RESEARCH NOTE

Minerals for War: British Columbia's Production of Mercury and Tungsten during the Second World War

Robert G. McCandless

During the Second World War, British Columbia's Department of Mines led provincial efforts to supply the Allies with critically important metals. Canada, the United States, and the United Kingdom needed metals to make munitions – the tools of war: everything from buttons on military uniforms to weapons and tanks to warplanes and warships. Belligerent countries needed strategic metals to make munitions, and Canada's sources could not meet its own demands.[1] This article focuses on newly opened mines in British Columbia that supplied Canada with two metals essential for the war effort – mercury and tungsten – while its many existing mines continued to produce coal, precious metals (silver and gold), and base metals like lead, zinc, and copper.

The policies and actions of eighty years ago remain relevant for two reasons: first, modern manufacturing needs cobalt, tantalum, lithium, and other rare metals;[2] second, Canada's wartime experience with strategic metals demonstrates how, despite mining being solely under provincial jurisdiction, the federal and provincial governments can cooperate effectively.

Many metals have strategic importance. As well as mercury and tungsten, these include chromium, cobalt, manganese, molybdenum, and nickel used in alloys with iron; antimony and tin, essential for making engine bearings; and magnesium, which is used for incendiary weapons or alloyed with aluminum for aircraft manufacture. In the late 1930s, British Columbia's Department of Mines remembered the metal shortages during the First World War. As early as 1938, and entirely

[1] Some strategic supplies, such as rubber for tires and silk for parachutes, are not metals.

[2] House of Commons, Standing Committee on Natural Resources: RNNR – Home – House of Commons of Canada (ourcommons.ca). See Recent Business, Report 6, RNNR Committee Report, *From Mineral Exploration to Advanced Manufacturing*, 43rd Parliament, 2nd session, 2021. The report uses the term "critical minerals."

on its own initiative, the province encouraged prospectors and mining companies to search for these critical metals by providing financial support ("grubstakes") and educational materials, and by directing its professional staff to undertake fieldwork at promising sites. This article focuses on the production of mercury and tungsten.

The province created the Department of Mines in 1874, and for the next sixty-five years it administered mineral tenures (i.e., claims and leases), collected taxes, and supervised mine safety. It provided free services, like mineral testing and assaying, and its geologists and engineers travelled throughout the province, inspecting sites and writing field reports that prospectors and miners and, most important, investors trusted.[3] Dr. John F. Walker, who was appointed deputy minister in 1936 and remained in that position until his retirement in 1957, led the sector's recovery from Depression-era metal prices, steered it through wartime demands for base metals, and laid a solid foundation for mining's burgeoning success in the late 1950s. He was an exemplary public servant.[4]

Canadians and others learned from their First World War experiences. Submarine warfare had proved that overseas sources could be disrupted, so on the eve of the Second World War, Canada, the United Kingdom, and, to a lesser extent, the United States anticipated threats to strategic commodities, including metals.[5] To avoid the alleged "war profiteering" of the earlier war and the Bren Gun controversy of 1938,[6] Canada awarded sole-source and "cost-plus" contracts under the aegis of the newly created Defence Purchasing Board, later renamed the War Supply Board.

In April 1940, Canada created a new department, munitions and supply, to assume the board's functions under a greatly increased budget. Its famous minister, Clarence D. Howe, headed the department throughout the war. Howe was accountable to Parliament but, in practice, delegated authority for wartime production to experienced men drawn from industry, trusting them to make decisions in the national interest. This was especially true of mining and metals. The Wartime Industries

---

[3] To appreciate this point, readers could review the infamous 1997 Bre-X fraud related to an overseas gold property.

[4] John Kenneth Galbraith once said, "This is the basic rule of all public service – if you succeed, your work is forgotten." He was interviewed at age ninety-four by the *Guardian Weekly*, 10 October 2002.

[5] Allied sources for tin, rubber, opium, and silk from Southeast Asia were stopped by the Japanese occupation. See H.W. Spiegel, *The Economics of Total War* (New York: Appleton-Century, 1942), 235.

[6] C.P. Stacey, *Arms, Men and Government: The War Policies of Canada, 1939–1945* (Ottawa: Queen's Printer, 1970). Stacey describes the Bren Gun controversy on page 101.

Control Board, a part of his department,[7] coordinated fifteen separate "controllers" whose task was to reduce competition for resources and set priorities. Some controllers wielded administrative powers over such natural resources as oil, coal, and timber. Except for shipbuilding and aircraft, the controllers' authority overlapped provincial jurisdiction, so they were careful to avoid usurping provincial powers in guiding national efforts to supply munitions.[8]

George C. Bateman, who was appointed as metals controller in July 1940, became Deputy Minister Walker's Ottawa contact. Their correspondence was collegial and candid, and they met on at least two occasions. Within a month of Bateman's appointment, Walker sent him a brief inventory of known occurrences in British Columbia of ore minerals that could be potential sources of strategic metals.[9] Walker concluded, however, that his department "could do little more without digging and drilling," meaning that exploring some promising sites would require significant expenditures.

At first, when the Department of Munitions and Supply placed very large orders for munitions in 1940, metal supplies seemed adequate. Even when supplies began to be questioned in late 1941, the government of Canada did not intervene or invest in mineral exploration or development but, rather, left those activities in private (i.e., corporate) hands. There were three important exceptions: British Columbia's Emerald tungsten mine (discussed below), the Chromeraine chromium mine in Quebec, and the Eldorado uranium mine in the Northwest Territories.[10]

It is necessary to pause here and emphasize that the war did not change the definition of "ore," a word with an ancient and persistent meaning – rock containing minerals from which something valuable can be recovered *at a profit*. The Parthenon was built with the proceeds of unusually rich silver ores mined at Laurium, about forty kilometres south of Athens.[11] The craft of mining has always rewarded those with the skills to find ores, extract metal, and sell it. In the long term,

---

[7] John de N. Kennedy *History of the Department of Munitions and Supply*, Vols. 1 and 2 (Ottawa: King's Printer, 1950) is definitive. The endpaper of volume 1 contains an organization chart showing the department's surprisingly flat structure.

[8] Wartime control over agriculture and fisheries remained within those federal departments.

[9] George C. Bateman to John. F. Walker, 30 July 1940, War Minerals Miscellaneous, box 35.4, "Records with regard to mineral titles," Minerals Resource Branch, GR-1579, British Columbia Archives (hereafter BCA). The target metals were tungsten, manganese, mercury, and molybdenum.

[10] The Chromeraine chromium mine in Quebec and the Eldorado uranium mine in the Northwest Territories are briefly described in Kennedy, *History of the Department of Munitions*, 1:508 and 336, respectively.

[11] T.A. Rickard, *Man and Metals* (New York: Whittlesey, 1932), 1:354ff.

markets keep supply and demand in balance, but, during wartime, prices for strategic metals like mercury and tungsten become very volatile. Belligerent countries bring their mines and metals under government regulation and stockpile supplies against possible shortages. Although Canada, the United States, and the United Kingdom controlled all metal sales prices, London and New York metal markets continued trading quantities of metal that were surplus to national needs. Once Allied governments had purchased the metals they needed, it was business as usual for mining and metal markets.

Before it entered the war, the United States cooperated with Canada and Great Britain in obtaining and stockpiling strategic metals that could not be obtained feasibly or economically within North America. These included tin, manganese, magnesium, chromium, mercury, and tungsten,[12] and such non-metallic minerals as mica, quartz, corundum, and fluorspar.[13] Shipments from overseas sources could be disrupted by naval attacks or embargoed by neutral countries that were primary, even sole sources of some metals. In the 1930s, China, Korea, and Portugal were among the major sources of tungsten, and Spain and Italy of mercury. Bolivia became important as a source of tin when the Japanese invasion cut off sources in Southeast Asia.[14] Other vulnerable metals included manganese (from India and Africa), vanadium (Peru), and chromium (Turkey).

In the late 1930s, British Columbia's Department of Mines was well aware of these supply risks and encouraged searches for these minerals. Within days of Canada's declaration of war on 10 September 1939, it closed a field school to train unemployed young men as prospectors under the 1937 Dominion-Provincial Youth Training Plan and directed its students to prospect for strategic metals.[15] Prospectors were offered training, given geological information bulletins,[16] and encouraged to bring in their rock samples for mineral identification and free testing and assaying. The First World War's Wartime Prospectors' Grubstake

[12] W.O. Hotchkiss discusses these metals and others in his *Minerals of Might* (Lancaster. PA: Jacques Cattell Press, 1945). Tin is discussed on page 93.

[13] Mica sheets are electrical insulators; quartz crystals tune electronic frequencies; corundum sand is an abrasive; fluorspar (fluorite) is essential to smelt aluminum.

[14] R. Warren James, *Wartime Economic Cooperation: A Study of Relations between Canada and the United States* (Toronto: Ryerson Press, 1949), 233–43.

[15] British Columbia Minister of Mines, *Annual Report 1939* (Victoria: King's Printer, 1940), A7. Some pupils investigated manganese ore minerals near Cowichan Lake, and others prospected for mercury near Savona.

[16] The Department of Mines published *Bulletin 5, Mercury* (1940); *Bulletin 9, Molybdenum* (1940); and *Bulletin 10, Tungsten* (1943), which describe the economics of these metals as well as their geology at known BC occurrences.

Act was amended to grant up to three hundred dollars to prospectors in a modest program that had some success.[17] The province protected mineral rights held by men who had joined the armed services, as it did during the First World War. To conceal economic information from the Axis powers, at Ottawa's request, the department initially refrained from publishing production data for lead, zinc, copper, and eleven other metals.[18] Meantime, the department carried on with its core tasks of mine inspections, managing mineral tenures and permitting, and reporting on the sector's economics, employment, exploration, and mine safety.

During 1941, Metals Controller George Bateman became increasingly concerned about national strategic metal supplies. In February 1942, he confided to Deputy Minister Walker, "There are very few people who have any realization of the serious situation with regard to the supplies of materials … we are anxious to try to keep existing operations going."[19] A month later, the government created the Wartime Metals Corporation to "assume the responsibility of administering, directing, operating and supervising such mining and metallurgical projects … necessary to meet serious shortages of certain metals and minerals."[20] If necessary, under Bateman's leadership, it could become the government's own mining company.

The Department of Munitions and Supply also appointed twelve senior mining executives to serve "without remuneration" as members of the Wartime Metals Advisory Committee.[21] The initial organizing meeting of 12 June 1942 included seven "associate members," including such provincial government officials as Walker and nine "guests." Among them was George Bateman, who reported "a scarcity of all metals and minerals today" and pleaded with the industry representatives to provide him with "inventory," meaning descriptions and estimated production costs of every potential mine site. He told them, in effect, "tell me about the properties and let me worry about metal prices and finding development capital." He mentioned tungsten, molybdenum, mica, copper, zinc, chromium, and cobalt. The minutes do not mention mercury, but

---

[17] British Columbia Minister of Mines, *Annual Report 1944* (Victoria: King's Printer, 1945), A50.
[18] Memos to Minister, 27 April 1940, GR-1579, 35.9, BCA. Withheld data were published in 1943.
[19] Bateman to Walker, 12 February 1942, GR-1579, 43.12, BCA.
[20] "Wartime Metals Corporation History," n.d., DMS Wartime Metals Corporation, document, Department of Reconstruction and Supply, RG 28-A, file 7, Library and Archives Canada (hereafter LAC).
[21] These were among C.D. Howe's famous "dollar-a-year" men.

Bateman may have told the committee about the new mine at Pinchi Lake during the interval indicated in the minutes as "off the record."[22]

During its three-year life, the Wartime Metals Corporation, guided by its advisory board, recommended subsidizing nineteen mining projects in Canada, five of which were in British Columbia. It also acted on behalf of its American counterpart, Metals Reserve Company, to use American capital to help a few Canadian mines increase their production of lead, zinc, and copper concentrate destined for American smelters.[23] In British Columbia, with this American capital, Wartime Metals invested in restoring production at two long-closed base metal mines, subsidizing two large copper mines, and developing the Emerald tungsten mine at Salmo in the central Kootenay region.[24] The closed mining properties were not economic by market criteria, but their proven metal reserves met Wartime Metals' funding criteria. Similarly, copper mines received payments per pound of copper produced after satisfying the metal controller that labour shortages had raised production costs above sales revenues.

A broad view of British Columbia's mining industry in 1939 helps to explain how its role was transformed. The BC Minister of Mines *Annual Report* that year listed over two hundred mines as shipping ore, twice as many as in 1929. Three large base metal mines – Sullivan at Kimberley, Britannia near Vancouver, and Copper Mountain near Princeton – employed almost half of six thousand men working in lode or hard rock mines. Hundreds more worked at five hard rock gold "camps": Bralorne near Lillooet, Zeballos on the west coast of Vancouver Island, Wells in the Cariboo, Premier near Stewart, and Nickel Plate near Hedley. Coal mines at Cumberland, Nanaimo, Princeton, and Fernie employed another two thousand miners. Gold, the province's most valuable mine product, earned a third of 1939 mineral revenue of $56 million, followed by lead, zinc, copper, and silver.[25]

The war adversely affected British Columbia's mining industry in five ways. First, base metal and coal mine production fell because miners enlisted in the armed forces or took other jobs, especially in shipbuilding and other munitions industries that offered better pay and working conditions. Second, wage controls meant that mines could not retain

[22] Minutes, Organizational Meeting War Metals Advisory Committee, Mining Association Vancouver, GR-1579, 38.3, BCA.

[23] Kennedy, 1:506.

[24] These were the Kootenay-Florence lead zinc mine at Ainsworth; Twin J or Tyee zinc copper near Duncan; Britannia copper near Vancouver; and Copper Mountain near Princeton. See Kennedy, 1:506 ff.

[25] Minister of Mines, *Annual Report 1939*, A14 to A34.

workers by offering higher wages.[26] Third, because it reduced efficiency, the loss of men increased costs beyond revenues. Fourth, the munitions industries competed for tools, oil fuels, and other supplies. Gold mining almost stopped.

The fifth effect of the war was less obvious but had important consequences. Mining companies also lacked money to explore beyond the limits of their proven ore reserves to find new ore to replace quantities already mined and milled. Otherwise, a mine would starve itself. These effects of the war are revealed in the sector's revenue. The value of production, including gold, reached a peak of $67 million in 1941, dropped to $42 million in 1944, and recovered only slightly in 1945. Copper production dropped by half in the same period.[27]

The labour shortage was the main problem. In July 1942, Walker confided to Bateman that "the base metal mining industry is still short at least 450 men … A lot of the men working underground are finding it quite easy to get work in the ship-building industry, where they are out in the open and where even in winter, working conditions are not too unpleasant. They may not be netting much more than if they had remained in the mines but are not working as many hours to do it; and you can't blame them for going after more congenial work."[28] A year later, in his *Annual Report*, the minister wrote, "The mining industry is experiencing difficult times and it is in a critical condition, due chiefly to the shortage of labour, and this is a direct result of the war."[29]

Most BC gold mines closed between 1941 and 1942 because fifteen hundred miners quit to enlist in the armed forces or take other jobs. The rich Bralorne gold camp started 1942 with three hundred men working underground and ended with just over a hundred.[30] Canada's gold mines were "at the bottom of the list when it came to priorities for materials and labour."[31] Canada did not stop gold mining because that would have intruded on provincial jurisdiction. Gold supported the monetary system, and gold mines were the sole employers in small communities like Gold Bridge, Stewart, Wells, and Hedley.[32] British Columbia's many

---

[26] At that time, union representation at coal and metal mines could not negotiate wages.

[27] British Columbia Minister of Mines, *Annual Report 1945* (Victoria: King's Printer, 1946), A22.

[28] Metals Controller, letter, 3 July 1942, GR-1579, 43.12, BCA.

[29] British Columbia Minister of Mines, *Annual Report 1943* (Victoria: Kings' Printer, 1944), A10.

[30] Lewis Green, *The Great Years: Gold Mining in the Bridge River Valley* (Vancouver: Tricouni Press, 2001), 214.

[31] Warren, *Wartime Economic Cooperation*, 107, 112.

[32] US Geological Survey, *Minerals Yearbook 1942*, Gold and Silver, 80–1, http://digital.library.wisc.edu/1711.dl/EcoNatRes.MinYB1942. In October 1942, American gold mines were declared "non-essential" and ordered to stop production.

coal mines also had labour shortages, worsened by decades of labour-management acrimony, and were so short of miners that, in May 1943, those who had enlisted were offered leave from military service if they returned to coal mining,[33] with wages paid by the federal government's Coal Controller.[34] Despite these inducements, coal mine employment decreased by 30 percent.[35]

These setbacks for British Columbia's mining industry were offset in part by the province's success in leading Canada's production of two strategic metals: mercury and tungsten.[36] Their ore minerals, meaning minerals that contain the metals, occur sporadically throughout the province; however, in 1939, Canada had no known economically feasible reserves – that is, no known ores, for those metals. Both topped lists of strategic metals because they were essential for munitions, and the war posed risks to peacetime offshore sources. As a consequence, the Allies collaborated in meeting their supply needs by developing new domestic sources, engaging in pre-emptive buying in the open market, and stockpiling. Thus, they avoided the speculation seen during the First World War.

In 1939, Deputy Minister Walker understood metal supply risks. Being apprehensive of speculation, he sought market information on strategic metals. He wrote to the Montreal office of British Metal Corporation (Canada) Ltd., brokers for United Kingdom buyers of non-ferrous metals. In October, their agent, Alfred Carels, commented on tungsten ore (discussed below) and explained that mercury prices, then $150 per seventy-six-pound "flask" ($4 per kilogram),[37] were "subject to violent fluctuations. Understand any reasonable production could be readily sold in Canada today … prices [are] highest for the past 13 years." A December letter concluded: "I cannot see how B.C. [strategic metal] ore could profitably move unless at 'war prices,'" and "it is evident that the Empire is not going to repeat the mistakes of 1914 by permitting artificially advanced prices."[38]

---

[33] Kennedy, 2:57.

[34] Memos to Minister, copy of memorandum, 19 May 1943, GR-1579, 35.9, BCA.

[35] Coal mine employment appears in *Annual Reports* from 1939 to 1945.

[36] Mercury and tungsten were the only two strategic metals that achieved new production between 1939 and 1945.

[37] Mercury was measured in seventy-six-pound (thirty-four-kilogram) iron "flasks," a measurement unit like barrels for oil, or bushels for wheat, and the optimum weight a man could carry on his back.

[38] War Minerals Miscellaneous, GR-1579, 35.4, BCA. A copy of Walker's letter was not on file, but Carel's replies of 23 October 1939 and 4 December 1939 suggest that Walker asked about tungsten, antimony, cobalt, manganese, chromium, molybdenum, and mercury.

Mercury is an essential metal. Worldwide, about 40 percent was used in drug and chemical applications and 20 percent in detonators for explosives. A variety of other uses, often dependent on mercury's unique property of remaining liquid at ordinary temperatures, consumed the rest.[39] The United States could not produce sufficient mercury to meet its growing wartime needs, and, with the British Commonwealth having no sources, the urgency to find and develop new supplies was acute.

The British Columbia Department of Mines knew that the British Empire had no known sources of mercury.[40] In 1938 and 1939, because of this and the growing threat of war, John S. Stevenson, a Department of Mines geologist, visited six sites in the province with showings of cinnabar, the distinctively red mercury ore mineral.[41] One had produced small quantities of the metal, but the deposit was not considered to be economic.[42] The 1937 discovery of cinnabar at Pinchi Lake, 130 kilometres northwest of Prince George, attracted immediate interest. Consolidated Mining and Smelting Company (CM&S), the province's largest mining company, quickly recognized its importance and, in 1939, took over claims staked only a year before. Soaring wartime prices were a powerful incentive, with New York mercury spot prices reaching $165 per flask (five dollars per kilogram), nearly double the prices of recent years.[43] CM&S placed a crew on site, built a camp, and began diamond drilling and underground exploration while improving road access from Fort St. James. The company developed the mine, built a small mill,[44] and in 1940 shipped seventy metric tonnes of mercury.[45] The mine's capacity was increased each year until 1943, when it produced 763 metric tonnes.[46]

---

[39] John S. Stevenson, *Mercury Deposits of British Columbia*, Bulletin No. 5, Department of Mines (Victoria: King's Printer, 1940), 16.

[40] British Columbia Minister of Mines, *Annual Report 1929* (Victoria: King's Printer, 1930) C373, had this comment in a report on mercury occurring on the "Sechart" Crown grant, beside Barkley Sound, Vancouver Island.

[41] John S. Stevenson, *Mercury Deposits of British Columbia*, Bulletin No. 5, Department of Mines (Victoria: King's Printer, 1940).

[42] British Columbia, Department of Energy, Mines and Petroleum Resources, search MINFILE Mineral Inventory (gov.bc.ca) for MINFILE Manitou 092O 023.

[43] US Geological Survey *Minerals Yearbook Review of 1940,Mercury,* 659, http://digital.library.wisc.edu/1711.dl/EcoNatRes.MinYB1940.

[44] Minister of Mines, *Annual Report 1939* (Victoria: King's Printer, 1940), A99; *Annual Report 1940*, (Victoria: King's Printer, 1941) A85.

[45] Canada, Dominion Bureau of Statistics, *Chronological Record of Canadian Mining Events from 1604 to 1943 and Historical Tables of the Mineral Production of Canada* (Ottawa: King's Printer, 1945), 69.

[46] MINFILE Pinchi Lake 093K 049. The stated mercury production for 1941 to 1944 inclusive appears correct but production reported for 1940, "160384 kg." seems in error.

Concealing production of mercury was critically important not only because of the acute need for it but also because Spain and Italy, which supplied over half of the world's pre-war mercury production, were no longer reliable sources. Spain was nominally neutral but aligned itself politically with Nazi Germany.[47] Italy joined the Axis in 1940 and stopped that source.

The discovery and production of mercury could hardly be kept secret, but the quantities of mercury produced in its first three years were not made public,[48] and the mine received no publicity.[49] In its *Minerals Yearbook 1941*, the United States Geological Survey reported: "Data for Canada cannot be published but [it] is well known that a noteworthy contributor to [world] supplies has been developed and is producing large quantities."[50] Three years after Pinchi Lake production started, the department's chief mining engineer, P.B Freeland, still felt compelled to use used the term "hush hush" in a passing reference made in a letter to a federal government colleague about another subject – tungsten.[51] After CM&S increased the mine's production, in his 1942 *Annual Report*, the Minister of Mines boasted: "The war-mineral picture is particularly bright. British Columbia's mercury contribution to the war effort is something to be proud of, and it seems likely that the Province will be amongst the future mercury producing countries of the world."[52] This proved optimistic.

The United States Metals Reserve Company paid top prices for mercury to ensure that American supply exceeded consumption. It purchased part of Pinchi mercury until September 1943.[53] The mine's total wartime production of eighteen hundred tonnes resulted in Canada's becoming "the second largest [mercury] producer among the [United] nations and large quantities were exported to the United Kingdom, the

---

[47] Spain was indebted to Germany for its military support during the Spanish Civil War, and some volunteer Spanish troops fought alongside German forces on the Eastern Front.

[48] Minister of Mines, *Annual Report 1943*, A13, contains the first reported provincial mercury production.

[49] "Clipping books 1940–1951," microfilm, Mineral Resources Branch, GR-2590, BCA. The earliest press clipping about mercury appeared in the *Vancouver Province*, 30 January 1943, (clipping lacks page number), which reported that, four months previously, CM&S had received "accelerated depreciation" on its expenses to develop the Pinchi Lake mine. The benefit was valued at forty-five dollars per flask produced, or about $1.30 per kilogram, in a contract to deliver ten thousand flasks (345 tonnes) to Wartime Metals Corp.

[50] United States Geological Survey, https://www.usgs.gov/centers/nmic/bureau-mines-minerals-yearbook-1932-1993. Follow external links for years and metals. See *Minerals Yearbook 1941,* Mercury 685.

[51] P.B. Freeland to V.L. Yardley-Wilmot, 25 February 1943, GR-1579, 33-1, BCA.

[52] British Columbia Minister of Mines, *Annual Report 1942* (Victoria: King's Printer, 1943), A10.

[53] USGS, *Minerals Yearbook 1943,* Mercury 714.

United States and the British Commonwealth countries."[54] Part of that production came from another but much smaller mercury property called Bralorne Takla, one hundred kilometres east of Hazelton, near Takla Lake.[55] Bralorne Mines Ltd., the province's leading gold miner, opened an underground mine, installed a small mill, and, in 1943, produced mercury from ore grades similar to those of Pinchi Lake.[56] This mine also had a short-lived sales contract with Metals Reserve Company. Metals Reserve doubled its mercury imports from Mexico and Canada by paying top prices in 1942–43 and increased its stockpile from twenty-seven thousand to seventy thousand flasks (931 to 2,153 tonnes). American domestic production and imports totalled almost 100,000 flasks (3,448 tonnes) against consumption of only 54,500 flasks (1,878) tonnes.[57] With this surplus on hand, Metals Reserve stopped imports and prices collapsed. Pinchi Lake closed in 1944 but reopened a few years later; Bralorne Takla did not.

TABLE 1
British Columbia Mercury Production (metric tonnes)

Production or trade	1939	1940	1941	1942	1943	1944
Manitou mine[1]	0.54	-	-	-	-	-
Bralorne Takla mine[1]	-	-	-	-	3.5	56
Pinchi Lake mine[1]	-	70	243	470	763	343
Mercury exports to US[2]	0	0	27.0	255	537	53.5
Mercury imports to Canada[3]	50	36	4	1	1	16
Mercury exports from Canada[3]	0	49	164	315	593	165

Sources: [1] Manitou MINFILE 092O 023; Bralorne Takla MINFILE 093K 049; Pinchi Lake MINFILE 093K 049.
[2] United States Geological Survey *Minerals Yearbook*, "Mercury," 1941 to 1945 inclusive.
[3] "Mercury at Pinchi Lake," 24 February 1950, note to file, RG-1579, 32-4, BCA. States quantities in pounds converted here to tonnes.

Table 1 shows that Canada imported mercury until Pinchi Lake began production and then became an exporter except for importing small quantities, probably specialty mercury compounds. Comparing

[54] Kennedy, 2:115. The Soviet Union depended on the Allies for mercury after Nazi forces occupied mines in the Donbas, or Donetz, region (Ukraine) and cut off its supplies.
[55] Stevenson, *Mercury Deposits*, 18ff, describes other sites, some of which briefly produced a few flasks of mercury.
[56] MINFILE 093N 008, Bralorne Takla.
[57] *Minerals Yearbook 1943,* Mercury, 713.

statistics of Canadian exports and American imports suggests that the initial production from Pinchi Lake was applied to Canadian needs and stockpiles, and probably exported to Great Britain. The increased exports to the United States in 1943 may indicate that by then Britain had an adequate stockpile and so reduced its purchases. The Americans may have obtained more by offering higher prices, and they may have been forwarding Canadian mercury to the Soviet Union under Lend-Lease.[58] Quantities identified as imports and exports do not reflect either consumption by Canadian industry or changes in quantities stockpiled by Wartime Metals Corporation.[59] The precision of mercury quantities is less important than is appreciating that mercury produced by the Pinchi Lake mine was very important to the Allied war effort.

Tungsten was the province's second success in producing strategic metals, exceptional because Wartime Metals Corporation itself owned, built, and briefly operated Canada's largest tungsten mine. Tungsten shares the top of any list of strategic metals of the Second World War because, like mercury, it has no substitute in some applications.[60] Tungsten is very heavy and hard,[61] with the highest melting point of any metal. Its alloys are resistant to heat and make the most durable cutting edges, which are required by high-speed machine tools and engine valve seats. It was also used in the cores of armour-piercing ammunition.[62] Tungsten has several ore minerals, some more valuable than others. In 1939, it was priced at twenty-three dollars per twenty-pound (nine-kilogram) short ton unit of tungsten trioxide (WO_3),[63] but prices depend on its source mineral and its impurities. The most abundant and best quality ores were found in China and Korea, but the war cut off those sources, and threatened shipments from the extensive deposits in Portugal. Pre-emptive purchases of tungsten mined in Portugal and Spain formed part of the tactics of Allied economic warfare, and, for a few months, British Columbia's Emerald mine was prepared to play an indirect, stand-in role.

---

[58] American contributions to the Soviet Union's war effort were immense. See, for example, John Keegan's *The Second World War* (New York: Penguin, 1990), 122.

[59] Consolidated Mining and Smelting Company (Teck Resources Ltd.) files for Pinchi Lake might describe mercury sales, but, at time of writing, access to those records was not available.

[60] Tin would also head any list, but Canadian production has always been insignificant.

[61] Tungsten has a density of nineteen grams per cubic centimetre versus lead, at 11 g/cc.

[62] Colin J. Smitherells, *Tungsten* (London: Chapman and Hall, 1952), 303; I.V. Hogg, *The Guns of World War II* (London: Macdonald and James, 1976), 57; M.M. Postan, D. Hay, and J.D. Scott, *Design and Development of Weapons* (London: HMSO, 1964), 368.

[63] Carels to Walker, 23 October 1939, War Minerals Miscellaneous, GR-1579, 35.4, BCA.

Starting just before the declaration of war, geologists from the Department of Mines mapped and evaluated tungsten occurrences throughout the province, which, by 1943, included eighty-one sites.[64] Prospecting for tungsten is relatively easy. Because of the distinctive heaviness of tungsten minerals, samples can be sorted by hand to make up small high-grade shipments. In addition, the tungsten ore mineral of greatest value is scheelite, a heavy white mineral whose characteristic fluorescence in ultraviolet (black) light also greatly simplifies prospecting. The department's early focus on tungsten and fieldwork ensured that its staff members were experts on the metal's economic geology and best qualified to advise on public investment in wartime sources. The federal government recognized the importance of tungsten in July 1942 when it budgeted $4,560,000 solely to buy tungsten concentrate and build a reserve of twelve hundred tons (1,090 tonnes).[65]

Tungsten was found at several sources in British Columbia. Earlier, two occurrences of tungsten ores near the Bralorne gold camp were tested for production. In 1943, small quantities were milled there,[66] and the concentrate was shipped to metallurgical labs located in the Department of Mines and Resources in Ottawa for further concentration.[67] Another tungsten occurrence known since the 1920s became an important wartime source. The Red Rose tungsten mine, south of Telkwa, was perched on a ridge at fifteen hundred metres elevation. It had a brief but important wartime life.[68] CM&S optioned the site in 1940, started underground exploration, and built a tramline down the mountain to the valley floor, where it erected a small mill. In the spring of 1942, after the company began milling about twenty-five tons (twenty-two tonnes) per day of run-of-mine ore, it entered into agreement with the Metals Controller. The company received $182,000 under a "Certificate of Necessity," effectively a grant,[69] to increase its mill capacity and deliver four hundred tons (360 tonnes) of tungsten concentrate. In early 1943, CM&S sought capital to expand mill capacity to eight hundred tons (725 tonnes) per day. The Metals Controller agreed but later that year cancelled the contract and

[64] John S. Stevenson, *Tungsten Deposits of British Columbia*, Bulletin No. 10, Department of Mines (Victoria: King's Printer, 1943), frontispiece.

[65] Consolidated Mining and Smelting, memorandum, 12 May 1944, Department of Reconstruction and Supply, RG 28-A, vol. 312, file 196-260-11-1, LAC.

[66] Bralorne Mine to P.B. Freeland, Department of Mines, 6 February 1943, GR-1579, 33-1, BCA. See also Stevenson, *Tungsten Deposits*, 101.

[67] This concentrate was ultimately sent to Atlas Plant Expansion Ltd. in Welland, Ontario, a Crown company responsible for meeting Canada's needs for specialty steels. See Kennedy 2:226.

[68] MINFILE Red Rose 093M 067.

[69] Memorandum, 20 December 1942, RG 28-A, vol. 312, file 196-26C-11-1, LAC.

reimbursed CM&S for some of its capital expenditures. Wartime Metals bought a total of 813,722 pounds (370 tonnes) of Red Rose concentrate, in part as agent for Metals Reserve Company in the United States.[70]

A third source was found almost by accident, rushed into production, and, for a few weeks, became the most important tungsten mine in Canada. Cursory examination of lead zinc ores at the former Emerald (Jersey) lead zinc mine, a few kilometres southeast of Salmo, found abundant, high-purity scheelite.[71] Wartime Metals was immediately notified, and by July 1942 the Department of Supply and Services received cabinet approval to explore the site and, if feasible, develop it and compensate its American owners.[72] Early results were compelling: the site met every criterion for development. In November 1942, rather than negotiate with the owners, Wartime Metals Corporation and its minister, C.D. Howe, received cabinet approval to expropriate the site, build a mill, and start mining on behalf of "His Majesty the King in Right of Canada."[73]

This operation was undertaken with exceptional speed. During the winter of 1942–43, underground workings were developed, a mine camp constructed, and a new aerial tramway conveyed ore from the mine adits down to a new mill beside the existing road and the Great Northern Railway.[74] Wartime Metals wanted a fully modern, "world class" tungsten producer. As of January 1943, two hundred men worked at the site, barely a year after the first examination of Emerald mine ore samples. But its life was short. The BC Minister of Mines *Annual Report* for 1943 stated: "the mill, completed in June, was put into operation on August 1st at the rate of about 200 tons per day; and was closed on September 10th, on instructions from the Wartime Metals Corporation."[75] In forty days of milling, it produced 271,765 pounds (123 tonnes) of very pure tungsten trioxide at a production cost of thirteen cents per pound, or about thirty-three cents per kilogram trioxide unit – very favourable economics.[76] After the war, the Crown sold the dormant mine to private interests.

Why was it closed? And why did Red Rose close in the same month? Fifteen years later, a government report stated: "abundant foreign tungsten became available and to prevent its going to the enemy,

---

[70] Consolidated Mining and Smelting Company, 31 January 1945, note to file, RG 28-A, vol. 312, file 196-26C-11-1, LAC.
[71] MINFILE Emerald 082FS 009.
[72] Records of the Privy Council Office, RG 2, vol. 1771, Order PC 7453, LAC.
[73] Records of the Privy Council Office, RG 2, vol. 1781, Order PC 10445, LAC.
[74] A mine adit is horizontal, as opposed to a shaft, which is vertical.
[75] Minister of Mines, *Annual Report 1943*, 79.
[76] Kennedy, 1:511.

requirements were met from this source."[77] Foreign tungsten meant from Portugal and, to a lesser extent, from Spain, the only sources available for Nazi Germany. The Allies wanted to stop or at least reduce those rail shipments, at one point threatening to cut off oil supplies to Spain and Portugal.[78] Instead, they chose the more conciliatory approach of pre-emptive purchases, simply paying more than Germany – sometimes a lot more. The 1939 base price for Portuguese tungsten averaged around twenty cents per kilogram of tungsten trioxide, but soon after the United States joined the war, speculation increased the spot price, which, at one time, soared to twenty-four dollars per kilogram. This distorted Portugal's economy so badly that its government, determined to remain neutral, appointed a commission to apportion tungsten sales to all belligerents, including Germany.[79] Spain did not attempt to regulate its tungsten sales.

After Portuguese and Spanish tungsten production peaked in 1943, prices dropped by two-thirds. Allied pre-emptive buying had the desired effect of reducing Spain's rail shipments of tungsten to Germany,[80] but small shipments continued until mid-1944, when the Allied occupation of France stopped rail traffic. Higher prices flooded tungsten markets in 1943, and the consequent growth in stockpiles and falling prices made Emerald and Red Rose production unnecessary. Of course, if Portugal and Spain had embargoed or limited tungsten sales to the Allies, production from Emerald and Red Rose would have been essential.[81]

This glimpse of British Columbia's contribution to Canada's metal mining industry during the Second World War has relevance for today's mining industry and its growing need for domestic production of minerals essential to modern industry. The Emerald tungsten mine, briefly owned by the Crown, was an exception to federal and provincial policies that left mining investment in private hands.

A second aspect of the province's wartime experience appears in the balancing and cooperation obtained between the needs of a national emergency and preserving provincial jurisdiction. Federal support limited

---

[77] H.W Little, *Tungsten*, Geological Survey of Canada, Economic Geology Series no. 17 (Ottawa: Queen's Printer, 1959), 4.

[78] Leonard Caruana and Hugh Rockoff, "A Wolfram in Sheep's Clothing: Economic Warfare in Spain, 1940–1944," *Journal of Economic History* 63, no. 1 (2003): 100, 106.

[79] Douglas L. Wheeler, "The Price of Neutrality: Portugal, the Wolfram Question and World War II," *Luso-Brazilian Review* 23, no. 1 (1986): 117.

[80] Japan had abundant tungsten from its conquests in China and Korea but could not deliver it to Germany. See Japanese submarine I-34 on Wikipedia.

[81] Coincidence or not, in September 1943, Portugal allowed the Allies to use the Azores as a base in their anti U-boat campaign.

TABLE 2
British Columbia Tungsten Production (metric tonnes)

Mine	1939	1940	1941	1942	1943	1944
Red Rose[1]				79.5	229	
Emerald[1]						123
Bralorne-Pioneer[2]					1.4	
Canadian production[3]	4.0	5.4	37.6	236	684	402
Exports to US[4]				3.72	29.4	103

Sources: [1] MINFILE Red Rose 093M 067; MINFILE Emerald 082FS 009; MINFILE Bralorne Takla 093N 008.
[2] Bralorne Mine to Department of Mines, 2 February 1943, Tungsten, GR-1579, 33-1, BCA, reports milling 30 tons of ore of 5 percent (i.e.,WO_3) ore.
[3] Statistics Canada, Historical Statistics of Canada, Section P Mining, series P1-26, https://www150.statcan.gc.ca/n1/pub/11-516-x/sectionp/P1_26c-eng.csv.
[4] United States Geological Survey, *Minerals Yearbook*, "Tungsten," 1941 to 1945 inclusive.

what could have been more adverse wartime effects on the industry. Supplying metals for munitions manufacture during the Second World War proved that government could intervene with focused investment to purchase supplies and stockpile strategic metals without distorting metal markets and long-standing policies towards private investment in mining. As well, the federal wartime role accommodated, and worked within, provincial jurisdiction over mining. British Columbia's planning for the war was effective in anticipating shortages of strategic metals and assigning resources to assist prospecting and property development. The province and Canada did not foresee –- and it would be unreasonable to have expected any government to foresee – the attrition of mine labour caused by service in the armed forces and the diversion of labour away from mining to war industries like shipbuilding. These effects decreased British Columbia's mineral production to the point at which it needed three years to recover its pre-war prosperity before going on to increase the contribution of metal mining to the provincial economy. Although the tungsten and mercury mines were active for only a short time during the war, they made a small but very significant BC contribution to the Allied war effort.