PolyMet Rail Car Modifications Evaluation

I. Introduction

In response to agency comments on the NorthMet Water Management Plan-Mine Version 2, as well as EPA comments on the SDEIS, PolyMet has committed to looking at modifications to their side-dumping ore cars (hereafter referred to as rail cars) to mitigate potential ore spillage during transit. This document summarizes the work that has been done to date to evaluate potential rail car ore spillage, and the analysis that was conducted to evaluate modifications to the rail cars that would mitigate ore spillage.

II. Evaluation of Potential Ore Spillage from Rail Cars

Ore excavated from the mine pits will be transported from the pit by truck, and then either unloaded at the Rail Transfer Hopper (RTH) or the Ore Surge Pile (OSP). Ore can be loaded to rail cars from either the RTH or the OSP. The rail cars will transport ore from the Mine Site to the Plant Site as a train set. Each train set consists of 16 to 20 side-dumping rail cars pulled by a locomotive.

PolyMet has an existing but currently decommissioned fleet of LTVSMC side-dump rail cars that are intended for use on the NorthMet Project. The design of the side-dumping rail car is presented in Figure 1. Each rail car has hinged doors located on the two long sides of the car; the space along the hinge is referred to as the hinge gap. There is also a joint between the movable dump door on the end of the rail car and the car body; this joint is referred to as the door gap. Figure 2 shows a photo of one of PolyMetõs side-dumping rail cars with the location of the hinge gap and door gap highlighted.

Ore will range in size from 48 inches down to small gravel and dust. Three potential ways that ore could be released to the environment during transport via rail car include: 1) ore spillage through the hinge gap, 2) ore spillage through the door gap, and 3) dust. Dust could be mitigated by spraying water on the loaded ore prior to transport, when necessary. The remainder of this document focuses on mitigating ore spillage from the rail cars during transit.

During Environmental Review of the Project, potential water quality impacts from ore spillage during transport were assessed by assuming that ore spillage could occur along the entire rail corridor. PolyMet has developed a model for that spillage which is described in the Waste Characterization Data Package (Version 10, Section 8.4.3). Potential rail car spillage was estimated based on tons of ore transported per year, the size distribution of blasted ore (from blast fragment model), and current rail car characteristics (including the size of the hinge gap (0.5ö) and door gaps (2ö)). From this information, the quantity of ore that could potentially spill through the door and hinge gaps was estimated to be 6.14 tons per year.

The SDEIS states that ñrainfall contacting the spilled ore material has the potential to release solutes, but with the small volume of ore and dilution from other sources, water quality is expected to meet the evaluation criteriaò (SDEIS, p. 5-98 and 5-144). The SDEIS also states that ñIn order to guard against possible adverse effects from spilled ore, monitoring and mitigation activities would be developedò (see Section 5.2.2.3.5). In addition to monitoring and mitigation activities, PolyMet has evaluated potential modifications to the rail cars (as discussed below) as a proactive measure to minimizing this spillage.

III. Potential Rail Car Modifications

Six options were analyzed for potential rail car modifications:

- Refurbishing rail cars: includes tightening or replacing all the linkages, bushings, and couplings, thereby minimizing the gaps along both the hinges and door areas
- Installing a Sandvik rubber liner: includes attaching a rubber liner to the bed of the rail car, which would hold the ore in a rubber liner within the car
- Retrofitting with hydraulic door closures: includes adding hydraulic equipment to aid in door closure, which is not a standard rail car retrofit, but could be done
- Welding angle iron to the door gaps: includes welding angle iron to the inside of the door, which would close the door gap
- Applying foam sealant: includes adding quick-curing foam to the hinge gap prior to loading to seal the hinge gap
- Purchasing new rail cars: includes purchasing new rail cars

Each option was evaluated based on the following categories:

- Environmental: Level of environmental impact (rank as *low*, *medium* or *high*, based on: *low* ï both hinge and door gaps are minimized; *medium* ï either hinge or door gap is minimized; *high* ï neither the hinge or door gaps are minimized)

- Installation: Level of difficulty for installation (rank as *low*, *medium* or *high*, based on: *low* ï no installation or easy to install by PolyMet; *medium* ï requires contractor installation; *high* ï requires design prior to contractor installation)

- Operational: Level of difficulty for operations (rank as *low*, *medium* or *high*, based on: *low* ï no interference with operations; *medium* ï some interference with operations ï i.e., adds personnel and time to operations; *high* ï unacceptable interference with operations ï i.e., could cause impacts to/shutdown of milling operations)

- Maintenance: Level of difficulty for maintenance (rank as *low*, *medium* or *high*, based on: *low* ï no or minimal maintenance required over life of mine; *medium* ï maintenance required periodically over life of mine; *high* ï maintenance required daily or annually)

- Financial: cost per car

IV. Results

Table 1 summarizes the rankings of each option. In evaluating the table, the options that were ranked ðLowô in the most categories were considered to be the better options based on the ranking system. The table shows that three of the six options (refurbishing rail car, applying foam sealant, and purchasing new rail cars) are preferred as they will reduce the gaps in both the hinge and door, and therefore have the least environmental impact. Of these three options, applying foam sealant can be ruled out due to the High rankings in all other aspects (installation, operational, and maintenance), versus the Low rankings in these same aspects for the other two options (refurbishing rail cars and purchasing new rail cars). Of the remaining two options, the only difference is cost per car: it is estimated that purchasing new rail cars will cost $185,500 more than refurbishing the existing cars. Therefore, refurbishing the existing cars was chosen as the best option to implement.

Table 1. Summary of Option Rankings

Option	**Aspect Review Summary**				
	Environmental **(Level of environmental impact: L, M, H)**	**Installation** **(level of difficulty to install: L, M, H)**	**Operational** **(level of operational problems: L, M, H)**	**Maintenance** **(level of maintenance needed: L, M, H)**	**Financial** **(cost/car)**
Refurbishing rail car	L	L	L	L	$ 39,500
Installing a Sandvik rubber liner	M	M	M	M	$ 69,000
Retrofitting with hydraulic door closures	M	H	M	M	$ 39,500 - $225,000 **
Welding angle iron to the door gaps	M	M	H	H	$ 42,000 *
Applying foam sealant	L	H	H	H	$ 2,800
Purchasing new rail cars	L	L	L	L	$ 225,000

*Includes $10,500/car, replaced 4 times in the 20 year mine life

** Consultant does not believe PolyMetôs cars can be retrofitted in this way. If they could, the cost was estimated to be between refurbishing the cars, and purchasing new cars

Aspect Review based on the following:

- Environmental: Level of environmental impact (rank as *low*, *medium* or *high*, based on: *low* ï both hinge and door gaps are minimized; *medium* ï either hinge or door gap is minimized; *high* ï neither the hinge or door gaps are minimized)
- Installation: Level of difficulty for installation (rank as *low*, *medium* or *high*, based on: *low* ï no installation or easy to install by PolyMet; *medium* ï contractor installation; *high* ï involves redesign prior to contractor installation)
- Operational: Level of difficulty for operations (rank as *low*, *medium* or *high*, based on: *low* ï no interference with operations; *medium* ï some interference with operations ï i.e., adds personnel and time to operations; *high* ï unacceptable interference with operations ï i.e., could cause impacts to/shutdown of milling operations)
- Maintenance: Level of difficulty for maintenance (rank as *low*, *medium* or *high*, based on: *low* ï no or minimal maintenance required over life of mine; *medium* ï maintenance required periodically over life of mine; *high* ï maintenance required daily or annually)
- Financial: cost per car

V. Next Steps

Having identified refurbishment of the rail cars as the best option, additional work was undertaken to quantify how much refurbishment would reduce potential environmental impacts. In the fall of 2014, PolyMet visited another mine site where side-dumping rail cars had been purchased from the same fleet as PolyMetôs rail cars. This mine site had recently had these cars refurbished, and they were currently in use at the time of the site visit (Figure 3). During the site visit, PolyMetôs representatives estimated that the size of the gaps on the refurbished rail cars measured 0.25ò for the hinge gap and 0ò for the door gap. If the same calculation is used to estimate potential rail car spillage (as was described in Section II above), with these new values (and keeping all other parameters the same), the quantity of ore that could potentially spill through the door and hinge gaps would be estimated at 0.20 tons per year. This is a 97% reduction from the originally calculated value of 6.14 tons per year.

Prior to use in operations, PolyMet will ensure that the rail car fleet be refurbished to reduce the sizes of the hinge and door gaps. This will greatly reduce the amount of potential ore spillage, and reduce any associated environmental impacts.

Figure 1. Illustration of Side-Dumping Rail Car

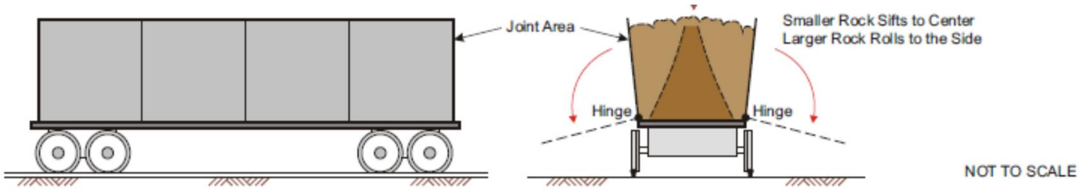

Figure 2. Photo of Side-Dumping Rail Car with Gaps Highlighted

Figure 3. Photo of Refurbished Side-Dumping Rail Car