

Australian Abrasive Minerals Pty Ltd

Harts Range Garnet Project Annual Technical Group Report For the period 16th October, 2015 to 15th October, 2016 EL24360, EL28696 & EL30138, GR078/12



Stratigraphic drilling hole 2015/10P at Harts Range 489925E, 7461507N

TARGET COMMODITY: GARNET

Map Sheet:	Alice Springs, Alcoota, Huckitta	1:250,000
	Riddoch, Delny, Dneiper	1:100,000

PROJECT OPERATOR: *Australian Abrasive Minerals Pty Ltd*

Author: John Baxter

30th October, 2016

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October-November 2015 for Australian Abrasive Minerals

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EXECUTIVE SUMMARY/ABSTRACT

The Harts Range Spinifex Bore Project tenements EL24360, EL28696 and EL30318 are located along the valley of the Plenty River and cover approximately 335km² or 89 blocks. Exploration Licence EL24378 was surrendered during the year. A garnet resource has been identified and estimated to contain 23.1Mt of sand containing 1.2Mt of garnet in the measured category and 44.5Mt of sand containing 2.65Mt garnet in the Inferred category. The tenements also contain a bore field which can supply process water at a rate of 1,210 m³/day (14 l/s). These are the keystones for project development.

A study of the potential water resources in the Harts Range Spinifex Bore Garnet Project area has been undertaken. From previous work three sources need to be examined. Firstly the Ambalindum Sandstone which supplies water to Spinifex Bore and the current project borefield; secondly an aquifer that is likely to be from fractured rock and calcrete that has been identified by aircore drilling and at Benstead Bore; and thirdly a poorly yielding shallow aquifer in the Tertiary sedimentary basin which has been discounted as a potential sustainable aquifer.

During the 2015-2016 exploration period Australian Abrasive Minerals Pty Ltd (AAM) have:

- Undertaken a full review of the water potential in the district
- Undertaken a review of tenement with reductions enacted
- Completed a deep stratigraphic drilling programme to assess aquifers in the immediate vicinity of the resource
- Successfully commenced construction of the mine at Harts Range

This report outlines the work that has been undertaken.

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INTRODUCTION

The Harts Range Spinifex Bore Project tenements included in GR78/12 are EL24360, EL28696 & EL30138 (Table 1). They are located along the valley of the Plenty River and cover approximately 335km² or 89 blocks. To date more than \$2M has been spent on the tenements on exploration (Table 2). A garnet resource has been identified and estimated to contain 23.1Mt of sand containing 1.2Mt of garnet in the measured category and 44.5Mt of sand containing 2.65Mt garnet in the inferred category (Coxhell, 2014). The tenements also contain a bore field which can supply process water at a rate of 1,210 m³/day (14 l/s) (Rockwater,2007).

Table 1 Australian Abrasive Minerals Tenements, September, 2014

Project	Prospects	Tenements	Blocks	Rent 2015-2016	Commitment 2015-2016	Anniversary
Harts Range						
	Riddoch	EL28696	15	\$ 1,487	\$ 36,000	12 th October
	Spinifex Bore	EL24360	61	\$12,548	\$ 74,500	14 th September
	Irrerlirre	EL24378*	40	\$8,327	\$ 24,700	14 th September
	Eldorado Nth	EL30138	13	\$1,127	\$ 16,750	16 th September
	TOTAL		129	\$23,489	\$151,950	

*Surrendered in the year

Table 2 Historical Expenditure on the Spinifex Bore Garnet Project

Tenement	Previous Tenement	Previous Expenditure	2013 Expenditure	2014 Expenditure	2015 Expenditure	2016 Expenditure
EL28696	EL10150 (part)	\$1,063,817	\$60,044	\$7,124	\$18,052	\$19,139
EL24360		\$603,471	\$32,744	\$113,558	\$24,807	\$15,375
EL24378*		\$86,850	\$20,475	\$24,461	\$6,070	\$12,665
EL30138				\$6,500	\$24,245	\$16,811
	TOTAL	\$1,754,138	\$113,263	\$151,643	\$73,174	\$63,990

*Surrendered in the year

All tenements are granted and the rent on the remaining tenements is \$16,986(including GST). There is a current commitment to spend \$127,250 across the 4 granted tenements. In 2015-2016 the majority of funds spent by the company were directed toward the establishment of operations on the contained ML but included some stratigraphic drilling.

In this reporting period 16th October, 2015 to 15th October, 2016 the main focus for Australian Abrasive Minerals Pty Ltd (AAM) has been construction of a wet plant at Spinifex Bore and a dry plant at Woodforde. Exploration has focussed on extending

knowledge of the stratigraphy below the project with a view to enhancing the water prospectivity in the district.

Location

The Harts Range Spinifex Bore Garnet Project, located within the Northern Territory, is approximately 134km northeast of Alice Springs (Figure 1). The project is accessed via travelling north along the Stuart Highway for 68km then east along the Plenty Highway for a further 143km. The first 84km along the Plenty Highway is sealed after which the remainder of the access is unsealed; with loose gravels and corrugations regularly encountered. A turn off onto a pastoral track heading north from the Harts Range police station leads into the project area.

The Plenty Highway provides excellent access to the tenements. From the highway there are numerous tracks that are generally negotiable except after heavy rain. The tenements are mainly north of the Plenty Highway as shown in Figure 1.

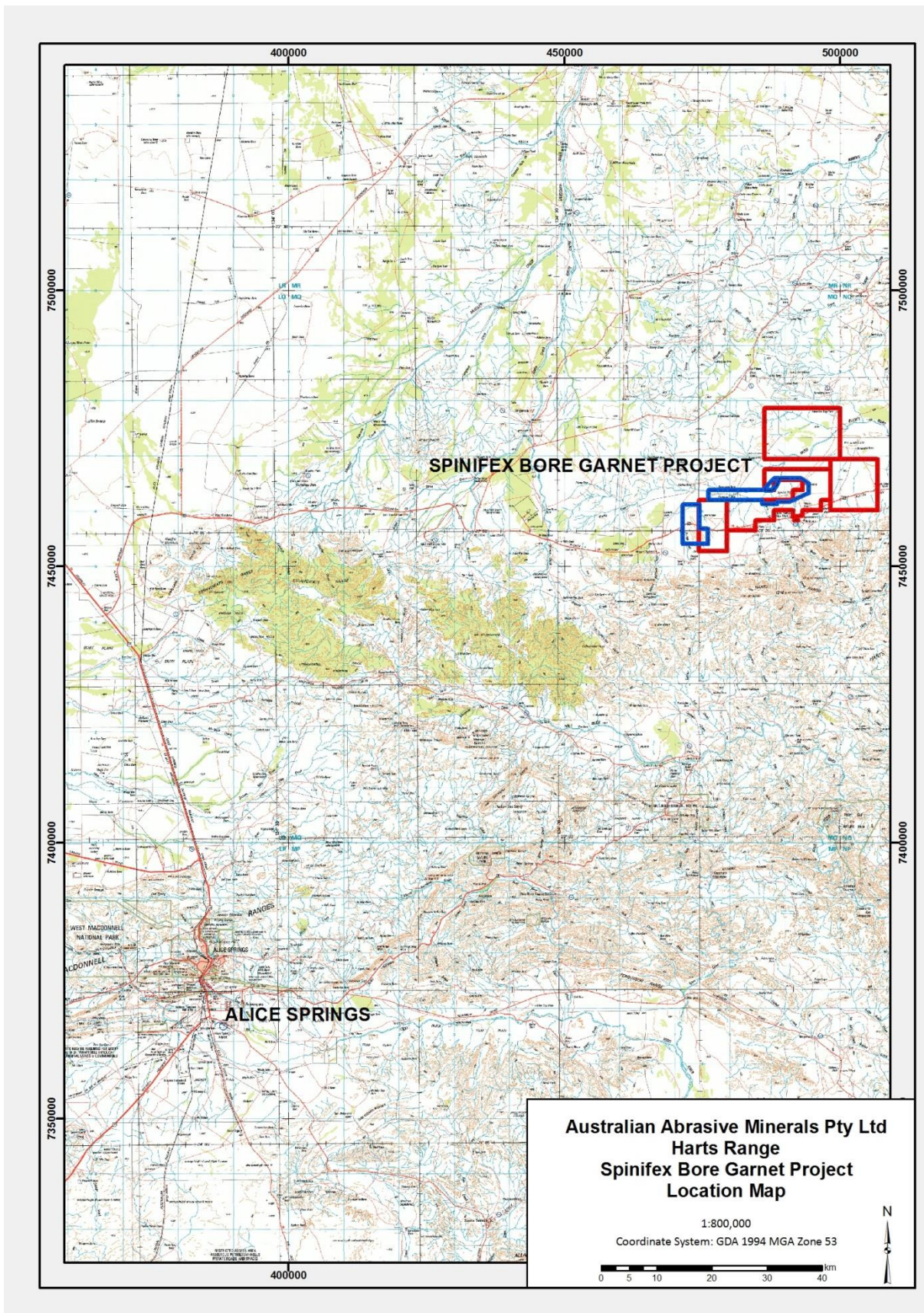


Figure 1 Location Plan for Harts Range Spinifex Bore Project 2016

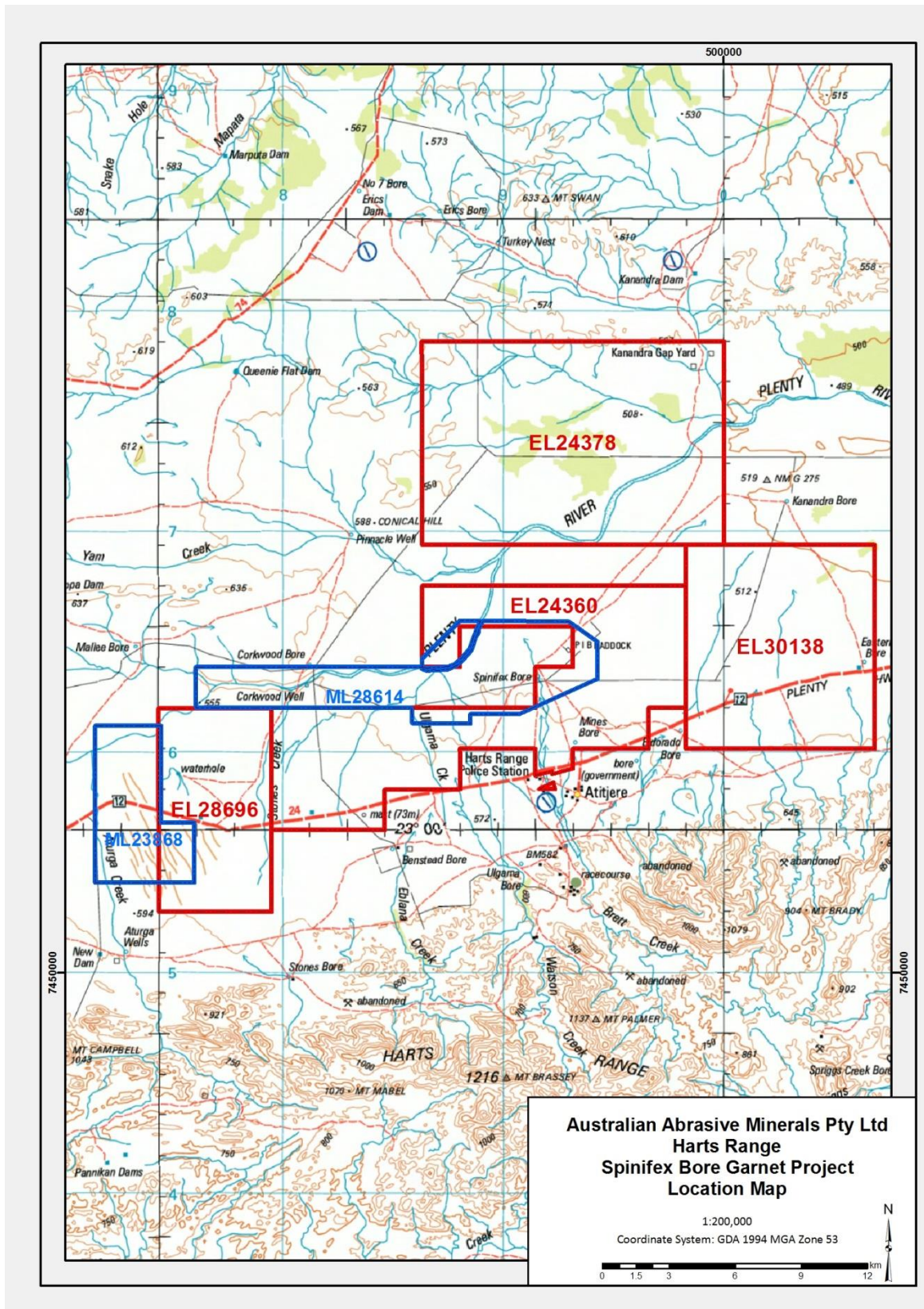


Figure 2 Locations of Australian Abrasive Minerals Pty Ltd Tenements, 2016 prior to reductions

Previous Work and Acquisition

Australian Abrasive Minerals Pty Ltd ('AAM') acquired the Harts Range Spinifex Bore Garnet Project from Matilda Zircon Ltd in 2009. Matilda (previously Olympia Resources Ltd) had previously conducted extensive work on the Aturga Project (ML23868) about 15 km to the west of the Harts Range Garnet Project identifying a deposit with 27.5Mt of sand containing 2.4Mt of garnet in Measured and Indicated categories. Matilda had also conducted reconnaissance drilling in the vicinity of the Harts Range Spinifex Bore Garnet Project and reported 51.7Mt of sand containing 3.8Mt of garnet in the Inferred category (Baxter and Stewart, 2009).

In 2016 AAM acquired a 90% interest in ML23868 and this will become part of the Harts Range Garnet Project.

Australian Abrasive Minerals Activities

In 2010 Australian Abrasive Minerals undertook a comprehensive resource drilling programme over a portion of the Inferred resource area identified by Matilda and identified 23.1Mt of sand containing 1.2Mt of garnet in the Measured category and 30.6Mt of sand containing 1.6Mt garnet in the Inferred category (Coxhell, 2010).

In 2012 Australian Abrasive Minerals completed a feasibility study on the identified resource in an endeavour to secure finance for development of the deposit. In 2013 AAM undertook a short exploration drilling program with a view to extend the resource and to further understand the stratigraphy in the district. Heavy mineral analysis of this program was completed in 2014.

Subsequently the data was reviewed and an update of the resource estimate by Coxhell (2010) was made. This concluded that the Inferred resources have been increased to 44.5Mt of sand containing 2.65Mt of garnet (Coxhell, 2014).

The breakdown of expenditure in 2015-2016 is shown in Table 3

Table 3 Expenditure on tenements 2015-2016

	EL24360	EL30318	EL28696
Geological	\$13,370	\$13,575	\$18,408
Geochemical Activities			
Geophysics			
Drilling			
Bulk Sampling			
Rehabilitation			
Pre-Feasibility			
Office Studies		\$1,200	
Overheads	\$2,005.50	\$2,036	\$ 731
Total	\$15,376	\$16,811	\$19,139

It is essential for the Harts Range Garnet Project that there is a supply of water for the life of the project. In 2015-2016 following further review of the stratigraphic data a further drilling. To test the Ambalindum aquifer was conducted.

GEOLOGICAL SETTING –EXPLORATION RATIONALE

Physiography

The Harts Range Spinifex Bore Garnet Project covers the floodplain of the Plenty River predominantly over the Kanandra Land System. It includes alluvial plains of Stones, Eblana, Ulgama, Watson and Brett Creeks.

The Kanandra System is characterized by sparsely timbered, red sandy plains on the north side of the Harts Range. The system can contain low dunes that particularly occur at the gradation to the Simpson land system which is characterized by large dunes.

The vegetation of the Kanandra system within the project area is dominated by scattered Ironwood trees (*Acacia estrophiolata*), tall shrubs of Witchetty Bush (*Acacia kempeana*), Cassia (*Senna artemisioides* subsp. *filifolia*), low shrubs such as Saltbushes (*Rhagodia* species) and grasses (*Aristida* species and *Eragrostis* species).

Geology and Mineralisation

Garnet bearing sands in paleochannels have been identified along the Plenty River floodplain from Aturga Creek (west of the Project) to Entire Creek (east of the Project). Australian Abrasive Minerals focussed their exploration in the vicinity of the bore field identified around Spinifex Bore concentrating on the floodplains of the Plenty River and Stones, Ulgama and Watson Creeks.

The stratigraphy of the region is now well known based on drilling and pitting, that has been conducted on the tenements over the past 10 years. It is summarized in Table 4.

Previous drilling for water on EL24360 has identified that to the south of the project the sand is underlain by Tertiary sediments of the Waite Formation and Ambalindum Sandstone. The Ambalindum Sandstone forms the aquifer that will eventually supply the treatment plant for the Harts Range Spinifex Bore Garnet Project. Follow-up drilling in April 2015 was designed to improve knowledge of the Ambalindum Sandstone distribution following on from the hydrogeology review completed in 2013.

Table 4 Stratigraphy of Harts Range Spinifex Bore Project Area

Range		Lithology	Cement
From	To		
10cm	15m	Red fine-grained silty sand - windblown – dunes to east	Unconsolidated
1.5m	5m	Brown-Orange fine to medium grained sand-floodplain	Partly consolidated with iron coating on grains
0	8m	Calcretised grey-white sand and pebbles-paleochannel	Usually free flowing, but may be partly cemented by calcrete
1m	7m	White-grey sand and cobbles - paleochannel	Often hard well-cemented
1m	2m	Calcrete	Well-cemented
40m	120m	Schist and clay with abundant biotite and chlorite OR Tertiary clay and sand	Lithified

2015-2016 EXPLORATION

Exploration Index Map

In 2015-2016 four holes were drilled to examine the stratigraphy and potential for shallow aquifers in the project area. Hole 2015/10 was re-drilled as a production bore 2015/10P. The locations are given in Table 5.

Table 5 Stratigraphic Bores 2015-16

Bore	Date Drilled October 2015	Easting	Northing	Depth (m)	Status
2015/9	17-18	488496	7460993	114	Back-filled
2015/10	18-19	489735	7461503	124	Monitor
2015/1P	19-20	488501	7461576	66	(Production)
2015/10P	25-27	489925	7461507	119	Production
OLY4P	21-23	489753	7462111	125	Production

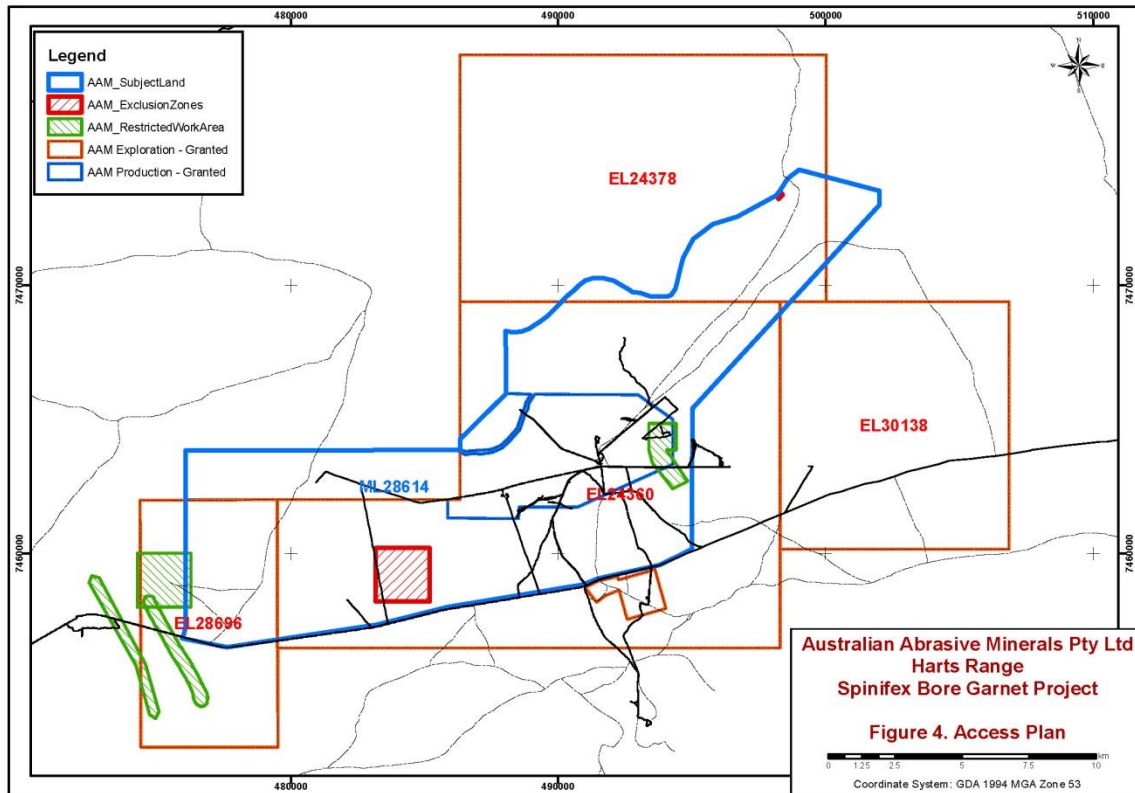
Full details of the drilling are located in the report in the Appendix.

Access Considerations

The Harts Range Spinifex Bore Project is located on pastoral land of Mt Riddock Station and is the subject of require clearances with AAPA and the CLC.

The project area has a significant network of tracks established for pastoral and previous mining exploration and these provide good access for exploration.

The areas of restricted access and tracks are shown on Figure 4.



Geological Studies

Geological studies in 2015-2016 were restricted to tenement assessment resulting in a program of surrendering of some blocks.

Mineralogy and Metallurgy

No Mineralogy or metallurgy was completed in 2014-2015. Samples collected in 2013-2014 were lost in transit to the Laboratory.

Geophysics and Remote Sensing

No remote sensing or geophysics was done during 2014-2015.

Surface Geochemistry

No soil or grab samples were taken during 2014-2015.

Drilling

In October 2015 a drilling program was conducted and this has been reported in the Appendix by John Barnett. The complete water drilling campaign from 2014 to 2016 is listed in Table 6.

Table 6 List of Water/Stratigraphic Bores drilled 2014 to 2016

Number	RN	Easting	Northing	Depth	Tenement
2015/1	RN19159	488490	7461594	66	EL24360
2015/2	RN19160	489266	7462006	84	ML28614
2015/3	RN19156	495008	7464262	132	EL24360
2015/4	RN19157	494854	7463286	144	EL24360
2015/5	RN19158	496004	7463595	138	EL24360
2015/9	RN19231	488496	7460993	114	EL24360
2015/10	RN19232	489735	7461503	124	EL24360
2015/1P	RN19233	488501	7461576	66	EL24360
OLY4P	RN19234	489925	7462111	125	EL24360
2015/10P	RN19235	489753	7461507	119	EL24360

The results of this drilling campaign are described in detail in Appendix 1. The digital data is Appendix 3.

Geotechnical Studies

No geotechnical studies were completed in 2014-2015

Resource estimation

No further resource estimations were made in 2014-2015

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Appendix 1

**REPORT ON
GROUNDWATER EXPLORATION AND DEVELOPMENT PROGRAMME
OCTOBER-NOVEMBER 2015
FOR
AUSTRALIAN ABRASIVE MINERALS**

1. INTRODUCTION

The long-term water-supply requirement for the Harts Range Spinifex Bore Garnet Project is 21 L/s for 20 years, the water to be used for ore processing. The medium-term requirement is 10 L/s.

Previous works have established a borefield (Spinifex Borefield) capable of supplying 14 L/s for at least 5 years, as indicated by computer modelling.

Groundwater exploration has been undertaken in September 2014, April 2015 and October-November 2015, with the aim of locating more production bore sites to supply the additional long-term water-supply requirement, and a source for the medium-term requirement closer to the Plant Site.

Drilling in September 2014 (referred to as Phases 1 and 2A) was concentrated on a potential weathered and fractured rock aquifer to the north and northwest of the Spinifex Borefield, where shallow mineral exploration bores had encountered indications of groundwater. Four bores were drilled including one test-production bore. The test-production bore (W5) was evaluated by pumping tests, and shown to have a sustainable yield of only 0.9 L/s. None of the other three bores gave promising results. This potential resource was therefore adjudged unlikely to be useful to the AAM Garnet Project.

The five original production bores forming the Spinifex Borefield (OLY1, OLY4, OLY7, OLY8 and OLY9) were redeveloped by airlifting as part of the Phase 1 programme.

Attention was then directed to investigating possible extensions of the Spinifex Bore aquifer (referred to as Phase 2B). This campaign was carried out in April 2015. Five bores were drilled over the period 25-29 April 2015, to investigate whether the Spinifex Bore aquifer extended eastwards and westwards beyond its currently proven extent. Three bores were drilled to the east, and two to the west, obtaining promising results in two of the eastern bores and in one of the western ones.

The Phase 3 programme, carried out in October-November 2015, is described in the current report. Two exploratory bores were drilled to the southwest of the existing borefield, and three additional production bores were constructed and test-pumped in the same vicinity. Additional production capacity of 5.5 L/s has been established by the Phase 3 programme.

2. DRILLING RESULTS

The general sequence in all Phase 2B and phase 3 bores is similar, as follows:

SILTY SAND : 6 – 15m thick
CALCRETE : 9 – 15m thick
CLAY : Grey and yellow, 47 – 103m thick. Sand or interbedded sand and clay aquifer near base of sequence, 5 – 15m thick.
BEDROCK : Quartz-biotite schist in west, weathered granite in east.

Two exploration bores designated 2015/9 and 2015/10 were drilled to the south and southwest of existing production bore OLY4. Bore 2015/10 intersected 5m of interbedded clay and sand between 101 – 106m depth, and produced an airlift yield of 3.5 L/s. Bore 2015/9 recorded 4m of clayey sand between 79 – 83m depth, but produced very little water, less than 0.5 L/s. These two bores were drilled using air-circulation, and collapsed on withdrawal of the drill string, preventing them being completed as monitoring bores.

Three sites were completed as production bores: one at site 2015/1, where 6.5 L/s had been obtained in an exploration bore in the April drilling campaign; one at site 2015/10, and one at OLY4. Bore OLY4 is cased with 100mm diameter casing, and was redrilled as OLY4P with 150mm diameter production casing and screen to accept a larger diameter production pump.

It was evident that the two deeper production bores planned would not be able to be completed using air-circulation, so the lower section of Bores 2015/10P and OLY4P were drilled by the mud-rotary method.

The exploration bore at site 2015/10 was also cleaned out using mud-circulation, and completed as a monitoring bore.

Details of all Phase 3 bores are summarised in Table 1 below.

TABLE 1: PHASE 3 BORES

BORE NO.	DATE DRILLED (OCT 15)	CO-ORDINATES		DEPTH DRILLED (m)	SCREEN DEPTH (m)	AQUIFER DEPTH (m)	AIRLIFT YIELD (L/s)	SWL (mbns) ¹	BEDROCK DEPTH (m)	STATUS
		NORTH	EAST							
2015/9	17 - 18	7460993	488496	114	-	-	<0.5	-	99	Back-filled
2015/10	18 - 19	7461503	489735	124	98.5 - 104.5	101-106	3.5	34.4	113	Monitor
2015/1P	19 - 20	7461576	488501	66	54 - 60	54 - 59	7.0	18.6	63	(Production)
2015/10P	25 - 27	7461507	489925	119	100 -106	101-106	3.5	36.7	113	Production
OLY4P	21 - 23	7462111	489753	125	99 - 108	99 - 108 115 - 118	3.0	37.5	125	Production

Note: 1. mbns – metres below natural surface

The three production bores are cased with 168 mm O.D (outside diameter), 4.8mm wall thickness steel casing and screened with 1 mm aperture stainless steel screen. A 6m sump is included below the screen to store any very fine sand or silt which may accumulate over time. The annulus of each bore is gravel-packed with 2 – 3 mm diameter gravel. Surface casing of 273 mm O.D has been installed to 5.5m below ground and capped with a flange and bolted-on cap. The surface casing is set in a 1m square concrete plinth.

Monitor Bore 2015/10 is cased with 50 mm Class 18 PVC tubing, machine-slotted against the open interval. A bolted cap is fitted to 168 mm O.D surface casing set in a concrete plinth.

3. TEST PUMPING

The three production bores were each tested by a step-drawdown test followed by a 24-hour constant discharge test.

3.1 Step-Drawdown Tests

The step-drawdown test consisted of three or four pumping phases of 30 minutes duration at different rates, separated by 30-minute recovery (non-pumping) periods.

Details of the tests are set out in Table 2 below; including the drawdown after 30 minutes of pumping during the constant discharge test.

TABLE 2: STEP-DRAWDOWN TEST RESULTS

BORE	PUMPING PHASE	PUMPING RATE Q (L/s)	DRAWDOWN S _w (m)	SPECIFIC DRAWDOWN (S _w /Q)
2015/1P	STEP 1	1.0	0.99	0.99
	STEP 2	2.5	2.22	0.89
	STEP 3	5.1	4.51	0.88
	STEP 4	6.0	5.29	0.88
	CONSTANT DISCHARGE	5.1	4.45	0.87
2015/10P	STEP 1	1.0	14.40	14.4
	STEP 2	2.0	25.19	12.6
	STEP 3	2.5	29.00	11.6
	CONSTANT DISCHARGE	2.3	26.17	11.4
OLY4P	STEP 1	1.0	8.63	8.6
	STEP 2	2.5	21.01	8.4
	STEP 3	3.75	33.27	8.8
	CONSTANT DISCHARGE	3.0	25.70	8.6

The similar values for specific drawdown across the range of pumping rates, for the tests on Bores 2015/1P and OLY4P, show no significant well losses and hence well constructed and developed bores.

The reducing values for specific drawdown in the step test on Bore 2015/10P indicate that the bore was still developing, and indeed the discharged water in Steps 1 and 2 was somewhat turbid with drilling mud. The similar values for Step 3 and the constant discharge test show that the bore was fully developed by that stage.

3.2 Constant Discharge Tests

The three production bores were each pumped for 24 hours at constant discharge. The results are shown in Table 3 below.

TABLE 3: CONSTANT DISCHARGE TEST RESULTS

SITE	BORE	RADIAL DISTANCE (m)	DISCHARGE RATE (L/s)	FINAL DRAWDOWN (m)	80% RECOVERY TIME (mins)	TRANSMISSIVITY (m ² /day)	STORATIVITY
2015/1	PR ¹	-	5.1	22.3	7500	4	-
	OB ²	24.15	-	20.0	8500	4	-
2015/10P	PR ¹	-	2.3	33.9	110	7	-
	OB ²	19.00	-	10.3	680	8	3 x 10 ⁻⁴
OLY4P	PR ¹	-	3.0	35.5	65	9	-
	OB ²	11.10	-	9.69	700	12	7 x 10 ⁻⁴

Note: 1. PR - Production Bore
2. OB - Observation Bore

Bore 2015/10P gave a leaky artesian response to pumping, and has an estimated sustainable yield of 2.5 L/s. Neither Bore OLY4P or OLY4 reacted to pumping from Bore 2015/10P.

Bore OLY4P also gave a leaky artesian response and has an estimated sustainable yield of 3 L/s. Neither Bore 2015/10P or 2015/10 reacted to pumping from Bore OLY4P, but OLY1 drew down by 1.6m during the constant discharge test on OLY4P.

Although Bore 2015/1 maintained a higher pumping rate for a lower amount of drawdown than the other two production bores, the rate of drawdown increased progressively throughout the test, indicating that the pumped aquifer was very limited in extent. This was

confirmed by the large drawdown in the observation bore and very slow recovery time. This bore is tapping a different aquifer than the main Spinifex Borefield, with a significantly higher water-level (see Table 1). Although the final drawdown trend would suggest that this bore could sustain a long-term pumping rate of 1 L/s, the very slow recovery rate indicates that the aquifer would become progressively dewatered with longer term pumping. This bore would only be usable for short-term standby.

4. GROUNDWATER CHEMISTRY

Samples were taken from the three production bores at the end of the constant discharge tests, and analysed by ALS Environmental in Sydney.

The analytical results are shown on Table 4 below.

TABLE 4: GROUNDWATER CHEMISTRY

PARAMETER	BORE 2015/1P	BORE 2015/10P	BORE OLY4P
pH	7.36	7.68	7.70
EC (microS/cm)	2720	2080	1580
Calcium (mg/L)	64	46	43
Magnesium (mg/L)	25	31	44
Sodium (mg/L)	451	285	240
Potassium (mg/L)	8	7	8
Bicarbonate (mg/L) ¹	74	217	248
Sulphate (mg/L)	410	324	238
Chloride (mg/L)	573	388	269
Nitrate (mg/L) ²	<0.5	7.6	7.1
Ferrous Iron (mg/L)	0.26	<0.05	<0.05
Fluoride (mg/L)	1.6	1.8	1.8
Sum of Ions (mg/L)	1607	1307	1099

Notes: 1. Converted from bicarbonate alkalinity.

2. Converted from nitrate as nitrogen.

All samples are of sodium chloride-sulphate type and are slightly alkaline. The sample from Bore 2015/1P, although from a different aquifer, is generally similar in chemistry, although slightly more saline, and with less bicarbonate.

5. CURRENT STATUS OF SPINIFEX BOREFIELD

There are six available production bores with significant yields, as shown on Table 5 below.

TABLE 5: PRODUCTION BORES

PRODUCTION BORE	ELEVATION (mAHD)	STICKUP (m)	WATER ¹ LEVEL (mbct) ²	SCREEN DEPTH (m)	SUSTAINABLE YIELD (L/s)	PUMP INTAKE SETTING (m)	SALINITY (mg/L TDS)
OLY1	542.9	0.75	33.76	92.0 – 98.0	5.8	87.0	1,188
OLY4P	546.7	0.50	37.46	99.0 – 108.0	3.0	94.0	1,099
OLY7	535.4	0.55	31.51	71.5 – 77.5	2.9	66.5	3,460
OLY8	532.9	0.80	29.88	58.0 – 64.0	1.2	53.0	N.D
OLY9	537.2	0.50	33.89	83.4 – 89.4	1.7	78.5	1,620
2015/10P	N.D	0.50	33.70	100.0 – 106.0	2.5	95.0	1,307

Note: 1 - October 2015.

2 - Metres below casing top.

The sustainable yields given above for Bores OLY7, OLY8 and OLY9 are derived from computer modelling described in the 2007 Rockwater report. This model simulated pumping from five

production bores OLY1, OLY4, OLY7, OLY89 and OLY9, and from an additional conceptual production bore in the north-western part of the borefield. These sustainable yields allow for mutual drawdown interference, assuming that the entire borefield is in operation.

The quoted sustainable yields for OLY1, OLY4P and 2015/10P are “stand-alone” yields, that is not allowing for any mutual drawdown interference. Any interference will be at least partially offset by leakage, both OLY4P and 2015/10P having shown a leaky artesian response to pumping. No realistic estimate of mutual interference can be given at this stage, because of the leaky artesian nature of the aquifer; any such interference can be estimated after the first three months of borefield operation. There was no interaction between 2015/10P and OLY4P during the testing programme, but OLY1 did draw down by 1.6m in response to pumping from OLY4P.

Ten monitoring bores are available for water-level measurements and are shown on Table 6 below.

TABLE 6: MONITORING BORES

BORE	ELEVATION (mAHD)	STICK-UP (m)	WATER* LEVEL 26/10/5 (m)	OPEN INTERVAL (m)	REMARKS
OLY4	546.7	0.25	37.36	108 - 118	-
OLY5	537.5	0.55	33.80	81 - 90	-
OLY6	541.4	0.40	36.83	86 - 101	-
NEW14	535.4	-	31.51	77 - 89	Adjacent OLY7
NEW15	533.2	-	30.18	67 - 79	Adjacent OLY8
NEW16	536.6	1.10	33.81	90 - 96	-
NEW17	532.8	1.10	30.51	71 - 77	-
NEW18	538.3	-	34.99	83 - 95	Adjacent OLY9
2015/10M	ND	0.45	34.41	98.5 - 104.5	-
W5	ND	0.70	11.44	23.3 - 47.3	Fractured Rock

Note: * - Below casing top.
ND - Not determined.

OLY2, although accessible, is screened against an interval of clay strata, and does not reflect the water-level in the Spinifex Bore aquifer.

6. CONCLUSIONS

- Two new production bores, 2015/10P and OLY4P, have been constructed and tested on the south-western side of the Spinifex Borefield. OLY4P is a 150mm diameter bore adjacent to a previous smaller diameter (100mm) bore, OLY4.

These two bores have a combined sustainable yield of 5.5 L/s.

A third production bore, 2015/1P, constructed further to the west, intersected a higher-level aquifer of limited extent. This bore only has potential for small, short-term supply.

- The two new bores, together with Bore OLY1, which has a sustainable yield of 5.8 L/s, have the capacity to provide the current medium-term process water requirement of 10 L/s.

The estimated combined salinity of the groundwater pumped at these rates from the three bores is about 1200 mg/L TDS.

3. The combined yields of the three bores, 2015/10P, OLY4P and OLY1 may be affected in the longer term by mutual drawdown interference. Bore OLY7 should be equipped to allow for this, and to provide standby capacity for bore and pump maintenance. Bore OLY7 has a sustainable yield of at least 2.9 L/s.
4. The Phase 2B and Phase 3 drilling campaigns have proved that the Spinifex Bore aquifer extends 650m further to the south-southwest and 3000m further to the east, than previously known. The limits of the aquifer have not yet been verified in either direction.

7. RECOMMENDATIONS

1. Four production bores should be equipped to supply the medium-term requirement for process water of 10 L/s, and allowing for standby capacity (Bore OLY7).

The estimated sustainable yields, and recommended pump inlet depths, are as follows:

BORE	SUSTAINABLE YIELD (L/s)	RECOMMEND OF PUMP INLET DEPTH (m)
OLY1	5.8	87
OLY4P	3.0	94
OLY7	2.9	66.5
2015/10P	2.5	95

2. When the borefield is brought into operation, the following water-level and water-quality monitoring programme should be undertaken. This programme is essential for careful management of the borefield, and to satisfy requirements for reporting to DME:

2.1 MEASUREMENT OF WATER-LEVELS:

- Bores OLY1, OLY4P, OLY7 and 2015/10P;
- Bores OLY4, NEW14 and 2014/10M;
- Bore OLY8 or NEW15;
- Bore OLY9 or NEW18.
- Water levels in these bores should be measured:
 - Weekly for the first month of operation;
 - Monthly thereafter.
- If possible, water-levels should be measured in each production bore after the pump has been turned off for at least 4 hours, and the duration of this recovery period noted at time of measurement.

2.2 WATER QUALITY:

- All operating production bores;
- EC and pH every quarter (on-site);
- Annual samples for full chemical analysis.

2.3 ABSTRACTION:

- All operating production bores;
- Metered abstraction every month.

2.4 REVIEW OF MONITORING:

- Water-levels and abstraction records should be reviewed after 3 months, and again after 12 months, to evaluate any mutual drawdown interference between bores, and to make any consequent adjustment in pumping rates which may be necessary.

John Barnett
Hydrogeologist

Note on Spinifex Bore

There is some doubt on the depth of Spinifex Bore itself. Steve Cadzow (*pers.comm*) reported it to be 110 feet (i.e 33.5m) deep and hence not within the same aquifer as the Spinifex Borefield itself.

On the other hand the Northern Territory Government record for Spinifex Bore (RN 13309) records its depth as 67m, that is 5m above the top of the aquifer in nearby OLY7.

BORE 1/2015P
7461576N; 488501E

0 – 6m	SAND	Silty and slightly clayey, very fine to very coarse grained, poorly sorted, subangular to rounded, quartz, ferruginous grains, trace garnet. Calcareous cemented layers 2 - 6m.
6 – 16m	CALCRETE	Pink, sandy. Sand up to gravel size, subangular to rounded, poorly sorted, quartz, ferruginous grains, minor heavy minerals and garnet.
16 - 18m	CLAY	Brown, sandy, sand as above.
18 – 54m	CLAY	Pale grey and yellow, a few slightly sandy bands.
54 – 59m	SAND	Coarse to very coarse, mainly coarse-grained, well sorted, subrounded to rounded, quartz, trace heavy minerals.
59 – 63m	CLAY	Slightly shaley, grey, red and purple.
63 – 66m	QUARTZ-BIOTITE SCHIST	Slightly weathered (no garnets).

Drilled Air-rotary.

Airlifted at 7 L/s after 2 hours.

168mm OD Steel casing +0.45 – 54m, and sump 60 – 66m. 150mm screen, 1mm aperture 54 – 60m.

BORE 2015/9
7460993N; 488496E

0 – 5m	SAND	Silty, red-brown, slightly clayey, very fine to coarse, mainly fine-grained, moderately sorted, subrounded to rounded, quartz, minor black heavy minerals, trace garnet.
5 - 6m	SAND	Minor gravel, minor garnet, otherwise as above.
6 – 13m	CALCRETE	Sandy, sand as far 5 – 6m, trace garnet.
13 – 17m	CALCRETE	White, Slightly sandy, trace garnet.
17 – 19m	CALCRETE	White, minor yellow, sandy fine to gravel, poorly sorted, subrounded to rounded quartz.
19 – 61m	CLAY	Yellow, minor brown and pink.
61 – 66m	CLAY	Grey.
66 – 79m	CLAY	Yellow, minor grey.
79 – 83m	SAND	Clayey, fine to very coarse, poorly sorted, subrounded to rounded quartz, minor black heavy minerals.
83 – 99m	CLAY	Grey and brown.
99 – 108m	CLAY	Grey-green and brown with small quartz crystals, slight schistose texture (VERY WEATHERED BEDROCK).
108 – 114m	HORNEBLENDE- QUARTZ SCHIST	No garnets

Very low water yield (<0.5 L/s) from 84m on.
Collapsed at 76m, unable to run 50mm PVC.

BORE 2015/10
7461503N; 489735E

BORE 2015/10P
7461507N; 489753E

0 – 6m	SAND	Slightly silty and clayey, very fine to coarse, mainly very fine to fine grained, moderately sorted, subrounded to rounded, quartz, minor black heavy minerals, trace garnet.
6 – 15m	CALCRETE	Pink, sandy, a few pebbles of green amphibolite schist, sand fine to gravel, poorly sorted, otherwise as above. Trace garnet.
15 – 20m	CALCRETE	Hard, white, brown and grey, slightly sandy, sand as for 6 – 15m, with a few quartz pebbles. Trace garnet.
20 – 101m	CLAY	Mainly yellow, minor pale grey, pink and brown, red-brown 90 – 101m; very slightly sandy 90 – 94m and 99 – 101m, sand fine to gravel, subrounded to rounded quartz, minor heavy minerals.
101 – 106m	INTERBEDDED CLAY and SAND	Sand very fine to medium grained, mainly fine to medium, well sorted, subrounded to rounded, quartz, minor black heavy minerals. Clay, yellow and pale grey.
106 – 113m	CLAY	Red-brown.
113 – 120m	VERY WEATHERED BEDROCK	Grey-green micaceous clay.
120 – 124m	MICA-SCHIST	Dark green, soft, weathered.

2015/10 Monitor Bore:
 Class 18 PVC, 50mm ND.
 Slotted 98.5 – 104.5 m bgl.
 Airlift 3.5 L/S after 1 hour.

2015/10P Production Bore:
 Air-rotary (Hammer bit) to 42m, mud-rotary (Drag bit) 42 – 119m.
 Final Airlift 2015/10P 3.5 L/s.
 Screen 100 – 106m, 6m Sump.

BORE OLY4 (P)
7462111N; 489925E

0 – 6m	SAND	Silty, slightly clayey, very fine to coarse, mainly fine to medium grained, moderately sorted, subrounded to rounded, quartz, minor black heavy minerals, trace garnet.
6 – 14m	SANDY CALCRETE	Sand as above, trace garnets.
14 – 22m	CALCRETE	Hard, cemented, sandy, grey and white. Rare garnets.
22 – 92m	CLAY	White and minor yellow 22 – 42m, pale grey and yellow 42 – 92m, some brown 42 – 53m.
92 – 118m	INTERBEDDED CLAY and SAND	Sand layers common 99 – 108m and 115 – 118m, minor sand layers 92 – 99m and 108 – 115m. Clay pale grey and yellow; sand fine to coarse grained, poorly sorted, subangular to subrounded, quartz, minor black heavy minerals.
118 – 125m	CLAY	Pale grey, dark grey and red-brown. A few fragments of very decomposed mica-schist at 125m.

CASED: +0.5 – 99m, 168mm Steel.

99 – 108m, 150mm Screen, 1mm aperture.

108 – 114m, 168mm Steel Sump, Bottom Cap.

6 bags 2 – 3mm gravel.

Airlifted 5 hours: Final airlift: 3 L/s.