

## **Memorandum**

From: Stewart Capp  
To: Alan Daley  
Date: 7<sup>th</sup> January 2011  
Subject: **Proposal for Scoping Study and Drilling - Arthur River - \$1,250,000**

---

### **Strategy**

The primary aim of this work is to test perceived critical issues related to the economics of developing magnesite resource at Arthur River, document development options at a scoping level and recommend further work as appropriate.

### **Drilling**

The drilling is planned in two parts.

The exploration drilling will;

- 1) Test continuity of the magnesite between the defined resource and the west side of the Johnnys Creek buffer zone. 10 holes are planned to test potential extensions to the high grade magnesite zone on the eastern side of the dolerite dyke, and provide some information about the number and thickness of dolerite sills interpreted in the area.
- 2) Test the width of the dolerite dyke in the centre of the high grade zone and any geotechnical issues associated with its margins.

The drilling is planned so that further drilling can be infilled on a 100m x 50m pattern in order to upgrade confidence to a JORC Indicated level at some point in the future. The proposed drill spacing should be sufficient to estimate an Inferred resource in the exploration area, subject to success in the drilling.

The hydrological investigation will;

- 1) Quantify to a high level of confidence potential hydrological issues in the Pit 1 area and its immediate surrounds.
- 2) Recommend further investigations that may be required to complete a pre-feasibility level investigation on the project.

	<b>Exploration</b>	<b>Hydrology</b>	<b>Total</b>
<b>Number of Holes</b>	11	5	16 holes
<b>Diamond Drill Meters</b>	1,650m	400m	2,050m
<b>Water Bore Meters</b>		100m	100m

## **Drilling Equipment**

The proposed drilling equipment is a skid mounted CS1000 P4 diamond drill rig, and support vehicles from E-Drill of Wynyard.

The drilling equipment will be walked into site across the ford on the Arthur River, with the proposed bridge being used for light vehicle traffic to re-supply and allow easy movement of personnel. The rig will be double shifted to increase productivity and minimise security issues. Average penetration rates of 20m per shift (40m per day) are anticipated.

E-Drill has been selected as the preferred contractor for this first round of work, due to their familiarity with the project and their availability. Their charges are in line with current industry standards.

The rig becomes available in early February 2011; pre ordering of critical long lead time items has already been approved, no invoices have been received to date.

A contingency of 10% has been included with the drilling to cover the potential for additional costs to apply due to poorer than expected ground conditions, or weather events that may extend the drilling program.

## **Technical Issues**

The biggest problems encountered in the past were associated with drilling through and collaring the holes in the 20 to 30m of alluvial cover over the magnesite body. This material tends to cave in and block the drill hole if the rods are removed to change out the PQ barrel for a blank HW rod as would be normal to case the collar of the hole.

The technique used successfully in the past was to collar the hole with HW rods and a PQ barrel and drill until fresh rock is encountered. The PQ barrel and HW rods are left in place and an HQ drill string is drilled through them. The PQ barrel tends to become wedged in place and cannot be recovered after completion of the hole.

The HW rods can be generally recovered by cutting them off above the PQ barrel. This results on average in the loss of a PQ barrel, reamer, bit and 1 HW rod per hole at a cost of \$3,356. PQ barrels have an 8 week lead time for delivery, hence the pre-ordering of equipment required for this job.

Drilling in the magnesite is generally good, and the cavities present little problem. They are interpreted to be filled with silt, which assists in retaining water return. The silts are difficult to recover with normal HQ triple tube (HQTT). Some effort will be

made in this program to recover some of the material to in order to assess its physical properties and allow for some geotechnical assessment.

All drilling will be orientated triple tube core (for geotechnical and geological information), with downhole surveys on 30m intervals.

Water monitoring bores will be drilled as vertical diamond holes and logged and sampled in the same manner as the exploration holes.

Due to its diameter the pumping bore must be drilled with a water bore rig. The hole will be logged but not sampled as it is an open hole drilling system which will be extensively contaminated by the overlying alluvium. The water bore rig is mounted on a large twin steer truck; significant works are required to the ford track across the Arthur River to facilitate access.

### **TMNL Purchasing**

TMNL are to provide;

- Core Trays
- Core blocks
- Sample bags
- Sampling equipment
- Core logging racks
- Accommodation and meals for all staff and drillers if camping.
- Transport on site (4WD) for TMNL personnel

### **Geological Personnel – Derwent Geoscience**

Technical oversight is estimated to comprise 8 to 12 days per month for Stewart Capp during the course of the drilling. In addition it is envisaged that Stewart will co-ordinate the technical aspects of the scoping study and compile the final report with the assistance of GME.

The project geologist will be Chris Allen, who is already familiar with the old core. He will be responsible for logging and sampling the core, drill rig supervision and geological interpretation.

Andrew Eastaugh will act as site foreman to oversee construction and operation of the core processing facility, drill site preparation, OH&S and site rehabilitation. He will also oversee other field labour on the project which will comprise at least 1 labourer at any time. Labour will be sourced locally in the Wynyard area.

Work times for field staff are budgeted on the basis of a 20 day month, with Andrew and Chris scheduling their breaks so that one or the other is present at all times whilst the rig is in operation.

Drill core will be collected from site and transported to the core shed in Wynyard for processing, logging and sampling. Two vehicles are required so that Andrew is free to

supervise all field work on site, and there is transport for the geologist to collect core and attend call outs to the rig when required.

Field personnel will be accommodated in Wynyard in a furnished rental house and cook their own meals. Suitable accommodation, and short rental terms are available.

Analytical work will be carried out by Burnie Research Laboratories (BRL) who conducted the metallurgical test work and analyses for TMNL in 2010.

## **Hydrology**

It is proposed to engage GHD to provide hydrological and geotechnical input to the scoping study as these issues are strongly linked in this project.

Based on the recommendations of Coffey, the hydrological program will be carried out to a pre-feasibility standard in the Pit 1 area as water issues are considered to be critical to the economics of mining an open pit.

Work will comprise installing a production bore, drilled into the magnesite between the dolerite dyke and Johnnys Creek, with four monitoring bores drilled around the margins of the envisaged pit area. The actual location of these holes will be determined by GHD.

Pumping tests will be carried out over a 6 to 10 day period on both the new bore and the original one in the Pit 1 area (if it is still functional), with monitoring and sampling of groundwater being undertaken at regular intervals.

Following the pump tests further measurements will be taken to measure to recovery rate of groundwater levels. The data will then be modelled so that predictions of pumping rates required to de-water the open pit at various levels can be made.

It is envisaged that the hydrologist and geotechnical engineer will make a site visit prior to the start of drilling to familiarise themselves with the project. The hydrologist will supervise the pumping tests, with labour provided by geological support staff already on site. These staff may also be trained to take regular measurements rainfall and water levels in the rivers and drill holes over the period during which active work is being conducted on site.

The Hydrologist will provide a report detailing;

1. The work carried out.
2. The data collected.
3. Hydrological models developed and the logic behind them.
4. Provide an informed opinion on hydrological issues and likely de-watering rates for input into the scoping study.
5. Make recommendations for further investigations as required.

## **Metallurgy, Markets and Processing**

Based on the recommendation of Process Technologies Australia (PTA – John Canterford) no further metallurgical test work is required for the scoping study. Work carried out in the past and recently by PTA suggests that it will be possible to produce a large range of acceptable Magnesia products, depending on how much pre and post calcination beneficiation is undertaken.

It is recommended that the focus move to addressing the issue of which magnesia products TMNL should be targeting for production so that future metallurgical test work is focused.

To that end the metallurgical study will comprise a desktop review of focusing on;

1. An overview of uses of magnesia products.
2. Assessment of the type of products that might be produced from Arthur River.
3. World consumption and production of those products.
4. Identification of any potential growth markets for those products and likely players in the industry.
5. Infrastructure required to produce the recommended products.
6. Estimates of Capex and Opex for different products.

PTA has recommended TNML purchase the recently released Roskill “Magnesium Compounds & Chemicals Global Industry markets and outlook” report as it will provide key data to the study.

## **Geotechnical**

Geotechnical input will comprise the following;

1. Assist with set up of geotechnical logging systems so they are compatible with GHD’s requirements.
2. Geotechnical logging of this drilling will be carried out by Derwent geological personnel.
3. Visit the core shed during the early phase of the drilling to ensure the data is being collected to the requisite standard.
4. On completion of drilling review the core and geotechnical data in the company of GHD’s waste rock specialist.
5. Provide an informed opinion on probable open pit batter angles, rock support recommendations and potential waste rock issues for input into the scoping study.
6. Make recommendations for further pre-feasibility level investigations.

## **Mine Engineering and Financial Model.**

Steve Gemell of Gemell Mining Engineers (GME) will be retained in an oversight role over the course of the study and will be engaged to complete a pit design and site layout to a scoping study level. He will also be responsible for compiling and checking the financial model that will be developed for the scoping study.

Derwent Geoscience will develop a resource model on completion of drilling; this will be optimised by Minecomp, using a cost matrix developed by GME and other parameters provided by the geotechnical, hydrological and metallurgical contributors.

GME has been budgeted on the basis of averaging 2 days per month on general inputs with 8 days to compile the mine design and financial model.

## **Environmental**

Pitt & Sherry (P&S) will be retained in their current role as environmental consultants to the project. At this stage it is envisaged that they will continue to conduct environmental monitoring sampling at Arthur River, and provide input into the scoping study.

## **Transport**

A consultant has been engaged by TMNL to provide an informed opinion on transport options and potential processing sites. They will also be asked to provide capital costs estimates for road access to the proposed mine site. Costs are an estimate at this stage.

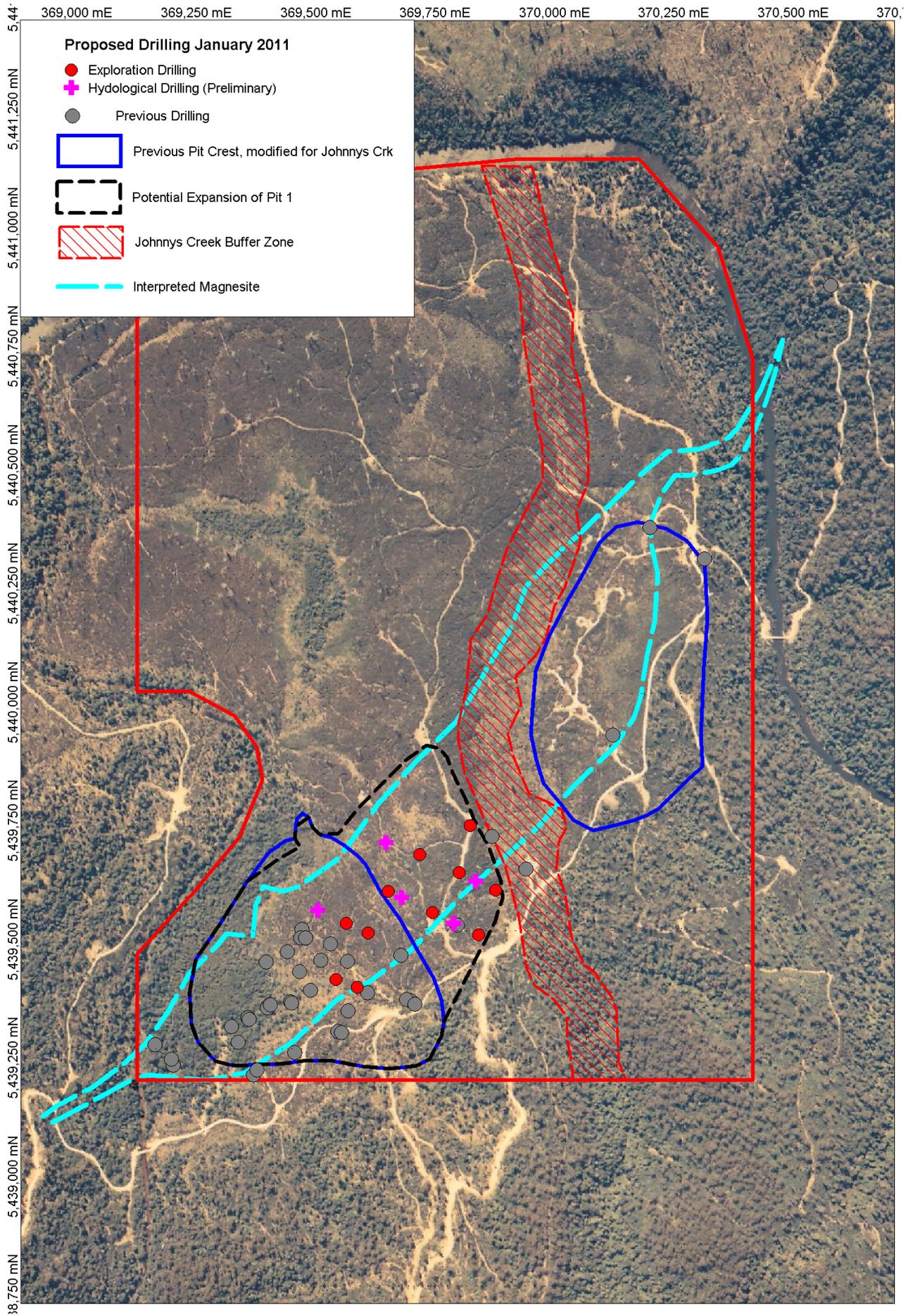
## **Site Access**

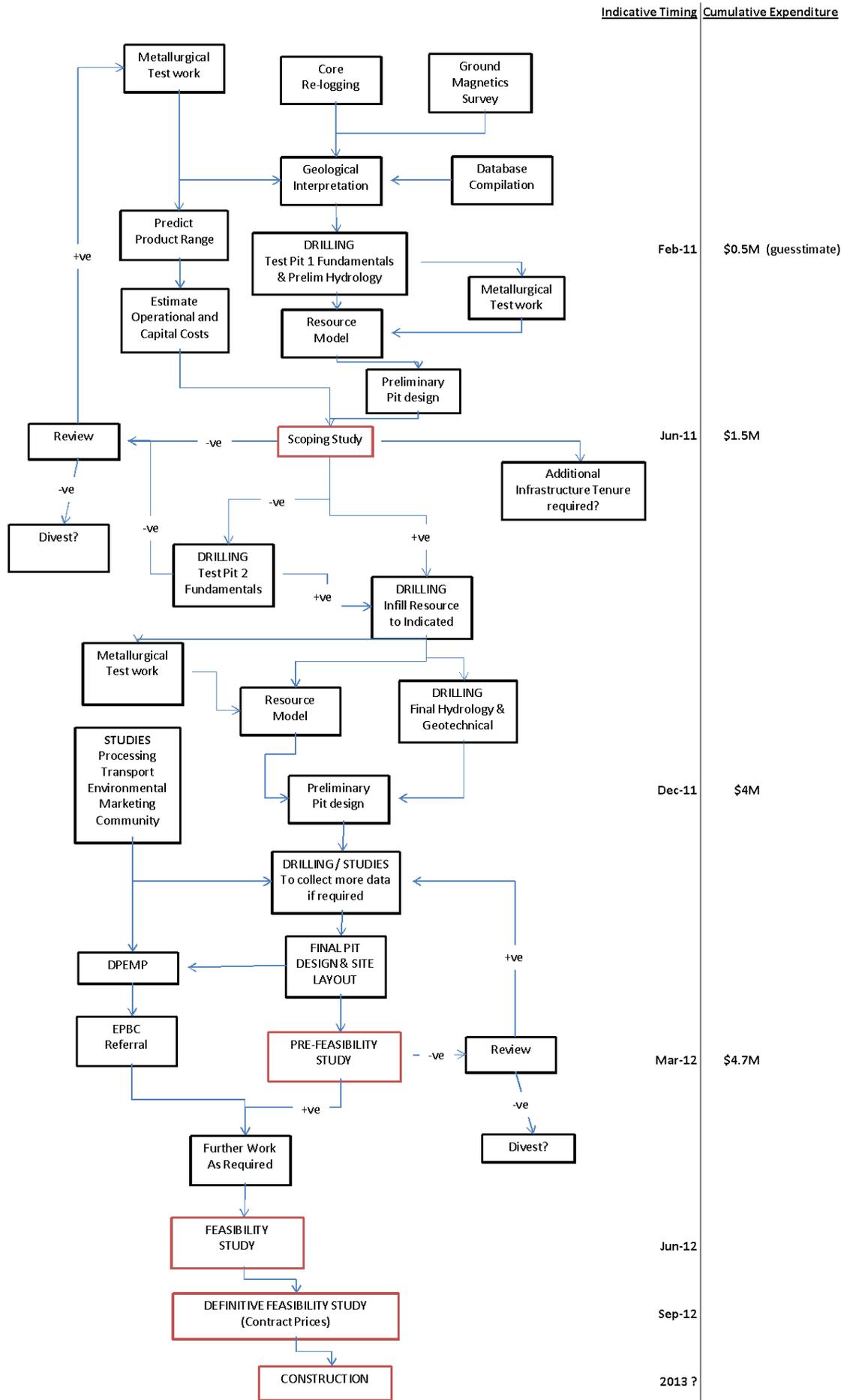
The budget for site access covers the following items;

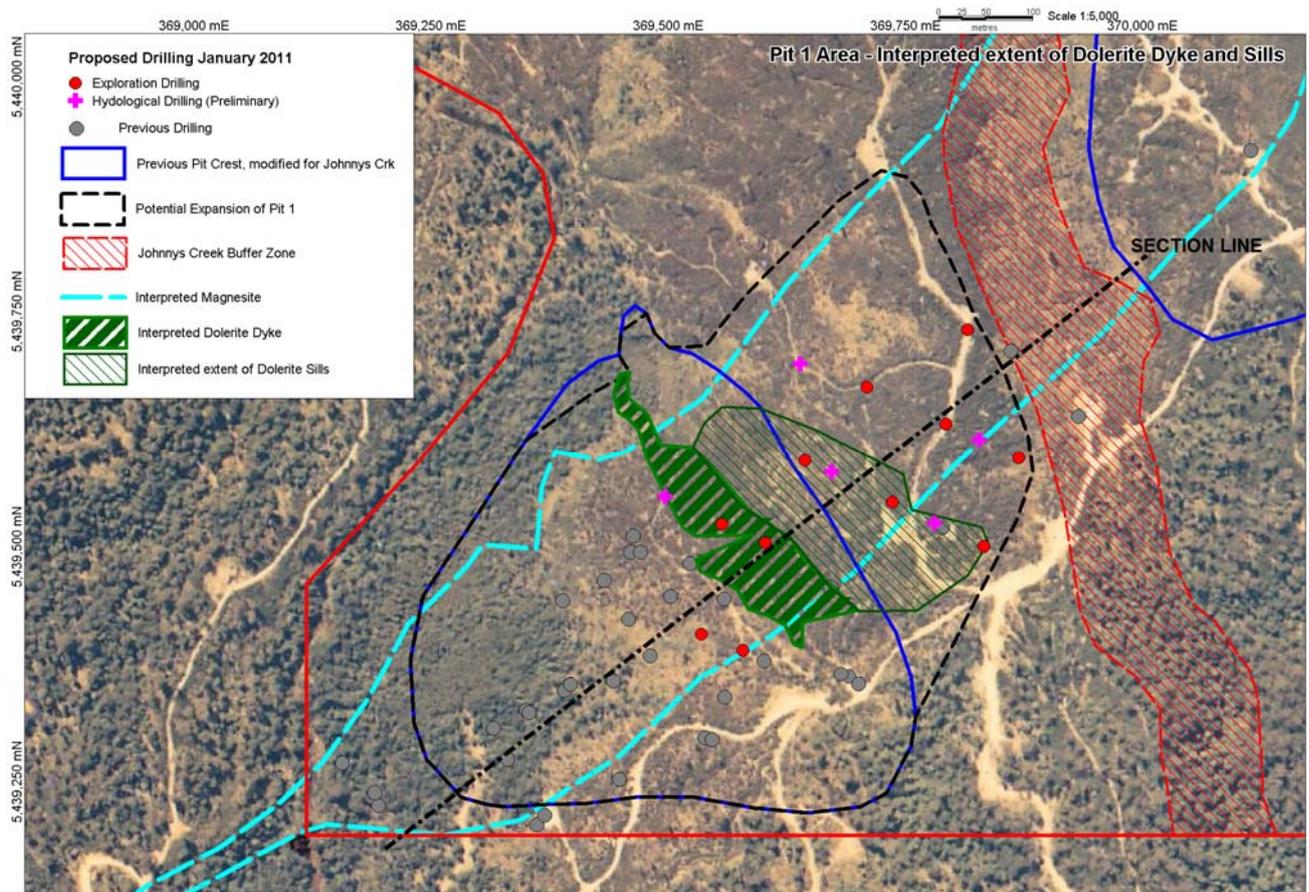
1. The total cost of fabricating and installing the bridge, which includes the upgrade of Farquhar's Road and installation of the buttresses.
2. An estimate of the cost of fitting an animal proof gate to the bridge.
3. Engineering oversight of the installation and fabrication of the bridge by Clive Roberts.
4. An estimate of the cost of upgrading the track down to the Arthur River Ford to allow access to site by the water bore rig.
5. An estimate of the cost of placing a rock ford on Johnnys Creek, and the associated oversight by the Giant Freshwater Crayfish expert.
6. A contingency of 10% has been included with this budget item to cover the likelihood of unforeseen events (weather) and additional unplanned works.

# Budget Estimate

	Total Budget \$1,267,825			January	February	March	April	May	June
	Unit Cost	Unit	Total	\$130,405	\$304,797	\$385,512	\$173,230	\$148,505	\$41,670
<b>Exploration Drilling</b>	<b>\$681,957</b>								
Mobilisation	2500	ea	\$5,000		\$2,500		\$2,500		
PQ Gear lost in Collar	3356	Hole	\$36,916		\$13,424	\$23,492	\$0		
PQ Meterage rates	154	Meter	\$50,820		\$18,480	\$32,340	\$0		
HQ Meterage rates	130.5	Meter	\$172,260		\$62,640	\$109,620	\$0		
Muds and Consumables	7.5	meter	\$12,375		\$4,500	\$7,875	\$0		
Work Time	280	hour	\$12,320		\$4,480	\$7,840	\$0		
Inactive Time	190	hour	\$4,180		\$1,520	\$2,660	\$0		
Core Orientations and DHS	4400	month	\$11,000		\$4,400	\$4,400	\$2,200		
Excavator on site	330	day	\$39,270		\$9,240	\$10,230	\$9,900	\$9,900	
D4 - Access Tracks & drill pads	121	hour	\$9,680		\$3,025	\$5,445	\$1,210		
D4 - Rehabilitation	121	hour	\$9,680					\$9,680	
Core Racks and other core shed equipment	5000	ea	\$5,000		\$5,000				
Vehicles x 2	170	day	\$20,230		\$4,760	\$5,270	\$5,100	\$5,100	
Core Saw	35	day	\$4,165		\$980	\$1,085	\$1,050	\$1,050	
Core Saw Blades	1	meter	\$2,050		\$600	\$1,200	\$250		
Analytical Work	43.2	ea	\$70,848		\$20,736	\$41,472	\$8,640		
Calico Sample Bags	0.45	ea	\$738		\$216	\$432	\$90		
Sample Ticket books	6.2	ea	\$102		\$30	\$60	\$12		
Core Trays	17	ea	\$8,713		\$2,550	\$5,100	\$1,063		
Polyweave sacks	1.2	ea	\$131		\$38	\$77	\$16		
Textas	4.25	ea	\$128		\$43	\$43	\$43		
Sundries	500	month	\$2,000		\$500	\$500	\$500	\$500	
Field Forman	505	day	\$47,975	\$7,575	\$10,100	\$10,100	\$10,100	\$10,100	
Project Geologist	550	day	\$44,000		\$11,000	\$11,000	\$11,000	\$11,000	
Labourer	350	day	\$28,000		\$7,000	\$7,000	\$7,000	\$7,000	
Meals	30	man/day	\$9,345	420	\$2,100	\$2,325	\$2,250	\$2,250	
Fuel	40	day	\$5,320	560	1120	1240	1200	1200	
Surveyor to pick up holes			\$5,000					\$5,000	
Technical Software Charges	25	hour	\$2,625	\$125	\$500	\$500	\$500	\$500	\$500
<b>Drilling Contingency @ 10%</b>			<b>\$61,987</b>						
<b>Hydrology</b>	<b>\$188,564</b>								
Production Bore	450	meter	\$45,000		\$45,000				
PQ Gear lost in Collar	3356	Hole	\$13,424			\$6,712	\$6,712		
PQ Meterage rates	154	meter	\$18,480			\$9,240	\$9,240		
HQ Meterage rates	130.5	meter	\$36,540			\$11,745	\$24,795		
Muds and Consumables	7.5	meter	\$3,000			\$1,125	\$1,875		
Work Time	280	hour	\$6,720			\$3,360	\$3,360		
Pump Rental	300	day	\$3,000			\$3,000			
Generator Rental	300	day	\$3,000			\$3,000			
Fuel	140	day	\$1,400			\$1,400			
Hydrologist	2000	day	\$48,000	4000	\$4,000	\$20,000	\$10,000	\$10,000	
Analytical Work	10000	estimate	\$10,000				\$10,000		
<b>Metallurgy, Markets &amp; Processing</b>	<b>\$53,000</b>								
Metallurgist - J Canterford	2000	day	\$48,000	8000	8000	8000	8000	8000	8000
Roskill Magnesium Compounds 2011 Report	US\$5,000	ea	\$5,000			5000			
<b>Geotechnical</b>	<b>\$22,000</b>								
Geotechnical Consultant	2000	estimate	\$16,000		\$4,000		\$4,000	\$8,000	
Waste Rock Consultant	2000	estimate	\$6,000					\$6,000	
<b>Mine Engineering &amp; Financial Model</b>	<b>\$45,400</b>								
Mining Engineer - S Gemell	2650	day	\$42,400	5300	5300	5300	5300	10600	10600
Open Pit Optimisation	3000	each	\$3,000					\$3,000	
<b>Environmental</b>	<b>\$17,115</b>								
Pitt and Sherry	2445	month	\$17,115	\$2,445	\$2,445	\$2,445	\$2,445	\$2,445	\$4,890
<b>Transport</b>	<b>\$25,000</b>								
Transport Consultant		Estimate	\$10,000				\$10,000		
Preliminary Access Road design and costing		Estimate	\$15,000					\$15,000	
<b>Site Access</b>	<b>\$128,910</b>								
Bridge Fabrication & Installation		Estimate	\$91,691	\$69,850	\$21,841				
Animal Proof gate for Bridge		Estimate	\$2,500		\$2,500				
Oversee fabrication & Installation - C Roberts	950	day	\$4,750	\$1,900	\$2,850				
Upgrade Arthur River Ford Track for truck access		Estimate	\$11,000	\$11,000					
Ford in Johnnys Creek		Estimate	\$5,000	\$5,000					
Crayfish Expert - Todd Walsh	750	day	\$2,250	\$2,250					
<b>Contingency - 10%</b>			<b>\$11,719.05</b>						
<b>Other</b>	<b>\$95,980</b>								
Core Shed rental	120	week	\$2,880	480	480	480	480	480	480
Furnished House in Wynyard	350	week	\$7,700	700	1400	1400	1400	1400	1400
Power and other house charges	100	week	\$2,200	200	400	400	400	400	400
General Technical Supervision - S Capp	1200	day	\$67,200	9600	9600	9600	9600	14400	14400
Community Engagement		Estimate	\$7,000		3500			3500	
Airfares, Travel and Accommodation		Estimate	\$9,000	1000	2000	2000	1000	2000	1000







**NEW DOLERITE MODEL Schematic Section**

