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Project: Kerosene Vale Ash Dam and Dry Ash Repository

Water Quality Assessment from April, 2015 to March, 2016 in relation to the Decommissioned Wallerawang Power Station

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Summary

This annual assessment report for 2015/16 reporting period has been prepared for the decommissioned and partly capped Kerosene Vale Ash Repository (KVAR) to address the requirements of the NSW Department of Planning and Environment's Consent conditions for monitoring to be undertaken to ascertain whether there have been any significant effects of the dry ash placement on the local surface or groundwater quality. Due to the complex, locally mineralised conditions, the assessment attempts to take these conditions into account, including any residual effects of the Kerosene Vale Ash Dam (KVAD) and Sawyers Swamp Creek Ash Dam (SSCAD).

The assessment found no significant effects on surface and groundwater quality due to the now decommissioned ash repository. This finding is consistent with that from previous reports and the predictions of the Stage 2 Environmental Assessment on the basis of limited rainfall infiltration into the dry ash placement.

The assessment of effects of the residual wet ash in the Kerosene Vale Ash Dam, which is beneath the Kerosene Vale Ash Repository, found no significant effects of its groundwater seepage on the local surface or groundwater. This was found to be due to the relatively low concentrations of ash related leachates from the long-held ash, leaving mainly leachates from the pre-existing coal waste/chitter in the mine void beneath the KVAD.

The local water table inside the KVAD and at the KVAR receiving groundwater bore WGM1/D5 has shown a noticeable decrease since 2012, possibly due to the effects of the KVAR subsurface drain and pumping from Lidsdale Cut, together with the effects of prolonged dry weather. This revealed the process whereby high concentrations of salts and trace metals, including aluminium, are released from pyrites in the coal waste/chitter in the area.

The Lidsdale Cut pond showed a significant decrease in salinity, trace metals and aluminium during the current period. This indicates a reduction in pyrite oxidation in the coal waste/chitter that forms the Lidsdale Cut mine void. It appears that the current management of maintaining a target water level in the pond is providing the observed improvements in water quality.

The distribution of aluminium in groundwater in the area was investigated and the most likely source is coal pyrites in the local Lidsdale Cut and KVAD coal mine voids, as well as in the benches used to support the KVAD walls. From these observations, it was suggested that the rare events of aluminium precipitation in Sawyers Swamp Creek appear to be due to leachates from the coal waste/chitter in the area being mobilised during high rainfall runoff events under coal pyrite oxidation conditions with the prevailing acidic conditions.

Due to the effects of the Springvale coal mine discharge, the Sawyers Swamp Creek Ash Dam (SSCAD) was shown to have no significant effects on the surface water quality of Sawyers Swamp Creek.. During periods with only natural stream flows and no mine water, both the KVAR and the KVAD seepages were estimated to be too small to have a significant effect on the local groundwater quality or on Sawyers Swamp Creek water quality. The SSCAD seepage to the creek through the v-notch was also found to have no significant effects on the creek under natural flow conditions. Some trace metals in the ash dam pond, notably zinc, showed an increase during the current period and it is recommended that the current low dissolved oxygen concentrations in the SSCAD pond be investigated as a possible cause.

Groundwater seepage from the SSCAD was also found to have no significant effects on the groundwater up-gradient of the Kerosene Vale Ash Repository. However, some seepage from the northern section of the SSCAD wall was evident, but the changes in salinity during 2014/15 and 2015/16 indicated that most of the salinity may be from the wider catchment rather than the ash dam.

1. Introduction

EnergyAustralia NSW previously advised that Wallerawang Power Station, including the Kerosene Vale Ash Repository (KVAR), ceased operation and subsequent ash production in March, 2014. Aurecon undertook the first surface and groundwater quality assessment report for the decommissioned KVAR in 2014/15 (Aurecon, 2015) and has been engaged to undertake the annual assessment report over the period April, 2015 to March, 2016, which includes changes in water quality over the time since decommissioning. Aurecon's scope also requires examination of long-term water quality changes from pre-dry ash placement to Stages 1 and II and during the decommissioned period to March, 2016.

The 2015/16 report is required for the NSW Department of Planning and Environment's Development Consent conditions for the Kerosene Vale Ash Repository because the Wallerawang Power Station Environment Protection Licence (EPL) L766 of 11th January, 2016 has been retained by EnergyAustralia NSW.

To assess the effects, if any, of the dry ash KVAR placement, it is necessary to also consider the effects of other sources of surface and groundwater on the receiving waters of Sawyers Swamp Creek. These include the residual effects of the previous wet slurry Kerosene Vale Ash Dam (KVAD), which is under the KVAR, seepage from Sawyers Swamp Creek Ash Dam, and to allow for other, non-ash related catchment inputs, including the local mineralised background conditions. The previous report (Aurecon, 2015) indicated that most of the leachates appearing in the local groundwater and in Sawyers Swamp Creek are from the pre-existing coal waste/chitter in the mine void beneath the Repository, rather than from the ash placement in the KVAD, or from rainfall infiltration through the KVAR into the KVAD.

The 2014/15 report findings are in agreement with that of previous reports, which found that the Stage 1 and Stage 2 dry ash placements of the KVAR were not measurably affecting the groundwater quality, when assessed in the context of the local coal area mineral effects (Connell Wagner, 2008 and Aurecon, 2014, 2015). In addition, although seepage due to limited rainfall infiltration through the KVAR dry ash may have combined with seepage from the KVAD, beneath the KVAR, and entered Sawyers Swamp Creek, no significant effects on the creek receiving water quality has been indicated. Recently, the dominant water quality and flow effects of the Springvale Mine water discharge[1] has made the effects, if any, of seepage from the KVAD/R and Lidsdale Cut (before seepage diversion in July, 2012), as well as from the Sawyers Swamp Creek Ash Dam (SSCAD), essentially undetectable in Sawyers Swamp Creek (Aurecon, 2013, 2014, 2015).

The 2014/15 report also noted that the Lidsdale Cut open-cut mine void is filled with coal waste/chitter because the mine void was back-filled with coal waste/chitter, as were other areas around Sawyers Swamp Creek (see Figure 3). It was suggested that an aluminium deposit in Sawyers Swamp Creek after heavy rainfall in May, 2012 did not originate from the pond in Lidsdale Cut, but from coal waste/chitter leachates previously placed over the wider area of Kerosene Vale. The reason for this view was that the aluminium concentration in the Lidsdale Cut pond did not increase until after the appearance of aluminium in the creek.

[1] The Springvale Mine water discharge to Sawyers Swamp Creek was intermittent since 2009, increased in 2012 and has been continuous since 2013

In recent years, it has been necessary to assess influences of the Springvale Mine water discharge of about 18 ML/day to Sawyers Swamp Creek, which was found to dominate the water quality in Sawyers Swamp Creek (Aurecon, 2014, 2015). The mine water discharge dilutes seepage from the Sawyers Swamp Creek Ash Dam (SSCAD) wall, such that the water quality in the creek reflects that of the mine water.

The approach of assessing potential effects of the KVAR on surface and groundwater by taking into account the background conditions has been continued in the 2015/16 report.

1.1 Background

In 2002, Delta Electricity (now EnergyAustralia NSW) obtained approval for conversion of the wet slurry ash (KVAD) placement process at Wallerawang Power Station to dry ash. The dry placement is called the Kerosene Vale Ash Repository (KVAR). Stage 1 of the placement was completed and capped in February, 2009. Approval was obtained for further placement in the Stage 2 Area at the KVAR in November, 2008. The Stage 2 Area placement began in April, 2009 and its second phase began in January, 2012. This placement was ongoing until cessation of operations in March, 2014.

Two major issues related to the water quality in Sawyers Swamp Creek became evident in the 2013/14 report (Aurecon, 2014). EnergyAustralia NSW advised Aurecon that all the Springvale Coal mine water has flowed into the creek since 1st July 2013. This change occurred because the mine water was no longer required to be sent directly to the power station for cooling water, so the emergency Springvale Coal mine water discharge point to upper Sawyers Swamp Creek (LDP20, see Figure 2) was removed from the Wallerawang Power Station licence on 2nd August, 2012 and became part of the Springvale Colliery licence. This discharge meant that ash related seepage effects from the KVAR, KVAD and SSCAD, if any, on the water quality in Sawyers Swamp Creek became essentially undetectable, due to the large volume of Springvale Mine Water within the system. It also meant that the creek monitoring site, WX7, has been compromised as the overall receiving water site for the ash placement area.

The other main issue at that time was that the Lidsdale Cut discharge to Sawyers Swamp Creek was stopped since July, 2012 in response to an aluminium incident in the creek, which was thought to originate from the Lidsdale Cut pond water quality, and by implication to seepage from the wet ash placed in the KVAD, beneath the KVAD, rather than from the naturally mineralised surrounding coal mine areas (see Figure 3, Section 2. Since then, the pond water has been pumped to the truck wash and then to the ash return canal (shown in Figure 1) and is treated at the station. These changes mean that the Lidsdale Cut pond has ceased to be part of the groundwater receiving waters for seepages from the KVAD/R area, and only the groundwater bore D5 has been considered since then as a groundwater receiving water site.

The 2014/15 report noted that the groundwater levels in the KVAD had been drawn down, apparently by a general reduction in levels due to the combined effects of pumping water from Lidsdale Cut, together with the initial drawdown by earlier installation of subsurface drains shown in Figure 1. It was suggested that the increased concentrations of trace metals in the KVAD groundwater, as well as at bore D5, in recent years was related to the groundwater level decreases and resulting chemical changes in the coal waste/chitter that forms the KVAD void and its presence in the wider area of Kerosene Vale.

The database from April, 2015 to March, 2016 has been included with that from previous years to examine changes since decommissioning and the current water quality and trace metal concentrations, including aluminium, in the KVAD groundwater, the KVAR groundwater bores, in Lidsdale Cut and influence of the groundwater inflows, SSCAD seepage and Springvale mine water on Sawyers Swamp Creek.

1.2 KVAD Subsurface Drains

As a result of the placement of dry ash on top of the KVAD, groundwater from the KVAD rose up into the KVAR dry ash through cracks in the clay capping, so a subsurface drain was installed in October, 2010. A schematic of the seepage diversion system is shown in Figure 1. The subsurface drains lowered the groundwater level so it did not reach the dry ash, and seepage from the KVAD was collected and sent to Lidsdale Cut pond via the existing KVAD toe drains.

Figure 1 also shows bores GW10 and GW11, which sample the groundwater in the KVAD, under the KVAR, on the western side. During 2011/12 the ground water level at bore GW10 was drawn down by about 1.5m following installation of the subsurface drains (Aurecon, 2014) and EnergyAustralia NSW advised Aurecon that GW10 bore was dry in 2014/15, apparently due to the additional effects of pumping water from Lidsdale Cut.

Groundwater seepage flows are still occurring from the northern section of the KVAD wall to Sawyers Swamp Creek and water levels and water quality are sampled by piezometers AP9 and AP17 in that area (Figure 1). Most of this groundwater is directed to Lidsdale Cut by the toe drain pipes.

In combination with the KVAD seepage diversion system, EnergyAustralia NSW also installed a new seepage collection and return system at the Sawyers Swamp Creek Ash Dam to minimise seepage from the ash dam into Sawyers Swamp Creek. The system commenced operating in May, 2010 returning seepage water from the ash dam seepage v-notch, the main seepage point (see Figure 1), and back to the SSCAD.

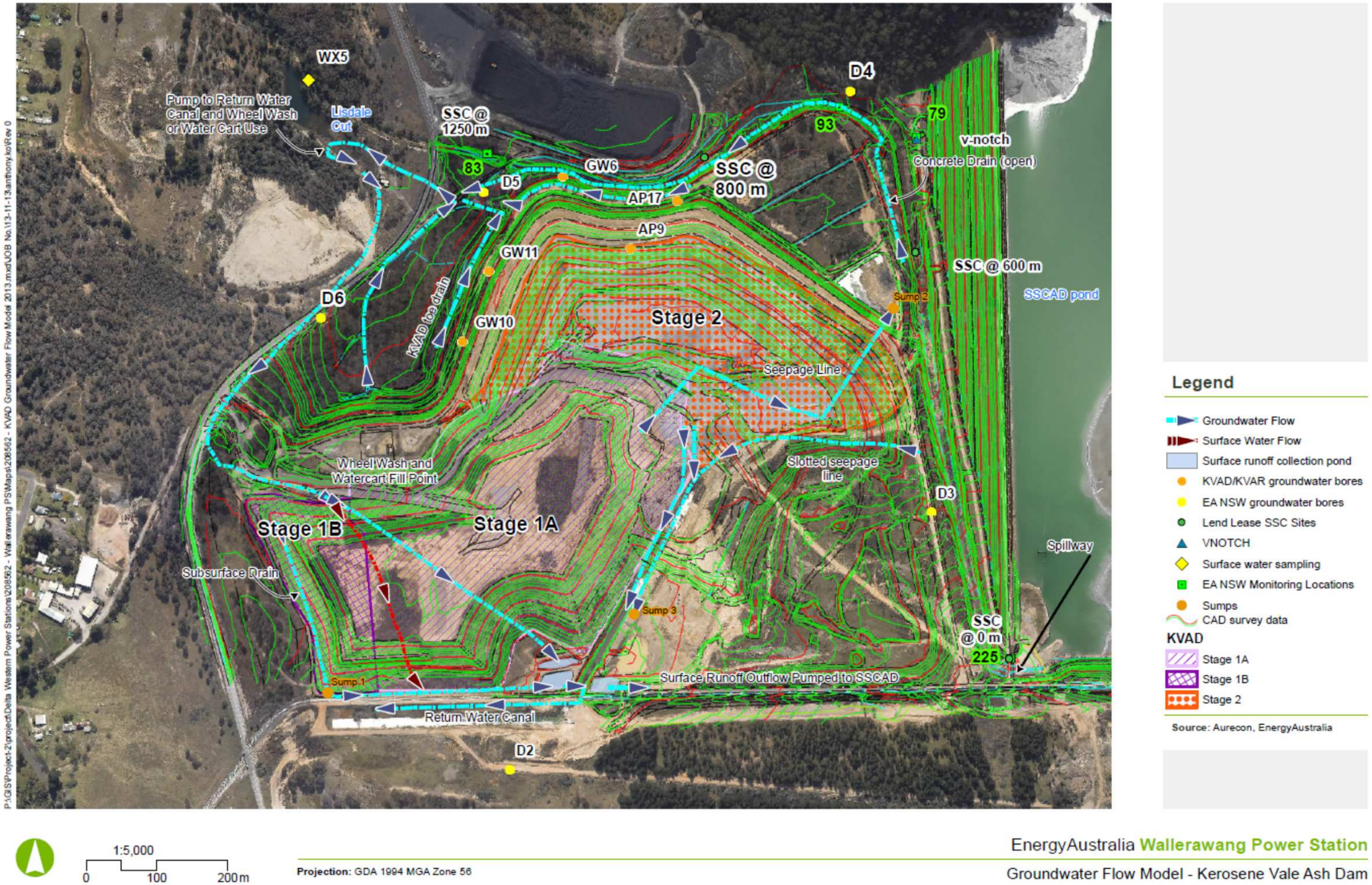

Figure 1: Schematic of Kerosene Vale Dry Ash Placement Area Seepage Diversion works

1.3 Scope

EnergyAustralia NSW advised Aurecon that, although Wallerawang Power Station had ceased operating, an annual water quality report is required for the NSW Planning and Environment's Development Consent conditions for the KVAR, so Aurecon has been requested to undertake the surface and groundwater quality report for 2015/16. EnergyAustralia NSW has advised that they expect the EPA will require evidence that the KVAR during the decommissioning period has not significantly affected surface and groundwater in the area.

Accordingly, the study requires an update of the Kerosene Vale Ash Repository (KVAR) surface and groundwater database from April, 2015 to March, 2016. The groundwater monitoring results are to be assessed to determine any impacts on Sawyers Swamp Creek (SSC) due to groundwater seepage into the creek. This will involve undertaking an assessment of water quality effects of the KVAD which is beneath the KVAR, its effects on the water quality in Lidsdale Cut, and taking into account possible effects of leachates from coal waste/chitter in the Kerosene Vale area. In addition, the water quality effects of the SSCAD pond and the Lidsdale Cut pond on Sawyers Swamp Creek are to be assessed, as well as effects of the Springvale coal mine water discharges to the creek.

Clause 2.0 in the Scope requires the water quality data to be compared to the baseline data and against the baseline condition as assessed in the Environmental Assessment with the ANZECC 2000 – Freshwater Aquatic Ecosystems guidelines (95% PL) to be used as a reference point. However, previous Aurecon reports use locally derived guidelines for elements that are naturally elevated due to the mineralised nature of the area and use Freshwater Aquatic Ecosystems guidelines for mercury and selenium for the ANZECC (2000) required 99% PL. These were previously approved by Delta Electricity and are proposed to be used in the 2015/16 report. In addition, as previously approved by Delta Electricity, previous Aurecon reports, showed that the OEMP requirement to use the groundwater beneath the KVAR as the receiving waters is not relevant to the site, so the 2015/16 report is proposed to continue to use the receiving water sites set out in previous reports, including WX7 in Sawyers Swamp Creek, taking into account that it is affected by the Springvale coal mine discharge. Aurecon will endeavour to use the relevant parts of the OEMP in the assessment of the water quality data.

1.4 Aims and Objectives

The aims and objectives of this report are to assess the effects of the decommissioned KVAR with the understanding that the power station has been decommissioned and that the Lidsdale Cut water is being pumped to the return canal.

One of the primary objectives of the design and operation of the KVAR is to have no adverse impact on the local ground or surface water quality. More specifically, this means that leachates from the dry ash placement should not increase concentrations of the various water quality characteristics in the receiving waters by more than the locally derived guidelines (based on the 90th percentile of the background, pre-placement sites) or the ANZECC (2000) guidelines for protection of aquatic life, whichever is higher.

As noted in all the reports since 2008, the ANZECC (2000) guideline approach of assessing the likely impact of water quality and trace metals in the seepages from the KVAR and KVAD on the receiving surface and groundwater was continued to be used in this report. This included local guidelines for some elements, due to the effects of mineralisation (coal bearing strata and coal wastes/chitter) in the ash placement area. The ANZECC (2000) guideline default trigger values and the locally derived guidelines are shown in Table 1, Section 2.7.

1.5 Previous Report

Aurecon (2015) undertook the 2014/15 annual water quality report, to May, 2015, for assessment of potential effects, if any, of the Kerosene Vale Ash Repository (KVAR) dry ash placement on the local surface and groundwater. The assessment included the effects of seepage diversion from the previous wet ash placement in the KVAD, located under the KVAR, on Sawyers Swamp Creek. The assessment found no likely effects on surface and groundwater quality of the KVAR. This finding is consistent with that from previous reports and the predictions of the Stage 2 Environmental Assessment on the basis of limited rainfall infiltration into the dry ash placement.

In addition, the 2014/15 report found that the sub-surface drains and diversion of the Lidsdale Cut discharge from Sawyers Swamp Creek to the return canal by pumping of water from Lidsdale Cut caused groundwater level decreases, which revealed that the KVAD, beneath the KVAR, contained mainly leachates from the pre-existing coal waste/chitter in the mine void. Accordingly, it was likely that there were no significant effects of the KVAR or the KVAD on the local surface or groundwater (including Lidsdale Cut) by ash related leachates. Coal waste/chitter leachates, including aluminium, were also found to be present in the Lidsdale Cut pond water.

In relation to the Lidsdale Cut seepage, it was suggested (Aurecon, 2014 and 2015) that the increased aluminium and trace metals in Sawyers Swamp Creek in May, 2012, shortly after the February/March, 2012 flood, originated from the local coal mine groundwater or coal waste/chitter in the area and was unlikely to be related to the KVAR or KVAD.

1.6 Information provided by EnergyAustralia NSW

In connection with the assignment, EnergyAustralia NSW has provided copies of:

- Surface and groundwater quality data from April 2015 to March, 2016, including water quality data collected in Sawyers Swamp Creek from upstream and downstream of the SSCAD spillway and v-notch and at the receiving water site, WX7
- Groundwater quality and levels in the SSCAD and KVAD seepage detection bores
- Groundwater quality and levels in the KVAD at bores A9, A17 and GW10 and GW11 as well as the groundwater flow rate (litres/minute) in the KVAD toe drain into Lidsdale Cut
- Water quality data from the SSCAD pond to define the pond water quality
- Water quality data from the Lidsdale Cut pond
- Background surface and groundwater data
- Relevant Lend Lease Infrastructure (LLI) KVAR management reports and water quality data in runoff collection ponds
- Relevant information on the status of the non-operating power station that may affect the local water quality conditions
- Location of any new water quality sampling sites established as part of the decommissioning studies for the power station
- Relevant correspondence with EPA on the water quality expectations in Sawyers Swamp Creek.

1.7 Data Quality

The data contained in this report was provided by EnergyAustralia NSW. The data was checked for outliers using the ANZECC (2000) protocol. In accordance with the protocol, outliers of three times the standard deviation from the mean were removed from the dataset, provided that no environmental changes had occurred that could account for such a significant change. Outliers have an asterisk next to the data in Attachment 2, thereby stopping the result from being used in statistical analyses by Excel.

As the database covers a long period of observations, it is likely that apparent changes in concentrations for trace metals such as silver, cadmium, chromium, copper and mercury may in fact be due to changes in the accuracy or detection limits of the analytical techniques used.

The OEMP requires the existing monitoring program to continue, with the addition of low detection limit analysis for trace metals (to ensure that the detection limit is lower than guideline values). All of the metals tested, except for silver, met these criteria. As the laboratory has not been able to test at the required detection limit, and in the absence of any reason to suppose that silver might be an issue in this case, it is suggested that silver be removed from the sampling program.

Note that some of the data provided had concentrations recorded as less than the detection limit. If the detection limit was less than ANZECC (2000) guideline concentration, it was determined that there was no reason to alter the concentration, so the < sign was removed to allow the spreadsheet to use the data. If the detection limit was higher than the ANZECC (2000) guideline, the concentration was halved.

1.8 Structure of the Report

Section 2 describes the surface and groundwater monitoring program and the ANZECC (2000) and locally derived guideline trigger values. The assessment of the KVAR on surface and groundwater is shown in Section 3. The estimated effects of the KVAD is shown in Section 4 and the Sawyers Swamp Creek Ash Dam surface and groundwater effects is presented in Section 5.

2. Surface and Groundwater Quality Monitoring

This Section provides an overview of the groundwater levels and surface and groundwater quality monitoring at the KVAR used for assessment of effects, if any, of leachates on the local surface and groundwater quality. The water quality sampling sites are shown in Figure 2.

Due to the inputs from the KVAD, which has the long-held wet ash placed in a coal mine void, containing coal waste and chitter in the bottom of the void, as well as from the local mining activities in the area (Figure 3[2]), the assessment takes into account the background conditions and provides the locally derived and ANZECC (2000) guideline trigger values, which apply as assessment criteria to the receiving waters. The discharge of Springvale Mine water to Sawyers Swamp Creek has also been taken into account.

2.1 Monitoring Design for Differentiation of Water Quality Sources

As the KVAR is a dry ash placement with compaction of the ash to minimise rainfall infiltration, the effects on the surface and groundwater quality at the receiving water sites should be, and has been shown to be limited. Due to the KVAR being located in a mineralised area, the assessment of effects has been by examination of the residual effects after allowing for the effects of the mineralised inputs. These inputs are the local coal mine voids containing coal waste/chitter, the KVAD imbedded in its void and Lidsdale Cut void groundwater seepage into Sawyers Swamp Creek. In addition to these inputs, is the SSCAD seepage to the creek.

The water quality monitoring is undertaken to ascertain whether the local/ANZECC (2000) guidelines (as applicable) are met in the groundwater receiving water bores D5 and D6 and in Sawyers Swamp Creek at the final surface water receiving water site, WX7 (see Figure 2). The results of the monitoring are to enable contingency actions and investigations to be initiated in a timely manner if these limits are approached.

[2] Note that the mine area plan shown in Figure 3 was provided without a legend so the areas have been described in the Figure name based on discussions with EnergyAustralia NSW.

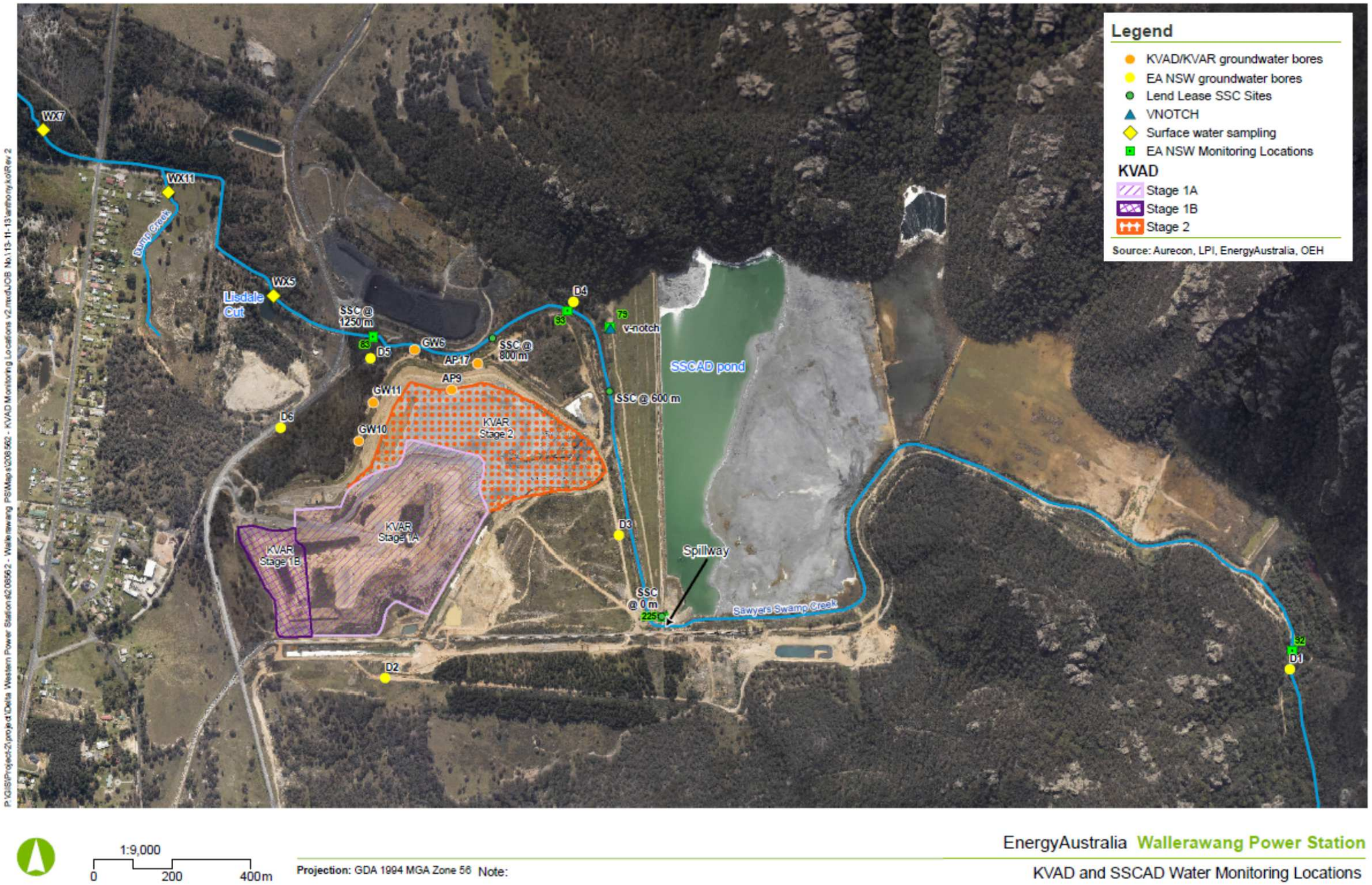

Figure 2: Surface and Groundwater Monitoring Sites for Sawyers Swamp Creek Ash Dam and Kerosene Vale Dry Ash Placement Area

Figure 3 shows coal mine voids containing coal waste/chitter. The void under the KVAD was filled with ash and then capped and the dry ash KVAR placed on top. The Lidsdale Cut open-cut mine void was filled with coal waste/chitter and only a small pond was left to collect local groundwater and the KVAD groundwater seepage via a toe drain. It is considered likely that coal waste/chitter was placed historically over the whole Kerosene Vale area.

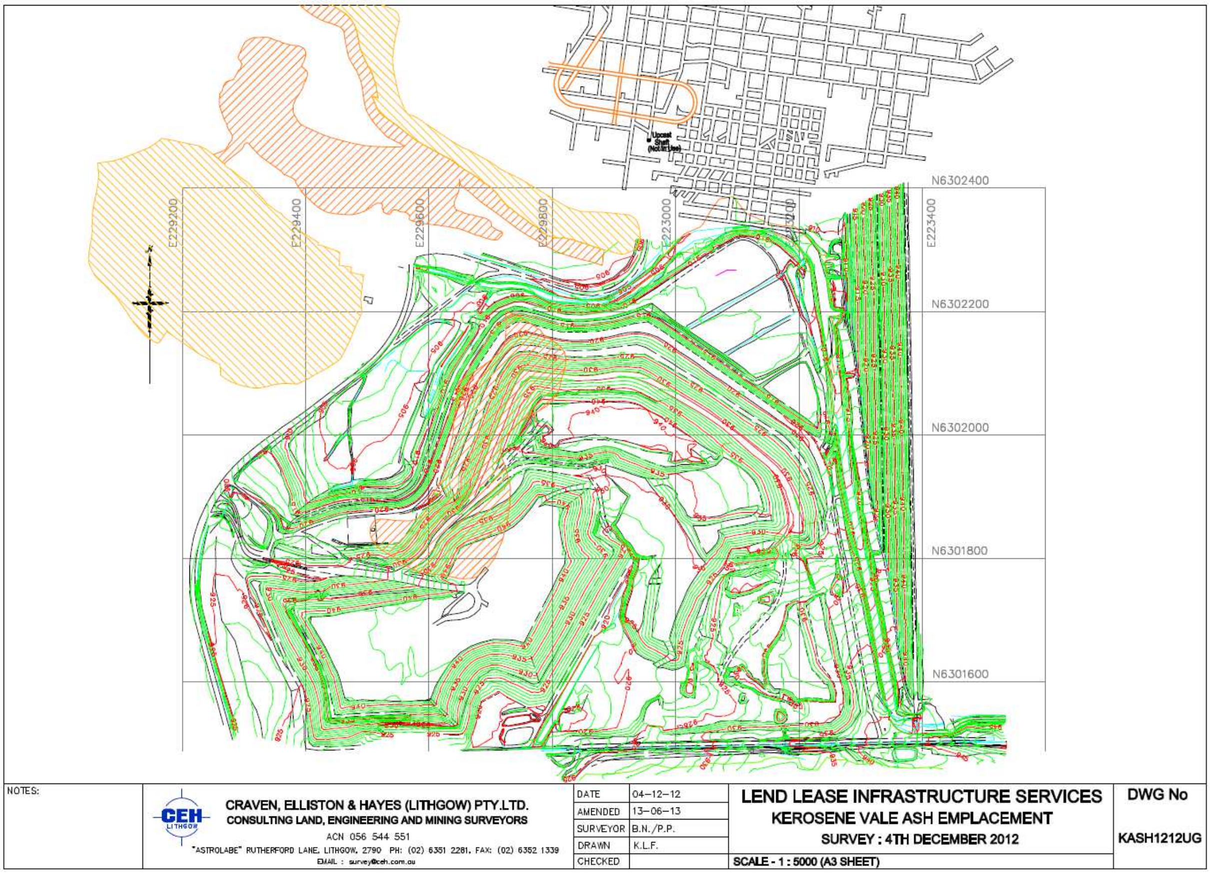

Figure 3. Location of original Kerosene Vale Ash Dam open-cut mine void used to store ash (hashed to right), Lidsdale Cut open-cut mine void filled with coal waste/chitter (hashed to left) and north of the Sawyers Swamp Creek: Centennial Coal surface coal emplacement on top of filled open-cut mine (hash to right, bordered by coal waste/chitter filled open-cut hashed to left) and plan of underground coal mine workings

2.2 Groundwater Monitoring

Piezometers installed in the Stage 2 area of the KVAR measure the amount of rainfall infiltration, accumulating above the KVAD clay capping. The previous report found that some rainfall infiltration was occurring but the piezometer bores are too small to sample for water quality and trace metals, so assessment of the potential effects on the local groundwater and surface water receiving waters had to be estimated (see Section 3).

To allow for the effects of various local sources of groundwater flowing under the KVAR into the KVAD and SSCAD areas, the up-gradient bores (WGM4/D1 and D2) are used as background. The down-gradient bores (WGM4/D3 and D4) are located for detection of the SSCAD seepage. Figure 6 indicates that the groundwater at bore D4 mainly flows to Sawyers Swamp Creek. However, as the groundwater seepage is expected to be slower than that from the much higher hydraulic head in the SSCAD, the SSCAD seepage effects on the creek, if any, would be expected to override any groundwater effects.

Bores WGM4/D5 and D6 are the seepage detection bores for the KVAD, as well as potential for rainfall infiltration and surface runoff from the KVAR to enter and mix with the KVAD groundwater seepage. It is understood that surface runoff from the KVAR is contained on site and in unlined collection ponds (see Section 2.4), so the potential for effects of the KVAR are for limited amounts of surface water to seep into the KVAD beneath the KVAR. These down-gradient bores also sample the combined effects of the local coal mine up-gradient inputs as well as those from the SSCAD and the KVAD and the KVAR. Details of the monitoring design were set out in Aurecon (2012).

2.3 Surface Water Monitoring

The surface water monitoring sites comprise:

- Lidsdale Cut (WX5), which discharged to Sawyers Swamp Creek until July, 2012
- The final receiving water site, WX7, in Sawyers Swamp Creek, which is downstream of Lidsdale Cut and the local background site, WX11, in Dump Creek and upstream of the junction with Sawyers Swamp Creek and the upper Coxs River (Figure 2).

Site WX5 samples the Lidsdale Cut pond which receives groundwater inflows from the local coal mine open-cut, surface runoff and the KVAD toe drains. EnergyAustralia NSW has advised Aurecon that sampling the water quality in the Lidsdale Cut pond from July, 2012 to September, 2013 was not undertaken due to drawdown of the void water level by the pumps that direct the water to the return canal. Sampling of the pond recommenced in October, 2013.

2.3.1 Sampling in Upper Sawyers Swamp Creek

Due to the discharge of mine water from the Springvale Coal Mine into Sawyers Swamp Creek, EnergyAustralia NSW began monitoring at the following five sites in the creek, which are shown as the green squares in Figure 2. The sites are:

- upstream of the SSCAD (site 92)
- at the SSCAD spillway (site 225)
- where the SSCAD v-notch seepage previously entered the creek (EnergyAustraliaNSW has advised that the seepage is now pumped back to the return canal) – site 79
- downstream of the v-notch (site 93)
- Downstream of KVAD (site 83).

These data, together with the routine, long-term Sawyers Swamp Creek data collected by EnergyAustralia NSW at the receiving water site, WX7, were used to identify any further changes, above that found in the previous report in water quality in Sawyers Swamp Creek as a result of the many changes mentioned above.

The monitoring data are shown in spread-sheet format in Attachment 2, including the minimums, maximums, means and post-dry ash median as well as the estimated baseline (pre-placement 90th percentile) and environmental goal concentrations. The data for the current reporting period from April, 2015 to March, 2016 is included with that from the previous report from 2013 to March, 2015 so the changes that have taken place can be seen in one report. The 2015/16 data are also summarised in Tables in the body of the report.

2.4 KVAR Site Monitoring and Runoff Management

Rainfall runoff from the KVAR dry placement area is collected by an ash perimeter drain which directs the runoff to a Collection Pond in the south-eastern corner of the Stage 1A area, as well as a more recent pond to the north-east of the Stage 2 area (Figure 2). It is understood that water pumped from the Lidsdale Cut pond water is directed to the south-eastern corner Collection Pond where it joins the KVAR runoff water. This water is understood to be returned to the power station and treated in the caustic injection plant. It then can be discharged to the Coxs River or pumped back to the SSCAD. It is also understood that some of the collected runoff water is reused for dust suppression by spraying on the dry ash deposit. The collection ponds are normally kept at a low level by pumping water to the power station return canal to prevent it from spilling into Sawyers Swamp Creek (Figure 2).

EnergyAustralia NSW’s contractor for ash placement at the KVAR, Lend Lease Infrastructure has installed piezometers at the site for sampling the groundwater height of groundwater infiltration which accumulates above the clay capping on top of the KVAD. The previous report noted that some piezometers in the KVAR Stage 2 area showed groundwater levels above that of the clay cap, which indicated rainwater infiltration. However, the piezometer bores were too narrow to be sampled for water quality, so the assessment of the potential effects on seepage to Sawyers Swamp Creek, leaking through cracks in the clay cap into the KVAD groundwater, as well as the local groundwater, was undertaken by estimation of the rainfall infiltration, as described in Section 3.1.

The bores GW10 and GW11 and AP9 and AP17, shown in Figure 2, sample the groundwater in the KVAD beneath the KVAR. The data from these bores, together with the local groundwater monitoring, as well as surface water quality monitoring in Sawyers Swamp Creek, was used to assess the surface and groundwater quality at the receiving water sites. The assessment was undertaken for the conditions of no surface discharge from Lidsdale Cut to Sawyers Swamp Creek and the Springvale Mine water discharge as the main flow in the creek.

2.5 Tracers for Dry Ash leachates

As mentioned in previous reports, the main trace metals and elements of interest in the rainfall runoff from the KVAR ash placement area are selenium, sulphate, boron, nickel and zinc. The background conditions in Sawyers Swamp Creek, upstream of the SSCAD at site WX1 (also known as site 92, see Figure 2) shows that aluminium is naturally elevated in the area. The ANZECC (2000) guideline trigger value is 0.055 mg/L for slightly to moderately disturbed systems but averaged 0.37 mg/L prior to the continuous discharge from Springvale since August, 2012 and averaged 1.37 mg/L during 2014/15 (Attachment 2, Section 7), so it has not been used as a tracer for the dry ash placement.

However, as mentioned above, aluminium concentrations in Lidsdale Cut, the KVAD and in the local groundwater bores, as well as in groundwater at KVAR have been examined to determine the source of aluminium that appears occasionally in Sawyers Swamp Creek after heavy rainfall events.

The elements used as ash leachate tracers, except selenium, are also present in the local mineralised coal geology of the area and are mainly due to the placement of mine spoil and chitter in the catchment. Chitter contains pyrites, which release sulphate and trace metals into the local groundwater and surface waters. Hence, selenium is used here as a tracer of the direct effects of the KVAR, as well as the previous wet ash systems in the KVAD and SSCAD on the local surface and groundwater.

Long-term trends in surface and groundwater quality generally use conductivity to trace salinity effects, which in the mineralised area, tends to follow that of sulphate. Sulphate and boron trends are used to show changes due to coal mining activities and selenium concentrations are used as an indicator of flyash management effects. Selenium concentrations are examined for trends if they consistently exceed the ANZECC (2000) guideline of 0.005 mg/L. Boron is used to monitor the effects of coal mining activities and can be used to represent potential effects of other trace metals.

2.6 Groundwater Levels

The water levels in the groundwater bores inside the KVAD (AP9, AP17 and GW11, note that GW10 is dry), as well as at the receiving water bores D5 and D6 (between the KVAD and Lidsdale Cut) are monitored to allow identification of seepage from the KVAD. Bores WGM1/D5 and D6 are situated down-gradient of the ash placement and up-gradient of the Lidsdale Cut to provide early detection of leachates from the KVAR placement area. Effects of the KVAR on groundwater level changes at these bores are also monitored.

The bores up-gradient of the KVAD are used to define the concentration of dissolved elements and the direction of water movement in the areas from up-gradient of the ash placement areas to Lidsdale Cut. Their interaction with the groundwater under the dry ash placement and inside the KVAD are shown in Figure 6, Section 4.4.

The groundwater level data are also used to monitor any rainfall infiltration accumulating above the clay capping in the KVAR, as well as confirming that the groundwater level in the KVAD is not reaching the dry ash placement above it since the subsurface drains were installed.

2.7 Climatic Conditions

The average annual rainfall at the Lithgow gauge over the period of KVAR ash placement from 2003 to March, 2016 decreased from 770 mm/year in 2014/15 to 741 mm/year (Attachment 1), which is 86% of the long-term average annual rainfall of 863 mm/year. During the period April, 2015 to March, 2016, the monthly average rainfall was only 61.8 mm/month and was below the long-term average of 72 mm/month every month, except during April, 2015 and January, 2016 when high rainfall events occurred of 184 and 167 mm, respectively.

Since the Stage 2A placement began in April, 2010, there has been a series of wet summers due to above average rainfall events. The most recent occurred in February/March, 2012 with a total of 342 mm, February/March, 2013 (total of 297 mm), 299mm in December and January, 2015 and 270mm in summer 2015/16 while the 2014 summer was relatively dry (see Attachment 1).

2.8 Methods

Routine surface and groundwater water quality monitoring in the area is undertaken monthly on behalf of EnergyAustralia NSW by Nalco Analytical Resources who measure conductivity, pH and temperature in the field with a calibrated instrument.

In house methods[3] based upon Standard Methods (APHA, 1998) are used for the general water quality characteristics of alkalinity, sulphate, chloride, calcium, magnesium, sodium, potassium, total dissolved solids (TDS) and total suspended solids (TSS, also known as non-filterable residue, NFR). The trace metals and elements monitored are the same for surface and groundwater: copper, cadmium, chromium, lead, zinc, iron, manganese, mercury, selenium, silver, arsenic, barium, boron and fluoride. Molybdenum, nickel and beryllium have been monitored since July, 2007 but beryllium was stopped in April, 2010 and aluminium has been monitored since July, 2010.

EnergyAustralia NSW has advised that the in-house methods are equivalent to those specified in DEC (2004), which also uses Standard Methods. (In this regard, it is relevant to note that the groundwater and Sawyers Swamp Creek monitoring is not required under the POEO licence). Trace metals were unfiltered, except for iron and manganese.

Groundwater bores are bailed and sampled after allowing time for the water level in the bore to re-establish. The depth to the water level from the top of the bore pipe is measured using a dip meter and the water surface elevation is calculated to AHD(m) after allowing for the pipe height.

Since April, 2006 the detection limits (DL) for routine monitoring of most trace metals tested were lower than the ANZECC (2000) guidelines (Table 1). Particular attention has been directed at the trace metals arsenic, cadmium, chromium, copper, mercury, nickel and lead, as well as the trace element selenium, which have been analysed with a low detection limit. However, due to sample matrix interference, silver has continued to be analysed above the ANZECC guideline trigger value of 0.00005mg/L since November, 2001 (see Attachment 2).

2.9 Guidelines

As used in previous reports since 2008, the principle of the ANZECC (1995) guidelines for protection of groundwater, where the potential future use of the water resource is considered, has been taken into account. In this regard, the Irrigation, Ecosystem and additional guidelines for protection of livestock or drinking water has been used, where appropriate, to provide a wider context of the ANZECC (2000) guidelines, to define acceptable ambient water quality at the KVAR Stage 2 receiving water sites.

The ANZECC Guidelines for Groundwater Protection in Australia (1995) and the NEPC (1999, update in May, 2013) require the background water quality in groundwater bores to be taken into account. As the NEPC (1999), and the updated 2013 version, did not define the meaning of "background" concentrations for groundwater, the baseline concentrations were continued to be defined as the 90th percentile of the pre-placement concentrations, or the ANZECC guideline default trigger values, whichever is higher. Use of the background 90th percentiles is taken from the ANZECC (2000) guideline procedure for condition 3, highly modified catchments, which generally occur in mineralised areas.

Local guidelines are based on the ANZECC (2000) guideline approach of estimating local guidelines using the 90th percentile for naturally mineralised, highly disturbed groundwater. Hence, the background 90th percentiles that are higher than the default trigger values, are used as the local guidelines. The local and ANZECC guideline trigger values used are called the Environmental Goals and are shown in Table 1.

The groundwater background concentrations use the pre-placement data from the background bore, WGM1/D2, and elevated concentrations at the seepage detection bore WGM1/D5 and Lidsdale Cut

[3] Nalco has NATA accreditation Number 1099 and accredited for ISO/IEC 17025

(WX5) were also taken into account. The surface water background concentrations use the pre-placement data at Dump Creek, WX11, which is the local background for the mineralised area. The pre-KVAR data at WX7 was also taken into account. The 90th percentile baseline concentrations for all the water quality characteristics monitored are shown in bold in Table 1.

As discussed in Section 2.1, the surface water guideline goals apply to the receiving waters of Sawyers Swamp Creek at WX7 (Figure 1). The groundwater goals apply to the seepage detection bore WGM1/D5, but not Lidsdale Cut (WX5) since July, 2012 (see Section 4.5), and these are used for early warning of potential effects on the Sawyers Swamp Creek receiving waters. These goals are used for assessment of the Stage 2 effects in this report.

In recent times, the level of groundwater in bore D5 has decreased due to lowering of the groundwater under the KVAR by the toe drains and sub-surface drains and sample collection has been limited at times (see Section 4.4).

Aluminium is not included in Table 1 due to the elevated concentrations in the 90th percentile of 5.7 mg/L at background groundwater bore WGM1/D1, which is located up-gradient of the SSCAD, and lack of KVAR pre-placement data to establish a baseline at bores D5 and D6. The source of aluminium in Sawyers Swamp Creek is investigated in Section 4.3 in relation to the water quality changes that have occurred in Lidsdale Cut since pumping began.

A hydrological flow chart which explains how the various flows and discharges enter Sawyers Swamp Creek and the local groundwater is shown in Figure 6, Section 4.

Table 1: Pre-dry Ash Placement Water Quality Baseline 90th Percentile at Background and Receiving Water Sites and resulting Guidelines or Goals for KVAD/R Groundwater, Lidsdale Cut and Sawyers Swamp Creek

	Groundwater				Surface Water		
Element (mg/L)	Background Groundwater (WGM1/D2)	KVAD & KVAR Groundwater (WGM1/D5)	Lidsdale Cut (WX5)		Dump Creek (WX11)	Sawyers Swamp Creek (WX7)	
	Pre-Placement (1988-2003) 90th Percentile	Pre-Placement (1988-2003) 90th Percentile	Pre-Placement (1992-2003) 90th Percentile	Groundwater Guidelines# or Goals	Pre-placement (1991-2003) 90th Percentile	Pre-placement (1991-2003) 90th Percentile	Surface Water Guidelines# or Goals
pH	5.4	4.5	6.9	6.5 – 8.0	8.0	7.6	6.5 – 8.0
Cond/ (µS/cm)	310	810	952	2600^	770	760	2200
TDS	258	550	650	2000++	772	584	1500^
SO4	61	328	359	1000	325	323	1000 ++
Cl	48	24	34	350	39	27	350 +
As	<0.001	0.008	<0.001	0.024	<0.001	<0.001	0.024
Ag	<0.001*	<0.001*	<0.001*	0.00005	<0.001	<0.001*	0.00005
Ba	0.114	0.148	0.054	0.7	0.050	0.043	0.7 +++
Be	-	0.006	-	0.1	-	-	0.1
B	0.10	1.7	2.16	**1.7**	1.45	2.33	**1.25**
Cd	0.001	0.004	<0.001	0.001	<0.001	<0.001	0.0015
Cr	0.041	0.041	<0.006	0.004	<0.001	<0.001	0.005
Cu	0.010	0.058	<0.005	0.005	0.002	<0.007	0.005
F	0.28	0.65	1.99	1.5	1.1	1.1	1.5+++
Fe	1.7	14.7	0.7	**1.7**	2.38	0.507	0.3+++
Hg	<0.0007*	<0.0006	<0.0002*	0.00006	<0.0002*	<0.0002*	0.00006
Mn	0.44	2.5	2.12	1.9	1.94	0.829	1.9
Mo	-	-	-	0.01	-	-	0.01 +
Ni	0.031	0.137	-	**0.137**	-	-	0.05
Pb	0.010	0.021	0.004	**0.01**	<0.001	0.003	0.005
Se	<0.001	0.001	0.001	0.005	0.003	0.003	0.005
Zn	0.114	0.505	0.304	**0.505**	0.28	0.153	**0.153**

Notes:

- * Detection limit used was higher than ANZECC guidelines; Concentrations highlighted in blue to indicate sampling sites with elements higher than the locally derived or ANZECC guidelines
- ‘ Groundwater conductivity derived from TDS 90th percentile of 2000 mg/L TDS/0.77; Creek TDS derived from 0.68 x 2200 µS/cm, which is the ANZECC (2000) low land river conductivity for protection of aquatic life
- # ANZECC (2000) guidelines for protection of freshwaters, livestock or irrigation water.

  Cadmium, Chromium, Copper, lead, nickel and zinc adjusted for effects of hardness: Ca, Mg in WGM1/D5 22.3, 29.0 mg/L: in Sawyers Swamp Creek 51.6, 38.0 mg/L, respectively

  Note: Chromium guideline is 1 ug/L for CrVI and adjusted for hardness effect

  Local guidelines using 90th percentile of pre-dry placement data in **bold** (Note: Fe guideline of 0.3 mg/L only marginally lower than

  WX7 90th percentile so used ANZECC (2000) guideline
- \+ Irrigation water moderately tolerant crops; irrigation. Note: Molybdenum drinking is 0.05 mg/L
- ++ Livestock
- +++ drinking water

As set out in Connell Wagner (2008), the adoption of the surface water conductivity guideline of 2,200µS/cm shown in Table 1 was based on the background Dump Creek site, WX11, and the Sawyers Swamp Creek receiving water site, WX7, both having 90th percentile conductivity of more than twice the ANZECC (2000) guideline default upland river trigger value of 350 µS/cm (upland rivers are defined as above 150m altitude).

The 90th percentile concentration at the Dump Creek site demonstrates that this was caused by local mineralisation effects, so use of the upland value was not considered appropriate. As a result, the higher ANZECC (2000) lowland (altitude below 150m) river conductivity trigger value of 2,200 µS/cm was used for protection of aquatic life in Sawyers Swamp Creek (Connell Wagner, 2008). This approach has proven to be appropriate because the background conductivity at WX11 increased to about 1400 uS/cm in the 2010/12 reporting period, apparently due to diffuse effects of coal mining activities in the area (Aurecon, 2012).

Although the background groundwater bore, D2, 90th percentile conductivity was lower than the upland river trigger value of 350 µS/cm, the pre-dry ash placement 90th percentiles at the KVAD groundwater bore D5, as well as the Lidsdale Cut conductivities, were higher than in the creeks. As groundwater seepage into Sawyers Swamp Creek would be slow, use of the creek trigger value was not considered appropriate for groundwater. Hence, the approach adopted was the ANZECC (1995) guidelines for protection of groundwater, where the potential future use of the water resource is taken into account. As shown in Table 1, the livestock drinking water guideline for salinity, of 2,000 mg/L TDS, was considered relevant to the assessment of groundwater in the area, should the groundwater be used for watering livestock in the future (Connell Wagner, 2008). The TDS was converted to the conductivity local trigger value of 2,600 µS/cm by dividing by the conversion factor 0.77, which was derived from the measured groundwater conductivity and TDS.

2.9.1 Receiving Waters

As discussed in Section 2.1 and Aurecon (2012), the following receiving water sites for assessment of ash leachate effects from the KVAR dry ash placement were identified:

- Groundwater bore WGM1/D5
- Lidsdale Cut (sampling site WX5)
- Sawyers Swamp Creek at site WX7.

However, as explained in Section 1.1, WX5 and WX7 have ceased to be receiving water sites in this report due to blocking of the Lidsdale Cut discharge (WX5) and its pumping to the return canal, and the dominant effects of the Springvale coal mine discharge on Sawyers Swamp Creek water quality (WX7). This only leaves bore D5 as the receiving water site, so the following provides clarification of how the receiving water site is used to assess effects of the SSCAD and KVAR.

With the various collection systems in place, bore WGM1/D5 represents the groundwater receiving water site for seepage from the KVAD/R that was not collected by the KVAD toe drains or the KVAR sub-surface drains that are directed to Lidsdale Cut via the KVAD toe drains. Consequently, the groundwater quality at bore D5, has continued to be used for early warning of potential effects of groundwater on the water quality in Sawyers Swamp Creek, if the Springvale mine water flow was to cease in the future.

However, due to the large changes that have taken place, the current assessment of effect of the KVAR on surface and groundwater has been undertaken by a direct method by estimating the rainfall infiltration through the dry ash and the effects of the resulting seepage on Sawyers Swamp Creek with no Springvale mine water flow (see Section 3). Section 3 also assesses the effects of the KVAR leachates on the groundwater at bore D5. A similar approach has been used to assess the effects of the KVAD seepage on bore D5, as well as its effects on Sawyers Swamp Creek with no Springvale mine water flow in Section 4.

As EnergyAustralia NSW has begun routine monitoring of the water quality in the upper Sawyers Swamp Creek where it flows through the coal measures upstream of the KVAR, changes in surface water quality at WX7 were assessed by comparison with these upstream sites, as well as the catchment background water quality in Dump Creek at WX11.

2.9.2 Early Warning of Water Quality Changes

An early warning of changes in water quality that may potentially approach the relevant local guidelines set out in Table 1 is required for the ash repository management to allow time for investigations of the causes of changes and controls to be implemented if necessary. The approach used is the ANZECC (2000) guideline procedure for developing triggers for investigations of the cause of changes, and possible management actions. This approach involves comparing the 50th percentile (median) in receiving waters with the 90th percentile of the background or pre-KVAR water quality at the receiving water sites. An early warning of changes is signalled when the post-placement 50th percentile exceeds the pre-placement 90th percentile water quality conditions. This approach is supplemented by the use of Control Charts to show concentration changes relative to local/ANZECC trigger values and the 90th percentile pre-KVAR conditions.

These procedures are applied to each down-gradient groundwater bore, the Lidsdale Cut (until July, 2012) and Sawyers Swamp Creek at WX7 to assess long-term changes that are approaching the local/ANZECC trigger values.

2.10 Control Charts

In previous reports, the long-term plots of the water quality data were used to allow the identification of trends against the baseline and environmental goals. The trends are tracked using Control Charts (APHA Standard Methods, 1995 and ANZECC guidelines for Monitoring and Reporting, 2000) and the significance of any changes is determined by comparison with the criteria of pre-placement 90th percentiles, post-placement medians, ANZECC (2000) guidelines or local guidelines. Due to Springvale mine water discharge, the ANZECC guidelines cease to apply to the receiving waters of Sawyers Swamp Creek. In addition, pumping of the water from Lidsdale Cut has been found to affect the water quality in the seepage detection bore D5, so the recent changes are shown in relevant tables in the report, as well as some of the changes by control charts.

The data are summarised in Tables in this report, or in spreadsheet format in Attachment 2, including the minimum, maximum and mean as well as the 90th percentile baseline, median post-placement, ANZECC guidelines and local guideline concentrations.

3. Review of Groundwater Quality

This Section reviews the groundwater quality during 2015/16 at the KVAR/KVAD. The approach taken for the 2015/16 assessment is to review the groundwater quality at:

- Bores sampling the groundwater in the long-held wet ash in the KVAD (AP9, AP17, GW11) and the KVAD north and western seepage points
- Seepage detection bores MPGM4/D5 and D6
- The Lidsdale Cut pond.

The review of this data took into account the water quality at the background bores D1 and D2, as well as effects of seepage from the SSCAD on its seepage detection bores D3 and D4, which are part of the background for the KVAR/KVAD.

As indicated in Sections 1 and 2, significant changes during 2015/16 that could not be accounted for have been examined to see if they influence the previous report findings of no significant effects of the KVAR. That is, the groundwater quality is compared with that in 2014/15 to confirm that the effects of the KVAR/KVAD, summarised from the previous report in Section 3, have remained essentially unchanged.

Review of the 2015/16 data begins with changes in the groundwater levels in the various bores as they determine the direction of groundwater flows in the area.

3.1 Groundwater Level Changes and Flow Directions

Figure 4 shows an overall long-term trend for groundwater elevation changes at the receiving water bores D5 and D6 down-gradient of the KVAD ash placement, compared to the background bores and those up-gradient of the KVAD.

Changes in groundwater levels have been relatively small since before dry ash placement began in 2003, but with increased variability in recent years, even at the background bores D1 and D2 up-gradient of the SSCAD. The greatest variability has been for bore D5 in recent years with the level decreasing to be the same as at bore D6 during dry weather, and often having no groundwater in the bore. The increased variability appears to be due to the prolonged period of below average rainfall since 2012 with intermittent high rainfall events (Attachment 1).

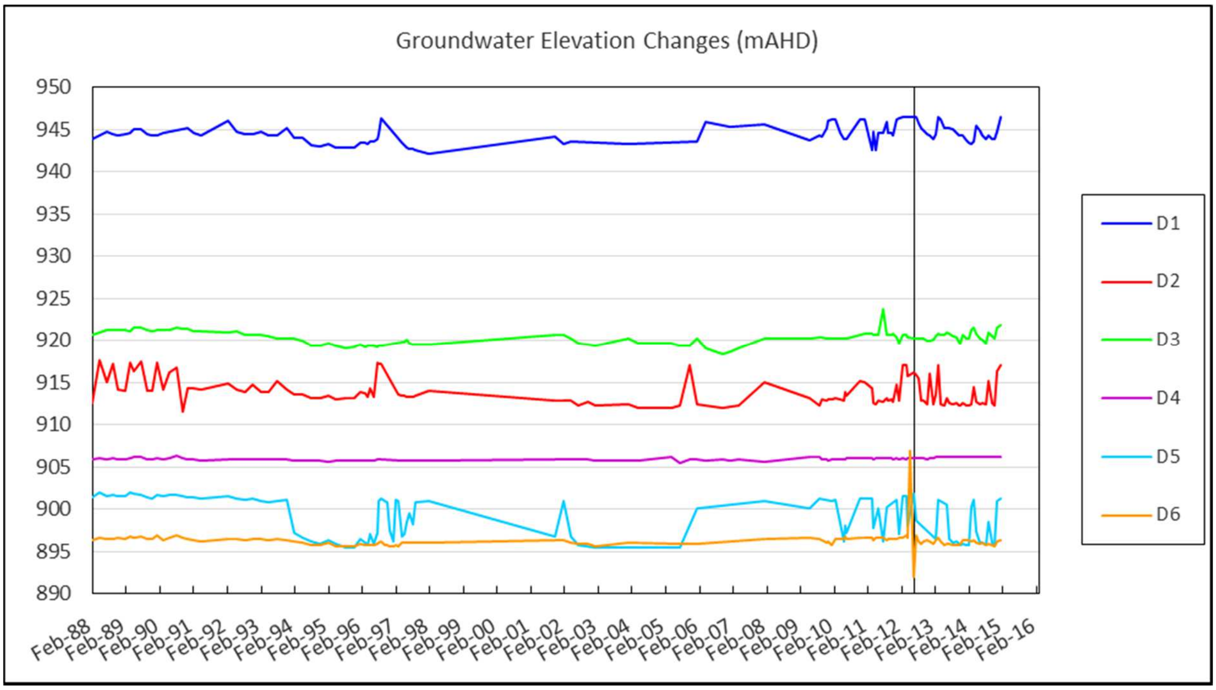

Figure 4. Long-term Groundwater Elevation changes at background bores WGM1/D1 and D2 and SSCAD seepage detection bores D3 and D4 compared to receiving water bores D5 and D6 down-gradient of the KVAD/R ash placement area (vertical line indicates pumping from Lidsdale Cut began June, 2012)

The groundwater flow directions are used to help explain why groundwater quality changes occur in the groundwater under and around the KVAD/R, as well as potential effects of seepage into Sawyers Swamp Creek. Figure 6 shows the indicative KVAD seepage flow paths to the KVAD toe drains and toward the low point of the Lidsdale Cut. Seepage from the KVAD, under the KVAR that is intercepted by the toe drains, is also shown. Any seepage that is not collected by the subsurface drains or the toe drains is shown as flowing to the local groundwater.

Following installation of the subsurface drains in 2010 and pumping of the water from the Lidsdale Cut pond from June, 2012, the groundwater at bore GW10, in the south-west of the KVAD, has become dry (Aurecon, 2015). In addition to the subsurface drain effects, it appears that pumping of the groundwater out of the Lidsdale Cut pond is drawing down the surrounding groundwater levels, as seen in Figure 5 at Bore D5, which is near the open-cut area that forms the Lidsdale Cut.

3.2 Groundwater Quality changes at Background Bores and SSCAD Seepage Bores

To understand groundwater quality changes, if any, at the KVAR/KVAD and bore D5 and D6 that have occurred since 2014/15, it is necessary to examine changes at the background bores, D1 and D2, as well as at the SSCAD seepage detection bores D3 and D4.

The SSCAD dam wall seepage that does not enter Sawyers Swamp Creek, but flows under it, is shown as flowing to the local groundwater sampled by bore D3 in Figure 6. These inflows are from the ash dam pond flowing under the ash dam wall due to hydrostatic pressure of the water height stored in the pond.

Table 3 shows there were no significant changes at the background bore D2. At bore D3, all the water quality and trace metals, except for iron had concentrations lower than the ANZECC/Local groundwater trigger values, while pH was acidic at 5.6. Bore D4 had similar low concentrations but iron and manganese were much higher than the guidelines and boron was marginally higher than its guideline. The pH was slightly acidic, but less so than at D3. There were no significant changes in water quality at both bores since 2014/15 relative to the ANZECC/Local groundwater trigger values.

The groundwater inflows from the northern end of the dam wall are mostly from the v-notch seepage point. Flows not collected and pumped back to the ash dam from the seepage collection pond, or those that enter Sawyers Swamp Creek, are sampled by bore D4. The groundwater quality at D4 was originally thought to be from the ash dam, but since 2014 the salinity in the ash dam pond has decreased to be lower than in D4 (Aurecon, 2015). This is confirmed in 2015/16 in Table 3. Hence, it appears likely that some groundwater from outside the wider area of the ash dam pond, possibly from under the nearby escarpment, is influencing the salinity at bore D4. Other than the historically high iron and manganese concentrations at D4, there were no trace metals showing significant increases in 2015/16 and all the other characteristics were lower than the ANZECC/Local groundwater trigger values.

From these observations, it is clear that the seepage from the SSCAD to the groundwater at the seepage detection bores up-gradient of the KVAD/R areas are not the source of the elevated concentrations of sulphate, boron, nickel and zinc at bore AP17 at the KVAD north wall, or sulphate, boron, cadmium, copper, nickel and zinc at the KVAD south-western seepage (site 94) or at bore D5 (Table 4 in Section 4.3).

Table 3: Water Quality for SSCAD Seepage detection Groundwater bores WGM1/D3 and D4 during Stage 2 to 2014/15 and the decommissioned KVAR period compared to the Groundwater Background bore D2, Bore D4 90th Percentile Baseline and Groundwater Guidelines or Goals

Element (mg/L)	SSCAD Seepage Affected Bores								Back-ground (April, 2015 to March, 2016)	D4 Baseline (Pre-Stage I 90th Percentile)	ANZECC Guideline Goals for Ground-water
	Stage 2A Post-placement (April, 2010 to January, 2012)		Stage 2 Post-placement (February, 2012 to March, 2013)		Stage 2 Post-placement (April, 2014 to March, 2015)		Decommissioned KVAR (April, 2015 to March, 2016)				
	D3	D4	D3	D4	D3	D4	D3	D4	D2	D4	
pH	5.9	5.8	6.1	5.7	5.8	5.9	5.6	6.2	4	6.8	6.5-8.0
Cond (µS/cm)	746	1500	540	1500	668	1658	637	1548	486	728	2600
TDS	450	1200	330	1200	403	1358	373	1186	292	510	2000
SO4	115	770	68	770	153	849	155	757	160	201	1000
Cl	105	33	66	35	74	45	67	32	26	45	350
Al					0.12	0.05	0.2	0.03	0.21		5.25
As					0.001	0.002	0.002	0.002	<0.001		0.024
Cd					0.0002	<0.0002	0.0001	<0.0001	<0.0002		0.001
Cr					0.001	<0.001	0.001	0.001	0.001		0.004
Cu	0.002	0.001	0.004	0.003	0.0019	0.0013	0.001	0.001*	0.001	0.010	0.005
Fe	0.03	43.0	4.2	39.0	2.37	47.7	4.1	51.7	0.89	86	1.7
Mn	0.73	18.0	0.80	16.5	0.73	15.8	0.6	14.3	0.51	6.5	1.9
B	0.03	1.50	0.02	1.55	0.04	1.75	<0.05	1.72	0.08	0.49	1.7
F	0.05	0.10	0.10	0.10	0.10	0.10	0.05	0.04	0.04	0.24	1.5
Mo					0.001	<0.001	<0.001	<0.001	<0.001		0.01
Ni	0.130	0.050	0.12	0.040	0.108	0.032	0.103	0.03	0.057	0.023	0.137
Pb					0.0015	0.001	0.002	0.001	0.002		0.005
Se	0.002	0.002	0.002	0.002	0.001	<0.002	<0.001	<0.001	<0.001	0.002	0.005
Zn	0.140	0.080	0.070	0.065	0.140	0.049	0.075	0.038	0.08	0.060	0.505

3.3 Groundwater Quality changes at KVAR/KVAD and Seepage Bores

The groundwater quality at the bores inside the KVAD and at its seepage points are compared with the water quality at the seepage detection bores D5 and D6, as well as Lidsdale Cut, during 2015/16 in Table 4. Although the Local/ANZECC trigger concentrations only apply to bores D5 and D6, the characteristics at all the sampling sites that had higher concentrations are highlighted in blue to indicate potential sources of salts and trace metals to the local groundwater, other than from the KVAR/KVAD area.

The following description of water quality characteristics begins for the bores inside the KVAD and seepage from the KVAD walls. These are then compared to the water quality conditions in bores D5 and D6 and at the Lidsdale Cut pond.

Table 4: Average Water Quality for KVAD Groundwater Quality compared to KVAR receiving water bores D5 and D6 as well as in the Lidsdale Cut during 2015/16

Element (mg/L)	Lidsdale Cut ground-water Quality in 2015/16	Bore D5 ground-water Quality in 2015/16	Bore D6 ground-water Quality in 2015/16	KVAD Groundwater Quality 2015/16					
				AP09	GW11	AP17	KVAD Ground-water Seepage North Wall (Site 86)	KVAD Ground-water Seepage South-west Wall (Site 94)	Ground-water Guidelines or Goals*
pH	3.4	4.0	3.8	6.1	7.6	3.9	3.0	3.4	6.5-8.0
Cond (µS/cm)	2549	1020	1328	2240	318	4934	4096	3770	2600
TDS	2089	752	1010	1720	266	4710	3110	3440	2000
SO4	1529	495	678	1159	45	3319	2400	2406	1000
Cl	21.1	26.1	29.2	41.4	27.2	16.7	18.6	36.3	350
Al	61.1	18.9	4.5	0.25	9.2	62.1	5.58	93.8	5.10**
As	0.013	0.005	0.003	0.071	0.003	0.004	0.004	0.019	0.024
B	6.6	1.76	0.76	2.1	0.05	11.7	8.1	9.65	1.7
Cd	0.0156	0.036	0.002	<0.0001	0.0001	0.0007	0.0002	0.025	0.001
Cr	0.006	0.0046	0.002	<0.0001	0.004	0.001	0.001	0.009	0.004
Cu	0.016	0.045	0.008	0.001	0.015	0.017	0.001	0.022	0.005
F	13.2	0.67	0.46	0.61	0.04	101.6	4.1	17.2	1.5
Fe	8.27	1.83	66.6	53.9	0.076	213	72.1	18.1	1.7
Mn	8.48	5.12	3.4	7.27	0.02	14.4	16.1	15.9	1.9
Mo	0.001	0.002	<0.001	0.121	<0.001	0.029	0.001	0.002	0.01
Ni	0.752	0.354	0.50	0.303	0.01	1.84	1.04	1.46	0.137
Pb	0.013	0.072	0.015	0.001	0.025	0.001	0.001	0.004	0.010
Se	0.022	0.002	<0.001	<0.001	0.001	0.001	0.001	0.018	0.005
Zn	1.62	2.07	1.30	0.127	0.102	5.51	1.56	2.59	0.505

* From Table 1

** Dump Creek 90th Percentile and bore D6 90th percentile (data for both from April, 2012 to March, 2015). These sites used as background for period since Lidsdale Cut discharge to SSC stopped (see Sections 4.2 and 4.3 for explanation).

Bore AP09 samples the groundwater inside the KVAD near the north wall (Figure 2) and had an increase in salinity during 2015/16, such that sulphate exceeded 1,000 mg/L (Table 4). The pH of 6.1 was higher than in the groundwater at D5 and as a result, the trace metals were much lower than at the receiving water bore, other than nickel which had a similar concentration, as well as iron, manganese and molybdenum which were much higher than at D5. Due to its low solubility in flyash (Kapoor and Christian, 2016) and its slightly acidic pH, the aluminium concentration was low at 0.25mg/L.

There was only one measurement at bore GW11, which was taken in July, 2016. The bore samples the KVAD groundwater on its western side. The pH at this bore is neutral at 7.6. Other than a small increase in salinity, the only increases seen since 2014/15 for trace metals were for lead (but was nearly 3-fold lower than at bore D5), as well as zinc, which remained at a low concentration. It was noted that the aluminium concentration at this bore increased from 2.5 mg/L in 2014/15 to 9.2 mg/L in 2015/2016 but remained below that at D5 and Lidsdale Cut, as well as at bore AP17 that samples the groundwater in the bench under the KVAD north wall.

Bore AP17 has an acidic pH of 3.9 and continued to have a very high salinity. There was a moderate increase in salinity at this bore since 2014/15 and the sulphate concentration was twice that in Lidsdale Cut. The associated high concentrations of boron, copper, fluoride, iron, nickel and zinc continued in 2015/16, with significant increases since 2014/15 for copper, nickel and zinc. These groundwater metal concentrations reflect the local mineralised conditions in the area because the benches supporting the dam wall are constructed of coal waste/chitter taken from the Lidsdale cut (see Attachment 3). Hence, the aluminium concentration of 62 mg/L at AP17 is similar to that in the Lidsdale cut but much lower than at Bore D5 (Table 4).

Groundwater seepage from the KVAD North Wall (Site 86) occurs at a higher level than the groundwater sampled by AP17 but is also highly acidic at pH 3.0. The high salinity and sulphate continued since 2014/15 with moderate increases since the previous year. Of the trace metals, significant increases were noted for the local mineralised elements of boron, fluoride, manganese, nickel and zinc. The aluminium concentration increased from 2.0 mg/L in 2014/15 to 5.6 mg/L during the current period. The apparent reasons for the lower aluminium concentration in the seepage compared to the AP17 groundwater is discussed in Section 4.3.2.

Table 4 shows that the seepage from the south-western wall (Site 94) of the KVAD during 2015/16 was acidic, while salinity and sulphate were high and similar to that at the north wall seepage. Most of the trace metals were elevated and had similar concentrations to those in either bore D5 or Lidsdale Cut or both. There were elevated concentrations of cadmium and chromium in the south-western KVAD seepage that did not occur in the KVAD groundwater or the north wall seepage. Furthermore, the elevated south-western concentrations were similar to those in D5 and Lidsdale Cut, suggesting a common source, possibly from coal pyrites, because the south-western seepage originates from beneath the KVAD, which was built on top of a coal mine void (see Figure 3).

The lack of effects of the KVAD groundwater on cadmium and chromium concentrations at bore D5 and Lidsdale Cut is supported by the low selenium concentrations at D5 as well as in the KVAD groundwater and the north wall seepage. The low selenium at D5 indicates no overall effects of the KVAR/KVAD groundwater on the water quality at D5.

3.3.1 Long-term changes at groundwater seepage detection bores

The long-term changes at bore D5 and Lidsdale Cut are shown in Tables 5 and 6 to assist with understanding the effects of the groundwater level changes and its associated increase in salinity, trace metals and aluminium concentrations.

To put the above assessments into the context of the long-term changes, Table 5 summarises the long-term groundwater quality changes at the KVAR/KVAD seepage detection groundwater bores, D5 and D6, during the Stage 2 dry ash placement from its initial placement in 2010 to the decommissioned KVAR in 2015/16.

Significant increases occurred for cadmium, chromium, copper, lead and zinc at both the D5 and D6 bores in 2014/15, which have persisted in the current period. Over the entire period, there were no significant changes in salinity, sulphate and selenium at either bore, as well as for aluminium (other than a decrease during the 2013/14 period).

Figure 5 shows the average concentrations at bore D5 during each period since 2010/12 and the large increases in cadmium, copper and lead since 2013/14. The Local/ANZECC (2000) guidelines concentration for copper and selenium, which are the same, of 0.005 mg/L, is shown for comparative purposes. By comparison, the copper, cadmium and lead concentrations in the KVAD bores were either lower than their Local/ANZECC (2000) guidelines or much lower than at bore D5, indicating another source of these metals at Bore D5, potentially from coal pyrites in the area.

Other than a decrease during the 2013/14 period, the aluminium essentially remained unchanged since 2010/12 at a moderate concentration of mostly less than 20 mg/L.

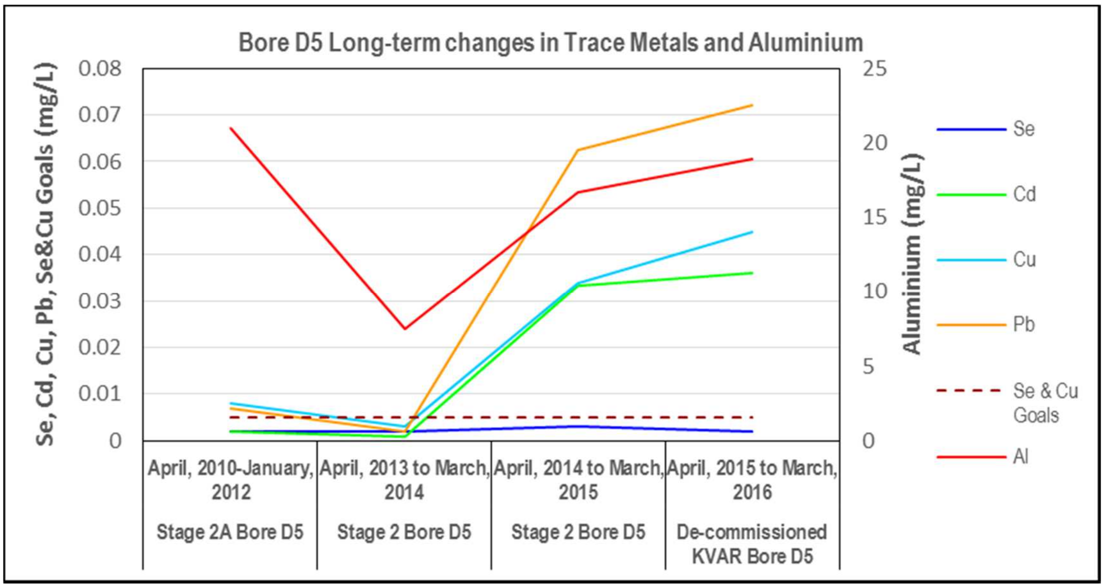

Figure 5: Average concentrations of trace metals and aluminium at bore D5 for each reporting period since 2010/2012.

Table 5: Long-term Groundwater Quality changes for KVAD groundwater seepage bores WGM1/D5 and D6 from Initial Stage 2 to current decommissioned period compared to background Bore D2, Bore D5 90th Percentile Baseline and Groundwater Guidelines or Goals

Element (mg/L)	KVAD & KVAR Dry Ash Placement Monitoring Bores								Back-ground April, 2013 to March, 2015	D5 Baseline (Pre-Stage I 90th Percent-ile)	ANZECC Guideline Goals for Ground-water
	Stage 2A April, 2010 to January, 2012		Stage 2 February, 2012 to March, 2013		Stage 2 April, 2014 to March, 2015		Decommissioned KVAR (April, 2015 to March, 2016)				
	D5	D6	D5	D6	D5	D6	D5	D6	D2	D5	
pH	3.6	3.2	3.7	3.4	3.9	3.3	4.0	3.8	4.0	4.5	6.5-8.0
Cond (µS/cm)	1356	1216	580	1300	717	1475	1020	1328	503	810	2600
TDS	1000	730	430	885	533	1007	752	1010	290	550	2000
SO4	680	485	240	530	330	658	495	678	159	328	1000
Cl	15	48	13	47	19.2	40	26.1	29.2	30	24	350
Al	21.0	3.6	7.5	1.85	16.7	3.55	18.9	4.5	0.27	-	**5.1**
As	0.001	0.001	0.001	0.002	0.007	0.005	0.005	0.003	0.001	0.008	**0.024**
B	2.2	0.74	0.80	0.63	1.06	0.85	1.76	0.76	0.1	1.7	**1.7**
Cd	0.002	0.001	0.001	0.0002	0.0334	0.002	0.036	0.002	0.0001	0.004	0.001
Cr	0.001	0.002	0.002	0.0015	0.005	0.002	0.0046	0.002	0.0014	0.041	0.004
Cu	0.008	0.005	0.003	0.005	0.034	0.005	0.045	0.008	0.0036	0.058	0.005
Fe	1.7	14.5	0.35	54.5	0.79	80.7	1.83	66.6	1.2	14.7	**1.7**
Mn	7.5	3.5	3.5	4.45	4.13	4.75	5.12	3.4	0.63	2.5	1.9
Mo	0.010	0.010	0.01	0.010	0.007	0.001	0.002	<0.001	0.001	-	0.010
F	0.80	0.40	0.60	0.30	1.28	0.51	0.67	0.46	0.09	0.65	1.5
Ni	0.540	0.350	0.230	0.345	0.316	0.496	0.354	0.50	0.068	0.137	**0.137**
Pb	0.007	0.012	0.002	0.002	0.0625	0.012	0.072	0.015	0.002	0.021	**0.010**
Se	0.002	0.002	<0.002	0.002	0.003	0.001	0.002	<0.001	0.001	0.002	0.005
Zn	1.10	0.895	0.560	0.920	1.62	1.30	2.07	1.30	0.094	0.505	**0.505**

Table 5 shows the current average pH at Bore D5 is 4.0 and similar to that in 2014/15. There was a moderate increase in salinity since 2014/15 but remained well below the guideline concentrations. No significant changes in trace metal concentrations occurred from 2014/15 to 2015/16, other than an increase in zinc. Most of the metals remained above the Local/ANZECC trigger concentrations but chromium was only marginally above it. There was only a small increase in aluminium at bore D5 from 16.7mg/L in 2014/15 to 18.9mg/L in 2015/16.

The long-term changes at bore D6 are also shown in Table 5. Figure 9 shows that, although bore D6 is located to sample the KVAD seepage from the south-western wall as it flows to Lidsdale Cut, it is diluted by background groundwater inflows giving relatively low salinity and sulphate concentrations. Even with these inflows the pH is acidic, and there have been moderate increases for nickel and zinc but notable increases for lead, cadmium and copper since 2012/13. The salinity and sulphate concentrations have remained essentially unchanged, as has the aluminium concentration, which was 4.5 mg/L in 2015/16.

3.4 KVAR effects on local Groundwater Quality

The potential effects of KVAR groundwater seepage on the local groundwater was assessed in 2014/15 by using the Wallerawang Power Station ash leachate results of (Ward, et al., 2009) together with the estimated rainfall infiltration into the KVAD beneath the KVAR. The estimated increases in groundwater concentrations from 2014/15 are shown in Table 7.

As the average groundwater quality concentrations in the KVAD increased from 2014/15 to 2015/16 (Table 7), it was conservatively assumed that the increases were due to increased ash leachates from the KVAR. That is, the ash leachates of 2014/15 were increased by the ratio of the KVAD concentrations in 2015/16 to the KVAD concentrations in 2014/15. The resulting local groundwater concentration increases during 2015/16 are shown in Table 7.

Table 7 also shows all of the increased concentrations, including salinity, sulphate and trace metals were expected to be lower than the Local/ANZECC (2000) guideline concentrations, other than for iron. Application of the higher concentrations during 2015/16 gave similarly low concentrations, indicating no effect of the KVAR on the local groundwater during the current reporting period.

3.5 KVAD effects on local Groundwater Quality

As the groundwater concentrations at bore D5 mostly do not meet the guidelines, the cause was investigated by the following approach used by the UTS groundwater modelling at Mt Piper Power station (Merrick, 1999). The slow rate of movement of groundwater from the KVAD to the low point of the Lidsdale Cut is sampled at bore D5, together with other non-KVAD inputs, so the D5 and average KVAD groundwater quality concentrations are compared in Table 7.

The salinity (total dissolved solids, TDS) at D5, at 752 mg/L, is about 3-fold lower than currently in the KVAD groundwater at 2232 mg/L. Changes in TDS concentrations from the Mt Piper ash placement area to the receiving water groundwater concentrations were used as an indicator of parallel changes in trace metals for the UTS groundwater model. Losses or gains in trace metal concentrations as the groundwater flowed through the surrounding mine spoil were adjusted, if necessary, by using the results of adsorption tests (PPI, 1999).

Similarly, the trace metal concentrations expected at bore D5 due to groundwater seepage from the KVAD were estimated using the TDS differences between the two locations and by initially assuming that there were no losses or gains as the groundwater flowed through the KVAD dam wall benches to D5. The expected concentrations at D5 were estimated, assuming the same 3-fold decrease in TDS, and the results are shown in Table 7. The effects of losses by adsorption on to the local soils, as well as gains in trace metal concentrations as the groundwater flowed through areas containing coal pyrites were subsequently examined to identify the effects of these sources on the concentrations at bore D5.

In the case of KVAR ash leachates entering the underlying KVAD by infiltration through the dry ash and the clay layer beneath it, some of the trace metals could be expected to be adsorbed onto the clay.

Table 6 shows that all the bore D5 trace metal concentrations during the current period were higher than the estimated increases (except iron, fluoride and molybdenum, which are highlighted in yellow). This indicates another source of the trace metal inputs to D5 other than in the groundwater in the KVAD flyash. The other source is most likely due to releases from local coal pyrites, including those in the KVAD benches and seepage from the KVAD coal mine void. The elements of iron, fluoride and molybdenum, were estimated to give an increase that was an order of magnitude higher than the concentrations at bore D5, indicating losses by adsorption onto the local soils as the KVAD groundwater flowed towards D5. This is consistent with the soil adsorption of 93% for fluoride and 98% for molybdenum (PPI, 1999). The lack of effects of the KVAD iron concentrations on bore D5 is unknown but indicates loss of dissolved iron in the seepage flow path from the KVAD to D5.

Table 6: Estimated local groundwater quality increases due to groundwater seepage from the KVAR/KVAD for the previous 2014/15 and the current periods compared to Bore D5 receiving water quality and the groundwater ANZECC (2000) Guidelines or Local Goals

Element (mg/L)	Bore D5 Ground-water (2015/16)	Average KVAD Groundwater Quality 2014/15	Average KVAD Groundwater Quality 2015/16	KVAD Ground-water Increase due to ash Leachates in 2014/15	KVAD Ground-water Increase due to ash Leachates in 2015/16	Expected Bore D5 Groundwater quality due to current average KVAD Groundwater Quality	Ground-water Guidelines or Goals*
pH	4.0	5.7	5.9	0.3	0.3	4.0	6.5-8.0
Cond (µS/cm)	1020	2057	2497	92	112	841	2600
TDS	752	1942	2232	77	88	752	2000
SO4	495	1243	1508	43	52	508	1000
Cl	26.1	19.7	28.4	-	4.8	9.7	350
Al	18.9	13.79	23.9	2.3	4.0	8.05	5.10**
As	0.005	0.022	0.026	0.005	0.006	0.009	0.024
B	1.76	4.2	4.6	0.3	0.33	1.55	1.7
Cd	0.036	0.0003	0.0003	<0.0001	<0.0001	0.0001	0.001
Cr	0.0046	0.048	0.0017	0.0007	<0.0001	0.001	0.004
Cu	0.045	0.007	0.011	0.0016	0.0025	0.004	0.005
F	0.67	-	34.1	-	5.8	11.5	1.5
Fe	1.83	87.5	89	8.5	8.6	30.0	1.7
Mn	5.12	7.53	7.2	0.73	0.70	2.43	1.9
Mo	0.002	0.063	0.050	0.0007	0.0006	0.017	0.01
Ni	0.354	0.572	0.720	0.012	0.015	0.243	0.137
Pb	0.072	0.003	0.009	-	0.005	0.005	0.010
Se	0.002	0.001	0.001	0.001	0.001	0.0003	0.005
Zn	2.07	1.28	1.91	0.064	0.096	0.644	0.505

** bore D6 90th percentile

3.6 Long-term changes for Lidsdale Cut Water Quality

To examine the water quality changes in Lidsdale Cut since pumping began, Table 7 summarises the data from Stage 1 during May, 2003 to March, 2010 and the initial Stage 2 period to the current decommissioned period.

The significant changes that took place over that time were: increases in salinity and sulphate to an elevated condition since 2013/14. For the trace metals, aluminium increased from less than 10 mg/L to 155 mg/L in 2013/14, to 198 mg/L in 2014/15 and decreased in the current period. Cadmium, began to increase in 2013/14 and was high during 2014/15 but had a significant decrease in the current period. As well as the changes observed for aluminium and cadmium, all the metals, including selenium, but except for molybdenum and manganese, showed similar increases within the previous reporting periods and then decreased during 2015/16. The only increases observed during 2015/16 were for iron and manganese and a minor increase for lead.

The possible reasons for these changes were examined further and it was noted that the water in the Lidsdale Cut pond has remained highly acidic, but the water quality greatly improved in 2015/16 compared to that during the previous period. There were significant decreases in salinity such that the conductivity is now lower than the local guideline concentration. Of the trace metals, significant decreases occurred for arsenic, boron, cadmium, chromium, copper, nickel, selenium and zinc, while iron and manganese significantly increased. The decrease in chromium was such that it is now only marginally above the guideline concentration. Aluminium decreased by about 70% from 198mg/L to 61mg/L.

The changes over time for aluminium, copper, cadmium, chromium and selenium are shown in Figure 6. Figure 6 shows large increases in concentrations for selenium, cadmium, copper, chromium and aluminium from 2012 to their peak in 2014/15 and large reductions in concentrations during 2015/16. The reductions may be due to maintaining a defined level of water in the pond.

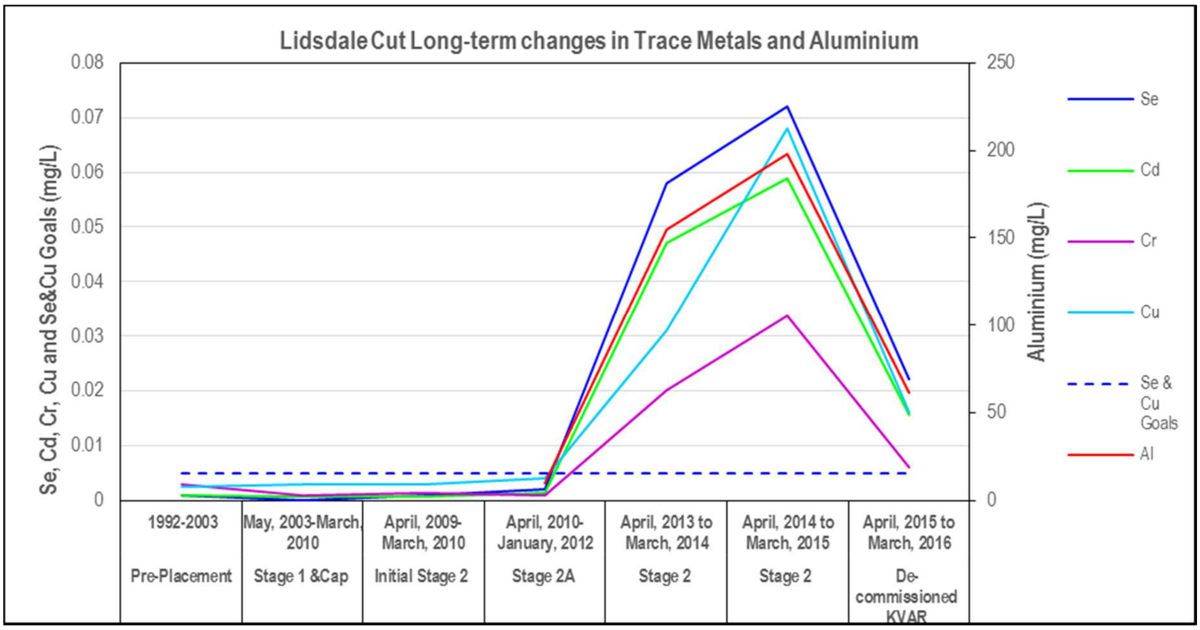

Figure 6: Average concentrations of trace metals and aluminium in the Lidsdale Cut Pond from the pre-KVAR placement period and each reporting period since 2003/2010

Table 7: Long-term Groundwater Quality changes for Lidsdale Cut Water Quality from Stage 1 and its Capping and Initial Stage 2 to the current decommissioned period compared to the pre-placement conditions and the Groundwater Guidelines or Goals

Element (mg/L)	Lidsdale Cut (WX5)							
	Pre-Placement (1992-2003) 90th Percentile	Stage 1 &Cap (May, 2003-March, 2010)	Initial Stage 2 (April, 2009-March, 2010)	Stage 2A (April, 2010-January, 2012) *	Stage 2 * April, 2013 to March, 2014	Stage 2 April, 2014 to March, 2015	Decommissioned KVAR (April, 2015 to March, 2016)	Ground-water Guidelines # or Goals
pH	6.9	4.3	3.4	4.8	3.4	3.5	3.4	6.5 – 8.0
Cond/ (µS/cm)	952	1178	1965	1011	3917	4146	2549	2600^
TDS	650	870	1500	740	4083	4633	2089	2000
SO4	359	580	970	460	2900	3148	1529	1000
Cl	34	18	19	21	28.7	33	21.1	350
Al	2.43	-	-	9.7	155	198	61.1	**5.1**
As	<0.001	0.002	0.002	0.002	0.020	0.030	0.013	0.024
B	2.16	2.50	5.20	2.4	13.3	14.8	6.6	**1.7**
Cd	<0.001	0.0008	0.0008	0.0013	0.047	0.059	0.0156	0.001
Cr	<0.006	0.001	0.0013	0.001	0.020	0.0337	0.006	0.004
Cu	<0.005	0.003	0.003	0.004	0.031	0.068	0.016	0.005
F	1.99	3.10	6.70	2.60	28.7	30.0	13.2	1.5
Fe	0.7	0.54	3.05	0.04	-	-	8.27	**1.7**
Mn	2.12	3.70	6.30	4.10	2.5	2.53	8.48	1.9
Mo	-	0.005	0.010	<0.010	0.001	0.004	0.001	0.010
Ni	-	0.375	0.540	0.280	1.08	1.129	0.752	**0.137**
Pb	0.004	0.003	0.003	0.002	0.015	0.006	0.013	**0.01**
Se	0.001	<0.001	0.001	0.002	0.058	0.072	0.022	0.005
Zn	0.304	0.360	1.20	0.520	2.84	2.815	1.62	**0.505**

* EnergyAustralia NSW was unable to monitor the water quality in the Lidsdale Cut void from July, 2012 to March, 2013 due to drawdown of the void water level by the pumps.

It appears that the increased concentrations of salinity, sulphate and trace metals in the Lidsdale Cut are due to coal pyrite oxidation, possibly due to a decrease in the water level in the pond caused by pumping of the water to the SSCAD. However, EnergyAustralia NSW has confirmed that pumping is undertaken to maintain a water level of 0.4 to 0.6m within the open-cut void pond. This suggests that the pyrite oxidation may be related to blocking of the natural groundwater flow, together with the KVAD toe drain inflows, from constantly flowing through the pond into Sawyers Swamp Creek.

As well as the release of cadmium, aluminium and the other metals released into solution, selenium release in acid mine drainage is also known to occur (see Förstner and Wittmann, 2012). Its release from the Lidsdale Cut chitter suggests that the selenium was accumulated as the insoluble sulphide over the long-term from the KVAD flyash, when it was an active ash dam (Aurecon, 2015). Its release as the soluble selenium may have occurred due to the change from reducing to oxidation of the pyrites as a result the changed groundwater flow conditions in the Lidsdale Cut pond.

The view that the source of elevated concentrations of salts, trace metals and aluminium is most likely due to releases from the local coal pyrites is further investigated in the next Section by examination of the aluminium distribution among the KVAR/KVAD groundwater bores, KVAD seepage points and bore D5 and Lidsdale Cut.

3.7 Distribution of Aluminium between groundwater sampling sites

The following graphs show the differences in aluminium concentrations between all the sampling sites in the KVAR/KVAD area by using pH/aluminium and sulphate/aluminium signatures.

Aluminium is known to come into solution under acidic conditions generated as a result of pyrite oxidation, and from the above review of the water quality at each site, it is apparent that elevated aluminium concentrations are associated with the presence of coal pyrites. Pyrite (FeS) oxidation also generates sulphate and acidic conditions, so the aluminium concentration was graphed against pH for each groundwater bore inside the KVAD and at bore D5 and Lidsdale Cut in Figure 6.

Figure 7 shows that the bores, AP09 and GW11, which sample the KVAD groundwater have near neutral pH and low aluminium concentrations, so they are separated from the other samples by their pH/aluminium signatures. All the other sites have acidic pH from 3.0 to 4.0. At these pH’s, the KVAD south-western wall seepage (Site 94), bore AP17 at the northern wall and Lidsdale Cut have high aluminium concentrations, while bore D5 has a moderate concentration and the north wall seepage (Site 86) had a similarly low concentration to that at bores AP09 and GW11.

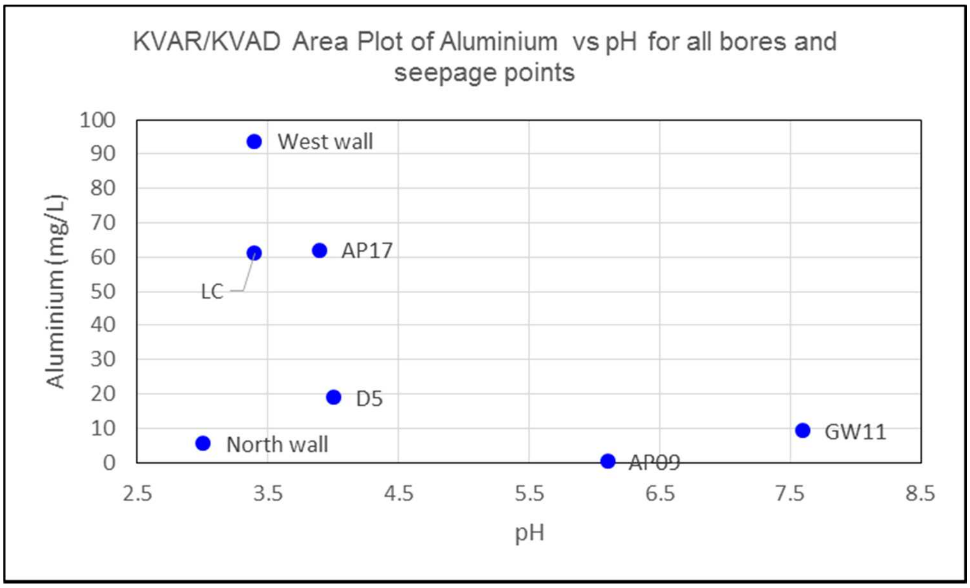

Figure 7. Signature plot of Aluminium concentration compared to pH for each groundwater bore and seepage points at the KVAD and at Bore D5 and Lidsdale Cut

The previous report suggested that the aluminium incident in 2012 may have originated from some part of the wider area of coal/chitter placements in the Sawyers Swamp Creek catchment, downstream of the SSCAD. Hence, the reasons for the lower aluminium concentrations at D5 and at the KVAD north wall seepage were investigated to assist in determining the role of coal waste/chitter on aluminium concentrations in the KVAR/KVAD area.

For the north wall seepage, EnergyAustralia NSW advised Aurecon that coal chitter was not used to construct the north wall of the KVAD where the seepage point is located, so the low concentration of aluminium is consistent with only soil used for that part of the dam wall. However, a drawing of the dam wall structure (see in Attachment 3) shows the use of coal chitter to construct benches that supports the dam wall.

Bore AP17 samples the groundwater under the north wall bench and has a much higher aluminium concentration than in the seepage point (Figure 6). This indicates that there is a source of aluminium in the north wall benches, which may explain the high aluminium concentration at bore AP17.

The variable aluminium concentrations seen in Figure 6, at similarly low pH's, indicates another factor (other than the vertical distribution of chitter in the KVAD walls) may be involved in determining their concentrations. The most likely factor is sulphate concentrations, because sulphate is generated by oxidation of the sulphur in coal pyrites (iron sulphide, FeS) and aluminium sulphate is highly soluble.

Figure 7 shows a plot of all the aluminium concentrations compared to sulphate for each groundwater bore and seepage point at the KVAR/KVAD. A regression of the bores showing aluminium concentrations associated with sulphate concentrations was significant for bores GW11, D5, Lidsdale Cut and the KVAD west wall seepage.

The low aluminium concentration at bore D5 was due to it having a low sulphate concentration of 495 mg/L, the second lowest of all the sampling sites, with GW11 having the lowest of only 45 mg/L. The sulphate/aluminium signature in Figure 8 indicates that, although bore D5 has an acidic pH, the amount of sulphate present limits the amount of aluminium maintained in solution in the groundwater.

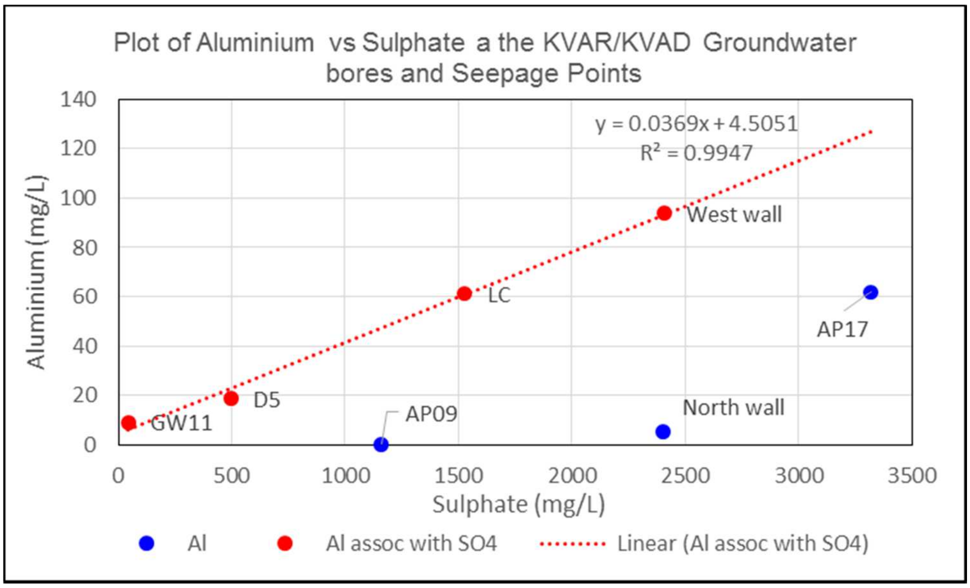

Figure 8. Signature plot of Aluminium concentration compared to Sulphate for each groundwater bore and seepage points at the KVAD and at Bore D5 and Lidsdale Cut

Figure 8 also shows that, although the south-west wall seepage has a similar sulphate concentration as the north wall, the south-western seepage has the highest aluminium concentration of all the sites. Examination of the location of the south-western seepage point in Figure 3 indicates that the high concentration occurs because the seepage is from under the KVAD, and the seepage is draining coal waste/chitter from the south-western area.

The above view that bore AP17 is sampling coal chitter used to construct benches is supported by the sulphate/aluminium signature in Figure 8. Although AP17 has a similar pH and similar aluminium concentration as in the Lidsdale Cut, a much higher sulphate concentration was required to maintain the aluminium concentration at AP17 (about double that at Lidsdale Cut). The most likely reason is that the dam wall at AP17 is not fully constructed of coal chitter, but the Lidsdale Cut void consists mostly, if not all, of coal waste/chitter. This indicates that more aluminium is released from the more abundant coal pyrites in Lidsdale Cut than at AP17, where coal pyrites are less abundant.

Before updating the potential effects of seepage from the KVAR/KVAD on Sawyers Swamp Creek, in addition to that undertaken in 2015/16, by using the recent water quality data, a review of the effects of the SSCAD on the water quality on the creek is undertaken in the next Section.

Figure 9: Kerosene Vale Ash Dam and Stage 1 and Stage 2 Dry Ash Repository Groundwater Level (RL m) Contours with Inferred Flow Directions (from sketch provided by Lend Lease Infrastructure to EnergyAustralia NSW)

4. Review of Surface Water Quality

This Section reviews the effects of seepage from under the Sawyers Swamp Creek Ash Dam wall on the water quality in Sawyers Swamp Creek, as well as the effects of seepage from the KVAR/KVAD further downstream.

Previous reports have shown that, prior to the Springvale coal mine water discharge into the creek since it became continuous in 2013, the SSCAD seepage was causing a moderate increase in salinity but there was no significant effect on trace metals. Although the mine water discharge now dominates the water quality in the creek, EnergyAustralia NSW has continued to monitor the water quality in the ash dam pond and at the main v-notch seepage point so significant changes can be related to the pre-mine water flow conditions. In addition, a seepage return water system was installed in May, 2010, so most of the v-notch seepage has been prevented from entering the creek since then. In addition, water from the Lidsdale Cut pond has been pumped into the return canal since June, 2012, so changes in water quality in the SSCAD pond are examined in this Section.

The effects of seepage from the KVAR/KVAD on Sawyers Swamp Creek were assessed as not significant in the previous report. Those potential effects are updated in Section 5.2.

4.1 Sawyers Swamp Creek Ash Dam effects on Surface water Quality

The previous report mentioned the dominant effects of the water quality in Sawyers Swamp Creek by the discharge of water from the Springvale Mine and the same conditions have persisted during the current period. Table 8 shows the long-term changes in water quality in the SSCAD pond and the current v-notch seepage, compared to the differences in the creek water quality from upstream to downstream of the v-notch seepage in 2015/16. Note that elements in the pond and the seepage with higher concentrations than the local guidelines are highlighted in blue to indicate potential sources of salts and trace metals, the guidelines actually apply to the receiving water site at WX7 and not the pond or the v-notch seepage.

The upstream site is located in the creek just downstream of the ash dam spillway. Catchment runoff from upstream of the ash dam enters the creek, via a pipe, that discharges over the spillway and joins the normal creek flow just upstream of the sampling location. Hence, the water quality differences from upstream to downstream covers the length of the entire dam wall. In this way, any seepage from the dam wall that enters the creek along its length could be addressed.

Previous reports have shown that trace metals are removed from the SSCAD pond water as it passes through the dam wall soils and exits into the creek at the v-notch. It is assumed that a similar removal process occurred for the whole length of the dam wall.

The significant changes in the SSCAD pond water quality concentrations shown in Table 8 were observed for:

- Conductivity and sulphate were moderately elevated during 2012 to 2015 but have reduced to about the same levels as during the wet ash period (before dry ash placement began at KVAR)
- Aluminium increased from 2.2 mg/L in 2014/15 to 7.8 mg/L in 2015/16
- Cadmium has increased since 2012 but is 4-fold lower than when the ash dam was used for wet ash placement

- Nickel has increased since 2012 and reached its highest concentration in 2015/16, but is still lower than during wet ash placement
- Selenium decreased by an order of magnitude from 0.15 mg/L to be less than the ANZECC (2000) guideline of 0.005 mg/L since 2014/15

Changes in the SSCAD v-notch discharge water quality concentrations were:

- The trace metals, including aluminium, showed significant reductions at the v-notch except nickel (remained about the same as in the pond) and manganese increased, possibly by release to the flow by soil material in the dam wall.
- Salinity increased at the v-notch, while sulphate was similar to that in the SSCAD pond and the pH increase from acidic to neutral in response to the increase in alkalinity, also indicating effects of passing through soil material in the dam wall.

Table 8: Water Quality in SSCAD for Pre-placement and Stage 2 Periods to 2014/15 and the V-notch Seepage Compared to Sawyers Swamp Creek Up- and Downstream of the V-notch and Surface Water Guidelines or Goals

Element (mg/L)	Pre-Placement (1996-2003)	Stage 2A (April, 2010-January 2012)	Stage 2 February, 2012 to March, 2013	Stage 2 during April, 2013-March 2015	Decommissioned KVAR (April, 2015 to March, 2016)	V-Notch Seepage 2015/16	SSC Upstream V-Notch Seepage April,2015 to March, 2016	SSC Down-stream V-Notch Seepage April, 2015 to March, 2016	Spring-vale Mine water discharge	ANZECC (2000) Guidelines & Goals for SSC
	SSCAD	SSCAD	SSCAD	SSCAD	SSCAD	SSCAD v-notch	SSC	SSC	Springvale Mine Water	
pH	5.4	4.8	4.8	6.1	4.8	7.2	8.3	8.7	8.1	6.5-8.0
Cond (µS/cm)	1219	1912	1457	1496	1169	1502	1169	1169	1163	2200
TDS	858	1418	1066	1083	820	1155	662	645	907*	1500
SO4	553	910	674	710	563	645	39	40.5	39.9	1000
Cl	18	30	20	19	13.9	27	7.0	6.6	6.0	350
Alk	18	19	25	28	3.6	151	580	577	581	-
Al	-	2.3	4.5	2.16	7.77	4.3	0.36	0.26	0.37	5.25
As	0.016	0.0013	0.002	0.002	0.002	0.003	0.024	0.022	0.023	0.024
Cd	0.012	0.0021	0.0042	0.0038	0.0046	0.003	0.0001	<0.0001	<0.001	0.0015
Cr	0.005	0.0014	0.0028	0.001	0.001	0.002	<0.001	<0.001	-	0.005
Cu	0.007	0.0115	0.0203	0.0055	0.011	0.003	<0.001	<0.001	0.002	0.005
Fe	0.17	0.21	0.08	0.10	0.13	0.086	0.008	0.025	0.004	0.3
Mn	1.2	1.34	1.17	1.23	1.64	2.28	0.008	0.012	0.007	1.9
B	4.7	2.01	1.82	2.07	2.15	1.31	0.108	0.095	0.073	**1.25**
F	9.3	2.15	2.21	2.19	2.73	1.89	0.96	0.97	1.17	1.5
Mo	0.152	0.033	0.013	0.024	0.004	0.008	0.045	0.046	0.046	0.01
Ni	0.129	0.041	0.071	0.076	0.108	0.097	0.004	0.003	0.004	0.05
Pb	0.002	0.001	0.003	0.001	0.001	0.002	<0.001	<0.001	<0.001	0.005
Se	0.151	0.006	0.009	0.004	0.003	0.001	<0.001	<0.001	<0.001	0.005
Zn	0.426	0.136	0.263	0.196	0.360	0.153	0.008	0.008	0.009	**0.153**

*Springvale TDS estimated from TDS=0.78xconductivity

To clarify the SSCAD long-term changes, Figure 10 shows the changes in conductivity and sulphate, as well as the trace metals boron, manganese, nickel and zinc since the wet ash placement to conversion to dry ash at the KVAR.

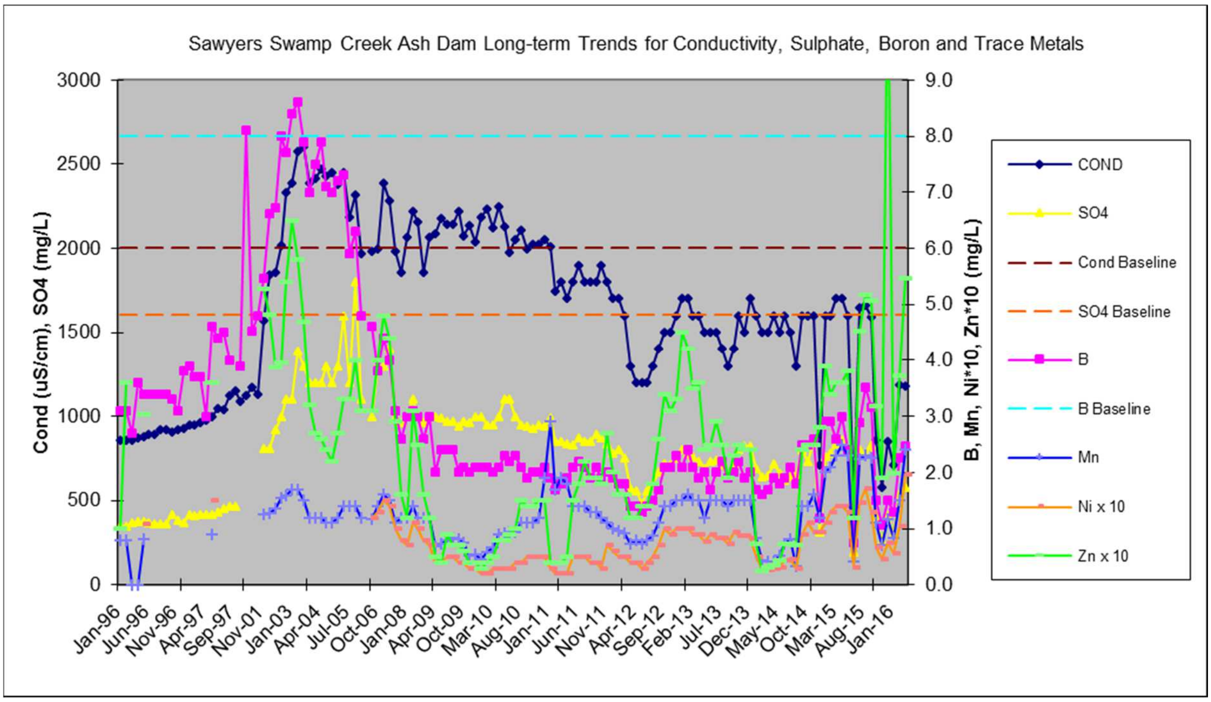

Figure 10: Long-term trends in conductivity, sulphate and trace metals in SSCAD Pond from periods of wet ash placement to 2003, dry ash placement at KVAR from 2003 to 2014 and pumping from Lidsdale Cut since 2012.

Figure 10 shows significant improvements in conductivity, sulphate and boron concentrations since diversion of ash placement in the SSCAD to the dry ash at KVAR. The conductivity has become highly variable in 2015/16, apparently due to capping of the unused areas and diversion of rainfall runoff into the reduced size of the pond at the dam wall. There has been a trend for increase since 2010 for nickel and manganese, while zinc has increased significantly in recent years.

The zinc increase may be related to release from the pond sediments, so it is suggested that the pond be examined for possible loss of dissolved oxygen in the bottom waters. Dissolved oxygen measurements in the surface water of the pond (Attachment 2) showed a large decrease from an average of about 14 mg/L to less than 6 mg/L since January, 2016.

Due to the dominant flow of the Springvale mine water, Table 8 shows the water quality and trace metals in Sawyers Swamp Creek are the same as the mine water and there is no difference in the creek from upstream to downstream of the v-notch seepage point.

In terms of assessing the effects of the ash dam seepage on the creek without any mine water flows, just natural stream flows, Table 7 shows that all the water quality and trace metal concentrations at the v-notch, other than cadmium, manganese, boron, fluoride and nickel had lower concentrations than the Local/ANZECC (2000) Guidelines for Sawyers Swamp Creek at the receiving water site WX7. The amount of dilution to reduce the trace metals to less than the guideline concentrations was examined by comparing the stream flow in Sawyers Swamp Creek of 4.5 ML/day (see Section 3.2) with the v-notch seepage flow, which averages 0.069 ML/day, which is about a 60-fold dilution.

As the cadmium concentration at the v-notch is twice as high as its guideline, and zinc is similar, a 2-fold dilution would be required to meet the guideline concentrations for these metals. The other metals require a lower rate of dilution. Hence, the V-notch inputs (even if they were not pumped back into SSCAD) are not expected to increase the concentrations in the creek above their guideline levels. This amount of dilution is also expected to be sufficiently high enough to allow for the unknowns of seepage along the whole length of the dam wall.

As the Sawyers Swamp Creek Ash Dam is unlikely to have had a significant effect on water quality or trace metals, the effects of KVAR/KVAD groundwater seepage on the creek further downstream are examined in the next Section.

4.2 KVAR/KVAD Groundwater Seepage Effects on Sawyers Swamp Creek

The following estimates of effects of the KVAR/KVAD groundwater seepage on Sawyers Swamp Creek are based on using creek concentrations from May, 2003 to July, 2007 (prior to any Springvale mine water discharges). These earlier creek concentrations are shown in Table 9.

The main KVAR/KVAD seepage point into Sawyers Swamp Creek is from the north wall near bore GW6 (Figure 2) and its water quality data for 2015/16 is shown in Table 9. As there is no reliable water quality data available for the creek upstream of the seepage, without the effects of mine water, the effects of the seepage were assessed by using the estimated seepage flows as well as the natural creek flows (Aurecon, 2015). Following that approach, the assessment of effects has been updated with the current decommissioned period north wall seepage data for 2015/16 in Table 9 (the current KVAR north wall seepage and the estimated increase in concentrations at WX7 are highlighted in grey).

Table 9 shows that all of the estimated increases in Sawyers Swamp Creek concentrations, including salinity, sulphate and trace metals, caused by the KVAR/KVAD seepage are expected to be lower than the Local/ANZECC (2000) guideline concentrations, other than for iron. The iron concentration in the north wall seepage at 72.1 mg/L was similar to the average of all the KVAD bores during 2014/15 of 87.5 mg/L, which was predicted to increase the creek concentrations by 7.4 mg/L. Consequently, the increase in the creek during 2015/16 was estimated to be 6.1 mg/L. However, high iron concentrations have existed for a long time and are widespread in the area (see Tables 3,4 and 5), and the iron concentration at WX7 averaged only 0.065 mg/L during the pre-mine water period, indicating that the iron does not stay in solution in the oxygenated creek waters.

Table 9: Estimated water quality increases in Sawyers Swamp Creek at WX7 due to groundwater seepage from the KVAR/KVAD without Springvale coal mine discharges for the previous 2014/15 and the current periods compared to recent Sawyers Swamp Creek concentrations and ANZECC (2000) Guidelines or Local Goals

	Sawyers Swamp Creek (WX7)					North Wall KVAD/R Seepage to SSC		Sawyers Swamp Creek prior to Mine water Discharge			
Element (mg/L)	Pre-placement (1991-2003) 90th Percentile	Stage 2A (April, 2010-January, 2012) Median	Ongoing Stage 2 (February, 2012-March, 2013)	Stage 2 during April, 2013-March 2015	Decommissioned KVAR (April, 2015 to March, 2016)	Stage 2 (April, 2014 to March, 2015)	Decommissioned KVAR (April, 2015-March, 2016)	WX7 Increase due to Decommissioned KVAR Leachate	WX7 Increase due to KVAR Leachate in 2014/15^	WX7 Pre-Springvale Mine Water Discharge #	Surface Water Guidelines or Goals
pH	7.6	7.3	7.5	8.7	8.8	2.9	3.0	-0.1	-0.1	6.3	6.5 – 8.0
Cond (µS/cm)	760	1100	828	1129	1154	3336	4096	18.7	15.2	1070	2200
TDS	584	690	553	696	659	2736	3110	14.5	12.8	774	1500^
SO4	323	300	156	36	38	1918	2400	9.0	7.2	496	1000 ++
Cl	27	16	11	5.3	5.9	18.7	18.6	0.1	0.1	26.5	350 +
Alkalinity	20	162*	257*	557	590	-	-	-	-	20	-
Al				0.20	0.42	2.0	5.58	1.06	0.38	0.274	**5.25**
As	<0.001	0.004	0.007	0.022	0.023	0.001	0.004	0.004	<0.001	0.015	0.024
B	2.33	1.4	0.634	0.091	0.143	5.8	8.1	0.067	0.048	2.26	**1.25**
Cd	<0.001	0.0007	0.0011	0.0001	0.0001	<0.0002	0.0002	0.0003	0.0003	0.0006	0.0015
Cr	<0.001	0.0025	0.0128	0.0013	0.001	0.0008	0.001	0.0001	<0.0001	0.0003	0.005
Cu	<0.007	0.003	0.0099	0.0021	0.001	0.001	0.001	0.001	<0.001	0.0004	0.005
F	1.1	1.7	1.7	1.10	1.17	0.5	4.1	0.16	-	0.89	1.5+++
Fe	0.507	0.02	0.26	-	0.025	-	72.1	6.1^	-	0.065	0.3+++
Mn	0.829	1.7	0.72	-	0.017	0.68	16.1	1.37	0.06^	1.12	1.9
Mo	-	0.02	0.014	0.043	0.045	<0.01	0.001	0.0001	<0.0001	0.005	0.01 +
Ni	-	0.16	0.059	0.006	0.005	0.43	1.04	0.0001	0.002	0.142	0.05
Pb	0.003	0.002	0.003	0.0011	0.001	0.0006	0.001	0.001	-	0.004	0.005
Se	0.003	<0.002	<0.001	0.001	<0.001	0.001	0.001	<0.001	<0.001	0.002	0.005
Zn	0.153	0.45	0.035	0.025	0.012	0.26	1.56	0.066	0.011	0.144	**0.153**

*averages used to allow for effects of periods of mine water pipeline leakage or the recent discharge

** Mine emergency discharge data from Aurecon (2010) for 17th Feb to 7th Aug09

#Averages for KVAR Stage I period May, 2003 to July, 2007 from Connell Wagner (2008) before Springvale discharge into Sawyers Swamp Creek from 17th February, 2009

^from Aurecon (2015); Estimated from average of KVAD Groundwater Quality in 2014/15

5. Discussion

This current review of the KVAR related surface and groundwater quality attempts to take into account the complex, locally mineralised conditions in which the KVAR is placed. The assessment of the effects of the decommissioned and partly capped KVAR has found similar results to those in 2014/15 of:

- Although the concentrations of some coal pyrite related trace metals increased in the seepage from the KVAD wall during 2015/16, no significant effects of rainfall infiltration through the KVAD on the water quality in Sawyers Swamp Creek is expected, even without the Springvale mine water discharge.
- As the rainfall infiltration seepage rate is small, and it has to pass through the clay capping under the KVAR to enter the KVAD, the trace metal concentrations in the KVAD are reduced in concentration, by adsorption onto the clay, to be less than the Local/ANZECC (2000) guideline concentrations. Although the selenium concentration in the receiving water bore D5 is also lower than the guideline, most of the other trace metals in the local groundwater have elevated concentrations due to releases from the local coal pyrites. Hence, no significant effects of the KVAR on local groundwater quality, is considered likely.

Significant decreases in salinity and trace metal concentrations occurred in the Lidsdale Cut pond during 2015/16 compared to the elevated concentrations during the previous period. Last year's report recommended that pumping from the Lidsdale Cut pond be reduced because it was considered that pumping caused a drawdown of the water level in the pond and allowed coal pyrite oxidation and release of trace metals and creation of sulphate. EnergyAustralia NSW has confirmed that pumping was not reduced, other than maintaining a water level of approximately 0.4 to 0.6m within the open-cut void pond. It was also advised that the Lidsdale Cut water is pumped to the truck wash area, from there to the ash return canal for pH adjustment at the power station caustic injection plant.

The 2014/15 report suggested that the precipitation of aluminium in Sawyers Swamp Creek in mid-2012 after a significant rainfall event appeared to be due to coal waste/chitter pyrites in the area, rather than due to the groundwater concentrations inside the KVAD. This view has been made clearer, having shown that the likely source of the aluminium is the result of pyrite oxidation of the local coal waste or chitter. It was found that coal waste/chitter is present in the KVAD benches, the open-cut coal mine void under the KVAD and in the Lidsdale Cut open-cut coal mine void, which is much larger than the pond area.

Although the concentrations of some trace metals, including aluminium, have increased in the SSCAD pond since the last report, the concentrations in the v-notch seepage have mostly decreased possibly due to adsorption onto soils in the dam wall. Due to the slow rate of seepage into Sawyers Swamp Creek (especially as flows from the v-notch seepage are captured and returned to the ash dam pond, all the water quality, trace metals and aluminium concentrations are expected to be lower than the Local/ANZECC (2000) guideline concentrations in the creek, even without the diluting effects of the current Springvale mine water discharge.

The observed increases in cadmium, aluminium and zinc in the SSCAD pond are unknown but may possibly be due to release from the pond sediments by low dissolved oxygen concentrations. Hence, it may be prudent for EnergyAustralia NSW to monitor dissolved oxygen concentrations near the bottom of the pond and investigate aeration of the waters to maintain the dissolved oxygen levels.

It is also suggested that EnergyAustralia NSW maintain monthly monitoring of the SSCAD pond and the v-notch seepage, as well as the Lidsdale Cut pond to assist in confirming the benefits of any management actions taken to limit mobilisation of metals from the Lidsdale Cut coal waste/chitter fill.

Due to the reduced and now relatively stable salinity and relatively low concentrations of most of the trace metals in SSCAD, as well as adsorption of the trace metals as they pass through the dam wall soils, no significant effects have been seen at the seepage detection bore D3. In addition, although there has been a steady increase in salinity at bore D4, no effects on trace metals have been seen.

6. Conclusions

The overall conclusions of this assessment for the 2015/16 study is that:

- The KVAR is not having a significant effect on the local surface and groundwater quality
- Leachates from the long-held ash in the KVAD have been largely depleted given the current conditions (as indicated by the very low selenium concentrations in the KVAD groundwater) and the remaining metal leachates, including aluminium, are from pre-existing coal waste/chitter in the void and benches that form the KVAD
- The slow rate of movement of groundwater from the KVAD had no significant effects on the receiving water groundwater at bore D5
- Salinity, trace metals and aluminium decreased in the Lidsdale Cut pond, possibly due to improved water management in the pond to minimise the effects of coal pyrite oxidation
- The elevated salinity, trace metals and aluminium at Lidsdale Cut are unrelated to groundwater seepage from the KVAD due to the overriding effects of coal pyrites in the open-cut mine void area that forms the Lidsdale Cut pond
- The SSCAD seepage is not having a significant effect on the local groundwater up-gradient of the KVAD. Seepage at the northern part of the dam wall has increased salinity above the MPGM4/D4 background levels, indicating that the increases are due to another source.

7. Recommendations

Based on the findings of this study, including the effects of pumping from Lidsdale Cut and the domination of the water quality in Sawyers Swamp Creek by the discharge of water from the Springvale Mine, the following recommendations are made:

- Continue monthly water quality monitoring at the EnergyAustralia NSW routine surface water and groundwater monitoring sites until the relevant Authorities advise on the decommissioning conditions for the site
- EnergyAustralia NSW continue to monitor the water quality in the Lidsdale Cut pond to see if the current decrease in concentrations continues
- EnergyAustralia NSW investigate the dissolved oxygen in the SSCAD pond bottom waters to see if it is maintaining sufficient levels to minimise release of trace metals from the pond sediments.

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Attachment 1

Lithgow Rainfall Data

Lithgow Rainfall Data from January, 2000 to March, 2013 (mm/month) from Bureau of Meteorology

Year(s)	January	February	March	April	May	June	July	August	September	October	November	December	Annual
2000	57	22.2	271.4	50.6	53.4	32.2	37.4	51.2	43	75	119.2	59	871.6
2001	105.4	90.6	89.6	84.4	28.8	9	63.2	30.8	46.4	58.8	80	26.6	713.6
2002	87.8	187	69.4	40.2	67.6	22.6	16.8	17	21.2	3	22	47.2	601.8
2003	3.6	135	41.8	38.4	54	43.2	20.6	0	18.6	82.4	121	68.8	627.4
2004	35	98.2	22.4	10.4	35.2	16.2	30.2	50.8	34.8	118.4	113.8	88.6	654
2005	102.8	104.6	55.8	28.6	14.2	117.2	59.2	24.6	87.6	116.5	159.4	48.4	918.9
2006	146.6	32.6	6.4	6.8	6.8	6.8	54.2	5.8	59.2	3.2	32.2	72.7	433.3
2007	92.6	141.4	72.1	44.6	56.6	223	24.9	65.4	9	37.8	134.7	67	969.1
2008	102	84.6	47.6	59.8	11	60.9	37.1	43.6	88.2	66.2	83.3	113.2	797.5
2009	25.2	165.8	28	74.5	80.9	44.5	35.9	48.8	63	69	23.6	81.5	740.7
2010	76.4	119.2	85.1	35.8	54.4	40.9	73.5	73.5	52.4	70.9	122.8	164.6	969.5
2011	114	57.2	77.2	41.2	51.2	72.4	24.6	58.7	78.4	46.2	168	96	885.1
2012	57.1	152.6	189.8	44.4	30.6	81.8	49.8	21.2	48.6	20.8	30.9	64.1	791.7
2013	64.1	113.2	184.2	66.2	28.1	29	24.4	23.2	36.8	21.8	95.2	34.2	720.4
2014	13.6	74	143.8	63	14	43.2	24.2	24.2	27.9	60.7	21.8	174.3	684.7
2015	124.8	31	35	184	31	26	44.6	31.6	12.6	37.2	67.2	57.2	682.2
2016	166.6	46.6	36.8										

Attachment 2

Wallerawang Power Station Ash Dam Surface Water and Groundwater Quality Stage 2 from February, 2012 to March, 2015 and April, 2015 to March, 2016

Attachment also contains:

- Pre-Dry Ash Placement Summary data before April, 2003 and;
- LLI Sawyers Swap Creek Data from February, 2010 to March, 2016

NOTE: Post-Dry Ash Placement Stage 1 and initial Stage 2 Raw Data and Summary statistics are in previous reports:

- Stage 1 Data from May, 2003 to July, 2007 in Connell Wagner, 2008
- Initial Stage 2 data from August/October, 2007 to April, 2010 in Aurecon, 2010)
- Stage 2A Water Quality Assessment from April, 2010 to January, 2012 in Aurecon (2012)

Post Dry Ash Placement Stage 2 Raw Data and Summary Statistics from February, 2012 to March, 2016:

1. Water Quality Data and Summary for Sawyers Swamp Creek WX7 and Background at Dump Creek WX11
2. Water Quality Data and Summary for Lidsdale Cut WX5
3. Water Quality Data and Summary for Sawyers Swamp Creek at WX1, upstream of SSCAD. EANSW site 92
4. Water Quality Data and Summary for SSCAD Groundwater Seepage Detection Bores WGM1/D3 and 1/D4
5. Water Quality Data and Summary for Background Groundwater Bore WGM1/D2
6. Water Quality Data and Summary for KVAD and KVAR Stage I and II Dry Ash Placements Seepage Detection Groundwater Bores WGM1/D5 and 1/D6
7. Water Quality Data and Summary for SSCAD (includes data from April, 2010 to January, 2012)
8. Water Quality Data and Summary for Sawyers Swamp Creek Monitoring from SSCAD Spillway to near WGM4/D5

Sawyers Swamp Creek EANSW & LLI WQ monitoring February, 2010 to March, 2015, including:

- Sawyer Swamp Creek at WX1, upstream SSCAD. EANSW Site 92
- Sawyers Swamp creek upstream @0 m where SSCAD diversion and Springvale Mine Water from August, 2012 enters SSC at spillway

- Sawyers Swamp Creek Ash Dam Seepage from V-notch (water collected and recycling back into dam)
- Sawyers Swamp Creek at @850m - upstream seepage from KVAD wall and Below SSCAD v-notch Seepage Point. EANSW Site 93 from June, 2012
- Sawyers Swamp Creek at 1250 m near GW Bore D5. EANSW Site 83
- KVAD/R Seepage water Northern wall collection pit near GW6 Groundwater from the KVAD on the northside drains
- KVAD southwestern seepage at Site 94
- KVAD groundwater Bores GW11, AP09 and AP17

1. Water Quality Data and Summary for Sawyers Swamp Creek WX7 and Background at Dump Creek WX11

a) SAWYERS SWAMP CEEK AT WOLGAN ROAD BRIDGE WX7 (mg/L)

Sawyers Swamp Creek WX7 Pre-Dry Ash Placement Summary 1991-April, 2003 (mg/L)																		
	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg
Average	0.001	0.274	22	0.001	0.919	0.037		20	0.001	19	44042	0.001	0.004	0.612	0.291	0.0001	12	15
Maximum	<0.01	0.647	84	<0.05	2.900	0.045		57	<0.002	82	147800	<0.01	0.009	3.100	0.927	0.0002	36	39
Minimum	0.001	0.105	5	0.001	0.205	0.030		4	0.001	6	3000	0.001	0.001	0.110	0.050	0.0001	1	4
90th Percentile	0.001	0.4927	33	0.001	2.331	0.043		38	0.001	27	76000	0.001	0.007	1.1	0.507	0.0002	27	22

*Outliers

Continued…………Sawyers Swamp Creek WX7 Pre-Dry Ash Placement Summary 1991-April, 2003 (mg/L)															
	Mn	Mo	NO2+NO3	Na	NFR	Ni	Ortho P	Pb	pH	Se	SiO2	SO4	TDS	TOT P	Zn
Average	0.635		0.061	40	21		0.006	0.002	7.0	0.002	12.2	160	308	0.017	0.099
Maximum	1.510		0.199	120	326		0.031	<0.01	9.3	<0.006	75.0	540	800	0.093	0.342
Minimum	0.153		0.009	11	2		0.001	0.001	6.1	0.001	0.1	38	20	0.001	0.004
90th Percentile	0.829		0.1158	86	23		0.013	0.003	7.6	0.003	22.4	323	584	0.047	0.153

*Outliers

Sawyers Swamp Creek WX7 Post-Stage 2A Ash Placement Data (mg/l) February, 2012 to March, 2015.																														
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	NO2+NO3	Na	NFR	Ni	Ortho P	Pb	pH	Se	SiO2	SO4
22-Feb-12	0.001	20.5	114	0.004	0.66	0.043		24	0.0019	12	601	0.003	0.006	1.5	0.005	0.00005	14.5	13.1	0.604	0.003	0.25	85.2	102	0.076		0.004	7.61	<0.002		157
8-Mar-12	0.001	3.4	24	<0.001	0.38	0.036		13.7	0.00055	11	313	<0.001	0.002	0.5	0.01	0.00005	8.96	7.19	0.468	0.005	0.3	30.8	26.5	0.037		<0.001	7.11	<0.002		95
19-Apr-12	0.001	18.2	4	0.001	1.63	0.034		37.2	0.0029	16	800	0.002	0.005	2.9	0.08	0.00005	29	17.5	1.88	0.003	0.25	91.2	51.2	0.143		0.001	5.24	0.001		351
23-May-12	0.001	272	12	0.01	3.16	0.056		68.5	0.0075	19	1342	0.055	0.026	8.9	0.034	0.00005	54.4	30.7	3.67	0.01	0.25	132	1088	0.281		0.015	4.6	0.002		648
21-Jun-12	0.001	2.7	38	<0.001	0.77	0.034		26.8	0.0003	18	612	<0.001	0.002	0.6	0.015	0.00005	11.2	20.8	1.6	0.003	0.25	63.4	20.9	0.084		0.001	7.08	<0.002		229
27-Jul-12	0.001	1.2	272	0.002	0.34	0.025		14.3	0.0002	12	763	<0.001	0.002	0.7	0.049	0.00005	8.87	10.6	0.648	0.009	0.3	142	34	0.034		<0.001	8.14	<0.002		118
15-Aug-12	0.001	6.3	97	0.006	0.46	0.046		18.6	0.0002	16	555	0.002	0.004	0.7	0.031	0.00005	8.83	12	0.602	<0.001	0.25	79.7	67.1	0.059		0.002	7.34	0.001		158
13-Sep-12	0.001	5.8	148	0.003	0.45	0.046		20.2	0.0002	16	647	0.002	0.004	0.9	0.025	0.00005	10.4	11.2	0.001	0.001	0.25	115	45.2	0.032		0.003	7.63	<0.002		148
11-Oct-12	0.001	1.3	395	0.003	0.31	0.023		13.5	0.0002	10	883	<0.001	0.003	1.0	3.04	0.00005	11.1	8.19	0.341	0.018	0.3	211	23.8	0.021		0.001	8.16	0.001		88
14-Nov-12	0.001	0.4	479	0.006	0.33	0.019		12.3	0.0002	7	1061	<0.001	0.002	1.4	0.073	0.00005	12.8	8.25	0.158	0.022	0.3	239	7.1	0.026		0.001	8.2	<0.002		83
12-Dec-12	0.001	0.3	513	0.013	0.09	0.018		5.97	0.0002	6	1032	<0.001	0.001	1.2	0.009	0.00005	11.8	2.98	0.014	0.025	0.55	238	12.6	0.007		<0.001	8.63	0.001		29
17-Jan-13	0.001	0.3	515	0.011	0.10	0.017		5.8	0.0002	5	998	<0.001	0.002	1.1	0.087	0.00005	11.3	2.73	0.001	0.042	0.45	222	6.79	0.004		0.002	8.16	0.001		27
21-Feb-13	0.001	0.2	512	0.012	0.11	0.014		6.35	0.0002	5	1011	<0.001	0.001	1.3	0.085	0.00005	10.5	2.91	0.016	0.031	0.4	284	3	0.007		<0.001	8.47	0.001		29
13-Mar-13	0.001	0.2	481	0.011	0.10	0.017		5.86	0.0002	5	977	<0.001	0.078	1.3	0.084	0.00005	11.9	3.32	0.033	0.024	0.25	240	3.73	0.009		0.004	8.47	0.001		31

Sawyers Swamp Creek WX7 Post-Stage 2A Ash Placement Data (mg/l) April, 2013 to March, 2015

Date	Ag	Al	Al_Filt	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	Cu_Filt	F	Fe	Hg	K	Mg	Mn	Mo	NO2+NO3	Na	NFR	Ni	Ortho P	Pb	pH	Se	SiO2	SO4	TDS	TKN	TN	TOT P	Zn	Zn_filt
10-Apr-13	0.0005	0.15	0.04	510	0.012	0.1	0.019		5.5	0.0001	5	1000	0.0005	0.0005	0.0005	1.4		0.00003	12.00	3.00		0.033		230		0.005		0.001	8.6	0.001		28	550		0.4		0.028	0.009
17-May-13	0.0005	0.24	0.03	510	0.014	0.08	0.02		5.7	0.0001	5	1000	0.0005	0.029	0.0005	1.3		0.00003	11.00	2.90		0.034		230		0.005		0.003	8.5	0.001		27	640		0.55		0.037	0.008
13-Jun-13	0.0005	0.22	0.06	550	0.017	0.09	0.019		6.5	0.0001	6	1000	0.0005	0.003	0.0005	1.2		0.00003	10.00	3.00		0.034		240		0.005		0.001	8.6	0.001		32	680		0.55		0.03	0.011
11-Jul-13	0.0005	0.08	0.03	560	0.014	0.11	0.018		5.8	0.0001	5	1100	0.0005	0.0005	0.0005	1.2		0.00003	12.00	4.00		0.034		260		0.004		0.0005	8.7	0.001		30	650		0.55		0.025	0.007
23-Aug-13	0.0005	0.2	0.02	600	0.013	0.09	0.022		5.2	0.0001	5	1100	0.001	0.0005	0.0005	0.05		0.00003	11.00	3.00		0.034		260		0.004		0.0005	8.7	0.001		27	670		0.6		0.02	0.007
26-Sep-13	0.0005	0.33	0.16	550	0.016	0.08	0.027		6.1	0.0001	5	1100	0.002	0.001	0.0005	0.1		0.00003	11.00	4.00		0.035		250		0.005		0.001	8.6	0.001		38	740		0.65		0.03	0.025
23-Oct-13	0.0005	0.12	0.02	590	0.018	0.11	0.021		4.9	0.0001	6	1200	0.002	0.0005	0.0005	1.2		0.00003	11.00	3.00		0.037		270		0.005		0.0005	8.7	0.001		40	800		0.5		0.023	0.007
6-Nov-13	0.0005	0.12	0.06	580	0.025	0.1	0.022		4.5	0.0001	5	1200	0.002	0.0005	0.0005	1.1		0.00003	11.00	3.00		0.037		260		0.005		0.0005	8.7	0.001		37	710		0.6		0.025	0.009
5-Dec-13	0.0005	0.14	0.08	540	0.024	0.11	0.022		5.1	0.0001	5	1200	0.002	0.0005	0.0005	1.5		0.00003	10.00	3.00		0.036		250		0.007		0.0005	8.7	0.001		45	680		0.6		0.029	0.006
15-Jan-14	0.0005	0.17	0.05	560	0.024	0.1	0.026		5	0.0001	5	1200	0.002	0.001	0.0005	1.2		0.00003	11.00	3.00		0.04		260		0.007		0.0005	8.7	0.001		39	660		0.65		0.021	0.0025
5-Feb-14	0.0005	0.13	0.04	560	0.025	0.09	0.025		4.5	0.0001	5	1200	0.002	0.0005	0.0005	1.1		0.00003	10.00	3.00		0.045		230		0.008		0.0005	8.7	0.001		41	660		0.6		0.024	0.007
5-Mar-14	0.0005	0.2	0.05	530	0.025	0.1	0.027		5	0.0001	5	1100	0.002	0.001	0.0005	1		0.00003	12.00	3.00		0.042		250		0.008		0.0005	8.7	0.001		42	700		0.6		0.031	0.008
3-Apr-14	0.0005	0.46	0.04	520	0.02	0.1	0.029		5.7	0.0001	6	1100	0.002	0.0005	0.0005	1.2		0.00003	12.00	3.00		0.04		260		0.008		0.001	8.7	0.001		42	730		0.35		0.028	0.008
1-May-14	0.0005	0.15	0.03	570	0.021	0.09	0.024		5.1	0.0001	5	1100	0.0005	0.0005	0.0005	1		0.00003	10.00	3.00		0.04		240		0.006		0.0005	8.7	0.001		39	720		0.4		0.032	0.01
12-Jun-14	0.0005	0.26	0.17	580	0.022	0.08	0.028		5.1	0.0001	5	1200	0.0005	0.0005	0.0005	1		0.00003	11.00	3.00		0.04		260		0.007		0.001	8.8	0.001		36	700		0.6		0.04	0.019
10-Jul-14	0.0005	0.16	0.04	530	0.021	0.1	0.024		6	0.0001	5	1200	0.0005	0.0005	0.0005	1.1		0.00003	11.00	3.00		0.04		260		0.007		0.001	8.7	0.001		39	740		0.55		0.031	0.009
14-Aug-14	0.0005	0.16	0.03	560	0.025	0.08	0.019		3.8	0.0001	5	1100	0.0005	0.0005	0.0005	1.3		0.00003	7.00	1.00		0.11		250		0.005		0.0005	8.7	0.001		31	680		0.5		0.03	0.0025
11-Sep-14	0.0005	0.23	0.07	560	0.029	0.08	0.027		4.8	0.0001	5	1100	0.0005	0.0005	0.0005	1.2		0.00003	10.00	3.00		0.04		240		0.005		0.0005	8.8	0.001		35	670		0.5		0.01	0.0025
23-Oct-14	0.0005	0.2	0.11	580	0.024	0.09	0.027		5	0.0001	5	1200	0.0005	0.0005	0.0005	1.2		0.00003	11.00	3.00		0.049		270		0.005		0.0005	8.8	0.001		38	700		0.6		0.03	0.006
13-Nov-14	0.0005	0.11	0.05	600	0.026	0.08	0.026		5.1	0.0001	6	1200	0.0005	0.0005	0.0005	1.3		0.00003	12.00	3.00		0.053		290		0.003		0.0005	8.8	0.001		38	720		0.35		0.024	0.0025
11-Dec-14	0.0005	0.2	0.06	580	0.028	0.08	0.029		5.4	0.0001	6	1100	0.0005	0.0005	0.0005	1.2		0.00003	12.00	3.00		0.06		280		0.006		0.0005	8.7	0.001		41	740		0.6		0.012	0.006
15-Jan-15	0.0005	0.17	0.06	580	0.029	0.09	0.028		5.6	0.0001	5	1100	0.0005	0.0005	0.0005	1.2		0.00003	12.00	4.00		0.045		280		0.005		0.0005	8.7	0.001		39	730		0.6		0.011	0.0025
12-Feb-15	0.0005	0.94	0.03	540	0.032	0.09	0.039		4.9	0.0001	6	1200	0.0005	0.001	0.0005	1.2		0.00003	12.00	3.00		0.058		270		0.005		0.002	8.8	0.001		39	730		0.75		0.011	0.0025
11-Mar-15	0.0005	0.43	0.06	520	0.012	0.07	0.021		4.5	0.0001	6	1100	0.0005	0.002	0.0005	1.2		0.00003	8.00	2.00		0.027		260		0.004		0.0005	8.8	0.001		31	710		0.5		0.015	0.009

Sawyers Swamp Creek WX7 Post-Stage 2A Ash Placement Data (mg/l) April, 2013 to March, 2015

	Ag	Al	Al_Filt	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	Cu_Filt	F	Fe	Hg	K	Mg	Mn	Mo	NO2+NO3	Na	NFR	Ni	Ortho P	Pb	pH	Se	SiO2	SO4	TDS	TKN	TN	TOT P	Zn	Zn_filt
Average	<0.001	0.2	0.058	556.7	0.022	0.091	0.025		5	0.0001	5.2917	1126	0.0010	0.0019	0.0005	1.10		0.00003	11	3		0.043		256		0.006		0.0008	8.7	0.001		36	696		0.55		0.025	0.0078
Maximum	<0.001	0.9	0.170	600.0	0.032	0.110	0.039		7	0.0001	6.0000	1200	0.0020	0.0290	0.0005	1.50		0.00003	12	4		0.110		290		0.008		0.0030	8.8	0.001		45	800		0.75		0.040	0.0250
Minimum	<0.001	0.08	0.020	510.0	0.012	0.070	0.018		4	0.0001	5.0000	180	0.0005	0.0005	0.0005	0.05		0.00003	7	1		0.027		230		0.003		0.0005	8.5	0.001		27	550		0.35		0.010	0.0025
50th Percentile	0.001	0.17	0.050	560.0	0.024	0.090	0.026		5	0.0001	5.0000	1100	0.0005	0.0005	0.0005	1.20		0.00003	11	3		0.040		260		0.005		0.0005	8.7	0.001		39	710		0.60		0.025	0.0070

Sawyers Swamp Creek WX7 Post-Stage 2A Ash Placement Data (mg/l) April, 2015 to March, 2016																																						
Date	Ag	Al	Al_Filt	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	Cu_Filt	F	Fe	Hg	K	Mg	Mn	Mo	NO2+NO3	Na	NFR	Ni	Ortho P	Pb	pH	Se	SiO2	SO4	TDS	TKN	TN	TOT P	Zn	Zn_filt
9-Apr-15	0.0005	0.43	0.05	520	0.014	0.12	0.034		6.6	0.0001	7	1100	0.001	0.001	0.001	1.2	0.05	0.00003	11.00	4.00	0.064	0.041	2	250		0.007	0.001	8.8	0.001		46	700	250		0.60		0.016	0.006
28-May-15	0.0005	0.27	0.02	560	0.016	0.06	0.033		4.8	0.0001	7	1100	0.001	0.001	0.001	1.1	0.02	0.00002	11.00	3.00	0.009	0.044	2	220		0.003	0.001	8.8	0.001		37	680	220		0.55		0.009	0.006
17-Jun-15	0.0005	0.31	0.06	618	0.015	0.08	0.031		4.5	0.0001	7	1100	0.001	0.001	0.001	1.1	0.05	0.00002	11.00	3.00	0.026	0.043	2	240		0.005	0.001	8.8	0.001		37	620	240		0.60		0.014	0.006
15-Jul-15	0.0005	0.43	0.03	619	0.023	0.09	0.028		4.44	0.0001	6.06	1100	0.001	0.001	0.001	1.4	0.011	0.00002	12.30	3.25	0.008	0.043	0.43	260		0.003	0.001	8.8	0.0001		55.1	611	260		0.70		0.01	0.005
19-Aug-15	0.0005	0.28	0.03	629	0.021	0.24	0.025		4.33	0.0001	5.8	1100	0.001	0.001	0.001	0.991	0.019	0.00002	12.20	3.10	0.008	0.044	0.54	262		0.004	0.001	8.8	0.0001		36.2	530	262		0.70		0.008	0.005
16-Sep-15	0.0005	0.31	0.04	606	0.019	0.07	0.031		4.79	0.0001	6.01	1100	0.001	0.001	0.001	0.714	0.01	0.00002	13.50	3.40	0.006	0.044	0.59	282		0.004	0.001	8.8	0.0001		34.9	630	282		0.80		0.011	0.005
21-Oct-15	0.0005	0.5	0.09	550	0.017	0.08	0.029		4.51	0.0001	6.31	1200	0.001	0.001	0.001	1.29	0.023	0.00002	14.80	3.33	0.006	0.043	0.550	259		0.004	0.001	8.8	0.0003		37.5	674	259		1.00		0.011	0.005
18-Nov-15	0.0005	0.46	0.09	536	0.029	0.18	0.034		5.12	0.0001	5.18	1200	0.001	0.001	0.001	1.03	0.024	0.00002	14.10	3.50	0.019	0.05	0.660	252		0.006	0.001	8.8	0.0004		35.3	702	252		1.10		0.012	0.005
9-Dec-15	0.0005	0.35	0.25	562	0.027	0.33	0.03		5.43	0.0001	5.22	1200	0.001	0.001	0.001	1.32	0.019	0.00002	14.10	3.70	0.038	0.042	0.660	301		0.009	0.001	8.7	0.0003		34.3	736	301		1.00		0.016	0.008
20-Jan-16	0.0005	0.46	0.06	654	0.028	0.08	0.029		4.69	0.0001	5.02	1300	0.001	0.001	0.001	1.43	0.02	0.00002	12.50	3.14	0.009	0.048	0.5	318		0.003	0.001	8.7	0.0003		35	672	318		0.80		0.006	0.006
11-Feb-16	0.0005	0.25	0.04	575	0.036	0.26	0.044		5.14	0.0001	5.51	1200	0.001	0.001	0.001	1.34	0.038	0.00002	13.00	3.51	0.007	0.047	0.57	281		0.008	0.001	8.8	0.0003		35	737	281		2.60		0.026	0.005
16-Mar-16	0.0005	1.18	0.05	649	0.028	0.12	0.028		4.08	0.0001	4.74	1200	0.001	0.001	0.001	1.13	0.018	0.00002	10.50	2.85	0.007	0.045	0.53	313		0.004	0.001	8.7	0.0002		33.7	614	313		0.80		0.009	0.005

Sawyers Swamp Creek WX7 Post-Stage 2A Ash Placement Data (mg/l) April, 2015 to March, 2016																																						
	Ag	Al	Al_Filt	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	Cu_Filt	F	Fe	Hg	K	Mg	Mn	Mo	NO2+NO3	Na	NFR	Ni	Ortho P	Pb	pH	Se	SiO2	SO4	TDS	TKN	TN	TOT P	Zn	Zn_filt
Average	0.0005	0.4	0.068	589.8	0.023	0.143	0.031		5	0.0001	5.9042	1158	0.0010	0.0010	0.001	1.17	0.03	0.00002	13	3	0.02	0.045	0.919	270		0.005		0.0010	8.8	0.0004		38	659		0.94		0.012	0.0056
Maximum	0.0005	1.2	0.250	654.0	0.036	0.330	0.044		7	0.0001	7.0000	1300	0.0010	0.0010	0.001	1.43	0.05	0.00003	15	4	0.06	0.050	2.000	318		0.009		0.0010	8.8	0.001		55	737		2.60		0.026	0.0080
Minimum	0.0005	0.3	0.020	520.0	0.014	0.060	0.025		4	0.0001	4.7400	1100	0.0010	0.0010	0.001	0.71	0.01	0.00002	11	3	0.01	0.041	0.430	220		0.003		0.0010	8.7	0.0001		34	530		0.55		0.006	0.0050
50th Percentile	0.0005	0.3	0.050	590.5	0.022	0.105	0.031		5	0.0001	5.9050	1150	0.0010	0.0010	0.001	1.17	0.02	0.00002	12	3	0.01	0.044	0.580	261		0.004		0.0010	8.8	0.0003		36	673		0.80		0.011	0.0050

b) Water Quality Data and Summary for Background at Dump Creek WX11

Dump Creek WX11 Pre-Dry Ash Placement Background Summary 1991-April, 2003 (mg/L)																														
	Ag	**Al**	**ALK**	**As**	**B**	**Ba**	**Be**	**Ca**	**Cd**	**Cl**	**COND**	**Cr**	**Cu**	**F**	**Fe**	**Hg**	**K**	**Mg**	**Mn**	**Mo**	**Na**	**NFR**	**Ni**	**Pb**	**pH**	**Se**	**SO4**	**TDS**	**Zn**	**Mn**
Average	0.001	0.13	7	0.001	0.64	0.03		32	0.001	23	56732	0.001	0.002	0.539	1.36	0.0002	23	24	0.63		76	5		0.001	6.6	0.002	209	559	0.09	0.63
Maximum	0.001	0.38	16	0.001	3.30	0.05		71	0.001	83	137113	0.001	0.002	1.200	11.00	0.0002	36	42	2.20		156	12		0.001	8.0	0.003	593	984	0.32	2.20
Minimum	0.001	0.04	0	0.001	0.04	0.02		18	0.001	8	32000	0.001	0.001	0.200	0.03	0.0002	14	14	0.09		39	2		0.001	3.6	0.001	88	362	0.00	0.09
90th Percentile	0.001	0.30	15	0.001	1.45	0.05		58	0.001	39	77000	0.001	0.002	1.100	2.38	0.0002	31	35	1.94		110	8		0.001	8.0	0.003	325	772	0.28	1.94

Dump Creek WX11 Post-Dry Ash Placement Data (mg/l) April, 2013 to March, 2015																													
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	NFR	Ni	Pb	pH	Se	SO4	TDS	Zn
10-Apr-13	0.0005	3	12.5	0.0005	3.2	0.02		78	0.0005	24	1800	0.0005	0.006	2.3		0.000025	33	76		0.01	120		0.5	0.005	3.1	0.001	868	1200	1.6
17-May-13	0.0005	3.7	12.5	0.0005	1.8	0.02		59	0.0008	25	1500	0.0005	0.007	1.8		0.000025	25	61		0.01	90		0.42	0.005	3.2	0.001	640	960	1.1
13-Jun-13	0.0005	2.4	12.5	0.0005	1.2	0.012		39	0.0008	18	1000	0.0005	0.004	1		0.000025	15	39		0.00	58		0.29	0.003	3.3	0.001	420	590	1
11-Jul-13	0.0005	3.2	12.5	0.0005	2.8	0.017		69	0.0008	24	1500	0.0005	0.004	1.9		0.000025	28	69		0.00	110		0.47	0.004	3.3	0.001	720	1100	1.2
23-Aug-13	0.0005	3.6	12.5	0.0005	2.2	0.017		64	0.0007	26	1400	0.002	0.005	1.5		0.000025	23	67		0.00	98		0.36	0.005	3.2	0.001	660	970	1.1
26-Sep-13	0.0005	3.2	12.5	0.0005	2	0.022		59	0.0007	27	1400	0.002	0.013	1.5		0.000025	22	60		0.00	93		0.41	0.005	3.3	0.001	660	1000	1.2
23-Oct-13	0.0005	4	12.5	0.0005	2.7	0.025		70	0.0008	28	1700	0.002	0.009	2.1		0.000025	27	71		0.00	110		0.47	0.009	3.1	0.001	810	1200	1.4
6-Nov-13	0.0005	4.1	12.5	0.001	3	0.024		81	0.0009	27	1800	0.003	0.014	2.4		0.000025	33	80		0.00	130		0.62	0.009	3.2	0.001	950	1300	1.7
5-Dec-13	0.0005	4.1	12.5	0.0005	3.3	0.021		86	0.0009	26	1900	0.003	0.006	2.9		0.000025	35	84		0.00	130		0.65	0.007	3.1	0.001	980	1200	1.5
15-Jan-14	0.0005	3.6	12.5	0.0005	3.6	0.027		89	0.0007	25	2000	0.002	0.016	2.5		0.000025	39	86		0.00	130		0.67	0.008	3.1	0.001	1000	1400	1.6
5-Feb-14	0.0005	3.4	12.5	0.0005	3.6	0.025		93	0.0006	24	2000	0.002	0.008	2.4		0.000025	39	88		0.00	120		0.67	0.006	3	0.001	1000	1400	1.8
5-Mar-14	0.0005	3.6	12.5	0.0005	3.4	0.025		91	0.0009	24	2000	0.002	0.007	2.1		0.000025	36	82		0.00	120		0.66	0.006	3.1	0.001	980	1500	1.6
3-Apr-14	0.0005	3.7	12.5	0.0005	3.6	0.023		94	0.0008	24	2000	0.002	0.01	2.1		0.000025	40	88		0.00	120		0.65	0.007	3.1	0.001	1100	1500	1.5
1-May-14	0.0005	3.9	12.5	0.0005	3.3	0.017		90	0.0007	22	2000	0.001	0.003	2.5		0.000025	36	86		0.00	110		0.62	0.006	3.1	0.001	1000	1400	1.4
12-Jun-14	0.0005	4.1	12.5	0.0005	3	0.016		88	0.0008	21	2000	0.001	0.005	2.2		0.000025	34	83		0.00	120		0.63	0.006	3.1	0.001	840	1400	1.7
10-Jul-14	0.0005	4.5	12.5	0.0005	3.9	0.017		110	0.0006	20	2100	0.001	0.003	3.1		0.000025	38	98		0.00	130		0.72	0.006	3.1	0.001	1000	1100	1.8
14-Aug-14	0.0005	5.2	12.5	0.001	3.4	0.016		97	0.0008	24	2100	0.001	0.003	3.1		0.000025	34	93		0.00	120		0.7	0.007	3.1	0.001	1200	1500	2.1
11-Sep-14	0.0005	1.7	12.5	0.0005	0.73	0.017		28	0.0005	14	690	0.001	0.009	0.8		0.000025	10	24		0.00	38		0.17	0.003	3.6	0.001	280	380	0.6
23-Oct-14	0.0005	5.3	12.5	0.0005	3.3	0.017		89	0.0008	24	1900	0.001	0.006	2.7		0.000025	32	84		0.00	110		0.61	0.008	3.1	0.001	920	1300	1.6
13-Nov-14	0.0005	6.9	12.5	0.001	3.8	0.031		110	0.0009	34	2200	0.001	0.011	3.9		0.000025	38	100		0.00	140		0.64	0.009	3.1	0.004	1200	1600	1.8
11-Dec-14	0.0005	2.7	12.5	0.0005	1.7	0.019		51	0.0007	15	1200	0.0005	0.004	1.8		0.000025	22	47		0.00	68		0.38	0.004	3.3	0.001	510	740	0.96
15-Jan-15	0.0005	4.2	12.5	0.0005	3.3	0.024		86	0.0006	20	1800	0.0005	0.007	2.6		0.000025	35	78		0.00	110		0.56	0.006	3.2	0.001	880	1300	1.3
12-Feb-15	0.0005	5.7	12.5	0.001	3.4	0.028		88	0.0009	26	2000	0.001	0.009	3.1		0.000025	36	84		0.00	120		0.61	0.009	3.1	0.001	980	1500	1.5
11-Mar-15	0.0005	5.7	12.5	0.001	2.8	0.025		88	0.0009	27	2000	0.001	0.006	3.3		0.000025	37	85		0.00	120		0.59	0.009	3.1	0.002	1100	1400	1.5

Dump Creek WX11 Post-Stage 2 Dry Ash Placement Post-Stage 2 Dry Ash Placement April, 2013 to March, 2015 (mg/l)																													
	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	NFR	Ni	Pb	pH	Se	SO4	TDS	Zn
Average	0.0	4.0	12.5	0.0	2.9	0.0		79.0	0.0	23.7	1749.6	0.0	0.0	2.3		0.0	31.1	75.5		0.0	109.0		0.5	0.0	3.2	0.0	862.4	1205.8	1.4
Maximum	0.0	6.9	12.5	0.0	3.9	0.0		110.0	0.0	34.0	2200.0	0.0	0.0	3.9		0.0	40.0	100.0		0.0	140.0		0.7	0.0	3.6	0.0	1200.0	1600.0	2.1
Minimum	0.00	1.70	12.50	0.00	0.73	0.01		28.00	0.00	14.00	690.00	0.00	0.00	0.80		0.00	10.00	24.00		0.00	38.00		0.17	0.00	3.00	0.00	280.00	380.00	0.60
50th Percentile	0.00	3.80	12.50	0.00	3.25	0.02		87.00	0.00	24.00	1900.00	0.00	0.01	2.35		0.00	34.00	82.50		0.00	120.00		0.61	0.01	3.10	0.00	935.00	1300.00	1.50

Dump Creek WX11 Post-Dry Ash Placement Data (mg/l) April, 2015 to March, 2016

Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	NFR	Ni	Pb	pH	Se	SO4	TDS	Zn
9-Apr-15	0.0005	3.9	12.5	0.001	2.5	0.023		67	0.0008	21	1600	0.001	0.007	2.3		0.00005	26	63	5.8	0.0005	86		0.44	0.006	3.2	0.001	730	1100	1.1
28-May-15	0.0005	3.6	12.5	0.001	1.9	0.018		66	0.0008	24	1500	0.001	0.005	1.7		0.00002	23	63	5.2	0.0005	83		0.39	0.005	3.3	0.001	690	980	1.1
17-Jun-15	0.0005	3.3	12.5	0.001	1.8	0.017		60	0.0006	24	1300	0.001	0.007	1.7		0.00002	24	55	4.6	0.0005	83		0.35	0.005	3.4	0.001	610	800	0.89
15-Jul-15	0.0005	1.42	0.5	0.001	0.65	0.013		28.8	0.0004	18.9	728	0.001	0.004	0.5		0.00002	10.6	24.4	2.01	0.0005	46.5		0.132	0.0005	3.75	0.0002	284	446	0.446
19-Aug-15	0.0005	4.23	0.5	0.001	2.76	0.016		63.6	0.0006	26.5	1580	0.001	0.007	0.857		0.00002	26.4	59.6	5.12	0.0005	95.2		0.46	0.005	3.31	0.0006	744	974	1.36
16-Sep-15	0.0005	3.43	0.5	0.001	2.3	0.017		67.3	0.0005	34.8	1462	0.001	0.006	1.08		0.00002	25.3	59.8	4.66	0.0005	104		0.335	0.003	3.48	0.0004	708	644	1.26
21-Oct-15	0.0005	1.14	0.5	0.001	0.53	0.018		21.7	0.0002	11.5	562	0.001	0.004	0.575		0.00002	12.2	15.7	1.49	0.0005	32.8		0.106	0.002	3.68	0.0001	224	346	0.376
18-Nov-15	0.0005	4.35	0.5	0.001	3.18	0.02		84.2	0.0007	19	1921	0.001	0.002	2.49		0.00002	37	71.6	7.04	0.0005	110		0.592	0.006	3.1	0.0005	948	1340	1.61
9-Dec-15	0.0005	4.13	0.5	0.001	3.76	0.02		95.8	0.0008	20.4	2098	0.001	0.008	2.78		0.00002	43.2	85.4	6.41	0.0005	126		0.663	0.005	2.92	0.0005	993	1400	1.7
20-Jan-16	0.0005	3.56	0.5	0.001	2.78	0.024		71	0.0005	20.8	1734	0.001	0.004	2.26		0.00002	32	67.1	5.94	0.0005	104		0.452	0.005	3.13	0.0004	806	1230	1.23
11-Feb-16	0.0005	4.34	0.5	0.001	3.23	0.02		81.2	0.0006	23.6	1889	0.001	0.006	2.26		0.00002	35.4	73.8	6.07	0.0005	112		0.515	0.005	2.94	0.0004	878	1090	1.42
16-Mar-16	0.0005	3.95	0.5	0.001	2.98	0.027		71.5	0.0007	20.3	1669	0.001	0.005	1.95		0.00002	29.9	65.4	5.61	0.0005	98.7		0.452	0.005	3.09	0.0004	777	1080	1.19

Dump Creek WX11 Post-Stage 2 Dry Ash Placement Post-Stage 2 Dry Ash Placement April, 2015 to March, 2016 (mg/l)

	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	NFR	Ni	Pb	pH	Se	SO4	TDS	Zn
Average	0.0005	3.9	10.5	0.0	2.7	0.0		76.4	0.0	23.2	1684.3	0.0013	0.0070	2.2		0.00004	30	71.27	4.13	0.001	103		0.515	0.006	3.2	0.001	830	1134	1.354
Maximum	0.0005	6.9	12.5	0.0	3.9	0.0		110.0	0.0	34.8	2200.0	0.0030	0.0160	3.9		0.00005	40	100.00	5.80	0.001	140		0.720	0.009	3.8	0.004	1200	1600	2.100
Minimum	0.0005	1.14	0.50	0.00	0.53	0.01		21.70	0.00	11.50	562.00	0.0010	0.0030	0.50		0.00002	10	15.70	1.49	0.001	33		0.106	0.001	3.00	0.000	224	346	0.376
50th Percentile	0.0005	3.90	12.50	0.00	3.15	0.02		87.00	0.00	24.00	1900.00	0.0010	0.0065	2.35		0.00005	34	82.50	4.66	0.001	115		0.610	0.006	3.10	0.001	935	1300	1.500

2. Water Quality Data and Summary for Lidsdale Cut WX5

Lidsdale Cut WX5 Pre-Dry Ash Placement Summary 1992-April, 2003 (mg/L)	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	NFR	Ni	Pb	pH	Se	SO4	TDS	Zn	Mn
Average	0.001	2.43	14	0.001	1.70	0.042		28	0.001	26	74991	0.003	0.003	1.50	0.51	0.0002	39	17	1.41		62	7		0.003	4.7	0.001	266	518	0.219	1.41
Maximum	0.001	3.17	50	0.001	2.17	0.060		32	0.001	78	113402	0.010	0.005	2.20	1.00	0.0002	53	21	2.34		84	15		0.004	6.9	0.001	400	671	0.397	2.34
Minimum	0.001	0.70	1	0.001	0.54	0.030		24	0.001	15	37800	0.001	0.002	0.98	0.07	0.0002	16	8	0.21		31	3		0.002	3.2	0.001	92	400	0.072	0.21
90th Percentile	0.001	3.08	38	0.001	2.16	0.054		31	0.001	34	95200	0.006	0.005	1.99	0.70	0.0002	51	20	2.12		77	13		0.004	6.9	0.001	359	650	0.304	2.12

Lidsdale Cut WX5 Post-Dry Ash Placement Data (mg/l) April, 2013 to March. 2015

Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	NFR	Ni	Pb	pH	Se	SO4	TDS	Zn
10-Apr-13																													
16-May-13																													
13-Jun-13																													
10-Jul-13																													
22-Aug-13																													
26-Sep-13																			2.5										
24-Oct-13	0.0005	220	12.5	0.031	19	0.025		340	0.084	32	4900	0.036	0.05	38		0.00005	270	120	2.5	0.0005	330		1.6	0.033	3.3	0.086	3700	5300	3.9
7-Nov-13	0.0005	220	12.5		17	0.018		340	0.065	34	4900	0.03	0.05	37		0.00005	290	120	2.5	0.0005	350		1.6	0.024	3.3	0.068	3900	5800	4.3
5-Dec-13	0.0005	180	12.5	0.026	14	0.048		280	0.044	31	4200	0.023	0.04	36		0.0001	230	91	2.5	0.0005	270		1.2	0.014	3.3	0.063	3300	4200	3.2
16-Jan-14	0.0005	120	12.5	0.015	12	0.032		220	0.036	27	3700	0.01	0.017	24		0.00005	200	72	2.5	0.0005	320		0.87	0.008	3.5	0.046	2500	3500	2.3
6-Feb-14	0.0005	140	12.5	0.017	13	0.026		260	0.034	32	4000	0.012	0.017	28		0.00005	220	85	2.5	0.0005	320		0.84	0.008	3.4	0.062	3000	4200	2.5
6-Mar-14	0.0005	52	12.5	0.009	4.9	0.075		97	0.017	16	1800	0.006	0.013	9		0.00005	73	28	2.5	0.0005	87		0.35	0.004	3.5	0.024	1000	1500	0.81
3-Apr-14	0.0005	18	12.5	0.004	2.1	0.062		49	0.0067	14	960	0.003	0.006	4.1		0.00005	37	19	2.5	0.0005	54		0.18	0.002	3.9	0.008	460	720	0.41
1-May-14	0.0005	66	12.5	0.012	6.6	0.042		140	0.016	19	2400	0.006	0.015	14		0.00005	100	52	2.5	0.0005	130		0.5	0.012	3.4	0.027	1400	2100	1.1
12-Jun-14	0.0005	150	12.5	0.017	12	0.025		260	0.039	25	3800	0.013	0.03	21		0.00005	180	85	2.5	0.0005	230		0.78	0.02	3.5	0.048	2400	3900	1.8
10-Jul-14	0.0005	180	12.5	0.037	13	0.021		290	0.042	29	4000	0.016	0.048	24		0.00005	190	92	2.5	0.0005	240		1.1	0.011	3.6	0.069	2600	4300	2.4
14-Aug-14	0.0005	120	12.5	0.02	10	0.029		240	0.035	28	3300	0.01	0.04	24		0.00005	150	86	2.5	0.0005	210		0.94	0.03	3.6	0.048	4900	3600	2.5
11-Sep-14	0.0005	33	12.5	0.004	3	0.11		68	0.009	13	1200	0.004	0.009	6.6		0.00005	47	24	2.5	0.0005	63		0.28	0.004	3.9	0.013	690	930	0.7
23-Oct-14	0.0005	40	12.5	0.005	4	0.021		90	0.01	13	1600	0.004	0.012	8.1		0.00005	63	31	2.5	0.0005	83		0.35	0.013	3.6	0.012	850	1200	0.78
13-Nov-14	0.0005	140	12.5	0.03	13	0.02		280	0.031	35	4000	0.013	0.032	29		0.00005	180	96	2.5	0.0005	240		1.1	0.028	3.3	0.046	3000	4100	2.8
11-Dec-14	0.0005	15	12.5	0.004	1.9	0.079		50	0.0047	10	890	0.001	0.006	3.8		0.00005	34	18	0.5	0.0005	49		0.19	0.003	3.8	0.006	420	600	0.37
15-Jan-15	0.0005	23	12.5	0.004	2.7	0.058		61	0.0055	11	1100	0.002	0.006	4.9		0.00005	43	25	2.5	0.0005	64		0.24	0.004	3.8	0.008	560	1000	0.48
12-Feb-15	0.0005	99	12.5	0.014	9.9	0.029		220	0.022	28	3400	0.008	0.02	19		0.00005	140	86	2.5	0.0005	200		0.9	0.036	3.2	0.04	2100	3200	2.5
11-Mar-15	0.0005	79	12.5	0.018	5.6	0.08		140	0.021	19	2200	0.009	0.023	15		0.00005	100	44	2.5	0.0005	130		0.52	0.008	3.5	0.041	1500	2000	1.3

Lidsdale Cut WX5 Post-Dry Ash Placement Data (mg/l) April, 2013 to March, 2015 (mg/l)

	Ag	al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Mn	Ni	Pb	pH	Se	SO4	TDS	Zn
Average	0.0005	105	12.5	0.016	9.1	0.044		190	0.0290	23	2908	0.011	0.024	19.2		5.3E-05	142	65	2.4	0.0005	187		0.75	0.015	3.5	0.040	2127	2897	1.9
Maximum	0.0005	220	12.5	0.037	19.0	0.110		340	0.0840	35	4900	0.036	0.050	38.0		1.0E-04	290	120	2.5	0.0005	350		1.60	0.036	3.9	0.086	4900	5800	4.3
Minimum	0.0005	15	12.5	0.004	1.9	0.018		49	0.0047	10	890	0.001	0.006	3.8		5.0E-05	34	18	0.5	0.0005	49		0.18	0.002	3.2	0.006	420	600	0.4
50th Percentile	0.0005	110	12.5	0.015	10.0	0.031		220	0.0265	26	3350	0.010	0.019	20.0		5.0E-05	145	79	2.5	0.0005	205		0.81	0.012	3.5	0.044	2250	3350	2.1

Lidsdale Cut WX5 Post-Dry Ash Placement Data (mg/l) April, 2015 to March. 2016																													
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	NFR	Ni	Pb	pH	Se	SO4	TDS	Zn
9-Apr-15	0.0005	66	25	0.014	5.6	0.038		120	0.02	16	2000	0.009	0.02	12	3.6	0.00005	84	36	5.4	0.001	100		0.46	0.004	3.6	0.032	1200	1800	1.0
27-May-15	0.0005	53	25	0.007	6.5	0.018		180	0.018	26	2700	0.004	0.019	15	27	0.00002	120	82	9.2	0.001	160		0.69	0.042	3.5	0.02	1800	2400	2.3
17-Jun-15	0.0005	68	25	0.011	5.3	0.032		130	0.018	18	2000	0.008	0.019	11	5.9	0.00002	84	42	5.7	0.001	110		0.44	0.008	3.6	0.026	1300	1700	1.0
15-Jul-15	0.0005	65.2	1	0.017	5.49	0.028		124	0.0199	18.3	2220	0.006	0.019	9.3	5.65	0.00002	88.4	44.7	6.38	0.001	125		0.529	0.006	3.71	0.0092	1280	1600	1.3
19-Aug-15	0.0005	103	1	0.022	9.94	0.017		200	0.0274	25.8	3310	0.008	0.033	20.1	6.99	0.00002	154	76.5	10.8	0.001	204		1.07	0.027	3.45	0.0116	2040	3260	2.4
16-Sep-15	0.0005	72	1	0.022	9.62	0.016		210	0.0147	29.5	3255	0.004	0.016	19.1	22.2	0.00002	138	91.2	10.8	0.001	217		0.886	0.031	3.36	0.0052	2100	2490	2.7
21-Oct-15	0.0005	47.9	1	0.007	4.32	0.077		121	0.0136	14.4	2000	0.005	0.014	11.2	2.5	0.00002	80.6	38.4	5.34	0.001	112		0.418	0.005	3.57	0.0088	1190	1610	1.0
18-Nov-15	0.0005	63.9	1	0.011	7.7	0.029		194	0.0145	24.8	3073	0.006	0.015	14.6	5.92	0.00002	129	73.2	11.4	0.001	185		0.962	0.008	3.33	0.0102	1870	2500	1.9
9-Dec-15	0.0005	80	1	0.023	10.1	0.024		244	0.0156	29.1	3618	0.008	0.013	17	6.2	0.00002	153	101	15.4	0.001	251		1.71	0.008	3.15	0.0123	2180	2970	2.36
20-Jan-16	0.0005	34.5	1	0.008	3.41	0.023		99.2	0.0084	13.6	1840	0.004	0.008	8.31	3.11	0.00002	75.4	36.8	5.15	0.001	105		0.479	0.004	3.34	0.0058	947	1460	0.932
10-Feb-16	0.0005	47.5	1	0.009	6.7	0.027		167	0.0093	23.1	2788	0.004	0.011	12.6	6.5	0.00002	114	71.5	10.6	0.001	166		0.891	0.012	3.13	0.07	1550	2010	1.69
16-Mar-16	0.0005	31.8	1	0.008	4.3	0.056		96.9	0.0073	14.1	1786	0.003	0.008	7.82	3.62	0.00002	68.1	37	5.56	0.001	96.5		0.49	0.006	3.24	0.05	894	1270	0.924

Lidsdale Cut WX5 Post-Dry Ash Placement Data (mg/l) April, 2015 to March, 2016 (mg/l)																													
	Ag	al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Mn	Ni	Pb	pH	Se	SO4	TDS	Zn
Average	0.0005	61	7.00	0.0133	6.58	0.032		157	0.0156	21	2549	0.0058	0.0163	13.17	8.3	0.00002	107	61	8.48	0.001	153		0.752	0.013	3.4	0.022	1529	2089	1.623
Maximum	0.0005	103	25.00	0.0230	10.10	0.077		244	0.0274	30	3618	0.0090	0.0330	20.10	27.0	0.00005	154	101	15.40	0.001	251		1.710	0.042	3.7	0.070	2180	3260	2.690
Minimum	0.0005	32	1.00	0.0070	3.41	0.016		97	0.0073	14	1786	0.0030	0.0080	7.82	2.5	0.00002	68	36	5.15	0.001	97		0.418	0.004	3.1	0.005	894	1270	0.924
50th Percentile	0.0005	65	1.00	0.0110	6.05	0.028		149	0.0152	21	2460	0.0055	0.0155	12.30	5.9	0.00002	101	58	7.79	0.001	143		0.610	0.008	3.4	0.012	1425	1905	1.490

3. Water Quality Data and Summary for Sawyers Swamp Creek at WX1, upstream of SSCAD. EANSW site 92

Sawyers Swamp Creek Upstream of SSCAD WX1 Post-Dry Ash Placement Data (mg/l) February, 2012 to March, 2015																															
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	NFR	Ni	Pb	pH	Se	SO4	TDS	Zn	Mn
10-Mar-92		0			0.042					8.0	3000				0.435				0.068										0.040	0.068

Sawyers Swamp Creek Upstream of SSCAD WX1 Post-Dry Ash Placement Data (mg/l) April, 2013 to March, 2015																																
SAMPLE	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	NFR	Ni	NO2+NO3	Pb	pH	Se	SO4	TDS	TKN	TN	TP	Zn
10-Apr-13	0.0005	0.74	13	0.0005	0.025	0.014		1.2	0.0001	9	140	0.0005	0.009	0.05		0.000025	1.8	0.58		0.005	27		0.005		0.002	6.3	0.001	24	69				0.025
16-May-13	0.0005	0.45	13	0.0005	0.025	0.014		1.2	0.0001	10	140	0.0005	0.009	0.05		0.000025	2	0.61		0.0005	26		0.005		0.001	6.3	0.001	24	84				0.024
13-Jun-13	0.0005	0.96	13	0.0005	0.04	0.013		1.2	0.0001	10	130	0.0005	0.004	0.05		0.000025	2	0.5		0.0005	25		0.001		0.001	6.3	0.001	23	97				0.03
10-Jul-13	0.0005	0.57	13	0.0005	0.03	0.011		0.96	0.0001	10	130	0.0005	0.001	0.05		0.000025	2	0.5		0.0005	26		0.001		0.0005	6.3	0.001	24	74		0		0.022
22-Aug-13	0.0005	0.79	29	0.0005	0.025	0.013		1.7	0.0001	10	140	0.002	0.0005	0.1		0.000025	2	0.5		0.0005	28		0.002		0.0005	6.5	0.001	23	93		0.5		0.019
26-Sep-13	0.0005	0.75	28	0.0005	0.025	0.011		1.8	0.0001	10	140	0.002	0.002	0.1		0.000025	2	0.5		0.0005	26		0.002		0.0005	6.8	0.001	22	100		0		0.016
24-Oct-13	0.0005	1.3	38	0.001	0.025	0.033		3	0.0001	12	160	0.003	0.003	0.1		0.000025	3	1		0.0005	29		0.003		0.003	6.8	0.001	18	100		0.5		0.022
05-Dec-13	0.0005	5.1	13	0.002	0.07	0.07		4.5	0.0001	12	170	0.005	0.009	0.1		0.000025	4	2		0.0005	27		0.007		0.007	6.4	0.001	36	120		0.5		0.052
11-Sep-14	0.0005	3.9	13	0.0005	0.025	0.053		4.4	0.0001	10	110	0.003	0.004	0.1		0.000025	4	2		0.0005	10		0.003		0.005	6.2	0.001	10	170		8		0.05
11-Dec-14	0.0005	2.6	13	0.0005	0.06	0.065		4	0.0001	11	110	0.002	0.004	0.1		0.00006	5	2		0.0005	10		0.004		0.004	6.1	0.001	11	150		13		0.03
14-Jan-15	0.0005	1.2	13	0.0005	0.06	0.026		3.6	0.0001	10	150	0.0005	0.004	0.1		0.00006	4	2		0.0005	23		0.002		0.002	6.3	0.001	28	150		1		0.014
11-Feb-15	0.0005	0.6	28	0.0005	0.05	0.019		2	0.0001	11	150	0.0005	0.003	0.1		0.00008	2	0.5		0.0005	26		0.002		0.002	6.6	0.001	25	120		0.5		0.009
11-Mar-15	0.0005	1.5	30	0.0005	0.025	0.027		2.5	0.0001	11	150	0.001	0.005	0.1		0.00005	3	1		0.0005	27		0.002		0.002	6.5	0.001	21	130		1		0.011

WX1 (mg/L) SAWYERS SWAMP CREEK FRESH WATER UPSTREAM OF SCAD April, 2013 to March, 2015																																
	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	NFR	Ni	NO2+NO3	Pb	pH	Se	SO4	TDS	TKN	TN	TP	Zn
Average	0.0005	1.574	19	0.0007	0.037	0.028		2.5	0.0001	10	140	0.0016	0.004	0.1		0.00004	2.8	1		0.0008	24		0.003		0.0023	6.4	0.001	22	112		2.5		0.025
Maximum	0.0005	5.1	38	0.0020	0.070	0.07		4.5	0.0001	12	170	0.0050	0.009	0.1		0.00008	5.0	2		0.0050	29		0.007		0.0070	6.8	0.001	36	170		13		0.052
Minimum	0.0005	0.45	13	0.0005	0.025	0.011		1.0	0.0001	9	110	0.0005	0.001	0.1		0.00003	1.8	1		0.0005	10		0.001		0.0005	6.1	0.001	10	69		0		0.009
50th Percentile	0.0005	0.96	13	0.0005	0.025	0.019		2.0	0.0001	10	140	0.0010	0.004	0.1		0.00003	2.0	1		0.0005	26		0.002		0.0020	6.3	0.001	23	100		0.5		0.022

Sawyers Swamp Creek Upstream of SSCAD WX1 Post-Dry Ash Placement Data (mg/l) April, 2015 to March, 2016

SAMPLE	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	NFR	Ni	NO2+NO3	Pb	pH	Se	SO4	TDS	TKN	TN	TP	Zn
11-Mar-15	0.0005	1.5	30	0.001	0.025	0.027		2.5	0.0001	11	150	0.001	0.005	0.1		0.00005	3	1		0.001	27		0.002	0.002	6.5	0.001	21	130	0.011	11-Mar-15	0.0005	1.5	30
09-Apr-15	0.0005	0.92	31	0.001	0.025	0.02		2	0.0001	10	160	0.001	0.002	0.1	0.63	0.00005	2	0.5	0.15	0.001	25		0.002	0.001	6.6	0.001	24	82	0.019	09-Apr-15	0.0005	0.92	31
27-May-15	0.0005	1	12.5	0.001	0.025	0.016		1.7	0.0001	10	150	0.001	0.002	0.1	0.76	0.00002	2	0.5	0.087	0.001	24		0.001	0.001	6.4	0.001	25	110	0.008	27-May-15	0.0005	1	12.5
17-Jun-15	0.0005	0.88	12.5	0.001	0.025	0.014		1.7	0.0001	10	140	0.001	0.002	0.1	0.59	0.00002	2	0.5	0.11	0.001	24		0.001	0.001	6.5	0.001	23	98	0.008	17-Jun-15	0.0005	0.88	12.5
15-Jul-15	0.0005	0.89	28	0.001	0.06	0.015		2.44	0.0001	10.1	141	0.001	0.001	0.05	0.588	0.00002	1.65	0.806	0.117	0.001	26.3		0.001	0.001	6.68	0.0001	24	106	0.009	15-Jul-15	0.0005	0.89	28
19-Aug-15	0.0005	0.97	26	0.001	0.025	0.012		2.15	0.0001	9.99	151	0.001	0.001	0.018	0.626	0.00002	1.51	0.68	0.093	0.001	26.9		0.001	0.001	6.97	0.0001	23.4	100	0.006	19-Aug-15	0.0005	0.97	26
16-Sep-15	0.0005	1.35	32	0.001	0.025	0.043		4.28	0.0001	10.3	143	0.001	0.001	0.01	0.496	0.00002	2.19	1.03	0.072	0.001	29.8		0.002	0.001	6.42	0.0001	24.5	94	0.018	16-Sep-15	0.0005	1.35	32
21-Oct-15	0.0005	3.52	34	0.002	0.025	0.064		2.87	0.0001	10	162	0.003	0.004	0.014	2.64	0.00016	3.39	1.25	0.445	0.001	28		0.003	0.005	6.3	0.0001	23.6	131	0.017	21-Oct-15	0.0005	3.52	34
18-Nov-15	0.0005	1.45	30	0.001	0.06	0.025		2.61	0.0001	9.8	150	0.001	0.003	0.01	0.551	0.00002	2.8	1.01	0.225	0.001	26.1		0.002	0.002	6.46	0.0001	21.8	104	0.012	18-Nov-15	0.0005	1.45	30
Dec 2015																																	
Jan 2016																																	
Feb 2016																																	
Mar 2016																																	

WX1 (mg/L) SAWYERS SWAMP CREEK FRESH WATER UPSTREAM OF SCAD April, 2015 to March, 2016

	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	NFR	Ni	NO2+NO3	Pb	pH	Se	SO4	TDS	TKN	TN	TP	Zn
Average	0.0005	1.373	25.8	0.00113	0.034	0.026		2.5	0.0001	10	150	0.001	0.002	0.1	0.86	4.1E-05	2.2	1	0.1624	0.001	26		0.002	0.0016	6.5	0.000	24	103	0.012	0.0005	1.373	25.8	0.00113
Maximum	0.0005	3.520	34	0.002	0.060	0.064		4.3	0.0001	10	162	0.003	0.004	0.1	2.64	0.00016	3.4	1	0.445	0.001	30	0	0.003	0.005	6.97	0.001	25	131	0.019	0.0005	3.520	34	0.002
Minimum	0.0005	0.880	12.5	0.001	0.025	0.012		1.7	0.0001	10	140	0.001	0.001	0.0	0.496	0.00002	1.5	1	0.072	0.001	24	0	0.001	0.001	6.3	0.0001	21.8	82	0.006	0.0005	0.880	12.5	0.001
50th Percentile	0.0005	0.985	29	0.001	0.025	0.018		2.3	0.0001	10	150	0.001	0.002	0.0	0.608	0.00002	2.0	1	0.114	0.001	26		0.002	0.001	6.48	0.0001	23.8	102	0.011	0.0005	0.985	29	0.001

4. Water Quality Data and Summary for SSCAD Groundwater Seepage Detection Bores WGM1/D3 and 1/D4

a) *Water Quality Data and Summary for WGM1/D3*

WGM1/D3 Pre-Dry Ash Placement Summary 1988- April, 2003 (mg/L)																													
	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	0.001	115		0.010	0.05	0.292		18.7	0.001	64	62308	0.009	0.005	0.19	4.9	0.0004	8	20.0	0.592		69	0.080	0.008	6.0	0.001	94	349	10.0	920.2	0.061
Maximum	0.001	229		0.043	0.22	5.700		31.0	0.001	140	77320	0.026	0.040	0.73	21.0	0.0009	38	28.0	1.930		109	0.092	0.074	6.9	0.003	144	660	11.1	921.5	0.200
Minimum	0.001	8		0.001	0.005	0.080		6.3	0.001	25	34200	0.001	0.001	0.040	0.5	0.0001	1	2.0	0.080		31	0.071	0.001	4.6	0.001	20	125	8.7	919.1	0.010
90th Percentile	0.001	154		0.027	0.19	0.150		24.0	0.001	77	72000	0.020	0.010	0.33	9.4	0.0007	9	25.0	0.710		85	0.089	0.014	6.4	0.002	116	470	10.9	921.3	0.110

WGM1/D3 Post-Dry Ash Placement Data (mg/L) April, 2013 to March 2015																																
Date	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
10-Apr-13	0.001	90	0.09	0.004	0.025	0.08		14	0.0002	75		560	0.001	0.011	0.05	11	0.00005	6.2		17	0.92	0.005	56	0.099	0.0005	6.1	0.001	69	350	9.5	920.70	0.038
17-May-13	0.001	58	0.07	0.003	0.025	0.064		12	0.0002	78		520	0.001	0.012	0.05	0.005	0.00005	6		16	0.42	0.005	61	0.05	0.004	5.8	0.001	66	300	9.6	920.60	0.13
13-Jun-13	0.001	55	0.1	0.002	0.07	0.069		13	0.0002	55		460	0.003	0.005	0.05	0.34	0.00005	5		18	0.55	0.001	52	0.087	0.001	5.7	0.001	71	280	9.3	920.90	0.096
10-Jul-13	0.001	64	0.08	0.003	0.07	0.076		15	0.0003	54		480	0.001	0.007	0.05	1.9	0.00005	6		20	0.57	0.001	56	0.098	0.001	5.8	0.001	83	260	9.4	920.80	0.17
22-Aug-13	0.001	100	0.09	0.003	0.025	0.078		18	0.0002	75		580	0.002	0.002	0.05	5	0.0009	6		24	0.66	0.001	66	0.097	0.0005	6	0.001	74	340	9.7	920.50	0.049
26-Sep-13	0.001	100	0.51	0.004	0.025	0.084		16	0.0002	73		570	0.002	0.003	0.1	11	0.00005	6		21	0.62	0.001	66	0.099	0.003	6	0.001	75	380	9.8	920.40	0.044
24-Oct-13	0.001	100	0.06	0.006	0.025	0.09		19	0.0002	85		660	0.004	0.003	0.1	0.74	0.00005	8		25	0.58	0.003	81	0.1	0.0005	5.9	0.001	90	400	10.4	919.80	0.041
7-Nov-13	0.001	87	0.04	0.002	0.025	0.086		18	0.0002	89		660	0.003	0.002	0.1	0.02	0.00005	7		23	0.61	0.001	75	0.098	0.0005	6	0.001	98	380	10.6	919.60	0.039
5-Dec-13	0.001	84	0.12	0.004	0.025	0.097		21	0.0002	97		710	0.003	0.003	0.1	0.08	0.00005	7		27	0.79	0.001	79	0.11	0.0005	6.1	0.001	130	380	9.5	920.70	0.051
16-Jan-14	0.001	90	0.07	0.004	0.025	0.094		20	0.0002	85		680	0.002	0.011	0.1	0.51	0.00005	7		26	0.67	0.001	78	0.13	0.005	6	0.001	120	360	9.9	920.30	0.055
6-Feb-14	0.001	95	0.14	0.003	0.025	0.099		20	0.0002	85		680	0.002	0.006	0.1	1.5	0.00005	7		26	0.63	0.001	75	0.12	0.004	5.9	0.001	110	370	9.9	920.30	0.042
6-Mar-14	0.001	59	0.08	0.001	0.025	0.093		18	0.0002	80		660	0.002	0.002	0.1	0.03	0.00005	7		23	0.93	0.001	65	0.1	0.001	5.7	0.001	130	400	8.9	921.30	0.069
3-Apr-14	0.001	33	0.14	0.001	0.09	0.1		19	0.0002	84		750	0.001	0.003	0.1	0.07	0.00005	7		29	1.4	0.001	82	0.21	0.001	5.5	0.001	190	470	8.6	921.60	0.14
2-May-14	0.001	44	0.04	0.002	0.025	0.096		20	0.0002	80		700	0.001	0.001	0.1	0.01	0.00005	7		26	0.7	0.001	76	0.082	0.002	5.6	0.001	160	430	9.4	920.80	0.18
13-Jun-14	0.001	46	0.08	0.001	0.025	0.074		14	0.0002	67		610	0.001	0.0005	0.1	0.005	0.00005	7		18	0.48	0.001	69	0.061	0.001	5.7	0.001	100	360	9.9	920.30	0.18
11-Jul-14	0.001	46	0.06	0.001	0.025	0.073		15	0.0002	71		610	0.001	0.001	0.1	0.005	0.00005	7		20	0.47	0.001	69	0.066	0.002	5.7	0.001	100	360	10.1	920.10	0.23
15-Aug-14	0.001	58	0.07	0.001	0.025	0.088		17	0.0002	82		620	0.001	0.0005	0.1	0.005	0.00005	7		21	0.51	0.001	70	0.061	0.001	5.8	0.001	110	370	10.5	919.70	0.18
12-Sep-14	0.001	44	0.12	0.001	0.025	0.093		20	0.0002	78		670	0.001	0.001	0.1	2.9	0.00005	7		23	0.67	0.001	68	0.08	0.002	6	0.001	170	400	9.3	920.90	0.15
24-Oct-14	0.001	52	0.06	0.001	0.025	0.085		20	0.0002	73		680	0.001	0.002	0.1	2.3	0.00005	7		24	0.6	0.001	72	0.076	0.0005	6.1	0.001	150	370	9.7	920.50	0.11
14-Nov-14	0.001	74	0.09	0.001	0.025	0.094		22	0.0002	87		710	0.001	0.002	0.1	6.2	0.00005	7		27	0.73	0.001	80	0.11	0.001	6.1	0.001	160	410	10	920.20	0.15
12-Dec-14	0.001	12.5	0.16	0.001	0.1	0.08		16	0.0002	55		660	0.001	0.003	0.1	0.75	0.00005	7		26	0.76	0.001	66	0.21	0.004	5.6	0.001	180	380	8.7	921.50	0.15
15-Jan-15	0.001	50	0.13	0.002	0.025	0.11		24	0.0002	69		740	0.001	0.003	0.1	10	0.00005	8		30	0.9	0.001	78	0.14	0.002	5.8	0.001	190	470	8.4	921.80	0.076
12-Feb-15	0.001	29	0.09	0.001	0.025	0.096		21	0.0002	70		640	0.001	0.002	0.1	3.3	0.00005	8		25	0.76	0.001	66	0.11	0.001	5.5	0.001	170	450	8.8	921.40	0.076
12-Mar-15	0.001	32	0.4	0.001	0.025	0.089		20	0.0002	73		620	0.001	0.004	0.1	2.9	0.00005	7		24	0.74	0.001	66	0.095	0.001	5.6	0.001	150	370	8.8	921.40	0.057

WGM1/D3 Post-Dry Ash Placement Data (mg/L) April, 2013 to March 2015																																
	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	<0.001	63	0.12	0.001	0.037	0.087		18	0.0002	74		668	0.001	0.002	0.1	2.37	0.00009	7		23	0.73	0.001	70	0.108	0.002	5.8	0.001	153	403	9.5	920.67	0.140
Maximum	<0.001	100	0.51	0.006	0.100	0.110		24	0.0003	97		750	0.004	0.012	0.1	11.00	0.00090	8		30	1.40	0.005	82	0.210	0.005	6.1	0.001	190	470	10.6	921.80	0.230
Minimum	<0.001	13	0.04	0.001	0.025	0.064		12	0.0002	54		460	0.001	0.001	0.05	0.01	0.00005	5		16	0.42	0.001	52	0.050	0.001	5.5	0.001	66	260	8.4	919.60	0.038
50th Percentile	<0.001	58	0.09	0.002	0.025	0.089		19	0.0002	77		660	0.001	0.003	0.1	0.75	0.00005	7		24	0.67	0.001	69	0.099	0.001	5.8	0.001	115	375	9.6	920.65	0.086

WGM1/D3 Post-Dry Ash Placement Data (mg/L) April, 2015 to March 2016

Date	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
10-Apr-15	0.0005	32	0.37	0.001	0.025	0.064		14	0.0001	60		610	0.001	0.002	0.1	1.8	0.00005	6		20	0.71	0.001	62	0.14	0.002	5.6	0.001	160	370	8.5	921.70	0.099
28-May-15	0.0005	31	0.12	0.001	0.025	0.096		21	0.0004	64		630	0.001	0.002	0.1	3.2	0.00002	7		24	0.64	0.001	58	0.085	0.001	5.7	0.001	160	370	8.8	921.40	0.091
18-Jun-15	0.0005	32	0.49	0.001	0.025	0.08		18	0.0001	74		600	0.001	0.001	0.1	2.5	0.00002	6		21	0.57	0.001	61	0.092	0.002	5.6	0.001	140	300	9	921.20	0.069
16-Jul-15	0.0005	32	0.3	0.001	0.025	0.089		17	0.0001	58.6		620	0.001	0.001	0.05	3.3	0.00002	6.6		19.2	0.58	0.001	55.7	0.082	0.002	6.01	0.0001	150	354	8.6	921.60	0.072
20-Aug-15	0.0005	34	0.11	0.0005	0.025	0.093		19.7	0.0001	68.9		659	0.001	0.001	0.05	4.43	0.00002	7.34		21	0.613	0.001	61.4	0.084	0.001	6.29	0.0001	162	386	9.1	921.10	0.068
17-Sep-15	0.0005	47	0.12	0.002	0.025	0.093		22.3	0.0001	67.3		678	0.001	0.001	0.05	5.58	0.00002	8.04		24.4	0.614	0.001	65.5	0.085	0.001	5.45	0.0001	177	390	9.3	920.90	0.067
22-Oct-15	0.0005	60	0.16	0.002	0.025	0.074		17.9	0.0001	67.4		607	0.001	0.001	0.05	5.93	0.00002	8.38		19.8	0.49	0.001	62	0.062	0.001	5.66	0.0001	137	392	9.6	920.60	0.036
19-Nov-15	0.0005	38	0.06	0.003	0.025	0.094		27.9	0.0001	58.3		641	0.001	0.001	0.05	5.86	0.00002	10.4		28.8	0.546	0.001	82.2	0.092	0.001	5.47	0.0001	160	368	9.1	921.10	0.054
10-Dec-15	0.0005	67	0.04	0.002	0.025	0.089		20.6	0.0002	65.6		643	0.001	0.001	0.005	5.32	0.00002	7.75		22.5	0.458	0.001	75.3	0.074	0.001	5.48	0.0001	148	472	9.5	920.70	0.056
21-Jan-16	0.0005	48	0.2	0.002	0.025	0.094		20.1	0.0001	68		689	0.001	0.002	0.038	6.82	0.00002	7.61		23.8	0.633	0.001	57.8	0.113	0.001	5.46	0.0001	164	353	8.5	921.70	0.059
11-Feb-16	0.0005	28	0.17	0.001	0.025	0.072		17.6	0.0001	72.6		652	0.001	0.001	0.036	2.87	0.00002	7.27		21.8	0.713	0.001	63.4	0.166	0.002	5.2	0.0001	166	337	8.6	921.60	0.11
17-Mar-16	0.0005	25	0.27	0.002	0.025	0.06		13.8	0.0001	74.6		620	0.001	0.001	0.022	1.79	0.00002	6.28		19.4	0.654	0.001	67	0.164	0.003	5.1	0.0001	140	379	8.6	921.60	0.123

WGM1/D3 Post-Dry Ash Placement Data (mg/L) April, 2015 to March 2016

	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	0.0005	39.5	0.20	0.0015	0.025	0.083		19	0.0001	67		637	0.0010	0.0013	0.05	4.1	0.00002	7		22	0.60	0.001	64	0.103	0.002	5.6	0.000	155	373	8.9	921.3	0.075
Maximum	0.0005	67	0.49	0.0030	0.025	0.096		28	0.0004	75		689	0.0010	0.0020	0.10	6.8	0.00005	10		29	0.71	0.001	82	0.166	0.003	6.3	0.001	177	472	9.6	921.7	0.123
Minimum	0.0005	25	0.04	0.0005	0.025	0.060		14	0.0001	58		600	0.0010	0.0010	0.01	1.8	0.00002	6		19	0.46	0.001	56	0.062	0.001	5.1	0.000	137	300	8.5	920.6	0.036
50th Percentile	0.0005	33	0.17	0.0015	0.025	0.089		19	0.0001	67		636	0.0010	0.0010	0.05	3.9	0.00002	7		21	0.61	0.001	62	0.089	0.001	5.5	0.000	160	370	8.9	921.3	0.069

b) Water Quality Data and Summary for WGM1/D4

WGM1/D4 Pre-Dry Ash Placement Summary 1988- April, 2003 (mg/L)																												
	Ag	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	0.001	96	0.003	0.27	0.372		30.0	0.002	30	58408	0.005	0.012	0.15	54.6	0.0009	6	18.9	4.588		29	0.018	0.006	6.3	0.009	118	327	1.3	905.8	0.041
Maximum	0.001	282	0.012	0.61	6.700		58.0	0.004	86	98969	0.019	0.100	0.72	120.0	0.0033	46	47.0	12.000		82	0.024	0.022	7.3	0.100	350	768	1.5	906.3	0.100
Minimum	0.001	20.60	0.001	0.07	0.050		16.0	0.001	6.00	16100	0.001	0.001	0.001	0.1	0.0002	0	1.8	0.094		4	0.011	0.001	5.2	0.001	11	96	0.8	905.3	0.004
90th Percentile	0.001	168	0.006	0.49	0.330		43.8	0.003	45	72780	0.012	0.036	0.24	86.0	0.0020	7	26.8	6.500		42	0.023	0.011	6.8	0.002	201	510	1.4	906.0	0.060

WGM1/D4 Post-Dry Ash Placement Data April, 2013 to March 2015 (mg/l)																																
Date	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
10-Apr-13	0.0005	35	0.01	0.002	1.9	0.023		85	0.0002	32		1600	0.001	0.004	0.05	49	0.00005	10		75	19	0.01	130	0.035	0.001	6	0.002	846	1300	1	906.12	0.05
16-May-13	0.0005	38	0.005	0.003	1.7	0.023		110	0.0002	33		1500	0.001	0.026	0.05	33	0.00005	10		79	19	0.01	130	0.03	0.002	5.8	0.002	820	1200	1	906.12	0.066
13-Jun-13	0.0005	50	0.025	0.003	1.8	0.009		110	0.0002	33		1500	0.001	0.001	0.05	22	0.00005	10		77	18	0.001	130	0.037	0.001	5.9	0.002	830	1200	0.9	906.22	0.064
10-Jul-13	0.0005	12.5	0.025	0.003	1.8	0.022		110	0.0002	33		1400	0.001	0.002	0.05	38	0.00005	9		75	17	0.001	120	0.034	0.001	5.5	0.002	790	1200	1	906.12	0.053
22-Aug-13	0.0005	40	0.04	0.003	1.8	0.023		110	0.0002	33		1500	0.001	0.001	0.05	28	0.00005	9		78	18	0.001	130	0.03	0.001	5.7	0.002	820	1200	1	906.12	0.044
26-Sep-13	0.0005	30	0.03	0.005	1.8	0.021		110	0.0002	33		1500	0.002	0.001	0.1	79	0.00005	9		76	18	0.001	130	0.033	0.001	5.7	0.002	830	1300	1	906.12	0.053
24-Oct-13	0.0005	60	0.005	0.004	2	0.02		110	0.0002	34		1600	0.002	0.001	0.1	27	0.00005	10		81	18	0.001	140	0.035	0.001	6	0.002	910	1300	1	906.12	0.059
7-Nov-13	0.0005	38	0.005	0.002	1.8	0.02		110	0.0002	33		1500	0.002	0.001	0.1	21	0.00005	9		77	18	0.001	130	0.033	0.001	5.8	0.002	830	1300	1	906.12	0.055
5-Dec-13	0.0005	32	0.04	0.003	1.8	0.018		100	0.0002	34		1600	0.003	0.003	0.1	16	0.00005	9		74	18	0.001	130	0.032	0.001	5.9	0.002	880	1200	1	906.12	0.06
16-Jan-14	0.0005	33	0.01	0.003	1.8	0.019		100	0.0002	32		1600	0.002	0.002	0.1	15	0.00005	10		72	17	0.001	130	0.036	0.001	5.8	0.002	820	1200	1	906.12	0.064
6-Feb-14	0.0005	35	0.005	0.003	1.7	0.02		96	0.0002	32		1500	0.001	0.001	0.1	16	0.00005	9		68	16	0.001	120	0.035	0.001	5.8	0.002	800	1200	1	906.12	0.05
6-Mar-14	0.0005	40	0.005	0.003	1.9	0.021		95	0.0002	32		1400	0.001	0.001	0.1	17	0.00005	9		66	17	0.001	120	0.033	0.001	5.9	0.002	780	1300	0.9	906.22	0.049
3-Apr-14	0.0005	48	0.02	0.002	1.7	0.048		240	0.0002	120		2700	0.001	0.001	0.1	13	0.00005	12		110	13	0.001	270	0.029	0.001	6	0.002	1500	2400	0.9	906.22	0.051
1-May-14	0.0005	50	0.3	0.003	1.7	0.019		120	0.0002	39		1600	0.001	0.001	0.1	30	0.00005	10		73	15	0.001	130	0.029	0.002	5.9	0.002	840	1400	0.9	906.22	0.054
12-Jun-14	0.0005	53	0.06	0.002	1.6	0.018		95	0.0002	28		1600	0.001	0.001	0.1	32	0.00005	10		64	16	0.001	120	0.033	0.001	6	0.002	700	1200	1	906.12	0.059
11-Jul-14	0.0005	56	0.005	0.002	1.9	0.019		100	0.0002	29		1600	0.001	0.001	0.1	30	0.00005	10		68	17	0.001	120	0.032	0.001	6	0.002	720	1300	0.9	906.22	0.052
14-Aug-14	0.0005	68	0.03	0.002	1.7	0.02		98	0.0002	32		1500	0.001	0.001	0.1	35	0.00005	9		69	17	0.001	120	0.032	0.001	6.1	0.002	780	1200	1	906.12	0.054
11-Sep-14	0.0005	38	0.04	0.002	1.6	0.021		110	0.0002	44		1600	0.001	0.001	0.1	66	0.00005	9		69	16	0.001	130	0.03	0.001	6.1	0.002	910	1300	0.9	906.22	0.05
23-Oct-14	0.0005	12.5	0.03	0.002	1.8	0.017		100	0.0002	32		1500	0.001	0.001	0.1	67	0.00005	9		68	16	0.001	120	0.031	0.001	5.4	0.002	760	1200	0.9	906.22	0.043
13-Nov-14	0.0005	34	0.02	0.002	1.8	0.018		98	0.0002	33		1500	0.001	0.001	0.1	62	0.00005	9		67	17	0.001	130	0.032	0.001	6	0.002	880	1200	1	906.12	0.075
11-Dec-14	0.0005	45	0.01	0.002	1.7	0.018		97	0.0002	33		1500	0.001	0.001	0.1	61	0.00005	10		67	16	0.001	130	0.036	0.001	6	0.002	760	1200	0.9	906.22	0.04
14-Jan-15	0.0005	44	0.06	0.002	2	0.021		130	0.0002	89		1800	0.001	0.001	0.1	58	0.00005	10		80	15	0.001	180	0.029	0.001	6	0.002	880	1500	0.9	906.22	0.034
11-Feb-15	0.0005	33	0.02	0.002	1.8	0.019		96	0.0002	32		1500	0.001	0.001	0.1	60	0.00005	9		63	15	0.001	120	0.035	0.001	5.8	0.002	730	1200	1	906.12	0.035
11-Mar-15	0.0005	38	0.02	0.002	1.7	0.022		98	0.0002	31		1500	0.001	0.005	0.1	59	0.00005	10		68	16	0.001	130	0.033	0.001	5.8	0.002	730	1200	1	906.12	0.04

WGM1/D4 Post-Dry Ash Placement Data April, 2013 to March 2015 (mg/l)																																
	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	<0.001	40	0.05	0.0021	1.75	0.021		110	0.0002	45		1658	0.0010	0.0013	0.10	47.8	0.00005	10		74	15.75	0.001	135	0.032	0.001	5.9	0.002	849	1358	1.0	906.2	0.049
Maximum	<0.001	68	0.30	0.0050	2.00	0.048		240	0.0002	120		2700	0.0030	0.0260	0.10	79.0	0.0001	12		110	19.00	0.010	270	0.037	0.002	6.1	0.002	1500	2400	1.0	906.2	0.075
Minimum	<0.001	13	0.01	0.0020	1.60	0.009		85	0.0002	28		1400	0.0010	0.0010	0.05	13.0	0.00005	9		63	13.00	0.001	120	0.029	0.001	5.4	0.002	700	1200	0.9	906.1	0.034
50th Percentile	<0.001	38	0.02	0.0020	1.80	0.020		100	0.0002	33		1500	0.0010	0.0010	0.10	32.5	0.00005	10		73	17.00	0.001	130	0.033	0.001	5.9	0.002	820	1200	1.0	906.1	0.053

WGM1/D4 Post-Dry Ash Placement Data April, 2015 to March 2016 (mg/l)																																
Date	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
10-Apr-15	0.0005	43	0.005	0.002	1.8	0.017		92	0.0001	32		1500	0.001	0.001	0.1	57	0.00005	10		65	16	0.001	120	0.032	0.001	5.9	0.001	760	1200	1.1	906.02	0.038
28-May-15	0.0005	70	0.02	0.001	1.4	0.021		110	0.0001	44		1600	0.001	0.0005	0.1	50	0.00002	9		66	12	0.001	130	0.025	0.001	6.2	0.001	800	1300	1.0	906.12	0.028
18-Jun-15	0.0005	60	0.02	0.002	1.6	0.018		100	0.0001	33		1400	0.002	0.74	0.1	53	0.00002	9		62	13	0.001	120	0.029	0.001	6.1	0.009	750	1200	1.0	906.12	0.039
16-Jul-15	0.0005	54	0.01	0.001	1.66	0.018		86	0.0001	32.5		1560	0.001	0.0005	0.05	38	0.00002	9.02		57	14	0.001	113	0.028	0.001	6.38	0.0001	832	1170	1.0	906.12	0.036
20-Aug-15	0.0005	36	0.005	0.002	1.92	0.017		92.1	0.0001	30		1560	0.001	0.0005	0.05	58.6	0.00002	10.2		60.6	14.2	0.001	122	0.034	0.001	6.32	0.0001	766	1190	1.0	906.12	0.041
17-Sep-15	0.0005	58	0.08	0.001	1.71	0.016		99.5	0.0001	31.3		1585	0.001	0.0005	0.05	55.6	0.00002	10.8		65.2	14.8	0.001	130	0.026	0.001	6.2	0.0001	654	1180	1.0	906.12	0.04
22-Oct-15	0.0005	59	0.04	0.002	1.63	0.016		91.7	0.0001	31.2		1596	0.001	0.0005	0.05	44.2	0.00002	12.1		61.1	15	0.001	124	0.027	0.001	6.16	0.0001	802	1270	1.0	906.12	0.039
19-Nov-15	0.0005	14	0.08	0.002	1.67	0.018		92.1	0.0001	27.6		1513	0.001	0.0005	0.05	53	0.00002	10.7		58.8	15.4	0.001	114	0.031	0.001	6.18	0.0001	758	1160	1.0	906.12	0.039
10-Dec-15	0.0005	68	0.02	0.002	1.97	0.017		116	0.0001	27.1		1575	0.001	0.001	0.005	55.3	0.00002	13.1		76	15.3	0.001	153	0.032	0.001	6.12	0.0001	784	1110	1.1	906.02	0.041
21-Jan-16	0.0005	46	0.04	0.002	1.7	0.016		88.7	0.0001	29.5		1575	0.001	0.003	0.005	51.9	0.00002	10.4		62	14.1	0.001	129	0.03	0.001	6.15	0.0001	731	1200	1.0	906.12	0.035
11-Feb-16	0.0005	56	0.005	0.002	1.68	0.015		91.9	0.0001	31.4		1551	0.001	0.0005	0.005	53.2	0.00002	10.5		60.1	14.2	0.001	122	0.031	0.001	6.1	0.0001	718	1170	1.0	906.12	0.038
17-Mar-16	0.0005	68	0.06	0.002	1.87	0.016		93.2	0.0001	30.6		1568	0.001	0.0005	0.019	51	0.00002	9.86		63.1	13.6	0.001	131	0.032	0.001	6.17	0.0001	728	1080	1.0	906.12	0.04

WGM1/D4 Post-Dry Ash Placement Data April, 2015 to March 2016 (mg/l)																																
	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	0.001	53	0.03	0.0018	1.72	0.017		96	0.0001	32		1549	0.0011	0.0624	0.05	51.7	0.00002	10		63	14.30	0.001	126	0.030	0.001	6.1650	0.001	757	1186	1.0	906.1	0.038
Maximum	0.001	70	0.08	0.0020	1.97	0.021		116	0.0001	44		1600	0.0020	0.7400	0.10	58.6	0.00005	13		76	16.00	0.001	153	0.034	0.001	6.3800	0.009	832	1300	1.1	906.1	0.041
Minimum	0.001	14	0.01	0.0010	1.40	0.015		86	0.0001	27		1400	0.0010	0.0005	0.01	38.0	0.00002	9		57	12.00	0.001	113	0.025	0.001	5.9000	0.000	654	1080	1.0	906.0	0.028
50th Percentile	0.001	57	0.02	0.0020	1.69	0.017		92	0.0001	31		1564	0.0010	0.0005	0.05	53.0	0.00002	10		62	14.20	0.001	123	0.031	0.001	6.1650	0.000	759	1185	1.0	906.1	0.039

5. Water Quality Data and Summary for Background Groundwater Bore WGM1/D1 and WGM1/D2

WGM1/D1 Pre-Dry Ash Placement Background Summary 1988- April, 2003 (mg/L)

	Ag	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn	Mn
Average	0.001	16	0.002	0.05	0.156		2.4	0.001	48		210	0.016	0.016	0.19	2.3	0.0002	3	2.5	0.37		27		0.010	5.3	0.002	4	143	4.0	944.0	0.078	0.37
Maximum	0.001	32	0.006	0.35	2.000		19.0	0.003	92		394	0.045	0.170	0.66	15.7	0.0006	10	15.0	1.00		65		0.035	6.8	0.003	31	302	6.1	946.3	0.230	1.00
Minimum	0.001	1.50	0.001	0.01	0.030		0.0	0.001	15		99	0.001	0.001	0.001	0.0	0.0001	0	0.0	0.05		8		0.001	4.2	0.001	0	50	1.9	942.1	0.012	0.05
90th Percentile	0.001	24	0.004	0.10	0.090		5.1	0.002	78		305	0.041	0.035	0.41	5.6	0.0004	6	5.0	0.66		44		0.018	5.9	0.002	9	215	5.3	945.0	0.122	0.66

WGM1/D1 Post-Dry Ash Placement Data April, 2013 to March 2015

SAMPLE	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
10-Apr-13	0.0005	12.5	0.23	0.0005	0.05	0.063		1.1	0.0001	21		140	0.001	0.002	0.05	0.01	0.000025	3.5		3.5	0.088	0.005	17	0.005	0.0005	5.8	0.001	20	48	1.9	946.22	0.029
16-May-13	0.0005	12.5	0.1	0.0005	0.05	0.044		1	0.0001	16		120	0.001	0.008	0.05	0.02	0.000025	3		3.5	0.03	0.005	15	0.005	0.0005	5.8	0.001	14	64	2.9	945.22	0.033
13-Jun-13	0.0005	12.5	0.13	0.0005	0.06	0.038		1.6	0.0001	19		130	0.001	0.003	0.05	0.04	0.000025	3		3	0.1	0.0005	16	0.002	0.0005	5.7	0.001	15	73	3	945.12	0.054
10-Jul-13	0.0005	12.5	0.59	0.0005	0.04	0.036		1.4	0.0001	21		130	0.001	0.004	0.05	0.24	0.000025	3		3	0.06	0.0005	18	0.002	0.0005	5.6	0.001	11	73	2.9	945.22	0.082
22-Aug-13	0.0005	12.5	1.3	0.0005	0.025	0.034		1.2	0.0001	24		130	0.002	0.004	0.05	0.09	0.000025	2		2	0.043	0.0005	20	0.002	0.002	5.7	0.001	9	96	3.1	945.02	0.05
26-Sep-13	0.0005	12.5	1.5	0.0005	0.025	0.031		1.3	0.0001	23		130	0.002	0.004	0.1	0.24	0.000025	2		2	0.079	0.0005	21	0.003	0.001	5.5	0.001	8	140	3.5	944.62	0.068
24-Oct-13	0.0005	12.5	0.74	0.0005	0.025	0.03		1.3	0.0001	26		140	0.003	0.003	0.1	0.02	0.000025	2		2	0.26	0.0005	21	0.003	0.001	5.5	0.001	8	100	3.8	944.32	0.075
7-Nov-13	0.0005	12.5	0.69	0.0005	0.025	0.027		1.3	0.0001	27		140	0.002	0.002	0.1	0.02	0.000025	2		2	0.34	0.0005	21	0.003	0.0005	5.6	0.001	8	110	3.9	944.22	0.078
5-Dec-13	0.0005	12.5	0.46	0.0005	0.025	0.032		1.3	0.0001	27		140	0.003	0.006	0.1	0.04	0.000025	2		2	0.48	0.0005	20	0.004	0.0005	5.7	0.001	8	78	3.9	944.22	0.1
16-Jan-14	0.0005	12.5	0.14	0.0005	0.28	0.029		15	0.0001	28		390	0.002	0.004	0.1	0.54	0.000025	3		12	2.9	0.0005	35	0.009	0.0005	5.6	0.001	120	200	4.4	943.72	0.085
6-Feb-14																														4.7	943.42	
6-Mar-14																														4.9	943.22	
3-Apr-14																														4.5	943.62	
2-May-14	0.0005	12.5	0.5	0.0005	0.025	0.03		1.6	0.0001	18		110	0.002	0.006	0.1	0.06	0.00015	2		2	0.52	0.0005	13	0.003	0.0005	5.5	0.001	5	69	2.6	945.52	0.099
13-Jun-14	0.0005	12.5	0.85	0.0005	0.025	0.028		0.99	0.0001	19		110	0.001	0.002	0.1	0.09	0.000025	2		1	0.095	0.0005	15	0.002	0.002	5.5	0.001	6	80	3.3	944.82	0.061
11-Jul-14	0.0005	12.5	0.89	0.0005	0.025	0.031		1	0.0001	22		120	0.001	0.002	0.1	0.07	0.000025	2		2	0.071	0.0005	17	0.002	0.001	5.4	0.001	6	98	3.8	944.32	0.061
15-Aug-14	0.0005	12.5	0.76	0.0005	0.025	0.032		0.9	0.0001	26		120	0.002	0.004	0.1	0.04	0.000025	2		1	0.068	0.0005	17	0.003	0.002	5.3	0.001	6	100	4.2	943.92	0.064
12-Sep-14	0.0005	12.5	1.6	0.0005	0.025	0.031		1.1	0.0001	29		120	0.001	0.002	0.1	0.04	0.000025	2		2	0.062	0.0005	18	0.002	0.001	5.7	0.001	6	72	3.9	944.22	0.07
24-Oct-14	0.0005	12.5	1.6	0.0005	0.025	0.039		0.99	0.0001	24		120	0.002	0.008	0.1	0.06	0.000025	2		2	0.21	0.0005	16	0.004	0.005	5.6	0.001	5	120	4.3	943.82	0.089
14-Nov-14	0.0005	12.5	0.52	0.0005	0.025	0.032		1.8	0.0001	28		140	0.001	0.004	0.1	0.31	0.000025	2		2	0.42	0.0005	19	0.004	0.001	5.6	0.001	10	74	4.3	943.82	0.11
12-Dec-14	0.0005	12.5	0.32	0.0005	0.025	0.031		1.7	0.0001	22		120	0.001	0.013	0.1	2.9	0.000025	4		2	0.31	0.0005	15	0.004	0.001	5.6	0.001	5	62	3.4	944.72	0.14
15-Jan-15	0.0005	12.5	0.08	0.0005	0.07	0.082		1.6	0.0001	24		180	0.001	0.001	0.1	0.02	0.000025	5		6	0.039	0.0005	21	0.001	0.0005	5.5	0.001	14	120	1.7	946.42	0.034
12-Feb-15	0.0005	12.5	0.27	0.0005	0.07	0.059		0.96	0.0001	11		120	0.001	0.001	0.1	0.02	0.000025	3		4	0.052	0.0005	13	0.001	0.0005	5.5	0.001	20	100	1.9	946.22	0.021
12-Mar-15	0.0005	12.5	0.42	0.0005	0.06	0.053		1.1	0.0001	10		110	0.002	0.44	0.1	0.03	0.000025	3		3	0.06	0.0005	13	0.002	0.0005	5.5	0.005	19	80	3	945.12	0.032

WGM1/D1 Post-Dry Ash Placement Data April, 2013 to March 2015

	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	0.0005	13	0.65	0.0005	0.05	0.039		2	0.0001	22		141	0.0016	0.0249	0.09	0.2	0.00003	3		3	0.30	0.001	18	0.003	0.001	5.6	0.001	15	93	3.5	944.6	0.068
Maximum	0.0005	13	1.60	0.0005	0.28	0.082		15	0.0001	29		390	0.0030	0.4400	0.10	2.9	0.00015	5		12	2.90	0.005	35	0.009	0.005	5.8	0.005	120	200	4.9	946.4	0.140
Minimum	0.0005	13	0.08	0.0005	0.03	0.027		1	0.0001	10		110	0.0010	0.0010	0.05	0.0	0.00003	2		1	0.03	0.001	13	0.001	0.001	5.3	0.001	5	48	1.7	943.2	0.021
50th Percentile	0.0005	13	0.52	0.0005	0.03	0.032		1	0.0001	23		130	0.0010	0.0040	0.10	0.0	0.00003	2		2	0.09	0.001	17	0.003	0.001	5.6	0.001	8	80	3.7	944.5	0.068

WGM1/D1 Post-Dry Ash Placement Data April, 2015 to March 2016

SAMPLE	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
10-Apr-15	0.0005	12.5	0.91	0.001	0.05	0.041		0.92	0.0001	17		110	0.001	0.003	0.1	0.08	0.00005	2		2	0.091	0.001	15	0.002	0.001	5.5	0.001	12	96	3.5	944.62	0.037
28-May-15	0.0005	12.5	0.24	0.001	0.06	0.07		1.4	0.0001	18		150	0.001	0.001	0.1	0.01	0.00002	3		5	0.024	0.001	13	0.001	0.001	5.5	0.001	14	90	1.8	946.32	0.028
18-Jun-15	0.0005	12.5	0.46	0.001	0.05	0.054		0.89	0.0001	15		120	0.001	0.002	0.1	0.02	0.00002	3		3	0.017	0.001	13	0.001	0.001	5.4	0.001	16	10	1.9	946.22	0.027
16-Jul-15	0.0005	6	0.88	0.001	0.05	0.041		0.821	0.0001	16		116	0.001	0.002	0.05	0.022	0.00002	2.17		2.33	0.021	0.001	14.2	0.001	0.001	5.88	0.0001	13.9	91	2.8	945.32	0.035
20-Aug-15	0.0005	7	1.73	0.001	0.05	0.038		0.807	0.0001	20.6		127	0.001	0.003	0.01	0.072	0.00002	2.15		1.89	0.023	0.001	17	0.002	0.002	6.24	0.0001	11	149	3.4	944.72	0.047
17-Sep-15	0.0005	12	1.63	0.001	0.05	0.034		0.881	0.0001	24.4		129	0.001	0.002	0.01	0.031	0.00002	2.04		1.91	0.034	0.001	20.7	0.001	0.002	5.27	0.0001	9.65	106	3.5	944.62	0.058
22-Oct-15	0.0005	10	0.96	0.001	0.05	0.032		1.03	0.0001	25.2		130	0.001	0.003	0.01	0.129	0.00002	2.63		1.77	0.05	0.001	20.8	0.002	0.001	5.2	0.0001	9	105	3.9	944.22	0.069
19-Nov-15	0.0005	10	0.52	0.001	0.05	0.036		1.2	0.0001	24.5		129	0.001	0.007	0.01	0.152	0.00002	2.46		1.85	0.132	0.001	19.4	0.002	0.001	5.09	0.0001	7.22	97	4	944.12	0.1
10-Dec-15	0.0005	9	0.68	0.001	0.05	0.036		1.18	0.0001	28.8		135	0.001	0.006	0.016	0.159	0.00002	2.09		1.96	21.5	0.001	22.4	0.002	0.001	5.06	0.0001	6.73	93	4.3	943.82	0.111
21-Jan-16	0.0005	10	2.38	0.001	0.05	0.047		1.03	0.0001	30.4		143	0.002	0.01	0.014	0.724	0.00002	2.39		1.95	0.094	0.001	20.8	0.003	0.003	5.03	0.0001	5.14	131	4.7	943.42	0.071
11-Feb-16	0.0005	11	0.61	0.001	0.05	0.03		2.97	0.0001	9.99		81	0.001	0.022	0.031	0.519	0.00002	3.05		1.48	0.047	0.001	7.96	0.002	0.001	5.12	0.0001	4.19	64	4.4	943.72	0.119
17-Mar-16	0.0005	11	0.49	0.001	0.05	0.028		3.37	0.0001	9.2		87	0.001	0.019	0.027	0.307	0.00002	4.21		1.61	0.105	0.001	6.93	0.003	0.001	5.26	0.0001	7.38	64	4.3	943.82	0.198

WGM1/D1 Post-Dry Ash Placement Data April, 2015 to March 2016

	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	0.0005	10	0.96	0.0010	0.05	0.041		1	0.0001	20		121	0.0011	0.0067	0.04	0.2	0.00002	3		2	1.84	0.001	16	0.002	0.001	5.4	0.000	10	91	3.5	944.6	0.075
Maximum	0.0005	13	2.38	0.0010	0.06	0.070		3	0.0001	30		150	0.0020	0.0220	0.10	0.7	0.00005	4		5	21.50	0.001	22	0.003	0.003	6.2	0.001	16	149	4.7	946.3	0.198
Minimum	0.0005	6	0.24	0.0010	0.05	0.028		1	0.0001	9		81	0.0010	0.0010	0.01	0.0	0.00002	2		1	0.02	0.001	7	0.001	0.001	5.0	0.000	4	10	1.8	943.4	0.027
50th Percentile	0.0005	11	0.78	0.0010	0.05	0.037		1	0.0001	19		128	0.0010	0.0030	0.02	0.1	0.00002	2		2	0.05	0.001	16	0.002	0.001	5.3	0.000	9	95	3.7	944.4	0.064

WGM1/D2 Pre-Dry Ash Placement Background Summary 1988- April, 2003 (mg/L)																															
	Ag	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn	Mn
Average	0.007	14	0.001	0.05	0.173		1.6	0.001	36	0.017	25534	0.013	0.007	0.17	1.1	0.0003	2	5.2	0.301		32	0.027	0.008	4.6	0.001	45	160	5.9	914.3	0.067	0.301
Maximum	0.020	138	0.002	0.30	3.000		13.0	0.001	104	0.021	44536	0.048	0.080	0.75	13.0	0.0009	5	16.0	0.800		66	0.032	0.074	5.6	0.001	102	345	8.7	917.6	0.180	0.800
Minimum	0.001	0.00	0.001	0.005	0.010		0.0	0.001	9.00	0.014	9720	0.001	0.001	0.001	0.03	0.0001	0	0.0	0.035		11	0.023	0.001	2.9	0.001	6	10	2.7	911.5	0.012	0.035
90th Percentile	0.016	24	0.001	0.10	0.114		5.0	0.001	48	0.020	31000	0.041	0.010	0.28	1.7	0.0007	4	9.0	0.442		42	0.031	0.010	5.4	0.001	61	258	7.3	917.2	0.114	0.442

WGM1/D2 Post-Dry Ash Placement Data April, 2013 to March 2015																															
Date	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	D2 SO4	TDS	WL1	WL AHD	Zn
10-Apr-13	0.0005	12.5	0.22	0.001	0.025	0.045		1.1	0.0002	32		360	0.001	0.004	0.05	0.17	0.000025	4.2		16	0.4	0.01	35	0.049	0.001	4.8	0.002	113	260	7.8	912.4	0.06
17-May-13	0.0005	12.5	0.3	0.001	0.1	0.04		2.7	0.0002	29		480	0.001	0.008	0.05	2	0.000025	4		25	0.78	0.01	47	0.08	0.003	4.1	0.002	160	270	7.9	912.3	0.11
13-Jun-13	0.0005	12.5	0.28	0.001	0.05	0.047		1.8	0.0002	29		400	0.003	0.004	0.05	0.1	0.000025	4		20	0.49	0.001	39	0.058	0.002	4.2	0.002	130	300	7	913.2	0.092
10-Jul-13	0.0005	12.5	0.2	0.001	0.03	0.04		1.5	0.0002	25		380	0.001	0.009	0.05	0.04	0.000025	4		23	0.48	0.001	39	0.054	0.001	4.6	0.002	120	190	7.6	912.6	0.075
22-Aug-13	0.0005	12.5	0.27	0.001	0.1	0.038		2.3	0.0002	34		480	0.002	0.004	0.05	1.7	0.00005	3		24	0.71	0.001	49	0.068	0.002	3.9	0.002	160	290	7.8	912.4	0.087
26-Sep-13	0.0005	12.5	0.27	0.001	0.09	0.036		2.2	0.0002	36		510	0.002	0.007	0.1	4.7	0.000025	3		21	0.69	0.001	56	0.075	0.002	3.8	0.002	160	350	7.7	912.5	0.097
24-Oct-13	0.0005	12.5	0.24	0.001	0.14	0.035		2.5	0.0002	38		590	0.003	0.006	0.1	3.2	0.000025	3		22	0.78	0.001	55	0.086	0.003	3.7	0.002	190	350	7.9	912.3	0.12
7-Nov-13	0.0005	12.5	0.24	0.001	0.15	0.033		2.8	0.0002	39		650	0.003	0.005	0.1	0.69	0.000025	3		22	0.81	0.001	59	0.094	0.003	3.5	0.002	190	370	7.9	912.3	0.13
5-Dec-13	0.0005	12.5	0.28	0.001	0.13	0.033		2.5	0.0002	41		590	0.003	0.006	0.1	0.73	0.000025	3		20	0.75	0.001	57	0.086	0.003	3.5	0.002	180	300	7.7	912.5	0.12
16-Jan-14	0.0005	12.5	0.2	0.001	0.16	0.034		2.5	0.0002	42		630	0.002	0.004	0.1	0.63	0.000025	3		19	0.75	0.001	60	0.086	0.003	3.4	0.002	190	310	7.9	912.3	0.12
6-Feb-14	0.0005	12.5	0.18	0.001	0.15	0.035		2.6	0.0002	39		640	0.001	0.004	0.1	0.76	0.000025	3		19	0.75	0.001	58	0.08	0.002	3.4	0.002	190	330	8	912.2	0.1
6-Mar-14	0.0005	12.5	0.2	0.001	0.15	0.036		2.4	0.0002	40		610	0.002	0.009	0.1	3.8	0.000025	3		18	0.76	0.001	53	0.081	0.002	3.6	0.002	180	320	7.8	912.4	0.12
3-Apr-14	0.0005	12.5	0.63	0.001	0.025	0.044		1.1	0.0002	20		380	0.002	0.002	0.1	0.02	0.000025	4		17	0.4	0.001	36	0.044	0.001	4.5	0.002	130	240	5.8	914.4	0.059
2-May-14	0.0005	12.5	0.24	0.001	0.06	0.026		1.4	0.0002	22		390	0.001	0.002	0.1	0.06	0.000025	4		17	0.47	0.001	39	0.048	0.002	4.3	0.002	120	240	7.5	912.7	0.075
13-Jun-14	0.0005	12.5	0.32	0.001	0.14	0.032		2.5	0.0002	28		570	0.001	0.002	0.1	0.37	0.000025	4		20	0.77	0.001	54	0.077	0.002	3.7	0.002	160	320	7.8	912.4	0.12
11-Jul-14	0.0005	12.5	0.28	0.001	0.17	0.031		2.8	0.0002	31		620	0.001	0.001	0.1	1.1	0.000025	4		22	0.87	0.001	57	0.087	0.003	3.6	0.002	180	340	7.7	912.5	0.12
15-Aug-14	0.0005	12.5	0.28	0.001	0.18	0.032		2.8	0.0002	35		620	0.001	0.001	0.1	2.9	0.000025	3		23	0.85	0.001	59	0.084	0.003	3.6	0.002	200	350	7.8	912.4	0.12
12-Sep-14	0.0005	12.5	0.34	0.001	0.025	0.041		1.3	0.0002	21		410	0.001	0.001	0.1	0.1	0.000025	4		20	0.45	0.001	42	0.05	0.002	4.9	0.002	150	250	5	915.2	0.08
24-Oct-14	0.0005	12.5	0.25	0.001	0.12	0.034		2.3	0.0002	29		540	0.001	0.001	0.1	1.5	0.000025	3		20	0.69	0.001	52	0.071	0.003	3.7	0.002	170	270	7.6	912.6	0.096
14-Nov-14	0.0005	12.5	0.35	0.001	0.18	0.029		3	0.0002	38		640	0.001	0.001	0.1	3.9	0.000025	4		23	0.84	0.001	62	0.083	0.003	3.5	0.002	210	330	7.9	912.3	0.12
12-Dec-14	0.0005	12.5	0.19	0.001	0.025	0.029		1.1	0.0002	15		380	0.001	0.001	0.1	0.02	0.000025	5		17	0.39	0.001	40	0.046	0.002	5	0.002	130	210	3.9	916.3	0.054
15-Jan-15	0.0005	12.5	0.16	0.001	0.025	0.028		1.1	0.0002	15		370	0.001	0.001	0.1	0.01	0.000025	4		17	0.38	0.001	39	0.039	0.002	5	0.002	130	250	3.1	917.1	0.048
12-Feb-15	0.0005	12.5	0.17	0.001	0.025	0.031		1.1	0.0002	20		360	0.001	0.001	0.1	0.02	0.000025	4		15	0.36	0.001	40	0.043	0.002	4.5	0.002	120	240	7.3	912.9	0.05
12-Mar-15	0.0005	12.5	0.31	0.001	0.09	0.037		2	0.0002	29		470	0.001	0.003	0.1	0.37	0.000025	4		19	0.57	0.001	52	0.061	0.002	4	0.002	160	290	7.7	912.5	0.071

WGM1/D2 Post-Dry Ash Placement Data April, 2013 to March 2015																															
	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	0.0005	13	0.29	0.0010	0.0888	0.035		2	0.0002	25.2500		479.1667	0.0011	0.0014	0.1000	0.8642	0.00003	4		20	0.5867	0.0010	49	0.0611	0.0023	4.1917	0.0020	155.0000	277.5000	7.2	913.0	0.0844
Maximum	0.0005	13	0.63	0.0010	0.18	0.047		3	0.0002	42		650	0.0030	0.0090	0.10	4.7	0.00005	5		25	0.87	0.010	62	0.094	0.003	5.0	0.002	210	370	8.0	917.1	0.130
Minimum	0.0005	13	0.16	0.0010	0.03	0.026		1	0.0002	15		360	0.0010	0.0010	0.05	0.0	0.00003	3		15	0.36	0.001	35	0.039	0.001	3.4	0.002	113	190	3.1	912.2	0.048
50th Percentile	0.0005	13	0.26	0.0010	0.10	0.035		2	0.0002	30		495	0.0010	0.0035	0.10	0.7	0.00003	4		20	0.70	0.001	52	0.073	0.002	3.9	0.002	160	295	7.7	912.5	0.097

WGM1/D2 Post-Dry Ash Placement Data April, 2015 to March 2016																																
Date	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	D2 SO4	TDS	WL1	WL AHD	Zn
10-Apr-15	0.0005	12.5	0.19	0.001	0.1	0.029		1.9	0.0001	27		500	0.001	0.001	0.1	0.53	0.00005	3		18	0.58	0.001	48	0.062	0.002	3.8	0.001	160	290	7.3	912.9	0.073
28-May-15	0.0005	12.5	0.16	0.001	0.06	0.03		1.4	0.0001	22		430	0.001	0.001	0.1	0.24	0.00002	4		16	0.45	0.001	42	0.046	0.001	4.3	0.001	140	270	7.5	912.7	0.058
18-Jun-15	0.0005	12.5	0.26	0.001	0.12	0.031		2	0.0001	29		510	0.001	0.001	0.1	2.3	0.00002	3		19	0.61	0.001	54	0.065	0.002	3.8	0.001	180	240	7.8	912.4	0.074
16-Jul-15	0.0005	0.5	0.2	0.001	0.025	0.032		1.24	0.0001	17.9		405	0.001	0.001	0.1	0.135	0.00002	3.07		14.8	0.419	0.001	44.5	0.048	0.001	4.74	0.0001	152	250	5.9	914.3	0.061
20-Aug-15	0.0005	0.5	0.31	0.001	0.14	0.033		2.17	0.0001	28.5		562	0.001	0.001	0.025	1.01	0.00002	3.76		19.3	0.642	0.001	54.7	0.075	0.002	3.85	0.0001	184	364	7.8	912.4	0.094
17-Sep-15	0.0005	0.5	0.22	0.001	0.09	0.029		2.01	0.0001	28.1		505	0.001	0.001	0.01	0.542	0.00002	3.79		19.7	0.558	0.001	55.5	0.054	0.001	4.03	0.0001	146	292	7.6	912.6	0.084
22-Oct-15	0.0005	0.5	0.25	0.001	0.16	0.028		2.61	0.0001	37.6		630	0.001	0.001	0.025	4.08	0.00002	4.18		18.5	0.725	0.001	60.4	0.073	0.002	3.61	0.0001	209	400	7.9	912.3	0.099
19-Nov-15	0.0005	0.5	0.15	0.001	0.025	0.027		1.45	0.0001	17.8		419	0.001	0.001	0.01	0.059	0.00002	3.55		13.2	0.396	0.001	44.9	0.049	0.001	3.97	0.0001	145	236	7	913.2	0.063
10-Dec-15	0.0005	0.5	0.26	0.001	0.14	0.032		2.76	0.0002	34.9		601	0.001	0.003	0.037	1.24	0.00002	3.74		20.4	0.598	0.001	62.6	0.081	0.002	3.56	0.0001	199	393	8	912.2	0.173
21-Jan-16	0.0005	0.5	0.15	0.001	0.025	0.024		1.28	0.0001	16.9		402	0.001	0.002	0.01	0.06	0.00002	3.38		12.7	0.365	0.001	40.9	0.041	0.001	3.89	0.0001	131	261	6.5	913.7	0.055
11-Feb-16	0.0005	0.5	0.12	0.001	0.05	0.027		1.08	0.0001	22.3		392	0.001	0.001	0.016	0.059	0.00002	3.41		12.7	0.312	0.001	44	0.038	0.001	4.12	0.0001	124	230	7.7	912.5	0.047
17-Mar-16	0.0005	0.5	0.21	0.001	0.08	0.028		1.52	0.0001	24.6		476	0.001	0.001	0.01	0.416	0.00002	2.97		14.7	0.467	0.001	51.6	0.056	0.002	3.77	0.0001	144	289	7.7	912.5	0.076

WGM1/D2 Post-Dry Ash Placement Data April, 2015 to March 2016																																
	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	0.0005	4	0.21	0.0010	0.08	0.029		2	0.0001	26		486	0.0010	0.0013	0.0	0.9	0.00002	3		17	0.51	0.0010	50.258	0.057	0.002	4.0	0.000	160	293	7.4	912.8	0.080
Maximum	0.0005	13	0.31	0.0010	0.16	0.033		3	0.0002	38		630	0.0010	0.0030	0.1	4.1	0.00005	4		20	0.73	0.0010	62.600	0.081	0.002	4.7	0.001	209	400	8.0	914.3	0.173
Minimum	0.0005	1	0.12	0.0010	0.03	0.024		1	0.0001	17		392	0.0010	0.0010	0.0	0.1	0.00002	3		13	0.31	0.0010	40.900	0.038	0.001	3.6	0.000	124	230	5.9	912.2	0.047
50th Percentile	0.0005	1	0.21	0.0010	0.09	0.029		2	0.0001	26		488	0.0010	0.0010	0.0	0.5	0.00002	3		17	0.51	0.0010	49.800	0.055	0.002	3.9	0.000	149	280	7.7	912.6	0.074

6. Water Quality Data and Summary for KVAD/R Dry Ash Placement Area Seepage Detection Groundwater Bores WGM1/D5 and 1/D6

a) Groundwater Bore WGM1/D5

WGM1/D5 Pre-Dry Ash Placement Background Summary 1988-April, 2003 (mg/L)

	Ag	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn	Mn
Average	0.001	18	0.004	1.29	0.166	0.006	12.4	0.002	20	0.061	701	0.017	0.019	0.41	6.9	0.0003	16	20.3	1.630		61	0.125	0.010	3.8	0.001	259	470	4.8	899.6	0.338	1.630
Maximum	0.001	90	0.013	2.00	1.700	0.006	23.0	0.005	90	0.075	1050	0.055	0.080	1.02	17.0	0.0007	23	34.0	3.970		127	0.140	0.050	5.4	0.002	380	1913	8.8	902.0	2.630	3.970
Minimum	0.001	1	0.001	0.08	0.010	0.006	5.2	0.001	8	0.047	283	0.003	0.001	0.10	0.1	0.0002	7	8.0	0.520		7	0.110	0.002	2.8	0.001	92	48	2.3	895.4	0.032	0.520
90th Percentile	0.001	51	0.008	1.70	0.148	0.006	19.7	0.004	24	0.072	810	0.041	0.058	0.65	14.7	0.0006	19	26.0	2.500		70	0.137	0.021	4.5	0.002	328	550	8.3	901.7	0.505	2.500

WGM1/D5 Post-Dry Ash Placement Date April, 2013 to March 2015

Date	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL AHD	WL1	Zn
10-Apr-13																																
17-May-13																																
13-Jun-13	0.001	12.5	4	0.0005	0.2	0.02		17	0.0006	5		340	0.004	0.009	0.4	0.09	0.00005	7		10	1.7	0.0005	9	0.097	0.003	3.7	0.001	130	200	900.49	3.7	0.25
10-Jul-13	0.001	12.5	6.6	0.0005	0.7	0.027		24	0.0007	11		520	0.003	0.003	0.5	0.55	0.00005	10		21	2.9	0.0005	24	0.18	0.003	3.8	0.001	220	350	896.49	7.7	0.35
22-Aug-13																														895.99	8.2	
26-Sep-13																														896.19	8	
24-Oct-13																														895.89	8.3	
7-Nov-13	0.001	130	27	0.007	1.4	0.086		33	0.013	36		840	0.01	0.044	0.1	2.9	0.00018	20		39	4.8	0.003	59	0.3	0.042	6.1	0.01	280	540	895.79	8.4	2.2
5-Dec-13																														895.89	8.3	
16-Jan-14																														895.79	8.4	
6-Feb-14																														895.79	8.4	
6-Mar-14	0.001	12.5	3.9	0.0005	0.27	0.025		16	0.0007	6		400	0.002	0.006	0.4	0.12	0.00005	7		10	1.6	0.0005	10	0.1	0.003	3.7	0.001	140	240	900.19	4	0.23
3-Apr-14	0.001	12.5	5.8	0.0005	0.22	0.036		19	0.001	4		370	0.002	0.003	0.5	0.87	0.00005	6		10	2.1	0.0005	8	0.14	0.002	3.8	0.001	150	250	901.09	3.1	0.34
2-May-14	0.001	12.5	8.9	0.0005	0.88	0.031		26	0.0006	15		590	0.004	0.002	0.7	1.9	0.00005	11		23	3.7	0.0005	23	0.23	0.002	3.9	0.001	260	420	897.29	6.9	0.3
13-Jun-14	0.001	12.5	61	0.029	1.7	0.17		43	0.11	30		1000	0.021	0.12	1.3	0.78	0.00033	19		44	6.2	0.006	59	0.72	0.22	4	0.01	440	780	895.99	8.2	6.4
11-Jul-14	0.001	12.5	24	0.013	2	0.052		44	0.071	33		1100	0.005	0.034	1.1	0.28	0.00005	20		50	6.7	0.001	67	0.55	0.11	4	0.003	500	870	896.09	8.1	2
15-Aug-14	0.001	12.5	16	0.008	1.4	0.036		34	0.068	29		920	0.004	0.017	0.9	0.27	0.00005	19		41	5.5	0.0005	49	0.33	0.086	4.1	0.002	460	720	895.69	8.5	2.5
12-Sep-14	0.001	12.5	7	0.0005	0.65	0.017		23	0.0024	11		550	0.002	0.015	0.5	0.16	0.00005	12		21	2.8	0.0005	24	0.17	0.008	3.8	0.001	250	340	898.49	5.7	0.43
24-Oct-14	0.001	12.5	8.9	0.007	0.76	0.034		23	0.022	12		590	0.004	0.045	0.5	1.2	0.00008	14		24	3.1	0.001	27	0.24	0.061	4.1	0.001	250	370	896.09	8.1	1.3
14-Nov-14	0.001	12.5	25	0.015	1.8	0.05		45	0.11	37		1100	0.009	0.13	1.2	0.93	0.00016	20		50	6.4	0.003	69	0.43	0.21	4	0.006	590	860	895.79	8.4	3.8
12-Dec-14	0.001	12.5	2.1	0.0005	0.28	0.014		13	0.0005	4		330	0.0005	0.003	0.1	0.08	0.00005	9		10	1.5	0.0005	10	0.094	0.003	3.8	0.001	110	200	900.89	3.3	0.16
15-Jan-15	0.001	12.5	6.7	0.0005	0.27	0.035		18	0.001	4		330	0.0005	0.003	0.4	0.12	0.00005	6		11	1.9	0.0005	8	0.18	0.002	4.1	0.001	140	250	901.29	2.9	0.45
12-Feb-15	0.001	12.5	9.4	0.001	0.94	0.034		27	0.0009	17		620	0.002	0.005	0.8	3.8	0.00005	11		21	3.3	0.0005	24	0.29	0.004	3.7	0.001	260	470	896.59	7.6	0.61
12-Mar-15	0.001	12.5	26	0.004	1.8	0.06		45	0.013	34		1100	0.005	0.033	1.5	5	0.00011	22		48	6.4	0.008	65	0.42	0.042	3.9	0.004	550	860	896.09	8.1	1.2

WGM1/D5 Post-Dry Ash Placement Date April, 2013 to March 2015

	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	0.0010	20	15.14	0.0055	0.95	0.045		28	0.0260	18		669	0.0049	0.0295	0.68	1.2	0.00009	13		27	3.79	0.002	33	0.279	0.050	4.0	0.003	296	483	897.3	6.9	1.408
Maximum	0.0010	130	61.00	0.0290	2.00	0.170		45	0.1100	37		1100	0.0210	0.1300	1.50	5.0	0.00033	22		50	6.70	0.008	69	0.720	0.220	6.1	0.010	590	870	901.3	8.5	6.400
Minimum	0.0010	13	2.10	0.0005	0.20	0.014		13	0.0005	4		330	0.0005	0.0020	0.10	0.1	0.00005	6		10	1.50	0.001	8	0.094	0.002	3.7	0.001	110	200	895.7	2.9	0.160
50th Percentile	0.0010	13	8.90	0.0008	0.82	0.035		25	0.0017	14		590	0.0040	0.0120	0.50	0.7	0.00005	12		22	3.20	0.001	24	0.235	0.006	3.9	0.001	255	395	896.1	8.1	0.530

WGM1/D5 Post-Dry Ash Placement Date April, 2015 to March 2016

Date	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL AHD	WL1	Zn
10-Apr-15	0.0005	12.5	21	0.006	2	0.05		39	0.051	30		1100	0.005	0.049	1.3	1.7	0.00011	20		47	6.2	0.003	64	0.39	0.084	4	0.005	560	870	896.09	8.1	1.7
28-May-15	0.0005	12.5	14	0.002	1.4	0.044		34	0.071	22		920	0.003	0.024	0.8	2.1	0.00002	14		36	4.8	0.001	42	0.33	0.08	3.9	0.002	430	650	896.19	8	2.3
18-Jun-15	0.0005	12.5	29	0.004	2.6	0.041		49	0.051	36		1300	0.003	0.051	1.5	0.31	0.00002	23		59	7.5	0.001	81	0.5	0.1	3.8	0.005	710	1000	896.09	8.1	2.5
16-Jul-15	0.0005	0.5	26.4	0.006	2.27	0.05		39.8	0.0353	29.2		1260	0.007	0.055	0.3	0.849	0.00009	23.3		48.4	6.61	0.002	65.2	0.446	0.09	3.78	0.0023	616	850	896.29	7.9	2.15
20-Aug-15	0.0005	0.5	30.5	0.007	2.67	0.042		46	0.0531	33.5		1310	0.006	0.067	0.674	0.541	0.00009	24.8		53.6	6.73	0.001	76.2	0.559	0.12	3.79	0.0026	649	919	895.89	8.3	3.2
17-Sep-15	0.0005	0.5	25.7	0.006	2.07	0.043		44.8	0.0444	31.4		1153	0.006	0.049	1.02	0.239	0.00005	26.8		51.2	5.86	0.001	61.6	0.401	0.099	3.78	0.0017	600	876	895.89	8.3	3.18
22-Oct-15	0.0005	0.5	29.8	0.005	2.08	0.066		49.8	0.0451	38.5		1363	0.01	0.1	0.917	1.07	0.0001	29.7		56.2	6.72	0.003	86.7	0.438	0.104	3.84	0.0036	703	1140	895.89	8.3	2.81
19-Nov-15	0.0005	0.5	8.27	0.005	0.97	0.036		23.2	0.0251	15.2		696	0.002	0.032	0.333	1.02	0.00002	21		22.4	2.95	0.001	35.2	0.209	0.048	3.97	0.0016	299	464	895.99	8.2	1.35
10-Dec-15	0.0005	0.5	12	0.005	1.16	0.029		31.6	0.0343	22.6		841	0.002	0.028	0.394	0.6	0.00002	22.5		33.6	3.34	0.001	50.6	0.335	0.057	3.81	0.0009	382	610	895.79	8.4	3.37
21-Jan-16	0.0005	3	4.31	0.002	0.99	0.026		21.6	0.0023	16.8		632	0.003	0.026	0.164	6.24	0.00002	16.6		24.3	2.88	0.001	34.5	0.126	0.009	4.82	0.0005	250	450	896.49	7.7	0.212
11-Feb-16	0.0005	0.5	12.6	0.005	1.33	0.067		32.5	0.0118	18.9		797	0.005	0.032	0.243	4.71	0.00006	16.5		28.7	3.59	0.008	41.6	0.233	0.041	4.39	0.0014	340	560	895.89	8.3	0.931
17-Mar-16	0.0005	0.5	13.8	0.005	1.54	0.041		31.3	0.0115	18.8		866	0.003	0.021	0.39	2.53	0.00002	18.3		33.7	4.25	0.003	54	0.276	0.03	4.28	0.0013	401	630	896.09	8.1	1.19

WGM1/D5 Post-Dry Ash Placement Date April, 2015 to March 2016

	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	0.0005	4	18.95	0.0048	1.76	0.045		37	0.0363	26		1020	0.0046	0.0445	0.67	1.8	0.00005	21		41	5.12	0.002	58	0.354	0.072	4.0	0.002	495	752	896.0	8.1	2.074
Maximum	0.0005	13	30.50	0.0070	2.67	0.067		50	0.0710	39		1363	0.0100	0.1000	1.50	6.2	0.00011	30		59	7.50	0.008	87	0.559	0.120	4.8	0.005	710	1140	896.5	8.4	3.370
Minimum	0.0005	1	4.31	0.0020	0.97	0.026		22	0.0023	15		632	0.0020	0.0210	0.16	0.2	0.00002	14		22	2.88	0.001	35	0.126	0.009	3.8	0.001	250	450	895.8	7.7	0.212
50th Percentile	0.0005	1	17.50	0.0050	1.77	0.043		37	0.0399	26		1010	0.0040	0.0405	0.53	1.0	0.00004	22		42	5.33	0.001	58	0.363	0.082	3.9	0.002	495	750	896.0	8.2	2.225

b) Groundwater Bore WGM1/D6

WGM1/D6 Pre-Dry Ash Placement Background Summary 1988-April, 2003 (mg/L)

	Ag	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	0.001	27	0.003	0.78	0.184		22.3	0.002	53	94830	0.011	0.016	0.14	93.3	0.0004	7	25.4	4.005		45	0.117	0.007	4.5	0.016	340	603	10.8	896.2	0.107
Maximum	0.001	390	0.015	1.10	1.900		33.0	0.009	160	143000	0.032	0.260	0.65	174.2	0.0009	48	34.0	5.400		90	0.210	0.023	5.8	0.100	536	902	11.4	896.9	0.566
Minimum	0.001	0	0.001	0.27	0.021		14.0	0.001	23	60100	0.001	0.001	0.001	0.1	0.0001	4	17.0	1.390		26	0.023	0.001	1.4	0.001	190	320	10.1	895.6	0.004
90th Percentile	0.001	39	0.005	0.98	0.210		27.0	0.003	65	110000	0.020	0.021	0.28	123.0	0.0007	9	30.0	4.810		55	0.191	0.013	5.5	0.043	381	736	11.2	896.6	0.232

WGM1/D6 Post-Dry Ash Placement Data April, 2013 to March 2015

Date	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
10-Apr-13	0.001	12.5	1.1	0.002	0.4	0.017		9.3	0.0001	53		810	0.001	0.009	0.3	3.9	0.00005	5.6		34	1.9	0.005	69	0.23	0.001	4.4	0.001	281	580	10.8	896.15	0.24
17-May-13	0.001	12.5	1.5	0.005	0.32	0.02		13	0.0014	60		950	0.002	0.01	0.05	37	0.00005	6		37	2.5	0.005	72	0.27	0.01	3.3	0.001	300	540	11.2	895.75	0.7
13-Jun-13	0.001	12.5	4.1	0.002	0.45	0.019		8.7	0.0006	32		1000	0.004	0.005	0.6	1.5	0.00005	6		59	1.5	0.0005	82	0.5	0.003	3.4	0.001	560	660	11.1	895.85	1.6
10-Jul-13	0.001	12.5	4.8	0.002	0.51	0.022		5.2	0.0005	26		930	0.002	0.006	0.6	0.76	0.00005	6		65	0.76	0.0005	86	0.52	0.002	3.6	0.001	400	630	11	895.95	1.1
22-Aug-13	0.001	12.5	3.6	0.002	0.41	0.017		6.3	0.0001	26		880	0.002	0.001	0.5	0.74	0.00005	6		59	1	0.0005	77	0.39	0.0005	3.5	0.001	370	560	11.2	895.75	0.9
26-Sep-13	0.001	12.5	2.8	0.002	0.4	0.019		8.8	0.0001	31		1000	0.003	0.002	0.5	25	0.00005	6		55	1.6	0.0005	79	0.46	0.0005	3.3	0.001	410	680	11.2	895.75	1.1
24-Oct-13	0.001	12.5	2.4	0.002	0.44	0.022		10	0.0001	35		980	0.004	0.003	0.5	10	0.00005	6		53	1.9	0.0005	79	0.45	0.0005	3.6	0.001	440	660	11.2	895.75	0.99
7-Nov-13	0.001	12.5	2.5	0.003	0.87	0.022		29	0.0002	36		1400	0.007	0.01	0.5	15	0.00005	14		61	3.5	0.002	89	0.52	0.005	3.1	0.001	610	860	11.1	895.85	1.1
5-Dec-13	0.001	12.5	4	0.006	0.77	0.027		22	0.0028	45		1600	0.004	0.009	0.8	16	0.00005	8		72	4	0.0005	92	0.63	0.008	3	0.001	660	870	10.7	896.25	2
16-Jan-14	0.001	12.5	3.8	0.007	0.82	0.028		23	0.0009	44		1600	0.004	0.006	0.7	22	0.00005	8		74	4.2	0.0005	96	0.65	0.004	3	0.001	680	920	10.7	896.25	1.6
6-Feb-14	0.001	12.5	3.1	0.006	0.9	0.026		29	0.0006	44		1700	0.004	0.009	0.6	40	0.00005	8		75	5.3	0.0005	86	0.56	0.003	2.9	0.001	750	1000	10.7	896.25	1.2
6-Mar-14	0.001	12.5	3.9	0.008	1	0.027		29	0.0007	46		1800	0.004	0.005	0.5	57	0.00005	8		74	6	0.0005	83	0.61	0.004	3	0.001	770	1200	10.8	896.15	1.3
3-Apr-14	0.001	12.5	6.5	0.004	0.7	0.023		20	0.0009	56		1700	0.003	0.005	0.1	10	0.00005	8		88	3.7	0.0005	130	0.67	0.005	3	0.001	750	1100	10.7	896.25	1.8
2-May-14	0.001	12.5	3	0.007	0.87	0.019		27	0.0008	47		1500	0.003	0.004	0.4	80	0.00005	8		70	5.4	0.0005	96	0.45	0.009	3.3	0.001	690	1000	10.9	896.05	0.6
13-Jun-14	0.001	12.5	2.6	0.007	1.1	0.022		36	0.0007	42		1600	0.003	0.002	0.5	130	0.00005	8		70	7.1	0.0005	94	0.4	0.009	3.6	0.001	720	1200	11.1	895.85	0.69
11-Jul-14	0.001	12.5	3.3	0.006	1.1	0.025		36	0.0014	44		1600	0.003	0.004	0.4	120	0.00005	8		72	7.3	0.0005	89	0.43	0.015	3.5	0.001	720	1200	10.9	896.05	0.99
15-Aug-14	0.001	12.5	2.1	0.006	0.94	0.019		31	0.003	44		1400	0.002	0.008	0.4	110	0.00005	8		61	6.4	0.0005	89	0.35	0.011	3.7	0.001	710	1100	11.2	895.75	1.3
12-Sep-14	0.001	12.5	5.4	0.003	0.4	0.017		5	0.0015	26		900	0.002	0.003	0.7	5.5	0.00005	5		53	0.74	0.0005	74	0.47	0.01	3.7	0.001	410	590	11.1	895.85	1.4
24-Oct-14	0.001	12.5	4.2	0.005	0.92	0.023		26	0.0022	37		1700	0.003	0.005	0.6	90	0.00005	7		71	4.9	0.001	85	0.55	0.016	2.9	0.001	660	950	11.2	895.75	1.8
14-Nov-14	0.001	12.5	4.2	0.006	1.1	0.026		34	0.0041	45		1600	0.002	0.008	0.6	130	0.00005	8		76	6.5	0.0005	94	0.54	0.02	3.2	0.001	880	1200	11.4	895.55	2
12-Dec-14	0.001	12.5	5.5	0.004	0.75	0.023		21	0.004	35		1500	0.002	0.006	0.6	69	0.00005	8		72	3.8	0.0005	93	0.66	0.018	3.1	0.001	610	880	10.8	896.15	1.9
15-Jan-15	0.001	12.5	5.7	0.003	0.58	0.018		8.2	0.001	33		1200	0.001	0.002	0.8	15	0.00005	7		65	1.1	0.0005	110	0.54	0.007	3.4	0.001	460	780	10.7	896.25	1.2
12-Feb-15	0.001	12.5	2.6	0.004	0.73	0.021		20	0.0036	32		1400	0.002	0.007	0.4	69	0.00005	7		58	3.6	0.0005	92	0.45	0.017	3	0.001	540	880	11.1	895.85	0.99
12-Mar-15	0.001	12.5	2.4	0.004	0.95	0.028		35	0.0025	40		1600	0.002	0.008	0.6	140	0.00005	8		74	6.5	0.0005	98	0.44	0.011	3.4	0.001	750	1200	11.2	895.75	0.93

WGM1/D6 Post-Dry Ash Placement Data April, 2013 to March 2015

	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	0.0010	13	3.55	0.0044	0.73	0.022		21	0.0014	40		1348	0.0029	0.0057	0.51	49.9	0.00005	7		65	3.80	0.001	89	0.489	0.008	3.3	0.001	589	885	11.0	896.0	1.226
Maximum	0.0010	13	6.50	0.0080	1.10	0.028		36	0.0041	60		1800	0.0070	0.0100	0.80	140.0	0.00005	14		88	7.30	0.005	130	0.670	0.020	4.4	0.001	880	1200	11.4	896.3	2.000
Minimum	0.0010	13	1.10	0.0020	0.32	0.017		5	0.0001	26		810	0.0010	0.0010	0.05	0.7	0.00005	5		34	0.74	0.001	69	0.230	0.001	2.9	0.001	281	540	10.7	895.6	0.240
50th Percentile	0.0010	13	3.45	0.0040	0.76	0.022		22	0.0009	41		1450	0.0030	0.0055	0.50	31.0	0.00005	8		68	3.75	0.001	89	0.485	0.008	3.3	0.001	635	880	11.1	895.9	1.150

WGM1/D6 Post-Dry Ash Placement Data April, 2015 to March 2016																																
Date	**Ag**	**ALK**	**Al**	**As**	**B**	**Ba**	**Be**	**Ca**	**Cd**	**Cl**	**Co**	**COND**	**Cr**	**Cu**	**F**	**Fe**	**Hg**	**K**	**Li**	**Mg**	**Mn**	**Mo**	**Na**	**Ni**	**Pb**	**pH**	**Se**	**SO4**	**TDS**	**WL1**	**WL AHD**	**Zn**
10-Apr-15	0.0005	12.5	3.9	0.005	0.91	0.023		27	0.0045	37		1600	0.002	0.008	0.7	100	0.000025	8		72	5.2	0.001	94	0.54	0.021	3.3	0.001	740	1200	11.1	895.85	1.40
28-May-15	0.0005	12.5	3.5	0.003	0.51	0.019		13	0.0039	29		1300	0.001	0.007	0.4	38	0.00002	6		59	2	0.001	89	0.43	0.019	3.3	0.001	510	740	11.3	895.65	1.00
18-Jun-15	0.0005	12.5	6	0.002	0.43	0.019		4.9	0.0023	22		1000	0.0005	0.007	0.5	2	0.00002	6		56	0.62	0.001	94	0.53	0.018	3.7	0.001	480	650	11.3	895.65	1.20
16-Jul-15	0.0005	0.5	5.05	0.002	0.43	0.017		5.29	0.0051	17.3		1010	0.001	0.015	0.4	6.69	0.00002	6.08		49.8	0.67	0.001	83.3	0.441	0.028	3.57	0.0001	431	658	11.3	895.65	1.21
20-Aug-15	0.0005	0.5	4.26	0.003	0.85	0.021		19.7	0.0035	28.6		1420	0.002	0.01	0.262	57.3	0.00002	7.84		68.8	3.09	0.001	103	0.586	0.014	3.72	0.0001	695	1030	11.3	895.65	1.57
17-Sep-15	0.0005	0.5	4.58	0.002	0.68	0.019		15.4	0.0005	24.2		1204	0.0005	0.005	0.292	40.4	0.00002	7.39		67.4	2.16	0.001	102	0.458	0.005	4.14	0.0001	631	922	11.4	895.55	1.48
22-Oct-15	0.0005	0.5	4.14	0.003	0.78	0.019		24.7	0.0007	32.9		1144	0.002	0.002	0.575	74.8	0.00002	9.57		69.5	3.83	0.001	100	0.487	0.006	4.18	0.0001	783	1130	11.3	895.65	1.35
19-Nov-15	0.0005	0.5	5.27	0.004	0.62	0.019		17.4	0.0014	24.7		1281	0.002	0.005	0.526	54.4	0.00002	7.82		62.2	2.83	0.001	95.9	0.538	0.016	3.98	0.0002	620	925	10.9	896.05	1.44
10-Dec-15	0.0005	0.5	4.37	0.002	1.24	0.023		37.7	0.0015	38.4		1626	0.003	0.006	0.436	143	0.00002	9.36		82.3	6.66	0.001	106	0.558	0.013	4.1	0.0002	967	1380	11	895.95	1.34
21-Jan-16	0.0005	0.5	6.12	0.002	0.99	0.022		34.9	0.0014	40		1747	0.003	0.014	0.641	123	0.00002	9.15		90.5	6.09	0.001	122	0.604	0.014	4.05	0.0002	930	1490	11	895.95	1.51
11-Feb-16	0.0005	0.5	2.86	0.002	0.51	0.012		12	0.001	18.4		1027	0.001	0.009	0.382	33.4	0.00002	6.56		47	1.86	0.001	89.3	0.374	0.009	3.94	0.0001	491	619	11.1	895.85	1.02
17-Mar-16	0.0005	4.32	0.5	0.001	1.12	0.02	34.4	0.0022	38.1	1587	0.002	0.009	0.0005	4.32	0.349	126	0.00002	7.94	76.4	5.96	0.001	103	0.478	0.016	4.16	7.94	0.0002	854	1370	11.1	895.85	1.13

WGM1/D6 Post-Dry Ash Placement Data April, 2015 to March 2016																																
	Ag	**ALK**	**Al**	**As**	**B**	**Ba**	**Be**	**Ca**	**Cd**	**Cl**	**Co**	**COND**	**Cr**	**Cu**	**F**	**Fe**	**Hg**	**K**	**Li**	**Mg**	**Mn**	**Mo**	**Na**	**Ni**	**Pb**	**pH**	**Se**	**SO4**	**TDS**	**WL1**	**WL AHD**	**Zn**
Average	0.0005	4	4.53	0.0026	0.76	0.019		21	0.0023	29		1329	0.0017	0.0081	0.46	66.6	0.00002	8		67	3.41	0.001	98	0.502	0.015	3.8	0.000	678	1010	11.2	895.8	1.304
Maximum	0.001	13	6.12	0.0050	1.24	0.023		38	0.0051	40		1747	0.0030	0.0150	0.70	143.0	0.00003	10		91	6.66	0.001	122	0.604	0.028	4.2	0.001	967	1490	11.4	896.1	1.570
Minimum	0.0005	1	2.86	0.0010	0.43	0.012		5	0.0005	17		1000	0.0005	0.0020	0.26	2.0	0.00002	6		47	0.62	0.001	83	0.374	0.005	3.3	0.000	431	619	10.9	895.6	1.000
50th Percentile	0.001	1	4.35	0.0020	0.73	0.019		19	0.0019	29		1291	0.0020	0.0075	0.42	55.9	0.00002	8		68	2.96	0.001	98	0.509	0.015	4.0	0.000	663	978	11.2	895.8	1.345

7. Water Quality Data and Summary for SSCAD

SSCAD Pre-Dry Ash Placement Background Summary 1996-April, 2003 (mg/L)																														
	Ag	ALK	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	CrIV	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	Zn	Mn	Mo	Na
Average	0.001	18	0.016	4.7	0.128	0.009	56	0.012	18	121893	0.005		0.007	9.3	0.17	0.0002	53	11	1.2	0.152	137	0.129	0.002	5.4	0.151	553	858	0.426	1.2	0.152	137
Maximum	0.001	53	0.039	8.6	0.152	0.009	140	0.020	74	257800	0.018		0.035	14.0	0.45	0.0002	110	18	1.7	0.190	380	0.150	0.005	6.5	0.379	1390	2170	0.650	1.7	0.190	380
Minimum	0.001	5	0.003	2.7	0.110	0.008	33	0.006	8	86000	0.001		0.001	7.2	0.03	0.0001	35	7	0.8	0.113	46	0.108	0.001	4.7	0.029	351	215	0.100	0.8	0.113	46
90th Percentile	0.001	28.4	0.034	8.0	0.142	0.009	107	0.020	28	200360	0.013		0.016	11.4	0.29	0.0002	88	15	1.7	0.182	287	0.146	0.005	6.0	0.298	1029	1604	0.580	1.7	0.182	287

SSCAD Post-Dry Ash Placement April, 2010 to January 2012 (data from August, 2007 to March, 2010 in Aurecon, 2010)																																				
Date	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	CrIV	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	Zn	Mn	Mo	Na	Ni	Pb
16-Apr-10	<0.001	20		0.001	2.1	0.07	0.001	83	0.002	40		2247	0.001		0.01	2.5	0.03	0.00005	49		19	0.89	0.03	370	0.03	0.001	4.5	0.003	1000	1600	0.08	0.89	0.03	370	0.03	0.001
26-May-10	<0.001	20		0.001	2.3	0.071		88	0.0022	39		2130	0.001		0.005	2.3	0.05	0.00005	50		20	0.92	0.01	380	0.03	0.001	5.5	0.002	1100	1600	0.08	0.92	0.01	380	0.03	0.001
9-Jun-10	<0.001	20		0.001	2.2	0.069		85	0.0022	37		1978	0.001		0.004	2.2	0.01	0.00005	50		19	0.93	0.02	370	0.03	0.001	5.9	0.003	1100	1600	0.09	0.93	0.02	370	0.03	0.001
1-Jul-10	<0.001	20	1.5	0.001	2.3	0.071		81	0.0023	35		2055	0.001		0.008	2.2	0.14	0.00005	46		19	0.94	0.02	350	0.04	0.001	4.9	0.003	1000	1600	0.1	0.94	0.02	350	0.04	0.001
25-Aug-10	<0.001	20	4	0.001	2.1	0.071		78	0.0026	32		2109	0.001		0.01	2.4	0.57	0.00005	46		19	1.1	0.01	330	0.04	0.001	4.6	0.003	950	1500	0.15	1.1	0.01	330	0.04	0.001
23-Sep-10	<0.001	20	3.6	0.001	1.9	0.067		81	0.0025	31		1996	0.001		0.012	2.7	1.4	0.00005	45		19	1.1	0.01	340	0.05	0.001	5.3	0.003	940	1500	0.14	1.1	0.01	340	0.05	0.001
27-Oct-10	<0.001	20		0.002	2	0.075		78	0.0028	30		2026	0.001		0.01	2.3	0.39	0.00005	44		17	1.1	0.01	320	0.05	0.001	5.2	0.004	930	1500	0.14	1.1	0.01	320	0.05	0.001
19-Nov-10	<0.001	20		0.002	2	0.083		79	0.0029	33		2023	0.001		0.011	2.5	0.15	0.00005	47		19	1.2	0.02	340	0.05	0.001	5	0.004	950	1400	0.15	1.2	0.02	340	0.05	0.001
9-Dec-10	<0.001	20	1.5	0.0018	2.1	0.044		84	0.0014	32		2051	0.001		0.0057	1.7	0.07	0.00005	48		17	1.9	0.01	350	0.05	0.001	4.2	0.004	940	1500	0.15	1.9	0.01	350	0.05	0.001
12-Jan-11	<0.001	20	0.32	0.002	1.9	0.029		90	0.0002	33		2007	0.001		0.001	1.3	1.3	0.00007	48		17	2.9	0.01	350	0.03	0.001	3.9	0.015	990	1400	0.04	2.9	0.01	350	0.03	0.001
24-Feb-11	<0.001	20	0.14	0.001	1.7	0.027		76	0.0008	28		1745	0.001		<0.001	1.4	0.09	0.00005	41		14	1.7	0.25	280	0.02	0.001	5	0.006	850	1300	0.04	1.7	0.25	280	0.02	0.001
24-Mar-11	<0.001	20	0.2	0.003	1.8	0.03		83	0.0005	27		1800	0.001		0.003	1.4	0.04	0.00005	42		15	1.9	0.16	290	0.02	0.001	4.2	0.006	850	1200	0.04	1.9	0.16	290	0.02	0.001
8-Apr-11	<0.001	20	0.73	0.001	1.9	0.037		81	0.001	28		1700	0.001		0.006	1.6	0.01	0.00005	44		14	1.8	0.04	280	0.02	0.001	5.1	0.005	840	1400	0.05	1.8	0.04	280	0.02	0.001
12-May-11	<0.001	20	2.8	0.001	2.1	0.052		82	0.003	26		1800	0.001		0.015	2.2	0.02	0.00005	45		16	1.4	0.01	290	0.05	0.001	4.6	0.005	830	1400	0.15	1.4	0.01	290	0.05	0.001
10-Jun-11	<0.001	20	3	0.001	2.2	0.041		84	0.003	28		1900	0.001		0.014	2.4	0.01	0.00005	42		16	1.4	0.01	290	0.05	0.001	4.5	0.005	870	1300	0.18	1.4	0.01	290	0.05	0.001
26-Jul-11	<0.001	20	2.7	0.001	2.1	0.031		91	0.002	26		1800	0.001		0.01	2.3	0.01	0.00005	45		15	1.4	0.01	300	0.05	0.001	4.8	0.004	850	1400	0.22	1.4	0.01	300	0.05	0.001
30-Aug-11	<0.001	20	1.8	0.001	1.9	0.023		87	0.002	28		1800	0.001		0.007	1.9	0.01	0.00005	44		14	1.3	0.01	290	0.04	0.001	4.9	0.004	850	1400	0.19	1.3	0.01	290	0.04	0.001
21-Sep-11	<0.001	20	1.6	0.001	2.1	0.024		96	0.002	29		1800	0.001		0.008	1.9	0.01	0.00005	48		15	1.3	0.01	310	0.04	0.001	4.9	0.004	890	1300	0.19	1.3	0.01	310	0.04	0.001
12-Oct-11	<0.001	20	1.3	0.001	1.9	0.037		94	0.001	28		1900	0.001		0.004	1.7	0.01	0.00005	46		15	1.2	0.03	290	0.03	0.001	5.2	0.006	870	1400	0.18	1.2	0.03	290	0.03	0.001
10-Nov-11	<0.001	20	7.2	0.002	2	0.098		75	0.0041	26		1800	0.010		0.046	2.3	0.09	0.00005	42		16	1.1	0.01	270	0.07	0.003	4.4	0.018	840	1300	0.27	1.1	0.01	270	0.07	0.003
8-Dec-11	<0.001	20	4.5	0.001	1.9	0.083		70	0.0037	25		1700	0.001		0.031	4	0.04	0.00005	39		15	1	0.01	260	0.06	0.002	4.8	0.014	780	1300	0.2	1	0.01	260	0.06	0.002
18-Jan-12	<0.001	2.6	20	0.001	1.8	0.079		70	0.003	27		1700	0.001		0.021	2.1	0.09	0.00005	40		15	0.96	0.02	280	0.05	0.001	5	0.014	800	1300	0.16	0.96	0.02	280	0.05	0.001

SSCAD Post-Stage 2A Dry Ash Placement April, 2010 to January, 2012 (mg/L)																															
	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	COND	Cr	CrIV	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	Zn	Mn	Mo	Na
Average	<0.001	19	3.3	0.0013	2.01	0.055		83	0.0021	30	1912	0.0014		0.0115	2.15	0.21	0.000051	45	17	1.34	0.033	315	0.041	0.001	4.8	0.006	910	1418	0.136	1.34	0.033	315
Maximum	<0.001	20	20.0	0.0030	2.30	0.098		96	0.0041	40	2247	0.0100		0.0460	4.00	1.40	0.000070	50	20	2.90	0.250	380	0.070	0.003	5.9	0.018	1100	1600	0.270	2.90	0.250	380
Minimum	<0.001	3	0.1	0.0010	1.70	0.023		70	0.0002	25	1700	0.0010		0.0010	1.30	0.01	0.000050	39	14	0.89	0.010	260	0.020	0.001	3.9	0.002	780	1200	0.040	0.89	0.010	260
50th Percentile	<0.001	20	1.8	0.0010	2.00	0.060		83	0.0022	29	1900	0.0010		0.0100	2.20	0.05	0.000050	45	16	1.20	0.010	305	0.040	0.001	4.9	0.004	880	1400	0.150	1.20	0.010	305

SSCAD Post-Dry Ash Placement April, 2013 to March 2015																															
Date	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	CrIV	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	Zn
10-Apr-13	0.001	12.5	2	0.002	2	0.073		58	0.005	21		1500	0.0005		0.018	2.4	0.050	0.00005	35		15	1.2	0.005	230	0.078	0.0005	5.5	0.006	691	940	0.24
16-May-13	0.001	12.5	2.5	0.002	1.7	0.071		59	0.0053	19		1500	0.0005		0.01	2.3	0.16	0.00005	38		16	1.5	0.005	220	0.09	0.0005	5.2	0.007	730	1100	0.25
13-Jun-13	0.001	12.5	1.7	0.002	2	0.065		61	0.0051	20		1500	0.0005		0.009	0.05	0.040	0.00005	37		16	1.5	0.014	210	0.083	0.0005	5.5	0.007	740	1100	0.29
10-Jul-13	0.001	12.5	1.6	0.002	2.2	0.066		60	0.005	20		1400	0.0005		0.009	2.1	0.03	0.00005	37		17	1.5	0.015	230	0.084	0.0005	5.4	0.006	710	1000	0.25
22-Aug-13	0.001	12.5	0.3	0.001	1.9	0.063		55	0.0038	19		1300	0.001		0.0005	1.7	0.005	0.00005	34		15	1.4	0.018	210	0.072	0.0005	6.8	0.003	650	990	0.19
26-Sep-13	0.001	12.5	1.2	0.002	2	0.066		59	0.0041	19		1400	0.002		0.003	1.9	0.1	0.00005	35		16	1.5	0.02	220	0.094	0.0005	5.6	0.004	720	1100	0.23
24-Oct-13	0.001	12.5	1.6	0.003	2.2	0.067		62	0.0044	20		1600	0.002		0.004	2.2	0.070	0.00005	36		16	1.5	0.016	230	0.087	0.0005	5.4	0.004	800	1100	0.25
7-Nov-13	0.001	12.5	1	0.002	1.9	0.078		61	0.0048	20		1500	0.002		0.003	2	0.02	0.00005	37		16	1.5	0.027	240	0.087	0.0005	5.8	0.006	820	1100	0.24
5-Dec-13	0.001	12.5	1.4	0.002	2	0.077		63	0.0043	22		1700	0.002		0.006	2.1	0.080	0.00005	38		17	1.5	0.03	240	0.084	0.0005	5.3	0.006	820	1200	0.24
16-Jan-14	0.001	99	0.08	0.004	1.7	0.061		52	0.0023	19		1600	0.002		0.002	1.8	0.005	0.00005	34		14	0.84	0.037	260	0.051	0.0005	8	0.003	690	1100	0.073
6-Feb-14	0.001	98	0.04	0.003	1.6	0.054		51	0.0014	19		1500	0.001		0.004	1.7	0.010	0.00005	32		14	0.43	0.043	240	0.029	0.0005	8.1	0.003	640	1100	0.025
6-Mar-14	0.001	81	0.15	0.002	1.7	0.05		54	0.0013	18		1500	0.002		0.002	1.8	0.01	0.00005	33		14	0.41	0.042	230	0.027	0.0005	7.9	0.003	650	1100	0.032
3-Apr-14	0.001	58	0.36	0.002	1.9	0.045		60	0.0014	19		1600	0.002		0.002	2.3	0.005	0.00005	38		16	0.41	0.04	240	0.028	0.0005	7.7	0.003	720	1100	0.035
1-May-14	0.001	61	0.24	0.001	1.8	0.045		57	0.0014	18		1500	0.001		0.002	1.9	0.03	0.00005	36		16	0.52	0.041	220	0.031	0.0005	7.8	0.002	660	1100	0.044
12-Jun-14	0.001	43	0.16	0.0005	1.9	0.045		63	0.0018	17		1600	0.001		0.002	1.7	0.050	0.00005	41		17	0.74	0.04	240	0.043	0.0005	7.6	0.002	620	1100	0.073
10-Jul-14	0.001	12.5	0.1	0.0005	2.1	0.043		64	0.0016	18		1500	0.001		0.002	1.8	0.005	0.00005	40		17	0.82	0.035	220	0.045	0.0005	7.3	0.002	640	1100	0.072
14-Aug-14	0.001	12.5	0.12	0.0005	1.8	0.034		58	0.0016	18		1300	0.001		0.002	2	0.040	0.00005	34		15	0.33	0.024	190	0.03	0.0005	7.3	0.002	650	1000	0.07
11-Sep-14	0.001	12.5	2.7	0.001	2.5	0.044		69	0.004	21		1600	0.001		0.003	2.6	0.04	0.00005	44		20	1.4	0.03	200	0.09	0.0005	5.4	0.004	800	1200	0.24
23-Oct-14	0.001	12.5	1.6	0.001	2.5	0.034		70	0.0046	19		1600	0.001		0.004	2.2	0.220	0.00005	43		19	1.4	0.013	210	0.11	0.0005	5.3	0.003	730	1100	0.25
13-Nov-14	0.001	12.5	2	0.002	2.6	0.038		73	0.0044	21		1600	0.001		0.004	2.7	0.09	0.00005	46		20	1.6	0.024	220	0.094	0.0005	5.4	0.003	860	1200	0.25
11-Dec-14	0.001	12.5	7.2	0.002	1.2	0.054		32	0.0046	9		710	0.001		0.01	2.2	0.070	0.00005	21		10	1.2	0.0005	61	0.095	0.002	4.6	0.004	310	460	0.28
14-Jan-15	0.001	12.5	6.5	0.002	2.9	0.045		79	0.0053	19		1600	0.001		0.007	3.3	0.09	0.00005	52		22	2	0.026	220	0.11	0.0005	4.8	0.006	760	1200	0.39
11-Feb-15	0.001	12.5	8	0.003	2.9	0.05		77	0.0063	20		1600	0.001		0.01	3.6	0.360	0.00005	49		21	2.1	0.022	200	0.13	0.001	4.6	0.005	780	1300	0.34
11-Mar-15	0.001	12.5	9.3	0.003	2.6	0.053		81	0.0067	20		1700	0.001		0.014	4.2	0.29	0.00005	53		23	2.3	0.005	210	0.14	0.001	4.4	0.008	840	1200	0.36

SSCAD Post-Stage 2 Dry Ash Placement April, 2013 to March, 2015 (mg/l)																															
	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr		Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	Zn
Average	0.0010	28	2.16	0.0019	2.07	0.055		62	0.0038	19		1496	0.0012		0.0055	2.19	0.1	0.00005	38		17	1.23	0.024	216	0.076	0.001	6.1	0.004	710	1083	0.196
Maximum	0.0010	99	9.30	0.0040	2.90	0.078		81	0.0067	22		1700	0.0020		0.0180	4.20	0.4	0.00005	53		23	2.30	0.043	260	0.140	0.002	8.1	0.008	860	1300	0.390
Minimum	0.0010	13	0.04	0.0005	1.20	0.034		32	0.0013	9		710	0.0005		0.0005	0.05	0.0	0.00005	21		10	0.33	0.001	61	0.027	0.001	4.4	0.002	310	460	0.025
50th Percentile	0.0010	13	1.50	0.0020	2.00	0.054		61	0.0044	19		1500	0.0010		0.0040	2.10	0.0	0.00005	37		16	1.40	0.024	220	0.084	0.001	5.5	0.004	720	1100	0.240

SSCAD Post-Dry Ash Placement April, 2015 to March 2016																															
Date	**Ag**	**ALK**	**Al**	**As**	**B**	**Ba**	**Be**	**Ca**	**Cd**	**Cl**	**Co**	**COND**	**Cr**	**CrIV**	**Cu**	**F**	**Fe**	**Hg**	**K**	**Li**	**Mg**	**Mn**	**Mo**	**Na**	**Ni**	**Pb**	**pH**	**Se**	**SO4**	**TDS**	**Zn**
9-Apr-15	0.0005	12.5	13	0.002	3	0.053		80	0.0075	23		1700	0.001		0.015	4.5	0.17	0.000025	50		22	2.5	0.0005	200	0.14	0.001	4.3	0.009	860	1300	0.36
27-May-15	0.0005	12.5	12	0.002	2.4	0.046		72	0.0067	19		1600	0.001		0.012	4.4	0.14	0.00002	44		21	2.3	0.002	160	0.13	0.0005	4.4	0.006	810	1100	0.38
17-Jun-15	0.0005	12.5	2.1	0.001	0.75	0.023		26	0.0014	6		460	0.001		0.005	0.7	0.03	0.00002	15		5	0.42	0.002	55	0.032	0.0005	5.4	0.001	195	250	0.12
15-Jul-15	0.0005	0.5	12.7	0.004	2.88	0.043		73.7	0.0066	18.1		1650	0.001		0.012	2.3	0.142	0.00002	50		20	2.24	0.008	181	0.147	0.0005	4.43	0.0039	803	1110	0.452
19-Aug-15	0.0005	0.5	13.6	0.004	3.52	0.04		79.2	0.007	18.3		1660	0.001		0.016	5.06	0.361	0.00002	53.1		21.2	2.3	0.007	195	0.172	0.0005	4.53	0.0035	776	1250	0.518
16-Sep-15	0.0005	0.5	11.2	0.004	3.17	0.037		82.7	0.0058	19.2		1591	0.001		0.012	4.5	0.416	0.00002	54.9		21	2.25	0.007	192	0.13	0.0005	4.74	0.0032	828	1150	0.506
21-Oct-15	0.0005	0.5	4.26	0.002	1.5	0.03		38.9	0.0028	9.58		855	0.001		0.012	1.82	0.048	0.00002	28.9		9.44	1.1	0.003	92.4	0.066	0.0005	4.72	0.002	406	601	0.318
18-Nov-15	0.0005	0.5	0.86	0.001	1.07	0.03		28.8	0.0017	7.78		581	0.001		0.003	0.691	0.04	0.00002	20.2		5.51	0.714	0.004	58.7	0.046	0.0005	5.45	0.0012	255	419	0.19
9-Dec-15	0.0005	2	2.29	0.003	1.5	0.026		53.8	0.0029	8.61		848	0.001		1.81	1.18	0.024	0.00002	28.1		9.75	1.17	0.004	91.7	0.076	0.051	5.4	0.0023	408	572	1.13
20-Jan-16	0.0005	0.5	1.27	0.001	1.29	0.028		36.2	0.0023	9.47		714	0.001		0.004	1.07	0.036	0.00002	25.5		7.78	0.834	0.004	65	0.056	0.0005	5.26	0.0012	298	382	0.198
10-Feb-16	0.0005	0.5	4.6	0.002	2.26	0.027		55.8	0.0042	14.5		1184	0.001		0.012	2.43	0.051	0.00002	39.6		13.1	1.51	0.002	129	0.104	0.0005	4.74	0.0028	537	800	0.373
16-Mar-16	0.0005	0.5	15.3	0.004	2.47	0.048		67.6	0.0065	12.9		1181	0.002		0.022	4.16	0.106	0.00002	39.4		19.1	2.4	0.001	101	0.196	0.002	4.27	0.0041	582	910	0.546

SSCAD Post-Stage 2 Dry Ash Placement April, 2015 to March, 2016 (mg/l)																															
	Ag	**ALK**	**Al**	**As**	**B**	**Ba**	**Be**	**Ca**	**Cd**	**Cl**	**Co**	**COND**	**Cr**		**Cu**	**F**	**Fe**	**Hg**	**K**	**Li**	**Mg**	**Mn**	**Mo**	**Na**	**Ni**	**Pb**	**pH**	**Se**	**SO4**	**TDS**	**Zn**
Average	0.0005	4	7.77	0.0025	2.15	0.036		58	0.0046	14		1169	0.0011		0.1613	2.73	0.1	0.00002	37		15	1.64	0.004	127	0.108	0.005	4.8	0.003	563	820	0.424
Maximum	0.0005	13	15.30	0.0040	3.52	0.053		83	0.0075	23		1700	0.0020		1.8100	5.06	0.4	0.00003	55		22	2.50	0.008	200	0.196	0.051	5.5	0.009	860	1300	1.130
Minimum	0.0005	1	0.86	0.0010	0.75	0.023		26	0.0014	6		460	0.0010		0.0030	0.69	0.0	0.00002	15		5	0.42	0.001	55	0.032	0.001	4.3	0.001	195	250	0.120
50th Percentile	0.0005	1	7.90	0.0020	2.33	0.034		62	0.0050	14		1183	0.0010		0.0120	2.37	0.1	0.00002	40		16	1.88	0.004	115	0.117	0.001	4.7	0.003	560	855	0.377

8.

Water Quality Data and Summary for Sawyers Swamp Creek Monitoring from SSCAD Spillway to near WGM4/D5

Sawyers Crk upstream 0 m where SSCAD diversion and Springvale Mine Water from April, 2013 to March, 2015 enters SSC at spillway																																			
Date	**Ag**	**Al**	**Alk**	**As**	**B**	**Ba**	**Be**	**Ca**	**Cd**	**Cl**	**Cond**	**Cr**	**Cu**	**F**	**Fe**	**Hg**	**K**	**Mg**	**Mn**	**Mo**	**Na**	**Ni**	**NO2+NO3**	**Pb**	**pH**	**PO4**	**se**	**So4**	**TDS**	**TKN**	**TN**	**TP**	**TSS**	**Turbidity (NTU)**	**Zn**
10/04/2013	0.0005	0.59	510	0.015	0.10	0.026		4.8	0.0001	4	1000	0.0005	0.0005	1.5		0.000025	10	2.3		0.036	250	0.005		0.002	8.3		0.001	25	580					3.4	0.022
16/05/2013	0.0005	1.3	520	0.019	0.09	0.035		4.5	0.0001	5	1000	0.0005	0.001	1.3		0.000025	11	2.4		0.038	230	0.005		0.003	8.2		0.001	23	700					40	0.022
13/06/2013	0.0005	0.13	560	0.018	0.07	0.021		5.2	0.0001	5	1000	0.0005	0.001	1.2		0.000025	10	3		0.033	230	0.005		0.001	8.4		0.001	25	650					5	0.024
10/07/2013	0.0005	0.34	570	0.019	0.08	0.03		5	0.0001	5	1000	0.0005	0.001	1.2		0.000025	11	3		0.04	260	0.005		0.002	8.4		0.001	25	600		0			17	0.025
22/08/2013	0.0005	0.2	580	0.014	0.07	0.025		4.7	0.0001	5	1000	0.002	0.0005	0.1		0.000025	11	3	0.5	0.032	250	0.004		0.0005	8.5		0.001	23	660		0			7.1	0.015
26/09/2013	0.0005	0.43	560	0.02	0.08	0.028		5.1	0.0001	5	1100	0.002	0.001	1.1		0.000025	11	3	0.5	0.037	260	0.004		0.001	8.5		0.001	30	770		0.5			14	0.023
24/10/2013	0.0005	0.09	600	0.024	0.08	0.022		3.9	0.0001	5	1200	0.002	0.0005	1.3		0.000025	11	2	0.5	0.037	280	0.005		0.0005	8.5		0.001	35	670		0.5			6.6	0.027
7/11/2013	0.0005	0.19	570	0.027	0.07	0.029		4	0.0001	5	1100	0.002	0.0005	1.2		0.000025	10	3	0.5	0.041	260	0.005		0.0005	8.5		0.001	33	650		0			9.7	0.025
5/12/2013	0.0005	0.07	530	0.026	0.08	0.024		4.5	0.0001	5	1100	0.003	0.0005	1.2		0.000025	10	3	0.5	0.039	260	0.006		0.0005	8.6		0.001	35	690		2			0.3	0.032
16/01/2014	0.0005	0.18	560	0.025	0.08	0.027		4.6	0.0001	5	1100	0.002	0.001	1.2		0.000025	11	3	0.5	0.044	240	0.006		0.0005	8.5		0.001	38	710		2			5	0.028
6/02/2014	0.0005	0.2	530	0.029	0.07	0.028		4.3	0.0001	5	1100	0.002	0.0005	1.2		0.000025	10	3	0.5	0.03	230	0.006		0.0005	8.6		0.001	40	700		2			4	0.022
6/03/2014	0.0005	0.14	540	0.026	0.08	0.026		3.9	0.0001	5	1100	0.002	0.0005	1.1		0.000025	11	3	0.5	0.043	240	0.005		0.0005	8.5		0.001	36	700		2			3.8	0.021
3/04/2014	0.0005	0.39	540	0.02	0.08	0.026		5.2	0.0001	5	1100	0.002	0.0005	1.3		0.000025	13	3	0.5	0.04	270	0.005		0.0005	8.4		0.001	43	760		2			5.6	0.026
1/05/2014	0.0005	0.18	570	0.02	0.07	0.024		4.7	0.0001	5	1100	0.0005	0.0005	1.3		0.000025	11	3	0.5	0.044	240	0.005		0.0005	8.5		0.001	36	690		2			7	0.034
12/06/2014	0.0005	0.14	530	0.019	0.08	0.025		5.2	0.0001	5	1100	0.0005	0.0005	1.1		0.000025	12	3	0.5	0.045	280	0.005		0.0005	8.5		0.001	38	690		1			3.4	0.029
10/07/2014	0.0005	0.17	530	0.029	0.08	0.026		5.2	0.0001	5	1200	0.001	0.002	1.2		0.000025	11	3	0.5	0.042	260	0.005		0.001	8.5		0.001	37	750		1			13	0.03
14/08/2014	0.0005	0.11	560	0.019	0.07	0.01		3.8	0.0001	5	1100	0.0005	0.0005	1.2		0.000025	7	0.5	0.5	0.039	250	0.003		0.001	8.6		0.001	28	680		1			3.6	0.028
11/09/2014	0.0005	0.14	560	0.029	0.07	0.03		4.4	0.0001	5	1100	0.0005	0.0005	1.1		0.000025	10	3	0.5	0.041	240	0.004		0.0005	8.5		0.001	31	660		1			6.9	0.01
23/10/2014	0.0005	0.21	580	0.025	0.08	0.026		4.7	0.0001	5	1200	0.0005	0.0005	1.3		0.000025	11	3	0.5	0.051	270	0.004		0.0005	8.6		0.001	36	760		1			6.8	0.012
13/11/2014	0.0005	0.1	600	0.028	0.07	0.027		5	0.0001	5	1200	0.0005	0.0005	1.1		0.000025	13	3	0.5	0.054	290	0.004		0.0005	8.5		0.001	35	730		0.5			2.9	0.024
11/12/2014	0.0005	0.28	580	0.026	0.07	0.03		5	0.0001	6	1200	0.0005	0.001	1.2		0.000025	12	3	0.5	0.067	280	0.004		0.0005	8.7		0.001	38	710		2			10	0.007
14/01/2015	0.0005	0.07	580	0.028	0.08	0.03		4.6	0.0001	5	1200	0.0005	0.0005	1.1		0.000025	12	3	0.5	0.05	270	0.004		0.0005	8.4		0.001	34	720		2			2.8	0.006
11/02/2015	0.0005	0.31	540	0.027	0.07	0.033		4.5	0.0001	6	1100	0.0005	0.001	1.1		0.000025	12	3	0.5	0.064	260	0.004		0.0005	8.5		0.001	37	730		2			11	0.008
11/03/2015	0.0005	0.38	510	0.009	0.07	0.013		4.2	0.0001	6	1100	0.0005	0.003	1.1		0.000025	8	1	0.5	0.028	260	0.002		0.0005	8.5		0.001	30	690		2			5.1	0.013

Sawyers Crk upstream 0 m where SSCAD diversion and Springvale Mine Water from April, 2013 to March, 2015 enters SSC at spillway																																			
	Ag	**Al**	**Alk**	**As**	**B**	**Ba**	**Be**	**Ca**	**Cd**	**Cl**	**Cond**	**Cr**	**Cu**	**F**	**Fe**	**Hg**	**K**	**Mg**	**Mn**	**Mo**	**Na**	**Ni**	**NO2+NO3**	**Pb**	**pH**	**PO4**	**se**	**So4**	**TDS**	**TKN**	**TN**	**TP**	**TSS**	**Turbidity (NTU)**	**Zn**
Average	<0.001	0.26	555	0.023	0.08	0.026		4.6	0.0001	5	1104	0.001	0.001	1.2		0.00003	10.8	2.7	0.500	0.04	257	0.005		0.001	8.5		0.001	33	694		1.26			8.1	0.021
Maximum	<0.001	1.30	600	0.029	0.10	0.035		5.2	0.0001	6	1200	0.003	0.003	1.5		0.00003	13.0	3.0	0.500	0.07	290	0.006		0.003	8.7		0.001	43	770		2.00			40.0	0.034
Minimum	<0.001	0.07	510	0.009	0.07	0.010		3.8	0.0001	4	1000	0.001	0.001	0.1		0.00003	7.0	0.5	0.500	0.03	230	0.002		0.001	8.2		0.001	23	580		0.00			0.3	0.006
50th Percentile	<0.001	0.19	560	0.025	0.08	0.026		4.7	0.0001	5	1100	0.001	0.001	1.2		0.00003	11.0	3.0	0.500	0.04	260	0.005		0.001	8.5		0.001	35	695		1.00			6.1	0.024

Sawyers Crk upstream 0 m where SSCAD diversion and Springvale Mine Water from April, 2015 to March, 2016 enters SSC at spillway																																				
Date	Ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	NO2+NO3	Pb	pH	PO4	se	So4	TDS	TKN	TN	DO	TSS	Turbidity (NTU)	Zn
9/04/2015	0.0005	0.19	510	0.013	0.07	0.027		5	0.0001	7	1100	0.001	0.001	1.1	0.02	0.000025	11	3	0.021	0.046	240	0.007	2	0.001	8.6		0.001	36	670		0.55	10.5		2.6	0.015
27/05/2015	0.0005	0.38	540	0.02	0.06	0.031		4.8	0.0001	21	1100	0.001	0.001	0.2	0.005	0.00002	11	3	0.008	0.043	240	0.003	0.5	0.001	8.4		0.001	100	680		0.55	6.3		2.6	0.011
17/06/2015	0.0005	0.33	540	0.017	0.07	0.035		4.1	0.0001	6	1100	0.001	0.001	0.9	0.005	0.00002	11	3	0.011	0.048	260	0.004	1	0.001	8.2		0.001	33	580		0.6	7.2		1.9	0.01
15/07/2015	0.0005	0.38	631	0.021	0.1	0.028		4.3	0.0001	5.93	1140	0.001	0.001	1.3	0.006	0.00002	12.1	3.19	0.007	0.044	259	0.003	0.28	0.001	8.47		0.0001	37.4	626		0.7	20.7		2.6	0.009
19/08/2015	0.0005	0.41	543	0.023	0.12	0.026		4.24	0.0001	6.33	1130	0.001	0.001	1.32	0.006	0.00002	12.4	3.11	0.004	0.048	268	0.004	0.38	0.001	8.59		0.0001	33.4	618		0.8	8.5		1.9	0.013
16/09/2015	0.0005	0.54	598	0.024	0.11	0.03		4.54	0.0001	5.86	1162	0.001	0.001	0.584	0.006	0.00002	13.1	3.3	0.004	0.045	278	0.002	0.46	0.001	8.31		0.0001	32.2	652		0.8	7.3		2.9	0.009
21/10/2015	0.0005	0.3	561	0.02	0.06	0.028		4.38	0.0001	6.24	1185	0.001	0.001	0.962	0.009	0.00002	14.7	3.27	0.008	0.041	258	0.003	0.42	0.001	8.24		0.0002	35	691		0.9	4.8		2.5	0.0025
18/11/2015	0.0005	0.39	567	0.03	0.15	0.033		4.72	0.0001	5.03	1203	0.001	0.001	0.985	0.004	0.00002	13.6	3.33	0.007	0.049	248	0.004	0.5	0.001	8.28		0.0003	33.5	718		1.1	12.5		2.1	0.007
9/12/2015	0.0005	0.3	612	0.028	0.15	0.032		4.97	0.0001	5.2	1218	0.001	0.001	1.03	0.008	0.00002	13.7	3.54	0.005	0.044	301	0.003	0.48	0.001	8.27		0.0003	32.4	702		0.9	7.7		2.8	0.0025
20/01/2016	0.0005	0.32	641	0.03	0.08	0.03		4.65	0.0001	5.14	1225	0.001	0.001	1.12	0.004	0.00002	11.5	3.05	0.01	0.05	335	0.004	0.27	0.001	8.21		0.0003	34.5	636		0.7	5.7		5.4	0.008
10/02/2016	0.0005	0.36	578	0.028	0.15	0.029		4.54	0.0001	5.47	1229	0.001	0.001	0.996	0.01	0.00002	12.3	3.21	0.007	0.044	266	0.002	0.4	0.001	8.2		0.0001	33.5	617		0.7	4.9		3.2	0.006
16/03/2016	0.0005	0.41	640	0.03	0.17	0.028		4.11	0.0001	4.65	1233	0.001	0.001	1.07	0.007	0.00002	11.1	2.84	0.008	0.043	333	0.004	0.35	0.001	8.16		0.0002	32.1	754		0.8	8.6		3.6	0.01

Sawyers Crk upstream 0 m where SSCAD diversion and Springvale Mine Water from April, 2015 to March, 2016 enters SSC at spillway																																			
	Ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	NO2+NO3	Pb	pH	PO4	se	So4	TDS	TKN	TN	DO	TSS	Turbidity (NTU)	Zn
Average	0.0005	0.54	641	0.03	0.15	0.035		5	0.0001	21	1229	0.001	0.001	1.32	0.02	3.54	0.021	0.05	335	0.007	3.54	0.021	2	0.001	8.6		0.001	100	718		1.1	10.5		5.4	0.015
Maximum	0.0005	0.54	641	0.03	0.17	0.035		5	0.0001	21	1233	0.001	0.001	1.32	0.02	3.54	0.021	0.05	335	0.007	3.54	0.021	2	0.001	8.6		0.001	100	754		1.1	6.3		5.4	0.015
Minimum	0.0005	0.19	510	0.013	0.06	0.026		4.1	0.0001	4.65	1100	0.001	0.001	0.2	0.004	2.84	0.004	0.041	240	0.002	2.84	0.004	0.27	0.001	8.16		0.0001	32.1	580		0.55	7.2		1.9	0.0025
50th Percentile	0.0005	0.37	572.5	0.0235	0.105	0.0295		4.54	0.0001	5.895	1173.5	0.001	0.001	1.013	0.006	3.15	0.0075	0.0445	263	0.0035	3.15	0.0075	0.44	0.001	8.275		0.00025	33.5	661		0.75	20.7		2.6	0.009

Sawyers Creek Ash Dam Seepage from V-notch (water collected and recycling back into dam) from April, 2013 to March, 2015																																	
Date	ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	Pb	pH	PO4	se	So4	TDS	TKN	TN	TSS	Turbidity (NTU)	Zn
10/04/2013	0.0005	0.04	77	0.0005	2.3	0.021		91	0.0001	39	1700	0.0005	0.003	1.5		0.000025	29	45		0.005	220	0.005	0.0005	7.2		0.002	825	1200				0.25	0.025
16/05/2013	0.0005	0.06	77	0.0005	2	0.023		99	0.0002	40	1700	0.0005	0.011	1.3		0.000025	30	48		0.005	210	0.005	0.0005	6.8		0.001	740	1300				0.95	0.034
13/06/2013	0.0005	0.1	77	0.0005	2	0.021		95	0.0001	38	1600	0.0005	0.004	1.2		0.000025	29	46		0.0005	210	0.009	0.0005	7		0.001	730	1200				1.9	0.04
10/07/2013	0.0005	0.025	79	0.0005	2.5	0.02		100	0.0001	38	1600	0.0005	0.0005	1.3		0.000025	31	51		0.0005	230	0.01	0.0005	7		0.001	760	1100		0		1.1	0.034
22/08/2013	0.0005	0.21	86	0.0005	2.2	0.037		100	0.0001	40	1600	0.002	0.0005	1.2		0.000025	31	49	0.5	0.0005	230	0.01	0.0005	7.1		0.001	760	1200		0		3.7	0.034
26/09/2013	0.0005	0.14	530	0.016	0.15	0.028		8.6	0.0001	7	1100	0.002	0.0005	1.1		0.000025	12	5	0.5	0.038	260	0.006	0.001	8.6		0.001	58	790		0		3.2	0.027
24/10/2013	0.0005	0.07	470	0.016	0.68	0.022		30	0.0001	14	1300	0.002	0.0005	1.3		0.000025	16	15	0.5	0.027	260	0.005	0.0005	8.4		0.001	230	950		2		1	0.025
7/11/2013	0.0005	0.05	450	0.015	0.64	0.026		30	0.0001	14	1300	0.002	0.0005	1.2		0.000025	16	15	0.5	0.028	260	0.005	0.0005	8.4		0.001	250	650		2		1.8	0.026
5/12/2013	0.0005	0.13	360	0.013	0.91	0.025		40	0.0001	20	1400	0.003	0.0005	1.3		0.000025	17	20	0.5	0.023	240	0.007	0.0005	8.2		0.001	350	840		2		3.1	0.037
16/01/2014	0.0005	0.14	560	0.022	0.1	0.028		5.2	0.0001	5	1100	0.002	0.0005	1.2		0.000025	11	3	0.5	0.042	250	0.005	0.0005	8.5		0.001	42	670		3		2.5	0.025
6/02/2014	0.0005	0.22	560	0.018	0.09	0.027		5.4	0.0001	5	1100	0.002	0.0005	1.2		0.000025	10	3	0.5	0.041	240	0.005	0.0005	8.5		0.001	38	710		0.5		3.6	0.019
6/03/2014	0.0005	0.05	76	0.0005	2.1	0.023		96	0.0001	36	1600	0.002	0.0005	1.1		0.000025	30	43	0.5	0.0005	190	0.011	0.0005	7.3		0.001	810	1300		2		0.45	0.04
3/04/2014	0.0005	0.67	250	0.005	0.46	0.025		25	0.0001	16	830	0.002	0.002	0.9		0.000025	12	12	0.5	0.02	140	0.007	0.0005	8.1		0.001	140	570		0.5		18	0.022
1/05/2014	0.0005	0.41	520	0.007	0.19	0.019		11	0.0001	9	1100	0.0005	0.001	1.2		0.000025	10	6	0.5	0.034	230	0.007	0.0005	8.5		0.001	57	700		0.5		5.6	0.029
12/06/2014	0.0005	0.16	390	0.007	0.37	0.022		19	0.0001	14	1100	0.0005	0.001	1		0.000025	13	11	0.5	0.027	220	0.011	0.0005	8.7		0.001	180	690		0.5		3.3	0.043
10/07/2014	0.0005	0.15	420	0.013	0.52	0.023		25	0.0001	13	1300	0.0005	0.0005	1.1		0.000025	15	14	0.5	0.032	270	0.008	0.0005	8.6		0.001	190	840		1		3.4	0.031
14/08/2014	0.0005	0.21	480	0.011	0.33	0.024		18	0.0004	14	1100	0.0005	0.001	1.3		0.000025	13	9	0.5	0.04	240	0.006	0.0005	8.6		0.001	150	810		0.5		4.9	0.02
11/09/2014	0.0005	0.39	77	0.0005	1.9	0.025		110	0.0003	35	1600	0.002	0.0005	1.2		0.000025	29	48	0.5	0.0005	190	0.013	0.0005	7.4		0.001	760	1300		2		3.7	0.05
23/10/2014	0.0005	0.18	77	0.0005	2.2	0.022		120	0.0005	37	1800	0.001	0.0005	1.5		0.000025	32	52	0.5	0.0005	210	0.037	0.0005	7.6		0.001	870	1400		2		1.9	0.073
13/11/2014	0.0005	0.12	80	0.0005	2.3	0.024		130	0.0008	38	1800	0.0005	0.0005	1.4		0.000025	34	54	0.5	0.001	220	0.05	0.0005	7.2		0.001	930	1500		2		0.65	0.11
11/12/2014	0.0005	2.8	58	0.0005	1.6	0.038		87	0.0006	28	1300	0.002	0.004	1.1		0.000025	28	39	0.5	0.0005	160	0.039	0.003	7.3		0.001	610	1000		2		110	0.072
14/01/2015	0.0005	0.4	74	0.0005	1.9	0.033		110	0.0019	33	1600	0.0005	0.001	1.4		0.000025	30	47	0.5	0.0005	180	0.092	0.0005	7.4		0.001	720	1200		2		11	0.13
11/02/2015	0.0005	0.45	67	0.0005	2.3	0.032		150	0.0048	41	2000	0.0005	0.0005	1.7		0.000025	36	60	0.5	0.0005	220	0.19	0.0005	7.2		0.001	990	1600		2		1.6	0.24
11/03/2015	0.0005	1.6	67	0.001	1.7	0.059		140	0.0048	37	1900	0.0005	0.004	1.8		0.000025	32	55	0.5	0.001	200	0.18	0.001	7.1		0.001	910	1500		2		50	0.2

Sawyers Creek Ash Dam Seepage from V-notch (water collected and recycling back into dam) from April, 2013 to March, 2015																																	
	ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	Pb	pH	PO4	se	So4	TDS	TKN	TN	TSS	Turbidity (NTU)	Zn
Average	<0.001	0.3	188	<0.001	1.64	0.027		79	0.0006	32	1509	0.0013	0.002	1.250	0.05	<0.00005	26	37	0.31	<0.01	217	0.028961538	<0.001	7.6		0.001	581	1099		1		9.9	0.05
Maximum	<0.001	2.8	560	<0.001	2.60	0.059		150	0.0048	53	2000	0.0030	0.011	1.800	0.22	<0.00005	38	60	0.50	<0.01	270	0.190	<0.001	8.7		0.002	990	1600		3		110.0	0.24
Minimum	<0.001	0.0	58	<0.001	0.09	0.019		5	0.0001	5	830	0.0005	0.001	0.200	0.01	0.00006	10	3	0.00	<0.01	140	0.005	0.001	6.8		0.001	38	570		0		0.3	0.02
50th Percentile	<0.001	0.2	85	<0.001	2.00	0.024		96	0.0001	38	1600	0.0010	0.002	1.250	0.03	<0.00005	29	45	0.50	<0.01	220	0.0095	<0.001	7.4		0.001	725	1200		2		3.2	0.03

Sawyers Creek Ash Dam Seepage from V-notch (water collected and recycling back into dam) from April, 2015 to March, 2016

Date	Ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	NO2+NO3	Pb	pH	PO4	se	So4	TDS	TKN	TN	DO	TSS	Turbidity (NTU)	Zn
9/04/2015	0.0005	1.3	50	0.0005	2.2	0.029		170	0.01	37	2300	0.0001	0.0001	2.9	0.05	0.000025	35	66	5.6	0.001	210	0.32	3	0.001	6.9		0.001	1200	1800		0.55	13.3		5.8	0.41
27/05/2015	0.0005	1.2	54	0.0005	1.8	0.031		180	0.0077	41	2100	0.0001	0.0001	2.7	0.02	0.00002	34	71	6.6	0.001	200	0.27	3	0.001	6.7		0.001	1200	1700		0.55	9.7		5.6	0.39
17/06/2015	0.0005	29	12.5	0.006	2.6	0.09		100	0.012	32	1500	0.016	0.018	4.9	0.59	0.00002	40	38	2.6	0.001	120	0.16	1	0.001	4.5		0.012	830	1100		0.6	12.1		21	0.51
15/07/2015	0.0005	1.78	106	0.002	0.7	0.037		43.3	0.0007	29.3	920	0.0001	0.002	0.8	0.166	0.00002	12.3	21.6	0.923	0.004	88.5	0.03	0.14	0.001	7.39		0.0006	324	614		0.6	25.3		74	0.062
19/08/2015	0.0005	0.21	407	0.005	0.7	0.019		40.4	0.0001	38.1	1370	0.0001	0.0001	1.71	0.005	0.00002	15.9	21.9	0.033	0.025	218	0.006	0.08	0.001	8.44		0.0002	291	994		0.3	13.4		3.3	0.005
16/09/2015	0.0005	0.22	467	0.006	0.7	0.027		40	0.0001	14	1374	0.0001	0.0001	0.788	0.013	0.00002	20	17.8	0.116	0.032	266	0.005	0.33	0.001	8.15		0.0001	270	912		0.3	9.9		3.7	0.006
21/10/2015	0.0005	9.81	97	0.005	0.51	0.089		42.3	0.0001	15.6	776	0.005	0.007	1.09	0.073	0.00002	16.1	18.5	0.841	0.004	89.7	0.014	0.06	0.01	7.37		0.0007	267	728		1.2	5.6		713	0.04
18/11/2015	0.0005	0.24	281	0.003	0.84	0.035		57.1	0.0001	16.1	1369	0.0001	0.0001	1.15	0.012	0.00002	20.1	24.5	0.329	0.016	192	0.007	0.05	0.001	7.88		0.0003	380	858		0.2	10.3		8.3	0.0025
9/12/2015	0.0005	0.6	82	0.002	2.14	0.031		236	0.0038	35.1	2452	0.0001	0.0001	2.42	0.004	0.00002	50.5	92.7	8.74	0.004	302	0.228	0.27	0.001	7.02		0.0004	1330	2060		0.4	8.1		5.3	0.299
20/01/2016	0.0005	0.76	111	0.002	0.66	0.017		52	0.0001	13.1	887	0.0001	0.001	1.56	0.048	0.00002	14.3	20.3	0.232	0.004	103	0.009	0.01	0.001	7.39		0.0002	301	620		0.2	6.2		21.8	0.014
10/02/2016	0.0005	0.16	153	0.0005	1.62	0.027		144	0.0002	30	2147	0.0001	0.0001	2.11	0.009	0.00002	34.1	59.4	1.19	0.005	230	0.016	0.005	0.001	7.62		0.0003	976	1680		0.1	5.1		4.3	0.012
16/03/2016	0.0005	9.05	78	0.004	0.27	0.072		26.4	0.0001	13.2	430	0.004	0.006	0.594	0.084	0.00002	6.91	12.6	1.12	0.002	41.3	0.013	0.08	0.007	6.85		0.0005	105	453		0.7	4.6		346	0.035

Sawyers Creek Ash Dam Seepage from V-notch (water collected and recycling back into dam) from April, 2015 to March, 2016

	Ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	NO2+NO3	Pb	pH	PO4	se	So4	TDS	TKN	TN	DO	TSS	Turbidity (NTU)	Zn
Average	0.0005	3.91	157	0.003	1.35	0.041		103	0.0033	28.19	1591.25	0.0018	0.0027	1.99	0.09	0.00002	27.03	42.2	2.38	0.008	184.93	0.104	0.83	0.002	7.21		0.0015	689	1213		0.47	10.9		76	0.163
Maximum	0.0005	29	467	0.006	2.6	0.09		236	0.012	41	2452	0.016	0.018	1.32	0.02	0.000025	50.5	92.7	8.74	0.032	302	0.32	3	0.01	8.44		0.012	1330	2060		1.2	25.3		713	0.51
Minimum	0.0005	0.16	12.5	0.0005	0.27	0.017		26.4	0.0001	13.1	430	0.0001	0.0001	0.2	0.004	0.00002	6.91	12.6	0.033	0.001	41.3	0.005	0.005	0.001	4.5		0.0001	105	453		0.1	4.6		3.3	0.0025
50th Percentile	0.0005	0.98	101.5	0.0025	0.77	0.031		54.55	0.00015	29.65	1372	0.0001	0.0001	1.013	0.006	0.00002	20.05	23.2	1.0215	0.004	196	0.015	0.11	0.001	7.38		0.00045	352	953		0.475	9.8		7.05	0.0375

Sawyer Creek @850m - upstream seepage from KVAD wall and Below v-notch Seepage Point. Detailed data from April, 2013 to March, 2015 is at Site 93

Date	Ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	Pb	pH	PO4	se	So4	TDS	TKN	TN	TSS	Turbidity (NTU)	Zn
10/04/2013	0.0005	0.16	500		0.12	0.02		7.1	0.0001	5	1000	0.0005		1.40		0.000025	11.0	3.3		0.03	250	0.005	0.002	8.5		0.001	35	600				3	0.022
16/05/2013	0.0005	0.77	510	0.017	0.10	0.03		6.7	0.0001	6	1000	0.0005	0.001	1.30		0.000025	11.0	3.5		0.04	240	0.005	0.002	8.5		0.001	36	650				23	0.019
13/06/2013	0.0005	0.10	550	0.018	0.11	0.02		7.9	0.0001	6	1000	0.0005	0.0005	1.20		0.000025	10.0	4.0		0.04	240	0.005	0.001	8.6		0.001	42	650				3	0.024
10/07/2013	0.0005	0.07	550	0.015	0.13	0.02		7.1	0.0001	6	1000	0.0005	0.0005	1.10		0.000025	11.0	4.0		0.04	250	0.004	0.0005	8.5		0.001	41	640		0.0		3	0.017
22/08/2013	0.0005	0.19	570	0.013	0.11	0.02		6.4	0.0001	6	1100	0.001	0.0005	1.10		0.000025	11.0	4.0	0.5	0.03	250	0.003	0.0005	8.7		0.001	37	650		1.0		3	0.015
26/09/2013	0.0005	0.43	550	0.017	0.11	0.03		7.1	0.0001	6	1100	0.002	0.002	1.10		0.000025	11.0	4.0	0.5	0.04	260	0.004	0.001	8.6		0.001	47	790		0.0		8	0.023
24/10/2013	0.0005	0.14	580	0.022	0.12	0.02		6.1	0.0001	6	1200	0.002	0.0005	1.20		0.000025	11.0	4.0	0.5	0.04	280	0.004	0.0005	8.7		0.001	49	690		2.0		4	0.02
7/11/2013	0.0005	0.25	570	0.027	0.10	0.03		5.7	0.0001	5	1100	0.002	0.0005	1.20		0.000025	11.0	3.0	0.5	0.04	260	0.005	0.0005	8.6		0.001	46	640		0.0		11	0.025
5/12/2013	0.0005	0.22	520	0.025	0.12	0.03		6.4	0.0001	6	1100	0.003	0.0005	1.30		0.000025	10.0	4.0	0.5	0.04	260	0.007	0.001	8.7		0.001	54	700		3.0		24	0.032
16/01/2014	0.0005	0.17	570	0.026	0.08	0.03		4.6	0.0001	5	1100	0.002	0.0005	1.20		0.000025	11.0	3.0	0.5	0.04	250	0.006	0.0005	8.7		0.001	37	700		3.0		10	0.023
6/02/2014	0.0005	0.11	540	0.024	0.08	0.03		4.4	0.0001	5	1100	0.002	0.0005	1.10		0.000025	10.0	3.0	0.5	0.04	230	0.005	0.0005	8.7		0.001	40	700		3.0		3	0.019
6/03/2014	0.0005	0.24	530	0.028	0.11	0.03		5.7	0.0001	6	1100	0.002	0.0005	1.10		0.000025	11.0	4.0	0.5	0.04	230	0.005	0.001	8.7		0.001	53	700		3.0		10	0.021
3/04/2014	0.0005	0.25	530	0.020	0.09	0.03		5.6	0.0001	5	1100	0.001	0.0005	1.30		0.000025	13.0	3.0	0.5	0.03	280	0.005	0.0005	8.7		0.001	42	760		3.0		6	0.022
1/05/2014	0.0005	0.13	570	0.020	0.07	0.03		5.0	0.0001	5	1100	0.0005	0.0005	1.10		0.000025	11.0	3.0	0.5	0.04	250	0.004	0.0005	8.7		0.001	37	680		0.5		6	0.032
12/06/2014	0.0005	0.17	530	0.019	0.07	0.03		5.0	0.0001	5	1200	0.0005	0.0005	1.10		0.000025	11.0	3.0	0.5	0.04	260	0.004	0.0005	9.0		0.001	38	700		2.0		5	0.028
10/07/2014	0.0005	0.06	530	0.021	0.07	0.02		5.1	0.0001	5	1200	0.0005	0.0005	1.20		0.000025	11.0	3.0	0.5	0.04	260	0.003	0.0005	8.7		0.001	37	740		2.0		3	0.02
14/08/2014	0.0005	0.15	560	0.021	0.07	0.02		3.6	0.0001	5	1100	0.0005	0.0005	1.30		0.000025	7.0	1.0	0.5	0.03	260	0.003	0.001	8.8		0.001	29	700		2.0		7	0.028
11/09/2014	0.0005	0.24	540	0.024	0.12	0.03		7.2	0.0001	6	1100	0.001	0.0005	1.10		0.000025	11.0	4.0	0.5	0.04	250	0.004	0.0005	8.6		0.001	49	660		2.0		5	0.02
23/10/2014	0.0005	0.15	570	0.024	0.09	0.03		5.4	0.0001	5	1200	0.0005	0.0005	1.20		0.000025	11.0	3.0	0.5	0.05	260	0.004	0.0005	8.7		0.001	42	760		3.0		2	0.011
13/11/2014	0.0005	0.29	590	0.030	0.08	0.03		5.6	0.0001	5	1200	0.0005	0.001	1.10		0.000025	12.0	4.0	0.5	0.05	280	0.006	0.0005	8.7		0.001	39	760		0.5		22	0.032
11/12/2014	0.0005	0.37	560	0.024	0.09	0.03		6.6	0.0001	7	1100	0.0005	0.001	1.20		0.000025	13.0	4.0	0.5	0.06	270	0.005	0.0005	8.8		0.001	48	740		3.0		15	0.008
14/01/2015	0.0005	0.14	560	0.027	0.09	0.03		6.0	0.0001	6	1200	0.0005	0.0005	1.00		0.000025	12.0	4.0	0.5	0.05	280	0.003	0.0005	8.6		0.001	40	730		3.0		6	0.007
11/02/2015	0.0005	0.41	540	0.030	0.08	0.04		5.2	0.0001	6	1100	0.0005	0.001	1.10		0.000025	12.0	3.0	0.5	0.06	260	0.005	0.001	8.7		0.001	40	740		3.0		17	0.009
11/03/2015	0.0005	0.36	520	0.010	0.07	0.02		4.6	0.0001	6	1100	0.0005	0.002	1.10		0.000025	8.0	2.0	0.5	0.03	250	0.011	0.0005	8.7		0.001	32	700		2.0		9	0.012

Sawyer Creek @850m - upstream seepage from KVAD wall and Below v-notch Seepage Point. Detailed data from April, 2013 to March, 2015 is at Site 93

	Ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	Pb	pH	PO4	se	So4	TDS	TKN	TN	TSS	Turbidity (NTU)	Zn
Average	<0.001	0.23	548	0.022	0.10	0.03		5.8	0.0001	6	1108	0.001	0.001	1.17		0.000025	10.9	3.4	0.50	0.04	257	0.005	0.001	8.7		0.001	41	699		2.0		9	0.020
Maximum	<0.001	0.77	590	0.030	0.13	0.04		7.9	0.0001	7	1200	0.003	0.002	1.40		0.000025	13.0	4.0	0.50	0.06	280	0.011	0.002	9.0		0.001	54	790		3.0		24	0.032
Minimum	<0.001	0.06	500	0.010	0.07	0.02		3.6	0.0001	5	1000	0.0005	0.001	1.00		0.000025	7.0	1.0	0.50	0.03	230	0.003	0.001	8.5		0.001	29	600		0.0		2	0.007
50th Percentile	<0.001	0.18	550	0.022	0.09	0.03		5.7	0.0001	6	1100	0.0005	0.001	1.15		0.000025	11.0	3.4	0.50	0.04	260	0.005	0.001	8.7		0.001	40	700		2.0		6	0.021

Sawyer Creek @850m - upstream seepage from KVAD wall and Below v-notch Seepage Point. Detailed data from April, 2015 to March, 2016 is at Site 93

Date	Ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	NO2+NO3	Pb	pH	PO4	se	So4	TDS	TKN	TN	DO	TSS	Turbidity (NTU)	Zn
9/04/2015	0.0005	0.24	520	0.015	0.1	0.032		7.2	0.0001	7	1100	0.001	0.001	1.2	0.02	0.000025	12	4	0.039	0.045	250	0.005	2	0.001	8.7		0.001	49	640		0.55	13.3		7	0.01
27/05/2015	0.0005	0.26	540	0.018	0.07	0.03		5.7	0.0001	15	1100	0.001	0.001	0.7	0.005	0.00002	11	4	0.012	0.044	240	0.004	2	0.001	8.6		0.001	100	670		0.55	6.3		3.2	0.009
17/06/2015	0.0005	0.27	530	0.016	0.07	0.03		4.4	0.0001	7	1100	0.001	0.001	0.9	0.03	0.00002	11	3	0.012	0.047	250	0.004	2	0.001	8.6		0.001	35	580		0.6	8.1		3.1	0.008
15/07/2015	0.0005	0.34	628	0.021	0.09	0.03		4.37	0.0001	6.13	1130	0.001	0.001	1.3	0.024	0.00002	11.8	3.21	0.009	0.043	254	0.003	0.38	0.001	8.65		0.0001	37.6	616		0.7	15.9		4.8	0.011
19/08/2015	0.0005	0.32	543	0.023	0.12	0.027		4.36	0.0001	6.2	1140	0.001	0.001	0.791	0.022	0.00002	12.6	3.24	0.006	0.045	274	0.004	0.47	0.001	8.74		0.0001	31.7	666		0.8	8.6		3.1	0.008
16/09/2015	0.0005	0.37	590	0.021	0.09	0.034		4.71	0.0001	6.22	1158	0.001	0.001	0.61	0.017	0.00002	13.2	3.47	0.006	0.047	286	0.002	0.54	0.001	8.69		0.0002	33.2	616		0.7	7.9		3.9	0.008
21/10/2015	0.0005	0.24	559	0.018	0.08	0.029		4.41	0.0001	6.38	1188	0.001	0.001	0.984	0.023	0.00002	14.7	3.33	0.006	0.042	259	0.002	0.51	0.001	8.67		0.0002	35	718		0.9	5.4		5	0.0025
18/11/2015	0.0005	0.28	535	0.027	0.09	0.032		4.72	0.0001	5.24	1206	0.001	0.001	1.03	0.024	0.00002	13.6	3.38	0.007	0.047	248	0.003	0.56	0.001	8.66		0.0003	33.4	644		1	8.4		4.1	0.0025
9/12/2015	0.0005	0.23	608	0.03	0.12	0.036		5.15	0.0001	5.23	1219	0.001	0.001	1.02	0.046	0.00006	14	3.71	0.021	0.049	306	0.004	0.62	0.001	8.64		0.0003	32.2	577		1.1	6.9		3.6	0.02
20/01/2016	0.0005	0.21	645	0.028	0.07	0.029		5.85	0.0001	4.95	1224	0.001	0.001	1.1	0.029	0.00007	14.3	3.95	0.01	0.049	378	0.003	0.38	0.001	8.64		0.0003	34.2	626		0.7	5.6		4.2	0.006
10/02/2016	0.0005	0.17	574	0.025	0.11	0.027		4.55	0.0001	5.56	1232	0.001	0.001	0.987	0.026	0.00002	12.2	3.21	0.007	0.045	268	0.003	0.5	0.001	8.7		0.0002	33.3	631		0.7	5.2		2.4	0.0025
16/03/2016	0.0005	0.19	650	0.026	0.13	0.027		4.08	0.0001	4.7	1229	0.001	0.001	1.05	0.037	0.00002	10.7	2.87	0.008	0.044	322	0.003	0.49	0.001	8.62		0.0002	31.9	757		0.7	8.3		2.7	0.006

Sawyer Creek @850m - upstream seepage from KVAD wall and Below v-notch Seepage Point. Detailed data from April, 2015 to March, 2016 is at Site 93

	Ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	Pb	pH	PO4	se	So4	TDS	TKN	TN	DO	Turbidity (NTU)	Zn
Average	0.0005	0.37	645	0.03	0.12	0.036		7.2	0.0001	15	1232	0.001	0.001	1.3	0.046	0.00007	14.7	4	0.039	0.049	378	0.005	0.001	8.74		0.001	100	718		1.1	15.9	7	0.02
Maximum	0.0005	0.37	650	0.03	0.13	0.036		7.2	0.0001	15	1232	0.001	0.001	1.3	0.046	0.00007	14.7	4	0.039	0.049	378	0.005	0.001	8.74		0.001	100	757		1.1	15.9	7	0.02
Minimum	0.0005	0.17	520	0.015	0.07	0.027		4.08	0.0001	4.7	1100	0.001	0.001	0.61	0.005	0.00002	10.7	2.87	0.006	0.042	240	0.002	0.001	8.6		0.0001	31.7	577		0.55	5.2	2.4	0.0025
50th Percentile	0.0005	0.25	566.5	0.022	0.09	0.03		4.63	0.0001	6.165	1173	0.001	0.001	1.0035	0.024	0.00002	12.4	3.355	0.0085	0.045	263.5	0.003	0.001	8.655		0.00025	33.8	635.5		0.7	8	3.75	0.008

Sawyers Creek at @1250 m near GWD5 (site 83) data from April, 2013 to March, 2015 is at Site 83																																		
Date	ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni		Pb	pH	PO4	se	So4	TDS	TKN	TN	TSS	Turbidity (NTU)	Zn
10/04/2013	0.0005	0.14	510	0.014	0.1	0.021		5.3	0.0001	5	1000	0.0005	0.0005	1.5		0.000025	9.5	2.8		0.034	250	0.005		0.002	8.5		0.001	26	580				2	0.024
16/05/2013	0.0005	1.4	520	0.016	0.1	0.029		5.1	0.0001	5	1000	0.0005	0.0005	1.3		0.000025	11	2.8		0.036	250	0.005		0.002	8.4		0.001	27	670				22	0.016
13/06/2013	0.0005	0.15	550	0.018	0.1	0.02		6.4	0.0001	5	1000	0.0005	0.0005	1.2		0.000025	10	3		0.034	230	0.006		0.0005	8.6		0.001	31	660				3.4	0.029
10/07/2013	0.0005	0.13	570	0.014	0.11	0.022		5.5	0.0001	5	1000	0.0005	0.0005	1.2		0.000025	11	3		0.038	250	0.005		0.0005	8.5		0.001	30	580		0		2	0.024
22/08/2013	0.0005	0.24	580	0.014	0.09	0.024		5.2	0.0001	5	1100	0.002	0.0005	1.1		0.000025	11	3	0.5	0.031	250	0.005		0.0005	8.7		0.001	27	650		0		5.8	0.022
26/09/2013	0.0005	0.31	560	0.018	0.08	0.027		5.4	0.0001	5	1100	0.002	0.003	1.1		0.000025	11	3	0.5	0.035	250	0.006		0.001	8.7		0.001	33	790		0		8.4	0.024
24/10/2013	0.0005	0.14	590	0.021	0.1	0.022		4.5	0.0001	5	1200	0.002	0.0005	1.3		0.000025	11	3	0.5	0.036	280	0.005		0.0005	8.7		0.001	40	760		2		2.6	0.028
7/11/2013	0.0005	0.13	580	0.025	0.09	0.027		4.4	0.0001	5	1100	0.002	0.0005	1.2		0.000025	11	3	0.5	0.039	270	0.005		0.0005	8.6		0.001	35	660		3		4.1	0.025
5/12/2013	0.0005	0.16	540	0.024	0.1	0.024		4.9	0.0001	5	1100	0.002	0.0005	1.3		0.000025	10	3	0.5	0.039	260	0.005		0.0005	8.7		0.001	39	660		3		1.7	0.027
16/01/2014	0.0005	0.19	560	0.025	0.08	0.03		4.5	0.0001	5	1100	0.002	0.0005	1.2		0.000025	11	3	0.5	0.042	250	0.006		0.0005	8.7		0.001	37	660		4		3.7	0.022
6/02/2014	0.0005	0.14	530	0.026	0.08	0.025		4.5	0.0001	5	1100	0.002	0.0005	1.1		0.000025	10	3	0.5	0.03	240	0.006		0.0005	8.7		0.001	40	650		3		2	0.026
6/03/2014	0.0005	0.22	540	0.026	0.09	0.03		4.6	0.0001	5	1100	0.002	0.0005	1.1		0.000025	12	3	0.5	0.042	240	0.006		0.0005	8.7		0.001	39	720		3		6.9	0.021
3/04/2014	0.0005	0.28	540	0.023	0.09	0.03		5.3	0.0001	6	1100	0.017	0.001	1		0.000025	13	3	0.5	0.04	280	0.006		0.0005	8.6		0.001	41	760		0.5		5.9	0.022
1/05/2014	0.0005	0.12	570	0.021	0.08	0.025		4.8	0.0001	5	1100	0.0005	0.0005	1		0.000025	10	3	0.5	0.039	240	0.007		0.0005	8.7		0.001	37	710		0.5		5.4	0.03
12/06/2014	0.0005	0.24	570	0.02	0.08	0.027		5	0.0001	5	1100	0.0005	0.0005	1.2		0.000025	11	3	0.5	0.043	270	0.016		0.001	8.7		0.001	38	680		2		7.8	0.041
10/07/2014	0.0005	0.18	530	0.022	0.09	0.024		5.4	0.0001	6	1200	0.001	0.001	1.3		0.000025	11	3	0.5	0.04	280	0.005		0.001	8.7		0.001	40	730		2		4	0.032
14/08/2014	0.0005	0.13	570	0.021	0.08	0.019		3.6	0.0001	5	1100	0.0005	0.0005	1.4		0.000025	7	1	0.5	0.037	260	0.004		0.0005	8.8		0.001	31	700		2		7.2	0.02
11/09/2014	0.0005	0.22	560	0.029	0.09	0.029		4.9	0.0001	5	1100	0.0005	0.0005	1.2		0.000025	11	3	0.5	0.036	250	0.005		0.0005	8.7		0.001	34	660		2		6	0.01
23/10/2014	0.0005	0.18	580	0.025	0.09	0.026		4.9	0.0001	5	1200	0.0005	0.0005	1.3		0.000025	11	3	0.5	0.051	270	0.005		0.0005	8.7		0.001	37	710		3		2.8	0.028
13/11/2014	0.0005	0.1	590	0.027	0.08	0.027		5	0.0001	5	1100	0.0005	0.001	1.1		0.000025	12	3	0.5	0.053	290	0.006		0.0005	8.7		0.001	36	740		0.5		2.1	0.032
11/12/2014	0.0005	0.18	580	0.025	0.08	0.029		4.8	0.0001	6	1200	0.0005	0.0005	1.2		0.000025	12	3	0.5	0.05	270	0.004		0.0005	8.7		0.001	40	740		3		6.2	0.014
14/01/2015	0.0005	0.15	560	0.029	0.08	0.03		5	0.0001	5	1100	0.0005	0.0005	1		0.000025	12	3	0.5	0.047	270	0.003		0.0005	8.7		0.001	36	740		0.5		6.3	0.005
11/02/2015	0.0005	0.32	540	0.03	0.08	0.032		4.5	0.0001	6	1200	0.0005	0.0005	1.2		0.000025	12	3	0.5	0.06	250	0.005		0.0005	8.5		0.001	38	740		3		16	0.008
11/03/2015	0.0005	0.45	520	0.012	0.08	0.02		4.4	0.0001	6	1100	0.0005	0.001	1.1		0.000025	8	2	0.5	0.028	270	0.005		0.0005	8.7		0.001	31	700		2		10	0.016

Sawyers Creek at @1250 m near GWD5 (site 83) data from April, 2013 to March, 2015 is at Site 83																																		
	ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni		Pb	pH	PO4	se	So4	TDS	TKN	TN	TSS	Turbidity (NTU)	Zn
Average	<0.001	0.25	556	0.022	0.09	0.026		5	0.0001	5	1104	0.0017	0.001	1.192		0.000025	11	3	0.50	0.04	259	0.006		0.001	8.7		0.001	35	694		1.9		6.0	0.02
Maximum	<0.001	1.40	590	0.030	0.11	0.032		6	0.0001	6	1200	0.0170	0.003	1.500		0.000025	13	3	0.50	0.06	290	0.016		0.002	8.8		0.001	41	790		4.0		22.0	0.04
Minimum	<0.001	0.10	510	0.012	0.08	0.019		4	0.0001	5	1000	0.0005	0.001	1.000		0.000025	7	1	0.50	0.03	230	0.003		0.001	8.4		0.001	26	580		0.0		1.7	0.01
50th Percentile	<0.001	0.18	560	0.023	0.09	0.027		5	0.0001	5	1100	0.0005	0.001	1.200		0.000025	11	3	0.50	0.04	255	0.005		0.001	8.7		0.001	37	700		2.0		5.6	0.02

Sawyers Creek at @1250 m near GWD5 (site 83) data from April, 2015 to March, 2016 is at Site 83																																			
Date	**Ag**	**Al**	**Alk**	**As**	**B**	**Ba**	**Be**	**Ca**	**Cd**	**Cl**	**Cond**	**Cr**	**Cu**	**F**	**Fe**	**Hg**	**K**	**Mg**	**Mn**	**Mo**	**Na**	**Ni**	**NO2+NO3**	**Pb**	**pH**	**PO4**	**se**	**So4**	**TDS**	**TKN**	**TN**	**DO**	**TSS**	**Turbidity (NTU)**	**Zn**
9/04/2015	0.0005	0.22	550	0.013	0.11	0.037		6.3	0.0001	7	1100	0.0005	0.0005	1.1	0.13	0.000025	11	4	0.046	0.036	250	0.004	2	0.0005	8.5		0.001	38	730		0.55	11.8		7	0.009
27/05/2015	0.0005	0.29	570	0.017	0.07	0.031		4.8	0.0001	6	1100	0.0005	0.0005	1.1	0.02	0.00002	11	3	0.002	0.041	230	0.004	2	0.0005	8.8		0.001	37	700		0.6	8.7		5.5	0.008
17/06/2015	0.0005	0.37	510	0.015	0.08	0.029		4.3	0.0001	7	1100	0.0005	0.0005	1.1	0.05	0.00002	11	3	0.013	0.043	240	0.009	2	0.0005	8.6		0.001	34	640		0.6	11.7		11	0.016
15/07/2015	0.0005	0.36	635	0.023	0.11	0.03		4.48	0.00005	6.24	1130	0.0005	0.0005	1.5	0.013	0.00002	12.5	3.34	0.007	0.043	268	0.003	0.43	0.0005	8.68		0.0001	42.2	626		0.6	20.7		4.4	0.007
19/08/2015	0.0005	0.26	637	0.021	0.07	0.025		4.28	0.00005	6.28	1140	0.0005	0.0005	1.33	0.01	0.00002	12.4	3.15	0.004	0.044	267	0.004	0.49	0.0005	8.75		0.0001	32.2	595		0.8	8.8		4.3	0.007
16/09/2015	0.0005	0.52	596	0.019	0.07	0.03		4.51	0.00005	6.02	1172	0.0005	0.0005	0.911	0.009	0.00002	12.9	3.26	0.007	0.043	277	0.007	0.57	0.0005	8.71		0.0001	38.6	558		0.8	8.8		4.8	0.015
21/10/2015	0.0005	0.5	557	0.017	0.07	0.03		4.56	0.00005	7.49	1192	0.0005	0.0005	1.62	0.02	0.00002	14.9	3.33	0.022	0.044	260	0.008	0.58	0.0005	8.7		0.0003	47.4	722		1	7.7		8.7	0.014
18/11/2015	0.0005	0.32	534	0.028	0.27	0.034		4.77	0.00005	5.06	1219	0.0005	0.0005	1.13	0.016	0.00002	13.9	3.38	0.006	0.051	252	0.005	0.61	0.0005	8.71		0.0004	33.7	682		0.9	7.3		5.6	0.008
9/12/2015	0.0005	0.24	607	0.028	0.1	0.032		5.19	0.00005	5.24	1232	0.0005	0.0005	1.19	0.018	0.00002	14.2	3.7	0.004	0.044	305	0.015	0.62	0.0005	8.72		0.0004	33.3	552		0.8	7.6		5.7	0.02
20/01/2016	0.0005	0.3	626	0.032	0.08	0.03		4.45	0.00005	4.93	1245	0.0005	0.0005	1.14	0.014	0.00002	13.9	3.71	0.01	0.051	335	0.003	0.45	0.0005	8.72		0.0003	34.1	688		0.8	5.8		4	0.007
10/02/2016	0.0005	0.17	577	0.024	0.11	0.029		4.64	0.00005	5.48	1229	0.0005	0.0005	1.35	0.018	0.00002	12.3	3.24	0.005	0.044	269	0.002	0.53	0.0005	8.61		0.0002	36.2	654		0.8	3.9		3.5	0.0025
16/03/2016	0.0005	0.52	648	0.03	0.11	0.03		4.03	0.00005	4.68	1244	0.0005	0.002	1.26	0.012	0.00002	10.5	2.79	0.009	0.044	311	0.006	0.5	0.001	8.69		0.0003	35	770		0.8	6.8		13.5	0.013

Sawyers Creek at @1250 m near GWD5 (site 83) data from April, 2015 to March, 2016 is at Site 83																																	
	Ag	**Al**	**Alk**	**As**	**B**	**Ba**	**Be**	**Ca**	**Cd**	**Cl**	**Cond**	**Cr**	**Cu**	**F**	**Fe**	**Hg**	**K**	**Mg**	**Mn**	**Mo**	**Na**	**Ni**	**NO3**	**Pb**	**pH**	**se**	**So4**	**TDS**	**TKN**	**TN**	**DO**	**Turbidity (NTU)**	**Zn**
Average	0.0005	0.52	637	0.032	0.27	0.037		6.3	0.0001	7.49	1245	0.0005	0.0005	1.62	0.13	0.000025	14.9	4	0.046	0.051	335	0.015	2	0.0005	8.8	0.001	47.4	730		1	20.7	11	0.02
Maximum	0.0005	0.52	648	0.032	0.27	0.037		6.3	0.0001	7.49	1245	0.0005	0.002	1.62	0.13	0.000025	14.9	4	0.046	0.051	335	0.015	2	0.001	8.8	0.001	47.4	770		1	20.7	13.5	0.02
Minimum	0.0005	0.17	510	0.013	0.07	0.025		4.03	0.00005	4.68	1100	0.0005	0.0005	0.911	0.009	0.00002	10.5	2.79	0.002	0.036	230	0.002	0.43	0.0005	8.5	0.0001	32.2	552		0.55	3.9	3.5	0.0025
50th Percentile	0.0005	0.31	586.5	0.022	0.09	0.03		4.535	0.00005	6.01	1182	0.0005	0.0005	1.165	0.017	0.00002	12.45	3.295	0.007	0.044	267.5	0.0045	0.575	0.0005	8.705	0.0003	35.6	668		0.8	8.2	5.55	0.0085

Seepage Water Northern wall collection pit near GW6

Site 86 Seepage water Northern wall collection pit near GW6 Groundwater from the KVAD on the northside drains from April, 2013 to March, 2015. All water reports to the pipe out to the Lisdale Cut.

Date	ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni		Pb	pH	PO4	se	So4	TDS	TKN	TN	TSS	Turbidity (NTU)
10-Apr-13	0.0005	1.1	12.5	0.001	3.5	0.014		98	0.0001	11	2400	0.0005	0.033	0.6		0.000025	85	61		0.005	160	0.14		0.003	2.9		0.001	1280	1700			2.3	0.14
17-May-13	0.0005	1.2	12.5	0.001	3	0.013		140	0.0001	17	2400	0.0005	0.0005	0.5		0.000025	89	68		0.005	160	0.14		0.001	3		0.001	1300	1900			4.8	0.1
13-Jun-13	0.0005	1.4	12.5	0.001	3	0.002		130	0.0001	17	2300	0.0005	0.0005	0.05		0.000025	74	65		0.0005	140	0.14		0.001	3		0.001	1100	1100			11	0.15
10-Jul-13	0.0005	1.3	12.5	0.0005	3.7	0.009		150	0.0001	18	2400	0.0005	0.0005	0.05		0.000025	84	74		0.0005	170	0.15		0.0005	3		0.001	1400	1700		0	45	0.14
22-Aug-13	0.0005	1	12.5	0.0005	4	0.006		170	0.0001	18	2600	0.002	0.0005	0.05		0.000025	93	81	0.5	0.0005	190	0.14		0.0005	2.9		0.001	1400	2000		0	4.9	0.13
26-Sep-13	0.0005	1.4	12.5	0.001	4.1	0.005		160	0.0001	19	2700	0.002	0.001	0.4		0.000025	91	77	0.5	0.001	190	0.16		0.001	2.9		0.001	1500	2300		0	7.3	0.16
24-Oct-13	0.0005	1.6	12.5	0.002	5	0.006		200	0.0001	20	3100	0.002	0.0005	0.5		0.000025	110	88	0.5	0.002	220	0.18		0.001	2.9		0.001	2000	2300		0.5	3.3	0.2
7-Nov-13	0.0005	1.7	12.5	0.002	4.7	0.005		200	0.0001	20	3100	0.002	0.001	0.4		0.000025	110	88	0.5	0.002	230	0.2		0.001	2.9		0.001	2300	2500		0	3.3	0.21
5-Dec-13	0.0005	2.4	12.5	0.002	5	0.003		200	0.0001	21	3200	0.003	0.002	0.6		0.000025	110	93	0.5	0.004	220	0.2		0.001	2.9		0.001	1800	2400		0.5	5.9	0.21
16-Jan-14	0.0005	1.7	12.5	0.003	5.5	0.004		210	0.0001	21	3400	0.003	0.001	0.6		0.000025	120	92	0.5	0.002	230	0.26		0.0005	2.9		0.001	2000	3000		0.5	21	0.19
6-Feb-14	0.0005	1.2	12.5	0.002	5.3	0.003		210	0.0001	21	3300	0.002	0.0005	0.4		0.000025	130	90	0.5	0.002	250	0.25		0.0005	2.8		0.001	1900	2600		0.5	2.7	0.15
6-Mar-14	0.0005	2.3	12.5	0.002	4.7	0.002		180	0.0001	19	3100	0.002	0.002	0.5		0.000025	97	73	0.5	0.0005	180	0.22		0.0005	2.8		0.001	1600	2400		0.5	1.4	0.15
3-Apr-14	0.0005	2.1	12.5	0.001	4.7	0.002		180	0.0001	20	2900	0.002	0.004	0.3		0.000025	110	79	0.5	0.0005	190	0.23		0.0005	2.9		0.001	1600	2200		0.5	1.1	0.15
1-May-14	0.0005	1.4	12.5	0.001	5.3	0.002		210	0.0001	20	3100	0.0005	0.001	0.5		0.000025	110	92	0.5	0.0005	200	0.27		0.0005	2.9		0.001	1700	2600		2	4.6	0.15
12-Jun-14	0.0005	1.6	12.5	0.0005	4.9	0.001		220	0.0001	19	3300	0.001	0.0005	0.5		0.000025	110	92	0.5	0.0005	220	0.28		0.0005	2.9		0.001	1800	2600		0.5	7.3	0.15
10-Jul-14	0.0005	1.7	12.5	0.001	5.9	0.001		240	0.0001	19	3300	0.001	0.0005	0.5		0.000025	120	97	0.5	0.0005	230	0.33		0.0005	2.9		0.001	2000	2700		0.5	40	0.16
14-Aug-14	0.0005	1.4	12.5	0.001	5.5	0.001		230	0.0001	21	3200	0.001	0.0005	0.4		0.000025	110	98	0.5	0.0005	220	0.37		0.0005	3.1		0.001	2100	2900		2	19	0.19
11-Sep-14	0.0005	2	12.5	0.001	5.1	0.002		200	0.0001	16	3000	0.001	0.0005	0.4		0.000025	96	84	0.5	0.0005	200	0.34		0.0005	2.9		0.001	1600	2300		0.5	25	0.19
23-Oct-14	0.0005	2	12.5	0.001	6.4	0.001		250	0.0001	18	3500	0.001	0.001	0.6		0.000025	120	99	0.5	0.0005	240	0.46		0.0005	2.9		0.001	2000	2800		0.5	1.1	0.24
13-Nov-14	0.0005	1.8	12.5	0.002	7.1	0.001		280	0.0001	21	3700	0.0005	0.0005	0.4		0.000025	140	110	0.5	0.0005	280	0.53		0.0005	2.9		0.001	2300	3300		0.5	0.8	0.32
11-Dec-14	0.0005	2.7	12.5	0.002	5	0.002		210	0.0001	17	3000	0.0005	0.002	0.5		0.000025	110	82	2.5	0.0005	200	0.45		0.0005	2.9		0.001	1700	2400		14	3.6	0.28
14-Jan-15	0.0005	2.4	12.5	0.001	5.5	0.001		210	0.0001	16	3100	0.0005	0.001	0.6		0.000025	110	81	0.5	0.0005	210	0.41		0.0005	2.9		0.001	1700	2400		0.5	1.4	0.26
11-Feb-15	0.0005	1.9	12.5	0.002	7.1	0.001		270	0.0001	19	3700	0.0005	0.001	0.4		0.000025	140	100	0.5	0.0005	250	0.64		0.0005	2.9		0.001	2000	3000		0.5	0.55	0.4
11-Mar-15	0.0005	2.8	12.5	0.002	6.1	0.005		280	0.0001	20	3800	0.001	0.004	0.6		0.000025	150	110	0.5	0.0005	260	0.68		0.002	2.9		0.002	2200	3100		0.5	6.7	0.5

Site 86 Seepage water Northern wall collection pit near GW6 Groundwater from the KVAD on the north side drains from April, 2013 to March, 2015. All water reports to the asbestos pipe out to the Lidsdale Cut (site 86)

	Ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	Pb	pH	PO4	se	So4	TDS	TKN	TN	TSS	Turbidity (NTU)
Average	0.0005	1.75	13	0.001	5.0	0.004		201	0.0001	19	3067	0.0013	0.002	0.43		0.00	109.1	86.4	0.60	0.00	210	0.299	0.001	2.9		0.001	1762	2425		1.2	9.3	0.21
Maximum	0.0005	2.80	13	0.003	7.1	0.014		280	0.0001	21	3800	0.003	0.033	0.60		0.00	150.0	110.0	2.50	0.01	280	0.680	0.003	3.1		0.002	2300	3300		14.0	45.0	0.50
Minimum	0.0005	1.00	13	0.001	3.0	0.001		98	0.0001	11	2300	0.0005	0.001	0.05		0.00	74.0	61.0	0.50	0.00	140	0.140	0.001	2.8		0.001	1100	1100		0.0	0.6	0.10
50th Percentile	0.0005	1.70	13	0.001	5.0	0.002		205	0.0001	19	3100	0.001	0.001	0.50		0.00	110.0	88.0	0.50	0.00	215	0.255	0.001	2.9		0.001	1750	2400		0.5	4.7	0.18

Site 86 Seepage water Northern wall collection pit near GW6 Groundwater from the KVAD on the northside drains from April, 2015 to March, 2016. All water reports to the pipe out to the Lisdale Cut.

Date	ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	DO	Pb	pH	NO3	se	So4	TDS	TKN	TN	Turbidity (NTU)	Zn
9/04/2015	0.0005	2.3	12.5	0.002	7	0.0005	270	0.0001	20	3800	0.001	0.001	0.001	0.4	48	0.000025	140	100	16	0.001	250	0.75	9.7	0.001	2.9	0.5	0.001	2100	3000		3.9	1.2	0.63
27/05/2015	0.0005	1	12.5	0.002	5.9	0.001	280	0.0001	20	3600	0.001	0.001	0.001	0.4	89	0.00002	140	100	16	0.001	230	0.81	7.5	0.001	3.1	0.5	0.001	2100	3200		4	15	0.82
17/06/2015	0.0005	1.8	12.5	0.002	6.3	0.002	260	0.0001	18	3400	0.001	0.001	0.001	0.6	69	0.00002	130	96	15	0.001	240	0.68	12.9	0.001	3	0.5	0.001	2100	2800		3.2	6.2	0.67
15/07/2015	0.0005	2.01	0.5	0.003	6.91	0.007	314	0.0003	17.5	4040	0.002	0.001	0.001	0.4	166	0.00002	168	119	15.9	0.001	294	0.817	8.1	0.001	3.18	0.025	0.0005	2540	3230		3.2	7.6	1.12
19/08/2015	0.0005	2.81	0.5	0.003	9.29	0.002	311	0.0001	18.9	4250	0.001	0.001	0.001	2.26	120	0.00002	170	110	16.7	0.001	282	1.2	7.2	0.001	3.05	0.05	0.0008	2570	3130		4.2	0.8	1.58
16/09/2015	0.0005	3.76	0.5	0.003	9.2	0.006	318	0.0001	19.1	4311	0.001	0.001	0.001	1.01	98.2	0.00002	165	114	16.1	0.002	295	0.999	6.8	0.001	3.03	0.05	0.0007	2630	2430		3.7	22.8	1.82
21/10/2015	0.0005	5.23	0.5	0.003	7.2	0.003	277	0.0001	17	4003	0.001	0.001	0.001	2.92	52	0.00002	142	94.4	14.6	0.001	254	0.846	6.9	0.002	2.87	0.05	0.0016	2250	3150		3.8	2.3	1.44
18/11/2015	0.0005	5.98	0.5	0.003	8.68	0.0005	310	0.0002	16.5	4263	0.001	0.001	0.001	3.74	57.6	0.00002	153	104	16.8	0.001	269	1	9.2	0.001	2.96	0.05	0.0013	2590	3720		4.1	2.6	1.69
9/12/2015	0.0005	7.04	0.5	0.006	12	0.001	363	0.0002	18.3	4604	0.0005	0.001	0.001	5.64	68.5	0.00002	178	124	18.3	0.001	337	1.66	4.6	0.001	2.83	0.02	0.0016	2860	3340		3.7	1.6	2.09
20/01/2016	0.0005	10.8	0.5	0.007	6.63	0.001	341	0.0003	19.4	4346	0.001	0.001	0.001	10.2	33.6	0.00002	153	111	15.6	0.003	312	1.3	6.2	0.001	2.96	0.01	0.002	2480	3500		4.4	1	2.39
10/02/2016	0.0005	10.2	0.5	0.004	8.28	0.0005	315	0.0002	18.5	4217	0.001	0.001	0.001	8.08	34.7	0.00002	151	103	16.3	0.001	275	1.15	3.4	0.001	2.81	0.01	0.0021	2280	2830		3.3	0.8	2.14
16/03/2016	0.0005	14	0.5	0.006	9.45	0.002	333	0.0003	19.5	4322	0.002	0.002	0.002	13.1	28.6	0.00002	154	109	16	0.001	316	1.24	3.4	0.001	2.84	0.02	0.0025	2310	3000		4.6	11.4	2.27

Site 86 Seepage water Northern wall collection pit near GW6 Groundwater from the KVAD on the north side drains from April, 2015 to March, 2016. All water reports to the asbestos pipe out to the Lidsdale Cut (site 86)

	Ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	Pb	pH	NO3	se	So4	TDS	TKN	TN	Turbidity (NTU)	Zn
Average	10.8	12.5	0.007	12	0.007	363	0.0003	20	4604	0.002	0.001	10.8	12.5	10.2	166	0.000025	178	124	18.3	0.003	337	1.66	0.002	3.18	0.5	0.0021	2860	3720		4.4	22.8	2.39
Maximum	14	12.5	0.007	12	0.007	363	0.0003	20	4604	0.002	0.002	14	12.5	13.1	166	0.000025	178	124	18.3	0.003	337	1.66	0.002	3.18	0.5	0.0025	2860	3720		4.6	22.8	2.39
Minimum	1	0.5	0.002	5.9	0.0005	260	0.0001	16.5	3400	0.0005	0.001	1	0.5	0.4	28.6	0.00002	130	94.4	14.6	0.001	230	0.68	0.001	2.81	0.01	0.0005	2100	2430		3.2	0.8	0.63
50th Percentile	4.495	0.5	0.003	7.74	0.0015	312.5	0.00015	18.7	4233.5	0.001	0.001	4.495	0.5	2.59	63.05	0.00002	153	106.5	16	0.001	278.5	0.9995	0.001	2.96	0.05	0.00115	2395	3140		3.85	2.45	1.635

Seepage Water Southwest wall at end of seepage line before entering Lidsdale Cut at Site 94

Site 94 Seepage water south-west wall groundwater seepage from the KVAD on from April, 2015 to March, 2016. All water reports to the pipe out to the Lisdale Cut.																																	
Date	**ag**	**Al**	**Alk**	**As**	**B**	**Ba**	**Be**	**Ca**	**Cd**	**Cl**	**Cond**	**Cr**	**Cu**	**F**	**Fe**	**Hg**	**K**	**Mg**	**Mn**	**Mo**	**Na**	**Ni**	**DO**	**Pb**	**pH**	**NO3**	**se**	**So4**	**TDS**	**TKN**	**TN**	**Turbidity (NTU)**	**Zn**
9/04/2015	0.0005	160	12.5		13	0.023	290	290	0.051	35	4300			28	12	0.000025	180	100	15	0.002	240	1.2	12.4	0.004	3.5	2.5	2900	4100	0.004		2.9	110	2.7
27/05/2015	0.0005	30	12.5	0.004	6.4	0.019	230	230	0.0096	42	3200	0.002	0.007	12	6.3	0.00002	120	110	15	0.001	230	1.3	11.7	0.003	3.3	2.5	1900	2800	0.003		3.75	28	2
17/06/2015	0.0005	42	12.5	0.007	3	0.044	78	78	0.011	13	1200	0.007	0.013	6.2	3.7	0.00002	47	22	3.1	0.001	63	0.27	15.7	0.004	3.8	5	690	910	0.004		2.5	130	0.65
15/07/2015	0.0005	41.8	0.5	0.01	7.24	0.02	209	209	0.0134	38.1	3380	0.004	0.02	6.4	20.6	0.00002	126	100	14.7	0.002	240	1.16	19.1	0.003	3.44	0.39	1940	2810	0.003		2.3	124	1.93
19/08/2015	0.0005	23.2	0.5	0.004	7.78	0.017	228	228	0.0057	42.3	3390	0.001	0.004	7.28	22.6	0.00002	130	112	17.7	0.002	256	1.58	10.9	0.004	3.44	0.49	1900	2530	0.004		2.9	50.9	2.11
16/09/2015	0.0005	78.4	0.5	0.025	8.98	0.023	256	256	0.0254	41	3469	0.008	0.022	6.94	11.7	0.00002	135	99.8	13.6	0.003	269	0.845	10.7	0.002	3.84	0.42	2250	3240	0.002		2	53.1	2.09
21/10/2015	0.0005	18.3	0.5	0.002	6.4	0.016	221	221	0.0044	41.8	3452	0.001	0.004	7.23	19.9	0.00002	134	111	15.3	0.002	244	1.16	9.7	0.003	3.36	0.41	2000	3250	0.003		2.9	52	1.76
18/11/2015	0.0005	160	0.5	0.025	11.3	0.019	289	289	0.0411	33.9	4243	0.017	0.041	24.1	14.8	0.00002	186	108	17.4	0.002	274	1.42	8.8	0.004	3.53	0.47	3160	4490	0.004		3.5	52.5	2.9
9/12/2015	0.0005	293	0.5	0.079	21.7	0.011	382	382	0.0768	34.4	5601	0.038	0.072	46.1	24.2	0.00002	316	137	17.2	0.001	369	2.8	7.9	0.004	3.23	0.24	4080	6140	0.004		4.5	24.4	5.7
20/01/2016	0.0005	217	0.5	0.047	10.2	0.013	294	294	0.0493	32.6	4860	0.023	0.047	34.5	22.3	0.00002	227	110	17.8	0.003	286	1.77	7.3	0.004	3.22	0.22	3500	4080	0.004		4	8.7	3.5
10/02/2016	0.0005	31.5	0.5	0.003	9.97	0.007	254	254	0.0039	41.6	4150	0.001	0.004	15.6	27.5	0.00002	163	138	22.4	0.001	263	2.07	5.5	0.004	3.02	0.3	2360	3190	0.004		3.9	1.2	2.91
16/03/2016	0.0005	30.7	0.5	0.005	9.81	0.011	257	257	0.0047	39.3	3999	0.001	0.006	11.9	32	0.00002	157	138	21.5	0.001	295	1.99	9.5	0.005	3.09	0.22	2190	3740	0.005		3.6	2.4	2.79

Site 94 Seepage water south-west wall groundwater seepage from the KVAD on from April, 2015 to March, 2016. All water reports to the pipe out to the Lisdale Cut. All water reports to the Lidsdale Cut (site 86)																																
	Ag	**Al**	**Alk**	**As**	**B**	**Ba**	**Be**	**Ca**	**Cd**	**Cl**	**Cond**	**Cr**	**Cu**	**F**	**Fe**	**Hg**	**K**	**Mg**	**Mn**	**Mo**	**Na**	**Ni**	**Pb**	**pH**	**NO3**	**se**	**So4**	**TDS**	**TKN**	**TN**	**Turbidity (NTU)**	**Zn**
Average	0.0005	93.825	12.5	0.079	21.7	0.044	382	0.0768	42.3	5601	0.038	0.072	93.825	46.1	27.5	0.000025	316	138	22.4	0.003	369	2.8	0.004	3.84	0.5	0.072	4080	6140		4.4	22.8	5.7
Maximum	0.0005	293	12.5	0.079	21.7	0.044	382	0.0768	42.3	5601	0.038	0.072	293	46.1	32	0.000025	316	138	22.4	0.003	369	2.8	0.005	3.84	0.5	0.072	4080	6140		4.6	22.8	5.7
Minimum	0.0005	18.3	0.5	0.002	3	0.007	78	0.0039	13	1200	0.001	0.004	18.3	6.2	3.7	0.00002	47	22	3.1	0.001	63	0.27	0.002	3.02	0.01	0.0017	690	910		3.2	0.8	0.65
50th Percentile	0.0005	41.9	0.5	0.007	9.395	0.018	255	0.0122	38.7	3734	0.004	0.013	41.9	11.95	20.25	0.00002	146	110	16.25	0.002	259.5	1.36	0.004	3.4	0.05	0.00885	2220	3245		3.85	2.45	2.405

KVAD groundwater bore GW11 April, 2015 to March 2016

Date	ag	Al	Alk	As	B	Ba	Be	Ca	Cd	Cl	Cond	Cr	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	DO	Pb	pH	NO3	se	So4	TDS	TKN	TN	Turbidity (NTU)	Zn	WL (m)
27/05/2015																																		3.5
16/07/2015	0.0005	9.22	61	0.003	0.05	0.088	27.7	0.0001	27.2	318	0.004	0.015	0.0005	0.4	0.076	0.00002	3.26	5.27	0.02	0.0005	28.5	0.01		0.025	7.55		0.001	45	266				0.102	2.2
16/09/2015																																		3.3
18/11/2015																																		3.4
10/02/2016																																		3.4

KVAD groundwater bore AP09 April, 2015 to March 2016

Date	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL AHD	WL1	Zn
10-Apr-15	0.0005	0.18	55	0.049	2.1	0.022		120	0.0001	37		2100	0.0001	0.0001	0.9	48	0.000025	96		62	7.1	0.13	140	0.21	0.001	6.2	0.001	1000	1600		2.8	0.079
28-May-15	0.0005	0.16	61	0.052	1.8	0.019		140	0.0001	41		2100	0.0001	0.0001	0.7	39	0.00002	100		68	7.1	0.1	140	0.24	0.001	6.2	0.001	1200	1700		2.8	0.094
18-Jun-15	0.0005	0.21	30	0.06	2	0.019		140	0.0001	42		1900	0.0001	0.0001	0.9	49	0.00002	100		66	7	0.12	150	0.27	0.001	5.9	0.001	1200	1600		2.8	0.11
16-Jul-15	0.0005	0.25	36	0.081	2.08	0.02		138	0.0001	41.7		2250	0.0001	0.0001	0.9	51.2	0.00002	111		70.4	7.07	0.125	161	0.3	0.001	6.33	0.0001	1140	1560		2.8	0.136
20-Aug-15	0.0005	0.28	60	0.088	2.59	0.018		133	0.0001	42.9		2320	0.0001	0.0001	0.124	51.6	0.00002	112		65	7	0.134	155	0.365	0.001	6.41	0.0001	1150	1150		2.8	0.149
17-Sep-15	0.0005	0.37	33	0.095	2.3	0.02		137	0.0001	44.2		2232	0.0001	0.0001	0.19	53.2	0.00002	116		67.3	7.15	0.127	161	0.262	0.001	6.13	0.0001	1150	1740		2.8	0.144
22-Oct-15	0.0005	0.33	36	0.089	1.88	0.017		130	0.0001	45		2278	0.0001	0.004	0.432	50.4	0.00002	115		63.4	6.87	0.124	153	0.291	0.001	6.02	0.0002	1180	1770		2.8	0.131
19-Nov-15	0.0005	0.25	25	0.07	2.03	0.019		137	0.0001	40.8		2311	0.0001	0.0001	0.737	65.2	0.00002	117		64.9	8.17	0.13	145	0.337	0.001	6	0.0002	1200	1990		2.9	0.138
10-Dec-15	0.0005	0.26	56	0.072	2.07	0.019		148	0.0001	41.6		2309	0.0001	0.002	0.571	49	0.00002	132		71.1	5.93	0.105	169	0.354	0.001	5.94	0.0001	1220	1610		2.9	0.134
21-Jan-16	0.0005	0.25	42	0.068	1.99	0.017		139	0.0001	40.6		2369	0.0001	0.006	0.783	68.7	0.00002	128		70.3	9.24	0.131	171	0.336	0.001	5.99	0.0001	1150	2010		2.9	0.133
11-Feb-16	0.0005	0.24	54	0.064	2.1	0.017		152	0.0001	40.8		2345	0.0001	0.0001	0.569	61.6	0.00002	138		75.7	7.58	0.106	173	0.328	0.001	5.88	0.0001	1170	2040		2.9	0.135
17-Mar-16	0.0005	0.27	58	0.064	2.19	0.017		140	0.0001	38.6		2367	0.0001	0.0001	0.489	59.6	0.00002	125		69.9	7.05	0.114	168	0.346	0.001	5.95	0.0002	1150	1870		2.9	0.138

KVAD groundwater bore AP09 April, 2015 to March 2016

	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	0.0005	0.37	61	0.095	2.59	0.022		152	0.0001	45		2369	0.0001	0.006	68.7	0.9	0.000025	138		75.7	9.24	0.134	173	0.365	0.001	6.41	0.001	1220	2040	2.9		0.149
Maximum	0.0005	0.37	61	0.095	2.59	0.022		152	0.0001	45		2369	0.0001	0.006	68.7	0.9	0.000025	138		75.7	9.24	0.134	173	0.365	0.001	6.41	0.001	1220	2040	2.9		0.149
Minimum	0.0005	0.16	25	0.049	1.8	0.017		120	0.0001	37		1900	0.0001	0.0001	39	0.124	0.00002	96		62	5.93	0.1	140	0.21	0.001	5.88	0.0001	1000	1150	2.8		0.079
50th Percentile	0.0005	0.25	48	0.069	2.075	0.019		138.5	0.0001	41.3		2293.5	0.0001	0.0001	51.4	0.6355	0.00002	115.5		67.65	7.085	0.1245	158	0.314	0.001	6.01	0.00015	1160	1720	2.8		0.1345

KVAD groundwater bore AP17 April, 2015 to March 2016

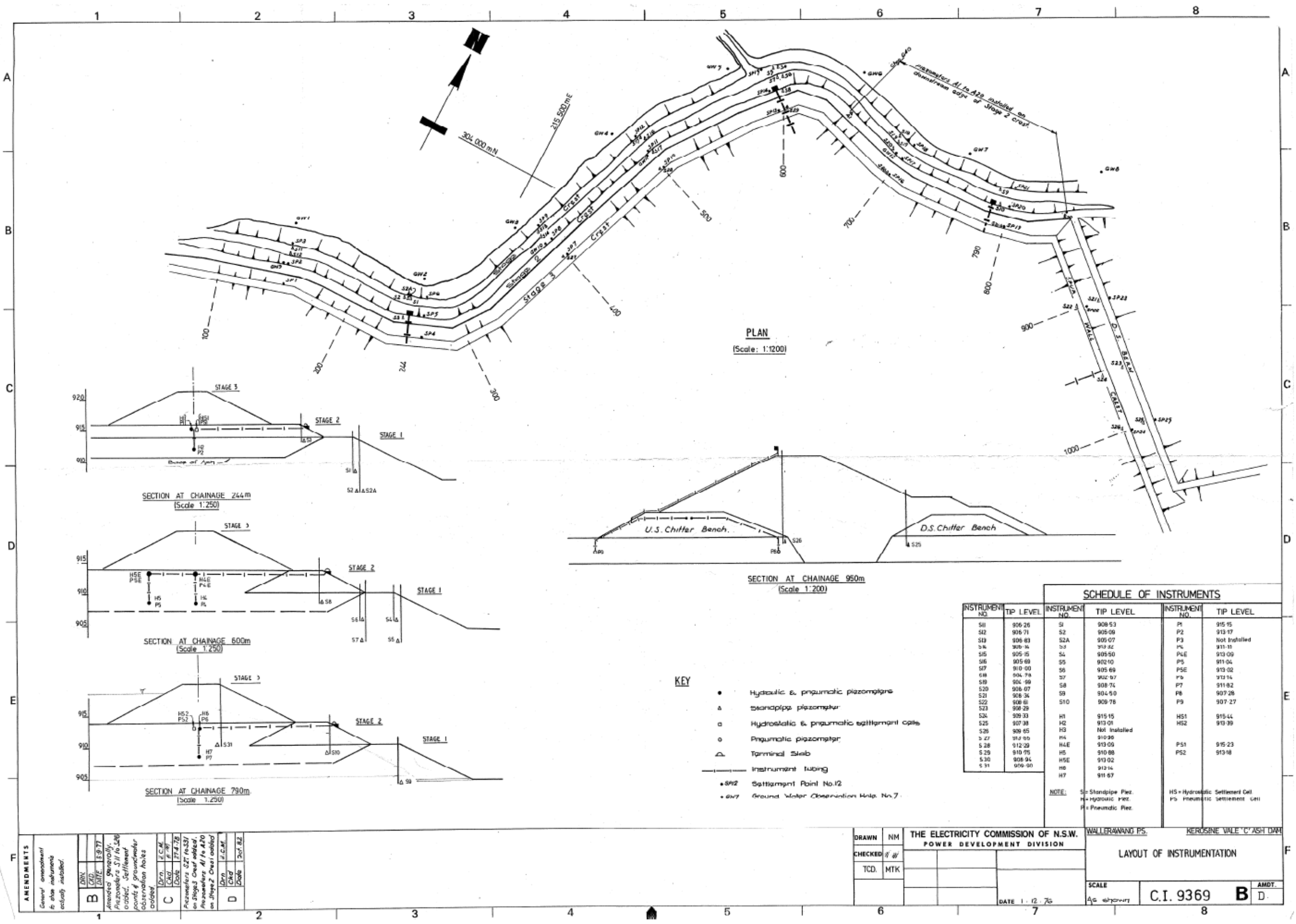
Date	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL AHD	WL1	Zn
10-Apr-15	0.0005	52	12.5	0.003	12	0.021		390	0.0006	17		5000	0.001	0.002	88	240	0.000025	270		95	16	0.052	300	1.7	0.0005	4.3	0.002	3500	4800		2.4	4.7
28-May-15	0.0005	52	12.5	0.002	9.9	0.007		420	0.0006	17		4800	0.002	0.003	89	190	0.00002	270		100	15	0.013	300	1.6	0.002	3.2	0.002	3100	4400		2.3	5.1
18-Jun-15	0.0005	59	12.5	0.002	11	0.007		430	0.0005	17		4300	0.001	0.002	93	220	0.00002	280		100	15	0.037	340	1.7	0.001	3.3	0.002	3300	4400		2.3	5.1
16-Jul-15	0.0005	61.1	0.5	0.004	11.3	0.01		430	0.0006	18.5		5030	0.001	0.003	103	206	0.00002	266		104	14.4	0.021	349	1.76	0.001	3.46	0.001	3440	4170		2.4	5.38
20-Aug-15	0.0005	70.1	0.5	0.004	13.8	0.007		423	0.0007	17.7		5150	0.001	0.004	93.8	177	0.00002	274		98.3	14.2	0.024	334	2.23	0.002	3.5	0.0009	3240	4310		2.4	5.94
17-Sep-15	0.0005	68.7	0.5	0.004	13.2	0.008		439	0.0008	14.3		4978	0.001	0.024	94	188	0.00002	277		107	13.5	0.034	365	1.71	0.002	3.58	0.0008	3220	4050		2.3	6.21
22-Oct-15	0.0005	57.8	0.5	0.003	10.8	0.006		409	0.0006	17.1		5074	0.001	0.016	108	162	0.00002	255		97.6	13.2	0.006	337	1.6	0.003	3.34	0.0012	3480	4680		2.4	4.93
19-Nov-15	0.0005	65.4	0.5	0.005	10.5	0.01		417	0.0008	15.7		5001	0.001	0.001	107	228	0.00002	261		95.8	14.1	0.041	339	1.7	0.0005	4.18	0.0011	3440	5190		2.4	5.59
10-Dec-15	0.0005	68.5	0.5	0.005	12.6	0.01		452	0.0008	15.3		5006	0.001	0.006	118	259	0.00002	291		106	15.6	0.035	376	2.56	0.0005	4.45	0.0012	3480	4970		2.2	7.25
21-Jan-16	0.0005	62.1	0.5	0.006	8.93	0.012		412	0.0009	15.6		4966	0.001	0.106	111	230	0.00002	282		96.8	14	0.057	360	1.76	0.0005	4.66	0.0012	3240	5250		2.4	5.13
11-Feb-16	0.0005	64.6	2	0.005	13.4	0.01		426	0.0009	17.4		4943	0.001	0.01	108	236	0.00002	277		99.1	14.5	0.022	348	1.9	0.0005	4.65	0.0013	3230	5210		2.4	5.48
17-Mar-16	0.0005	64	0.5	0.003	13.1	0.012		415	0.0011	17.7		4965	0.001	0.021	106	220	0.00002	272		96.4	13.8	0.004	362	1.85	0.002	3.93	0.0017	3160	5090		2.4	5.35

KVAD groundwater bore AP17 April, 2015 to March 2016

	Ag	ALK	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	COND	Cr	Cu	F	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	pH	Se	SO4	TDS	WL1	WL AHD	Zn
Average	0.0005	70.1	12.5	0.006	13.8	0.021		452	0.0009	18.5		5150	0.002	0.106	68.7	0.9	0.000025	138		107	16	0.057	376	2.56	0.003	4.66	0.002	3500	5250	2.9		0.149
Maximum	0.0005	70.1	12.5	0.006	13.8	0.021		452	0.0011	18.5		5150	0.002	0.106	68.7	0.9	0.000025	138		107	16	0.057	376	2.56	0.003	4.66	0.002	3500	5250	2.9		0.149
Minimum	0.0005	52	0.5	0.002	8.93	0.006		390	0.0005	14.3		4300	0.001	0.001	39	0.124	0.00002	96		95	13.2	0.004	300	1.6	0.0005	3.2	0.0008	3100	4050	2.8		0.079
50th Percentile	0.0005	63.05	0.5	0.004	11.65	0.01		421.5	0.00075	17		4989	0.001	0.005	51.4	0.6355	0.00002	115.5		98.7	14.3	0.029	344	1.735	0.001	3.755	0.0012	3270	4740	2.8		0.1345

Attachment 3

Construction drawing of KVAD wall showing chitter used to construct the benches



SCHEDULE OF INSTRUMENTS

INSTRUMENT NO.	TIP LEVEL	INSTRUMENT NO.	TIP LEVEL	INSTRUMENT NO.	TIP LEVEL
S11	906·26	S1	908·53	P1	915·15
S12	906·71	S2	905·09	P2	913·17
S13	906·83	S2A	905·07	P3	Not Installed
S14	906·14	S3	913·32	P4	911·11
S15	905·15	S4	905·50	P4E	913·09
S16	905·69	S5	902·10	P5	911·04
S17	910·00	S6	905·69	P5E	913·02
S18	904·79	S7	902·67	P6	913·14
S19	904·99	S8	908·74	P7	911·82
S20	906·07	S9	904·50	P8	907·28
S21	906·34	S10	909·78	P9	907·27
S22	908·61				
S23	908·29	H1	915·15	HS1	915·44
S24	909·33	H2	913·01	HS2	913·39
S25	907·38	H3	Not Installed		
S26	909·65	H4	910·96		
S27	913·65	H4E	913·09	PS1	915·23
S28	912·29	H5	910·88	PS2	913·18
S29	910·75	H5E	913·02		
S30	908·94	H6	913·14		
S31	909·90	H7	911·67		

NOTE: S = Standpipe Piez. H = Hydraulic Piez. P = Pneumatic Piez. HS = Hydrostatic Settlement Cell PS = Pneumatic Settlement Cell

DRAWN	NM	THE ELECTRICITY COMMISSION OF N.S.W. POWER DEVELOPMENT DIVISION	WALLERAWANG P.S. KEROSINE VALE 'C' ASH DAM
CHECKED			LAYOUT OF INSTRUMENTATION
TCD.	MTK	DATE 1 · 12 · 76	SCALE As shown — C.I. 9369 B — AMDT. D.

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