June 2000

REPORT ON THE
PLACER CLAIMS OF THE

SPANISH MOUNTAIN PROPERTY,

BRITISH COLUMBIA

RECEIVED
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Gold Commissioner's Office
VANCOUVER, B.C.

Sampling
and
Metallurgical Testing

Lakeview 1,2

Cariboo Mining District

52° 35' N, 121° 25' W
NTS 93-A/11

Owner:	Imperial Metals Corporation
Operator:	Imperial Metals Corporation, Suite 420 - 355 Burrard Street Vancouver, B.C. V6C 2G8

Submitted February 6th, 2001

Stephen B. Robertson, P.Geo.

EXECUTIVE SUMMARY

The Spanish Mountain Property is centered approximately six km east of the village of Likely in the Cariboo Region of central British Columbia. The property has numerous hard-rock gold showings, some with exceptional grades, but they are generally small and erratic in nature. Exploration efforts have turned the focus from these small high-grade (and frustrating) targets, to the potential for low to medium grade bulk tonnage targets.

Imperial Metals has optioned the property to test the potential to provide mill feed at the company's 100% owned, 20,000 tonne/day Mount Polley Mine only 15 km to the west. A low to medium grade, large tonnage deposit in the area could provide a supplemental source of mill feed for Mount Polley, especially if it proves to be possible to upgrade, or pre-treat the Spanish Mountain mineralization before shipment. The pre-treatment would be by size reduction followed by screening, as testing has shown strong concentration of gold in the finest size fraction when this is done.

The existence of placer gold has long been known on Spanish Mountain and the general area of Spanish Mountain has been the site of considerable mining activity over the years. In a 1993 report by Renoble Holdings, it was reported that at that time, all drainages on Spanish Mountain were being worked by placer miners.

With the pre-treatment concept proposed for the bedrock mineralization, the placer soils stockpiled by Renoble in 1993 was tested by screening to determine if the placer gold was equally susceptible to concentration, and if so, could be considered for processing with the hard rock mineralization.

Results show a very good concentration of gold in the screening fines, however the size distribution of the placer soils is much finer than the crushed or blasted bedrock mineralization. For this reason, consideration of dry screening the two products together can not be considered practical.

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1.0 INTRODUCTION

1.1 LOCATION AND ACCESS

The Spanish Mountain Property is located approximately 6 km east of the village of Likely in east central British Columbia (See Figure 1.1). The area of work was centred at 56° 35' N, 121° 25' W on NTS map sheet 93A/11.

Access to the CPW claim is via a switchback road leading southwards up Spanish Mountain from km point 1307 on the 1300 logging road (also known as Spanish Lake Road). Access to the property can also be gained from the south via a network of smaller 2 wheel drive roads leading down from the top of Spanish Mountain. That road network joins up to the Spanish Lake road just west of McKeown Mines. An airstrip is located at km point 1302.5 on the Spanish Lake Road.

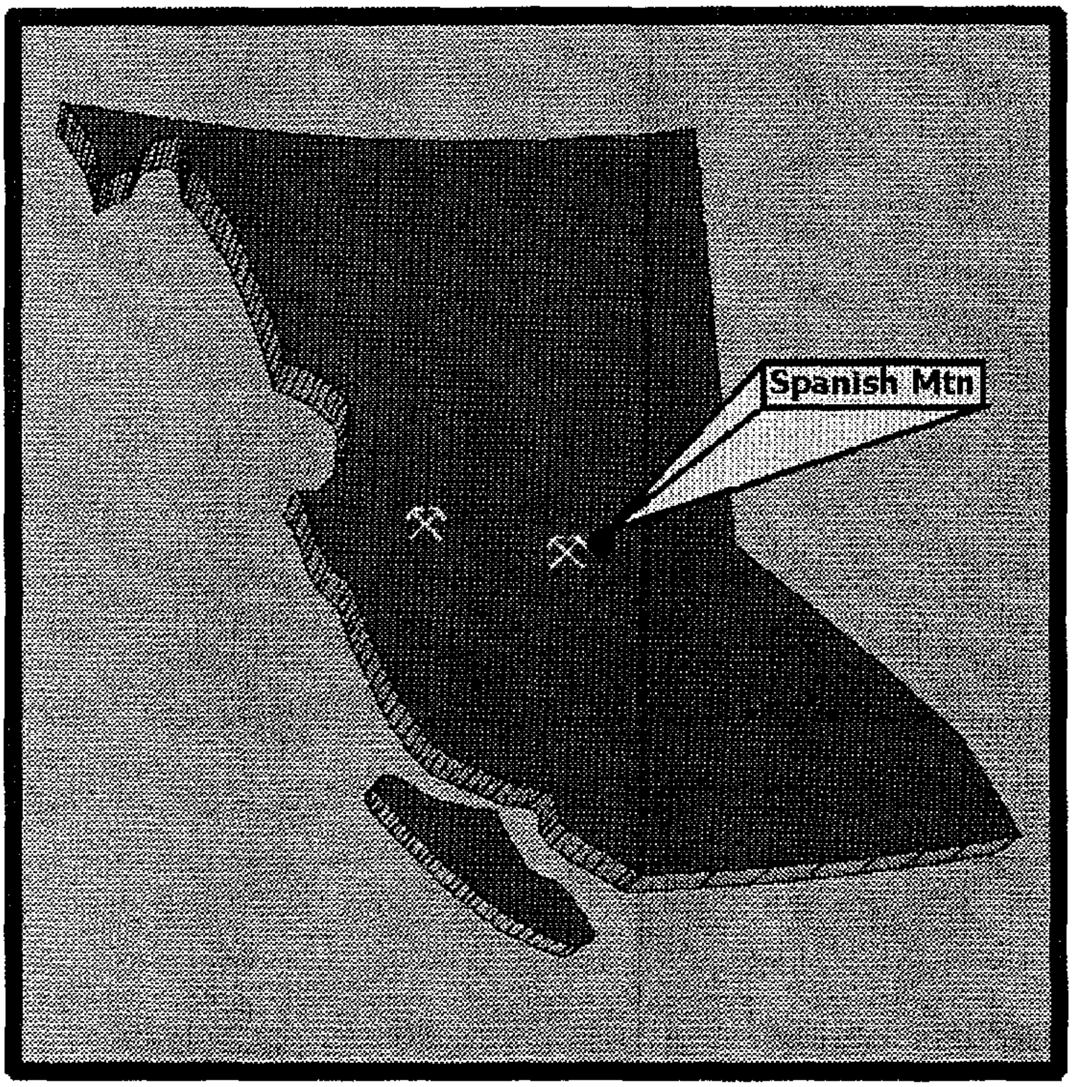


Figure 1.1 Property Location

1.2 PHYSIOGRAPHY

The property lies on the northern slope of Spanish Mountain, within the eastern part of the Central Quesnel Trough. Spanish Mountain is located on the western flank of the Quesnel Highland of the Interior Plateau. The terrain is moderately mountainous, with rounded peaks and ridges separated by U-shaped valleys. The highest point on Spanish Mountain is about 1585 metres and the valley bottom is at about 915 metres above mean sea level.

1.3 LAND TENURE

The property comprises 13 contiguous mineral claims (74 units for 4,400 acres) and two overlying and contiguous placer claims (2 units for 340 acres) (Figure 1.2; Table 1.1). All of the claims listed are under the influence of an agreement between Imperial Metals Corporation and Wildrose Resources Ltd. Under this agreement Imperial can earn an undivided 75% interest from Wildrose through expenditures of $500,000 ($CDN) prior to December 31, 2004. Royalties are payable to Wildrose and to prospector Bob Mickle through an underlying agreement. The underlying Mickle agreement affects all claims in the property except the CPW claim.

The CPW claim is also subject to an underlying agreement, giving the original vendors (individuals Wallster and McMillan) the right to repurchase the claim after April 24, 2004 if certain conditions have not been met. A sliding scale royalty and payments must be paid to the CPW vendors under certain conditions.

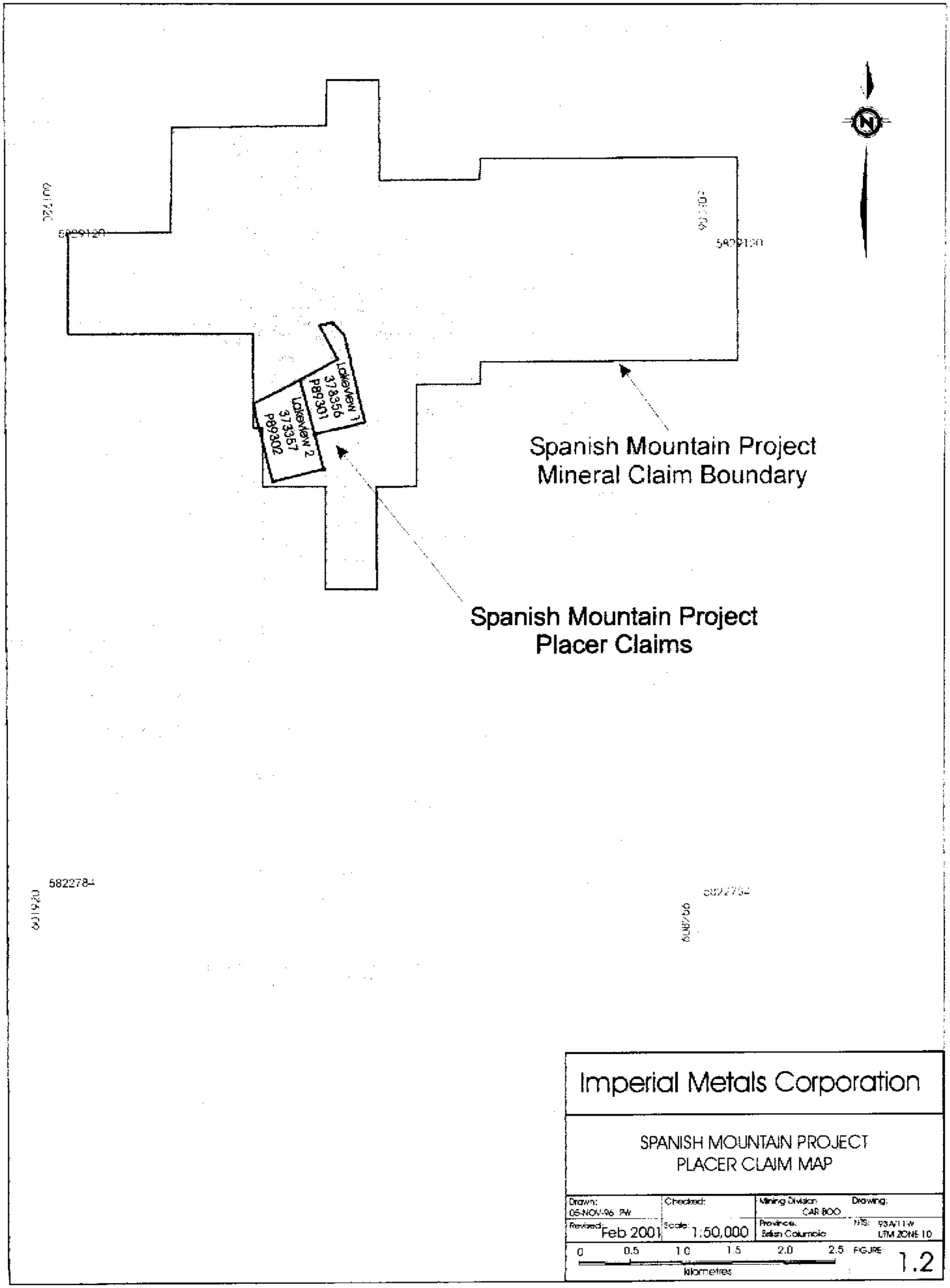
1.4 STATUS OF PROJECT

The Spanish Mountain property hosts a number of gold showings in bedrock with minor associated base metals in some cases, often occurring in quartz veins and quartz stockwork. The preferred trend to most of the vein hosting structures is generally north northeasterly.

Imperial Metals has optioned the property to test the potential to provide mill feed at the company's 100% owned, 20,000 tonne/day Mount Polley Mine located 15 km to the west (38 km by road). A low to medium grade, large tonnage deposit in the area could provide a source of mill feed for Mount Polley, especially if it proves to be possible to upgrade, or pre-treat the Spanish Mountain mineralization before shipment. The pre-treatment being researched includes size reduction followed by screening, as testing has shown strong concentration of gold in the finest size fraction when this process is done (Robertson, 2001).

Placer gold potential of Spanish Mountain has been known of for many years and the area has had periods of very high activity. In a 1993 report by Renoble Holdings, it was reported that at that time, all drainages on Spanish Mountain were being worked by placer miners.

With the pre-treatment concept proposed for the bedrock mineralization, some of the placer material which had been stockpiled by Renoble in 1993 was tested using the same screening technique, to determine if the placer gold was also susceptible to concentration, and if so, could be considered for processing with the hard rock mineralization. It is this testwork on the placer stockpile that is presented in this report.



Imperial Metals Corporation

SPANISH MOUNTAIN PROJECT
PLACER CLAIM MAP

FIGURE 1.2

Spanish Mountain – List of Claims						
CLAIM NAME	TITLE #	UNITS	TAG #	RECORD DATE	EXPIRY DATE	REQ'D EXP.
PESO*	204021	9	15303	Sept 21, 1979	Nov 1, 2000	$1,800
NR 1*	373415	1	687222M	Nov 15, 1999	Nov 1, 2001	$100
MARCH 2*	204275	4	48433	Mar 17, 1980	Nov 1, 2001	$800
MARCH 1*	204274	20	48434	Mar 17, 1980	Nov 1, 2001	$4,000
NR 2*	373416	1	687223M	Nov 15, 1999	Nov 1, 2001	$100
DON 1*	204224	1	485273M	Dec 24, 1979	Nov 1, 2002	$200
DON 2*	204225	1	485274M	Dec 24, 1979	Nov 1, 2002	$200
DON 4*	204227	1	485276M	Dec 24, 1979	Nov 1, 2002	$200
JUL 2*	204334	9	16535	Aug 8, 1980	Nov 1, 2002	$1,800
MY 1*	204727	2	65430	May 30, 1983	Nov 1, 2002	$400
MEY 1*	205151	20	84232	May 8, 1986	Nov 1, 2002	$4,000
DON 3*	204226	1	485275M	Dec 24, 1979	Nov 1, 2002	$200
CPW	204667	4	2300	Nov 1, 1982	Nov 1, 2006	$800
LAKEVIEW 1 (PLACER)	373356	1	P89301	Nov 16, 1999	Nov 16, 2000	$500
LAKEVIEW 2 (PLACER)	373357	1	P89302	Nov 16, 1999	Nov 16, 2000	$500

Table 1.1 List of Claims

1.5 PROPERTY HISTORY

Prospecting and mining in the Cariboo district (Quesnel Trough) have been continually active since the first discovery of placer gold in the late 1859 at Horsefly and Quesnel Forks. The great Cariboo gold rush began in the spring of 1860, spreading north to Barkerville, establishing one of the most productive placer districts found anywhere, with an estimated total production of between 2.5 and 3 million ounces of gold to date and production continuing (Levson and Giles, 1993).

Local sites of placer mining activity include the Bullion Pit, Quesnel Forks, Cariboo River, Keithly Creek, and Cedar Creek. McKeown Mines property, which lies on Spanish Mountain to the northwest of the Spanish Mountain property, has been the most active placer operation in the Spanish Mountain area in recent history. Gold recovered in the area is usually chunky and rough, often with large quartz inclusions, indicating that it is locally derived (Levson and Gilles, 1993). In fact, much of the placer gold that is known in the Likely area is suspected of having come from Spanish Mountain, including the fresh angular portion of the gold found at the Bullion Pit, some 15 km to the northwest (Panteleyev et al, 1996).

In 1993 Renoble Holdings, intent on mining both the high-grade lode gold occurrences and the overlying placer deposits, installed 1.7 km of 4" steel water line, to pump water 250 vertical metres from Spanish Lake to a 5,000 m3 reservoir. It was then pumped an additional 80 metres higher to the temporary processing area. Pilot plant equipment there consisting of a grizzly, trommel, primary and secondary jigs, Knelson concentrator, washing plant, and a water system with pumps and piping.

Once the Renoble test infrastructure was set up and a large stockpile of placer soil from the Madre area was established, a small amount of material was test run through the plant (approximately 150 - 200 tonnes). No further work was done after the initial testing, which recovered 106.20 grams gold, but was reported to have many inefficiencies.

No placer mining activity has occurred at the Spanish Mountain Property since 1993.

2.0 GEOLOGY

The Geology of the Spanish Mountain area has been described by many geologists with the most recent discussions of Regional Geology presented by Panteleyev et al, 1996, and the Placer geology thoroughly described by Levson and Giles, 1993. The most recent industry report pertaining to the placer gold occurrence on the property is presented by Renoble Holdings in an unpublished company report (no author named).

2.1 REGIONAL GEOLOGY

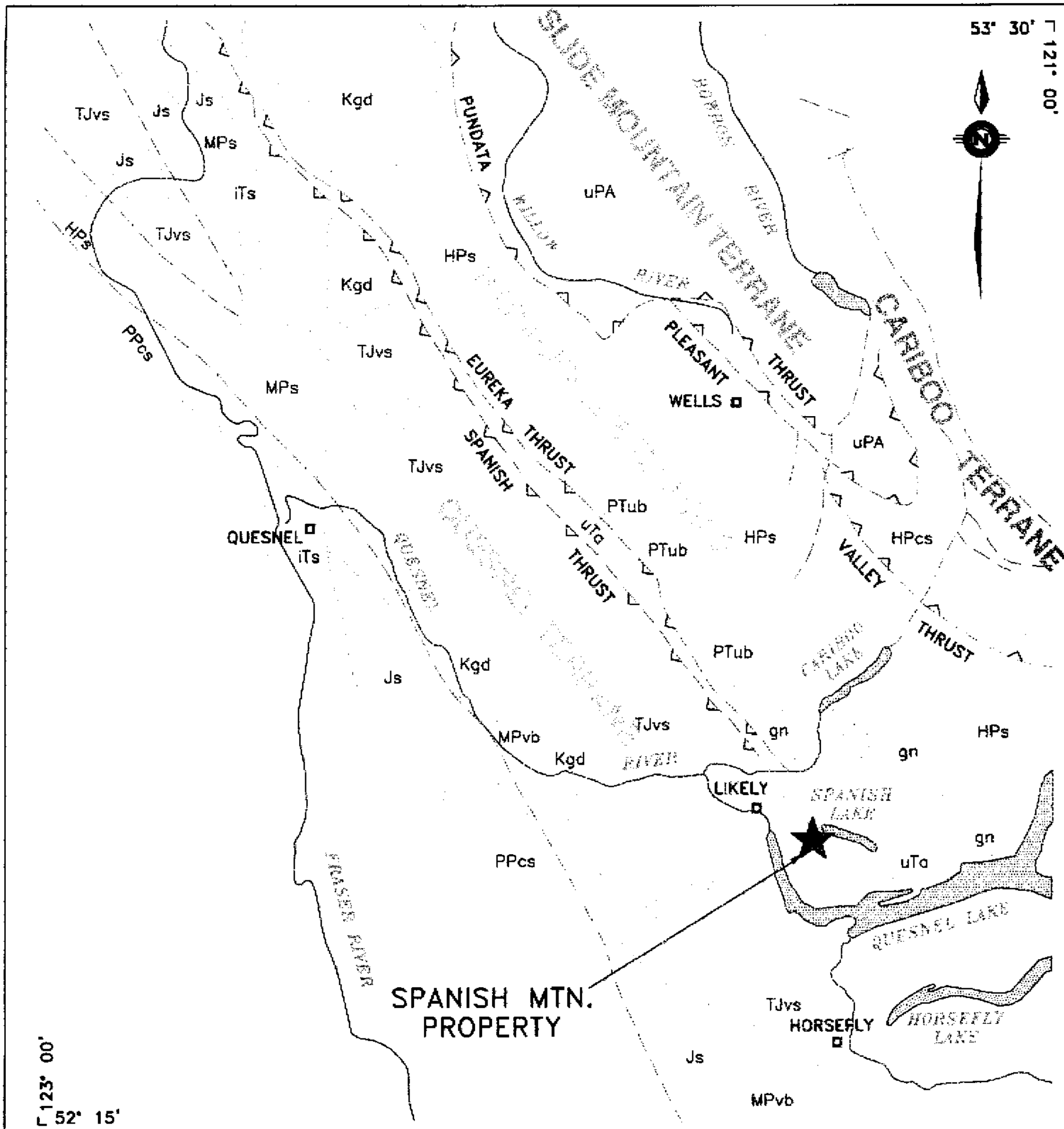
The Canadian Cordillera is comprised of 5 major morphogeological belts, of which the Spanish Mountain project is located in the Intermontane Belt. The easternmost Terrane within the Intermontane is Quesnellia (alternatively called Quesnel Terrane, or more informally, Quesnel Trough). Quesnellia has two major groups of rocks: the lower, generally fine grained clastic sedimentary package of mid to late Triassic age and the overlying volcanic rock of late Triassic to early Jurassic age which occupy the core of the Quesnel Terrane (See fig 2.1).

The sedimentary package is dominantly dark phyllitic rocks that were formed by the filling of the Quesnel Basin, in a low energy, stagnant environment. The evidence of the basinal morphology remains with the rocks on the eastern edge of the terrane dipping gently to the southwest and those on the western edge generally dipping to the northeast. The estimated thickness of sedimentary rocks is believed to be a minimum of 2500 metres (Rees, 1987) up to 4000 metres (Bloodgood, 1990).

The volcanic rocks along the core of the Quesnel Terrane were deposited as the quiet deep stagnant Quesnel Basin transformed into a much more active shallow water island arc environment. The volcanics, mostly subaqueously deposited alkalic basalts, formed as flows, pillows, breccias and tuffs. Locally derived sedimentary rocks are found throughout the volcanic rock package and are more abundant near the top of the sequence. An estimate of thickness of the volcanic package is approximately 6500 metres (Rees, 1987).

The Quesnel Terrane is considered allochthonous, thrust into contact with the Barkerville Terrane of the Omineca Belt along the Eureka Thrust during the Jurassic. The Jurassic was a time of tectonic convergence along the western margin of the North American continent. To the west, the Quesnellia is in contact with the Cache Creek Terrane along a high-angle strike slip fault, which is probably a southern extension of the Pinchi Fault.

As a result of the Jurassic accretionary tectonism, the older (and therefore lower) units generally exhibit amphibolite facies metamorphism with tight isoclinal folds and well-developed cleavage. The Younger or upper rocks exhibit more open folds and brittle deformation in areas of greenschist metamorphism.



TERTIARY

MPvb	Olivine basalt flows, breccia, tuff
MPs	Sandstone, shale, conglomerate, diatomite lignite
iTs	Paleogene conglomerate, sandstone, mudstone, lignite

CRETACEOUS

Kgd	Granodiorite, quart monzonite quartz diorite

TRIASSIC–JURASSIC

Js	Shale, greywacke, conglomerate
TJvs	Andesite, basalt, tuff, breccia, conglomerate, ...

PERMIAN &/or TRIASSIC

PTub	Peridotite, dunite, pyroxenite, serpentinite

PENNSYLVANIAN AND PERMIAN

PPCs	CACHE CREEK GROUP Ribbon chert, argillite, limestone, greenstone

MISSISSIPPIAN TO PERMIAN

uPA	SLIDE MOUNTAIN GROUP Basalt, breccia, tuff, chert, argillite, sandstone, ...

HADRYNIAN TO PALEOZOIC

HPcs	CARIBOO, BLACK STUART & KAZA GROUPS Limestone, dolomite, argillite, phyllite, quartzite, ...
HPs	SNOWSHOE GROUP Mainly micaceous quartzite and phyllite; sandstone, ...

UNKNOWN AGE

gn	Augen granite, granodiorite gneiss

GEOLOGICAL CONTACT

FAULT (KNOWN OR INFERRED)

THRUST FAULT

MODIFIED FROM:
B.C. E.M.P.R. BULLETIN 89, by Levson and Giles (1993)
CYPRUS CANADA (1996)

Imperial Metals Corp

SPANISH MOUNTAIN PROJECT
REGIONAL TECTONIC SETTING

Drawn: 05-NOV-96 PW	Checked:	Mining Division: CARIBOO	Drawing: SP-REGNL.dwg
Revised: Jan 2001	Scale: NA	Province: British Columbia	NTS: 93A/11
0 5 10 15 20 25 KILOMETRES			FIGURE: 2.1

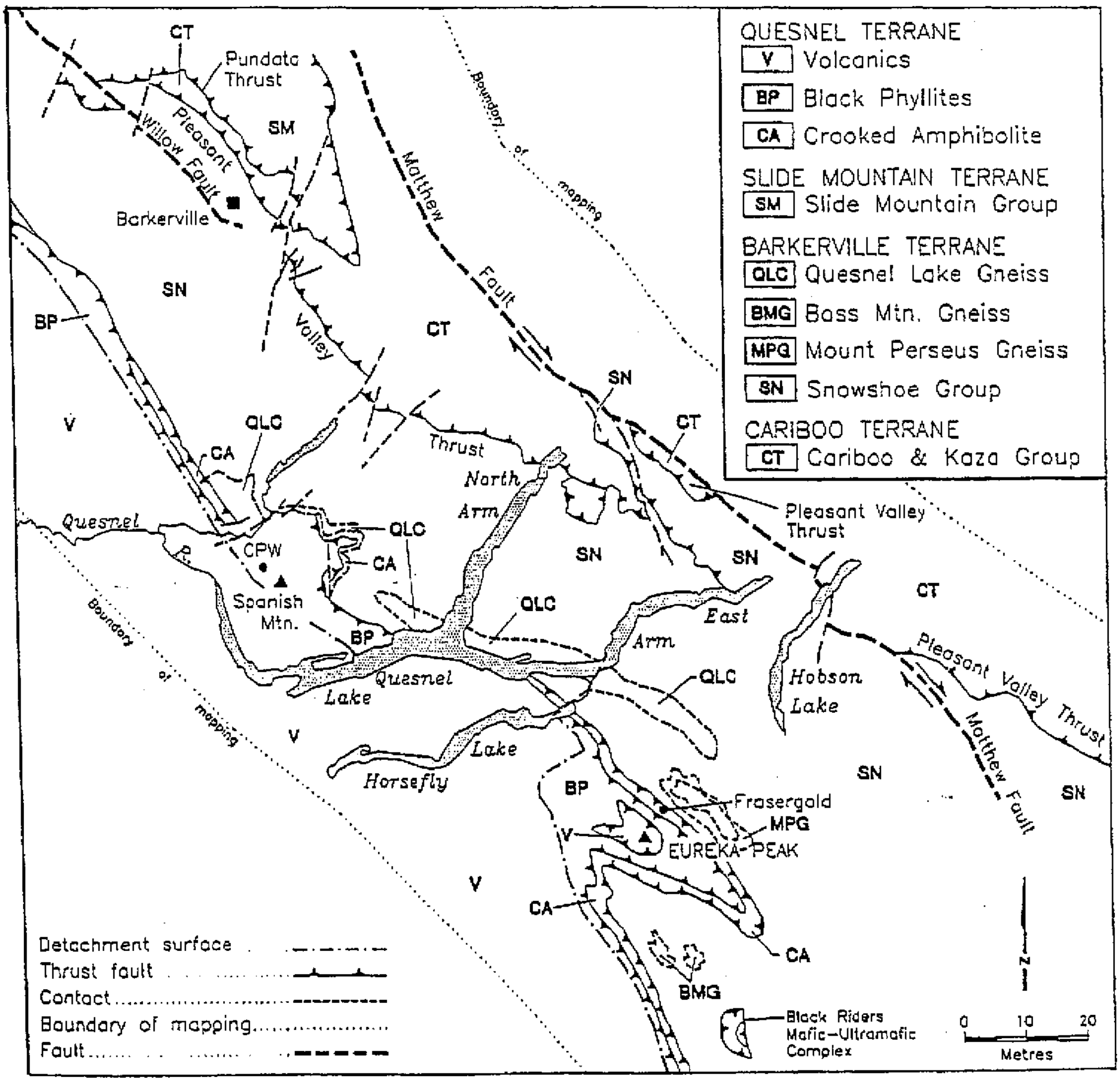


FIGURE 2.2 REGIONAL GEOLOGY OF THE SPANISH MOUNTAIN AREA

2.2 PROPERTY GEOLOGY

The Spanish Mountain property is underlain interbedded black phyllites, siltstones, shales and tuffs of mid to late Triassic age This metasedimentary and volcanic package of rock, correlatable with the Nicola Group of Southern British Columbia (Bloodgood, 1990), has been regionally metamorphosed to greenschist facies.

The main placer deposition at Spanish Creek (McKeown Mines) to the south of and also above the valley bottom, is believed to be preglacial, large paleochannel in nature (Levson and Giles, 1993). This is not the source of gold on the Spanish Mountain Property however, being close to the top of the mountain in an area bearing no gravel. The anomalous gold concentration within the soil and colluvium on the upper part of the mountain is found with a direct spatial relation to known bedrock gold mineralization. A 800 by 600 metre area centred over the known auriferous veins is covered with soil that reports over 0.1 ppm gold and more than half of the samples grade better than 0.4 ppm gold (Renoble, 1993). The soils grids are also show definite dispersion of the anomalous soil to the northwest in the direction of ice movement (See figure 2.3).

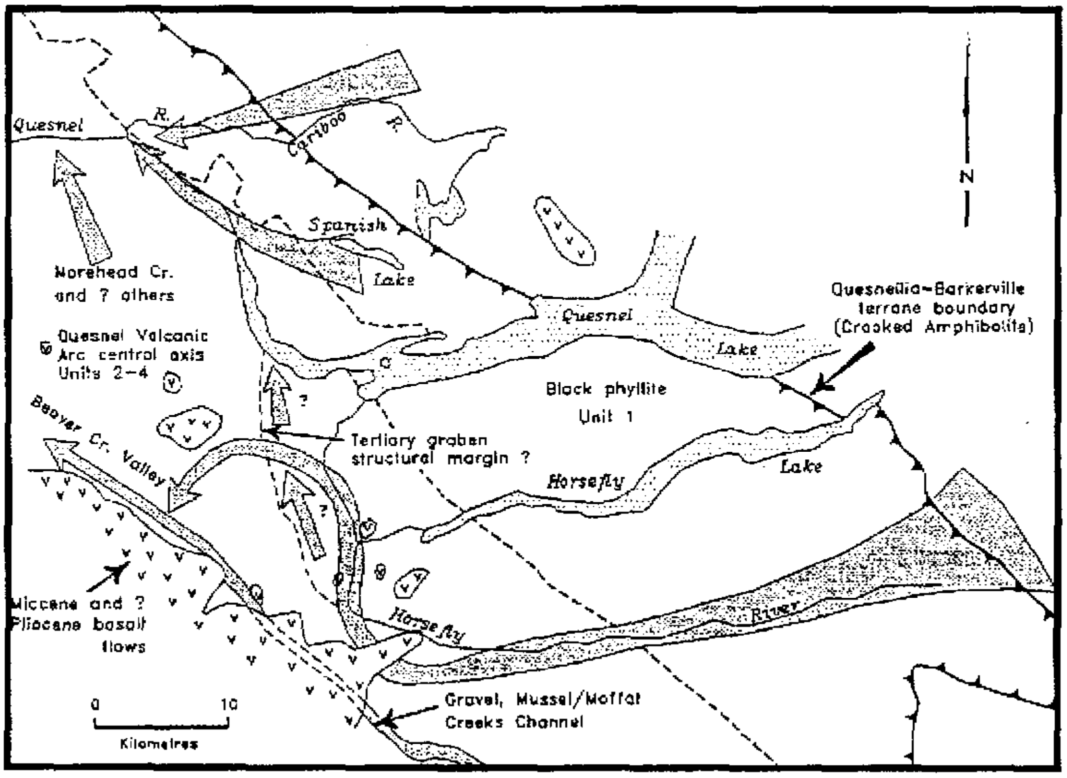


Figure 2.3. Placer Deposition in the Horsefly – Quesnel Lake area. Note the placer trend originating at Spanish Mountain and stretching up to the Bullion Pit/ Quesnel Forks Area (Panteleyev, 1996).

3.0 2000 WORK PROGRAM

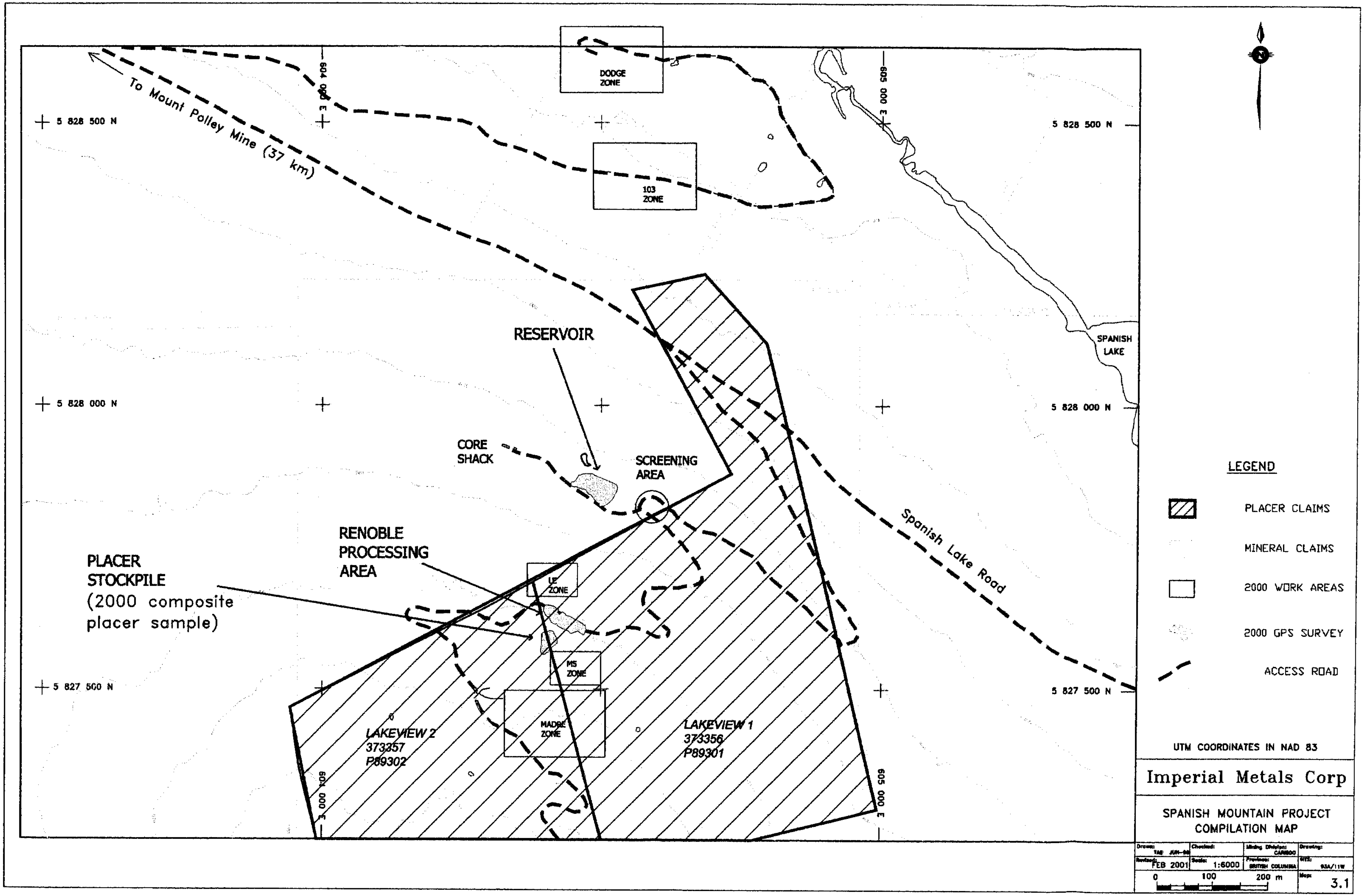
Imperial Metals first investigated the Spanish Mountain project in late fall of 1999. Samples from the Madre and LE Zones were subjected to a variety of metallurgical tests and it was found that size reduction, followed by screening would effectively concentrate gold into the finest size fractions. This led to the investigation to determine if the mineralization at Spanish Mountain could be pre-treated onsite before shipment to the Mount Polley concentrator.

In conjunction with the 2000 exploration of the auriferous bedrock mineralization, Imperial sampled an existing placer stockpile to determine if the same screening process would concentrate the gold enough that it would warrant studying the possibility of including placer soil with the hard rock feed. Renoble mined the stockpiled placer material from the Madre Zone in 1993. That area is host to auriferous quartz veins and localized sediment hosted gold mineralization.

Estimates of the volume of mineralized soil on the property have been made by Renoble but are not included in this report. It can certainly be concluded that the volume of placer material available is substantial and certainly warrants investigation. The volume of the stockpiled material is estimated by Renoble to be approximately 7000 m^3.

The sample was gathered from six, widely spaced localities around the base of the stockpile (See figure 3.1). A garden spade was used to dig at least 50 cm down into the pile and approximately one shovel full was extracted from each location.

The sample was placed into a 20 liter plastic bucket and sealed for transportation to Mount Polley metallurgical lab for testing. The sample was coned and quartered down to a workable size, and then dry screened. Each size fraction was weighed and assayed. The assay procedure can be found in Appendix A.


To Mount Polley Mine (37 km)
DODGE ZONE
103 ZONE
604 000 E
605 000 E
5 828 500 N
5 828 000 N
5 827 500 N
SPANISH LAKE
RESERVOIR
CORE SHACK
SCREENING AREA
RENOBLE PROCESSING AREA
PLACER STOCKPILE
(2000 composite placer sample)
LE ZONE
MS ZONE
MADRE ZONE
LAKEVIEW 2
373357
P89302
LAKEVIEW 1
373356
P89301
Spanish Lake Road
LEGEND
PLACER CLAIMS
MINERAL CLAIMS
2000 WORK AREAS
2000 GPS SURVEY
ACCESS ROAD
UTM COORDINATES IN NAD 83
Imperial Metals Corp
SPANISH MOUNTAIN PROJECT
COMPILATION MAP
FEB 2001
1:6000
BRITISH COLUMBIA
CARIBOO
93A/11W
0
100
200 m
3.1

4.0 DISCUSSION OF RESULTS

The results of the metallurgical work done at the Mount Polley facility are presented in Table 4.1. The head sample grade of 0.43 g/t gold was lower than expected. Renoble reported the placer stockpile to have an expected grade of approximately 0.033 oz gold/M^3. Assuming the placer material to be 1.721 tonnes/ M^3 and knowing 0.033 troy oz is 1.03 grams the head grade of the pile should be approximately:

1.03 grams/1.721 tonnes = 0.60 g/t gold

The discrepancy can be explained by the fact that the sample was composited from many spots around the pile, but is too small to be representative of the entire pile.

When the entire sample was screened, a full 49.4% of the material passed the 10-mesh screen and over 80% passed the $^3/_8$" screen, showing that the sample is very fine. For this reason alone, it is very unlikely that the placer material could be treated with any of the coarser hard rock mineralization that is mined. If it were to be processed it would need to be in a separate circuit that could treat the much finer material.

Like the hard rock mineralization, size fractionation is an effective method of concentrating the gold, with 81.3% of the gold passing the 10-mesh screen in 49.4% of the sample weight. The sample was not screened any further than 10 mesh as even that size is too small to be practical for the type of screening operation envisioned at Spanish Mountain.

Table 4.1 Metallurgical Testing

Spanish Mountain Placer											From Fine to Coarse	
Screen Fractions		SM Placer Sample				Assays, %, g/t		% Distribution		Cumul.	Cumul.
	microns	g	% Wt	% Ret'd	% Pass	Au	$Cu_{(T)}$	Au	$Cu_{(T)}$	Au Distr.	Au Head
2"	50000	0.0	0.0	0.0	100.0			0.0	0.0	100.0	0.43
1 1/2"	37500	522.9	7.8	7.8	92.2	0.09	0.019	1.6	11.8	100.0	0.43
1"	25000	103.5	1.5	9.3	90.7	0.04	0.020	0.1	2.5	98.4	0.46
3/4"	19000	158.3	2.4	11.7	88.3	0.01	0.009	0.1	1.7	98.2	0.47
1/2"	12500	318.3	4.7	16.4	83.6	0.02	0.009	0.2	3.4	98.2	0.48
3/8"	9500	231.3	3.4	19.8	80.2	0.03	0.008	0.2	2.2	98.0	0.51
4#	4750	725.2	10.8	30.6	69.4	0.38	0.007	9.5	6.0	97.7	0.53
8#	2360	837.1	12.4	43.0	57.0	0.07	0.007	2.0	7.0	88.2	0.55
10#	1700	511.9	7.6	50.6	49.4	0.28	0.010	4.9	6.1	86.2	0.65
-10#'	-1700	3324.3	49.4	100.0	0.0	0.71	0.015	81.3	59.3	81.3	0.71
		6732.8	100.0			**0.43**	**0.012**	100.0	100.0		

5.0 RECOMMENDATIONS

The work done on the sample processed in this program demonstrated that the placer material is considerably finer than the material that was mined in July of 2000. Although *size fractionation is an effective tool in concentration of gold within the sample*, it requires a much smaller screen size than what could be practically used in a bulk tonnage dry screening process. For that reason, any consideration of processing of the placer material at Spanish Mountain would need to be in a circuit separate from the hard rock mineralization, or a wet screening process would need to be considered for both.

Regarding the investigation of processing the placer and hard rock mineralization together, no further work is recommended at this time.

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PROJECT STATEMENTS

2000

List of personnel

Steve Robertson	IMC	Project Manager	June 8
Eric LeNeve	MP	Consultant	June 8
Rudi Durfeld	DG	GPS Survey Consultant	July 4

Note:

IMC	Imperial Metals Corporation
MP	*Mount Polley Corporation*
DG	Durfeld Geological

Spanish Mountain Placer Project - 2000
Statement of Expenditures

Salaries				
	S Robertson - Project Manager	0.5 days @	$375	$188
	K Hicks - Map preparation, and computer wor	0.5 days @	$250	$125
	E Leneve - Sample collection and Delivery	0.5 days @	$250	$125
GPS Surveying and Mapping				
	Durfeld Geological	0.25 days @	$400	$100
Transportation				
	Truck Rental	0.5 days @	$65	$33
	Fuel			$25
Assays				
	Mount Polley	9 samples @	$7	$63
Metallurgical Test Lab				
	Mount Polley	0.5 days @	$750	$375
Report Writing and Drafting				$750
Subtotal				$1,783
Filing Fees				$400
Total				$2,183

Statement of Qualifications

Stephen B. Robertson, P.Geo.

I, Stephen Robertson, of 1969 - B Lower Road, Roberts Creek, British Columbia, hereby certify that:

- I am a geologist, employed by Imperial Metals Corporation.
- I am a 1989 graduate of the University of Alberta in Edmonton, with a Bachelor of Science degree in geology.
- I have been employed in mining since 1988 and have continuously practiced my profession since 1989.
- I am a Professional Geoscientist, registered with the Association of Professional Engineers and Geoscientists of the Province of British Columbia.
- I supervised and planned the program as described in this report.
- This report is based on the information gained during the 2000 field season and a review of public reports.
- This report may be used for development of the property or raising of funds, provided that *no portion of it is used out of context, or in such a manner as to convey a meaning* different from that set out in the whole.

Signed at Vancouver, British Columbia, this 7th day of February, 2001.

Stephen Robertson, P.Geo.

S.B. Robertson
British Columbia
Geoscientist

APPENDIX A

ANALYTICAL TECHNIQUE
MOUNT POLEY MINING CORPORATION

SCOPE: This procedure shall be used for normal mine and exploration samples and concentrates as received at the Mount Polley mine site only.

INTRODUCTION:

This procedure involves a fire assay fusion with lead as the collecting medium for the precious metals. The lead is separated from the slag and is then removed by cupellation leaving a silver prill containing the precious metals. The prill is then parted using conc. HNO_3 and conc. HCl and the resulting solution is determined for Au by AAS.

SAFETY:

Due to the fire assay lab containing both high temperature furnaces and lead, special rules and safety precautions must be followed to avoid accidents and elevated blood lead levels or lead poisoning.

1. Safety shoes or boots must be worn at all times when in fire assay.
2. Smoking, eating and drinking are prohibited in and around the fire assay section at all times.
3. Gloves are to worn when mixing samples with flux or in any other processes which involve the handling of flux or litharge.
4. Safety glasses or masks must be worn when deslagging buttons and are recommended when using or looking into furnaces.
5. Fluxing must be performed in the flux hood at all times.
6. The extraction wet scrubber must be on at all times when cupellation, fusion or fluxing in the fluxing hood is being performed. This extraction should be started at the beginning of the shift and must be checked after power fluctuations and re-set if necessary. No cupellation or fluxing can be performed under any circumstances if the scrubber unit is down for maintenance or is not working.
7. Only staff fully trained in furnace maintenance may be involved in repairing the furnace or replacing the electrical elements.
8. Gloves must be worn at all times when placing pots or cupels into furnaces or when removing them.
9. Hands should be thoroughly cleaned, particularly under the finger nails, before eating, drinking or smoking after working in fire assay.
10. Any spillage of flux or chemicals must be cleaned up immediately.

REAGENTS / CONSUMABLES

1. Flux (prepared commercially, see recipe below)
   Mine Flux: dense soda ash (350kg), lead oxide (600 kg), borax glass (80 kg), flour (35 kg), silver nitrate (110 g/t), kerosene
   Con Flux: dense soda ash (350kg), lead oxide (600 kg), borax glass (80 kg), kerosene
2. 30 gram Crucibles.
3. Cupels (6A).
4. Potassium Nitrate (KNO_3), technical.
5. Borax, anhydrous sodium tetra-borate, technical.
6. Soda Ash, anhydrous sodium carbonate, technical.
7. Litharge, lead monoxide, technical.
8. Silica (SiO_2).
9. Flour, plain.
10. Silver nitrate ($AgNO_3$), AR grade.
11. Kerosene, commercial grade.

PROCEDURE

1. Flux up a rack of pots with 90 ± 10 g of the appropriate flux (measured with a calibrated scoop).
2. Record the weight to be weighed for the samples on the worksheet if they are all the same. If not write the weight in the appropriate column.
3. Weigh the samples usually at 20.00 ± 0.02 g for Mines and Heads and Tails or at 10.00 ± 0.02 g for Concentrates and transfer the sample in on top of the flux checking to ensure it is put in the correct pot. Check every sample number when weighing to ensure the sample order is correct and samples are put in the correct pots. Add a silver inquart to concentrate samples.
4. Weigh a standard into pot 23 and enter the name of the standard and the weight used (standards of higher gold concentrations may require differing weights).
5. Double check that all weights, etc. have been entered and paperwork completed and that the correct flux additions have all been made.
6. Mix the flux and sample thoroughly by stirring with a spatula. The mixture should contain no lumps of flux or sample and should be a uniform colour.
7. Load the samples into a pre-heated pot furnace and fuse at 1900 °F until fusion is complete. This usually takes 45 to 60 minutes. The melt should be still, i.e. the circulation of lead is no longer apparent.
8. When all of the samples have fused, pour the melt into cast iron moulds, ensuring no lead is lost.
9. Leave to cool. When cooled sufficiently, break the slag away from the lead, and hammer into a button (removing all the slag) taking care not to loose any lead.

Note: Re-assay samples with buttons less than 20g, adjusting the flux as required. Buttons over 60g can be split.

10. Transfer the lead buttons to the button dropper and then to the heated cupels in the cupellation furnace set at 1800 °F and close the door.
11. After a few minutes, open the door to see if all the buttons have "opened" and are "driving". If so, close the door and open the door vent and the main vent. If not, close the door and wait until they have started "driving". If the buttons become "frozen" (caused by solidification of lead over the surface) the temperature should be raised quickly by closing all vents. The temperature should be carefully controlled, as too high a temperature will cause losses, especially for silver, and results obtained by raising the temperature after "freezing" are usually low.
12. When cupellation is complete, remove the cupels from the furnace and allow to cool with fume extraction. Note any large or unusual prills on the worksheet and repeat the samples (with suitable reagents).
13. Transfer the gold/silver prill to a test tube with the first tube in the fire labelled as A, B, C, MR, etc..
14. Add 1.0 ml of 1:4 HNO_3 , cover with plastic wrap and place on the digestor block for 15 minutes or until the solution has gone colourless and the prills have fully parted. Remove from the block and cool to room temperature.
15. Carefully add 2.0 mls of con. HCl and place back on digestor block for 20 minutes.
16. Add 2.0 mls of distilled water and vortex mix.
17. Let the solution settle for 15 minutes and read on the AAS under the following conditions:

	Au
Lamp Current (mA)	10
Slit Width (nm)	0.7
Wavelength (nm)	242.8
Background Correction	On

CALIBRATION STANDARD PREPARATION:

Standards are made from commercially supplied 1000 ppm stock solutions.

0.50 ppm:	5 mls of 100 ppm Au + 100 mls HNO_3 + 100 mls HCl → 1000 mls
1.00 ppm:	10 mls of 100 ppm Au + 100 mls HNO_3 + 100 mls HCl → 1000 mls
2.00 ppm:	20 mls of 100 ppm Au + 100 mls HNO_3 + 100 mls HCl → 1000 mls
10 ppm:	10 mls of 1000 ppm Au + 100 mls HNO_3 + 100 mls HCl → 1000 mls
20 ppm:	20 mls of 1000 ppm Au + 100 mls HNO_3 + 100 mls HCl → 1000 mls

There are some common problems encountered in fire assay fusion and cupellation. A list of possible causes and remedies are as follows:

A. FUSION

DEFECT	POSSIBLE CAUSE	REMEDY
excessive viscosity, thick slag	low finish temp., excess of acid fluxes	increase temp., less silica and borax, more litharge and soda
undecomposed or insoluble slag components	fusion time too short, insufficient acid fluxes, insufficient flux or specified material	fuse longer, add extra flux or silica or borax
unfused material in slag or on sides of the crucibles	poor mixing	ensure samples are properly mixed
Shotting	excessive slag viscosity	add 25g litharge
lead splattered in mould	unfused particles of Fe_3O_4 between slag and lead, very high sulphides	reduce sample size, fuse longer, add nitre
small button	slag too acidic, excessive nitre, insufficient flour	decrease silica and increase litharge, decrease nitre, add flour
large button	excessive litharge in flux, sample contains sulphides or organics (soils)	decrease litharge, add nitre
hard or brittle button	litharge in button, very high Au (>1%), base metals in button, button contains sulphides (dark grey in colour)	use higher fusion temp, decrease sample weight/increase litharge, increase litharge and soda ash.
speiss or matte	insufficient litharge or soda ash	decrease sample weight and increase litharge
crucibles leak after being eaten through (assaying carbon)	crucibles too worn, excess of basic fluxes. lack of acidic fluxes	discard worn crucibles, decrease litharge and soda, increase silica and borax, increase sample size or add silica
excessive frothing or overflowing during fusion	excessive flux or sample for the crucible, excessive nitre	decrease flux and sample charges, decrease nitre

B. CUPELLATION

DEFECT	POSSIBLE CAUSE	REMEDY
frozen buttons	temp too low, cupels started too cold, excessive airflow over cupels, door/vents opened too early, very high base metals	increase temp. preheat cupels to > 930°C, check for leaks around the door, vent settings allow too great an airflow, ensure samples are "driving" prior to opening vents/door, reassay using smaller sample charge
driving takes > 5 mins	cupellation temp. too low, cupels too cold, cupels allowed to cool too much during loading, excess base metals or sulphides in button	increase cupellation temp., preheat cupels to > 930°C, load cupels carefully but quickly, reassay using nitre or lower sample weight
sprouting of prills	large prills (high silver content samples)	cool slowly and starve O_2 by covering immediately after removing from cupellation.

GENERAL NOTES

1. Thorough mixing of the sample is critical otherwise low recoveries in gold assays will result.
2. Visual observation should be maintained on unusual or non-routine samples to ensure that fusion proceeds satisfactorily.
3. If the prill has a whitish-gold appearance (this colour is readily observed) the ratio of gold to silver may be too high to ensure complete parting. If a prill has a greyish white pitted appearance it usually contains a high proportion of bismuth or lead.
4. The volumes of acids and water used in the prill digestion, and also the temperature, must be carefully controlled. Evaporation loss must be kept to a minimum, however, a sufficiently high temperature is required for complete dissolution of silver and gold and precipitation and coagulation of silver chloride.

RANGE

When taking a 20g sample charge the lower detection limit is 0.01 ppm Au and the higher detection limit is 60 ppm Au. The assay of higher level Au samples requires additional silver for parting, or a smaller sample weight to be taken to ensure a Ag to Au ratio of at least 3.0 to 1.

CALCULATIONS:

$$\text{ppm in sample} = \frac{\text{AA reading x sample vol. (mls)}}{\text{sample wt. (g)}}$$

REPORTING OF RESULTS:

Au low range (0 to 10 ppm) :

Report all results to the second decimal i.e. 0.315 g/t = 0.32 g/t

Au high range (> 10 ppm) :

Report all results to the first decimal i.e. 12.35 g/t = 12.4 g/t