



Mine Handout  
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## MYRA FALLS OPERATIONS

### WESTMIN RESOURCES LIMITED

#### LOCATION

The Mine sites of Westmin Resources Limited are located near the south end of Buttle Lake, or about 32 km (20 miles) west of Courtenay. A 90 km (56 mile) paved highway provides access from Campbell River, B.C.

The present operation consist of two active underground mines (Lynx and H-W), a concentrating plant, offices, camp facilities, two hydro electric generator plants, supplementary diesel generator, tailings disposal area and water treatment ponds and facilities. The Price and Myra Mines and the Lynx open pit are no longer active.

#### HISTORY

The claims covering the Lynx and Price Mines were originally prospected and staked in 1918 by James Cross & Associates of Victoria.

The Myra Mine was originally held by the Paramount Mining Co. of Toronto. They did some development work between 1919 and 1925 with inconclusive results. Probably due to remoteness and depressed metal prices little work was done in Myra Valley until 1959, when the claims were acquired and consolidated by the Reynolds Syndicate who in turn sold the ground to Western Mines Limited in 1961. Development commenced in 1970 and access to the mine was provided by a 670 m (2200 foot) decline tunnel at minus 8 1/2 degrees. Mining was completed in 1986. The Myra Mine was not a large mine but carried excellent silver and zinc values.

The Price Mine has been partially developed. It lies adjacent to the Myra Mine. Only a limited amount of development has been carried out to date.

The Lynx Mine started developing as an open pit in 1966. At this time the only access to the mine site was by boat and barge on Buttle Lake which had its water level raised by Hydro Electric Developments. All construction equipment, materials, men and supplies used these means of transportation. Camps were built to house the men, and the plant was built.

Western Mines built the present 40 km (25 mile) road on the east side of Buttle Lake in 1968 and it was paved in 1970. The road provides access for concentrate shipments and also easy access for the public to the south end of the Park.

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The open pit and concentrator started production in late 1967 at 860 tonnes per day producing copper and zinc concentrates. As mining of the open pit continued diamond drilling established underground ore reserves and an internal shaft was sunk to a depth of 335 m (1100 feet) with horizontal levels at 45.7 m (150 feet) intervals. Exploration continued with favourable results and the decision was made to bring the property into production. The Lynx underground mine is still in operation producing approximately 10,400 tonnes per month. The original open pit was completed in 1975.

With the Lynx Mine ore reserve declining, an aggressive exploration program was started in early 1979. This program was very successful in locating a massive sulphide deposit that is known as the H-W Mine. The H-W stands for Harold Wright, first President of Western Mines. In 1976 Brascan Ltd. acquired control of Western Mines Ltd. and merged it with its oil interests in Calgary, forming Westmin Resources Limited.

Following additional drilling and feasibility studies a decision was made to sink a 6 compartment shaft, 716 m (2350 feet) deep, serviced by a 49 (160 feet) high headframe. Production started in 1985. Development prior to production consisted of 12000 meters of drifting and 2000 meters of raising.

### GEOLOGY

The ore bodies occur in a 457 m (1550 foot) thick stratigraphic sequence of volcanic rocks of Permian age, approximately 180-200 million years old. Within the sequence three (3) Rhyolitic horizons are recognized. Rhyolite is an acidic, light coloured rock which may occur as volcanic ash, called Tuff, or it may have originated as a lava and is called Flow. It is often altered to grey or light coloured, foliated rock called Sericite Schist, especially in the vicinity of the ore bodies.

Lynx, Myra and Price orebodies outcropped above the valley floor and belong to the "upper" Rhyolitic horizon. The "Lower" Rhyolite horizon hosts the H-W ore body about 305 m (1000 feet) below the valley floor.

At the Lynx Mine, numerous individual ore lenses typically occur at the top of the Rhyolite. At the H-W Mine, the ore is at or near the base of the Rhyolite.

The orebodies trend in a northwest/southeast direction; over a known length of 6100 m (20000 feet) for the Lynx/Myra/Price Rhyolitic horizon.

Between the Rhyolitic horizons are other volcanic rocks of a more basic composition, which are often green coloured, especially the Andesites.

The major ore minerals are sphalerite (zinc sulphide), chalcopyrite (copper sulphide) and galena (lead sulphide). The ore minerals may occur massive and fine grained or

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disseminated in Rhyolitic or sericite schist.

**MINING**

The underground mobile fleet of the H-W Mine consists of a fleet of trucks, 0.76 to 3.8 cu m (1 to 5 cu yard) scooptrams, drill jumbos, longhole drill rigs, a road grader, bulk ANFO explosive vehicles, plus scissor lift trucks for ground control work, various personnel carriers and mobile service vehicles for tradesmen. There is also a large, 5-bay shop. The shop area also contains a lunchroom, drill repair and electrical shops and warehouse with computer facilities.

While both Lynx and H-W Mines have massive sulphide deposits, the H-W Mine allows for a bulk mining system using rubber-tired diesel equipment. Parts of the Lynx Mine have been modified to allow some use of this type of equipment. Ore from the Lynx Mine is slushed, trammed and hoisted to an upper tramping level which transfers the ore to a surface coarse ore bin prior to crushing. Primary crushing of Lynx ore to minus six inches is done in a 1219 mm x 1067 mm (48" x 42") jaw crusher and is hoisted to a 100 tonne storage bin in the headframe with 11.5 tonne skips. Ore is then fed from the bin using a 1219 mm x 3658 mm (48" x 144") hydrastroke feeder to a 1.4 kilometre long conveyor which discharges to a 3600 tonne live capacity coarse ore bin at the concentrator.

**CONCENTRATOR (MILL)**

The conveyed material is reduced in cone crushers to a further minus 16 mm (5/8") and hence to rod mills and ball mills where the minerals are liberated in slurry form. This slurry is treated by a standard differential floatation method.

In the mill, the ore minerals in the broken ore from underground are concentrated by eliminating most of the waste rock and pyrite (iron sulphide) associated with the ore. That way the desired metal sulphides (copper and zinc) are shipped to the smelters. For example the ore from the Mines is usually about 5% zinc. After eliminating most of the waste, zinc concentrate assays approximately 50% zinc. This mineral is still in the form of zinc sulphide after the concentrating process, but without most of the waste rock and iron pyrite that has been removed.

The filtered concentrates are trucked to the Company's storage and ship loading facilities in Campbell River. Gold and silver are not separated at the mine, but are contained within the base metal concentrates and ultimately recovered at the smelter. The copper and zinc concentrated are loaded onto ships for delivery to smelters in and Japan. Products have also been sold to Trail, B.C., Korea and Spain.

**ENVIRONMENT/TAILINGS TREATMENT**

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In mid-1981 Westmin Resources registered the proposed expansion of the Myra Falls Operations (from 800 to 2700 tonnes as at 1985) with the British Columbia Metal Mines Steering Committee. The requirements are that new or expanded developments provide a two-staged, detailed socioeconomic and environmental impact assessment before government "approval-in-principle" can be granted. Westmin's Stage 1 Report was submitted to the Steering Committee in December, 1981, and was accepted by the Provincial Government. However, prior to submission of the Stage II Report, Westmin was requested to complete the necessary work to improve substantially the downstream water quality of Myra Creek, and also to undertake a community information and public participation program aimed at broadening the acceptability of the proposed expansion, which is located in Strathcona Park. Westmin was also required to cease disposal of tailing into Buttle Lake.

In order to achieve this, Westmin accelerated the engineering and design work that had already commenced on integrating a water collection and treatment system and an on-land tailings disposal system for both the existing operations and the new H-W operations. The essential systems, including surface water and groundwater collection (on-land tailings disposal system under-drainage) and future waste water treatment, were effectively installed during July and August of 1982, and modifications were carried out in October and November. The system has proven to be highly successful. Detailed monitoring undertaken not only by Westmin but also by Federal and Provincial agencies proved the combined new systems to be very effective. Buttle Lake water quality exceeds the March, 1987 Federal guidelines for the protection of fresh water aquatic life and is considerably better than the quality in 1971 when monitoring commenced.

A pilot plant trial of the proposed on-land tailings disposal system using a proven methodology known as the "sub-aerial" technique to produce a fully-drained seismically stable, dry-land mass provide sufficient design data to satisfy the most stringent intergovernmental review. Stability of the current tailings deposit has exceeded the original design criteria.

Studies completed in late June, 1983 by Dr. Pederson of U.B.C. show that the tailings previously deposited in Buttle Lake are non-reactive. They have not and are most unlikely to leach because of the oxygen deficient nature of lake bottoms. This and other reports indicate that the tailings do not contribute to the metals in the lake and will eventually be covered by a natural organic rich layer of river sediments.

To reduce surface water entering into the leachate producing waste piles, a bypass ditch was constructed above the waste piles.

The on-land "sub-aerial" tailing disposal method has been used in Australia, Africa and Great Britain. The tailings form a structurally stable mass that can withstand the largest earthquake in the area. The tailings pile is also faced by rip-rap to above the

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one in 200 year flood level in Myra Creek. The pile above this level will be sealed and revegetated.

Tailing water is bled off immediately together with any precipitation and collected by a specially designed under-drainage system. These waters are pumped to the Myra integrated water management system for treatment.

**ADDITIONAL INFORMATION**

There are almost 460 employees at the Myra Falls Operations of Westmin Resources Limited, most of whom live in Campbell River, Courtenay and surrounding areas. The approximate percentage of employees that work in various areas of the mine are: 15% at the Lynx Mine, 36.7% at the H-W Mine, 12% in the Mill, 25% at the Plant (Maintenance department). 6% in Administration, Warehouse and Purchasing, 1% in First Aid and Safety, 0.3% in Training, 3% in Engineering, and 1% in Geology. The majority of employees are transported by seven buses and several company light vehicles daily to and from the mine site from Campbell River and beyond.

Westmin purchases approximately \$10 million of services and supplies in this area and the payroll amount to \$36 million per year. The Company policy is to hire and buy locally, whenever possible, provided the product meets specifications and is competitive in price.

One other point Westmin feels very strongly about is safety. In Canada there is an annual award called the John T. Ryan Safety Award for underground metal mines and is awarded to the mine with the lowest accident frequency for the year. Westmin's Myra Falls Operations has won the B.C. & Yukon award in 1984, 1986 and 1991 and expects someday to win the National Award.

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GLOSSARY

GEOLOGICAL TERMS

WASTE ROCK	All rock which cannot be mined at a profit
ORE	Natural occurring minerals which can be mined at a profit
POLYMETALLIC ORE	Copper, zinc, gold and silver minerals are present in economic quantities. Pyrite content is low, assaying less than 20%.
BLEND ORE	Copper, lead, zinc, gold and silver minerals are present in economic quantities, but lead assays less than 0.2%. Pyrite content is high and assays more than 20% iron.
SULPHIDE	Mineral composed of metal and sulphur.
SPHALERITE	Zinc sulphide (ore mineral)
CHALCOPYRITE	Copper/Iron sulphide (ore mineral)
GALENA	Lead sulphide (ore mineral)
PYRITE	Iron sulphide (waste mineral)
FAULT	A fracture or fracture zone along which there has been displacement of the sides relative to one another.

MINING TERMS

SHAFT	A vertical excavation used for access and material transportation below the valley floor.
DRIFT	A horizontal tunnel driven underground.
STOPE	Any underground excavation made for the purpose of removing ore close to the surface.
OPEN PIT	A surface excavation made for the purpose of removing ore close to the surface.
FILL, BACKFILL	Any material used to refill a cavity caused by mining.