OPAL VALE PTY LTD

REPORT ON:
GROUND WATER ASSESSMENT,
11 CHITTY ROAD,
TOODYAY, WA
MAY 2015

Stass Environmental
Environmental Science & Engineering

REPORT TITLE: **GROUND WATER ASSESSMENT, 11 CHITTY ROAD, TOODYAY, WA.**

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Stass Environmental
Environmental Science & Engineering

ABN 73 976 537 552

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GROUNDWATER ASSESSMENT,
11 CHITTY ROAD ,
TOODYAY, WA

1 INTRODUCTION

Opal Vale Pty Ltd (Opal Vale) intends to develop a landfill on this site of the old clay pit at 11 Chitty Road, Toodyay, at some stage. To fulfill regulatory requirements, a groundwater review had to be undertaken.

To be able to define the groundwater conditions at the site, nine groundwater monitoring bores were installed to provide information on:

1. the depth of the water table,
2. the groundwater quality; and
3. the geology below the site

The regional geology and hydrology of the area was reviewed by a literature review of available data on the region obtained from the Geological Survey of Western Australia.

The site was found to be located on weathered schists (fine clayey) geologic materials with expected low transmissivity and groundwater yield. This would suggest that the site is suitable for the activities which are intended by Opal Vale in that the impact on groundwater from the proposed landfill is expected to be minimal if any.

This report provides the detail of the groundwater investigations and monitoring bore installation programme as well as the groundwater quality analytical results for the site.

2 OBJECTIVES

The objectives of this study are to:

- Review of available regional groundwater and geology data.
- Install groundwater monitoring bores to suit the proposed landfill
- Obtain baseline groundwater quality data from the site.
- Provide a detailed report on the work

3 TERMS OF REFERENCE

Mr. Sam Mangione of Opal Vale Pty Ltd requested that Stass Environmental submit a proposal for the groundwater site assessment, baseline groundwater quality database and installation of groundwater monitoring bores at the Opal Vale facility.

4 SCOPE OF WORK

The following scope of work was carried out:

a) Review of all available data and reports

Review all available data on the groundwater studies performed to date for the development.

b) Provide a short synthesis of the available information

The reviewed reports are to be synthesized into a short form format, to provide a summary of the groundwater status at the site.

c) Assessment of available information

The available information is to be assessed for correctness and adequacy in terms of the proposed development and installation and logging of monitoring bores.

d) Reporting

The information and the interpretation of the data are presented in this document as a stand-alone report.

5 DISCRIPTION OF THE REGION

5.1 LOCATION

The Toodyay geological zone lies approximately 70km east of Perth in Western Australia and covers an area of approximately 2km^2 (Figure 1).

5.2 CLIMATE

The region experiences a Mediterranean climate, characterised by warm dry summers and cool wet winters. During summer (September to March) a belt of anticyclones lies over the region producing dry easterly winds and high temperatures. During winter this belt moves north and the predominant winds blow onshore from the south-west bringing cool temperatures and cold fronts that produce 90% of the region's total annual rainfall. Average annual rainfall varies between 300mm and 420mm and the average daily temperatures range from 17^{o}C to 30^{o}C in summer and from 6 ^{o}C to 17 ^{o}C in winter.

TABLE 1 Rainfall Records, Northam Station No 010111 (shown as mm/month)

Month	Mean 1902-2014	Mean 1980-2010	2013	2014
January	10.3	17.7	18.4	1.2
February	13.2	16.9	5.8	2.4
March	18.3	16	65.7	0.6
April	23.3	20.2	12.2	48.8
May	55.4	51.1	54.4	77.2
June	79.5	69.8	5.6	45.2
July	82.3	74.7	65.1	87.0
August	60.6	55.6	80.1	41.2
September	37.5	39.2	75.3	41.8
October	24.8	22.1	24.7	50.8
November	12.4	17.3	0.2	8.6
December	9.3	10.1	3.2	
TOTAL ANNUAL	427.1	410.8	410.7	

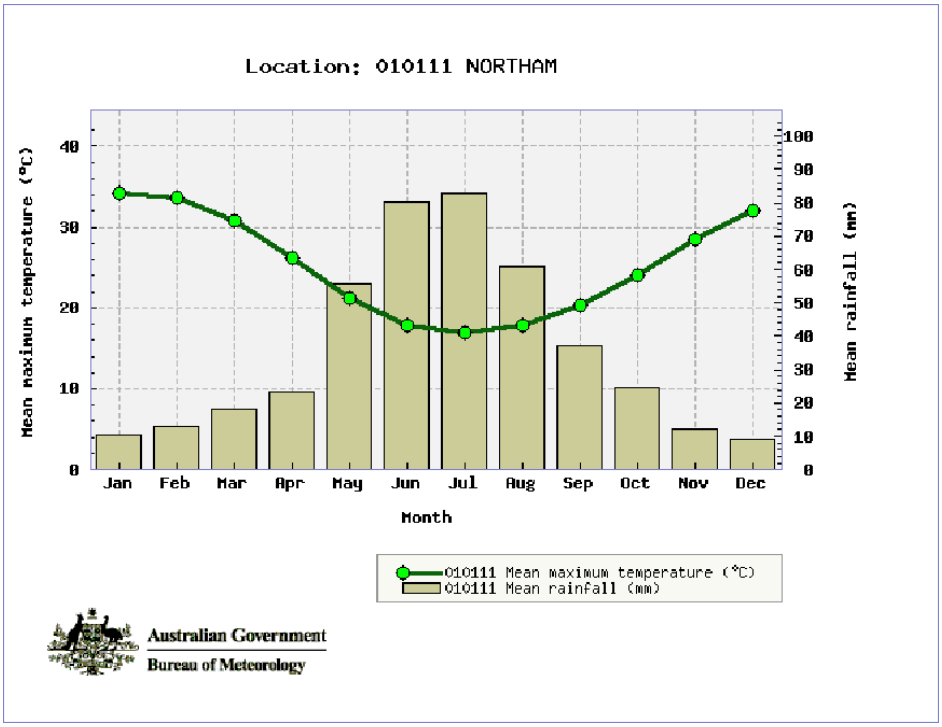
Over the period 1877 to the present the following rainfall statistics apply:

Mean – 427.1 mm/yr *Median* – N/A mm/yr

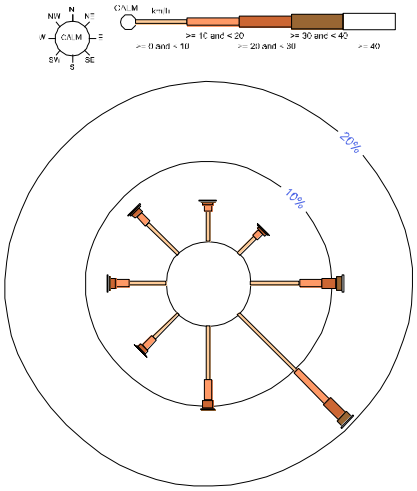
Lowest – 194.1 mm/yr *Highest* – 710.9 mm/yr

TABLE 2 Mean maximum temperature records, Northam, Station No.010111 (in degrees C)

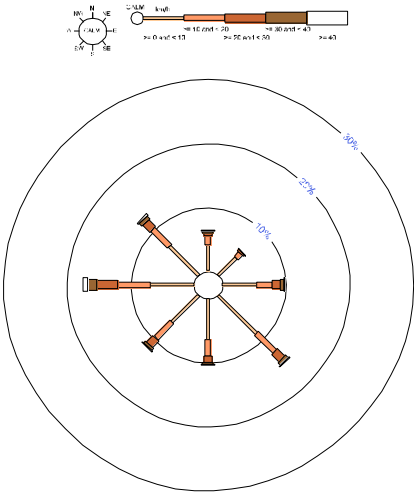
Month	Mean 1902-2014	2012	2013
January	34.2	34.6	34.5
February	33.7	33.2	36.1
March	30.8	32.1	29.2
April	26.1	27.6	29.0
May	21.2	23.4	21.1
June	17.9	18.6	19.0
July	16.9	18.0	17.9
August	18.0	19.4	19.5
September	20.4	21.6	20.1
October	24.1	26.6	25.7
November	28.5	28.2	31.1
December	32.1	33.8	33.6
Annual Average	25.3	26.4	26.4



Wind Roses – Annual wind direction and velocity statistics



Morning winds



Afternoon winds

5.3 GEOLOGY AND LANDFORMS

5.3.1 Geology - Regional

Main geological components of the southwest Yilgarn Craton

The area is characterized by discrete, linear metamorphic belts enveloped by diffuse areas of migmatite, containing isolated rafts of the earlier gneissic sequences (Wilde, 1990). The present distribution of gneiss and migmatite is largely controlled by the emplacement of Late Archaean granitoids which typically post-date metamorphism and regional tectonism. The high-grade gneisses and supracrustal rocks have been grouped within the Jimperding, Chittering and Balingup Metamorphic Belts (Wilde, 1980 and 1990). Migmatite is locally developed at the margins of these belts and also forms more extensive areas in the eastern part of the region. There are also a number of small greenstone belts, ranging in metamorphic grade from greenschist to granulite facies, widely distributed across the region (Fig. 1). All these sequences are intruded by a variety of granitoids, including charnockites in the east.

Metamorphic Belts

The chief rock-type in the Jimperding, Chittering and Balingup Metamorphic Belts is layered quartz-feldsparbiotite gneiss. Some units are paragneiss and show gradations to arkosic quartzite and quartz-mica schist and are interleaved with orthoquartzite, banded iron formation and rare calc-silicate rocks. This association is a characteristic feature of the Jimperding Metamorphic Belt east and southeast of Toodyay and of the south-eastern part of the Balingup belt. It has been interpreted as indicating stable shelf sedimentation on a pre-existing sialic basement (Gee ***et*** *al.,* 1981; Wilde, 1990). In contrast, the Chittering and western portion of

the Balingup Metamorphic Belt consist mainly of pelite, semi-pelite and greywacke. Banded iron formation and quartzite are absent and this association has been interpreted to be the result of rapid, trough-style sedimentation along a continental margin (Gee ***et*** al.,1981; Wilde, 1990).

The Jimperding Metamorphic Belt shows a progressive eastward increase in metamorphic grade fiom lower amphibolite to granulite facies, with the presence of andalusite, sillimanite and cordierite indicating low pressure. In contrast, the Chittering and Balingup Metamorphic Belts are chiefly at amphibolite facies, with the presence of kyanite, sillimanite and staurolite indicating moderate pressure, Barrovian-type metamorphism (Wilde, 1990). This contrast in grade between the metamorphic belts appears to be in part related to their location, with the higher pressure assemblages occurring at the western margin of the craton, associated with ductile shear zones related to early movement along the Darling Fault Zone (Blight ***et*** *aZ.,* 1981; Bretan, 1985). This zone has been reactivated at several later periods, resulting in local retrogression to greenschist facies assemblages.

Greenstone Belts

There are a number of small greenstone belts present in the Western Gneiss Terrain. In the south-eastern portion (Fig. l), areas of mafic and felsic granulite are interleaved with a variety of metasedimentary rocks. These were interpreted as 'keels' of original greenstone belts by Wilson (1969) and this interpretation is supported by more recent work on the mafk granulites (Wilde and Pidgeon, 1987; Nemchin ***et aZ.,*** in press). The mineralogical features indicate that this area underwent low to moderate pressure granulite facies metamorphism and the enclosing granitoids commonly include hypersthene-bearing charnockites (Wilde, 1990).

Three lower grade greenstone belts are present near the western margin of the Yilgam Craton; the Saddleback, Morangup and Wongan Hills Greenstone Belts. The Saddleback Greenstone Belt (Wilde, 1976 and 1990) near Boddington (Fig. 1) is poorly-exposed due to an extensive cover of Tertiary laterite. It is composed of mafic and felsic volcanic rocks, with minor sedimentary units, metamorphosed to greenschist facies and generally in faulted contact with orthogneiss, migmatite and granite. However, in the extreme southwest, granite intrudes metasediments and felsic pyroclastic rocks (Wilde, 1976). The Morangup Greenstone Belt near Toodyay (Wilde and Pidgeon, 1990) consists predominantly of metabasalt with a greenschist facies assemblage of tremolite-actinolite, albite and clinozoisite. Porphyritic andesite and fine grained metasedimentary rocks are also present. The sequence is also poorly exposed and the full extent of the belt is unknown. The Wongan Hills Greenstone Belt consists predominantly of basalt, dacite, chert, banded iron formation and mica schist, interleaved with paragneiss and intruded by small ultramafic units, all metamorphosed to upper amphibolite facies (Carter and Lipple, 1982). The presence of cordierite indicates low pressure conditions, similar to those in the nearby Jimperding Metamorphic Belt (Pidgeon ***et al.,*** 1990).

Granitoids

Granitoids occur as two large batholiths that occupy a considerable portion of the southwest Yilgarn Craton. The granitoids east of Meckering and Quairading and around Lake Grace were informally referred to as the "Wheat Belt" granites by Wilson (1958), whereas the western area has been termed the Darling Range Batholith (Wilde and Low, 1978). The zone of mignatite referred to above separates the two batholithic areas.

Around Katanning many porphyritic granites are hypersthene-bearing and petrographically and geochemically identical to those developed further east within the zone of migmatite and gneiss south of Quairading and in the "Wheat Belt" batholith. Wilde and Pidgeon (1987) describe reaction textures from near Lake Grace which indicate that hypersthene and subsequent mafic minerals followed a magmatic crystallisation sequence and that these charnockites are of igneous origin.

The granitoids of the Darling Range Batholith are quite diverse and show considerable textural variation. They range in composition from granodiorite to granite; the compositional variations being commonly independent of textural changes. Where cross-cutting relations can be identified, granodiorite is invariably the earliest phase. Most granitoids are undeformed, although plutons of porphyritic granite that occur close to the eastern boundaries of the Chittering and Balingup Metamorphic Belts show evidence of intense ductile shearing. There is a westward increase in deformation, resulting in a progressive change from porphyritic granite to augen gneiss, mylonite and ultramylonite (Blight ***et*** *aL,* 1981). This deformation is related to early movement along the Darling Fault Zone, accompanied by medium pressure, amphibolite facies metamorphism (Wilde, 1990).

There are also a number of small bodies of quartz-poor granitoids of dioritic, monzonitic and syenitic affinity within the granite batholiths. More extensive areas of quartz monzonite occur south of Darkan (Fig. 1) and these are rich in amphibolite xenoliths. A distinctive, tectonised quartz monzonite (the Gibralter Quartz Monzonite) forms a narrow, discontinuous zone along the eastern boundary of the Balingup Metamorphic Belt (Wilde and Walker, 1982 and 1984) in association with migmatite.

5.3.2 Geology - Site

The site is located on the dissected Darling Plateau. The locality consists of an elongate narrow plateau remnant that runs north west along the ridge line in the west, at an elevation of 280 metres AHD ranging down to about 240 metres in the north west.

The general area is located in a drainage basin of the Avon River system and geologically, is are part of the Pre-Cambrian meta sedimentary complex which is known as the Jimperding Metamorphic Belt. The Jimperding Metamorphic Belt Series extends as a 120 kilometre long belt in a north-westerly direction from York to Clackline and from there to Jimperding and then Chittering, where it becomes the higher grade metamorphic Chittering Metamorphic Belt.

Williamson's Pit is located on the crest of a hill, at an elevation of about 290 metres AHD.

To the west of the pit the land is gently undulating before sloping relatively uniformly to the river flat. To the immediate east of the pit the land slopes gently down to a small drainage line (draining from south to north) at about 280 metres and from there the land slopes gently upwards to about 330 metres.

The Jimperding Series consists of inter-bedded schists, quartzites and minor metamorphosed volcanics. They are steeply dipping and trend northerly and then north-westerly. However under the void only weathered schists are encountered, because these are the only parts of the regolith that are suitable for brick manufacture.

The area to be filled is a void cut into deep micaceous clays formed from the weathering of schists of the Jimperding Metamorphic Belt. The rocks are predominantly weathered andalusite and kaolin-quartz-mica schists that are near vertical and striking generally north. These schists have been subjected to a long period of weathering, in the Mesozoic - Cainozoic, to produce the laterite erosion surface, of which a remnant caps the nearby hills.

A number of hydrothermal quartz veins intersect the exposed geological sequences, presumably intruded along fracture lines. The quartz veins are either massive white quartz veins or a reddish coloured quartz which has been fractured, presumably due to earlier metamorphic events, These older quartz veins tend to have the fractures infilled with a clay/silt matrix.

Weathering of the rocks is deep, and, from a drilling program conducted by Austral Brick, shows the depth of weathering as over 30 metres. The base of the weathered material was not found because the clay quality reduced with depth and drilling was stopped.

Williamson's Pit is located in an area of micaceous silty clay which becomes fresher with depth and shows some laterisation. Clayey sands are present in small amounts.

Only clays suitable for brick making are excavated.

5.3.3 Soils

The soils which overlay the weathered schists (clay) belong to the Yalanbee and Leaver soil landscape units. In the vicinity of Williamson's Pit is a yellow gravelly loamy sand and loam which overlies sandy clay at a depth of about 0.5 metres.

6 SITE HYDROGEOLOGY

6.1 Regional Hydrogeology – Previous Investigations

The local hydrogeology has been characterised from an interpretation of the exploration drilling undertaken by Austral Brick and hydrogeological studies completed by Martinick McNulty in 1998.

On 24 March 1998 ten holes were drilled by Wallis Drilling with a Mantis drilling rig which was mounted on a Toyota Landcruiser, to assess the local geology and groundwater conditions.

Water was generally not encountered during drilling, with the exception of some holes which are located approximately 1 kilometre to the northwest of the pit. In these holes granite was intersected and water was found to be present in weathered basement.

Hydraulic testing of all of the monitoring bores (WF 1 to WF 11) was undertaken by Martinick McNaulty to determine the in-situ hydraulic properties of the schistose clay. Testing comprised injection of a known volume of water into the bore and subsequently monitoring the rate at which the water level declined. Analysis of the response was completed using the Bower and Rice method.

From the results of the hydraulic testing it was concluded by Martinick McNulty, that the schistose clay present in the pit and its vicinity has a low to very low permeability and that the groundwater regime in that area is classified as an aquiturd/aquiclude. That is to say, although groundwater is present there is no defined aquifer system. The sandy clays are partially saturated and the local groundwater levels and vary with changes in topography.

6.1.1 Permeability

Six piezometers were installed by Martinick/McNulty around the perimeter and another four within the clay pit at that time. Whilst the clay pit has been enlarged in the past decade, the results provide a good indication of the geotechnical properties of the weathered schist.

In each piezometer a PVC standpipe of 50 millimetre diameter was installed immediately after the hole was drilled. The casing was slotted for the entire depth of the hole and all of the piezometers were surveyed by Scanlan Surveying in May 1998. A summary of monitoring bore details is provided in Table 3 (Martinick McNaulty 2002).

Two clay samples were collected by Martinick/McNaulty from the floor of Williamson's Pit adjacent to bores WF2 and WF4. These samples were analysed for particle size distribution, optimal moisture content for compaction and permeability of the compacted clay.

Table 3 Permeability Testing (Martinick McNaulty 1998)

Drill Hole	East	North	Top of Casing	Local RL	Permeability m/d	Permeability m/s
WF1	449865	6449588	88.41	81.91	0.0164	1.1 x 10-7
WF2	449915	6495825	89.2	81.69	0.0041	4.7 x 10-8
WF3	449761	6495895	82.07	80.71	0.0037	4.2 x 10-8
WF4	449870	6495734	86	81.2	0.0064	7.4 x 10-8
WF5	449756	6496127	85.5	80.49	0.038	4.4 x 10-7
WF6	49956 6	495896	99.57	85.3	0.00034	3.0 x 10-9
WF7	449845	6495626	86.37	80.99	0.0017	1.9 x 10-8
WF9	449658	6495750	90.5	86.89	0.006	6.9 x 10-8
WF10	0449632	6495903	86.44	83.90	0.0030	3.4 x 10-8
WF11	1449606	6495610	84.62	80.88	0.0204	2.4 x 10-7

The distribution of particle sizes demonstrated that the material in Williamson's Pit consists of a clayey silty sand with minor gravel. The clay content varies from 4 to 8%, the silt content varies from 26% to 33% silt, and the sand content varies from 53 to 56%.

The falling head permeability tests for samples compacted to 90% standard compaction at optimal moisture content, gave coefficients of permeability of $3.12xI0^{-9}$ and $1.49x10^{-8}$ metres per second respectively for WF2 and WF4. The compaction tests indicate that maximum dry densities of 1.87 and 1.74 tonnes per cubic metre at optimum moisture contents of 13% and 17% could be achieved for the material obtained from WF2 and WF4, respectively.

The above tests indicate that the clay can be used as landfill liner material, if compacted.

6.2 REGIONAL GROUNDWATER QUALITY

The regional groundwater quality is highly variable, with water quality ranging from 500 mg/l as TDS to 3000 mg/l TDS. Ground water tends to be slightly acidic with pH in the range of 4 to 5 not uncommon.

7 MONITORING BORE INSTALLATION

Drilling at the site commenced in June 2011 and was completed in 5 days. Further installation of monitoring bores was required as the outcome of the SAT process in 2013, and a further 5 monitoring bores were installed in April 2013. All fieldwork undertaken, including a summary of the investigation methodology utilised is summarised in the following sections in chronological order.

7.1 LOCATION OF GROUNDWATER MONITOR WELLS

7.1.1 Previously Installed Monitor Wells

No previously installed wells (pre 2011) were observed at on site. Wells drilled for previous investigations have been decommissioned or were unusable. Other bores in the general area to 2 km radius, registered with Department of Water are shown below. No registered bores are located within a radius of 2 km from the site. The nearest bore is located 2.2 km up hydraulic groundwater gradient, to the east of the site.

7.1.2 Monitor Well Site Selection

Nine new groundwater monitor wells (designated SE-1 to SE-9) were installed at the site during this investigation. The locations for these wells were selected after an evaluation of the regional groundwater flow direction (previous groundwater monitoring).

Monitor wells SE-1 to SE-3 were installed within the south-western areas. Monitor well SE-4 targeted the aquifer up-hydraulic gradient boundaries of the site. Monitoring bores SE 5 and SE 6 targeted the south and south east side of the pit edge, while monitoring bores SE 7, and SE 8 the north and north western edges. Monitoring bore SE 9 was installed to record the far western side of the proposed development.

Prior to the commencement of drilling activities, all services within the site area were identified and located to prevent potential damage. Accurate locations of the nine newly installed monitoring bores are shown on Figure 6.

7.1.3 Drilling

The nine monitor wells (SE1 to SE9) were installed by Mick Lewis Drilling under supervision by Stass Environmental using the down hole hammer rotary drilling technique (refer Appendix B, Photographs 1). At all drilling locations, natural clays and muscovite schists were encountered throughout the entire profile therefore allowing trouble free well completion.

Drilling locations SE 1 to SE 9

- After positioning the drill rig, 150mm diameter holes were drilled to approximately 50 to 60m.

- The casing was inserted and sand packed to one metre above the slotted interval (see Figure 8 to 17).
- Bentonite pellets were placed immediately above the sand packing and measured with a weighted tape until a one metre thick seal was formed.
- The annulus of the hole was backfilled with local drilled materials mixed with cement grout to the ground surface and sealed with bentonite at the ground surface to prevent surface water leakage to groundwater. A cement pad measuring 300mm from the centre of the bore annulus was also placed to further reduce the potential for surface waters to short circuit down the bore annulus.

Steel protective surface covers, protruding approximately 600mm above the ground surface were also installed over all PVC casings and lockable with padlocks. Monitor well logs and construction diagrams are contained within Appendix B.

Five in-pit bores were also installed to a depth of approximately 10 m, to monitor any sub-surface waters within the pit (again, as part of the SAT outcome).

7.1.4 Development

Immediately following well installation, monitor wells SE-1 SE 9 were developed to remove sediment initially using compressed air from the drill rig and later an electric submersible pump (Grundfoss MP1 and other electric pumps).

7.1.5 Position and level survey

A position and level survey was undertaken by a licensed surveyor to determine Australian Map Grid (AMG) coordinates and Australian Height Datum (AHD) elevations of each monitor well casing including the wells from 2011 installation and newly installed monitor well (2013). During the level survey, elevations of each monitor well were obtained from the highest point on the bore protective cover opening, which was also permanently marked for future reference. These reference points were used during the collection of water levels as described in Section 7.6. The results of this position and level survey are shown below:

Table 4 MONITOR WELL SURVEY DATA

Monitor Well	Easting (mAMG)	Northing (mAMG)	PVC Casing Elevation (mAHD)	Descriptive Location
SE1	6495635.67	449807.22	274.4	Close to drainage line
SE2	6495913.67	449616.1	285.58	Along the downgrad. Road
SE3	6496193.89	449382.97	291.64	Along the downgrad. Road
SE4	6495785.76	450377.9	299.86	Upstream of quarry
SE 5	6495858.19	449809.33	280.553	South edge of pit
SE 6	6495855.09	450039.37	286.78	East edge of pit
SE 7	6496095.83	450043.12	289.08	North edge of pit
SE 8	6496172.63	449770.44	292.86	North east of pit
SE 9	6496373.32	449643.15	278.62	Far north east of pit
pit 1	6496054.74	449813.3	274.89	In pit shallow bore
pit 2	6496122.84	449804.3	274.4	In pit shallow bore
pit 3	6496067.8	449783.51	285.58	In pit shallow bore
pit 4	6496037.54	449911.15	291.64	In pit shallow bore
pit 5	6495948.38	449707.85	299.86	In pit shallow bore

Note: mAHD – metres above Australian Height Datum

mAMG – metres relative to Australian Map Grid

All positions were determined by a licensed surveyor using a differential GPS instrumentation, calibrated to within +/- 2mm accuracy. AHD elevations were surveyed to +/- 2mm. These levels of accuracy are judged to be within the requirements of this study.

Photo plate 1 - Drill cuttings sampled at 1 m intervals. Water struck at 39 m depth.

Photo plate 2 - cuttings sampled at 1 m intervals. Water struck at 44 m depth.

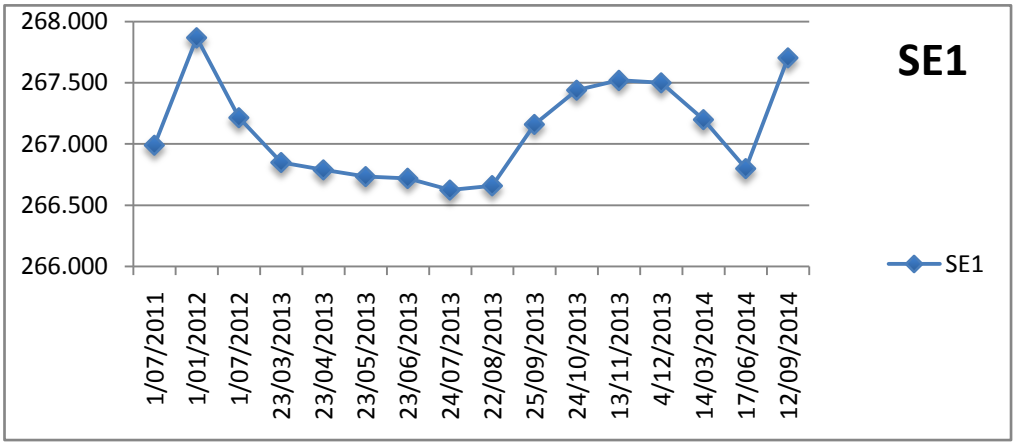
7.2 Water Level Measurement

Water levels were measured in all monitor wells on-site prior to the purging and sampling of each well (described earlier in Section 7). These levels were assessed to be suitable for hydrogeological interpretation. The highest of these levels, measured quarterly between 2011 and 2014 reduced to AHD using the level survey data are shown in Table 5 below.

Table 5 Highest water levels 2011 to 2014

Monitor Well	Easting (mAMG)	Northing (mAMG)	Highest Water Elevation (mAHD)
SE1	6495636	449807.2	267.868
SE2	6495914	449616.1	272.46
SE3	6496194	449383	273.94
SE4	6495786	450377.9	278.34
SE 5	6495858	449809.3	271.78
SE 6	6495855	450039.4	272.885
SE 7	6496096	450043.1	273.275
SE 8	6496173	449770.4	271.94
SE 9	6496373	449643.2	270.715
pit 1	6496055	449813.3	270.565
pit 2	6496123	449804.3	271.75
pit 3	6496068	449783.5	270.275
pit 4	6496038	449911.2	270.5
pit 5	6495948	449707.9	271.92

The data obtained from the quarterly measurements of the static water level at the bores is provided in the graphs below:


SE1
268.000
267.500
267.000
266.500
266.000
1/07/2011
1/01/2012
1/07/2012
23/03/2013
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23/05/2013
23/06/2013
24/07/2013
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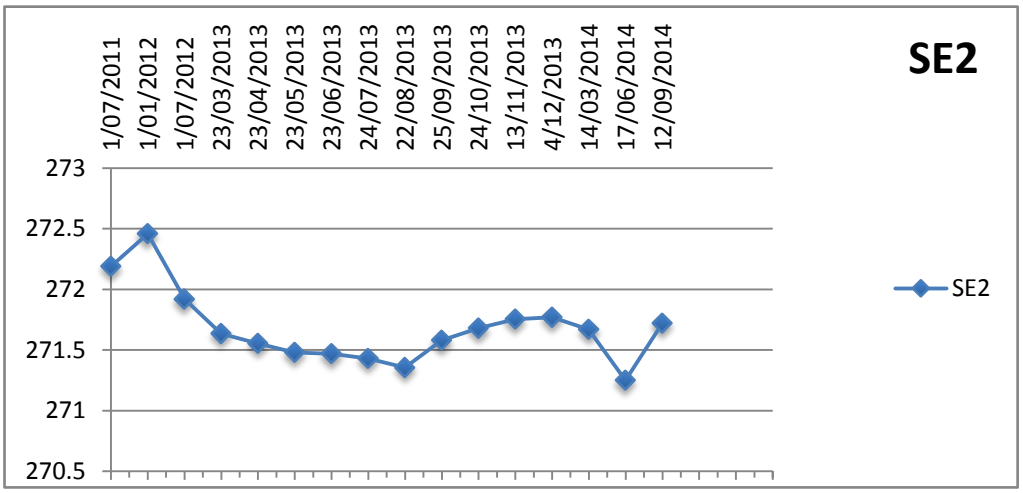
14/03/2014
17/06/2014
12/09/2014
SE1


SE2
1/07/2011
1/01/2012
1/07/2012
23/03/2013
23/04/2013
23/05/2013
23/06/2013
24/07/2013
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25/09/2013
24/10/2013
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273
272.5
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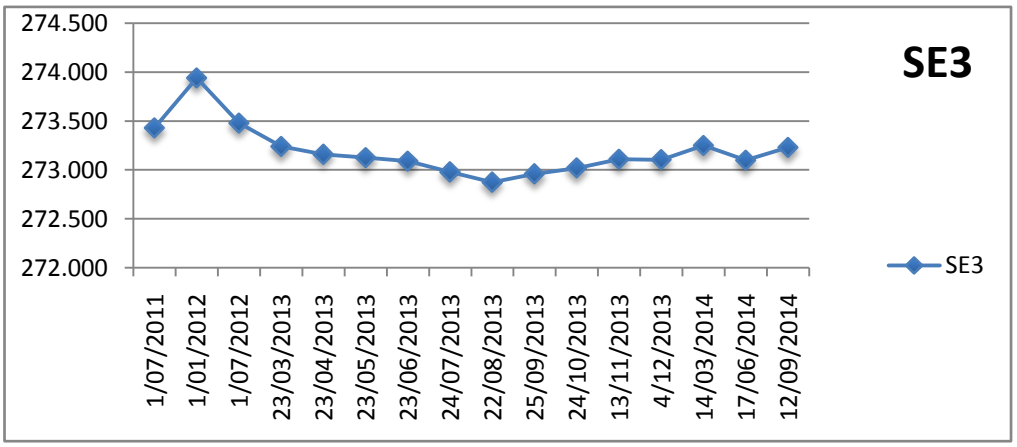
271.5
271
270.5
SE2


SE3
274.500
274.000
273.500
273.000
272.500
272.000
1/07/2011
1/01/2012
1/07/2012
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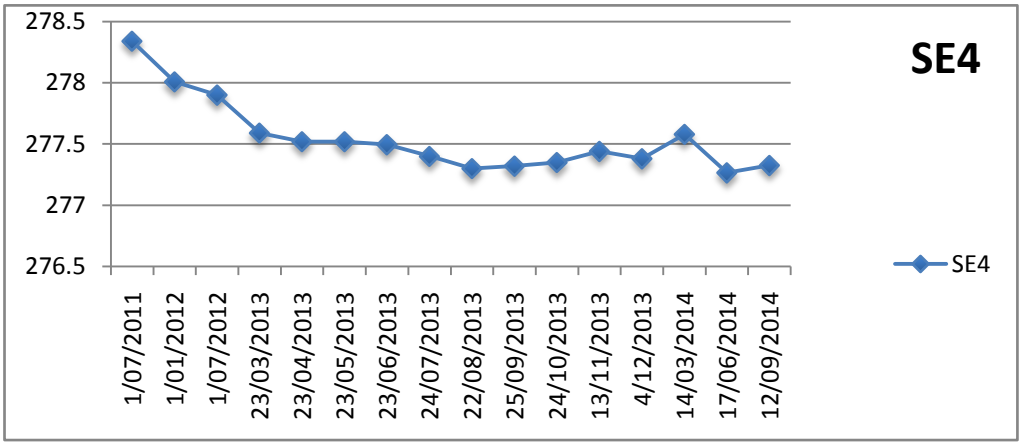
23/06/2013
24/07/2013
22/08/2013
25/09/2013
24/10/2013
13/11/2013
4/12/2013
14/03/2014
17/06/2014
12/09/2014
SE3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23/06/2013
24/07/2013
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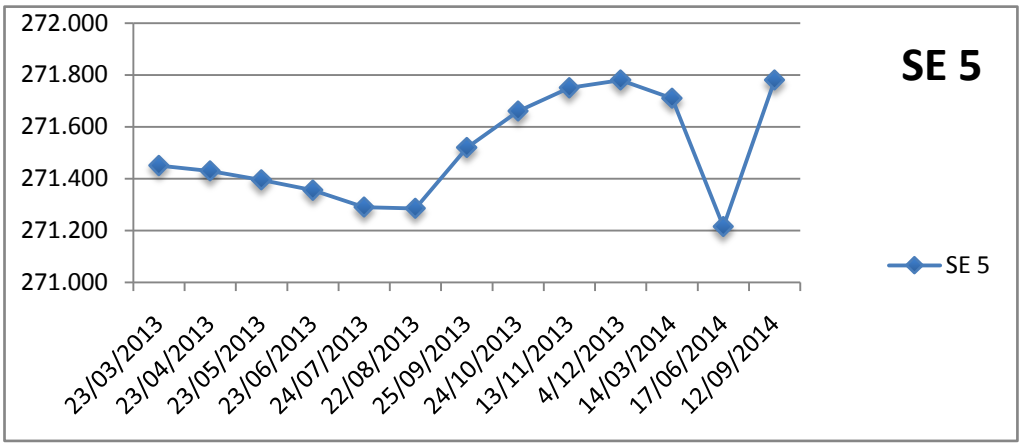
4/12/2013
14/03/2014
17/06/2014
12/09/2014
SE4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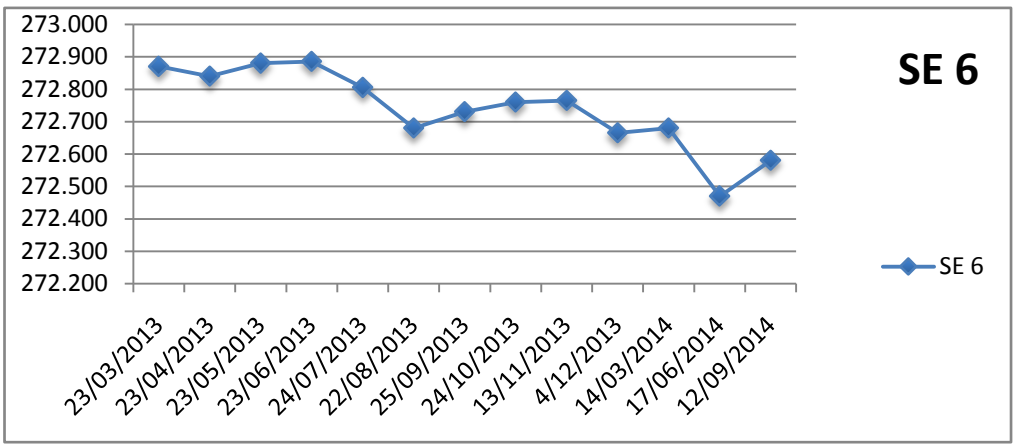
14/03/2014
17/06/2014
12/09/2014
SE 5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23/05/2013
23/06/2013
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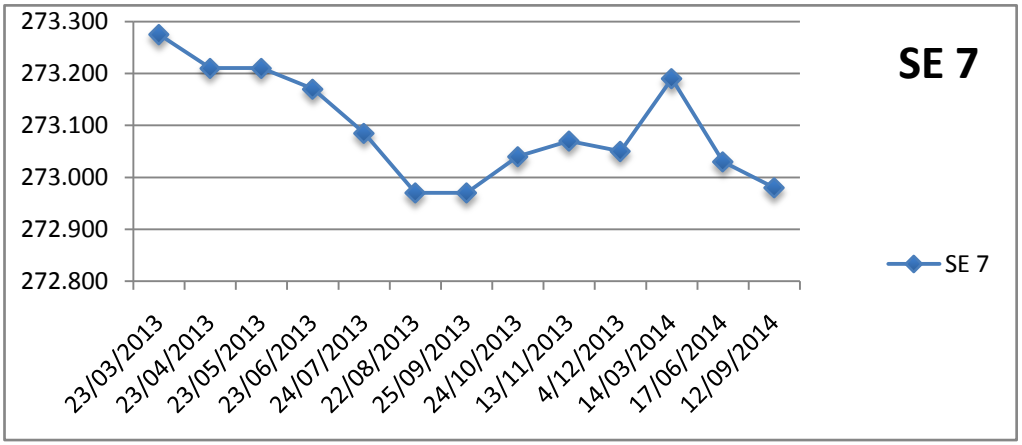
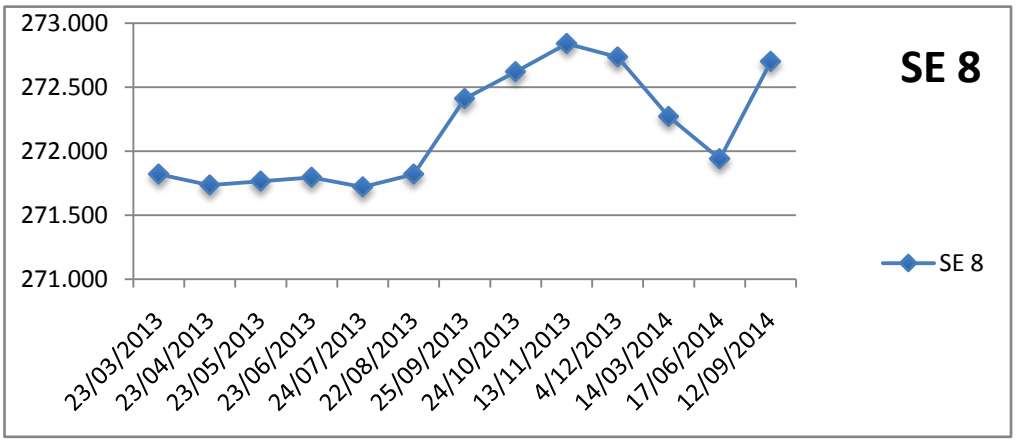
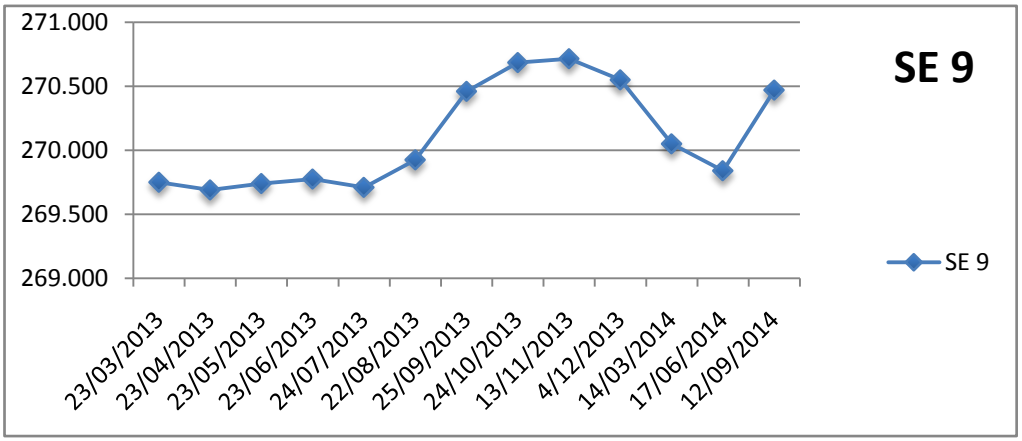
12/09/2014
SE 6







7.2.1 Purging and Sampling

Groundwater samples were obtained from a total of 4 locations on and around the site from the 9 new monitoring wells. Prior to sampling, each monitor well was purged at a rate of

approximately 5 L/min using a decontaminated submersible pump for a minimum of 15 minutes (i.e. purge volume of greater than 75L).

Groundwater samples were collected in laboratory supplied and preservative treated containers from each monitor well after withdrawing the submersible pump. Groundwater samples were collected in accordance with AS 5667.1:1998 . All samples were stored on ice and transported MGT Eurofins laboratories in Melbourne for analysis with appropriate chain-of-custody documentation. In addition, one duplicate sample was obtained at each monitoring event and submitted for quality control purposes.

The laboratory certificates of all of these analyses are provided in the Appendix D.

7.2.2 Field Water Quality Data

Water quality of the groundwater samples was tested in the field. The following table presents the average results over the period 2011 to 2014:

Table 6 Average of the field water quality record (June 2011 to October 2014)

Bore ID	pH	Elect. Cond Us/cm	TDS ppm
SE 1	3.7	3744	1886
SE 2	4.45	7536	3904
SE 3	6.9	8640	4490
SE 4	5.8	488	257
SE 5	4.9	4188	2326
SE 6	4.4	6936	3415
SE 7	3.7	10628	4836
SE 8	6.01	692	346
SE 9	5.2	12854	981

Field water quality records were recorded at all bores, from SE-1 to SE-9 between March 2013 and October 2014. Previous to that bores SE-1 to SE-4 were sampled when installed in 2011 and then again quarterly to 2014.

It is apparent from the field water quality results that two different groundwater aquifers have been intersected by the 9 bores installed around the site. Bores SE-1, SE-2, SE-3, SE-5, SE-6 and SE-7 report poor water quality of brackish nature, whereas bores SE-4, SE-8 and SE-9, which are located to the east and north of the site report relatively fresh water conditions.

The field water quality records for pH, electrical conductivity and field salinity testing are provided in Tables 7 to 9. It is worth noting that while most of the bores presented a relatively steady water quality, the variation in both pH and EC at bore SE 9 was at times significant, with salinity increasing with reduction in acidity (rise in pH) of the groundwater.

Table 7 - Field water quality record - pH

Bore ID	SE1	SE2	SE3	SE4	SE 5	SE 6	SE 7	SE 8	SE 9
Northings	6495635.667	6495913.7	6496193.886	6495786	6495858	6495855.090	6496096	6496173	6496373
Eastings	449807.222	449616.1	449382.966	450377.9	449809.3	450039.370	450043.1	449770.4	449643.2
1/07/2011									
18/01/2012	3.590	4.03	3.910	6.23					
18/07/2012	4.620	6.4	4.360	8.89					
13/01/2013	3.740	4.4	4.720	6.15					
23/03/2013	4.050	5.630	3.870	6.140	5.860	5.170	4.300	6.760	6.370
24/07/2013	3.190	4.650	36.980	5.360	4.730	4.510	3.620	6.15	4.93
24/10/2013	3.750	4.300	4.220	4.710	4.780	4.450	3.620	6.020	5.130
13/11/2013	3.800	4.270	3.540	5.410	4.640	4.660	3.520	5.550	6.150
4/12/2013	3.340	4.240	3.890	5.070	4.520	3.980	3.410	5.650	4.860
14/03/2014	3.630	4.000	3.350	5.680	5.000	4.220	3.660	6.530	5.350
17/06/2014	3.520	3.330	3.450	5.080	4.620	4.240	3.530	5.670	4.620
12/09/2014	3.520	3.700	3.550	5.260	4.710	4.270	3.650	5.790	4.420
Average	**3.705**	**4.450**	**6.895**	**5.816**	**4.858**	**4.438**	**3.664**	**6.015**	**5.229**

Table 8 - Field water quality record - Electric Conductivity in µS/cm

Bore ID	SE1	SE2	SE3	SE4	SE 5	SE 6	SE 7	SE 8	SE 9
Northings	6495635.667	6495913.7	6496193.886	6495786	6495858	6495855.090	6496096	6496173	6496373
Eastings	449807.222	449616.1	449382.966	450377.9	449809.3	450039.370	450043.1	449770.4	449643.2
18/01/2012	4300	6070	7690	327					
18/07/2012	3920	5200	7880	473					
9/01/2013	3750	5670	7750	540					
23/03/2013	3620	5600	8500	532	5090	5870	6480	1358	597
24/07/2013	3770	5440	12490	507	5260	5640	11230	570	952
24/10/2013	3650	5860	5570	479	4130	5570	11600	529	2310
13/11/2013	3620	5790	5450	504	3990	5640	10960	527	841
4/12/2013	3600	6080	12260	452	4270	6950	10950	523	852
14/03/2014	3710	10200	8770	453	3830	7900	11350	635	3320
17/06/2014	3640	12880	9650	644	3680	8610	11180	979	700
12/09/2014	3600	14110	9030	455	3250	8510	11270	415	698
Average	**3744**	**7536**	**8640**	**488**	**4188**	**6836**	**10628**	**692**	**1284**

Table 9 - Field salinity record in mg/l

Bore ID	SE1	SE2	SE3	SE4	SE 5	SE 6	SE 7	SE 8	SE 9
Northings	6495635.667	6495913.7	6496193.886	6495786	6495858	6495855.090	6496096	6496173	6496373
Eastings	449807.222	449616.1	449382.966	450377.9	449809.3	450039.370	450043.1	449770.4	449643.2
18/01/2012	2976	4231	5315	327					
1/01/2012	1310	2880	4430	236					
1/07/2012	1840	2810	3800	260					
23/03/2013	1810	2800	4250	261	2470	2890	3240	675	3000
24/07/2013	1890	2720	6290	252	2620	2830	5540	285	474
24/10/2013	1830	2940	2790	239	2080	2790	5800	260	1170
13/11/2013	1810	2900	2740	251	2000	2820	5480	262	422
4/12/2013	1800	3040	6130	226	2140	3470	5500	263	426
14/03/2014	1860	5120	4300	227	3830	3950	5680	321	1660
17/06/2014	1820	6440	4830	323	1840	4310	1820	490	350
12/09/2014	1800	7060	4520	228	1630	4260	5630	208	349
Average	**1886**	**3904**	**4490**	**257**	**2326**	**3415**	**4836**	**346**	**981**

8 LABORATORY ANALYSIS

8.1 Analytes

All groundwater and quality control samples were analysed using National Association of Testing Authorities (NATA) registered methods and analytical techniques for the following determinants.

- Major anions and cations, pH, conductivity, ammoniacal nitrogen and total dissolved solids (TDS);
- Heavy metals including arsenic, cadmium, chromium, copper, nickel, lead, zinc and mercury;

The chain-of-custody documentation and analytical data as presented by the laboratories appears within Appendix D.

8.2 Quality Control

The following sections describe the testing methodologies and quality assurance/quality control (QA/QC) procedures used for analysis of the water samples obtained during the field activities.

8.3 Field Duplicates and Blank Samples

One field blank sample (designated SE-5) was obtained. The results of the field duplicate and blank analyses are included in the Appendix D.

The Relative Percentage Difference (RPD) values calculated for the duplicated groundwater analysis ranged from incalculable where results were below laboratory practical quantitation limits (PQLs).

Analysis of the blank groundwater sample (designated SE 5) reported concentrations below the respective practical quantization limits (PQLs). Expected background concentrations were reported for major anions, cations and the heavy metals analyses conducted.

8.4 Laboratory Control Samples, Spike Recoveries, Duplicates and Blanks

Laboratory control and spiked samples were analysed by ARL and MGT Eurofins for all analytes (where applicable). All recovery results were within recommended control limits, indicating the results of the sample analyses are adequate for the purposes of this report, with a general tendency to slightly overestimate the concentrations of each individual analyte. All laboratory blank samples reported concentrations less than the PQL.

Laboratory duplicate analysis was conducted for heavy metals, cations, anions, ammoniacal nitrogen and total nitrogen. All RPDs were well within acceptable limits.

9 GROUNDWATER QUALITY

The groundwater analytical results are summarised in Appendix C. Based on the analytical results obtained, the following conclusions can be derived.

9.1 Major Ions and Groundwater Parameters

Analysis of groundwater samples reported all major ions and parameters

9.2 Heavy Metals

Analysis of most of downgradient and upgradient groundwater reported dissolved heavy metal concentrations above the DEC (2010) fresh water guidelines. Bores SE-4, SE-8 and SE-9 are located north and east of the proposed landfill and water within these bores is characterised by relatively low salinity (ranging some 200 to 1000 mg/l as TDS), the absence of heavy metals (arsenic, cadmium, copper, nickel, lead and zinc) and moderate pH (close to neutral). In general, the water quality to the north and east of the proposed landfill can be described as relatively good.

To the south and west of the site, the groundwater displays poor water quality. The water is brackish with TDS ranging from 2000mg/l to over 6000 mg/l. Heavy metals are present for all sampling events, with nickel being the main heavy metal of concern as the concentrations of this water quality variable have in the past been in the order of 200 times over the drinking water guidelines. Lead and copper are also prevalent, with occasional presence of small amounts of cadmium and arsenic. Table 10 presents water quality analyses from the most recent sampling event in September 2014. These analyses can be considered as representative of all other sampling events.

Summaries of the water quality in the bores are presented in Appendix C.

9.3 Nitrate

Unlike with the heavy metals, nitrate (or other nitrogen species) is not present in the groundwaters to the south and west of the proposed site, but is present to the north and east. This is most likely as a consequence of land use - the land is stocked with sheep.

The water quality with respect to all the nitrogen species complies with DER water quality guidelines for drinking water.

Table 10 – Water Quality Results - September 2014

	SE1	SE2	SE3	SE4	SE5	SE6	SE7	SE8	SE9	NG2
Chloride	**1000**	**4800**	**2900**	100	**910**	**2800**	**3900**	48	59	58
Conductivity (at 25Â°C)	**3700**	**14000**	**9400**	440	**3300**	**8700**	**12000**	400	**700**	**700**
pH	**3.5**	**3.8**	**3.4**	6.1	5.9	**4.3**	**3.7**	7.1	7.4	5.9
Sulphate (as S)	41	240	190	5.6	44	110	60	12	66	67
Total Dissolved Solids	**1900**	**9000**	**5100**	260	**1800**	**4500**	**6800**	270	490	480
Alkali Metals										
Calcium	1.1	25	3.7	0.9	1.7	2.2	5.5	< 0.5	< 0.5	< 0.5
Magnesium	40	420	300	9.9	70	100	100	1.3	1.8	1.9
Potassium	2.8	53	66	1.5	17	11	7.2	2.3	1.9	1.8
Sodium	**550**	**2100**	**1200**	70	470	**1500**	**1800**	81	130	130
Heavy Metals										
Arsenic (filtered)	0.001	0.002	0.004	< 0.001	< 0.001	0.001	0.002	< 0.001	< 0.001	< 0.001
Cadmium (filtered)	0.0003	0.0019	**0.027**	< 0.0002	0.0004	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0002
Chromium (filtered)	0.001	0.004	< 0.001	< 0.001	< 0.001	0.005	0.002	< 0.001	< 0.001	< 0.001
Copper (filtered)	0.46	1.8	0.01	0.013	0.003	0.085	0.093	0.002	0.007	0.007
Lead (filtered)	**0.096**	**0.66**	**0.1**	< 0.001	< 0.001	**0.014**	0.003	< 0.001	< 0.001	< 0.001
Manganese (filtered)	0.093	1.2	1.8	0.017	1.6	0.055	0.1	< 0.005	< 0.005	< 0.005
Mercury (filtered)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	**0.098**	**1.2**	**3.8**	0.014	**0.49**	**0.029**	**0.046**	< 0.001	0.003	0.003
Zinc (filtered)	0.1	0.91	3.2	0.024	0.38	0.052	0.058	0.004	0.038	0.039
Total Nitrogen Set (as N)										
Nitrate & Nitrite (as N)	< 0.05	< 0.05	< 0.05	7.7	< 0.05	0.13	0.98	5.7	7.5	8
Total Kjeldahl Nitrogen (as N)	< 0.2	0.3	< 0.2	0.3	< 0.2	< 0.2	< 0.2	< 0.2	0.2	< 0.2
Total Nitrogen (as N)	< 0.2	0.3	< 0.2	8	< 0.2	< 0.2	1	5.7	7.7	8

All results in mg/l.
Values in bold exceed drinking water guidelines

10 GROUNDWATER CONDITIONS

10.1 Groundwater Hydraulics

Regional ground water was inferred to be flowing in a north to north-westerly direction south of the site and also north-westerly, north of the site. This observation is based on observed flow directions of local creeks and brooks and also the topography which is expected to provide some control on regional groundwater flow. Figures 4a, 4b and 4c illustrates the direction of groundwater flows based on lines of equal potential derived from the groundwater elevation in each monitor well (Section 7) during high SWL monitoring events after the wet cycle.

Ground water (as a deep confined aquiclude) appears to exist underneath the whole of the proposed landfill. Ground water arrives from the east and the predominant flow direction from the proposed landfill site is to the south and north west, with a relatively steep hydraulic gradient of approximately 0.03, when calculated with respect to a closest potential groundwater pathway to the Jimperding Brook. The site sits on a topographical saddle which is also reflected in the groundwater potentiometric surface morphology.

10.2 Conceptual Hydrogeological Model

A conceptual groundwater model has been derived from a review of previous reports relating to the drilling, and the recent installation of more piezometers at the site.

Figure 7 illustrates the major features of the conceptual hydrogeological model of the quarry area and surrounds. The major elements of the model are:

- The local geology is characterised by weathered micaceous schists with steep paleo-bedding which strikes northwards. The weathered zone above fresh bedrock extends to between 40 and 50m. This zone is primarily a white silty/clay with inclusions of quartzite, mica and is criss-crossed by a number of hydrothermal quartz veins. No local faulting has been observed from aerial photography nor is reported in geological maps of the area.
- Recharge to the local aquifers is likely to be from zones to the east, potentially a long distance away. Local geology is of very low permeability and is unlikely to provide rainfall recharge of any magnitude. The closest groundwater discharge to the site is the Jimperding Brook, located about 1 km to the south of the site.
- The upper 10 to 15 m of this weathered zone is mined for clay. Below this level the clay becomes saline and is no longer suitable for brick and tile production.
- The aquifer/aquitard has a steep groundwater gradient with respect to Jimperding Brook (0.03). Seasonal groundwater level fluctuations over the site are in the order of 0.5 to 1.2 m.
- The aquifer/aquitard which is located in weathered micaceous schists at depth and is confined by between 30 and 50 m thick bed of weathered micaceous to gritty silt/clays,

from the ground surface (see Figure 7). This indicates that the aquifer/aquitard is separated from the surface by some 30m (in the east) to 50m (in the west) of clay beds. This was borne out during the drilling of the monitor wells (see geological logs of SE-1 to SE-9), as groundwater strikes were all well below the current potentiometric surface. This also shows that the depth to groundwater aquifers/aquitards increases westwards.

- It is concluded that this is a deep sitting confined aquifer/aquitard, with relatively poor water yield.
- Significant upward piezometric pressure due to confinement by clay rich stratigraphy and steep aquifer gradient.
- Stabilised potentiometric head relatively close to the surface (within 10 to 20 m from the natural ground surface). Potentiometric head is the result of the confining pressure at the aquifer level. Lateral groundwater flow is likely to be restricted by the clay rich mineralisation, resulting in poor transmissivity. This was shown by the relatively long time (up to 2 days) it took the monitoring bores to stabilise a SWL after drilling was completed (see cross sections in DWG OV-03-ACW and site plan in DWG OV-02-ACW)
- Ground water chemistry recorded for the period July 2011 to September 2014 shows that the waters south and south-west of the site are not fit for human consumption. Ground water to the east and north east of the site is of good quality.
- The potential primary beneficial use of groundwater in proximity to the site is (i) aquatic environment in the Jimperding Brook 900 m to the south and south-west, (ii) stock watering from the Jimperding Brook, (iii) possible future groundwater abstraction at residences to the north, potentially for domestic purposes (see DWG OV-01- ACW).

Geological logs for the bores drilled during June 2011 and April 2013 are shown in Figures 8 to 16.

10.3 Groundwater flow

The potentiometric groundwater surface elevation is shown in Figures 4a to 4c and the aquifer/aquitard location is derived from the water strikes recorded during drilling of the monitoring bores. Figure 4 is generated from the highest recorded water level events over the period July 2011 to September 2014.

The local land gradient is towards the south and north-west from the site, but the groundwater flow direction is recorded to the south, calculated from the potentiometric isoclines. This flow direction is used in the risk assessment for impact on potential receptors, as Jimperding Brook is the closet potential receptor to the site (912 m south). An assumption is made that a preferential groundwater flow path to the receptor exists directly south to Jimperding Brook.

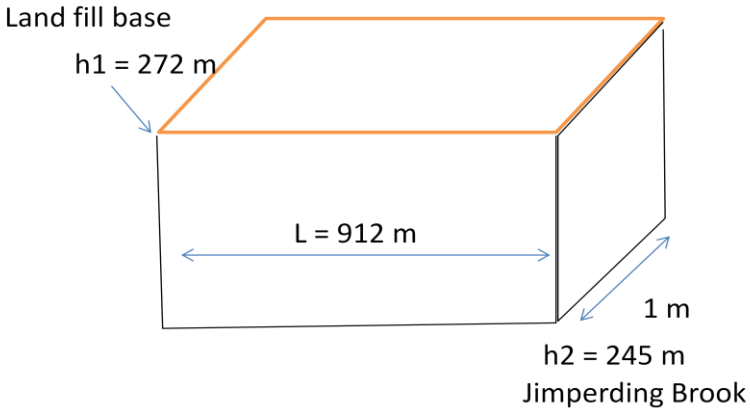
10.3.1 Direct Calculation for Travel Time from Proposed Landfill to Jimperding Brook:

An assumed hydrogeological connection between the site and Jimperding Brook is used to provide a worst case scenario for contamination impact of a sensitive receptor.

The receptor pathway would be along a quartzite geological structure which would allow groundwater flow from below the proposed landfill and be intercepted by the base flow of the Jimperding Brook.

The following model calculation seeks to provide the time period that a contaminant would take to reach the Brook, under purely advective groundwater flow conditions.

- Hydraulic conductivity through a fractured quartzite with a silt matrix - 0.08m/d (Freeze & Cherry, 1979)
- Porosity - 10%. While clay may have porosities in the order of 40%, silt is more likely to be in the 10% range.
- Gradient - 0.03 from the conceptualization below:



Not to scale

Calculation

Darcy's law is the basic equation that describes fluid flow through porous media. There are many ways to write Darcy's Law, and a few of them will be presented here. The first equation contains a velocity term, v (L/T), a conductivity term, K (L/T), a head term, h (L), and a distance term, l (L):

$v = -K(\Delta h/\Delta l)$

L =912m K = 1 x 10^{-6} m/s Porosity = 10% or 0.1

A = 1 x 27 = 27m^2 $dh = (h_2 - h_1) = (272 - 245) = -27$ m

therefore,

i = (27)/912 = -0.0296 = -0.03

v = - (10^{-6}) x (-0.03) = 3 x 10^{-8} m/s

Q = - (10^{-6}) x (-0.03) x 27 = 0.81 x 10^{-7} m^3/s

Note: To Calculate Average Linear Velocity which is what we use for groundwater calculations you must divide v by porosity.

Average Linear Velocity

v/porosity = 3 x 10^{-8} / 0.1 = 3 x 10^{-7} m/s

Therefore daily travel distance = 3 x 10^{-7} x 86,400 = 0.026 m/day

and in a year, 0.026 x 365 = 9.5 m/year

To cover the full distance (912 m) it will take groundwater 96 years to reach Jimperding Brook.

NOTE:

Hydraulic conductivity assumed to be that of silt (0.08 m/day), which is worst case scenario, as the lithological material matrix is a silt-clay mix, which could be considered less permeable.

No dispersion or other solute transport assumptions taken into account.

10.3.2 Bioscreen Modelling

Bioscreen is a screening model which simulates a contaminant plume in one dimension. It is programmed in Microsoft® Excel, is based on the Domenico analytical solute transport model, and has the ability to simulate advection, dispersion and adsorption. For the purposes of this report a solute transport model, without decay, was used to simulate the worst case condition scenartio. A hypothetical direct preferential path from the proposed landfill to Jimperding Brook was modelled to again simulate the worst case condition. It should be noted that no such pathway has been observed to date, however, in the interest of providing a worst case condition scenario, the hypothetical pathway was assumed as the basis for the model.

Bioscreen was run for a period of 10 years to determine which contaminants were likely to reach the closest sensitive receptor (Jimperding Brook) at concentrations above the guideline values. A cross sectional area was estimated for the plume using the flow rate from the base of the landfill and the calculated seepage velocity. Flow rate was assumed to be conserved.

As an assumption was taken that a conservative contaminant (non-decay) at a concentration of 600 mg/l (say chloride) will leave the landfill through a 50 m wide and 2 m deep saturated contact zone (approximately 200 litres/day for the whole landfill site). This would be roughly equivalent to a loss of 10l/day/ha over the Stage 1 of the landfill. The Bioscreen input and output screens are provided over the next 3 pages.

The Bioscreen modelling results indicated that after 80 years the closest impact would be about 823m downgradient of the site, with a total plume mass of some 1510 kgs with

concentrations of an arbitrary conservative contaminant reduced from 600 mg/l to less than 50 mg/l.

The Bioscreen model calculations use dispersion in addition to advection of a conservative contaminant, which allows for solute transport to be faster than by purely advective flow of groundwater (previous calculation). These calculations show that the first "breakthrough" of contamination to the Brook is possible within 100 years of the landfill developing a leak.

This concludes that if in fact there was a direct hydraulic connection between the base of the landfill and the Jimperding Brook, of higher permeability then the surrounding geology (for example a fractured quartz vein or similar structural geological; feature), the time frame for any water quality impact to the Jimperding Brook would be close to two decades, providing ample time for corrective action to be taken as required.

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence — *Version 1.4*

Keesler AFB
SWMU 66
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
or
0.02 → 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.
20 → Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	*Vs*	30.0	*(ft/yr)*
or		*or*	
Hydraulic Conductivity	*K*	1.0E-04	*(cm/sec)*
Hydraulic Gradient	*i*	0.029	*(ft/ft)*
Porosity	*n*	0.1	*(-)*

2. DISPERSION

Longitudinal Dispersivity*	*alpha x*	23.6	*(ft)*
Transverse Dispersivity*	*alpha y*	2.4	*(ft)*
Vertical Dispersivity*	*alpha z*	0.0	*(ft)*
or		*or*	
Estimated Plume Length	*Lp*	920	*(ft)*

3. ADSORPTION

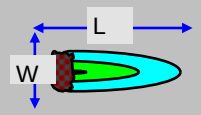
Retardation Factor*	*R*	1.0	*(-)*
or		*or*	
Soil Bulk Density	*rho*	1.7	*(kg/l)*
Partition Coefficient	*Koc*	38	*(L/kg)*
FractionOrganicCarbon	*foc*	5.7E-5	*(-)*

4. BIODEGRADATION

1st Order Decay Coeff*	*lambda*	0.0E+0	*(per yr)*
or		*or*	
Solute Half-Life	*t-half*	0.00	*(year)*
or Instantaneous Reaction Model			
Delta Oxygen*	*DO*	1.5	*(mg/L)*
Delta Nitrate*	*NO3*	45	*(mg/L)*
Observed Ferrous Iron*	*Fe2+*	25	*(mg/L)*
Delta Sulfate*	*SO4*	25	*(mg/L)*
Observed Methane*	*CH4*	6.6	*(mg/L)*

5. GENERAL

Modeled Area Length*	2992	*(ft)*
Modeled Area Width*	164	*(ft)*
Simulation Time*	100	*(yr)*



6. SOURCE DATA

Source Thickness in Sat.Zone* 6.6 *(ft)*

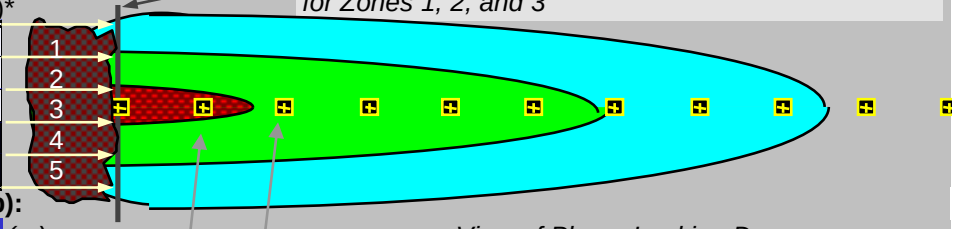
Source Zones:

Width* (ft)	Conc. (mg/L)*
28	10
30	300
14	600
30	300
28	10

Source Halflife (see Help):

Infinite	Infinite	*(yr)*
Inst. React.	1st Order	
Soluble Mass In Source NAPL, Soil	infinite	*(Kg)*

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)	600.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Dist. from Source (ft)	*0*	*299*	*598*	*898*	*1197*	*1496*	*1795*	*2094*	*2394*	*2693*	*2992*

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — **View Output**

RUN ARRAY — **View Output**

Help

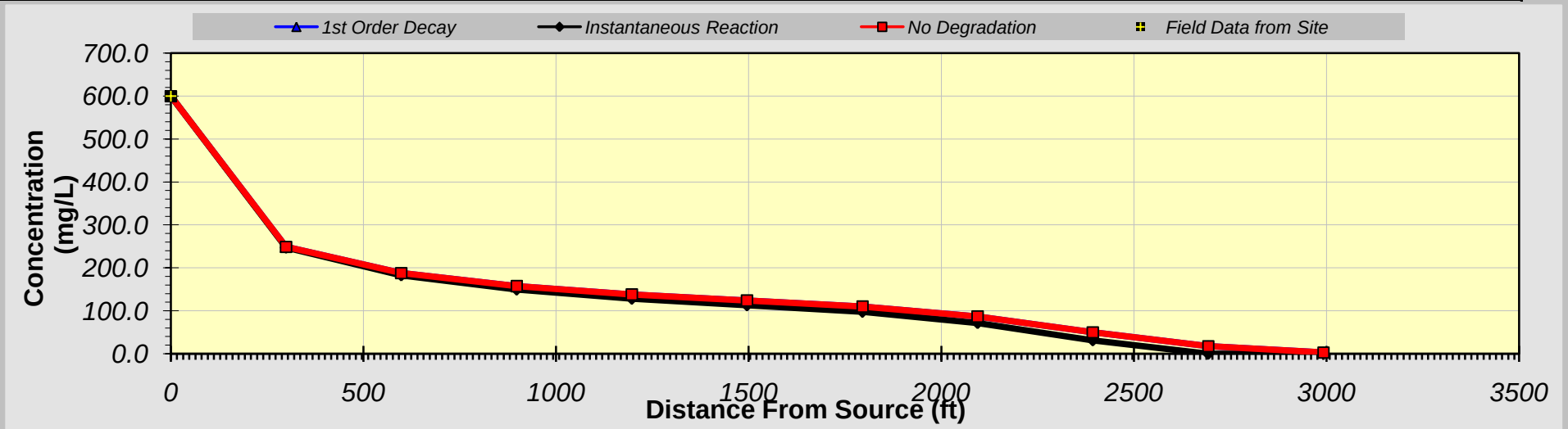
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	299	598	898	1197	1496	1795	2094	2394	2693	2992
No Degradation	600.000	249.292	188.196	157.290	137.837	123.761	109.833	86.634	50.444	18.057	3.513
1st Order Decay	600.000	249.292	188.196	157.290	137.837	123.761	109.833	86.634	50.444	18.057	3.513
Inst. Reaction	600.000	247.234	182.754	149.471	128.315	112.912	97.566	71.839	31.591	0.000	0.000
Field Data from Site	600.000										



Replay Animation

Next Timestep

Prev Timestep

Time:

80 Years

Return to Input

Recalculate This Sheet

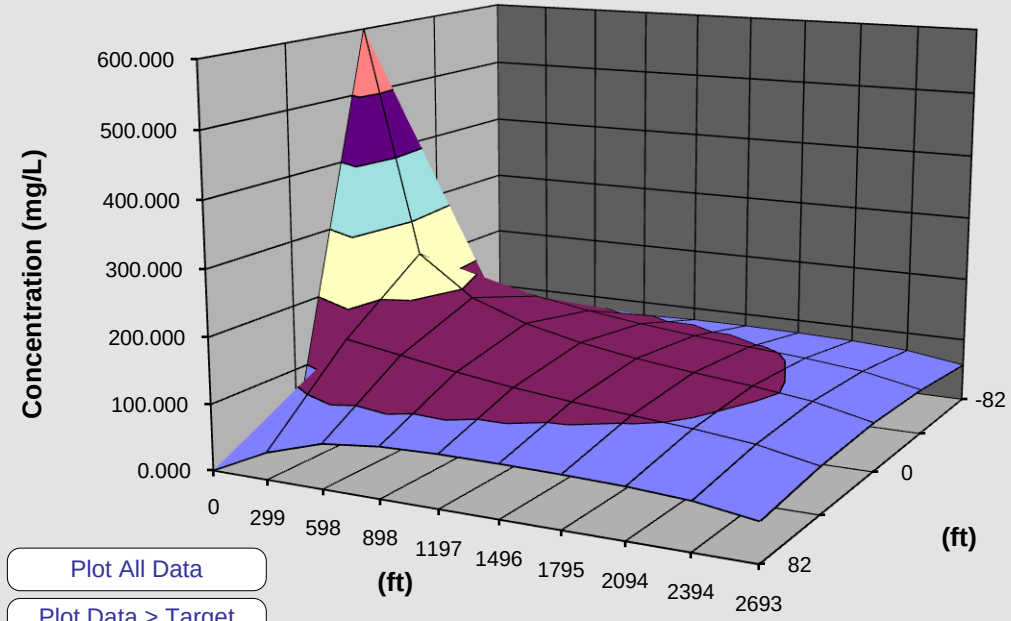
DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft) ↓ / Distance from Source (ft)	0	299	598	898	1197	1496	1795	2094	2394	2693	2992
82	0.000	40.758	67.283	76.670	79.371	79.336	78.084	75.827	70.576	57.619	36.016
41	10.000	159.184	145.580	131.438	120.090	111.040	103.620	96.805	87.493	69.800	42.827
0	600.000	249.292	188.196	157.291	137.860	124.206	113.868	105.016	93.989	74.408	45.372
-41	10.000	159.184	145.580	131.438	120.090	111.040	103.620	96.805	87.493	69.800	42.827
-82	0.000	40.758	67.283	76.670	79.371	79.336	78.084	75.827	70.576	57.619	36.016
MASS FLUX (mg/day)	4.1E+4	4.1E+4	3.9E+4	3.6E+4	3.4E+4	3.2E+4	3.0E+4	2.8E+4	2.6E+4	2.1E+4	1.3E+4

Model to Display:

- *No Degradation Model*
- *1st Order Decay Model*
- *Instantaneous Reaction Model*

Time: **100 Years** Target Level: **10.000** mg/L Displayed Model: **No Degradation**



Plot All Data

Plot Data > Target

Plume and Source Masses (Order-of-Magnitude Accuracy)

Plume Mass if No Biodegradation	1510.9	*(Kg)*
- Actual Plume Mass	1510.9	*(Kg)*
= Plume Mass Removed by Biodeg	**0.0**	*(Kg)*
	0 %	

Change in Electron Acceptor/Byproduct Masses:

Oxygen	*Nitrate*	*Iron II*	*Sulfate*	*Methane*	
na	na	na	na	na	*(Kg)*

Contam. Mass in Source (t=0 Years)	infinite	*(Kg)*
Contam. Mass in Source Now (t=100Years)	Infinite	*(Kg)*
Current Volume of Groundwater in Plume	9.9	*(ac-ft)*
Flowrate of Water Through Source Zone	0.059	*(ac-ft/yr)*

Mass HELP

Recalculate

11 CONCLUSIONS

On the basis of this study, the following conclusions are reached:

- The site is underlain by a confined aquifer/aquitard of limited extent which is confined by thick beds (up to 30 m thick) of clays and weathered schist/quartzite.
- Based on the water yield and aquifer physical characteristics, the water body can be defined as a confined aquitard.
- The water quality in south and south west downgradient bores is poor, indicating impacts from salinity and geological weathering of in situ mineralisation (presence of heavy metals). Ground water quality to the north and east of the site is good.
- While the yield from the aquifer has not been tested, the geological materials recovered from the drilling suggest that this aquifer is potentially low yielding with poor aquifer transmissivity (low hydraulic conductivity).
- The recently installed bores are adequately located to define the local aquifers and are suitably positioned for monitoring of the groundwater below the site.
- The highest possible groundwater potentiometric surface (measured between July 2011 and September 2014) is below the current floor of the pit.
- The groundwater conditions at the site are favorable for the development of a waste management facility as the aquifer below and adjacent to the site cannot be considered a beneficial water resource due to likely low yielding water characteristics and in some locations poor water quality. This observation is related to the significant clay content in the matrix of the geologic materials recorded during installation of the site groundwater monitoring bores.
- Modelling of the most sensitive receptor pathways shows that it will take in excess of 90 years for water leaking from the landfill to reach the most sensitive and closest receptor - the Jimperding Brook. The Bioscreen model suggests that it may also take up to 100 years for a contaminant "breakthrough" to be observed at the Brook (first recorded concentration) if a preferential groundwater flow path exists in a direct line between the landfill and Jimperding Brook

- The beneficial groundwater use in the area is considered to be sufficient for “stock watering”. Groundwater to the east and north of the site is suitable for domestic use.
- Water yields from bores adjacent to the site are likely to be poor due to the low permeability of the aquifer/aquitard.

12 RECOMMENDATIONS

The following recommendations are made, based on the investigations to date:

- As the downgradient groundwater quality exceeds the DER guidelines for fresh waters, it is recommended that the baseline water quality survey data is used as water quality triggers. If required, these water quality analyses can be performed again to confirm the water quality data base currently available.
- Static water level (SWL) and quality of the groundwater should be continue to be monitored at a quarterly interval.

13 REFERENCES

- Department of Environment and Conservation, 2010. – Contaminated Sites Management Series.
- Department of Environment and Conservation, 2005. – The use of risk assessment in contaminated site assessment.
- Wilde, S. A. 1994. Crustal Evolution OF The South Western Yilgam Craton. Geological Society OF Australia (WA, DIVISION) EXCURSION GUIDEBOOK, 7,20P.
- Landform Research, 2009. Management and Rehabilitation Program of Clay Pit Class 11 Landfill, Lot M2027, Chitty Road, Toodyay, Opal Vale Pty Ltd.

14 GLOSSARY OF TERMS

Abstraction Pumping groundwater from an aquifer.

AHD Australian Height Datum; equivalent to: Mean Sea Level (MSL) + 0.026 m; Low Water Mark Fremantle (LWMF) + 0.756 m.

Alluvium Unconsolidated sediments transported by streams and rivers and deposited.

AMG Australian Map Grid.

Anticline Sedimentary strata folded in an arch.

Aquifer A geological formation or group of formations able to receive, store and transmit significant quantities of water.

Confined A permeable bed saturated with water and lying between an upper and a lower confining layer of low permeability.

Baseflow Portion of river and stream flow coming from groundwater discharge.

Basement Competent rock formations underneath sediments.

Bore Small diameter well, usually drilled with machinery.

bns Below natural surface.

Colluvium Material transported by gravity downhill of slopes.

Confining bed Sedimentary bed of very low hydraulic conductivity.

Conformably Sediments deposited in a continuous sequence without a break.

Conductivity The flow through a unit cross sectional area of an aquifer under a unit hydraulic gradient.

Dewatering Abstraction of groundwater from bores to assist in mining.

Evapotranspiration A collective term for evaporation and transpiration.

Gradient The rate of change of total head per unit distance of flow at a given point and in a given direction.

Head The height of the free surface of a body of water above a given subsurface point.

Hydraulic Pertaining to groundwater motion.

Flux Flow.

Fault A fracture in rocks or sediments along which there has been an observable displacement.

Formation A group of rocks or sediments which have certain characteristics in common, were deposited about the same geological period, and which constitute a convenient unit for description.

Porosity The ratio of the volume of void spaces, to the total volume of a rock matrix.

Potentiometric An imaginary surface representing the total head of groundwater and defined by the level to which water will rise in a bore.

Specific yield The volume of water than an unconfined aquifer releases from storage per unit surface area of the surface.

Semi-confined A semi-confined or a leaky aquifer is saturated and bounded above by a semi-permeable layer and below by a layer that is either impermeable or semi-permeable.

Semi-unconfined Intermediate between semi confined and unconfined, when the upper semi-permeable layer easily transmits water.

Unconfined A permeable bed only partially filled water and overlying a relatively impermeable layer. Its upper boundary is formed by a free watertable or phreatic level under atmospheric pressure.

Transmissivity The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient.

Transpiration The loss of water vapour from a plant, mainly through the leaves.

Watertable The surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere.

Well Large diameter bore, usually dug by hand.

15 LIMITATIONS

1. The conclusions presented in this report are relevant to the condition of the site and the state of legislation currently enacted as at the date of this report. We do not make any representation or warranty that the conclusions in this report will be applicable in the future as there may be changes in the condition of the site, applicable legislation or other factors that would affect the conclusions contained in this report.

2. Stass Environmental has used a degree of skill and care ordinarily exercised by reputable members of our profession practicing in the same or similar locality. Conclusions are based on representative samples or locations at the site, the intensity of those samples being in accordance with the usual levels of testing carried out for this type of investigation. Due to the inherent variability in natural soils we cannot warrant that the whole overall condition of the site is identical or substantially similar to the representative samples.

3. This report has been prepared for Opal Vale and for the specific purpose to which it refers. No responsibility is accepted to any third party and neither the whole of the report or any part or reference thereto may be published in any document, statement or circular nor in any communication with third parties without our prior written approval of the form and context in which it will appear.

4. This report and the information contained in it is the intellectual property of Stass Environmental. Opal Vale is granted an exclusive licence for the use of the report for the purpose described in the report.

APPENDIX A
Figures and drawings

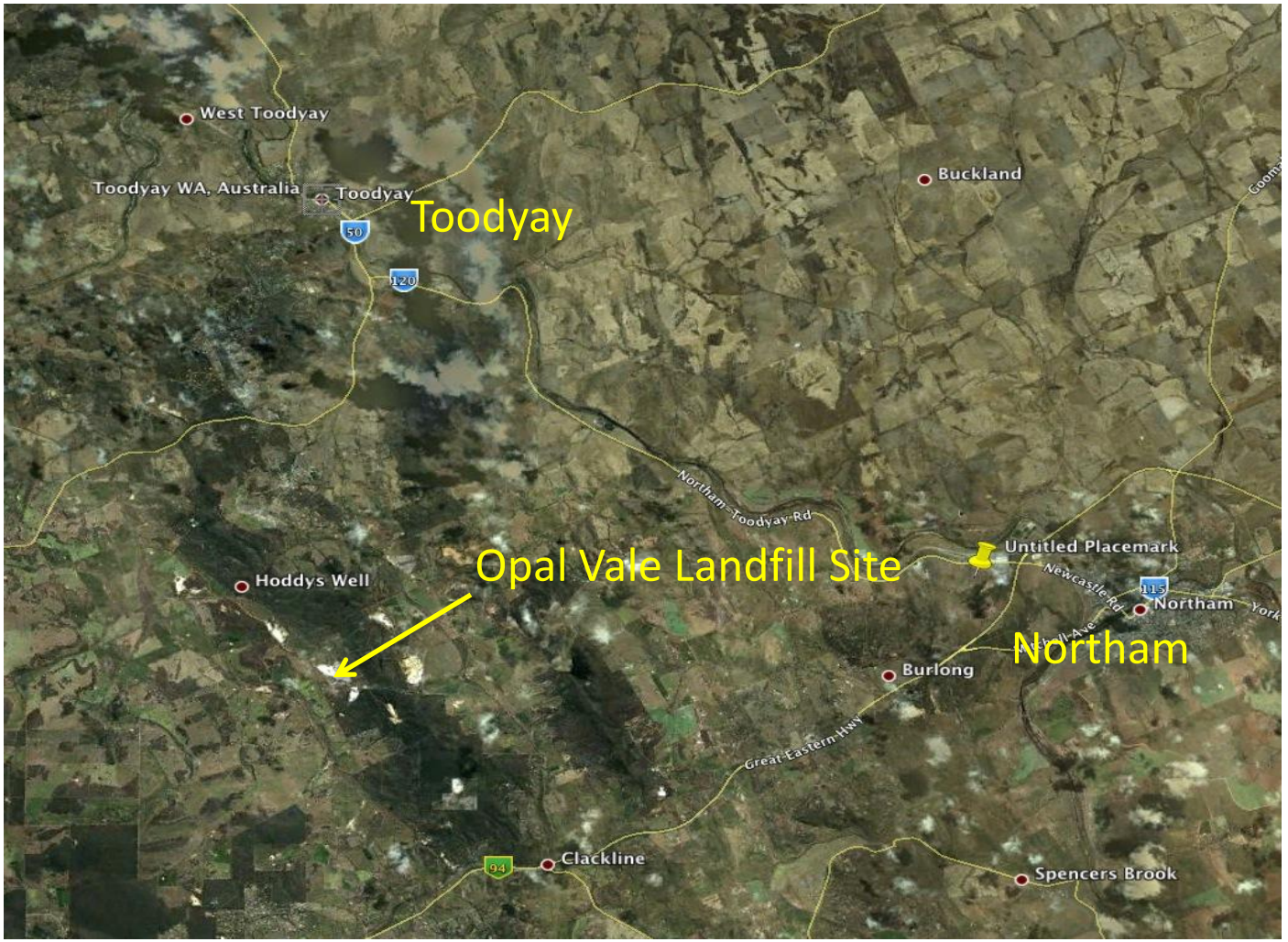


Figure 1 : Location of the Site

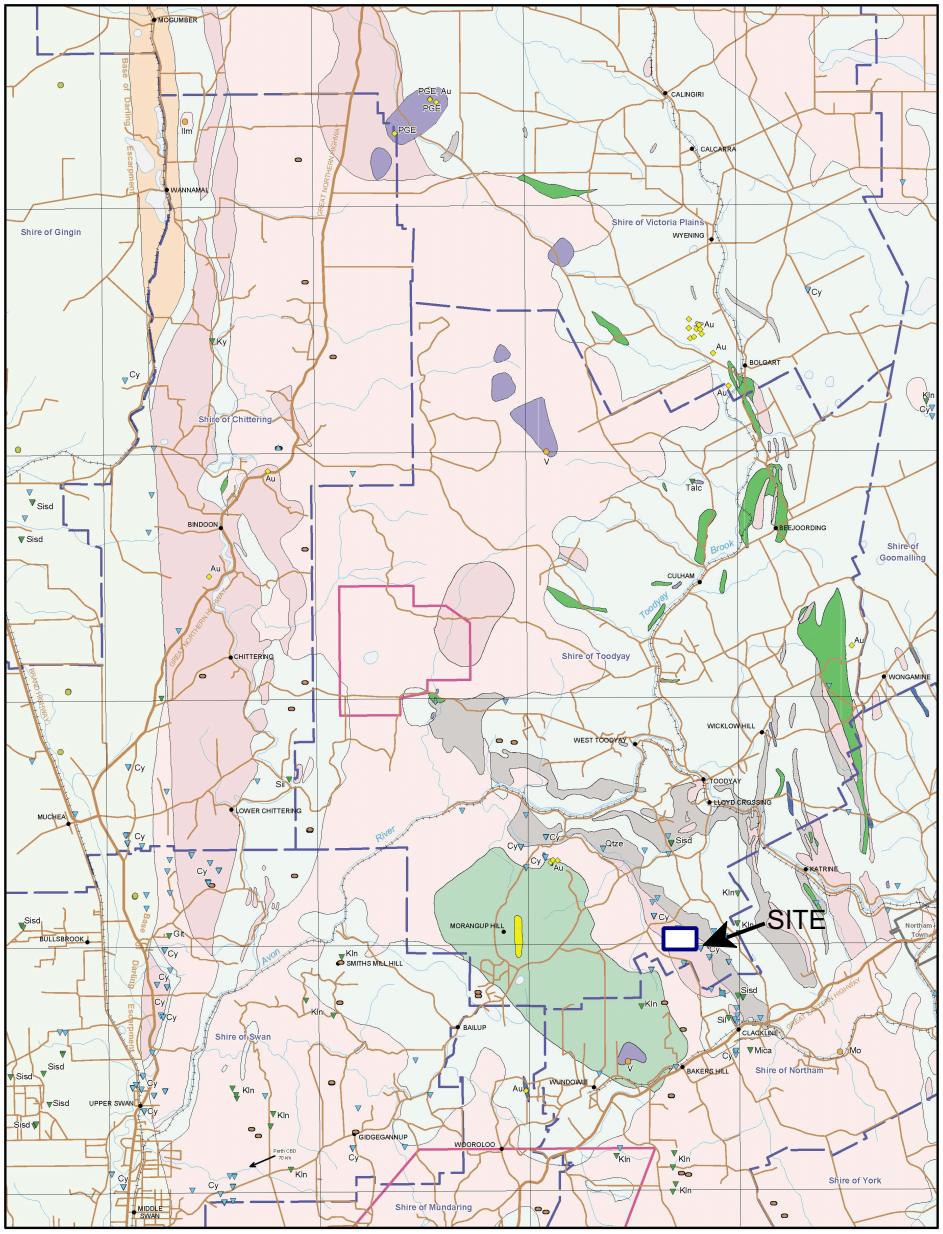
Stass Environmental

Purple dots show locations of registered bores
Source: DoW geographical atlas, DECEMBER 2011

Figure 1a : Registered bores adjacent to site

Figure 2 : Site Layout and Monitoring Bore Locations

Stass Environmental



RESOURCE POTENTIAL FOR LAND USE PLANNING

TOODYAY AREA

Rock types	Mineral potential	Regional planning implications
Sedimentary rocks of the Perth Basin		
Granitic rock	Low for gold, high for dimension stone	
Granite, gneiss, migmatite	Unknown	
Schist, granofels	High for industrial minerals (sillimanite, kyanite, graphite)	
Calc-silicate gneiss, mylonite	High for base and other metals (copper, zinc, and lead)	
Banded iron-formation, metamorphosed	High for iron ore	
Quartzite	High for construction materials (crushed rock) and building stone	
Felsic volcanic rock, metamorphosed	High for gold and base metals	
Mafic volcanic rock, metamorphosed	Very high for gold	
Altered mafic intrusive to volcanic rock, metamorphosed	Very high for gold	
Mafic to ultramafic rock, metamorphosed	Very high for platinum group metals and steel industry metals	

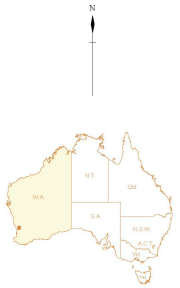
Overlying weathered materials (widespread but not shown on map)

Laterite, widespread on hills	Very high for bauxite, gold, and ironstone gravel
Alluvial and eolian sand; in valleys	Very high for construction sands

Mineral occurrences, deposits, and mines by groups	Resource
Precious metal	Gold (Au), platinum-group metals (PGE)
Steel industry metal	Vanadium (V), molybdenum (Mo)
Specialty metal	Heavy mineral sands (zircon and titanium minerals)
Iron	Iron ore
Alumina	Bauxite
Industrial mineral	Ilmenite (Ilm), glauconite (Glt), kyanite (Ky), sillimanite (Sil), silica sand (Sisd), kaolin (Kln), mica, talc
Construction material	Unspecified unless indicated; rock, sand, gravel, clay (Cy), quartzite as dimension stone (Qtze)

(Note, may not include mines authorized by Shires)

- Geological boundary
- Major road / Highway
- Minor road
- Railway
- Localities
- Town of Northam
- Shire boundary
- Watercourse
- Waterbody
- Bauxite tenement (Mining Lease 1SA)



Department of Industry and Resources

Geological Survey of Western Australia

SCALE 1: 200 000

5000 0 10

Metres Kilometres

Fig 3 - Geology of the area indicating the location of the site.

Stass Environmental

Figure 4a :Static Water Level and Ground Water Flow Direction - June 2011

Stass Environmental

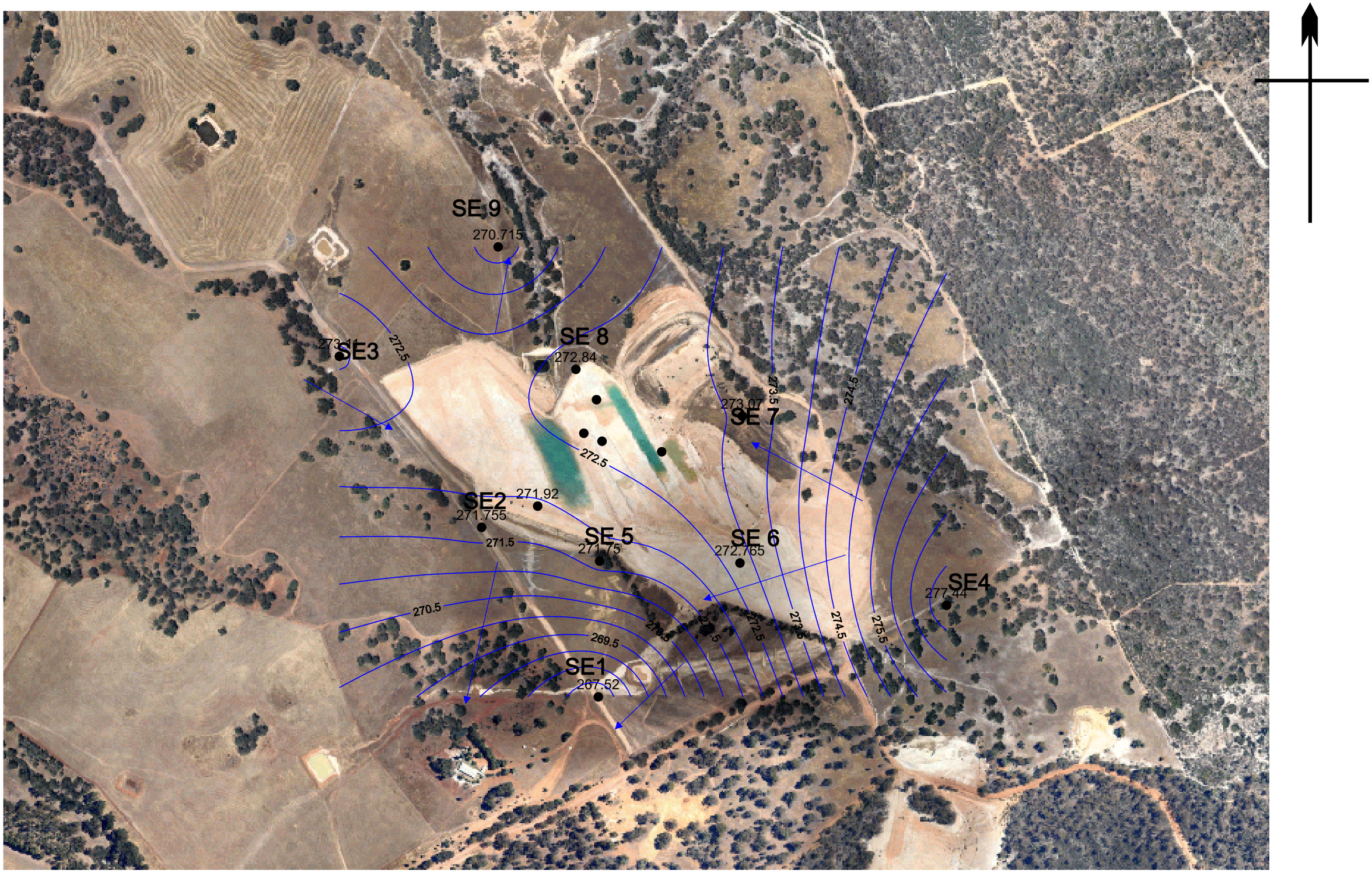


Figure 4b : Highest recorded ground water levels, September 2013 and flow directions

Stass Environmental

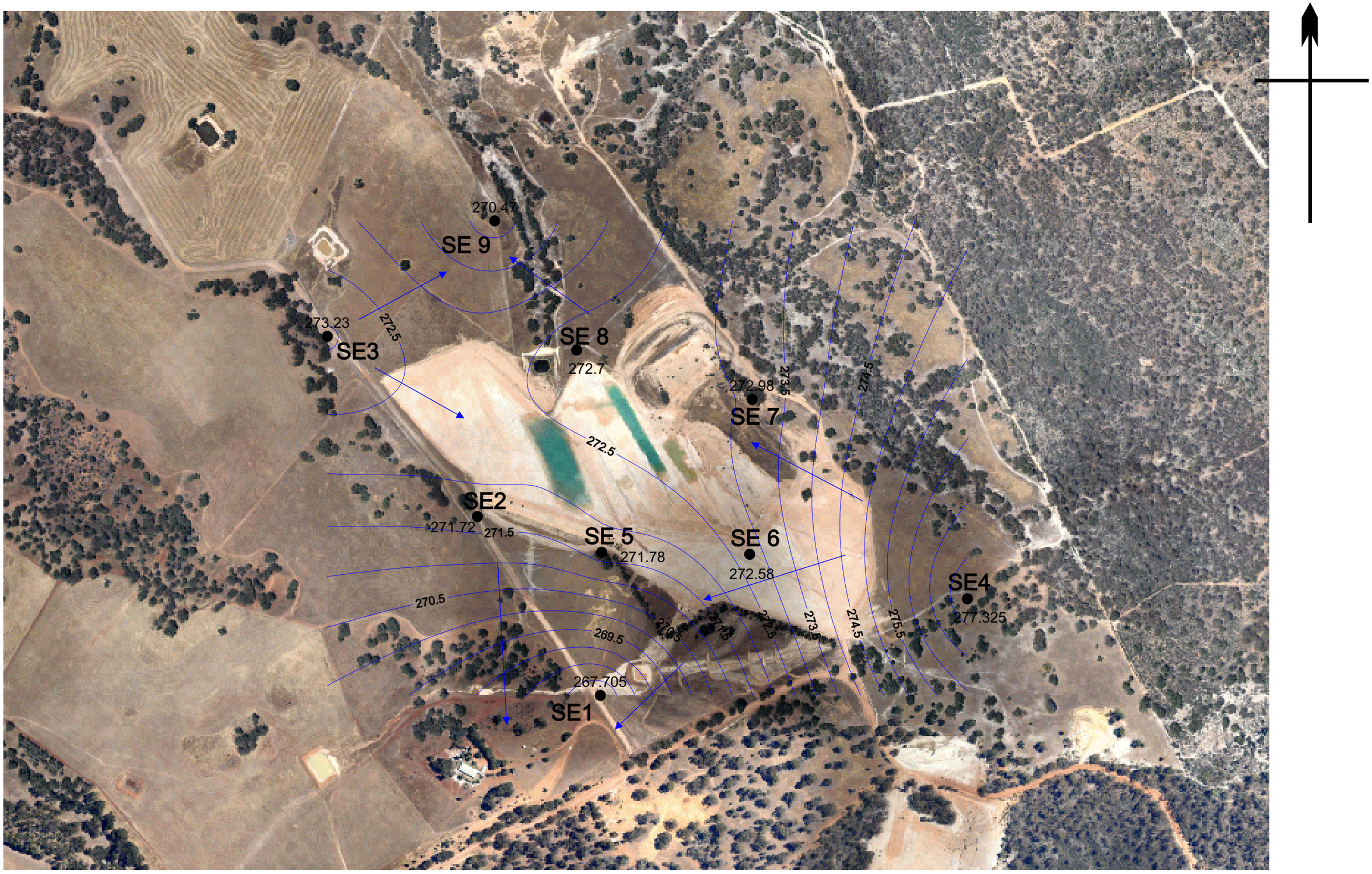


Figure 4c : Highest recorded ground water levels, November 2014 and flow directions

Stass Environmental

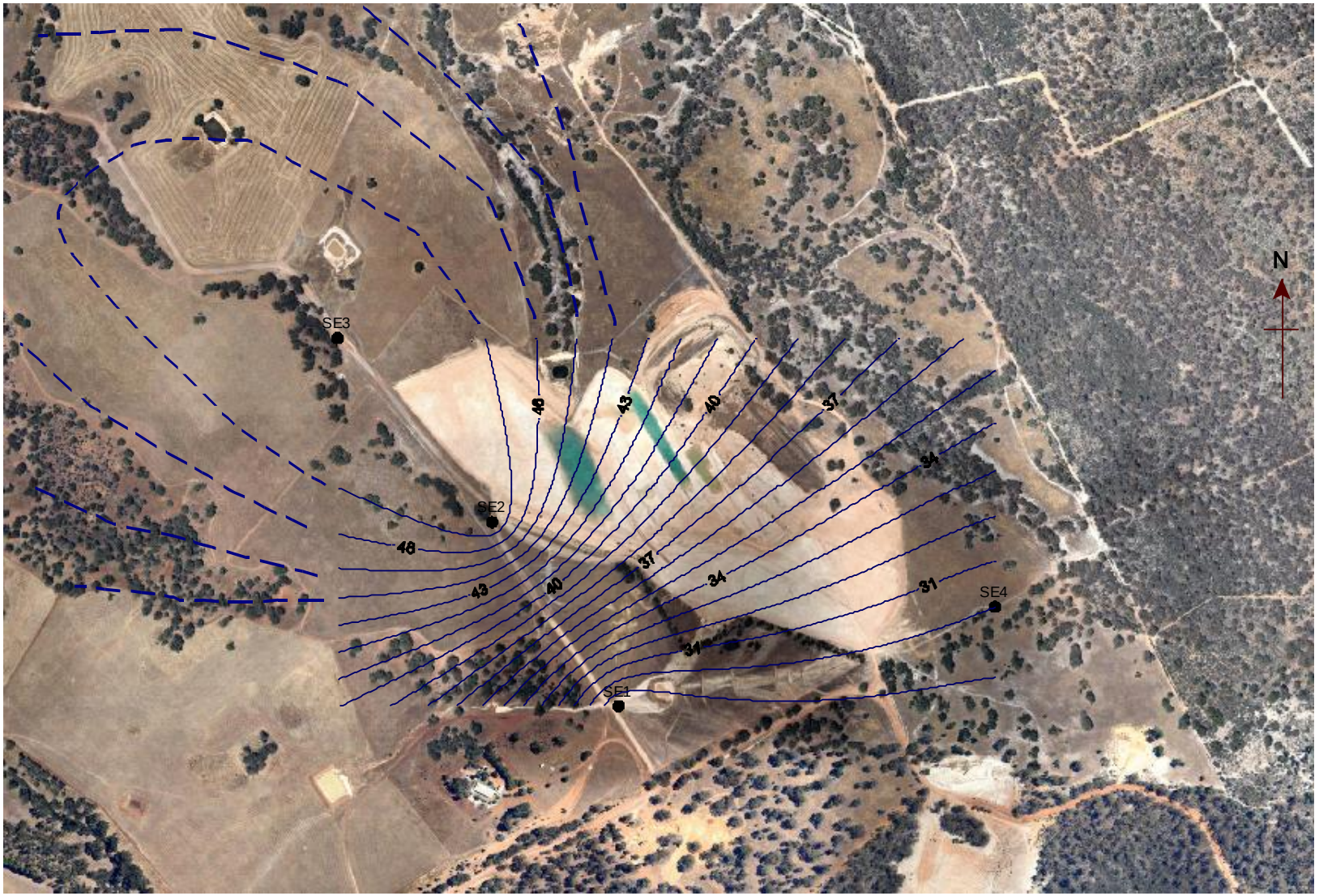


Figure 5 : Depth to water strikes recorded during drilling

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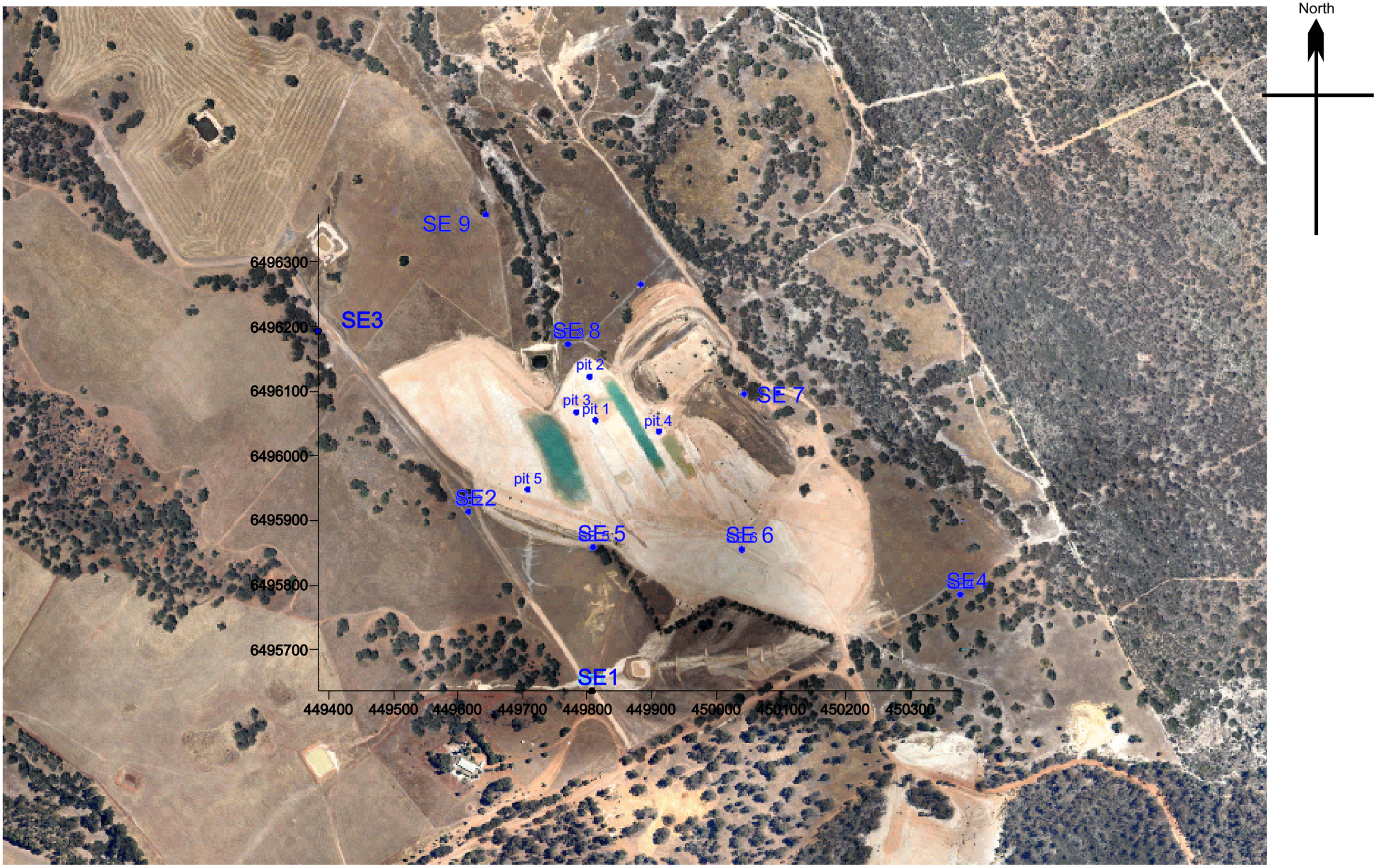

Figure 6 : Location of all bores installed at the site, from 2011 to 2013

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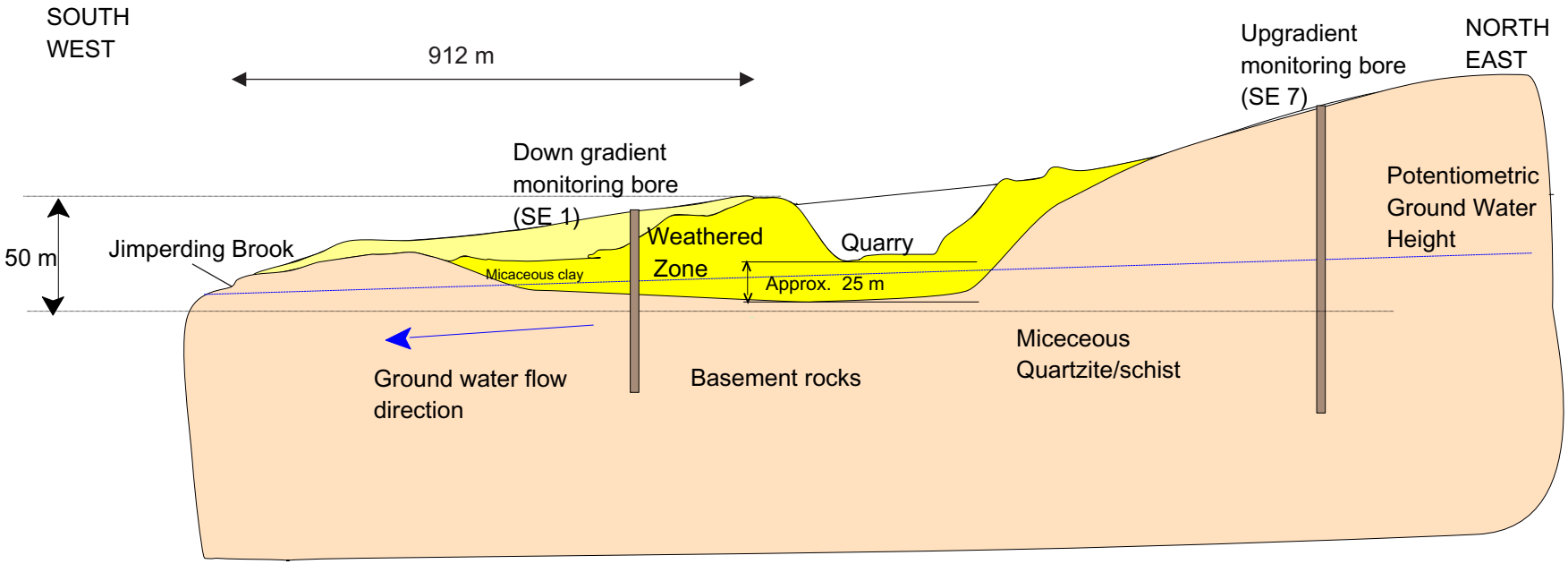
Opalvale Quarry, Chitty Road
Ground Water Conceptual Model



Not to scale - Scaled cross sections in Dwg OV-03-ACW

Figure 7 :Geohydrological Conceptual Model

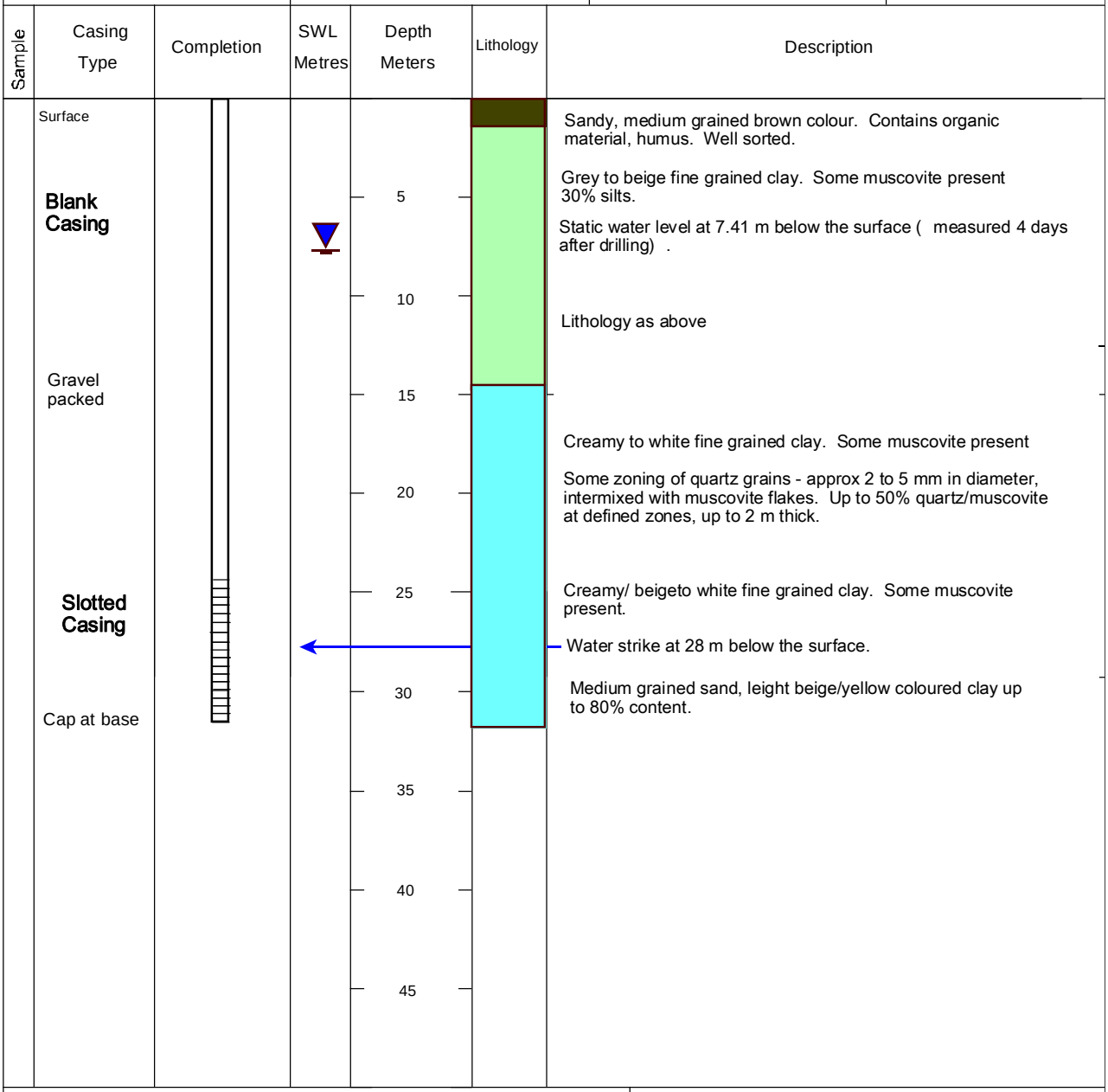
Stass Environmental

BORE CONSTRUCTION

Stass Environmental

Coords: 449807.2 East 6495636 North

Drill Rig: Mick Lewis Drilling DHH	Date Drilled: 27 June 2011	Logged By: A. Stass
Boring Dia: Auger 150 mm	Boring Number: Bore SE 1	



Completion Notes:

Piezometer SE1

Class 12, 55 mm blank PVC casing from 0 to 26m bgs;
Class 12, 55 mm, slotted, PVC casing from 26 to 32 mbgs;

Colar is set at 0.55 m above gs

Water field quality: pH = 4.28, EC = 4060 uS/cm, TDS 2340 mg/l
REDOX = 145 mV

Piezometer was capped at base.

Site:

Opalvale Clay Quarry
11 Chitty Road
Toodyay

Project No.: Ovale 001

Page 1

Figure 8 - Geological and construction log of Bore SE 1

BORE CONSTRUCTION

Stass Environmental

Coords: 449616.1East by 6495914 North

Drill Rig: Mick Lewis Drilling DHH	Date Drilled: 27 June 2011	Logged By: A. Stass
Boring Dia: DHH 150 mm	Boring Number: Bore SE 2	

Sample	Casing Type	Completion	SWL Metres	Depth Meters	Lithology	Description
	Surface					Grey to beige medium grained sand. 30% clay.
	Blank Casing			6		Grey to beige fine grained clay. Some muscovite present 30% silts.
				12		Static water level at 13.39 below the surface (measured 3 days after drilling)
	Gravel packed			18		Lithology as above
	Slotted Casing			24		Lithology as above, some colour change to more beige
	Cap at base			30		
				36		
				42		
				48		Water strike at 48 m below the surface.
				54		

Completion Notes:

Piezometer SE 2
Class 12, 55 mm blank PVC casing from 0 to 47 mbgs;
Class 12, 55 mm, slotted, PVC casing from 47 to 53 mbgs;

Colar is set at 0.55 m above g.s.

Water field quality:pH = 4.99, EC = 4890 uS/cm, TDS 2830 mg/l
REDOX = 105 mV
Piezometer was capped at base.

Site:

Opalvale Clay Quarry
11 Chitty Road
Toodyay

Project No.: Ovale001 | Page 2

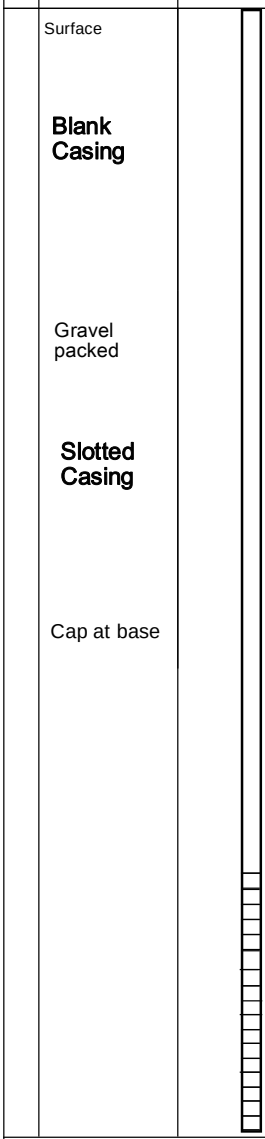
Figure 9 - Geological and construction log of Bore SE 2

BORE CONSTRUCTION

Stass Environmental

Coords: 449382.96 East by 6496193 North, RL 291.64 mAHD

Drill Rig: Mick Lewis Drilling DHH	Date Drilled: 30 June 2011	Logged By: A. Stass
Boring Dia: DHH 150 mm	Boring Number: Bore SE 3	



Depth Meters	Description
	Grey to beige medium grained sand. 30% clay.
6	Creamy white clay. Some muscovite present 30% silts.
12	Static water level at 14.52 below the surface (measured 1 day after drilling)
18	Grey clay, some visible mica, then some colour change to more beige/cream
24	Yellow to beige clay
30	light grey to beige clay - visible mica some muscovite mica 1mm to 15 mm across
36	
42	Creamy to grey clay, gritty with quartz grains, also some plagioclase feldspar. Clay becoming moist at 47 m depth
48	Water strike at 48 m below the surface.
54	Wet grey clay very gritty with quartz grains - grit up to 40% of content. Grit at approx 1 mm diameter
58	

Completion Notes:

Piezometer SE 2

Class 12, 55 mm blank PVC casing from 0 to 46 mbgs;
Class 12, 55 mm, slotted, PVC casing from 46 to 58mbgs;
Colar is set at 0.55 m above g.s.

Water field quality: pH = 4.41, EC = 8090 uS/cm, TDS 4790 mg/l
REDOX = 135 mV

Piezometer was capped at base.

Site:

Opalvale Clay Quarry
11 Chitty Road
Toodyay

Project No.: Ovale001 Page 3

Figure 10 - Geological and construction log of Bore SE 3

BORE CONSTRUCTION

Stass Environmental

Coords: 450377.89East by 6495785.76 North, RL 299.86 mAHD

Drill Rig: Mick Lewis Drilling DHH	Date Drilled: 29 June 2011	Logged By: A. Stass
Boring Dia: DHH 150 mm	Boring Number: Bore SE 4	

Sample	Casing Type	Completion	SWL Metres	Depth Meters	Lithology	Description
	Surface					Coffee rock. Yellopw to orange laterite pebbles
	Blank Casing			6		Dark beige clay. Very gritty 30% grit. Grit diameter at an average of 2 mm
				12		White to grey clay, some grit approx 20% content
	Gravel packed			18		Coarse white to creamy sand. Quartz grit at 80% some clay
						Static water level at 18.21 below the surface (measured 2 days after drilling)
	Slotted Casing			24		Very coarse grit, mostly quartz
				30		Creamy to grey clay, gritty with quartz grains, also some plagioclase feldspar. 10% mica, 50% quartz grains, 40% clay
	Cap at base					First water strike at 30 m
				36		Coarse white quartz grit, grains at 1mm to 8mm. Clay 10% by content, patches of orange clay. Uniform to 40m depth. Dry to moist ground.
				42		Quartz gravel. 2mm to 20mm diameter. Average 5mm diameter. Fractured quartzite rock, no mica. White to translucent quartz fragments.
				48		Water strike at 46 m below the surface.
				54		Clay, getting finer, no grit. White to grey clay.
				58		

Completion Notes:
Piezometer SE 4
Class 12, 55 mm blank PVC casing from 0 to 42 mbgs;
Class 12, 55 mm, slotted, PVC casing from 42 to 53mbgs;
Colar is set at 0.55 m above g.s.

Water field quality:pH = 6.2, EC = 430 uS/cm, TDS 223 mg/l
REDOX = 38 mV
Piezometer was capped at base.

Site:

Opalvale Clay Quarry
11 Chitty Road
Toodyay

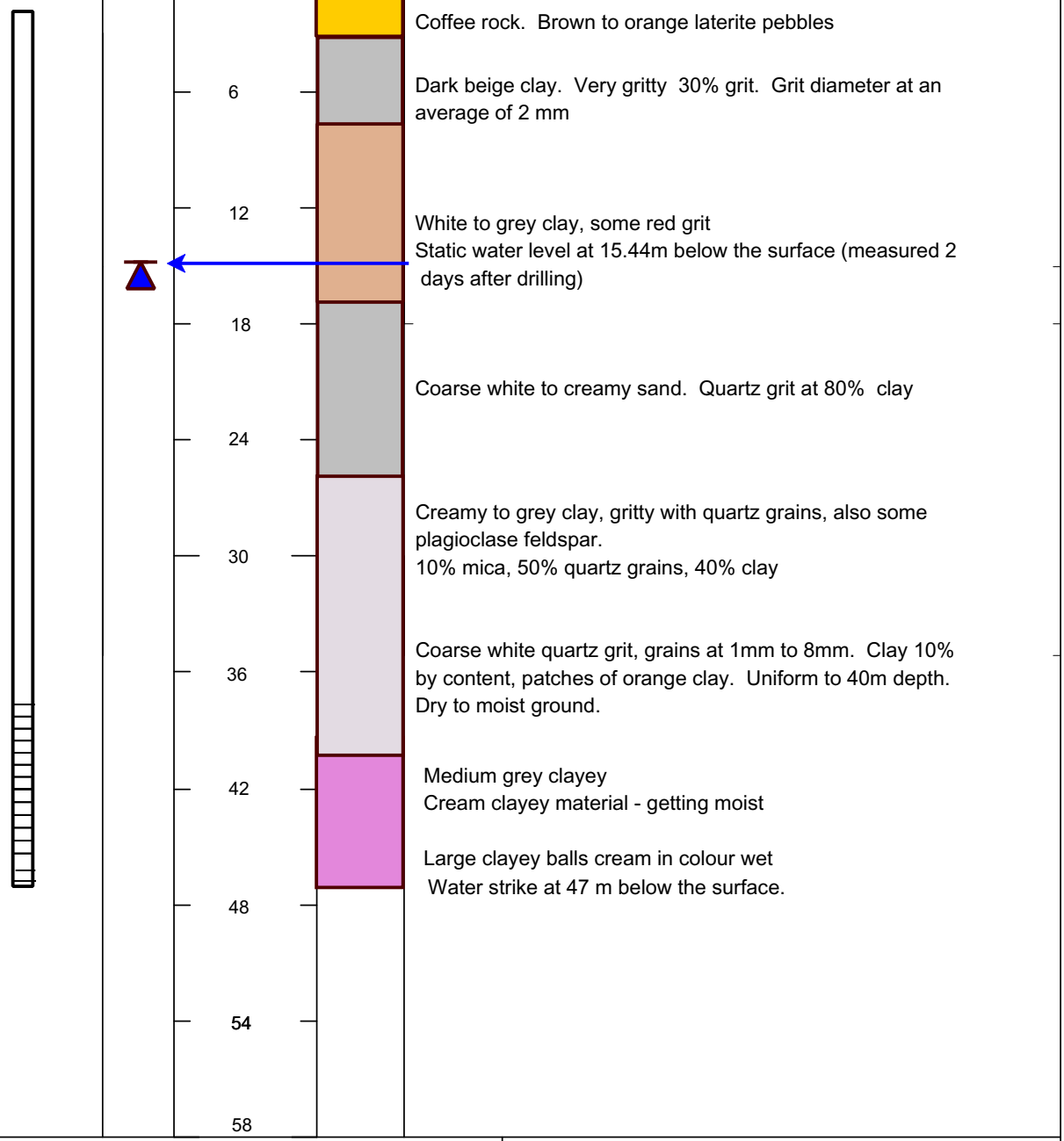
Project No.: Ovale001 | Page 4

Figure 11 - Geological and construction log of Bore SE 4

Stass Environmental

Coords: 449809.33 East by 6495858.19 North, RL 280.553 mAHD

Drill Rig: Mick Lewis Drilling DHH	Date Drilled: 20 March 2013	Logged By: N Grobler
Boring Dia: DHH 150 mm	Boring Number: Bore SE 5	



Completion Notes:

Piezometer SE 5

Class 12, 55 mm blank PVC casing from 0 to 36 mbgs;
Class 12, 55 mm, slotted, PVC casing from 38 to 47mbgs;

Colar is set at 0.65 m above g.s.

Water field quality:pH = 5.7, EC =4260 uS/cm, TDS 2130 mg/l
REDOX = 157 mV
Piezometer was capped at base.

Site:

Opalvale Clay Quarry
11 Chitty Road
Toodyay

Project No.: Ovale001

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Figure 12 - Geological and construction log of Bore SE 5

Stass Environmental

Coords: 450039.37 East by 6495855.09 North, RL 286.78 mAHD

Drill Rig: Mick Lewis Drilling DHH	Date Drilled: 20 March 2013	Logged By: N Grobler
Boring Dia: DHH 150 mm	Boring Number: Bore SE 6	

Sample	Casing Type	Completion	SWL Metres	Depth Meters	Lithology	Description
	Surface					Brown sand and mica
	Blank Casing			6		Red medium clay. Very gritty 80% grit. Grit diameter at an average of 2 mm. Quartz cuttings.
				12		White to cream clay cuttings, some red grit
	Gravel and cement grout packed 1 m bentonite seal above slotted casing					Static water level at 16.700 m below the surface (measured 2 days after drilling)
				18		Purple sandy cuttings, quartz pieces evident.
	Slotted Casing	Cap at base		24		Coarse white quartz grit, grains at 1mm to 8mm. Clay 10% by content, patches of red clay. Dry to moist ground.
						Medium grey clayey, a lot of mica
				30		Water strike at 31 m below the surface.
				36		Brown mud at 35 m
				42		
				48		
				54		
				58		

Completion Notes:

Piezometer SE 6

Class 12, 55 mm blank PVC casing from 0 to 25 mbgs;
Class 12, 55 mm, slotted, PVC casing from 26 to 35 mbgs;

Colar is set at 0.65 m above g.s.

Water field quality:pH = 4.8, EC =6050 uS/cm, TDS 3020 mg/l
REDOX = 210 mV

Piezometer was capped at base.

Site:

Opalvale Clay Quarry
11 Chitty Road
Toodyay

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Figure 13 - Geological and construction log of Bore SE 6

Stass Environmental

Coords: 450043.12 East by 6496095.83 North, RL 289.08 mAHD

Drill Rig: Mick Lewis Drilling DHH	Date Drilled: 20 March 2013	Logged By: N Grobler
Boring Dia: DHH 150 mm	Boring Number: Bore SE 7	

Sample	Casing Type	Completion	SWL Metres	Depth Meters	Lithology	Description
	Surface					Brown clay and mica
	Blank Casing			6		White to cream clay cuttings, some red grit
	Gravel and cement grout packed			12		Brown to cream clay cuttings, some red grit fine creamy clay cuttings
	1 m bentonite seal above slotted casing			18		
						Static water level at 21.700 m below the surface (measured 2 days after drilling)
	Slotted Casing			24		Fine yellow to grey cuttings, 60% clay. Very dusty. Coarse white quartz grit, grains at 1mm to 10mm. Clay 80% creamy clay by content, patches of red clay. moist ground.
	Cap at base			30		Water strike at 29.5 m below the surface.
				36		
				42		
				48		
				54		
				58		

Completion Notes:

Piezometer SE 7

Class 12, 55 mm blank PVC casing from 0 to 22 mbgs;
Class 12, 55 mm, slotted, PVC casing from 23.5 to 29.5mbgs;

Colar is set at 0.65 m above g.s.

Water field quality:pH = 4.4, EC =5260 uS/cm, TDS 2620 mg/l
REDOX = 230 mV

Piezometer was capped at base.

Site:

Opalvale Clay Quarry
11 Chitty Road
Toodyay

Project No.: Ovale001

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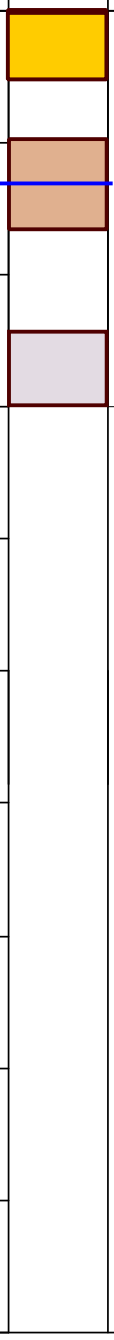
Figure 14 - Geological and construction log of Bore SE 7

Stass Environmental

Coords: 449770.44 East by 6496172.63 North, RL 292.86 mAHD

Drill Rig: Mick Lewis Drilling DHH	Date Drilled: 19 March 2013	Logged By: N Grobler
Boring Dia: DHH 150 mm	Boring Number: Bore SE 8	

Sample	Casing Type	Completion	SWL Metres	Depth Meters	Lithology	Description
	Surface Blank Casing Gravel and cement grout packed 1 m bentonite seal above slotted casing Slotted Casing	 Cap at base		6 12 18 24 30 36 42 48 54 58		Surface detritus Fine white clayey cuttings, very little mica Static water level at 7.700 m below the surface (measured 2 days after drilling) Brown to creamy clay cuttings, 20% mica. Creamy coloured sand with mica cuttings. Pink medium grained sand, mica and clay cuttings moist ground. Water strike at 17.00 m below the surface.

Completion Notes:

Piezometer SE 8

Class 12, 55 mm blank PVC casing from 0 to 12 mbgs;
Class 12, 55 mm, slotted, PVC casing from 12 to 18mbgs;

Colar is set at 0.65 m above g.s.

Water field quality:pH = 6.59, EC =1583 uS/cm, TDS 792 mg/l
REDOX = 76.3 mV

Piezometer was capped at base.

Site:

Opalvale Clay Quarry
11 Chitty Road
Toodyay

Project No.: Ovale001

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Figure 15 - Geological and construction log of Bore SE8

Stass Environmental

Coords: 449643.15 East by 6496373.32 North, RL 278.62 mAHD

Drill Rig: Mick Lewis Drilling DHH	Date Drilled: 19 March 2013	Logged By: N Grobler
Boring Dia: DHH 150 mm	Boring Number: Bore SE 9	

Sample	Casing Type	Completion	SWL Metres	Depth Meters	Lithology	Description
	Surface Blank Casing Gravel and cement grout packed 1 m bentonite seal above slotted casing Slotted Casing	Cap at base		6 12 18 24 30 36 42 48 54 58		Medium grained brown sand, clay and some mica Static water level at 5.200 m below the surface (measured 2 days after drilling) Cream to white clay cuttings, a lot of mica. Dark brown cuttings, clay and a lot of mica. Water strike at 14.00 m below the surface. Creamy clay, wet

Completion Notes:

Piezometer SE 9

Class 12, 55 mm blank PVC casing from 0 to 12 mbgs;
Class 12, 55 mm, slotted, PVC casing from 12 to 18mbgs;

Colar is set at 0.65 m above g.s.

Water field quality:pH = 6.23, EC =630 uS/cm, TDS 315 mg/l
REDOX = 21.2 mV
Piezometer was capped at base.

Site:

Opalvale Clay Quarry
11 Chitty Road
Toodyay

Project No.: Ovale001

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Figure 16 - Geological and construction log of Bore SE9

Stass Environmental

Coords: 449707.85 East by 6495948.38 North, RL 299.86 mAHD

Drill Rig: Hollow Stem Auger	Date Drilled: 1 May 2013	Logged By: N Grobler
Boring Dia: DHH 180 mm	Boring Number: Bore Pit 5	

Sample	Casing Type	Completion	SWL Metres	Depth Meters	Lithology	Description
	Surface Slotted Casing	 Cap at base		3 6 9 12 18 24 30 36 42 48 54 58		Cream to white clay cuttings, a lot of mica. Hard quartzite at base, auger refusal at 8.5 m Bore dry to bottom

Completion Notes:
Piezometer Pit 5

Class 9, 55 mm, slotted, PVC casing from 0 to 8.5mbgs;
Colar is set at 0.55 m above g.s.

Piezometer was capped at base.

Site:

Opalvale Clay Quarry
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Toodyay

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Figure Pit bores - Geological and construction log of Bore Pit 5

Stass Environmental

Coords: 449911.15 East by 6496037.54 North, RL 291.64 mAHD

Drill Rig: Hollow Stem Auger	Date Drilled: 30 April 2013	Logged By: N Grobler
Boring Dia: DHH 180 mm	Boring Number: Bore Pit 4	

Sample	Casing Type	Completion	SWL Metres	Depth Meters	Lithology	Description
	Surface Slotted Casing	 Cap at base		3 6 9 12 18 24 30 36 42 48 54 58		Cream to white clay cuttings, a lot of mica. Bore dry to bottom

Completion Notes:
Piezometer Pit 4

Class 9, 55 mm, slotted, PVC casing from 0 to 10mbgs;
Colar is set at 0.55 m above g.s.

Piezometer was capped at base.

Site:

Opalvale Clay Quarry
11 Chitty Road
Toodyay

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Figure Pit bores - Geological and construction log of Bore Pit 4

Stass Environmental

Coords: 449783.51 East by 6496067.8 North, RL 285.58 mAHD

Drill Rig: Hollow Stem Auger	Date Drilled: 30 April 2013	Logged By: N Grobler
Boring Dia: DHH 180 mm	Boring Number: Bore Pit 3	

Sample	Casing Type	Completion	SWL Metres	Depth Meters	Lithology	Description
	Surface Slotted Casing	 Cap at base		3 6 9 12 18 24 30 36 42 48 54 58		Static water level at 2.54 m below the surface (measured 1 days after drilling) Cream to white clay cuttings, a lot of mica. Hard quartzite intercepted 4 m depth

Completion Notes:
Piezometer Pit 3

Class 9, 55 mm, slotted, PVC casing from 0 to 10mbgs;
Colar is set at 0.35 m above g.s.

Piezometer was capped at base.

Site:

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Toodyay

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Figure Pit bores - Geological and construction log of Bore Pit 3

Stass Environmental

Coords: 449804.3 East by 6496122.84 North, RL 274.4 mAHD

Drill Rig: Hollow Stem Auger	Date Drilled: 29 April 2013	Logged By: N Grobler
Boring Dia: DHH 180 mm	Boring Number: Bore Pit 2	

Sample	Casing Type	Completion	SWL Metres	Depth Meters	Lithology	Description
	Surface Slotted Casing	 Cap at base		3 6 9 12 18 24 30 36 42 48 54 58		Static water level at 1.69 m below the surface (measured 1 days after drilling) Cream to white clay cuttings, a lot of mica. Hard quartzite intercepted 2 m depth Wet from 3 m below ground

Completion Notes:
Piezometer Pit 2

Class 9, 55 mm, slotted, PVC casing from 0 to 10mbgs;
Colar is set at 0.35 m above g.s.

Piezometer was capped at base.

Site:

Opalvale Clay Quarry
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Toodyay

Project No.: Ovale001

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Figure Pit bores - Geological and construction log of Bore Pit 2

Stass Environmental

Coords: 449813.3 East by 6496054.74 North, RL 274.89 mAHD

Drill Rig: Hollow Stem Auger	Date Drilled: 29 April 2013	Logged By: N Grobler
Boring Dia: DHH 180 mm	Boring Number: Bore Pit 1	

Sample	Casing Type	Completion	SWL Metres	Depth Meters	Lithology	Description
	Surface Slotted Casing	 Cap at base		3 6 9 12 18 24 30 36 42 48 54 58		Static water level at 5.06 m below the surface (measured 1 days after drilling) Cream to white clay cuttings, a lot of mica. Dry during drilling Some moisture at 10 m depth

Completion Notes:
Piezometer Pit 1

Class 9, 55 mm, slotted, PVC casing from 0 to 10mbgs;
Colar is set at 0.35 m above g.s.

Piezometer was capped at base.

Site:

Opalvale Clay Quarry
11 Chitty Road
Toodyay

Project No.: Ovale001

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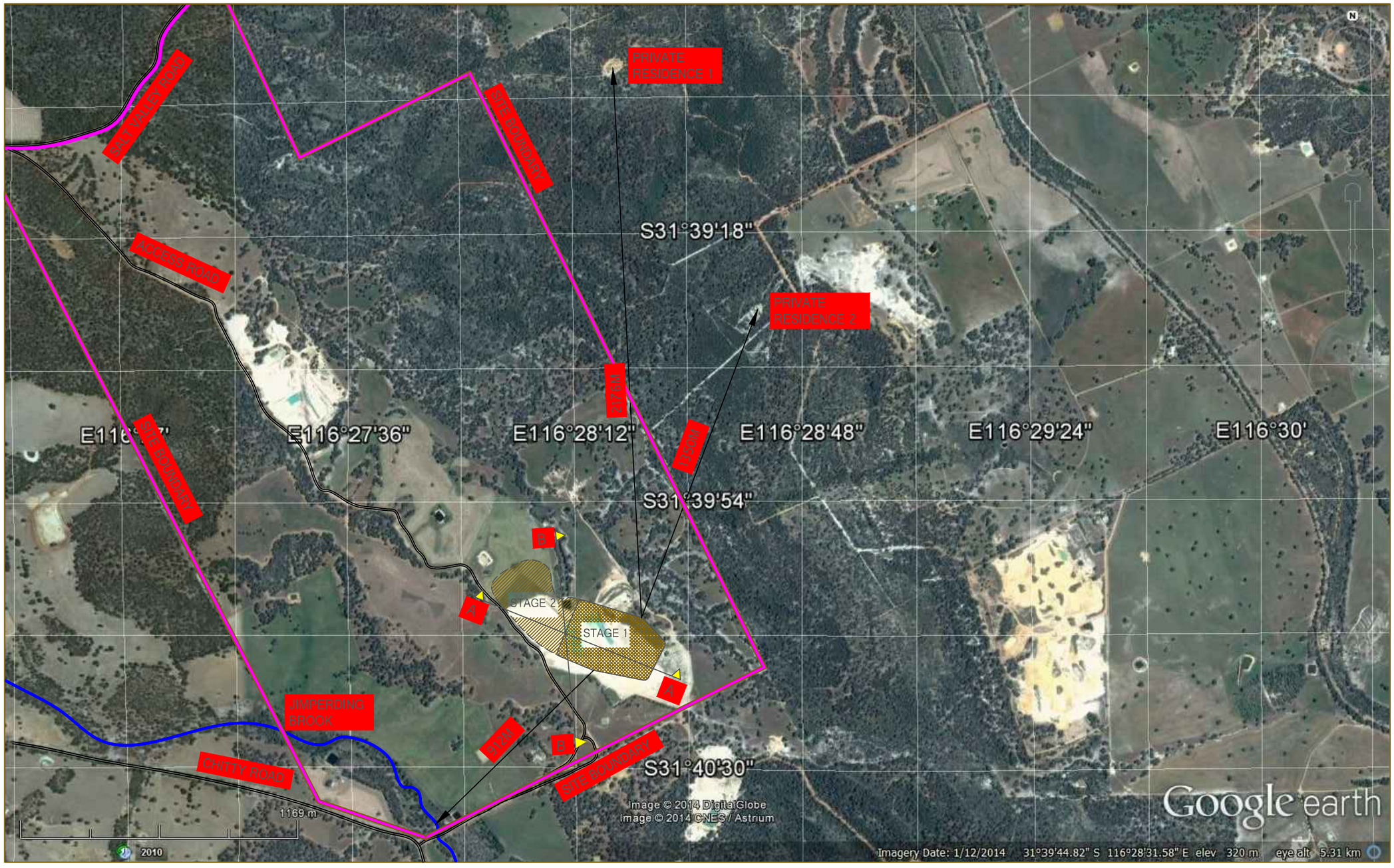
Figure Pit bores - Geological and construction log of Bore Pit 1



No	DATE	REVISION
5	06/12/14	REVISED PROP BOUNDARY
4	06/12/14	REVISED ROAD NAME
3	05/12/14	ADDED SITE BOUNDARY
2	03/12/14	ADDED BACKGROUND MASKS TO NOTES
1	02/12/14	PRELIMINARY

OPAL VALE -
PROPOSED CLASS II LANDFILL
LOT 11 CHITTY ROAD
TOODYAY

RECEPTOR PATHWAYS
SITE PLAN

Stass Environmental
Environmental Science & Engineering
PO BOX 11, KALAMUNDA
WA 6926
T: (08)63635276 F: (08)
WWW.stass.com.au

DRN: ACW	DATE: 01/12/14	CHKD :AS	SCALE : 1:17000	DWG No: OV-01-ACW	REV: 5

1 DENOTES SURFACE WATER FLOW DIRECTION

2 DENOTES SURFACE WATER CHANNELS FLOW DIRECTION

3 DENOTES VEGETATED SCREEN

4 DENOTES GROUNDWATER FLOW DIRECTION

No	DATE	REVISION
4	17/12/14	REVISED GROUNDWATER FLOW DIRECTIONS
3	05/12/14	ADDED GROUND WATER FLOWS AND SITE BOUNDARY
2	04/12/14	REVISED LINE THICKNESS AND COLOURS
1	02/12/14	PRELIMINARY

OPAL VALE -
PROPOSED CLASS II LANDFILL
LOT 11 CHITTY ROAD
TOODYAY

RECEPTOR PATHWAYS
SITE LAYOUT PLAN

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Environmental Science & Engineering
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WA 6926
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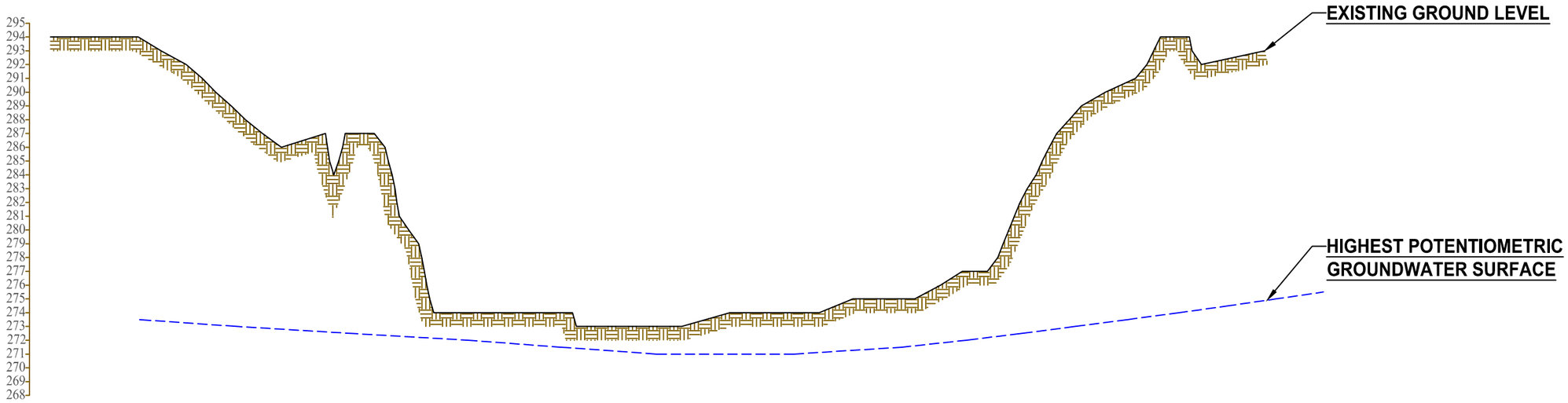
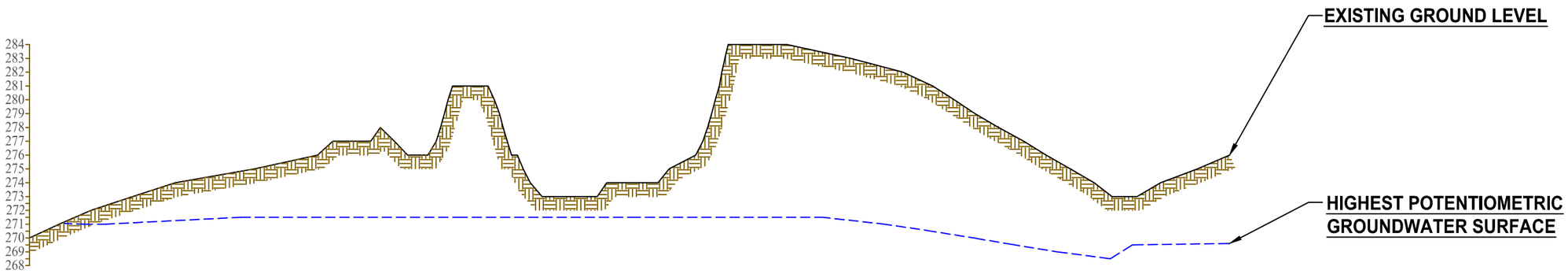
DRN: ACW	DATE: 01/12/14	CHKD :AS	SCALE : 1:9500	DWG No: OV-02-ACW	REV: 4



SECTION A - A



SECTION B - B

No	DATE	REVISION
3	04/12/14	REVISED TITLE BLOCK
2	03/12/14	REVISED NOTES
1	02/12/14	PRELIMINARY

OPAL VALE -
PROPOSED CLASS II LANDFILL
LOT 11 CHITTY ROAD
TOODYAY

RECEPTOR PATHWAYS
SECTIONS

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DRN: ACW	DATE: 01/12/14	CHKD :AS	SCALE : 1:3500 HORIZONTAL 1:350 VERTICAL	DWG No: OV-03-ACW	REV: 3

APPENDIX B
Photographs

Drilling at depth showing dry conditions

Bore logging

1 m interval sample record showing water intersected at the last 4 samples (46 m below the surface)

Finished bore - example

APPENDIX C
Water Quality Summaries

	SE1	SE2	SE3	SE4	SE5	SE6	SE7	SE8	SE9	NG2
24-Jul-13										
Chloride	1100	1600	4200	310	1600	1700	3700	53	120	1800
Conductivity (at 25Â°C)	3600	5200	12000	1100	4900	5400	9900	520	910	5200
pH	3.7	4.6	4.2	6	5	4.8	4	7.2	5.1	4.7
Sulphate (as S)	45	87	220	17	71	94	59	13	85	89
Total Dissolved Solids	1900	3000	7300	600	2800	3100	5400	360	650	3100
Alkali Metals										
Calcium	2.2	11	5.7	2.2	4.3	5.7	6	< 0.5	< 0.5	11
Magnesium	42	140	350	15	130	68	180	0.8	4.2	150
Potassium	8	36	56	3.7	25	9.6	6.4	5	3.9	34
Sodium	610	750	1800	160	690	940	1700	120	200	760
Heavy Metals										
Arsenic (filtered)	0.001	< 0.001	0.004	< 0.001	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001
Cadmium (filtered)	0.0003	0.0007	0.019	< 0.0002	0.015	0.0013	< 0.0002	< 0.0002	0.0002	0.0007
Chromium (filtered)	0.001	< 0.001	0.002	< 0.001	< 0.001	0.002	0.003	< 0.001	0.001	< 0.001
Copper (filtered)	0.37	0.22	1.1	0.011	0.18	0.065	0.12	0.002	0.004	0.23
Lead (filtered)	0.074	0.024	0.085	< 0.001	0.012	0.008	0.011	< 0.001	< 0.001	0.023
Manganese (filtered)	0.081	0.7	0.64	0.03	1.7	0.18	0.041	< 0.005	< 0.005	0.73
Mercury (filtered)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.096	0.37	2.1	0.014	0.9	0.084	0.049	0.001	0.001	0.38
Zinc (filtered)	0.12	0.52	1.4	0.056	0.73	0.15	0.038	0.007	0.019	0.54
Total Nitrogen Set (as N)										
Nitrate & Nitrite (as N)	0.07	< 0.05	< 0.05	5.3	< 0.05	0.17	1.6	8.6	7.2	< 0.05
Total Kjeldahl Nitrogen (a	0.7	0.7	0.4	0.4	< 0.2	< 0.2	< 0.2	0.9	0.9	0.2
Total Nitrogen (as N)	0.8	0.7	0.4	5.7	< 0.2	< 0.2	1.6	9.5	8.1	0.2

	SE1	SE2	SE3	SE4	SE5	SE6	SE7	SE8	SE9	NG2
4-Oct-14										
Chloride	1000	2000	4100	99	1400	2300	3300	39	88	88
Conductivity (at 25Â°C)	3300	6100	11000	430	4300	7400	9000	480	790	770
pH	3.3	4.6	3.7	5.7	4.7	4.2	3.6	6.7	4.9	4.8
Sulphate (as S)	45	110	230	< 5	75	120	52	18	85	86
Total Dissolved Solids	1900	3400	7000	240	2600	3700	4800	320	560	560
Alkali Metals										
Calcium	1.3	10	5	1.1	5	2.6	5.7	< 0.5	< 0.5	< 0.5
Magnesium	43	170	370	11	110	110	170	0.8	2.7	2.7
Potassium	3.1	38	62	1.5	21	12	6.4	3.3	2.1	2.1
Sodium	570	890	1900	71	640	1300	1700	130	57	160
Heavy Metals										
Arsenic (filtered)	< 0.001	0.002	0.003	< 0.001	< 0.001	0.001	0.002	< 0.001	< 0.001	< 0.001
Cadmium (filtered)	0.0004	0.0007	0.022	< 0.0002	0.0026	0.0003	0.0002	< 0.0002	< 0.0002	< 0.0002
Chromium (filtered)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	0.002
Copper (filtered)	0.39	0.1	0.52	0.006	0.079	0.091	0.14	0.001	0.005	0.004
Lead (filtered)	0.083	0.021	0.076	< 0.001	0.006	0.012	0.006	< 0.001	< 0.001	< 0.001
Manganese (filtered)	0.08	0.95	0.79	0.019	1.5	0.057	0.12	< 0.005	< 0.005	< 0.005
Mercury (filtered)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.064	0.45	1.4	0.011	0.46	0.02	0.013	< 0.001	0.001	0.001
Zinc (filtered)	0.077	0.5	1.3	0.031	0.51	0.047	0.025	0.004	0.012	0.008
Total Nitrogen Set (as N)										
Nitrate & Nitrite (as N)	< 0.05	0.08	0.07	5.7	0.06	0.1	1.6	6.2	6.1	6.1
Total Kjeldahl Nitrogen (a	0.8	< 0.2	< 0.2	< 0.2	0.2	< 0.2	0.9	1.6	< 0.2	< 0.2
Total Nitrogen (as N)	0.8	< 0.2	< 0.2	5.7	0.26	< 0.2	2.5	7.8	6.1	6.1

	SE1	SE2	SE3	SE4	SE5	SE6	SE7	SE8	SE9	NG2
14-Mar-14										
Chloride	1100	4200	2400	130	3200	2600	4100	160	98	130
Conductivity (at 25Â°C)	3400	13000	7300	400	9800	8200	11000	630	790	890
pH	3.6	4.1	3.4	5.8	5.2	4.5	3.7	6.5	5.3	5.3
Sulphate (as S)	47	190	160	< 5	140	120	62	17	69	65
Total Dissolved Solids	1900	7200	4000	240	5500	4600	6000	420	530	580
Alkali Metals										
Calcium	< 5	16	5.8	< 5	7.4	< 5	5.4	< 5	< 5	< 5
Magnesium	42	310	240	11	170	110	190	< 5	< 5	< 5
Potassium	< 5	43	47	< 5	26	7.7	< 5	< 5	< 5	< 5
Sodium	630	2100	1200	69	1800	1500	2200	140	170	190
Heavy Metals										
Arsenic (filtered)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (filtered)	0.0003	0.0021	0.022	< 0.0002	0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Chromium (filtered)	< 0.001	0.002	0.001	< 0.001	0.001	0.004	0.003	< 0.001	< 0.001	0.001
Copper (filtered)	0.39	1.2	0.15	0.004	0.043	0.062	0.096	0.002	0.004	0.004
Lead (filtered)	0.09	0.47	0.043	< 0.001	0.011	0.013	0.01	< 0.001	< 0.001	< 0.001
Manganese (filtered)	0.12	1.1	1.1	0.014	1.3	0.042	0.13	< 0.005	0.015	0.026
Mercury (filtered)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.096	1	2.6	0.008	0.31	0.017	0.04	< 0.001	0.002	0.003
Zinc (filtered)	0.14	0.92	2.6	0.022	0.35	0.057	0.086	0.006	0.032	0.039
Total Nitrogen Set (as N)										
Nitrate & Nitrite (as N)	< 0.05	0.06	2.1	7.2	0.06	0.12	0.82	7.8	7.9	7.8
Total Kjeldahl Nitrogen (as	< 0.2	< 0.2	< 0.2	0.7	< 0.2	< 0.2	< 0.2	0.8	0.6	0.8
Total Nitrogen (as N)	< 0.2	< 0.2	2.1	7.9	< 0.2	< 0.2	0.8	8.6	8.5	8.6

	SE1	SE2	SE3	SE4	SE5	SE6	SE7	SE8	SE9	NG2
17-Jul-14										
Chloride	1000	4400	2900	160	1100	2800	3900	220	58	110
Conductivity (at 25Â°C)	3900	14000	11000	680	3900	9300	12000	1100	730	710
pH	3.6	3.7	2.9	5.1	5.1	4.2	3.7	5.6	5.3	6
Sulphate (as S)	41	180	150	7.3	52	100	58	11	66	9.9
Total Dissolved Solids	1800	7300	4900	330	1800	4300	5800	520	450	360
Alkali Metals										
Calcium	1.1	21	4.9	0.8	2.9	2.8	6.7	< 0.5	< 0.5	< 0.5
Magnesium	39	390	310	12	74	130	200	2.1	2.1	2.1
Potassium	2.6	52	69	1.4	18	9.5	6.2	2.4	1.7	2.3
Sodium	620	2100	1400	99	590	1600	2100	100	120	110
Heavy Metals										
Arsenic (filtered)	< 0.001	< 0.005	< 0.005	< 0.001	< 0.001	0.001	< 0.005	< 0.001	< 0.001	< 0.001
Cadmium (filtered)	0.0003	0.0018	0.039	< 0.0002	0.001	< 0.0002	< 0.001	< 0.0002	< 0.0002	< 0.0002
Chromium (filtered)	< 0.001	< 0.005	< 0.005	< 0.001	< 0.001	0.003	< 0.005	< 0.001	< 0.001	< 0.001
Copper (filtered)	0.35	1.6	0.051	0.01	0.008	0.057	0.097	0.006	0.004	0.003
Lead (filtered)	0.086	0.61	0.11	< 0.001	< 0.001	0.015	< 0.025	< 0.001	< 0.001	< 0.001
Manganese (filtered)	0.069	1.1	1.4	0.015	1.6	0.044	0.095	0.008	< 0.005	< 0.005
Mercury (filtered)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.069	1.1	4.2	0.011	0.44	0.02	0.047	0.004	0.001	0.002
Zinc (filtered)	0.077	0.91	3.8	0.02	0.39	0.04	0.074	0.009	0.013	0.006
Total Nitrogen Set (as N)										
Nitrate & Nitrite (as N)	< 0.05	0.06	0.27	7.4	0.12	0.2	0.91	7	7.9	7.1
Total Kjeldahl Nitrogen (as	< 0.2	3.8	3	3.6	2.8	2.9	9.4	0.3	3.5	3.2
Total Nitrogen (as N)	< 0.2	3.9	3.3	11	2.9	3.1	10	7.3	11	10

	SE1	SE2	SE3	SE4	SE5	SE6	SE7	SE8	SE9	NG2
12-Sep-14										
Chloride	1000	4800	2900	100	910	2800	3900	48	59	58
Conductivity (at 25Â°C)	3700	14000	9400	440	3300	8700	12000	400	700	700
pH	3.5	3.8	3.4	6.1	5.9	4.3	3.7	7.1	7.4	5.9
Sulphate (as S)	41	240	190	5.6	44	110	60	12	66	67
Total Dissolved Solids	1900	9000	5100	260	1800	4500	6800	270	490	480
Alkali Metals										
Calcium	1.1	25	3.7	0.9	1.7	2.2	5.5	< 0.5	< 0.5	< 0.5
Magnesium	40	420	300	9.9	70	100	100	1.3	1.8	1.9
Potassium	2.8	53	66	1.5	17	11	7.2	2.3	1.9	1.8
Sodium	550	2100	1200	70	470	1500	1800	81	130	130
Heavy Metals										
Arsenic (filtered)	0.001	0.002	0.004	< 0.001	< 0.001	0.001	0.002	< 0.001	< 0.001	< 0.001
Cadmium (filtered)	0.0003	0.0019	0.027	< 0.0002	0.0004	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Chromium (filtered)	0.001	0.004	< 0.001	< 0.001	< 0.001	0.005	0.002	< 0.001	< 0.001	< 0.001
Copper (filtered)	0.46	1.8	0.01	0.013	0.003	0.085	0.093	0.002	0.007	0.007
Lead (filtered)	0.096	0.66	0.1	< 0.001	< 0.001	0.014	0.003	< 0.001	< 0.001	< 0.001
Manganese (filtered)	0.093	1.2	1.8	0.017	1.6	0.055	0.1	< 0.005	< 0.005	< 0.005
Mercury (filtered)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.098	1.2	3.8	0.014	0.49	0.029	0.046	< 0.001	0.003	0.003
Zinc (filtered)	0.1	0.91	3.2	0.024	0.38	0.052	0.058	0.004	0.038	0.039
Total Nitrogen Set (as N)										
Nitrate & Nitrite (as N)	< 0.05	< 0.05	< 0.05	7.7	< 0.05	0.13	0.98	5.7	7.5	8
Total Kjeldahl Nitrogen (as N)	< 0.2	0.3	< 0.2	0.3	< 0.2	< 0.2	< 0.2	< 0.2	0.2	< 0.2
Total Nitrogen (as N)	< 0.2	0.3	< 0.2	8	< 0.2	< 0.2	1	5.7	7.7	8

APPENDIX D

Chain of Custody and Laboratory Certificates

11-4452

CHAIN OF CUSTODY & ANALYSIS REQUEST

Stass Environmental
PO Box 11
Kalamunda, WA 6926
Ph (08) 63635276
Fx (08) 94547615

LAB ARL
ADDRESS
LAB CONTACT
PHONE

Page 1 1 1

PROJECT # OV01
PROJECT NAME Opalvale CHITTY
COLLECTORS NAME AWS
LAB JOB #

PRELIM. RESULTS BY: ☐ VERBAL ☐ FAX ☑ EMAIL
andre@stass.com.au
FINAL REPORT BY:
LAB QUOTE REF:

SAMPLE ID	DEPTH (metres)	LAB #	MATRIX: WATER	SOIL	SWAB	SLUDGE	PRESERVATION METHOD: ICE	ACIDIFIED	OTHER	NONE	SAMPLING DATE	No. OF CONTAINERS	PHENOL SP.	ANALYSIS REQUIRED & METHOD CODE: TPH	BTEX (PURGE & TRAP)	CO3 HCO3	PAH	Total Nitrogen	Na, Ca, K, Mg	NO3, NH4	scan	As, Cd, Cr, Cu, Mn, Ni, Pb, Zn	FILTER prior to testing	pH	Conductivity (mS/m)	TDS (mg/l)	REMARKS
DISCRETE SAMPLE REQUEST:																											
SE1			*				*				1-Jul-11	1						*				*	*	*	*	*	email results to
SE2			*				*				1-Jul-11	1						*				*	*	*	*	*	andre@stass.com.au
SE3			*				*				1-Jul-11	1						*				*	*	*	*	*	
SE4			*				*				4-Jul-11	1						*				*	*	*	*	*	
SE5			*				*				4-Jul-11	1						*				*	*	*	*	*	
COMPOSITE SAMPLE REQUEST:																											

6/7/11
Amanda
S
S

Relinquished by:	Date	Time	Received by:	Date	Time	Custody Seals Intact?	Additional Comments:
Andre Stasikowski	6/7/11		Jenna-H	07/07/2011	1:40	Yes / No	
Relinquished by:	Date	Time	Received by:	Date	Time	Samples Received Chilled? Yes / No	Queries to Andre at 6363 5276

Stass Environmental
PO Box 11
Kalamunda, WA 6926
Ph (08) 63635276
Fx (08) 94547615

CHAIN OF CUSTODY & ANALYSIS REQUEST

LAB ARL
ADDRESS
LAB CONTACT
PHONE

PROJECT # OV02
PROJECT NAME Opalvale CHITTY
COLLECTORS NAME AWS
LAB JOB #

PRELIM. RESULTS BY: ☐ VERBAL ☐ FAX ☑ EMAIL
andre@stass.com.au
FINAL REPORT BY:
LAB QUOTE REF:

SAMPLE ID	DEPTH (metres)	LAB #	MATRIX				PRESERVATION METHOD				SAMPLING DATE	No. OF CONTAINERS	PHENOL SP.	ANALYSIS REQUIRED & METHOD CODE											REMARKS
			WATER	SOIL	SWAB	SLUDGE	ICE	ACIDIFIED	OTHER	NONE				TPH	BTEX (PURGE & TRAP)	CO3 HCO3	PAH	Total Nitrogen	Na, Ca, K, Mg	NO3, NH4 scan	As, Cd, Cr, Cu, Mn, Ni, Pb, Zn	FILTER prior to testing	pH	Conductivity (mS/m)	TDS (mg/l)	
DISCRETE SAMPLE REQUEST:																										
SE1			*				*				18-Jan-12	1						*			*	*	*	*	*	email results to
SE2			*				*				18-Jan-12	1						*			*	*	*	*	*	andre@stass.com.au
SE3			*				*				18-Jan-12	1						*			*	*	*	*	*	
SE4			*				*				18-Jan-12	1						*			*	*	*	*	*	
SE5			*				*				18-Jan-12	1						*			*	*	*	*	*	
COMPOSITE SAMPLE REQUEST:																										

Relinquished by:	Date	Time	Received by:	Date	Time		
Andre Stasikowski						Custody Seals Intact?	Yes / No
Relinquished by:	Date	Time	Received by:	Date	Time	Samples Received Chilled?	Yes / No

Additional Comments:

Queries to Andre at 6363 5276

Stass Environmental
PO Box 11
Kalamunda, WA 6926
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Fx (08) 94547615

CHAIN OF CUSTODY & ANALYSIS REQUEST

LAB MGT LabMark
ADDRESS
LAB CONTACT Natalie
PHONE

PROJECT # OV03
PROJECT NAME Opalvale CHITTY
COLLECTORS NAME Nolan Grobler
LAB JOB #

PRELIM. RESULTS BY: ☐ VERBAL ☐ FAX ☑ EMAIL
andre@stass.com.au
FINAL REPORT BY:
LAB QUOTE REF:

SAMPLE ID	DEPTH (metres)	LAB #	MATRIX				PRESERVATION METHOD				SAMPLING DATE	No. OF CONTAINERS	PHENOL SP.	ANALYSIS REQUIRED & METHOD CODE											REMARKS
DISCRETE SAMPLE REQUEST:			WATER	SOIL	SWAB	SLUDGE	ICE	ACIDIFIED	OTHER	NONE				TPH	BTEX (PURGE & TRAP)	CO3 HCO3	PAH	Total Nitrogen	Na, Ca, K, Mg	Cl, SO_4 scan	As, Cd, Cr, Cu, Hg, Mn, Ni, Pb, Zn	FILTER prior to testing	pH	Conductivity (mS/m)	TDS (mg/l)	
SE1			*				*				18-Jul-12	1						*	*	*	*	*	*	*	*	email results to
SE2			*				*				18-Jul-12	1						*	*	*	*	*	*	*	*	andre@stass.com.au
SE3			*				*				18-Jul-12	1						*	*	*	*	*	*	*	*	
SE4			*				*				18-Jul-12	1						*	*	*	*	*	*	*	*	
NG3			*				*				18-Jul-12	1						*	*	*	*	*	*	*	*	
COMPOSITE SAMPLE REQUEST:																										

Relinquished by:	Date	Time	Received by:	Date	Time	
Nolan Grobler						Custody Seals Intact? Yes / No
Relinquished by:	Date	Time	Received by:	Date	Time	Samples Received Chilled? Yes / No

Additional Comments:

Queries to Andre at 6363 5276

VIA WA

Stass Environmental

PO Box 11
Kalamunda, WA 6926
Ph (08) 63635276
Fx (08) 94547615

CHAIN OF CUSTODY & ANALYSIS REQUEST

LAB MGT LabMark
ADDRESS
LAB CONTACT Natalie
PHONE

PROJECT # OV04
PROJECT NAME Opalvale CHITTY
COLLECTORS NAME Nolan Grobler
LAB JOB #

PRELIM. RESULTS BY: ☐ VERBAL ☐ FAX ☑ EMAIL
andre@stass.com.au
FINAL REPORT BY:
LAB QUOTE REF:

SAMPLE ID	DEPTH (metres)	LAB #	MATRIX: WATER	SOIL	SWAB	SLUDGE	PRESERVATION METHOD: ICE	ACIDIFIED	OTHER	NONE	SAMPLING DATE	No. OF CONTAINERS	PHENOL SP.	ANALYSIS REQUIRED & METHOD CODE: TPH	BTEX (PURGE & TRAP)	CO3 HCO3	PAH	Total Nitrogen	Na, Ca, K, Mg	Cl, SO_4 scan	As, Cd, Cr, Cu, Hg, Mn, Ni, Pb, Zn	FILTER prior to testing	pH	Conductivity (mS/m)	TDS (mg/l)	REMARKS
DISCRETE SAMPLE REQUEST:																										
DM 1			*				*				6-Aug-12	1								*	*	*	*	*	*	email results to
DM 2			*				*				6-Aug-12	1								*	*	*	*	*	*	andre@stass.com.au
COMPOSITE SAMPLE REQUEST:																										

Relinquished by:	Date	Time	Received by:	Date	Time	
Nolan Grobler				6/8/12	3pm.	Custody Seals Intact? Yes / No
Relinquished by:	Date	Time	Received by:	Date	Time	Samples Received Chilled? Yes / No
				7/8/12	8:19 am	

Additional Comments:
#347203
Queries to Andre at 6363 5276

VIA MM-

Stass Environmental

PO Box 11
Kalamunda, WA 6926
Ph (08) 63635276
Fx (08) 94547615

CHAIN OF CUSTODY & ANALYSIS REQUEST

LAB MGT LabMark
ADDRESS
LAB CONTACT Natalie
PHONE

PROJECT # OV04
PROJECT NAME Opalvale CHITTY
COLLECTORS NAME Nolan Grobler
LAB JOB #

PRELIM. RESULTS BY: ☐ VERBAL ☐ FAX ☑ EMAIL
andre@stass.com.au
FINAL REPORT BY:
LAB QUOTE REF:

SAMPLE ID	DEPTH (metres)	LAB #	MATRIX: WATER	SOIL	SWAB	SLUDGE	PRESERVATION METHOD: ICE	ACIDIFIED	OTHER	NONE	SAMPLING DATE	No. OF CONTAINERS	PHENOL SP.	TPH	BTEX (PURGE & TRAP)	CO3 HCO3	PAH	Total Nitrogen	Na, Ca, K, Mg	Cl, SO_4 scan	As, Cd, Cr, Cu, Hg, Mn, Ni, Pb, Zn	FILTER prior to testing	pH	Conductivity (mS/m)	TDS (mg/l)	REMARKS
DISCRETE SAMPLE REQUEST:																										
SE1			*				*				24-Jul-13	3						*	*	*	*	*	*	*	*	email results to
SE2			*				*				24-Jul-13	3						*	*	*	*	*	*	*	*	andre@stass.com.au
SE3			*				*				24-Jul-13	3						*	*	*	*	*	*	*	*	
SE4			*				*				24-Jul-13	3						*	*	*	*	*	*	*	*	
SE5			*				*				24-Jul-13	3						*	*	*	*	*	*	*	*	
SE6			*				*				24-Jul-13	3						*	*	*	*	*	*	*	*	
SE7			*				*				24-Jul-13	3						*	*	*	*	*	*	*	*	
SE8			*				*				24-Jul-13	3						*	*	*	*	*	*	*	*	
SE9			*				*				24-Jul-13	3						*	*	*	*	*	*	*	*	
NG2			*				*				24-Jul-13	3						*	*	*	*	*	*	*	*	
COMPOSITE SAMPLE REQUEST:																										

Relinquished by:	Date	Time	Received by:	Date	Time
Nolan Grobler			Catherine	25/7	8:21am

Custody Seals Intact? Yes / No
Samples Received Chilled? Yes / No

Additional Comments:
Queries to Andre at 6363 5276

387045

ARQP500620.

CHAIN OF CUSTODY & ANALYSIS REQUEST

Stass Environmental
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Kalamunda, WA 6926
Ph (08) 63635276
Fx (08) 94547615

LAB MGT LabMark
ADDRESS
LAB CONTACT Dave
PHONE

PROJECT # OV05
PROJECT NAME Opalvale CHITTY
COLLECTORS NAME Nolan Grobler
LAB JOB # 402563

PRELIM. RESULTS BY: ☐ VERBAL ☐ FAX ☑ EMAIL
andre@stass.com.au
FINAL REPORT BY:
LAB QUOTE REF:

SAMPLE ID	DEPTH (metres)	LAB #	MATRIX: WATER	SOIL	SWAB	SLUDGE	PRESERVATION METHOD: ICE	ACIDIFIED	OTHER	NONE	SAMPLING DATE	No. OF CONTAINERS	PHENOL SP.	TPH	BTEX (PURGE & TRAP)	CO3 HCO3	PAH	Total Nitrogen	Na, Ca, K, Mg	Cl, SO_4 scan	As, Cd, Cr, Cu, Hg, Mn, Ni, Pb, Zn	FILTER prior to testing	pH	Conductivity (mS/m)	TDS (mg/l)	REMARKS
DISCRETE SAMPLE REQUEST																										
SE1			*				*				4-Oct-13	3						*	*	*	*	*	*	*	*	email results to
SE2			*				*				4-Oct-13	3						*	*	*	*	*	*	*	*	andre@stass.com.au
SE3			*				*				4-Oct-13	3						*	*	*	*	*	*	*	*	
SE4			*				*				4-Oct-13	3						*	*	*	*	*	*	*	*	
SE5			*				*				4-Oct-13	3						*	*	*	*	*	*	*	*	
SE6			*				*				4-Oct-13	3						*	*	*	*	*	*	*	*	
SE7			*				*				4-Oct-13	3						*	*	*	*	*	*	*	*	
SE8			*				*				4-Oct-13	3						*	*	*	*	*	*	*	*	
SE9			*				*				4-Oct-13	3						*	*	*	*	*	*	*	*	
NG2			*				*				4-Oct-13	3						*	*	*	*	*	*	*	*	
COMPOSITE SAMPLE REQUEST																										

Relinquished by:	Date	Time	Received by:	Date	Time	
Nolan Grobler						Custody Seals Intact? Yes / No
Relinquished by:	Date	Time	Received by:	Date	Time	Samples Received Chilled? Yes / No
			TONY W	5/12	8:43	

Additional Comments:

Queries to Andre at 6363 5276

AP&P000706

Stass Environmental

PO Box 11
Kalamunda, WA 6926
Ph (08) 63635276
Fx (08) 94547615

CHAIN OF CUSTODY & ANALYSIS REQUEST

LAB ADDRESS: MGT Eurofinns
LAB CONTACT: Dave
PHONE:

PROJECT #: OV06
PROJECT NAME: Opalvale CHITTY
COLLECTORS NAME: Nolan Grobler
LAB JOB #:

PRELIM. RESULTS BY: ☐ VERBAL ☐ FAX ☑ EMAIL
andre@stass.com.au
FINAL REPORT BY:
LAB QUOTE REF:

SAMPLE ID	DEPTH (metres)	LAB #	MATRIX				PRESERVATION METHOD				SAMPLING DATE	No. OF CONTAINERS	PHENOL SP.	ANALYSIS REQUIRED & METHOD CODE												REMARKS
DISCRETE SAMPLE REQUEST:			WATER	SOIL	SWAB	SLUDGE	ICE	ACIDIFIED	OTHER	NONE				TPH	BTEX (PURGE & TRAP)	CO3 HCO3	PAH	Total Nitrogen	Na, Ca, K, Mg	Cl, SO_4 scan	As, Cd, Cr, Cu, Hg, Mn, Ni, Pb, Zn	FILTER prior to testing	pH	Conductivity (mS/m)	TDS (mg/l)	
SE1			*				*				14-Mar-14	3						*	*	*	*	*	*	*	*	email results to
SE2			*				*				14-Mar-14	3						*	*	*	*	*	*	*	*	andre@stass.com.au
SE3			*				*				14-Mar-14	3						*	*	*	*	*	*	*	*	
SE4			*				*				14-Mar-14	3						*	*	*	*	*	*	*	*	
SE5			*				*				14-Mar-14	3						*	*	*	*	*	*	*	*	
SE6			*				*				14-Mar-14	3						*	*	*	*	*	*	*	*	
SE7			*				*				14-Mar-14	3						*	*	*	*	*	*	*	*	
SE8			*				*				14-Mar-14	3						*	*	*	*	*	*	*	*	
SE9			*				*				14-Mar-14	3						*	*	*	*	*	*	*	*	
NG2			*				*				14-Mar-14	3						*	*	*	*	*	*	*	*	
COMPOSITE SAMPLE REQUEST:																										Report: 412062

Relinquished by:	Date	Time	Received by:	Date	Time		
Nolan Grobler			Tony W	17/3	9:06am	Custody Seals Intact?	Yes / No
Relinquished by:	Date	Time	Received by:	Date	Time	Samples Received Chilled?	Yes / No

Additional Comments:

Queries to Andre at 6363 5276

WP QP 000792

Stass Environmental
PO Box 11
Kalamunda, WA 6926
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Fx (08) 94547615

CHAIN OF CUSTODY & ANALYSIS REQUEST

LAB ADDRESS: MGT Eurofinns
LAB CONTACT: Dave
PHONE:
Page 1 1 1

PROJECT #: OV06
PROJECT NAME: Opalvale CHITTY
COLLECTORS NAME: Nolan Grobler
LAB JOB #:

PRELIM. RESULTS BY: ☐ VERBAL ☐ FAX ☑ EMAIL
andre@stass.com.au
FINAL REPORT BY:
LAB QUOTE REF:

SAMPLE ID	DEPTH (metres)	LAB #	MATRIX: WATER	SOIL	SWAB	SLUDGE	PRESERVATION METHOD: ICE	ACIDIFIED	OTHER	NONE	SAMPLING DATE	No. OF CONTAINERS	PHENOL SP.	TPH	BTEX (PURGE & TRAP)	CO3 HCO3	PAH	Total Nitrogen	Na, Ca, K, Mg	scan Cl, SO_4	As, Cd, Cr, Cu, Hg, Mn, Ni, Pb, Zn	FILTER prior to testing	pH	Conductivity (mS/m)	TDS (mg/l)	REMARKS
DISCRETE SAMPLE REQUEST:														ANALYSIS REQUIRED & METHOD CODE												
SE1			*				*				17-Jun-14	3						*	*	*	*	*	*	*	*	email results to
SE2			*				*				17-Jun-14	3						*	*	*	*	*	*	*	*	andre@stass.com.au
SE3			*				*				17-Jun-14	3						*	*	*	*	*	*	*	*	
SE4			*				*				17-Jun-14	3						*	*	*	*	*	*	*	*	
SE5			*				*				17-Jun-14	3						*	*	*	*	*	*	*	*	
SE6			*				*				17-Jun-14	3						*	*	*	*	*	*	*	*	
SE7			*				*				17-Jun-14	3						*	*	*	*	*	*	*	*	
SE8			*				*				17-Jun-14	3						*	*	*	*	*	*	*	*	
SE9			*				*				17-Jun-14	3						*	*	*	*	*	*	*	*	
NG2			*				*				17-Jun-14	3						*	*	*	*	*	*	*	*	
COMPOSITE SAMPLE REQUEST:																										

Relinquished by:	Date	Time	Received by:	Date	Time	
Nolan Grobler			Catherine EF/mgt	18/6	8 38am	Custody Seals Intact? Yes / No
Relinquished by:	Date	Time	Received by:	Date	Time	Samples Received Chilled? Yes / No

Additional Comments:

Queries to Andre at 6363 5276

422159

Stass Environmental

PO Box 11
Kalamunda, WA 6926
Ph (08) 63635276
Fx (08) 94547615

CHAIN OF CUSTODY & ANALYSIS REQUEST

LAB MGT Eurofinns
ADDRESS
LAB CONTACT Dave
PHONE

PROJECT # OV06
PROJECT NAME Opalvale CHITTY
COLLECTORS NAME Nolan Grobler
LAB JOB #

PRELIM. RESULTS BY: ☐ VERBAL ☐ FAX ☑ EMAIL
andre@stass.com.au
FINAL REPORT BY:
LAB QUOTE REF:

SAMPLE ID	DEPTH (metres)	LAB #	MATRIX: WATER	SOIL	SWAB	SLUDGE	PRESERVATION METHOD: ICE	ACIDIFIED	OTHER	NONE	SAMPLING DATE	No. OF CONTAINERS	PHENOL SP.	TPH	BTEX (PURGE & TRAP)	CO3 HCO3	PAH	Total Nitrogen	Na, Ca, K, Mg	Cl, SO_4 scan	As, Cd, Cr, Cu, Hg, Mn, Ni, Pb, Zn	FILTER prior to testing	pH	Conductivity (mS/m)	TDS (mg/l)	REMARKS
DISCRETE SAMPLE REQUEST:																										
SE1			*				*				12-Sep-14	3						*	*	*	*	*	*	*	*	email results to
SE2			*				*				12-Sep-14	3						*	*	*	*	*	*	*	*	andre@stass.com.au
SE3			*				*				12-Sep-14	3						*	*	*	*	*	*	*	*	
SE4			*				*				12-Sep-14	3						*	*	*	*	*	*	*	*	
SE5			*				*				12-Sep-14	3						*	*	*	*	*	*	*	*	
SE6			*				*				12-Sep-14	3						*	*	*	*	*	*	*	*	
SE7			*				*				12-Sep-14	3						*	*	*	*	*	*	*	*	
SE8			*				*				12-Sep-14	3						*	*	*	*	*	*	*	*	
SE9			*				*				12-Sep-14	3						*	*	*	*	*	*	*	*	
NG2			*				*				12-Sep-14	3						*	*	*	*	*	*	*	*	
COMPOSITE SAMPLE REQUEST:																										

Relinquished by:	Date	Time	Received by:	Date	Time	
Nolan Grobler			Catherine Ellmat	15/9	8.32 am	Custody Seals Intact? Yes / No
						Samples Received Chilled? Yes / No

Additional Comments:

Queries to Andre at 6363 5276

432062

Analytical Reference Laboratory

LABORATORY REPORT

ARL Lab No: 11-4452
Date: 25 July 2011

CLIENT: Stass Environmental
PO Box 11
KALAMUNDA WA 6926

ATTENTION: Andre Stasikowski

SAMPLE DESCRIPTION: Five water samples as received for analysis of conductivity, total nitrogen, pH, total dissolved solids and metals.

DATE RECEIVED: 06 July 2011

LOCATION / JOB NO: OV01 - Opalvale CHITTY

PURCHASE ORDER: NA

METHOD REFERENCES:

pH in Water	ARL No. 014
Total Dissolved Solids in Water	ARL No. 017
Conductivity and Salinity in Water	ARL No. 019
Metals in Water	ARL No. 402, 403
Total Nitrogen	ARL No. 330

Kim Rodgers
Laboratory Manager

Analytical Reference Laboratory (WA) Pty. Ltd.
46-48 Banksia Road, Welshpool, Western Australia 6106 Telephone: 08 6253 4444 Facsimile: 08 6253 4440
www.arlwa.com.au ABN: 91 050 159 898

Metals Quality Control Data

	Matrix Spike	Certified Reference Material
	% Recovery	
Arsenic	104%	122%
Cadmium	118%	114%
Chromium	89%	113%
Copper	94%	98%
Manganese	96%	97%
Nickel	98%	101%
Lead	104%	107%
Zinc	106%	101%

Nutrients Quality Control Data

	Matrix Spike	Certified Reference Material
	% Recovery	
Total Nitrogen	104%	108%

Inorganics Quality Control Data

	Matrix Spike	Certified Reference Material
	% Recovery	
pH	-	101%
Conductivity	-	105%
Total Dissolved Solids	-	97%

Nutrients

Date Prepared **6/07/2011**
Date Analysed **7/07/2011**

ARL Lab No	Method Detection Limit	11-4452-1	11-4452-2	11-4452-3	11-4452-4	11-4452-5
Sample Marks		SE1	SE	SE3	SE4	SE5
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Total Nitrogen	0.2	0.4	0.3	0.4	7.1	< 0.2

Metals

Date Prepared **7/07/2011**
Date Analysed **8/07/2011, 14/07/2011**

ARL Lab No	Method Detection Limit	11-4452-1	11-4452-2	11-4452-3	11-4452-4	11-4452-5
Sample Marks		SE1	SE	SE3	SE4	SE5
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Arsenic	0.001	0.002	0.006	0.002	0.001	< 0.001
Cadmium	0.002	< 0.002	< 0.002	0.037	< 0.002	< 0.002
Chromium	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Copper	0.01	0.45	0.30	4.4	0.01	0.01
Manganese	0.01	0.20	0.79	1.7	0.05	< 0.01
Nickel	0.01	0.17	0.48	3.4	0.01	< 0.01
Lead	0.01	0.06	0.02	0.03	< 0.01	< 0.01
Zinc	0.01	0.21	0.48	2.6	0.01	< 0.01

Stass Environmental
ARL Lab No: 11-4452
25 July 2011

ARL Lab No	Date Analysed	Units	Method Detection Limit	11-4452-1	11-4452-2	11-4452-3	11-4452-4	11-4452-5
Sample Marks				SE1	SE	SE3	SE4	SE5
pH	7/07/2011	#	-	4.4	4.9	4.3	6.4	7.5
Conductivity	7/07/2011	mS/cm	0.01	4.8	5.6	9.0	0.50	0.60
Total Dissolved Solids	7/07/2011	mg/l	5	2800	3500	5700	280	310

Environmental and Analytical Laboratory

LABORATORY REPORT

Job Number: 12-0379
Revision: 00
Date: 7 February 2012

ADDRESS: **Stass Environmental**
PO Box 11
Kalamunda WA 6926

ATTENTION: Andre Stasikowski

DATE RECEIVED: 18/01/2012

YOUR REFERENCE: OV02, Opalvale CHITTY

PURCHASE ORDER: N/A

APPROVALS:

Leigh Bermingham
Chemist - Inorganics

REPORT COMMENTS:

Samples are analysed on an as received basis unless otherwise noted.

METHOD REFERENCES:

ARL No. 040	Arsenic by Hydride Atomic Absorption
ARL No. 402/403	Metals in Water by ICPOES/MS
ARL No. 313	NOx in Water by Discrete Analyser
ARL No. 330	Persulphate Method for Simultaneous Determination of TN & TP
ARL No. 014	pH in Water
ARL No. 019	Conductivity and Salinity in Water
ARL No. 017	Total Dissolved Solids (At 105^{o}C)

NATA
WORLD RECOGNISED
ACCREDITATION
This document is issued in accordance with NATA's accreditation requirements
Accreditation No. 2377

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LABORATORY REPORT

Stass Environmental

ARL Job No: 12-0379 *Revision: 00* *Date:* 7 February 2012

Metals in Water Sample No: Sample Description:	LOR	UNITS	12-0379-1 SE1	12-0379-2 SE2	12-0379-3 SE3	12-0379-4 SE4	12-0379-5 SE5
Arsenic - Dissolved	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium - Dissolved	0.002	mg/L	<0.002	0.005	0.038	<0.002	<0.002
Chromium - Dissolved	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Copper - Dissolved	0.01	mg/L	0.44	0.37	1.2	0.03	0.04
Manganese - Dissolved	0.01	mg/L	0.22	0.86	1.7	0.06	<0.01
Nickel - Dissolved	0.01	mg/L	0.19	0.64	2.7	0.01	<0.01
Lead - Dissolved	0.01	mg/L	0.12	0.07	0.22	<0.01	<0.01
Zinc - Dissolved	0.01	mg/L	0.24	0.72	2.5	0.07	<0.01

Nutrients in Water Sample No: Sample Description:	LOR	UNITS	12-0379-1 SE1	12-0379-2 SE2	12-0379-3 SE3	12-0379-4 SE4	12-0379-5 SE5
NOx-N	0.01	mg/L	<0.01	<0.01	<0.01	5.5	0.31
Total Nitrogen	0.2	mg/L	1.0	0.9	0.9	5.5	1.4

Misc. Inorganics in Water Sample No: Sample Description:	LOR	UNITS	12-0379-1 SE1	12-0379-2 SE2	12-0379-3 SE3	12-0379-4 SE4	12-0379-5 SE5
pH	0.1	pH units	3.6	4.1	3.9	6.2	8.3
Conductivity	0.01	mS/cm	4.1	5.6	7.7	0.48	0.85
Total Dissolved Solids	5	mg/L	2,400	4,000	5,800	300	480

Result Definitions

LOR Limit of Reporting
[NT] Not Tested
[ND] Not Detected at indicated Limit of Reporting
[NR] Analysis Not Requested
(SS) Surrogate Standard Compound

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eurofins | mgt

Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Stass Environmental
PO BOX 11
KALAMUNDA
WA 6926

Attention: **Andre Stasikowski**

Report **387045-W**
Client Reference OPALVALE CHITTY OV04
Received Date Jul 25, 2013

Client Sample ID			**SE1**	**SE2**	**SE3**	**SE4**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins | mgt Sample No.			**M13-Jl18356**	**M13-Jl18357**	**M13-Jl18358**	**M13-Jl18359**
Date Sampled			**Jul 24, 2013**	**Jul 24, 2013**	**Jul 24, 2013**	**Jul 24, 2013**
Test/Reference	LOR	Unit				
Chloride	1	mg/L	1100	1600	4200	310
Conductivity (at 25°C)	10	uS/cm	3600	5200	12000	1100
pH	0.1	units	3.7	4.6	4.2	6.0
Sulphate (as S)	5	mg/L	45	87	220	17
Total Dissolved Solids	10	mg/L	1900	3000	7300	600
Total Nitrogen Set (as N)						
Nitrate & Nitrite (as N)	0.05	mg/L	0.07	< 0.05	< 0.05	5.3
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	0.7	0.7	0.4	0.4
Total Nitrogen (as N)	0.2	mg/L	0.8	0.7	0.4	5.7
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	0.001	< 0.001	0.004	< 0.001
Cadmium (filtered)	0.0002	mg/L	0.0003	0.0007	0.019	< 0.0002
Chromium (filtered)	0.001	mg/L	0.001	< 0.001	0.002	< 0.001
Copper (filtered)	0.001	mg/L	0.37	0.22	1.1	0.011
Lead (filtered)	0.001	mg/L	0.074	0.024	0.085	< 0.001
Manganese (filtered)	0.005	mg/L	0.081	0.70	0.64	0.030
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.096	0.37	2.1	0.014
Zinc (filtered)	0.001	mg/L	0.12	0.52	1.4	0.056
Alkali Metals						
Calcium	0.5	mg/L	2.2	11	5.7	2.2
Magnesium	0.5	mg/L	42	140	350	15
Potassium	0.5	mg/L	8.0	36	56	3.7
Sodium	0.5	mg/L	610	750	1800	160

Client Sample ID			**SE5**	**SE6**	**SE7**	**SE8**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins | mgt Sample No.			**M13-Jl18360**	**M13-Jl18361**	**M13-Jl18362**	**M13-Jl18363**
Date Sampled			**Jul 24, 2013**	**Jul 24, 2013**	**Jul 24, 2013**	**Jul 24, 2013**
Test/Reference	LOR	Unit				
Chloride	1	mg/L	1600	1700	3700	53

Client Sample ID			SE5	SE6	SE7	SE8
Sample Matrix			Water	Water	Water	Water
Eurofins | mgt Sample No.			M13-Jl18360	M13-Jl18361	M13-Jl18362	M13-Jl18363
Date Sampled			Jul 24, 2013	Jul 24, 2013	Jul 24, 2013	Jul 24, 2013
Test/Reference	LOR	Unit				
Conductivity (at 25°C)	10	uS/cm	4900	5400	9900	520
pH	0.1	units	5.0	4.8	4.0	7.2
Sulphate (as S)	5	mg/L	71	94	59	13
Total Dissolved Solids	10	mg/L	2800	3100	5400	360
Total Nitrogen Set (as N)						
Nitrate & Nitrite (as N)	0.05	mg/L	< 0.05	0.17	1.6	8.6
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	< 0.2	< 0.2	< 0.2	0.9
Total Nitrogen (as N)	0.2	mg/L	< 0.2	< 0.2	1.6	9.5
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001	0.002	< 0.001
Cadmium (filtered)	0.0002	mg/L	0.015	0.0013	< 0.0002	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	0.002	0.003	< 0.001
Copper (filtered)	0.001	mg/L	0.18	0.065	0.12	0.002
Lead (filtered)	0.001	mg/L	0.012	0.008	0.011	< 0.001
Manganese (filtered)	0.005	mg/L	1.7	0.18	0.041	< 0.005
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.90	0.084	0.049	0.001
Zinc (filtered)	0.001	mg/L	0.73	0.15	0.038	0.007
Alkali Metals						
Calcium	0.5	mg/L	4.3	5.7	6.0	< 0.5
Magnesium	0.5	mg/L	130	68	180	0.8
Potassium	0.5	mg/L	25	9.6	6.4	5.0
Sodium	0.5	mg/L	690	940	1700	120

Client Sample ID			SE9	NG2
Sample Matrix			Water	Water
Eurofins | mgt Sample No.			M13-Jl18364	M13-Jl18365
Date Sampled			Jul 24, 2013	Jul 24, 2013
Test/Reference	LOR	Unit		
Chloride	1	mg/L	120	1800
Conductivity (at 25°C)	10	uS/cm	910	5200
pH	0.1	units	5.1	4.7
Sulphate (as S)	5	mg/L	85	89
Total Dissolved Solids	10	mg/L	650	3100
Total Nitrogen Set (as N)				
Nitrate & Nitrite (as N)	0.05	mg/L	7.2	< 0.05
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	0.9	0.2
Total Nitrogen (as N)	0.2	mg/L	8.1	0.2
Heavy Metals				
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001
Cadmium (filtered)	0.0002	mg/L	0.0002	0.0007
Chromium (filtered)	0.001	mg/L	0.001	< 0.001
Copper (filtered)	0.001	mg/L	0.004	0.23
Lead (filtered)	0.001	mg/L	< 0.001	0.023

Client Sample ID			SE9	NG2
Sample Matrix			**Water**	**Water**
Eurofins | mgt Sample No.			**M13-Jl18364**	**M13-Jl18365**
Date Sampled			**Jul 24, 2013**	**Jul 24, 2013**
Test/Reference	LOR	Unit		
Heavy Metals				
Manganese (filtered)	0.005	mg/L	< 0.005	0.73
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.001	0.38
Zinc (filtered)	0.001	mg/L	0.019	0.54
Alkali Metals				
Calcium	0.5	mg/L	< 0.5	11
Magnesium	0.5	mg/L	4.2	150
Potassium	0.5	mg/L	3.9	34
Sodium	0.5	mg/L	200	760

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

Description	Testing Site	Extracted	Holding Time
Chloride	Melbourne	Jul 25, 2013	28 Day
- Method: MGT 1100A			
Conductivity (at 25°C)	Melbourne	Jul 25, 2013	28 Day
- Method: APHA 2510 Conductivity by Direct Measurement			
pH	Melbourne	Jul 25, 2013	0 Hours
- Method: APHA 4500 pH by Direct Measurement - ** Samples analysed outside holding time. Analysis should be performed in situ. Results for reference only.			
Sulphate (as S)	Melbourne	Jul 25, 2013	28 Day
- Method: In house MGT1110A (SO4 by Discrete Analyser)			
Total Dissolved Solids	Melbourne	Jul 31, 2013	7 Day
- Method: APHA 2540C Total Dissolved Solids			
Total Nitrogen Set (as N)			
Nitrate & Nitrite (as N)	Melbourne	Jul 25, 2013	28 Day
- Method: APHA 4500-NO3/NO2 Nitrate-Nitrite Nitrogen by FIA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Jul 25, 2013	7 Day
- Method: APHA 4500 TKN			
Heavy Metals (filtered)	Melbourne	Jul 25, 2013	180 Day
- Method: USEPA 6020 Heavy Metals			
Mobil Metals : Metals M15	Melbourne	Jul 25, 2013	28 Day
- Method: USEPA 6010/6020 Heavy Metals & USEPA 7470/71 Mercury			
Alkali Metals	Melbourne	Jul 25, 2013	180 Day
- Method: USEPA 6010 Alkali Metals			

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NATA # 1261 Site # 20794

Company Name: Stass Environmental
Address: PO BOX 11
KALAMUNDA
WA 6926

Client Job No.: OPALVALE CHITTY OV04

Order No.:
Report #: 387045
Phone: (08)6363 5276
Fax: (08)9454 7615

Received: Jul 25, 2013 8:21 AM
Due: Aug 1, 2013
Priority: 5 Day
Contact Name: Andre Stasikowski

Eurofins | mgt Client Manager: Natalie Krasselt

Sample Detail					Arsenic (filtered)	Cadmium (filtered)	Calcium	Chloride	Chromium (filtered)	Conductivity (at 25°C)	Copper (filtered)	Lead (filtered)	Magnesium	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)	pH	Potassium	Sodium	Sulphate (as S)	Total Dissolved Solids	Zinc (filtered)	Total Nitrogen Set (as N)
Laboratory where analysis is conducted																							
Melbourne Laboratory - NATA Site # 1254 & 14271					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																							
Brisbane Laboratory - NATA Site # 20794																							
External Laboratory																							
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**																			
SE1	Jul 24, 2013		Water	M13-Jl18356	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE2	Jul 24, 2013		Water	M13-Jl18357	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE3	Jul 24, 2013		Water	M13-Jl18358	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE4	Jul 24, 2013		Water	M13-Jl18359	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE5	Jul 24, 2013		Water	M13-Jl18360	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE6	Jul 24, 2013		Water	M13-Jl18361	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE7	Jul 24, 2013		Water	M13-Jl18362	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE8	Jul 24, 2013		Water	M13-Jl18363	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE9	Jul 24, 2013		Water	M13-Jl18364	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
NG2	Jul 24, 2013		Water	M13-Jl18365	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Eurofins | mgt Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual PQLs are matrix dependant. Quoted PQLs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Acknowledgment.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

UNITS

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Units

TERMS

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environment Protection Authority
APHA	American Public Health Association
ASLP	Australian Standard Leaching Procedure (AS4439.3)
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within

QC - ACCEPTANCE CRITERIA

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries : Recoveries must lie between 50-150% - Phenols 20-130%.

QC DATA GENERAL COMMENTS

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxophene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxophene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Arochlor 1260 in Matrix Spikes and LCS's.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPD's are calculated from raw analytical data thus it is possible to have two sets of data.

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/L	< 1			1	Pass	
Sulphate (as S)	mg/L	< 5			5	Pass	
Total Dissolved Solids	mg/L	< 10			10	Pass	
Method Blank							
Total Nitrogen Set (as N) Total Nitrogen Set (as N)							
Nitrate & Nitrite (as N)	mg/L	< 0.05			0.05	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Method Blank							
Heavy Metals (filtered) USEPA 6020 Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Manganese (filtered)	mg/L	< 0.005			0.005	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.001			0.001	Pass	
Method Blank							
Alkali Metals USEPA 6010 Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
LCS - % Recovery							
Chloride	%	107			70-130	Pass	
Sulphate (as S)	%	107			70-130	Pass	
LCS - % Recovery							
Total Nitrogen Set (as N) Total Nitrogen Set (as N)							
Nitrate & Nitrite (as N)	%	124			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	95			70-130	Pass	
LCS - % Recovery							
Heavy Metals (filtered) USEPA 6020 Heavy Metals							
Arsenic (filtered)	%	93			80-120	Pass	
Cadmium (filtered)	%	94			80-120	Pass	
Chromium (filtered)	%	96			80-120	Pass	
Copper (filtered)	%	92			80-120	Pass	
Lead (filtered)	%	94			80-120	Pass	
Manganese (filtered)	%	93			80-120	Pass	
Mercury (filtered)	%	92			70-130	Pass	
Nickel (filtered)	%	92			80-120	Pass	
Zinc (filtered)	%	94			80-120	Pass	
LCS - % Recovery							
Alkali Metals USEPA 6010 Alkali Metals							
Calcium	%	104			70-130	Pass	
Magnesium	%	107			70-130	Pass	
Potassium	%	113			70-130	Pass	
Sodium	%	98			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Total Nitrogen Set (as N)				Result 1					
Nitrate & Nitrite (as N)	M13-Jl16126	NCP	%	126			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	M13-Jl18036	NCP	%	96			70-130	Pass	
Spike - % Recovery									
Heavy Metals (filtered)				Result 1					
Arsenic (filtered)	M13-Jl18987	NCP	%	88			75-125	Pass	
Cadmium (filtered)	M13-Jl18987	NCP	%	83			75-125	Pass	
Chromium (filtered)	M13-Jl18987	NCP	%	88			75-125	Pass	
Copper (filtered)	M13-Jl18987	NCP	%	82			75-125	Pass	
Lead (filtered)	M13-Jl18987	NCP	%	84			75-125	Pass	
Manganese (filtered)	M13-Jl18987	NCP	%	87			75-125	Pass	
Mercury (filtered)	M13-Jl20169	NCP	%	75			70-130	Pass	
Nickel (filtered)	M13-Jl18987	NCP	%	82			75-125	Pass	
Zinc (filtered)	M13-Jl18987	NCP	%	84			75-125	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	B13-Jl20045	NCP	%	105			70-130	Pass	
Magnesium	M13-Jl18356	CP	%	99			70-130	Pass	
Potassium	M13-Jl18356	CP	%	86			70-130	Pass	
Sodium	M13-Jl18356	CP	%	107			70-130	Pass	
Spike - % Recovery									
				Result 1					
Chloride	M13-Jl18361	CP	%	117			70-130	Pass	
Spike - % Recovery									
				Result 1					
Sulphate (as S)	M13-Jl18362	CP	%	119			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (at 25°C)	M13-Jl18030	NCP	uS/cm	7800	7700	2.0	30%	Pass	
Duplicate									
Total Nitrogen Set (as N)				Result 1	Result 2	RPD			
Nitrate & Nitrite (as N)	M13-Jl16126	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Heavy Metals (filtered)				Result 1	Result 2	RPD			
Arsenic (filtered)	M13-Jl18987	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium (filtered)	M13-Jl18987	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	M13-Jl18987	NCP	mg/L	0.0040	0.0044	<1	30%	Pass	
Copper (filtered)	M13-Jl18987	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Lead (filtered)	M13-Jl18987	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Manganese (filtered)	M13-Jl18987	NCP	mg/L	0.016	0.016	<1	30%	Pass	
Nickel (filtered)	M13-Jl18987	NCP	mg/L	0.0060	0.0052	5.1	30%	Pass	
Zinc (filtered)	M13-Jl18987	NCP	mg/L	0.0080	0.0084	<1	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	M13-Jl18356	CP	mg/L	2.2	2.1	2.0	30%	Pass	
Magnesium	M13-Jl18356	CP	mg/L	42	41	2.0	30%	Pass	
Potassium	M13-Jl18356	CP	mg/L	8.0	8.0	<1	30%	Pass	
Sodium	M13-Jl18356	CP	mg/L	610	600	2.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Dissolved Solids	M13-Jl18360	CP	mg/L	2800	2900	4.0	30%	Pass	

Duplicate									
				Result 1	Result 2	RPD			
Chloride	M13-Jl18361	CP	mg/L	1700	1700	<1	30%	Pass	
Sulphate (as S)	M13-Jl18361	CP	mg/L	94	93	<1	30%	Pass	
Duplicate									
Mobil Metals : Metals M15				Result 1	Result 2	RPD			
Mercury (filtered)	M13-Jl18361	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Chloride	M13-Jl18362	CP	mg/L	3700	3700	<1	30%	Pass	
Sulphate (as S)	M13-Jl18362	CP	mg/L	59	59	<1	30%	Pass	
Duplicate									
Total Nitrogen Set (as N)				Result 1	Result 2	RPD			
Total Kjeldahl Nitrogen (as N)	M13-Jl18364	CP	mg/L	0.9	0.9	4.4	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	No
Organic samples had Teflon liners	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised By

Natalie Krasselt	Client Services
Emily Rosenberg	Senior Analyst-Metal (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)

Glenn Jackson
Laboratory Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Uncertainty data is available on request

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Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Stass Environmental
PO BOX 11
KALAMUNDA
WA 6926

Attention: **Andre Stasikowski**

Report **402563-W**
Client Reference OPALVALE CHITTY OV05
Received Date Dec 05, 2013

Client Sample ID			**SE1**	**SE2**	**SE3**	**SE4**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins | mgt Sample No.			**M13-De05257**	**M13-De05258**	**M13-De05259**	**M13-De05260**
Date Sampled			**Dec 04, 2013**	**Dec 04, 2013**	**Dec 04, 2013**	**Dec 04, 2013**
Test/Reference	LOR	Unit				
Chloride	1	mg/L	1000	2000	4100	99
Conductivity (at 25°C)	10	uS/cm	3300	6100	11000	430
pH	0.1	units	3.3	4.6	3.7	5.7
Sulphate (as S)	5	mg/L	45	110	230	< 5
Total Dissolved Solids	10	mg/L	1900	3400	7000	240
Total Nitrogen Set (as N)						
Nitrate & Nitrite (as N)	0.05	mg/L	< 0.05	0.08	0.07	5.7
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	0.8	< 0.2	< 0.2	< 0.2
Total Nitrogen (as N)	0.2	mg/L	0.8	< 0.2	< 0.2	5.7
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	< 0.001	0.002	0.003	< 0.001
Cadmium (filtered)	0.0002	mg/L	0.0004	0.0007	0.022	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	0.39	0.10	0.52	0.006
Lead (filtered)	0.001	mg/L	0.083	0.021	0.076	< 0.001
Manganese (filtered)	0.005	mg/L	0.080	0.95	0.79	0.019
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.064	0.45	1.4	0.011
Zinc (filtered)	0.001	mg/L	0.077	0.50	1.3	0.031
Alkali Metals						
Calcium	0.5	mg/L	1.3	10	5.0	1.1
Magnesium	0.5	mg/L	43	170	370	11
Potassium	0.5	mg/L	3.1	38	62	1.5
Sodium	0.5	mg/L	570	890	1900	71

Client Sample ID			**SE5**	**SE6**	**SE7**	**SE8**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins | mgt Sample No.			**M13-De05261**	**M13-De05262**	**M13-De05263**	**M13-De05264**
Date Sampled			**Dec 04, 2013**	**Dec 04, 2013**	**Dec 04, 2013**	**Dec 04, 2013**
Test/Reference	LOR	Unit				
Chloride	1	mg/L	1400	2300	3300	39
Conductivity (at 25°C)	10	uS/cm	4300	7400	9000	480
pH	0.1	units	4.7	4.2	3.6	6.7
Sulphate (as S)	5	mg/L	75	120	52	18
Total Dissolved Solids	10	mg/L	2600	3700	4800	320

Client Sample ID			SE5	SE6	SE7	SE8
Sample Matrix			Water	Water	Water	Water
Eurofins | mgt Sample No.			M13-De05261	M13-De05262	M13-De05263	M13-De05264
Date Sampled			Dec 04, 2013	Dec 04, 2013	Dec 04, 2013	Dec 04, 2013
Test/Reference	LOR	Unit				
Total Nitrogen Set (as N)						
Nitrate & Nitrite (as N)	0.05	mg/L	0.06	0.10	1.6	6.2
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	0.2	< 0.2	0.9	1.6
Total Nitrogen (as N)	0.2	mg/L	0.26	< 0.2	2.5	7.8
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	< 0.001	0.001	0.002	< 0.001
Cadmium (filtered)	0.0002	mg/L	0.0026	0.0003	0.0002	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	0.079	0.091	0.14	0.001
Lead (filtered)	0.001	mg/L	0.006	0.012	0.006	< 0.001
Manganese (filtered)	0.005	mg/L	1.5	0.057	0.12	< 0.005
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.46	0.020	0.013	< 0.001
Zinc (filtered)	0.001	mg/L	0.51	0.047	0.025	0.004
Alkali Metals						
Calcium	0.5	mg/L	5.0	2.6	5.7	< 0.5
Magnesium	0.5	mg/L	110	110	170	0.8
Potassium	0.5	mg/L	21	12	6.4	3.3
Sodium	0.5	mg/L	640	1300	1700	130

Client Sample ID			SE9	NG2
Sample Matrix			Water	Water
Eurofins | mgt Sample No.			M13-De05265	M13-De05266
Date Sampled			Dec 04, 2013	Dec 04, 2013
Test/Reference	LOR	Unit		
Chloride	1	mg/L	88	88
Conductivity (at 25°C)	10	uS/cm	790	770
pH	0.1	units	4.9	4.8
Sulphate (as S)	5	mg/L	85	86
Total Dissolved Solids	10	mg/L	560	560
Total Nitrogen Set (as N)				
Nitrate & Nitrite (as N)	0.05	mg/L	6.1	6.1
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	< 0.2	< 0.2
Total Nitrogen (as N)	0.2	mg/L	6.1	6.1
Heavy Metals				
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002
Chromium (filtered)	0.001	mg/L	0.001	0.002
Copper (filtered)	0.001	mg/L	0.005	0.004
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001
Manganese (filtered)	0.005	mg/L	< 0.005	< 0.005
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.001	0.001
Zinc (filtered)	0.001	mg/L	0.012	0.008
Alkali Metals				
Calcium	0.5	mg/L	< 0.5	< 0.5
Magnesium	0.5	mg/L	2.7	2.7

Client Sample ID			SE9	NG2
Sample Matrix			**Water**	**Water**
Eurofins | mgt Sample No.			**M13-De05265**	**M13-De05266**
Date Sampled			**Dec 04, 2013**	**Dec 04, 2013**
Test/Reference	LOR	Unit		
Alkali Metals				
Potassium	0.5	mg/L	2.1	2.1
Sodium	0.5	mg/L	57	160

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chloride	Melbourne	Dec 06, 2013	28 Day
- Method: MGT 1100A			
Conductivity (at 25°C)	Melbourne	Dec 09, 2013	28 Day
- Method: APHA 2510 Conductivity by Direct Measurement			
pH	Melbourne	Dec 06, 2013	0 Hours
- Method: APHA 4500 pH by Direct Measurement - ** Samples analysed outside holding time. Analysis should be performed in situ. Results for reference only.			
Sulphate (as S)	Melbourne	Dec 06, 2013	28 Day
- Method: In house MGT1110A (SO4 by Discrete Analyser)			
Total Dissolved Solids	Melbourne	Dec 10, 2013	7 Day
- Method: APHA 2540C Total Dissolved Solids			
Total Nitrogen Set (as N)			
Nitrate & Nitrite (as N)	Melbourne	Dec 06, 2013	28 Day
- Method: APHA 4500-NO3/NO2 Nitrate-Nitrite Nitrogen by FIA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Dec 06, 2013	7 Day
- Method: APHA 4500 TKN			
Heavy Metals (filtered)	Melbourne	Dec 05, 2013	180 Day
- Method: USEPA 6020 Heavy Metals			
Mobil Metals : Metals M15	Melbourne	Dec 05, 2013	28 Day
- Method: USEPA 6010/6020 Heavy Metals & USEPA 7470/71 Mercury			
Alkali Metals	Melbourne	Dec 05, 2013	180 Day
- Method: USEPA 6010 Alkali Metals			

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NATA # 1261 Site # 20794

Company Name: Stass Environmental
Address: PO BOX 11
KALAMUNDA
WA 6926

Client Job No.: OPALVALE CHITTY OV05

Order No.:
Report #: 402563
Phone: (08)6363 5276
Fax: (08)9454 7615

Received: Dec 5, 2013 8:43 AM
Due: Dec 12, 2013
Priority: 5 Day
Contact Name: Andre Stasikowski

Eurofins | mgt Client Manager: Mark Rodriquez

Sample Detail					Arsenic (filtered)	Cadmium (filtered)	Calcium	Chloride	Chromium (filtered)	Conductivity (at 25°C)	Copper (filtered)	Lead (filtered)	Magnesium	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)	pH	Potassium	Sodium	Sulphate (as S)	Total Dissolved Solids	Zinc (filtered)	Total Nitrogen Set (as N)
Laboratory where analysis is conducted																							
Melbourne Laboratory - NATA Site # 1254 & 14271					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																							
Brisbane Laboratory - NATA Site # 20794																							
External Laboratory																							
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**																			
SE1	Dec 04, 2013		Water	M13-De05257	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE2	Dec 04, 2013		Water	M13-De05258	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE3	Dec 04, 2013		Water	M13-De05259	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE4	Dec 04, 2013		Water	M13-De05260	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE5	Dec 04, 2013		Water	M13-De05261	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE6	Dec 04, 2013		Water	M13-De05262	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE7	Dec 04, 2013		Water	M13-De05263	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE8	Dec 04, 2013		Water	M13-De05264	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE9	Dec 04, 2013		Water	M13-De05265	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
NG2	Dec 04, 2013		Water	M13-De05266	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Eurofins | mgt Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual PQLs are matrix dependant. Quoted PQLs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Acknowledgment.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

UNITS

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Units

TERMS

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
ASLP	Australian Standard Leaching Procedure (AS4439.3)
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - ACCEPTANCE CRITERIA

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries : Recoveries must lie between 50-150% - Phenols 20-130%.

QC DATA GENERAL COMMENTS

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxophene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxophene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Arochlor 1260 in Matrix Spikes and LCS's.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPD's are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/L	< 1			1	Pass	
Sulphate (as S)	mg/L	< 5			5	Pass	
Total Dissolved Solids	mg/L	< 10			10	Pass	
Method Blank							
Total Nitrogen Set (as N)							
Nitrate & Nitrite (as N)	mg/L	< 0.05			0.05	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Method Blank							
Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Manganese (filtered)	mg/L	< 0.005			0.005	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.001			0.001	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
LCS - % Recovery							
Chloride	%	102			70-130	Pass	
Sulphate (as S)	%	106			70-130	Pass	
LCS - % Recovery							
Total Nitrogen Set (as N)							
Nitrate & Nitrite (as N)	%	96			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	82			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic (filtered)	%	109			80-120	Pass	
Cadmium (filtered)	%	100			80-120	Pass	
Chromium (filtered)	%	102			80-120	Pass	
Copper (filtered)	%	102			80-120	Pass	
Lead (filtered)	%	98			80-120	Pass	
Manganese (filtered)	%	107			80-120	Pass	
Mercury (filtered)	%	92			70-130	Pass	
Nickel (filtered)	%	99			80-120	Pass	
Zinc (filtered)	%	102			80-120	Pass	
LCS - % Recovery							
Alkali Metals							
Calcium	%	100			70-130	Pass	
Magnesium	%	106			70-130	Pass	
Potassium	%	91			70-130	Pass	
Sodium	%	118			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Chloride	M13-De05305	NCP	%	106			70-130	Pass	
Sulphate (as S)	M13-De05257	CP	%	101			70-130	Pass	
Spike - % Recovery									
Total Nitrogen Set (as N)				Result 1					
Nitrate & Nitrite (as N)	M13-De05257	CP	%	94			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	M13-De05257	CP	%	97			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Chromium (filtered)	M13-De03873	NCP	%	96			70-130	Pass	
Nickel (filtered)	M13-De03873	NCP	%	91			70-130	Pass	
Zinc (filtered)	M13-De03873	NCP	%	100			70-130	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	M13-De05488	NCP	%	104			70-130	Pass	
Magnesium	M13-De05257	CP	%	100			70-130	Pass	
Potassium	M13-De05488	NCP	%	92			70-130	Pass	
Sodium	M13-De05257	CP	%	110			70-130	Pass	
Spike - % Recovery									
				Result 1					
Sulphate (as S)	M13-De05258	CP	%	102			70-130	Pass	
Spike - % Recovery									
Total Nitrogen Set (as N)				Result 1					
Nitrate & Nitrite (as N)	M13-De05258	CP	%	80			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Mercury (filtered)	M13-De05258	CP	%	75			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	M13-De05262	CP	%	93			70-130	Pass	
Cadmium (filtered)	M13-De05262	CP	%	83			70-130	Pass	
Copper (filtered)	M13-De05262	CP	%	82			70-130	Pass	
Lead (filtered)	M13-De05262	CP	%	82			70-130	Pass	
Manganese (filtered)	M13-De05262	CP	%	84			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
Chloride	M13-De05257	CP	mg/L	1000	1000	<1	30%	Pass	
Sulphate (as S)	M13-De05257	CP	mg/L	45	45	<1	30%	Pass	
Duplicate									
Total Nitrogen Set (as N)				Result 1	Result 2	RPD			
Nitrate & Nitrite (as N)	M13-De05257	CP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Total Kjeldahl Nitrogen (as N)	M13-De05257	CP	mg/L	0.8	0.3	94	30%	Fail	Q15
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Mercury (filtered)	M13-De05257	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	M13-De05257	CP	mg/L	1.3	1.4	1.0	30%	Pass	
Magnesium	M13-De05257	CP	mg/L	43	43	1.0	30%	Pass	
Potassium	M13-De05257	CP	mg/L	3.1	3.5	11	30%	Pass	
Sodium	M13-De05257	CP	mg/L	570	560	2.0	30%	Pass	

Duplicate									
				Result 1	Result 2	RPD			
Chloride	M13-De05258	CP	mg/L	2000	1900	<1	30%	Pass	
Conductivity (at 25°C)	M13-De05258	CP	uS/cm	6100	6200	2.0	30%	Pass	
Sulphate (as S)	M13-De05258	CP	mg/L	110	110	<1	30%	Pass	
Duplicate									
Total Nitrogen Set (as N)				Result 1	Result 2	RPD			
Nitrate & Nitrite (as N)	M13-De05258	CP	mg/L	0.08	0.07	17	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Dissolved Solids	M13-De05262	CP	mg/L	3700	3900	5.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	M13-De05262	CP	mg/L	0.001	0.002	23	30%	Pass	
Cadmium (filtered)	M13-De05262	CP	mg/L	0.0003	0.0002	22	30%	Pass	
Chromium (filtered)	M13-De05262	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	M13-De05262	CP	mg/L	0.091	0.089	1.5	30%	Pass	
Lead (filtered)	M13-De05262	CP	mg/L	0.012	0.012	2.6	30%	Pass	
Manganese (filtered)	M13-De05262	CP	mg/L	0.057	0.056	1.9	30%	Pass	
Nickel (filtered)	M13-De05262	CP	mg/L	0.020	0.020	<1	30%	Pass	
Zinc (filtered)	M13-De05262	CP	mg/L	0.047	0.047	<1	30%	Pass	
Duplicate									
Total Nitrogen Set (as N)				Result 1	Result 2	RPD			
Nitrate & Nitrite (as N)	M13-De05265	CP	mg/L	6.1	6.1	1.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Organic samples had Teflon liners	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
Q15	The RPD reported passes Eurofins | mgt's Acceptance Criteria as stipulated in SOP 05. Refer to Glossary Page of this report for further details

Authorised By

Mark Rodriquez	Client Services
Emily Rosenberg	Senior Analyst-Metal (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)

Glenn Jackson
Laboratory Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Uncertainty data is available on request

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Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Stass Environmental
PO BOX 11
KALAMUNDA
WA 6926

Attention: **Andre Stasikowski**

Report **412062-W**
Client Reference OPALVALE CHITTY OV06
Received Date Mar 17, 2014

Client Sample ID			**SE1**	**SE2**	**SE3**	**SE4**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins | mgt Sample No.			**M14-Ma12755**	**M14-Ma12756**	**M14-Ma12757**	**M14-Ma12758**
Date Sampled			**Mar 14, 2014**	**Mar 14, 2014**	**Mar 14, 2014**	**Mar 14, 2014**
Test/Reference	LOR	Unit				
Chloride	1	mg/L	1100	4200	2400	130
Conductivity (at 25°C)	10	uS/cm	3400	13000	7300	400
pH	0.1	units	3.6	4.1	3.4	5.8
Sulphate (as S)	5	mg/L	47	190	160	< 5
Total Dissolved Solids	10	mg/L	1900	7200	4000	240
Total Nitrogen Set (as N)						
Nitrate & Nitrite (as N)	0.05	mg/L	< 0.05	0.06	2.1	7.2
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	< 0.2	< 0.2	< 0.2	0.7
Total Nitrogen (as N)	0.2	mg/L	< 0.2	< 0.2	2.1	7.9
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (filtered)	0.0002	mg/L	0.0003	0.0021	0.022	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	0.002	0.001	< 0.001
Copper (filtered)	0.001	mg/L	0.39	1.2	0.15	0.004
Lead (filtered)	0.001	mg/L	0.090	0.47	0.043	< 0.001
Manganese (filtered)	0.005	mg/L	0.12	1.1	1.1	0.014
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.096	1.0	2.6	0.008
Zinc (filtered)	0.001	mg/L	0.14	0.92	2.6	0.022
Alkali Metals						
Calcium	0.5	mg/L	[G01]< 5	16	5.8	[G01]< 5
Magnesium	0.5	mg/L	42	310	240	11
Potassium	0.5	mg/L	[G01]< 5	43	47	[G01]< 5
Sodium	0.5	mg/L	630	2100	1200	69

Client Sample ID			**SE5**	**SE6**	**SE7**	**SE8**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins | mgt Sample No.			**M14-Ma12759**	**M14-Ma12760**	**M14-Ma12761**	**M14-Ma12762**
Date Sampled			**Mar 14, 2014**	**Mar 14, 2014**	**Mar 14, 2014**	**Mar 14, 2014**
Test/Reference	LOR	Unit				
Chloride	1	mg/L	3200	2600	4100	160
Conductivity (at 25°C)	10	uS/cm	9800	8200	11000	630
pH	0.1	units	5.2	4.5	3.7	6.5
Sulphate (as S)	5	mg/L	140	120	62	17
Total Dissolved Solids	10	mg/L	5500	4600	6000	420

Client Sample ID			SE5	SE6	SE7	SE8
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins | mgt Sample No.			**M14-Ma12759**	**M14-Ma12760**	**M14-Ma12761**	**M14-Ma12762**
Date Sampled			**Mar 14, 2014**	**Mar 14, 2014**	**Mar 14, 2014**	**Mar 14, 2014**
Test/Reference	LOR	Unit				
Total Nitrogen Set (as N)						
Nitrate & Nitrite (as N)	0.05	mg/L	0.06	0.12	0.82	7.8
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	< 0.2	< 0.2	< 0.2	0.8
Total Nitrogen (as N)	0.2	mg/L	< 0.2	< 0.2	0.8	8.6
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (filtered)	0.0002	mg/L	0.0005	< 0.0002	< 0.0002	< 0.0002
Chromium (filtered)	0.001	mg/L	0.001	0.004	0.003	< 0.001
Copper (filtered)	0.001	mg/L	0.043	0.062	0.096	0.002
Lead (filtered)	0.001	mg/L	0.011	0.013	0.010	< 0.001
Manganese (filtered)	0.005	mg/L	1.3	0.042	0.13	< 0.005
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.31	0.017	0.040	< 0.001
Zinc (filtered)	0.001	mg/L	0.35	0.057	0.086	0.006
Alkali Metals						
Calcium	0.5	mg/L	7.4	[G01]< 5	5.4	[G01]< 5
Magnesium	0.5	mg/L	170	110	190	[G01]< 5
Potassium	0.5	mg/L	26	7.7	[G01]< 5	[G01]< 5
Sodium	0.5	mg/L	1800	1500	2200	140

Client Sample ID			SE9	NG2
Sample Matrix			**Water**	**Water**
Eurofins | mgt Sample No.			**M14-Ma12763**	**M14-Ma12764**
Date Sampled			**Mar 14, 2014**	**Mar 14, 2014**
Test/Reference	LOR	Unit		
Chloride	1	mg/L	98	130
Conductivity (at 25°C)	10	uS/cm	790	890
pH	0.1	units	5.3	5.3
Sulphate (as S)	5	mg/L	69	65
Total Dissolved Solids	10	mg/L	530	580
Total Nitrogen Set (as N)				
Nitrate & Nitrite (as N)	0.05	mg/L	7.9	7.8
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	0.6	0.8
Total Nitrogen (as N)	0.2	mg/L	8.5	8.6
Heavy Metals				
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	0.001
Copper (filtered)	0.001	mg/L	0.004	0.004
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001
Manganese (filtered)	0.005	mg/L	0.015	0.026
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.002	0.003
Zinc (filtered)	0.001	mg/L	0.032	0.039

Client Sample ID			SE9	NG2
Sample Matrix			**Water**	**Water**
Eurofins | mgt Sample No.			**M14-Ma12763**	**M14-Ma12764**
Date Sampled			**Mar 14, 2014**	**Mar 14, 2014**
Test/Reference	LOR	Unit		
Alkali Metals				
Calcium	0.5	mg/L	[G01]< 5	[G01]< 5
Magnesium	0.5	mg/L	[G01]< 5	[G01]< 5
Potassium	0.5	mg/L	[G01]< 5	[G01]< 5
Sodium	0.5	mg/L	170	190

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chloride	Melbourne	Mar 17, 2014	28 Day
- Method: MGT 1100A			
Conductivity (at 25°C)	Melbourne	Mar 17, 2014	28 Day
- Method: APHA 2510 Conductivity by Direct Measurement			
pH	Melbourne	Mar 18, 2014	0 Hours
- Method: APHA 4500 pH by Direct Measurement - ** Samples analysed outside holding time. Analysis should be performed in situ. Results for reference only.			
Sulphate (as S)	Melbourne	Mar 17, 2014	28 Day
- Method: In house MGT1110A (SO4 by Discrete Analyser)			
Total Dissolved Solids	Melbourne	Mar 21, 2014	7 Day
- Method: APHA 2540C Total Dissolved Solids			
Total Nitrogen Set (as N)			
Nitrate & Nitrite (as N)	Melbourne	Mar 18, 2014	28 Day
- Method: APHA 4500-NO3/NO2 Nitrate-Nitrite Nitrogen by FIA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Mar 18, 2014	7 Day
- Method: APHA 4500 TKN			
Heavy Metals (filtered)	Melbourne	Mar 17, 2014	180 Day
- Method: USEPA 6020 Heavy Metals			
Mobil Metals : Metals M15	Melbourne	Mar 17, 2014	28 Day
- Method: USEPA 6010/6020 Heavy Metals & USEPA 7470/71 Mercury			
Alkali Metals	Melbourne	Mar 17, 2014	180 Day
- Method: USEPA 6010 Alkali Metals			

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NATA # 1261 Site # 20794

Company Name: Stass Environmental
Address: PO BOX 11
KALAMUNDA
WA 6926

Client Job No.: OPALVALE CHITTY OV06

Order No.:
Report #: 412062
Phone: (08)6363 5276
Fax: (08)9454 7615

Received: Mar 17, 2014 9:06 AM
Due: Mar 24, 2014
Priority: 5 Day
Contact Name: Andre Stasikowski

Eurofins | mgt Client Manager: Natalie Krasselt

Sample Detail					Arsenic (filtered)	Cadmium (filtered)	Calcium	Chloride	Chromium (filtered)	Conductivity (at 25°C)	Copper (filtered)	Lead (filtered)	Magnesium	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)	pH	Potassium	Sodium	Sulphate (as S)	Total Dissolved Solids	Zinc (filtered)	Total Nitrogen Set (as N)
Laboratory where analysis is conducted																							
Melbourne Laboratory - NATA Site # 1254 & 14271					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																							
Brisbane Laboratory - NATA Site # 20794																							
External Laboratory																							
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**																			
SE1	Mar 14, 2014		Water	M14-Ma12755	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE2	Mar 14, 2014		Water	M14-Ma12756	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE3	Mar 14, 2014		Water	M14-Ma12757	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE4	Mar 14, 2014		Water	M14-Ma12758	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE5	Mar 14, 2014		Water	M14-Ma12759	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE6	Mar 14, 2014		Water	M14-Ma12760	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE7	Mar 14, 2014		Water	M14-Ma12761	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE8	Mar 14, 2014		Water	M14-Ma12762	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE9	Mar 14, 2014		Water	M14-Ma12763	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
NG2	Mar 14, 2014		Water	M14-Ma12764	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Eurofins | mgt Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual PQLs are matrix dependant. Quoted PQLs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Acknowledgment.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

UNITS

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Units

TERMS

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
ASLP	Australian Standard Leaching Procedure (AS4439.3)
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - ACCEPTANCE CRITERIA

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries : Recoveries must lie between 50-150% - Phenols 20-130%.

QC DATA GENERAL COMMENTS

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxophene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxophene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Arochlor 1260 in Matrix Spikes and LCS's.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPD's are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/L	< 1			1	Pass	
Sulphate (as S)	mg/L	< 5			5	Pass	
Total Dissolved Solids	mg/L	< 10			10	Pass	
Method Blank							
Total Nitrogen Set (as N)							
Nitrate & Nitrite (as N)	mg/L	< 0.05			0.05	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Method Blank							
Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Manganese (filtered)	mg/L	< 0.005			0.005	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.001			0.001	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
LCS - % Recovery							
Chloride	%	104			70-130	Pass	
Sulphate (as S)	%	100			70-130	Pass	
LCS - % Recovery							
Total Nitrogen Set (as N)							
Nitrate & Nitrite (as N)	%	110			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	87			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic (filtered)	%	93			80-120	Pass	
Cadmium (filtered)	%	96			80-120	Pass	
Chromium (filtered)	%	92			80-120	Pass	
Copper (filtered)	%	92			80-120	Pass	
Lead (filtered)	%	94			80-120	Pass	
Manganese (filtered)	%	95			80-120	Pass	
Mercury (filtered)	%	82			70-130	Pass	
Nickel (filtered)	%	93			80-120	Pass	
Zinc (filtered)	%	96			80-120	Pass	
LCS - % Recovery							
Alkali Metals							
Calcium	%	86			70-130	Pass	
Magnesium	%	86			70-130	Pass	
Potassium	%	84			70-130	Pass	
Sodium	%	80			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Sulphate (as S)	M14-Ma15973	NCP	%	87			70-130	Pass	
Spike - % Recovery									
Total Nitrogen Set (as N)				Result 1					
Nitrate & Nitrite (as N)	M14-Ma11876	NCP	%	70			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Mercury (filtered)	M14-Ma13777	NCP	%	81			70-130	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	M14-Ma12756	CP	%	93			70-130	Pass	
Magnesium	M14-Ma12756	CP	%	109			70-130	Pass	
Potassium	M14-Ma12756	CP	%	93			70-130	Pass	
Sodium	M14-Ma12756	CP	%	114			70-130	Pass	
Spike - % Recovery									
				Result 1					
Chloride	M14-Ma12757	CP	%	98			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	M14-Ma12763	CP	%	86			70-130	Pass	
Cadmium (filtered)	M14-Ma12763	CP	%	84			70-130	Pass	
Chromium (filtered)	M14-Ma12763	CP	%	89			70-130	Pass	
Copper (filtered)	M14-Ma12763	CP	%	80			70-130	Pass	
Lead (filtered)	M14-Ma12763	CP	%	88			70-130	Pass	
Manganese (filtered)	M14-Ma12763	CP	%	92			70-130	Pass	
Nickel (filtered)	M14-Ma12763	CP	%	79			70-130	Pass	
Zinc (filtered)	M14-Ma12763	CP	%	101			70-130	Pass	
Spike - % Recovery									
Total Nitrogen Set (as N)				Result 1					
Total Kjeldahl Nitrogen (as N)	M14-Ma12764	CP	%	81			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
Total Dissolved Solids	M14-Ma12755	CP	mg/L	1900	2100	5.0	30%	Pass	
Duplicate									
Total Nitrogen Set (as N)				Result 1	Result 2	RPD			
Nitrate & Nitrite (as N)	M14-Ma12533	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	M14-Ma12756	CP	mg/L	16	16	1.0	30%	Pass	
Magnesium	M14-Ma12756	CP	mg/L	310	310	1.0	30%	Pass	
Potassium	M14-Ma12756	CP	mg/L	43	43	<1	30%	Pass	
Sodium	M14-Ma12756	CP	mg/L	2100	2000	3.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Chloride	M14-Ma12757	CP	mg/L	2400	2400	1.1	30%	Pass	
Sulphate (as S)	M14-Ma12757	CP	mg/L	160	160	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	M14-Ma12763	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium (filtered)	M14-Ma12763	CP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	M14-Ma12763	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	M14-Ma12763	CP	mg/L	0.004	0.004	<1	30%	Pass	

Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Lead (filtered)	M14-Ma12763	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Manganese (filtered)	M14-Ma12763	CP	mg/L	0.015	0.016	4.7	30%	Pass	
Mercury (filtered)	M14-Ma12763	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	M14-Ma12763	CP	mg/L	0.002	0.002	2.8	30%	Pass	
Zinc (filtered)	M14-Ma12763	CP	mg/L	0.032	0.034	5.6	30%	Pass	
Duplicate									
Total Nitrogen Set (as N)				Result 1	Result 2	RPD			
Total Kjeldahl Nitrogen (as N)	M14-Ma12764	CP	mg/L	0.8	0.9	6.4	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	No
Organic samples had Teflon liners	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
G01	The LORs have been raised due to matrix interference

Authorised By

Natalie Krasselt	Client Services
Emily Rosenberg	Senior Analyst-Metal (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)

Glenn Jackson
Laboratory Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Uncertainty data is available on request

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Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Stass Environmental
PO BOX 11
KALAMUNDA
WA 6926

Attention: **Andre Stasikowski**

Report **422159-W**
Client Reference OPALVALE CHITTY OV06
Received Date Jun 18, 2014

Client Sample ID **Sample Matrix** **Eurofins | mgt Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**SE1** **Water** **M14-Jn14082** **Jun 17, 2014**	**SE2** **Water** **M14-Jn14083** **Jun 17, 2014**	**SE3** **Water** **M14-Jn14084** **Jun 17, 2014**	**SE4** **Water** **M14-Jn14085** **Jun 17, 2014**
Chloride	1	mg/L	1000	4400	2900	160
Conductivity (at 25°C)	10	uS/cm	3900	14000	11000	680
pH	0.1	units	3.6	3.7	2.9	5.1
Sulphate (as S)	5	mg/L	41	180	150	7.3
Total Dissolved Solids	10	mg/L	1800	7300	4900	330
Total Nitrogen Set (as N)						
Nitrate & Nitrite (as N)	0.05	mg/L	< 0.05	0.06	0.27	7.4
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	< 0.2	3.8	3.0	3.6
Total Nitrogen (as N)	0.2	mg/L	< 0.2	3.9	3.3	11
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.005	< 0.005	< 0.001
Cadmium (filtered)	0.0002	mg/L	0.0003	0.0018	0.039	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.005	< 0.005	< 0.001
Copper (filtered)	0.001	mg/L	0.35	1.6	0.051	0.010
Lead (filtered)	0.001	mg/L	0.086	0.61	0.11	< 0.001
Manganese (filtered)	0.005	mg/L	0.069	1.1	1.4	0.015
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.069	1.1	4.2	0.011
Zinc (filtered)	0.001	mg/L	0.077	0.91	3.8	0.020
Alkali Metals						
Calcium	0.5	mg/L	1.1	21	4.9	0.8
Magnesium	0.5	mg/L	39	390	310	12
Potassium	0.5	mg/L	2.6	52	69	1.4
Sodium	0.5	mg/L	620	2100	1400	99

Client Sample ID			SE5	SE6	SE7	SE8
Sample Matrix			Water	Water	Water	Water
Eurofins | mgt Sample No.			M14-Jn14086	M14-Jn14087	M14-Jn14088	M14-Jn14089
Date Sampled			Jun 17, 2014	Jun 17, 2014	Jun 17, 2014	Jun 17, 2014
Test/Reference	LOR	Unit				
Chloride	1	mg/L	1100	2800	3900	220
Conductivity (at 25°C)	10	uS/cm	3900	9300	12000	1100
pH	0.1	units	5.1	4.2	3.7	5.6
Sulphate (as S)	5	mg/L	52	100	58	11
Total Dissolved Solids	10	mg/L	1800	4300	5800	520
Total Nitrogen Set (as N)						
Nitrate & Nitrite (as N)	0.05	mg/L	0.12	0.20	0.91	7.0
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	2.8	2.9	9.4	0.3
Total Nitrogen (as N)	0.2	mg/L	2.9	3.1	10	7.3
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	< 0.001	0.001	< 0.005	< 0.001
Cadmium (filtered)	0.0002	mg/L	0.0010	< 0.0002	< 0.001	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	0.003	< 0.005	< 0.001
Copper (filtered)	0.001	mg/L	0.008	0.057	0.097	0.006
Lead (filtered)	0.001	mg/L	< 0.001	0.015	< 0.025	< 0.001
Manganese (filtered)	0.005	mg/L	1.6	0.044	0.095	0.008
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.44	0.020	0.047	0.004
Zinc (filtered)	0.001	mg/L	0.39	0.040	0.074	0.009
Alkali Metals						
Calcium	0.5	mg/L	2.9	2.8	6.7	< 0.5
Magnesium	0.5	mg/L	74	130	200	2.1
Potassium	0.5	mg/L	18	9.5	6.2	2.4
Sodium	0.5	mg/L	590	1600	2100	100

Client Sample ID			SE9	NG2
Sample Matrix			Water	Water
Eurofins | mgt Sample No.			M14-Jn14090	M14-Jn14091
Date Sampled			Jun 17, 2014	Jun 17, 2014
Test/Reference	LOR	Unit		
Chloride	1	mg/L	58	110
Conductivity (at 25°C)	10	uS/cm	730	710
pH	0.1	units	5.3	6.0
Sulphate (as S)	5	mg/L	66	9.9
Total Dissolved Solids	10	mg/L	450	360
Total Nitrogen Set (as N)				
Nitrate & Nitrite (as N)	0.05	mg/L	7.9	7.1
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	3.5	3.2
Total Nitrogen (as N)	0.2	mg/L	11	10
Heavy Metals				
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	0.004	0.003
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001
Manganese (filtered)	0.005	mg/L	< 0.005	< 0.005

Client Sample ID			SE9	NG2
Sample Matrix			**Water**	**Water**
Eurofins | mgt Sample No.			**M14-Jn14090**	**M14-Jn14091**
Date Sampled			**Jun 17, 2014**	**Jun 17, 2014**
Test/Reference	LOR	Unit		
Heavy Metals				
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.001	0.002
Zinc (filtered)	0.001	mg/L	0.013	0.006
Alkali Metals				
Calcium	0.5	mg/L	< 0.5	< 0.5
Magnesium	0.5	mg/L	2.1	2.1
Potassium	0.5	mg/L	1.7	2.3
Sodium	0.5	mg/L	120	110

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chloride	Melbourne	Jun 18, 2014	28 Day
- Method: MGT 1100A			
Conductivity (at 25°C)	Melbourne	Jun 18, 2014	28 Day
- Method: APHA 2510 Conductivity by Direct Measurement			
pH	Melbourne	Jun 18, 2014	0 Hours
- Method: APHA 4500 pH by Direct Measurement - ** Samples analysed outside holding time. Analysis should be performed in situ. Results for reference only.			
Sulphate (as S)	Melbourne	Jun 18, 2014	28 Day
- Method: In house MGT1110A (SO4 by Discrete Analyser)			
Total Dissolved Solids	Melbourne	Jun 18, 2014	7 Day
- Method: APHA 2540C Total Dissolved Solids			
Total Nitrogen Set (as N)			
Nitrate & Nitrite (as N)	Melbourne	Jun 18, 2014	28 Day
- Method: APHA 4500-NO3/NO2 Nitrate-Nitrite Nitrogen by FIA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Jun 18, 2014	7 Day
- Method: APHA 4500 TKN			
Heavy Metals (filtered)	Melbourne	Jun 18, 2014	180 Day
- Method: USEPA 6020 Heavy Metals			
Mobil Metals : Metals M15	Melbourne	Jun 18, 2014	28 Day
- Method: USEPA 6010/6020 Heavy Metals & USEPA 7470/71 Mercury			
Alkali Metals	Melbourne	Jun 18, 2014	180 Day
- Method: USEPA 6010 Alkali Metals			

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NATA # 1261 Site # 20794

Company Name: Stass Environmental
Address: PO BOX 11
KALAMUNDA
WA 6926

Client Job No.: OPALVALE CHITTY OV06

Order No.:
Report #: 422159
Phone: (08)6363 5276
Fax: (08)9454 7615

Received: Jun 18, 2014 8:38 AM
Due: Jun 25, 2014
Priority: 5 Day
Contact Name: Andre Stasikowski

Eurofins | mgt Client Manager: Natalie Krasselt

Sample Detail					Arsenic (filtered)	Cadmium (filtered)	Calcium	Chloride	Chromium (filtered)	Conductivity (at 25°C)	Copper (filtered)	Lead (filtered)	Magnesium	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)	pH	Potassium	Sodium	Sulphate (as S)	Total Dissolved Solids	Zinc (filtered)	Total Nitrogen Set (as N)
Laboratory where analysis is conducted																							
Melbourne Laboratory - NATA Site # 1254 & 14271					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																							
Brisbane Laboratory - NATA Site # 20794																							
External Laboratory																							
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**																			
SE1	Jun 17, 2014		Water	M14-Jn14082	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE2	Jun 17, 2014		Water	M14-Jn14083	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE3	Jun 17, 2014		Water	M14-Jn14084	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE4	Jun 17, 2014		Water	M14-Jn14085	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE5	Jun 17, 2014		Water	M14-Jn14086	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE6	Jun 17, 2014		Water	M14-Jn14087	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE7	Jun 17, 2014		Water	M14-Jn14088	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE8	Jun 17, 2014		Water	M14-Jn14089	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE9	Jun 17, 2014		Water	M14-Jn14090	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
NG2	Jun 17, 2014		Water	M14-Jn14091	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Eurofins | mgt Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual PQLs are matrix dependant. Quoted PQLs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Acknowledgment.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

UNITS

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Units

TERMS

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
ASLP	Australian Standard Leaching Procedure (AS4439.3)
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - ACCEPTANCE CRITERIA

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries : Recoveries must lie between 50-150% - Phenols 20-130%.

QC DATA GENERAL COMMENTS

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxophene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxophene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Arochlor 1260 in Matrix Spikes and LCS's.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPD's are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/L	< 1			1	Pass	
Sulphate (as S)	mg/L	< 5			5	Pass	
Total Dissolved Solids	mg/L	< 10			10	Pass	
Method Blank							
Total Nitrogen Set (as N)							
Nitrate & Nitrite (as N)	mg/L	< 0.05			0.05	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Method Blank							
Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Manganese (filtered)	mg/L	< 0.005			0.005	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.001			0.001	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
LCS - % Recovery							
Chloride	%	103			70-130	Pass	
Sulphate (as S)	%	108			70-130	Pass	
LCS - % Recovery							
Total Nitrogen Set (as N)							
Nitrate & Nitrite (as N)	%	110			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	86			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic (filtered)	%	97			80-120	Pass	
Cadmium (filtered)	%	97			80-120	Pass	
Chromium (filtered)	%	90			80-120	Pass	
Copper (filtered)	%	94			80-120	Pass	
Lead (filtered)	%	100			80-120	Pass	
Manganese (filtered)	%	90			80-120	Pass	
Mercury (filtered)	%	102			70-130	Pass	
Nickel (filtered)	%	93			80-120	Pass	
Zinc (filtered)	%	95			80-120	Pass	
LCS - % Recovery							
Alkali Metals							
Calcium	%	99			70-130	Pass	
Magnesium	%	103			70-130	Pass	
Potassium	%	99			70-130	Pass	
Sodium	%	101			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Nitrogen Set (as N)				Result 1					
Nitrate & Nitrite (as N)	M14-Jn13515	NCP	%	111			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	M14-Jn14082	CP	%	70			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Mercury (filtered)	M14-Jn14082	CP	%	93			70-130	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	M14-Jn14759	NCP	%	101			70-130	Pass	
Magnesium	M14-Jn14759	NCP	%	99			70-130	Pass	
Potassium	M14-Jn14759	NCP	%	93			70-130	Pass	
Spike - % Recovery									
				Result 1					
Chloride	M14-Jn14086	CP	%	116			70-130	Pass	
Sulphate (as S)	M14-Jn14086	CP	%	111			70-130	Pass	
Spike - % Recovery									
				Result 1					
Chloride	M14-Jn14088	CP	%	111			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	M14-Jn14091	CP	%	92			70-130	Pass	
Cadmium (filtered)	M14-Jn14091	CP	%	92			70-130	Pass	
Chromium (filtered)	M14-Jn14091	CP	%	84			70-130	Pass	
Copper (filtered)	M14-Jn14091	CP	%	88			70-130	Pass	
Lead (filtered)	M14-Jn14091	CP	%	96			70-130	Pass	
Manganese (filtered)	M14-Jn14091	CP	%	86			70-130	Pass	
Nickel (filtered)	M14-Jn14091	CP	%	85			70-130	Pass	
Zinc (filtered)	M14-Jn14091	CP	%	90			70-130	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Sodium	M14-Jn14091	CP	%	100			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Nitrogen Set (as N)				Result 1	Result 2	RPD			
Nitrate & Nitrite (as N)	M14-Jn13525	NCP	mg/L	7.9	8.0	1.0	30%	Pass	
Total Kjeldahl Nitrogen (as N)	M14-Jn14082	CP	mg/L	< 0.2	< 0.2	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Mercury (filtered)	M14-Jn14082	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Chloride	M14-Jn14086	CP	mg/L	1100	1100	<1	30%	Pass	
Sulphate (as S)	M14-Jn14086	CP	mg/L	52	52	1.1	30%	Pass	
Total Dissolved Solids	M14-Jn14086	CP	mg/L	1800	1900	2.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Chloride	M14-Jn14091	CP	mg/L	110	110	<1	30%	Pass	
Sulphate (as S)	M14-Jn14091	CP	mg/L	9.9	9.8	<1	30%	Pass	

Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	M14-Jn14091	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium (filtered)	M14-Jn14091	CP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	M14-Jn14091	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	M14-Jn14091	CP	mg/L	0.003	0.003	<1	30%	Pass	
Lead (filtered)	M14-Jn14091	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Manganese (filtered)	M14-Jn14091	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Nickel (filtered)	M14-Jn14091	CP	mg/L	0.002	0.002	2.8	30%	Pass	
Zinc (filtered)	M14-Jn14091	CP	mg/L	0.006	0.006	2.9	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	M14-Jn14091	CP	mg/L	< 0.5	< 0.5	<1	30%	Pass	
Magnesium	M14-Jn14091	CP	mg/L	2.1	2.1	<1	30%	Pass	
Potassium	M14-Jn14091	CP	mg/L	2.3	2.4	2.0	30%	Pass	
Sodium	M14-Jn14091	CP	mg/L	110	110	2.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	No
Organic samples had Teflon liners	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised By

Natalie Krasselt	Client Services
Emily Rosenberg	Senior Analyst-Metal (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)

Glenn Jackson
Laboratory Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Uncertainty data is available on request

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Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Stass Environmental
PO BOX 11
KALAMUNDA
WA 6926

Attention: **Andre Stasikowski**

Report **432062-W**
Client Reference OPALVALE CHITTY OV06
Received Date Sep 15, 2014

Client Sample ID **Sample Matrix** **Eurofins | mgt Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**SE1** **Water** **M14-Se11684** **Sep 12, 2014**	**SE2** **Water** **M14-Se11685** **Sep 12, 2014**	**SE3** **Water** **M14-Se11686** **Sep 12, 2014**	**SE4** **Water** **M14-Se11687** **Sep 12, 2014**
Chloride	1	mg/L	1000	4800	2900	100
Conductivity (at 25°C)	10	uS/cm	3700	14000	9400	440
pH	0.1	pH Units	3.5	3.8	3.4	6.1
Sulphate (as S)	5	mg/L	41	240	190	5.6
Total Dissolved Solids	10	mg/L	1900	9000	5100	260
Total Nitrogen Set (as N)						
Nitrate & Nitrite (as N)	0.05	mg/L	< 0.05	< 0.05	< 0.05	7.7
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	< 0.2	0.3	< 0.2	0.3
Total Nitrogen (as N)	0.2	mg/L	< 0.2	0.3	< 0.2	8.0
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	0.001	0.002	0.004	< 0.001
Cadmium (filtered)	0.0002	mg/L	0.0003	0.0019	0.027	< 0.0002
Chromium (filtered)	0.001	mg/L	0.001	0.004	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	0.46	1.8	0.010	0.013
Lead (filtered)	0.001	mg/L	0.096	0.66	0.10	< 0.001
Manganese (filtered)	0.005	mg/L	0.093	1.2	1.8	0.017
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.098	1.2	3.8	0.014
Zinc (filtered)	0.001	mg/L	0.10	0.91	3.2	0.024
Alkali Metals						
Calcium	0.5	mg/L	1.1	25	3.7	0.9
Magnesium	0.5	mg/L	40	420	300	9.9
Potassium	0.5	mg/L	2.8	53	66	1.5
Sodium	0.5	mg/L	550	2100	1200	70

Client Sample ID			SE5	SE6	SE7	SE8
Sample Matrix			Water	Water	Water	Water
Eurofins | mgt Sample No.			M14-Se11688	M14-Se11689	M14-Se11690	M14-Se11691
Date Sampled			Sep 12, 2014	Sep 12, 2014	Sep 12, 2014	Sep 12, 2014
Test/Reference	LOR	Unit				
Chloride	1	mg/L	910	2800	3900	48
Conductivity (at 25°C)	10	uS/cm	3300	8700	12000	400
pH	0.1	pH Units	5.9	4.3	3.7	7.1
Sulphate (as S)	5	mg/L	44	110	60	12
Total Dissolved Solids	10	mg/L	1800	4500	6800	270
Total Nitrogen Set (as N)						
Nitrate & Nitrite (as N)	0.05	mg/L	< 0.05	0.13	0.98	5.7
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	< 0.2	< 0.2	< 0.2	< 0.2
Total Nitrogen (as N)	0.2	mg/L	< 0.2	< 0.2	1.0	5.7
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	< 0.001	0.001	0.002	< 0.001
Cadmium (filtered)	0.0002	mg/L	0.0004	< 0.0002	< 0.0002	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	0.005	0.002	< 0.001
Copper (filtered)	0.001	mg/L	0.003	0.085	0.093	0.002
Lead (filtered)	0.001	mg/L	< 0.001	0.014	0.003	< 0.001
Manganese (filtered)	0.005	mg/L	1.6	0.055	0.10	< 0.005
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.49	0.029	0.046	< 0.001
Zinc (filtered)	0.001	mg/L	0.38	0.052	0.058	0.004
Alkali Metals						
Calcium	0.5	mg/L	1.7	2.2	5.5	< 0.5
Magnesium	0.5	mg/L	70	100	100	1.3
Potassium	0.5	mg/L	17	11	7.2	2.3
Sodium	0.5	mg/L	470	1500	1800	81

Client Sample ID			SE9	NG2
Sample Matrix			Water	Water
Eurofins | mgt Sample No.			M14-Se11692	M14-Se11693
Date Sampled			Sep 12, 2014	Sep 12, 2014
Test/Reference	LOR	Unit		
Chloride	1	mg/L	59	58
Conductivity (at 25°C)	10	uS/cm	700	700
pH	0.1	pH Units	7.4	5.9
Sulphate (as S)	5	mg/L	66	67
Total Dissolved Solids	10	mg/L	490	480
Total Nitrogen Set (as N)				
Nitrate & Nitrite (as N)	0.05	mg/L	7.5	8.0
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	0.2	< 0.2
Total Nitrogen (as N)	0.2	mg/L	7.7	8.0
Heavy Metals				
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	0.007	0.007
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001
Manganese (filtered)	0.005	mg/L	< 0.005	< 0.005

Client Sample ID			SE9	NG2
Sample Matrix			**Water**	**Water**
Eurofins | mgt Sample No.			**M14-Se11692**	**M14-Se11693**
Date Sampled			**Sep 12, 2014**	**Sep 12, 2014**
Test/Reference	LOR	Unit		
Heavy Metals				
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.003	0.003
Zinc (filtered)	0.001	mg/L	0.038	0.039
Alkali Metals				
Calcium	0.5	mg/L	< 0.5	< 0.5
Magnesium	0.5	mg/L	1.8	1.9
Potassium	0.5	mg/L	1.9	1.8
Sodium	0.5	mg/L	130	130

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chloride	Melbourne	Sep 16, 2014	28 Day
- Method: MGT 1100A			
Conductivity (at 25°C)	Melbourne	Sep 16, 2014	28 Day
- Method: APHA 2510 Conductivity by Direct Measurement			
pH	Melbourne	Sep 16, 2014	0 Hours
- Method: APHA 4500 pH by Direct Measurement - ** Samples analysed outside holding time. Analysis should be performed in situ. Results for reference only.			
Sulphate (as S)	Melbourne	Sep 16, 2014	28 Day
- Method: In house MGT1110A (SO4 by Discrete Analyser)			
Total Dissolved Solids	Melbourne	Sep 19, 2014	7 Day
- Method: APHA 2540C Total Dissolved Solids			
Total Nitrogen Set (as N)			
Nitrate & Nitrite (as N)	Melbourne	Sep 16, 2014	28 Day
- Method: APHA 4500-NO3/NO2 Nitrate-Nitrite Nitrogen by FIA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Sep 16, 2014	7 Day
- Method: APHA 4500 TKN			
Heavy Metals (filtered)	Melbourne	Sep 15, 2014	180 Day
- Method: USEPA 6020 Heavy Metals			
Mobil Metals : Metals M15	Melbourne	Sep 15, 2014	28 Day
- Method: USEPA 6010/6020 Heavy Metals & USEPA 7470/71 Mercury			
Alkali Metals	Melbourne	Sep 15, 2014	180 Day
- Method: USEPA 6010 Alkali Metals			

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NATA # 1261 Site # 20794

Company Name: Stass Environmental
Address: PO BOX 11
KALAMUNDA
WA 6926

Client Job No.: OPALVALE CHITTY OV06

Order No.:
Report #: 432062
Phone: (08)6363 5276
Fax: (08)9454 7615

Received: Sep 15, 2014 8:32 AM
Due: Sep 22, 2014
Priority: 5 Day
Contact Name: Andre Stasikowski

Eurofins | mgt Client Manager: Natalie Krasselt

Sample Detail					Arsenic (filtered)	Cadmium (filtered)	Chloride	Chromium (filtered)	Conductivity (at 25°C)	Copper (filtered)	Lead (filtered)	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)	pH	Sulphate (as S)	Total Dissolved Solids	Zinc (filtered)	Alkali Metals	Total Nitrogen Set (as N)
Laboratory where analysis is conducted																				
Melbourne Laboratory - NATA Site # 1254 & 14271					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																				
Brisbane Laboratory - NATA Site # 20794																				
External Laboratory																				
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**																
SE1	Sep 12, 2014		Water	M14-Se11684	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE2	Sep 12, 2014		Water	M14-Se11685	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE3	Sep 12, 2014		Water	M14-Se11686	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE4	Sep 12, 2014		Water	M14-Se11687	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE5	Sep 12, 2014		Water	M14-Se11688	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE6	Sep 12, 2014		Water	M14-Se11689	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE7	Sep 12, 2014		Water	M14-Se11690	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE8	Sep 12, 2014		Water	M14-Se11691	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE9	Sep 12, 2014		Water	M14-Se11692	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
NG2	Sep 12, 2014		Water	M14-Se11693	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Eurofins | mgt Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

UNITS

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

TERMS

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
ASLP	Australian Standard Leaching Procedure (AS4439.3)
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - ACCEPTANCE CRITERIA

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries : Recoveries must lie between 50-150% - Phenols 20-130%.

QC DATA GENERAL COMMENTS

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxophene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxophene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Arochlor 1260 in Matrix Spikes and LCS's.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPD's are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/L	< 1			1	Pass	
Sulphate (as S)	mg/L	< 5			5	Pass	
Total Dissolved Solids	mg/L	< 10			10	Pass	
Method Blank							
Total Nitrogen Set (as N)							
Nitrate & Nitrite (as N)	mg/L	< 0.05			0.05	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Method Blank							
Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Manganese (filtered)	mg/L	< 0.005			0.005	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.001			0.001	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
LCS - % Recovery							
Chloride	%	108			70-130	Pass	
Sulphate (as S)	%	106			70-130	Pass	
LCS - % Recovery							
Total Nitrogen Set (as N)							
Nitrate & Nitrite (as N)	%	95			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	80			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic (filtered)	%	111			80-120	Pass	
Cadmium (filtered)	%	102			80-120	Pass	
Chromium (filtered)	%	105			80-120	Pass	
Copper (filtered)	%	109			80-120	Pass	
Lead (filtered)	%	104			80-120	Pass	
Manganese (filtered)	%	111			80-120	Pass	
Mercury (filtered)	%	103			70-130	Pass	
Nickel (filtered)	%	108			80-120	Pass	
Zinc (filtered)	%	110			80-120	Pass	
LCS - % Recovery							
Alkali Metals							
Calcium	%	95			70-130	Pass	
Magnesium	%	104			70-130	Pass	
Potassium	%	95			70-130	Pass	
Sodium	%	99			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Chloride	M14-Se12214	NCP	%	118			70-130	Pass	
Spike - % Recovery									
Total Nitrogen Set (as N)				Result 1					
Total Kjeldahl Nitrogen (as N)	M14-Se11684	CP	%	71			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	M14-Se11684	CP	%	95			70-130	Pass	
Cadmium (filtered)	M14-Se11684	CP	%	88			70-130	Pass	
Chromium (filtered)	M14-Se11684	CP	%	92			70-130	Pass	
Copper (filtered)	M14-Se12246	NCP	%	99			70-130	Pass	
Lead (filtered)	M14-Se11684	CP	%	86			70-130	Pass	
Manganese (filtered)	M14-Se11684	CP	%	83			70-130	Pass	
Mercury (filtered)	M14-Se12246	NCP	%	97			70-130	Pass	
Nickel (filtered)	M14-Se11684	CP	%	81			70-130	Pass	
Zinc (filtered)	M14-Se11684	CP	%	80			70-130	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	M14-Se14251	NCP	%	95			70-130	Pass	
Magnesium	M14-Se14251	NCP	%	90			70-130	Pass	
Potassium	M14-Se14251	NCP	%	91			70-130	Pass	
Spike - % Recovery									
				Result 1					
Sulphate (as S)	M14-Se11689	CP	%	109			70-130	Pass	
Spike - % Recovery									
Total Nitrogen Set (as N)				Result 1					
Nitrate & Nitrite (as N)	M14-Se11690	CP	%	92			70-130	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Sodium	M14-Se11693	CP	%	99			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
pH	M14-Se11684	CP	pH Units	3.5	3.5	pass	30%	Pass	
Duplicate									
Total Nitrogen Set (as N)				Result 1	Result 2	RPD			
Total Kjeldahl Nitrogen (as N)	M14-Se11684	CP	mg/L	< 0.2	< 0.2	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	M14-Se11684	CP	mg/L	0.001	0.001	4.0	30%	Pass	
Cadmium (filtered)	M14-Se11684	CP	mg/L	0.0003	0.0003	7.0	30%	Pass	
Chromium (filtered)	M14-Se11684	CP	mg/L	0.001	0.001	13	30%	Pass	
Copper (filtered)	M14-Se11684	CP	mg/L	0.46	0.46	<1	30%	Pass	
Lead (filtered)	M14-Se11684	CP	mg/L	0.096	0.094	2.0	30%	Pass	
Manganese (filtered)	M14-Se11684	CP	mg/L	0.093	0.093	1.0	30%	Pass	
Mercury (filtered)	M14-Se11684	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	M14-Se11684	CP	mg/L	0.098	0.097	1.0	30%	Pass	
Zinc (filtered)	M14-Se11684	CP	mg/L	0.10	0.11	2.0	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	M14-Se13657	NCP	mg/L	9.6	9.6	<1	30%	Pass	
Magnesium	M14-Se13657	NCP	mg/L	18	18	<1	30%	Pass	
Potassium	M14-Se13657	NCP	mg/L	3.4	3.6	5.0	30%	Pass	

Duplicate									
				Result 1	Result 2	RPD			
Total Dissolved Solids	M14-Se11686	CP	mg/L	5100	5200	3.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Chloride	M14-Se11689	CP	mg/L	2800	2800	<1	30%	Pass	
Sulphate (as S)	M14-Se11689	CP	mg/L	110	110	1.2	30%	Pass	
Duplicate									
Total Nitrogen Set (as N)				Result 1	Result 2	RPD			
Nitrate & Nitrite (as N)	M14-Se11690	CP	mg/L	0.98	0.94	4.0	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Sodium	M14-Se11693	CP	mg/L	130	130	3.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised By

Natalie Krasselt	Client Services
Emily Rosenberg	Senior Analyst-Metal (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)

Glenn Jackson
Laboratory Manager

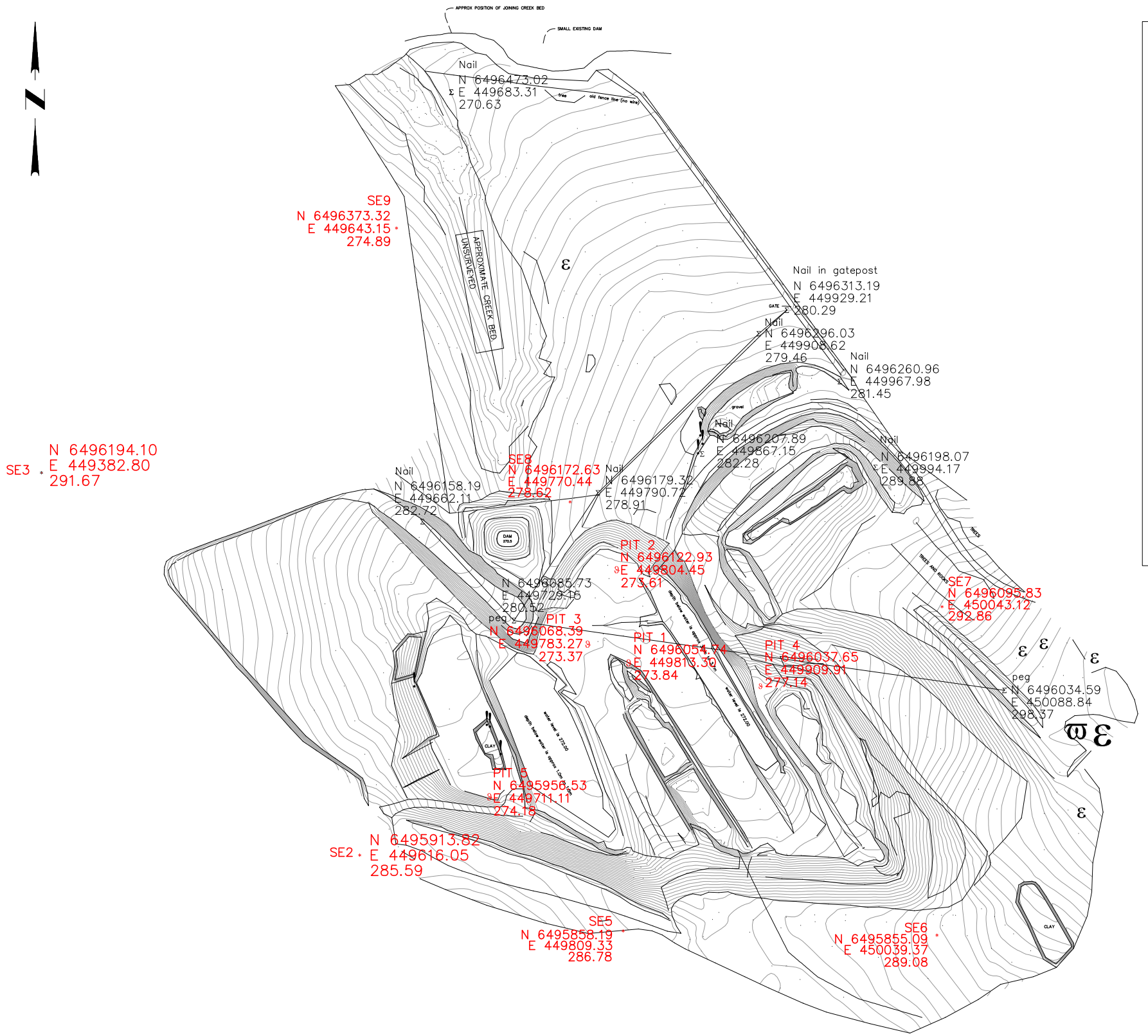
Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Uncertainty data is available on request

APPENDIX E
Survey Reports



Point listing

Name	Northing	Easting	Elevation	Feature Code
BDYLINE	6495125.655	449129.576	239.027	31100
CHE3	6493023.160	442693.206	392.405	21600
CHE3A	6493023.162	442693.204	392.407	21600
CHED3-RM1	6493025.682	442693.369	392.210	SPIKE
CHED3-RM2	6493023.165	442697.427	392.195	SPIKE
CHED3-RM3	6493023.055	442694.861	392.300	SPIKE
CHED3-RM4	6493020.563	442692.605	392.295	SPIKE
CHED4-RM2	6494323.025	442704.460	351.055	SPIKE
CHED4-RM3	6494325.512	442699.512	351.211	SPIKE
CHED5-RM1	6494329.090	441861.422	368.543	SPIKE
CHED5-RM2	6494325.575	441864.652	368.351	SPIKE
CHED5-RM3	6494325.725	441859.642	368.382	SPIKE
CHED5-RM4	6494329.075	441856.955	368.499	SPIKE
CHEDARING3	6493023.164	442693.196	392.405	SSM
CHEDARING4	6494325.512	442704.038	351.253	SSM
CHEDARING5	6494328.382	441859.746	368.702	SSM
LOTCNR	6495874.648	450563.388	302.755	22100
PTH258	6501265.383	443544.416	218.200	SSM
PTH259	6502939.125	449201.633	258.660	SSM
PTH323	6489857.650	448065.521	327.677	SSM
PTH323-RM1	6489860.842	448065.491	327.604	SPIKE
PTH323-RM2	6489859.203	448069.316	327.640	SPIKE
PTH323-RM3	6489855.165	448062.472	327.518	SPIKE
SE1	6495635.667	449807.222	274.404	37600
SE2	6495913.669	449616.098	285.584	37600
SE3	6496193.886	449382.966	291.643	37600
SE4	6495785.759	450377.899	299.858	37600
SIP	6495761.495	450336.553	296.610	21500
SIP1	6495761.495	450336.555	296.624	21500

Notes:

plane survey based on MGA Coordinates of Bore SE1

rev 2 : Pit walls have changed

Water levels shown refer to first survey

SHIRE OF TOODYAY

PROJECT: LOT 11 CHITTY ROAD, TOODYAY	CLIENT: OPAL VALE
	SUPERINTENDENT: IW Projects
TITLE : UPDATED TOPOGRAPHIC SITE SURVEY	
	Height Datum: AHD
	Horizontal Datum: GDA94 MGA ZONE 50 (see note above)
Australasia Pacific Survey Consultants 27 Violet Grove, Shenton Park.6008 phone 0418905021	SCALE: DRAWN : C.J.S DATE : 8/4/2013
	DWG No opalvale lot 11-001 REV 2

APPENDIX F

Field water quality and level data

pH

Bore ID	SE1	SE2	SE3	SE4	SE 5	SE 6	SE 7	SE 8	SE 9
Northings	6495635.667	6495913.7	6496193.886	6495786	6495858	6495855.090	6496096	6496173	6496373
Eastings	449807.222	449616.1	449382.966	450377.9	449809.3	450039.370	450043.1	449770.4	449643.2
1/07/2011									
18/01/2012	3.590	4.03	3.910	6.23					
18/07/2012	4.620	6.4	4.360	8.89					
13/01/2013	3.740	4.4	4.720	6.15					
23/03/2013	4.050	5.630	3.870	6.140	5.860	5.170	4.300	6.760	6.370
24/07/2013	3.190	4.650	36.980	5.360	4.730	4.510	3.620	6.15	4.93
24/10/2013	3.750	4.300	4.220	4.710	4.780	4.450	3.620	6.020	5.130
13/11/2013	3.800	4.270	3.540	5.410	4.640	4.660	3.520	5.550	6.150
4/12/2013	3.340	4.240	3.890	5.070	4.520	3.980	3.410	5.650	4.860
14/03/2014	3.630	4.000	3.350	5.680	5.000	4.220	3.660	6.530	5.350
17/06/2014	3.520	3.330	3.450	5.080	4.620	4.240	3.530	5.670	4.620
12/09/2014	3.520	3.700	3.550	5.260	4.710	4.270	3.650	5.790	4.420
Average	3.705	4.450	6.895	5.816	4.858	4.438	3.664	6.015	5.229

EC

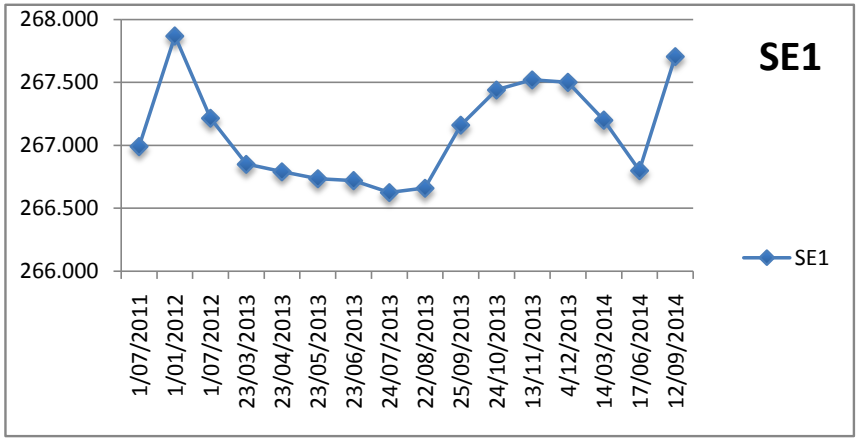
Bore ID	SE1	SE2	SE3	SE4	SE 5	SE 6	SE 7	SE 8	SE 9
Northings	6495635.667	6495913.7	6496193.886	6495786	6495858	6495855.090	6496096	6496173	6496373
Eastings	449807.222	449616.1	449382.966	450377.9	449809.3	450039.370	450043.1	449770.4	449643.2
18/01/2012	4300	6070	7690	327					
18/07/2012	3920	5200	7880	473					
9/01/2013	3750	5670	7750	540					
23/03/2013	3620	5600	8500	532	5090	5870	6480	1358	597
24/07/2013	3770	5440	12490	507	5260	5640	11230	570	952
24/10/2013	3650	5860	5570	479	4130	5570	11600	529	2310
13/11/2013	3620	5790	5450	504	3990	5640	10960	527	841
4/12/2013	3600	6080	12260	452	4270	6950	10950	523	852
14/03/2014	3710	10200	8770	453	3830	7900	11350	635	3320
17/06/2014	3640	12880	9650	644	3680	8610	11180	979	700
12/09/2014	3600	14110	9030	455	3250	8510	11270	415	698
Average	3744	7536	8640	488	4188	6836	10628	692	1284

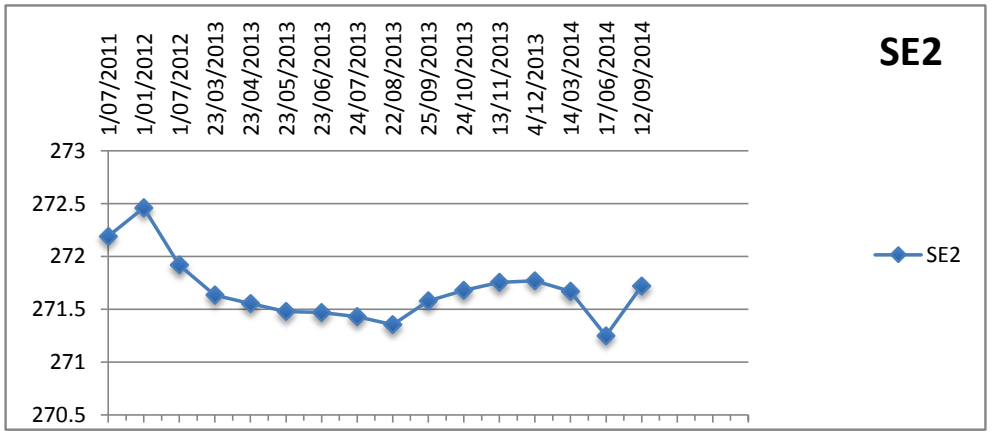
TDS

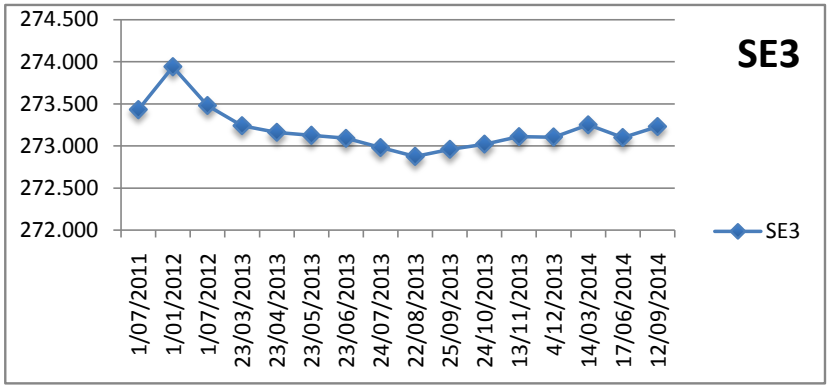
Bore ID	SE1	SE2	SE3	SE4	SE 5	SE 6	SE 7	SE 8	SE 9
Northings	6495635.667	6495913.7	6496193.886	6495786	6495858	6495855.090	6496096	6496173	6496373
Eastings	449807.222	449616.1	449382.966	450377.9	449809.3	450039.370	450043.1	449770.4	449643.2
18/01/2012	2976	4231	5315	327					
1/01/2012	1310	2880	4430	236					
1/07/2012	1840	2810	3800	260					
23/03/2013	1810	2800	4250	261	2470	2890	3240	675	3000
24/07/2013	1890	2720	6290	252	2620	2830	5540	285	474
24/10/2013	1830	2940	2790	239	2080	2790	5800	260	1170
13/11/2013	1810	2900	2740	251	2000	2820	5480	262	422
4/12/2013	1800	3040	6130	226	2140	3470	5500	263	426
14/03/2014	1860	5120	4300	227	3830	3950	5680	321	1660
17/06/2014	1820	6440	4830	323	1840	4310	1820	490	350
12/09/2014	1800	7060	4520	228	1630	4260	5630	208	349
Average	1886	3904	4490	257	2326	3415	4836	346	981

Opal Vale Class II Landfill - Groundwater Levels (m AHD)

Bore ID	SE1	SE2	SE3	SE4	SE 5	SE 6	SE 7	SE 8	SE 9	Pit 1	Pit 2	Pit 3	Pit 4	Pit 5
Northings	6495635.667	6495913.67	6496193.886	6495785.76	6495858.19	6495855.090	6496095.83	6496172.63	6496373.32	6496055	6496123	6496068	6496038	6495948
Eastings	449807.222	449616.098	449382.966	450377.899	449809.33	450039.370	450043.12	449770.44	449643.15	449813.3	449804.3	449783.5	449911.2	449707.9
1/07/2011	266.990	272.19	273.430	278.34										
1/01/2012	267.868	272.46	273.940	278.008										
1/07/2012	267.215	271.92	273.480	277.9										
23/03/2013	266.850	271.635	273.240	277.590	271.450	272.870	273.275	271.820	269.750					
23/04/2013	266.790	271.555	273.160	277.520	271.430	272.840	273.210	271.735	269.690					
23/05/2013	266.735	271.480	273.125	277.520	271.395	272.880	273.210	271.765	269.740	270.050	271.715	270.060	270.240	270.325
23/06/2013	266.720	271.470	273.090	277.495	271.355	272.885	273.170	271.795	269.775	270.100	271.640	270.200	270.320	270.430
24/07/2013	266.625	271.430	272.980	277.400	271.290	272.805	273.085	271.72	269.71					
22/08/2013	266.660	271.355	272.875	277.300	271.285	272.680	272.970	271.82	269.925				270.5	270.61
25/09/2013	267.160	271.580	272.960	277.320	271.520	272.730	272.970	272.410	270.460					
24/10/2013	267.440	271.680	273.020	277.350	271.660	272.760	273.040	272.620	270.685					
13/11/2013	267.520	271.755	273.110	277.440	271.750	272.765	273.070	272.840	270.715					271.920
4/12/2013	267.500	271.770	273.105	277.380	271.780	272.665	273.050	272.735	270.550					
14/03/2014	267.200	271.670	273.250	277.580	271.710	272.680	273.190	272.270	270.050	270.565	271.560	270.275	270.260	271.210
17/06/2014	266.800	271.250	273.100	277.265	271.215	272.470	273.030	271.940	269.840		271.750		269.680	
12/09/2014	267.705	271.720	273.230	277.325	271.780	272.580	272.980	272.700	270.470					



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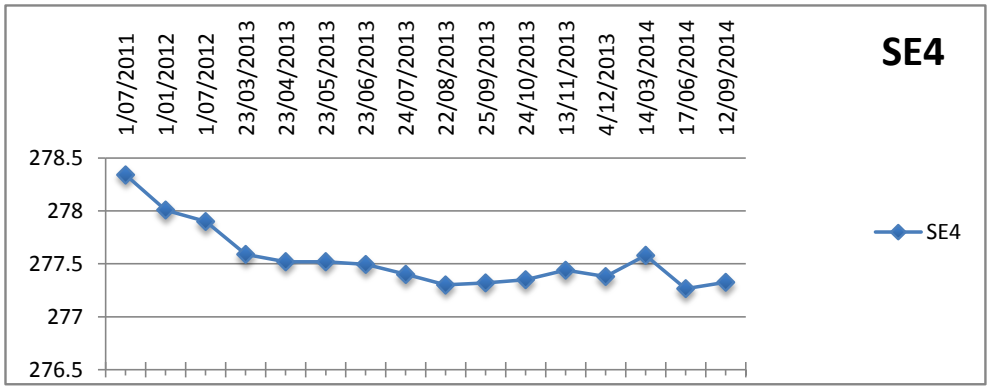
14/03/2014
17/06/2014
12/09/2014
SE3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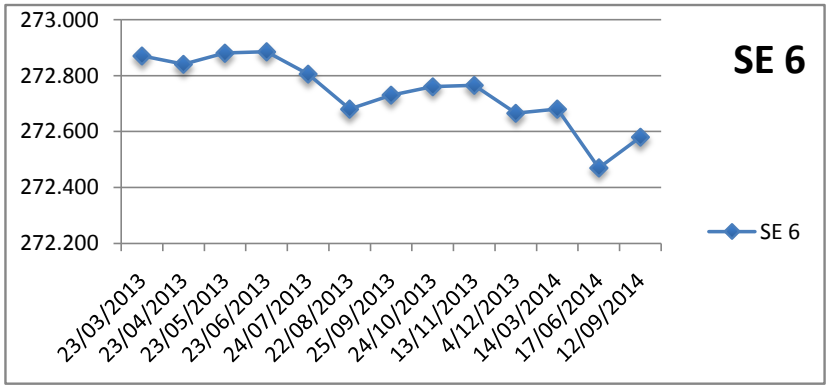
SE4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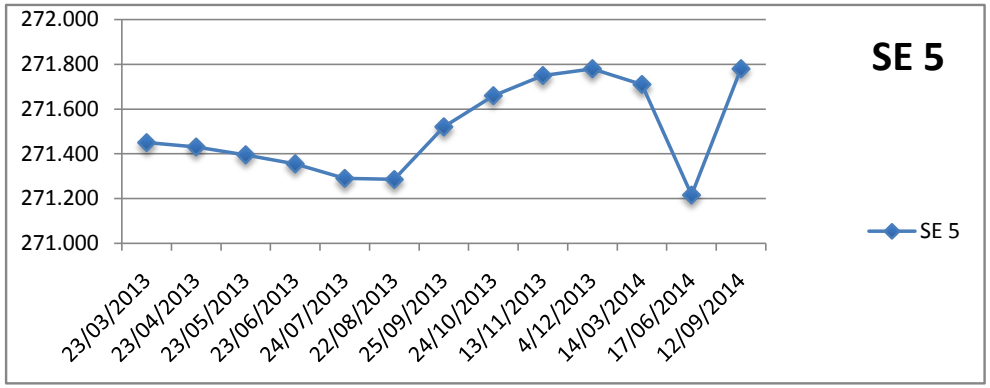
13/11/2013
4/12/2013
14/03/2014
17/06/2014
12/09/2014
SE 6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271.000
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22/08/2013
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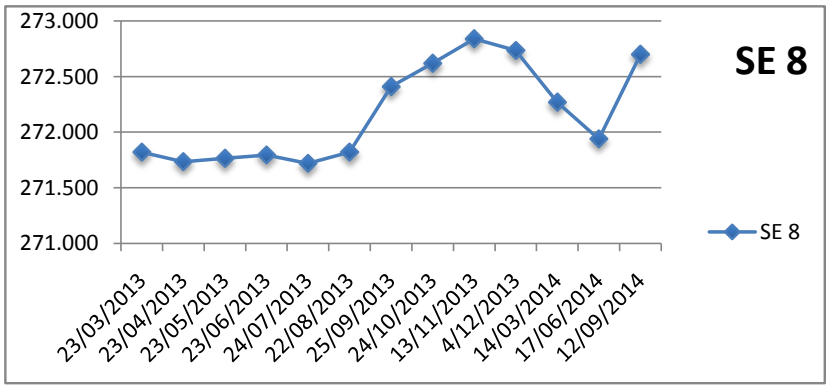
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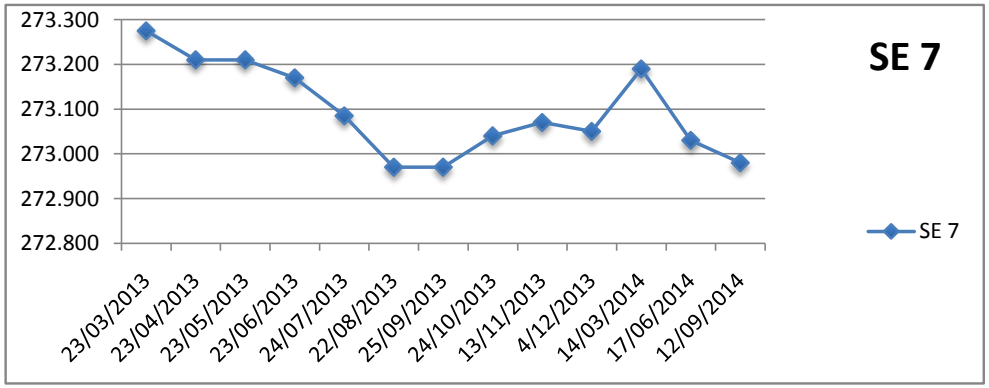
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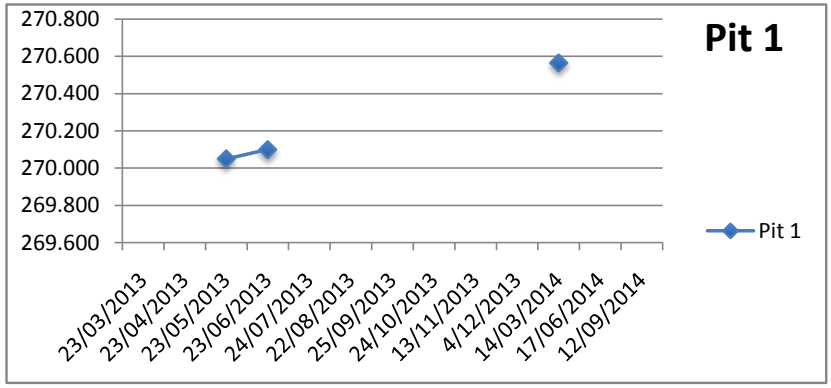
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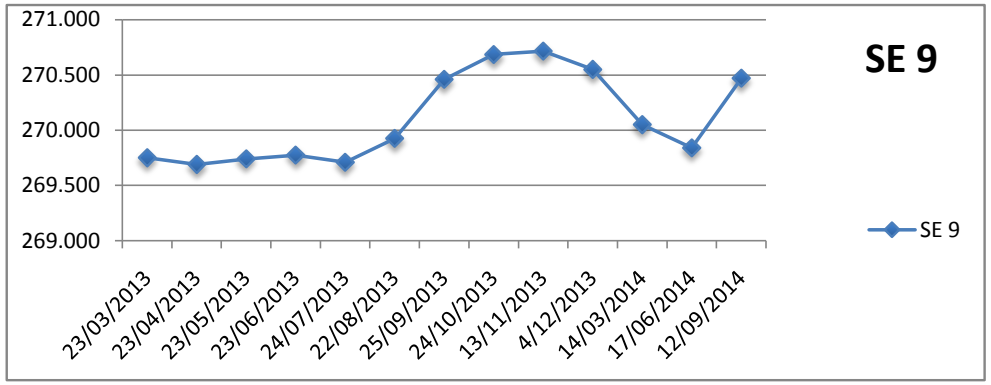
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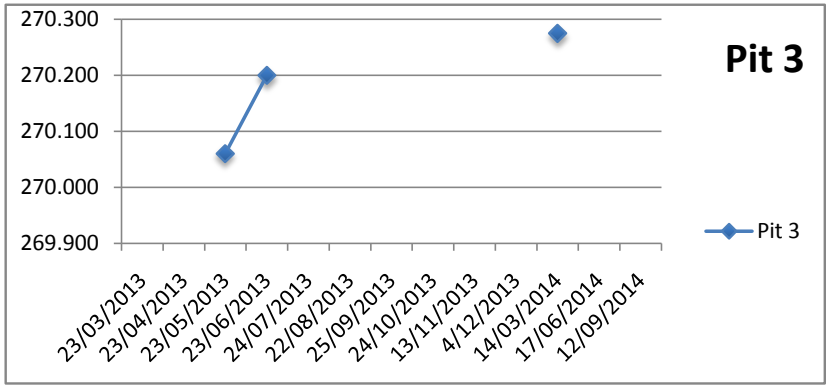
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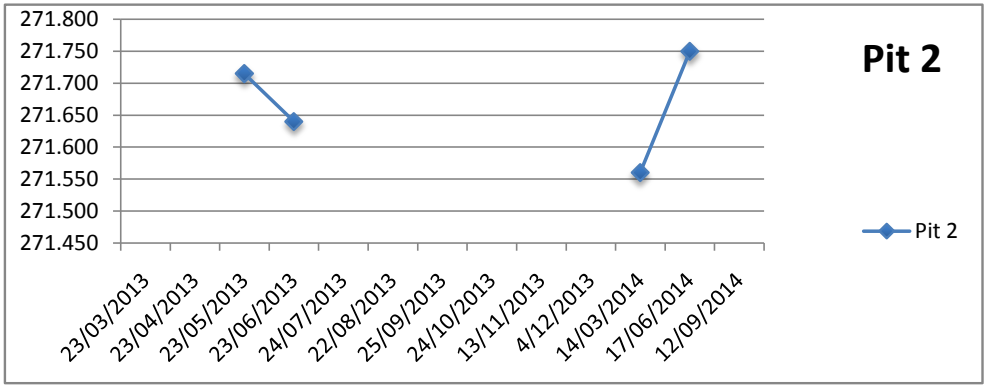
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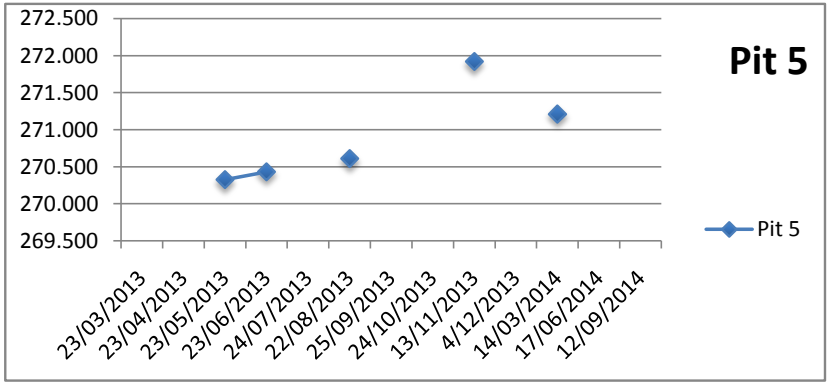
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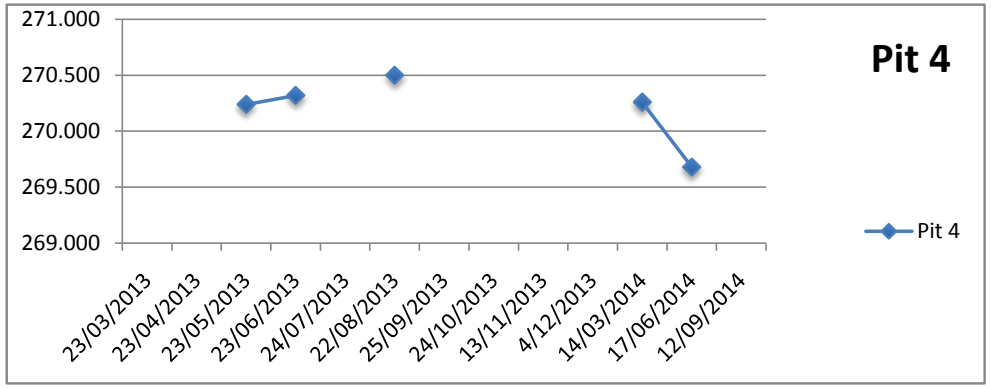
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