TECHNICAL REPORT NO. 2114

EL 7353, WOLLOGORANG, NT

First Annual and Final Report for the period
May 1991 - April 1992

Jane Slack-Smith
PROJECT GEOLOGIST
DISTRIBUTION

1. Northern Territory Department of Mines and Energy
2. Helix Resources NL
3. File
CONTENTS

1. INTRODUCTION
2. LOCATION AND ACCESS
3. TENURE
4. GEOLOGY AND PHYSIOGRAPHY
5. PREVIOUS EXPLORATION
6. EXPLORATION ACTIVITIES
7. CONCLUSIONS AND ACTIVITIES
8. EXPENDITURE
9. REFERENCES

FIGURES

1. EL 7353, LOCATION AND ACCESS
2. GEOLOGY
3. DRAINAGE AND SAMPLE LOCATION

APPENDIX

1. GEOCHEMICAL RESULTS
1. **INTRODUCTION**

Helix Resources NL (Helix) attained Exploration Licence 7353 at Wollogorang to explore an area of the eastern McArthur Basin for diamonds and base metals.

Microdiamonds occur as a "cloud" over a large area of the Northern Territory, with the highest abundances surrounding pipe-like structures in an area between Coanjula Creek and Brunette Downs (Smith et al, 1990), to the west of EL 7353. The area covered by EL 7353 has had little previous exploration, hence it had the potential to host an unknown diamond occurrence.

Helix's exploration rationale at Wollogorang was to establish whether the occurrence of wide spread blue corundum was related to diamond occurrence. Blue corundum and diamonds are known to co-exist in the Copeton (NSW) and Anakie (Qld) diamond fields. It was suggested by Lishmund and Oakes (1983) that the conduits for the basaltic lava containing sapphires may have been shared by the diamond source rocks previously. The blue corundum in the McArthur Basin is found in highest concentrations in stream and loam samples derived from near the volcanic sequences.

Helix undertook a steam sediment sampling programme of the base of the Settlement Creek Volcanic sequence and the underlying units to ascertain the diamond potential for the area.

Copper mineralisation occurs in several different geological settings namely breccia pipes, veins and stratiform deposits in the Calvert Hills area. A brief sampling programme was conducted to assess a small fault system parallel to the Calvert Fault for base-metal and precious metal mineralisation.

2. **TENURE**

Exploration Licence 7353 was granted to Helix Resources NL by the Northern Territory Department of Mines and Energy on 22 May 1991 for a period of 12 months. The tenement covers an area of 747km² (240 blocks). EL 7353 was surrendered on 23 April 1992.

3. **LOCATION AND ACCESS**

Exploration Licence 7353 is located in the north-east quadrant of the Calvert Hills 1:250,000 mapsheet (Sheet SE 53-8) (Figure 1). The area is accessible by graded road from Borroloola to Burketown. Wollogorang Station is some 260km from Borroloola. Station tracks provide limited access within the tenement. A helicopter was employed to access the south-eastern sections of the tenement, where 4WD access was difficult.

4. **PREVIOUS EXPLORATION**

An information search conducted at the Northern Territory Department of Mines and Energy revealed little previous exploration within the boundary of EL 7353.
A small amount of vein type copper mineralisation has been mined from Vulcan Prospect (Eupene Exploration Ent., 1989) which is located in the south of EL 7353 (Figure 2). In 1979 CRA Exploration Ltd reported taking two rock samples in the Vulcan Prospect area. The samples were assayed and returned very low values of copper (<100ppm), low values of other base metals and gold was not detected. Some barite was reported. It was concluded that an area other than Vulcan Prospect was sampled.

In 1984-85 Stockdale Prospecting Ltd took six stream sediment samples from much the same area as EL 7353. Four non-kimberlitic ilmenites were found, however, no diamonds or diamond indicator minerals were reported.

Redbank Copper Field is located some 10km west of EL 7353. Redbank Mine is a hydrothermally mineralised breccia-pipe. It was found in 1912 and sustained small scale operations until 1960. Subsequent exploration revealed over fifty breccia-pipes in the area, only four of which carry significant mineralisation (NTGS, 1989).

5. REGIONAL GEOLOGY AND PHYSIOGRAPHY

Exploration Licence 7353 lies on the south-eastern edge of the McArthur Basin. The land is characterised by gently undulating hills deeply incised by major drainage. Settlement Creek and Branch Creek and their tributaries drain the tenement area. Both systems flow to the northeast and are intermittent with some perennial water-holes. Settlement Creek is flanked by flat-lying alluvium, while Branch Creek cuts through more resistant beds forming steep-sided gorges.

The tenement covers an area of outcropping Middle Proterozoic Tawallah Group comprising the oldest group of the McArthur Basin sequence. The units represented in drainage samples are Seigal Volcanics, Carolina Sandstone, McDermott Formation, Sly Creek Sandstone, Aquarium Formation, Settlement Creek Volcanics and the Wollogorang Volcanics (Figure 2).

The Tawallah Group, as described below by Ahmad and Wygralak (1989) consists of alternating detrital sediments, volcanics and carbonates and overlies the igneous and metamorphic complexes of the Murphy Inlier.
The Westmoreland Conglomerate unconformably overlies the Murphy Inlier and is the lowest unit of the Tawallah Group it does not outcrop in the tenement area. The Seigal Volcanics conformably overlie the Westmoreland Conglomerate and consist of basic lavas with tholeiitic affinities (Darby 1986 *fide* Ahmad and Wygralak 1989), with minor tuff, sandstone and siltstone interbeds. The Carolina Sandstone is one of these interbeds with a thickness of some 20m. Only the upper portion of the Seigal Volcanics, above the Carolina Sandstone outcrops within the tenement boundary. The McDermott Formation conformably overlies the Seigal Volcanics within the tenement area but lenses out to the southwest where Sly Creek Sandstone directly overlies the Seigal Volcanics. The McDermott Formation is characterised by carbonate bank - shoreline facies sediments. A variety of rock-types and sedimentary structures, such as oolite and pisolite bearing sediments, cross bedding, ripple marks, pseudomorphs after evaporitic minerals and stratiform and columnar stromatolites represent changes in local depositional environment. A chertified unit within the McDermott Formation forms a topographically prominent resistant ridge. The Sly Creek Sandstone consists of fine to medium grained laminated sandstone, with symmetric ripple-marks, and desiccation cracks. It is laterally and vertically uniform. The appearance of glauconite in the sediments marks the onset of deposition of the Aquarium Formation. The Aquarium Formation changes from sandstone to upper units of dolomitic siltstone and dolomite with glauconite throughout, indicating a decrease in the influx of terrigenous material into a shallow marine environment. The Settlement Creek Volcanics conformably overlie the Aquarium Formation and consist of a series of lava flows, sills, siltstone interbeds and pyroclastic material. The Wollogorang Formation which overlies the Settlement Creek Volcanics, consists of dolomitic sandstones and siltstones. Oolites, stromatolites, cross-bedding, ripple marks, intraclast breccias, halite clasts, bituminous nodules and ferruginous sandstones indicate a varying depositional environment namely low-energy lagoonal, marginal marine to high energy carbonate bank with periods of emergence. The overlying Gold Creek Volcanics are comprised of trachytic lavas with tuffs, tuffaceous and lithic sandstone and siltstone. Ahmad and Wygralak suggest a number of breccia pipes and a marked thickening of the Gold Creek Volcanics near Redbank indicate that major extrusive centres were proximal.

Darby (1986) *fide* Ahmad and Wygralak (1989) classified the Settlement Creek Volcanics as latite and suggest that while the Seigal Volcanics have tholeiitic affinity, the Settlement Creek and Gold Creek Volcanics have more alkaline characteristics but all three have been derived from the same source.

The beds of the Tawallah Group dip shallowly (less than 5°) to the north and northwest. Some folding is evident in the Aquarium Formation, Sly Creek Sandstone and the McDermott Formation between Branch Creek and Settlement Creek. The fold system consists of a series of open folds either cylindrical or domal with their axes orientated about a north-easterly direction.

Several faults trending NW-SE are located in the south of the tenement area. They parallel the Calvert Fault some 35km to the south. A conjugate fault and several lineaments trend WSW-ENE.
6. **EXPLORATION SUMMARY**

Helix Resources NL has conducted stream sediment sampling, air photo interpretation, rock sampling and rock geochemistry on Exploration Licence 7353.

Field work was conducted in September 1991. A base camp was established at Wollogorang Station in the north of the exploration licence area.

52 stream sediment samples (Figure 3) were taken at a spacing of approximately 1 sample per 14 km², predominantly from the Settlement Creek and Branch Creek drainage systems. The samples consisted of 15-25 kg of -3mm creek gravel, taken from the best available trapsite. Good heavy mineral trap site samples were abundant in the larger and more deeply incised major creeks. The samples were returned to Diatech Laboratories in Perth where they underwent heavy mineral concentration (Willey table and tetrabromoethane heavy liquid separation). The light fraction (Specific Gravity <2.96) was discarded and the heavy fractions screened at 1.0mm, 0.4mm and 0.25mm. The +0.25mm fractions were observed for diamond indicator minerals and any other anomalous mineralogy. Mineral observation was conducted by the author at the office of Helix Resources in West Perth. Anomalous grains were removed and analysed qualitatively using the Geosem scanning electron microscope at CSIRO Laboratories, Floreat Park.

The +1.0mm fraction consisted principally of pisolite nodules, quartz and weathered lithic fragments. The finer fractions comprised iron oxides, quartz, ilmenite, tourmaline, zircon, epidote, rutile and hornblende with lesser amounts of anatase, leucoxene and blue corundum and trace amounts of sphene, clinopyroxene, malachite, kyanite and apatite. Glaucophane was present in all size fractions from samples downstream of Aquarium Formation. Finer fractions of samples taken from drainage off Settlement Creek Volcanics contained up to 80% Fe-rich ilmenite.

No diamonds or diamond indicator minerals were recovered.

10 rock samples were taken from in two traverses a NW-SE trending fault in the south of the exploration licence some 5km NE of Carolina airstrip (Figure 3). The samples were assayed for Cu, Ni, Zn, Ag and Pb, using perchloric acid digestion and AAS finish and Au, Pt and Pd using fire assay, lead collection and ICP-MS finish at Analabs Perth. No significant geochemical results were returned (Appendix 1).
7. CONCLUSIONS AND RECOMMENDATIONS

No diamonds or diamond indicator minerals were isolated from stream sediment samples taken from Exploration Licence 7353. It is concluded that the area has little prospectivity for an economic diamond deposit.

Geochemical results of a faulted area in the south of Exploration Licence 7353 have revealed very low values of Cu, Ni, Zn, Ag, Pb, Au, Pt and Pd. The faulted area is not prospective for these elements.

Subsequent to these results the area was relinquished by Helix Resources NL on 23 April 1992.
8. **EXPENDITURE**

The following expenditure details are for the period ending 23 April, 1992.

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries and Wages</td>
<td>11,370</td>
</tr>
<tr>
<td>Travel and Accommodation</td>
<td>3,133</td>
</tr>
<tr>
<td>Aerial Photography and Mapping</td>
<td>232</td>
</tr>
<tr>
<td>Assay and Geochemical</td>
<td>5,611</td>
</tr>
<tr>
<td>Consultants</td>
<td>25</td>
</tr>
<tr>
<td>Photocopying and Stationary</td>
<td>38</td>
</tr>
<tr>
<td>Data Acquisition</td>
<td>16</td>
</tr>
<tr>
<td>Freight and Cartage</td>
<td>1,354</td>
</tr>
<tr>
<td>Fuel, Oil, Service, Tyres</td>
<td>1,119</td>
</tr>
<tr>
<td>Vehicle Rental</td>
<td>1,732</td>
</tr>
<tr>
<td>Tenement Application Costs</td>
<td>1,195</td>
</tr>
<tr>
<td>Mines Department Rental</td>
<td>2,515</td>
</tr>
<tr>
<td>Field Equipment</td>
<td>247</td>
</tr>
<tr>
<td>Field Expenses</td>
<td>139</td>
</tr>
<tr>
<td>Machinery and Equipment Hire</td>
<td>399</td>
</tr>
<tr>
<td>Helicopter Hire</td>
<td>9,383</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>38,508</strong></td>
</tr>
<tr>
<td>Administration Costs (10%)</td>
<td>3,851</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$42,359</strong></td>
</tr>
</tbody>
</table>
9. REFERENCES


FIGURES
FIGURE 1: EL 7353 LOCATION AND ACCESS
APPENDIX
## Analytical Report

**INVOICE TO:**
Tony Martin  
Helix Resources NL  
PO Box 825  
West Perth WA 6005

**RECEIVED**
6 APR 1992

**ORDER No.**
1410

**DATE RECEIVED**
24/03/92

**RESULTS REQUIRED**
ASAP

<table>
<thead>
<tr>
<th>SAMPLE NUMBERS</th>
<th>SAMPLE DESCRIPTION</th>
<th>ELEMENT/METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1 1/1/6, W2 1/1/6</td>
<td>RK Prep : BP009, BP018</td>
<td>Au, Pt, Pd/65333</td>
</tr>
<tr>
<td>W1 1/1/6, W2 1/1/6</td>
<td>RK Prep :</td>
<td>Cu, Ni, Pb, Zn, Ag/6A101</td>
</tr>
</tbody>
</table>

**RESULTS**

**TO**
West Perth WA 6005

**REMARKS**
<table>
<thead>
<tr>
<th>TUBE No.</th>
<th>SAMPLE No.</th>
<th>Ni</th>
<th>Cu</th>
<th>Zn</th>
<th>Pd</th>
<th>Ag</th>
<th>Pt</th>
<th>Au</th>
<th>Pb</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WD 1/1</td>
<td>45</td>
<td>209</td>
<td>4</td>
<td>1.63</td>
<td>&lt;2</td>
<td>3.4</td>
<td>3.34</td>
<td>&lt;5</td>
</tr>
<tr>
<td>2</td>
<td>WD 1/2</td>
<td>5</td>
<td>43</td>
<td>7</td>
<td>1.21</td>
<td>&lt;2</td>
<td>9.35</td>
<td>2.6</td>
<td>&lt;5</td>
</tr>
<tr>
<td>3</td>
<td>WD 1/3</td>
<td>&lt;5</td>
<td>14</td>
<td>11</td>
<td>0.89</td>
<td>&lt;2</td>
<td>6.48</td>
<td>1.55</td>
<td>&lt;5</td>
</tr>
<tr>
<td>4</td>
<td>WD 1/4</td>
<td>&lt;5</td>
<td>15</td>
<td>10</td>
<td>0.68</td>
<td>&lt;2</td>
<td>5.21</td>
<td>1.1</td>
<td>&lt;5</td>
</tr>
<tr>
<td>5</td>
<td>WD 2/1</td>
<td>35</td>
<td>15</td>
<td>120</td>
<td>4.47</td>
<td>&lt;2</td>
<td>3.89</td>
<td>&lt;1</td>
<td>&lt;5</td>
</tr>
<tr>
<td>6</td>
<td>WD 2/2</td>
<td>5</td>
<td>62</td>
<td>18</td>
<td>3.5</td>
<td>&lt;2</td>
<td>5.13</td>
<td>&lt;1</td>
<td>&lt;5</td>
</tr>
<tr>
<td>7</td>
<td>WD 2/3</td>
<td>&lt;5</td>
<td>112</td>
<td>4</td>
<td>5.56</td>
<td>&lt;2</td>
<td>9.04</td>
<td>2.16</td>
<td>&lt;5</td>
</tr>
<tr>
<td>8</td>
<td>WD 2/4</td>
<td>&lt;5</td>
<td>22</td>
<td>18</td>
<td>2.23</td>
<td>&lt;2</td>
<td>8.15</td>
<td>3.95</td>
<td>&lt;5</td>
</tr>
<tr>
<td>9</td>
<td>WD 2/5</td>
<td>&lt;5</td>
<td>25</td>
<td>12</td>
<td>2.54</td>
<td>&lt;2</td>
<td>5.06</td>
<td>1.95</td>
<td>&lt;5</td>
</tr>
<tr>
<td>10</td>
<td>WD 2/6</td>
<td>70</td>
<td>51</td>
<td>78</td>
<td>4.48</td>
<td>&lt;2</td>
<td>4.78</td>
<td>4.04</td>
<td>&lt;5</td>
</tr>
</tbody>
</table>

**DETECTION**

| DETECTION | 5 | 4 | 4 | 0.5 | 2 | 0.5 | 1. | 5 |

**UNITS**

| UNITS | ppm | ppm | ppm | ppb | ppm | ppb | ppb | ppm |

**METHOD**

| METHOD | GA101 | GA101 | GA101 | G6333 | GA101 | G6333 | G6333 | GA101 |

Results in ppm unless otherwise specified.
T = element present, but concentration too low to measure.
X = element concentration is below detection limit.
— = element not determined.

AUTHORISED OFFICER: C. Scully