EXPLORATION LICENCES: EL22244-EL22247, EL22251-EL22252, EL22351, EL23116-EL23119, EL23121, EL23510-EL23513 and EL23515

"CALVERT HILLS PROJECT"

JOINT ANNUAL REPORT

FOR THE PERIOD

22 AUGUST 2002 TO 8 JULY 2004

BY

C.A. WASHBURN
TENEMENT REPORT INDEX

OPERATOR: Astro Mining NL

PROJECT: Calvert Hills

TENEMENTS: Exploration Licences: EL22244-EL22247, EL22251-EL22252, EL22351, EL23116-EL23119, EL23121, EL23510-EL23515

JOINT REPORT PERIOD: 22 August 2002 to 8 July 2004

DUE DATE: 

AUTHOR: C. A. Washburn

STATE: Northern Territory

LATITUDE: S16°05’ – S17°30’

LONGITUDE: E135°45’ – E137°45’

MGA mN: 8225000 - 8060000

mE: 575000 - 800000

1 : 250,000 SHEET: SE53-03 Bauhinia Downs, SE53-04 Robinson River, SE5308 Calvert Hills

1 : 100,000 SHEET: 6064 Mallapungah, 6163 Lancewood, 6164 Glyde, 6165 Borroloola, 6263 Surprise Creek, 6264 Foelsche, 6265 Wearyan, 6363 Calvert Hills, 6364 Pungalina, 6365 Robinson, 6463 Wollogorang, 6464 Selby

MINERAL FIELD:

COMMODITY: Diamonds

KEYWORDS: Diamonds, aeromagnetic survey, Landsat Interpretation, data review, geology, surface sampling
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1 SUMMARY OF EXPLORATION ACTIVITIES

Exploration carried out over the Calvert Hills Project during the reporting period included the acquisition of geological, topographic and geophysical data, GIS compilations and data reviews, compilation of openfile data.

2 TENEMENT STATUS

Astro Mining NL is manager of the Calvert Hills Project, tenements are held either by Astro Mining or Axis Consultants. The project consists of eighteen tenements covering an area of 8,347km².

<table>
<thead>
<tr>
<th>Tenement</th>
<th>Date of Grant</th>
<th>Area (km²)</th>
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<td>8 Jul 2003</td>
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3 LOCATION AND ACCESS

The Calvert Hills Project covers approximately 8,347 square kilometers surrounding and east of the Merlin diamond field. Tenements cover the Bauhinia Downs, Robinson River and Calvert Hills 1:250,000 map sheets. Access to the area is via the Carpentaria Highway, east from Daly Waters to Cape Crawford, Borroloola and from the south via Wollongorang.

4 GEOLOGY

All the economic diamond deposits and other significantly diamondiferous occurrences in Australia occur on the North Australian Craton (“NAC”). The NAC underlies the Kimberley region of northern WA, the northern two thirds of the NT and the north western part of Queensland. It is also host to many significant base metal, gold and uranium deposits. The NAC was formed at about 1850 million years (Ma) during the Barramundi Orogeny by the amalgamation of Archaean and early Proterozoic rocks which now form the basement rocks of the NAC. Proterozoic (1820-1600 Ma ) platform cover sediments, Palaeozoic volcanics and
sediments, and Mesozoic sediments cover these basement rocks. The Palaeozoic volcanics comprise the Lower Cambrian Antrim Plateau Volcanics (about 550 Ma in age) and its equivalents. The only volcanic activity that has occurred on the NAC for the past 500 Ma has been the intrusion of diamondiferous kimberlite at 367 Ma (the Devonian age Merlin kimberlite field), 179 Ma (Jurassic age Timber Creek kimberlite field), and the 25 Ma (Tertiary age) lamproite field in the Ellendale (West Kimberley) area.

The large time span for the intrusion of diamondiferous rocks makes the NAC very prospective for diamond exploration and indicates diamonds have been preserved in the lithosphere below the NAC and that eruption of diamond-bearing volcanic rocks can occur at any time during the last 500 Ma. It is expected that kimberlites would occur in the central parts of the NAC and lamproites would be favored in the marginal areas and in cross cutting Proterozoic mobile zones.

The kimberlites and lamproites of the NAC tend to occur along major north west and north east trending structures. These structures can be seen in the gravity data crossing the NAC and have a strike length of many hundreds of kilometers. These structures are interpreted to be fundamental fractures in the NAC and are potential channel ways for diamondiferous intrusives.

4.1 LOCAL GEOLOGY

The Merlin region tenements are centred on the eastern side of the Batten Trough, which comprises Mesoproterozoic rocks of the McArthur Group, which are unconformably overlain in the south east by the Lower Cambrian age Bukalara Sandstone and small outliers of Cretaceous sediments. The McArthur River lead-zinc mine is located near the north western boundary of the Merlin Project area.

The Calvert Hills region tenements are situated in the north east section of the NAC, to the west of the Queensland border. The surface geology comprises mainly Mesoproterozoic sediments and volcanics, which are locally overlain by Cretaceous marine sediments. The Proterozoic and Mesozoic sediments are essentially undeformed and flat-lying. Terrestrial conditions have prevailed since the Cretaceous and deep chemical weathering has produced extensive lateritic soils and some silcrete and calcrete deposits (Pietsch et al 1991).

5 EXPLORATION

5.1 DATA REVIEW

The areas selected for exploration are based on a regional diamond prospectivity review carried out by Astro (Wright 2000), and in areas of moderate to high prospectivity, available open ground was covered by exploration licence applications. Open file exploration data were obtained from the Northern Territory Geological Survey (NTGS), a division of the NT Department of Business, Industry and Resource Development (DBIRD), formerly the NT Department of Mines and Energy (DME).

Available exploration data comprised open file reports of past exploration activity, NTGS and company open file airborne geophysical survey data and Landsat 7 thematic mapper (TM) data. The data was available on CD-ROM by request to the NTGS.

Open file exploration reports were examined and diamond exploration sampling data entered into Excel and a GIS database. Topographic and geological maps at a scale of 1:250 000 were acquired in raster format as a base for the plotting of the data (Figure 3).
The NTGS supplied the available geophysical data as located data files and processed grid images. Astro has acquired approximately 1 million line kilometers of geophysical over the Northern Territory. Stacked magnetic profiles of the first vertical derivative of the residual magnetics were processed from the located data and imported into the GIS. Images of total magnetic intensity and vertical derivatives were supplied by the NTGS. The stacked profiles were used to select pipe-like targets that may represent kimberlite or lamproite intrusives (Figure 4).

Geophysical processing was conducted in-house and a number of anomalies defined. The examination of stacked profiles is considered essential in searching for pipe-like targets as the gridding routines used to prepare images, smooth the data and hence hide small targets. A pipe response may only occur on one line when using regional data and would be missed if only images are used.

Magnetic targets were numbered using the abbreviated 1:100,000 map sheet name and a sequential number (Figure 5). The line spacing of these regional surveys ranges from 300 to 500 m, and has been used to detect pipe-like responses on one or more lines. The aim is to detect a pipe field by finding at least one pipe with the regional data, and then to acquire more detailed geophysics to identify other pipes in the field.

Landsat TM data was processed in-house using ERMapper and RGB colour images were produced comprising channels 321, 531, 741 and principle components (PC) 123. Thirty-three Landsat scenes have been acquired from the NTGS over the Northern Territory, covering all of the tenement areas.

5.2 Previous Work

**EL23121-Glyde River**

Rio Tinto (via CRA Exploration and Ashton Mining) has explored the tenement area for kimberlite. Ashton collected two bulk samples from separate drainages and recovered grades of 7 cpht and 10 cpht. Helicopter magnetics and EM covered the northern part of the tenement as part of Rio Tinto’s exploration around the Merlin pipe field. Indicator mineral sampling and geophysics did not indicate the presence of any kimberlitic sources on the tenement and both companies surrendered the ground. The fact that only bulk sampling recognised the presence of diamonds in these drainages confirms Astro’s conclusion that previous exploration by conventional stream sampling has not fully tested these areas.

**Merlin Area Tenements**

Ashton and Rio Tinto have carried out diamond exploration in the area which eventually resulted in the discovery of the Merlin mine. Exploration has comprised traditional stream and loam sampling for indicator minerals, aeromagnetic surveys and some EM geophysical surveys.

**EL 22244 & EL22351**

These two EL’s lie south of Borroloola and east of the McArthur River Pb-Zn mine. EL’s 22244 and 22351 have been sampled at a density of 12.5 and 20.8 km²/sample. Only two microdiamonds have been recovered by previous work in this area.

**EL22245**

This EL adjoins the southern boundary of EL22244 and the northern boundary of EL23119, and
is about 20 km east of the Merlin mine. This tenement has been densely sampled (1.5 km²/sample) and has produced macrodiamonds in two samples and microdiamonds in nine samples. Chromite was recovered in 48 samples. Repeat sampling and follow-up sampling by previous explorers failed to find a source for these diamonds.

EL23116

Tenement EL23116 is located immediately north of Cape Crawford and has no recorded open file stream sampling information.

EL23117

This tenement lies 44 km WNW of Merlin and 11 km NE of the Abner Range kimberlite pipe. No past sampling information could be located for this tenement.

EL23118

EL23118 lies closest to the Abner Range kimberlite and no open file data on diamond sampling is available for this area.

EL23119

This EL adjoins the southern boundary of EL22245 and has a high sample density of 1.1 km²/sample.

EL23120

EL23120 is located about 43 km SE of the Merlin diamond field and has a sampling density of 25.3 km²/sample, but 95% of the tenement is unsampled. Open file reports record the collection of 2 samples, but Ashton and CRAE have probably sampled the tenement as part of open range exploration.

Calvert Hills Tenements

Ashton and Rio Tinto have carried out exploration to varying extents on various parts of the area. Past conventional indicator mineral sampling has recovered macrodiamonds, microdiamonds and chromite indicator minerals.

EL22246, EL22247 & EL22251

These tenements are located on the eastern side of the Robinson River 1:250 000 map sheet. Examination of the open file data has indicated that these tenements are under-explored and more work should be done. Sample site density is 72, 19 and 10 km² per sample for EL’s 22246, 22247 and 22251 respectively.

EL22252

This EL lies in the central part of the Calvert Hills 1:250 000 map sheet. The EL straddles the NW-SE trending Calvert Fault. Ashton recovered three microdiamonds but follow-up failed to indicate a source.
5.3 GEOPHYSICS

**EL23121-Glyde River**

The tenement area is covered by the NTGS Bauhinia aeromagnetic survey and an open file aeromagnetic and EM survey (Tintagel survey – area 2) flown by Ashton / Rio Tinto.

<table>
<thead>
<tr>
<th>Survey</th>
<th>Direction (degrees)</th>
<th>Line Spacing (m)</th>
<th>Height AGL (m)</th>
<th>Sample Interval (m)</th>
<th>Resolution (nT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bauhinia</td>
<td>090</td>
<td>400</td>
<td>80</td>
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<td>Tintagel – area 2</td>
<td>180</td>
<td>100</td>
<td>60</td>
<td>8</td>
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</table>

No magnetic anomalies were picked from the Bauhinia survey data. Eight EM and four magnetic targets were picked by Ashton / Rio Tinto, but none were drilled.

**Merlin Area Tenements**

Numerous company geophysical surveys have been flown in various parts of the area with the main aeromagnetic surveys listed below.

<table>
<thead>
<tr>
<th>Survey</th>
<th>Direction (degrees)</th>
<th>Line Spacing (m)</th>
<th>Height AGL (m)</th>
<th>Sample Interval (m)</th>
<th>Resolution (nT)</th>
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<tr>
<td>Bauhinia</td>
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<td>14</td>
<td>0.04</td>
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<tr>
<td>Robinson River</td>
<td>090</td>
<td>500</td>
<td>100</td>
<td>7</td>
<td>0.001</td>
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<tr>
<td>Foelsche</td>
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<td>200</td>
<td>60</td>
<td>11.6</td>
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<tr>
<td>Glyde</td>
<td>045</td>
<td>300</td>
<td>80</td>
<td></td>
<td>0.04</td>
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</table>

EL 22244 & EL22351

Twenty two magnetic targets were selected from stacked profiles of the first vertical derivative magnetics and 23 magnetic targets were selected from the magnetic images. These targets require field follow-up and surface loam sampling for indicator minerals.

EL22245

Four magnetic targets were selected from stacked profiles of the first vertical derivative magnetics and 4 magnetic targets were selected from the magnetic images. These targets require field follow-up and surface loam sampling for indicator minerals.

EL23119

Rio Tinto flew the western part of the tenement with helicopter EM (Tintagel survey) but no obvious anomalies were detected.

**Calvert Hills Tenements**

The area is covered by regional aeromagnetic data complied by the NTGS Robinson River and Barkly surveys and open file company survey data.

<table>
<thead>
<tr>
<th>Survey</th>
<th>Direction (degrees)</th>
<th>Line Spacing (m)</th>
<th>Height AGL (m)</th>
<th>Sample Interval (m)</th>
<th>Resolution (nT)</th>
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</thead>
<tbody>
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<td>500</td>
<td>100</td>
<td>7</td>
<td>0.001</td>
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<tr>
<td>Area</td>
<td>X</td>
<td>Y</td>
<td>Width</td>
<td>Height</td>
<td>Target</td>
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<td>-----</td>
<td>----</td>
<td>-------</td>
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<td>Barkly Area 1</td>
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</table>

Stacked magnetic profiles for the Robinson River and Barkly surveys have been produced and examined for pipe-like targets.

EL22246, EL22247 & EL22251

Eleven magnetic targets were selected from stacked profiles of the first vertical derivative magnetics and 26 magnetic targets were selected from the magnetic images. These targets require field follow-up and surface loam sampling for indicator minerals.

5.4 **LANSAT7 TM**

Landsat TM data was processed in-house using ERMapper and RGB colour images were produced comprising channels 321, 531, 741 and principle components (PC) 123. Thirty-three Landsat scenes have been acquired from the NTGS over the Northern Territory, covering all of the tenement areas.

**EL23121-Glyde River**

Three Landsat TM targets are recommended for ground follow-up.

**Merlin Area Tenements**

EL 22244 & EL22351

Seventeen Landsat TM targets have been identified for surface inspection and loam sampling.

EL22245

Nine Landsat TM targets have been identified for surface inspection and loam sampling.

**Calvert Hills Tenements**

EL22246, EL22247 & EL22251

Twenty Landsat TM targets have been identified for surface inspection and loam sampling.

5.5 **PROPOSED EXPLORATION**

**EL23121-Glyde River**

The initial exploration targets in this tenement are the two known diamondiferous drainages and the alluvial gravels of the Glyde River (figure 6). Work needs to be undertaken to assess the amount of potentially economic gravels in these areas. Other drainages may also be diamondiferous and require sampling. All the work carried out by Ashton and CRAE failed to indicate the presence of a primary source on the tenement, but this will need to be reviewed.

Reconnaissance geological mapping should be carried out along the drainages to allow estimates of gravel volumes and to allow selection of sites for further sampling. If a mineable resource is present, then bulk sampling is proposed to estimate diamond value and grade.

Four bulk samples are proposed to test other drainages in the EL for diamonds. Three Landsat TM targets are recommended for ground follow-up. The eastern part of the tenement appears to be poorly drained and a detailed EM and/or airborne gravity survey may be necessary in this area.
to detect hidden pipes. Follow up will also be carried out on the magnetic and EM anomalies located by Rio Tinto.

**Merlin Area Tenements**

The main exploration target considered for immediate follow-up is the Foelsche target area where macrodiamonds and microdiamonds have been recovered, but no source has been found to date.

EL 22244 & EL22351

15 mini-bulk samples are proposed to effectively explore this tenement block.

EL22245

Five mini-bulk samples are proposed to validate the occurrence of macrodiamonds and identify a drainage that will lead to the source of these diamonds. A sample is also proposed for the upper reaches of the Foelsche River where large numbers (20-50 grains) of chromite were recovered by a previous explorer.

EL23116

Four mini-bulk samples would be required to test this EL.

EL23117

Four mini-bulk samples are proposed.

EL23118

The narrow shape of the EL and the orientation of the drainage do not make this area particularly suited to stream sampling. Three mini-bulk samples are proposed for this area.

EL23119

One mini-bulk sample is proposed to test the tenement for macrodiamonds.

EL23120

Six mini-bulk samples are proposed for this EL.

**Calvert Hills Tenements**

The main drainages in this tenement group have yielded diamonds and chromite locally. Poor indicator mineral dispersion due to intense, long-term weathering, has made conventional indicator mineral sampling difficult to interpret and ineffective.

Aeromagnetic and Landsat TM targets will be followed up by surface loam sampling comprising the collection of two 40 kg –2mm samples from directly over the target area. Loam from anthills will be sought in areas of obvious deep cover or transported overburden.

Mini-bulk sampling is proposed as a replacement for conventional sampling. The mini-bulk sampling method will comprise the collection of a larger stream sample (1 tonne of –2mm material) from major drainages of the area for the direct detection of diamond. This 1 tonne of –2mm will be processed down to 0.3 mm and will be approximately equivalent to a conventional 50 tonne bulk sample processed to 1 mm.

EL22246, EL22247 & EL22251

It is proposed that 18 mini-bulk samples be collected around the outside of the tenement block. The tenements drain the headwaters of the major creeks in the area and samples collected near the edges of the tenement block will effectively test the area for the occurrence of macrodiamonds.

EL22252

Four mini-bulk samples are proposed to test the tenement for macrodiamonds.
6 BIBLIOGRAPHY

