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MINFILE Record Summary

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 File Created: 28-May-1988 by Eileen Van der Flier Keller (EVFK)
 Last Edit: 04-Jul-2013 by Nicole Barlow (NB)

SUMMARY [Summary Help](#)

Name	MERRITT COAL, MERRITT, COAL GULLY, MIDDLESBORO, NORMANDALE, COLDWATER HILLS, DIAMOND VALE	NMI Mining Division	Nicola
Status	Past Producer	BCGS Map	092I017
Latitude	050° 06' 03"	NTS Map	092I02E
Longitude	120° 44' 38"	UTM	10 (NAD 83)
Commodities	Coal	Northing	5552279
Tectonic Belt	Intermontane	Easting	661343
		Deposit Types	A04 : Bituminous coal
		Terrane	Overlap Assemblage

Capsule Geology

The Merritt Coal property is located 1 kilometre south of Merritt and approximately 250 kilometres east of Vancouver.

The Merritt coalfield consists of several areas of isolated Tertiary sedimentary outcrops that occur with a 15-kilometre radius and cover an area of 105 square kilometres. More recent volcanics overlie some of the Tertiary sediments. Faulting and rapid lateral changes in stratigraphy have made seam correlation and underground mining very difficult. Up to ten coal seams containing high-volatile bituminous B-rank coal occur in the Eocene Coldwater Formation (Princeton Group), interbedded with sandstone, shale and conglomerate. The timing of the coal deposition coincides with the Laramide orogeny. Due to the instability of the depositional environment, coal seams can reach extraordinary thicknesses but exhibit extreme variation over short distances with seams tending to merge, split and exclude lots of partings. This has the effect of creating small areas with excellent coal development conditions. The seam numbers and thicknesses vary across the Merritt coalfield with seams lensing out into shale laterally and commonly containing seam splits. The number and thickness of coal seams decreases slightly from Coal Gully Hill (MINFILE 092ISE066) to Coldwater Hill (MINFILE 092ISE081), and significantly more toward the Normandale mine (MINFILE 092ISE061) in the east and the Sunshine mine area to the north of the Nicola River.

The structure of the basin in the southwest (Middlesboro–Coal Gully area) consists of a series of northwest-trending folds and faults. The faults dip to the southwest and northeast. In the Coldwater Hill area, the structure is less complicated with some broad flexures and a northeast-trending anticline disturbing the predominantly northeast dips (20 to 35 degrees) of the strata. In the Diamondvale area, the strata are monoclinical, striking 235 degrees and dipping approximately 27 degrees southwest toward Coldwater Hill. A broad syncline might separate these two areas. In the Hamilton Creek area, a northeast-trending syncline is present, while to the north at the Normandale mine, strata strikes north and dips close to vertical. Both the west and east margins of the basin appear to be structurally most complex. The basin overlies a Triassic volcanic surface and is partially overlain by younger basalts.

The Merritt coalfield underlies the same flat-bottomed valley that hosts the city of Merritt. Coal seams outcrop in the southwest and northeast regions of the coalfield. The best outcrop of the coal measures occurs in the Coal Gully area (MINFILE 092ISE066), where four seams are present in a 229-metre section. In the adjacent Middlesboro mines (Coldwater Hill, MINFILE 092ISE081), up to eight seams ranging from 0.76 to 7.9 metres thick were recognized in 235 metres of section. The quality of coal has been rated as high-volatile B bituminous by the American Society for Testing and Materials. The coal is not coking coal on its own but has some coking potential if mixed with other coals. The processed quality of the coal is 2.7 per cent moisture, 9.5 per cent ash, 37.4 per cent volatile matter, 50.4 per cent fixed carbon, 0.7 per cent sulphur and with a calorific value of 7200 kilocalories per kilogram.

According to an evaluation by Imperial Metals in 1983, Coal Gully Hill was the only location on the Merritt coal property with enough volume to consider surface mining. The Crows Nest pit was tentatively delineated in the northern foreground of Coal Gully Hill. The pit contained an estimated 4.63 million tonnes (5.1 million short tons) of indicated reserves. Another potential pit, the Prospect pit, was identified further up Coal Gully Hill to the west of the Crows Nest pit. No holes had been drilled in the area but geological projections made from old workings and surface exposures gave an estimated inferred reserve of 6.3 million tonnes (Coal Assessment Report 762).

Other small mines within the Merritt coalfield include the Normandale mine (MINFILE 092ISE061) to the east and the two Sunshine mines to the north. In the Normandale area (MINFILE 092ISE061), two holes drilled by Crows Nest Resources in 1982 intersected six and eight coal seams ranging in thickness from 0.2 to 1.6 metres and 0.5 to 2 metres, respectively. A small tonnage was mined from this area in the early 1900s.

Three coal seams outcrop in the Coldwater Hill area and up to six intersections were encountered in drillholes. In addition, several shaly coal units are present. The Number 2 mine (MINFILE 092ISE081) is located here. Seven seams were mined by Middlesboro Collieries on Lot 166 (containing MINFILEs 092ISE066, 092ISE141 and 092ISE081 and now contained within Coal License 369548). All of the mines started from coal outcrops and did not require shafts to be sunk. Mining was carried out in all seams in the western portion of Lot 166, but in the northeast only seams Numbers 2 and 3 were worked while the main lower seams remained untouched. The seams and mines were numbered in the order in which they were discovered and worked. In stratigraphic section, the seams were (in descending order) Numbers 2, 3, 6, 8, 4, 5 and 7.

The seams contained a total coal thickness of 3.44 metres (37 feet). The Number 2 seam was 1.52 metres (5 feet) thick and worked in the Number 2 and Number 2 North mines. 21.34 metres (70 feet) below the Number 2 seam, the Number 3 seam was 0.76 metres (2.5 feet) thick and worked in the Number 3 mine. 17.98 metres (59 feet) below the Number 3 seam, the Number 6 seam was 1.22 metres (4 feet) thick and worked in the Number 6 section of the Number 4 and Number 3 North mines. Sixty four metres (210 feet) below the Number 6 seam, the Number 8 seam was 2.13 metres (7 feet) thick and worked in the Number 8 and 9 sections of the Number 4 mine. 54.86 metres (180 feet) below the Number 8 seam, the Number 4 seam was 3.048 metres (10 feet) thick and worked in the Number 7 and Number 4 East mines and the Number 4 section of the Number 4 mine. 36.58 metres (120 feet) below the Number 4 seam, the Number 5 seam was 1.37 metres (4.5 feet) thick and worked in the Number 3 East mine and the Number 5 section of the Number 4 mine. 54.86 metres (180 feet) below the Number 5 seam, the Number 7 seam was 4.27 metres (14 feet) thick and worked in the Number 1 and Number 3 West mines.

East of the town of Merritt and south of the Nicola River are the Diamondvale Numbers 3 and 4 mines (MINFILE 092ISE142). Six coal seams occur in 94 metres of strata, of which two were mined in the abovementioned mines.

The Geological Survey of Canada first reported coal in the area between 1877 and 1878. From 1892 to 1904, three holes were drilled and coal outcrops along the Coldwater River were mined. In 1906, the rail connection to the main TransCanada rail line was completed and regular commercial coal production began. That year, the Nicola Valley Coal and Coke Company and the Diamondvale Coal & Iron Company began coal mining operations in the area. Nicola Valley Coal founded the Middlesboro Colliery approximately 1.6 kilometres southwest of Merritt. Most of the coal produced was sold as railroad coal. The Coldwater River formed the property boundary between the Middlesboro Collieries and the Diamondvale Coal & Iron Company holdings. The Middlesboro Collieries Number 2 mine in the Number 2 seam on the western end of Lot 166 (containing MINFILES 092ISE066 and 092ISE081 and now contained within Coal License 389548) was driven toward the Coldwater River. The mine reached the property boundary at several points and was still in coal at these locations. Even though a significant amount of coal remained, the mine was eventually abandoned and allowed to fill with water. Middlesboro Collieries operated two mines on Coldwater Hill until 1944. The Diamondvale Coal & Iron Company sank several shafts on Lot 122 (northeast of Lot 166) near the boundary of the Number 2 mine belonging to Middlesboro Colliery. Coal was reached but the mine was abandoned in favour of smaller seams on the eastern side of the basin. Seams at the Diamondvale operation were mined intermittently, but as of 1948 total production was less than 45 360 tonnes (50 000 short tons; Coal Assessment Report 150).

In 1910, the Coal Hill Syndicate began mining operations on Lot 1227 on the western boundary of the Middlesboro Colliery. Mining took place in the same seams as the Middlesboro mines. Yearly production was entirely dependent on railroad demands and in 15 years the mine produced more than 453 590 tonnes (500 000 short tons) of coal. Pacific Coast Coal Company later sank a shaft immediately north of Lot 166. A coal seam was reached within 30.48 metres (100 feet) of the surface; however, the coal was not of satisfactory quality or thickness and only a minimal amount of work was completed before the operation was abandoned.

After 1945, Samuel Gerrard continued small-scale mining on Coldwater Hill. In an effort to rejuvenate coal mining in the Merritt area, the BC Department of Mines sponsored a 1946 drilling program that targeted the area between Coal Gully and Coldwater hills. Results of this drilling proved the continuity of coal measures between the two hills and on the eastern side of the Coldwater River. In the 1940s, Coldwater Coal Mines acquired the lots formerly owned by the now-dissolved Middlesboro Collieries and Diamondvale Coal companies. The lots formed a continuous property running approximately northeast to southwest through the Merritt coalfield. Coldwater Coal Mines dewatered the abandoned Number 2 mine on Lot 166 to within 213.36 metres (700 feet) of the portal. Very little caving was encountered and moderate amounts of coal were successfully recovered from the pillars. By 1948, a total of more than 2 million tonnes of coal had been produced by coal seams mined on the southwest side of the basin. Most of the coal was produced from several medium-sized mines rather than a single large operation. One mine projected more than 609.6 metres (2000 feet) from the portal, but most extended a much smaller distance. Seven larger coal mines and numerous small coal mines were in operation in the area. The last coal mine in the area closed in 1963.

Imperial Metals acquired Lot 166 from Samuel Gerrard and in 1960 drilled 16 rotary drill holes totalling 1157 metres on Coal Gully and Coldwater hills. Two of the sixteen holes were later deepened by diamond drilling. From 1968 to 1969, Sumicoll Consultants Company Limited of Japan Co. evaluated the property, providing an estimate of 35 million tonnes indicated resource on Coldwater Hill and recommending an underground mining operation. A detailed coal-sample analysis was conducted in 1970.

Shell Canada Resources and its subsidiary company, Crows Nest Resources, optioned the property from Imperial Metals from 1978 to 1982. During this time, 24 holes were drilled, most on the north end of Coal Gully Hill. From 1978 to 1979, exploration work included detailed geological mapping, bulldozer trenching on coal occurrences and a location survey that included all locatable coal occurrences, drillholes and mine portals. Geophysical surveys, including reflection and refraction seismic and resistivity surveys, were conducted on Coal Gully and Coldwater hills. Results from the surveys were considered questionable. During this time, 3877 metres were drilled in 20 rotary drill holes. All but one of the holes were drilled on Coal Gully and Coldwater hills. Most of the drilling was completed on the south end of Coal Gully Hill and on the flat foreground where a small potential pit had been delineated. The delineated pit contained an estimated 5.1 million tonnes of geological in-place coal reserves. At the request of the District Mining Inspector, Crows Nest Resources bulldozed all the old portals that could be found on the property in 1979. In 1980, Crows Nest Resources drilled three holes totalling 663 metres in the Normandale area without encountering any coal seams of commercial mining potential.

As of 1983, coal was reported to be burning underground on Coldwater Hill and hot steam was escaping from shafts on Coal Gully Hill, although coal exposed by old mining operations was standing well at many other locations. In 1991, the BC Geological Survey drilled four holes. Analysis of the drilling results determined that the Merritt coalfield had good potential for methane gas.

Forum Ventures Limited acquired a 50 per cent interest in the property from Imperial Metals Corporation in 2001. Shortly thereafter, Forum Ventures acquired additional claims in the vicinity of the property, including the Diamondvale property. Forum intended to investigate coalbed methane and conventional coal mining opportunities. At the time of acquisition, the property was in the very early stages of evaluation for coalbed methane potential. Shortly thereafter, the company changed its name to Forum Development Corporation. By early 2002, Forum had acquired 100 per cent interest in the Merritt coal property. In 2003, Forum retained Westwater Mines Limited to guide coalbed methane activities on the property. A Notice of Work and Reclamation was submitted later that year, which proposed a work program consisting of three drillholes totalling 962 metres to test the full thickness of coal measures in the Coldwater Hill area and assess the potential for coalbed gas production and coking blend or thermal coals. In 2004, the company had initiated a baseline ground-water survey and planned to drill a 455-metre borehole to test the potential quantity and flow rates of natural gas from coal seams and to recover samples for coal quality and gas desorption testing. By 2006, Forum Development Corporation had ceded their interests in the property. As of 2010, the Merritt Coal property was owned and operated by Robert Frederick Weicker.

Between 1906 and 1963, approximately 2.6 million tonnes of coal were produced from underground mining operations in the area (Coal Assessment Report 762). Approximately 80 per cent of the coal production in the area occurred at Coal Gully Hill. From 1932 to 1936, Middlesboro Collieries produced 124 150 tonnes (136 852 short tons) of coal (MacDonald, 1936). Between 1906 and 1944, Middlesboro Collieries was able to recover more than 9071 tonnes (10 000 short tons) of coal per 0.4 hectares (1 acre) of ground broken (Coal Assessment Report 150). In 1983, an unofficial resource estimate indicated 11.4 million tonnes (5.1 million tonnes of indicated and 6.3 million tonnes of inferred in-place reserves) of surface resource at Coal Gully Hill and 120 million tonnes (40 million tonnes of indicated and 80 million tonnes of inferred in-place reserves) of underground resource in the Coal Gully Hill, Coldwater Hill and Diamondvale areas (Coal Assessment Report 762). In 1989, a resource estimate for the Merritt coalfield (not National Instrument 43-101 compliant) was released stating measured geological reserves of 10 million tonnes, indicated reserves of 20 million tonnes and inferred reserves of 40 million tonnes of high-volatile bituminous B-rank coal, respectively (Open File 1992-1; Geological Survey of Canada, Paper 89-4). The predominant rank of coal in the Merritt coalfield is high-volatile A to C bituminous coal.

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- GSC OF 980
- GSC MAP 886A
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PR REL Forum Ventures Limited, Oct. 2, 2001; Forum Development Corporation, Nov. 27, 2001; Mar. 7, 2002; Jan. 17, Jul. 4, 2003;
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As of 1983, coal was reported to be burning underground on Coldwater Hill and hot steam was escaping from shafts on Coal Gully Hill, although coal exposed by old mining operations was standing well at many other locations. In 1991, the BC Geological Survey drilled four holes. Analysis of the drilling results determined that the Merritt coalfield had good potential for methane gas.

Forum Ventures Limited acquired a 50 per cent interest in the property from Imperial Metals Corporation in 2001. Shortly thereafter, Forum Ventures acquired additional claims in the vicinity of the property, including the Diamondvale property. Forum intended to investigate coalbed methane and conventional coal mining opportunities. At the time of acquisition, the property was in the very early stages of evaluation for coalbed methane potential. Shortly thereafter, the company changed its name to Forum Development Corporation. By early 2002, Forum had acquired 100 per cent interest in the Merritt coal property. In 2003, Forum retained Westwater Mines Limited to guide coalbed methane activities on the property. A Notice of Work and Reclamation was submitted later that year, which proposed a work program consisting of three drillholes totalling 962 metres to test the full thickness of coal measures in the Coldwater Hill area and assess the potential for coalbed gas production and coking blend or thermal coals. In 2004, the company had initiated a baseline ground-water survey and planned to drill a 455-metre borehole to test the potential quantity and flow rates of natural gas from coal seams and to recover samples for coal quality and gas desorption testing. By 2006, Forum Development Corporation had ceded their interests in the property. As of 2010, the Merritt Coal property was owned and operated by Robert Frederick Weicker.

Between 1906 and 1963, approximately 2.6 million tonnes of coal were produced from underground mining operations in the area (Coal Assessment Report 762). Approximately 80 per cent of the coal production in the area occurred at Coal Gully Hill. From 1932 to 1936, Middlesboro Collieries produced 124 150 tonnes (136 852 short tons) of coal (MacDonald, 1936). Between 1906 and 1944, Middlesboro Collieries was able to recover more than 9071 tonnes (10 000 short tons) of coal per 0.4 hectares (1 acre) of ground broken (Coal Assessment Report 150). In 1983, an unofficial resource estimate indicated 11.4 million tonnes (5.1 million tonnes of indicated and 6.3 million tonnes of inferred in-place reserves) of surface resource at Coal Gully Hill and 120 million tonnes (40 million tonnes of indicated and 80 million tonnes of inferred in-place reserves) of underground resource in the Coal Gully Hill, Coldwater Hill and Diamondvale areas (Coal Assessment Report 762). In 1989, a resource estimate for the Merritt coalfield (not National Instrument 43-101 compliant) was released stating measured geological reserves of 10 million tonnes, indicated reserves of 20 million tonnes and inferred reserves of 40 million tonnes of high-volatile bituminous B-rank coal, respectively (Open File 1992-1: Geological Survey of Canada, Paper 89-4). The predominant rank of coal in the Merritt coalfield is high-volatile A to C bituminous coal.

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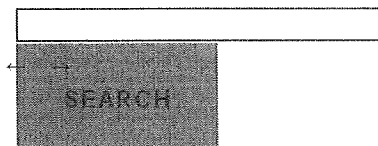
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Yale Environment 360



Teck Resources' Greenhills mine in British Columbia's Elk Valley. CREDIT: GARTH LENZ

From Canadian Coal Mines, Toxic Pollution That Knows No Borders

Massive open-pit coal mines in British Columbia are leaching high concentrations of selenium into the Elk River watershed, damaging fish populations and contaminating drinking water. Now this pollution is flowing across the Canadian-U.S. border, threatening the quality of U.S. waters.

BY CHLOE WILLIAMS

APRIL 1, 2019

Paul Samycia was in a boat floating on British Columbia's Elk River when he reeled in a strange-looking trout. One side of the fish looked like any other cutthroat trout – black speckles, orange belly, olive back. The other side of the fish had a hole in its face. Its gill cover, the flap on the side of its head, was partially missing.

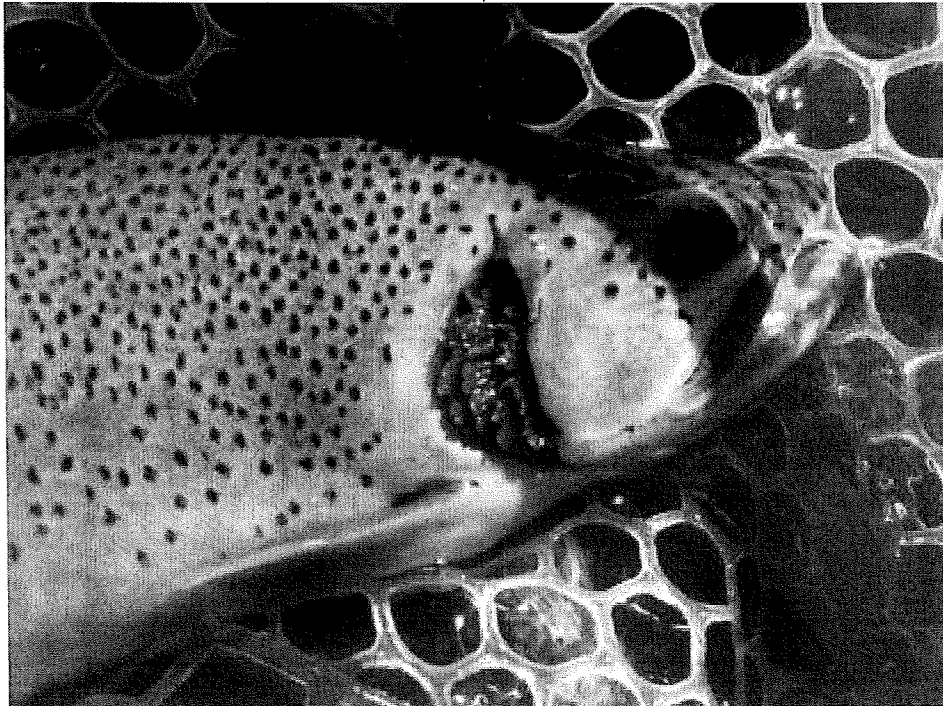
Samycia snapped a photo of the fish. For the last four years, Samycia, the owner of Elk River Guiding Company, a fly-fishing shop and outfitter based in Fernie, British Columbia, has been collecting photos of misshapen catches. Some have shortened gill plates. Others have snubbed noses, making them look like they swam into a rock. He and fellow guides have amassed nearly 40 photos.

Samycia started noticing the deformities about 10 years ago, but the sightings are becoming increasingly common. Scientists have found substantial evidence that the cause is selenium, a trace element, leaching from coal mines in the Elk River watershed. A 2013 study found heightened selenium concentrations downstream of mines in the Elk Valley, and a 2014 report linked high selenium to a slew of damaging ecological consequences in the river, including malformations and reproductive failure in fish.

Environmental groups now are raising concerns about harm to the ecosystem, ranging from the Elk River's tributaries to waters downstream that cross into the United States. They also point to risks for human health in communities nearest to the mines, where selenium is contaminating drinking water. Meanwhile, tensions on both sides of the border are escalating: U.S. members of a binational water regulator sounded alarm bells last year, charging that Canadian members were suppressing scientific evidence related to the selenium pollution and its risks to the ecosystem and human health. The situation in the Elk has been called "a monumental selenium spill in slow motion."

“We have one of the biggest selenium contamination issues in the world taking place in the Elk River,” says one biologist.

The destructive consequences of selenium pollution are well documented in North America. In the 1970s, agricultural runoff carried high selenium loads into a reservoir in California's San Joaquin Valley, causing deformities in fish, reptiles, and birds. In the early 2000s, a vast mountaintop removal mining operation in West Virginia wrecked ecosystems in the Mud River. The problem in the Elk Valley is one of the most current and pressing examples. “We have one of the biggest selenium contamination issues in the world taking place in the Elk River,” says Erin Sexton, a biologist at the University of Montana who has been studying the region for nearly 20 years. It's also one of the few cases to extend beyond borders. Now, scientists, conservation groups, industry, and government organizations from both Canada and the U.S. are trying to find a solution to one of the most complex, far-reaching selenium leaks either country has ever seen. The Elk River begins its journey in the Canadian Rockies and flows southwest for 140 miles through meandering oxbows before reaching Lake Koocanusa and the Montana border. Miners have excavated coal from the Canadian side of the watershed since the 1800s. In the past 40 years, large-scale, open-pit mining has come to dominate the region – a technique that involves stripping away layers of rock to get at coal deposits deeper in the earth.



A deformed cutthroat trout with its gill cover missing, found in the Elk River downstream of several major coal mines. COURTESY OF PAUL SAMYCIA

Teck Resources, a Canadian mining company and the world's second largest exporter of steelmaking coal, operates five open-pit coal mines within the watershed. These mines are some of the biggest in Canada. Together, they have the capacity to produce more than 21.7 million tons of metallurgical coal, an essential ingredient in producing steel from iron ore. To get at the coal, the company uses a technique called cross-valley fill, which in practice, looks a lot like mountaintop removal mining. Workers dig into hillsides, creating massive, terraced craters - holes so big they make 550-ton trucks look like toys. They separate the valuable coal from the unwanted rubble and dump the debris into waste piles throughout the valley. Scratching away at the surface day and night, the company has moved enough earth to flatten mountains, all while filling valleys with massive heaps of rock.

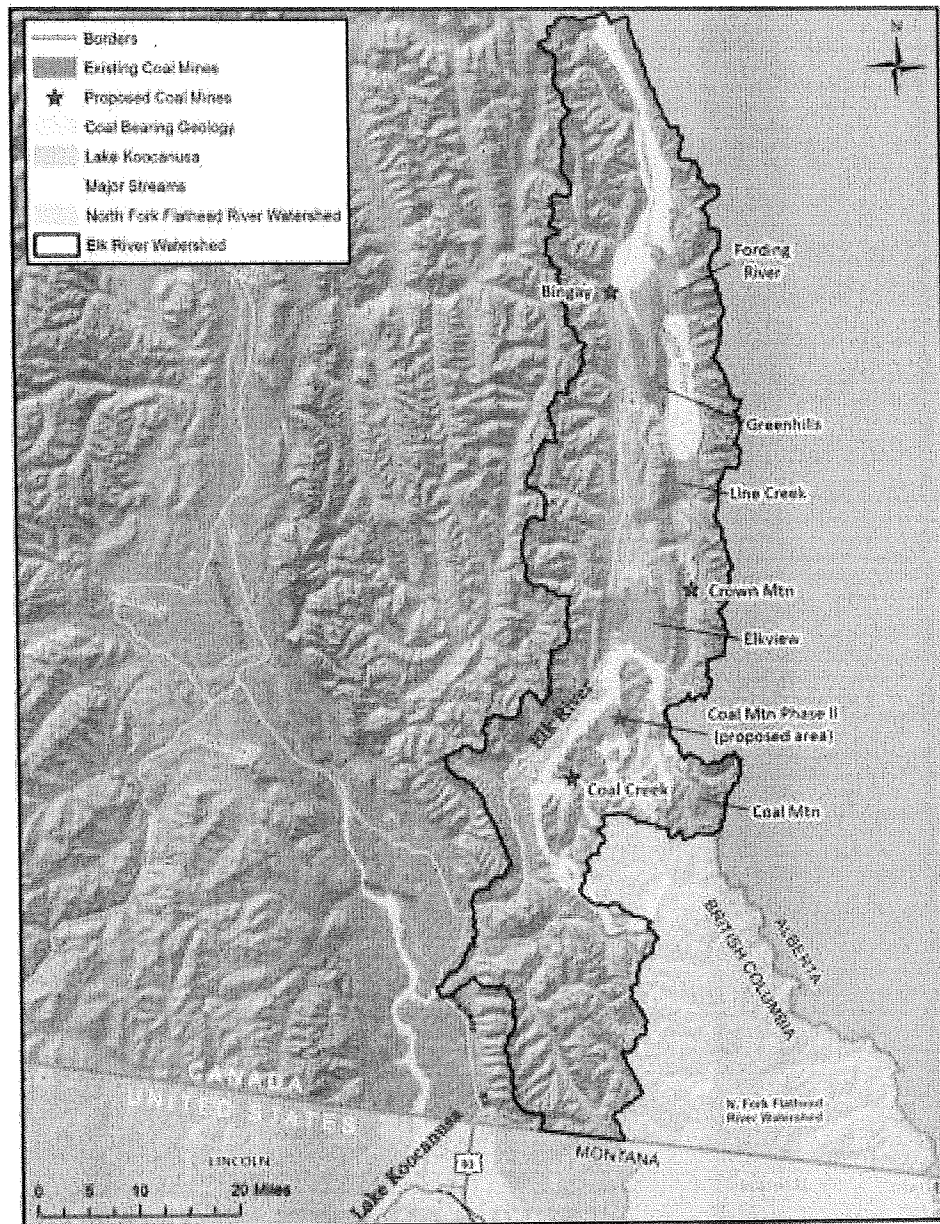


ALSO ON YALE E360

Leveling Appalachia: The legacy of mountaintop removal mining. Watch the documentary.

The piles of rubble are the source of the selenium problem. The trace element is naturally occurring and often accompanies the same geological formations as coal. When exposed to water and air, the element seeps out of rock and soil. In small

amounts, selenium is necessary for biological function. At higher concentrations, however, it can become harmful. That's the "paradox of selenium," says Dennis Lemly, a retired selenium ecotoxicology expert who used to work as a researcher for the U.S. Forest Service and Wake Forest University in North Carolina. "Just a few times more than is required for normal health can be toxic." In humans, chronic exposure to high selenium concentrations can cause nausea, fatigue, skin lesions, and neurological disorders. In other animals, the high levels of the element have been shown to cause liver damage, paralysis, and even death.



Selenium from coal mines along the Elk River and its tributaries travels more than 100 miles to Lake Koocanusa and into Montana. ERIN SEXTON / UNIVERSITY OF MONTANA

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In Sparwood, a community of 3,490 people less than two miles from one of Teck's mines, selenium in drinking water is reaching concerning levels. The town, located within the traditional territory of the Ktunaxa Nation, pulled one of its water wells offline last spring when selenium exceeded British Columbia's drinking water standard of 10 micrograms per liter (selenium has been measured as high as 13.5 micrograms per liter, District of Sparwood records show). Last spring, Teck issued a statement warning landowners and farmers that "some mine-related constituents may be elevated." Company testing found that selenium levels in four private wells exceeded provincial standards. Teck did not comment on the specific selenium concentrations in these wells.

In an emailed statement, Chris Stannell, a company spokesperson, wrote that Teck has worked with governments, scientists, and First Nations to develop a management plan to address the selenium issue and is "dedicating significant resources to taking the steps necessary to achieve the objectives" laid out in that plan.

In the meantime, Sparwood has two other wells to provide residents with clean drinking water, and Teck is now financing the construction of a new well to replace the tainted one, according to Sparwood Mayor David Wilks. The company has also been supplying bottled water to landowners whose private wells contain selenium levels exceeding British Columbia's standard.

British Columbia's guideline for the protection of aquatic life is 2 micrograms per liter. The U.S. Environmental Protection Agency's standard is 3.1 micrograms per liter in rivers and 1.5 in lakes. In the Elk Valley's waters, selenium has been recorded at 50 to 70 micrograms per liter and in some cases, as high as 100 micrograms per liter.

Selenium levels were at least seven times higher in the Elk's waters below mines than above them.

Those high selenium levels have had major repercussions on the watershed, Sexton, of the University of Montana, says. "The impacts are pretty extensive." She and her colleagues conducted one of the first publicly available scientific studies showing that mining in the Elk Valley was detrimental to the river's ecosystems. They collected ecological and water quality data in both the Elk and its neighboring watershed, the Flathead, which is considered relatively pristine. Sexton was baffled by the differences she saw. Selenium levels were at least seven times higher in the Elk's rivers below mines than above them or in the Flathead, according to a 2013 report she published. The researchers also found reduced algae and invertebrate diversity in the Elk compared to the Flathead – a sign that selenium pollution was killing off sensitive species.

Algae and invertebrates form the base of the food web in a river system. The selenium they accumulate in their tissues gets transferred up the food chain. In

fish, the element tends to concentrate in females' eggs, either killing juvenile fish or causing major birth defects. "Then all of a sudden the fish start disappearing, and in a couple of years, they're all gone," says Richard Hauer, a now-retired limnologist from the University of Montana who co-authored the study with Sexton. If you weren't paying attention to the early warning signs, you might not notice a selenium problem until it's too late, he says.

In the Elk Valley, scientists have been paying attention to the warnings. A 2014 review by Lemly, the selenium ecotoxicology expert, details evidence of selenium poisoning in fish, including telltale signs such as twisted spines and cranial deformities. Environment Canada, the federal agency that oversees environmental enforcement, asked Lemly to conduct the review as part of its investigation into selenium pollution coming from Teck's mines.



The Upper Fording River, a tributary where selenium levels are some of the highest in the Elk watershed. COURTESY OF LARS SANDER-GREEN / WILDSIGHT

Lemly's conclusions were unequivocal: Selenium levels in fish eggs and in surface waters are beyond those known to cause reproductive failure, he writes. In one of the Elk's tributaries with the highest selenium concentrations, the Upper Fording River, he estimates that the element is killing nearly half of juvenile fish – more than 180,000 fish each year. The Upper Fording is also home to a genetically pure and distinct population of westslope cutthroat trout (*Oncorhynchus clarkii lewisii*), which is a species of special concern in Canada. Lemly calls the fish a sentinel species. "As they go, the aquatic system goes," he says.

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The Upper Fording River is now closed to angling due to uncertainties about the viability of the cutthroat population. Meanwhile, questions remain about health risks linked to eating fish from river. “It’s not an area that’s being that well researched,” says Lars Sander-Green, an analyst with Wildsight, a local environmental group. Although not specific to the Elk watershed, a 2017 study conducted by the Canadian government found that subsistence fishermen and First Nations who eat fish caught downstream from sources of pollution have high selenium blood concentrations. Prolonged exposure to selenium in humans can cause selenosis, a condition linked to hair loss, skin lesions, neurological disorders, and intestinal problems.

A few miles north of the Montana border, water from the Elk River spills into Lake Koocanusa and drifts across the U.S. border to Libby Dam. There too, selenium levels have increased. David Naftz, a hydrologist with the U.S. Geological Survey (USGS), is part of a team collecting samples of water, sediment, fish tissue, and eggs to better understand how selenium moves through the ecosystem. “The large amount of selenium coming into Lake Koocanusa is concerning,” Naftz says. There’s an influx of upwards of 14,000 kilograms per year – seven times more than Utah’s Great Salt Lake where USGS scientists reported selenium in the eggs of eared grebes and black-crowned night herons approaching levels that cause reproductive failure.

Regulating an environmental problem that affects international waters is extremely complicated, experts say.

Regulating an environmental problem that affects international waters is extremely complicated, experts say. In Montana, selenium standards are used to set discharge limits on permits. British Columbia employs a similar scheme. But conservation groups say the system on the north side of the border is broken. “We don’t have anything enforceable,” Wildsight’s Sander-Green says. Water quality guidelines in British Columbia are just that – guidelines, not laws.

The government in 2013 ordered Teck to develop a water quality management plan to address the selenium issue. But according to company reports, Teck exceeded the selenium limits laid out in the plan six times in 2016 and another 20 times in 2017. A 2016 audit shows British Columbia’s provincial government granted Teck permits despite getting input from experts that the proposed selenium levels on those permits failed to protect the environment. U.S. commissioners from the International Joint Commission, a binational regulatory body that oversees shared Canada-U.S. waters, have also been critical. In a letter last year, they accused Canadian commissioners of minimizing scientific evidence on the valley’s selenium problem and its risk to aquatic and human life. Sexton says she finds the continuous lack of regulatory response to the selenium

← → issue shocking. “As a scientist, you do this kind of work with the objective that the data you collect will inform environmental decision-making,” she says. But mining in the Elk Valley has steadily moved forward, despite mounting evidence pointing to the source of the problem. “From the big picture, it doesn’t appear that there is any regulatory response at all,” she says.



Biologist Erin Sexton conducts water sampling in the Elk River. COURTESY OF ERIN SEXTON

The Canadian government is currently working on amendments to federal mining regulations that would place compliance limits on selenium discharges. British Columbia and Montana are also working to set selenium standards for Lake Kootenai by 2020. Once established, the binational standard would be used to inform discharge limits on permits on both sides of the border. Until then, the Ktunaxa Nation Council, along with other First Nations’ leaders, are urging governments on both sides of the border to adopt more conservative interim standards for selenium in the lake.

Teck plans to build six new waste treatment plants by 2030, but currently it has only one, and it had to be shut down at least twice because of technical problems since it came online in 2014. The company is considering other water treatment options too, such as systems that use microbes to remove selenium from water-filled pits. Some question whether those tools are capable of stopping such a massive selenium leak. These technologies have never been used at such a large scale, says USGS’s Naftz.

Meanwhile, three companies have proposed new mines in the Elk River watershed. Currently in the early stages of environmental assessment, each new mines would

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add another 8 million tons of coal production to the valley. Sexton says the area needs a moratorium on mining until technologies have been proven capable of mitigating pollutants. By continuing to issue mining permits, regulators are only letting the problem get worse, she says. But others point out that stopping the mining isn't necessarily going to make things better. "A moratorium on mining without a solution is just a moratorium," Hauer says. The region needs a long-term solution to deal with such a massive, long-term problem.



ALSO ON YALE E360

A new way of understanding what makes a river healthy. Read more.

For now, the mines show no signs of slowing. Trucks continue hauling rock waste to ever-growing piles; trains loaded with coal head toward the coast destined for overseas markets; the people of Sparwood worry about the safety of their drinking water; and fishermen collect photos of deformed fish for their growing file.



Chloe Williams is a Canadian freelance journalist, covering energy, environmental health, and neuroscience. Her work has appeared in *Audubon*, *Popular Science*, and *Spectrum*. She lives in Edmonton, Alberta. [MORE →](#)

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Working Toward our Water Goals: Selenium Management

Vision: We contribute to the ability of present and future generations to enjoy a balance between the social, economic, recreational and cultural benefits of water resources, within ecologically sustainable limits.

Water. We use it every day — to drink, wash the dishes, have a shower — and can often take it for granted. Yet only about 2.5% of the world's water is fresh and of this, 70% is trapped in glaciers. Further, in many regions of the world, access to basic drinking water remains a major challenge. As the world's population continues to grow, demand for fresh water will only increase.

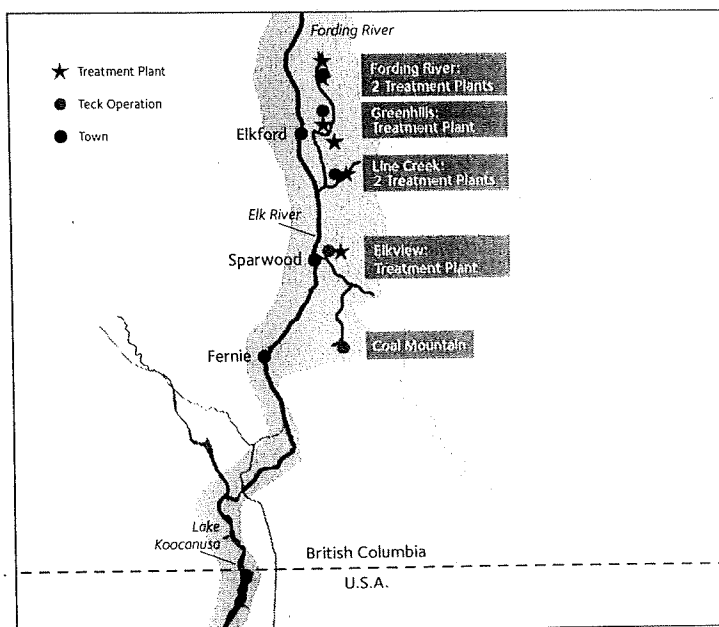
What is the connection between water and selenium management?

Water plays a key role in transporting essential minerals, including selenium, throughout ecosystems. However, when large quantities of rock are disturbed by mining and become exposed to water and air, they undergo oxidation, which can accelerate the release of minerals like selenium.

When this process occurs, selenium can be carried by water from precipitation or run-off into the watershed. Increased concentrations of selenium have been observed downstream of coal mining operations in many parts of the world, including near our coal operations in the Elk Valley in British Columbia.

As the operator of five steelmaking coal mines in the Elk Valley, which employ more than 4,000 people who live in the region, fish in the rivers, and enjoy the outdoors, we take water quality issues seriously.

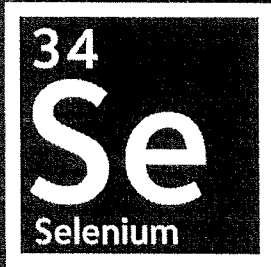
The Government of British Columbia recently announced a framework to develop a plan to address water quality issues in the Elk Valley. Under this framework, Teck will work with governments, First Nations and communities to develop an Elk Valley Water Quality Plan that will maintain the health of the watershed while supporting continued mining.



Planned water treatment plants at our operations in the Elk Valley.



Our West Line Creek water treatment facility under construction.



What is selenium?

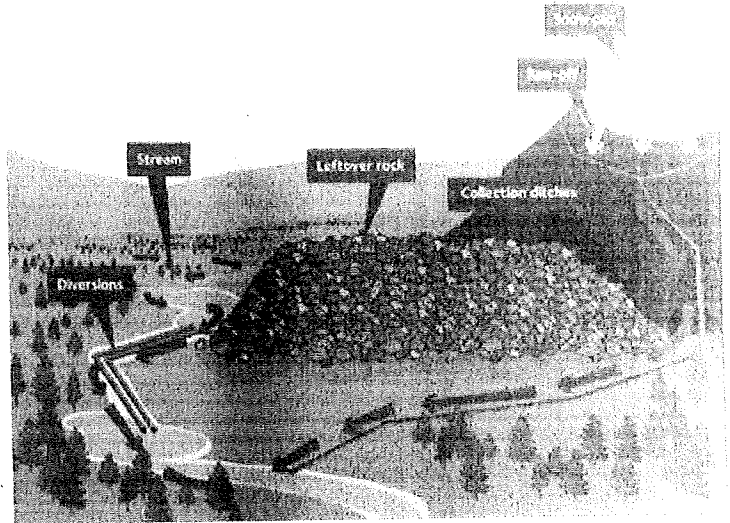
- A naturally occurring element, essential for all living things
- Can be harmful when present in elevated concentrations
- Occurs naturally in rock and its release can be accelerated by mining activities
- Precipitation and run-off flowing through waste rock can carry selenium into the watershed

Continued from page 3

Development of the Elk Valley Water Quality Plan will include extensive public consultation and guidance from a multi-party technical advisory committee. The strategy and water treatment technologies, already developed by Teck as part of our selenium management plan, will aid in the creation of the Elk Valley Water Quality Plan. As part of our approach to managing water quality, Teck has proposed investments over the next five years of up to \$600 million for the installation of water diversion and treatment facilities, for research and development to improve management of selenium and other substances, and for ongoing aquatic monitoring.

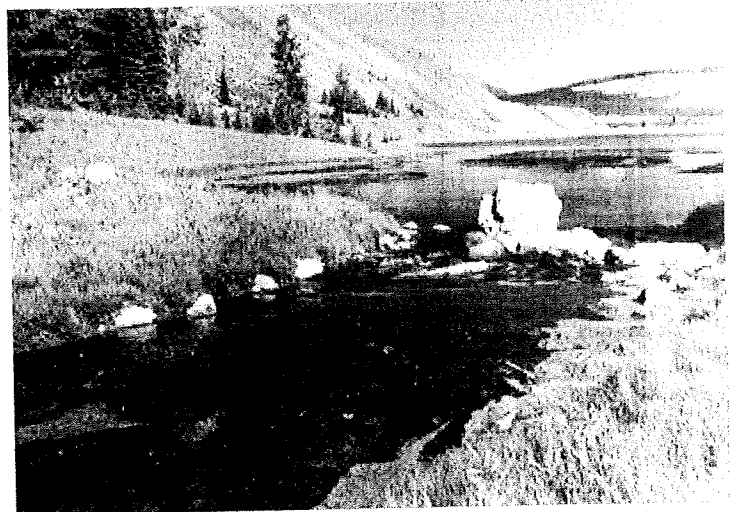
"Our strategy is designed to stabilize and reverse the trend of selenium and other substances to keep the watersheds near our mining operations healthy for present and future generations," said Dr. Robin Johnstone, General Manager, Environment, Community and Aboriginal Affairs.

For more information on our approach to protecting water quality in the Elk Valley, please visit www.teck.com/elkvalley

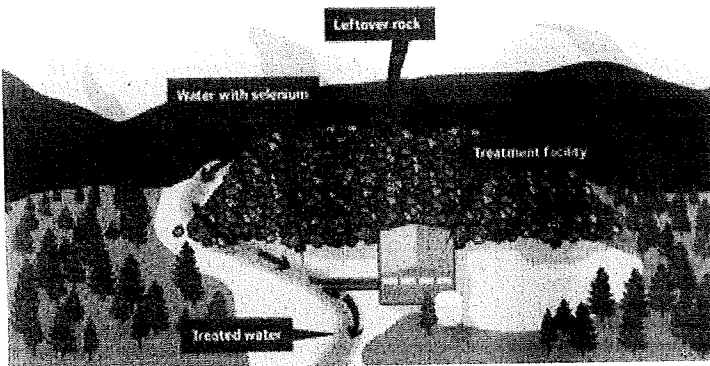


How does water diversion work?

A series of channels and culverts diverts the waterway at a specific point before it comes into contact with waste rock from the mine, preventing it from picking up selenium. The water is diverted from its usual channel to avoid contact with waste rock before joining with another stream. Run-off is also collected in ditches above the mine and channelled around waste rock, preventing it from picking up selenium.

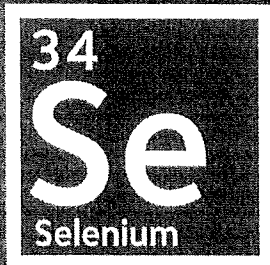


A waterway near our operations in the Elk Valley, British Columbia



How does water treatment work?

An intake brings water into a treatment facility or buried treatment cells downstream of the mine. The water is treated to remove selenium and then discharged directly back into the waterway.



What is selenium?

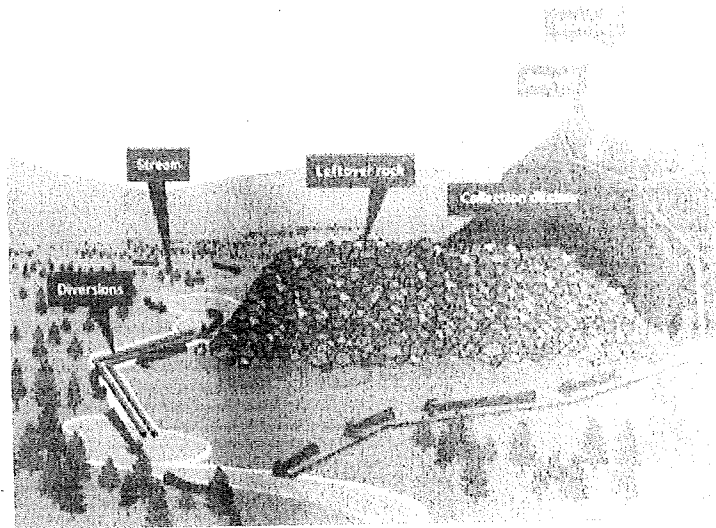
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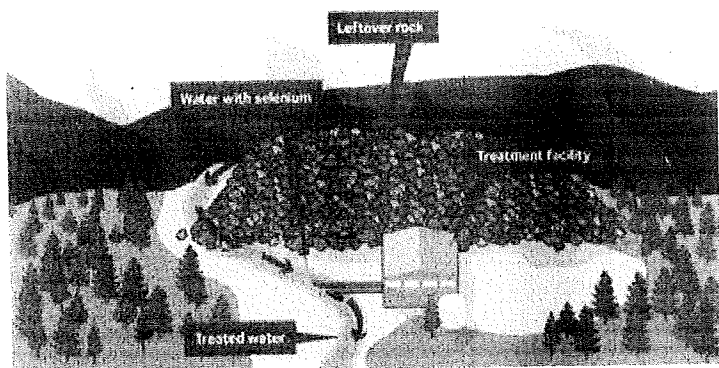
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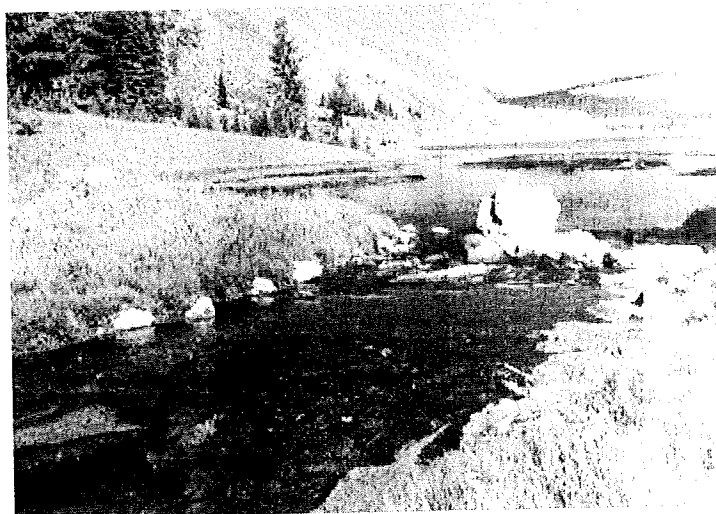
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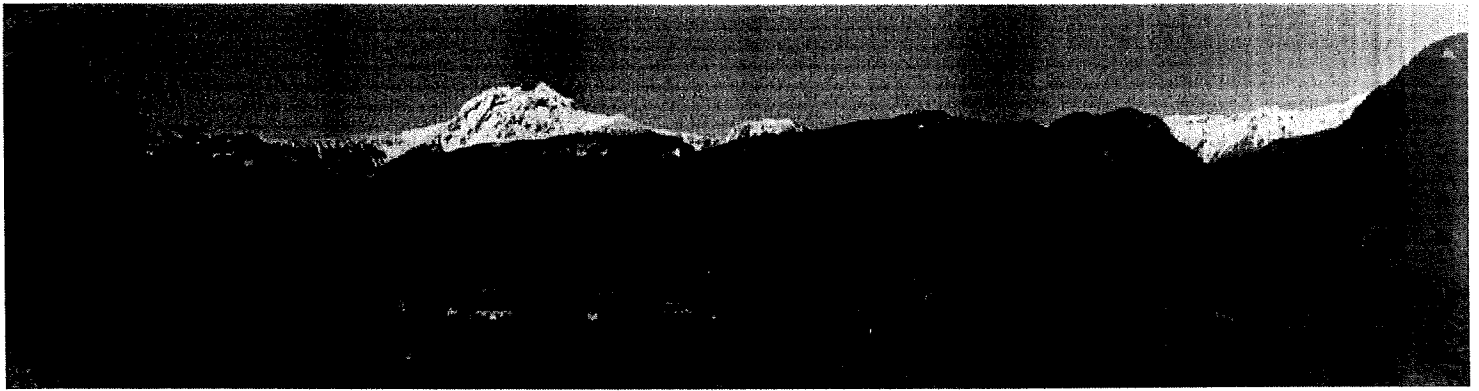


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A waterway near our operations in the Elk Valley, British Columbia



A view from Squamish, British Columbia into the waters of Howe Sound, where the Vancouver Aquarium's Howe Sound research initiative is being conducted.

Above and Below the Surface: Investing in B.C. Waters

Submitted by Vancouver Aquarium staff member Linda Nishida

In April 2012, Teck announced a \$12.5 million investment to the Vancouver Aquarium as part of our water strategy. The funds help to support the aquarium's expansion as well as enhanced research, conservation and education programs focused on water.

Between British Columbia's West Vancouver and the Sunshine Coast lies Howe Sound, a beautiful stretch of water measuring approximately 30 by 20 kilometres, surrounded by majestic mountains and wildlife. People who drive through the area marvel at its pristine beauty. This beauty extends below the surface of the water, where a rich marine ecosystem is teeming with more than 650 species of fish, invertebrates and other aquatic life.

When the Vancouver Aquarium's Howe Sound research initiative began, Howe Sound was far from a thriving marine ecosystem, due to decades of impact from industrial activities around its shores. Untreated water discharges from the historical Britannia Mine, which closed in 1974 and is unrelated to Teck operations, had long been depositing heavy metals into Howe Sound. For decades, the equivalent of 69 pennies of copper and 20,800 pop cans of vinegar were discharged every minute, creating an inhospitable environment for marine life.

In 2003, the Britannia Mine Rehabilitation Project saw updated mine reclamation practices applied to the site. The project included a \$15.5 million water treatment facility as well as an investment from Teck of \$1.75 million that was directed toward refurbishing the Britannia Mine Museum and initiating an extensive site clean-up program.

Today, you can see the results of those investments above and below the surface. Howe Sound animal populations are beginning to recover, as marine life is returning in growing numbers. For example, certain fish populations, such as herring and hake, have begun to be seen in areas where they had previously been depleted. Pacific white-sided dolphins have been in residence in Howe Sound in recent years, most probably because of the abundance of herring, hake and pollock on which they feed.

The Vancouver Aquarium is continuing its surveying efforts of the area and is compiling information through a shared education program called "Counting on Howe Sound." Trained divers will continue to identify and monitor marine life throughout Howe Sound as its recovery continues.



Dr. Alejandro Frid, Vancouver Aquarium post-doctoral research fellow, records data on a ling cod he sees in Howe Sound as part of the aquarium's annual Ling Cod Egg Mass Survey. Monitoring efforts such as this one help to gauge the health of a species.

Water Drop

Approximately 2.5% of the world's water is fresh water and of this, about 30% is groundwater.

Selenium Management Success at Cardinal River Operations

Managing the release of selenium from waste rock is a priority for our coal operations in order to ensure the health of watersheds near where we operate and support continued sustainable mining in these regions.

Selenium, an element that is essential for human and animal health in small amounts, can, in high enough quantities, potentially affect aquatic health. As such, each of our steelmaking coal operations is required to submit an annual selenium management plan to our coal business unit, developed through engagement with stakeholders including community members, industry, and provincial and federal agencies.

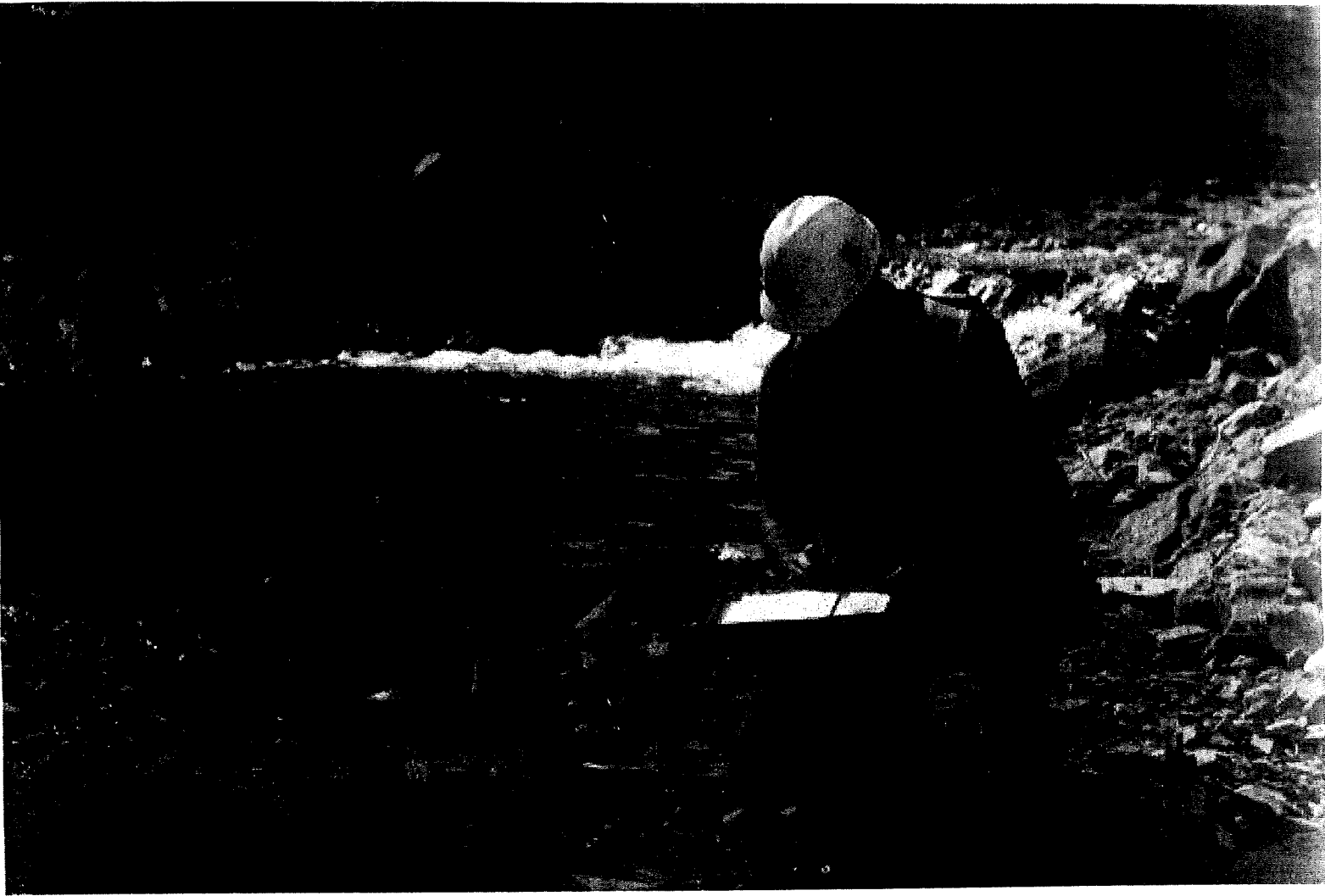
"We take selenium into consideration with every decision we make," said Marc Symbaluk, Superintendent, Environment, Cardinal River Operations (CRO). "Since 2011, these plans have been an important component of our sustainability commitment to address water quality, keeping clean water clean and restoring affected water resources."

As a result, CRO has made strong progress, implementing procedures to reduce and control selenium with the goal of protecting the McLeod River watershed. While the strategy includes actions throughout the mine's life cycle,

reclamation and legacy sites at CRO were prioritized after a site-specific ecological risk assessment showed that approach would have the greatest overall benefit to these areas.

One example of action at a legacy site was the 2013 commissioning of a pipeline to transport water with elevated selenium concentrations from CRO's B6 Pit to the coal processing plant for use as process water. This system, which went into operation in 2014, represents one way that water can be reused to help reduce the release of selenium downstream of the operation.

These plans have been an important component of our sustainability commitment to address water quality, keeping clean water clean...



CRO also maintains a biochemical reactor (BCR) treatment facility on Leyland Pond for capturing and passively treating selenium prior to release into the watershed. The BCR works by using naturally occurring organisms to reduce the mobility of selenium. The Leyland Pond BCR has become the coal business unit's benchmark for measuring the success of this passive water treatment technology on a pilot scale application, and has the potential to inform selenium management at other sites in the future.

In 2014, CRO additionally began examining the effectiveness of managing selenium through use of saturated waste rock fills, mined-out coal pits that have been filled with waste rock and allowed to saturate with water. Saturated waste rock fills show potential as a technique for managing selenium release, and the work underway at CRO is an important component of our overall selenium research and development program.

Selenium management at CRO is integrated into the cost of doing business, and the results of surface and groundwater monitoring in 2014 indicate that the selenium management plan is having a positive impact.

Of the future of the work at CRO, Marc says the results are encouraging: "Our actions will continue to influence water quality in the McLeod River watershed, ensuring its long-term health and supporting continued sustainable mining in the region." ■

Above: An environmental officer takes a water sample.

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Introduzca un nombre

Letter to the Editor, The Globe and Mail - Selenium Manager the Elk Valley

20/10/2014 2:30 PM | Vancouver, Corporativo

To the Editor,

I was disappointed to read Mark Hume's October 20th article on selenium in the Elk Valley, in which he claims this issue is not being addressed, while ignoring the groundbreaking international effort underway to do exactly that.

As Mr. Hume is aware, Teck, as the operator of five steelmaking coal mines in the Elk Valley, has been working in close collaboration with provincial and federal regulators, including Environment Canada, as well as First Nations, communities, government, and independent scientific experts to develop an Elk Valley Water Quality Plan (Plan) that will set out the steps for addressing selenium levels within the region. This is the first time in Canada that such a broad range of stakeholders have been brought together to develop a watershed-based approach to protect water quality on this scale.

The article fails to credit the involvement of local residents in the Elk Valley who attended 11 open houses and meetings to provide their input into the development of the Plan. Or the technical experts from Canada and the U.S., who held hundreds of hours of meetings during the same period to provide science-based feedback on every aspect of the Plan's development. The research being done in cooperation with universities in Canada and the U.S. to develop new and better approaches to managing selenium.

Mr. Hume also repeats comments that researcher Dennis Lemly made previously about a situation in Idaho. In doing so, Hume draws an irresponsible parallel between the Elk Valley and Idaho not supported by facts.

In addition, Mr. Hume does not mention the significant work that has already been done, and will continue under the Plan. To date, Teck has constructed water management infrastructure, including our \$100 million full-scale water treatment facility at our Line Creek Operations. Achieving the objectives of the Plan will require significant further investment on the part of Teck, including construction of additional water treatment facilities, ongoing research into water management technology and techniques, and extensive aquatic monitoring. We anticipate spending approximately \$600 million over a 10-year period on protecting water quality as we implement the Plan.

To suggest that this unprecedented amount of engagement, consultation, research and investment somehow equates to the issue being "ignored" is not only wrong, it is disrespectful of the work of numerous stakeholders, employees and communities who are focused on taking the steps necessary to protect the ecosystem and supporting continued, sustainable development in the region.

Sincerely,

Marcia Smith
Senior Vice President, Sustainability and External Affairs
Teck

Letter_to_the_Editor_Globe_and_Mail_M&M

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Teck will hold further information sessions on ground water issues in Kimberley

22-Jan-2021 | Kimberley Bulletin

by Carolyn Grant

Ryan Peterson from Teck made a presentation on ground water issues to Kimberley Council, and said there would be information sessions once all the feedback and questions had been gathered.

He stressed that Teck is committed to long-term management of groundwater issues and continual improvement. There are no unacceptable risks.

In December 2020 Teck sent letters to some Kimberley residents to notify them that environmental assessments indicated that groundwater affected by historical operations and acid rock drainage had migrated to a portion of the aquifer underlying parts of Kimberley and Marysville.

Landowners would not encounter the impacted ground water during everyday activities on their properties, and the water does not affect Kimberley's drinking water supply.

While the impacted groundwater does not affect day to day use of the notified properties, notification is required under the Contaminated Sites Regulation and necessary before Teck can get approval of a remediation plan.

Since mine closure in 2001, Teck has used various strategies to mitigate acid rock drainage, including limiting oxygen water contact with sulphides, consolidation of waste materials, cover systems, revegetation, diversions, interception, treatment of impacted water and comprehensive monitoring and assessments following a risk management plan.

A network of wells around Sullivan Hill, where the mine was located, are regularly sampled. Water in Mark Creek, Luke Creek and the St. Mary River was routinely tested as well, and Peterson said there has been significant improvement in that water quality resulting from Teck's mitigation systems since closure.

Peterson told Council that there was no evidence that any contaminated water had migrated towards the water supply.

More detailed information on all Teck's mitigation strategies can be found at www.teck.com/sullivan [http://www.teck.com/sullivan].

If anyone has questions or feedback, call 250-427-8425 or email Sullivan.feedback@teck.com.

All feedback and questions from the public meetings already held and received through calls and emails will be considered and used to update information for future meetings.

Peterson estimated that the next round of information sessions would be in late February.

carolyn.grant@kimberleybulletin.com

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Water allocation change proposed in Alberta

14-Jan-2021 | The Western Producer

By Doug Ferguson

A provincial proposal to promote open-pit coal mining by helping such projects get water from the Oldman River is step in the wrong direction for Alberta, said a legal expert.

Such mines risk exposing irrigated farms in southern Alberta to pollutants such as selenium, said professor Nigel B. Chair of Natural Resources Law in the Faculty of Law at the University of Calgary.

They also risk further harming the province's reputation, he said.

"We have a global image problem associated with carbon and it doesn't make sense to me to be allowing international companies to come and extract more coal from this province."

But the proposal will help support Alberta's economic recovery plan, Jess Sinclair, press secretary to Environment Minister Jason Nixon, said in an e-mail.

It will make "water resources in an underused area available for all potential uses, while also ensuring irrigators, ranchers and farmers have access to the water they need and maintaining a healthy aquatic environment, including considerations for the province's native trout species...," she said.

The provincial government wants to change a water allocation order that primarily reserves 11,000 acre feet of water upstream of the Oldman Reservoir for irrigation. It includes the Oldman, Castle and/or Crowsnest rivers, said a statement from the Oldman Watershed Council.

Alberta earlier announced it was separately rescinding a 44-year-old provincial policy that limited surface coal mining on much of the eastern slopes of the Rocky Mountains.

Several ranchers and First Nations opposed to that move have asked for judicial reviews of the coal policy decision. A request of the ranchers, whose operations are near Nanton, Alta., is to be heard Jan. 19-20 by the Alberta Court of Appeal Bench in Calgary.

"Most of the mines are still in the exploration phase and have not applied for a water licence yet," said the Oldman Watershed Council.

An acre foot is 1,233.5 cubic metres of water.

Only 150-acre feet are currently allowed for industrial purposes compared to 9,350 for irrigation, said the statement. Under the latter limit, only 1,295 acre feet has been licensed or applied for by irrigators over the years, it said.

As a result, the provincial government wants to set one overall limit for all sectors upstream of the Oldman Reservoir, the council said.

"The total limit of 11,000 acre feet would still apply, but the majority of it would no longer be set aside for irrigation."

The limits set by the current allocation order, which were established in 2003, "have created barriers to economic development," it said.

"It is expected that if federal and provincial regulators approve the coal mines being proposed along the eastern slopes of the Oldman watershed, and the proposed changes are made to the order, that coal companies would apply for at least the total allocation that is available."

But Banks said the rest of the Oldman River basin is closed to new allocations to help ensure water conservation, and no new water licences are being issued.

The provincial proposal "is a way of providing basically new water rights for free, so to that degree, it kind of disrupts the market that we have created in the basin overall, which recognises the value of water as a scarce resource," he said.

The impact of the proposal in terms of water availability downstream of the Oldman Reservoir "should be negligible. The amount of water is small by comparison," said the statement by the Oldman Watershed Council. "However, in every drop counts."

The provincial government is considering setting aside 2,200 acre feet, or 20 percent of the total limit upstream of reservoir, to maintain environmental flows, it said. It is unclear if this would be enough in terms of the impact on the as water quality and fish habitats, the council said.

Studies have not yet been made of the inflow stream needs of the Castle, Crowsnest, Livingstone or upper Oldman their tributaries, it said.

"We do know that smaller streams are more sensitive and vulnerable, so it is critical that in-stream flow needs assessments are completed, and that streams where withdrawals are made are monitored."

The council will examine concerns about potential pollutants such as selenium, said executive director Shannon Frank west of Alberta, Teck Resources Ltd. in B.C.'s Elk Valley has spent hundreds of millions of dollars dealing with the problem its coal mining operations, she said.

"And so there's a lot of processing, like water treatment and filtering that needs to be done to get rid of it, and there has been that it's not as easy as it sounds. We don't have the kind of technology and processes that are proven to work."

Fish populations have substantially declined downstream in B.C., said Frank, adding "humans can be impacted at a concentration (of selenium), and crops can be impacted as well, so it just depends on that concentration ... that's why it is so important, and why water quality and quantity are so interconnected."

However, Sinclair said the "continued safety of our critical water systems is the priority of this government. Users with allocations - First Nations, irrigators and municipalities to name a few groups - will always have priority of access to water."

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Selenium and Westslope Cutthroat Trout in the Fording River

27/10/2014 10:15 AM | Vancouver, Corporate

Recent media articles in the Globe and Mail regarding reports prepared for Environment Canada have raised questions about the impact of selenium on the health of Westslope cutthroat trout in the Fording River.

The articles have presented certain aspects of these reports in a very misleading light, and most glaringly, the reference to 180,000 trout dying annually are simply not true. Based on work completed by Cope et al. (2014), in cooperation with the Ktunaxa Nation and the provincial government, the Westslope cutthroat trout population within the Upper Fording River – which is estimated at approximately 3,000 fish – has been cited as healthy and robust.

At the same time, we recognize selenium is a serious challenge that requires action to ensure the health of the watershed over the long-term. That is why we are working in cooperation with provincial and federal regulators, including Environment Canada, as well as First Nations, communities, governments in the U.S. and independent scientific experts to develop the Upper Fording Valley Water Quality Plan (Plan) that will set out the approach to addressing selenium levels within the region. This is a first in Canada that such a broad range of stakeholders has been brought together to develop a watershed-based approach to protect water quality on this scale.

As part of the development of the Plan we have undertaken extensive public consultation including 11 open house meetings in the Elk Valley. In addition, technical experts from Canada and the U.S. have held over 200 hours of meetings to provide science-based feedback on every aspect of the Plan's development.

Teck has also constructed water management infrastructure, including our \$120 million full-scale water treatment facility at Line Creek Operations. Achieving the objectives of the Plan will require significant further investment, including construction of additional water treatment facilities, ongoing research into water management technology and treatment and extensive aquatic monitoring. We anticipate spending approximately \$600 million over a five year period on projects to improve water quality as we implement the Plan.

On another matter, roughly 40 kilometers south of the Upper Fording River, at our Line Creek Operations, we recently discovered 34 deceased fish in the area of the water treatment facility. We have notified regulatory authorities and initiated an investigation to determine the cause. While the investigation into this incident is ongoing, the startup process of the water treatment facility—recently installed to reduce selenium in water—may potentially be related to the incident. As a precautionary measure, the facility was shut down following the incident. It's important to note that there is no indication that selenium is a factor in this incident.

We are committed to taking the steps necessary to address water quality and allow for continued sustainable mining in the Elk Valley. Through measures such as the Elk Valley Water Quality Plan, along with the West Line Creek Water Treatment facility, we will ensure the health of the watershed is protected for the long term.

14-78-TR Selenium and Westslope Cutthroat Trout in the

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Teck Resources Limited

Wanted: A Legal Regime to Clean Up Orphaned / Abandoned Mines in Canada

Joseph F. Castrilli*

This article describes the environmental, social, and economic problems posed by orphaned and abandoned mines and summarizes the state of Canadian law on the issue. Orphaned and abandoned mines are those for which the owner cannot be found, or for which the owner is financially unable to carry out cleanup. There are an estimated 10,000 such mines in Canada and more than 5,700 in Ontario alone, with cleanup costs expected to be in the billions, paid predominantly by taxpayers. Current laws operate on the assumption that a responsible person is available, upon whom regulators may impose obligations. Under these laws, an orphaned or abandoned mine, which by definition has no responsible person, is implicitly presumed not to occur. These laws largely do not apply to orphan/abandoned mines, and have not

developed mechanisms for addressing them, other than through an emergency response by government using public monies to remedy the problem. Financial security requirements have also proven to be a weak link in existing legislation. Predictions of the quantum of financial security needed from applicants to ensure proper closure and rehabilitation been inaccurate. In these cases, when mining companies became insolvent or disappeared, funding necessary to avoid major shortfalls in cleanup costs had to be provided by the government, with little expectation of cost recovery. A solution to this situation will require legislative reform, including imposing fees on mining companies that will allow governments to establish dedicated orphaned and abandoned mine funds to finance cleanups.

Cet article décrit les problèmes environnementaux, sociaux et économiques que posent les mines orphelines et abandonnées, et résume l'état du droit canadien à ce sujet. On qualifie d'« orphelines et abandonnées » les mines dont le propriétaire ne peut être identifié, ou est incapable de financer le nettoyage. On estime qu'il y en a 10 000 au Canada, dont plus de 5 700 en Ontario seulement, et que les citoyens canadiens défrayeront la majeure partie de leurs coûts de nettoyage, chiffrés dans les milliards. Les lois actuelles misent sur l'existence et la disponibilité d'une personne responsable de chaque mine à qui les autorités peuvent imposer des obligations. Ces lois présument implicitement qu'il n'y a pas de mines orphelines ou abandonnées puisque celles-ci, par définition, n'ont pas de responsable. Ces lois sont donc généralement inapplicables aux mines orphelines ou abandonnées et ne contiennent pas de mécanismes

pour répondre à ces situations, au-delà des actions gouvernementales d'urgence financées par les deniers publics. Les exigences quant aux garanties financières se sont aussi avérées être un maillon faible dans la législation actuelle. Les estimations quant au montant de garantie requis des potentiels exploitants afin de couvrir le coût de fermeture et de réhabilitation des mines ont souvent été incorrectes. Ainsi, lorsque les compagnies minières responsables deviennent insolvables ou disparaissent, le gouvernement doit puiser dans ses propres fonds afin d'éviter des déficits majeurs dans les coûts de nettoyage, avec peu d'expectatives de recouvrement des coûts. Une solution à ce problème nécessitera une réforme législative comportant entre autres l'imposition de frais aux compagnies minières pour permettre l'établissement de fonds dédiés au financement du nettoyage des mines orphelines et abandonnées.

* Counsel, Canadian Environmental Law Association, Toronto, Ontario. Member of the Ontario and British Columbia Bars. Certified as a specialist in environmental law by the Law Society of Upper Canada. LL.B. (Queen's University, 1984); LL.M. Environmental and Natural Resources Law (Northwestern School of Law of Lewis & Clark College, 1997). This article is a summary of a report prepared for the National Orphaned/Abandoned Mines Initiative – Guidelines for Legislative Review Task Group ("NOAMI – GLRTG") and released in 2007 when the author was still in private practice. Views expressed here are those of the author and not necessarily those of NOAMI – GLRTG. The article is accurate to 2007.

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In Canada, the mining industry, governments, and local communities recognize that orphaned or abandoned mines—mines whose owner cannot be found or is financially unable to carry out cleanup—pose environmental, health, safety, and economic problems. In June 2001, a multi-stakeholder workshop was held in Winnipeg to review the issue of orphaned/abandoned mine sites in the country and identify approaches for cleanup. The resulting recommendations and guiding principles, presented at a September 2001 Mines Ministers Conference, became an Action Plan that received the support of the Ministers. A national multi-stakeholder Advisory Committee on Orphaned/Abandoned Mines was subsequently established in 2002 and charged with undertaking the Action Plan.

The National Orphaned/Abandoned Mines Initiative (“NOAMI”) is a co-operative Canadian program, guided by the Advisory Committee and composed of the mining industry, federal, provincial and territorial governments, environmental non-government organizations, and First Nations. The Advisory Committee has created several Task Groups to address different aspects of the orphaned/abandoned mine problem. The Task Groups notably focus on: information gathering; community involvement; legal and regulatory barriers to voluntary collaboration in undertaking cleanup measures; funding models and approaches; and guidelines for legislative review.

The responsibilities of the NOAMI Guidelines for Legislative Review Task Group (“GLRTG”), conferred in 2003 by the Mines Ministers, included the development of a series of guidelines to facilitate a focused review of the legislative, regulatory, and policy framework as it applies to collaboration, liability, and funding in relation to orphaned/abandoned Canadian mines. In particular, the guidelines, finalized in 2004, were designed to facilitate the completion of a review of legislation (acts, regulations, and instruments such as permits, licences,

approvals) and related policies, programs, and practices with regard to orphaned/abandoned mine sites, as well as contaminated and operating sites where there is demonstrated relevance to legacy issues. The ultimate goal is to ensure that approaches across jurisdictions are themselves consistent, certain, transparent, coordinated, and efficient.

The report that forms the basis of this article was prepared to apply the guidelines and to complete the review as it relates to collaboration, liability, and funding for each jurisdiction considered in the report (federal, provincial, and territorial) in relation to orphaned/abandoned, contaminated, and operating mines in Canada.

In this regard, Part II of the article provides a brief background to the orphaned/abandoned mines problem. Part III then briefly reviews constitutional authority for the control of mining activity in Canada. Part IV summarizes what legislative, regulatory, and policy authority was examined for the control of mining activity at the federal, provincial and territorial levels. Part V provides overall findings with respect to collaboration, liability, and funding measures in relation to orphaned/abandoned, contaminated, and operating mines. Part VI then offers brief conclusions. Finally, Part VII (Appendix A) sets out the recommendations from the various reports prepared for NOAMI by the author.

2. BACKGROUND UPDATE: THE PROBLEM OF ORPHANED/ABANDONED MINES

Orphaned or abandoned mine sites are generally defined as closed mines whose ownership has reverted to the Crown, either because the owner has retired from business or, as is the case with some historic properties, because no owner can be found. They are also described as mine sites where the owner has ceased or indefinitely suspended advanced exploration, mining, or mine production without rehabilitating the site.¹ There are an estimated 10,000 such mine sites in Canada, requiring varying degrees of rehabilitation.² More than 5,700 are located in Ontario.³

In the mid-1990s, a House of Commons Standing Committee on Natural Resources reported:

The main issue raised by old mining sites, unlike current and future mines, is the issue of liability for funding site reclamation. The onus today is on the governments concerned and on the mining industry to assume joint or several liability for activities that were conducted at those sites, in some cases a long time ago.⁴

The United Nations Environment Programme ("UNEP") has described abandoned mine sites as one of the major outstanding international environmental problems related to mining:

¹ Mining Association of Canada (MAC), *Orphaned/Abandoned Mines in Canada: Fact Sheet* (Ottawa: MAC, 2001) at 1.

² National Orphaned/Abandoned Mines Initiative (NOAMI), *2002-2008 Performance Report* (Ottawa: NOAMI, 2009) at 5.

³ Ontario Ministry of Northern Development, Mines and Forestry (MNDMF), *Abandoned Mines/ Mine Hazards* (Toronto: MNDMF, 2009), online: Ontario MNDMF <http://www.mndm.gov.on.ca/mines/mg/abanmin/default_e.asp>.

⁴ Parliament, Standing Committee on Natural Resources, *Lifting Canadian Mining Off the Rocks* (December 1994) at 35 (Chair: Robert D. Nault).

It is a legacy of centuries old practices and of inadequate, insufficient or non-existent mine closure. The potential costs of rehabilitation, the lack of clearly assigned (or assumed) responsibility, the absence of criteria and standards of rehabilitation and other factors have delayed action by all parties - industry, governments, and communities.⁵

According to UNEP the impact of abandoned mines can include:

... altered landscape; unused pits and shafts; land no longer useable due to loss of soil, pH, slope of land; abandoned tailings dumps; changes in groundwater regime; contaminated soils and aquatic sediments; subsidence; and vegetation changes.

UNEP further notes that the results of such impacts can cause:

... loss of productive land; loss or degradation of groundwater; pollution of surface water by sediment or salts; fish affected by contaminated sediments; changes in river regimes; air pollution from dust or toxic gases; risks of falls into shafts and pits; and landslides.

Accordingly, UNEP observes that:

In addition to the obvious problems for [a] community, most of these situations represent a considerable cost to public authorities which are often expected to make the sites secure and prevent ongoing pollution. The public is increasingly demanding action and this visible legacy of the past is producing growing community opposition to current mining activities. The orphan sites problem therefore continues to cast a shadow over all mining at a time when major operators are improving their operations and are trying to improve the image of their sites and their company.⁶

The abandoned mine problem, according to UNEP, is also global in scope. The following are some of its effects and repercussions across the world:

- Large areas of dryland forest in Australia that were mined during the goldrush of the 1860s still have not recovered;
- Acid drainage from abandoned mines in the United Kingdom has severely contaminated streams;
- The collapse of an abandoned mine dumpsite swept away a local school in Wales;
- A large number of major abandoned mines are listed under the "Superfund" program in the United States because of extensive contamination from materials and exposed ore bodies left behind;
- Abandoned pits and shafts over a large area of uncontrolled past mining in West African countries poses serious public safety risks to people in the area;⁷

⁵ United Nations Environment Programme, Division of Technology, Industry and Economics, *Abandoned Mines - Problems, Issues and Policy Challenges for Decision Makers: Summary Report* (June 2001) at 14 [UNEP Report 2001].

⁶ *Ibid* at 15, 16.

⁷ *Ibid* at 15.

- An extended history of gold mining has left many square kilometres of land around Johannesburg, South Africa, covered with tailings dumps. Dust from some dumps may be adversely affecting the health of residents in nearby townships.⁸

Similar problems have recently been identified in Canada. In 2002, the Commissioner of the Environment and Sustainable Development reported that:

[h]undreds of thousands of tons of highly toxic chemicals such as arsenic and cyanide are found at northern abandoned mine sites. These chemicals, the result of past mining operations, have accumulated to hazardous levels. Indian and Northern Affairs Canada estimates that the cleanup and closure of these complex contaminated sites will cost Canadian taxpayers at least \$555 million. In many cases, long-term site management will be needed because complete and definitive cleanup will not be possible.⁹

The same difficulties appear to exist at the provincial level. In British Columbia, for example, the Auditor General reported in 2002 that:

[industrial activity including] mining practices going back decades have been carried out on public and private lands... Many of these operations have left a variety of contaminating substances - notably chemicals and metals - present in the soil, surface water and groundwater at numerous locations around the province. These contaminants can be present at levels that threaten the environment and human health

For example, run-off containing copper and iron compounds from an abandoned mine near Mount Washington on Vancouver Island has formed two colourful streams: one runs red with iron compounds and one runs blue with copper compounds. The compounds in the stream are affecting aquatic life

Cleanup of such sites can be costly¹⁰

For the UNEP, the orphaned/abandoned mine problem requires both legal and financial solutions.¹¹

Finally, a 2002 report by Canada to the World Summit on Sustainable Development recognized that:

Over the last decade, the Canadian mining industry has been at the centre of intense public debate on key sustainable development issues in Canada ... debate to which the industry began to respond proactively in the 1990s. Some of the issues that have driven this debate include:

⁸ Colin Noy Boocock, *Environmental Impacts of Foreign Direct Investment in the Mining Sector in Sub-Saharan Africa* (Paris, Organization of Economic Cooperation and Development, 2002) at 2, prepared for the Global Forum on International Investment Conference on Foreign Direct Investment and the Environment: "Lessons to be Learned from the Mining Sector," online at: <<http://www.oecd.org/dataoecd/44/40/1819582.pdf>>.

⁹ Commissioner of the Environment and Sustainable Development (CESD), *Abandoned Mines in the North: Report to the House of Commons* (Ottawa: CESD, 2002) at 1 [CESD Report I].

¹⁰ Auditor General of British Columbia, *2002/2003 Report # 5: Managing Contaminated Sites on Provincial Lands* (Victoria: AGBC, 2002) at 13, 15.

¹¹ UNEP Report 2001, *supra* note 5 at 11.

....

- the legacy of abandoned mines across Canada, and the threats to environmental and human health and safety that these raise, according to site-specific circumstances.

....

The legacy of abandoned mines – un-reclaimed sites with no known owner – remains a complex challenge in Canada for governments, the mining industry and communities.¹²

This article summarizes a larger 2007 report examining the regimes in place for controlling contaminated and operating mines as well as orphaned/abandoned mines in Canada, which itself followed up on work previously undertaken for NOAMI on removing barriers to collaboration, as well as developing funding approaches as to the cleanup of orphaned/abandoned mines.¹³

3. CONSTITUTIONAL AUTHORITY WITH RESPECT TO THE CONTROL OF MINING ACTIVITY IN CANADA

The division of powers set out in the Canadian *Constitution Act, 1867*¹⁴ allocates the authority to enact laws on mining activity between Parliament and provincial legislatures. This authority encompasses the issue of orphaned/abandoned mines. Specifically, federal legislative jurisdiction over mining and related activity derives from its constitutional powers over public property,¹⁵ taxation,¹⁶ seacoast and inland fisheries,¹⁷ Indian lands,¹⁸ and criminal law.¹⁹ Works situated wholly within a certain province that are declared by Parliament to be for the general advantage of Canada (the declaratory power),²⁰ as well as peace, order, and good government,²¹ have been used to justify federal legislation relating to all aspects of the uranium industry.

¹² Government of Canada, *Sustainable Development: A Canadian Perspective* (Ottawa: Canada, 2002) at 72-73, 78 (national assessment report prepared for World Summit in Johannesburg, South Africa).

¹³ Joseph F. Castrilli, *Report on the Legislative, Regulatory, and Policy Framework Respecting Collaboration, Liability, and Funding Measures in Relation to Orphaned/Abandoned, Contaminated, and Operating Mines in Canada* (Ottawa: NOAMI, 2007) [Castrilli 2007]; Joseph F. Castrilli, *Barriers to Collaboration: Orphaned/Abandoned Mines in Canada* (Ottawa: NOAMI, 2002) [Castrilli 2002]; Joseph F. Castrilli, *Potential Funding Approaches for Orphaned/Abandoned Mines in Canada* (Ottawa: NOAMI, 2003) [Castrilli 2003]; Joseph F. Castrilli & Gary Scandlan, *Creating A Legal Regime to Fund Cleanup of Orphaned and Abandoned Mines in Canada: A Task Past Due* (2006), 23 CELR (3d) 72 [Castrilli & Scandlan]. These reports also may be viewed online at <<http://www.abandonedmines.org>>.

¹⁴ *Constitution Act, 1867* (UK), 30 & 31 Vict., c 3, reprinted in RSC 1985, App II, No 5 [hereinafter *Constitution Act, 1867*].

¹⁵ *Ibid*, s 91(1A).

¹⁶ *Ibid*, s 91(3).

¹⁷ *Ibid*, s 91(12).

¹⁸ *Ibid*, s 91(24).

¹⁹ *Ibid*, s 91(27).

²⁰ *Ibid*, s 92(10)(c).

²¹ *Ibid*, preamble to s 91.

Provincial legislative authority also arises from several constitutional heads of power. These include direct taxation within the province,²² management and sale of public lands belonging to the province,²³ property and civil rights in the province,²⁴ non-renewable natural resources,²⁵ and, in Ontario, Quebec, Nova Scotia, and New Brunswick, ownership of all lands, mines, and minerals belonging to those provinces at the time of Confederation.²⁶

North of the 60th parallel, federal authority to legislate generally predominates due to federal ownership of natural resources. South of the 60th parallel, provincial constitutional authority to legislate predominates (except with respect to uranium mining) due to provincial ownership of public lands, natural resources, and authority with respect to property and civil rights.²⁷

The federal spending power²⁸ would allow the federal government to exercise a measure of authority south of the 60th parallel, as it relates to the issue of orphaned/abandoned mine sites, through the financing of cleanup and research as well as by conditioning such financing on the adoption of federal standards. In practice, Parliament has relied on the federal spending power to impose national standards for hospital insurance, medical care, and student housing programs as a condition of federal contribution to these provincial regimes. The courts have upheld each of these federal spending power initiatives in social and health-related areas.²⁹ Indeed, leading authorities have suggested that under the federal spending power Parliament may spend or lend funds to any government, institution, or individual it wishes, for the purposes of its choosing, and may attach any conditions to such grants or loans—including conditions on matters it could not legislate directly.³⁰ The courts have been prepared to accept these arrangements because withholding federal monies to fund a matter within provincial

²² *Ibid.*, s 92(2).

²³ *Ibid.*, s 92(5).

²⁴ *Ibid.*, s 92(13).

²⁵ *Ibid.*, s 92A.

²⁶ *Ibid.*, s 109. For a more ample review of constitutional authority to regulate mining activity in Canada, see Joseph F. Castrilli, "Environmental Regulation of the Mining Industry in Canada: An Update of Legal and Regulatory Requirements" (2000) 34 UBC L Rev 91 at 97-101.

²⁷ Government of Canada, *Sustainable Development: A Canadian Perspective* (Ottawa: Canada, 2002) at 72 (national assessment report prepared for World Summit in Johannesburg, South Africa). This report notes that: "Canada's federal, provincial and territorial governments play complementary roles in the mining sector. The federal government regulates all uranium mining in Canada, as well as all mining activities on public lands in Yukon, the Northwest Territories and Nunavut. The provincial governments own the natural resources within their jurisdiction, and are responsible for policies and regulations covering exploration, development and extraction of mineral resources as well as the construction, management, reclamation and close-out of mine-sites in their jurisdiction. Both levels of government have responsibility for the environmental regulation of the mining industry in their own areas of jurisdiction." *Ibid.*

²⁸ *Ibid.*, s 91(1A).

²⁹ See e.g. *Re Canada Assistance Plan*, [1991] 2 SCR 525; *Eldridge v British Columbia*, [1997] 3 SCR 624 (dictum upholding *Canada Health Act*); *Central Mortgage and Housing Corporation v Co-op College Residences*, 13 OR (2d) 394 (Ont CA) (upholding federal loans for student housing).

³⁰ Peter W. Hogg, *Constitutional Law of Canada*, looseleaf, Vol. 1 (Toronto: Carswell, 1998) at 6-17.

jurisdiction does not result in regulation of that matter by the federal government.³¹ Under the federal spending power, a federal department or agency with the requisite statutory enabling authority could therefore act with respect to orphaned/abandoned mines south of the 60th parallel through loans, grants, and other financial arrangements. In particular, it could impose conditions regarding cleanup standards for air, land, and water protection.

4. LEGISLATIVE AND REGULATORY AUTHORITY EXAMINED

The 2007 report provided an in-depth review of existing and prospective legislative, regulatory, and policy authority for controlling mining activity at the federal, provincial, and territorial levels in Canada. It took into account legislative and regulatory requirements pertaining to mining, environmental, land use planning, and workplace safety in the examined jurisdictions. In this regard, the report considered over 50 federal, provincial, and territorial statutes, over 80 federal, provincial, and territorial regulations, and approximately 30 non-statutory and non-regulatory federal, provincial, and territorial programs. Mining and environmental legislation considered was scrutinized to determine how it addressed many of nine categories of provisions identified in the NOAMI guidelines. The nine categories were the following: (1) licence and permit, (2) assessment, (3) monitoring, (4) liability, (5) emergency response, (6) financial instruments, (7) application and exemption, (8) designation of orphaned/abandoned sites, and (9) community involvement. Because the relevant laws largely do not address certain categories, such as the designation of orphaned/abandoned sites, the 2007 report also examined policies, programs, and related initiatives that do touch on these matters.

Four broad areas of federal law oversee the operation of contaminated and orphaned/abandoned mine lands as well as their abatement, remediation, and reclamation. The first is federal environmental and resource management law, applicable throughout the country. The second area is environmental management legislation applicable across Canada except north of the 60th parallel. The third is environmental and natural resource management legislation applicable predominantly north of the 60th parallel (northern Canada). The fourth is federal workplace safety legislation, which applies to the management of mine operations at federally regulated facilities. These categories of legislation were reviewed in detail.

Further, six broad areas of provincial law are potentially applicable to the issue of operating, contaminated, and orphaned/abandoned mine lands and their abatement, remediation, and reclamation. The first is the common law, or judge-made law, which exists in each of the nine common law provinces of Canada. The second is the civil law of Quebec. The third area encompasses laws enacted by provincial legislatures designed to facilitate mining exploration, development, and closure. The fourth includes pollution control or environmental—including environmental assessment—legislation enacted by provincial legislatures designed to address emissions to air, discharges to water, or contamination of, and disturbance to, land from mining activities. The fifth is workplace safety legislation that can apply to mine operations. The sixth is planning legislation that, in some jurisdictions, may serve to reinforce mining and environmental law requirements in the context of provincial land use policies. An overview of provincial legislation was undertaken, as well as a more detailed province-by-province examination.

³¹ *Re Canada Assistance Plan*, supra note 29 at 567.

Historically, provincial mining laws have shared many of the same characteristics because they are based on Crown ownership and exploitation of mineral resources. Most provincial mining laws set out the manner in which the Crown may dispose of its minerals and others may obtain rights to them. As environmental concerns with respect to mining activities have increased in recent years, they largely have been addressed through environmental law reforms. Certain stages of mining operations, including exploration, reclamation, and rehabilitation, have also seemed particularly well suited to regulation under mining laws. With some exceptions, however, mining laws generally have not addressed the issue of long-abandoned mine sites, or the special measures that may be necessary to facilitate their abatement, remediation, or reclamation. In part, this may be a function of the perception that, to the extent such matters are to be addressed as a matter of law, this should occur through environmental legislation. The points were addressed in the report with regard to mining laws.

The environmental legislation of each province contains many of the same regulatory elements. In general, these include:

1. general prohibitions on pollution;³²
2. application procedure and permit, approval, or licensing authority for discharges (that constitute an exception to the general pollution prohibitions);³³
3. authority, as part of, or in conjunction with, the above application procedure, to require preparation of environmental assessment of proposed activity;³⁴
4. authority for a variety of environmental remediation and cleanup orders;³⁵
5. exemption or variance authority from approvals and orders;³⁶
6. an appeal regime in respect of approvals and orders;³⁷
7. a complex regime of quasi-criminal and administrative offences and penalties (including provisions creating environmental liability for officers and directors of corporations);³⁸

³² See e.g. *Ontario Water Resources Act*, RSO 1990, c O.40, s 32 (a person that discharges, causes, or permits a discharge of any material of any kind into or in any waters or on any shore or bank thereof or in any place that may impair the quality of the water is guilty of an offence).

³³ See e.g. *Alberta Environmental Protection and Enhancement Act*, RSA 2000, c E-12, ss 66 (procedure on applications for approval), 68 (issuance of approval by director).

³⁴ See e.g. *Environmental Assessment Act*, RSO 1990, c E.18.

³⁵ See e.g. *Environmental Protection Act*, RSO 1990, c E.19, ss 7 (control orders), 8 (stop orders), 17 (remedial orders), 43 (waste removal orders), 97 (restoration orders) [Ontario EPA].

³⁶ See e.g. *Alberta Environmental Protection and Enhancement Act*, RSA 2000, c E-12, s 77 (any person engaged in an activity governed by the regulations may apply to the Minister for a certificate of variance to vary a term or condition of an approval or requirement of the regulations).

³⁷ See e.g. Ontario EPA, *supra* note 35 at ss 139-140 (refusals to issue approvals, licenses, permits, the imposition of terms and conditions on such instruments, or the issuance of orders entitles person to appeal such decisions to an administrative appeal tribunal established under the Act).

³⁸ *Ibid*, ss 186-193 (general offence and penalty provisions for violation of the Act), 194 (duties, offences, and liability of directors and officers of corporations).

8. special regimes of obligation and liability in relation to spills of pollutants into the environment;³⁹
9. complex regimes of management requirements and liability in relation to hazardous wastes and, in some provinces, contaminated lands;⁴⁰ and
10. regulation-making authority.⁴¹

In the absence of statutory provisions to the contrary, many of these standard elements could be expected to apply to abandoned mine land abatement, remediation, and reclamation activities.

A number of aspects of provincial environmental law, policy, or practice merited special attention because of their (1) potential significance to, or direct impact on, abandoned mine land abatement, remediation, and reclamation activities, or (2) potential precedent value as to the manner in which to address such activities. Most provinces possess legislation designed to avoid risks to worker and general public safety and health in the workplace, including in the operation of mines. They have also enacted laws authorizing the creation of local (municipal) governments, as well as laws that delegate to municipalities specific planning and regulatory powers over land uses. In exercising such powers, municipalities can play key roles with respect to environmental protection objectives, including those arising from mining activity. The review examined the matters of provincial interest that municipal authorities and others must consider as they exercise their responsibilities under planning legislation, as well as the powers delegated to municipal governments under such legislation.

Each of the above categories of law features both potential opportunities for, and obstacles to, facilitating the abatement, remediation, and reclamation of operating, contaminated, and orphaned/abandoned mines. The review summarized the relevant legislation of nine provinces (Prince Edward Island was excluded due to its lack of mining activity).

The legal and institutional framework for regulation of mining activity in Northern Canada (north of the 60th parallel), historically the almost exclusive domain of the federal government, is in a period of transition. In the Yukon, the federal and territorial governments entered into a Devolution Transfer Agreement ("DTA") that came into force in April 2003. The effect of this agreement is to transfer authority for administration and control of land, water, and mineral resources as well as law-making powers with respect thereto from the federal government to the Yukon government. The federal government retains financial responsibility for remediation of past impacts from mining activities that occurred before April 2003. The Yukon laws now covering mining and resource management activity "mirror" the federal laws repealed when the DTA came into force. In turn, some of the "mirror" Yukon laws are intended to be temporary until the Yukon or federal governments enact replacement legislation. The federal and Northwest Territories governments are now negotiating an arrangement similar to the DTA. Currently, federal mining and resource management laws continue to apply to the Northwest Territories as well as to Nunavut. In turn, Nunavut, officially created in 1999 when it was sepa-

³⁹ *Ibid*, Part X (duties and liabilities of owners and persons having control of pollutants that are spilled into the environment).

⁴⁰ See e.g. *Environmental Management Act*, SBC 2003, c 53, Part 4 (contaminated site remediation).

⁴¹ See e.g. *Environmental Protection Act*, SNL 2002, c E-14.2, s 111 (regulation-making authority).

rated from the Northwest Territories, continues to use the latter's environmental legislation as its own for the time being.

There also may be policies, programs, or related initiatives that are not explicitly set out or authorized in federal, provincial, and territorial legislation but apply to the issue of operating contaminated orphaned/abandoned mine lands and to their abatement, remediation, and reclamation. These were also reviewed in detail.

5. OVERALL FINDINGS ON COLLABORATION, LIABILITY, AND FUNDING FOR OPERATING CONTAMINATED AND ORPHANED/ABANDONED MINES IN CANADA

This part of the article makes three broad areas of findings arising from the 2007 review of federal, provincial, and territorial laws, policies, and programs respecting operating, contaminated, and orphaned/abandoned mines in Canada. These areas of findings pertain to collaboration, to liability, and to funding.

Overall, the findings suggest that a gap in existing law endures with respect to the orphaned/abandoned mine problem. Both mining and environmental laws assume that there is a responsible person available, one upon whom regulators may impose obligations (such as permits, licences, assessment, monitoring) and, if necessary, liability. Such laws are silent on the orphaned/abandoned mine issue. They implicitly presume that orphaned/abandoned mines, sites which by definition have no responsible person, do not come into existence. Accordingly, these instruments do not apply to these situations and contain no mechanisms to address them (with the exception of an emergency response led by the government, using public funds to remedy the problem).⁴²

As a gloss on the overall finding above, the environmental laws of certain Maritime and Western provinces have recognized the concept of an "orphan contaminated site." These statutes, which define such a site in a manner generically similar to an orphaned/abandoned mine, are relatively new and contain very broad, if general, authority for the government to address the "orphan contaminated site." This authority is usually to enter into agreements, development programs, or adopt other response measures. In the mining context, however, these statutes do not seem to have yet translated into any programs different from the government's pre-existing emergency response authority and corresponding power to expend public funds for mine assessment and cleanup. On its face, moreover, it seems likely that a "contaminated site" could also be a mine, in which case these particular laws could apply. Yet it also appears that in at least one of these jurisdictions (Alberta) the main type of mining which has occurred in the past (coal) may not generate the sort of issues that would cause provincial authorities to apply contaminated site laws to the mines.⁴³

The application of funding measures, such as financial security requirements, has been another weak link in existing legislation, on the whole. In several cases noted in the report, predictions as to the quantum of financial security needed from applicants to ensure proper closure and rehabilitation have been inaccurate. In these cases, when mining companies became

⁴² Castrilli 2007, *supra* note 13 at 138-140 (e.g. Ontario), 209 (general).

⁴³ *Ibid* at 92 (Alberta), 184-185 (Newfoundland).

insolvent or disappeared the government had to advance the funding necessary to avoid major shortfalls in cleanup costs. Little expectation of cost recovery accompanied the expenditure.⁴⁴

Finally, ad hoc non-statutory collaborative attempts to address the orphaned/abandoned mine problem, while of importance from a practical and precedent standpoint, do not appear to be the most effective overall solution if cast as the primary response to the issue. Given the potential magnitude, scope, and cost of the orphaned/abandoned mine problem, a systematic approach resulting in collaborations involving many sites would or should occur. The 2007 review was, however, unable to identify more than a few site collaborations across the country.⁴⁵

These and related issues respecting collaboration, liability, and funding are covered in more detail below.

5.1 Collaboration

The 2007 review identified four types of collaborative measures. First, there are federal-provincial collaborations. One example is the Canada-Ontario agreement respecting abandoned uranium mine and mill tailings, under which each government agrees to cover 50 percent of perpetual care costs where a producer or owner is unable to pay for cleanup due to bankruptcy, insolvency, or emergency circumstances.⁴⁶

Second, there are federal-territorial collaborations. An example is the Canada-Yukon DTA, under which Canada is responsible for the remediation of environmental impacts associated with activities that occurred on an abandoned mine site prior to 1 April 2003. In turn, the Yukon is responsible for the remediation of impacts associated with permits or authorizations issued by that government to mining operations after this date.⁴⁷

Third, there are federal-industry collaborations. An example arises with respect to the 2002 federal mine site reclamation policy for the Northwest Territories (and Nunavut). Under this policy, if a mine operator is insolvent and a receiver, interim receiver, or trustee-in-bankruptcy abandons a mine because the unsecured environmental liabilities exceed the economic value of the mine, the federal government will enter into transactions with a purchaser of such an abandoned mine under certain conditions. These conditions include the following: the purchaser would have limited liability for the existing environmental condition of the property; a portion of the economic value of the production from the mine would be attributed to a fund

⁴⁴ *Ibid* at 196 (e.g. Yukon). In 2002, the office of the federal environment commissioner noted several examples in the Yukon where advance prediction of the appropriate quantum of security was not accurate in the circumstances of particular mining operations that became insolvent. See Commissioner of the Environment and Sustainable Development, *Abandoned Mines in the North: Report to the House of Commons* (Ottawa: CESD, 2002) at 9 (Faro Mine: amount of financial security collected from owner was \$14 million; estimated costs to DIAND to cleanup: at least \$200 million; Mount Nansen Mine: amount of financial security collected from owner was \$445,000; estimated costs to DIAND to cleanup: \$6.3 million). Accordingly, while the authority to impose a financial security requirement is an important component in ensuring that mines do not become a burden on the public purse, it may not be the complete solution to the problem of orphaned/abandoned mines.

⁴⁵ Castrilli 2007, *supra* note 13 at 209.

⁴⁶ *Ibid* at 46-47.

⁴⁷ *Ibid* at 200-201.

for the remediation of the existing liabilities at the site; and the purchaser would remain fully liable for the remediation costs of any environmental impact resulting from its own operations at the site. Pursuant to this policy, the federal government entered into a variation of this arrangement with respect to the Giant Mine. While the federal environment commissioner commented adversely upon the particulars of this arrangement, in part because it may have departed from some of the conditions set out in the policy, the federal government has defended the arrangement given the circumstances.⁴⁸

Fourth, there are provincial-industry collaborations. Examples include:

- The 2001 British Columbia indemnification for environmental liabilities to the successor companies of the Britannia Mine operators in exchange for \$30 million. Using this amount, the provincial government undertook remediation activities at the mine site. The current estimated total cost for remediation and treatment is \$75 million, to which the province is contributing \$45 million. Although there are conflicting views as to whether the Britannia Mine is “abandoned,” the arrangement between the province and the successor companies specifies a fixed level of mining company contribution (i.e. \$30 million) and blends it with an indeterminate level of public funds (\$45 million to date) so as to solve the orphaned/abandoned problem of that particular mine. Over time, and depending on the particulars of the Britannia Mine arrangement, if the commitment of public funds were to grow while the company contribution remained fixed the arrangement may be viewed as problematic from a public policy perspective;⁴⁹
- The 2003 Ontario and Ontario Mining Association (“OMA”) memorandum of understanding, allowing mining companies to make voluntary contributions towards the rehabilitation of historical abandoned mines on Crown lands in return for a tax deduction and indemnification from liability. Under the partnership arrangement, Ontario administers funds received from industry, government, or other parties. Ontario and OMA expect that implementation of the agreement could result in enhancing the rate of rehabilitation of abandoned mine hazards in Ontario, and improving the image of the mining industry;⁵⁰
- Two site-specific government-industry partnerships also have been entered into in Ontario. In the first, when a former mine owner entered receivership, Ontario and Kinross Mines made an arrangement to co-share liabilities while the company conducted exploration work and developed closure plans. In the second, Ontario and Falconbridge entered into an arrangement with respect to the abandoned Kam Kotia mine that granted the company exclusive exploratory rights for five years in exchange for environmental funding of \$50,000 per year toward site cleanup. Ontario also exempted Falconbridge from full cleanup costs respecting existing hazards, unless the company significantly worsened the situation.⁵¹

⁴⁸ *Ibid* at 45-46.

⁴⁹ *Ibid* at 72-74.

⁵⁰ *Ibid* at 138, 210.

⁵¹ *Ibid* at 138, 211.

The first two types of collaborations noted above (federal-provincial, federal-territorial) are arrangements wherein the totality of environmental cleanup costs for orphaned/abandoned mines is paid for through public funds. Their advantage is making available a broader base of public funding for cleanup of orphaned/abandoned mines. Their disadvantage is that, with only public funds available, the cleanup process may still be very lengthy due to a variety of factors arising from the lack of a permanent dedicated funding source (as opposed to simply monies from consolidated revenue) as well as the overall magnitude of the orphaned/abandoned mine problem.⁵²

The third and fourth types of collaboration noted above (federal-industry, provincial-industry) have the potential to alleviate some of the government's financial burden. The public purse will fund only part of the cleanup costs and the availability of a broader base of funds can accelerate the response to the problem. One potential disadvantage of these types of collaboration is that they do not tackle systematically the overall orphaned/abandoned mine problem: the sites that may be on Crown land or attract industry interest may not be those most in need of environmental attention. Further, the proportion of public to private funds may (likely will) vary considerably from site to site, as will the terms and conditions of the arrangement, depending on the best "deal" that can be negotiated in the circumstances.⁵³

In addition, the environmental laws of Newfoundland and Labrador and of Nova Scotia authorize the government to enter into agreements, establish programs, as well as take other measures necessary to restore and secure contaminated sites and the affected environment where a responsible person cannot be identified or is unable to pay cleanup costs. While this authority is not mine-specific, there are circumstances where a contaminated site also could be a mine. The provisions essentially define the orphaned/abandoned mine situation (i.e. responsible person cannot be identified or is unable to pay for cleanup) and make it evident that the provincial treasury may be the primary, if not the sole, funding source of last resort for solving the problem. Given the wording of the statutes, however, and depending on how these authorities are administered, the laws of these provinces also may be considered precedents for *encouraging* voluntary abandoned mine land abatement, remediation, and reclamation activities. What may be necessary is greater specificity and guidance in the laws themselves as to how they will be applied, if at all, in the context of orphaned/abandoned mines. Furthermore, these statutes may need to be more pro-active in order to attract, on a systematic basis, public and private sector collaborators in solving the orphaned/abandoned mine problem.⁵⁴

Finally, some provinces, such as Manitoba⁵⁵ and Saskatchewan,⁵⁶ were of the view that the federal government and the mining industry should be collaborating with them on orphaned/abandoned mine clean-up because of past federal government and mining industry encouragement, promotion, or undertaking of mining activity in their jurisdictions to meet national security needs (e.g. war effort; uranium mining).

⁵² *Ibid* at 211.

⁵³ *Ibid*.

⁵⁴ *Ibid* at 169, 172 (Nova Scotia), 181-182, 184 (Newfoundland).

⁵⁵ *Ibid* at 119 (Manitoba).

⁵⁶ *Ibid* at 105 (Saskatchewan).

5.2 Liability

In general, the federal, provincial, and territorial jurisdictions reviewed appear to possess authority under both mining and environmental legislation to impose three types of liability with respect to mining activity: quasi-criminal, administrative, and civil. (Exceptions to this are the Northwest Territories and Nunavut. At this time, they have enacted environmental and mine workplace safety legislation but not general mining legislation. This situation should change in the relatively near future for the Northwest Territories when federal authority for public land—mines and minerals—and for water management will devolve to the territorial government. This will likely result in mining legislation that “mirrors” current federal mining laws). Quasi-criminal liability may arise from public or private prosecution of an offender in a court for violation of general prohibitions contained in mining or environmental legislation and regulations, or in the terms and conditions of licences, permits, approvals, or remedial orders issued thereunder. Administrative liability may arise from the issuance by the Minister, by inspectors, or by federal/provincial/territorial officers of remedial orders, as well as from the suspension or cancellation of licences, permits, or approvals. Civil liability stems from governmental or private court actions or applications seeking damages, injunctions, cost recovery, and other remedies available under statutory law and common law.

The imposition of liability with regard to mine sites is most effective where a viable responsible party still exists, against whom financial obligations or sanctions may be imposed. In the case of orphaned/abandoned mines, that person either cannot be identified or is unable to pay for rehabilitation. Under most legislation, many such facilities revert to Crown ownership. The only entity against whom liability may attach in these circumstances is the Crown itself. Thus, orphaned/abandoned mines, by definition, render ineffectual statutory regimes based solely or primarily on the imposition of liability for non-compliance, and these regimes make it inevitable that the legal, financial, and technical responsibility for orphaned/abandoned sites will revert to government.⁵⁷ The report noted many examples of the potential financial liability for cleanup that has been accruing, or may yet accrue, to governments as a result of the orphaned/abandoned mine problem:

- Federal government (northern Canada only): \$550 million (estimate viewed as conservative);
- Ontario: \$500 million;
- Quebec: \$75 million;
- Manitoba: no estimate (currently inspecting all the known approximately 250 inactive/abandoned mines to establish the province's liability);
- Saskatchewan: no estimate (assessment of 75 abandoned mines completed);
- Newfoundland and Labrador: partial estimate at least \$20 million (one site); no estimate to date for at least nine other sites;
- British Columbia: no estimate for the province as a whole; \$45 million government contribution towards solving environmental problems at Britannia Mine alone;

⁵⁷ *Ibid* at 212 and Part VI of Castrilli 2007 Report.

- Alberta: no estimate;
- Nova Scotia: no estimate;
- New Brunswick: no estimate.⁵⁸

The authority to impose joint and several liability that exists under some environmental legislation may potentially expand the range of persons upon whom liability may be imposed. This authority cannot, however, create responsible parties where truly none exist.

Finally, there is another noteworthy emerging trend in the imposition of liability under environmental legislative regimes. It relates to the circumstances under which protection from environmental liability for contaminated sites may be available to certain classes of otherwise potentially responsible persons (e.g. receivers, receiver-managers, trustees-in-bankruptcy). This development may provide a precedent for future legislative reforms that would protect volunteers who seek to remediate orphaned/abandoned mines. Some examples of this already have occurred on an ad hoc basis and were identified in the 2007 report.⁵⁹ A potential statutory precedent along these lines has developed in British Columbia, where historic, exploration, advanced exploration, producing or past producing mine sites are exempted from the application of certain types of environmental orders and/or security obligations that could otherwise apply to contaminated mining sites under provincial environmental law. The objective of such exemptions may be to encourage voluntary remediation or commercial re-mining activity as a means of solving some of the sites' environmental problems. Concern has also been expressed, however, that the approach could eventually increase the number of, and public liability for, orphaned/abandoned mine sites.⁶⁰

5.3 Funding

Approximately a decade ago, UNEP stated that the orphaned/abandoned mine problem required both legal and financial solutions.⁶¹ It is easy to see why this is the case. Economists long have noted that spillover effects or externalities occur when private markets do not function efficiently. When a company emits air pollutants over a community, its residents endure spillover costs in terms of potential nuisance, health, and environmental consequences. Governments may control external costs through tools such as regulation, taxation, subsidies, or, more recently, market-trading measures.⁶² These instruments are powerless in the context of orphaned/abandoned mines because the parties who created the costs are no longer financially viable, cannot be identified or located, or no longer exist. Accordingly, applying regulatory, tax, subsidy, or other measures is impossible and these sites, often located on Crown land, revert to Crown ownership. The social, economic and cultural costs remain to be solved. In the orphaned/abandoned mines context, the favoured funding approaches are relatively simple to state, though more difficult and controversial to apply. We shall now address some of them.

⁵⁸ *Ibid* at 212.

⁵⁹ *Ibid* at 213.

⁶⁰ *Ibid* at 63-65.

⁶¹ UNEP Report 2001, *supra* note 11.

⁶² J. Owen Saunders, "The Economic Approach" in Elaine L. Hughes, Alastair R. Lucas & William A. Tilleman, eds, *Environmental Law and Policy*, 3d ed (Toronto: Emond Montgomery Publications, 2003) at 391-400, 416-424.

First, governments (federal, provincial, or federal-provincial) could fund the rehabilitation of these sites through general revenue. The theory behind this approach is that governments set the standards, provided access to minerals, collected corporate income taxes, mining taxes, royalties, payroll taxes, and taxes on personal income. In parallel, governments either did not require, or did not enforce, adequate rehabilitation during the operating life of the sites, while there was still someone available upon whom to impose these financial obligations. This approach makes all taxpayers responsible for resolution of the problem.

Second, the present mining industry could contribute to a fund especially created for the rehabilitation of orphaned/abandoned mines. This idea is based on a generalized notion of "polluter pays," or the internalization of external costs imposed on the industry as a whole as a cost of doing future business in the jurisdiction. This approach renders the mining industry, as well as the ultimate consumers of the products of the industry, responsible for the resolution of the problem.

Third, governments could provide incentives for existing mining companies to rehabilitate orphaned/abandoned mines. These could come in the form of tax deductions, exemptions from liability, issuance of a mining licence on an adjacent site, financial contribution by the government in partnership with a mining company, or other similar arrangements. This approach makes both taxpayers and consumers responsible for the resolution of the problem.

Fourth, governments could, without imposing new taxes or fees on the mining industry, re-direct a portion of existing mining tax revenue and reduce existing incentives to the industry,⁶³ and earmark both streams to orphaned/abandoned mine rehabilitation generally or to a specifically designed fund. This approach allocates responsibility to both taxpayers and consumers. Historically, however, the calculation of mine royalties has not included the need to alleviate a problem that the industry was not addressing, namely orphaned/abandoned mine sites. Accordingly, the adoption of this approach would require very careful consideration.

Fifth, governments could use a combination of the above, or related funding approaches.

⁶³ The question of whether, why, and the extent to which the mining industry has received preferential tax treatment, incentives, and subsidies has been debated for over 30 years in Canada, going back at least to the 1972 Royal Commission on Taxation (hereinafter the "Carter Commission"). The federal government adopted few of the Commission's proposals that would have ended the noted preferential tax treatment of the industry. The debate has, however, continued. See Nancy D. Olewiler, "Non-Fuel Mineral Taxation: The Carter Commission and Subsequent Tax Reform" in W. Neil Brooks, ed., *The Quest for Tax Reform* (Toronto: Carswell, 1988) 249 at 257, 261 (noting an extraordinarily complex federal and provincial tax system that perpetuates distortionary subsidies the Carter Commission sought to eliminate for the mining industry, that are not received by other sectors of the economy). Historically, the reasons for such subsidies or incentives have included the fact that mining is an inherently risky activity that contributes to economic growth, employment, development, and exports, such that it requires stimulation through a reduced level of taxation or tax concessions. *Ibid* at 250-251. See also Ontario Fair Tax Commission, *Fair Taxation in a Changing World* (Toronto: Queen's Printer for Ontario, 1993) at 493-512 (noting suggestions for rethinking Ontario's approach to mining taxation). See also MiningWatch Canada and Pembina Institute for Appropriate Development, *Looking Beneath the Surface: An Assessment of the Value of Public Support for the Metal Mining Industry in Canada* (Ottawa: MWC-PIAD, 2002) at 122-128 (noting recommendations for ending recent federal and provincial tax credit programs for flow-through shares in the mining sector, and for removing other provincial sales and exploration tax exemptions).

Several of these funding mechanisms have in fact been employed in a number of jurisdictions. In general, however, existing mining legislation has done fairly little by way of preventing mining activity and its aftermath from becoming a taxpayer problem. Under existing mining and environmental laws, sources of funding to address the orphaned/abandoned mine problem may arise from numerous authorities. These sources include fees, security, cost recovery authority arising from non-compliance with laws, expenditure of public funds flowing from the statutory emergency response authority, and the authority to impose levies and create permanent funds dedicated specifically to site remediation.⁶⁴

Fee requirements as a condition of obtaining a licence, a permit, or approval for a mining or milling facility range from the merely nominal, to time spent by government in reviewing applications and supporting documentation including, in some instances, environmental assessment reviews. The authority to impose fees is not, however, based on the potential abandonment of such sites, or on the costs of rehabilitation.⁶⁵

Financial instruments, such as security requirements, imposed as conditions of licence, permit, or approval issuance are designed to address ongoing and post-operation rehabilitation and restoration of mine sites. This authority will usually address matters such as the amount, form, return, and default with respect to such security. Financial security requirements are based on the ability to predict, at the time of application and periodically thereafter, the costs of complete site rehabilitation, restoration, and cleanup after mining operations cease. Practical experience has not demonstrated the accuracy of predictions on the quantum of financial security necessary to achieve this goal. Numerous examples summarized in the report illustrate the gap between the two.⁶⁶

In terms of cost recovery of public funds expended by the Crown to rehabilitate mine sites, generally both mining and environmental laws characterize costs incurred by government to correct dangerous conditions at a mine site as a charge against, and a debt due by, the mine operator to the Crown. The debt binds the property that is the subject of the lease or mineral disposition. The Crown has a lien and charge against the property in respect of that debt, recoverable against the mine owner or operator in a court of competent jurisdiction. Its liability does not cease upon permanent closure or abandonment of the mine. Where the security provided under a closure plan does not cover the costs of rehabilitation, the portion not covered by the security also constitutes a debt due to the Crown recoverable from the owner or operator in a court of competent jurisdiction.⁶⁷

Such cost recovery provisions can be effective against a mine operator with other assets in the jurisdiction, or against a valuable, if closed or abandoned, mine property. Such provisions would not be very effective, however, against an operator that either no longer exists, is judgment proof, has left the jurisdiction along with all its assets, has deposited inadequate security, or has left behind a damaged or contaminated property worth less than the costs of cleanup. Apart from the authorization for the government to correct dangerous conditions (and pre-

⁶⁴ Castrilli 2007, *supra* note 13 at 213.

⁶⁵ *Ibid.*

⁶⁶ *Ibid* and *supra* note 39.

⁶⁷ Castrilli 2007, *ibid* at 213-214.

sumably expend public funds), mining and environmental laws do not offer a program to address situations when a mine is abandoned and orphaned.⁶⁸

As noted above, mining and environmental laws generally authorize government expenditure of public funds arising out of statutory emergency response authority. This appears to have been the primary basis relied upon to address problems created by orphaned/abandoned mines. The inadequacy of cost recovery measures in these circumstances has been noted above.

The laws of the jurisdictions reviewed for this report do not create the authority to impose levies and create permanent funds dedicated specifically to mine site remediation. However, Newfoundland and Labrador environmental law does authorize the Minister to “impose levies and establish a fund” for the purposes of contaminated site remediation generally. It is not clear if levies have been imposed, a fund established, what might otherwise be the source or quantum of monies associated with this statutory provision, or whether the regime is meant to apply to mines that also constitute contaminated sites. Still, the provision may be unique among provincial environmental legislation in Canada in formally authorizing the establishment, as a matter of law, of an orphaned sites fund that could also be applied to orphaned/abandoned mines. In practice, however, the provincial treasury appears to have been, to date, the primary funding source for the province’s current program of abandoned mine rehabilitation.⁶⁹

A 2006 study undertaken by the author⁷⁰ considered a levy on industrial production as a funding approach that could help solve orphaned/abandoned mines cleanup problems. The study examined a number of jurisdictions that adopted this mechanism or were considering it. The typical characteristics of these programs include the establishment in law of a government entitlement to impose a fee or tax on (an) industry sector(s), which fee or tax would be deposited into a dedicated fund earmarked solely for the purpose of orphaned/abandoned mine cleanup. Seven existing or proposed programs were considered under the laws of the United States, Ontario, Manitoba, and Alberta. From an analysis of those programs, the 2006 study drew the following findings and conclusions:

- On their face and as applied to date, funding approaches for cleanup of orphaned/abandoned mines that are based exclusively on a levy on mining industry production generally appeared to fulfill—with some exceptions—many of the principles and criteria identified in the 2006 study by government and non-government stakeholders as applicable to the problem (e.g. polluter pays, beneficiary pays);
- The exception relates primarily to the principle of fairness, to the extent that monies can be, and have been, used to pay for rehabilitation of sites from industries that do not contribute to the fund established under such regimes (as is the case under the United States Abandoned Mine Reclamation Fund—“AMRF”—and the Superfund);
- There is insufficient information to know whether by itself a levy on mining production could ensure a sustainable source of funds for the cleanup of orphaned/abandoned mines in Canada. Similar programs in the United States

⁶⁸ *Ibid* at 214.

⁶⁹ *Ibid* at 182, 184-185, 214.

⁷⁰ Castrilli & Scanlon, *supra* note 13 at 155-156.

(e.g. AMRF—abandoned coal mines) have been very successful in raising funds roughly commensurate with the magnitude of the problem facing that jurisdiction. Programs in Canada have not (e.g. Ontario - Management of Abandoned Aggregate Properties—“MAAP”—abandoned pits and quarries), due to the imposition of exceedingly low levies;

- The adequacy of hybrid programs, such as those in Manitoba respecting pits and quarries and those in Alberta regarding oil and gas, is more difficult to evaluate solely in relation to abandoned sites because they apply both to currently operating but soon to be abandoned as well as long abandoned sites;
- Some respondents to a survey conducted as part of the 2006 study were of the view that a levy could provide sustainable funding for orphaned/abandoned mine cleanup. Others opined that a levy on industrial production, while important, would be insufficient by itself to cover the costs of orphaned/abandoned mine cleanup given the magnitude of the problem. Still other respondents cautioned that eventual industry contribution to the fund would have to be calibrated so as to avoid impairing the competitiveness of Canadian producers;
- Until there is an accurate estimate of the magnitude of cleanup costs by jurisdiction it is impossible to determine whether a levy on mining production by itself would be sufficient to solve the problem in Canada at the federal or provincial level, and at what level such a levy should be set.

It is likely that a levy, in combination with other approaches discussed in this article, will be necessary to address the problem in Canada.

6. CONCLUSIONS

Unless one is enthusiastic about taxpayers funding post-abandonment remedial efforts, current Canadian responses to the question of orphaned and abandoned mines have been largely unsuccessful at solving the environmental, social, and economic problems caused by such sites. The governments' failure to address the issue legislatively has resulted in an extensive unmet need in this area. The appendix to this article provides over 60 recommendations based on three reports prepared by the author for NOAMI between 2002 and 2007. A central theme of the recommendations is that the orphaned/abandoned mine problem must be addressed directly and comprehensively in legislation and that such legislation should include a permanent funding approach (primarily a dedicated orphaned/abandoned mine fund) toward this purpose. While space does not allow a justification for all the recommendations below, readers interested in particulars may review the background reports themselves at <<http://www.abandonedmines.org>>.

7. APPENDIX: RECOMMENDATIONS

In the 2002 report *Barriers to Collaboration* for NOAMI, the following recommendations were made relating to the orphaned/abandoned mine problem in Canada:

Based on the above review there are some precedents to be drawn from [it] that provide a basis for recommendations that might be of assistance to the [Barriers to Collaboration] Task Group. These recommendations are premised on the view

that either existing legislation will have to be amended one law at a time (as in an omnibus bill), or that a single stand-alone law will need to be enacted that has the same effect. Accordingly, the following is a short list of possible components or options (some stated in the alternative with the source noted) for a federal and provincial legislative/regulatory approach to facilitating voluntary abandoned mine land abatement, remediation, and reclamation:

- Amend existing or enact new law that encourages volunteers to abate, remediate, and reclaim abandoned mine lands by (1) setting out the protections afforded, (2) identifying who is eligible for protection under the Act, (3) identifying the types of projects covered, and (4) listing the exceptions to immunity from liability (Pennsylvania generally; Kentucky and USDOJ with regard to permit blocking);
- Exempt volunteers from being "responsible persons" under contaminated site, water pollution, or related laws as a result of carrying out "good Samaritan" remediation if (1) prior to commencing the remediation, the volunteer was not a "responsible person" in respect of the site; and (2) environment (or environment and mining) ministry officers approve the work. The exemption would not apply to the extent the contamination or water pollution is caused or exacerbated by work carried out negligently, (or grossly negligently, or by wilful misconduct) of the volunteer (recommended but only partially adopted in British Columbia; California);
- Establish (1) an abandoned mine reclamation "good Samaritan" permit program, which would require permittees to specify reclamation plans and meet certain standards for cleanup, ensure public participation, and environment ministry oversight of cleanups; (2) provide that only "orphan" sites, with no identifiable responsible persons, can be the subject of a reclamation permit; (3) waive potential environmental liability for reclamation permittees during cleanup, but not if the water quality is made worse by the permittee. Where water quality is made worse, environmental liability would re-apply; (4) require compliance with all other water quality and environmental laws (US Congressional Bills);
- Require remining operators to implement strategies that control pollutant releases and ensure that pollutant discharges during remining activities are less than the pollutant levels released from the abandoned site prior to remining. Remining operators would have to develop a site-specific pollution abatement plan designed to reduce the pollution load from pre-existing discharges. The plan must incorporate the design and implementation of best management practices, based on environmental ministry guidance. Require operators to ensure that levels of certain specific substances (e.g. iron, manganese, and pH, etc.) in pre-existing discharges are not made worse from remining activities (USEPA under *Clean Water Act*);
- Create exemptions from remediation liability at "historic mine sites." A person would not be responsible for remediation at a historic mine site if: (1) indemnification has been provided to the person for that site under appropriate legislation; or (2) the person has acquired mineral or coal rights at the site for the purpose of undertaking mineral or coal exploration activities and the exploration activities have not exacerbated any contami-

nation that existed at the time the person acquired these mineral or coal rights (British Columbia);

- Adoption of measures identified under Part IV.C above (from various federal/provincial jurisdictions in Canada [among them: *partial exemption from liability for historic mine site contamination* for those seeking to remine such sites as has recently been enacted in one province; *variance authority* that acts as an “escape valve” from generally applicable environmental requirements such as approvals and regulations, subject to certain obligations, such as consultation with those who may be directly affected by the proposed variance; *exemptions for secured creditors* from being held as persons responsible for cleanup in certain circumstances are a potential precedent under several provincial laws that could be extended to abandoned mine land volunteers; *orphan contaminated site rehabilitation agreements* are authorized in several provinces and constitute a precedent for a more sophisticated approach of this type for volunteers in the abandoned mine land context; *limitations of liability* of responsible persons through a variety of apportionment, allocation, minor contributor, and other measures have been legislated under provincial environmental laws and constitute precedents for more equitable treatment of abandoned mine land volunteers].

Finally, these proposals should be considered in conjunction with other measures that are outside the scope of this report (e.g. abandoned mine land funds, more effective security deposits, etc.), but also appear to be integral to development of a comprehensive response to the abandoned mine land problem in Canada.⁷¹

In the 2003 *Funding Approaches* report for NOAMI, the following recommendations were made:

Based on the above review the authors provide the following recommendations for the consideration of the [Funding Models] Task Group:⁷²

1. Governments in Canada with authority for control of mining⁷³ should amend existing or enact new legislation⁷⁴ addressing specifically adoption and implementation of a funding regime for cleanup of orphaned/abandoned mines in their respective jurisdictions.
2. The funding regime should be designed to substantially eliminate the backlog of orphaned/abandoned mines in the jurisdiction in which the

⁷¹ Castrilli 2002, *supra* note 13 at 66-67.

⁷² These recommendations do not address what the percentage financial contribution should be from each of the funding approaches identified in recommendation 3, below. One reason for this is that, at the time of writing the report, the authors lacked available information on a number of matters important for such a determination. These include: (1) an accurate estimate of the costs for cleanup of orphaned/abandoned mines in each jurisdiction in Canada; (2) the economic health of the mining industry for each jurisdiction in Canada; or (3) the timeframe that governments in each jurisdiction will want to use to achieve cleanup. While the authors recommend that the cleanup timeframe not exceed 2-3 decades, this is still a matter that governments will need to consider on a jurisdiction by jurisdiction basis.

⁷³ The expression includes federal, provincial, and, where appropriate, territorial governments.

⁷⁴ “Legislation” as used here includes, where appropriate, the rules and regulations promulgated under the statute.

legislation is enacted within a reasonable timeframe (i.e. one or more decades not one or more centuries). To achieve this goal the legislation should identify the minimum and maximum quantum of monies that the Fund identified in recommendation 4 below should commence with at the start of each government fiscal year and authorize a well-defined remedial action planning and budgetary process.

3. Such legislative regimes should be based on a mix of all of the following funding approaches including:
 - Government funding from general revenues coming from a single level of government;
 - Federal-provincial (or federal-territorial) government funded cost sharing arrangements from general revenues, where appropriate;⁷⁵
 - Levies on mining industry production;
 - Government-industry partnerships;
 - Government re-direction of a portion of existing mining tax revenue, and reduction of existing incentives to the mining industry and application of both streams to orphaned/abandoned mine cleanup; and
 - Other sources of monies such as interest on monies contained in the Fund, deposits to the Fund of fines and administrative penalties imposed on the mining industry under this law and general environmental legislation, donations by individuals or others, etc.
4. The legislative regime adopted in each jurisdiction should include establishment of an Orphaned/Abandoned Mine Cleanup Fund ("OAMCF" or "Fund") into which general government revenue, industry levies, and other monies are deposited on an annual basis.
5. The legislation should specify the minimum annual financial appropriation to be made by the government and the period over which that level of appropriation is to continue. Where there is a shortfall from the declared minimum size of the Fund set out in recommendation 2 following estimates based on implementation of all of the funding approaches set out in recommendation 3, the legislation should set out how the shortfall is to be made up for that year.
6. The legislation also should specify the annual levy or levy range to be imposed on each mining company, mining industry sector, or classes within a sector as a cost attributable to its activities in the jurisdiction and the period over which that level of contribution is to continue. The levy calculation may be based on fixed fee(s) per tonne of production, percentage of net proceeds from the previous year, or other method. In specifying the levy or levy range the legislation may take into account such factors as credits to the industry arising from government-industry partnerships, mining type (e.g. surface, underground), environmental impacts, and related matters. The levy should be designed to achieve three objectives.

⁷⁵ It should be recognized that, where federal financing occurs, of the federal government will be entitled to establish national standards, should it so desire, pursuant to the federal spending power of the Canadian Constitution.

First, it should not constitute an undue financial burden on the mining industry.⁷⁶ Second, it should generate sufficient funds for meeting statutory objectives within a reasonable timeframe in conjunction with the other funding approaches. Third, it should be structured so that it does not exert an inflationary influence on the economy.

7. The legislation should set out the basis for government-industry partnerships, including whether they may be generic or site specific, or both. Where such arrangements are entered into, the legislation should set out the effect of such arrangements, if any, on the annual levy noted in recommendation 6 and tax and incentive measures noted in recommendation 8.
8. The legislation should amend federal and provincial tax laws to specifically identify (1) the annual quantum of mining tax revenue being re-directed to the Fund, and (2) the annual quantum reduction of existing incentives to the mining industry being re-directed to the Fund.
9. The legislation should set out the specific purposes of the funding regime including:
 - Reclamation and restoration of land and water resources adversely affected by past mining activities;
 - Cleanup of abandoned surface mine, processing, milling, and disposal areas;
 - Sealing, filling, and grading abandoned underground mine entries, shafts, openings, and voids;
 - Planting of land adversely affected by past mining to prevent erosion and sedimentation, including measures for the conservation of soil, water, woodland, fish, and wildlife;
 - Prevention, abatement, treatment and control of water pollution created by mine drainage including restoration of stream beds, and construction and operation of water treatment plants;
 - Prevention, abatement, and control of mine subsidence;
 - Protection of public health, safety, general welfare, and property from extreme danger or adverse effects of abandoned mines;
 - Protection, repair, replacement, or enhancement of public facilities, such as roads, recreation, conservation, and open space areas;
 - Provision for studies or technical reports by qualified professionals on remedial solutions to environmental, health, or safety problems at orphaned/abandoned mines;
 - Compensation for private property or health damage; and

⁷⁶ This can include sensitivity to cash flow and ability to pay within a particular timeframe during periods of economic downturn that impact on the mining industry. The result could be deferral of a requirement on a company to pay the levy in certain years as long as the deferred payment is made up in subsequent years.

- Public involvement and reporting.
10. The legislation should specify that lands and water eligible for cleanup through the funding regime are those for which there is no identifiable responsible person and that were mined or adversely affected by mining and abandoned or left inadequately reclaimed prior to a date identified in the law. The legislation also should address how (whether) the funding regime will address sites abandoned after the above date so as not to encourage creation of future orphaned/abandoned mines.
 11. The legislation should specify the orphaned/abandoned mine cleanup priorities under which the funding regime will operate. Possible priorities could include cleanup of sites posing (1) extreme danger to public health, safety, welfare, property, and the environment and (2) adverse effects⁷⁷ to public health, safety, welfare, property, and the environment, including restoration of land, water, fish and wildlife resources degraded by past mining activity.
 12. The legislation should identify the administering entity for the funding regime. The authors recommend that this entity be either a department of government or special government agency created by the legislation establishing the funding regime. Whichever entity is chosen it should bring to the task the expertise that resides within mines and environment departments as well as industry because of the safety, environmental, human health, and engineering problems posed by orphaned/abandoned mines. Furthermore, the decision-making processes employed by the entity should include public input, oversight, accountability, and freedom from conflict of interest. Use of a multi-stakeholder advisory body should be considered to achieve these objectives.
 13. The legislation should authorize promulgation of rules and regulations addressing such matters pertaining to administration of the funding regime as:
 - Levy collection, mining production reporting, and compliance;
 - General fund administration;
 - Remedial action planning and budgetary process;
 - General reclamation requirements relating to such matters as determining eligibility of specific lands and waters, cleanup objectives and priorities;
 - Exemptions, credits for industry partnership contributions, variances, and/or time-limited deferrals from the funding regime;
 - Program considerations such as land, water, or mineral rights required for cleanup, jurisdictional responsibilities, non-emergency site selec-

⁷⁷ "Adverse effects" include: (a) impairment of the quality of the environment for any use that can be made of it, (b) injury or damage to property or to plant or animal life, (c) harm or material discomfort to any person, (d) impairment of the health or safety of any person, (e) rendering any property or plant or animal life unfit for human use, (f) loss of enjoyment of normal use of property, or (g) interference with the normal conduct of business.

tion criteria, emergency projects, and the application of risk assessment to the site selection and site cleanup process;

- Site considerations such as mine drainage, slide-prone areas, erosion and sedimentation, toxic materials, hydrologic balance, public health and safety, fish and wildlife values, and air quality;
 - Community involvement and public consultation in site selection and site cleanup projects as well as policy development; and
 - Such further and other matters as deemed appropriate in the circumstances.
14. In conjunction with [the] establishment of a funding regime, the process of cleanup of orphaned/abandoned mines should be facilitated through measures designed to eliminate barriers and facilitate community involvement identified by previous studies commissioned by NOAMI. The authors are of the view that (1) adopting any funding approach beyond appropriation of government funding from general revenue and (2) addressing existing legal and institutional barriers to orphaned/abandoned mine cleanup⁷⁸ will compel Parliament and provincial legislatures to address these and related problems as a matter of law. In the circumstances, establishing a comprehensive legal and financial response to these matters appears warranted.⁷⁹

The two overriding legislative reform themes emerging from the 2002 and 2003 reports pertain to laws that facilitate volunteers in the rehabilitation of orphaned/abandoned mines and establish permanent funding arrangements for addressing the orphaned/abandoned mine problem without relying entirely on public funds. The findings from the current report, which expands the review to operating and contaminated, as well as orphaned/abandoned, mines suggest that the recommendations from previous reports are still relevant.

To underscore the need for legislative reform in these two areas, the following supplemental recommendations are advanced for the purposes of expanding or clarifying law reforms proposed in the 2002 and 2003 reports. Repetition with past recommendations may occur but is not intended. Where there are any inconsistencies between past and current recommendations, the latter take precedence.

To facilitate voluntary rehabilitation of orphaned/abandoned mines, amendment of existing, or enactment of new, legislation should address the following matters:

1. Establish that the purpose of such legislation is the facilitation of cleanup of orphaned/abandoned mines by limiting the potential liability of persons who undertake such cleanup.
2. Ensure that the scope of such legislation is not intended to facilitate new mining activities or any reduction in the scope of responsibility and liability associated with any current or new mining and processing activities.
3. Authorize the issuance of permits for the rehabilitation of orphaned/abandoned mines to persons (government, non-government, First Nation, etc.).

⁷⁸ See generally Castrilli 2002, *supra* note 13.

⁷⁹ Castrilli 2003, *supra* note 13 at 11-12.

4. Authorize as a condition of permit issuance the submission of an orphaned/abandoned mine rehabilitation plan that includes such information as:
 - Identity of persons proposing, and land area to be addressed by, the plan;
 - Environment adversely affected by past mining activities at the orphaned/abandoned mine;
 - Baseline environmental conditions at the time of permit application, including impacts from the orphaned/abandoned mine;
 - Conditions at the orphaned/abandoned mine that are causing the adverse environmental impacts;
 - Identity of current and past owners or operators of, or of persons whose activities contributed to the conditions on, the land on which the orphaned/abandoned mine is located;
 - Rehabilitation plan goals and objectives, including actions to be taken to meet applicable environmental requirements to the maximum extent practicable and that will not worsen baseline environmental conditions identified above;
 - Rehabilitation plan practices and estimated schedule and completion date for implementing such practices designed to meet applicable environmental requirements to the maximum extent practicable, and that will not worsen baseline environmental conditions identified above;
 - Description of how proposed practices will result in the rehabilitation plan meeting applicable environmental requirements to the maximum extent practicable and will not worsen baseline environmental conditions identified above;
 - Proposed monitoring, assessment, and reporting that will evaluate success of practices during and after implementation in comparison to the baseline conditions;
 - Proposed contingency plans for responding to emergencies at the orphaned/abandoned mine to ensure that practices implemented during such events achieve rehabilitation plan goals and objectives;
 - Budget for rehabilitation plan, including source(s) of funding or financing to ensure plan implementation can be achieved;
 - Legal authority of applicant to conduct rehabilitation plan activities at orphaned/abandoned mine;
 - Covenant obligating future landowners to operate and maintain property so as to ensure rehabilitation plan goals and objectives continue to be met.
5. Authorize government review of applications, including public notice and opportunity for comment and, in the case of major orphaned/abandoned

mine rehabilitation projects, public hearing(s) on the application as part of the process of determining if a permit should be issued.

6. Authorize government issuance of a permit if (1) applicant has made reasonable efforts to locate and identify current and past owners or operators of, or those whose activities contributed to the conditions on, the land on which the orphaned/abandoned mine is located; (2) no such person exists or is otherwise financially able to undertake the rehabilitation plan; and (3) the rehabilitation plan demonstrates with reasonable certainty that the implementation of the plan will meet applicable environmental requirements to the maximum extent practicable and will not worsen baseline environmental conditions identified above.
7. Set out circumstances under which the Government could modify or terminate the permit.
8. Allow a permit holder to sell or use materials recovered during the implementation of the rehabilitation plan, but require that the sale proceeds be used to defray rehabilitation costs of the site addressed in the permit or the costs of rehabilitation at other orphaned/abandoned mine sites.

To provide a source of funding for the rehabilitation of orphaned/abandoned mines, amendment of existing, or enactment of new, legislation should address the following matters:

1. Establish that the purpose of such legislation is to create a dedicated source of funding to ensure cleanup of orphaned/abandoned mines.
2. Require that, among other sources for such funding, fees, levies, percentage of net proceeds, or other methods of fund acquisition will be imposed on persons producing minerals from a mine and will be payable to government (or government agency established under the regime).

Other recommendations not directly or primarily connected to facilitating volunteers or establishing a dedicated fund for cleanup of orphaned/abandoned mines follow based on the nine categories of provisions investigated for this report:

Licence/Permit

1. Mining laws that authorize approval of mining operations in the absence of a closure plan should be amended to require such a plan as a condition of approval.
2. Environmental and/or mining laws should be amended to ensure that approval requirements with respect to mining operations and/or remediation, including orphaned/abandoned mine remediation, address protection of drinking water supplies.

Assessment

3. Mining laws that contain minimal or no assessment information with respect to environmental matters should be reconciled with environmental laws and,

if necessary, one, the other, or both amended to require the production of requisite assessment information.

Monitoring

4. Mining laws that contain no monitoring requirements with respect to environmental matters should be reconciled with environmental laws and, if necessary, one, the other, or both amended to require such activity to ensure no gaps in monitoring coverage.
5. Mining and/or environmental laws should include the cost of on-going and post operation monitoring as part of financial assurance obligations.

Liability

6. Mining laws that exempt mining operators from liability from certain orders available under environmental laws where mining lands or rights have been surrendered, should be amended to remove the exemptions.
7. Environmental laws that exempt historic, exploration, advanced exploration, producing and past producing mines from certain types of liability, should be amended to remove the exemptions, except to the extent activities at historic mine sites represent "Good Samaritan" attempts to remediate the sites.
8. Liability under mining and environmental laws should be made at least joint and several, but allow apportionment of costs by agreement between persons responsible for mine site contamination.

Emergency Response

9. Mining and environmental laws that are silent on, or unclear about, the authority to undertake emergency response actions in a mining context, should be amended to explicitly authorize such activity.
10. Where environmental laws exempt (or grant the Minister discretion to exempt) a proponent from having to conduct an individual environmental assessment (where the project is in response to a contaminated or orphaned/abandoned mine site emergency and carrying out the project forthwith is in the interest of preventing damage to property, environment, public health or safety), conditions should be attached to the exemption to ensure community involvement occurs of the type set out in recommendation 28, below.

Financial Instruments

11. Where mining or environmental laws do not provide for provision of financial assurance or security with respect to operating mines, such laws should be amended to do so.
12. Where mining or environmental laws do not provide for periodic re-evaluation of the adequacy of financial assurance or security and adjustment with respect to operating mines, such laws should be amended to do so.

13. Where mining or environmental laws do not require that in determining the amount of security with respect to operating mines for purposes of mine rehabilitation on a site-specific basis certain factors identified in the laws must be addressed, such laws should be amended to do so. At least the following factors should be identified in such laws:
 - current cost for labour, equipment, supplies and services to conduct such rehabilitation activities as removing buildings, structures, or foundations;
 - capping or filling pits and shafts;
 - stabilizing tailings disposal sites and drainage containment facilities;
 - surface contouring;
 - establishing proper site drainage;
 - re-vegetation;
 - other work necessary to reclaim area disturbed by mining activity.
14. Where mining or environmental laws do not provide for a closure plan for mining activity, such laws should be amended to do so. Such closure plan should be required to include the form and amount of financial assurance or security, a schedule of the estimated capital and operating costs of carrying out, in accordance with the plan, closure of the project site, rehabilitation of the site, and programs to monitor and manage the site after closure. Such a closure plan should be certified by an officer or director of the proponent (where the proponent is a corporation) and either a professional engineer, geologist, or accountant. All aspects of the closure plan should be subject to periodic (yearly) review and adjustment where necessary.
15. Where mining or environmental laws do not require a closure plan to contain information regarding consultations carried out with all aboriginal peoples and other members of the public affected by a mining project, including a description of their comments and response, if any, to financial assurance portions of the closure plan, such laws should be amended to do so.
16. Environmental laws that exempt exploration, advanced exploration, producing and past producing mines from having to provide financial security should be amended to remove the exemptions.
17. Mining laws that are silent on recovery of mine cleanup costs incurred by government should be amended to authorize such recovery.
18. Limits established by mining or environmental regulations on the quantum of mine site financial security should be removed.
19. Mining and/or environmental laws should include the cost of on-going and post operation monitoring as part of financial assurance obligations.

Application/Exemption

20. Where laws respecting environmentally contaminated sites do not apply because mining law rehabilitation provisions apply, both laws should be reconciled and, if necessary, one, the other, or both amended to ensure there are no gaps in coverage.
21. Where rock fill or mill tailing wastes are exempt from the application of waste management provisions of environmental laws, these laws should be reconciled with any other relevant or applicable laws and, if necessary, amended to remove the exemptions.
22. Environmental laws that exempt mining exploration projects from the application of such laws should be amended to remove the exemption.
23. The discretion under environmental assessment laws to exempt the application of EA requirements to mining projects above a certain threshold of production capacity or disturbance area should be reviewed and, where necessary, amended to reduce or eliminate the discretion.
24. Threshold limits for the application of EA requirements based on production capacity or disturbance area should be reviewed and, where necessary, amended to reduce the threshold limits.

Designation of Orphaned/Abandoned Sites

25. See 2002 and 2003 reports and above supplementary recommendations where appropriate.
26. Mining laws, where applicable, should be amended so that their definitions for "abandoned mines" do not define them as sites where permit obligations have been satisfied.
27. Building on the work that has been undertaken in several jurisdictions set out in this report with respect to contaminated sites or orphaned/abandoned mines, mining laws should be amended to define orphaned/abandoned mines as un-rehabilitated sites for which a person responsible cannot be identified or is unable to pay for cleanup, set criteria for identifying these facilities, and authorize compilation of an inventory or database of such sites that is accessible to the public.

Community Involvement

28. Mining and/or environmental laws should be amended to (1) authorize public involvement and/or hearings before a contaminated or orphaned/abandoned mine site remediation plan or order is issued, (2) establish a site registry for the collection and dissemination of information to the public regarding procedures for investigation and designation of such sites, and (3) require the Minister to provide opportunities for public input in the development of regulations respecting contamination levels or investigation/ remediation standards at such sites.

29. Where mining or environmental laws do not require a closure plan to contain information regarding consultations carried out with all aboriginal peoples and other members of the public affected by a mining project, including a description of their comments and response, if any, to the closure plan, such laws should be amended to do so.
30. Mining or environmental laws should (1) require an EA hearing determining whether a major mining project proposal "is in the public interest" having regard to its social, economic, and environmental effects and whether it should be approved, and (2) authorize costs and/or funding to interveners participating in the process.
31. Mining and/or environmental laws should (1) require applicants for mining permits or variances to include information showing the nature and extent of all consultations undertaken with aboriginal peoples and other members of the public who will be directly affected by the proposed permit or variance, (2) allow such persons to submit statements of concern that must be considered by the responsible ministry, and (3) require the responsible ministry to give notice of issuance of any environmental protection or related order respecting a mining operation to the local authority of the municipality where the mine is located, a First Nation, or such other persons as may be affected as is appropriate in the circumstances.⁸⁰

⁸⁰ These recommendations are taken from Castrilli 2007, *supra* note 13 at 220-225.