COMMUNITY ADVISORY GROUP SUBMISSION TO THE BRITISH COLUMBIA ENVIRONMENTAL ASSESSMENT OFFICE AND THE GOVERNMENT OF CANADA CANADIAN ENVIRONMENTAL ASSESSMENT AGENCY FOR THE NOVEMBER 7, 2014 VERSION OF THE APPLICATION INFORMATION REQUIREMENTS/ENVIRONMENTAL IMPACT STATEMENT GUIDELINES FOR THE PROPOSED KGHM AJAX MINING INC. AJAX PROJECT

12-17-2014

1. KGHM AJAX COVERING LETTER

In the cover letter, it is stated that "Application Information Requirements/Environmental Impact Statement Guidelines AIR/EISg document was developed and approved by the BC Environmental Assessment Office and Canadian Environmental Assessment Agency in June 2013 following extensive review by the Project Working Group (comprised of representatives from federal, provincial, and local governments, and Aboriginal groups), and the public."

With all due respect, the Community Advisory Group (CAG) does not agree with this statement for reasons that will become clear in this submission. The withholding of key information by the Proponent (e.g., assay data), the exclusion of existing information for the Ajax deposit from the review (e.g., 2009 Assessment Report), and the exclusion of many issues raised in previous public comment periods and submissions to the EAO and the CEAA have prevented the review from being as extensive in scope as it should be, given the close proximity of the project to an urban area.

2. PROJECT DESCRIPTION P1 OF P7 AND P2 OF P7

The following statement is not accurate and should be revised in the final AIR/EIS:

"KGHM Ajax Mining Inc. proposes to develop the Ajax Project, an open pit copper-gold mine at the historic Afton Mining Camp, south-west of the City of Kamloops, British Columbia (BC)," and "The Project is located in the South-Central Interior of British Columbia, southeast of the junction of the Trans-Canada Highway No. 1 and the Coquihalla Highway (No. 5), within the Thompson Nicola Regional District. The coordinates for the centre of the Project area are approximately 50°36' N latitude and 120°24' W longitude."

This statement is inaccurate because the southwest corner of the City of Kamloops lies in the immediate vicinity of the Inks Lake-Coquihalla Highway interchange. The entire Afton project is located to the east-southeast of this point. In fact, as the Project Description states: "Some ancillary facilities, including the exploration camp, administration building, and explosives storage, may be located just within the city boundaries." This places the Ajax project directly south of the City of Kamloops.

Regarding the statements:

"…details of the design are subject to change as work continues. The numbers presented in the AIR/EIS Guidelines are based on the feasibility study and provided for general understanding of the project only since they will be refined as additional engineering is completed."

Will changes be implemented with or without the public consultation? Does the term "design are subject to change" imply such design parameters as location, size, dimension and/or volume?

3. PROJECT DESCRIPTION P3 OF P7 WASTE ROCK

The total amount of waste rock, including topsoil, is 1,197 Mt. It is stated that 5 waste rock storage facilities are planned. Storage amounts are stated for four facilities, totaling 848 Mt. The unstated amount is for the Tailings Embankments. What is the estimated amount of waste rock that will be used for the Tailings Embankments?

An earlier version of the AIR/EIS stated that overburden and topsoil would be stored in stockpiles east of the open pit. This revision states that "Overburden and topsoil will be stored in stockpiles on the East Waste Rock Storage Facility." What is the rationale for this change of plan?

Based on information obtained from the Ajax Information Meeting, November 25, 2014, KGHM personnel stated that the Ajax deposit is open and trending to the Northeast, which is in the direction of the EWRSF. It was also stated that KGHM Ajax may be placing all the waste rock destined for the EWRSF to the SWRSF. If the EWRSF is not going to be developed because of the possibility of pit development in the vicinity of the proposed EWRSF, the revised Project Description in the AIR/EIS should state this.

Regarding the statement:

"The Tailings Storage Facility (TSF) will be located south west of the open pit and east of Lac Le Jeune Road. The TSF shall be a conventional tailings storage facility including seepage collection, ponds at the four embankments. Collection ditches along the embankments will direct surface run-off along the downstream face of the embankments to the seepage collection ponds for pumping back into the TSF. The maximum elevation of the tailings would be at about 1, 065 masl along the west side."

Wouldn't it be more cost effective and environmentally friendly to reuse the existing Afton TSF at the 'historic Afton Mining Camp', as declared by the Proponent in the introduction on Page 1? If the Proponent proposes a new TSF, then shouldn't the existing Afton TSF be reclaimed first, in order to see Proponent's commitment to environmental protection and minimization of mine impacts?

Regarding the statement:

"Five mine rock storage facilities (MRSFs) are planned: the South Mine Rock Storage Facility (SMRSF), East Mine Rock Storage Facility (EMRSF). Tailings Embankment Mine Rock Storage Facility (TEMRSF), In-Pit Mine Rock Storage Facility (IPMRSF), and the Tailings Embankment. The SMRSF will store 450 Mt of mine rock and will have a final elevation of 1,135 masl. The EMRSF will have a top elevation of 1,000 masl and hold 74 Mt of mine rock. The TEMRSF will store 137 Mt of mine rock and will reach an ultimate elevation of 990 masl. The IPMRSF will hold 187 Mt of mine rock. Overburden and topsoil will be stored in stockpiles east of the open pit. These stockpiles will be utilized when progressive reclamation is not active or storage is not possible within currently planned areas of disturbance."

Instead increasing the number and top elevations of rock storage facilities, wouldn't it be more environmentally responsible to use the existing Afton pit for storage, which would help to reclaim the Afton site and reduce impacts in the area of the new earth disturbance?

4. PROJECT DESCRIPTION P3 OF P7 WATER MANAGEMENT FACILITIES

Do the water management facilities include the seepage ponds in the mine closure phase? If not, why are these facilities not included in the assessment?

5. PROJECT DESCRIPTION P6 OF P7 DEVELOPMENT OF THE AIR/EIS GUIDELINES

This section contains the following statement:

"In August 2013, an internal evaluation was undertaken by KAM which identified opportunities to optimize the Project design; this resulted in changes to the Project's General Arrangement (GA) that the Proponent felt would address some of the concerns raised in earlier consultation processes. On May 29, 2014, KAM announced the 'Ajax South' GA. In June 2014, updates were made to the AIR to reflect changes in the Project layout."

This statement suggests that the Figure 2.2-2 *Ajax South General Arrangement* in the revised AIR/EIS was released on May 29, 2014 and is the same document. This is not the case. Figure 2.2-2 was not released on May 29 2014 in the *We've Listened* document. According to the map legend, Figure 2.2-2 was completed October 21, 2014. This statement needs to be revised to state that details of the Ajax South GA were not released until November 10, 2014, when the revised AIR/EIS was posted on the EAO website.

6. PREFACE TO THE AIR/EIS GUIDELINES: P 2 OF P7

Regarding the statement: "the proposed key infrastructure will be located outside of the Kamloops city limits," What about infrastructure that is not "key"? What will be located inside Kamloops? And how close is the "key infrastructure" set to be to Kamloops? Why has that information not been specified?

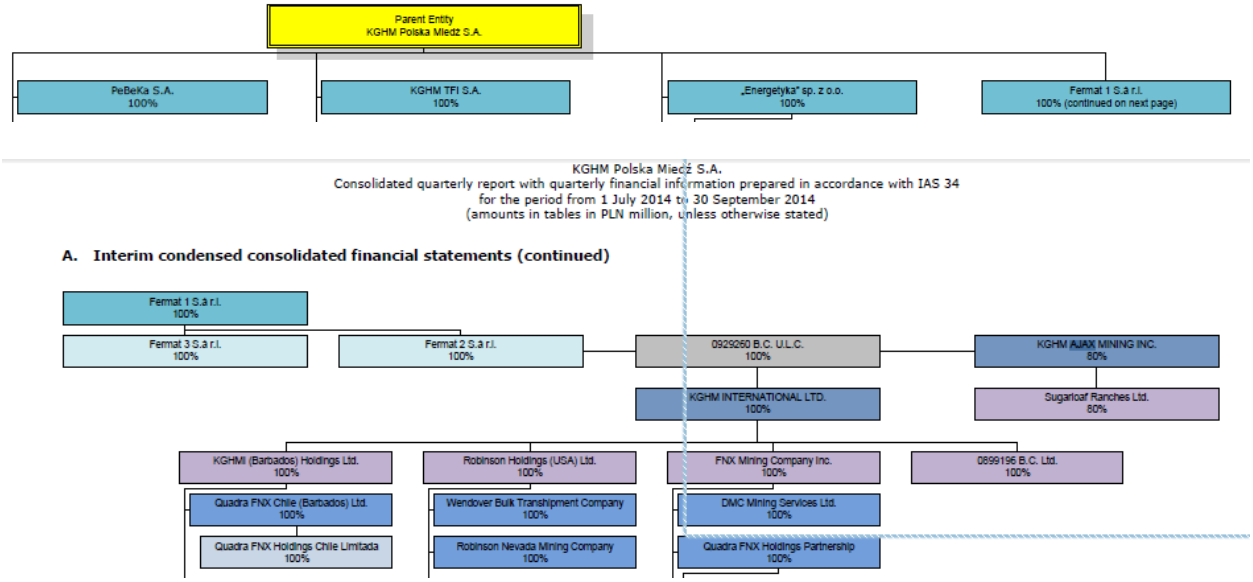
7. SECTION 2.1.1 PROPONENT

This section states:

"KGHM Ajax Mining Inc. (KAM) is a joint venture company between KGHM Polska Miedź S.A. and Abacus Mining and Exploration Corp. (AME). KGHM Polska Miedź S.A. is a Polish copper mining and smelting company, the ninth largest copper producer in the world. It was created as a state-owned company in 1961 and was privatized in 1991; since 1997, it has traded publically on the Warsaw Stock Exchange under the symbol "KGHM"."

According to the KGHM Polska Miedź S.A. 3rd Quarter Report, November 13, 2014, the corporate ownership structure of KGHM Ajax Mining Inc. is more complex than this statement indicates. Given that the BC Environmental Assessment Office must assess the financial ability of the Proponent to fund mitigation and compensation costs, it is important that an accurate description of the corporate ownership structure be provided in the AIR/EIS and in the Application.

As the following organization chart from the same Quarterly report indicates, KGHM Ajax Mining Inc. is 80% owned by 0929260 B.C. U.L.C. This BC numbered company is 100% owned by a subsidiary, Fermat 2 S.á.r.l., which in turn is owned 100% by subsidiary Fermat 1 S.á.r.l., which in turn is 100% owned by the parent company, KGHM Polska Miedź S.A. Also, it is incorrect that KGHM has been privatized. It was partly privatized, as the Polish Government still retains almost 32% ownership of the company.



8. SECTION 2.2.2 PROJECT LOCATION

This section states:

"The Project is located in the South-Central Interior of British Columbia, south-west of the city of Kamloops, within the Thompson Nicola Regional District as shown in Figures 2.2-1 and 2.2-2. The Project lies in an area identified as asserted traditional territories of the Stk'emlupsemc of the Secwepemc Nation (Tk'emlúps te Secwepemc and Skeetchestn Indian Band) as well as the asserted traditional territories of the Nlaka'pamux (Ashcroft and Lower Nicola Indian Bands) Nation. The coordinates for the centre of the proposed mine are approximately 50°36' N latitude and 120°24' W longitude. The primary components are proposed to be adjacent to, but outside Kamloops city limits. The closest Project facility to the neighbourhood of Aberdeen is the EWRSF at approximately 1.7 km. The proposed infrastructure will be located primarily on private land owned by KAM, with some utilisation of Crown land."

The Proponent states that "The closest project facility to the neighbourhood of Aberdeen is the EMRSF at approximately 1.7 km." A clause should be added stating that the closest project facility to the City of Kamloops designated urban growth area in the Kamloops Official Community Plan is approximately one kilometre.

Mine Access

Present text:

"During the initial construction phase, access to the project area from Kamloops will be via exit 366 off the Trans-Canada Highway (No.1), west along Frontage Road, and then south along Lac Le Jeune Road to the old Afton Mine Haul Road near the Inks Lake Junction (approximately 9 km by road). Midway through construction and during operations, access will be from Inks Lake Interchange off the Highway No. 5 to service roads connecting the interchange to the old Afton Mine Haul Road."

Suggested new text:

Access to the project area from Kamloops will be from Inks Lake Interchange off the Highway No. 5 service roads connecting the interchange to the old Afton Mine Haul Road.

Rationale:

The Lac Le Jeune Road is essentially a paved "country road" with hills and tight corners, and will not support heavy traffic. Also, it would be very hard to change people's habits if they're allowed to use Lac Le Jeune Road for a few years while the intersection is upgraded and the mine developed.

Proximity to Future Development

The CAG requests that a reference be added to this section with regard to the distance the mine location is away from "future development" as shown in the City of Kamloops Official Community Plan. This is an important fact that should not be overlooked as the OCP clearly states that 48% of the City's future growth is in the southwest sector and much of this land is only 900 meters from the EWRSF. The Proponent makes reference to the distance to city limits and the closest neighbourhood but not future development which is instrumental to the City of Kamloops in achieving their growth predictions. Loss of this development land will have huge financial impacts to the residents and taxpayers.

9. 2.5 ALTERNATIVE MEANS OF UNDERTAKING THE PROJECT

Issue: Alternative methods and locations of tailings and waste rock disposal

A discussion of alternative methods and locations of tailings and waste rock disposal needs to be added. In the 2009 Ajax Preliminary Assessment Technical Report, the proposed tailings disposal location was to use the Afton mine tailings impoundment, and to use areas south and east of the pit, and the pit itself, for waste rock disposal.

In the 2011 Project Description and the 2012 Ajax feasibility study, the proposed tailings location was between the Lac Le Jeune Road and the Coquihalla Highway south of Inks Lake, and the waste rock area had shifted to the north and east of the pit. This proposal was for a dry stack disposal method.

The current plan is for a partly water covered tailings impoundment in the Goose Lake area, and waste rock areas to the south and east of the pit, including the pit itself.

If the Proponent makes or proposes changes to size, geometry, volume, location or other to mining/processing infrastructure, then the public should have input into it, and be able to review changes.

The CAG requests an assessment of potential environmental, City, and public health impacts of the three TSF scenarios: the TSF at the historic Afton site; the TSF west from the Ajax pit; and finally the TSF south-southwest from the pit, unless there are more options still coming. This way the community would be able to review the scenarios and the Proponent justification for the final design.

The CAG requests that the Application contain a detailed methodological comparison of the financial benefits and costs, environmental and health impacts, and risks of all three alternatives.

10. 3.2 MINERAL RESOURCES

In this section it is stated that the size of the Mineral Resource is 512 Mt, based on assumed prices of US$2.88/lb. for copper and US$1,200/oz. for gold, and that this information is based on a mineral resources estimate by Timothy O. Kuhl, dated May 26, 2011. This information is taken from the Wardrop 2011 Ajax Feasibility Study Technical Report. This report also contains a Mineral Reserve Statement, dated October 31, 2011 in which the total proven and probable mineral reserves are estimated to be 503 Mt, based on assumed prices of US$2.50/lb. for copper and US$1,085/oz. for gold.

For financial analysis purposes, the CAG requests that the Proponent use a range of price assumptions, including the two price assumptions used in the 2011 Feasibility Study. For sensitivity analysis, a low price assumption of US$2.00/lb for copper and US$850/oz. for gold also should be included in the financial analysis.

11. 3.3 SITE GEOCHEMISTRY

KGHM AJAX Chief Geologist, Chris Wild, stated at the Ajax Information Meeting on November 25, 2014 that Ajax is assaying for 48 elements. All assay data for the Ajax project should be disclosed.

Due to the presence of chromium in the ore, the concentrations of **hexavalent Chromium [Cr (VI)]** must also be determined.

It is noted on page 10 of the 2009 Assessment Report for the Ajax Property, Section 3.2 Property Geology, that tremolite-actinolite is present. The Proponent must provide information on the concentration of these minerals in the ore, waste rock, and tailings, and whether these minerals are found in fibrous form.

Information must be provided for the assay method (s) used for determining the concentration of each element, the confidence level for each assay method, the number of samples, the drill hole locations and directions, the core sections, the name (s) of the assay lab (s) that did the work, and the due diligence that was undertaken to ensure the validity of the assay results (i.e., independent analytical cross-checking). The most up to date 3-D geological model should also be provided.

As stated earlier, due to the proximity of the mine to the City of Kamloops, the level of reliability of the assay information must be as high as possible in order to provide for the highest safeguards for the health of the residents.

It is noted that for many topics, the AIR/EIS and associated documents specify the types of models or the guidelines that should be used for describing and predicting impacts. Unfortunately, for the composition of the rock to be blasted and crushed, no standards or guidelines are recommended. This absence of direction is in spite of the fact that different assay methods have different levels of confidence with regard to data accuracy.

In the case of the proposed Ajax mine, due to its close proximity to a major population centre, the required level of accuracy for the assay data should be as high as possible. Assay data of insufficient accuracy increases the risk that the health impacts will be insufficiently assessed, understood, or mitigated.

12. 3.3 SITE GEOCHEMISTRY

Presence of Measurable Uranium

The March 16, 2009 *Assessment Report on the Abacus-New Gold Joint Venture Diamond Drilling Program on the Ajax Property from November 1, 2007 to October 7, 2008,* revealed eight drill holes with measureable uranium of 10 ppm or more. The references for these holes are:

AK2007-2210 10 ppm; Copper: 1361 ppm; p 941

AK2007-2236, 30 ppm; Copper: 1870 ppm; p. 1009
AK2008-0332 10 ppm at 5 intervals: 1:7; 25; 32 & 36; Copper at the intervals: 149; 2490; 59; 100; 19; p. 1417
AK 2008-0370R 17 and 10 ppm at intervals 91 & 92; Copper 1892 and 548 ppm at the same intervals; p. 1567
AK 2008-0394 20, 20, 10 and 20 ppm at 4 respective internals: 126; 129; 130 & 131; Copper at these 4 respective intervals: 191; 158; 119; 182 ppm; p. 1644
AK2008-0404 20 ppm; Copper: 507 ppm; p. 1713
AK2008-1006 80 ppm; Copper 1408 ppm; p.2303
AK2008-1650 40 ppm; Copper: 3432 ppm; p.2675

The CAG is interested in the exact locations of these drill holes, and at what point in the production schedule that the rock located in these drill holes will be blasted.

Also, the CAG is concerned that the existing 28 element analysis used for the assessment report may not accurately measure the uranium levels in the Ajax deposit. Therefore, the CAG wants to know what other assay methods the Proponent proposes to use to determine more accurate levels of uranium in the Ajax deposit.

If there are significant levels of uranium in the Ajax deposit, how does KGHM Ajax propose to isolate and store the material that contains this uranium?

13. 3.4.3 DRILLING AND BLASTING

Project Description: Blast Size (Paragraph 4, page 2 of Preface)

The revised text states that the bench size will increase from 12 to 15 m, with drill-hole depth increasing from 13.5 to 17.5 m. It is also stated that "mineralized material will be blasted to comply with fragmentation requirements and a specified particle distribution."

The Application should provide information on the maximum charge size per hole necessary to achieve the lowest particle size distribution target.

With regard to assessing potential fugitive emissions from all blasting activities associated with the Ajax project, the CAG would like the BC EAO and the CEAA to designate the following document to be used in the Ajax assessment: *National Pollutant Inventory Emission estimation technique manual for Explosives detonation and firing ranges, Version 3.0, January 2012*, Australian Government, Department of Sustainability, Environment, Water, Population and Communities.

14. 3.6.4 HPGR FEED

There is mention of a "dust collection system". The Application should contain a detailed description of this system, including the percentage of dust reduction, its efficiency in reducing

particulate emissions of various sizes, potential operational failures, and the consequences of such failures.

15. 3.6.6 GRINDING AND CLASSIFICATION

The change from a specified number of components (two) for the grinding and ball mill circuits to an unspecified number suggests that the number of circuits could be greater than two. Given that the grinding units are amongst the largest uses of electricity in a mine, the Proponent should clarify how many grinding and ball mill circuits it is planning to install. Does an increase in the number of ball mill circuits represent an increase in the capacity of the mine?

16. 3.7 TAILINGS MANAGEMENT

Section 3.2 states that the size of the Mineral Resource is 512 Mt. This section states that "The current TSF design has capacity to store approximately 440 million tonnes of tailings." According to Table 19-3 of the 2011 Feasibility Study, the annual concentrate tonnage will be 197,435 tonnes, or approximately 4.5 million tonnes over the life of the mine. Subtracting this tonnage from the size of the mineral resource leaves an amount of 507.5 million tonnes of tailings.

Where will the additional 67.5 million tonnes of tailings be disposed? Given that the *current* TSF design is for 440 million tonnes of tailings, are there plans to alter the current design of the TSF to accommodate more tailings?

If more ore is discovered and mined, where will the tailings from this ore be disposed?

17. 3.7 TAILINGS MANAGEMENT

Will the Proponent be building a spillway to handle excess water in the tailings impoundment? If not, why not?

If so, will the discharge water require an effluent discharge permit, and will the effluent be treated?

18. 3.8.1. WASTE ROCK FACILITIES

The reduced size of the East Waste Rock Storage Facility (74 Mt) to only 16% of that of the South Waste Rock Storage Facility (450 Mt) raises a question of why the EWR couldn't be added to the SWRSF. Are there geotechnical concerns here?

A key issue is the stability of the proposed waste rock facilities. On the following page is an image of a waste rock failure at Newmont's Gold Quarry mine in Nevada on February 5, 2005.

This facility had been engineered and constructed in the 1990s. When it failed, the facility had already been vegetated (i.e. it was decommissioned). A total of 9.1 million tonnes was displaced. The facility had been constructed on a uniform, underlying slope of 1-2%. The maximum width of the run-out was 460 m. and the run-out depth was 183 m. The base of the facility was approximately 1554 masl, and the elevation of the maximum run-out point was 1552 masl, indicating a slope of just over 1% in the run-out zone.

Failure scenarios for this facility, and for that matter, all mine facilities, need to be provided so that the public has an understanding of the potential risk of these facilities. A massive failure of the SWRSF has the potential to block Peterson Creek, even below where the proposed Peterson Creek diversion rejoins the creek. If a waste rock failure results in a blockage of Peterson Creek, once this blockage is over-topped, a massive debris flow down Peterson Creek will likely occur. Failure scenarios need to include potential impacts on all inhabitants and properties downstream, especially downtown Kamloops.

Waste Rock Failure, Gold Quarry Mine, Nevada, February 5, 2005

Four of the five waste rock areas will be constructed outside the open pit, while one disposal area will be located within the pit. Of the four waste rock areas outside the pit, all will be constructed on slopes greater than the waste rock area that failed at the Gold Quarry mine. The largest, the South Waste Rock Facility, will be built at just over one kilometre south-west of Peterson Creek. For one slope tangent for this facility, the underlying top elevation is approximately 1071 masl, while the toe of the proposed facility is approximately 1006 masl, over a distance of about 385 metres, for an average slope of 16.9%. The top elevation of this waste rock area will be about1135 masl, suggesting a maximum waste rock depth of 64 metres. The elevation change between the toe of this waste rock area to Peterson Creek is about 133 metres, over a horizontal distance of about 1034 metres, for an average run-out slope of 12.9%. If a sufficient amount of

material was to be displaced along this tangent, it is possible that a blockage of Peterson Creek could occur, with a subsequent possible debris flow down the creek and through downtown Kamloops.

Dust control is cited as one of the issues listed in the May 1991 British Columbia Mine Waste Research Committee *Mined Rock and Overburden Piles, Investigation and Design Manual, Interim Guidelines*, a document that forms part of the reference material for the Ajax AIR/EIS. Page 23 of the manual states that "It is generally good practice to establish a climatological station at the mine site." Currently, the only climatological station operated by the Proponent is located in the north-east lee of Sugarloaf Hill, a distance of over 5 km from the nearest proposed waste rock facility.

The establishment of meteorological stations at or near the mine site was recommended by Dr. Steyn in February 2012. Dr. Steyn's recommendations including placing a tower-mounted anemometer at or near the crest of either Sugarloaf Hill or Coal Hill to characterize valley scale wind speed and direction in the general location of the proposed tailings piles. In addition, Dr. Steyn recommended that meteorological measurements be taken at or near the location of the proposed tailings piles in order to understand dust suspension from tailings piles. Such data would also allow an assessment of frequency of occurrence and direction of strong winds over the tailings piles.

19. 3.12 SITE WATER MANAGEMENT

A water management plan...include as first bullet:

• Preservation of both water quality and quantity, of both surface water and groundwater of the Jacko Lake/Jacko Creek system will be addressed.

Final water balance...zero discharge during Operation.' Add: Control /disposition in perpetuity of runoff or seepage water from disturbed areas will be addressed in the A/EIS.

20. 3.15 POWER SUPPLY

New entry below 'Construction methods'

• Design and restoration plans will address visual impact, and potential weed invasion.

21. 3.16 ACCESS AND SITE ROADS

Add, after first full paragraph ending 'A/EIS:'

Use of Goose Lake Road/Hwy 5A by project related traffic will not be permitted. Use of Lac Le Jeune road will be addressed.

Access to and safe public use of Jacko Lake and Stake Lake/Lac Le Jeune area will be addressed.

22. 3.18.1 TAILING STORAGE FACILITY CLOSURE

It is noted that this section states "The proposed closure cover will minimize wind and water erosion, and reduce infiltration into the TSF, eventually reducing seepage from the toe of the TSF. Seepage will continue to be collected and monitored at seepage collection ponds during closure/postclosure."

The words, *and treated if necessary,* should be added after the word *monitored.*

23. 3.18.2 MINE ROCK MANAGEMENT FACILITIES CLOSURE

This section states that "Following closure, re-contouring of the slopes will be carried out to ensure the physical stability of the facilities…"

The word *ensure* should be replaced by *increase* because ensure means a certainty or a guarantee that something will happen. Re-contouring cannot guarantee stability, only increase it. There will always be a risk of slope failure.

Add: '...mulching' to successfully establish an acceptable plant cover as agreed with a government/NGO team.

24. 3.18.4 AND 3.18.5 PROCESSING PLANT AND ACCESS ROAD CLOSURE

"vegetated with appropriate plant species" and "re-vegetated". Which plants will be chosen and why? Will KAM try to restore the original plants species?

25. 4.0 ASSESSMENT PROCESS

Since the environmental assessment for the Ajax project began, the CAG believes that the assessment has not been as rigorous, comprehensive and transparent as it should be due to the following practices:

1. Withholding of key information by KGHM
2. EAO interpretation of the relevant legislation, regulation and policies
3. Failure of EAO to properly consider Health Agency concerns
4. Weaknesses of Public Meetings
5. Failure of both federal and provincial governments to establish a panel review with public Hearings.

These practices will be discussed in turn herewith:

1. Withholding of key information by KGHM

One of KGHM Ajax's public consultation objectives is "to share information between KGHM Ajax and the community and vice versa."[1] The Proponent also professes to "refer to the following sources for guidance on public consultation requirements for the Ajax Mine Project:

- *Core Values of Public Participation*[2]
- *Code of Ethics for Public Participation*[3]
- *Stakeholder Engagement Good Practice Handbook"*[4]

One of the principles in the *Code of Ethics for Public Participation* is to encourage "the disclosure of all information relevant to the public's understanding and evaluation of a decision."

In the *Stakeholder Engagement Good Practice Handbook*, the following five good practice principles of disclosure are listed:

- Disclose early
- Disclose objective information
- Design disclosure to support consultation
- Provide meaningful information
- Ensure the accessibility of information[5]

One of the major issues in the Ajax assessment is the lack of disclosure by the Proponent of assay data for the project; in particular the data for non-ore toxic elements and toxic substances known to be in the ore (e.g. arsenic, asbestos, cadmium, chromium, lead, manganese, mercury, uranium), but also assay data for the target ores of copper and gold for drilling that has been done for 2013 and 2014. The data for the presence of toxic elements and substances must be considered essential to the scientific integrity of the Ajax assessment, and this data forms core scientific information necessary for determining environmental and health impacts. The lack of disclosure, and even the lack of early disclosure, of this key information creates the risk that key questions will not be identified early enough in the assessment process to ensure a comprehensive, rigorous, and defensible assessment. This in turn raises the risk of the assessment being challenged on these grounds, which may result in a delay, or even termination of the project.

The *Handbook* provides the following commentary on situations where non-disclosure of information may be considered.

> There will be situations in which disclosing certain types of information at sensitive stages in the project cycle might entail risks. It is understood, for example, that in the very early stages of project development, revealing your hand to your competitors about what you intend to do could pose serious business risks. Such factors will need to be considered in deciding what to disclose and when. Other reasons for non-disclosure might include: commercial confidentialities and proprietary

> information, information of a personal privacy, safety, or individual security nature; or situations where releasing information very early in the development of a project might unnecessarily raise public expectations, cause speculative behavior, or create unnecessary fears. However, considerations for non-disclosure need to be weighed against the need for stakeholder groups to be informed in order to protect their interests. In general, experience shows that companies committed to transparency and accountability help promote the long-term profitability of their investments.

Of the reasons that have been listed in this commentary for non-disclosure, to our knowledge, only one, proprietary information, has been cited by the Proponent. This reason has been given to members of the public on more than one occasion. When members of the Kamloops Area Preservation Association asked that Appendix B of the 2012 Ajax Feasibility Study, which we understand includes information about deleterious substances in the Ajax deposit, be included as a document for the environmental assessment KGHM initially said that it would make this document available for public viewing in its Kamloops office. KGHM Ajax quickly reversed this decision and refused to disclose this information.[6]

This lack of disclosure of the assay data has had a negative effect on the ability of the assessment process to deliver a comprehensive and scientifically rigorous assessment. On May 10, 2012, at a meeting of the Health Sub-Working Group, an adjunct of the Technical Working Group, the Interior Health Authority (IHA) asked for the assay data as part of its review of the Proponent's *Dispersion Modelling Plan.* This Plan, prepared by Stantec Consulting Ltd. for the Proponent, delineates which substances that will be emitted from the mine will be studied for human health assessment. As the document states, "Stantecs (sic) Senior Toxicologist selected the substances to model from assay results provided by KAM."[7]

The disclosure does not apply only to geological data. The same reasoning for disclosure applies to the meteorological data and water quality and streamflow data. The Proponent has been collecting meteorological data since 2006 and there is no good reason why this data shouldn't be made public to enable the EAO to conduct its due diligence and evaluate the reliability of the Proponent's proposed assessment approach, as well as to facilitate improvements to the Ajax project as early as possible in the design process.

As suggested by the lack of disclosure of all the baseline data held by KGHM Ajax, there is a risk that important issues will be overlooked in the environmental assessment, possibly leading to flaws in the project design, or even delays or outright rejection of the project. In turn, this could have serious financial repercussions on the Proponent and investors. Given the non-financially beneficial nature of the toxic elements in the Ajax deposit, there appears to be no financial reason for withholding the assay data for these toxic elements. As the International Finance Corporation's disclosure principles suggest, and as the IFC concludes: "In general, experience shows that companies committed to transparency and accountability help promote the long-term profitability of their investments."[10]

As suggested by the disclosure principle of ensuring accessibility of information, it is important for reasons of fairness and transparency for the public to have easy access to the many reference documents that are cited in the AIR/EIS and associated documents. These reference documents

consist of standards, guidelines, and methodologies that are used to determine impacts, and subsequent mitigation strategies or compensation.

Although many of these documents are available on-line, some are not. The Detailed Noise Modelling Plan for the Ajax project, for example, has references to eight such documents.[11] One of these documents is the *ISO 1996-2:2007. Acoustics – Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels.* This document appears to be only available from the ISO for a cost of 158 Swiss Francs.

If the public has to pay a large sum of money to obtain the documents upon which the Proponent will be making its case for project approval, this raises a question of fairness.

The CAG notes that the EAO's *Fairness and Service Code*, which was published in order to give the "public an understanding of what can be expected during a provincial environmental assessment" states that information and records relating to the environmental assessments will be available on the EAO website. The EAO has further committed that policies will be available on the EAO website. [12] The CAG believes this commitment extends to the documents upon which the Proponent will rely.

2. EAO interpretation of the relevant legislation, regulation and policies

On several occasions the Proponent has cited "proprietary information" for not disclosing assay data for the Ajax project and related exploratory drilling. At the May 10, 2012 Health SubGroup meeting, the meeting minutes state that "the Proponent noted that, due to proprietary rights, the assay results would not be shared with working group members; however, if there is an interest in specific metals or certain elements, that information can be provided upon request."[20]

The CAG does not dispute KGHM Ajax's ownership of the assay data. Disclosure, however, does not change the ownership status of this data. The timely disclosure of assay data is required by securities disclosure laws and regulations in Canada for mining companies that are publicly traded on Canadian securities exchanges, and for mining companies that intend to trade on these exchanges.[21] KGHM's efforts to withhold assay data from the environmental assessment process is reflected in the Public Consultation Plan that it prepared for the Ajax assessment, as required under the Section 11 Order. This Plan was accepted by the BC EAO and posted to its website on May 9, 2012. Section 6.6 of this plan states, "All technical information and reporting will be made available on the website, subject to where KGHM is legally able to do so." KGHM cited the following 'constraints' to sharing information:

- Specifications under National Instrument 43-101 regarding investor privileged information;
- Security Exchange Commission dissemination rules;

A review of NI 43-101 standards and related guidelines documents and other securities commission disclosure rules indicate that such standards and guidelines are designed to encourage the dissemination of material information.

Perhaps even more troubling is the fact that KGHM Ajax neglected to refer to National Policy 51-201 *Disclosure Standards*, which was issued by the Ontario Securities Commission on July 12, 2002,[22] and re-issued in 2013. Section 3.3 (f) of this Standard explicitly allows companies to selectively disclose information to government agencies as a *Necessary Course of Business.*

Since the acquisition of an environmental assessment certificate from the EAO, and a similar approval from the federal government, is necessary for the Proponent to undertake the project, providing key material information such as assay data to government agencies, when requested by those agencies to do their work as part of the environmental assessment for these approvals, is a necessary course of business.

NI 51-201, Section 4.4 (2) also provides guidance in what should be considered material information for mining companies:

> As a guiding principle, if there is any doubt about whether particular information is material, we encourage companies to err on the side of materiality and release information publicly.

Applied to the Ajax proposal, this guiding principle strongly supports the CAG's position that all assay data ―target ore and trace elements― is material information due to the close proximity of the Ajax deposit, and related potential deposits currently in the exploration stage, to the City of Kamloops. If the Ajax proposal was located 30 km. from the nearest community, the materiality of toxic trace elements such as arsenic, cadmium, chromium, mercury, lead and uranium may not be an issue. However, the close proximity of a population of approximately 100,000 people to the Ajax proposal makes the information about these trace elements *material information* as evidenced by the request by the Interior Health Authority for this information. The proposed construction of a tailings pond within the Peterson Creek watershed, and the clear potential for a breach per the recent Mount Polley disaster, also militates in favour of information about the elements in the tailings fines being material.

Also relevant is the interpretation of Section 8.6 of the Section 11 Order. The Ajax Project Assessment Lead maintains that he only has the authority to require additional information from the Proponent at the Application Stage. However, Section 8.6 resides in Part D of the Order, *Assessment Procedures – Pre-Application Stage.* A close reading of Section 8.6 indicates that there are no clauses that prevent the Project Assessment Lead from requiring the Proponent to disclose information, such as assay data, during the Pre-Application Stage. The EAO Code supports the CAG's request that the EAO act to require additional information now, stating:

> The purpose of the pre-application stage is to ensure that when an application for an environmental assessment certificate is reviewed it contains the necessary information to allow the EAO to undertake its assessment and make recommendations to the Ministers making the decision.[23]

The principle clause of Section 8.6 states "The Proponent may be required to provide information in addition to that presented in the application…" The subordinate clause, states: "…including information from studies identified in the Application which are completed after the Application is filed…" This clause does not restrict the Project Assessment Lead from asking for further information from the Proponent during the Pre-Application Stage. If the clause had said "including *only* information from studies identified in the Application," it may be possible to argue that this would preclude the Project Assessment Lead from asking for further information during the Pre-Application Stage. The final clause in Section 8.6, "within time limits set by the Project Assessment Lead," clearly establishes no limitation on when the Project Assessment Lead can ask for further information during the Pre-Application Stage.

The proper application of Section 8.6 mandated the Project Assessment Lead to require the Proponent to provide assay data to the IHA when the IHA requested this data from the Proponent at the May 10, 2012 Health Sub-Group meeting, and the Proponent obstructed this request with a requirement that the request be in writing. At a June 24, 2014 Community Advisory Group meeting with the Project Assessment Lead, it was pointed out that he was in attendance at the Health Sub-Group meeting and that he had the power at that meeting to order the Proponent to release the assay data to the IHA. The Project Assessment Lead replied he did not require the information as "I don't have the power to ask for that until it's in the Application stage." When it was subsequently pointed out that Section 8.6 refers to the Pre-Application Stage, the Project Assessment Lead cited "nuances of the regulations in the Act," as explanation for why he did not require the Proponent to release the assay data to the IHA. With respect, we believe the Project Assessment Lead has misread the legislation. Section 11(2)(c)(i) of the *Environmental Assessment Act* clearly supports a wide discretion for the Project Assessment Lead to require information. Even if section 8.6 did preclude the Project Assessment Lead from requiring assay information in the pre-application phase, which is not conceded, the EAO always retained the general discretion – under section 13 of the *Environmental Assessment Act*- to vary its section 11 order in a manner that would allow it to require the provision of such information.

3. Failure of EAO to properly consider Health Agency concerns.

Government agency correspondence regarding health assessment issues that have been posted on the EAO website, or obtained through Freedom of Information requests suggest a disturbing tendency to not properly consider health impact issues.

IHA personnel who had been tasked with participating in the Ajax assessment wrote a letter dated June 21, 2012 and addressed to the EAO Project Assessment Lead, requesting that "Proponents should be obliged to provide detailed core constituent data from top to bottom of a proposed mine, added chemicals, tailings composition, details of water intake and output, and expected long term health effects prior to acceptance of a project for EAO review." The letter stated further that "A policy of secrecy regarding toxic metals, radionuclides, and mining process chemicals is untenable and constitutes a potential health hazard to the public and a large waste of public funds for fundamentally incomplete reviews once a project has been accepted for environmental and health review by EA, EIA, HIA, and HRA."

This letter was part of the comments from government agencies as specified in Sections 8.2-8.4 of the Section 11 Order that are to assist the Project Assessment Lead in determining the scope of the Application Information Requirements. The letter originated as a request by the EAO at the May 10, 2012 Health Sub-Working Group meeting. At this meeting, it was mentioned that the IHA was expecting comments from the BC Centre for Disease Control. The following excerpts from the minutes of the May 10, 2012 Health Sub-Working Group meeting clearly show that the EAO was expecting expert comments on health-related assessment issues, and that these comments would be used to revise the draft Application Information Requirements:

> It was proposed that the deadline for feedback occur approximately one week after the meeting. Working group members requested an extension to the feedback deadline within the realm of 2-3 weeks. Interior Health was unable to confirm an exact timeline due to the request being made to the British Columbia Centre for Disease Control (BCCDC) to provide comment.
>
> EAO noted that the next steps in the EA process for the proposed Project would include revision of the dAIR based on public and working group comments and review by the working group of the Proponent's responses to comments on the dAIR.

Comments from the BCCDC were provided to the IHA in a May 25, 2012 letter, and presumably were incorporated in the June 21, 2012 letter from the IHA to the BC EAO. It is now apparent that the June 21, 2012 letter written by IHA Medical Health Officer, Dr. Peter Barss, was received by the EAO after the AIR for original Ajax project proposal was finalized.

Oddly, a letter written on June 19, 2012 by IHA Environmental Health Officer, Misty Palm, was received by the BC EAO, but was not posted on the BC EAO website until June 27, 2013. Equally strangely, another letter written by Misty Palm to the EAO on March 12, 2013, was not posted until July 3, 2013. The March 12, 2013 letter contains references to the June 19, 2012 letter and a July 18, 2012 letter, both letters written by Misty Palm, and providing comments on the air and noise modelling plans—topics that are of very high interest to the citizens of Kamloops.

There is also a six page March 1, 2012 letter from Misty Palm to the BC EAO that was not posted on the BC EAO website until July 3, 2013.

With regard to the July 18, 2012 letter, it was stated that "Interior Health (IH) does not have adequate technical capacity to provide detailed comments on the study design and methodology." The letter has also not been posted by the BC EAO, although it would have been aware of the letter because it was mentioned in the March 12, 2013 letter to the BC EAO. It should also be noted that the July 18, 2012 letter was retrieved through Freedom of Information.

What is clear from this confusing array of letters is that a large amount of technical information on human health concerns was not posted for public review until well after the second and last Pre-Application public comment period ended in March 2012. This does not accord with the EAO's guiding principle of transparency, including the commitment to post information and records relating to environmental assessments on the EAO website. Nor is it consistent with the

EAO guiding principle of inclusiveness: parties cannot fairly participate when all pertinent information is not available.

Has the EAO compared the contents of the two IHA letters to determine whether any important comments were not included in the AIR? Now that the AIR is currently being revised due to the new mine plan, this provides ample opportunity to consider the comments made in the June 21, 2012 letter.

4. Weaknesses of Public Meetings

KGHM's open house meetings and the two "open mike" sessions KGHM has hosted have had several major weaknesses.

First, the open house meetings have had an abundance of glossy photos and slide presentations but little informative material. Despite repeated public requests for the disclosure of assay information, to the CAG's knowledge, this information has never been presented at any Open House meeting.

Second, attendees at the open house meetings have realized during post-open house discussions that many of the verbal answers given by the Proponent's staff are contradictory.

Third, the open mike meetings have been characterized by limitations to the number of questions asked by individual attendees, thereby making it impossible in a public forum to pursue issues in detail. Also, there are no audio or audio-visual recordings of the answers given the by the Proponent, and no written transcript, thereby providing no objective record of the proceedings.

5. Failure of both federal and provincial governments to establish a panel review with public hearings

The failure by the federal and provincial governments to establish an expert review panel with public hearings for the Ajax proposal in the face of strong public support for a review panel and requests by the City of Kamloops and the Stk'emlupsemc te Secwepemc Nation raises questions about the fairness and transparency of the Ajax environmental assessment process.

26. 5.0 EFFECTS ASSESSMENT

In 'The assessment methodology ...will include...', add as bullet 7:

- Documentation of field-based natural resource assessment that was carried out and consultations completed on the proposed new areas of disturbance in the present project site plan

add as bullets 8 and 9:

- Effects of a long north-south barrier to the east-west movement of wildlife and the movement of cattle will be addressed

- The economic impact of the loss of potential usable forage production will be evaluated in terms of equivalent value of hay as fed when cattle are not on grass, in the time frame of active mining and restoration, and projected forward into perpetuity based on estimated residual, safely usable forage production.

27. 5.1.1 VALUED COMPONENTS

Failure to Provide a Rationale for Rejected Value Components

In a letter from the Community Advisory Group to the BC EAO, dated November 16, 2012, several issues regarding the Ajax assessment were presented. Below is part of the Project Assessment Lead's December 19, 2012 reply, which did not provide a rationale for rejecting certain valued components:

> For those topics related to the EA, I have forwarded your comments to the appropriate provincial and federal agencies represented on the EA Working Group for their information and input. Topics related to the proposed Project or Proponent (e.g. presence of measurable uranium, employment and wage data; project feasibility; insurance and corporate structure), have been shared with the Proponent. The Proponent will determine how or if they wish to respond. For those comments pertaining to the EA process generally, we would be interested to hear from the group what topics are of most interest/priority so we can include these in the agenda for future CAG meetings.

One of the issues the CAG raised was the absence of soil contamination studies in the AIR/EIS. According to Environment Canada's *Code of Practice for Metals Mines*:

> Mining activity may also contaminate terrestrial plants. Metals may be transported into terrestrial ecosystems adjacent to mine sites as a result of releases of airborne particulate matter and seepage of groundwater or surface water.
>
> In some cases, the uptake of contaminants from the soil in mining areas can lead to stressed vegetation. In such cases, the vegetation could be stunted or dwarfed.[27]

Despite this awareness of the issue of soil contamination from open pit mining, Section 6.2 of the Ajax AIR/EIS, *Geology, Landforms and Soils,* only mentions the "Potential effects of the project on slope stability including on the Aberdeen Hills area, soil erosion, and existing geohazards will be assessed." In the *Summary of the Draft Human Health and Ecological Risk Assessment for the Ajax Mine Project,* the issue of soil contamination is confined to 25 surface soil samples from the mine area and 10 from the residential area, and no soil samples for grasslands or crop land.[28]

The November 2012 CAG letter also asked that the following species be added to the Valued Components for study purposes, but all were excluded from the AIR/EIS:

Castor Canadensis (beaver)
Ondatra zibethicus (muskrat)
Ursus americanus (black bear)
Puma concolor (cougar)

The exclusion of beaver is particularly mystifying given that beaver have created many of the ponds along the Peterson Creek water course, and these ponds play a major role in supporting other species in the area.

The visual impacts of blast plumes is another issue raised in the November 2012 CAG letter that receives scant attention in the AIR/EIS. The only reference to the visual impacts of blast plumes is in Section *10.4.4.2 Assessment of Vibration and Noise from Daily Blasting Activities,* where it is stated that "Visual and audio records of the blasts will be provided, as available."

Conspicuously absent from the AIR/EIS are pollinators as a Valued Component. Butterflies make the list as a species to be studied, but the rationale for doing so is not for their role as pollinators. Soil contamination, air quality contamination from mine emissions, use of herbicides to control "weeds", and a reduction in vegetation diversification by mine development, will all contribute to negative impacts on pollinators.

28. 5.1.6 CUMULATIVE EFFECTS ASSESSMENT

Section (d) *Cumulative Environmental Effects*, of the CEAA *Background Information* document states that "The evaluation of potential cumulative environmental effects will focus on the interaction between the residual environmental effects of the Project, after mitigation measures are applied, and the environmental effects of other past, present or reasonably foreseeable future projects or activities."[13] Section 19(a) of *CEAA 2012* requires cumulative effects assessment. Furthermore, the common law recognizes cumulative effects assessment as a normative component of environmental assessment under the *Environmental Assessment Act*: *West Moberly First Nations v. British Columbia (Minister of Energy and Mines)* 2014 BCSC 924 at para. 124.

On August 2, 2013, less than six weeks after the initial AIR/EIS was finalized, KGHM Ajax issued a news release stating:

> Our evaluation also included geologic surveys on the project area that identified possible ore bodies which have the potential to increase the project's copper and gold resources. We have begun conducting additional drilling and studies to evaluate the economic viability of the mineralized zones.[14]

On the same day, at a news conference, KHGM International officials, Yves Lacasse and Dan Ferriter, mentioned several times the possibility of new ore bodies in relation to the Ajax

deposit. The CAG notes that during the news conference, KGHM indicated that it was evaluating mineral potential "inside of our current project footprint" which, at that time, extended significantly into the City of Kamloops. Therefore, it would appear that a significant amount of drilling for the potentially new ore bodies is within the City of Kamloops.

In its fourth quarter report for 2013, KGHM Polska Miedź made the following statement:

> Afton-Ajax project in Canada (KGHM Polska Miedź S.A. 80%, Abacus Mining and Exploration Corp. 20%) – exploration work continued, including geophysical research and a campaign of exploratory drilling on the adjacent areas of Rainbow and Ajax North. Further geological work, which will provide more precise knowledge of the initially identified ore potential, will be realised in 2014. Work also continued on the preparation of an alternate mine plan, including changing the siting of certain mining facilities, which will enable both maximisation of the value of the Afton-Ajax project as well as reduce its impact on the environment.

Clearly in the Proponent's mind, the Rainbow and Ajax North areas are part of the new Ajax mine. It is reasonably foreseeable that they will be developed, and such development should be included in any effects assessment undertaken in relation to Ajax.

On February 28, 2014, KGHM Polska Miedź stated that "exploration work continued, including geophysical research and a campaign of exploratory drilling on the adjacent properties of Rainbow and Ajax North.[15]

Furthermore, Teck's inclusion of the Rainbow and Iron Mask deposits in a 2011 Net Smelter Return royalty agreement with Abacus indicates that the probability of development is high, and reasonably foreseeable. Abacus' 2012 Ajax feasibility study reported as follows:

> Pursuant to the Asset Purchase Agreement, Teck has retained a 1.5% NSR royalty with respect to each of the Rainbow and Iron Mask Properties that were purchased by Abacus from Teck and which comprise part of the Afton Ajax property.[16]

On May 29, 2014, Abacus Mining and Exploration Inc. issued a news release stating

> A major work programme is planned for 2014 consisting of various permitting activities, detailed engineering work, metallurgical test work, optimization studies and exploration and condemnation drilling. The objective of the exploration drilling programme, estimated to comprise 13,500 metres, is to identify potentially economic mineral resources close to the Ajax mining complex for future resource definition, as well as to test several highly-prospective regional targets outside the Ajax area, which resources could add significant value to the project.[17]

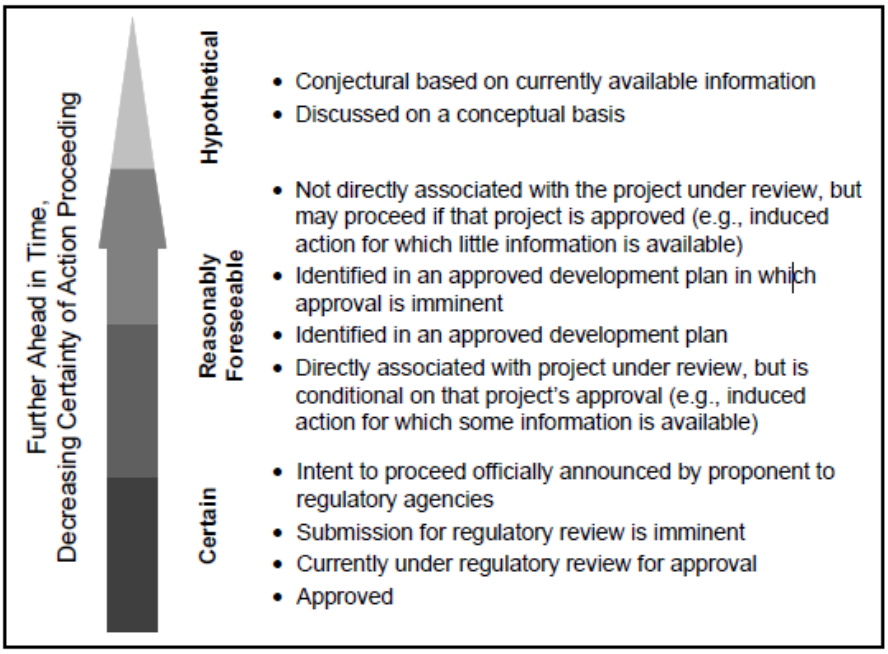
On November 13, 2014, KGHM released its 3rd Quarter report with the following update on Ajax (page 23):

At present engineering work is in progress, reflecting changes in the siting of selected mine facilities, in accordance with the new mine plan published in May 2014. **Exploration is also being conducted in the vicinity of the planned pit, aimed at identifying additional geological potential, which would enable prolongation of mine life and increase the project's economic value.** Work continued on preparing environmental permit applications, which are expected to be submitted in the first half of 2015.

On November 25, 2014, Ajax Chief Geologist, Chris Wild, characterized the Ajax deposit as a "starter-pit" upon which other nearby deposits could be sequentially developed. Deposits mentioned include: Rainbow, and the DM/Audra-Crescent zone.

Figure 3.1-1 *Regional Geology in the Project Area* shows in map form several other mineral deposits in the project area. One deposit identified on this map is the Galaxy deposit which is located only about 1.2 km. southwest of the neighbourhood of Pine Valley. While the 2006 NI 43-101 Technical Report for this deposit states that "the size and grade of the Galaxy zone are insufficient to allow the deposit to be exploited as a stand-alone operation…There is potential, however, to develop the deposit in conjunction with other known deposits of similar grade nearby."[18]

Figure 1: Options for Selecting Future Actions (page 19)



As outlined above in *Figure 1: Options for Selecting Future Actions* in the CEAA *Cumulative Effects Assessment Practitioners Guide*, the criterion for determining whether a future activity should be included in the cumulative effects assessment is whether the activity is *reasonably foreseeable.*

Given the history of mining and exploration in what is described by the mining industry as the *Afton mining camp* it is reasonable to conclude that extraction from the Ajax deposit is not likely

to be the last deposit mined in this area. Turning to the question of whether additional mining activity is foreseeable, based on KGHM Ajax's Chief Geologist's comments about Ajax being a "starter pit" and the mining of other deposits being done in sequence, it is clear that the development of mineral processing facilities is a prerequisite for mining other deposits, and that this further development can be foreseeably anticipated if Ajax is approved.

It is recognized that there is always some doubt about any future economic activity occurring due to financial considerations. If the Ajax deposit and other nearby deposits were located a considerable distance from human population, it could be argued that the cost of assessing the cumulative impacts of these nearby deposits is not warranted because of the low likelihood of impacts to human health. However, because of the close proximity of these deposits to a large urban population, it is argued that governments need to err on the side of caution and carry out a rigorous cumulative assessment of all reasonably foreseeable mining projects in the Afton mining camp.

29. 5.1.6.1 POTENTIAL INTERACTION BETWEEN RESIDUAL PROJECT EFFECTS AND OTHER PROJECTS OR ACTIVITIES

The Proponent has provided the following bullet points defining 'reasonably foreseeable' projects that omit the 'growth-inducing potential' criterion established by the CEAA.

- 'Reasonably foreseeable' projects will be projects and activities that:
  - Have entered into a formal project approval or permitting process; or
  - Have not entered a formal process but that have been discussed publicly by proponents; or
  - Have been specified through discussion with regulators, Aboriginal groups, and/or other stakeholders, and
  - Possess sufficient project-description information to inform a cumulative effects assessment.

A bullet point for growth-inducing potential, as defined by the CEAA cumulative effects guidelines, needs to be added to provide the rationale for assessing activities such as the likely development of adjacent ore deposits due to the growth-inducing potential of the Ajax project. The following CEA guidelines for defining "reasonably foreseeable" projects are provided to support this request.

THE BASICS OF DOING A CEA

The following italicized section is taken from the Canadian Environmental Assessment Agency Operational Policy Statement: *Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act*

 The study area is large enough to allow the assessment of Valued Ecosystem Components (VECs) that may be affected by the action being assessed. This may result in an area that is considerably larger than the action's "footprint". Each VEC may have a different study area.

 Other actions that have occurred, exist, or may yet occur which may also affect those same VECs are identified. Future actions that are approved within the study area must be considered; officially announced and reasonably foreseeable actions should be considered if they may affect those VECs and there is enough information about them to assess their effects. Some of these actions may be outside the study area if their influence extends for considerable distances and length of time. P,2 practitioners guide

Growth-inducing potential*: Each new action can induce further actions to occur. The effects of these "spin-off" actions (e.g., increased vehicle access into a previously unroaded hinterland area) may add to the cumulative effects already occurring in the vicinity of the proposed action, creating a "feedback" effect. Such actions may be considered as "reasonably foreseeable actions" (Section 3.2.4). p. 6*

Reasonably Foreseeable*: The action may proceed, but there is some uncertainty about this conclusion (The Canadian Environmental Assessment Agency's Operational Policy Statement Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act recommends that at least these types of projects be considered).*

• ***Hypothetical****: There is considerable uncertainty whether the action will ever proceed. P. 19*

A major criterion for selecting other actions is whether the action causes similar effects on the same VECs as the action under assessment. Focussing on actions with similar effects is a good first step, and will ensure that the most appropriate actions are included in the assessment (i.e., those with the greatest likelihood of causing effects that interact). Such a criterion is attractive from a practical point of view, as it could significantly reduce the number of actions a practitioner may have to consider. P. 20

Induced actions (e.g., public activities) rarely fall under the scrutiny of an approved process: they
just happen, and one must examine the likelihood of this based on existing use, precedent and implications of the assessed action proceeding. Best practice suggests that effort should be made in identifying actions if there is reason to believe they may occur, yet are not overly hypothetical. As illustrated in Figure 1, consideration of induced actions may be more reasonable if there is sufficient information describing them to allow an adequate assessment of their effects.

Accordingly, in identifying future projects to include in the cumulative environmental effects assessment, responsible authorities should consider projects that are "certain" and "reasonably foreseeable", as recommended by the Practitioners Guide. The Act does not require consideration of hypothetical projects, but responsible authorities may choose to do so at their discretion.
Information concerning the cumulative environmental effects of the project under assessment combined with hypothetical projects may contribute to future environmental planning; however, it should not be the determining factor in the environmental assessment decision under the Act.

Based on these guidelines, it is noted that the development of ore bodies that are either an extension of the Ajax deposit, or are in the vicinity of the Ajax project, and are owned by the Proponent constitute actions with similar effects to that of the Ajax project. In fact, it would appear that these guidelines were written specifically for projects like Ajax, which involve other potential activities very similar to the activity that is being assessed – mineral extraction. Key information is the potential size and grade of the ore body, which is derived from assay data. The CAG believes that the Proponent should be required to disclosure all assay data it has obtained for other ore bodies

30. 5.1.6.1 POTENTIAL INTERACTION

Is KAM aware that there is an ongoing federally-funded research project on lodgepole pine/dwarf mistletoe/pine beetle being conducted in the vicinity of the proposed footprint? Also – why isn't the Stake Lake hiking and cross-country skiing area mentioned explicitly? There is also a dog-walk trail in the vicinity as well. (Table 8.6-1 alludes to this, but is not clear). Goose Lake is also a well-used skating rink in the winter.

31. 6.1.2 BACKGROUND

The Proponent states that "Meteorological stations at Kamloops Airport and on the project site are illustrated on Figure 10.1-1…"

This statement needs to be corrected because there are no stations in this Figure that are on the project site. The closest meteorological station to the project site in this Figure is a station operated by the Proponent that is located at a site northeast of Sugarloaf Hill. However, this site is located within the City of Kamloops. Since the Proponent has stated in Section 2.2.2 that the project is located with the Thompson Nicola Regional District, it is incorrect to state that there are meteorological stations on the project site.

The lack of a meteorological station that would accurately reflect weather conditions in the immediate mine area is another issue. Dr. Douw Steyn recommended the establishment of a meteorological station on Coal Hill to provide more accurate on-site weather data than is being provided by the station the Proponent currently operates in the lee of Sugarloaf Hill. According to the *BC Mine Waste Rock Pile Research Committee Interim Guidelines*[25], which the Proponent has referenced, "It is generally good practise to establish a climatological station at the mine site."[26]

32. 6.2.1 Geology, Landforms and Soils

The only soil studies mentioned in this section is a reference to soil erosion in Section 6.2.2 *Background*, where it is stated that "Data will be compiled on the regional and site soils such as soil types; and erosion (vulnerability).

The only mention of soil contamination studies in the AIR/EIS is in Section 10.3.4, *Potential Effects of the Project and Proposed Mitigation,* where it is stated that modelling will be done of deposition of metals into soils from airborne particulate matter over the lifetime of the project, and in Section 17.6, *Accidents and Malfunctions,* where it is stated that contamination of soils and/or water due to spill, leaks, etc… will be discussed.

In the HHERA, sampling of surface soil is listed, consisting of 25 samples in the mine area, and 10 in the residential area.

There appears to be no systematic methodology for a comprehensive sampling of all soil types in the mine study area, and no mention of assessing the contamination by airborne mine emissions of soils used for rangeland and crops. The CAG believes that baseline information on the microbiota and the abiotic components of the soil sample areas is required, and that a geoaccumulation index for each sample site be calculated before and during mine operation. The following excerpt from *A review of soil heavy metal pollution from mines in China: Pollution and health risk assessment* (Science of the Total Environment 468–469 (2014) 843–853) is an example of the methodology used to calculate the geoaccumulation index:

> 2.1. Data collection and processing
>
> Conventional sampling procedures have involved collecting representative soil samples located in the vicinity of mines. Some studies have divided the areas under investigation into different zones (Li et al., 2010; Yin et al., 2008; Zhao et al., 2012). In general, every study zone was further divided into a grid of cells using a systematic grid sampling method with regularly spaced intervals. Afterwards, soil samples were collected in the field via random sampling methods, and samples were usually collected to a depth of 0–15 cm (Liu et al., 2007; Wu et al., 2010), 0–20 cm (Guo et al., 2011; Liu et al., 2006; Zhang et al., 2009), 20–40 cm (Hui et al., 2011) and then mixed thoroughly to give a composite sample (Liu et al., 2007; Wu et al., 2010). In the laboratory, soil samples were always air-dried at room temperature, and then pulverized and sieved. In general, soil samples in these studies were digested with a typical concentrated acid mixture (e.g. HNO3–HClO4–HF or HNO3–HClO4–HCl or HCl–HNO3–HF–HClO4) (Li et al., 2010; Liu et al., 2006, 2007; Zhao et al., 2012). Then, digested soil solutions were treated by a variety of analytical methods, such as atomic fluorescence spectrophotometry (Shi et al., 2010; Zhu et al., 2007) and inductively coupled plasma atomic emission spectrometry (Feng et al., 2011; H.W. Li et al., 2008). The sampling strategies and processing methods used in the selected studies are all widely accepted by the scientific community.
>
> The mean, range, and standard deviation values of the heavy metals found at various mining areas were collated (Table S2). In addition, in order to substantiate the comparisons with standards, percentile values (10th, 25th, 50th, 75th, and 90th) of the heavy metal concentrations were analyzed and the percentages of mining areas in comparisons with soil standards were calculated (Tables S3, S4). All the statistical

analyses for the data were performed by the software package SPSS 19.0 (IBM SPSS Inc., Chicago, USA) for Windows.

2.2. Index of geoaccumulation

The geoaccumulation index (Igeo) was introduced by Müller (Müller, 1969) and has been widely employed in European trace metal studies (Ji et al., 2008). It enables the assessment of environmental contamination by comparing differences between current and preindustrial concentrations. Originally used with river bottom sediments, it can also be applied to the assessment of soil contamination (Loska et al., 2004). In this study, the Igeo for the soils of examined mines was computed using the following equation:

Igeo ¼ log2 Cn=1:5Bn

where Cn is the measured concentration of every heavy metal found in the mine soil (mg/kg), and Bn is the geochemical background value of the heavy metals found in the soil (mg/kg), which is given in Table S5 (CNEMC, China National Environmental Monitoring Center, 1990). The constant 1.5 is used due to potential variations in the baseline data (Loska et al., 2004; Solgi et al., 2012). The geoaccumulation index consists of 7 classes or grades (Table 1), whereby the highest class 6 reflects a 100-fold enrichment above the background values (Forstner et al., 1990). The Igeo values for the heavy metals of the examined mines are listed in Table S6.

33. 6.3 SURFACE WATER QUALITY

The AIR should fully address all potential impacts on (Sections 6.3, 6.4, 6.5, 6.6) water quality and quantity during all phases of the project, including in perpetuity after closure. Impacts to be addressed should be existing surface and groundwater water use, existing water rights upstream and downstream from Jacko Lake; and the effects of a large area of active watershed being removed when included behind the tailings dams. Also, the implications in perpetuity of potential toxicity of runoff or seepage from the project area should be addressed.

The number and locations of monitoring sights on Figure 6.3-1 does not seem to be adequate. There are no upstream watershed monitoring stations from the proposed mining infrastructure, and some stations are within the mine pit itself, which would only give background water quality info prior to the pit excavation. There should be more sites which would remain in the area starting from the preliminary “design stage’ monitoring to ‘closure/post closure’ monitoring, in order to have a full picture of spatial and temporal impacts on local/regional water quality. The monitoring should also include upstream Peterson Creek above mine operations, in addition to the downstream Peterson Creek below mine operations.

34. 6.5 GROUNDWATER QUALITY AND 6.6 GROUNDWATER QUANTITY

Undeveloped Lands north of the proposed mine site is designated as Future Development Lands in the City of Kamloops OCP. Groundwater seepage from the Pit and the Tailings Storage Facility will impact the lands downslope and north of the mine in many ways but a significant determination of the whether these lands can ever be developed will be based on the piezometric pressures in the existing developed neighbourhoods of Aberdeen. **Any additional rises in piezometric pressures will have catastrophic consequences to existing homes and any future development of the stakeholders lands**.

According to Golder & Associates, who have completed many groundwater studies and produced numerous reports for the City of Kamloops, any additional groundwater WILL cause piezometric pressures to rise. As indicated in the reports natural recharge of groundwater from as far away as Chuwhels Mountain (approximately 19 kms southwest of Aberdeen) is making its way to the residential areas of Aberdeen. If groundwater recharge from Chuwhels Mountain can increase the discharge rates of groundwater into the Aberdeen neighbourhood, certainly a wet storage tailing lake (2 kms from Aberdeen) with a projected capacity of 440 million tonnes of tailings will have significant influence on the piezometric pressures in the Aberdeen neighbourhood and any future development in the area of Kamloops that was designated to accommodate 48% of the City's growth. See attached map and pages from Golder & Associates report.

Additional groundwater discharge laced with toxic metals in the areas designated for residential development could affect ability to develop these lands and groundwater seepage from the mine or wet tailings storage facility will increase the piezometric pressures in the areas of Aberdeen that are already susceptible to slippage.

To ensure that a real understanding of the impacts, real and actual data must be collected and used in the modeling programs and that "Assumptions" are not used. Therefore more rigorous information gathering must be undertaken to determine the exact Hydrology of the area, both in and around the mine site as well as all lands north and downslope of the mine site. Modeling of groundwater migration and rates cannot be relied upon to provide definitive answers as to the Hydrology of the area and how groundwater movement is taking place.

The CAG requests that the Aberdeen Highlands Development Corp. be added/listed to Stakeholder Input in Tables 6.5-1 and 6.6-1.

35. 6.5.2 BACKGROUND

The groundwater and surface water monitoring stations should be adequately selected to representatively illustrate quality evolvement through all stages from design to post-closure. Therefore the wells and sites should be selected so that levels and sampling will be possible though out the lifespan of stages/operations, making sure there will be enough wells and surface water sights to collect samples and measure levels, as the sites closest to the mine pit will likely go dry - meaning no information on quality and levels.

Use of groundwater tracing techniques is recommended to evaluate groundwater flows and potential contaminant flow direction and dispersion.

The CAG recommends that any new proposed monitoring wells be drilled to penetrate through the maximum depth of the pit in its proximity, or as a function of distance from the pit and expected contours of the groundwater cone of depression. This would ensure that the monitoring wells would always be functional to sample and measure levels of groundwater.

The existing wells are likely not deep enough.

36. 6.5.4 and 6.6.4 POTENTIAL EFFECTS OF THE PROJECT AND PROPOSED MITIGATION

The CAG requests that:

1. Real recharge and discharge data needs to be obtained from the areas in and around the mine site and north thru to the existing Aberdeen residential neighbourhood to get an actual understanding of the Hydrology of this area to use as inputs into the groundwater flow models for both groundwater quality and quantity.

2. Many, more groundwater monitoring wells need to be added in the areas north of the proposed pit and the existing Aberdeen neighborhood and monitored for a **minimum of 1 full year** to obtain real and historical annual data on the amount of recharge and discharge amounts and the hydrogeologic flow systems of the area for use in the "models" rather than using assumptions". For the West Highlands development in Aberdeen, Aberdeen Highlands was required to install 22 groundwater wells over approx. 100 acres; it is noted that map 6.5-1 shows approx. 50 groundwater wells over a much larger area (oddly enough there is no reference to the size of the area the mine will occupy), and there are NO groundwater wells between the pit and the existing Aberdeen neighbourhood.

3. Capillary electrophoresis/laser-induced fluorescence tracing of dyes needs to be undertaken to verify the **quality** of the existing water and continued monitoring undertaken throughout the life of the mine to ensure the quality of the water is not compromised through the leaching of toxic metals. This information can be used in a number of other studies on human health, quality of local water wells, creeks and lakes, country foods, mammals, rare plants and sensitive ecological communities, just to name a few.

4. Spectrofluorimetry laser-induced fluorescence tracing of fluorescence dyes needs to be undertaken for understanding the **Hydrogeologic flow systems and quantity** of groundwater at present for use in the groundwater flow models and monitored throughout the life of the mine to verify the modeling systems and or mitigation measures.

37. 6.5.5 RESIDUAL EFFECTS AND THEIR SIGNIFICANCE

The Proponent investigate different scenarios of mine infrastructure locations and impacts within different watersheds prior to selection of the final proposed infrastructure outline. Most likely locating the mine infrastructure within the existing Afton mine watershed would have significantly lower environmental impacts, than moving the infrastructure to new areas and watersheds.

38. 6.5.7 and 6.6.7 CONCLUSION

The CAG requests that Financial Compensation be added to both these sections in the event future development and or existing development is impacted due to an increase in groundwater discharge in the lower areas of Aberdeen or the quality of water becomes toxic and unusable due to leaching of metals from the mine.

39. 6.6.2 BACKGROUND

The CAG does not agree with substituting 'incorporation' for 'characterization.' Characterization suggests a more detailed portrayal of groundwater. Incorporation suggests less detail and merely inclusion.

40. 6.7.2 FISH

Why are fish from only Jacko Lake to be tested for metal accumulation (fish tissue metals)? Which metals are to be assayed?

41. 6.7.4 POTENTIAL EFFECTS OF THE PROJECT AND PROPOSED MITIGATION

Add as 3rd, 4th, 5th and 6th bullets in 'This section of the A/EIS will:

- Quantify socially and economically the value of Jacko Lake as an early-late season sport fishery.
- Describe the methodology to document the state of annual health of the Jacko Lake fishery and report annually to the public.
- Describe how the water flow effect necessary to freshen the important fishery/fishing area in the bay leading up to the outlet of Jacko Lake will be maintained.
- Quantify proposed compensation to replace Jacko Lake with an equivalent fishery, should the long established fishery diminish.

42. 6.8 RARE PLANTS

Why only threatened/rare plants? Could not any plant be a potential source of medicine or food, or be an important component to the ecosystem? Also fungi (e.g., mushrooms) are not listed. There are likely some important fungi in the region. Some of this is partially addressed in 10.3 Country Foods, but not explicitly.

Table 6.8-1 Rare plants

Why weren't First Nations peoples addressed as stakeholders on Rare Plants? (although aboriginal interests are mentioned in the preamble).

43. 6.10.1 GRASSLANDS - RATIONALE

Also, under Rationale (for choosing a VC for 6.10.1 p.82), the CAG believes that '...one or more of the following:' must be changed to 'all of the following,' and that this change should apply to many of the 18 VCs...

44. 6.10.2 GRASSLANDS - BACKGROUND

Field studies to determine....
Change 4th bullet to 'Present and potential plant species and communities'... , and 5th bullet from 'a select group of species' to 'all common species, and less species which are often represented in the Upper Grasslands.'
Add bullet 6 as: Probable environmental and social value of free east-west movement of wildlife and cattle between the grasslands to the east and the forested rangelands to the west. Could go into 8.5 Land and Resource Use?
Add bullet 7 as: Probable economic value to the overall ranching industry of the maximum level of sustainable forage production, quantified in tonnes of replaced fed hay.
Add bullet 8 as: The probable value of wildlife habitat to be lost by the elimination of Peterson Creek from Jacko Lake to the east side of the proposed project.

45. 6.14 MIGRATORY BIRDS

There have likely been studies on the birds (and other organisms) that use Goose Lake. These studies need to be consulted to determine exactly what will be lost in the conversion of Goose Lake to a tailings storage facility.

Change 'Waterfowl' to 'Waterfowl, including swans'.

46. 6.15.1 RAPTORS - RATIONALE

Include Snowy Owl

47. 6.17 MAMMALS

There are many common small mammals that are not considered "focal species" in the AIR/EIS. However, these small mammals are incredibly important as food for raptors and other larger animals. It is suggested that a mechanism for the monitoring of small mammals also be undertaken in order to predict effects on the predators.

Add to list beaver, whitetail deer, coyote, and black bear.

Top of page 107:

'Focal species were selected considering the presence of suitable and potentially suitable habitat'

48. 7.0 ASSESSMENT OF POTENTIAL ECONOMIC EFFECTS

Risk/Benefit Analysis, Mitigation, and Compensation Costs

During the public comment periods, several submissions were made asking that the economic feasibility of the Ajax project be assessed. These requests were dismissed as being out of scope. The EAO now has the chance to rectify that dismissal, which the Community Advisory Group (CAG) regards as a reviewable error, for the reasons listed below.

First, the issue of compensation is in scope, as compensation is a mitigation measure pursuant to the *Canadian Environmental Assessment Act, 2012* S.C. 2012 c. 19, s. 52 at Section 2(1).

Second, any reasonable and defensible justification analysis must include a consideration of whether or not the subject project is financially feasible, and whether the Proponent is able to finance mitigation and closure obligations. [29] If significant adverse effects are found, section 52(2) of CEAA *2012* will require that Cabinet consider whether such effects are justified. Section 17(3)(b) of the *Environmental Assessment Act* also provides ministers with the discretion to consider "any other matters that they consider relevant to the public interest in making their decision on the application." The EAO Code notes that the EAO will consider whether any significant adverse effects "may be justified in the circumstances, given the benefits and opportunities that the proposed project is expected to provide." [30]

Third, it would not be reasonable for the EAO, the provincial Ministers, the federal decision-maker, nor the federal Cabinet to consider the detailed information regarding project benefits required by section 2.7 of the AIR/EIS (i.e. direct and indirect employment estimates, contractor

supply services estimates and estimated annual government revenues) without any analysis of whether the Proponent is in fact financially capable of delivering those benefits.

The ability of the Proponent to pay compensation or carry out mitigation measures is a major issue for a project that has the potential to cause hundreds of millions in damages. The shifting of mine processing facilities, particularly the tailings facility, into the Peterson Creek watershed, with the final portion of the creek draining through downtown Kamloops, has increased the potential liability of the project.

The potential liability of the proposed tailings facility alone is a case in point. The impoundment structure for this facility will be approximately 139 metres in height upon completion. In comparison, only three BC Hydro dams are higher than this. The 2012 Province of British Columbia *Dam Safety Review Guidelines (*Version 3) require reports on such matters as consequence classification, dam safety analysis, hazards and failure modes analysis, emergency preparedness, and public safety and security. A review of the *BC Dam Failure Consequences Classification Conversion Table*[31] suggests that a 139 metre high dam located in the Peterson Creek watershed would receive an 'Extreme' risk classification, which is the highest level of risk in the classification table due to the facts that a catastrophic dam failure would imperil the lives of over 100 hundred residents downstream, and would likely cause over $100 million in damage to infrastructure (e.g. the Canadian Pacific Railway mainline), and to public, commercial, and residential properties. The catastrophic failure on August 4, 2014 of the Mount Polley tailings facility, which was engineered in the 1990s, is an example of what can go wrong with engineered facilities.

Determining the financial ability of mining companies to undertake mitigation and compensation measures during the construction and operation of the mine, and to undertake mine closure costs, is an issue that was addressed in *Pacific Booker Minerals Inc. v. British Columbia (Minister of the Environment)*) 2013 BCSC 2258. The petitioner argued that using "risk/benefit" analysis to assess the financial ability of the Proponent to fund mitigation and compensation costs was not legally part of the assessment process. Justice Affleck disagreed.

> I view the entire environmental assessment process, and the decision-making role of the ministers following receipt of a report, along with the executive director's recommendations, as a "risk/benefit" analysis. The ultimate task of the ministers was to make a decision about the certificate after taking into account the technical analysis of environmental effects conducted by the EAO; the views of those affected by the project, prominent among which was the objections of First Nations; the risk of long term environmental damage and very substantial remediation costs if mitigation measures were not entirely successful, as well as the benefits to the people of this province of an employment and wealth generating project. They were then to weigh the risks against the benefits and decide whether it was in the public interest that the risks were worth taking. It should not be a surprise that the executive director recommended a "risk/benefit" analysis.[32]

Risk/benefit analysis is methodologically similar to cost/benefit analysis in the sense that risk often transforms into costs for those affected by a project. With risk/benefit analysis being recognized by the BC Supreme Court as being the essence of environmental assessment, the critical question for the Ajax project is how various stakeholders are negatively or positively affected by the project. It is expected that the Proponent will not ignore accounting for those who will benefit from the project, while doing as little as possible to assess costs to those negatively affected.

The assessment of project impacts on different social groups is either called *distributional impact assessment*, or *environmental justice impact assessment*. In the United States, it is now an Executive Order that federal government regulatory changes must include an assessment of distributional impacts.[33]

In Canada, something analogous to distributional impact assessment is part of the *Canadian Environmental Assessment Act* for the assessment of the environmental effects of designated projects (such as the Ajax mine proposal) on the health and socio-economic conditions, traditional land use, and cultural and physical heritage of aboriginal peoples.[34]

Children are a societal group that prompts the need to conduct a distributional impact assessment for the Ajax project, given the higher vulnerability children have to toxic substances. As a minimum, the following guidelines and technical documents should be required references as part of a distributional impact assessment for the Ajax project:

- *A Framework for Assessing Health Risks of Environmental Exposures to Children* (U.S. EPA 2006a);
- *Cancer Guidelines* (U.S. EPA 2005a);
- *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens*
- (U.S. EPA 2005);
- *Child-Specific Exposures Handbook* (U.S. EPA 2008b)
- *Highlights of the Child-Specific Exposure Factors Handbook* (U.S. EPA 2009a)
- *Guidance on Selecting Age Groups for Monitoring and Assessing Childhood Exposures to Environmental Contaminants* (U.S. EPA 2005c).

Other societal groups that require specific health impact assessment for the Ajax project are those with Chronic Obstructive Pulmonary Disease, as well as people with high blood pressure.

For non-health related impacts, additional stakeholder groups need to be identified for risk assessment. For example, those residing in the dust fall-out zone from the mine or in the noise plume of the mine may suffer serious losses in property values. Another example is water license holders on Peterson Creek who may experience a decline in water quantity and quality due to the mine.

49. 7.1 ECONOMIC GROWTH

Rationale, Research and References

A summary of the rationale for Economic Growth as a VC is discussed. Economic growth is justified for inclusion into the analysis by KGHM Ajax because of aboriginal interest, public interest and relevant legislation or policy concerning the VC (pg. 112 of 202). The assessment will be done using the B.C. input-output model. Discussion will center on the estimated direct, indirect and induced economic impacts of the project.

There are a number of concerns with the use of economic growth as described. It is very limited in scope and does not identify any risks and economic costs of environmental degradation, health or depletion of natural resources. There are a number of very important VCs that the Ajax project does not address in the assessment of potential economic effects that are relevant to the community. These are discussed below.

First, the definition of Valued Component as defined in the "Guideline for the Selection of Valued Components and Assessment of Potential Effects" by the EAO, September 9th 2013.

> "For the purpose of environmental assessment in BC, Valued Components (VCs) are components of the natural and human environment that are considered by the Proponent, public, Aboriginal groups, scientists and other technical specialists, and government agencies involved in the assessment process to have scientific, ecological, economic, social, cultural, archaeological, historical, or other importance." (page 4)

As stated in the guideline, VCs must vary by project, industry and geographic region in order to address the impact of the project on the five pillars of sustainability such as environmental, health, economic, social and heritage. How does the project affect these five pillars of sustainability? Within the definition of EAO, the current methodology does not address important VC components. These are listed below.

a. Failure to examine genuine wealth growth

The Canadian, the B.C. government, the general public and First Nation communities are interested in sustainable development - not any type of development. Sustainable development cannot rely on economic growth models based on traditional indicators such as GDP (gross domestic product) or traditional input-output models that do not account for sustainable development. Economists now use Genuine Wealth Growth as a measure of the true economic growth (Arrow et al., 2004, Dasgupta 2008; 2010). Economic growth as measured by GDP cannot help to achieve sustainability because it does not account for an economy's total productive base. However, estimating the Genuine Wealth Growth Rate as a VC will take into account not only the traditional engines of economic growth such as physical capital investment

(net of depreciation of physical capital) but it will include the impact of the project on human capital, the rate of natural resource depletion and environmental degradation. The Genuine Wealth Growth rate is adjusted for population growth as well as technological change. Empirical estimates show that the growth rate of per capita genuine wealth is lower than economic growth as measured traditionally (See Posner and Costanza, 2011 for various studies). If the genuine growth rate is negative it implies sustainable development is not being achieved.

The CAG is particularly interested in this measure as it provides information on possible avenues to achieve sustainability. Arrow et al. (2003) offer a framework to evaluate projects and assess sustainable development.

Will the input-output model consider the possible negative impacts of the project on human capital, health, natural resource depletion and environmental degradation?

Examining Genuine Wealth Growth is relevant, comprehensive, representative, responsive and concise (the attributes of VC). Genuine Wealth Growth is relevant, practical, measureable, responsive, accurate and predictable (the attribute of indicators).

References

Arrow, K. J., Dasgupta, P., & Mäler, K. G. (2003). Evaluating projects and assessing sustainable development in imperfect economies. Environmental and Resource Economics, 26(4), 647-685.

Arrow, K., Dasgupta, P., Goulder, L., Daily, G., Ehrlich, P., Heal, G., ... & Walker, B. (2004). Are we consuming too much?. Journal of Economic Perspectives, 147-172.

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b. Failure to account for the economic cost of damaging the ecosystem services provided by grassland

Kamloops is surrounded by beautiful grasslands that provide us with many ecosystem services. These ecosystem services include fresh water, food, recreation, flood prevention, soil erosion control, carbon sequestration and storage, pollination, and others. Furthermore, grasslands have an option value for future use, a bequest value for future unborn generations to use, and an existence value to maintain the habitat for plants, animals and species that are at risk. Most of these ecosystem services were mentioned in previous sections of this report and mitigation actions that will be undertaken to reduce the damages the project will cause. But what has not

been mentioned is the current economic value of the grasslands and how much will be lost because of the operation. This needs to be addressed.

Figure 1 below is a framework that the Proponent can use to estimate the compensation required for ecological damages. It is important to note that the baseline cannot be: "ecosystem service damages without any regulation" and the treatment condition: "ecosystem services damages with mitigation action." Conducting such a study would imply that the project has only benefits as mitigation actions reduce the damages relative to no mitigation action. There are no ecosystem damages now and there will be damages if the project proceeds. Mitigation can reduce the impact under the treatment condition but there are still ecosystem damages and hence costs to be measured as a value component. The baseline condition must be "current ecosystem services without the project" and treatment condition will be "ecosystem services provided (less) with project (regulated preferably)."

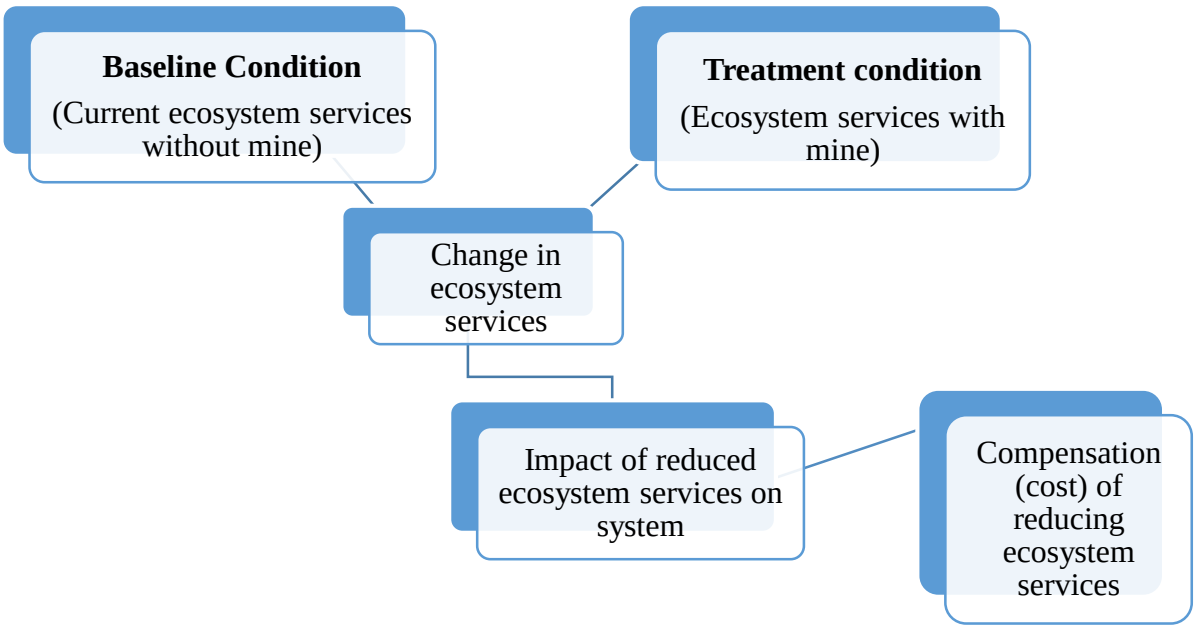

Figure 1: Framework to assess the cost of the impact on the grassland ecosystem

Following the above scientific methodology the Proponent can estimate the value component under the baseline and treatment condition. The Proponent must provide the impact of the project on ecosystem services and the compensation required for using these services for the production. Methodology to estimate baseline conditions is shown below.

In 1997, a study by Costanza and his team of academics entitled "The value of the world's ecosystem services and natural capital" attempted to place a monetary value (price) on nature and the ecosystem services it provides. They published a ground breaking paper in the prestigious journal Nature. The team of researchers conservatively estimated the value of the world's ecosystem services at $33 trillion per year, while world Gross Domestic Product, which measures the market value of all goods and services produced worldwide, was estimated at $18 trillion per year. The value of ecosystem services was almost two times larger than the world economy's production.

Since this seminal paper, many studies have re-examined the value of nature. A report in 2009 by Sara Wilson titled "The Value of B.C.'s Grasslands" placed the value on the scarce 740,000 hectares of B.C.'s grasslands between $1 and $4 billion per year.

If we allocate this value proportionally to the 2,500 hectares of land where the KGHM Ajax mine will be operating, we arrive at a figure between $3.4 and $13 million per year for ecosystem services. These services occur every year into perpetuity. What is today's value of these ecosystem services? A conventional discount rate that has been used for ecosystem services is three percent per year. Using this rate and assuming that the $3.4 million to $13 million per year of services grow at two percent per year – a rate similar to the growth rate of income per person over the long run – today's value of the grasslands would be somewhere in the range of $340 million to $1.3 billion.

Over the project's life and beyond ecosystem benefits will be damaged. Mitigation will reduce the damages but damages will still occur.

The CAG is interested in the economic cost of the damages to ecosystem services during the life of the project and beyond. Will the economic benefits exceed the ecosystem damages? How much will be damaged needs to be addressed?

Examining the damages to ecosystem services is relevant, comprehensive, representative, responsive and concise (the attributes of a VC). The economic costs of the damages are relevant, practical, measureable, responsive, accurate and predictable (the attributes of an indicator).

References

Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Naeem, S., Limburg, K., Paruelo, J., O'Neill, R.V., Raskin, R., Sutton, P., van den Belt, M., (1997). "The value of the world's ecosystem services and natural capital." Nature, 387, 253–260.

Costanza, Robert, et al. (2006)."The value of New Jersey's ecosystem services and natural capital." Gund Institute for Ecological Economics, University of Vermont and New Jersey Department of Environmental Protection, Trenton, New Jersey, 13.

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http://www.destinationbc.ca/getattachment/Resources/British-Columbia-s-Tourism-Brand/Super_Natural_BC_Brand.pdf.aspx

Wilson, Sara, (2009). "The Value of BC's Grasslands: Exploring Ecosystem Values and Incentives for Conservation." Report submitted to Grasslands Conservation Council Of British Columbia. Access at: http://www.bcgrasslands.org/learn-more/our-publications

Tsigaris, Peter, (2014) "Protecting our grasslands is good Economics" The Armchair Mayor News, Editorial article, March, http://armchairmayor.ca/2014/03/23/protecting-our-grasslands-is-good-economics

c. Failure to account for the economic costs of the health impacts of increased air pollution

On March 9, 2014, Dr. Tsigaris gave a public talk sponsored by the TRU Faculty Association Human Rights Committee and the TRU Eco Club. The talk was entitled, "What are the possible economic costs of an increase in air pollution in Kamloops?"

The talk discussed the cost-benefit of further increases (decreases) in air pollution. The presentation investigated existing air pollution in Kamloops and the possible sources. The talk then proceeded with the exploration of the impact of air pollution on health, the value society places on safety and a brief overview of two benefit-cost studies performed by the Environmental Protection Agency in the U.S. to determine the consequence of the regulatory amendments to the Clean Air Act over time.

From this point forward, the possible health effects of increased air pollution in Kamloops were examined. Currently, Kamloops air quality as measured by the annual average $PM_{2.5}$ exceeds the B.C. objective of 8 µg/m3. For the 2013 year $PM_{2.5}$ averaged 8.9 µg/m3 and was statistically significantly different from the annual averages observed in 2011 and 2012 (See Tsigaris and Schemenauer, 2014). For this year it is expected to exceed 9 ug/m3. Due to the close proximity of the mine to Kamloops, air quality will deteriorate further and there are economic costs with increased air pollution.

According to the Wardrop Feasibility study (2012):

> The project is expected to generate Criteria Air Contaminants (CACs - particulate matter and atmospheric emissions) from surface disturbance and fossil fuel combustion during construction, operations, decommissioning and reclamation of the project."

And that:

> "Fugitive dust is expected to be the major emission relevant to air quality and the primary concern for nearby residents."

Hence it is not a question of "will it happen?" but a question of "how much will it affect the Kamloops airshed?" and a question of "what is the health care cost (compensation required) of an increase in particulate matter in a city that is already exceeding B.C. guidelines?"

Epidemiological studies provide risk estimates from various cohort studies (long-term). Studies examine the impact of a 10 µg/m3 in PM2.5 or PM10 change on premature mortality. These studies show that increasing PM10 or PM2.5 concentration by 10 µg/m3 increases incidence of premature mortality by 14% (Brook et al., 2010; Circulation: range from 3 to 26%). Hence a 1 µg/m3 increase on $PM_{2.5}$ in the long run will increase premature mortality by 1.4%. In a population of 90,000, and with a baseline mortality rate of 0.89% using a typical health function it implies 11 premature deaths per year (See figure below).

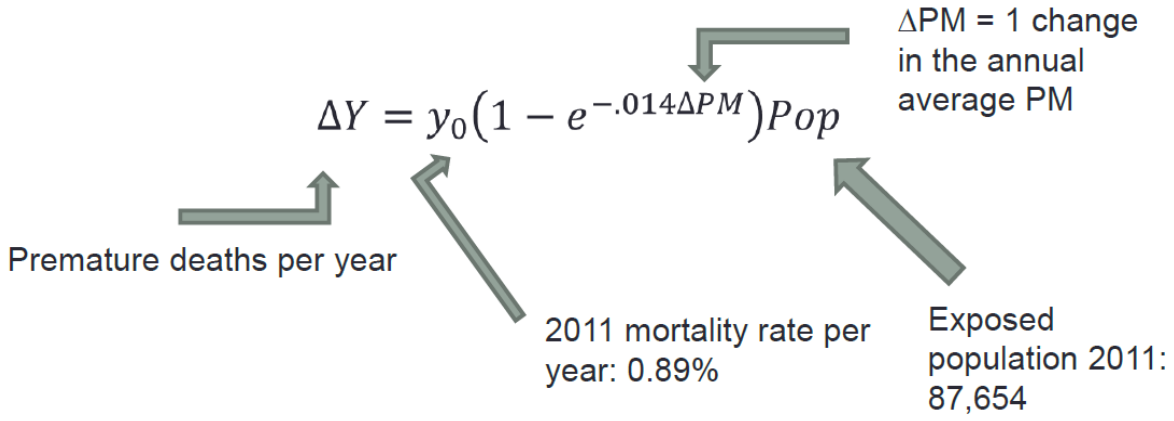


Figure 1: Health impact function. Pop is exposed population, y_0 is the baseline mortality rate and ΔY is the estimated increased premature mortality per year.

If the proposed mine had started say in 1961 then the health impact would be much smaller due to a much smaller population. There would be an increased risk of only 2 premature deaths per year.

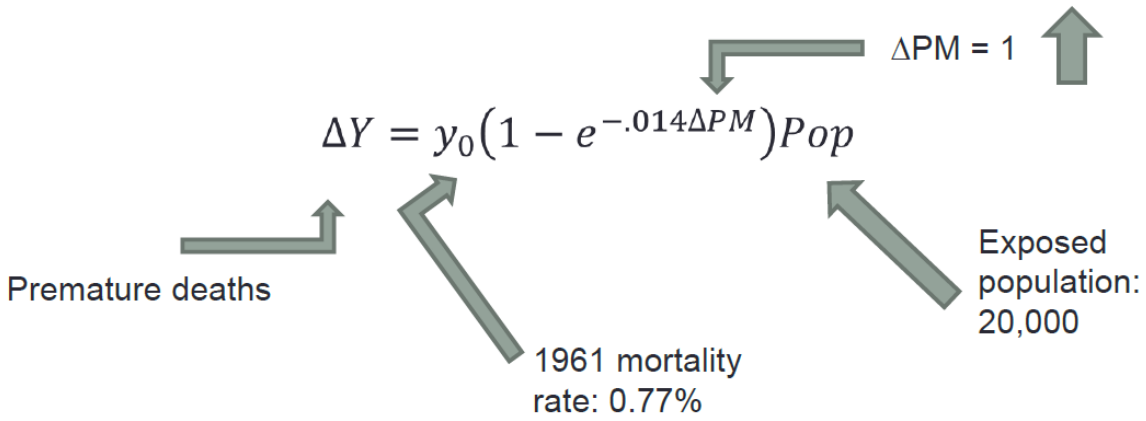


Figure 2: Health impact function with a smaller exposed population.

Mines operate in remote areas and not close to large urban cities. If this mine was 30 km far away from the city then the impact would be much smaller. Kamloops already is surrounded by a significant mining activity as shown in the next figure:

Figure 3: Mining in close proximity to a large urban city. From Tsigaris (2014) presentation

Already there is an underground copper and gold mine, New Gold, in operation next to the city of Kamloops. Adding KGHM Ajax next to New Gold will create a giant mining operation that is almost as big as highland Valley Copper Mine.

The Proponent should be required to consider the combined impact on the Kamloops airshed.

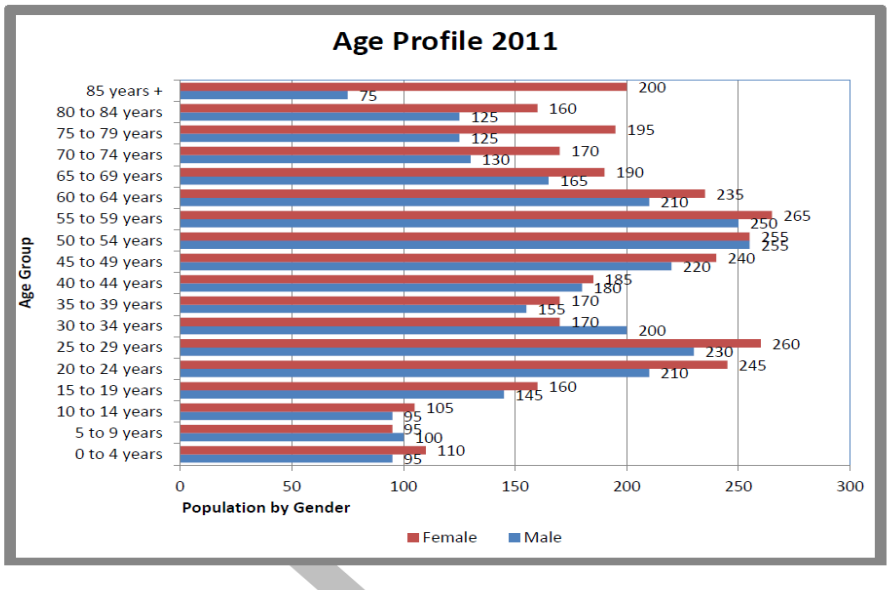
Studies also find that there are no threshold levels and that short-term exposure to particles can cause health damages (Pope et al., 2011).

These health impacts require compensation (cost). Research shows that most of the health costs are associated with mortality and the value society places on safety. Although a small fraction of the population will die prematurely due to exposure to increase air contaminants, it is the price society places on safety that is very high per life saved that makes this the biggest health care cost. Other costs of increased air pollution are associated with increased morbidity such as chronic and acute bronchitis, ER visits, hospital admissions and doctor visits; medication use; respiratory problems; asthma attacks; pneumonia; lung function problems; inflammation; ischemic heart failure, cardiac effects and heart attacks; school absences; lost work days; as well as residential and recreational visibility issues; material damage; agriculture; timber; and

fishing impacts. These impacts translate into costs and hence require compensation. They are very significant impacts and underestimated, as pain and suffering is not priced in the market. Morbidity as opposed to mortality impacts will affect a larger fraction of the population.

Kamloops has a large population of retirees whose health is very sensitive to a deterioration of air quality. The age structure distribution of the downtown can be seen below:

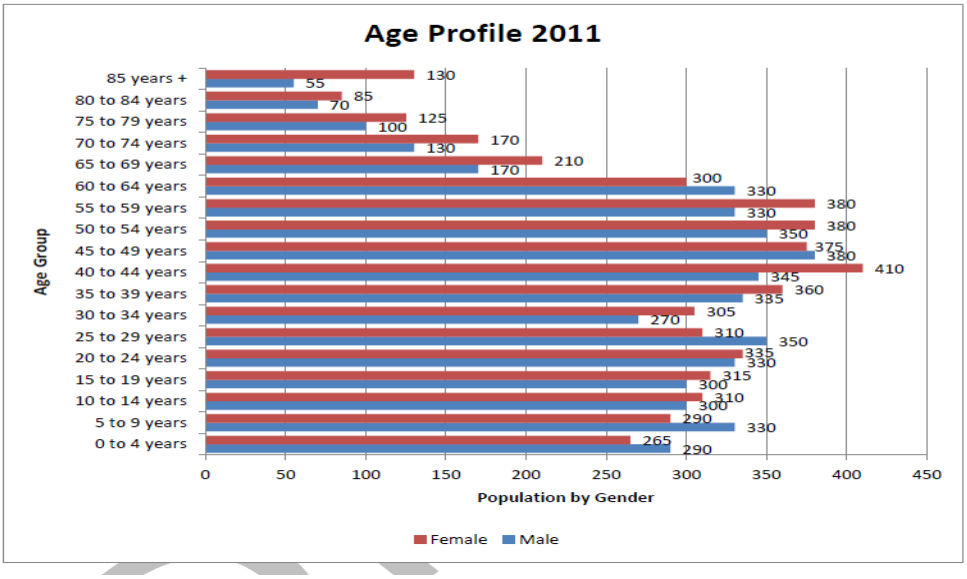
Neighbourhood Profiles: Downtown



City of Kamloops Statistical Report – 2011

The Aberdeen area, which is in very close proximity to the mine, has a younger age distribution. Young children are also very sensitive to exposure of heavy metals and increased air contaminants.

Neighbourhood Profiles: Aberdeen/Pineview Valley



City of Kamloops Statistical Report – 2011

One way to measure the value people place on safety and thus reducing the risk of dying prematurely is to use the concept of a Value of a Statistical Life. The value can be used to estimate how much people are willing to pay for a small reduction in the risk of dying prematurely from increased air pollution exposure. The median value from 30 U.S. labour market studies is $7 million per life saved (Viscusi, 2005). The U.S. EPA uses $9.1 million per statistical life saved and the Food and Drug Administration in the US uses $7.9 million.

Using a Value of Statistical Life of $8.4 million (average) then an increase in long-term exposure to annual $PM_{2.5}$ by 1 µg/m3 has a social cost from the risk of premature mortality of approximately $92.4 million per year. At a 5% discount rate and for 25 years this amounts to $1.3 billion dollars cost in present value. Adding morbidity costs estimated at $240 million in present value amounts to approximately a $1.6 billion in health cost. Morbidity costs are transferred from the U.S. EPA (2012) estimated cost which is around 10-20% of the total cost of increased air pollution. A sensitivity analysis would have the costs at $450 million to $3.3 billion. These costs are for only a 1 ug/m3. If the air quality deteriorates by more, the costs will increase further.

Tsigaris concluded that a 1 µg/m3 increase in $PM_{2.5}$ over a 25 year period will lead to an increase in health costs in terms of increased premature mortality and morbidity in the range of a low amount of $450 million to a high estimated value of $3.3 billion with a mean of $1.6 billion in present value terms.

In addition, a virtual "world tour" was taken to determine whether large urban cities are located close to large open pit mines. The evidence indicated that large cities are rarely close to large open pit mines. It is significantly more common to find small towns near open pit mines. Because of a larger exposed population, the increased air pollution has a bigger health impact

for a large city relative to small towns. See **section i** below for the geographical location of mines around the world and how unprecedented in the world this project is.

Hence the assessment lacks discussion on the economic costs of a possible health impact arising from a deteriorating air quality in Kamloops. A good program to use to measure the economic costs of increased (reduced) air pollution that the company can use to assess these is known as the BenMap program from the U.S. EPA.

Figure 2 below is a framework that the Proponent can use to estimate the monetary value of health effects of increased air contaminants. Note that the baseline cannot be: "air quality without any regulation" and the treatment condition: "air quality with mitigation action." Conducting such a study would imply that the project has been already accepted which is not the case. Mitigation can reduce the impact under the treatment condition but there are still health effects and hence costs to be measured as a value component. The baseline condition must be current air quality without the project and treatment condition will be air quality with project (regulated preferably).

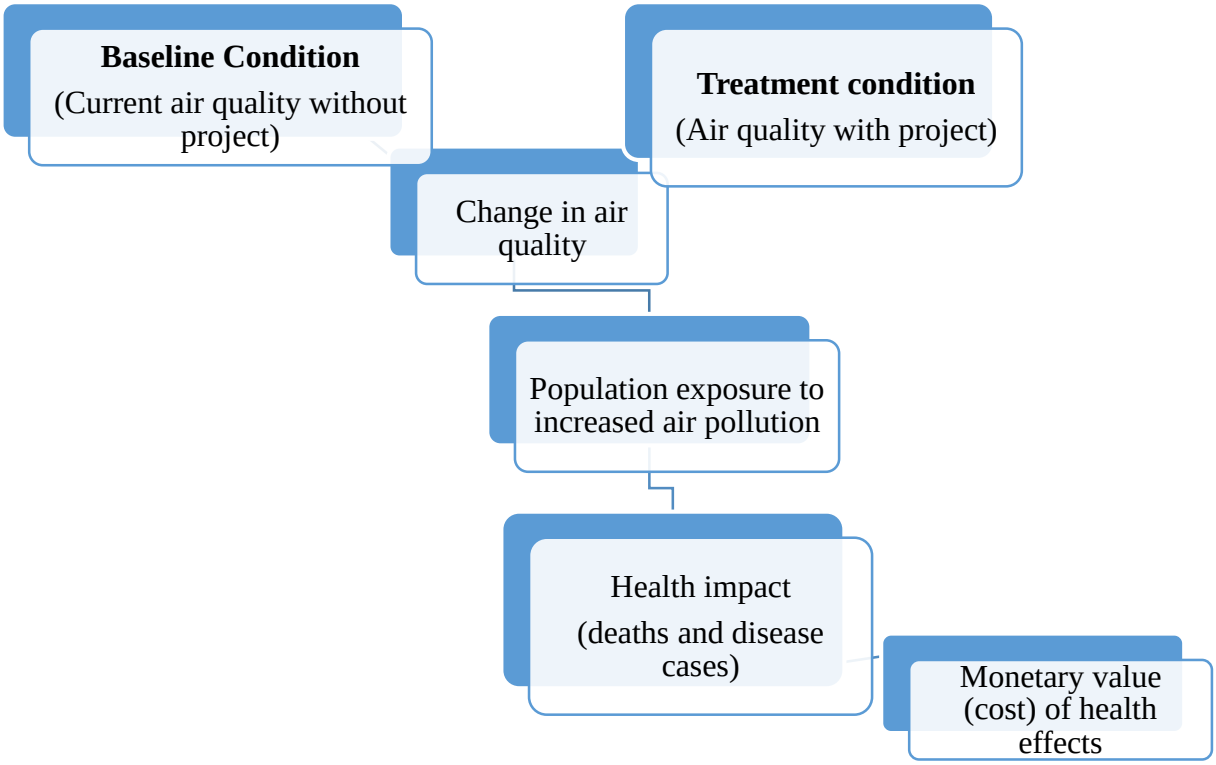


Figure 2: Framework to assess cost of health impact, BENMAP program

The CAG requests that KGHM Ajax use the BenMap program to measure the economic costs of increased air pollution. Even a 1 ug/m3 increase is significant enough to cause a major health impact with significant health costs.

Examining the damages to health is relevant, comprehensive, representative, responsive and concise (the attributes of VC). The economic costs of the health impacts are relevant, practical, measureable, responsive, accurate and predictable (the attribute of indicators).

References:

Tsigaris, P, (2014), "An economic assessment of the possible health impacts from deteriorating air quality in Kamloops", Clock Theatre, Thompson Rivers University, Kamloops, B.C., sponsored by TRUFA Human Rights and TRU ECO.

Links to all parts of this lecture series are
http://youtu.be/JvRLElDv6wI
http://youtu.be/K5M7dnZ4xaM
http://youtu.be/VKcHzFq63U0
http://youtu.be/wubOKF3F_c0
http://youtu.be/Um8pBQ28Lmw

d. Failure to account for conflict costs and environmental risks

Because of the enormous pressure to get operations started, firms tend to pay little attention to community concerns. Firms assume that the community and the government will support the project due to job creation and all the other VCs mentioned in the assessment. This is not true. It can be seen by the increased time it takes to start an operation due to opposition by communities. A 2008 study by Goldman Sachs found that the starting time of 190 projects undertaken by international oil companies has almost doubled since the late 90s. This can cause a significant increase in their costs.

Davis and Franks (2011) defined conflict costs as "the negative impacts on a company's tangible and intangible assets from failing to avoid, mitigate or resolve conflict with local communities at an early stage," and they define conflict "broadly along a continuum, from low-level tension to escalated situations involving a complete relationship breakdown or violence."

According to the research "most extractive companies do not identify, understand and aggregate the full range of costs of conflict with local communities." KGHM Ajax needs to address this in the assessment and invest resources into reducing the conflict other than having private parties, glossy brochures without much substance and any references, videos with not much content that deals with the community issues. Furthermore, they avoid meaningful conservations with groups concerned with the possible negative impacts of the mine. Numerous protests over this period have occurred.

Franks et al. (2014) find from the study of 50 mine operations around the world the following:

- Environmental issues were the most important disputes. This was followed by the absence of dialogue with community stakeholders to provide input and consent at the

beginning of the project as well as health and safety issues. These issues are also central to the Citizens of Kamloops.

- Most conflicts with community leading to the suspension and abandonment of the projects appear during the feasibility and construction phases. This is an important risk that investors need to know and factored into the economic analysis.
- Company-community conflict related to mining tends to escalate from campaigns and procedural actions through to physical protest.

Translation of social and environmental risks to business costs has not occurred in the case of KGHM Ajax. Factors that have caused the failure of the firm to respond to the expressed concerns about risk are similar to what the study found. Supporters of the mine dismiss the community's perception of risk as baseless, fear mongering and "unscientific". Local groups such as the Kamloops Area Preservation Association, Kamloops Physicians for a Healthy Environment, and Kamloops Moms for Clean Air, have serious concerns with the negative impact of the project. The firm has never met with these local groups to address and discuss the issues of concern. Finally the firm has failed to respond because it relies on the government approval process to account for such costs. However, the firm fails to understand that many community members do not trust the process. The approval process has been made less rigorous in order to increase "efficiency".

From the research by Frank et al. (2014) mining companies identified the most important conflict costs as those arising from lost production as a result of delay. The opportunity cost from the inability to pursue projects, or to produce output, was the primary cost of conflict. Other costs include security spending, risk management, and personnel costs as well as costs associated with the outcomes of conflict. Examples of the latter include project modification, redress, material damages, lost productivity, impact on capital, reputational impact, and impacts on personnel. Costs also are defined in terms of loss of market value of the firm.

The KGHM project has already delayed starting construction and operations and could be delayed even further given the August 4th 2014 Mount Polley tailings-pond disaster. According to the Energy and Mine Minister Bill Bennett as of August 18th 2014 there is now an independent investigation on the disaster. The provincial government does not want this to happen again. Public confidence needs to be restored according to the Energy and Mine Minister Bennett. The provincial government has ordered a third-party review of all tailings-pond dams in B.C. for safety. Imperial Metals, the owner of the Mount Polley Mine, will pay the cost of the investigation.

Imperial metals has suffered loss of production due to delays not only for the Polley mine but also for the Red Chris mine which was about to start production and the Ruddock Creek zinc and lead underground mine, located 155 km northeast of Kamloops, which has received an eviction order from two First Nation's Bands. The disaster has already been very costly to Imperial Metals and can be seen from the reduction in the market value when the disaster occurred. Before the disaster the company had a stock market value of approximately $1.25 billion dollars on (August 1st 2014) and on August 5th 2014, the day after the disaster, the market value dropped to $750 million. Since then the stock has fallen further but this is due to market conditions than the evaluation of the specific event. Currently the market value of the

company is $647 million (as of December 4th 2014). In other words, this tailings pond failure cost shareholders about $500 million in stock market value. This $500 million can be seen as the market assessment of the total cost of the disaster. It includes the market assessment of environmental and conflict costs as a result of the breach.

Major world class mining companies with $3-$5 billion capital expenditures for projects suffer $20 million dollars per week of delayed production ($1 billion per year) in net present value terms due to community conflicts. This represents approximately a 25 cents loss of NPV for every 1 of capital expenditures invested due to a one year delay. Translating this to the Ajax mine a delay by 1 year would cost the firm $200 million in NPV (25% of initial capital expenditures of $795 million). Delay costs in the start-up of the Red Chris mine was estimated at $20 million per quarter ($80 million per year) by Canaccord Genuity Mining Analyst Gary Lampard.

In one of the cases of the Franks et al. research, the cost of delay was incorporated into the budget as construction costs. A 50 percent margin was included to account for delays due to conflict. The original feasibility study of KGHM reported capital expenditures of $495 million while the 2012 reported $795 million. No explanation has been given but the question arises as to whether this $300 million has been set aside for conflict costs.

Financial services companies are starting to factor in risk of delays in projects. The study reports that Credit Swiss in Australia applied a 2.9 percent discount on the valuation of AGL Energy (AGK) to account for regulatory approval delays due to conflict with community on hydraulic fracturing at one of AGK's projects. KGHM Ajax should disclose a possible 3 percent conflict risk premium to the NPV calculations.

Another cost that is often overlooked is the additional staff time, especially at the upper level, allocated to the conflict. Their time can be used for other more productive tasks. Due to the conflict KGHM has hired a number of people to deal with the conflict. These positions would not be needed if the conflict was not present.

The role of government regulation is a significant factor in reducing conflict and their costs. The research by Franks et al. indicates that the government approach to reduce green tape and to accelerate the approval processes, like in Australia and Canada, in order to reduce business costs results in the opposite. According to this research the acceleration of the approval processes increases business costs and does not lower them. The lax regulations create mistrust by the community. Community then takes on the role of a regulator. Lax regulations make the price of legal license to operate much lower to firms but there is no free lunch here. Communities in return respond and increase the price to the firm to have a social license to operate. Basically social license replaces the legal license. The authors conclude "Our findings suggest that any reduction of appropriate oversight of social and environmental performance has the potential to lead to substantial costs for the industry in the medium – to long-term through heightened risk of company-community conflict."

The community is concerned with the proximity of the mine to Kamloops. According to the community members the health and environmental risks are too high. This conflict between the

community and KGHM Ajax mining adds considerably to the costs and to the riskiness of the project. The conflict has not been assessed, understood nor reported in the 2012 Feasibility Study to investors. This conflict can lead to a potential loss of value and investors need to be informed that this is a real threat to their investment.

The assessment needs to address the conflict costs that can arise from such a project.

Examining the conflict is relevant, comprehensive, representative, responsive and concise (the attributes of VC). The economic costs of the conflict are relevant, practical, measureable, responsive, accurate and predictable (the attribute of indicators).

References

Davis, R., & Franks, D. M. (2011, October). The costs of conflict with local communities in the extractive industry. In Proceedings of the First International Seminar on Social Responsibility in Mining, Santiago, Chile (Vol. 30).

Franks, D. M., Davis, R., Bebbington, A. J., Ali, S. H., Kemp, D., & Scurrah, M. (2014). Conflict translates environmental and social risk into business costs. Proceedings of the National Academy of Sciences, 111(21), 7576-7581.

Dare, M., Schirmer, J., & Vanclay, F. (2014). Community engagement and social license to operate. Impact Assessment and Project Appraisal, (ahead-of-print), 1-10.

e. Failure to account for net economic benefits and costs of the project.

The discussion by the Proponent about Value Components seems to focus on the estimated direct, indirect and induced economic impacts of the project. However, any project undertaken by anyone has direct, indirect and induced economic impacts. That is not what is relevant. Measuring direct, indirect and induced economic impacts hugely overestimates the benefits. For example, increased air pollution has a direct economic impact in that more dollars will be spent on the health sector as stated previously to treat the increased morbidity. Someone got paid (high paying salaries too) to treat the people that were affected by the increased air pollution. Does the dollar impact constitute a benefit? One would hope not. The economic impacts do not account for the use and compensation of scarce resources that produce the impacts. The Proponent cannot present estimates of employment and tax impacts as "benefits." It must present the net benefits or costs of the project. Dollar impact is not an economic Value Component. What is an Value Component are the net benefits and costs (private and social) of the project. As Shaffer (2013) states:

> "What must be measured for a proper benefit-cost assessment is what those affected would be willing to pay to acquire the positive consequences or be compensated to fully offset the negative." (page 2)

Estimating direct, indirect and induced economic impacts is not consistent with standard economic analysis. Standard economic analysis requires one to conduct a cost-benefit analysis and not dollar impacts.

More examples are provided below regarding why impact, direct or otherwise, are not valid Value Components. The project will generate high paying employment opportunities (with risk) but what is the incremental income? Labour has an opportunity cost in that it can be used elsewhere. These skilled workers are not chronically unemployed. The workers can earn the same if not a higher salary elsewhere. Hence the direct impact is large but the net benefit is minimal to British Columbia or Canada. The net benefit is the incremental salary earned from a Provincial or even more important from a Canadian perspective. What are the benefits to British Columbia if the workers are re-allocated from one place to another? What are the benefits to Canada if the worker is re-allocated from Alberta to Kamloops, British Columbia? As stated above, these skilled workers are in short supply and can find employment elsewhere. The increase in the average salary as indicated by the Proponent (See http://www.ajaxmine.ca/project-economics) is a clear signal that that there is a shortage of these workers and hence the opportunity cost is very high. For the government it is the net revenues (net of expenses) that should count not only the direct and indirect tax revenue that the project will generate. The worker will pay provincial and federal income and consumption taxes if they work at the proposed project or if they work elsewhere in B.C. or as a matter of fact anywhere in Canada. Also the government needs to consider the possible new expenses that will accrue if the project is allowed to proceed with operation. Local businesses will have an indirect impact but what is the net benefit? It is not the indirect dollar impact of the project on sales but on the net profit (the bottom line). Net benefits to businesses will accrue if the additional revenue from the additional goods and services produced were greater than the marginal cost of producing these goods and services. As stated above increased demand for skilled workers could have an impact on wages due to the increased shortage of skilled workers. Average wages have increased according to the Price Waterhouse Copper's annual report (See again KGHM Ajax Project Economics at: See http://www.ajaxmine.ca/project-economics). The increased wages in this sector might trigger an increase in wages in other closely linked sectors which will adversely affect the cost structure of the other industries. Furthermore, the attractiveness of high paying jobs might affect many students not pursuing higher education because the opportunity cost of attending post-secondary schooling will increase. These students earn a higher income after graduation if they pursued a degree. Another example is B.C. Hydro, which would have to supply the electricity at a price that is less than the marginal cost of producing it. This net cost has to be considered in a proper cost-benefit analysis. Finally, the additional health, ecological, environmental and conflict costs must also be considered in a proper cost-benefit analysis.

Hence a proper economic assessment of benefits and costs requires identifying all of the positive and negative impacts the project may have and then assessing the value placed on these impacts by society. Again, Value Component in economics does not mean the dollar impact. Value in economics is created when the maximum $ amount a person is willing to pay to acquire something exceeds the minimum $ amount another person is willing to offer the good or service. The minimum amount includes the incremental cost of producing an extra unit of good or service including external costs as well as one's opportunity cost. Alternatively,

value is created if the willingness to pay of those positively affected exceeds what they actually pay (and what they actually pay reflects the full cost of production). Hence those that are negatively affected will need to be fully compensated for the losses. This is Value Component in economics — not impacts.

There are a number of sectors that will be affected if the mine goes into operation. Furthermore, the sectors affected depend on the standing of the project. Will the project be viewed from the lenses of the local community? Or will it be viewed from the lenses of the Province? Or will it be viewed from the lenses of Canada as a whole or even the world? Which standing is taken could affect the outcome cost-benefit study. Shaffer (2013) conducted a benefit cost analysis which took a British Columbia (Canadian in some occasions) standing.

In principal, the Proponent should consider the positive and negative consequences on:

The producer – This would be the expected net present value of the project in excess of the opportunity cost of the funds invested. The Proponent has done considerable work in this area already as it would want to raise funds if the project proceeds. The 2012 Ajax Feasibility Study estimated the NPV of the project at $108 million U.S. before taxes and royalties at the all equity cost of capital of 12% and at reasonable base metal prices over the 23 year life of the project ($2.75 per pound and $1085 per oz.). The NPV increases to $416 million before taxes and royalties if the discount rate used is 8%. Shaffer (2013) analyzing the Prosperity mine assumed that there would be limited net benefits (zero economic profits) to the owners of project in terms of excess profits beyond the opportunity cost of the invested capital. The Prosperity mine had an internal rate of return of about 11.5% while Ajax is estimated at 14.5% before taxes and royalties. It is also reasonable to assume that the Ajax project will not have excess profits over and above the expected returned of similar risky projects. The metal is of a low grade, the price of the metal is mean reverting to its long run equilibrium price which is below what it is currently trading and there are also conflict and other risks that are not accounted for in the discount rate. In addition, translation of social and environmental risks to business costs is not considered in the above net present value calculations. Also from a local, British Columbian or Canadian perspective any excess expected economic profits can be considered minor.

Hence economic profits, accounting for the opportunity cost, can be assumed to be nil.

Consumers – The additional consumer surplus (happiness) realized by consumers of the additional copper and gold around the world must be accounted for because the project might impact the price of the metal. Consumers will benefit only if the price falls. Consumer surplus is the net benefit to buyers and is defined as their maximum willingness to pay net of the price consumers pay to buy the product. The latter is the opportunity cost of buying the metal versus using the funds to buy something else. At the margin, and prior to the Proponent operating or any other change, the marginal consumer can be considered to have no consumer surplus. The expansion of the supply of the metal will put downward pressure on the price of the metals and this will benefit all existing and new consumers. The latter will enter and buy the expanded supply because of the lower price, ceteris paribus. Shaffer (2013) assumed a limited impact on the price of metals and focused on the other stakeholders. This assumption is not unreasonable

for the proposed mine. The impact on the price of copper will also be marginal given that the amount of copper that will be extracted every year will be only 0.3% of the world supply. The Proponent is very small relative to the world market to have any significant impact on the prices of the metals. Even if there is a net benefit on consumers around the world most of this would be offset with the reduction in producers' surplus as discussed next.

Zero effect or if there is a small reduction in the price of metals there will be a gain in consumer surplus

Economic activity related to other producers of the metal – New mines have a negative impact on the revenue and profits of existing mines as it leads to more supply and more competition. More supply lowers price of the metal and benefits consumers but hurts existing producers. The reduction in the price of the metal, if any, will have a negative impact on all existing producers including other mines in B.C. and in the Kamloops local area including Highland Valley Copper and New Gold. This is measured by a reduction in producer's surplus and should be considered in a proper cost-benefit assessment. If there is a small impact on the price of metals it is mostly offset by the increased consumer surplus.

Given a small reduction in the price of metals there will be a loss in producer surplus to existing mines. This is mostly offset by the gain in consumers' surplus and hence can be considered an equally weighted re-distribution or transfer payment.

Economic activity related to employment – What counts is the net benefits the workers would realize from the employment net of their opportunity cost which is their next best alternative. For example, if the worker can be employed in Northern B.C. at a salary equal to or greater than the one he will receive at the proposed mine, then the net benefits will be minimal if any.

Economists generally do not count labour costs as a benefit of the project. The Proponent is trying to get social license by claiming that gross wages are benefits. Gross wages are not benefits. They are costs. First, they need to be net of taxes to be benefits to workers. Second, a significant part of the salary is compensation the worker gets for the increased riskiness of the job at the mine. Third, these skilled workers are not chronically unemployed but are scarce and in high demand. They have an opportunity cost in that they can work elsewhere and make a similar if not a higher salary. Hence, any net benefits arising from employment are small if any. Kamloops has a diversified economy and has an unemployment rate hovering around 6 percent. The unemployment rate is much lower for skilled workers of the project type. The unemployment rate can be considered to be at the natural rate. For these skilled workers it is even below the natural rate. Professor Arnold Harberger, a highly regarded labour economist, argued that even in a severe economic recession, when the unemployment rate is elevated, one might assign as net benefits only 30 percent of the wages paid to the workers, and this only during the short usually recessionary period (See also Treasury Board of Canada Secretariat, 2007). Workers for most part of their life have other employment opportunities that are equally as good. Hence, it is the incremental income that matters.

The Proponent states at http://www.ajaxmine.ca/project-economics: "Roughly 500 full-time positions ranging from technical to mining services, health and safety, and administrative will be required over the 20-year mine life." And also state that: "According to Price Waterhouse Cooper's annual report on mining in B.C. (2012), although net earnings were down, total mining expenditures rose to $9.2 billion, while direct employment increased by 12 per cent, and the average salary rose from $115,700 in 2011 to $121,900."

Hence the direct gross wage bill would be in the range of $60 million dollars per year. This is the direct impact and a benefit to the worker but it is not a net benefit to him or her or to British Columbia or to Canada.

In a brochure, KGHM Ajax stated that the project will result locally in 1330 jobs during the two-year construction phase (2013-2015) and spending of $1.1 million per day of which 37% to stay in Kamloops. During operations they state that there will be 870 (500 direct and 645 indirect) employees during the 23-year mine life. Again this is a direct impact but not a net economic benefit. This is a huge exaggeration of the benefits. Furthermore, these employment and spillover multipliers are magnified because the counterfactual is not accounted for. What would the economy be like without the presence of the mine? Kamloops would continue and strive to increase the community's standard of living through other initiatives. Will the counterfactual be considered?

Shaffer (2013) assumed generously the net benefit to workers to be in the order of 25 percent of the gross wage bill ($7.6 million of the total wage bill of $30.6 million). This was done to account for the fact that some workers could be earning less in their current job relative to moving into say a unionized environment. But this would mean that someone else lost income to make up the increased salary. Making a similar lavish assumption as Shaffer the project will yield a net benefit of about $15 million per year (25 percent of $60 million) gross of income and consumption taxes.

Hence under generous assumptions, and no other negative labour market changes, the net benefit to employment is in the order of $15 million per year gross of taxes.

Economic activity related to Businesses – The mine will have positive and negative spillovers to other businesses. The positive spillovers are not the additional sales the businesses will make because of the project. Positive spillover is the impact on the net profits to businesses. Net benefits will increase from the expansion of the supply of the additional goods and services if and only if the incremental revenue is in excess of the incremental costs. In addition any negative spillovers should be accounted for. For example, if wages locally increase as a result of the project, and because of a shortage of workers, then labor costs to other firms will increase and this will reduce their profits.

KGHM Ajax states an economic stimulus of the order of $150 million per year for 2 years in Kamloops and approximately $180 million from wages, material, parts, power, fuel and other services per year for 23 years during the operation phase. This is an economic stimulus but again cannot be considered net benefits. First, wages should be treated as discussed previously. Second, economic stimulus is irrelevant for a cost-benefit analysis with such environmental

and health risks attached to it. What are relevant are the net benefits to businesses which are any additional profits. The net profit margin across all industries in Canada is around 10%. Removing labour from the above economic stimulus as it is a cost to local businesses and has been captured previously, in the economic activity related to employment section of this analysis, we are left with approximately $50 million per year during the construction phase and about $100 million per year during operations which can be assumed to accrue to businesses locally, across the province, Canada and the world. With a 10% profit margin and assuming wages or other costs do not increase for the existing businesses, the net benefits can be assumed to be around $10 million per year. Since Kamloops accounts for 40% of the spending according to KGHM Ajax this would imply a $4 million net benefit per year to the local businesses.

Hence, the net benefit to businesses is in the order of $10 million per year.

But there could be net costs also. This would occur if the incremental revenue is less than the incremental costs as would be the case with electricity provision from B.C. Hydro. This net cost is further elaborated below as is it significant and must be considered as a negative impact of the project:

According to Table 21-9 of the 2012 Ajax Feasibility Study, the mine would use 471,946,457 kWh per year at a cost of 3.5 cents US$. In Canadian dollars and per MWh, this works out to about $40 revenue to BC Hydro. BC Hydro rates are regulated to reflect its historical average cost. Historical average costs are much lower than the marginal cost of producing new electricity. Also industries get a lower rate per unit of energy use than residential consumers. However, B.C. Hydro rates will be increasing in the future. The increase in Hydro rates will increase the cost of the mine's operations which is not reflected in the previous net present value calculations. Even, at $50 per MWh it is significantly below the marginal cost of providing electricity,

The marginal cost of new power is estimated at $124/MWh as per the Calvert-Lee Report (2012). The average price BC Hydro will compensate new suppliers from the 2010 Call (for power) is over $125/MWh according to Shaffer's (2013) report. The 472 GWh per year electricity usage, is about 10.3% of the 4,600 GWh annual power generation from the proposed Site C Dam. Though Site C could have potentially a lower cost of generating electricity estimated at $110/MWh (B.C. Hydro, 2013). It is underestimated as it excludes transmission costs which in BC are very high due to long distances and rugged terrain. In addition there are distributional capital, operating costs and environmental costs that need to be considered with the proposed Site C Dam.

Assuming the marginal cost is in the order of $135/MWh to reflect not only generation costs but all other costs (private and social) BC Hydro ratepayers are subsidizing the proposed mine to the tune of $84 per MWh. Since KGHM Ajax would use 471,946 MWh a year, the cost of generating new power for Ajax would be $63.7 million a year.

Ajax, Table 21-9 of the Feasibility Study, states a payment of $16.5 million US$ a year for power, or about $18.5 million CDN$ at today's exchange rate. However, even if the new

power costs is between $58.2 and $63.7 million a year which is an underestimation as it only refers to generation costs, the subsidy to Ajax is about $40-$45 million a year. Shaffer (2013) estimates the cost to the New Prosperity mine at $50 million per year relative to the 2009 report of $35 million.

Hence the net loss to B.C Hydro of supplying electricity below the marginal cost of production is in the order of $40 million per year

Hence there is a net economic loss in the order of $30 million ($40 million loss from B.C. Hydro net of the $10 million gain to businesses) per year arising from economic activity related to businesses.

Local, Provincial and Federal Government – The next sector is associated with the net benefits or the net costs which accrue to local, provincial and the federal government. These net benefits are the additional tax revenue less the additional costs. The net benefits or costs would be different for the local government, provincial and federal government (and also different from a world perspective). For example, there would be no incremental tax revenue accruing to the B.C. government if workers who were currently employed elsewhere in B.C, changed jobs to be closer to home. However, mineral and corporate taxes paid by the mine would be incremental revenue. Subsidies provided and tax credits would need to be subtracted from the incremental revenue. Incremental costs could result from an increased population, infrastructure and other services to the community and the mine.

KGHM Ajax states on its website:

"Based on economic data and assumptions in the Ajax Project's feasibility study (hyperlink), it is estimated that over the course of construction and projected 20-year mine life, the Ajax Project will contribute up to $550 million in federal and provincial taxes, $210 million in British Columbia Mining Act tax, and $110 million in municipal taxes. Additionally, all levels of government are expected to benefit from increased indirect taxation arising from income, property and consumer taxation from business and employees working for or servicing the Ajax Project."

As stated above, income and consumption taxes cannot be counted. Only incremental tax revenue can be counted. Again the direct impacts overstate the net benefits. The $550 million in federal and provincial taxes are mostly payroll and consumption taxes. A worker that works elsewhere in British Columbia or Canada and decides to take on employment for KGHM Ajax is already paying income and consumption taxes. Hence there isn't a net benefit to British Columbia from the worker or to Canada if the worker came from another province. One would hope that the environmental review process will want to see the tax revenue impact from Canadian lenses, and not from a Provincial standing taking revenue away from another province. Second, there is no indication that the above mentioned figures are discounted to the present or are just added up over the life of the project. This will exaggerate the tax revenue collected by the government. Third, wages are gross of salary and hence payroll and consumption taxes are already included in the $15 million per year net benefits to employment.

Counting these again would constitute double counting. As stated above, the incremental tax revenue that is relevant is the royalties and corporate taxes paid by the mine.

Although corporate taxes are not provided explicitly one can get an estimated figure based on the Net Present Value (NPV) of the project which was $108-$416 million before taxes, royalties and financing costs (See also Shaffer, 2009). This is equivalent to a cash flow of approximately $14-$40 million per year on an annualized basis before taxes and royalties. According to Shaffer (2009) the effective tax rate would be less than 30% after accounting for tax reduction strategies and tax credits. This amounts to $4-$12 million in annual tax revenue (30% of $14-$40 million). Royalties amount to $210 million over the life of the project as stated by KGHM. This would be about $9 million per year undiscounted. This clearly shows that the figure is an overestimation as royalties and corporate taxes would constitute 50% of the net present value of the firm. Also KGHM states a $110 million in municipal taxes which amounts to $5 million to year undiscounted. This probably is an overestimation again as New Gold will be contributing $1.5-$2 million per year when the mine is included within the city limits. In total, this can be generously estimated to be around $20 million per year and this assumes that metal prices will be at the level assumed by the mine. Shaffer (2013) retained its earlier 2009 estimate of net benefits for government which was estimated at $11 million per year based on the estimated corporate income taxes plus the mineral taxes assessed indirectly from the Feasibility study of the New Prosperity mine.

This estimate needs to be offset in part by the additional government services that will be needed as a result of migration into the region. There also could be increased poverty if in-migration puts additional pressure on demand which results in a higher cost of living. Also unemployment could increase as more people come in to search for employment opportunities. There could be a negative impact if people migrate out from the area and this could result in a loss of tax revenue. The impact on services required is very hard to predict and there is uncertainty of the tax revenue as the sector is cyclical and the company will attempt to find strategies to minimize their tax burden.

Hence there is a possible net benefit to government in the order of $20 million per year.

Environment and community – Any costs associated with a negative environmental externality (net of any positive externalities) that may arise from the project such as the economic costs on health from increased air pollution, noise, the damages from the impact of increased GHGs on climate, the cost of paying for GHG emissions, as well as the economic cost of ecological damages and on the depletion of natural resources and water quality.

Health Cost - The project is expected to generate air contaminants. As illustrated in the previous section Tsigaris (2013) estimated the health cost from increased premature mortality and morbidity at the low end value of $450 million assuming that air quality in Kamloops deteriorates by 1 μg/m3 in $PM_{2.5}$ over a 25 year period. Assuming that the mine will cause increased particulate matter of 1 $\mu g/m^3$ over the annual average it will translate to an annualized cost of $30 million.

Hence, conservatively the health cost is at least $30 million per year.

Ecological Damages to Grasslands – Ecosystem services during the construction, operation and after the mine closes will be affected. As stated previously these include fresh water, food, recreation, flood prevention, soil erosion control, carbon sequestration and storage, pollination, and others. The option value for future use of grasslands, the bequest value for future unborn generations to use, and an existence value to maintain the habitat for plants, animals and species that are at risk will be reduced even with mitigation action. As estimated in b. above the loss can range between $3.4 million to $13 million conservatively.

Taking the mid-range as an estimate of ecological damages we have $8 million per year.

Other damages not accounted for:

- Damages due to the emission of GHGs: Not estimated
- Restoration costs: Not estimated
- Cost of a catastrophic event like Mount Polley tailings dam breach: Not estimated
- Cost of increased noise: Not estimated
- Cost of health advisories issued: not estimated.

Other local community benefits and costs – Any net benefits or costs arising from social externalities such as the impact of the mine on community services, infrastructure, city image and values, conflict costs, housing values, poverty and increased unemployment, and impact on tourism, etc.

Community benefits net of costs have not been estimated. Although there will be some philanthropic initiatives by the mining company, the additional costs will probably far exceed the benefits. See section i of this report on the impact of mining on communities in terms of income, poverty and unemployment.

Hence the important factors of the project to consider in terms of impact are economic activity: workers, economic activity: businesses, government, environment and local community.

A summary of impacts in terms of net benefits is presented in table 1. Table 2 presents other possible impacts without estimation.

TABLE 1: An estimated net benefit and cost of the project

Category	Measure of Net Benefit or Cost	Estimated annual value
The producer	Economic profits beyond opportunity cost	0
Consumers	Consumers surplus	0 or a gain
Other producers	Producers surplus	0 or an offsetting loss with consumers surplus
Economic activity: Employment	Income beyond the workers opportunity cost	$15 million per year
Economic activity Other businesses	Incremental revenue net of incremental costs	$10 million per year

Economic activity B.C. Hydro	Incremental revenue net of incremental cost of electricity purchase	($40 million) per year
Government	Incremental revenue net of incremental expenditures	$20 million per year (Incremental expenditures not estimated)
Environmental Emissions	Compensation required for less safety environment and morbidity costs	($30 million) per year (lower estimated cost)
Environment Ecological damages	Compensation required to willingly accept impact	($8 million per year)
Net Economic benefits or losses		At least $17 million per year in net economic losses

TABLE 2: Net benefits and costs not measured

Category	Measure of Net Benefit or Cost	Estimated annual value
Environmental Damages due to GHG emissions	GHG emissions per year times the price of a tonne of carbon emitted	Negative, Not estimated
Environmental Restoration costs	Actual clean-up costs after closer.	Negative, Not estimated
Environmental Catastrophic event	The cost of buying insurance to protect the community from a catastrophic event	Negative, Not estimated
Community Poverty increase (decrease)	Increase (decrease) cost of support system	Negative given the existing evidence Not estimated
Community Unemployment increase (decrease)	Increase (decrease) cost of support system	Negative given the existing evidence Not estimated
Community Impact on First Nation communities and cultural values	In principle, compensation demanded to offset cost	Negative Not estimated
Community Population changes – pressure on services and infrastructure	Compensation demanded for provision on additional services and infrastructure expansion and maintenance	Not estimated
Community Noise	Compensation demanded to offset cost of increased noise.	Negative Not estimated

Community Property values	Compensation demanded to offset possible reduction in property values and taxes	Negative in areas close to the mine like Aberdeen, Sahali, Not estimated
Community Impact on Tourism	Compensation demanded to offset possible reduction in tourism losses	Possible negative due to image of city Not estimated
Community Conflict with community's vision	Conflict costs. Compensation demanded to offset conflict with community	Negative, Not estimated
Community Enhanced economic activity and related opportunities	In principle willingness to pay for enhanced opportunities	Positive Not estimated
Net economic benefits and costs not measured		Mostly Negative

The Proponent may wish to challenge these net benefits (or costs) and present their own estimates. Furthermore, the Proponent must estimate the net benefits or costs of the impacts listed in table 2 and may wish to add other value components to the list.

References:

Harberger, A. "The Social Opportunity Cost of Labour: Problems of Concept and Measurement as Seen from a Canadian Perspective", Technical Study 15, Canada Employment and Immigration Commission Task Force on Labour Market Development, July, 1981.

Shaffer, M., Marvin Shaffer & Associates, Ltd., Benefits and Costs of the Proposed Prosperity Gold Copper Mine Project, report prepared for Friends of the Nemaiah Valley, March 11, 2009.

Shaffer, M., Net Economic Benefits of the New Prosperity Project, report prepared for MiningWatch Canada, Marvin Shaffer & Associates Ltd. June 12, 2013.

Treasury Board of Canada Secretariat, Canadian Cost-Benefit Analysis Guide: Regulatory Proposals, 2007, p.4 and p.15

Lee, M. and J. Calvert. Clean Electricity, Conservation and Climate Justice in BC, Meeting our energy needs in a zero-carbon future. June 20, 2012. Access report at: https://www.policyalternatives.ca/electricity-justice

Other issues

Table 7.1-1: Scientific/professional knowledge (information sources)

f. There is lack of description in the information sources of what is contained in the baseline socio-economic studies, the British Columbia Input-Output model and professional judgment. This must be expanded to have a better picture of the information sources. For example, it is strange that scientific peer reviewed published research is not mentioned in the scientific/professional knowledge (information sources) of Table 7.1-1. This is also true for all the other sections (7.2-7.6) of the Assessment of Potential Economic Effects. There is a vast amount of scientific literature that addresses all of these socio-economic impacts.

50. 7.1.4 POTENTIAL EFFECTS OF THE PROJECT AND PROPOSED MITIGATION

g. Failure to account for a possible impact on unemployment and poverty:

It is a common belief that mining and other extractive industries will bring significant economic benefits and prosperity to communities. However, a U.S. study indicates that this is not always the case. The study was a meta-analysis of the results of 301 published articles and/or technical papers. The authors selected papers that compared nonmetropolitan mining regions in the U.S., excluding those that are predominately rural, relative to other nonmetropolitan regions and/or against the same mining regions but across time. Contrary to popular belief, the authors discovered that half of the studies found negative economic outcomes in mining communities, with the rest split equally between favorable and neutral effects.

Income was favorable in 48 per cent of the papers, but many other studies found unfavorable effects (34 per cent) and the remaining 18 per cent found a neutral effect. When it came to poverty, 44 per cent of the studies found an adverse effect on poverty in mining non-metropolitan regions, followed by 36 per cent that found a neutral effect and only 20 per cent of the studies found a positive effect on poverty. Almost 60 per cent of the studies found unemployment increasing in the mining regions, with 25 per cent being neutral and only 20 studies found unemployment declining.

They also reported that over half the positive findings came from the period prior to 1982 which is considered a boom period for this sector. The majority of the findings after 1982, considered the bust period, found significant adverse effects.

They concluded by stating: “Until and unless future studies produce dramatically different findings, there appears to be no scientific basis for accepting the widespread, ‘obvious’ assumption that mining will lead to economic improvement.”

Given these findings, how is this application going to account for risk of higher unemployment and a higher poverty level? A recent source of information on the relationship between mining and poverty is provided in Maier et al. (2014).

References:

Freudenburg, W. R., & Wilson, L. J., 2002. Mining the data: Analyzing the economic implications of mining for nonmetropolitan regions. Sociological Inquiry, 72(4), 549-575.

Maier, R. M., Díaz-Barriga, F., Field, J. A., Hopkins, J., Klein, B., & Poulton, M. M. (2014). Socially responsible mining: the relationship between mining and poverty, human health and the environment. Reviews on environmental health, 29(1-2), 83-89.

h. Failure to account for the impact on labour market from boom and bust periods: What are the local spillover benefits from the Ajax mine?

Local firms and employment benefit from the presence of the mine as long as the sector is booming. Local employment multipliers are usually published to trumpet these "spillover" benefits. The multipliers are usually reported to be greater than unity, implying that for every direct job created more than one local sector job is generated. This is the good news.

However, we should be aware that the multiplier operates in the opposite direction as well. During a bust, for every direct job lost more than one indirect local job is destroyed. Furthermore, a proper assessment of the spillover effects is to consider the counter-factual scenario: What would happen in a town without the mine?

This allows us to compare spillover effects when a project is "on" relative to the project being "off." In the case of the mine, will the assessment consider the counter-factual scenario or not?

A paper in scientific literature written by Black, McKinnish and Sanders entitled "The Economic Impact of the Coal Boom and Bust," published in the Economic Journal in 2005 addresses this issue.

Black et al. examined the impact of the coal boom in the 1970s and the subsequent coal bust in the 1980s on local economies in a four-state region of Kentucky, Ohio, Pennsylvania and West Virginia. They compared the spillover effect in non-mining sectors (construction, retail and services) of counties that have a large coal sector to similar counties that have no coal mines (the counter factual).

Their results are surprising when one controls for the counter factual. Large employment multipliers disappear. They found that one direct mining job created during the boom period generates less than one local sector job (0.17 to be precise). During the bust period, for every one direct mining job lost, there were 0.35 local non-mining jobs destroyed.

The reason for the difference is that during the boom more people are drawn to the mining-dependent county, but during the bust a much larger number of people leave the county. What can I conclude from this finding? The evidence indicates small spillover effects from mining relative to non-mining counties. These effects are worse during a bust relative to a boom period.

Marchand (2012) examined the energy price impact of two boom periods and one bust period on local labour markets in Western Canada for the period 1971-2006. Spillover multipliers were again found to be smaller than usually reported by proposals. To control for the counterfactual, the authors estimated differential growth rates in local employment and earnings with and without energy resource sectors. They found spillover multipliers to be less than unity but larger than the Black et al. study. They state: "The local job multipliers indicate that job creation within the energy extraction sector leads to modest job creation within the non-energy local sectors during boom periods. For every ten energy extraction jobs created during a boom period, approximately three construction jobs, two retail jobs, and four and a half service jobs are created."

A study by Weber (2013) also found that natural gas production boom had modest effects on employment and income in Colorado, Texas, and Wyoming. Gas production created about 223 jobs per year for gas boom counties and concluded that existing estimates of jobs from developing shale gas have been too large.

The Application should consider the counterfactual, so that it does not exaggerate the local spillover benefits, and, should assess the economic risk of a bust.

References:

Black, D., McKinnish, T., & Sanders, S. (2005). The economic impact of the coal boom and bust. The Economic Journal, 115(503), 449-476.

Marchand, J. (2012). Local labor market impacts of energy boom-bust-boom in Western Canada. Journal of Urban Economics, 71(1), 165-174.

Weber, J. G. (2012). The effects of a natural gas boom on employment and income in Colorado, Texas, and Wyoming. Energy Economics, 34(5), 1580-1588.

i. Failure to account for the proximity of a large open pit mine close to a large urban area. Information taken with Permission from Dr. Tsigaris.

People living in Kamloops often wonder if it is common to find an open pit mine close to a large urban city. Data from the website http://www.infomine.com/minesite/ were collected for 157 open pit mines around the world. The website also identified the closest towns or cities to the mines. Some towns/cities were closest to more than one mine. In addition, information on the population size of the towns and cities was collected from various sources.

The evidence presented below indicates that it is extremely unlikely to observe a large open pit mine in close proximity to a large urban city like Kamloops. The probability (chance) of observing a town with a small population (i.e., a "small town") closest to an open pit mine is significantly higher than the probability of observing a town or city with a larger population.

The number of towns/cities observed closest to open pit mines falls very fast (exponentially) as the population of the town/cities increases. Figure 1 shows the pattern in Australia.

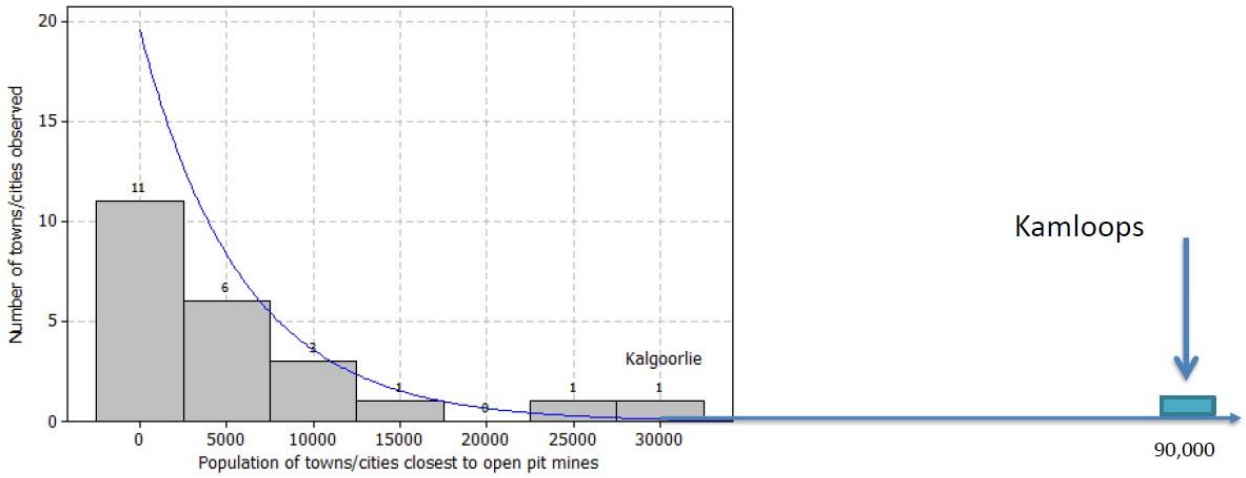


Fig. 1: Towns and cities closest to open pit mines in Australia. Kamloops added for comparison.

There are 23 towns/cities identified and 40 open pit mine towns in Australia. Eleven very small towns are nearby open pit mines. This is followed by six town/cities in the 5,000 population range. Then only three towns/cities are in the 10,000 population range. A very small number of towns/cities appear in higher population ranges. Kalgoorlie has the highest population at approximately 32,000. The mine is adjacent to the city. Kamloops is almost three times larger than Kalgoorlie. The average distance of these towns/cities from their respective mines is 40 kilometers. Many towns/cities are very close while others are far away in distance.

In Australia, open pit mines are not near large urban cities of the size of Kamloops or larger. Kalgoorlie is at the tail end of the distribution. It is not difficult to compute the chances of observing an open pit mine near a large urban city like Kamloops (or larger) in Australia. Assuming that the distribution is exponentially declining, the chances of a city the size of Kamloops (or greater) being observed close to an open pit mine in Australia is approximately 1 in 20 million.

The odds of winning the 6/49 lottery is approximately 1 in 14 million. It is not only in Australia; a similar pattern can be observed in Canada as shown in Figure 2.

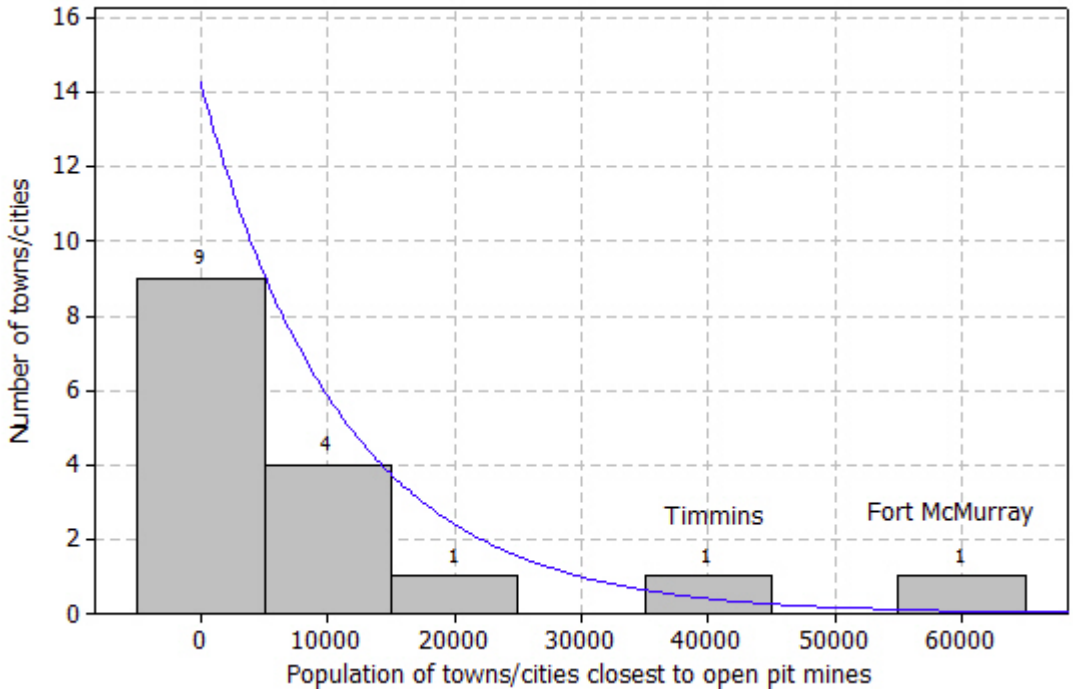


Figure 2: Towns and cities closest to twenty two open pit mines in Canada

Out of 16 towns/cities, there are nine very small towns that are closest to open pit mines. Only four cities with a population size of 10,000 are closest to open pit mines including Williams Lake. Williams Lake is the closest town to Gibraltar mine. The distance between Williams Lake and Gibraltar mine is 60 km. Fort McMurray is surrounded by four oil sands projects with an average distance of 55 km from the city.

Timmins, Ontario is nearby an open pit mine, but Timmins' population of 43,000 is half the size of Kamloops. Furthermore, Timmins' topography is very different from Kamloops. See the Dome Mine and its proximity to South Porcupine, a small community of Timmins at: http://en.wikipedia.org/wiki/File:Dome_Mine_2.JPG

The U.S. has a similar frequency distribution to that of Canada and Australia. In the U.S., there is one city close to an open pit mine that has a similar population size as Kamloops. This is West Jordan in Salt Lake County. The Bingham Canyon mine owned by Rio Tinto group is very close to Salt Lake City County.

The large mine has been operating since 1906. West Jordan was incorporated in 1941 and grew towards the mine, but kept a certain distance as seen in Figure 3. The pit of the mine from the Centre of the city is 16 km. It is extremely unlikely that the mine would be allowed to expand towards West Jordan if this was ever a consideration. Salt Lake County, which has similar topography and winter inversions like Kamloops, is ranked one of the worst U.S. counties in terms of particulate matter and air pollution. For further details on Salt Lake County's air quality see http://utah.sierraclub.org/content/utah-air-quality.

Figure 3: West Jordan and the Bingham Canyon Mine.

Including developing and under developed economically nations in the sample does not change the pattern. There are many very small towns closest to open pit mines relative to larger towns/cities. As the population of the towns/cities increases, the frequency of observing these larger towns/cities close to open pit mines falls very fast. A handful of cities, larger in population than Kamloops, are closest to respective open pit mines. These cities are all located in developing nations such as Brazil, Chile, and Peru. But even there, most of these cities are far away in distance from the mines, as indicated in Figure 4. However, there is an exception. There is an open pit gold mine that is very close (3 km) to Obuasi, Ghana. We leave it to the readers to investigate the socioeconomic conditions of the Obuasi city in Ghana, which is easy to find by the Google search engine.

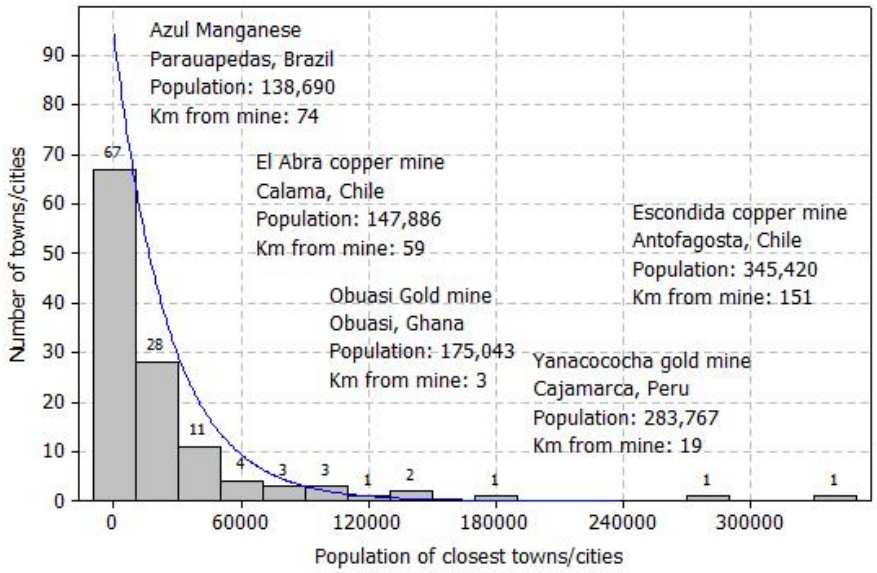


Fig. 4: Towns and cities closest to open pit mines around the world.

After searching across 157 open pit mines, and 122 towns/cities around the world, finding a large open pit mine close to a large urban area like Kamloops is extremely rare. Obuasi Gold mine in Ghana is the only city that has an open pit mine within city limits. In terms of impact of the mine it is interesting to read the following report by the Eldis organization:

> "Report highlighting how poor communities in Obuasi, Ghana are suffering environmental pollution and social problems apparently as a result of gold mining activity. It examines how rivers and streams have been polluted with arsenic, iron, manganese and heavy metals from past gold mining activities by Anglo American's subsidiary, AngloGold Ashanti (AGA) and its predecessor, Ashanti Goldfields Corporation (AGC)."
>
> http://www.eldis.org/go/home&id=17572&type=Document#.VIx1eyvF97I

What can we conclude from the above analysis? Large open pit mines are more commonly located closer to small towns than to larger urban cities. Small towns nearby open pit mines remain small. They do not grow much over time. There must be a reason for this universal pattern and it has to do with the health impact. Open pit mines provide economic benefits but also discharge pollution. Pollution has an impact on health. Health impacts are proportional to the exposed populations. The higher the population of the town/city, the more people are exposed to pollution.

The proposed KGHM Ajax project is unique in the world and is a very unusual case. CAG would like to know the baseline socio-economic studies which will be used to study this unique in the world project. The assessment should mention and address this issue.

References:

Tsigaris, P., 2014, "Large open pit mines in close proximity to centres as large as Kamloops are unlikely" Editorial Article, The Armchair Mayor News, April 2014, http://armchairmayor.ca/2014/04/13/large-open-pit-mines-in-close-proximity-to-centres-as-large-as-kamloops-are-unlikely/

In summary, none of the economic valued components in the Ajax assessment (economic growth; labour force, employment and training; income; business; property values; economic diversification) provide any information to conduct a risk or cost analysis of the project, as part of a risk/benefit or cost/benefit analysis. The rationale for undertaking risk/benefit analysis is provided by the 2012 Pacific Booker Minerals Inc. v. British Columbia (Minister of the Environment) BC Supreme Court ruling, in which Justice Affleck ruled that the entire environmental assessment process is a "risk/benefit" analysis. Justice Affleck's ruling was based on the B.C. Government's power to assess the financial ability of a Proponent to fund mitigation and compensation costs. Neglecting to undertake such an analysis of a major project may constitute a failure by the government to do its "due diligence."

For the Ajax project, this ability of the Proponent to fund mitigation and compensation costs should be based on an analysis of up-to-date and accurate costs (e.g. capital costs, wages and electricity costs) and cash flow estimates, which were outlined in the 2012 Ajax Feasibility Study.

Additional questions that relate to the Proponent's ability to cover risks include:

1. What types of insurance coverage will KGHM Ajax have for the construction and operational phases of the project?
2. What types of claims will be covered under the various policies KHGM Ajax is expected to have?
3. Will KGHM Ajax have insurance coverage for pollution legal liability?
4. If pollution legal liability is covered under the insurance policies KGHM Ajax will have in place, is it possible that the policy could potentially be exhausted by other types of claims in any given year?
5. In the Ajax Feasibility Study (page 21-13), it is noted that $1.2 million US$ has been budgeted under G&A expenses. Has KGHM Ajax determined its insurance coverage limits?
6. During the Northern Gateway Pipeline Hearing, an Enbridge representative agreed that it would be a good idea for his company to get a preliminary indication of insurance coverage. Has the insurance market been approached by KGHM Ajax for quotes for insurance coverage? Has KGHM Ajax obtained any information regarding insurance coverage so that it can do a preliminary analysis of matching its risks to its insurance needs?
7. Would such risk analysis be provided to potential lenders and investors for the project?
8. What are the risk characteristics (e.g., probability of incidence, cost of each incidence?)
9. Has KGHM Ajax done any cost estimates of possible risk events (e.g. blockage of Peterson Creek by slide activity; contamination of Peterson Creek due to a tailings line failure; structural damage from blasting, earthquake activity)?
10. What risks that KGHM Ajax faces are insurable, and what risks are not insurable?
11. If a property owner is claiming damage due to blasting, or excessive dust, would the claimant submit their claim to KGHM Ajax or the insurance company, or government?
12. What is the corporate structure of KGHM's holdings in Canada?
13. Will KGHM Polska Miedz serve as a guarantor if KGHM Ajax does not have adequate insurance coverage in the event of an incident that exceeds the costs of KGHM Ajax's insurance coverage?
14. The bonding requirements by the B.C. Government for mining developments appear to cover only reclamation costs. Is KGHM Ajax willing to enter into funding arrangements through the federal and provincial governments for other than reclamation costs arising from the operation of the Ajax mine?

51. 7.2. LABOUR FORCE, EMPLOYMENT AND TRAINING

7.2.4 Potential Effects of the Project and Proposed Mitigation

The Application should compare the net economic benefits of a local hire versus no local hire policy. Kamloops is home to many hundreds of skilled mine workers who travel out of town for employment. If Ajax employs these workers, and no workers from within or outside of Kamloops take the place of these workers, there may be no or possibly even a net economic loss to Kamloops, if these workers were to take a cut in pay. Importing workers to work in Ajax, on the other hand, will constitute a net increase in income for the study area.

52. 7.5.4 PROPERTY VALUES – POTENTIAL EFFECTS OF THE PROJECT AND PROPOSED MITIGATION

The definition of mitigate is to: alleviate; lessen; ease; allay; moderate; diminish; tone down; soften; relieve.

The definition of compensate is to: reimburse; pay off; pay compensation; pay damages; pay costs; give back.

The CAG believes that if the mine's impacts result in a loss of property value, and mitigation measures are not sufficient to prevent loss of property value, the owner should be compensated by the mine. Therefore, the term *Compensation* should be added to the title of this section.

53. 7.5.4 PROPERTY VALUES - POTENTIAL EFFECTS OF THE PROJECT AND PROPOSED MITIGATION AND COMPENSATION

The Application should describe the potential impacts on property values from airblasts, noise and vibration. The Application should describe how noise and airblasts are propagated by wind, cloud cover and temperature inversions, and how often these conditions are expected to occur in a five kilometer radius of the mine.

The Application should discuss noise characteristics such as noise level, tonality, duration and impulsiveness, and the times at which these various noise aspects will be experienced by those living within audible range of the mine.

The Application should describe how it intends to monitor and mitigate impacts from noise, airblasts, and vibration with reference to the following best practice mine management procedures:

• Development of blasting guidelines to determine blast/no blast, suitable/unsuitable weather conditions;
• Conducting a pre-blast environmental assessment with consideration given to wind speed, direction and shear and the strength of temperature inversions prior to each blast.

Meteorological conditions will then be compared with internal blasting guidelines before an approval to blast is issued;
• Use of initiation systems that minimise vibration;
• Use of adequate stemming lengths to ensure maximum confinement of explosive charges minimizing flyrock and overpressure;
• Use of suitable quality stemming material - being either drill cuttings, rock sourced from site or imported gravel, when necessary;
• Ensuring adequate burden is present on all faces. In some instances face surveying (laser profiling) techniques may be employed to measure overburden between the blast face and blastholes to ensure sufficient burden is present to prevent blowouts and blast anomalies;
• Adherence to blast loading and initiation designs where practicable;
Use of monitoring data to establish and refine predictive tools to estimate likely overpressure and vibration levels during the design process of subsequent blasts; and
• Evaluating new technology and alternative blasting methodologies that become available for their potential to lessen environmental impacts from blasting, in the context of safe, efficient mining operations.

The Proponent should include in its Application a description of the community engagement program it will establish to provide blast, noise, and vibration monitoring data to residents within a 5 km radius of mine operations, and to provide opportunities for public complaints or inquiries regarding mine operations.

With regard to the potential impacts on properties from blasting, the Application should describe provisions for residents within 3 km of blasting for structural inspections of their property before blasting occurs, similar to the best practice blast management procedures implemented by BHP Billiton for its Mt. Arthur coal mine in Australia.

54. 8.1 COMMUNITY HEALTH AND WELL-BEING

Needs to include more specifics on the valuation and devaluation of properties close to the mine and in Kamloops as whole.

55. 8.2 INFRASTRUCTURE, PUBLIC FACILITIES, AND SERVICES

Needs to quantify the actual impact on health care facilities and personnel, i.e. lack of physicians.

Needs to quantify the loss of physicians and health personnel due to mine location.

56. 8.3.4 DARK SKY

Add as 3rd bullet: ‘Effect of 24 hour light on wildlife’.

57. 8.4 VISUAL IMPACT/AESTHETIC FEATURES

Visual Impact of Blast Plume

http://www.quartier-sud-malartic.com/images/dynamitage-osisko-malartic-27octobre2012-8.jpg

The preceding image is a photo of a 940,000 tonne blast at the Osisko open pit gold mine at Malartic, Quebec, on October 27, 2012. The photo was taken immediately north of the railway tracks on Rue Royale, about 1.3 km due north of the mine perimeter. Large production blasts at the proposed Ajax mine have the potential to create similar visible blast plumes adjacent to the City of Kamloops.

Questions about the chemical content of blast emissions from Ajax, and their possible health impacts, have already been submitted by the public and the CAG. The issue of plume visibility also needs to be addressed. From Google Earth imagery, the top elevation of the material to be removed in the proposed Ajax pit is about 991 metres above sea level (masl). This means that blasting will begin at or near this elevation. The Aberdeen Ridge trends from between 980 masl to 1023 masl. Therefore, it is likely that a blast plume of 150-200 metres in height will be seen within parts of the City. South and SW winds have the potential to carry blast emissions well into the City.

On blue sky days, the Ajax blast plume will likely be extensively photographed and could become a defining negative image for the City of Kamloops. The CAG believes that the visual impacts of blast plumes from the Ajax mine need to be assessed, including the possible effects of stress and anxiety from concerns about potential toxins in the blast plume.

The CAG requests that the Applicant be required as a permit condition to install a web cam to record each blast it conducts and to post each recording on a public information website.

The CAG requests that the Applicant provide a commitment to providing information to the public about blast plumes. An example of the types of information the Applicant should provide is the following information on mine blast plumes provided by the Government of New South Wales. Information provided by the Applicant should not be limited to what is contained in the NSW information bulletin. For example, the Applicant should describe under what meteorological conditions a blast plume from the Ajax mine may persist and affect people who are downwind of the blast site.

MINE BLAST FUMES AND YOU

The information below is for the general community. For assessment of occupational risks, and health impacts of blast fumes for mine workers, please refer to the relevant occupational health service for advice.

What are blast fumes?

Blasting is used to break up solid rock in open cut mines and quarries. Blast fumes are the gases that may be generated during blasting. Some of the gases are toxic and some are not. In terms of health impacts, the critical gases generated are oxides of nitrogen (NOx) - nitrogen dioxide (NO_2) and nitric oxide (NO).
Nitrogen dioxide gives blast gas plumes their characteristic reddish orange colour and pungent odour.
Gases produced during blasting usually disperse rapidly and pose no acute health risk. Under certain conditions the gas plume may persist and can affect nearby people or residents who are downwind of the blast site.

What are the potential health effects from exposure?

Exposure to the fumes in a blast plume is usually very brief – seconds to minutes. For most people, any health effects from exposure to a blast plume are short lived.
Symptoms from high level exposure may include:
• Eye, nose and throat irritation and coughing
• Dizziness and headache
• Shortness of breath
• Wheezing or exacerbation of asthma

Serious lung inflammation (pulmonary oedema) has been known to develop several hours after exposure to very high levels of NO_2.

What should I do if I see a plume?

1. Avoid exposure to the plume. If you see a plume, do not enter it (this includes driving through it) and move out of the plume's path if possible. If at home, head indoors, close all doors and windows. If you are in a car, wind up windows and close vents until the plume passes.
2. If you find yourself in a plume, try to move out of it as quickly as possible.

3. If you have been exposed, use water to thoroughly wash eyes, and to clear your nose and throat.
4. If you experience respiratory symptoms you should seek immediate medical attention and inform the doctor of possible NO_2 exposure. Be alert for possible delayed breathing problems. If you are an asthmatic, use your reliever medicine.

Who should I notify if I see a blast plume?

Throughout NSW blast fumes can be reported to the NSW Environment Protection Authority's environment line on **131 555**. In the Upper Hunter Valley, blast fumes should also be reported to the Department of Planning & Infrastructure compliance office on 6575 3405.

58. 8.5 LAND AND RESOURCE USE – 8.5.2 BACKGROUND

As discussed in Section 5.1.6 Cumulative Effects Assessment, the Project Definition needs to be broadened to include the cumulative effects of other reasonably foreseeable mineral extraction activities (e.g., Rainbow, Ajax Pit expansion, Ajax North, the DM/Audra-Crescent deposits, Iron Mask) on land use within the City of Kamloops. An assessment should be required of the impacts to the City of Kamloops of restructuring community, transportation, and municipal service plans (e.g. water, storm and sanitary sewer) to accommodate the growth, envisioned in current community plans that will not occur due to mine development, elsewhere in and beyond city boundaries (e.g., Thompson Nicola Regional District).

59. 8.6.4 OUTDOOR RECREATION

This section... will:

- Address the potential impact of the project on Roads and public road use.

Prohibitions/restrictions on industrial traffic on Lac le Jeune Road, Hwy 5A , Long Lake Road, and Goose Lake road will be addressed in this section as well or in 3.17, with clarification of industrial routes that will be used, and at what times. Activities taking place elsewhere in the vicinity of the project will also be considered, including access to Hull Lake. Indirect effects of the Project on other VCs included in the environment and health disciplines will be considered in the assessment as appropriate (e.g., effects to Fish and Fish Habitat will be considered with respect to fishing).

Negative impact of air quality right where people are exercising is contraindicated.

60. 8.7 SUPPORTING TOPIC – JACKO LAKE

This section of the Application/EIS will draw from other VCs and summarize:

- Potential effects specific to Jacko Lake as described in other parts of the Application;
- Discussion on the perceived effects to the lake as identified in key person interviews (e.g., recreational users);

- Effect of decreased inflow into Jacko Lake from the tailings area on existing downstream/upstream water use.
- Effect of changing outflow pattern of Jacko Lake will be assessed in terms of impact on fisheries values in Jacko Lake
- Effect of current overflow from Jacko Lake flows into Inks Lake on the Alkali/Cherry Creek watershed.
- Suggested mitigation measures as described in other parts of the Application; and
- If required, other mitigation measures to address overall effects to the lake that are not captured by other VCs.

61. 10.0 – ASSESSMENT OF POTENTIAL HEALTH EFFECTS

The REVIHAAP (Review of Evidence on Health Aspects of Air Pollution) was developed in 2013 as a technical report for the WHO. This should be used as a reference document when discussing the health impacts of air pollution, until superseded by high quality research that is recognized by the WHO.

Further documented information on the human health impacts of air, water and soil pollution produced by mining and other heavy industry can be obtained from The Kamloops Physicians for a Healthy Environment Society (KPHES) website (www.kphe.ca). There are over 450 papers listed on the website that have been vetted by the medical community in Kamloops as being relevant to the issue of the potential installation of an open-pit mine on the upwind edge of the community. There are also reports on the website that were specifically prepared by KPHES members on air pollution topics, as well as press releases and other public statements.

If the Proponent's application for an open-pit mine on the upwind edge of Kamloops is approved, the emissions of $PM_{2.5}$ from the site will be added to those from existing sources in and near the city. The Proponent's dispersion model cannot be initiated with $PM_{2.5}$ data from 2003, as is proposed, since 2003 has been shown to be unrepresentative of the long-term record of $PM_{2.5}$ in the city and because the measurements were made in 2003 with the older TEOM instrument and must be corrected upwards to agree with the current measurement technology (BAM instrument).

These issues are thoroughly addressed in reports (Tsigaris and Schemenauer, 2014a, 2014b) that have reconstructed the entire PM2.5 database for the period 1998 to 2013. The estimated mean of the annual average $PM_{2.5}$ over the period 1998-2013 is 8.7 $\mu g/m^3$. This is already over the current British Columbia Ambient Air Quality Objective value of 8 $\mu g/m^3$. It is well above the provincial goal of 6 $\mu g/m^3$.

A further report (Tsigaris and Schemenauer, 2014c) showed that not only are there large year-to-year variations in PM2.5 annual average values but there are also monthly variations within the year, as well as months such as November and August with exceptionally high average values. Beyond these variations are daily and hourly peak values that exceed the monthly and annual averages. The description of the existing $PM_{2.5}$ data must be very carefully done in

order for the dispersion modelling to be correctly initiated and have any value whatsoever. It is only then that the model outputs can be examined to assess the potential for both long-term and acute health effects from the mine's emissions.

These three reference documents are available on the Kamloops Physicians for a Healthy Environment webpage:

Tsigaris, P. and R.S. Schemenauer, 2014a: Statistical Study of $PM_{2.5}$ Measured at the Kamloops Federal Building for Years 2011, 2012 and 2013 ; Statistical Report for Kamloops Physicians for a Healthy Environment Society, 27 June 2014, pp 8. Accessible at: www.kphe.ca.

Tsigaris, P. and R.S. Schemenauer, 2014b: Reconstructing the Historic Database of Annual $PM_{2.5}$ Values for Kamloops, B.C. by Calculating the Offset between TEOM and BAM Measurements; prepared for Kamloops Physicians for a Healthy Environment Society (KPHES), 25 July 2014, pp 20. Accessible at: www.kphe.ca.

Tsigaris, P. and R.S. Schemenauer, 2014c: The Influence of Prescribed Burning of Wood in the Kamloops Fire Centre on the PM2.5 Values in Kamloops in the Month of November; prepared for Kamloops Physicians for a Healthy Environment Society (KPHES), 11 December 2014, pp 14. Accessible in January 2015 at: www.kphe.ca.

The rationale for the choice of contaminants to be measured and included in dispersion models needs to be laid out – real data from core samples is required. The public needs access to more information than the list submitted in the draft AIR.

Hexavalent Chromium, manganese, aluminum, iron, radon, silica, strontium and yttrium should be added to the list of metals to be studied.

Since KGHM Ajax has not stated which assay data was used by the Stantec toxicologist to determine substances of interest, and conversely rule out substances of interest, or released the assay data to the public, it is not possible to determine how this selection was made. What is known is that assay data from the *Summary Report on the 2007 and 2008 Abacus-New Gold Inc. Joint Venture Diamond Drill Program on the Ajax Property*,[8] indicates the presence of significant levels of chromium and manganese, the presence of uranium for eight drill holes, and the presence of asbestos; yet all of these substances have been excluded from the Ajax assessment. Without the disclosure of all the assay data for the Ajax project, it is not possible to determine if the exclusion of these substances is justified.

If Ajax is approved and developed, and it turns out that there are significant levels of chromium in the Ajax deposit, the possibility exists that some of this chromium may be converted to a highly carcinogenic chromium compound known as hexavalent Chromium VI. A study published in 2013 in the *International Journal of Environmental Engineering and Management,* found that in the open pit mining of chromite in mines in India, some of the chromium was being converted to hexavalent Chromium VI by the process of lateralization, and contaminating the ground water.[9]

The applicant must provide Kamloops specific baseline population health data which has been collected from members of the population. This should include blood samples, hair samples for mineral/element levels and pulmonary function studies. These are needed for good baseline data. These levels and measurements should be monitored during the mine life so health impacts can be properly assessed. The BC Center of Disease Control should be consulted to draft the best design of this health maintenance study.

Particulates in diesel exhaust have now been confirmed as a class I carcinogen (since the original dAIR). The Proponent should be required to measure diesel and ultrafine particulates at the perimeter of the mine property and should be required to model the dispersion of ultrafine particulates throughout the full model domain. The rationale for diesel estimation and dispersion modeling would be improved by a study of a full operational mine site. We would like modelling of short term and long term health effects related to diesel exposure.

The measurement of PM2.5 and ultrafine particulates needs to be done at the edge of the mine site in a perimeter fashion, as well has having multiple meters placed throughout the city, not just the one operational meter in downtown Kamloops.

We would like the applicant to include discussion of the impacts on human health of exposure to various airborne contaminants in short term increments (1 hour, 24 hours, 1 week, 1 month) as well as over the longer term. This discussion should include all short term health related impacts as well as long term impacts. Specific reference should be made to COPD, asthma, MI, and stroke — all of which cause mortality. It should also specifically discuss the risks to a developing fetus that are represented by various exposure scenarios, and discussion of risks to the average citizen as well as those with pre-existing conditions.

Please provide clear statements pertaining to measurement error and uncertainty in PM10 and PM2.5 dispersion calculations.

We would like to have the consultants include a study of a currently active mine, such as Highland Valley Copper, for comparison with the proposed project. This should include collection of real data at locations equal in distance from the mine to the nearest subdivisions that could be impacted in Kamloops. This should include more than dust collection - it should include specific measurement of PM2.5 and PM 10.

If not being measured, then a clear statement (and discussion of the rationale) that ultrafine particles are not being measured should be included in the dAIR.

Given a community garden in Vancouver BC was recently shut down due to contaminants (heavy metals) found in Kentucky Blue Grass grown in a country garden model, we require the Proponent to study plant contamination at various distances from the mine site throughout the life of the mine. We also require that the Proponent study plant contamination at an existing mine such as HVC to corroborate their modelling.

The Proponent must characterize the soluble, insoluble and bioavailable components of the soil. This must be done from the mine perimeter to the Thompson River bottom. This should be done from the soil surface down to the depths of existing aquifers.

Airborne particles from the mine will settle on all surfaces downwind of the mine. People, especially children and animals, will interact with these surfaces on a daily basis. The chemical composition of the dust partitioned by particle size and composition should be studied. This study cannot be done using simple dust cups. Supersensitive receptors (children) require special baseline studies and comprehensive longitudinal follow up.

An alarm system for the Kamloops community should be developed so that citizens and specifically schools could be made aware of poor air quality (e.g. so that children are not allowed to play outside if air quality is poor). This could be similar to the innovative system used in California. This needs to be done with real-time measurements and would require more air monitoring stations that the unreliable station in downtown Kamloops.

The current BC government model for calculation of ventilation indexes could be expanded to provide the city with advance warning of potentially dangerous air pollution episodes. Like the BHP Billiton Mount Arthur coal mine, we support the adoption of meteorological criteria which when fulfilled, blasting would not occur.

There needs to be advance notice public alarm systems for dam failure, spills, leaks, and decanting procedures.

The emergency disaster plan for Interior Health/Kamloops should be revised to reflect the extreme risk of a catastrophic tailings pond breach, seepage pond breach or waste rock pile failure. If the community (and health authority) does not have the capacity to respond appropriately to the above situations, then the mine should not be built.

The emergency action planning should include notification, evacuation, transportation, emergency housing, infrastructure plans, water supply and waste management.

On September 12, 2012, Ralph Adams, an Air Quality Meteorologist for the BC Ministry of Environment, approved the *Final Detailed Dispersion Modelling Plan*. There is no evidence posted on the BC EAO website for the Ajax project indicating that the IHA approved this Plan, or whether Ralph Adams relied on geological and toxicological expertise to approve this plan. Dispersion modelling requires qualified health impact expertise.

The proposed project is massive and unprecedented. Since the last dAIR, the medical health officers passed a resolution in April 2013, requiring all reviewable projects under the BC Environmental Assessment Act to have a health impact assessment. The wording of the motion is noted below:

THEREFORE BE IT RESOLVED

1. That it is the position of the Health Officer Council that a Health Impact Assessment must be considered for all reviewable projects under the BC Environmental Assessment Act, and if appropriate a complete HIA be performed and externally funded as part of the project review process.
2. That the Health Officers Council offer to work with the Ministry of Environment, and the EAO to develop the necessary guidance documents to support the implementation of HIA in the assessment of reviewable projects.

The CAG requests that this project be assessed in accordance with this motion.

62. 10.1.1 METEOROLOGICAL DATA

Sections 10.1.4 and 10.1.2

Issue: The mine lacks relevant meteorological measurements.

The Kamloops Airport is stated to be a main source of weather and climate data for the proposed mine. The Proponent must be required to provide a scientifically sound argument as to why meteorological measurements made at the valley bottom in Kamloops have any validity on a mountain plateau 600 m higher in elevation. In particular, why would the wind speed and direction data from the valley bottom have any relevance? Precipitation amounts will be different, as will precipitation types due to the longer cold season with temperatures below freezing. How are these measurements relevant to the project area? Humidity at the proposed mine site will be very different than at the valley bottom. In the colder half of the year, humidity in the project area will be higher than at the valley bottom and this has an impact on visibility, particulate matter/droplet size, particulate sedimentation rates, particulate interaction with vegetation, and other issues. Total solar radiation should also be monitored at the site and downwind in the City of Kamloops to look for changes in 'sunshine', which may result from fugitive dust and other mining activities.

Measurements that have been made outside the new project area in the lee of Sugarloaf Mountain are compromised by the poor choice of location and cannot produce meteorological measurements that are representative of the new project area.

63. 10.1.2 EXTREME WEATHER EVENTS

Sections 10.1.6 and 5.1.6 and 10.2

Issue: No data exist for extreme rain, snow and wind events at the mine site.

It is stated in Section 10.1.6 that KAM will provide "Identification and description of existing or reasonably foreseeable projects or activities that have the potential to interact with the

project" and "Identification and description of any potential cumulative effects" and An assessment of the significance of the cumulative effects, following methodology presented in Section 5.1.6".

Since there are no meteorological data in existence for the project site, much less a 30-year climatology of extreme weather events as is typically examined, it will be impossible to do a rigorous "Cumulative Effects Assessment". All aspects of the meteorological conditions at the project site will impact the Cumulative Effects Assessment. Extreme wind conditions, as one example, will raise large amounts of dust from the surface in the project site and move it downwind. Extreme winds will also affect the water surface on the large tailings pond being proposed and could cause concerns for overflow or structural problems. Extreme rainfall can also cause runoff issues and contribute to the amount of water entering the tailings pond. The impact of the lack of data on extreme meteorological events must be addressed.

Extreme weather events can also affect Domestic Water Quality (Section 10.2) due to the potential for the movement of contaminated water or soils out of the project area into inhabited rural or urban areas.

64. 10.1.3 TAILINGS STORAGE FACILITY

Section 3.7
Issue: The Probable Maximum Precipitation (PMP) event is unknown.

With no meteorological data from the project site and no Climatological data from the project site, any estimate of the PMP event would have a large margin of error. The use of climatological data from the Kamloops airport or other lower elevation sites would seriously underestimate the rainfall at the higher elevation mine site. A design for the Tailings Storage Facility (TSF) based on an inadequate estimate of the PMP could compromise the safety of the TSF through the construction of tailings storage embankments that are too low to contain the added water from very high precipitation events.

Similarly, water storage and seepage ditches around the embankments could fail if the PMP event is underestimated due to the lack of any historical meteorological and climatological data from the project site.

65. 10.1.4 SITE WATER MANAGEMENT PLAN

Section 3.12
Issue: There are no meteorological or climatological data from the project site.

With no meteorological data from the project site and no Climatological data from the project site, any site water management plan would have large uncertainties. Both rainfall and snowfall amounts, their distribution on the project site, and extreme values of these parameters, will have to be known for a credible site water management plan to be designed.

66. 10.1.5 GREENHOUSE GAS MANAGEMENT

Section 6.1.2
Issue: There are no meteorological or climatological data from the project site.

It is stated that data from regional and site meteorological stations will provide baseline data for calculations of greenhouse gas emissions from the project site. However, meteorological data from the Kamloops airport, a distant valley bottom site, are not applicable to the project site, and no on-going meteorological measurements are being made on the new project site to provide any baseline weather data. This lack of data compromises any calculation of the dispersion of greenhouse gases generated by the mine.

It is stated that "Data will be compiled from the regional and site climate stations for..." Climate 'normals' are averages of measurements of meteorological parameters for a specified period of 30 years. There are no such climate data for the proposed project site and apparently no measurements being made at present on the proposed project site. It is, therefore, incorrect to say "site climate stations".

67. 10.1.2 BACKGROUND

Issue: The mine lacks historical airborne particulate measurements in a relevant location.

The Proponent states "long-term baseline information on Particulate matter (PM) is available for the project area from the National Air Pollution Surveillance Program (NAPS)...The NAPS Brocklehurst station is located approximately 7 km from the northern edge of the project footprint."

The Proponent fails to mention that the PM2.5 measurements made at the Brocklehurst site are from a valley bottom site in the middle of the City of Kamloops. They have no relevance to what has happened, or is happening, on the mountain plateau 600 m higher in elevation. In addition, the data were obtained at Brocklehurst using the old TEOM instrument, which severely underestimated PM2.5 concentrations. The Proponent should be required to rigorously demonstrate that any data used from NAPS or NPRI databases are in fact relevant to the site of the proposed mine and be required to install modern well-calibrated instruments to measure PM2.5 both on the mine site and immediately downwind.

68. 10.1.7 PROXIMITY

Section 10.1.3
Issue: Airborne particulates from the proposed mine will move outside the 30 km x 30 km study area.

Section 10.1.3 states the "preliminary study area boundary" will be 30 km x 30 km.

The distance from the mine pit to Rayleigh is 22 km. Rayleigh is downwind of the mine site and about 600 meters (m) lower in elevation. This is an example of a point that would be outside the preliminary study area boundary, which is stated to be centered on the new project area. If the average wind speed is 2 meters per second (m s-1), the transit time from the pit area to Rayleigh is about three hours.

The terminal velocity (settling speed in still air) of a 10 um (micrometer) diameter particle of density one (equivalent to water density) is 0.3 cm s-1. In three hours, such a particle would fall 32 m. Smaller particles (PM2.5) would fall a shorter distance in the same time period. Denser particles will settle somewhat faster. In the real world, the particles will move where the wind and air turbulence takes them. Descending air from the mine site will move particulates into the valley bottom and air movement along the South Thompson, North Thompson and Thompson River valleys can distribute the particles over distances of tens or even hundreds of kilometers. The proposed study area should be significantly expanded in size.

69. 10.1.8 MODEL DOMAIN

Sections 10.1.3 and 10.1.4
Issue: The size of the area being modelled is too small.

The stated (Section 10.1.3) new model domain area is 30 km x 30 km. If centered on the open pit, this domain would not cover areas as far north as Rayleigh or other areas up the various river valleys near Kamloops.

Section 10.1.4 says "the effects assessment will consider a modelling domain 20 km x 20 km centered on the Project site". This will not even include all of downtown Kamloops.
Particles with aerodynamic diameters less than or equal to 10 um are called PM10. A subset of this are the fine particles, PM2.5, with aerodynamic diameters less than or equal to 2.5 um. These fine particles will travel farther in the wind than the larger particles in the coarse fraction between 10 and 2.5 um. A good example is the high concentration of PM2.5 hundreds and in some cases thousands of km downwind of forest fires. Mines are large producers of PM2.5. Environment Canada's 2012 NPRI data shows Highland Valley Copper is the second highest in Canada out of almost 4000 industries reporting and New Gold/New Afton is the third highest. KGHM/Ajax will likely be a major emitter of PM2.5 as well and these particles have the potential to travel long distances. The proposed study domain size of 30 km x 30 km is too small to examine both the short-term and long-term impacts on the entire City of Kamloops and the surrounding area.
The model domain is not large enough to allow for consideration of re-entrainment of air back into the model domain. A larger domain would allow for consideration of air moving north up a valley and then back south into the city. This is the type of reversal of wind direction that occurs in the valleys in and around Kamloops.

70. 10.1.9 CALPUFF MODEL

Section 10.1.4
Issue: The model will be run using "one year of prognostic meteorological data (2003)".

There is no a priori reason to expect 2003 to have similar meteorological conditions to another year, whether it is 2014 or 2034. Therefore, the model output, as stated, would have little relevance in determining what the dispersion of pollutants would be in future years.
Standard practice in defining weather conditions at a site is to use climatological data, which are averages of 30 years of meteorological data. This should be required to initiate the CALPUFF model.
It is stated that the CALMET component of the CALPUFF model will use "surface meteorological observations from four stations"; however, there are no weather stations in the project area as presently defined. There are no wind measurements or other data measured on the newly defined project site. Even the station behind Sugarloaf Mountain in the City of Kamloops is so poorly located as to be severely compromised for model initiation.
Four parameters are to be modelled: DF, TSP, PM2.5, PM10. To this should be added, ultrafine particulates.
In addition, the model output should calculate the reduction in total solar radiation arriving at the receptor sites due to the increased particulate matter in the air. A reduction in total solar radiation is directly related to decreases in plant growth and crop yields.
Both the model input data and the model output parameters need to be seriously and rigorously examined.

71. 10.1.10 KATABATIC WINDS

Section 10.1.4

Issue: The model does not have adequate resolution to describe downslope drainage winds.
The proposed mine is running a limited air quality model. The CALPUFF model used by the sub-contractor to KGHM/Ajax is capable of modelling the katabatic winds that drain cold air downslope at night in mountainous areas and the anabatic winds that flow upslope in the daytime. It is stated that "topographically generated winds" will be included in the data being put into the model. It is not stated that the Proponent will in fact model the flux of pollutants from the mine when katabatic winds flow from the upper plateau into the valley where the City of Kamloops is located. Nor is it evident that the model has sufficient resolution to deal with the detailed terrain features that channel these katabatic winds into the city.

The model should be run with sufficient resolution to adequately show the drainage air from the proposed mine site into the City of Kamloops. The model outputs should show the estimated concentrations of DF, TSP, PM2.5, PM10 and ultrafine particulates in specific areas impacted by katabatic winds.

72. 10.1.11 ULTRAFINE PARTICLES

Section 10.1.1 and Section 10.1.4

Issue: The mine (p 146, Section 10.1.1) will not model deposition of ultrafine particulates.

The document states (Section 10.1.1) that despite knowing that ultrafine particulates (aerodynamic diameter less than 1 um) are implicated in negative health impacts, they will not model them. The reason stated is that they are included in PM2.5.

Table 10.1-1 states that "Trucks and heavy equipment direct emissions" will be "considered in the effects analysis for air quality and human health".

Trucks emit (direct emissions) some ultrafine particulates but more importantly, the gases emitted by diesel trucks produce ultrafine particulates a short distance from the tailpipes. It is necessary that the production of ultrafine particulates be considered separately in the air quality analysis and be included in the model calculations. This must include both direct emission and gas-to-particle conversion. Ultrafine particulates should be added to the list of Criteria Air Contaminants in Section 10.1.4 (p 152).

The current instrumentation to measure PM2.5 uses instrumentation, such as the Beta Attenuation Monitor (BAM), to measure the mass of particulate with aerodynamic diameters less than 2.5 um in diameter. Most of the mass is associated with the largest particle sizes in this category; however, most of the particle numbers are associated with the smallest particle sizes. This means that the output of the BAM instrument is essentially unrelated to how many ultrafine particles are in the air and is not an appropriate instrument to use to characterize how much ultrafine particulate is in the air. In the same way, other measurements such as dustfall cups and Partisol filter samplers are also of no use in determining how much ultrafine particulate is in the air.

Since ultrafine particles are generated by mining activities, such as the use of diesel trucks, and since the usage of diesel fuel by the mine will be similar in volume to that consumed by the entire City of Kamloops, a specific protocol needs to be developed before the mine opens for the measurement of background concentrations of ultrafine particulates and for measuring concentrations after the mine is in operation. This also leads to the requirement that the model being utilized by the mine include concentrations of ultrafine particulates as one of the model parameters.

73. 10.1.12 SURFACE WATER QUALITY

Section 6.3.2
Issue: Precipitation Chemistry needs to be measured

Table 6.3-2 is presented with an unacceptable lack of rigour and science. When presenting Method Detection Levels (MDL) for parameters to be analyzed for in the ground water, the units must be given for each statement of the MDL value, otherwise the table is meaningless.

To properly understand surface water quality, a measurement of the precipitation (rain and snow) chemistry must also be made on an event by event basis at the project site. Precipitation is an important input of water to the site along with the water pumped in from Kamloops Lake. The chemistry of both these sources must be known. The precipitation chemistry should be compared to a site established upwind of the project area to establish whether the mine's production of fugitive dust is affecting the measured precipitation chemistry.

74. 10.1.13 SURFACE WATER QUANTITY

Section 6.4.2
Issue: Precipitation Amount needs to be measured

In addition to baseline Hydrology stations to be established in the project area, a measurement of the precipitation (rain and snow) amount must also be made on an event by event basis in the project area. Precipitation, in addition to seepage and discharge from mining operations, is a determining factor for the amount of surface water.

75. 10.1.14 SITE WATER BALANCE

Section 6.4.4
Issue: Evaporation of water from the site will not be calculated

This section describes the factors to be included in a site water balance. Evaporation from: the tailings pond; spraying of water into the air; ore processing activities; wetting roads; vehicle exhaust; and so on, is an important component of any rigorous site water balance. Evaporation must be included. Similarly, fog formed over the project area in the cold season will move downwind and represents a flux of water out of the site that should be included in the calculated site water balance.

76. 10.5.4 NOISE AND VIBRATION – POTENTIAL EFFECTS OF THE PROJECT AND PROPOSED MITIGATION

The Application should contain a description of the program the Proponent proposes for monitoring noise, vibrations, and air blasts. The monitoring program should include the following procedures:

• Routine monitoring of noise levels at selected sites to verify the output of the noise model in relation to actual noise levels. Selected sites should include Pacific Way Elementary, Aberdeen

Elementary, McGowan Park, Knutsford Hall, and a location in the designated residential area of the Aberdeen Community Plan due north of the proposed East Waste Rock Facility;

• Use of a mobile real-time noise monitor for continuously monitoring noise levels arising from various mining operations;

• Air blast overpressure recorded for every blast at the aforementioned selected sites;

• Vibration testing at residences on request;

• Real time posting of monitoring data on an internet web site;

• Provision for recording noise related complaints, and a monthly report on an internet web site of the number of noise complaints and compliance with regulatory requirements.

77. 11.2 MONITORING

There is a parasitic forest pathogen, Dwarf Mistletoe, which resides in the vicinity. This parasite, which grows on lodgepole pine, spreads its tiny seeds by explosive discharge, and seeds do stick to almost any surface they become in contact with. It is possible that seed could land on trucks headed to the lower mainland, and from there, it might be possible for the seeds to reach other areas of pines not yet infected by the parasite, thus spreading the disease.

78. 17.6 ACCIDENTS OR MALFUNCTIONS

Failure of dams and impoundments for seepage collection and runoff ponds should be added to the accidents or malfunctions that will be discussed in the AIR/EIS.

79. 17.12 FOLLOW-UP PROGRAMS

With regard to monitoring the effectiveness of the Dam Safety Program for the proposed tailings facility and other impoundments for the Ajax mine, the Proponent should commit to implementing the international best standards of practice consisting of at least the following actions:

- An annual report by the Engineer of Record on what was done at the dam by way of design, construction, deposition, and instrumentation during the preceding year.
- A report by an independent and different engineering firm of the status of the dam. In South Africa as a result of the Bafokeng and Merrispruit failures, this is done every three months.
- Annual or more frequent meetings by an independent panel of three senior peer reviewers. All the oil sands tailings impoundments have peer review boards

80. FIGURES

Every map in the Revised AIR Rev 1.B dated November 7, 2014 is inadequate as there is no labeling of the local neighbourhoods and or local communities in and around the proposed mine site. For example "Knutsford" is not shown on even one map. This exclusion is not acceptable. All local communities, whether they are a neighbourhood or a community, need to be shown.

The CAG requests that the Proponent provide a separate map showing all non-mine owned private property and Crown lease land located within 5 km of the project area.

The CAG requests that the Proponent provide a map showing the Regional Geology of the Project Area, as depicted in Figure 3.1-1, with an overlay of the areas designated for residential/urban development in the Aberdeen Community Plan.

Footnotes

[1] *Proposed Ajax Mine Project Public Consultation Plan,* May 9, 2012, p. 4.

[2] International Association for Public Participation

[3] Ibid. [4] International Finance Corporation

[5] International Finance Corporation, 2007, *Stakeholder Engagement Good Practice Handbook*, pp. 28-29.

[6] The Feasibility Study (p 13-28) states that "The complete assay results of the copper concentrate are included in Appendix B. The Feasibility Study also indicates that further assay data is available in *Feasibility Metallurgical Testing Ajax Project Report No. KM2688.*

[7] Stantec Consulting Ltd., May 6, 2013, *Detailed Dispersion Modelling Plan*, p. 2-10.

[8] Ajax 2012 Feasibility Study, p. 13-1.

[9] Haripriya, Mishra and Himanshu Bhusan Sahu, *Environmental Scenario of Chromite Mining at Sukinda Valley – a Review*, International Journal of Environmental Engineering and Management, Volume 4, No. 4 (2013, pp. 287-292.

[10] Supra, IFC, p. 30.

[11] Stantec, April 29,2012, *A Detailed Noise Modelling Plan for the Ajax Project* (Draft), p. 8-1.

[12] *Supra* note 1 at pp. 2 and 9.

[13] Canadian Environmental Assessment Agency, Revised August 2011, *Background Information for the Initial Federal Public Comment Period on the Comprehensive Study pursuant to the Canadian Environmental Assessment Act of the Ajax Mine Project, Kamloops, British Columbia,* CEAA Registry Reference Number: 11-03-62225; File Number: 4302-0072, p. 12.

[14] http://www.ajaxmine.ca/blog?year=2013&month=8

[15] KGHM Polska Miedź S.A., *Consolidated quarterly report QSr 4/2013, p.24*

[16] Abacus, Ajax Copper/Gold Project – Feasibility Study, January 6, 2012 at p. 4-7.

[17] Abacus Mining and Exploration Inc., SEDAR

[18] Discovery-Corp Enterprises Inc., July 25, 2006, *National Instrument NI 43-101 Technical Report on the Galaxy Property located in the Afton Area,* p. 1.

[19] Discovery-Corp Enterprises Inc., October 15, 2013, *National Instrument NI 43-101 Technical Report Galaxy Copper-Gold Project,* p. 16.

[20] The Kamloops Area Preservation Association sent the IHA a letter asking if this request had been made to KGHM Ajax, but in a written response the IHA refused to disclose whether or not this request had been made.

[21] Hogan, Gregory, and Alexander Pizale, February 7, 2014, *National In*strument 43-101: What Investors Need to Know about Technical Reports. http://www.casselsbrock.com/CBNewsletter

[22] Ontario Securities Commission, (2002) 25 OSCB 4492, National Policy 51-201 *Disclosure Standards*

[23] EAO Code at 5.

[24] *Proposed Ajax Mine Project: Public Consultation Plan,* May 9, 2012, Submitted to EAO under Section 11 Order by KGHM Ajax Mining Inc., p. 14.

[25] AIR/EIS, p. 29

[26] *BC The BC Mine Waste Rock Pile Research Committee Interim Guidelines*, p. 23.

[27] https://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=CBE3CD59-1&offset=5

[28] Bryan Leece, Stantec, no date, *Summary of the Draft Human Health and Ecological Risk Assessment for the Proposed Ajax Mine,* p. 25.

[29] *Pacific Booker Minerals Inc. v. British Columbia (Environment)*, 2013 BCSC 2258 at 41.

[30] EAO Code at 7.

[31] *BC Regulation 163/2011*

[32] *Pacific Booker Minerals Inc. v. British Columbia (Minister of the Environment)*, 2013 BCSC 2258 at para. 126.

[33] United States Government, January 18, 2011, *Improving Regulation and Regulatory Review,* Executive Order 13563, Federal Register, Volume 76, No.14, Section 1 (b) (3), p. 3821.