

**BALD MOUNTAIN MINING RISKS:
Hidden from the Public**



Natural Resources
Council of Maine

NRCM gathered the information in this investigative report from documents secured through Freedom of Access Act (FOAA) requests to the Department of Environmental Protection.

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Cover Photo: Bald Mountain, Aroostook County by Judy Berk; LightHawk Overflight



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EXECUTIVE SUMMARY

In 2012, the Maine Legislature enacted a law to weaken Maine's mining regulations. The bill was passed at the request of Canada-based J.D. Irving, Ltd., which wants to pursue an open-pit mine at Bald Mountain in Aroostook County. This is not the first time that a mining company has been interested in extracting metals from an ore deposit at Bald Mountain. In the 1990s, two mining companies—Boliden Resources and Black Hawk Mining Inc.—owned the mineral rights and began the DEP permitting process for possible mining operations. For this investigative report, NRCM reviewed Boliden and Black Hawk reports that were secured through a Freedom of Access Act (FOAA) request.

As described below, technical experts have concluded that the ore body and surrounding rock at Bald Mountain have high acid-generating potential and that some of the rock would start releasing acid very quickly upon exposure to air and water. According to consultants for Boliden, an open-pit mine at Bald Mountain would likely never be able to meet water quality standards in the area. DEP believed that even a much smaller open-pit mine proposed by Black Hawk would cause unacceptable risks to groundwater because of high arsenic levels. The geologist who discovered the Bald Mountain ore deposit also has repeatedly stated that an open-pit mine at Bald Mountain would cause major environmental problems.

DEP understands the significance of the information in this report but has not shared it with Maine lawmakers or the public. As a result, Maine's decision makers have been making critical decisions about the future of mining in Maine and its potential impacts on the environment while lacking fundamental information about the threats of a mine at Bald Mountain—the ore deposit driving Irving's (and some lawmakers') push to weaken Maine's mining regulations.

For Maine people and lawmakers to develop a fair assessment of the consequences of any proposed change in Maine's mining regulations, they must have complete and accurate information. DEP should be sharing all information about the risks of a Bald Mountain mine.

FINDINGS

- **Bald Mountain is an unusually dangerous site for a mining operation for the following reasons:**
 - **High likelihood of Acid Mine Drainage pollution.** Consultants concluded that the ore and surrounding rock have particularly high acid-generating potential, and some of the rock would start releasing acid very quickly on exposure to air and water.
 - **Difficulty meeting water quality standards.** An open-pit mine at Bald Mountain would likely never be able to meet water quality standards in the area, according to consultants for the mining company Boliden.



The Bald Mountain ore deposit in Aroostook County has very high concentrations of sulfur and arsenic, raising major risks of acid mine drainage (AMD) pollution to rivers and streams, as seen in this image of AMD from Montana.

- o **Extremely high arsenic concentrations.** J.S. Cummings, the geologist who discovered the Bald Mountain site, has stated in correspondence with Maine legislators that an open-pit mine at Bald Mountain would cause major environmental problems due to high arsenic levels (1,258 ppm to 29,155 ppm). In 1998, DEP believed that even a small mining operation at Bald Mountain, proposed by Black Hawk, would cause unacceptable risks to groundwater because of high levels of arsenic.
- **DEP failed to share information with lawmakers about risks at Bald Mountain.** Information about the inherent dangers of the Bald Mountain ore deposit is sitting in DEP files, but DEP never shared it with Maine decision makers while they were considering J.D. Irving’s proposal to weaken Maine’s mining regulations.¹
- **DEP technical staff have had little opportunity to speak publicly.** DEP leadership failed to allow its technical experts to share information with lawmakers that would have helped them understand why companies abandoned their pursuit of open-pit mines at Bald Mountain in the 1990s. Staff who were involved in those permit applications are still working at the DEP.
- **Irving job estimates are likely inflated.** J.D. Irving’s claim that a mine at Bald Mountain would generate 700 “direct or indirect” jobs greatly exceeds any previous job estimates.
 - o Boliden estimated only 80-130 jobs for a full-scale open-pit mine.²
 - o Black Hawk estimated only 75 jobs for its reduced proposal to mine the gossan cap.³

The discrepancies with J.D. Irving’s claims about jobs are striking, and DEP should have shared this information with legislators. An open-pit mine at Bald Mountain would have much higher environmental risks and much lower employment prospects than Irving is claiming. This is consistent with what communities nationwide have experienced. Mining companies are notorious for overpromising on jobs and underestimating environmental risks.

1 The committee file for L.D. 1853 includes more than 700 pages of materials, yet DEP did not provide for the record any of the Boliden or Black Hawk assessments that document the risks of the Bald Mountain deposit.

2 Mark Stebbins, Maine DEP. 1990. Inter-Departmental Memorandum re: Bald Mountain Tour and Presentation/August 30, 1990. September 13, 1990. P. 3.

3 NMM Resources, Inc., Bald Mountain Project, Volume 3, Environmental Impact Report, p. 58.

OVERVIEW

In 2012, at the request of Canada-based J.D. Irving, Ltd, the Maine Legislature passed a law directing the Department of Environmental Protection (DEP) to draft new, less stringent rules for metallic mineral mining in Maine.⁴ Company President James Irving pushed for the new law because he wants to operate an open-pit mine at Bald Mountain in Aroostook County.⁵ Although Maine lawmakers spent many hours dealing with the complex issues raised by Irving's bill (L.D. 1853), DEP leadership failed to inform legislators about the very high environmental risks of mining at Bald Mountain.

DEP archives include many detailed assessments for companies that were actively pursuing a mine at Bald Mountain in the 1980s and 1990s. These studies reveal that the ore body at Bald Mountain is particularly dangerous and would require extraordinary steps to prevent severe environmental damage. The ore at Bald Mountain is so reactive when exposed to water and air—rapidly creating sulfuric acid—that a mine operator would need to pursue complex and expensive techniques to limit harmful levels of acid mine drainage.⁶ (See sidebar.)

Consultants advised one previous owner of the Bald Mountain mineral rights that it would be impossible to avoid contaminating groundwater and surface water in the area, and that this “inevitable” water pollution could be a “fatal flaw” for an open-pit mine at Bald Mountain. These consultants suggested that the only path forward for an open-pit mine would be to lower water quality standards for nearby streams. Irving has taken a similar path by pushing for weaker mining regulations.

J.S. Cummings, the geologist who discovered Bald Mountain's deposit, has warned that an open-pit mine there could be “a debacle” because of very high arsenic levels.⁷ Cummings also expressed concern that nobody had informed the public or the Legislature of the extremely high arsenic levels at Bald Mountain.⁸ DEP Commissioner Patricia Aho and DEP Policy Director Heather Parent have provided essentially all of DEP's testimony and commentary to the Legislature on the mining issue. Technical staffers, including staff members deeply familiar with the high risks posed by the Bald Mountain ore body, were not invited by DEP leadership to speak with lawmakers about any of these issues.

In this paper, NRCM provides information about the high risks of an open-pit mine at Bald Mountain. Much of this information comes from documents that were made available by a Freedom of Access Act (FOAA) request submitted by Lindsey Newland Bowker, of Stonington, Maine.⁹ NRCM believes that the DEP had a responsibility to share information in their records about the risks of any open-pit

Understanding Acid Mine Drainage

Acid mine drainage is a major problem with hardrock mines. It occurs when mining companies excavate sulfur-containing rock buried deep beneath the earth's surface. The rock reacts with the air and water to form sulfuric acid, which can kill aquatic creatures if it spreads into surface waters and lowers the pH sufficiently. The acid also leaches out heavy metals naturally present in the rock, many of which are extremely toxic to fish and other aquatic organisms. These metals can include lead, arsenic, cadmium, mercury, copper, and zinc.

Acid mine drainage is a worldwide problem, causing ecological destruction and contamination of drinking water. Once acid mine drainage starts, it is very difficult to contain or stop. It can continue for hundreds or even thousands of years until the available sulfur-containing minerals are exhausted.

4 “Last month Gov. Paul LePage signed into law LD 1853 which streamlined Maine's mining permitting and regulatory process... The legislation was drafted at Irving's request.” *Bangor Daily News*, May 3, 2012. <http://bangordailynews.com/2012/05/03/business/james-irving-addresses-maine-mining-interests-at-umfk-forum/>

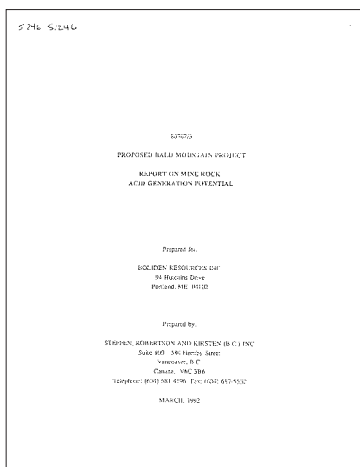
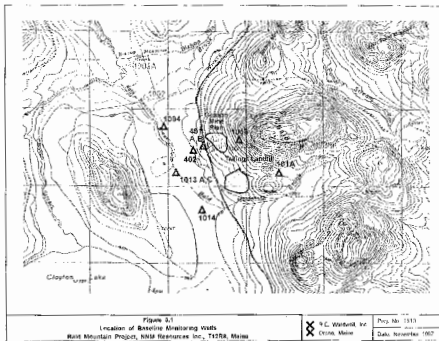
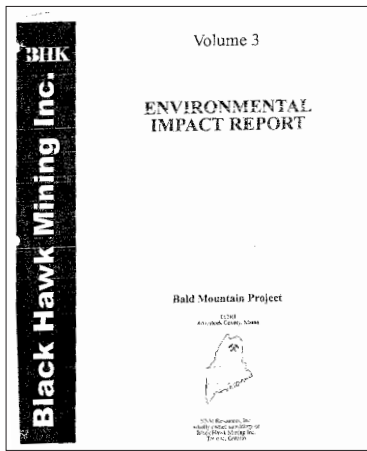
5 “The entire operation, Irving said, will have a 500-acre footprint with the mine's pit covering 100 acres.” *Ibid.*, May 3, 2012.

6 Acid mine drainage occurs when sulfur compounds in ore react to form sulfuric acid when exposed to air and water. This reaction does not occur rapidly or on a large scale when ore is buried deep underground and kept away from air. However, mining exposes ore to air and water, allowing ideal conditions for acid formation. The sulfuric acid that comes from ore can kill fish and aquatic life and also leaches toxic metals from the ore. These metals can also enter waterbodies and kill the creatures that live there.

7 J.S. Cummings letter to Representative John Martin. September 7, 2012. P. 5.

8 J.S. Cummings letter to Representative Jeff McCabe. May 10, 2013. P. 1.

9 Lindsey Newland Bowker is a former environmental risk manager for New York City.



Examples of documents in DEP’s files that it has not discussed publicly: *Environmental Impact Report, Bald Mountain Project, Black Hawk Mining, Inc. (top); map of Black Hawk’s proposed “gossen cap” mine and associated monitoring wells (middle); proposed Bald Mountain Project, Report on Mine Rock Acid Generation Potential, Prepared for Boliden (bottom).*

mining operation at Bald Mountain. Had they done so, the Legislature might not have passed L.D. 1853—a bill that could change and weaken mining rules statewide, driven by Irving’s interest in mining a site abandoned by others, in part, because the environmental risks were so high.

Boliden’s Exploration of Bald Mountain (Early 1990s)

In the early 1990s, the large Swedish mining firm Boliden Resources owned the mineral rights at Bald Mountain. The company conducted environmental studies at the site, and its consultants analyzed these data as well as those from previous site owners. In 1990, the Canadian consulting firm Steffan, Robertson, and Kirsten (SRK) prepared an evaluation of environmental risks and management options for the site entitled “Opinion of Technical and Economic Aspects of Waste Management, Bald Mountain Project.” The study describes the serious risks associated with Boliden’s plan to build a large open-pit mine at Bald Mountain—which is what Irving wants to do.

Here are some of the key conclusions of the SRK report:

1. The Bald Mountain ore deposit likely would generate large amounts of acid very rapidly.

The report states that:

“Acid-base accounting tests performed on the mine rocks as part of this study have demonstrated that the 13 million tons of foot wall mine rock and 12 million tons of massive sulfide mine rock would be potentially highly acid generating.”¹⁰; and

“The massive sulfide rock contains up to 50% sulfur and exhibits a very high net acid generation potential. It would be necessary to place this material below water soon after the rock has been mined...”¹¹

Even rock with much lower sulfur content can form sulfuric acid and cause acid mine drainage. Fifty percent sulfur content is very high, and this greatly increases the risk of acid mine drainage polluting surrounding waters. Placing waste rock below water soon after mining is also not typical mining practice. Waste rock is typically stored in piles and eventually capped. However, the waste rock from the ore body at Bald Mountain is so reactive that it would start forming acid very quickly, according to Boliden’s consultants, so immediate underwater storage would be required to prevent large scale acid mine drainage. The SRK report also states:

The massive sulfide mine rock is expected to be potentially highly acid generating and will oxidize and release poor quality drainage within a period of months of mining if the oxidation process is allowed to proceed. The rate of acid generation would be minimized by placing the mine rock directly into the tailings impoundment so that it is submerged below water as soon as possible after it is mined. Careful preparation of a pad on the liner and controlled dump construction would be required to avoid damage to the liner.¹²

Again, this is an uncommon procedure that could add significant costs to the project.

10 Steffen Robertson, and Kirsten (B.C.) Inc. 1990. Opinion of Technical and Economic Aspects of Waste Management, Bald Mountain Project. P. 5-7. Foot wall rock is rock from underneath the ore body.

11 Ibid., P. 5-8

12 Ibid., P. 6-14

Concerning the estimated 13-17 million tons of waste foot wall rock an open-pit mine would generate, SRK states the following:

Long term storage of this mine rock under water is essential in order to inhibit the acid generation process. The conceptual waste management plan incorporates stock piling of this mine rock during mining and then backfilling this to the open pit at mine closure...If no measures to control acid generation are implemented, it is anticipated that drainage emerging from the stockpile would develop high acidity and metal contents, based on the laboratory tests carried out to date and equivalent conditions at other mines. Temporary measures to inhibit the development of acid generation in the stockpile and/or to prevent or mitigate impact on receiving waters would be required during the period of mine operation.¹³

SRK goes on to recommend capping a large portion of the footwall waste rock pile during mining operations and possibly mixing it with lime while it is stockpiled. Again, this indicates the high reactivity of the Bald Mountain ore body and surrounding rock and the high risk of extensive acid mine drainage at this site. The fact that a mining consultant recommended back filling a substantial portion of the waste rock into the pit also reveals the risks inherent at Bald Mountain, as, typically, mining companies strongly oppose backfilling the pit because of the high cost.

2. The water quality impacts of an open-pit mine at Bald Mountain likely would be severe.

J.D. Irving, Ltd. President James Irving has expressed great confidence that his company can construct a large open-pit mine without harming the excellent water quality of the streams and ponds in the Bald Mountain area. He even said, "If I can't go and drink the water at the end of the pipe coming from the mine, we shouldn't be doing it."¹⁴ However, SRK's report states that damage to water quality from a pit mine at Bald Mountain is inevitable and a possible "fatal flaw" to such a mine:

The maintenance of water quality in the downstream surface waters of Bald Mountain Brook and Clayton Stream is a possible fatal flaw. During operations the quantity and quality of treated water discharge is sufficiently large that it will be difficult, with the dilution flows available, to prevent degradation of these streams to levels where their ecosystems are not deleteriously effected [sic]. Following decommissioning the release of untreated seepage from the tailings and (particularly) the pit will also result in reduced water quality...¹⁵

Based on a review of the available documents, there are several areas related to the mine water management and treatment systems which may result in a fatal flaw. It is not probable, based upon the current conditions, that either the surface water discharge or land application option are viable based upon the expected treatment cost and efficiency needed to achieve either background surface water quality or aquatic life criteria. In the case of a surface water discharge the available dilution is minimal, while in the case of land application the required surface area and storage volume



EASTERN BROOK TROUT (USFWS)

***What's at Stake:** Brook trout are very sensitive to acid and heavy metal pollution that open-pit mines cause. Aroostook County and the Bald Mountain area specifically are famous for their brook trout fishing, as described by Aroostook County Tourism: "Shady brooks, spring-fed ponds, and crystal clear streams are the perfect home for brook trout. And there's nothing like the feeling of gently laying out 30 feet of line right on the edge of the deep pool where you know they're waiting. Aroostook is one of the last strongholds in the northeastern United States for the native brook trout..."¹ Many people in the Bald Mountain area make their living by guiding fishermen or from revenue generated by stays at local inns and camps.*

1 Accessed at http://www.visitaroostook.com/things_to_do/outdoor_recreation_sports_adventure/fishing/brook_trout/

13 Ibid., P. 6-15

14 *Bangor Daily News*. May 3, 2012 <http://bangordailynews.com/2012/05/03/business/james-irving-addresses-maine-mining-interests-at-umfk-forum/>

15 Steffen Robertson, and Kirsten (B.C.) Inc. 1990. Opinion of Technical and Economic Aspects of Waste Management, Bald Mountain Project. Executive Summary PP. x-xi

are excessive. It is not probable that any conventional or advanced treatment process can achieve background water quality.¹⁶ [Emphasis added]

The last sentence of this excerpt is worthy of focused attention. Boliden's consultant is warning the company that neither conventional nor advanced treatment processes could restore polluted water from a Bald Mountain open-pit mine to pre-mining conditions.

3. The types of "advanced" water treatment technologies that Irving has said it would use are unlikely to work well at Bald Mountain.

Irving has touted the benefits of "new" technologies that will lessen the impact of mining pollution on water quality. In particular, Irving has mentioned reverse osmosis, a method of removing metals from water. SRK stated the following about reverse osmosis and ion exchange, another "advanced" method of metals removal:

These latter processes are not preferred due to expense, complexity, and the problems associated with brine or regeneration solutions. The side streams produced from these processes contain very high concentrations of dissolved constituents which can not [sic] be continuously disposed of in the tailings impoundment. A mine water treatment system based on the advanced processes is not practical or justifiable.¹⁷

Instead, SRK recommended that Boliden seek lower water quality standards for potential receiving waters around Bald Mountain so that they can discharge more heavily polluted wastewater.¹⁸ Lowering the water quality standards for high quality, Class A streams would be highly unusual in Maine, yet SRK warned Boliden that it would likely be impossible to get a permit for an open-pit mine without doing so. SRK's recommendation to seek lower water quality standards also foreshadowed Irving's push for L.D. 1853, which directed DEP to weaken environmental standards.

Black Hawk's Pursuit of a Smaller Open-Pit Mine (Late 1990s)

Boliden never went forward with an application to mine at Bald Mountain. In 1995, Black Hawk Mining purchased Boliden's mineral rights at Bald Mountain. In 1997, the company applied for a permit for a much smaller mining operation that would have targeted only the "gossan cap," which overlies the much larger massive sulfide ore body at Bald Mountain.¹⁹ Black Hawk estimated that the gossan cap contains only 1.2 million tons of ore, whereas the full sulfide ore body at Bald Mountain contains about 35 million tons of ore.²⁰ However, DEP staff that reviewed Black Hawk's permit application at the time believed that even this scaled-back proposal would cause unacceptable environmental risks.

In particular, DEP was concerned about arsenic levels in the gossan cap ore.²¹ DEP believed that disposal of the tailings, even from this much smaller proposed mine, would result in further degradation of groundwater quality in the vicinity of the site, which already has elevated arsenic levels. Specifically, DEP called attention to the following statement from Black Hawk:

Vat leach tailings, when deposited in the landfill, are predicted to release elevated arsenic levels during periods of active infiltration and seepage. Similarly, elevated concentrations of cyanide, copper, mercury, and silver are also expected during the initial flushing of residual metal-cyanide in interstitial waters. Overtime [sic], flushing and aeration through the pile is expected to result in reduced cyanide, copper, mercury and silver concentrations emanating in the seepage. Comparative reductions in arsenic concentrations overtime [sic] has [sic] not been observed."²²

In other words, test results showed that arsenic from even the greatly reduced volume of tailings in the scaled back Black Hawk proposal would significantly degrade water quality in the Bald Mountain area beyond the elevated levels of arsenic naturally occurring there.

¹⁶ Ibid., P. 8-6.

¹⁷ Ibid., P. 8-5

¹⁸ Ibid., P. 9-1

¹⁹ A gossan cap is weathered or oxidized rock overlying an ore body.

²⁰ NMM, Resources, Inc. 1997. Application for Mining. P. ii

²¹ Maine DEP. 1998. Letter from Mark Stebbins to James Hendry, Vice President, Black Hawk Mining, Inc. June 23.

²² NMM, Resources, Inc. 1997. Application for Mining. P. 84.

Geologist Who Discovered Bald Mountain Ore Deposit Warns Against Open-Pit Mine

The Boliden and Black Hawk assessments provided clear warnings about the risks and costs of either a large or small open-pit mine at Bald Mountain. DEP has these assessments in its files, but discussed none of them during deliberations on Irving's mining bill. However, J.S. Cummings, the geologist who discovered the Bald Mountain deposit, communicated similar concerns in letters to legislators during the past two legislative sessions. In a letter to Representative Jeff McCabe (D-Skowhegan), for example, J.S. Cummings stated:

Simply from the standpoint of extractable tonnage, an open pit mine at Bald Mountain presents potentially greater risks to the environment than the Callahan deposit. However, as noted in my letter to [Representative John] Martin, such risks are compounded by the fact that approximately 94% of the high-sulfide tonnage (i.e. 32 to 36,000,000 tons) would be relegated to the tailing pond as high-sulfide slurry.

As if the foregoing were not enough to cause concern as to an open-pit at Bald Mountain, there is the arsenic problem [emphasis in original]. Some articles in the press have mentioned high levels of arsenic in some waters at the Bald Mountain site. However, to my knowledge no one has informed the public or the legislature that the arsenic content of the sulphide mass is extremely anomalous [emphasis in original]. . . . *Assay data on a suite of ten massive sulfide intercepts showed arsenic (As) varying from 1258 ppm to 29,155 ppm (2.91%)* [italics in original]. Thus, the tens of millions of tons of high-sulphide slurry relegated to the tailings-pond would contain very high levels of arsenic. These extremely high arsenic contents are representative of the Bald Mountain mass and are far higher than massive sulphides in general. . . .²³

Mr. Cummings was even more emphatic about the dangers of an open-pit mine at Bald Mountain in a letter he wrote to Representative John Martin (D-Eagle Lake) in 2012:

It appears that if the Irving group proceeds and acquires the necessary permits, they intend to mine the hard-rock copper-zinc concentrations at Bald Mountain by means of a large open-pit. This scenario is a prescription for a debacle [emphasis in original], meaning either that the permits may never be granted, or if such are granted then undoubtedly there will be unwarranted environmental problems down the road.²⁴

During the 2012 and 2013 legislative deliberations on the mining issue, Senator Tom Saviello (R-Franklin) requested that State Geologist Robert Marvinney provide presentations about Maine's metallic mineral deposits to the Environment and Natural Resources Committee. Despite what J.S. Cummings said to lawmakers about the high arsenic content in the sulfide ore at Bald Mountain, Marvinney never raised this same concern. Rather, he focused simply on elevated arsenic concentrations in the baseline ground water and surface water data gathered for Boliden and Black Hawk. Unfortunately, this focus on arsenic in the water (and not the much bigger problem of extremely high arsenic concentrations in the ore) misled some lawmakers to believe that a mine at Bald Mountain might be fine since the water already has elevated arsenic levels. Such a conclusion invites much higher arsenic pollution if the ore body is explored and arsenic is released in acid mine drainage.

Based on what is known about Bald Mountain, the state geologist should have been telling lawmakers that the ore body is dangerous and that an open-pit mine there would likely cause enduring pollution to rivers, streams, and lakes throughout the area. That is what SRK concluded in its assessment to Boliden; it is what the DEP concluded in reviewing Black Hawk's application; and it is what J.S. Cummings felt compelled to say in correspondence to Maine lawmakers. The DEP and Maine Geological Survey have failed in not raising similar concerns.

23 J.S. Cummings letter to Representative Jeff McCabe. May 10, 2013. P. 1.

24 J.S. Cummings letter to Representative John Martin. September 7, 2012. P. 5.

CONCLUSIONS



Example of Acid Mine Drainage Costs and Impacts: *Acid mine drainage (AMD) at the Iron Mountain Mine near Redding, California, has caused extensive fish kills in the nearby rivers and streams¹. Cleanup costs at the Iron Mountain site are more than \$200 million to date². Scientists with the U.S. Geological Survey estimate that the Iron Mountain site will continue to produce AMD for 2,500 to 3,000 years³.*

Despite all of this evidence about the dangers of mining at Bald Mountain, DEP failed to present this information to lawmakers as they considered J.D. Irving's proposal to weaken Maine's mining rules. DEP leadership failed to allow its own technical experts to share information with lawmakers that would have helped them understand why Boliden abandoned its proposed Bald Mountain mine in the early 1990s. DEP also failed to explain to legislators how the inherent risks of the Bald Mountain ore body made even Black Hawk's proposal for a much smaller mine very risky.

DEP must also be aware, because it has the relevant documents, that J.D. Irving's claim that a mine at Bald Mountain would generate 700 "direct or indirect" jobs greatly exceeds the job estimates of either Boliden or Black Hawk. Boliden estimated only 80-130 jobs for a full-scale open-pit mine and Black Hawk estimated 75 jobs for its reduced proposal to mine the gossan cap. The discrepancies with J.D. Irving's claim are striking, and DEP should have shared this information with legislators.

Over the past two years, NRCM has urged Maine lawmakers to be aware that mining companies are notorious for glossing over the environmental impacts of their proposed mines and overpromising economic benefits.²⁵ Maine people and decision makers need accurate information to assess changes to Maine's mining regulations. DEP has information it should have brought forward, but didn't. As a result, Maine's decision makers are making critical decisions about the future of mining in Maine, and its potential impacts on the environment, without important information about the inherent dangers of the Bald Mountain ore deposit.

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- 1 USEPA. 2006. Abandoned Mine Lands Case Study: Iron Mountain Mine. Pp. 5-6. Accessed at <http://www.epa.gov/aml/tech/imm.pdf>. Pp. 5-6
 - 2 ITRC Mining Waste Team. Iron Mountain Mine Case Study. Accessed at http://www.itrcweb.org/miningwasteguidance/cs19_iron_mine.htm
 - 3 USEPA. 2006. Abandoned Mine Lands Case Study: Iron Mountain Mine. Pp. 5-6. Accessed at <http://www.epa.gov/aml/tech/imm.pdf>. Pp. 8-10.

²⁵ See "Predicting Water Quality Problems at Hardrock Mines: A Failure of Science, Oversight, and Good Practice," Maest and Kuipers; <http://www.earthworksaction.org/files/publications/PredictionsComparisonsWhitePaperFINAL.pdf>; and "A Mining Truth Report," Conservation Minnesota, Friends of the Boundary Waters Wilderness, and Minnesota Center for Environmental Advocacy; <http://miningtruth.org/faq-sulfide-mining-minnesota-truth-report.pdf>

APPENDIX: Arsenic Health Risks

Arsenic occurs naturally in the environment in both organic (typically non-toxic) and inorganic forms. Inorganic arsenic is toxic and carcinogenic (cancer-causing). The high levels of arsenic in the Bald Mountain ore deposit are serious cause for concern, because arsenic extracted during the mining process could enter the environment and pose risks to public health and wildlife. Below are some excerpts about the risks from arsenic as described by the Agency for Toxic Substances and Disease Registry:

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of “pins and needles” in hands and feet...

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The Department of Health and Human Services (DHHS) and the EPA have determined that inorganic arsenic is a known human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans...

There is some evidence that long-term exposure to arsenic in children may result in lower IQ scores. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults. There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant females, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal tissues. Arsenic is found at low levels in breast milk.

Source: Agency for Toxic Substances and Disease Registry; <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=19&tid=3>

