

Sachi De Souza

From: Sachi De Souza
Sent: July-29-15 3:23 PM
To: David Harpley
Subject: RE: Adequacy Review

Hello David,

In response to your email requesting additional information on the Adequacy Review and specifically, on the topics of spills and risk assessment, the Review Board provides the following.

The Terms of Reference provided the Review Board's expectation on the level of detail required to fulfill these requirements. The adequacy review provided additional clarification. This correspondence will hopefully provide additional clarity. In follow-up to this correspondence Review Board staff will arrange a teleconference with Can Zinc.

To assess the potential unintended effects of the project on the environment from accidents and malfunctions a risk assessment is required. The ToR referenced the Failure Modes and Effects Analysis (FMEA) methodology. The DAR referenced this risk assessment methodology and contained a link which describes FMEA and how to conduct it (http://technology.infomine.com/enviromine/issues/cls_fmea.html).

The Review Board is familiar with the FMEA methodology and considers it, and several others methods, a useful method for assessing risk.

The FMEA methodology requires assessing multiple components and how they could affect the project on their own and then combining these components into a holistic assessment of risk. The individual components include, but are not limited to:

- Failure modes, which may include consideration of:
 - Geohazards – such as avalanches, landslides, slumps, (described in Appendix 2 of the DAR)
 - The existing environment – such as terrain stability, peak water flows at water course crossings, permafrost, etc. (part of which is in Appendix 2 of the DAR)
 - Weather – potential effects may include fog, heavy precipitation, icing, snow
 - Engineered structures – such as roads, bridges, equipment failure and malfunctions, spill response plans
 - Human error - such as driver fatigue
- Assessment of potential spills on the environment for all products hauled on the road
- Road design – which should include design mitigations to minimize or avoid the effects of geohazards, the existing environment, and weather on the road and may include such things as road grade, design of bridges, line of site etc.
- Mitigations to minimize or avoid accidents malfunctions – such as driver training and spill response

The reason why the risk assessment presented in the DAR was considered inadequate was because it did not fully follow the FMEA methodology. At a very high level it is not clear how CanZinc accommodated items such as geohazards and weather in road design and what the residual risks are after implementation mitigations to minimize or avoid these components.

Further, the FMEA defines 'risk' as a function of likelihood and consequence. The DAR on page 193 stated that risk and likelihood can be considered interchangeably. This use of risk to mean the same as likelihood is fundamentally incompatible with the FMEA methodology. The proper definitions for risk, likelihood, and consequence need to be

followed. (As a note, the approach used for assessing the risks associated with the geohazards (Table 7.2.2-1 of Appendix 2) did follow the definitions outlined in the FMEA). To be clear, risk is combination of 1) the **likelihood** of an accident or malfunction occurring and 2) the **consequence** of the accident or malfunction (which also takes into account likely and worst-case type scenarios).

All of these components can individually lead to risks such as accident or malfunction but combined they can increase the likelihood and/or severity of an incident. The potential interplay between these components must also be assessed. A way to help with understanding this interplay is through scenarios. For instance, if a truck hauling concentrate or fuel is descending the haul road, and a storm occurs and brings heavy precipitation and fog, precipitation may cause a section of the road or a bridge to wash out or, trigger geohazards which causes the same effects. The fog may cause reduced visibility which may result in the driver not seeing the hazards and the truck running off the road. This may in turn lead to a spill of concentrate. The weather may increase the severity of the spill by spreading the concentrate through wind and rain. This may be exacerbated because the spill response may not be possible due to the road or bridge being washed out and rendered impassable.

To understand the consequence a spill, the effect of the material spilled to the environment must be described. This should include effects to water quality, air quality, vegetation, wildlife, and people. The consequence must also consider the residual effects as it is unlikely that a 100% of the material spilled can be retrieved. This assessment of consequence should consider what may happen in a worst-case types scenario, such as if a large quantity of material is deposited into a water course and carried downstream with no response available.

The risk assessment must also include the confidence associated with the risk predictions. The DAR does not provide this information.

As stated previously, the risk assessment required by the ToR, the FMEA method, must also include consideration of the effects to human health and safety that could result from accidents and malfunctions.

To help, I've attached a link of the risk assessment done for the NICO project (http://www.reviewboard.ca/upload/project_document/EA0809-004_17_SON_Accidents_and_Malfunctions.PDF) . It was done for a larger project but may provide some guidance.

I will call you shortly do discuss,

Sachi

From: David Harpley [<mailto:david@canadianzinc.com>]
Sent: July 26, 2015 7:54 PM
To: Chuck Hubert
Cc: Sachi De Souza
Subject: Adequacy Review

With respect to Section 7 of the Review, it says the DAR "does not state which risk assessment best practice method was used and it does not conform to the best practice referenced in the ToR, or on page 193 of the DAR (that is, the FMEA in this case)". Also, "The assessment of effects provided in section 9 of the DAR does not conform".

For the analysis of spills in the DAR, I would like to know more clearly why the assessment of risks and effects does not conform in order to make the necessary changes.

Please call me at home tomorrow if possible with this information.

Thanks.

David Harpley
VP, Environment and Permitting Affairs
Canadian Zinc
Home Office 604 594 3855, Office 604 688 2001

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David Harpley
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Sachi De Souza

From: Sachi De Souza
Sent: July-29-15 1:18 PM
To: 'David Harpley'
Cc: Chuck Hubert
Subject: RE: Adequacy Review

Hi David,

There appears to be a typo in the Adequacy Review for section 19. We apologize. The Adequacy Review should have read "cultural and heritage resources," not "noise." As was stated in the Review Board's response letter (http://www.reviewboard.ca/upload/project_document/EA1415-01_MVEIRB_response_to_CanZinc_Adequacy_letter.PDF), the Review Board recommends that CanZinc host a community workshop to gather the information necessary to address the outstanding requirements for the potential impacts to cultural and heritage resources. In addition, as with other subjects of note, CanZinc should focus on steps 3 and 4 from section 4.1 and section 7.1 of the Terms of Reference.

Regarding section 13 of the Adequacy Review, as was stated in the Review Board's June 24th letter, CanZinc should focus on addressing steps 3 and 4 from section 4.1, and section 7.1 from the Terms of Reference. The effects assessment can be less rigorous than what is done for key lines of inquiry.

I hope this clarifies.

Sachi

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From: David Harpley [<mailto:david@canadianzinc.com>]
Sent: July-29-15 11:58 AM
To: Sachi De Souza
Cc: Chuck Hubert
Subject: RE: Adequacy Review

Sachi, I also have concerns with section 19. This seems to refer to noise, and is a duplication with sections 13 and 6.4. Please clarify. Sections 13 and 19 are also highlighting the need for nearly all assessment steps for this item, which doesn't seem necessary.

David Harpley
VP, Environment and Permitting Affairs
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