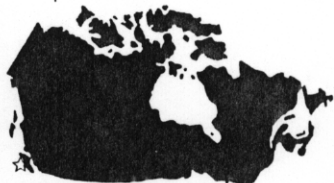


FORMIDABLE EXPERTISE



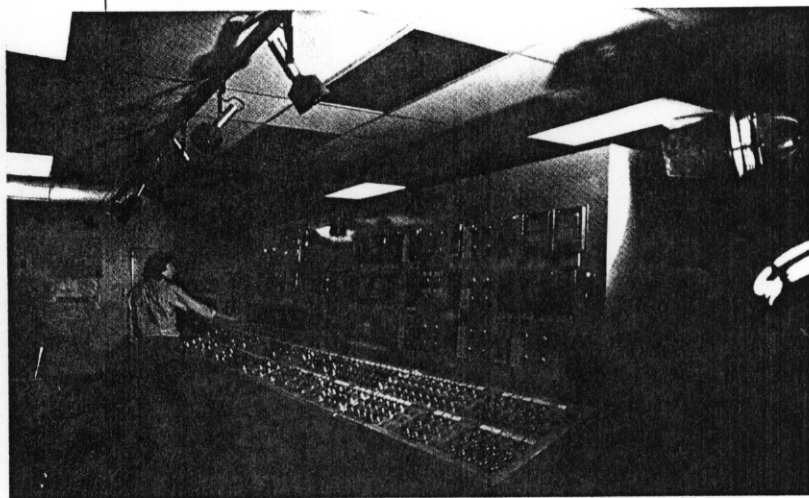
MineVisit

By David Duval

More than 700 people in and around the town of Campbell River on Vancouver Island make their living in Strathcona Provincial Park, some earning more than \$80,000 per year. These people aren't raking leaves or cleaning up campsites — using sophisticated equipment and techniques, they are mining one of Canada's richest poly-

ing for its mining operation were severely affected a few years ago by a controversial decision made by the British Columbia government.

The government announced plans to change the park boundaries and allow mining and logging in designated areas. It had previously agreed to hold public hearings on such changes, but the government eventu-



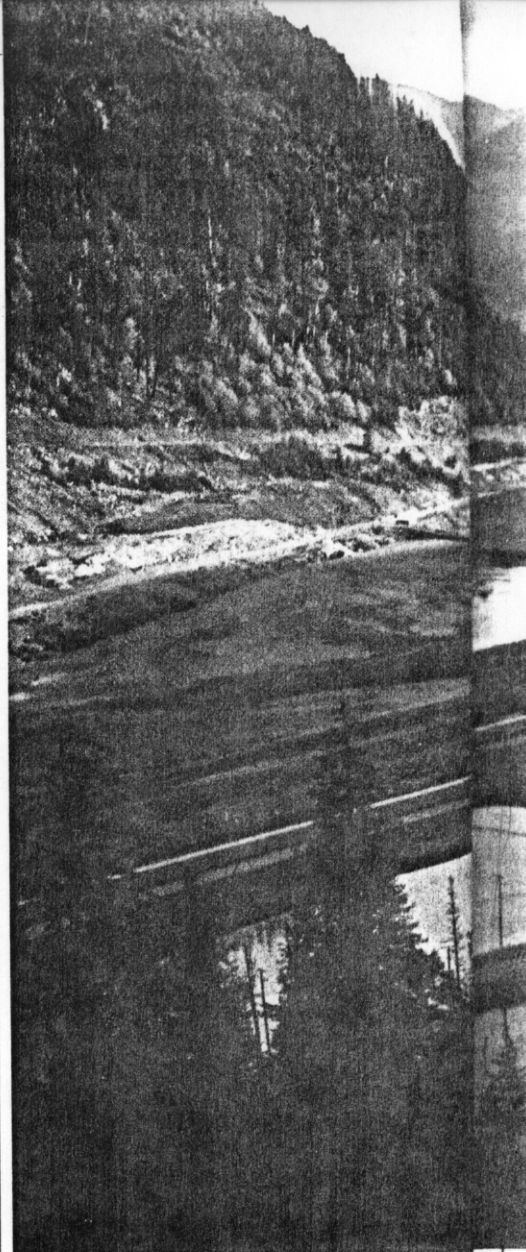
A recent expansion has made the Myra Falls mill on Vancouver Island one of the most modern in Canada.

metallic mineral deposits, Westmin Resources' Myra Falls complex, 55 miles west of Campbell River. Each day the underground mine delivers about 4,000 tonnes of ore to Westmin's recently expanded mill, which is among the most modern in the country.

Operating in the middle of a park hasn't been easy for Westmin, the surface operations of which cover a miniscule portion of the 1,200-sq-mi park. Indeed, company efforts to garner public support and understand-

ally made the decision arbitrarily, much to the chagrin of a strong environmental lobby in the region and to Westmin, which became embroiled in the controversy that followed.

After considerable flip-flopping, the boundary change proposal was abandoned and the government agreed with the environmental lobby that no industrial activity of any kind would be allowed in the park. Westmin, of course, could stay, but the company's activities will be limited to its present area.



Westmin, the Mining Association of Canada, and several smaller resource companies proposed a multiple land-use concept for such areas, which would take into account the economic value of the land. The government refused to consider this proposal.

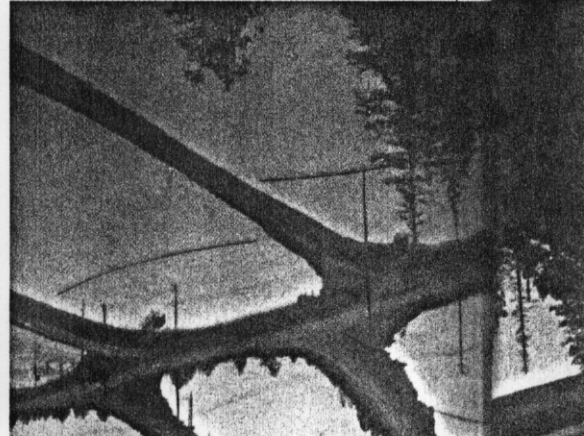
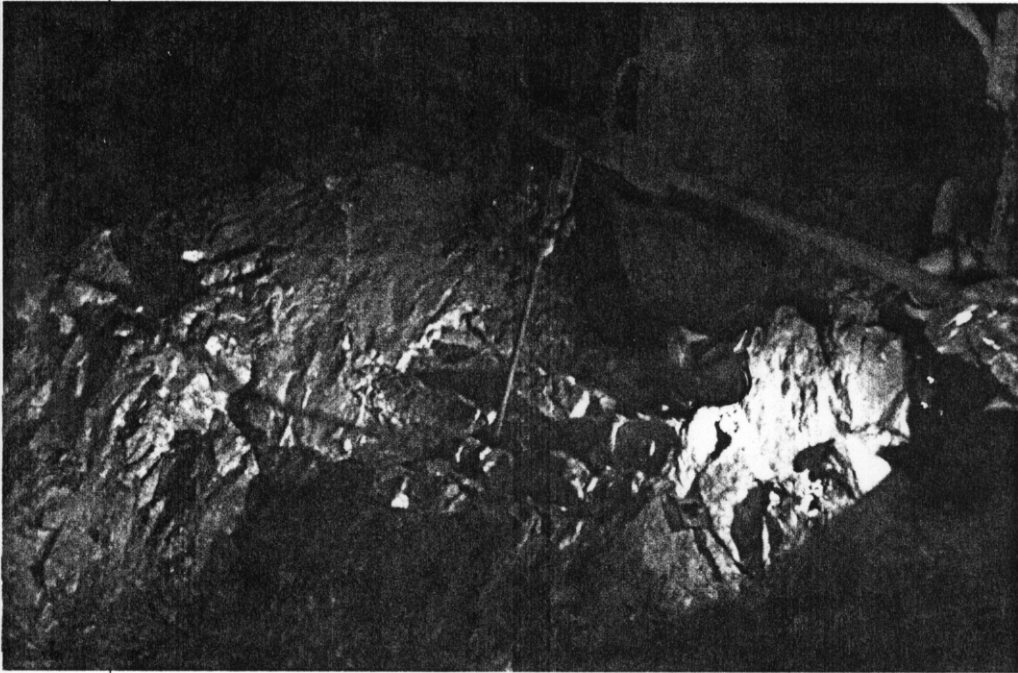
Although it must answer to three regulatory departments (environment, mines and parks), Myra Falls is highly efficient, with "leading edge" technology in several areas, including environmental protection. Protecting the environment has to be a major concern because the mine is near Buttle Lake, the water reservoir for Campbell River and headwaters for a commercial fishing industry. Westmin emphasizes that, through the mine's tenure, the water quality of the lake has consistently met federal government guidelines for the Protection of Fresh Water Aquatic Life.

Research is under way into acid

The company's formidable geological expertise enables it to predict the location of the H-W horizon in specific areas with a high degree of confidence. Recognizing paleo-troughs and ridges — critical features governing the location and extent of potential massive sulphide deposits — is less predictable, however. The H-W massive sulphide deposits occur in the Devonian age Myra formation of the Sicker Group volcanics. These massive sulphide deposits average more than 50% pyrite content and range in size from the 20-million-tonne main lens to the

at 12 million tons averaging 0.07 oz gold per ton, 1.1 oz silver, 2.4% copper, 0.36% lead and 5.3% zinc. This is sufficient for a 7-to-8-year mine life. A budget of \$6.5 million has been allocated for exploration work this year, most of it to evaluate the H-W north flank, immediately north and below the Lynx mine, and a portion of the gap between H-W and Lynx mines. The H-W horizon has already been intersected at depth north of the Lynx mine. In recent years, activity has been geared toward ore definition at the H-W mine, which supplies more than 90% of Westmin's mill feed.

mine drainage, a problem affecting several other mines in British Columbia, including the old Mt Washington property on Vancouver Island. Acidic run-off from Westmin's open pit operation, which is no longer in production, is being treated, but Westmin is seeking a permanent solution to the problem. Acid mine drainage results from the chemical oxidation of sulphides. (This process can be slow or fast, depending on the type of mineral dealt with.) Bacterial action then takes over, increasing the oxidation rate and level of acid production. These bacterial agents are difficult to eradicate once they are established, so an ounce of prevention in this case is probably worth more than a pound of cure. Environmental concerns aside, exploration is the key to maintaining and expanding the company's mine-able reserve base, which now stands



Achieving approval from a strong B.C. environmental lobby hasn't been easy. But water quality consistently meets governmental standards. Below: one of the three methods used to mine the H-W deposit.



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smallest north lens, at fewer than 500,000 tonnes.

The main lens is a flat-lying, dish-shaped deposit, ranging in thickness from 6.5 ft on the fringe to 215 ft locally in the core. Defined over a 4,000-ft strike length, it measures up to 1,150 ft wide. The lens is strongly zoned with a zinc-rich fringe and copper-rich core. Ore mineralization is primarily sphalerite and chalcopyrite with subordinate bornite, tennantite and galena. Minor amounts of native gold are also present.

Two hydro-electric generating stations supply about 14 MW of power to Myra Falls at a considerable cost saving over diesel-generated power. Diesel generators are available for emergencies, however. The Thelwood hydro plant (8 MW) is supplied with water from Jim Mitchell Lake, about three miles up Thelwood Creek from the plant. Water from the lake passes through a 2,500-ft-long tunnel before entering the 2.5-mile-long penstock that services the generating plant.

In October, 1988, a section of the tunnel roof collapsed, filling about 650 ft of it with sandy fault material. A decline adit was collared near the top end of the tunnel above the high water elevation of Jim Mitchell Lake; this was completed by early January, 1989. A 230-ft bypass tunnel was constructed around the caved area, which was sealed off by a bulkhead to prevent migration of debris into the new tunnel. Shotcrete was applied to the bypass tunnel to inhibit caving, and hydro power was restored on March 19.

Mining

Three different mining methods are employed at the H-W mine because of variable orebody geometry, grade distribution and ground conditions, as well as the need for high productivity. Among these are two variations of cut-and-fill (longitudinal and post pillar), along with blast hole and room-and-pillar mining methods. About 39% of all stope production comes from cut-and-fill post pillar, 37% from blasthole and/or sub-level retreat, 10% from longitudinal cut-and-fill, and 14% from room-and-pillar.

Load-haul-dump vehicles are used to transfer H-W stope material to ore passes and then to a 1,000-tonne surge bin. Because of variable stope grades, blending is required and this is accomplished by controlling tramming pat-

terns. Ore is crushed to -6 inches with an underground jaw crusher and then hoisted to surface in 10-tonne skips and conveyed to the mill.

The mine is highly mechanized and, with the exception of one single-boom hydraulic jumbo, drilling equipment is all pneumatic. The company has eight 2-boom Tamrock pneumatic jumbos, six 3-boom Tamrock pneumatic jumbos, and one 3-boom Tamrock pneumatic track jumbo. For longhole stoping, it has five Solo long hole drills. Mucking is done with eight Wagner ST3-5 Scooptrams and 14 Wagner ST5 Scooptrams. In hazardous areas, some of these vehicles can be operated by remote control.

Long waste hauls are handled by JDT haulage trucks; two explosives loading trucks are available for long hole and room-and-pillar blasts. Rock-bolting, pipe-hanging and the installation of ventilation ducting are han-

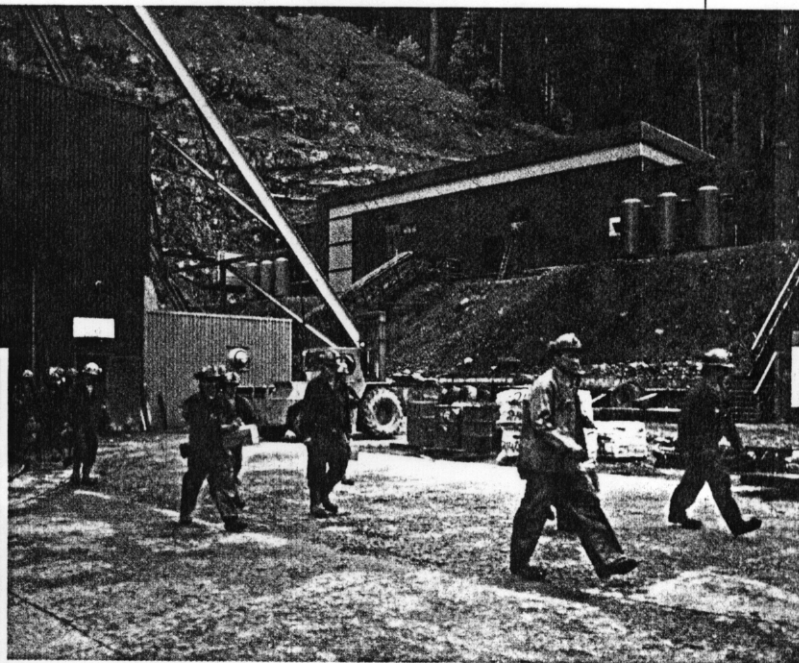
ing on the main haulage route were picked up easily. Apparently, a similar system is used at the Kidd Creek mine near Timmins, Ont.

Drill jumbos are used for mine development, stope preparation and production mining, while longhole drills have several applications, including production drilling and cable-bolting for ground support. This type of bolting, which involves pumping a cement grout into a hole containing a

mine.

Westmin has an elaborate backfill system for controlling ground movement. It consists of a de-sliming plant adjacent to the new mill, a reclaim/storage area at the north end of the tailings pond, and a backfill plant on surface just north of the H-W mine workings. Up to 3,000 dry tonnes of tailings can be handled by the fill system each day.

The concentrator has two parallel



An increased milling rate of 4,400 tons per day means more sampling for process control.

grinding and roughing circuits, each with a capacity of 2,000 tonnes per day. Each circuit has a fine ore bin feeding an open circuit rod mill and ball mill in closed circuit with a pair of cyclones. Independent fine ore storage and feeding systems were chosen for each grinding and rougher flotation circuit to maximize flotation flexibility due to the variability of H-W ore. Present operating practice is to mix ore types as much as possible and treat both flotation circuits as required.

Ore is conveyed from the underground to cone crushers where it is reduced to - 5/8 inches, then to rod and ball mills where the minerals are liberated in slurry form. This slurry is treated by a standard differential flotation method. Head grades are quite variable depending on which stopes in the mine are providing feed. Copper heads can vary from 1.2% to 4.5%, zinc heads from 2.5% to 10.5%, lead head grades from 0.3% to 1.1% and iron head grades from 10% to 38%.

Blending of the different ore types underground and in secondary/tertiary crushing is necessary to avoid

dled by a fleet of 14 scissor deck lift vehicles. The company is testing a rock-bolting jumbo as an alternative to the scissor lifts, which could eventually be phased out.

When *The Northern Miner Magazine* visited the mine, the company was also testing a closed circuit television system on one of its locomotives. The monitor is situated in the cab of the locomotive and the camera on the last car of the ore train. Both are enclosed in metal boxes. The system seemed to work quite well and the reflective vests worn by people work-

steel cable, has proven very effective at the mine, although it is expensive. Cable bolts are used almost exclusively in longhole stopes where dilution and safety are key concerns. Conventional rock bolts, rebars, split sets, and wire meshing are also installed during the course of mining and development.

Ground control programs are sometimes custom-designed for specific areas by Westmin's geotechnical department. Data are collected by stressmeters, extensometers, earth pressure cells and single-wire closure cells that are set up throughout the



Charles Stafford, general manager of the Myra Falls operation, which has recently undergone a 4,000-tonne-per-day mine, mill and plant expansion.

tion to the pump box. Cyclone overflow is 75% passing 75 microns. Copper scavenger and zinc scavenger concentrates are both reground in cir-

cuits of the same basic design.

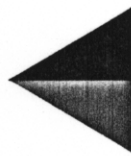
To provide maximum operational flexibility, the concentrator was designed with two parallel roughing and zinc-cleaning circuits. Flotation performance is monitored in 23 different streams by a Courier 300 On-stream analyser. Assays of copper, lead, zinc and iron are displayed on a control room monitor every five minutes with an additional sample updated every 15 minutes. Hourly averages are printed for a permanent record.

Flotation uses Outokumpu OK8 (300-cu-ft) cells for all functions with

severe fluctuations in feed grades. But this problem is expected to diminish as more working places become available in the H-W mine. For the expansion to 4,400 tons per day, Westmin's concentrator modifications were primarily in the flotation area. Materials-handling capability was increased and all concentrate thickeners were retrofitted with high-capacity feed systems. The grinding circuit was fitted with expanded cycloning capacity and rod mill (8x12 ft) speed was increased to 76% critical speed from 66%. Because of the extra power requirement, the rod mill motor size was increased to 400 from 350 HP.

Two additional Larox PF32 pressure filters (see Specs department, in this issue) were added to increase dewatering capability and ensure sufficient availability for maintenance. By July, 1988, the concentrator capacity had been increased to 4,000 tonnes per day.

The plant's 11.5x15-ft ball mills are driven with 1,100-HP, synchronous motors and are charged with 2-ft balls. Grinding media addition is determined by the power draw of the drive motor. The ball mills are rubber-lined. Rod mill discharge is 80% passing 425 microns. The rod mill liners are of the Noranda Wave design and have a 4-inch lift when installed. Rod and ball mill discharges are pumped to a pair of 20-inch cyclone classifiers, and an analog control loop maintains the cyclone feed density using water addi-



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In 1988, Westmin produced 118,790 tonnes of copper concentrates and 96,640 tonnes of zinc concentrates.

the exception of one cell used as a zinc cleaner circuit scavenger. The level control unit uses a float to determine cell level and adjusts the position of the discharge dart with an air-operated positioner.

Westmin is installing a new process control system to optimize the performance of the concentrator. Significant cost savings are expected in a

number of areas including reagent consumption. The highly sophisticated Foxboro system, which displays data on 13 graphic displays, will be introduced on a staged basis, the company said.

Mill tailings are gravity-fed to a backfill cyclone plant and backfill sand is produced by single-stage classification. The cyclone solids split is 50% to

overflow and 50% to underflow. Backfill sand is either pumped directly to the mine's backfill tanks for immediate placement or to a storage facility for reclaim as required.

Thickener underflow is pumped one mile to a tailings storage area while the overflow is deposited in the tailings area using a sub-aerial technique. □

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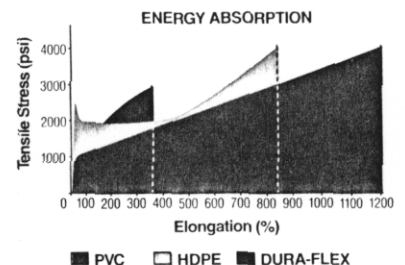
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