

823354

Summary Report and Recommendations  
Athelstan - Jackpot Property  
Greenwood Mining Division  
British Columbia

by

A. R. Grant, PhD, P. Eng.  
A. Robert Grant, Inc.  
Consulting Economic Geologist  
P. O. Box 15  
Langley, Washington 98260

November 29, 1983

ALAN ROBERT GRANT  
CONSULTING GEOLOGIST  
P.O. BOX 15  
LANGLEY, WASHINGTON 98260

-----  
(206) 321-4365

Summary Report and Recommendations  
Athelstan - Jackpot Property  
Greenwood Mining Division  
British Columbia

Introduction

This report is prepared at the request of Mr. W. G. Hallauer, owner of the subject property. The Athelstan-Jackpot mines produced approximately 6,979 oz. Au and 8,234 oz. Ag from 38,665 tons of ore intermittently during the period from ca. 1900 through 1938. Precious metal mineralization occurs mainly in massive sulfide lenses in talc-carbonate altered, serpentized ultramafic rocks. Several lenses appear to be present within the altered section over a vertical range of approximately 100'.

During 1981, 28 percussion and 3 core holes were drilled on the property. The results of this work indicate that the Athelstan-Jackpot does have the potential for the presence of an economic gold target. However, sampling difficulties encountered during the 1981 program suggest that future work must incorporate a more controlled sample recovery method to accurately evaluate grade.

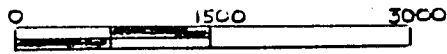
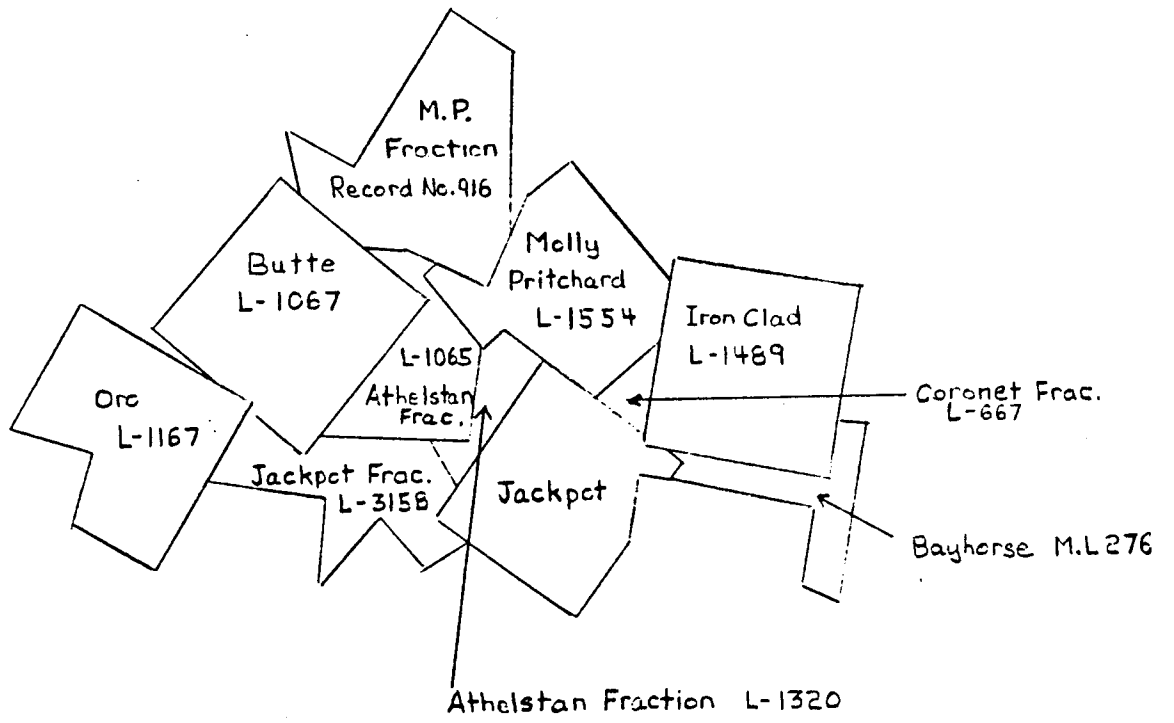
A limited drill program of 12 reverse circulation holes is recommended. These holes will test and accurately sample the principal extensions of the main ore horizons as exposed in the Athelstan and Jackpot stopes. Estimated cost of this work is \$48,000.00 (U.S.).

Location and Access

The center of the claim block is situated at approximately 49°03' 48" N, 118° 32' 44" W.

The property consists of 9 Crown Granted mineral claims, 1 claim held by location and 1 mineral lease. The Crown Grants are (see Fig. 1):

Oro - L 1167  
Butte - L 1067  
Molly Pritchard - L 1554  
Athelstan Fraction - L 1065  
Jackpot - L 2224  
Jackpot Fraction - L 3158



Athelstan Group Mineral Claims  
Greenwood Mining Division  
B.C.

Athelstan Fraction - L 1320  
Coronet Fraction - L 677  
Iron Clad - L 1489

The validity dates for the M. P. Fraction (Record No. 916) and for the Bayhorse (M. L. 276) are not known as of the time of this writing. It is assumed they are current through 1983.

Included in the property package are 19 acres of land which are part of the Cascade Water Power right of way that crosses several of the claims as a narrow strip ca. 120' wide. This right of way is recorded as District Lot 1248S in the Kettle River Assessment District (Smilkameen Division Yale District).

The claims are located approximately 5 miles ESE of Greenwood at an elevation of ca. 4,200'. Access to the property is excellent, either directly from Greenwood via the Phoenix mine (closed 1978)-Lone Star Road or via a logging road leaving Highway 3 approximately 9.5 miles east of Grand Forks. During the early days, a 3 mile RR spur was built, connecting the property with the CPR spur at the Phoenix Camp. This spur could easily be cleared allowing a gentle grade road access directly to the Jackpot workings. Currently, the final 1 mile of the access road from Phoenix is rough and not maintained.

#### History and Development

Production records on the property are not complete. According to the Federal Department of Mines and Resources report (GS Paper 45-20) on the Greenwood-Phoenix area, production on the property prior to 1930 totaled 36,614 tons yielding 5,781 oz. Au, 6,757 oz. Ag and 15,965 lbs. Cu. Older reports, while not indicating tonnage, state the average production grade varied between 0.3 and 0.4 oz./ton Au. According to the previous owner (Mr. W. E. McArthur, Jr.), post-1930 production was 2,051 tons averaging 0.582 Au, 0.72 Ag, 0.15% Cu, 0.04% Ni and 12.47% As.

Considerable development work was accomplished on both the Athelstan and Jackpot claims prior to 1912. This work included an unknown amount of drifts, crosscuts and shallow stopes. Many of the workings are now inaccessible but it was possible in 1981 to enter sections of both the Athelstan and Jackpot stopes for purpose of inspection and sampling. In addition, numerous shafts and declines are present, particularly on the Butte, Athelstan Fraction, Jackpot and Iron Clad crown grants. Most of the shafts were flooded as of 1981.

#### Geology

The property is underlain by a complex of meta-igneous rocks which are intruded by a diorite pluton of probable Mesozoic age. These

rocks are part of a broad belt of fault-bounded supracrustal and igneous rocks which occur in a graben-like structural feature extending in a general northerly direction from north-central Washington (Lone Star Mine and vicinity) to well north of the Athelstan-Jackpot property.

The oldest rocks on the property consist of a meta-volcanic section probably belonging to the Upper Paleozoic-Lower Triassic Anarchist Series mapped by Daley in his classic 49th Parallel work. These same rocks were subsequently included in a unit named the Attwood Formation by C.G.S. and B.C. Department of Mines mapping. The meta-volcanic rocks consist dominantly of meta-dacite and meta-andesite flow rocks, sections of which have been metamorphosed to greenstone and greenschist. These rocks were intruded by irregular masses of ultra-mafic rock which are partly converted to serpentinite, possibly during the same phase of regional metamorphism responsible for the greenstone and greenschist development. Both of the above units were intruded by a biotite-hornblende diorite pluton. A few post-mineral mafic to felsic dikes of probable Tertiary age represent the final stage of igneous activity.

The gold mineralization of potential economic significance appears to occur mostly in the serpentinitized ultramafic rocks. Within and adjacent to the zones of mineralization, silicification and talc-carbonate alteration are widespread. In several sections of both the Athelstan and Jackpot workings, the presence of mariopite and/or fuchsite is common, particularly in zones of intense hydrothermal alteration.

Structural data in the central mine area are abundant, particularly in light of the accessibility of the Jackpot stope. The dominant trend of shearing appears to vary from ca. NE-SW to NW-SW. Dips of these structures range from  $<10^\circ$  to  $>70^\circ$  both E and W. Near horizontal shearing also appears to be common. It is suspected that many of the higher angle shears are normal faults which have caused some displacement of the sulfide lenses.

### Economic Geology

The dominant sulfides on the property are pyrite and arsenopyrite with subordinate pyrrhotite, chalcopyrite and, locally, sphalerite. Outside of the main sulfide shoots, 1%-2% pyrite is very common in the meta-igneous country rocks. Old mine reports suggest that the sulfide lenses are replacement deposits along localized zones of shearing in the talc-carbonate rocks. Observations made during property examinations by the author do not support this suggestion. Rather, the lenses more likely are the result of sulfide filling and deposition along pre-existing low-angle shears. According to the Geological Survey (GS Paper 45-20), the shape and size of several of the ore bodies mined could be inferred based upon examination of the workings still accessible in

1936. At the Jackpot, 2 of the lenses mined were crescentic in plan and plunged  $10^{\circ}$  -  $40^{\circ}$  E. They ranged in thickness from several feet to  $>25'$  (average  $10'$ ) over a length of at least  $100'$  and a width of at least  $40'$ . During the 1930's, narrower parts of these lenses were mined. At the Athelstan, ca. 300 vertical feet above the Jackpot, the only accessible stope as of 1936 measured  $60' \times 40'$  with an ore thickness ranging from  $3'-8'$ . During 1936, a winze sunk in the floor of this stope to a depth of  $12'$  was entirely in ore (GS Paper 45-20).

As of 1981, sections of both the Athelstan and Jackpot stopes were accessible for mapping and sampling. Most of the quartz-sulfide lenses dip gently east to southeast. The lenses appear to occur in a parallel to sub-parallel series of shear zones. These structures can be traced (mostly by exposures in the various underground workings and open cuts) from ca.  $1,200'$  east of the Jackpot stope area to ca.  $600'$  west of the Athelstan stope. Gold-bearing massive sulfide lenses also occur on the Iron Clad Crown Grant claim. However, these lenses, consisting mostly of massive pyrrhotite, appear to be lenticular vein fillings in diorite and not of particular economic significance.

Mapping data indicate the presence of at least several gold-bearing shears and incorporated sulfide lenses within a vertical range of  $>100'$ . According to the GS report (1945), the sulfide lenses are displaced by numerous NNE striking,  $40^{\circ}$  -  $70^{\circ}$  NW dipping normal faults. It is of interest to note that these faults roughly parallel the boundary faults of the graben-like structure in which the Athelstan-Jackpot property is situated. Further south, in the Lexington and Lone Star areas, similarly striking faults thought to be sub-parallel strands of the graben boundary faults, commonly displace the ore horizons. If this is the case, the various sulfide occurrences found in the workings from the Butte area eastward to the Jackpot area (downhill) could be juxtaposed blocks of several continuous lenses. On the Butte claim, 2 lens segments can be mapped within 60 vertical feet in adjacent workings. There, the lens segments are separated by a NW trending NE dipping fault. If normal faulting prevails, these two segments could represent offsets of the same lens.

Samples collected by W. E. McArthur, Sr. in the 1930's indicate the variation in grade within the various sulfide shoots. Fourteen samples taken in the Athelstan stope (sample widths vary from  $1.66'-8'$ ) average  $0.45$  o/t Au and  $1.42$  o/t Ag. Six samples from the Jackpot stope (widths vary from  $2'-6'$ ) average  $0.325$  o/t Au and  $1.21$  o/t Ag. Eight samples from various Butte claim workings (widths vary from  $1'-8'$ ) average  $0.245$  o/t Au and  $0.61$  o/t Ag. 1978 composite grabs from several dumps assayed as follows:

<u>Location</u>	<u>Description</u>	<u>Au</u>	<u>Ag</u>
Athelstan stockpile	siliceous ore	0.356	0.44
Upper Jackpot dump	part oxid. massive py	0.360	0.38
Lower Jackput dump	massive unoxid. py	0.680	2.76
Dump on RR cut- Jackpot dump	pyritic breccia	0.996	5.26

Underground sample results from both the Athelstan and Jackpot stopes indicate the presence of potential ore-grade material. The unweighted average of all samples (29 total) in the Athelstan stope is 0.105 o/t Au. Samples taken from specific sulfide lenses or limonitized shears in the stope range from 0.14 to 0.89 o/t Au over widths ranging from 1' to 6.5'.

The unweighted average of all samples (36 total, excluding dike material) in the Jackpot stope is 0.172 o/t Au. Samples taken in the main sulfide lens target range from 0.06-0.84 o/t Au over widths ranging from 3.3' to 7'. The thickest exposed section of massive sulfide in the stope is 13.3' with an average grade of 0.26 o/t Au and 0.35 o/t Ag. The weighted average of 11 samples of silicified fractured serpentinite at various localities in the Jackpot workings is 0.048 o/t Au.

A surprising section of the Jackpot mineralized zone is present in the lowest level of the eastern drift. There, the serpentinite is strongly sheared parallel to but somewhat above the down-dip extension of the principal sulfide lens. Little, if any, apparent quartz introduction has occurred. In spite of the absence of sulfides and alteration, both Au and Ag values are significantly higher in this area than elsewhere in the mine. The weighted average of nine samples is 0.363 o/t Au and 1.68 o/t Ag over an average sample width of 4.4'. Neither the top nor bottom of this mineralized section is exposed in the drift.

Only a few rock samples have been taken in the Butte zone. There, several semi-massive sulfide lenses, averaging 1'-2' in thickness, range in value from 0.15 to 0.584 o/t Au. Wall rock values adjacent to these lenses range from <0.003 to 0.02 o/t Au.

Based upon spatial relationships noted between the lower Jackpot and upper Butte zones, the total thickness of the serpentinite host appears to be greater than 400'. However, the distribution of serpentinite is complicated by the adjacent and subjacent diorite pluton. The serpentinite is intruded by diorite ca. 300' east of the Jackpot stope. Mineralization in the serpentinite appears to extend to the intrusive contact. However, the diorite itself constitutes an assay cutoff contact even though several massive to semi-massive dominantly pyrrhotite lenses do occur in the intrusive particularly east and downhill of Jackpot. In contrast to significant gold mineralization known to occur with massive pyrrhotite elsewhere in the Phoenix district, most of the

massive pyrrhotite veins present on the Athelstan-Jackpot property contain little precious metal content. A few of the known pyrrhotite veins carry small amounts of visible galena. Select samples of this material contain silver values ranging from 0.58 - 4.16 o/t.

### Geochemical Sampling

A total of 399 soil samples were collected under the author's supervision during the 1980-81 seasons. This work delineated an anomalous (>100 ppb) Au-in-soil zone ca. 480' N-S by 2,600' E-W. This zone is roughly coincident with the area of the Athelstan-Jackpot workings and the outcrop pattern of the silicified serpentinite host rock. Numerous other 1-5 station point Au-in-soil anomalies exist within the survey grid. Some of these are thought to reflect the presence of very minor gold in massive pyrrhotite veins in the diorite. Soil values are shown on Plate I accompanying this report.

### Geophysical Surveys

During spring, 1981 Arrowhead Resources contracted Mr. Steve Persunka to conduct VLF-EM and magnetometer surveys over the property. A total of 8.2 line miles were run on a surveyed grid as shown on Plate I. Survey results are mixed. Unfortunately much of the target zone is within an area of interference from nearby telephone and electric power lines. Outside the obvious interference area, VLF-EM response suggests the presence of a linear conductor greater than 950' in length. The conductor is open to the west beyond the survey grid. Drilling in this zone did not encounter mineralization and it is suspected that electrical interference is more widespread than originally thought.

The magnetometer data does not appear to be particularly helpful because of the high magnetic susceptibility both in the serpentinite and high-mafic content diorite.

### Drilling

During 1981, 28 percussion holes with a total aggregate footage of 4,735' and 3 core holes with a total aggregate footage of 400' were drilled by Arrowhead Resources on the property. Analysis results of the percussion drilling are attached to this report as Appendix I.

The percussion drilling program partly tested an area ca. 650' x 1,900'. The results of this work indicate that the gold values in the western half of the target zone are very erratic and that diorite dikes cause significant dilution in the mineralized horizons. Furthermore, the serpentinite in some areas is cut off at depth by the subjacent diorite mass. As a consequence, the probability of discovery of significant mineralization west of the Athelstan stope towards the Butte zone is poor.



Drilling results east of the Athelstan stope towards and beyond the Jackpot stope are mixed. Several holes encountered values ranging from 0.03-0.345 o/t Au at varying depths within the serpentine. The Arrowhead drilling did not adequately explore either the direct extension of the gold-bearing target between the Athelstan and Jackpot stopes or the >800' eastern extension of the Jackpot zone toward the shafts in the 100-200 N, 400-500 E area of the survey grid (see plate I).

The reliability of grade accuracy from the percussion drilling is subject to question. As an example, a core hole (81-2) was drilled parallel to percussion hole P-13. P-13 encountered a 5' intercept from 75'-80' containing 1590 ppb Au (converted to 0.046 o/t Au). The 81-2 intercept from 73'-78.5' assayed 0.158 o/t Au. It is thought that considerable riffing of the heavy minerals occurs as the sample is lifted along the irregular wall of the hole. Any further down-hole hammer drilling at the Athelstan-Jackpot should utilize a double-walled method of recovery.

Another poor and opposite type of comparison between core and percussion results involves holes P-12 and DDH 81-3. P-12 was drilled in a pillar of the Jackpot stope to sample the lowest level of the eastern drift whereas previously mentioned, a weighted average of nine samples assayed 0.363 o/t Au. P-12 encountered a 5' intercept between 30'-35' containing 6450 ppb Au (converted value of 0.186 o/t Au). DDH 81-3, drilled within 10' of the P-12 collar, encountered no significant values except a very weak anomalous value of 131 ppb Au between 23'-39'. The absence of significant values in DDH 81-3 cannot be explained.

### Summary and Recommendations

While the results of the 1981 drilling program were not particularly encouraging, an untested zone extending from the Athelstan stope on the west to east of the Jackpot stope (measuring ca. 1,300'x200') should be explored. This zone has the potential for the presence of a near-surface pitable zone of mineralization varying in thickness between 5' and 20'. Total geological potential of this target is 22,000 tpfv with possible significant extensions to the north and east.

A small reverse circulation drilling program would provide the necessary sample information to determine whether the zone constitutes a realistic economic target. Cost estimates for this work are presented below.

Drill site preparation	\$ 3,500
Drilling - 12 reverse circulation holes, average depth 150'; total footage 1,800'; estimated cost (all inclusive)-\$14.00/ft.	25,200
Assays	3,500

Support, transportation	\$ 2,000
Project supervision	6,000
Sampler	1,500
Contingency-15%	<u>6,300</u>
Project Total	\$48,000 (U.S.)

*A R Grant*  
A. R. Grant  
Consulting Geologist  
November 29, 1983

ALAN ROBERT GRANT  
CONSULTING GEOLOGIST  
P.O. BOX 15  
LANGLEY, WASHINGTON 98260

-----  
(206) 321-4365

CERTIFICATE

I, Alan Robert Grant, of Langley, Washington, do hereby certify:

1. That I am a Consulting Geologist residing at 828 Edgecliff Drive (P. O. Box 15), Langley, Washington 98260.
2. That I am a graduate of the University of Washington with the following degrees: B.S. in Geology (1955), M.S. in Geology (1959) and PhD in Geology (1966).
3. That a) I have practiced my profession for over 24 years, b) that I have been self-employed as a Consulting Geologist since 1965 and c) I am licensed to do business in the State of Washington as A. Robert Grant, Inc.
4. That I do not have nor do I intend to receive directly or indirectly any interest in the property reported herein.
5. That I have been retained as a Consultant by Mr. W. G. Hallauer of Oroville, Washington, and that this report, dated November 29, 1983, is based upon my personal examination of the property as discussed in this report during the period from 1978 through 1981.
6. That I hereby grant permission to Mr. W. G. Hallauer for the use of my report dated November 29, 1983.

Alan Robert Grant  
Alan Robert Grant  
November 29, 1983

SUBSCRIBED AND SWORN to before me this 29th day of November, 1983.

Lonna M. Parker  
Lonna M. Parker, Notary Public  
in and for the State of  
Washington, residing in Langley

Appendix I

ATHELSTAN - JACKPOT DRILLING RESULTS - GEOCHEM  
All Au values-ppb

1.	P-81-1	10-45-29 ppb	
	T.D.-115'	45-50-3640	
		50-55-220	
		55-115-31	
2.	P-81-1B	10-80-95	
	T.D.-200'	80-200-9	
3.	P-81-2	0-200-1.5	T.D.-200' diorite
4.	P-81-3	5-40-67	
	T.D.-170'	40-50-315	
		50-85-71	
		85-100-195	
		100-170-17.5	
5.	P-81-4	10-105-28	
	T.D.-200'	105-200-75	
6.	P-81-5	5-75-52	
	T.D.-200'	75-90-678	
		90-200-52	
7.	P-81-6	5-50-9	
	T.D.-200'	50-55-330	
		55-110-10	
		110-115-190	
		115-200-14	
8.	P-81-7	10-200-15	T.D.-200' diorite
		5-20-90	
9.	P-81-8	20-70-17.5	
	T.D.-190'	70-75-430	
		75-190-48	
10.	P-81-9A	5-25-272	20-25-2.76 o/t Ag
	T.D.-30'	25-30-25	
11.	P-81-9B	15-60-33	T.D.-60'
12.	P-81-96	0-135-20	T.D.-195'
		135-150-120	
		150-195-16	
13.	P-81-10	5-10-135	
	T.D.-200'	10-30-2172	
		30-120-66	
		120-125-295	
		125-200-26	

Appendix I - 2

14.	P-81-11	5-25-252
	T.D.-200'	25-200-22
15.	P-81-12	10-30-36
	T.D.-200'	30-35-6450
		35-50-246
		50-200-92
16.	P-81-13	10-35-13
	T.D.-180'	35-40-395
		40-55-22
		55-100-509
		100-115-45
		115-125-267
		125-145-36
		145-155-303
		155-180-40
17.	P-81-14	5-120-32
	T.D.-200'	120-175-808
		175-200-42
18.	P-81-15	10-45-9
	T.D.-220'	45-65-348
		65-220-7
19.	P-81-16	3-30-6
	T.D.-180'	30-55-283
		55-155-27
		155-180-14
20.	P-81-17	3-130-18
	T.D.-140'	130-140-6247
21.	P-81-18	5-140-10
	T.D.-180'	140-155-117
		155-160-1400
		168-180-56
22.	P-81-19	5-20-163
	T.D.-200'	20-125-38
		125-160-484
		160-200-23
23.	P-81-20	10-25-10
	T.D.-35'	25-35-180
24.	P-81-21	10-15-5
	T.D.-200'	15-25-508
		25-200-10
25.	P-81-22	6-35-18
	T.D.-50'	35-50-232

Appendix I - 3

- |     |           |                      |
|-----|-----------|----------------------|
| 26. | P-81-23   | 3-20-5               |
|     | T.D.-190' | 20-35-188            |
|     |           | 35-75-94             |
|     |           | 75-120-458           |
|     |           | 120-190-7            |
| 27. | P-81-24   | 10-65-28             |
|     | T.D.-200' | 65-90-192            |
|     |           | 90-200-18            |
| 28. | P-81-25   | 3-130-6              |
|     | T.D.-200' | 130-135-550          |
|     |           | 135-145-10           |
|     |           | 145-150-2200 (0.076) |
|     |           | 150-200-64           |