Ore Values and Proven Reserves of the Blackstone Mine

This article summarizes geological and milling data provided by geologists and engineers who supervised development and operation of the Blackstone mine during the 1980s.

Exploration programs
Richwell Resources, a lessee of the Blackstone mine in the mid-1980s, carried out a development program that included nine reverse-circulation and 27 diamond-core drill holes to establish a 2000-ft^2 block of ore reserves. The company also constructed a pilot mill for processing Blackstone's high-grade ore. In addition to drilling, the exploration included a series of deep trenches, a 40-acre resistivity survey, and channel sampling that showed a wide area of leachable gold and silver.

Mineralization
Consistent with Robert N. Bell's study of the Blackstone, and its kinship to the Butte, Montana Mining District, geologists overseeing development of the property in the 1980s described the mine's mineralization as a system of quartz veins hosting high-grade ore in large zones of copper, lead, zinc, silver, and gold. The high-grade ore zone is bordered by extensive areas of lower-grade leachable gold and silver ore.

Drilling confirmed the mineralization is associated with a series of shear zones adjacent to tertiary granite and rhyolite dikes, similar to those found in Butte. The shear zones crosscut a cretaceous granodiorite roof pendant within an 850' by 7,500' mineralized zone. Three zones of alteration are associated with the veins and include:

- Epidote-chlorite halo hosting a high-grade ore zone
- Sericite-manganese oxide zone hosting leachable gold, silver, and base metals
- Argillic zone containing leachable gold and silver.

Exploratory drilling at the Blackstone established the minimum depth of the zones to be 400 feet.

Mining zones
Approximately 35,000 tons of ore containing 0.106 oz. gold, 23.58 oz. silver, 98 lbs. copper, 22 lbs. manganese, 80 lbs. lead, and 170 lbs. zinc per ton were mined and stockpiled at the Blackstone in 1986. Drilling also defined 700,000 tons of lower-grade leachable ore containing .078 oz. gold, 2.11 oz. silver, 4 lbs. copper, 40 lbs. manganese, 5 lbs. lead, and 10 lbs. zinc per ton. The drilling results suggest a potential 3 million tons of leach-grade ore and 186,000 tons of high-grade ore adjacent to the pit.

	Stockpiled ore values				Leach-grade ore values			
Metal	*Price*	*Amount*	*Unit*	*Stockpile*	*Price*	*Amount*	*Unit*	*Leach-grade ore*
Copper	$2.56	98	lbs.	$10,290,000	$2.56	4	lbs.	$9,800,000
Lead	$0.95	30	lbs.	$882,000	$0.95	0	lbs.	$0
Zinc (as Zinc oxide)	$5.00	170	lbs.	$7,650,000	$5.00	10	lbs.	$10,500,000
Silver	$16.15	23.53	ozs.	$15,176,850	$16.15	2.110	lbs.	$31,755,500
Gold	$1,197.00	0.106	ozs.	$4,197,600	$1,197.00	0.078	ozs.	$72,072,000
Tons				30,000				700,000
Total				$38,196,450				$124,127,500
Total all ore grades								**$162,323,950**

Geologist's Report on the Blackstone Mine Project
Elmore County, Idaho
July 21, 1986

Richard E. Kucera, PhD, FGAA, FGAC
Vancouver, British Columbia

The purpose of this report is to describe the results of an earlier geological exploration and drilling program of the Blackstone Mine area, Elmore County, Idaho and discuss recommendations for further work.

Location and access

The Blackstone property consists of 5 patented claims and 32 located claims in Sections 13, 14, and 15, T2S, R10E, and Section 18, T2S, R11E, about 60 miles southeast of Boise, Idaho. Access is via the Hill City County Road, 6 miles south of U.S. Highway 26.

The Blackstone property lies at an elevation of approximately 5,800 feet and extends along the crest of a low granite ridge that rises about 1,000 feet above the broad Camas Prairie valley to the north. Surface development consists of a 100 x 600-foot open pit located near the eastern end of the five patented claim block.

The claims are held by Richwell Resources Ltd. under a lease agreement with Blackstone Mining Company Ltd., the property owner. It is understood that Richwell has an option to obtain a 100 percent leasehold interest subject to a 4 percent net smelter return in favor of Blackstone.

Sources of information

The primary sources of information on which the report is based include geologic data, maps, drill logs, cross sections, and other information obtained from Mr. Richard F. DeLong of Reno, Nevada. In his report of March 29, 1986, he summarized the drilling of a total of nine inclined, reverse-circulation rotary drill holes on the extreme eastern portion of the Blackstone property. The drill holes (3,010 total footage) tested the vertical and horizontal extent of the geologic structure, rock alteration, and mineralization.

In addition, the writer has drawn upon other appropriate sources including assays, petrographic analyses, publications pertaining to the geology of Elmore County, Idaho, and discussions with Richwell Resources Limited.

Geology

The Blackstone property lies within the Volcano Mining District, which contains a number of gold-silver base metal veins and pods grouped along a zone of structural weakness near the southern edge of the Idaho batholith.

Silver-rich quartz veins of the Blackstone Mine are intimately associated with granitic dikes and are localized by an east-west shear zone in a quartz monzonite facies of the Idaho batholith. Surface development on the Ohio and Kentucky patented claims exhibit quartz veins and stockwork, and the adjacent country rock is intensely altered.

Delong (1986) states that three zones of alteration with some mineralization surround the stockwork. The zones from the stockwork outward are: a sulfide-epidote zone, a sulfide-sericite zone, and a sericite-manganese oxide zone, which is the most widespread alteration associated with the deposit.

Nine drill holes intersected east-west structures that host quartz veins and altered rock at the eastern end of the property. The structures and associated quartz veins dip north between 50° and 70°. Two major structures at the surface converge at depth with a combined thickness of 90 to 130 feet and have a well-developed zone of altered rock between them. The vertical extent of the structure is at least 300 to 400 feet downdip.

DeLong, using cross-sections and plan views from drill-hole data, developed a three-dimensional model of the quartz veins, structures, and altered rock. A body of rock can be outlined which measures approximately 600 x 200 x 400 feet. According to DeLong, this body of altered and mineralized rock, partially blocked out by drilling, possibly contains 3 million to 4 million tons.

Results

DeLong reported on surface samples taken from the open pit at the eastern end of the property. They contain 3.8 to 11.3 ounces/ton silver in the stockwork, 5.1 to 11.2 ounces/ton gold in the sulfide-epidote zone, 3.3 ounces/ton silver in the sulfide-sericites zone, and 0.25 to 1.0 ounces/ton silver in the sericite-manganese oxide zone. Base metal values range from 0.66% to 6.40% lead, 0.46% to 5.4% copper, and 0.38% to 6.95% zinc.

Assays obtained from drill holes S4 and S7 show the following (sampling at 5-foot intervals; silver by fire assay; base metals by atomic absorption):

S4

Footage: 400 feet to depth of 300 feet, angle 45°
Silver: 55 to 345 feet = 0.3% to 6.4 ounces/ton (3.31 ounces average)
Copper: 55 to 330 feet = 0.3% to 2.96%
Zinc: 55 to 295 feet= trace to 1.6%

S7

Footage: 400 feet to depth of 312 feet, angle 50°
Silver - 60-75, 95-115, 255-295 feet = 2.25 to 10.40 ounces/ton (4.68 ounces silver average)
Copper: 60-75, 95-115, 160-200, 255-295 feet = 0.9 to 2.7 percent
Zinc - 60-75, 95-115, 160-20, 255-295 feet = 0.39 to 2.3 percent
Data from drill holes S4 and S7 indicate silver-rich ore lies at depths of less than 300 feet, having average values ranging from 3.31 to 4.68 ounces silver/ton with significant copper values as well.

Although only a small area located at the eastern end of the patented claim block has been drilled; drill-hole data outline a silver deposit that shows excellent potential for lateral and depth extension. Additional work is needed to determine the size and shape of the zone of silver-bearing quartz veins and altered host rock, especially in areas on strike to the west.

Recommendations

I recommend a rotary drilling program on that segment of the patented claim block situated in Sections 14, T2S, R10E; work to start adjacent to the previously drilled area. The program would consist of 400-foot holes on 100-foot centers for a minimum of 28,000 feet of drilling. Trenches excavated at several localities should be mapped and sampled to help correlate surface geology and mineralization to that in the drill holes. Drilling toward the south at a dip of 45° would intersect the northward dipping, east-west trending, fractures, quartz veins, and alteration zones. There should be flexibility in the choice of drilling sites, based on geologic data gathered during the drilling program. In addition, I recommend two exploratory holes be drilled in that segment of the claim block that is situated in Sec. 15.

A rotary reverse-circulation drill should be used with samples taken at 5-foot intervals. Since the reverse-circulation drill rig will not effectively produce clean samples in wet ground, it will be necessary to change to a coring operation when ground water is encountered. Selected holes should be cored to a depth of 400 to 600 feet to determine if a zone of enrichment exists at the water table. I recommend fire assay of samples by Universal Laboratories of San Francisco, California.

Report on the Blackstone Mine Project
Elmore County, Idaho
August 11, 1988

Richard E. Kucera, PhD, FGAA, FGAC
Vancouver, British Columbia

Introduction

This report was prepared at the request of Mr. James Hawley, President of Richwell Resources Ltd. ("Richwell"). The purpose of this report is to describe the results of the 1987 geological exploration and drilling program of the Blackstone Mine. The writer makes certain recommendations for further work.

The Blackstone property consists of 5 patented claims and 27 located claims in sections 13, 14, and 15, T.2S., R.10E., Boise Meridian, Elmore County, about 60 miles southeast of Boise, Idaho. Access is via the Hill City County Road, 6 miles south of Highway 26. Richwell holds a 100 percent leasehold interest in the claims under an agreement with Blackstone Mining Company Ltd., owner of the property.

Present surface development consists of a 100 x 600-foot open pit located near the eastern end of the five patented claim block. During 1987, the company mined, shipped, and crushed mill-grade ore, which was processed at Richwell's mill located at Fairfield, Idaho.

Sources of information

The primary sources of information on which this report is based include geologic data, maps, drill logs, cross sections, and other information obtained from Mr. Richard F. DeLong, consulting geologist of Reno, Nevada. In his report of March 29, 1986, he summarizes the work in the drilling of nine inclined, reverse circulation rotary drill holes on the extreme eastern portion of the Blackstone property. Richard E. Kucera, consulting geologist, reviewed the geology and work program and made certain recommendations in his report of July 21, 1986. In addition, the writer has drawn upon information from James Zarubica, consulting geologist, Ketchum, Idaho. In his report of December 17, 1987, he summarized the results of the winter drilling program and calculated proven ore reserves. The writer visited the property in 1986 and the mill site at Fairfield in 1988 and has had numerous discussions with Mr. Zarubica and Mr. Hawley.

Exploration program - 1987

This phase of the exploration was under the direction of James Zarubica, consulting geologist. The program included 27 diamond-core drill holes totaling approximately 11,500 feet. A grid was established to block out reserves in a 40 x 50 foot linear pattern along the strike of mineralized shear zones. A series of deep trenches, pits and cuts delineated a wide altered zone containing low-grade gold and silver mineralization. This development program has greatly expanded the scope of the area identified by the 1986 drilling.

Mineralization

According to Zarubica, mineralization at the Blackstone occurs as a system of quartz veins containing high-grade massive sulfide ones and extensive halos of low-grade silver and gold mineralization. The drill holes have confirmed that mineralization is associated with 11 shear zones adjacent to tertiary granite and rhyolite dikes. The shear zones crosscut a cretaceous granodiorite roof pendant within a zone 850 feet wide and approximately 7,500 feet long. The shear zones and associated quartz veins strike in an east-west direction and dip north between 50° and 70°.

Zarubica noted that three zones of alteration are associated with the vein stockwork and include:

- Epidote-chlorite halo hosting a high-grade ore zone
- Sericite-manganese oxide zone hosting leachable-grade gold/silver and base metal mineralization

- Argyllic zone containing leachable gold/silver mineralization

Core drilling has established the minimum depth of these zones to be 400 feet.

Mining zones
Based on the development, Zarubica calculated that a high-grade mining zone has been proven to contain 35,500 tons of 0.106 ounces gold, 23.58 ounces silver, 4.94 percent copper, 1.15 percent manganese, 4 percent lead, and 8.5 percent zinc. A low-grade mining zone contains 700,000 tons of leachable reserves having an average grade of .078 ounces gold, 2.11 ounces silver, 0.2 percent copper, 2 percent manganese, 0.25 percent lead, and 0.5 percent zinc.

In addition to proven reserves, drilling suggests that as much as 3 million tons of probable leach-grade ore and an additional 186,000 tons of high-grade ore may exist on the Blackstone property. Additional drilling is required.

Mill operations
Richwell has mined and stockpiled 4,000 tons of mill-grade ore and begun test milling at its Fairfield facility in Camas County, Idaho, approximately 16 miles from the Blackstone Mine. The mill utilizes an environmentally safe ammonium thiosulphate leaching circuit to process the oxidized portion of the ore. To recover the non-leachable sulfide values remaining in the tailings, the Company will add a flotation circuit.

At the time of this writing, the mill equipment is being installed in Richwell's new facility located at Gooding, Idaho. The Company anticipates processing mill-grade ore at approximately 35 tons per day, to begin production in September 1988. It is understood that the Company plans to sell concentrates from the milling operation to the Johnson Matthey refinery in Salt Lake City, Utah and the American Smelting and Refining Company in Montana.

Summary
Richwell has completed a second-phase drilling and development program at the Blackstone Mine in Elmore County, Idaho. Present surface development consists of a 100 x 600-foot open pit near the eastern end of the property.

The existing workings at the Blackstone consist of 221,500 tons of mill-grade ore, of which 35,500 tons have been proven. The average grade of the mill-grade ore is .106 ounces gold and 23.58 ounces silver per ton. Drill holes have proven 700,000 tons leach-grade ore containing .078 ounces gold and 2.1 ounces silver per ton.

During 1987 the Company mined, shipped, and crushed 4,000 tons of mill-grade ore. The ore was removed from the proven ore block delineated by the drilling program. Processing has been done at Richwell's hydrometallurgy mill located in Fairfield, Idaho and will continue in new facilities in Gooding, Idaho.

The 35,500 tons of mill-grade ore will provide approximately 3.8 years of mill feed based on a production capacity of 35 tons per day (assuming 22 operating days per month). Should the larger 186,000 ton ore block have the same grade, these reserves would add an additional 20 years of mill feed.

Recommendations

1. Richwell is in an enviable position to mine and mill proven ore reserves for several years. Revenues generated from the milling can be used to fund further exploration and development work at the Blackstone Mine. I recommend that Richwell mine and process the 35,500-ton ore block and bulk sample the probable 186,000-ton ore block to determine grade and metallurgical characteristics.

2. Add a flotation circuit in the mill to recover non-leachable sulfides remaining in the tailings.

3. Bulk sample the 700,000 ton leach-grade reserves found associated with the sericite-manganese oxide zone. Conduct experimental leach tests using ammonium thiosulphate (or other solvent). Determine the optimum processing methodology in anticipation of commencing large-scale heap leaching at the Blackstone Mine in early 1989.

4. Additional drilling is essential to outline the bulk tonnage of gold and silver mineralization. A grid should be established to block out reserves in a linear pattern along the strike of identified shear zones. A rotary reverse-circulation drill utilizing a 50-foot grid pattern is recommended.

5. An adequate base map of the Blackstone property is important. I recommend that low-level aerial photographs be obtained to be used for photo interpretation and compilation of a topographic base map. A scale of 1 inch = 200 feet will provide optimum coverage. Because the photographs will be taken for geologic use, the flight line should be laid out in an east-west direction in consideration of the geologic "grain" of the Blackstone property.

Careful stereoscopic interpretation of the aerial photos could help delineate rock types on the property and locate very subtle fractures, many of which are probably inconspicuous on the ground.

A topographic base map should be compiled from the aerial photos having a scale of 1 inch = 200 feet and a contour interval of 20 feet. Using this map as a base, the geologic information on the aerial photos can be transferred to the map, including all mineral outcroppings, trenches, pits, and drill-hole locations.

Certificate of qualification

I, Richard E. Kucera, hereby certify that:

1. I am an associate of Kucera and Associates Consultants of #201, 810 West Broadway, Vancouver, B.C. V5Z 4C9.

2. I am a fellow of the Geological Association of Canada, and a member of the American Association of Petroleum Geologists and Geological Society of America.

3. I hold B.Sc. and M.Sc. degrees from The Ohio State University and a Ph.D. from the University of Colorado.

4. I have been practicing my profession as a Geologist for over 25 years.

5. I have no direct or indirect interest nor do I expect to have any direct or indirect interest in the properties or securities of Richwell Resources Ltd.

6. The statements made in Kucera and Associates Consultants report of August 11, 1988 on the Blackstone Mine project were based on information obtained as specified in the report.

7. The report has been prepared for the exclusive use of the participants of the project and no part of it shall be reproduced, distributed or made available to any other person, company, regulatory body or organization without the complete context of the report or without my permission.

8. Consent is hereby granted to use the report, in its complete form only, in a Filing Statement, Statement of Material Facts, or Prospectus by Richwell Resources Ltd.

Gross Value of Proven Ore Reserves, Blackstone Mine, Elmore County, Idaho
May 16, 1996

Richard E. Kucera, PhD, FGAA, FGAC
Vancouver, British Columbia

Introduction

This report, prepared at the request of Mr. James Hawley III, will calculate the gross value of proven ore reserves at the Blackstone Mine, located in Elmore County, Idaho. These reserves are polymetallic ore containing commercial quantities of gold, silver, copper, manganese, and zinc.

Previous work

The author has drawn upon information from James Zarubica, consulting geologist of Ketchum, Idaho. In his report of December 1987, Zarubica summarized the results of the 1987 drilling program, and he calculated proven and probable ore reserves.

The present writer visited the property in 1986 to review the geology in the field, study the work progress, and make certain recommendations, resulting in two reports, dated July 21, 1986 and August 11, 1988. In addition, the writer summarized the development work taking place at the Blackstone Mine and discussed the processing metallurgy and mill operations located at Gooding, Idaho, March 14, 1990.

Estimated proven ore reserves

Based on the results of the development work, Zarubica has calculated that a high-grade ore zone (mill-grade) has been proven to contain 35,500 tons of .106 ounces gold, 23.58 ounces silver, 4.94 percent copper, 1.5 percent manganese, and 8.5 percent zinc. He has estimated that the low-grade (leach-grade) deposits contain 700,000 tons of leachable reserves having an average yield of .078 ounces gold, 2.11 ounces silver, 0.2 percent copper, 2 percent manganese, 0.25 percent lead, and 0.5 percent zinc.

To calculate the gross value of ore reserves at the Blackstone Mine, I have referred to current commodity prices published in the *Wall Street Journal,* May 7, 1996.

ESTIMATED PROVEN RESERVES – BLACKSTONE MINE				
High-grade ore (mill-grade) (35,500 tons)	**Assay/ton**	**Price (5/7/96)**	**Value/ton**	**Total value**
Gold	0.106	$ 394.10	$ 41.77	1,482,998
Silver	23.530	5.44	128.00	4,544,114
Copper	4.94%	1.25	123.01	4,366,713
Manganese	1.15%	1.16	26.68	947,140
Zinc	8.50%	0.50	85.34	3,029,570
Total				**$ 14,370,535**
Leach-grade ore (700,000 tons)				
Gold	0.078	$ 394.10	$ 30.74	21,511,860
Silver	2.110	5.44	11.48	8,029,000
Copper	0.20%	1.25	4.98	3,486,000
Manganese	2.00%	1.16	46.40	32,480,000
Lead	0.25%	0.50	25.35	17,745,000
Zinc	0.50%	0.50	5.02	3,514,000
Total				**$ 86,765,000**

In addition to proven reserves, drilling results suggest to Zarubica that as much as 3 million tons of probable leach-grade ore and an additional 186,000 tons of high-grade ore may be proven by further development of the Blackstone property. Therefore, additional drilling and computer modeling of the area surround the pit is recommended to expand the tonnage of proven reserves. All figures in this report are subject to fluctuations in metal prices.