SEL 22 / 1999

NORTH EAST TASMANIA

ANNUAL REPORT

PERIOD ENDING 8TH AUGUST 2004

VAN DIEMAN MINES PTY LIMITED

31ST January 2005

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EXECUTIVE SUMMARY

During the year the tenement was transferred from the previous holder, Mineral Holdings Australia Pty Limited, to Van Dieman Mines Pty Limited. Van Dieman Mines is a wholly owned subsidiary of a UK public company, Van Dieman Mines Plc. Prior to this transfer Van Dieman had held an "Option to Purchase" from Mineral Holdings and as part of its commitment under that arrangement had continued to conduct work in relation to the tenement.

Mineral Holdings had, in the opinion of Van Dieman technical staff, quite adequately illustrated the sapphire bearing potential of the older Tertiary alluvial deposits of North East Tasmania but had failed to establish if the sapphire representative of those deposits was of economic interest to world gem end users. In order to test the acceptability of the sapphire in such markets Van Dieman developed a strategy to test these markets, specifically

A. To review the world gem market and in particular the position of sapphire as a component of the "Colored Stone" segment of the market;
B. To present at various US based trade shows samples of the Tasmanian sapphire and to assess its acceptability;
C. Using information gained from "A" and "B" above to develop a long term strategy to market Tasmanian sapphire; and
D. To determine what value could be attributed the sapphire component of the heavy mineral fraction of the Tertiary alluvial deposits.

To institute the above strategies two company directors, Neil Kinnane and Ken Frey attended the 2004 Tucson Gem and Mineral Show (February 2004) and the JA Jewelry Association) Show in New York (June 2004) where they met with many industry leaders including the President of the American Gem Traders Association (AGTA) the leading colored stone industry association.

Results of these activities have greatly improved the companies understanding of the world sapphire industry, an industry currently in a state of flux and major change and have enabled the company to position Tasmanian sapphire into the world market in an extremely favorable position.

Further the company is now confident to assign a value per cubic metre to the sapphire component of the Tertiary alluvial deposits and thus advance to economic development of several of the resources it has acquired from Mineral Holdings.

Work is continuing in developing branding of the Tasmanian product and securing market outlets for both the rough and finished products. During 2005 the company will continue to represent itself at major international gem shows and by mid 2005 hopes to be in a position to present meaningful size trial parcels to major end colored stone users.

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1.0 INTRODUCTION

During previous years of tenure Mineral Holdings had made an effort to purchase small parcels of rough sapphire and from those have selectively cut the best of the gem material. While this program met with some success it was, by its very nature, of limited value, specifically, as it was unable to address the following:

a. Parcels had in all instances been pre-sorted and the best gem material, ergo, the larger material put aside and not included;
b. The exact source locations were, as a rule, closely guarded secrets and thus only general localities were provided by the parcel seller; and
c. The zones of specific interest to Mineral Holdings, that is, the deeply buried (+20 m) older alluvials were thus not tested and the gem content remained problematic.

Irregardless of these difficulties Mineral Holdings did manage to produce some parcels of small finished product. These parcels were used by Van Dieman in its presentations to industry and in all instances were very well to enthusiastically received.

Results of the various marketing trips and studies indicate that while blue sapphire continues to be the lead colored stone on world markets and looks to continue in that position, discoveries of previously undetected heat treatments have seriously impacted on the image of sapphire as a “natural” gemstone. Laboratory studies within the AGTA and the GIA (Gemmological Institute of America) have begun to clarify and define these processes however the damage done to the sapphire image has now set markets on a crusade to locate and market “natural-unheated” gem material. To some extent these changes have worked in favor of Tasmanian stone and Van Dieman is now working to establish the “natural” nature of the North Eastern Tasmanian sapphire in world markets.

Original estimates of quantity, quality and value established by Mineral Holdings now appear conservative. Values per gram for rough stone of US $12.00 per gram appear at least half of what can realistically be achieved while the 20% gem component in rough parcels, a figure established from the parcel purchases also appears conservative. Grade "in-situ" remains problematical however work by Van Dieman detailed later in this report has better defined grade on a deposit by deposit (locality) basis.

Van Dieman has recently completed negotiations in relation to the purchase of a specialist sapphire / tin test plant and hopes to have that in position and operational in mid 2005. Material derived from those proposed test programs is to be used to better define:

a. Sapphire sizing, quality, gem component and color;
b. Ore grades in unworked ground;
c. Suitability of material for cutting as unheated "natural" stone and any potential treatment available that may enhance the stone without occurring sales penalties; and
d. To establish a suite of "Standard" sapphire samples to be distributed to world gemological laboratories to establish within world gem markets a signature for Tasmanian sapphire.

Work is ongoing in relation to establishing end marketing strategies and alliances and will be reported further as progress is made.

2.0 MARKET REVIEW

The highly diversified nature of the world gem markets and in particular the colored stone market made an assessment difficult. Moves to regulate markets, particularly within the USA mean that more information is now becoming available particularly in relation to consumption and total markets, however price ranges for individual gemstones remain cloaked in secrecy and few references are available detailing rough gem prices.

2.1 HISTORICAL REVIEW

The Colored Stone Magazine publishes annually, a summary of the colored stone market in the USA. For the past ten years blue sapphire has been the market leader (See Table 1) and based on current trends this status is not about to change. These trends, while for the USA only, also reflect world markets in such zones as the European Union, Japan and Asia – Pacific.

TABLE 1
TOP TEN SELLING COLORED GEMSTONES IN THE USA

2001	2002	2003
Blue Sapphire	Blue Sapphire	Blue Sapphire
Pearl	Ruby	Ruby
Tanzanite	Emerald	Tanzanite
Ruby	Tanzanite	Emerald
Emerald	Amethyst	Amethyst
Amethyst	Rhodolite Garnet	Blue Topaz
Green Tourmaline	Pearl	Tsavorite Garnet
Rhodolite Garnet	Opal	Aquamarine
Fancy Sapphire & Pink Tourmaline (Tie)	Peridot	Opal
Blue Topaz	Blue Topaz	Green Tourmaline

Source: Colored Stone Magazine: Jan/Feb 2002 & Jan/Feb 2003

It should be noted that unlike other commercial markets the colored stone market is driven to a large extent by:

a. Perceptions, true or otherwise of stone values;
b. Personal preferences in respect of color;
c. Fashion driven either seasonally or annually; and
d. Supply driven.

It can thus be seen that the position for instance of sapphire, emerald and ruby remain almost unchanged year by year while other “semi-precious” stones move wildly up and down the table driven by rough supply and fashion demand. An example of these fluctuations are positional movements in gems such as blue topaz and peridot. Blue sapphire is thus seen as the most stable gem commodity outside diamond.

Our studies of the market indicate that the USA remains to pre-imminent colored stone market, Table 2 illustrates the dominance of that market.

TABLE 2

COMPARATIVE WORLD MARKETS FOR COLORED GEMSTONES

FIGURES IN US $ Millions

2001	2002	2003
(Six Months March to Sept)	(Six Months March to Sept)	(Annually)
UNITED STATES		
273.3	304.5	612.0
Source: United States Department of Commerce		
EUROPEAN UNION		
175.5	155.5	307.8
Source: Eurostat / Haver Analysis		
JAPAN		
93.0	89.3	143.0
Source: Jewelry Trade Centre, Japan		

It was interesting to note during these studies that there was no perceptive effect of the 911 disaster on the US markets as would have been expected, rather it was the other world markets that noted a dramatic downturn in colored stone sales was recorded.

These downturns are certainly in part due to the 911 attacks however they may also be attributed to the effect of the discovery of mass produced 'Be' Lattice Diffused sapphire which certainly impacted on the non-blue sapphire market. In 2001 and 2002 a batch of new surface diffused sapphire was reported within the market place. Surface diffusion using 'Mg' rich fluxes was a well known practice however these new stones had characteristics unlike those previously seen. Subsequent test work indicated that the Thai "Heaters" had in fact used 'Be' rich fluxes and had thus dramatically altered the nature of the stone producing dramatic color changes in all spectral shades.

2.2 CURRENT AND FUTURE MARKET TRENDS

Regulatory procedures in the USA adopted by their leading market associations such as the AGTA and GIA meant however that 'Be' Diffusion had less of an impact on a disclosure driven market. The effect on the market was most dramatic particularly in Japan and Europe where the bulk of the stone first became available. While prices for traditional blue unheated sapphire remained stable the question of authenticity of stones saw a drop in consumption and market decline in sales. Improved detection methods (see later) and disclosure requirements, particularly in the US market have seen blue sapphire hold its ground. Current market demands are for "Natural Untreated" stone or at least disclosure of minimal conventional heat treatment.

Prices remain stable although most pricing schedules now note that price discounts must be applied for material that has been diffused in any manner. The reader is referred to Appendix 9.1 that details average price structures for "BLUE SAPPHIRE" (all locations except Burma, Kashmir and Montana). Active marketing of 'natural' stone is now being conducted by many wholesale gem dealers particularly those associated with the AGTA resulting in an upsurge in demand for fine blue sapphire.

Demands by leading industry groups within the US market for full disclose in relation to treatment of colored stones has seen a shift by many dealers to sales of “natural” stones. The AGTA has strict guidelines for disclosure and while aimed specifically at the mass produced ‘Be’ Diffused stones such rules will have an impact long term on conventionally heat treated blue sapphire. With this in mind Van Dieman has positioned itself with several US groups to take advantage of the disclosure rules and by doing so will be in a position to benefit from the projected increases in sales for blue sapphire during the next five to ten years.

3.0 NORTH EAST TASMANIAN SAPPHIRE

Sapphire is known from a number of localities in Tasmania, principally from:

a. North East Tasmania (The north east tinfields);
b. North West including Stanley, Boat Harbour, Sisters Beach and Bell Mount and the Blythe River.
c. During the Mineral Holdings exploration work sapphire was reported to the company from the Esk Valley near Fingal.

Most of the sapphire material obtained by Mineral Holdings represented samples taken from disturbed ground, that is, old tailings or active stream sediments comprised in the main old tailings. Few samples could be said to be representative of un-worked Tertiary alluvial ground and certainly none were representative of the deeply buried zones that form the economic tin / sapphire targets at Scotia, Endurance and Pioneer.

3.1 COLOR / HUE

Without exception, all samples, whether derived from company bulk sampling, dish sampling or from purchased parcels, were of a dominantly blue hue varying from pale grey-blue corundum through a range of pale to mid-blue and fine cornflower blue. Fancy colors, green, yellow, pink and parti colors were present to some degree in all parcels, the purchased parcel from the Pioneer Mine exhibited more color variation than all other samples and pale yellow stones were noted in samples from the Wyniford River.

Star sapphire was recovered from a number of localities, it dominated samples taken from Spinel Creek near Weldborough and from Back Creek near Branxholm. Color varied from black to brown, no blue or fancy star material was noted.

3.2 SIZING

To accurately determine size distribution would require the collection and processing of between 500 and 1,000 cubic meters of un-mined virgin alluvial ground.

Budget restraints by Mineral Holdings precluded this scale of work thus any size analyses detailed here are at best conjectural and almost certainly does not represent the true picture of size distribution of sapphire in un-mined alluvial horizons.

A number of factors control sapphire sizing, specifically:

a. The distance of the deposit from sapphire source rocks;
b. The energy of the alluvial environment in which the deposits were laid down;
c. The original nature of the sapphire, whether crystalline or fragmentary; and
d. Any reworking of deposits.

In the case of the North East these factors are compounded by the effect of previous mining and by a complicated series of erosional and depositional cycles during Tertiary times. Elsewhere in Australia size populations are generally positively skewed, that is they contain a larger proportion of smaller material. Exceptions to this do occur particularly where the samples are proximal to source. In such instances we would then expect to see negative skewing of the population. See Figure 1.

Table 3 reflects size analyses conducted by Mineral Holdings on five samples from the North East. Included are a Purchased Parcel 1 and a Theoretical Parcel based on experience in other locations, the tabulation has been graphed as Figure 1.

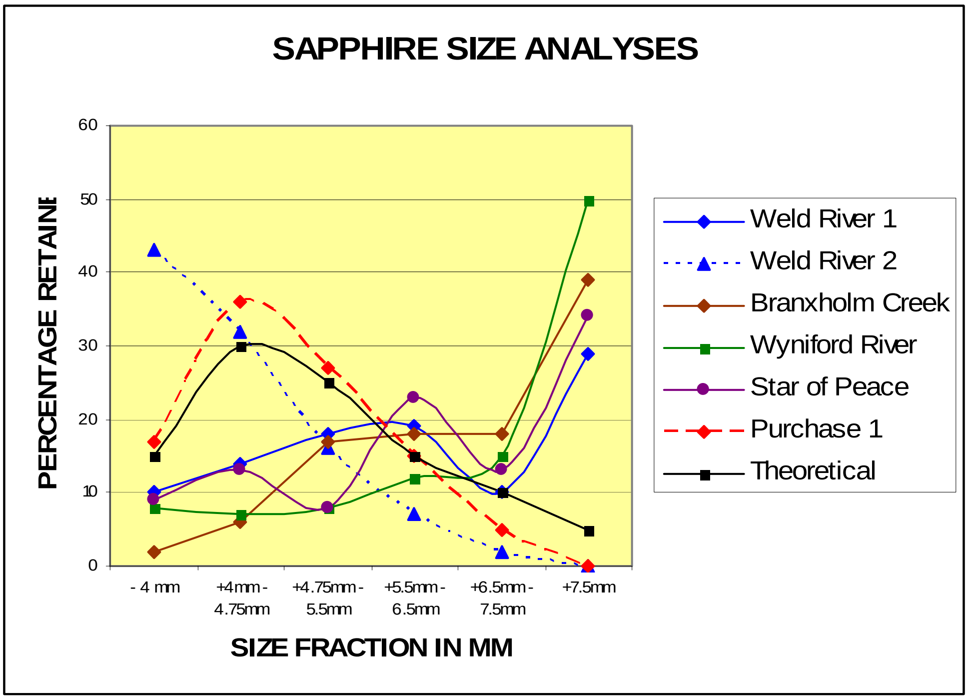
TABLE 3

SIZE ANALYSES AFTER MINERAL HOLDINGS

PARCEL NAME	PERCENTAGE RETAINED					
	- 4 mm	+4mm -4.75mm	+4.75mm - 5.5mm	+5.5mm -6.5mm	+6.5mm -7.5mm	+7.5mm
Weld River 1	10	14	18	19	10	29
Weld River 2	43	32	16	7	2	0
Branxholm Creek	2	6	17	18	18	39
Wyniford River	8	7	8	12	15	50
Star of Peace	9	13	8	23	13	34
Purchase 1	17	36	27	15	5	0
Postulated	15	30	25	15	10	5

FIGURE 1

GRAPHICAL REPRESENTATION OF TABLE 3 SIZE ANALYSES



Of the five samples analysed by Mineral Holdings only that from the Weld River (#2) appears to represent the usual size distribution one would expect to see. The other samples reflect proximal influences, being located close to, or immediately adjacent to, source rocks. Purchase 1 is a parcel of stone purchased by Mineral Holdings. It is known that the larger gem sized gem quality stones were removed from the parcel thus while the plot closely reflects the type of distribution normally expected, removal of stone from the top three size fractions has resulted in a steeper slope on the right hand arm than would normally be the case.

Observation made of various local collections throughout the region indicate that in fact the general population we should expect to see is one positively skewed but with a significant “larger” size fraction population, that is, a plot closely approximating that of Purchase 1.

Sapphire prices are quoted for sizes ranging from "Melee" , 1 to 4.5 mm, that is approximately 0.04 carats to 0.47 carats and then for stones above 4.5 mm by carat. The sizing work conducted to date indicates that while the bulk of the Tasmanian stone will probably be of Melee grade, rough stone above 6.5 mm will provide a finished product of +0.5 carats.

3.3 SAMPLE TREATMENT

Mineral Holdings adopted the following procedure for assessment of purchased parcels, specifically:

- Parcel thoroughly dried and weighed;
- Parcel acid washed in HF to remove unwanted Fe stains and silica mineral impurities;
- Parcel washed to remove acid, dried and reweighed;
- Parcel handpicked to remove obvious zircon and topaz;
- Parcel sorted into the following fractions:
  - gem quality blue requiring no further treatment,
  - gem quality fancy requiring no further treatment,
  - material requiring some form of heat treatment, and
  - low grade material split into two samples one for heat treatment the other for comparative control.
- The various fractions cut after treatment and returned.

In the case of field sample concentrates the following procedure was adopted, specifically:

- Initial sample volume recorded, sample dished to concentrate,
- Concentrate dried and hand picked;
- Sapphires counted and weighed;
- Results converted to gm / LCM sapphire.

Neither technique was particularly suitable as a method of providing quantitative data. In the first instance all parcels had been high-graded prior to purchase and the relationship of weight to original volume and size fractions was unknown.

In the second instance sample sizes were too small to be considered representative of the alluvial deposits being targeted and were vulnerable to "nugget" effect problems.

In two instance Mineral Holdings attempted to bulk sample several deposits using earthmoving machinery and a small gravity test unit. Treatment of 1 to 2 cubic metre samples was ineffectual. With the test plant set to recover sapphire tin losses were severe, with it set to recover tin, sapphire losses were total. Van Dieman has reviewed these problems and proposes to retest several areas using a larger more flexible test unit and larger sample volumes. The metallurgical reasons for these losses are dealt with in the section headed RECOMMENDATIONS.

3.4 GRADE

Mineral Holdings in previous reporting set out a series of tabulated sample results. Those results have been reviewed in light of recent work by Van Dieman that has included a reassessment of the general regional geological setting. It is important when assessing the previous sampling to take into account depositional factors, deposit locations in relation to palaeo-drainage, the type of sample and what it represents, the proximity of the sample location to possible source rocks and any effects human influences may have had on the collection sites.

In assessing grades it should be noted that the term sapphire is used in the broadest sense to include all corundum material and does not differentiate between corundum and the corundum variety sapphire. The economic component of the sapphire grades quoted, in this text, is thus described as "gem".

Appendix 9.2 is a reworking of the Mineral Holdings data to reflect these various influences in an effort to determine if some idea of local average sapphire grades can be achieved. Specifically results for the various districts selected are:

a. WELD RIVER DISTRICT:

This area is located within the Weld River above the confluence with the Ringarooma River and including a major west bank tributary, Spinel Creek. A total of 14 sites sampled all except one considered to represent disturbed ground. Spinel Creek contains large volumes of heavy mineral rich sands derived proximally from old hydraulic tin workings, heavy mineral load is considered unnaturally high. Average grade for Spinel Creek samples 83.58 gm / LCM.

The Moorina sample, 12.15 gm / LCM, was taken from undisturbed ground and is considered to be representative of the grade of undisturbed wash in the Weld River District.

b. BRANXHOLM DISTRICT:

Of the nine samples collected none are considered representative of unworked alluvial ground. Those from Ruby Flat and Pearce's Creek were not expected to contain sapphire being proximal to tin bearing greisen deposits and distal from basaltic source material. The Arba Tin Mine tailings appear to have a widespread influence in the lower Black Creek and Branxholm Creek watersheds probably as a result of spreading of tailings over a wide area during the 1929 floods. The Grays Creek sample was disappointing as this creek sheds directly from an Older Tertiary Basalt hill behind Branxholm. Re-sampling in the area has subsequently yielded coarse grained, angular zircon, spinel and sapphire.

c. MAIN CREEK AND CASCADE RIVER:

All samples were collected in active recent stream alluvium. All locations are in stream systems directly shedding from Older Tertiary Basalts and were expected to yield some anomalously high corundum grades. If the two highest grades obtained from the upper reaches of Main Creek are deleted from the result table an average grade of 8.93 gm / LCM is returned. This is in line with grades reported for undisturbed alluvial wash.

d. WYNIFORD RIVER:

All samples were collected from active alluvium however at several locations it was difficult to determine if the very bouldery ground had been previously disturbed. The average, 16.13 gm / LCM for the eight samples is in line with average grades for similar areas at Main Creek and the Weld River. Removing the anomalously high value gives an average of 7.64 gm / LCM.

No sapphire could be recovered from the tailings (Circa late 1970's) at the Wildcat Mine however Gilbert Salter (Pers. Comm) advises that he regularly recovered large blue sapphires from his primary jig in his Wyniford operation during the same period.

As the Wyniford River Lead was the principal feeder for the Pioneer deposit it is proposed that the tin bearing basal wash at Pioneer will contain sapphire grades of between 7 and 16 gm / LCM. This is supported by the presence of a percentage of yellow and parti stones in both the Wyniford samples and in the Pioneer Purchased parcel.

e. MT CAMERON DISTRICT:

The current working faces at Summers Mine just south of Mt Cameron represent one of the few places where samples representative of un-worked Tertiary alluvium could be obtained. Inspections of the operational plant indicated large quantities of fine blue sapphire being washed across the primary and secondary jig beds. Subsequent sampling at the working face yielded an average of 10.97 gm / LCM of sapphire. This result is considered the most reliable of all those obtained by Mineral Holdings and is in close agreement with the average grade obtained for the Wyniford (Pioneer) sampling. This grade has been used in resource calculations at the nearby Endurance Mine as the ore at Summers is felt to be directly related to the ore zones at Endurance.

f. PRIORY DISTRICT:

Previous sampling experience in this area shedding the Blue Tier to the south suggested that the older tin bearing palaeo-alluvial deposits contained a very rich zirco-spilic mineral suite. Sapphire could be regularly “specked” from the basement in old workings and the sediments in this region contained a higher proportion of un-weathered basaltic material than the sediment pile to the north of the Blue Tier. The extremely high average grade reported from the samples reflects the increased basaltic influence.

It was not possible to sample un-worked ground nevertheless results suggest that the basal tin bearing horizons in these deposits also contain appreciable quantities of sapphire. Material observed in local collections included a number of semi-rounded “Dogs Tooth” crystals of +20 gm size and abundant +7 mm material.

g. GREAT NORTHERN PLAINS DISTRICT:

All the deposits sampled by Mineral Holdings form part of, or are immediately peripheral to, the Great Northern Plains however it should be noted that each has a somewhat different depositional environment, specifically:

- Canary Mine – sample almost certainly not on basement as the basal layers are obscured by tailings.
- McGregor’s Mine – inspection indicates that the workings are most likely on a false basement and samples do not represent basal tin rich horizons, sampling supports this as all tin values are very low.
- Aberfoyle Mine – two actual workings sampled. The high value was returned from what was visibly highly mineralized basal alluvium, in fact from a 0.3 m interval resting immediately on basement. In the East workings samples were obtained from high bottom in areas that are probably peripheral to the main tin bearing zone (long since mined).

- Delta Mine - areas of residual wash draped on a zone of high basement south west of the main GNP area.
- Dry Gut / Dugard's Mine – samples certainly of tin bearing wash but from stockpiled ore thus position in profile unknown.
- Wanex – samples from bulk testing that may have been conducted outside known tin bearing channels.

The average grade of all samples, tailings and zero values included is 4.65 gm / LCM, deleting tailings results in a grade of 8.93 gm / LCM and excluding the very high value from Aberfoyle a grade of 1.42 gm / LCM.

Previous drilling throughout the GNP District indicates that in all cases where the hole is within the "Ore Channel" holes indicate a zone of basal enrichment, usually the basal 1 to 2 metre zone. This would mean that the high value from Aberfoyle should be validly included in the averages and that in the GNP District we would be looking to expect an average sapphire grade of between 4.0 and 9.0 gm / LCM.

Testing by Mineral Holdings on purchased parcels indicated that of the total weight of the parcel of sapphire, some 20% could be considered as "gem" and worth cutting, that is 20% is the economically significant component of the sapphire grade. While this figure is verifiable for the Purchased Parcels it should be remembered that the best gem material had been removed prior to purchase, thus it is not unreasonable to assume that in parcels that have not been pre-sorted the gem component will be +20%.

3.5 VALUE OF SAPPHIRE

Quantities of cut product of the North east Tasmanian sapphire are limited and insufficient on which to base a firm valuation. Initial assessments of both rough and cut material have been carried out by several leading US dealers, results are summarized below and back-up information provided in the Appendices.

A. VALUE OF ROUGH SAPPHIRE PARCELS;

Rough parcels can be sold in one of two formats, specifically:

- Unsorted "Run of Mine" which will include all non gem corundum, some zircon, spinel and topaz; and
- Sorted and Sized parcels which include various size ranges of "First" and "Second" quality gem. Non gem corundum is often also offered as a sorted parcel.

Pricing is difficult to determine for Tasmanian stone as none is regularly placed into world markets, as a guide the current pricing for Central Queensland stone is provided in Table 4, that table also includes the normal sorting sizings.

TABLE 4
SAPPHIRE PRICING AND SIZING SCHEDULE - SIZE & SORTED

SIZE (mm)	QUALITY	PRICE (US $ / Gram	PRICE (US $ / Carat)
+ 7.5	Gem	48.80	9.76
+6.5	Gem	38.00	7.60
+5.5	Gem	24.50	4.90
+4.75	Gem	19.00	3.80
+ 4.0	Gem	10.90	2.18
- 4.0	Gem	5.50	1.10
+4.75	Seconds	10.90	2.18
-4.75	Seconds	5.50	1.10
All Sizes	Corundum	$150 / kg	

Source: Coolamon Mining Pty Limited

It is possible to apply these prices to data from the Mineral Holdings testing however it should be noted that in the absence of data from larger bulk samples that would overcome "nugget effect' problems, end values of gem sapphire per cubic metre are at best very preliminary. Table 5 provides some background for such a calculation and assumes sale of a 100 gram parcel in size fractional splits as seen in Purchase Parcel 1.

TABLE 5
ESTIMATE OF VALUE / LCM OF TASMANIAN GEM SAPPHIRE
SIZED AND SORTED PARCELS

PURCHASE PARCEL 1	SIZE FRACTIONS					
100 GRAMS	- 4 mm	+4mm -4.75mm	+4.75mm - 5.5mm	+5.5mm -6.5mm	+6.5mm -7.5mm	+7.5mm
WEIGHTS / FRACTION	17.00	36.00	27.00	15.00	5.00	0.00
PRICE / GRAM	5.50	10.90	19.00	24.50	38.00	48.80
VALUE OF FRACTION	93.50	392.40	513.00	367.50	190.00	0.00
TOTAL PARCEL VALUE IN US $		1556.40				
TOTAL PARCEL WEIGHT IN GRAMS		100.00				
AVERAGE PRICE PER GRAM US$		15.56				

LOCATION		GRADES
Weld River		12.15
Branxholm		
Main Creek		8.93
Wyniford River		16.13
Mt Cameron		10.97
Priory		
GNP		8.93
TOTAL OF GRADES		57.11
AVERAGE GRADE / LCM		11.42
20% GEM GRADE / LCM		2.28
VALUE / LCM		35.55

It should be further pointed out that the rough pricing used to arrive at this average assumes value for Central Queensland stone. This is, at best, the lowest quality Australian material currently on the market. Lava Plains, Queensland and Inverell, NSW rough achieve far higher prices than those set out in these tabulations. Dealers opinions are that Tasmanian stone will attract a premium price c/f other Australian material.

B. VALUE OF CUT SAPPHIRE PARCELS

Values set out in the following text are quoted as "wholesale", retail prices fluctuate wildly and are for the most part dependant on individual dealer mark-up rates. Figures quoted are taken from the Fall / Winter 2004 - 2005 edition of "The Guide to Wholesale Gem Pricing".

Sapphire pricing is set out in a number of categories based both on sizing, quality, color and source specifically:

- Sizing
  - Melee 1 mm to 4.5 mm (0.04 to 0.5 carats)
  - Non Melee +0.5 carats
  - Cabochon 1 to + 10 carats
- Quality Graded on a 1 to 10 basis
  - Melee & Cabochon
    - Commercial 1 - 4
    - Good 4 - 6
    - Fine 6 - 8
    - Extra Fine 8 - 10
  - Non Melee
    - Commercial
      - Lower 1 - 2
      - Middle 2 - 3
      - Upper 3 - 4
    - Good
      - Lower 4 - 5
      - Upper 5 - 6
    - Fine
      - Lower 6 - 7
      - Upper 7 - 8
    - Extra Fine
      - Lower 8 - 9
      - Upper 9 - 10

In addition The Guide provides specific details of enhancement factors to be applied to each of the above categories as a correlation between Shape / Quality / Price. That table is repeated below as Table 6.

TABLE 6

SHAPE / QUALITY / PRICE CORRELATION CHART

CUT TYPE	COMMERCIAL	GOOD	FINE	EXTRA FINE
Cushion / Emerald	As Shown	0 to 7%	7% to 12%	12% to 20%
Oval	As Shown	As Shown	As Shown	As Shown
Round / Heart	As Shown	0 to 7%	7% to 15%	10% to 20%
Pear / Marquise	0 to 5%	-5% to 10%	-5% to -10%	-5% to -10%
Princess Melee	5% to 10%	10% to 15%	15% to 20%	20% to 25%

Source: The Guide to Wholesale Gem Pricing

Winter / Fall, 2004 – 2005

"As Shown" refers to prices quoted in the general tabulations, factors are applied to those prices

The Guide further categorizes stone into colors, specifically:

Black Star Sapphire

Blue Sapphire (All origins except Burma, Kashmir, Montana) Tasmanian Category

Blue Sapphire (Burma)

Blue Sapphire (Diffusion)

Blue Sapphire (Montana)

Blue Star Sapphire

Color Change Sapphire

Golden / Yellow Sapphire

Green Sapphire

Orange Sapphire

Padparadscha

Pink Sapphire

Purple Sapphire

Using the current pricing from The Guide and applying this to Tasmanian stone the following values can be arrived at.

Classification	Good to Fine Quality	5 - 7	
	Melee Average Price	US $10 to $120	$65.00
	0.5 to 1 Carat Price	US $105 to $320	$212.50

These values equate to US $15.56 for rough sorted gem or US $94.50 per gram for cut recovered value for the same material. Calculations used to arrive at these figures are set out in the Appendix 9.3. Clearly further premiums can be obtained by cutting particular shapes, for example Princess Cut Melee would attract a 10% to 20% bonus on these prices.

4.0 SAPPHIRE DIFFUSION – THE CONTROVERSY

The heat treatment of sapphire has been conducted for so long that until recently it was accepted as routine within the trade. Heating was conventionally carried out to:

- Improve color by burning out unwanted secondary colors;
- Create a new color;
- Improve transparency by melting "silk' inclusions (principally rutile needles: and
- Heal fractures by heating in the presence of a flux.

The latter is normally applied to ruby and rarely to sapphire. In certain stones low temperatures are all that is required and at these temperatures traditional heat treatment indicators may not be observable. In high temperature heating the stone invariably exhibits distinctive changes in the nature of inclusions.

Lattice diffusion of sapphire is not a new science. It was developed in the early 1970's by Union Carbide to improve the quality of their synthetic Linde star sapphires. This treatment requires that stones be heated to high temperatures just near their melting point. This results in an expansion of the crystal lattice and thus allows the flow of atoms from outside into the gem, thus creating color change. A technical explanation of this process is give by Richard Hughes.

"*When a crystal is heated, lattice defects are created in proportion to the temperature reached. If the stone is heated too much its bonds break and it melts, but if heated just below the melting point where the maximum defects exist without destroying the specimen, it is possible for atoms to move (diffuse) into the structure, via the point defects*"

Thus the lighter members of the Periodic Table such as Titanium and Magnesium were used in fluxes to add color to colorless or pale corundum.

Shortly after the Union Carbide work this process was being applied on a regular basis, particularly by Thai Heaters to improve color of natural corundum in particular to improve saturation of blue color or to add blue color.

This had several drawbacks, specifically:

- It was a near surface effect that could often be destroyed by re-cutting;
- Mg and Ti were slow to absorb into the lattice and the treatment was thus relatively expensive.

Diffused stones produced in the 1970's and 80's were thus easy to detect and hence easier to certify as to the treatment type involved. Surface diffusion became an accepted norm.

Unfortunately the gem industry is never still for long and in 2001 events occurred that were to turn the sapphire market upside down. **Enter berllyium !!**

The discovery of the effect of "Be" was probably accidental, this is the opinion of John Emmett and Scarrett of the AGTA. It is likely that the Thai heaters noted that parcels of Madagascan corundum material produced a predominance of yellow – pink hues after treatment. This was apparently caused by the presence of chrysoberyl in the parcel. They then decided to heavy the mix by adding "Be" powders to the fluxes, not a safe practice given the toxicity of "Be". This treatrment resulted in them being able to turn any color sapphire or corundum into a wide variety of shades of yellow, orange even to the rare padparasha hues.

Magically they now had a way of turning all that African purplish stone, second grade Madagascan blue, all the Australian green and deep blue to lovely yellow stones. Having created a massive stockpile of yellow and pink stone the problem arose as to how to market the material. Where to dispose of this large windfall? The American market was too risky as the AGTA and GIA are always looking out for new treatment scams. Some bright Thai wholesaler realized that in Japan it was the Year of the Sapphire. As Japanese buyers have a great affinity for yellow to orange and red stone and in particular padparasha an ideal outlet was found.

Having purchased a mass of stone, treated and had it cut for a cost now estimated to be around US $10,000, they sold the parcel on to the unsuspecting Japanese for a mere US $100 million. There the saga should have ended. Some of this material was sent to the Japan Gemmological Institute Lab.

Unfortunately the lab classified it as "Natural Untreated" sapphire and so everyone went about their business of selling the $100 million on to the consumer.

Then a few pieces of stone reached the AGTA Lab in New York, the AGTA knew that it had been treated in some fashion but could not place the provenance and was suspicious of color. After a multitude of tests, laser ablading produced a significant "Be" response, alien to sapphire. Subsequent testing by Emmett, Scarrett and others resulted in the discovery of deep diffusion of "Be" into the lattice of the sapphire. Unlike the Ti and Mg used in the 1970's and 80's the smaller Be atoms could move more freely through the heated lattice and thus were able to penetrate at a faster rate (more economic) and deeper into the stone (more difficult to detect).

When this hit the news following the 2002 Tucson Show the result was the dismissal of the Director and most of the staff at the Japanese lab and an almost complete shunning of sapphire by the Japanese consumer. Rules for disclosure in the US market were implemented and a sudden push for natural untreated stone was the result. To this day why no one (particularly the Japanese wholesalers) asked the million dollar question

"*Where is this new mine that is producing all this yellow, orange and rare padparascha stone???"*

is amazing.

What are the long term implications. Without strict disclosure (See Appendix 9.4) of this form of treatment there is a very real risk of flooding the world market with "Diffusion Treated" sapphire thus making "fine" sapphire as commonplace as blue topaz. This is difficult to assess. Certainly Australian stone can still be sold to the Thai but this is counterproductive for Australian producers as much of the material ends up as Be Diffused product. All this achieves is to continue to provide the Thai with the means to slice back rough prices and to hold the miner to ransom. Central Queensland stone is in our opinion almost not saleable, certainly the blue is not.

Fancy stone will still be sought both for its own value but also as low cost feed for diffusion since it responds very well, better than the blue, to such treatment. Lava Plains, Queensland and to a lesser degree NSW stone is more acceptable and there are ways to sell that material outside the Thai cartel into a better US market.

This is further compounded by a recent discovery that prolonged heating in a Be rich flux will eventually produce a standard "cornflower" blue stone not unlike the finest Sri Lankan material.

For Tasmanian stone the implications are of concern however it is a somewhat unique situation. Tasmania stone is rarely seen on world markets, it is as a rule of finer quality than its mainland counterparts and coming from one source mine or series of operations provenance can be closely controlled. Given that Van Dieman can in every way comply with current disclosure and authenticity requirements marketing of natural or conventionally heated stone is not seen as having long term effect on project viability.

5.0 PROPOSED WORK PROGRAM 2005 – 2006

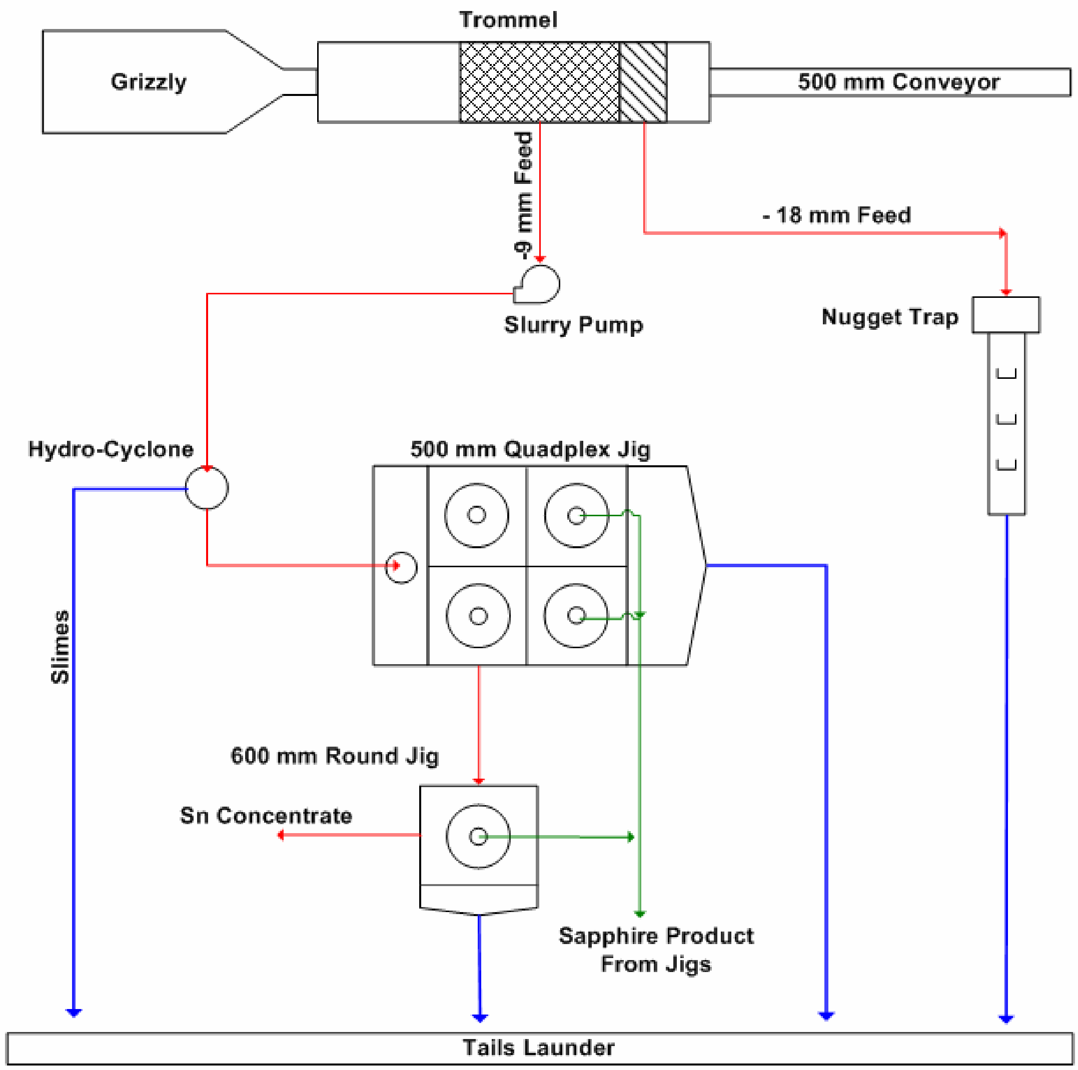
The presence of sapphire is not questioned however the task of locating "Stand Alone" sapphire projects is difficult if not impossible. Sapphire grades are well below those economically mined in Central Queensland or NSW and thus for sapphire to become commercially viable it must be produced in conjunction with other heavy minerals. Alluvial tin is the obvious co-product. Recognition of the multi-mineral target has meant that Van Dieman is now able to focus their exploration work on those tin – sapphire deposits that represent "Stand Alone" mining operations.

The problem with the targets recognized to date is that without exception all are deeply buried palaeo-placers, that is, having a depth of burial in excess of 10 metres. Meaningful sapphire testing required production of sample sapphire concentrates of in excess of 100 grams per parcel, this is not possible from drilling of the buried placers and depth of burial precludes viable bulk sampling. Marketing is ongoing and will require production of larger parcels of gem material. Work programs have been designed to result in production of reasonable quantities of sapphire while at the same time allowing the company to report content of associated heavy minerals.

5.1 BULK SAMPLING PROGRAM

The small bulk test unit purchased by Mineral Holdings while adequate for the original tin / sapphire bulk testing programs has not the flexibility or capacity to enable the level of test work required to test for multi-products, to produce parcels of sapphire of sufficient size for laboratory testing and assessment or have sufficient throughput to make processing of larger samples viable.

Van Dieman has undertake, in conjunction with Goldfield Engineering, Inc., of Salt Lake City, Utah, treatment plant design studies of circuitry that would allow concurrent sampling for sapphire plus other heavy minerals. A plant capacity of 10 cubic metres / hour was selected as optimum throughput and given grades averaging 10 gm / LCM of sapphire (Corundum) a 50 cubic metre sample would in theory produce some 500 grams of corundum sample.



Plant design provided by Goldfield Engineering, Inc., of Lindon, Utah, USA
Units electric powered by 40 HP Perkins Diesel Altarnator set
Water pump skid mounted remote unit

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7 March 2005

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FIGURE 2

This size sample is considered ideal for analysis, heat treatment testing, cutting and valuation. It is proposed that 5 to 10 samples of this size would provide sapphire samples representative of the North Eastern gem material.

The plant design (See Figure 2 - Flowsheet) incorporates two trailer mounted units comprising:

UNIT 1 - FEEDER AND SCREENING:

- Wet vibrating grizzly feeder
- Trommel, 0.8 m diam. x 3.2 m long
  1.4 m scrubbing section
  0.9 m of 6 mm screen
  0.5 m of 18 mm screen
- Oversize stacker conveyor
- Nugget trap and sluice
- 3” x 2” Slurry pump to Unit 2

UNIT 2 – RECOVERY SYSTEM:

- Krebs TU – 10 Hydrocyclone ahead of
- 1 x 0.5 m Crossflow Quadplex jig designed to recover tin / gold in primary cells and sapphire in secondary cells
- 1 x 0.6 m diam. circular jig to process primary underflows

WATER UNIT

- 1 X Berkeley Water Pump 4” x 3” Skid Mounted

POWER UNIT

- 40 Hp Perkins Diesel Genset. Skid Mounted

CLEANUP UNIT

- I x Goldtron cleanup unit comprising circular jig and table

The unit is designed to be fed directly by excavator or loader and thus would be positioned immediately adjacent to the sample hole. Oversize and tailings would be stored locally to the plant and returned to the excavated hole immediately post excavation.

Sample sites have as yet to be selected, this will be undertake early in 2005 and prior to delivery of the test unit. Formal proposals are to be placed with the Department in March 2005.

5.2 SAMPLE TREATMENT

It is assumed that each bulk sample will produce several discreet heavy mineral samples, specifically:

a. Tin Concentrate estimated to be +70% SnO_2;
b. Gold Concentrate; and
c. Sapphire concentrate.

The treatment of these samples and the general treatment flowsheet for sampling is set out in Figure 3. While there is no requirement for the company to report tin or gold grades the company believes that every effort should be made to provide the Department with such detail.

Treatment of sapphire samples will involve the following protocol:

A. SITE PREPARATION

a. The raw concentrate reduced to a “Corundum Only” concentrate;
b. The concentrate acid washed to remove unwanted mineral and staining on corundum;
c. Sample dried and weighed;
d. Raw unsorted sample sized;
e. Each size fraction sorted into gem, seconds and corundum;
f. Sample authenticity documented and sample dispatched to laboratory of Crystal Chemistry in the USA for further treatment;

B. USA SAMPLE PROTOCOL

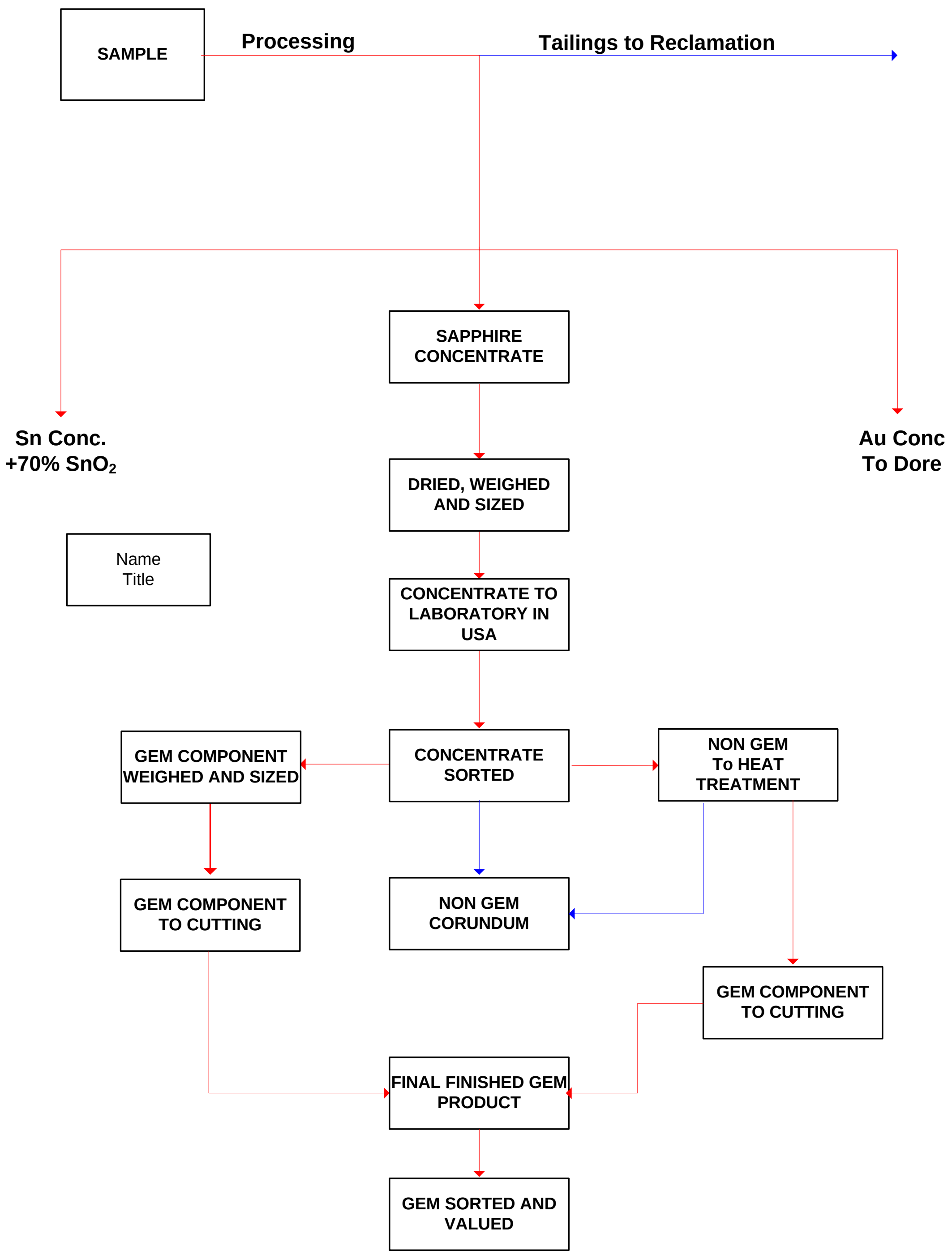
Each sample treated as follows:

a. Each sample checked as to weight and sizing;
b. Each size fraction assessed by gem cutter, all material that can be immediately cut is set aside and the fraction weighed;
c. Material assessed as suitable for heat treatment passed to Dr. J. Emmett of Crystal Chemistry who will undertake treatment in line with the protocols set out in Appendix 9.5;
d. Following heat treatment parcels sorted into cutting grade material and all material dispatched to cutting house;
e. Finished products received, resultant cut fractions reported as % recovered from each parcel;
f. Parcels assessed and valued.

The company believes that by using the protocols set out above it will be better positioned to fully assess the position the sapphire heavy mineral component of the deposits has in the possible economic development of the various resources as tin - sapphire projects.

Further to ensure that other groups cannot run of the back of the Van Dieman work it is proposed to provide the flowing laboratories with a set of “Type” samples of Tasmanian sapphire, that is both natural unheated and heat treated material. Laboratories should include:

AGTA – Gemological Testing Center (USA),
GIA – Gem Trade Laboratory (USA)
CISGEM (Italy)
GAAJ Laboratory (Japan)
GIT – Gem Testing Laboratory (Thailand)
Gubelin Gem Lab (Switzerland)
SSEF Swiss Gemmological Institute (Switzerland)
GI Australia - Laboratory



SAMPLE TREATMENT FLOWSHEET

FIGURE 3

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5.3 MARKETING

Further marketing programs are only possible if the company is able to produce meaningful parcels of rough and cut stone. It has been suggested that a minimum parcel of 1000 carats of finished product covering the various fractions set out previously is a minimum for presentation to the market. Given that such a parcel can be produced by mid to late 2005 then the following program is proposed:

- Attend the 2005 Tucson Gem and Mineral Show;
- Produce type parcels and distribute;
- Attend with representative parcels the Las Vegas and JA New York Shows in the USA in mid 2005;
- Attend the September Bangkok and Hong Kong Shows; and
- Prepare a technical paper regarding Tasmanian sapphire for inclusion in the GIA (USA) Magazine

By mid 2005 it should be possible for the company to have in place preliminary marketing arrangements with several larger US dealers, these should be formalized as mine production nears.

5.4 UNIVERSITY STUDIES

The company proposed to provide scholarship funding for a post graduate student at the University of Tasmania to undertake specialist research into Tasmanian sapphires. This should be formulated and in place by January 2005.

6.0 CONCLUSIONS

While much work has been previously undertaken by Mineral Holdings it was to a degree disjointed due to budget restrictions and hampered by poorly executed programs by previous Joint Venture partners. As a result of the Mineral Holdings work and reassessment of that work by Van Dieman a number of conclusions can be made specifically:

a. No one deposit in North East Tasmania can be classified as a "Stand Alone" sapphire deposit rather it is clear that economic mining of sapphire can only be undertaken where that mineral occurs in conjunction with other heavy minerals such as tin and gold;
b. It is not possible to apportion and average grade to the sapphire content of alluvials in the north east rather grades should be determined on a district by district basis using depositional and other related geological criteria;
c. Grades of un-worked ground in the various areas selected are closely positioned about the mean and appear to vary from lows of 4 gm / LCM to 13 gm / LCM. A regional average of just in excess of 11 gm / LCM is quoted.
d. Grades are for sapphire / corundum and do not represent gem quality material, studies indicate that of the 11 gram average some 20% is gem quality, that is just in excess of 2.0 gm / LCM.
e. Based on current market values the gem sapphire component of the alluvials has a value of around US $15.56 per m^3.
f. In order to more adequately quantify the grades and value of the sapphire it is necessary to produce rough parcels of in excess of 100 grams. This can only be done by treatment of larger bulk samples of around 50 m^3 per site.
g. Ongoing sample evaluation and marketing can only be undertaken given larger sample sizes.

7.0 RECOMMENDATIONS

It is recommended that:

a. The program of bulk testing be commenced as soon as possible in 2005 and the order for the test plant required to conduct that work be placed as soon as possible;
b. The protocols of sample treatment be initiated and arrangements put in place to have Crystal Chemistry carry out sample assessment;
c. Programs proposals and applications in support of the programs set out above be lodged with the Department as soon as possible in 2005
d. The Scholarship arrangement be put in place prior to commencement of the 2005 academic year.

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9. APPENDICES

9.1 WHOLESALE SAPPHIRE PRICING SCHEDULE

Taken from The Guide to Wholesale Gem Pricing, Fall / Winter 2004 - 2005

WHOLESALE SAPPHIRE PRICING SCHEDULE

TENEMENT: SEL 22 / 1999 **DATE:** 14-March-2005

PRICING PARAMETERS

COMMODITY: Blue Sapphire - All Origins Except Burma, Kashmir, Montana)

COLOR: Violet, bluish violet, violetish blue, blue, very slightly greenish blue, greenish blue, very strongly greenish blue

CLARITY: Type II - usually eye clean with some inclusions under magnfication

CUT: Native cuts usually seen; well cut stones sometimes available

CARAT WEIGHT: Over 20 carats is rare in finer qualities, therefore prices are negotiable.
Very large commercial - quality Blue sapphires are readily available.

REFERENCE DATA: RI 1.762 - 1.770 SG 4.00 +0.10, - 0.05 H = 9
Bir 0.008 - 0.010
Fluorescence: LW & SW inert to weak chalky blue to yellow or greenish white
Spectrum: Three bands in the blue at approximately 4500, 4600 and 4700 A.U

TREATMENT: Heat **CURRENCY:** US Dollars

MELEE SAPPHIRE

SIZE mm	APPROX WEIGHT ct	COMMERCIAL 1 - 4	GOOD 4 - 6	FINE 6 - 8	EXTRA FINE 8 - 10
1 to 3	0.02 - 0.16	10 - 30	30 - 70	70 - 140	140 - 300
3 to 4	0.16 - 0.36	10 - 30	30 - 100	100 - 225	225 - 325
4 to 4.5	0.36 - 0.50	20 - 50	50 - 120	120 - 225	225 - 500

CABOCHON CUT

SIZE carats	APPROX WEIGHT ct	COMMERCIAL 1 - 4	GOOD 4 - 6	FINE 6 - 8	EXTRA FINE 8 - 10
1 to <5		9 - 60	60 - 270	270 - 900	900 & up
5 to <10		25 - 90	90 - 450	450 - 1,350	1,350 & up

WHOLESALE SAPPHIRE PRICING SCHEDULE

STANDARD SAPPHIRE (+0.5 CARATS)

SIZE carats	COMMERCIAL			GOOD		FINE	
	LOWER 1 - 2	MIDDLE 2 - 3	UPPER 3 - 4	4 - 5	5 - 6	6 - 7	7 - 8
0.5 - <1	10 - 15	15 - 30	30 - 60	60 - 105	105 - 210	210 - 320	320 - 450
1 - <2	20 - 35	35 - 75	75 - 125	125 - 280	280 - 420	420 - 685	685 - 1,250
2 - <3	35 - 55	55 - 100	100 - 275	275 - 365	365 - 630	630 - 1,050	1,050 - 1,775
3 - <4	35 - 65	65 - 175	175 - 350	350 - 675	675 - 1,000	1,000 - 1,575	1,575 - 2,100
4 - <5	40 - 80	80 - 250	250 - 400	400 - 775	775 - 1,200	1,200 - 1,900	1,900 - 2,300
5 - <6	40 - 100	100 - 300	300 - 500	500 - 1,000	1,000 - 1,575	1,575 - 2,600	2,600 - 4,000
6 - <8	50 - 150	150 - 375	375 - 800	800 - 1,400	1,400 - 1,900	1,900 - 3,150	3,150 - 4,200
8 - <10	55 - 175	175 - 400	450 - 900	900 - 2,100	2,100 - 2,700	2,700 - 3,675	3,675 - 4,700
10 - <20	70 - 200	200 - 500	500 - 1,000	1,000 - 2,200	2,200 - 2,800	2,800 - 4,700	4,700 - 5,500

SIZE carats	EXTRA FINE	
	8 - 9	9 - 10
0.5 - <1	425 - 650	650 -870
1 - <2	1,200 - 1,600	1,600 - 2,000
2 - <3	1,700 - 2,400	2,400 - 3,000
3 - <4	2,000 - 3,200	3,200 - 4,000
4 - <5	2,200 - 3,600	3,600 - 4,500
5 - <6	3,500 - 4,500	4,500 - 5,000
6 - <8	4,000 - 5,000	5,000 - 5,500
8 - <10	4,500 - 5,500	5,500 - 6,500
10 - <20	5,300 - 8,000	8,000 - 12,000

9.2 MINERAL HOLDIONMGS TEST DATA – REASSESSMENT

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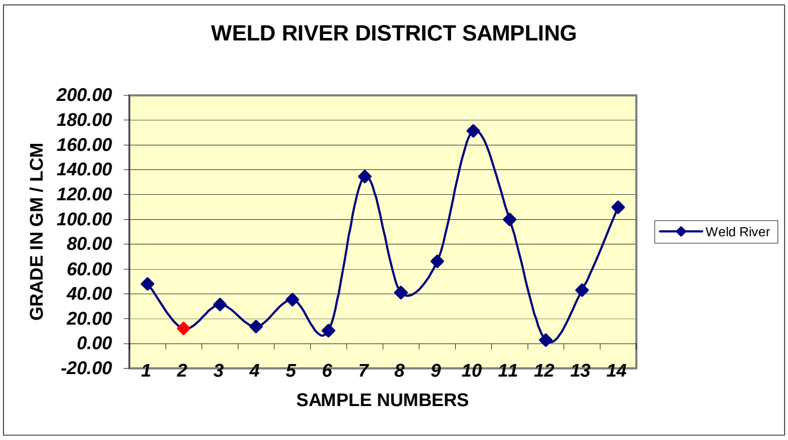
RECONNAISSANCE HEAVY MINERAL SAMPLING

TENEMENT: SEL 22 / 1999 **DATE:** 16/09/2001 **PROJECT:** Weld River District

SAMPLE NO	SAMPLE SITE	CORUNDUM Number	Mass grams	Grade g/LCM	COMMENT
29	Weld River at Moorina	7	0.3713	48.00	Disturbed
63	Moorina Wash	7	0.1588	12.15	Undisturbed
68	Weld River, Weldborough	22	0.5008	31.50	Disturbed
86	Weld River 1.5 k below Weldborough	4	0.1581	13.80	Disturbed
87	Weld River Below Spinel Creek	9	0.5461	35.40	Disturbed
88	Weld River Above Spinel Creek	3	0.1611	10.50	Disturbed
30	Spinel Creek	39	1.5368	134.60	Old Tailings, Disturbed
54	Spinel Creek	19	0.4225	41.10	Old Tailings, Disturbed
55	Spinel Creek	20	0.6829	66.15	Old Tailings, Disturbed
56	Spinel Creek	72	2.0872	171.30	Old Tailings, Disturbed
57	Spinel Creek	45	1.3539	99.90	Old Tailings, Disturbed
58	Spinel Creek	2	0.0266	2.70	Old Tailings, Disturbed
59	Western Tributary	29	0.5524	43.05	Undisturbed
89	Spinel Creek Just above Weld River	38	1.2053	109.80	Old Tailings, Disturbed
		TOTAL		819.95	
		AVERAGE GRADE		**58.57**	



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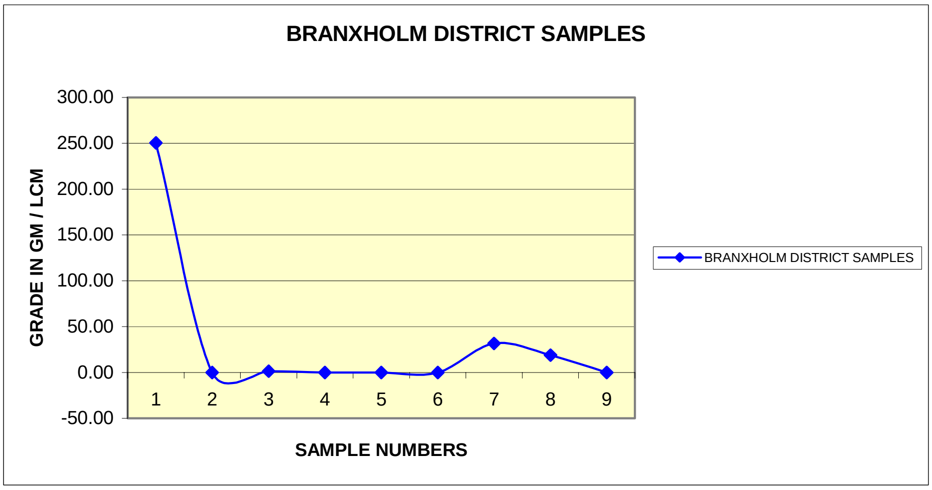
RECONNAISSANCE HEAVY MINERAL SAMPLING

TENEMENT: SEL 22 / 1999 **DATE:** 16/09/2001 **PROJECT:** Branxholm District

SAMPLE NO	SAMPLE SITE	CORUNDUM Number	CORUNDUM Mass grams	CORUNDUM Grade g/LCM	COMMENT
16	Black Creek	12	0.3920	250.50	Arba Tailings Influence
17	Branxholm Creek			0.00	Active Stream
20	Arba Mine Tailings	1	0.0094	1.50	Tailings
26	Ruby Flat Mine Tailings			0.00	Tailings, Greisen no basalt influence
27	Pearce Creek			0.00	Active Stream
38	Black Creek at Highway			0.00	Active Stream
52	Black Creek	8	0.2904	31.50	Arba Tailings Influence
53	Black Creek	9	0.2576	18.90	Arba Tailings Influence
78	Creek to Grays Hill			0.00	Active Stream
		TOTAL		302.40	
		AVERAGE GRADE		**33.60**	



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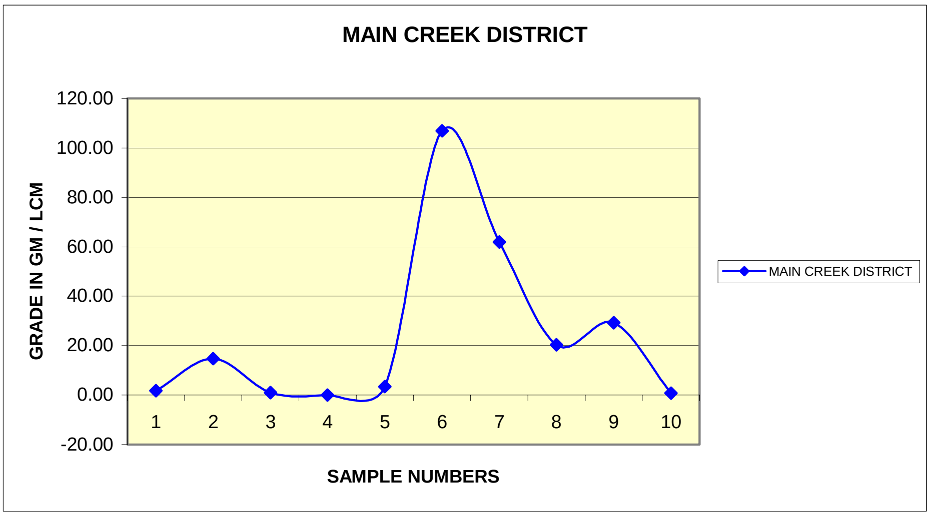
RECONNAISSANCE HEAVY MINERAL SAMPLING

TENEMENT: SEL 22 / 1999 **DATE:** 16/09/2001 **PROJECT:** Main Creek and Cascade River

SAMPLE NO	SAMPLE SITE	CORUNDUM Number	CORUNDUM Mass grams	CORUNDUM Grade g/LCM	COMMENT
19	Main Creek	1	0.0120	1.80	Active Stream
28	Main Creek at Derby	9	0.1537	14.70	Active Stream
39	Cascade River below Mt Paris	1	0.0127	1.05	Active Stream
40	Minnie Jessup Creek			0.00	Active Stream
41	Main Creek - top end	1	0.032	3.45	Active Stream
60	Main Creek	35	1.4152	106.95	Active Stream
61	Main Creek	14	0.675	61.95	Active Stream
62	Cascade River	13	0.2261	20.40	Active Stream
79	Main Creek Headwaters	10	0.2969	29.30	Active Stream
84	Old Cascade River at Derby	1	0.0065	0.75	Active Stream
		TOTAL		240.35	
		AVERAGE GRADE		**24.04**	



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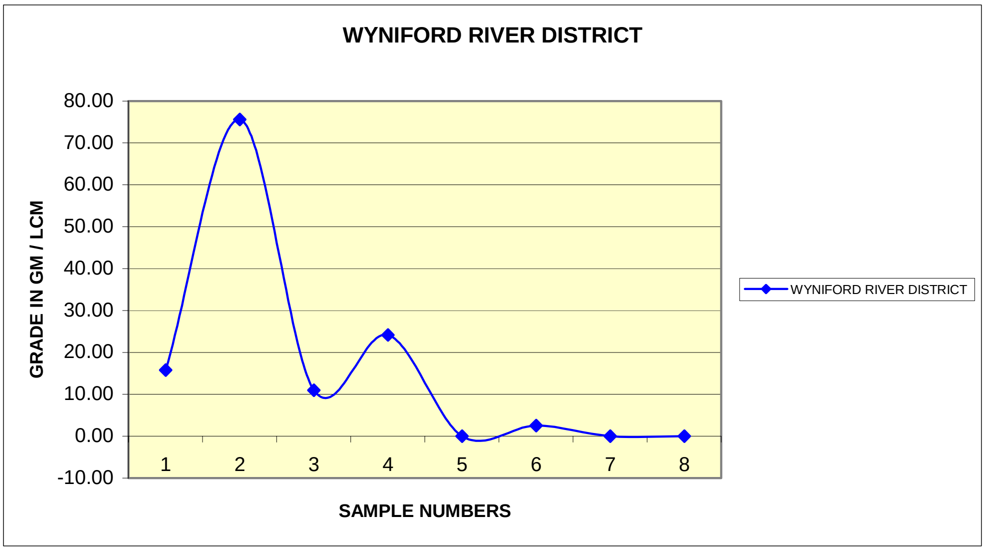
RECONNAISSANCE HEAVY MINERAL SAMPLING

TENEMENT: SEL 22 / 1999 **DATE:** 16/09/2001 **PROJECT:** Wyniford River

SAMPLE NO	SAMPLE SITE	CORUNDUM Number	CORUNDUM Mass grams	CORUNDUM Grade g/LCM	COMMENT
25	Wyniford River	4	0.0953	15.75	Active Stream
42	Wyniford River	33	0.8024	75.60	Active Stream
43	Wyniford River	9	0.1322	11.00	Active Stream
44	Wyniford River	22	0.2837	24.15	Active Stream
45	Wyniford River			0.00	Possibly resorted ground
46	Wyniford River	1	0.0334	2.55	Active Stream
47	Wyniford River			0.00	Active Stream
48	Wyniford River			0.00	Active Stream
		TOTAL		129.05	
		AVERAGE GRADE		**16.13**	



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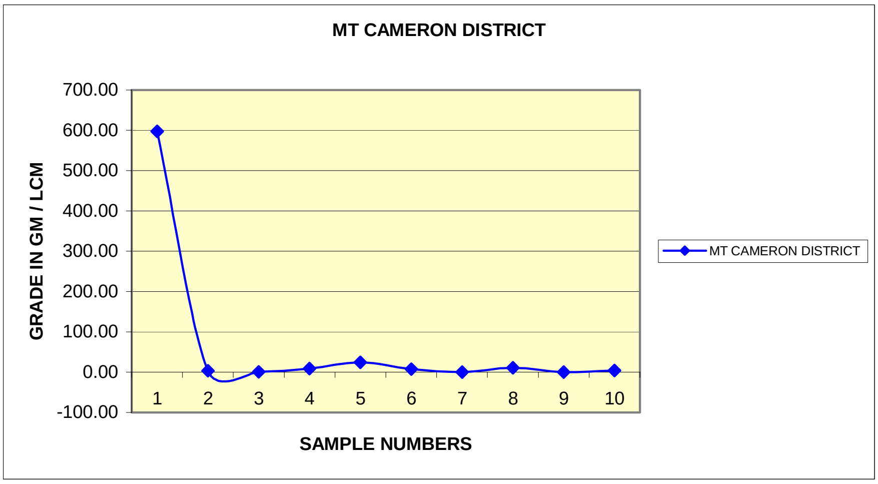
RECONNAISSANCE HEAVY MINERAL SAMPLING

TENEMENT: SEL 22 / 1999 **DATE:** 16/09/2001 **PROJECT:** Mt Cameron - Dorset Lake District

SAMPLE NO	SAMPLE SITE	CORUNDUM Number	Mass grams	Grade g/LCM	COMMENT
35	Summers Mine Jig Tails	326	6.7383	597.00	Current Tailings
630076	Summers Mine Water Pump Site			3.51	Undisturbed
630077	Summers Mine below Cleaner Jig			0.81	Current Tailings
630078A	Summers Mine Current face			8.61	Undisturbed
630078B	Summers Mine Current Face			24.66	Undisturbed
630078C	Summers Mine Current Face			7.10	Undisturbed
4	Mt Cameron Creek			0.00	Active Stream with tailings
32	Ruby Creek, South Mt Cameron	13	0.0998	11.00	Active Stream with tailings
75	Sapphire Creek			0.00	Granite shed
76	Endurance Mine Jig Ragging	3	0.0536	4.20	Tailings
		TOTAL		656.89	
		AVERAGE GRADE		**65.69**	

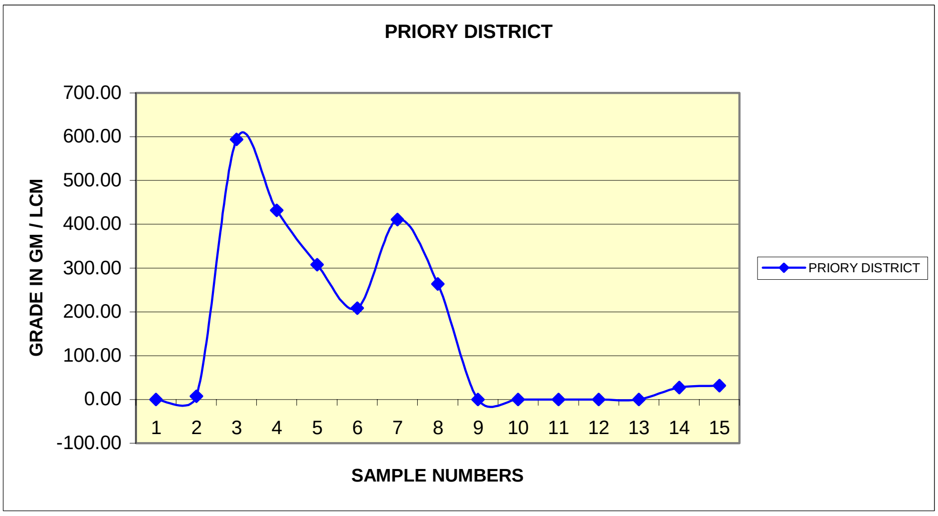


VAN DIEMAN MINES PTY LIMITED

RECONNAISSANCE HEAVY MINERAL SAMPLING

TENEMENT: SEL 22 / 1999 **DATE:** 16/09/2001 **PROJECT:** Priory District

SAMPLE NO	SAMPLE SITE	CORUNDUM Number	Mass grams	Grade g/LCM	COMMENT
630082	George River			0.00	Active and major stream
600083	Littlechilds Creek			7.40	Active
630085	Un-named Creek			594.00	Active
630086	Un-Named Creek			432.00	Active
630087	East Branch Un-named Creek			307.50	Active
630088	West Branch Un-named Creek			208.50	Active
630089	East Bank of Un-named Creek			411.00	Active
630090	Bank Between Un-named Creek			264.00	Active
132956	Albion Creek Tributary			0.00	Active
132957	Albion Creek			0.00	Active
132958	Albion Creek Tailings			0.00	Tailings
132959	Forester Creek			0.00	Active
132960	Forester Creek Tailings			0.00	Tailings
132961	George River Tailings			27.00	Tailings
132969	West Branch			31.50	Active
		TOTAL		2282.90	
		AVERAGE GRADE		**152.19**	

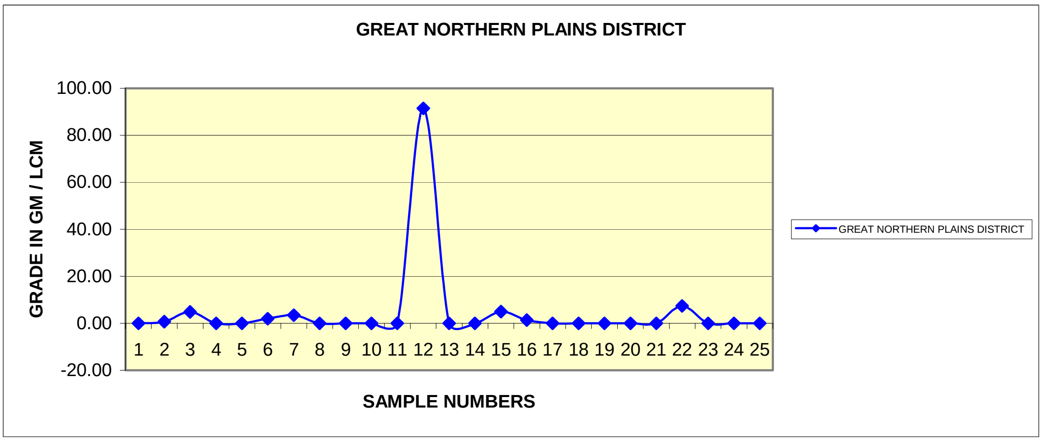


VAN DIEMAN MINES PTY LIMITED

RECONNAISSANCE HEAVY MINERAL SAMPLING

TENEMENT: SEL 22 / 1999 **DATE:** 16/09/2001 **PROJECT:** Great Northern Plains District

SAMPLE NO	SAMPLE SITE	CORUNDUM Number	CORUNDUM Mass grams	CORUNDUM Grade g/LCM	COMMENT
1	Canary Mine			0.00	Not basal wash
2	McGregor Mine Tailings	2	0.0119	0.75	Tailings
8	Delta Mine Tailings	5	0.0507	4.80	Tailings
9	Delta Mine Feed			0.00	Basal wash,
10	Dugard Mine Tailings			0.00	Tailings
12	Dry Gut Mine Feed	1	0.0108	1.95	Not basal sample
81	Creek past McGregors Mine	3	0.0254	3.50	Tailings
82	McGregors Wash			0.00	Not basal horizon, false bottom?
83	McGregors Wash			0.00	Not basal horizon, false bottom?
630059	McGregors Wash			0.00	Not basal horizon, false bottom?
630060	McGregors Wash			0.00	Not basal horizon, false bottom?
630061	Aberfoyle Central	97	1.0638	91.50	Basal Horizon
630062	Aberfoyle Central			0.00	Basal Horizon,peripheral ore
630063	Aberfoyle East			0.00	Basal Horizon,peripheral ore
630064	Aberfoyle East	4	0.0577	4.95	Basal Horizon,peripheral ore
630065	Aberfoyle Central	1	0.0106	1.35	Basal Horizon,peripheral ore
630066	Aberfoyle Central			0.00	Basal Horizon,peripheral ore
630067	Dry Gut			0.00	Not basal sample
630068	Dry Gut			0.00	Not basal sample
630069	Dry Gut			0.00	Not basal sample
630070	Delta Workings			0.00	Shallow ore
630071	Delta Workings	5	0.0453	7.35	Shallow ore
630072	Delta Workings			0.00	Shallow ore
630080	Wanex			0.00	May not be in ore zone
630081	Wanex			0.00	May not be in ore zone
		TOTAL		116.15	
		AVERAGE GRADE		**4.65**	



VAN DIEMAN MINES PTY LIMITED

RECONNAISSANCE HEAVY MINERAL SAMPLING

TENEMENT: SEL 22 / 1999 **DATE:** 16/09/2001 **PROJECT:** Miscellaneous

SAMPLE NO	SAMPLE SITE	CORUNDUM Number	CORUNDUM Mass grams	CORUNDUM Grade g/LCM	COMMENT
64	Rio Grande Creek				
65	Frome River				
66	Old Workings at Frome River				
67	Wickborg Creek				
3	Fly by Night Creek				
5	Galloways Creek	2	0.0268	8.6	
21	Monarch Mine Tailings North	1	0.0027	0.3	
22	Monarch Mine Tailings South	2	0.0209	2.7	
33	Cambells Creek				
34	Ah Kaws Creek				
49	Gressons Wash				
50	Gressons Mine Tails Top				
51	Gressons Mine Tails Bottom				
72	Ah Kaws Creek				
73	Gresson Mine Tailings				
74	Motts Creek				
6	Star Hill Mine Tailings				
7	Hardens Ravine Tributary				
13	Amber Creek				
14	Amber Hill Mine Tailings				
15	Star Creek	1	0.0148	2.1	
18	Hardens Ravine				
23	Amber Hill Mine Tailings				
24	Amber Hill Workings Tailings				
71	Amber Creek above bridge				
36	Banca Creek				
37	Banca Mine Tailings				
80	Musselroe River				
85	Musselroe River below Vern Woods	1	0.0977	15.5	
29	7 km from St Helens				
69	North George River				
70	South George River				
77	Crystal Creek				

9.3 VALUATION CRITERIA

VAN DIEMAN MINES PTY LIMITED

SAPPHIRE PRICING STRUCTURE - PARCELS OF GEM ROUGH

TENEMENT: SEL 22 / 1999 DATE: March 1, 2005

PURCHASE PARCEL 1	SIZE FRACTIONS					
100 GRAMS	- 4 mm	+4mm -4.75mm	+4.75mm - 5.5mm	+5.5mm -6.5mm	+6.5mm -7.5mm	+7.5mm
WEIGHTS / FRACTION	17.00	36.00	27.00	15.00	5.00	0.00
PRICE / GRAM	5.50	10.90	19.00	24.50	38.00	48.80
VALUE OF FRACTION	93.50	392.40	513.00	367.50	190.00	0.00
TOTAL PARCEL VALUE IN US $		1556.40				
TOTAL PARCEL WEIGHT IN GRAMS		100.00				
AVERAGE PRICE PER GRAM US$		15.56				

LOCATION		GRADES
Weld River		12.15
Branxholm		
Main Creek		8.93
Wyniford River		16.13
Mt Cameron		10.97
Priory		
GNP		8.93
TOTAL OF GRADES		57.11
AVERAGE GRADE / LCM		11.42
20% GEM GRADE / LCM		2.28
VALUE / LCM		35.55

VAN DIEMAN MINES PTY LIMITED

SAPPHIRE PRICING STRUCTURE - PARCELS OF CUT GEM

TENEMENT: SEL 22 / 1999 **DATE:** March 1, 2005

ASSUMPTIONS		WEIGHT Grams	VALUE US $ / Gram	TOTAL US $ / Gram	
ROUGH PARCEL (GEM)		1000	15.56	15,560.00	
CUT RECOVERY		20%			
CUT PRODUCT		200			
CUT PRODUCT CARATS		1000			
MELEE AVERAGE PRICE		65.00		65,000.00	
0.5 TO 1 CARAT		212.50		212,500.00	
RECOVERY DIVIDED AS TO					
MELEE		80%		52,000.00	
0.5 TO 1 CARAT		20%		42,500.00	
GROSS RECOVERED AFTER CUTTING				**94,500.00**	
LESS					
	CUTTING COSTS		US $ 0.60 / Carat		600.00
	HEAT TREATMENT		2.00 / gram		2,500.00
	INSURANCE		$1.00 / gram		1,000.00
	FREIGHT		$1.00 / gram		1,000.00
	TOTAL COSTS				5,100.00
NET RECOVERED AFTER COSTS					**89,400.00**

9.4 AGTA – LMHC INFORMATION SHEET – SAPPHIRE ENHANCEMENT

L M H C I n f o r m a t i o n S h e e t # 1

Standardised Gemmological Report Wording (implementation beginning February, 2004)

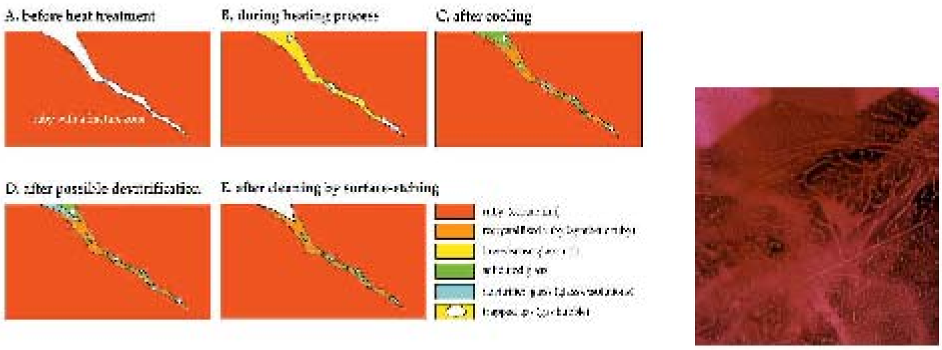
Corundum with residue from the heating process present in healed fissures and/or cavities

Members of the Laboratory Manual Harmonization Committee (LMHC) have standardized the nomenclature that they use to describe heat treatment in corundum and the degree to which fissure "healing" has occurred, and the residue that remains within the healed fissures and cavities, following the heating of corundum.

Healed fissures:

Any corundum that shows indications of heat treatment and a degree of healing along (previous) fractures - see Figure 1 - which also contain residue from the heating process, shall be described as « species » '**natural corundum**', « variety » '**ruby' or 'sapphire'** « comments » '**Indications of heating**' (to modify the colour or transparency of the stone), plus the appropriate residue quantification terminology - **alpha numeric and/or text description**"[1]. See Table 1 and examples in figures 2a, 2b, 2c and 3.

Note 1: As an option, e.g., for "simplified reporting" situations, the quantification of residue in healed fissures may be replaced by the statement "**residue in healed fissures**".
Note 2: wording in parenthesis is optional
Note 3: This clause may include the presence of **small** filled cavities



a b

Figure 1: Flux assisted healing of a fracture during the heating process. A fracture that has been healed by the synthesis of corundum or other materials during the heat treatment or crystal growth processes. (Hänni, H.A., 1998) (a) schematic (b) actual

Table 1 Residue quantification terminology

Status →	No indications of heating	Indications of heating (no residue)	Indications of heating with residue in fissures				
Report Alpha numeric →	NTE	TE	TE1	TE2	TE3	TE4	TE5
Report Text →	No indications of heating	Indications of heating	Minor residue in fissures		Moderate residue in fissures		Significant residue in fissures

Status →	Indications of heating with residue in cavities		
Report Alpha numeric→	C1	C2	C3
Report Text→	(Minor) Residue in cavities	(Moderate) Residue in cavities	(Significant) Residue in cavities

Wording in parenthesis optional

[1] In the cases of TE1 and TE2 (minor) or TE3 and TE4 (moderate), when the text version is selected a reference to the specific alpha-numeric shall be indicated either by combining the two or placing an « x » in the appropriate point of the comparative scale.

LMHC Information Sheet #2

Standardised Gemmological Report Wording (implementation February 2004)

Corundum with colour induced by lattice diffusion

Members of the Laboratory Manual Harmonization Committee (LMHC) have standardised the nomenclature that they use to describe the lattice diffusion of elements into corundum.

Sapphire – indications of heating

Any sapphire that shows indications of having undergone heating which usually involves the introduction/diffusion of hydrogen, that modifies or creates colour, shall be described as « species » **'natural corundum'**, « variety » **'sapphire'** « comments » **'indications of heating'**.

Note 1: Since the 1970's the heating of blue sapphires has usually involved the addition or removal of hydrogen. During this period the industry designated such stones originally as "natural" and not requiring a declaration of the treatment and later as "enhanced by heat" only. Given this context, LMHC members designate these stones as above.

Corundum – lattice diffusion of foreign elements other than hydrogen

Any corundum that shows indications of having undergone heating accompanied by the introduction/diffusion of a chemical element(s) (facilitating the modification or creation of colour) from an external source, shall be described as « species » **'natural corundum'**, « variety » **'sapphire' / 'ruby'** « comments » **'indications of heating, (shallow[1]) colour induced by,**

(lattice) diffusion of a chemical element(s) from an external source'.
or
the introduction of a chemical element(s) from an external source'.

[1] Shall be used when the created colour is shallow along with re-cutting caution note

Note 2: wording in parenthesis is optional
Note 3: this clause encompasses the treatment previously described by gemmological laboratories as "surface diffusion".
Note 4: those persons buying or selling stones to which the above clause applies sometimes use descriptions such as 'surface diffusion treated' or 'heated with the addition of e.g., beryllium, titanium etc.' These descriptions and others are commonly used trading terms but are not used by LMHC members.

LMHC

Information Sheet # 3

Standardised Gemmological Report Wording
Implementation beginning January, 2005

Corundum with glass filled fractures and/or cavities enhancing the clarity

Members of the Laboratory Manual Harmonisation Committee (LMHC) have standardised the nomenclature that they use to describe filled fractures in corundum. This nomenclature is used for all situations that involve the filling of fractures or cavities with glass, where there are indications that the clarity of the gemstone has been altered by this process. Excluded from this nomenclature are treatments that involve the flux assisted healing of fractures (for which see Information Sheet #1).

Filled fractures or cavities in corundum:

Any corundum that shows indications of having undergone clarity modification (unrelated to the flux assisted healing process described in Information Sheet #1), through the filling of fractures with glass shall be described as « species » '**natural corundum**', « variety » '**ruby**' **or** '**sapphire**' « comments » **['indications of clarity enhancement / modification], or [indications of material in fractures]**, plus optional texts 1 and / or 2 below.

Optional text 1: the appropriate quantification terminology – **alpha numeric and/or text description**' see tables 1 and 2 and examples in figures 2a, 2b, and 2c.

Optional text 2: the identification of the filler by either using the text in table 1 or by stating the following: using a glass-like compound to reduce the visibility of fractures. See examples in figures 2a, 2b, and 2c.

Table 1. **Quantification of material in fractures**

Status→	No indications of clarity enhancement	Indications of clarity enhancement / material in fractures		
Report Alpha numeric		F1	F2	F3
Report Text →	No indications of clarity enhancement / modification or No indications of material in fractures	Indications of (minor) clarity enhancement / modification or Indications of (a minor amount of) material in fractures	Indications of (moderate) clarity enhancement / modification or Indications of (a moderate amount of) material in fractures	Indications of (significant) clarity enhancement / modification or Indications of (a significant amount of) material in fractures
Further optional report comment		([a glass], [a lead glass], [a silica glass], has been identified as the filler)		

Special Notices to Table 1	
1.	Whether using the alpha numeric or text description the report shall also illustrate the equivalent by appending the above chart.
2.	The presence of an insignificant amount of clarity enhancement need not be declared
3.	The presence of materials within fractures that have occurred naturally are not within the context of this clause and need not be declared
4.	Wordings in parenthesis '( )' are optional, wording in '[ ]' are alternatives.

It is possible that during the clarity enhancement process in addition to fractures, cavities may become filled with the clarity enhancing substance being used, i.e., glass. When such filled cavities are found in clarity enhanced stones (excluding the situations described in Information Sheet #1) the report text and / or alpha numeric in table 2 shall be additionally used.

Table 2: **Quantification of material in cavities**

Status →	Filled cavities		
Report Alpha numeric→	(C1)	(C2)	(C3)
Report Text→	(Minor) filled cavities	(Moderate) filled cavities	(Significant) filled cavities

LMHC Laboratory Manual Harmonisation Committee

9.5 HEAT TREATMENT PROTOCOLS

Development of a Processing Protocol for Tasmanian Sapphire

A proposal presented by

Crystal Chemistry to

Van Dieman Mines

10 March 2005

Objective

It is anticipated that significant quantities of sapphire will be recovered as a byproduct of a major tin mining project to be undertaken by Van Dieman Mines in Tasmania. In general, the majority of all gem sapphire sold in the world today is heat treated in order to improve the color, the clarity, or both. The objective of the work proposed herein is to develop a processing protocol for the Tasmanian sapphire which maximizes the gem value within practical production constraints.

Background

Crystal Chemistry was formed in 1989 by John L. Emmett and Troy R. Douthit to pursue the development of corundum heat-treating processes in support of various mining and gem cutting organizations. Although the majority of all corundum is heat treated in Thailand, there is a requirement for the development of new processes for material that is difficult to treat. In addition, we have found that even rather simple heat treatment processes can be further optimized, and when subjected to rigid process control, result in substantial increases in sapphire value.

To date, Crystal Chemistry has conducted major protocol development efforts for sapphire mines in the following locations:

- Three different types of alluvial sapphire from Montana, USA.
- Three different types of sapphire from Madagascar.
- Sapphire from Chimwazulu Hill, Malawi.
- Sapphire from King's Plain deposit, Australia.
- Sapphire from Subera deposit, Australia.

Crystal Chemistry also routinely conducts production processing of sapphire for a list of clients worldwide. And finally, we support major gemological laboratories with consulting services and experimental gemstone processing.

Scope of Work

Crystal Chemistry proposes in conjunction with Columbia Gem House to develop a complete processing protocol for the Tasmanian sapphire. In this proposal we are assuming that the sapphire produced will be essentially homogeneous from the point of view of its trace element chemistry and its inclusions. That is, the protocol developed will be effective on all of the material.

Given the fact that the deposit is alluvial in nature we would expect only size distribution changes from place to place. These assumptions will have to be checked as mining proceeds. The protocol to be developed will be comprised of the following steps worked jointly with CGH:

Cleaning

The sapphire concentrate from the mine is cleaned of adhering non-corundum material that would interfere with the visual evaluation of the material or would interfere with a heat-treatment process by melting and/or interacting with the sapphire. Occasionally, cleaning is as simple as washing with detergents. However, in the great majority of cases, cleaning requires both hydrofluoric and hydrochloric acids to remove silicate and iron oxide contamination.

Sorting out Non-Corundum Minerals

The corundum concentrate from most sapphire mining operations contains a wide variety of non-corundum minerals at low concentrations, such as zircon, topaz, quartz, feldspar, garnet, chrysoberyl, etc. All of these minerals must be removed prior to any heat treatment as they will melt and/or react with the sapphire or the furnace furniture, resulting in financial loss. The lighter minerals are usually removed using flotation with heavy liquids, while heavier minerals are often removed by hand sorting under visible or UV light. In some cases we use a low temperature heat treatment to decompose the contaminant (e.g., topaz) without melting it. The decomposed topaz (mullite) is opaque white and thus easily removed by hand before high temperature heat treatment.

Work with Crystal Chemistry to develop and write out protocols as to how gem variety separation can occur on a volume scale. Provide written suggestions as to how this could be most economically accomplished in a production phase.

Here also we would look at various gem materials “removed” and do an initial assessment as to their market viability. If there is additional development work on other materials needed, we could determine a research schedule at that time.

Size Grading

Understanding the size distribution of the rough is key to understanding the sizes and quantities of finished gems that the mine can produce. The cleaned corundum is size graded through an array of circular hole sieves to provide a histogram of the size distribution. Depending on the size range it may be necessary to develop more than one heat treatment process. The reason for this is simply that a sapphire of optimal color saturation at 3 to 4 mm will be too dark at 7 to 8 mm. Thus the larger material may need to be processed differently to produce a lighter result.

Develop a size grading system based both on heat treatment parameters, but also finished stone parameters.

Sorting the Corundum

Sorting of the corundum is carried out for several reasons.

1. There may be a significant fraction of totally opaque corundum that will not respond to any heat treatment that, if removed, will reduce heat treatment costs.
2. There may be significant numbers of larger stones that can be sawed to remove a substantial amount of waste material, further reducing the material that must be heat treated.
3. Determine if there is a component of the rough that should be cut without heat treatment. This may require cutting trials where part is cut untreated and part is treated to determine the best value.

Heat Treatment

The major heat treatment processes are conducted prior to cutting the final gems. To develop the process or processes we use 6 to 10 standard processes for screening the response of the sapphire to very different points in the temperature, time, oxygen partial pressure, hydrogen partial pressure parameter space. This screening will have to be done on several size groups for each screening test. The sapphire from these screening tests will be delivered to Columbia Gem House (CGH) for cutting and evaluation. We expect that 20 to 40 furnace experiments will be necessary for this screening, depending on the size distribution. Concurrently we will conduct chemical analyses with SIMS (Secondary Ion Mass Spectrometry) on representative samples. In addition we will conduct UV-VIS-NIR and FTIR spectroscopy on the samples. The data from the CGH evaluation of the screening tests, the chemical analysis, and the spectroscopy will be used to define the general region of the heat treatment parameter space to be focused upon for process optimization. At this point we will also know whether we need multiple processes for multiple sizes.

Work with Crystal Chemistry to review scientific data of gem resources to determine if it could be used to develop an origin "finger print" of this deposit.

The optimization of the heat treatment processes will entail optimization of the process before cutting and development of the after cutting heat treatment process. We have learned that it is often possible to further optimize the color of sapphire by rather low temperature processing after the stones have been cut. This after cutting heat treatment has become an important part of much of our heat treatment technology. This low temperature processing can only be done effectively on the cut stones as only with cut stones can the color be accurately judged. Depending on the size distribution of the sapphire, we would anticipate that 20 to 40 furnace experiments will be required for pre-cutting optimization, and 10 to 20 furnace experiments will be necessary for post-cutting optimization. Again, the cutting and evaluation of these sample lots will be performed by CGH.

The results of the processing protocol development should closely define the value of the sapphire being produced by the mine. In addition it will produce a very good estimate of the size range and quality of the gems available for market.

GEMSTONE CUTTING

a) CGH will work with Crystal Chemistry to determine furnace experiment size samples to accomplish objectives.
b) Sort, preform and cut all individual samples and track separately.
c) Analyze for best style of cutting to obtain optimum value.
d) Upon completion of cutting samples, CGH will sort to a yet to be determined size and quality grading system.
e) After sorting, we will determine percentage of yield from rough in each size, grade and color. A tracking sheet will be prepared for each heating trial.
f) Once sorted, document the grade yield and size distribution and apply relative or tentative values to be used to determine the best heating process.
g) Keep each cut sample separate as a future reference and attach an analysis sheet with each.
h) Determine the best quality and the best heat method to yield the greatest value.

Costs

This proposal is being written without ever having seen a mine run sample of the corundum concentrate that will be produced. Additionally, there are substantial uncertainties regarding the actual number of experiments needed to achieve a practical optimal protocol. Uncertainties similar to these are a part of every protocol development project that Crystal Chemistry has undertaken. Thus we believe that we can accomplish the tasks described within the budget provided below. CGH will separately bill for cutting and other activities.

Work done at Crystal Chemistry: cleaning, furnace experiments, Spectroscopy, documentation (3 man-months @ $15K/man-month)	US$45,000
Consumables: furnace ceramics, heating elements, gases, lap plates, sieve plates	4,500
Capital Equipment digital camera back for documentation	7,800
Analytical chemistry by Evans East, Inc. 15 samples @ $350/sample	5,250
TOTAL:	US$62,550

Time Line

Assuming that CGH can provide a 10 to 11 day turn-around time for cutting test lots and evaluation, we estimate that the protocol development can be accomplished in 3 to 3 1/2 months. It may be more realistic to assume a 17 or 18 day turn-around time to allow for missed shipments, sorting and grading by CGH. In that case the project will require 4 to 4 1/2 months.

Final Report

A final report documenting the work done on this project will be prepared and distributed within 60 days of the completion of the experimental work and evaluations.

Terms

Crystal Chemistry's standard terms for such projects are 50% due at initiation of the project and 50% due upon completion. Other terms can also be negotiated.

Development of a Processing Protocol for Tasmanian Sapphire

A proposal presented by

Crystal Chemistry to

Van Dieman Mines

10 March 2005

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Scope of Work

Crystal Chemistry proposes in conjunction with Columbia Gem House to develop a complete processing protocol for the Tasmanian sapphire. In this proposal we are assuming that the sapphire produced will be essentially homogeneous from the point of view of its trace element chemistry and its inclusions. That is, the protocol developed will be effective on all of the material. Given the fact that the deposit is alluvial in nature we would expect only size distribution changes from place to place. These assumptions will have to be checked as mining proceeds. The protocol to be developed will be comprised of the following steps worked jointly with CGH:

Cleaning

The sapphire concentrate from the mine is cleaned of adhering non-corundum material that would interfere with the visual evaluation of the material or would interfere with a heat-treatment process by melting and/or interacting with the sapphire. Occasionally, cleaning is as simple as washing with detergents. However, in the great majority of cases, cleaning requires both hydrofluoric and hydrochloric acids to remove silicate and iron oxide contamination.

Sorting out Non-Corundum Minerals

The corundum concentrate from most sapphire mining operations contains a wide variety of non-corundum minerals at low concentrations, such as zircon, topaz, quartz, feldspar, garnet, chrysoberyl, etc. All of these minerals must be removed prior to any heat treatment as they will melt and/or react with the sapphire or the furnace furniture, resulting in financial loss. The lighter minerals are usually removed using flotation with heavy liquids, while heavier minerals are often removed by hand sorting under visible or UV light. In some cases we use a low temperature heat treatment to decompose the contaminant (e.g., topaz) without melting it. The decomposed topaz (mullite) is opaque white and thus easily removed by hand before high temperature heat treatment.

Size Grading

Understanding the size distribution of the rough is key to understanding the sizes and quantities of finished gems that the mine can produce. The cleaned corundum is size graded through an array of circular hole sieves to provide a histogram of the size distribution. Depending on the size range it may be necessary to develop more than one heat treatment process. The reason for this is simply that a sapphire of optimal color saturation at 3 to 4 mm will be too dark at 7 to 8 mm. Thus the larger material may need to be processed differently to produce a lighter result.

Sorting the Corundum

Sorting of the corundum is carried out for several reasons.

3. There may be a significant fraction of sapphire that can be cut to attractive gemstones without heat treatment, thus providing a 100% natural product.
4. There may be a significant fraction of totally opaque corundum that will not respond to any heat treatment that, if removed, will reduce heat treatment costs.
5. There may be significant numbers of larger stones that can be sawed to remove a substantial amount of waste material, further reducing the material that must be heat treated.

Heat Treatment

The major heat treatment processes are conducted prior to cutting the final gems. To develop the process or processes we use 6 to 10 standard processes for screening the response of the sapphire to very different points in the temperature, time, oxygen partial pressure, hydrogen partial pressure parameter space. This screening will have to be done on several size groups for each screening test. The sapphire from these screening tests will be delivered to Columbia Gem House (CGH) for cutting and evaluation. We expect that 20 to 40 furnace experiments will be necessary for this screening, depending on the size distribution. Concurrently we will conduct chemical analyses with SIMS (Secondary Ion Mass Spectrometry) on representative samples. In addition we will conduct UV-VIS-NIR and FTIR spectroscopy on the samples.

The data from the CGH evaluation of the screening tests, the chemical analysis, and the spectroscopy will be used to define the general region of the heat treatment parameter space to be focused upon for process optimization. At this point we will also know whether we need multiple processes for multiple sizes.

The optimization of the heat treatment processes will entail optimization of the process before cutting and development of the after cutting heat treatment process. We have learned that it is often possible to further optimize the color of sapphire by rather low temperature processing after the stones have been cut. This after cutting heat treatment has become an important part of much of our heat treatment technology. This low temperature processing can only be done effectively on the cut stones as only with cut stones can the color be accurately judged. Depending on the size distribution of the sapphire, we would anticipate that 20 to 40 furnace experiments will be required for pre-cutting optimization, and 10 to 20 furnace experiments will be necessary for post-cutting optimization. Again, the cutting and evaluation of these sample lots will be performed by CGH.

The results of the processing protocol development should closely define the value of the sapphire being produced by the mine. In addition it will produce a very good estimate of the size range and quality of the gems available for market.

Costs

This proposal is being written without ever having seen a mine run sample of the corundum concentrate that will be produced. Additionally, there are substantial uncertainties regarding the actual number of experiments needed to achieve a practical optimal protocol. Uncertainties similar to these are a part of every protocol development project that Crystal Chemistry has undertaken. Thus we believe that we can accomplish the tasks described within the budget provided below. CGH will separately bill for cutting and other activities.

Work done at Crystal Chemistry: cleaning, furnace experiments, Spectroscopy, documentation (3 man-months @ $15K/man-month)	US$45,000
Consumables: furnace ceramics, heating elements, gases, lap plates, sieve plates	4,500
Capital Equipment digital camera back for documentation	7,800
Analytical chemistry by Evans East, Inc. 15 samples @ $350/sample	5,250
TOTAL:	US$62,550

Time Line

Assuming that CGH can provide a 10 to 11 day turn-around time for cutting test lots and evaluation, we estimate that the protocol development can be accomplished in 3 to 3 1/2 months. It may be more realistic to assume a 17 or 18 day turn-around time to allow for missed shipments, sorting and grading by CGH. In that case the project will require 4 to 4 1/2 months.

Final Report

A final report documenting the work done on this project will be prepared and distributed within 60 days of the completion of the experimental work and evaluations.

Terms

Crystal Chemistry's standard terms for such projects are 50% due at initiation of the project and 50% due upon completion. Other terms can also be negotiated.