

# **Annual Report for the Period**

**April 2014 to March 2015**

**EL15/2009**

**Hawkes Creek North**

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**Date: February 2015**

## **ABSTRACT**

This report details the work undertaken on exploration licence EL15/2009 Hawkes Creek North during the 12 month period to March 4 2015. The work comprised of bulk test pitting and detailed analysis with the intention of trial processing. The chemical analysis was inferior to that expected from previous drilling and test pitting programs, limiting the usable resource volume. Processing improvements are under investigation to determine the commercial viability of the resource.

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## **1. INTRODUCTION**

Tasmanian Advanced Minerals Pty Ltd (TAM) is actively mining high purity silica from three locations in Tasmania, from one near Corinna and from two areas near the Arthur River in northwest Tasmania. The Blackwater mine is on the south side of the river two to four kilometres west of Kanunnah Bridge and the Hawkes Creek mine is a further five kilometres to the west, but on the north side of the river. All mined silica is screened on each site, segregated according to chemical impurity profile, and trucked to TAM's processing facility at Wynyard. Processing involves blending the feed, removal of discrete particle impurities, and particle size control and separation.

TAM's tenements in the area are shown in Figure 1. EL15/2009 adjoins TAM's currently operating Hawkes Creek mine 27M/2009 to the north and west. The licence is held by TAM.

The silica resource on the EL15/2009 is present as a ridge intersected by three gullies, and designated First Hill Northwest through to Fourth Hill Northwest. Three samples were taken from the Second and Third hills, which comprise the largest quantity of resource on the licence as calculated by previous exploration work.

The objective of the exploration was to extract several samples of approximately 300 tonnes each to investigate processing characteristics. Bulk test pit locations are shown in Figure 2. Physical and chemical characteristics can impact on suitability for processing. Important physical characteristics include particle size and shape, and the hardness of lump material. Some critical chemical impurities are iron and chromium, the latter present as chromite.

Datum used in this report is GDA94.

## **2. REVIEW OF PREVIOUS WORK**

Previous work on the licence comprises two test pitting programs, one in 2010 and the next in 2011. The locations of these test pits are shown in Figure 2. For the 2010 campaign a 7.5t Takeuchi excavator was used, but was less than ideal due to the tightly packed and rocky nature of the silica in many pits. In the second round of exploration some 42 additional test pits were dug in November-December 2011 with a 12 tonne Caterpillar excavator, a substantially larger and more capable machine than the Takeuchi. Pits were dug along the crest of the ridge and on short side lines. Pale coloured silica flour is present on all of the four hills, but on the Third and Fourth Hills Northwest the occurrence is up to 50 m wide whereas on Second Hill Northwest the occurrence may be only 15 m wide. The occurrence on the First Hill Northwest is small though it is of easy access.

Pale coloured silica flour and lump silica that was encountered in the various test pits. In most pits the silica flour was pale brown or very pale brown in colour and along most of the Northwest Track it contains abundant lump silica. This lump silica is generally very fine grained, grey or white, sometimes crudely banded, cherty quartz though there is common colloform banding of cherty and crystalline quartz, often around crystal lined vughs ('lacy agate' texture).

The silica flour deposit on Second Hill NW is thin and narrow. Assuming a width of 15m and an average depth of 3.5 m a very speculative resource estimate for the deposit was given as 34,125 tonnes.

On Third and Fourth Hills Northwest a 3m thickness line or isopach was interpolated from the test pit data. The combined area enclosed by the 3m isopach at Third and Fourth Hills NW is substantial and 16 test pits with an average thickness of silica flour of 4.9 m fall inside the isopach. Assuming an overall average thickness of 4m of silica flour within the 3m isopach allows the following speculative resource estimate to be made 64,400 tonnes. However it was observed that the proportion of lump and waste within the resource was unknown, so the current round of bulk sampling was recommended to assess the yield of commercial silica flour.

### **3. EXPLORATION COMPLETED DURING THE REPORTING PERIOD**

Access is gained via the Northwest Track from the northern border of TAM's Hawkes Creek mine 27M/2009. In preparation for the sample extraction the track was cleared of fallen trees, and flow-through log bridges and silt-traps were either constructed or repaired in the gullies between the hills. A new stockpile pad was constructed on 27/M2009 for screening and storage of the samples.

Clearing, stripping and mining of the test pits was undertaken with a 22t Komatsu excavator, one of the excavators TAM uses for its commercial mining operations. Trees were cleared then topsoil was stripped prior to surface sampling. This initial sampling is to gauge whether or not stripping has been sufficient prior to mining as high impurity levels are found near the overburden contact. In Pits 1 and 3 initial surface results indicated the need for further stripping. A summary of the daily work log is given in Appendix 1, and photographs of activity are shown in Appendix 2.

The pits were excavated with an animal-safe construction, with at least one sloping side and drainage to the side of the ridge. The location of the test pits are shown in Figure 2. The pits and tracks were rehabilitated by replacing top soil and vegetative matter after completion of the extraction.

### **4. DISCUSSION OF RESULTS**

After stripping the topsoil from the test pits the upper layer of silica, generally 0.5m in depth was stripped, as is common practice is TAM's other mining operation locations. Then the upper surfaces were sampled on a grid basis, and checked for impurities. If the impurity levels are too high further stripping is undertaken. Two of the most important contaminants in silica for use in LCD and OLED glass are iron and chromium.

Fe and Cr levels were significantly elevated on many parts of the stripped surfaces of Pits 1 and 3. The levels remained high with further stripping at some points on the surface necessitating stripping up to 1.5m before acceptable levels were obtained prior to proceeding to bulk sample extraction.

After extraction the silica was trucked to the stockpile pad on 27M/2009 where it was screened over a Reid Screen with 50mm mesh aperture. As the screened stockpile was being added to, samples were taken approximately every 60 tonnes from around the perimeter of the added portion of the pile in order to obtain details of the impurity profile average and range.

Analysis was performed in TAM's Wynyard laboratory by Perkin Elmer Optima 2100 ICP OES and Varian 720 ICP OES. Sample preparation includes removal of  $-45\mu\text{m}$  material from the sample as that fine size fraction is usually very high in many impurities which can be removed in TAM's processing operations. So the prepared sample provides a more accurate indication of whether or not the sample can be processed than just analysing the raw sample. The results are given in Appendix 3. Impurities other than Fe and Cr listed in Appendix 3 are within acceptable ranges, so this discussion focuses on iron and chromium. Chromium impurities are present as chromite. The amount and variability of iron and chromium could impact on the viability of this resource.

Both iron and chromium have strong impacts on the light transmittance of glass. The impact of chromium however can be up to 10 times the impact of iron, so acceptable levels of chromium are much lower than acceptable levels of iron. Alkaline earth alumino silica glass is used for LCD and OLED applications. These glasses utilise little flux in the formulations so high melting point impurities such as chromite can remain undissolved in glass sheets, described as "stones" in the industry. Silica which results in glass with stones is not tolerated by the industry. Thus chromium as chromite has dual detrimental effects for LCD and OLED glass production, both lowering transmittance and stone formation.

The Fe and Cr levels in the Pit 2 silica are acceptable, so it was trialled in the feed blend of TAM's Wynyard processing plant. In addition to chemical impurities, particle size distribution and coarse particle hardness can impact on processing. Particle size distribution results are shown in Appendix 3.

As the EL15/2009 resource is comparatively small in quantity it would comprise a minor component of the plant feed blend should mining operations eventuate. A one-in-nine (11%) feed blend was used in the trial to reflect the small resource tonnage. Other feed components were Blackwater and Corinna silica. Processing occurred without problems.

Silica from Pits 1 and 3 has not been processed to date as the levels of Fe and Cr are not within the range that can be processed at Wynyard.

## 5. CONCLUSIONS

The extent of stripping required to obtain what was expected to be acceptable bulk samples was greater than expected. Considering the relatively small size of the resource and its shallow depth, the extent of stripping that was needed would result in a commercially unviable usable resource quantity.

Moreover in Pits 1 and 3 although pre-extraction surface sampling indicated that the extracted samples should be of a quality that could be processed, they were not, indicating high impurity variability. Chromite impurities are the most significant impurities of concern.

In TAM's processing facility hydrocyclones remove small size fraction impurities, and spirals and magnets remove larger size heavy minerals, and magnetic and para magnetic minerals such as chromite.

Chromite impurity problems are not limited to EL15/2009. Significant areas of TAM's mining leases have chromite contamination, accordingly process development work is already under investigation to improve chromite removal at Wynyard. The focus is development of a new magnet system. This process development work will continue in 2015. Should the process development work be successful higher chromite feed blends will be able to be processed, including the remaining unprocessed bulk samples from this exploration work. The extent to which the process improvement allows removal of magnetic impurities will determine the acceptable impurity levels in the feed, and therefore the extent of stripping required in mining, and finally therefore the commercial viability of the EL15/2009 resource.

## 6. ENVIRONMENT

The pits were excavated in an animal-safe construction with at least one sloping side and drainage to the side of the ridge. The pits and tracks were rehabilitated by replacing top soil and vegetative matter after completion of the extraction.

## EXPENDITURE

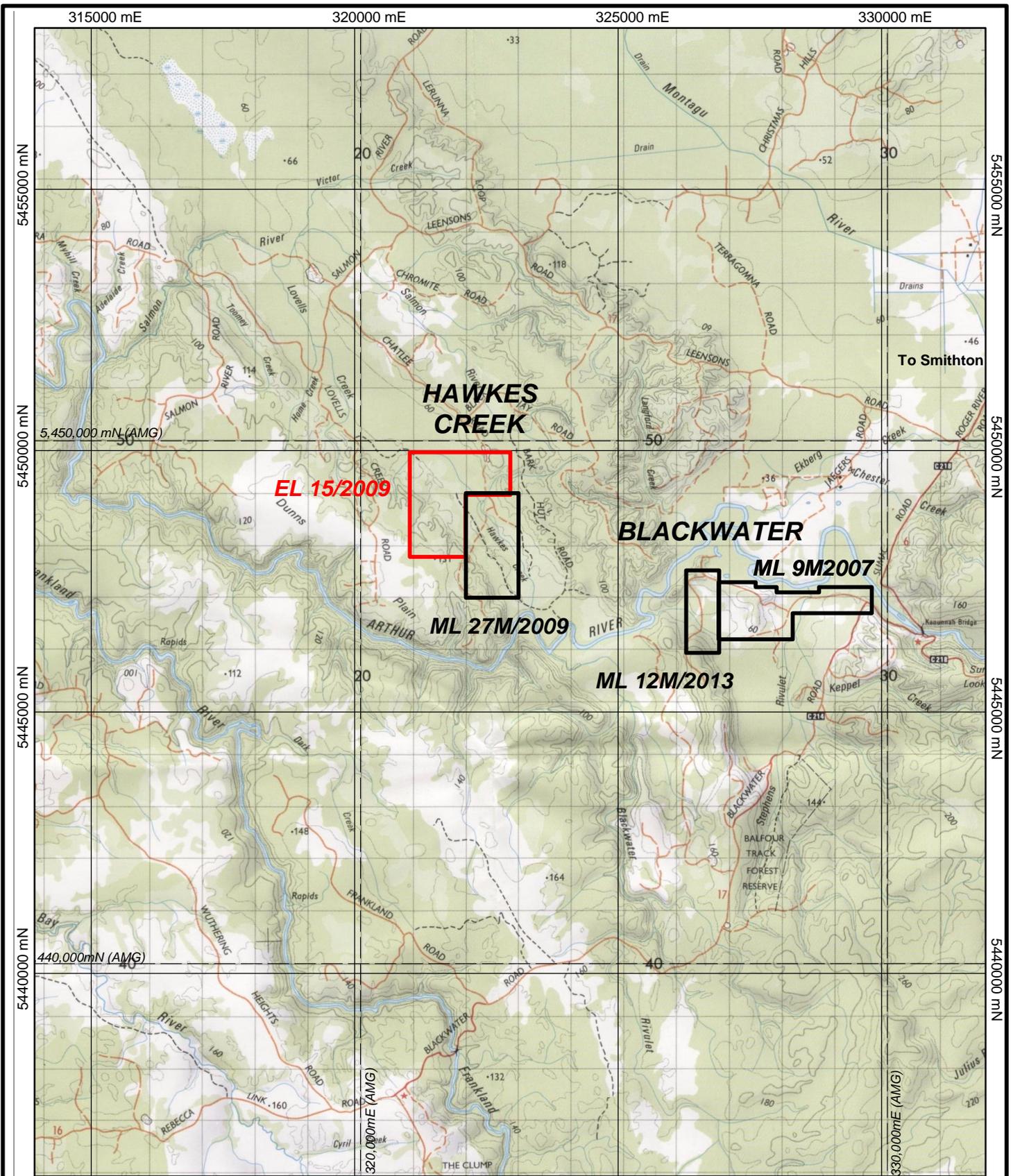
Expenditure for the exploration program is given below:

<b>Activity</b>	<b>Expenditure</b>
Site Preparation & Mining	\$50,900
Site Rehabilitation	\$ 3,200
Processing	\$35,000
Laboratory	\$ 4,900
Administration	\$ 4,600
<b>Total</b>	<b>\$98,600</b>

## **REFERENCES**

Turner, N. J. 2010. EL15/2009 Hawkes Creek; EL35/2003 Stephens Rivulet and Hawkes Creek; ML 9M2007 Blackwater. Combined interim report on work in February-March, 2010.

Turner, N.J. 2012. EL15/2009 Hawes Creek; ML 27M/2009 Hawkes Creek. Combined report November, 2011 – March, 2012

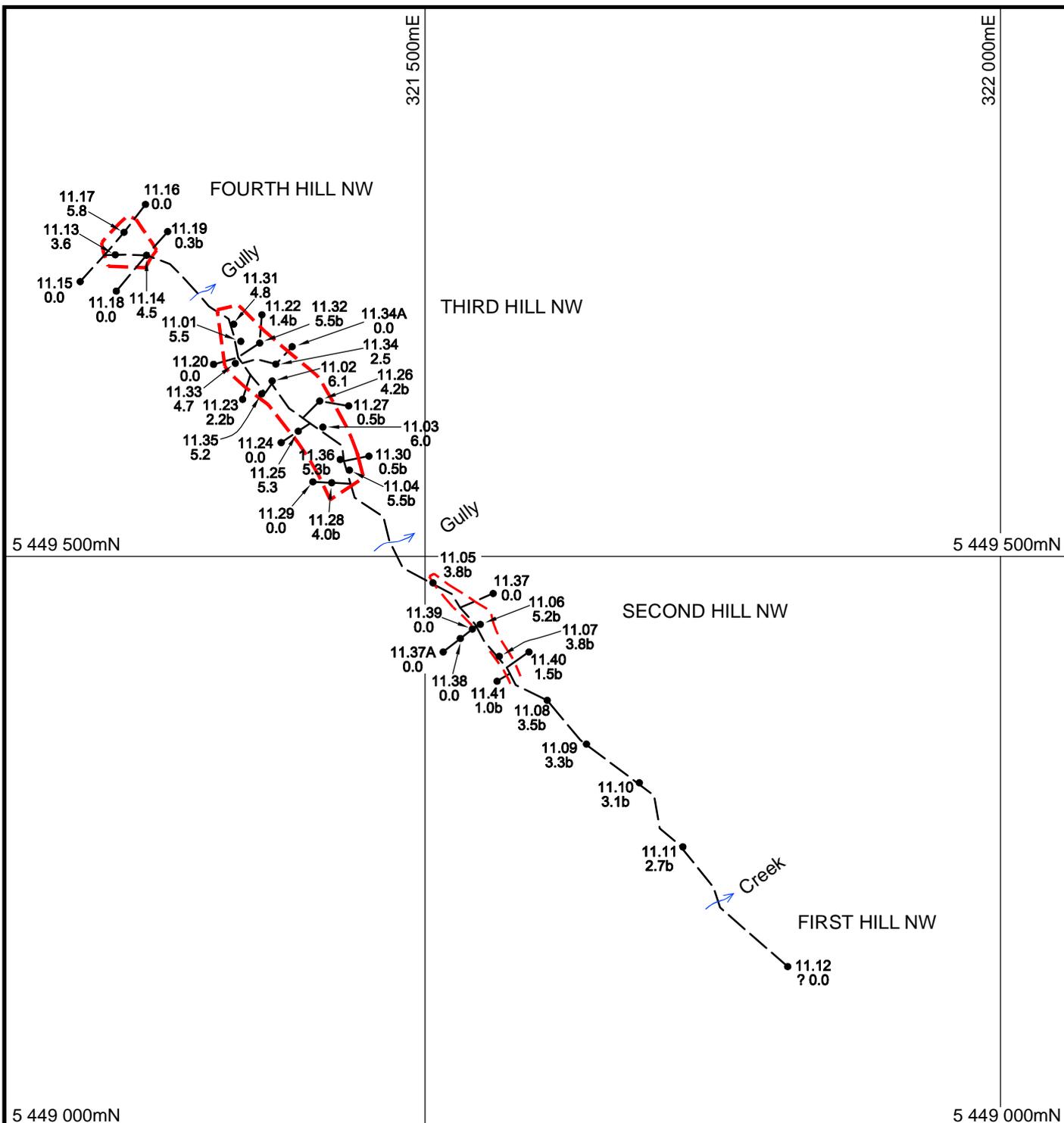


**TASMANIAN ADVANCED MINERALS Pty Ltd**  
**BLACKWATER AND HAWKES CREEK TENEMENTS AT 18.02.15**

**ML 27M/2009 and EL 15/2009 - HAWKES CREEK**

# LOCATION PLAN

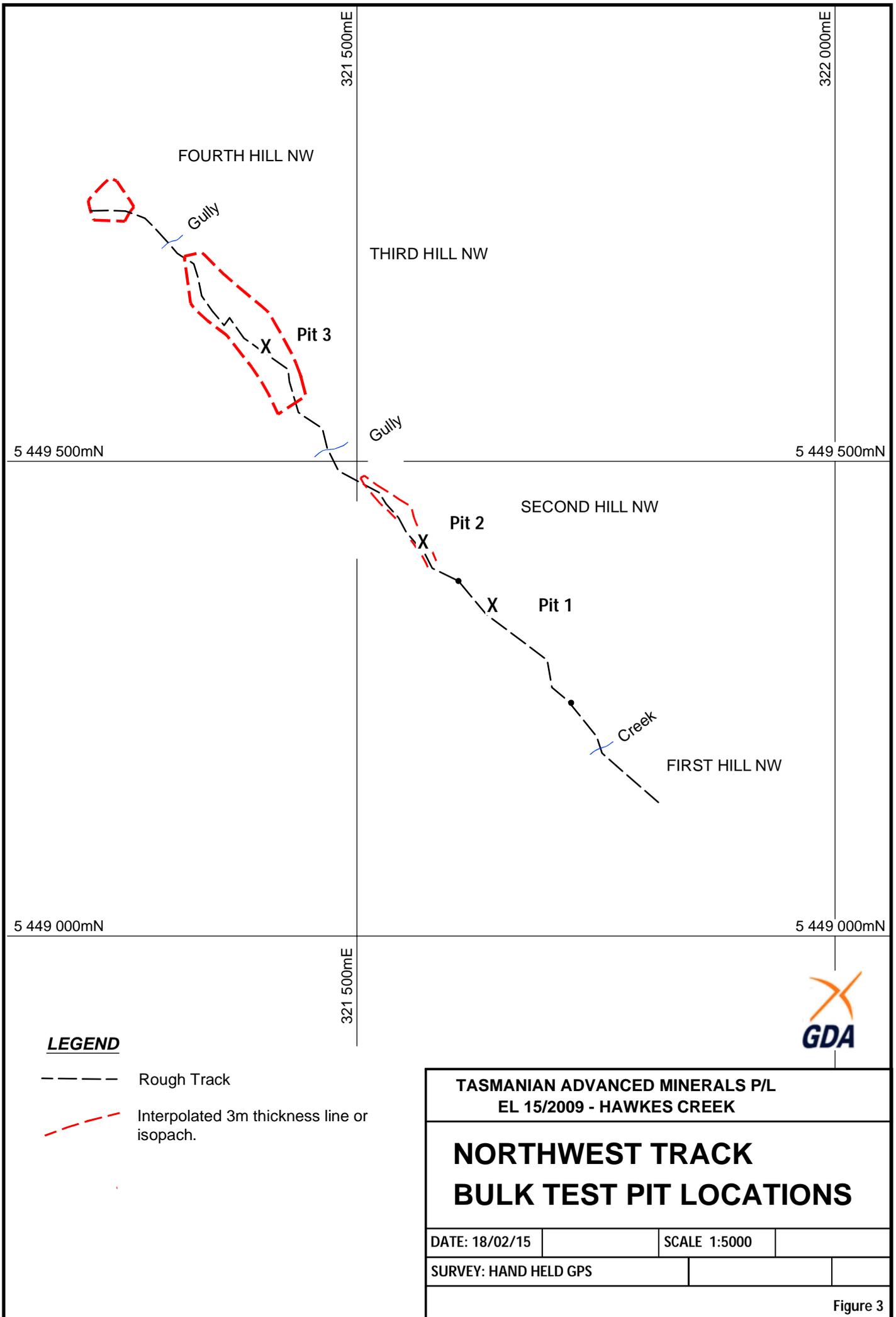
Date: 18/02/15	File : AR-Tenements 100k.wor
Scale: 1:100,000	Projection: MGA Zone 33 (GDA94)
Figure No	1



**LEGEND**

- Rough Track
- 11.33 4.7 Test pit with the number (11.33) and thickness (4.7m) of pale silica flour and lump silica.
- - - Interpolated 3m thickness line or isopach.
- b Indicates that the bottom of the pale silica was reached.

<b>TASMANIAN ADVANCED MINERALS P/L</b>			
<b>EL 15/2009 - HAWKES CREEK</b>			
<b>TEST PITS ALONG THE NORTHWEST TRACK</b>			
Compiled : Nic Turner	Drawn : Gillian Bennett	Date : 23/03/12	Scale : 1:5000
Survey : Hand held GPS, Tape and Compass		File : HC-TP-NWTrack.dwg	Figure : 2
<b>N. J. Turner Geological Services Pty Ltd</b>			



**LEGEND**

- Rough Track
- - - Interpolated 3m thickness line or isopach.



<b>TASMANIAN ADVANCED MINERALS P/L</b> <b>EL 15/2009 - HAWKES CREEK</b>			
<b>NORTHWEST TRACK</b> <b>BULK TEST PIT LOCATIONS</b>			
DATE: 18/02/15		SCALE 1:5000	
SURVEY: HAND HELD GPS			
Figure 3			

## Appendix 1: Work Log Summary

Date	Activity
3 Nov	Construct new stockpile pad.
4 Nov	Construct new stockpile pad.
5 Nov	Clear Northwest Track and construct new log bridge at 1 <sup>st</sup> gully.
6 Nov	Construct silt traps, build/repair gully crossings.
7 Nov	Clear and strip 1 <sup>st</sup> and 2 <sup>nd</sup> pits. Sample surfaces.
10 Nov	Clear and strip 1 <sup>st</sup> and 2 <sup>nd</sup> pits. Sample surfaces.
11 Nov	Clear and strip 3 <sup>rd</sup> pit. Sample surface.
12 Nov	Re-strip 1 <sup>st</sup> pit.
19 Nov	Mine 1 <sup>st</sup> pit.
20 Nov	Mine 1 <sup>st</sup> and 2 <sup>nd</sup> pits. Screen 1 <sup>st</sup> pit product.
21 Nov	Mine 1 <sup>st</sup> and 2 <sup>nd</sup> pits. Screen 1 <sup>st</sup> pit product.
24 Nov	Re-strip 3 <sup>rd</sup> pit. Screen 2 <sup>nd</sup> pit product.
25 Nov	Mine and screen 3 <sup>rd</sup> pit product.
26 Nov	Dig test holes in each pit and sample.
10-12 Dec	Rehabilitation work on pits and track.
Feb 2015	Process 2 <sup>nd</sup> pit silica.

## Appendix 2: Site Activity Photographs

Construction of gully crossing



Gully Crossing to 2<sup>nd</sup> Hill



Silt trap at near creek crossing



Main Access Track



Topsoil removal: strippings downslope for silt control



Surface sample point



**Extracting the bulk sample**



**Pit 3: High lump content**



**Screening the bulk sample at 50mm**



**Oversize will be broken down and re-screened**



**Pit 3 Stockpile**



**Stockpiles from each bulk sample pit**



**Track Rehabilitation**



**Test Pit Rehabilitation**



### Appendix 3: Bulk Sample Analysis

#### Analytical Results (ppm)

Lot	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	CaO	MgO	Cu	Cr	Mn	Ni	Na <sub>2</sub> O	SO <sub>3</sub>	K <sub>2</sub> O	Li <sub>2</sub> O
Pit 1 s/1	126	32	51	184	12	0.2	6.0	0.3	0.0	26	21	21	0.6
Pit 1 s/2	126	29	42	248	12	0.2	7.4	0.3	0.1	26	21	21	0.6
Pit 1 s/3	105	24	28	261	11	0.1	5.1	0.2	0.0	26	21	21	0.6
Pit 1 s/4	88	19	23	242	8	0.1	3.2	0.2	0.0	26	21	21	0.6
Pit 1 s/5	110	31	33	275	10	0.1	1.5	0.3	0.0	26	21	21	0.6
Pit 2 s/1	114	18	49	249	13	0.1	3.2	0.2	0.0	26	21	16	0.4
Pit 2 s/2	108	17	34	265	10	0.1	0.6	0.2	0.0	26	21	16	0.4
Pit 2 s/3	103	16	22	306	9	0.1	0.6	0.2	0.0	26	21	16	0.4
Pit 2 s/4	76	14	29	269	9	0.1	1.2	0.2	0.0	26	21	16	0.4
Pit 2 s/5	77	12	27	291	9	0.1	0.9	0.1	0.0	26	21	16	0.4
Pit 3 s/1	97	30	42	288	14	0.2	3.6	0.3	0.1	37	13	15	0.5
Pit 3 s/2	86	50	34	353	18	0.1	1.4	0.4	0.1	37	13	15	0.5
Pit 3 s/3	86	49	35	360	18	0.1	1.4	0.4	0.1	37	13	15	0.5
Pit 3 s/4	85	33	33	356	17	0.1	0.9	0.3	0.1	37	13	15	0.5
Pit 3 s/5	120	113	41	391	23	0.2	1.3	0.4	0.0	37	13	15	0.5

(note: s/1, s/2.....s/5 designates sample number, approximately one sample per 60 tonnes)

#### Particle Size Distribution (% retained on screens in µm)

Lot	425	300	250	150	106	75	45	PAN
Pit 1	27.9	7.3	3.7	8.7	5.3	5.2	11.2	30.4
Pit 2	22.3	6.2	3.0	7.5	5.4	6.0	13.6	35.9
Pit 3	46.6	4.6	1.9	5.3	3.6	4.1	8.5	24.8