

**AN APPLICATION FOR A RETENTION LICENCE AT ABERFOYLE HILL
AS A FLOW ON APPLICATION FROM EL 38/1997**

FOR MINERAL HOLDINGS AUSTRALIA PTY LTD

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AN APPLICATION FOR A RETENTION LICENCE AT ABERFOYLE HILL

1.0 Introduction

This is an application on behalf of Mineral Holdings Australia Pty Ltd for a Retention Licence of 4 sq km as a flow on title to EL 38/97.

EL 38/97 was granted to Mineral Holdings Australia Pty Ltd on 6th March 1998 for a maximum of 5 years over an area of 4 sq km at Aberfoyle Hill, near Gladstone, NE Tasmania. The EL is adjacent and to the south of RLs 8715 and 8723 held by the same company covering the Fosters Marshes alluvial tin resources and otherwise is completely surrounded on all sides by EL 32/2001 covering the remainder of the Great Northern Plains also in the name of Mineral Holdings (Plan 1). Mineral Holdings has spent \$71,311 on exploration and evaluation during the tenure of EL38/97.

The targets are bentonitic clays suitable as a pelletising agent for Savage River iron ore as well as a wide range of other industrial uses and heavy mineral placers exposed in the old alluvial tin workings as an integral part of the consolidated Ringarooma Alluvial Tin Project being run by Mineral Holdings over the Great Northern Plains and offshore Ringarooma Bay. The Project is currently optioned to Mining and Marine Pty Ltd of Hobart.

2.0 Previous Exploration by Mineral Holdings

The exploration work on EL 38/97 has been described in a series of annual reports by Duncan and Rhodes (1999, 2000 and 2001) and Duncan et al. (2002) and a final report by Duncan (2003).

The regional geology and the generalized envelope of the alluvial tin mineralisation are depicted in Plan 2.

Initial exploration by drilling, during the first two years, led to the discovery of a clay deposit averaging 6m thick under a sandy overburden 1-2m thick on the western side of the Ringarooma River, adjacent to the old Dry Gut alluvial tin workings.

In the third year of the licence, the focus of investigation was shifted to the evaluation of the sapphire content of the alluvials of the Great Northern Plains. Prior to drilling, a scout program was carried out on the more accessible alluvials exposed in the old working faces at MacGregors, Aberfoyle and Dry Gut alluvial tin mines.

The samples of wash were hand dug, sieved, handpicked and assayed to record their values of tin, sapphire and gold. Aberfoyle Central (four samples) gave the best values of 1800g/BCM tin and 110g/BCM sapphire in one sample at the Boomerang face and 140g/BCM tin and 1.6g/BCM sapphire in one sample at the northern Sea

Shell face. Aberfoyle East (two samples) gave 252g/BCM tin in one sample and 5.5g/BCM sapphire in the other. Dry Gut and Delta (to the NW) showed some interest with 430g/BCM tin and minor sapphire at 0.54g/BCM in a composite of three samples in the former and best value of 1028g/BCM tin and 8.8g/BCM sapphire of 3 samples in the latter.

In the fourth year, based on these promising results and as part of a larger program on the Great Northern Plains, four pits were dug by excavator in the old workings of the Aberfoyle alluvial tin mine and three bulk samples of basal, gravel wash in the 1-2 cu m range were extracted and processed through a mobile treatment plant.

The resulting concentrates and screen products were hand picked and assayed for heavy minerals and sapphires and the results calculated back to give grades in the alluvial wash. These are described later in the report.

Following reports from an industry source that rare earths adsorbed on clays could be a potential exploration target as there was some production from these in China, it was decided to do a preliminary scan of rare earth contents in the Aberfoyle Hill clay deposit outlined by Mineral Holdings in previous exploration on this licence.

Four samples of clay from the deposit were selected as follows- three montmorillonites derived from Jurassic dolerite and one kaolinite from Mathinna metasediment.

The rare earths determined were the light earths-lanthanum, cerium, praseodymium, neodymium, samarium and europium and the heavy earths- gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium and lutetium.

The most common rare earths in the samples are cerium, neodymium and lanthanum. Collectively, the rare earths range from 53 to 205ppm in the samples, well below the 2000ppm -2% required for commercial deposits of this nature (see Table 3, Appendix).

The clays in the deposit at Aberfoyle Hill have combined rare earth values up to about 200ppm but fall well short of the concentrations required for commercial extraction by one or two orders of magnitude.

3.0 Inventory of Resources

3.1 Clay Resources

Exploration at the Dry Gut Prospect by Mineral Holdings Australia Pty Ltd consisted of a program of 10 drill holes ranging from 100 to 250m apart with a combined depth extent of 76m which confirmed a clay deposit over an area of 0.25 sq km (Plan 5).

Geologically, the clays are overlying an altered dolerite bedrock and are considered to have been derived from the dolerite by Tertiary weathering.

The results from the drilling are summarised in the Table below and the logs are contained in the Appendix.

Table

Hole No	Clay (m)	Overburden (m)	Description
1	3	1	brown grey clays
2	4.2	2	yellow, grey and brown clays
3	2.75	1.5	brown plastic and grey sticky clays
4	0.75	1	yellow and brown clays
5	10.5	2	grey and yellow (blue clays)
6	10.1	2	brown, grey and white clays
7	5.7	2	green, brown and blue clays
8	9.9	0.3	grey, brown and blue clays
9	6	1	brown clays
10	7	1	yellow, brown and red clays

The clays have a range of colours (brown, grey, blue, green, white, black and red) and textures (waxy, plastic and sticky) and the deposit is from 0.75 to +10.5m thick, averaging 6m under a sandy overburden from 1 to 2m thick. This gives an inferred, geological, in situ resource of 1.5 million cubic metres (cu m) or 2.8 million tonnes of mixed clays (assuming an SG factor of 1.86).

The thickest section of clay is on a 20m high ridge intersected by holes 5 and 6 each of which shows a 10m thickness of a consistent plastic to sticky clay in grey, yellow and brown colours. The area enclosed by the 20m contour is about 100m by 200m and taking a 10m thickness gives 200,00 cu m or 372,000 tonnes as an indicated resource (JORC,1999). At an annual production rate of 15,000 tonnes, the deposit would yield about 25 years supply.

The ridge runs off this licence to the west and if the clay proves to be marketable, then the area to the west within EL 32/2001 should be secured for additional potential resources. The overburden is commonly 1-2m thick of fine-grained, grey sand passing into brown, sandy clay or “coffee rock”. The more homogeneous clays commonly overlie and are derived from the dolerite bedrock apart from the southern section of variable clays which overlie a mixed bedrock of granite and metasediment.

The clays have been extensively tested for their properties particularly by Sud-Chemie of Germany but also by Australian Bulk Minerals and Amdel and the details are contained in the Appendix. Previous testing before EL 38/97, including identification by the CSIRO, is contained in the 1999 annual report.

Identification of the clays reveals that the northern group are mainly smectite whereas in the south kaolinite is more common although impure. Industrial testing by Australian Bulk Minerals showed that the clays would not be suitable as a pelletising agent. Percentage Water Adsorption (PWA) values were in the range 100- 300 where 600- 800 would be required to rival Wyoming bentonite. Tests by Sud-Chemie A.G. of Germany confirm the low adsorption and swelling volume features and infer that the clay is a low swelling smectite such as beidellite and /or nontronite rather than montmorillonite as was suggested by the early CSIRO test which gave Fe, Mg and Ca rather than Na in the chemistry.

Beidellite and nontronite are widely found in soils derived from the weathering of basic rocks such as the Jurassic dolerite in this case. Fuller's Earth in Europe comes from this source and provides encouragement that higher adsorptive clays may still be found at Aberfoyle Hill. The kaolinite clays are too impure to be considered as an exploration target.

An RL is required to allow further technical studies of the clays in the deposit to determine the full range of properties leading to the identification of market possibilities. The extraction of rare earths is not considered viable at this stage. Bulk sampling would be necessary for a full feasibility study prior to extraction. As there are no recognisable impurities within the clay, recovery would be in the 90-100% category. The overburden is up to 2m of sand lending itself to prestripping and stockpiling for eventual rehabilitation.

Mining would be by open cut with an area adjacent for stock piling, shedding and site facilities. The landscape is a flat plain currently used as a grazing lease which facilitates the possible construction of an all weather gravel road of about 800m to the site from the Gladstone- Bridport road which should cost less than \$50,000.

Environmentally, the indicated deposit is on a lightly timbered low ridge with small, dry eucalypt species within a Forestry Regional Reserve. Rehabilitation would be subject to the Forest Practices Code and within the Environmental Management Plan to be submitted with the Mining Lease application.

No estimates of working costs or price and demand forecasts are possible until a market has been established for the product. The indicated smectite clay resource is conservatively valued at \$2Million (\$10 /cu m).

3.2 Tin Resources

The proposed RL straddles an area of alluvial tin resources ranging from drilled, unmined resources (Wanex area), through residual resources in the old alluvial workings (Aberfoyle, MacGregors and Dry Gut) to areas which have occasional good values in drill holes widely apart, or areas where the old drilling has been ineffective or too shallow and coverage has been patchy and non-systematic and sometimes absent and where interpretations suggest the presence of untested palaeochannels or leads (the Aberfoyle Lead running to the NW).

3.2.1 Wanex Area

Modern drilling by Portland Holdings Pty Ltd (1969, poorly recorded) and particularly West Australian Nickel Exploration Co (Wanex, 1972-73) over the former mining lease CML 42M/76 established, using 250 holes, a proven reserve of 1.53M cu m grading 133g/cu m tin metal (Hellyer, 1983). Part of this indicated resource (JORC, 1999) is contained in the NE quadrant of the RL area (Plan 3).

This information is contained in two reports by L. R. Baster (1971-73, 1972). It has proved impossible to access this data despite rigorous searching in the archives of Mineral Resources Tasmania and in the records of various exploration companies. As a result, it is not possible to recast these resources to allow for prestripping the overburden as has been done for the Fosters Marshes mineralisation (Kinnane, 2001). A fragment of chart shows the intensity of the drilling (Plan 8, Appendix).

The drilling also showed a 200m wide palaeochannel (Nye's MacGregor Lead) trending NW through the MacGregor workings towards the Fosters Marshes area. Many of these holes were unbottomed and only drilled to the reachable depth of the Dorset Dredge (15-18m). The immediate intention was to prove enough resources to allow the Dorset Dredge to work through from MacGregors Lagoon northwest to the Braithwaites Resources drilled by the Mines Dept in 1967 on the Great Northern Plains.

This resource was subsequently reassessed by Santos during their drilling campaign in the Fosters Marshes area to the north as proven, in situ reserves of 3.82M cu m at 106g/cu m SnO₂ within which there is a probable, recoverable high grade zone of 1.52M cu m at 139g/cu m SnO₂ (Hellyer, 1983).

In the western angle of the CML, the Wanex drilling was stopped well before the Aberfoyle Hill and here and in most of the NW quadrant of the RL area there has been no drilling. Yet on the edge of this zone, rich values in sporadic drill holes nearly reach 200g Sn/cu m and require to be evaluated by more modern drilling for additional resources (Plan 3).

Also on Plan 3 is the interpreted Aberfoyle Lead arising from Nye's 1932 work (Plan 4) which cuts NW across the RL and joins the residual resources at Aberfoyle Mine with the unmined resource blocks of the Delta zone of the Great Northern Plains (Kinnane, 2001). This structure remains to be evaluated and could increase the possible resource figures substantially.

3.2.2 Residual Resources

Historically, the larger alluvial mines at Aberfoyle and MacGregors which were worked in the period 1880 to 1916 and the smaller ones along the terraces of the Ringarooma River (such as Taylors, Canary, Roy, Richardsons and Black Duck) were closed not because of depletion of resources but rather loss of adequate water head from the Mt Cameron water race and inability to remove sluiced tails because of falling basement (Nye, 1932).

Residual alluvial resources at Aberfoyle Mine in the SE quadrant of the RL area are not as yet defined due to lack of drilling but potential exists for reasonable volumes in association with the residuals in the adjacent alluvial mines at MacGregors, Beltz,

Taylor's and Delta which together with Wanex area have been assessed as potentially containing about 2,500 tonnes of tin concentrates (Kinnane, 2001). The present outlines of these mine workings have been plotted on Plan 3 from interpretation of modern air photos.

A rough chart (Plan 4) from the above publication Nye (1932) shows a compilation of historic workings of the larger alluvial mines and the sporadic exploration drilling covering the SE part of the RL area. In addition, Nye has interpreted possible deep leads or depositional channels in or near the old mines controlling the alluvial tin resources. The two marked on the chart are the MacGregor Lead (also called the Deep Creek Lead) and the Aberfoyle Lead. Production records from the mines are not continuous but as an example at Aberfoyle 129.3 tons of tin concentrates were produced from 1906-1916.

In a subsequent report (1970), Nye predicted the meeting of a number of parallel leads flowing NW into the Fosters Marshes area –the Scotia (or Scoloch) Lead, an unnamed lead 1km to the SW, the McGregor Lead passing through the NW corner of the RL area and the Aberfoyle Lead either joining the McGregor Lead or running parallel to it in the RL area. This is summarised on regional Plan 2 and Plan 3 shows the last mentioned leads and their possible connection with the resource blocks to the north subsequently established by Santos on the Fosters Marshes area of the Great Northern Plain (Kinnane, 2001).

From past production, the potential residual resources at Aberfoyle have been assessed as at least the same again giving a volume of 650,000 cu m at an average grade of 200g/cu m of SnO₂ (the average from the Great Northern Plains) yielding 130 tonnes of tin concentrates. These are assigned to the lead running north from the Aberfoyle mine. A similar volume of wash can be assigned to the proposed extension of the palaeochannel running NW to join up with the resource blocks in the Delta zone (Plan 3).

3.2.3 Recent Testing

To test the value of the residual wash, a limited bulk-testing program of 4 pits was carried out in year 4 in the RL area by Mineral Holdings in the Aberfoyle workings using an excavator and mobile jig plant following a survey that revealed that shallow ground was present at the Sea Shell Face and at Aberfoyle East and deeper ground at the Boomerang Face (locations and logs in Plan 6, Tables 1, appendix). The work has shown that, in two of these pits, basal alluvial wash of reasonable grade can be accessed in the former work faces. As well as arriving at the tin grade, the processing has allowed estimation of the accessory minerals – ilmenite/rutile, zircon, gold and sapphire. (Duncan et al, 2002).

The two successful pits ABE 3 and 4, at Aberfoyle Central and East respectively, have SnO₂ grades in the range 100-130, TiO₂ 24-29, ZrO₂ 9-11 and sapphire up to 3.3 g/LCM. Tantalum and niobium pentoxides are in the range 0.35-0.55g/LCM with the Nb/Ta ratio being about 2 or 3 to 1. (Table 2, appendix).

The bulk values are lower than the Great Northern Plain resource values as deduced from the drilling, the latter having an average grade of about 200g/cu m SnO₂. The

lower mineral grades may be due to excessive ragging of the jig bed by steel nut-punchings on the mobile plant causing loss of the heavy minerals cassiterite, zircon, rutile and ilmenite as well as sapphire.

3.2.4 Dry Gut Area

The Dry Gut former alluvial tin workings are on the western side of the Ringarooma River in the SW quadrant of the RL area adjacent to the clay deposit. The area was not bulk sampled due to time constraints but hand samples of a 0.5m thick, coarse wash layer gave 430g tin metal/BCM and the cassiterite was seen to be coarse from a pan concentrate. The wash is also sapphire- and gold –bearing with 0.54g/BCM and 0.018g/BCM respectively. The old workings are littered with silcrete boulders indicating a high-energy environment of deposition and the basement is altered dolerite.

The production history is incomplete but about 3 tons of high quality (+74% Sn) tin concentrates were produced in the 1960s by K. Richardson (pers. com.) by hydraulic sluicing using pumped water from lagoons by the river. Earlier production is thought to approach 2 tons and there is a possibility of much earlier production by the Chinese.

Coarse black cassiterite is mentioned as well as brown, finer-grained cassiterite. Residual ground, some of it shallow and rich, is reported along the ridge and the slopes down to the Ringarooma River (Plan 5). Possible resources are of the order of 100,000 cu m at 200g/cu m SnO₂.

3.2.5 Delta Area

The Delta tin deposit is 1km to the north also on the western side and overlooking the Ringarooma River. It is just outside the NW quadrant of the RL area but contained in EL 32/2001 also held by Mineral Holdings. The main workings consist of a narrow, irregular open cut running east west for 198m into the terrace at about 4-6m above the flood plain of the Ringarooma River (Leaman, 1974). In the floor of the workings, silcrete boulders approach 1m across on a basement of dolerite. The mine operated from 1934 to 1938 and produced 16.3 tons of tin concentrates by sluicing.

Unspecified residual resources are evident at Delta. Some mineralisation has been intersected NE of the old workings and to the west by Utah Development where it is patchy and low grade. The resource potential in the Delta –Dugarde area has been given as 4M cu m at 120g/cu m SnO₂ (Santos) and at Delta the prospectivity has been assessed as 1.5M cu m at 130g/cu m SnO₂.

Both the Dry Gut and the Delta deposits, which are aligned east west, may have been channels feeding into the adjacent, interpreted Aberfoyle Lead.

4.0 Resource Summary

The resources estimates in the proposed RL area are summarised in the following way-

NE quadrant

- part of indicated resource 1,520,000 cu m at 139g/cu m SnO₂ within 3.82M cu m at 106g/cu m SnO₂ (Hellyer, 1983),
- the controlling structure is the MacGregor Lead heading into Braithwaites Resource on Gt Northern Plains,
- unspecified potential in west with good tin intersections in sporadic drill holes on edge of Aberfoyle Lead.

SE quadrant

- possible resources of order of 650,000 cu m at 200g/cu m SnO₂ as residual resources north of the Aberfoyle workings (this study, from Nye, 1932)
- controlling structure is the Aberfoyle Lead running north from the mine workings.

SW quadrant

- possible resources 100,000 cu m at 200g/cu m SnO₂ as Dry Gut residual resources (this study, from pers. com. K Richardson),
- interpreted feeder channel running easterly into the Aberfoyle Lead,
- inferred resources of 1.5M cu m of mixed clays containing the most part of 200,000 cu m as an indicated resource of smectite clay (this study),
- residual clay deposit overlying and derived from dolerite.

NW quadrant

- possible resources of order of 650,000 cu m at 200g/cu m SnO₂ (this study, from Nye, 1932),
- controlling structure is the Aberfoyle Lead running NW towards the Delta resource block on the Gt Northern Plains,
- small part of Dry Gut alluvial tin resource,
- small part of the indicated smectite clay resources (this study).

Whereas, the inferred and indicated resources conform to the JORC convention, the possible resources do not, being a measure of the prospectivity with greater risk than the JORC categories and being based on what has been produced historically and the interpreted position of a controlling structure in this case a lead or palaeochannel.

5.0 Feasibility Study

Only preliminary feasibility studies have been done on this area as part of the Great Northern Plains placer tin mineralisation studies (MacArthur, 1995, and Mason 2000).

Based on a number of mining techniques such as a single bucket ladder, an overburden stripping and smaller dredge, a double ladder dredge and backhoe mining, the operating costs were around Aus\$1.68, \$1.59, \$1.40 - \$1.50 and \$1.44 - \$2.22/ cu m respectively.

More recently, Kinnane (internal memo) has suggested using other methods such as strip mining using scrapers, bulldozers or large hydraulic excavators and mining using conventional backhoe, trucks or gravel pumps or the removal of overburden by dragline and mining of wash by conventional methods. Preliminary estimates suggest that running a 100 cu m/hour alluvial plant with backhoe and bulldozers and jig based gravity plants would cost from \$2.50- \$10.00/ cu m depending on a number of variables such as overburden to ore ratios, grade, water and labour availability, location, access and infrastructure.

In a specific case, Kinnane has calculated that for a two dredge or pre-stripping operation, the estimated cost would be \$1.70/ cu m against an estimated resource value of \$4.40/ cu m (see Table 4, appendix) giving a net surplus of \$2.70/ cu m. It is also expected that similar costs and surplus figures could be achieved using a “dry mining” method.

Based on these figures, the possible value of the alluvials in the Wanex area (1.52M cu m) would be Aus\$6.7M and those of the Aberfoyle area (1.4M cu m) including Dry Gut) of the order of \$6.2M.

The LME price graph (Plan 9, Appendix) shows that the tin price is currently on the high point of a six month cycle at US\$4700. Since the above figures in the Table were calculated in 2002, the tin price has dropped from Aus\$8,650 to the present \$7617 (9th March 2003) partially due to the stronger Aus dollar against the US dollar. However, the outlook for 2003 is good with the forecast (Australian Mining, December 2002) that the price will increase by 17.8% due to reductions in mine output mainly in China with resulting concentrate shortages and falling refined tin production.

An appropriate treatment plant circuit is featured in Plan 7 (Appendix)- and recognises the complex assemblage of accessory heavy minerals including gold, sapphire, ilmenite, rutile, zircon and tantalite which substantially increase the value per cubic metre of the alluvial deposits. Preliminary costs suggest an amount of \$1.25million for the plant although the availability of second hand plant would reduce this figure substantially.

The mining and plant infrastructure would depend on the scenario chosen for the development of the mains resources of Foster Marshes area but the present site of the former Dorset Dredge treatment shed (only foundations now) would be central for both areas. This site is on the Great Northern Plains at 5,469,600mN; 580,900mE and connected to the Gladstone- Cape Portland road by a 6 km gravel road.

Environmentally, the old tin mining areas have been disturbed and degraded in the past. However, any new mining operations will have to be subject to the modern planning and environmental provisions. The area is in general both a lightly forested Regional Reserve and private property to the north where diary pastures predominate. There are Prescription Forestry Communities along the Ringarooma River and to the north there is a Ramsar Site impinging on the resources area which will have to be accommodated with appropriate rehabilitation procedures.

6.0 Conclusions

Exploration carried out by Mineral Holdings over the period 1998 to 2003 has discovered a clay deposit and evaluated alluvial tin resources within EL 38/97, Aberfoyle Hill.

6.1 The resources of alluvial tin (SnO₂) wash are-

Wanex area	Part of an indicated, 1.52M cu m within a larger (3.82M cu m) lower grade resource
Aberfoyle area	Possible, 1.3M cu m contained in the interpreted Aberfoyle Lead or palaeochannel running from the Aberfoyle workings to the Delta resource block
Dry Gut area	Possible, 100,000 cu m contained in a possible channel feeding easterly into the Aberfoyle Lead

6.2 The clay resources are-

Dry Gut area	Indicated, 200,000 cu m of smectite clays within an
	Inferred, 1.5M cu m of mixed clays

6.3 On the basis of the resources discovered and evaluated, Mineral Holdings Australia Pty Ltd applied for a retention licence of 4 sq km on 6th March 2003. Both the clay and tin resources need further evaluation and marketing prior to development.

6.4 The alluvial resources are an integral part of the Ringarooma Project of Mineral Holdings which seeks to explore and develop the heavy minerals and sapphire placer deposits of the Ringarooma River Basin particularly the Great Northern Plains and offshore. The project which has the potential to yield a resource base of up to 100,000 tonnes of cassiterite concentrates (Kinnane, 2001) is currently optioned to Mining and Marine International Pty Ltd.

7.0 References

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APPENDIX

- **Logs of auger drill holes DGH 1-10**
- **Sample information**
- **Description and location of composite samples for Sud-Chemie A G, Australian Bulk Minerals and Amdel**
- **Industrial and scientific evaluation tests for clay**
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- **Table 3- Rare Earth Analyses, Dry Gut Clay**
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- **Plan 9- LME Price Graph for Tin Metal, 2002-03**

