Harts Range Feasibility Study
Marketing, Cost and Financial Evaluation

Summary

A mine and processing plant with a maximum production capacity of 80,000 tpy of abrasives can be constructed for the Harts Range Project for a capital cost of AUS$4 million. This plant carries out dry processing only at the Harts Range minesite with secondary wet and dry processing occurring at Alice Springs

The majority of approvals are in place for the Harts Range Project however further environmental approval is required for the Alice Springs secondary processing plant. Completion of the approvals process is expected to be completed over the next 3 months.

A garnet market survey carried out by Mineralex along with data from other sources indicates an abrasive market in Australia of approximately 50,000 tpy of which approximately 30,000 tpy is garnet.

It appears feasible for Olympia to gain 20% of this market as the Alice Springs location makes Olympia's products very cost competitive in the Northern Territory and Queensland and competitive to a lesser extent in South Australia, Victoria and NSW.

Based on Olympia's current market data it is predicted that sales of 6000 tpy of Garnet and Garnetblende into the Australian market could be achieved in the first year of the Harts range operation. At this level of sales the operating cash flow would be approximately at breakeven. In year 2 sales are predicted to increase to 10,000 tpy with a net operating cashflow of $300,000. At some stage it is anticipated that banning of copper slag will lead to large bulk shipments into Asia leading to operating cash flows at Harts Range in excess of $1 million per year.

It is difficult to produce a truely bankable feasibility study with no off take agreements and with Garnetblende being a new product to the abrasive market. Finance from banks for Harts Range is unlikely and other methods of financing will need to be investigated.

Recommendations

1. The Board endorses the concept of a 60 tph plant for the Harts Range project
2. Management completes the feasibility study for Hart Range over the next month
3. The marketing work done to date is completed to a higher standard by Warwick Bartle or other appropriate person
4. Management continues the approvals process with the aim of having all approvals in place by mid year
5. Continuing efforts are made to obtain off take agreements and form relationships with abrasive marketing organisations.

Background

A feasibility study was completed by HBH Consultants in early 2004. This initial feasibility study was lacking in a number of areas including marketing, mining methodology and plant and process design. Since this feasibility study was completed a large amount of further work has occurred on this project and we are now at the stage of writing a more complete feasibility study which will form the basis for the raising of capital and commencement of operations at Harts Range. The areas of importance for the feasibility study are given below:

1. Geology
2. Approvals and Access
3. Mine Planning
4. Process Plant Design
5. Transport
6. Marketing
7. Capital and Operating Cost Estimation
8. Financial Analysis
9. Project Financing

Following are short summaries on where we are in each of the above areas:

1 Geology

A mining reserve has been defined. No further work is required for the feasibility study.

2 Approvals and Access

An ILUA is in place. Heritage clearances completed by AAPA and CLC. We are awaiting results of CLC clearance.

Environmental assessment for the project has been passed from DIPE to DBIRD. Olympia needs to complete and submit MMP (Mine Management Plan) incorporating all commitments made in PER prior to commencement of mining. With the change of the processing plan to dry processing at Harts Range it is not now essential to gain approval to use bore water at Harts range however we will attempt to obtain permission to allow possibility of wet processing at Harts Range in the future.

We now need to gain approval to carry out processing at Alice Springs but do not foresee problems in gaining this. This approval process will start this month.

3 Mine Planning

A mine schedule has been completed by Pertola Pty Ltd. This requires updating to reflect the changed production rate.

4 Process Plant Design

Testwork carried out by Outokumpu indicates that dry separation at Harts Range can be carried out successfully. We are awaiting the final report on test work to incorporate in the feasibility study.

We are arranging for test costeans to be dug at Harts range to observe the nature of ore at depth and confirm the free flowing nature of the sand which is necessary to carry out dry processing.

5 Transport

Expressions of interest have been received from Freightlink and a number of trucking companies to transport bulk mineral from Harts Range to Darwin. The initial scope of work on which the expressions of interest were based is now not valid.

The current production plan is to produce a lower tonnage at startup which will be bagged at Alice Springs and transported to customers in containers.

There is now a need to transport bulk concentrate from the Harts Range mine to the Alice Springs processing plant. We have obtained a budget price of $15 per tonne from Alice Springs Bush Haulage for the concentrate cartage from Harts Range to Alice Springs. Freightlink and NQX (Toll) have provided budget prices for container transport within Australia.

6 Marketing

To date we have obtained no off-take agreements for the Harts Range products. This report looks at the likely sales of Harts Range products into Australia based on a report by Mineralex and marketing information gained from discussions with abrasive suppliers within Australia.

7 Capital and Operating Costs

Jim Miller (Jacmin Pty Ltd) has carried out a capital costing for the Harts Range Project.

Operating costs have been estimated from information supplied by Jim Miller, Piacentini and Son and Pertola Pty Ltd.

8 Financial Analysis

Financial analysis has been carried out on the Harts Range Project based on the proposed production plan and the estimated capital and operating costs. This analysis will be expanded to provide more information for financiers.

9 Project Financing

The method of financing the Harts Range Project is yet to be determined.

10 Summary

All areas of the feasibility study are close to completion and have been carried out to a satisfactory standard. The only weakness in our feasibility study is our inability to obtain off-take agreements for our products and the need to estimate sales tonnage and prices in a competitive market.

Capital Cost

The capital cost for the Harts range Project is based upon a 60 tph head feed dry processing plant situated at Harts Range. A coarse and fine concentrate will be produced from the Harts Range Plant at approximately 12.5 tph. The concentrates will then be trucked separately to two stockpiles adjacent to a secondary processing plant in Alice Springs. The secondary plant would contain a wet attritioning and hydrosizing circuit, a drier and a dry magnet plant. Initially all product would be bagged at Alice Springs in 25kg paper bags or 1 tonne bulk bags.

Jim Miller of Jacmin Services Pty Ltd carried out the capital costing. The capital cost for the project has been estimated to be $5.5 million if all new plant and equipment is used. This price can be reduced to $3.4 million if maximum use is made of used plant and equipment in areas apart from the separation equipment. The separation equipment cannot be sourced second hand and must all be costed as new.

If the Mildura dry separation plant is purchased off Bemax some $500,000 worth of the second hand equipment can be sourced from this plant leading to the cost of the used plant option dropping to $2.9 million plus the cost of the Bemax plant. Given that Olympia's current offer for the Bemax plant is $800,000 then for the Harts Range Project it would be cheaper to buy second hand equipment from another source than to purchase the Bemax plant to supply used equipment. Purchasing the Bemax plant is however, of great benefit to the Keysbrook project so spending capital in 2005 for the Harts range and Keysbrook projects rather than in 2006 for Keysbrook only is probably justified.

Given that agreement has not as yet been reached with Bemax for the Mildura plant we must assume at this time that the capital cost for plant and equipment for the Harts Range project is $3.4 million. This cost does not include any start-up working capital. As this project will likely have a sales ramp up time period where it will be operating at a loss it is recommended that approximately half a million dollars be allowed as working capital i.e. the capital required for the Harts Range Project is $4 million.

Operating Costs

The Harts Range Project is anticipated to start off with relatively low sales with sales increasing as Garnetblende finds increasing acceptance as a replacement for current sand blasting abrasives such as garnet and copper slag. With this slow start-up in mind the operation of the project has been designed to minimise fixed operating costs (overheads) and to have a pricing strategy which gives a minimum AUS$20 margin of sales price over variable operating costs.

The fixed operating annual costs are estimated as:

Northern Territory Operations Manager	$130,000
Marketing Manager	$100,000
Harts Range Electricity Generator hire	$72,800
Rates and Charges	$20,000
Total	**$322,800**

The $332,800 represents the loss the Harts Range operation will make if no production or sales occur. This represents the maximum potential operating loss assuming:

1. That the project doesn't build up excessive stock and produces at a rate to match sales.
2. That sales margins are maintained at a minimum of AUS$20 per tonne
3. No financing costs are included.

On the minimum $20 sales variable cost sales margin the breakeven sales would be $332,800/$20 = 16,640 tonnes per year. In fact the marketing study indicates the ability to achieve much higher sales margins than $20 in the Northern Territory and Queensland giving a breakeven sales tonnage of approximately 6000 tonnes per year.

Although the remaining costs are variable they are not all directly variable on production tonnage eg labour costs increase as longer hours are worked and more operators are required however the labour cost per tonne generally reduces as production increases.

The operating cost model gives the following direct production costs at different production tonnages:

Production / Sales per Year	Direct Operating Cost Per Tonne Produced
6,000	$157
10,000	$125
40,000	$112
80,000	$106

The direct unit operating costs are higher than was the case when all processing was done at Harts Range to produce larger tonnages of bulk product. The extra unit costs are due to the lower production rate and also an extra $25 per tonne cost for trucking concentrate from Harts Range to Alice Springs and bagging of the product.

Marketing

The ability to market the garnet and Garnetblende produced at Harts Range is key to the success of the project.

It is known that there is a large market for abrasives in South East Asia which is largely being supplied by waste copper slag from the Japanese copper smelters. This product is being dumped into the market at below cost and Olympia cannot compete with this product. Burwell has similarly imported 26,000 tonnes of copper slag into Australia at a price which Olympia cannot compete with. There is a strong move to ban the use of copper slag for environmental reasons and Malaysia and four states in Australia have already banned its use and/or disposal. As more countries ban the use of copper slag for sand blasting the opportunity will arise for producers of other suitable abrasives for sand blasting to sell large tonnages of their product into South East Asia. Olympia recognises this opportunity and plans to supply its Garnetblende

and Garnet into this market. In the short term the South East Asian ship builders, who are the largest users of sand blasting abrasives in South East Asia, are loathe to pay extra to purchase Olympia's products instead of copper slag.

Olympia to date has been unable to secure off take agreements for its products and may not be able to achieve this until more widespread banning of the use of copper slag.

Garnetblende is a new product to the sand blasting industry and it is important that its use is accepted in the industry prior to the expected banning of copper slag. It is Olympia's intention therefore to start producing abrasive products as soon as practicable and to sell them in relatively small tonnages into the local Australian market as well as South East Asia.

A small plant has been designed to produce up to 80,000 tpy of abrasive products at the relatively low capital cost of $4 million. This plant has low overhead costs and therefore will operate profitably at sales tonnages of less than 10,000 tpy.

The Australian market for abrasives is not well documented however it is thought to be approximately 50,000 tpy. To sell 10,000 tpy into Australia Olympia would need to gain approximately 20% of the market share. Olympia's ability to do this will depend on the markets acceptance of Garnetblende as a cheaper alternative to garnet. Testwork indicates that Garnetblende is a suitable substitute for garnet on single use applications. If acceptance of Garnetblende occurs there is a significant opportunity to sell both Olympia Garnetblende and Garnet into the Australian market.

Olympia commissioned Mineralex Agencies Pty Ltd to carry out a market survey of the Australian Industrial Garnet Market. Mineralex estimated the Australian consumption of industrial garnet to be 25,000 to 30,000 tpy.

Australian garnet import figures for 2003/2004 show that 19,600 tonnes of garnet were imported into Australia with the majority from India.

In discussions with Burwell they estimated that the sales of abrasives in Australia was 36,000 to 40,000 tpy made up of:

Burwell Sales	Copper Slag	7,200 tpy
	Ilmenite	4,800 tpy
	Garnet (Indian)	5,000-6,000 tpy
	Staurolite	5,000-8,000 tpy
GMA	Garnet	12,000-18,000 tpy
Total		34,000 -44,000 tpy

Burwell and GMA are the largest sellers of abrasives in Australia however the above figures do not take into account sales by others such as Pan Abrasives. The above data is not consistent however the following estimate of the Australian abrasive market seems reasonable:

Garnet (Indian)	15,000-20,000 tpy
Garnet (GMA)	10,000-15,000 tpy
Total Garnet	**25,000-35,000 tpy**
Copper Slag	7,000 tpy
Ilmenite	5,000 tpy
Staurolite	5000-8000 tpy
Crushed Glass + Others	1000-2000 tpy
Total Other Abrasives	**18,000-22,000 tpy**

The total abrasive market in Australia appears to be approximately 50,000 tpy with approximately 30,000 tonnes of the total abrasives used being garnet.

The distribution of sales within Australia is important for Olympia as the Alice Springs production location points to Olympia being most competitive in the Northern Territory, South Australia and Queensland. The following budget quotes were obtained for transport of containerised product within Australia from Freightlink and NQX (Toll).

From	To	$ per Tonne Containerised	
		NQX	Freightlink
Alice Springs	Darwin	$115	$50
Alice Springs	Adelaide	$66	
Alice Springs	Melbourne	$98	
Alice Springs	Brisbane	$55	
Alice Springs	Sydney	$85	
Alice Springs	Perth via Darwin	$230	
Alice Springs	Perth via Adelaide	$187	
Alice Springs	Rockhampton	$128	

Discussions were held with NQX re their high price of transport from Alice Springs to Darwin compared with Freightlink. They maintain that they cannot lower their price so the Freightlink price is used in the following study.

Melbourne Abrasive Market

Imports of garnet into Melbourne in 2003/2004 were 4072 tonnes. The data we have on abrasives sold to Melbourne is as follows:

Abrasive	Price ($ per tonne)	Data Source
Crushed Glass	$130	Pan Abrasives
Indian Garnet	$225	Pan Abrasives
Indian Garnet	$260	Mineralex
GMA Garnet	$285.75	Mineralex

To cover operating costs $100 and $150 are used as the base cost of Garnetblende and Garnet ex Alice Springs. A minimum sales margin of $20 per tonne is added to this cost along with the transport cost to come up with the minimum Garnetblende and Garnet sales price for the Melbourne market i.e.

Garnetblende Sales Price in Melbourne = $100 + $20 + $98 = $218 per tonne
Garnet Sales Price in Melbourne = $150 + $20 + $98 = $268 per tonne

Based on the above it can be seen that Olympia products are not cost competitive with Crushed Glass but are competitive with both Indian and GMA Garnet. With the current increasing container freight rates between India and Australia Garnetblende in particular would be competitive with Indian and GMA Garnet.

In the Melbourne market it is unlikely that a margin of greater than the minimum $20 per tonne could be achieved.

Sydney Abrasive Market

Imports of Indian Garnet into Sydney in 2003/2004 were 3349 tonnes. Our data on abrasives sold into Sydney is as follows:

Abrasive	Price ($ per tonne)	Data Source
Staurolite	$186	Burwell
GMA Garnet	$260	Burwell
Beach Minerals Garnet	$153	Burwell
MDL Ilmenite	$130	Burwell
Indian Garnet	$260.65	Mineralex
GMA Garnet	$282	Mineralex

Garnetblende Sales Price in Sydney = $100 + $20 + $85 = $205 per tonne
Garnet Sales Price in Sydney = $150 + $20 + $85 = $255 per tonne

Garnet and Garnetblende are not cost competitive with Beach Minerals Garnet, MDL Ilmenite and Staurolite. They are competitive with the higher quality Indian garnet and GMA garnet. Sydney appears a difficult market for Olympia given the presence of cheaper Beach Minerals garnet and Staurolite.

Brisbane Market

Imports of Indian Garnet into Brisbane in 2003/2004 were 7457 tonnes. Our data on abrasives sold into Brisbane is as follows:

Abrasive	Price ($ per tonne)	Data Source
Indian Garnet	$260.65	Mineralex
GMA Garnet	$340	Mineralex

Garnetblende Sales Price in Brisbane = $100 + $20 + $55 = $175 per tonne
Garnet Sales Price in Brisbane = $150 + $20 + $55 = $225 per tonne

With the low “back haul” freight rate Brisbane is a market where Olympia has a real cost advantage over competitive garnet products. This combined with the high 7457 tpy import of Indian Garnet make Brisbane very attractive with the likelihood of sales margins of $40 - $50 being achievable and high sales volumes.

Darwin Market

Imports of Indian Garnet into Darwin in 2003/2004 were 602 tonnes. Olympia has little data on the cost of Garnet in Darwin but a figure of $319 per tonne has been obtained for GMA Garnet. The price for Indian garnet is likely to be at least the $260.65 price achieved at Brisbane.

Using the Freightlink transport price of $50 per tonne Alice Springs to Darwin the sales prices for Olympia's products are:

Garnetblende Sales Price in Darwin = $100 + $20 + $50 = $170 per tonne
Garnet Sales Price in Darwin = $150 + $20 + $50 = $220 per tonne

As would be expected Olympia's products will be very cost competitive in Darwin with $50 per tonne sales margins likely to be achievable.

Adelaide Market

There are no figures available on the Adelaide market. Adelaide is the base of GMA's distributor – Blastmaster. Given the opportunity for "back loading" Garnet from Perth to Adelaide either on rail or road GMA garnet would be in a strong position and probably dominate the Adelaide garnet market.

Garnetblende Sales Price in Adelaide = $100 + $20 + $66 = $186 per tonne
Garnet Sales Price in Adelaide = $150 + $20 + $66 = $236 per tonne

Olympia should be competitive with GMA especially with Garnetblende however more data is required on this market.

Rockhampton Market

There are no consumption figures available on the Rockhampton abrasive market. Mineralex quote a price of $340 per tonne for GMA garnet in Rockhampton.

Garnetblende Sales Price in Rockhampton = $100 + $20 + $128 = $248 per tonne
Garnet Sales Price in Rockhanpton = $150 + $20 + $128 = $298 per tonne

Olympia is cost competitive with GMA in Rockhampton and should have the ability to achieve $50 sales margins in this market

Alice Springs, Tennant Creek and Mount Isa Markets

Little information is available on these markets but Olympia will obviously be very cost competitive in these markets and should obtain the majority of their abrasive sales at high sales margins.

Market summary

The following table represents a summary of the potential markets with estimated prices and sales tonnages for the first year of operation.

Market	Product	Sales Tonnes	Sale Price	Margin / Tonne	Sales
Melbourne	Garnet	100	$268	$20	$26,800
	Garentblende	300	$218	$20	$65,400
Sydney	Garnet	100	$255	$20	$25,500
	Garentblende	300	$205	$20	$80,000
Brisbane	Garnet	600	$255	$50	$153,000
	Garentblende	2000	$205	$50	$410,000
Darwin	Garnet	200	$250	$50	$50,000
	Garentblende	400	$200	$50	$80,000
Adelaide	Garnet	0	$236	$20	0
	Garentblende	500	$186	$20	$93,000
Rockhampton	Garnet	400	$328	$50	$131,200
	Garentblende	900	$278	$50	$250,200
Alice Springs,	Garnet	100	$250	$80	$25,000
Tennent, Isa	Garentblende	400	$200	$80	$80,000
Total		**6300**			**$1,470,100**

The above assumes sales of 3900 tonnes into Brisbane and Rockhampton taking up to half of the Queensland market. It is assumed that this market share will be gained predominantly from Indian garnet and to a lesser extent from GMA garnet.

Sales of 1100 tonnes are assumed into the Northern Territory and Mount Isa. This represents a significant proportion of the Northern Territory and Mount Isa market but being located in the Northern Territory Olympia would expect to gain most of this market.

Sales into Sydney, Melbourne and Adelaide are assumed to be quite low at only 1300 tonnes in total.

Sales prices range from $186 to $278 per tonne for Garnetblende and $200 to $328 per tonne for garnet. Although a higher price is expected to be achieved for the coarse products than the 30/60 products they have been assumed to sell at the same price in this analysis.

In the second year of operation it is anticipated that Olympia will increase sales to at least 10,000 tpy or 20% of the Australian market. At 10,000 tpy of sales the net cash flow from operations will be approximately $300,000 tpy.

Financial Analysis

Fig 1 gives the financial model for the 60 tph dry mining plant running at only 7.2% availability to produce 6,323 tonne of product per year. At sales prices ex Alice Springs of AUS$100 and AUS$150 per tonne of Garnetblende and Garnet there is a negative cash flow of $278,365 per year.

Fig 2 gives the predicted sales breakdown for year 1 which indicated an average sales margin of $47.78 above the $150 and $100 assumed in the production model. This extra margin increases the project cashflow by $301,000 per year.

The net predicted cashflow for the first year is therefore $301,000 - $278,365 = $22,635 i.e. just above breakeven.

The financial and sales models for 10,000 tpy of sales are given in figs 3 and 4. The net predicted cashflow for year 2 is $432,000 - $122,242 = $309,758.

To indicate the affect that significant bulk sales to Asia would have I have assumed that bulk sales to Asia occur in year 3 at 30,000 tpy and 70,000 tpy in year 4. The financial models for years 3 and 4 are shown in fig 5 and 6. The margin on these bulk South East Asian sales is assumed to be AUS$20 per tonne.

The operating cash flow based on the above scenario is shown in Fig 7. The operating cash flow breaks even in year 1 and increases to $300,000 in year 2. With the bulk sales into Asia the cash flow increases to $900,000 in year 3 and $1.7 million in year 4.

The above marketing analysis was carried out by myself and it is recommended that this analysis be upgraded to a higher standard by a person experienced in marketing such as Warwick Bartle.

Project Financing

It is difficult to produce a truly Bankable Feasibility Study for this project because without off take agreements the sales tonnage and price of the new product Garnetblende can only be estimated.

Banking finance will be difficult to obtain.

The project might be financed via equity however this would have a significant dilution effect.

Potential ways to finance the Harts Range Project include:

1. Through a Joint Venture with an abrasive marketing organisation
2. Loan finance with an equity component as a “sweetener”
3. Delay project to 2007 and self finance from Keysbrook earnings.

Peter Gazzard

Harts Range Feasibility Study

Section 4 Operations

4.1 Mining and Processing

4.1.1 Mining Rate

The mining rate is to be such as to produce a maximum of 300,000 tpy of final products from the Harts Range Project. It is anticipated that the full 300,000 tonnage will not be required initially and the start tonnage may be as low as 100,000 tpy.

The ore at Harts Range has been categorised into five principal types i.e.:

Dunal
Swale
Floodplain
Paleochannel
River Channel

The dunal and swale ore contains garnet and hornblende of a relatively fine grain size. This relative fineness leads to the dunal and swale ore incurring greater losses in recovery to product and producing less high value coarse product. This in turn makes the dune and swale ore of less value than the paleochannel, floodplain and river channel ore.

In order to maximise returns from the harts Range Project in the early years of operation it is planned to mine minimal dune and swale ore.

The river channel ore by nature of the fact that it is more environmentally sensitive through being associated with current creek beds and the associated river bank trees and vegetation has not been included in the ore for initial environmental approval. At a later date Olympia anticipates seeking environmental approval to mine this river channel ore but currently it cannot be mined.

Given the above, the schedule mines for the first 6.5 years of the project life in predominantly Paleochannel and Floodplain ore south of the Plenty Highway in between Aturga Creek and the dunes.

When mining in the paleochannel and floodplain ore a mining rate of 200 tph will be sufficient to produce 300,000 tpy of product for sale. Based on 90% mining availability 200 tph translates to approximately 1.6 million tpy of ore mined (the yield from paleochannel and floodplain ore is approximately 20% to final product).

4.1.2 Basis for mine Design

In Situ Bulk Density	1.7 t/m^3
Loose bulk density	1.5 t/m3
Angle of repose of dry sand	33 degrees
Topsoil depth	20 cm

Maximum pit depth 7 meters

4.1.3 Geotechnical Engineering

Being an open sand pit with a depth of less than 7 meters there are no significant geotechnical problems at Harts Range

4.1.4 Ground Water

There is no near surface groundwater in the project area. From work done by Territory Ground Water Services in November 2004 (Mathews, 2004) the shallowest groundwater is an unconfined aquifer at a depth of 20 to 30 meters below surface. The mining pit will be well above the ground water level and there is not expected to be any inflow of groundwater into the mining operations except in flood conditions.

4.1.5 Surface Water

The project area contains the Aturga Creek and Plenty River. Both watercourses are ephemeral and flow is typically a quick rise in water level to a flood peak after heavy rain followed by several days or weeks of declining flows. Flash flooding is relatively common. Floodplain inundation for periods longer than one week is uncommon.

Flow records for the Plenty River indicate that the river averages two to three small flows per year with flow duration of about one to five days. Large flows may last for up to three weeks.

Aturga Creek with a smaller catchment, flows much less frequently (average one small flow every two years). Creeks with smaller catchments, or in local rain shadows, may flow as little as once or twice a decade.

The mine strategy for flooding and inundation of the floodplain will be:

- Diversion bunds will be constructed around the mining pit to stop minor flood events flooding the pit and interrupting operations.
- The mining pit will have a pit pump which will remove smaller amounts of rain and surface water inflow from the pit.
- The in-pit mining equipment will be easily movable and able to be moved onto higher ground on the dunes if major flooding is likely.
- If a major flood event occurs and the pit is flooded mine process pumps will be used in addition to the pit pump to empty the pit.
- The wet concentrator, dry separation plant and other non pit infrastructure will be built on high ground on the dunes above historical flooding levels.

From historical data it is estimated that a major flood event will occur less than once every two years. Assuming the need to remove mining equipment from the pit the flood is likely to halt operations by approximately one week. This one week halt to operations every two years equates to a 1% loss in operating availability.

4.1.6 Operating Plan

The operational sequence of events at Harts Range will be similar to that used by heavy mineral sands miners in Western Australia i.e.

- Survey of area to be cleared for mining for artefacts and conservation value of vegetation
- Clearance and mulching of vegetation using tractor and mulcher plus bulldozer when necessary
- Removal of topsoil by self elevating scraper or agricultural ground levellers
- Mining using one Caterpillar 988 front end loader (FEL) or equivalent.
- In pit screening and slurrying using a trommel or vibrating screen to remove +2mm oversize
- Pumping of slurry via a polyethelene pipeline to a wet concentrator
- Removal of clay at the wet concentrator via hydrocyclones with the clay slurry gravitating into a slimes thickener.
- Separation of coarse garnet and hornblende sand (concentrate) from fine sand (-250 microns) and quartz sand using spiral concentrators and hydrosizers.
- Mixing of quartz and fine sand with thickened clay fines and pumping mixed slurry back into the mined out pit.
- Contouring of surface of backfilled tails using a bulldozer
- Placement of topsoil and vegetation onto backfill.
- Separation of the mixed garnet/hornblende concentrate into final products in the dry separation plant.

A plan and cross section showing the proposed mine layout and operating sequence is given in Figs XXXX and XXXX

4.1.6.1 Area Survey

Although surveys for artefacts have been carried out prior to gaining environmental approval it is necessary to carry out more detailed searches of all areas just prior to clearance of vegetation and topsoil for mining. Members of the local indigenous community will carry out these surveys. If artefacts or sites of significance are discovered a method of addressing these artefacts or sites must be agreed with xxxxx before clearance can commence.

A survey of the vegetation on the Harts Range mining lease was completed prior to gaining environmental approval. The environmental licence stipulates areas which must not be disturbed during mining and any area to be cleared must be checked against these clearance banned areas. In addition significant stands of trees should be assessed for conservation value prior to clearance and where practicable high conservation value trees should not be cleared.

4.1.6.2 Clearance and Mulching prior to Mining

The land cleared of vegetation and topsoil prior to mining will be minimised to the equivalent of one months mining i.e. approximately 1 hectare.
Any large trees which need to be cleared will be pushed down with a bulldozer and moved off the mine path. Scrub and bushes will be mulched with an agricultural tractor and mulcher. Smaller branches of cleared trees will also be mulched. This

mulch will be laid on top of topsoil replaced after mining to assist the rehabilitation process and minimise erosion and loss of topsoil off rehabilitation areas.

4.1.6.3 Removal of Topsoil

The top 20 cm of the orebody will be removed as topsoil by a self elevating scraper. Apart from the initial period of mining when the pit backfill area is being established all topsoil removed will be directly placed back on contoured backfill.
Topsoil removal will follow closely behind vegetation clearance to minimise mine open area.

4.1.6.4 Mining

Mining will be carried out using one 988 FEL. A second backup FEL will be on site to carry out mining when the primary mining loader is being serviced. The second loader will also be used for moving oversize away from the screening plant when required.

The FEL will travel between the mine face and a dump hopper which feeds via a conveyor onto a trommel or vibrating screen (2mm aperture). To maintain a mining rate of 200 tph the FEL will need to mine on average, less than 200 meters from the dump hopper. Regular feed hopper and screen plant moves will be required to follow movement of the mining face. These moves are planned for once per fortnight.

Mining will be carried out continuously 24 hours per day, 7 days per week. The mining study assumes 90% availability of the mining and screening operations. This availability includes an allowance for hopper and screen plant moves.

The operator of the mining FEL will be relieved by the screen/wet plant operator to allow lunch and other breaks to be taken.

4.1.6.5 In-Pit Screening

The flowsheet of the in-pit screening, hydrocycloning and wet concentration is given in Fig XXXX

Mined ore will travel by conveyor from the dump hopper to the In-Pit screen or trommel. Oversize greater than 2 mm from the screen/trommel will be carried by a conveyor to an oversize stockpile in the pit. If the oversize stockpile builds up to the discharge of the oversize conveyor it will be moved to elsewhere in the pit by the standby FEL.

The screen will be a wet screen and undersize sand and clay will be washed through the screen into a pump hopper underneath the screen. From this hopper slurried ore will be pumped to the desliming hydrocylones at the wet concentrator.

4.1.6.6 Hydrocycloning and Slime Thickening

Ore from the In-Pit screen plant will be pumped out of the pit in a polyethylene pipeline to the wet concentrator hydrocyclone bank.

Overflow from the hydrocyclones containing the clay fines will gravitate into a 13 meter diameter slimes thickener. Underflow from the thickener will mix with the tails sand from the wet concentrator and be pumped as backfill back into the mined out pit. Clean thickener overflow water will gravitate into the site water dam to be reused in the process.
Underflow sand from the hydrocyclones will gravitate into the wet concentrator feed constant density (CD) tank.

4.1.6.6.1 Wet Concentration

Slurry from the CD tank will be pumped to the primary hydrosizers. Overflow from the primary hydrosizers containing fine (-250 micron) sand will discharge into the tails hopper. Underflow from the primary hydrosizers will be pumped to the secondary hydrosizers
The secondary hydrosizers produce a coarse concentrate as underflow which is pumped to the drying shed. The overflow from the secondary hydrosizers is pumped onto the three stage spiral circuit.
The spiral circuit removes the majority of the remaining quartz sand as a tail and produces a fine concentrate which is pumped to the drying shed.
The overflow from the primary hydrosizers and the tails from the spiral circuit are combined with the thickener underflow and pumped into the mined out pit as backfill.

4.1.6.7 Backfill Re-contouring

The backfill from the wet concentrator once in place in the mined out pit will require approximately a week to stabilise before a bulldozer can move onto the backfill surface to re-contour the backfill to match the surrounding landform.

4.1.6.8 Replacement of Topsoil and Vegetation

Topsoil from in front of the mine path will be removed by scraper and placed directly on top of the re-contoured backfill. If required the topsoil and top of the backfill will be ripped by the bulldozer to reduce compaction.
Mulched vegetation will then be brought from in front of the mine path and directly laid on the topsoil.

4.1.6.9 Production of final products in the Dry Separation Plant (DSP)

The minerals in the DSP feed are separated through differences in magnetic susceptibility. The minerals present in thee DSP feed are:

Magnetite / Ilmenite	Highly magnetic
Garnet	Moderately magnetic
Hornblende	Weakly magnetic
Quartz	Non Magnetic

Once separated magnetically the Garnet and Garnetblende (Hornblende + Garnet mixture) are sized using a screen and sizing roll into 30/60# and +30# Garnet and Garnetblende products.

The DSP flowsheet is given in Fig XXXX

The coarse and fine concentrates from the wet concentrator will drain and to an extent dry (to 2% - 3% moisture) in the drying shed. The concentrates will then be treated batch wise through the DSP. The DSP has a feed capacity of 50 tph.

Concentrate will be taken from the drying shed via a 966 FEL or equivalent and fed into the DSP feed hopper. From the feed hopper concentrate will be conveyed into the drier and from the drier onto a 0.6mm scalping screen.

From the scalping screen the dried concentrate will pass through Primary Rare Earth Drum (RED) Magnets. The most magnetic fraction (M1) from the RED magnets will be passed over the Garnet Rare Earth Roll (RER) magnets to remove ilmenite to tail.

The non magnetic fraction from the Garnet RER Magnets joins the second magnetic fraction off the Primary RED magnets and passes over the Garnet RED magnets. The Garnet RED magnets remove hornblende from the garnet as a non mag and carry out a size split on the magnetic fraction with the finer size going to a double deck 600/250 micron screen. The undersize (-250 micron) off the screen is rejected as a tail. The +250 / -600 micron sand is 30/60# Garnet Product. The +600 micron sand is +30# Garnet product.

The non magnetic fraction off the Primary RED magnet is put over the Garnetblende RER magnet to reject quartz as a non mag. The magnetic fraction off the Garnetblende RER magnet joins the third magnetic fraction off the primary RED magnets and the non magnetic fraction off the Garnet RED magnet and is put over a sizing roll. The finest fraction off the sizing roll (-250 micron) is rejected to tail. The coarsest (+600 micron) is the +30# Garnetblende product. The +250 / -600 micron sand is 30/60# Garnetblende product. The 4 products produced in the dry circuit are:

- 30/60# Garnetblende
- +30# Garnetblende
- 30/60# Garnet
- +30# Garnet

The DSP will have sufficient floor area to add extra equipment a later date to produce further products eg 80# garnet.

4.1.7 Equipment List

It is intended to contract out the mining at Harts Range. The following equipment is proposed to be used by the contractor:

Equipment	Units	Type / Model	Utilisation (hrs/yr)
Front End Loader	2	Caterpillar 988	10,000
Water Truck	1	Bell B40C	2000
Grader	1		1000
Bulldozer	1	Caterpillar D7	1000
Front End Loader	1	Caterpillar 966	2000

Lighting Unit	1		4000
Utility	1	Toyota Landcruiser Tray Back	6000
Back Hoe Excavator	1		1000

In addition to the contractor equipment Olympia will lease or purchase the following equipment:

Equipment	Units	Type / Model	Utilisation (hrs/yr)
Forklift	1	Toyota 3 Tonne	3000
Utilities	2	Toyota Landcruiser Tray Back	12,000
Minibus	1	12 seat	1000
Crane	1	Franna 7 Tonne	1000

4.1.8 Personnel List

It is intended to work a 4 shift roster working 12 hours per shift. Three operators would be on shift i.e. Loader operator, wet plant operator and dry plant operator. One of the three operators will be a senior operator in charge of the shift. The remainder of the workforce would be on a day shift roster.
The following workforce is proposed to be used at Harts Range:

Position	Number	Type	Roster
Mine Manager	1	Employee	Day
Metallurgist	1	Employee	Day
Maintenance Supervisor	1	Employee	Day
Cooks / Cleaners	2	Employee	Day
Contractor Supervisor/Fitter	1	Contractor	Day
Loader Drivers	4	Contractor	Shift
Wet Plant Operators	4	Employee	Shift
Dry Plant Operators	4	Employee	Shift
Fitters	2	Employee	Day
Relief Operators	2	Employee	Day/Shift
Electrician	2	Employee	Day
Baggers	3	Employee	Day
Total Manning	**27**		

4.1.9 Mine Planning

Mine planning for Harts Range will be supplied from the Perth head office of Olympia. Initially the mine planning will be carried out by consultants. The consultants will supply pit design and pit limits which will be pegged out on site by a consultant surveyor from Alice Springs.

The consistent nature of the Harts Range deposits and the obvious visual cut off between the orebody and basement will lead to grade control being quite straight forward. The basement cut off will be determined visually by the loader driver with

assistance of the site mine manager and metallurgist where required. There is no need for a grade control geologist to be employed on site at Harts Range.

4.1.10 Product Quality Control

The need to supply consistent quality products to customers is essential to the success of the Harts Range Project. Olympia will set up appropriate systems and procedures to ensure consistent quality products and gain quality accreditation for the Harts Range site.

A metallurgist will be employed at Harts Range to supervise the operation of the wet concentration and dry separation plants and the quality system. The metallurgist will be responsible for maximising recovery of ore to product and producing consistent quality products.

To assist in this a small laboratory will be on site containing sink/float and screening equipment as well as a binocular microscope. This laboratory will be operated by the metallurgist.

The site metallurgist will also be responsible for process development work including investigating the potential to produce additional products.

Fig 4.3 ***Draft*** **HARTS RANGE MINESITE PLANT**

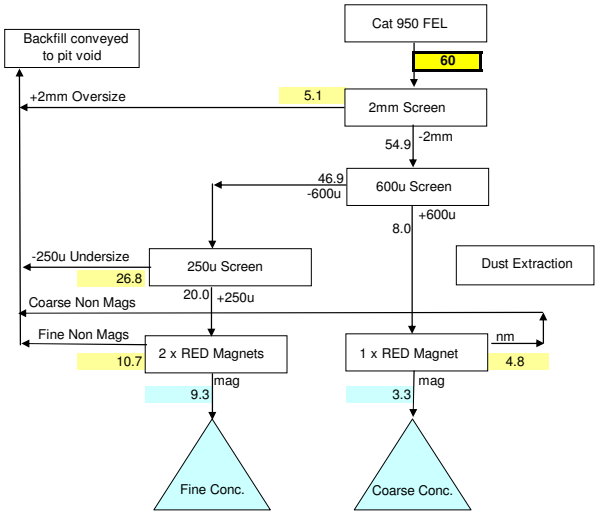
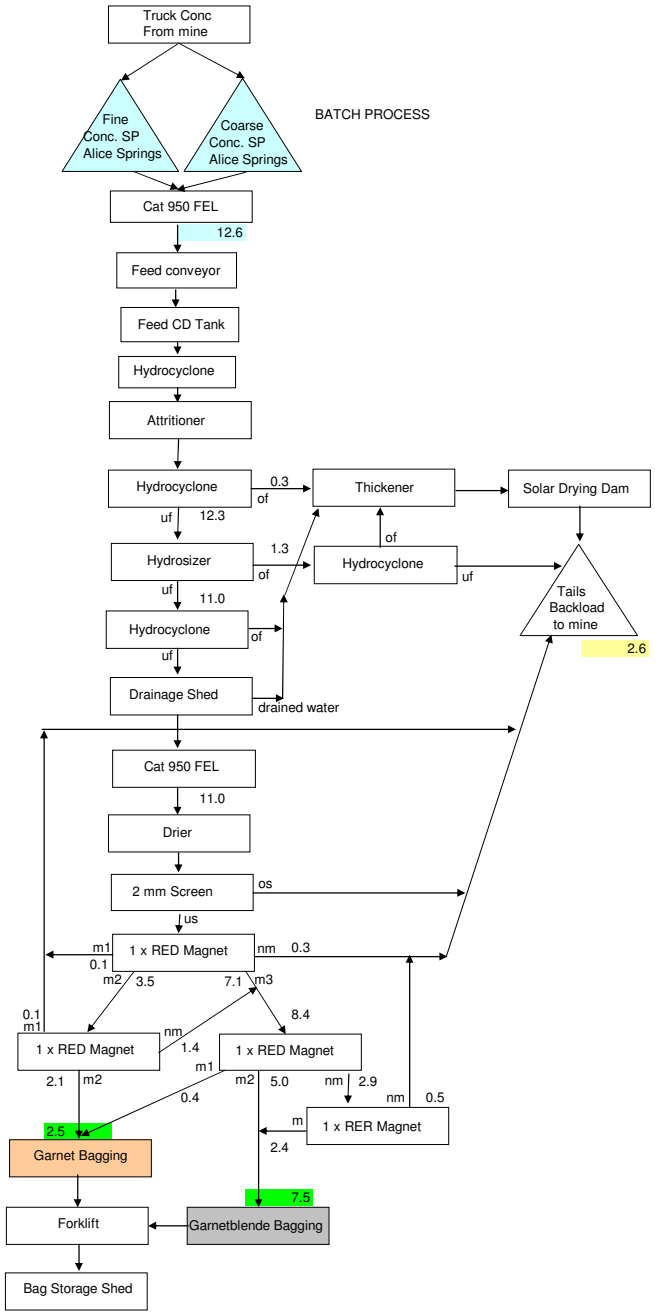


Fig 4.4 ***Draft*** **ALICE SPRINGS PROCESSING PLANT**



Section 4 Operations

4.1 Mining and Processing

4.1.1 Mining Rate

The mining rate for Stage 1 is to be such as to produce a maximum of 80,000 tpy of final products from the Harts Range Project. It is anticipated that the full 80,000 tonnage will not be required initially and the start tonnage may be as low as 6,000 tpy.

Stage 2 expansion to a maximum of 300,000 tpy of final products will commence at a time dependent on sales. It is anticipated however that the Stage 2 expansion will occur 3 to 5 years after Stage 1 start-up.

The ore at Harts Range has been categorised into five principal types i.e.:

Dunal
Swale
Floodplain
Paleochannel
River Channel

The dunal and swale ore contains garnet and hornblende of a relatively fine grain size. This relative fineness leads to the dunal and swale ore incurring greater losses in recovery to product and producing less high value coarse product. This in turn makes the dune and swale ore of less value than the paleochannel, floodplain and river channel ore.

In order to maximise returns from the Harts Range Project in the early years of operation it is planned to mine minimal dune and swale ore.

The river channel ore is more environmentally sensitive through being associated with current creek beds and the associated river bank trees and vegetation and has not been included in the orebody for initial environmental approval.

Given the above, the schedule for the first years of mining is predominantly in Paleochannel and Floodplain ore south of the Plenty Highway between Aturga Creek and the dunes.

During Stage 1 when mining in the paleochannel and floodplain ore a mining rate of 60 tph will be sufficient to produce 80,000 tpy of product for sale. Based on 90% mining availability 60 tph translates to approximately 470,000 tpy of ore mined (the yield from paleochannel and floodplain ore is approximately 17% to final product).

In Stage 2 when mining in the floodplain and paleochannel ore a mining rate of 225 tph will be required to produce 300,000 tpy of product for sale. At 90% availability this translates to approximately 1.8 million tpy of ore mined.

4.1.2 Basis for mine Design

In Situ Bulk Density	1.7 t/m^3
Loose bulk density	1.5 t/m3
Angle of repose of dry sand	33 degrees
Topsoil depth	20 cm
Maximum pit depth	7 meters

4.1.3 Geotechnical Engineering

Being an open sand pit with a depth of less than 7 meters there are no significant geotechnical problems at Harts Range

4.1.4 Ground Water

There is no near surface groundwater in the project area. From work done by Territory Ground Water Services in November 2004 (Mathews, 2004) the shallowest groundwater is an unconfined aquifer at a depth of 20 to 30 meters below surface. The mining pit will be well above the ground water level and there is not expected to be any inflow of groundwater into the mining operations except in flood conditions.

4.1.5 Surface Water

The project area contains the Aturga Creek and Plenty River. Both watercourses are ephemeral and flow is typically a quick rise in water level to a flood peak after heavy rain followed by several days or weeks of declining flows. Flash flooding is relatively common. Floodplain inundation for periods longer than one week is uncommon.

Flow records for the Plenty River indicate that the river averages two to three small flows per year with flow duration of about one to five days. Large flows may last for up to three weeks.

Aturga Creek with a smaller catchment, flows much less frequently (average one small flow every two years). Creeks with smaller catchments, or in local rain shadows, may flow as little as once or twice a decade.

The mine strategy for flooding and inundation of the floodplain will be:

- Diversion bunds will be constructed around the mining pit to stop minor flood events flooding the pit and interrupting operations.
- The mining pit will have a pit pump which will remove limited rain and surface water inflow from the pit.
- The in-pit mining equipment will be easily movable and able to be moved onto higher ground on the dunes if major flooding is likely.
- The camp, workshop and other non pit infrastructure will be built on high ground on the dunes above historical flooding levels.

From historical data it is estimated that a major flood event will occur less than once every two years. Assuming the need to remove mining equipment from the pit the

flood is likely to halt operations by approximately one week. This one week halt to operations every two years equates to a 1% loss in operating availability.

4.1.6 Operating Plan Harts Range Mining and Dry Separation

The operational sequence of events at Harts Range will be as below:

- Survey of area to be cleared for mining for artefacts and conservation value of vegetation
- Clearance and mulching of vegetation using tractor and mulcher plus bulldozer when necessary
- Removal of topsoil by self elevating scraper
- Mining using one Caterpillar 950 front end loader (FEL) or equivalent.
- In pit screening using vibrating screens to remove +2mm oversize and -250 micron undersize as well as producing +600 and +250/-600 micron fractions for magnetic separation
- In pit magnetic separation producing +600 and +250/-600 magnetic concentrates which will be stockpiled on site
- Conveying of -250 micron, +2mm and +600 and +250/-600 micron non magnetic backfill sand into mined out pit.
- Contouring the surface of backfilled tails using a bulldozer
- Placement of topsoil and vegetation onto backfill.

A plan and cross section showing the proposed mine layout and operating sequence is given in Figs 4.1 and 4.2

4.1.6.1 Area Survey

Although surveys for artefacts have been carried out prior to gaining heritage and environmental approval it is necessary to carry out more detailed searches of all areas just prior to clearance of vegetation and topsoil for mining. Members of the local indigenous community will carry out these surveys. If artefacts or sites of significance are discovered a method of addressing these artefacts or sites must be agreed with the Traditional Owners before clearance can commence.

A survey of the vegetation on the Harts Range mining lease was completed prior to gaining environmental approval. The environmental licence stipulates areas which must not be disturbed during mining and any area to be cleared must be checked against these clearance banned areas. In addition significant stands of trees should be assessed for conservation value prior to clearance and where practicable high conservation value trees should not be cleared.

4.1.6.2 Clearance and Mulching prior to Mining

The land cleared of vegetation and topsoil prior to mining will be minimised to the equivalent of one months mining i.e. less than 1 hectare.
Any large trees which need to be cleared will be pushed down with a bulldozer and moved off the mine path. Scrub and bushes will be mulched with an agricultural

tractor and mulcher. Smaller branches of cleared trees will also be mulched. This mulch will be laid on top of topsoil replaced after mining to assist the rehabilitation process and minimise erosion and loss of topsoil off rehabilitation areas.

4.1.6.3 Removal of Topsoil

The top 20 cm of the orebody will be removed as topsoil by a self elevating scraper. Apart from the initial period of mining when the pit backfill area is being established all topsoil removed will be directly placed back on contoured backfill.
Topsoil removal will follow closely behind vegetation clearance to minimise mine open area.

4.1.6.4 Mining

Mining will be carried out using one 950 FEL. A second backup FEL may also be kept on site to carry out mining when the primary mining loader is being serviced. The second loader would also be used for moving oversize away from the screening plant when required.

The FEL will travel between the mine face and a dump hopper which feeds via a conveyor onto the first vibrating screen (2mm aperture). To maintain a mining rate of 60 tph the FEL will need to mine on average, less than 200 meters from the dump hopper. Regular feed hopper and screen plant moves will be required to follow movement of the mining face. These moves are planned to occur approximately once every six weeks.

Mining will be carried out initially on day shift only but will move to continuous operation to match sales requirements. The mining study assumes 90% availability of the mining and screening operations. This availability includes an allowance for hopper and screen plant moves.

The operator of the mining FEL will be relieved by the fixed plant operator to allow lunch and other breaks to be taken.

4.1.6.5 In-Pit Screening and Magnetic Separation

The flowsheet of the in-pit screening and magnet circuit is given in Fig 4.3

Mined ore will travel by conveyor from the dump hopper to the in-pit screen and magnetic circuit. The ore will be screened at 2mm, 600 micron and 250 micron. The +2mm and -250 micron material will be discharged onto the backfill conveyor to be conveyed back into the mining void.

The +600 and +250/-600 micron screened products will be passed through a magnet circuit to produce coarse (+600 micron) and fine (+250/-600 micron) magnetic concentrates which will be conveyed onto separate concentrate stockpiles. The non magnetics from the magnet circuit will be discharged onto the backfill conveyor along with the +2mm and -250 micron material from the screens to be conveyed back to the mining void.

Because the Harts Range separation plant operates dry; dust extraction will be required on the screening and magnetic separation plants.

4.1.6.6 Backfill Re-contouring

The backfill from the in pit screening and magnetic separation circuit once in place in the mined out pit will be re-contoured by dozer to match the surrounding landform.

4.1.6.7 Replacement of Topsoil and Vegetation

Topsoil from in front of the mine path will be removed by scraper and placed directly on top of the re-contoured backfill. Mulched vegetation will then be brought from in front of the mine path and directly laid on the topsoil.

4.1.7 Operating Plan Alice Springs Separation Plant (ASSP)

- The coarse and fine concentrates will be transported by truck to the ASSP where the will be separately stockpiled before being batch treated through the ASSP.
- The concentrates will be fed from the stockpiles into the wet circuit of the separation plant using a 950 FEL via a dry feed hopper and conveyor.
- A wet circuit consisting of attritioners, hydrosizers and hydrocyclones will remove clay and fine sand from the concentrates
- Clay will be pumped to a small thickener
- The cleaned concentrate will be pumped to a drainage shed
- After draining the concentrate will be fed by the 950 FEL to the dryer
- Once dried the sand will pass over a 2mm scalping screen and then into the magnet circuit.
- Separation of the mixed garnet/hornblende concentrate into final products will occur on magnets in the dry circuit of the separation plant.

The Alice Springs Separation Plant flowsheet is given in Fig 4.4

4.1.7.1.1 Wet circuit

Sand will be fed into the wet circuit feed tank via conveyor. From the feed tank concentrate will be pumped in a slurry through a hydocyclone into attritioners which will clean clay from the sand grain surfaces. After attritioning the sand will be pumped through a second hydrocyclone into a hydrosizer. The hydrosizer will remove fine sand and any remaining clay as an overflow. The hydrosizer overflow will be pumped, along with tails from the dry circuit through a third hydrocyclone onto a tailings stockpile.

The overflow from the 3 hydrocyclones will be fed into the slimes thickener. The underflow from the slimes thickener will be pumped to a small clay drying dam. The overflow water from the thickener will be fed back into the circuit.

4.1.7.2 Dry Circuit

The minerals in the dry circuit feed are separated through differences in magnetic susceptibility. The minerals present in thee dry circuit feed are:

Magnetite / Ilmenite	Highly magnetic
Garnet	Moderately magnetic
Hornblende	Weakly magnetic
Quartz	Non Magnetic

Once separated magnetically the Garnet and Garnetblende products will be held in silos prior to being bagged or fed into trucks for bulk transport.

The coarse and fine concentrates from the wet concentrator will drain and to an extent dry (to 2% - 3% moisture) in the drying shed. The concentrates will then be treated batch wise through the ASSP. The ASSP (in Stage 1) has a feed capacity of 15 tph.

Concentrate will be taken from the drying shed via a 950 FEL or equivalent and fed into the ASSP feed hopper. From the feed hopper concentrate will be conveyed into the drier and from the drier onto a 2mm scalping screen. The undersize from the scalping screen is fed onto a magnet circuit consisting of 3 Rare Earth Drum and 1 Rare Earth Roll Magnets

The 4 products produced in the magnet circuit are:

- 30/60# Garnetblende
- +30# Garnetblende
- 30/60# Garnet
- +30# Garnet

The Alice Springs Separation Plant will have sufficient floor area to add extra equipment at a later date to produce further products eg 80# garnet.

4.1.8 Equipment List

The following equipment is proposed to be used at Harts Range and Alice Springs:

			Utilisation (hrs/yr)	
Equipment	Units	Type / Model	Continuous	Start-up
Front End Loader	2	Caterpillar 950	20,000	2000
Bulldozer	1	Caterpillar D7	1000	100
Front End Loader	1	Caterpillar 950	2000	0
Lighting Unit	1		4000	0
Utility	2	Toyota Twin Cab	12,000	12,000
Forklift	1	Toyota 3 Tonne	10,000	2000

4.1.9 Personnel List

Whilst in continuous operation it is intended to work a 4 shift roster working 12 hours per shift. On Start-up 20 hours per week will be worked on day work at each site.

Harts Range

On continuous operation two operators would be on each shift i.e. a loader operator and a fixed plant operator. One of the operators will be the senior operator in charge of the shift. The remainder of the workforce on a continuous operation would be on a day shift roster.

On Start-up the only permanent employee at Harts Range will be the Mine Manager. Loader and other machine operators will be employed on a casual basis from the local community.

The following workforce is proposed to be used at Harts Range:

Position	Continuous	Start-up	Roster
Mine Manager	1	1	Day
Mechanical Trades	1		Day
Cooks / Cleaners	2		Day
Loader Drivers	4 (Shift)	0.5 (Day)	Day/Shift
Plant Operators	4		Shift
Relief Operators	1		Shift
Total Manning	**13**	**1.5**	

Alice Springs

On continuous operation at Alice Springs two employees would be on each shift. One employee would operate the fixed plant and the other would drive the loader and carry out the product bagging. The remaining employees would be on a day shift roster.

On Start-up the only permanent employee at Harts Range will be the Plant Supervisor who would be a metallurgist. The loader and bagging operator will be employed on a casual basis from Alice Springs.

The following workforce is proposed to be used at Alice Springs:

Position	Continuous	Start-up	Roster
Plant Supervisor / Met	1	1	Day
Mechanical Trades	1		Day
Plant Operators	4		Shift
Loader drivers / Baggers	4(Shift)	1(Day)	Day/Shift
Relief Operators	1		Shift
Total Manning	**11**	**2**	

4.1.10 Mine Planning

Mine planning for Harts Range will be supplied from the Perth head office of Olympia. Initially the mine planning will be carried out by consultants. The consultants will supply pit design and pit limits which will be pegged out on site by a consultant surveyor from Alice Springs.

The consistent nature of the Harts Range deposits and the obvious visual cut off between the orebody and basement will lead to grade control being quite straight forward. The basement cut off will be determined visually by the loader driver with assistance of the site mine manager where required. There is no need for a grade control geologist to be employed on site at Harts Range.

4.1.11 Product Quality Control

The need to supply consistent quality products to customers is essential to the success of the Harts Range Project. Olympia will set up appropriate systems and procedures to ensure consistent quality products and gain quality accreditation for the Harts Range and Alice Springs site.

A metallurgist will be employed at Alice Springs to supervise the operation of the Alice Springs separation plant and the quality system. The metallurgist will also be responsible for the metallurgical performance of the Harts Range fixed plant and will have overall responsibility for maximising recovery of ore to product and producing consistent quality products.

To assist in this a small laboratory will be on site at Alice Springs containing sink/float and screening equipment as well as a binocular microscope. This laboratory will be operated by the metallurgist.

The metallurgist will also be responsible for process development work including investigating the potential to produce additional products.

Section 6 Infrastructure and Administration

6.1 Accommodation

A single person's accommodation camp will be constructed at Harts Range. Initially this camp will consist of the following:

- 4 rooms with ensuites
- Kitchen and dining room
- Bathroom and toilet block
- Landscaped outdoor area
- Administration Office

Accommodation costs will be borne by Olympia for both Olympia employees and contractors

6.2 Site Access

Access to the minesite will be via a 400 meter long road off the Plenty highway. The Plenty Highway will be fenced in the vicinity of the minesite to discourage unauthorised access onto the site via four wheel drive vehicles. The access road will have double gates which will be locked when no Olympia personnel are on the minesite

The mining pit and rehabilitation areas will be fenced to discourage access of visitors or fauna onto these areas.

6.3 Water Supply

The Harts Range mining operation will commence utilising dry mining and processing. Testwork has indicated that dry processing will be successful in producing a satisfactory concentrate for further wet and dry processing at the Alice Springs Separation Plant.

Dry processing will be assessed in the initial operation of the Stage 1 Plant and if successful will continue to be used both in the Stage 1 and Stage 2 Plants. If dry separation does not work efficiently then some wet processing may have to be incorporated into the operations at Harts Range.

At the request of the Department of Environment further work is being carried out in the vicinity of Harts Range to show that water is available from aquifers in the area which can be extracted without significant effects on the water supply of the local Aboriginal community and pastoralists.

6.4 Power Generation

Power will be supplied to the minesite via diesel generators.

6.5 Diesel and Oil Storage

A bunded fuel farm will be constructed to store diesel and greases for the mining operations and to supply the diesel power generators. The fuel farm will be constructed to comply with Northern Territory government requirements.

6.6 Workshop / Warehouse

A small workshop and warehouse will be constructed on site. Adjacent to the Workshop will be a vehicle wash down bay with bunding and fuel traps as required by government regulations.

6.7 Weighbridge

A weighbridge will be constructed at the Alice Springs Separation Plant site.

6.8 Employee Transport to site

Employees based in Alice Springs who work at the Harts Range site will initially be transported to Harts Range in a company utility. As the operation grows employees will be transported between Harts Range and Alice Springs in a bus. The bus will be supplied by a contract bus company and will be paid for by Olympia.

Local employees and contractors will provide their own transport.

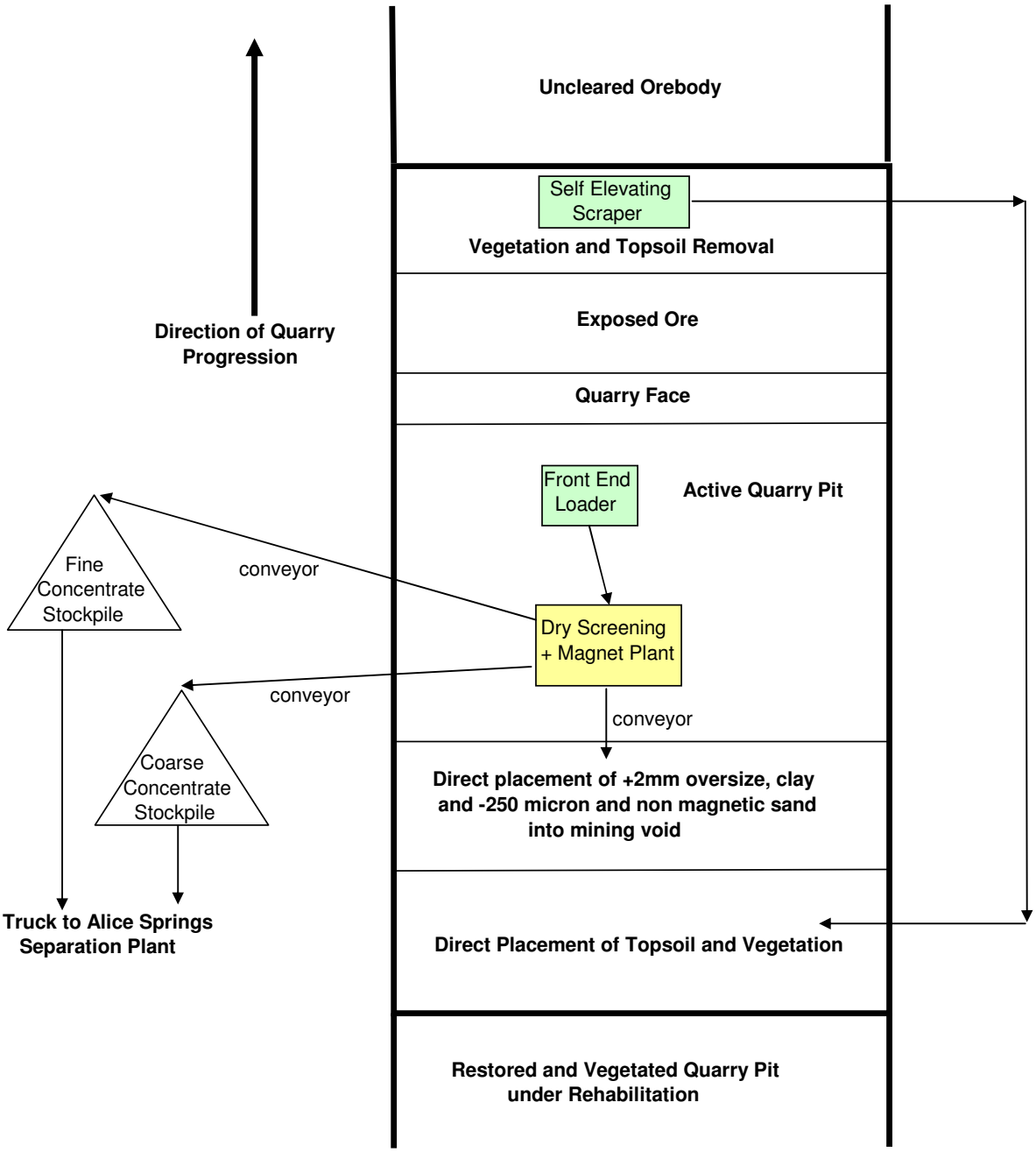
6.9 Accounting and Human Resources

There will be no accounting or human resources personnel based at Harts Range or Alice Springs. All accounts received on site will if correct, be signed off and posted to the Perth Head Office of Olympia for processing and payment.
Human resource issues will be dealt with on site through line management. Support will be provided out of Perth or Alice Springs as required.
All Olympia employees will be employed under Australian Workplace Agreements (AWA) and paid fortnightly from Perth.

6.10 Communications

High speed data communications will be provided between the Harts Range site and Perth.
Communications within the Harts Range site will be provided via two-way radios.

Fig 4.1 ***Draft*** **Harts Range Quarry and Dry Processing Operations Plan**



Section 7 Logistics and Transport

7.1 Concentrate Cartage

Dry concentrate from the two Harts Range stockpiles will be trucked to Alice Springs and stockpiled on the separation plant site prior to being processed.

Approximately 20% of the concentrate will be rejected as tailings from the separation plant. The tailings will contain clay, quartz sand and some garnet and hornblende. These tailings will be back-loaded on the concentrate truck and deposited in the mining void.

The tonnage of concentrate and separation plant tails trucked each year is given in the following table:

Harts Range Trucking	Stage 1		Stage 2
	Start-up tpy	Max tpy	Max tpy
Concentrate	7,200	96,000	360,000
Separation Plant Tails	1,440	19,200	72,000

7.2 Products

Initially 4 products will be produced at the Harts Range site in the following product mix:

Product	Weight Percent	Stage 1		Stage 2
		Start-up tonnes	max tonnes	max tonnes
30/60 Garnetblende	66%	3,950	52,800	198,000
+30# Garnetblende	14%	850	11,200	42,000
30/60 Garnet	12%	720	9,600	36,000
+30# Garnet	8%	480	6,400	24,000
Total	100%	6,000	80,000	300,000

There may be the opportunity to produce other products such as 80 mesh garnet for water jet cutting but at this time only the above products are assumed to be produced.

It is assumed that the first 20,000 tpy of product will be sold bagged in either 1 tonne or 25kg bags into the Australian and South East Asian market.

Bagging will be carried out at Alice Springs. Transport of bagged products will be by rail and/or truck

Sales above 20,000 tpy will likely come from large bulk contracts which will be shipped out of Port of Darwin utilising the bulk loading facilities.

The bulk product will be transported by truck or train to Darwin and stored in dedicated sheds close to the Darwin East Arm Port. During shipping it will be loaded

from the storage shed into side tipping trucks by front end loaders and trucked to the Port shiploader. It is anticipated that shipments of bulk product will be in parcels of 10,000 to 20,000 tonnes.

7.3 Product Storage

Products to be bagged at the Alice Springs Separation Plant will be held in silos. Product will be fed from the silos via conveyors to bagging equipment. Bagged product will be stored temporarily in a shed until being loaded by forklift onto trucks or into containers for transport. This bag storage shed will be 1,000 square meters in floor area to hold approximately 500 tonnes of bagged product
The bulk product will be stored in 100 tonne drive-under silos which will allow direct loading into trucks for bulk transport to Darwin.

At Darwin a storage shed of approximately 6000 square meters will be constructed on a Land Corporation lease near the Port of Darwin. The shed will be close to the rail bulk discharge hopper to allow conveying of product from the train discharge hopper directly into the storage shed. If transport to Darwin is by truck rather than by train this conveyor will be designed into the storage facility but not constructed initially. The feasibility study, to minimise capital expenditure assumes that the storage shed will be constructed by a third party and leased to Olympia.

7.4 Transport

The transport of product, concentrate and tails will be tendered.

Section 8 Marketing

8.1 Market Overview

The ability to market the garnet and Garnetblende produced at Harts Range is key to the success of the Harts Range project.

It is known that there is a large market for abrasives in South East Asia which is largely being supplied by waste copper slag from the Japanese copper smelters. This product is being dumped into the market at below cost and Olympia cannot compete with this product. Burwell has similarly imported 26,000 tonnes of copper slag into Australia at a price which Olympia cannot compete with. There is a strong move to ban the use of copper slag for environmental reasons and Malaysia and four states in Australia have already banned its use and/or disposal. As more countries ban the use of copper slag for sand blasting the opportunity will arise for producers of other suitable abrasives for sand blasting to sell large tonnages of their product into South East Asia. Olympia recognises this opportunity and plans to supply its Garnetblende and Garnet into this market. In the short term the South East Asian ship builders, who are the largest users of sand blasting abrasives in South East Asia, are loathe to pay extra to purchase Olympia's products instead of copper slag.

Olympia to date has been unable to secure off take agreements for its products and may not be able to achieve this until more widespread banning of the use of copper slag.

Garnetblende is a new product to the sand blasting industry and it is important that its use is accepted in the industry prior to the expected banning of copper slag. It is Olympia's intention therefore to start producing abrasive products as soon as practicable and to sell them in relatively small tonnages into the local Australian market as well as South East Asia.

A small plant has been designed to produce up to 80,000 tpy of abrasive products at the relatively low capital cost of $4 million. This plant has low overhead costs and therefore will operate profitably at sales tonnages of less than 10,000 tpy.

The Australian market for abrasives is not well documented however it is thought to be approximately 50,000 tpy. To sell 10,000 tpy into Australia Olympia would need to gain approximately 20% of the market share. Olympia's ability to do this will depend on the markets acceptance of Garnetblende as a cheaper alternative to garnet. Testwork indicates that Garnetblende is a suitable substitute for garnet on single use applications. If acceptance of Garnetblende occurs there is a significant opportunity to sell both Olympia Garnetblende and Garnet into the Australian market.

Olympia commissioned Mineralex Agencies Pty Ltd to carry out a market survey of the Australian Industrial Garnet Market. Mineralex estimated the Australian consumption of industrial garnet to be 25,000 to 30,000 tpy.

Australian garnet import figures for 2003/2004 show that 19,600 tonnes of garnet were imported into Australia with the majority from India.

In discussions with Burwell they estimated that the sales of abrasives in Australia was 36,000 to 40,000 tpy made up of:

Burwell Sales	Copper Slag	7,200 tpy
	Ilmenite	4,800 tpy
	Garnet (Indian)	5,000-6,000 tpy
	Staurolite	5,000-8,000 tpy
GMA	Garnet	12,000-18,000 tpy
Total		34,000 -44,000 tpy

Burwell and GMA are the largest sellers of abrasives in Australia however the above figures do not take into account sales by others such as Pan Abrasives. The above data is not consistent however the following estimate of the Australian abrasive market seems reasonable:

Garnet (Indian)	15,000-20,000 tpy
Garnet (GMA)	10,000-15,000 tpy
Total Garnet	**25,000-35,000 tpy**
Copper Slag	7,000 tpy
Ilmenite	5,000 tpy
Staurolite	5000-8000 tpy
Crushed Glass + Others	1000-2000 tpy
Total Other Abrasives	**18,000-22,000 tpy**

The total abrasive market in Australia appears to be approximately 50,000 tpy with approximately 30,000 tonnes of the total abrasives used being garnet.

The distribution of sales within Australia is important for Olympia as the Alice Springs production location points to Olympia being most competitive in the Northern Territory, South Australia and Queensland. The following budget quotes were obtained for transport of containerised product within Australia from Freightlink and NQX (Toll).

From	To	$ per Tonne Containerised	
		NQX	Freightlink
Alice Springs	Darwin	$115	$50
Alice Springs	Adelaide	$66	
Alice Springs	Melbourne	$98	
Alice Springs	Brisbane	$55	
Alice Springs	Sydney	$85	
Alice Springs	Perth via Darwin	$230	
Alice Springs	Perth via Adelaide	$187	
Alice Springs	Rockhampton	$128	

Discussions were held with NQX re their high price of transport from Alice Springs to Darwin compared with Freightlink. They maintain that they cannot lower their price so the lower Freightlink price is used in the following study.

8.2 Melbourne Abrasive Market

Imports of garnet into Melbourne in 2003/2004 were 4072 tonnes. The price data we have on abrasives sold to Melbourne is as follows:

Abrasive	Price ($ per tonne)	Data Source
Crushed Glass	130	Pan Abrasives
Indian Garnet	$225	Pan Abrasives
Indian Garnet	$260	Mineralex
GMA Garnet	$285.75	Mineralex

To cover operating costs $100 and $150 are used as the base cost of Garnetblende and Garnet ex Alice Springs. A minimum sales margin of $20 per tonne is added to this cost along with the transport cost to come up with the minimum Garnetblende and Garnet sales price for the Melbourne market i.e.

Garnetblende Sales Price in Melbourne = $100 + $20 + $98 = $218 per tonne
Garnet Sales Price in Melbourne = $150 + $20 + $98 = $268 per tonne

Based on the above it can be seen that Olympia products are not cost competitive with Crushed Glass but are competitive with both Indian and GMA Garnet. With the current increasing container freight rates between India and Australia Garnetblende in particular would be competitive with Indian and GMA Garnet.

In the Melbourne market it is unlikely that a margin of greater than the minimum $20 per tonne could be achieved.

8.3 Sydney Abrasive Market

Imports of Indian Garnet into Sydney in 2003/2004 were 3349 tonnes. Our price data on abrasives sold into Sydney is as follows:

Abrasive	Price ($ per tonne)	Data Source
Staurolite	$186	Burwell
GMA Garnet	$260	Burwell
Beach Minerals Garnet	$153	Burwell
MDL Ilmenite	$130	Burwell
Indian Garnet	$260.65	Mineralex
GMA Garnet	$282	Mineralex

Garnetblende Sales Price in Sydney = $100 + $20 + $85 = $205 per tonne
Garnet Sales Price in Sydney = $150 + $20 + $85 = $255 per tonne

Garnet and Garnetblende are not cost competitive with Beach Minerals Garnet, MDL Ilmenite and Staurolite. They are competitive with the higher quality Indian garnet

and GMA garnet. Sydney appears a difficult market for Olympia given the presence of cheaper Beach Minerals garnet and Staurolite.

8.4 Brisbane Market

Imports of Indian Garnet into Brisbane in 2003/2004 were 7457 tonnes. Our price data on abrasives sold into Brisbane is as follows:

Abrasive	Price ($ per tonne)	Data Source
Indian Garnet	$260.65	Mineralex
GMA Garnet	$340	Mineralex

Garnetblende Sales Price in Brisbane = $100 + $20 + $55 = $175 per tonne
Garnet Sales Price in Brisbane = $150 + $20 + $55 = $225 per tonne

With the low "back haul" freight rate Brisbane is a market where Olympia has a real cost advantage over competitive garnet products. This combined with the high 7457 tpy import of Indian Garnet make Brisbane very attractive with the likelihood of sales margins of $40 - $50 being achievable and high sales volumes.

8.5 Darwin Market

Imports of Indian Garnet into Darwin in 2003/2004 were 602 tonnes. Olympia has little data on the cost of Garnet in Darwin but a figure of $319 per tonne has been obtained for GMA Garnet. The price for Indian garnet is likely to be at least the $260.65 price achieved at Brisbane.

Using the Freightlink transport price of $50 per tonne Alice Springs to Darwin the sales prices for Olympia's products are:

Garnetblende Sales Price in Darwin = $100 + $20 + $50 = $170 per tonne
Garnet Sales Price in Darwin = $150 + $20 + $50 = $220 per tonne

As would be expected Olympia's products will be very cost competitive in Darwin with $50 per tonne sales margins likely to be achievable.

8.6 Adelaide Market

There are no figures available on the Adelaide market. Adelaide is the base of GMA's distributor – Blastmaster. Given the opportunity for "back loading" Garnet from Perth to Adelaide either on rail or road GMA garnet would be in a strong position and probably dominate the Adelaide garnet market.

Garnetblende Sales Price in Adelaide = $100 + $20 + $66 = $186 per tonne
Garnet Sales Price in Adelaide = $150 + $20 + $66 = $236 per tonne

Olympia should be competitive with GMA especially with Garnetblende however more data is required on this market.

8.6 Rockhampton Market

There are no consumption figures available on the Rockhampton abrasive market. Mineralex quote a price of $340 per tonne for GMA garnet in Rockhampton.

Garnetblende Sales Price in Rockhampton = $100 + $20 + $128 = $248 per tonne
Garnet Sales Price in Rockhanpton = $150 + $20 + $128 = $298 per tonne

Olympia is cost competitive with GMA in Rockhampton and should have the ability to achieve $50 sales margins in this market

8.7 Alice Springs, Tennant Creek and Mount Isa Markets

Little information is available on these markets but Olympia will obviously be very cost competitive in these markets and should obtain the majority of their abrasive sales at high sales margins.

8.8 Market summary

The following table represents a summary of the potential markets with estimated prices and sales tonnages for the first year of operation.

Market	Product	Sales Tonnes	Sale Price	Margin / Tonne	Sales
Melbourne	Garnet	100	$268	$20	$26,800
	Garentblende	300	$218	$20	$65,400
Sydney	Garnet	100	$255	$20	$25,500
	Garentblende	300	$205	$20	$80,000
Brisbane	Garnet	600	$255	$50	$153,000
	Garentblende	2000	$205	$50	$410,000
Darwin	Garnet	200	$250	$50	$50,000
	Garentblende	400	$200	$50	$80,000
Adelaide	Garnet	0	$236	$20	0
	Garentblende	500	$186	$20	$93,000
Rockhampton	Garnet	400	$328	$50	$131,200
	Garentblende	900	$278	$50	$250,200
Alice Springs,	Garnet	100	$250	$80	$25,000
Tennent, Isa	Garentblende	400	$200	$80	$80,000
Total		**6300**			**$1,470,100**

The above assumes sales of 3900 tonnes into Brisbane and Rockhampton taking up to half of the Queensland market. It is assumed that this market share will be gained predominantly from Indian garnet and to a lesser extent from GMA garnet.

Sales of 1100 tonnes are assumed into the Northern Territory and Mount Isa. This represents a significant proportion of the Northern Territory and Mount Isa market but being located in the Northern Territory Olympia would expect to gain most of this market.Sales into Sydney, Melbourne and Adelaide are assumed to be quite low at only 1300 tonnes in total.

Sales prices range from $186 to $278 per tonne for Garnetblende and $200 to $328 per tonne for garnet. Although a higher price is expected to be achieved for the coarse products than the 30/60 products they have been assumed to sell at the same price in this analysis.

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Option 1 - New Equip

		Equipment			Labour				Spare	Freight	Mark	Total
Item	Description	Qty	Unit	Rate	Value	Hrs	Rate	Value	Parts		Up	
	MINE-SITE											
Section 1.1	Equipment											
1	Road Hopper	1	off	$48,500	$48,500	24	$75	$1,800	$0	$3,000	0	$53,300
2	Feeder - 240v AC 8.0 amps	1	off	$8,837	$8,837	12	$75	$900	$640	$960	0	$11,337
3	No.1 elevator - 75tph 18.5kW	1	off	$29,000	$29,000	16	$75	$1,200	$880	$1,500	0	$32,580
4	Scalping Screen - Schenck MH1-1236											
	Single deck 3.6mx1.2m ; 5.5kW	1	off	$64,430	$64,430	16	$75	$1,200	$3,580	$3,600	0	$72,810
5	O/S Discharge Conveyor - 8m long											
	400mm wide, 2.2kW	1	off	$16,460	$16,460	16	$75	$1,200	$832	$1,500	0	$19,992
6	Product Elevator No.2 - as for No.1	1	off	$29,000	$29,000	16	$75	$1,200	$0	$1,500	0	$31,700
7	0.7mm Screen - Schenck Mh1-1236											$0
	Single deck 3.6mx1.2m ; 5.5kW	2	off	$64,430	$128,860	32	$75	$2,400	$0	$7,200	0	$138,460
8	Fine Product Elevator - as No.2	1	off	$29,000	$29,000	16	$75	$1,200	$0	$1,500	0	$31,700
9	Coarse Product Elevator -10tph 2.2kW	1	off	$22,000	$22,000	16	$75	$1,200	$980	$1,500	0	$25,680
10	Coarse RED - 1m wide, 1 stage, 4kW	1	off	$95,000	$95,000	20	$75	$1,500	$4,800	$960	0	$102,260
13	Derrick Screen	4	off	$80,540	$322,160	64	$75	$4,800	$0	$15,600	0	$342,560
14	Air sizer				$0	0	$75	$0	$0	$0	0	$0
16	Product Elevators - 2,2kw	3	off	$17,800	$53,400	48	$75	$3,600	$964	$1,500	0	$59,464
17	Fine RED's - 1m wide, 1s, 2x4kW	2	off	$95,000	$190,000	20	$75	$1,500	$0	$1,920	0	$193,420
18	Product Conveyors 400mm wide,10m											$0
	long, 5kW	2	off	$20,660	$41,320	32	$75	$2,400	$0	$3,000	0	$46,720
19	Air Compressor	1	off	$4,380	$4,380	8	$75	$600	$0	$960	0	$5,940
20	Dust Collection System	1	off	$180,000	$180,000	incl	$75	$0	$0	$12,000	0	$192,000
21	Ammenities/Office Module	1	off	$24,500	$24,500	8	$75	$600	$0	$6,000	0	$31,100
22	Potable Water Tank	1	off	$2,300	$2,300	4	$75	$300	$0	$960	0	$3,560
					$1,289,147			$27,600	$12,676	$65,160		$1,394,583
Section 1.2	Fabrication											
1	Modules											
	Screen Module Skid Base & Structure	18	tonne	$5,500	$99,000	64	$75	$4,800	$0	$12,000	0	$115,800
	Separator & Elevator Module	11	tonne	$5,500	$60,500	36	$75	$2,700	$0	$8,000	0	$71,200

	Stairs, Handrails & Floor Mesh	1	lot	$13,550	$13,550	16	$75	$1,200	$0	$3,000	0	$17,750
	Cladding	80	sqm	$70	$5,600	incl	$75	$0	$0	$960	0	$6,560
2	Product Piping	96	m	$56	$5,376	36	$75	$2,340	$120	$960	0	$8,796
3	Manual Samplers	4	off	$280	$1,120	4	$75	$260	$250	$0	0	$1,630
4	Product Bins	0							$0			$0
	Air Lines	1	lot	$1,800	$1,800	32	$75	$2,400	$120	$0	0	$4,320
					$186,946			$13,700	$490	$24,920		$226,056
Section 1.3	Electrics & Instrumentation											
	Electrics.	1	lot	$128,000	$128,000	160	$75	$12,000	$3,250	$6,000		$149,250
	Instrumentation	2	lot	$43,000	$43,000	64	$75	$4,800	$1,600	$0		$49,400
					$173,000			$16,800	$4,850	$6,000		$198,650
	Hire of 0.5MW Power Plant = $1,400/week plus fuel (taken over 12 mths)											
Section 1.4	Miscellaneous											
	Cranage	3	wks	$7,000	$21,000	0	$75	$0	$0	$0	0	$21,000
	Vendors	1	off	$2,700	$2,700	0	$75	$0	$0	$0	0	$2,700
	Air Fares	10	off	$10,000	$10,000	0	$75	$0	$0	$0	0	$10,000
	Vehicle Hire	3	wks	$3,200	$3,200	0	$75	$0	$0	$0	0	$3,200
	Management	1	lot	$16,000	$16,000	0	$75	$0	$0	$0	0	$16,000
	Site Preparation	1	lot	$12,000	$12,000	0	$75	$0	$0	$0	0	$12,000
	Sewerage System	1	off	$9,000	$9,000	0	$75	$0	$0	$0	0	$9,000
	Power consumption 280kW/hr				$73,900							$73,900
	Section Sub-Total											**$1.893,189**
	PROCESSING PLANT											
Section 2.1	Equipment											

	Road hopper	1	off	$48,500	$48,500	24	$75	$1,800	$0	$3,000	0	$53,300
	Feeder	1	off	$8,837	$8,837	12	$75	$900	$0	$960	0	$10,697
	Infeed Conveyor - 2.2kW	1	off	$18,830	$18,830	16	$75	$1,200	$0	$1,500	0	$21,530
	Attritioner - 37kW	1	off	$95,000	$95,000	8	$75	$600	$3,300	$960	0	$99,860
	Hydrosizer Feed Hydrocyclone	1	off	$5,950	$5,950	8	$75	$600	$0	$0	0	$6,550
	Hydrosizer.	1	off	$45,000	$45,000	16	$75	$1,200	$2,250	$960	0	$49,410
	Multihopper & Pumps - 45kW	6	off	$19,550	$117,300	32	$75	$2,400	$3,200	$6,000	0	$128,900
	Plant O/F Hopper & Pump - 7.5kW	0	off	$0	$0	0	$75	$0	$0	$0	0	$0
	Thickener - 5kW	1	off	$180,000	$180,000	128	$75	$9,600	$0	$12,000	0	$201,600
	Flocculant System - 5.5kW	1	off	$66,000	$66,000	40	$75	$3,000	$2,800	$960	0	$72,760
	Thickener U/F Pump - 15kW	1	off	$14,503	$14,503	8	$75	$600	$0	$0	0	$15,103
	Thickener O/F Water Hopper & Pump	1	off	$26,600	$26,600	16	$75	$1,200	$0	$960	0	$28,760
	Tails Return Water Hopper & Pump	0	off	$0	$0	0	$75	$0	$0	$0	0	$0
	Sump Pump - 11kW	2	off	$13,357	$26,714	4	$75	$300	$0	$0	0	$27,014
	Drying Shed Hydrocyclone	2	off	$5,950	$11,900	8	$75	$600	$0	$0	0	$12,500
	Road Hopper	1	off	$48,500	$48,500	24	$75	$1,800	$0	$3,000	0	$53,300
	Feeder - 5kW	1	off	$8,837	$8,837	12	$75	$900	$0	$960	0	$10,697
	Infeed System - 2.2kW	1	off	$18,830	$18,830	24	$75	$1,800	$0	$1,500	0	$22,130
	Drier - 37kW	1	off	$300,000	$300,000	48	$75	$3,600	$26,900	$12,000	0	$342,500
	Primary RED - 4kW	1	off	$95,000	$95,000	24	$75	$1,800	$2,375	$960	0	$100,135
	Garnet RED - 4kW	1	off	$95,000	$95,000	24	$75	$1,800	$0	$960	0	$97,760
	Garnetblende RED - 4kW	1	off	$95,000	$95,000	24	$75	$1,800	$0	$960	0	$97,760
	Garnetblende RER Magnet - 5kW	1	off	$78,800	$78,800	24	$75	$1,800	$0	$960	0	$81,560
	Elevators - 2.2kW	7	off	$22,000	$154,000	112	$75	$8,400	$0	$10,500	0	$172,900
	Tails Conveyor - 2.2kW	1	off	$18,830	$18,830	24	$75	$1,800	$0	$1,500	0	$22,130
	Bagging Bins	2	off	$86,000	$172,000	16	$75	$1,200	$0	$3,000	0	$176,200
	Bagging Machine	1	off	$13,000	$13,000	8	$75	$600	$0	$960	0	$14,560
	Dust Collection System - 55kW	1	off	$176,000	$176,000	64	$75	$4,800	$2,200	$6,000	0	$189,000
	Air Compressor - 5kW	1	off	$4,380	$4,380	8	$75	$600	$0	$960	0	$5,940
					$1,943,311			$56,700	$43,025	$71,520	0	$2,114,556
	Power comsumption - 250kW/hr											
Section 2.2	Fabrication											
	Drying Plant support Structure	7	tonne	$5,500	$38,500	84	$75	$6,300	nil	$6,000	0	$56,300
	Separation Plant Support Structure	11	tonne	$60,500	$60,500	132	$75	$9,900	nil	$9,000	0	$69,400
	Drying Shed						$75		nil		0	
					$99,000			$16,200	$0	$15,000		$130,200

Section 2.3	Electrics & Instrumentation											
	Electricals	1	lot	$168,000	$168,000	240	$75	$18,000	$4,480	$6,000	0	$196,480
	Instrumentation	1	lot	$66,000	$66,000	96	$75	$7,200	$6,880	$0	0	$80,080
	Possible Main Connection Up-grade	1	lot	$30,000	$30,000	0	$75	$0	$0	$0	0	$30,000
					$264,000			$25,200	$11,360	$6,000	0	$306,560
Section 2.4	Miscellaneous											
	Foundations	26	cum	$1,800	$46,800	incl	$75	$0	$0	$0	0	$46,800
	Site Preparation	1	lot	$18,000	$18,000	incl	$75	$0	$0	$0	0	$18,000
	Sealing	600	sqm	$23	$13,800	incl	$75	$0	$0	$0	0	$13,800
	Water Lines	1	lot	$16,600	$16,600	$80	$75	$6,000	$0	$0	0	$22,600
	Air Lines	1	lot	$6,300	$6,300	$32	$75	$2,400	$0	$0	0	$8,700
	Field Lines	400	m	$7	$2,800	$64	$75	$4,800	$0	$0	0	$7,600
	Ammenities Module	0	off	$0	$0	$0	$75	$0	$0	$0	0	$0
	Communications	1	lot	$12,000	$12,000	incl	$75	$0	$0	$0	0	$12,000
	Vendors	1	lot	$3,000	$3,000	incl	$75	$0	$0	$0	0	$3,000
	Air Fares	1o	off	$10,000	$10,000	incl	$75	$0	$0	$0	0	$10,000
	Vehicle Hire	3	weeks	$3,200	$3,200	incl	$75	$0	$0	$0	0	$3,200
	Cranage	3	weeks	$5,500	$16,500	incl	$75	$0	$0	$0	0	$16,500
	Management	1	lot	$16,000	$16,000	incl	$75	$0	$0	$0		$16,000
					$165,000			$13,200		$12,000		$178,200
	Assume water service available, main											
	road access available.											
	Section Sub-Total											**$2,729,516**
	EPCM											**$200,000**
	Project Estimate Total											**$4,822,705**
	Include +15% Varience											
	Total Project Estimate excl GST											**$5.5m**

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Option 2 - Used Equip if available

		Equipment			Labour				Spare	Freight	Mark	Total
Item	Description	Qty	Unit	Rate	Value	Hrs	Rate	Value	Parts		Up	
	MINE-SITE											
Section 1.1	Equipment											
	Road Hopper	1	off	$19,000	$19,000	24	$75	$1,800	$0	$3,000	0	$23,800
	Feeder - 240v AC 8.0 amps	0	off	$0	$0	0	$75	$0	$0	$0	0	$0
	No.1 elevator - 75tph 18.5kW	1	off	$9,000	$9,000	16	$75	$1,200	$880	$1,500	0	$12,580
	Scalping Screen - Schenck MH1-1236											$0
	Single deck 3.6mx1.2m ; 5.5kW	1	off	$15,000	$15,000	16	$75	$1,200	$3,580	$3,600	0	$23,380
	O/S Discharge Conveyor - 8m long											$0
	400mm wide, 2.2kW	1	off	$10,500	$10,500	16	$75	$1,200	$832	$1,500	0	$14,032
	Product Elevator No.2 - as for No.1	1	off	$9,000	$9,000	16	$75	$1,200	$0	$1,500	0	$11,700
	0.7mm Screen - Schenck Mh1-1236											$0
	Single deck 3.6mx1.2m ; 5.5kW	2	off	$13,000	$26,000	32	$75	$2,400	$0	$3,600	0	$32,000
	Fine Product Elevator - as No.2	1	off	$9,000	$9,000	16	$75	$1,200	$0	$1,500	0	$11,700
	Coarse Product Elevator -10tph 2.2kW	1	off	$8,000	$8,000	16	$75	$1,200	$980	$1,500	0	$11,680
	Coarse RED - 1m wide, 1 stage, 4kW	1	off	$95,000	$95,000	20	$75	$1,500	$4,800	$960	0	$102,260
	Derrick Screen	4	off	$15,000	$60,000	64	$75	$4,800	$0	$15,600	0	$80,400
	Air sizer				$0	0	$75	$0	$0	$0	0	$0
	Product Elevators - 2,2kw	3	off	$8,000	$24,000	48	$75	$3,600	$964	$1,500	0	$30,064
	Fine RED's - 1m wide, 1s, 2x4kW	2	off	$95,000	$190,000	20	$75	$1,500	$2,375	$1,920	0	$195,795
	Product Conveyors 400mm wide,10m											$0
	long, 5kW	2	off	$12,000	$24,000	32	$75	$2,400	$0	$3,000	0	$29,400
	Air Compressor	1	off	$4,380	$4,380	8	$75	$600	$0	$960	0	$5,940
	Dust Collection System	1	off	$50,000	$50,000	incl	$75	$0	$0	$24,000	0	$74,000
	Ammenity Module	1	off	$15,000	$15,000	8	$75	$600	$0	$6,000	0	$21,600
	Potable Water Tank	1	off	$2,300	$2,300	4	$75	$300	$0	$960	0	$3,560
					$570,180			$26,700	$14,411	$72,600		$683,891
Section 1.2	Fabrication											
	Modules											
	Screen Module Skid Base & Structure	18	tonne	$5,500	$99,000	64	$75	$4,800	$0	$12,000	0	$115,800
	Separator & Elevator Module	11	tonne	$5,500	$60,500	36	$75	$2,700	$0	$8,000	0	$71,200

	Stairs, Handrails & Floor Mesh	1	lot	$13,550	$13,550	16	$75	$1,200	$0	$3,000	0	$17,750
	Cladding	80	sqm	$70	$5,600	incl	$75	$0	$0	$960	0	$6,560
	Product Piping	96	m	$56	$5,376	36	$75	$2,340	$120	$960	0	$8,796
	Manual Samplers	4	off	$280	$1,120	4	$75	$260	$250	$0	0	$1,630
	Product Bins	0							$0			$0
	Air Lines	1	lot	$1,800	$1,800	32	$75	$2,400	$120	$0	0	$4,320
					$186,946			$13,700	$490	$24,920		$226,056
Section 1.3	Electrics & Instrumentation											
	Electrics.	1	lot	$128,000	$128,000	160	$75	$12,000	$3,250	$6,000		$149,250
	Instrumentation	2	lot	$43,000	$43,000	64	$75	$4,800	$1,600	$0		$49,400
					$173,000			$16,800	$4,850	$6,000		$198,650
	Hire of 0.5MW Power Plant = $1,400/week plus fuel (taken over 12 mths)											
Section 1.4	Miscellaneous											
	Cranage	3	wks	$7,000	$21,000	0	$75	$0	$0	$0	0	$21,000
	Vendors	1	off	$2,700	$2,700	0	$75	$0	$0	$0	0	$2,700
	Air Fares	10	off	$10,000	$10,000	0	$75	$0	$0	$0	0	$10,000
	Vehicle Hire	3	wks	$3,200	$3,200	0	$75	$0	$0	$0	0	$3,200
	Management	1	lot	$16,000	$16,000	0	$75	$0	$0	$0	0	$16,000
	Site Preparation	1	lot	$12,000	$12,000	0	$75	$0	$0	$0	0	$12,000
	Sewerage System	1	off	$9,000	$9,000	0	$75	$0	$0	$0	0	$9,000
					$73,900							$73,900
	Section Sub-Total											**$1,182,497**
	PROCESSING PLANT											
Section 2.1	Equipment											

	Road hopper	1	off	$19,000	$19,000	24	$75	$1,800	$0	$3,000	0	$23,800
	Feeder	1	off	$0	$0	12	$75	$900	$0	$960	0	$1,860
	Infeed Conveyor - 2.2kW	1	off	$6,000	$6,000	16	$75	$1,200	$0	$1,500	0	$8,700
	Attritioner - 37kW	1	off	$10,000	$10,000	8	$75	$600	$3,300	$960	0	$14,860
	Hydrosizer Feed Hydrocyclone	1	off	$1,200	$1,200	8	$75	$600	$0	$0	0	$1,800
	Hydrosizer.	1	off	$16,000	$16,000	16	$75	$1,200	$2,250	$960	0	$20,410
	Multihopper & Pumps - 45kW	6	off	$12,000	$72,000	32	$75	$2,400	$3,200	$6,000	0	$83,600
	Plant O/F Hopper & Pump - 7.5kW	0	off	$0	$0	0	$75	$0	$0	$0	0	$0
	Thickener - 5kW	1	off	$35,000	$35,000	128	$75	$9,600	$0	$12,000	0	$56,600
	Flocculant System - 5.5kW	1	off	$66,000	$66,000	40	$75	$3,000	$2,800	$960	0	$72,760
	Thickener U/F Pump - 15kW	1	off	$8,000	$8,000	8	$75	$600	$0	$0	0	$8,600
	Thickener O/F Water Hopper & Pump	1	off	$12,000	$12,000	16	$75	$1,200	$0	$960	0	$14,160
	Tails Return Water Hopper & Pump	0	off	$0	$0	0	$75	$0	$0	$0	0	$0
	Sump Pump - 11kW	2	off	$5,000	$10,000	4	$75	$300	$0	$0	0	$10,300
	Drying Shed Hydrocyclone	2	off	$1,200	$2,400	8	$75	$600	$0	$0	0	$3,000
	Road Hopper	1	off	$19,000	$19,000	24	$75	$1,800	$0	$3,000	0	$23,800
	Feeder	1	off	$0	$0	12	$75	$900	$0	$960	0	$1,860
	Infeed System - 2.2kW	1	off	$9,000	$9,000	24	$75	$1,800	$0	$1,500	0	$12,300
	Drier - 37kW	1	off	$48,000	$48,000	48	$75	$3,600	$26,900	$12,000	0	$90,500
	Primary RED - 4kW	1	off	$95,000	$95,000	24	$75	$1,800	$2,375	$960	0	$100,135
	Garnet RED - 4kW	1	off	$95,000	$95,000	24	$75	$1,800	$0	$960	0	$97,760
	Garnetblende RED - 4kW	1	off	$95,000	$95,000	24	$75	$1,800	$0	$960	0	$97,760
	Garnetblende RER Magnet - 5kW	1	off	$78,800	$78,800	24	$75	$1,800	$0	$960	0	$81,560
	Elevators - 2.2kW	7	off	$8,000	$56,000	112	$75	$8,400	$0	$10,500	0	$74,900
	Tails Conveyor - 2.2kW	1	off	$9,000	$9,000	24	$75	$1,800	$0	$1,500	0	$12,300
	Bagging Bins	2	off	$16,000	$32,000	16	$75	$1,200	$0	$3,000	0	$36,200
	Bagging Machine	1	off	$13,000	$13,000	8	$75	$600	$0	$960	0	$14,560
	Dust Collection System - 55kW	1	off	$32,000	$32,000	64	$75	$4,800	$2,200	$6,000	0	$45,000
	Air Compressor	1	off	$4,380	$4,380	8	$75	$600	$0	$960	0	$5,940
					$843,780			$56,700	$43,025	$71,520	0	$1,015,025
Section 2.2	Fabrication											
	Drying Plant support Structure	7	tonne	$5,500	$38,500	84	$75	$6,300	nil	$6,000	0	$56,300
	Separation Plant Support Structure	11	tonne	$60,500	$60,500	132	$75	$9,900	nil	$9,000	0	$69,400
	Drying Shed						$75		nil		0	
					$99,000			$16,200	$0	$15,000		$130,200

Section 2.3	Electrics & Instrumentation											
	Electricals	1	lot	$168,000	$168,000	240	$75	$18,000	$4,480	$6,000	0	$196,480
	Instrumentation	1	lot	$66,000	$66,000	96	$75	$7,200	$6,880	$0	0	$80,080
	Possible Main Up-grade	1	lot	$30,000	$30,000	0	$75	$0	$0	$0	0	$30,000
												$306,560
Section 2.4	Miscellaneous											
	Foundations	26	cum	$1,800	$46,800	incl	$75	$0	$0	$0	0	$46,800
	Site Preparation	1	lot	$18,000	$18,000	incl	$75	$0	$0	$0	0	$18,000
	Sealing	600	sqm	$23	$13,800	incl	$75	$0	$0	$0	0	$13,800
	Water Lines	1	lot	$16,600	$16,600	$80	$75	$6,000	$0	$0	0	$22,600
	Air Lines	1	lot	$6,300	$6,300	$32	$75	$2,400	$0	$0	0	$8,700
	Field Lines	400	m	$7	$2,800	$64	$75	$4,800	$0	$0	0	$7,600
	Ammenities Module	0	off	$0	$0	incl	$75	$0	$0	$0	0	$0
	Communications	1	lot	$12,000	$12,000	incl	$75	$0	$0	$0	0	$12,000
	Vendors	1	lot	$3,000	$3,000	incl	$75	$0	$0	$0	0	$3,000
	Air Fares	1o	off	$10,000	$10,000	incl	$75	$0	$0	$0	0	$10,000
	Vehicle Hire	3	weeks	$3,200	$3,200	incl	$75	$0	$0	$0	0	$3,200
	Cranage	3	weeks	$5,500	$16,500	incl	$75	$0	$0	$0	0	$16,500
	Management	1	lot	$16,000	$16,000	incl	$75	$0	$0	$0		$16,000
					$165,000			$13,200		$12,000		$178,200
	Assume water service available, main											
	road access available.											
	Note; Items highlited would be available ex-Thurla											
	Section Sub-Total											**$1,629,985**
	EPCM											**$200,000**
	Total project Estimate excl GST											**$3,012,482**
	Including +15% Varience											**$3.5m**