08:30		29-JUL-2014 10:00	
Compound	CAS Number	LOR	Unit	ES1416611-006		ES1416611-007		ES1416611-008		ES1416611-009		ES1416611-010	
EG020T: Total Metals by ICP-MS - Continued													
Beryllium	7440-41-7	0.001	mg/L	<0.001		<0.001		<0.001		<0.001		<0.001	
Barium	7440-39-3	0.001	mg/L	0.056		0.071		0.097		0.093		0.033	
Cadmium	7440-43-9	0.0001	mg/L	0.0001		<0.0001		<0.0001		<0.0001		<0.0001	
Cobalt	7440-48-4	0.001	mg/L	<0.001		<0.001		0.002		<0.001		0.001	
Copper	7440-50-8	0.001	mg/L	<0.001		<0.001		0.003		<0.001		<0.001	
Lead	7439-92-1	0.001	mg/L	<0.001		<0.001		0.002		<0.001		<0.001	
Lithium	7439-93-2	0.001	mg/L	0.090		0.001		0.003		0.006		0.185	
Manganese	7439-96-5	0.001	mg/L	0.029		0.110		0.047		0.062		0.012	
Nickel	7440-02-0	0.001	mg/L	0.003		<0.001		0.003		<0.001		0.006	
Rubidium	7440-17-7	0.001	mg/L	0.010		0.002		0.006		0.001		0.016	
Selenium	7782-49-2	0.01	mg/L	<0.01		<0.01		<0.01		<0.01		<0.01	
Strontium	7440-24-6	0.001	mg/L	5.53		0.189		0.229		1.30		12.5	
Zinc	7440-66-6	0.005	mg/L	<0.005		<0.005		0.010		<0.005		<0.005	
Boron	7440-42-8	0.05	mg/L	<0.05		<0.05		<0.05		<0.05		0.05	
EG035T: Total Recoverable Mercury by FIMS													
Mercury	7439-97-6	0.0001	mg/L	<0.0001		<0.0001		<0.0001		<0.0001		<0.0001	
EK040P: Fluoride by PC Titrator													
Fluoride	16984-48-8	0.1	mg/L	0.5		0.5		0.7		0.6		0.2	
EK055G: Ammonia as N by Discrete Analyser													
Ammonia as N	7664-41-7	0.01	mg/L	0.15		0.58		0.07		<0.01		0.98	
EK057G: Nitrite as N by Discrete Analyser													
Nitrite as N	14797-65-0	0.01	mg/L	0.02		0.01		0.01		<0.01		0.22	
EK058G: Nitrate as N by Discrete Analyser													
Nitrate as N	14797-55-8	0.01	mg/L	0.55		0.06		0.55		<0.01		10.7	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser													
Nitrite + Nitrate as N	----	0.01	mg/L	0.57		0.07		0.56		<0.01		10.9	
EK067G: Total Phosphorus as P by Discrete Analyser													
Total Phosphorus as P	----	0.01	mg/L	<0.01		0.05		0.14		0.09		<0.01	
EN055: Ionic Balance													
Total Anions	----	0.01	meq/L	50.7		4.95		4.23		18.2		74.2	
Total Cations	----	0.01	meq/L	57.5		4.78		3.93		19.4		78.7	
Ionic Balance	----	0.01	%	6.25		1.77		3.74		3.19		2.97	
EP080/071: Total Petroleum Hydrocarbons													



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				SW6	SW7	SW8	SW9	SW10
				29-JUL-2014 08:50	29-JUL-2014 11:10	29-JUL-2014 10:55	29-JUL-2014 08:30	29-JUL-2014 10:00
Compound	CAS Number	LOR	Unit	ES1416611-006	ES1416611-007	ES1416611-008	ES1416611-009	ES1416611-010
EP080/071: Total Petroleum Hydrocarbons - Continued								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	97.3	97.0	96.3	98.5	106
Toluene-D8	2037-26-5	0.1	%	105	108	107	109	101
4-Bromofluorobenzene	460-00-4	0.1	%	99.1	102	102	99.7	100



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				SW11	SW12	SW13	SW14	SW15
				29-JUL-2014 10:15	29-JUL-2014 09:45	29-JUL-2014 12:40	29-JUL-2014 13:40	29-JUL-2014 13:15
Compound	CAS Number	LOR	Unit	ES1416611-011	ES1416611-012	ES1416611-013	ES1416611-014	ES1416611-015
EA005: pH								
pH Value	----	0.01	pH Unit	7.74	8.60	8.49	7.87	7.61
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	161	5810	616	937	684
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	176	3360	299	484	326
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	18	5	5	5	7
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	21	613	131	126	72
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	14	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	40	86	165	174	80
Total Alkalinity as CaCO3	----	1	mg/L	40	86	179	174	80
ED040T: Total Major Anions								
Silicon as SiO2	14464-46-1	0.1	mg/L	20.2	2.5	11.9	16.0	12.2
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	8	1070	64	102	40
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	20	977	55	130	136
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	2	59	21	14	9
Magnesium	7439-95-4	1	mg/L	4	113	19	22	12
Sodium	7440-23-5	1	mg/L	22	1060	84	159	116
Potassium	7440-09-7	1	mg/L	6	10	3	5	4
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.26	<0.01	0.20	0.27	0.28
Iron	7439-89-6	0.05	mg/L	1.37	<0.05	0.53	0.48	0.31
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	3.68	0.13	0.39	2.11	1.55
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.003	0.002	0.002	0.002	0.001
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				SW11	SW12	SW13	SW14	SW15
				29-JUL-2014 10:15	29-JUL-2014 09:45	29-JUL-2014 12:40	29-JUL-2014 13:40	29-JUL-2014 13:15
Compound	CAS Number	LOR	Unit	ES1416611-011	ES1416611-012	ES1416611-013	ES1416611-014	ES1416611-015
EG020T: Total Metals by ICP-MS - Continued								
Barium	7440-39-3	0.001	mg/L	0.067	0.046	0.014	0.054	0.040
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.002	<0.001	<0.001	0.003	0.002
Lead	7439-92-1	0.001	mg/L	0.003	<0.001	<0.001	0.001	0.001
Lithium	7439-93-2	0.001	mg/L	0.004	0.042	0.002	0.012	0.004
Manganese	7439-96-5	0.001	mg/L	0.032	0.006	0.203	0.124	0.017
Nickel	7440-02-0	0.001	mg/L	0.002	<0.001	<0.001	0.002	0.002
Rubidium	7440-17-7	0.001	mg/L	0.005	0.003	<0.001	0.004	0.003
Selenium	7782-49-2	0.01	mg/L	<0.01	0.02	<0.01	<0.01	<0.01
Strontium	7440-24-6	0.001	mg/L	0.131	3.58	0.269	0.704	0.254
Zinc	7440-66-6	0.005	mg/L	0.010	<0.005	<0.005	0.009	0.013
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.4	0.6	0.6	0.4	0.3
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.02	<0.01	0.01	<0.01
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.07	<0.01	<0.01	0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	6.91	<0.01	0.24	0.37
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	6.98	<0.01	0.24	0.38
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.11	<0.01	0.01	0.06	0.05
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	1.53	51.6	6.46	9.27	6.27
Total Cations	----	0.01	meq/L	1.54	58.6	6.34	9.55	6.58
Ionic Balance	----	0.01	%	----	6.37	0.95	1.49	2.44
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				SW11	SW12	SW13	SW14	SW15
				29-JUL-2014 10:15	29-JUL-2014 09:45	29-JUL-2014 12:40	29-JUL-2014 13:40	29-JUL-2014 13:15
Compound	CAS Number	LOR	Unit	ES1416611-011	ES1416611-012	ES1416611-013	ES1416611-014	ES1416611-015
EP080/071: Total Petroleum Hydrocarbons - Continued								
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	87.0	96.7	84.4	89.6	114
Toluene-D8	2037-26-5	0.1	%	85.4	85.2	79.1	83.2	109
4-Bromofluorobenzene	460-00-4	0.1	%	80.7	87.4	76.2	78.0	102



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				SW16	SW17	SW18	----	----
				29-JUL-2014 11:50	29-JUL-2014 11:40	29-JUL-2014 11:30	----	----
Compound	CAS Number	LOR	Unit	ES1416611-016	ES1416611-017	ES1416611-018	----	----
EA005: pH								
pH Value	----	0.01	pH Unit	7.99	7.91	7.72	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	701	710	1280	----	----
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	340	356	662	----	----
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	6	5	6	----	----
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	90	93	187	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	86	88	164	----	----
Total Alkalinity as CaCO3	----	1	mg/L	86	88	164	----	----
ED040T: Total Major Anions								
Silicon as SiO2	14464-46-1	0.1	mg/L	13.3	13.4	4.0	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	38	39	156	----	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	139	143	213	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	13	14	22	----	----
Magnesium	7439-95-4	1	mg/L	14	14	32	----	----
Sodium	7440-23-5	1	mg/L	110	112	207	----	----
Potassium	7440-09-7	1	mg/L	3	3	7	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.24	0.23	0.04	----	----
Iron	7439-89-6	0.05	mg/L	0.23	0.21	0.21	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	1.80	1.82	0.45	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	0.001	<0.001	0.001	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	----	----



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				SW16	SW17	SW18	----	----
				29-JUL-2014 11:50	29-JUL-2014 11:40	29-JUL-2014 11:30	----	----
Compound	CAS Number	LOR	Unit	ES1416611-016	ES1416611-017	ES1416611-018	----	----
EG020T: Total Metals by ICP-MS - Continued								
Barium	7440-39-3	0.001	mg/L	0.054	0.055	0.066	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	0.003	0.003	0.001	----	----
Lead	7439-92-1	0.001	mg/L	0.001	0.001	<0.001	----	----
Lithium	7439-93-2	0.001	mg/L	0.004	0.004	0.013	----	----
Manganese	7439-96-5	0.001	mg/L	0.011	0.013	0.040	----	----
Nickel	7440-02-0	0.001	mg/L	0.001	0.001	0.001	----	----
Rubidium	7440-17-7	0.001	mg/L	0.003	0.003	0.002	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Strontium	7440-24-6	0.001	mg/L	0.247	0.259	1.04	----	----
Zinc	7440-66-6	0.005	mg/L	0.012	0.014	<0.005	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.2	0.2	0.2	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	0.02	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.19	0.19	0.02	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.19	0.19	0.02	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.03	0.04	0.02	----	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	6.43	6.60	12.5	----	----
Total Cations	----	0.01	meq/L	6.66	6.80	12.9	----	----
Ionic Balance	----	0.01	%	1.75	1.44	1.47	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	----	----



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				SW16	SW17	SW18	----	----
				29-JUL-2014 11:50	29-JUL-2014 11:40	29-JUL-2014 11:30	----	----
Compound	CAS Number	LOR	Unit	ES1416611-016	ES1416611-017	ES1416611-018	----	----
EP080/071: Total Petroleum Hydrocarbons - Continued								
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	----	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	----	----
^ Total Xylenes	1330-20-7	2	µg/L	<2	<2	<2	----	----
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	106	107	106	----	----
Toluene-D8	2037-26-5	0.1	%	98.4	94.8	98.1	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	92.5	91.1	90.6	----	----



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

CERTIFICATE OF ANALYSIS

Work Order	: ES1520559	Page	: 1 of 18
Amendment	: 1		
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Sydney
Contact	: MS SARAH BROWN	Contact	: Loren Schiavon
Address	: PO BOX 3148	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
	SINGLETON NSW, AUSTRALIA 2330		
Telephone	: +61 02 6575 9000	Telephone	: +61 2 8784 8503
Project	: 60309876 RIXS CREEK SW ANNUAL 2015	Date Samples Received	: 27-Apr-2015 16:32
Order number	: 60309876/1.1	Date Analysis Commenced	: 27-Apr-2015
C-O-C number	: ----	Issue Date	: 20-Nov-2017 13:53
Sampler	: SARAH BROWN		
Site	: ----		
Quote number	: EN/004/14		
No. of samples received	: 24		
No. of samples analysed	: 24		



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ashesh Patel	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW
Pabi Subba	Senior Organic Chemist	Sydney Organics, Smithfield, NSW
Shobhna Chandra	Metals Coordinator	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EA015 : TDS by method may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Samples not received in a suitable time frame to conduct the analysis EA005 within the recommended holding time.
- Amendment (20/11/2017): This report has been amended and re-released to allow the reporting of additional dissolved Aluminium for all samples.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW1	SW2	SW3	SW4	SW5
Client sampling date / time					27-Apr-2015 10:30	27-Apr-2015 10:20	27-Apr-2015 14:35	27-Apr-2015 09:50	27-Apr-2015 10:15
Compound	CAS Number	LOR	Unit		ES1520559-001	ES1520559-002	ES1520559-003	ES1520559-004	ES1520559-005
					Result	Result	Result	Result	Result
EA005: pH									
pH Value	----	0.01	pH Unit		7.07	7.01	7.32	8.30	8.83
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		158	133	154	1990	2780
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	10	mg/L		150	154	171	948	1430
EA025: Suspended Solids									
Suspended Solids (SS)	----	5	mg/L		8	6	18	16	8
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		22	22	29	296	343
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	35
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		43	32	32	150	153
Total Alkalinity as CaCO3	----	1	mg/L		43	32	32	150	188
ED040T: Total Major Anions									
Silicon as SiO2	14464-46-1	0.1	mg/L		18.3	16.8	26.4	6.3	4.6
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		4	3	21	328	436
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		19	17	14	335	516
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		4	4	5	31	22
Magnesium	7439-95-4	1	mg/L		3	3	4	53	70
Sodium	7440-23-5	1	mg/L		18	16	18	323	454
Potassium	7440-09-7	1	mg/L		4	5	3	7	8
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.59	0.88	0.64	<0.01	<0.01
Iron	7439-89-6	0.05	mg/L		0.60	0.78	0.60	<0.05	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		2.55	3.06	3.62	0.71	0.33
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	0.001	0.001
Arsenic	7440-38-2	0.001	mg/L		0.002	0.001	0.003	0.002	0.002
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Client sample ID

				SW1	SW2	SW3	SW4	SW5
Client sampling date / time				27-Apr-2015 10:30	27-Apr-2015 10:20	27-Apr-2015 14:35	27-Apr-2015 09:50	27-Apr-2015 10:15
Compound	CAS Number	LOR	Unit	ES1520559-001	ES1520559-002	ES1520559-003	ES1520559-004	ES1520559-005
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Barium	7440-39-3	0.001	mg/L	0.046	0.047	0.042	0.040	0.036
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	0.001	0.001	0.001	0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.003	0.008	0.004	0.003	0.002
Lead	7439-92-1	0.001	mg/L	0.001	0.002	0.001	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L	0.003	0.004	0.004	0.032	0.041
Manganese	7439-96-5	0.001	mg/L	0.058	0.065	0.036	0.011	0.008
Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.002	0.002	0.001
Rubidium	7440-17-7	0.001	mg/L	0.004	0.005	0.006	0.006	0.004
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium	7440-24-6	0.001	mg/L	0.054	0.051	0.067	2.21	1.56
Zinc	7440-66-6	0.005	mg/L	0.011	0.019	0.010	0.005	<0.005
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.4	0.2	0.2	0.3	0.4
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.14	0.16	0.03	0.27	0.07
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	0.10	0.02
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.03	0.04	0.05	1.39	0.45
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.03	0.04	0.05	1.49	0.47
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.09	0.09	0.13	0.06	<0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	1.48	1.18	1.47	19.3	27.4
Total Cations	----	0.01	meq/L	1.33	1.27	1.44	20.1	26.8
Ionic Balance	----	0.01	%	----	----	----	2.16	1.09
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW1	SW2	SW3	SW4	SW5
Client sampling date / time					27-Apr-2015 10:30	27-Apr-2015 10:20	27-Apr-2015 14:35	27-Apr-2015 09:50	27-Apr-2015 10:15
Compound	CAS Number	LOR	Unit		ES1520559-001	ES1520559-002	ES1520559-003	ES1520559-004	ES1520559-005
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		97.8	96.7	99.1	95.5	96.3
Toluene-D8	2037-26-5	2	%		106	107	106	104	102
4-Bromofluorobenzene	460-00-4	2	%		94.9	97.2	99.5	97.2	95.4



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW6	SW7	SW8	SW9	SW10
Client sampling date / time					27-Apr-2015 10:00	27-Apr-2015 11:00	27-Apr-2015 11:10	27-Apr-2015 09:35	27-Apr-2015 12:10
Compound	CAS Number	LOR	Unit		ES1520559-006	ES1520559-007	ES1520559-008	ES1520559-009	ES1520559-010
					Result	Result	Result	Result	Result
EA005: pH									
pH Value	----	0.01	pH Unit		8.49	7.61	7.41	7.47	8.47
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		2090	352	230	624	2800
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	10	mg/L		1010	220	703	344	1450
EA025: Suspended Solids									
Suspended Solids (SS)	----	5	mg/L		11	<5	212	56	9
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		277	54	36	108	384
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		10	<1	<1	<1	14
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		147	85	62	70	228
Total Alkalinity as CaCO3	----	1	mg/L		158	85	62	70	242
ED040T: Total Major Anions									
Silicon as SiO2	14464-46-1	0.1	mg/L		6.4	11.5	114	29.5	6.4
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		321	15	27	125	432
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		370	47	26	67	450
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		22	7	6	17	45
Magnesium	7439-95-4	1	mg/L		54	9	5	16	66
Sodium	7440-23-5	1	mg/L		350	49	29	81	526
Potassium	7440-09-7	1	mg/L		7	10	10	3	7
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	0.10	0.59	0.02	<0.01
Iron	7439-89-6	0.05	mg/L		<0.05	0.16	1.23	0.05	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.62	1.69	27.7	5.89	0.38
Antimony	7440-36-0	0.001	mg/L		0.001	<0.001	<0.001	<0.001	0.007
Arsenic	7440-38-2	0.001	mg/L		0.002	0.002	0.006	0.003	0.004
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW6	SW7	SW8	SW9	SW10
Client sampling date / time				27-Apr-2015 10:00	27-Apr-2015 11:00	27-Apr-2015 11:10	27-Apr-2015 09:35	27-Apr-2015 12:10	
Compound	CAS Number	LOR	Unit	ES1520559-006	ES1520559-007	ES1520559-008	ES1520559-009	ES1520559-010	
				Result	Result	Result	Result	Result	
EG020T: Total Metals by ICP-MS - Continued									
Barium	7440-39-3	0.001	mg/L	0.035	0.049	0.150	0.055	0.044	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.009	0.003	0.002	
Copper	7440-50-8	0.001	mg/L	0.002	0.003	0.018	0.005	0.002	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.014	0.003	<0.001	
Lithium	7439-93-2	0.001	mg/L	0.032	0.002	0.020	0.008	0.058	
Manganese	7439-96-5	0.001	mg/L	0.008	0.051	0.158	0.080	0.009	
Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.013	0.004	0.003	
Rubidium	7440-17-7	0.001	mg/L	0.004	0.004	0.037	0.011	0.010	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	0.03	
Strontium	7440-24-6	0.001	mg/L	1.55	0.132	0.157	0.442	5.57	
Zinc	7440-66-6	0.005	mg/L	<0.005	0.007	0.070	0.023	<0.005	
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	0.3	0.5	0.4	0.3	0.5	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.18	0.08	0.14	2.58	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	0.05	<0.01	0.02	<0.01	0.60	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	0.10	0.08	0.21	0.11	24.9	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	0.15	0.08	0.23	0.11	25.5	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.06	0.29	0.78	0.07	<0.01	
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L	----	----	----	----	28.3	
Total Anions	----	0.01	meq/L	20.3	3.34	2.53	5.89	----	
Total Cations	----	0.01	meq/L	20.9	3.48	2.23	5.76	----	
Ionic Balance	----	0.01	%	----	----	----	----	4.41	
Ionic Balance	----	0.01	%	1.59	2.04	----	1.10	----	
EP080/071: Total Petroleum Hydrocarbons									



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Client sample ID

				SW6	SW7	SW8	SW9	SW10
Client sampling date / time				27-Apr-2015 10:00	27-Apr-2015 11:00	27-Apr-2015 11:10	27-Apr-2015 09:35	27-Apr-2015 12:10
Compound	CAS Number	LOR	Unit	ES1520559-006	ES1520559-007	ES1520559-008	ES1520559-009	ES1520559-010
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	96.3	107	90.6	95.1	90.4
Toluene-D8	2037-26-5	2	%	103	112	97.8	100	100
4-Bromofluorobenzene	460-00-4	2	%	94.7	103	89.9	94.5	91.8



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW11	SW12	SW13	SW14	SW15
Client sampling date / time					27-Apr-2015 13:25	27-Apr-2015 10:45	27-Apr-2015 14:20	27-Apr-2015 14:05	27-Apr-2015 14:50
Compound	CAS Number	LOR	Unit		ES1520559-011	ES1520559-012	ES1520559-013	ES1520559-014	ES1520559-015
					Result	Result	Result	Result	Result
EA005: pH									
pH Value	----	0.01	pH Unit		6.83	8.19	7.43	7.34	7.16
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		111	2500	259	579	876
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	10	mg/L		178	1280	215	310	482
EA025: Suspended Solids									
Suspended Solids (SS)	----	5	mg/L		18	14	8	7	6
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		22	310	58	76	129
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		12	148	48	60	71
Total Alkalinity as CaCO3	----	1	mg/L		12	148	48	60	71
ED040T: Total Major Anions									
Silicon as SiO2	14464-46-1	0.1	mg/L		26.5	9.9	23.7	27.8	27.2
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		6	464	38	60	70
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		19	466	23	92	179
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		4	22	10	9	17
Magnesium	7439-95-4	1	mg/L		3	62	8	13	21
Sodium	7440-23-5	1	mg/L		17	437	31	73	114
Potassium	7440-09-7	1	mg/L		5	9	3	4	5
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.88	0.01	0.13	0.04	0.03
Iron	7439-89-6	0.05	mg/L		0.82	<0.05	0.25	0.12	0.21
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		4.32	0.68	3.70	3.79	3.90
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.002	0.002	0.002	0.002	0.002
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Client sample ID

				SW11	SW12	SW13	SW14	SW15
Client sampling date / time				27-Apr-2015 13:25	27-Apr-2015 10:45	27-Apr-2015 14:20	27-Apr-2015 14:05	27-Apr-2015 14:50
Compound	CAS Number	LOR	Unit	ES1520559-011	ES1520559-012	ES1520559-013	ES1520559-014	ES1520559-015
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Barium	7440-39-3	0.001	mg/L	0.054	0.100	0.033	0.063	0.080
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	0.001	<0.001	0.001	0.001	0.002
Copper	7440-50-8	0.001	mg/L	0.005	0.021	0.004	0.005	0.005
Lead	7439-92-1	0.001	mg/L	0.002	0.001	0.001	0.001	0.002
Lithium	7439-93-2	0.001	mg/L	0.004	0.031	0.004	0.008	0.008
Manganese	7439-96-5	0.001	mg/L	0.039	0.010	0.149	0.030	0.067
Nickel	7440-02-0	0.001	mg/L	0.003	0.002	0.002	0.003	0.003
Rubidium	7440-17-7	0.001	mg/L	0.006	0.004	0.006	0.006	0.007
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium	7440-24-6	0.001	mg/L	0.037	1.21	0.108	0.252	0.438
Zinc	7440-66-6	0.005	mg/L	0.015	0.022	0.010	0.012	0.018
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.2	0.4	0.2	0.2	0.2
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.02	0.04	0.02	0.11
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.02	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.03	0.27	0.09	0.55	0.30
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.03	0.29	0.09	0.55	0.30
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.12	0.04	0.05	0.07	0.06
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	0.90	25.8	2.40	5.04	7.92
Total Cations	----	0.01	meq/L	1.31	----	2.58	4.80	7.66
Ionic Balance	----	0.01	%	----	0.66	----	2.53	1.70
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW11	SW12	SW13	SW14	SW15
Client sampling date / time					27-Apr-2015 13:25	27-Apr-2015 10:45	27-Apr-2015 14:20	27-Apr-2015 14:05	27-Apr-2015 14:50
Compound	CAS Number	LOR	Unit		ES1520559-011	ES1520559-012	ES1520559-013	ES1520559-014	ES1520559-015
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		95.8	94.6	94.4	95.5	93.0
Toluene-D8	2037-26-5	2	%		102	102	100	102	99.1
4-Bromofluorobenzene	460-00-4	2	%		92.9	93.1	91.9	90.7	93.9



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW16	SW17	SW18	SW19	SW20
Client sampling date / time					27-Apr-2015 11:45	27-Apr-2015 11:30	27-Apr-2015 11:35	27-Apr-2015 12:30	27-Apr-2015 12:45
Compound	CAS Number	LOR	Unit		ES1520559-016	ES1520559-017	ES1520559-018	ES1520559-019	ES1520559-020
					Result	Result	Result	Result	Result
EA005: pH									
pH Value	----	0.01	pH Unit		7.65	7.66	7.63	7.32	6.98
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		567	666	498	154	104
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	10	mg/L		342	373	296	187	1310
EA025: Suspended Solids									
Suspended Solids (SS)	----	5	mg/L		<5	<5	7	<5	250
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		88	100	72	31	18
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		59	77	54	30	25
Total Alkalinity as CaCO3	----	1	mg/L		59	77	54	30	25
ED040T: Total Major Anions									
Silicon as SiO2	14464-46-1	0.1	mg/L		26.2	26.1	26.0	28.4	226
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		50	33	53	11	30
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		96	136	77	21	16
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		12	17	9	6	4
Magnesium	7439-95-4	1	mg/L		14	14	12	4	2
Sodium	7440-23-5	1	mg/L		77	89	62	16	13
Potassium	7440-09-7	1	mg/L		4	4	5	7	5
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.06	0.05	0.06	0.62	0.96
Iron	7439-89-6	0.05	mg/L		0.20	0.18	0.14	0.66	0.89
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		3.60	3.47	3.66	4.24	61.8
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.001	0.001	0.002	0.001	0.010
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	0.003



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Client sample ID

				SW16	SW17	SW18	SW19	SW20
Client sampling date / time				27-Apr-2015 11:45	27-Apr-2015 11:30	27-Apr-2015 11:35	27-Apr-2015 12:30	27-Apr-2015 12:45
Compound	CAS Number	LOR	Unit	ES1520559-016	ES1520559-017	ES1520559-018	ES1520559-019	ES1520559-020
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Barium	7440-39-3	0.001	mg/L	0.056	0.069	0.053	0.049	0.394
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	0.001	0.001	0.001	0.002	0.017
Copper	7440-50-8	0.001	mg/L	0.005	0.005	0.012	0.005	0.036
Lead	7439-92-1	0.001	mg/L	0.001	0.001	0.002	0.001	0.028
Lithium	7439-93-2	0.001	mg/L	0.006	0.006	0.009	0.005	0.068
Manganese	7439-96-5	0.001	mg/L	0.023	0.016	0.020	0.177	0.368
Nickel	7440-02-0	0.001	mg/L	0.002	0.003	0.003	0.003	0.027
Rubidium	7440-17-7	0.001	mg/L	0.006	0.006	0.006	0.007	0.084
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	0.01
Strontium	7440-24-6	0.001	mg/L	0.264	0.253	0.265	0.117	0.185
Zinc	7440-66-6	0.005	mg/L	0.014	0.017	0.018	0.012	0.137
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.2	0.3	0.3	0.2	0.2
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.01	0.03	0.02	0.20	0.06
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	0.04
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.29	0.07	0.33	0.05	0.08
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.29	0.07	0.33	0.05	0.12
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.05	0.04	0.07	0.14	0.86
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	4.93	6.06	4.35	1.42	1.58
Total Cations	----	0.01	meq/L	5.20	5.97	4.26	1.50	1.06
Ionic Balance	----	0.01	%	2.69	0.74	1.10	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW16	SW17	SW18	SW19	SW20
Client sampling date / time					27-Apr-2015 11:45	27-Apr-2015 11:30	27-Apr-2015 11:35	27-Apr-2015 12:30	27-Apr-2015 12:45
Compound	CAS Number	LOR	Unit		ES1520559-016	ES1520559-017	ES1520559-018	ES1520559-019	ES1520559-020
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		89.1	81.7	98.0	97.5	97.4
Toluene-D8	2037-26-5	2	%		93.4	102	104	103	103
4-Bromofluorobenzene	460-00-4	2	%		84.2	93.9	94.6	93.3	94.7



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW21	SW22	OOP DUMP SED DAM-WEST	OOP DUMP SED DAM-EAST	----
Client sampling date / time					27-Apr-2015 13:45	27-Apr-2015 13:00	27-Apr-2015 13:15	27-Apr-2015 13:35	----
Compound	CAS Number	LOR	Unit		ES1520559-021	ES1520559-022	ES1520559-023	ES1520559-024	-----
				Result	Result	Result	Result	Result	----
EA005: pH									
pH Value	----	0.01	pH Unit		7.35	7.24	7.27	7.85	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		132	4240	122	354	----
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	10	mg/L		873	2240	2300	2890	----
EA025: Suspended Solids									
Suspended Solids (SS)	----	5	mg/L		----	----	----	3000	----
Suspended Solids (SS)	----	5	mg/L		142	8	1730	----	----
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		16	790	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		31	115	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		31	115	----	----	----
ED040T: Total Major Anions									
Silicon as SiO2	14464-46-1	0.1	mg/L		110	17.3	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		29	366	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		21	1070	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		3	92	----	----	----
Magnesium	7439-95-4	1	mg/L		2	136	----	----	----
Sodium	7440-23-5	1	mg/L		20	642	----	----	----
Potassium	7440-09-7	1	mg/L		4	9	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.79	0.01	----	----	----
Iron	7439-89-6	0.05	mg/L		0.69	0.17	----	----	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		29.8	0.78	----	----	----
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	----	----	----
Arsenic	7440-38-2	0.001	mg/L		0.007	<0.001	----	----	----

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW21	SW22	OOP DUMP SED DAM-WEST	OOP DUMP SED DAM-EAST	----
Client sampling date / time				27-Apr-2015 13:45	27-Apr-2015 13:00	27-Apr-2015 13:15	27-Apr-2015 13:35	----	
Compound	CAS Number	LOR	Unit	ES1520559-021	ES1520559-022	ES1520559-023	ES1520559-024	-----	
				Result	Result	Result	Result	----	
EG020T: Total Metals by ICP-MS - Continued									
Beryllium	7440-41-7	0.001	mg/L	0.002	<0.001	----	----	----	
Barium	7440-39-3	0.001	mg/L	0.145	0.159	----	----	----	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----	
Cobalt	7440-48-4	0.001	mg/L	0.011	0.002	----	----	----	
Copper	7440-50-8	0.001	mg/L	0.025	0.003	----	----	----	
Lead	7439-92-1	0.001	mg/L	0.017	<0.001	----	----	----	
Lithium	7439-93-2	0.001	mg/L	0.022	0.011	----	----	----	
Manganese	7439-96-5	0.001	mg/L	0.201	0.648	----	----	----	
Nickel	7440-02-0	0.001	mg/L	0.015	0.003	----	----	----	
Rubidium	7440-17-7	0.001	mg/L	0.051	0.003	----	----	----	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----	
Strontium	7440-24-6	0.001	mg/L	0.111	2.35	----	----	----	
Zinc	7440-66-6	0.005	mg/L	0.078	0.009	----	----	----	
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	0.3	0.3	----	----	----	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.08	0.10	----	----	----	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	0.04	<0.01	----	----	----	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	0.09	0.12	----	----	----	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	0.13	0.12	----	----	----	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.36	0.04	----	----	----	
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L	1.82	40.1	----	----	----	
Total Cations	----	0.01	meq/L	1.29	43.9	----	----	----	
Ionic Balance	----	0.01	%	----	4.56	----	----	----	
EP080/071: Total Petroleum Hydrocarbons									



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Client sample ID

				SW21	SW22	OOP DUMP SED DAM-WEST	OOP DUMP SED DAM-EAST	----
Client sampling date / time				27-Apr-2015 13:45	27-Apr-2015 13:00	27-Apr-2015 13:15	27-Apr-2015 13:35	----
Compound	CAS Number	LOR	Unit	ES1520559-021	ES1520559-022	ES1520559-023	ES1520559-024	-----
				Result	Result	Result	Result	----
EP080/071: Total Petroleum Hydrocarbons - Continued								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	----	----	----
Toluene	108-88-3	2	µg/L	<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	----	----	----
^ Total Xylenes	1330-20-7	2	µg/L	<2	<2	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	92.6	92.1	----	----	----
Toluene-D8	2037-26-5	2	%	112	117	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	86.9	86.5	----	----	----



Surrogate Control Limits

Sub-Matrix: **WATER**

		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

CERTIFICATE OF ANALYSIS

Work Order	: ES1612375	Page	: 1 of 18
Amendment	: 1		
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Sydney
Contact	: MS SARAH BROWN	Contact	: Julia Fracala
Address	: PO BOX 3148	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
	SINGLETON NSW, AUSTRALIA 2330		
Telephone	: +61 02 6575 9000	Telephone	: +61-2-8784 8555
Project	: 60309876 RIXS CREEK SW ANNUAL	Date Samples Received	: 08-Jun-2016 16:50
Order number	: 60309876/1.1	Date Analysis Commenced	: 08-Jun-2016
C-O-C number	: S1015	Issue Date	: 20-Nov-2017 13:54
Sampler	: DONNA CARLISLE, JORDAN ROBINSON		
Site	: ----		
Quote number	: EN/004/16		
No. of samples received	: 22		
No. of samples analysed	: 22		



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Merrin Avery	Supervisor - Inorganic	Newcastle - Inorganics, Mayfield West, NSW
RICHARD TEA	Lab technician	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Samples #3, 10, 11, 13-15, and 19-22 not received in a suitable time frame to conduct the analysis EA005 within the recommended holding time.
- EN055: Ionic Balance out of acceptable limits for various samples due to analytes not quantified in this report.
- Amendment (20/11/2017): This report has been amended and re-released to allow the reporting of additional dissolved aluminium from all samples.



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Client sample ID

				SW1	SW2	SW3	SW4	SW5
Client sampling date / time				08-Jun-2016 12:05	08-Jun-2016 12:15	08-Jun-2016 08:25	08-Jun-2016 11:25	08-Jun-2016 11:50
Compound	CAS Number	LOR	Unit	ES1612375-001	ES1612375-002	ES1612375-003	ES1612375-004	ES1612375-005
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	7.08	7.34	7.65	8.44	8.65
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	205	162	245	3590	3950
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	136	121	193	2080	2210
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	24	<5	30	12	6
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	33	26	49	391	458
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	31
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	56	47	61	217	287
Total Alkalinity as CaCO3	----	1	mg/L	56	47	61	217	319
ED040T: Total Major Anions								
Silicon as SiO2	14464-46-1	0.1	mg/L	5.6	5.6	12.9	4.3	3.8
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	11	6	35	725	779
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	24	19	20	601	655
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	5	4	8	41	48
Magnesium	7439-95-4	1	mg/L	5	4	7	70	82
Sodium	7440-23-5	1	mg/L	21	17	26	638	680
Potassium	7440-09-7	1	mg/L	5	5	4	10	10
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.09	0.14	0.17	0.02	<0.01
Iron	7439-89-6	0.05	mg/L	0.69	1.20	0.92	<0.05	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.77	0.84	1.39	0.68	0.35
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	0.003	0.002
Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.002	0.002	0.002
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Client sample ID

				SW1	SW2	SW3	SW4	SW5
Client sampling date / time				08-Jun-2016 12:05	08-Jun-2016 12:15	08-Jun-2016 08:25	08-Jun-2016 11:25	08-Jun-2016 11:50
Compound	CAS Number	LOR	Unit	ES1612375-001	ES1612375-002	ES1612375-003	ES1612375-004	ES1612375-005
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Barium	7440-39-3	0.001	mg/L	0.043	0.046	0.061	0.038	0.058
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	0.001	0.001
Copper	7440-50-8	0.001	mg/L	0.001	<0.001	0.002	0.004	0.002
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L	0.002	0.002	0.002	0.062	0.068
Manganese	7439-96-5	0.001	mg/L	0.050	0.041	0.025	0.011	0.005
Nickel	7440-02-0	0.001	mg/L	0.001	<0.001	0.001	0.002	0.002
Rubidium	7440-17-7	0.001	mg/L	0.002	0.002	0.002	0.009	0.006
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	0.02	0.01
Strontium	7440-24-6	0.001	mg/L	0.090	0.073	0.120	3.52	4.58
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	0.009	<0.005
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.3	0.3	0.3	0.4	0.5
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.20	0.16	0.04	1.19	0.09
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	0.18	0.07
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.03	<0.01	0.04	9.15	3.37
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.03	<0.01	0.04	9.33	3.44
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.07	0.08	0.06	0.03	0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	2.02	1.60	2.51	36.4	41.1
Total Cations	----	0.01	meq/L	1.70	1.40	2.21	35.8	39.0
Ionic Balance	----	0.01	%	----	----	----	0.82	2.64
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW1	SW2	SW3	SW4	SW5
Client sampling date / time					08-Jun-2016 12:05	08-Jun-2016 12:15	08-Jun-2016 08:25	08-Jun-2016 11:25	08-Jun-2016 11:50
Compound	CAS Number	LOR	Unit		ES1612375-001	ES1612375-002	ES1612375-003	ES1612375-004	ES1612375-005
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		122	87.0	97.1	87.7	102
Toluene-D8	2037-26-5	2	%		97.4	94.0	101	92.1	105
4-Bromofluorobenzene	460-00-4	2	%		94.6	86.9	92.5	87.9	93.0



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW6	SW7	SW8	SW9	SW10
Client sampling date / time					08-Jun-2016 11:15	08-Jun-2016 13:30	08-Jun-2016 13:15	08-Jun-2016 11:05	08-Jun-2016 10:45
Compound	CAS Number	LOR	Unit		ES1612375-006	ES1612375-007	ES1612375-008	ES1612375-009	ES1612375-010
					Result	Result	Result	Result	Result
EA005: pH									
pH Value	----	0.01	pH Unit		8.64	7.67	7.95	7.83	8.56
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		4040	382	305	1200	6290
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		2480	266	238	636	3760
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		10	8	8	<5	<5
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		468	52	60	201	791
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		27	<1	<1	<1	39
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		286	106	111	204	468
Total Alkalinity as CaCO3	----	1	mg/L		314	106	111	204	507
ED040T: Total Major Anions									
Silicon as SiO2	14464-46-1	0.1	mg/L		3.9	14.4	20.9	3.2	6.8
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		812	15	6	218	1090
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		677	47	28	140	1110
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		49	6	9	31	86
Magnesium	7439-95-4	1	mg/L		84	9	9	30	140
Sodium	7440-23-5	1	mg/L		732	45	31	151	1100
Potassium	7440-09-7	1	mg/L		11	11	12	4	10
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	0.14	0.22	0.04	<0.01
Iron	7439-89-6	0.05	mg/L		<0.05	0.55	1.76	<0.05	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.15	2.29	3.07	0.72	0.18
Antimony	7440-36-0	0.001	mg/L		0.003	<0.001	<0.001	<0.001	0.005
Arsenic	7440-38-2	0.001	mg/L		0.003	0.003	0.006	0.002	0.006
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW6	SW7	SW8	SW9	SW10
Client sampling date / time				08-Jun-2016 11:15	08-Jun-2016 13:30	08-Jun-2016 13:15	08-Jun-2016 11:05	08-Jun-2016 10:45	
Compound	CAS Number	LOR	Unit	ES1612375-006	ES1612375-007	ES1612375-008	ES1612375-009	ES1612375-010	
				Result	Result	Result	Result	Result	
EG020T: Total Metals by ICP-MS - Continued									
Barium	7440-39-3	0.001	mg/L	0.048	0.071	0.085	0.055	0.042	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Cobalt	7440-48-4	0.001	mg/L	<0.001	0.001	0.002	<0.001	0.002	
Copper	7440-50-8	0.001	mg/L	0.002	0.002	0.002	<0.001	0.004	
Lead	7439-92-1	0.001	mg/L	<0.001	0.001	0.002	<0.001	<0.001	
Lithium	7439-93-2	0.001	mg/L	0.071	0.002	0.002	0.006	0.132	
Manganese	7439-96-5	0.001	mg/L	0.005	0.132	0.205	0.039	0.006	
Nickel	7440-02-0	0.001	mg/L	0.003	0.003	0.003	0.001	0.005	
Rubidium	7440-17-7	0.001	mg/L	0.008	0.003	0.005	0.002	0.011	
Selenium	7782-49-2	0.01	mg/L	0.02	<0.01	<0.01	<0.01	0.01	
Strontium	7440-24-6	0.001	mg/L	4.53	0.175	0.174	0.977	10.4	
Zinc	7440-66-6	0.005	mg/L	<0.005	0.015	0.006	<0.005	<0.005	
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.05	<0.05	<0.05	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	0.5	0.4	0.6	0.5	0.2	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.11	0.44	0.42	0.03	0.32	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	0.08	0.05	<0.01	<0.01	0.40	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	5.42	0.34	0.01	<0.01	8.18	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	5.50	0.39	0.01	<0.01	8.58	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.03	0.13	0.16	0.02	<0.01	
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L	42.3	3.76	3.13	12.6	64.1	
Total Cations	----	0.01	meq/L	----	----	2.97	----	----	
Total Cations	----	0.01	meq/L	41.5	3.28	----	10.7	63.9	
Ionic Balance	----	0.01	%	----	----	2.70	----	----	
Ionic Balance	----	0.01	%	0.98	6.81	----	8.10	0.20	
EP080/071: Total Petroleum Hydrocarbons									



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Client sample ID

				SW6	SW7	SW8	SW9	SW10
Client sampling date / time				08-Jun-2016 11:15	08-Jun-2016 13:30	08-Jun-2016 13:15	08-Jun-2016 11:05	08-Jun-2016 10:45
Compound	CAS Number	LOR	Unit	ES1612375-006	ES1612375-007	ES1612375-008	ES1612375-009	ES1612375-010
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	125	81.6	105	104	113
Toluene-D8	2037-26-5	2	%	93.1	108	94.5	87.1	100
4-Bromofluorobenzene	460-00-4	2	%	92.5	88.4	85.8	83.7	96.6



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW11	SW12	SW13	SW14	SW15
Client sampling date / time					08-Jun-2016 09:00	08-Jun-2016 11:40	08-Jun-2016 08:05	08-Jun-2016 10:35	08-Jun-2016 08:40
Compound	CAS Number	LOR	Unit		ES1612375-011	ES1612375-012	ES1612375-013	ES1612375-014	ES1612375-015
					Result	Result	Result	Result	Result
EA005: pH									
pH Value	----	0.01	pH Unit		7.20	8.40	7.93	7.07	6.97
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		114	3060	593	261	407
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		236	1770	350	181	285
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		78	20	15	<5	14
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		16	248	111	51	53
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		22	105	131	51	50
Total Alkalinity as CaCO3	----	1	mg/L		22	105	131	51	50
ED040T: Total Major Anions									
Silicon as SiO2	14464-46-1	0.1	mg/L		31.5	4.1	17.4	16.3	19.7
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		9	456	76	39	32
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		15	595	62	26	70
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		3	30	18	9	8
Magnesium	7439-95-4	1	mg/L		2	42	16	7	8
Sodium	7440-23-5	1	mg/L		11	562	70	26	49
Potassium	7440-09-7	1	mg/L		5	4	3	4	3
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.34	0.02	0.10	0.31	0.24
Iron	7439-89-6	0.05	mg/L		3.29	<0.05	0.18	0.25	0.41
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		7.52	0.83	1.92	1.42	3.72
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		0.004	<0.001	0.002	<0.001	0.001
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Client sample ID

				SW11	SW12	SW13	SW14	SW15
Client sampling date / time				08-Jun-2016 09:00	08-Jun-2016 11:40	08-Jun-2016 08:05	08-Jun-2016 10:35	08-Jun-2016 08:40
Compound	CAS Number	LOR	Unit	ES1612375-011	ES1612375-012	ES1612375-013	ES1612375-014	ES1612375-015
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Barium	7440-39-3	0.001	mg/L	0.092	0.038	0.046	0.032	0.044
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	0.002	<0.001	0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.006	0.002	0.002	0.005	0.005
Lead	7439-92-1	0.001	mg/L	0.006	<0.001	0.001	<0.001	0.002
Lithium	7439-93-2	0.001	mg/L	0.005	0.020	0.003	0.004	0.005
Manganese	7439-96-5	0.001	mg/L	0.060	0.010	0.209	0.041	0.024
Nickel	7440-02-0	0.001	mg/L	0.004	0.002	0.002	0.002	0.003
Rubidium	7440-17-7	0.001	mg/L	0.011	0.002	0.004	0.003	0.007
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium	7440-24-6	0.001	mg/L	0.045	2.24	0.243	0.146	0.167
Zinc	7440-66-6	0.005	mg/L	0.018	<0.005	0.006	0.012	0.017
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.3	0.5	0.5	0.2	0.2
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.13	<0.01	0.07	<0.01	0.03
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.06	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.14	0.67	0.13	0.51	0.11
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.14	0.73	0.13	0.51	0.11
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.12	0.01	0.05	0.11	0.06
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	1.05	28.4	5.95	2.56	3.64
Total Cations	----	0.01	meq/L	0.92	29.5	5.34	2.26	3.26
Ionic Balance	----	0.01	%	----	1.92	5.45	----	5.44
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW11	SW12	SW13	SW14	SW15
Client sampling date / time					08-Jun-2016 09:00	08-Jun-2016 11:40	08-Jun-2016 08:05	08-Jun-2016 10:35	08-Jun-2016 08:40
Compound	CAS Number	LOR	Unit		ES1612375-011	ES1612375-012	ES1612375-013	ES1612375-014	ES1612375-015
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		105	109	122	80.5	84.8
Toluene-D8	2037-26-5	2	%		87.2	92.1	88.8	95.0	92.7
4-Bromofluorobenzene	460-00-4	2	%		84.6	89.4	85.3	81.8	86.7



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW16	SW17	SW18	SW19	SW20
Client sampling date / time					08-Jun-2016 12:40	08-Jun-2016 12:55	08-Jun-2016 12:30	08-Jun-2016 10:15	08-Jun-2016 09:30
Compound	CAS Number	LOR	Unit		ES1612375-016	ES1612375-017	ES1612375-018	ES1612375-019	ES1612375-020
					Result	Result	Result	Result	Result
EA005: pH									
pH Value	----	0.01	pH Unit		7.61	7.55	6.90	8.03	7.93
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		512	515	719	671	222
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		376	354	532	773	1130
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		7	<5	6	62	48
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		69	64	114	126	31
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		59	59	47	107	62
Total Alkalinity as CaCO3	----	1	mg/L		59	59	47	107	62
ED040T: Total Major Anions									
Silicon as SiO2	14464-46-1	0.1	mg/L		18.5	19.1	15.7	78.4	103
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		36	36	78	59	17
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		102	101	142	105	23
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		11	11	16	19	6
Magnesium	7439-95-4	1	mg/L		10	9	18	19	4
Sodium	7440-23-5	1	mg/L		65	64	80	72	26
Potassium	7440-09-7	1	mg/L		2	3	5	8	5
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.21	0.18	0.20	<0.01	0.05
Iron	7439-89-6	0.05	mg/L		0.22	0.22	0.42	0.30	0.50
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		3.49	3.45	3.83	20.2	31.3
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		<0.001	0.001	0.002	0.009	0.007
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	0.001



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Client sample ID

				SW16	SW17	SW18	SW19	SW20
Client sampling date / time				08-Jun-2016 12:40	08-Jun-2016 12:55	08-Jun-2016 12:30	08-Jun-2016 10:15	08-Jun-2016 09:30
Compound	CAS Number	LOR	Unit	ES1612375-016	ES1612375-017	ES1612375-018	ES1612375-019	ES1612375-020
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Barium	7440-39-3	0.001	mg/L	0.052	0.064	0.075	0.242	0.296
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	0.001	0.001	0.002	0.009	0.009
Copper	7440-50-8	0.001	mg/L	0.005	0.007	0.006	0.012	0.026
Lead	7439-92-1	0.001	mg/L	0.001	0.002	0.003	0.012	0.021
Lithium	7439-93-2	0.001	mg/L	0.004	0.005	0.009	0.017	0.025
Manganese	7439-96-5	0.001	mg/L	0.013	0.019	0.054	0.373	0.176
Nickel	7440-02-0	0.001	mg/L	0.002	0.017	0.004	0.012	0.018
Rubidium	7440-17-7	0.001	mg/L	0.006	0.005	0.007	0.026	0.039
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium	7440-24-6	0.001	mg/L	0.191	0.186	0.448	0.466	0.196
Zinc	7440-66-6	0.005	mg/L	0.017	0.023	0.022	0.041	0.076
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	0.06	<0.05
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.2	0.2	0.2	0.3	0.6
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	0.28	0.07	0.03
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.09	0.09	0.03	0.62	0.36
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.09	0.09	0.03	0.62	0.36
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.05	0.04	0.06	0.34	0.40
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	4.80	4.78	6.57	6.33	2.24
Total Cations	----	0.01	meq/L	4.25	4.15	5.89	5.85	1.89
Ionic Balance	----	0.01	%	6.15	7.04	5.48	3.95	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW16	SW17	SW18	SW19	SW20
Client sampling date / time					08-Jun-2016 12:40	08-Jun-2016 12:55	08-Jun-2016 12:30	08-Jun-2016 10:15	08-Jun-2016 09:30
Compound	CAS Number	LOR	Unit		ES1612375-016	ES1612375-017	ES1612375-018	ES1612375-019	ES1612375-020
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		78.0	107	98.9	123	87.7
Toluene-D8	2037-26-5	2	%		103	96.2	90.2	90.7	108
4-Bromofluorobenzene	460-00-4	2	%		86.7	85.3	85.1	88.2	94.6



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW21	SW22	----	----	----
Client sampling date / time					08-Jun-2016 09:15	08-Jun-2016 09:50	----	----	----
Compound	CAS Number	LOR	Unit		ES1612375-021	ES1612375-022	-----	-----	-----
				Result	Result		----	----	----
EA005: pH									
pH Value	----	0.01	pH Unit		7.75	5.89	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		153	16500	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		700	11900	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		44	<5	----	----	----
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		26	3950	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		50	45	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		50	45	----	----	----
ED040T: Total Major Anions									
Silicon as SiO2	14464-46-1	0.1	mg/L		66.9	19.2	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		8	3040	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		13	4290	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		4	404	----	----	----
Magnesium	7439-95-4	1	mg/L		4	714	----	----	----
Sodium	7440-23-5	1	mg/L		16	2720	----	----	----
Potassium	7440-09-7	1	mg/L		3	18	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.08	1.10	----	----	----
Iron	7439-89-6	0.05	mg/L		0.40	0.53	----	----	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		18.6	1.80	----	----	----
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	----	----	----
Arsenic	7440-38-2	0.001	mg/L		0.005	<0.001	----	----	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	0.002	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW21	SW22	----	----	----
Client sampling date / time					08-Jun-2016 09:15	08-Jun-2016 09:50	----	----	----
Compound	CAS Number	LOR	Unit		ES1612375-021	ES1612375-022	-----	-----	-----
					Result	Result	----	----	----
EG020T: Total Metals by ICP-MS - Continued									
Barium	7440-39-3	0.001	mg/L		0.113	0.122	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	0.0008	----	----	----
Cobalt	7440-48-4	0.001	mg/L		0.005	0.116	----	----	----
Copper	7440-50-8	0.001	mg/L		0.015	0.006	----	----	----
Lead	7439-92-1	0.001	mg/L		0.011	<0.001	----	----	----
Lithium	7439-93-2	0.001	mg/L		0.014	0.054	----	----	----
Manganese	7439-96-5	0.001	mg/L		0.093	6.75	----	----	----
Nickel	7440-02-0	0.001	mg/L		0.011	0.061	----	----	----
Rubidium	7440-17-7	0.001	mg/L		0.029	0.007	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	----	----	----
Strontium	7440-24-6	0.001	mg/L		0.117	10.7	----	----	----
Zinc	7440-66-6	0.005	mg/L		0.047	0.169	----	----	----
Boron	7440-42-8	0.05	mg/L		<0.05	0.22	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.4	0.3	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.03	1.40	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	0.07	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.31	0.15	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.31	0.22	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.26	0.11	----	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		1.53	185	----	----	----
Total Cations	----	0.01	meq/L		1.30	198	----	----	----
Ionic Balance	----	0.01	%		----	3.25	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	<50	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW21	SW22	----	----	----
Client sampling date / time					08-Jun-2016 09:15	08-Jun-2016 09:50	----	----	----
Compound	CAS Number	LOR	Unit		ES1612375-021	ES1612375-022	-----	-----	-----
				Result	Result		----	----	----
EP080/071: Total Petroleum Hydrocarbons - Continued									
C15 - C28 Fraction	----	100	µg/L		<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	----	----	----
Toluene	108-88-3	2	µg/L		<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	----	----	----
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	----	----	----
^ Sum of BTEX	----	1	µg/L		<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	<5	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		100	81.8	----	----	----
Toluene-D8	2037-26-5	2	%		117	107	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		107	91.1	----	----	----



Surrogate Control Limits

Sub-Matrix: **WATER**

		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128