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Dear Ross

New Oakleigh Groundwater Study

1. Introduction

Sinclair Knight Merz Pty Ltd (SKM) has been engaged by New Oakleigh Coal Pty Ltd (NOC) to undertake a groundwater assessment at New Oakleigh Mine near Rosewood, Queensland. The objective of this assessment is to identify the source and cause of the seepage in areas adjacent to the North Pit residual void and Covers Gully (southern section).

2. Context

New Oakleigh Coal Mine lies on the outskirts of the township of Rosewood, west of Ipswich. Several open cut pits have been mined and there are also multiple layers of historical underground workings in various parts of the New Oakleigh project area.

3. Project Background

New Oakleigh Mine has operated since the 1980's commencing operations initially east of the Rosewood-Marburg Road with operations moving west of the Rosewood Marburg Road in the late 1990's where coal extraction and processing is still occurring.

The Mine footprint additionally includes historic underground workings (approximately 100yrs old) and an Ipswich City Council landfill and transfer station (Rosewood Tip).

This report relates to areas of the eastern section of the Site, specifically the former extractive and now filled area known as the North Pit and a filled area known as Covers Gully.

4. North Pit

The North Pit was mined from the mid 1970's to late 1990's. In around 2000 the residual void was divided into two areas using spoil. The northern most section was then used as a Tailings

Storage Facility (TSF). The remainder of the void was backfilled on a staged basis with latest works being carried out in 2007.

5. Covers Gully

A drainage line, known locally as Covers Gully, runs in a south-westerly direction through the southern part of the pit area and a low flow of brackish water is reported to be constantly present within the gully from below Rosewood Tip. The latter was created by dumping material directly into the gully. A Waste Transfer Station operated by Ipswich CC located on top of the old tip and immediately north east of this is a small dam containing brackish water which was the water source for the former Coal Handling and Preparation Plant (CHPP).

6. Previous Studies

6.1 North Pit

In 2009 NOC commissioned a data review and conceptual model (AGE 2009) to try and identify the mechanism behind the seepage breakouts. The data review indicated that the following hydrogeological units are present within the area:

- A perched aquifer associated with backfilled spoil/tailings contained in the mine void.
- A shallow perched aquifer within a higher permeability fractured regolith zone between the soils and weathered bedrock.
- A deeper semi-confined to confined aquifer contained in the low to moderately permeable coal seams.

Also in 2009 a geophysical survey was carried out (GeoConsult 2009) to define any geophysical anomalies which may be associated with sub-surface geological changes (resulting from faulting). The Thiel Surface Impedance Method (TSIM) was used. Several linear anomalies were identified to the north of the pit which were identified as being faults striking N-S, NW-SE and E-W.

6.2 Covers Gully

There is limited geological data available for the Covers Gully area.

7. Objective

NOC has commissioned SKM to undertake a groundwater study to identify the source/cause of the seepage in the vicinity of the North Pit and to identify the source of the constant water flow in Covers Gully.

The aim of the North Pit study is to identify the mechanism behind the seepage breakouts with a further goal of developing a remediation strategy should it be identified that the seepage is a consequence of mining activities.

The aim of the Covers Gully study is to identify the mechanism behind the water flow with a further goal of developing a remediation strategy should it be identified that the seepage is a consequence of mining activities.

8. Site Description and Settings

The site location is shown in Attachment A which also indicates the outline of the former North Pit. Much of the void has been filled by waste rock ('mullock') during and after mining operations. The final pit void also included also received tailings pumped from the former CHPP.

9. Seepages

Tailings from the CHPP were pumped to the North Pit TSF from 1998 until end of 2004. Seeps were first noticed in 2000 in a gully (the western gully – on the Drysdale property) to the north of the pit. Later in 2006 a second seepage was reported within the eastern gully (Yeoman property) again to the north of the pit (AGE 2009).

Some rehabilitation of the tailings was completed in 2008 which included partial capping of the desiccated western portion of the tailings area. Around the same time a third seepage breakout was observed within the eastern gully near to confluence with the western gully. All seepage breakout areas were defined by dieback of the grass cover and salt crystal at the surface (AGE 2009).

10. Geological Setting

The mine was constructed in Jurassic Walloon Coal Measures (WCM) (shale, siltstone, sandstone, coal, mudstone and limestone). Up to 63 individual coal seams between the WW Seam and the Rea 5 seam (a depth of 210m in exploration borehole #8016). The strata dip to the SE at 3degrees The WCM strata are reported to be weathered to a depth of between 6m and 21m. East of the North Pit the WCM are overlain by Tertiary Basalt and minor breccia flows (AGE 2009).

Two faults in the WCM were reported (anecdotally) in the northern (low) wall and crossing the western creek alignment. Further anecdotal evidence suggest that groundwater inflows were experienced from the either the faults or the coal seams (AGE 2009).

11. Hydrogeology

The hydrogeological conceptual model indentified by AGE (2009) and confirmed by SKM (this report) consists of the groundwater within the WCM, primarily as fracture flow in coal seams and in faults, joints and along bedding plains. Groundwater within the pit is also to be found in the rock fill which has filled much of the original mine void and in the weathered rock and regolith overlying the unweathered WCM.

During operation of the pit, groundwater was reported to flow into the pit from fractures and from seams in the pit walls and was kept under control by pumping from a borehole adjacent to a fault in the pit wall. Groundwater levels beneath the property to the north of the pit were reported to be at depths of 33m and 45m below ground level in a bore and an air shaft (AGE 2009).

AGE (2009) proposed that the observed seepages in the creeks north of the pit were due to groundwater in the pit infill overflowing at the lowest point of the old northern pit wall and flowing via the regolith to emerge at the surface at an elevation of 135mAHD.

12. Geophysical survey

A geophysical survey using EM34 and resistivity methods was carried out by Earth Technology Solutions (ETS 2011). The principal survey line was run parallel to the north (low) wall of the pit using both EM34 and resistivity. A further four EM34 lines were run to the north and parallel to this principal line. Further lines of EM34 were run across the fill material in north pit. Resistivity and EM34 were also run in the Cover Gulley area.

The survey lines indentified two zones of elevated conductivity coinciding with the two main surface gullies running between the edge of the pit and the seepages. These zones were interpreted to represent shallow preferential pathways of saline groundwater. Additionally two other conductive zones below a depth of 15m in the northern pit wall, between the two gullies, was interpreted as indicating preferential flow in a fault/shear zone in the north pit low wall.

At the Covers Gulley site a conductive zone was indentified coinciding with an open drainage gulley and the estimated intersection of a buried storm water pipe.

13. Scope of Works

To meet the project objective SKM undertook the following:

13.1 North Pit

Two piezometers (BH7 and BH8) were installed in the low wall to the north of the pit boundary. These wells were located in the high conductivity zones identified in the geophysical investigation.

Three piezometers (BH1, BH2 and BH4) were installed around the tailings dam, drilled through the infill material but not reaching the top of bedrock (pit floor).

One piezometer (BH3) was installed in an open-hole drilled borehole to the south of North Pit.

Two shallow piezometers (BH9 and BH10) were installed into a shallow augured borehole to a depth of approximately 1.5m near the observed point of emergence of seepage on neighbouring properties. Due to the amount of vegetation present around the Drysdale property seepage BH10 was installed within the mine lease adjacent to the property boundary.

13.2 Covers Gulley

Two piezometers (BH5 and BH6) were installed into boreholes drilled through the infill and underlying bedrock.

13.3 Drilling Technique

All drilling and monitoring well installation was undertaken by Ken Dippell - a Class 2 DERM licensed water well driller.

Where the ground was competent the drilling was completed entirely by air rotary technique (BH7 and BH8). Where the ground was less competent and/or air circulation was lost then the boreholes (started by air rotary) were completed by the cable tool technique (BH1, BH2, BH3, BH4, BH5 and BH6).

The boreholes completed by a combination of air rotary and cable tool techniques were those in the pit and at Covers Gulley - where rock fill was encountered. The depth of these boreholes was originally intended to be to the base of the fill (pit floor in the case of the North Pit boreholes BH1, BH2, BH3 and BH4) and this was identified by the driller as the point where greater resistance to drilling was encountered. Unfortunately survey data later proved that the pit floor had not been reached in the North Pit boreholes. The lithological similarity between fill and bedrock made the identification of bedrock difficult for the SKM drilling supervisor as the chips showed no significant change. The correct depths of fill are shown on the cross sections in Attachment H. These depths were obtained from digital elevation mapping (DEM) pre- and post-mining. As a result the sampling from these boreholes was from the upper fill only rather than a composite of all layers. It is not possible to determine the impact this may

have had on the chemical composition of the sampled groundwater. The impact upon the measured piezometric (groundwater) level is not likely to be significant.

Shallow boreholes (BH9 and BH10) were advanced using a hand auger.

Borehole logs are included in Attachment C.

13.4 Monitoring Well Construction

Piezometers were constructed with 50mm ID Class 18 PVC casing and screen. Deep wells were fitted at the surface with a monument cover and padlock.

13.5 Well Survey

Wells were surveyed by NOC (to mAHD) with data included in Attachment D and utilised within this report.

13.6 Water Sampling

Groundwater bores were purged (3 to 5 well volumes) prior to sampling. Groundwater samples were obtained on two separate occasions over the 2011-2012 wet-season between 7 February 2012 and 2-3 April 2012.

Five surface water sampling location were selected, from:

- Water pooling in the former North Pit TSF (SW1);
- The western gulley discharge (SW2);
- A separate pool of water directly south of the North Pit TSF (SW3);
- Water pooling in the pond located north of BH5 and BH6 (SW4); and
- The discharge at Covers Gulley down slope from the old ICC landfill (SW5).

The locations of all water samples is included on Figure 1, Attachment A

14. Field Data

14.1 Observations

Drilling conditions, construction details and elevations are summarised in Table 1.

- **Table 1 Piezometer Details**

Borehole ID	Total Depth (m)	Apparent Depth of Fill (m)	Screen Interval (mbgl)	Top of Casing (mAHD)	SWL (Feb 2012) (mAHD)	SWL (Mar 2012) (mAHD)
BH1	18	6*	9-18	151.345	144.40	143.143
BH2	17	5*	8-17	151.96	144.34	144.295
BH3	16	8*	7-16	161.649	-	157.939
BH4	19	7*	10-19	153.774	144.78	144.819
BH5	25	16	16-25	106.724	92.89	89.93
BH6	14.5	14.5	5.5-14.5	107.008	96.95	96.896
BH7	16	2	7-16	150.24	145.07	145.052
BH8	24	NA	15-24	157.382	143.88	143.857
BH9	0.8	NA	0.3-0.8	141.591	-	DRY
BH10	1.5	NA	0.5-1.5	141.142	140.79	140.712

NA – No fill material identified

SWL – Static water level

mbgl – metres below ground level

AHD – Australian height datum

* These boreholes did not encounter the base of the fill as explained in s13.3

14.2 7 February 2012 Sampling Event

Sampling was undertaken using disposable bailers. Due to a rain event on the day of sampling, and resultant restricted access to the site, BH3 and BH9 were unable to be sampled. Surface water discharge (seepage) from Covers Gully was insufficient to be sampled.

14.3 2-3 April 2012 Sampling Event

A 12V submersible pump was used to sample BH1 to BH8. Decontamination of the pump and tubing using Decon90 and demineralised water was undertaken between each sampling location.

Sampling was undertaken using a disposable bailer in BH10.

BH9 was dry and no seepage was observed.

To undertake sampling in the western gully, a sump was dug (approximately 100mm in depth) allowing sampling bottles to be placed in the sump for collection of this surface water sample (SW2).

14.4 19 April 2012 Sampling Event

A sample was taken from SW5 which had been omitted from the 2-3 April sampling event.

14.5 Sample Collection and Analysis

Samples for heavy metals were field filtered (0.45µm) with samples tested in the field for physico-chemical properties (EC, pH, Eh) with DO undertaken on surface water samples only.

All samples were placed in laboratory prepared bottles in an Esky with ice and submitted to a Australian Laboratory Services (ALS), a NATA accredited laboratory under Chain-of-Custody documentation for analysis of :

- Major anions and cations (SO_4, Cl, Na, K, Mg, Ca)
- Total alkalinity
- Nitrate and nitrite (NO_3 and NO_2)
- 15 no. dissolved metals (Al, As, Ba, Be, Bo, Cd, Cr, Cu, Fe, Hg, Mn, Mo, Pb, Se, Zn)
- pH, EC

One quality assurance duplicate sample was taken.

15. Results

Laboratory and field data is tabulated in Attachment B with raw laboratory data included in Attachment E.

15.1 Hydrogeochemistry

Two piper plots are included as Attachment F for surface water and for groundwater. Data from AGE (2009) is also included for comparison. The groundwater and surface water plots indicate five geochemical groupings:

Group A – This is the biggest group and includes the surface water data from SW2, SW4, BD1, BD2, BD3 and groundwater from BH3, BH4, BH6, BH7 and BH10.

Group B – This group includes groundwater (only) from BH1, BH5 and BH2.

Group C – This group contains surface water from SW1, SW3 and SW5 and groundwater from BH5.

Group D – This group contain only the groundwater samples taken in two sample visits from BH8.

Group E – This group contains only the surface water sample taken by AGE (2009) in the North pit TSF.

North Pit

The similarity between samples in **Group A** including the sample taken from seeps in 2009 (AGE 2009) and the groundwater in the rock fill at BH3 and BH4 suggests that the water seeping from the west gulley (the east gully wasn't analysed as no seepage was observed on the day of sampling) to the north of North Pit possibly originates from the groundwater in the rock fill. The difference of this group from SW1 (North Pit TSF) indicate that any influence that the water in the TSF has on the water in the seepages at this time is small or negligible.

The sample taken from the TSF in 2009 (sample 'NP') is quite different in character from those samples taken from the TSF in 2012 as part of this study. The sample is out on its own (**Group E**).

The recent samples from the TSF (SW1) (**Group C**) shows little similarity with the 2009 sample (Group E). The main reason for this is considered to be the lack of rainfall in 2009. This is seen in the high salinity at this time compared to the recent sampling which was undertaken after heavy rainfall.

BH8 (**Group D**) is quite different in character from the water in all other groundwater and surface water samples. It is also acidic, whereas all other sample are near neutral or slightly alkaline. It is considered that the acidity in BH8 may be as result of the oxidation of potentially acid forming material e.g. pyrites (FeS_2) present in the bedrock. Because BH8 has a separate geochemical signature from any other sample it is suggested that the influence of this groundwater is likely to be localised to the borehole.

Group B water lies between Groups A and C and may indicate a mixing of these two which are in turn mostly low salinity surface water (Group C) and rock fill groundwater (Group A).

Covers Gulley

The samples from Covers Gully fall in Group A, B and C. Groundwater in BH6 and the surface water in the adjacent dam (SW4) both lie in Group A. Whereas the (slightly deeper) groundwater in BH5 falls both into Group B and Group C on separate sampling events. Group C also contains the water sample taken from the seepage below the landfill (SW5).

There is similarity in major ion distribution and therefore a potential connection between the water in the dam (SW4) and the water from the shallower borehole, completed in rock fill at this location BH6. The similarity in geochemical distribution and salinity between BH5 (completed in the bedrock) and seepage SW5 (beneath the landfill) points to a link between the two however there are other contributing waters to SW5, indicated by elevated nitrogen in the

sample taken, the latter suggesting some contamination of SW5 by landfill leachate may be occurring.

15.2 Slug testing

Slug testing (falling and rising head tests) were carried out by SKM in April 2011. The results of the tests are summarised in the Table 2. The interpretation is included in Attachment F.

Table 2 Slugs test results

Bore	Test material	Hydraulic conductivity (k) m/day	Permeability
BH1	Rock fill	0.06	LOW
BH2	Rock fill	0.02	LOW
BH3	Rock fill	0.2	LOW
BH4	Rock fill	0.02	LOW
BH6	Rock fill/bedrock	0.04	LOW
BH7	Bedrock	0.05	LOW
BH8	Bedrock	0.3	LOW

The results of the slug test indicate the rock and rock fill is consistently of low to moderate permeably. The highest permeability is encountered in BH8 (0.3m/day) which is considered to lie in a fault zone and BH3 (0.2m/day) which lies in the rock fill in the south west part of the pit.

16. Groundwater Flow Conceptual Model

The cross sections in Attachment H illustrate the groundwater flow conceptual model for the North Pit and Covers Gulley areas. The sections indicate the previous and present land surface as well as a known depth of the pit prior to infilling.

The line of section A-E runs approximately north-south from the west gulley, across North Pit and down Covers Gulley. It misses the old high wall to the south-east of the pit. The rock infill of the pit is indicated, including a partition it is understood was constructed to separate the rest of the pit from the TSF. The groundwater table is indicated where levels have been measured in boreholes and projected where there is no available information. A groundwater divide is shown near BH3, which as it lies in a valley is the likely location of infiltration.

Although not shown in either of the sections the high wall to the south east of the pit is considered to lie near to another surface- and groundwater divide. At the top of the hillside at that location is a basalt outcrop dipping to the south east. The dip of the surface and the dip of the strata are likely to convey surface and groundwater away from the pit in this area. Inflow to the pit across the site boundaries is therefore considered to be minimal. The water contained within the pit therefore is derived primarily from runoff internal to the pit and groundwater from infiltration of this runoff.

Southwards along section A-E and away from the former pit outline the rock fill extends along Covers Gulley. The groundwater table gradient is shallow and parallels the boundary between the fill and the underlying rock. The section indicates the source of the Cover Gulley seep beneath the landfill as being at the location where the rock comes to the surface. This is supported by the similarity in salinity and major ion chemistry major ion at SW5 (the seep) and BH5. It is noted that the analysis of the water sampled at SW5 potentially also indicated contamination by landfill leachate (elevated nitrogen).

Seepages to the north of North Pit are accounted for as result of the high groundwater table in the rock fill and the pathways in the low wall, either via shallow regolith, coal seams and/or major fractures in the rock, as indicated by mapped lineaments and geophysical survey results. There are differences in the major ion chemistry that suggest the groundwater at BH1 and BH2 may not contribute much to SW2 however the similarity between SW2 and other borehole in the rock fill support the theory that the seepage water originates from within the fill material.

It is considered that the groundwater inflow to North Pit are influenced by local infiltration and potentially infiltration from the old underground, the later is discussed below.

16.1.1 The Old Underground

Examination of a series of historic aerial photographs of North Pit (taken between 1999 and 2011) made available to SKM by NOC indicated that during the drought (pre-2009) surface water was maintained in the TSF. This evidence, anecdotally supported by NOC (pers. comm. Ross Bennett), is indicative of a possible permanent source of groundwater feeding the TSF during this period. Without such a groundwater input recharging the North Pt during this extended dry period the TSF might justifiably have been expected to dry up.

Prior to this information the groundwater catchment of the former open pit and therefore the groundwater inflow was expected to be small. This belief has now been brought into question because the continued standing water present in the TSF during the drought.

The old underground workings extend to the south and east from North Pit (Figure 1). The lowest seam in the underground is understood to be the Gunthorpe Seam which was the lowest (or just above the lowest) worked seam in the North Pit.

Information obtained from NOC Exploration Geologist (Danique Bax) indicated that:

"The floor of the open cut pit differed across the area, but remained in either the Roots (RT), Little Jim (LJ) or Trewick (TR) seams, which are located fairly close together stratigraphically. Additionally, the only seams above this that were mined in the undergrounds within the North Pit region are the Gunthorpe (GN), along with the John (JN) seam, and the Hall (HL) seam in small areas, that appear to have been on the inferred boundaries of the pit. There were other seams that were underground mined around the North Pit area, however, they did not appear to have been intersected during open cut mining, and these were the Butlers (BT), Cowells (CW), and Joyson (JY) seams, which were all at depths lower than the open cut floor. There are a few other seams that sit outside of the North Pit area that were mined also, however, these also sit deeper than what the open cut floor was."

The recorded extent of the underground is shown in Figure 1. This indicates that the open pit extended up to, and possibly into, the old underground (GN seam and above).

- **Figure 1 Plan of old workings (AGE 2009)**

The present water level(s) in the old underground is not known and therefore the potential groundwater contribution to North Pit could not be determined in this study. It was originally intended to drill a borehole in the area of the old underground as part of this study but this was deemed impractical by NOC. Further study is therefore required to establish these levels. This work will needed as follows:

- Review of the mine plans and details of closure to establish the natural drainage direction of the workings and the potential for interconnection.
- Establishment of the piezometric surface in relation to the groundwater levels in North Pit.
- Sampling the groundwater in the underground which will require drilling into the old working unless old exploration boreholes (or shafts) remaining open can be found.

<u>Groundwater quality in the old underground</u>

Previous work by Douglas and Partners (2004) reported that:

"The New Oakleigh Mine EMOS (2002) states that results of the monitoring of groundwater from underground working within the coal measures show that the ground water has a electrical conductivity of 5,000 to 7,000µS/cm indicating the groundwater to be brackish."

This level of electrical conductivity is the same as was encountered in BH1 and BH2 located within the pit although it is less that that recorded in BH4 and BH3, also within the pit. This information indicates that the natural groundwater of the coal measures is of a "similar" salinity to the groundwater currently encountered in the North Pit and in the seepages.

17. Conclusions

The conclusions to this report draw together the various studies that have be carried out including the previous reported (notably AGE 2009) as well as information provided to SKM by NOC, geophysical surveying by Paul Fameli (Earth Technology Solutions 2011) and borehole drilling in 2011 along with subsequent sampling and analysis.

17.1 North Pit

A more robust conceptual model has been provided in this report that builds upon that provided by AGE in 2009 and links the North Pit and the Cover Gulley areas. This model indicates that the rock fill in the old pit is mostly saturated and that the groundwater is saline (6,000-11,000µS/cm) with a pH slightly acidic - pH5.8 (BH4) to neutral. The groundwater gradients in the fill are low. The groundwater in the fill has a drainage-divide located to the south of the pit with groundwater to the south of this line flowing to the south and off-site with little or no surface expression (seepage). To the north of this divide the groundwater pools around the TSF where the groundwater gradient is near horizontal. The groundwater from this area is seen to discharge to the north, either over the surface or through shallow soil and regolith around SW2 or via coal seams to the west (Drysdale property) and east (Yeoman property) gullies to the north of the pit.

The rate of discharge off site is controlled by the level of the water table in the fill in the North Pit and the permeability pathways through the ground to the north. These pathways are the shallow weathered regolith (SW2) and weathered coal seams and possibly a N-S trending fault zone (BH8).

17.2 Covers Gulley

The current elevation of the seepage observed down slope from the old tip at Covers Gulley appears to be coincident with the groundwater table elevation and therefore maybe a natural discharge for groundwater flows from southern part of the North Pit and the rock infill in Covers Gulley. However, because the seepage is typically very small it is considered more likely that the seepage (SW5) is localised and that the regional groundwater flow is deeper. The water sample taken from the seepage SW5 has elevated nitrogen which is typical of landfill leachate (originating from the tip) although it retains a geochemical signature and salinity that is similar to a nearby borehole BH5 which is constructed in the bedrock. It doesn't have the same signature as the water contained in the old CHPP dam above the landfill indicating that this is not the primary source of the seepage, although it may contribute.

18. Recommendations

North Pit

It is considered that the only way the seepage from North Pit can be controlled is by the reduction of the groundwater level in the rock fill. In the north-west of the pit this groundwater elevation is coincident with the lowest part of the pit low wall and so groundwater is seen to discharge at this point resulting in seepage observed at the surface (SW2). Lowering the groundwater table to below this point will reduce this overflow.

Furthermore, lowering the groundwater level in the North Pit will reduce the driving head that forces water though regolith, the coal seams and fractures into the gullies to the north.

Reducing the groundwater level in the fill could be achieved in part by re-contouring and then capping and planting the fill. Presently all the surface water in the northern part of the site is captured in the TSF or other low lying areas and this ends up either increasing evaporation or infiltration. By selective filling and grading, the site could be left to drain naturally both to the north (via SW2) and to the south (via Covers Gulley). By capping and planting, infiltration can be minimised and evapotranspiration increased. Successful re-vegetation will also help prevent erosion and sediment from being transported offsite.

It may not be possible to lower the groundwater level sufficiently to completely prevent future seepage particularly in consideration of the possible groundwater inflow from the old underground workings. If the groundwater at the northern boundary of North Pit table could be returned to the level it was prior to mining any residual seepage may in fact replicate natural seepage (further down the gulley) pre-mining. There is no information to say what this elevation should be however.

Further study of the potential for drainage from the old underground to the North Pit is required to determine the contribution this may have on maintaining artificially high groundwater levels in the pit.

Covers Gully

From its major ion signature it is suggested that the seepage below the landfill at Covers Gulley originates primarily from groundwater in the bedrock. However, it is recognised that the landfill and the former CHPP dam above the landfill, as well as local drains probably also contribute. By selective grading and capping and extensive planting the infiltration in the southern part of North Pit and in Covers Gulley could be which would result in lowering of groundwater levels which should reduce the observed seepage.

Furthermore, it considered that the presence of the old CHPP dam may contribute to the maintenance of a groundwater level in Covers Gulley above levels pre-mining. Seepage from the dam would result in localised groundwater mound beneath it which will constrict groundwater flow draining from Covers Gulley. Removal of the dam should therefore reduce the local groundwater level and result in decreased discharge at the observed seepage areas.

Yours sincerely

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Attachments:

Attachment A:	*Site Plan*
Attachment B:	*Tables*
Attachment C:	*Borehole Logs*
Attachment D:	*Survey Data (from NHC)*
Attachment E:	*Laboratory Data*
Attachment F:	*Piper Plots*
Attachment G:	*Aquifer Permeability Data*
Attachment H:	*Groundwater flow conceptual model*

References

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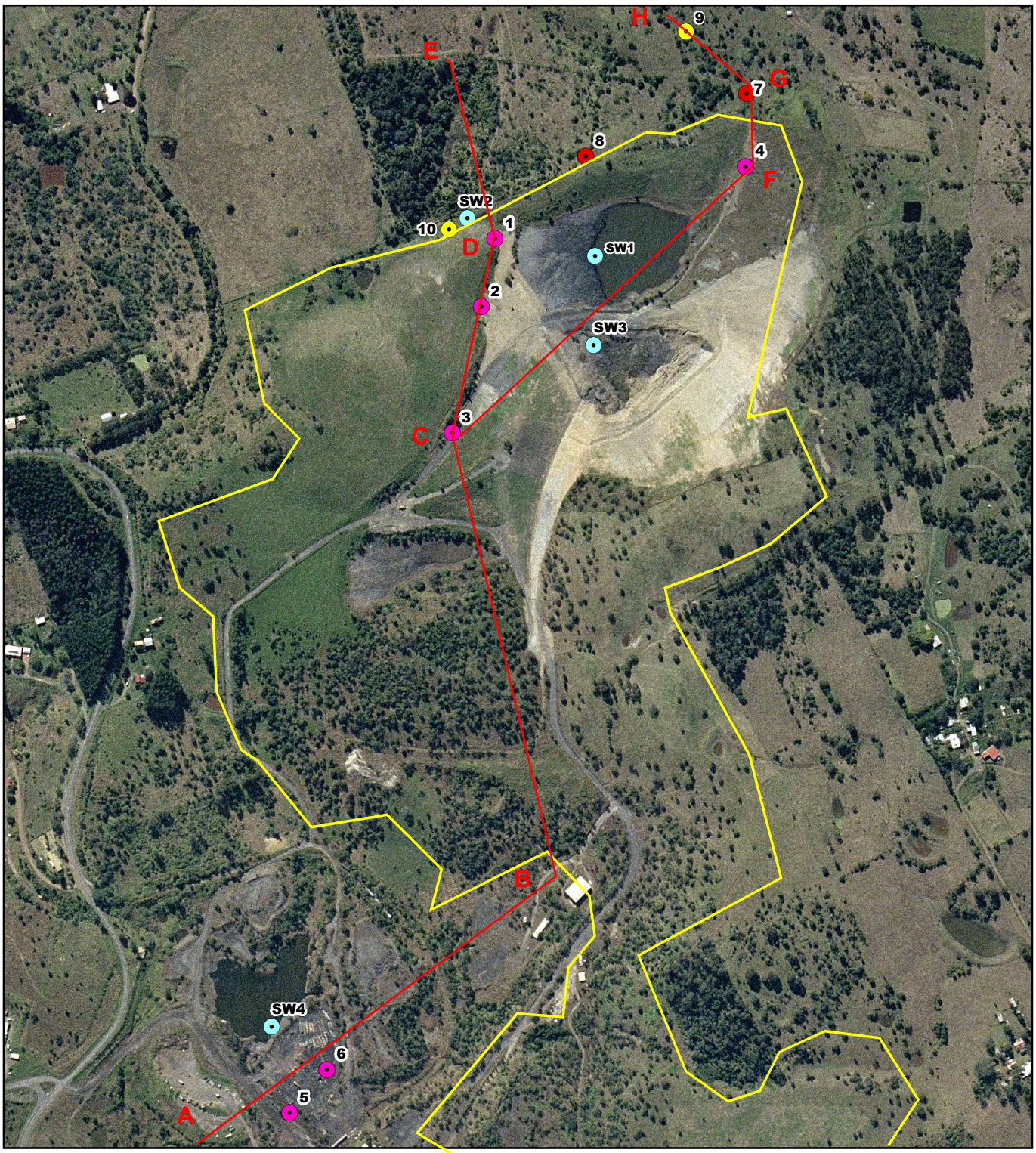
Attachment A: Site Map

NEWHOPE OAKLEIGH BOREHOLES V2



LEGEND

Bore Type

- Bedrock Bore Holes
- Rock Fill Bore Holes
- Shallow Auger Holes
- Surface Water Sample

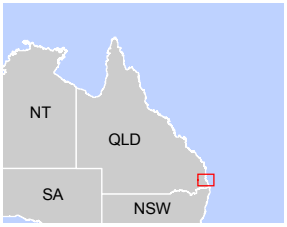
A — B
Line of section

[AGD 1984 AMG ZONE 56]

A4 1:8,000

0 300

Metres



[PROJECT: QE09870 New Oakleigh Groundwater Study]

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Prepared by : JR
Checked by : MA

Attachment B – Tables

Feb 2012

Field_ID	BH1	BH2	BH4	BH5	BH6	BH7	BH8	BH10	SW1
Sampled_Date-Time	7/02/2012	7/02/2012	7/02/2012	7/02/2012	7/02/2012	7/02/2012	7/02/2012	7/02/2012	7/02/2012

Chem_Group	ChemName	Units	EQL								
Field parameters	pH	pH_units		6.77	7.09	5.82	7.08	6.74	6.53	4.85	7.19	9.58
	Redox Potential	mV		384.3	323.5	335.7	258.8	-	193.7	434	-93.5	266.4
	Electrical Conductivity	uS/cm		6580	7850	9620	3590	8650	5460	10700	5320	723
Inorganics	Alkalinity (Bicarbonate as CaCO3)	mg/L	1	1240	1220	1150	787	872	880	4	1050	80
	Alkalinity (Carbonate as CaCO3)	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	66
	Alkalinity (Hydroxide) as CaCO3	µg/L	1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
	Alkalinity (total) as CaCO3	mg/L	1	1240	1220	1150	787	872	880	4	1050	146
	Anions Total	meq/L	0.01	75.2	86.8	115	37.2	94.3	74.6	114	89.5	5.65
	Cations Total	meq/L	0.01	79.6	93.5	126	40.7	101	82	124	98.5	5.47
	Chloride	mg/L	1	613	986	1700	396	1670	1090	2560	1350	68
	Ionic Balance	%	0.01	2.8	3.71	4.68	4.48	3.22	4.71	4.35	4.78	1.58
	Nitrate (as N)	mg/L	0.01	0.04	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Nitrite (as N)	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Nitrogen (Total Oxidised)	mg/L	0.01	0.04	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	pH (Lab)	pH_Units	0.01	7.42	7.65	7.4	7.69	7.35	7.06	4.86	7.41	9.52
	Sodium (Filtered)	mg/L	1	1250	1510	1570	835	1140	902	945	1310	92
	Sulphate	mg/L	1	1590	1660	2120	493	1430	1260	1980	1460	39
	Electrical Conductivity	uS/cm	1	6120	7450	9920	3340	8530	6430	10200	7770	561
Lead	Lead (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.018	<0.001
Metals	Aluminium (Filtered)	mg/L	0.01	<0.01	<0.01	<0.01	0.03	0.04	<0.01	0.39	1.77	0.01
	Arsenic (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.007	<0.001	0.002	0.004
	Barium (Filtered)	mg/L	0.001	0.024	0.044	0.053	0.042	0.099	0.04	0.024	0.046	0.105
	Beryllium (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Boron (Filtered)	mg/L	0.05	0.1	0.07	0.08	0.17	0.1	0.13	0.2	0.08	<0.05
	Cadmium (Filtered)	mg/L	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	<0.0001	0.0028	0.0029	<0.0001
	Calcium (Filtered)	mg/L	1	147	128	332	42	354	169	413	232	12
	Chromium (III+VI) (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Copper (Filtered)	mg/L	0.001	0.002	0.002	0.002	0.002	0.001	0.001	0.008	0.04	0.004
	Iron (Filtered)	mg/L	0.05	0.07	0.07	0.12	0.06	1.9	5.32	31.7	6.16	<0.05
	Magnesium (Filtered)	mg/L	1	212	256	499	25	403	414	750	358	10
	Manganese (Filtered)	mg/L	0.001	1.07	0.737	2.33	0.27	1.8	1.61	7.09	1.89	0.005
	Mercury (Filtered)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Potassium (Filtered)	mg/L	1	16	14	19	8	7	9	16	18	2
	Selenium (Filtered)	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Zinc (Filtered)	mg/L	0.005	0.034	0.021	0.037	0.015	0.019	0.048	0.946	0.162	0.007

Apr 2012

Field_ID	BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8	BH10	SW1	SW2	SW3	SW4	SW5
Sampled_Date-Time	2/04/2012	2/04/2012	2/04/2012	2/04/2012	2/04/2012	2/04/2012	2/04/2012	2/04/2012	2/04/2012	2/04/2012	2/04/2012	2/04/2012	2/04/2012	19/04/2012

Chem_Group	ChemName	Units	EQL													
Field parameters	pH	pH_units		6.82	6.93	7.24	6.7	7.13	6.73	6.28	4.56	6.63	9.41	7.42	9.23	8.18	
	Redox Potential	mV		-60	-60	6	-26	167	12	-105	50	-15	-7	-24	-35	-26	
	Electrical Conductivity	uS/cm		6410	7160	11400	10500	5060	9990	6140	9330	8410	718	6110	598	4950	
	Dissolved Oxygen	mg/L		–	--	--	--	--	--	--	--	--	5.33	1.12	5..62	6.49	
Inorganics	Alkalinity (Bicarbonate as CaCO3)	mg/L	1	1150	1190	333	1080	728	897	702	2	961	115	880	106	190	1080
	Alkalinity (Carbonate as CaCO3)	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	44	<1	16	<1	<1
	Alkalinity (Hydroxide) as CaCO3	µg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Alkalinity (total) as CaCO3	mg/L	1	1150	1190	333	1080	728	897	702	2	961	159	880	122	190	1080
	Anions Total	meq/L	0.01	76.1	83.2	115	122	54.8	111	85.4	104	93.0	5.43	102	5.48	45.4	41.7
	Cations Total	meq/L	0.01	80.7	85.5	127	134	57.9	122	92.7	114	98.0	5.64	112	5.40	49.2	38.7
	Chloride	mg/L	1	591	814	2450	1790	787	1960	1200	1970	1330	80	1570	54	854	633
	Ionic Balance	%	0.01	2.92	1.36	4.84	4.67	2.71	4.67	4.11	4.22	2.64	1.79	4.69	0.81	3.91	3.74
	Nitrate (as N)	mg/L	0.01	0.01	<0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.02	<0.01	20
	Nitrite (as N)	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
	Nitrogen (Total Oxidised)	mg/L	0.01	0.01	<0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.02	<0.01	20
	pH (Lab)	pH_Units	0.01	7.56	7.62	7.58	7.39	7.57	7.15	6.92	4.76	7.43	9.22	7.95	8.71	8.27	7.97
	Sodium (Filtered)	mg/L	1	1260	1410	1720	1680	1030	1410	938	984	1300	98	1600	98	597	746
	Sulphate	mg/L	1	1750	1750	1890	2380	866	1800	1800	2340	1740	<1	1920	73	843	108
	Electrical Conductivity	uS/cm	1	6380	7180	11600	10900	5250	10200	7460	9610	8470	614	8850	530	4460	3940
Lead	Lead (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Metals	Aluminium (Filtered)	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.01	0.43	<0.01	0.05	<0.01	0.02	<0.01	0.08
	Arsenic (Filtered)	mg/L	0.001	0.001	<0.001	0.002	<0.001	0.001	0.002	0.007	0.012	<0.001	0.003	0.002	0.001	0.003	0.002
	Barium (Filtered)	mg/L	0.001	0.027	0.027	0.061	0.052	0.117	0.064	0.035	0.020	0.030	0.106	0.129	0.024	0.050	0.173
	Beryllium (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Boron (Filtered)	mg/L	0.05	0.08	0.06	<0.05	0.06	0.14	0.07	0.13	0.17	0.06	<0.05	<0.05	<0.05	0.06	0.21
	Cadmium (Filtered)	mg/L	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0019	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Calcium (Filtered)	mg/L	1	141	104	520	322	118	402	191	350	222	10	180	8	151	49
	Chromium (III+VI) (Filtered)	mg/L	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	0.001	0.002	<0.001	0.005	<0.001	<0.001
	Copper (Filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002
	Iron (Filtered)	mg/L	0.05	<0.05	0.09	0.38	0.16	1.76	6.83	7.15	38.6	0.13	0.08	0.08	0.06	0.05	0.64
	Magnesium (Filtered)	mg/L	1	224	227	310	534	84	486	512	643	364	10	400	8	187	42
	Manganese (Filtered)	mg/L	0.001	0.980	0.542	0.400	1.44	1.97	1.35	3.04	5.64	1.69	0.017	7.66	0.002	<0.001	0.477
	Mercury (Filtered)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Potassium (Filtered)	mg/L	1	17	13	22	20	10	7	9	14	18	2	17	3	10	14
	Selenium (Filtered)	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Zinc (Filtered)	mg/L	0.005	0.022	0.020	0.011	0.020	0.010	0.016	0.165	0.765	0.078	0.012	0.006	<0.005	<0.005	<0.005

Attachment C – Borehole Logs

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MONITORING WELL
BH01

CLIENT New Hope Coal Australia **PROJECT NAME** New Oakleigh Groundwater Study
PROJECT NUMBER QE09870 **PROJECT LOCATION** New Oakleigh

DATE STARTED 1/11/11 **COMPLETED** 1/12/11 **RL SURFACE** 151.3 m AHD **RL TOC** 150.7 m AHD
CONTRACTOR KA & LC Dippell **COORDINATES** 459052.0 m E 6946308.0 m N MGA94
EQUIPMENT Rotary Air/Cable Tools **LOCATION** 152" 35'.165 27" 36'.295
HOLE DIAMETER 150 to 127 mm **LOGGED BY** AH **CHECKED BY** MP
NOTES

Method	Depth (m)	Material Description	Moisture Content	Consistency / Density	Sample	PID (ppm)	Well Details	Additional Observations
RAB	0	FILL: Gravelly clay, minor coal gravel, dark brown.					2" PVC Sch. 40	
		FILL: Clayey sand, brown.						
	2	Minor coal gravel.						
	4						Gravel	
	6	Sandy CLAY, high plasticity, light grey.						
		SANDSTONE, gravels, extremely weathered, fine to medium grained, light grey/brown.					Bentonite Seal	
	8						Gravel	
							2" PVC Sch. 40 0.010" slot	
	10	SANDSTONE, gravels, very weathered, medium grained, grey.						
	12							Hole cave in, changed drilling methods to cable tools.
		Sandy CLAY, high plasticity, light grey.	W					
	14							
	16							
	18	Borehole terminated. Limit of investigation. EOH at 18.00 m						
	20							
	22							
	24							

Water
- Water level on date shown
- Water inflow
- Partial outflow
- Complete outflow

Classification symbols and soil description based on USCS

Moisture
D Dry
M Moist
W Wet

Consistency
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard

Density
VL Very Loose
L Loose
MD Medium Dense
VD Very Dense

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MONITORING WELL
BH02

CLIENT New Hope Coal Australia **PROJECT NAME** New Oakleigh Groundwater Study
PROJECT NUMBER QE09870 **PROJECT LOCATION** New Oakleigh

DATE STARTED 1/11/11 **COMPLETED** 1/12/11 **RL SURFACE** 151.3 m AHD **RL TOC** 152.0 m AHD
CONTRACTOR KA & LC Dippell **COORDINATES** 459024.0 m E 6946227.0 m N MGA94
EQUIPMENT Rotary Air/Cable Tools **LOCATION** 152" 35'.143 27" 36'.341
HOLE DIAMETER 150 to 127 mm **LOGGED BY** AH **CHECKED BY** MP
NOTES

Depth (m)	Material Description	Moisture Content	Consistency / Density	Sample	PID (ppm)	Well Details	Additional Observations
0	FILL: Gravelly clay, minor coal gravel, dark brown.						2" PVC Sch. 40
2	FILL: Clayey sand, light brown to grey.						
4							
5.6	SANDSTONE, gravels, extremely weathered, fine to medium grained, light grey/brown.						Gravel
6							Bentonite Seal
8							Gravel
8							2" PVC Sch. 40 0.010" slot
8	Inflow ▼						
10	Light grey, clayey	W					
12							
14							
16							
16	Coal						
16	SANDSTONE, gravels, dark grey, clayey						
16.6	Borehole terminated. Limit of investigation EOH at 16.60 m						
18							
20							
22							
24							

Water
- Water level on date shown
- Water inflow
- Partial outflow
- Complete outflow

Classification symbols and soil description based on USCS

Moisture
D Dry
M Moist
W Wet

Consistency
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard

Density
VL Very Loose
L Loose
MD Medium Dense
VD Very Dense

SKM 2011 LOG NEW OAKLEIGH BORE LOGS.GPJ SKM_02 LIB.GLB 17/4/12

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MONITORING WELL
BH03

CLIENT New Hope Coal Australia **PROJECT NAME** New Oakleigh Groundwater Study
PROJECT NUMBER QE09870 **PROJECT LOCATION** New Oakleigh

DATE STARTED 1/11/11 **COMPLETED** 1/12/11 **RL SURFACE** 161.0 m AHD **RL TOC** 161.6 m AHD
CONTRACTOR KA & LC Dippell **COORDINATES**
EQUIPMENT Rotary Air/Cable Tools **LOCATION** 152" 35'.129 27" 36'.436
HOLE DIAMETER 150 to 127 mm **LOGGED BY** AH **CHECKED BY** MP
NOTES

Depth (m)	Material Description	Classification Symbol	Graphic Log	Water	Moisture Content	Consistency / Density	Sample	PID (ppm)	Well Details	Additional Observations
0	FILL: sandy clay, light brown, trace coal gravel.									2" PVC Sch. 40
8	SILTSTONE gravels: brown			During drilling						Bentonite; Gravel; 2" PVC Sch. 40 0.010" slot
12	COAL and COALSTONE gravels									
14	COALSTONE and SILTSTONE gravels									
16	Borehole terminated. Limit of investigation EOH at 16.00 m									

Water
- Water level on date shown
- Water inflow
- Partial outflow
- Complete outflow

Classification symbols and soil description based on USCS

Moisture
D Dry
M Moist
W Wet

Consistency
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard

Density
VL Very Loose
L Loose
MD Medium Dense
VD Very Dense

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MONITORING WELL
BH04

CLIENT New Hope Coal Australia **PROJECT NAME** New Oakleigh Groundwater Study
PROJECT NUMBER QE09870 **PROJECT LOCATION** New Oakleigh

DATE STARTED 1/11/11 **COMPLETED** 1/12/11 **RL SURFACE** 153.2 m AHD **RL TOC** 153.8 m AHD
CONTRACTOR KA & LC Dippell **COORDINATES** 459399.0 m E 6946436.0 m N MGA94
EQUIPMENT Rotary Air/Cable Tools **LOCATION** 152" 35'.379 27" 36'.228
HOLE DIAMETER 150 to 127 mm **LOGGED BY** AH **CHECKED BY** MP
NOTES

Depth (m)	Material Description
0	FILL: silty gravel, light brown.
1	FILL: gravelly clay, minor coal gravel, dark brown.
4	FILL: sandy clay, trace coal gravel.
6	Minor weathered sandstone.
7.5	SANDSTONE, gravels, extremely weathered, fine to medium grained, light grey.
8	Trace fine grained gravel.
11.5	Becoming dark brown.
12	SILTSTONE and SANDSTONE gravels
15	SILTSTONE gravel
18	COALSTONE gravel
18.5	SILTSTONE gravel
18.5	Borehole terminated. Limit of investigation. EOH at 18.50 m

During drilling ▼

Well Details: 2" PVC Sch. 40; Gravel; Bentonite; Gravel; 2" PVC Sch. 40 0.010" slot

Additional Observations: Hole collapse

Water
- Water level on date shown
- Water inflow
- Partial outflow
- Complete outflow

Classification symbols and soil description based on USCS

Moisture
D Dry
M Moist
W Wet

Consistency
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard

Density
VL Very Loose
L Loose
MD Medium Dense
VD Very Dense

SKM 2011 LOG NEW OAKLEIGH BORE LOGS.GPJ SKM_02 LIB.GLB 17/4/12

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MONITORING WELL
BH05

CLIENT New Hope Coal Australia **PROJECT NAME** New Oakleigh Groundwater Study
PROJECT NUMBER QE09870 **PROJECT LOCATION** New Oakleigh

DATE STARTED 1/11/11 **COMPLETED** 1/12/11 **RL SURFACE** 106.1 m AHD **RL TOC** 106.7 m AHD
CONTRACTOR KA & LC Dippell **COORDINATES** 458748.0 m E 6945085.0 m N MGA94
EQUIPMENT Rotary Air/Cable Tools **LOCATION** 152" 34'.979 27" 36'.947
HOLE DIAMETER 150 to 127 mm **LOGGED BY** AH **CHECKED BY** MP
NOTES

Depth (m)	Material Description	Moisture Content	Well Details	Additional Observations
0	FILL: clay with minor soft shales, brown			2" PVC Sch. 40
	Dark brown, organic odour			
2				
	Trace coal gravel			
4	Becoming light grey, no odour			Gravel
6	Dark brown			
8				
10				Bentonite
				Gravel
12	Trace soft shales			
				2" PVC Sch. 40 0.010" slot
14				
16	SILTSTONE, gravels, dark brown/grey/brown	W		
18				
20				
22				
24				

During drilling

Water
- Water level on date shown
- Water inflow
- Partial outflow
- Complete outflow

Classification symbols and soil description based on USCS

Moisture
D Dry
M Moist
W Wet

Consistency
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard

Density
VL Very Loose
L Loose
MD Medium Dense
VD Very Dense

SKM 2011 LOG NEW OAKLEIGH BORE LOGS.GPJ SKM_02 LIB.GLB 17/4/12

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MONITORING WELL
BH05

CLIENT New Hope Coal Australia
PROJECT NAME New Oakleigh Groundwater Study
PROJECT NUMBER QE09870
PROJECT LOCATION New Oakleigh

DATE STARTED 1/11/11 **COMPLETED** 1/12/11
RL SURFACE 106.1 m AHD **RL TOC** 106.7 m AHD
CONTRACTOR KA & LC Dippell
COORDINATES 458748.0 m E 6945085.0 m N MGA94
EQUIPMENT Rotary Air/Cable Tools
LOCATION 152" 34'.979 27" 36'.947
HOLE DIAMETER 150 to 127 mm
LOGGED BY AH **CHECKED BY** MP
NOTES

Method	Water	Depth (m)	Graphic Log	Classification Symbol	Material Description	Moisture Content	Consistency / Density	Sample	PID (ppm)	Well Details	Additional Observations
					Borehole terminated. Limit of investigation. EOH at 25.00 m						

Water
- Water level on date shown
- Water inflow
- Partial outflow
- Complete outflow

Classification symbols and soil description based on USCS

Moisture
- D Dry
- M Moist
- W Wet

Consistency
- VS Very Soft
- S Soft
- F Firm
- St Stiff
- VSt Very Stiff
- H Hard

Density
- VL Very Loose
- L Loose
- MD Medium Dense
- VD Very Dense

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MONITORING WELL
BH06
PAGE 1 OF 1

CLIENT New Hope Coal Australia
PROJECT NAME New Oakleigh Groundwater Study
PROJECT NUMBER QE09870
PROJECT LOCATION New Oakleigh

DATE STARTED 22/11/11 **COMPLETED** 24/11/11
RL SURFACE 106.4 m AHD **RL TOC** 107.0 m AHD
CONTRACTOR KA & LC Dippell
COORDINATES 458812.0 m E 6945167.0 m N MGA94
EQUIPMENT Rotary Air/Cable Tools
LOCATION 152" 35'.017 27" 36'.915
HOLE DIAMETER 150 to 127 mm
LOGGED BY AH **CHECKED BY** MP
NOTES

Method	Water	Depth (m)	Graphic Log	Classification Symbol	Material Description	Moisture Content	Consistency / Density	Sample	PID (ppm)	Well Details	Additional Observations
		0			FILL: Sandy clay, brown.						2" PVC Sch. 40
					Minor coal gravel.						
		2			Medium to high plasticity, dark brown, trace coal gravel.						
		4									
					No recovery.						Bentonite Seal
		6									Gravel
					FILL: Shales and coal.						
		8									2" PVC Sch. 40 0.010" slot
	▼	10				W					
		12									
		14									
					Borehole terminated on rock. EOH at 14.50 m						
		16									
		18									
		20									
		22									
		24									

Water
- ▼ Water level on date shown
- ► Water inflow
- ◁ Partial outflow
- ◄ Complete outflow

Classification symbols and soil description based on USCS

Moisture
- D Dry
- M Moist
- W Wet

Consistency
- VS Very Soft
- S Soft
- F Firm
- St Stiff
- VSt Very Stiff
- H Hard

Density
- VL Very Loose
- L Loose
- MD Medium Dense
- VD Very Dense

SKM 2011 LOG NEW OAKLEIGH BORE LOGS.GPJ SKM_02 LIB.GLB 17/4/12

SKM Pty Ltd
32 Cordelia Street
South Brisbane QLD 4101
Telephone: 07 3026 7100

MONITORING WELL
BH07

CLIENT New Hope Coal Australia
PROJECT NAME New Oakleigh Groundwater Study
PROJECT NUMBER QE09870
PROJECT LOCATION New Oakleigh

DATE STARTED 1/10/11 **COMPLETED** 31/10/11
RL SURFACE 149.6 m AHD **RL TOC** 150.2 m AHD
CONTRACTOR KA & LC Dippell
COORDINATES 459382.0 m E 6946514.0 m N MGA94
EQUIPMENT Rotary Air
LOCATION 152" 35'.365 27" 36'.179
HOLE DIAMETER 150 mm
LOGGED BY AH **CHECKED BY** MP
NOTES

Depth (m)	Material Description	Sample	Additional Observations
0	FILL: Clay, dark brown.		2" PVC Sch. 40
	FILL: Sandy clay, light brown, trace cobbles.		
2	Brown / light grey.		
	NATURAL: COAL, extremely weathered , black, high plasticity.		
4	Sandy CLAY, light brown.		
	COAL, extremely weathered, dark brown to black.		
	Dark brown.		Bentonite Seal
6	SANDSTONE, extremely weathered, very fine grained, light grey.		Gravel
	MUDSTONE, extremely weathered, light grey.		2" PVC Sch. 40 0.010" slot
8	Trace coal gravel.		
	COAL, dark brown.		
10	SANDSTONE, highly weathered, fine grained, light grey.		
12	Increasing fines.		
	COAL, dark brown.		
14	MUDSTONE, dark brown.		
	SANDSTONE, highly weathered, fine to medium grained, light grey.		
16	Borehole terminated. Limit of investigation. EOH at 16.00 m		
18			
20			
22			
24			

Water: at 1.38pm 1/11/11; Inflow; Inflow

Water
- Water level on date shown
- Water inflow
- Partial outflow
- Complete outflow

Classification symbols and soil description based on USCS

Moisture
D Dry
M Moist
W Wet

Consistency
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard

Density
VL Very Loose
L Loose
MD Medium Dense
VD Very Dense

SKM Pty Ltd
32 Cordelia Street
South Brisbane QLD 4101
Telephone: 07 3026 7100

MONITORING WELL
BH08

CLIENT New Hope Coal Australia
PROJECT NAME New Oakleigh Groundwater Study
PROJECT NUMBER QE09870
PROJECT LOCATION New Oakleigh

DATE STARTED 1/10/11 **COMPLETED** 31/10/11
RL SURFACE 156.8 m AHD **RL TOC** 157.4 m AHD
CONTRACTOR KA & LC Dippell
COORDINATES 459165.0 m E 6946426.0 m N MGA94
EQUIPMENT Rotary Air
LOCATION 152" 35'.279 27" 36'.233
HOLE DIAMETER 150 mm
LOGGED BY AH **CHECKED BY** MP
NOTES

Depth (m)	Material Description	Well Details / Additional Observations
	Topsoil: organic clay, mottled brown.	2" PVC Sch. 40
2	NATURAL: SANDSTONE, highly weathered, fine to medium grained, light brown.	
4		
6	SANDSTONE, highly weathered, fine to medium grained, brown (70%) interbedded with subordinate highly weathered siltstone, light red (30%).	
8		
	SILTSTONE, highly weathered siltstone, light red (90%) stratified with minor highly weathered sandstone (10%).	
10	MUDSTONE, trace sand, brown.	
12		
	COAL, highly weathered.	Bentonite Seal
14	SILTSTONE, highly weathered, banded, minor coal.	Gravel
	COAL, weathered.	2" PVC Sch. 40 0.010" slot
16	SILTSTONE, highly weathered, light grey.	
Inflow	SANDSTONE, highly weathered, fine grained, interbedded with minor siltstone.	
18		
	SILTSTONE, highly weathered, minor interbedding with very fine grained sandstone, grey.	
20	SANDSTONE, Highly weathered, very fine grained, grey.	
22		
Inflow	Coal, dark brown.	
	Trace fines	
24	Borehole terminated. Limit of investigation. EOH at 24.00 m	

Water
- Water level on date shown
- Water inflow
- Partial outflow
- Complete outflow

Classification symbols and soil description based on USCS

Moisture
D Dry
M Moist
W Wet

Consistency
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard

Density
VL Very Loose
L Loose
MD Medium Dense
VD Very Dense

SKM Pty Ltd
32 Cordelia Street
South Brisbane QLD 4101
Telephone: 07 3026 7100

MONITORING WELL
BH09

CLIENT New Hope Coal Australia **PROJECT NAME** New Oakleigh Groundwater Study

PROJECT NUMBER QE09870 **PROJECT LOCATION** New Oakleigh

DATE STARTED 1/11/11 **COMPLETED** 30/11/11 **RL SURFACE** 141.2 m AHD **RL TOC** 141.6 m AHD

CONTRACTOR SKM **COORDINATES** 459332.0 m E 6946577.0 m N MGA94

EQUIPMENT Hand Auger **LOCATION**

HOLE DIAMETER 100 mm **LOGGED BY** AH **CHECKED BY** MP

NOTES

Method	Water	Depth (m)	Graphic Log	Classification Symbol	Material Description	Moisture Content	Consistency / Density	Sample	PID (ppm)	Well Details	Additional Observations
		0		CI	TOPSOIL: sandy clay, organics, soft, intermediate, brown						2" PVC Sch. 40 (0.15m) Bentonite Seal (0.15 - 0.2m) Gravel (0.2- 0.8m) 2" PVC Sch. 40 0.010" slot (0.3-0.8m)
				CL	NATURAL: Sandy CLAY, trace gravel and cobbles. low plasticity, soft, brown.						
					Refusal on cobble. EOH at 0.80 m						
		2									
		4									
		6									
		8									
		10									
		12									
		14									
		16									
		18									
		20									
		22									
		24									

Water
- Water level on date shown
- Water inflow
- Partial outflow
- Complete outflow

Classification symbols and soil description based on USCS

Moisture
D Dry
M Moist
W Wet

Consistency
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard

Density
VL Very Loose
L Loose
MD Medium Dense
VD Very Dense

SKM Pty Ltd
32 Cordelia Street
South Brisbane QLD 4101
Telephone: 07 3026 7100

MONITORING WELL
BH10

CLIENT New Hope Coal Australia **PROJECT NAME** New Oakleigh Groundwater Study

PROJECT NUMBER QE09870 **PROJECT LOCATION** New Oakleigh

DATE STARTED 1/12/11 **COMPLETED** 31/12/11 **RL SURFACE** 140.6 m AHD **RL TOC** 141.1 m AHD

CONTRACTOR SKM **COORDINATES** 458972.0 m E 6946332.0 m N MGA94

EQUIPMENT Hand Auger **LOCATION**

HOLE DIAMETER 100 mm **LOGGED BY** AH **CHECKED BY** MP

NOTES

Method	Water	Depth (m)	Graphic Log	Classification Symbol	Material Description	Moisture Content	Consistency / Density	Sample	PID (ppm)	Well Details	Additional Observations
				CI	TOPSOIL: sandy clay, organic, soft, medium plasticity, gleyed, dark blue, organic odour.						2" PVC Sch. 40 (0.15m) Bentonite Seal (0.15 - 0.2m) Gravel (0.2- 0.8m) 2" PVC Sch. 40 0.010" slot (0.3-0.8m)
				CI	FILL: sandy clay with trace gravel, medium to coarse grained sand, low plasticity, soft, brown/dark brown.						
				CH	NATURAL: CLAY, high plasticity, soft, grey/brown.						
		2			Refusal on cobble. EOH at 1.50 m						
		4									
		6									
		8									
		10									
		12									
		14									
		16									
		18									
		20									
		22									
		24									

Water
- Water level on date shown
- Water inflow
- Partial outflow
- Complete outflow

Classification symbols and soil description based on USCS

Moisture
D Dry
M Moist
W Wet

Consistency
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard

Density
VL Very Loose
L Loose
MD Medium Dense
VD Very Dense

Attachment D – Survey Data (from NHC)

Location of groundwater bores installed by SKM in December 2011 as part of North Pit Seepage Investigation
Points surveyed by Peter MacDonald and Ross Bennett 11/01/2012

Bore	Easting AMG	Northing AMG	Level Standpipe	Level Ground
Bore 1	459051.857	6946308.223	151.345	150.692
Bore 2	459024.802	6946227.488	151.96	151.318
Bore 3	458988.162	6946049.531	161.649	161.039
Bore 4	459398.82	6946436.222	153.774	153.188
Bore 5	458747.857	6945085.296	106.724	106.101
Bore 6	458812.391	6945166.682	107.008	106.376
Bore 7	459381.983	6946514.466	150.24	149.574
Bore 8	459165.458	6946425.567	157.382	156.75
Bore 9	459331.885	6946576.954	141.591	141.16
Bore 10	458972.506	6946332.039	141.142	140.586

Attachment E – Laboratory Data

ALS Group
Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB1203544**	Page	: 1 of 6
Client	: **SINCLAIR KNIGHT MERZ**	Laboratory	: Environmental Division Brisbane
Contact	: MR MATTHEW POMEROY	Contact	: Customer Services
Address	: P O BOX 3848 SOUTH BRISBANE QLD, AUSTRALIA 4101	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: mpomeroy@globalskm.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3026 7100	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3026 7300	Facsimile	: +61 7 3243 7218
Project	: NEW OAKLEIGH GW	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: QE09870		
C-O-C number	: ----	Date Samples Received	: 08-FEB-2012
Sampler	: M.POMEROY & O.KANAS	Issue Date	: 15-FEB-2012
Site	: ----		
		No. of samples received	: 10
Quote number	: EN/003/11	No. of samples analysed	: 10

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics

General Comments

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

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

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

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

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

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

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: MW1	MW2	SW1	MW4	MW5
				Client sampling date / time: 07-FEB-2012 15:00	07-FEB-2012 15:00	07-FEB-2012 15:00	07-FEB-2012 15:00	07-FEB-2012 15:00
				EB1203544-001	EB1203544-002	EB1203544-003	EB1203544-004	EB1203544-005
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.42	7.65	9.52	7.40	7.69
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	6120	7450	561	9920	3340
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	66	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	1240	1220	80	1150	787
Total Alkalinity as CaCO3	----	1	mg/L	1240	1220	146	1150	787
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1590	1660	39	2120	493
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	613	986	68	1700	396
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	147	128	12	332	42
Magnesium	7439-95-4	1	mg/L	212	256	10	499	25
Sodium	7440-23-5	1	mg/L	1250	1510	92	1570	835
Potassium	7440-09-7	1	mg/L	16	14	2	19	8
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.01	<0.01	0.03
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.004	<0.001	0.001
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L	0.024	0.044	0.105	0.053	0.042
Cadmium	7440-43-9	0.0001	mg/L	0.0001	0.0002	<0.0001	0.0001	0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.002	0.002	0.004	0.002	0.002
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	1.07	0.737	0.005	2.33	0.270
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	0.034	0.021	0.007	0.037	0.015
Boron	7440-42-8	0.05	mg/L	0.10	0.07	<0.05	0.08	0.17
Iron	7439-89-6	0.05	mg/L	0.07	0.07	<0.05	0.12	0.06
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: MW1	MW2	SW1	MW4	MW5
				Client sampling date / time: 07-FEB-2012 15:00	07-FEB-2012 15:00	07-FEB-2012 15:00	07-FEB-2012 15:00	07-FEB-2012 15:00
				EB1203544-001	EB1203544-002	EB1203544-003	EB1203544-004	EB1203544-005
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.04**	<0.01	<0.01	**0.02**	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.04**	<0.01	<0.01	**0.02**	<0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**75.2**	**86.8**	**5.65**	**115**	**37.2**
Total Cations	----	0.01	meq/L	**79.6**	**93.5**	**5.47**	**126**	**40.7**
Ionic Balance	----	0.01	%	**2.80**	**3.71**	**1.58**	**4.68**	**4.48**

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: MW6	MW7	MW8	DUP1	MW10
				Client sampling date / time: 07-FEB-2012 15:00	07-FEB-2012 15:00	07-FEB-2012 15:00	07-FEB-2012 15:00	07-FEB-2012 15:00
				EB1203544-006	EB1203544-007	EB1203544-008	EB1203544-009	EB1203544-010
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.35	7.06	4.86	----	7.41
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	8530	6430	10200	----	7770
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	872	880	4	----	1050
Total Alkalinity as CaCO3	----	1	mg/L	872	880	4	----	1050
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1430	1260	1980	----	1460
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	1670	1090	2560	----	1350
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	354	169	413	----	232
Magnesium	7439-95-4	1	mg/L	403	414	750	----	358
Sodium	7440-23-5	1	mg/L	1140	902	945	----	1310
Potassium	7440-09-7	1	mg/L	7	9	16	----	18
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.04	<0.01	0.39	0.02	1.77
Arsenic	7440-38-2	0.001	mg/L	<0.001	0.007	<0.001	0.003	0.002
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L	0.099	0.040	0.024	0.101	0.046
Cadmium	7440-43-9	0.0001	mg/L	0.0001	<0.0001	0.0028	<0.0001	0.0029
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.001	0.001	0.008	0.003	0.040
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.001	<0.001	0.018
Manganese	7439-96-5	0.001	mg/L	1.80	1.61	7.09	0.006	1.89
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	0.019	0.048	0.946	0.008	0.162
Boron	7440-42-8	0.05	mg/L	0.10	0.13	0.20	<0.05	0.08
Iron	7439-89-6	0.05	mg/L	1.90	5.32	31.7	<0.05	6.16
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	<0.01	<0.01	<0.01	----	<0.01

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: MW6	MW7	MW8	DUP1	MW10
				Client sampling date / time: 07-FEB-2012 15:00	07-FEB-2012 15:00	07-FEB-2012 15:00	07-FEB-2012 15:00	07-FEB-2012 15:00
				EB1203544-006	EB1203544-007	EB1203544-008	EB1203544-009	EB1203544-010
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	<0.01	----	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	<0.01	----	<0.01
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**94.3**	**74.6**	**114**	----	**89.5**
Total Cations	----	0.01	meq/L	**101**	**82.0**	**124**	----	**98.5**
Ionic Balance	----	0.01	%	**3.22**	**4.71**	**4.35**	----	**4.78**

ALS Group
Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB1209042**	Page	: 1 of 8
Client	: **SINCLAIR KNIGHT MERZ**	Laboratory	: Environmental Division Brisbane
Contact	: MR MATTHEW POMEROY	Contact	: Customer Services
Address	: P O BOX 3848 SOUTH BRISBANE QLD, AUSTRALIA 4101	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: mpomeroy@globalskm.com	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3026 7100	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3026 7300	Facsimile	: +61 7 3243 7218
Project	: QE09870 NEW OAKLEIGH	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 02-APR-2012
Sampler	: O.Kanas	Issue Date	: 12-APR-2012
Site	: ----		
		No. of samples received	: 14
Quote number	: EN/003/11	No. of samples analysed	: 13

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Andrew Epps	Metals Production Chemist	Brisbane Inorganics
Jonathon Angell	Inorganic Coordinator	Brisbane Inorganics
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics

General Comments

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

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

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

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

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID	MB1	MB2	MB3	MB4	MB5
				Client sampling date / time	02-APR-2012 15:00	02-APR-2012 15:00	02-APR-2012 15:00	02-APR-2012 15:00	02-APR-2012 15:00
					EB1209042-001	EB1209042-002	EB1209042-003	EB1209042-004	EB1209042-005
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.56	7.62	7.58	7.39	7.57
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		6380	7180	11600	10900	5250
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		1150	1190	333	1080	728
Total Alkalinity as CaCO3	----	1	mg/L		1150	1190	333	1080	728
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		1750	1750	1890	2380	866
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		591	814	2450	1790	787
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		141	104	520	322	118
Magnesium	7439-95-4	1	mg/L		224	227	310	534	84
Sodium	7440-23-5	1	mg/L		1260	1410	1720	1680	1030
Potassium	7440-09-7	1	mg/L		17	13	22	20	10
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	0.02
Arsenic	7440-38-2	0.001	mg/L		0.001	<0.001	0.002	<0.001	0.001
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L		0.027	0.027	0.061	0.052	0.117
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		0.980	0.542	0.400	1.44	1.97
Molybdenum	7439-98-7	0.001	mg/L		0.003	0.032	0.024	0.007	0.003
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		0.022	0.020	0.011	0.020	0.010
Boron	7440-42-8	0.05	mg/L		0.08	0.06	<0.05	0.06	0.14
Iron	7439-89-6	0.05	mg/L		<0.05	0.09	0.38	0.16	1.76
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: WATER			Client sample ID	MB1	MB2	MB3	MB4	MB5
			Client sampling date / time	02-APR-2012 15:00	02-APR-2012 15:00	02-APR-2012 15:00	02-APR-2012 15:00	02-APR-2012 15:00
Compound	CAS Number	LOR	Unit	EB1209042-001	EB1209042-002	EB1209042-003	EB1209042-004	EB1209042-005
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.01**	<0.01	**0.01**	**0.01**	**0.01**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.01**	<0.01	**0.01**	**0.01**	**0.01**
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**76.1**	**83.2**	**115**	**122**	**54.8**
Total Cations	----	0.01	meq/L	**80.7**	**85.5**	**127**	**134**	**57.9**
Ionic Balance	----	0.01	%	**2.92**	**1.36**	**4.84**	**4.67**	**2.71**

Analytical Results

Sub-Matrix: WATER				Client sample ID	MB6	MB7	MB8	MB10	SW1
				Client sampling date / time	02-APR-2012 15:00	02-APR-2012 15:00	02-APR-2012 15:00	02-APR-2012 15:00	02-APR-2012 15:00
Compound	CAS Number	LOR	Unit		EB1209042-006	EB1209042-007	EB1209042-008	EB1209042-009	EB1209042-010
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.15	6.92	4.76	7.43	9.22
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		10200	7460	9610	8470	614
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	44
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		897	702	2	961	115
Total Alkalinity as CaCO3	----	1	mg/L		897	702	2	961	159
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		1800	1800	2340	1740	<1
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		1960	1200	1970	1330	80
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		402	191	350	222	10
Magnesium	7439-95-4	1	mg/L		486	512	643	364	10
Sodium	7440-23-5	1	mg/L		1410	938	984	1300	98
Potassium	7440-09-7	1	mg/L		7	9	14	18	2
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	0.01	0.43	<0.01	0.05
Arsenic	7440-38-2	0.001	mg/L		0.002	0.007	0.012	<0.001	0.003
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L		0.064	0.035	0.020	0.030	0.106
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	0.0001	0.0019	0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	0.004	0.001	0.002
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		1.35	3.04	5.64	1.69	0.017
Molybdenum	7439-98-7	0.001	mg/L		0.001	0.003	<0.001	0.004	0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		0.016	0.165	0.765	0.078	0.012
Boron	7440-42-8	0.05	mg/L		0.07	0.13	0.17	0.06	<0.05
Iron	7439-89-6	0.05	mg/L		6.83	7.15	38.6	0.13	0.08
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: MB6	MB7	MB8	MB10	SW1
				Client sampling date / time: 02-APR-2012 15:00	02-APR-2012 15:00	02-APR-2012 15:00	02-APR-2012 15:00	02-APR-2012 15:00
				EB1209042-006	EB1209042-007	EB1209042-008	EB1209042-009	EB1209042-010
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.02**	**0.01**	**0.01**	**0.01**	**0.02**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.02**	**0.01**	**0.01**	**0.01**	**0.02**
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**111**	**85.4**	**104**	**93.0**	**5.43**
Total Cations	----	0.01	meq/L	**122**	**92.7**	**114**	**98.0**	**5.64**
Ionic Balance	----	0.01	%	**4.67**	**4.11**	**4.22**	**2.64**	**1.79**

Analytical Results

Sub-Matrix: WATER				Client sample ID	SW2	SW3	SW4	----	----
				Client sampling date / time	02-APR-2012 15:00	02-APR-2012 15:00	02-APR-2012 15:00	----	----
Compound	CAS Number	LOR	Unit		EB1209042-011	EB1209042-012	EB1209042-013	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.95	8.71	8.27	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		8850	530	4460	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	16	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		880	106	190	----	----
Total Alkalinity as CaCO3	----	1	mg/L		880	122	190	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		1920	73	843	----	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		1570	54	854	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		180	8	151	----	----
Magnesium	7439-95-4	1	mg/L		400	8	187	----	----
Sodium	7440-23-5	1	mg/L		1600	98	597	----	----
Potassium	7440-09-7	1	mg/L		17	3	10	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	0.02	<0.01	----	----
Arsenic	7440-38-2	0.001	mg/L		0.002	0.001	0.003	----	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Barium	7440-39-3	0.001	mg/L		0.129	0.024	0.050	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	0.005	<0.001	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Manganese	7439-96-5	0.001	mg/L		7.66	0.002	<0.001	----	----
Molybdenum	7439-98-7	0.001	mg/L		0.004	0.002	0.001	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Zinc	7440-66-6	0.005	mg/L		0.006	<0.005	<0.005	----	----
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	0.06	----	----
Iron	7439-89-6	0.05	mg/L		0.08	0.06	0.05	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	0.01	mg/L		<0.01	<0.01	<0.01	----	----

Analytical Results

Sub-Matrix: WATER			Client sample ID	SW2	SW3	SW4	----	----
			Client sampling date / time	02-APR-2012 15:00	02-APR-2012 15:00	02-APR-2012 15:00	----	----
Compound	CAS Number	LOR	Unit	EB1209042-011	EB1209042-012	EB1209042-013	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.02**	**0.02**	<0.01	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.02**	**0.02**	<0.01	----	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**102**	**5.48**	**45.4**	----	----
Total Cations	----	0.01	meq/L	**112**	**5.40**	**49.2**	----	----
Ionic Balance	----	0.01	%	**4.69**	**0.81**	**3.91**	----	----

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EM1204457**	Page	: 1 of 4
Client	: **SINCLAIR KNIGHT MERZ**	Laboratory	: Environmental Division Melbourne
Contact	: MR MATTHEW POMEROY	Contact	: Carol Walsh
Address	: 32 CORDELIA STREET SOUTH BRISBANE QLD, AUSTRALIA 4101	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: mpomeroy@skm.com.au	E-mail	: carol.walsh@alsglobal.com
Telephone	: +61 07 3026 7100	Telephone	: +61-3-8549 9608
Facsimile	: ----	Facsimile	: +61-3-8549 9601
Project	: QE09870 - New Oakleigh	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 23-APR-2012
Sampler	: MP	Issue Date	: 27-APR-2012
Site	: ----		
		No. of samples received	: 1
Quote number	: EN/003/11	No. of samples analysed	: 1

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics
Varsha Ho Wing	Non-Metals Team Leader	Melbourne Inorganics

General Comments

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

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

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

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

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

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

- **Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.**

Analytical Results

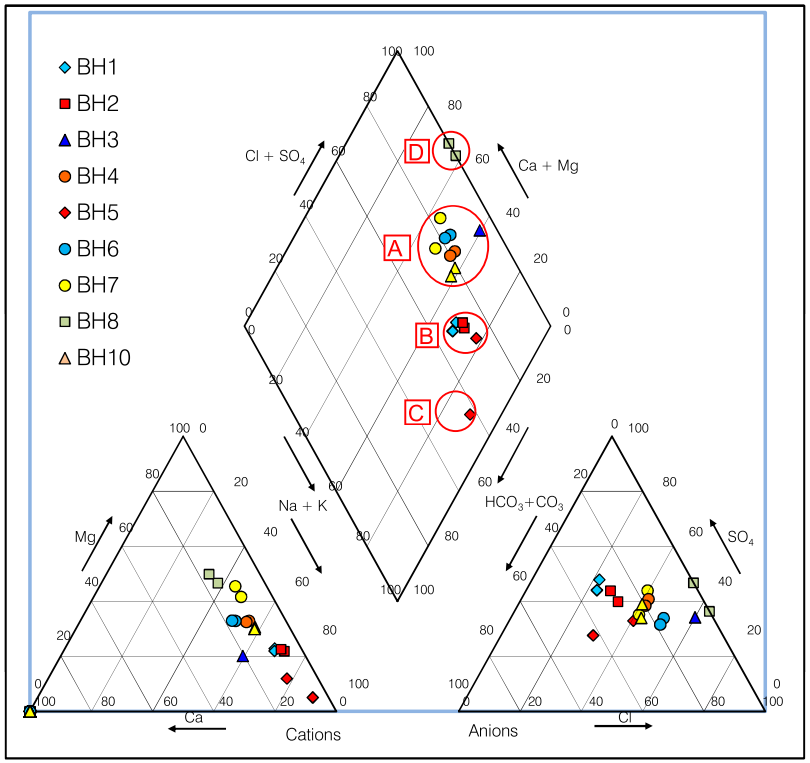
Sub-Matrix: WATER				Client sample ID	SW5	----	----	----	----
				Client sampling date / time	19-APR-2012 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EM1204457-001	----	----	----	----
EA005: pH									
pH Value	----	0.01	pH Unit		**7.97**	----	----	----	----
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		**3940**	----	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**1080**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**1080**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**108**	----	----	----	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		**633**	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**49**	----	----	----	----
Magnesium	7439-95-4	1	mg/L		**42**	----	----	----	----
Sodium	7440-23-5	1	mg/L		**746**	----	----	----	----
Potassium	7440-09-7	1	mg/L		**14**	----	----	----	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.08**	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L		**0.002**	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L		**0.173**	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L		**0.002**	----	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L		**0.477**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L		**0.002**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	----	----	----	----
Boron	7440-42-8	0.05	mg/L		**0.21**	----	----	----	----
Iron	7439-89-6	0.05	mg/L		**0.64**	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	0.01	mg/L		**0.02**	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									

Analytical Results

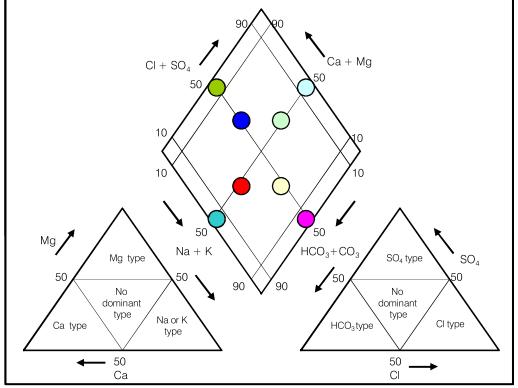
Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: SW5	----	----	----	----
				Client sampling date / time: 19-APR-2012 15:00	----	----	----	----
				EM1204457-001	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser - Continued								
Nitrate as N	14797-55-8	0.01	mg/L	**20.0**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**20.0**	----	----	----	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**41.7**	----	----	----	----
Total Cations	----	0.01	meq/L	**38.7**	----	----	----	----
Ionic Balance	----	0.01	%	**3.74**	----	----	----	----

Attachment F – Piper Plots



WATER TYPE CATEGORISATION



WATER TYPE SUB-FIELDS

- Ca + Mg, Na + K type
- Ca + Mg type
- HCO_3, Cl + SO_4 type
- HCO_3 + CO_3 type
- Na + K, Ca + Mg type
- Na + K type
- Cl + SO_4, HCO_3 type
- Cl + SO_4 type

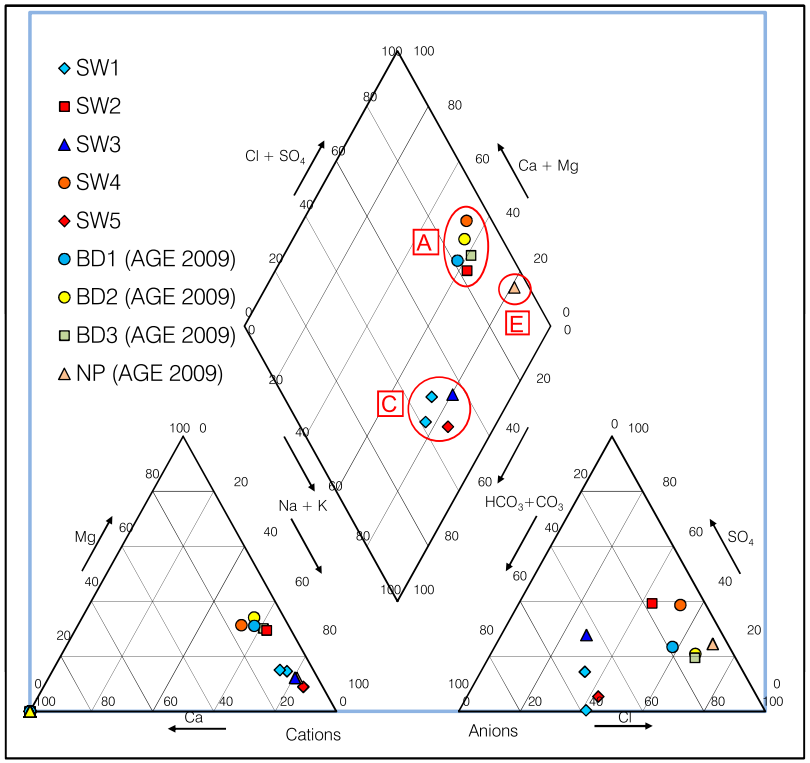
SINCLAIR KNIGHT MERZ SKM

Piper Diagram

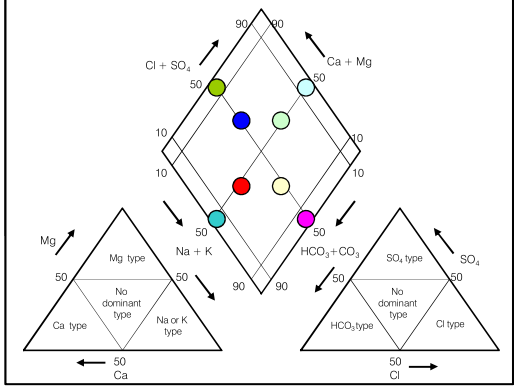
F.1

Date:	16/04/2012	Project:	New Oakleigh GW	Description:	April 2012 Water Sampling
PATH: I:\QENV\Projects\QE09870\Technical\Chemistry\[Hydrochem file april data_DMc_GW.xls]PI		Project No:	QE09870	Client:	New Hope Coal

HydroCHEM 1.0



WATER TYPE CATEGORISATION



WATER TYPE SUB-FIELDS

- Ca + Mg, Na + K type
- Ca + Mg type
- HCO_3, Cl + SO_4 type
- HCO_3 + CO_3 type
- Na + K, Ca + Mg type
- Na + K type
- Cl + SO_4, HCO_3 type
- Cl + SO_4 type

SINCLAIR KNIGHT MERZ SKM

Piper Diagram

F.2

Date: 16/04/2012

Project: New Oakleigh GW

Description: April 2012 Water Sampling

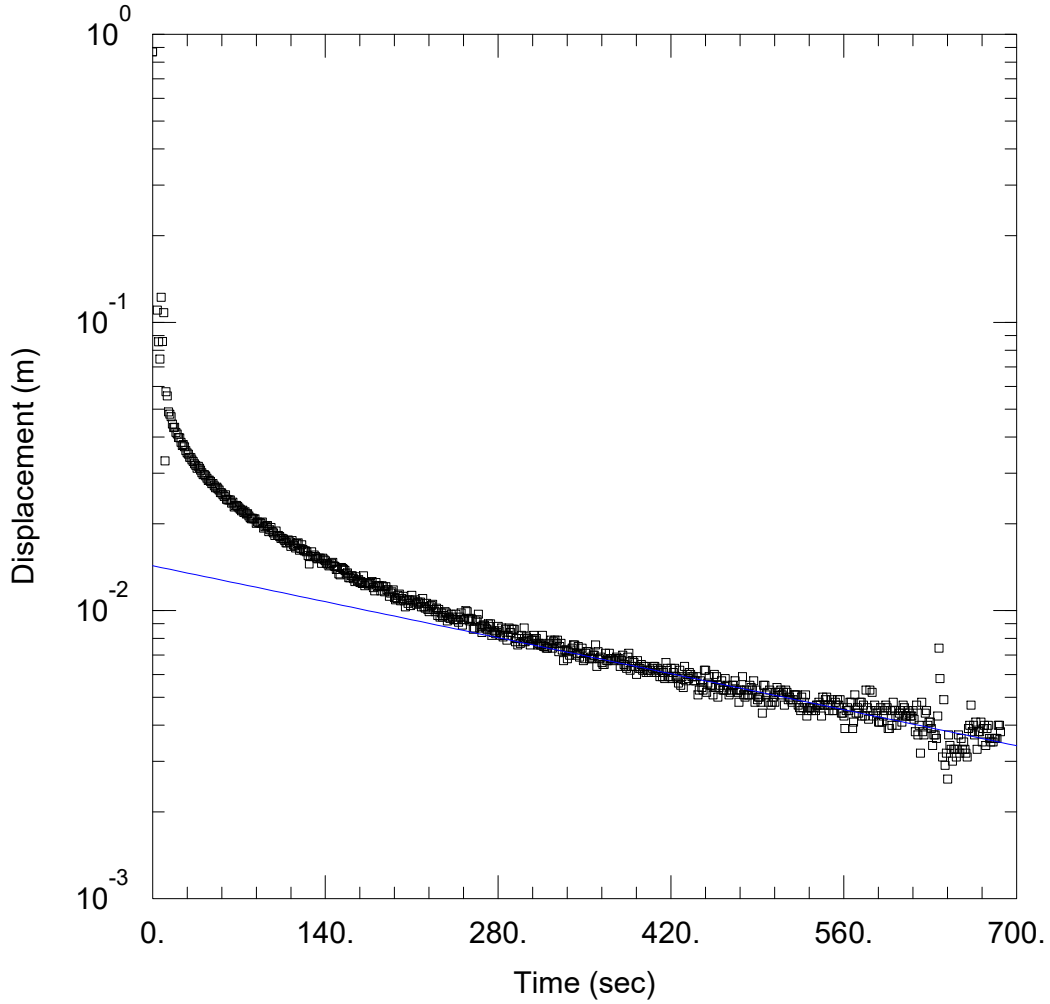
PATH: I:\QENV\Projects\QE09870\Technical\Chemistry\[Hydrochem file april data_DMc_2.xls]PIPE

Project No: QE09870

Client: New Hope Coal

HydroCHEM 1.0

Attachment G – Aquifer Permeability Data



WELL TEST ANALYSIS

Data Set: I:\...\BH1 Falling head_DMc.aqt
Date: 04/18/12 Time: 16:41:58

PROJECT INFORMATION

Company: SKM
Client: New Oakleigh Coal
Project: QE09870
Location: North Pit
Test Well: BH1

AQUIFER DATA

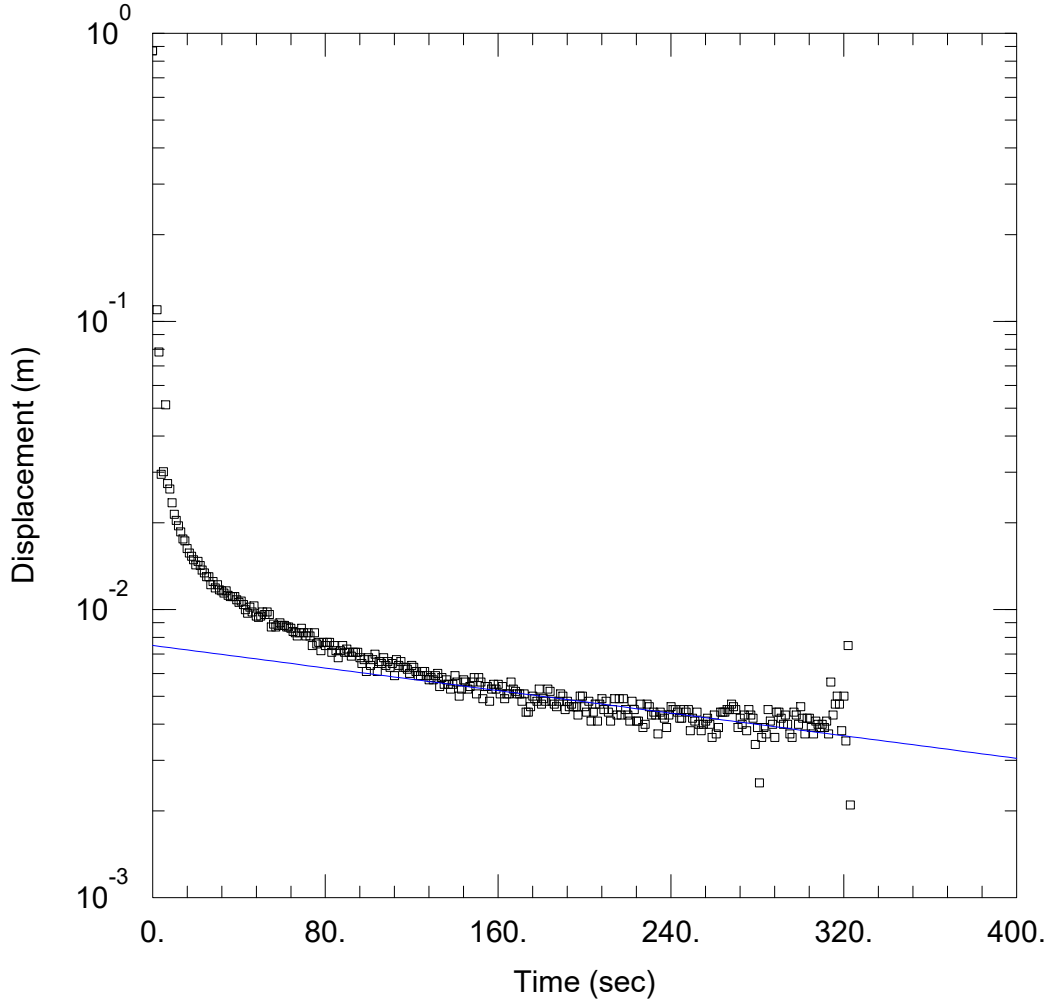
Saturated Thickness: 5. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH1 Falling head)

Initial Displacement: 0.87 m Static Water Column Height: 11.45 m
Total Well Penetration Depth: 11. m Screen Length: 10. m
Casing Radius: 0.025 m Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined Solution Method: Hvorslev
K = 0.05878 m/day y0 = 0.01431 m



WELL TEST ANALYSIS

Data Set: I:\...\BH2 Falling head.aqt
Date: 04/18/12 Time: 16:43:08

PROJECT INFORMATION

Company: SKM
Client: New Oakleigh Coal
Project: QE09870
Location: North Pit
Test Well: BH2

AQUIFER DATA

Saturated Thickness: 10. m Anisotropy Ratio (Kz/Kr): 1.

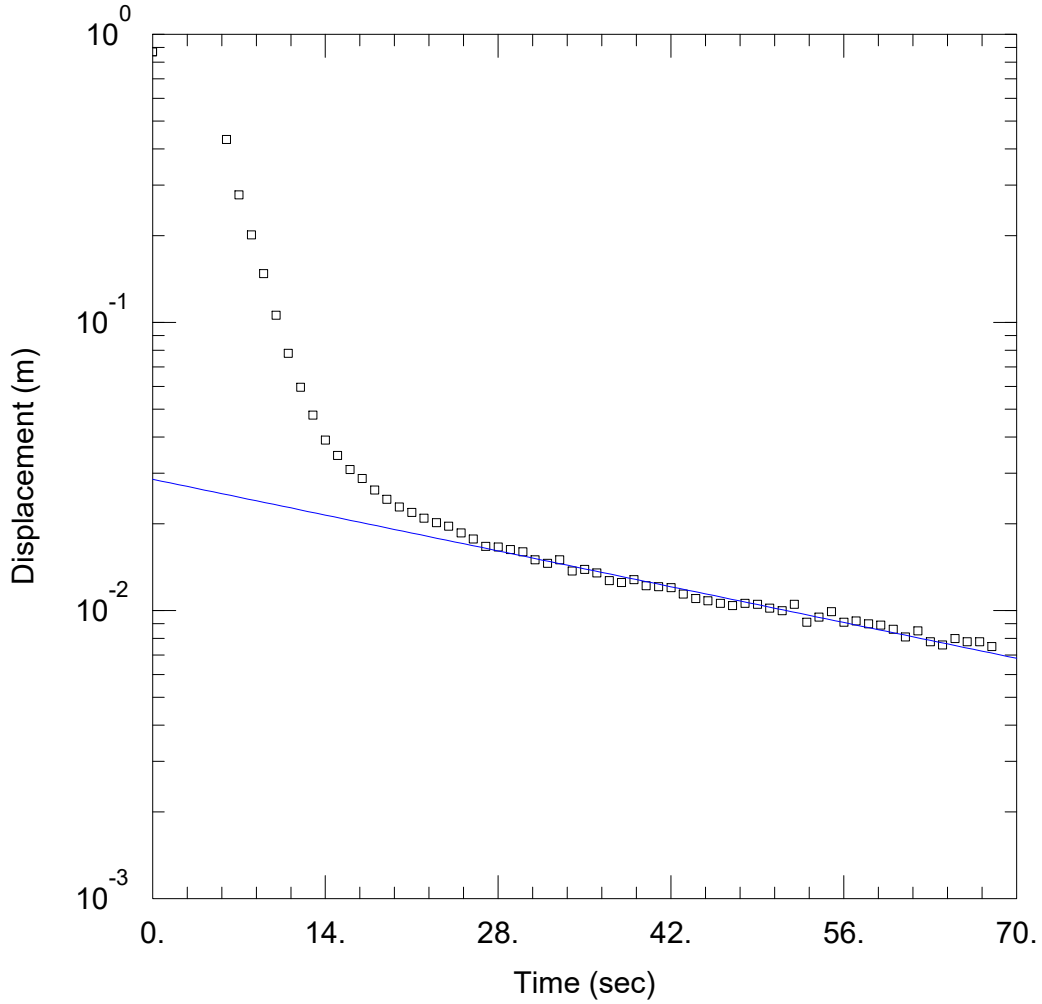
WELL DATA (BH2 Falling head)

Initial Displacement: 0.87 m Static Water Column Height: 9.98 m
Total Well Penetration Depth: 11. m Screen Length: 10. m
Casing Radius: 0.025 m Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.02339 m/day y0 = 0.007508 m



WELL TEST ANALYSIS

Data Set: I:\...\BH3 Rising head (2).aqt
Date: 04/18/12 Time: 16:44:42

PROJECT INFORMATION

Company: SKM
Client: New Oakleigh Coal
Project: QE09870
Location: North Pit
Test Well: BH3

AQUIFER DATA

Saturated Thickness: 12. m Anisotropy Ratio (Kz/Kr): 1.

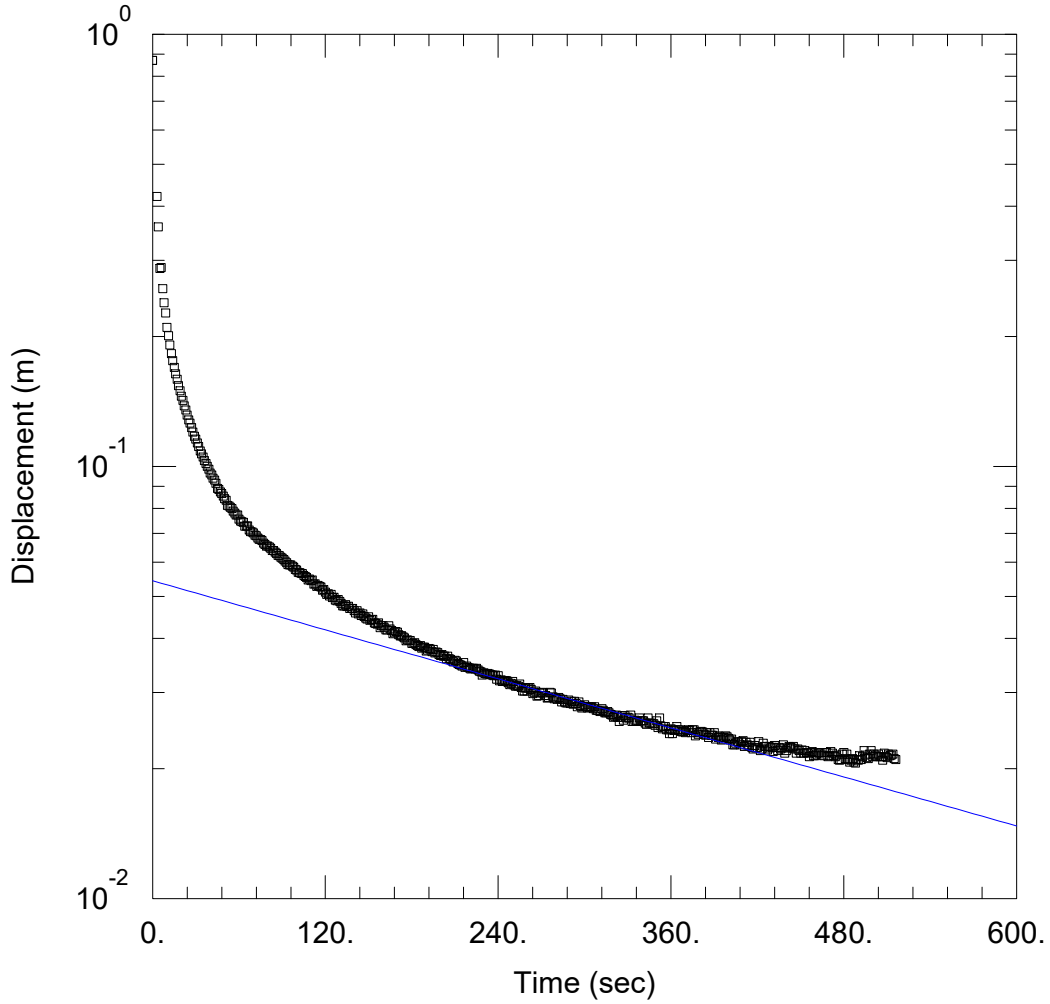
WELL DATA (BH3 Rising head (2))

Initial Displacement: 0.87 m Static Water Column Height: 12.9 m
Total Well Penetration Depth: 10. m Screen Length: 9. m
Casing Radius: 0.025 m Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.2134 m/day y0 = 0.02854 m



WELL TEST ANALYSIS

Data Set: I:\...\BH4 Rising head.aqt
Date: 04/18/12 Time: 16:45:59

PROJECT INFORMATION

Company: SKM
Client: New Oakleigh Coal
Project: QE09870
Location: North Pit
Test Well: BH4

AQUIFER DATA

Saturated Thickness: 10.6 m Anisotropy Ratio (Kz/Kr): 1.

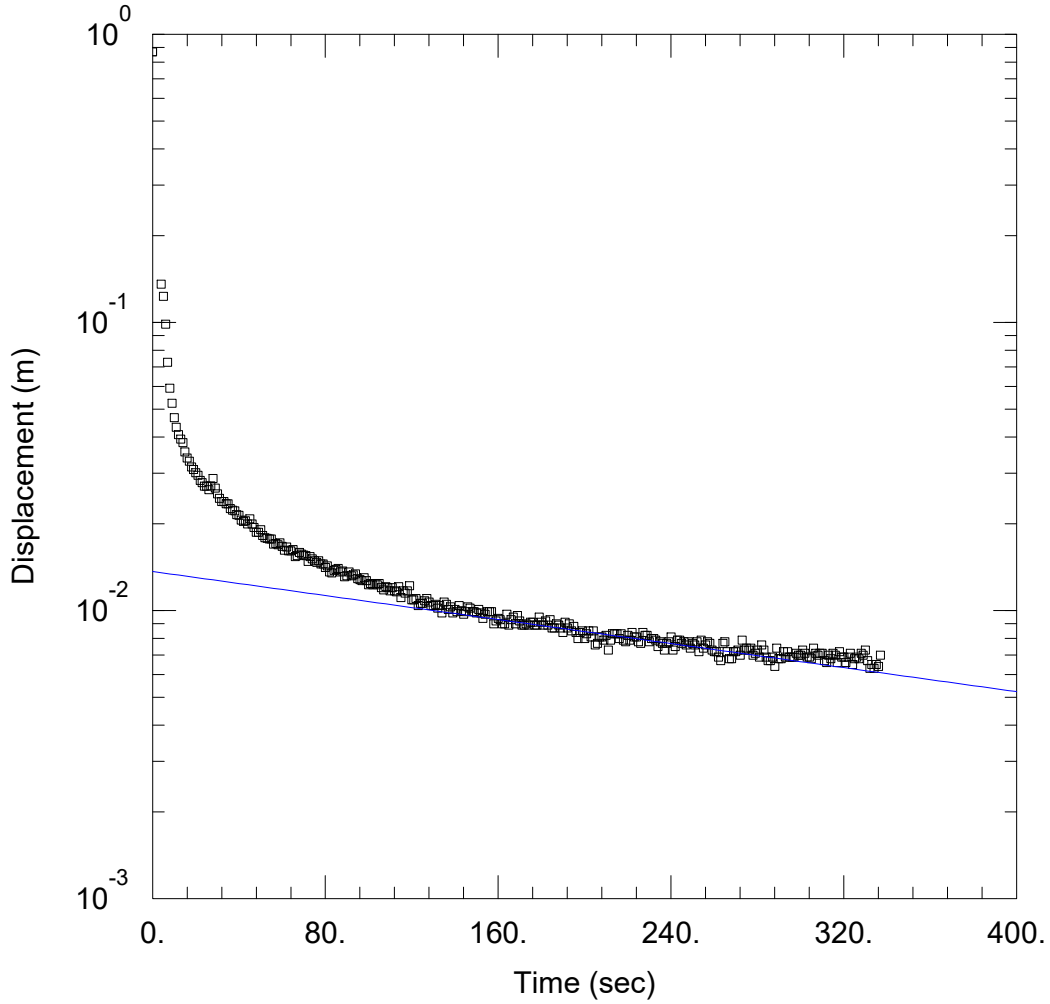
WELL DATA (BH4 Rising head)

Initial Displacement: 0.87 m Static Water Column Height: 10.63 m
Total Well Penetration Depth: 10. m Screen Length: 9. m
Casing Radius: 0.025 m Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.02339 m/day y0 = 0.05439 m



WELL TEST ANALYSIS

Data Set: I:\...\BH6 Rising head.aqt
Date: 04/18/12 Time: 16:47:02

PROJECT INFORMATION

Company: SKM
Client: New Oakleigh Coal
Project: QE09870
Location: Covers Gulley
Test Well: BH6

AQUIFER DATA

Saturated Thickness: 5. m Anisotropy Ratio (Kz/Kr): 1.

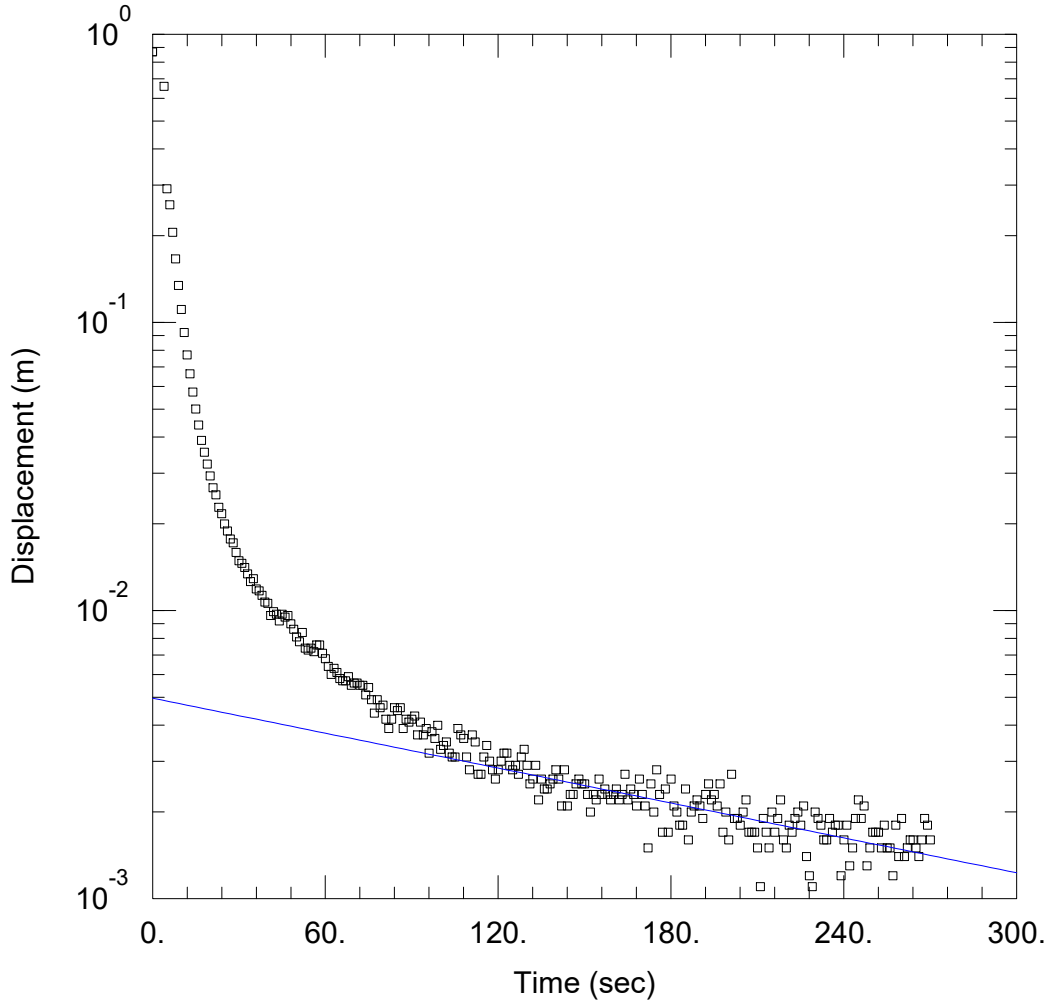
WELL DATA (BH6 Rising head)

Initial Displacement: 0.87 m Static Water Column Height: 5.02 m
Total Well Penetration Depth: 7. m Screen Length: 6. m
Casing Radius: 0.025 m Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.04458 m/day y0 = 0.01366 m



WELL TEST ANALYSIS

Data Set: I:\...\BH7 Falling head.aqt
Date: 04/18/12 Time: 16:49:04

PROJECT INFORMATION

Company: SKM
Client: New Oakleigh Coal
Project: QE09870
Location: North Pit
Test Well: BH7

AQUIFER DATA

Saturated Thickness: 11.5 m Anisotropy Ratio (Kz/Kr): 1.

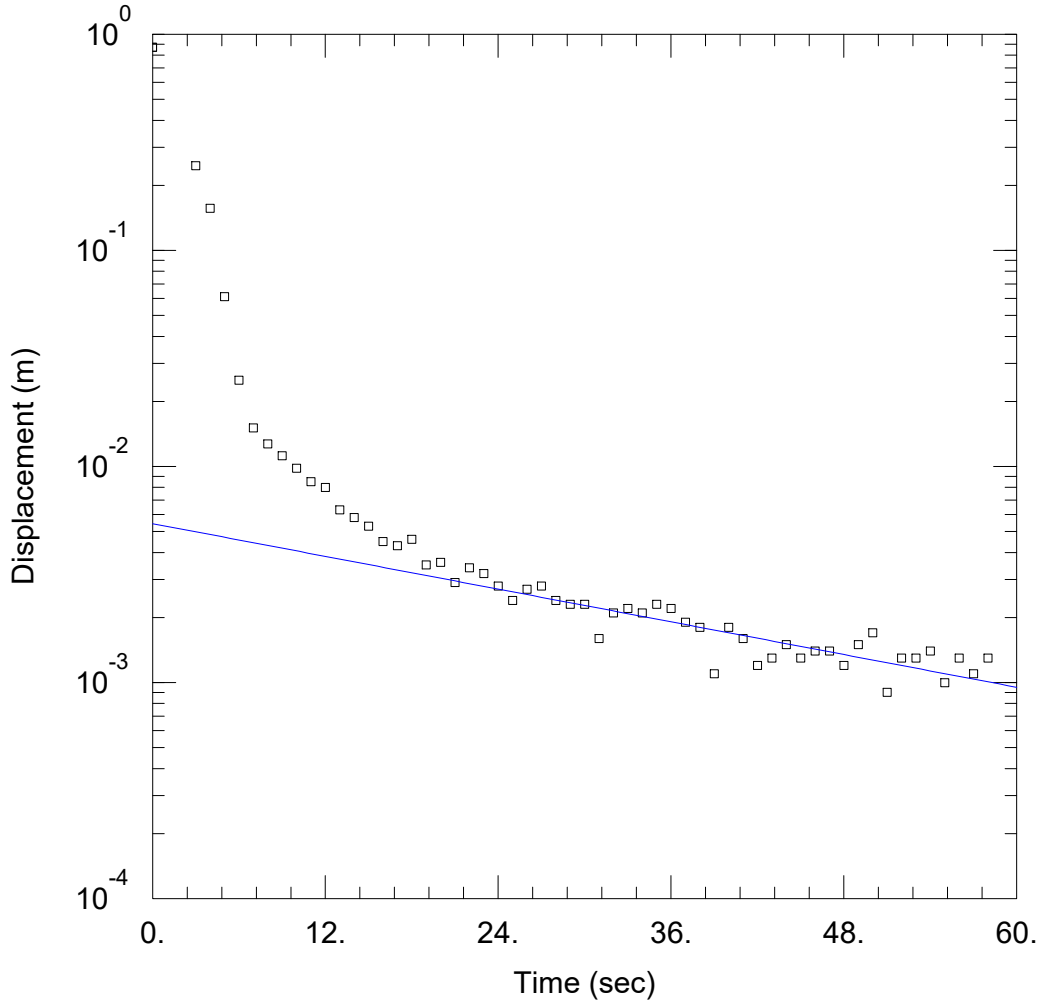
WELL DATA (BH7 Falling head)

Initial Displacement: 0.87 m
Total Well Penetration Depth: 10. m
Casing Radius: 0.025 m
Static Water Column Height: 11.5 m
Screen Length: 9. m
Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.04888 m/day
y0 = 0.00496 m



WELL TEST ANALYSIS

Data Set: I:\...\BH8 Falling head.aqt
Date: 04/18/12 Time: 16:50:14

PROJECT INFORMATION

Company: SKM
Client: New Oakleigh Coal
Project: QE09870
Location: North Pit
Test Well: BH8

AQUIFER DATA

Saturated Thickness: 11. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH8 Falling head)

Initial Displacement: 0.87 m
Total Well Penetration Depth: 10. m
Casing Radius: 0.025 m
Static Water Column Height: 11.13 m
Screen Length: 9. m
Well Radius: 0.075 m

SOLUTION

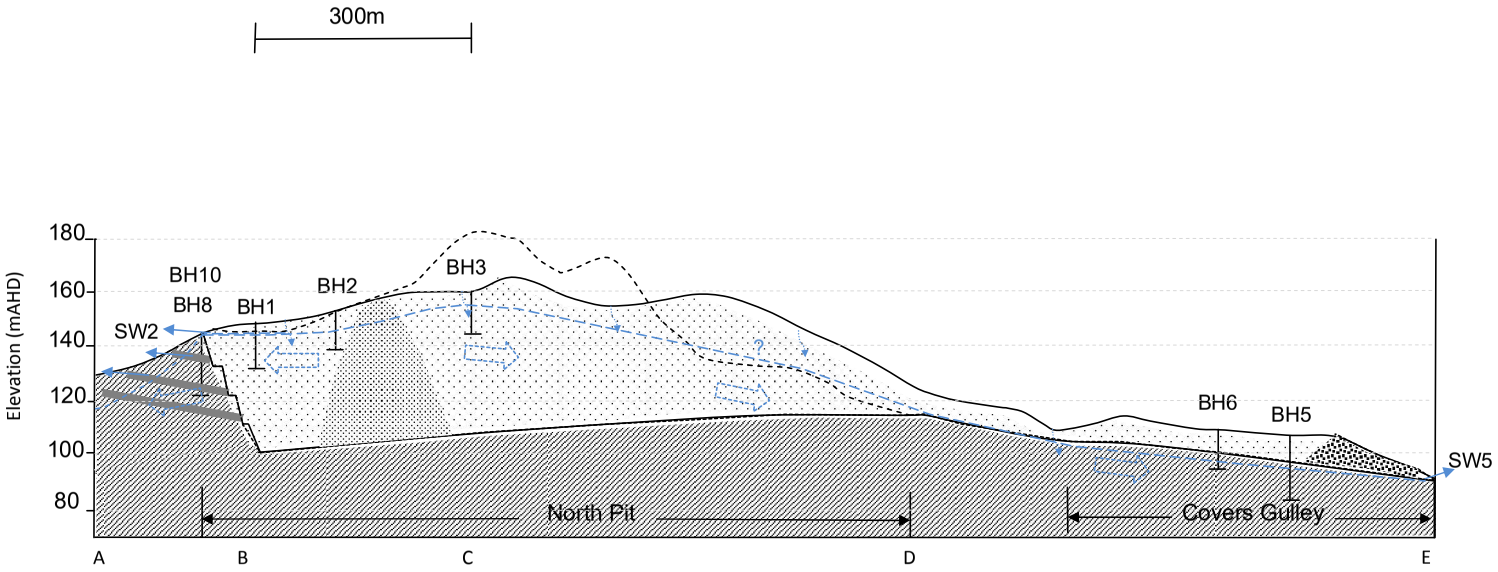
Aquifer Model: Confined
Solution Method: Bouwer-Rice

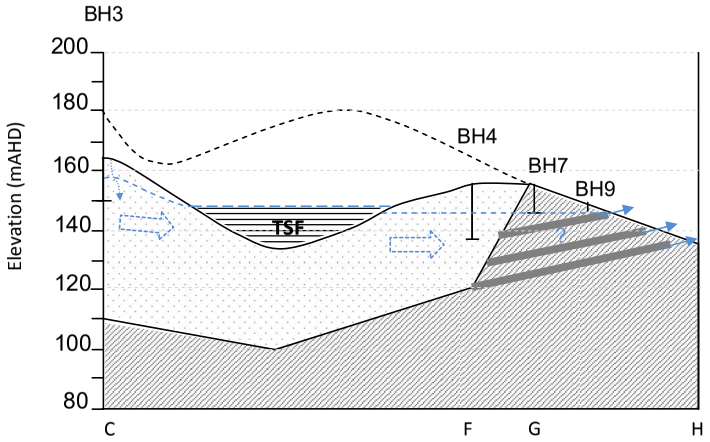
K = 0.3084 m/day
y0 = 0.005439 m

Attachment H – Groundwater Flow Conceptual Model

Attachment H: Groundwater Flow Conceptual Model

Refer to Attachment A for locations





Key

- 1974 surface
- 2010 surface
- Rock fill
- Bedrock
- Coal seam
- Groundwater level
- Seep
- Tailings storage facility (TSF)
- Groundwater flow direction
- Rock fill partition
- Infiltration

Electrical conductivity (EC) and pH of samples

	2009 (AGE)		Feb 2011 (SKM)		April 2011 (SKM)	
ID	EC (µS/cm)	pH	EC (µS/cm)	pH	EC (µS/cm)	pH
BH1	-	-	6580	6.77	6410	6.82
BH2	-	-	7850	7.09	7160	6.93
BH3	-	-	-	-	11400	7.24
BH4	-	-	9620	5.82	10500	6.7
BH5	-	-	3590	7.08	5060	7.13
BH6	-	-	8650	6.74	9990	6.73
BH7	-	-	5460	6.53	6140	6.28
BH8	-	-	10700	4.85	9330	4.56
BH9	-	-	-	-	dry	dry
BH10	-	-	5320	7.19	8410	6.63
SW1	-	-	723	9.58	718	9.41
SW2	-	-	-	-	6110	7.42
SW3	-	-	-	-	598	9.23
SW4	-	-	-	-	4950	8.18
SW5	-	-	-	-	3950	7.97
NP	3300	8.6	-	-	-	-
BD1	9000	8.0	-	-	-	-
BD2	9200	8.2	-	-	-	-
BD3	4200	8.3	-	-	-	-