

External **Memorandum**

To: Jim Scott – PolyMet, Stuart Arkley – MDNR

From: Katie Wenigmann, Greg Williams, Miguel Wong

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed – PolyMet

RS-74

Date: October 14, 2008 **Project:** 23/69-862-015-074

c: John Borovsky, Tina Pint

Table of Contents

1.0 Int	roduction	4
	anges in Modeling Inputs	
2.1	Changes in Tailings Basin Seepage	
2.2	Changes in Discharges from Babbitt WWTP & Pit 5NW	6
2.3	Changes in Input Water Quality	7
3.0 Mo	deling Results	7
3.1	Tailings Basin-Proposed Action	
3.1.1	Deterministic Water Quality Predictions at PM-12 of Tailings Basin-Proposed Action	ı. 7
3.1.2	Deterministic Water Quality Predictions at PM-13 of Tailings Basin-Proposed Action	ı. 7
3.1.3	Culpability Analysis of Tailings Basin-Proposed Action	9
3.1.4	Factor to Exceed of Tailings Basin-Proposed Action	15
3.2	Tailings Basin-Geotechnical Mitigation.	17
3.2.1	Deterministic Water Quality Predictions at PM-12 of Tailings Basin-Geotechnical	
	Mitigation	. 17
3.2.2	Deterministic Water Quality Predictions at PM-13 of Tailings Basin-Geotechnical	
	Mitigation	. 17
3.2.3	Culpability Analysis of Tailings Basin-Geotechnical Mitigation	19
3.2.4	Factor to Exceed of Tailings Basin-Geotechnical Mitigation	
	nclusions	

To: Jim Scott – PolyMet, Stuart Arkley – MDNR
From: Katie Wenigmann, Greg Williams, Miguel Wong
Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed – PolyMet RS-74
Date: October 14, 2008
Project: 23/69-862-015-074

Page:

List of Tables

Table 1	Estimated Tailings Basin seepage for selected parameters calibrated to existing conditions
Table 2-1	Low, Average, and High Flows in the Embarrass River at PM-12 and PM-13
Table 4-1	Unrecoverable Seepage Flows from the Tailings Basin during Operation and Closure under Tailings Basin – Proposed Action
Table 4-4	Unrecoverable Seepage Flows from the Tailings Basin during Operation and Closure for Tailings Basin – Geotechnical Mitigation
Table 5-2	Input Concentrations Used in the Embarrass River Mass-Balance Model
Table 5-4	Deterministic Water Quality Predictions at Surface Water Monitoring Station PM-12 in Low Flow Conditions, Tailings Basin – Proposed Action
Table 5-5	Deterministic Water Quality Predictions at Surface Water Monitoring Station PM-12 in Average Flow Conditions, Tailings Basin – Proposed Action
Table 5-6	Deterministic Water Quality Predictions at Surface Water Monitoring Station PM-12 in High Flow Conditions, Tailings Basin – Proposed Action
Table 5-7	Deterministic Water Quality Predictions at Surface Water Monitoring Station PM-13 in Low Flow Conditions, Tailings Basin – Proposed Action
Table 5-8	Deterministic Water Quality Predictions at Surface Water Monitoring Station PM-13 in Average Flow Conditions, Tailings Basin – Proposed Action
Table 5-9	Deterministic Water Quality Predictions at Surface Water Monitoring Station PM-13 in High Flow Conditions, Tailings Basin – Proposed Action
Table 5-10	Multiplying Factors for Concentrations of Leachate from PolyMet Tailings Basin (Cell 1E & 2E) and Hydrometallurgical Residue Cells That Would Cause the Embarrass River Water Chemistry Predictions to Exceed the Minnesota Surface Water Quality Standards
Table 5-11	Comparison of concentrations of leachate from PolyMet Tailings Basin (Cell 1E & 2E) and Hydrometallurgical Residue Cells (all occurring concurrently) that would cause Embarrass River water chemistry predictions to exceed the Minnesota surface water quality standards and the "Base Case" concentrations of these mine site features.
Table 7-1	Deterministic Water Quality Predictions at Surface Water Monitoring Station PM-12 in Low Flow Conditions, Tailings Basin – Geotechnical Mitigation
Table 7-2	Deterministic Water Quality Predictions at Surface Water Monitoring Station PM-12 in Average Flow Conditions, Tailings Basin – Geotechnical Mitigation
Table 7-3	Deterministic Water Quality Predictions at Surface Water Monitoring Station PM-12 in High Flow Conditions, Tailings Basin – Geotechnical Mitigation

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 3

Table 7-4	Deterministic Water Quality Predictions at Surface Water Monitoring Station PM-13 in Low Flow Conditions, Tailings Basin – Geotechnical Mitigation
Table 7-5	Deterministic Water Quality Predictions at Surface Water Monitoring Station PM-13 in Average Flow Conditions, Tailings Basin – Geotechnical Mitigation
Table 7-6	Deterministic Water Quality Predictions at Surface Water Monitoring Station PM-13 in High Flow Conditions, Tailings Basin – Geotechnical Mitigation

List of Figures

Figure 5-3	Deterministic Water Quality Predictions for Arsenic, Cobalt, Copper, Nickel,
	Antimony and Sulfate at PM-12 (Embarrass River) as a Function of Tailings Basin –
	Proposed Action Development

- Figure 5-4 Deterministic Water Quality Predictions for Arsenic, Cobalt, Copper, Nickel,
 Antimony and Sulfate at PM-13 (Embarrass River) as a Function of Tailings Basin –
 Proposed Action Development
- Figure 7-1 Deterministic Water Quality Predictions for Arsenic, Cobalt, Copper, Nickel,
 Antimony and Sulfate at PM-12 (Embarrass River) as a Function of Tailings Basin –
 Geotechnical Mitigation Development
- Figure 7-2 Deterministic Water Quality Predictions for Arsenic, Cobalt, Copper, Nickel, Antimony and Sulfate at PM-13 (Embarrass River) as a Function of Tailings Basin – Geotechnical Mitigation Development

List of Appendices

Appendix E	Calibration of Mass-Balance Model for Embarrass River Watersheds for Surface Water Runoff Water Quality
Appendix F	Predicted Concentrations Using Mass-Balance Models for Embarrass River Watersheds
Appendix G	Culpability Analysis of Tailings Basin Features and Embarrass River Watershed Features for Tailings Basin-Proposed Action and Tailings Basin-Geotechnical Mitigation
Appendix I	Calibration of Mass-Balance Model for Existing LTVSMC Tailings Basin Seepage Rate in the Embarrass River Watershed

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 4

1.0 Introduction

This memo presents additional deterministic predictions of surface water quality in the Embarrass River that corresponds to changes in the seepage from the Tailings Basin (Cells 1E & 2E and Cell 2W) and discharges from Babbitt WWTP and Pit 5NW during low flows under PolyMet's NorthMet Project for both Tailings Basin-Proposed Action and Tailings Basin-Geotechnical Mitigation. At the meeting between the Agencies (MDNR, MPCA), PolyMet, Tribes, and Barr held at Barr's Minneapolis Office on September 23, 2008, questions were raised regarding the accuracy of low flow estimates in the Embarrass River and the associated amount of seepage coming from the Tailings Basin Area. This memo was formally promised as a result of the meeting on October 9, 2008 between Barr, MDNR and the Tribes at Barr's Minneapolis Office. The information presented here does not supersede the information presented in the RS74B Draft-02 report submitted on September 13, 2008 (henceforth referred to as RS74B, Draft-02). This memo further analyzes the impacts to the Embarrass River during low flow conditions and confirms that even with the changes described, the deterministically predicted water quality in the Embarrass River does not exceed any Minnesota surface water quality standards other than those already represented in RS74B, Draft-02. Only changes with respect to RS74B, Draft-02 are presented; and the table and figure numbering follows RS74B, Draft-02.

2.0 Changes in Modeling Inputs

2.1 Changes in Tailings Basin Seepage

There are two inputs from the Tailings Basin included in the Embarrass River model: seepage from Cell 2W and seepage from Cells 1E/2E. Under existing conditions (i.e., prior to PolyMet Operations) the estimated seepage from LTVSMC Cell 2W was 4,123 gpm (9.2 cfs) and from Cells 1E/2E was 900 gpm (2.01 cfs) in RS74B, Draft-02. However, the lowest monitored total flow in the river at PM-13 was 7.2 cfs in July 2004, which is less than the calculated seepage from the existing LTVSMC Tailings Basin, indicating that not all of the estimated seepage is reaching the Embarrass River. Therefore in RS74B, Draft-02 during dry conditions, only 1.2 cfs of total seepage flow of the Tailings Basin was added to the model (because baseflow in the Embarrass River at PM-13 is approximately 5 cfs). The effective seepage value of 1.2 cfs was determined based on calibration of the Embarrass River model using sulfate as a sample parameter during low flow events. Therefore, not all of the load from the Tailings Basin was accounted for in the model during low flow conditions.

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 5

The existing 4,123 gpm seepage from LTVSMC Cell 2W was calibrated against 2001 data, which was when LTVSMC was shut-down and pond on Cell 2W started to dry up. It is expected that seepage from Cell 2W would decrease over time; hence it is probable that the actual seepage from LTVSMC Cell 2W is less than 4,123 gpm in 2008. The final steady state condition has been estimated at 610 gpm. However, all the groundwater flow models of the Tailings Basin are steady-state. It was never intended to predict transient seepage losses from Cell 2W.

It is possible that the instantaneous flow measurements taken during the water quality monitoring measurements in the Embarrass River are not extremely accurate. Accurate flow measurements require a detailed rating curve that can be difficult to develop for low flows or a well-calibrated measurement device such as an ACDP. Therefore, it is possible that the actual low flow in the Embarrass River is different from the estimate of 7.2 cfs based on the July 2004 measurement.

Therefore, it was decided to calibrate the existing conditions model to obtain the total LTVSMC Tailings Basin seepage. The calibration was completed focusing on low flow conditions using a variety of parameters: calcium, chloride, copper, fluoride, iron, magnesium, sodium, and sulfate. Calibrations were performed based on the average of parameter concentrations at PM-13 observed during two flow conditions: 1) flows less than 10 cfs (occurring in July 2004, August 2004, and October 2006), and 2) flows between 10 and 20 cfs (occurring in June 2004, August 2006, November 2006, and July 2007). These calibrations are presented in Appendix I of this memo.

Under the first flow conditions, calibration was performed by assuming no surface runoff to PM-12 or PM-13. The total seepage from the Tailings Basin was then varied in order to match the model-predicted parameter concentration at PM-13 to the average of the concentrations observed at that location on the dates listed above. Groundwater inflows to the Embarrass River were held constant. The total flow in the river at PM-13 was allowed to differ from that recorded during sampling; total flow as calculated in the calibration is the sum of the Babbitt WWTP inflow, the groundwater inflow (i.e., the natural groundwater recharge), and the seepage from the Tailings Basin. This process was performed both assuming no discharge from the Pit 5NW as well as a discharge of 0.26 cfs from the Pit 5NW (the minimum observed flow based on NTS sampling data).

Calibration to the periods of flow between 10 and 20 cfs differs slightly from the method used for flows less than 10 cfs. For these flows, the flow in the Embarrass River at PM-13 was held constant at 16.5 cfs (the average of the flows observed on the dates listed above, which vary from 15.2 to 17.9 cfs). Again, groundwater inflow was held constant. Surface runoff into the Embarrass River was calculated as the remainder of the 16.5 cfs total flow less the groundwater inflow, Babbitt WWTP discharge, Pit 5NW discharge, and Tailings Basin seepage. The seepage from the Tailings Basin was varied in order to match the model-predicted parameter concentration at PM-13 to the

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 6

average of the concentrations observed at that location on the dates listed above. This process was performed both assuming no discharge from the Pit 5 NW as well as a discharge of 0.26 cfs from the Pit 5NW (the minimum observed flow based on NTS sampling data).

The results of the calibrations are presented in Table 1 of this memo. The results indicate that the seepage from the Tailings Basin to the Embarrass River upstream of PM-13 is less than the estimated seepage in RS74B, Draft-02 of 11.2 cfs during average and high flow conditions. However, the seepage from the Tailings Basin to the Embarrass River upstream of PM-13 is greater than the estimated seepage in RS74B, Draft-02 of 1.2 cfs during low flow conditions. The results of the calibration in Table 1 average about 2.1 cfs for the seepage from the Tailings Basin. The calibration of sulfate, calcium, and magnesium suggest a greater seepage flow as flows in the river at PM-13 increase from less than 10 cfs to values between 10 and 20 cfs. Chloride and sodium demonstrated the opposite trend. These contrasting trends prevent the development of a relationship between Tailings Basin seepage flow and flows in the Embarrass River. High concentrations of sulfate in the Pit 5NW prevented accurate calibration when flow in the river was less than 10 cfs and flows from Pit 5NW were considered (see Table 1). It is likely that the Pit 5NW discharge is insignificant during periods of very low flow or the load is being stored somewhere upstream in the watershed.

As seen in Table 1, the LTVSMC Tailings Basin seepage ranged from 1 to 4 cfs. When calibrated against chloride, a non-reactive solute, the estimated LTVSMC Tailings Basin seepage was 4 cfs during very low flows and with zero discharge from Pit 5NW. This is the highest value calibrated, and it was chosen to be used in the surface water quality model. Therefore, it was assumed that existing conditions seepage from Cells 1E/2E is 900 gpm (2.01 cfs). The remaining seepage (895 gpm or 1.99 cfs) is from Cell 2W and is assumed to be constant until PolyMet Tailings Basin closure. Seepage from PolyMet Tailings Basin Cells 1E/2E during operations and closure remain the same as in RS74B, Draft-02. Table 4-1 presents the seepage from the Tailings Basin-Proposed Action design and Table 4-4 presents the seepage from the Tailings Basin-Geotechnical Mitigation design for low, average and high flow conditions (i.e., the seepage rates used in modeling in this memo are the same for low, average and high flows). For comparison, Table 4-1 and Table 4-4 also provide the values used in RS74B, Draft-02.

2.2 Changes in Discharges from Babbitt WWTP & Pit 5NW

In RS74B, Draft-02 the discharges from Babbitt WWTP and Pit 5NW were assumed to be zero during low flow conditions. In this memo, the discharge from Babbitt WWTP was assumed to be 0.33 cfs under all flow conditions. The discharge from Pit 5NW is assumed to be 0.26 cfs during low flow conditions, which corresponds to the lowest measured discharge during the monitoring period of June 2001 to December 2007. The average monitored discharge from Pit 5NW of 1.99 cfs was

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 7

assumed during average and high flow conditions. Table 2-1 has been updated to reflect the changes in modeled discharges from Babbitt WWTP and Pit 5NW during low flow conditions.

2.3 Changes in Input Water Quality

There are no changes in water quality from RS74B, Draft-02 except for the surface runoff, which was recalibrated for existing conditions (i.e., no PolyMet Tailings Basin and Hydrometallurgical Residue Facility inputs) using a seepage rate of 4 cfs from the existing LTVSMC Tailings Basin. Table 5-2 displays the recalibrated surface runoff water quality.

3.0 Modeling Results

3.1 Tailings Basin-Proposed Action

3.1.1 Deterministic Water Quality Predictions at PM-12 of Tailings Basin-Proposed Action

Results at surface water quality monitoring location PM-12 are not presented in this memo because this location is upstream of the Tailings Basin and the water quality of all inputs to this location are below the Minnesota surface water quality standards. However, for reference the results are presented in Tables 5-4 to 5-6.

3.1.2 Deterministic Water Quality Predictions at PM-13 of Tailings Basin-Proposed Action

Deterministic water quality predictions of each constituent of analysis during Years 1, 5, 8, 9, 15, 20, Closure, and Post-Closure at surface water monitoring location PM-13 along with the most stringent of the chronic aquatic toxicity-based Minnesota surface water quality standards are presented in Tables 5-7 to 5-9 for low, average and high flows under Tailings Basin-Proposed Action. The maximum deterministic water quality predictions of some key water quality parameters are summarized below:

• Antimony. The highest deterministic water quality prediction of antimony is 0.00509 mg/L at PM-13 in Year 20 during low flow conditions under Tailings Basin-Proposed Action vs. 0.00209 mg/L at PM-13 in Year 20 during low flow conditions in RS74B, Draft-02. This new predicted highest value is about one-sixth of the Minnesota surface water quality standard of 0.031 mg/L. The average concentration from surface water quality monitoring in 2004, 2006 and 2007 at PM-13 is 0.00150 mg/L.

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 8

• Arsenic. The highest deterministic water quality prediction of arsenic is 0.00779 mg/L at PM-13 in Year 20 during low flow conditions under Tailings Basin-Proposed Action vs. 0.00393 mg/L at PM-13 in Post-Closure during low flow conditions in RS74B, Draft-02. This new predicted highest value is about one-sixth of the Minnesota surface water quality standard of 0.053 mg/L. The average concentration from surface water quality monitoring in 2004, 2006 and 2007 at PM-13 is 0.00100 mg/L.

- Cobalt. The highest deterministic water quality prediction of cobalt is 0.00414 mg/L at PM-13 in Year 20 during low flow conditions under Tailings Basin-Proposed Action vs. 0.00172 mg/L at PM-13 in Year 20 during low flow conditions in RS74B, Draft-02. This new predicted highest value is about 80 percent of the Minnesota surface water quality standard of 0.005 mg/L. The average concentration from surface water quality monitoring in 2004, 2006 and 2007 at PM-13 is 0.00050 mg/L.
- Copper. The highest deterministic water quality prediction of copper is 0.01110 mg/L at PM-13 in Year 20 during low flow conditions under Tailings Basin-Proposed Action vs. 0.00579 mg/L at PM-13 in Post-Closure during low flow conditions in RS74B, Draft-02. This new predicted highest value is about two-thirds of the Minnesota surface water quality standard of 0.0172 mg/L, based on a hardness of 246.7 mg/L. (The corresponding Minnesota surface water quality standard in RS74B, Draft-02 is 0.0116 mg/L based on a hardness of 130.7 mg/L). The average concentration from surface water quality monitoring in 2004, 2006 and 2007 at PM-13 is 0.00200 mg/L.
- Nickel. The highest deterministic water quality prediction of nickel is 0.06689 mg/L at PM-13 in Year 15 during low flow conditions under Tailings Basin-Proposed Action vs. 0.01829 mg/L at PM-13 in Year 20 during low flow conditions in RS74B, Draft-02. This new predicted highest value is less than two-thirds the Minnesota surface water quality standard of 0.1086 mg/L based on a hardness of 238.0 mg/L. (The corresponding Minnesota surface water quality standard in RS74B, Draft-02 is 0.0804 mg/L based on a hardness of 166.7 mg/L). The average concentration from surface water quality monitoring in 2004, 2006 and 2007 at PM-13 is 0.00207 mg/L.
- Sulfate. The highest deterministic water quality prediction of sulfate is 156.1 mg/L at PM-13 in Year 15 during low flow conditions under Tailings Basin-Proposed Action vs. 63.4 mg/L at PM-13 in Year 20 during low flow conditions in RS74B, Draft-02. There is no Minnesota surface water quality standard for sulfate applicable to the Use Classification of the Embarrass River. The average concentration from surface water quality monitoring in 2004, 2006 and 2007 at PM-13 is 36.1 mg/L.

Identical to RS74B, Draft-02, all constituents meet minimum in-stream Minnesota water quality standards at PM-13 during low, average and high flow conditions for all modeled scenarios under the

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 9

Tailings Basin-Proposed Action except for aluminum (see Tables 5-7 to 5-9). See Section 5.2.3.1 of RS74B, Draft-02 for discussion.

The deterministic model predicts sulfate concentrations at PM-13 that are above the average measured concentration of 36.1 mg/L. The high concentrations of sulfate in the Pit 5NW discharge (1,046 mg/L) result in a significant load to the Embarrass River, as the deterministic model assumes conservation of mass. During low flow conditions, seepage from Cells 1E/2E of the PolyMet Tailings Basin also results in a significant load in the Embarrass River (the highest predicted concentration of seepage from Cells 1E/2E is 241.9 mg/L in Year 15). Although the model calibration works well under average flow conditions, it does not under low flow conditions. Including the load from the Pit 5NW discharge and a flow of 4 cfs from the existing LTVSMC Tailings Basin, the model calibration resulted in predicted sulfate concentrations (95.9 mg/L for low flow conditions) that are higher than the measured concentrations during low flow conditions (41.30 mg/L) even without any additional mining inputs. When using the existing conditions model to obtain the total LTVSMC Tailings Basin seepage using sulfate, it was found that a LTVSMC Tailings Basin seepage flow rate of approximately 1.6 cfs provided the best fit calibration for flows less than 10 cfs and with no Pit 5NW discharge. It is possible that sulfate is being stored in wetlands, banks or ice during low flow conditions.

3.1.3 Culpability Analysis of Tailings Basin-Proposed Action

The culpability analysis (i.e., the degree of a particular Plant Site facility's or natural feature's impact on the overall deterministic water quality predictions in the Embarrass River) for the six water quality parameters of importance (antimony, arsenic, cobalt, copper, nickel and sulfate) and under low, average and high flow conditions are presented in Appendix G of this memo. All upstream impacts, including those from both natural features (i.e., groundwater recharge and surface runoff from areas that will not be disturbed by the Plant Site facilities) and Tailings Basin facilities (e.g., hydrometallurgical residue cell liner leakage, Cells 1E/2E seepage) were investigated for all scenarios and flow conditions at the PM-13 surface water quality monitoring stations.

The culpability analysis is completed for two sets of graphs which are presented in Appendix G of this memo for Tailings Basin-Proposed Action:

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 10

- Mass flux of upstream impacts (concentration of the feature multiplied by the flow of the feature).
- Percent contributions at PM-13 (mass flux of each feature divided by total mass flux at a certain location).

In Appendix G, "-" indicates that the mass flux is zero (e.g., there is no surface runoff during low flow conditions), whereas "0.00" indicates that the mass flux is very small. The figures in Appendix G present the full set of results of the culpability analysis for the Tailings Basin-Proposed Action. The main results of this analysis are presented below. If a result is different from RS74B, Draft-02, the RS74B, Draft-02 result is presented in a sub-bullet for comparison.

<u>Low Flow Conditions – Tailings Basin-Proposed Action</u>

- Seepage from Cells 1E/2E of the Tailings Basin in all years, followed by natural groundwater recharge from the watershed in Years 1, 5, 8, 9, Closure and Post-Closure, represents the main input determining concentrations of arsenic.
 - o In RS74B, Draft-02, natural groundwater recharge from the watershed, followed by seepage from Cell 2W in Year 1 and seepage from Cells 1E/2E of the Tailings Basin in all other years, represents the main input determining concentrations of arsenic.
- Seepage from Cells 1E/2E of the Tailings Basin in Years 5, 8, 9, 15 and 20, followed by natural groundwater recharge from the watershed in Years 5, 8, and 9, represents the main input determining concentrations of cobalt. Natural groundwater recharge from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin and seepage from Cell 2W, represents the main input determining concentrations of cobalt in Years 1, Closure and Post-Closure.
 - In RS74B, Draft-02, natural groundwater recharge from the watershed, followed by seepage from Cell 2W in Year 1 and seepage from Cells 1E/2E of the Tailings Basin in all other years, represents the main input determining concentrations of cobalt.
- Natural groundwater recharge from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin and seepage from Cell 2W, represents the main input determining concentrations of copper and nickel in Years 1.
 - o In RS74B, Draft-02, natural groundwater recharge from the watershed, followed by seepage from Cell 2W in Year 1 and seepage from Cells 1E/2E of the Tailings

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 11

Basin in all other years, represents the main input determining concentrations of copper.

- o In RS74B, Draft-02, natural groundwater recharge from the watershed represents the main input determining concentrations of nickel in Year 1.
- Seepage from Cells 1E/2E of the Tailings Basin in Years 5, 8, 9, 15, 20, Closure and Post-Closure, followed by natural groundwater recharge from the watershed in Years 5, 8, 9, Closure and Post-Closure, represents the main input determining concentrations of copper.
 - o In RS74B, Draft-02, natural groundwater recharge from the watershed, followed by seepage from Cell 2W in Year 1 and seepage from Cells 1E/2E of the Tailings Basin in all other years, represents the main input determining concentrations of copper.
- Seepage from Cells 1E/2E of the Tailings Basin in Years 5, 8, 9, 15, 20, Closure and Post-Closure, followed by natural groundwater recharge from the watershed in Years 5, Closure and Post-Closure, represents the main input determining concentrations of nickel.
 - o In RS74B, Draft-02, seepage from Cells 1E/2E of the Tailings Basin, followed by natural groundwater recharge from the watershed, represents the main input determining concentrations of nickel in Years 15 and 20.
 - o In RS74B, Draft-02, natural groundwater recharge from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of nickel in Years 5, 8, 9, Closure and Post-Closure.
- Seepage from Cells 1E/2E of the Tailings Basin in all years, followed by natural groundwater recharge from the watershed in Years 1, 5, Closure and Post-Closure, represents the main input determining concentrations of antimony.
 - o In RS74B, Draft-02, natural groundwater recharge from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of antimony in all years.
- Seepage from Cells 1E/2E of the Tailings Basin, followed by seepage from Cell 2W and discharge from Pit 5NW, represents the main input determining concentrations of sulfate in Years 1, 5, 8 and 9.
 - o In RS74B, Draft-02, seepage from Cell 2W, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of sulfate in Year 1.

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 12

- o In RS74B, Draft-02, seepage from Cell 2W, followed by liner leakage from the Hydrometallurgical Residue Cells and seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of sulfate in Years 5, 8 and 9.
- Seepage from Cells 1E/2E of the Tailings Basin represents the main input determining concentrations of sulfate in Years 15 and 20.
 - o In RS74B, Draft-02, liner leakage from the Hydrometallurgical Residue Cells, followed by seepage from Cells 1E/2E of the Tailings Basin and from Cell 2W, represents the main input determining concentrations of sulfate in Years 15 and 20.
- Discharge from Pit 5NW, followed by seepage from Cells 1E/2E of the Tailings Basin and from Cell 2W, represents the main input determining concentrations of sulfate in Closure and Post-Closure.
 - o In RS74B, Draft-02, seepage from Cell 2W, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of sulfate in Closure.
 - o In RS74B, Draft-02, seepage from Cells 1E/2E of the Tailings Basin, followed by seepage from Cell 2W, represents the main input determining concentrations of sulfate in Post-Closure.

Average Flow Conditions – Tailings Basin-Proposed Action

- Seepage from Cells 1E/2E of the Tailings Basin, followed by natural surface water runoff from the watershed, represents the main input determining concentrations of arsenic in Years 15 and 20. This is the same as in RS74B, Draft-02.
- Natural surface water runoff from the watershed, followed by Seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of arsenic in Years 1, 5, 8, 9, Closure and Post-Closure.
 - o In RS74B, Draft-02, natural surface water runoff from the watershed, followed by seepage from Cell 2W, represents the main input determining concentrations of arsenic in Year 1.
 - o In RS74B, Draft-02, natural surface water runoff from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of arsenic in Years 5, 8, 9, Closure and Post-Closure.

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 13

• Natural surface water runoff from the watershed represents the main input determining concentrations of cobalt in Years 1, 5, 8, 9, Closure and Post-Closure.

- o In RS74B, Draft-02, natural surface water runoff from the watershed, followed by seepage from Cell 2W, represents the main input determining concentrations of cobalt in Year 1.
- o In RS74B, Draft-02, natural surface water runoff from the watershed represents the main input determining concentrations of cobalt in Years 5, 8, 9, Closure and Post-Closure.
- Seepage from Cells 1E/2E of the Tailings Basin, followed by natural surface water runoff from the watershed, represents the main input determining concentrations of cobalt in Years 15 and 20. This is the same as in RS74B, Draft-02.
- Natural surface water runoff from the watershed represents the main input determining concentrations of copper in Year 1.
 - o In RS74B, Draft-02, natural surface water runoff from the watershed, followed by seepage from Cell 2W, represents the main input determining concentrations of copper in Year 1.
- Natural surface water runoff from the watershed, followed by Seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of copper in Years 5, 8, 9, Closure and Post-Closure. This is the same as in RS74B, Draft-02.
- Seepage from Cells 1E/2E of the Tailings Basin, followed by natural surface water runoff from the watershed, represents the main input determining concentrations of copper in Years 15 and 20. This is the same as in RS74B, Draft-02.
- Natural surface water runoff from the watershed, followed by natural groundwater recharge from the watershed, represents the main input determining concentrations of nickel in Year 1.
 - In RS74B, Draft-02, natural surface water runoff from the watershed, followed by seepage from Cell 2W, represents the main input determining concentrations of nickel in Year 1.
- Seepage from Cells 1E/2E of the Tailings Basin, followed by natural surface water runoff from the watershed, represents the main input determining concentrations of nickel in Years 5, 8, and 9. This is the same as in RS74B, Draft-02.
- Seepage from Cells 1E/2E of the Tailings Basin represents the main input determining concentrations of nickel in Years 15 and 20. This is the same as in RS74B, Draft-02.

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 14

• Natural surface water runoff from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of nickel in Closure and Post-Closure. This is the same as in RS74B, Draft-02.

- Seepage from Cells 1E/2E of the Tailings Basin, followed by natural groundwater recharge from the watershed, represents the main input determining concentrations of antimony in Years 1 and 5, and in Closure and Post-Closure.
 - In RS74B, Draft-02, seepage from Cells 1E/2E of the Tailings Basin, followed by natural groundwater recharge from the watershed, represents the main input determining concentrations of antimony in Year 1 and in Closure and Post-Closure.
- Seepage from Cells 1E/2E of the Tailings Basin represents the main input determining concentrations of antimony in Years 8, 9, 15 and 20.
 - o In RS74B, Draft-02, seepage from Cells 1E/2E of the Tailings Basin represents the main input determining concentrations of antimony in Years 5, 8, 9, 15 and 20.
- Discharge from Pit 5NW in all years, followed by seepage from Cells 1E/2E of the Tailings Basin in Years 8, 9, 15 and 20, represents the main input determining concentrations of sulfate.
 - o In RS74B, Draft-02, discharge from Pit 5NW, followed by seepage from Cell 2W and seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of sulfate in Years 1, 5, 8, and 9.
 - o In RS74B, Draft-02, discharge from Pit 5NW, followed by seepage from Cells 1E/2E of the Tailings Basin and seepage from Cell 2W, represents the main input determining concentrations of sulfate in Years 15 and 20.
 - o In RS74B, Draft-02, discharge from Pit 5NW represents the main input determining concentrations of sulfate in Closure and Post-Closure.

<u>High Flow Conditions – Tailings Basin-Proposed Action</u>

- Natural surface water runoff from the watershed represents the main input determining concentrations of arsenic, cobalt and copper in all years. This is the same as in RS74B, Draft-02.
- Natural surface water runoff from the watershed represents the main input determining concentrations of nickel in Years 1, 5, 8, 9, Closure and Post-Closure. This is the same as in RS74B, Draft-02.

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 15

- Natural surface water runoff from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of nickel in Years 15 and 20. This is the same as in RS74B, Draft-02.
- Natural surface water runoff from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of antimony in Years 1, 5, Closure and Post-Closure.
 - o In RS74B, Draft-02, Natural surface water runoff from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of antimony in Years 1, Closure and Post-Closure.
 - Seepage from Cells 1E/2E of the Tailings Basin, followed by natural surface water runoff from the watershed, represents the main input determining concentrations of antimony in Years 8, 9, 15 and 20.
 - o In RS74B, Draft-02, Seepage from Cells 1E/2E of the Tailings Basin, followed by natural surface water runoff from the watershed, represents the main input determining concentrations of antimony in Years 5, 8, 9, 15, and 20.
 - Natural surface water runoff from the watershed, followed by discharge from Pit 5NW, represents the main input determining concentrations of sulfate in all years. This is the same as in RS74B, Draft-02.

3.1.4 Factor to Exceed of Tailings Basin-Proposed Action

This section presents the analysis conducted to determine what increase in NorthMet Project's Tailings Basin seepage chemical concentrations would cause the deterministic water quality predictions in the Embarrass River watershed to exceed Minnesota surface water quality standards under Tailings Basin-Proposed Action.

The predicted chemical concentrations for the leachate from the PolyMet Tailings Basin (Cells 1E/2E) and Hydrometallurgical Residue Facility were multiplied concurrently by a factor. The determination of the factor for a given parameter (antimony, arsenic, cobalt, copper and nickel) and flow condition (low, average or high) was based on deterministic water quality predictions in the Embarrass River that exceed Minnesota surface water quality standards for that parameter at PM-13 and a given stage of the Tailings Basin development or closure under the Tailings Basin- Proposed Action.

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 16

Table 5-10 presents the smallest factors, along with the location and scenario that would cause the deterministic water quality predictions to exceed Minnesota surface water quality standards in the Embarrass River at PM-13. There is no applicable Minnesota surface water quality standard for sulfate given the use classification of the Embarrass River. However, there is emerging interest in sulfate, and so the corresponding sulfate concentration for the smallest factors referred to above is also presented in Table 5-10.

Table 5-11 compares the concentrations of leachate from PolyMet Tailings Basin (Cells 1E/2E) and Hydrometallurgical Residue Facility (all occurring concurrently) that would cause Embarrass River deterministic water chemistry predictions to exceed Minnesota surface water quality standards and the "base case" concentrations of these Tailings Basin features. "Base Case" concentrations are those reasonable worst case concentrations presented in Tables 4-2 and 4-3 of RS74B, Draft-02.

The main results of this analysis are presented below:

- Antimony. The smallest factor to exceed the corresponding standard is 6.4 under the Tailings Basin- Proposed Action vs. 33.0 in RS74B, Draft-02.
- Arsenic. The smallest factor to exceed the corresponding standard is 7.9 under the Tailings Basin- Proposed Action vs. 34.0 in RS74B, Draft-02.
- Cobalt. The smallest factor to exceed the corresponding standard is 1.2 under the Tailings Basin- Proposed Action vs. 5.7 in RS74B, Draft-02.
- Copper. The smallest factor to exceed the corresponding standard is 1.7 under the Tailings Basin- Proposed Action vs. 3.6 in RS74B, Draft-02.
- Nickel. The smallest factor to exceed the corresponding standard is 1.8 under the Tailings Basin- Proposed Action vs. 6.1 in RS74B, Draft-02.

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 17

3.2 Tailings Basin-Geotechnical Mitigation

3.2.1 Deterministic Water Quality Predictions at PM-12 of Tailings Basin-Geotechnical Mitigation

Results at surface water quality monitoring location PM-12 are not presented in this memo because this location is upstream of the Tailings Basin and the water quality of all inputs to this location are below the Minnesota surface water quality standards. However, for reference the results are presented in Tables 7-1 to 7-3.

3.2.2 Deterministic Water Quality Predictions at PM-13 of Tailings Basin-Geotechnical Mitigation

Deterministic water quality predictions of each constituent of analysis during Years 1, 5, 10, 15, 20, Closure, and Post-Closure at surface water monitoring location PM-13 along with the most stringent of the chronic aquatic toxicity-based Minnesota surface water quality standards are presented in Tables 7-4 to 7-6 for low, average and high flows under Tailings Basin-Geotechnical Mitigation. The maximum deterministic water quality predictions of some key water quality parameters are summarized below:

- Antimony. The highest deterministic water quality prediction of antimony is 0.00555 mg/L at PM-13 in Year 10 during low flow conditions under Tailings Basin-Geotechnical Mitigation vs. 0.00217 mg/L at PM-13 in Year 10 during low flow conditions in RS74B, Draft-02. This new predicted highest value is about one-sixth of the Minnesota surface water quality standard of 0.031 mg/L. The average concentration from surface water quality monitoring in 2004, 2006 and 2007 at PM-13 is 0.00150 mg/L.
- Arsenic. The highest deterministic water quality prediction of arsenic is 0.00762 mg/L at PM-13 in Post-Closure during low flow conditions under Tailings Basin-Geotechnical Mitigation vs. 0.00545 mg/L at PM-13 in Post-Closure during low flow conditions in RS74B, Draft-02. This new predicted highest value is about one-sixth of the Minnesota surface water quality standard of 0.053 mg/L. The average concentration from surface water quality monitoring in 2004, 2006 and 2007 at PM-13 is 0.00100 mg/L.
- Cobalt. The highest deterministic water quality prediction of cobalt is 0.00164 mg/L at PM-13 in Year 20 during low flow conditions under Tailings Basin-Geotechnical Mitigation vs. 0.00131 mg/L at PM-13 in Post-Closure during low flow conditions in RS74B, Draft-02. This new predicted highest value is about one-third of the Minnesota surface water quality

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 18

standard of 0.005 mg/L. The average concentration from surface water quality monitoring in 2004, 2006 and 2007 at PM-13 is 0.00050 mg/L.

- Copper. The highest deterministic water quality prediction of copper is 0.00740 mg/L at PM-13 in Year 20 during low flow conditions under Tailings Basin-Geotechnical Mitigation vs. 0.00513 mg/L at PM-13 in Post-Closure during low flow conditions in RS74B, Draft-02. This new predicted highest value is less than one-half the Minnesota surface water quality standard of 0.0162 mg/L, based on a hardness of 223.5 mg/L. (The corresponding Minnesota surface water quality standard in RS74B, Draft-02 is 0.01278 mg/L based on a hardness of 152.8 mg/L). The average concentration from surface water quality monitoring in 2004, 2006 and 2007 at PM-13 is 0.00200 mg/L.
- Nickel. The highest deterministic water quality prediction of nickel is 0.01451 mg/L at PM-13 in Year 20 during low flow conditions under Tailings Basin-Geotechnical Mitigation vs. 0.00868 mg/L at PM-13 in Year 20 during low flow conditions in RS74B, Draft-02. This new predicted highest value is about one-sixth the Minnesota surface water quality standard of 0.1030 mg/L based on a hardness of 223.5 mg/L. (The corresponding Minnesota surface water quality standard in RS74B, Draft-02 is 0.07829 mg/L based on a hardness of 161.6 mg/L). The average concentration from surface water quality monitoring in 2004, 2006 and 2007 at PM-13 is 0.00207 mg/L.
- Sulfate. The highest deterministic water quality prediction of sulfate is 150.1 mg/L at PM-13 in Year 10 during low flow conditions under Tailings Basin-Geotechnical Mitigation vs. 61.6 mg/L at PM-13 in Year 10 during low flow conditions in RS74B, Draft-02. There is no Minnesota surface water quality standard for sulfate applicable to the Use Classification of the Embarrass River. The average concentration from surface water quality monitoring in 2004, 2006 and 2007 at PM-13 is 36.1 mg/L.

Identical to RS74B, Draft-02, all constituents meet minimum in-stream Minnesota water quality standards at PM-13 during low, average and high flow conditions for all modeled scenarios under the Tailings Basin-Geotechnical Mitigation except for aluminum (see Tables 7-4 to 7-6). See Section 7.2.3.1 of RS74B, Draft-02 for discussion.

The deterministic model predicts sulfate concentrations at PM-13 that are above the average measured concentration of 36.1 mg/L. The high concentrations of sulfate in the Pit 5NW discharge (1,046 mg/L) result in a significant load to the Embarrass River, as the deterministic model assumes conservation of mass. During low flow conditions, seepage from Cell 1E/2E of the PolyMet Tailings Basin also results in a significant load in the Embarrass River (the highest predicted concentration of seepage from Cell 1E/2E is 223.1 mg/L in Year 10). Although the model calibration works well

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 19

under average flow conditions, it does not under low flow conditions. Including the load from the Pit 5NW discharge and a flow of 4 cfs from the LTVSMC Tailings Basin, the model calibration resulted in predicted sulfate concentrations (95.9 mg/L for low flow conditions) higher than the measured concentrations during low flow conditions (41.30 mg/L) even without any additional mining inputs. When using the existing conditions model to obtain the total LTVSMC Tailings Basin seepage using sulfate, it was found that a LTVSMC Tailings Basin seepage flow rate of approximately 1.6 cfs provided the best fit calibration for flows less than 10 cfs and with no Pit 5NW discharge. It is possible that sulfate is being stored in wetlands, banks or ice during low flow conditions.

3.2.3 Culpability Analysis of Tailings Basin-Geotechnical Mitigation

The culpability analysis (i.e., the degree of a particular Plant Site facility's or natural feature's impact on the overall deterministic water quality predictions in the Embarrass River) for the six water quality parameters of importance (antimony, arsenic, cobalt, copper, nickel and sulfate) and under low, average and high flow conditions are presented in Appendix G of this memo. All upstream impacts, including those from both natural features (i.e., groundwater recharge and surface runoff from areas that will not be disturbed by the Plant Site facilities) and Tailings Basin facilities (e.g., hydrometallurgical residue cells liner leakage, Cells 1E/2E seepage) were investigated for all scenarios and flow conditions at the PM-13 surface water quality monitoring stations.

The culpability analysis is completed for two sets of graphs which are presented in Appendix G for Tailings Basin-Geotechnical Mitigation:

- Mass flux of upstream impacts (concentration of the feature multiplied by the flow of the feature).
- Percent contributions at PM-13 (mass flux of each feature divided by total mass flux at a certain location).

In Appendix G, "-" indicates that the mass flux is zero (e.g., there is no surface runoff during low flow conditions), whereas "0.00" indicates that the mass flux is very small. The figures in Appendix G present the full set of results of the culpability analysis for the Tailings Basin-Geotechnical Mitigation. The main results of this analysis are presented below. If a result is

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 20

different from RS74B, Draft-02, the RS74B, Draft-02 result is presented in a sub-bullet for comparison.

Low Flow Conditions - Tailings Basin-Geotechnical Mitigation

- Seepage from Cells 1E/2E of the Tailings Basin, followed by natural groundwater recharge from the watershed, represents the main input determining concentrations of arsenic in all years.
 - o In RS74B, Draft-02, natural groundwater recharge from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of arsenic in Years 1, 5, 10, 15, 20 and Closure.
 - In RS74B, Draft-02, seepage from Cells 1E/2E of the Tailings Basin, followed by natural groundwater recharge from the watershed, represents the main input determining concentrations of arsenic in Post-Closure.
- Natural groundwater recharge from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin and seepage from Cell 2W, represents the main input determining concentrations of cobalt in Years 1, Closure and Post-Closure.
- Seepage from Cells 1E/2E of the Tailings Basin, followed by natural groundwater recharge from the watershed, represents the main input determining concentrations of cobalt in Years 5, 10, 15 and 20.
 - o In RS74B, Draft-02, natural groundwater recharge from the watershed, followed by seepage from Cell 2W, represents the main input determining concentrations of cobalt in Years 1, 5, 10, 15 and Closure.
 - o In RS74B, Draft-02, natural groundwater recharge from the watershed, followed seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of cobalt in Years 20 and Post-Closure.
- Seepage from Cells 1E/2E of the Tailings Basin, followed by natural groundwater recharge from the watershed, represents the main input determining concentrations of copper in all years.
 - o In RS74B, Draft-02, natural groundwater recharge from the watershed in all years, followed by seepage from Cells 1E/2E of the Tailings Basin in Years 20 and Post-Closure, represents the main input determining concentrations of copper.

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 21

 Seepage from Cells 1E/2E of the Tailings Basin, followed by natural groundwater recharge from the watershed, represents the main input determining concentrations of nickel in all years.

- o In RS74B, Draft-02, natural groundwater recharge from the watershed in all years, followed by seepage from Cells 1E/2E of the Tailings Basin in Years 1, 5, 10, 15, and 20, represents the main input determining concentrations of nickel.
- Seepage from Cells 1E/2E of the Tailings Basin, followed by natural groundwater recharge from the watershed, represents the main input determining concentrations of antimony in Year 1.
- Seepage from Cells 1E/2E of the Tailings Basin represents the main input determining concentrations of antimony in Years 5, 10, 15 and 20.
- Natural groundwater recharge from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of antimony in Closure and Post-Closure.
 - o In RS74B, Draft-02, natural groundwater recharge from the watershed in all years, followed by seepage from Cells 1E/2E of the Tailings Basin in Years 1, 5, 10, 15, and 20, represents the main input determining concentrations of antimony.
- Seepage from Cells 1E/2E of the Tailings Basin, followed by seepage from Cell 2W and discharge from Pit 5NW, represents the main input determining concentrations of sulfate in Year 1.
 - o In RS74B, Draft-02, seepage from Cell 2W, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of sulfate in Years 1 and Closure.
- Seepage from Cells 1E/2E of the Tailings Basin represents the main input determining concentrations of sulfate in Years 5, 10, 15, and 20.
 - o In RS74B, Draft-02, seepage from Cell 2W, followed by liner leakage from the Hydrometallurgical Residue Cells and seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of sulfate in Year 5.
 - o In RS74B, Draft-02, liner leakage from the Hydrometallurgical Residue Cells, followed by seepage from Cells 1E/2E of the Tailings Basin and seepage from Cell 2W, represents the main input determining concentrations of sulfate in Years 10, 15 and 20.

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 22

• Seepage from Cells 1E/2E of the Tailings Basin, followed by discharge from Pit 5NW and by seepage from Cell 2W, represents the main input determining concentrations of sulfate in Closure and Post-Closure.

o In RS74B, Draft-02, seepage from Cells 1E/2E of the Tailings Basin, followed by seepage from Cell 2W, represents the main input determining concentrations of sulfate in Post-Closure.

<u>Average Flow Conditions – Tailings Basin-Geotechnical Mitigation</u>

- Natural surface water runoff from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of arsenic in all years. This is the same as in RS74B, Draft-02.
- Natural surface water runoff from the watershed represents the main input determining concentrations of cobalt in all years. This is the same as in RS74B, Draft-02. However, in the updated modeling, seepage from Cells 1E/2E of the Tailings Basin is an important secondary input determining concentrations of cobalt in Year 20.
- Natural surface water runoff from the watershed in all years, followed by seepage from Cells 1E/2E of the Tailings Basin in Years 10, 15 and 20 only, represents the main input determining concentrations of copper. This is the same as in RS74B, Draft-02.
- Natural surface water runoff from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of nickel in Year 1.
 - o In RS74B, Draft-02, natural surface water runoff from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin and seepage from Cell 2W, represents the main input determining concentrations of nickel in Year 1.
- Seepage from Cells 1E/2E of the Tailings Basin, followed by natural surface water runoff from the watershed, represents the main input determining concentrations of nickel in Years 5, 10, 15 and 20.
 - o In RS74B, Draft-02, seepage from Cells 1E/2E of the Tailings Basin, followed by natural surface water runoff from the watershed and seepage from Cell 2W, represents the main input determining concentrations of nickel in Years 5, 10, 15 and 20.
- Natural surface water runoff from the watershed, followed by natural groundwater recharge from the watershed, represents the main input determining concentrations of nickel in Closure and Post-Closure. This is the same as in RS74B, Draft-02.

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 23

- Seepage from Cells 1E/2E of the Tailings Basin represents the main input determining concentrations of antimony in Years 1, 5, 10, 15 and 20. This is the same as in RS74B, Draft-02.
- Natural groundwater recharge from the watershed, followed by natural surface water runoff from the watershed, represents the main input determining concentrations of antimony in Closure and Post-Closure.
 - In RS74B, Draft-02, natural groundwater recharge from the watershed represents the main input determining concentrations of antimony in Closure and Post-Closure.
- Discharge from Pit 5NW, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of sulfate in Years 1, 5, 10, 15 and 20.
 - o In RS74B, Draft-02, discharge from Pit 5NW, followed by seepage from Cell 2W and seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of sulfate in Years 1, 5, 10, 15 and 20.
- Discharge from Pit 5NW represents the main input determining concentrations of sulfate in Closure and Post-Closure. This is the same as in RS74B, Draft-02.

<u>High Flow Conditions – Tailings Basin-Geotechnical Mitigation</u>

- Natural surface water runoff from the watershed represents the main input determining concentrations of arsenic, cobalt, copper, and nickel in all years. This is the same as in RS74B, Draft-02.
- Natural surface water runoff from the watershed, followed by seepage from Cells 1E/2E of the Tailings Basin, represents the main input determining concentrations of antimony in Year 1.
 - o In RS74B, Draft-02, seepage from Cells 1E/2E of the Tailings Basin, followed by natural surface water runoff from the watershed, represents the main input determining concentrations of antimony in Year 1.
- Seepage from Cells 1E/2E of the Tailings Basin, followed by natural surface water runoff from the watershed, represents the main input determining concentrations of antimony in Years 5, 10, 15 and 20. This is the same as in RS74B, Draft-02.
- Natural surface water runoff from the watershed represents the main input determining concentrations of antimony in Closure and Post-Closure.

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 24

o In RS74B, Draft-02, natural surface water runoff from the watershed, followed by natural groundwater recharge from the watershed, represents the main input determining concentrations of antimony in Closure.

- o In RS74B, Draft-02, natural surface water runoff from the watershed represents the main input determining concentrations of antimony in Post-Closure.
- Natural surface water runoff from the watershed, followed by discharge from Pit 5NW, represents the main input determining concentrations of sulfate in all years. This is the same as in RS74B, Draft-02.

3.2.4 Factor to Exceed of Tailings Basin-Geotechnical Mitigation

This section presents the analysis conducted to determine what increase in NorthMet Project's Tailings Basin seepage chemical concentrations would cause the deterministic water quality predictions in the Embarrass River watershed to exceed Minnesota surface water quality standards under Tailings Basin-Geotechnical Mitigation.

The predicted chemical concentrations for the leachate from the PolyMet Tailings Basin (Cells 1E/2E) and Hydrometallurgical Residue Facility were multiplied concurrently by a factor. The determination of the factor for a given parameter (antimony, arsenic, cobalt, copper and nickel) and flow condition (low, average or high) was based on deterministic water quality predictions in the Embarrass River that exceed Minnesota surface water quality standards for that parameter at PM-13 and a given stage of the Tailings Basin development or closure under the Tailings Basin-Geotechnical Mitigation.

Table 5-10 presents the smallest factors, along with the location and scenario that would cause the deterministic water quality predictions to exceed Minnesota surface water quality standards in the Embarrass River at PM-13. There is no applicable Minnesota surface water quality standard for sulfate given the use classification of the Embarrass River. However, there is emerging interest in sulfate, and so the corresponding sulfate concentration for the smallest factors referred to above is also presented in Table 5-10.

Table 5-11 compares the concentrations of leachate from PolyMet Tailings Basin (Cells 1E/2E) and Hydrometallurgical Residue Facility (all occurring concurrently) that would cause Embarrass River deterministic water chemistry predictions to exceed Minnesota surface water quality standards and

Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed - PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page: 25

the "base case" concentrations of these Tailings Basin features. "Base Case" concentrations are those reasonable worst case concentrations presented in Tables 4-3 and 4-5 of RS74B, Draft-02.

The main results of this analysis are presented below:

- Antimony. The smallest factor to exceed the corresponding standard is 6.2 under the Tailings Basin-Geotechnical Mitigation vs. 32.0 in RS74B, Draft-02.
- Arsenic. The smallest factor to exceed the corresponding standard is 9.3 under the Tailings Basin-Geotechnical Mitigation vs. 16.9 in RS74B, Draft-02.
- Cobalt. The smallest factor to exceed the corresponding standard is 4.4 under the Tailings Basin-Geotechnical Mitigation vs. 13.7 in RS74B, Draft-02.
- Copper. The smallest factor to exceed the corresponding standard is 2.7 under the Tailings Basin-Geotechnical Mitigation vs. 6.1 in RS74B, Draft-02.
- Nickel. The smallest factor to exceed the corresponding standard is 9.2 under the Tailings Basin-Geotechnical Mitigation vs. 31.1 in RS74B, Draft-02.

4.0 Conclusions

The deterministically predicted water quality in the Embarrass River does not exceed any additional Minnesota surface water quality standards than was presented in RS74B, Draft-02. (The only parameter to exceed Minnesota surface water quality standards in RS74B, Draft-02 was aluminum). However, there are increases in the concentrations of almost all parameters during low flow conditions when the seepage from the Tailings Basin (Cells 1E & 2E and Cell 2W) and discharges from Babbitt WWTP and Pit 5NW were increased. Under Tailings Basin-Proposed Action, the predicted concentrations at PM-13 of cobalt, copper and nickel are within two-thirds of the Minnesota surface water quality standard. The smallest factor to exceed the corresponding standard is 1.2, 1.7 and 1.8 for cobalt, copper, and nickel, respectively.

The predicted concentrations at PM-13 under the Tailings Basin-Geotechnical Mitigation are further below the Minnesota surface water quality standards than under the Tailings Basin-Proposed Action. The highest predicted concentration of copper is less than one-half the Minnesota surface water quality standard. The smallest factor to exceed the corresponding standard is 2.7 for copper under

To: Jim Scott - PolyMet, Stuart Arkley - MDNR

From: Katie Wenigmann, Greg Williams, Miguel Wong
Subject: Changes to the Tailings Basin Flows in the Embarrass River Watershed – PolyMet RS-74

Date: October 14, 2008 Project: 23/69-862-015-074

Page:

Tailings Basin-Geotechnical Mitigation; factors for other parameters of interest are larger, indicating that the predicted concentrations are relatively much lower than the Minnesota surface water quality standard.

Table 1. Estimated LTVSMC Tailings Basin seepage for selected parameters calibrated to existing conditions

	Existing LTVSMC Tailings Basin Seepage					
	Calibration	to flows at	Calibration	to flows at		
	PM-13	< 10 cfs	PM-13 1	0-20 cfs		
	Pit 5NW	Pit 5NW	Pit 5NW	Pit 5NW		
Parameter	Q = 0 cfs	Q = 0.26 cfs	Q = 0 cfs	Q = 0.26 cfs		
Ca	1.9	1.4	3.9	3.4		
CI	4.0	3.9	1.0	1.0		
Cu	1	1	1	1		
F	1.7	1.7	6.0 ²	6.0 ²		
Fe	2.8	2.9	1	1		
Mg	1.8	0.3	3.3	2.2		
Na	4.2	3.1	2.5	1.8		
SO ₄	1.6	3	4.0	2.4		

¹ Concentrations in river or surface runoff were higher than in Tailings Basin seepage, preventing unique calibration solution

² Data may be skewed by a single high value (2.28 mg/L) at PM-13 in November 2006. Omission of this point leads to calibration flows of ~0.8 cfs.

³ Loading from Pit 5NW is greater than load observed in river at PM-13.

Table 2-1. Low, Average, and High Flows in the Embarrass River at PM-12 and PM-13

	Location in En	nbarrass River
Flow ¹ (cfs)	PM-12	PM-13
Low	1.19	5.66
Average	13.80	81.53
High	144.35	853.08

¹ Flows include surface water runoff, natural groundwater seepage, and discharges from Babbitt WWTP and Pit 5NW

FOR COMPARISON: RS74B, Draft-02 Values

	Location in Embarrass River		
Flow ¹ (cfs)	PM-12	PM-13	
Low	0.86	5.07	
Average	13.80	81.53	
High	144.35	853.08	

¹ Flows include surface water runoff, natural groundwater seepage, and discharges from Babbitt WWTP and Pit 5NW. In RS74B, Draft-02 no discharges from Babbitt WWTP and Pit 5NW were accounted for under low flow conditions.

Table 4-1. Unrecoverable Seepage Flows from the Tailings Basin During Operation and Closure under Tailings Basin - Proposed Action

	October 13, 2008 Memo - Unrecoverable Seepage to Embarrass River Watershed by Source - all flow conditions (gpm)				
	Hydrometallurgical Residue Cells	Cells 1E & 2E	Cell 2W		
Prior to PolyMet Operations (2007)		900	895		
Year 1	0.468	1430	895		
Year 5	6.732	1841	895		
Year 8	5.043	2150	895		
Year 9	5.956	2360	895		
Year 15	7.833	2535	895		
Year 20	8.664	2680	895		
Closure	0.744	1100	750		
Post-Closure	0.744	1100	610		

* 900 gpm + 895 gpm = 1795 gpm = 4 cfs

Prior to PolyMet Operations, the flows from Cells 1E & 2E and Cell 2W are calibrated to chloride concentrations measured in the Embarrass River to obtain a seepage of 4 cfs (1,795 gpm) from the combined LTVSMC Tailings Basin.

FOR COMPARISON: RS74B, Draft-02 Values

	RS74B, Draft-02 Unrecoverable Seepage to Embarrass River Watershed by Source - high and average flow (gpm)					
	Hydrometallurgical Residue Cells	Cells 1E & 2E	Cell 2W	Hydrometallurgical Residue Cells	Cells 1E & 2E	Cell 2W
Prior to PolyMet Operations (2001)		900	4123		97	442
Year 1	0.468	1430	<i>3573</i>	0.468	154	<i>385</i>
Year 5	6.732	1841	3573	6.732	183	355
Year 8	5.043	2150	3573	5.043	202	336
Year 9	5.956	2360	3573	5.956	214	324
Year 15	7.833	2535	3573	7.833	224	315
Year 20	8.664	2680	3573	8.664	231	308
Closure	0.744	1100	1510	0.744	227	312
Post-Closure	0.744	1100	610	0.744	346	192

Previously in RS74 Draft-01 and Draft-02, it was assumed that the existing flow from Cell 2W was 4,123 gpm (9.2 cfs) for high and average flows based on calibration of 2001 data. For low flows the sum of Cells 1E & 2E and Cell 2W was 1.2 cfs (539 gpm) which had been calibrated to measured sulfate concentrations in the river.

Table 4-4. Unrecoverable Seepage Flows from the Tailings Basin During Operation and Closure for Tailings Basin - Geotechnical Mitigation

	October 13, 2008 Memo - Unrecoverable Seepage to Embarrass River Watershed by Source - all flow conditions (gpm)				
	Hydrometallurgical Residue Cells ¹	Cells 1E & 2E	Cell 2W		
Prior to PolyMet Operations (2007)		900	895		
Year 1	0.468	1600	895		
Year 5	6.732	2260	895		
Year 10	7.712	2490	895		
Year 15	7.833	2700	895		
Year 20	8.664	2900	895		
Closure	0.744	777	750		
Post-Closure	0.744	777	610		

900 gpm + 895 gpm = 1795 gpm = 4 cfs

FOR COMPARISON: RS74B. Draft-02 Values

	RS74B, Draft-02 Unrecoverable Seepage to Embarrass River Watershed by Source - high and average flow (gpm)			RS74B, Draft-02 Unrecoverable Seepage to Embarrass River Watershed by Source - low flow (gpm)		
	Hydrometallurgical Residue Cells	Cells 1E & 2E	Cell 2W	Hydrometallurgical Residue Cells	Cells 1E & 2E	Cell 2W
Prior to PolyMet Operations (2001)		900	4123		97	442
Year 1	0.468	1600	3573	0.468	167	372
Year 5	6.732	2260	3573	6.732	209	330
Year 10	7.712	2490	3573	5.043	221	317
Year 15	7.833	2700	3573	7.833	232	307
Year 20	8.664	2900	3573	8.664	241	297
Closure	0.744	777	1510	0.744	183	356
Post-Closure	0.744	777	610	0.744	302	237

Previously in RS74 Draft-01 and Draft-02, it was assumed that the existing flow from Cell 2W was 4,123 gpm (9.2 cfs) for high and average flows based on calibration of 2001 data. For low flows the sum of Cells 1E & 2E and Cell 2W was 1.2 cfs (539 gpm) which had been calibrated to measured sulfate concentrations in the river.

¹Seepage from Hydrometallurgical Residue Cells is the same for Tailings Basin-Proposed Action and Tailings Basin-Geotechnical Mitigation. Prior to PolyMet Operations, the flows from Cells 1E & 2E and Cell 2W are calibrated to chloride concentrations measured in the Embarrass River to obtain a seepage of 4 cfs (1,795 gpm) from the combined LTVSMC Tailings Basin.

Table 5-2. Input Concentrations Used in the Embarrass River Mass-Balance Model

FOR COMPARISON: RS74B, Draft-02 Values

				Pre-PolyMet		
Parameter	Units	Surface Runoff Concentration	Median Groundwater Concentration	Seepage from Cell 2W	Area 5 Pit NW Discharge	
Ag	mg/L	0.00011	0.000008	0.0001	0.00016	
Al	mg/L	0.12	0.025	1.5788	0.0133	
As	mg/L	0.00075	0.00273	0.002905	0.0013	
В	mg/L	0.027	0.0212	0.33	0.132	
Ва	mg/L	0.016	0.0681	0.09298	0.0044	
Be	mg/L	0.0001	0.000023	0.00075	0.0001	
Ca	mg/L	15	19	59.78	95.4	
Cd	mg/L	0.00008	0.0003	0.000188	0.0001	
CI	mg/L	6.5	1.8	21.54	5.95	
Co	mg/L	0.0006	0.0011	0.001556	0.00055	
Cu	mg/L	0.0015	0.004	0.004555	0.0035	
F	mg/L	0.2	0.385	1.55	0.125	
Fe	mg/L	2.9	0.035	4.594	0.038	
Hardness	mg/L	70	87.5	436.6	943	
K	mg/L	0.6	1.6	7.77	53.8	
Mg	mg/L	5.9	10.65	69.97	271	
Mn	mg/L	0.3	0.188	1.183	0.485	
Na	mg/L	6	4.9	44.31	120	
Ni	mg/L	0.0012	0.007	0.00688	0.0052	
Pb	mg/L	0.00015	0.0012	0.0012	0.0003	
Sb ¹	mg/L	0.00004	0.0015	0.00025	0.00025	
Se	mg/L	0.0003	0.00295	0.00109	0.0016	
SO ₄	mg/L	4	8.5	152.4	1046	
TI	mg/L	0.0002	0.000004	0.0002	0.0006	
Zn	mg/L	0.016	0.0115	0.01435	0.003	

Surface Runoff Concentration
0.00011
0.00011
0.00075
0.012
0.011
0.0001
13
0.00008
10
0.0006
0.0015
0.1
2.9
70
3.7
6
0.3
6
0.0012
0
0.00002
0.0003
4
0.0002
0.016

¹ Antimony was not measured in the MPCA or the Copper Nickel Study, therefore the groundwater value from the Partridge River watershed was used for the median groundwater concentration.

Table 5-4. Deterministic water quality predictions at surface water monitoring station PM-12 (mg/L)

Tailings Basin - Proposed Action

Low flow conditions

Parameter	Average Measured Conditions	Year 01	Year 05	Year 08	Year 09	Year 15	Year 20	Closure	Post- Closure	Hardness Independent Standard
Aq	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.001
Al	0.0983	0.0513	0.0513	0.0513	0.0513	0.0513	0.0513	0.0513	0.0513	0.125
As	0.0010	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.053
В	0.0175	0.0228	0.0228	0.0228	0.0228	0.0228	0.0228	0.0228	0.0228	0.5
Ba	0.0155	0.0537	0.0537	0.0537	0.0537	0.0537	0.0537	0.0537	0.0537	
Be	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Ca	13.4	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	
Cd	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	
Cd-Std	0.0008	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	
CI	4.5	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	230
Co	0.0006	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.005
Cu	0.0015	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	
Cu-Std	0.0062	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	
F	0.1000	0.3337	0.3337	0.3337	0.3337	0.3337	0.3337	0.3337	0.3337	
Fe	1.7200	0.8295	0.8295	0.8295	0.8295	0.8295	0.8295	0.8295	0.8295	
Hard	61.7	82.6	82.6	82.6	82.6	82.6	82.6	82.6	82.6	
K	8.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	
Mg	6.2	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	
Mn	0.1600	0.2191	0.2191	0.2191	0.2191	0.2191	0.2191	0.2191	0.2191	
Na	3.0	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	
Ni	0.0019	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	
Ni-Std	0.0346	0.0444	0.0444	0.0444	0.0444	0.0444	0.0444	0.0444	0.0444	
Pb	0.0002	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	
Pb-Std	0.0017	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	
Sb	0.0015	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.031
Se	0.0005	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.005
SO ₄	4.6	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	
TI	0.0002	0.000058	0.000058	0.000058	0.000058	0.000058	0.000058	0.000058	0.000058	0.00056
Zn	0.0183	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	
Zn-Std	0.0704	0.0902	0.0902	0.0902	0.0902	0.0902	0.0902	0.0902	0.0902	

¹⁾ The hardness dependent standards for Cd, Cu, Ni, Pb and Zn are listed below the deterministic water quality predictions for each parameter.

²⁾ Deterministic water quality predictions at PM-12 does not change during mine operation and closure because it is upstream of the tailings basin.
3) Predictions for low flow conditions correspond to surface runoff equal to zero, and groundwater recharge as the only natural flow contribution.

Table 5-5. Deterministic water quality predictions at surface water monitoring station PM-12 (mg/L)

Embarrass River PM-12 Tailings Basin - Proposed Action

Average flow conditions

Parameter	Average Measured Conditions	Year 01	Year 05	Year 08	Year 09	Year 15	Year 20	Closure	Post- Closure	Hardness Independent Standard
Ag	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.001
Al	0.0983	0.1141	0.1141	0.1141	0.1141	0.1141	0.1141	0.1141	0.1141	0.125
As	0.0010	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.053
В	0.0175	0.0266	0.0266	0.0266	0.0266	0.0266	0.0266	0.0266	0.0266	0.5
Ва	0.0155	0.0192	0.0192	0.0192	0.0192	0.0192	0.0192	0.0192	0.0192	
Be	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Ca	13.4	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	
Cd	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Cd-Std	0.0008	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	
CI	4.5	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	230
Co	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.005
Cu	0.0015	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	
Cu-Std	0.0062	0.0070	0.0070	0.0070	0.0070	0.0070	0.0070	0.0070	0.0070	
F	0.1000	0.2115	0.2115	0.2115	0.2115	0.2115	0.2115	0.2115	0.2115	
Fe	1.7200	2.7215	2.7215	2.7215	2.7215	2.7215	2.7215	2.7215	2.7215	
Hard	61.7	71.1	71.1	71.1	71.1	71.1	71.1	71.1	71.1	
K	8.0	0.6	0.6	0.6	0.7	0.7	0.7	0.6	0.6	
Mg	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	
Mn	0.1600	0.2930	0.2930	0.2930	0.2930	0.2930	0.2930	0.2930	0.2930	
Na	3.0	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	
Ni	0.0019	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	
Ni-Std	0.0346	0.0391	0.0391	0.0391	0.0391	0.0391	0.0391	0.0391	0.0391	
Pb	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	
Pb-Std	0.0017	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	
Sb	0.0015	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.031
Se	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.005
SO ₄	4.6	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	
TI	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.00056
Zn	0.0183	0.0157	0.0157	0.0157	0.0157	0.0157	0.0157	0.0157	0.0157	
Zn-Std	0.0704	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	

¹⁾ The hardness dependent standards for Cd, Cu, Ni, Pb and Zn are listed below the deterministic water quality predictions for each parameter.

²⁾ Deterministic water quality predictions at PM-12 does not change during mine operation and closure because it is upstream of the tailings basin.

Table 5-6. Deterministic water quality predictions at surface water monitoring station PM-12 (mg/L)

Tailings Basin - Proposed Action

High flow conditions

Parameter	Average Measured Conditions	Year 01	Year 05	Year 08	Year 09	Year 15	Year 20	Closure	Post- Closure	Hardness Independent Standard
Ag	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.001
Al	0.0983	0.1194	0.1194	0.1194	0.1194	0.1194	0.1194	0.1194	0.1194	0.125
As	0.0010	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.053
В	0.0175	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270	0.5
Ва	0.0155	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	
Be	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Ca	13.4	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	
Cd	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Cd-Std	0.0008	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	
CI	4.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	230
Co	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.005
Cu	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	
Cu-Std	0.0062	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	
F	0.1000	0.2011	0.2011	0.2011	0.2011	0.2011	0.2011	0.2011	0.2011	
Fe	1.7200	2.8829	2.8829	2.8829	2.8829	2.8829	2.8829	2.8829	2.8829	
Hard	61.7	70.1	70.1	70.1	70.1	70.1	70.1	70.1	70.1	
K	0.8	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
Mg	6.2	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	
Mn	0.1600	0.2993	0.2993	0.2993	0.2993	0.2993	0.2993	0.2993	0.2993	
Na	3.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Ni	0.0019	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	
Ni-Std	0.0346	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	
Pb	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	
Pb-Std	0.0017	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	
Sb	0.0015	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.031
Se	0.0005	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.005
SO ₄	4.6	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
TI	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.00056
Zn	0.0183	0.0160	0.0160	0.0160	0.0160	0.0160	0.0160	0.0160	0.0160	
Zn-Std	0.0704	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	

¹⁾ The hardness dependent standards for Cd, Cu, Ni, Pb and Zn are listed below the deterministic water quality predictions for each parameter.

²⁾ Deterministic water quality predictions at PM-12 does not change during mine operation and closure because it is upstream of the tailings basin.

Table 5-7. Deterministic water quality predictions at surface water monitoring station PM-13 (mg/L)

Tailings Basin - Proposed Action

Low flow conditions

Parameter	Average Measured Conditions	Year 01	Year 05	Year 08	Year 09	Year 15	Year 20	Closure	Post- Closure	Hardness Independent Standard
Ag	0.0001	0.0003	0.0003	0.0004	0.0004	0.0005	0.0006	0.0003	0.0003	0.001
Al	0.1916	0.3091	0.3157	0.3053	0.3004	0.4295	0.4069	0.4467	0.4094	0.125
As	0.0010	0.0036	0.0041	0.0043	0.0047	0.0072	0.0078	0.0051	0.0051	0.053
В	0.0443	0.1155	0.1160	0.1192	0.1217	0.1276	0.1356	0.1216	0.1147	0.5
Ва	0.0278	0.0651	0.0632	0.0625	0.0621	0.0457	0.0683	0.0639	0.0629	
Be	0.0001	0.0002	0.0003	0.0003	0.0004	0.0007	0.0007	0.0003	0.0003	
Ca	19.9	36.1	40.7	48.0	50.1	53.4	52.0	38.2	37.5	
Cd	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0003	0.0003	
Cd-Std	0.0015	0.0023	0.0022	0.0022	0.0022	0.0022	0.0023	0.0020	0.0019	
CI	7.0	10.9	10.7	8.4	8.5	9.1	9.9	6.9	6.4	230
Co	0.0005	0.0012	0.0015	0.0016	0.0017	0.0040	0.0041	0.0012	0.0012	0.005
Cu	0.0020	0.0046	0.0053	0.0058	0.0059	0.0099	0.0111	0.0076	0.0077	
Cu-Std	0.0123	0.0169	0.0168	0.0166	0.0167	0.0168	0.0172	0.0154	0.0150	
F	0.3900	1.8179	1.2235	0.7188	0.6819	0.6185	0.7180	0.4794	0.4441	
Fe	1.2900	0.9520	0.8969	0.8502	0.8219	0.8050	0.7940	1.0707	0.9547	
Hard	143.5	239.4	236.5	231.9	235.3	238.0	246.7	205.7	198.1	
K	2.3	6.2	5.9	5.6	5.8	8.5	8.7	7.0	6.9	
Mg	15.9	38.9	33.2	28.2	27.4	25.3	28.3	29.6	28.3	
Mn	0.1100	0.4114	0.4086	0.3983	0.3911	0.3895	0.4564	0.3917	0.3657	
Na	12.7	32.9	24.9	19.3	20.6	19.3	19.6	16.6	15.7	
Ni	0.0021	0.0075	0.0148	0.0190	0.0208	0.0669	0.0659	0.0088	0.0088	
Ni-Std	0.0708	0.1092	0.1080	0.1063	0.1076	0.1086	0.1120	0.0960	0.0930	
Pb	0.0003	0.0010	0.0010	0.0012	0.0014	0.0013	0.0014	0.0011	0.0011	
Pb-Std	0.0050	0.0097	0.0095	0.0093	0.0095	0.0096	0.0100	0.0080	0.0076	
Sb	0.0015	0.0022	0.0030	0.0038	0.0042	0.0050	0.0051	0.0022	0.0022	0.031
Se	0.0005	0.0019	0.0020	0.0020	0.0020	0.0015	0.0024	0.0022	0.0022	0.005
SO ₄	36.1	99.9	111.0	115.4	123.3	156.1	148.6	87.2	85.1	
TI	0.0002	0.0003	0.0004	0.0004	0.0004	0.0006	0.0005	0.0003	0.0003	0.00056
Zn	0.0123	0.0115	0.0141	0.0187	0.0234	0.0378	0.0336	0.0141	0.0141	
Zn-Std	0.1440	0.2221	0.2198	0.2162	0.2189	0.2210	0.2278	0.1953	0.1892	

¹⁾ The hardness dependent standards for Cd, Cu, Ni, Pb and Zn are listed below the deterministic water quality predictions for each parameter.

²⁾ Predictions for low flow conditions correspond to surface runoff equal to zero, and groundwater recharge as the only natural flow contribution.

Table 5-8. Deterministic water quality predictions at surface water monitoring station PM-13 (mg/L)

Tailings Basin - Proposed Action

Average flow conditions

Parameter	Average Measured Conditions	Year 01	Year 05	Year 08	Year 09	Year 15	Year 20	Closure	Post- Closure	Hardness Independent Standard
Ag	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0001	0.001
Al	0.1916	0.1415	0.1442	0.1440	0.1442	0.1642	0.1617	0.1552	0.1500	0.125
As	0.0010	0.0011	0.0012	0.0013	0.0013	0.0017	0.0018	0.0013	0.0012	0.053
В	0.0443	0.0401	0.0410	0.0421	0.0428	0.0440	0.0456	0.0399	0.0389	0.5
Ва	0.0278	0.0219	0.0221	0.0223	0.0225	0.0202	0.0237	0.0212	0.0210	
Ве	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0001	0.0001	
Ca	19.9	19.2	20.0	21.2	21.7	22.3	22.2	19.3	19.1	
Cd	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Cd-Std	0.0015	0.0012	0.0012	0.0012	0.0012	0.0012	0.0013	0.0012	0.0012	
CI	7.0	7.0	7.1	6.8	6.8	6.9	7.0	6.5	6.5	230
Co	0.0005	0.0007	0.0007	0.0007	0.0008	0.0011	0.0011	0.0007	0.0007	0.005
Cu	0.0020	0.0019	0.0021	0.0021	0.0022	0.0028	0.0030	0.0022	0.0022	
Cu-Std	0.0123	0.0100	0.0101	0.0101	0.0102	0.0103	0.0104	0.0096	0.0095	
F	0.3900	0.4008	0.3360	0.2717	0.2687	0.2610	0.2775	0.2304	0.2256	
Fe	1.2900	2.5993	2.5744	2.5549	2.5417	2.5316	2.5237	2.6332	2.6261	
Hard	143.5	108.6	109.6	109.9	111.1	112.0	113.8	103.1	101.9	
K	2.3	2.4	2.4	2.4	2.4	2.8	2.9	2.4	2.4	
Mg	15.9	15.3	14.8	14.2	14.2	13.9	14.4	14.0	13.8	
Mn	0.1100	0.3176	0.3182	0.3175	0.3169	0.3170	0.3274	0.3142	0.3110	
Na	12.7	11.6	10.8	10.1	10.3	10.2	10.3	9.5	9.4	
Ni	0.0021	0.0021	0.0031	0.0038	0.0041	0.0111	0.0111	0.0021	0.0021	
Ni-Std	0.0708	0.0559	0.0564	0.0565	0.0570	0.0574	0.0582	0.0535	0.0530	
Pb	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	
Pb-Std	0.0050	0.0035	0.0036	0.0036	0.0036	0.0037	0.0038	0.0033	0.0033	
Sb	0.0015	0.0003	0.0004	0.0006	0.0007	0.0008	0.0008	0.0003	0.0003	0.031
Se	0.0005	0.0005	0.0006	0.0006	0.0006	0.0005	0.0006	0.0005	0.0005	0.005
SO₄	36.1	36.8	38.9	40.1	41.7	46.9	46.2	34.6	34.1	
TI	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0002	0.0002	0.00056
Zn	0.0123	0.0152	0.0155	0.0161	0.0168	0.0190	0.0184	0.0155	0.0155	
Zn-Std	0.1440	0.1137	0.1146	0.1149	0.1159	0.1167	0.1183	0.1088	0.1077	

¹⁾ The hardness dependent standards for Cd, Cu, Ni, Pb and Zn are listed below the deterministic water quality predictions for each parameter.

Table 5-9. Deterministic water quality predictions at surface water monitoring station PM-13 (mg/L)

Tailings Basin - Proposed Action

High flow conditions

Parameter	Average Measured Conditions	Year 01	Year 05	Year 08	Year 09	Year 15	Year 20	Closure	Post- Closure	Hardness Independent Standard
Ag	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.001
Al	0.1916	0.1222	0.1225	0.1225	0.1225	0.1246	0.1243	0.1235	0.1230	0.125
As	0.0010	0.0008	0.0008	0.0008	0.0008	0.0009	0.0009	0.0008	0.0008	0.053
В	0.0443	0.0283	0.0284	0.0285	0.0286	0.0288	0.0289	0.0283	0.0282	0.5
Ва	0.0278	0.0166	0.0166	0.0167	0.0167	0.0164	0.0168	0.0165	0.0165	
Be	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Ca	19.9	15.3	15.4	15.5	15.6	15.6	15.6	15.3	15.3	
Cd	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Cd-Std	0.0015	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	
CI	7.0	6.6	6.6	6.5	6.5	6.5	6.6	6.5	6.5	230
Co	0.0005	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007	0.0006	0.0006	0.005
Cu	0.0020	0.0015	0.0016	0.0016	0.0016	0.0016	0.0017	0.0016	0.0016	
Cu-Std	0.0123	0.0072	0.0072	0.0072	0.0072	0.0072	0.0073	0.0072	0.0071	
F	0.3900	0.2203	0.2139	0.2074	0.2071	0.2063	0.2081	0.2030	0.2025	
Fe	1.2900	2.8696	2.8668	2.8645	2.8630	2.8618	2.8609	2.8733	2.8727	
Hard	143.5	73.9	74.0	74.1	74.2	74.4	74.6	73.3	73.2	
K	2.3	0.8	0.8	0.8	8.0	0.8	0.8	0.8	8.0	
Mg	15.9	6.9	6.8	6.8	6.8	6.7	6.8	6.7	6.7	
Mn	0.1100	0.3018	0.3019	0.3018	0.3017	0.3018	0.3028	0.3014	0.3011	
Na	12.7	6.6	6.5	6.4	6.4	6.4	6.4	6.3	6.3	
Ni	0.0021	0.0013	0.0014	0.0015	0.0015	0.0022	0.0022	0.0013	0.0013	
Ni-Std	0.0708	0.0404	0.0405	0.0405	0.0405	0.0406	0.0407	0.0401	0.0401	
Pb	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	
Pb-Std	0.0050	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0021	0.0021	
Sb	0.0015	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.031
Se	0.0005	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.005
SO ₄	36.1	7.3	7.6	7.7	7.9	8.4	8.4	7.1	7.0	
TI	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.00056
Zn	0.0123	0.0159	0.0159	0.0160	0.0161	0.0163	0.0163	0.0160	0.0160	
Zn-Std	0.1440	0.0820	0.0822	0.0822	0.0824	0.0825	0.0827	0.0815	0.0814	

¹⁾ The hardness dependent standards for Cd, Cu, Ni, Pb and Zn are listed below the deterministic water quality predictions for each parameter.

Table 5-10. Multiplying Factors for Concentrations of Leachate from PolyMet Tailings Basin (Cell 1E & 2E) and Hydrometallurgical Residue Cells That Would Cause the Embarrass River Water Chemistry Predictions to Exceed the Minnesota Surface Water Quality Standards

Embarrass River

Proposed Action

			Low Flow					Average Flow					High Flow		
					Corresponding					Corresponding					Corresponding
					SO ₄					SO ₄					SO ₄
					concentration					concentration					concentration
Parameter	Standard (mg/L) ¹	Factor	Year	Location	(mg/L)	Standard (mg/L) ¹	Factor	Year	Location	(mg/L)	Standard (mg/L) ¹	Factor	Year	Location	(mg/L)
As	0.0530	7.9	Year 15	PM-13	932.9	0.0530	54.0	Year 15	PM-13	935.3	0.0530	513.0	Year 15	PM-13	897.4
Co	0.0050	1.2	Year 15	PM-13	181.2	0.0050	8.0	Year 15	PM-13	164.6	0.0050	78.0	Year 15	PM-13	142.2
Cu	0.0172	1.7	Year 20	PM-13	220.8	0.0104	6.6	Year 20	PM-13	134.2	0.0073	41.0	Year 20	PM-13	73.8
Ni	0.1192	1.8	Year 15	PM-13	248.5	0.0592	6.0	Year 15	PM-13	131.1	0.0408	40.0	Year 15	PM-13	76.2
Sb	0.0310	6.4	Year 15	PM-13	764.6	0.0310	43.0	Year 15	PM-13	751.0	0.0310	416.0	Year 15	PM-13	729.0

Geotechnical Mitigation

			Low Flow					Average Flow					High Flow		
					Corresponding SO ₄					Corresponding SO ₄			J		Corresponding SO ₄
					concentration					concentration					concentration
Parameter	Standard (mg/L) ¹	Factor	Year	Location	(mg/L)	Standard (mg/L) ¹	Factor	Year	Location	(mg/L)	Standard (mg/L) ¹	Factor	Year	Location	(mg/L)
As	0.0530	9.3	Post-Closure	PM-13	397.5	0.0530	89.0	Year 10	PM-13	1393.3	0.0530	858.0	Year 10	PM-13	1,366.6
Co	0.0050	4.4	Year 20	PM-13	416.5	0.0050	27.9	Year 20	PM-13	415.1	0.0050	267.0	Year 20	PM-13	377.7
Cu	0.0162	2.7	Year 20	PM-13	272.6	0.0102	10.5	Year 20	PM-13	170.0	0.0072	67.0	Year 20	PM-13	99.8
Ni	0.1030	9.2	Year 20	PM-13	823.1	0.0569	32.3	Year 20	PM-13	459.9	0.0406	220.0	Year 20	PM-13	312.4
Sb	0.0310	6.2	Year 10	PM-13	686.7	0.0310	42.3	Year 10	PM-13	678.3	0.0310	409.0	Year 10	PM-13	655.0

As, Co and Sb standards are hardness independent. Cu and Ni standards are hardness dependent and assume that the hardness and standards do not change from Tables 5-7 to 5-9 and Tables 7-4 to 7-6.

Table 5-11. Comparison of concentrations of leachate from PolyMet Tailings Basin (Cell 1E & 2E) and Hydrometallurgical Residue Cells (all occurring concurrently) that would cause Embarrass River water chemistry predictions to exceed the Minnesota surface water quality standards and the "Base Case" concentrations of these mine site features. "Base Case" concentrations are those presented in Tables 5-7 to 5-9 and Tables 7-4 to 7-6.

Embarrass River

Proposed Action

				As					(Co						Cu						Ni					(Sb		
Flow/Yield Condition	Lov	v Flow	Avera	ge Flow	High	h Flow	Low	Flow	Avera	ge Flow	High	Flow	Lov	/ Flow	Avera	ge Flow	Hig	h Flow	Low	/ Flow	Avera	ge Flow	High	h Flow	Low	Flow	Avera	ge Flow	Hig	h Flow
Year when Standard Exceeded	Ye	ar 15	Yea	ar 15	Ye	ar 15	Yea	ar 15	Yea	ar 15	Yea	ar 15	Ye	ar 20	Ye	ar 20	Ye	ear 20	Ye	ar 15	Yea	ar 15	Ye	ar 15	Yea	ar 15	Yea	ar 15	Ye	ear 15
	"Base Case" Concen- tration (mg/L)	ance	"Base Case" Concen- tration (mg/L)	causing exceed- ance	"Base Case" Concen- tration (mg/L)	Concentration causing exceedance (mg/L)	"Base Case" Concen- tration (mg/L)	exceed- ance	"Base Case" Concen- tration (mg/L)	Concentration causing exceedance (mg/L)	"Base Case" Concen- tration (mg/L)	Concen- tration causing exceed- ance (mg/L)	"Base Case" Concen- tration (mg/L)		"Base Case" Concen- tration (mg/L)	Concentration causing exceed-ance (mg/L)	"Base Case" Concen- tration (mg/L)	Concen- tration causing exceed- ance (mg/L)	"Base Case" Concen- tration (mg/L)	Concentration causing exceedance (mg/L)	"Base Case" Concen- tration (mg/L)	Concentration causing exceedance (mg/L)	"Base Case" Concen- tration (mg/L)	Concentration causing exceedance (mg/L)	"Base Case" Concen- tration (mg/L)	exceed- ance			"Base Case" Concen- tration (mg/L)	Concen- tration causing exceed- ance (mg/L)
PolyMet Tailings Basin	0.0155	0.123	0.0155	0.838	0.0155	7.959	0.0087	0.010	0.0087	0.069	0.0087	0.676	0.0202	0.0344	0.0202	0.133	0.0202	0.829	0.1537	0.277	0.1537	0.922	0.1537	6.146	0.0113	0.073	0.0113	0.488	0.0113	4.719
Hydrometal- lurgical Residue Cells	0.0040	0.032	0.0040	0.2160	0.0040	2.0520	0.0050	0.006	0.0050	0.0400	0.0050	0.3900	0.0015	0.0026	0.0015	0.0099	0.0015	0.0615	0.0980	0.176	0.0980	0.5880	0.0980	3.9200	0.0040	0.026	0.0040	0.1720	0.0040	1.6640
Factor to Exceed Standard		7.9		54.0		513.0		1.2		8.0		78.0		1.7		6.6		41.0		1.8		6.0		40.0		6.4		43.0		416.0

Embarrass River

Geotechnical Mitigation

			ļ	\s					C	ю					(Cu						Ni					(Sb		
Flow/Yield Condition	Low	Flow	Averaç	ge Flow	High	Flow	Low	Flow	Averaç	ge Flow	High	Flow	Lov	Flow	Avera	ge Flow	High	n Flow	Lov	v Flow	Avera	ge Flow	High	n Flow	Low	Flow	Avera	ge Flow	High	h Flow
Year when Standard Exceeded	Post-C	Closure	Yea	nr 10	Yea	ar 10	Yea	ar 20	Yea	ır 20	Yea	ar 20	Ye	ar 20	Yea	ar 20	Yea	ar 20	Ye	ear 20	Yea	ar 20	Yea	ar 20	Yea	ar 10	Yea	ar 10	Ye	ar 10
	"Base Case" Concen- tration	exceed- ance	"Base Case" Concen- tration	exceed-	"Base Case" Concen- tration (mg/L)	Concen- tration causing exceed- ance (mg/L)	"Base Case" Concen- tration (mg/L)	Concentration causing exceedance (mg/L)	Concen- tration	Concentration causing exceedance (mg/L)	"Base Case" Concen- tration (mg/L)	Concen- tration causing exceed- ance (mg/L)	"Base Case" Concen- tration (mg/L)	Concentration causing exceedance (mg/L)	"Base Case" Concen- tration (mg/L)	Concentration causing exceedance (mg/L)	"Base Case" Concen- tration (mg/L)	Concentration causing exceedance (mg/L)	"Base Case" Concen- tration (mg/L)	exceed-	"Base Case" Concen- tration (mg/L)	Concentration causing exceedance (mg/L)	"Base Case" Concen- tration (mg/L)	Concentration causing exceedance (mg/L)	"Base Case" Concen- tration (mg/L)	Concentration causing exceedance (mg/L)	"Base Case" Concen- tration (mg/L)	exceed- ance	"Base Case" Concen- tration (mg/L)	Concentration causing exceedance (mg/L)
PolyMet Tailings Basin	0.0279	0.221	0.0094	0.509	0.0094	4.839	0.0022	0.003	0.0022	0.017	0.0022	0.170	0.0114	0.019	0.0114	0.075	0.0114	0.469	0.0236	0.042	0.0236	0.141	0.0236	0.943	0.0117	0.075	0.0117	0.504	0.0117	4.88
Hydrometal- lurgical Residue Cells	0.0040	0.0316	0.0040	0.2160	0.0040	2.0520	0.0050	0.0060	0.0050	0.0400	0.0050	0.3900	0.0015	0.0026	0.0015	0.0099	0.0015	0.0615	0.0980	0.1764	0.0980	0.5880	0.0980	3.9200	0.0040	0.0256	0.0040	0.1720	0.0040	1.6640
Factor to Exceed Standard		9.3		89.0		858.0		4.4		27.9		267.0		2.7		10.5		67.0		9.2		32.3		220.0		6.2		42.3		409.0

Table 7-1. Deterministic water quality predictions at surface water monitoring station PM-12 (mg/L)

Tailings Basin - Geotechnical Mitigation

Low flow conditions

Parameter	Average Measured Conditions	Year 01	Year 05	Year 10	Year 15	Year 20	Closure	Post- Closure	Hardness Independent Standard
Ag	0.0001	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.001
Al	0.0983	0.0513	0.0513	0.0513	0.0513	0.0513	0.0513	0.0513	0.125
As	0.0010	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.053
В	0.0175	0.0228	0.0228	0.0228	0.0228	0.0228	0.0228	0.0228	0.5
Ba	0.0155	0.0537	0.0537	0.0537	0.0537	0.0537	0.0537	0.0537	0.0
Be	0.0001	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	
Ca	13.4	17.9	17.9	17.9	17.9	17.9	17.9	17.9	
Cd	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	
Cd-Std	0.0008	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	
CI	4.5	3.1	3.1	3.1	3.1	3.1	3.1	3.1	230
Co	0.0006	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.005
Cu	0.0015	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	
Cu-Std	0.0062	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	
F	0.1000	0.3337	0.3337	0.3337	0.3337	0.3337	0.3337	0.3337	
Fe	1.7200	0.8295	0.8295	0.8295	0.8295	0.8295	0.8295	0.8295	
Hard	61.7	82.6	82.6	82.6	82.6	82.6	82.6	82.6	
K	8.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	
Mg	6.2	9.3	9.3	9.3	9.3	9.3	9.3	9.3	
Mn	0.1600	0.2191	0.2191	0.2191	0.2191	0.2191	0.2191	0.2191	
Na	3.0	5.2	5.2	5.2	5.2	5.2	5.2	5.2	
Ni	0.0019	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	
Ni-Std	0.0346	0.0444	0.0444	0.0444	0.0444	0.0444	0.0444	0.0444	
Pb	0.0002	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	
Pb-Std	0.0017	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	
Sb	0.0015	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.031
Se	0.0005	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.005
SO ₄	4.6	7.3	7.3	7.3	7.3	7.3	7.3	7.3	
TI	0.0002	0.000058	0.000058	0.000058	0.000058	0.000058	0.000058	0.000058	0.00056
Zn	0.0183	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	
Zn-Std	0.0704	0.0902	0.0902	0.0902	0.0902	0.0902	0.0902	0.0902	

¹⁾ The hardness dependent standards for Cd, Cu, Ni, Pb and Zn are listed below the deterministic water quality predictions for each parameter.

²⁾ Deterministic water quality predictions at PM-12 does not change during mine operation and closure because it is upstream of the tailings ba

³⁾ Predictions for low flow conditions correspond to surface runoff equal to zero, and groundwater recharge as the only natural flow contribution

Table 7-2. Deterministic water quality predictions at surface water monitoring station PM-12 (mg/L)

Tailings Basin - Geotechnical Mitigation

Average flow conditions

Parameter	Average Measured Conditions	Year 01	Year 05	Year 10	Year 15	Year 20	Closure	Post- Closure	Hardness Independent Standard
Ag	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.001
Al	0.0983	0.1141	0.1141	0.1141	0.1141	0.1141	0.1141	0.1141	0.125
As	0.0010	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.053
В	0.0175	0.0266	0.0266	0.0266	0.0266	0.0266	0.0266	0.0266	0.5
Ba	0.0155	0.0192	0.0192	0.0192	0.0192	0.0192	0.0192	0.0192	0.0
Be	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Ca	13.4	15.2	15.2	15.2	15.2	15.2	15.2	15.2	
Cd	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Cd-Std	0.0008	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	
CI	4.5	6.2	6.2	6.2	6.2	6.2	6.2	6.2	230
Co	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.005
Cu	0.0015	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	
Cu-Std	0.0062	0.0070	0.0070	0.0070	0.0070	0.0070	0.0070	0.0070	
F	0.1000	0.2115	0.2115	0.2115	0.2115	0.2115	0.2115	0.2115	
Fe	1.7200	2.7215	2.7215	2.7215	2.7215	2.7215	2.7215	2.7215	
Hard	61.7	71.1	71.1	71.1	71.1	71.1	71.1	71.1	
K	0.8	0.6	0.6	0.7	0.7	0.7	0.6	0.6	
Mg	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	
Mn	0.1600	0.2930	0.2930	0.2930	0.2930	0.2930	0.2930	0.2930	
Na	3.0	5.9	5.9	5.9	5.9	5.9	5.9	5.9	
Ni	0.0019	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	
Ni-Std	0.0346	0.0391	0.0391	0.0391	0.0391	0.0391	0.0391	0.0391	
Pb	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	
Pb-Std	0.0017	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	
Sb	0.0015	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.031
Se	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.005
SO ₄	4.6	4.3	4.3	4.3	4.3	4.3	4.3	4.3	
TI	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.00056
Zn	0.0183	0.0157	0.0157	0.0157	0.0157	0.0157	0.0157	0.0157	
Zn-Std	0.0704	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	

¹⁾ The hardness dependent standards for Cd, Cu, Ni, Pb and Zn are listed below the deterministic water quality predictions for each parameter.

²⁾ Deterministic water quality predictions at PM-12 does not change during mine operation and closure because it is upstream of the tailings ba

Table 7-3. Deterministic water quality predictions at surface water monitoring station PM-12 (mg/L)

Tailings Basin - Geotechnical Mitigation

High flow conditions

Parameter	Average Measured Conditions	Year 01	Year 05	Year 10	Year 15	Year 20	Closure	Post- Closure	Hardness Independent Standard
Ag	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.001
Al	0.0983	0.1194	0.1194	0.1194	0.1194	0.1194	0.1194	0.1194	0.125
As	0.0010	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.053
В	0.0175	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270	0.0270	0.5
Ва	0.0155	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	
Be	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Ca	13.4	15.0	15.0	15.0	15.0	15.0	15.0	15.0	
Cd	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Cd-Std	0.0008	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	
CI	4.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	230
Co	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.005
Cu	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	
Cu-Std	0.0062	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	
F	0.1000	0.2011	0.2011	0.2011	0.2011	0.2011	0.2011	0.2011	
Fe	1.7200	2.8829	2.8829	2.8829	2.8829	2.8829	2.8829	2.8829	
Hard	61.7	70.1	70.1	70.1	70.1	70.1	70.1	70.1	
K	8.0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
Mg	6.2	5.9	5.9	5.9	5.9	5.9	5.9	5.9	
Mn	0.1600	0.2993	0.2993	0.2993	0.2993	0.2993	0.2993	0.2993	
Na	3.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Ni	0.0019	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	
Ni-Std	0.0346	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	
Pb	0.0002	0.00016	0.00016	0.00016	0.00016	0.00016	0.00016	0.00016	
Pb-Std	0.0017	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	
Sb	0.0015	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.031
Se	0.0005	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.005
SO ₄	4.6	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
TI	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.00056
Zn	0.0183	0.0160	0.0160	0.0160	0.0160	0.0160	0.0160	0.0160	
Zn-Std	0.0704	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	

¹⁾ The hardness dependent standards for Cd, Cu, Ni, Pb and Zn are listed below the deterministic water quality predictions for each parameter

²⁾ Deterministic water quality predictions at PM-12 does not change during mine operation and closure because it is upstream of the tailings ba

Table 7-4. Deterministic water quality predictions at surface water monitoring station PM-13 (mg/L)

Tailings Basin - Geotechnical Mitigation

Low flow conditions

Parameter	Average Measured Conditions	Year 01	Year 05	Year 10	Year 15	Year 20	Closure	Post- Closure	Hardness Independent Standard
Ag	0.0001	0.0003	0.0004	0.0004	0.0004	0.0005	0.0003	0.0003	0.001
Al	0.1916	0.2989	0.2653	0.3038	0.2810	0.2664	0.4273	0.3862	0.125
As	0.0010	0.0040	0.0043	0.0055	0.0049	0.0048	0.0075	0.0076	0.053
В	0.0443	0.1159	0.1184	0.1243	0.1267	0.1299	0.1062	0.0983	0.5
Ва	0.0278	0.0639	0.0623	0.0613	0.0612	0.0627	0.0597	0.0585	
Be	0.0001	0.0003	0.0003	0.0004	0.0003	0.0003	0.0004	0.0004	
Ca	19.9	46.5	50.4	64.1	54.3	47.7	38.1	37.4	
Cd	0.0001	0.0003	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	
Cd-Std	0.0015	0.0024	0.0026	0.0024	0.0022	0.0021	0.0022	0.0022	
CI	7.0	10.0	12.5	8.6	8.8	9.0	6.5	5.9	230
Co	0.0005	0.0013	0.0013	0.0014	0.0015	0.0016	0.0015	0.0015	0.005
Cu	0.0020	0.0049	0.0051	0.0053	0.0062	0.0074	0.0059	0.0060	
Cu-Std	0.0123	0.0178	0.0187	0.0178	0.0168	0.0162	0.0168	0.0165	
F	0.3900	1.3809	1.5588	0.6054	0.6268	0.6416	0.7297	0.7004	
Fe	1.2900	0.9198	0.8132	0.7968	0.7704	0.7395	0.9922	0.8639	
Hard	143.5	260.8	283.1	261.3	238.5	223.5	237.4	230.3	
K	2.3	6.3	6.7	6.2	5.7	5.5	8.0	8.0	
Mg	15.9	37.7	38.6	24.8	25.1	25.2	37.6	36.4	
Mn	0.1100	0.3916	0.3737	0.3341	0.3436	0.3558	0.3755	0.3467	
Na	12.7	29.9	32.8	24.6	22.4	20.9	19.7	18.8	
Ni	0.0021	0.0106	0.0117	0.0144	0.0136	0.0145	0.0064	0.0064	
Ni-Std	0.0708	0.1174	0.1258	0.1176	0.1088	0.1030	0.1084	0.1056	
Pb	0.0003	0.0010	0.0010	0.0019	0.0018	0.0017	0.0011	0.0011	
Pb-Std	0.0050	0.0108	0.0120	0.0108	0.0096	0.0089	0.0096	0.0092	
Sb	0.0015	0.0033	0.0038	0.0055	0.0047	0.0046	0.0011	0.0011	0.031
Se	0.0005	0.0019	0.0019	0.0021	0.0020	0.0020	0.0026	0.0026	0.005
SO ₄	36.1	116.3	132.8	150.1	135.5	128.6	98.1	96.1	
TI	0.0002	0.0003	0.0004	0.0005	0.0005	0.0005	0.0001	0.0001	0.00056
Zn	0.0123	0.0141	0.0145	0.0337	0.0361	0.0334	0.0122	0.0121	
Zn-Std	0.1440	0.2388	0.2560	0.2392	0.2214	0.2095	0.2205	0.2149	

¹⁾ The hardness dependent standards for Cd, Cu, Ni, Pb and Zn are listed below the deterministic water quality predictions for each parameter

²⁾ Predictions for low flow conditions correspond to surface runoff equal to zero, and groundwater recharge as the only natural flow contribution

Table 7-5. Deterministic water quality predictions at surface water monitoring station PM-13 (mg/L)

Tailings Basin - Geotechnical Mitigation

Average flow conditions

Parameter	Average Measured Conditions	Year 01	Year 05	Year 10	Year 15	Year 20	Closure	Post- Closure	Hardness Independent Standard
Ag	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0001	0.001
Al	0.1916	0.1409	0.1388	0.1452	0.1426	0.1409	0.1506	0.1454	0.125
As	0.0010	0.0012	0.0013	0.0015	0.0014	0.0014	0.0015	0.0015	0.053
В	0.0443	0.0405	0.0422	0.0435	0.0443	0.0452	0.0376	0.0365	0.5
Ba	0.0278	0.0219	0.0224	0.0225	0.0227	0.0231	0.0204	0.0202	0.0
Be	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Ca	19.9	20.6	21.7	23.8	22.6	21.7	19.1	19.0	
Cd	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Cd-Std	0.0015	0.0012	0.0013	0.0013	0.0012	0.0012	0.0012	0.0012	
CI	7.0	6.9	7.4	6.8	6.8	6.9	6.5	6.4	230
Co	0.0005	0.0007	0.0007	0.0007	0.0007	0.0008	0.0007	0.0007	0.005
Cu	0.0020	0.0020	0.0021	0.0021	0.0023	0.0025	0.0020	0.0020	
Cu-Std	0.0123	0.0103	0.0107	0.0105	0.0103	0.0102	0.0098	0.0097	
F	0.3900	0.3507	0.3934	0.2587	0.2638	0.2679	0.2550	0.2502	
Fe	1.2900	2.5880	2.5448	2.5323	2.5192	2.5057	2.6381	2.6309	
Hard	143.5	111.9	117.6	115.3	112.6	110.9	105.6	104.4	
K	2.3	2.4	2.5	2.5	2.4	2.4	2.5	2.4	
Mg	15.9	15.3	15.8	13.8	14.0	14.0	14.7	14.5	
Mn	0.1100	0.3155	0.3142	0.3087	0.3102	0.3123	0.3118	0.3086	
Na	12.7	11.3	12.1	11.0	10.7	10.5	9.8	9.6	
Ni	0.0021	0.0025	0.0028	0.0032	0.0032	0.0034	0.0018	0.0018	
Ni-Std	0.0708	0.0574	0.0598	0.0589	0.0577	0.0569	0.0546	0.0541	
Pb	0.0003	0.0003	0.0003	0.0004	0.0004	0.0004	0.0003	0.0002	
Pb-Std	0.0050	0.0037	0.0039	0.0038	0.0037	0.0036	0.0034	0.0034	
Sb	0.0015	0.0005	0.0006	0.0009	0.0008	0.0008	0.0002	0.0002	0.031
Se	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.005
SO ₄	36.1	39.2	42.8	45.9	44.2	43.6	35.3	34.8	
TI	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0002	0.0002	0.00056
Zn	0.0123	0.0155	0.0155	0.0184	0.0188	0.0185	0.0153	0.0153	
Zn-Std	0.1440	0.1166	0.1216	0.1196	0.1172	0.1157	0.1110	0.1100	

¹⁾ The hardness dependent standards for Cd, Cu, Ni, Pb and Zn are listed below the deterministic water quality predictions for each parameter

Table 7-6. Deterministic water quality predictions at surface water monitoring station PM-13 (mg/L)

Tailings Basin - Geotechnical Mitigation

High flow conditions

Parameter	Average Measured Conditions	Year 01	Year 05	Year 10	Year 15	Year 20	Closure	Post- Closure	Hardness Independent Standard
Ag	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.001
Al	0.1916	0.1221	0.1219	0.1226	0.1223	0.1222	0.1230	0.1225	0.125
As	0.0010	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.053
В	0.0443	0.0284	0.0286	0.0287	0.0288	0.0289	0.0280	0.0279	0.5
Ва	0.0278	0.0166	0.0167	0.0167	0.0167	0.0167	0.0164	0.0164	
Be	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Ca	19.9	15.4	15.5	15.8	15.6	15.6	15.3	15.3	
Cd	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Cd-Std	0.0015	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	
CI	7.0	6.5	6.6	6.5	6.5	6.5	6.5	6.5	230
Co	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.005
Cu	0.0020	0.0015	0.0016	0.0016	0.0016	0.0016	0.0016	0.0015	
Cu-Std	0.0123	0.0072	0.0073	0.0073	0.0072	0.0072	0.0072	0.0072	
F	0.3900	0.2153	0.2199	0.2061	0.2066	0.2071	0.2055	0.2050	
Fe	1.2900	2.8684	2.8634	2.8619	2.8604	2.8588	2.8740	2.8734	
Hard	143.5	74.3	74.9	74.7	74.4	74.3	73.5	73.4	
K	2.3	8.0	0.8	0.8	0.8	0.8	0.8	0.8	
Mg	15.9	6.8	6.9	6.7	6.7	6.7	6.8	6.7	
Mn	0.1100	0.3016	0.3015	0.3009	0.3011	0.3013	0.3012	0.3009	
Na	12.7	6.5	6.6	6.5	6.5	6.5	6.4	6.4	
Ni	0.0021	0.0013	0.0014	0.0014	0.0014	0.0014	0.0013	0.0013	
Ni-Std	0.0708	0.0405	0.0408	0.0408	0.0406	0.0406	0.0402	0.0402	
Pb	0.0003	0.00016	0.00016	0.00018	0.00018	0.00018	0.00016	0.00016	
Pb-Std	0.0050	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0021	
Sb	0.0015	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.031
Se	0.0005	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.005
SO ₄	36.1	7.6	8.0	8.3	8.2	8.1	7.1	7.0	
TI	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.00056
Zn	0.0123	0.0159	0.0160	0.0162	0.0163	0.0163	0.0159	0.0159	
Zn-Std	0.1440	0.0824	0.0830	0.0828	0.0825	0.0824	0.0817	0.0816	

¹⁾ The hardness dependent standards for Cd, Cu, Ni, Pb and Zn are listed below the deterministic water quality predictions for each parameter

Figure 5-3: Deterministic Water Quality Predictions for Arsenic, Cobalt, Copper, Nickel, Antimony and Sulfate at PM-12 (Embarrass River) as a Function of Tailings Basin - Proposed Action Development

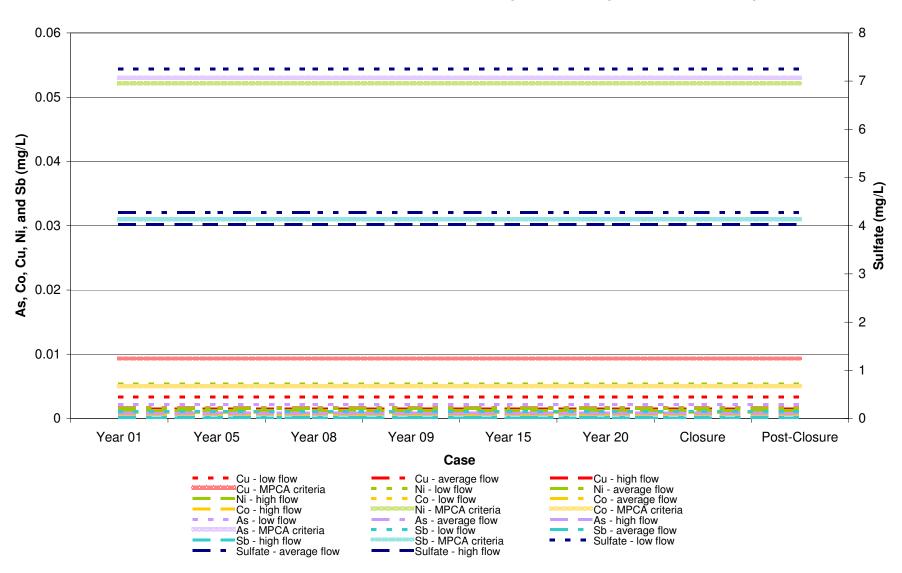


Figure 5-4: Deterministic Water Quality Predictions for Arsenic, Cobalt, Copper, Nickel, Antimony and Sulfate at PM-13 (Embarrass River) as a Function of Tailings Basin - Proposed Action Development

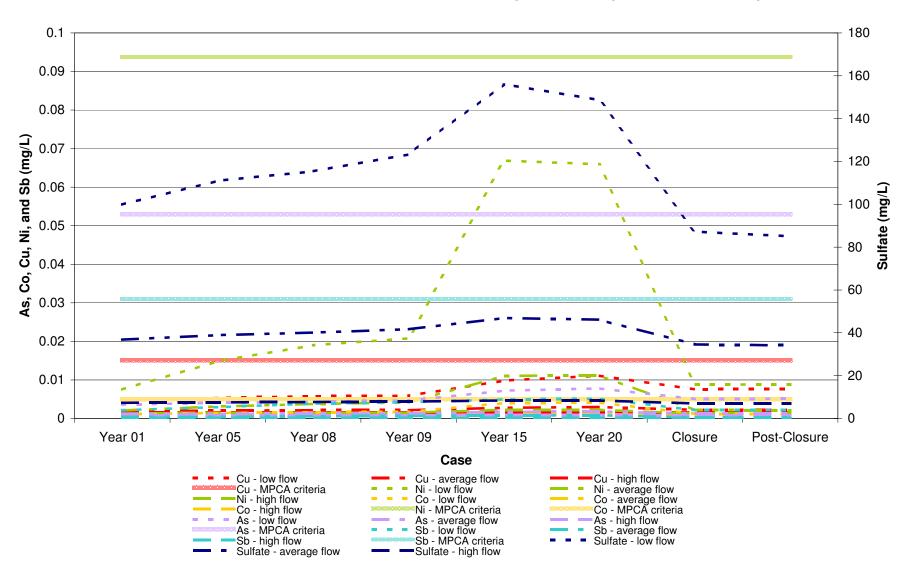


Figure 7-1: Deterministic Water Quality Predictions for Arsenic, Cobalt, Copper, Nickel, Antimony and Sulfate at PM-12 (Embarrass River) as a Function of Tailings Basin - Geotechnical Mitigation Development

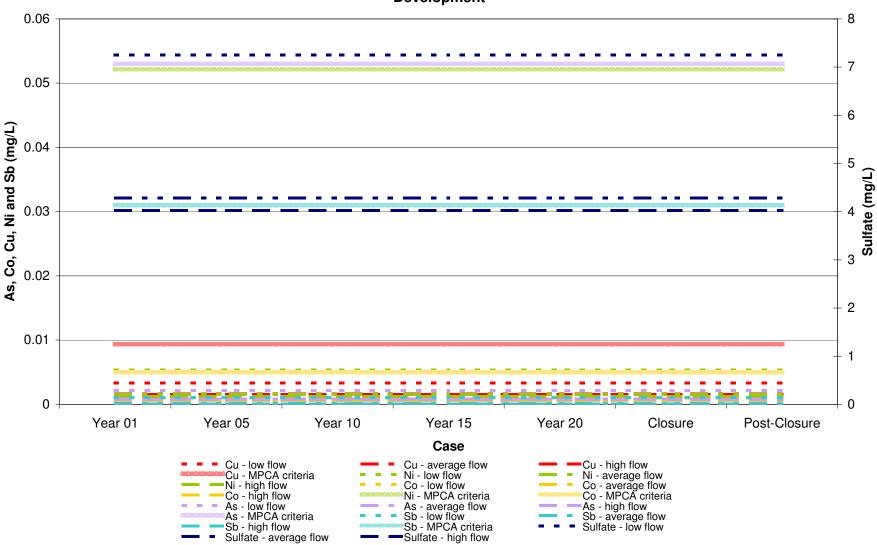
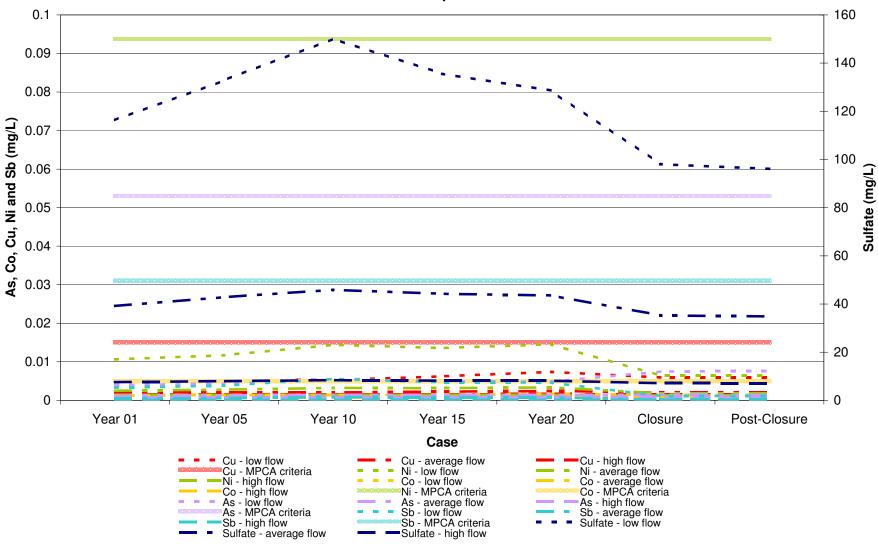


Figure 7-2: Deterministic Water Quality Predictions for Arsenic, Cobalt, Copper, Nickel, Antimony and Sulfate at PM-13 (Embarrass River) as a Function of Tailings Basin - Geotechnical Mitigation Development



Appendix E

Calibration of Mass-Balance Model for Embarrass River Watersheds for Surface Water Runoff Water Quality

Embarra	ass River Model - Calibration to Baseline V	Vater Qua	lity Data
Parameter:			
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)
ata	surface water flow into PM-13	Q_s13 =	56.01 (cfs)
Ö	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
×	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)
프	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)
nput Flow Data	Hydrometallurgical Residue Cells Liner Leakage ground water flow into PM-12	Q_rrs = Q_g12 =	0.00 (cfs) 0.86 (cfs)
ם	ground water flow into PM-13	Q_g13 =	4.21 (cfs)
			/ /
æ	concentration of surface water into PM-12	C_s12 =	0.11 (μg/l)
Data	concentration of surface water into PM-13	C_s13 =	0.11 (μg/l)
l no	concentration of WWTP discharge	C_sBab =	0.11 (µg/l)
ıtrati	concentration of Area 5 Pit NW discharge	C_spit =	0.16 (µg/l)
Sen	concentration of LTVSMC Tailings Basin seepage	C_fs =	0.1 (μg/l)
Sono	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	0.008 (µg/l)
lnp	concentration of ground water flow into PM-13	C_g13 =	0.008 (µg/l)
		1	1
آ . ا	flow in river at PM-12	Q_r12 =	13.79 (cfs)
Water Balance	flow in river at PM-13	Q_r13 =	80.00 (cfs)
<u></u> ≤ m	flow check	Q_ck =	80.00 (cfs)
		I	
	mass flux of surface water into PM-12	M_s12 =	39 (µg/s)
₩_	mass flux of surface water into PM-13 mass flux of Babbitt WWTP	M_s13 = M sBab =	174 (μg/s) 1 (μg/s)
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge	M_spit =	9 (μg/s)
latior Flux	concentration of Area 3 ht rww discharge	M_fs =	11 (µg/s)
를 표	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (μg/s)
Calcul Mass I	mass flux of ground water into PM-12	M_g12 =	0 (μg/s)
ő <u>≌</u>	mass flux of ground water into PM-13	M_g13 =	1 (µg/s)
Φ	The state of the s	M 40	12/
Mass Balance	mass flux in river at PM-12	M_r12 =	40 (μg/s)
Mass Balan	g		
≥ ₪	mass flux in river at PM-13	M_r13 =	236 (µg/s)
Calculated Concentration			
Calculated Concentral	concentration in river at PM-12	C_r12 =	0.10 (μg/l)
Lla Gn			, , ,
alct			
ပိပိ	concentration in river at PM-13	C_r13 =	0.10 (μg/l)
Observed Concentration			
rat G	Observed concentration in river at PM-12		ND (0.2) (μg/l)
Observed	OBSOLVED CONCONTRATION IN THYON ALT INFIE		(μg/1)
se			

Embarrass River Model - Calibration to Baseline Water Quality Data Parameter: Aluminum surface water flow into PM-12 Q s12 = 12.60 (cfs) surface water flow into PM-13 Q s13 =56.01 (cfs) 0.33 (cfs) Babbitt WWTP discharge Q sBab = Area 5 Pit NW discharge 1.99 (cfs) Q spit = LTVSMC Tailings Basin seepage Q fs =4.00 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 0.12 (mg/l) $C_s13 =$ 0.12 (mg/l) concentration of surface water into PM-13 Concentration concentration of WWTP discharge C sBab = 0.12 (mg/l) concentration of Area 5 Pit NW discharge 0.01325 (mg/l) C_spit = 1.5788 (mg/l) concentration of LTVSMC Tailings Basin seepage $C_fs =$ concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 0 (mg/l) concentration of ground water flow into PM-12 0.025 (mg/l) $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 0.025 (mg/l) Balance flow in river at PM-12 Q_r12 = 13.79 (cfs) flow in river at PM-13 Q r13 =80.00 (cfs) flow check 80.00 (cfs) Q_ck = M s12 =mass flux of surface water into PM-12 43 (mg/l) mass flux of surface water into PM-13 M s13 =190 (mg/l) mass flux of Babbitt WWTP M sBab = 1 (mg/l) Calculation concentration of Area 5 Pit NW discharge M_spit = (mg/l) concentration of LTVSMC Tailings Basin seepage M fs =179 (mg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/l) mass flux of ground water into PM-12 $M_{g12} =$ 1 (mg/l) mass flux of ground water into PM-13 $M_g13 =$ 3 (mg/l) Balance mass flux in river at PM-12 M r12 =45 (mg/s) mass flux in river at PM-13 $M_r13 =$ 417 (mg/s) Concentration Calculated concentration in river at PM-12 C r12 = 0.114 (mg/l) C_r13 = concentration in river at PM-13 0.184 (mg/l) Concentration Observed concentration in river at PM-12 0.099 (mg/l) Observed concentration in river at PM-13 (mg/l)

Embarrass River Model - Calibration to Baseline Water Quality Data			
Parameter:			
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)
Data	surface water flow into PM-13	Q_s13 =	56.01 (cfs)
D ₀	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
Flow	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)
끝	LTVSMC Tailings Basin seepage Hydrometallurgical Residue Cells Liner Leakage	Q_fs =	4.00 (cfs)
Ħ	ground water flow into PM-12	Q_rrs = Q_g12 =	0.00 (cfs) 0.86 (cfs)
Input	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	4.21 (cfs)
_	ground water now into t will to	Q_910 =	4.21 (013)
æ	concentration of surface water into PM-12	C_s12 =	0.75 (μg/l)
Data	concentration of surface water into PM-13	C_s13 =	0.75 (µg/l)
L L	concentration of WWTP discharge	C sBab =	0.75 (µg/l)
atic	concentration of Area 5 Pit NW discharge	C_spit =	1.325 (µg/l)
entr	concentration of LTVSMC Tailings Basin seepage	C_fs =	2.905 (µg/l)
Suce	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	2.73 (µg/l)
ndu	•		2.73 (µg/l)
	concentration of ground water flow into PM-13	C_g13 =	2.73 (µg/I)
Ф	flow in river at PM-12	Q r12 =	13.79 (cfs)
Water Balance	flow in river at PM-13	Q_r13 =	80.00 (cfs)
Water Baland	flow check	Q_ck =	80.00 (cfs)
		<u>. – </u>	, ,
	mass flux of surface water into PM-12	M s12 =	268 (µg/s)
	mass flux of surface water into PM-13	M_s13 =	1189 (µg/s)
of	mass flux of Babbitt WWTP	M_sBab =	7 (µg/s)
5 ×	concentration of Area 5 Pit NW discharge	M_spit =	75 (µg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	329 (µg/s)
lno se	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (µg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12	M_g12 =	66 (µg/s)
02	mass flux of ground water into PM-13	M_g13 =	325 (µg/s)
		1	
ce	mass flux in river at PM-12	M_r12 =	341 (μg/s)
Mass Balanc			
Ma Ba	mass flux in river at PM-13	M_r13 =	2258 (µg/s)
nc			
Calculated Concentration		1	
ate ntra	concentration in river at PM-12	C_r12 =	0.87 (μg/l)
Se 25			
Calculated Concentral			
OO	concentration in river at PM-13	C_r13 =	1.00 (μg/l)
_			
Observed Concentration			
ed tra	Observed concentration in river at PM-12		ND (2) (μg/l)
)rve		1	() (I' 3')
Observed			
Ōΰ	Observed concentration in river at PM-13		ND (2) (μg/l)

Embarrass River Model - Calibration to Baseline Water Quality Data			
Parameter:	Boron		
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)
Data	surface water flow into PM-13	Q_s13 =	56.01 (cfs)
D	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
≥	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)
운	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)
t t	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00 (cfs)
nput Flow	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	0.86 (cfs) 4.21 (cfs)
_	Iground water now into FM-13	Q_g13 =	4.21 (CIS)
	concentration of surface water into PM-12	C_s12 =	27 (µg/l)
Data	concentration of surface water into PM-13	C_s13 =	27 (µg/l)
	concentration of WWTP discharge	C sBab =	27 (µg/l)
atio	-	_	
intra	concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage	C_spit = C_fs =	131.5 (μg/l) 330 (μg/l)
nce	concentration of LTVSMC Tailings basin seepage concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0
ပိ			
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	21.2 (µg/l)
드	concentration of ground water flow into PM-13	C_g13 =	21.2 (µg/l)
Ф	flow in river at PM-12	Q r12 =	13.79 (cfs)
ance.	flow in river at PM-12 flow in river at PM-13 flow check	Q_r13 =	80.00 (cfs)
Water Baland	flow check	Q_ck =	80.00 (cfs)
	now criccit	<u> </u>	00.00 (0.3)
	mass flux of surface water into PM-12	M_s12 =	9631 (μg/s)
	mass flux of surface water into PM-13	M_s13 =	42794 (µg/s)
of	mass flux of Babbitt WWTP	M_sBab =	252 (µg/s)
5 ×	concentration of Area 5 Pit NW discharge	M_spit =	7406 (µg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	37356 (µg/s)
S S	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (μg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12	$M_g12 =$	516 (μg/s)
ŰΣ	mass flux of ground water into PM-13	M_g13 =	2526 (µg/s)
		1	
e e	Image flux in river at PM 12	M r12	10200 (112/5)
SS	mass flux in river at PM-12	M_r12 =	10399 (µg/s)
Mass Balance	D		100404 (()
≥ 🗅	mass flux in river at PM-13	M_r13 =	100481 (µg/s)
Calculated Concentration			
ed	concentration in river at PM-12	C r12 =	26.64 (µg/l)
llat ent	os.		20.0 Τ (μg/1)
Calculated Concentral			
S S	concentration in river at PM-13	C_r13 =	44.38 (µg/l)
			,,, , , ,
nc			
y atic			
vec	Observed concentration in river at PM-12		ND (35) (μg/l)
ser			
Observed Concentration	Observed concentration in river at PM-13		44.3 (µg/l)
		-	· (F.9/·/

Embarrass River Model - Calibration to Baseline Water Quality Data			
Parameter:	Barium		
	surface water flow into PM-12	Q_s12 =	11.54 (cfs)
Data	surface water flow into PM-13	Q_s13 =	50.77 (cfs)
صّ	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
Flow	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)
윤	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)
Input	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00 (cfs)
윤	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	0.86 (cfs) 4.21 (cfs)
_	ground water now into FWF13	Q_g13 =	4.21 (015)
æ	concentration of surface water into PM-12	C_s12 =	16 (µg/l)
Data	concentration of surface water into PM-13	C_s13 =	16 (µg/l)
L L	concentration of WWTP discharge	C sBab =	16 (µg/l)
atic	concentration of Area 5 Pit NW discharge	C_spit =	4.4 (µg/l)
entr	concentration of LTVSMC Tailings Basin seepage	C_fs =	92.98 (µg/l)
Suce	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0 O
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	68.1 (µg/l)
ndr	concentration of ground water flow into PM-13	C_g13 =	68.1 (μg/l)
_	concentration of ground water flow into PM-13	C_g13 =	68.1 (µg/1)
Φ	flow in river at PM-12	Q r12 =	12.73 (cfs)
Water Balance	flow in river at PM-13	Q_r13 =	73.70 (cfs)
Water Balan	flow check	Q_ck =	73.70 (cfs)
-	,	<u> </u>	(0.0)
	mass flux of surface water into PM-12	M s12 =	5225 (µg/s)
	mass flux of surface water into PM-13	M_s13 =	22989 (µg/s)
of	mass flux of Babbitt WWTP	M_sBab =	149 (µg/s)
e ×	concentration of Area 5 Pit NW discharge	M_spit =	248 (µg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	$M_fs =$	10525 (μg/s)
	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (µg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12	M_g12 =	1657 (µg/s)
∪ ≥	mass flux of ground water into PM-13	M_g13 =	8114 (µg/s)
ice oc	mass flux in river at PM-12	M_r12 =	7032 (µg/s)
Mass Balanc			
Σ̈́α̈́	mass flux in river at PM-13	M_r13 =	48908 (μg/s)
	T	1	
Calculated Concentration			
ted	concentration in river at PM-12	C_r12 =	19.52 (μg/l)
Calculated Concentrat		_	(1.0.)
alc			
ÖÖ	concentration in river at PM-13	C_r13 =	23.45 (μg/l)
Observed Concentration			
/ed ntra	Observed concentration in river at PM-12		15.50 (μg/l)
Observed			
ဗို ဝိ	Observed concentration in river at PM-13		27.80 (µg/l)
		1	(F-9··/

Embarrass River Model - Calibration to Baseline Water Quality Data			
Parameter:	Beryllium		
	•		
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)
Data	surface water flow into PM-13	Q_s13 =	56.01 (cfs)
D	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
≥	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)
nput Flow	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)
t t	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00 (cfs)
횬	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	0.86 (cfs) 4.21 (cfs)
_	Iground water now into FM-13	Q_g13 =	4.21 (CIS)
	concentration of surface water into PM-12	C_s12 =	0.1 (µg/l)
Data	concentration of surface water into PM-13	C_s13 =	0.1 (µg/l)
	concentration of WWTP discharge	C sBab =	0.1 (µg/l)
atio	-	_	
intra	concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage	C_spit = C_fs =	0.1 (μg/l) 0.75 (μg/l)
nput Concentration	concentration of LTVSMC Tailings basin seepage concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0.75 (μg/l)
ပိ			
put	concentration of ground water flow into PM-12	C_g12 =	0.023 (µg/l)
드	concentration of ground water flow into PM-13	C_g13 =	0.023 (µg/l)
Φ	flow in river at PM-12	Q r12 =	13.79 (cfs)
ter	flow in river at PM-12 flow in river at PM-13 flow check	Q_r13 =	80.00 (cfs)
Water Baland	flow check	Q_ck =	80.00 (cfs)
	non onour	<u> </u>	00.00 (0.0)
	mass flux of surface water into PM-12	M_s12 =	36 (µg/s)
	mass flux of surface water into PM-13	M_s13 =	158 (µg/s)
of	mass flux of Babbitt WWTP	M_sBab =	1 (µg/s)
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge	M_spit =	6 (µg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	85 (µg/s)
S S	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (µg/s)
Calcul Mass	mass flux of ground water into PM-12	$M_g12 =$	1 (µg/s)
ŰΣ	mass flux of ground water into PM-13	M_g13 =	3 (µg/s)
		1	
Ф	mass flux in river at PM-12	M r12 -	37 (ug/s)
SS	mass flux in river at PM-12	M_r12 =	37 (μg/s)
Mass Balance	and the string of DM 10	M =10	000 (/-)
2 0	mass flux in river at PM-13	M_r13 =	289 (µg/s)
_			
Calculated Concentration			
ed	concentration in river at PM-12	C_r12 =	0.10 (µg/l)
llat ent	os.	<u> </u>	(μg/1)
Calculated Concentral			
္	concentration in river at PM-13	C_r13 =	0.13 (µg/l)
Ľ			
Observed Concentration	0		ND (0.5)
Observed	Observed concentration in river at PM-12		ND (0.2) (μg/l)
ser			
දී රි	Observed concentration in river at PM-13		ND (0.2) (μg/l)

Embarrass River Model - Calibration to Baseline Water Quality Data			
Parameter:	Calcium		
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)
Data	surface water flow into PM-13	Q_s13 =	56.01 (cfs)
	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
Input Flow	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)
띮	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)
ŧ	Hydrometallurgical Residue Cells Liner Leakage ground water flow into PM-12	Q_rrs = Q_g12 =	0.00 (cfs)
d	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	0.86 (cfs) 4.21 (cfs)
_	ground water now into this to	<u> </u>	4.21 (013)
_	concentration of surface water into PM-12	C_s12 =	15 (mg/l)
Data	concentration of surface water into PM-13	C_s13 =	15 (mg/l)
iţi	concentration of WWTP discharge	C_sBab =	15 (mg/l)
ntra	concentration of Area 5 Pit NW discharge	C_spit =	95.35 (mg/l)
ce	concentration of LTVSMC Tailings Basin seepage	C_fs =	59.78 (mg/l)
nput Concentration	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0
out 6	concentration of ground water flow into PM-12	C_g12 =	19 (mg/l)
, i	concentration of ground water flow into PM-13	C_g13 =	19 (mg/l)
ന	flow in river at PM-12	Q r12 =	13.79 (cfs)
Water Balance	flow in river at PM-13	Q_r13 =	80.00 (cfs)
Water Balan	flow check		80.00 (cfs)
> ш	lliow check	Q_ck =	80.00 (CIS)
	Impact flow of confess materials DM 10	IM at0	E0E0 (/a)
	mass flux of surface water into PM-12 mass flux of surface water into PM-13	M_s12 = M_s13 =	5350 (µg/s) 23774 (mg/s)
_	mass flux of Babbitt WWTP	M_sBab =	140 (mg/s)
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge	M_spit =	5370 (mg/s)
atior	concentration of LTVSMC Tailings Basin seepage	M fs =	6767 (mg/s)
음도	concentration of Hydrometallurgical Residue Cells Liner Leakage	M rrs =	0 (mg/s)
Calcul Mass I	mass flux of ground water into PM-12	M_g12 =	462 (mg/s)
ΰŽ	mass flux of ground water into PM-13	M_g13 =	2264 (mg/s)
Se Se	mass flux in river at PM-12	M_r12 =	5953 (mg/s)
Mass Balanc	· · · · · · · · · · · · · · · · · · ·	 	(g, o/
Mass Balan	mass flux in river at PM-13	M_r13 =	44128 (mg/s)
			· = - (g, o/
Calculated Concentration			
tra	concentration in river at PM-12	C r12 =	15.25 (mg/l)
Calculated Concentrat		_	
글일			
ပိ ပိ	concentration in river at PM-13	C_r13 =	19.49 (mg/l)
ř			
_ atio			
ed otra	Observed concentration in river at PM-12	<u> </u>	13.4 (mg/l)
erv			
Observed Concentration	0	1	40.0 (")
00	Observed concentration in river at PM-13		19.9 (mg/l)

Embarrass River Model - Calibration to Baseline Water Quality Data			
	Cadmium		
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)
Data	surface water flow into PM-13	Q_s13 =	56.01 (cfs)
	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
nput Flow	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)
윤	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)
=	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00 (cfs)
آو	ground water flow into PM-12	Q_g12 =	0.86 (cfs)
_	ground water flow into PM-13	Q_g13 =	4.21 (cfs)
æ	concentration of surface water into PM-12	C_s12 =	0.08 (µg/l)
Data	concentration of surface water into PM-13	C_s13 =	0.08 (µg/l)
L L	concentration of WWTP discharge	C sBab =	0.08 (µg/l)
atic	concentration of Area 5 Pit NW discharge	C_spit =	0.1 (µg/l)
entr	concentration of LTVSMC Tailings Basin seepage	C_fs =	0.188 (μg/l)
Suce	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0 (μg/ι)
Š	concentration of ground water flow into PM-12	 C_g12 =	0.3 (µg/l)
nput Concentration	concentration of ground water flow into PM-13		
	concentration of ground water flow into PM-13	C_g13 =	0.3 (µg/l)
Φ	flow in river at PM-12	Q r12 =	13.79 (cfs)
ter	flow in river at PM-12 flow in river at PM-13 flow check	Q_r13 =	80.00 (cfs)
Water Balan	flow check	Q_ck =	80.00 (cfs)
	non oncox	<u>a_</u> 5.t =	00.00 (0.0)
	mass flux of surface water into PM-12	M s12 =	29 (µg/s)
	mass flux of surface water into PM-13	M_s13 =	127 (µg/s)
of	mass flux of Babbitt WWTP	M_sBab =	1 (µg/s)
5 ×	concentration of Area 5 Pit NW discharge	M_spit =	6 (µg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	21 (µg/s)
를 S S	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (µg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12	M_g12 =	7 (µg/s)
∪ ≥	mass flux of ground water into PM-13	M_g13 =	36 (µg/s)
ice Ce	mass flux in river at PM-12	M_r12 =	37 (μg/s)
Mass Balance			
B E	mass flux in river at PM-13	M_r13 =	226 (µg/s)
	Т		
fion			
Calculated Concentration	concentration in river at PM-12	C_r12 =	0.09 (µg/l)
		<u> </u>	(F-3, -)
alct onc			
ပိ ပိ	concentration in river at PM-13	C_r13 =	0.10 (μg/l)
	T		
Observed Concentration			
ed tra	Observed concentration in river at PM-12		ND (0.2) (µg/l)
erve Sen			
Observed			ND (0.5)
00	Observed concentration in river at PM-13		ND (0.2) (μg/l)

Casla saus	on Diver Marial Calibration to Decaling M	1-1 0	lia . Data	
	ass River Model - Calibration to Baseline V Chloride	vater Qua	iity Data	
Parameter:	Official			
' Data	surface water flow into PM-12 surface water flow into PM-13 Babbitt WWTP discharge Area 5 Pit NW discharge	Q_s12 = Q_s13 = Q_sBab = Q_spit =	12.60 (c 56.01 (c 0.33 (c 1.99 (c	ofs) ofs)
Input Flow	LTVSMC Tailings Basin seepage Hydrometallurgical Residue Cells Liner Leakage ground water flow into PM-12 ground water flow into PM-13	Q_fs = Q_fs = Q_rrs = Q_g12 = Q_g13 =	4.00 (c 0.00 (c 0.86 (c	ofs) ofs)
Data	concentration of surface water into PM-12 concentration of surface water into PM-13	C_s12 = C_s13 =	6.5 (n 6.5 (n	
tion [concentration of WWTP discharge	C_sBab =	6.5 (n	
entra	concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage	C_spit = C fs =	5.95 (n 21.54 (n	
Concentration	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =		ng/l)
Input C	concentration of ground water flow into PM-12	C_g12 =	1.8 (m	ng/l)
디	concentration of ground water flow into PM-13	C_g13 =	1.8 (n	ng/l)
r eo	flow in river at PM-12	Q_r12 =	13.79 (c	cfs)
Water Balance	flow in river at PM-13 flow check	Q_r13 = Q_ck =	80.00 (c 80.00 (c	
	now check	Q_0N =	00.00 (0	13)
	mass flux of surface water into PM-12 mass flux of surface water into PM-13	M_s12 = M s13 =	2319 (n 10302 (n	
n of	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge	M_sBab = M_spit =	61 (n 335 (n	ng/l)
Calculation of Mass Flux	concentration of LTVSMC Tailings Basin seepage concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12	M_fs = M_rrs = M_g12 =	2438 (n 0 (n 44 (n	ng/l) ng/l)
S S	mass flux of ground water into PM-13	M_g13 =		ng/l)
Mass Balance	mass flux in river at PM-12	M_r12 =	2423 (n	ng/s)
Mass Balan	mass flux in river at PM-13	M_r13 =	15713 (n	ng/s)
Ē				
ated ntratio	concentration in river at PM-12	C_r12 =	6.21 (n	mg/l)
Calculated Concentration	concentration in river at PM-13	C_r13 =	6.94 (n	ng/l)
uc				
ed rtratic	Observed concentration in river at PM-12		4.49 (n	ng/l)
Observed Concentration	Observed concentration in river at PM-13		6.98 (n	ng/l)

Embarrass River Model - Calibration to Baseline Water Quality Data				
Parameter:		ator Quar	ity Data	•
Parameter:	CODAIL			
	surface water flow into PM-12	Q_s12 =	12.60	(cfs)
ফু	surface water flow into PM-13	Q s13 =	56.01	
Data	Babbitt WWTP discharge	Q_sBab =	0.33	
	Area 5 Pit NW discharge	Q_spit =	1.99	
é	LTVSMC Tailings Basin seepage	Q_fs =	4.00	
T T	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	` '
nput Flow	ground water flow into PM-12	Q_g12 =	0.86	` /
	ground water flow into PM-13	Q_g13 =	4.21	(cfs)
_	concentration of surface water into PM-12	C_s12 =	0.6	(µg/l)
Data	concentration of surface water into PM-13	C_s13 =		(µg/l)
] u	concentration of WWTP discharge	C sBab =		(µg/l)
atic	concentration of Area 5 Pit NW discharge	C_spit =		(μg/l)
entr	concentration of LTVSMC Tailings Basin seepage	C_fs =	1.556	
ouc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =		(µg/l)
nput Concentration	concentration of ground water flow into PM-12	 C_g12 =		(µg/l)
ndu	concentration of ground water flow into PM-13	C_g13 =		(μg/l)
	portionalization of ground water flow lifto FW-13	<u>∪_g13 =</u>	1.1	(P9/1)
Φ	flow in river at PM-12	Q_r12 =	13.79	(cfs)
	flow in river at PM-13	Q_r13 =	80.00	
Water Balan	flow check	Q ck=	80.00	
		. –		, ,
	mass flux of surface water into PM-12	M_s12 =	214	(µg/s)
	mass flux of surface water into PM-13	M_s13 =		(µg/s)
Jo (mass flux of Babbitt WWTP	M_sBab =		(µg/s)
latior Flux	concentration of Area 5 Pit NW discharge	M_spit =		(µg/s)
<u>a</u> 되	concentration of LTVSMC Tailings Basin seepage	M_fs =		(µg/s)
<u>on</u>	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12	M_rrs = M_g12 =		(μg/s) (μg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12	M_g13 =		(μg/s) (μg/s)
<u> </u>	indee nax or ground water into 1 in 10	<u>g</u> . c =	101	(µg/0)
(D)				
Mass Balance	mass flux in river at PM-12	M_r12 =	246	(µg/s)
Mass Balan				
Σä	mass flux in river at PM-13	M_r13 =	1533	(µg/s)
-		1		
- tior				
Calculated Concentration	concentration in river at PM-12	C_r12 =	0.63	(µg/l)
Salc	DM 40	010	0.00	((II)
00	concentration in river at PM-13	C_r13 =	0.68	(µg/l)
<u>_</u>				
Observed Concentration				
vec	Observed concentration in river at PM-12		0.58	(µg/l)
Observed Concentra				
පි රි	Observed concentration in river at PM-13		ND (1)	(µg/l)

Embarrass River Model - Calibration to Baseline Water Quality Data			
Parameter:	Copper		
	• •		
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)
Data	surface water flow into PM-13	Q_s13 =	56.01 (cfs)
ρ	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
Input Flow	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)
띮	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)
ŧ	Hydrometallurgical Residue Cells Liner Leakage ground water flow into PM-12	Q_rrs = Q_g12 =	0.00 (cfs) 0.86 (cfs)
d	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	0.86 (cfs) 4.21 (cfs)
_	ground water now into 1 Mi-10	<u> </u>	4.21 (013)
	concentration of surface water into PM-12	C_s12 =	1.5 (µg/l)
Data	concentration of surface water into PM-13	C_s13 =	1.5 (µg/l)
	concentration of WWTP discharge	C sBab =	1.5 (µg/l)
atio		_	
ıntra	concentration of Area 5 Pit NW discharge	C_spit = C fs =	3.45 (μg/l) 4.555 (μg/l)
nput Concentration	concentration of LTVSMC Tailings Basin seepage concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	4.555 (μg/l) 0 (μg/l)
ပိ			
put	concentration of ground water flow into PM-12	C_g12 =	4 (µg/l)
	concentration of ground water flow into PM-13	C_g13 =	4 (µg/l)
40	flow in river at PM-12	Q r12 =	13.79 (cfs)
nce	niow in river at PM-12		i '
Water Balance	flow in river at PM-13	Q_r13 =	80.00 (cfs)
S @	flow check	Q_ck =	80.00 (cfs)
		I. 40	5051/ /)
	mass flux of surface water into PM-12	M_s12 =	535 (µg/s)
₩	mass flux of surface water into PM-13 mass flux of Babbitt WWTP	M_s13 = M_sBab =	2377 (µg/s) 14 (µg/s)
U	concentration of Area 5 Pit NW discharge	M_spit =	194 (µg/s)
lation Flux	concentration of Area of In TVV disentage	M fs =	
			5161(110/9)
Jati File			516 (µg/s)
alculati ass FIu	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (μg/s)
Calculation of Mass Flux			0 (μg/s)
Calculati Mass Flu	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12	M_rrs = M_g12 =	0 (μg/s) 97 (μg/s)
Φ	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13	M_rrs = M_g12 = M_g13 =	0 (μg/s) 97 (μg/s) 477 (μg/s)
Φ 0	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12	M_rrs = M_g12 =	0 (μg/s) 97 (μg/s)
Φ 0	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12	M_rrs = M_g12 = M_g13 = M_r12 =	0 (µg/s) 97 (µg/s) 477 (µg/s) 646 (µg/s)
	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13	M_rrs = M_g12 = M_g13 =	0 (μg/s) 97 (μg/s) 477 (μg/s)
Mass Balance	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12	M_rrs = M_g12 = M_g13 = M_r12 =	0 (µg/s) 97 (µg/s) 477 (µg/s) 646 (µg/s)
Mass Balance	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12	M_rrs = M_g12 = M_g13 = M_r12 =	0 (µg/s) 97 (µg/s) 477 (µg/s) 646 (µg/s)
Mass Balance	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13	M_rrs = M_g12 = M_g13 = M_r12 = M_r13 =	0 (μg/s) 97 (μg/s) 477 (μg/s) 646 (μg/s) 4210 (μg/s)
Mass Balance	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12	M_rrs = M_g12 = M_g13 = M_r12 =	0 (µg/s) 97 (µg/s) 477 (µg/s) 646 (µg/s)
Mass Balance	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13	M_rrs = M_g12 = M_g13 = M_r12 = M_r13 =	0 (μg/s) 97 (μg/s) 477 (μg/s) 646 (μg/s) 4210 (μg/s)
Mass Balance	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12	M_rrs = M_g12 = M_g13 = M_r12 = M_r13 = C_r12 =	0 (µg/s) 97 (µg/s) 477 (µg/s) 646 (µg/s) 4210 (µg/s)
Φ 0	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13	M_rrs = M_g12 = M_g13 = M_r12 = M_r13 =	0 (μg/s) 97 (μg/s) 477 (μg/s) 646 (μg/s) 4210 (μg/s)
Calculated Mass Concentration Balance	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12	M_rrs = M_g12 = M_g13 = M_r12 = M_r13 = C_r12 =	0 (µg/s) 97 (µg/s) 477 (µg/s) 646 (µg/s) 4210 (µg/s)
Calculated Mass Concentration Balance	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12	M_rrs = M_g12 = M_g13 = M_r12 = M_r13 = C_r12 =	0 (µg/s) 97 (µg/s) 477 (µg/s) 646 (µg/s) 4210 (µg/s)
Calculated Mass Concentration Balance	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12 concentration in river at PM-13	M_rrs = M_g12 = M_g13 = M_r12 = M_r13 = C_r12 =	0 (μg/s) 97 (μg/s) 477 (μg/s) 646 (μg/s) 4210 (μg/s) 1.66 (μg/l) 1.86 (μg/l)
Calculated Mass Concentration Balance	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12	M_rrs = M_g12 = M_g13 = M_r12 = M_r13 = C_r12 =	0 (µg/s) 97 (µg/s) 477 (µg/s) 646 (µg/s) 4210 (µg/s)
Mass Balance	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12 concentration in river at PM-13	M_rrs = M_g12 = M_g13 = M_r12 = M_r13 = C_r12 =	0 (μg/s) 97 (μg/s) 477 (μg/s) 646 (μg/s) 4210 (μg/s) 1.66 (μg/l) 1.86 (μg/l)

Embarrass River Model - Calibration to Baseline Water Quality Data			
Parameter:	Fluoride		
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)
<u>ta</u>	surface water flow into PM-13	Q_s13 =	56.01 (cfs)
Data	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
>	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)
Flow	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)
_ <u>+</u>	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00 (cfs)
Input F	ground water flow into PM-12	Q_g12 =	0.86 (cfs)
	ground water flow into PM-13	Q_g13 =	4.21 (cfs)
	concentration of surface water into PM-12	C_s12 =	0.2 (mg/l)
Data			
	concentration of surface water into PM-13	C_s13 =	0.2 (mg/l)
tior	concentration of WWTP discharge	C_sBab =	0.2 (mg/l)
ntra	concentration of Area 5 Pit NW discharge	C_spit =	0.125 (mg/l)
cer	concentration of LTVSMC Tailings Basin seepage	C_fs =	1.55 (mg/l)
Son	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0 (mg/l)
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	0.385 (mg/l)
드	concentration of ground water flow into PM-13	C_g13 =	0.385 (mg/l)
	L	1	
r S	flow in river at PM-12	Q_r12 =	13.79 (cfs)
Water Balance	flow in river at PM-13	Q_r13 =	80.00 (cfs)
<u> </u>	flow check	Q_ck =	80.00 (cfs)
			1.
	mass flux of surface water into PM-12	M_s12 =	71 (mg/l)
4 <u>-</u>	mass flux of surface water into PM-13	M_s13 =	317 (mg/l)
٥ ر	mass flux of Babbitt WWTP	M_sBab =	2 (mg/l)
latior Flux	concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage	M_spit = M fs =	7 (mg/l) 175 (mg/l)
<u>a</u> ⊟	concentration of LTVSMC Tailings basin seepage concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	
lcu ss	mass flux of ground water into PM-12	M_g12 =	0 (mg/l) 9 (mg/l)
Calculation of Mass Flux	mass flux of ground water into PM-13	M g13 =	46 (mg/l)
	inace hax of ground water into this to	<u>_</u> g	. o (g, .)
(D)			
ŏ	mass flux in river at PM-12	M_r12 =	83 (mg/s)
Mass Balance			
Σ̈́ä	mass flux in river at PM-13	M_r13 =	628 (mg/s)
	Т		
Calculated Concentration			
ed rat	concentration in river at PM-12	C_r12 =	0.21 (mg/l)
Calculated Concentral	STATE OF THE STATE		(1119/1)
를 <mark>한</mark>			
ပိ ပိ	concentration in river at PM-13	C_r13 =	0.28 (mg/l)
		· =	
on			
d atj	Observed concentration is vivey at DM 10		0.10
Observed Concentration	Observed concentration in river at PM-12	<u> </u>	0.10 (mg/l)
ser			
පි වි	Observed concentration in river at PM-13		0.39 (mg/l)

Embarrass River Model - Calibration to Baseline Water Quality Data				
Parameter:			•	
				_
	surface water flow into PM-12	Q_s12 =	1.01 (cfs)	
ıta	surface water flow into PM-13	Q_s13 =	0.72 (cfs)	
Dis	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)	
<u> </u>	Area 5 Pit NW discharge	Q_spit =	0.26 (cfs)	
문	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)	_
ち	Hydrometallurgical Residue Cells Liner Leakage ground water flow into PM-12	Q_rrs = Q_g12 =	0.00 (cfs) 0.86 (cfs)	-
nput Flow Data	ground water flow into PM-13	Q_g12 = Q_g13 =	4.21 (cfs)	_
_	ground water new into the 10	<u> </u>	4.21 (010)	_
_	concentration of surface water into PM-12	C_s12 =	2.9 (mg/l)	٦
Data	concentration of surface water into PM-13	C_s13 =	2.9 (mg/l)	
] uo	concentration of WWTP discharge	C_sBab =	2.9 (mg/l)	
trati	concentration of Area 5 Pit NW discharge	C_spit =	0.038 (mg/l)	
ë	concentration of LTVSMC Tailings Basin seepage	C_fs =	4.594 (mg/l)	
ono	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0 (mg/l)	
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	0.035 (mg/l)	
lnp	concentration of ground water flow into PM-13	C_g13 =	0.035 (mg/l)	
_ 8	flow in river at PM-12	Q_r12 =	2.20 (cfs)	
Water Balance	flow in river at PM-13	Q_r13 =	11.39 (cfs)	
ž Š	flow check	Q_ck =	11.39 (cfs)	
	mass flux of surface water into PM-12	M_s12 =	83 (mg/l)	_
₩	mass flux of surface water into PM-13 mass flux of Babbitt WWTP	M_s13 = M sBab =	59 (mg/l) 27 (mg/l)	_
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge	M_spit =	0 (mg/l)	-
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	520 (mg/l)	-
声	concentration of Environmentallurgical Residue Cells Liner Leakage	M_rrs =	0 (mg/l)	-
Calcul Mass I	mass flux of ground water into PM-12	M_g12 =	1 (mg/l)	-
ပို ဗိ	mass flux of ground water into PM-13	M_g13 =	4 (mg/l)	_
Φ				
s or	mass flux in river at PM-12	M_r12 =	111 (mg/s))
Mass Balance				
≥ ₪	mass flux in river at PM-13	M_r13 =	694 (mg/s))
		ı		_
tio_				
Calculated Concentration	concentration in river at PM-12	C_r12 =	1.78 (mg/l)	
		_	(9/1)	\neg
<u> </u>				
ိ ပိ	concentration in river at PM-13	C_r13 =	2.15 (mg/l)	[
Observed Concentration				
d ati	Observed concentration in river at DM 19		0.06 (~~~/!\	
ž ve	Observed concentration in river at PM-12		2.26 (mg/l)	\dashv
ser				
Observed	Observed concentration in river at PM-13		1.70 (mg/l)	
		1	····• (····g/1)	

121.55

(mg/l)

Embarrass River Model - Calibration to Baseline Water Quality Data Parameter: Hardness surface water flow into PM-12 Q s12 = 12.60 (cfs) surface water flow into PM-13 Q s13 =56.01 (cfs) 0.33 (cfs) Babbitt WWTP discharge Q sBab = Area 5 Pit NW discharge 1.99 (cfs) Q spit = LTVSMC Tailings Basin seepage Q fs =4.00 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 70 (mg/l) $C_s13 =$ 70 (mg/l) concentration of surface water into PM-13 Concentration 70 (mg/l) concentration of WWTP discharge C sBab = 942.7 (mg/l) concentration of Area 5 Pit NW discharge C_spit = 436.6 (mg/l) concentration of LTVSMC Tailings Basin seepage $C_fs =$ C rrs = 0 (mg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage 87.5 (mg/l) concentration of ground water flow into PM-12 $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 87.5 (mg/l) Balance flow in river at PM-12 Q_r12 = 13.79 (cfs) flow in river at PM-13 Q r13 =80.00 (cfs) flow check 80.00 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =24969 (mg/l) mass flux of surface water into PM-13 M s13 =110947 (mg/l) $M_sBab =$ mass flux of Babbitt WWTP 654 (mg/l) Calculation concentration of Area 5 Pit NW discharge M_spit = 53090 (mg/l) concentration of LTVSMC Tailings Basin seepage M fs =49423 (mg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/l) 2130 (mg/l) mass flux of ground water into PM-12 $M_{g12} =$ mass flux of ground water into PM-13 M g13 =10425 (mg/l) Balance 27752 (mg/s) mass flux in river at PM-12 M r12 =251638 (mg/s) mass flux in river at PM-13 $M_r13 =$ Concentration Calculated concentration in river at PM-12 C r12 = 71.09 (mg/l) C_r13 = concentration in river at PM-13 111.15 (mg/l) Concentration Observed concentration in river at PM-12 53.66 (mg/l)

Observed concentration in river at PM-13

Embarrass River Model - Calibration to Baseline Water Quality Data			
Parameter:	Magnesium		
	· ·		
	surface water flow into PM-12	Q s12 =	12.60 (cfs)
효	surface water flow into PM-13	Q_s13 =	56.01 (cfs)
Data	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)
nput Flow	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)
=	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00 (cfs)
ᅙ	ground water flow into PM-12	Q_g12 =	0.86 (cfs)
	ground water flow into PM-13	Q_g13 =	4.21 (cfs)
	concentration of surface water into PM-12	C_s12 =	5.9 (mg/l)
Data			
ä	concentration of surface water into PM-13	C_s13 =	5.9 (mg/l)
iöi	concentration of WWTP discharge	C_sBab =	5.9 (mg/l)
trat	concentration of Area 5 Pit NW discharge	C_spit =	271 (mg/l)
Sen	concentration of LTVSMC Tailings Basin seepage	C_fs =	69.97 (mg/l)
Sonc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	10.65 (mg/l)
Inp	concentration of ground water flow into PM-13	C_g13 =	10.65 (mg/l)
Φ	flow in river at PM-12	Q r12 =	13.79 (cfs)
ano ano	flow in river at PM-12 flow in river at PM-13 flow check	Q_r13 =	80.00 (cfs)
Water Baland	flow check	Q_ck =	80.00 (cfs)
/ Ш	now check	Q_CK =	60.00 (CIS)
	mass flux of surface water into PM-12	M s12 =	2105 (μg/s)
	mass flux of surface water into PM-13	M_s13 =	9351 (mg/s)
₩	mass flux of Babbitt WWTP	M_sBab =	55 (mg/s)
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge	M_spit =	15262 (mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	7921 (mg/s)
l e u	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (mg/s)
Calcul	mass flux of ground water into PM-12	M_g12 =	259 (mg/s)
ပိ ≌ိ	mass flux of ground water into PM-13	M_g13 =	1269 (mg/s)
φ.	mana flux in river at DM 10	M +10	0410 (~~~~/~)
Mass Balance	mass flux in river at PM-12	M_r12 =	2419 (mg/s)
Mass Balan	Land of the street of DNA 40	M	00004 (()
≥ @	mass flux in river at PM-13	M_r13 =	36221 (mg/s)
_			
Calculated Concentration			
ed	concentration in river at PM-12	C r12 =	6.20 (mg/l)
lat ent	oonoonaaaon iii iivoi atti wii 12	<u> </u>	0.20 (mg/i)
Calculated Concentral			
Co Co	concentration in river at PM-13	C_r13 =	16.00 (mg/l)
		13	(1119/1)
Ē			
l iệi			
		1	0.0 ((1)
ed	Observed concentration in river at PM-12		6.2 (mg/l)
erved	Observed concentration in river at PM-12		6.2 (mg/l)
Observed Concentration	Observed concentration in river at PM-12 Observed concentration in river at PM-13		6.2 (mg/l)

Embarrass River Model - Calibration to Baseline Water Quality Data			
Parameter:	Manganese		
_	9		
	surface water flow into PM-12	Q_s12 =	0.00 (cfs)
Data	surface water flow into PM-13	Q_s13 =	0.00 (cfs)
Da Da	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
	Area 5 Pit NW discharge	Q_spit =	0.26 (cfs)
nput Flow	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)
±	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00 (cfs)
ᅙ	ground water flow into PM-12	Q_g12 =	0.86 (cfs)
	ground water flow into PM-13	Q_g13 =	4.21 (cfs)
	concentration of surface water into PM-12	C_s12 =	0.3 (mg/l)
Data			
0 د	concentration of surface water into PM-13	C_s13 =	0.3 (mg/l)
ţi	concentration of WWTP discharge	C_sBab =	0.3 (mg/l)
ıtra	concentration of Area 5 Pit NW discharge	C_spit =	0.65 (mg/l)
cer	concentration of LTVSMC Tailings Basin seepage	C_fs =	1.183 (mg/l)
Son	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	0.188 (mg/l)
Inp	concentration of ground water flow into PM-13	C_g13 =	0.188 (mg/l)
O.	flow in river at PM-12	Q r12 =	1.91 (cfs)
er Zuce	flow in river at PM-12 flow in river at PM-13 flow check	Q_r13 =	9.66 (cfs)
Water Baland	flow check		` ´
> ш	now check	Q_ck =	9.66 (cfs)
	mass flux of surface water into PM-12	M_s12 =	0 (μg/s)
	mass flux of surface water into PM-13	M_s13 =	0 (mg/s)
ð	mass flux of Babbitt WWTP	M_sBab =	3 (mg/s)
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge	M_spit =	5 (mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	134 (mg/s)
l en s	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (mg/s)
Calcul Mass	mass flux of ground water into PM-12	M_g12 =	5 (mg/s)
ΰŽ	mass flux of ground water into PM-13	M_g13 =	22 (mg/s)
		_	
ф	man flow in vivey at DM 10	M =10	7 (, , , , , , , , , , , , , , , , , ,
ss and	mass flux in river at PM-12	M_r12 =	7 (mg/s)
Mass Balance			
≥ 🗅	mass flux in river at PM-13	M_r13 =	168 (mg/s)
_		1	
Calculated Concentration			
ed rat	concentration in river at PM-12	C r12 =	0.14 (mg/l)
late	CONCENTIALION IN TIVEL ALT IVI-12	J_112 =	0.14 (IIIg/I)
Calculated Concentral			
So Sal	concentration in river at PM-13	C_r13 =	0.62 (mg/l)
	Toolooma allom minor all mino	10_110 =	0.02 (mg/i)
_			
atio			
ed	Observed concentration in river at PM-12		0.34 (mg/l)
erv			
Observed Concentration	0		0.00 (#)
00	Observed concentration in river at PM-13		0.20 (mg/l)

Embarrass River Model - Calibration to Baseline Water Quality Data			
Parameter:			
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)
Data	surface water flow into PM-13	Q_s13 =	56.01 (cfs)
De	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
Flow	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)
윤	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)
Ħ	Hydrometallurgical Residue Cells Liner Leakage ground water flow into PM-12	Q_rrs = Q_g12 =	0.00 (cfs) 0.86 (cfs)
Input	ground water flow into PM-12 ground water flow into PM-13	Q_g13 =	4.21 (cfs)
_	ground water now into t wi to	<u> </u>	4.21 (013)
æ	concentration of surface water into PM-12	C_s12 =	6.0 (mg/l)
Data	concentration of surface water into PM-13	C_s13 =	6.0 (mg/l)
u u	concentration of WWTP discharge	C sBab =	6.0 (mg/l)
atic	concentration of Area 5 Pit NW discharge	C_spit =	119.5 (mg/l)
entr	concentration of LTVSMC Tailings Basin seepage	C_fs =	44.31 (mg/l)
ouc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C rrs =	0
nput Concentration	concentration of ground water flow into PM-12	 C_g12 =	4.9 (mg/l)
ndu			` ~
_	concentration of ground water flow into PM-13	C_g13 =	4.9 (mg/l)
Φ	flow in river at PM-12	Q r12 =	13.79 (cfs)
Water Balance	flow in river at PM-13	Q_r13 =	80.00 (cfs)
Water Balan	flow check	Q_ck =	80.00 (cfs)
	non onour	<u> </u>	00.00 (0.0)
	mass flux of surface water into PM-12	M s12 =	2140 (µg/s)
	mass flux of surface water into PM-13	M_s13 =	9510 (mg/s)
o	mass flux of Babbitt WWTP	M_sBab =	56 (mg/s)
e ×	concentration of Area 5 Pit NW discharge	M_spit =	6730 (mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	5016 (mg/s)
luc Iss I	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (mg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12	M_g12 =	119 (mg/s)
0 2	mass flux of ground water into PM-13	M_g13 =	584 (mg/s)
		1	
e e	mass flux in river at PM-12	M_r12 =	2315 (mg/s)
ss			(g, c)
Mass Balanc	mass flux in river at PM-13	M_r13 =	24155 (mg/s)
-		<u>. – </u>	Κ σ /
تِ			
Calculated Concentration			
ate.	concentration in river at PM-12	C_r12 =	5.93 (mg/l)
er ula			
Calculated Concentral			
ÖÖ	concentration in river at PM-13	C_r13 =	10.67 (mg/l)
tion			
ed tration	Observed concentration in river at PM-12		3.0 (mg/l)
rved	Observed concentration in river at PM-12		3.0 (mg/l)
Observed Concentration	Observed concentration in river at PM-12		3.0 (mg/l)

Embarrass River Model - Calibration to Baseline Water Quality Data			
Parameter:			
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)
Data	surface water flow into PM-13	Q_s13 =	56.01 (cfs)
ص	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
nput Flow	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)
Ⅰ 은	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)
= =	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00 (cfs)
وَ	ground water flow into PM-12	Q_g12 =	0.86 (cfs)
	ground water flow into PM-13	Q_g13 =	4.21 (cfs)
	concentration of surface water into PM-12	C_s12 =	1.2 (µg/l)
Data	concentration of surface water into PM-13	C_s13 =	1.2 (µg/l)
L L	concentration of WWTP discharge	C sBab =	1.2 (µg/l)
atic	concentration of Area 5 Pit NW discharge	C_spit =	5.2 (µg/l)
entr	concentration of LTVSMC Tailings Basin seepage	C_fs =	6.88 (μg/l)
nput Concentration	concentration of Hydrometallurgical Residue Cells Liner Leakage	C rrs =	0 (μg/l)
Š	concentration of ground water flow into PM-12	 C_g12 =	7 (µg/l)
ndr			
	concentration of ground water flow into PM-13	C_g13 =	7 (μg/l)
(D)	flow in river at PM-12	Q r12 =	13.79 (cfs)
er	flow in river at PM 12	Q_r13 =	80.00 (cfs)
Water Baland	flow in river at PM-12 flow in river at PM-13 flow check	Q_rrs = Q_ck =	80.00 (cfs)
	niow check	Q_CK =	00.00 (CIS)
	mass flux of surface water into PM-12	M_s12 =	428 (µg/s)
	mass flux of surface water into PM-13	M_s13 =	1902 (µg/s)
of	mass flux of Babbitt WWTP	M_sBab =	11 (µg/s)
Ę ×	concentration of Area 5 Pit NW discharge	M_spit =	293 (µg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	779 (µg/s)
S E	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (μg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12	M_g12 =	170 (µg/s)
ΰŽ	mass flux of ground water into PM-13	M_g13 =	834 (µg/s)
	Т	1	<u> </u>
Ge	mass flux in river at PM-12	M_r12 =	610 (µg/s)
Mass Balance		<u> </u>	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Me Ba	mass flux in river at PM-13	M_r13 =	4417 (µg/s)
no			
ed	concentration in river at PM-12	C_r12 =	1.6 (µg/l)
Calculated Concentration	CONSCINUATION IN TIVE ALT IN-12	0_112 =	1.0 (μg/1)
Ilcu			
ပိ ပိ	concentration in river at PM-13	C_r13 =	2.0 (μg/l)
ion			
≥d trat	Observed concentration in river at PM-12		1.9 (µg/l)
)rve	- Control of the Cont		(FS/1/
Observed Concentration			
00	Observed concentration in river at PM-13		2.1 (μg/l)

Embarrass River Model - Calibration to Baseline Water Quality Data			
Parameter:			
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)
Data	surface water flow into PM-13	Q_s13 =	56.01 (cfs)
De	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
<u> </u>	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)
문	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)
Ħ	Hydrometallurgical Residue Cells Liner Leakage ground water flow into PM-12	Q_rrs = Q_g12 =	0.00 (cfs) 0.86 (cfs)
Input Flow	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	4.21 (cfs)
	ground water new into 1 W 10	<u> </u>	4.21 (013)
	concentration of surface water into PM-12	C_s12 =	0.15 (µg/l)
ata			
ŭ	concentration of surface water into PM-13	C_s13 =	0.15 (µg/l)
io	concentration of WWTP discharge	C_sBab =	0.15 (μg/l)
trat	concentration of Area 5 Pit NW discharge	C_spit =	0.3 (µg/l)
.uec	concentration of LTVSMC Tailings Basin seepage	C_fs =	1.2 (µg/l)
ono	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0
nput Concentration Data	concentration of ground water flow into PM-12	C_g12 =	1.2 (µg/l)
ln	concentration of ground water flow into PM-13	C_g13 =	1.2 (µg/l)
d)	flow in river at PM-12	Q r12 =	13.79 (cfs)
er	flow in river at PM-12 flow in river at PM-13 flow check		
Water Balan	flow in river at PW-13	Q_r13 = Q_ck =	80.00 (cfs) 80.00 (cfs)
	now check	Q_CK =	60.00 (CIS)
	mass flux of surface water into PM-12	M_s12 =	54 (μg/s)
	mass flux of surface water into PM-13	M s13 =	238 (µg/s)
of	mass flux of Babbitt WWTP	M_sBab =	1 (µg/s)
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge	M_spit =	17 (µg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	136 (µg/s)
s P	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (µg/s)
Calcul Mass I	mass flux of ground water into PM-12	$M_g12 =$	29 (μg/s)
∪∑	mass flux of ground water into PM-13	M_g13 =	143 (μg/s)
ф	mans flux in river at DM 10	M ×10	0.4 (/5)
SS	mass flux in river at PM-12	M_r12 =	84 (μg/s)
Mass Balance	mass flux in river at PM-13	M r13 =	618 (µg/s)
	made nex in twel at t will to		στο ((μ9/3)
Calculated Concentration			
ed trat	concentration in river at PM-12	C_r12 =	0.22 (µg/l)
Calculated Concentral	STATE OF THE STATE		(μg/·/
<u>10</u>		1	
္က ပိ	concentration in river at PM-13	C_r13 =	0.27 (μg/l)
no			
ا عtic			ND (0.55)
vec ntr	Observed concentration in river at PM-12	1	ND (0.30) (μg/l)
en Ice		1	
Observed Concentration	Observed concentration in river at PM-13		0.27 (µg/l)
	Observed Concentration III IIVer at FIVI-13	ı	<mark>0.27</mark> (μg/l)

Embarrass River Model - Calibration to Baseline Water Quality Data			
Parameter:	Antimony		
	·		
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)
Data	surface water flow into PM-13	Q_s13 =	56.01 (cfs)
De	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
≥	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)
은	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)
nput Flow	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00 (cfs)
횬	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	0.86 (cfs) 4.21 (cfs)
_	Iground water now into FM-13	Q_g13 =	4.21 (CIS)
æ	concentration of surface water into PM-12	C_s12 =	0.04 (µg/l)
Data	concentration of surface water into PM-13	 C_s13 =	0.04 (µg/l)
] uc	concentration of WWTP discharge	C sBab =	0.04 (µg/l)
atic	concentration of Area 5 Pit NW discharge	C_spit =	0.25 (µg/l)
entr	concentration of LTVSMC Tailings Basin seepage	C_fs =	0.25 (µg/l)
onc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	1.5 (µg/l)
Inpi	concentration of ground water flow into PM-13	C_g13 =	1.5 (µg/l)
စ္ပ	flow in river at PM-12	Q_r12 =	13.79 (cfs)
Water Baland	flow in river at PM-12 flow in river at PM-13 flow check	Q_r13 =	80.00 (cfs)
B &	flow check	Q_ck =	80.00 (cfs)
	mass flux of surface water into PM-12	M_s12 =	14 (µg/s)
·	mass flux of surface water into PM-13	M_s13 =	63 (µg/s)
o To	mass flux of Babbitt WWTP	M_sBab =	0 (µg/s)
. <u>5</u> ×	concentration of Area 5 Pit NW discharge	M_spit =	14 (µg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	28 (µg/s)
cn	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (µg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12	M_g12 = M_g13 =	37 (μg/s) 179 (μg/s)
02	mass flux of ground water into PM-13	W_g13 =	179 (µg/s)
99	mass flux in river at PM-12	M_r12 =	51 (µg/s)
ss		 	(1-3/
Mass Balance	mass flux in river at PM-13	M_r13 =	336 (µg/s)
			000 (Mg/0)
_			
Calculated Concentration			
tec	concentration in river at PM-12	C_r12 =	0.13 (μg/l)
e la			
Calculated Concentral			
ပိ ပိ	concentration in river at PM-13	C_r13 =	0.15 (μg/l)
O			
atic			
ntr.	Observed concentration in river at PM-12		ND (0.3) (μg/l)
ce			
Observed Concentration	Observed concentration in river at PM-13		ND (0.3) (μg/l)
	Coscived concentiation in five at Fivi-15	<u> </u>	(μg/1)

Embarrass River Model - Calibration to Baseline Water Quality Data				
Parameter:	Parameter: Selenium			
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)	
Data	surface water flow into PM-13	Q_s13 =	56.01 (cfs)	
D ₀	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)	
Input Flow	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)	
끝	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)	
Ħ	Hydrometallurgical Residue Cells Liner Leakage ground water flow into PM-12	Q_rrs = Q_g12 =	0.00 (cfs)	
du	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	0.86 (cfs) 4.21 (cfs)	
_	ground water now into 1 M-13	<u> </u>	4.21 (013)	
~	concentration of surface water into PM-12	C_s12 =	0.3 (µg/l)	
Data	concentration of surface water into PM-13	 C_s13 =	0.3 (μg/l)	
	concentration of WWTP discharge	C sBab =	0.3 (µg/l)	
atio	concentration of Area 5 Pit NW discharge	C_spit =	1.6 (µg/l)	
entr	concentration of LTVSMC Tailings Basin seepage	C_spit =	1.09 (µg/l)	
nce	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0 (μg/1)	
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	2.95 (µg/l)	
put	-			
	concentration of ground water flow into PM-13	C_g13 =	2.95 (µg/l)	
0	flow in river at PM-12	Q r12 =	13.79 (cfs)	
Water Balance			1` ′	
Water Balan	flow in river at PM-13 flow check	Q_r13 =	80.00 (cfs)	
> Ш	Illow cneck	Q_ck =	80.00 (cfs)	
	Impact they of confess contains DM 10	IM at0	107 (/a)	
	mass flux of surface water into PM-12 mass flux of surface water into PM-13	M_s12 = M_s13 =	107 (μg/s) 475 (μg/s)	
_	mass flux of Babbitt WWTP	M_sBab =	3 (µg/s)	
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge	M_spit =	90 (µg/s)	
atior	concentration of LTVSMC Tailings Basin seepage	M fs =	123 (µg/s)	
음도	concentration of Hydrometallurgical Residue Cells Liner Leakage	M rrs =	0 (µg/s)	
Calcul Mass I	mass flux of ground water into PM-12	M_g12 =	72 (µg/s)	
ΰ≌̈́	mass flux of ground water into PM-13	M_g13 =	351 (µg/s)	
φ	mace flux in river at PM 12	M r12	192 (μα/ο)	
SS	mass flux in river at PM-12	M_r12 =	182 (µg/s)	
Mass Balanc	DATE OF THE PROPERTY OF THE PR	M ::40	1000 (/-)	
∠Ш	mass flux in river at PM-13	M_r13 =	1222 (µg/s)	
_				
Calculated Concentration				
ed	concentration in river at PM-12	C r12 =	0.47 (µg/l)	
lat ent	concentration in most act witz	0_112 =	υ. τ η (μg/1)	
<u> </u>				
Calculated Concentral	concentration in river at PM-13	C_r13 =	0.54 (µg/l)	
		13	(١٠٥١)	
atio				
ed	Observed concentration in river at PM-12		ND (1) (μg/l)	
erv				
Observed Concentration	Observed consentration is since at DM 40		NID (4)	
0.0	Observed concentration in river at PM-13	l	ND (1) (μg/l)	

Embarrass River Model - Calibration to Baseline Water Quality Data			
Parameter:	Sulfate		
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)
Data	surface water flow into PM-13	Q_s13 =	56.01 (cfs)
De	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)
	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)
은	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)
nput Flow	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00 (cfs)
횬	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	0.86 (cfs) 4.21 (cfs)
_	Iground water now into FM-13	Q_g13 =	4.21 (015)
_	concentration of surface water into PM-12	C_s12 =	4 (mg/l)
Data	concentration of surface water into PM-13	C_s13 =	4 (mg/l)
		C sBab =	
jg.	concentration of WWTP discharge	_	4 (mg/l)
ntra	concentration of Area 5 Pit NW discharge	C_spit =	1046.3 (mg/l)
<u>Se</u>	concentration of LTVSMC Tailings Basin seepage	C_fs =	152.4 (mg/l)
nput Concentration	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0
i c	concentration of ground water flow into PM-12	C_g12 =	8.5 (mg/l)
Inp	concentration of ground water flow into PM-13	C_g13 =	8.5 (mg/l)
0	flow in river at DM 12	O r12	13.79 (cfs)
r Don	niow in river at PM-12	Q_r12 =	
Water Baland	flow in river at PM-12 flow in river at PM-13 flow check	Q_r13 =	80.00 (cfs)
<u> </u>	flow check	Q_ck =	80.00 (cfs)
		II. 40	1 44071/ /)
	mass flux of surface water into PM-12	M_s12 =	1427 (µg/s)
₩	mass flux of surface water into PM-13 mass flux of Babbitt WWTP	M_s13 = M_sBab =	6340 (mg/s) 37 (mg/s)
	concentration of Area 5 Pit NW discharge	M_spit =	58924 (mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	17252 (mg/s)
를 표 고	concentration of Hydrometallurgical Residue Cells Liner Leakage	M rrs =	
alcula ass Fi	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12	M_rrs = M g12 =	0 (mg/s)
Calculation of Mass Flux	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13	M_rrs = M_g12 = M_g13 =	0 (mg/s)
Calcula Mass Fi	mass flux of ground water into PM-12	M_g12 =	0 (mg/s) 207 (mg/s)
(1)	mass flux of ground water into PM-12 mass flux of ground water into PM-13	M_g12 = M_g13 =	0 (mg/s) 207 (mg/s) 1013 (mg/s)
(1)	mass flux of ground water into PM-12	M_g12 =	0 (mg/s) 207 (mg/s)
(1)	mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12	M_g12 = M_g13 = M_r12 =	0 (mg/s) 207 (mg/s) 1013 (mg/s) 1671 (mg/s)
	mass flux of ground water into PM-12 mass flux of ground water into PM-13	M_g12 = M_g13 =	0 (mg/s) 207 (mg/s) 1013 (mg/s)
Mass Balance	mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12	M_g12 = M_g13 = M_r12 =	0 (mg/s) 207 (mg/s) 1013 (mg/s) 1671 (mg/s)
Mass Balance	mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12	M_g12 = M_g13 = M_r12 =	0 (mg/s) 207 (mg/s) 1013 (mg/s) 1671 (mg/s)
Mass Balance	mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12	M_g12 = M_g13 = M_r12 =	0 (mg/s) 207 (mg/s) 1013 (mg/s) 1671 (mg/s)
Mass Balance	mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13	M_g12 = M_g13 = M_r12 = M_r13 =	0 (mg/s) 207 (mg/s) 1013 (mg/s) 1671 (mg/s) 85200 (mg/s)
Mass Balance	mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13	M_g12 = M_g13 = M_r12 = M_r13 =	0 (mg/s) 207 (mg/s) 1013 (mg/s) 1671 (mg/s) 85200 (mg/s)
(1)	mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13	M_g12 = M_g13 = M_r12 = M_r13 =	0 (mg/s) 207 (mg/s) 1013 (mg/s) 1671 (mg/s) 85200 (mg/s)
Calculated Mass Concentration Balance	mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12	M_g12 = M_g13 = M_r12 = M_r13 = C_r12 =	0 (mg/s) 207 (mg/s) 1013 (mg/s) 1671 (mg/s) 85200 (mg/s)
Calculated Mass Concentration Balance	mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12	M_g12 = M_g13 = M_r12 = M_r13 = C_r12 =	0 (mg/s) 207 (mg/s) 1013 (mg/s) 1671 (mg/s) 85200 (mg/s)
Calculated Mass Concentration Balance	mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12 concentration in river at PM-13	M_g12 = M_g13 = M_r12 = M_r13 = C_r12 =	0 (mg/s) 207 (mg/s) 1013 (mg/s) 1671 (mg/s) 85200 (mg/s) 4.3 (mg/l) 37.6 (mg/l)
Calculated Mass Concentration Balance	mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12	M_g12 = M_g13 = M_r12 = M_r13 = C_r12 =	0 (mg/s) 207 (mg/s) 1013 (mg/s) 1671 (mg/s) 85200 (mg/s)
Mass Balance	mass flux of ground water into PM-12 mass flux of ground water into PM-13 mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12 concentration in river at PM-13	M_g12 = M_g13 = M_r12 = M_r13 = C_r12 =	0 (mg/s) 207 (mg/s) 1013 (mg/s) 1671 (mg/s) 85200 (mg/s) 4.3 (mg/l) 37.6 (mg/l)

Embarrass River Model - Calibration to Baseline Water Quality Data						
Parameter:	Thallium					
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)			
Data	surface water flow into PM-13	Q_s13 =	56.01 (cfs)			
Ö	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)			
Flow	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)			
윤	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)			
Ħ	Hydrometallurgical Residue Cells Liner Leakage ground water flow into PM-12	Q_rrs = Q_g12 =	0.00 (cfs) 0.86 (cfs)			
Input	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	4.21 (cfs)			
_	ground water now into t wi to	<u> Q_910 </u>	4.21 (013)			
æ	concentration of surface water into PM-12	C_s12 =	0.2 (mg/l)			
Data	concentration of surface water into PM-13	C_s13 =	0.2 (mg/l)			
L L	concentration of WWTP discharge	C sBab =	0.2 (mg/l)			
atic	concentration of Area 5 Pit NW discharge	C_spit =	0.6 (mg/l)			
entr	concentration of LTVSMC Tailings Basin seepage	C_fs =	0.2 (mg/l)			
Duc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0			
nput Concentration	concentration of ground water flow into PM-12	 C_g12 =	0.004 (mg/l)			
ndu	•		0.004 (mg/l)			
_	concentration of ground water flow into PM-13	C_g13 =	0.004 (mg/l)			
Φ	flow in river at PM-12	Q r12 =	13.79 (cfs)			
Water Balance	flow in river at PM-13	Q_r13 =	80.00 (cfs)			
Water Baland	flow check	Q_ck =	80.00 (cfs)			
	,	<u> </u>	(0.0)			
	mass flux of surface water into PM-12	M s12 =	71 (µg/s)			
	mass flux of surface water into PM-13	M_s13 =	317 (mg/s)			
of	mass flux of Babbitt WWTP	M_sBab =	2 (mg/s)			
e ×	concentration of Area 5 Pit NW discharge	M_spit =	34 (mg/s)			
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	23 (mg/s)			
lno Ss	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (mg/s)			
Calculation of Mass Flux	mass flux of ground water into PM-12	M_g12 =	0 (mg/s)			
0 2	mass flux of ground water into PM-13	M_g13 =	0 (mg/s)			
Ce	mass flux in river at PM-12	M_r12 =	73 (mg/s)			
Mass Balanc						
Ma Ba	mass flux in river at PM-13	M_r13 =	447 (mg/s)			
nc						
Calculated Concentration		1				
ate ntra	concentration in river at PM-12	C_r12 =	0.19 (mg/l)			
Se iii						
Calculated Concentrat						
00	concentration in river at PM-13	C_r13 =	0.20 (mg/l)			
_						
Observed Concentration						
ed tra∷	Observed concentration in river at PM-12	1	ND (0.4) (μg/l)			
eni			_ (***/ (\mag' ·/			
Observed						
ဝီ ဝိ	Observed concentration in river at PM-13		ND (0.4) (μg/l)			

Embarrass River Model - Calibration to Baseline Water Quality Data						
Parameter:	Zinc					
	surface water flow into PM-12	Q_s12 =	12.60 (cfs)			
Data	surface water flow into PM-13	Q_s13 =	56.01 (cfs)			
D	Babbitt WWTP discharge	Q_sBab =	0.33 (cfs)			
≥	Area 5 Pit NW discharge	Q_spit =	1.99 (cfs)			
운	LTVSMC Tailings Basin seepage	Q_fs =	4.00 (cfs)			
nput Flow	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00 (cfs)			
횬	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	0.86 (cfs) 4.21 (cfs)			
_	Iground water now into FM-13	Q_g13 =	4.21 (CIS)			
_	concentration of surface water into PM-12	C_s12 =	16 (µg/l)			
Data	concentration of surface water into PM-13	C_s13 =	16 (µg/l)			
	concentration of WWTP discharge	C sBab =	16 (μg/l)			
atio	-	_				
intra	concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage	C_spit = C_fs =	3 (μg/l) 14.35 (μg/l)			
nce	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0 (μg/ι)			
nput Concentration						
put	concentration of ground water flow into PM-12	C_g12 =	11.5 (µg/l)			
드	concentration of ground water flow into PM-13	C_g13 =	11.5 (μg/l)			
(I)	flow in river at PM-12	Q r12 =	13.79 (cfs)			
er ance	flow in river at PM-12 flow in river at PM-13 flow check	Q_r13 =	80.00 (cfs)			
Water Baland	flow check	Q_rrs = Q_ck =	80.00 (cfs)			
	now check	Q_CR =	00.00 (CIS)			
	mass flux of surface water into PM-12	M_s12 =	5707 (μg/s)			
	mass flux of surface water into PM-13	M_s13 =	25359 (µg/s)			
ð	mass flux of Babbitt WWTP	M_sBab =	149 (µg/s)			
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge	M_spit =	169 (µg/s)			
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	1624 (µg/s)			
en es	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (µg/s)			
Calcul Mass	mass flux of ground water into PM-12	M_g12 =	280 (µg/s)			
ő∑	mass flux of ground water into PM-13	M_g13 =	1370 (μg/s)			
Ф	mass flux in river at PM-12	M r12 -	6137 (µg/s)			
Mass Balance	mass flux in river at PM-12	M_r12 =	0107 (μg/5)			
Mass Baland	mage flux in river et DM 12	M -12	24650 (ug/a)			
∠ Ш	mass flux in river at PM-13	M_r13 =	34659 (µg/s)			
_		I				
Calculated Concentration						
tra	concentration in river at PM-12	C r12 =	15.72 (µg/l)			
Jai en		_	(F.S)			
Calculated Concentral						
ပိ ပိ	concentration in river at PM-13	C_r13 =	15.31 (μg/l)			
on						
ط ati	Observed separation in vivous & DM 10		10.0 (/1)			
ve(∌ntr	Observed concentration in river at PM-12		18.3 (µg/l)			
Observed Concentration						
දී රි	Observed concentration in river at PM-13		12.3 (μg/l)			

Appendix F.1
Embarrass River
Proposed Action
Year 1

FLOWS

Case	Year 1				
Flows	Low Flow Conditions (no surface runoff)				Node
in : River	flow in river at PM-12	Q_r12_L =	1.19	(cfs)	PM-12
Total flow in Embarrass Ri	flow in river at PM-13	Q_r13_L =	10.84	(cfs)	PM-13
Tota	flow check	Q_ck_L =	10.84	(cfs)	1
	surface water flow into PM-12	Q_s12_L =	0.00	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_L =	0.00	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_L =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_L =	0.26	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_L =	3.19	(cfs)	PM-13
e p	hydrometallurgical residue cells liner leakage	Q_rrs_L =	0.00	(cfs)	PM-13
flow	seepage from cell 2W	Q_s2w_L =	1.99	(cfs)	PM-13
Input	ground water flow into PM-12	Q_g12_L =	0.86	(cfs)	PM-12
ᄪ	ground water flow into PM-13	Q_g13_L =	4.21	(cfs)	PM-13

Case	Year 1				
Flow	Average Flow Conditions (mean annual)				_
n River	flow in river at PM-12	Q_r12_M =	13.80	(cfs)	PM-12
Total flow in Embarrass River	flow in river at PM-13	Q_r13_M =	86.71	(cfs)	PM-13
Tota	flow check	Q_ck_M =	86.71	(cfs)	-
	surface water flow into PM-12	Q_s12_M =	12.61	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_M =	61.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_M =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_M =	1.99	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_M =	3.19	(cfs)	PM-13
g Z	hydrometallurgical residue cells liner leakage	Q_rrs_M =	0.00	(cfs)	PM-13
١	seepage from cell 2W	Q_s2w_M =	1.99	(cfs)	PM-13
Input flow	ground water flow into PM-12	Q_g12_M =	0.86	(cfs)	PM-12
Ę	ground water flow into PM-13	Q_g13_M =	4.21	(cfs)	PM-13

Case	Year 1				
Flow	High Flow Conditions (avg. annual 1-day max flow)				_
n River	flow in river at PM-12	Q_r12_H =	144.35	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_H =	858.26	(cfs)	PM-13
Total Emb	flow check	Q_ck_H =	858.26	(cfs)	
	surface water flow into PM-12	Q_s12_H =	143.16	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_H =	702.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_H =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_H =	1.99	(cfs)	PM-13
<u>ta</u>	seepage from Tailings Basin Cells 1E and 2E	Q_fs_H =	3.19	(cfs)	PM-13
flow data	hydrometallurgical residue cells liner leakage	Q_rrs_H =	0.00	(cfs)	PM-13
FI o	seepage from cell 2W	Q_s2w_H =	1.99	(cfs)	PM-13
Input 1	ground water flow into PM-12	Q_g12_H =	0.86	(cfs)	PM-12
dul	ground water flow into PM-13	Q_g13_H =	4.21	(cfs)	PM-13

Case Parameter	Year 1 Silver			
		1	1	ı
	concentration of surface water into PM-12	C_s12 =	0.00011	(mg/L
data	concentration of surface water into PM-13	C_s13 =	0.00011	(mg/L
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.00011	(mg/L
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00015	(mg/L
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00096	(mg/L
concei	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.000125	(mg/L
S	concentration in tailings basin cell 2W	C_s2w =	0.000100	(mg/L
Input	concentration of ground water into PM-12	C_g12 =	0.000008	(mg/L
≝	concentration of ground water into PM-13	C_g13 =	0.000008	(mg/L
			I ow Flo	NA/

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
tion	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.19	(mg/s)	2	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)		(mg/s)		(mg/s)
င်	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)		(mg/s)
	Illass iiux iii livei at Fivi-13	VI_I I 3 =	Low Flo		Average		High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)	0.000		0.000	(mg/L)

Case	Year 1			
Parameter	Aluminum			
		-		
	concentration of surface water into PM-12	C_s12 =	0.12	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.12	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.12	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.01325	(mg/L)
ntra		C_fs =	0.01	(mg/L)
je.	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.18	(mg/L)
Conc	concentration in tailings basin cell 2W	C_s2w =	1.5788	(mg/L)
Ħ	concentration of ground water into PM-12	C_g12 =	0.025	(mg/L)
	concentration of ground water into PM-13	C a13 -	0.025	(ma/L)

		Low Flo	w	Average	Flow	High Fl	low
mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	42.82	(mg/s)	486	(mg/s)
mass flux of ground water into PM-12	M_g12 =	0.61	(mg/s)	0.61	(mg/s)	0.61	(mg/s)
mass flux in Babbitt WWTP discharge	M_sBab =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s)
mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	208.96	(mg/s)	2,386	(mg/s)
mass flux of ground water into PM-13	M_g13 =	2.98	(mg/s)	2.98	(mg/s)	2.98	(mg/s)
mass flux of Area 5 Pit NW discharge	M_spit =	0.10	(mg/s)	0.75	(mg/s)	0.75	(mg/s)
The state of the s	M_fs =	0.90	(mg/s)	0.90	(mg/s)	0.90	(mg/s)
mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
mass flux in seepage from cell 2W	M_s2w =	89.13	(mg/s)	89.13	(mg/s)	89.13	(mg/s
		Low Flo	w	Average	Flow	High Fl	low
mass flux in river at PM-12	M_r12 =	1.73	(mg/s)	44.55	(mg/s)	487.90	(mg/s)
mass flux in river at PM-13	M_r13 =			347.27	(mg/s)	2,967.45	
		Low Flo	w	Average	Flow	High FI	low
concentration in river at PM-12	C_r12 =	0.051	(mg/L)	0.114	(mg/L)	0.119	(mg/L)
	mass flux of ground water into PM-12 mass flux in Babbitt WWTP discharge mass flux of surface water into PM-13 mass flux of ground water into PM-13 mass flux of Area 5 Pit NW discharge mass flux in seepage from Tailings Basin Cells 1E and 2E mass flux in hydrometallurgical residue cells liner leakage mass flux in seepage from cell 2W mass flux in river at PM-12 mass flux in river at PM-13	mass flux of ground water into PM-12 mass flux in Babbitt WWTP discharge mass flux of surface water into PM-13 mass flux of ground water into PM-13 mass flux of ground water into PM-13 mass flux of Area 5 Pit NW discharge mass flux in seepage from Tailings Basin Cells 1E and 2E mass flux in hydrometallurgical residue cells liner leakage mass flux in seepage from cell 2W mass flux in river at PM-12 mass flux in river at PM-13 M_r13 =	mass flux of surface water into PM-12 M_s12 = - mass flux in Babbitt WWTP discharge M_sBab = 1.12 mass flux of surface water into PM-13 M_s13 = - mass flux of ground water into PM-13 M_g13 = 2.98 mass flux of Area 5 Pit NW discharge M_spit = 0.10 mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.90 mass flux in hydrometallurgical residue cells liner leakage M_rrs = 0.01 mass flux in seepage from cell 2W M_s2w = 89.13 Low Flo mass flux in river at PM-12 M_r12 = 1.73 mass flux in river at PM-13 M_r13 = 94.84 Low Flo	mass flux of surface water into PM-12 M_s12 = - (mg/s) mass flux of ground water into PM-12 M_g12 = 0.61 (mg/s) mass flux in Babbitt WWTP discharge M_sBab = 1.12 (mg/s) mass flux of surface water into PM-13 M_s13 = - (mg/s) mass flux of ground water into PM-13 M_g13 = 2.98 (mg/s) mass flux of Area 5 Pit NW discharge M_spit = 0.10 (mg/s) mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.90 (mg/s) mass flux in hydrometallurgical residue cells liner leakage M_rrs = 0.01 (mg/s) mass flux in seepage from cell 2W M_s2w = 89.13 (mg/s) Low Flow mass flux in river at PM-12 M_r12 = 1.73 (mg/s) Low Flow	mass flux of surface water into PM-12 M_s12 = - (mg/s) 42.82 mass flux of ground water into PM-12 M_g12 = 0.61 (mg/s) 0.61 mass flux in Babbitt WWTP discharge M_sBab = 1.12 (mg/s) 1.12 mass flux of surface water into PM-13 M_s13 = - (mg/s) 208.96 mass flux of ground water into PM-13 M_g13 = 2.98 (mg/s) 2.98 mass flux of Area 5 Pit NW discharge M_spit = 0.10 (mg/s) 0.75 mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.90 (mg/s) 0.90 mass flux in hydrometallurgical residue cells liner leakage M_rrs = 0.01 (mg/s) 0.01 mass flux in seepage from cell 2W M_s2w = 89.13 (mg/s) 89.13 Low Flow Average mass flux in river at PM-12 M_r12 = 1.73 (mg/s) 44.55 mass flux in river at PM-13 M_r13 = 94.84 (mg/s) 347.27 Low Flow Average	mass flux of surface water into PM-12 M_s12 = - (mg/s) 42.82 (mg/s) mass flux of ground water into PM-12 M_g12 = 0.61 (mg/s) 0.61 (mg/s) mass flux in Babbitt WWTP discharge M_sBab = 1.12 (mg/s) 1.12 (mg/s) mass flux of surface water into PM-13 M_s13 = - (mg/s) 208.96 (mg/s) mass flux of ground water into PM-13 M_g13 = 2.98 (mg/s) 2.98 (mg/s) mass flux of Area 5 Pit NW discharge M_spit = 0.10 (mg/s) 0.75 (mg/s) mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.90 (mg/s) 0.90 (mg/s) mass flux in hydrometallurgical residue cells liner leakage M_rrs = 0.01 (mg/s) 0.01 (mg/s) mass flux in seepage from cell 2W M_s2w = 89.13 (mg/s) 89.13 (mg/s) Low Flow Average Flow M_r13 = 94.84 (mg/s) 347.27 (mg/s) Average Flow	mass flux of surface water into PM-12 M_s12 = - (mg/s) 42.82 (mg/s) 486 mass flux of ground water into PM-12 M_g12 = 0.61 (mg/s) 0.61 (mg/s) 0.61 mass flux in Babbitt WWTP discharge M_sBab = 1.12 (mg/s) 1.12 (mg/s) 1.12 mass flux of surface water into PM-13 M_s13 = - (mg/s) 208.96 (mg/s) 2,386 mass flux of ground water into PM-13 M_g13 = 2.98 (mg/s) 2.98 (mg/s) 2.98 mass flux of Area 5 Pit NW discharge M_spit = 0.10 (mg/s) 0.75 (mg/s) 0.75 mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.90 (mg/s) 0.90 (mg/s) 0.90 mass flux in hydrometallurgical residue cells liner leakage M_rrs = 0.01 (mg/s) 0.01 (mg/s) 0.01 mass flux in river at PM-12 M_s2w = 89.13 (mg/s) 89.13 (mg/s) 89.13 mass flux in river at PM-13 M_r12 = 1.73 (mg/s) 44.55 (mg/s) 487.90 mass flux in river at PM-13 M_r13 = 94.84 (mg/s) 347.27 (mg/s) 2.967.45 Low Flow Average Flo

Case	Year 1			
Parameter	Arsenic			
		0 10		(")
	concentration of surface water into PM-12	C_s12 =	0.00075	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00075	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.00075	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.001325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.005946518	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.00291	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.00273	(mg/L)
<u>r</u>	concentration of ground water into PM-13	C_g13 =	0.00273	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.27	(mg/s)	3	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
<u>t</u>	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.31	(mg/s)	15	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.54	(mg/s)	0.54	(mg/s)	0.54	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပို ဍ	mass flux in seepage from cell 2W	M_s2w =	0.16	(mg/s)	0.16	(mg/s)	0.16	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.34	(mg/s)	3.11	(mg/s)
Mass ba at each	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.004	(mg/L)	0.001	(mg/L)	0.001	(mg/L)

Year 1 Boron		
concentration of surface water into PM-12	C_s12 =	0.027 (r
concentration of surface water into PM-13	C_s13 =	0.027 (r
	C_sBab =	0.027 (r
	concentration of surface water into PM-12 concentration of surface water into PM-13	Boron concentration of surface water into PM-12 concentration of surface water into PM-13 C_s12 = concentration of surface water into PM-13 C_s13 =

		concentration of surface water into PW-12	U_S12 =	0.027	(mg/L)
	ata	concentration of surface water into PM-13	C_s13 =	0.027	(mg/L)
	ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.027	(mg/L)
	章	concentration in Area 5 Pit NW discharge	C_spit =	0.1315	(mg/L)
	ıtı	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.138981444	(mg/L)
	9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.11	(mg/L)
	S	concentration in tailings basin cell 2W	C_s2w =	0.33	(mg/L)
	ţ	concentration of ground water into PM-12	C_g12 =	0.0212	(mg/L)
	트	concentration of ground water into PM-13	C_g13 =	0.0212	(mg/L)
•			•		•

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	9.64	(mg/s)	109	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)	0.52	(mg/s)	0.52	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	47.02	(mg/s)	537	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	2.53	(mg/s)	2.53	(mg/s)	2.53	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.97	(mg/s)	7.41	(mg/s)	7.41	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	12.53	(mg/s)	12.53	(mg/s)	12.53	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	18.63	(mg/s)	18.63	(mg/s)	18.63	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)	110.16	
a g	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	688.06	, ,
	T		Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.023	(mg/L)	0.027	(mg/L)	0.027	(mg/L)
Con	concentration in river at PM-13	C r13 =	0.115	(mg/L)	0.040	(mg/L)	0.028	(mg/L)

Case	Year 1	1		
Parameter	Barium]		
		1_		l
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
ntration	concentration in Area 5 Pit NW discharge	C_spit =	0.0044	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.29E-02	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	5.00E-03	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.09298	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0681	(mg/L)
duj	concentration of ground water into PM-13	C_g13 =	0.0681	(mg/L)

			Low Flor	W	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	1.66	(mg/s)	1.66	(mg/s)	1.66	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
it.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s)
Ser J	mass flux of ground water into PM-13	M_g13 =	8.11	(mg/s)	8.11	(mg/s)	8.11	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	4.77	(mg/s)	4.77	(mg/s)	4.77	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
္ မ	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	5.25	(mg/s)		(mg/s)
			Low Flor	W	Average	Flow	High Fl	low
Mass balance at each node		M_r12 = M_r13 =		(mg/s)		(mg/s)	66.63	(mg/s)
		[<u>_</u>	Low Flor		Average		High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.054	(mg/L)	0.019	(mg/L)	0.016	(mg/L)

Case	i cai i			
Parameter	Beryllium			
		_		
	concentration of surface water into PM-12	C_s12 =	0.0001	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0001	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0001	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000271356	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0	(mg/L)
ouos	concentration in tailings basin cell 2W	C_s2w =	0.00075	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.000023	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.000023	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.17	(mg/s)	2	(mg/s)
Gen	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.02	(mg/s)	0.02	(mg/s)	0.02	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	-	(mg/s)	-	(mg/s)	-	(mg/s)
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =		(mg/s)		(mg/s)		(mg/s)
≥ ø	mass flux in river at PM-13	M_r13 =	Low Flo	(mg/s)	0.29 Average	(mg/s)	2.47 High Fl	(mg/s)
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
<u>ა</u>	concentration in river at PM-13	C_r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg

Case Parameter	Year 1 Calcium			
- urumotor	Calolani	ı		
	concentration of surface water into PM-12	C_s12 =	15	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	15	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	15	(mg/L)
ntration	concentration in Area 5 Pit NW discharge	C_spit =	95.35	(mg/L)
ıt.	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	45.78662467	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	416	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	59.78	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	19	(mg/L)
duj	concentration of ground water into PM-13	C_g13 =	19	(mg/L)

			Low Flo	W	Average	Flow	High Fl	High Flow	
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5,352.95	(mg/s)	60,771	(mg/s)	
_	mass flux of ground water into PM-12	M_g12 =	462.42	(mg/s)	462.42	(mg/s)	462.42	(mg/s)	
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	140.09	(mg/s)	140.09	(mg/s)	140.09	(mg/s)	
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	26,119.49	(mg/s)	298,224	(mg/s)	
cen	mass flux of ground water into PM-13	M_g13 =	2,263.72	(mg/s)	2,263.72	(mg/s)	2,263.72	(mg/s)	
io X	mass flux of Area 5 Pit NW discharge	M_spit =	701.59	(mg/s)	5,369.83	(mg/s)	5,369.83	(mg/s)	
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	4,128.35	(mg/s)	4,128.35	(mg/s)	4,128.35	(mg/s)	
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =		(mg/s)	12.28	(mg/s)		(mg/s)	
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =	3,374.76	(mg/s)	3,374.76	(mg/s)	1.77	(mg/s)	
			Low Flo	w	Average	Flow	High Fl	ow	
ass balance each node	mass flux in river at PM-12	M_r12 =	602.51	(mg/s)	5,955.45	(mg/s)	61,373.93	(mg/s)	
Mass at eac	mass flux in river at PM-13	M_r13 =	11,083.21 Low Flo		47,223.88 Average	. 0 /	371,373.85 High Fl		
			LOW FIO	vv	Average	FIOW	nigii Fi	OW	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	17.891	(mg/L)	15.249	(mg/l)	15.024	(mg/l)	
Converture flux to concer	concentration in river at PM-13	C_r13 =	36.122	(mg/L)	19.244	(mg/l)	15.290	(mg/l)	

centration of surface water into PM-12	C s12 =	0.00008	(mg/L
centration of surface water into PM-13	C_s13 =	0.00008	
centration in Babbitt WWTP discharge	C_sBab =	0.00008	(mg/L
centration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L
centration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000117453	(mg/L
centration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0004	(mg/L
centration in tailings basin cell 2W	C_s2w =	0.000188	(mg/L
centration of ground water into PM-12	C_g12 =	0.0003	(mg/L
centration of ground water into PM-13	C_g13 =	0.0003	(mg/L
	entration of surface water into PM-13 entration in Babbitt WWTP discharge entration in Area 5 Pit NW discharge entration in seepage from Tailings Basin Cells 1E and 2E entration in hydrometallurgical residue cells liner leakage entration in tailings basin cell 2W entration of ground water into PM-12	entration of surface water into PM-13 C_s13 = entration in Babbitt WWTP discharge entration in Area 5 Pit NW discharge entration in Area 5 Pit NW discharge entration in seepage from Tailings Basin Cells 1E and 2E entration in hydrometallurgical residue cells liner leakage C_rrs = entration in tailings basin cell 2W C_s2w = entration of ground water into PM-12 C_g12 =	entration of surface water into PM-13

			Low Flo	Low Flow		Average Flow		High Flow	
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.03	(mg/s)	0	(mg/s)	
_	mass flux of ground water into PM-12	M_g12 =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)	
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)	
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.14	(mg/s)	2	(mg/s)	
Cen	mass flux of ground water into PM-13	M_g13 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)	
i X	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)	
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)	
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)	
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	0.01	(mg/s)		(mg/s)	
			Low Flo	w	Average	Flow	High Fl	ow	
balance th node	mass flux in river at PM-12	M_r12 =	0.01	(mg/s)	0.04	(mg/s)	0.33	(mg/s)	
iss	mass flux in river at PM-13	M_r13 =	0.07 Low Flo	(mg/s)	0.24	(mg/s)	1.99 High Fl	(mg/s)	
			LOW 1 10	vv	Average	liow	riigii i	OW	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)	
Convertilux to	concentration in river at PM-13	C_r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)	

Case	i cai i			
Parameter	Chloride			
	concentration of surface water into PM-12	C_s12 =	6.5	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	6.5	(mg/L)
0	concentration in Babbitt WWTP discharge	C_sBab =	6.5	(mg/L)
tion	concentration in Area 5 Pit NW discharge	C_spit =	5.95	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.89E+01	(mg/L)
- E	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.76E+03	(mg/L)
lo co	concentration in tailings basin cell 2W	C_s2w =	21.54	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	1.8	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	1.8	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,319.61	(mg/s)	26,334	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	43.81	(mg/s)	43.81	(mg/s)	43.81	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	60.70	(mg/s)	60.70	(mg/s)	60.70	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	11,318.44	(mg/s)	129,230	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	214.46	(mg/s)	214.46	(mg/s)	214.46	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	43.78	(mg/s)	335.09	(mg/s)	335.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,700.65	(mg/s)	1,700.65	(mg/s)	1,700.65	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	51.97	(mg/s)	51.97	(mg/s)	51.97	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	1,216.00	(mg/s)	1,216.00	(mg/s)	1,216.00	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
alance node	mass flux in river at PM-12	M_r12 =	104.51	(mg/s)	2,424.12	(mg/s)	26,438.79	(mg/s)
Mass balance at each node	mass flux in river at PM-13	M_r13 =	3,331.37		17,260.73	(mg/s)	159,187.35	
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	3.103	(mg/L)	6.207	(mg/L)	6.472	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	10.858		7.024	(mg/L)	6.554	

concentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-13

concentr

Case Parameter	Year 1 Cobalt			
	concentration of surface water into PM-12	C_s12 =	0.0006	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0006	(mg/L)
n da	concentration in Babbitt WWTP discharge	C_sBab =	0.0006	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.000555	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001174401	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	1	(mg/s)	0.21	(mg/s)	2	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.04	(mg/s)	12	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s)
conc	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.11	(mg/s)	0.11	(mg/s)	0.11	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
	mass flux in seepage from cell 2W	M_s2w =	0.09	(mg/s)	0.09	(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.25	(mg/s)	2.46	(mg/s)
Mas at ea	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
	Т		Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Con	concentration in river at PM-13	C_r13 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/L)

C_rrs =

C_s2w =

C_g12 = C_g13 = 0.005 (mg/L)

0.001556 (mg/L)

0.0011 (mg/L)

0.0011 (mg/L)

Case	Year 1	1		
Parameter	Copper			
i		ı	ı	
	concentration of surface water into PM-12	C_s12 =	0.0015	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0015	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0015	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00345	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.005888719	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0015	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.004555	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.004	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.004	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.54	(mg/s)	6	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s)
ij	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.61	(mg/s)	30	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	0.48	(mg/s)	0.48	(mg/s)	0.48	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.19	(mg/s)	0.19	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.53	(mg/s)	0.53	(mg/s)	0.53	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =		(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =		(mg/s)		(mg/s)	0.26	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =		(mg/s)		(mg/s)		(mg/s)
	mass nax in two at the to	101_110 =	Low Flo		Average		High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)		(mg/L)		(mg/L)
ರ ≓ ೪	concentration in river at PM-13	C_r13 =	0.005	(mg/L)	0.002	(mg/L)	0.002	(mg/L)

Case Parameter	Year 1 Fluoride			
	concentration of surface water into PM-12	C_s12 =	0.2	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.2	(mg/L)
0	concentration in Babbitt WWTP discharge	C_sBab =	0.2	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.125	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	4.57E+00	(mg/L)
<u></u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	2.85E+00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	1.55	(mg/L)
	concentration of ground water into PM-12	C_g12 =	0.385	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.385	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	71.37	(mg/s)	810	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	9.37	(mg/s)	9.37	(mg/s)	9.37	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	1.87	(mg/s)	1.87	(mg/s)	1.87	(mg/s
concentration	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	348.26	(mg/s)	3,976	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	45.87	(mg/s)	45.87	(mg/s)	45.87	(mg/s
i co	mass flux of Area 5 Pit NW discharge	M_spit =	0.92	(mg/s)	7.04	(mg/s)	7.04	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	412.18	(mg/s)	412.18	(mg/s)	412.18	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.08	(mg/s)	0.08	(mg/s)	0.08	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	87.50	(mg/s)	87.50	(mg/s)	87.50	(mg/s
			Low Flo	w	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	11.24	(mg/s)	82.61	(mg/s)	821.52	(mg/s
Mass I at eacl	mass flux in river at PM-13	M_r13 =	557.79 Low Flo		983.54 Average		5,350.52 High Fl	
ν Ε			2011 7 10		7. O. u.go			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.334	(mg/L)	0.212	(mg/L)	0.201	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	1.818	(mg/L)	0.401	(mg/L)	0.220	(ma/i

concentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Input concer

Case Parameter	Year 1 Iron			
	concentration of surface water into PM-12	C_s12 =	2.9	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	2.9	(mg/L)
n dê	concentration in Babbitt WWTP discharge	C_sBab =	2.9	(mg/L)
읃	concentration in Area 5 Pit NW discharge	C_spit =	0.037761905	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C fs =	4.00E-03	(ma/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,034.90	(mg/s)	11,749	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.85	(mg/s)	0.85	(mg/s)	0.85	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	27.08	(mg/s)	27.08	(mg/s)	27.08	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	5,049.77	(mg/s)	57,657	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	4.17	(mg/s)	4.17	(mg/s)	4.17	(mg/s)
E co	mass flux of Area 5 Pit NW discharge	M_spit =	0.28	(mg/s)	2.13	(mg/s)	2.13	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.36	(mg/s)	0.36	(mg/s)	0.36	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	259.35	(mg/s)	259.35	(mg/s)	259.35	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =		(mg/s)	1,062.84		11,777.08	
2 0	mass flux in river at PM-13	M_r13 =	292.10 Low Flo		6,378.62 Average		69,699.73 High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.829	(mg/L)	2.721	(mg/L)	2.883	(mg
Converture flux to concer	concentration in river at PM-13	C r13 =	0.952	(mg/L)	2,599	(mg/L)	2.870	(ma/l

C_rrs = C_s2w =

C_g12 =

C_g13 =

4.00E-01 (mg/L)

4.594 (mg/L)

0.035 (mg/L)

0.035 (mg/L)

Case	Year 1	
Parameter	Hardness	

I		concentration of surface water into PM-12	C_s12 =	70	(mg/L)
ı	ata	concentration of surface water into PM-13	C_s13 =	70	(mg/L)
	ğ	concentration in Babbitt WWTP discharge	C_sBab =	70	(mg/L)
	臺	concentration in Area 5 Pit NW discharge	C_spit =	942.7142857	(mg/L)
	ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	3.15E+02	(mg/L)
	ē	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	8.61E+03	(mg/L)
	Ö	concentration in tailings basin cell 2W	C_s2w =	436.6	(mg/L)
	Ħ	concentration of ground water into PM-12	C_g12 =	87.5	(mg/L)
	트	concentration of ground water into PM-13	C_g13 =	87.5	(mg/L)

			Low Flo	W	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	24,980.41	(mg/s)	283,600	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	2,129.58	(mg/s)	2,129.58	(mg/s)	2,129.58	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	653.73	(mg/s)	653.73	(mg/s)	653.73	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	121,890.93	(mg/s)	1,391,712	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	10,425.01	(mg/s)	10,425.01	(mg/s)	10,425.01	(mg/s
E co	mass flux of Area 5 Pit NW discharge	M_spit =	6,936.49	(mg/s)	53,090.84	(mg/s)	53,090.84	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	28,397.48	(mg/s)	28,397.48	(mg/s)	28,397.48	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	254.25	(mg/s)	254.25	(mg/s)	254.25	(mg/s
ဒ္ ဒိ	mass flux in seepage from cell 2W	M_s2w =	24,647.41	(mg/s)	24,647.41	(mg/s)	24,647.41	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	2,783.31	(mg/s)	27,763.72	(mg/s)	286,383.27	(mg/s
Mass ba at each	mass flux in river at PM-13	M_r13 =	73,443.94 Low Flo		266,469.63 Average		1,794,910.18 High Fl	
ω -			2011 1 10		Average	1011		
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	82.647	(mg/L)	71.091	(mg/L)	70.104	(mg/L
Conve flux to concer	concentration in river at PM-13	C r13 =	239.367	(mg/L)	108.588	(ma/L)	73.899	(ma/l

Case	Year 1]		
Parameter	Potassium			
	concentration of surface water into PM-12	C s12 =	0.60	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.60	(mg/L)
g c	concentration in Babbitt WWTP discharge	C_sBab =	0.60	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	53.80	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	9.15	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	7.77	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	1.60	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	1.60	(mg/L)

ass flux of surface water into PM-12 ass flux of ground water into PM-12 ass flux in hydrometallurgical residue cells liner leakage ass flux of surface water into PM-13 ass flux of ground water into PM-13 ass flux in Babbitt WWTP discharge ass flux of Area 5 Pit NW discharge ass flux in seepage from Tailings Basin Cells 1E and 2E ass flux in seepage from cell 2W	M s12 = M g12 = M_rrs = M_s13 = M_g13 = M_sBab = M_spit = M_fs =	0.05 - 190.63	(mg/s) (mg/s)	0.05 1,044.78 190.63	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s)	0.05 11,929 190.63	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s)
ass flux in hydrometallurgical residue cells liner leakage ass flux of surface water into PM-13 ass flux of ground water into PM-13 ass flux in Babbitt WWTP discharge ass flux of Area 5 Pit NW discharge ass flux in seepage from Tailings Basin Cells 1E and 2E	M_rrs = M_s13 = M_g13 = M_sBab = M_spit = M_fs =	0.05 - 190.63 5.60 395.86	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s)	0.05 1,044.78 190.63 5.60	(mg/s) (mg/s) (mg/s) (mg/s)	0.05 11,929 190.63 5.60	(mg/s) (mg/s) (mg/s) (mg/s)
ass flux of surface water into PM-13 ass flux of ground water into PM-13 ass flux in Babbitt WWTP discharge ass flux of Area 5 Pit NW discharge ass flux in seepage from Tailings Basin Cells 1E and 2E	M_s13 = M_g13 = M_sBab = M_spit = M_fs =	- 190.63 5.60 395.86	(mg/s) (mg/s) (mg/s) (mg/s)	1,044.78 190.63 5.60	(mg/s) (mg/s) (mg/s)	11,929 190.63 5.60	(mg/s) (mg/s) (mg/s)
ass flux of ground water into PM-13 ass flux in Babbitt WWTP discharge ass flux of Area 5 Pit NW discharge ass flux in seepage from Tailings Basin Cells 1E and 2E	M_g13 = M_sBab = M_spit = M_fs =	5.60 395.86	(mg/s) (mg/s) (mg/s)	190.63 5.60	(mg/s) (mg/s)	190.63 5.60	(mg/s) (mg/s)
ass flux in Babbitt WWTP discharge ass flux of Area 5 Pit NW discharge ass flux in seepage from Tailings Basin Cells 1E and 2E	M_spit = M_fs =	5.60 395.86	(mg/s) (mg/s)	5.60	(mg/s)	5.60	(mg/s)
ass flux of Area 5 Pit NW discharge ass flux in seepage from Tailings Basin Cells 1E and 2E	M_spit = M_fs =	395.86	(mg/s)				
ass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =			3,029.85	(mg/s)	3,029.85	(mg/s)
• • • • • • • • • • • • • • • • • • • •		825.45	(ma/a)				
ass flux in seepage from cell 2W			(IIIg/S)	825.45	(mg/s)	825.45	(mg/s)
ase nax in scopage nom con ziv	M_s2w =	438.64	(mg/s)	438.64	(mg/s)	438.64	(mg/s)
		Low Flo	w	Average	Flow	High Flo	ow
ass flux in river at PM-12	M_r12 =					2,469.85	
ass lidx iii livel at i wi lo	IVI_1 10 =						
oncentration in river at PM-12	C_r12 =					0.605	
	ass flux in river at PM-12 ass flux in river at PM-13	ass flux in river at PM-12 $M_r12 =$ ass flux in river at PM-13 $M_r13 =$ ncentration in river at PM-12 $C_r12 =$	Low Flo ass flux in river at PM-12 M_r12 = 38.99 ass flux in river at PM-13 M_r13 = 1,895.18 Low Flo ncentration in river at PM-12 C_r12 = 1.158	Low Flow Ass flux in river at PM-12 Ass flux in river at PM-13 C_r12 = 1.158 (mg/L)	Low Flow Average	Low Flow Average Flow ass flux in river at PM-12	Low Flow Average Flow High Florate Incentration in river at PM-12

Case Parameter	Year 1 Magnesium			
	-	1		
	concentration of surface water into PM-12	C_s12 =	5.90	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	5.90	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	5.90	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	48.72	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	213.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	69.97	(mg/L)
	concentration of ground water into PM-12	C_g12 =	10.65	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	10.65	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,105.49	(mg/s)	23,903	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	259.20	(mg/s)	259.20	(mg/s)	259.20	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	55.10	(mg/s)	55.10	(mg/s)	55.10	(mg/s
tra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,273.66	(mg/s)	117,301	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	1,268.87	(mg/s)	1,268.87	(mg/s)	1,268.87	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	1,994.02	(mg/s)	15,261.91	(mg/s)	15,261.91	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	4,392.66	(mg/s)	4,392.66	(mg/s)	4,392.66	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	6.29	(mg/s)	6.29	(mg/s)	6.29	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	3,950.02	(mg/s)	3,950.02	(mg/s)	3,950.02	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	314.30	(mg/s)	2,419.79	(mg/s)	24,217.73	(mg/s
Mass ba at each i	mass flux in river at PM-13	M_r13 =	11,926.17 Low Flo		37,573.21 Average		166,398.91 High Fl	
ss								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	9.333	(mg/L)	6.196	(mg/l)	5.928	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	38.870	(mg/L)	15.311	(ma/l)	6.851	(ma/l

oncentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 1 Manganese			
		4		
	concentration of surface water into PM-12	C_s12 =	0.30	(mg/L)
# **	concentration of surface water into PM-13	C_s13 =	0.30	(mg/L)
, and a		C_sBab =	0.30	(mg/L)
ي.	concentration in Area 5 Pit NW discharge	C_spit =	0.49	(mg/L)
12	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.29	(mg/L)

			Low Flo	W	Average I	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	1	(mg/s)	107.06	(mg/s)	1,215	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	4.58	(mg/s)	4.58	(mg/s)	4.58	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	2.80	(mg/s)	2.80	(mg/s)	2.80	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	522.39	(mg/s)	5,964	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	22.40	(mg/s)	22.40	(mg/s)	22.40	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	3.57	(mg/s)	27.31	(mg/s)	27.31	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	26.10	(mg/s)	26.10	(mg/s)	26.10	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္မ င	mass flux in seepage from cell 2W	M_s2w =	66.78	(mg/s)	66.78		66.78	(mg/s)
		_	Low Flo	w	Average I	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	7.38	(mg/s)	114.44	(mg/s)	1,222.81	(mg/s)
Mass	mass flux in river at PM-13	M_r13 =	126.23		779.42	, ,	7,329.88	
	Т		Low Flo	W	Average I	FIOW	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.219	(mg/L)	0.293	(mg/l)	0.299	(mg/l)
Con	concentration in river at PM-13	C_r13 =	0.411	(mg/L)	0.318	(mg/l)	0.302	(mg/l)

C_s2w =

C_g12 =

C_g13 =

0.00 (mg/L)

1.18

0.19

(mg/L)

(mg/L)

0.19 (mg/L)

Case Parameter	Year 1 Sodium			
	Leave to the of the form of the DM 40	0 .40	0.00	n
_	concentration of surface water into PM-12	C_s12 =		(mg/L
data	concentration of surface water into PM-13	C_s13 =	6.00	(mg/L
pu	concentration in Babbitt WWTP discharge	C_sBab =	6.00	(mg/L
흝	concentration in Area 5 Pit NW discharge	C_spit =	119.50	(mg/L
concentration	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	66.13	(mg/L
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	255.00	(mg/L
Ş	concentration in tailings basin cell 2W	C_s2w =	44.31	(mg/L
Input	concentration of ground water into PM-12	C_g12 =	4.90	(mg/L
≝	concentration of ground water into PM-13	C_g13 =	4.90	(mg/L
			I ow Flo	NA/

			Low Flo	W	Average I	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,141.18	(mg/s)	24,309	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	119.26	(mg/s)	119.26	(mg/s)	119.26	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	56.03	(mg/s)	56.03	(mg/s)	56.03	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,447.79	(mg/s)	119,290	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	583.80	(mg/s)	583.80	(mg/s)	583.80	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	879.28	(mg/s)	6,729.88	(mg/s)	6,729.88	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	5,962.27	(mg/s)	5,962.27	(mg/s)	5,962.27	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	7.53	(mg/s)	7.53	(mg/s)	7.53	(mg/s)
မ ပိ	mass flux in seepage from cell 2W	M_s2w =	2,501.44	(mg/s)	2,501.44	(mg/s)	2,501.44	(mg/s)
			Low Flo	w	Average I	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	175.29	(mg/s)	2,316.47	(mg/s)	24,483.86	(mg/s)
Mass	mass flux in river at PM-13	M_r13 =	10,109.61 Low Flo		28,549.18 Average l		159,558.37 High Fl	
			20110		7.1.0.ugo I			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	5.205	(mg/L)	5.931	(mg/l)	5.993	(mg/l)
Conve flux to	concentration in river at PM-13	C_r13 =	32.949	(mg/L)	11.634	(mg/l)	6.569	(mg/l)

Case Parameter	Year 1 Nickel		
	concentration of surface water into PM-12	C_s12 =	0.0012
<u> </u>	Concentration of surface water into Fivi-13	C_s13 =	0.0012
7		C. sBah –	0.0012

		concentration of surface water into PW-12	U_S12 =	0.0012	(mg/L)
	ata	concentration of surface water into PM-13	C_s13 =	0.0012	(mg/L)
	ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0012	(mg/L)
	章	concentration in Area 5 Pit NW discharge	C_spit =	0.0052	(mg/L)
	ıtı	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.009513833	(mg/L)
	9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.098	(mg/L)
	con	concentration in tailings basin cell 2W	C_s2w =	0.00688	(mg/L)
	ţ	concentration of ground water into PM-12	C_g12 =	0.007	(mg/L)
	트	concentration of ground water into PM-13	C_g13 =	0.007	(mg/L)
•					

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.43	(mg/s)	5	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.09	(mg/s)	24	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.83	(mg/s)	0.83	(mg/s)	0.83	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.04	(mg/s)	0.29	(mg/s)	0.29	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.86	(mg/s)	0.86	(mg/s)	0.86	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပို ၁	mass flux in seepage from cell 2W	M_s2w =	0.39	(mg/s)	0.39	(mg/s)		(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)		(mg/s)
at 🖺	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
	T		Low Flo	W	Average	FIOW	High Fl	ow
Convert mass flux to	concentration in river at PM-12 concentration in river at PM-13	C_r12 =	0.005	(mg/L)	0.002	(mg/L)	0.001	(mg/L)
Convertilux to concer	concentration in river at PM-13	C_r13 =	0.008	(mg/L)	0.002	(mg/L)	0.001	(mg/L)

Case	year 1			
Parameter	Lead			
		-		
	concentration of surface water into PM-12	C_s12 =	0.00015	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00015	(mg/L)
بق	concentration in Babbitt WWTP discharge	C_sBab =	0.00015	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.0003	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000585798	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0005	(mg/L)
Con	concentration in tailings basin cell 2W	C_s2w =	0.0012	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.0012	(mg/L)
<u>u</u>	concentration of ground water into PM-13	C_g13 =	0.0012	(mg/L)

			Low Flo	w	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.05	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.26	(mg/s)	3	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.02	(mg/s)	0.02	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္မွ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.08	(mg/s)	0.64	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	0.30 Low Flo	(mg/s)	0.63	(mg/s)	3.90 High Fl	(mg/s
nass		0.10		(4)		((1)		
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)		(mg/L)	0.000	

concentration of ground water into PM-13

Case	Year 1			
Parameter	Antimony			
	concentration of surface water into PM-12	C_s12 =	4.00E-05	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	4.00E-05	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	4.00E-05	(mg/L)
₽	concentration in Area 5 Pit NW discharge	C_spit =	2.50E-04	(mg/L)
tr	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	4.83E-03	(mg/L)
le le	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
ő	concentration in tailings basin cell 2W	C s2w =	2.50E-04	(ma/L)

mass flux in Babbitt WWTP discharge M_sBab = 0.00 (mg/s) 0.00 (mg/s) 0.00 (mg/s)	0 (mg/s 04 (mg/s 00 (mg/s 1 (mg/s
mass flux in Babbitt WWTP discharge M_sBab = 0.00 (mg/s) 0.00 (mg/s) 0.00 (mg/s)	00 (mg/s
Type mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.44 (mg/s) 0.44 (mg/s) 0.44 (mg/s) 0.00 (mg/s)	
mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.44 (mg/s) 0.44 (mg/s) 0.00 (1 (mg/s
mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.44 (mg/s) 0.44 (mg/s) 0.00 (1,9,0
Mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.44 (mg/s) 0.44 (mg/s) 0.00 (18 (mg/s
Mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.44 (mg/s) 0.44 (mg/s) 0.00 (01 (mg/s
Low Flow Average Flow High	14 (mg/s
Low Flow Average Flow High	00 (mg/s
M_r12	01 (mg/s
mass flux in river at PM-12 M_r12 = 0.04 (mg/s) 0.05	Flow
	20 (mg/s
The mass flux in river at PM-13 M_r13 = 0.67 (mg/s) 0.76 (mg/s) 1	64 (mg/s

C_g12 =

C_g13 =

1.50E-03 (mg/L)

1.50E-03 (mg/L)

Case	Year 1			
Parameter	Selenium			
	concentration of surface water into PM-12	C_s12 =	0.0003	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0003	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0003	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.0016	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000967892	(mg/L)
192	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.054	(mg/L)
cor	concentration in tailings basin cell 2W	C_s2w =	0.00109	(mg/L)
ant	concentration of ground water into PM-12	C_g12 =	0.00295	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.00295	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.11	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ħ,	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.52	(mg/s)	6	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	0.35	(mg/s)	0.35	(mg/s)	0.35	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.18	(mg/s)	1.29	(mg/s)
Mas at ea	mass flux in river at PM-13	M_r13 =	0.59	(mg/s)	1.30	(mg/s)	7.85 High Fl	(mg/s
SS L			LOW FIO	W	Average	Flow	riigii Fi	OW
rt mas ntratic	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.000	(mg/L)	0.000	(mg/l
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.002	(mg/L)	0.001	(mg/L)	0.000	(mg/L

Case Parameter	Year 1 Sulfate			
		- 	1	1
	concentration of surface water into PM-12	C_s12 =	4.00	(mg/L
data	concentration of surface water into PM-13	C_s13 =	4.00	(mg/L
	concentration in Babbitt WWTP discharge	C_sBab =	4.00	(mg/L
concentration	concentration in Area 5 Pit NW discharge	C_spit =	1046.27	(mg/L
ra tr	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	142.79	(mg/L
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	7347.00	(mg/L
Ş	concentration in tailings basin cell 2W	C_s2w =	152.40	(mg/L
Input	concentration of ground water into PM-12	C_g12 =	8.50	(mg/L
<u> </u>	concentration of ground water into PM-13	C_g13 =	8.50	(mg/L
			I ow Flo	147

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,427.45	(mg/s)	16,206	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	206.87	(mg/s)	206.87	(mg/s)	206.87	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	37.36	(mg/s)	37.36	(mg/s)	37.36	(mg/s)
tra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	6,965.20	(mg/s)	79,526	(mg/s)
Ce.	mass flux of ground water into PM-13	M_g13 =	1,012.72	(mg/s)	1,012.72	(mg/s)	1,012.72	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	7,698.43	(mg/s)	58,922.60	(mg/s)	58,922.60	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	12,874.84	(mg/s)	12,874.84	(mg/s)	12,874.84	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	216.95	(mg/s)	216.95	(mg/s)	216.95	(mg/s)
ပို န	mass flux in seepage from cell 2W	M_s2w =	8,603.45	(mg/s)	8,603.45	(mg/s)	8,603.45	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
ass balance	mass flux in river at PM-12	M_r12 =	244.23	(mg/s)	1,671.68	(mg/s)	16,449.94	(mg/s)
Mass		M_r13 =	30,650.62		90,267.44		177,606.90	
			Low Flo	w	Average	FIOW	High Fl	ow
Convert mass flux to	concentration in river at PM-12	C_r12 =	7.252	(mg/L)	4.280	(mg/l)	4.027	(mg/l)
Conve flux to	concentration in river at PM-13	C_r13 =	99.896	(mg/L)	36.785	(mg/l)	7.312	(mg/l)

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 1 Thallium			
	concentration of surface water into PM-12	C_s12 =	0.0002	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0002	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0002	(mg/L)
흹	concentration in Area 5 Pit NW discharge	C_spit =	0.0006	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00096816	(mg/L)
, N	concentration in hydrometallurgical residue cells liner leakage	C rrs -	0.0002	(ma/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.35	(mg/s)	4	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒ္ ဒ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =		(mg/s)		(mg/s)		(mg/s)
≥ ø	mass flux in river at PM-13	M_r13 =	Low Flo	(mg/s)	Average	(mg/s)	4.92 High Fl	(mg/s)
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)		(mg/L)		(mg/L)

C_s2w =

C_g12 =

C_g13 =

0.0002

0.000004

0.000004

(mg/L) (mg/L)

(mg/L)

Case Parameter	Year 1 Zinc			
	concentration of surface water into PM-12	C s12	_	
at a		C_s13	=	

I		concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
ı	ata	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
ı	ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
ı	臺	concentration in Area 5 Pit NW discharge	C_spit =	0.003	(mg/L)
ı	ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.009842772	(mg/L)
ı	ē	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.01	(mg/L)
I	Con	concentration in tailings basin cell 2W	C_s2w =	0.01435	(mg/L)
ı	Ę	concentration of ground water into PM-12	C_g12 =	0.0115	(mg/L)
	트	concentration of ground water into PM-13	C_g13 =	0.0115	(mg/L)

			Low Flo	W	Average I	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.28	(mg/s)	0.28	(mg/s)	0.28	(mg/s)
tio	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.02	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
		M_fs =	0.89	(mg/s)	0.89	(mg/s)	0.89	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Co to		M_s2w =	0.81	(mg/s)	0.81	(mg/s)	0.81	(mg/s)
			Low Flo	W	Average I	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.43	(mg/s)	6.14	(mg/s)	65.25	(mg/s)
Ma	mass flux in river at PM-13	M_r13 =	3.52	(mg/s)	37.24	(mg/s)	386.59	(mg/s)
			Low Flo	w	Average I	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.013	(mg/L)	0.016	(mg/L)	0.016	(mg/L)
ပို့ မို့ ပိ	concentration in river at PM-13	C_r13 =	0.011	(mg/L)	0.015	(mg/L)	0.016	(mg/L)

Appendix F.2
Embarrass River
Proposed Action
Year 5

FLOWS

Case	Year 5		ĺ		
Flows	Low Flow Conditions (no surface runoff)				Node
n River	flow in river at PM-12	Q_r12_L =	1.19	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_L =	11.77	(cfs)	PM-13
Total Emba	flow check	Q_ck_L =	11.77	(cfs)	
	surface water flow into PM-12	Q_s12_L =	0.00	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_L =	0.00	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_L =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_L =	0.26	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_L =	4.10	(cfs)	PM-13
p /	hydrometallurgical residue cells liner leakage	Q_rrs_L =	0.01	(cfs)	PM-13
flow	seepage from cell 2W	Q_s2w_L =	1.99	(cfs)	PM-13
Input 1	ground water flow into PM-12	Q_g12_L =	0.86	(cfs)	PM-12
du	ground water flow into PM-13	Q_g13_L =	4.21	(cfs)	PM-13

Case	Year 5				
Flow	Average Flow Conditions (mean annual)				_
n River	flow in river at PM-12	Q_r12_M =	13.80	(cfs)	PM-12
Total flow in Embarrass River	flow in river at PM-13	Q_r13_M =	87.64	(cfs)	PM-13
Tota	flow check	Q_ck_M =	87.64	(cfs)	
	surface water flow into PM-12	Q_s12_M =	12.61	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_M =	61.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_M =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_M =	1.99	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_M =	4.10	(cfs)	PM-13
g <	hydrometallurgical residue cells liner leakage	Q_rrs_M =	0.01	(cfs)	PM-13
ē.	seepage from cell 2W	Q_s2w_M =	1.99	(cfs)	PM-13
Input flow	ground water flow into PM-12	Q_g12_M =	0.86	(cfs)	PM-12
Ę	ground water flow into PM-13	Q_g13_M =	4.21	(cfs)	PM-13

Case	Year 5				
Flow	High Flow Conditions (avg. annual 1-day max flow)				_
n River	flow in river at PM-12	Q_r12_H =	144.35	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_H =	859.19	(cfs)	PM-13
Total	flow check	Q_ck_H =	859.19	(cfs)	
	surface water flow into PM-12	Q_s12_H =	143.16	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_H =	702.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_H =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_H =	1.99	(cfs)	PM-13
<u>t</u> a	seepage from Tailings Basin Cells 1E and 2E	Q_fs_H =	4.10	(cfs)	PM-13
flow data	hydrometallurgical residue cells liner leakage	Q_rrs_H =	0.01	(cfs)	PM-13
Į Š	seepage from cell 2W	Q_s2w_H =	1.99	(cfs)	PM-13
Input 1	ground water flow into PM-12	Q_g12_H =	0.86	(cfs)	PM-12
du	ground water flow into PM-13	Q_g13_H =	4.21	(cfs)	PM-13

Case Parameter	Year 5 Silver			
		-		
	concentration of surface water into PM-12	C_s12 =	0.00011	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00011	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.00011	(mg/L)
Ē	concentration in Area 5 Pit NW discharge	C_spit =	0.00015	(mg/L)
concentration	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00090	(mg/L)
ē	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.000125	(mg/L)
Ş	concentration in tailings basin cell 2W	C_s2w =	0.000100	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.000008	(mg/L)
≝	concentration of ground water into PM-13	C_g13 =	0.000008	(mg/L)
			I ow Flo	AZ.

			Low Flo	W	Average I	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	1	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.19	(mg/s)	2	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
conc	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)		(mg/s)
			Low Flo	w	Average I	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.45	(mg/s)
Mass at ea	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
	Т	_	Low Flo	w	Average I	low	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Con	concentration in river at PM-13	C_r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case	Year 5			
Parameter	Aluminum			
	concentration of surface water into PM-12	C_s12 =	0.12	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.12	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.12	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.01325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	9.61E-02	(mg/L)
95	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80E-01	(mg/L)
LO CO	concentration in tailings basin cell 2W	C_s2w =	1.5788	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.025	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.025	(mg/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	42.82	(mg/s)	486	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.61	(mg/s)	0.61	(mg/s)	0.61	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s)
ıt.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	208.96	(mg/s)	2,386	(mg/s)
Cer	mass flux of ground water into PM-13	M_g13 =	2.98	(mg/s)	2.98	(mg/s)	2.98	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.10	(mg/s)	0.75	(mg/s)	0.75	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	11.16	(mg/s)	11.16	(mg/s)	11.16	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.08	(mg/s)	0.08	(mg/s)	0.08	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	89.13	(mg/s)	89.13	(mg/s)	89.13	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	1.73	(mg/s)	44.55	(mg/s)	487.90	(mg/s
Ma at e	mass flux in river at PM-13	M_r13 =	105.17	(mg/s)	357.60	(mg/s)	2,977.78	(mg/s
			Low Flo	w	Average	Flow	High Fl	low
Convert mass flux to concentration	concentration in river at PM-12	C r12 =	0.051	(mg/L)	0.114	(mg/L)	0.119	(mg/L

concentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 5 Arsenic			
	concentration of surface water into PM-12	C_s12 =	0.00075	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00075	(mg/L)
n de	concentration in Babbitt WWTP discharge	C_sBab =	0.00075	(mg/L)
<u>i</u>	concentration in Area 5 Pit NW discharge	C_spit =	0.001325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.006775027	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.27	(mg/s)	3	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.31	(mg/s)	15	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.79	(mg/s)	0.79	(mg/s)	0.79	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒ္ ဒ	mass flux in seepage from cell 2W	M_s2w =	0.16	(mg/s)	0.16	(mg/s)	0.16	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
ıss ba each r	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =		(mg/s)		(mg/s)		(mg/s)
1			Low Flo		Average		High Fl	
t E	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Convert ma flux to concentrat	concentration in river at PM-12 concentration in river at PM-13	C_r12 =		(mg/L)		(mg/L)		0.001

C_s2w =

C_g12 =

C_g13 =

0.004 (mg/L)

0.00273 (mg/L)

0.00291

0.00273

(mg/L)

(mg/L)

Case Parameter	Year 5 Boron			
	concentration of surface water into PM-12	C_s12 =	0.027	(mg
at a	concentration of surface water into PM-13	C_s13 =	0.027	(mg
n dat	concentration in Babbitt WWTP discharge	C_sBab =	0.027	(mg
. <u>ō</u>	concentration in Area 5 Pit NW discharge	C spit =	0 1315	(mo

n då	concentration in Babbitt WWTP discharge	C_sBab =	0.027	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.1315	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.135355742	(mg/L)
i S	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.11	(mg/L)
Son	concentration in tailings basin cell 2W	C_s2w =	0.33	(mg/L)
but	concentration of ground water into PM-12	C_g12 =	0.0212	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.0212	(mg/L)
			Low Flor	W
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)
Ĕ			4	

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	9.64	(mg/s)	109	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)	0.52	(mg/s)	0.52	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	47.02	(mg/s)	537	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	2.53	(mg/s)	2.53	(mg/s)	2.53	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.97	(mg/s)	7.41	(mg/s)	7.41	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	15.72	(mg/s)	15.72	(mg/s)	15.72	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s)
င္မ ပိ	mass flux in seepage from cell 2W	M_s2w =	18.63	(mg/s)	18.63	(mg/s)	18.63	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.77	(mg/s)	10.40	(mg/s)	110.16	(mg/s)
Ma at	mass flux in river at PM-13	M_r13 =		(mg/s)	101.74		691.28	
		1	Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.023	(mg/L)	0.027	(mg/L)	0.027	(mg/L)
Convertilux to concer	concentration in river at PM-13	C_r13 =	0.116	(mg/L)	0.041	(mg/L)	0.028	(mg/L)

Case Parameter	Year 5 Barium			
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
Ęi	concentration in Area 5 Pit NW discharge	C_spit =	0.0044	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.03E-02	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	5.00E-03	(mg/L)
concentration	concentration in tailings basin cell 2W	C_s2w =	0.09298	(mg/L)
	concentration of ground water into PM-12	C_g12 =	0.0681	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.0681	(mg/L)

		L		w	Average I	Average Flow		High Flow	
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)	
	mass flux of ground water into PM-12	M_g12 =	1.66	(mg/s)	1.66	(mg/s)	1.66	(mg/s)	
	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)	
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s)	
	mass flux of ground water into PM-13	M_g13 =	8.11	(mg/s)	8.11	(mg/s)	8.11	(mg/s)	
	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.25	(mg/s)	0.25	(mg/s)	
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	5.84	(mg/s)	5.84	(mg/s)	5.84	(mg/s)	
	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)	
ე ე	mass flux in seepage from cell 2W	M_s2w =	5.25	(mg/s)	5.25	(mg/s)	5.25	(mg/s)	
			Low Flow		Average l	Flow	High Flow		
Mass balance at each node	mass flux in river at PM-12	M_r12 =	1.81	(mg/s)	7.52	(mg/s)	66.63	(mg/s)	
Mas	mass flux in river at PM-13	M_r13 =		(mg/s)	54.83		404.19	, ,	
			Low Flow		Average I	Flow	High Flow		
Convert mass flux to concentration	concentration in river at PM-12 concentration in river at PM-13	C_r12 =	0.054	(mg/L)	0.019	(mg/L)	0.016	(mg/L)	
Co _o flux cor	concentration in river at PM-13	C_r13 =	0.063	(mg/L)	0.022	(mg/L)	0.017	(mg/L)	

Case Parameter	Year 5 Beryllium			
	concentration of surface water into PM-12	C_s12 =	0.0001	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0001	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0001	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000454842	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.00075	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.000023	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.000023	(mg/L)

			Low Flo	W	Average	Flow	High F	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.17	(mg/s)	2	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
con	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
		M_fs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	-	(mg/s)	-	(mg/s)	-	(mg/s)
Co		M_s2w =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
			Low Flo	w	Average	Flow	High F	low
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)		(mg/s)
a Š	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	_	(mg/s)
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
္ ႏ	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case Parameter	Year 5 Calcium			
		1	ı	1
	concentration of surface water into PM-12	C_s12 =	15	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	15	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	15	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	95.35	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	55.55427025	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	416	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	59.78	(mg/L)
_	concentration of ground water into PM-12	C_g12 =	19	(mg/L)
In put	concentration of ground water into PM-13	C_g13 =	19	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5,352.95	(mg/s)	60,771	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	462.42	(mg/s)	462.42	(mg/s)	462.42	(mg/s)
Ē	mass flux in Babbitt WWTP discharge	M_sBab =	140.09	(mg/s)	140.09	(mg/s)	140.09	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	26,119.49	(mg/s)	298,224	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	2,263.72	(mg/s)	2,263.72	(mg/s)	2,263.72	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	701.59	(mg/s)	5,369.83	(mg/s)	5,369.83	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	6,450.21	(mg/s)	6,450.21	(mg/s)	6,450.21	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	176.59	(mg/s)	176.59	(mg/s)	176.59	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	3,374.76	(mg/s)	3,374.76	(mg/s)	25.38	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	602.51	(mg/s)	5,955.45	(mg/s)	61,373.93	(mg/s)
Mass b at each	mass flux in river at PM-13	M_r13 =	13,569.37		49,710.04		373,883.63	
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	17.891	(mg/L)	15.249	(mg/l)	15.024	(mg/l)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	40.729	(mg/L)	20.042	(mg/l)	15.377	(ma/l)

Case Parameter	Year 5 Cadmium			
	concentration of surface water into PM-12	C_s12 =	0.00008	(mg/L)
<u>ta</u>	concentration of surface water into PM-13	C_s13 =	0.00008	(mg/L)
ation da	concentration in Babbitt WWTP discharge		0.00008	(mg/L)
	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000238486	(mg/L)
e e	concentration in hydrometallurgical residue cells liner leakage	C rrs =	0.0004	(mg/L)
5	concentration in tailings basin cell 2W	C_s2w =	0.000188	(mg/L)
Input o	concentration of ground water into PM-12	C_g12 =	0.0003	(mg/L)
	concentration of ground water into PM-13	C_g13 =	0.0003	(mg/L)

			Low Flo	W	Average I	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	1	(mg/s)	0.03	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.14	(mg/s)	2	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
conc	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)		(mg/s)
			Low Flo	w	Average I	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.01	(mg/s)	0.04	(mg/s)	0.33	(mg/s)
Mass at eac	mass flux in river at PM-13	M_r13 =	0.08 Low Flo	(mg/s)		(mg/s)		(mg/s)
		_	LOW FIO	w	Average I	riow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Con	concentration in river at PM-13	C_r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case Parameter	Year 5 Chloride			
		1		
	concentration of surface water into PM-12	C_s12 =	6.5	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	6.5	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	6.5	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	5.95	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.07E+01	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.76E+03	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	21.54	(mg/L)
	concentration of ground water into PM-12	C_g12 =	1.8	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	1.8	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,319.61	(mg/s)	26,334	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	43.81	(mg/s)	43.81	(mg/s)	43.81	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	60.70	(mg/s)	60.70	(mg/s)	60.70	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	11,318.44	(mg/s)	129,230	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	214.46	(mg/s)	214.46	(mg/s)	214.46	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	43.78	(mg/s)	335.09	(mg/s)	335.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,244.90	(mg/s)	1,244.90	(mg/s)	1,244.90	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	747.10	(mg/s)	747.10	(mg/s)	747.10	(mg/s)
ပို ဍ	mass flux in seepage from cell 2W	M_s2w =	1,216.00	(mg/s)	1,216.00		1,216.00	(mg/s)
			Low Flo	w	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	104.51	(mg/s)	2,424.12	(mg/s)	26,438.79	(mg/s)
Ma: at 6	mass flux in river at PM-13	M_r13 =	3,570.75	(mg/s)	17,500.11	(mg/s)	159,426.73	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)	6.207	(mg/L)	6.472	(mg/L)
ა ≓ ა	concentration in river at PM-13	C_r13 =	10.718	(mg/L)	7.056	(mg/L)	6.557	(mg/L)

Case Parameter	Year 5 Cobalt			
	concentration of surface water into PM-12	C_s12 =	0.0006	(mg/L
data	concentration of surface water into PM-13	C_s13 =	0.0006	(mg/L
	concentration in Babbitt WWTP discharge	C_sBab =	0.0006	(mg/L
concentration	concentration in Area 5 Pit NW discharge	C_spit =	0.000555	(mg/L
rt a	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00200513	(mg/L
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.005	(mg/L
E S	concentration in tailings basin cell 2W	C_s2w =	0.001556	(mg/L
Input	concentration of ground water into PM-12	C_g12 =	0.0011	(mg/L
트	concentration of ground water into PM-13	C_g13 =	0.0011	(mg/L

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	1	(mg/s)	0.21	(mg/s)	2	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.04	(mg/s)	12	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s)
conc	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.23	(mg/s)	0.23	(mg/s)	0.23	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
	mass flux in seepage from cell 2W	M_s2w =	0.09	(mg/s)	0.09	(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.25	(mg/s)	2.46	(mg/s)
Mas: at ea	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
	1		Low Flo	w	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Con	concentration in river at PM-13	C_r13 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/L)

Case	Year 5	1		
Parameter	Copper]		
			1	
	concentration of surface water into PM-12	C_s12 =	0.0015	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0015	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0015	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00345	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.007797191	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0015	(mg/L)
conc	concentration in tailings basin cell 2W	C_s2w =	0.004555	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.004	(mg/L)
宣	concentration of ground water into PM-13	C_g13 =	0.004	(mg/L)

			Low Flo	W	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.54	(mg/s)	6	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s)
ij	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.61	(mg/s)	30	(mg/s)
Cer	mass flux of ground water into PM-13	M_g13 =	0.48	(mg/s)	0.48	(mg/s)	0.48	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.19	(mg/s)	0.19	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.91	(mg/s)	0.91	(mg/s)	0.91	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =		(mg/s)	0.00	(mg/s)		(mg/s)
္ မိ	mass flux in seepage from cell 2W	M_s2w =	0.26	(mg/s)	0.26	(mg/s)	0.26	(mg/s)
			Low Flo	W	Average	Flow	High Fl	low
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =		(mg/s)		(mg/s)		(mg/s)
		111_115	Low Flo		Average		High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.003	(mg/L)	0.002	(mg/L)	0.002	(mg/L)

Case Parameter	Year 5 Fluoride			
		1		
	concentration of surface water into PM-12	C_s12 =	0.2	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.2	(mg/L)
p u	concentration in Babbitt WWTP discharge	C_sBab =	0.2	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.125	(mg/L)
nt ra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	2.25E+00	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	2.85E+00	(mg/L)
COL	concentration in tailings basin cell 2W	C_s2w =	1.55	(mg/L)
Ħ	concentration of ground water into PM-12	C_g12 =	0.385	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.385	(mg/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	71.37	(mg/s)	810	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	9.37	(mg/s)	9.37	(mg/s)	9.37	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	1.87	(mg/s)	1.87	(mg/s)	1.87	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	348.26	(mg/s)	3,976	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	45.87	(mg/s)	45.87	(mg/s)	45.87	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.92	(mg/s)	7.04	(mg/s)	7.04	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	260.89	(mg/s)	260.89	(mg/s)	260.89	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	1.21	(mg/s)	1.21	(mg/s)	1.21	(mg/s)
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =	87.50	(mg/s)	87.50	(mg/s)	87.50	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =	11.24	(mg/s)	82.61 833.39	(mg/s)	821.52 5,200.36	
	Indo hax in two at the to	10_110 =	Low Flo		Average		High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.334	(mg/L)	0.212	(mg/L)	0.201	(mg/L)
S = S	concentration in river at PM-13	C r13 =	1 224	(mg/L)	0.226	(mg/L)	0.214	(mg/L

Case Parameter	Year 5 Iron			
raiailletei	iioii	J		
	concentration of surface water into PM-12	C_s12 =	2.9	(mg/L
data	concentration of surface water into PM-13	C_s13 =	2.9	(mg/L
ğ	concentration in Babbitt WWTP discharge	C_sBab =	2.9	(mg/L
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.037761905	(mg/L
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.96E-02	(mg/L
concent	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	4.00E-01	(mg/L
CO	concentration in tailings basin cell 2W	C_s2w =	4.594	(mg/L
Input	concentration of ground water into PM-12	C_g12 =	0.035	(mg/L
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.035	(mg/L
			I ow Flo	

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,034.90	(mg/s)	11,749	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.85	(mg/s)	0.85	(mg/s)	0.85	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	27.08	(mg/s)	27.08	(mg/s)	27.08	(mg/s)
concentration	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	5,049.77	(mg/s)	57,657	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	4.17	(mg/s)	4.17	(mg/s)	4.17	(mg/s)
u X	mass flux of Area 5 Pit NW discharge	M_spit =	0.28	(mg/s)	2.13	(mg/s)	2.13	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	6.92	(mg/s)	6.92	(mg/s)	6.92	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	259.35		259.35	(mg/s)	259.35	
			Low Flo	w	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	27.93	(mg/s)	1,062.84	(mg/s)	11,777.08	(mg/s)
Mass at eac	mass flux in river at PM-13	M_r13 =	298.82	(mg/s)	6,385.34	(mg/s)	69,706.44	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.829	(mg/L)	2.721	(mg/L)	2.883	(mg/L)
Converture flux to concer	concentration in river at PM-13	C_r13 =	0.897	(mg/L)	2.574	(mg/L)	2.867	(mg/L)

Case	Year 5
Parameter	Hardness

	concentration of surface water into PM-12	C_s12 =	70	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	70	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	70	(mg/L)
Ē	concentration in Area 5 Pit NW discharge	C_spit =	942.7142857	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	2.61E+02	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	8.61E+03	(mg/L)
lo s	concentration in tailings basin cell 2W	C_s2w =	436.6	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	87.5	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	87.5	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	24,980.41	(mg/s)	283,600	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	2,129.58	(mg/s)	2,129.58	(mg/s)	2,129.58	(mg/s)
tio	mass flux in Babbitt WWTP discharge	M_sBab =	653.73	(mg/s)	653.73	(mg/s)	653.73	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	121,890.93	(mg/s)	1,391,712	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	10,425.01	(mg/s)	10,425.01	(mg/s)	10,425.01	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	6,936.49	(mg/s)	53,090.84	(mg/s)	53,090.84	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	30,336.71	(mg/s)	30,336.71	(mg/s)	30,336.71	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	3,654.83	(mg/s)	3,654.83	(mg/s)	3,654.83	(mg/s)
မ ပိ	mass flux in seepage from cell 2W	M_s2w =	24,647.41	(mg/s)	24,647.41	(mg/s)	24,647.41	(mg/s)
			Low Flo	w	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	2,783.31		27,763.72		286,383.27	
at M	mass flux in river at PM-13	M_r13 =	78,783.76 Low Flo		271,809.45 Average		1,800,250.00 High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	82.647 236.473	(mg/L)	71.091 109.588	(mg/L)	70.104 74.038	(mg/L)

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 5 Potassium			
rarameter	T Guassiani	ı		
	concentration of surface water into PM-12	C_s12 =	0.60	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.60	(mg/L)
n da	concentration in Babbitt WWTP discharge	C_sBab =	0.60	(mg/L)
엹	concentration in Area 5 Pit NW discharge	C_spit =	53.80	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	7.67	(mg/L)
Ser	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80	(mg/L)
lo.	concentration in tailings basin cell 2W	C s2w =	7.77	(ma/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	214.12	(mg/s)	2,431	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	38.94	(mg/s)	38.94	(mg/s)	38.94	(mg/s)
ţi	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.76	(mg/s)	0.76	(mg/s)	0.76	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1,044.78	(mg/s)	11,929	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	190.63	(mg/s)	190.63	(mg/s)	190.63	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	5.60	(mg/s)	5.60	(mg/s)	5.60	(mg/s)
		M_spit =	395.86	(mg/s)	3,029.85	(mg/s)	3,029.85	(mg/s)
Convert	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	890.78	(mg/s)	890.78	(mg/s)	890.78	(mg/s)
ဝိ		M_s2w =	438.64	(mg/s)	438.64	(mg/s)	438.64	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance		M_r12 =		(mg/s)	253.82		2,470.56	
2 (mass flux in river at PM-13	M_r13 =	1,961.22 Low Flo		5,854.11 Average		18,955.03 High FI	
Convert mass flux to	concentration in river at PM-12	C_r12 =	1.179	(mg/L)	0.650	(mg/L)	0.605	(mg/l)
ું ફ ઇ	concentration in river at PM-13	C_r13 =	5.887	(mg/L)	2.360	(mg/L)	0.780	(mg/l)

C_g12 =

C_g13 =

1.60 (mg/L)

1.60 (mg/L)

oncentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 5 Magnesium			
	concentration of surface water into PM-12	C_s12 =	5.90	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	5.90	(mg/L)
d n		C_sBab =	5.90	(mg/L)
Ę	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)
t.	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	29.76	(mg/L)

			Low Flo	w	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,105.49	(mg/s)	23,903	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	259.20	(mg/s)	259.20	(mg/s)	259.20	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	55.10	(mg/s)	55.10	(mg/s)	55.10	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,273.66	(mg/s)	117,301	(mg/s)
concentration	mass flux of ground water into PM-13	M_g13 =	1,268.87	(mg/s)	1,268.87	(mg/s)	1,268.87	(mg/s)
con	mass flux of Area 5 Pit NW discharge	M_spit =	1,994.02	(mg/s)	15,261.91	(mg/s)	15,261.91	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	3,455.69	(mg/s)	3,455.69	(mg/s)	3,455.69	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	90.42	(mg/s)	90.42	(mg/s)	90.42	(mg/s)
င်	mass flux in seepage from cell 2W	M_s2w =	3,950.02	(mg/s)	3,950.02		3,950.02	(mg/s)
			Low Flo	w	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	314.30	(mg/s)	2,419.79	(mg/s)	24,217.73	(mg/s)
Ma	mass flux in river at PM-13	M_r13 =	11,073.32	(mg/s)	36,720.36	(mg/s)	165,546.07	(mg/s)
			Low Flo	w	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	9.333	(mg/L)	6.196	(mg/l)	5.928	(mg/l)
Con	concentration in river at PM-13	C_r13 =	33.237	(mg/L)	14.805	(mg/l)	6.808	(mg/l)

C_s2w =

C_g12 =

C_g13 =

213.00

69.97

10.65

(mg/L)

(mg/L)

(mg/L)

10.65 (mg/L)

Case Parameter	Year 5 Manganese			
	concentration of surface water into PM-12	C_s12 =	0.30	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.30	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.30	(mg/L)
ntration	concentration in Area 5 Pit NW discharge	C_spit =	0.49	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.31	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	1.18	(mg/L)
	concentration of ground water into PM-12	C_g12 =	0.19	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.19	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	107.06	(mg/s)	1,215	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	4.58	(mg/s)	4.58	(mg/s)	4.58	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	2.80	(mg/s)	2.80	(mg/s)	2.80	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	522.39	(mg/s)	5,964	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	22.40	(mg/s)	22.40	(mg/s)	22.40	(mg/s)
io X	mass flux of Area 5 Pit NW discharge	M_spit =	3.57	(mg/s)	27.31	(mg/s)	27.31	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	36.00	(mg/s)	36.00	(mg/s)	36.00	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္မွ င	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	66.78	(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	7.38	(mg/s)	114.44	(mg/s)	1,222.81	(mg/s)
Mass at eac	mass flux in river at PM-13	M_r13 =	136.13 Low Flo		789.32 Average		7,339.78 High Fl	
			LOW 110		Avelage	liow	riigii i	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.219	(mg/L)	0.293	(mg/l)	0.299	(mg/l)
Converture flux to concer	concentration in river at PM-13	C_r13 =	0.409	(mg/L)	0.318	(mg/l)	0.302	(mg/l)

concentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case

Year 5

Input concen

Parameter	Sodium			
			1	
	concentration of surface water into PM-12	C_s12 =	6.00	(mg/L)
at a	concentration of surface water into PM-13	C_s13 =	6.00	(mg/L)
n dat	concentration in Babbitt WWTP discharge	C_sBab =	6.00	(mg/L)
章	concentration in Area 5 Pit NW discharge	C_spit =	119.50	(mg/L)
Ē	concentration in seepage from Tailings Basin Cells 1E and 2E	C fe -	34.82	(ma/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,141.18	(mg/s)	24,309	(mg/s)
	mass flux of ground water into PM-12	M_g12 =	119.26	(mg/s)	119.26	(mg/s)	119.26	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	56.03	(mg/s)	56.03	(mg/s)	56.03	(mg/s)
concentration	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,447.79	(mg/s)	119,290	(mg/s
Çe	mass flux of ground water into PM-13	M_g13 =	583.80	(mg/s)	583.80	(mg/s)	583.80	(mg/s
li x	mass flux of Area 5 Pit NW discharge	M_spit =	879.28	(mg/s)	6,729.88	(mg/s)	6,729.88	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	4,042.46	(mg/s)	4,042.46	(mg/s)	4,042.46	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	108.24	(mg/s)	108.24	(mg/s)	108.24	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	2,501.44	(mg/s)	2,501.44	(mg/s)	2,501.44	(mg/s
			Low Flo	w	Average	Flow	High Fl	low
Mass balance at each node		M_r12 =	175.29 8,290.51		2,316.47		24,483.86	
			Low Flo		Average		High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	5.205	(mg/L)	5.931	(mg/l)	5.993	(mg/l)

C_rrs =

C_s2w =

C_g12 =

C_g13 =

255.00 (mg/L)

44.31 (mg/L)

4.90 (mg/L)

4.90 (mg/L)

concentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-13

concentra

Case Parameter	Year 5 Nickel			
	concentration of surface water into PM-12	C_s12 =	0.0012	(mg/L)
at a	concentration of surface water into PM-13	C_s13 =	0.0012	(mg/L)
n de	concentration in Babbitt WWTP discharge	C_sBab =	0.0012	(mg/L)
Ë	concentration in Area 5 Pit NW discharge	C_spit =	0.0052	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.029814715	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.43	(mg/s)	5	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
Ē	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.09	(mg/s)	24	(mg/s)
Se	mass flux of ground water into PM-13	M_g13 =	0.83	(mg/s)	0.83	(mg/s)	0.83	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.04	(mg/s)	0.29	(mg/s)	0.29	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	3.46	(mg/s)	3.46	(mg/s)	3.46	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
မ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.39	(mg/s)	0.39	(mg/s)	0.39	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
balance h node	mass flux in river at PM-12	M_r12 =	0.18	(mg/s)	0.61	(mg/s)	5.04	(mg/s)
Mass ba		M_r13 =	4.95 Low Flo	(mg/s)	7.72	(mg/s)	33.92 High Fl	(mg/s)
			LOW 1 10		Average	1000	riigii i	
Convert mass flux to	concentration in river at PM-12	C_r12 =	0.005	(mg/L)	0.002	(mg/L)	0.001	(mg/L)
Conve flux to	concentration in river at PM-13	C_r13 =	0.015	(mg/L)	0.003	(mg/L)	0.001	(mg/L)

C_rrs =

C_s2w =

C_g12 =

C_g13 =

0.098 (mg/L) 0.00688 (mg/L)

0.007 (mg/L)

0.007 (mg/L)

Case	Year 5		
Parameter	Lead		
	concentration of surface water into PM-12	C_s12 =	0.00015 (mg/L)
<u> </u>	concentration of surface water into PM-13	C s13 =	0.00015 (mg/L)

data	concentration of surface water into PM-13	C_s13 =	0.00015	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.00015	(mg/L)
Ē	concentration in Area 5 Pit NW discharge	C_spit =	0.0003	(mg/L)
ntration	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000769203	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0005	(mg/L)
conc	concentration in tailings basin cell 2W	C_s2w =	0.0012	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0012	(mg/L)
<u>u</u>	concentration of ground water into PM-13	C_g13 =	0.0012	(mg/L)
			Low Flor	W
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.05	(mg/s)	1	(mg/s)
	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.26	(mg/s)	3	(mg/s)
сеп	mass flux of ground water into PM-13	M_g13 =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s)
con	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.02	(mg/s)	0.02	(mg/s)
		M_fs =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
	mass flux in seepage from cell 2W	M_s2w =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.08	(mg/s)	0.64	(mg/s)
Ma		M_r13 =	0.33	(mg/s)	0.66	(mg/s)	3.94	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12 concentration in river at PM-13	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
S ‡ 5	concentration in river at PM-13	C_r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case Parameter	Year 5 Antimony		
	concentration of surface water into PM-12	C_s12 =	4.00E-05 (mg/L)
data	concentration of surface water into PM-13	C_s13 =	4.00E-05 (mg/L)
٣	concentration in Babbitt WWTP discharge	C_sBab =	4.00E-05 (mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	2.50E-04 (mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.47E-03 (mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C rrs =	0.004 (mg/L)
conce	concentration in tailings basin cell 2W	C s2w =	2.50E-04 (mg/L)
	concentration of ground water into PM-12	C g12 =	1.50E-03 (mg/L)
Input	concentration of ground water into PM-13	o C_g13 =	1.50E-03 (mg/L)

			Low Flo	W	Average I	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.01	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.75	(mg/s)	0.75	(mg/s)	0.75	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	W	Average I	Flow	High Fl	ow
Mass balance		M_r12 =		(mg/s)		(mg/s)		(mg/s)
ž t	mass flux in river at PM-13	M_r13 =	0.98	(mg/s)	1.08 Average I	(mg/s)	1.95 High Fl	(mg/s)
Convert mass flux to	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
υ ‡ δ	concentration in river at PM-13	C_r13 =	0.003	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case Parameter	Year 5 Selenium			
		-	ı	1
	concentration of surface water into PM-12	C_s12 =	0.0003	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0003	(mg/L)
Ф	concentration in Babbitt WWTP discharge	C_sBab =	0.0003	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.0016	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001159434	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.054	(mg/L)
COL	concentration in tailings basin cell 2W	C_s2w =	0.00109	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.00295	(mg/L)
≝	concentration of ground water into PM-13	C_g13 =	0.00295	(mg/L)

			Low Flo	w	Average	Flow	High F	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.11	(mg/s)	1	(mg/s)
⊊	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ıt.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.52	(mg/s)	6	(mg/s
Ser	mass flux of ground water into PM-13	M_g13 =	0.35	(mg/s)	0.35	(mg/s)	0.35	(mg/s
io X	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.09	(mg/s)	0.09	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.02	(mg/s)	0.02	(mg/s)	0.02	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
			Low Flo	w	Average	Flow	High F	low
ass balance each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.18	(mg/s)	1.29	(mg/s
Mass at eac		M_r13 =		(mg/s)		(mg/s)	7.92 High F l	(mg/s
a M	mass flux in river at PM-13		Low Flo	w	Average	Flow	High	ı Fl
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)		(mg/L)	0.000	

Case Parameter	Year 5 Sulfate			
	concentration of surface water into PM-12	C s12 =	4.00	(mg/L)
	concentration of surface water into PM-12	C_s12 = C s13 =		(mg/L)
g	concentration in Babbitt WWTP discharge	C_sBab =		(mg/L)
ţi	concentration in Area 5 Pit NW discharge	C_spit =	1046.27	(mg/L)
concentration	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	140.42	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	7347.00	(mg/L)
Ö	concentration in tailings basin cell 2W	C_s2w =	152.40	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	8.50	(mg/L)
<u>≃</u>	concentration of ground water into PM-13	C_g13 =	8.50	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,427.45	(mg/s)	16,206	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	206.87	(mg/s)	206.87	(mg/s)	206.87	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	37.36	(mg/s)	37.36	(mg/s)	37.36	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	6,965.20	(mg/s)	79,526	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	1,012.72	(mg/s)	1,012.72	(mg/s)	1,012.72	(mg/s)
Lo n	mass flux of Area 5 Pit NW discharge	M_spit =	7,698.43	(mg/s)	58,922.60	(mg/s)	58,922.60	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	16,304.02	(mg/s)	16,304.02	(mg/s)	16,304.02	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	3,118.71	(mg/s)	3,118.71	(mg/s)	3,118.71	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	8,603.45	(mg/s)	8,603.45	(mg/s)	8,603.45	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	244.23	(mg/s)	1,671.68	(mg/s)	16,449.94	(mg/s)
Mae at 6	mass flux in river at PM-13	M_r13 =	36,981.55	(mg/s)	96,598.37	(mg/s)	183,937.83	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	7.252	(mg/L)	4.280	(mg/l)	4.027	(mg/l)
Co the co	concentration in river at PM-13	C r13 =	111.002	(mg/L)	38.947	(mg/l)	7.565	(mg/l)

Case Parameter	Year 5 Thallium			
		1	ı	
	concentration of surface water into PM-12	C_s12 =	0.0002	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0002	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0002	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0006	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000906999	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0002	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.0002	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.000004	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.000004	(mg/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.35	(mg/s)	4	(mg/s)
Sen	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.11	(mg/s)	0.11	(mg/s)	0.11	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	low
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =		(mg/s)		(mg/s)		(mg/s)
0	Illass liux Ill livel at Fivi-13	W_113 =	Low Flo		Average		High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(ma/L)	0.000	(ma/l

Case Parameter	Year 5 Zinc		
	concentration of surface water into PM-12	C_s12 =	0.016 (mg/L)
# # **	concentration of surface water into PM-13	C_s13 =	0.016 (mg/L)
ů 2	Iconcentration in Badditt WW LP discharge	C_sBab =	0.016 (mg/L)
-	concentration in Area 5 Pit NW discharge	C_spit =	0.003 (mg/L)

concentration in seepage from Tailings Basin Cells 1E and 2E C_fs =

concentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration in river at PM-13

concentration of ground water into PM-12

concentration of ground water into PM-13

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	0.28	(mg/s)	0.28	(mg/s)	0.28	(mg/s
ntrat	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/
Cer	mass flux of ground water into PM-13	M_g13 =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/
Con	mass flux of Area 5 Pit NW discharge	M_spit =	0.02	(mg/s)	0.17	(mg/s)	0.17	(mg/
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	2.05	(mg/s)	2.05	(mg/s)	2.05	(mg/
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	0.81	(mg/s)	0.81	
			Low Flo	W	Average	Flow	High Fl	ow
9 <u>0</u>								
ss balance	mass flux in river at PM-12	M_r12 =	0.43	(mg/s)	6.14	(mg/s)	65.25	(mg/
Mass balance at each node		M_r12 = M_r13 =	4.68	(mg/s)		(mg/s)	387.76	(mg/s
Mass balan at each nod				(mg/s)		(mg/s)		(mg/

C_<u>r13</u> =

C_rrs =

C_s2w = C_g12 =

C_g13 =

0.017646569 (mg/L)

0.01 (mg/L)

0.01435 (mg/L)

0.0115 (mg/L)

0.0115 (mg/L)

Appendix F.3
Embarrass River
Proposed Action
Year 8

FLOWS

Case	Year 8				
Flows	Low Flow Conditions (no surface runoff)				Node
n River	flow in river at PM-12	Q_r12_L =	1.19	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_L =	12.46	(cfs)	PM-13
Total Emba	flow check	Q_ck_L =	12.46	(cfs)	
	surface water flow into PM-12	Q_s12_L =	0.00	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_L =	0.00	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_L =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_L =	0.26	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_L =	4.79	(cfs)	PM-13
p /	hydrometallurgical residue cells liner leakage	Q_rrs_L =	0.01	(cfs)	PM-13
flow	seepage from cell 2W	Q_s2w_L =	1.99	(cfs)	PM-13
Input 1	ground water flow into PM-12	Q_g12_L =	0.86	(cfs)	PM-12
삡	ground water flow into PM-13	Q_g13_L =	4.21	(cfs)	PM-13

Case	Year 8				
Flow	Average Flow Conditions (mean annual)				_
n River	flow in river at PM-12	Q_r12_M =	13.80	(cfs)	PM-12
Total flow in Embarrass R	flow in river at PM-13	Q_r13_M =	88.33	(cfs)	PM-13
Total	flow check	Q_ck_M =	88.33	(cfs)	1
	surface water flow into PM-12	Q_s12_M =	12.61	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_M =	61.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_M =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_M =	1.99	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_M =	4.79	(cfs)	PM-13
g /	hydrometallurgical residue cells liner leakage	Q_rrs_M =	0.01	(cfs)	PM-13
ĮŠ	seepage from cell 2W	Q_s2w_M =	1.99	(cfs)	PM-13
Input flow	ground water flow into PM-12	Q_g12_M =	0.86	(cfs)	PM-12
ᄪ	ground water flow into PM-13	Q_g13_M =	4.21	(cfs)	PM-13

Case	Year 8				
Flow	High Flow Conditions (avg. annual 1-day max flow)				_
n River	flow in river at PM-12	Q_r12_H =	144.35	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_H =	859.88	(cfs)	PM-13
Tota Emb	flow check	Q_ck_H =	859.88	(cfs)	1
	surface water flow into PM-12	Q_s12_H =	143.16	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_H =	702.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_H =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_H =	1.99	(cfs)	PM-13
ţa	seepage from Tailings Basin Cells 1E and 2E	Q_fs_H =	4.79	(cfs)	PM-13
flow data	hydrometallurgical residue cells liner leakage	Q_rrs_H =	0.01	(cfs)	PM-13
<u>§</u>	seepage from cell 2W	Q_s2w_H =	1.99	(cfs)	PM-13
Input	ground water flow into PM-12	Q_g12_H =	0.86	(cfs)	PM-12
트	ground water flow into PM-13	Q_g13_H =	4.21	(cfs)	PM-13

Case Parameter	Year 8 Silver			
		1		ı
	concentration of surface water into PM-12	C_s12 =	0.00011	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00011	(mg/L)
ğu	concentration in Babbitt WWTP discharge	C_sBab =	0.00011	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.00015	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00089	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.000125	(mg/L)
cor	concentration in tailings basin cell 2W	C_s2w =	0.000100	(mg/L)
it i	concentration of ground water into PM-12	C_g12 =	0.000008	(mg/L)
<u>=</u>	concentration of ground water into PM-13	C_g13 =	0.000008	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ħ,	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.19	(mg/s)	2	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.12	(mg/s)	0.12	(mg/s)	0.12	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.45	(mg/s)
Mas: at ea	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s
ss uo			Low Flo	w	Average	Flow	High FI	0
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/
Conve flux to	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(ma/l

Case Parameter	Year 8 Aluminum			
		-	T	1
	concentration of surface water into PM-12	C_s12 =	0.12	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.12	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.12	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.01325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.01E-01	(mg/L)
95	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80E-01	(mg/L)
LO CO	concentration in tailings basin cell 2W	C_s2w =	1.5788	(mg/L)
nput	concentration of ground water into PM-12	C_g12 =	0.025	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.025	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	42.82	(mg/s)	486	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.61	(mg/s)	0.61	(mg/s)	0.61	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	208.96	(mg/s)	2,386	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	2.98	(mg/s)	2.98	(mg/s)	2.98	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.10	(mg/s)	0.75	(mg/s)	0.75	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	13.63	(mg/s)	13.63	(mg/s)	13.63	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	89.13	(mg/s)	89.13	(mg/s)	89.13	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
alance node	mass flux in river at PM-12	M_r12 =	1.73	(mg/s)	44.55	(mg/s)	487.90	(mg/s)
Mass balance at each node	mass flux in river at PM-13	M_r13 =	107.62		360.05	(mg/s)	2,980.23	
			Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.051	(mg/L)	0.114	(mg/L)	0.119	(mg/L)
Conver flux to concer	concentration in river at PM-13	C r13 =	0.305	(mg/L)	0.144	(mg/L)	0.122	(mg/L)

Case	Year 8			
Parameter	Arsenic			
		_		
	concentration of surface water into PM-12	C_s12 =	0.00075	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00075	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.00075	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.001325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.007035766	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.00291	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.00273	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.00273	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.27	(mg/s)	3	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
Ē	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ita	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.31	(mg/s)	15	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.95	(mg/s)	0.95	(mg/s)	0.95	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.16	(mg/s)	0.16	(mg/s)	0.16	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.34	(mg/s)	3.11	(mg/s)
Mass k at each	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Conve flux to	concentration in river at PM-13	C r13 =	0.004	(mg/L)	0.001	(mg/L)	0.001	(ma/L)

Case Parameter	Year 8 Boron			
		4		
ration data	concentration of surface water into PM-12	C_s12 =	0.027	(mg/L
	concentration of surface water into PM-13	C_s13 =	0.027	(mg/L
	concentration in Babbitt WWTP discharge	C_sBab =	0.027	(mg/L
	concentration in Area 5 Pit NW discharge	C_spit =	0.1315	(mg/L
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.140897597	(mg/L
concent	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.11	(mg/L
Ö	concentration in tailings basin cell 2W	C_s2w =	0.33	(mg/L
Input	concentration of ground water into PM-12	C_g12 =	0.0212	(mg/L
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.0212	(mg/L
			I ow Flo	W

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	9.64	(mg/s)	109	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)	0.52	(mg/s)	0.52	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	47.02	(mg/s)	537	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	2.53	(mg/s)	2.53	(mg/s)	2.53	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.97	(mg/s)	7.41	(mg/s)	7.41	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	19.10	(mg/s)	19.10	(mg/s)	19.10	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	18.63	(mg/s)	18.63	(mg/s)	18.63	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	0.77	(mg/s)	10.40	(mg/s)	110.16	(mg/s)
Mass at eac	mass flux in river at PM-13	M_r13 =		(mg/s)	105.11		694.66	
	T		Low Flo	W	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.023	(mg/L)	0.027	(mg/L)	0.027	(mg/L)
Converture flux to concer	concentration in river at PM-13	C_r13 =	0.119	(mg/L)	0.042	(mg/L)	0.029	(mg/L)

Case	Year 8	1		
Parameter	Barium			
			1	
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0044	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.04E-02	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	5.00E-03	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.09298	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0681	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.0681	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	1.66	(mg/s)	1.66	(mg/s)	1.66	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	8.11	(mg/s)	8.11	(mg/s)	8.11	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	6.84	(mg/s)	6.84	(mg/s)	6.84	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဗ လိ	mass flux in seepage from cell 2W	M_s2w =	5.25	(mg/s)	5.25	(mg/s)	5.25	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	1.81	(mg/s)	7.52	(mg/s)	66.63	(mg/s)
M, at	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	405.18	
			Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.054	(mg/L)	0.019	(mg/L)	0.016	(mg/L)
Co flux col	concentration in river at PM-13	C_r13 =	0.063	(mg/L)	0.022	(mg/L)	0.017	(mg/L)

Case Parameter	Year 8 Beryllium			
		1		
	concentration of surface water into PM-12	C_s12 =	0.0001	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0001	(mg/L)
Ф	concentration in Babbitt WWTP discharge	C_sBab =	0.0001	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000543459	(mg/L)
95	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0	(mg/L)
lo S	concentration in tailings basin cell 2W	C_s2w =	0.00075	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.000023	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.000023	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ħ,	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.17	(mg/s)	2	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	-	(mg/s)	_	(mg/s)	-	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.41	(mg/s)
Mas at e	mass flux in river at PM-13	M_r13 =	0.12	(mg/s)		(mg/s)		(mg/s
			LOW FIO	w	Average	FIOW	High Fl	ow
t mass	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(ma/l

Case	Year 8			
Parameter	Calcium			
		-		
	concentration of surface water into PM-12	C_s12 =	15	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	15	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	15	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	95.35	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	72.53696661	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	416	(mg/L)
conc	concentration in tailings basin cell 2W	C_s2w =	59.78	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	19	(mg/L)
<u>I</u>	concentration of ground water into PM-13	C_g13 =	19	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5,352.95	(mg/s)	60,771	(mg/s)
concentration	mass flux of ground water into PM-12	M_g12 =	462.42	(mg/s)	462.42	(mg/s)	462.42	(mg/s)
	mass flux in Babbitt WWTP discharge	M_sBab =	140.09	(mg/s)	140.09	(mg/s)	140.09	(mg/s)
ita	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	26,119.49	(mg/s)	298,224	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	2,263.72	(mg/s)	2,263.72	(mg/s)	2,263.72	(mg/s)
Conc	mass flux of Area 5 Pit NW discharge	M_spit =	701.59	(mg/s)	5,369.83	(mg/s)	5,369.83	(mg/s)
		M_fs =	9,833.30	(mg/s)	9,833.30	(mg/s)	9,833.30	(mg/s)
onvert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	132.27	(mg/s)	132.27	(mg/s)	132.27	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	3,374.76	(mg/s)	3,374.76	(mg/s)	19.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	602.51	(mg/s)	5,955.45	(mg/s)	61,373.93	(mg/s)
Mass b at each		M_r13 =	16,908.15		53,048.82		377,216.04	
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	17.891	(mg/L)	15.249	(mg/l)	15.024	(mg/l)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	47.965		21.223	(f)	15.501	(#)

Case Parameter	Year 8 Cadmium			
		_		
	concentration of surface water into PM-12	C_s12 =	0.00008	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00008	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.00008	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000383404	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0004	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.000188	(mg/L)
	concentration of ground water into PM-12	C_g12 =	0.0003	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.0003	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.03	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.14	(mg/s)	2	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
မ္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.01	(mg/s)	0.04	(mg/s)	0.33	(mg/s
Mass ba at each	mass flux in river at PM-13	M_r13 =	0.11 Low Flo	(mg/s)	0.28	(mg/s)	2.03 High Fl	(mg/s
ss			LOW 1 10	W	Average	low	Illgiiii	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(ma/l

Case	Year 8			
Parameter	Chloride			
		-		
	concentration of surface water into PM-12	C_s12 =	6.5	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	6.5	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	6.5	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	5.95	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.07E+00	(mg/L)
ie i	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.76E+03	(mg/L)
LO S	concentration in tailings basin cell 2W	C_s2w =	21.54	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	1.8	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	1.8	(mg/L)

		Low Flo	w	Average	Flow	High Fl	ow	
mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,319.61	(mg/s)	26,334	(mg/s)	
mass flux of ground water into PM-12	M_g12 =	43.81	(mg/s)	43.81	(mg/s)	43.81	(mg/s)	
mass flux in Babbitt WWTP discharge	M_sBab =	60.70	(mg/s)	60.70	(mg/s)	60.70	(mg/s)	
mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	11,318.44	(mg/s)	129,230	(mg/s)	
mass flux of ground water into PM-13	M_g13 =	214.46	(mg/s)	214.46	(mg/s)	214.46	(mg/s)	
mass flux of Area 5 Pit NW discharge	M_spit =	43.78	(mg/s)	335.09	(mg/s)	335.09	(mg/s)	
mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	823.25	(mg/s)	823.25	(mg/s)	823.25	(mg/s)	
mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	559.62	(mg/s)	559.62	(mg/s)	559.62	(mg/s)	
mass flux in seepage from cell 2W	M_s2w =	1,216.00	(mg/s)	1,216.00	(mg/s)	1,216.00		
		Low Flo	w	Average	Flow	High Fl	ow	
mass flux in river at PM-12	M_r12 =	104.51	(mg/s)	2,424.12	(mg/s)	26,438.79	(mg/s)	
mass flux in river at PM-13	M r13 =	2,961.63	, ,		(mg/s)	150.017.01	(mg/s)	
	mass flux of ground water into PM-12 mass flux in Babbitt WWTP discharge mass flux of surface water into PM-13 mass flux of ground water into PM-13 mass flux of Area 5 Pit NW discharge mass flux in seepage from Tailings Basin Cells 1E and 2E mass flux in hydrometallurgical residue cells liner leakage mass flux in seepage from cell 2W	mass flux of ground water into PM-12 M_g12 = mass flux in Babbitt WWTP discharge M_sBab = mass flux of surface water into PM-13 M_s13 = mass flux of ground water into PM-13 M_g13 = mass flux of Area 5 Pit NW discharge M_spit = mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = mass flux in hydrometallurgical residue cells liner leakage M_rrs = mass flux in seepage from cell 2W M_s2w =	mass flux of ground water into PM-12 M_g12 = 43.81 mass flux in Babbitt WWTP discharge M_sBab = 60.70 mass flux of surface water into PM-13 M_s13 = - mass flux of ground water into PM-13 M_g13 = 214.46 mass flux of Area 5 Pit NW discharge M_spit = 43.78 mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 823.25 mass flux in hydrometallurgical residue cells liner leakage M_rs = 559.62 mass flux in seepage from cell 2W M_s2w = 1,216.00 Low Flo	mass flux of ground water into PM-12 M_g12 = 43.81 (mg/s) mass flux in Babbitt WWTP discharge M_sBab = 60.70 (mg/s) mass flux of surface water into PM-13 M_s13 = - (mg/s) mass flux of ground water into PM-13 M_g13 = 214.46 (mg/s) mass flux of Area 5 Pit NW discharge M_spit = 43.78 (mg/s) mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 823.25 (mg/s) mass flux in hydrometallurgical residue cells liner leakage M_rs = 559.62 (mg/s) mass flux in seepage from cell 2W M_s2w = 1,216.00 (mg/s) Low Flow	mass flux of ground water into PM-12 M_g12 = 43.81 (mg/s) 43.81 mass flux in Babbitt WWTP discharge M_sBab = 60.70 (mg/s) 60.70 mass flux of surface water into PM-13 M_s13 = - (mg/s) 11,318.44 mass flux of ground water into PM-13 M_g13 = 214.46 (mg/s) 214.46 mass flux of Area 5 Pit NW discharge M_spit = 43.78 (mg/s) 335.09 mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 823.25 (mg/s) 823.25 mass flux in hydrometallurgical residue cells liner leakage M_rrs = 559.62 (mg/s) 559.62 mass flux in seepage from cell 2W M_s2w = 1,216.00 (mg/s) 1,216.00 Low Flow	mass flux of ground water into PM-12 M_g12 = 43.81 (mg/s) 43.81 (mg/s) mass flux in Babbitt WWTP discharge M_sBab = 60.70 (mg/s) 60.70 (mg/s) mass flux of surface water into PM-13 M_s13 = - (mg/s) 11,318.44 (mg/s) mass flux of ground water into PM-13 M_g13 = 214.46 (mg/s) 214.46 (mg/s) mass flux of Area 5 Pit NW discharge M_spit = 43.78 (mg/s) 335.09 (mg/s) mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 823.25 (mg/s) 823.25 (mg/s) mass flux in hydrometallurgical residue cells liner leakage M_rs = 559.62 (mg/s) 559.62 (mg/s) mass flux in seepage from cell 2W M_s2w = 1,216.00 (mg/s) 1,216.00 (mg/s)	mass flux of ground water into PM-12 M_g12 = 43.81 (mg/s) 43.81 (mg/s) 43.81 mass flux in Babbitt WWTP discharge M_sBab = 60.70 (mg/s) 60.70 (mg/s) 60.70 (mg/s) 60.70 mass flux of surface water into PM-13 M_s13 = - (mg/s) 11,318.44 (mg/s) 129,230 mass flux of ground water into PM-13 M_g13 = 214.46 (mg/s) 214.46 (mg/s) 214.46 mass flux of Area 5 Pit NW discharge M_spit = 43.78 (mg/s) 335.09 (mg/s) 335.09 (mg/s) 335.09 mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 823.25 (mg/s) 823.25 (mg/s) 823.25 (mg/s) 823.25 mass flux in hydrometallurgical residue cells liner leakage M_rrs = 559.62 (mg/s) 559.62 (mg/s) 559.62 (mg/s) 559.62 (mg/s) 1,216.00 (mg/s) 1,216.0	

Case	Year 8			
Parameter	Cobalt			
		-		
	concentration of surface water into PM-12	C_s12 =	0.0006	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0006	(mg/L)
ğ u	concentration in Babbitt WWTP discharge	C_sBab =	0.0006	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.000555	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.002321539	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.005	(mg/L)
Sor	concentration in tailings basin cell 2W	C_s2w =	0.001556	(mg/L)
t to	concentration of ground water into PM-12	C_g12 =	0.0011	(mg/L)
宣	concentration of ground water into PM-13	C_g13 =	0.0011	(mg/L)

			Low Flo	w	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.21	(mg/s)	2	(mg/s)
concentration flux	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s
	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.04	(mg/s)	12	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s
la co	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.31	(mg/s)	0.31	(mg/s)	0.31	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.25	(mg/s)	2.46	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	0.57 Low Flo	(mg/s)	1.86	(mg/s)	14.96 High Fl	
ass								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	0.002	(mg/L)	0.001	(mg/L)	0.001	(ma/l

Case	Year 8			
Parameter	Copper			
		_		
	concentration of surface water into PM-12	C_s12 =	0.0015	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0015	(mg/L)
P u	concentration in Babbitt WWTP discharge	C_sBab =	0.0015	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.00345	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00854201	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0015	(mg/L)
COL	concentration in tailings basin cell 2W	C_s2w =	0.004555	(mg/L)
but	concentration of ground water into PM-12	C_g12 =	0.004	(mg/L)
	concentration of ground water into PM-13	C_g13 =	0.004	(mg/L)

•			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.54	(mg/s)	6	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.61	(mg/s)	30	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	0.48	(mg/s)	0.48	(mg/s)	0.48	(mg/s
con	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.19	(mg/s)	0.19	(mg/s
		M_fs =	1.16	(mg/s)	1.16	(mg/s)	1.16	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.26	(mg/s)	0.26	(mg/s)	0.26	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.11	(mg/s)	0.65	(mg/s)	6.19	(mg/s
Mass b		M_r13 =	2.03 Low Flo	(mg/s)	5.35 Average	(mg/s)	38.10 High Fl	
<i>"</i>			LOW 1 10		Average	liow	riigii i	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.003	(mg/L)	0.002	(mg/L)	0.002	(mg/l
Convergible to concer	concentration in river at PM-13	C r13 =	0.006	(mg/L)	0.002	(mg/L)	0.002	(ma/l

Case Parameter	Year 8 Fluoride			
				, ,,
	concentration of surface water into PM-12	C_s12 =	0.2	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.2	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.2	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.125	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	7.89E-01	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	2.85E+00	(mg/L)
conc	concentration in tailings basin cell 2W	C_s2w =	1.55	(mg/L)
nbut	concentration of ground water into PM-12	C_g12 =	0.385	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.385	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	71.37	(mg/s)	810	(mg/s)
concentration flux	mass flux of ground water into PM-12	M_g12 =	9.37	(mg/s)	9.37	(mg/s)	9.37	(mg/s)
	mass flux in Babbitt WWTP discharge	M_sBab =	1.87	(mg/s)	1.87	(mg/s)	1.87	(mg/s)
<u>i</u> t	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	348.26	(mg/s)	3,976	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	45.87	(mg/s)	45.87	(mg/s)	45.87	(mg/s)
Cont	mass flux of Area 5 Pit NW discharge	M_spit =	0.92	(mg/s)	7.04	(mg/s)	7.04	810 (mg/s) .37 (mg/s) .87 (mg/s) .87 (mg/s) .88 (mg/s) .89 (mg/s) .89 (mg/s) .94 (mg/s) .91 (mg/s) .50 (mg/s) .51 (mg/s) .52 (mg/s) .51 (mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	106.94	(mg/s)	106.94	(mg/s)	106.94	(mg/s)
onvert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.91	(mg/s)	0.91	(mg/s)	0.91	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	87.50	(mg/s)	87.50	(mg/s)	87.50	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	11.24	(mg/s)	82.61	(mg/s)	821.52	(mg/s)
Mass b at each		M_r13 =	253.37		679.12			
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	0.334	(mg/L)	0.212	(mg/L)	0.201	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.719	(mg/L)	0.272	(mg/L)	0.207	(mg/L

concentration in tailings basin cell 2W

concentration of ground water into PM-12 concentration of ground water into PM-13

Case Parameter	Year 8 Iron			
	concentration of surface water into PM-12	C s12 =	2.9	(mg/L)
d ata		C_s13 =		(mg/L)
		C_sBab =	2.9	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.037761905	(mg/L)
t z	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.80E-02	(mg/L)
ā	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	4.00E-01	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,034.90	(mg/s)	11,749	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.85	(mg/s)	0.85	(mg/s)	0.85	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	27.08	(mg/s)	27.08	(mg/s)	27.08	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	5,049.77	(mg/s)	57,657	(mg/s)
Se T	mass flux of ground water into PM-13	M_g13 =	4.17	(mg/s)	4.17	(mg/s)	4.17	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.28	(mg/s)	2.13	(mg/s)	2.13	(mg/s)
		M_fs =	7.86	(mg/s)	7.86	(mg/s)	7.86	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.13	(mg/s)		(mg/s)	0.13	(mg/s)
္ ပိ	mass flux in seepage from cell 2W	M_s2w =	259.35	(mg/s)	259.35		259.35	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	27.93	(mg/s)	1,062.84		11,777.08	
			Low Flo		Average		High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.829	(mg/L)	2.721	(mg/L)	2.883	(mg/L)

C_s2w =

C_g12 =

C_g13 =

4.594 (mg/L)

0.035

(mg/L)

0.035 (mg/L)

Case Parameter	Year 8 Hardness			
	concentration of surface water into PM-12	C_s12 =	70	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	70	(mg/L)
p u	concentration in Babbitt WWTP discharge	C_sBab =	70	(mg/L)
엹	concentration in Area 5 Pit NW discharge	C_spit =	942.7142857	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	2.52E+02	(mg/L)

Con	concentration in seepage from Tailings Basin Cells TE and ZE	U_IS =	2.52E+02	(mg/L)					
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	8.61E+03	(mg/L)					
	concentration in tailings basin cell 2W	C_s2w =	436.6	(mg/L)					
	concentration of ground water into PM-12	C_g12 =	87.5	(mg/L)					
트	concentration of ground water into PM-13	C_g13 =	87.5	(mg/L)					
			Low Flo	w	Average	Flow	High Fl	ow	
concentration flux	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	24,980.41	(mg/s)	283,600	(mg/s	
	mass flux of ground water into PM-12	M_g12 =	2,129.58	(mg/s)	2,129.58	(mg/s)	2,129.58	(mg/s	
	mass flux in Babbitt WWTP discharge	M_sBab =	653.73	(mg/s)	653.73	(mg/s)	653.73	(mg/s	
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	121,890.93	(mg/s)	1,391,712	(mg/s	
	mass flux of ground water into PM-13	M_g13 =	10,425.01	(mg/s)	10,425.01	(mg/s)	10,425.01	(mg/s	
	mass flux of Area 5 Pit NW discharge	M_spit =	6,936.49	(mg/s)	53,090.84	(mg/s)	53,090.84	(mg/	
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	34,228.62	(mg/s)	34,228.62	(mg/s)	34,228.62	(mg/	
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	2,737.70	(mg/s)	2,737.70	(mg/s)	2,737.70	(mg/	
မ ပိ	mass flux in seepage from cell 2W	M_s2w =	24,647.41	(mg/s)	24,647.41	(mg/s)	24,647.41	(mg/	
			Low Flow		Average	Average Flow		High Flow	
ass balance each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =	2,783.31		27,763.72		286,383.27		
a Z	mass flux in river at PM-13	M_r13 =	81,758.54		274,784.23		1,803,224.78		
		_	Low Flo	W	Average	Flow	High Fl	ow	
mass	concentration in river at PM-12	C_r12 =	82.647	(mg/L)	71.091	(mg/L)	70.104	(mg/l	
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	231.931	(ma/L)	109.930	(mg/L)	74.102	(ma/	

Case	Year 8			
Parameter	Potassium			
		-		
	concentration of surface water into PM-12	C_s12 =	0.60	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.60	(mg/L)
0	concentration in Babbitt WWTP discharge	C_sBab =	0.60	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	53.80	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.73	(mg/L)
ie i	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80	(mg/L)
LOS	concentration in tailings basin cell 2W	C_s2w =	7.77	(mg/L)
Į,	concentration of ground water into PM-12	C_g12 =	1.60	(mg/L)
ם	concentration of ground water into PM-13	C_g13 =	1.60	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	214.12	(mg/s)	2,431	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	38.94	(mg/s)	38.94	(mg/s)	38.94	(mg/s)
ë	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.57	(mg/s)	0.57	(mg/s)	0.57	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1,044.78	(mg/s)	11,929	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	190.63	(mg/s)	190.63	(mg/s)	190.63	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	5.60	(mg/s)	5.60	(mg/s)	5.60	(mg/s)
		M_spit =	395.86	(mg/s)	3,029.85	(mg/s)	3,029.85	(mg/s)
onvert	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	912.75	(mg/s)	912.75	(mg/s)	912.75	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	438.64	(mg/s)	438.64	(mg/s)	438.64	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	39.51	(mg/s)	253.63	(mg/s)	2,470.37	(mg/s)
Mass b at each		M_r13 =	1,982.99		5,875.88		18,976.80	
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	1.173	(mg/L)	0.649	(mg/L)	0.605	(mg/l)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	5.625		0.051	(mg/L)	0.780	(ma/l)

concentration in tailings basin cell 2W

concentration of ground water into PM-12 concentration of ground water into PM-13

Case Parameter	Year 8 Magnesium			
	The state of the s	0 .10	5.00	(/l)
data	concentration of surface water into PM-12 concentration of surface water into PM-13	C_s12 = C s13 =		(mg/L) (mg/L)
		C_sBab =		(mg/L)
tion	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)
ntra	Iconcontration in coopage from Tailings Basin Colle 1E and 2E	C_fs =	17.33	(mg/L)
Cer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	213.00	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,105.49	(mg/s)	23,903	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	259.20	(mg/s)	259.20	(mg/s)	259.20	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	55.10	(mg/s)	55.10	(mg/s)	55.10	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,273.66	(mg/s)	117,301	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	1,268.87	(mg/s)	1,268.87	(mg/s)	1,268.87	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	1,994.02	(mg/s)	15,261.91	(mg/s)	15,261.91	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	2,349.41	(mg/s)	2,349.41	(mg/s)	2,349.41	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	67.73	(mg/s)	67.73	(mg/s)	67.73	(mg/s)
ဒ္ ဒိ	mass flux in seepage from cell 2W	M_s2w =	3,950.02	(mg/s)	3,950.02	(mg/s)	3,950.02	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	314.30		2,419.79		24,217.73	
<u> </u>	mass flux in river at PM-13	M_r13 =	9,944.35 Low Flo		35,591.39 Average		164,417.09 High Fl	
uss on			LOW 1 10	W	Average	low	Tilgii I	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	9.333	(mg/L)	6.196	(mg/l)	5.928	(mg/l
Convertury to concer	concentration in river at PM-13	C r13 =	28.210	(mg/L)	14.239	(mg/l)	6.757	(ma/l

C_s2w =

C_g12 =

C_g13 =

(mg/L)

(mg/L)

10.65 (mg/L)

69.97

10.65

Case	Year 8			
Parameter	Manganese			
	concentration of surface water into PM-12	C_s12 =	0.30	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.30	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	0.30	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.49	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.30	(mg/L)
<u></u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	1.18	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.19	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.19	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	107.06	(mg/s)	1,215	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	4.58	(mg/s)	4.58	(mg/s)	4.58	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	2.80	(mg/s)	2.80	(mg/s)	2.80	(mg/s
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	522.39	(mg/s)	5,964	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	22.40	(mg/s)	22.40	(mg/s)	22.40	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	3.57	(mg/s)	27.31	(mg/s)	27.31	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	40.29	(mg/s)	40.29	(mg/s)	40.29	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	66.78	(mg/s)	66.78	(mg/s)	66.78	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	7.38	(mg/s)	114.44	(mg/s)	1,222.81	(mg/s
Mass ba at each i	mass flux in river at PM-13	M_r13 =	140.42 Low Flo		793.61 Average		7,344.07 High Fl	_
ss u								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.219	(mg/L)	0.293	(mg/l)	0.299	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	0.398	(mg/L)	0.317	(mg/l)	0.302	(ma/l

Case	year 8			
Parameter	Sodium			
		-		
	concentration of surface water into PM-12	C_s12 =	6.00	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	6.00	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	6.00	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	119.50	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	18.93	(mg/L)
a)	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	255.00	(mg/L)
conc	concentration in tailings basin cell 2W	C_s2w =	44.31	(mg/L)
ħ	concentration of ground water into PM-12	C_g12 =	4.90	(mg/L)
ndul	concentration of ground water into PM-13	C_g13 =	4.90	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,141.18	(mg/s)	24,309	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	119.26	(mg/s)	119.26	(mg/s)	119.26	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	56.03	(mg/s)	56.03	(mg/s)	56.03	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,447.79	(mg/s)	119,290	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	583.80	(mg/s)	583.80	(mg/s)	583.80	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	879.28	(mg/s)	6,729.88	(mg/s)	6,729.88	(mg/s
		M_fs =	2,566.23	(mg/s)	2,566.23	(mg/s)	2,566.23	(mg/s
onvert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	81.08	(mg/s)	81.08	(mg/s)	81.08	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	2,501.44	(mg/s)	2,501.44	(mg/s)	2,501.44	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	175.29	(mg/s)	2,316.47	(mg/s)	24,483.86	(mg/s
Mass k		M_r13 =	6,787.12		25,226.70		156,235.89	
			Low Flo	W	Average	FIOW	High FI	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	5.205	(mg/L)	5.931	(mg/l)	5.993	(mg/l)
Conver flux to	concentration in river at PM-13	C r13 =	19.254	(mg/L)	10.092	(mg/l)	6.420	(ma/l)

Case Parameter	Year 8 Nickel			
	concentration of surface water into PM-12	C_s12 =	0.0012	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0012	(mg/L)
٦	concentration in Babbitt WWTP discharge	C_sBab =	0.0012	(mg/L)
ţi	concentration in Area 5 Pit NW discharge	C_spit =	0.0052	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C fs =	0.038551821	(mg/L)

늍	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.038551821	(mg/L)				
concentr	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.098	(mg/L)				
Ö	concentration in tailings basin cell 2W	C_s2w =	0.00688	(mg/L)				
Input	concentration of ground water into PM-12	C_g12 =	0.007	(mg/L)				
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.007	(mg/L)				
			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.43	(mg/s)	5	(mg/s)
	mass flux of ground water into PM-12	M_g12 =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)		(mg/s)
trat	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.09	(mg/s)	24	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.83	(mg/s)	0.83	(mg/s)	0.83	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.04	(mg/s)	0.29	(mg/s)	0.29	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	5.23	(mg/s)	5.23	(mg/s)	5.23	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.39	(mg/s)	0.39	(mg/s)	0.39	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.18	(mg/s)	0.61	(mg/s)	5.04	(mg/s)
Mass at eac	mass flux in river at PM-13	M_r13 =	6.70 Low Flo	(mg/s)	9.47 Average	(mg/s)	35.67 High Fl	(mg/s)
			LOW FIO	VV	Average	TIOW	High Fi	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.005	(mg/L)	0.002	(mg/L)	0.001	(mg/L)
Convertill filt to concer	concentration in river at PM-13	C_r13 =	0.019	(mg/L)	0.004	(mg/L)	0.001	(mg/L)

Case	Year 8			
Parameter	Lead			
	concentration of surface water into PM-12	C a10	0.00015	(ma/L)
īa	concentration of surface water into PM-12	C_s12 = C s13 =	0.00015 0.00015	, ,
ı data	concentration in Babbitt WWTP discharge	C_sBab =	0.00015	, ,
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0003	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001239552	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0005	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.0012	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0012	(mg/L)
duj	concentration of ground water into PM-13	C_g13 =	0.0012	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.05	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
Ęi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.26	(mg/s)	3	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.02	(mg/s)	0.02	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	0.07	(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
balance h node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.08	(mg/s)	0.64	(mg/s)
iss	mass flux in river at PM-13	M_r13 =	0.41 Low Flo	(mg/s)	0.74 Average	(mg/s)	4.02 High Fl	(mg/s)
			LOW 110	VV	Average	11000	Ingili	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Conve flux to conce	concentration in river at PM-13	C_r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case Parameter	Year 8 Antimony]		
	,	1		
	concentration of surface water into PM-12	C_s12 =	4.00E-05	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	4.00E-05	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	4.00E-05	(mg/L)
章	concentration in Area 5 Pit NW discharge	C_spit =	2.50E-04	(mg/L)
ntration	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	8.28E-03	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
eouce	concentration in tailings basin cell 2W	C_s2w =	2.50E-04	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	1.50E-03	(mg/L)
<u>u</u>	concentration of ground water into PM-13	C_g13 =	1.50E-03	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.01	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
ij	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
it	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
		M_fs =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s)
onvert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.04	(mg/s)	0.05	(mg/s)	0.20	(mg/s)
Mass b at each		M_r13 =		(mg/s)	_	(mg/s)		(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.004	(mg/L)	0.001	(mg/L)	0.000	(ma/l

Case Parameter	Year 8 Selenium			
		•		
	concentration of surface water into PM-12	C_s12 =	0.0003	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0003	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0003	(mg/L)
章	concentration in Area 5 Pit NW discharge	C_spit =	0.0016	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001331851	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.054	(mg/L)
l os	concentration in tailings basin cell 2W	C_s2w =	0.00109	(mg/L)
į	concentration of ground water into PM-12	C_g12 =	0.00295	(mg/L)
윤	concentration of ground water into PM-13	C a13 -	0 00295	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.11	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.52	(mg/s)	6	(mg/s
Ser	mass flux of ground water into PM-13	M_g13 =	0.35	(mg/s)	0.35	(mg/s)	0.35	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.09	(mg/s)	0.09	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.02	(mg/s)	0.02	(mg/s)	0.02	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
balance ch node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.18	(mg/s)	1.29	(mg/s
Mass ba		M_r13 =		(mg/s)		(mg/s)		(mg/s
mass	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.000	(mg/L)	0.000	
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.002	(mg/L)	0.001	(mg/L)	0.000	(ma

Case	Year 8			
Parameter	Sulfate			
	concentration of surface water into PM-12	C_s12 =	4.00	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	4.00	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	4.00	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	1046.27	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	153.28	(mg/L)
193	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	7347.00	(mg/L)
LO COL	concentration in tailings basin cell 2W	C_s2w =	152.40	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	8.50	(mg/L)
du	concentration of ground water into PM-13	C_g13 =	8.50	(mg/L)

			Low Flo	W	Average	Flow	High Flo	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,427.45	(mg/s)	16,206	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	206.87	(mg/s)	206.87	(mg/s)	206.87	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	37.36	(mg/s)	37.36	(mg/s)	37.36	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	6,965.20	(mg/s)	79,526	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	1,012.72	(mg/s)	1,012.72	(mg/s)	1,012.72	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	7,698.43	(mg/s)	58,922.60	(mg/s)	58,922.60	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	20,779.12	(mg/s)	20,779.12	(mg/s)	20,779.12	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	2,336.11	(mg/s)	2,336.11	(mg/s)	2,336.11	(mg/s)
ე ე	mass flux in seepage from cell 2W	M_s2w =	8,603.45	(mg/s)	8,603.45	(mg/s)	8,603.45	(mg/s)
			Low Flo	W	Average	Flow	High Flo	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	244.23	(mg/s)	1,671.68	(mg/s)	16,449.94	(mg/s)
Ma: at e	mass flux in river at PM-13	M_r13 =	40,674.05	(mg/s)	100,290.87	(mg/s)	187,630.33	(mg/s)
			Low Flo	w	Average	Flow	High Flo	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	7.252	(mg/L)	4.280	(mg/l)	4.027	(mg/l)
S H S	concentration in river at PM-13	C_r13 =	115.384	(mg/L)	40.122	(mg/l)	7.710	(mg/l)

Case Parameter	Year 8 Thallium			
rarameter	manum	ı		
	concentration of surface water into PM-12	C_s12 =	0.0002	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0002	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0002	(mg/L)
章	concentration in Area 5 Pit NW discharge	C_spit =	0.0006	(mg/L)
ıtr	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000934618	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0002	(mg/L)
Ö	concentration in tailings basin cell 2W	C_s2w =	0.0002	(mg/L)
out	concentration of ground water into PM-12	C_g12 =	0.000004	(mg/L)
<u>=</u>	concentration of ground water into PM-13	C_g13 =	0.000004	(mg/L)

			Low Flo	w	Average	Flow	High F	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ita	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.35	(mg/s)	4	(mg/s
Ser	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High F	low
balance ch node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.07	(mg/s)	0.81	(mg/s
Mass ba		M_r13 =		(mg/s)		(mg/s)		(mg/s
mass	concentration in river at PM-12	C r12 -	Low Flo		Average		High F	
Convert mass Ma flux to concentration at e	mass flux in river at PM-13	M_r13 =	Low Flo		Average		Hi	
concentration in river at I	PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case Parameter	Year 8 Zinc			
r urumotor		ı		
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.003	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.029073121	(mg/L)
ncer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.01	(mg/L)
l o	concentration in tailings basin cell 2W	C_s2w =	0.01435	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0115	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.0115	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.28	(mg/s)	0.28	(mg/s)	0.28	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.02	(mg/s)	0.17	(mg/s)	0.17	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	3.94	(mg/s)	3.94	(mg/s)	3.94	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.81	(mg/s)	0.81	(mg/s)	0.81	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
balance th node	mass flux in river at PM-12	M_r12 =	0.43	(mg/s)	6.14	(mg/s)	65.25	(mg/s
Mass ba at each		M_r13 =	6.58 Low Flo	(mg/s)	40.29 Average	(mg/s)	389.65 High Fl	
ss uo			2011 110		, we age		9	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.013	(mg/L)	0.016	(mg/L)	0.016	(mg/l
Conve flux to conce	concentration in river at PM-13	C r13 =	0.019	(mg/L)	0.016	(mg/L)	0.016	(ma/L

Appendix F.4
Embarrass River
Proposed Action
Year 9

FLOWS

Case	Year 9				
Flows	Low Flow Conditions (no surface runoff)				Node
in River	flow in river at PM-12	Q_r12_L =	1.19	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_L =	12.93	(cfs)	PM-13
Total Emba	flow check	Q_ck_L =	12.93	(cfs)	
	surface water flow into PM-12	Q_s12_L =	0.00	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_L =	0.00	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_L =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_L =	0.26	(cfs)	PM-13
草	seepage from Tailings Basin Cells 1E and 2E	Q_fs_L =	5.26	(cfs)	PM-13
da ' da	hydrometallurgical residue cells liner leakage	Q_rrs_L =	0.01	(cfs)	PM-13
No.	seepage from cell 2W	Q_s2w_L =	1.99	(cfs)	PM-13
nput flow data	ground water flow into PM-12	Q_g12_L =	0.86	(cfs)	PM-12
du	ground water flow into PM-13	Q_g13_L =	4.21	(cfs)	PM-13

Case	Year 9				
Flow	Average Flow Conditions (mean annual)				_
n River	flow in river at PM-12	Q_r12_M =	13.80	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_M =	88.80	(cfs)	PM-13
Total	flow check	Q_ck_M =	88.80	(cfs)	-
	surface water flow into PM-12	Q_s12_M =	12.61	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_M =	61.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_M =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_M =	1.99	(cfs)	PM-13
草	seepage from Tailings Basin Cells 1E and 2E	Q_fs_M =	5.26	(cfs)	PM-13
g	hydrometallurgical residue cells liner leakage	Q_rrs_M =	0.01	(cfs)	PM-13
<u> </u>	seepage from cell 2W	Q_s2w_M =	1.99	(cfs)	PM-13
Input flow data	ground water flow into PM-12	Q_g12_M =	0.86	(cfs)	PM-12
ם	ground water flow into PM-13	Q g13 M =	4.21	(cfs)	PM-13

Case	Year 9				
Flow	High Flow Conditions (avg. annual 1-day max flo	ow)			_
n River	flow in river at PM-12	Q_r12_H =	144.35	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_H =	860.35	(cfs)	PM-13
Tota	flow check	Q_ck_H =	860.35	(cfs)	
	surface water flow into PM-12	Q_s12_H =	143.16	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_H =	702.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_H =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_H =	1.99	(cfs)	PM-13
ā	seepage from Tailings Basin Cells 1E and 2E	Q_fs_H =	5.26	(cfs)	PM-13
flow data	hydrometallurgical residue cells liner leakage	Q_rrs_H =	0.01	(cfs)	PM-13
S N	seepage from cell 2W	Q_s2w_H =	1.99	(cfs)	PM-13
Input 1	ground water flow into PM-12	Q_g12_H =	0.86	(cfs)	PM-12
du	ground water flow into PM-13	Q_g13_H =	4.21	(cfs)	PM-13

Case	Year 9	1		
Parameter	Silver			
		-		1
	concentration of surface water into PM-12	C_s12 =	0.00011	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00011	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.00011	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00015	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00090	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.000125	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.000100	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.000008	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.000008	(mg/L)

			Low Flo	W	Average l	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0	(mg/s)	2	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	W	Average I	Flow	High Fl	ow
Mass balance		M_r12 =		(mg/s)		(mg/s)		(mg/s)
ž	mass flux in river at PM-13	M_r13 =	0.14 Low Flo	(mg/s)		(mg/s)		(mg/s)
Convert mass flux to	concentration in river at PM-12	C_r12 =		(mg/L)	0.000		0.000	(mg/L)
Con	concentration in river at PM-13	C_r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case	Year 9			
Parameter	Aluminum			
		-		
	concentration of surface water into PM-12	C_s12 =	0.12	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.12	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.12	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.01325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.07E-01	(mg/L)
Ser	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80E-01	(mg/L)
LO S	concentration in tailings basin cell 2W	C_s2w =	1.5788	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.025	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.025	(mg/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	43	(mg/s)	486	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.61	(mg/s)	0.61	(mg/s)	0.61	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	209	(mg/s)	2,386	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	2.98	(mg/s)	2.98	(mg/s)	2.98	(mg/s
E co	mass flux of Area 5 Pit NW discharge	M_spit =	0.10	(mg/s)	0.75	(mg/s)	0.75	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	15.88	(mg/s)	15.88	(mg/s)	15.88	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s
င္မွ ပိ	mass flux in seepage from cell 2W	M_s2w =	89.13	(mg/s)	89.13	(mg/s)	89.13	(mg/s
			Low Flo	w	Average	Flow	High Fl	low
ass balance each node	mass flux in river at PM-12	M_r12 =	1.73	(mg/s)	44.55	(mg/s)	487.90	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	109.89		362.31		2,982.50	
	<u> </u>	IM_ITO =	Low Flo		Average		High F	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.051	(mg/L)	0.114	(mg/L)	0.119	(mg
Conve flux to	concentration in river at PM-13	C r13 =	0.300	(mg/L)	0.144	(mg/L)	0.122	(ma/

Case	Year 9	1		
Parameter	Arsenic			
		-		
	concentration of surface water into PM-12	C_s12 =	0.00075	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00075	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.00075	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.001325	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.007592467	(mg/L)
95	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
lo co	concentration in tailings basin cell 2W	C_s2w =	0.00291	(mg/L)
ħ	concentration of ground water into PM-12	C_g12 =	0.00273	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.00273	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0	(mg/s)	3	(mg/s)
<u>_</u>	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1	(mg/s)	15	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.13	(mg/s)	1.13	(mg/s)	1.13	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =	0.16	(mg/s)	0.16	(mg/s)	0.16	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.34	(mg/s)	3.11	(mg/s)
Mass ba at each		M_r13 =		(mg/s)		(mg/s)		(mg/s)
	T	1	Low Flo	W	Average	FIOW	High Fl	ow
t mass tration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.005	(mg/L)	0.001	(mg/L)	0.001	(mg/L)

Case	Year 9			
Parameter	Boron			
	concentration of surface water into PM-12	C_s12 =	0.027	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.027	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.027	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.1315	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.145082047	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.11	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.33	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0212	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.0212	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	10	(mg/s)	109	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)	0.52	(mg/s)	0.52	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	47	(mg/s)	537	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	2.53	(mg/s)	2.53	(mg/s)	2.53	(mg/s
i x	mass flux of Area 5 Pit NW discharge	M_spit =	0.97	(mg/s)	7.41	(mg/s)	7.41	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	21.59	(mg/s)	21.59	(mg/s)	21.59	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	18.63	(mg/s)	18.63	(mg/s)	18.63	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.77	(mg/s)	10.40	(mg/s)	110.16	(mg/s
Mass ba at each i	mass flux in river at PM-13	M_r13 =	44.52 Low Flo	(mg/s)	107.61 Average		697.15 High Fl	
lss on								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.023	(mg/L)	0.027	(mg/L)	0.027	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	0.122	(mg/L)	0.043	(mg/L)	0.029	(ma/l

Case	Year 9			
Parameter	Barium			
		1		1
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
ntration	concentration in Area 5 Pit NW discharge	C_spit =	0.0044	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.05E-02	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	5.00E-03	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.09298	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0681	(mg/L)
duj	concentration of ground water into PM-13	C_g13 =	0.0681	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	6	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	1.66	(mg/s)	1.66	(mg/s)	1.66	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	28	(mg/s)	318	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	8.11	(mg/s)	8.11	(mg/s)	8.11	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	7.51	(mg/s)	7.51	(mg/s)	7.51	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	5.25	(mg/s)		(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	1.81	(mg/s)	7.52	(mg/s)	66.63	(mg/s)
Mass at eac	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	405.86	
		-	Low Flo	W	Average	FIOW	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.054	(mg/L)	0.019	(mg/L)	0.016	(mg/L)
Convertilux to	concentration in river at PM-13	C_r13 =	0.062	(mg/L)	0.022	(mg/L)	0.017	(mg/L)

Case	Year 9			
Parameter	Beryllium	<u> </u>		
		1		
	concentration of surface water into PM-12	C_s12 =	0.0001	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0001	(mg/L)
ğu	concentration in Babbitt WWTP discharge	C_sBab =	0.0001	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00056357	(mg/L)
193	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0	(mg/L)
COL	concentration in tailings basin cell 2W	C_s2w =	0.00075	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.000023	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.000023	(mg/L)

	mass flux of surface water into PM-12							low
_	Thass have of surface water into 1 M-12	M_s12 =	-	(mg/s)	0	(mg/s)	0	(mg/s)
concentration flux	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0	(mg/s)	2	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
la co	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.08	(mg/s)	0.08	(mg/s)	0.08	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	-	(mg/s)	-	(mg/s)	-	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.41	(mg/s
Mass at eac		M_r13 =		(mg/s)		(mg/s)		2.53 (mg/s)
			Low Flo	w	Average	Flow	High	E
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	

Case	Year 9	1		
Parameter	Calcium			
		1		1
	concentration of surface water into PM-12	C_s12 =	15	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	15	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	15	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	95.35	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	75.53238205	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	416	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	59.78	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	19	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	19	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	1	(mg/s)	5,352.95	(mg/s)	60,771	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	462.42	(mg/s)	462.42	(mg/s)	462.42	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	140.09	(mg/s)	140.09	(mg/s)	140.09	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	1	(mg/s)	26,119.49	(mg/s)	298,224	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	2,263.72	(mg/s)	2,263.72	(mg/s)	2,263.72	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	701.59	(mg/s)	5,369.83	(mg/s)	5,369.83	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	11,239.50	(mg/s)	11,239.50	(mg/s)	11,239.50	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	156.22	(mg/s)	156.22	(mg/s)	156.22	(mg/s)
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	3,374.76	(mg/s)	3,374.76	(mg/s)	22.45	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	602.51		5,955.45		61,373.93	
at 🖺	mass flux in river at PM-13	M_r13 =	18,338.29 Low Flo		54,478.96		378,649.62	, ,
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)	15.249		15.024	
Convertiux to concer	concentration in river at PM-13	C_r13 =	50.131	(mg/L)	21.679	(mg/L)	15.552	(mg/l)

Case	Year 9			
Parameter	Cadmium	J		
	concentration of surface water into PM-12	C s12 =	0.00008	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00008	, ,
	concentration in Babbitt WWTP discharge	C_sBab =	0.00008	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000407879	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0004	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.000188	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0003	(mg/L)
<u>=</u>	concentration of ground water into PM-13	C_g13 =	0.0003	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.03	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.14	(mg/s)	2	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	0.01	(mg/s)	0.04	(mg/s)	0.33	(mg/s)
Mg at	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	W	Average	Flow	High FI	ow
Convert mass flux to	concentration in river at PM-12 concentration in river at PM-13	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Converture flux to concer	concentration in river at PM-13	C_r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case Parameter	Year 9 Chloride			
		1		
	concentration of surface water into PM-12	C_s12 =	6.5	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	6.5	(mg/L)
ρ	concentration in Babbitt WWTP discharge	C_sBab =	6.5	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	5.95	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.89E+00	(mg/L)
5	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.76E+03	(mg/L)
Sor	concentration in tailings basin cell 2W	C_s2w =	21.54	(mg/L)
t t	concentration of ground water into PM-12	C_g12 =	1.8	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	1.8	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,319.61	(mg/s)	26,334	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	43.81	(mg/s)	43.81	(mg/s)	43.81	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	60.70	(mg/s)	60.70	(mg/s)	60.70	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	11,318.44	(mg/s)	129,230	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	214.46	(mg/s)	214.46	(mg/s)	214.46	(mg/s
li co	mass flux of Area 5 Pit NW discharge	M_spit =	43.78	(mg/s)	335.09	(mg/s)	335.09	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	876.22	(mg/s)	876.22	(mg/s)	876.22	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	660.93	(mg/s)	660.93	(mg/s)	660.93	(mg/s
ဒ္ ပိ	mass flux in seepage from cell 2W	M_s2w =	1,216.00	(mg/s)	1,216.00	(mg/s)	1,216.00	(mg/s
			Low Flo	W	Average	Flow	High Fl	ow
balance h node	mass flux in river at PM-12	M_r12 =	104.51	(mg/s)	2,424.12	(mg/s)	26,438.79	(mg/s
Mass ba at each	mass flux in river at PM-13	M_r13 =	3,115.90 Low Flo		17,045.26 Average		158,971.88 High Fl	
S =								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	3.103	(mg/L)	6.207	(mg/L)	6.472	(mg/L
Conve flux to	concentration in river at PM-13	C r13 =	8 518	(mg/L)	6 783	(mg/L)	6.529	(ma/l

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 9 Cobalt			
	concentration of surface water into PM-12	C_s12 =	0.0006	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0006	(mg/L)
n dá	concentration in Babbitt WWTP discharge	C_sBab =	0.0006	(mg/L)
얉	concentration in Area 5 Pit NW discharge	C_spit =	0.000555	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.002481389	(mg/L)
ē	concentration in hydrometallurgical residue cells liner leakage	C rrs =	0.005	(ma/L)

			Low Flo	W	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.21	(mg/s)	2	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.04	(mg/s)	12	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.37	(mg/s)	0.37	(mg/s)	0.37	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္မ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.25	(mg/s)	2.46	(mg/s)
Ma	mass flux in river at PM-13	M_r13 =	0.63	(mg/s)	1.91	(mg/s)	15.01	(mg/s)
	_		Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Con	concentration in river at PM-13	C_r13 =	0.002	(mg/L)	0.001	(mg/L)	0.001	(mg/L)

0.001556

0.0011

0.0011 (mg/L)

(mg/L) (mg/L)

C_s2w =

C_g12 =

C_g13 =

Case	Year 9	1		
Parameter	Copper			
			1	
	concentration of surface water into PM-12	C_s12 =	0.0015	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0015	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0015	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00345	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.008625606	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0015	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.004555	(mg/L)
nput	concentration of ground water into PM-12	C_g12 =	0.004	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.004	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.54	(mg/s)	6	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.61	(mg/s)	30	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.48	(mg/s)	0.48	(mg/s)	0.48	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.19	(mg/s)	0.19	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.28	(mg/s)	1.28	(mg/s)	1.28	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.26	(mg/s)	0.26	(mg/s)	0.26	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	0.11	(mg/s)		(mg/s)	6.19	(mg/s)
Mg at	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
	1		Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to	concentration in river at PM-12 concentration in river at PM-13	C_r12 =	0.003	(mg/L)	0.002	(mg/L)	0.002	(mg/L)
Convertilux to concer	concentration in river at PM-13	C_r13 =	0.006	(mg/L)	0.002	(mg/L)	0.002	(mg/L)

Case	Year 9			
Parameter	Fluoride			
	concentration of surface water into PM-12	C_s12 =	0.2	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.2	(mg/L)
ğu	concentration in Babbitt WWTP discharge	C_sBab =	0.2	(mg/L)
ratio	concentration in Area 5 Pit NW discharge	C_spit =	0.125	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.91E-01	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	2.85E+00	(mg/L)
Son	concentration in tailings basin cell 2W	C_s2w =	1.55	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.385	(mg/L)
	concentration of ground water into PM-13	C_g13 =	0.385	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	71.37	(mg/s)	810	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	9.37	(mg/s)	9.37	(mg/s)	9.37	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	1.87	(mg/s)	1.87	(mg/s)	1.87	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	348.26	(mg/s)	3,976	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	45.87	(mg/s)	45.87	(mg/s)	45.87	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.92	(mg/s)	7.04	(mg/s)	7.04	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	102.84	(mg/s)	102.84	(mg/s)	102.84	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	1.07	(mg/s)	1.07	(mg/s)	1.07	(mg/s)
ပို့ ဍ	mass flux in seepage from cell 2W	M_s2w =	87.50	(mg/s)	87.50	(mg/s)	87.50	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =		(mg/s)		(mg/s)	821.52	
M.	mass flux in river at PM-13	M_r13 =	249.44 Low Flo		675.19 Average		5,042.16 High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.334	(mg/L)		(mg/L)		(mg/L)

Case	Year 9			
Parameter	Iron			
		-		
	concentration of surface water into PM-12	C_s12 =	2.9	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	2.9	(mg/L)
ρ	concentration in Babbitt WWTP discharge	C_sBab =	2.9	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.037761905	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.91E-02	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	4.00E-01	(mg/L)
Sor	concentration in tailings basin cell 2W	C_s2w =	4.594	(mg/L)
t t	concentration of ground water into PM-12	C_g12 =	0.035	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.035	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,034.90	(mg/s)	11,749	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.85	(mg/s)	0.85	(mg/s)	0.85	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	27.08	(mg/s)	27.08	(mg/s)	27.08	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	5,049.77	(mg/s)	57,657	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	4.17	(mg/s)	4.17	(mg/s)	4.17	(mg/s
la co	mass flux of Area 5 Pit NW discharge	M_spit =	0.28	(mg/s)	2.13	(mg/s)	2.13	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	8.80	(mg/s)	8.80	(mg/s)	8.80	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	259.35	(mg/s)	259.35	(mg/s)	259.35	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
balance th node	mass flux in river at PM-12	M_r12 =	27.93	(mg/s)	1,062.84	(mg/s)	11,777.08	(mg/s
Mass ba at each	mass flux in river at PM-13	M_r13 =	300.68		6,387.20 Average		69,708.30 High Fl	_
ISS								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.829	(mg/L)	2.721	(mg/L)	2.883	(mg/L
Conve flux to conce	concentration in river at PM-13	C r13 =	0.822	(mg/L)	2 542	(mg/L)	2.863	(ma/l

Case	Year 9
Parameter	Hardness

Ī		concentration of surface water into PM-12	C_s12 =	70	(mg/L)
	ata	concentration of surface water into PM-13	C_s13 =	70	(mg/L)
	σğ	concentration in Babbitt WWTP discharge	C_sBab =	70	(mg/L)
	Ē	concentration in Area 5 Pit NW discharge	C_spit =	942.7142857	(mg/L)
	ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	2.56E+02	(mg/L)
	ē	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	8.61E+03	(mg/L)
	Ö	concentration in tailings basin cell 2W	C_s2w =	436.6	(mg/L)
	Ħ	concentration of ground water into PM-12	C_g12 =	87.5	(mg/L)
	트	concentration of ground water into PM-13	C_g13 =	87.5	(mg/L)

			Low Flo	w	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	24,980.41	(mg/s)	283,600	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	2,129.58	(mg/s)	2,129.58	(mg/s)	2,129.58	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	653.73	(mg/s)	653.73	(mg/s)	653.73	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	121,890.93	(mg/s)	1,391,712	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	10,425.01	(mg/s)	10,425.01	(mg/s)	10,425.01	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	6,936.49	(mg/s)	53,090.84	(mg/s)	53,090.84	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	38,042.63	(mg/s)	38,042.63	(mg/s)	38,042.63	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	3,233.31	(mg/s)	3,233.31	(mg/s)	3,233.31	(mg/s)
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	24,647.41	(mg/s)	24,647.41	(mg/s)	24,647.41	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	2,783.31	(mg/s)	27,763.72	(mg/s)	286,383.27	(mg/s)
Mass ba at each	mass flux in river at PM-13	M_r13 =	86,068.16		279,093.85		1,807,534.40	
			Low Flo	w	Average	Flow	High FI	ow
t mass tration	concentration in river at PM-12	C_r12 =	82.647	(mg/L)	71.091	(mg/L)	70.104	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	235.281	(mg/L)	111.063	(mg/L)	74.238	(mg/L)

Case	Year 9			
Parameter	Potassium			
		_		
	concentration of surface water into PM-12	C_s12 =	0.60	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.60	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.60	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	53.80	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	7.04	(mg/L)
95	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80	(mg/L)
Los	concentration in tailings basin cell 2W	C_s2w =	7.77	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	1.60	(mg/L)
ם	concentration of ground water into PM-13	C_g13 =	1.60	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	214.12	(mg/s)	2,431	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	38.94	(mg/s)	38.94	(mg/s)	38.94	(mg/s)
	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.68	(mg/s)	5.60	(mg/s)	0.68	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1,044.78	(mg/s)	11,929	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	190.63	(mg/s)	190.63	(mg/s)	190.63	(mg/s)
la co	mass flux in Babbitt WWTP discharge	M_sBab =	5.60	(mg/s)	3,029.85	(mg/s)	5.60	(mg/s)
	mass flux of Area 5 Pit NW discharge	M_spit =	395.86	(mg/s)	1,048.24	(mg/s)	3,029.85	(mg/s
Convert to mass	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,048.24	(mg/s)	0.68	(mg/s)	1,048.24	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	438.64	(mg/s)	438.64	(mg/s)	438.64	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	39.62	(mg/s)	258.66	(mg/s)	2,470.47	(mg/s)
Mass	mass flux in river at PM-13	M_r13 =	2,118.59 Low Flo		6,011.48 Average		19,112.40 High Fl	
ss			LOW 1 10	W	Average	low	Ingiri	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	1.176	(mg/L)	0.662	(mg/L)	0.605	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	5.791	(mg/L)	2.392	(mg/L)	0.785	(ma/l

oncentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 9 Magnesium			
	concentration of surface water into PM-12	C_s12 =	5.90	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	5.90	(mg/L)
Ċ	concentration in Babbitt WWTP discharge	C_sBab =	5.90	(mg/L)
Ę	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C fs =	16.28	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,105.49	(mg/s)	23,903	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	259.20	(mg/s)	259.20	(mg/s)	259.20	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	55.10	(mg/s)	55.10	(mg/s)	55.10	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,273.66	(mg/s)	117,301	(mg/s)
concentration	mass flux of ground water into PM-13	M_g13 =	1,268.87	(mg/s)	1,268.87	(mg/s)	1,268.87	(mg/s)
con	mass flux of Area 5 Pit NW discharge	M_spit =	1,994.02	(mg/s)	15,261.91	(mg/s)	15,261.91	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	2,422.93	(mg/s)	2,422.93	(mg/s)	2,422.93	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	79.99	(mg/s)	79.99	(mg/s)	79.99	(mg/s)
င္	mass flux in seepage from cell 2W	M_s2w =	3,950.02	(mg/s)	3,950.02		3,950.02	(mg/s)
			Low Flo	w	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	314.30	(mg/s)	2,419.79	(mg/s)	24,217.73	(mg/s)
at Mi	mass flux in river at PM-13	M_r13 =	10,030.13		35,677.17		164,502.88	
		1	Low Flo	w	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	9.333	(mg/L)	6.196	(mg/L)	5.928	(mg/l)
Con flux con	concentration in river at PM-13	C_r13 =	27.419	(mg/L)	14.197	(mg/L)	6.756	(mg/l)

213.00

69.97

10.65

(mg/L)

(mg/L)

(mg/L)

10.65 (mg/L)

C_rrs =

C_s2w =

C_g12 =

C_g13 =

oncentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12 concentration of ground water into PM-13

Case Parameter	Year 9 Manganese			
	concentration of surface water into PM-12	C_s12 =	0.30	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.30	(mg/L)
n da	concentration in Babbitt WWTP discharge	C_sBab =	0.30	(mg/L)
읉	concentration in Area 5 Pit NW discharge	C_spit =	0.49	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C fs =	0.29	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	107.06	(mg/s)	1,215	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	4.58	(mg/s)	4.58	(mg/s)	4.58	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	2.80	(mg/s)	2.80	(mg/s)	2.80	(mg/s)
concentration flux	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	522.39	(mg/s)	5,964	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	22.40	(mg/s)	22.40	(mg/s)	22.40	(mg/s)
con flux	mass flux of Area 5 Pit NW discharge	M_spit =	3.57	(mg/s)	27.31	(mg/s)	27.31	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	42.96	(mg/s)	42.96	(mg/s)	42.96	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =	66.78	(mg/s)	66.78	(mg/s)	66.78	(mg/s)
			Low Flo	W	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =		(mg/s)	114.44		1,222.81	, ,
2 0	mass flux in river at PM-13	M_r13 =	143.09 Low Flo		796.28 Average		7,346.74 High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.219	(mg/L)		(mg/L)	0.299	

C_rrs =

C_s2w =

C_g12 =

C_g13 =

0.00 (mg/L)

1.18 (mg/L)

0.19 (mg/L)

0.19 (mg/L)

Case Parameter	Year 9 Sodium			
	concentration of surface water into PM-12	C s12 =	6.00	(mg/L
n data	concentration of surface water into PM-13	C_s13 =		(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	6.00	(mg/L)
concentration	concentration in Area 5 Pit NW discharge	C_spit =	119.50	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	22.11	(mg/L)
<u>Se</u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	255.00	(mg/L)
CO	concentration in tailings basin cell 2W	C_s2w =	44.31	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	4.90	(mg/L)
duj	concentration of ground water into PM-13	C_g13 =	4.90	(mg/L)
			Low Flor	

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,141.18	(mg/s)	24,309	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	119.26	(mg/s)	119.26	(mg/s)	119.26	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	56.03	(mg/s)	56.03	(mg/s)	56.03	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,447.79	(mg/s)	119,290	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	583.80	(mg/s)	583.80	(mg/s)	583.80	(mg/s)
Lo n	mass flux of Area 5 Pit NW discharge	M_spit =	879.28	(mg/s)	6,729.88	(mg/s)	6,729.88	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	3,289.71	(mg/s)	3,289.71	(mg/s)	3,289.71	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	95.76	(mg/s)	95.76	(mg/s)	95.76	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	2,501.44	(mg/s)	2,501.44	(mg/s)	2,501.44	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	175.29	(mg/s)	2,316.47	(mg/s)	24,483.86	(mg/s)
Mg at	mass flux in river at PM-13	M_r13 =	7,525.28		25,964.85		156,974.04	
			Low Flo	w	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	5.205	(mg/L)	5.931	(mg/L)	5.993	(mg/l)
Conve flux to concer	concentration in river at PM-13	C_r13 =	20.572	(mg/L)	10.332	(mg/L)	6.447	(mg/l)

concentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-13

concentra

(mg/L)
(mg/L)
(mg/L)
(mg/L)
(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow	
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.43	(mg/s)	5	(mg/s)	
_	mass flux of ground water into PM-12	M_g12 =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)	
ē	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)	
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.09	(mg/s)	24	(mg/s)	
ce	mass flux of ground water into PM-13	M_g13 =	0.83	(mg/s)	0.83	(mg/s)	0.83	(mg/s)	
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.04	(mg/s)	0.29	(mg/s)	0.29	(mg/s)	
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	6.13	(mg/s)	6.13	(mg/s)	6.13	(mg/s)	
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)	
မ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.39	(mg/s)	0.39	(mg/s)	0.39	(mg/s)	
			Low Flo	w	Average	Flow	High Flow		
balance h node	mass flux in river at PM-12	M_r12 =	0.18	(mg/s)	0.61	(mg/s)	5.04	(mg/s)	
Mass ba		M_r13 =	7.60 Low Flo	(mg/s)	10.38	(mg/s)	36.58 High Fl	(mg/s)	
			2011 1 10		Average	1011	ingiii		
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.005	(mg/L)	0.002	(mg/L)	0.001	(mg/L)	
Conve flux to	concentration in river at PM-13	C_r13 =	0.021	(mg/L)	0.004	(mg/L)	0.002	(mg/L)	

C_rrs =

C_s2w =

C_g12 =

C_g13 =

0.098 (mg/L) 0.00688 (mg/L)

0.007 (mg/L)

0.007 (mg/L)

Case Parameter	Year 9 Lead		
	concentration of surface water into PM-12	C_s12 =	0.00015 (mg/l
# #	concentration of surface water into PM-13	C_s13 =	0.00015 (mg/l
c c	concentration in Babbitt WWTP discharge	C_sBab =	0.00015 (mg/l
ي ج	concentration in Area 5 Pit NW discharge	C spit =	0.0003 (mg/l

ratio	concentration in Area 5 Pit NW discharge	C_spit =	0.0003	(mg/L)				
T T	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001749429	(mg/L)				
concent	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0005	(mg/L)				
Ö	concentration in tailings basin cell 2W	C_s2w =	0.0012	(mg/L)				
nout	concentration of ground water into PM-12	C_g12 =	0.0012	(mg/L)				
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.0012	(mg/L)				
					-			
			Low Flo	W	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M s12 =	-	(mg/s)	0.05	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration flux	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.26	(mg/s)	3	(mg/s)
e E	mass flux of ground water into PM-13	M_g13 =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s)
u X	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.02	(mg/s)	0.02	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.26	(mg/s)	0.26	(mg/s)	0.26	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	0.07	(mg/s)	0.07	(mg/s)
		1	Low Flo	w	Average	Flow	High Fl	ow
φ "								
Mass balance at each node	mass flux in river at PM-12	M r12 =	0.03	(mg/s)	0.08	(mg/s)	0.64	(mg/s)
bal n	IIIass iiux iii iivei at i ivi-12	IVI_1 1Z =	0.03	(IIIg/S)	0.00	(IIIg/S)	0.04	(IIIg/S)
iss								
M at	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
	1	1	Low Flo	w	Average	Flow	High FI	ow
SS								
m agi	concentration in river at PM-12	C r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(ma/L)
ert o	onomic and in the latest and the	0_112 -	0.001	(111g/L)	0.000	(111g/L)	0.000	(111g/L)
Convert mass flux to concentration	concentration in river at PM-12 concentration in river at PM-13							
ა	concentration in river at PM-13	C_r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case	Year 9			
Parameter	Antimony	J		
	concentration of surface water into PM-12	C_s12 =	4.00E-05	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	4.00E-05	(mg/L)
βρι	concentration in Babbitt WWTP discharge	C_sBab =	4.00E-05	(mg/L)
章	concentration in Area 5 Pit NW discharge	C_spit =	2.50E-04	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	8.83E-03	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
Con	concentration in tailings basin cell 2W	C_s2w =	2.50E-04	(mg/L)
out	concentration of ground water into PM-12	C_g12 =	1.50E-03	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	1.50E-03	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.01	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s
con	mass flux of ground water into PM-13	M_g13 =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s
	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.31	(mg/s)	1.31	(mg/s)	1.31	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	0.04	(mg/s)	0.05	(mg/s)	0.20	(mg/s
Mass at eac		M_r13 =		(mg/s)		(mg/s)	2.52 High Fl	
a M	mass flux in river at PM-13	M_r13 =	Low Flo		Average		Hiç	
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0 004	(mg/L)	0.001	(mg/L)	0.000	(mc

Case	Year 9			
Parameter	Selenium			
		-		
	concentration of surface water into PM-12	C_s12 =	0.0003	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0003	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0003	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.0016	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001403839	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.054	(mg/L)
eouce	concentration in tailings basin cell 2W	C_s2w =	0.00109	(mg/L)
ħ	concentration of ground water into PM-12	C_g12 =	0.00295	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.00295	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.11	(mg/s)	1	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ıt.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.52	(mg/s)	6	(mg/s
concentration flux	mass flux of ground water into PM-13	M_g13 =	0.35	(mg/s)	0.35	(mg/s)	0.35	(mg/s
	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.09	(mg/s)	0.09	(mg/s
		M_fs =	0.21	(mg/s)	0.21	(mg/s)	0.21	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.02	(mg/s)	0.02	(mg/s)	0.02	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.18	(mg/s)	1.29	(mg/s
Mass ba at each		M_r13 =	0.73 Low Flo	(mg/s)	1.44 Average	(mg/s)	7.99 High Fl	
			LOW I IO	VV	Average	I IOW	riigii i	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.000	(mg/L)	0.000	(mg/l
Conve	concentration in river at PM-13	C r13 =	0.002	(mg/L)	0.001	(mg/L)	0.000	(ma/l

Case Parameter	Year 9 Sulfate	1		
Parameter	Sunate	<u> </u>		
	concentration of surface water into PM-12	C_s12 =	4.00	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	4.00	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	4.00	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	1046.27	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	166.62	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	7347.00	(mg/L)
eouce	concentration in tailings basin cell 2W	C_s2w =	152.40	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	8.50	(mg/L)
du	concentration of ground water into PM-13	C_g13 =	8.50	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,427.45	(mg/s)	16,206	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	206.87	(mg/s)	206.87	(mg/s)	206.87	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	37.36	(mg/s)	37.36	(mg/s)	37.36	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	6,965.20	(mg/s)	79,526	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	1,012.72	(mg/s)	1,012.72	(mg/s)	1,012.72	(mg/s)
con	mass flux of Area 5 Pit NW discharge	M_spit =	7,698.43	(mg/s)	58,922.60	(mg/s)	58,922.60	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	24,792.97	(mg/s)	24,792.97	(mg/s)	24,792.97	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	2,759.02	(mg/s)	2,759.02	(mg/s)	2,759.02	(mg/s)
င့် ပိ	mass flux in seepage from cell 2W	M_s2w =	8,603.45	(mg/s)	8,603.45	(mg/s)	8,603.45	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	244.23 45,110.81		1,671.68		16,449.94	
≥ 0	Illass iiux iii livei at Fivi-13	IVI_I I 3 =	Low Flo		Average		192,067.08 High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	7.252 123.317	(mg/L)		(mg/L)	4.027 7.888	(mg/l)

concentration of ground water into PM-12 concentration of ground water into PM-13

Case Parameter	Year 9 Thallium			
	concentration of surface water into PM-12	C_s12 =	0.0002	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0002	(mg/L)
0	concentration in Babbitt WWTP discharge	C_sBab =	0.0002	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0006	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000967503	(mg/L)
8	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0002	(mg/L)
ů	concentration in tailings basin cell 2W	C_s2w =	0.0002	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.35	(mg/s)	4	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္မ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.07	(mg/s)	0.81	(mg/s)
Ma	mass flux in river at PM-13	M_r13 =	0.16	(mg/s)	0.61	(mg/s)	4.98	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Con	concentration in river at PM-13	C_r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

C_g12 =

C_g13 =

0.000004 (mg/L)

0.000004 (mg/L)

Case Parameter	Year 9 Zinc			
		1	T	ı
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L
data	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.003	(mg/L
ra tr	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.039738069	(mg/L
concent	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.01	(mg/L
S	concentration in tailings basin cell 2W	C_s2w =	0.01435	(mg/L
Input	concentration of ground water into PM-12	C_g12 =	0.0115	(mg/L
≝	concentration of ground water into PM-13	C_g13 =	0.0115	(mg/L
			I ow Flo	

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.28	(mg/s)	0.28	(mg/s)	0.28	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.02	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	5.91	(mg/s)	5.91	(mg/s)	5.91	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒ္ ဒ	mass flux in seepage from cell 2W	M_s2w =	0.81	(mg/s)	0.81	(mg/s)	0.81	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)		(mg/s)
at M	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	391.62	
			Low Flo	w	Average	FIOW	High Fl	ow I
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.013	(mg/L)	0.016	(mg/L)	0.016	(mg/L)
Conve flux to concer	concentration in river at PM-13	C r13 =	0.023	(mg/L)	0.017	(mg/L)	0.016	(mg/L)

Appendix F.5
Embarrass River
Proposed Action
Year 15

FLOWS

Case	Year 15				
Flows	Low Flow Conditions (no surface runoff)				Node
in s River	flow in river at PM-12	Q_r12_L =	1.19	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_L =	13.32	(cfs)	PM-13
Tota	flow check	Q_ck_L =	13.32	(cfs)	
	surface water flow into PM-12	Q_s12_L =	0.00	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_L =	0.00	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_L =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_L =	0.26	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_L =	5.65	(cfs)	PM-13
, da	hydrometallurgical residue cells liner leakage	Q_rrs_L =	0.02	(cfs)	PM-13
flow	seepage from cell 2W	Q_s2w_L =	1.99	(cfs)	PM-13
Input	ground water flow into PM-12	Q_g12_L =	0.86	(cfs)	PM-12
<u>u</u>	ground water flow into PM-13	Q_g13_L =	4.21	(cfs)	PM-13

Case	Year 15				
Flow	Average Flow Conditions (mean annual)				_
n River	flow in river at PM-12	Q_r12_M =	13.80	(cfs)	PM-12
Total flow in Embarrass River	flow in river at PM-13	Q_r13_M =	89.19	(cfs)	PM-13
Tota	flow check	Q_ck_M =	89.19	(cfs)	4
	surface water flow into PM-12	Q_s12_M =	12.61	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_M =	61.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_M =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_M =	1.99	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_M =	5.65	(cfs)	PM-13
g v	hydrometallurgical residue cells liner leakage	Q_rrs_M =	0.02	(cfs)	PM-13
١٥	seepage from cell 2W	Q_s2w_M =	1.99	(cfs)	PM-13
Input flow	ground water flow into PM-12	Q_g12_M =	0.86	(cfs)	PM-12
μ	ground water flow into PM-13	Q_g13_M =	4.21	(cfs)	PM-13

Case	Year 15				
Flow	High Flow Conditions (avg. annual 1-day max flow)				_
n River	flow in river at PM-12	Q_r12_H =	144.35	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_H =	860.74	(cfs)	PM-13
Tota	flow check	Q_ck_H =	860.74	(cfs)	
	surface water flow into PM-12	Q_s12_H =	143.16	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_H =	702.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_H =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_H =	1.99	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_H =	5.65	(cfs)	PM-13
, da	hydrometallurgical residue cells liner leakage	Q_rrs_H =	0.02	(cfs)	PM-13
flow	seepage from cell 2W	Q_s2w_H =	1.99	(cfs)	PM-13
Input	ground water flow into PM-12	Q_g12_H =	0.86	(cfs)	PM-12
<u>u</u>	ground water flow into PM-13	Q_g13_H =	4.21	(cfs)	PM-13

Case	Year 15			
Parameter	Silver			
	concentration of surface water into PM-12	C s12 =	0.00011	(ma/L)
data	concentration of surface water into PM-13	C_s12 =	0.00011	,
	concentration in Babbitt WWTP discharge	C_sBab =	0.00011	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00015	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00122	(mg/L)
ncer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.000125	(mg/L)
S	concentration in tailings basin cell 2W	C_s2w =	0.000100	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.000008	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.000000	(mg/L)

			Low Flo	W	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.19	(mg/s)	2	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.19	(mg/s)	0.19	(mg/s)	0.19	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.45	(mg/s)
Mass at eac	mass flux in river at PM-13	M_r13 =	0.20	(mg/s)	0.44	(mg/s)	2.84	(mg/s)
			Low Flo	w	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Converture flux to concer	concentration in river at PM-13	C_r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case	Year 15			
Parameter	Aluminum			
			Г	1
	concentration of surface water into PM-12	C_s12 =	0.12	(mg/L)
4	concentration of surface water into PM-13	C_s13 =	0.12	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.12	(mg/L)
in tion	concentration in Area 5 Pit NW discharge	C_spit =	0.01325	(mg/L)
<u> </u>	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	4.43E-01	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80E-01	(mg/L)
5	concentration in tailings basin cell 2W	C s2w =	1 5788	(ma/L)

8	concentration in tailings basin cell 2W	C_s2w =	1.5788	(mg/L)				
Ħ	concentration of ground water into PM-12	C_g12 =	0.025	(mg/L)				
Ξ	concentration of ground water into PM-13	C_g13 =	0	(mg/L)				
			Low Flo	w	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	42.82	(mg/s)	486	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.61	(mg/s)	0.61	(mg/s)	0.61	(mg/s)
Ë	mass flux in Babbitt WWTP discharge	M_sBab =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s)
itrai	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	208.96	(mg/s)	2,386	(mg/s)
e Ce	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.10	(mg/s)	0.75	(mg/s)	0.75	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	70.86	(mg/s)	70.86	(mg/s)	70.86	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	89.13	(mg/s)	89.13	(mg/s)	89.13	(mg/s
			Low Flo	W	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	1.73	(mg/s)	44.55	(mg/s)	487.90	(mg/s
Mass b at eacl	mass flux in river at PM-13	M_r13 =	161.90 Low Flo		414.33 Average		3,034.51 High Fl	,
			LOW FIO	W	Average	FIOW	nigii ri	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.051	(mg/L)	0.114	(mg/L)	0.119	(mg/L
Conver flux to concen	concentration in river at PM-13	C r13 =	0.430	(mg/L)	0 164	(mg/L)	0.125	(ma/l

Case Parameter	Year 15 Arsenic			
	concentration of surface water into PM-12	C s12 =	0.00075	(ma/L
data	concentration of surface water into PM-13	C_s13 =	0.00075	`
	concentration in Babbitt WWTP discharge	C_sBab =	0.00075	(mg/L
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.001325	(mg/L
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.015514819	(mg/L
ncer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L
00	concentration in tailings basin cell 2W	C_s2w =	0.00291	(mg/L
Input	concentration of ground water into PM-12	C_g12 =	0.00273	(mg/L
≝	concentration of ground water into PM-13	C_g13 =	0	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.27	(mg/s)	3	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.31	(mg/s)	15	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s)
con	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	2.48	(mg/s)	2.48	(mg/s)	2.48	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပို့ ဍ		M_s2w =		(mg/s)	0.16	(mg/s)		(mg/s)
			Low Flow		Average	Average Flow		ow
Mass balance at each node		M_r12 =	0.07	(mg/s)	0.34	(mg/s)	3.11	(mg/s)
Mg at	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
	1		Low Flo	W	Average	Flow	High Fl	ow
onvert mass ux to oncentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Conver flux to concer	concentration in river at PM-13	C_r13 =	0.007	(mg/L)	0.002	(mg/L)	0.001	(mg/L)

Case	Year 15			
Parameter	Boron			
	I		2.22	, ,,
	concentration of surface water into PM-12	C_s12 =	0.027	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.027	(mg/L)
Ę.	concentration in Babbitt WWTP discharge	C_sBab =	0.027	(mg/L)
	concentration in Area 5 Pit NW discharge	C_spit =	0.1315	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.173169588	(mg/L)
ncei	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.11	(mg/L)
00	concentration in tailings basin cell 2W	C_s2w =	0.33	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0212	(mg/L)
≝	concentration of ground water into PM-13	C_g13 =	0	(mg/L)

			Low Flow		Average Flow		High Flow	
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	9.64	(mg/s)	109	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)	0.52	(mg/s)	0.52	(mg/s)
Ęi	mass flux in Babbitt WWTP discharge	M_sBab =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
tra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	47.02	(mg/s)	537	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.97	(mg/s)	7.41	(mg/s)	7.41	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	27.67	(mg/s)	27.67	(mg/s)	27.67	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s)
ပို့ ဍ	mass flux in seepage from cell 2W	M_s2w =	18.63	(mg/s)	18.63	(mg/s)	18.63	(mg/s)
			Low Flow		Average	Average Flow		ow
balance th node	mass flux in river at PM-12	M_r12 =	0.77	(mg/s)	10.40	(mg/s)	110.16	(mg/s)
Mass ba		M_r13 =	48.09 Low Flo	(mg/s)	111.18 Average		700.72 High Fl	
							g	
Convert mass flux to	concentration in river at PM-12 concentration in river at PM-13	C_r12 =	0.023	(mg/L)	0.027	(mg/L)	0.027	(mg/L)
Conve flux to	concentration in river at PM-13	C_r13 =	0.128	(mg/L)	0.044	(mg/L)	0.029	(mg/L)

Case	Year 15			
Parameter	Barium			
	Land to the first of the DM 40	0 .40	0.040	(/l)
_	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
<u> </u>	concentration in Area 5 Pit NW discharge	C_spit =	0.0044	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.35E-02	(mg/L)
ncei	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	5.00E-03	(mg/L)
00	concentration in tailings basin cell 2W	C_s2w =	0.09298	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0681	(mg/L)
Ĕ	concentration of ground water into PM-13	C_g13 =	0	(mg/L)

			Low Flow		Average Flow		High Flow	
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	1.66	(mg/s)	1.66	(mg/s)	1.66	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	_	(mg/s)	27.86	(mg/s)	318	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	_	(mg/s)	-	(mg/s)		(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	10.14	(mg/s)	10.14	(mg/s)	10.14	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	5.25	(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	1.81	(mg/s)	7.52	(mg/s)	66.63	(mg/s)
Ma at c	mass flux in river at PM-13	M_r13 =	17.23	(mg/s)	51.02	(mg/s)	400.37	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.054	(mg/L)	0.019	(mg/L)	0.016	(mg/L)
Converture flux to concer	concentration in river at PM-13	C_r13 =	0.046	(mg/L)	0.020	(mg/L)	0.016	(mg/L)

Case Parameter	Year 15 Beryllium			
	concentration of surface water into PM-12	C s12 =	0.0001	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0001	(mg/L)
ation	concentration in Babbitt WWTP discharge	C_sBab =	0.0001	(mg/L)
	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001410903	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.00075	(mg/L)
ğ	concentration of ground water into PM-12	C_g12 =	0.000023	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.17	(mg/s)	2	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s)
con	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.23	(mg/s)	0.23	(mg/s)	0.23	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	-	(mg/s)	-	(mg/s)	-	(mg/s)
ဒို ဒိ	mass flux in seepage from cell 2W	M_s2w =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
			Low Flow		Average Flow		High Flow	
Mass balance at each node		M_r12 =		(mg/s)	0.04	(mg/s)	0.41	(mg/s)
at B	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	W	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12 concentration in river at PM-13	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Conve flux to conce	concentration in river at PM-13	C_r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case	Year 15				
Parameter	Calcium				
		_			
	concentration of surface water into PM-12	C_	_s12 =	15	(mg/L)
data	concentration of surface water into PM-13	C_	_s13 =	15	(mg/L)
	concentration in Babbitt WWTP discharge	C	_sBab =	15	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C	_spit =	95.35	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C	_fs =	95.38057957	(mg/L)
ncer	concentration in hydrometallurgical residue cells liner leakage	С	rrs =	416	(mg/L)
202	concentration in tailings basin cell 2W	C_	_s2w =	59.78	(mg/L)
Input	concentration of ground water into PM-12	C_	_g12 =	19	(mg/L)
빌	concentration of ground water into PM-13	C_	_g13 =	0	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5,352.95	(mg/s)	60,771	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	462.42	(mg/s)	462.42	(mg/s)	462.42	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	140.09	(mg/s)	140.09	(mg/s)	140.09	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	26,119.49	(mg/s)	298,224	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	_	(mg/s)	-	(mg/s)	-	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	701.59	(mg/s)	5,369.83	(mg/s)	5,369.83	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	15,242.69	(mg/s)	15,242.69	(mg/s)	15,242.69	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	205.46	(mg/s)	205.46	(mg/s)	205.46	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	3,374.76	(mg/s)	3,374.76	(mg/s)	29.52	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	602.51		5,955.45		61,373.93	
2 0	mass flux in river at PM-13	M_r13 =	20,127.01		56,267.68 Average		380,445.41	
onvert mass ux to oncentration	concentration in river at PM-12	C_r12 =	17.891	(mg/L)	15.249		15.024	
Converture flux to	concentration in river at PM-13	C r13 =	53.397	(mg/L)	22.293	(mg/l)	15.618	(mc

Case	Year 15			
Parameter	Cadmium			
	concentration of surface water into PM-12	C a12 =	0.00008	(ma/l)
ta	concentration of surface water into PM-12	C_s12 = C s13 =	0.00008	, ,
n data	concentration in Babbitt WWTP discharge	C_sBab =	0.00008	, ,
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000705708	(mg/L)
псе	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0004	(mg/L)
Los	concentration in tailings basin cell 2W	C_s2w =	0.000188	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0003	(mg/L)
duj	concentration of ground water into PM-13	C_g13 =	0	(mg/L)

			Low Flo	w	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.03	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
tion	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.14	(mg/s)	2	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.11	(mg/s)	0.11	(mg/s)	0.11	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Co to	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flow		Average Flow		High Flow	
ass balance each node	mass flux in river at PM-12	M_r12 =	0.01	(mg/s)	0.04	(mg/s)	0.33	(mg/s)
Mass	mass flux in river at PM-13	M_r13 =	0.13	(mg/s)	0.31	(mg/s)	2.05	(mg/s)
			Low Flo	w	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
_	concentration in river at PM-13	C_r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case	Year 15			
Parameter	Chloride			
		-		
	concentration of surface water into PM-12	C_s12 =	6.5	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	6.5	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	6.5	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	5.95	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	7.60E+00	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.76E+03	(mg/L)
00	concentration in tailings basin cell 2W	C_s2w =	21.54	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	1.8	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0	(mg/L)

			Low Flo	w	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,319.61	(mg/s)	26,334	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	43.81	(mg/s)	43.81	(mg/s)	43.81	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	60.70	(mg/s)	60.70	(mg/s)	60.70	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	11,318.44	(mg/s)	129,230	(mg/s
	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	_	(mg/s)	-	(mg/s
la co	mass flux of Area 5 Pit NW discharge	M_spit =	43.78	(mg/s)	335.09	(mg/s)	335.09	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,215.25	(mg/s)	1,215.25	(mg/s)	1,215.25	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	869.24	(mg/s)	869.24	(mg/s)	869.24	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	1,216.00	(mg/s)	1,216.00	(mg/s)	1,216.00	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
balance th node	mass flux in river at PM-12	M_r12 =	104.51	(mg/s)	2,424.12	(mg/s)	26,438.79	(mg/s
ISS eac	mass flux in river at PM-13	M_r13 =	3,448.78 Low Flo		17,378.14 Average		159,304.77 High Fl	
SS C								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	3.103	(mg/L)	6.207	(mg/L)	6.472	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	9.150	(mg/L)	6.885	(mg/L)	6.540	(ma/l

Case	Year 15			
Parameter	Cobalt			
	concentration of surface water into PM-12	C_s12 =	0.0006	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0006	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0006	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.000555	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.008661931	(mg/L)
ncer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.005	(mg/L)
uoa	concentration in tailings basin cell 2W	C_s2w =	0.001556	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0011	(mg/L)
Inp	concentration of ground water into PM-13	C_g13 =	0	(mg/L)

			Low Flo	W	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.21	(mg/s)	2	(mg/s)
-	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.04	(mg/s)	12	(mg/s)
сеп	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s)
con	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.38	(mg/s)	1.38	(mg/s)	1.38	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Co to	mass flux in seepage from cell 2W	M_s2w =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
			Low Flo	w	Average	Flow	High FI	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo		Average	Flow	High Fl	
Convert mass flux to	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
ပို့ 🚅 ပိ	concentration in river at PM-13	C_r13 =	0.004	(mg/L)	0.001	(mg/L)	0.001	(mg/L)

concentration of ground water into PM-12

concentration of ground water into PM-13

Case	Year 15			
Parameter	Copper			
		-		
	concentration of surface water into PM-12	C_s12 =	0.0015	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0015	(mg/L)
		C_sBab =	0.0015	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00345	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.020766721	(mg/L)
93	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0015	(mg/L)
Ĭ,	concentration in tailings basin cell 2W	C s2w =	0.004555	(ma/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.54	(mg/s)	6	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s)
Ęi	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.61	(mg/s)	30	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.19	(mg/s)	0.19	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	3.32	(mg/s)	3.32	(mg/s)	3.32	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.26	(mg/s)		(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High FI	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)		(mg/s)
a ≥	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	W	Average	riow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.003	(mg/L)	0.0017	(mg/L)	0.002	(mg/L)
Co flux	concentration in river at PM-13	C_r13 =	0.010	(mg/L)	0.0028	(mg/L)	0.002	(mg/L)

C_g12 =

C_g13 =

0.004 (mg/L)

Case Parameter	Year 15 Fluoride				
i didilictoi	Tuonido				
	concentration of surface water into PM-12	C_	_s12 =	0.2	(mg/L)
data	concentration of surface water into PM-13	C.	_s13 =	0.2	(mg/L)
	concentration in Babbitt WWTP discharge	C.	_sBab =	0.2	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C.	_spit =	0.125	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_	_fs =	8.26E-01	(mg/L)
ncer	concentration in hydrometallurgical residue cells liner leakage	С	rrs =	2.85E+00	(mg/L)
Ö	concentration in tailings basin cell 2W	C_	_s2w =	1.55	(mg/L)
Input	concentration of ground water into PM-12	C_	_g12 =	0.385	(mg/L)
<u> </u>	concentration of ground water into PM-13	C	_g13 =	0	(mg/L)

			Low Flo	W	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	71.37	(mg/s)	810	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	9.37	(mg/s)	9.37	(mg/s)	9.37	(mg/s)
ţio	mass flux in Babbitt WWTP discharge	M_sBab =	1.87	(mg/s)	1.87	(mg/s)	1.87	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	348.26	(mg/s)	3,976	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	ı	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.92	(mg/s)	7.04	(mg/s)	7.04	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	132.08	(mg/s)	132.08	(mg/s)	132.08	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	1.41	(mg/s)	1.41	(mg/s)	1.41	(mg/s)
င်	mass flux in seepage from cell 2W	M_s2w =	87.50	(mg/s)	87.50	(mg/s)	87.50	(mg/s)
			Low Flo	W	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =	11.24	(mg/s)	82.61 658.90	(mg/s)	821.52 5,025.87	
	III daa iid ii	W_113 -	Low Flo		Average		High FI	, ,
Convert mass flux to concentration	concentration in river at PM-12 concentration in river at PM-13	C_r12 =		(mg/L)		(mg/L)		(mg/L)

Case	Year 15				
Parameter	Iron				
		_	40		, ",
_	concentration of surface water into PM-12	C.	_s12 =	2.9	(mg/L)
data	concentration of surface water into PM-13	C_	_s13 =	2.9	(mg/L)
	concentration in Babbitt WWTP discharge	C_	_sBab =	2.9	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C	_spit =	0.037761905	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C	_fs =	9.82E-02	(mg/L)
nceı	concentration in hydrometallurgical residue cells liner leakage	С	rrs =	4.00E-01	(mg/L)
Ö	concentration in tailings basin cell 2W	C_	_s2w =	4.594	(mg/L)
Input	concentration of ground water into PM-12	C	_g12 =	0.035	(mg/L)
<u>=</u>	concentration of ground water into PM-13	C	_g13 =	0	(mg/L)

			Low Flo	w	Average	Flow	High FI	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,034.90	(mg/s)	11,749	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.85	(mg/s)	0.85	(mg/s)	0.85	(mg/s
ţ	mass flux in Babbitt WWTP discharge	M_sBab =	27.08	(mg/s)	27.08	(mg/s)	27.08	(mg/s
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	5,049.77	(mg/s)	57,657	(mg/s
	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s
la co	mass flux of Area 5 Pit NW discharge	M_spit =	0.28	(mg/s)	2.13	(mg/s)	2.13	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	15.69	(mg/s)	15.69	(mg/s)	15.69	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.20	(mg/s)	0.20	(mg/s)	0.20	(mg/s
ပို ဍ	mass flux in seepage from cell 2W	M_s2w =	259.35	(mg/s)	259.35	(mg/s)	259.35	(mg/s
			Low Flo	w	Average	Flow	High FI	low
balance th node	mass flux in river at PM-12	M_r12 =	27.93	(mg/s)	1,062.84	(mg/s)	11,777.08	(mg/s
Mass ba at each		M_r13 =	303.44 Low Flo		6,389.96 Average		69,711.07 High Fl	
S =			LOW 1 10		Avelage	liow	Ingiri	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.829	(mg/L)	2.721	(mg/L)	2.883	(mg/
Convergillax to concer	concentration in river at PM-13	C r13 =	0.805	(mg/L)	2 532	(mg/L)	2.862	(ma/l

Case	Year 15
Parameter	Hardness

	concentration of surface water into PM-12	C_s12 =	70	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	70	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	70	(mg/L)
Ë	concentration in Area 5 Pit NW discharge	C_spit =	942.7142857	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	3.20E+02	(mg/L)
cer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	8.61E+03	(mg/L)
l S	concentration in tailings basin cell 2W	C_s2w =	436.6	(mg/L)
Ħ	concentration of ground water into PM-12	C_g12 =	87.5	(mg/L)
립	concentration of ground water into PM-13	C_g13 =	0	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	24,980.41	(mg/s)	283,600	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	2,129.58	(mg/s)	2,129.58	(mg/s)	2,129.58	(mg/s)
ncentrat K	mass flux in Babbitt WWTP discharge	M_sBab =	653.73	(mg/s)	653.73	(mg/s)	653.73	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	121,890.93	(mg/s)	1,391,712	(mg/s)
	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	_	(mg/s)
	mass flux of Area 5 Pit NW discharge	M_spit =	6,936.49	(mg/s)	53,090.84	(mg/s)	53,090.84	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	51,106.04	(mg/s)	51,106.04	(mg/s)	51,106.04	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	4,252.38	(mg/s)	4,252.38	(mg/s)	4,252.38	(mg/s)
ပို ဍ	mass flux in seepage from cell 2W	M_s2w =	24,647.41	(mg/s)	24,647.41	(mg/s)	24,647.41	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
balance th node	mass flux in river at PM-12	M_r12 =	2,783.31	(mg/s)	27,763.72	(mg/s)	286,383.27	(mg/s)
ass	mass flux in river at PM-13	M_r13 =	89,725.62 Low Flo	,	282,751.31 Average		1,811,191.86 High Fl	, ,
			LOWITO	VV	Average	liow	Iligii I	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	82.647	(mg/L)	71.091	(mg/L)	70.104	(mg/L)
Conver flux to concen	concentration in river at PM-13	C r13 =	238.041	(mg/L)	112.023	(mg/L)	74.354	(ma/L)

Case	Year 15			
Parameter	Potassium			
		-		
	concentration of surface water into PM-12	C_s12 =	0.60	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.60	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.60	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	53.80	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	14.58	(mg/L)
Je J	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80	(mg/L)
COL	concentration in tailings basin cell 2W	C_s2w =	7.77	(mg/L)
but	concentration of ground water into PM-12	C_g12 =	1.60	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.00	(mg/L)

			Low Flo	W	Average	Flow	High FI	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	214.12	(mg/s)	2,431	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	38.94	(mg/s)	38.94	(mg/s)	38.94	(mg/s)
ţi	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.89	(mg/s)	0.89	(mg/s)	0.89	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1,044.78	(mg/s)	11,929	(mg/s
cen	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	_	(mg/s
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	5.60	(mg/s)	5.60	(mg/s)	5.60	(mg/s
	mass flux of Area 5 Pit NW discharge	M_spit =	395.86	(mg/s)	3,029.85	(mg/s)	3,029.85	(mg/s
Convert to mass	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	2,330.24	(mg/s)	2,330.24	(mg/s)	2,330.24	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	438.64	(mg/s)	438.64	(mg/s)	438.64	(mg/s
			Low Flo	W	Average	Flow	High FI	low
balance th node	mass flux in river at PM-12	M_r12 =	39.83	(mg/s)	253.95	(mg/s)	2,470.69	(mg/s)
Mass ba at each	mass flux in river at PM-13	M_r13 =	3,210.18 Low Flo		7,103.07 Average		20,203.99 High FI	_
" -			2011 10		Avolugo	1000	- Ingiri	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	1.183	(mg/L)	0.650	(mg/L)	0.605	(mg/l)
Conve	concentration in river at PM-13	C r13 =	8.517	(mg/L)	2 814	(mg/L)	0.829	(ma/l)

concentration in river at PM-13

Case Parameter	Year 15 Magnesium			
	concentration of surface water into PM-12	C_s12 =	5.90	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	5.90	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	5.90	(mg/L)
tion	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)

Ę	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)				
centratio	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	19.82	(mg/L)				
ē	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	213.00	(mg/L)				
00	concentration in tailings basin cell 2W	C_s2w =	69.97	(mg/L)				
nout	concentration of ground water into PM-12	C_g12 =	10.65	(mg/L)				
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.00	(mg/L)				
			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,105.49	(mg/s)	23,903	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	259.20	(mg/s)	259.20	(mg/s)	259.20	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	55.10	(mg/s)	55.10	(mg/s)	55.10	(mg/s)
trai	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,273.66	(mg/s)	117,301	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	1,994.02	(mg/s)	15,261.91	(mg/s)	15,261.91	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	3,167.81	(mg/s)	3,167.81	(mg/s)	3,167.81	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	105.20	(mg/s)	105.20	(mg/s)	105.20	(mg/s)
ပို ဍ	mass flux in seepage from cell 2W	M_s2w =	3,950.02	(mg/s)	3,950.02	(mg/s)	3,950.02	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
8 a								
anc	mass flux in river at PM-12	M r12 =	314.30	(ma/s)	2,419.79	(ma/s)	24,217.73	(ma/s)
Mass balance at each node	Indeed not in the 12	IVI_11Z -	014.00	(mg/s)	2,413.73	(mg/3)	24,217.70	(mg/s)
ass								
at 🗵	mass flux in river at PM-13	M_r13 =	9,531.35		35,178.39	, ,	164,004.09	
		1	Low Flo	w	Average	Flow	High Fl	ow
				1			1	
SS							1	
mass	concentration in river at PM-12	C r12 =	9 333	(ma/L)	6 196	(ma/l)	5 928	(ma/l)
ert mass o entration	concentration in river at PM-12	C_r12 =	9.333	(mg/L)	6.196	(mg/l)	5.928	(mg/l)

C_r13 =

Case Parameter	Year 15 Manganese			
	concentration of surface water into PM-12	C_s12 =	0.30 (mg/L
data	concentration of surface water into PM-13	C_s13 =	0.30 (mg/L
		C_sBab =	0.30 (mg/L
tion	concentration in Area 5 Pit NW discharge	C_spit =	0.49 (mg/L

			Low Flor	W
				•
Ξ	concentration of ground water into PM-13	C_g13 =	0.00	(mg/L)
ğ	concentration of ground water into PM-12	C_g12 =	0.19	(mg/L)
9	concentration in tailings basin cell 2W	C_s2w =	1.18	(mg/L)
ခွ	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.00	(mg/L)
ir Er	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.43	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.49	(mg/L)
n dat	concentration in Babbitt WWTP discharge	C_sBab =	0.30	(mg/L)

			Low Flo	w	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	107.06	(mg/s)	1,215	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	4.58	(mg/s)	4.58	(mg/s)	4.58	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	2.80	(mg/s)	2.80	(mg/s)	2.80	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	522.39	(mg/s)	5,964	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	3.57	(mg/s)	27.31	(mg/s)	27.31	(mg/s
	mass flux in accorded from Tailings Dasin Calls 1E and 2E	M_fs =	69.10	(mg/s)	69.10	(mg/s)	69.10	(mg/s
onvert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	66.78	(mg/s)	66.78	(mg/s)	66.78	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	7.38	(mg/s)	114.44	(mg/s)	1,222.81	(mg/s
Mass bat each		M_r13 =	146.83		800.03		7,350.49	
			Low Flo	W .	Average	FIOW	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.219	(mg/L)	0.293	(mg/l)	0.299	(mg/l)
Conver flux to	concentration in river at PM-13	C r13 =	0.390	(mg/L)	0.317	(mg/l)	0.302	(ma/l

Case	Year 15			
Parameter	Sodium			
	concentration of surface water into PM-12	C_s12 =	6.00	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	6.00	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	6.00	(mg/L)
ntration	concentration in Area 5 Pit NW discharge	C_spit =	119.50	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	22.52	(mg/L)
concei	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	255.00	(mg/L)
S	concentration in tailings basin cell 2W	C_s2w =	44.31	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	4.90	(mg/L)
≝	concentration of ground water into PM-13	C g13 =	0.00	(mg/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,141.18	(mg/s)	24,309	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	119.26	(mg/s)	119.26	(mg/s)	119.26	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	56.03	(mg/s)	56.03	(mg/s)	56.03	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,447.79	(mg/s)	119,290	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	879.28	(mg/s)	6,729.88	(mg/s)	6,729.88	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	3,599.56	(mg/s)	3,599.56	(mg/s)	3,599.56	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	125.94	(mg/s)	125.94	(mg/s)	125.94	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	2,501.44	(mg/s)	2,501.44	(mg/s)	2,501.44	(mg/s
			Low Flo	w	Average	Flow	High Fl	low
balance th node	mass flux in river at PM-12	M_r12 =	175.29	(mg/s)	2,316.47	(mg/s)	24,483.86	(mg/s
Mass ba at each		M_r13 =	7,281.51 Low Flo		25,721.08 Average		156,730.27 High Fl	
			LOW FIO	W	Average	FIOW	High Fi	low
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	5.205	(mg/L)	5.931	(mg/l)	5.993	(mg/l)
Convergillation Concer	concentration in river at PM-13	C r13 =	19.318	(ma/L)	10.190	(ma/l)	6.434	(ma/l)

concentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-13

concenti

Case Parameter	Year 15 Nickel			
	concentration of surface water into PM-12	C_s12 =	0.0012	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0012	(mg/L)
n dâ	concentration in Babbitt WWTP discharge	C_sBab =	0.0012	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.0052	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.153655831	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.43	(mg/s)	5	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.09	(mg/s)	24	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.04	(mg/s)	0.29	(mg/s)	0.29	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	24.56	(mg/s)	24.56	(mg/s)	24.56	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s)
င္မ င	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	0.39	(mg/s)		(mg/s)
			Low Flo	W	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.18	(mg/s)	0.61	(mg/s)	5.04	(mg/s)
Ma at e	mass flux in river at PM-13	M_r13 =	25.21	(mg/s)	27.98	(mg/s)	54.19	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
onvert mass ux to oncentration	concentration in river at PM-12	C_r12 =	0.005	(mg/L)	0.002	(mg/L)	0.001	(mg/L)
Conver flux to concer	concentration in river at PM-13	C_r13 =	0.067	(mg/L)	0.011	(mg/L)	0.002	(mg/L)

C_rrs =

C_s2w =

C_g12 = C_g13 = 0.098 (mg/L)

0.007 (mg/L)

0 (mg/L)

0.00688 (mg/L)

Case Parameter			
	concentration of surface water into PM-12	C_s12 =	0.00015 (mg/L
	concentration of surface water into PM-13	C_s13 =	0.00015 (mg/L)
Ë	concentration in Babbitt WWTP discharge	C_sBab =	0.00015 (mg/L
7			

	ata	concentration of surface water into PM-13	C_s13 =	0.00015	(mg/L)
	βρι	concentration in Babbitt WWTP discharge	C_sBab =	0.00015	(mg/L)
	tio	concentration in Area 5 Pit NW discharge	C_spit =	0.0003	(mg/L)
	ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.002409879	(mg/L)
	ICEL	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0005	(mg/L)
	uos	concentration in tailings basin cell 2W	C_s2w =	0.0012	(mg/L)
	at	concentration of ground water into PM-12	C_g12 =	0.0012	(mg/L)
	duj	concentration of ground water into PM-13	C_g13 =	0	(mg/L)
•	-			-	

			Low Flo	W	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.05	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.26	(mg/s)	3	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.02	(mg/s)	0.02	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.39	(mg/s)	0.39	(mg/s)	0.39	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)		(mg/s)	0.00	(mg/s)
င့် ပိ	mass flux in seepage from cell 2W	M_s2w =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
			Low Flo	W	Average	Flow	High FI	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)		(mg/s)
	mass max m. rvor ac v m. re	111_110	Low Flo		Average		High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case Parameter	Year 15 Antimony			
	concentration of surface water into PM-12	C_s12 =	4.00E-05	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	4.00E-05	(mg/L)
) di	concentration in Babbitt WWTP discharge	C_sBab =	4.00E-05	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	2.50E-04	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C fs =	1.13E-02	(mg/L)

늍	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.13E-02	(mg/L)				
ncentr	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)				
ů O	concentration in tailings basin cell 2W	C_s2w =	2.50E-04	(mg/L)				
Input	concentration of ground water into PM-12	C_g12 =	1.50E-03	(mg/L)				
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.00E+00	(mg/L)				
			Low Flo	w	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.01	(mg/s)	0	(mg/s)
	mass flux of ground water into PM-12	M_g12 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
trat	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
cen	mass flux of ground water into PM-13	 M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.81	(mg/s)	1.81	(mg/s)	1.81	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	W	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.04	(mg/s)	0.05	(mg/s)	0.20	(mg/s)
Mass	mass flux in river at PM-13	M_r13 =	1.87 Low Flo	(mg/s)	1.96 Average	(mg/s)	2.84 High Fl	(mg/s)
			LOW 1 10	VV	Average	liow	Iligii I	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Convertiux to	concentration in river at PM-13	C_r13 =	0.005	(mg/L)	0.001	(mg/L)	0.000	(mg/L)

Case Parameter	Year 15 Selenium				
	concentration of surface water into PM-12	С	s12 =	0.0003	(mg/L)
data	concentration of surface water into PM-13	С	_s13 =	0.0003	(mg/L)
	concentration in Babbitt WWTP discharge	C_	sBab =	0.0003	(mg/L)
ntration	concentration in Area 5 Pit NW discharge	C_	_spit =	0.0016	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_	_fs =	0.002521801	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	С	rrs =	0.054	(mg/L)
conce	concentration in tailings basin cell 2W	C_	_s2w =	0.00109	(mg/L)
Input	concentration of ground water into PM-12	C_	_g12 =	0.00295	(mg/L)
≝	concentration of ground water into PM-13	C_	_g13 =	0	(mg/L)
				Low Flor	A/

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.11	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.52	(mg/s)	6	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s)
con	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.40	(mg/s)	0.40	(mg/s)	0.40	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ပို ဍ		M_s2w =		(mg/s)	0.06	(mg/s)		(mg/s)
			Low Flo	W	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.18	(mg/s)	1.29	(mg/s)
Ma at c	mass flux in river at PM-13	M_r13 =	0.58	(mg/s)	1.29	(mg/s)	7.84	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
onvert mass ux to oncentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Conver flux to concer	concentration in river at PM-13	C_r13 =	0.002	(mg/L)	0.001	(mg/L)	0.000	(mg/L)

Case Parameter	Year 15 Sulfate			
	concentration of surface water into PM-12	C_s12 =	4.00	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	4.00	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	4.00	(mg/L)
Ē	concentration in Area 5 Pit NW discharge	C_spit =	1046.27	(mg/L)
ntration	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	241.92	(mg/L)
ncer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	7347.00	(mg/L)
L O	concentration in tailings basin cell 2W	C_s2w =	152.40	(mg/L)
np ut	concentration of ground water into PM-12	C_g12 =	8.50	(mg/L)
<u>=</u>	concentration of ground water into PM-13	C_g13 =	0.00	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,427.45	(mg/s)	16,206	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	206.87	(mg/s)	206.87	(mg/s)	206.87	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	37.36	(mg/s)	37.36	(mg/s)	37.36	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	6,965.20	(mg/s)	79,526	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	7,698.43	(mg/s)	58,922.60	(mg/s)	58,922.60	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	38,661.16	(mg/s)	38,661.16	(mg/s)	38,661.16	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	3,628.60	(mg/s)	3,628.60	(mg/s)	3,628.60	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	8,603.45	(mg/s)	8,603.45		8,603.45	(mg/s)
		1	Low Flo	w	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	244.23	(mg/s)	1,671.68	(mg/s)	16,449.94	(mg/s)
Mas	mass flux in river at PM-13	M_r13 =	58,835.87		118,452.69	, ,	205,792.15	
	T		Low Flo	w	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	7.252	(mg/L)	4.280	(mg/l)	4.027	(mg/l)
Con	concentration in river at PM-13	C_r13 =	156.091	(mg/L)	46.930	(mg/l)	8.448	(mg/l)

Case	Year 15			
Parameter	Thallium			
		_		
	concentration of surface water into PM-12	C_s12 =	0.0002	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0002	(mg/L)
Ę.	concentration in Babbitt WWTP discharge	C_sBab =	0.0002	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.0006	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001193197	(mg/L)
200	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0002	(mg/L)
00	concentration in tailings basin cell 2W	C_s2w =	0.0002	(mg/L)
ă	concentration of ground water into PM-12	C_g12 =	0.000004	(mg/L)
<u>r</u>	concentration of ground water into PM-13	C_g13 =	0	(mg/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ęi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.35	(mg/s)	4	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.19	(mg/s)	0.19	(mg/s)	0.19	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	low
balance ch node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.07	(mg/s)	0.81	(mg/s
Mass ba at each	mass flux in river at PM-13	M_r13 =	0.21 Low Flo	(mg/s)	0.66	(mg/s)	5.02 High Fl	(mg/s
ss								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L
Conve flux to	concentration in river at PM-13	C r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(ma/L

Case	Year 15			
Parameter	Zinc			
	concentration of surface water into PM-12	C s12 =	0.016	(mg/L)
data	concentration of surface water into PM-13	C_s13 =		(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.003	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.081197396	(mg/L)
192	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.01	(mg/L)
202	concentration in tailings basin cell 2W	C_s2w =	0.01435	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0115	(mg/L)
<u>r</u>	concentration of ground water into PM-13	C_g13 =	0	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.28	(mg/s)	0.28	(mg/s)	0.28	(mg/s
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s
concentration flux	mass flux of ground water into PM-13	M_g13 =	-	(mg/s)	-	(mg/s)	-	(mg/s
	mass flux of Area 5 Pit NW discharge	M_spit =	0.02	(mg/s)	0.17	(mg/s)	0.17	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	12.98	(mg/s)	12.98	(mg/s)	12.98	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.81	(mg/s)	0.81	(mg/s)	0.81	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.43	(mg/s)	6.14	(mg/s)	65.25	(mg/s
Mass ba at each I	mass flux in river at PM-13	M_r13 =	14.24 Low Flo	(mg/s)	47.96	(mg/s)	397.32 High Fl	
Ω =			2011 1 10		7 troitage			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.013	(mg/L)	0.016	(mg/L)	0.016	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	0.038	(mg/L)	0.019	(mg/L)	0.016	(ma/l

Appendix F.6
Embarrass River
Proposed Action
Year 20

FLOWS

Case	Year 20				
Flows	Low Flow Conditions (no surface runoff)				Node
in s River	flow in river at PM-12	Q_r12_L =	1.19 (cfs)	PM-12
low	flow in river at PM-13	Q_r13_L =	13.64 (cfs)	PM-13
Total flow in Embarrass F	flow check	Q_ck_L=	13.64 (cfs)	
	surface water flow into PM-12	Q_s12_L =	0.00	cfs)	PM-12
	surface water flow into PM-13	Q_s13_L =	0.00	cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_L =	0.33 (cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_L =	0.26 (cfs)	PM-13
ţa	seepage from Tailings Basin Cells 1E and 2E	Q_fs_L =	5.97 (cfs)	PM-13
flow data	hydrometallurgical residue cells liner leakage	Q_rrs_L =	0.02 (cfs)	PM-13
Ę	seepage from cell 2W	Q_s2w_L =	1.99 (cfs)	PM-13
Input	ground water flow into PM-12	Q_g12_L =	0.86 (cfs)	PM-12
Ē	ground water flow into PM-13	Q_g13_L =	4.21 (cfs)	PM-13

Case	Year 20			
Flow	Average Flow Conditions (mean annual)			
n River	flow in river at PM-12	Q_r12_M =	13.80 (cfs) PM-12
Total flow in Embarrass Ri	flow in river at PM-13	Q_r13_M =	89.51 (cfs) PM-13
Total	flow check	Q_ck_M =	89.51 (cfs)
	surface water flow into PM-12	Q_s12_M =	12.61 (cfs) PM-12
	surface water flow into PM-13	Q_s13_M =	61.53 (cfs	PM-13
	Babbitt WWTP discharge	Q_sBab_M =	0.33 (cfs	PM-12
	Area 5 Pit NW discharge	Q_spit_M =	1.99 (cfs	PM-13
ţ	seepage from Tailings Basin Cells 1E and 2E	Q_fs_M =	5.97 (cfs	PM-13
, data	hydrometallurgical residue cells liner leakage	Q_rrs_M =	0.02 (cfs	PM-13
flow	seepage from cell 2W	Q_s2w_M =	1.99 (cfs	PM-13
Input f	ground water flow into PM-12	Q_g12_M =	0.86 (cfs	PM-12
a u	ground water flow into PM-13	Q_g13_M =	4.21 (cfs	PM-13

Case	Year 20				
Flow	High Flow Conditions (avg. annual 1-day max flow)				_
n River	flow in river at PM-12	Q_r12_H =	144.35	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_H =	861.06	(cfs)	PM-13
Tota	flow check	Q_ck_H =	861.06	(cfs)	
	surface water flow into PM-12	Q_s12_H =	143.16	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_H =	702.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_H =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_H =	1.99	(cfs)	PM-13
ţa	seepage from Tailings Basin Cells 1E and 2E	Q_fs_H =	5.97	(cfs)	PM-13
e p	hydrometallurgical residue cells liner leakage	Q_rrs_H =	0.02	(cfs)	PM-13
١٥	seepage from cell 2W	Q_s2w_H =	1.99	(cfs)	PM-13
Input flow data	ground water flow into PM-12	Q_g12_H =	0.86	(cfs)	PM-12
ဋ	ground water flow into PM-13	Q_g13_H =	4.21	(cfs)	PM-13

concentration of ground water into PM-12 concentration of ground water into PM-13

Case	Year 20			
Parameter	Silver			
		1	1	
	concentration of surface water into PM-12	C_s12 =	0.00011	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00011	(mg/L)
		C_sBab =	0.00011	(mg/L)
tion	concentration in Area 5 Pit NW discharge	C_spit =	0.00015	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00124	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.000125	(mg/L)
5	concentration in tailings basin cell 2W	C_s2w =	0.000100	(mg/L)

			Low Flo	W	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ij	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.19	(mg/s)	2	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.21	(mg/s)	0.21	(mg/s)	0.21	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	low
alance	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.45	(mg/s)
Mass balance at each node	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	_	(mg/s)
			Low Flo	w	Average	Flow	High Fl	low
mass	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

C_g12 =

C_g13 =

0.000008 (mg/L)

0.000008 (mg/L)

Case Parameter	Year 20 Aluminum			
	concentration of surface water into PM-12	C_s12 =	0.12	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.12	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.12	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.01325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	3.74E-01	(mg/L)
193	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80E-01	(mg/L)
LO CO	concentration in tailings basin cell 2W	C_s2w =	1.5788	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.025	(mg/L)
du	concentration of ground water into PM-13	C_g13 =	0.025	(mg/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	42.82	(mg/s)	486	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.61	(mg/s)	0.61	(mg/s)	0.61	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s)
Ħ,	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	208.96	(mg/s)	2,386	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	2.98	(mg/s)	2.98	(mg/s)	2.98	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.10	(mg/s)	0.75	(mg/s)	0.75	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	63.12	(mg/s)	63.12	(mg/s)	63.12	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	89.10	(mg/s)	89.10	(mg/s)	89.10	(mg/s
			Low Flo	w	Average	Flow	High Fl	low
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)	487.90	
ā≧	mass flux in river at PM-13	M_r13 =	157.12 Low Flo		409.55 Average		3,029.73 High FI	
ي د			LOW 110		Average	l low	Tilgiri	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.051	(mg/L)	0.114	(mg/L)	0.119	(mg/L
Conve flux to conce	concentration in river at PM-13	C r13 =	0.407	(mg/L)	0.162	(mg/L)	0.124	(ma/l

Case Parameter	Year 20 Arsenic			
	concentration of surface water into PM-12	C s12 =	0.00075	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00075	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.00075	(mg/L)
ntration	concentration in Area 5 Pit NW discharge	C_spit =	0.001325	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.014389887	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.00291	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.00273	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.00273	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.27	(mg/s)	3	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.31	(mg/s)	15	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	2.43	(mg/s)	2.43	(mg/s)	2.43	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.16	(mg/s)	0.16	(mg/s)		(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.34	(mg/s)	3.11	(mg/s)
Mass at eac	mass flux in river at PM-13	M r13 =	3.01	(mg/s)	4.64	(mg/s)	21.02	(mg/s)
		. –	Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)	0.001			(mg/L)
2 ≒ 2	concentration in river at PM-13	C_r13 =	0.008	(mg/L)	0.002	(mg/L)	0.001	(mg/L)

Case Parameter	Year 20 Boron			
		-		
	concentration of surface water into PM-12	C_s12 =	0.027	(mg/L
data	concentration of surface water into PM-13	C_s13 =	0.027	(mg/L
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.027	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.1315	(mg/L
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.174123916	(mg/L
concent	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.11	(mg/L
CO	concentration in tailings basin cell 2W	C_s2w =	0.33	(mg/L
Input	concentration of ground water into PM-12	C_g12 =	0.0212	(mg/L
≝	concentration of ground water into PM-13	C_g13 =	0.0212	(mg/L
			I ow Flo	LA/

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	9.64	(mg/s)	109	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)	0.52	(mg/s)	0.52	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	47.02	(mg/s)	537	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	2.53	(mg/s)	2.53	(mg/s)	2.53	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.97	(mg/s)	7.41	(mg/s)	7.41	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	29.42	(mg/s)	29.42	(mg/s)	29.42	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s)
မ ပိ	mass flux in seepage from cell 2W	M_s2w =	18.62	(mg/s)	18.62	(mg/s)	18.62	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	0.77	(mg/s)	10.40	(mg/s)	110.16	(mg/s)
Mass		M_r13 =	52.37 Low Flo	(mg/s)	115.46 Average		705.00 High Fl	
			201110		Average		Iligii I	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.023	(mg/L)	0.027	(mg/L)	0.027	(mg/L)
Conve flux to	concentration in river at PM-13	C_r13 =	0.136	(mg/L)	0.046	(mg/L)	0.029	(mg/L)

Case Parameter	Year 20 Barium			
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
ntration	concentration in Area 5 Pit NW discharge	C_spit =	0.0044	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.60E-02	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	5.00E-03	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.09298	(mg/L)
	concentration of ground water into PM-12	C_g12 =	0.0681	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.0681	(mg/L)

			Low Flow		Average	Average Flow		High Flow	
Convert concentration to mass flux	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)	
	mass flux of ground water into PM-12	M_g12 =	1.66	(mg/s)	1.66	(mg/s)	1.66	(mg/s)	
	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)	
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s)	
	mass flux of ground water into PM-13	M_g13 =	8.11	(mg/s)	8.11	(mg/s)	8.11	(mg/s)	
	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.25	(mg/s)	0.25	(mg/s)	
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	11.15	(mg/s)	11.15	(mg/s)	11.15	(mg/s)	
	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)	
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	5.25	(mg/s)	5.25	(mg/s)	5.25	(mg/s)	
			Low Flow		Average	Average Flow		High Flow	
Mass balance at each node	mass flux in river at PM-12	M_r12 =	1.81	(mg/s)	7.52	(mg/s)	66.63	(mg/s)	
Ma	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	409.50	, ,	
		,	Low Flow		Average	Flow	High Fl	High Flow	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.054	(mg/L)	0.019	(mg/L)	0.016	(mg/L)	
CS Fig. So	concentration in river at PM-13	C_r13 =	0.068	(mg/L)	0.024	(mg/L)	0.017	(mg/L)	

Case Parameter	Year 20 Beryllium			
	concentration of surface water into PM-12	C_s12 =	0.0001	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0001	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0001	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00131326	(mg/L)
ncer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0	(mg/L)
ō	concentration in tailings basin cell 2W	C_s2w =	0.00075	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.000023	(mg/L)
<u>=</u>	concentration of ground water into PM-13	C_g13 =	0.000023	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.17	(mg/s)	2	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.22	(mg/s)	0.22	(mg/s)	0.22	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	-	(mg/s)	_	(mg/s)	_	(mg/s)
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
balance th node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.41	(mg/s)
Mass ba at each		M_r13 =	0.27 Low Flo	(mg/s)	0.48 Average	(mg/s)	2.67 High Fl	(mg/s
8 E			200 110		Avolugo		- Ingili	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L
Conve flux to conce	concentration in river at PM-13	C r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(ma/L

Case Parameter	Year 20 Calcium			
	concentration of surface water into PM-12	C s12 =	15	(mg/L)
data	concentration of surface water into PM-12	C_s12 =		(mg/L) (mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =		(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	95.35	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	76.37590202	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	416	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	59.78	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	19	(mg/L)
_ <u>≅</u>	concentration of ground water into PM-13	C_g13 =	19	(mg/L)

			Low Flo	W	Average I	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5,352.95	(mg/s)	60,771	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	462.42	(mg/s)	462.42	(mg/s)	462.42	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	140.09	(mg/s)	140.09	(mg/s)	140.09	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	26,119.49	(mg/s)	298,224	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	2,263.72	(mg/s)	2,263.72	(mg/s)	2,263.72	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	701.59	(mg/s)	5,369.83	(mg/s)	5,369.83	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	12,906.03	(mg/s)	12,906.03	(mg/s)	12,906.03	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	227.25	(mg/s)	227.25	(mg/s)	227.25	(mg/s)
မ ပိ	mass flux in seepage from cell 2W	M_s2w =	3,373.51	(mg/s)	3,373.51	(mg/s)	32.66	(mg/s)
			Low Flo	w	Average l	Flow	High Fl	ow
Mass balance at each node		M_r12 =	602.51		5,955.45		61,373.93	
<i>a</i> ≤	mass flux in river at PM-13	M_r13 =	20,074.61 Low Flo		56,215.28 Average	,	380,397.40 High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C r12 =		(mg/L)	15.249		15.024	

oncentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12 concentration of ground water into PM-13

Case Parameter	Year 20 Cadmium			
	concentration of surface water into PM-12	C_s12 =	0.00008	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00008	(mg/L)
n da	concentration in Babbitt WWTP discharge	C_sBab =	0.00008	(mg/L)
ŧ	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1F and 2F	C fs =	0.000534314	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.03	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ţ	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ita	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.14	(mg/s)	2	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =		(mg/s)		(mg/s)		(mg/s)
0	Illiass liux III livel at Fivi-13	W_113 =	Low Flo		Average		High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L
_ ც ⊒ ც	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(ma/l

C_rrs =

C_s2w =

C_g12 =

C_g13 =

0.0004

0.000188 (mg/L)

0.0003 (mg/L)

0.0003 (mg/L)

(mg/L)

Case Parameter	Year 20 Chloride			
	concentration of surface water into PM-12	C s12 =	6.5	(mg/L)
concentration data	concentration of surface water into PM-13	C_s13 =	6.5	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	6.5	(mg/L)
	concentration in Area 5 Pit NW discharge	C_spit =	5.95	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	7.66E+00	(mg/L)
je je	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.76E+03	(mg/L)
CO	concentration in tailings basin cell 2W	C_s2w =	21.54	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	1.8	(mg/L)
<u>r</u>	concentration of ground water into PM-13	C_g13 =	1.8	(mg/L)
			Low Flo	147

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,319.61	(mg/s)	26,334	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	43.81	(mg/s)	43.81	(mg/s)	43.81	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	60.70	(mg/s)	60.70	(mg/s)	60.70	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	11,318.44	(mg/s)	129,230	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	214.46	(mg/s)	214.46	(mg/s)	214.46	(mg/s)
io x	mass flux of Area 5 Pit NW discharge	M_spit =	43.78	(mg/s)	335.09	(mg/s)	335.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,293.94	(mg/s)	1,293.94	(mg/s)	1,293.94	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	961.45	(mg/s)	961.45	(mg/s)	961.45	(mg/s)
ဒိ ဒ	mass flux in seepage from cell 2W	M_s2w =	1,215.55		1,215.55	(mg/s)	1,215.55	
			Low Flo	w	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	104.51	(mg/s)	2,424.12	(mg/s)	26,438.79	(mg/s)
Mass at eac	mass flux in river at PM-13	M_r13 =	3,833.69 Low Flo		17,763.05 Average	. 0 /	159,689.67 High Fl	
			LOW 1 10	VV	Average	liow	riigii i i	OW .
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	3.103	(mg/L)	6.207	(mg/L)	6.472	(mg/L)
Conve flux to concer	concentration in river at PM-13	C_r13 =	9.928	(mg/L)	7.012	(mg/L)	6.553	(mg/L)

Case Parameter	Year 20 Cobalt			
	concentration of surface water into PM-12	C s12 =	0.0006	(mg/L)
data	concentration of surface water into PM-13		0.0006	(mg/L)
ū	concentration in Babbitt WWTP discharge	C_sBab =	0.0006	(mg/L)
	concentration in Area 5 Pit NW discharge	C_spit =	0.000555	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.007940593	(mg/L)
e e	concentration in hydrometallurgical residue cells liner leakage	C rrs =	0.005	(mg/L)
ő	concentration in tailings basin cell 2W	C s2w =	0.001556	(mg/L)
	concentration of ground water into PM-12	C g12 =	0.0011	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.0011	(mg/L)

			Low Flo	W	Average I	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	1	(mg/s)	0.21	(mg/s)	2	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.04	(mg/s)	12	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s)
conc	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.34	(mg/s)	1.34	(mg/s)	1.34	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
	mass flux in seepage from cell 2W	M_s2w =	0.09	(mg/s)	0.09	(mg/s)		(mg/s)
			Low Flo	w	Average I	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.25	(mg/s)	2.46	(mg/s)
Mass at ea	mass flux in river at PM-13	M_r13 =	1.60 Low Flo	(mg/s)		(mg/s)		(mg/s)
		_	LOW FIO	w	Average I	riow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Con	concentration in river at PM-13	C_r13 =	0.004	(mg/L)	0.001	(mg/L)	0.001	(mg/L)

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 20 Copper			
	concentration of surface water into PM-12	C_s12 =	0.0015	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0015	(mg/L)
n da		C_sBab =	0.0015	(mg/L)
ţ	concentration in Area 5 Pit NW discharge	C_spit =	0.00345	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.020208301	(mg/L)
Ser	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0015	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.54	(mg/s)	6	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.61	(mg/s)	30	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.48	(mg/s)	0.48	(mg/s)	0.48	(mg/s)
i i	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.19	(mg/s)	0.19	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	3.41	(mg/s)	3.41	(mg/s)	3.41	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္မ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.26	(mg/s)		(mg/s)	0.26	(mg/s)
			Low Flo	W	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.11	(mg/s)	0.65	(mg/s)	6.19	(mg/s)
Ma	mass flux in river at PM-13	M_r13 =	4.29	(mg/s)		(mg/s)	40.35	(mg/s)
			Low Flo	W	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.003	(mg/L)	0.002	(mg/L)	0.002	(mg/L)
Convertilux to concer	concentration in river at PM-13	C_r13 =	0.011	(mg/L)	0.003	(mg/L)	0.002	(mg/L)

C_s2w =

C_g12 =

C_g13 =

0.004555

0.004

0.004 (mg/L)

(mg/L)

(mg/L)

Case	Teal 20			
Parameter	Fluoride			
		-		
	concentration of surface water into PM-12	C_s12 =	0.2	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.2	(mg/L)
0	concentration in Babbitt WWTP discharge	C_sBab =	0.2	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.125	(mg/L)
tr	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	7.70E-01	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	2.85E+00	(mg/L)
lo S	concentration in tailings basin cell 2W	C_s2w =	1.55	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.385	(mg/L)
<u>n</u>	concentration of ground water into PM-13	C_g13 =	0.385	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	71.37	(mg/s)	810	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	9.37	(mg/s)	9.37	(mg/s)	9.37	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	1.87	(mg/s)	1.87	(mg/s)	1.87	(mg/s)
it.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	348.26	(mg/s)	3,976	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	45.87	(mg/s)	45.87	(mg/s)	45.87	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.92	(mg/s)	7.04	(mg/s)	7.04	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	130.19	(mg/s)	130.19	(mg/s)	130.19	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	1.56	(mg/s)	1.56	(mg/s)	1.56	(mg/s)
ဗ လိ	mass flux in seepage from cell 2W	M_s2w =	87.47	(mg/s)	87.47	(mg/s)	87.47	(mg/s)
			Low Flo	W	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	11.24	(mg/s)	82.61	(mg/s)	821.52	(mg/s)
M, at	mass flux in river at PM-13	M_r13 =	277.25		703.00		5,069.97	, ,
	T		Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.334	(mg/L)	0.212	(mg/L)	0.201	(mg/L)
Co flux col	concentration in river at PM-13	C_r13 =	0.718	(mg/L)	0.278	(mg/L)	0.208	(mg/L)

Case Parameter	Year 20 Iron			
	concentration of surface water into PM-12	C s12 =	2.9	(mg/L)
data	concentration of surface water into PM-13	C_s13 =		(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	2.9	(mg/L)
concentration	concentration in Area 5 Pit NW discharge	C_spit =	0.037761905	(mg/L)
	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	8.72E-02	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	4.00E-01	(mg/L)
Ö	concentration in tailings basin cell 2W	C_s2w =	4.594	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.035	(mg/L)
	concentration of ground water into PM-13	C_g13 =	0.035	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,034.90	(mg/s)	11,749	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.85	(mg/s)	0.85	(mg/s)	0.85	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	27.08	(mg/s)	27.08	(mg/s)	27.08	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	5,049.77	(mg/s)	57,657	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	4.17	(mg/s)	4.17	(mg/s)	4.17	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.28	(mg/s)	2.13	(mg/s)	2.13	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	14.74	(mg/s)	14.74	(mg/s)	14.74	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.22	(mg/s)	0.22	(mg/s)	0.22	(mg/s)
င္မ င	mass flux in seepage from cell 2W	M_s2w =	259.25	(mg/s)	259.25	(mg/s)	259.25	
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	27.93	(mg/s)	1,062.84	(mg/s)	11,777.08	(mg/s)
Ma	mass flux in river at PM-13	M_r13 =	306.59	(mg/s)	6,393.11	(mg/s)	69,714.22	(mg/s)
			Low Flo	W	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12 concentration in river at PM-13	C_r12 =	0.829	(mg/L)	2.721	(mg/L)	2.883	(mg/L)
Conver flux to concer	concentration in river at PM-13	C r13 =	0.794	(mg/L)	2.524	(mg/L)	2.861	(mg/L)

Case Parameter	Year 20 Hardness			
	concentration of surface water into PM-12	C_s12 =	70	(m
2		C_s13 =	70	(m
7	concentration in Babbitt WWTP discharge	C_sBab =	70	(m

		concentration of surface water into PW-12	U_S12 =	70	(mg/L)
	ata	concentration of surface water into PM-13	C_s13 =	70	(mg/L)
	ı da	concentration in Babbitt WWTP discharge	C_sBab =	70	(mg/L)
	tion	concentration in Area 5 Pit NW discharge	C_spit =	942.7142857	(mg/L)
	ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	2.71E+02	(mg/L)
	Icer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	8.61E+03	(mg/L)
	cor	concentration in tailings basin cell 2W	C_s2w =	436.6	(mg/L)
	out	concentration of ground water into PM-12	C_g12 =	87.5	(mg/L)
	duj	concentration of ground water into PM-13	C_g13 =	87.5	(mg/L)
•			•		

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	24,980.41	(mg/s)	283,600	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	2,129.58	(mg/s)	2,129.58	(mg/s)	2,129.58	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	653.73	(mg/s)	653.73	(mg/s)	653.73	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	121,890.93	(mg/s)	1,391,712	(mg/s
Cer	mass flux of ground water into PM-13	M_g13 =	10,425.01	(mg/s)	10,425.01	(mg/s)	10,425.01	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	6,936.49	(mg/s)	53,090.84	(mg/s)	53,090.84	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	45,758.38	(mg/s)	45,758.38	(mg/s)	45,758.38	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	4,703.46	(mg/s)	4,703.46	(mg/s)	4,703.46	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	24,638.27	(mg/s)	24,638.27	(mg/s)	24,638.27	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	2,783.31	(mg/s)	27,763.72	(mg/s)	286,383.27	(mg/s
Mas at e	mass flux in river at PM-13	M_r13 =	95,244.92 Low Flo		288,270.61 Average		1,816,711.16 High Fl	
ss u			LOW FIO	w	Average	Flow	High Fi	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	82.647	(mg/L)	71.091	(mg/L)	70.104	(mg/
Convertill Concertion	concentration in river at PM-13	C r13 =	246.661	(mg/L)	113.794	(mg/L)	74.553	(ma/l

Case	Year 20			
Parameter	Potassium	<u> </u>		
		ı	Г	
	concentration of surface water into PM-12	C_s12 =	0.60	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.60	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	0.60	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	53.80	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	13.45	(mg/L)
<u></u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	7.77	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	1.60	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	1.60	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	214.12	(mg/s)	2,431	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	38.94	(mg/s)	38.94	(mg/s)	38.94	(mg/s
Ę	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.98	(mg/s)	0.98	(mg/s)	0.98	(mg/s
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1,044.78	(mg/s)	11,929	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	190.63	(mg/s)	190.63	(mg/s)	190.63	(mg/s
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	5.60	(mg/s)	5.60	(mg/s)	5.60	(mg/s
	mass flux of Area 5 Pit NW discharge	M_spit =	395.86	(mg/s)	3,029.85	(mg/s)	3,029.85	(mg/s
Convert to mass	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	2,272.35	(mg/s)	2,272.35	(mg/s)	2,272.35	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	438.48	(mg/s)	438.48	(mg/s)	438.48	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	39.92	(mg/s)	254.04	(mg/s)	2,470.78	(mg/s
Mass ba at each i	mass flux in river at PM-13	M_r13 =	3,342.85 Low Flo		7,235.74 Average		20,336.66 High Fl	
ω ⊏			2011 110		7.torugo			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	1.186	(mg/L)	0.650	(mg/L)	0.605	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	8.657	(mg/L)	2.856	(mg/L)	0.835	(ma/l

Case Parameter	Year 20 Magnesium			
	concentration of surface water into PM-12	C s12 =	5.90	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	5.90	(mg/L)
n da	Iconcentration in Bappitt VVVV LP discharge	C_sBab =	5.90	(mg/L)
ţi	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)

concentration of surface water into PM-13 C_s13 = 5.90 (mg/L) concentration in Babbitt WWTP discharge concentration in Area 5 Pit NW discharge concentration in Area 5 Pit NW discharge concentration in seepage from Tailings Basin Cells 1E and 2E C_fs = 19.45 (mg/L) concentration in hydrometallurgical residue cells liner leakage concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L) concentration of ground water into PM-12 C g12 = 10.65 (mg/L)		concentration of caracce trater into 1 to 12	0_0:= -	0.00	(9, -)
concentration in Babbitt WWTP discharge	ata	concentration of surface water into PM-13	C_s13 =	5.90	(mg/L)
concentration in seepage from Tailings Basin Cells 1E and 2E C_fs = 19.45 (mg/L concentration in hydrometallurgical residue cells liner leakage C_rrs = 213.00 (mg/L concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L		concentration in Babbitt WWTP discharge	C_sBab =	5.90	(mg/L)
concentration in seepage from Tailings Basin Cells 1E and 2E C_fs = 19.45 (mg/L concentration in hydrometallurgical residue cells liner leakage C_rrs = 213.00 (mg/L concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration tailings basin cell 2W C_s2w = 69.97 (mg/L concentration t		concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)
concentration in tailings basin cell 2W C_s2w = 69.97 (mg/L	ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	19.45	(mg/L)
	Ser	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	213.00	(mg/L)
concentration of ground water into PM-12 C. g12 = 10.65 (mg/l	cor	concentration in tailings basin cell 2W	C_s2w =	69.97	(mg/L)
Concentration of ground water into 1 W 12 O_g12 = 10:05 (mg/s	t t	concentration of ground water into PM-12	C_g12 =	10.65	(mg/L)
concentration of ground water into PM-13	ם	concentration of ground water into PM-13	C_g13 =	10.65	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,105.49	(mg/s)	23,903	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	259.20	(mg/s)	259.20	(mg/s)	259.20	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	55.10	(mg/s)	55.10	(mg/s)	55.10	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,273.66	(mg/s)	117,301	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	1,268.87	(mg/s)	1,268.87	(mg/s)	1,268.87	(mg/s)
Lo n	mass flux of Area 5 Pit NW discharge	M_spit =	1,994.02	(mg/s)	15,261.91	(mg/s)	15,261.91	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	3,286.07	(mg/s)	3,286.07	(mg/s)	3,286.07	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	116.36	(mg/s)	116.36	(mg/s)	116.36	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	3,948.56	(mg/s)	3,948.56	(mg/s)	3,948.56	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	314.30	(mg/s)	2,419.79	(mg/s)	24,217.73	(mg/s)
Mg at	mass flux in river at PM-13	M_r13 =	10,928.17	,	36,575.21		165,400.92	
			Low Flo	W	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	9.333	(mg/L)	6.196	(mg/l)	5.928	(mg/l)
Conve flux to concer	concentration in river at PM-13	C_r13 =	28.301	(mg/L)	14.438	(mg/l)	6.788	(mg/l)

Case	Year 20			
Parameter	Manganese	J		
	concentration of surface water into PM-12	C_s12 =	0.30	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.30	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.30	(mg/L)
tior	concentration in Area 5 Pit NW discharge	C_spit =	0.49	(mg/L)
tra tra	concentration of surface water into PM-12 concentration of surface water into PM-13 concentration in Babbitt WWTP discharge concentration in Area 5 Pit NW discharge concentration in seepage from Tailings Basin Cells 1E and 2	C_fs =	0.45	(mg/L)
	concentration of surface water into PM-12	C_rrs =	0.00	(mg/L)
log	concentration in tailings basin cell 2W	C_s2w =	1.18	(mg/L)
	concentration of ground water into PM-12	C_g12 =	0.19	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.19	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	107.06	(mg/s)	1,215	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	4.58	(mg/s)	4.58	(mg/s)	4.58	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	2.80	(mg/s)	2.80	(mg/s)	2.80	(mg/s)
it	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	522.39	(mg/s)	5,964	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	22.40	(mg/s)	22.40	(mg/s)	22.40	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	3.57	(mg/s)	27.31	(mg/s)	27.31	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	76.11	(mg/s)	76.11	(mg/s)	76.11	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	66.76	(mg/s)	66.76	(mg/s)	66.76	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
balance ch node	mass flux in river at PM-12	M_r12 =	7.38	(mg/s)	114.44	(mg/s)	1,222.81	(mg/s)
Mass ba at each	mass flux in river at PM-13	M_r13 =	176.22 Low Flo		829.41 Average		7,379.87 High Fl	
			2011 1 10		Average	1.011	- Ingili	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.219	(mg/L)	0.293	(mg/l)	0.299	(mg/l)
Converture flux to concer	concentration in river at PM-13	C_r13 =	0.456	(mg/L)	0.327	(mg/l)	0.303	(mg/l)

Case Parameter	Year 20 Sodium			
	concentration of surface water into PM-12	C_s12 =	6.00	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	6.00	(mg/L)
d u	Iconcentration in Bappitt WW LP discharge	C_sBab =	6.00	(mg/L)
i	concentration in Area 5 Pit NW discharge	C_spit =	119.50	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	19.36	(mg/L)

	concentration in Area 5 Fit NVV discharge	U_3pit =	113.50	(IIIg/L)				
	concentration in seepage from Tailings Basin Cells 1E and 2l	E C_fs =	19.36	(mg/L)				
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	255.00	(mg/L)				
	concentration in tailings basin cell 2W	C_s2w =	44.31	(mg/L)				
	concentration of ground water into PM-12	C_g12 =	4.90	(mg/L)				
	concentration of ground water into PM-13	C_g13 =	4.90	(mg/L)				
			Low Flo	w	Average I	Flow	High Flo	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,141.18	(mg/s)	24,309	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	119.26	(mg/s)	119.26	(mg/s)	119.26	(mg/s)
ion	mass flux in Babbitt WWTP discharge	M_sBab =	56.03	(mg/s)	56.03	(mg/s)	56.03	(mg/s)
concentration	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,447.79	(mg/s)	119,290	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	583.80	(mg/s)	583.80	(mg/s)	583.80	(mg/s)
Ö	mass flux of Area 5 Pit NW discharge	M_spit =	879.28	(mg/s)	6,729.88	(mg/s)	6,729.88	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M fs =	3,272.20	(mg/s)	3,272.20	(mg/s)	3,272.20	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M rrs =	139.30	(mg/s)	139.30	(mg/s)	139.30	(mg/s)
ပိ	mass flux in seepage from cell 2W	M_s2w =	2,500.51	(mg/s)	2,500.51		2,500.51	(mg/s)
			Low Flo	w	Average I	Flow	High Flo	ow
8	9							
Mass balance	mass flux in river at PM-12	M_r12 =	175.29	(mg/s)	2,316.47	(mg/s)	24,483.86	(mg/s)
p p	ភូ							
ass								
Σ	mass flux in river at PM-13	M_r13 =	7,550.38 Low Flo		25,989.95 Average		156,999.14 High Fl	` '
			LOW FIO	vv	Average	FIOW	High Fit	OW
SS	5							
E E	concentration in river at PM-12	C r12 =	5.205	(mg/L)	5.931	(mg/l)	5.993	(mg/l)
ert	ti di			`		, , ,		
Convert mass flux to	concentration in river at PM-13							
ŭ≓	concentration in river at PM-13	C_r13 =	19.554	(mg/L)	10.259	(mg/l)	6.443	(mg/l)

concentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-13

Case Parameter	Year 20 Nickel			
	concentration of surface water into PM-12	C_s12 =	0.0012	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0012	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0012	(mg/L)
_	concentration in Area 5 Pit NW discharge	C_spit =	0.0052	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.141786777	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.43	(mg/s)	5	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.09	(mg/s)	24	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.83	(mg/s)	0.83	(mg/s)	0.83	(mg/s)
u X	mass flux of Area 5 Pit NW discharge	M_spit =	0.04	(mg/s)	0.29	(mg/s)	0.29	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	23.96	(mg/s)	23.96	(mg/s)	23.96	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s)
င္ င	mass flux in seepage from cell 2W	M_s2w =	0.39	(mg/s)	0.39	(mg/s)	0.39	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)		(mg/s)
at M	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
	T	_	Low Flo	W	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.005	(mg/L)	0.002	(mg/L)	0.001	(mg/L)
Con	concentration in river at PM-13	C r13 =	0.066	(mg/L)	0.011	(mg/L)	0.002	(mg/L)

C_rrs =

C_s2w =

C_g12 = C_g13 = 0.098 (mg/L) 0.00688 (mg/L)

0.007 (mg/L)

0.007 (mg/L)

Case	Year 20			
Parameter	Lead			
	concentration of surface water into PM-12	C_s12 =	0.00015	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00015	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.00015	(mg/L)
Ē	concentration in Area 5 Pit NW discharge	C_spit =	0.0003	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001841737	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0005	(mg/L)
COL	concentration in tailings basin cell 2W	C_s2w =	0.0012	(mg/L)
Į,	concentration of ground water into PM-12	C_g12 =	0.0012	(mg/L)
宣	concentration of ground water into PM-13	C_g13 =	0.0012	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.05	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.26	(mg/s)	3	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.02	(mg/s)	0.02	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.31	(mg/s)	0.31	(mg/s)	0.31	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.08	(mg/s)	0.64	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	0.55 Low Flo	(mg/s)	0.88	(mg/s)	4.16 High Fl	
ass								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(ma/l

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 20 Antimony			
	concentration of surface water into PM-12	C_s12 =	4.00E-05	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	4.00E-05	(mg/L)
		C_sBab =	4.00E-05	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	2.50E-04	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.02E-02	(mg/L)
cer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
_				

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.01	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.73	(mg/s)	1.73	(mg/s)	1.73	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	0.01	(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =		(mg/s)		(mg/s)		(mg/s)
at M	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	W	Average	FIOW	High FI	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Converture flux to concer	concentration in river at PM-13	C r13 =	0.005	(mg/L)	0.001	(mg/L)	0.000	(mg/L)

C_s2w =

C_g12 =

C_g13 =

(mg/L)

(mg/L)

2.50E-04

1.50E-03

1.50E-03 (mg/L)

Case Parameter	Year 20 Selenium			
i arameter	Ocionian	<u> </u>		
	concentration of surface water into PM-12	C_s12 =	0.0003	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0003	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0003	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.0016	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.002326015	(mg/L)
ie i	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.054	(mg/L)
LO CO	concentration in tailings basin cell 2W	C_s2w =	0.00109	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.00295	(mg/L)
≝	concentration of ground water into PM-13	C_g13 =	0.00295	(mg/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.11	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
it.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.52	(mg/s)	6	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	0.35	(mg/s)	0.35	(mg/s)	0.35	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.09	(mg/s)	0.09	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.39	(mg/s)	0.39	(mg/s)	0.39	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
			Low Flo	w	Average	Flow	High Fl	low
ass balance each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.18	(mg/s)	1.29	(mg/s
Mass at eac		M_r13 =		(mg/s)		(mg/s)	8.18 High Fl	(mg/s
	1		Low Flo	w	Average	Flow	High I	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.000	(mg/L)	0.000	

	i		
ncentration of surface water into PM-12	C s12 =	4.00	(mg/L
ncentration of surface water into PM-13	C_s13 =		(mg/L
ncentration in Babbitt WWTP discharge	C_sBab =	4.00	(mg/L
ncentration in Area 5 Pit NW discharge	C_spit =	1046.27	(mg/L
ncentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	211.97	(mg/L
ncentration in hydrometallurgical residue cells liner leakage	C_rrs =	7347.00	(mg/L
ncentration in tailings basin cell 2W	C_s2w =	152.40	(mg/L
ncentration of ground water into PM-12	C_g12 =	8.50	(mg/L
ncentration of ground water into PM-13	C_g13 =	8.50	(mg/L
	centration of surface water into PM-13 centration in Babbitt WWTP discharge centration in Area 5 Pit NW discharge centration in seepage from Tailings Basin Cells 1E and 2E centration in hydrometallurgical residue cells liner leakage centration in tailings basin cell 2W centration of ground water into PM-12	centration of surface water into PM-13 C_s13 = centration in Babbitt WWTP discharge C_sBab = centration in Area 5 Pit NW discharge C_spit = centration in seepage from Tailings Basin Cells 1E and 2E C_fs = centration in hydrometallurgical residue cells liner leakage C_rrs = centration in tailings basin cell 2W C_s2w = centration of ground water into PM-12 C_g12 =	centration of surface water into PM-13 $C_s13 = 4.00$ centration in Babbitt WWTP discharge $C_sBab = 4.00$ centration in Area 5 Pit NW discharge $C_spit = 1046.27$ centration in seepage from Tailings Basin Cells 1E and 2E $C_sfs = 211.97$ centration in hydrometallurgical residue cells liner leakage $C_s2w = 152.40$ centration of ground water into PM-12 $C_s212 = 8.50$

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,427.45	(mg/s)	16,206	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	206.87	(mg/s)	206.87	(mg/s)	206.87	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	37.36	(mg/s)	37.36	(mg/s)	37.36	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	6,965.20	(mg/s)	79,526	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	1,012.72	(mg/s)	1,012.72	(mg/s)	1,012.72	(mg/s)
Lo n	mass flux of Area 5 Pit NW discharge	M_spit =	7,698.43	(mg/s)	58,922.60	(mg/s)	58,922.60	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	35,819.52	(mg/s)	35,819.52	(mg/s)	35,819.52	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	4,013.51	(mg/s)	4,013.51	(mg/s)	4,013.51	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	8,600.26	(mg/s)	8,600.26	(mg/s)	8,600.26	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	244.23	(mg/s)	1,671.68	(mg/s)	16,449.94	(mg/s)
Mg at	mass flux in river at PM-13	M_r13 =	57,388.66		117,005.48		204,344.94	
			Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to	concentration in river at PM-12	C_r12 =	7.252	(mg/L)	4.280	(mg/l)	4.027	(mg/l)
Conve flux to concer	concentration in river at PM-13	C r13 =	148.623	(mg/L)	46.188	(mg/l)	8.386	(mg/l)

Case Parameter	Year 20 Thallium			
		4		
	concentration of surface water into PM-12	C_s12 =	0.0002	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0002	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.0002	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0006	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001147722	(mg/L)
ncer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0002	(mg/L)
lo con	concentration in tailings basin cell 2W	C_s2w =	0.0002	(mg/L)
į	concentration of ground water into PM-12	C_g12 =	0.000004	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.000004	(mg/L)

•			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
tio	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
tra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.35	(mg/s)	4	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.19	(mg/s)	0.19	(mg/s)	0.19	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.07	(mg/s)	0.81	(mg/s
Mass ba at each i	mass flux in river at PM-13	M_r13 =	0.21 Low Flo	(mg/s)	0.66	(mg/s)	5.03 High Fl	(mg/s
SS LC							g	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(ma/

Case Parameter	Year 20 Zinc			
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
at a	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
<u>"</u>	Iconcentration in Bappitt WW LP discharge	C_sBab =	0.016	(mg/L)
يَ يُ	concentration in Area 5 Pit NW discharge	C_spit =	0.003	(mg/L)

				(9, =/
ata	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
₽	concentration in Area 5 Pit NW discharge	C_spit =	0.003	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.061124366	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.01	(mg/L)
S	concentration in tailings basin cell 2W	C_s2w =	0.01435	(mg/L)
Ħ	concentration of ground water into PM-12	C_g12 =	0.0115	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.0115	(mg/L)

			Low Flo	w	Average l	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	1	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.28	(mg/s)	0.28	(mg/s)	0.28	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	1	(mg/s)	27.86	(mg/s)	318	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.02	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	10.33	(mg/s)	10.33	(mg/s)	10.33	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
မ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.81	(mg/s)	0.81	(mg/s)	0.81	(mg/s)
			Low Flo	w	Average l	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.43	(mg/s)	6.14	(mg/s)	65.25	(mg/s)
Ma	mass flux in river at PM-13	M_r13 =	12.97	(mg/s)	46.68	(mg/s)	396.04	(mg/s)
			Low Flo	w	Average I	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.013	(mg/L)	0.016	(mg/L)	0.016	(mg/L)
Con	concentration in river at PM-13	C_r13 =	0.034	(mg/L)	0.018	(mg/L)	0.016	(mg/L)

Appendix F.7
Embarrass River
Proposed Action
Closure

FLOWS

Case	Closure				
Flows	Low Flow Conditions (no surface runoff)				Node
in s River	flow in river at PM-12	Q_r12_L =	1.19	(cfs)	PM-12
Total flow in Embarrass Ri	flow in river at PM-13	Q_r13_L =	9.78	(cfs)	PM-13
Tota	flow check	Q_ck_L =	9.78	(cfs)	
	surface water flow into PM-12	Q_s12_L =	0.00	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_L =	0.00	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_L =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_L =	0.26	(cfs)	PM-13
<u>t</u> a	seepage from Tailings Basin Cells 1E and 2E	Q_fs_L =	2.45	(cfs)	PM-13
flow data	hydrometallurgical residue cells liner leakage	Q_rrs_L =	0.00	(cfs)	PM-13
lo N	seepage from cell 2W	Q_s2w_L =	1.67	(cfs)	PM-13
Input 1	ground water flow into PM-12	Q_g12_L =	0.86	(cfs)	PM-12
<u>u</u>	ground water flow into PM-13	Q_g13_L =	4.21	(cfs)	PM-13

Case	Closure				
Flow	Average Flow Conditions (mean annual)				_
n River	flow in river at PM-12	Q_r12_M =	13.80	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_M =	85.65	(cfs)	PM-13
Total Emba	flow check	Q_ck_M =	85.65	(cfs)	
	surface water flow into PM-12	Q_s12_M =	12.61	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_M =	61.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_M =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_M =	1.99	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_M =	2.45	(cfs)	PM-13
	hydrometallurgical residue cells liner leakage	Q_rrs_M =	0.00	(cfs)	PM-13
Š Š	seepage from cell 2W	Q_s2w_M =	1.67	(cfs)	PM-13
Input flow	ground water flow into PM-12	Q_g12_M =	0.86	(cfs)	PM-12
ဋ	ground water flow into PM-13	Q_g13_M =	4.21	(cfs)	PM-13

Case	Closure				
Flow	High Flow Conditions (avg. annual 1-day max flow)				_
n River	flow in river at PM-12	Q_r12_H =	144.35	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_H =	857.20	(cfs)	PM-13
Tota	flow check	Q_ck_H =	857.20	(cfs)	
	surface water flow into PM-12	Q_s12_H =	143.16	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_H =	702.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_H =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_H =	1.99	(cfs)	PM-13
草	seepage from Tailings Basin Cells 1E and 2E	Q_fs_H =	2.45	(cfs)	PM-13
flow data	hydrometallurgical residue cells liner leakage	Q_rrs_H =	0.00	(cfs)	PM-13
<u>[</u>	seepage from cell 2W	Q_s2w_H =	1.67	(cfs)	PM-13
Input	ground water flow into PM-12	Q_g12_H =	0.86	(cfs)	PM-12
트	ground water flow into PM-13	Q_g13_H =	4.21	(cfs)	PM-13

Case Parameter	Closure Silver			
	concentration of surface water into PM-12	C s12 =	0.00011	(mg/L)
data	concentration of surface water into PM-13	 C_s13 =	0.00011	` •
ρ r	concentration in Babbitt WWTP discharge	C_sBab =	0.00011	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00015	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00097	(mg/L)
ie i	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.000125	(mg/L)
Son	concentration in tailings basin cell 2W	C_s2w =	0.000100	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.000008	(mg/L)
<u>=</u>	concentration of ground water into PM-13	C a13 =	0.000008	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
<u>t</u>	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.19	(mg/s)	2	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
မ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.45	(mg/s)
Mass ba at each	mass flux in river at PM-13	M_r13 =		(mg/s)	_	(mg/s)		(mg/s)
	T		Low Flo	w	Average	FIOW	High FI	ow
t mass tration	concentration in river at PM-12 concentration in river at PM-13	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case Parameter	Closure Aluminum			
		1		1
	concentration of surface water into PM-12	C_s12 =	0.12	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.12	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	0.12	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.01325	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.37E-01	(mg/L)
nce	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80E-01	(mg/L)
S	concentration in tailings basin cell 2W	C_s2w =	1.5788	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.025	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.025	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	42.82	(mg/s)	486	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.61	(mg/s)	0.61	(mg/s)	0.61	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	208.96	(mg/s)	2,386	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	2.98	(mg/s)	2.98	(mg/s)	2.98	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.10	(mg/s)	0.75	(mg/s)	0.75	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	44.20	(mg/s)	44.20	(mg/s)	44.20	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	74.66	(mg/s)	74.66	(mg/s)	74.66	(mg/s
			Low Flo	w	Average	Flow	High FI	ow
balance th node	mass flux in river at PM-12	M_r12 =	1.73	(mg/s)	44.55	(mg/s)	487.90	(mg/s
Mass ba at each		M_r13 =	123.68 Low Flo		376.10 Average		2,996.29 High Fl	
ss uo								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.051	(mg/L)	0.114	(mg/L)	0.119	(mg/l
Conve flux to conce	concentration in river at PM-13	C r13 =	0.447	(ma/L)	0 155	(mg/L)	0.124	(ma/l

Case Parameter	Closure Arsenic			
		4		
	concentration of surface water into PM-12	C_s12 =	0.00075	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00075	(mg/L)
ğ u	concentration in Babbitt WWTP discharge	C_sBab =	0.00075	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.001325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.012359831	(mg/L)
95	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
log	concentration in tailings basin cell 2W	C_s2w =	0.00291	(mg/L)
Ħ	concentration of ground water into PM-12	C_g12 =	0.00273	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.00273	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.27	(mg/s)	3	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.31	(mg/s)	15	(mg/s)
Gen	mass flux of ground water into PM-13	M_g13 =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.86	(mg/s)	0.86	(mg/s)	0.86	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.34	(mg/s)	3.11	(mg/s
Me at	mass flux in river at PM-13	M_r13 =		(mg/s)	3.04	(mg/s)	19.42	
			Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Conve flux to conce	concentration in river at PM-13	C r13 =	0.005	(mg/L)	0.001	(mg/L)	0.001	(mg/L

Case Parameter	Closure Boron			
	concentration of surface water into PM-12	C_s12 =	0.027	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.027	(mg/L)
بق	concentration in Babbitt WWTP discharge	C_sBab =	0.027	(mg/L)
Ę.	concentration in Area 5 Pit NW discharge	C_spit =	0.1315	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.198832748	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.11	(mg/L)
CO	concentration in tailings basin cell 2W	C_s2w =	0.33	(mg/L)
Ħ	concentration of ground water into PM-12	C_g12 =	0.0212	(mg/L)
윤		C a13 -	0.0212	(ma/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	9.64	(mg/s)	109	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)	0.52	(mg/s)	0.52	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	47.02	(mg/s)	537	(mg/s)
Çe	mass flux of ground water into PM-13	M_g13 =	2.53	(mg/s)	2.53	(mg/s)	2.53	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.97	(mg/s)	7.41	(mg/s)	7.41	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	13.79	(mg/s)	13.79	(mg/s)	13.79	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	15.61	(mg/s)	15.61	(mg/s)	15.61	(mg/s)
			Low Flo	w	Average	Flow	High Fl	low
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =		(mg/s)		(mg/s)	110.16	
	Indo hax in two at the to	10_110 =	Low Flo		Average		High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.023	(mg/L)	0.027	(mg/L)	0.027	(mg/L)
S = S	concentration in river at PM-13	C r13 =	0.122	(ma/L)	0.040	(ma/L)	0.000	(mg/L

Case Parameter	Closure Barium			
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0044	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	4.81E-02	(mg/L)
ncer	concentration in hydrometallurgical residue cells liner leakage	C rrs =	5.00E-03	(mg/L)
6	concentration in tailings basin cell 2W	C s2w =	0.09298	(mg/L)
_	concentration of ground water into PM-12	C_g12 =	0.0681	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.0681	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	1.66	(mg/s)	1.66	(mg/s)	1.66	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	8.11	(mg/s)	8.11	(mg/s)	8.11	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.25	(mg/s)	0.25	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	3.34	(mg/s)	3.34	(mg/s)	3.34	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	4.40	(mg/s)	4.40	(mg/s)	4.40	(mg/s
			Low Flo	W	Average	Flow	High Fl	ow
balance ch node	mass flux in river at PM-12	M_r12 =	1.81	(mg/s)	7.52	(mg/s)	66.63	(mg/s
Mass ba at each		M_r13 =	17.69 Low Flo	(mg/s)	51.47 Average	(mg/s)	400.83 High Fl	
ass			2011 1 10		Morago			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.054	(mg/L)	0.019	(mg/L)	0.016	(mg/l
Conve flux to conce	concentration in river at PM-13	C r13 =	0.064	(mg/L)	0.021	(mg/L)	0.017	(ma/l

Case Parameter	Closure Beryllium			
rarameter	Derymum			
	concentration of surface water into PM-12	C_s12 =	0.0001	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0001	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0001	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000808254	(mg/L)
95	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0	(mg/L)
Ö	concentration in tailings basin cell 2W	C_s2w =	0.00075	(mg/L)
ħ	concentration of ground water into PM-12	C_g12 =	0.000023	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.000023	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıt.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.17	(mg/s)	2	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	-	(mg/s)	-	(mg/s)	_	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
balance h node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.41	(mg/s)
Mass ba at each		M_r13 =	0.10 Low Flo	(mg/s)		(mg/s)		(mg/s)
			LOW FIO	W	Average	riow	High Fl	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Conver flux to	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case Parameter	Closure Calcium			
		-		1
	concentration of surface water into PM-12	C_s12 =	15	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	15	(mg/L)
ρ	concentration in Babbitt WWTP discharge	C_sBab =	15	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	95.35	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	59.94387899	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	416	(mg/L)
Con	concentration in tailings basin cell 2W	C_s2w =	59.78	(mg/L)
t t	concentration of ground water into PM-12	C_g12 =	19	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	19	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5,352.95	(mg/s)	60,771	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	462.42	(mg/s)	462.42	(mg/s)	462.42	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	140.09	(mg/s)	140.09	(mg/s)	140.09	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	26,119.49	(mg/s)	298,224	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	2,263.72	(mg/s)	2,263.72	(mg/s)	2,263.72	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	701.59	(mg/s)	5,369.83	(mg/s)	5,369.83	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	4,157.57	(mg/s)	4,157.57	(mg/s)	4,157.57	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	19.51	(mg/s)	19.51	(mg/s)	19.51	(mg/s
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	2,826.97	(mg/s)	2,826.97	(mg/s)	2.80	(mg/s
			Low Flo	N	Average	Flow	High Fl	ow
balance h node	mass flux in river at PM-12	M_r12 =	602.51	(mg/s)	5,955.45	(mg/s)	61,373.93	(mg/s
Mass ba at each	mass flux in river at PM-13	M_r13 =	10,571.86 Low Flo		46,712.53 Average		371,411.34 High Fl	
" c			LOW 1 10		Average	liow	riigii i	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	17.891	(mg/L)	15.249	(mg/l)	15.024	(mg/l)
Conver flux to concer	concentration in river at PM-13	C r13 =	38.183	(ma/L)	19.271	(mg/l)	15.310	(ma/l)

Case	Closure			
Parameter	Cadmium			
	concentration of surface water into PM-12	C_s12 =	0.00008	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00008	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.00008	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000227872	(mg/L)
95	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0004	(mg/L)
lo co	concentration in tailings basin cell 2W	C_s2w =	0.000188	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.0003	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.0003	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.03	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
tra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.14	(mg/s)	2	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.02	(mg/s)	0.02	(mg/s)	0.02	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.01	(mg/s)	0.04	(mg/s)	0.33	(mg/s
Mas		M_r13 =	0.07	(mg/s)	0.24	(mg/s)	1.99 High Fi	(mg/s
8 E			LOW 110		Average	1000	ingiri	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(ma/L

Case Parameter	Closure Chloride			
	concentration of surface water into PM-12	C s12 =	6.5	(ma/l)
ata	concentration of surface water into PM-12	C_s12 = C s13 =		(mg/L) (mg/L)
P u	concentration in Babbitt WWTP discharge	C_sBab =		(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	5.95	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.29E+00	(mg/L)
200	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.76E+03	(mg/L)
cor	concentration in tailings basin cell 2W	C_s2w =	21.54	(mg/L)
nput	concentration of ground water into PM-12	C_g12 =	1.8	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	1.8	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,319.61	(mg/s)	26,334	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	43.81	(mg/s)	43.81	(mg/s)	43.81	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	60.70	(mg/s)	60.70	(mg/s)	60.70	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	11,318.44	(mg/s)	129,230	(mg/s
Ser	mass flux of ground water into PM-13	M_g13 =	214.46	(mg/s)	214.46	(mg/s)	214.46	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	43.78	(mg/s)	335.09	(mg/s)	335.09	(mg/s)
		M_fs =	436.24	(mg/s)	436.24	(mg/s)	436.24	(mg/s
onvert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	82.56	(mg/s)	82.56	(mg/s)	82.56	(mg/s
ပိ 👨	mass flux in seepage from cell 2W	M_s2w =	1,018.62		1,018.62		1,018.62	
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	104.51	(mg/s)	2,424.12	(mg/s)	26,438.79	(mg/s
Mass k at each		M_r13 =	1,900.17		15,829.53 Average		157,756.15 High Fl	
			LOW 1 10		Average	11000	riigii i	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	3.103	(mg/L)	6.207	(mg/L)	6.472	(mg/L
Conver flux to	concentration in river at PM-13	C r13 =	6.863	(mg/L)	6,530	(mg/L)	6.503	(ma/L

Case Parameter	Closure Cobalt			
		1		
	concentration of surface water into PM-12	C_s12 =	0.0006	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0006	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0006	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.000555	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001356866	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.005	(mg/L)
Con	concentration in tailings basin cell 2W	C_s2w =	0.001556	(mg/L)
#	concentration of ground water into PM-12	C_g12 =	0.0011	(mg/L)
ם	concentration of ground water into PM-13	C_g13 =	0.0011	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.21	(mg/s)	2	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
<u>t</u>	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.04	(mg/s)	12	(mg/s)
concentration	mass flux of ground water into PM-13	M_g13 =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s)
u X	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
မ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.25	(mg/s)	2.46	(mg/s)
Mass ba at each	mass flux in river at PM-13	M_r13 =	0.34 Low Flo	(mg/s)		(mg/s)		(mg/s)
			LOW FIO	w	Average	FIOW	High Fl	OW
t mass tration	concentration in river at PM-12 concentration in river at PM-13	C_r12 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(ma/L)

Case Parameter	Closure Copper			
	··	4		
	concentration of surface water into PM-12	C_s12 =	0.0015	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0015	(mg/L)
0	concentration in Babbitt WWTP discharge	C_sBab =	0.0015	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00345	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.018240705	(mg/L)
Se	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0015	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.004555	(mg/L)
	concentration of ground water into PM-12	C_g12 =	0.004	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.004	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.54	(mg/s)	6	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.61	(mg/s)	30	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.48	(mg/s)	0.48	(mg/s)	0.48	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.19	(mg/s)	0.19	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.27	(mg/s)	1.27	(mg/s)	1.27	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.22	(mg/s)	0.22	(mg/s)	0.22	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
balance h node	mass flux in river at PM-12	M_r12 =	0.11	(mg/s)	0.65	(mg/s)	6.19	(mg/s
Mass ba at each		M_r13 =	2.09 Low Flo	(mg/s)	5.41 Average	(mg/s)	38.16 High Fl	
<i>o</i> 5			LOW 1 10		Average	liow	riigii i	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.003	(mg/L)	0.002	(mg/L)	0.002	(mg/L
Converture flux to	concentration in river at PM-13	C r13 =	0.008	(mg/L)	0.002	(mg/L)	0.002	(ma/L

Case	Closure			
Parameter	Fluoride	J		
	concentration of surface water into PM-12	C_s12 =	0.2	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.2	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.2	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.125	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.82E-02	(mg/L)
95	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	2.85E+00	(mg/L)
Ö	concentration in tailings basin cell 2W	C_s2w =	1.55	(mg/L)
t ta	concentration of ground water into PM-12	C_g12 =	0.385	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.385	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	71.37	(mg/s)	810	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	9.37	(mg/s)	9.37	(mg/s)	9.37	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	1.87	(mg/s)	1.87	(mg/s)	1.87	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	348.26	(mg/s)	3,976	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	45.87	(mg/s)	45.87	(mg/s)	45.87	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.92	(mg/s)	7.04	(mg/s)	7.04	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.27	(mg/s)	1.27	(mg/s)	1.27	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s
ဒို ဒိ	mass flux in seepage from cell 2W	M_s2w =	73.30	(mg/s)	73.30	(mg/s)	73.30	
			Low Flo	w	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	11.24	(mg/s)	82.61	(mg/s)	821.52	(mg/s
Mass at eac		M_r13 =	132.73 Low Flo		558.48 Average		4,925.45 High Fl	
ss			Low Flo	W	Average	Flow	High Fl	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.334	(mg/L)	0.212	(mg/L)	0.201	(mg/
Conve flux to conce	concentration in river at PM-13	C r13 =	0.479	(mg/L)	0.230	(mg/L)	0.203	(ma/l

Case	Closure			
Parameter	Iron			
		1	1	
	concentration of surface water into PM-12	C_s12 =	2.9	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	2.9	(mg/L)
D L	concentration in Babbitt WWTP discharge	C_sBab =	2.9	(mg/L)
ratio .	concentration in Area 5 Pit NW discharge	C_spit =	0.037761905	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.75E-01	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	4.00E-01	(mg/L)
COL	concentration in tailings basin cell 2W	C_s2w =	4.594	(mg/L)
brit	concentration of ground water into PM-12	C_g12 =	0.035	(mg/L)
ם	concentration of ground water into PM-13	C_g13 =	0.035	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,034.90	(mg/s)	11,749	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	0.85	(mg/s)	0.85	(mg/s)	0.85	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	27.08	(mg/s)	27.08	(mg/s)	27.08	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	5,049.77	(mg/s)	57,657	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	4.17	(mg/s)	4.17	(mg/s)	4.17	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.28	(mg/s)	2.13	(mg/s)	2.13	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	46.80	(mg/s)	46.80	(mg/s)	46.80	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.02	(mg/s)	0.02	(mg/s)	0.02	(mg/s
င္မွ ပိ	mass flux in seepage from cell 2W	M_s2w =	217.25	(mg/s)	217.25	(mg/s)	217.25	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	27.93	(mg/s)	1,062.84	(mg/s)	11,777.08	(mg/s
Mass ba at each i	mass flux in river at PM-13	M_r13 =	296.45 Low Flo		6,382.97 Average		69,704.07 High Fl	
ass					- monage			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.829	(mg/L)	2.721	(mg/L)	2.883	(mg/l
o X 6	concentration in river at PM-13	C r13 =	1.071			(mg/L)	2.873	

Case Parameter	Closure Hardness			
	concentration of surface water into PM-12	C_s12 =	70	(mg/L)
4	concentration of surface water into PM-13	C_s13 =	70	(mg/L)
<u> </u>	concentration in Babbitt WWTP discharge	C_sBab =	70	(mg/L)
i C	concentration in Area 5 Pit NW discharge	C_spit =	942.7142857	(mg/L)
<u> </u>		C_fs =	227	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	8610	(mg/L)
, ac	concentration in tailings basin cell 2W	C_s2w =	436.6	(mg/L)
	concentration of ground water into PM-12	C_g12 =	87.5	(mg/L)
	concentration of ground water into PM-13	C a13 -	97.5	(ma/L)

			Low Flow		Average Flow		High Flow		
ntration	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	24,980.41	(mg/s)	283,600	(mg/s)	
	mass flux of ground water into PM-12	M_g12 =	2,129.58	(mg/s)	2,129.58	(mg/s)	2,129.58	(mg/s)	
	mass flux in Babbitt WWTP discharge	M_sBab =	653.73	(mg/s)	653.73	(mg/s)	653.73	(mg/s)	
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	121,890.93	(mg/s)	1,391,712	(mg/s)	
	mass flux of ground water into PM-13	M_g13 =	10,425.01	(mg/s)	10,425.01	(mg/s)	10,425.01	(mg/s	
	mass flux of Area 5 Pit NW discharge	M_spit =	6,936.49	(mg/s)	53,090.84	(mg/s)	53,090.84	(mg/s	
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	15,770.06	(mg/s)	15,770.06	(mg/s)	15,770.06	(mg/s	
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	403.90	(mg/s)	403.90	(mg/s)	403.90	(mg/s	
င္ င	mass flux in seepage from cell 2W	M_s2w =	20,646.59	(mg/s)	20,646.59	(mg/s)	20,646.59	(mg/s	
			Low Flow		Average Flow		High Fl	High Flow	
Mass balance at each node	mass flux in river at PM-12	M_r12 =	2,783.31	(mg/s)	27,763.72	(mg/s)	286,383.27	(mg/s	
Ma at e	mass flux in river at PM-13	M_r13 =	56,965.36	(mg/s)	249,991.05	(mg/s)	1,778,431.60	(mg/s	
			Low Flow		Average Flow	Flow	High Flow	ow	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	82.647	(mg/L)	71.091	(mg/L)	70.104	(mg/L	
ರ≓ಣ	concentration in river at PM-13	C r13 =	205.746	(ma/L)	103.132	(ma/L)	73.311	(ma/l	

Case Parameter	Closure Potassium			
	concentration of surface water into PM-12	C s12 =	0.60	(mg/L)
ata		C_s13 =		(mg/L)
ρr	concentration in Babbitt WWTP discharge	C_sBab =	0.60	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	53.80	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	13.37	(mg/L)
ie i	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80	(mg/L)
20.	concentration in tailings basin cell 2W	C_s2w =	7.77	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	1.60	(mg/L)
프	concentration of ground water into PM-13	C_g13 =	1.60	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	214.12	(mg/s)	2,431	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	38.94	(mg/s)	38.94	(mg/s)	38.94	(mg/s
ë	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.08	(mg/s)	0.08	(mg/s)	0.08	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1,044.78	(mg/s)	11,929	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	190.63	(mg/s)	190.63	(mg/s)	190.63	(mg/s
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	5.60	(mg/s)	5.60	(mg/s)	5.60	(mg/s
		M_spit =	395.86	(mg/s)	3,029.85	(mg/s)	3,029.85	(mg/s
Convert to mass	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	927.38	(mg/s)	927.38	(mg/s)	927.38	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	367.44	(mg/s)	367.44	(mg/s)	367.44	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	39.03	(mg/s)	253.14	(mg/s)	2,469.88	(mg/s
Mass		M_r13 =	1,925.94 Low Flo		5,818.83 Average		18,919.75 High Fl	
			LOW 1 10		Average	liow	Ingiri	OW .
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	1.159	(mg/L)	0.648	(mg/L)	0.605	(mg/l
Convergible to concer	concentration in river at PM-13	C r13 =	6.956	(mg/L)	2.401	(mg/L)	0.780	(ma/l

Case	Closure			
Parameter	Magnesium			
	concentration of surface water into PM-12	C_s12 =	5.90	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	5.90	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	5.90	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	18.87	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	213.00	(mg/L)
eouce	concentration in tailings basin cell 2W	C_s2w =	69.97	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	10.65	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	10.65	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,105.49	(mg/s)	23,903	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	259.20	(mg/s)	259.20	(mg/s)	259.20	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	55.10	(mg/s)	55.10	(mg/s)	55.10	(mg/s
ıt.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,273.66	(mg/s)	117,301	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	1,268.87	(mg/s)	1,268.87	(mg/s)	1,268.87	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	1,994.02	(mg/s)	15,261.91	(mg/s)	15,261.91	(mg/s
		M_fs =	1,308.55	(mg/s)	1,308.55	(mg/s)	1,308.55	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	9.99	(mg/s)	9.99	(mg/s)	9.99	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	3,308.85	(mg/s)	3,308.85	(mg/s)	3,308.85	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	314.30	(mg/s)	2,419.79	(mg/s)	24,217.73	(mg/s
Mass		M_r13 =	8,204.58 Low Flo		33,851.63 Average		162,677.33 High Fl	
у с			2011 1 10		Average	1.011	- ing.i.i.	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	9.333	(mg/L)	6.196	(mg/l)	5.928	(mg/l
Convergible to concer	concentration in river at PM-13	C r13 =	29.633	(mg/L)	13.965	(mg/l)	6.706	(ma/l

Case	Closure			
Parameter	Manganese			
		-		
	concentration of surface water into PM-12	C_s12 =	0.30	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.30	(mg/L)
ğι	concentration in Babbitt WWTP discharge	C_sBab =	0.30	(mg/L)
ratio	concentration in Area 5 Pit NW discharge	C_spit =	0.49	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.28	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.00	(mg/L)
ros	concentration in tailings basin cell 2W	C_s2w =	1.18	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.19	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.19	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	107.06	(mg/s)	1,215	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	4.58	(mg/s)	4.58	(mg/s)	4.58	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	2.80	(mg/s)	2.80	(mg/s)	2.80	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	522.39	(mg/s)	5,964	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	22.40	(mg/s)	22.40	(mg/s)	22.40	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	3.57	(mg/s)	27.31	(mg/s)	27.31	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	19.17	(mg/s)	19.17	(mg/s)	19.17	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒ္ ပိ	mass flux in seepage from cell 2W	M_s2w =	55.94	(mg/s)	55.94	(mg/s)	55.94	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	7.38	(mg/s)	114.44	(mg/s)	1,222.81	(mg/s)
Mas at e	mass flux in river at PM-13	M_r13 =	108.46 Low Flo		761.65 Average		7,312.11 High Fl	
σ c			LOW FIO	W	Average	Flow	High Fi	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.219	(mg/L)	0.293	(mg/l)	0.299	(mg/l)
Conve flux to concer	concentration in river at PM-13	C r13 =	0.392	(mg/L)	0.314	(mg/l)	0.301	(mg/l)

Case	Closure	ı		
Parameter	Sodium			
	concentration of surface water into PM-12	C_s12 =	6.00	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	6.00	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	6.00	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	119.50	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	12.15	(mg/L)
ie i	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	255.00	(mg/L)
COL	concentration in tailings basin cell 2W	C_s2w =	44.31	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	4.90	(mg/L)
트		C_g13 =	4.90	(mg/L)

mass flux of ground water into PM-12 M_g12 = 119.26 (mg/s) 129.25 (mg/s)	•			Low Flo	w	Average	Flow	High Fl	ow
Mass Section Section	n	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,141.18	(mg/s)	24,309	(mg/s)
Mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 842.70 (mg/s) (mg/s	_ n	mass flux of ground water into PM-12	M_g12 =	119.26	(mg/s)	119.26	(mg/s)	119.26	(mg/s)
Mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 842.70 (mg/s) (mg/s	ı İğ	mass flux in Babbitt WWTP discharge	M_sBab =	56.03	(mg/s)	56.03	(mg/s)	56.03	(mg/s)
Mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 842.70 (mg/s) (mg/s) 842.70 (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s	n tra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,447.79	(mg/s)	119,290	(mg/s)
Mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 842.70 (mg/s) (mg/s) 842.70 (mg/s) (mg/s) 842.70 (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s	n ceu	mass flux of ground water into PM-13	M_g13 =	583.80	(mg/s)	583.80	(mg/s)	583.80	(mg/s)
Mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 842.70 (mg/s) (mg/s) 842.70 (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s	uo; n	mass flux of Area 5 Pit NW discharge	M_spit =	879.28	(mg/s)	6,729.88	(mg/s)	6,729.88	(mg/s)
Low Flow Average Flow High		mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	842.70	(mg/s)	842.70	(mg/s)	842.70	(mg/s)
Low Flow Average Flow High	mag u	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	11.96	(mg/s)	11.96	(mg/s)	11.96	(mg/s)
mass flux in river at PM-12	ပိ ဍ ြ	mass flux in seepage from cell 2W	M_s2w =	2,095.40	(mg/s)	2,095.40	(mg/s)	2,095.40	(mg/s
M_r13 = 4,588.43 (mg/s) 23,028.01 (mg/s) 154,037. Low Flow Average Flow High				Low Flo	w	Average	Flow	High Fl	ow
Low Flow Average Flow High	ass							24,483.86	
88 E			1112111					High Fl	
Q U U U U U U U U U U U U U U U U U U U	t 2	concentration in river at PM-12	C_r12 =	5.205	(mg/L)	5.931	(mg/l)	5.993	(mg/l)

Case	Closure			
Parameter	Nickel			
	concentration of surface water into PM-12	C_s12 =	0.0012	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0012	(mg/L)
p u		C_sBab =	0.0012	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.0052	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.015125217	(mg/L)
ie i	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.098	(mg/L)
S	concentration in tailings basin cell 2W	C_s2w =	0.00688	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.007	(mg/L)
ᆵ		C_g13 =	0.007	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.43	(mg/s)	5	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.09	(mg/s)	24	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	0.83	(mg/s)	0.83	(mg/s)	0.83	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.04	(mg/s)	0.29	(mg/s)	0.29	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.05	(mg/s)	1.05	(mg/s)	1.05	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	0.18	(mg/s)	0.61	(mg/s)	5.04	(mg/s
Mass		M_r13 =	2.43 Low Flo	(mg/s)		(mg/s)	31.41 High Fl	
Convert mass flux to M	1	M_r13 =	Low Flo		Average			
Conve flux to	concentration in river at PM-13	C r13 =	0.009	(mg/L)	0.002	(mg/L)	0.001	(m

Case	Closure			
Parameter	Lead			
		-		
	concentration of surface water into PM-12	C_s12 =	0.00015	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00015	(mg/L)
Ф	concentration in Babbitt WWTP discharge	C_sBab =	0.00015	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0003	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001097329	(mg/L)
8	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0005	(mg/L)
ouos	concentration in tailings basin cell 2W	C_s2w =	0.0012	(mg/L)
ŧ	concentration of ground water into PM-12	C_g12 =	0.0012	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.0012	(mg/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.05	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ita	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.26	(mg/s)	3	(mg/s
Ser	mass flux of ground water into PM-13	M_g13 =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.02	(mg/s)	0.02	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.08	(mg/s)	0.08	(mg/s)	0.08	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
			Low Flo	w	Average	Flow	High Fl	low
ass balance each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.08	(mg/s)	0.64	(mg/s
Mass at eac		M_r13 =		(mg/s)		(mg/s)	3.91 High Fl	(mg/s
a M	mass flux in river at PM-13		Low Flo	W	Average	Flow	Hi	gh F
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)		(mg/L)	0.000	

Case Parameter	Closure Antimony			
				1
	concentration of surface water into PM-12	C_s12 =	4.00E-05	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	4.00E-05	(mg/L)
ğ u	concentration in Babbitt WWTP discharge	C_sBab =	4.00E-05	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	2.50E-04	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.37E-03	(mg/L)
95	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
LO CO	concentration in tailings basin cell 2W	C_s2w =	2.50E-04	(mg/L)
t t	concentration of ground water into PM-12	C_g12 =	1.50E-03	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	1.50E-03	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.01	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.37	(mg/s)	0.37	(mg/s)	0.37	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒ္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.04	(mg/s)	0.05	(mg/s)	0.20	(mg/s)
Mas: at ea	mass flux in river at PM-13	M_r13 =	0.60 Low Flo	(mg/s)	0.70	(mg/s)	1.57 High Fl	(mg/s
ss			LOW FIO	W	Average	Flow	High Fi	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/
Conve flux to	concentration in river at PM-13	C r13 =	0.002	(mg/L)	0.000	(mg/L)	0.000	(ma/l

Case Parameter	Closure Selenium			
- 4-4		ı		
	concentration of surface water into PM-12	C_s12 =	0.0003	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0003	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0003	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.0016	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001503093	(mg/L)
95	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.054	(mg/L)
Los	concentration in tailings basin cell 2W	C_s2w =	0.00109	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.00295	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.00295	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.11	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.52	(mg/s)	6	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	0.35	(mg/s)	0.35	(mg/s)	0.35	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ဒ္	mass flux in seepage from cell 2W	M_s2w =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	<u>M_</u> r12 =	0.07	(mg/s)	0.18	(mg/s)	1.29	(mg/s)
Mas at e	mass flux in river at PM-13	M_r13 =	0.60	(mg/s)	1.30	(mg/s)	7.85 High Fl	(mg/s
o c			LOW 1 10	v	Average	low	riigii i	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.000	(mg/L)	0.000	(mg/L
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.002	(mg/L)	0.001	(mg/L)	0.000	(mg/L

Case Parameter	Closure Sulfate			
r drameter	Cunate	ı		
	concentration of surface water into PM-12	C_s12 =	4.00	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	4.00	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	4.00	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	1046.27	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	110.25	(mg/L)
ē	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	7347.00	(mg/L)
Sono	concentration in tailings basin cell 2W	C_s2w =	152.40	(mg/L)
ţ	concentration of ground water into PM-12	C_g12 =	8.50	(mg/L)
In put	concentration of ground water into PM-13	C_g13 =	8.50	(mg/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,427.45	(mg/s)	16,206	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	206.87	(mg/s)	206.87	(mg/s)	206.87	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	37.36	(mg/s)	37.36	(mg/s)	37.36	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	6,965.20	(mg/s)	79,526	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	1,012.72	(mg/s)	1,012.72	(mg/s)	1,012.72	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	7,698.43	(mg/s)	58,922.60	(mg/s)	58,922.60	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	7,646.82	(mg/s)	7,646.82	(mg/s)	7,646.82	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	344.66	(mg/s)	344.66	(mg/s)	344.66	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	7,206.92	(mg/s)	7,206.92	(mg/s)	7,206.92	(mg/s)
			Low Flo	w	Average	Flow	High Fl	low
Mass balance at each node		M_r12 =	244.23		1,671.68		16,449.94	
a Š	mass flux in river at PM-13	M_r13 =	24,153.77		83,770.59		171,110.05	
			Low Flo	W	Average	FIOW	High FI	low
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	7.252	(mg/L)	4.280	(mg/l)	4.027	(mg/l)
Conve flux to	concentration in river at PM-13	C r13 =	87.238	(ma/L)	34.559	(ma/l)	7 054	(mg/l)

Case Parameter	Closure Thallium			
raramotor		l		
	concentration of surface water into PM-12	C_s12 =	0.0002	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0002	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0002	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.0006	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000917488	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0002	(mg/L)
Son	concentration in tailings basin cell 2W	C_s2w =	0.0002	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.000004	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.000004	(mg/L)

M_g12 = 0.00 (mg/s) 0.00 (Low Flo	w	Average	Flow	High F	low
Mass flux in Babbitt WWTP discharge Mass flux of surface water into PM-13 Mass flux of surface water into PM-13 Mass flux of ground water into PM-13 Mass flux of ground water into PM-13 Mass flux of Area 5 Pit NW discharge Maspit = 0.00 (mg/s) 0.01 (mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.06 (mg/s) 0.06 (mg/s) 0.06 (mg/s) 0.00 (mg/s) 0.01 (_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.06 (mg/s) 0.06 (mg/s) 0.06 (mg/s) 0.06 (mg/s) 0.00 (mg/s) 0.00 (mg/s) 0.00 (mg/s) 0.00 (mg/s) 0.00 (mg/s) 0.00 (mg/s) 0.01 (mg/s) (mg/s) 0.01 (mg/s) 0.01 (mg/s) 0.01 (mg/s) (mg/s) 0.01 (mg/s) (mg/s) 0.01 (mg/s) (mg/s) 0.01 (mg/s) (m	Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.06 (mg/s) 0.06 (mg/s) 0.06 (mg/s) 0.06 (mg/s) 0.00 (mg/s) 0.00 (mg/s) 0.00 (mg/s) 0.00 (mg/s) 0.00 (mg/s) 0.00 (mg/s) 0.01 (mg/s) (mg/s) 0.01 (mg/s) 0.01 (mg/s) (mg/s) 0.01 (mg/s) (mg/s) 0.01 (mg/s) (mg/s) 0.01 (mg/s) (it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.35	(mg/s)	4	(mg/s
Mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.06 (mg/s) 0.06 (mg/s) 0.00 (mg/s) 0.01 (mg/s) (mg/s) 0.01 (mg/s) 0.01 (mg/s) 0.01 (mg/s) (mg/s) 0.01 (mg/s) (mg/s) 0.01 (mg/s) cer	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s	
Mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.06 (mg/s) 0.06 (mg/s) 0.00 (mg/s) 0.01 (mg/s) 0.	ςž	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s
Low Flow Average Flow High Flow		mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
Low Flow Average Flow High Flow	a K	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
M_r12 0.00 (mg/s) 0.07 (mg/s) 0.81	ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
M_r13 = 0.08 (mg/s) 0.53 (mg/s) 4.90				Low Flo	w	Average	Flow	High F	low
M_r13 = 0.08 (mg/s) 0.53 (mg/s) 4.90	balance	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.07	(mg/s)	0.81	(mg/s
	Mass		M_r13 =						
C_r12 = 0.000 (mg/L) 0.000 (mg/L) 0.000	Convert mass flux to Ma			Low Flo	W	Average	Flow	High	F

Case Parameter	Closure Zinc			
	concentration of surface water into PM-12	C s12 =	0.016	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
ep c	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
Ē	concentration in Area 5 Pit NW discharge	C_spit =	0.003	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.020231354	(mg/L)
5	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.01	(mg/L)
CO	concentration in tailings basin cell 2W	C_s2w =	0.01435	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.0115	(mg/L)
	concentration of ground water into PM-13	C a13 -	0.0115	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.28	(mg/s)	0.28	(mg/s)	0.28	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.02	(mg/s)	0.17	(mg/s)	0.17	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.40	(mg/s)	1.40	(mg/s)	1.40	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	0.68	(mg/s)	0.68	(mg/s)	0.68	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	0.43	(mg/s)	6.14	(mg/s)	65.25	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	386.98 High Fl	
a M	mass flux in river at PM-13		Low Flo	w	Average	Flow	High	ı Fl
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)		(mg/L)	0.016	

Appendix F.8
Embarrass River
Proposed Action
Post-Closure

FLOWS

Case	Post-Closure				
Flows	Low Flow Conditions (no surface runoff)				Node
in River	flow in river at PM-12	Q_r12_L =	1.19	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_L =	9.47	(cfs)	PM-13
Total	flow check	Q_ck_L =	9.47	(cfs)	1
	surface water flow into PM-12	Q_s12_L =	0.00	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_L =	0.00	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_L =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_L =	0.26	(cfs)	PM-13
草	seepage from Tailings Basin Cells 1E and 2E	Q_fs_L =	2.45	(cfs)	PM-13
da da	hydrometallurgical residue cells liner leakage	Q_rrs_L =	0.00	(cfs)	PM-13
No.	seepage from cell 2W	Q_s2w_L =	1.36	(cfs)	PM-13
nput flow data	ground water flow into PM-12	Q_g12_L =	0.86	(cfs)	PM-12
du	ground water flow into PM-13	Q_g13_L =	4.21	(cfs)	PM-13

Case	Post-Closure				
Flow	Average Flow Conditions (mean annual)				_
n River	flow in river at PM-12	Q_r12_M =	13.80	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_M =	85.34	(cfs)	PM-13
Total Emba	flow check	Q_ck_M =	85.34	(cfs)	
	surface water flow into PM-12	Q_s12_M =	12.61	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_M =	61.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_M =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_M =	1.99	(cfs)	PM-13
ta	seepage from Tailings Basin Cells 1E and 2E	Q_fs_M =	2.45	(cfs)	PM-13
da da	hydrometallurgical residue cells liner leakage	Q_rrs_M =	0.00	(cfs)	PM-13
Input flow data	seepage from cell 2W	Q_s2w_M =	1.36	(cfs)	PM-13
Ę	ground water flow into PM-12	Q_g12_M =	0.86	(cfs)	PM-12
ם	ground water flow into PM-13	Q_g13_M =	4.21	(cfs)	PM-13

Case	Post-Closure				
Flow	High Flow Conditions (avg. annual 1-day max flo	w)			_
n River	flow in river at PM-12	Q_r12_H =	144.35	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_H =	856.89	(cfs)	PM-13
Total	flow check	Q_ck_H =	856.89	(cfs)	
	surface water flow into PM-12	Q_s12_H =	143.16	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_H =	702.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_H =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_H =	1.99	(cfs)	PM-13
ā	seepage from Tailings Basin Cells 1E and 2E	Q_fs_H =	2.45	(cfs)	PM-13
da da	hydrometallurgical residue cells liner leakage	Q_rrs_H =	0.00	(cfs)	PM-13
flow data	seepage from cell 2W	Q_s2w_H =	1.36	(cfs)	PM-13
Input 1	ground water flow into PM-12	Q_g12_H =	0.86	(cfs)	PM-12
du	ground water flow into PM-13	Q_g13_H =	4.21	(cfs)	PM-13

Case Parameter	Post-Closure Silver			
	concentration of surface water into PM-12	C_s12 =	0.00011	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00011	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.00011	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00015	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00097	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.000125	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.000100	(mg/L)
	concentration of ground water into PM-12	C_g12 =	0.000008	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.000008	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	1	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ęi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.19	(mg/s)	2	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
မို ပိ	mass flux in seepage from cell 2W	M_s2w =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.45	(mg/s)
Mas at e		M_r13 =		(mg/s)		(mg/s)		(mg/s)
	T		Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Co flux	concentration in river at PM-13	C_r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case Parameter	Post-Closure Aluminum			
		1	T	ı
	concentration of surface water into PM-12	C_s12 =	0.12	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.12	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	0.12	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.01325	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.37E-01	(mg/L)
ncer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80E-01	(mg/L)
Ö	concentration in tailings basin cell 2W	C_s2w =	1.5788	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.025	(mg/L)
<u>=</u>	concentration of ground water into PM-13	C_g13 =	0.025	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	42.82	(mg/s)	486	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.61	(mg/s)	0.61	(mg/s)	0.61	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	208.96	(mg/s)	2,386	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	2.98	(mg/s)	2.98	(mg/s)	2.98	(mg/s
io X	mass flux of Area 5 Pit NW discharge	M_spit =	0.10	(mg/s)	0.75	(mg/s)	0.75	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	44.20	(mg/s)	44.20	(mg/s)	44.20	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
ဒ္ ပိ	mass flux in seepage from cell 2W	M_s2w =	60.72	(mg/s)	60.72	(mg/s)	60.72	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
balance h node	mass flux in river at PM-12	M_r12 =	1.73	(mg/s)	44.55	(mg/s)	487.90	(mg/s
Mass ba at each		M_r13 =	109.74 Low Flo		362.17 Average		2,982.35 High Fl	
ω -			201110		Average	1.0	- Ingiri	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.051	(mg/L)	0.114	(mg/L)	0.119	(mg/L
Converture flux to	concentration in river at PM-13	C r13 =	0.409	(mg/L)	0.150	(mg/L)	0.123	(ma/l

Case Parameter	Post-Closure Arsenic			
		-	,	1
	concentration of surface water into PM-12	C_s12 =	0.00075	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00075	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.00075	(mg/L)
章	concentration in Area 5 Pit NW discharge	C_spit =	0.001325	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.012359831	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
lo co	concentration in tailings basin cell 2W	C_s2w =	0.00291	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.00273	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.00273	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.27	(mg/s)	3	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıţra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.31	(mg/s)	15	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.86	(mg/s)	0.86	(mg/s)	0.86	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.11	(mg/s)	0.11	(mg/s)	0.11	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
balance th node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.34	(mg/s)	3.11	(mg/s)
Mass ba at each		M_r13 =	1.38 Low Flo	(mg/s)	3.02	(mg/s)	19.39 High Fl	
8 E			2011 1 10		7 TO LUGO			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.0022	(mg/L)	0.001	(mg/L)	0.001	(mg/L
Conve flux to conce	concentration in river at PM-13	C r13 =	0.0051	(mg/L)	0.001	(mg/L)	0.001	(ma/L

concentration in tailings basin cell 2W

concentration of ground water into PM-12 concentration of ground water into PM-13

Case	Post-Closure			
Parameter	Boron			
		-	,	
	concentration of surface water into PM-12	C_s12 =	0.027	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.027	(mg/L)
p u	concentration in Babbitt WWTP discharge	C_sBab =	0.027	(mg/L)
읉	concentration in Area 5 Pit NW discharge	C_spit =	0.1315	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.198832748	(mg/L)
92	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.11	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	9.64	(mg/s)	109	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)	0.52	(mg/s)	0.52	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	47.02	(mg/s)	537	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	2.53	(mg/s)	2.53	(mg/s)	2.53	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.97	(mg/s)	7.41	(mg/s)	7.41	(mg/s)
		M_fs =	13.79	(mg/s)	13.79	(mg/s)	13.79	(mg/s)
Convert	mass flux in seepage from Tailings Basin Cells 1E and 2E mass flux in hydrometallurgical residue cells liner leakage	M_rrs =		(mg/s)		(mg/s)	0.01	(mg/s)
၀၁	mass flux in seepage from cell 2W	M_s2w =	12.69	(mg/s)	12.69	(mg/s)	12.69	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance	mass flux in river at PM-12	M_r12 =		(mg/s)		(mg/s)	110.16	
_	III ass ilax iii ivei at i vi io	IVI_110 =	Low Flo		Average		High FI	
Convert mass flux to	concentration in river at PM-12	C_r12 =		(mg/L)		(mg/L)		(mg/L)
ο ≢	concentration in river at PM-13	C_r13 =	0.115	(mg/L)	0.039	(mg/L)	0.028	(mg/L)

C_s2w =

C_g12 =

C_g13 =

0.33 (mg/L)

0.0212 (mg/L)

0.0212 (mg/L)

Case Parameter	Post-Closure Barium			
raiailletei	Barium	ı		
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
ntration de	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
	concentration in Area 5 Pit NW discharge	C_spit =	0.0044	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	4.81E-02	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	5.00E-03	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.09298	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0681	(mg/L)
<u>=</u>	concentration of ground water into PM-13	C_g13 =	0.0681	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	1.66	(mg/s)	1.66	(mg/s)	1.66	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	8.11	(mg/s)	8.11	(mg/s)	8.11	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	3.34	(mg/s)	3.34	(mg/s)	3.34	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ე ე	mass flux in seepage from cell 2W	M_s2w =	3.58	(mg/s)	3.58	(mg/s)	3.58	(mg/s)
			Low Flo	W	Average	Flow	High Flow	
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)		(mg/s)
at ⊠	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	400.01	
			Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.054	(mg/L)	0.019	(mg/L)	0.016	(mg/L)
S I o	concentration in river at PM-13	C_r13 =	0.063	(mg/L)	0.021	(mg/L)	0.016	(mg/L)

Case Parameter	Post-Closure Beryllium			
	concentration of surface water into PM-12	C_s12 =	0.0001	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0001	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.0001	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000808254	(mg/L)
ncer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0	(mg/L)
lo con	concentration in tailings basin cell 2W	C_s2w =	0.00075	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.000023	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.000023	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.17	(mg/s)	2	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
Con	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	-	(mg/s)	-	(mg/s)	-	(mg/s
င္မွ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.41	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	0.09 Low Flo	(mg/s)	0.30	(mg/s)	2.49 High Fl	(mg/s
nass								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)		(mg/L)	0.000	

Case Parameter	Post-Closure Calcium			
	concentration of surface water into PM-12	C s12 =	15	(mg/L)
data	concentration of surface water into PM-13	C_s13 =		(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	15	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	95.35	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	59.94387899	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	416	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	59.78	(mg/L)
	concentration of ground water into PM-12	C_g12 =	19	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	19	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5,352.95	(mg/s)	60,771	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	462.42	(mg/s)	462.42	(mg/s)	462.42	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	140.09	(mg/s)	140.09	(mg/s)	140.09	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	26,119.49	(mg/s)	298,224	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	2,263.72	(mg/s)	2,263.72	(mg/s)	2,263.72	(mg/s)
Lo n	mass flux of Area 5 Pit NW discharge	M_spit =	701.59	(mg/s)	5,369.83	(mg/s)	5,369.83	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	4,157.57	(mg/s)	4,157.57	(mg/s)	4,157.57	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	19.51	(mg/s)	19.51	(mg/s)	19.51	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	2,299.27	(mg/s)	2,299.27	(mg/s)	2.80	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	602.51	(mg/s)	5,955.45	(mg/s)	61,373.93	(mg/s)
Ma	mass flux in river at PM-13	M_r13 =	10,044.16	(mg/s)	46,184.83	(mg/s)	371,411.34	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	17.891	(mg/L)	15.249	(mg/l)	15.024	(mg/l)
o X i	concentration in river at PM-13	C r13 =	37.472	(ma/L)	19.123	(ma/l)	15.316	(ma/l)

oncentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12 concentration of ground water into PM-13

Case Parameter	Post-Closure Cadmium			
	concentration of surface water into PM-12	C_s12 =	0.00008	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00008	(mg/L)
n da		C_sBab =	0.00008	(mg/L)
9.	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C fs =	0.000227872	(ma/L)

mass flux of surface water into PM-12 mass flux of ground water into PM-12 mass flux in Babbitt WWTP discharge mass flux of surface water into PM-13 mass flux of ground water into PM-13	M_s12 = M_g12 = M_sBab = M_s13 =	0.01	(mg/s) (mg/s)	0.01	(mg/s) (mg/s) (mg/s)		(mg/s) (mg/s)
mass flux in Babbitt WWTP discharge mass flux of surface water into PM-13	M_sBab = M_s13 =					1	` '
mass flux of surface water into PM-13	M_s13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(ma/e)
		-					(111g/3)
mass flux of ground water into PM-13	M = 10		(mg/s)	0.14	(mg/s)	2	(mg/s)
	$M_g13 =$	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.02	(mg/s)	0.02	(mg/s)	0.02	(mg/s)
mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
		Low Flo	W	Average	Flow	High Fl	ow
mass flux in river at PM-12	M_r12 =						(mg/s)
nace nex in mer at 1 m 10	<u>_</u>			_			
concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
ייייייייייייייייייייייייייייייייייייייי	nass flux in hydrometallurgical residue cells liner leakage nass flux in seepage from cell 2W nass flux in river at PM-12 nass flux in river at PM-13	hass flux in hydrometallurgical residue cells liner leakage M_rrs = hass flux in seepage from cell 2W hass flux in seepage from cell 2W hass flux in river at PM-12 hass flux in river at PM-13 M_r12 = hass flux in river at PM-13 C_r12 =	Description Description	M_rrs = 0.00 (mg/s) mass flux in hydrometallurgical residue cells liner leakage M_rrs = 0.00 (mg/s) mass flux in seepage from cell 2W M_s2w = 0.01 (mg/s) Low Flow	M_rrs = 0.00 (mg/s) 0.00	Mass flux in hydrometallurgical residue cells liner leakage Mass flux in hydrometallurgical residue cells liner leakage Mass flux in seepage from cell 2W Mass flux in river at PM-12 Mass flux in river at PM-12 Mass flux in river at PM-13 Mass f	Mass flux in hydrometallurgical residue cells liner leakage Mass flux in hydrometallurgical residue cells liner leakage Mass flux in seepage from cell 2W Mass flux in flow Mass flux in flux in flow Mass flux in

0.0004

0.000188 (mg/L)

0.0003 (mg/L)

0.0003 (mg/L)

(mg/L)

C_rrs =

C_s2w =

C_g12 =

C_g13 =

Case Parameter	Post-Closure Chloride			
	concentration of surface water into PM-12	C s12 =	6.5	(mg/L)
n data	concentration of surface water into PM-13	C_s13 =		(mg/L)
		C_sBab =	6.5	(mg/L)
concentration	concentration in Area 5 Pit NW discharge	C_spit =	5.95	(mg/L)
ra Tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.29E+00	(mg/L)
ē	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.76E+03	(mg/L)
Ö	concentration in tailings basin cell 2W	C_s2w =	21.54	(mg/L)
tha <u>u</u>	concentration of ground water into PM-12	C_g12 =	1.8	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	1.8	(mg/L)
				ν υ
			Low Flo	M

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,319.61	(mg/s)	26,334	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	43.81	(mg/s)	43.81	(mg/s)	43.81	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	60.70	(mg/s)	60.70	(mg/s)	60.70	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	11,318.44	(mg/s)	129,230	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	214.46	(mg/s)	214.46	(mg/s)	214.46	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	43.78	(mg/s)	335.09	(mg/s)	335.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	436.24	(mg/s)	436.24	(mg/s)	436.24	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	82.56	(mg/s)	82.56	(mg/s)	82.56	(mg/s)
င္မ င	mass flux in seepage from cell 2W	M_s2w =	828.47	(mg/s)	828.47	(mg/s)	828.47	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	104.51	(mg/s)	2,424.12	(mg/s)	26,438.79	(mg/s)
Ma at	mass flux in river at PM-13	M_r13 =	1,710.03		15,639.39		157,566.01	, ,
			Low Flo	W	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	3.103	(mg/L)	6.207	(mg/L)	6.472	(mg/L)
Converture flux to concer	concentration in river at PM-13	C_r13 =	6.380	(mg/L)	6.475	(mg/L)	6.498	(mg/L)

concentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-13

concent

Case Parameter	Post-Closure Cobalt			
	concentration of surface water into PM-12	C_s12 =	0.0006	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0006	(mg/L)
ď L	Iconcentration in Badditt vv vv LP discharge	C_sBab =	0.0006	(mg/L)
Ė	concentration in Area 5 Pit NW discharge	C_spit =	0.000555	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001356866	(mg/L)
T	concentration in seepage nom railings basin cells it and zt	U_I3 =	0.001330000	(III)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.21	(mg/s)	2	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
tra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.04	(mg/s)	12	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s)
u x La x	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္ င	mass flux in seepage from cell 2W	M_s2w =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.25	(mg/s)	2.46	(mg/s)
Mass	mass flux in river at PM-13	M_r13 =	0.32 Low Flo	(mg/s)	1.61 Average	(mg/s)	14.71 High Fl	(mg/s)
			201110		Average		Illgilli	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Conve flux to conce	concentration in river at PM-13	C_r13 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/L)

C_rrs =

C_s2w =

C_g12 =

C_g13 =

0.005 (mg/L)

0.001556 (mg/L)

0.0011 (mg/L)

0.0011 (mg/L)

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Post-Closure Copper			
	concentration of surface water into PM-12	C_s12 =	0.0015	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0015	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0015	(mg/L)
tion	concentration in Area 5 Pit NW discharge	C_spit =	0.00345	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.018240705	(mg/L)
oncer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0015	(mg/L)
Ö	concentration in tailings basin cell 2W	C s2w =	0.004555	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.54	(mg/s)	6	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.61	(mg/s)	30	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	0.48	(mg/s)	0.48	(mg/s)	0.48	(mg/s
con	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.19	(mg/s)	0.19	(mg/s
		M_fs =	1.27	(mg/s)	1.27	(mg/s)	1.27	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.11	(mg/s)	0.65	(mg/s)	6.19	(mg/s
Mass b at each		M_r13 =	2.05 Low Flo	(mg/s)	5.37 Average	(mg/s)	38.12 High Fl	
			LOW I IO	VV	Average	liow	riigii i i	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.00331	(mg/L)	0.002	(mg/L)	0.002	(mg/l
Convergible to concer	concentration in river at PM-13	C r13 =	0.00766	(mg/L)	0.002	(mg/L)	0.002	(ma/l

C_g12 =

C_g13 =

0.004

0.004

(mg/L)

(mg/L)

Case	Post-Closure			
Parameter	Fluoride	<u> </u>		
			1	ı
	concentration of surface water into PM-12	C_s12 =	0.2	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.2	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.2	(mg/L)
ratio	concentration in Area 5 Pit NW discharge	C_spit =	0.125	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.82E-02	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	2.85E+00	(mg/L)
ouoo	concentration in tailings basin cell 2W	C_s2w =	1.55	(mg/L)
Ħ	concentration of ground water into PM-12	C_g12 =	0.385	(mg/L)
nd <u>u</u>	concentration of ground water into PM-13	C_g13 =	0.385	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	71.37	(mg/s)	810	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	9.37	(mg/s)	9.37	(mg/s)	9.37	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	1.87	(mg/s)	1.87	(mg/s)	1.87	(mg/s)
concentration	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	348.26	(mg/s)	3,976	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	45.87	(mg/s)	45.87	(mg/s)	45.87	(mg/s)
concept	mass flux of Area 5 Pit NW discharge	M_spit =	0.92	(mg/s)	7.04	(mg/s)	7.04	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.27	(mg/s)	1.27	(mg/s)	1.27	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s)
ပို ၁	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	59.62	(mg/s)	59.62	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)	821.52	
	mass flux in river at PM-13	M_r13 =	119.04 Low Flo		544.80 Average		4,911.77 High Fl	
Convert mass flux to concentration	concentration in river at PM-12 concentration in river at PM-13	C_r12 =		(mg/L)	0.212	(mg/L)		(mg/L)

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Post-Closure Iron			
	concentration of surface water into PM-12	C s12 =	29	(mg/L)
data		C_s13 =		(mg/L)
d d	concentration in Babbitt WWTP discharge	C_sBab =	2.9	(mg/L)
tio	concentration in Area 5 Pit NW discharge	C_spit =	0.037761905	(mg/L)
ntra		C_fs =	6.75E-01	(mg/L)
leo leo	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	4.00E-01	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,034.90	(mg/s)	11,749	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.85	(mg/s)	0.85	(mg/s)	0.85	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	27.08	(mg/s)	27.08	(mg/s)	27.08	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	5,049.77	(mg/s)	57,657	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	4.17	(mg/s)	4.17	(mg/s)	4.17	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.28	(mg/s)	2.13	(mg/s)	2.13	(mg/s)
	man flux in account from Tailings Bosin Calls 15 and 25	M_fs =	46.80	(mg/s)	46.80	(mg/s)	46.80	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.02	(mg/s)	0.02	(mg/s)	0.02	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	176.69	(mg/s)	176.69	(mg/s)	176.69	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 = M_r13 =	27.93 255.89	(mg/s)	1,062.84		11,777.08 69,663.52	, ,
			Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to	concentration in river at PM-12	C_r12 =	0.829	(mg/L)	2.721	(mg/L)	2.883	(mg/L)
S ∄ 5	concentration in river at PM-13	C r13 =	0.955	(mg/L)	2.626	(mg/L)	2.873	(mg/L)

C_s2w =

C_g12 =

C_g13 =

4.594 (mg/L)

0.035

(mg/L)

0.035 (mg/L)

Case	Post-Closure			
Parameter	Hardness]		
		ſ		1
	concentration of surface water into PM-12	C_s12 =	70	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	70	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	70	(mg/L)
<u> </u>	concentration in Area 5 Pit NW discharge	C_spit =	942.7142857	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	2.27E+02	(mg/L)
concei	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	8.61E+03	(mg/L)
cor	concentration in tailings basin cell 2W	C_s2w =	436.6	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	87.5	(mg/L)
<u>=</u>	concentration of ground water into PM-13	C_g13 =	87.5	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	24,980.41	(mg/s)	283,600	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	2,129.58	(mg/s)	2,129.58	(mg/s)	2,129.58	(mg/s)
Ē	mass flux in Babbitt WWTP discharge	M_sBab =	653.73	(mg/s)	653.73	(mg/s)	653.73	(mg/s)
concentration	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	121,890.93	(mg/s)	1,391,712	(mg/s)
Se .	mass flux of ground water into PM-13	M_g13 =	10,425.01	(mg/s)	10,425.01	(mg/s)	10,425.01	(mg/s)
COU	mass flux of Area 5 Pit NW discharge	M_spit =	6,936.49	(mg/s)	53,090.84	(mg/s)	53,090.84	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	15,770.06	(mg/s)	15,770.06	(mg/s)	15,770.06	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	403.90	(mg/s)	403.90		403.90	
ပိ န	mass flux in seepage from cell 2W	M_s2w =	16,792.56	(mg/s)	16,792.56	(mg/s)	16,792.56	(mg/s)
			Low Flo	W	Average	Average Flow High Flo		ow
balance	mass flux in river at PM-12	M_r12 =	2,783.31	(mg/s)	27,763.72	(mg/s)	286,383.27	(mg/s)
ass	mass flux in river at PM-13	M_r13 =	53,111.33 Low Flo		246,137.02 Average		1,774,577.57 High Fl	
			2011 110		Average	1011	ingiiii	
Convert mass flux to	concentration in river at PM-12	C_r12 =	82.647	(mg/L)	71.091	(mg/L)	70.104	(mg/L)
Conve flux to	concentration in river at PM-13	C_r13 =	198.144	(mg/L)	101.913	(mg/L)	73.178	(mg/L)

Case Parameter	Post-Closure Potassium			
		- 1	ı	
	concentration of surface water into PM-12	C_s12 =	0.60	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.60	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.60	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	53.80	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	13.37	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80	(mg/L)
conc	concentration in tailings basin cell 2W	C_s2w =	7.77	(mg/L)
nput	concentration of ground water into PM-12	C_g12 =	1.60	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	1.60	(mg/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	214.12	(mg/s)	2,431	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	38.94	(mg/s)	38.94	(mg/s)	38.94	(mg/s)
concentration flux	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.08	(mg/s)	0.08	(mg/s)	0.08	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1,044.78	(mg/s)	11,929	(mg/s)
	mass flux of ground water into PM-13	M_g13 =	190.63	(mg/s)	190.63	(mg/s)	190.63	(mg/s)
i x	mass flux in Babbitt WWTP discharge	M_sBab =	5.60	(mg/s)	5.60	(mg/s)	5.60	(mg/s)
	and the state of t	M_spit =	395.86	(mg/s)	3,029.85	(mg/s)	3,029.85	(mg/s)
onvert mass	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	927.38	(mg/s)	927.38	(mg/s)	927.38	(mg/s)
ဒ္ ဒိ	mass flux in seepage from cell 2W	M_s2w =	298.85	(mg/s)	298.85	(mg/s)	298.85	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	39.03	(mg/s)	253.14	(mg/s)	2,469.88	(mg/s)
Ma at e		M_r13 =	1,857.35	(mg/s)	5,750.24	(mg/s)	18,851.16	(mg/s)
			Low Flo	w	Average	Flow	High Fl	low
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)	Average			lov

Case Parameter	Post-Closure Magnesium			
	concentration of surface water into PM-12	C s12 =	5.90	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	5.90	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	5.90	(mg/L)
ntration	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	18.87	(mg/L)
cez	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	213.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	69.97	(mg/L)
	concentration of ground water into PM-12	C_g12 =	10.65	(mg/L)
thou!	concentration of ground water into PM-13	C_g13 =	10.65	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,105.49	(mg/s)	23,903	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	259.20	(mg/s)	259.20	(mg/s)	259.20	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	55.10	(mg/s)	55.10	(mg/s)	55.10	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,273.66	(mg/s)	117,301	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	1,268.87	(mg/s)	1,268.87	(mg/s)	1,268.87	(mg/s)
io X	mass flux of Area 5 Pit NW discharge	M_spit =	1,994.02	(mg/s)	15,261.91	(mg/s)	15,261.91	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,308.55	(mg/s)	1,308.55	(mg/s)	1,308.55	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	9.99	(mg/s)	9.99	(mg/s)	9.99	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	2,691.19	(mg/s)	2,691.19	(mg/s)	2,691.19	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	314.30 7,586.93		2,419.79		24,217.73	
	•		Low Flo		Average		High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	9.333	(mg/L)	6.196	(mg/l)	5.928	(mg/l)

concentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Post-Closure Manganese			
	concentration of surface water into PM-12	C_s12 =	0.30	(mg/L)
ta ta	concentration of surface water into PM-13	C_s13 =	0.30	(mg/L)
, , , , , , , , , , , , , , , , , , ,		C_sBab =	0.30	(mg/L)
Ę	concentration in Area 5 Pit NW discharge	C_spit =	0.49	(mg/L)
<u> </u>	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.28	(mg/L)

			Low Flo	W	Average I	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	1	(mg/s)	107.06	(mg/s)	1,215	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	4.58	(mg/s)	4.58	(mg/s)	4.58	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	2.80	(mg/s)	2.80	(mg/s)	2.80	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	522.39	(mg/s)	5,964	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	22.40	(mg/s)	22.40	(mg/s)	22.40	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	3.57	(mg/s)	27.31	(mg/s)	27.31	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	19.17	(mg/s)	19.17	(mg/s)	19.17	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္မ င	mass flux in seepage from cell 2W	M_s2w =	45.50	(mg/s)	45.50	(mg/s)	45.50	(mg/s)
		_	Low Flo	w	Average I	Average Flow High Floring		ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	7.38	(mg/s)	114.44	(mg/s)	1,222.81	(mg/s)
Mass	mass flux in river at PM-13	M_r13 =		(mg/s)	751.21		7,301.67	
	Т		Low Flo	W	Average I	low	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.219	(mg/L)	0.293	(mg/l)	0.299	(mg/l)
Con	concentration in river at PM-13	C_r13 =	0.366	(mg/L)	0.311	(mg/l)	0.301	(mg/l)

C_s2w =

C_g12 =

C_g13 =

0.00

1.18

0.19

(mg/L)

(mg/L)

(mg/L)

0.19 (mg/L)

Case	rost-closure			
Parameter	Sodium			
		_		
	concentration of surface water into PM-12	C_s12 =	6.00	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	6.00	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	6.00	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	119.50	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	12.15	(mg/L)
ē	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	255.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	44.31	(mg/L)
	concentration of ground water into PM-12	C_g12 =	4.90	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	4.90	(mg/L)

and the state of the state of the DM 40							
mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,141.18	(mg/s)	24,309	(mg/s)
mass flux of ground water into PM-12	M_g12 =	119.26	(mg/s)	119.26	(mg/s)	119.26	(mg/s)
mass flux in Babbitt WWTP discharge	M_sBab =	56.03	(mg/s)	56.03	(mg/s)	56.03	(mg/s)
mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,447.79	(mg/s)	119,290	(mg/s)
mass flux of ground water into PM-13	M_g13 =	583.80	(mg/s)	583.80	(mg/s)	583.80	(mg/s)
mass flux of Area 5 Pit NW discharge	M_spit =	879.28	(mg/s)	6,729.88	(mg/s)	6,729.88	(mg/s)
mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	842.70	(mg/s)	842.70	(mg/s)	842.70	(mg/s)
mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	11.96	(mg/s)	11.96	(mg/s)	11.96	(mg/s)
mass flux in seepage from cell 2W	M_s2w =	1,704.26	(mg/s)	1,704.26	(mg/s)	1,704.26	(mg/s
		Low Flo	w	Average	Flow	High Fl	ow
mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =						
The control of the co	11						
concentration in river at PM-12	C_r12 =	5.205	(mg/L)	5.931	(mg/l)	5.993	(mg/l)
	mass flux in Babbitt WWTP discharge mass flux of surface water into PM-13 mass flux of ground water into PM-13 mass flux of Area 5 Pit NW discharge mass flux in seepage from Tailings Basin Cells 1E and 2E mass flux in hydrometallurgical residue cells liner leakage mass flux in seepage from cell 2W mass flux in river at PM-12 mass flux in river at PM-13	mass flux in Babbitt WWTP discharge M_sBab = mass flux of surface water into PM-13 M_s13 = mass flux of ground water into PM-13 M_g13 = mass flux of Area 5 Pit NW discharge M_spit = mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = mass flux in hydrometallurgical residue cells liner leakage M_rrs = mass flux in seepage from cell 2W M_s2w = mass flux in river at PM-12 M_r12 = mass flux in river at PM-13 M_r13 =	mass flux in Babbitt WWTP discharge M_sBab = 56.03 mass flux of surface water into PM-13 M_s13 = - mass flux of ground water into PM-13 M_g13 = 583.80 mass flux of Area 5 Pit NW discharge M_spit = 879.28 mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 842.70 mass flux in hydrometallurgical residue cells liner leakage M_rrs = 11.96 mass flux in seepage from cell 2W M_s2w = 1,704.26 Low Flo mass flux in river at PM-12 M_r12 = 175.29 mass flux in river at PM-13 M_r13 = 4,197.29 Low Flo	mass flux in Babbitt WWTP discharge M_sBab = 56.03 (mg/s) mass flux of surface water into PM-13 M_s13 = - (mg/s) mass flux of ground water into PM-13 M_g13 = 583.80 (mg/s) mass flux of Area 5 Pit NW discharge M_spit = 879.28 (mg/s) mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 842.70 (mg/s) mass flux in hydrometallurgical residue cells liner leakage M_rrs = 11.96 (mg/s) mass flux in seepage from cell 2W M_s2w = 1,704.26 (mg/s) Low Flow mass flux in river at PM-12 M_r12 = 175.29 (mg/s) mass flux in river at PM-13 M_r13 = 4,197.29 (mg/s)	mass flux in Babbitt WWTP discharge M_sBab = 56.03 (mg/s) 56.03 mass flux of surface water into PM-13 M_s13 = - (mg/s) 10,447.79 mass flux of ground water into PM-13 M_g13 = 583.80 (mg/s) 583.80 mass flux of Area 5 Pit NW discharge M_spit = 879.28 (mg/s) 6,729.88 mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 842.70 (mg/s) 842.70 mass flux in hydrometallurgical residue cells liner leakage M_rs = 11.96 (mg/s) 11.96 mass flux in seepage from cell 2W M_s2w = 1,704.26 (mg/s) 1,704.26 Low Flow Average M_r12 = 175.29 (mg/s) 2,316.47 mass flux in river at PM-13 M_r13 = 4,197.29 (mg/s) 22,636.87 Low Flow Average	mass flux in Babbitt WWTP discharge M_sBab = 56.03 (mg/s) 56.03 (mg/s) mass flux of surface water into PM-13 M_s13 = - (mg/s) 10,447.79 (mg/s) mass flux of ground water into PM-13 M_g13 = 583.80 (mg/s) 583.80 (mg/s) mass flux of Area 5 Pit NW discharge M_spit = 879.28 (mg/s) 6,729.88 (mg/s) mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 842.70 (mg/s) 842.70 (mg/s) mass flux in hydrometallurgical residue cells liner leakage M_rs = 11.96 (mg/s) 11.96 (mg/s) mass flux in seepage from cell 2W M_s2w = 1,704.26 (mg/s) 1,704.26 (mg/s) Low Flow Average Flow M_r12 = 175.29 (mg/s) 2,316.47 (mg/s) mass flux in river at PM-13 M_r13 = 4,197.29 (mg/s) 22,636.87 (mg/s) Low Flow Average Flow	mass flux in Babbitt WWTP discharge M_sBab = 56.03 (mg/s) 56.03 (mg/s) 56.03 mass flux of surface water into PM-13 M_s13 = - (mg/s) 10,447.79 (mg/s) 119,290 mass flux of ground water into PM-13 M_g13 = 583.80 (mg/s) 583.80 (mg/s) 583.80 mass flux of Area 5 Pit NW discharge M_spit = 879.28 (mg/s) 6,729.88 (mg/s) 6,729.88 mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 842.70 (mg/s) 842.70 (mg/s) 842.70 mass flux in hydrometallurgical residue cells liner leakage M_rrs = 11.96 (mg/s) 11.96 (mg/s) 11.96 (mg/s) 11.96 mass flux in seepage from cell 2W M_s2w = 1,704.26 (mg/s) 1,704.26 (mg/s) 1,704.26 (mg/s) 1,704.26 Low Flow Average Flow High Fl mass flux in river at PM-13 M_r13 = 4,197.29 (mg/s) 22,636.87 (mg/s) 153,646.06 Low Flow Average Flow High Fl

Case Parameter	Post-Closure Nickel			
	concentration of surface water into PM-12	C s12 =	0.0012	(mg/L
data	concentration of surface water into PM-13		0.0012	(mg/L
Ë	concentration in Babbitt WWTP discharge		0.0012	(mg/L
	concentration in Area 5 Pit NW discharge	C_spit =	0.0052	(mg/L
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.015125217	(mg/L
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.098	(mg/L
conce	concentration in tailings basin cell 2W	C_s2w =	0.00688	(mg/L
Input	concentration of ground water into PM-12	C_g12 =	0.007	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.007	(mg/L
			Low Flo	W

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.43	(mg/s)	5	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
Ęi	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.09	(mg/s)	24	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.83	(mg/s)	0.83	(mg/s)	0.83	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.04	(mg/s)	0.29	(mg/s)	0.29	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.05	(mg/s)	1.05	(mg/s)	1.05	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =	0.26	(mg/s)	0.26	(mg/s)	0.26	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	0.18	(mg/s)	0.61	(mg/s)	5.04	(mg/s)
Mass at eac	mass flux in river at PM-13	M_r13 =	2.37 Low Flo	(mg/s)	5.14 Average	(mg/s)	31.35 High Fl	(mg/s)
			LOW FIO	W	Average	FIOW	nigii ri	l
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.005	(mg/L)	0.002	(mg/L)	0.001	(mg/L)
Converture flux to concer	concentration in river at PM-13	C_r13 =	0.009	(mg/L)	0.002	(mg/L)	0.001	(mg/L)

Case Parameter	Post-Closure Lead			
	concentration of surface water into PM-12	C_s12 =	0.00015	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00015	(mg/L)
ntration da	concentration in Babbitt WWTP discharge		0.00015	(mg/L)
	concentration in Area 5 Pit NW discharge	C_spit =	0.0003	(mg/L)
rt ra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001097329	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0005	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.0012	(mg/L)
	concentration of ground water into PM-12	C_g12 =	0.0012	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.0012	(mg/L)

			Low Flo	W	Average	Flow	High F	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.05	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.26	(mg/s)	3	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.02	(mg/s)	0.02	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.08	(mg/s)	0.08	(mg/s)	0.08	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပို ဍ	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	0.05	(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High F	ow
Mass balance at each node		M_r12 = M_r13 =		(mg/s)		(mg/s)		(mg/s)
	mass max mirror at i wi to	IVI_1 10 =	Low Flo		Average		High F	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)	0.000			(mg/L)

Case Parameter	Post-Closure Antimony			
	concentration of surface water into PM-12	C s12 =	4.00E-05	(ma/L)
ata	concentration of surface water into PM-13	C_s13 =	4.00E-05	` '
р	concentration in Babbitt WWTP discharge	C_sBab =	4.00E-05	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	2.50E-04	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.37E-03	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
LO S	concentration in tailings basin cell 2W	C_s2w =	2.50E-04	(mg/L)
pat	concentration of ground water into PM-12	C_g12 =	1.50E-03	(mg/L)
宣	concentration of ground water into PM-13	C_g13 =	1.50E-03	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.01	(mg/s)	0	(mg/s)
concentration flux	mass flux of ground water into PM-12	M_g12 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s)
uo X	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
		M_fs =	0.37	(mg/s)	0.37	(mg/s)	0.37	(mg/s
onvert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.04	(mg/s)	0.05	(mg/s)	0.20	(mg/s)
Mass k at eack		M_r13 =	0.60 Low Flo	(mg/s)	0.70	(mg/s)	1.57 High Fl	(mg/s
			LOWIN		Average	liow	Ingilit	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L
Conver flux to	concentration in river at PM-13	C r13 =	0.002	(mg/L)	0.000	(mg/L)	0.000	(ma/L

Case Parameter	Post-Closure Selenium			
		1		
	concentration of surface water into PM-12	C_s12 =	0.0003	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0003	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0003	(mg/L)
ratio	concentration in Area 5 Pit NW discharge	C_spit =	0.0016	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001503093	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.054	(mg/L)
Con	concentration in tailings basin cell 2W	C_s2w =	0.00109	(mg/L)
į į	concentration of ground water into PM-12	C_g12 =	0.00295	(mg/L)
ndu	concentration of ground water into PM-13	C_g13 =	0.00295	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.11	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.52	(mg/s)	6	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.35	(mg/s)	0.35	(mg/s)	0.35	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.18	(mg/s)	1.29	(mg/s)
Mas at e	mass flux in river at PM-13	M_r13 =	0.59	(mg/s)		(mg/s)		(mg/s
			LOW FIO	w	Average	FIOW	High Fl	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.000	(mg/L)	0.000	(mg/L
Conver flux to	concentration in river at PM-13	C r13 =	0.002	(ma/L)	0.001	(mg/L)	0.000	(ma/l

concentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-13

Case Parameter	Post-Closure Sulfate			
	concentration of surface water into PM-12	C_s12 =	4.00	(mg/L)
20 20 20 20 20 20 20 20 20 20 20 20 20 2	concentration of surface water into PM-13	C_s13 =	4.00	(mg/L)
<u>"</u>	Iconcentration in Bappitt WW LP discharge	C_sBab =	4.00	(mg/L)
Ę	concentration in Area 5 Pit NW discharge	C_spit =	1046.27	(mg/L)
<u> </u>	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	110.25	(mg/L)

			Low Flo	W	Average I	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	1	(mg/s)	1,427.45	(mg/s)	16,206	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	206.87	(mg/s)	206.87	(mg/s)	206.87	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	37.36	(mg/s)	37.36	(mg/s)	37.36	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	6,965.20	(mg/s)	79,526	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	1,012.72	(mg/s)	1,012.72	(mg/s)	1,012.72	(mg/s)
ux con	mass flux of Area 5 Pit NW discharge	M_spit =	7,698.43	(mg/s)	58,922.60	(mg/s)	58,922.60	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	7,646.82	(mg/s)	7,646.82	(mg/s)	7,646.82	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	344.66	(mg/s)	344.66	(mg/s)	344.66	(mg/s)
င္မ ပိ	mass flux in seepage from cell 2W	M_s2w =	5,861.63	(mg/s)	5,861.63	(mg/s)	5,861.63	
			Low Flo	w	Average I	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	244.23	(mg/s)	1,671.68	(mg/s)	16,449.94	(mg/s)
Mass ba at each	mass flux in river at PM-13	M_r13 =	22,808.48 Low Flo		82,425.30 Average		169,764.76 High Fl	, ,
			LOW FIO	w	Average	riow	nigii Fi	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	7.252	(mg/L)	4.280	(mg/l)	4.027	(mg/l)
Con	concentration in river at PM-13	C_r13 =	85.092	(mg/L)	34.128	(mg/l)	7.001	(mg/l)

C_rrs =

C_s2w =

C_g12 = C_g13 = 7347.00 (mg/L)

152.40 (mg/L)

8.50 (mg/L)

8.50 (mg/L)

Embarrass River Mass-Balance Model-Tailings Basin-Proposed Action

Case	Post-Closure			
Parameter	Thallium			
		-		
	concentration of surface water into PM-12	C_s12 =	0.0002	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0002	(mg/L)
D	concentration in Babbitt WWTP discharge	C_sBab =	0.0002	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0006	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000917488	(mg/L)
-	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0002	(mg/L)
ou o	concentration in tailings basin cell 2W	C_s2w =	0.0002	(mg/L)
ħ	concentration of ground water into PM-12	C_g12 =	0.000004	(mg/L)
<u>ı</u> dı	concentration of ground water into PM-13	C_g13 =	0.000004	(mg/L)

•			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.35	(mg/s)	4	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
		M_fs =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
onvert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.07	(mg/s)	0.81	(mg/s)
Mass k at each		M_r13 =	0.08 Low Flo	(mg/s)	0.53	(mg/s)	4.89 High Fl	(mg/s
			LOWIIO	VV	Average	I IOW	Ingiri	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L
Conver flux to	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(ma/l

Embarrass River Mass-Balance Model-Tailings Basin-Proposed Action

concentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Post-Closure Zinc			
	concentration of surface water into PM-12	C s12 =	0.016	(mg/L)
data	concentration of surface water into PM-13	 C_s13 =		(mg/L)
n da		C_sBab =	0.016	(mg/L)
엹	concentration in Area 5 Pit NW discharge	C_spit =	0.003	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.020231354	(mg/L)
_				

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.28	(mg/s)	0.28	(mg/s)	0.28	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.02	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.40	(mg/s)	1.40	(mg/s)	1.40	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =	0.55	(mg/s)	0.55	(mg/s)	0.55	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)		(mg/s)
ā	mass flux in river at PM-13	M_r13 =	3.78 Low Flo	(mg/s)	37.49 Average	(mg/s)	386.85 High Fl	
"			LOW FIO	W	Average	FIOW	High Fi	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.013	(mg/L)	0.016	(mg/L)	0.016	(mg/L
Convertiux to	concentration in river at PM-13	C r13 =	0.014	(mg/L)	0.016	(ma/L)	0.016	(ma/l

C_s2w =

C_g12 =

C_g13 =

0.01 (mg/L) 0.01435

0.0115 (mg/L)

0.0115 (mg/L)

(mg/L)

Appendix F.9
Embarrass River
Geotechnical Mitigation
Year 1

FLOWS

Case	Year 1				
Flows	Low Flow Conditions (no surface runoff)				Node
n River	flow in river at PM-12	Q_r12_L =	1.19	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_L =	11.22	(cfs)	PM-13
Total Emba	flow check	Q_ck_L =	11.22	(cfs)	
	surface water flow into PM-12	Q_s12_L =	0.00	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_L =	0.00	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_L =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_L =	0.26	(cfs)	PM-13
<u>t</u> a	seepage from Tailings Basin Cells 1E and 2E	Q_fs_L =	3.56	(cfs)	PM-13
da v	hydrometallurgical residue cells liner leakage	Q_rrs_L =	0.0010	(cfs)	PM-13
flow data	seepage from cell 2W	Q_s2w_L =	1.99	(cfs)	PM-13
Input 1	ground water flow into PM-12	Q_g12_L =	0.86	(cfs)	PM-12
dul	ground water flow into PM-13	Q_g13_L =	4.21	(cfs)	PM-13

Case	Year 1				
Flow	Average Flow Conditions (mean annual)				
n River	flow in river at PM-12	Q_r12_M =	13.80	(cfs)	PM-12
Total flow in Embarrass Ri	flow in river at PM-13	Q_r13_M =	87.09	(cfs)	PM-13
Total	flow check	Q_ck_M =	87.09	(cfs)	
	surface water flow into PM-12	Q s12 M =	12.61	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_M =	61.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_M =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_M =	1.99	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_M =	3.56	(cfs)	PM-13
	hydrometallurgical residue cells liner leakage	Q_rrs_M =	0.0010	(cfs)	PM-13
flow	seepage from cell 2W	Q_s2w_M =	1.99	(cfs)	PM-13
Input 1	ground water flow into PM-12	Q_g12_M =	0.86	(cfs)	PM-12
ဋ	ground water flow into PM-13	Q_g13_M =	4.21	(cfs)	PM-13

Case	Year 1				
Flow	High Flow Conditions (avg. annual 1-day max flo	w)			_
n River	flow in river at PM-12	Q_r12_H =	144.35	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_H =	858.64	(cfs)	PM-13
Tota	flow check	Q_ck_H =	858.64	(cfs)	
	surface water flow into PM-12	Q_s12_H =	143.16	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_H =	702.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_H =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_H =	1.99	(cfs)	PM-13
草	seepage from Tailings Basin Cells 1E and 2E	Q_fs_H =	3.56	(cfs)	PM-13
da /	hydrometallurgical residue cells liner leakage	Q_rrs_H =	0.0010	(cfs)	PM-13
flow data	seepage from cell 2W	Q_s2w_H =	1.99	(cfs)	PM-13
Input 1	ground water flow into PM-12	Q_g12_H =	0.86	(cfs)	PM-12
du	ground water flow into PM-13	Q_g13_H =	4.21	(cfs)	PM-13

Case	Year 1			
Parameter	Silver			
	concentration of surface water into PM-12	C_s12 =	0.00011	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00011	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.00011	(mg/L)
ţi	concentration in Area 5 Pit NW discharge	C_spit =	0.00015	(mg/L)
ntration	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00086	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.000125	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.000100	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.000008	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.000008	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.19	(mg/s)	2	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)		(mg/s)		(mg/s)
ပို ခဲ့	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)		(mg/s)
	mass nax in river at r ivi re	10_110 =	Low Flo		Average		High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.00004			(mg/L)		(mg/L)

Case Parameter	Year 1 Aluminum			
	concentration of surface water into PM-12	C_s12 =	0.12	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.12	(mg/L)
<u> </u>	concentration in Babbitt WWTP discharge	C_sBab =	0.12	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.01325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.01	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.18	(mg/L)
Ö	concentration in tailings basin cell 2W	C_s2w =	1.5788	(mg/L)
ŧ	concentration of ground water into PM-12	C_g12 =	0.025	(mg/L)
ᅙ	concentration of ground water into PM-13	C a13 -	0.025	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	42.82	(mg/s)	486	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	0.61	(mg/s)	0.61	(mg/s)	0.61	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	208.96	(mg/s)	2,386	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	2.98	(mg/s)	2.98	(mg/s)	2.98	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.10	(mg/s)	0.75	(mg/s)	0.75	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.01	(mg/s)	1.01	(mg/s)	1.01	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	89.10	(mg/s)	89.10	(mg/s)	89.10	(mg/s
			Low Flo	w	Average	Flow	High FI	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	1.73	(mg/s)	44.55	(mg/s)	487.90	(mg/s
Mass I at eacl	mass flux in river at PM-13	M_r13 =	94.91 Low Flo	(mg/s)	347.34 Average		2,967.53 High Fl	
ω ⊏			2011 7 10		7.torugo			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.051	(mg/L)	0.114	(mg/L)	0.119	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	0.299	(mg/L)	0.141	(mg/L)	0.122	(ma/l

Case	Year 1			
Parameter	Arsenic			
		-		
	concentration of surface water into PM-12	C_s12 =	0.00075	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00075	(mg/L)
ų di	concentration in Babbitt WWTP discharge	C_sBab =	0.00075	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.001325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.006769615	(mg/L)
Icei	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
cor	concentration in tailings basin cell 2W	C_s2w =	0.00291	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.00273	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.00273	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.27	(mg/s)	3	(mg/s)
concentration flux	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
it	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.31	(mg/s)	15	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s)
u X	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.68	(mg/s)	0.68	(mg/s)	0.68	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	0.16	(mg/s)	0.16	(mg/s)	0.16	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.34	(mg/s)	3.11	(mg/s)
Mass ba at each	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	w	Average	FIOW	High Fl	ow
t mass tration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.004	(mg/L)	0.001	(mg/L)	0.001	(mg/L)

oncentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 1 Boron			
	concentration of surface water into PM-12	C s12 =	0.027	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.027	(mg/L)
d d		C_sBab =	0.027	(mg/L)
₽	concentration in Area 5 Pit NW discharge	C_spit =	0.1315	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C fs =	0.137838474	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	9.64	(mg/s)	109	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)	0.52	(mg/s)	0.52	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	47.02	(mg/s)	537	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	2.53	(mg/s)	2.53	(mg/s)	2.53	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.97	(mg/s)	7.41	(mg/s)	7.41	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	13.91	(mg/s)	13.91	(mg/s)	13.91	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င် င	mass flux in seepage from cell 2W	M_s2w =		(mg/s)		(mg/s)	18.62	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.77	(mg/s)	10.40	(mg/s)	110.16	(mg/s)
Mg at	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	689.42	
	T		Low Flo	w	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.023	(mg/L)	0.027	(mg/L)	0.027	(mg/L)
Converture flux to concer	concentration in river at PM-13	C r13 =	0.116	(mg/L)	0.041	(mg/L)	0.028	(mg/L)

C_rrs =

C_s2w =

C_g12 =

C_g13 =

0.11 (mg/L)

0.33 (mg/L)

0.0212 (mg/L)

0.0212 (mg/L)

Case	rear i			
Parameter	Barium			
		-		
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
0	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.0044	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.05E-02	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	5.00E-03	(mg/L)
Los	concentration in tailings basin cell 2W	C_s2w =	0.09298	(mg/L)
ţ	concentration of ground water into PM-12	C_g12 =	0.0681	(mg/L)
du	concentration of ground water into PM-13	C_g13 =	0.0681	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	1.66	(mg/s)	1.66	(mg/s)	1.66	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	8.11	(mg/s)	8.11	(mg/s)	8.11	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	5.09	(mg/s)	5.09	(mg/s)	5.09	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	5.25	(mg/s)	5.25	(mg/s)	5.25	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)		(mg/s)
a ≊	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	403.43	, ,
			Low Flo	w	Average	FIOW	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.054	(mg/L)	0.019	(mg/L)	0.016	(mg/L)
Con	concentration in river at PM-13	C_r13 =	0.064	(mg/L)	0.022	(mg/L)	0.017	(mg/L)

Case	Year 1			
Parameter	Beryllium			
		-		
	concentration of surface water into PM-12	C_s12 =	0.0001	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0001	(mg/L)
Ě	concentration in Babbitt WWTP discharge	C_sBab =	0.0001	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000376001	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0	(mg/L)
LO CO	concentration in tailings basin cell 2W	C_s2w =	0.00075	(mg/L)
į,	concentration of ground water into PM-12	C_g12 =	0.000023	(mg/L)
<u>q</u>	concentration of ground water into PM-13	C_g13 =	0.000023	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.17	(mg/s)	2	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	-	(mg/s)	-	(mg/s)	-	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.41	(mg/s)
at M	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
		1	Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Con	concentration in river at PM-13	C_r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case Parameter	Year 1 Calcium			
		•		
	concentration of surface water into PM-12	C_s12 =	15	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	15	(mg/L)
٦	concentration in Babbitt WWTP discharge	C_sBab =	15	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	95.35	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	77.28097689	(mg/L)
Se le	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	416	(mg/L)
, i	concentration in tailings basin cell 2W	C_s2w =	59.78	(mg/L)
į	concentration of ground water into PM-12	C_g12 =	19	(mg/L)
<u>=</u>	concentration of ground water into PM-13	C_g13 =	19	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5,352.95	(mg/s)	60,771	(mg/s)
concentration flux	mass flux of ground water into PM-12	M_g12 =	462.42	(mg/s)	462.42	(mg/s)	462.42	(mg/s)
	mass flux in Babbitt WWTP discharge	M_sBab =	140.09	(mg/s)	140.09	(mg/s)	140.09	(mg/s
ıt.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	26,119.49	(mg/s)	298,224	(mg/s
Cer	mass flux of ground water into PM-13	M_g13 =	2,263.72	(mg/s)	2,263.72	(mg/s)	2,263.72	(mg/s
Ę co	mass flux of Area 5 Pit NW discharge	M_spit =	701.59	(mg/s)	5,369.83	(mg/s)	5,369.83	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	7,796.40	(mg/s)	7,796.40	(mg/s)	7,796.40	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	12.28	(mg/s)	12.28	(mg/s)	12.28	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	3,373.51	(mg/s)	3,373.51	(mg/s)	1.77	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
balance h node	mass flux in river at PM-12	M_r12 =	602.51	(mg/s)	5,955.45	(mg/s)	61,373.93	(mg/s
Mass ba at each	mass flux in river at PM-13	M_r13 =	14,750.01 Low Flo		50,890.68 Average		375,041.91 High Fl	
ν =			2011 1 10		7110.090			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	17.891	(mg/L)	15.249	(mg/l)	15.024	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	46.453	(ma/L)	20.648	(ma/l)	15.434	(ma/l

Case	Year 1	1		
Parameter	Cadmium]		
		1		
	concentration of surface water into PM-12	C_s12 =	0.00008	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00008	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.00008	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00032784	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0004	(mg/L)
Souc	concentration in tailings basin cell 2W	C_s2w =	0.000188	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0003	(mg/L)
<u>u</u>	concentration of ground water into PM-13	C_g13 =	0.0003	(mg/L)

			Low Flo	W	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.03	(mg/s)	0	(mg/s)
concentration flux	mass flux of ground water into PM-12	M_g12 =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıt.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.14	(mg/s)	2	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
ž X	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
		M_fs =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	low
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.01	(mg/s)	0.04	(mg/s)	0.33	(mg/s)
Mass ba at each	mass flux in river at PM-13	M_r13 =	0.09 Low Flo	(mg/s)		(mg/s)		(mg/s)
			LOW FIO	w	Average	FIOW	High Fl	low
t mass tration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

concentration in tailings basin cell 2W

concentration of ground water into PM-12 concentration of ground water into PM-13

Parameter	Chloride			
	concentration of surface water into PM-12	C_s12 =	6.5	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	6.5	(mg/L)
n da	concentration in Babbitt WWTP discharge	C_sBab =	6.5	(mg/L)
을	concentration in Area 5 Pit NW discharge	C_spit =	5.95	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.52E+01	(mg/L)
Se le	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.76E+03	(mg/L)

			Low Flo	W	Average	Flow	w High Flow	
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,319.61	(mg/s)	26,334	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	43.81	(mg/s)	43.81	(mg/s)	43.81	(mg/s)
Ęi	mass flux in Babbitt WWTP discharge	M_sBab =	60.70	(mg/s)	60.70	(mg/s)	60.70	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	11,318.44	(mg/s)	129,230	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	214.46	(mg/s)	214.46	(mg/s)	214.46	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	43.78	(mg/s)	335.09	(mg/s)	335.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,538.17	(mg/s)	1,538.17	(mg/s)	1,538.17	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	51.97	(mg/s)	51.97	(mg/s)	51.97	(mg/s)
မ ပိ	mass flux in seepage from cell 2W	M_s2w =	1,215.55	(mg/s)	1,215.55	(mg/s)	1,215.55	(mg/s)
			Low Flow		Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	104.51	(mg/s)	2,424.12	(mg/s)	26,438.79	(mg/s)
M _a	mass flux in river at PM-13	M_r13 =	3,168.44		17,097.80		159,024.42	
			Low Flo	W	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	3.103	(mg/L)	6.207	(mg/L)	6.472	(mg/L)
Converture flux to concer	concentration in river at PM-13	C r13 =	9.979	(mg/L)	6.937	(mg/L)	6.544	(mg/L)

C_s2w =

C_g12 =

C_g13 =

21.54 (mg/L)

1.8 (mg/L)

1.8 (mg/L)

Case Parameter	Year 1 Cobalt			
	concentration of surface water into PM-12	C s12 =	0.0006	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0006	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0006	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.000555	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001495727	(mg/L)
concent	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.005	(mg/L)
Ö	concentration in tailings basin cell 2W	C_s2w =	0.001556	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0011	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.0011	(mg/L)

			Low Flow		Average	Average Flow		ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.21	(mg/s)	2	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.04	(mg/s)	12	(mg/s)
Se T	mass flux of ground water into PM-13	M_g13 =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
		M_fs =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
္ ပိ	mass flux in seepage from cell 2W	M_s2w =		(mg/s)		(mg/s)	0.09	(mg/s)
			Low Flow		Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
ō £ ō	concentration in river at PM-13	C r13 =	0.001	I I		(mg/L)	1	(mg/L)

Case	Year 1			
Parameter	Copper			
	concentration of surface water into PM-12	C_s12 =	0.0015	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0015	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0015	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00345	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.0068095	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0015	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.004555	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.004	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.004	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.54	(mg/s)	6	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.61	(mg/s)	30	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	0.48	(mg/s)	0.48	(mg/s)	0.48	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.19	(mg/s)	0.19	(mg/s)
		M_fs =	0.69	(mg/s)	0.69	(mg/s)	0.69	(mg/s)
onvert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.26	(mg/s)	0.26	(mg/s)	0.26	(mg/s)
			Low Flow		Average Flow		High Flow	
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.11	(mg/s)	0.65	(mg/s)	6.19	(mg/s)
Mass b at each		M_r13 =		(mg/s)		(mg/s)	37.63	
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	0.003	(mg/L)	0.002	(mg/L)	0.002	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.005	(mg/L)	0.002	(mg/L)	0.002	/ma/l

Case	Year 1			
Parameter	Fluoride	<u> </u>		
	concentration of surface water into PM-12	C s12 =	0.2	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =		(mg/L)
Ф	concentration in Babbitt WWTP discharge	C_sBab =	0.2	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.125	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	2.90E+00	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	2.85E+00	(mg/L)
Son	concentration in tailings basin cell 2W	C_s2w =	1.55	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.385	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.385	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	71.37	(mg/s)	810	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	9.37	(mg/s)	9.37	(mg/s)	9.37	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	1.87	(mg/s)	1.87	(mg/s)	1.87	(mg/s
ıt.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	348.26	(mg/s)	3,976	(mg/s
concentration	mass flux of ground water into PM-13	M_g13 =	45.87	(mg/s)	45.87	(mg/s)	45.87	(mg/s
co Licon	mass flux of Area 5 Pit NW discharge	M_spit =	0.92	(mg/s)	7.04	(mg/s)	7.04	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	292.90	(mg/s)	292.90	(mg/s)	292.90	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.08	(mg/s)	0.08	(mg/s)	0.08	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	87.47	(mg/s)	87.47	(mg/s)	87.47	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	11.24	(mg/s)	82.61	(mg/s)	821.52	(mg/s
at 🛱	mass flux in river at PM-13	M_r13 =	438.48		864.24		5,231.21	
	T		Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.334	(mg/L)	0.212	(mg/L)	0.201	(mg/L
Conve flux to	concentration in river at PM-13	C r13 =	1.381	(mg/L)	0.351	(mg/L)	0.215	(ma/l

oncentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 1 Iron			
	concentration of surface water into PM-12	C_s12 =	2.9	(mg/L)
data ata	concentration of surface water into PM-13	C_s13 =	2.9	(mg/L)
d n		C_sBab =	2.9	(mg/L)
Ę	concentration in Area 5 Pit NW discharge	C_spit =	0.037761905	(mg/L)
t.	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	4.00E-03	(mg/L)

			Low Flo	w	Average I	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	1	(mg/s)	1,034.90	(mg/s)	11,749	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.85	(mg/s)	0.85	(mg/s)	0.85	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	27.08	(mg/s)	27.08	(mg/s)	27.08	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	5,049.77	(mg/s)	57,657	(mg/s)
concentration flux	mass flux of ground water into PM-13	M_g13 =	4.17	(mg/s)	4.17	(mg/s)	4.17	(mg/s)
u X	mass flux of Area 5 Pit NW discharge	M_spit =	0.28	(mg/s)	2.13	(mg/s)	2.13	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.40	(mg/s)	0.40	(mg/s)	0.40	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
င္မ င	mass flux in seepage from cell 2W	M_s2w =	259.25	(mg/s)	259.25		259.25	(mg/s)
		_	Low Flow		Average Flow		High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	27.93	(mg/s)	1,062.84	(mg/s)	11,777.08	(mg/s)
Mass at ea	mass flux in river at PM-13	M_r13 =	292.05		6,378.57		69,699.67	
	Т		Low Flo	W	Average I	low	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.829	(mg/L)	2.721	(mg/L)	2.883	(mg/L)
Con	concentration in river at PM-13	C_r13 =	0.920	(mg/L)	2.588	(mg/L)	2.868	(mg/L)

4.00E-01

4.594

0.035

C_s2w =

C_g12 =

C_g13 =

(mg/L)

(mg/L)

(mg/L)

0.035 (mg/L)

	Case Parameter	Hardness		
ı				
		concentration of surface water into PM-12	C_s12 =	

	concentration of surface water into PM-12	C_s12 =	70	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	70	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	70	(mg/L)
章	concentration in Area 5 Pit NW discharge	C_spit =	942.7142857	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	3.74E+02	(mg/L)
ie i	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	8.61E+03	(mg/L)
LO S	concentration in tailings basin cell 2W	C_s2w =	436.6	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	87.5	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	87.5	(mg/L)

			Low Flow		Average Flow		High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	24,980.41	(mg/s)	283,600	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	2,129.58	(mg/s)	2,129.58	(mg/s)	2,129.58	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	653.73	(mg/s)	653.73	(mg/s)	653.73	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	121,890.93	(mg/s)	1,391,712	(mg/s)
Sen	mass flux of ground water into PM-13	M_g13 =	10,425.01	(mg/s)	10,425.01	(mg/s)	10,425.01	(mg/s)
i s	mass flux of Area 5 Pit NW discharge	M_spit =	6,936.49	(mg/s)	53,090.84	(mg/s)	53,090.84	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	37,758.64	(mg/s)	37,758.64	(mg/s)	37,758.64	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	254.25	(mg/s)	254.25	(mg/s)	254.25	(mg/s)
ပို့ ၁	mass flux in seepage from cell 2W	M_s2w =	24,638.27	(mg/s)	24,638.27	(mg/s)	24,638.27	(mg/s)
			Low Flow		Average Flow		High Flow	
Mass balance at each node		M_r12 =	2,783.31	(mg/s)	27,763.72	(mg/s)	286,383.27	(mg/s)
Ma at	mass flux in river at PM-13	M_r13 =	82,795.96		275,821.65		1,804,262.20	, ,
			Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	82.647	(mg/L)	71.091	(mg/L)	70.104	(mg/L)
CO FEE	concentration in river at PM-13	C_r13 =	260.755	(mg/L)	111.911	(mg/L)	74.251	(mg/L)

Case Parameter	Year 1 Potassium]		
	concentration of surface water into PM-12	C_s12 =	0.60	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.60	(mg/L)
Ž	concentration in Babbitt WWTP discharge	C_sBab =	0.60	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	53.80	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	9.31	(mg/L)
leo leo	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80	(mg/L)
	concentration in tailings basin cell 2W	C_s2w =	7.77	(mg/L)
5	concentration of ground water into PM-12	C_g12 =	1.60	(mg/L)
ngu	concentration of ground water into PM-13	C a13 -	1.60	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	214.12	(mg/s)	2,431	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	38.94	(mg/s)	38.94	(mg/s)	38.94	(mg/s
₫	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1,044.78	(mg/s)	11,929	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	190.63	(mg/s)	190.63	(mg/s)	190.63	(mg/s
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	5.60	(mg/s)	5.60	(mg/s)	5.60	(mg/s
	mass flux of Area 5 Pit NW discharge	M_spit =	395.86	(mg/s)	3,029.85	(mg/s)	3,029.85	(mg/s
Convert to mass	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	938.93	(mg/s)	938.93	(mg/s)	938.93	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	438.48	(mg/s)	438.48	(mg/s)	438.48	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	38.99	(mg/s)	253.11	(mg/s)	2,469.85	(mg/s
Mass at eac		M_r13 =	2,008.49 Low Flo		5,901.39 Average		19,002.31 High Fl	
<u> </u>			LOW 1 10		Average	liow	riigii i	OW.
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	1.158	(mg/L)	0.648	(mg/L)	0.605	(mg/l
Conver flux to concer	concentration in river at PM-13	C r13 =	6.326	(mg/L)	2.394	(mg/L)	0.782	(ma/l

Case	Year 1	1		
Parameter	Magnesium			
		1	T	
	concentration of surface water into PM-12	C_s12 =	5.90	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	5.90	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	5.90	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	44.03	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	213.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	69.97	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	10.65	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	10.65	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,105.49	(mg/s)	23,903	(mg/s)
	mass flux of ground water into PM-12	M_g12 =	259.20	(mg/s)	259.20	(mg/s)	259.20	(mg/s)
tior	mass flux in Babbitt WWTP discharge	M_sBab =	55.10	(mg/s)	55.10	(mg/s)	55.10	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,273.66	(mg/s)	117,301	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	1,268.87	(mg/s)	1,268.87	(mg/s)	1,268.87	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	1,994.02	(mg/s)	15,261.91	(mg/s)	15,261.91	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	4,441.73	(mg/s)	4,441.73	(mg/s)	4,441.73	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	6.29	(mg/s)	6.29	(mg/s)		(mg/s)
္ ပိ	mass flux in seepage from cell 2W	M_s2w =	3,948.56		3,948.56		3,948.56	
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	314.30	(mg/s)	2,419.79	(mg/s)	24,217.73	(mg/s)
Ma at	mass flux in river at PM-13	M_r13 =	11,973.76		37,620.81		166,446.51	
			Low Flo	W	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	9.333	(mg/L)	6.196	(mg/l)	5.928	(mg/l)
S (i)	concentration in river at PM-13	C r13 =	37.710	(ma/L)	15.264	(ma/l)	6.850	(ma/l)

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case	Year 1			
Parameter	Manganese			
	concentration of surface water into PM-12	C_s12 =	0.30	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.30	(mg/L)
, p	Iconcentration in Bannitt WW IP discharde	C_sBab =	0.30	(mg/L)
:≘	concentration in Area 5 Pit NW discharge	C_spit =	0.49	(mg/L)
ntra		C_fs =	0.24	(mg/L)
Leo Leo	N I	C_rrs =	0.00	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	107.06	(mg/s)	1,215	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	4.58	(mg/s)	4.58	(mg/s)	4.58	(mg/s)
Ë	mass flux in Babbitt WWTP discharge	M_sBab =	2.80	(mg/s)	2.80	(mg/s)	2.80	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	522.39	(mg/s)	5,964	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	22.40	(mg/s)	22.40	(mg/s)	22.40	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	3.57	(mg/s)	27.31	(mg/s)	27.31	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	24.25	(mg/s)	24.25	(mg/s)	24.25	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	66.76	(mg/s)	66.76	(mg/s)	66.76	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =	7.38 124.35	(mg/s)	114.44 777.54		1,222.81 7,328.00	
			Low Flo		Average		High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.219	(mg/L)	0.293	(mg/l)	0.299	(mg/l)
್ಟ್ ಟ	concentration in river at PM-13	C r13 =	0.392	(mg/L)	0.315	(mg/l)	0.302	(ma)

C_s2w =

C_g12 =

C_g13 =

1.18 (mg/L)

0.19 (mg/L)

0.19 (mg/L)

Case Parameter	Year 1 Sodium			
		_		
	concentration of surface water into PM-12	C_s12 =	6.00	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	6.00	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	6.00	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	119.50	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	52.95	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	255.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	44.31	(mg/L)
	concentration of ground water into PM-12	C_g12 =	4.90	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =		(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,141.18	(mg/s)	24,309	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	119.26	(mg/s)	119.26	(mg/s)	119.26	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	56.03	(mg/s)	56.03	(mg/s)	56.03	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,447.79	(mg/s)	119,290	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	583.80	(mg/s)	583.80	(mg/s)	583.80	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	879.28	(mg/s)	6,729.88	(mg/s)	6,729.88	(mg/s)
		M_fs =	5,341.70	(mg/s)	5,341.70	(mg/s)	5,341.70	(mg/s)
Convert	mass flux in seepage from Tailings Basin Cells 1E and 2E mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	7.53	(mg/s)	7.53	(mg/s)	7.53	(mg/s)
ပိ .	mass flux in seepage from cell 2W	M_s2w =	2,500.51	(mg/s)	2,500.51		2,500.51	(mg/s)
			Low Flo	w	Average	Flow	High FI	ow
Mass balance	mass flux in river at PM-12	M_r12 =	175.29		2,316.47		24,483.86	
≥ `	mass flux in river at PM-13	M_r13 =	9,488.11 Low Flo		27,927.68 Average		158,936.87 High FI	
Convert mass flux to	concentration in river at PM-12	C_r12 =	5.205	(mg/L)	5.931		5.993	
ర ≓	concentration in river at PM-13	C_r13 =	29.882	(mg/L)	11.331	(mg/l)	6.541	(mg/l)

Case	Year 1			
Parameter	Nickel			
		-		
	concentration of surface water into PM-12	C_s12 =	0.0012	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0012	(mg/L)
p u	concentration in Babbitt WWTP discharge	C_sBab =	0.0012	(mg/L)
atior	concentration in Area 5 Pit NW discharge	C_spit =	0.0052	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.019144051	(mg/L)
Ser	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.098	(mg/L)
con	concentration in tailings basin cell 2W	C_s2w =	0.00688	(mg/L)
ţ	concentration of ground water into PM-12	C_g12 =	0.007	(mg/L)
5	apparation of ground water into DM 10	C ~12	0.007	(ma/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.43	(mg/s)	5	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.09	(mg/s)	24	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.83	(mg/s)	0.83	(mg/s)	0.83	(mg/s)
con	mass flux of Area 5 Pit NW discharge	M_spit =	0.04	(mg/s)	0.29	(mg/s)	0.29	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.93	(mg/s)	1.93	(mg/s)	1.93	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
္ င	mass flux in seepage from cell 2W	M_s2w =	0.39	(mg/s)	0.39	(mg/s)	0.39	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =	0.18	(mg/s)	0.61	(mg/s)	5.04	(mg/s)
Mi at	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
	ı	1	Low Flo	W	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.005	(mg/L)	0.002	(mg/L)	0.001	(mg/L)
S I S	concentration in river at PM-13	C_r13 =	0.011	(mg/L)	0.002	(mg/L)	0.001	(mg/L)

Case Parameter	Year 1 Lead			
				I
	concentration of surface water into PM-12	C_s12 =	0.00015	(mg/L
data	concentration of surface water into PM-13		0.00015	(mg/L
ntration de	concentration in Babbitt WWTP discharge	C_sBab =	0.00015	(mg/L
	concentration in Area 5 Pit NW discharge	C_spit =	0.0003	(mg/L
ra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000886329	(mg/L
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0005	(mg/L
conce	concentration in tailings basin cell 2W	C_s2w =	0.0012	(mg/L
Input	concentration of ground water into PM-12	C_g12 =	0.0012	(mg/L
≝	concentration of ground water into PM-13	C_g13 =	0.0012	(mg/L
			Low Flor	

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.05	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.26	(mg/s)	3	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.02	(mg/s)	0.02	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	0.07	(mg/s)		(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
balance ch node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.08	(mg/s)	0.64	(mg/s)
Mass ba at each	mass flux in river at PM-13	M_r13 =	0.33 Low Flo	(mg/s)	0.66	(mg/s)	3.94 High Fl	(mg/s)
			LOW 1 10	VV	Average	I low	Iligii I	l
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Convertilux to	concentration in river at PM-13	C_r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case Parameter	Year 1 Antimony			
		ı	1	
	concentration of surface water into PM-12	C_s12 =	4.00E-05	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	4.00E-05	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	4.00E-05	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	2.50E-04	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	8.05E-03	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	2.50E-04	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	1.50E-03	(mg/L)
宣	concentration of ground water into PM-13	C_g13 =	1.50E-03	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.01	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.81	(mg/s)	0.81	(mg/s)	0.81	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.04	(mg/s)	0.05	(mg/s)	0.20	(mg/s
Mass I at eacl	mass flux in river at PM-13	M_r13 =	1.04 Low Flo	(mg/s)	1.14 Average	(mg/s)	2.01 High Fl	(mg/s
ss								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	0.003	(mg/L)	0.000	(mg/L)	0.000	(ma/l

Case	Year 1			
Parameter	Selenium			
		_		
	concentration of surface water into PM-12	C_s12 =	0.0003	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0003	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0003	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.0016	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001106406	(mg/L)
50	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.054	(mg/L)
LO CO	concentration in tailings basin cell 2W	C_s2w =	0.00109	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.00295	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.00295	(mg/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.11	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ita	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.52	(mg/s)	6	(mg/s
Ser	mass flux of ground water into PM-13	M_g13 =	0.35	(mg/s)	0.35	(mg/s)	0.35	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.09	(mg/s)	0.09	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.11	(mg/s)	0.11	(mg/s)	0.11	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
			Low Flo	w	Average	Flow	High Fl	low
balance ch node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.18	(mg/s)	1.29	(mg/s
Mass ba at each		M_r13 =		(mg/s)		(mg/s)		(mg/s
	1	C_r12 =	Low Flo		Average		High Fl	
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.002	(mg/L)	0.001	(mg/L)	0.000	(mc

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 1 Sulfate			
	concentration of surface water into PM-12	C_s12 =	4.00	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	4.00	(mg/L)
		C_sBab =	4.00	(mg/L)
tion	concentration in Area 5 Pit NW discharge	C_spit =	1046.27	(mg/L)
ntra		C_fs =	190.00	(mg/L)
cer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	7347.00	(mg/L)
1 5	•			

			Low Flo	W	Average I	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,427.45	(mg/s)	16,206	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	206.87	(mg/s)	206.87	(mg/s)	206.87	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	37.36	(mg/s)	37.36	(mg/s)	37.36	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	6,965.20	(mg/s)	79,526	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	1,012.72	(mg/s)	1,012.72	(mg/s)	1,012.72	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	7,698.43	(mg/s)	58,922.60	(mg/s)	58,922.60	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	19,167.71	(mg/s)	19,167.71	(mg/s)	19,167.71	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	216.95	(mg/s)	216.95	(mg/s)	216.95	(mg/s)
င့် င	mass flux in seepage from cell 2W	M_s2w =	8,600.26	(mg/s)	8,600.26	(mg/s)	8,600.26	(mg/s)
			Low Flo	w	Average I	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	244.23	(mg/s)	1,671.68	(mg/s)	16,449.94	(mg/s)
Ma at	mass flux in river at PM-13	M_r13 =	36,940.30		96,557.11	, ,	183,896.57	
	I	1	Low Flo	w	Average I	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12 concentration in river at PM-13	C_r12 =	7.252	(mg/L)	4.280	(mg/l)	4.027	(mg/l)
S ∰ S	concentration in river at PM-13	C_r13 =	116.339	(mg/L)	39.177	(mg/l)	7.568	(mg/l)

C_s2w = C_g12 =

C_g13 =

152.40 (mg/L)

8.50 (mg/L)

8.50 (mg/L)

Case	year 1			
Parameter	Thallium			
		_		
	concentration of surface water into PM-12	C_s12 =	0.0002	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0002	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0002	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0006	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000907911	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0002	(mg/L)
eouce	concentration in tailings basin cell 2W	C_s2w =	0.0002	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.000004	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.000004	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.35	(mg/s)	4	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င်	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	0.01	(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =		(mg/s)		(mg/s)		(mg/s)
	Illiass liux III livel at Fivi-13	IVI_I I 3 =	Low Flo		Average		High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)	0.000	(mg/L)		(mg/L)

Case Parameter	Year 1 Zinc			
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
Ę	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
	concentration in Area 5 Pit NW discharge	C_spit =	0.003	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.0182086	(mg/L)
Ser	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.01	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.01435	(mg/L)
	concentration of ground water into PM-12	C_g12 =	0.0115	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.0115	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
	mass flux of ground water into PM-12	M_g12 =	0.28	(mg/s)	0.28	(mg/s)	0.28	(mg/s)
tion	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.02	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.84	(mg/s)	1.84	(mg/s)	1.84	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)		(mg/s)
င်	mass flux in seepage from cell 2W	M_s2w =	0.81	(mg/s)	0.81	(mg/s)	0.81	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)	65.25 387.54	(mg/s)
	mass nax in river at r ivi re	10_110 =	Low Flo		Average		High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)	0.016	(mg/L)	0.016	(mg/L)

Appendix F.10
Embarrass River
Geotechnical Mitigation
Year 5

FLOWS

Case	Year 5				
Flows	Low Flow Conditions (no surface runoff)				Node
n River	flow in river at PM-12	Q_r12_L =	1.19	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_L =	12.70	(cfs)	PM-13
Total Emba	flow check	Q_ck_L =	12.70	(cfs)	
	surface water flow into PM-12	Q_s12_L =	0.00	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_L =	0.00	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_L =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_L =	0.26	(cfs)	PM-13
<u>ta</u>	seepage from Tailings Basin Cells 1E and 2E	Q_fs_L =	5.04	(cfs)	PM-13
da da	hydrometallurgical residue cells liner leakage	Q_rrs_L =	0.015	(cfs)	PM-13
<u>§</u>	seepage from cell 2W	Q_s2w_L =	1.99	(cfs)	PM-13
nput flow data	ground water flow into PM-12	Q_g12_L =	0.86	(cfs)	PM-12
트	ground water flow into PM-13	Q_g13_L =	4.21	(cfs)	PM-13

Case	Year 5				
Flow	Average Flow Conditions (mean annual)				_
n River	flow in river at PM-12	Q_r12_M =	13.80	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_M =	88.57	(cfs)	PM-13
Tota	flow check	Q_ck_M =	88.57	(cfs)	
	surface water flow into PM-12	Q_s12_M =	12.61	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_M =	61.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_M =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_M =	1.99	(cfs)	PM-13
<u>ta</u>	seepage from Tailings Basin Cells 1E and 2E	Q_fs_M =	5.04	(cfs)	PM-13
g /	hydrometallurgical residue cells liner leakage	Q_rrs_M =	0.015	(cfs)	PM-13
lo N	seepage from cell 2W	Q_s2w_M =	1.99	(cfs)	PM-13
nput flow data	ground water flow into PM-12	Q_g12_M =	0.86	(cfs)	PM-12
ᄪ	ground water flow into PM-13	Q_g13_M =	4.21	(cfs)	PM-13

Case	Year 5				
Flow	High Flow Conditions (avg. annual 1-day max flow)				_
in River	flow in river at PM-12	Q_r12_H =	144.35	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_H =	860.12	(cfs)	PM-13
Tota	flow check	Q_ck_H =	860.12	(cfs)	1
	surface water flow into PM-12	Q_s12_H =	143.16	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_H =	702.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_H =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_H =	1.99	(cfs)	PM-13
<u>ta</u>	seepage from Tailings Basin Cells 1E and 2E	Q_fs_H =	5.04	(cfs)	PM-13
flow data	hydrometallurgical residue cells liner leakage	Q_rrs_H =	0.015	(cfs)	PM-13
<u>§</u>	seepage from cell 2W	Q_s2w_H =	1.99	(cfs)	PM-13
Input	ground water flow into PM-12	Q_g12_H =	0.86	(cfs)	PM-12
트	ground water flow into PM-13	Q_g13_H =	4.21	(cfs)	PM-13

Case	Year 5			
Parameter	Silver	J		
	concentration of surface water into PM-12	C_s12 =	0.00011	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00011	(mg/L)
ration da	concentration in Babbitt WWTP discharge	C_sBab =	0.00011	(mg/L)
	concentration in Area 5 Pit NW discharge	C_spit =	0.00015	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00086	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.000125	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.000100	(mg/L)
į	concentration of ground water into PM-12	C_g12 =	0.000008	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.000008	(mg/L)

			Low Flo	W	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.19	(mg/s)	2	(mg/s)
Cer	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.12	(mg/s)	0.12	(mg/s)	0.12	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
္ မ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	low
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)		(mg/s)
≥ ∞	mass flux in river at PM-13	M_r13 =	0.13 Low Flo	(mg/s)	0.37 Average	(mg/s)	2.77 High Fl	(mg/s)
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)		(mg/L)		(mg/L)

Case Parameter	Year 5 Aluminum			
	concentration of surface water into PM-12	C s12 =	0.12	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.12	(mg/L)
g c	concentration in Babbitt WWTP discharge	C_sBab =	0.12	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.01325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.00E-02	(mg/L)
ie e	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80E-01	(mg/L)
Ö	concentration in tailings basin cell 2W	C_s2w =	1.5788	(mg/L)
nput	concentration of ground water into PM-12	C_g12 =	0.025	(mg/L)
Ξ.	concentration of ground water into PM-13	C a13 -	0.025	(ma/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	42.82	(mg/s)	486	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.61	(mg/s)	0.61	(mg/s)	0.61	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	208.96	(mg/s)	2,386	(mg/s
Ser	mass flux of ground water into PM-13	M_g13 =	2.98	(mg/s)	2.98	(mg/s)	2.98	(mg/s
co Licon	mass flux of Area 5 Pit NW discharge	M_spit =	0.10	(mg/s)	0.75	(mg/s)	0.75	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.42	(mg/s)	1.42	(mg/s)	1.42	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.08	(mg/s)	0.08	(mg/s)	0.08	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	89.10	(mg/s)	89.10	(mg/s)	89.10	(mg/s
			Low Flo	w	Average	Flow	High Fl	low
ass balance each node	mass flux in river at PM-12	M_r12 =	1.73	(mg/s)	44.55	(mg/s)	487.90	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =		(mg/s)	347.83		2,968.01 High Fl	
		M_r13 =	Low Flo		Average		Hig	
Convert mass flux to concentration	concentration in river at PM-13	C r13 =		(mg/L)		(mg/L)	0.122	

Case Parameter	Year 5 Arsenic			
rarameter	Algelio			
	concentration of surface water into PM-12	C_s12 =	0.00075	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00075	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.00075	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.001325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.006769615	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.00291	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.00273	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.00273	(mg/L)

nass flux of surface water into PM-12 nass flux of ground water into PM-12 nass flux in Babbitt WWTP discharge nass flux of surface water into PM-13 nass flux of ground water into PM-13 nass flux of Area 5 Pit NW discharge	M_s12 = M_g12 = M_sBab = M_s13 = M_g13 =		(mg/s) (mg/s) (mg/s) (mg/s)	0.07 0.01	(mg/s) (mg/s) (mg/s)	0.07 0.01	(mg/s) (mg/s) (mg/s) (mg/s)
nass flux in Babbitt WWTP discharge nass flux of surface water into PM-13 nass flux of ground water into PM-13	M_sBab = M_s13 = M_g13 =	0.01	(mg/s) (mg/s)	0.01	(mg/s)	0.01	(mg/s)
nass flux of surface water into PM-13 nass flux of ground water into PM-13	M_s13 = M_g13 =	-	(mg/s)				
nass flux of ground water into PM-13	M_g13 =	0.33		1.31	(mg/s)	15	(ma/s)
		0.33					(9,0)
nass flux of Area 5 Pit NW discharge	M onit		(mg/s)	0.33	(mg/s)	0.33	(mg/s)
	M_spit =	0.01	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
nass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.96	(mg/s)	0.96	(mg/s)	0.96	(mg/s)
nass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
nass flux in seepage from cell 2W	M_s2w =	0.16	(mg/s)	0.16	(mg/s)	0.16	(mg/s)
		Low Flo	w	Average I	Flow	High Fl	ow
nass flux in river at PM-12	M_r12 =						(mg/s)
nass flux in river at PW-13	VI_F13 =				, ,		
oncentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
n	nass flux in hydrometallurgical residue cells liner leakage nass flux in seepage from cell 2W nass flux in river at PM-12 nass flux in river at PM-13	hass flux in hydrometallurgical residue cells liner leakage M_rrs = hass flux in seepage from cell 2W M_s2w = hass flux in river at PM-12 M_r12 = hass flux in river at PM-13 M_r13 = hass flux in river at PM-12 C_r12 =	M_rrs = 0.00	M_rrs = 0.00 (mg/s) mass flux in hydrometallurgical residue cells liner leakage M_rrs = 0.00 (mg/s)	Name Name	M_rrs = 0.00 (mg/s) 0.00	Nass flux in hydrometallurgical residue cells liner leakage M_rrs = 0.00 (mg/s) 0.00 (mg/s) 0.00 (mg/s)

Case Parameter	Year 5 Boron			
	concentration of surface water into PM-12	C_s12 =	0.027	(mg/l
ata	concentration of surface water into PM-13	C_s13 =	0.027	(mg/l
n dat	Iconcentration in Bappitt WW LP discharge	C_sBab =	0.027	(mg/l
.0	concentration in Area 5 Pit NW discharge	C spit =	0 1315	(ma/l

ı	ata	concentration of surface water into PM-13	C_s13 =	0.027	(mg/L)
ı	ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.027	(mg/L)
ı	章	concentration in Area 5 Pit NW discharge	C_spit =	0.1315	(mg/L)
ı	ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.137838474	(mg/L)
ı	Se	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.11	(mg/L)
ı	COU	concentration in tailings basin cell 2W	C_s2w =	0.33	(mg/L)
۱	Ħ	concentration of ground water into PM-12	C_g12 =	0.0212	(mg/L)
l	트	concentration of ground water into PM-13	C_g13 =	0.0212	(mg/L)
-				·	

			Low Flo	w	Average I	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	9.64	(mg/s)	109	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)	0.52	(mg/s)	0.52	(mg/s)
ţio	mass flux in Babbitt WWTP discharge	M_sBab =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
<u>t</u> ra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	47.02	(mg/s)	537	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	2.53	(mg/s)	2.53	(mg/s)	2.53	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.97	(mg/s)	7.41	(mg/s)	7.41	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	19.64	(mg/s)	19.64	(mg/s)	19.64	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s)
မို ပိ	mass flux in seepage from cell 2W	M_s2w =	18.62	(mg/s)	18.62	(mg/s)	18.62	(mg/s)
			Low Flo	w	Average I	Flow	High Fl	ow
Mass balance at each node		M_r12 =		(mg/s)	10.40		110.16	
≥ ia	mass flux in river at PM-13	M_r13 =	42.57 Low Flo	(mg/s)	105.66 Average I		695.20 High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.023	(mg/L)	0.027	(mg/L)	0.027	(mg/L)
() - :	concentration in river at PM-13	C r13 =	0 118	(mg/L)	0.042	(ma/L)	1 0 020	(mg/L)

Case Parameter	Year 5 Barium			
		ı		
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0044	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.05E-02	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	5.00E-03	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.09298	(mg/L)
nput .	concentration of ground water into PM-12	C_g12 =	0.0681	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.0681	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	1.66	(mg/s)	1.66	(mg/s)	1.66	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	8.11	(mg/s)	8.11	(mg/s)	8.11	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	7.19	(mg/s)	7.19	(mg/s)	7.19	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပို့ ဍ	mass flux in seepage from cell 2W	M_s2w =	5.25	(mg/s)	5.25	(mg/s)	5.25	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	1.81	(mg/s)	7.52	(mg/s)	66.63	(mg/s)
M, at	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	405.54	, ,
			Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.054	(mg/L)	0.019	(mg/L)	0.016	(mg/L)
Con	concentration in river at PM-13	C_r13 =	0.062	(mg/L)	0.022	(mg/L)	0.017	(mg/L)

Case	Year 5			
Parameter	Beryllium			
		_		
	concentration of surface water into PM-12	C_s12 =	0.0001	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0001	(mg/L)
Ф	concentration in Babbitt WWTP discharge	C_sBab =	0.0001	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000376001	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0	(mg/L)
ŭo	concentration in tailings basin cell 2W	C_s2w =	0.00075	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.000023	(mg/L)
ם	concentration of ground water into PM-13	C_g13 =	0.000023	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ıt.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.17	(mg/s)	2	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s
		M_fs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	-	(mg/s)	-	(mg/s)	-	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.41	(mg/s
Mass b		M_r13 =	0.10 Low Flo	(mg/s)	0.32	(mg/s)	2.50 High Fl	(mg/s
			LOW 1 10		Average	1000	riigirri	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(ma/l

Case	Year 5			
Parameter	Calcium			
		-		
	concentration of surface water into PM-12	C_s12 =	15	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	15	(mg/L)
D C	concentration in Babbitt WWTP discharge	C_sBab =	15	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	95.35	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	77.28097689	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	416	(mg/L)
lo co	concentration in tailings basin cell 2W	C_s2w =	59.78	(mg/L)
t t	concentration of ground water into PM-12	C_g12 =	19	(mg/L)
Idul	concentration of ground water into PM-13	C_g13 =	19	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5,352.95	(mg/s)	60,771	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	462.42	(mg/s)	462.42	(mg/s)	462.42	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	140.09	(mg/s)	140.09	(mg/s)	140.09	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	26,119.49	(mg/s)	298,224	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	2,263.72	(mg/s)	2,263.72	(mg/s)	2,263.72	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	701.59	(mg/s)	5,369.83	(mg/s)	5,369.83	(mg/s
		M_fs =	11,012.42	(mg/s)	11,012.42	(mg/s)	11,012.42	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	176.59	(mg/s)	176.59	(mg/s)	176.59	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	3,373.51	(mg/s)	3,373.51	(mg/s)	25.38	(mg/s
			Low Flo	W	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	602.51	(mg/s)	5,955.45	(mg/s)	61,373.93	(mg/s
Mass k at each		M_r13 =	18,130.33 Low Flo		54,271.00 Average		378,445.83 High Fl	
			LOW 1 10		Average	IOW	riigii i	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	17.891	(mg/L)	15.249	(mg/l)	15.024	(mg/l
Conver flux to concer	concentration in river at PM-13	C r13 =	50.427	(ma/L)	21.651	(ma/l)	15.547	(ma/l

oncentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 5 Cadmium			
	concentration of surface water into PM-12	C_s12 =	0.00008	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00008	(mg/L)
g L	concentration in Babbitt WWTP discharge	C_sBab =	0.00008	(mg/L)
₽	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C fs =	0.00032784	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.03	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.14	(mg/s)	2	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.01	(mg/s)	0.04	(mg/s)	0.33	(mg/s)
Mass ba at each	mass flux in river at PM-13	M_r13 =	0.10 Low Flo	(mg/s)	0.27	(mg/s)	2.02 High Fl	(mg/s
σ c			2011110		7.co.ugo			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L
Conve flux to	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(ma/l

0.0004

0.000188 (mg/L)

0.0003 (mg/L)

0.0003 (mg/L)

(mg/L)

C_rrs =

C_s2w =

C_g12 =

C_g13 =

Parameter (
	Chloride			
<u> </u>	concentration of surface water into PM-12	C_s12 =	6.5	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	6.5	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	6.5	(mg/L)
_	concentration in Area 5 Pit NW discharge	C_spit =	5.95	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.52E+01	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.76E+03	(mg/L)
con	concentration in tailings basin cell 2W	C_s2w =	21.54	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	1.8	(mg/L)
	concentration of ground water into PM-13	C_g13 =	1.8	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,319.61	(mg/s)	26,334	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	43.81	(mg/s)	43.81	(mg/s)	43.81	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	60.70	(mg/s)	60.70	(mg/s)	60.70	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	11,318.44	(mg/s)	129,230	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	214.46	(mg/s)	214.46	(mg/s)	214.46	(mg/s
la co	mass flux of Area 5 Pit NW discharge	M_spit =	43.78	(mg/s)	335.09	(mg/s)	335.09	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	2,172.67	(mg/s)	2,172.67	(mg/s)	2,172.67	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	747.10	(mg/s)	747.10	(mg/s)	747.10	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	1,215.55	(mg/s)	1,215.55	(mg/s)	1,215.55	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	104.51		2,424.12		26,438.79	
ā≥	mass flux in river at PM-13	M_r13 =	4,498.06 Low Flo		18,427.42 Average		160,354.05 High FI	
			LOW FIO	VV	Average	FIOW	High Fi	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	3.103	(mg/L)	6.207	(mg/L)	6.472	(mg/L
Conver flux to concer	concentration in river at PM-13	C r13 =	12.511	(mg/L)	7 351	(mg/L)	6.588	(ma/l

Case	Year 5			
Parameter	Cobalt			
		1		
	concentration of surface water into PM-12	C_s12 =	0.0006	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0006	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0006	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.000555	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001495727	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.005	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.001556	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0011	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.0011	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.21	(mg/s)	2	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.04	(mg/s)	12	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s)
Lo n	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.21	(mg/s)	0.21	(mg/s)	0.21	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပို ၁	mass flux in seepage from cell 2W	M_s2w =	0.09	(mg/s)	0.09	(mg/s)		(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)		(mg/s)
at M	mass flux in river at PM-13	M_r13 =	0.47 Low Flo	(mg/s)		(mg/s)	14.86 High Fl	(mg/s)
			LOW FIO	vv	Average	FIOW	nigii Fi	OW
Convert mass flux to concentration	concentration in river at PM-12 concentration in river at PM-13	C_r12 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Convertilux to concer	concentration in river at PM-13	C_r13 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/L)

Case	Year 5			
Parameter	Copper			
		_		
	concentration of surface water into PM-12	C_s12 =	0.0015	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0015	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0015	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.00345	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.0068095	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0015	(mg/L)
eouce	concentration in tailings basin cell 2W	C_s2w =	0.004555	(mg/L)
ħ	concentration of ground water into PM-12	C_g12 =	0.004	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.004	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.54	(mg/s)	6	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
ıt.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.61	(mg/s)	30	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	0.48	(mg/s)	0.48	(mg/s)	0.48	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.19	(mg/s)	0.19	(mg/s
		M_fs =	0.97	(mg/s)	0.97	(mg/s)	0.97	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.26	(mg/s)	0.26	(mg/s)	0.26	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.11	(mg/s)	0.65	(mg/s)	6.19	(mg/s
Mass k at each		M_r13 =	1.84 Low Flo	(mg/s)	5.16 Average	(mg/s)	37.91 High Fl	
<i>"</i>			LOW 1 10		Average	IOW	riigii i	OW.
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.003	(mg/L)	0.002	(mg/L)	0.002	(mg/l
Convergible to concer	concentration in river at PM-13	C r13 =	0.005	(mg/L)	0.002	(mg/L)	0.002	(ma/l

Case Parameter	Year 5 Fluoride			
	concentration of surface water into PM-12	C_s12 =	0.2	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.2	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.2	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.125	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	2.90E+00	(mg/L)
မ္ပ	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	2.85E+00	(mg/L)
conc	concentration in tailings basin cell 2W	C_s2w =	1.55	(mg/L)
ţ	concentration of ground water into PM-12	C_g12 =	0.385	(mg/L)
in put	concentration of ground water into PM-13	C q13 =	0.385	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	71.37	(mg/s)	810	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	9.37	(mg/s)	9.37	(mg/s)	9.37	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	1.87	(mg/s)	1.87	(mg/s)	1.87	(mg/s
ıt.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	348.26	(mg/s)	3,976	(mg/s
Ser	mass flux of ground water into PM-13	M_g13 =	45.87	(mg/s)	45.87	(mg/s)	45.87	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.92	(mg/s)	7.04	(mg/s)	7.04	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	413.72	(mg/s)	413.72	(mg/s)	413.72	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	1.21	(mg/s)	1.21	(mg/s)	1.21	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	87.47	(mg/s)	87.47	(mg/s)	87.47	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	11.24	(mg/s)	82.61	(mg/s)	821.52	(mg/s
Mass	mass flux in river at PM-13	M_r13 =	560.43		986.18		5,353.16	
	<u> </u>	IM_ITO =	Low Flo		Average		High F	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.334	(mg/L)	0.212	(mg/L)	0.201	(mg
Conve flux to	concentration in river at PM-13	C r13 =	1.559	(mg/L)	0.393	(mg/L)	0.220	(ma/

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case	Year 5			
Parameter	Iron			
	concentration of surface water into PM-12	C_s12 =	2.9	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	2.9	(mg/L)
		C_sBab =	2.9	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.037761905	(mg/L)
t.	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	4.00E-03	(mg/L)
Cer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	4.00E-01	(mg/L)
	2			

nass flux of surface water into PM-12		Low Flo	w	Average	Flow	High Fl	ow
	M_s12 =	-	(mg/s)	1,034.90	(mg/s)	11,749	(mg/s)
nass flux of ground water into PM-12	M_g12 =	0.85	(mg/s)	0.85	(mg/s)	0.85	(mg/s)
nass flux in Babbitt WWTP discharge	M_sBab =	27.08	(mg/s)	27.08	(mg/s)	27.08	(mg/s)
nass flux of surface water into PM-13	M_s13 =	-	(mg/s)	5,049.77	(mg/s)	57,657	(mg/s)
nass flux of ground water into PM-13	M_g13 =	4.17	(mg/s)	4.17	(mg/s)	4.17	(mg/s)
nass flux of Area 5 Pit NW discharge	M_spit =	0.28	(mg/s)	2.13	(mg/s)	2.13	(mg/s)
nass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.57	(mg/s)	0.57	(mg/s)	0.57	(mg/s)
nass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
ass flux in seepage from cell 2W	M_s2w =	259.25	(mg/s)	259.25	(mg/s)	259.25	(mg/s)
		Low Flo	w	Average	Flow	High Fl	ow
nass flux in river at PM-12	M_r12 =	27.93	(mg/s)	1,062.84	(mg/s)	11,777.08	(mg/s)
nass flux in river at PM-13	M_r13 =	292.37 Low Flo			(mg/s)	69,700.00 High Fl	(mg/s)
าล	ass flux of surface water into PM-13 ass flux of ground water into PM-13 ass flux of Area 5 Pit NW discharge ass flux in seepage from Tailings Basin Cells 1E and 2E ass flux in hydrometallurgical residue cells liner leakage ass flux in seepage from cell 2W ass flux in river at PM-12	ass flux of surface water into PM-13 ass flux of ground water into PM-13 ass flux of Area 5 Pit NW discharge ass flux in seepage from Tailings Basin Cells 1E and 2E ass flux in hydrometallurgical residue cells liner leakage M_rrs = ass flux in seepage from cell 2W M_s2w = M_r12 =	ass flux of surface water into PM-13				

C_s2w = C_g12 =

C_g13 =

4.594 (mg/L)

0.035 (mg/L)

0.035 (mg/L)

Case	Year 5
Parameter	Hardness

	concentration of surface water into PM-12	C_s12 =	70	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	70	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	70	(mg/L)
章	concentration in Area 5 Pit NW discharge	C_spit =	942.7142857	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	3.74E+02	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	8.61E+03	(mg/L)
Ö	concentration in tailings basin cell 2W	C_s2w =	436.6	(mg/L)
Ħ	concentration of ground water into PM-12	C_g12 =	87.5	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	87.5	(mg/L)

			Low Flo	w	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	24,980.41	(mg/s)	283,600	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	2,129.58	(mg/s)	2,129.58	(mg/s)	2,129.58	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	653.73	(mg/s)	653.73	(mg/s)	653.73	(mg/s
tra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	121,890.93	(mg/s)	1,391,712	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	10,425.01	(mg/s)	10,425.01	(mg/s)	10,425.01	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	6,936.49	(mg/s)	53,090.84	(mg/s)	53,090.84	(mg/s
		M_fs =	53,334.08	(mg/s)	53,334.08	(mg/s)	53,334.08	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	3,654.83	(mg/s)	3,654.83	(mg/s)	3,654.83	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	24,638.27	(mg/s)	24,638.27	(mg/s)	24,638.27	(mg/s
			Low Flo	w	Average	Flow	High FI	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	2,783.31	(mg/s)	27,763.72	(mg/s)	286,383.27	(mg/s
Mass k at each		M_r13 =	101,771.99 Low Flo		294,797.68 Average		1,823,238.23 High Fl	
			LOW FIO	VV	Average	FIOW	nigii Fi	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	82.647	(mg/L)	71.091	(mg/L)	70.104	(mg/l
Conver flux to	concentration in river at PM-13	C r13 =	283.067	(mg/L)	117.606	(mg/L)	74.902	(ma/l

Case	Year 5	1		
Parameter	Potassium			
	concentration of surface water into PM-12	C_s12 =	0.60	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.60	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.60	(mg/L)
章	concentration in Area 5 Pit NW discharge	C_spit =	53.80	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	9.31	(mg/L)
ie i	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80	(mg/L)
Ö	concentration in tailings basin cell 2W	C_s2w =	7.77	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	1.60	(mg/L)
Ĕ		C a13 -	1.60	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
m	nass flux of surface water into PM-12	M_s12 =	-	(mg/s)	214.12	(mg/s)	2,431	(mg/s)
m	nass flux of ground water into PM-12	M_g12 =	38.94	(mg/s)	38.94	(mg/s)	38.94	(mg/s)
m tio	nass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.76	(mg/s)	0.76	(mg/s)	0.76	(mg/s)
m trai	nass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1,044.78	(mg/s)	11,929	(mg/s)
m Ce	nass flux of ground water into PM-13	M_g13 =	190.63	(mg/s)	190.63	(mg/s)	190.63	(mg/s)
concentration flux	nass flux in Babbitt WWTP discharge	M_sBab =	5.60	(mg/s)	5.60	(mg/s)	5.60	(mg/s)
	nass flux of Area 5 Pit NW discharge	M_spit =	395.86	(mg/s)	3,029.85	(mg/s)	3,029.85	(mg/s)
onvert mass	nass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,326.24	(mg/s)	1,326.24	(mg/s)	1,326.24	(mg/s)
S & m	ass flux in seepage from cell 2W	M_s2w =	438.48	(mg/s)	438.48		438.48	
			Low Flo	w	Average	Flow	High Fl	ow
ass ba	nass flux in river at PM-12	M_r12 =	39.70 2,396.51	(mg/s)	253.82 6,289.41		2,470.56	
2 65 [III	lass liux III liver at FW-13	IVI_I 13 =	Low Flo		Average		High FI	
Convert mass flux to concentration	oncentration in river at PM-12	C_r12 =	1.179	(mg/L)	0.650	(mg/L)	0.605	(mg/l)
유크 []	oncentration in river at PM-13	C r13 =	6 666	(mg/L)	2 500	(mg/L)	0.797	(ma)

Case	Year 5	1		
Parameter	Magnesium			
		ı	1	
	concentration of surface water into PM-12	C_s12 =	5.90	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	5.90	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	5.90	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	44.03	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	213.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	69.97	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	10.65	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	10.65	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,105.49	(mg/s)	23,903	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	259.20	(mg/s)	259.20	(mg/s)	259.20	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	55.10	(mg/s)	55.10	(mg/s)	55.10	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,273.66	(mg/s)	117,301	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	1,268.87	(mg/s)	1,268.87	(mg/s)	1,268.87	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	1,994.02	(mg/s)	15,261.91	(mg/s)	15,261.91	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	6,273.94	(mg/s)	6,273.94	(mg/s)	6,273.94	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	90.42	(mg/s)	90.42	(mg/s)	90.42	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	3,948.56	(mg/s)	3,948.56	(mg/s)	3,948.56	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	314.30	(mg/s)	2,419.79	(mg/s)	24,217.73	(mg/s
Mass at eac		M_r13 =	13,890.10 Low Flo		39,537.14 Average		168,362.85 High Fl	
Ω ⊏			LOW 110		Average	liow	Tilgitti	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	9.333	(mg/L)	6.196	(mg/l)	5.928	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	38.634	(mg/L)	15.773	(mg/l)	6.917	(ma/l

Case Parameter	Year 5 Manganese			
rarameter	mungunese	ı		
	concentration of surface water into PM-12	C_s12 =	0.30	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.30	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.30	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.49	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.24	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.00	(mg/L)
ouc	concentration in tailings basin cell 2W	C_s2w =	1.18	(mg/L)
Ħ	concentration of ground water into PM-12	C_g12 =	0.19	(mg/L)
In put	concentration of ground water into PM-13	C_g13 =	0.19	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow	
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	107.06	(mg/s)	1,215	(mg/s)	
_	mass flux of ground water into PM-12	M_g12 =	4.58	(mg/s)	4.58	(mg/s)	4.58	(mg/s	
ē	mass flux in Babbitt WWTP discharge	M_sBab =	2.80	(mg/s)	2.80	(mg/s)	2.80	(mg/s	
<u>t</u> raj	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	522.39	(mg/s)	5,964	(mg/s	
Cen	mass flux of ground water into PM-13	M_g13 =	22.40	(mg/s)	22.40	(mg/s)	22.40	(mg/s	
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	3.57	(mg/s)	27.31	(mg/s)	27.31	(mg/s	
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	34.25	(mg/s)	34.25	(mg/s)	34.25	(mg/s	
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s	
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	66.76	(mg/s)	66.76	(mg/s)	66.76	(mg/s	
			Low Flo	w	Average	Flow	High Fl	High Flow	
iss balance each node	mass flux in river at PM-12	M_r12 =	7.38	(mg/s)	114.44	(mg/s)	1,222.81	(mg/s	
ISS	mass flux in river at PM-13	M_r13 =	134.35 Low Flo		787.55 Average		7,338.01 High Fl		
ss u			201110		Average		- Ingili		
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.219	(mg/L)	0.293	(mg/l)	0.299	(mg/	
Conve flux to	concentration in river at PM-13	C r13 =	0.374	(mg/L)	0.314	(mg/l)	0.301	(mg/l	

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 5 Sodium			
	concentration of surface water into PM-12	C_s12 =	6.00	(mg/L)
data	concentration of surface water into PM-13	 C_s13 =		(mg/L)
n da	Iconcentration in Bannitt WW LP discharde	C_sBab =	6.00	(mg/L)
₽	concentration in Area 5 Pit NW discharge	C_spit =	119.50	(mg/L)
ntra		C_fs =	52.95	(mg/L)
95		C_rrs =	255.00	(mg/L)

			Low Flo	W	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,141.18	(mg/s)	24,309	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	119.26	(mg/s)	119.26	(mg/s)	119.26	(mg/s)
Ęi	mass flux in Babbitt WWTP discharge	M_sBab =	56.03	(mg/s)	56.03	(mg/s)	56.03	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,447.79	(mg/s)	119,290	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	583.80	(mg/s)	583.80	(mg/s)	583.80	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	879.28	(mg/s)	6,729.88	(mg/s)	6,729.88	(mg/s)
		M_fs =	7,545.15	(mg/s)	7,545.15	(mg/s)	7,545.15	(mg/s)
Convert	mass flux in seepage from Tailings Basin Cells 1E and 2E mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	108.24	(mg/s)	108.24	(mg/s)	108.24	(mg/s)
ပိ .	mass flux in seepage from cell 2W	M_s2w =	2,500.51	(mg/s)	2,500.51	(mg/s)	2,500.51	(mg/s)
			Low Flo	W	Average	Flow	High FI	ow
Mass balance	mass flux in river at PM-12	M_r12 =	175.29		2,316.47		24,483.86	, , ,
≥ `	mass flux in river at PM-13	M_r13 =	11,792.27 Low Flo		30,231.84 Average		161,241.03 High FI	
Convert mass flux to	concentration in river at PM-12	C_r12 =	5.205	(mg/L)	5.931	(mg/l)	5.993	(mg/l)
ರ≢	concentration in river at PM-13	C_r13 =	32.799	(mg/L)	12.061	(mg/l)	6.624	(mg/l)

C_s2w =

C_g12 =

C_g13 =

44.31 (mg/L) (mg/L)

4.90

4.90 (mg/L)

concentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 5 Nickel]		
	concentration of surface water into PM-12	C_s12 =	0.0012	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0012	(mg/L)
n da	concentration in Babbitt WWTP discharge	C_sBab =	0.0012	(mg/L)
:	concentration in Area 5 Pit NW discharge	C_spit =	0.0052	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.019144051	(mg/L)

		Low Flo	W	Average	Flow	High Fl	ow	
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.43	(mg/s)	5	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
ţio	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.09	(mg/s)	24	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.83	(mg/s)	0.83	(mg/s)	0.83	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.04	(mg/s)	0.29	(mg/s)	0.29	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	2.73	(mg/s)	2.73	(mg/s)	2.73	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
င့ ၁	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	0.39	(mg/s)		(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 = M r13 =		(mg/s)		(mg/s)		(mg/s)
		111_114	Low Flo		Average		High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)		(mg/L)		(mg/L)

C_s2w =

C_g12 =

C_g13 =

0.098 (mg/L)

0.007 (mg/L)

0.00688

0.007

(mg/L)

(mg/L)

Case Parameter	Year 5 Lead			
		1		1
	concentration of surface water into PM-12	C_s12 =	0.00015	(mg/L
concentration data	concentration of surface water into PM-13	C_s13 =	0.00015	(mg/L
	concentration in Babbitt WWTP discharge	C_sBab =	0.00015	(mg/L)
	concentration in Area 5 Pit NW discharge	C_spit =	0.0003	(mg/L
ra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000886329	(mg/L
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0005	(mg/L
Ş	concentration in tailings basin cell 2W	C_s2w =	0.0012	(mg/L
Input	concentration of ground water into PM-12	C_g12 =	0.0012	(mg/L
≝	concentration of ground water into PM-13	C_g13 =	0.0012	(mg/L
			I ow Flo	W

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.05	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.26	(mg/s)	3	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.02	(mg/s)	0.02	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
balance th node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.08	(mg/s)	0.64	(mg/s)
Mass ba at each	mass flux in river at PM-13	M_r13 =	0.37 Low Flo	(mg/s)	0.70 Average	(mg/s)	3.97 High Fl	(mg/s)
			LOW 1 10	VV	Average	liow	riigiri	l l
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Convertilux to	concentration in river at PM-13	C_r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case	Year 5			
Parameter	Antimony			
	concentration of surface water into PM-12	C_s12 =	4.00E-05	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	4.00E-05	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	4.00E-05	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	2.50E-04	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	8.05E-03	(mg/L)
ie i	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
LO CO	concentration in tailings basin cell 2W	C_s2w =	2.50E-04	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	1.50E-03	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	1.50E-03	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.01	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
a t	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s
E co	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.15	(mg/s)	1.15	(mg/s)	1.15	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
balance ch node	mass flux in river at PM-12	M_r12 =	0.04	(mg/s)	0.05	(mg/s)	0.20	(mg/s
Mass		M_r13 =		(mg/s)		(mg/s)	2.35 High F l	(mg/s
Mass	mass flux in river at PM-13	M_r13 =	Low Flo		Average			
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.004	(mg/L)	0.001	(mg/L)	0.000	(mc

Case	Year 5			
Parameter	Selenium			
	concentration of surface water into PM-12	C_s12 =	0.0003	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0003	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0003	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0016	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001106406	(mg/L)
95	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.054	(mg/L)
eouce	concentration in tailings basin cell 2W	C_s2w =	0.00109	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.00295	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.00295	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.11	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
Ö	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.52	(mg/s)	6	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.35	(mg/s)	0.35	(mg/s)	0.35	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.16	(mg/s)	0.16	(mg/s)	0.16	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.02	(mg/s)	0.02	(mg/s)	0.02	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.18	(mg/s)	1.29	(mg/s)
Mass k at each	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	W	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Conve flux to	concentration in river at PM-13	C r13 =	0.002	(mg/L)	0.001	(mg/L)	0.000	(ma/L

oncentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 5 Sulfate			
	concentration of surface water into PM-12	C_s12 =	4.00	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	4.00	(mg/L)
p u	concentration in Babbitt WWTP discharge	C_sBab =	4.00	(mg/L)
읉	concentration in Area 5 Pit NW discharge	C_spit =	1046.27	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C fs =	190.00	(ma/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,427.45	(mg/s)	16,206	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	206.87	(mg/s)	206.87	(mg/s)	206.87	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	37.36	(mg/s)	37.36	(mg/s)	37.36	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	6,965.20	(mg/s)	79,526	(mg/s)
	mass flux of ground water into PM-13	M_g13 =	1,012.72	(mg/s)	1,012.72	(mg/s)	1,012.72	(mg/s)
u X	mass flux of Area 5 Pit NW discharge	M_spit =	7,698.43	(mg/s)	58,922.60	(mg/s)	58,922.60	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	27,074.39	(mg/s)	27,074.39	(mg/s)	27,074.39	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	3,118.71	(mg/s)	3,118.71	(mg/s)	3,118.71	(mg/s)
ဒို ဒိ	mass flux in seepage from cell 2W	M_s2w =	8,600.26	(mg/s)	8,600.26	(mg/s)	8,600.26	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
balance h node	mass flux in river at PM-12	M_r12 =	244.23	(mg/s)	1,671.68	(mg/s)	16,449.94	(mg/s)
Mass ba at each		M_r13 =	47,748.73 Low Flo		107,365.55 Average		194,705.01	
			Low Flo	W	Average	Flow	High Fl	ow
t mass tratior	concentration in river at PM-12	C_r12 =	7.252	(mg/L)	4.280	(mg/l)	4.027	(mg/l
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	132.808	(mg/L)	42.832	(mg/l)	7.999	(ma/l)

C_rrs =

C_s2w =

C_g12 =

C_g13 =

7347.00 (mg/L)

152.40 (mg/L)

8.50 (mg/L)

8.50 (mg/L)

Case Parameter	Year 5 Thallium			
		•		
	concentration of surface water into PM-12	C_s12 =	0.0002	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0002	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0002	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.0006	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000907911	(mg/L)
Ser	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0002	(mg/L)
COL	concentration in tailings basin cell 2W	C_s2w =	0.0002	(mg/L)
ant	concentration of ground water into PM-12	C_g12 =	0.000004	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.000004	(mg/L)

			Low Flo	w	Average	Flow	High F	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.35	(mg/s)	4	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High F	low
balance th node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.07	(mg/s)	0.81	(mg/s
Mass ba at each		M_r13 =	0.15 Low Flo	(mg/s)	0.60	(mg/s)	4.96 High F	(mg/s
nass	DIAMETER STATE OF THE STATE OF	0.40						
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)		(mg/L)	0.000	

Case Parameter	Year 5 Zinc			
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
concentration	concentration in Area 5 Pit NW discharge	C_spit =	0.003	(mg/L)
rt a	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.0182086	(mg/L
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.01	(mg/L
Ö	concentration in tailings basin cell 2W	C_s2w =	0.01435	(mg/L)
in put	concentration of ground water into PM-12	C_g12 =	0.0115	(mg/L)
<u>=</u>	concentration of ground water into PM-13	C_g13 =	0.0115	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
	mass flux of ground water into PM-12	M_g12 =	0.28	(mg/s)	0.28	(mg/s)	0.28	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/s)
con	mass flux of Area 5 Pit NW discharge	M_spit =	0.02	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	2.59	(mg/s)	2.59	(mg/s)	2.59	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =		(mg/s)		(mg/s)	0.00	(mg/s)
ပို ခဲ့	mass flux in seepage from cell 2W	M_s2w =	0.81	(mg/s)	0.81	(mg/s)	0.81	(mg/s)
		_	Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.43	(mg/s)	6.14	(mg/s)	65.25	(mg/s)
	mass flux in river at PM-13	M_r13 =	5.23	(mg/s)	38.95	(mg/s)	388.31	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12 concentration in river at PM-13	C_r12 =	0.013	(mg/L)	0.016	(mg/L)	0.016	(mg/L)
Converture flux to concer	concentration in river at PM-13	C_r13 =	0.015	(mg/L)	0.016	(mg/L)	0.016	(mg/L)

Appendix F.11
Embarrass River
Geotechnical Mitigation
Year 10

FLOWS

Case	Year 10				
Flows	Low Flow Conditions (no surface runoff)				Node
n River	flow in river at PM-12	Q_r12_L =	1.19	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_L =	13.22	(cfs)	PM-13
Total Emba	flow check	Q_ck_L =	13.22	(cfs)	
	surface water flow into PM-12	Q_s12_L =	0.00	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_L =	0.00	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_L =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_L =	0.26	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_L =	5.55	(cfs)	PM-13
p /	hydrometallurgical residue cells liner leakage	Q_rrs_L =	0.017	(cfs)	PM-13
flow	seepage from cell 2W	Q_s2w_L =	1.99	(cfs)	PM-13
Input 1	ground water flow into PM-12	Q_g12_L =	0.86	(cfs)	PM-12
du	ground water flow into PM-13	Q_g13_L =	4.21	(cfs)	PM-13

Case	Year 10				
Flow	Average Flow Conditions (mean annual)				_
n River	flow in river at PM-12	Q_r12_M =	13.80	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_M =	89.09	(cfs)	PM-13
Total Emba	flow check	Q_ck_M =	89.09	(cfs)	
	surface water flow into PM-12	Q_s12_M =	12.61	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_M =	61.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_M =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_M =	1.99	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_M =	5.55	(cfs)	PM-13
	hydrometallurgical residue cells liner leakage	Q_rrs_M =	0.017	(cfs)	PM-13
<u> </u>	seepage from cell 2W	Q_s2w_M =	1.99	(cfs)	PM-13
Input flow	ground water flow into PM-12	Q_g12_M =	0.86	(cfs)	PM-12
ဋ	ground water flow into PM-13	Q_g13_M =	4.21	(cfs)	PM-13

Case	Year 10				
Flow	High Flow Conditions (avg. annual 1-day max flow)				_
n River	flow in river at PM-12	Q_r12_H =	144.35	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_H =	860.64	(cfs)	PM-13
Tota	flow check	Q_ck_H =	860.64	(cfs)	1
	surface water flow into PM-12	Q_s12_H =	143.16	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_H =	702.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_H =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_H =	1.99	(cfs)	PM-13
<u>ta</u>	seepage from Tailings Basin Cells 1E and 2E	Q_fs_H =	5.55	(cfs)	PM-13
flow data	hydrometallurgical residue cells liner leakage	Q_rrs_H =	0.017	(cfs)	PM-13
lo N	seepage from cell 2W	Q_s2w_H =	1.99	(cfs)	PM-13
Input	ground water flow into PM-12	Q_g12_H =	0.86	(cfs)	PM-12
트	ground water flow into PM-13	Q_g13_H =	4.21	(cfs)	PM-13

Case	Year 10			
Parameter	Silver			
		· 		
	concentration of surface water into PM-12	C_s12 =	0.00011	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00011	(mg/L)
Ď	concentration in Babbitt WWTP discharge	C_sBab =	0.00011	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.00015	(mg/L)
ntra		C_fs =	0.00084	(mg/L)
i e		C_rrs =	0.000125	(mg/L)
		C_s2w =	0.000100	(mg/L)
part	concentration of ground water into PM-12	C_g12 =	0.000008	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.000008	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.19	(mg/s)	2	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
0 =	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	0.00 (mg/s)
		M_fs =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.45	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	0.14 Low Flo	(mg/s)	0.38	(mg/s)	2.78 High Fl	
iass					J			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)		(mg/L)	0.000	

Case Parameter	Year 10 Aluminum			
	concentration of surface water into PM-12	C_s12 =	0.12	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.12	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.12	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.01325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.25E-01	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80E-01	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	1.5788	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.025	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.025	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	42.82	(mg/s)	486	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.61	(mg/s)	0.61	(mg/s)	0.61	(mg/s
ë	mass flux in Babbitt WWTP discharge	M_sBab =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	208.96	(mg/s)	2,386	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	2.98	(mg/s)	2.98	(mg/s)	2.98	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.10	(mg/s)	0.75	(mg/s)	0.75	.12 (mg/s) .86 (mg/s) .98 (mg/s) .75 (mg/s) .65 (mg/s) .09 (mg/s) .10 (mg/s) h Flow
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	19.65	(mg/s)	19.65	(mg/s)	19.65	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s
င္မွ ပိ	mass flux in seepage from cell 2W	M_s2w =	89.10	(mg/s)	89.10	(mg/s)	89.10	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	1.73	(mg/s)	44.55	(mg/s)	487.90	(mg/s
iss eac	mass flux in river at PM-13	M_r13 =	113.63 Low Flo		366.06 Average		2,986.25 High Fl	
ss uo			201110		Average			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.051	(mg/L)	0.114	(mg/L)	0.119	(mg/
Conve flux to concer	concentration in river at PM-13	C r13 =	0.304	(mg/L)	0.145	(mg/L)	0.123	(ma/i

Case	Year 10			
Parameter	Arsenic			
		1		
	concentration of surface water into PM-12	C_s12 =	0.00075	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00075	(mg/L)
D	concentration in Babbitt WWTP discharge	C_sBab =	0.00075	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.001325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.009432521	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
Son	concentration in tailings basin cell 2W	C_s2w =	0.00291	(mg/L)
but	concentration of ground water into PM-12	C_g12 =	0.00273	(mg/L)
≟	concentration of ground water into PM-13	C_g13 =	0.00273	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.27	(mg/s)	3	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
ss balance Convert concentration each node to mass flux	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.31	(mg/s)	15	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s
o X	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.07	(mg/s)	0.07	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.48	(mg/s)	1.48	(mg/s)	1.48	(mg/s
n ve	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.16	(mg/s)	0.16	(mg/s)	0.16	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
balance th node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.34	(mg/s)	3.11	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	2.06 Low Flo	(mg/s)	3.69	(mg/s)	20.07 High Fl	
nass								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)		(mg/L)	0.001	

Case Parameter	Year 10 Boron			
	concentration of surface water into PM-12	C s12 =	0.027	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.027	(mg/L)
ρι	concentration in Babbitt WWTP discharge	C_sBab =	0.027	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.1315	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.149974322	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.11	(mg/L)
ō	concentration in tailings basin cell 2W	C_s2w =	0.33	(mg/L)
in the	concentration of ground water into PM-12	C_g12 =	0.0212	(mg/L)
흔	concentration of ground water into PM-13	C a13 =	0.0212	(ma/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	9.64	(mg/s)	109	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)	0.52	(mg/s)	0.52	(mg/s)
ass balance Convert concentration to mass flux to mass flux	mass flux in Babbitt WWTP discharge	M_sBab =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	47.02	(mg/s)	537	(mg/s)
Sen Cen	mass flux of ground water into PM-13	M_g13 =	2.53	(mg/s)	2.53	(mg/s)	2.53	(mg/s)
č X	mass flux of Area 5 Pit NW discharge	M_spit =	0.97	(mg/s)	7.41	(mg/s)	7.41	(mg/s)
		M_fs =	23.55	(mg/s)	23.55	(mg/s)	23.55	(mg/s)
ı ve	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s)
ဒို ဒိ	mass flux in seepage from cell 2W	M_s2w =	18.62	(mg/s)	18.62	(mg/s)	18.62	(mg/s
			Low Flo	w	Average	Flow	High FI	low
ass		M_r12 = M_r13 =	46.48	(mg/s)	10.40	(mg/s)	110.16 699.11	(mg/s
			Low Flo	w	Average	Flow	High Fl	low
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.023	(mg/L)	0.027	(mg/L)	0.027	(mg/L

Case Parameter	Year 10 Barium			
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
р	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
tion	concentration in Area 5 Pit NW discharge	C_spit =	0.0044	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	4.92E-02	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	5.00E-03	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.09298	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0681	(mg/L)
<u> </u>	concentration of ground water into PM-13	C a13 =	0.0681	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	1.66	(mg/s)	1.66	(mg/s)	1.66	(mg/s
Ss balance Convert concentration each node to mass flux	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	8.11	(mg/s)	8.11	(mg/s)	8.11	(mg/s
i i	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.25	(mg/s)	0.25	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	7.73	(mg/s)	7.73	(mg/s)	7.73	(mg/s
E K	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
မိ ပိ	mass flux in seepage from cell 2W	M_s2w =	5.25	(mg/s)	5.25	(mg/s)	5.25	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
balance ch node	mass flux in river at PM-12	M_r12 =	1.81	(mg/s)	7.52	(mg/s)	66.63	(mg/s
Mass at ead	mass flux in river at PM-13	M_r13 =	22.93 Low Flo	(mg/s)	56.71 Average	(mg/s)	406.07 High Fl	
mass ation	concentration in river at PM 12	C r12						
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.054	(mg/L)	0.019	(mg/L)	0.016	

Case Parameter	Year 10 Beryllium			
rarameter	Derymani			
	concentration of surface water into PM-12	C_s12 =	0.0001	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0001	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.0001	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000587308	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.00075	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.000023	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.000023	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ϊ	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.17	(mg/s)	2	(mg/s
Se	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
		M_fs =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	-	(mg/s)	-	(mg/s)	-	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.41	(mg/s
Mass		M_r13 =	0.14 Low Flo	(mg/s)	0.35	(mg/s)	2.54 High Fl	(mg/s
ss			LOW FIO	W	Average	Flow	nigii Fi	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/
Conve flux to	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(ma/l

Case Parameter	Year 10 Calcium			
	concentration of surface water into PM-12	C_s12 =	15	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	15	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	15	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	95.35	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	107.272439	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	416	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	59.78	(mg/L)
	concentration of ground water into PM-12	C_g12 =	19	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	19	(mg/L)

			Low Flo	w	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5,352.95	(mg/s)	60,771	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	462.42	(mg/s)	462.42	(mg/s)	462.42	(mg/s
ë	mass flux in Babbitt WWTP discharge	M_sBab =	140.09	(mg/s)	140.09	(mg/s)	140.09	(mg/s
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	26,119.49	(mg/s)	298,224	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	2,263.72	(mg/s)	2,263.72	(mg/s)	2,263.72	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	701.59	(mg/s)	5,369.83	(mg/s)	5,369.83	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	16,841.82	(mg/s)	16,841.82	(mg/s)	16,841.82	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	202.28	(mg/s)	202.28	(mg/s)	202.28	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	3,373.51	(mg/s)	3,373.51	(mg/s)	29.07	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	602.51	(mg/s)	5,955.45	(mg/s)	61,373.93	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	23,985.42 Low Flo		60,126.09 Average		384,304.62 High Fl	
Ω =			2011 1 10		7.tro.ugo			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	17.891	(mg/L)	15.249	(mg/l)	15.024	(mg/
Conve flux to	concentration in river at PM-13	C r13 =	64.116	(mg/L)	23.848	(mg/l)	15.779	(ma/l

Case Parameter	Year 10 Cadmium			
rarameter	Caumum			
	concentration of surface water into PM-12	C_s12 =	0.00008	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00008	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.00008	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000645923	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0004	(mg/L)
con	concentration in tailings basin cell 2W	C_s2w =	0.000188	(mg/L)
nput	concentration of ground water into PM-12	C_g12 =	0.0003	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.0003	(mg/L)

Low Flow Average Flow High	low
M_s12 = - (mg/s) 0.03 (mg/s)	(mg/s
$M_g12 = 0.01 (mg/s) 0.01 (mg/s) 0.11 (mg/s) 0.11$	(mg/s
$M_sBab = 0.00 (mg/s) 0.00 (mg/s) 0.00$	(mg/s
M_s13 = - (mg/s) 0.14 (mg/s)	(mg/s
M_g13 = 0.04 (mg/s) 0.04 (mg/s) 0.1	(mg/s
M_spit = 0.00 (mg/s) 0.01 (mg/s) 0.01	(mg/s
n Cells 1E and 2E M_fs = 0.10 (mg/s) 0.10 (mg/s) 0.	(mg/s
cells liner leakage M_rrs = 0.00 (mg/s) 0.00 (mg/s) 0.00	(mg/s
M_s2w = 0.01 (mg/s) 0.01 (mg/s) 0.1	(mg/s
Low Flow Average Flow High	low
M_r12 = 0.01 (mg/s) 0.04 (mg/s) 0.:	(mg/s
	(mg/s
Low Flow Average Flow Hig	

Case Parameter	Year 10 Chloride			
		- -		
	concentration of surface water into PM-12	C_s12 =	6.5	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	6.5	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	6.5	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	5.95	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.09E+00	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.76E+03	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	21.54	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	1.8	(mg/L)
≝	concentration of ground water into PM-13	C_g13 =	1.8	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,319.61	(mg/s)	26,334	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	43.81	(mg/s)	43.81	(mg/s)	43.81	(mg/s
ë	mass flux in Babbitt WWTP discharge	M_sBab =	60.70	(mg/s)	60.70	(mg/s)	60.70	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	11,318.44	(mg/s)	129,230	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	214.46	(mg/s)	214.46	(mg/s)	214.46	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	43.78	(mg/s)	335.09	(mg/s)	335.09	(mg/s
		M_fs =	799.23	(mg/s)	799.23	(mg/s)	799.23	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	855.78	(mg/s)	855.78	(mg/s)	855.78	(mg/s
ဒို ဒိ	mass flux in seepage from cell 2W	M_s2w =	1,215.55	(mg/s)	1,215.55		1,215.55	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	104.51	(mg/s)	2,424.12	(mg/s)	26,438.79	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	3,233.31		17,162.67		159,089.29	
	1		Low Flo	w	Average	Flow	High F	I
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	3.103 8.643	(mg/L)		(mg/L)	6.472	

Case Parameter	Year 10 Cobalt			
	concentration of surface water into PM-12	C_s12 =	0.0006	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0006	(mg/L)
p u	concentration in Babbitt WWTP discharge	C_sBab =	0.0006	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.000555	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001629161	(mg/L)
ice.	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.005	(mg/L)
l os	concentration in tailings basin cell 2W	C_s2w =	0.001556	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.0011	(mg/L)
=		C a13 =	0.0011	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.21	(mg/s)	2	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
ıt.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.04	(mg/s)	12	(mg/s
Ser	mass flux of ground water into PM-13	M_g13 =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.26	(mg/s)	0.26	(mg/s)	0.26	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s
			Low Flo	w	Average	Flow	High Flow	
iss balance each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.25	(mg/s)	2.46	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	0.51 Low Flo	(mg/s)	1.80	(mg/s)	14.90 High Fl	
ss			201110		Avoiago		- Ing	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(ma/l

Case	Year 10			
Parameter	Copper			
		_		
	concentration of surface water into PM-12	C_s12 =	0.0015	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0015	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0015	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.00345	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.006983188	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0015	(mg/L)
S	concentration in tailings basin cell 2W	C_s2w =	0.004555	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.004	(mg/L)
	concentration of ground water into PM-13	C_g13 =	0.004	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.54	(mg/s)	6	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.61	(mg/s)	30	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.48	(mg/s)	0.48	(mg/s)	0.48	(mg/s
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.19	(mg/s)	0.19	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.10	(mg/s)	1.10	(mg/s)	1.10	(mg/s
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.26	(mg/s)	0.26	(mg/s)	0.26	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.11	(mg/s)	0.65	(mg/s)	6.19	(mg/s
M M		M_r13 =	1.97	(mg/s)	5.28	(mg/s)	38.04	(mg/s
			Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to	concentration in river at PM-12	C_r12 =	0.003	(mg/L)	0.002	(mg/L)	0.002	(mg/L)
ŏ ⊋ 8	concentration in river at PM-13	C r13 =	0.005	(mg/L)	0.002	(mg/L)	0.002	(ma/

Case Parameter	Year 10 Fluoride			
		•		
	concentration of surface water into PM-12	C_s12 =	0.2	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.2	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.2	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.125	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.07E-01	(mg/L)
193	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	2.85E+00	(mg/L)
Sor	concentration in tailings basin cell 2W	C_s2w =	1.55	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.385	(mg/L)
du	concentration of ground water into PM-13	C_g13 =	0.385	(mg/L)

			Low Flo	w	Average	Flow	High F	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	71.37	(mg/s)	810	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	9.37	(mg/s)	9.37	(mg/s)	9.37	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	1.87	(mg/s)	1.87	(mg/s)	1.87	(mg/s)
ıt.	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	348.26	(mg/s)	3,976	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	45.87	(mg/s)	45.87	(mg/s)	45.87	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.92	(mg/s)	7.04	(mg/s)	7.04	(mg/s)
		M_fs =	79.61	(mg/s)	79.61	(mg/s)	79.61	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	1.39	(mg/s)	1.39	(mg/s)	1.39	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	87.47	(mg/s)	87.47	(mg/s)	87.47	(mg/s)
			Low Flow Average		Flow	High Flow		
Mass balance at each node	mass flux in river at PM-12	M_r12 =	11.24	(mg/s)	82.61	(mg/s)	821.52	(mg/s)
Mass ba at each I	mass flux in river at PM-13	M_r13 =	226.49		652.24		5,019.21	
			Low Flo	W	Average	Flow	High F	low
mass	concentration in river at PM-12	C_r12 =	0.334	(mg/L)	0.212	(mg/L)	0.201	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.605	(mg/L)	0.259	(mg/L)	0.206	(mg/L)

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case	Year 10			
Parameter	Iron			
		-	,	
	concentration of surface water into PM-12	C_s12 =	2.9	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	2.9	(mg/L)
		C_sBab =	2.9	(mg/L)
tion	concentration in Area 5 Pit NW discharge	C_spit =	0.037761905	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	3.97E-02	(mg/L)
Cer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	4.00E-01	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,034.90	(mg/s)	11,749	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.85	(mg/s)	0.85	(mg/s)	0.85	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	27.08	(mg/s)	27.08	(mg/s)	27.08	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	5,049.77	(mg/s)	57,657	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	4.17	(mg/s)	4.17	(mg/s)	4.17	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.28	(mg/s)	2.13	(mg/s)	2.13	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	6.24	(mg/s)	6.24	(mg/s)	6.24	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.19	(mg/s)	0.19	(mg/s)	0.19	(mg/s)
င္မ င	mass flux in seepage from cell 2W	M_s2w =	259.25	(mg/s)	259.25	(mg/s)	259.25	(mg/s)
			Low Flo	W	Average	Flow	High FI	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	27.93	(mg/s)	1,062.84	(mg/s)	11,777.08	(mg/s)
Ma	mass flux in river at PM-13	M_r13 =	298.06	(mg/s)	6,384.58		69,705.69	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.829	(mg/L)	2.721	(mg/L)	2.883	(mg/L)
	concentration in river at PM-13	C r13 =	0.797	(mg/L)	2.532	(mg/L)	2.862	(mg/L)

C_s2w =

C_g12 =

C_g13 =

4.594 (mg/L)

0.035

(mg/L)

0.035 (mg/L)

Case	rear 10		
Parameter	Hardness		
	concentration of surface water into PM-12	C_s12 =	
<u>a</u>	concentration of surface water into PM-13	C e13 =	

	concentration of surface water into PM-12	C_s12 =	70	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	70	(mg/L)
p u	concentration in Babbitt WWTP discharge	C_sBab =	70	(mg/L)
tio	concentration in Area 5 Pit NW discharge	C_spit =	942.7142857	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	3.11E+02	(mg/L)
leel	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	8.61E+03	(mg/L)
con	concentration in tailings basin cell 2W	C_s2w =	436.6	(mg/L)
out	concentration of ground water into PM-12	C_g12 =	87.5	(mg/L)
dul	concentration of ground water into PM-13	C_g13 =	87.5	(mg/L)

			Low Flow		Average Flow		High Flow		
Convert concentration to mass flux	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	24,980.41	(mg/s)	283,600	(mg/s)	
	mass flux of ground water into PM-12	M_g12 =	2,129.58	(mg/s)	2,129.58	(mg/s)	2,129.58	(mg/s)	
	mass flux in Babbitt WWTP discharge	M_sBab =	653.73	(mg/s)	653.73	(mg/s)	653.73	(mg/s)	
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	121,890.93	(mg/s)	1,391,712	(mg/s	
	mass flux of ground water into PM-13	M_g13 =	10,425.01	(mg/s)	10,425.01	(mg/s)	10,425.01	(mg/s	
	mass flux of Area 5 Pit NW discharge	M_spit =	6,936.49	(mg/s)	53,090.84	(mg/s)	53,090.84	(mg/s	
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	48,800.08	(mg/s)	48,800.08	(mg/s)	48,800.08	(mg/s	
	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	4,186.52	(mg/s)	4,186.52	(mg/s)	4,186.52	(mg/s	
	mass flux in seepage from cell 2W	M_s2w =	24,638.27	(mg/s)	24,638.27	(mg/s)	24,638.27	(mg/s	
			Low Flow		Average Flow		High Fl	High Flow	
Mass balance at each node	mass flux in river at PM-12	M_r12 =	2,783.31	(mg/s)	27,763.72	(mg/s)	286,383.27	(mg/s	
Mas: at ea	mass flux in river at PM-13	M_r13 =	97,769.68 Low Flo		290,795.36 Average		1,819,235.91 High Fl		
sss			Low 1 to		Average	low	riigii i		
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	82.647	(mg/L)	71.091	(mg/L)	70.104	(mg/l	
	concentration in river at PM-13	C r13 =	261.349	(mg/L)	115.339	(mg/L)	74.693	(mg/L	

Case Parameter	Year 10 Potassium			
		1		
	concentration of surface water into PM-12	C_s12 =	0.60	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.60	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.60	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	53.80	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	7.98	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	7.77	(mg/L)
—	concentration of ground water into PM-12	C_g12 =	1.60	(mg/L)
ndu I	concentration of ground water into PM-13	C_g13 =	1.60	(mg/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	214.12	(mg/s)	2,431	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	38.94	(mg/s)	38.94	(mg/s)	38.94	(mg/s)
Ę	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.88	(mg/s)	0.88	(mg/s)	0.88	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1,044.78	(mg/s)	11,929	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	190.63	(mg/s)	190.63	(mg/s)	190.63	(mg/s
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	5.60	(mg/s)	5.60	(mg/s)	5.60	(mg/s
	mass flux of Area 5 Pit NW discharge	M_spit =	395.86	(mg/s)	3,029.85	(mg/s)	3,029.85	(mg/s
Convert to mass	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,252.62	(mg/s)	1,252.62	(mg/s)	1,252.62	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	438.48	(mg/s)	438.48	(mg/s)	438.48	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
balance ch node	mass flux in river at PM-12	M_r12 =	39.82	(mg/s)	253.93	(mg/s)	2,470.67	(mg/s)
Mass ba at each		M_r13 =	2,323.01 Low Flo		6,215.90 Average		19,316.82 High Fl	
Ω =								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	1.182	(mg/L)	0.650	(mg/L)	0.605	(mg/l)
Conve flux to	concentration in river at PM-13	C r13 =	6.210	(mg/L)	2 465	(mg/L)	0.793	(ma/l)

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case	Year 10			
Parameter	Magnesium			
		T		
	concentration of surface water into PM-12	C_s12 =	5.90	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	5.90	(mg/L)
č	concentration in Babbitt WWIP discharge	C_sBab =	5.90	(mg/L)
읉	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)
ntra		C_fs =	10.43	(mg/L)
9		C_rrs =	213.00	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,105.49	(mg/s)	23,903	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	259.20	(mg/s)	259.20	(mg/s)	259.20	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	55.10	(mg/s)	55.10	(mg/s)	55.10	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,273.66	(mg/s)	117,301	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	1,268.87	(mg/s)	1,268.87	(mg/s)	1,268.87	(mg/s)
conc	mass flux of Area 5 Pit NW discharge	M_spit =	1,994.02	(mg/s)	15,261.91	(mg/s)	15,261.91	(mg/s)
	man flux in account from Tailings Bosin Calls 15 and 25	M_fs =	1,638.19	(mg/s)	1,638.19	(mg/s)	1,638.19	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	103.57	(mg/s)	103.57	(mg/s)	103.57	(mg/s)
Co to	mass flux in seepage from cell 2W	M_s2w =	3,948.56	(mg/s)	3,948.56	(mg/s)	3,948.56	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =	314.30 9,267.50		2,419.79		24,217.73	, ,
			Low Flo		Average	Flow	High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	9.333	(mg/L)	6.196	(mg/l)	5.928	(mg/l)
	concentration in river at PM-13	C r13 =	24.773	(mg/L)	13.848	(ma/l)	6.723	(ma/l)

C_s2w =

C_g12 =

C_g13 =

69.97

10.65

10.65 (mg/L)

(mg/L) (mg/L)

Case	Year 10			
Parameter	Manganese			
	concentration of surface water into PM-12	C_s12 =	0.30	(mg/
ata	concentration of surface water into PM-13	C_s13 =	0.30	(mg/
n dat	concentration in Babbitt WWTP discharge	C_sBab =	0.30	(mg/
<u>.</u> 5	concentration in Area 5 Pit NIW discharge	C spit -	0.40	(ma

ata	concentration of surface water into PM-13	C_s13 =	0.30	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.30	(mg/L)
후	concentration in Area 5 Pit NW discharge	C_spit =	0.49	(mg/L)
ıt.	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.16	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.00	(mg/L)
COL	concentration in tailings basin cell 2W	C_s2w =	1.18	(mg/L)
ă	concentration of ground water into PM-12	C_g12 =	0.19	(mg/L)
宣	concentration of ground water into PM-13	C_g13 =	0.19	(mg/L)
_				
	put concentration	concentration in Babbitt WWTP discharge concentration in Area 5 Pit NW discharge concentration in seepage from Tailings Basin Cells 1E and 2E concentration in hydrometallurgical residue cells liner leakage	concentration in Babbitt WWTP discharge	concentration in Babbitt WWTP discharge

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	107.06	(mg/s)	1,215	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	4.58	(mg/s)	4.58	(mg/s)	4.58	(mg/s)
tio	mass flux in Babbitt WWTP discharge	M_sBab =	2.80	(mg/s)	2.80	(mg/s)	2.80	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	522.39	(mg/s)	5,964	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	22.40	(mg/s)	22.40	(mg/s)	22.40	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	3.57	(mg/s)	27.31	(mg/s)	27.31	(mg/s)
		M_fs =	24.88	(mg/s)	24.88	(mg/s)	24.88	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
် လ		M_s2w =	66.76	(mg/s)	66.76	(mg/s)	66.76	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance	mass flux in river at PM-12	M_r12 =	7.38	(mg/s)	114.44	(mg/s)	1,222.81	(mg/s)
Mag	mass flux in river at PM-13	M_r13 =	124.99	(mg/s)	778.18	(mg/s)	7,328.64	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to	concentration in river at PM-12	C_r12 =	0.219	(mg/L)	0.293	(mg/l)	0.299	(mg/l)
8 ⊋ 8	concentration in river at PM-13	C_r13 =	0.334	(mg/L)	0.309	(mg/l)	0.301	(mg/l)

Case Parameter	Year 10 Sodium			
	concentration of surface water into PM-12	C_s12 =	6.00	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	6.00	(mg/L)
۾	concentration in Babbitt WWTP discharge	C_sBab =	6.00	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	119.50	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	31.37	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	255.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	44.31	(mg/L)
	concentration of ground water into PM-12	C_g12 =	4.90	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	4.90	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,141.18	(mg/s)	24,309	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	119.26	(mg/s)	119.26	(mg/s)	119.26	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	56.03	(mg/s)	56.03	(mg/s)	56.03	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,447.79	(mg/s)	119,290	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	583.80	(mg/s)	583.80	(mg/s)	583.80	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	879.28	(mg/s)	6,729.88	(mg/s)	6,729.88	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	4,924.53	(mg/s)	4,924.53	(mg/s)	4,924.53	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	123.99	(mg/s)	123.99	(mg/s)	123.99	(mg/s)
င္မ င	mass flux in seepage from cell 2W	M_s2w =	2,500.51		2,500.51		2,500.51	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	175.29	(mg/s)	2,316.47	(mg/s)	24,483.86	(mg/s)
a g	mass flux in river at PM-13	M_r13 =	9,187.40		27,626.97		158,636.16	
			Low Flo	W	Average	FIOW	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	5.205	(mg/L)	5.931	(mg/l)	5.993	(mg/l)
S	concentration in river at PM-13	C_r13 =	24.559	(mg/L)	10.958	(mg/l)	6.513	(mg/l)

Case Parameter	Year 10 Nickel			
	concentration of surface water into PM-12	C_s12 =	0.0012	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0012	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0012	(mg/L)
ntration	concentration in Area 5 Pit NW discharge	C_spit =	0.0052	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.024818317	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.098	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.00688	(mg/L)
	concentration of ground water into PM-12	C_g12 =	0.007	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.007	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.43	(mg/s)	5	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.09	(mg/s)	24	(mg/s)
Ser J	mass flux of ground water into PM-13	M_g13 =	0.83	(mg/s)	0.83	(mg/s)	0.83	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.04	(mg/s)	0.29	(mg/s)	0.29	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	3.90	(mg/s)	3.90	(mg/s)	3.90	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s)
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =	0.39	(mg/s)	0.39	(mg/s)	0.39	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.18	(mg/s)	0.61	(mg/s)	5.04	(mg/s)
	mass flux in river at PM-13	M_r13 =		(mg/s)	_	(mg/s)		(mg/s)
		_	Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12 concentration in river at PM-13	C_r12 =	0.005	(mg/L)	0.002	(mg/L)	0.001	(mg/L)
Converture flux to concer	concentration in river at PM-13	C_r13 =	0.014	(mg/L)	0.003	(mg/L)	0.001	(mg/L)

oncentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12 concentration of ground water into PM-13

Case Parameter	Year 10 Lead			
	concentration of surface water into PM-12	C_s12 =	0.00015	(mg/L)
7 7	concentration of surface water into PM-13	C_s13 =	0.00015	(mg/L)
, , , , , , , , , , , , , , , , , , ,		C_sBab =	0.00015	(mg/L)
≘	concentration in Area 5 Pit NW discharge	C_spit =	0.0003	(mg/L)
7	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.002998768	(mg/L)

			Low Flow		Average	Average Flow		High Flow	
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.05	(mg/s)	1	(mg/s)	
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)	
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)	
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.26	(mg/s)	3	(mg/s)	
Sen	mass flux of ground water into PM-13	M_g13 =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s)	
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.02	(mg/s)	0.02	(mg/s)	
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.47	(mg/s)	0.47	(mg/s)	0.47	(mg/s)	
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)		(mg/s)	0.00	(mg/s)	
ပို့ ၁	mass flux in seepage from cell 2W	M_s2w =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)	
			Low Flow		Average	Average Flow		ow	
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.08	(mg/s)	0.64	(mg/s)	
Mass at ea	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)	
	T	1	Low Flo	W	Average	FIOW	High FI	ow	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)	
Convertilux to concer	concentration in river at PM-13	C_r13 =	0.002	(mg/L)	0.000	(mg/L)	0.000	(mg/L)	

C_s2w =

C_g12 =

C_g13 =

0.0005

0.0012

0.0012 (mg/L)

(mg/L)

(mg/L) 0.0012 (mg/L)

concentration of ground water into PM-13

Case Parameter	Year 10 Antimony			
		0 -10	4.005.05	(/l)
_	concentration of surface water into PM-12	C_s12 =	4.00E-05	, ,
data	concentration of surface water into PM-13	C_s13 =	4.00E-05	(mg/L)
P		C_sBab =	4.00E-05	(mg/L)
i E	concentration in Area 5 Pit NW discharge	C_spit =	2.50E-04	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.17E-02	(mg/L)
cer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
Ö	concentration in tailings basin cell 2W	C s2w =	2.50E-04	(ma/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.01	(mg/s)	0	(mg/s)
concentration flux	mass flux of ground water into PM-12	M_g12 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s
E co	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.84	(mg/s)	1.84	(mg/s)	1.84	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	low
balance ch node	mass flux in river at PM-12	M_r12 =	0.04	(mg/s)	0.05	(mg/s)	0.20	(mg/s
Mass ba at each		M_r13 =		(mg/s)		(mg/s)		(mg/s
mass ration	concentration in river at PM-12	C r12 =	0.001	(mg/L)	Average 0.000	Flow (mg/L)	High FI 0.000	
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.006			(mg/L)	0.000	

C_g12 =

C_g13 =

1.50E-03 (mg/L)

1.50E-03 (mg/L)

Case Parameter	Year 10 Selenium			
	concentration of surface water into PM-12	C s12 =	0.0003	(mg/L)
data	concentration of surface water into PM-13	 C_s13 =	0.0003	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0003	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0016	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00156894	(mg/L)
ဗ္ဂ	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.054	(mg/L)
ou o	concentration in tailings basin cell 2W	C_s2w =	0.00109	(mg/L)
nput	concentration of ground water into PM-12	C_g12 =	0.00295	(mg/L)
벌	concentration of ground water into PM-13	C_g13 =	0.00295	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.11	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.52	(mg/s)	6	(mg/s)
concentration	mass flux of ground water into PM-13	M_g13 =	0.35	(mg/s)	0.35	(mg/s)	0.35	(mg/s)
E co	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s)
			Low Flow		Average Flow		High Flow	
alance	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.18	(mg/s)	1.29	(mg/s)
ass ba	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.002	(mg/L)	0.001	(mg/L)	0.000	(ma/L)

Case Parameter	Year 10 Sulfate			
	concentration of surface water into PM-12	C_s12 =	4.00	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	4.00	(mg/L)
n da	concentration in Babbitt WWTP discharge	C_sBab =	4.00	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	1046.27	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	223.12	(mg/L)
8	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	7347.00	(mg/L)
ůo	concentration in tailings basin cell 2W	C_s2w =	152.40	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	8.50	(mg/L)
ဋ	concentration of ground water into PM-13	C a13 =	8 50	(ma/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,427.45	(mg/s)	16,206	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	206.87	(mg/s)	206.87	(mg/s)	206.87	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	37.36	(mg/s)	37.36	(mg/s)	37.36	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	6,965.20	(mg/s)	79,526	(mg/s
cen	mass flux of ground water into PM-13	M_g13 =	1,012.72	(mg/s)	1,012.72	(mg/s)	1,012.72	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	7,698.43	(mg/s)	58,922.60	(mg/s)	58,922.60	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	35,029.37	(mg/s)	35,029.37	(mg/s)	35,029.37	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	3,572.40	(mg/s)	3,572.40	(mg/s)	3,572.40	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	8,600.26	(mg/s)	8,600.26	(mg/s)	8,600.26	(mg/s
			Low Flo	w	Average	Flow	High Fl	low
Mass balance at each node		M_r12 =	244.23 56,157.40		1,671.68		16,449.94 203,113.67	
()	THESS HEARITH OF ALT IN TO	IW_110 =	Low Flo		Average		High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	7.252	(mg/L)	4.280	(mg/l)	4.027	(mg/l)
್ರ≘ ೫	concentration in river at PM-13	C r13 =	150.115	(ma/L)	45.920	(ma/l)	8.339	(ma/l)

Case	Year 10			
Parameter	Thallium			
		_		
	concentration of surface water into PM-12	C_s12 =	0.0002	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0002	(mg/L)
Ф	concentration in Babbitt WWTP discharge	C_sBab =	0.0002	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.0006	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001032064	(mg/L)
i Ge	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0002	(mg/L)
S	concentration in tailings basin cell 2W	C_s2w =	0.0002	(mg/L)
but	concentration of ground water into PM-12	C_g12 =	0.000004	(mg/L)
<u>u</u>	concentration of ground water into PM-13	C_g13 =	0.000004	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.35	(mg/s)	4	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
		M_fs =	0.16	(mg/s)	0.16	(mg/s)	0.16	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒို ဒိ		M_s2w =		(mg/s)	0.01	(mg/s)		(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)		(mg/s)
at M	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	W	Average	FIOW	High FI	low
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
S E S	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0,000	(mg/L)

oncentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12 concentration of ground water into PM-13

Case Parameter	Year 10 Zinc			
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
at a	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
<u> </u>		C_sBab =	0.016	(mg/L)
Ę	concentration in Area 5 Pit NW discharge	C_spit =	0.003	(mg/L)
t.	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.063569909	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	1	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.28	(mg/s)	0.28	(mg/s)	0.28	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	1	(mg/s)	27.86	(mg/s)	318	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.02	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	9.98	(mg/s)	9.98	(mg/s)	9.98	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.81	(mg/s)	0.81	(mg/s)	0.81	(mg/s)
			Low Flow		Average	Average Flow		ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.43	(mg/s)	6.14	(mg/s)	65.25	(mg/s)
Mas ate	mass flux in river at PM-13	M r13 =	12.62	(mg/s)	46.33	(mg/s)	395.69	(mg/s)
		1 -	Low Flo		Average		High Fl	
Convert mass flux to concentration		C_r12 =		(mg/L)	0.016			(mg/L)
ડ ≓ ડ	concentration in river at PM-13	C_r13 =	0.034	(mg/L)	0.018	(mg/L)	0.016	(mg/L)

C_rrs =

C_s2w =

C_g12 =

C_g13 =

0.01 (mg/L)

0.0115 (mg/L)

(mg/L) 0.0115 (mg/L)

0.01435

Appendix F.12
Embarrass River
Geotechnical Mitigation
Year 15

FLOWS

Case	Year 15				
Flows	Low Flow Conditions (no surface runoff)				Node
in s River	flow in river at PM-12	Q_r12_L =	1.19	(cfs)	PM-12
low	flow in river at PM-13	Q_r13_L =	13.69	(cfs)	PM-13
Total flow in Embarrass Ri	flow check	Q_ck_L =	13.69	(cfs)	
	surface water flow into PM-12	Q_s12_L =	0.00	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_L =	0.00	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_L =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_L =	0.26	(cfs)	PM-13
<u>ta</u>	seepage from Tailings Basin Cells 1E and 2E	Q_fs_L =	6.02	(cfs)	PM-13
flow data	hydrometallurgical residue cells liner leakage	Q_rrs_L =	0.02	(cfs)	PM-13
<u>[</u>	seepage from cell 2W	Q_s2w_L =	1.99	(cfs)	PM-13
Input	ground water flow into PM-12	Q_g12_L =	0.86	(cfs)	PM-12
ᄪ	ground water flow into PM-13	Q_g13_L =	4.21	(cfs)	PM-13

Case	Year 15				
Flow	Average Flow Conditions (mean annual)				_
in s River	flow in river at PM-12	Q_r12_M =	13.80	(cfs)	PM-12
l ov	flow in river at PM-13	Q r13 M =	89.56	(cfs)	PM-13
Total flow in Embarrass Ri	flow check	Q_ck_M =	89.56	(cfs)	
	surface water flow into PM-12	Q_s12_M =	12.61	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_M =	61.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_M =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_M =	1.99	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_M =	6.02	(cfs)	PM-13
g Z	hydrometallurgical residue cells liner leakage	Q_rrs_M =	0.02	(cfs)	PM-13
flow	seepage from cell 2W	Q_s2w_M =	1.99	(cfs)	PM-13
Input	ground water flow into PM-12	Q_g12_M =	0.86	(cfs)	PM-12
ם	ground water flow into PM-13	Q_g13_M =	4.21	(cfs)	PM-13

Case	Year 15				
Flow	High Flow Conditions (avg. annual 1-day max flow)				_
in s River	flow in river at PM-12	Q_r12_H =	144.35	(cfs)	PM-12
low	flow in river at PM-13	Q_r13_H =	861.11	(cfs)	PM-13
Total flow in Embarrass F	flow check	Q_ck_H =	861.11	(cfs)	
	surface water flow into PM-12	Q_s12_H =	143.16	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_H =	702.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_H =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_H =	1.99	(cfs)	PM-13
ita E	seepage from Tailings Basin Cells 1E and 2E	Q_fs_H =	6.02	(cfs)	PM-13
flow data	hydrometallurgical residue cells liner leakage	Q_rrs_H =	0.02	(cfs)	PM-13
	seepage from cell 2W	Q_s2w_H =	1.99	(cfs)	PM-13
Input	ground water flow into PM-12	Q_g12_H =	0.86	(cfs)	PM-12
<u> </u>	ground water flow into PM-13	Q_g13_H =	4.21	(cfs)	PM-13

81.53

Case Parameter	Year 15 Silver			
	concentration of surface water into PM-12	C s12 =	0.00011	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00011	(mg/L)
0	concentration in Babbitt WWTP discharge	C_sBab =	0.00011	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00015	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00089	(mg/L)
ē	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.000125	(mg/L)
CO	concentration in tailings basin cell 2W	C_s2w =	0.000100	(mg/L)
nput	concentration of ground water into PM-12	C_g12 =	0.000008	(mg/L)
Ĕ	concentration of ground water into PM-13	C a13 =	0.000008	(ma/L)

			Low Flow		Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.19	(mg/s)	2	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.45	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s
		C r12 =	0.000		Average 0.000		0.000	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)		(mg/L)	0.000	

Case Parameter	Year 15 Aluminum			
	concentration of surface water into PM-12	C_s12 =	0.12	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.12	(mg/L)
ρι	concentration in Babbitt WWTP discharge	C_sBab =	0.12	(mg/L)
ratio	concentration in Area 5 Pit NW discharge	C_spit =	0.01325	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	8.74E-02	(mg/L)
ncer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80E-01	(mg/L)
lo con	concentration in tailings basin cell 2W	C_s2w =	1.5788	(mg/L)
t a	concentration of ground water into PM-12	C_g12 =	0.025	(mg/L)
르	concentration of ground water into PM-13	C_g13 =	0.025	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	42.82	(mg/s)	486	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.61	(mg/s)	0.61	(mg/s)	0.61	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s)
tra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	208.96	(mg/s)	2,386	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	2.98	(mg/s)	2.98	(mg/s)	2.98	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.10	(mg/s)	0.75	(mg/s)	0.75	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	14.87	(mg/s)	14.87	(mg/s)	14.87	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	89.10	(mg/s)	89.10	(mg/s)	89.10	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	1.73	(mg/s)	44.55	(mg/s)	487.90	(mg/s
at M	mass flux in river at PM-13	M_r13 =	108.86		361.29		2,981.47	_
	1		Low Flo	W	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.051	(mg/L)	0.114	(mg/L)	0.119	(mg/L
Conve flux to	concentration in river at PM-13	C r13 =	0.281	(mg/L)	0.143	(mg/L)	0.122	(ma/L

Case Parameter	Year 15 Arsenic			
	concentration of surface water into PM-12	C_s12 =	0.00075	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00075	(mg/L)
Ę	concentration in Babbitt WWTP discharge	C_sBab =	0.00075	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.001325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.007825647	(mg/L)
ice i	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
l oo	concentration in tailings basin cell 2W	C_s2w =	0.00291	(mg/L)
t t	concentration of ground water into PM-12	C_g12 =	0.00273	(mg/L)
효	concentration of ground water into PM-13	C a13 =	0 00273	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.27	(mg/s)	3	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.31	(mg/s)	15	(mg/s
	mass flux of ground water into PM-13	M_g13 =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s
io X	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.07	(mg/s)	0.07	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.33	(mg/s)	1.33	(mg/s)	1.33	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.16	(mg/s)	0.16	(mg/s)	0.16	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.34	(mg/s)	3.11	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	1.91 Low Flo	(mg/s)	3.55 Average	(mg/s)	19.92 High Fl	
mass ation	concentration in river at PM-12	C. r12 -						
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)		(mg/L)	0.001	

Parameter	Boron			
	concentration of surface water into PM-12	C_s12 =	0.027	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.027	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.027	(mg/L)
Ē	concentration in Area 5 Pit NW discharge	C_spit =	0.1315	(mg/L)
t a	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.153530941	(mg/L)
concentration of surface water into PM-13 C_s13 = 0.00 concentration in Babbitt WWTP discharge concentration in Area 5 Pit NW discharge concentration in Area 5 Pit NW discharge concentration in seepage from Tailings Basin Cells 1E and 2E C_fs = 0.15353094 concentration in hydrometallurgical residue cells liner leakage concentration in tailings basin cell 2W concentration of ground water into PM-12 C_g12 = 0.02	0.11	(mg/L)		
5	concentration in tailings basin cell 2W	C_s2w =	0.33	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.0212	(mg/L)
<u>=</u>	concentration of ground water into PM-13	C_g13 =	0.0212	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	9.64	(mg/s)	109	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)	0.52	(mg/s)	0.52	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	47.02	(mg/s)	537	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	2.53	(mg/s)	2.53	(mg/s)	2.53	(mg/s)
conc	mass flux of Area 5 Pit NW discharge	M_spit =	0.97	(mg/s)	7.41	(mg/s)	7.41	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	26.14	(mg/s)	26.14	(mg/s)	26.14	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s)
0 -	mass flux in seepage from cell 2W	M_s2w =	18.62	(mg/s)	18.62	(mg/s)	18.62	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =		(mg/s)	10.40	(mg/s)	110.16 701.71	
≥ 0	Illass liux III livel at Fivi-13	IVI_I 13 =	Low Flo	, ,	Average		High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)	0.027	(mg/L)	0.027	(mg/L)

Case	Year 15			
Parameter	Barium			
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0044	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.00E-02	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	5.00E-03	(mg/L)
Souc	concentration in tailings basin cell 2W	C_s2w =	0.09298	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0681	(mg/L)
ם	concentration of ground water into PM-13	C_g13 =	0.0681	(mg/L)

•			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	1.66	(mg/s)	1.66	(mg/s)	1.66	(mg/s
ē	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	8.11	(mg/s)	8.11	(mg/s)	8.11	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.25	(mg/s)	0.25	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	8.50	(mg/s)	8.50	(mg/s)	8.50	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	5.25	(mg/s)	5.25	(mg/s)	5.25	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	1.81	(mg/s)	7.52	(mg/s)	66.63	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	23.71 Low Flo	(mg/s)	57.49 Average	(mg/s)	406.85 High Fl	
nass								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.054	(mg/L)	0.019	(mg/L)	0.016	(mg/

Case Parameter	Year 15 Beryllium			
	concentration of surface water into PM-12	C s12 =	0.0001	(ma/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0001	` ` '
0	concentration in Babbitt WWTP discharge	C_sBab =	0.0001	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000487063	(mg/L)
8	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0	(mg/L)
ČO	concentration in tailings basin cell 2W	C_s2w =	0.00075	(mg/L)
no ut	concentration of ground water into PM-12	C_g12 =	0.000023	(mg/L)
	concentration of ground water into PM-13	C a13 -	0.000023	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ita	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.17	(mg/s)	2	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.08	(mg/s)	0.08	(mg/s)	0.08	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	-	(mg/s)	-	(mg/s)	-	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.41	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	0.13 Low Flo	(mg/s)	0.34	(mg/s)	2.53 High Fl	(mg/s
iass								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/l

Case	Year 15	1		
Parameter	Calcium			
			1	
	concentration of surface water into PM-12	C_s12 =	15	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	15	(mg/L)
Р	concentration in Pobbitt WWTP discharge	C_sBab =	15	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	95.35	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	81.6110992	(mg/L)
4		C_rrs =	416	(mg/L)
Souce	concentration in tailings basin cell 2W	C_s2w =	59.78	(mg/L)
nont		C_g12 =	19	(mg/L)
2	concentration of ground water into PM-13	C a13 -	10	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5,352.95	(mg/s)	60,771	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	462.42	(mg/s)	462.42	(mg/s)	462.42	(mg/s
ë	mass flux in Babbitt WWTP discharge	M_sBab =	140.09	(mg/s)	140.09	(mg/s)	140.09	(mg/s
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	26,119.49	(mg/s)	298,224	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	2,263.72	(mg/s)	2,263.72	(mg/s)	2,263.72	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	701.59	(mg/s)	5,369.83	(mg/s)	5,369.83	(mg/s
		M_fs =	13,893.59	(mg/s)	13,893.59	(mg/s)	13,893.59	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	205.46	(mg/s)	205.46	(mg/s)	205.46	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	3,373.51	(mg/s)	3,373.51	(mg/s)	29.52	(mg/s
			Low Flo	W	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	602.51	(mg/s)	5,955.45	(mg/s)	61,373.93	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	21,040.37 Low Flo		57,181.04 Average		381,360.03 High Fl	
ass								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	17.891	(mg/L)	15.249	(mg/L)	15.024	(mg/
Conve flux to	concentration in river at PM-13	C r13 =	54.319	(ma/L)	22.561	(ma/L)	15.649	(ma/

Case	Year 15			
Parameter	Cadmium			
	concentration of surface water into PM-12	C_s12 =	0.00008	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00008	(mg/L)
Ф	concentration in Babbitt WWTP discharge	C_sBab =	0.00008	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000567381	(mg/L)
oncel	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0004	(mg/L)
S	concentration in tailings basin cell 2W	C_s2w =	0.000188	(mg/L)
t t	concentration of ground water into PM-12	C_g12 =	0.0003	(mg/L)
Idu	concentration of ground water into PM-13	C_g13 =	0.0003	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.03	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.14	(mg/s)	2	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒ္ ဒိ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.01	(mg/s)	0.04	(mg/s)	0.33	(mg/s)
	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =		(mg/L)	0.000	(mg/L)	0.000	(ma/L)

Case	Year 15			
Parameter	Chloride			
		-		
	concentration of surface water into PM-12	C_s12 =	6.5	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	6.5	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	6.5	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	5.95	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.66E+00	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.76E+03	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	21.54	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	1.8	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	1.8	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,319.61	(mg/s)	26,334	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	43.81	(mg/s)	43.81	(mg/s)	43.81	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	60.70	(mg/s)	60.70	(mg/s)	60.70	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	11,318.44	(mg/s)	129,230	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	214.46	(mg/s)	214.46	(mg/s)	214.46	(mg/s)
con	mass flux of Area 5 Pit NW discharge	M_spit =	43.78	(mg/s)	335.09	(mg/s)	335.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	963.96	(mg/s)	963.96	(mg/s)	963.96	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	869.24	(mg/s)	869.24	(mg/s)	869.24	(mg/s)
0 -	mass flux in seepage from cell 2W	M_s2w =	1,215.55	(mg/s)	1,215.55	(mg/s)	1,215.55	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =	104.51 3,411.50		2,424.12		26,438.79 159,267.48	
	mass nax in river at r ivi re	IVI_1 10 -	Low Flo		Average		High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =		(mg/L)		(mg/L)		(mg/L)

Case	Year 15			
Parameter	Cobalt			
	concentration of surface water into PM-12	C_s12 =	0.0006	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0006	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0006	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.000555	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001926627	(mg/L)
8	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.005	(mg/L)
ůo	concentration in tailings basin cell 2W	C_s2w =	0.001556	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0011	(mg/L)
<u>=</u>	concentration of ground water into PM-13	C_g13 =	0.0011	(mg/L)

•			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.21	(mg/s)	2	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
<u>t</u> ra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.04	(mg/s)	12	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s
		M_fs =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.25	(mg/s)	2.46	(mg/s
Mass	mass flux in river at PM-13	M_r13 =	0.59 Low Flo	(mg/s)	1.87	(mg/s)	14.97 High Fl	
t mass tration	concentration in river at PM-12	C_r12 =		(mg/L)		(mg/L)	0.001	
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.002	(mg/L)	0.001	(mg/L)	0.001	(ma)

Case	Year 15			
Parameter	Copper			
		_		
	concentration of surface water into PM-12	C_s12 =	0.0015	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0015	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0015	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00345	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.009053616	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0015	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.004555	(mg/L)
	concentration of ground water into PM-12	C_g12 =	0.004	(mg/L)
Input	concentration of ground water into PM-13	C q13 =	0.004	(mg/L)

High Flow
6 (mg/
0.10 (mg/
0.01 (mg/
30 (mg/
0.48 (mg/
0.19 (mg/
1.54 (mg/
0.00 (mg/
0.26 (mg/
High Flow
6.19 (mg/
38.48 (mg/
Hig

Case Parameter	Year 15 Fluoride			
		ı		
	concentration of surface water into PM-12	C_s12 =	0.2	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.2	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.2	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.125	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.63E-01	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	2.85E+00	(mg/L)
eouce	concentration in tailings basin cell 2W	C_s2w =	1.55	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.385	(mg/L)
ם	concentration of ground water into PM-13	C_g13 =	0.385	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	71.37	(mg/s)	810	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	9.37	(mg/s)	9.37	(mg/s)	9.37	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	1.87	(mg/s)	1.87	(mg/s)	1.87	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	348.26	(mg/s)	3,976	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	45.87	(mg/s)	45.87	(mg/s)	45.87	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.92	(mg/s)	7.04	(mg/s)	7.04	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	95.87	(mg/s)	95.87	(mg/s)	95.87	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	1.41	(mg/s)	1.41	(mg/s)	1.41	(mg/s)
ဒ္ ပိ	mass flux in seepage from cell 2W	M_s2w =	87.47	(mg/s)	87.47	(mg/s)	87.47	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	11.24	(mg/s)	82.61	(mg/s)	821.52	(mg/s)
Ma		M_r13 =	242.78	(mg/s)	668.53	(mg/s)	5,035.50	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.334	(mg/L)	0.212	(mg/L)	0.201	(mg/L)
<u> </u>	concentration in river at PM-13	C r13 =	0.627	(mg/L)	0.264	(mg/L)	0.207	/ma/l

Case	Year 15			
Parameter	Iron			
		-		
	concentration of surface water into PM-12	C_s12 =	2.9	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	2.9	(mg/L)
č	concentration in Babbitt WWTP discharge	C_sBab =	2.9	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.037761905	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	3.86E-02	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	4.00E-01	(mg/L)
l os	concentration in tailings basin cell 2W	C_s2w =	4.594	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.035	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.035	(mg/L)

			Low Flo	W	Average	Flow	High Flo	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,034.90	(mg/s)	11,749	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.85	(mg/s)	0.85	(mg/s)	0.85	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	27.08	(mg/s)	27.08	(mg/s)	27.08	(mg/s)
concentration flux	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	5,049.77	(mg/s)	57,657	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	4.17	(mg/s)	4.17	(mg/s)	4.17	(mg/s)
u X	mass flux of Area 5 Pit NW discharge	M_spit =	0.28	(mg/s)	2.13	(mg/s)	2.13	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	6.57	(mg/s)	6.57	(mg/s)	6.57	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.20	(mg/s)	0.20	(mg/s)	0.20	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	259.25	(mg/s)	259.25	(mg/s)	259.25	(mg/s)
			Low Flo	w	Average	Flow	High Flo	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	27.93	(mg/s)	1,062.84	(mg/s)	11,777.08	(mg/s)
Mass ba at each i		M_r13 =	298.40 Low Flo		6,384.92 Average		69,706.03 High Fl	
			LOWIIO	VV	Average	liow	riigii i	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.829	(mg/L)	2.721	(mg/L)	2.883	(mg/L)
Conver flux to concen	concentration in river at PM-13	C r13 =	0.770	(mg/L)	2.519	(mg/L)	2.860	(ma/L)

Case Parameter	Year 15 Hardness			
r drameter	Traidiness			
	concentration of surface water into PM-12	C_s12 =	70	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	70	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	70	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	942.7142857	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	2.55E+02	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	8.61E+03	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	436.6	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	87.5	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	87.5	(mg/L)

			Low Flo	W	Average	Flow	High F	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	24,980.41	(mg/s)	283,600	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	2,129.58	(mg/s)	2,129.58	(mg/s)	2,129.58	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	653.73	(mg/s)	653.73	(mg/s)	653.73	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	121,890.93	(mg/s)	1,391,712	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	10,425.01	(mg/s)	10,425.01	(mg/s)	10,425.01	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	6,936.49	(mg/s)	53,090.84	(mg/s)	53,090.84	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	43,358.02	(mg/s)	43,358.02	(mg/s)	43,358.02	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	4,252.38	(mg/s)	4,252.38	(mg/s)	4,252.38	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	24,638.27	(mg/s)	24,638.27	(mg/s)	24,638.27	(mg/s)
			Low Flo	W	Average	Flow	High F	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	2,783.31	(mg/s)	27,763.72	(mg/s)	286,383.27	(mg/s)
at at	mass flux in river at PM-13	M_r13 =	92,393.48	, ,	285,419.17		1,813,859.72	
			Low Flo	W	Average	Flow	High F	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	82.647	(mg/L)	71.091	(mg/L)	70.104	(mg/L)
S = S	concentration in river at PM-13	C_r13 =	238.530	(mg/L)	112.615	(mg/L)	74.432	(mg/L)

Case Parameter	Year 15 Potassium			
Turumeter	1 OttoSium			
	concentration of surface water into PM-12	C_s12 =	0.60	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.60	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	0.60	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	53.80	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.68	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	7.77	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	1.60	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	1.60	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	214.12	(mg/s)	2,431	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	38.94	(mg/s)	38.94	(mg/s)	38.94	(mg/s
ë	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.89	(mg/s)	5.60	(mg/s)	0.89	(mg/s
<u>t</u> raj	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1,044.78	(mg/s)	11,929	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	190.63	(mg/s)	190.63	(mg/s)	190.63	(mg/s
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	5.60	(mg/s)	3,029.85	(mg/s)	5.60	(mg/s
	mass flux of Area 5 Pit NW discharge	M_spit =	395.86	(mg/s)	1,137.30	(mg/s)	3,029.85	(mg/s
Convert to mass	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,137.30	(mg/s)	0.89	(mg/s)	1,137.30	(mg/s
င့် ပိ	mass flux in seepage from cell 2W	M_s2w =	438.48	(mg/s)	438.48		438.48	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	39.83	(mg/s)	258.66	(mg/s)	2,470.69	(mg/s
at M	mass flux in river at PM-13	M_r13 =	2,207.70		6,100.59		19,201.51	
			Low Flo	w	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	1.183	(mg/L)	0.662	(mg/L)	0.605	(mg/l)
Conve flux to	concentration in river at PM-13	C r13 =	5.700	(mg/L)	2.407	(mg/L)	0.788	(ma/l

Case	Year 15			
Parameter	Magnesium			
	concentration of surface water into PM-12	C_s12 =	5.90	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	5.90	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	5.90	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	12.36	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	213.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	69.97	(mg/L)
ţ	concentration of ground water into PM-12	C_g12 =	10.65	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	10.65	(mg/L)
_	Concentration of ground water fill FW-13	O_g13 =	10.03	(IIIg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,105.49	(mg/s)	23,903	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	259.20	(mg/s)	259.20	(mg/s)	259.20	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	55.10	(mg/s)	55.10	(mg/s)	55.10	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,273.66	(mg/s)	117,301	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	1,268.87	(mg/s)	1,268.87	(mg/s)	1,268.87	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	1,994.02	(mg/s)	15,261.91	(mg/s)	15,261.91	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	2,104.35	(mg/s)	2,104.35	(mg/s)	2,104.35	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	105.20	(mg/s)	105.20	(mg/s)	105.20	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	3,948.56	(mg/s)	3,948.56	(mg/s)	3,948.56	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	314.30	(mg/s)	2,419.79	(mg/s)	24,217.73	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	9,735.30 Low Flo		35,382.34 Average		164,208.04 High Fl	
<i>"</i>			201110		Average			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	9.333	(mg/L)	6.196	(mg/L)	5.928	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	25.133	(ma/L)	13.960	(ma/L)	6.738	(ma/l

Case Parameter	Year 15 Manganese			
raiaiiletei	wanganese			
	concentration of surface water into PM-12	C_s12 =	0.30	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.30	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.30	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.49	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.19	(mg/L)
<u></u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	1.18	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.19	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.19	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	107.06	(mg/s)	1,215	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	4.58	(mg/s)	4.58	(mg/s)	4.58	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	2.80	(mg/s)	2.80	(mg/s)	2.80	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	522.39	(mg/s)	5,964	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	22.40	(mg/s)	22.40	(mg/s)	22.40	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	3.57	(mg/s)	27.31	(mg/s)	27.31	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	33.00	(mg/s)	33.00	(mg/s)	33.00	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	66.76	(mg/s)	66.76	(mg/s)	66.76	(mg/s
			Low Flo	W	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	7.38	(mg/s)	114.44	(mg/s)	1,222.81	(mg/s
Mass	mass flux in river at PM-13	M_r13 =	133.10 Low Flo		786.29 Average		7,336.75 High Fl	
mass	concentration in river at PM-12	C_r12 =		(mg/L)		(mg/L)	0.299	
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.344	(mg/L)	0.310	(mg/L)	0.301	(ma

Case Parameter	Year 15 Sodium			
	concentration of surface water into PM-12	C_s12 =	6.00	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	6.00	(mg/L)
0	concentration in Babbitt WWTP discharge	C_sBab =	6.00	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	119.50	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	26.02	(mg/L)
<u></u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	255.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	44.31	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	4.90	(mg/L)
Ē	concentration of ground water into PM-13	C_g13 =	4.90	(mg/L)

			Low Flo	w	Average	Flow	High Flo	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,141.18	(mg/s)	24,309	(mg/s
	mass flux of ground water into PM-12	M_g12 =	119.26	(mg/s)	119.26	(mg/s)	119.26	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	56.03	(mg/s)	56.03	(mg/s)	56.03	(mg/s
tra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,447.79	(mg/s)	119,290	(mg/s
Gen	mass flux of ground water into PM-13	M_g13 =	583.80	(mg/s)	583.80	(mg/s)	583.80	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	879.28	(mg/s)	6,729.88	(mg/s)	6,729.88	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	4,430.53	(mg/s)	4,430.53	(mg/s)	4,430.53	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	125.94	(mg/s)	125.94	(mg/s)	125.94	(mg/s
င္မွိ မ	mass flux in seepage from cell 2W	M_s2w =	2,500.51	(mg/s)	2,500.51	(mg/s)	2,500.51	(mg/s
			Low Flo	w	Average	Flow	High Flo	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	175.29	(mg/s)	2,316.47	(mg/s)	24,483.86	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	8,695.35 Low Flo		27,134.93 Average		158,144.12 High Flo	
σ ⊑			2011110		7.vo.ugo			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	5.205	(mg/L)	5.931	(mg/L)	5.993	(mg/
Conve flux to	concentration in river at PM-13	C r13 =	22.449	(ma/L)	10.706	(mg/L)	6.489	(ma/i

Case Parameter	Year 15 Nickel			
	concentration of surface water into PM-12	C s12 =	0.0012	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0012	, ,
ρι	concentration in Babbitt WWTP discharge	C_sBab =	0.0012	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.0052	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.022174447	(mg/L)
le le	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.098	(mg/L)
cor	concentration in tailings basin cell 2W	C_s2w =	0.00688	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.007	(mg/L)
9	concentration of ground water into PM-13	C a13 -	0.007	(ma/L)

•			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.43	(mg/s)	5	(mg/s)
concentration flux	mass flux of ground water into PM-12	M_g12 =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s
	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.09	(mg/s)	24	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	0.83	(mg/s)	0.83	(mg/s)	0.83	(mg/s
COU	mass flux of Area 5 Pit NW discharge	M_spit =	0.04	(mg/s)	0.29	(mg/s)	0.29	(mg/s
		M_fs =	3.78	(mg/s)	3.78	(mg/s)	3.78	(mg/s
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.39	(mg/s)	0.39	(mg/s)	0.39	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance	mass flux in river at PM-12	M_r12 =	0.18	(mg/s)	0.61	(mg/s)	5.04	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	5.27 Low Flo	(mg/s)	8.04	(mg/s)	34.24 High Fl	
iass					Avoidgo		- mg.r.r	
Convert mass flux to	concentration in river at PM-12	C_r12 =	0.005	(mg/L)	0.002	(mg/L)	0.001	(mg/
ა ≘ მ	concentration in river at PM-13	C r13 =	0.014	(mg/L)	0.003	(mg/L)	0.001	L

Case	Year 15
Parameter	Lead

	concentration of surface water into PM-12	C_s12 =	0.00015	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00015	(mg/L)
٦	concentration in Babbitt WWTP discharge	C_sBab =	0.00015	(mg/L)
<u>ā</u>	concentration in Area 5 Pit NW discharge	C_spit =	0.0003	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.002700416	(mg/L)
Se le	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0005	(mg/L)
5	concentration in tailings basin cell 2W	C_s2w =	0.0012	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.0012	(mg/L)
르	concentration of ground water into PM-13	C_g13 =	0.0012	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.05	(mg/s)	1	(mg/s)
	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.26	(mg/s)	3	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.02	(mg/s)	0.02	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.46	(mg/s)	0.46	(mg/s)	0.46	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.08	(mg/s)	0.64	(mg/s)
Mass ba at each	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.002	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 15 Antimony			
	concentration of surface water into PM-12	C s12 =	4.00E-05	(ma/L)
data		C_s13 =	4.00E-05	` ' '
č	concentration in Babbitt WW IP discharge	C_sBab =	4.00E-05	(mg/L)
읉	concentration in Area 5 Pit NW discharge	C_spit =	2.50E-04	(mg/L)
ntra	Iconcontration in coopage from Tailings Basin Colle 1E and 2E	C_fs =	9.29E-03	(mg/L)
95		C_rrs =	0.004	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.01	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.58	(mg/s)	1.58	(mg/s)	1.58	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.04	(mg/s)	0.05	(mg/s)	0.20	(mg/s)
at at	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
		1	Low Flo	w	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Converture flux to concer	concentration in river at PM-13	C_r13 =	0.005	(mg/L)	0.001	(mg/L)	0.000	(mg/L)

C_s2w =

C_g12 =

C_g13 =

(mg/L)

2.50E-04

1.50E-03 (mg/L)

1.50E-03 (mg/L)

Case Parameter	Year 15 Selenium			
	concentration of surface water into PM-12	C_s12 =	0.0003	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0003	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0003	(mg/L)
Ę.	concentration in Area 5 Pit NW discharge	C_spit =	0.0016	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001534421	(mg/L)
ē	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.054	(mg/L)
concentration	concentration in tailings basin cell 2W	C_s2w =	0.00109	(mg/L)
no nt	concentration of ground water into PM-12	C_g12 =	0.00295	(mg/L)
ဋ	concentration of ground water into PM-13	C_g13 =	0.00295	(mg/L)

			Low Flo	W	Average I	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	1	(mg/s)	0.11	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.52	(mg/s)	6	(mg/s)
Ser	mass flux of ground water into PM-13	M_g13 =	0.35	(mg/s)	0.35	(mg/s)	0.35	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.26	(mg/s)	0.26	(mg/s)	0.26	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ပို့ ဍ	mass flux in seepage from cell 2W	M_s2w =		(mg/s)	0.06	(mg/s)		(mg/s)
			Low Flo	w	Average I	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.18	(mg/s)	1.29	(mg/s)
Mas at e	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
		1	Low Flo	w	Average I	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
ა	concentration in river at PM-13	C_r13 =	0.002	(mg/L)	0.001	(mg/L)	0.000	(mg/L)

concentration in hydrometallurgical residue cells liner leakage

concentration in tailings basin cell 2W

concentration of ground water into PM-12

concentration of ground water into PM-13

Case Parameter	Year 15 Sulfate			
	concentration of surface water into PM-12	C_s12 =	4.00	(mg/L)
20 to	concentration of surface water into PM-13	C_s13 =	4.00	(mg/L)
<u>"</u>		C_sBab =	4.00	(mg/L)
Ę	concentration in Area 5 Pit NW discharge	C_spit =	1046.27	(mg/L)
<u> </u>	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	183.93	(mg/L)

		Low Flow		Average	Average Flow		High Flow		
rert concentrat ass flux	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,427.45	(mg/s)	16,206	(mg/s)	
	mass flux of ground water into PM-12	M_g12 =	206.87	(mg/s)	206.87	(mg/s)	206.87	(mg/s)	
	mass flux in Babbitt WWTP discharge	M_sBab =	37.36	(mg/s)	37.36	(mg/s)	37.36	(mg/s)	
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	6,965.20	(mg/s)	79,526	(mg/s)	
	mass flux of ground water into PM-13	M_g13 =	1,012.72	(mg/s)	1,012.72	(mg/s)	1,012.72	(mg/s)	
	mass flux of Area 5 Pit NW discharge	M_spit =	7,698.43	(mg/s)	58,922.60	(mg/s)	58,922.60	(mg/s)	
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	31,312.16	(mg/s)	31,312.16	(mg/s)	31,312.16	(mg/s)	
	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	3,628.60	(mg/s)	3,628.60	(mg/s)	3,628.60		
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	8,600.26	(mg/s)	8,600.26	(mg/s)	8,600.26		
			Low Flow		Average	Flow	High F	High Flow	
ass balance each node	mass flux in river at PM-12	M_r12 =	244.23	(mg/s)	1,671.68	(mg/s)	16,449.94	(mg/s)	
Mass at eac	mass flux in river at PM-13	M_r13 =	52,496.39		112,113.21		199,452.67		
			Low Flow		Average	Average Flow		High Flow	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	7.252	(mg/L)	4.280	(mg/L)	4.027	(mg/l)	
Convertilux to concer	concentration in river at PM-13	C_r13 =	135.529	(mg/L)	44.235	(mg/L)	8.185	(mg/l)	

C_s2w =

C_g12 =

C_g13 =

7347.00

152.40

(mg/L)

(mg/L) 8.50 (mg/L)

8.50 (mg/L)

Case	Year 15			
Parameter	Thallium			
		-		
	concentration of surface water into PM-12	C_s12 =	0.0002	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0002	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0002	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.0006	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001032291	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0002	(mg/L)
l o	concentration in tailings basin cell 2W	C_s2w =	0.0002	(mg/L)
ħ	concentration of ground water into PM-12	C_g12 =	0.000004	(mg/L)
<u>u</u>	concentration of ground water into PM-13	C_g13 =	0.000004	(mg/L)

			Low Flo	W	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
= =	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.35	(mg/s)	4	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
u X	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
		M_fs =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	low
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.07	(mg/s)	0.81	(mg/s)
Mass ba at each	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	W	Average	FIOW	High Fl	low
t mass tration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/L)

Case Parameter	Year 15 Zinc		
	concentration of surface water into PM-12	C_s12 =	0.016 (mg/
ata	concentration of surface water into PM-13	C_s13 =	0.016 (mg/
ı dat	concentration in Babbitt WWTP discharge	C_sBab =	0.016 (mg/
<u>[i</u>	concentration in Area 5 Pit NW discharge	C_spit =	0.003 (mg/

ata	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
章	concentration in Area 5 Pit NW discharge	C_spit =	0.003	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.066565637	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.01	(mg/L)
Sor	concentration in tailings basin cell 2W	C_s2w =	0.01435	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.0115	(mg/L)
<u>r</u>	concentration of ground water into PM-13	C_g13 =	0.0115	(mg/L)
		•	•	•
			Low Flo	w

			Low Flo	W	Average I	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.28	(mg/s)	0.28	(mg/s)	0.28	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.02	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	11.33	(mg/s)	11.33	(mg/s)	11.33	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
မိ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.81	(mg/s)	0.81	(mg/s)	0.81	(mg/s)
			Low Flo	W	Average l	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.43	(mg/s)	6.14	(mg/s)	65.25	(mg/s)
Ma at	mass flux in river at PM-13	M_r13 =	13.97	(mg/s)	47.69	(mg/s)	397.04	(mg/s)
			Low Flo	w	Average I	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.013	(mg/L)	0.016	(mg/L)	0.016	(mg/L)
Con	concentration in river at PM-13	C_r13 =	0.036	(mg/L)	0.019	(mg/L)	0.016	(mg/L)

Appendix F.13
Embarrass River
Geotechnical Mitigation
Year 20

FLOWS

Case	Year 20				
Flows	Low Flow Conditions (no surface runoff)				Node
n River	flow in river at PM-12	Q_r12_L =	1.19	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_L =	14.13	(cfs)	PM-13
Total Emba	flow check	Q_ck_L =	14.13	(cfs)	
	surface water flow into PM-12	Q_s12_L =	0.00	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_L =	0.00	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_L =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_L =	0.26	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_L =	6.46	(cfs)	PM-13
da v	hydrometallurgical residue cells liner leakage	Q_rrs_L =	0.0193	(cfs)	PM-13
Į O	seepage from cell 2W	Q_s2w_L =	1.99	(cfs)	PM-13
nput flow	ground water flow into PM-12	Q_g12_L =	0.86	(cfs)	PM-12
Į,	ground water flow into PM-13	Q_g13_L =	4.21	(cfs)	PM-13

Case	Year 20				
Flow	Average Flow Conditions (mean annual)				_
n River	flow in river at PM-12	Q_r12_M =	13.80	(cfs)	PM-12
Total flow in Embarrass R	flow in river at PM-13	Q_r13_M =	90.00	(cfs)	PM-13
Total Fmb	flow check	Q_ck_M =	90.00	(cfs)	
	surface water flow into PM-12	Q_s12_M =	12.61	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_M =	61.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_M =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_M =	1.99	(cfs)	PM-13
ţ.	seepage from Tailings Basin Cells 1E and 2E	Q_fs_M =	6.46	(cfs)	PM-13
data	hydrometallurgical residue cells liner leakage	Q_rrs_M =	0.0193	(cfs)	PM-13
flow (seepage from cell 2W	Q_s2w_M =	1.99	(cfs)	PM-13
lnout f	ground water flow into PM-12	Q_g12_M =	0.86	(cfs)	PM-12
	ground water flow into PM-13	Q_g13_M =	4.21	(cfs)	PM-13

Case	Year 20				
Flow	High Flow Conditions (avg. annual 1-day max fl	ow)			_
n River	flow in river at PM-12	Q_r12_H =	144.35	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_H =	861.55	(cfs)	PM-13
Tota	flow check	Q_ck_H =	861.55	(cfs)	
	surface water flow into PM-12	Q_s12_H =	143.16	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_H =	702.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_H =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_H =	1.99	(cfs)	PM-13
草	seepage from Tailings Basin Cells 1E and 2E	Q_fs_H =	6.46	(cfs)	PM-13
g	hydrometallurgical residue cells liner leakage	Q_rrs_H =	0.0193	(cfs)	PM-13
flow data	seepage from cell 2W	Q_s2w_H =	1.99	(cfs)	PM-13
Input 1	ground water flow into PM-12	Q_g12_H =	0.86	(cfs)	PM-12
du	ground water flow into PM-13	Q_g13_H =	4.21	(cfs)	PM-13

Case	Year 20			
Parameter	Silver			
		-		
	concentration of surface water into PM-12	C_s12 =	0.00011	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00011	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.00011	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00015	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00095	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.000125	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.000100	(mg/L)
ţ	concentration of ground water into PM-12	C_g12 =	0.000008	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.000008	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.19	(mg/s)	2	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒ္	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.45	(mg/s)
	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.000		0.000	(mg/L)	0.000	(mg/L)

Case Parameter	Year 20 Aluminum			
		•		
	concentration of surface water into PM-12	C_s12 =	0.12	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.12	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.12	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.01325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.88E-02	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80E-01	(mg/L)
souce	concentration in tailings basin cell 2W	C_s2w =	1.5788	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.025	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.025	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	42.82	(mg/s)	486	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.61	(mg/s)	0.61	(mg/s)	0.61	(mg/s
=	mass flux in Babbitt WWTP discharge	M_sBab =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	208.96	(mg/s)	2,386	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	2.98	(mg/s)	2.98	(mg/s)	2.98	(mg/s
mass ma	mass flux of Area 5 Pit NW discharge	M_spit =	0.10	(mg/s)	0.75	(mg/s)	0.75	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	12.58	(mg/s)	12.58	(mg/s)	12.58	(mg/s
nve mas	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	89.10	(mg/s)	89.10	(mg/s)	89.10	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	1.73	(mg/s)	44.55	(mg/s)	487.90	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	106.58		359.01		2,979.19	
uss			Low Flo	w	Average	Flow	High FI	0
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.051	(mg/L)	0.114	(mg/L)	0.119	(mg
Conve flux to	concentration in river at PM-13	C r13 =	0.266	(mg/L)	0.141	(mg/L)	0.122	(mg/

Case Parameter	Year 20 Arsenic			
	concentration of surface water into PM-12	C_s12 =	0.00075	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00075	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.00075	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.001325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.007453418	(mg/L)
面	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
conc	concentration in tailings basin cell 2W	C_s2w =	0.00291	(mg/L)
ŧ	concentration of ground water into PM-12	C_g12 =	0.00273	(mg/L)
Input	concentration of ground water into PM-13	C a13 =	0.00273	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.27	(mg/s)	3	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
at	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.31	(mg/s)	15	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s)
u X	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.36	(mg/s)	1.36	(mg/s)	1.36	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္မ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.16	(mg/s)	0.16	(mg/s)	0.16	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.34	(mg/s)	3.11	(mg/s)
	mass flux in river at PM-13	M_r13 =		(mg/s)	3.58	(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.005	(mg/L)	0.001	(mg/L)	0.001	(ma/L)

Case Parameter	Year 20 Boron			
	concentration of surface water into PM-12	C s12 =	0.027	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.027	(mg/L)
ρ	concentration in Babbitt WWTP discharge	C_sBab =	0.027	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.1315	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.158659552	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.11	(mg/L)
o	concentration in tailings basin cell 2W	C_s2w =	0.33	(mg/L)
Ħ	concentration of ground water into PM-12	C_g12 =	0.0212	(mg/L)
<u> </u>	concentration of ground water into PM-13	C a13 -	0.0212	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	9.64	(mg/s)	109	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)	0.52	(mg/s)	0.52	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s
concentration flux	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	47.02	(mg/s)	537	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	2.53	(mg/s)	2.53	(mg/s)	2.53	(mg/s
ž čo ž	mass flux of Area 5 Pit NW discharge	M_spit =	0.97	(mg/s)	7.41	(mg/s)	7.41	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	29.01	(mg/s)	29.01	(mg/s)	29.01	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	18.62	(mg/s)	18.62	(mg/s)	18.62	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.77	(mg/s)	10.40	(mg/s)	110.16	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	51.96 Low Flo	(mg/s)	115.04 Average		704.59 High Fl	
mass	concentration in river at PM-12	C_r12 =		(mg/L)		(mg/L)	0.027	
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.130	(mg/L)	0.045	(mg/L)	0.029	(ma/

Case Parameter	Year 20 Barium			
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
р	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
tion	concentration in Area 5 Pit NW discharge	C_spit =	0.0044	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.40E-02	(mg/L)
cer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	5.00E-03	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.09298	(mg/L)
nput	concentration of ground water into PM-12	C_g12 =	0.0681	(mg/L)
을	concentration of ground water into PM-13	C a13 =	0.0681	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	1.66	(mg/s)	1.66	(mg/s)	1.66	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	8.11	(mg/s)	8.11	(mg/s)	8.11	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	9.87	(mg/s)	9.87	(mg/s)	9.87	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	5.25	(mg/s)	5.25	(mg/s)	5.25	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	1.81	(mg/s)	7.52	(mg/s)	66.63	(mg/s)
Mass ba at each I		M_r13 =		(mg/s)		(mg/s)	408.22	
	1	_	Low Flo	W	Average	FIOW	High Fl	ow
t mass tration	concentration in river at PM-12	C_r12 =	0.054	(mg/L)	0.019	(mg/L)	0.016	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.063	(mg/L)	0.023	(mg/L)	0.017	(ma/L)

Case Parameter	Year 20 Beryllium			
	·			
	concentration of surface water into PM-12	C_s12 =	0.0001	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0001	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	0.0001	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000472927	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.00075	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.000023	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.000023	(mg/L)

mass flux of surface water into PM-12 M_s12 = - (mg/s) 0.04 (mg/s) mass flux of ground water into PM-12 M_g12 = 0.00 (mg/s) 0.00 (mg/s)	
mass flux of ground water into PM-12 M g12 = 0.00 (mg/s) 0.00 (mg/s)	0 (mg/s
	0.00 (mg/s
mass flux in Babbitt WWTP discharge M_sBab = 0.00 (mg/s) 0.00 (mg/s)	0.00 (mg/s
mass flux of surface water into PM-13 M_s13 = - (mg/s) 0.17 (mg/s)	2 (mg/s
mass flux of ground water into PM-13	0.00 (mg/s
mass flux in Babbitt WWTP discharge M_sBab = 0.00 (mg/s) 0.00 (mg/s) mass flux of surface water into PM-13 M_s13 = - (mg/s) 0.17 (mg/s) mass flux of ground water into PM-13 M_g13 = 0.00 (mg/s) 0.00 (mg/s) mass flux of Area 5 Pit NW discharge M_spit = 0.00 (mg/s) 0.01 (mg/s)	0.01 (mg/s
	0.09 (mg/s
mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.09 (mg/s) 0.09 (mg/s) mass flux in hydrometallurgical residue cells liner leakage M_rrs = - (mg/s) - (mg/s) mass flux in hydrometallurgical residue cells liner leakage M_rrs = - (mg/s) - (mg/s) mass flux in seepage from Cell 2W M_s2w = 0.04 (mg/s) 0.04 (mg/s)	- (mg/s
mass flux in seepage from cell 2W M_s2w = 0.04 (mg/s) 0.04 (mg/s)	0.04 (mg/s
Low Flow Average Flow	High Flow
mass flux in river at PM-12	0.41 (mg/s
mass flux in river at PM-13 M_r13 = 0.13 (mg/s) 0.35 (mg/s)	2.53 (mg/s
Low Flow Average Flow C r12 0 000 (mg/l) 0 000 (mg/l)	0.000 (
concentration in river at PM-12 C_r12 = 0.000 (mg/L) 0.000 (mg/L) 0.000 (mg/L) 0.000 (mg/L)	

Case	Year 20			
Parameter	Calcium			
		1		1
	concentration of surface water into PM-12	C_s12 =	15	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	15	(mg/L)
0	concentration in Babbitt WWTP discharge	C_sBab =	15	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	95.35	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	65.23766506	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	416	(mg/L)
Sor	concentration in tailings basin cell 2W	C_s2w =	59.78	(mg/L)
but	concentration of ground water into PM-12	C_g12 =	19	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	19	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5,352.95	(mg/s)	60,771	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	462.42	(mg/s)	462.42	(mg/s)	462.42	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	140.09	(mg/s)	140.09	(mg/s)	140.09	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	26,119.49	(mg/s)	298,224	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	2,263.72	(mg/s)	2,263.72	(mg/s)	2,263.72	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	701.59	(mg/s)	5,369.83	(mg/s)	5,369.83	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	11,928.83	(mg/s)	11,928.83	(mg/s)	11,928.83	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	227.25	(mg/s)	227.25	(mg/s)	227.25	(mg/s)
ပို ဍ	mass flux in seepage from cell 2W	M_s2w =	3,373.51	(mg/s)	3,373.51	(mg/s)	32.66	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	602.51	(mg/s)	5,955.45	(mg/s)	61,373.93	(mg/s)
	mass flux in river at PM-13	M_r13 =	19,097.41	, ,	55,238.08	(mg/s)	379,420.20	\ \ \ \ \ \
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	17.891	(mg/L)	15.249	(mg/l)	15.024	(mg/l)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	47.743		21.686	(mg/l)	15.561	

Case Parameter	Year 20 Cadmium			
		-"	,	
	concentration of surface water into PM-12	C_s12 =	0.00008	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00008	(mg/L)
Ф	concentration in Babbitt WWTP discharge	C_sBab =	0.00008	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000503271	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0004	(mg/L)
couc	concentration in tailings basin cell 2W	C_s2w =	0.000188	(mg/L)
at	concentration of ground water into PM-12	C_g12 =	0.0003	(mg/L)
ndu	concentration of ground water into PM-13	C_g13 =	0.0003	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.03	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
at	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.14	(mg/s)	2	(mg/s)
) C	mass flux of ground water into PM-13	M_g13 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
i So	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.09	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.01	(mg/s)	0.04	(mg/s)	0.33	(mg/s)
Mass ba at each i		M_r13 =	0.15 Low Flo	(mg/s)	0.32	(mg/s)	2.07 High Fl	(mg/s
ي د							-	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L
Conve flux to	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(ma/l

Case Parameter	Year 20 Chloride			
		-	1	
	concentration of surface water into PM-12	C_s12 =	6.5	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	6.5	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	6.5	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	5.95	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.85E+00	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.76E+03	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	21.54	(mg/L)
_	concentration of ground water into PM-12	C_g12 =	1.8	(mg/L)
In put	concentration of ground water into PM-13	C_g13 =	1.8	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,319.61	(mg/s)	26,334	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	43.81	(mg/s)	43.81	(mg/s)	43.81	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	60.70	(mg/s)	60.70	(mg/s)	60.70	(mg/s
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	11,318.44	(mg/s)	129,230	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	214.46	(mg/s)	214.46	(mg/s)	214.46	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	43.78	(mg/s)	335.09	(mg/s)	335.09	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,070.58	(mg/s)	1,070.58	(mg/s)	1,070.58	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	961.45	(mg/s)	961.45	(mg/s)	961.45	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	1,215.55	(mg/s)	1,215.55	(mg/s)	1,215.55	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	104.51	(mg/s)	2,424.12	(mg/s)	26,438.79	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	3,610.33		17,539.69 Average		159,466.31 High Fl	
ass			Low Flo	w	Average	Flow	High Fi	O۱
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	3.103	(mg/L)	6.207	(mg/L)	6.472	(mg
Conve flux to	concentration in river at PM-13	C r13 =	9.026	(mg/L)	6.886	(mg/L)	6.540	(ma/

Case	Year 20	1		
Parameter	Cobalt			
		·		
	concentration of surface water into PM-12	C_s12 =	0.0006	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0006	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.0006	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.000555	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00218589	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.005	(mg/L)
lo co	concentration in tailings basin cell 2W	C_s2w =	0.001556	(mg/L)
5	concentration of ground water into PM-12	C_g12 =	0.0011	(mg/L)
ם		C_g13 =	0.0011	(mg/L)

mass flux of ground water into PM-12 M_g12 = 0.03 (mg/s) 0.03 (mg/s) 0.05 (m	Low Flow	Average Flow	High Flow
mass flux in Babbitt WWTP discharge M_sBab = 0.01 (mg/s) 0.02 (mg/s) 0.03 (mg/s) 0.04 (mg/s) 0.04 (mg/s) 0.05 (m	water into PM-12	0.21 (mg/s)	2 (mg/s
mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.40 (mg/s) 0.40 (water into PM-12 M_g12 = 0.03 (mg/s)	0.03 (mg/s)	0.03 (mg/s
mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.40 (mg/s) 0.40 (WWTP discharge M_sBab = 0.01 (mg/s)	0.01 (mg/s)	0.01 (mg/s
mass flux in river at PM-13 M_r13 = 0.66 (mg/s) 0.40 (mg/s	water into PM-13	1.04 (mg/s)	12 (mg/s
Mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.40 (mg/s) 0.	water into PM-13	0.13 (mg/s)	0.13 (mg/s
mass flux in river at PM-13 M_r13 = 0.66 (mg/s) 0.40 (mg/s	Pit NW discharge M_spit = 0.00 (mg/s)	0.03 (mg/s)	0.03 (mg/s
M_s2w = 0.09 (mg/s) 0.09 (mg/s) 0.09 (mg/s) 0.00 (mg/s) 0.	e from Tailings Basin Cells 1E and 2E M_fs = 0.40 (mg/s)	0.40 (mg/s)	0.40 (mg/s
Low Flow Average Flow High	etallurgical residue cells liner leakage M_rrs = 0.00 (mg/s)	0.00 (mg/s)	0.00 (mg/s
mass flux in river at PM-12	e from cell 2W M_s2w = 0.09 (mg/s)	0.09 (mg/s)	0.09 (mg/s
M_r13 = 0.66 (mg/s) 1.94 (mg/s) 15.04 (mg/s) 1.94 (mg/s) (mg/s) 1.94 (mg/s) (mg/s) (mg/s) (mg/s)	Low Flow	Average Flow	High Flow
mass flux in river at PM-13 M_r13 = 0.66 (mg/s) 1.94 (mg/s) 15.04	PM-12	0.25 (mg/s)	2.46 (mg/s
			15.04 (mg/s
Concentration in river at PM-12 C_r12 = 0.001 (mg/L) 0.001	Low Flow	Average Flow	

Case	Year 20			
Parameter	Copper			
	concentration of surface water into PM-12	C_s12 =	0.0015	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0015	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.0015	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00345	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.011428793	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0015	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.004555	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.004	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.004	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.54	(mg/s)	6	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.61	(mg/s)	30	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	0.48	(mg/s)	0.48	(mg/s)	0.48	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.19	(mg/s)	0.19	(mg/s
		M_fs =	2.09	(mg/s)	2.09	(mg/s)	2.09	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္မွ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.26	(mg/s)	0.26	(mg/s)	0.26	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.11	(mg/s)	0.65	(mg/s)	6.19	(mg/s
iss eac	mass flux in river at PM-13	M_r13 =	2.96 Low Flo	(mg/s)	6.28	(mg/s)	39.03 High Fl	
nass								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.003	(mg/L)		(mg/L)	0.002	

Case Parameter	Year 20 Fluoride			
	concentration of surface water into PM-12	C_s12 =	0.2	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.2	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.2	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.125	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	5.99E-01	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	2.85E+00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	1.55	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.385	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.385	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	71.37	(mg/s)	810	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	9.37	(mg/s)	9.37	(mg/s)	9.37	(mg/s
ë	mass flux in Babbitt WWTP discharge	M_sBab =	1.87	(mg/s)	1.87	(mg/s)	1.87	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	348.26	(mg/s)	3,976	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	45.87	(mg/s)	45.87	(mg/s)	45.87	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.92	(mg/s)	7.04	(mg/s)	7.04	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	109.60	(mg/s)	109.60	(mg/s)	109.60	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	1.56	(mg/s)	1.56	(mg/s)	1.56	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	87.47	(mg/s)	87.47	(mg/s)	87.47	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	11.24	(mg/s)	82.61	(mg/s)	821.52	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	256.65 Low Flo		682.40 Average		5,049.38 High Fl	
ss u			LOW 1 10		Average	l low	Ingiri	
Convert mass flux to	concentration in river at PM-12	C_r12 =	0.334	(mg/L)	0.212	(mg/L)	0.201	(mg/
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.642	(mg/L)	0.268	(mg/L)	0.207	(ma/l

Case	Year 20	1		
Parameter	Iron			
			1	
	concentration of surface water into PM-12	C_s12 =	2.9	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	2.9	(mg/L)
7	concentration in Pobbitt WWTD discharge	C_sBab =	2.9	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.037761905	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	2.17E-02	(mg/L)
<u> </u>		C_rrs =	4.00E-01	(mg/L)
Suoc	concentration in tailings basin cell 2W	C_s2w =	4.594	(mg/L)
no di		C_g12 =	0.035	(mg/L)
2	concentration of ground water into PM-13	C a13 -	0.035	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,034.90	(mg/s)	11,749	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.85	(mg/s)	0.85	(mg/s)	0.85	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	27.08	(mg/s)	27.08	(mg/s)	27.08	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	5,049.77	(mg/s)	57,657	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	4.17	(mg/s)	4.17	(mg/s)	4.17	(mg/s
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.28	(mg/s)	2.13	(mg/s)	2.13	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	3.97	(mg/s)	3.97	(mg/s)	3.97	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.22	(mg/s)	0.22	(mg/s)	0.22	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	259.25	(mg/s)	259.25	(mg/s)	259.25	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	27.93	(mg/s)	1,062.84	(mg/s)	11,777.08	(mg/s)
Mass ba at each i		M_r13 =	295.82 Low Flo		6,382.34 Average		69,703.45 High Fl	_
SS L								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.829	(mg/L)	2.721	(mg/L)	2.883	(mg/L
Conve flux to	concentration in river at PM-13	C r13 =	0.740	(mg/L)	2.506	(mg/L)	2.859	(ma/L

Case	Teal 20			
Parameter	Hardness			
		-		
	concentration of surface water into PM-12	C_s12 =	70	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	70	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	70	(mg/L)
ntration	concentration in Area 5 Pit NW discharge	C_spit =	942.7142857	(mg/L)
tra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	2.18E+02	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	8.61E+03	(mg/L)
eouce	concentration in tailings basin cell 2W	C_s2w =	436.6	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	87.5	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	87.5	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	24,980.41	(mg/s)	283,600	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	2,129.58	(mg/s)	2,129.58	(mg/s)	2,129.58	(mg/s
ë	mass flux in Babbitt WWTP discharge	M_sBab =	653.73	(mg/s)	653.73	(mg/s)	653.73	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	121,890.93	(mg/s)	1,391,712	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	10,425.01	(mg/s)	10,425.01	(mg/s)	10,425.01	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	6,936.49	(mg/s)	53,090.84	(mg/s)	53,090.84	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	39,904.86	(mg/s)	39,904.86	(mg/s)	39,904.86	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	4,703.46	(mg/s)	4,703.46	(mg/s)	4,703.46	(mg/s
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =	24,638.27	(mg/s)	24,638.27	(mg/s)	24,638.27	(mg/s
			Low Flo	W	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	2,783.31	(mg/s)	27,763.72	(mg/s)	286,383.27	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	89,391.40 Low Flo	, ,	282,417.09 Average		1,810,857.64 High Fl	
ass			LOW 1 10		Average	liow	riigii i	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	82.647	(mg/L)	71.091	(mg/L)	70.104	(mg/
S S S	concentration in river at PM-13	C r13 =	223.474	(· · · / /)	110.877	(#)	74.270	, ,

Case	Year 20			
Parameter	Potassium			
	concentration of surface water into PM-12	C_s12 =	0.60	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.60	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.60	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	53.80	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.23	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	7.77	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	1.60	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	1.60	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	214.12	(mg/s)	2,431	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	38.94	(mg/s)	38.94	(mg/s)	38.94	(mg/s)
ë	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.98	(mg/s)	0.98	(mg/s)	0.98	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1,044.78	(mg/s)	11,929	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	190.63	(mg/s)	190.63	(mg/s)	190.63	(mg/s
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	5.60	(mg/s)	5.60	(mg/s)	5.60	(mg/s
	mass flux of Area 5 Pit NW discharge	M_spit =	395.86	(mg/s)	3,029.85	(mg/s)	3,029.85	(mg/s
Convert to mass	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,138.87	(mg/s)	1,138.87	(mg/s)	1,138.87	(mg/s
ဒို ဒိ	mass flux in seepage from cell 2W	M_s2w =	438.48	(mg/s)	438.48	(mg/s)	438.48	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	39.92	(mg/s)	254.04	(mg/s)	2,470.78	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	2,209.36 Low Flo	, ,	6,102.25 Average		19,203.17 High Fl	
- S			LOW 1 10		Average	I low	Ingiri	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	1.186	(mg/L)	0.650	(mg/L)	0.605	(mg/
Conve flux to concer	concentration in river at PM-13	C r13 =	5.523	(mg/L)	2 396	(mg/L)	0.788	(ma/l

Case Parameter	Year 20 Magnesium			
		1_		
	concentration of surface water into PM-12	C_s12 =	5.90	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	5.90	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	5.90	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	13.44	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	213.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	69.97	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	10.65	(mg/L)
벌	concentration of ground water into PM-13	C_g13 =	10.65	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,105.49	(mg/s)	23,903	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	259.20	(mg/s)	259.20	(mg/s)	259.20	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	55.10	(mg/s)	55.10	(mg/s)	55.10	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,273.66	(mg/s)	117,301	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	1,268.87	(mg/s)	1,268.87	(mg/s)	1,268.87	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	1,994.02	(mg/s)	15,261.91	(mg/s)	15,261.91	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	2,457.15	(mg/s)	2,457.15	(mg/s)	2,457.15	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	116.36	(mg/s)	116.36	(mg/s)	116.36	(mg/s)
ပို ဍ	mass flux in seepage from cell 2W	M_s2w =	3,948.56	(mg/s)	3,948.56	(mg/s)	3,948.56	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	314.30	(mg/s)	2,419.79	(mg/s)	24,217.73	(mg/s)
	mass flux in river at PM-13	M_r13 =	10,099.26		35,746.30	(mg/s)	164,572.01	
			Low Flo	w	Average	Flow	High FI	ow
mass	concentration in river at PM-12	C_r12 =	9.333	(mg/L)	6.196	(mg/l)	5.928	(mg/l)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	25.248	(mg/L)	14.034	(ma/l)	6.750	(ma/l)

Case Parameter	Year 20 Manganese			
		-	Т	1
	concentration of surface water into PM-12	C_s12 =	0.30	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.30	(mg/L)
7	concentration in Publitt WWTP discharge	C_sBab =	0.30	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.49	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.23	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.00	(mg/L)
io	concentration in tailings basin cell 2W	C_s2w =	1.18	(mg/L)
ing	concentration of ground water into PM-12	C_g12 =	0.19	(mg/L)
	concentration of ground water into PM-13	C a13 =	0.19	(ma/L)

			Low Flo	W	Average	Flow	High Flo	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	107.06	(mg/s)	1,215	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	4.58	(mg/s)	4.58	(mg/s)	4.58	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	2.80	(mg/s)	2.80	(mg/s)	2.80	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	522.39	(mg/s)	5,964	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	22.40	(mg/s)	22.40	(mg/s)	22.40	(mg/s)
nox	mass flux of Area 5 Pit NW discharge	M_spit =	3.57	(mg/s)	27.31	(mg/s)	27.31	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	42.20	(mg/s)	42.20	(mg/s)	42.20	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ .	mass flux in seepage from cell 2W	M_s2w =	66.76	(mg/s)		(mg/s)	66.76	(mg/s)
			Low Flo	W	Average	Flow	High Flo	ow
sd ser	mass flux in river at PM-12	M_r12 =		(mg/s)	114.44		1,222.81	
≥ 3	mass flux in river at PM-13	M_r13 =	142.30	, ,	795.50		7,345.96	,
Convert mass flux to	concentration in river at PM-12	C_r12 =	0.219	(mg/L)	0.293	(mg/l)	0.299	
ರ ≓ ೪	concentration in river at PM-13	C_r13 =	0.356	(mg/L)	0.312	(mg/l)	0.301	(mg/l)

Case	Year 20			
Parameter	Sodium			
	concentration of surface water into PM-12	C_s12 =	6.00	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	6.00	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	6.00	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	119.50	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	22.22	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	255.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	44.31	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	4.90	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	4.90	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,141.18	(mg/s)	24,309	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	119.26	(mg/s)	119.26	(mg/s)	119.26	(mg/s
ë	mass flux in Babbitt WWTP discharge	M_sBab =	56.03	(mg/s)	56.03	(mg/s)	56.03	(mg/s
<u>t</u> raj	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,447.79	(mg/s)	119,290	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	583.80	(mg/s)	583.80	(mg/s)	583.80	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	879.28	(mg/s)	6,729.88	(mg/s)	6,729.88	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	4,062.28	(mg/s)	4,062.28	(mg/s)	4,062.28	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	139.30	(mg/s)	139.30	(mg/s)	139.30	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	2,500.51	(mg/s)	2,500.51	(mg/s)	2,500.51	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	175.29	(mg/s)	2,316.47	(mg/s)	24,483.86	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	8,340.46 Low Flo		26,780.03 Average		157,789.22 High Fl	
SS C			LOW FIO	W	Average	FIOW	nigii Fi	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	5.205	(mg/L)	5.931	(mg/l)	5.993	(mg/
Conve flux to	concentration in river at PM-13	C r13 =	20.851	(mg/L)	10.514	(mg/l)	6.472	(ma/

Case	Year 20 Nickel			
Parameter	NICKEI	l		
	concentration of surface water into PM-12	C_s12 =	0.0012	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0012	(mg/L)
Ф	concentration in Babbitt WWTP discharge	C_sBab =	0.0012	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0052	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.023571036	(mg/L)
95	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.098	(mg/L)
Con	concentration in tailings basin cell 2W	C_s2w =	0.00688	(mg/L)
5	concentration of ground water into PM-12	C_g12 =	0.007	(mg/L)
宣	concentration of ground water into PM-13	C_g13 =	0.007	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.43	(mg/s)	5	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.09	(mg/s)	24	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	0.83	(mg/s)	0.83	(mg/s)	0.83	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.04	(mg/s)	0.29	(mg/s)	0.29	(mg/s
		M_fs =	4.31	(mg/s)	4.31	(mg/s)	4.31	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.39	(mg/s)	0.39	(mg/s)	0.39	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.18	(mg/s)	0.61	(mg/s)	5.04	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	5.81 Low Flo	(mg/s)	8.58 Average	(mg/s)	34.78 High Fl	
ass			201110		Average			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.005	(mg/L)	0.002	(mg/L)	0.001	(mg/
Conve flux to	concentration in river at PM-13	C r13 =	0.015	(mg/L)	0.003	(mg/L)	0.001	(ma/l

Case Parameter	Year 20 Lead			
	concentration of surface water into PM-12	C s12 =	0.00015	(mg/L)
data	concentration of surface water into PM-13	 C_s13 =	0.00015	` '
	concentration in Babbitt WWTP discharge	C_sBab =	0.00015	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0003	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.002295615	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0005	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.0012	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0012	(mg/L)
ב	concentration of ground water into PM-13	C_g13 =	0.0012	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.05	(mg/s)	1	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.26	(mg/s)	3	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.02	(mg/s)	0.02	(mg/s
		M_fs =	0.42	(mg/s)	0.42	(mg/s)	0.42	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.08	(mg/s)	0.64	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	0.66 Low Flo	(mg/s)	0.99	(mg/s)	4.27 High Fl	(mg/s
nass	concentration in river at PM 12	C r12						
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)		(mg/L)	0.000	

Case	Year 20			
Parameter	Antimony			
		ı	r	
	concentration of surface water into PM-12	C_s12 =	4.00E-05	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	4.00E-05	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	4.00E-05	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	2.50E-04	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	8.78E-03	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	2.50E-04	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	1.50E-03	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	1.50E-03	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.01	(mg/s)	0	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.61	(mg/s)	1.61	(mg/s)	1.61	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	W	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.04	(mg/s)	0.05	(mg/s)	0.20	(mg/s
(O		M_r13 =	1.84 Low Flo	(mg/s)	1.94	(mg/s)	2.81 High Fl	(mg/s
nass	DIAMETER STATE OF THE STATE OF	0.40						
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)		(mg/L)	0.000	

Case Parameter	Year 20 Selenium			
		•		
	concentration of surface water into PM-12	C_s12 =	0.0003	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0003	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.0003	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0016	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001434159	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.054	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.00109	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.00295	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.00295	(mg/L)

								ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.11	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.52	(mg/s)	6	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.35	(mg/s)	0.35	(mg/s)	0.35	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.09	(mg/s)	0.09	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.26	(mg/s)	0.26	(mg/s)	0.26	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s
ဒိ ဒ	mass flux in seepage from cell 2W	M_s2w =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.18	(mg/s)	1.29	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	8.05 High Fl	
		C r12 -	Low Flo		Average		High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.000	(mg/L)	0.000)

Case Parameter	Year 20 Sulfate			
	concentration of surface water into PM-12	C s12 =	4.00	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	4.00	(mg/L)
Р	concentration in Babbitt WWTP discharge	C_sBab =	4.00	(mg/L)
tion	concentration in Area 5 Pit NW discharge	C_spit =	1046.27	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	163.33	(mg/L)
cer	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	7347.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	152.40	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	8.50	(mg/L)
<u> </u>	concentration of ground water into PM-13	C a13 =	8 50	(ma/L)

			Low Flo	w	Average	Flow	High Flo	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,427.45	(mg/s)	16,206	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	206.87	(mg/s)	206.87	(mg/s)	206.87	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	37.36	(mg/s)	37.36	(mg/s)	37.36	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	6,965.20	(mg/s)	79,526	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	1,012.72	(mg/s)	1,012.72	(mg/s)	1,012.72	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	7,698.43	(mg/s)	58,922.60	(mg/s)	58,922.60	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	29,864.60	(mg/s)	29,864.60	(mg/s)	29,864.60	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	4,013.51	(mg/s)	4,013.51	(mg/s)	4,013.51	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	8,600.26	(mg/s)	8,600.26	(mg/s)	8,600.26	(mg/s
			Low Flo	w	Average	Flow	High Flo	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	244.23	(mg/s)	1,671.68	(mg/s)	16,449.94	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	51,433.74 Low Flo		111,050.56 Average		198,390.02 High Flo	
<i>"</i>			2011 1 10		Average			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	7.252	(mg/L)	4.280	(mg/l)	4.027	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	128.582	(mg/L)	43.598	(mg/l)	8.137	(ma/l

Case Parameter	Year 20 Thallium			
	concentration of surface water into PM-12	C_s12 =	0.0002	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0002	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0002	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0006	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001001115	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0002	(mg/L)
ouo	concentration in tailings basin cell 2W	C_s2w =	0.0002	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.000004	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.000004	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
tra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.35	(mg/s)	4	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္မွ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.07	(mg/s)	0.81	(mg/s
iss eac	mass flux in river at PM-13	M_r13 =	0.20 Low Flo	(mg/s)	0.65	(mg/s)	5.02 High Fl	(mg/s
ss				-	- The stage		- Ing.	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/l
Conve flux to concer	concentration in river at PM-13	C r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(ma/l

Case	Year 20			
Parameter	Zinc			
		1_		
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.003	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.058688337	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.01	(mg/L)
COL	concentration in tailings basin cell 2W	C_s2w =	0.01435	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0115	(mg/L)
ם	concentration of ground water into PM-13	C_g13 =	0.0115	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.28	(mg/s)	0.28	(mg/s)	0.28	(mg/s
Ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.02	(mg/s)	0.17	(mg/s)	0.17	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	10.73	(mg/s)	10.73	(mg/s)	10.73	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
မိ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.81	(mg/s)	0.81	(mg/s)	0.81	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.43	(mg/s)	6.14	(mg/s)	65.25	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	13.37 Low Flo	(mg/s)	47.09 Average	(mg/s)	396.44 High Fl	
ass			LOW FIO	W	Average	Flow	nigh Fi	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.013	(mg/L)	0.016	(mg/L)	0.016	(mg/
ರ≅ೞ	concentration in river at PM-13	C r13 =	0.033	(mg/L)	0.018	(mg/L)	0.016	(ma

Appendix F.14
Embarrass River
Geotechnical Mitigation
Closure

FLOWS

Case	Closure				
Flows	Low Flow Conditions (no surface runoff)				Node
n River	flow in river at PM-12	Q_r12_L =	1.19	(cfs)	PM-12
Fotal flow in Embarrass F	flow in river at PM-13	Q_r13_L =	9.06	(cfs)	PM-13
Total flow Embarras	flow check	Q_ck_L =	9.06	(cfs)	
	surface water flow into PM-12	Q_s12_L =	0.00	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_L =	0.00	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_L =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_L =	0.26	(cfs)	PM-13
data	seepage from Tailings Basin Cells 1E and 2E	Q_fs_L =	1.73	(cfs)	PM-13
da da	hydrometallurgical residue cells liner leakage	Q_rrs_L =	0.0017	(cfs)	PM-13
flow	seepage from cell 2W	Q_s2w_L =	1.67	(cfs)	PM-13
Input 1	ground water flow into PM-12	Q_g12_L =	0.86	(cfs)	PM-12
du	ground water flow into PM-13	Q_g13_L =	4.21	(cfs)	PM-13

Case	Closure				
Flow	Average Flow Conditions (mean annual)				_
n River	flow in river at PM-12	Q_r12_M =	13.80	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_M =	84.93	(cfs)	PM-13
Total Emba	flow check	Q_ck_M =	84.93	(cfs)	1
	surface water flow into PM-12	Q_s12_M =	12.61	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_M =	61.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_M =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_M =	1.99	(cfs)	PM-13
草	seepage from Tailings Basin Cells 1E and 2E	Q_fs_M =	1.73	(cfs)	PM-13
g g	hydrometallurgical residue cells liner leakage	Q_rrs_M =	0.0017	(cfs)	PM-13
Input flow data	seepage from cell 2W	Q_s2w_M =	1.67	(cfs)	PM-13
Ę	ground water flow into PM-12	Q_g12_M =	0.86	(cfs)	PM-12
<u> </u>	ground water flow into PM-13	Q g13 M =	4.21	(cfs)	PM-13

Case	Closure				
Flow	High Flow Conditions (avg. annual 1-day max flo	w)			_
n River	flow in river at PM-12	Q_r12_H =	144.35	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_H =	856.48	(cfs)	PM-13
Tota	flow check	Q_ck_H =	856.48	(cfs)	
	surface water flow into PM-12	Q_s12_H =	143.16	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_H =	702.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_H =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_H =	1.99	(cfs)	PM-13
ţ <u>a</u>	seepage from Tailings Basin Cells 1E and 2E	Q_fs_H =	1.73	(cfs)	PM-13
flow data	hydrometallurgical residue cells liner leakage	Q_rrs_H =	0.00	(cfs)	PM-13
No.	seepage from cell 2W	Q_s2w_H =	1.67	(cfs)	PM-13
Input 1	ground water flow into PM-12	Q_g12_H =	0.86	(cfs)	PM-12
du	ground water flow into PM-13	Q_g13_H =	4.21	(cfs)	PM-13

Case	Closure			
Parameter	Silver			
		-		1
	concentration of surface water into PM-12	C_s12 =	0.00011	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00011	(mg/L)
ρι	concentration in Babbitt WWTP discharge	C_sBab =	0.00011	(mg/L)
ratio	concentration in Area 5 Pit NW discharge	C_spit =	0.00015	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00124	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.000125	(mg/L)
Sor	concentration in tailings basin cell 2W	C_s2w =	0.000100	(mg/L)
but	concentration of ground water into PM-12	C_g12 =	0.00008	(mg/L)
<u>r</u>	concentration of ground water into PM-13	C_g13 =	0.000008	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.19	(mg/s)	2	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒ္ ဒ	mass flux in seepage from cell 2W	M_s2w =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.45	(mg/s)
	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.000		0.000	(mg/L)	0.000	(ma/L)

Case	Closure			
Parameter	Aluminum			
		-		1
	concentration of surface water into PM-12	C_s12 =	0.12	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.12	(mg/L)
ρι	concentration in Babbitt WWTP discharge	C_sBab =	0.12	(mg/L)
ratio	concentration in Area 5 Pit NW discharge	C_spit =	0.01325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.15E-01	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80E-01	(mg/L)
Sor	concentration in tailings basin cell 2W	C_s2w =	1.5788	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.025	(mg/L)
宣	concentration of ground water into PM-13	C_g13 =	0.025	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	1	(mg/s)	42.82	(mg/s)	486	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.61	(mg/s)	0.61	(mg/s)	0.61	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	ı	(mg/s)	208.96	(mg/s)	2,386	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	2.98	(mg/s)	2.98	(mg/s)	2.98	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.10	(mg/s)	0.75	(mg/s)	0.75	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	30.13	(mg/s)	30.13	(mg/s)	30.13	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ဒို ဒိ	mass flux in seepage from cell 2W	M_s2w =	74.66	(mg/s)	74.66	(mg/s)	74.66	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	1.73	(mg/s)	44.55	(mg/s)	487.90	(mg/s)
Mg at	mass flux in river at PM-13	M_r13 =	109.60		362.03		2,982.21	
-			Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.051	(mg/L)	0.114	(mg/L)	0.119	(mg/L)
S I 0	concentration in river at PM-13	C_r13 =	0.427	(mg/L)	0.151	(mg/L)	0.123	(mg/L)

Case	Closure			
Parameter	Arsenic			
		_		
	concentration of surface water into PM-12	C_s12 =	0.00075	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00075	(mg/L)
ρι	concentration in Babbitt WWTP discharge	C_sBab =	0.00075	(mg/L)
ratio	concentration in Area 5 Pit NW discharge	C_spit =	0.001325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.027915158	(mg/L)
50	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
Con	concentration in tailings basin cell 2W	C_s2w =	0.00291	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.00273	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.00273	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.27	(mg/s)	3	(mg/s)
c	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
concentration flux	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.31	(mg/s)	15	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s
la con	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒ္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
ss balance each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.34	(mg/s)	3.11	(mg/s)
Mass at eac		M_r13 =	1.91 Low Flo	(mg/s)	3.55 Average	(mg/s)	19.93 High Fl	
ي د			LOW 110		Average	liow	riigirii	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.001	(mg/L)	0.001	(mg/L
Conve flux to	concentration in river at PM-13	C r13 =	0.007	(mg/L)	0.001	(mg/L)	0.001	(ma/L

Case	Closure			
Parameter	Boron			
		-		
	concentration of surface water into PM-12	C_s12 =	0.027	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.027	(mg/L)
рu	concentration in Babbitt WWTP discharge	C_sBab =	0.027	(mg/L)
ratio	concentration in Area 5 Pit NW discharge	C_spit =	0.1315	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.150573845	(mg/L)
loe l	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.11	(mg/L)
Son	concentration in tailings basin cell 2W	C_s2w =	0.33	(mg/L)
but	concentration of ground water into PM-12	C_g12 =	0.0212	(mg/L)
宣	concentration of ground water into PM-13	C_g13 =	0.0212	(mg/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	9.64	(mg/s)	109	(mg/s
concentration flux	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)	0.52	(mg/s)	0.52	(mg/s
	mass flux in Babbitt WWTP discharge	M_sBab =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	47.02	(mg/s)	537	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	2.53	(mg/s)	2.53	(mg/s)	2.53	(mg/s
o X	mass flux of Area 5 Pit NW discharge	M_spit =	0.97	(mg/s)	7.41	(mg/s)	7.41	(mg/s
		M_fs =	7.38	(mg/s)	7.38	(mg/s)	7.38	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	15.61	(mg/s)	15.61	(mg/s)	15.61	(mg/s
			Low Flo	w	Average	Flow	High Fl	low
iss balance each node	mass flux in river at PM-12	M_r12 =	0.77	(mg/s)	10.40	(mg/s)	110.16	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	679.88 High Fl	
mass	concentration in river at PM-12	C r12 =	0.023	(mg/L)	Average 0.027	(mg/L)	0.027	
Convert mass flux to concentration	concentration in river at PM-13	C r13 =		(mg/L)		(mg/L)	0.027	

Case Parameter	Closure Barium			
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0044	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.95E-02	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	5.00E-03	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.09298	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0681	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.0681	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
on	mass flux of ground water into PM-12	M_g12 =	1.66	(mg/s)	1.66	(mg/s)	1.66	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	8.11	(mg/s)	8.11	(mg/s)	8.11	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.25	(mg/s)	0.25	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.95	(mg/s)	0.95	(mg/s)	0.95	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္မွ င	mass flux in seepage from cell 2W	M_s2w =	4.40	(mg/s)	4.40	(mg/s)	4.40	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	1.81	(mg/s)	7.52	(mg/s)	66.63	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	15.30 Low Flo	(mg/s)	49.09 Average	(mg/s)	398.45 High Fl	
ass			LOW 1 10		Average	liow	Tilgirri	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.054	(mg/L)	0.019	(mg/L)	0.016	(mg/
Conve flux to concer	concentration in river at PM-13	C r13 =	0.060	(ma/L)	0.020	(mg/L)	0.016	(ma/

Case Parameter	Closure Beryllium			
		•		
	concentration of surface water into PM-12	C_s12 =	0.0001	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0001	(mg/L)
ğ	concentration in Babbitt WWTP discharge	C_sBab =	0.0001	(mg/L)
ratior	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001323498	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C rrs =	0	(mg/L)
l e	concentration in tailings basin cell 2W	C_s2w =	0.00075	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.000023	(mg/L)
르	concentration of ground water into PM-13	C_g13 =	0.000023	(mg/L)

(1) (1) (1) (2) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1	
urface water into PM-12 M_s12 = - (mg/s) 0.04 (mg/s)	0 (mg/s
round water into PM-12 M_g12 = 0.00 (mg/s) 0.00 (mg/s)	0.00 (mg/s
abbitt WWTP discharge M_sBab = 0.00 (mg/s) 0.00 (mg/s)	0.00 (mg/s
urface water into PM-13	2 (mg/s
round water into PM-13 M_g13 = 0.00 (mg/s) 0.00 (mg/s)	0.00 (mg/s
rea 5 Pit NW discharge	0.01 (mg/s
pepage from Tailings Basin Cells 1E and 2E M_fs = 0.06 (mg/s) 0.06 (mg/s)	0.06 (mg/s
/drometallurgical residue cells liner leakage M_rrs = - (mg/s) - (mg/s)	- (mg/s
pepage from cell 2W M_s2w = 0.04 (mg/s) 0.04 (mg/s)	0.04 (mg/s
Low Flow Average Flow	High Flow
ver at PM-12	0.41 (mg/s
ver at PM-13	2.50 (mg/s
in river at PM-12	0.00

Case Parameter	Closure Calcium			
	concentration of surface water into PM-12	C_s12 =	15	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	15	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	15	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	95.35	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	68.73996034	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	416	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	59.78	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	19	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	19	(mg/L)

			Low Flo	w	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5,352.95	(mg/s)	60,771	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	462.42	(mg/s)	462.42	(mg/s)	462.42	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	140.09	(mg/s)	140.09	(mg/s)	140.09	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	26,119.49	(mg/s)	298,224	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	2,263.72	(mg/s)	2,263.72	(mg/s)	2,263.72	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	701.59	(mg/s)	5,369.83	(mg/s)	5,369.83	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	3,367.90	(mg/s)	3,367.90	(mg/s)	3,367.90	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	19.51	(mg/s)	19.51	(mg/s)	19.51	(mg/s)
ဒ္ ပိ	mass flux in seepage from cell 2W	M_s2w =	2,826.97	(mg/s)	2,826.97	(mg/s)	2.80	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	602.51	(mg/s)	5,955.45	(mg/s)	61,373.93	(mg/s)
Mass at eac		M_r13 =	9,782.19 Low Flo		45,922.86 Average		370,621.67 High Fl	_
ss u			200 110		Avoiago	1011	- Ingiri	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	17.891	(mg/L)	15.249	(mg/l)	15.024	(mg/l)
Conve flux to	concentration in river at PM-13	C r13 =	38.136	(mg/L)	19.106	(mg/l)	15.291	(mg/l)

Case Parameter	Closure Cadmium			
	concentration of surface water into PM-12	C_s12 =	0.00008	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00008	(mg/L)
Ф	concentration in Babbitt WWTP discharge	C_sBab =	0.00008	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001182282	(mg/L)
95	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0004	(mg/L)
Son	concentration in tailings basin cell 2W	C_s2w =	0.000188	(mg/L)
ţ	concentration of ground water into PM-12	C_g12 =	0.0003	(mg/L)
ndu	concentration of ground water into PM-13	C_g13 =	0.0003	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.03	(mg/s)	0	(mg/s)
ation	mass flux of ground water into PM-12	M_g12 =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.14	(mg/s)	2	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s
ž čo Ę	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.01	(mg/s)	0.04	(mg/s)	0.33	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	0.11 Low Flo	(mg/s)	0.28	(mg/s)	2.03 High Fl	(mg/s
ass			LOW 1 10	"	Average	liow	Tilgirri	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/
$\overline{O} \cong \overline{O}$	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	/ma/

Case Parameter	Closure Chloride			
		_		
	concentration of surface water into PM-12	C_s12 =	6.5	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	6.5	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	6.5	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	5.95	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	3.97E+00	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.76E+03	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	21.54	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	1.8	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	1.8	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,319.61	(mg/s)	26,334	(mg/s
ation	mass flux of ground water into PM-12	M_g12 =	43.81	(mg/s)	43.81	(mg/s)	43.81	(mg/s
	mass flux in Babbitt WWTP discharge	M_sBab =	60.70	(mg/s)	60.70	(mg/s)	60.70	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	11,318.44	(mg/s)	129,230	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	214.46	(mg/s)	214.46	(mg/s)	214.46	(mg/s
ž čo Įį	mass flux of Area 5 Pit NW discharge	M_spit =	43.78	(mg/s)	335.09	(mg/s)	335.09	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	194.68	(mg/s)	194.68	(mg/s)	194.68	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	82.56	(mg/s)	82.56	(mg/s)	82.56	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	1,018.62	(mg/s)	1,018.62	(mg/s)	1,018.62	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	104.51	(mg/s)	2,424.12	(mg/s)	26,438.79	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	1,658.61 Low Flo		15,587.96 Average		157,514.59 High Fl	
σ c			2011 110		Average		- Ingiri	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	3.103	(mg/L)	6.207	(mg/L)	6.472	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	6.466	(mg/L)	6.485	(mg/L)	6.499	(ma/i

Case	Closure			
Parameter	Cobalt	l		
	concentration of surface water into PM-12	C_s12 =	0.0006	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0006	(mg/L)
ρι	concentration in Babbitt WWTP discharge	C_sBab =	0.0006	(mg/L)
ratio	concentration in Area 5 Pit NW discharge	C_spit =	0.000555	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.002707554	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.005	(mg/L)
Son	concentration in tailings basin cell 2W	C_s2w =	0.001556	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.0011	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.0011	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.21	(mg/s)	2	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.04	(mg/s)	12	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.25	(mg/s)	2.46	(mg/s)
Mass at eac		M_r13 =	0.37 Low Flo	(mg/s)	1.66 Average	(mg/s)	14.76 High Fl	
ss uo			LOW FIO	w	Average	FIOW	High Fi	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/
Conve flux to	concentration in river at PM-13	C r13 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/L

Case Parameter	Closure Copper			
	- Coppe			
	concentration of surface water into PM-12	C_s12 =	0.0015	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0015	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.0015	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00345	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.014116893	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0015	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.004555	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.004	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.004	(mg/L)

			Low Flo	w	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.54	(mg/s)	6	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.61	(mg/s)	30	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.48	(mg/s)	0.48	(mg/s)	0.48	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.19	(mg/s)	0.19	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.69	(mg/s)	0.69	(mg/s)	0.69	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္မွ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.22	(mg/s)	0.22	(mg/s)	0.22	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	0.11	(mg/s)	0.65	(mg/s)	6.19	(mg/s)
Mass at eac		M_r13 =	1.52 Low Flo	(mg/s)	4.84 Average	(mg/s)	37.59 High Fl	
% <u>=</u>			LOW 1 10	vv	Average	liow	riigii i i	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.003	(mg/L)	0.002	(mg/L)	0.002	(mg/L
Conve flux to	concentration in river at PM-13	C r13 =	0.006	(mg/L)	0.002	(mg/L)	0.002	(ma/L

Case	Closure			
Parameter	Fluoride			
	concentration of surface water into PM-12	C_s12 =	0.2	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.2	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.2	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.125	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.14E+00	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	2.85E+00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	1.55	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.385	(mg/L)
ם	concentration of ground water into PM-13	C_g13 =	0.385	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	71.37	(mg/s)	810	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	9.37	(mg/s)	9.37	(mg/s)	9.37	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	1.87	(mg/s)	1.87	(mg/s)	1.87	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	348.26	(mg/s)	3,976	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	45.87	(mg/s)	45.87	(mg/s)	45.87	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.92	(mg/s)	7.04	(mg/s)	7.04	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	55.70	(mg/s)	55.70	(mg/s)	55.70	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s)
ဒ္ ဒ	mass flux in seepage from cell 2W	M_s2w =	73.30	(mg/s)	73.30	(mg/s)	73.30	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	11.24	(mg/s)	82.61	(mg/s)	821.52	(mg/s)
	mass flux in river at PM-13	M_r13 =	187.16		612.92	(mg/s)	4,979.89	
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	0.334	(mg/L)	0.212	(mg/L)	0.201	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.730	(mg/L)	0.255	(mg/L)	0.205	(ma/L)

Case	Closure			
Parameter	Iron			
		ı		
	concentration of surface water into PM-12	C_s12 =	2.9	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	2.9	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	2.9	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.037761905	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	9.94E-02	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	4.00E-01	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	4.594	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.035	(mg/L)
<u>=</u>	concentration of ground water into PM-13	C_g13 =	0.035	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,034.90	(mg/s)	11,749	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.85	(mg/s)	0.85	(mg/s)	0.85	(mg/s
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	27.08	(mg/s)	27.08	(mg/s)	27.08	(mg/s
tra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	5,049.77	(mg/s)	57,657	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	4.17	(mg/s)	4.17	(mg/s)	4.17	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.28	(mg/s)	2.13	(mg/s)	2.13	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	4.87	(mg/s)	4.87	(mg/s)	4.87	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.02	(mg/s)	0.02	(mg/s)	0.02	(mg/s
ဒ္ ဒ	mass flux in seepage from cell 2W	M_s2w =	217.25	(mg/s)	217.25	(mg/s)	217.25	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
ba I L	mass flux in river at PM-12	M_r12 =	27.93	(mg/s)	1,062.84	(mg/s)	11,777.08	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	254.52		6,341.04		69,662.15	
			Low Flo		Average	Flow	High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.829	(mg/L)	2.721	(mg/L)	2.883	(mg
ું ≓ું ઇ	concentration in river at PM-13	C r13 =	0.992	(ma/L)	2 638	(mg/L)	2.874	(ma

Case Parameter	Closure Hardness			
		1	ı	ı
	concentration of surface water into PM-12	C_s12 =	70	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	70	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	70	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	942.7142857	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	402	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	8610	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	436.6	(mg/L)
_	concentration of ground water into PM-12	C_g12 =	87.5	(mg/L)
In put	concentration of ground water into PM-13	C_g13 =	87.5	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	24,980.41	(mg/s)	283,600	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	2,129.58	(mg/s)	2,129.58	(mg/s)	2,129.58	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	653.73	(mg/s)	653.73	(mg/s)	653.73	(mg/s)
<u>t</u> ra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	121,890.93	(mg/s)	1,391,712	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	10,425.01	(mg/s)	10,425.01	(mg/s)	10,425.01	(mg/s)
u X	mass flux of Area 5 Pit NW discharge	M_spit =	6,936.49	(mg/s)	53,090.84	(mg/s)	53,090.84	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	19,699.16	(mg/s)	19,699.16	(mg/s)	19,699.16	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	403.90	(mg/s)	403.90	(mg/s)	403.90	(mg/s)
0 -	mass flux in seepage from cell 2W	M_s2w =	20,646.59	(mg/s)	20,646.59	(mg/s)	20,646.59	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =	2,783.31		27,763.72		286,383.27	
2 00	Illiass liux III livel at Fivi-13	VI_I 13 =	Low Flo		Average		1,762,360.70 High FI	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	82.647 237.397		71.091	(mg/L)	70.104	

Case Parameter	Closure Potassium			
	concentration of surface water into PM-12	C_s12 =	0.60	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.60	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	0.60	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	53.80	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	21.31	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	7.77	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	1.60	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	1.60	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	214.12	(mg/s)	2,431	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	38.94	(mg/s)	38.94	(mg/s)	38.94	(mg/s
ë	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.08	(mg/s)	0.08	(mg/s)	0.08	(mg/s
<u>t</u> raj	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1,044.78	(mg/s)	11,929	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	190.63	(mg/s)	190.63	(mg/s)	190.63	(mg/s
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	5.60	(mg/s)	5.60	(mg/s)	5.60	(mg/s
	mass flux of Area 5 Pit NW discharge	M_spit =	395.86	(mg/s)	3,029.85	(mg/s)	3,029.85	(mg/s
Convert to mass	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,043.93	(mg/s)	1,043.93	(mg/s)	1,043.93	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	367.44	(mg/s)	367.44	(mg/s)	367.44	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	39.03	(mg/s)	253.14	(mg/s)	2,469.88	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	2,042.48 Low Flo		5,935.37 Average		19,036.29 High Fl	
8 E			LOW FIO	W	Average	Flow	High Fi	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	1.159	(mg/L)	0.648	(mg/L)	0.605	(mg/
Conve flux to	concentration in river at PM-13	C r13 =	7.963	(mg/L)	2.469	(mg/L)	0.785	(ma/l

Case Parameter	Closure Magnesium			
	concentration of surface water into PM-12	C_s12 =	5.90	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	5.90	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	5.90	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	55.96	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	213.00	(mg/L)
ouos	concentration in tailings basin cell 2W	C_s2w =	69.97	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	10.65	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	10.65	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,105.49	(mg/s)	23,903	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	259.20	(mg/s)	259.20	(mg/s)	259.20	(mg/s
ë	mass flux in Babbitt WWTP discharge	M_sBab =	55.10	(mg/s)	55.10	(mg/s)	55.10	(mg/s
<u>t</u> raj	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,273.66	(mg/s)	117,301	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	1,268.87	(mg/s)	1,268.87	(mg/s)	1,268.87	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	1,994.02	(mg/s)	15,261.91	(mg/s)	15,261.91	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	2,741.51	(mg/s)	2,741.51	(mg/s)	2,741.51	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	9.99	(mg/s)	9.99	(mg/s)	9.99	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	3,308.85	(mg/s)	3,308.85	(mg/s)	3,308.85	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	314.30	(mg/s)	2,419.79	(mg/s)	24,217.73	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	9,637.53 Low Flo		35,284.58 Average		164,110.28 High Fl	
χ <u>-</u>			LOW 1 10	W	Average	l low	Iligirii	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	9.333	(mg/L)	6.196	(mg/l)	5.928	(mg/
Conve flux to	concentration in river at PM-13	C r13 =	37.572	(ma/L)	14.680	(mg/l)	6.771	(ma/

Case Parameter	Closure Manganese			
	· ·			
	concentration of surface water into PM-12	C_s12 =	0.30	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.30	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.30	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.49	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.14	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	1.18	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.19	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.19	(mg/L)

			Low Flo	w	Average	Flow	High Fl	low
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	107.06	(mg/s)	1,215	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	4.58	(mg/s)	4.58	(mg/s)	4.58	(mg/s
ë	mass flux in Babbitt WWTP discharge	M_sBab =	2.80	(mg/s)	2.80	(mg/s)	2.80	(mg/s
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	522.39	(mg/s)	5,964	(mg/s
Sen	mass flux of ground water into PM-13	M_g13 =	22.40	(mg/s)	22.40	(mg/s)	22.40	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	3.57	(mg/s)	27.31	(mg/s)	27.31	(mg/s
		M_fs =	7.03	(mg/s)	7.03	(mg/s)	7.03	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	55.94	(mg/s)	55.94	(mg/s)	55.94	(mg/s
			Low Flo	w	Average	Flow	High Fl	low
iss balance each node	mass flux in river at PM-12	M_r12 =	7.38	(mg/s)	114.44	(mg/s)	1,222.81	(mg/s
Mass	mass flux in river at PM-13	M_r13 =		(mg/s)	749.51		7,299.97 High F	
	1		Low Flo	w	Average		High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.219	(mg/L)	0.293	(mg/l)	0.299	(mg
<u> </u>	concentration in river at PM-13	C r13 =	0.376	(ma/L)	0.312	(//)	0.301	/

Case Parameter	Closure Sodium			
		•		
	concentration of surface water into PM-12	C_s12 =	6.00	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	6.00	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	6.00	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	119.50	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	26.63	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C rrs =	255.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	44.31	(mg/L)
_	concentration of ground water into PM-12	C_g12 =	4.90	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	4.90	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,141.18	(mg/s)	24,309	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	119.26	(mg/s)	119.26	(mg/s)	119.26	(mg/s
ë	mass flux in Babbitt WWTP discharge	M_sBab =	56.03	(mg/s)	56.03	(mg/s)	56.03	(mg/s
<u>t</u> raj	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,447.79	(mg/s)	119,290	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	583.80	(mg/s)	583.80	(mg/s)	583.80	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	879.28	(mg/s)	6,729.88	(mg/s)	6,729.88	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,304.55	(mg/s)	1,304.55	(mg/s)	1,304.55	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	11.96	(mg/s)	11.96	(mg/s)	11.96	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	2,095.40	(mg/s)	2,095.40	(mg/s)	2,095.40	(mg/s
			Low Flo	W	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	175.29	(mg/s)	2,316.47	(mg/s)	24,483.86	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	5,050.29 Low Flo		23,489.86 Average		154,499.05 High Fl	
σ ⊑			200 110		Average	11011	- Ingili	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	5.205	(mg/L)	5.931	(mg/l)	5.993	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	19.689	(ma/L)	9.773	(mg/l)	6.374	(ma/l

Case Parameter	Closure Nickel			
		-		
	concentration of surface water into PM-12	C_s12 =	0.0012	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0012	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.0012	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0052	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.005498724	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.098	(mg/L)
souce	concentration in tailings basin cell 2W	C_s2w =	0.00688	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.007	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.007	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.43	(mg/s)	5	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
tra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.09	(mg/s)	24	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.83	(mg/s)	0.83	(mg/s)	0.83	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.04	(mg/s)	0.29	(mg/s)	0.29	(mg/s
		M_fs =	0.27	(mg/s)	0.27	(mg/s)	0.27	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.18	(mg/s)	0.61	(mg/s)	5.04	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	30.63 High Fl	
			Low Flo	w	Average	Flow	High F	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.005	(mg/L)		(mg/L)	0.001	

Case	Closure			
Parameter	Lead			
		•		
	concentration of surface water into PM-12	C_s12 =	0.00015	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00015	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	0.00015	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0003	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00095888	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0005	(mg/L)
Son	concentration in tailings basin cell 2W	C_s2w =	0.0012	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.0012	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.0012	(mg/L)

			Low Flor	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.05	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
ţi	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.26	(mg/s)	3	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s)
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.02	(mg/s)	0.02	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
0 -	mass flux in seepage from cell 2W	M_s2w =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 = M_r13 =		(mg/s)		(mg/s)		(mg/s)
	Illiass hux in liver at Fivi-13	VI_1 13 =	Low Flo		Average		High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)		(mg/L)	0.000	

Case Parameter	Closure Antimony			
	concentration of surface water into PM-12	C_s12 =	4.00E-05	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	4.00E-05	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	4.00E-05	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	2.50E-04	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.16E-03	(mg/L)
<u></u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	2.50E-04	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	1.50E-03	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	1.50E-03	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.01	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.04	(mg/s)	0.05	(mg/s)	0.20	(mg/s
ISS	mass flux in river at PM-13	M_r13 =	0.29 Low Flo	(mg/s)	0.38	(mg/s)	1.26 High Fl	(mg/s
ass								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(ma/l

Case Parameter	Closure Selenium			
		•		
	concentration of surface water into PM-12	C_s12 =	0.0003	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0003	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.0003	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0016	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.003346354	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.054	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.00109	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	0.00295	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.00295	(mg/L)

			Low Flo	W	Average	Flow	High FI	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.11	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.52	(mg/s)	6	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.35	(mg/s)	0.35	(mg/s)	0.35	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.16	(mg/s)	0.16	(mg/s)	0.16	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒ္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.18	(mg/s)	1.29	(mg/s)
Mass at eac		M_r13 =	0.66 Low Flo	(mg/s)	1.36 Average	(mg/s)	7.91 High Fl	(mg/s
ss uo			201110		Average			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.000	(mg/L)	0.000	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	0.003	(mg/L)	0.001	(mg/L)	0.000	(ma/L

Case Parameter	Closure Sulfate			
	concentration of surface water into PM-12	C_s12 =	4.00	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	4.00	(mg/L)
Ф	concentration in Babbitt WWTP discharge	C_sBab =	4.00	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	1046.27	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	176.50	(mg/L)
nce.	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	7347.00	(mg/L)
los	concentration in tailings basin cell 2W	C_s2w =	152.40	(mg/L)
nput	concentration of ground water into PM-12	C_g12 =	8.50	(mg/L)
ם	concentration of ground water into PM-13	C_g13 =	8.50	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,427.45	(mg/s)	16,206	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	206.87	(mg/s)	206.87	(mg/s)	206.87	(mg/s)
Ë	mass flux in Babbitt WWTP discharge	M_sBab =	37.36	(mg/s)	37.36	(mg/s)	37.36	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	6,965.20	(mg/s)	79,526	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	1,012.72	(mg/s)	1,012.72	(mg/s)	1,012.72	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	7,698.43	(mg/s)	58,922.60	(mg/s)	58,922.60	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	8,647.39	(mg/s)	8,647.39	(mg/s)	8,647.39	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	344.66	(mg/s)	344.66	(mg/s)	344.66	(mg/s)
ပို ဍ	mass flux in seepage from cell 2W	M_s2w =	7,206.92	(mg/s)	7,206.92	(mg/s)	7,206.92	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	244.23	(mg/s)	1,671.68	(mg/s)	16,449.94	(mg/s)
	mass flux in river at PM-13	M_r13 =	25,154.34	(mg/s)	84,771.16	(mg/s)	172,110.62	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	7.252	(mg/L)	4.280	(mg/l)	4.027	(mg/l)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	98.064		35.268		7.101	

Case Parameter	Closure Thallium			
	concentration of surface water into PM-12	C_s12 =	0.0002	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0002	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0002	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0006	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000106288	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0002	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.0002	(mg/L)
	concentration of ground water into PM-12	C_g12 =	0.000004	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.000004	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
tion	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.35	(mg/s)	4	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.07	(mg/s)	0.81	(mg/s)
	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High FI	ow
mass	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.000		0.000	(mg/L)	0.000	(ma/L)

Case	Closure	1		
Parameter	Zinc			
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
P	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
ratio	concentration in Area 5 Pit NW discharge	C_spit =	0.003	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.012754048	(mg/L)
i e c		C_rrs =	0.01	(mg/L)
	concentration in tailings basin cell 2W	C_s2w =	0.01435	(mg/L)
į	concentration of ground water into PM-12	C_g12 =	0.0115	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.0115	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.28	(mg/s)	0.28	(mg/s)	0.28	(mg/s)
ē	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.02	(mg/s)	0.17	(mg/s)	0.17	(mg/s)
		M_fs =	0.62	(mg/s)	0.62	(mg/s)	0.62	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =	0.68	(mg/s)	0.68	(mg/s)	0.68	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.43	(mg/s)	6.14	(mg/s)	65.25	(mg/s)
	mass flux in river at PM-13	M_r13 =	3.13	(mg/s)	36.84	(mg/s)	386.20	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	0.013	(mg/L)	0.016	(mg/L)	0.016	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =		(mg/L)	0.015	(mg/L)	0.016	(ma/L)

Appendix F.15
Embarrass River
Geotechnical Mitigation
Post-Closure

FLOWS

Case	Post-Closure				
Flows	Low Flow Conditions (no surface runoff)				Node
n River	flow in river at PM-12	Q_r12_L =	1.19	(cfs)	PM-12
Fotal flow in Embarrass F	flow in river at PM-13	Q_r13_L =	8.75	(cfs)	PM-13
Total flow Embarras	flow check	Q_ck_L =	8.75	(cfs)	
	surface water flow into PM-12	Q_s12_L =	0.00	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_L =	0.00	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_L =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_L =	0.26	(cfs)	PM-13
Iţa	seepage from Tailings Basin Cells 1E and 2E	Q_fs_L =	1.73	(cfs)	PM-13
flow data	hydrometallurgical residue cells liner leakage	Q_rrs_L =	0.00	(cfs)	PM-13
flov	seepage from cell 2W	Q_s2w_L =	1.36	(cfs)	PM-13
Input	ground water flow into PM-12	Q_g12_L =	0.86	(cfs)	PM-12
n In	ground water flow into PM-13	Q_g13_L =	4.21	(cfs)	PM-13

Case	Post-Closure				
Flow	Average Flow Conditions (mean annual)				_
n River	flow in river at PM-12	Q_r12_M =	13.80	(cfs)	PM-12
Total flow in Embarrass Ri	flow in river at PM-13	Q_r13_M =	84.62	(cfs)	PM-13
Total	flow check	Q_ck_M =	84.62	(cfs)	
	surface water flow into PM-12	Q_s12_M =	12.61	(cfs)	- PM-12
	surface water flow into PM-13	Q_s13_M =	61.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_M =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_M =	1.99	(cfs)	PM-13
2	seepage from Tailings Basin Cells 1E and 2E	Q_fs_M =	1.73	(cfs)	PM-13
, data	hydrometallurgical residue cells liner leakage	Q_rrs_M =	0.00	(cfs)	PM-13
flow	seepage from cell 2W	Q_s2w_M =	1.36	(cfs)	PM-13
1	ground water flow into PM-12 ground water flow into PM-13	Q_g12_M =	0.86	(cfs)	PM-12
<u> </u>	ground water flow into PM-13	Q_g13_M =	4.21	(cfs)	PM-13

Case	Post-Closure				
Flow	High Flow Conditions (avg. annual 1-day max f	low)			_
n River	flow in river at PM-12	Q_r12_H =	144.35	(cfs)	PM-12
Total flow in Embarrass F	flow in river at PM-13	Q_r13_H =	856.17	(cfs)	PM-13
Tota	flow check	Q_ck_H =	856.17	(cfs)	4
	surface water flow into PM-12	Q_s12_H =	143.16	(cfs)	PM-12
	surface water flow into PM-13	Q_s13_H =	702.53	(cfs)	PM-13
	Babbitt WWTP discharge	Q_sBab_H =	0.33	(cfs)	PM-12
	Area 5 Pit NW discharge	Q_spit_H =	1.99	(cfs)	PM-13
ā	seepage from Tailings Basin Cells 1E and 2E	Q_fs_H =	1.73	(cfs)	PM-13
da da	hydrometallurgical residue cells liner leakage	Q_rrs_H =	0.00	(cfs)	PM-13
flow data	seepage from cell 2W	Q_s2w_H =	1.36	(cfs)	PM-13
Input 1	ground water flow into PM-12	Q_g12_H =	0.86	(cfs)	PM-12
du	ground water flow into PM-13	Q_g13_H =	4.21	(cfs)	PM-13

Case Parameter	Post-Closure Silver			
	concentration of surface water into PM-12	C_s12 =	0.00011	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00011	(mg/L)
р	concentration in Babbitt WWTP discharge	C_sBab =	0.00011	(mg/L)
tion	concentration in Area 5 Pit NW discharge	C_spit =	0.00015	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00124	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.000125	(mg/L)
eouce	concentration in tailings basin cell 2W	C_s2w =	0.000100	(mg/L)
_	concentration of ground water into PM-12	C_g12 =	0.000008	(mg/L)
nput	concentration of ground water into PM-13	C a13 =	0.000008	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
Ö	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.19	(mg/s)	2	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
concentration	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s
		M_fs =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.45	(mg/s
Mass	mass flux in river at PM-13	M_r13 =	0.07 Low Flo	(mg/s)		(mg/s)	2.71 High Fl	
Convert mass flux to	concentration in river at PM-12	C_r12 =		(mg/L)	Average 0.000	(mg/L)	0.000	
Conver	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg

Case Parameter	Post-Closure Aluminum			
		1		
	concentration of surface water into PM-12	C_s12 =	0.12	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.12	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	0.12	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.01325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	6.15E-01	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80E-01	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	1.5788	(mg/L)
į	concentration of ground water into PM-12	C_g12 =	0.025	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	0.025	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	42.82	(mg/s)	486	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.61	(mg/s)	0.61	(mg/s)	0.61	(mg/s)
ë	mass flux in Babbitt WWTP discharge	M_sBab =	1.12	(mg/s)	1.12	(mg/s)	1.12	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	208.96	(mg/s)	2,386	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	2.98	(mg/s)	2.98	(mg/s)	2.98	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.10	(mg/s)	0.75	(mg/s)	0.75	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	30.13	(mg/s)	30.13	(mg/s)	30.13	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	60.72	(mg/s)	60.72	(mg/s)	60.72	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	1.73	(mg/s)	44.55	(mg/s)	487.90	(mg/s)
Mass ba at each		M_r13 =	95.66 Low Flo	(mg/s)	348.09 Average		2,968.28 High Fl	\ \ \ /
			LOW I IO	VV	Average	I IOW	riigii i	OW
t mass tration	concentration in river at PM-12	C_r12 =	0.051	(mg/L)	0.114	(mg/L)	0.119	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.386	(mg/L)	0.145	(mg/L)	0.123	(ma/L)

Case	Post-Closure			
Parameter	Arsenic	i		
		·		
	concentration of surface water into PM-12	C_s12 =	0.00075	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.00075	(mg/L)
ρι	concentration in Babbitt WWTP discharge	C_sBab =	0.00075	(mg/L)
atio	concentration in Area 5 Pit NW discharge	C_spit =	0.001325	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.027915158	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
Con	concentration in tailings basin cell 2W	C_s2w =	0.00291	(mg/L)
t t	concentration of ground water into PM-12	C_g12 =	0.00273	(mg/L)
으	concentration of ground water into PM-13	C_g13 =	0.00273	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.27	(mg/s)	3	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.31	(mg/s)	15	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.33	(mg/s)	0.33	(mg/s)	0.33	(mg/s)
i X	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
င္မွ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.11	(mg/s)	0.11	(mg/s)	0.11	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
ass balance each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.34	(mg/s)	3.11	(mg/s)
Mass at eac		M_r13 =	1.89 Low Flo	(mg/s)	3.53 Average	(mg/s)	19.90 High Fl	(mg/s)
ss uc			LOW FIO	W	Average	Flow	nigii ri	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.001	(mg/L)	0.001	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	0.008	(mg/L)	0.001	(mg/L)	0.001	(ma/L

Case Parameter	Post-Closure Boron			
		1	T	
	concentration of surface water into PM-12	C_s12 =	0.027	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.027	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.027	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.1315	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.150573845	(mg/L)
a)	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.11	(mg/L)
conc	concentration in tailings basin cell 2W	C_s2w =	0.33	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0212	(mg/L)
Ē	concentration of ground water into PM-13	C_g13 =	0.0212	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	9.64	(mg/s)	109	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.52	(mg/s)	0.52	(mg/s)	0.52	(mg/s)
tior	mass flux in Babbitt WWTP discharge	M_sBab =	0.25	(mg/s)	0.25	(mg/s)	0.25	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	47.02	(mg/s)	537	(mg/s)
cen	mass flux of ground water into PM-13	M_g13 =	2.53	(mg/s)	2.53	(mg/s)	2.53	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.97	(mg/s)	7.41	(mg/s)	7.41	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	7.38	(mg/s)	7.38	(mg/s)	7.38	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
Co to		M_s2w =	12.69	(mg/s)	12.69	(mg/s)	12.69	(mg/s)
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	0.77	(mg/s)	10.40	(mg/s)	110.16	(mg/s)
M ta	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	676.97	
			Low Flo	W	Average	Flow	High FI	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.023	(mg/L)	0.027	(mg/L)	0.027	(mg/L)
Con	concentration in river at PM-13	C_r13 =	0.098	(mg/L)	0.037	(mg/L)	0.028	(mg/L)

Case	Post-Closure			
Parameter	Barium			
		-		
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
p u	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0044	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.95E-02	(mg/L)
90	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	5.00E-03	(mg/L)
Con	concentration in tailings basin cell 2W	C_s2w =	0.09298	(mg/L)
t d	concentration of ground water into PM-12	C_g12 =	0.0681	(mg/L)
ဋ	concentration of ground water into PM-13	C q13 =	0.0681	(ma/L)

mass flux in river at PM-12	•			Low Flo	w	Average	Flow	High Fl	ow
mass flux in Babbitt WWTP discharge M_sBab = 0.15 (mg/s) 0.15 (mg/s)		mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.95 (mg/s) 0.95 (mg/s) mass flux in hydrometallurgical residue cells liner leakage M_rrs = 0.00 (mg/s) 0.00 (mg/s) mass flux in seepage from cell 2W M_s2w = 3.58 (mg/s) 3.58 (mg/s) Low Flow Average Flow H mass flux in river at PM-12 M_r12 = 1.81 (mg/s) 7.52 (mg/s)	_	mass flux of ground water into PM-12	M_g12 =	1.66	(mg/s)	1.66	(mg/s)	1.66	(mg/s
mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.95 (mg/s) 0.95 (mg/s)	ıtratior	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s
mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.95 (mg/s) 0.95 (mg/s)		mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s
mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.95 (mg/s) 0.95 (mg/s)	Ceu	mass flux of ground water into PM-13	M_g13 =	8.11	(mg/s)	8.11	(mg/s)	8.11	(mg/s
mass flux in seepage from Tailings Basin Cells 1E and 2E M_fs = 0.95 (mg/s) 0.95 (mg/s)	e S	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.25	(mg/s)	0.25	(mg/s
M_s2w = 3.58 (mg/s) 3.58 (mg/s) Sepage from cell 2W M_s2w = 3.58 (mg/s) Sepage from cell 2W M_s2w		mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.95	(mg/s)	0.95	(mg/s)	0.95	(mg/s
Low Flow Average Flow H		mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
mass flux in river at PM-12	င္မွ င	mass flux in seepage from cell 2W	M_s2w =	3.58	(mg/s)	3.58	(mg/s)	3.58	(mg/s
mass flux in river at PM-12				Low Flo	w	Average	Flow	High Fl	ow
	iss balance each node	mass flux in river at PM-12	M_r12 =	1.81	(mg/s)	7.52	(mg/s)	66.63	(mg/s
mass flux in river at PM-13 M_r13 = 14.48 (mg/s) 48.27 (mg/s) 38	Mass at ea	mass flux in river at PM-13	M_r13 =					397.63	
Low Flow Average Flow H		ı		Low Flo	w	Average	Flow	High F	

Case	Post-Closure			
Parameter	Beryllium			
	concentration of surface water into PM-12	C_s12 =	0.0001	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0001	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0001	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.0001	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.001323498	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0	(mg/L)
Souc	concentration in tailings basin cell 2W	C_s2w =	0.00075	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.000023	(mg/L)
드	concentration of ground water into PM-13	C_g13 =	0.000023	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.04	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.17	(mg/s)	2	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ž čo Ę	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	-	(mg/s)	-	(mg/s)	-	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.04	(mg/s)	0.41	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	0.10 Low Flo	(mg/s)	0.31	(mg/s)	2.50 High Fl	
mass	concentration in river at PM-12	C_r12 =		(mg/L)		(mg/L)	0.000	
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(ma/

Case Parameter	Post-Closure Calcium			
	concentration of surface water into PM-12	C_s12 =	15	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	15	(mg/L)
0	concentration in Babbitt WWTP discharge	C_sBab =	15	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	95.35	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	68.73996034	(mg/L)
8	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	416	(mg/L)
Ö	concentration in tailings basin cell 2W	C_s2w =	59.78	(mg/L)
pout	concentration of ground water into PM-12	C_g12 =	19	(mg/L)
2	concentration of ground water into PM-13	C a13 =	10	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5,352.95	(mg/s)	60,771	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	462.42	(mg/s)	462.42	(mg/s)	462.42	(mg/s
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	140.09	(mg/s)	140.09	(mg/s)	140.09	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	26,119.49	(mg/s)	298,224	(mg/s
Ceu	mass flux of ground water into PM-13	M_g13 =	2,263.72	(mg/s)	2,263.72	(mg/s)	2,263.72	(mg/s
i X	mass flux of Area 5 Pit NW discharge	M_spit =	701.59	(mg/s)	5,369.83	(mg/s)	5,369.83	(mg/s
		M_fs =	3,367.90	(mg/s)	3,367.90	(mg/s)	3,367.90	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	19.51	(mg/s)	19.51	(mg/s)	19.51	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	2,299.27	(mg/s)	2,299.27	(mg/s)	2.80	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	602.51	(mg/s)	5,955.45	(mg/s)	61,373.93	(mg/s
Mass	mass flux in river at PM-13	M_r13 =	9,254.49		45,395.16		370,621.67	
			Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	17.891	(mg/L)	15.249	(mg/l)	15.024	(mg/l
Conve flux to	concentration in river at PM-13	C r13 =	37.364	(mg/L)	18.956	(mg/l)	15.296	(mg/l

0.00008	(mg/L)
0.00008	(mg/L)
= 0.00008	(mg/L)
0.0001	(mg/L)
0.001182282	(mg/L)
0.0004	(mg/L)
0.000188	(mg/L)
0.0003	(mg/L)
0.0003	(mg/L)
	0.0001 0.001182282 0.0004 0.000188 0.0003

•			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.03	(mg/s)	0	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
concentration flux	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.14	(mg/s)	2	(mg/s
	mass flux of ground water into PM-13	M_g13 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s
	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.01	(mg/s)	0.04	(mg/s)	0.33	(mg/s)
Mass ba		M_r13 =	0.11 Low Flo	(mg/s)	0.28	(mg/s)	2.03 High Fl	(mg/s
ss								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/L
Conve flux to	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(ma/l

Case	Post-Closure			
Parameter	Chloride			
		-		
	concentration of surface water into PM-12	C_s12 =	6.5	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	6.5	(mg/L)
р	concentration in Babbitt WWTP discharge	C_sBab =	6.5	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	5.95	(mg/L)
nt ra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	3.97E+00	(mg/L)
Se	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.76E+03	(mg/L)
con	concentration in tailings basin cell 2W	C_s2w =	21.54	(mg/L)
ŧ	concentration of ground water into PM-12	C_g12 =	1.8	(mg/L)
Input	concentration of ground water into PM-13	C g13 =	1.8	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,319.61	(mg/s)	26,334	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	43.81	(mg/s)	43.81	(mg/s)	43.81	(mg/s)
Ęi	mass flux in Babbitt WWTP discharge	M_sBab =	60.70	(mg/s)	60.70	(mg/s)	60.70	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	11,318.44	(mg/s)	129,230	(mg/s)
Cen	mass flux of ground water into PM-13	M_g13 =	214.46	(mg/s)	214.46	(mg/s)	214.46	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	43.78	(mg/s)	335.09	(mg/s)	335.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	194.68	(mg/s)	194.68	(mg/s)	194.68	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	82.56	(mg/s)	82.56	(mg/s)	82.56	(mg/s)
ဒ္ ဒိ	mass flux in seepage from cell 2W	M_s2w =	828.47	(mg/s)	828.47	(mg/s)	828.47	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	104.51	(mg/s)	2,424.12	(mg/s)	26,438.79	(mg/s)
Mass ba at each i		M_r13 =	1,468.46	,	15,397.82		157,324.45	
			Low Flo	w	Average	Flow	High Fl	ow
t mass tration	concentration in river at PM-12	C_r12 =	3.103	(mg/L)	6.207	(mg/L)	6.472	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	5.929	(mg/L)	6.430	(mg/L)	6.493	(ma/L)

Case	Post-Closure			
Parameter	Cobalt			
	concentration of surface water into PM-12	C_s12 =	0.0006	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0006	(mg/L)
٦	concentration in Babbitt WWTP discharge	C_sBab =	0.0006	(mg/L)
ation	concentration in Area 5 Pit NW discharge	C_spit =	0.000555	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.002707554	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.005	(mg/L)
conc	concentration in tailings basin cell 2W	C_s2w =	0.001556	(mg/L)
nbut	concentration of ground water into PM-12	C_g12 =	0.0011	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.0011	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.21	(mg/s)	2	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
Ë	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1.04	(mg/s)	12	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s)
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ဒ္ ဒ	mass flux in seepage from cell 2W	M_s2w =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.25	(mg/s)	2.46	(mg/s)
	mass flux in river at PM-13	M_r13 =		(mg/s)	1.65	(mg/s)		(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
mass	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.001	(mg/L)	0.001	(mg/L)	0.001	(ma/L)

Case	Post-Closure			
Parameter	Copper			
		_		
	concentration of surface water into PM-12	C_s12 =	0.0015	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.0015	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.0015	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.00345	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.014116893	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0015	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.004555	(mg/L)
	concentration of ground water into PM-12	C_g12 =	0.004	(mg/L)
Input	concentration of ground water into PM-13	C q13 =	0.004	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.54	(mg/s)	6	(mg/s
concentration flux	mass flux of ground water into PM-12	M_g12 =	0.10	(mg/s)	0.10	(mg/s)	0.10	(mg/s
	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
tra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.61	(mg/s)	30	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.48	(mg/s)	0.48	(mg/s)	0.48	(mg/s
ž čo Ę	mass flux of Area 5 Pit NW discharge	M_spit =	0.03	(mg/s)	0.19	(mg/s)	0.19	(mg/s
		M_fs =	0.69	(mg/s)	0.69	(mg/s)	0.69	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.11	(mg/s)	0.65	(mg/s)	6.19	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	37.55 High Fl	
		C r12 =	Low Flo		Average		High F	
Convert mass flux to concentration	concentration in river at PM-12 concentration in river at PM-13	C_r12 =		(mg/L)		(mg/L)	0.002	

Case Parameter	Post-Closure Fluoride			
		-	T	
	concentration of surface water into PM-12	C_s12 =	0.2	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.2	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.2	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.125	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.14E+00	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	2.85E+00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	1.55	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.385	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.385	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	71.37	(mg/s)	810	(mg/s)
concentration flux	mass flux of ground water into PM-12	M_g12 =	9.37	(mg/s)	9.37	(mg/s)	9.37	(mg/s)
	mass flux in Babbitt WWTP discharge	M_sBab =	1.87	(mg/s)	1.87	(mg/s)	1.87	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	348.26	(mg/s)	3,976	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	45.87	(mg/s)	45.87	(mg/s)	45.87	(mg/s
la x	mass flux of Area 5 Pit NW discharge	M_spit =	0.92	(mg/s)	7.04	(mg/s)	7.04	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	55.70	(mg/s)	55.70	(mg/s)	55.70	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.13	(mg/s)	0.13	(mg/s)	0.13	(mg/s
ဒိ ဒိ	mass flux in seepage from cell 2W	M_s2w =	59.62	(mg/s)	59.62	(mg/s)	59.62	(mg/s
			Low Flo	W	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =		(mg/s)		(mg/s)	821.52	
at 🖫	mass flux in river at PM-13	M_r13 =	173.48		599.23		4,966.21	_
			Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.334	(mg/L)	0.212	(mg/L)	0.201	(mg/L
Conver flux to concer	concentration in river at PM-13	C r13 =	0.700	(ma/L)	0.250	(mg/L)	0.205	(ma/l

Case Parameter	Post-Closure Iron			
_	concentration of surface water into PM-12	C s12 =	2.0	(mg/L)
ata		C_s12 = C_s13 =		(mg/L)
p u	concentration in Babbitt WWTP discharge	C_sBab =	2.9	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.037761905	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	9.94E-02	(mg/L)
ē	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	4.00E-01	(mg/L)
o	concentration in tailings basin cell 2W	C_s2w =	4.594	(mg/L)
but	concentration of ground water into PM-12	C_g12 =	0.035	(mg/L)
<u> </u>		C g13 =	0.035	(ma/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,034.90	(mg/s)	11,749	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.85	(mg/s)	0.85	(mg/s)	0.85	(mg/s)
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	27.08	(mg/s)	27.08	(mg/s)	27.08	(mg/s)
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	5,049.77	(mg/s)	57,657	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	4.17	(mg/s)	4.17	(mg/s)	4.17	(mg/s
la con	mass flux of Area 5 Pit NW discharge	M_spit =	0.28	(mg/s)	2.13	(mg/s)	2.13	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	4.87	(mg/s)	4.87	(mg/s)	4.87	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.02	(mg/s)	0.02	(mg/s)	0.02	(mg/s
ဒ္ ပိ	mass flux in seepage from cell 2W	M_s2w =	176.69	(mg/s)	176.69	(mg/s)	176.69	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =		(mg/s)	1,062.84		11,777.08	(mg/s
a K	mass flux in river at PM-13	M_r13 =	213.97		6,300.48		69,621.59	
			Low Flo	W	Average	Flow	High Fl	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.829	(mg/L)	2.721	(mg/L)	2.883	(mg/L
Conver flux to concer	concentration in river at PM-13	C r13 =	0.864	(mg/L)	2.631	(mg/L)	2.873	(ma/l

Case	rost-closule			
Parameter	Hardness			
		-		
	concentration of surface water into PM-12	C_s12 =	70	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	70	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	70	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	942.7142857	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	4.02E+02	(mg/L)
95	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	8.61E+03	(mg/L)
LO COL	concentration in tailings basin cell 2W	C_s2w =	436.6	(mg/L)
brt	concentration of ground water into PM-12	C_g12 =	87.5	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	87.5	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	24,980.41	(mg/s)	283,600	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	2,129.58	(mg/s)	2,129.58	(mg/s)	2,129.58	(mg/s)
concentration	mass flux in Babbitt WWTP discharge	M_sBab =	653.73	(mg/s)	653.73	(mg/s)	653.73	(mg/s)
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	121,890.93	(mg/s)	1,391,712	(mg/s)
ceu	mass flux of ground water into PM-13	M_g13 =	10,425.01	(mg/s)	10,425.01	(mg/s)	10,425.01	(mg/s)
COUC	mass flux of Area 5 Pit NW discharge	M_spit =	6,936.49	(mg/s)	53,090.84	(mg/s)	53,090.84	(mg/s)
		M_fs =	19,699.16	(mg/s)	19,699.16	(mg/s)	19,699.16	(mg/s)
Convert	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	403.90	(mg/s)	403.90	(mg/s)	403.90	(mg/s)
ပို ဒု		M_s2w =	16,792.56	(mg/s)	16,792.56	(mg/s)	16,792.56	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance	mass flux in river at PM-12	M_r12 =	2,783.31		27,763.72		286,383.27	
<i>ñ</i> ≤	mass flux in river at PM-13	M_r13 =	57,040.43 Low Flo		250,066.12 Average	,	1,778,506.67 High Fl	
Convert mass flux to	concentration in river at PM-12	C_r12 =	82.647	(mg/L)	71.091	(mg/L)	70.104	(mg/L)
o = 0	concentration in river at PM-13	C r13 =	230.297	I(ma/L)	104.420	(ma/L)	73.402	I(ma/L)

Case	Post-Closure			
Parameter	Potassium			
	T	1		ı
	concentration of surface water into PM-12	C_s12 =	0.60	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.60	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	0.60	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	53.80	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	21.31	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	1.80	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	7.77	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	1.60	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	1.60	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	214.12	(mg/s)	2,431	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	38.94	(mg/s)	38.94	(mg/s)	38.94	(mg/s
ë	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.08	(mg/s)	0.08	(mg/s)	0.08	(mg/s
<u>t</u> raj	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	1,044.78	(mg/s)	11,929	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	190.63	(mg/s)	190.63	(mg/s)	190.63	(mg/s
concentration flux	mass flux in Babbitt WWTP discharge	M_sBab =	5.60	(mg/s)	5.60	(mg/s)	5.60	(mg/s
	mass flux of Area 5 Pit NW discharge	M_spit =	395.86	(mg/s)	3,029.85	(mg/s)	3,029.85	(mg/s
Convert to mass	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,043.93	(mg/s)	1,043.93	(mg/s)	1,043.93	(mg/s
င့် ပိ	mass flux in seepage from cell 2W	M_s2w =	298.85	(mg/s)	298.85		298.85	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	39.03	(mg/s)	253.14	(mg/s)	2,469.88	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	1,973.89		5,866.78		18,967.70	
ass			Low Flo	w	Average	Flow	High Fl	01
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	1.159	(mg/L)	0.648	(mg/L)	0.605	(mg
Conve flux to	concentration in river at PM-13	C r13 =	7.969	(mg/L)	2 450	(mg/L)	0.783	(ma/

Case Parameter	Post-Closure Magnesium			
		1		
	concentration of surface water into PM-12	C_s12 =	5.90	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	5.90	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	5.90	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	271.00	(mg/L)
nt ra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	55.96	(mg/L)
8	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	213.00	(mg/L)
con	concentration in tailings basin cell 2W	C_s2w =	69.97	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	10.65	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	10.65	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,105.49	(mg/s)	23,903	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	259.20	(mg/s)	259.20	(mg/s)	259.20	(mg/s
ë	mass flux in Babbitt WWTP discharge	M_sBab =	55.10	(mg/s)	55.10	(mg/s)	55.10	(mg/s
<u>t</u> raj	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,273.66	(mg/s)	117,301	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	1,268.87	(mg/s)	1,268.87	(mg/s)	1,268.87	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	1,994.02	(mg/s)	15,261.91	(mg/s)	15,261.91	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	2,741.51	(mg/s)	2,741.51	(mg/s)	2,741.51	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	9.99	(mg/s)	9.99	(mg/s)	9.99	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	2,691.19	(mg/s)	2,691.19	(mg/s)	2,691.19	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	314.30	(mg/s)	2,419.79	(mg/s)	24,217.73	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	9,019.88 Low Flo		34,666.93 Average		163,492.63 High Fl	
% <u>=</u>			LOW FIO	W	Average	Flow	riigii Fi	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	9.333	(mg/L)	6.196	(mg/l)	5.928	(mg/
Conve flux to	concentration in river at PM-13	C r13 =	36.417	(ma/L)	14.476	(mg/l)	6.748	(ma/i

Case Parameter	Post-Closure Manganese			
		1	ı	1
	concentration of surface water into PM-12	C_s12 =	0.30	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.30	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.30	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.49	(mg/L)
nt ra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.14	(mg/L)
a)	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.00	(mg/L)
conc	concentration in tailings basin cell 2W	C_s2w =	1.18	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.19	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.19	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	107.06	(mg/s)	1,215	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	4.58	(mg/s)	4.58	(mg/s)	4.58	(mg/s
ë	mass flux in Babbitt WWTP discharge	M_sBab =	2.80	(mg/s)	2.80	(mg/s)	2.80	(mg/s
<u>t</u> raj	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	522.39	(mg/s)	5,964	(mg/s
Cen	mass flux of ground water into PM-13	M_g13 =	22.40	(mg/s)	22.40	(mg/s)	22.40	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	3.57	(mg/s)	27.31	(mg/s)	27.31	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	7.03	(mg/s)	7.03	(mg/s)	7.03	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	45.50	(mg/s)	45.50	(mg/s)	45.50	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	7.38	(mg/s)	114.44	(mg/s)	1,222.81	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	85.88 Low Flo	(mg/s)	739.07 Average		7,289.53 High Fl	
ss			LOW FIO	W	Average	Flow	High Fi	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.219	(mg/L)	0.293	(mg/l)	0.299	(mg/
Conve flux to	concentration in river at PM-13	C r13 =	0.347	(mg/L)	0.309	(mg/l)	0.301	(ma/i

Case Parameter	Post-Closure Sodium			
raiailletei	Soulum			
	concentration of surface water into PM-12	C_s12 =	6.00	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	6.00	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	6.00	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	119.50	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	26.63	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	255.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	44.31	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	4.90	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	4.90	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	2,141.18	(mg/s)	24,309	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	119.26	(mg/s)	119.26	(mg/s)	119.26	(mg/s
Ë	mass flux in Babbitt WWTP discharge	M_sBab =	56.03	(mg/s)	56.03	(mg/s)	56.03	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	10,447.79	(mg/s)	119,290	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	583.80	(mg/s)	583.80	(mg/s)	583.80	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	879.28	(mg/s)	6,729.88	(mg/s)	6,729.88	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	1,304.55	(mg/s)	1,304.55	(mg/s)	1,304.55	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	11.96	(mg/s)	11.96	(mg/s)	11.96	(mg/s
င္မ ပိ	mass flux in seepage from cell 2W	M_s2w =	1,704.26	(mg/s)	1,704.26	(mg/s)	1,704.26	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	175.29	(mg/s)	2,316.47	(mg/s)	24,483.86	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	4,659.15		23,098.72 Average		154,107.91	
	ı		Low Flo		Average		High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	5.205	(mg/L)	5.931	(mg/l)	5.993	(mg

Case Parameter	Post-Closure Nickel			
	concentration of surface water into PM-12	C_s12 =	0.0012	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0012	(mg/L)
7	concentration in Babbitt WWTP discharge	C_sBab =	0.0012	(mg/L)
tion	concentration in Area 5 Pit NW discharge	C_spit =	0.0052	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.005498724	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.098	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.00688	(mg/L)
_	concentration of ground water into PM-12	C_g12 =	0.007	(mg/L)
nput	concentration of ground water into PM-13	C a13 =	0.007	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.43	(mg/s)	5	(mg/s
_	mass flux of ground water into PM-12	M_g12 =	0.17	(mg/s)	0.17	(mg/s)	0.17	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
ıtra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	2.09	(mg/s)	24	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.83	(mg/s)	0.83	(mg/s)	0.83	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.04	(mg/s)	0.29	(mg/s)	0.29	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.27	(mg/s)	0.27	(mg/s)	0.27	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
င္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.26	(mg/s)	0.26	(mg/s)	0.26	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.18	(mg/s)	0.61	(mg/s)	5.04	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =		(mg/s)		(mg/s)	30.57	
		C r12 =	Low Flo	w	Average	Flow	High Fl	
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.005	(mg/L)		(mg/L)	0.001	

Case Parameter	Post-Closure Lead			
	T			
	concentration of surface water into PM-12	C_s12 =	0.00015	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	0.00015	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	0.00015	(mg/L)
tion	concentration in Area 5 Pit NW discharge	C_spit =	0.0003	(mg/L)
ntratic	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.00095888	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0005	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	0.0012	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	0.0012	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	0.0012	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.05	(mg/s)	1	(mg/s)
_	mass flux of ground water into PM-12	M_g12 =	0.03	(mg/s)	0.03	(mg/s)	0.03	(mg/s
Ę	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
itra	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.26	(mg/s)	3	(mg/s
cer	mass flux of ground water into PM-13	M_g13 =	0.14	(mg/s)	0.14	(mg/s)	0.14	(mg/s
concentration flux	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.02	(mg/s)	0.02	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.05	(mg/s)	0.05	(mg/s)	0.05	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.03	(mg/s)	0.08	(mg/s)	0.64	(mg/s
Mass at eac	mass flux in river at PM-13	M_r13 =	0.27 Low Flo	(mg/s)	0.60	(mg/s)	3.87 High Fl	
ass			201110		Avoiago			
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/
Conve flux to	concentration in river at PM-13	C r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(ma/

Case Parameter	Post-Closure Antimony			
	·	4		
	concentration of surface water into PM-12	C_s12 =	4.00E-05	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	4.00E-05	(mg/L)
ਰ	concentration in Babbitt WWTP discharge	C_sBab =	4.00E-05	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	2.50E-04	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	1.16E-03	(mg/L)
	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.004	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	2.50E-04	(mg/L)
Ę	concentration of ground water into PM-12	C_g12 =	1.50E-03	(mg/L)
Input	concentration of ground water into PM-13	C_g13 =	1.50E-03	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.01	(mg/s)	0	(mg/s)
centration	mass flux of ground water into PM-12	M_g12 =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
cer	mass flux of ground water into PM-13	M_g13 =	0.18	(mg/s)	0.18	(mg/s)	0.18	(mg/s)
L CO	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.06	(mg/s)	0.06	(mg/s)	0.06	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
ss balance each node	mass flux in river at PM-12	M_r12 =	0.04	(mg/s)	0.05	(mg/s)	0.20	(mg/s)
Mass at eac	mass flux in river at PM-13	M_r13 =	0.28 Low Flo	(mg/s)	0.38 Average	(mg/s)	1.25 High Fl	(mg/s
ass			Low Flo	w	Average	Flow	High Fi	ow
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(mg/
Conve flux to	concentration in river at PM-13	C r13 =	0.001	(mg/L)	0.000	(mg/L)	0.000	(ma/l

Case	Post-Closure			
Parameter	Selenium			
	concentration of surface water into PM-12	C_s12 =	0.0003	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0003	(mg/L)
ρι	concentration in Babbitt WWTP discharge	C_sBab =	0.0003	(mg/L)
ratio	concentration in Area 5 Pit NW discharge	C_spit =	0.0016	(mg/L)
ıtra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.003346354	(mg/L)
50	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.054	(mg/L)
Con	concentration in tailings basin cell 2W	C_s2w =	0.00109	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.00295	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.00295	(mg/L)

			Low Flo	W	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.11	(mg/s)	1	(mg/s)
ation	mass flux of ground water into PM-12	M_g12 =	0.07	(mg/s)	0.07	(mg/s)	0.07	(mg/s)
	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
it a	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.52	(mg/s)	6	(mg/s)
Ceu	mass flux of ground water into PM-13	M_g13 =	0.35	(mg/s)	0.35	(mg/s)	0.35	(mg/s)
u X	mass flux of Area 5 Pit NW discharge	M_spit =	0.01	(mg/s)	0.09	(mg/s)	0.09	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.16	(mg/s)	0.16	(mg/s)	0.16	(mg/s)
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s)
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.04	(mg/s)	0.04	(mg/s)	0.04	(mg/s)
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node	mass flux in river at PM-12	M_r12 =	0.07	(mg/s)	0.18	(mg/s)	1.29	(mg/s)
Mass ba at each		M_r13 =	0.65 Low Flo	(mg/s)		(mg/s)	-	(mg/s)
			LOW FIO	W	Average	FIOW	High FI	ow
t mass tration	concentration in river at PM-12	C_r12 =	0.002	(mg/L)	0.000	(mg/L)	0.000	(mg/L)
Convert mass flux to concentration	concentration in river at PM-13	C r13 =	0.003	(mg/L)	0.001	(mg/L)	0.000	(ma/L)

Case	Post-Closure			
Parameter	Sulfate			
	concentration of surface water into PM-12	C_s12 =	4.00	(mg/L)
data	concentration of surface water into PM-13	C_s13 =	4.00	(mg/L)
	concentration in Babbitt WWTP discharge	C_sBab =	4.00	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	1046.27	(mg/L)
nt ra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	176.50	(mg/L)
an an	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	7347.00	(mg/L)
conce	concentration in tailings basin cell 2W	C_s2w =	152.40	(mg/L)
Input	concentration of ground water into PM-12	C_g12 =	8.50	(mg/L)
<u> </u>	concentration of ground water into PM-13	C_g13 =	8.50	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	1,427.45	(mg/s)	16,206	(mg/s)
ncentration	mass flux of ground water into PM-12	M_g12 =	206.87	(mg/s)	206.87	(mg/s)	206.87	(mg/s)
	mass flux in Babbitt WWTP discharge	M_sBab =	37.36	(mg/s)	37.36	(mg/s)	37.36	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	6,965.20	(mg/s)	79,526	(mg/s)
Sen	mass flux of ground water into PM-13	M_g13 =	1,012.72	(mg/s)	1,012.72	(mg/s)	1,012.72	(mg/s)
o X	mass flux of Area 5 Pit NW discharge	M_spit =	7,698.43	(mg/s)	58,922.60	(mg/s)	58,922.60	(mg/s)
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	8,647.39	(mg/s)	8,647.39	(mg/s)	8,647.39	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	344.66	(mg/s)	344.66	(mg/s)	344.66	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	5,861.63	(mg/s)	5,861.63	(mg/s)	5,861.63	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
Mass balance at each node		M_r12 =	244.23		1,671.68		16,449.94	
at M	mass flux in river at PM-13	M_r13 =	23,809.05 Low Flo		83,425.87 Average		170,765.33 High Fl	
ø c			LOW 1 10	VV	Average	liow	riigii i	OW
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	7.252	(mg/L)	4.280	(mg/l)	4.027	(mg/l)
Conve flux to	concentration in river at PM-13	C r13 =	96.128	(mg/L)	34.836	(mg/l)	7.048	(ma/l)

Case Parameter	Post-Closure Thallium			
rarameter	manum			
	concentration of surface water into PM-12	C_s12 =	0.0002	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.0002	(mg/L)
ρι	concentration in Babbitt WWTP discharge	C_sBab =	0.0002	(mg/L)
ratio	concentration in Area 5 Pit NW discharge	C_spit =	0.0006	(mg/L)
tr	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.000106288	(mg/L)
9	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.0002	(mg/L)
lo S	concentration in tailings basin cell 2W	C_s2w =	0.0002	(mg/L)
put	concentration of ground water into PM-12	C_g12 =	0.000004	(mg/L)
트	concentration of ground water into PM-13	C_g13 =	0.000004	(mg/L)

			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	0.07	(mg/s)	1	(mg/s)
centration	mass flux of ground water into PM-12	M_g12 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
	mass flux in Babbitt WWTP discharge	M_sBab =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	0.35	(mg/s)	4	(mg/s
ceu	mass flux of ground water into PM-13	M_g13 =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
i X	mass flux of Area 5 Pit NW discharge	M_spit =	0.00	(mg/s)	0.03	(mg/s)	0.03	(mg/s
	mass flux in seepage from Tailings Basin Cells 1E and 2E	M_fs =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
မ္ ပိ	mass flux in seepage from cell 2W	M_s2w =	0.01	(mg/s)	0.01	(mg/s)	0.01	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.00	(mg/s)	0.07	(mg/s)	0.81	(mg/s
iss eac	mass flux in river at PM-13	M_r13 =	0.02 Low Flo	(mg/s)	0.47	(mg/s)	4.84 High Fl	(mg/s
ass								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.000	(mg/L)	0.000	(mg/L)	0.000	(mg/l
S S S	concentration in river at PM-13	C r13 =	0.000	(mg/L)	0.000	(mg/L)	0.000	/ma/l

Case	Post-Closure			
Parameter	Zinc			
	concentration of surface water into PM-12	C_s12 =	0.016	(mg/L)
ata	concentration of surface water into PM-13	C_s13 =	0.016	(mg/L)
Ф	concentration in Babbitt WWTP discharge	C_sBab =	0.016	(mg/L)
ration	concentration in Area 5 Pit NW discharge	C_spit =	0.003	(mg/L)
ntra	concentration in seepage from Tailings Basin Cells 1E and 2E	C_fs =	0.012754048	(mg/L)
<u> </u>	concentration in hydrometallurgical residue cells liner leakage	C_rrs =	0.01	(mg/L)
conc	concentration in tailings basin cell 2W	C_s2w =	0.01435	(mg/L)
nput	concentration of ground water into PM-12	C_g12 =	0.0115	(mg/L)
ü	concentration of ground water into PM-13	C_g13 =	0.0115	(mg/L)

•			Low Flo	w	Average	Flow	High Fl	ow
	mass flux of surface water into PM-12	M_s12 =	-	(mg/s)	5.71	(mg/s)	65	(mg/s)
ncentration x	mass flux of ground water into PM-12	M_g12 =	0.28	(mg/s)	0.28	(mg/s)	0.28	(mg/s)
	mass flux in Babbitt WWTP discharge	M_sBab =	0.15	(mg/s)	0.15	(mg/s)	0.15	(mg/s
	mass flux of surface water into PM-13	M_s13 =	-	(mg/s)	27.86	(mg/s)	318	(mg/s
Ser	mass flux of ground water into PM-13	M_g13 =	1.37	(mg/s)	1.37	(mg/s)	1.37	(mg/s
o X	mass flux of Area 5 Pit NW discharge	M_spit =	0.02	(mg/s)	0.17	(mg/s)	0.17	(mg/s
		M_fs =	0.62	(mg/s)	0.62	(mg/s)	0.62	(mg/s
Convert to mass	mass flux in hydrometallurgical residue cells liner leakage	M_rrs =	0.00	(mg/s)	0.00	(mg/s)	0.00	(mg/s
ပိ ဍ	mass flux in seepage from cell 2W	M_s2w =	0.55	(mg/s)	0.55	(mg/s)	0.55	(mg/s
			Low Flo	w	Average	Flow	High Fl	ow
iss balance each node	mass flux in river at PM-12	M_r12 =	0.43	(mg/s)	6.14	(mg/s)	65.25	(mg/s
Mass	mass flux in river at PM-13	M_r13 =	3.00 Low Flo	(mg/s)	36.72 Average	(mg/s)	386.07 High Fl	
nass								
Convert mass flux to concentration	concentration in river at PM-12	C_r12 =	0.013	(mg/L)		(mg/L)	0.016	

Appendix G

Culpability Analysis of Tailings Basin Features and Embarrass River Watershed Features for Tailings Basin-Proposed Action and Tailings Basin-Geotechnical Mitigation

Tailings Basin-Proposed Action

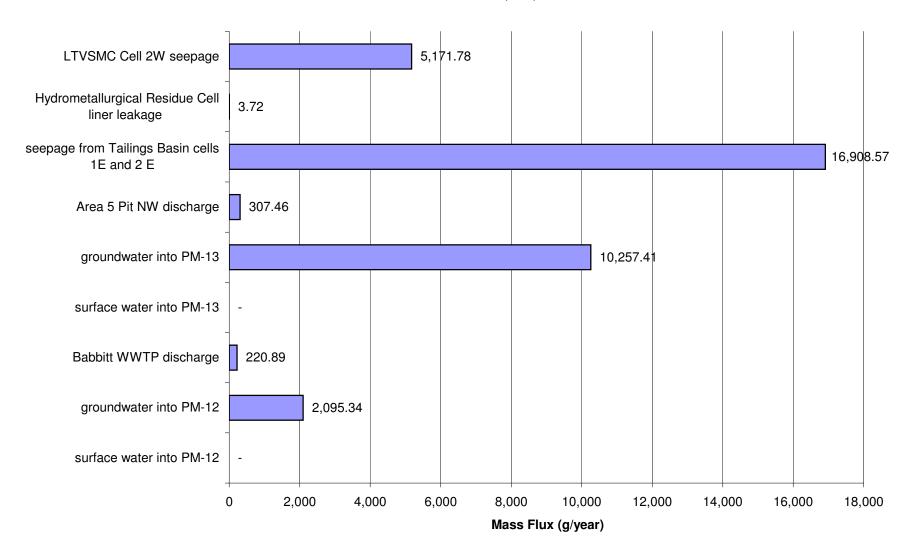
G.2 Embarrass River Watershed

Tailings Basin-Geotechnical Mitigation

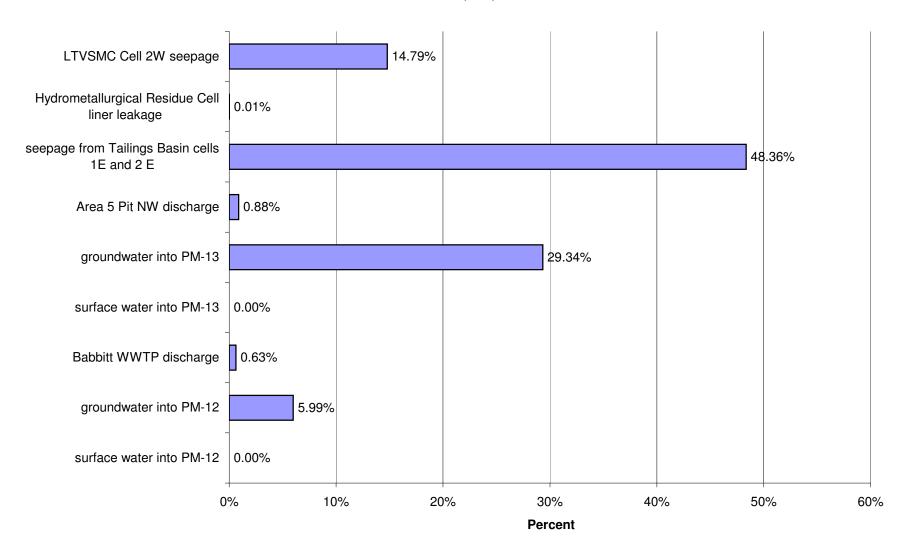
G.4 Embarrass River Watershed

Appendix G.2 Embarrass River Watershed Proposed Action

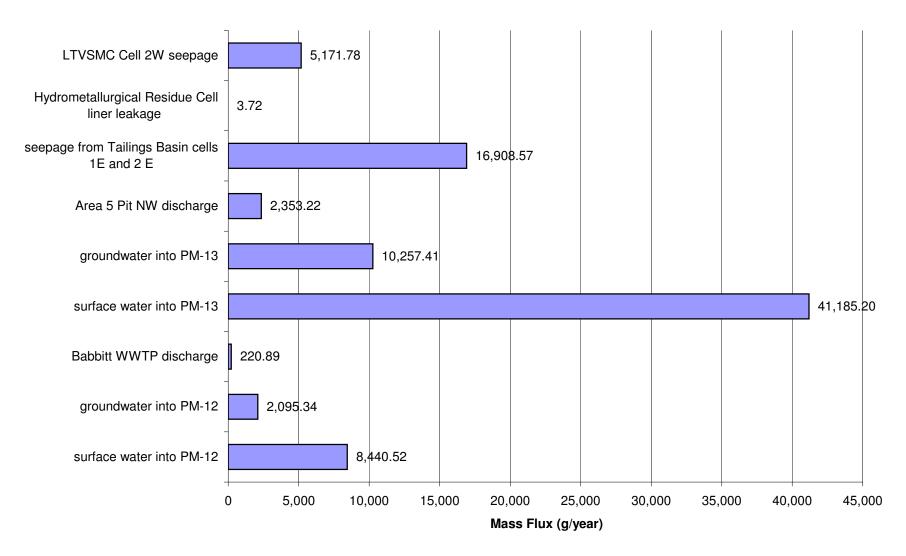
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Low Flow for Arsenic (As)



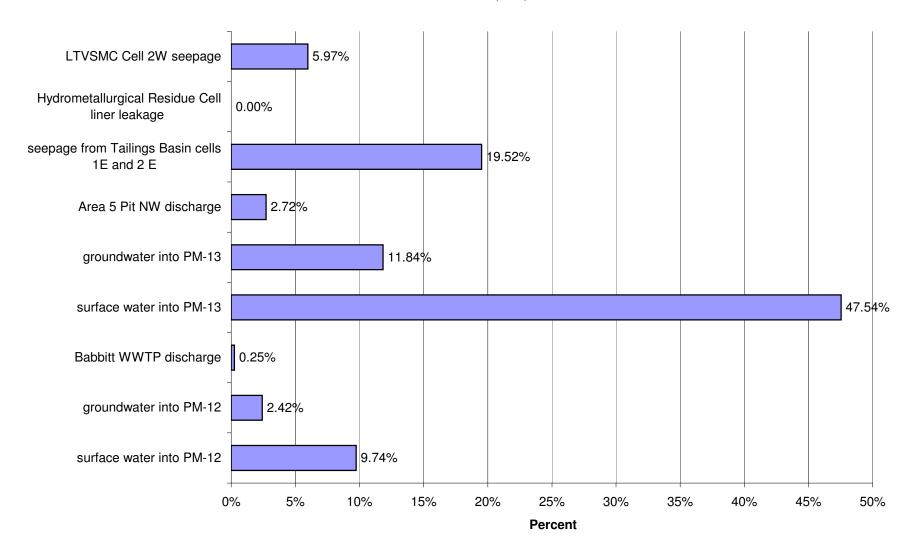
Proposed Action: Percent of Impacts at PM-13 in Year 1 for Low Flow for Arsenic (As)



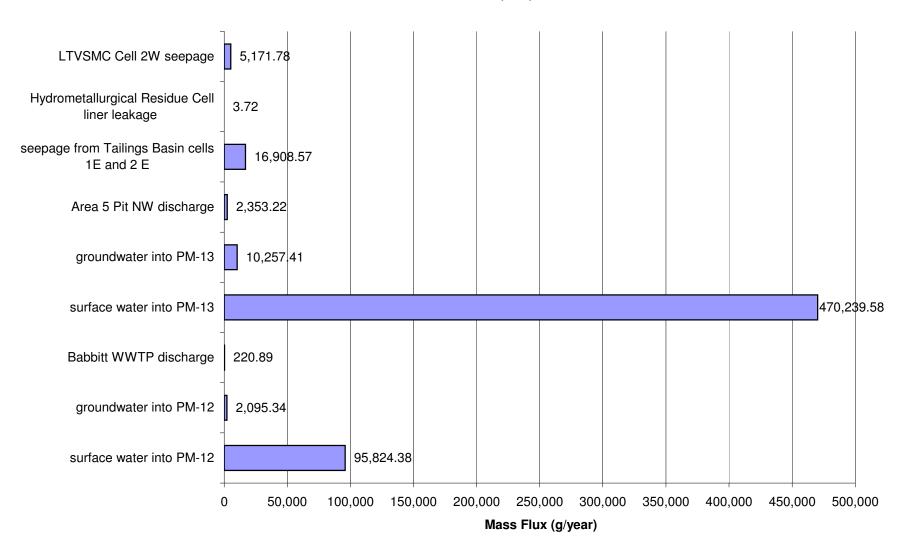
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Average Flow for Arsenic (As)



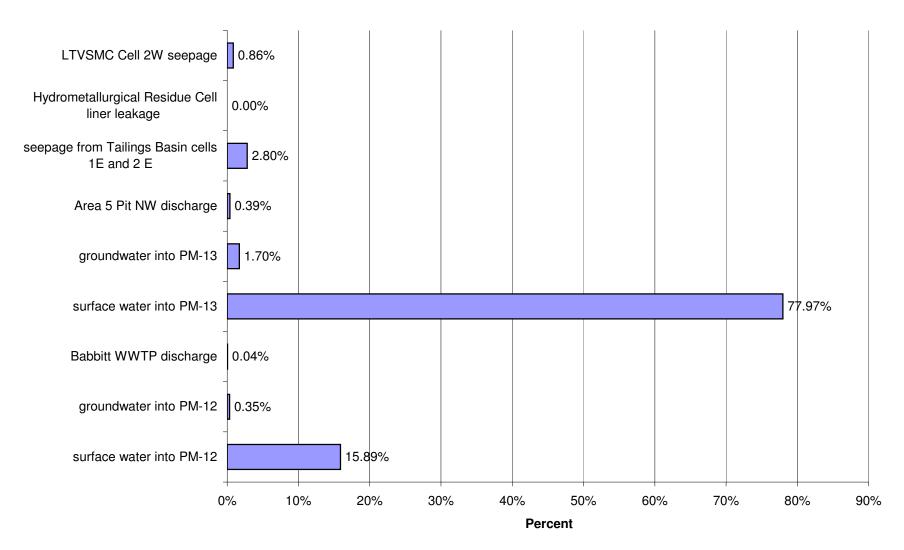
Proposed Action: Percent of Impacts at PM-13 in Year 1 for Average Flow for Arsenic (As)



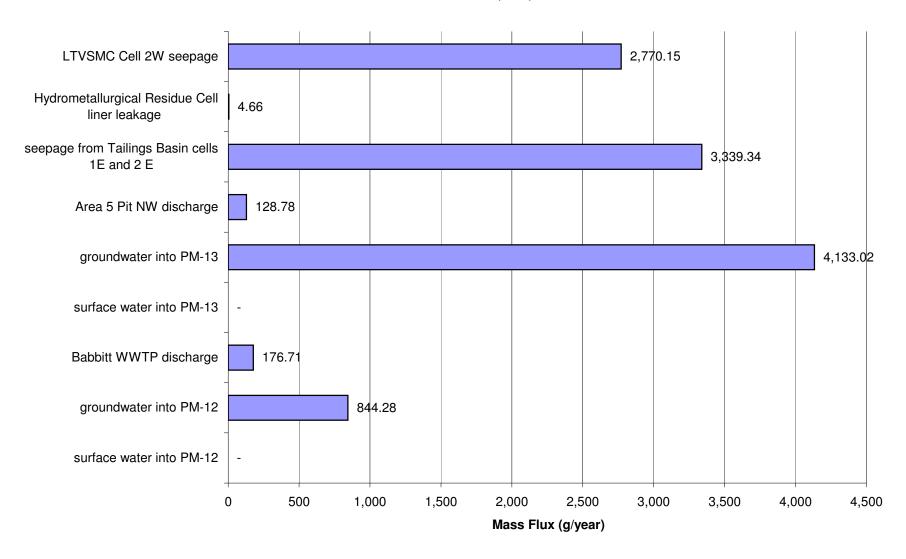
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for High Flow for Arsenic (As)



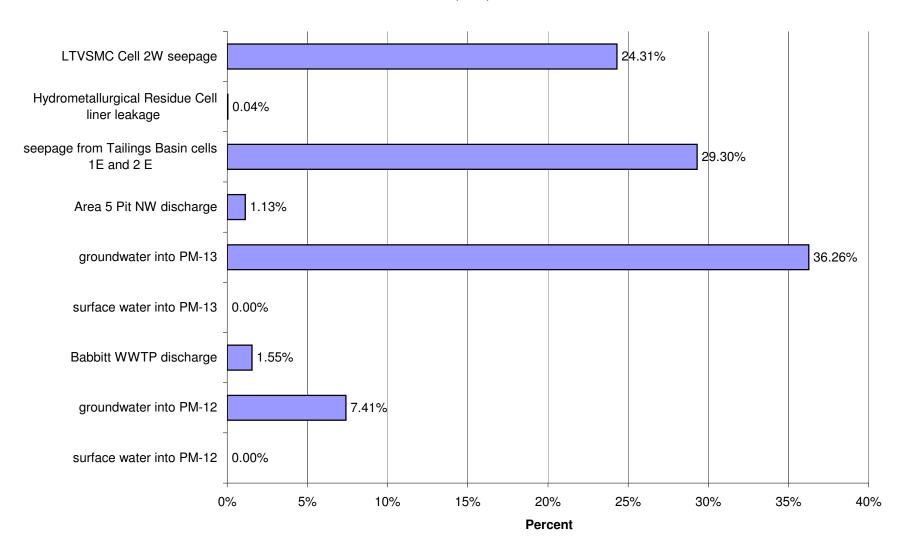
Proposed Action: Percent of Impacts at PM-13 in Year 1 for High Flow for Arsenic (As)



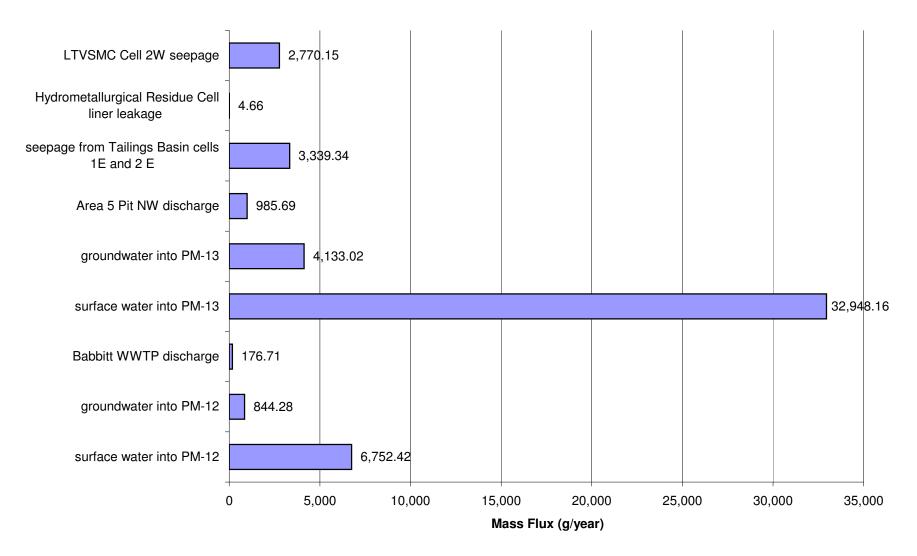
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Low Flow for Cobalt (Co)



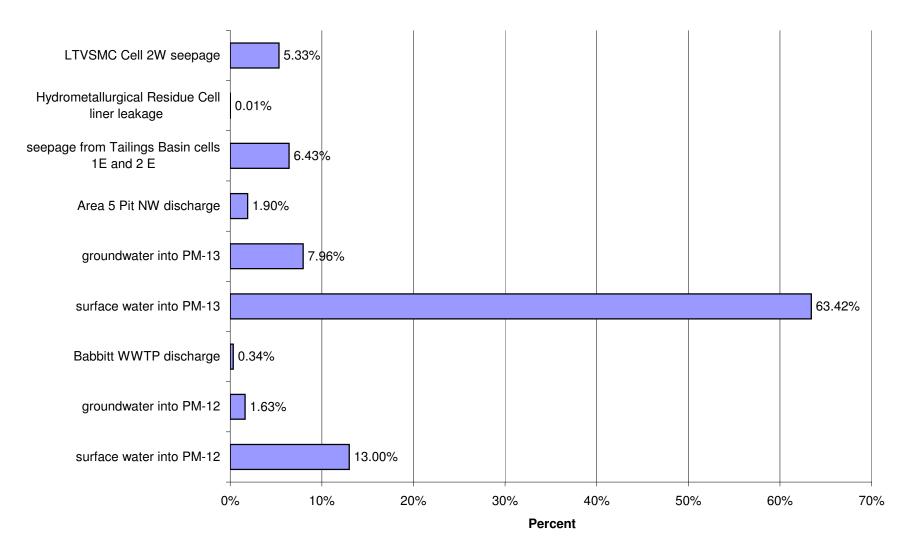
Proposed Action: Percent of Impacts at PM-13 in Year 1 for Low Flow for Cobalt (Co)



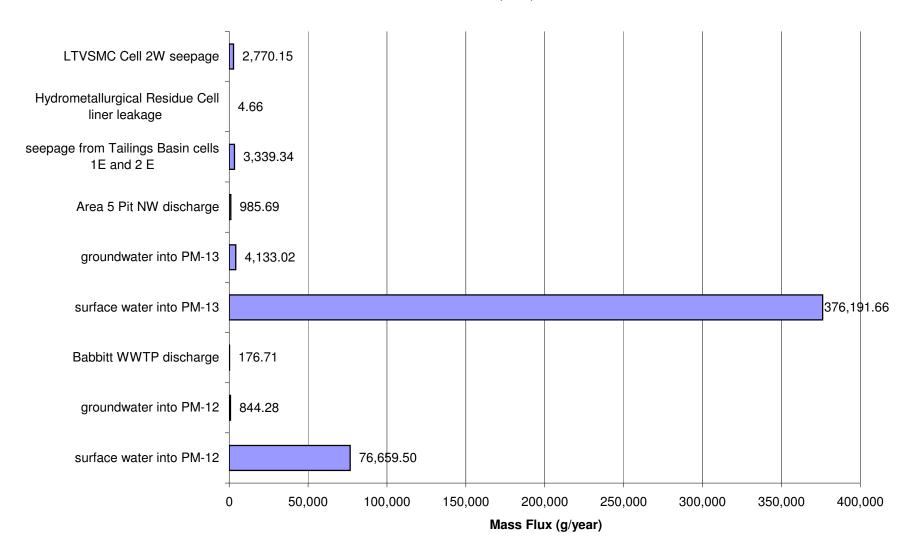
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Average Flow for Cobalt (Co)



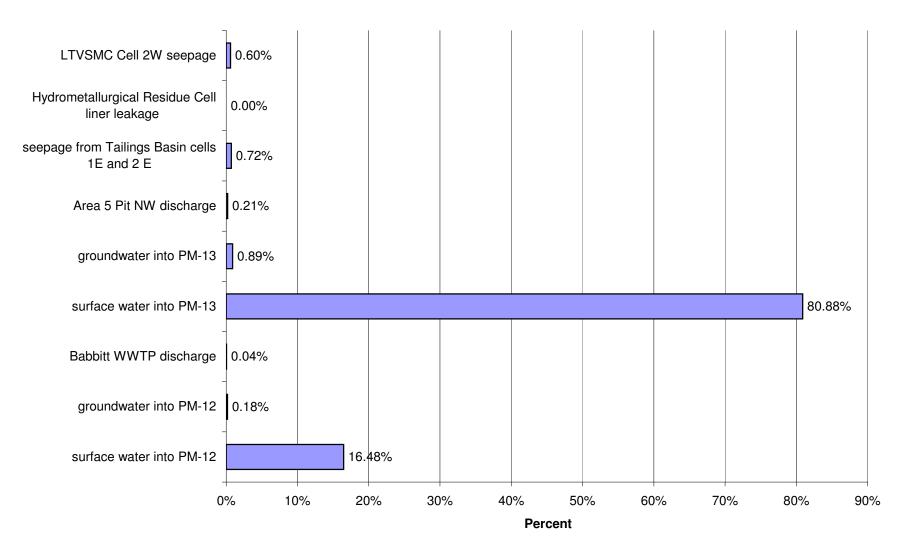
Proposed Action: Percent of Impacts at PM-13 in Year 1 for Average Flow for Cobalt (Co)



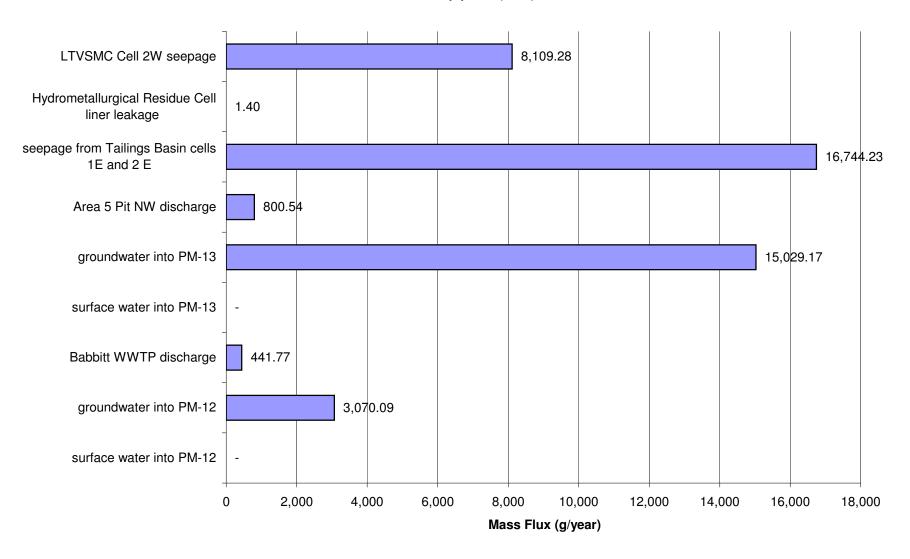
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for High Flow for Cobalt (Co)



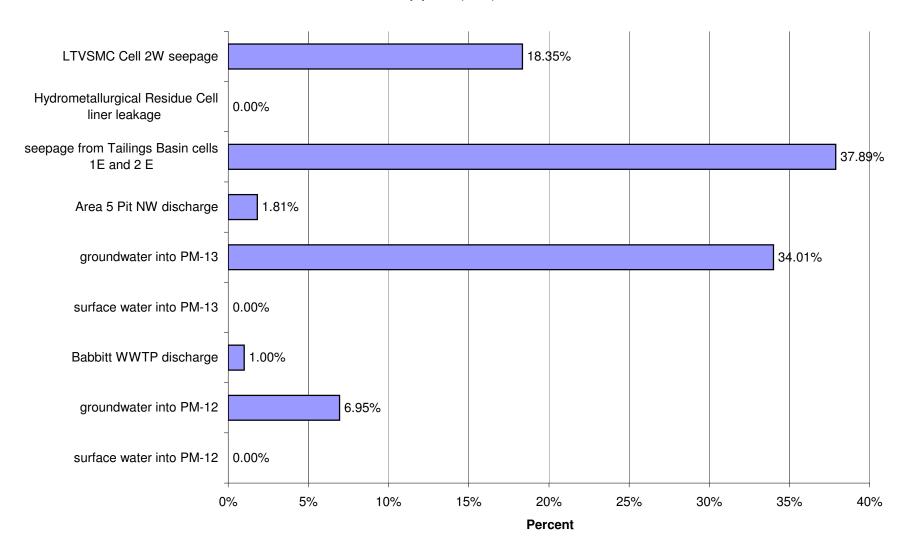
Proposed Action: Percent of Impacts at PM-13 in Year 1 for High Flow for Cobalt (Co)



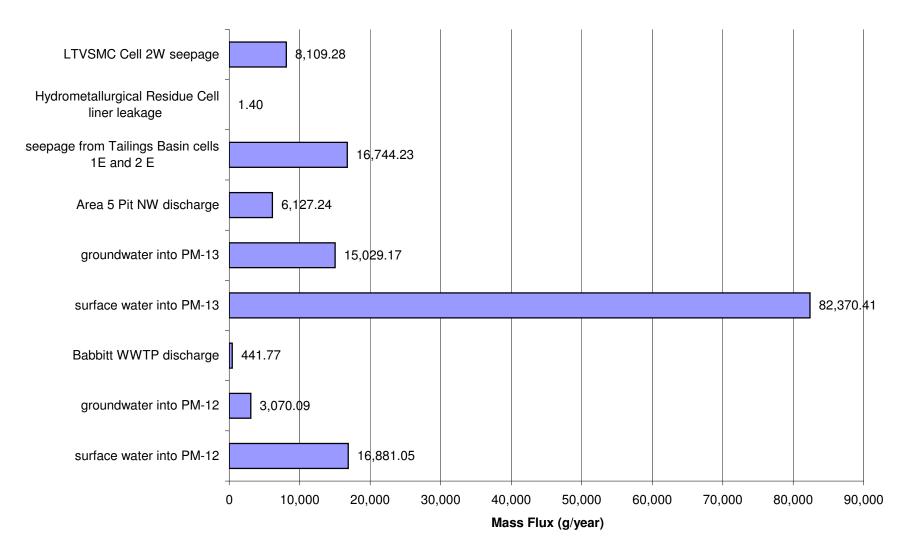
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Low Flow for Copper (Cu)



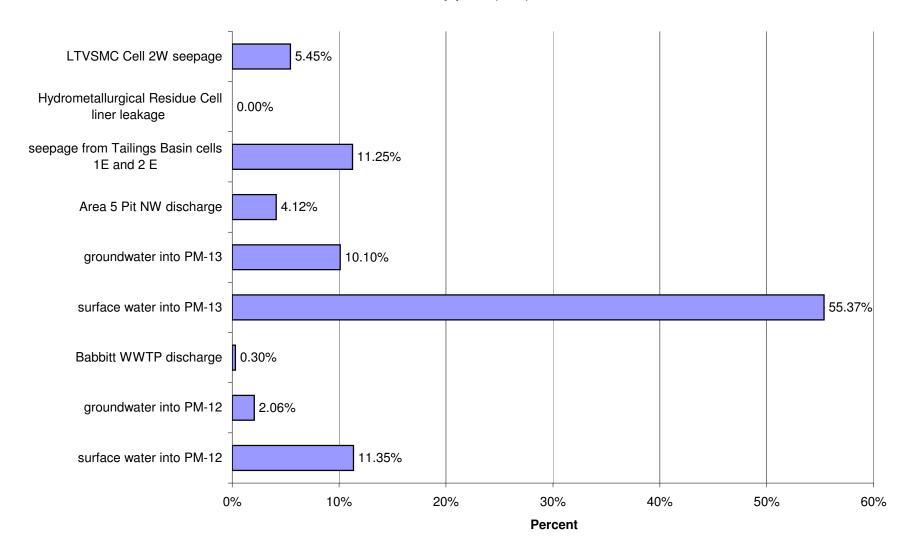
Proposed Action: Percent of Impacts at PM-13 in Year 1 for Low Flow for Copper (Cu)



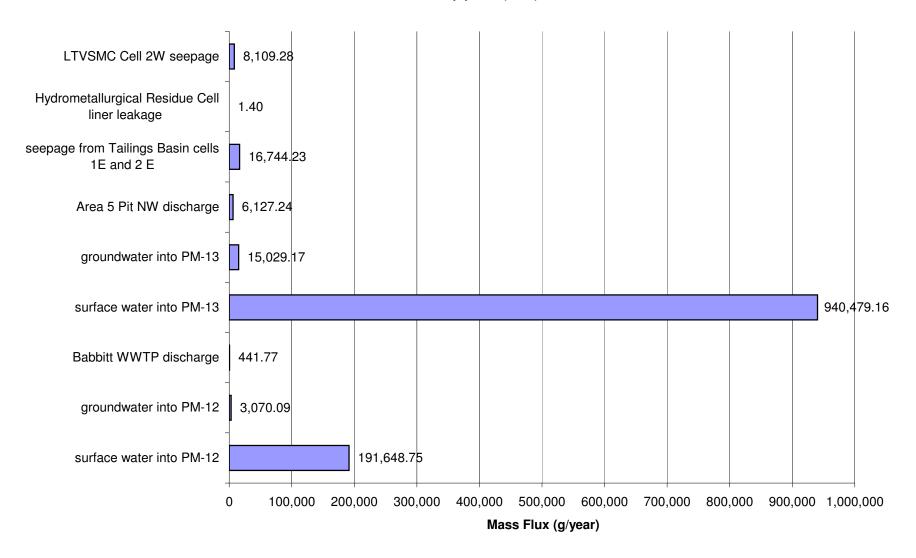
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Average Flow for Copper (Cu)



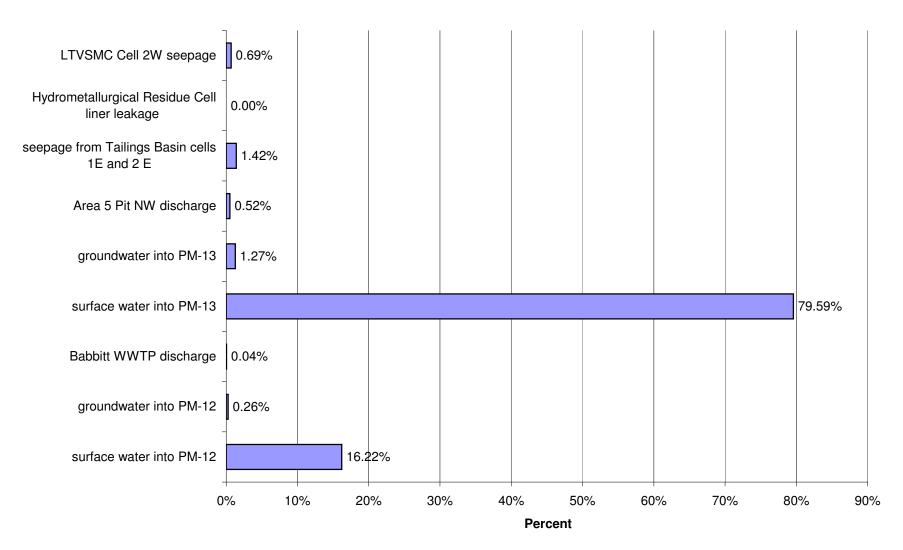
Proposed Action: Percent of Impacts at PM-13 in Year 1 for Average Flow for Copper (Cu)



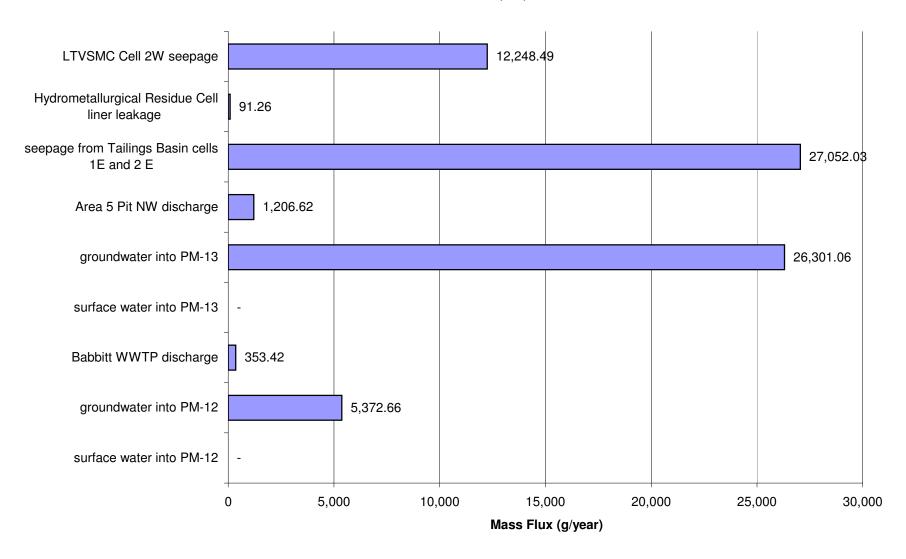
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for High Flow for Copper (Cu)



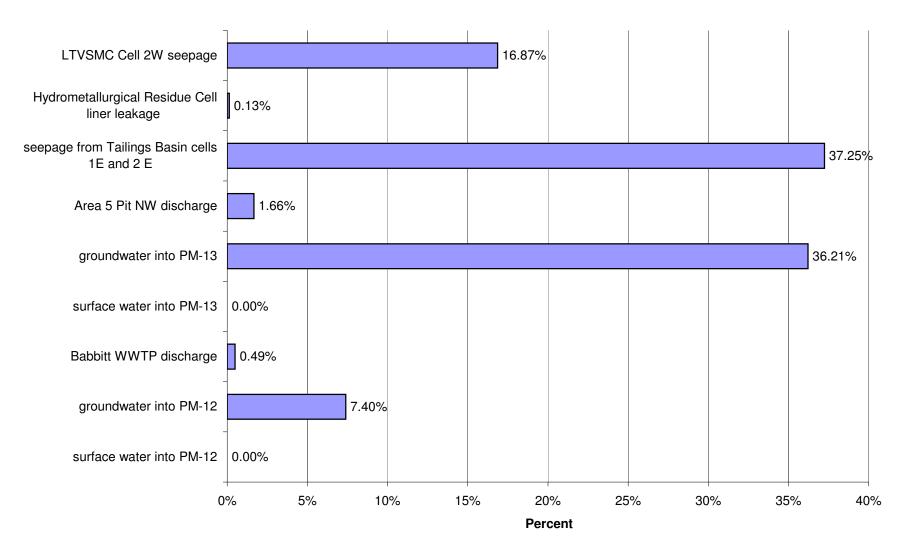
Proposed Action: Percent of Impacts at PM-13 in Year 1 for High Flow for Copper (Cu)



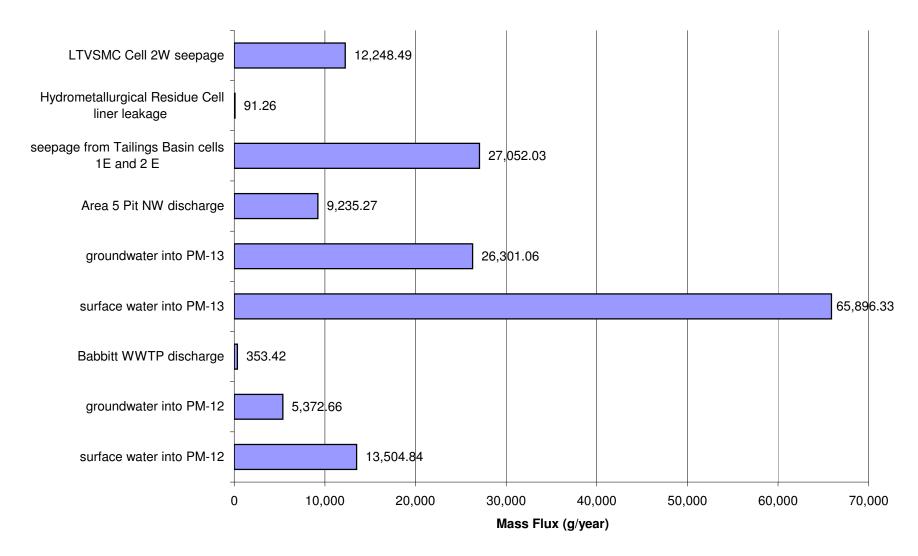
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Low Flow for Nickel (Ni)



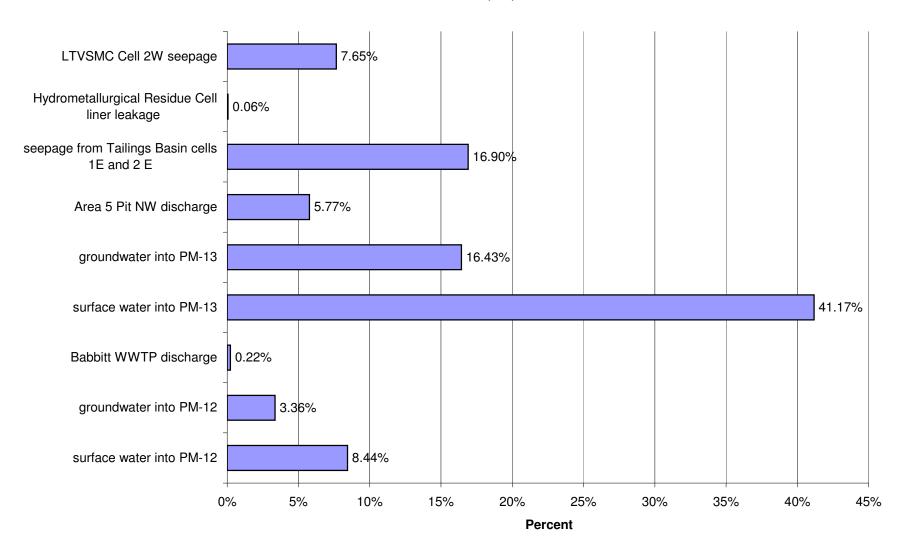
Proposed Action: Percent of Impacts at PM-13 in Year 1 for Low Flow for Nickel (Ni)



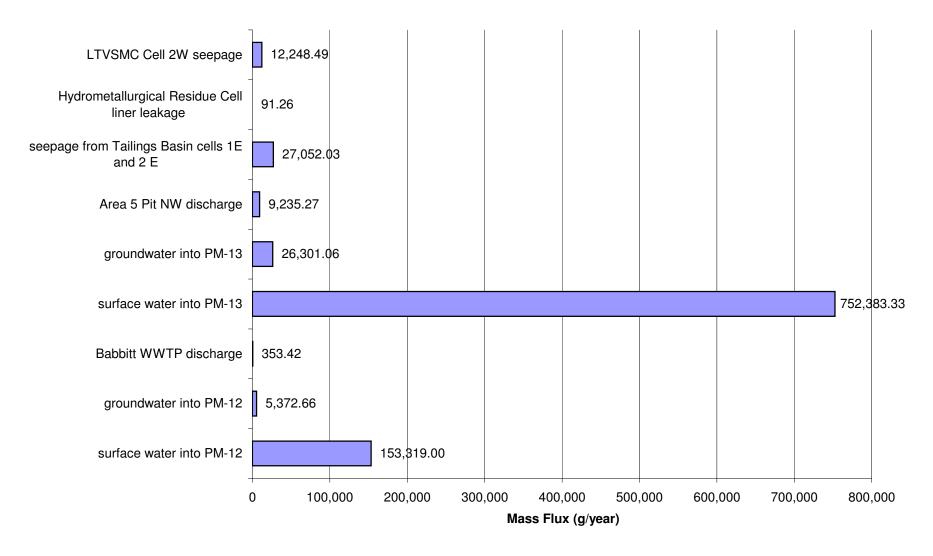
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Average Flow for Nickel (Ni)



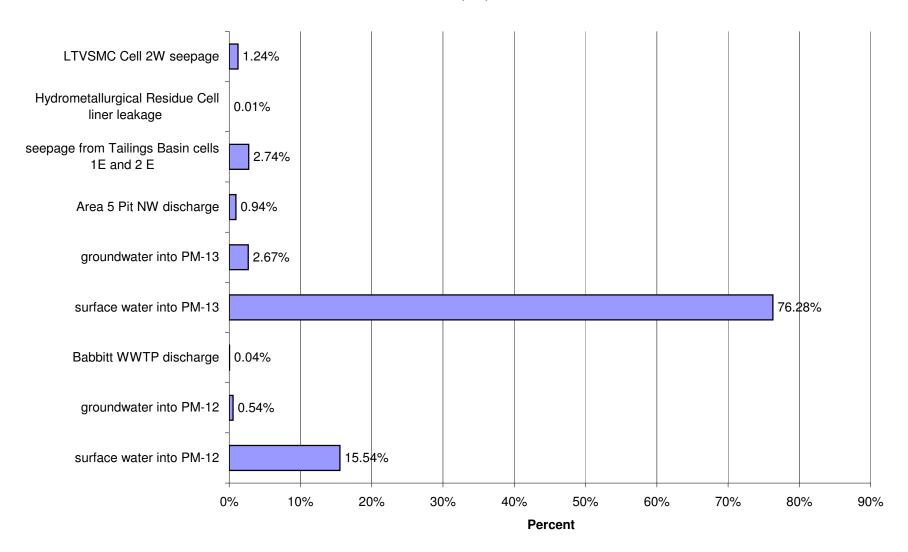
Proposed Action: Percent of Impacts at PM-13 in Year 1 for Average Flow for Nickel (Ni)



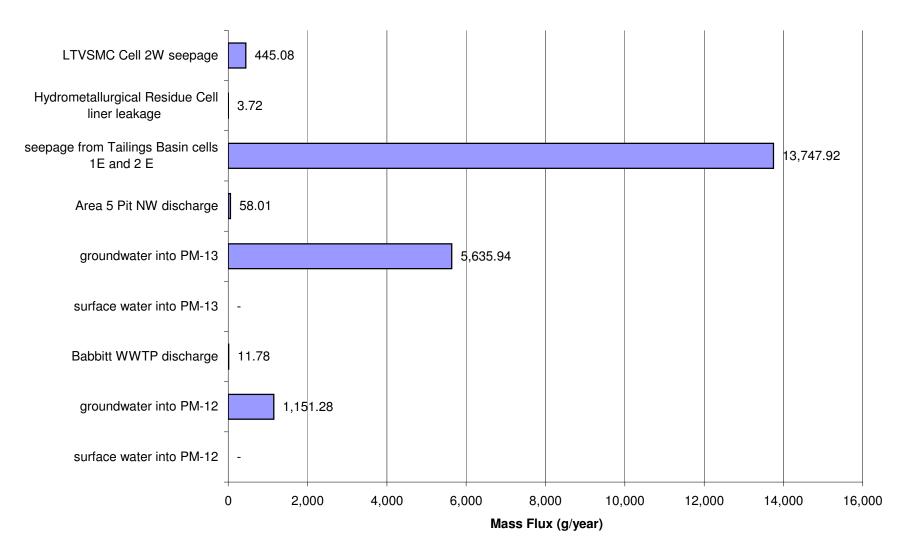
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for High Flow for Nickel (Ni)



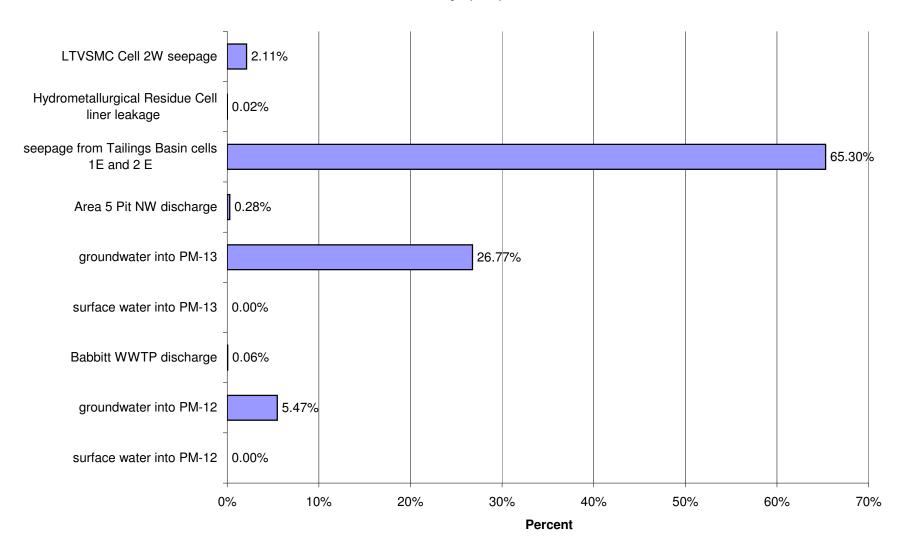
Proposed Action: Percent of Impacts at PM-13 in Year 1 for High Flow for Nickel (Ni)



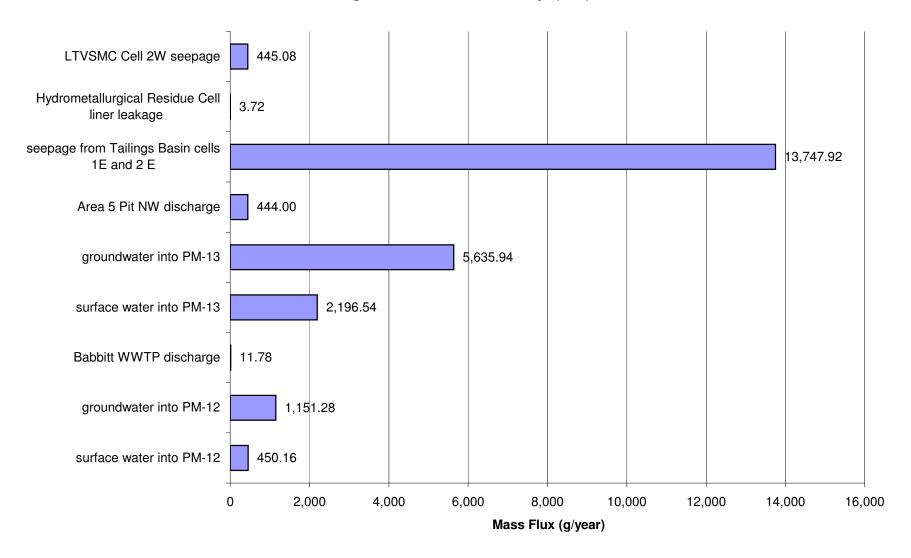
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Low Flow for Antimony (Sb)



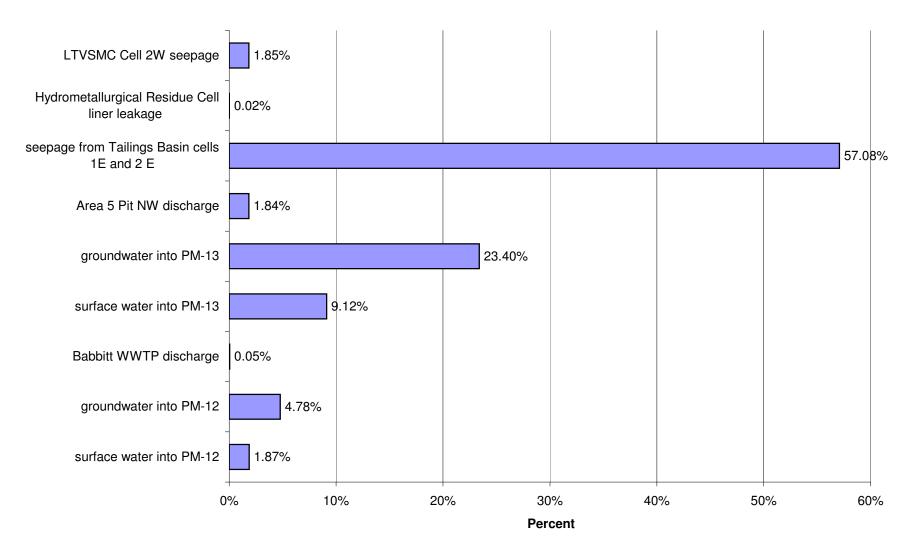
Proposed Action: Percent of Impacts at PM-13 in Year 1 for Low Flow for Antimony (Sb)



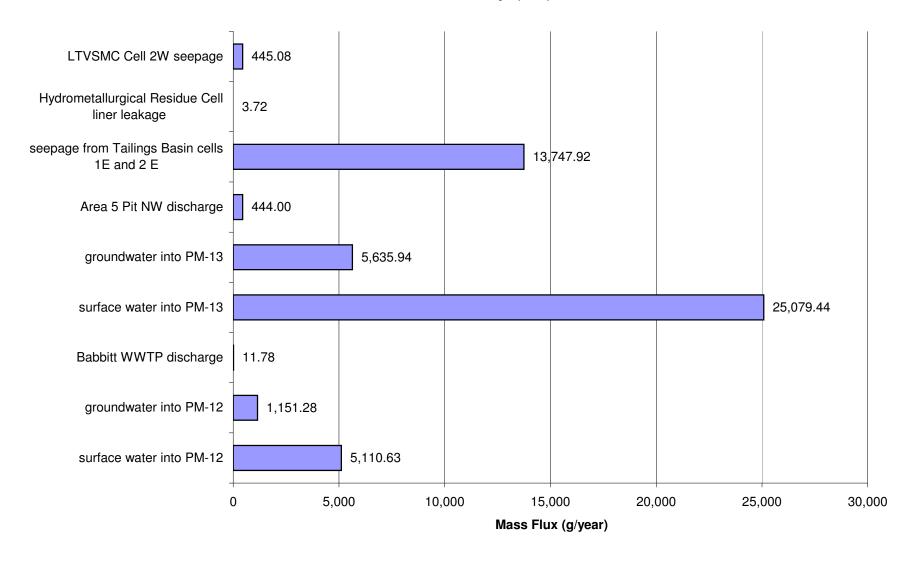
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Average Flow for Antimony (Sb)



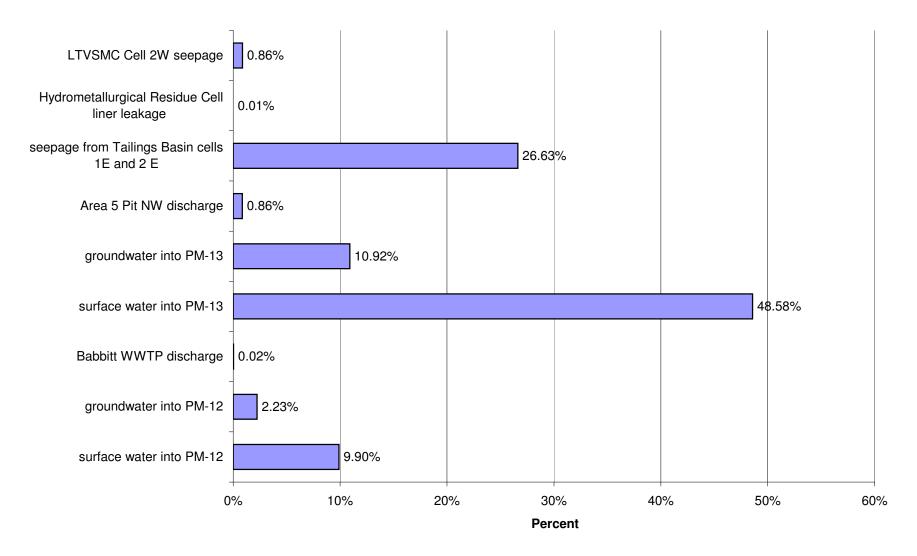
Proposed Action: Percent of Impacts at PM-13 in Year 1 for Average Flow for Antimony (Sb)



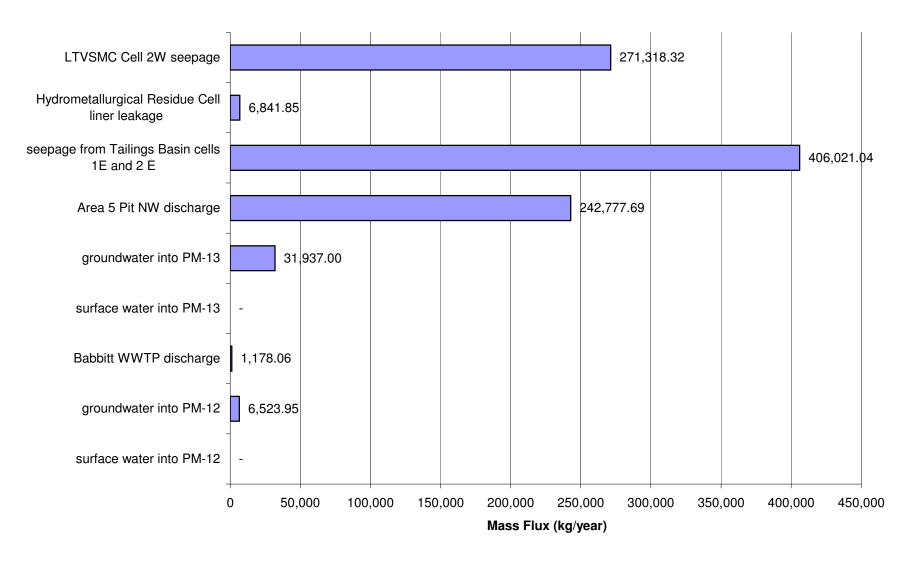
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for High Flow for Antimony (Sb)



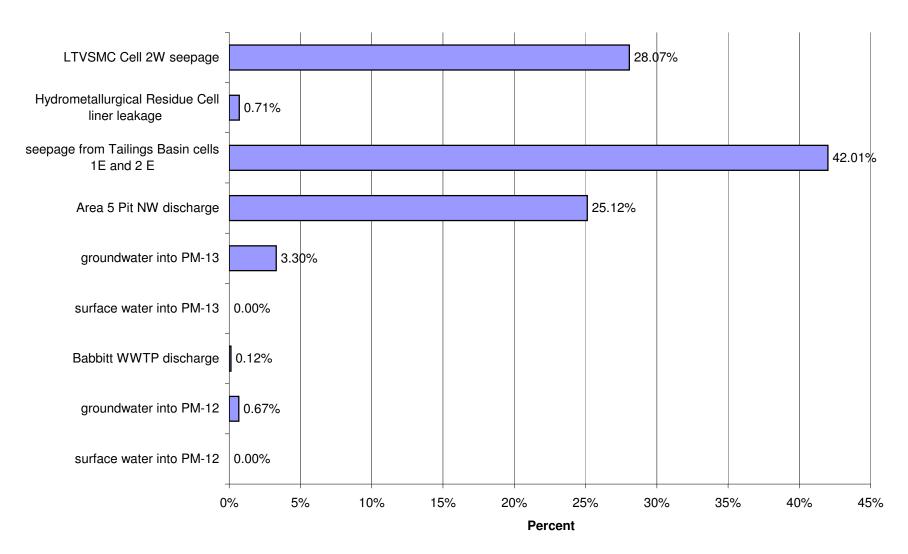
Proposed Action: Percent of Impacts at PM-13 in Year 1 for High Flow for Antimony (Sb)



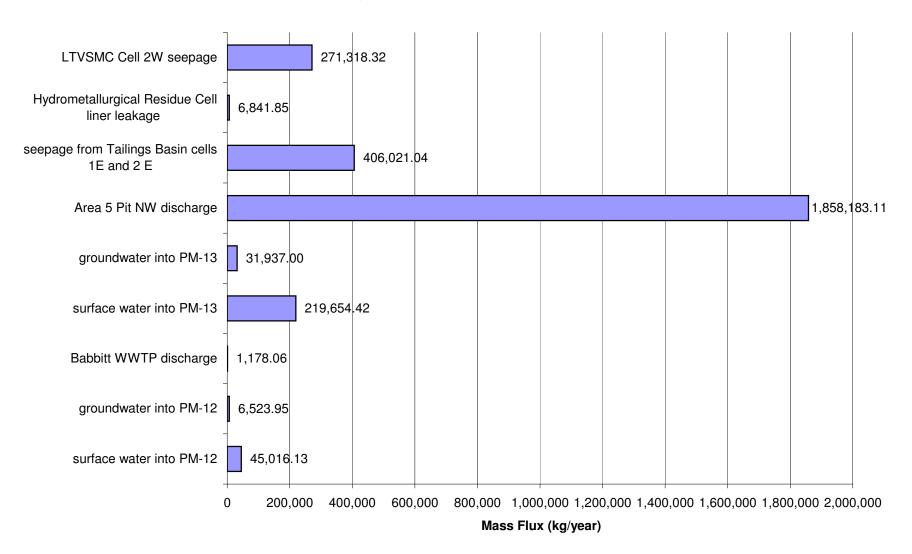
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 1 for Low Flow for Sulfate (SO₄)



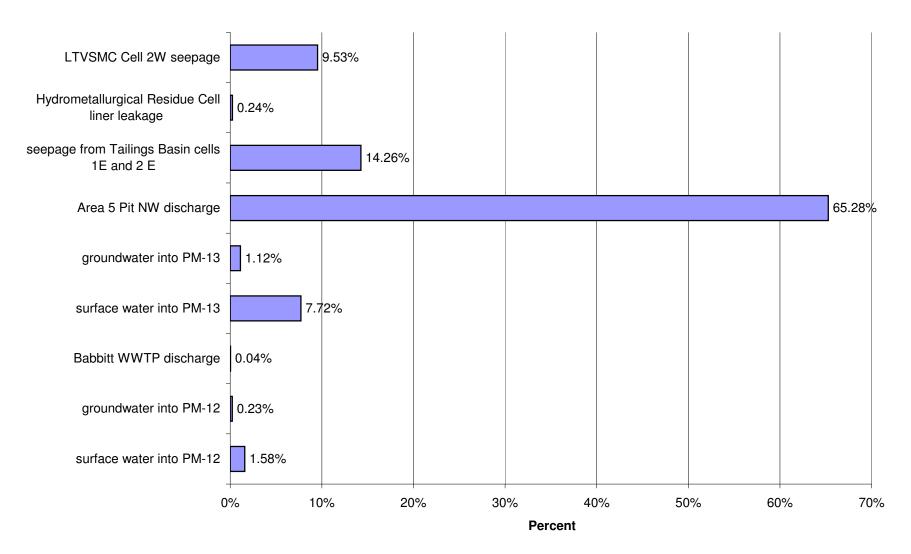
Proposed Action: Percent of Impacts at PM-13 in Year 1 for Low Flow for Sulfate (SO₄)



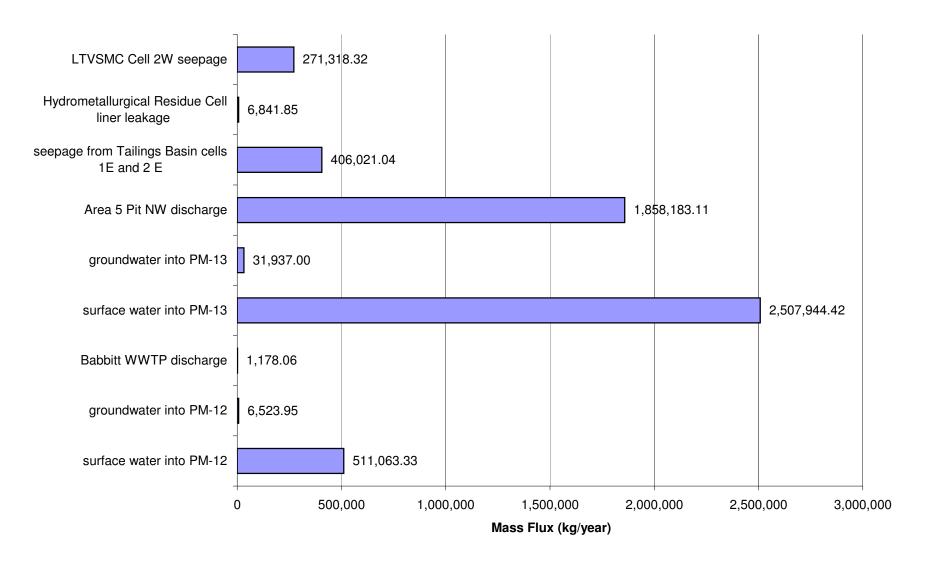
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 1 for Average Flow for Sulfate (SO₄)



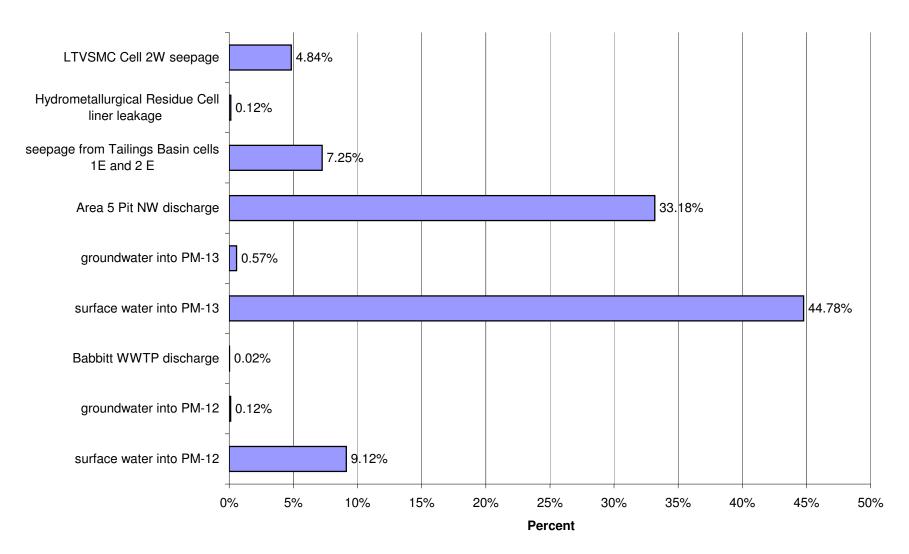
Proposed Action: Percent of Impacts at PM-13 in Year 1 for Average Flow for Sulfate (SO₄)



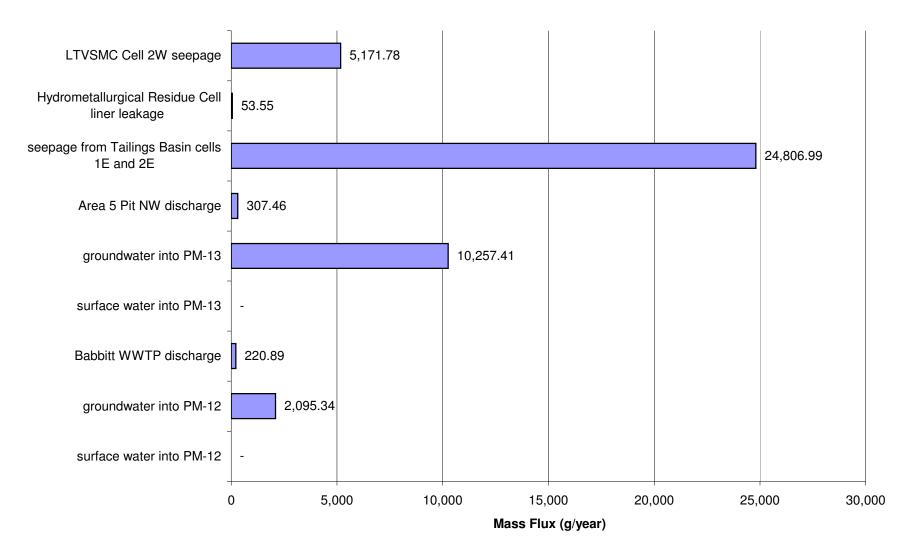
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 1 for High Flow for Sulfate (SO₄)



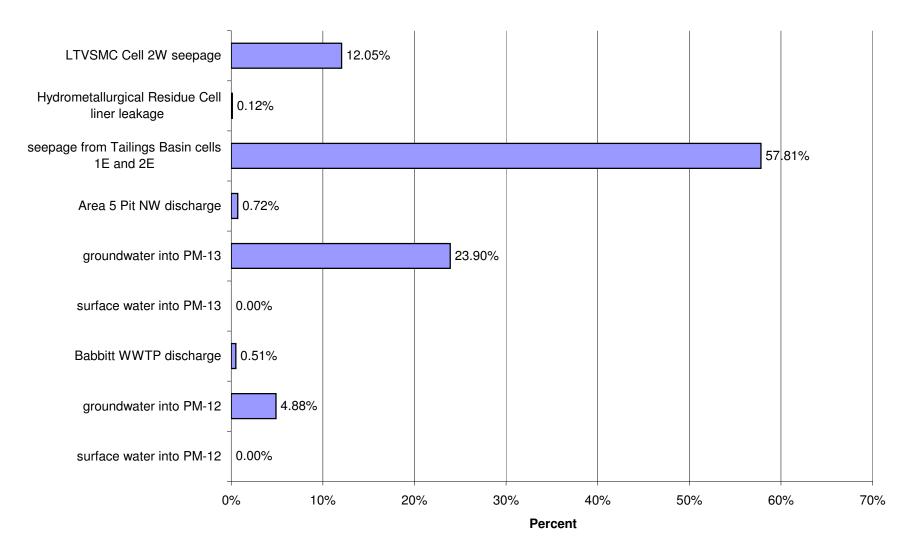
Proposed Action: Percent of Impacts at PM-13 in Year 1 for High Flow for Sulfate (SO₄)



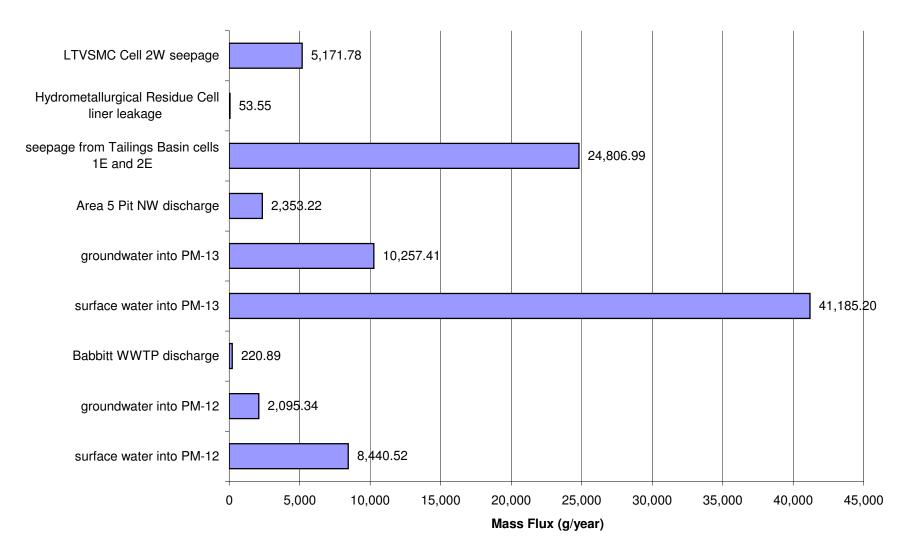
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Low Flow for Arsenic (As)



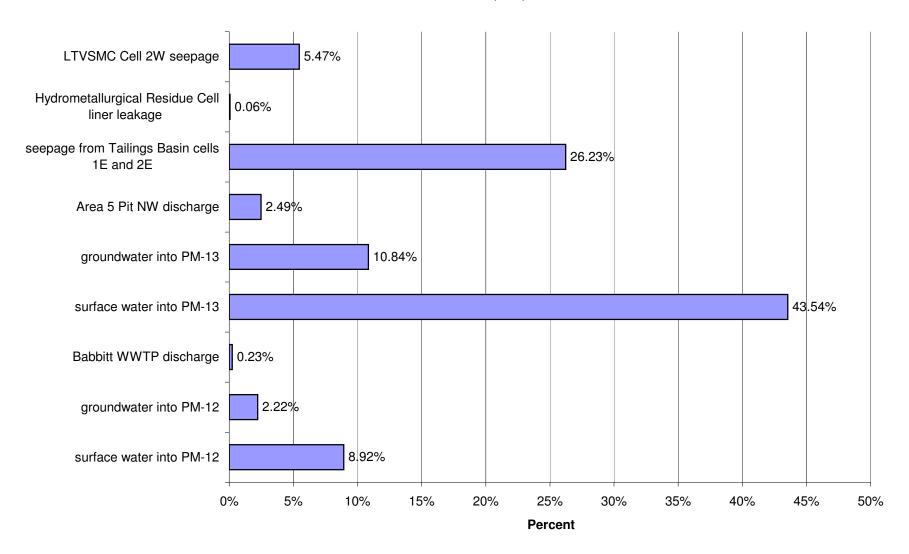
Proposed Action: Percent of Impacts at PM-13 in Year 5 for Low Flow for Arsenic (As)



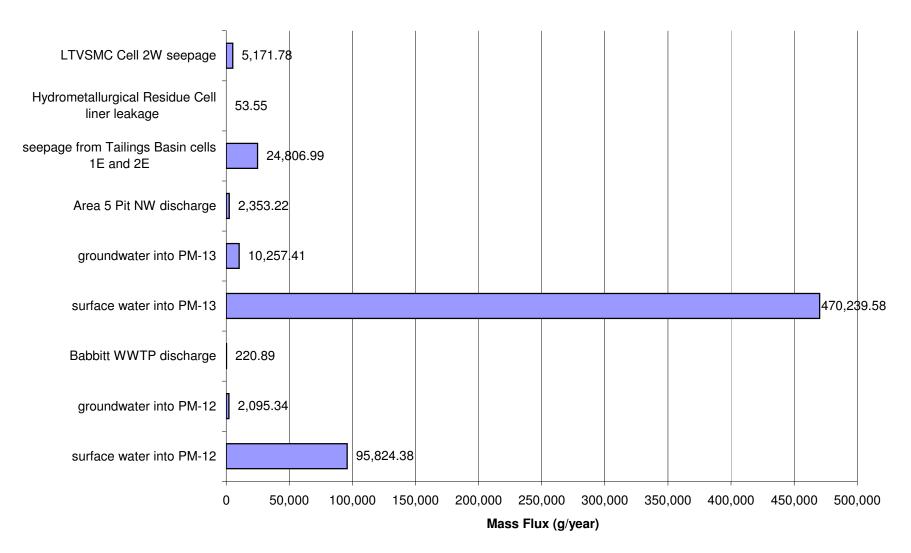
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Average Flow for Arsenic (As)



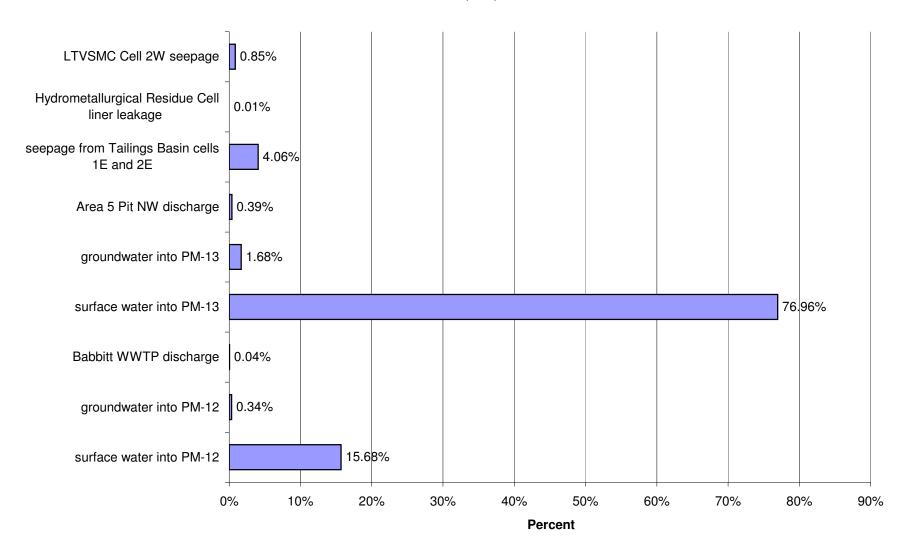
Proposed Action: Percent of Impacts at PM-13 in Year 5 for Average Flow for Arsenic (As)



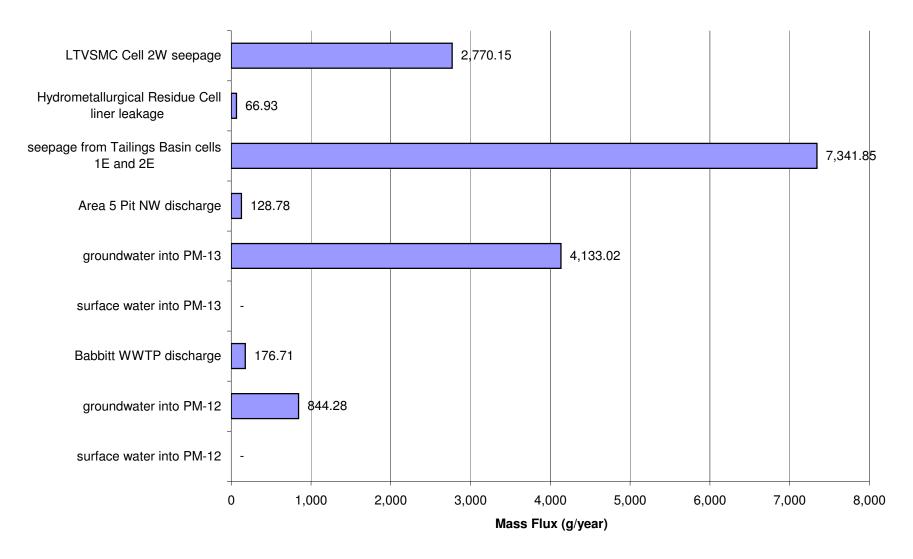
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for High Flow for Arsenic (As)



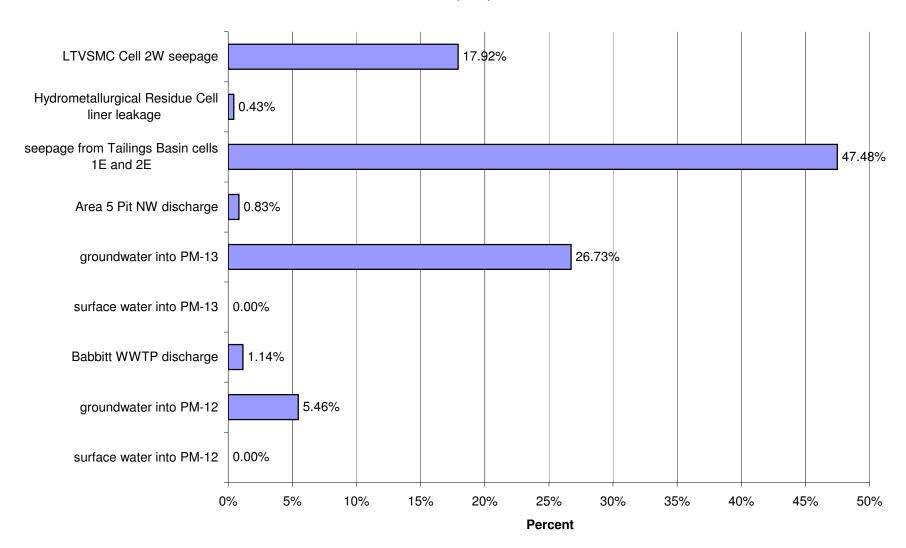
Proposed Action: Percent of Impacts at PM-13 in Year 5 for High Flow for Arsenic (As)



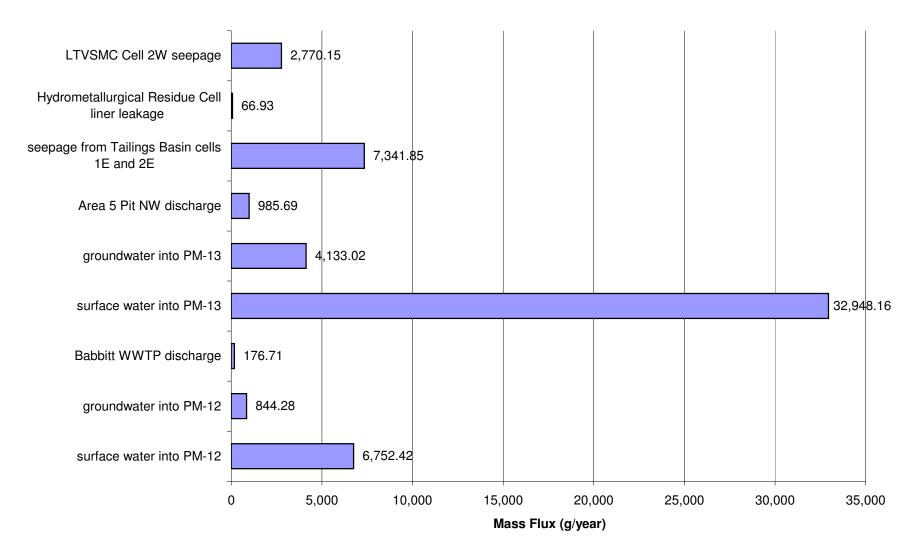
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Low Flow for Cobalt (Co)



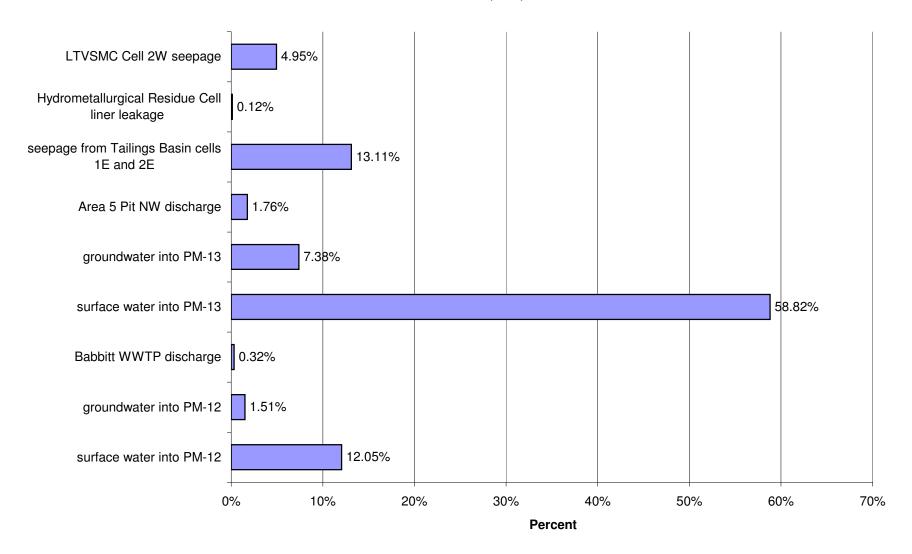
Proposed Action: Percent of Impacts at PM-13 in Year 5 for Low Flow for Cobalt (Co)



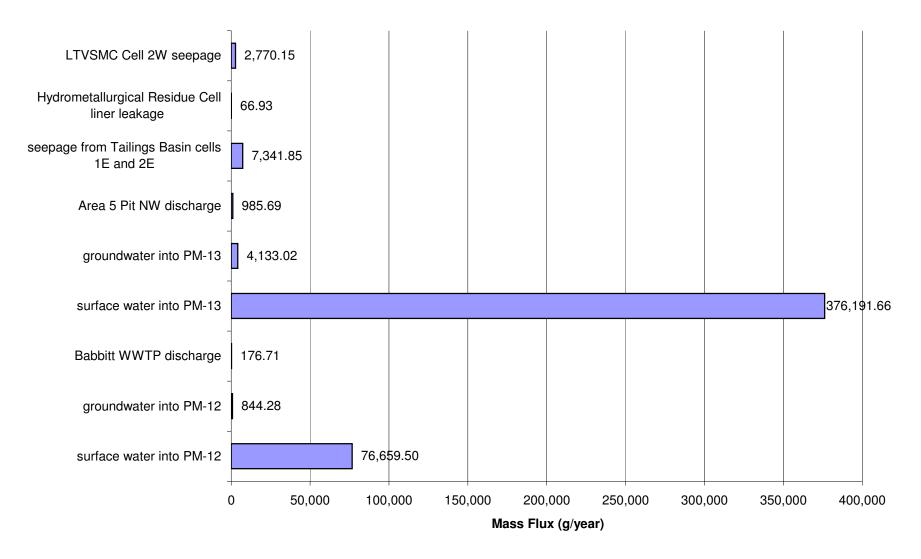
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Average Flow for Cobalt (Co)



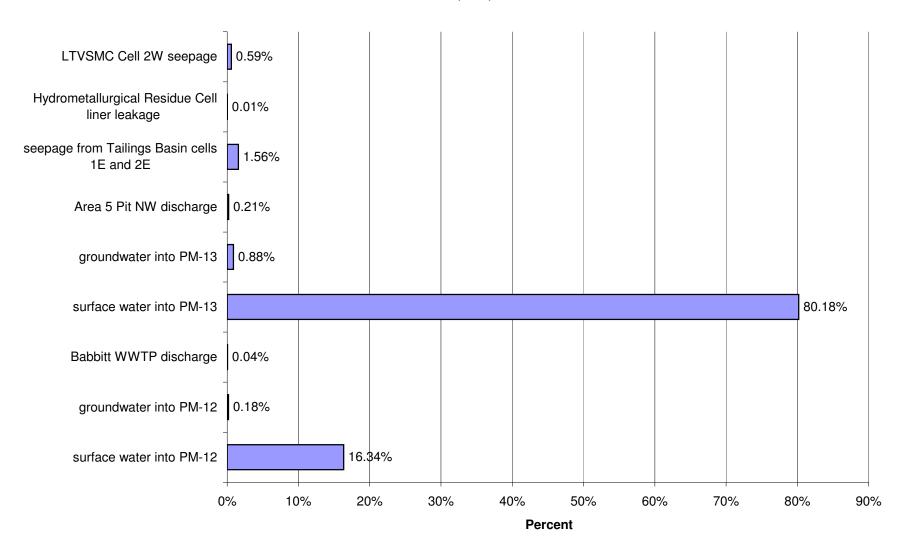
Proposed Action: Percent of Impacts at PM-13 in Year 5 for Average Flow for Cobalt (Co)



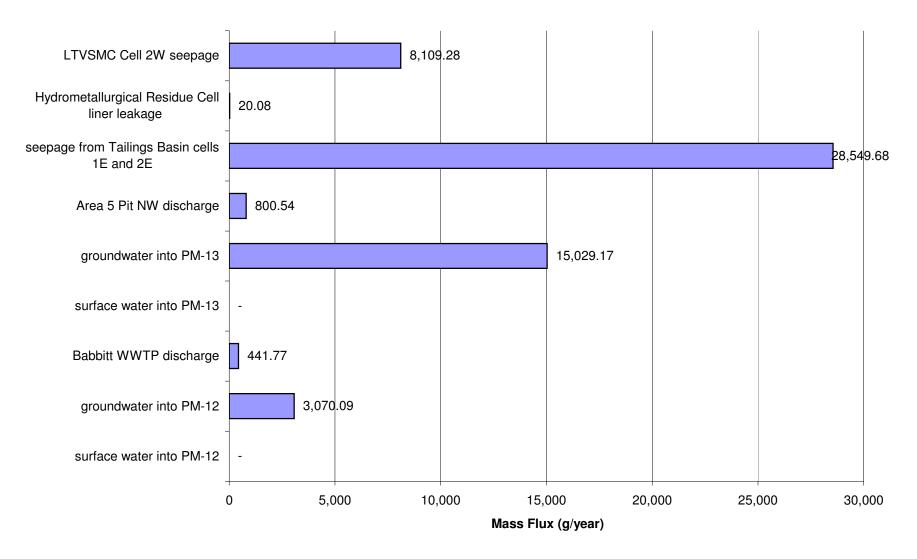
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for High Flow for Cobalt (Co)



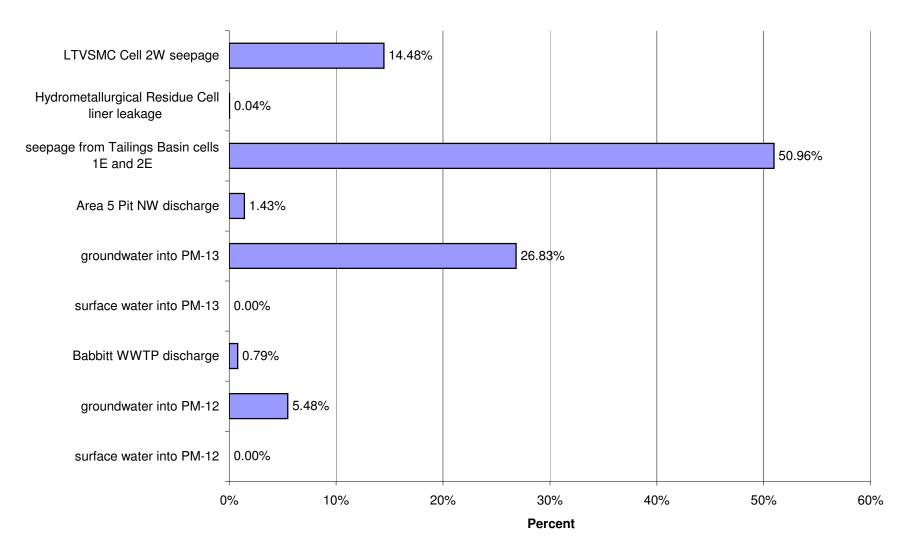
Proposed Action: Percent of Impacts at PM-13 in Year 5 for High Flow for Cobalt (Co)



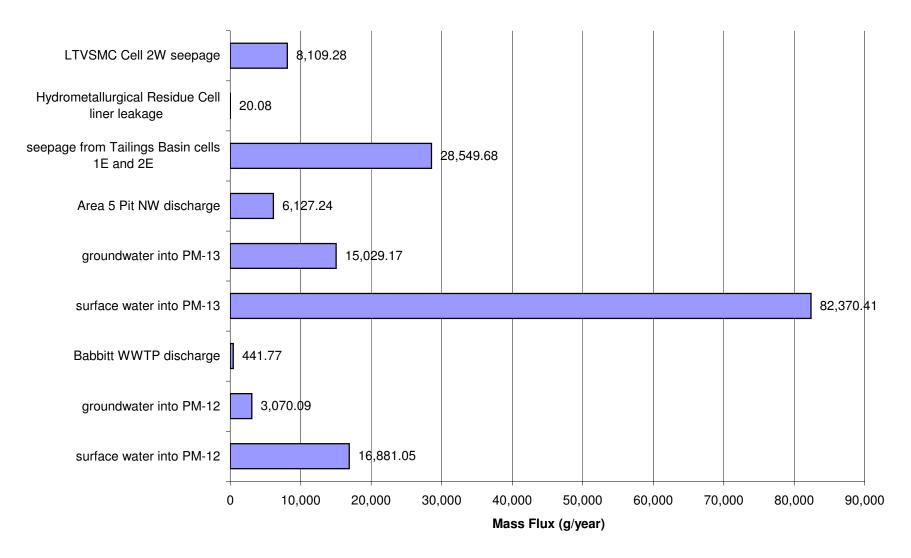
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Low Flow for Copper (Cu)



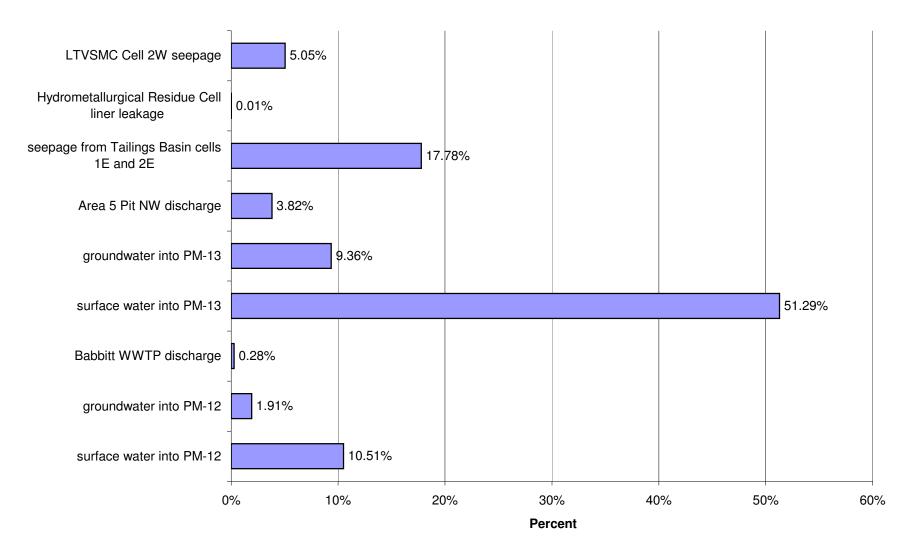
Proposed Action: Percent of Impacts at PM-13 in Year 5 for Low Flow for Copper (Cu)



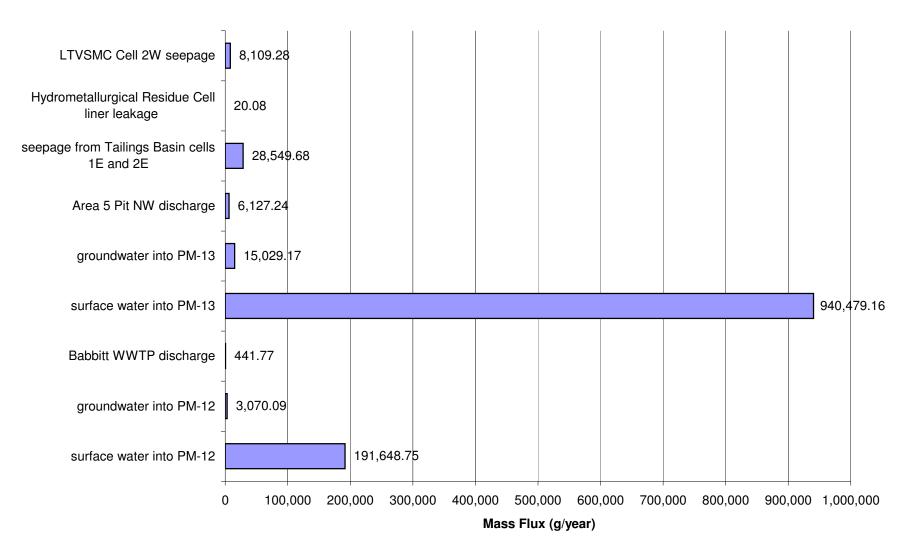
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Average Flow for Copper (Cu)



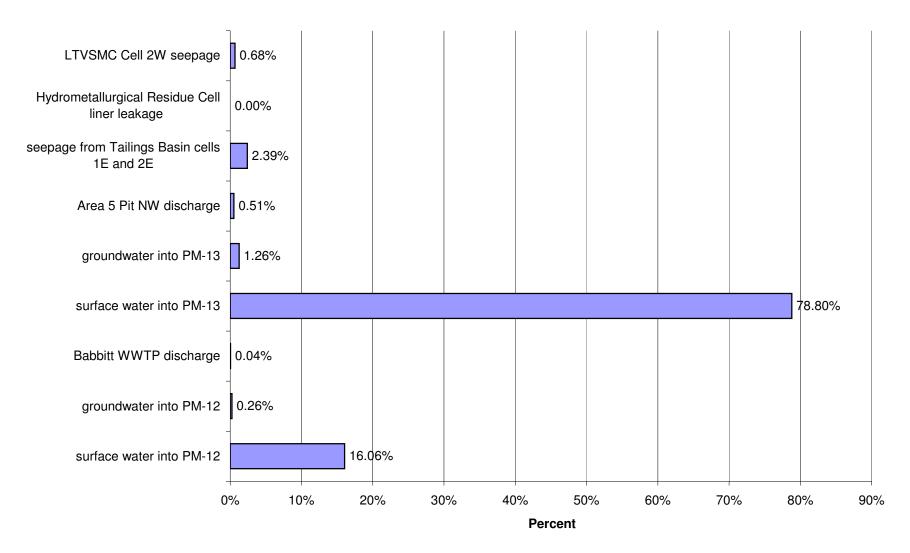
Proposed Action: Percent of Impacts at PM-13 in Closure for Year 5 Flow for Copper (Cu)



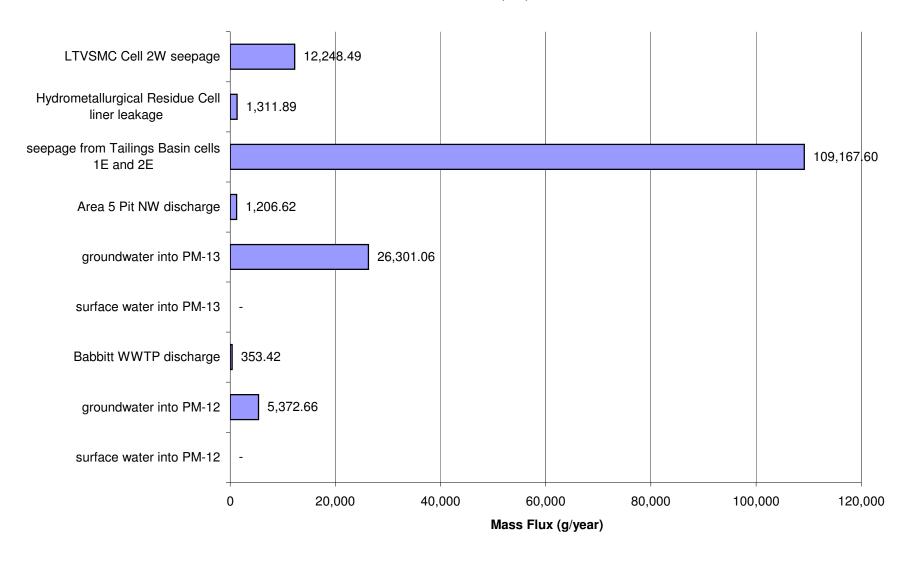
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for High Flow for Copper (Cu)



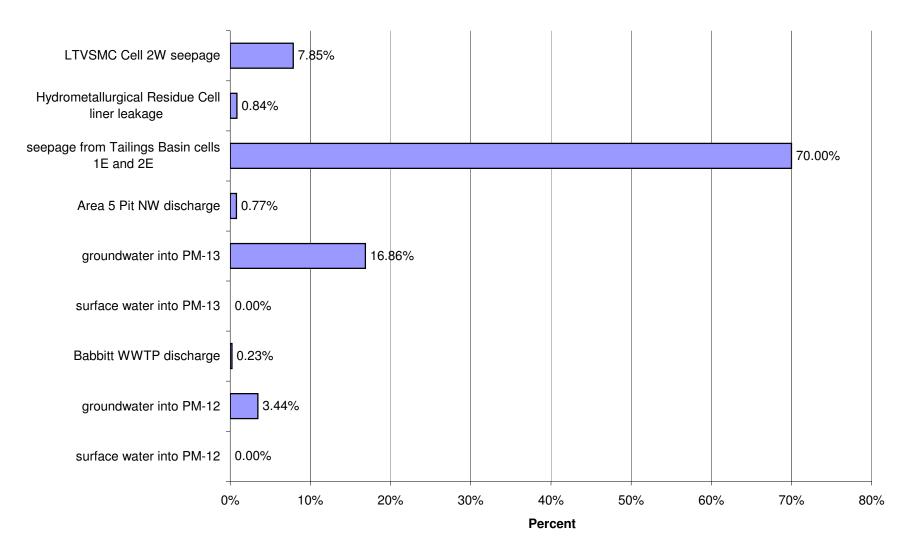
Proposed Action: Percent of Impacts at PM-13 in Year 5 for High Flow for Copper (Cu)



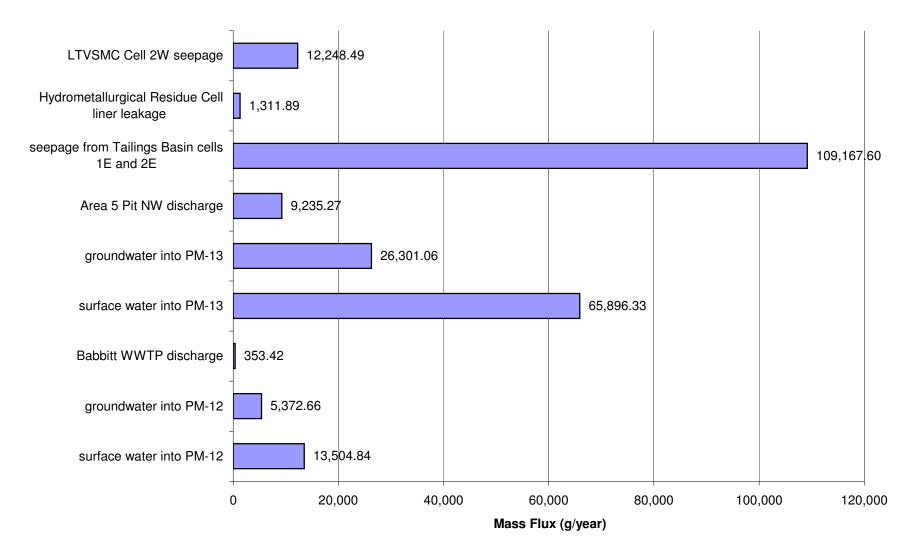
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Low Flow for Nickel (Ni)



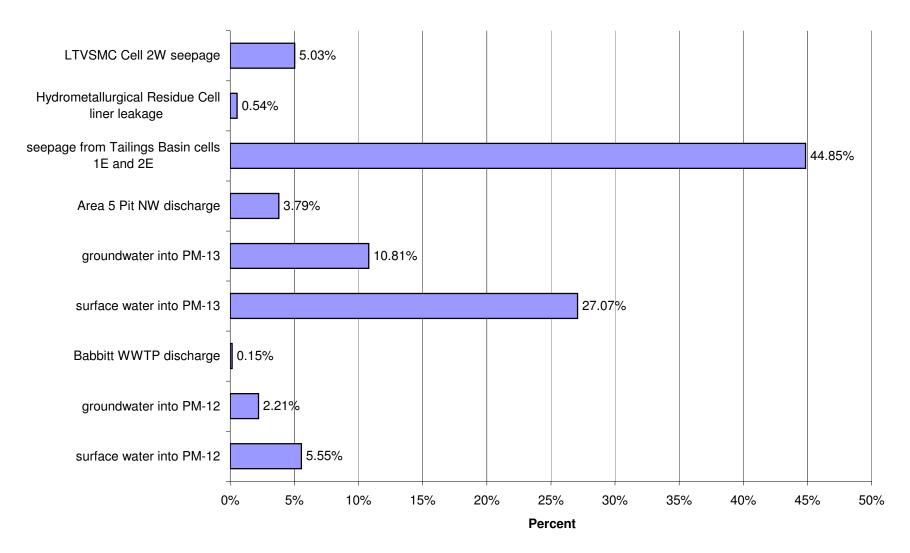
Proposed Action: Percent of Impacts at PM-13 in Year 5 for Low Flow for Nickel (Ni)



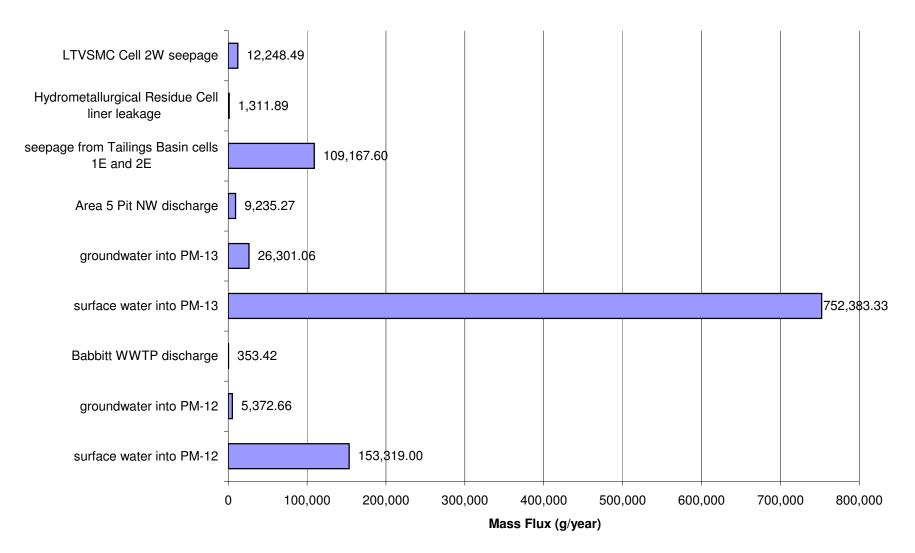
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Average Flow for Nickel (Ni)



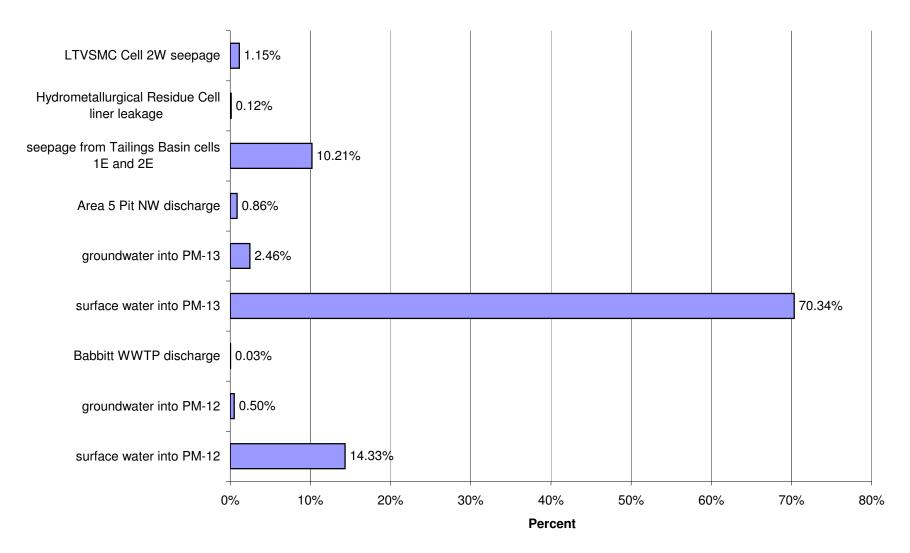
Proposed Action: Percent of Impacts at PM-13 in Year 5 for Average Flow for Nickel (Ni)



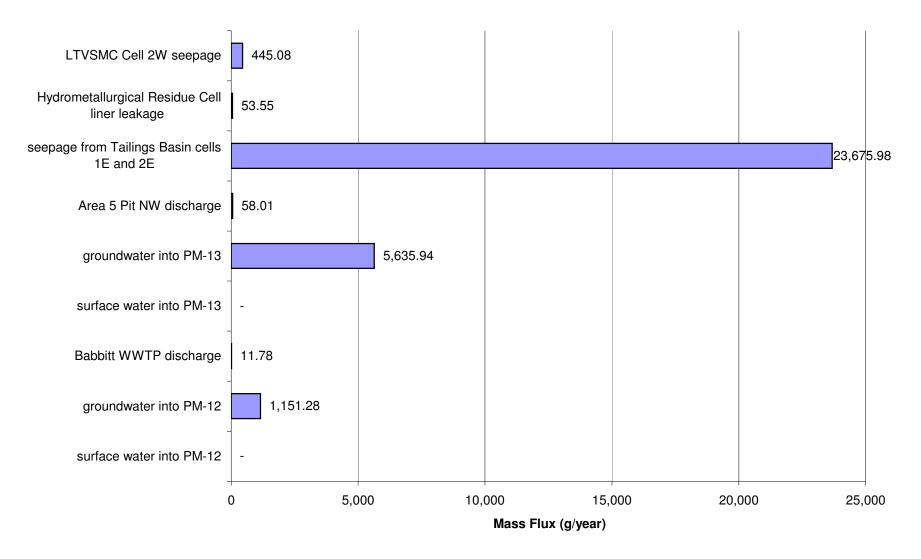
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for High Flow for Nickel (Ni)



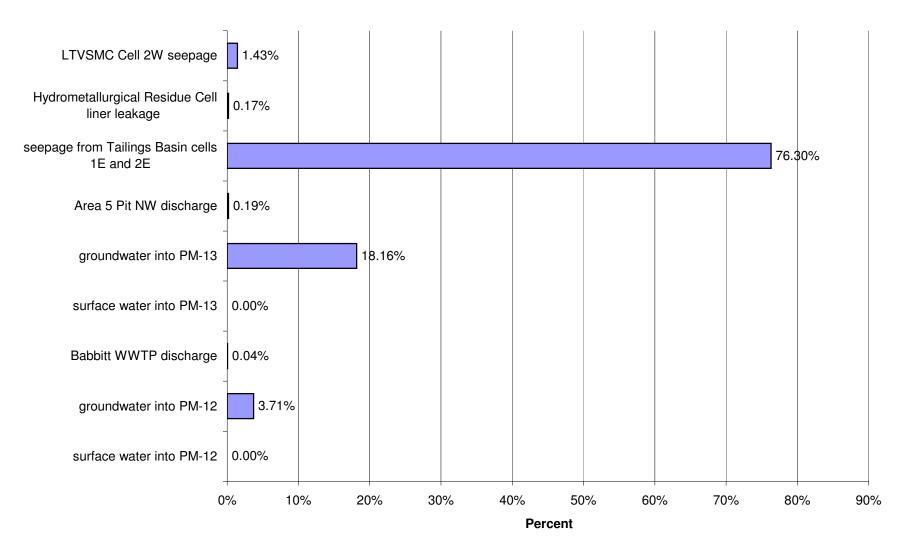
Proposed Action: Percent of Impacts at PM-13 in Year 5 for High Flow for Nickel (Ni)



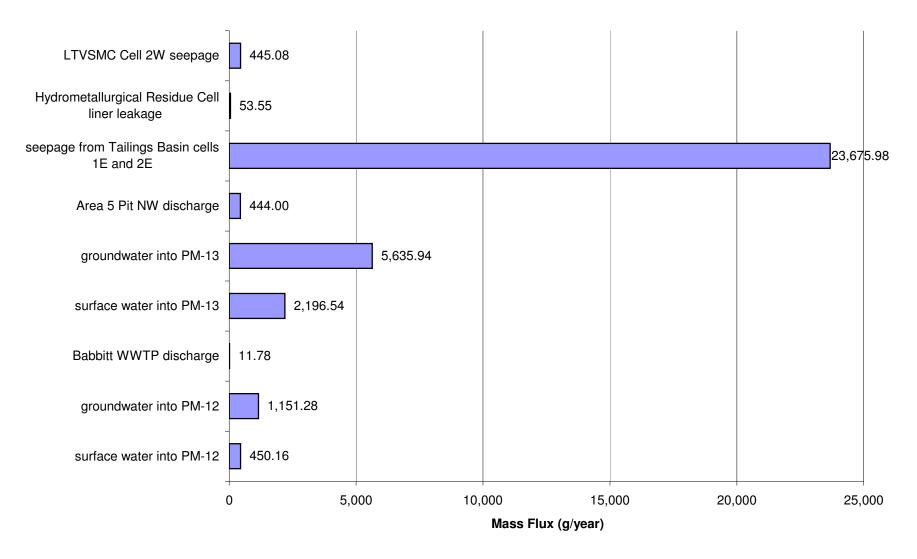
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Low Flow for Antimony (Sb)



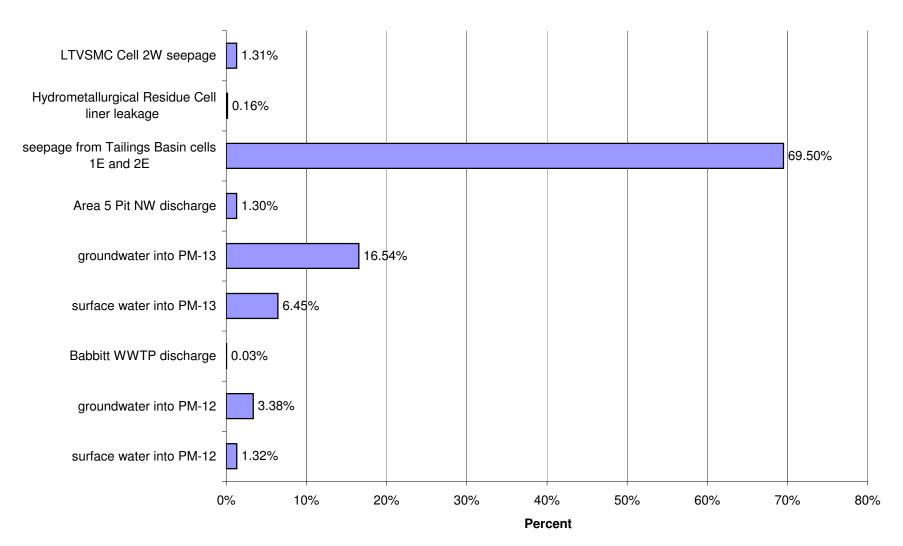
Proposed Action: Percent of Impacts at PM-13 in Year 5 for Low Flow for Antimony (Sb)



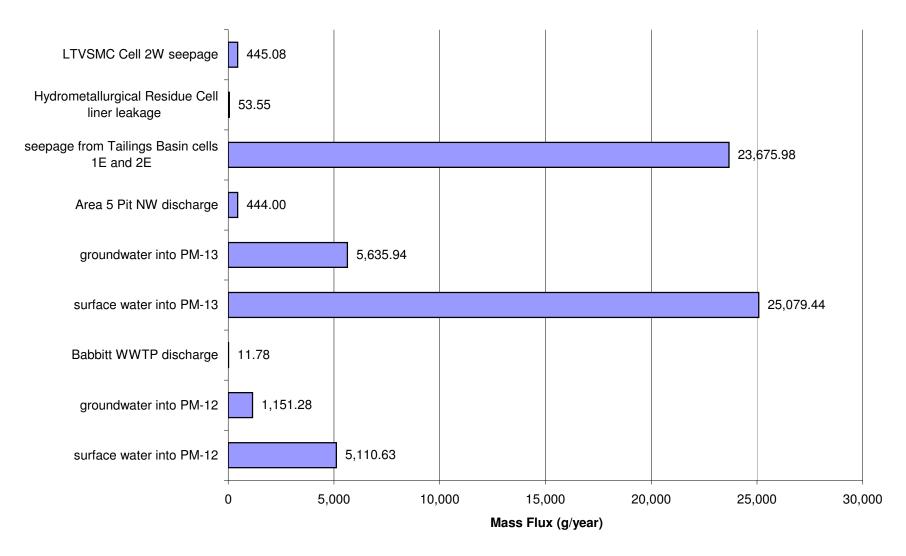
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Average Flow for Antimony(Sb)



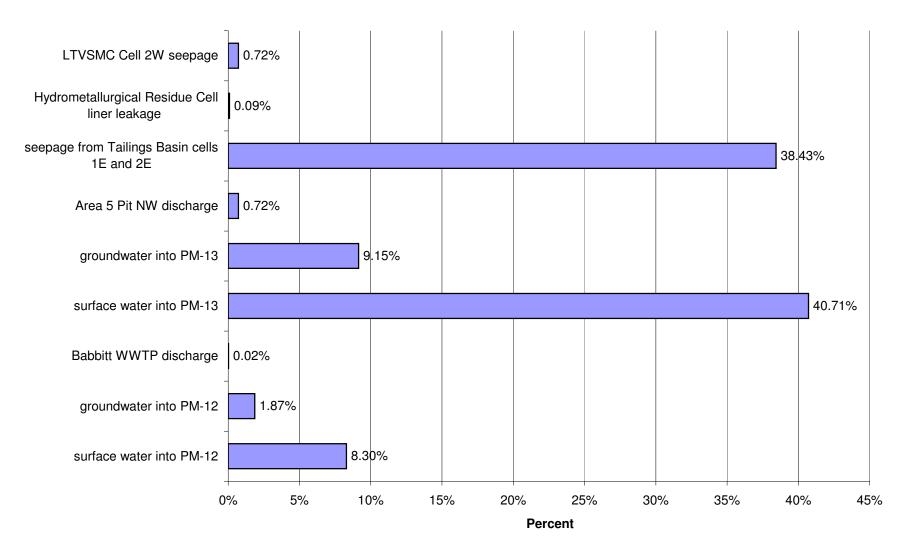
Proposed Action: Percent of Impacts at PM-13 in Year 5 for Average Flow for Antimony (Sb)



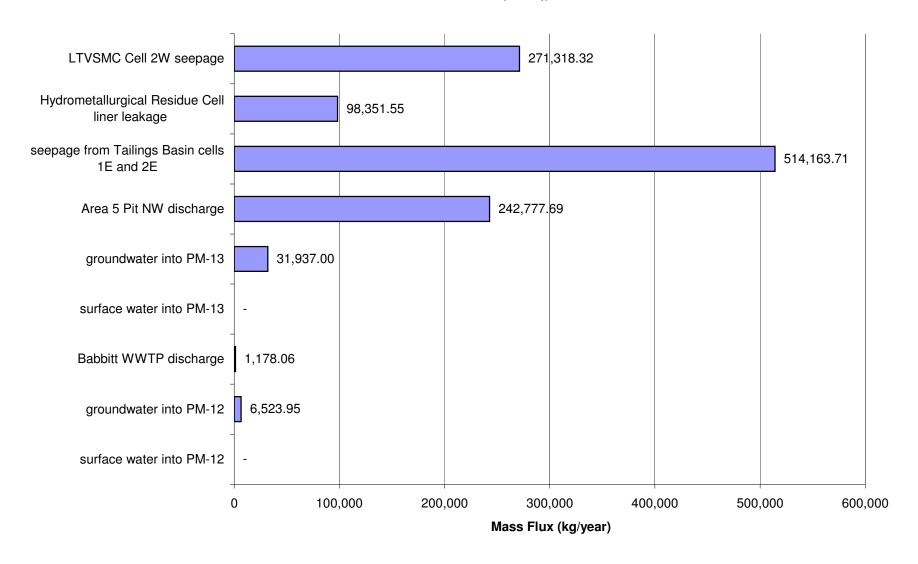
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for High Flow for Antimony (Sb)



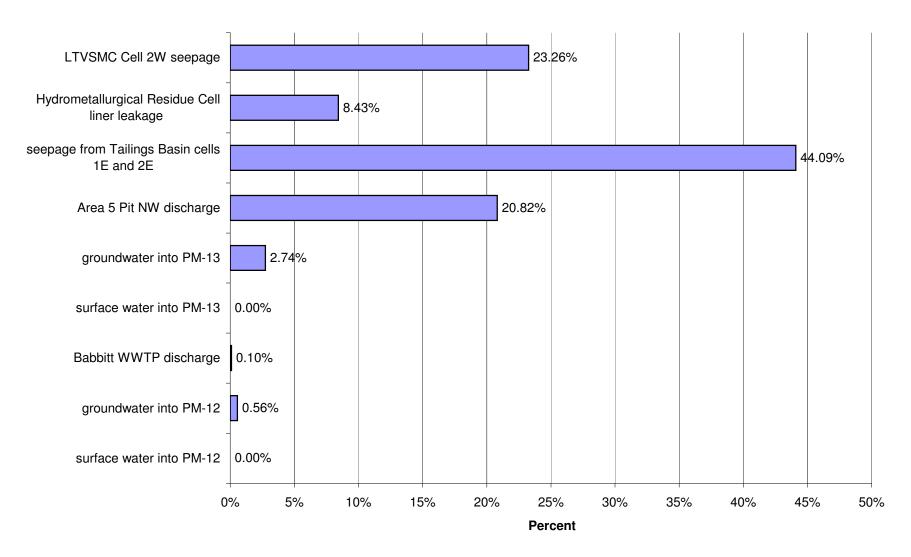
Proposed Action: Percent of Impacts at PM-13 in Year 5 for High Flow for Antimony (Sb)



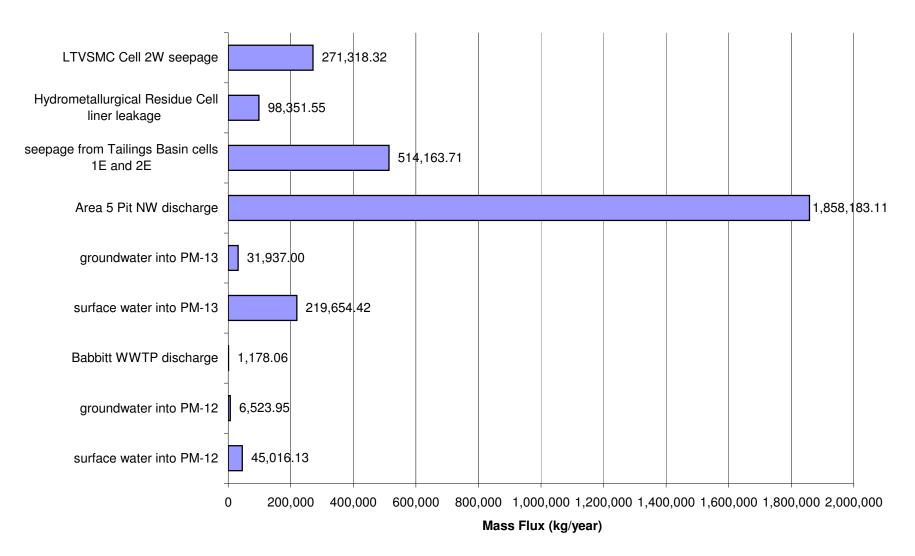
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 5 for Low Flow for Sulfate (SO₄)



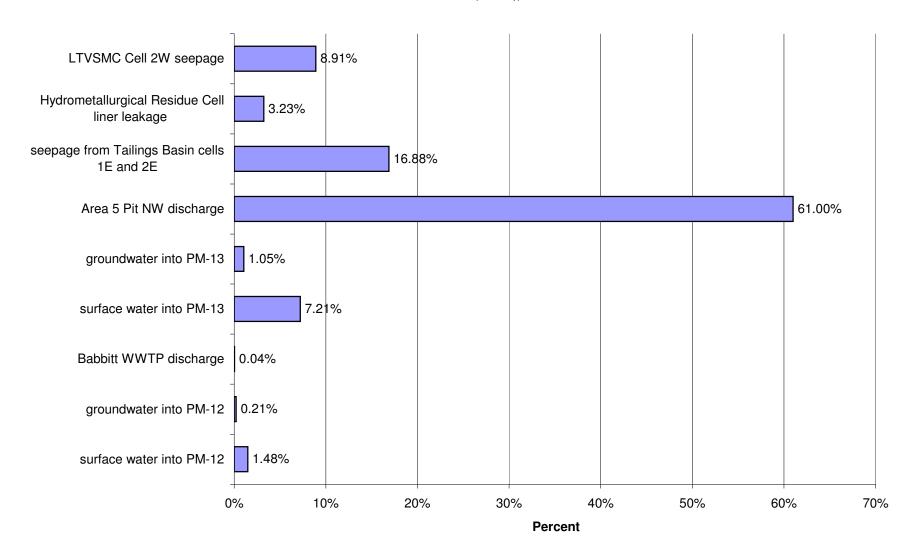
Proposed Action: Percent of Impacts at PM-13 in Year 5 for Low Flow for Sulfate (SO₄)



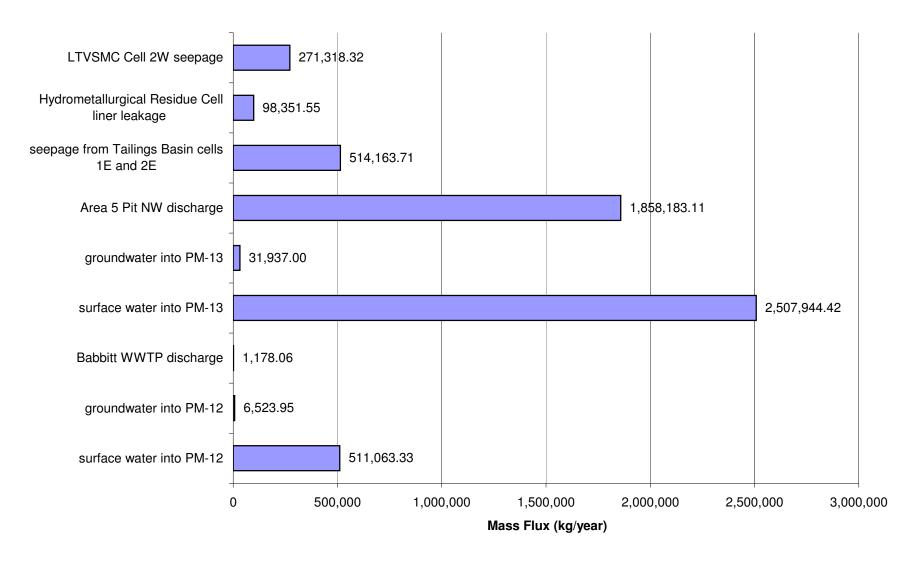
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 5 for Average Flow for Sulfate (SO₄)



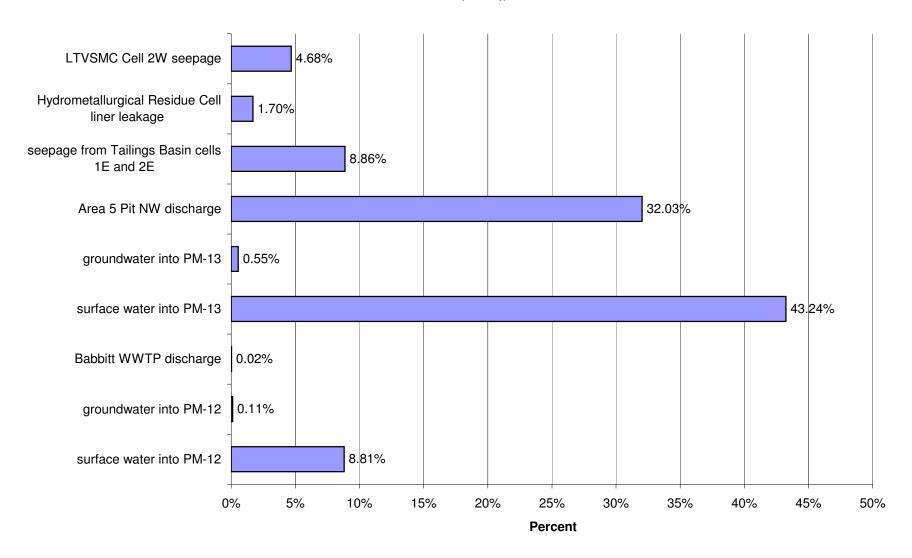
Proposed Action: Percent of Impacts at PM-13 in Year 5 for Average Flow for Sulfate (SO₄)



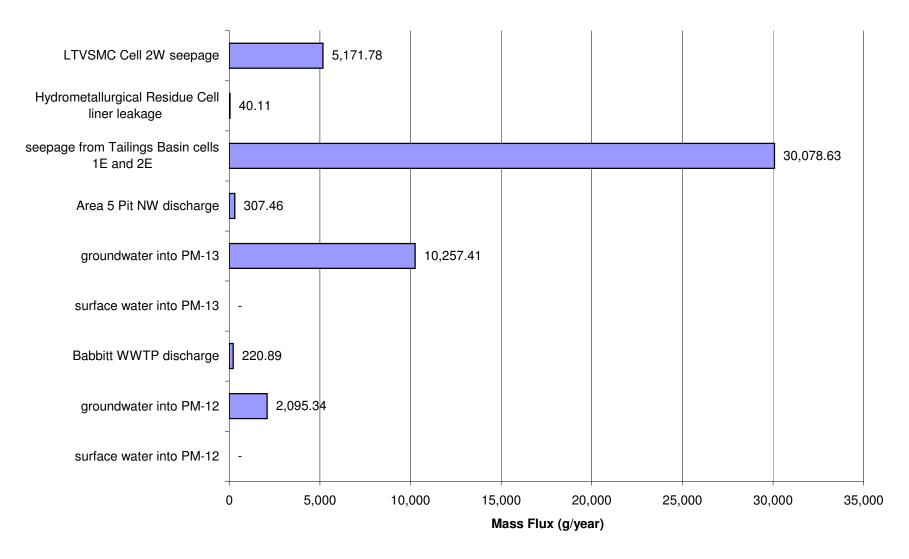
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 5 for High Flow for Sulfate (SO₄)



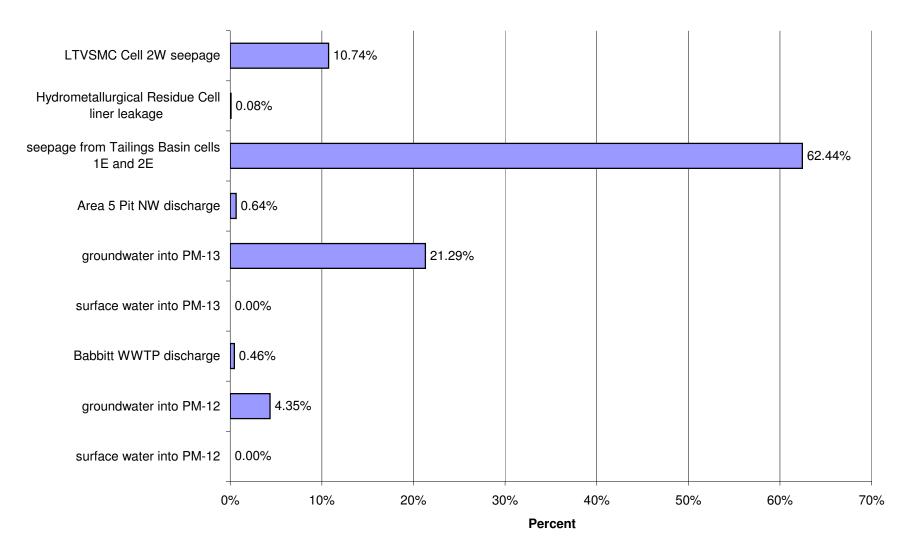
Proposed Action: Percent of Impacts at PM-13 in Year 5 for High Flow for Sulfate (SO₄)



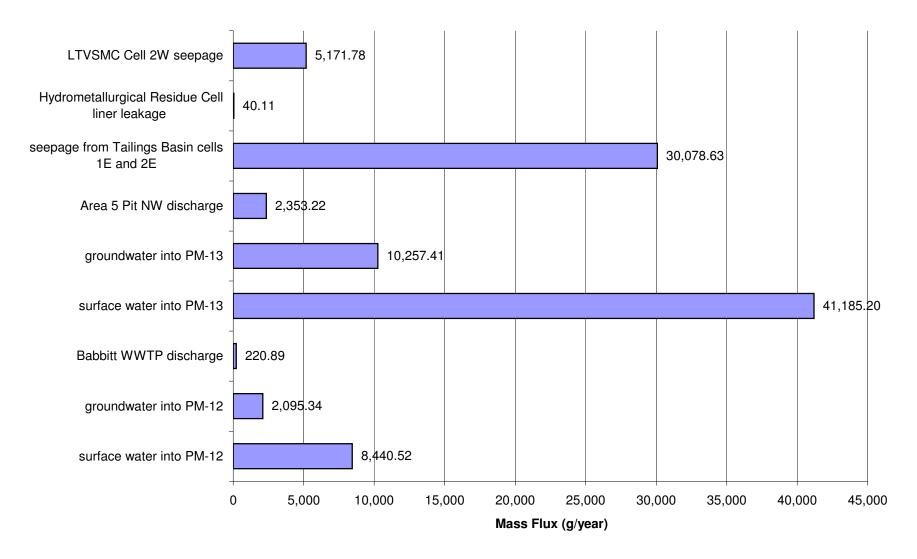
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 8 for Low Flow for Arsenic (As)



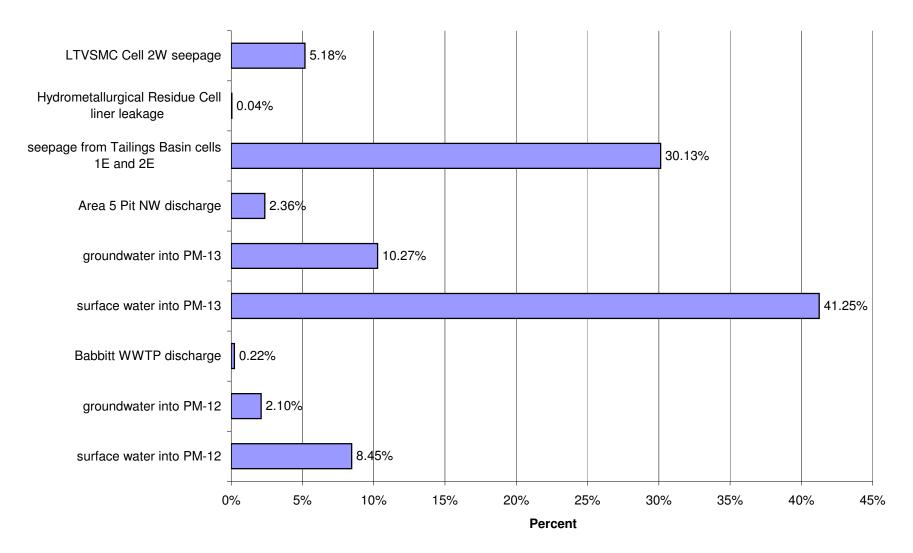
Proposed Action: Percent of Impacts at PM-13 in Year 8 for Low Flow for Arsenic (As)



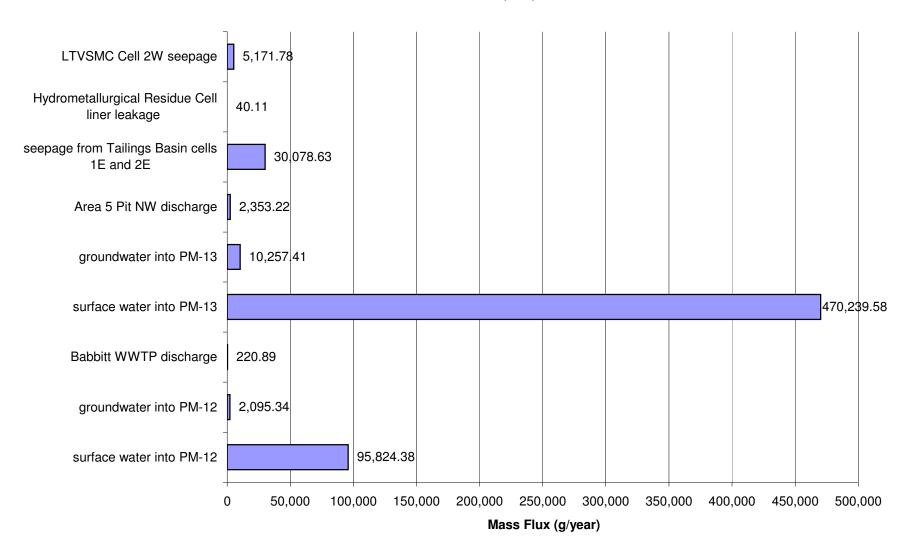
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 8 for Average Flow for Arsenic (As)



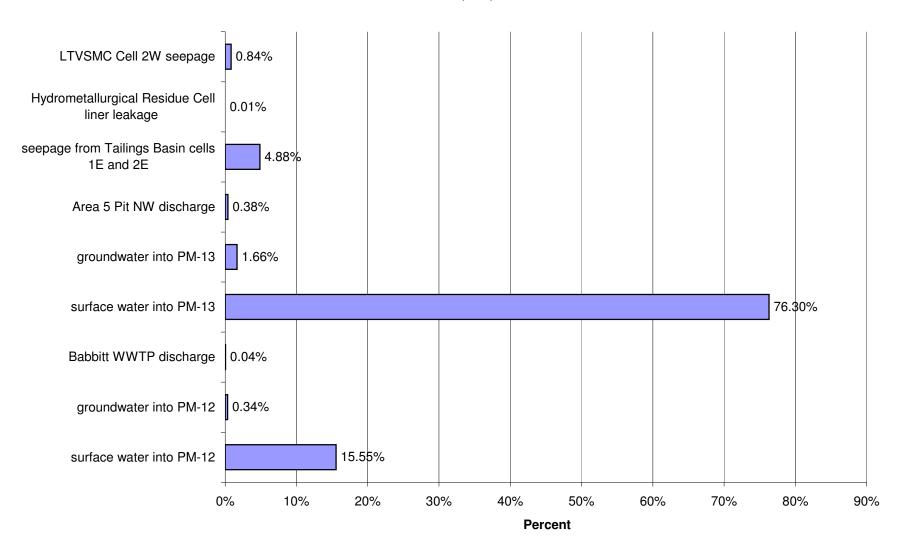
Proposed Action: Percent of Impacts at PM-13 in Year 8 for Average Flow for Arsenic (As)



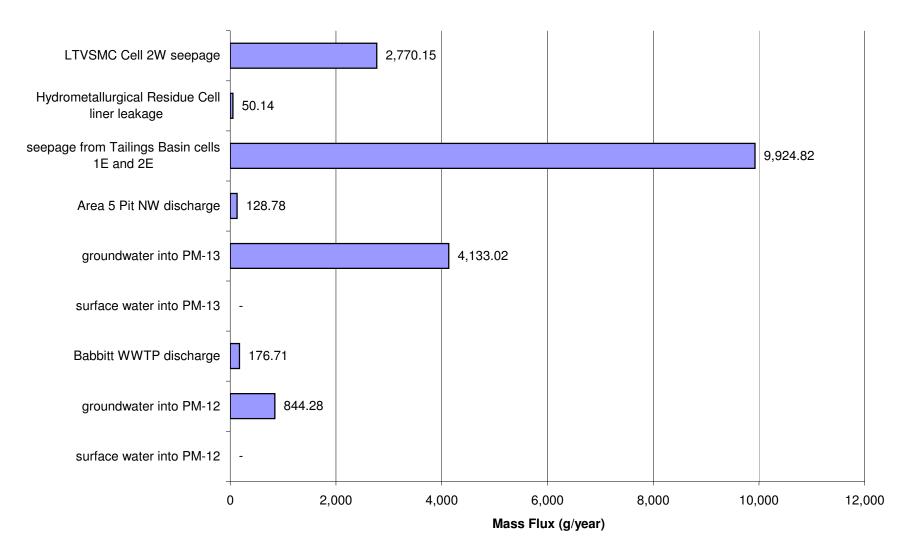
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 8 for High Flow for Arsenic (As)



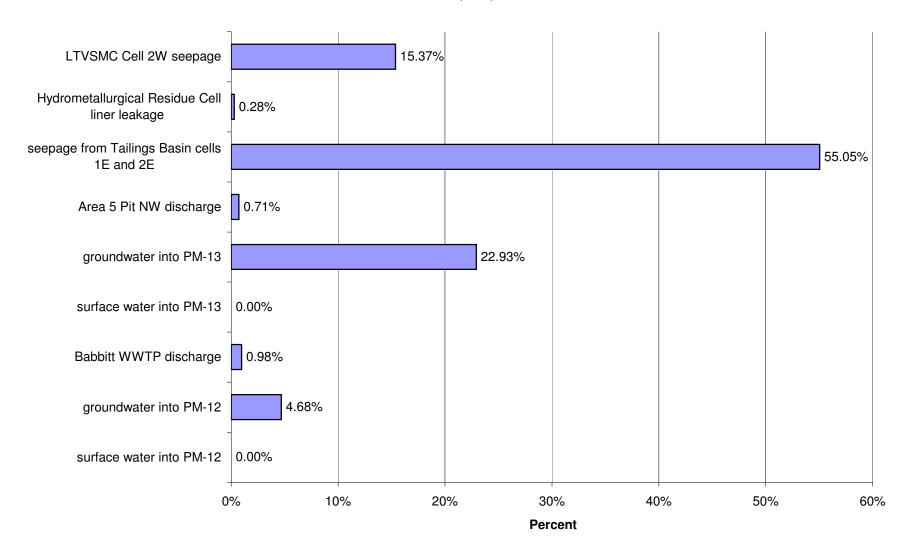
Proposed Action: Percent of Impacts at PM-13 in Year 8 for High Flow for Arsenic (As)



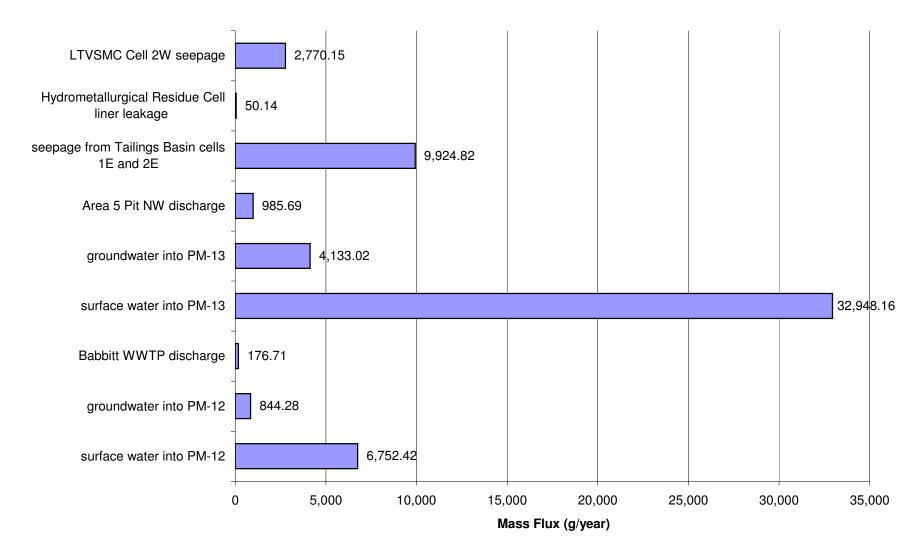
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 8 for Low Flow for Cobalt (Co)



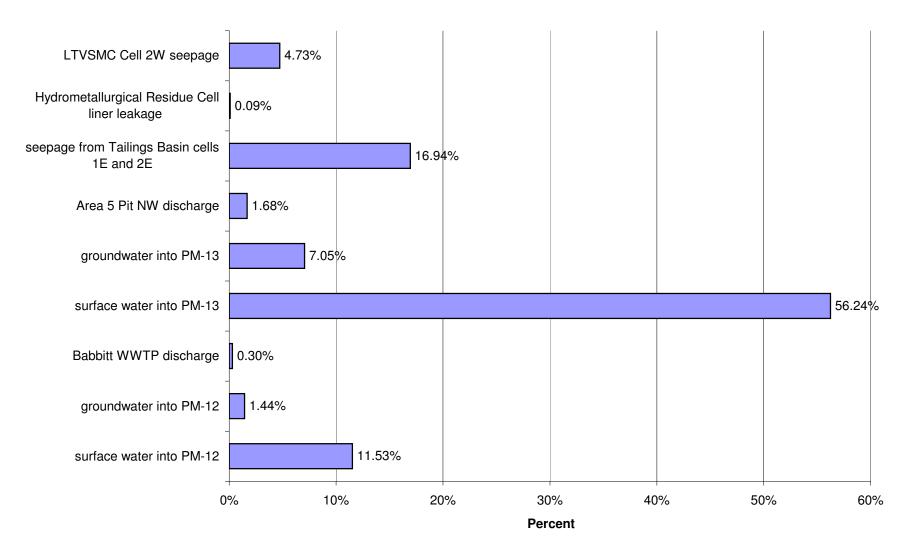
Proposed Action: Percent of Impacts at PM-13 in Year 8 for Low Flow for Cobalt (Co)



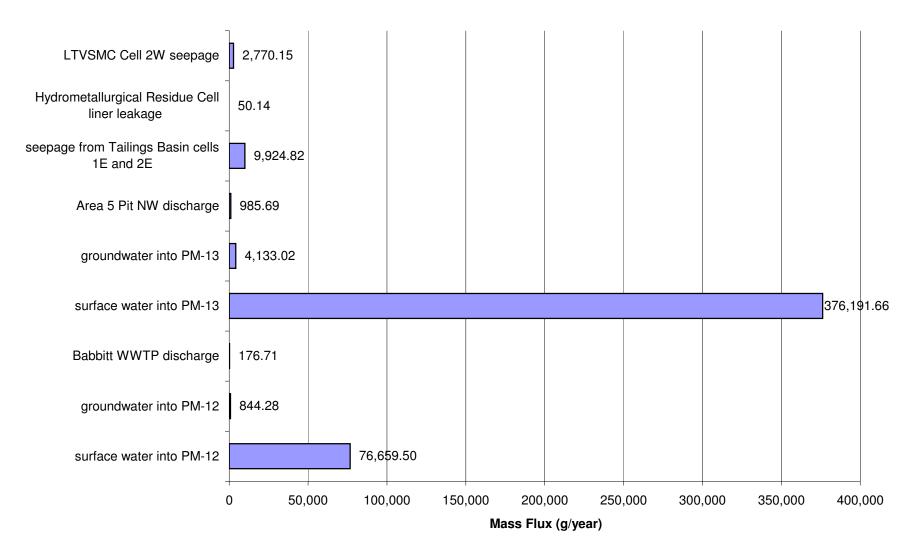
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 8 for Average Flow for Cobalt (Co)



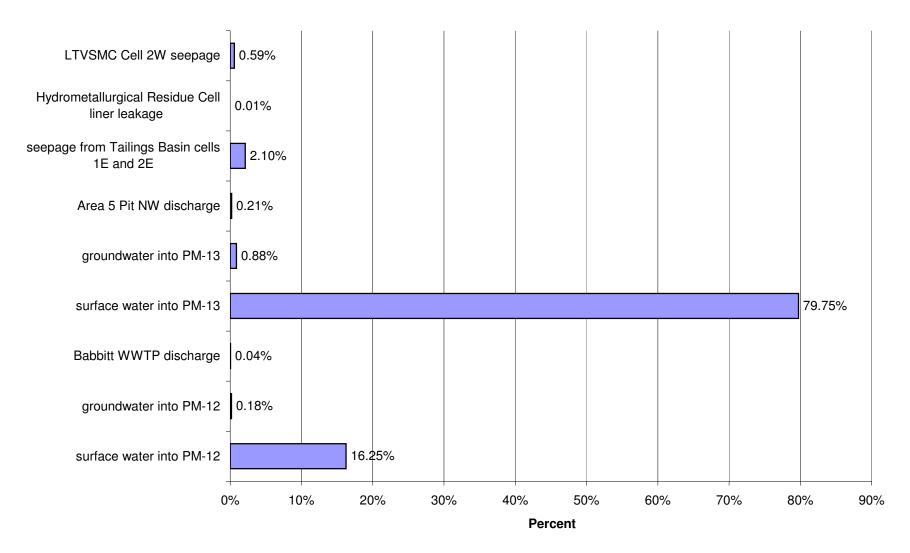
Proposed Action: Percent of Impacts at PM-13 in Year 8 for Average Flow for Cobalt (Co)



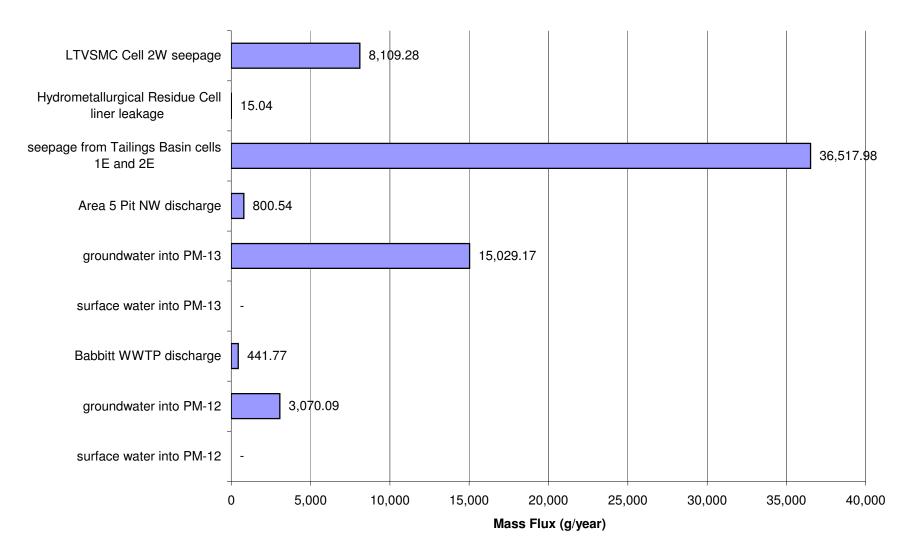
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 8 for High Flow for Cobalt (Co)



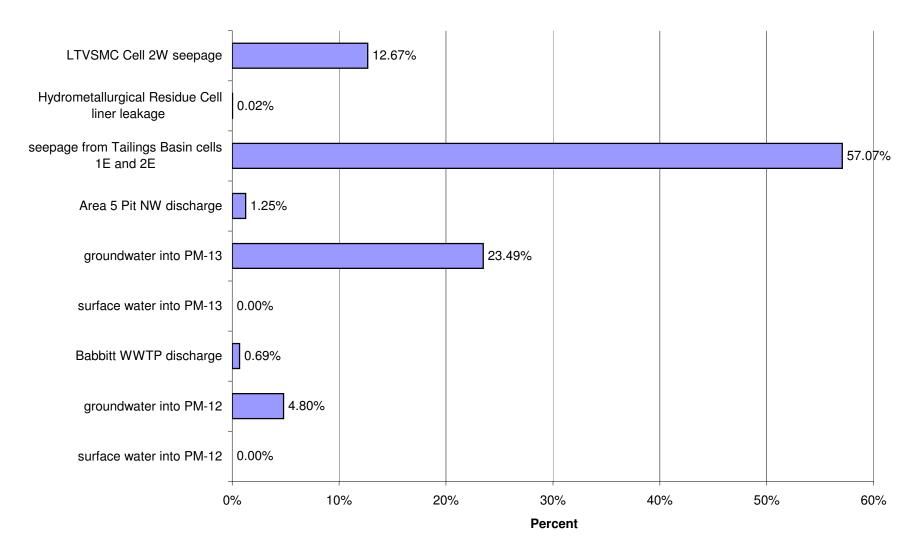
Proposed Action: Percent of Impacts at PM-13 in Year 8 for High Flow for Cobalt (Co)



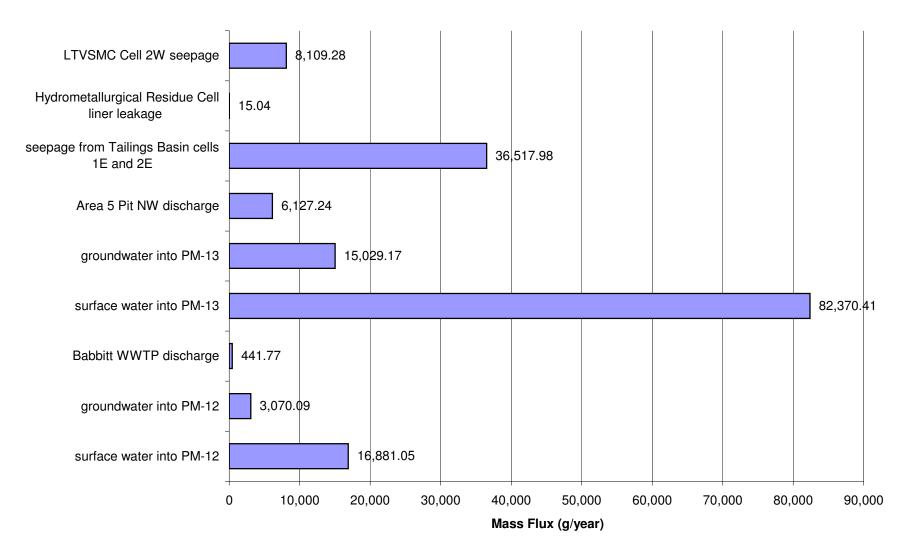
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 8 for Low Flow for Copper (Cu)



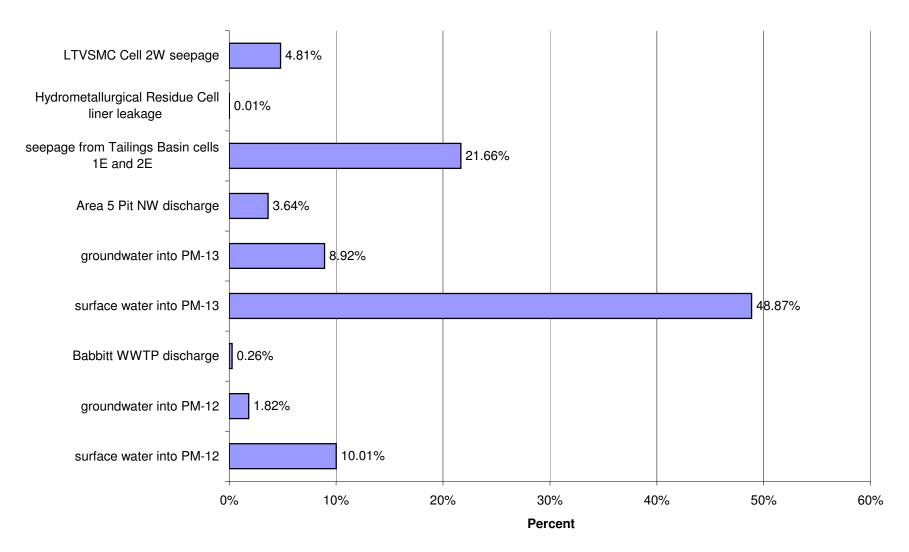
Proposed Action: Percent of Impacts at PM-13 in Year 8 for Low Flow for Copper (Cu)



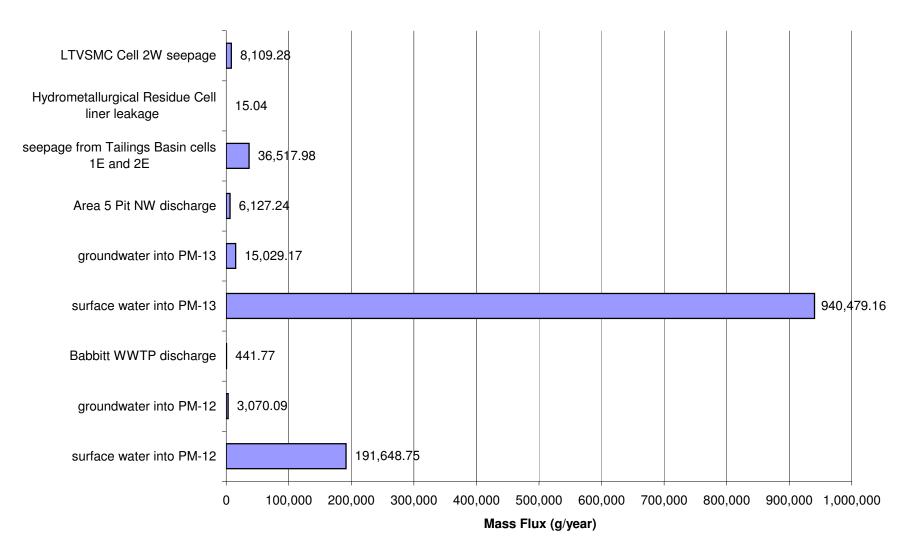
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 8 for Average Flow for Copper (Cu)



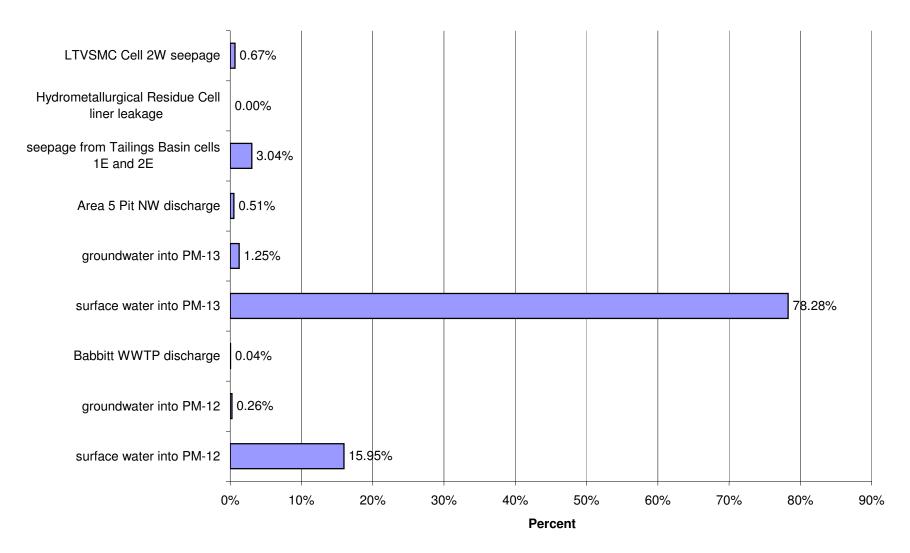
Proposed Action: Percent of Impacts at PM-13 in Year 8 for Average Flow for Copper (Cu)



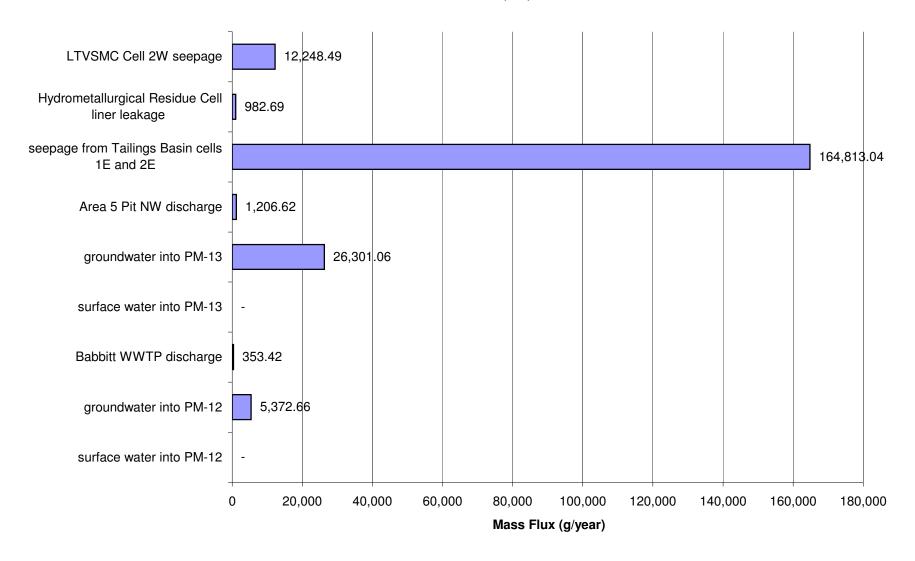
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 8 for High Flow for Copper (Cu)



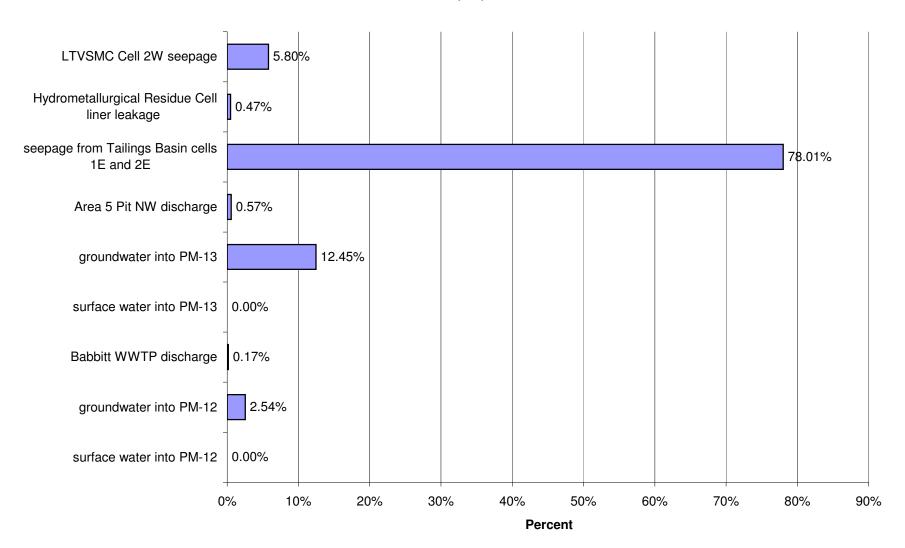
Proposed Action: Percent of Impacts at PM-13 in Year 8 for High Flow for Copper (Cu)



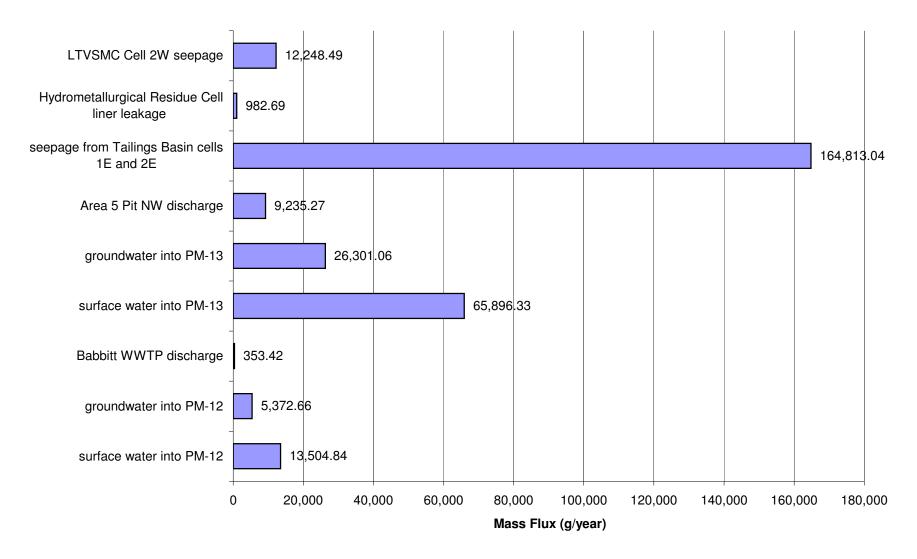
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 8 for Low Flow for Nickel (Ni)



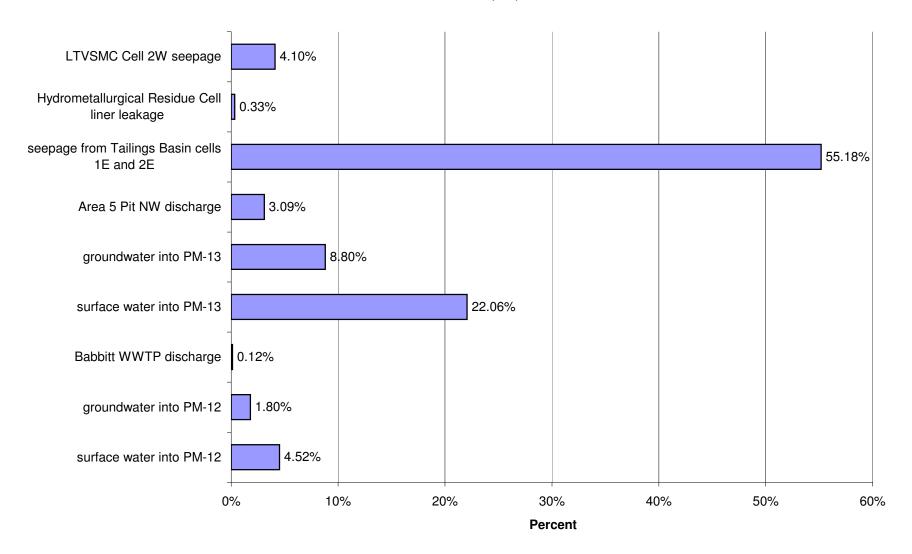
Proposed Action: Percent of Impacts at PM-13 in Year 8 for Low Flow for Nickel (Ni)



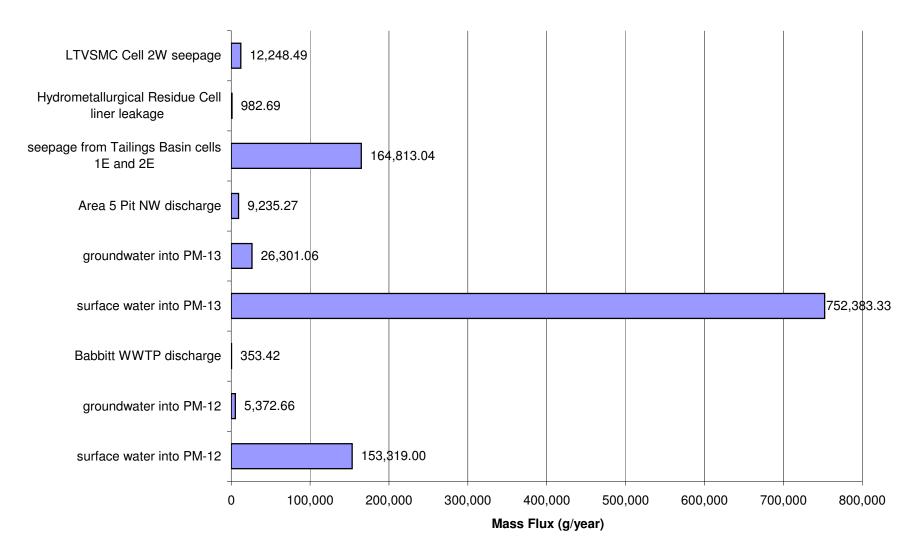
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 8 for Average Flow for Nickel (Ni)



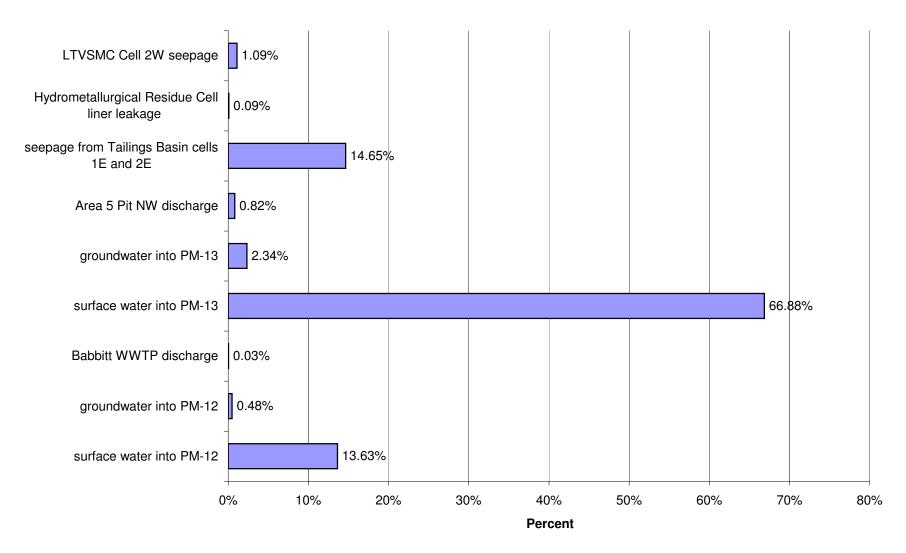
Proposed Action: Percent of Impacts at PM-13 in Year 8 for Average Flow for Nickel (Ni)



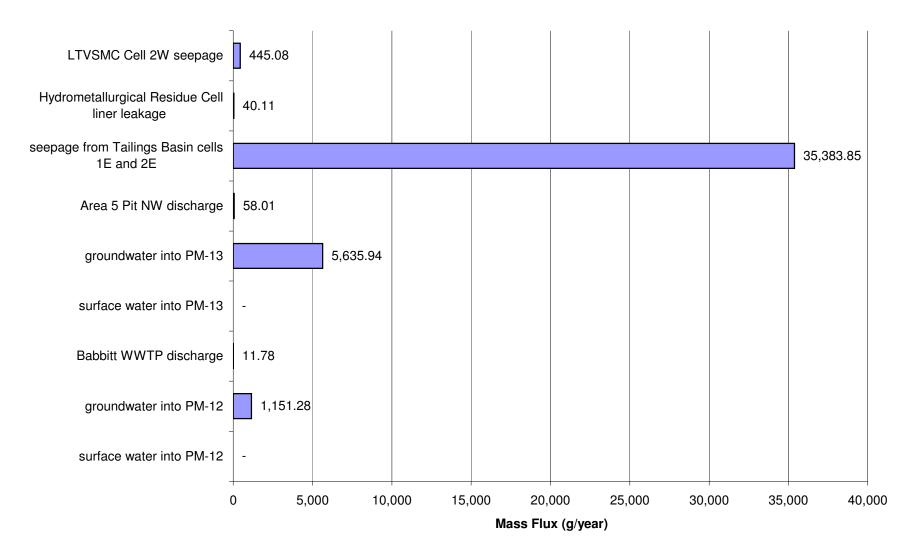
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 8 for High Flow for Nickel (Ni)



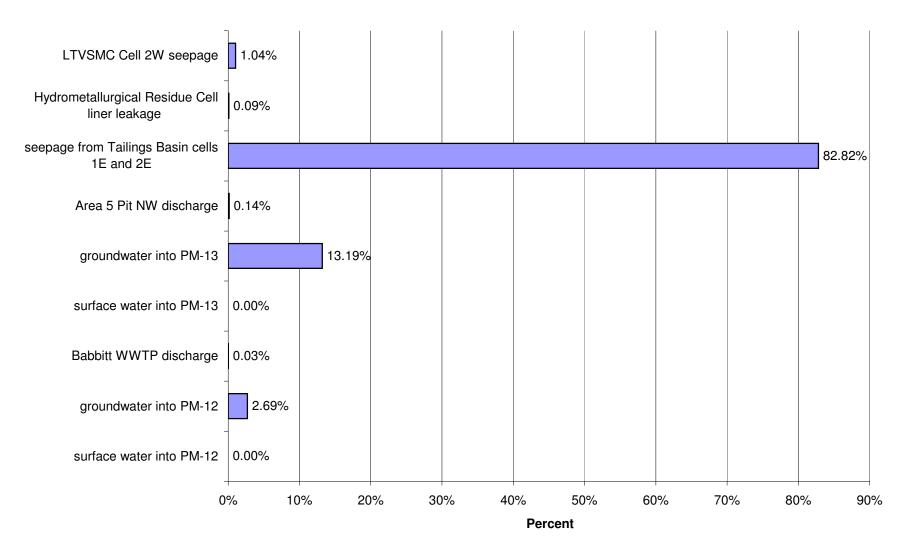
Proposed Action: Percent of Impacts at PM-13 in Year 8 for High Flow for Nickel (Ni)



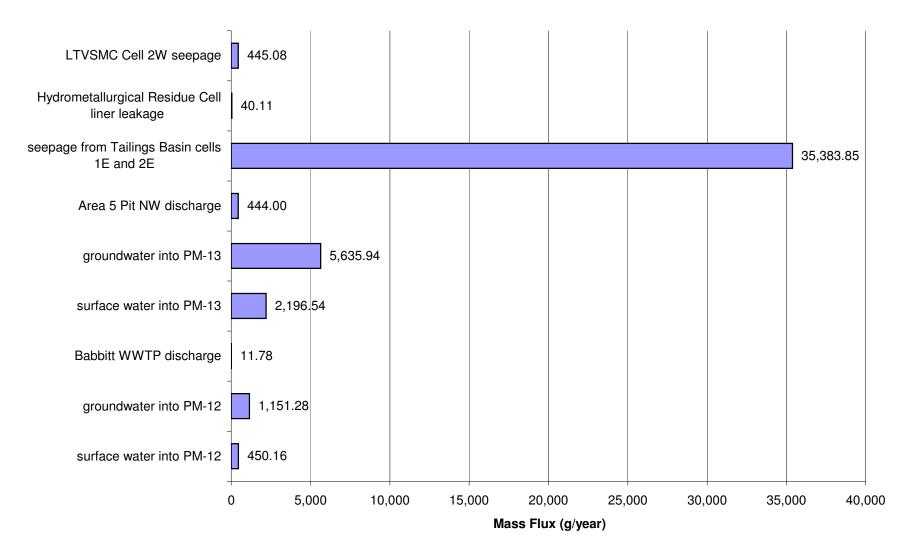
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 8 for Low Flow for Antimony (Sb)



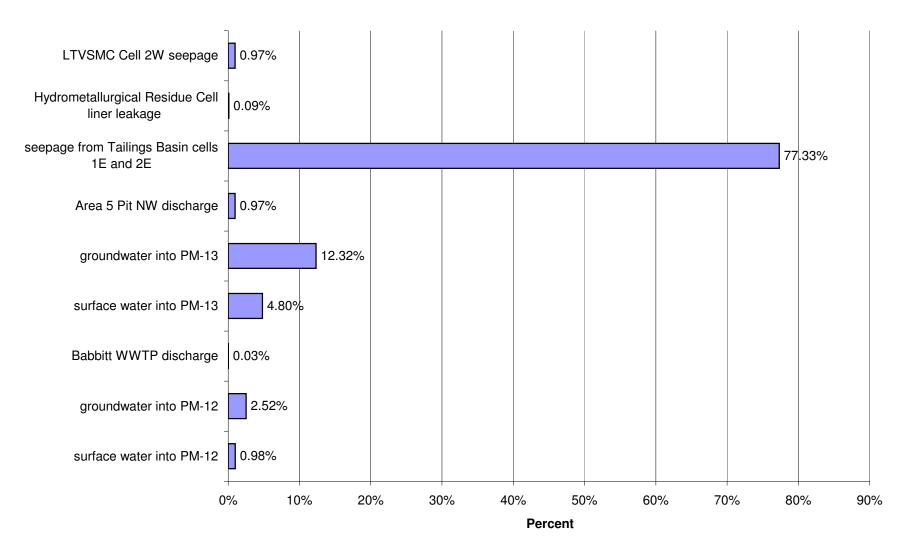
Proposed Action: Percent of Impacts at PM-13 in Year 8 for Low Flow for Antimony (Sb)



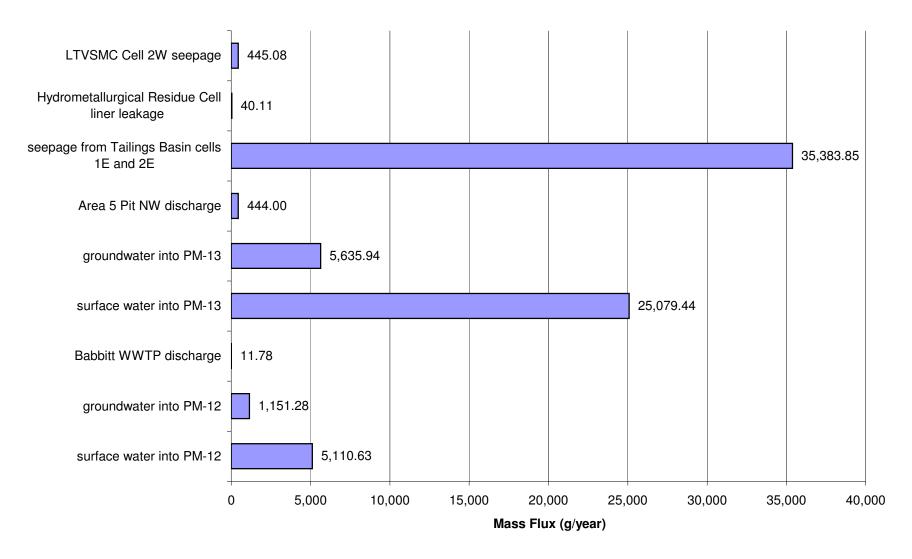
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 8 for Average Flow for Antimony (Sb)



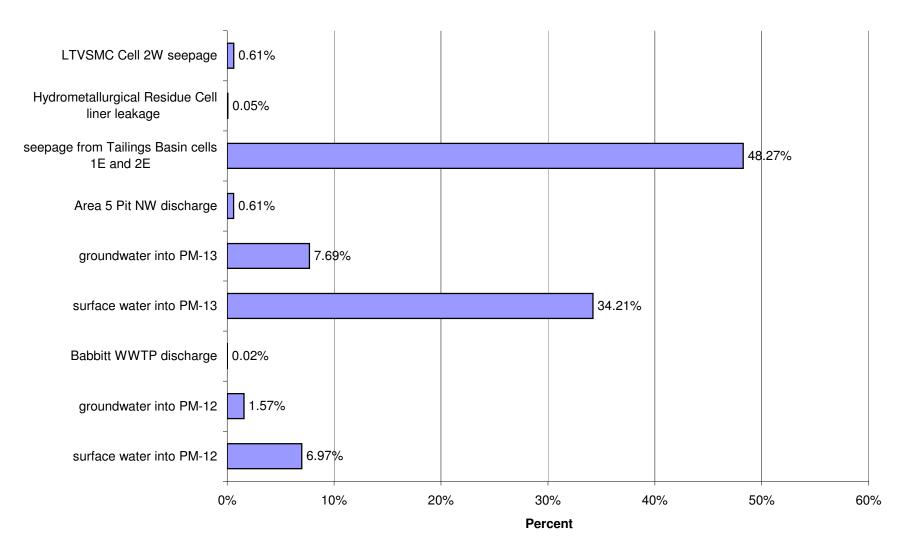
Proposed Action: Percent of Impacts at PM-13 in Year 8 for Average Flow for Antimony (Sb)



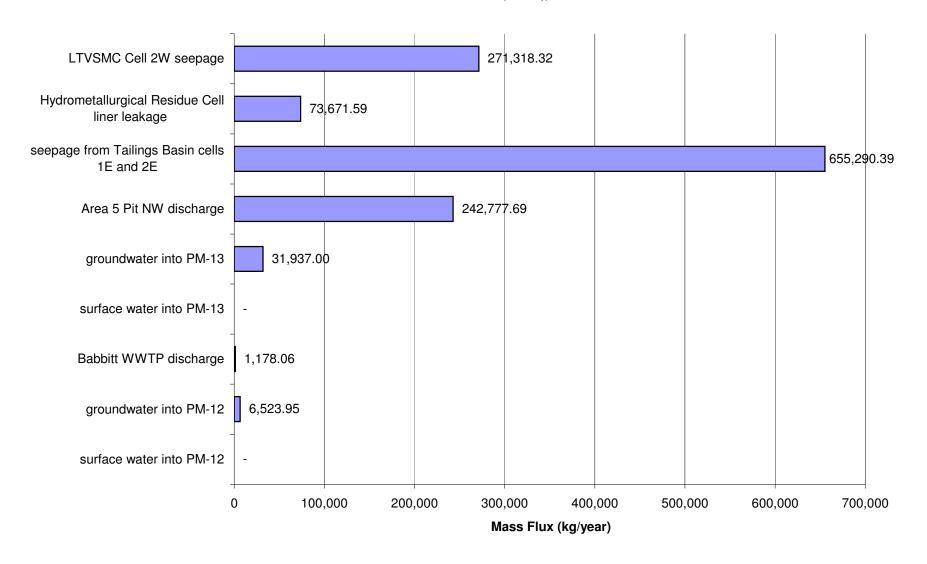
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 8 for High Flow for Antimony (Sb)



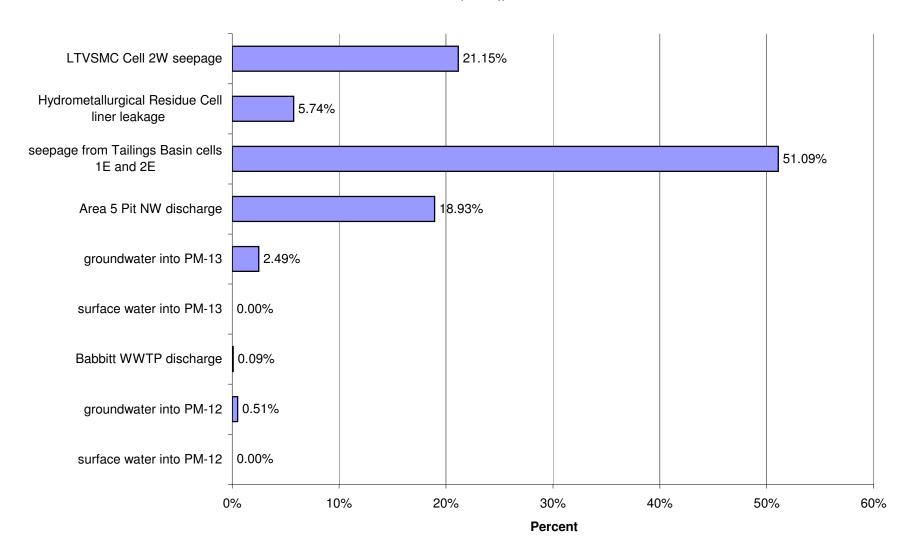
Proposed Action: Percent of Impacts at PM-13 in Year 8 for High Flow for Antimony (Sb)



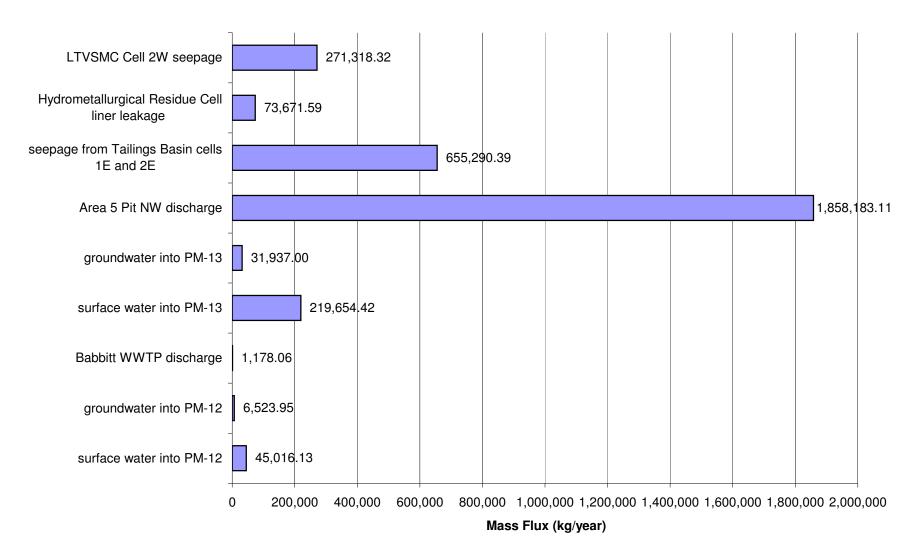
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 8 for Low Flow for Sulfate (SO₄)



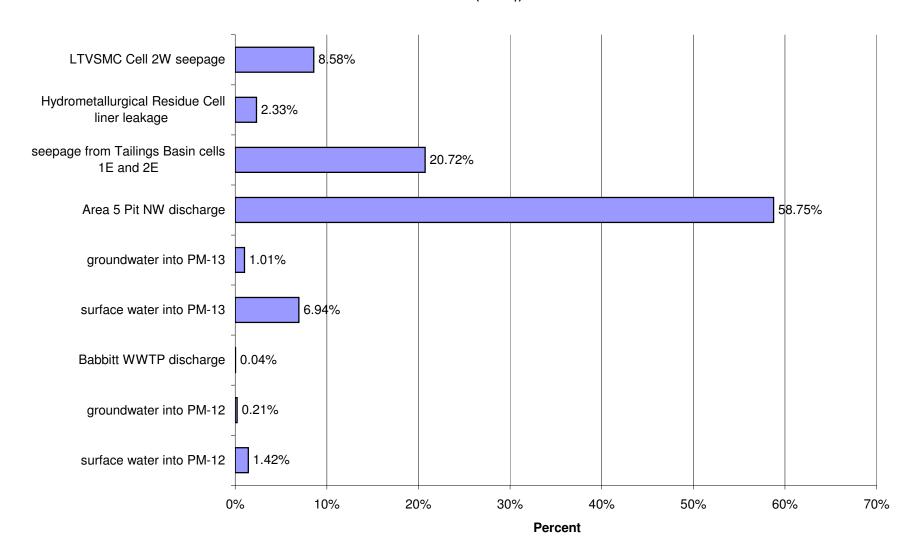
Proposed Action: Percent of Impacts at PM-13 in Year 8 for Low Flow for Sulfate (SO₄)



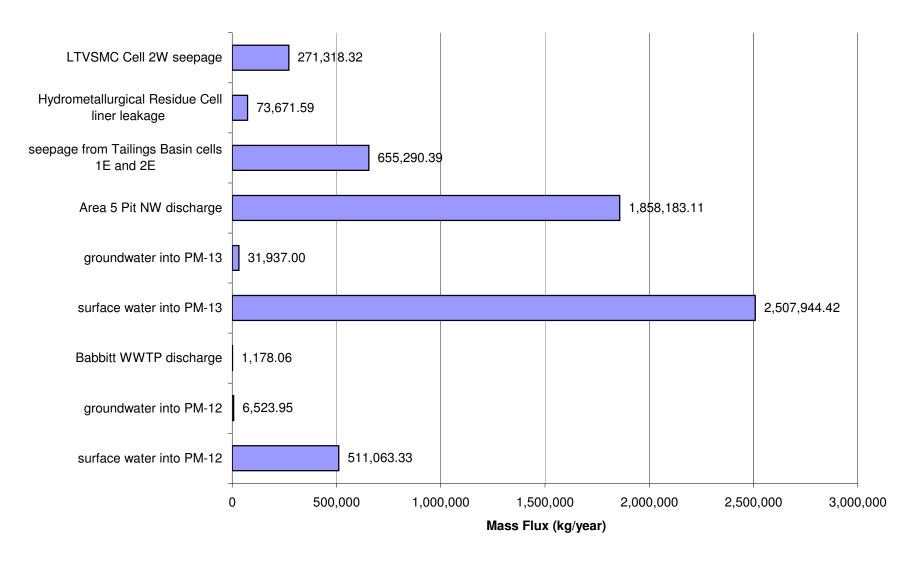
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 8 for Average Flow for Sulfate (SO₄)



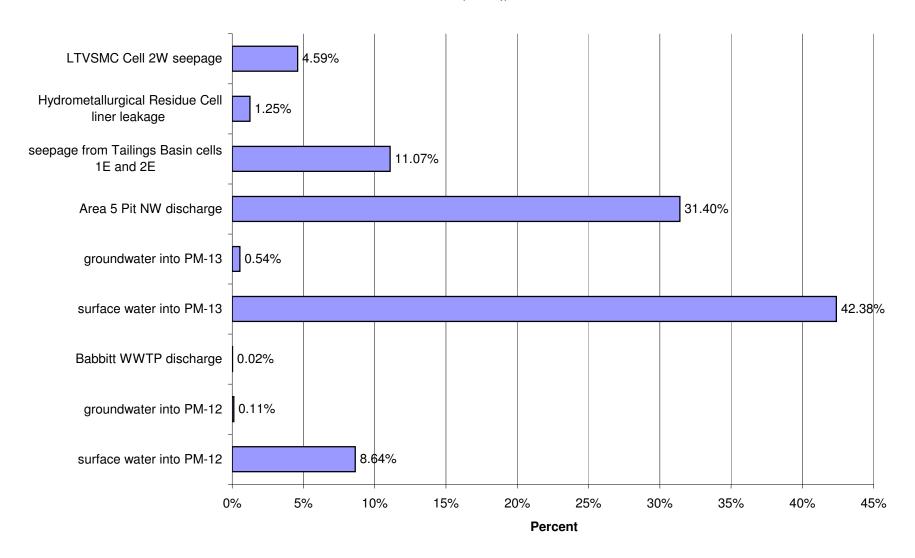
Proposed Action: Percent of Impacts at PM-13 in Year 8 for Average Flow for Sulfate (SO₄)



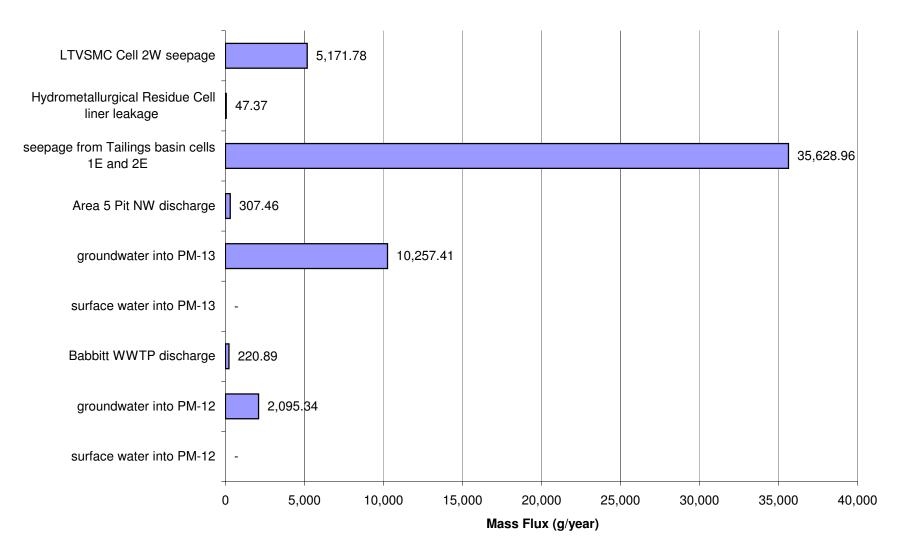
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 8 for High Flow for Sulfate (SO₄)



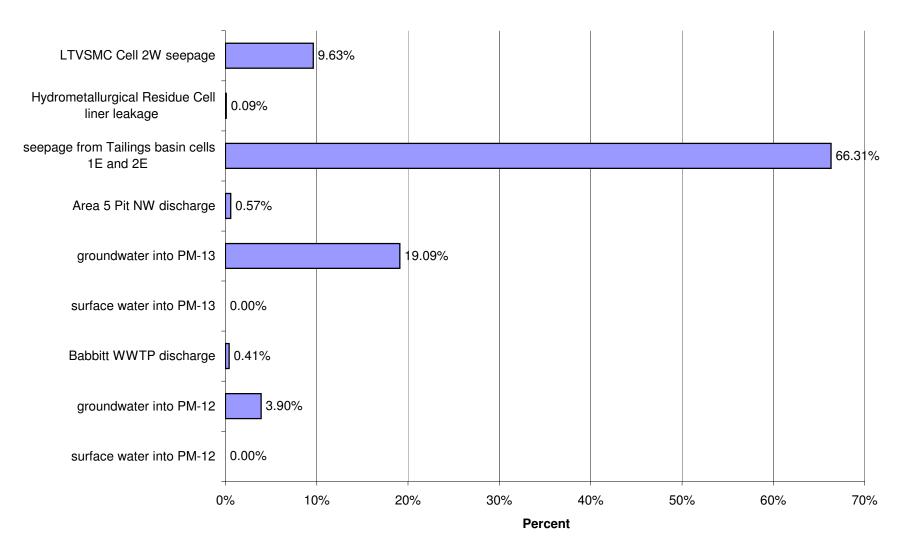
Proposed Action: Percent of Impacts at PM-13 in Year 8 for High Flow for Sulfate (SO₄)



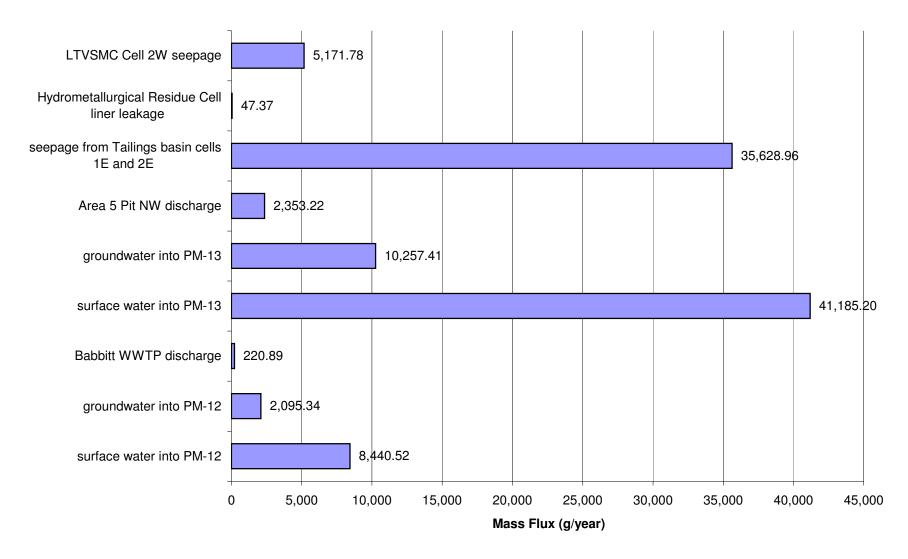
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 9 for Low Flow for Arsenic (As)



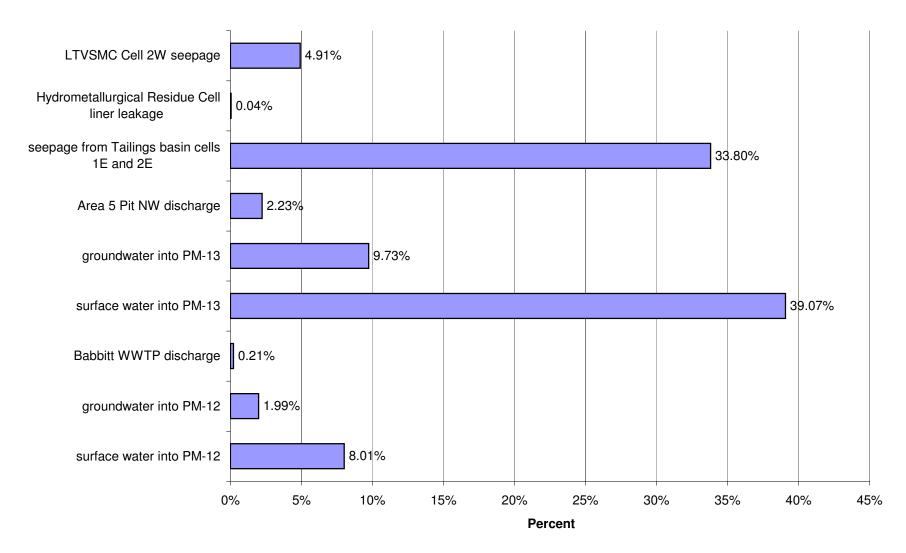
Proposed Action: Percent of Impacts at PM-13 in Year 9 for Low Flow for Arsenic (As)



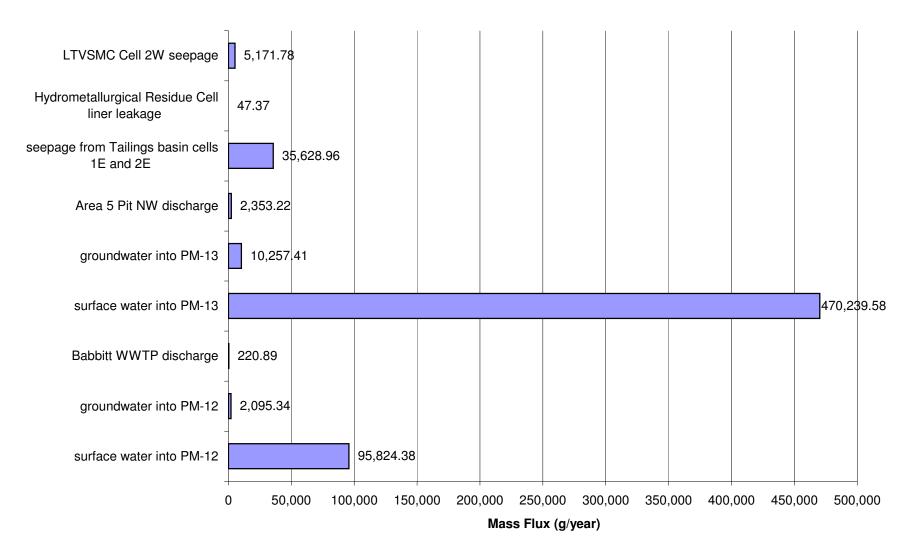
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 9 for Average Flow for Arsenic (As)



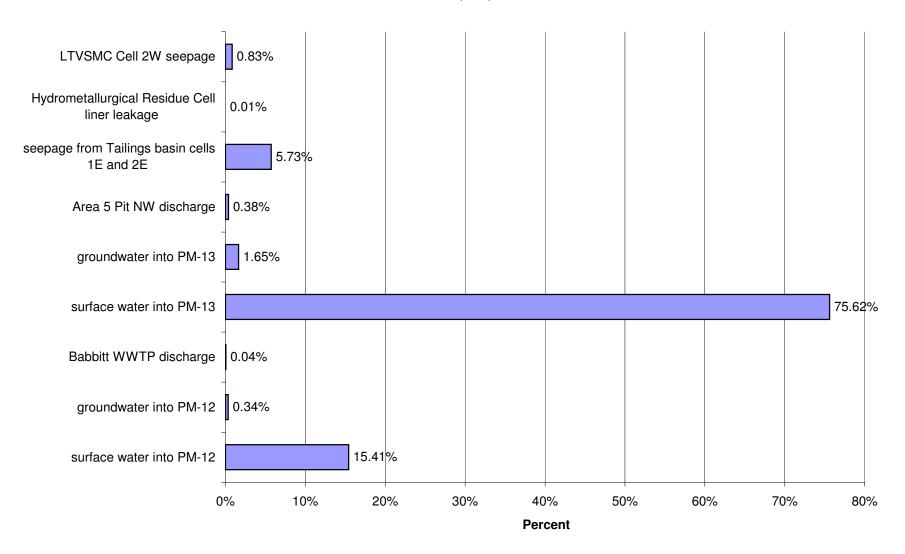
Proposed Action: Percent of Impacts at PM-13 in Year 9 for Average Flow for Arsenic (As)



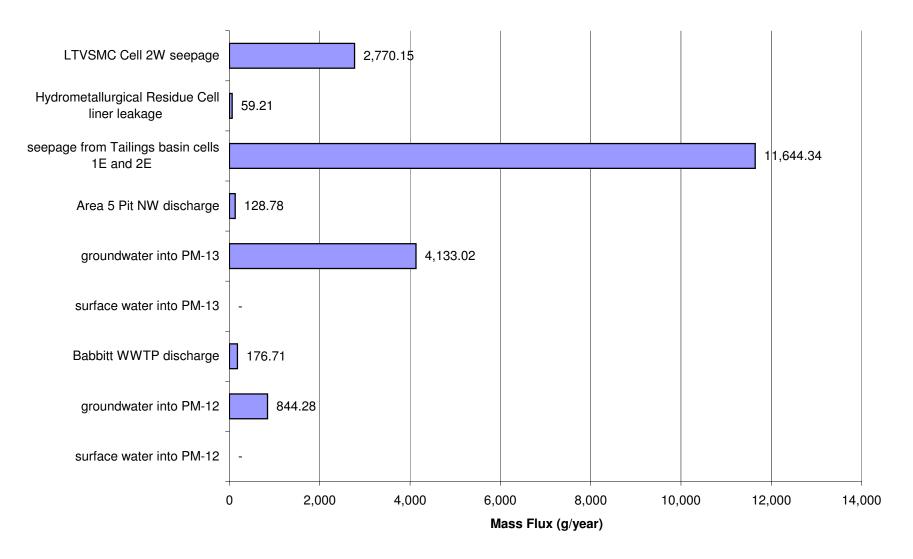
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 9 for High Flow for Arsenic (As)



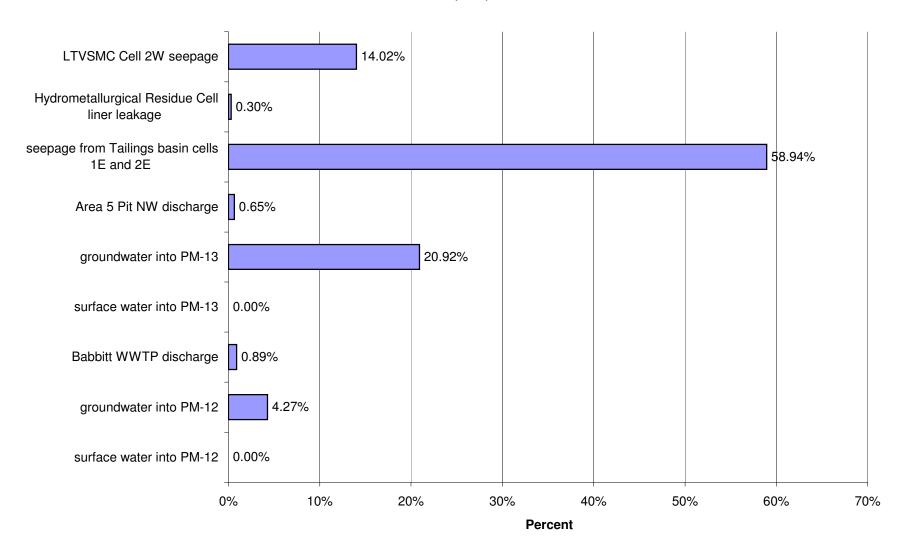
Proposed Action: Percent of Impacts at PM-13 in Year 9 for High Flow for Arsenic (As)



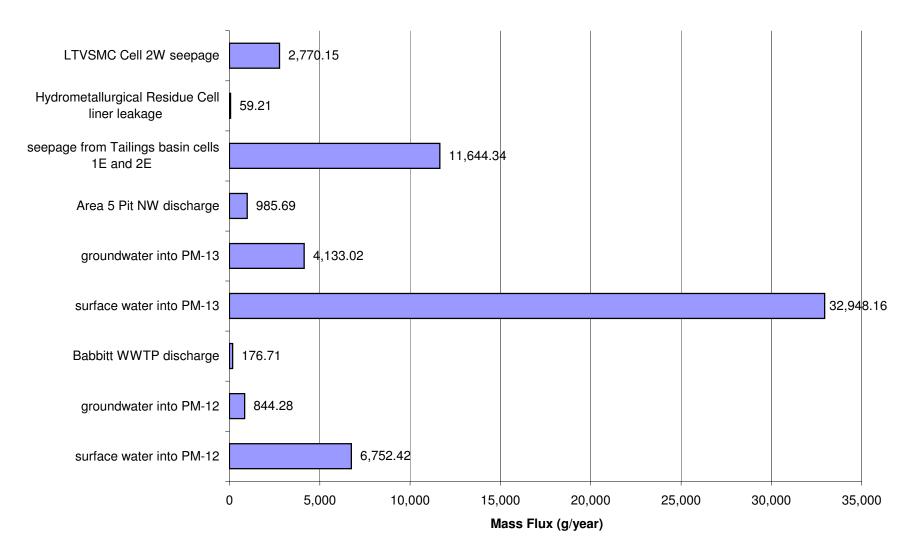
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 9 for Low Flow for Cobalt (Co)



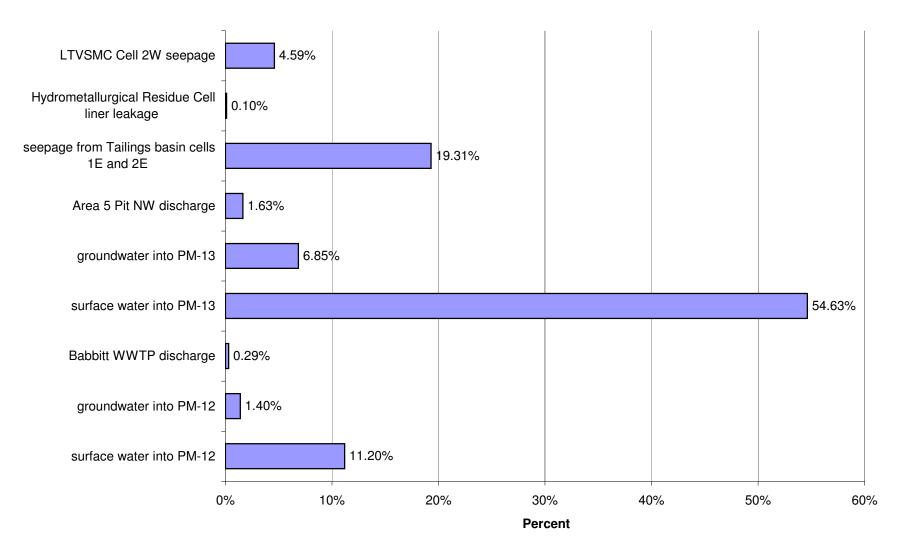
Proposed Action: Percent of Impacts at PM-13 in Year 9 for Low Flow for Cobalt (Co)



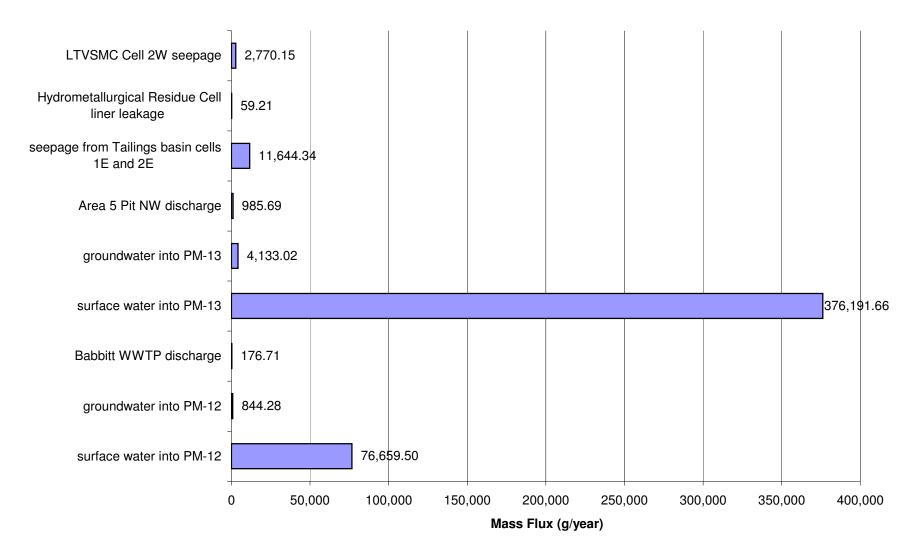
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 9 for Average Flow for Cobalt (Co)



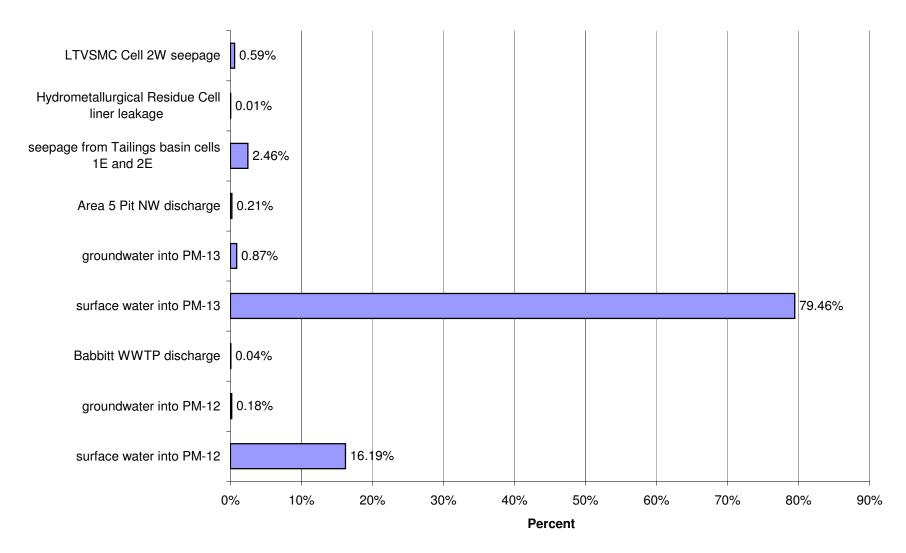
Proposed Action: Percent of Impacts at PM-13 in Year 9 for Average Flow for Cobalt (Co)



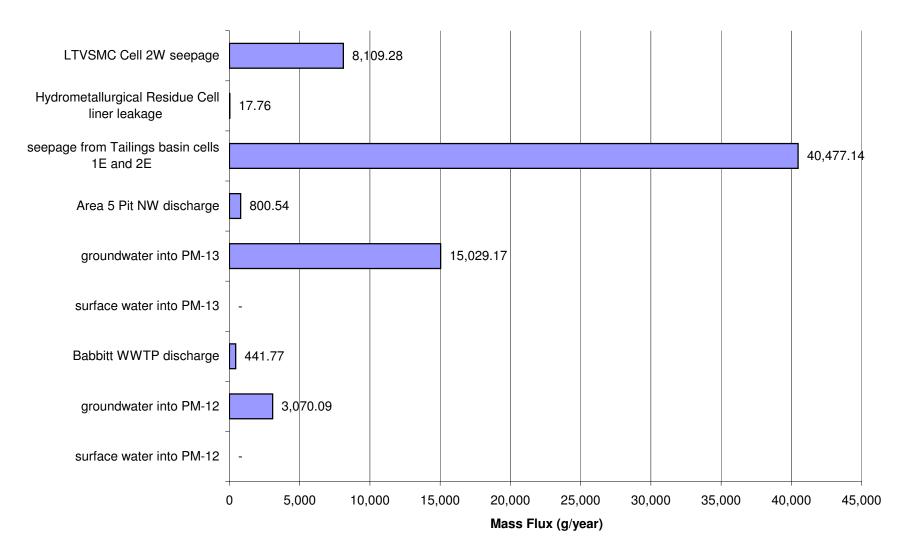
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 9 for High Flow for Cobalt (Co)



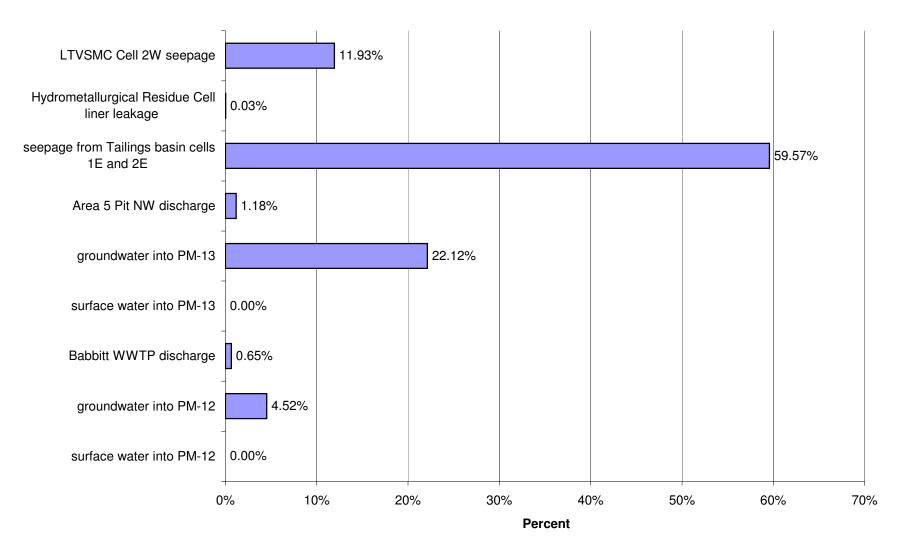
Proposed Action: Percent of Impacts at PM-13 in Year 9 for High Flow for Cobalt (Co)



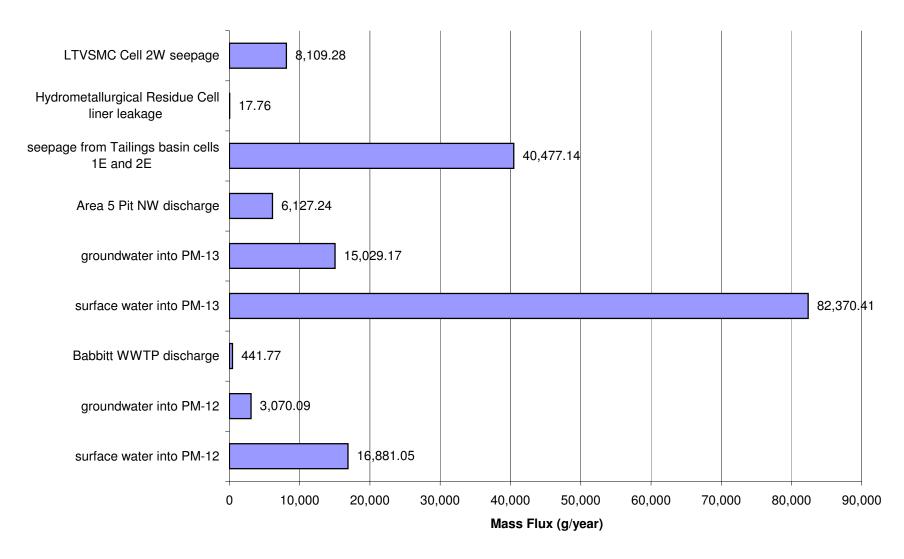
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 9 for Low Flow for Copper (Cu)



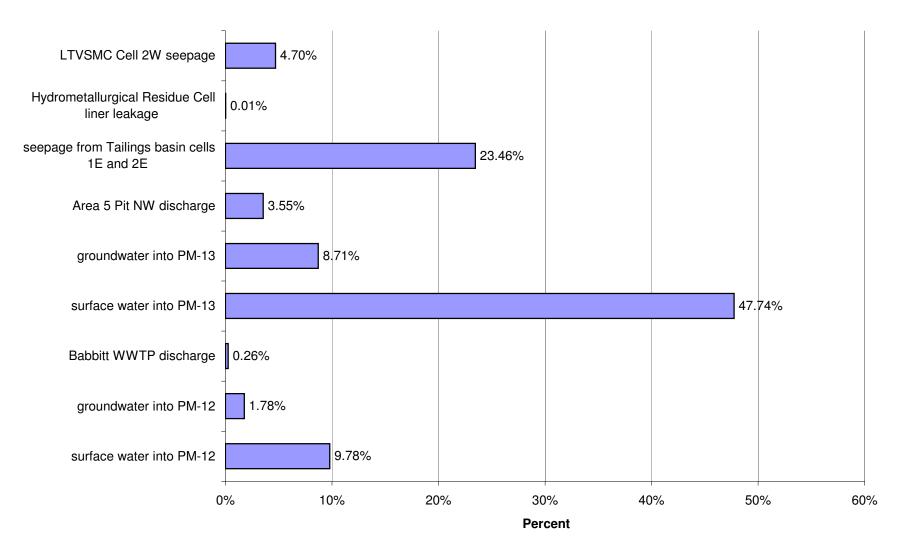
Proposed Action: Percent of Impacts at PM-13 in Year 9 for Low Flow for Copper (Cu)



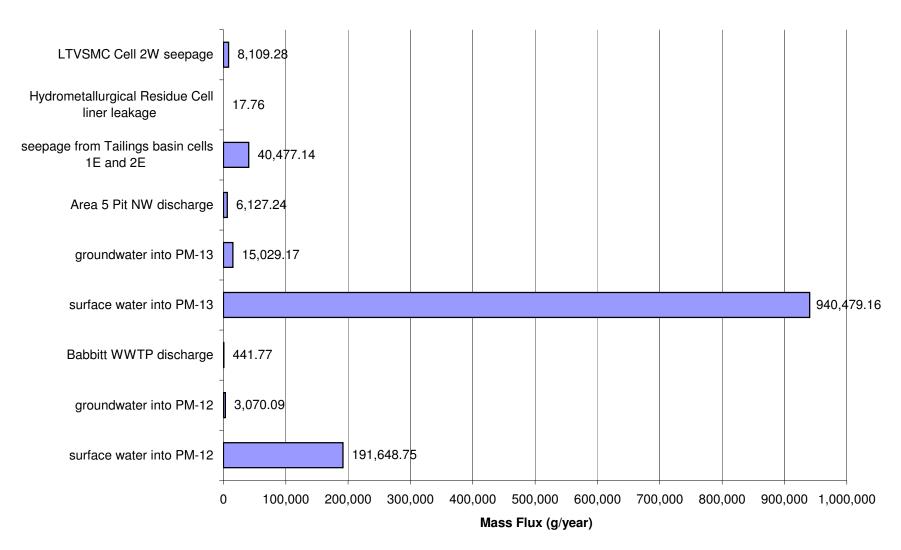
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 9 for Average Flow for Copper (Cu)



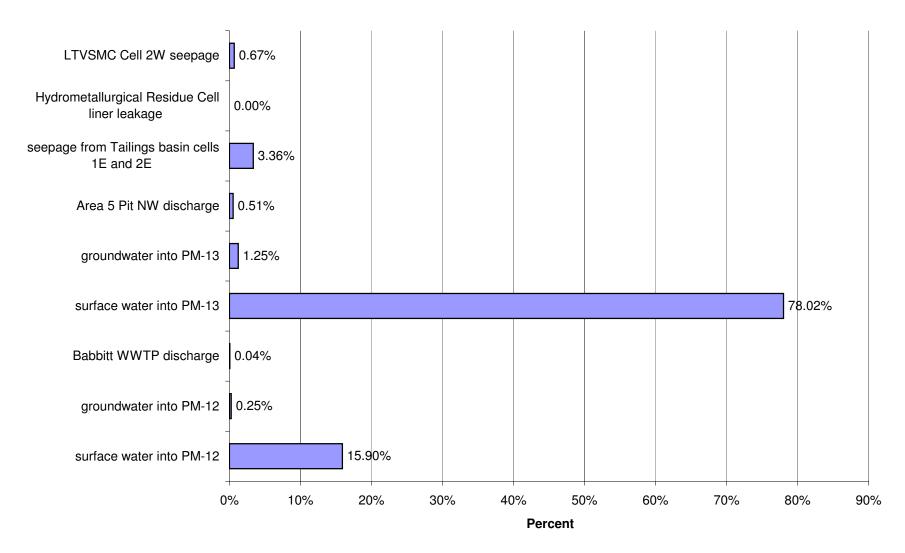
Proposed Action: Percent of Impacts at PM-13 in Year 9 for Average Flow for Copper (Cu)



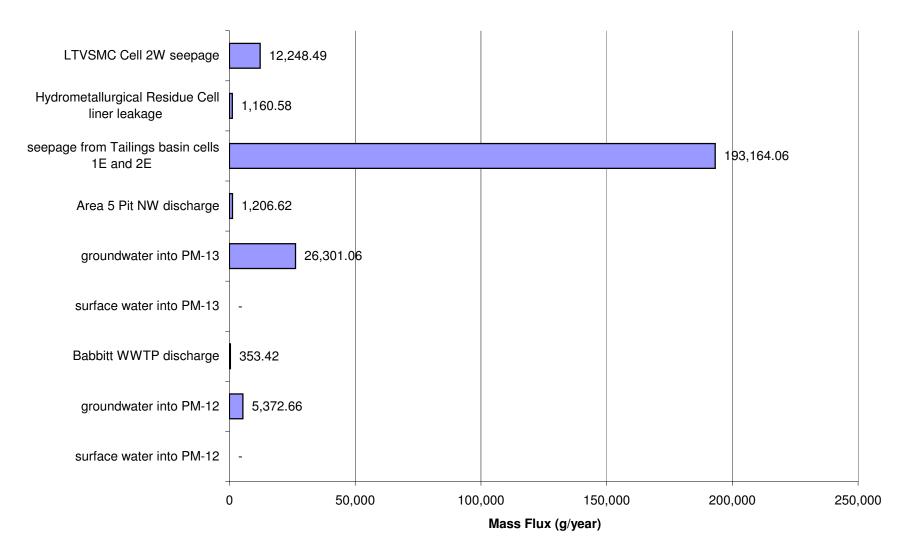
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 9 for High Flow for Copper (Cu)



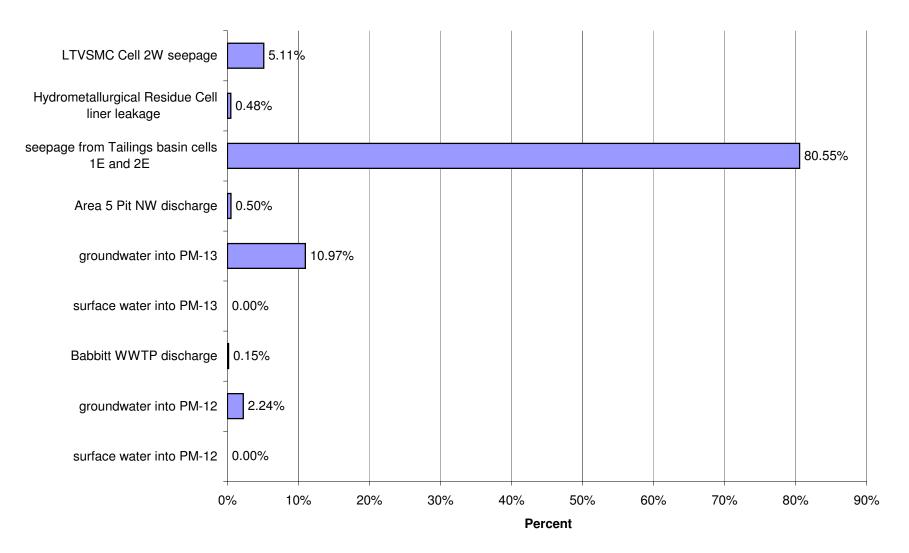
Proposed Action: Percent of Impacts at PM-13 in Year 9 for High Flow for Copper (Cu)



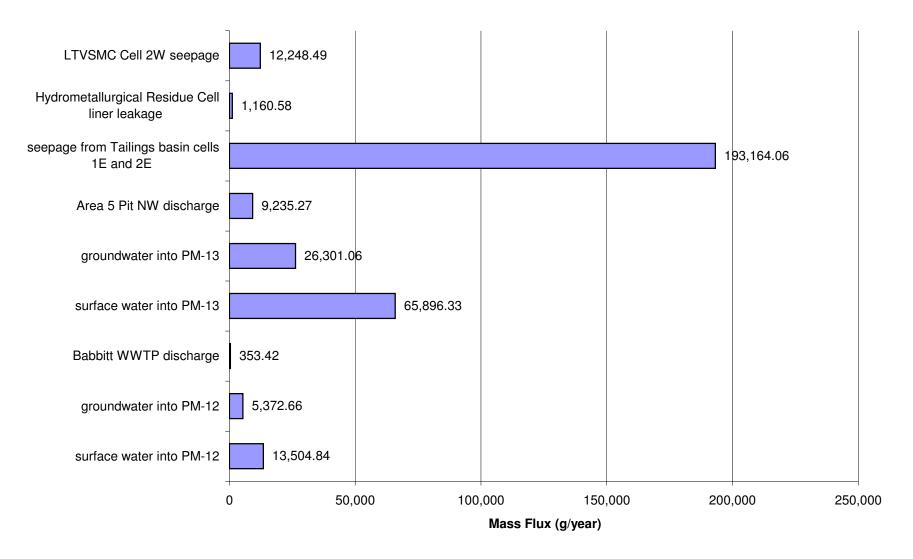
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 9 for Low Flow for Nickel (Ni)



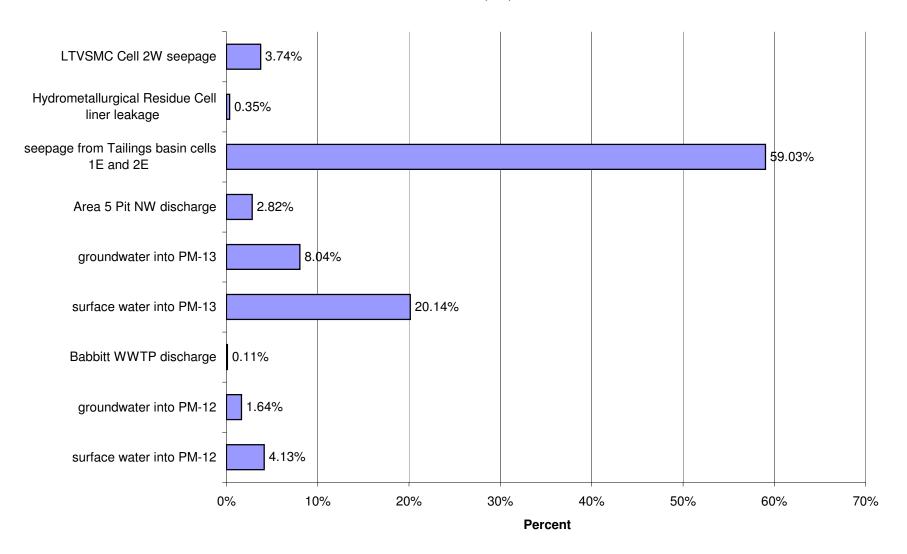
Proposed Action: Percent of Impacts at PM-13 in Year 9 for Low Flow for Nickel (Ni)



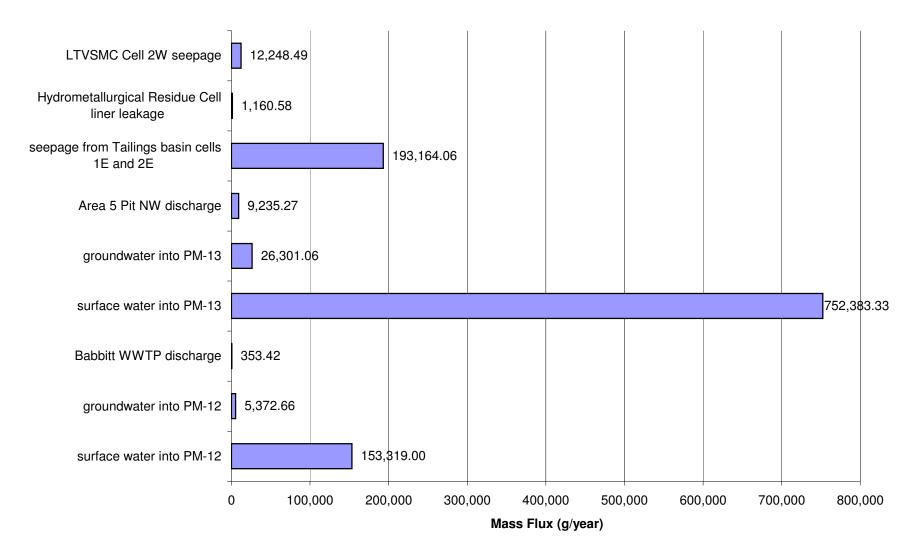
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 9 for Average Flow for Nickel (Ni)



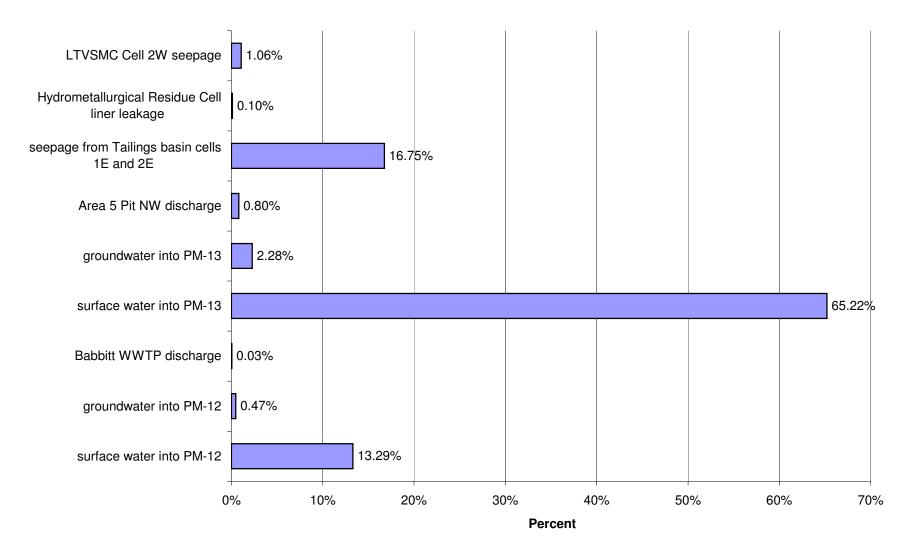
Proposed Action: Percent of Impacts at PM-13 in Year 9 for Average Flow for Nickel (Ni)



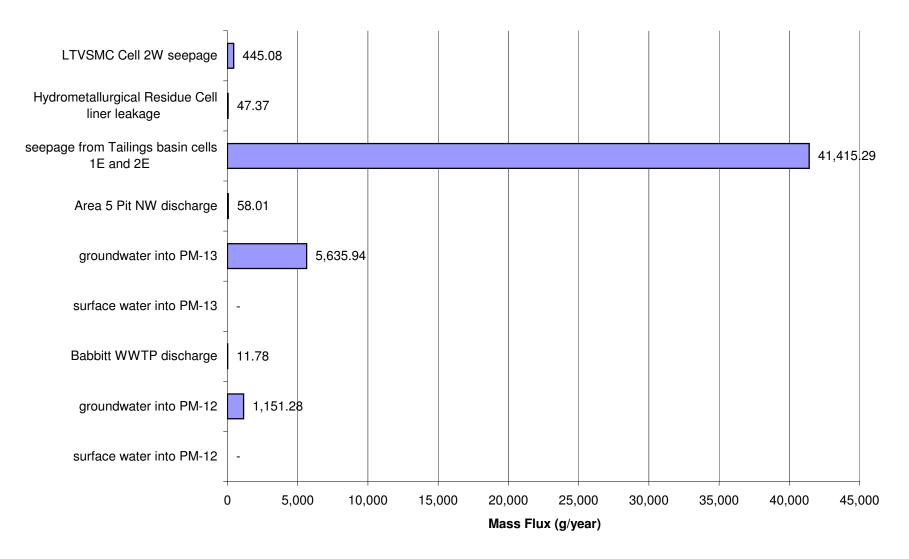
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 9 for High Flow for Nickel (Ni)



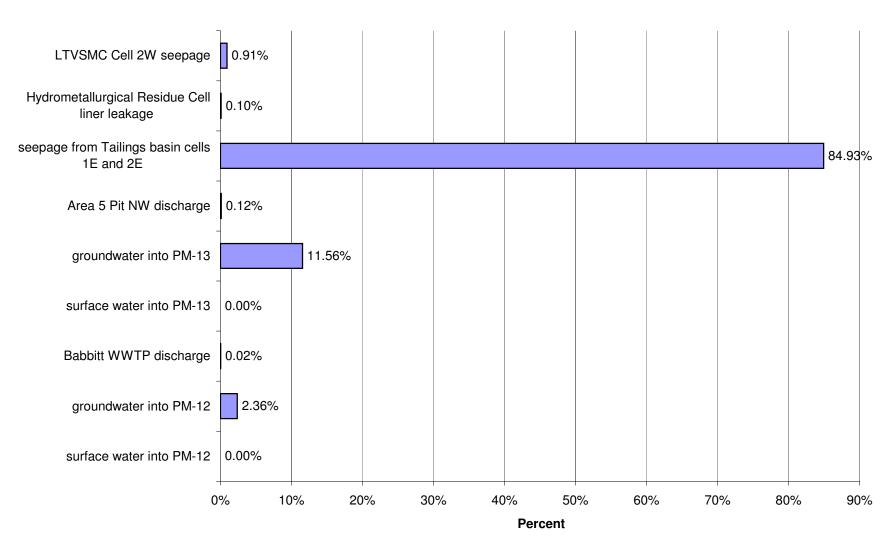
Proposed Action: Percent of Impacts at PM-13 in Year 9 for High Flow for Nickel (Ni)



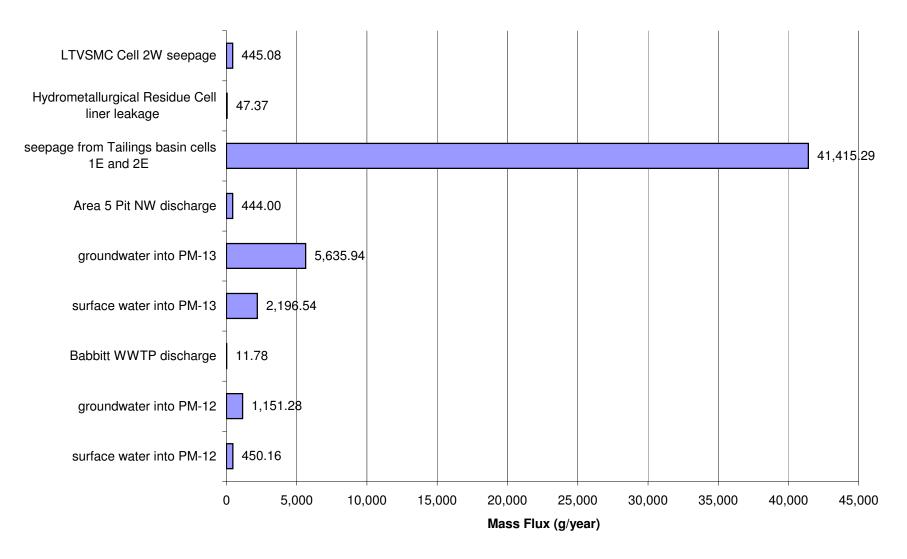
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 9 for Low Flow for Antimony (Sb)



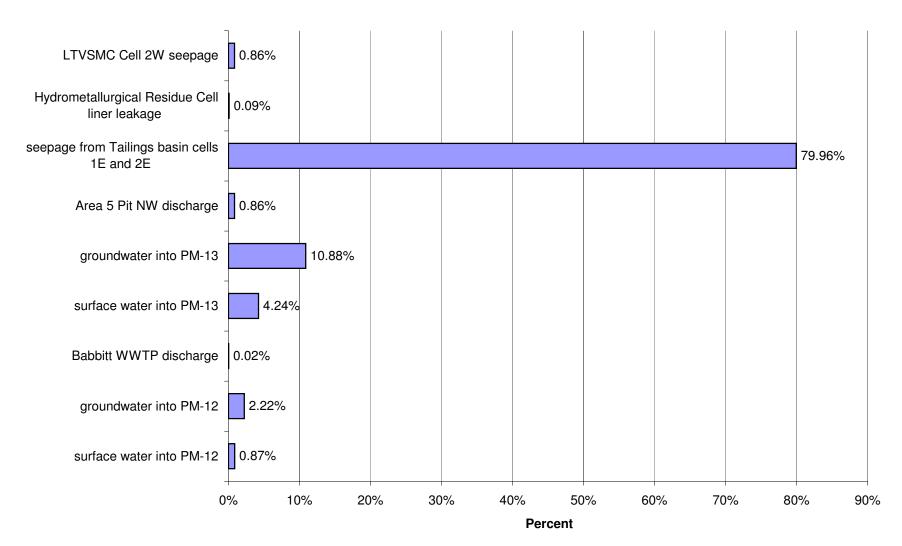
Proposed Action: Percent of Impacts at PM-13 in Year 9 for Low Flow for Antimony (Sb)



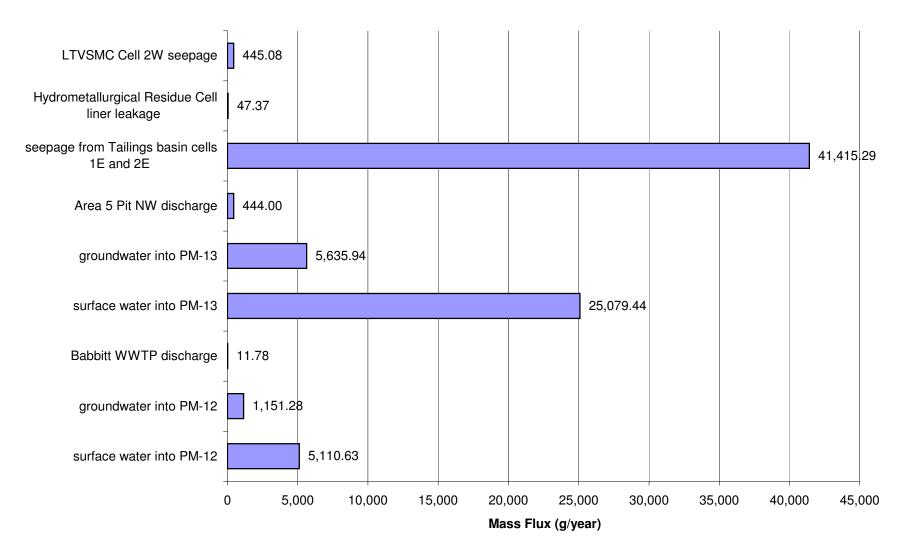
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 9 for Average Flow for Antimony (Sb)



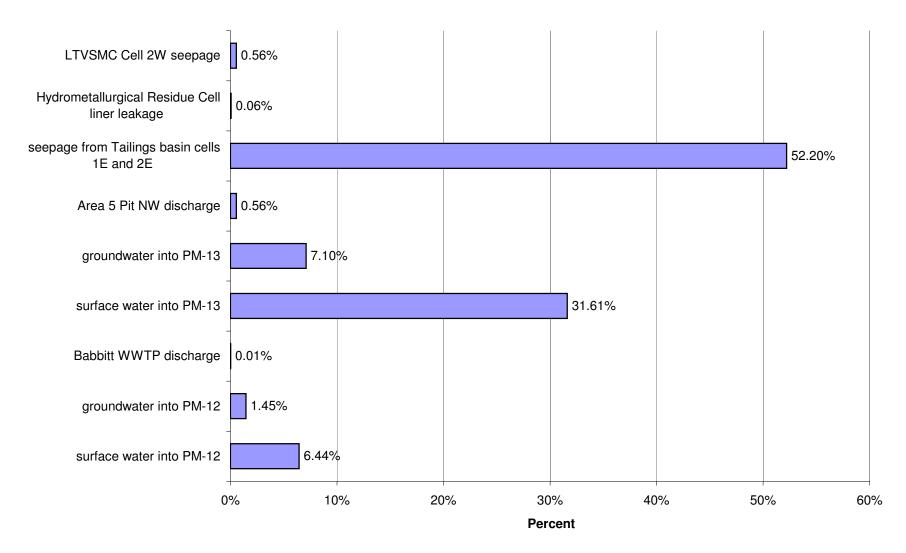
Proposed Action: Percent of Impacts at PM-13 in Year 9 for Average Flow for Antimony (Sb)



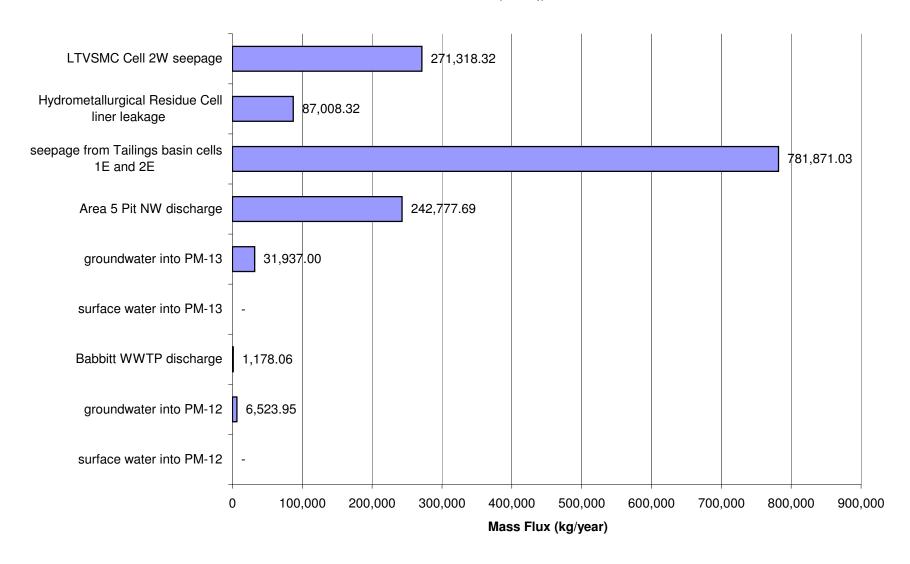
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 9 for High Flow for Antimony (Sb)



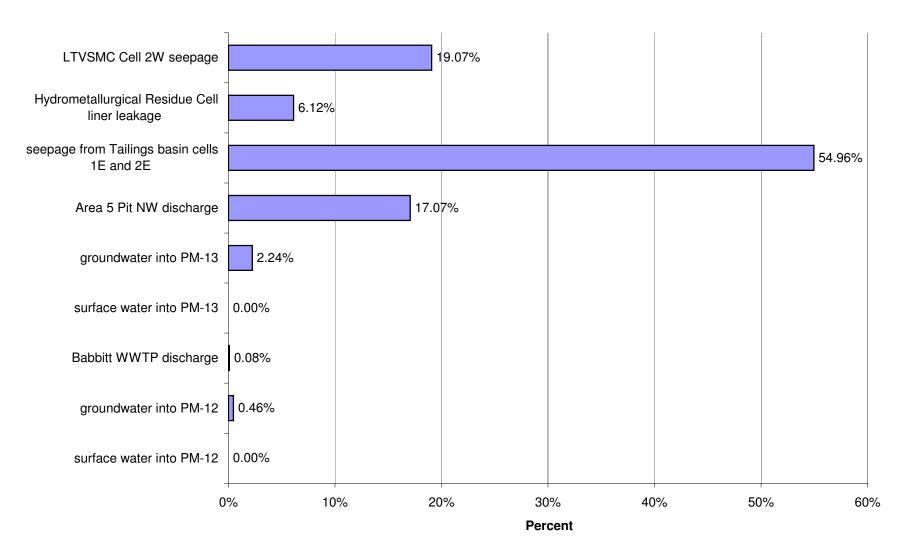
Proposed Action: Percent of Impacts at PM-13 in Year 9 for High Flow for Antimony (Sb)



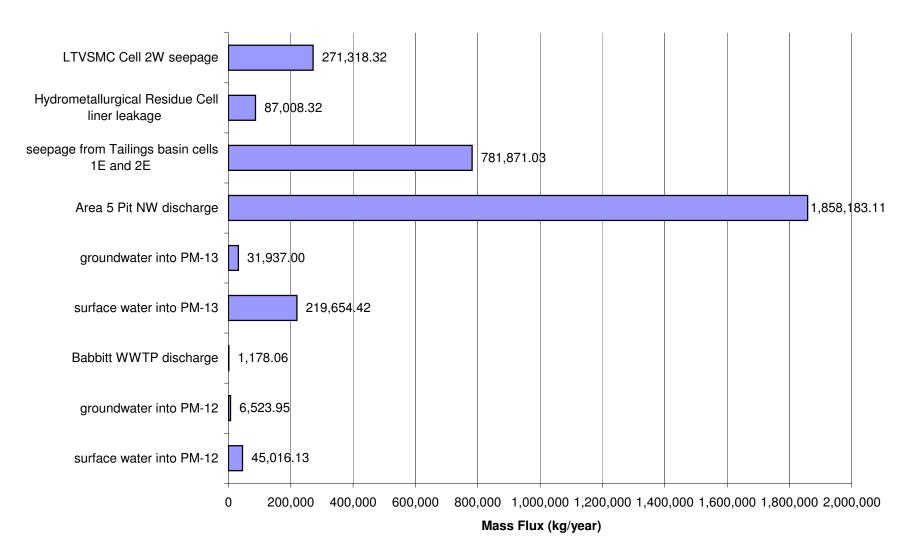
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 9 for Low Flow for Sulfate (SO₄)



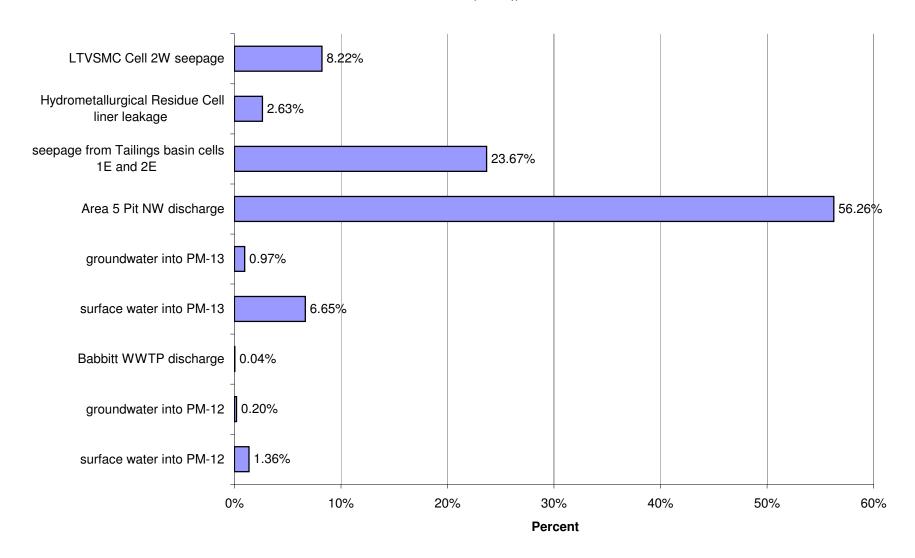
Proposed Action: Percent of Impacts at PM-13 in Year 9 for Low Flow for Sulfate (SO₄)



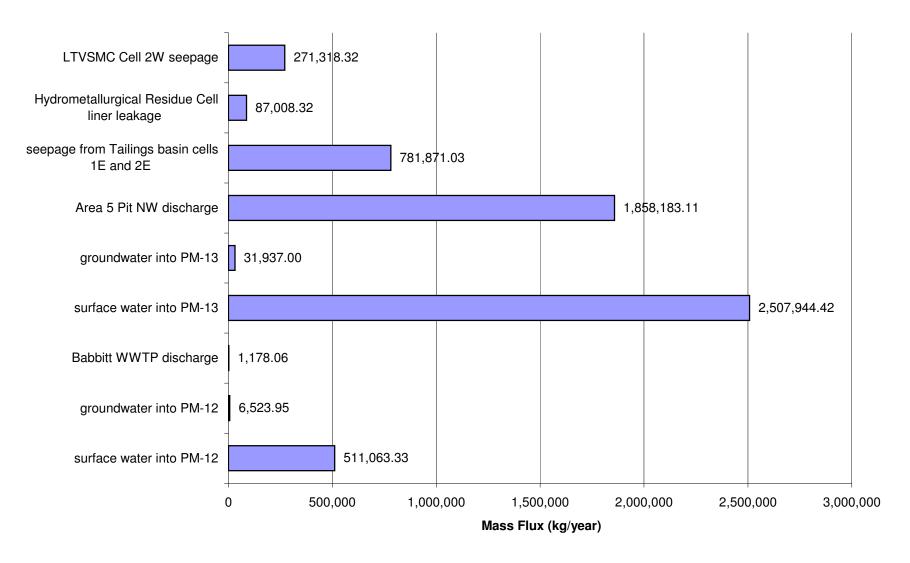
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 9 for Average Flow for Sulfate (SO₄)



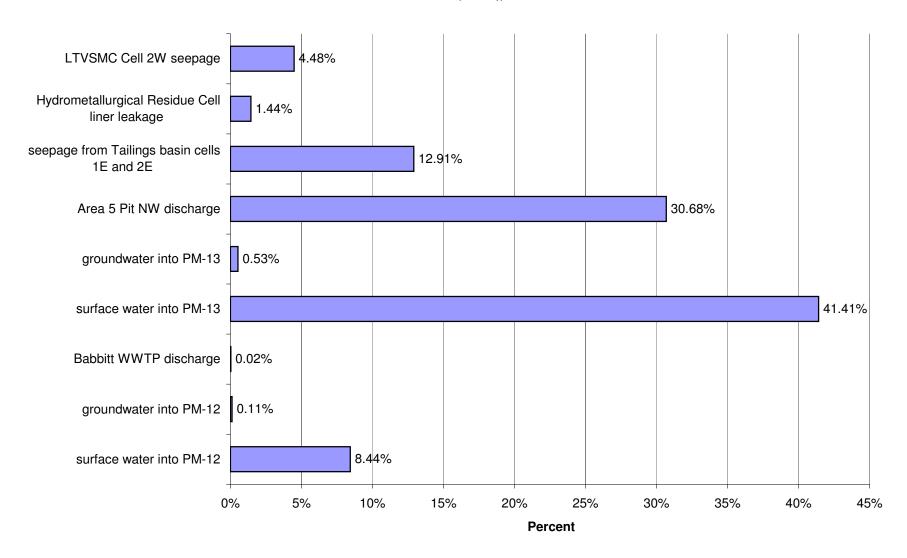
Proposed Action: Percent of Impacts at PM-13 in Year 9 for Average Flow for Sulfate (SO₄)



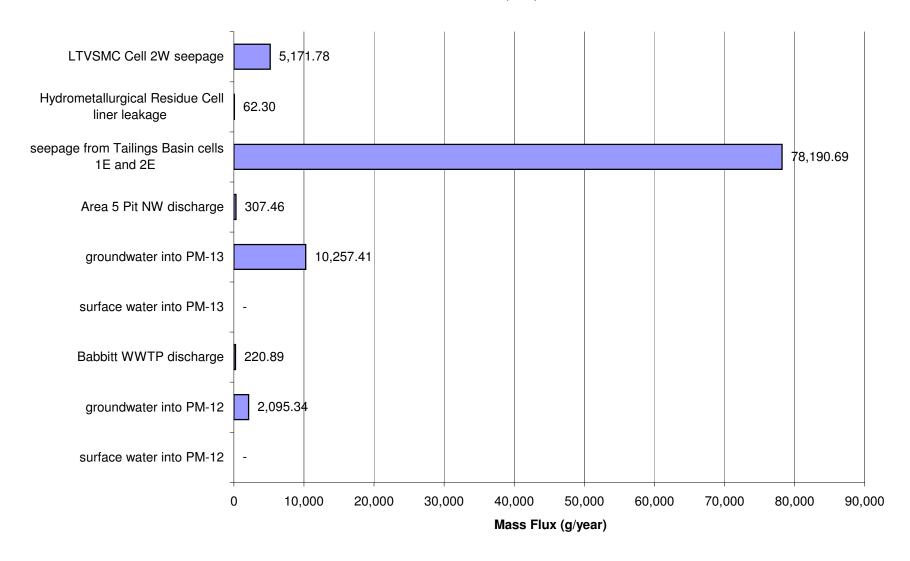
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 9 for High Flow for Sulfate (SO₄)



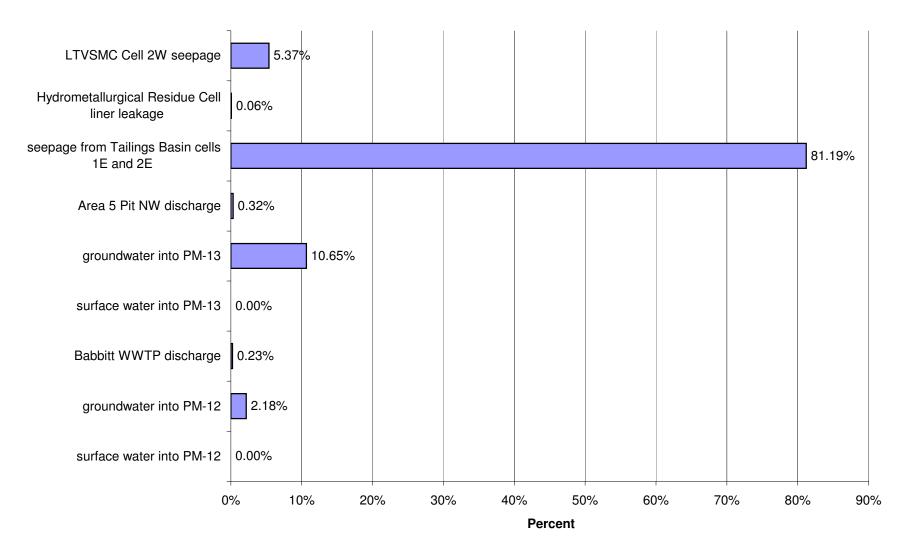
Proposed Action: Percent of Impacts at PM-13 in Year 9 for High Flow for Sulfate (SO₄)



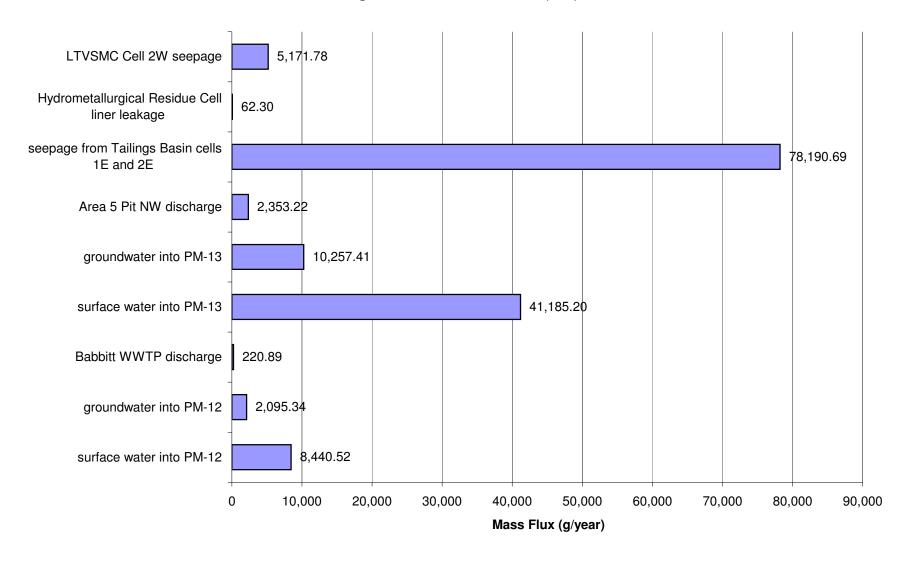
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Low Flow for Arsenic (As)



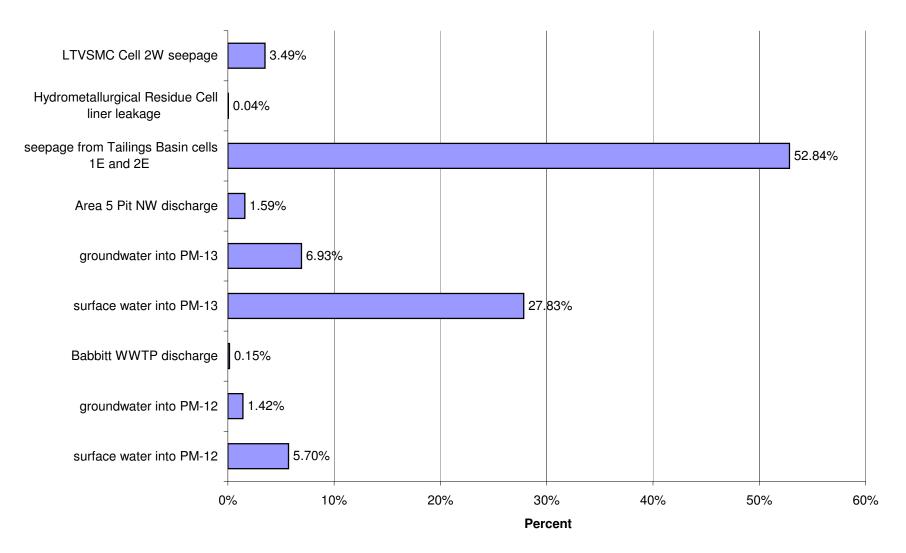
Proposed Action: Percent of Impacts at PM-13 in Year 15 for Low Flow for Arsenic (As)



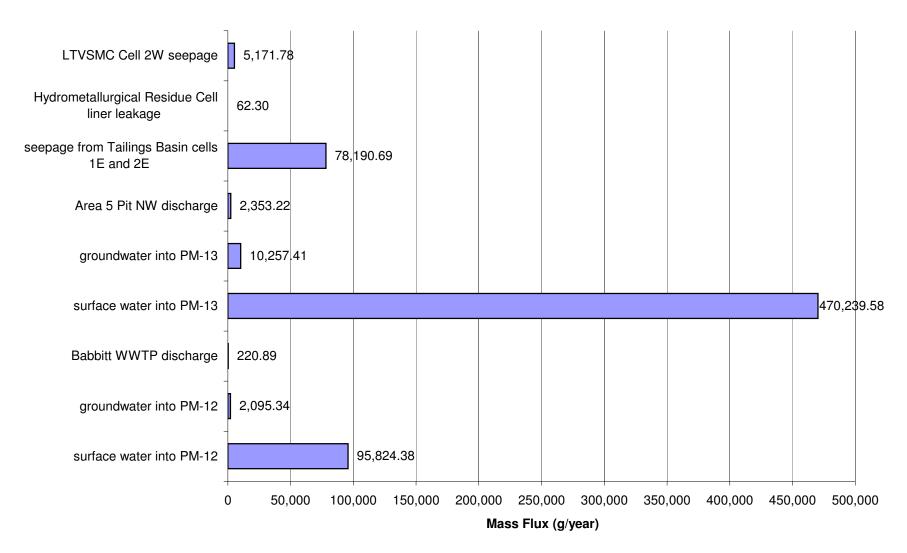
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Average Flow for Arsenic (As)



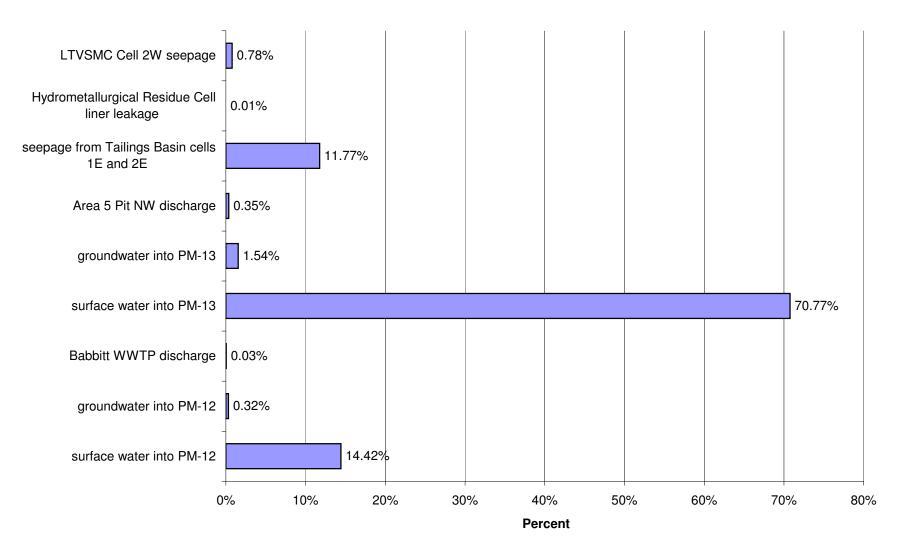
Proposed Action: Percent of Impacts at PM-13 in Year 15 for Average Flow for Arsenic (As)



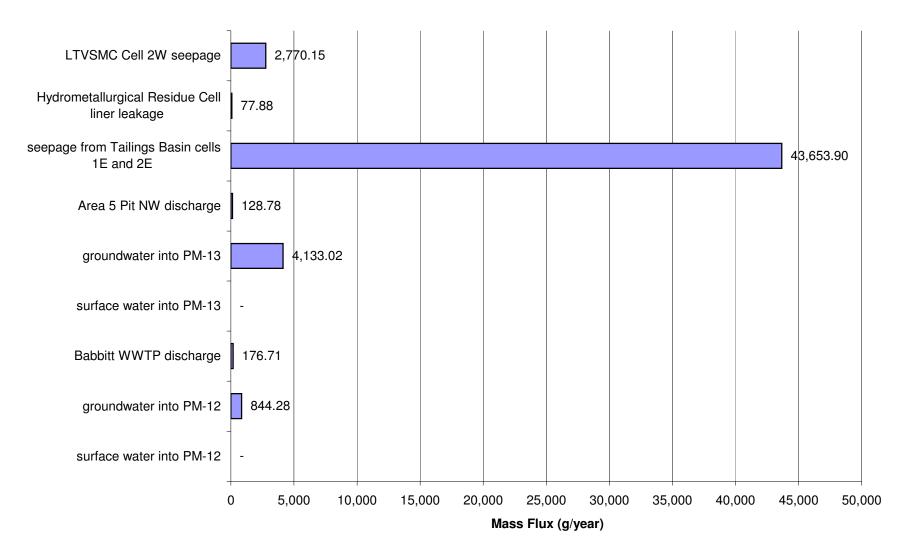
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for High Flow for Arsenic (As)



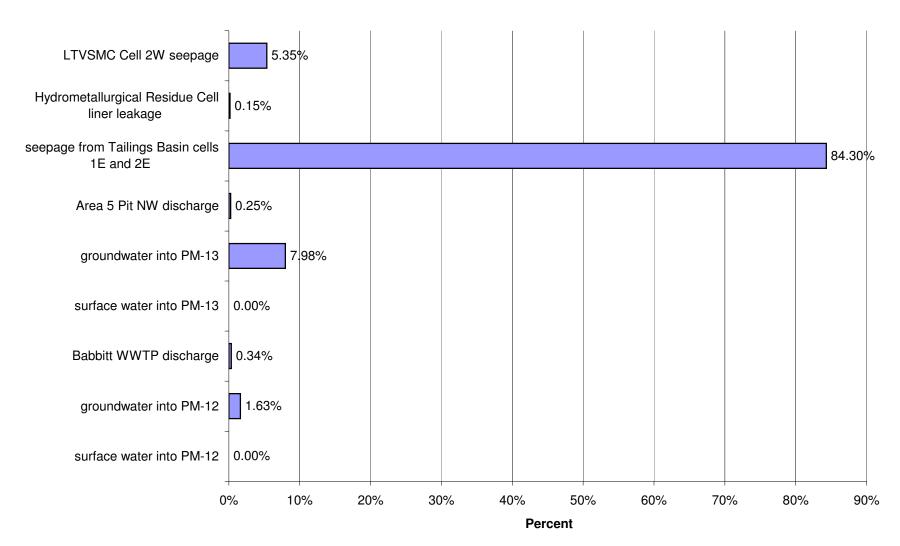
Proposed Action: Percent of Impacts at PM-13 in Year 15 for High Flow for Arsenic (As)



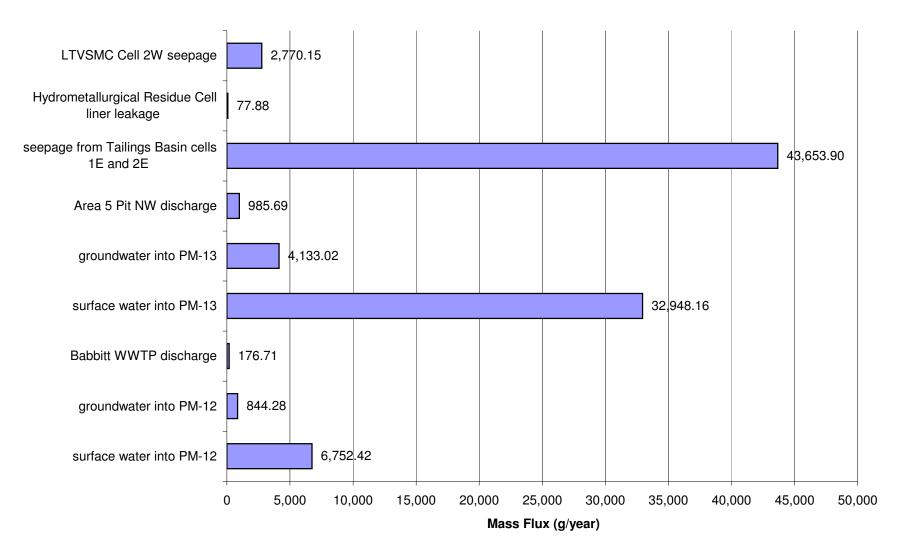
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Low Flow for Cobalt (Co)



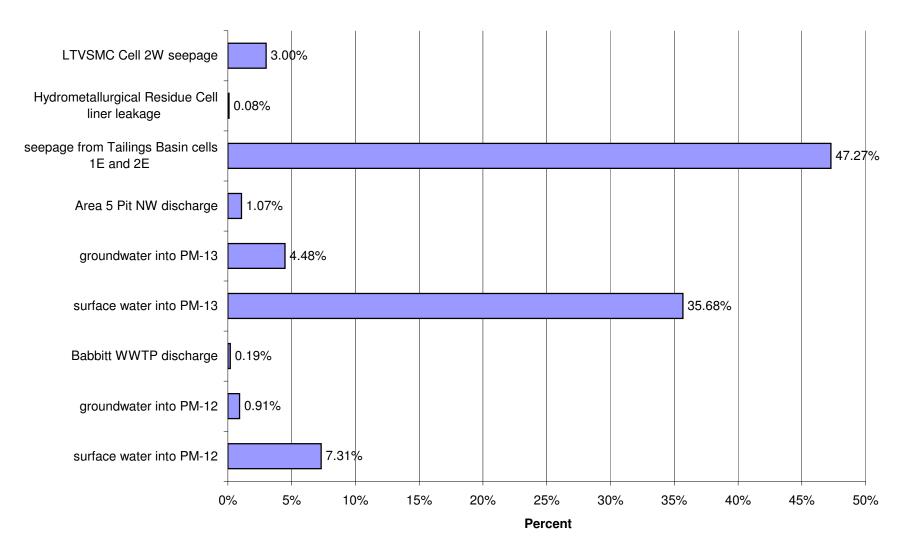
Proposed Action: Percent of Impacts at PM-13 in Year 15 for Low Flow for Cobalt (Co)



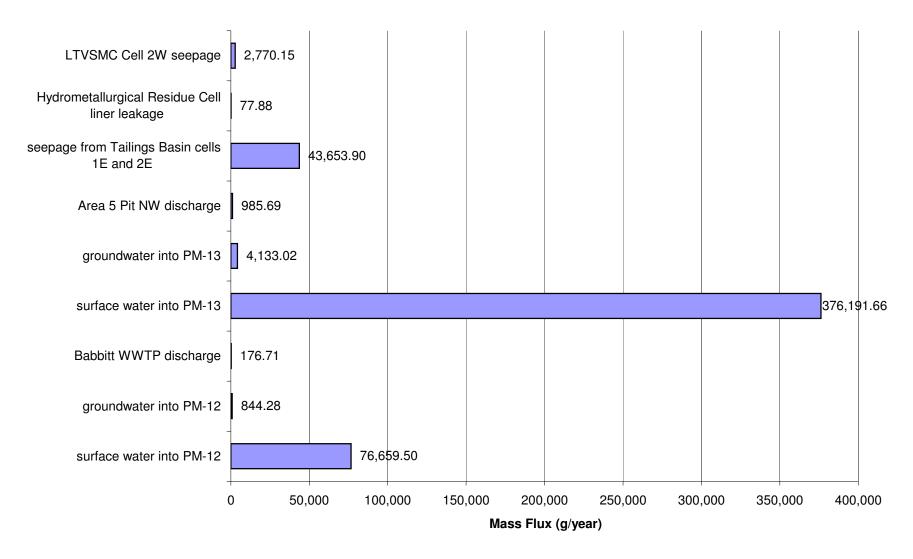
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Average Flow for Cobalt (Co)



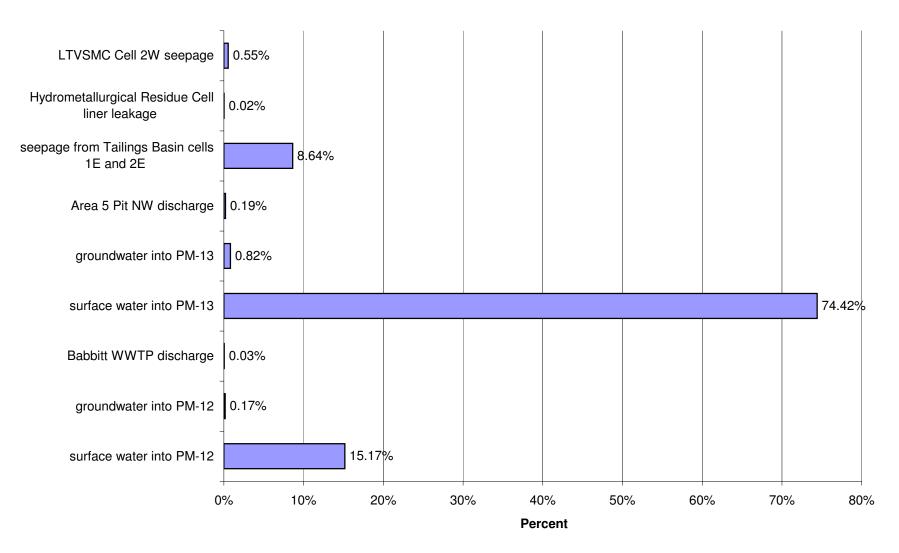
Proposed Action: Percent of Impacts at PM-13 in Year 15 for Average Flow for Cobalt (Co)



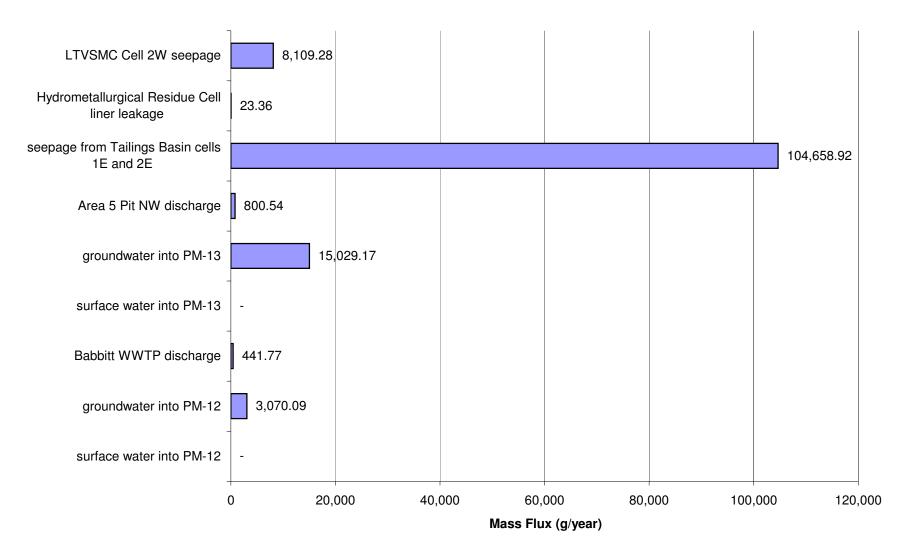
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for High Flow for Cobalt (Co)



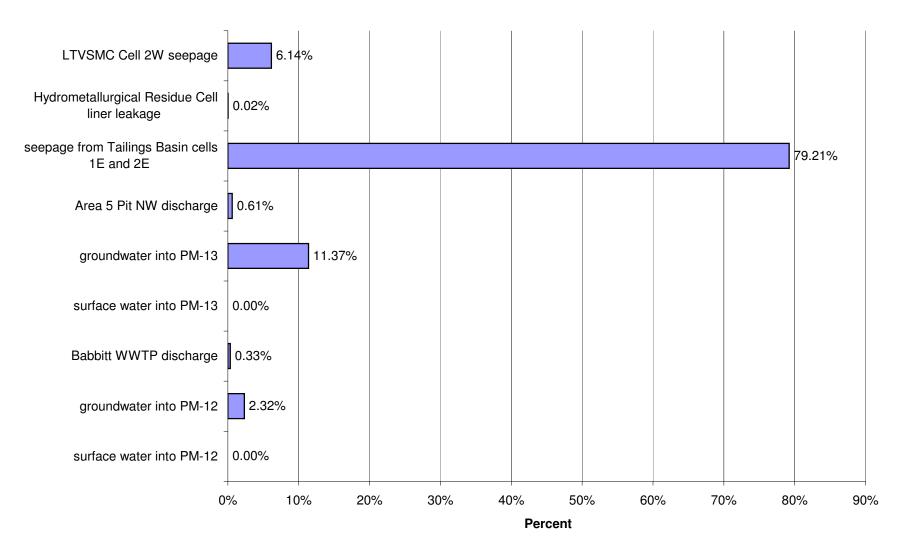
Proposed Action: Percent of Impacts at PM-13 in Year 15 for High Flow for Cobalt (Co)



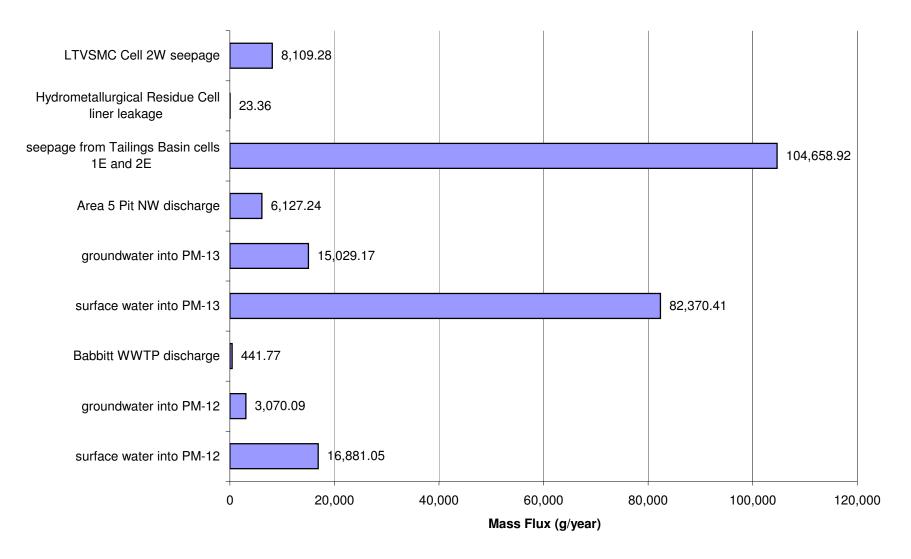
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Low Flow for Copper (Cu)



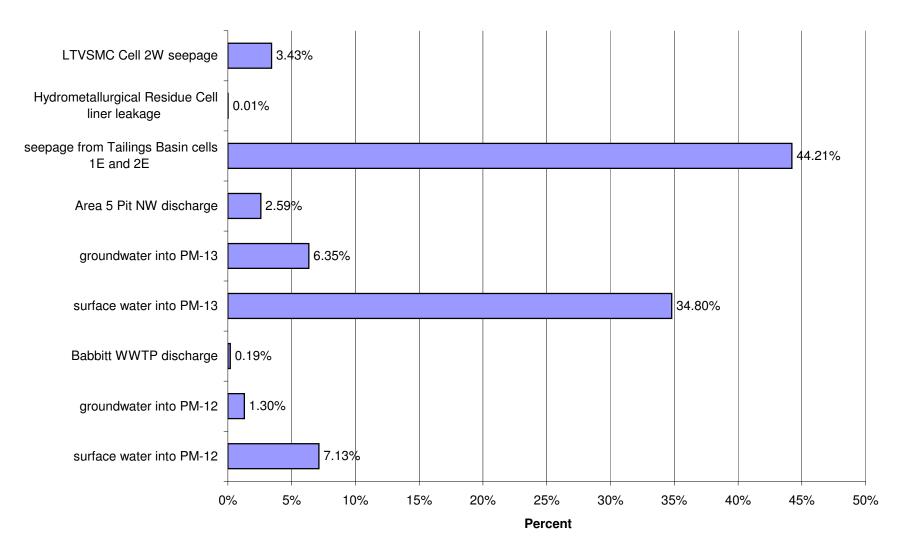
Proposed Action: Percent of Impacts at PM-13 in Year 15 for Low Flow for Copper (Cu)



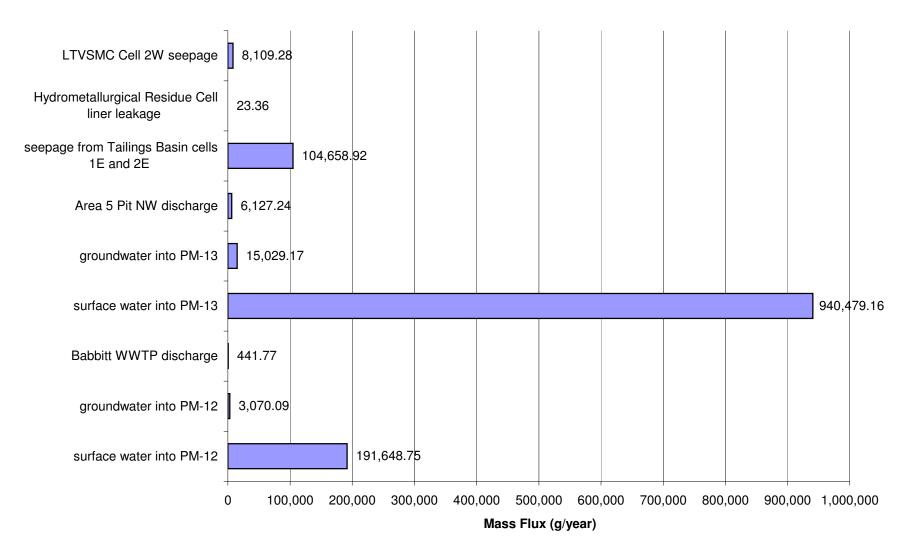
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Average Flow for Copper (Cu)



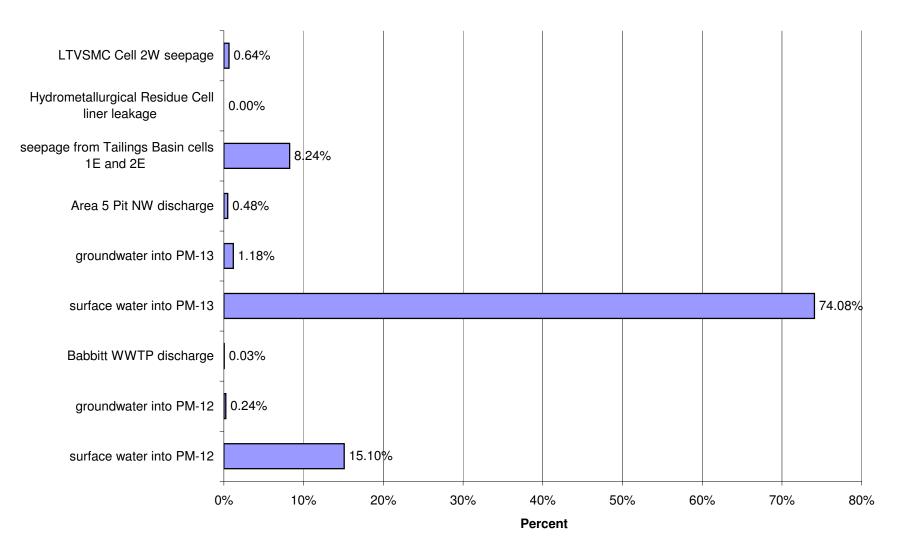
Proposed Action: Percent of Impacts at PM-13 in Year 15 for Average Flow for Copper (Cu)



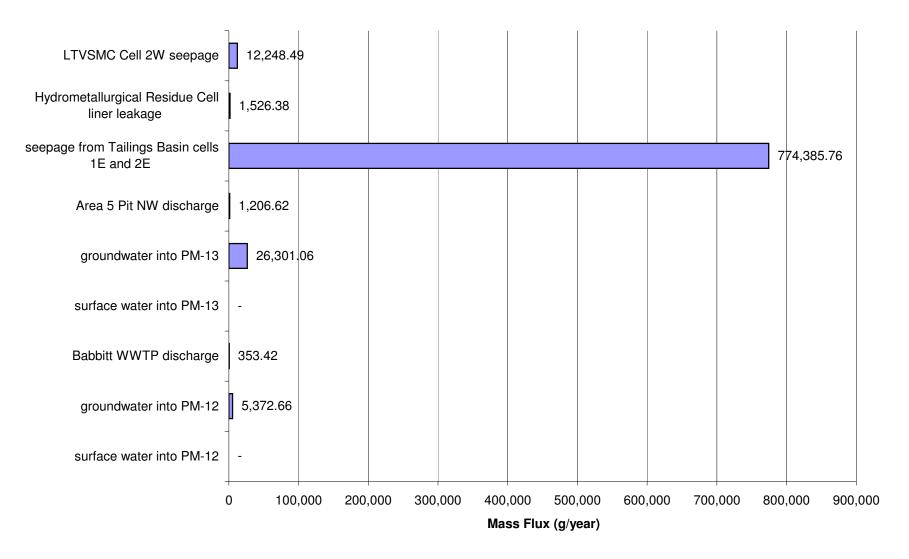
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for High Flow for Copper (Cu)



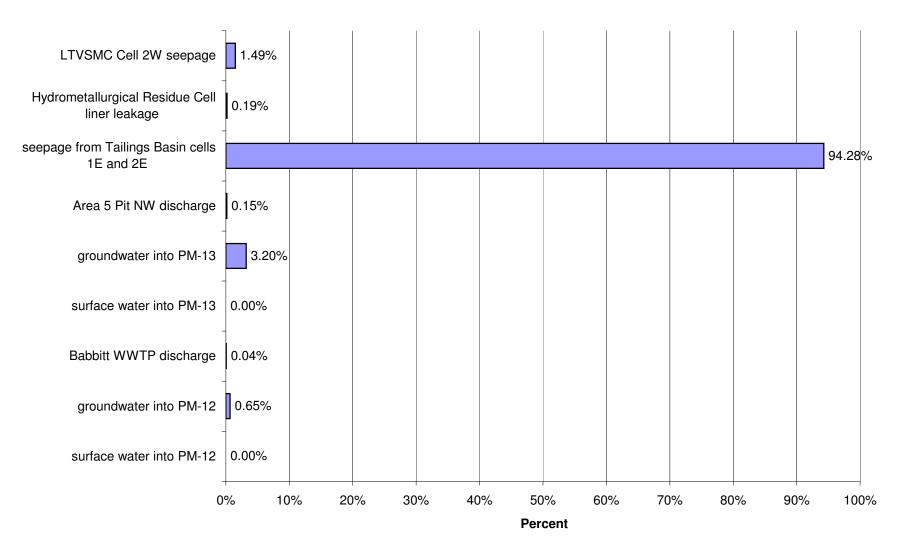
Proposed Action: Percent of Impacts at PM-13 in Year 15 for High Flow for Copper (Cu)



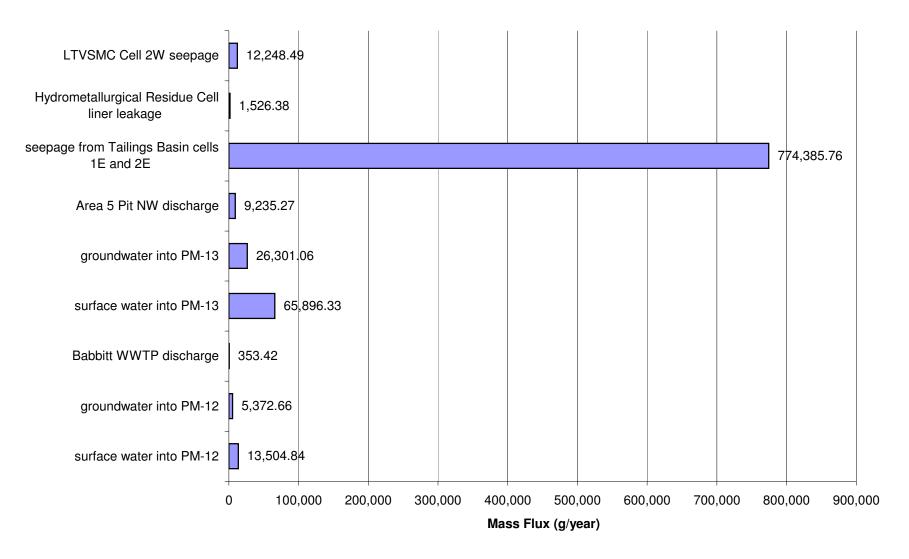
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Low Flow for Nickel (Ni)



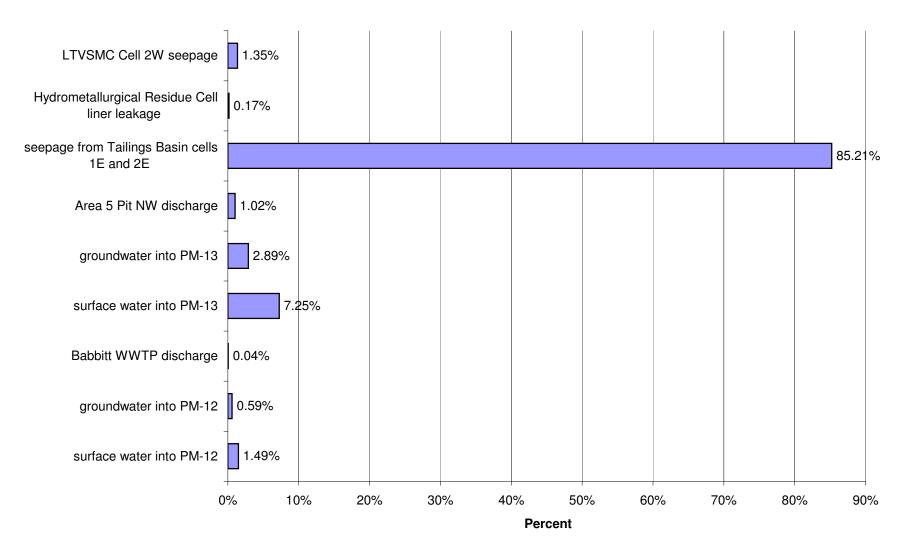
Proposed Action: Percent of Impacts at PM-13 in Year 15 for Low Flow for Nickel (Ni)



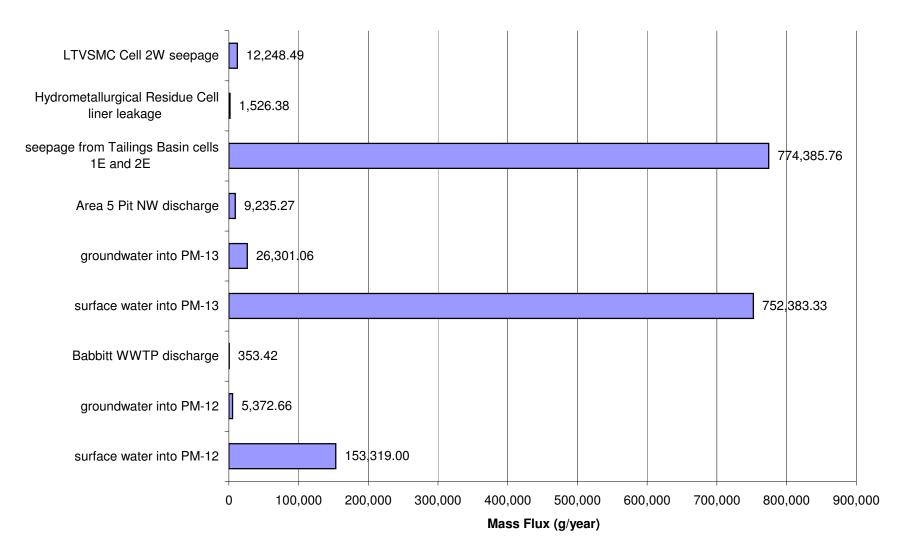
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Average Flow for Nickel (Ni)



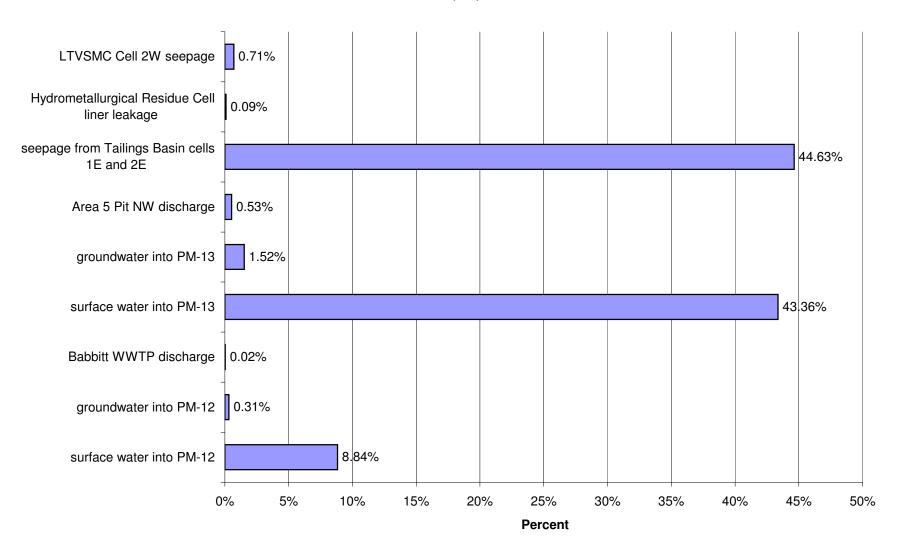
Proposed Action: Percent of Impacts at PM-13 in Year 15 for Average Flow for Nickel (Ni)



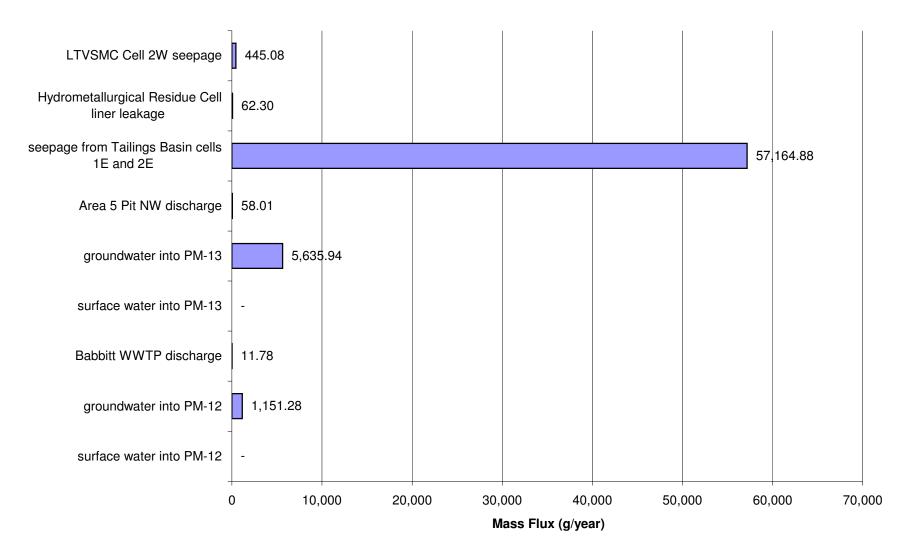
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for High Flow for Nickel (Ni)



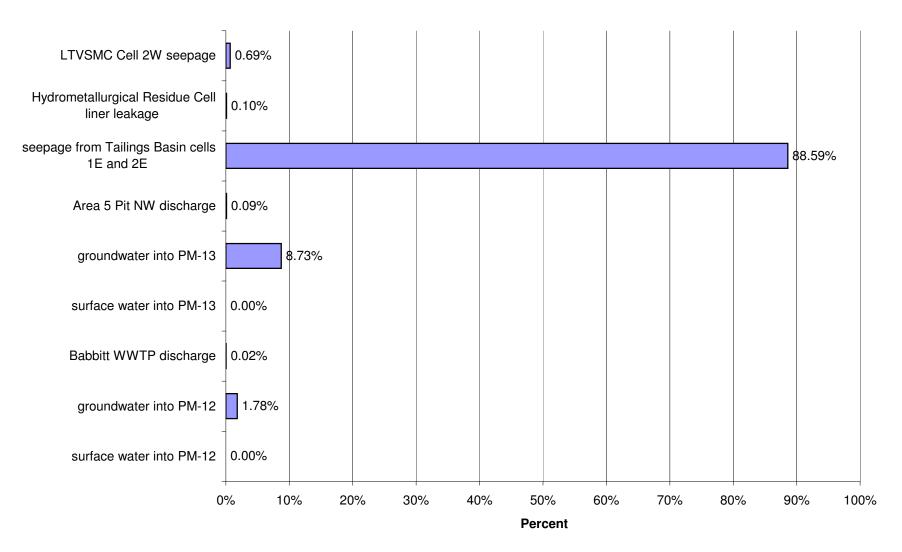
Proposed Action: Percent of Impacts at PM-13 in Year 15 for High Flow for Nickel (Ni)



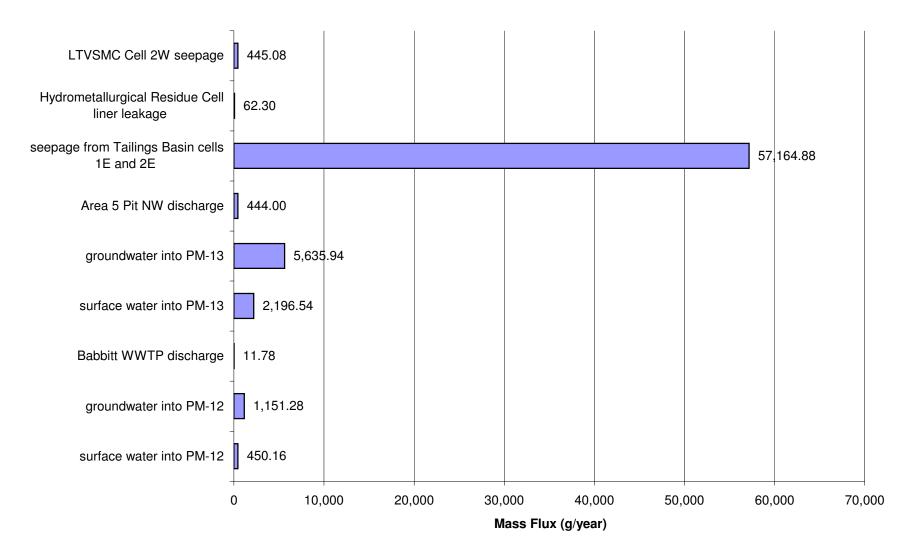
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Low Flow for Antimony (Sb)



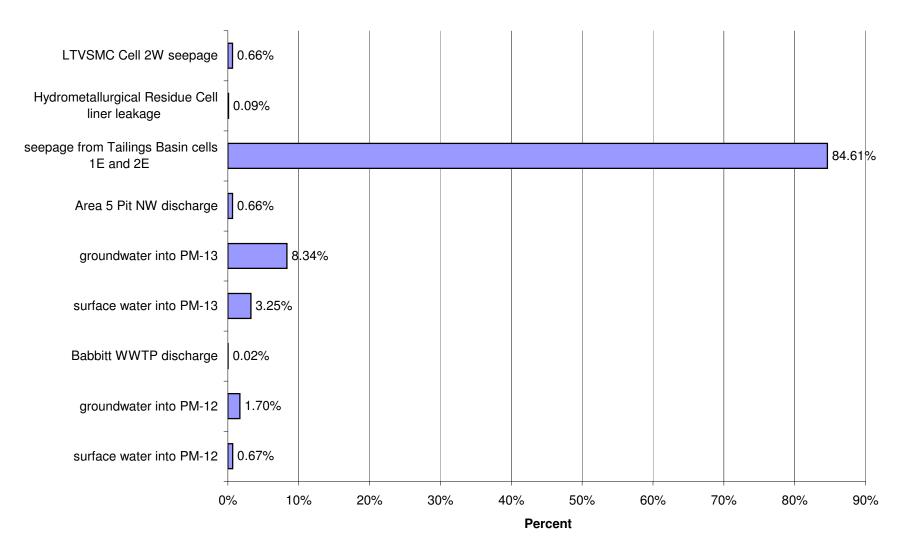
Proposed Action: Percent of Impacts at PM-13 in Year 15 for Low Flow for Antimony (Sb)



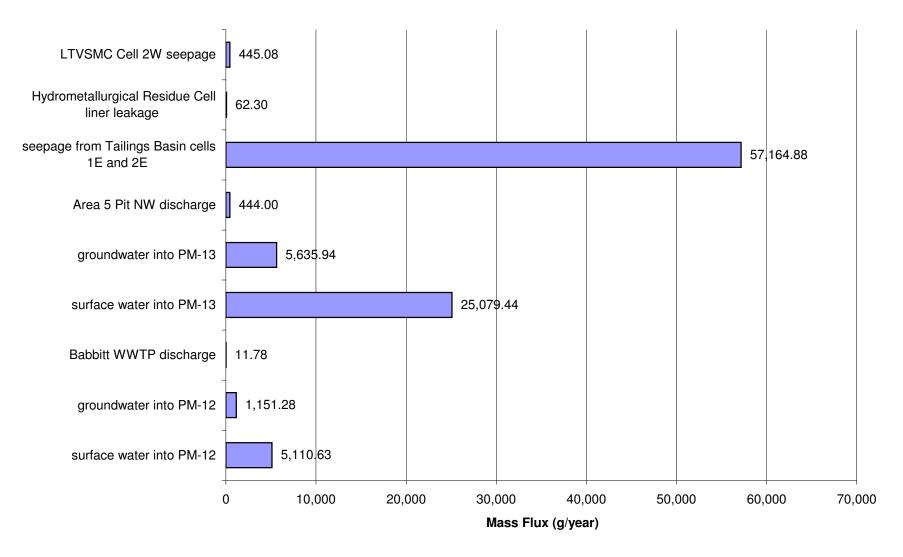
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Average Flow for Antimony (Sb)



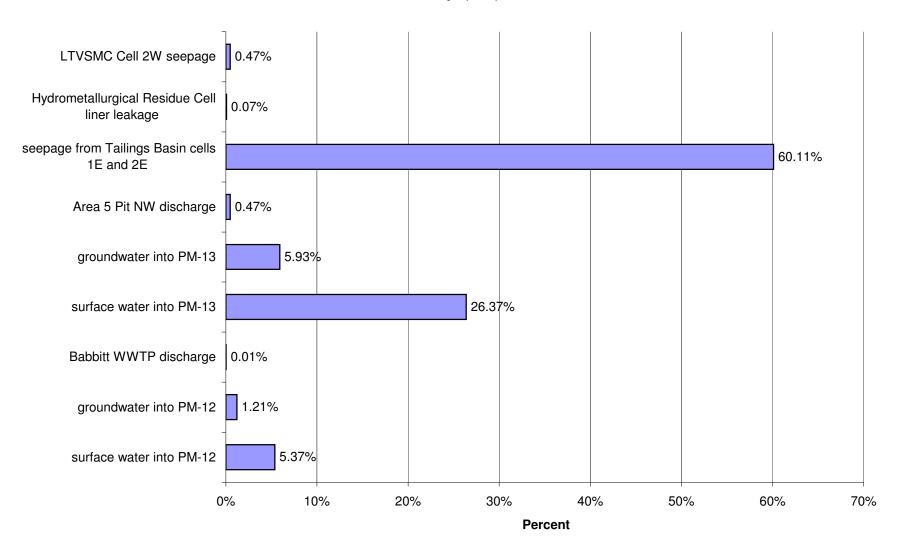
Proposed Action: Percent of Impacts at PM-13 in Year 15 for Average Flow for Antimony (Sb)



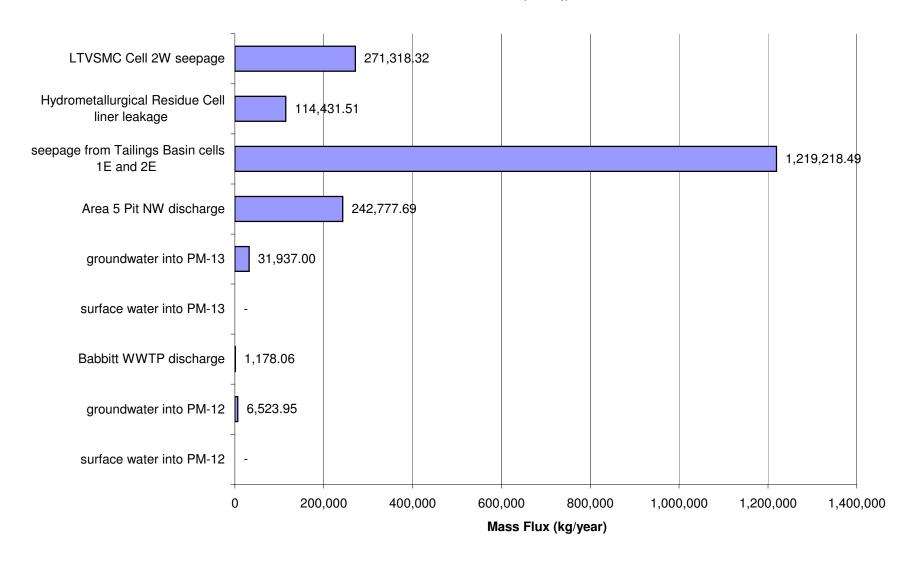
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for High Flow for Antimony (Sb)



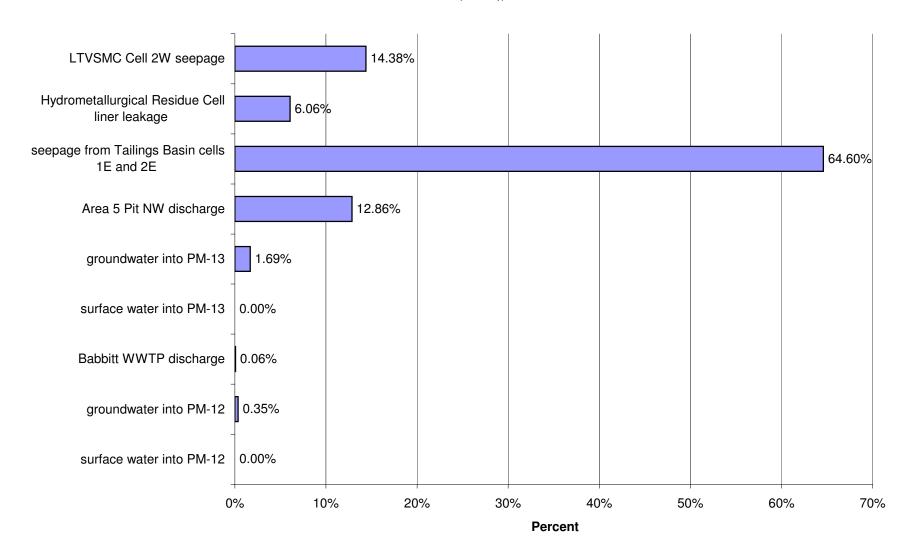
Proposed Action: Percent of Impacts at PM-13 in Year 15 for High Flow for Antimony (Sb)



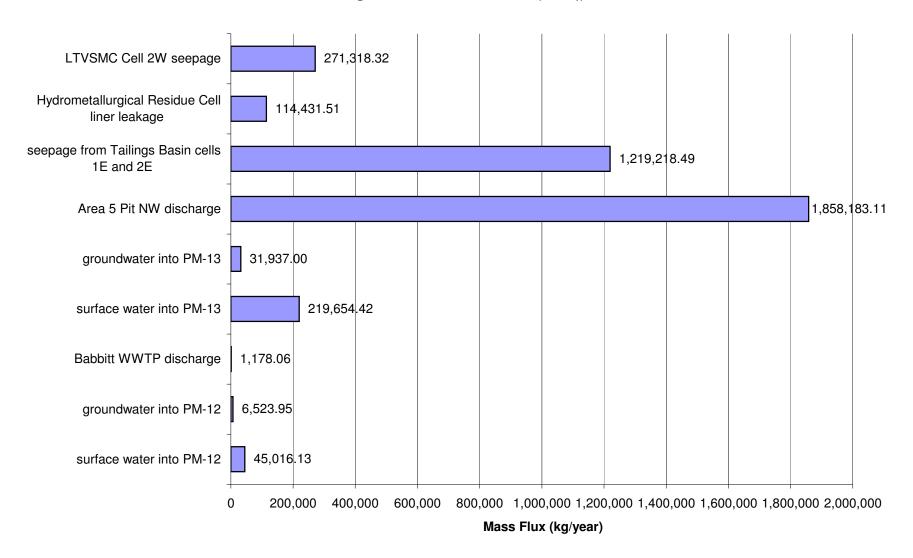
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 15 for Low Flow for Sulfate (SO₄)



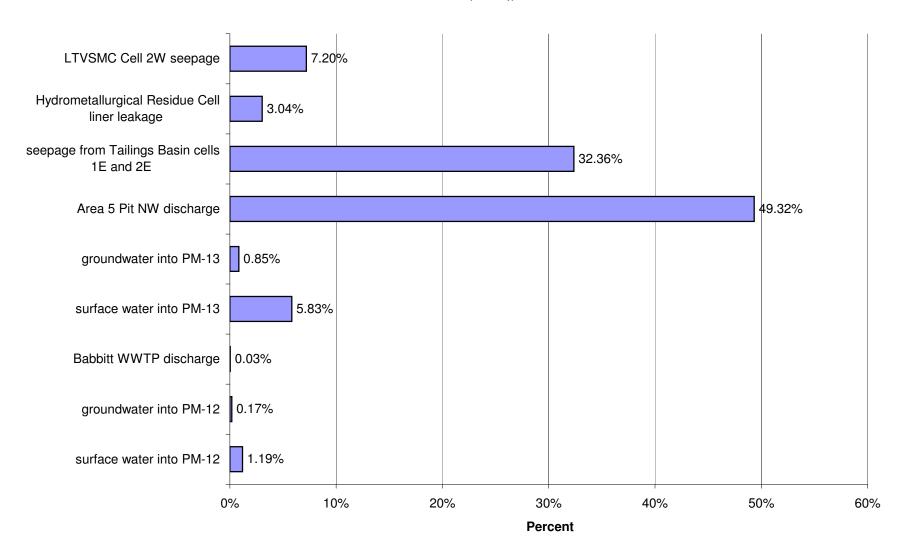
Proposed Action: Percent of Impacts at PM-13 in Year 15 for Low Flow for Sulfate (SO₄)



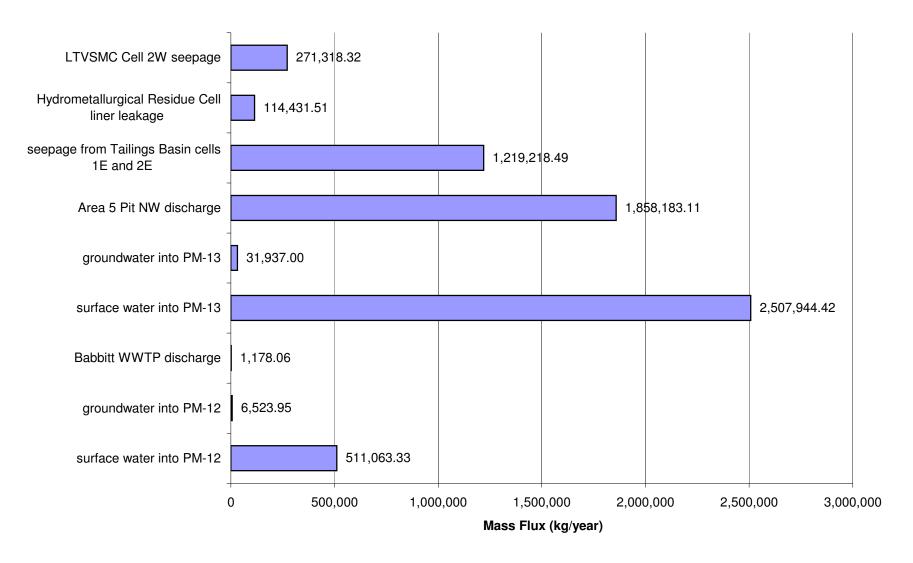
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 15 for Average Flow for Sulfate (SO₄)



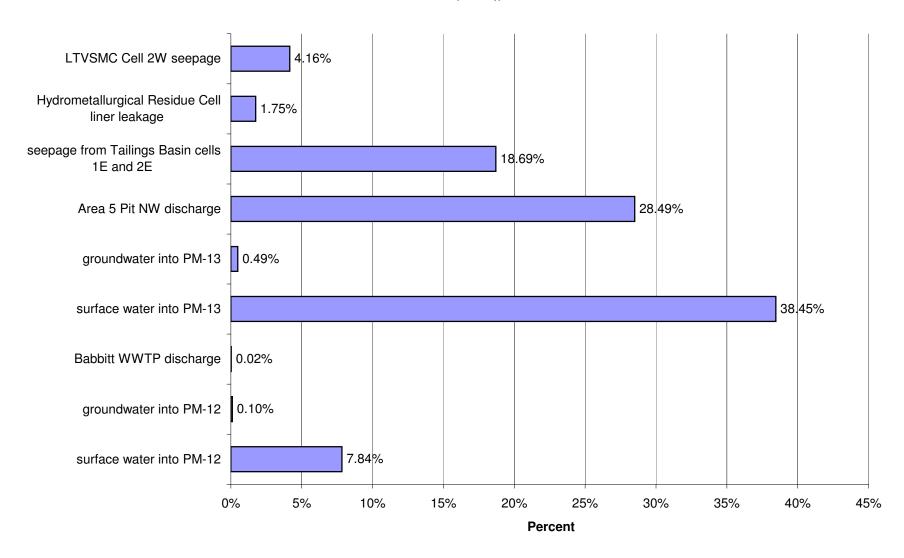
Proposed Action: Percent of Impacts at PM-13 in Year 15 for Average Flow for Sulfate (SO₄)



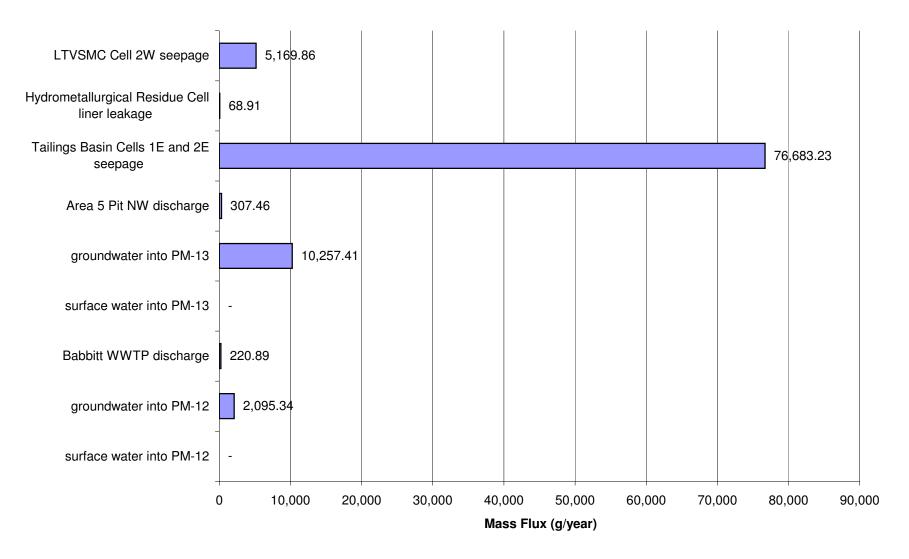
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 15 for High Flow for Sulfate (SO₄)



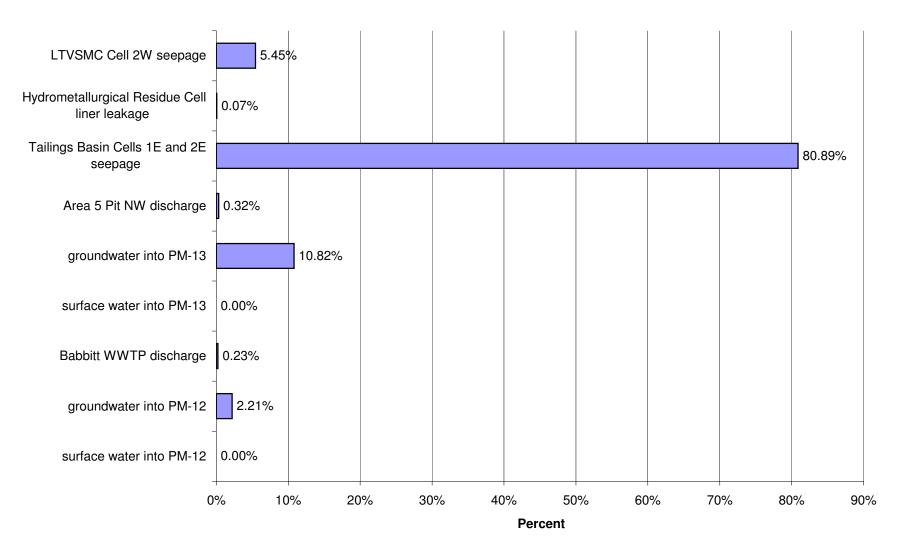
Proposed Action: Percent of Impacts at PM-13 in Year 15 for High Flow for Sulfate (SO₄)



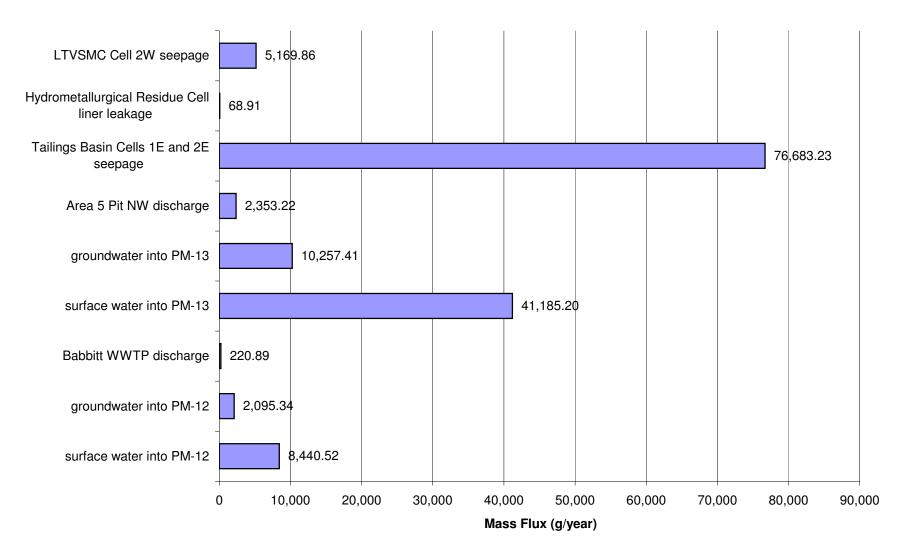
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Low Flow for Arsenic (As)



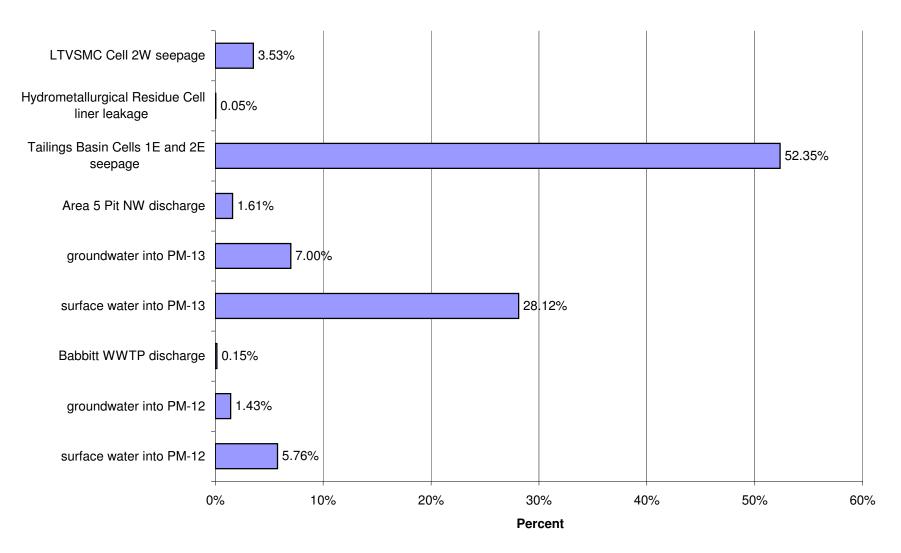
Proposed Action: Percent of Impacts at PM-13 in Year 20 for Low Flow for Arsenic (As)



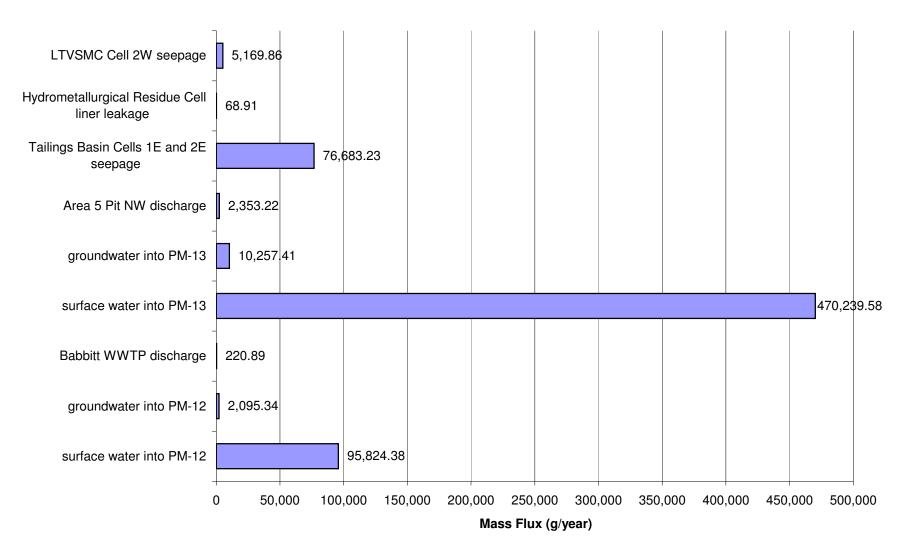
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Average Flow for Arsenic (As)



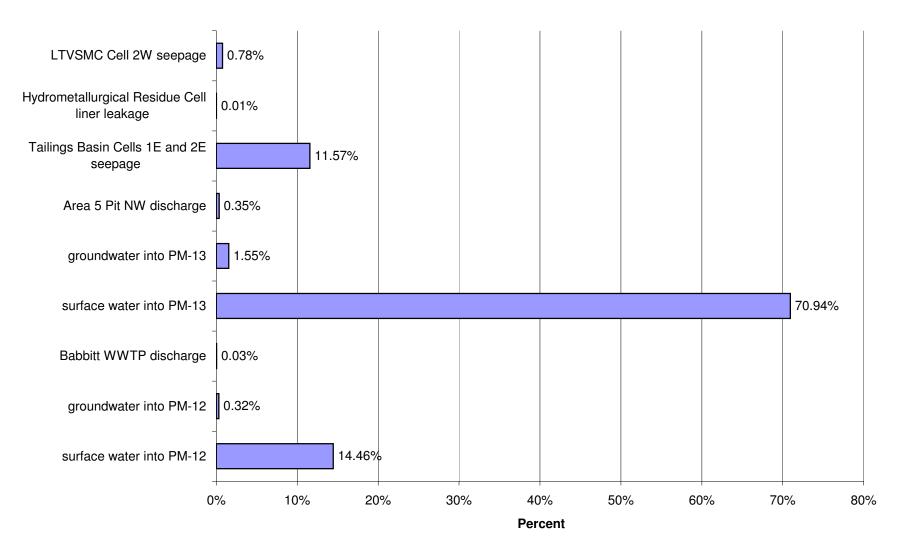
Proposed Action: Percent of Impacts at PM-13 in Year 20 for Average Flow for Arsenic (As)



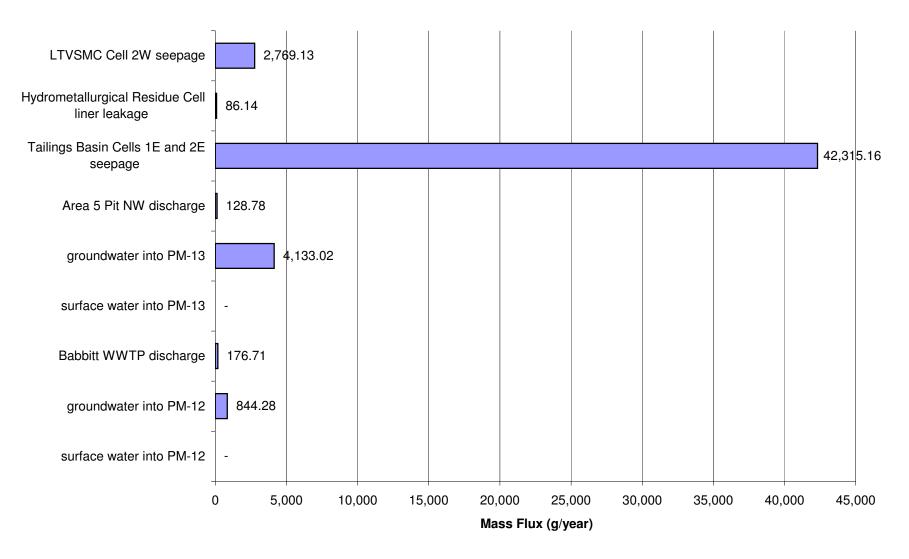
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for High Flow for Arsenic (As)



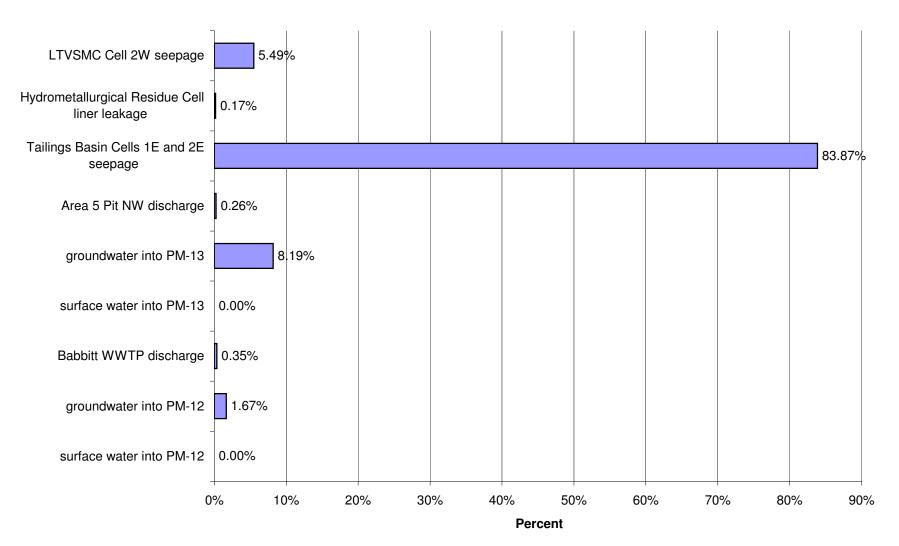
Proposed Action: Percent of Impacts at PM-13 in Year 20 for High Flow for Arsenic (As)



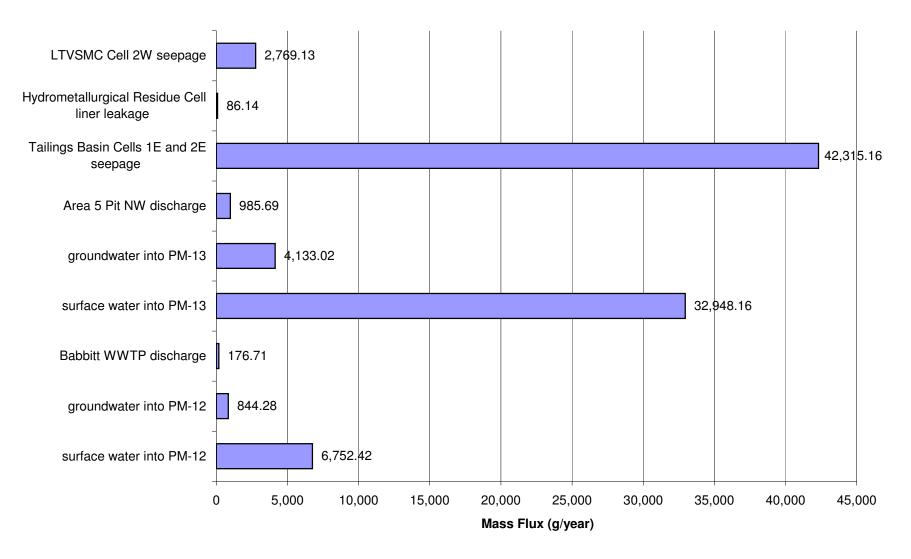
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Low Flow for Cobalt (Co)



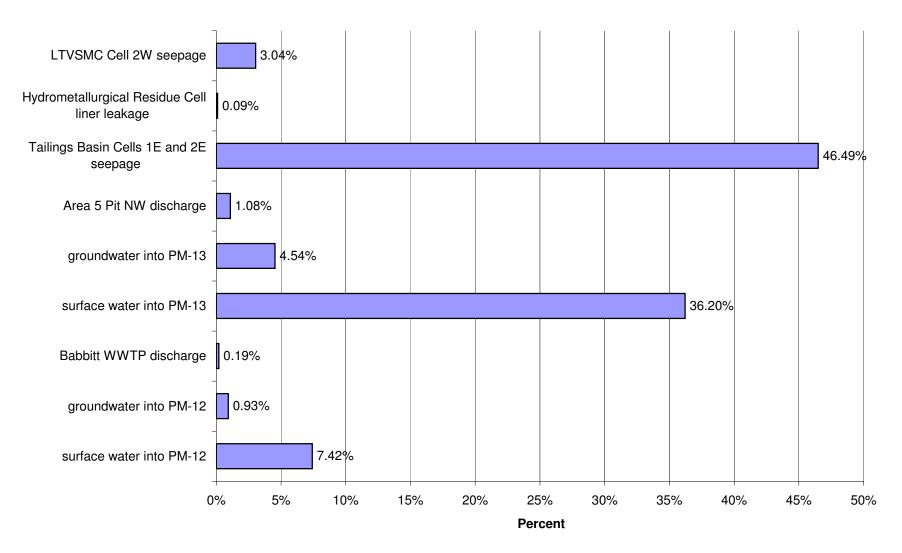
Proposed Action: Percent of Impacts at PM-13 in Year 20 for Low Flow for Cobalt (Co)



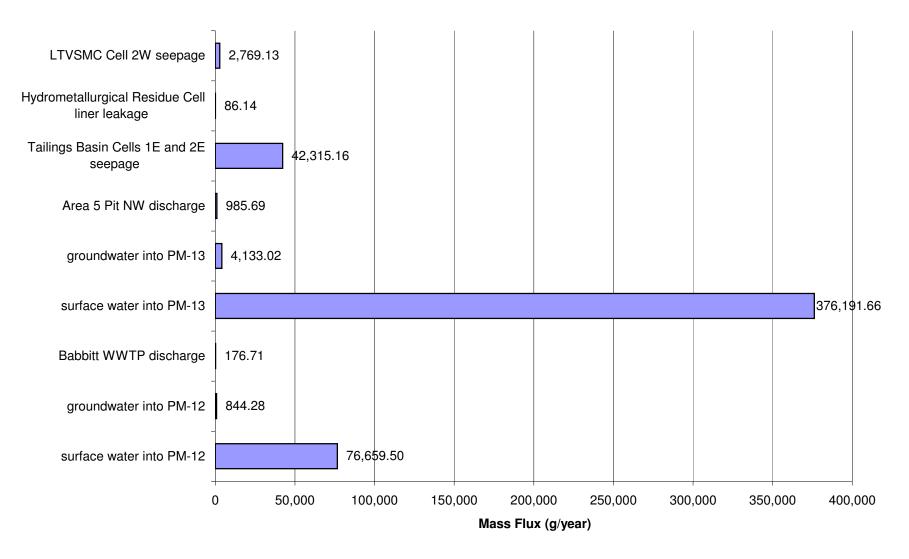
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Average Flow for Cobalt (Co)



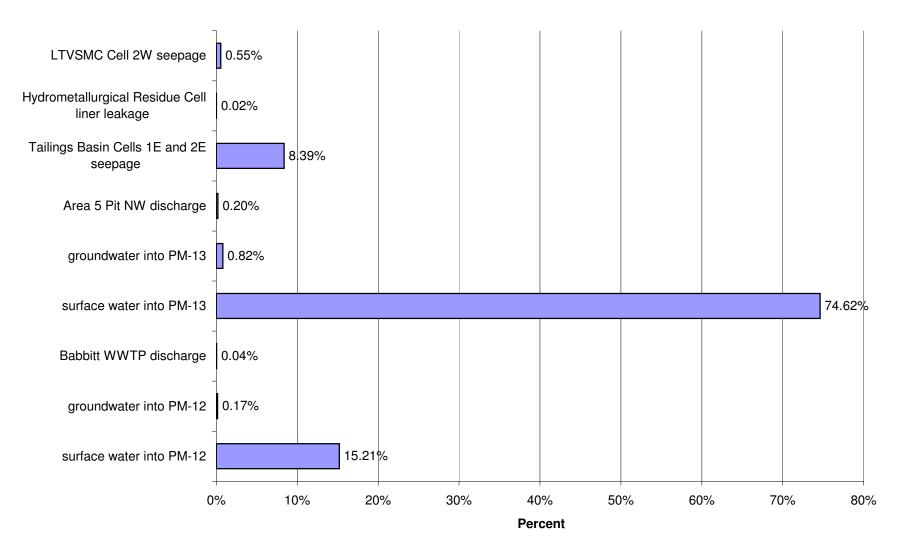
Proposed Action: Percent of Impacts at PM-13 in Year 20 for Average Flow for Cobalt (Co)



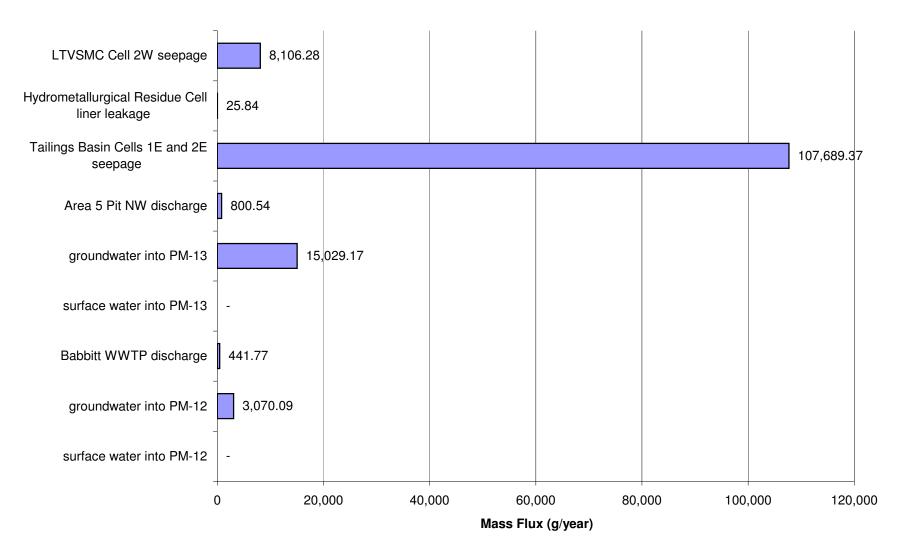
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for High Flow for Cobalt (Co)



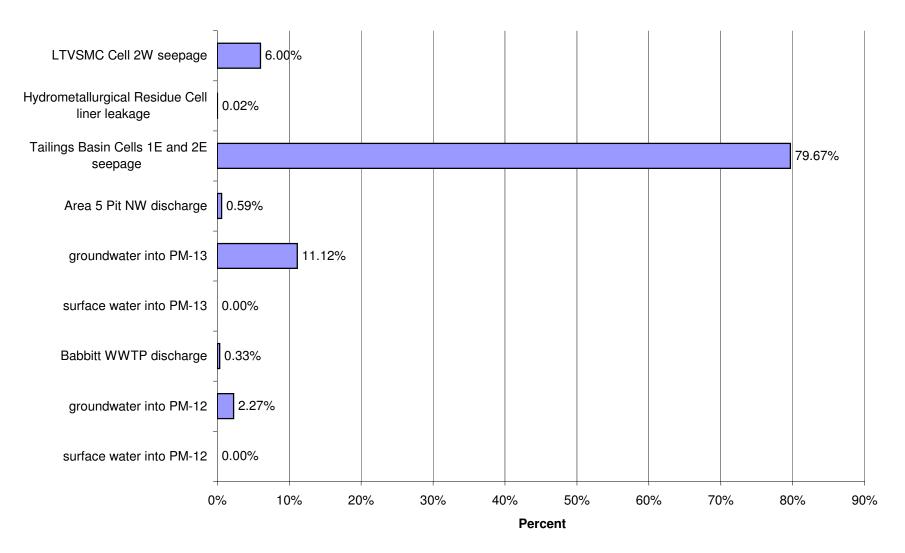
Proposed Action: Percent of Impacts at PM-13 in Year 20 for High Flow for Cobalt (Co)



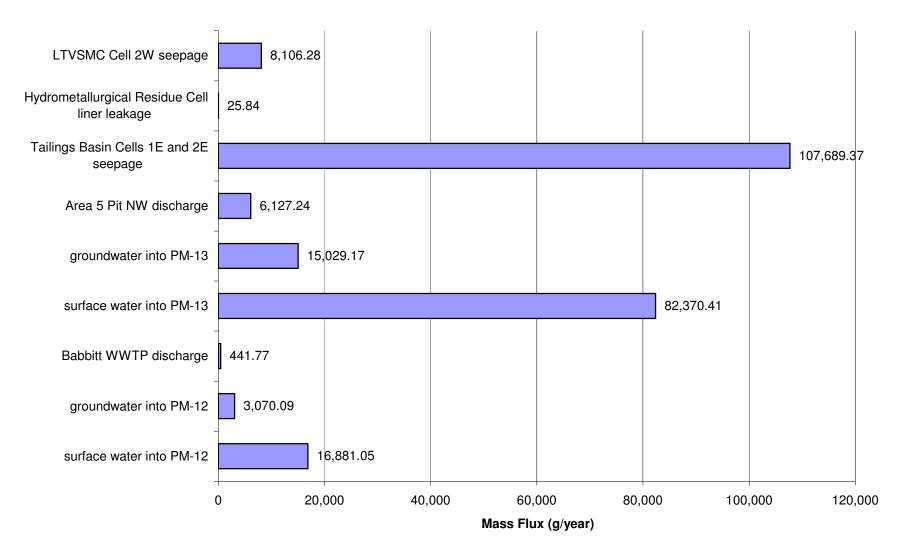
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Low Flow for Copper (Cu)



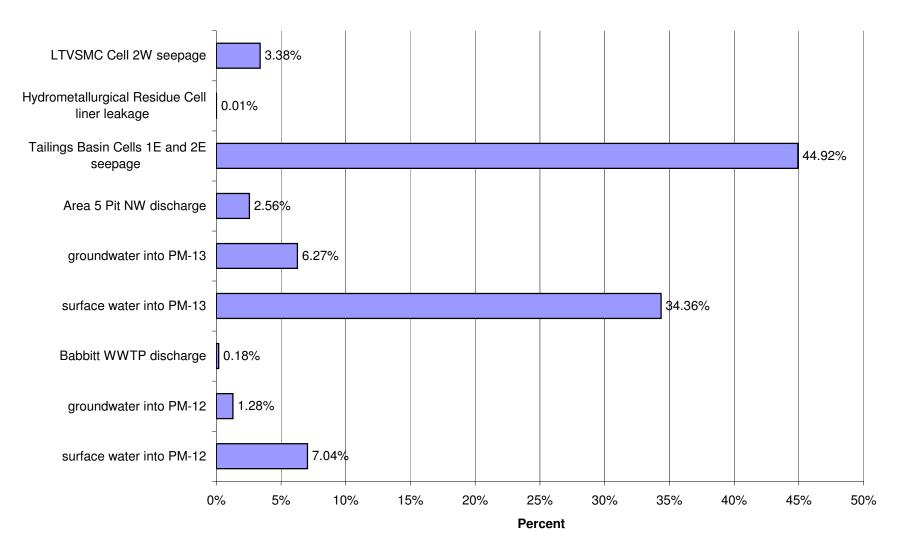
Proposed Action: Percent of Impacts at PM-13 in Year 20 for Low Flow for Copper (Cu)



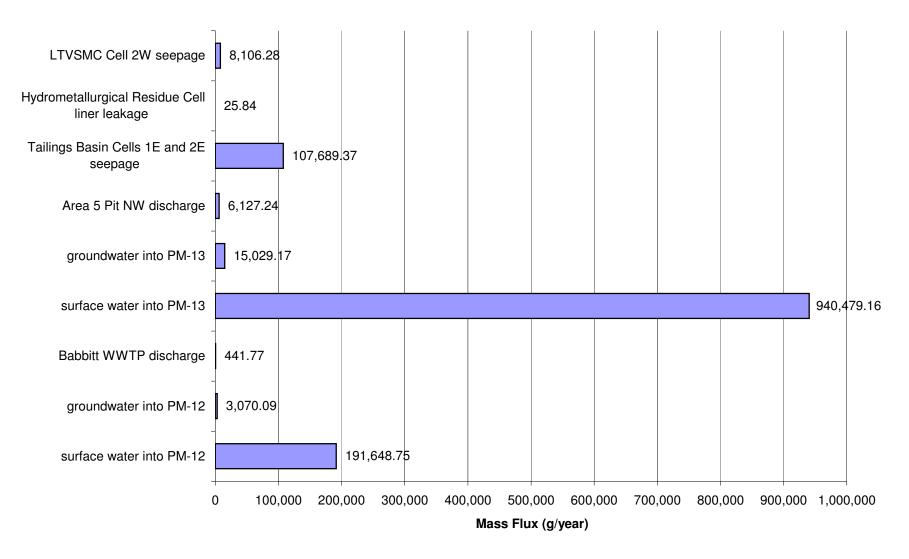
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Average Flow for Copper (Cu)



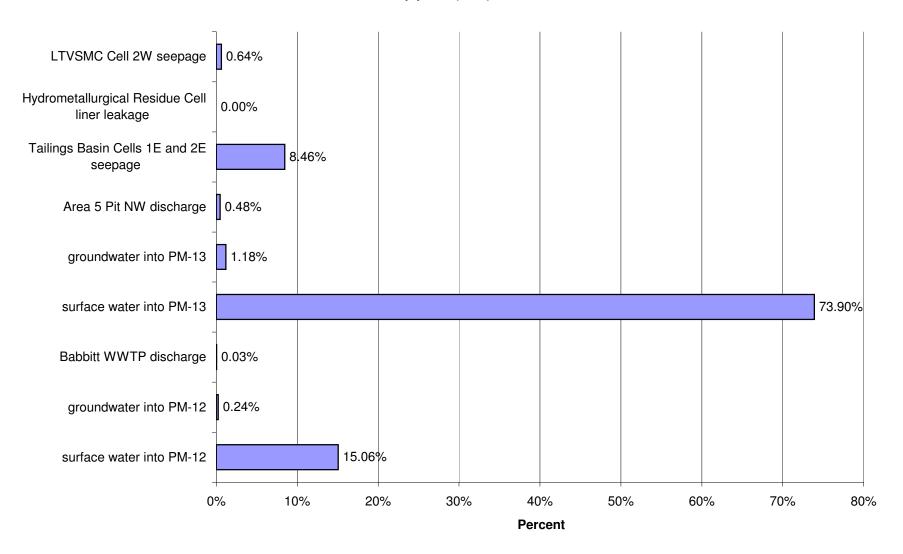
Proposed Action: Percent of Impacts at PM-13 in Year 20 for Average Flow for Copper (Cu)



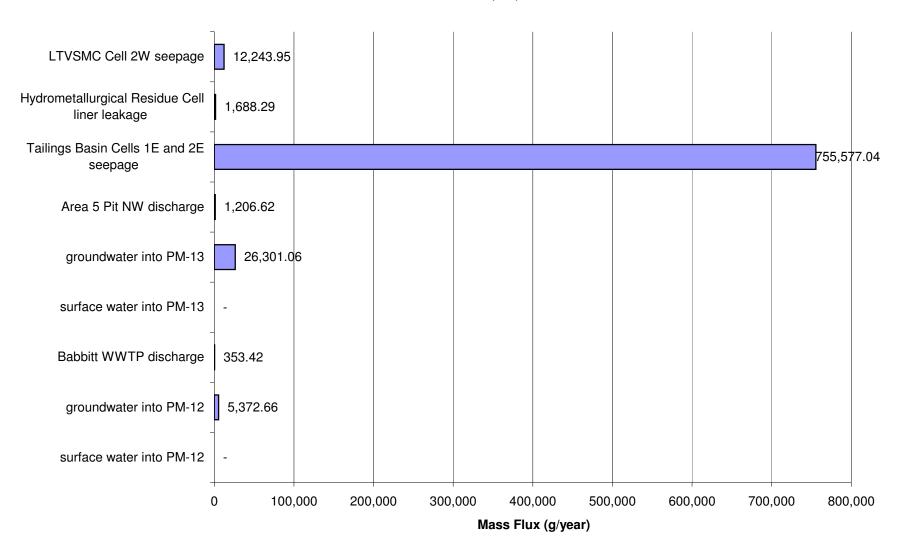
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for High Flow for Copper (Cu)



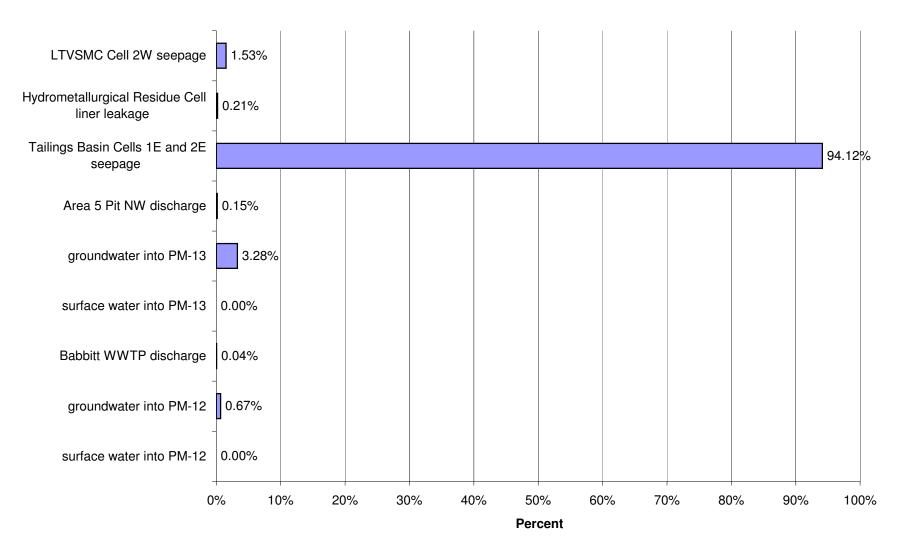
Proposed Action: Percent of Impacts at PM-13 in Year 20 for High Flow for Copper (Cu)



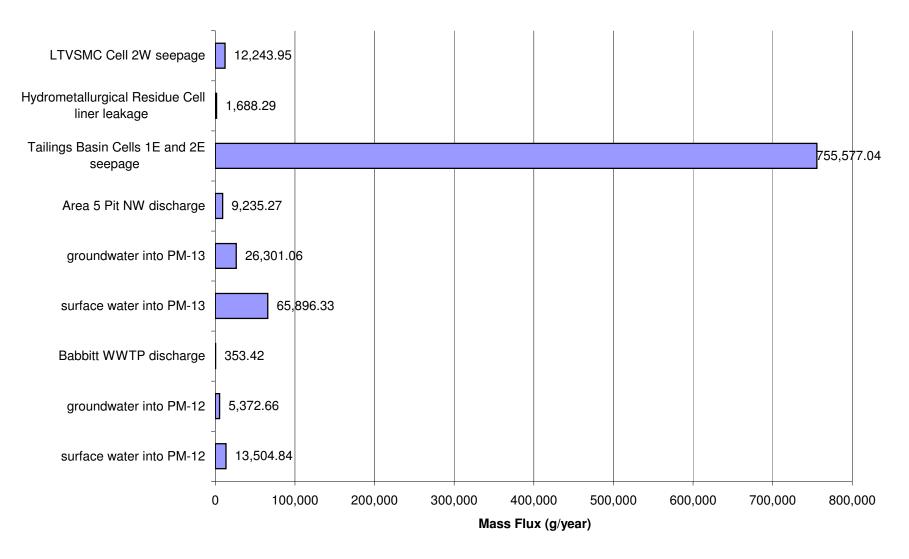
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Low Flow for Nickel (Ni)



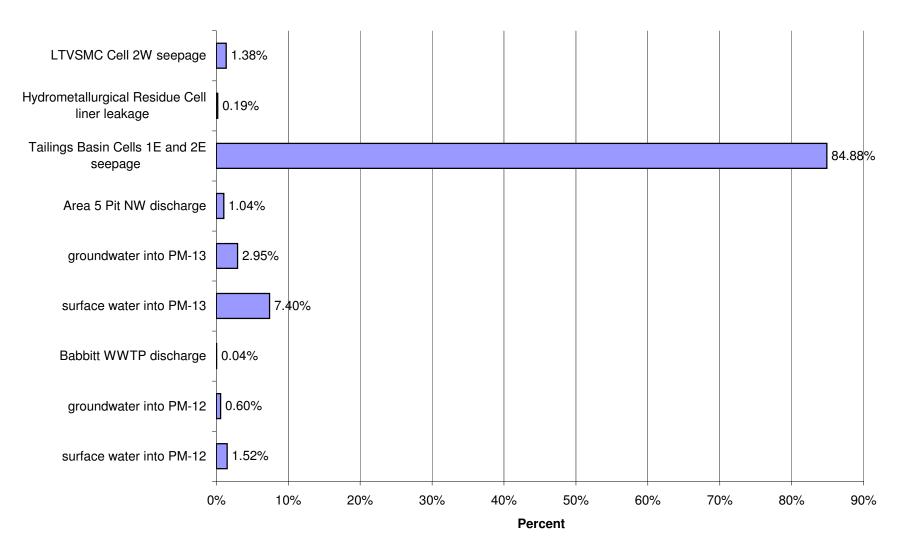
Proposed Action: Percent of Impacts at PM-13 in Year 20 for Low Flow for Nickel (Ni)



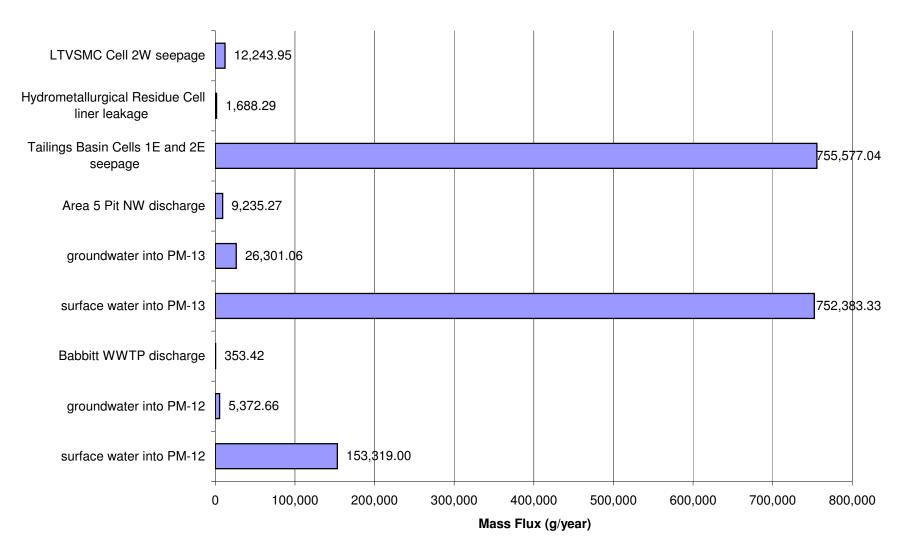
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Average Flow for Nickel (Ni)



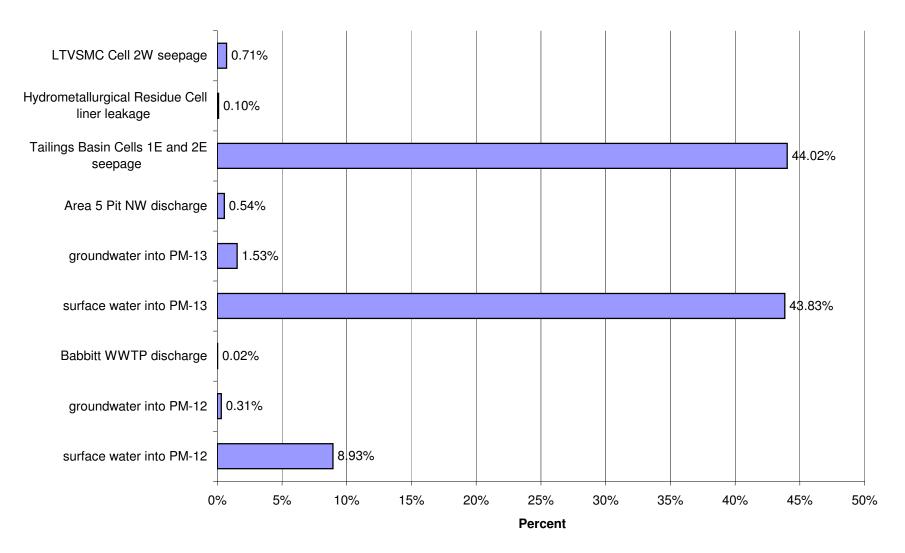
Proposed Action: Percent of Impacts at PM-13 in Year 20 for Average Flow for Nickel (Ni)



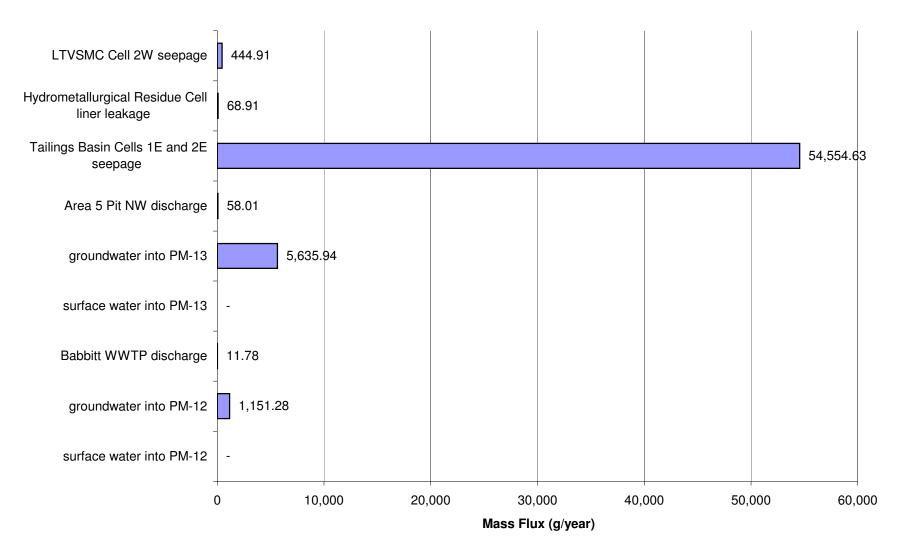
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for High Flow for Nickel (Ni)



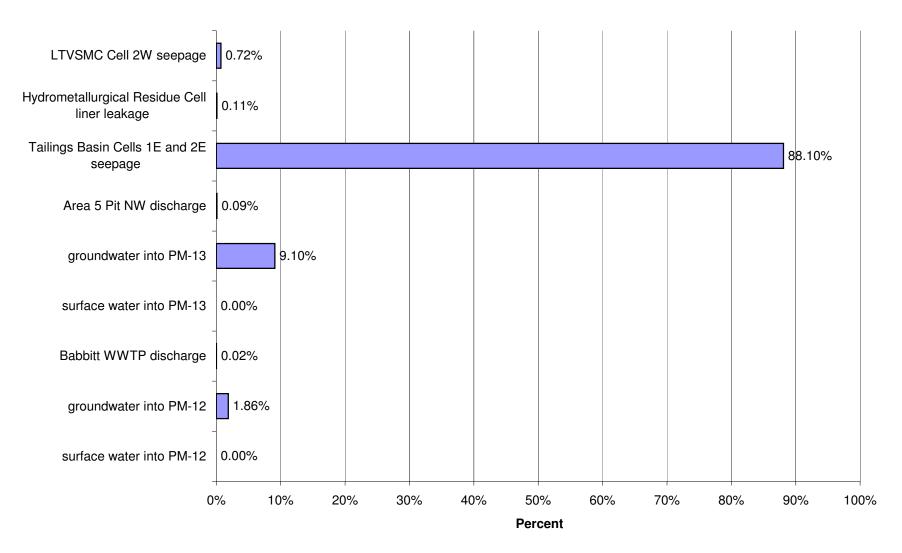
Proposed Action: Percent of Impacts at PM-13 in Year 20 for High Flow for Nickel (Ni)



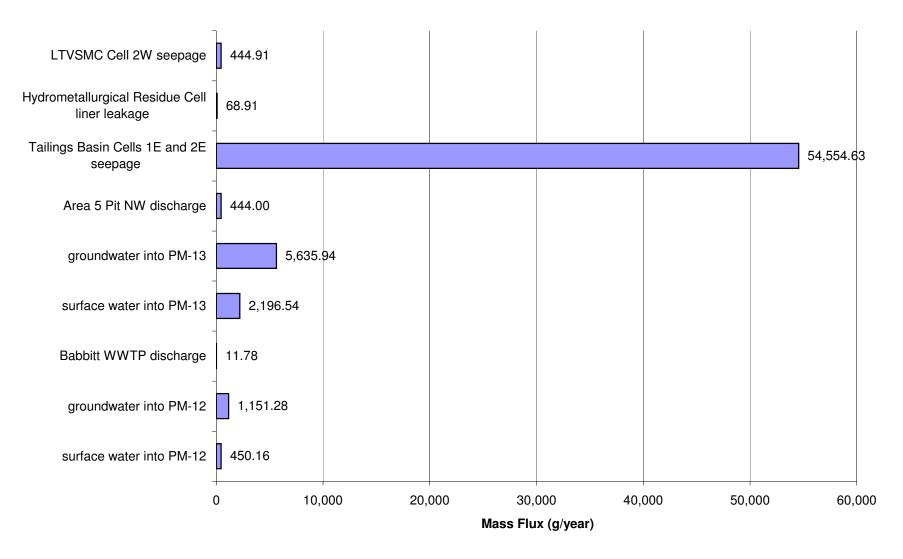
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Low Flow for Antimony (Sb)



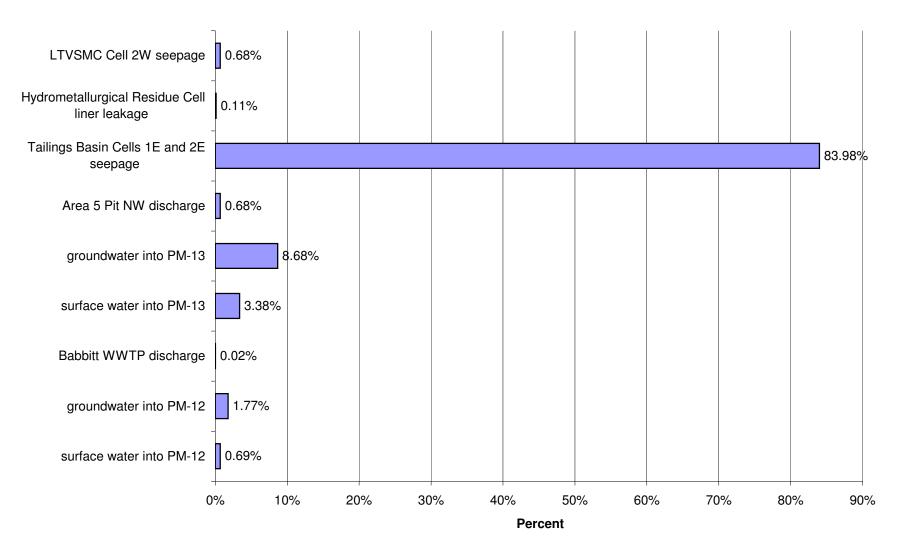
Proposed Action: Percent of Impacts at PM-13 in Year 20 for Low Flow for Antimony (Sb)



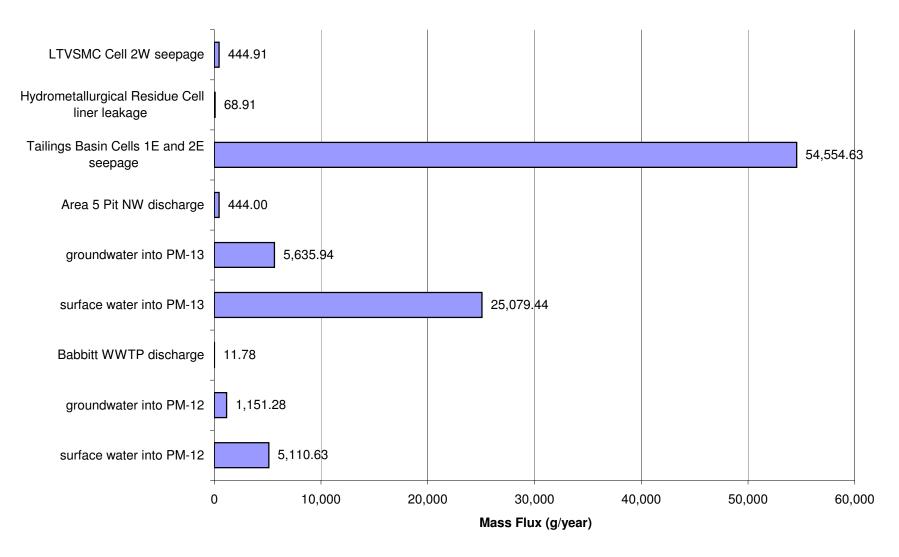
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Average Flow for Antimony (Sb)



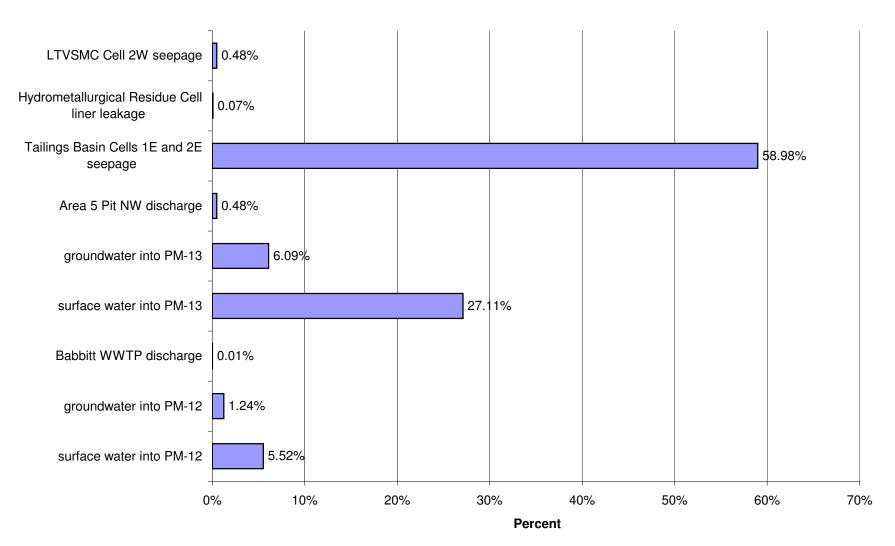
Proposed Action: Percent of Impacts at PM-13 in Year 20 for Average Flow for Antimony (Sb)



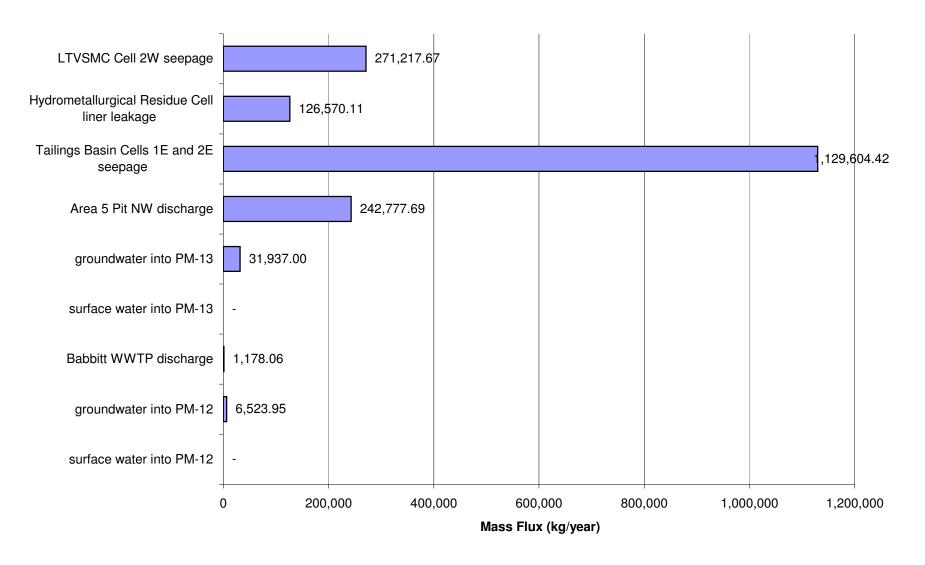
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for High Flow for Antimony (Sb)



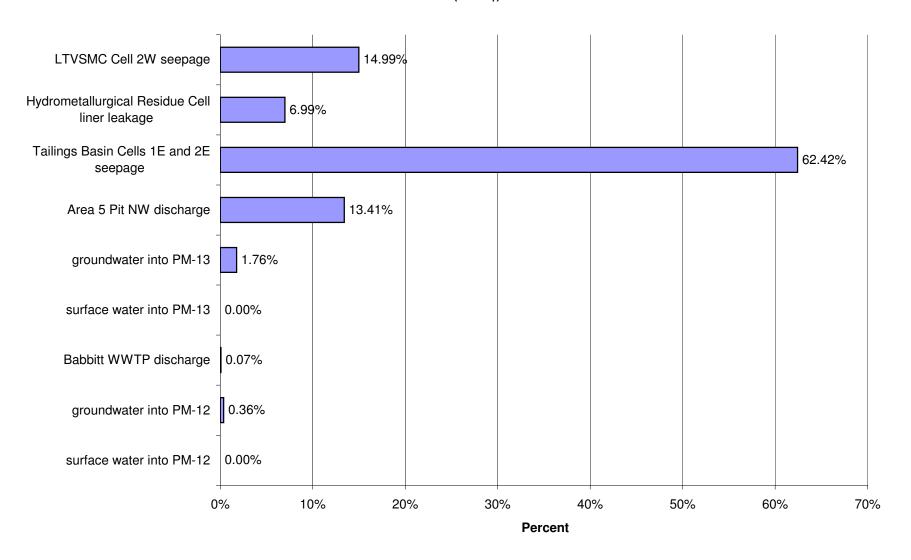
Proposed Action: Percent of Impacts at PM-13 in Year 20 for High Flow for Antimony (Sb)



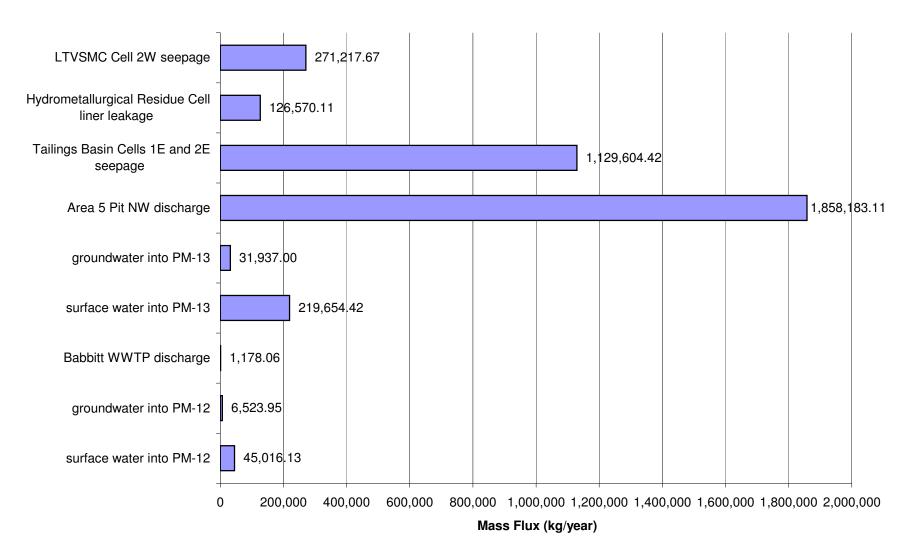
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 20 for Low Flow for Sulfate (SO₄)



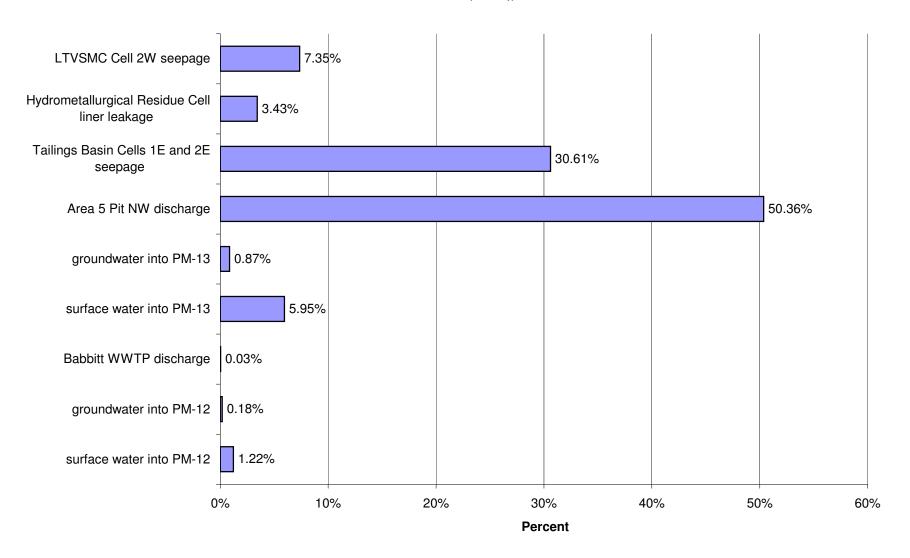
Proposed Action: Percent of Impacts at PM-13 in Year 20 for Low Flow for Sulfate (SO₄)



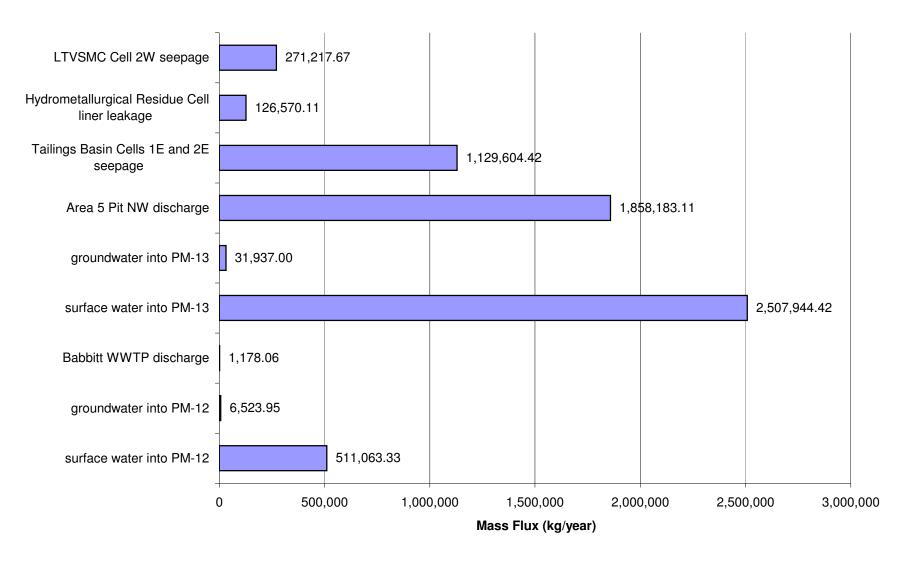
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 20 for Average Flow for Sulfate (SO₄)



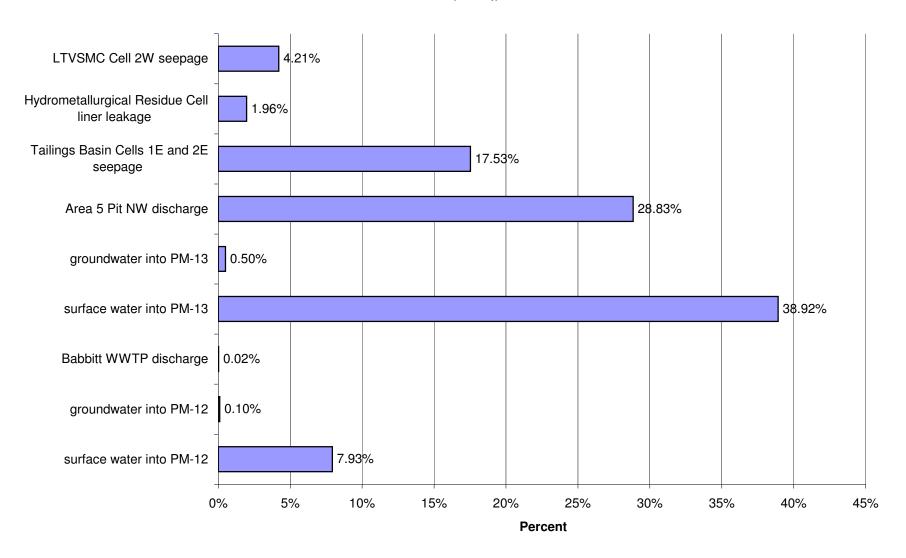
Proposed Action: Percent of Impacts at PM-13 in Year 20 for Average Flow for Sulfate (SO₄)



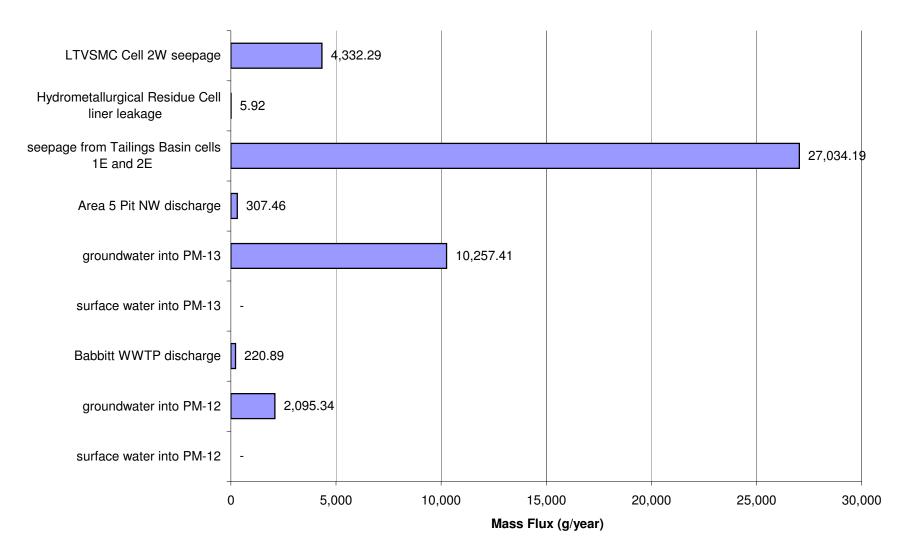
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Year 20 for High Flow for Sulfate (SO₄)



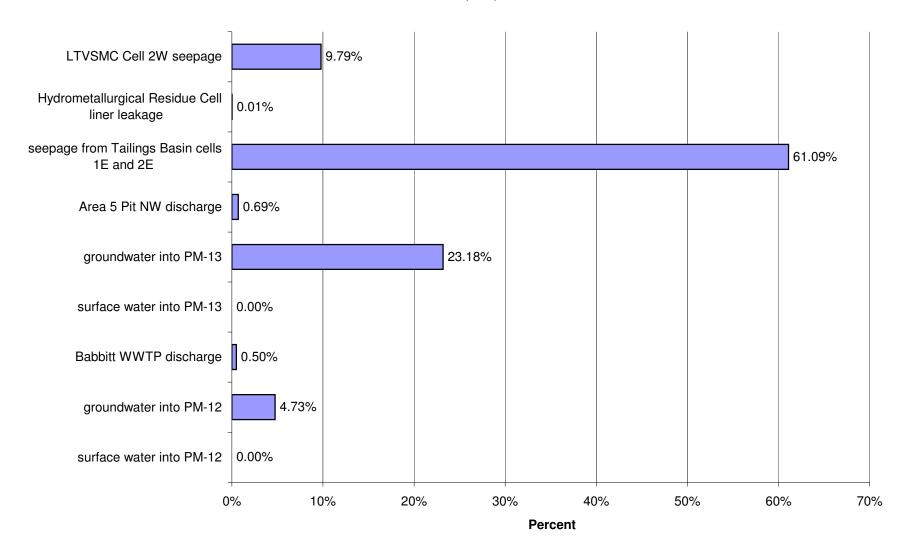
Proposed Action: Percent of Impacts at PM-13 in Year 20 for High Flow for Sulfate (SO₄)



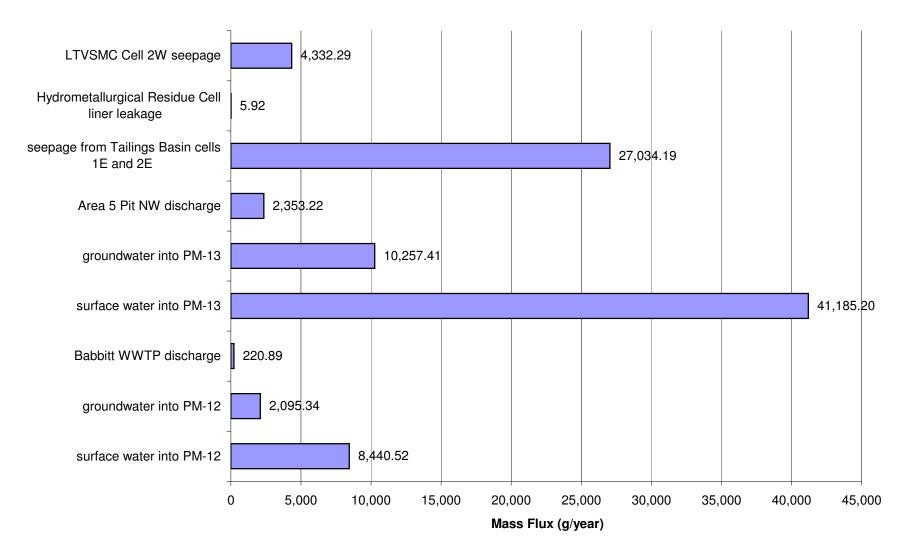
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Closure for Low Flow for Arsenic (As)



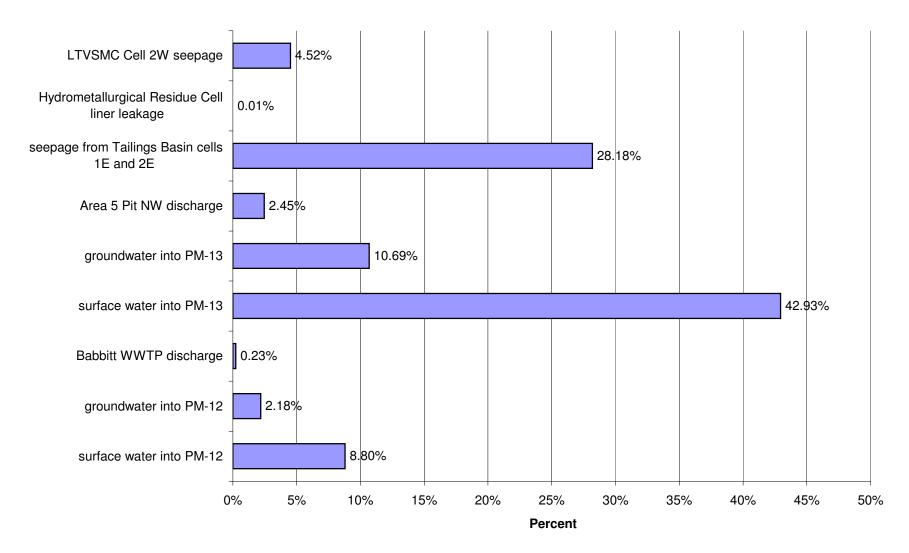
Proposed Action: Percent of Impacts at PM-13 in Closure for Low Flow for Arsenic (As)



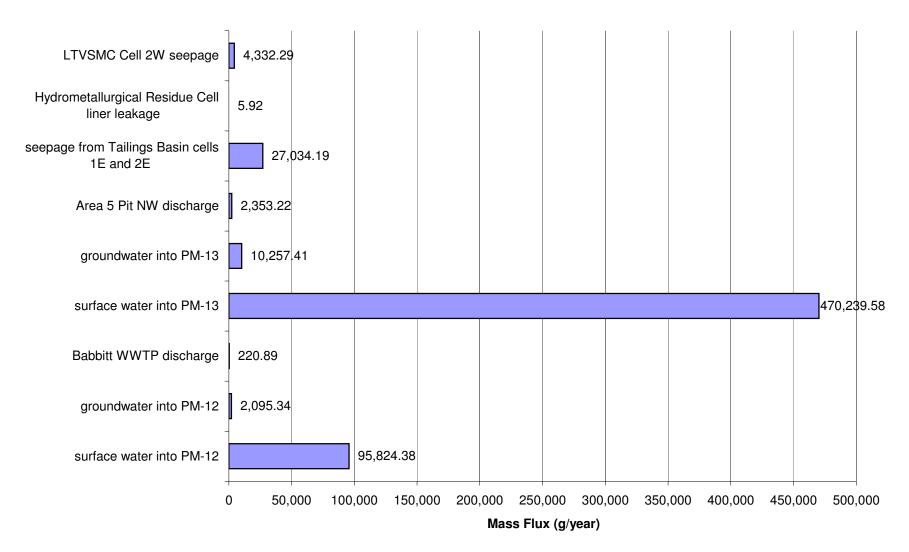
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Closure for Average Flow for Arsenic (As)



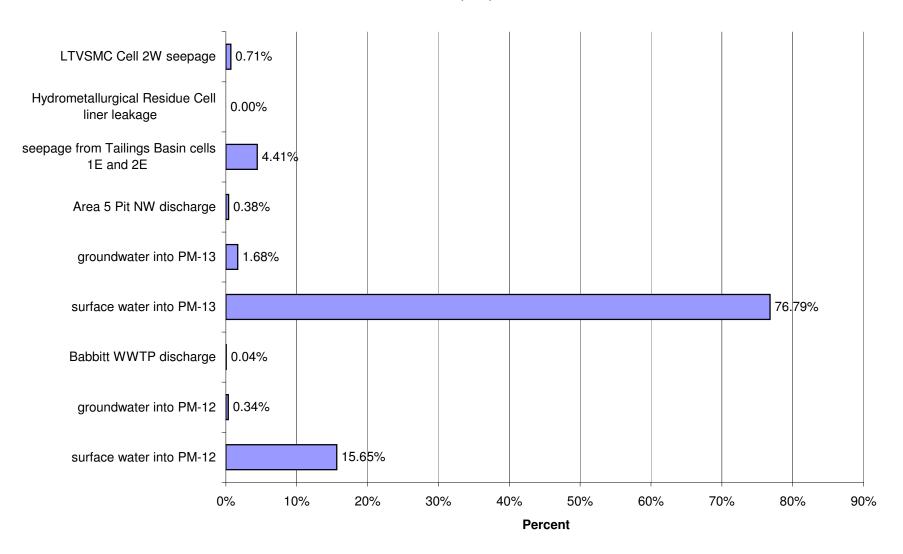
Proposed Action: Percent of Impacts at PM-13 in Closure for Average Flow for Arsenic (As)



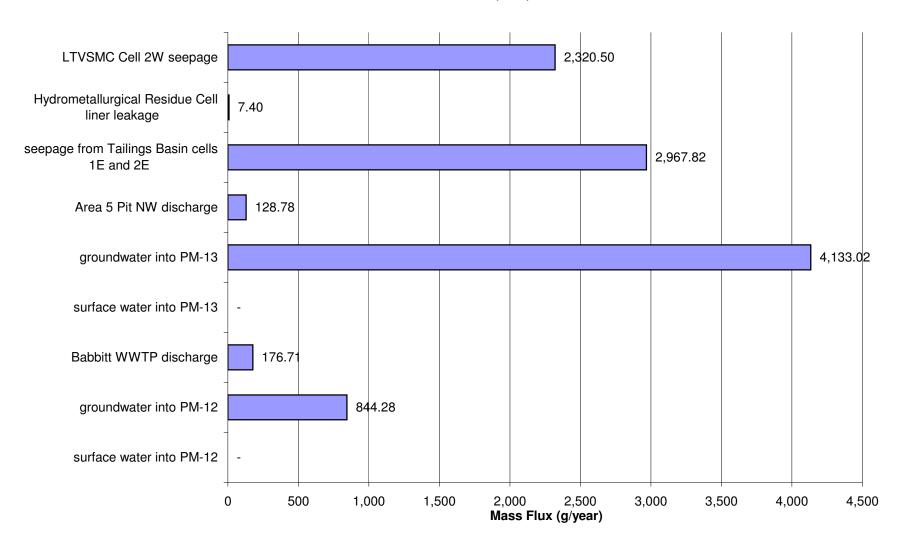
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Closure for High Flow for Arsenic (As)



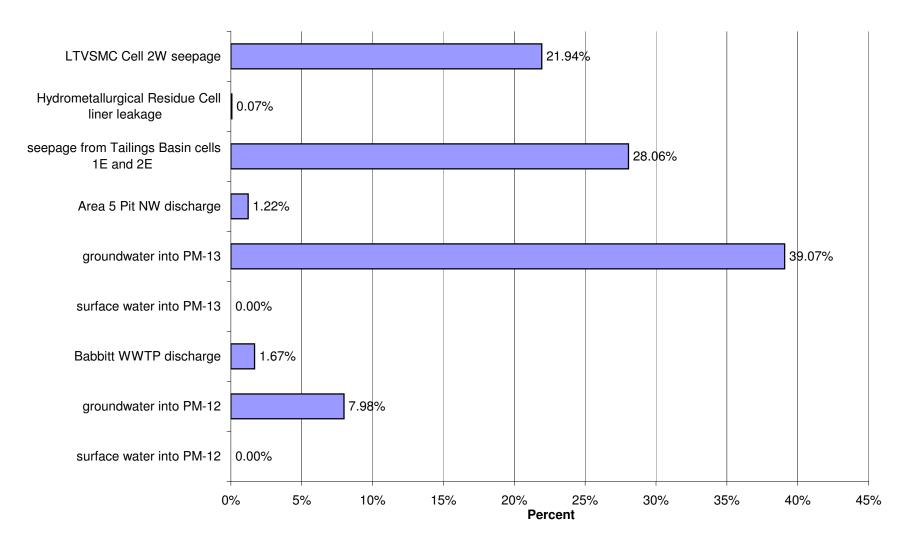
Proposed Action: Percent of Impacts at PM-13 in Closure for High Flow for Arsenic (As)



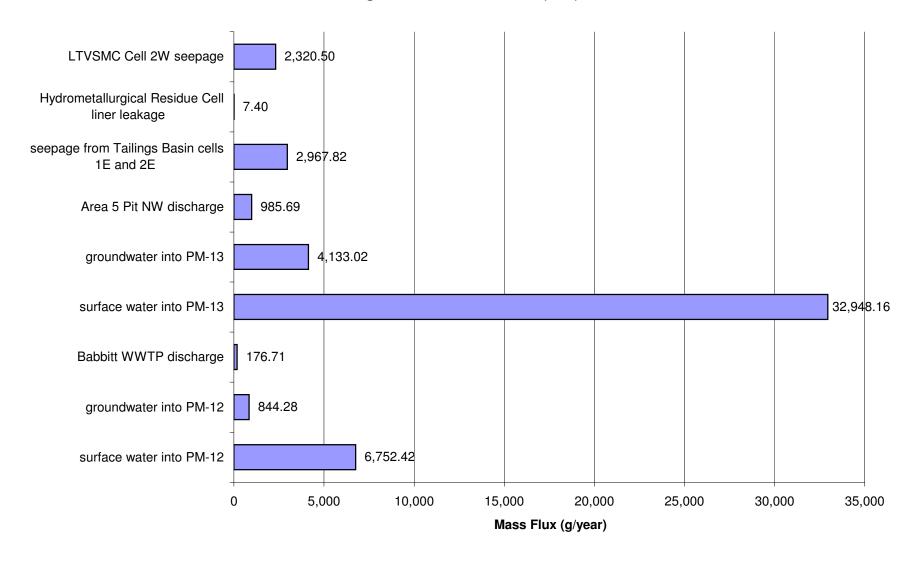
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Closure for Low Flow for Cobalt (Co)



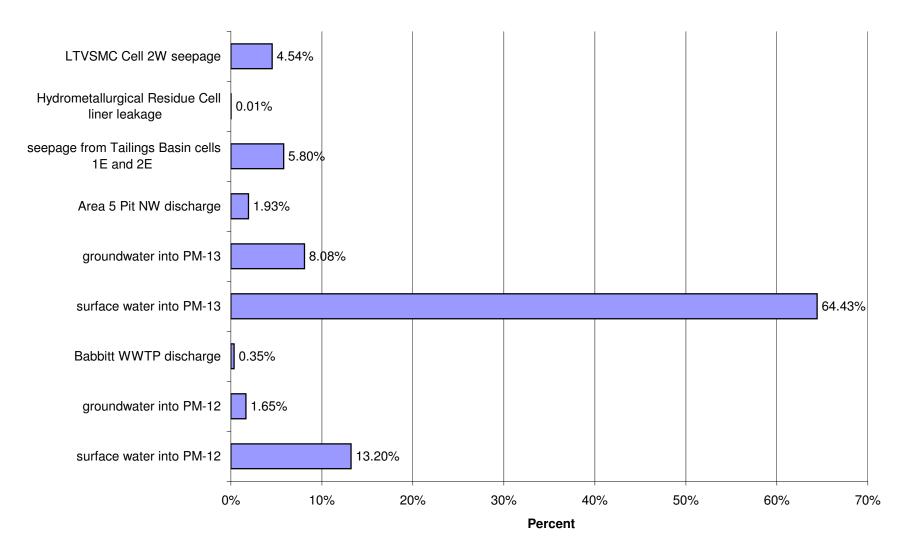
Proposed Action: Percent of Impacts at PM-13 in Closure for Low Flow for Cobalt (Co)



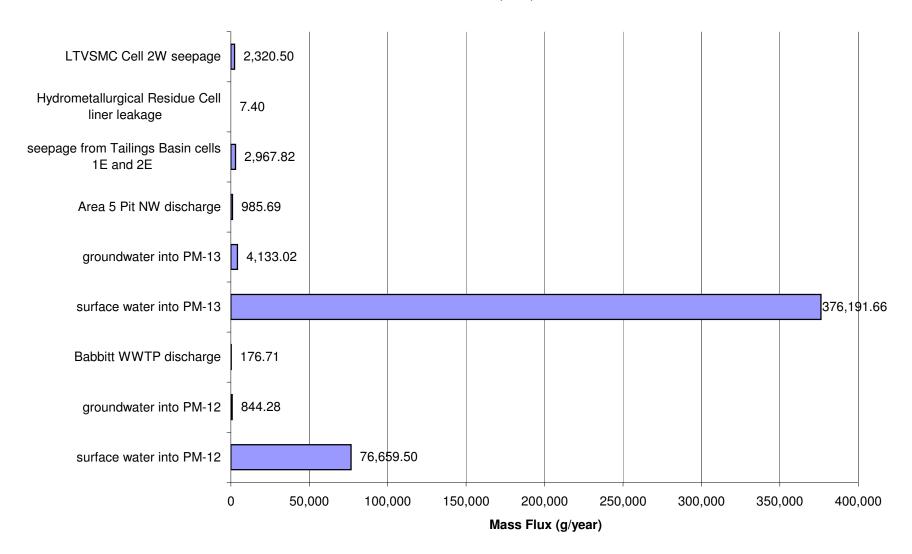
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Closure for Average Flow for Cobalt (Co)



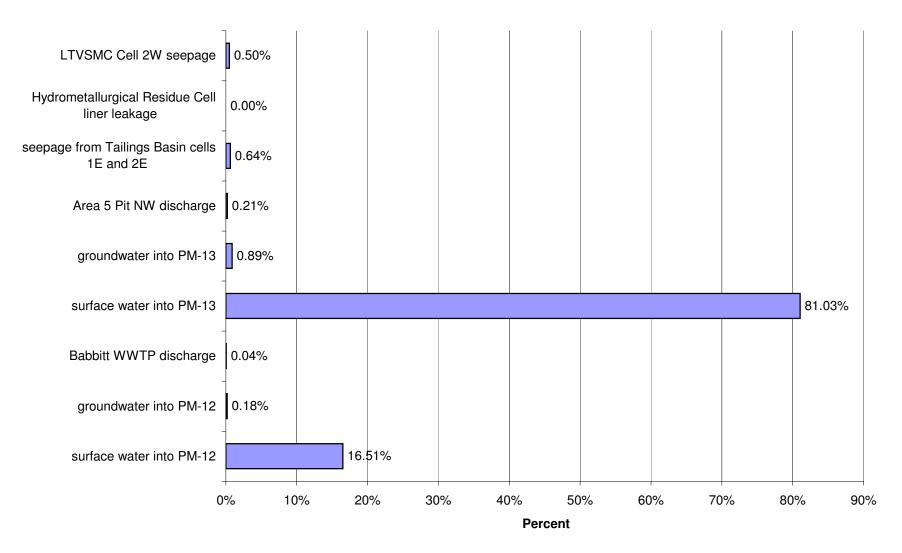
Proposed Action: Percent of Impacts at PM-13 in Closure for Average Flow for Cobalt (Co)



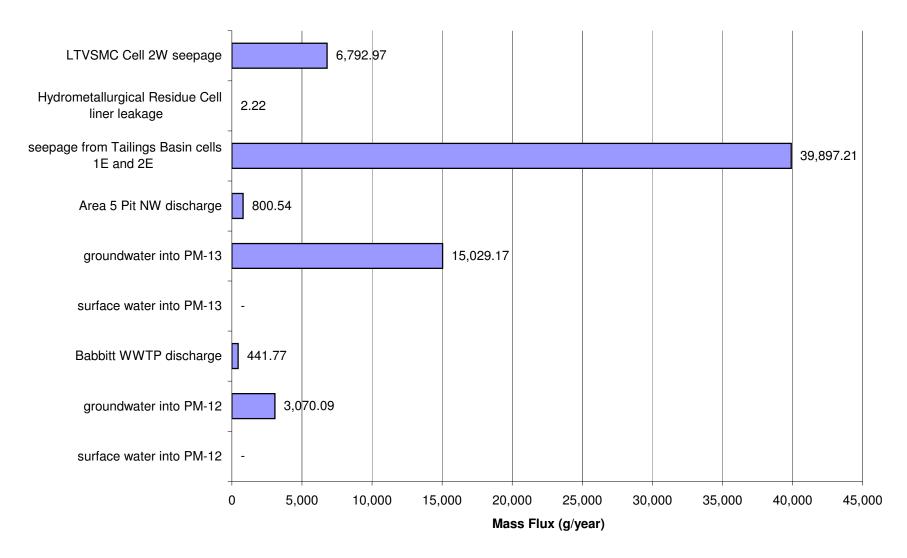
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Closure for High Flow for Cobalt (Co)



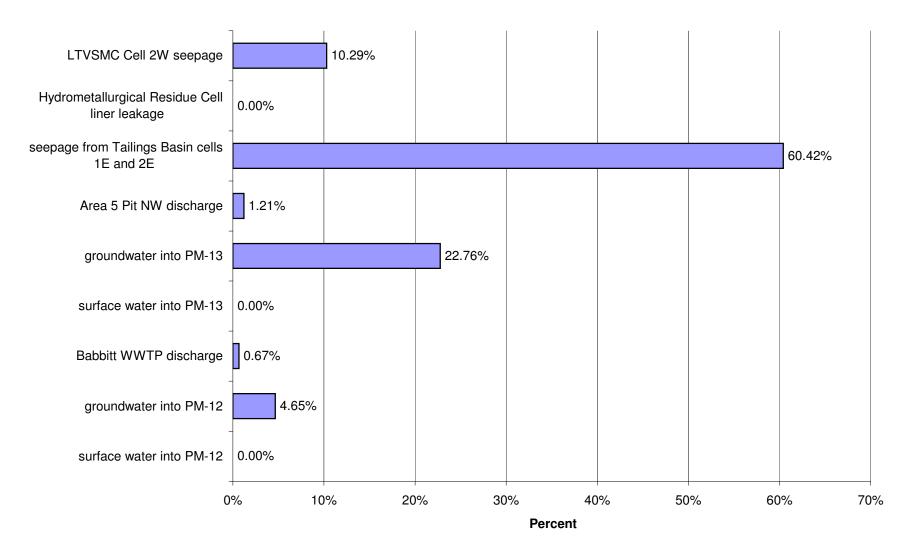
Proposed Action: Percent of Impacts at PM-13 in Closure for High Flow for Cobalt (Co)



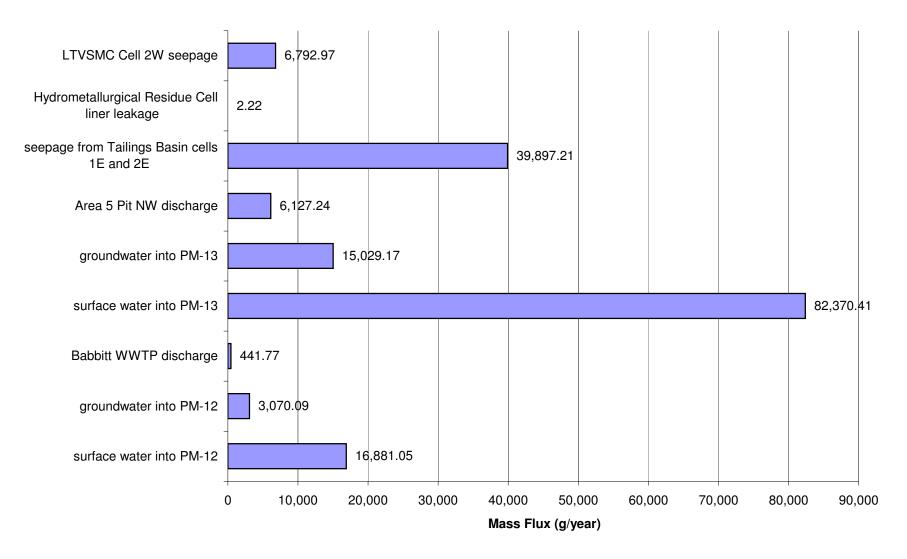
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Closure for Low Flow for Copper (Cu)



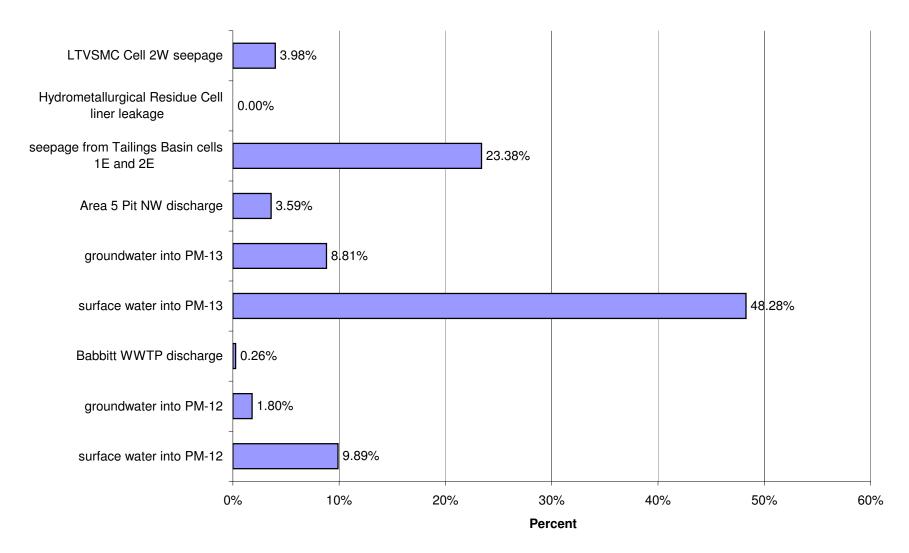
Proposed Action: Percent of Impacts at PM-13 in Closure for Low Flow for Copper (Cu)



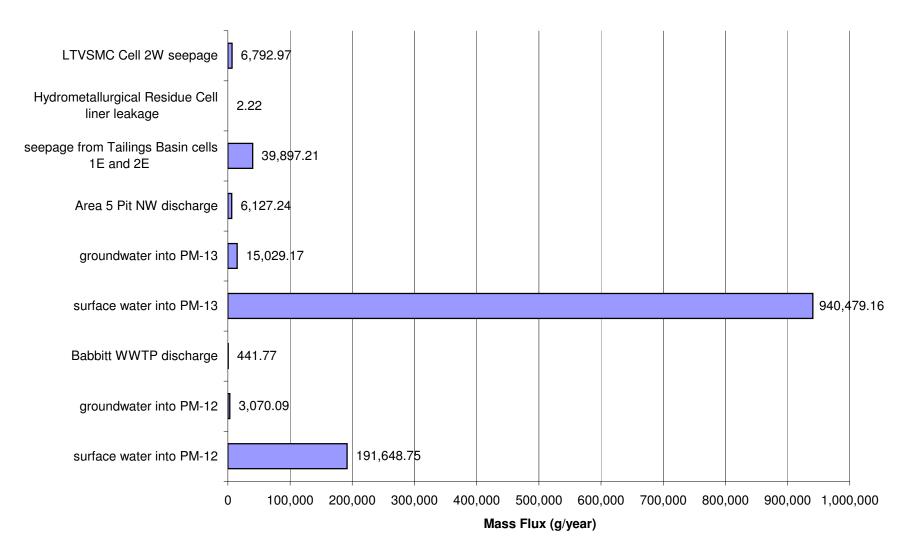
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Closure for Average Flow for Copper (Cu)



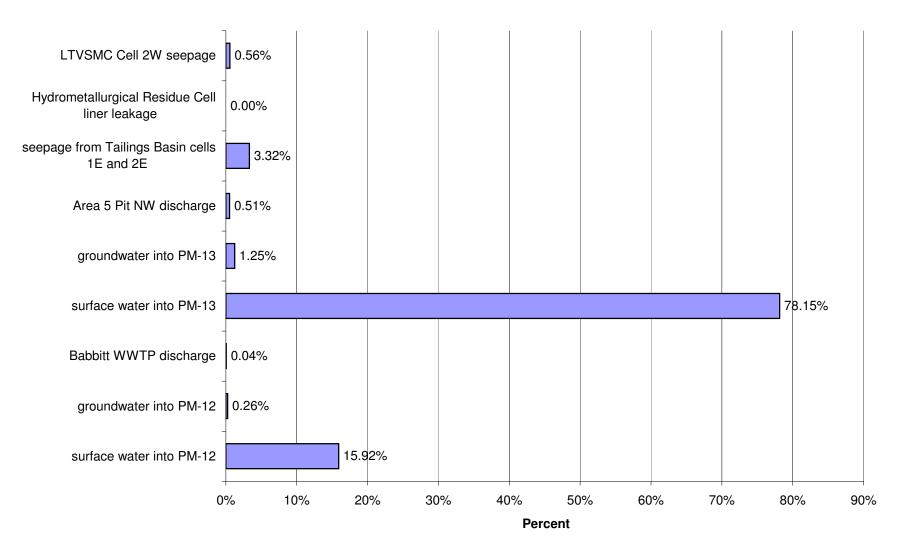
Proposed Action: Percent of Impacts at PM-13 in Closure for Average Flow for Copper (Cu)



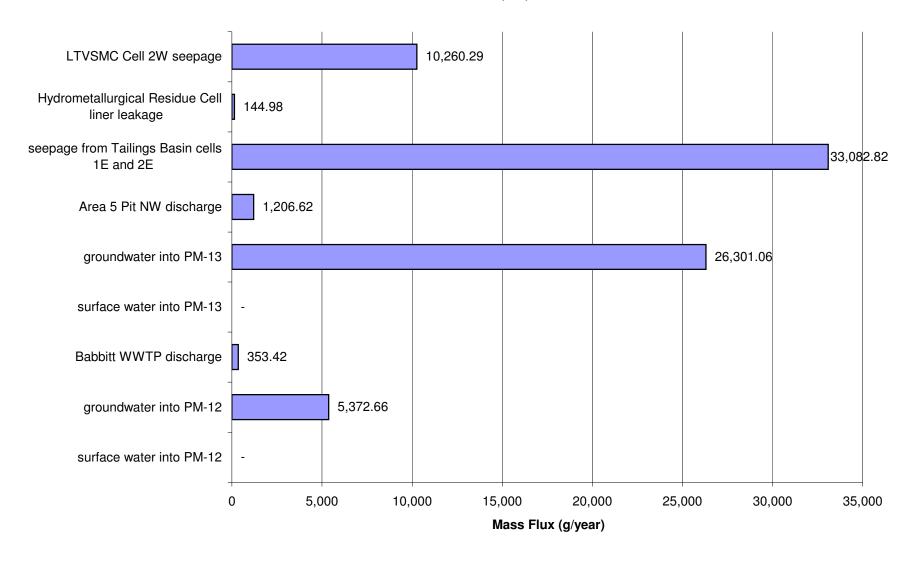
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Closure for High Flow for Copper (Cu)



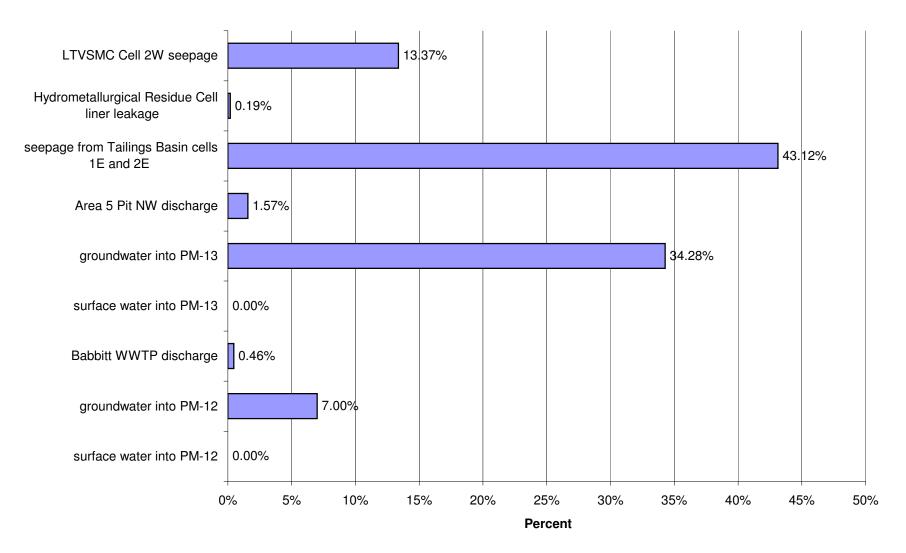
Proposed Action: Percent of Impacts at PM-13 in Closure for High Flow for Copper (Cu)



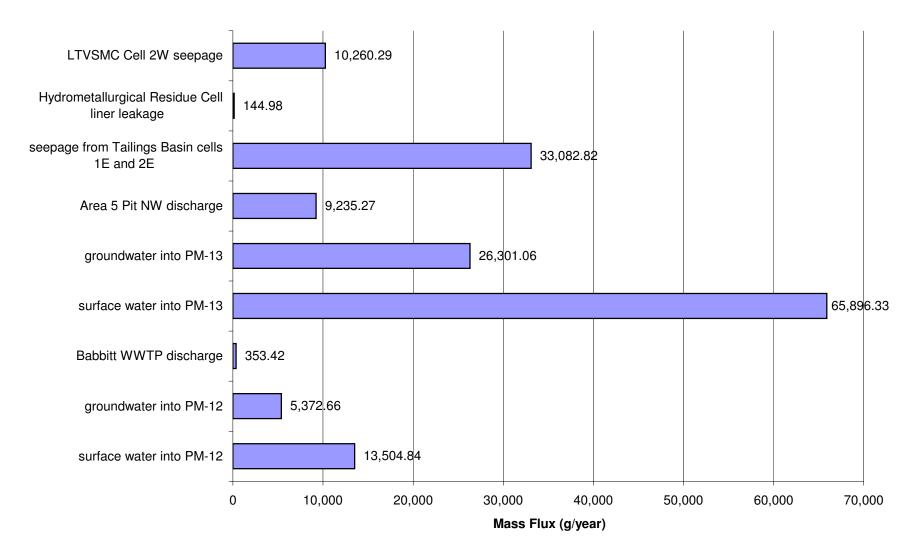
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Closure for Low Flow for Nickel (Ni)



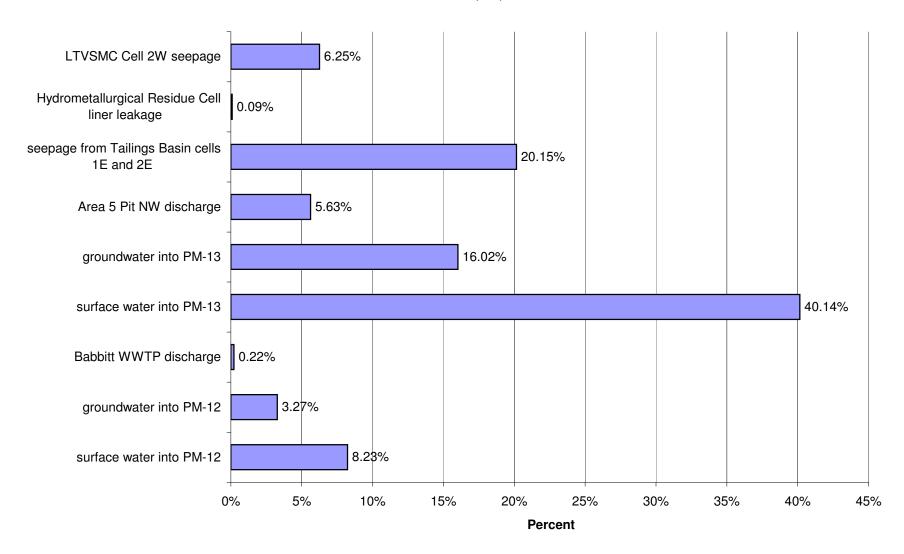
Proposed Action: Percent of Impacts at PM-13 in Closure for Low Flow for Nickel (Ni)



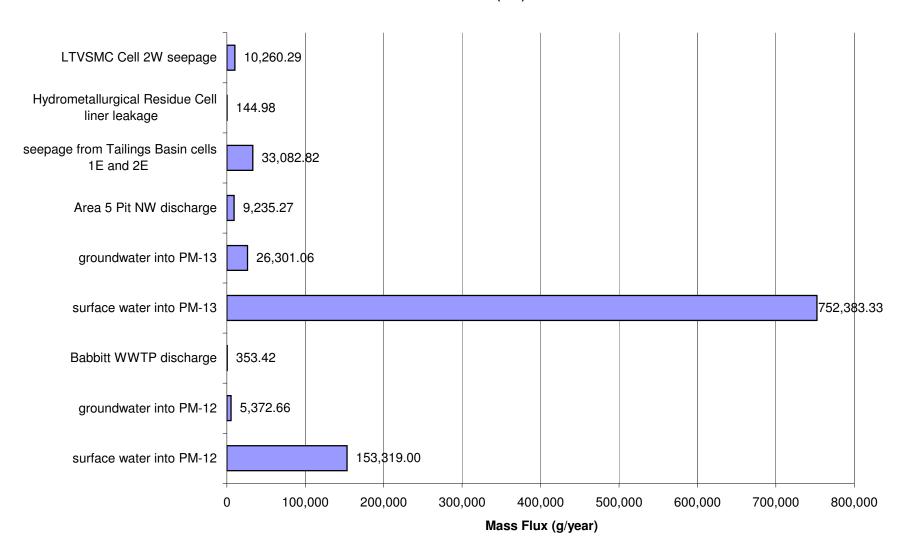
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Closure for Average Flow for Nickel (Ni)



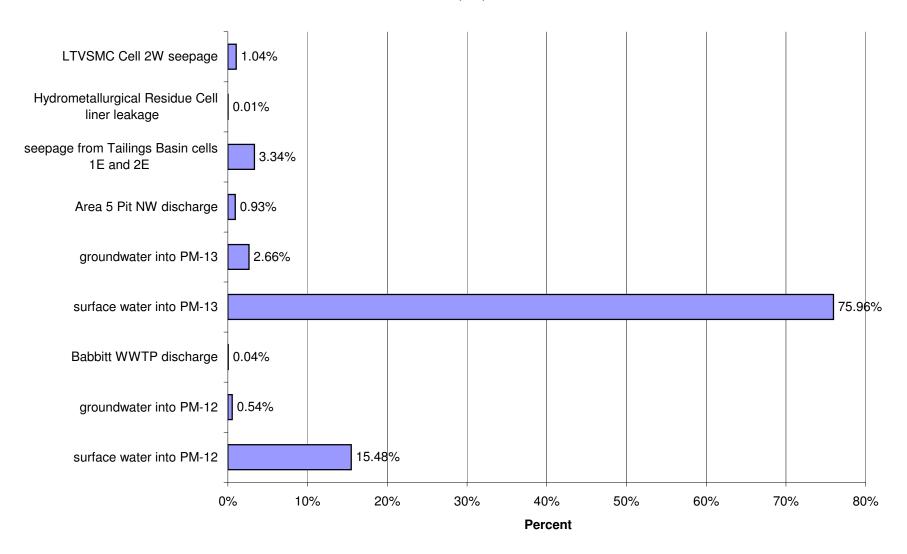
Proposed Action: Percent of Impacts at PM-13 in Closure for Average Flow for Nickel (Ni)



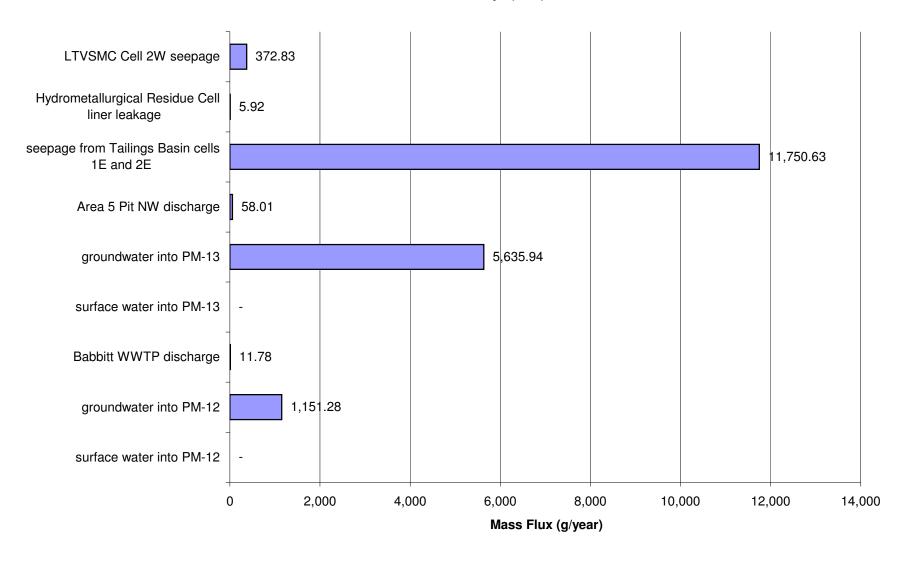
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Closure for High Flow for Nickel (Ni)



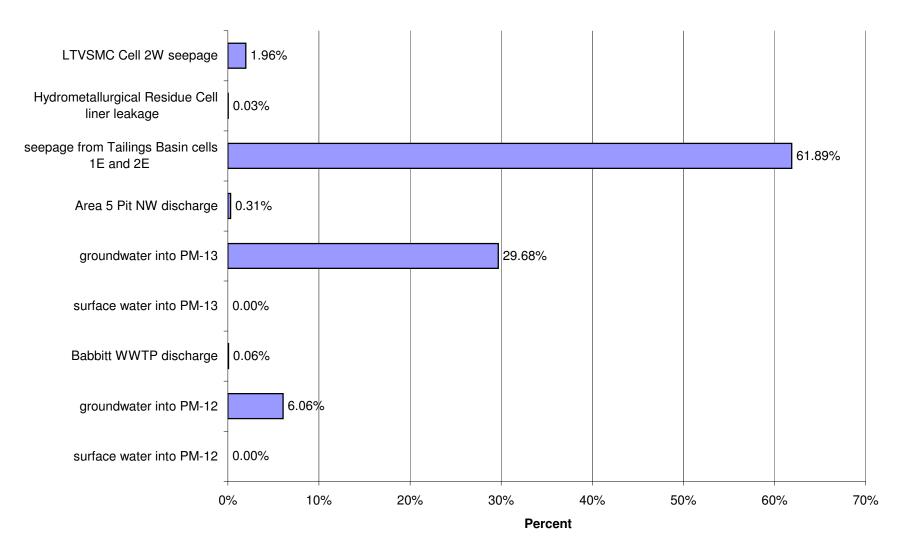
Proposed Action: Percent of Impacts at PM-13 in Closure for High Flow for Nickel (Ni)



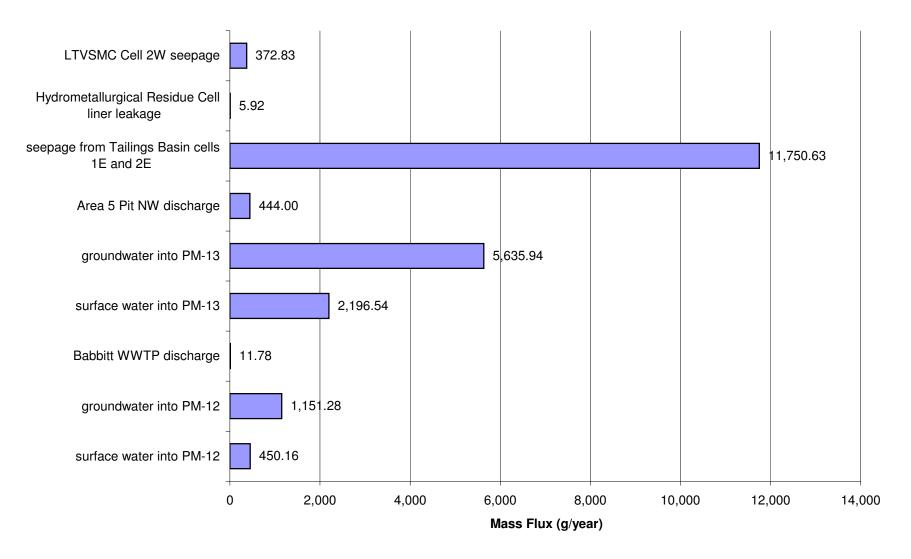
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Closure for Low Flow for Antimony (Sb)



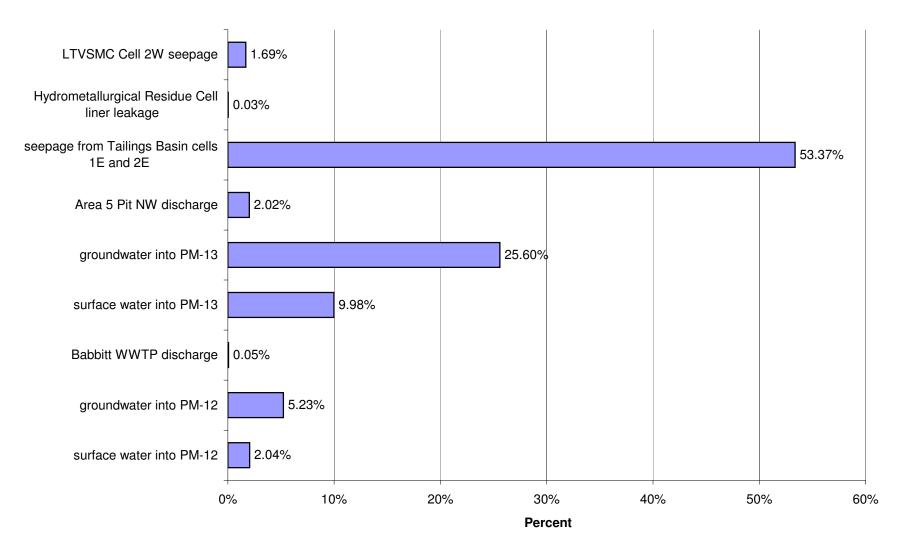
Proposed Action: Percent of Impacts at PM-13 in Closure for Low Flow for Antimony (Sb)



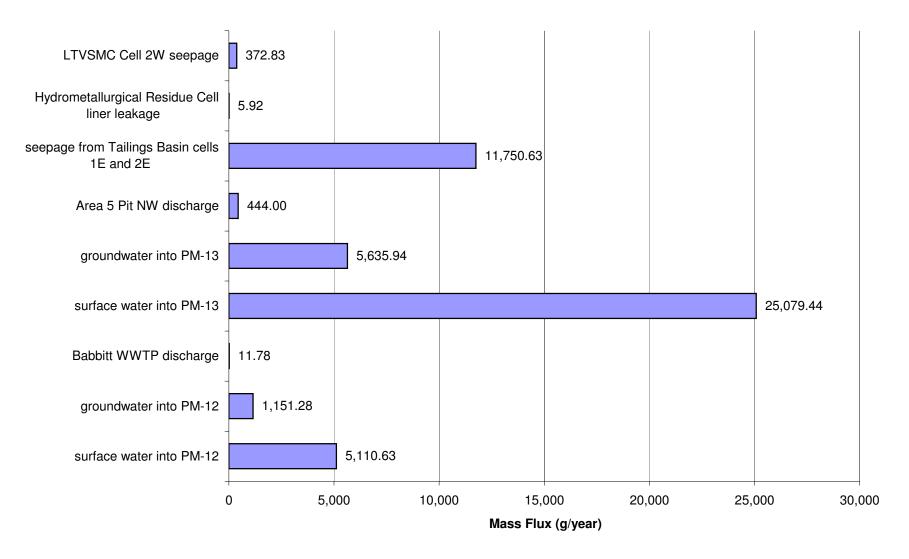
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Closure for Average Flow for Antimony (Sb)



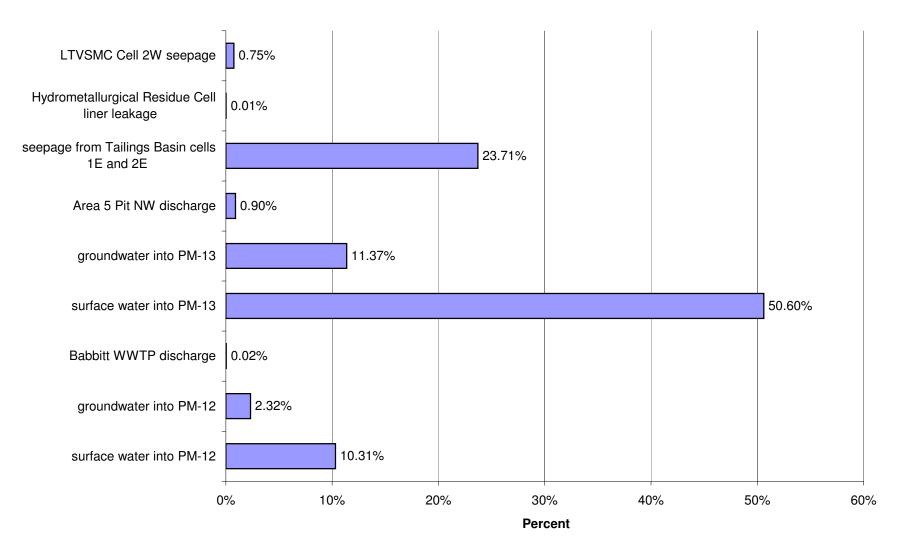
Proposed Action: Percent of Impacts at PM-13 in Closure for Average Flow for Antimony (Sb)



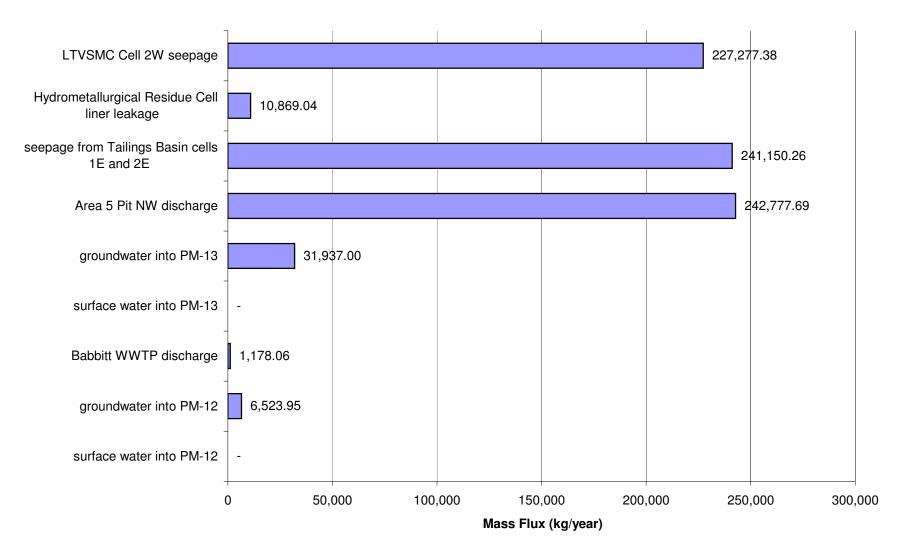
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Closure for High Flow for Antimony (Sb)



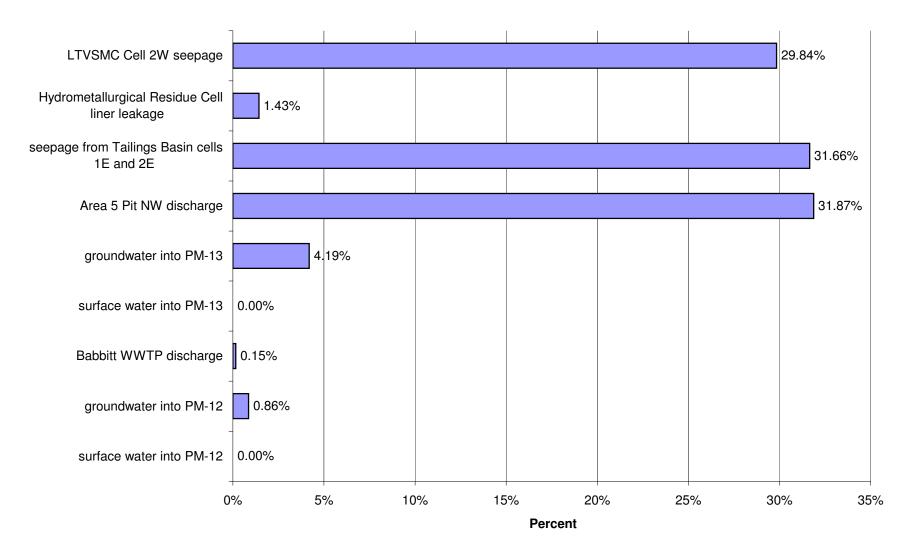
Proposed Action: Percent of Impacts at PM-13 in Closure for High Flow for Antimony (Sb)



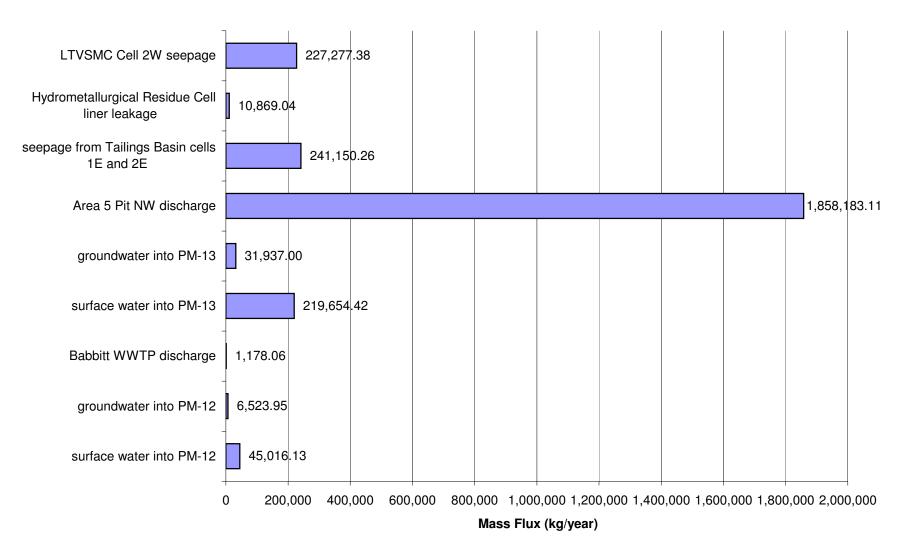
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Closure for Low Flow for Sulfate (SO4)



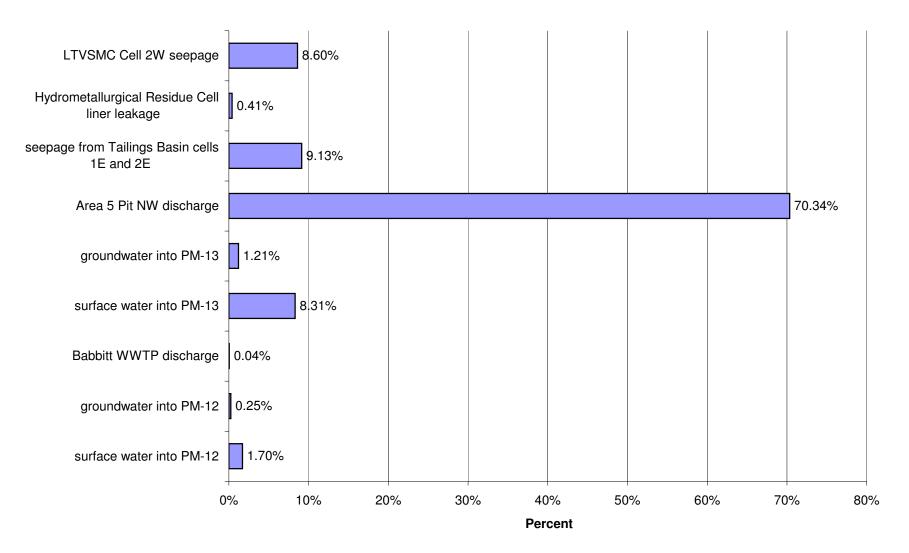
Proposed Action: Percent of Impacts at PM-13 in Closure for Low Flow for Sulfate (SO4)



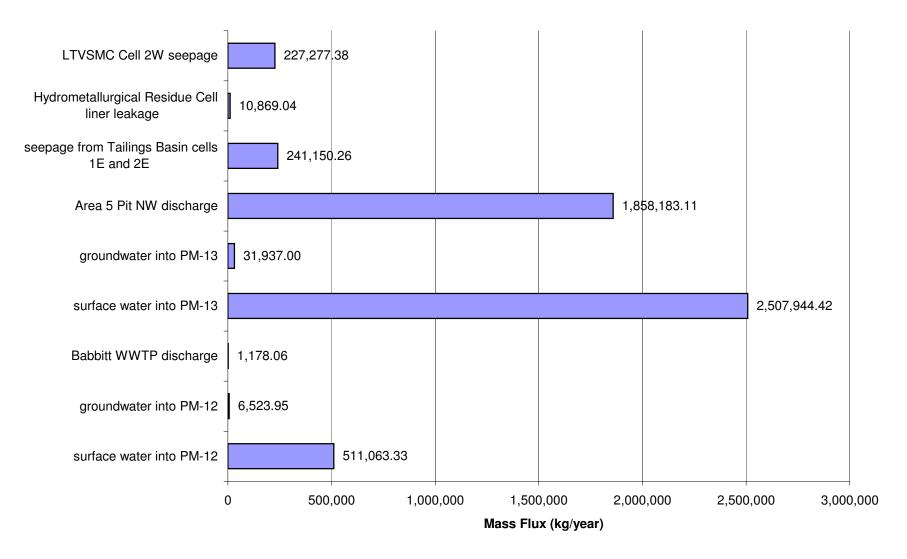
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Closure for Average Flow for Sulfate (SO4)



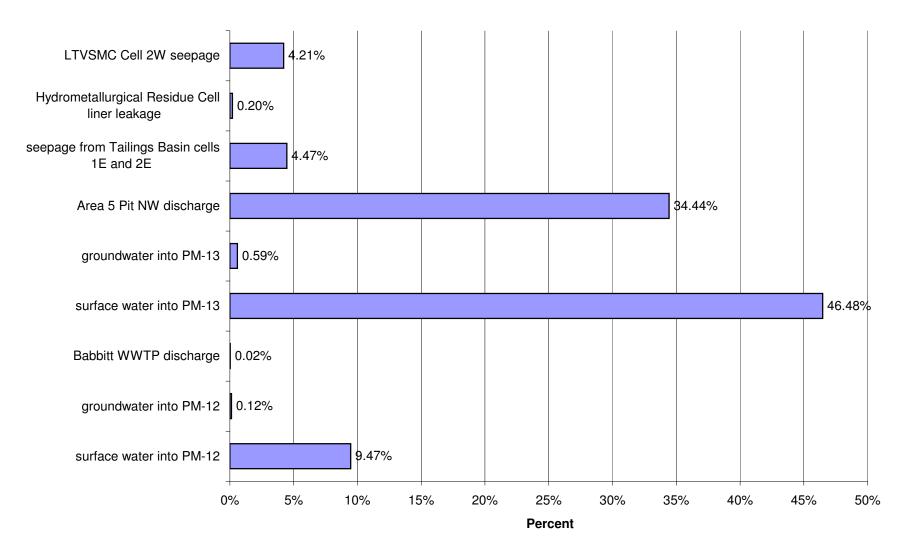
Proposed Action: Percent of Impacts at PM-13 in Closure for Average Flow for Sulfate (SO4)



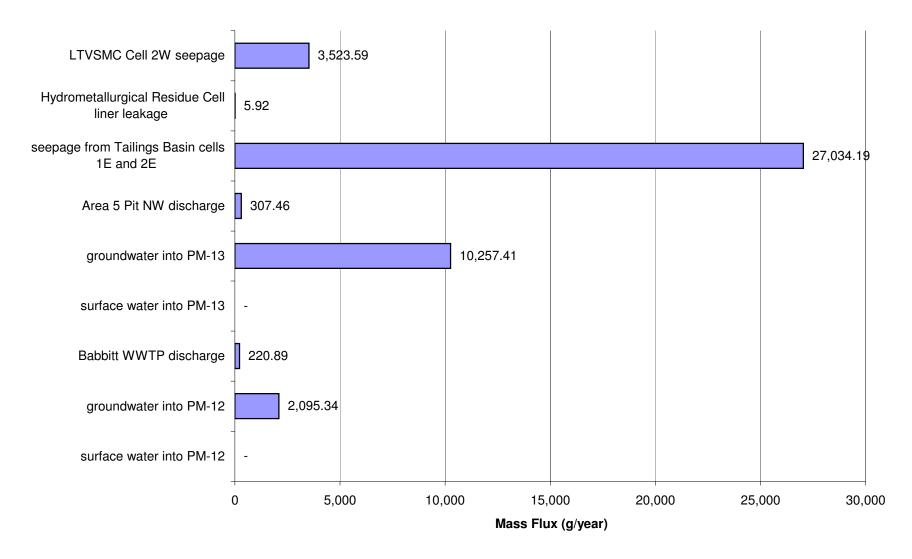
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Closure for High Flow for Sulfate (SO4)



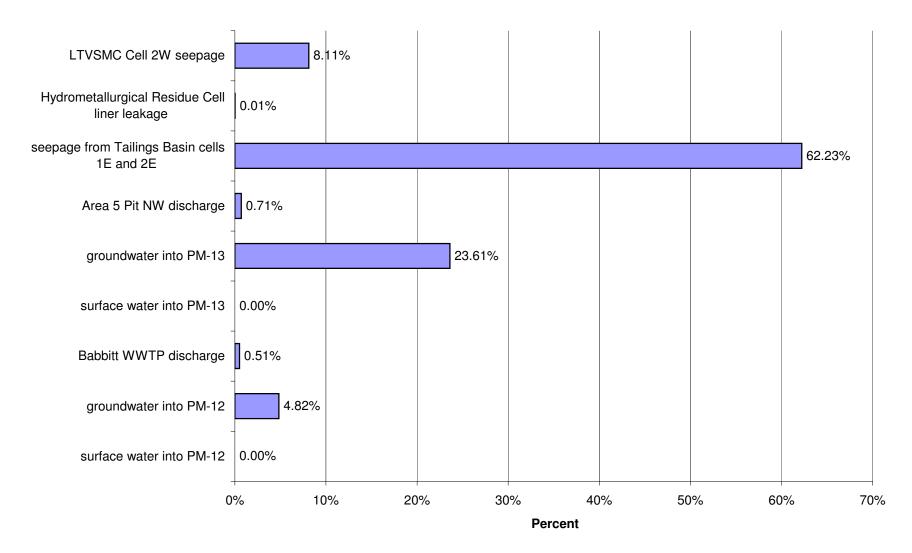
Proposed Action: Percent of Impacts at PM-13 in Closure for High Flow for Sulfate (SO4)



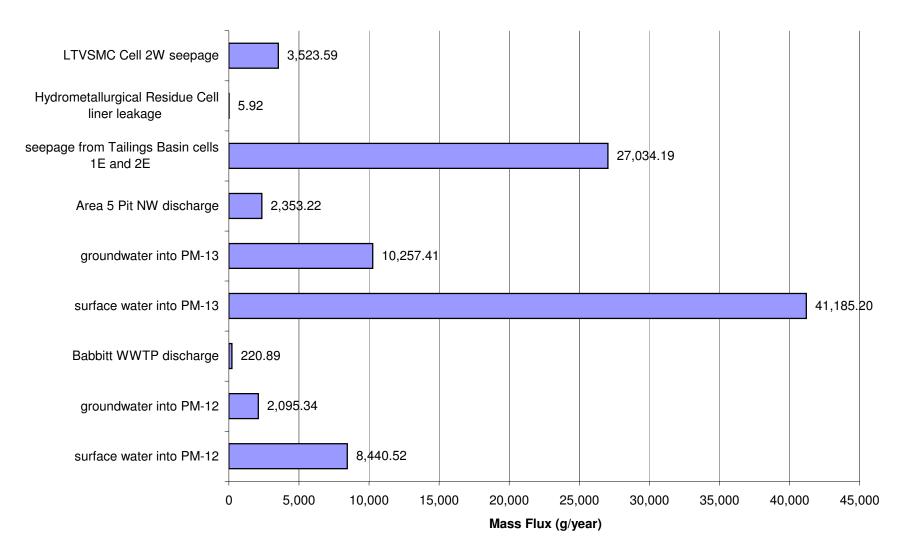
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Low Flow for Arsenic (As)



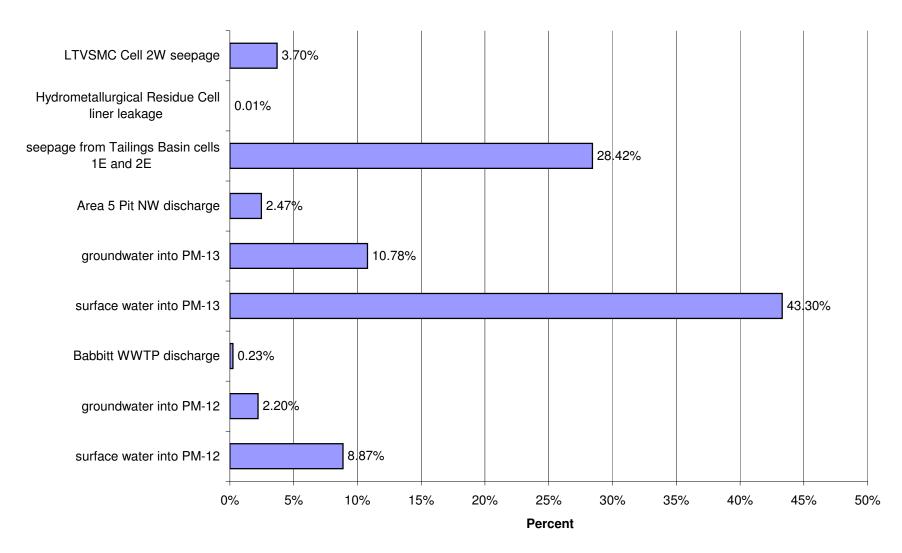
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for Low Flow for Arsenic (As)



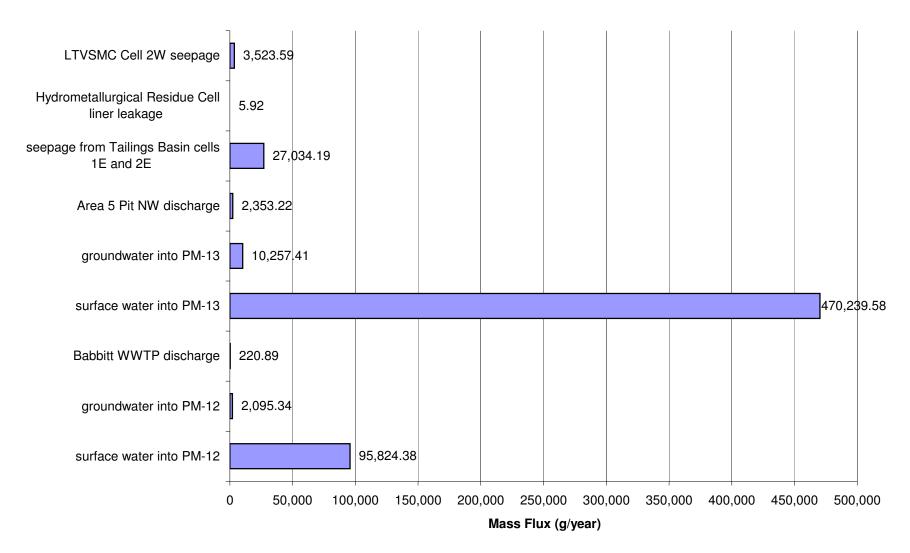
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Average Flow for Arsenic (As)



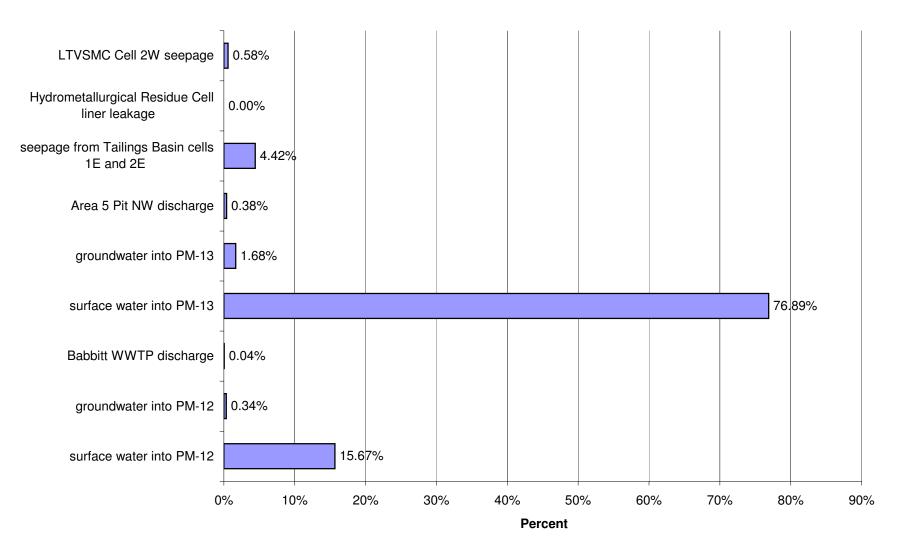
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for Average Flow for Arsenic (As)



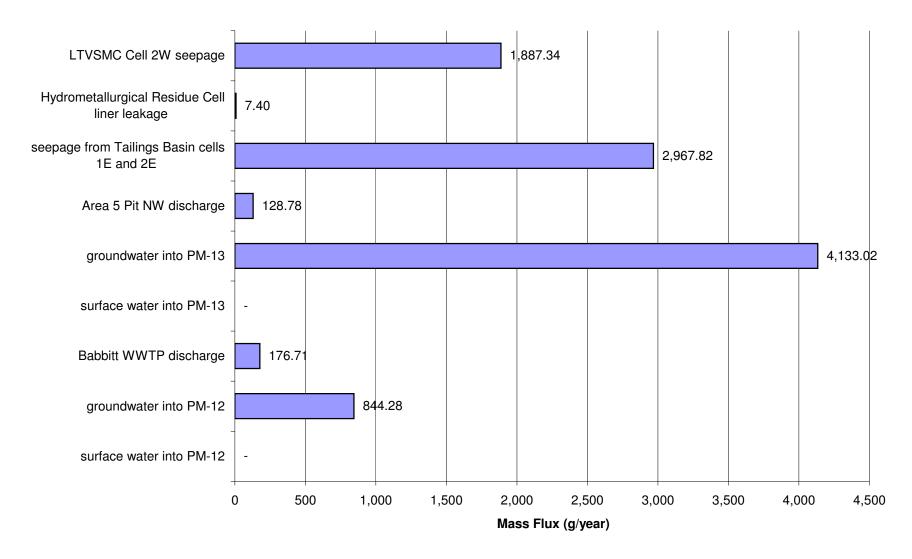
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for High Flow for Arsenic (As)



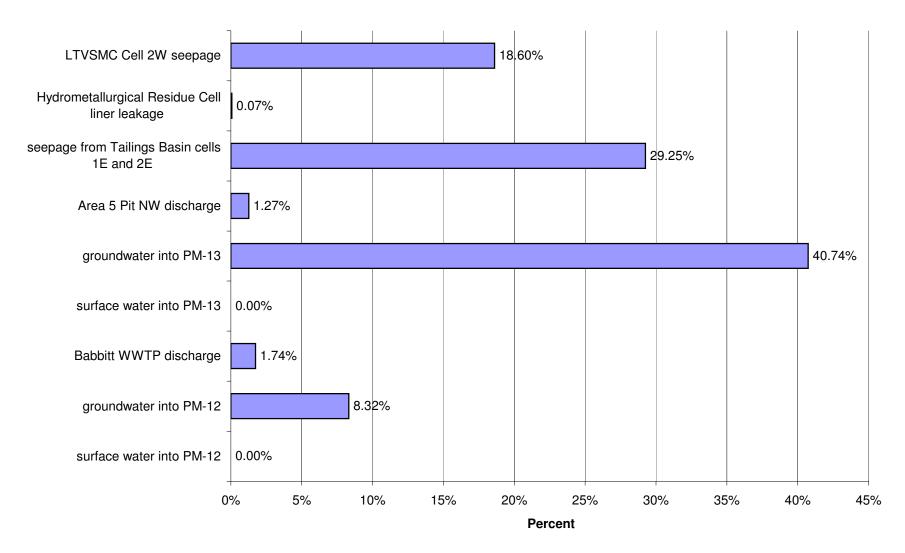
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for High Flow for Arsenic (As)



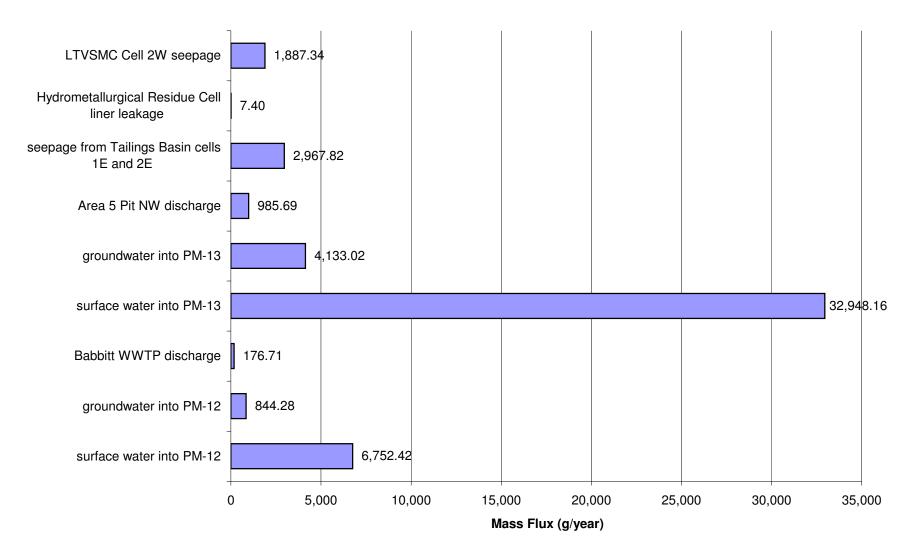
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Low Flow for Cobalt (Co)



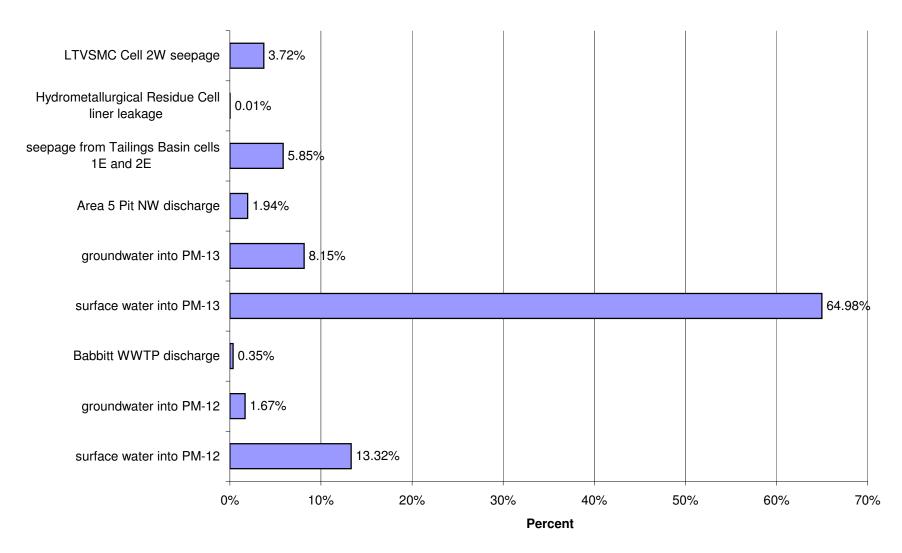
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for Low Flow for Cobalt (Co)



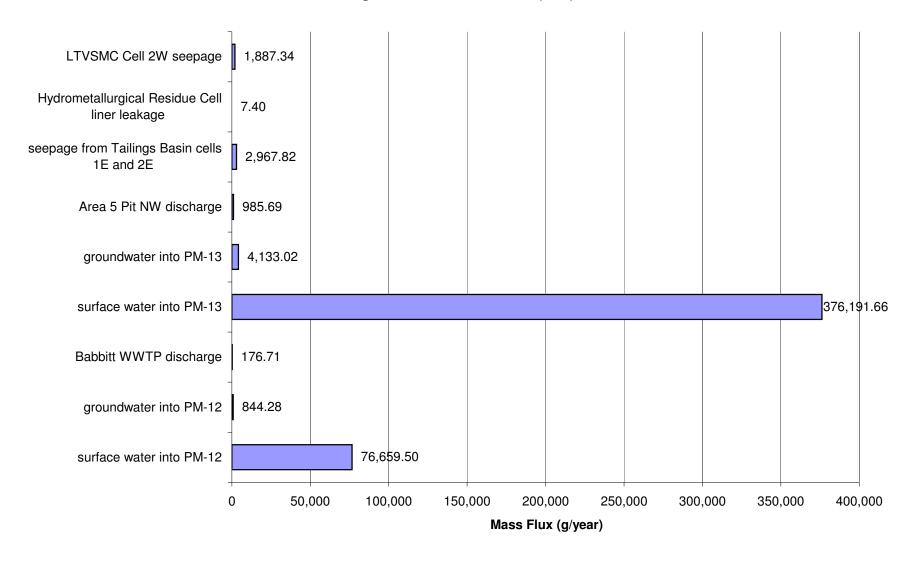
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Average Flow for Cobalt (Co)



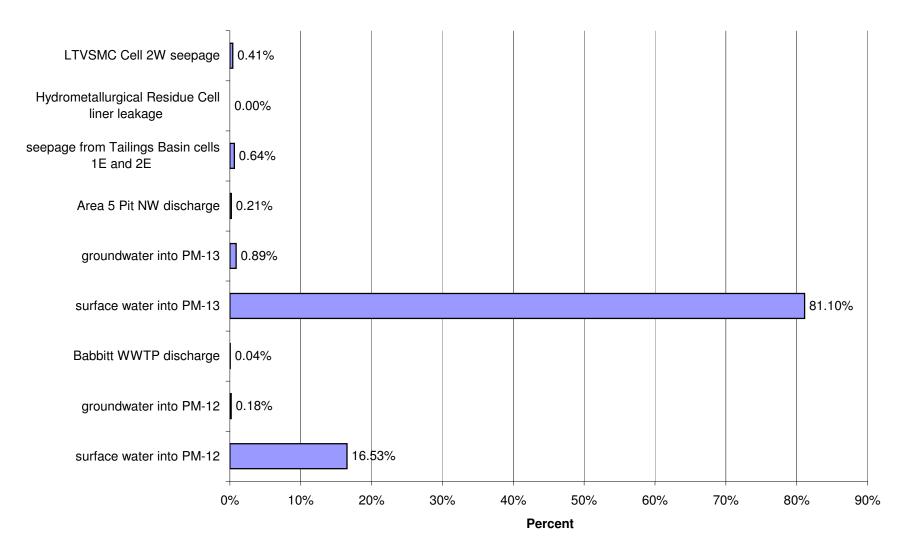
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for Average Flow for Cobalt (Co)



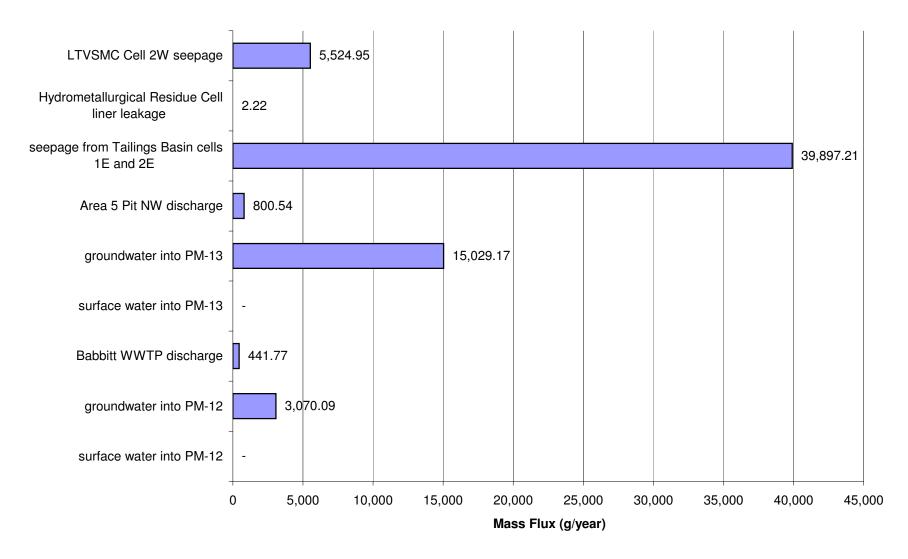
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for High Flow for Cobalt (Co)



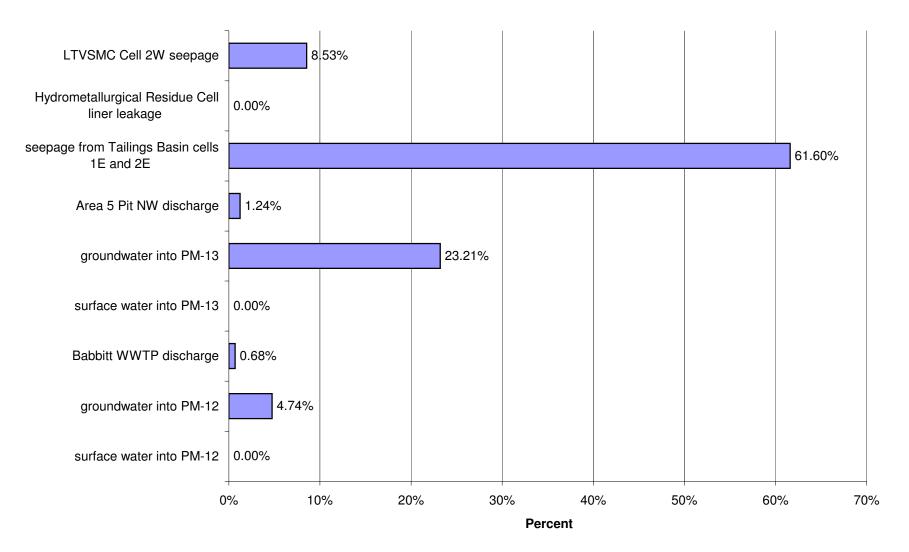
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for High Flow for Cobalt (Co)



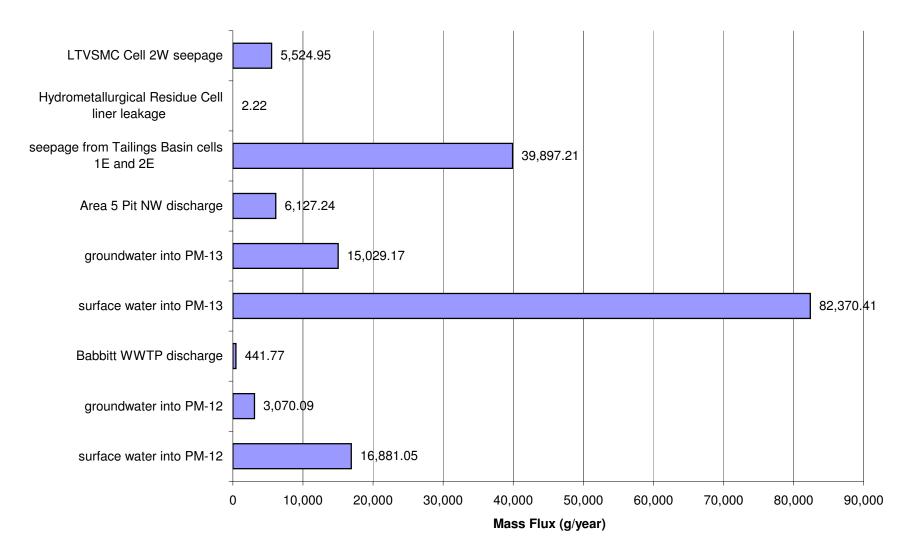
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Low Flow for Copper (Cu)



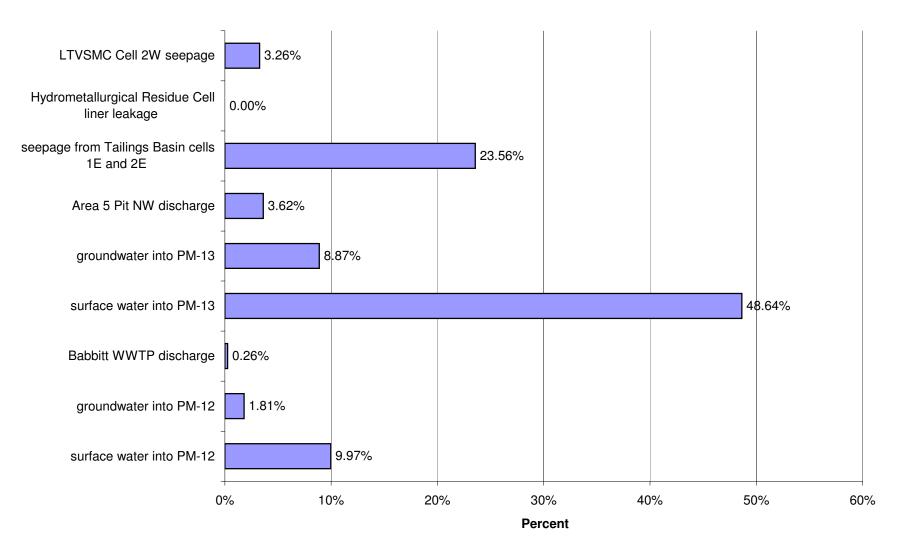
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for Low Flow for Copper (Cu)



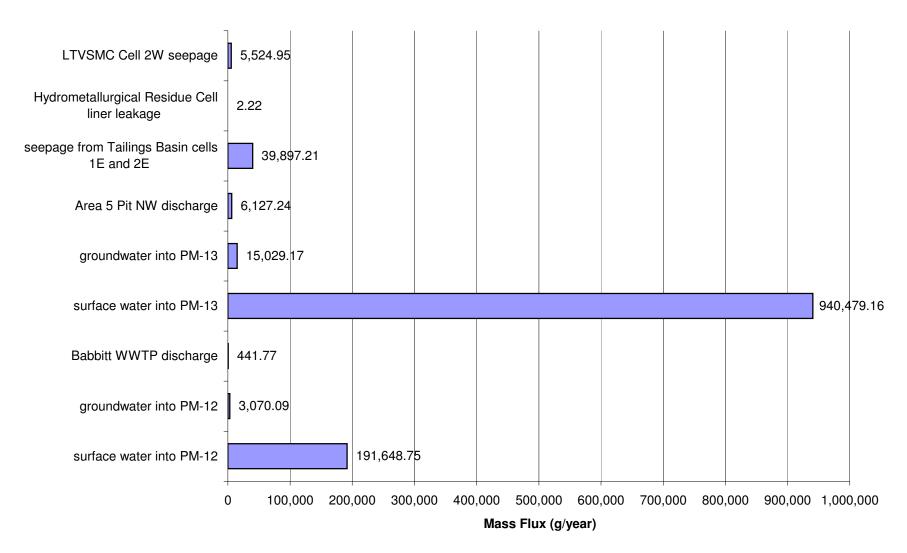
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Average Flow for Copper (Cu)



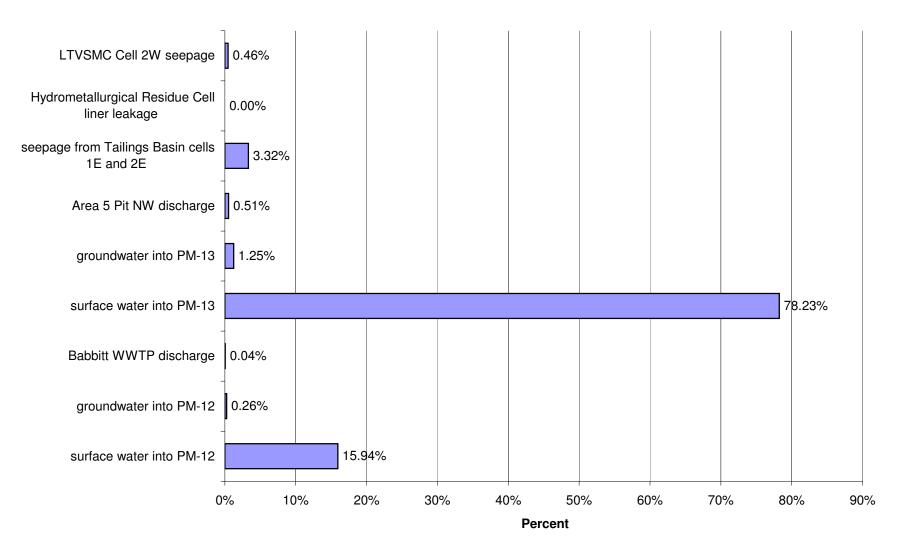
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for Average Flow for Copper (Cu)



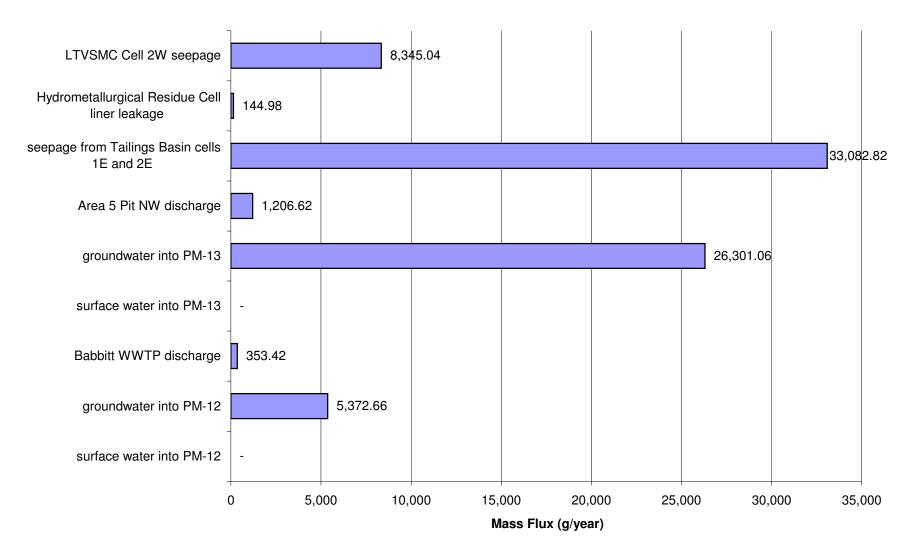
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for High Flow for Copper (Cu)



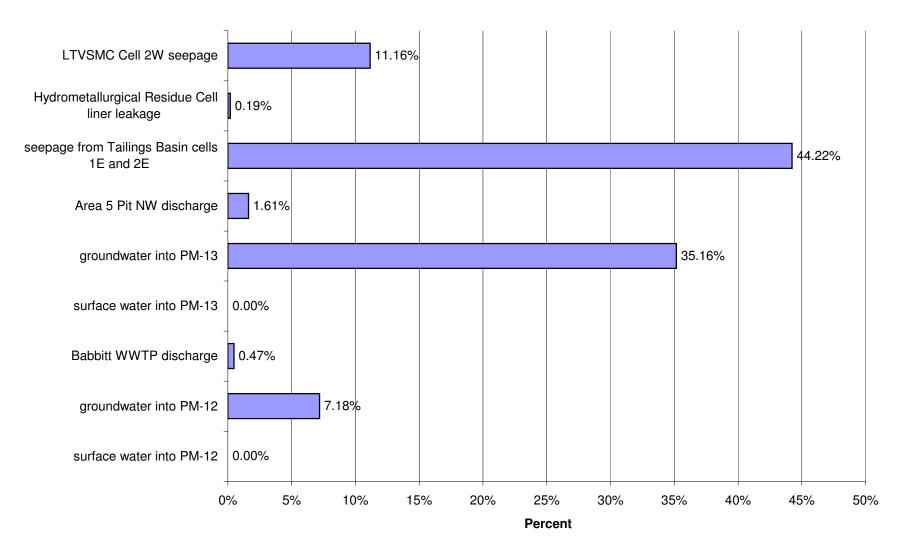
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for High Flow for Copper (Cu)



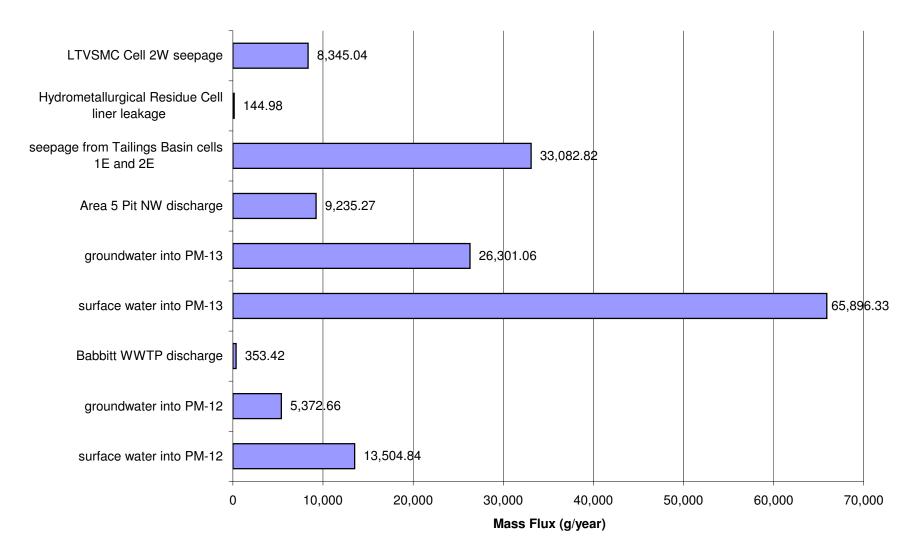
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Low Flow for Nickel (Ni)



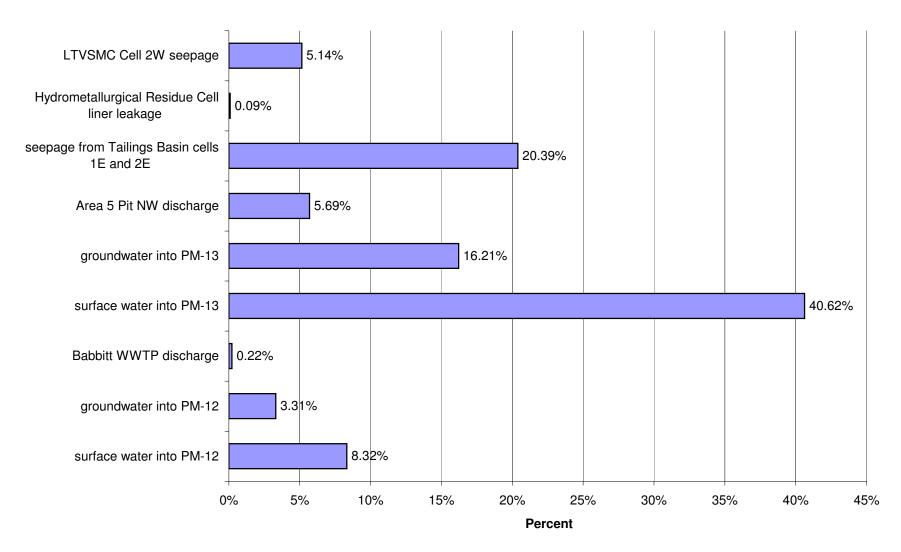
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for Low Flow for Nickel (Ni)



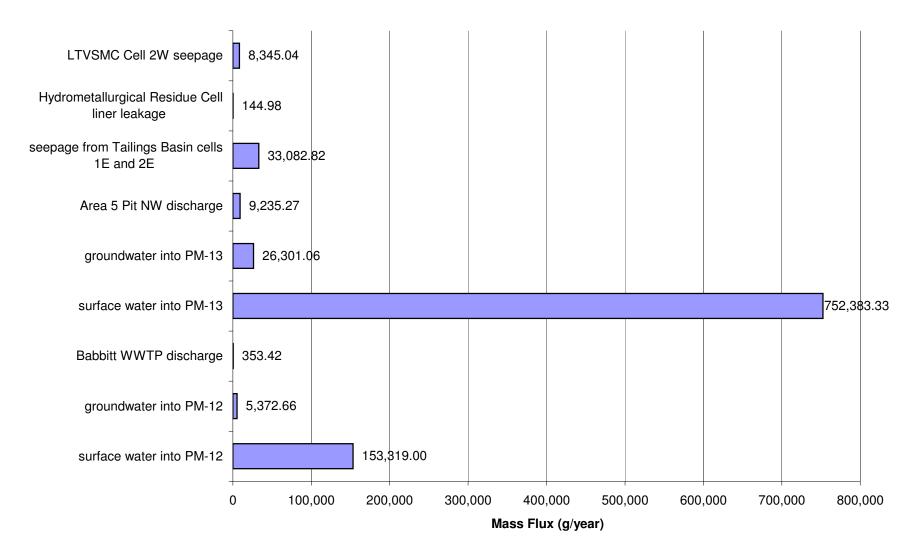
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Average Flow for Nickel (Ni)



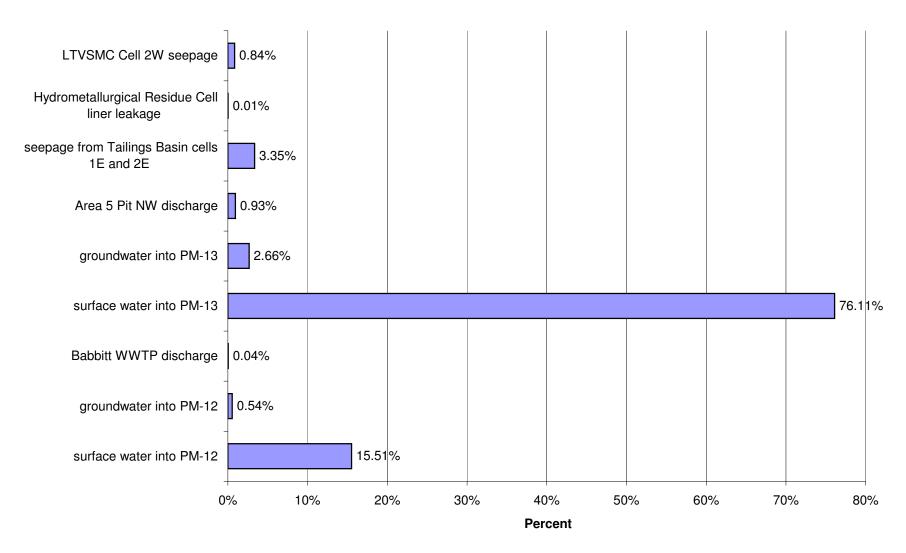
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for Average Flow for Nickel (Ni)



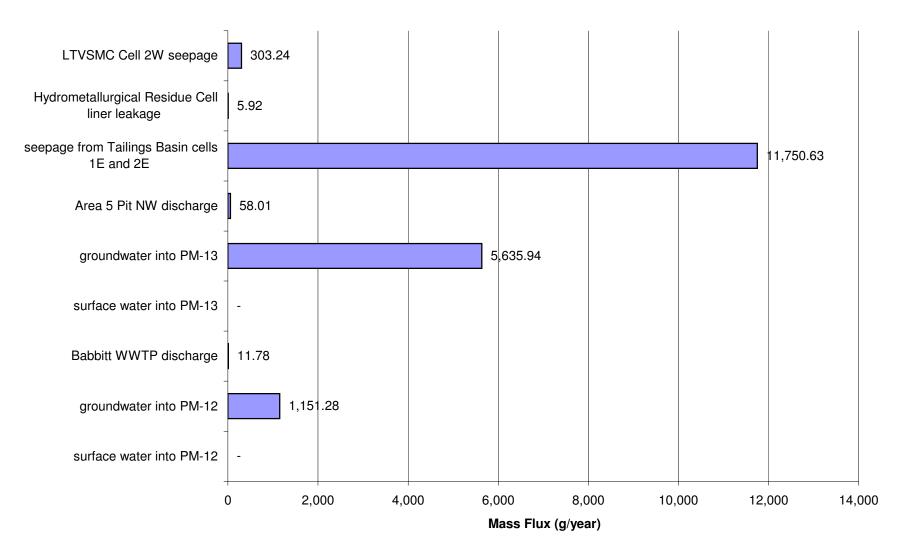
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for High Flow for Nickel (Ni)



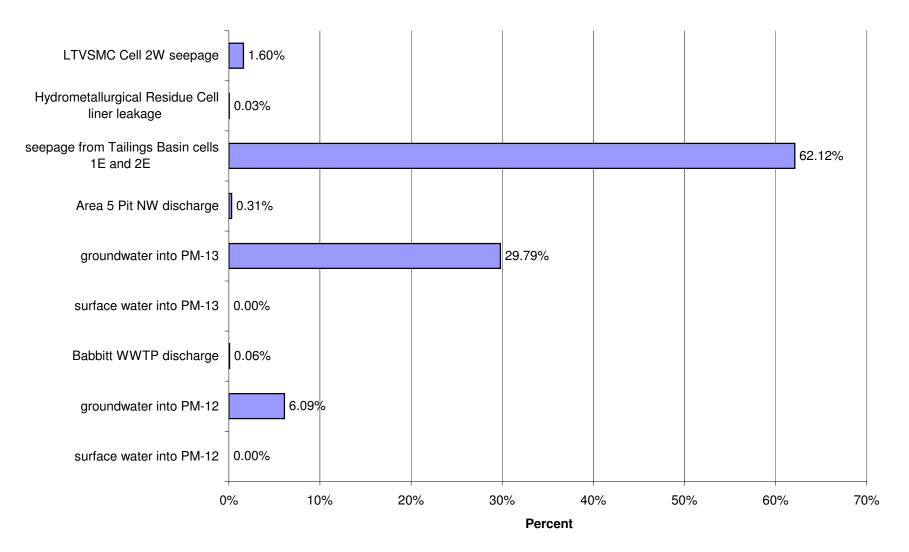
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for High Flow for Nickel (Ni)



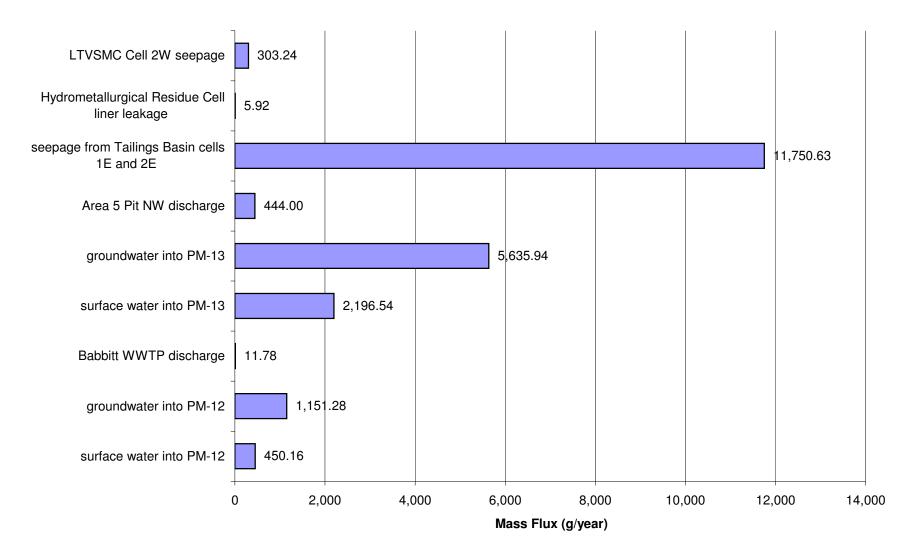
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Low Flow for Antimony (Sb)



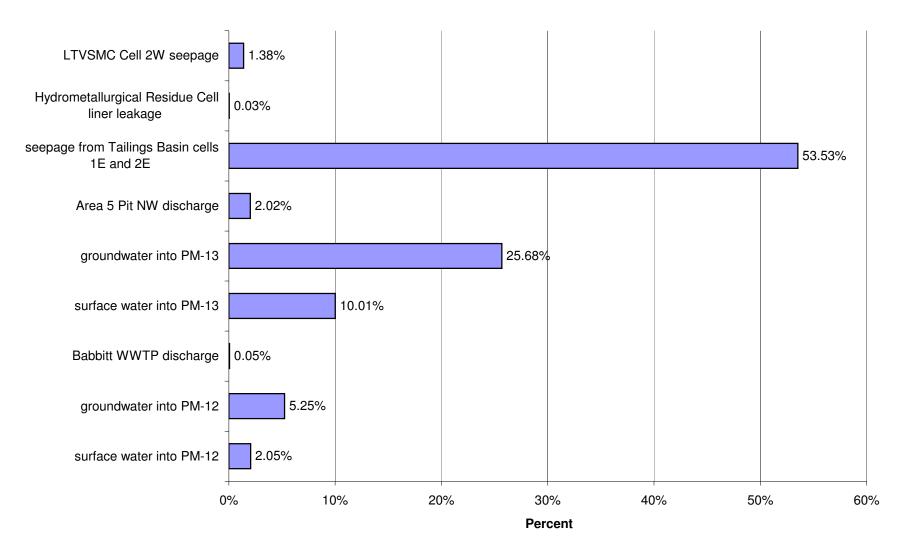
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for Low Flow for Antimony (Sb)



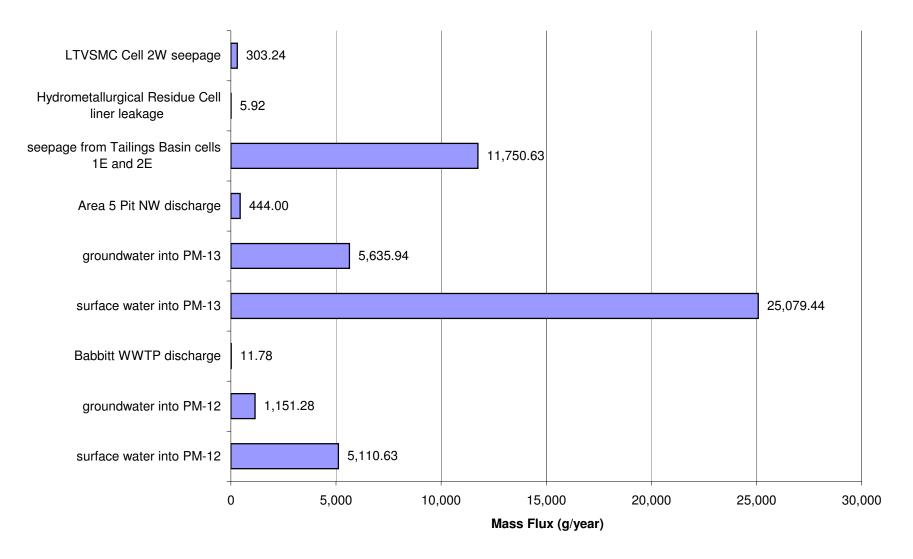
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Average Flow for Antimony (Sb)



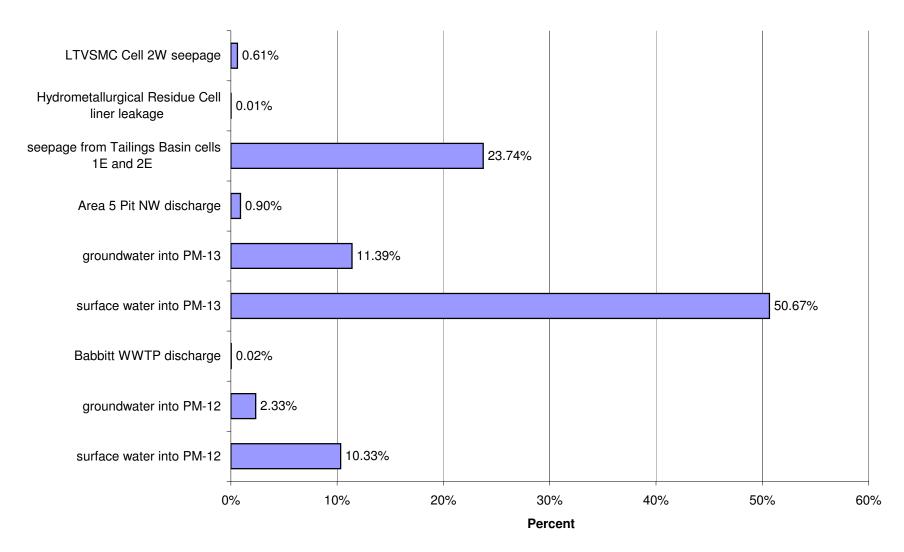
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for Average Flow for Antimony (Sb)



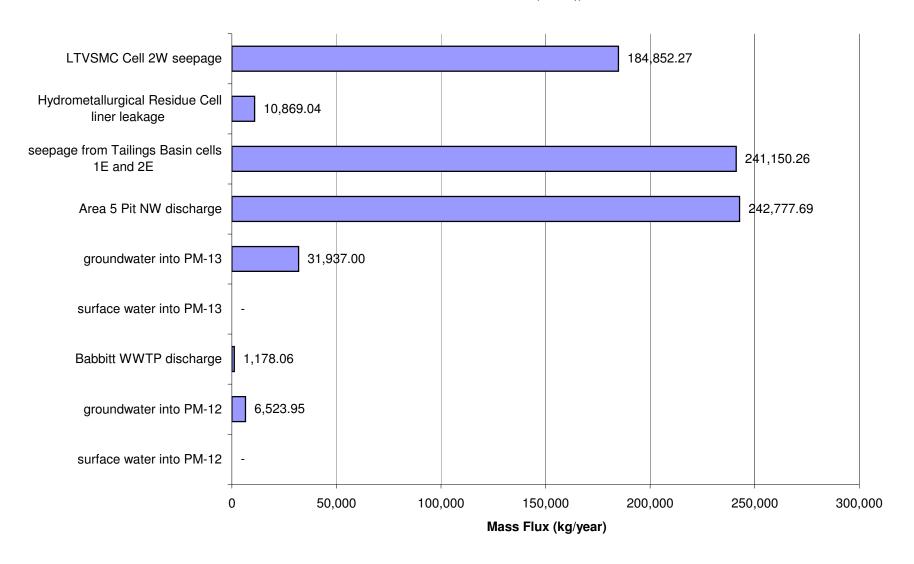
Proposed Action: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for High Flow for Antimony (Sb)



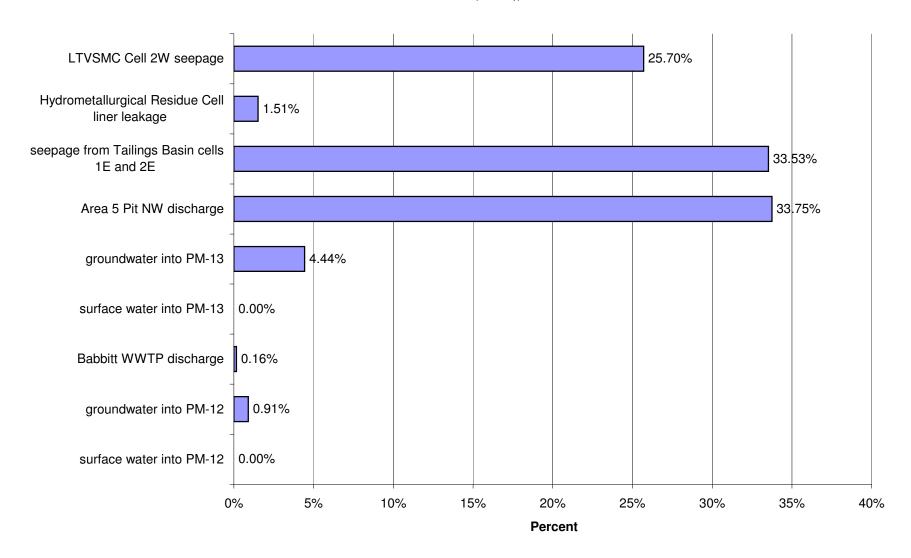
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for High Flow for Antimony (Sb)



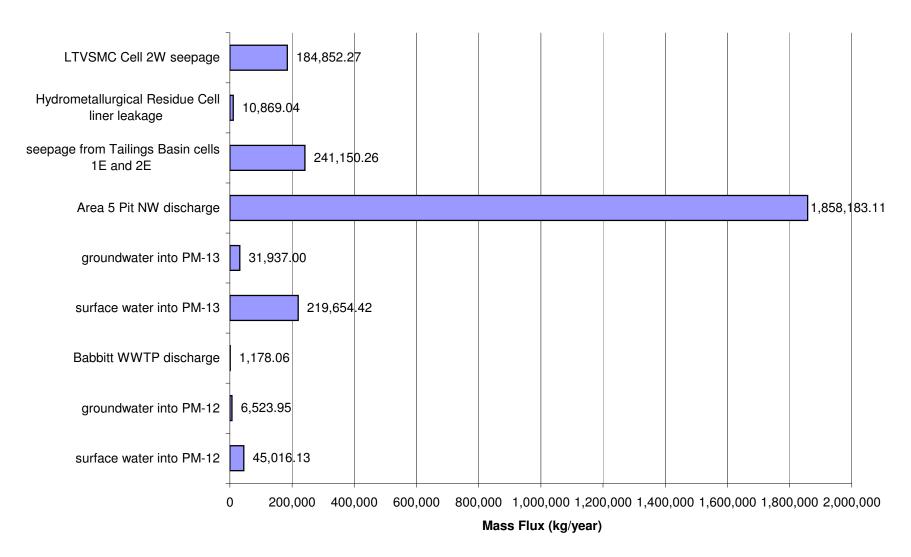
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Post - Closure for Low Flow for Sulfate (SO₄)



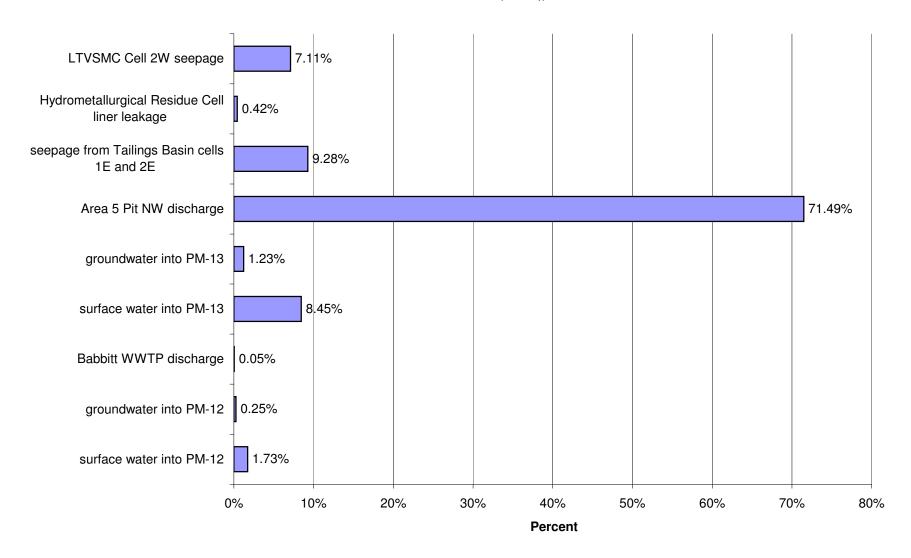
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for Low Flow for Sulfate (SO₄)



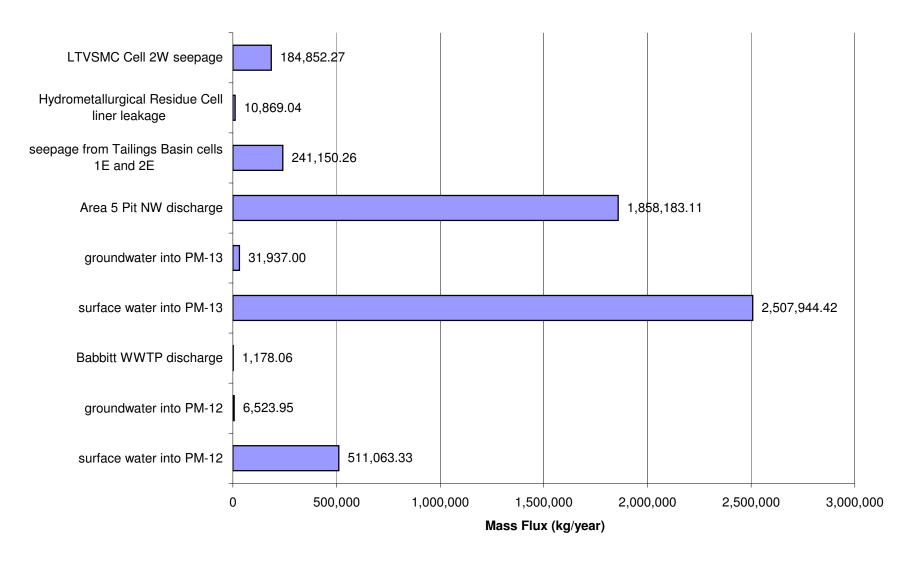
Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Post - Closure for Average Flow for Sulfate (SO₄)



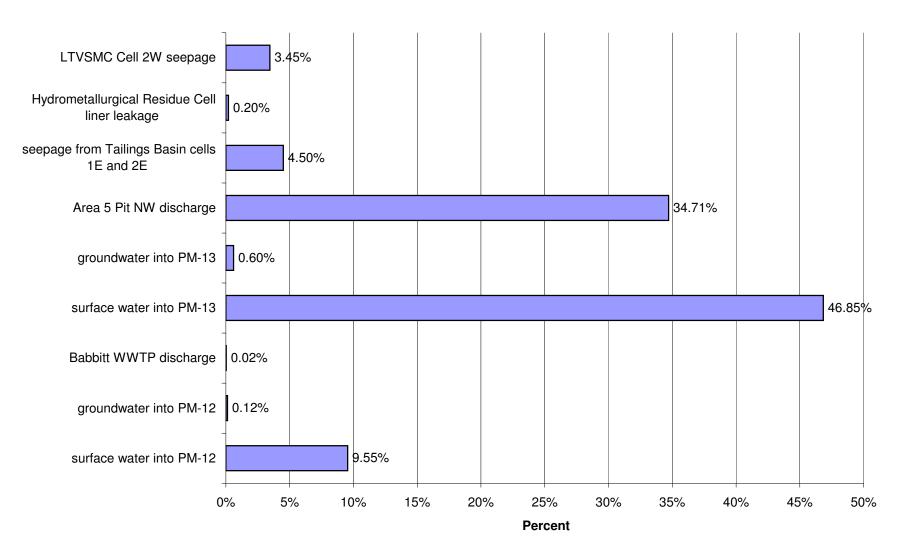
Proposed Action: Percent of Impacts at PM-13 in Post - Closure for Average Flow for Sulfate (SO₄)



Proposed Action: Mass Flux (kg/year) of Impacts at PM-13 in Post - Closure for High Flow for Sulfate (SO₄)

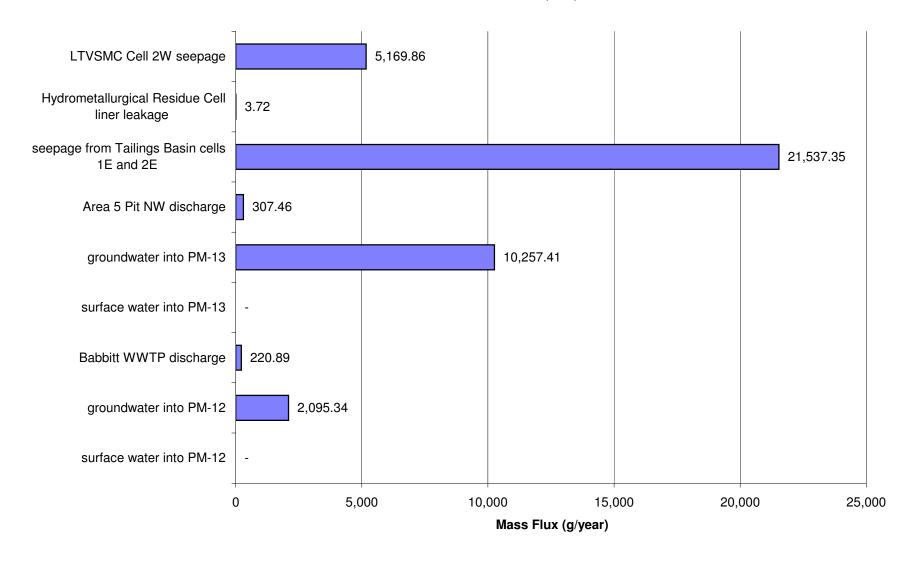


Proposed Action: Percent of Impacts at PM-13 in Post - Closure for High Flow for Sulfate (SO₄)

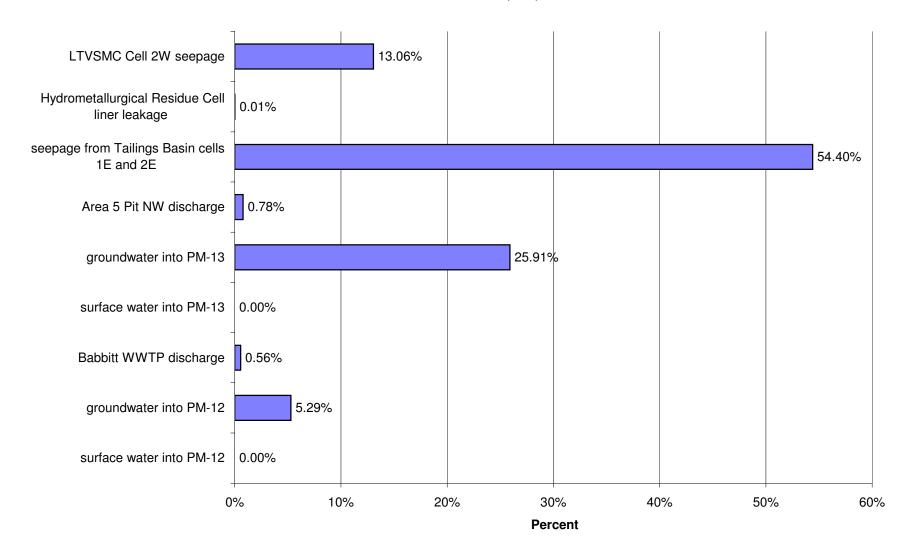


Appendix G.4 Embarrass River Watershed Geotechnical Mitigation

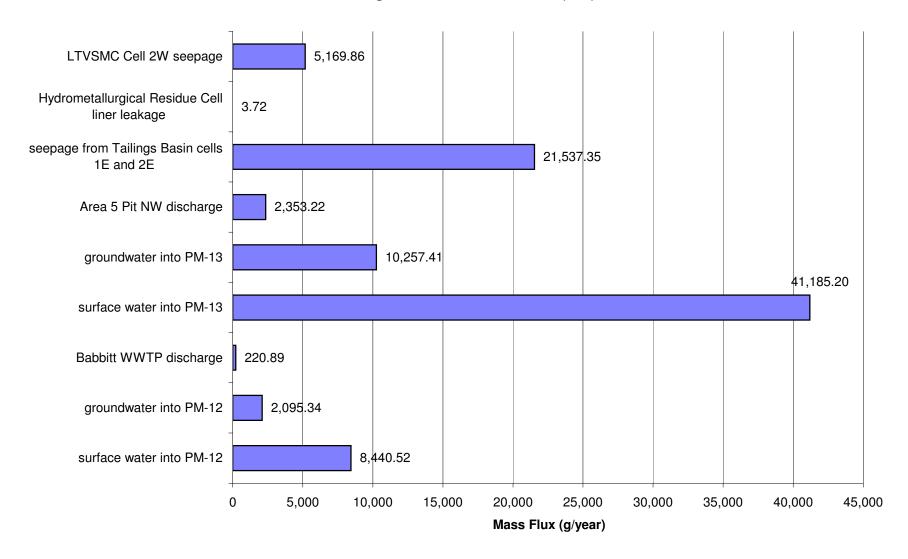
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Low Flow for Arsenic (As)



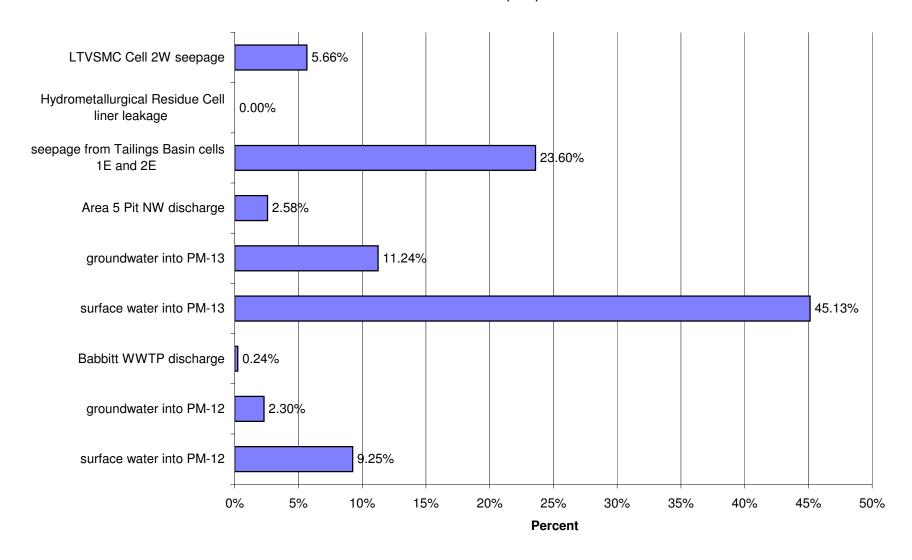
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for Low Flow for Arsenic (As)



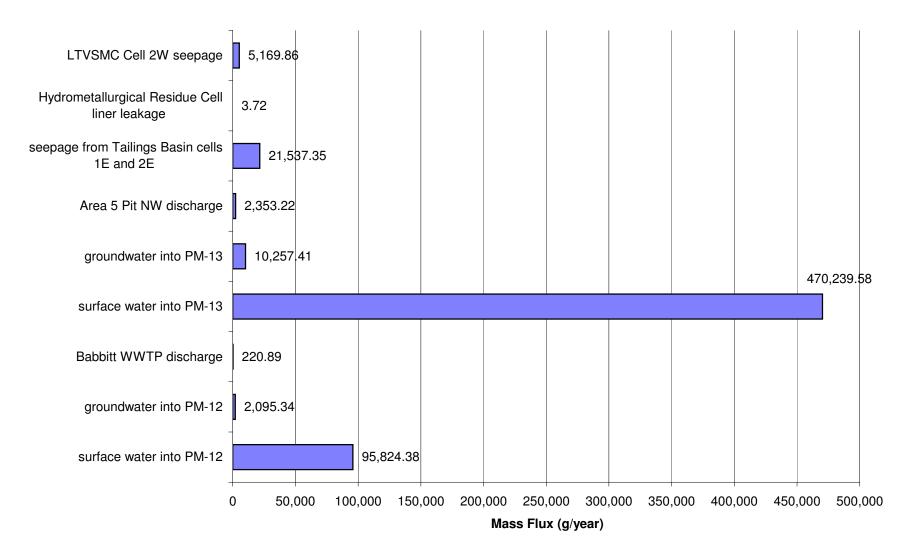
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Average Flow for Arsenic (As)



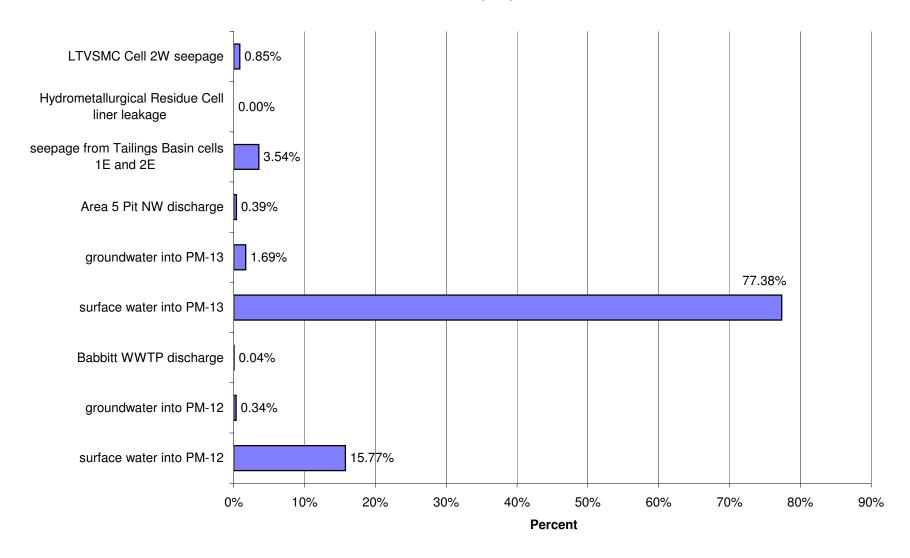
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for Average Flow for Arsenic (As)



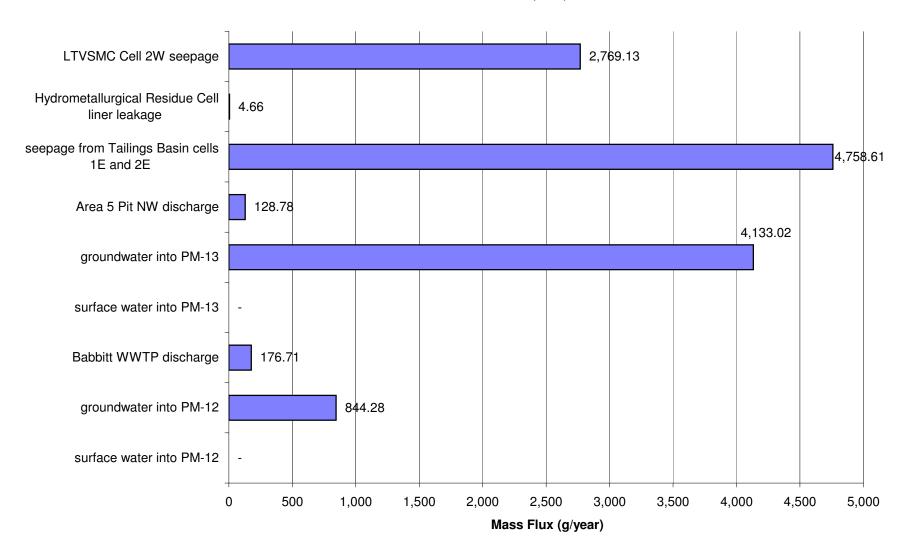
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for High Flow for Arsenic (As)



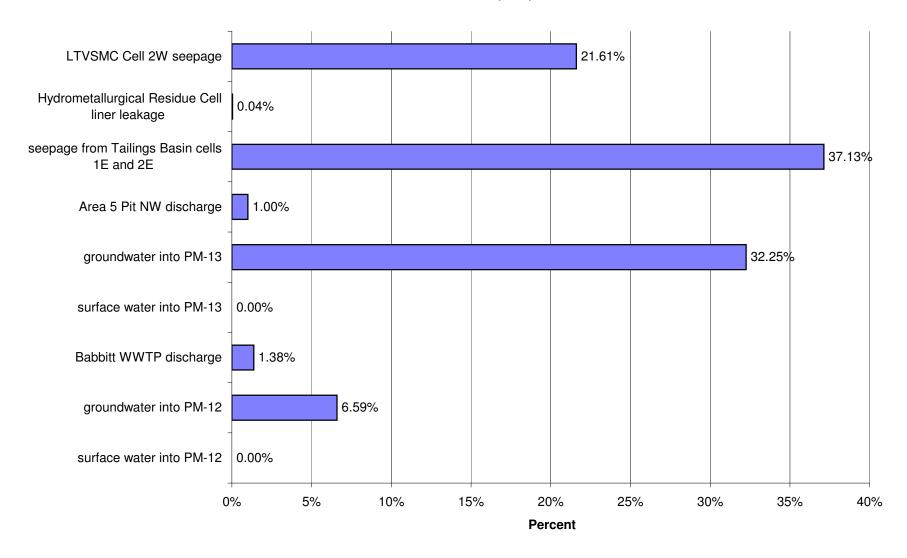
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for High Flow for Arsenic (As)



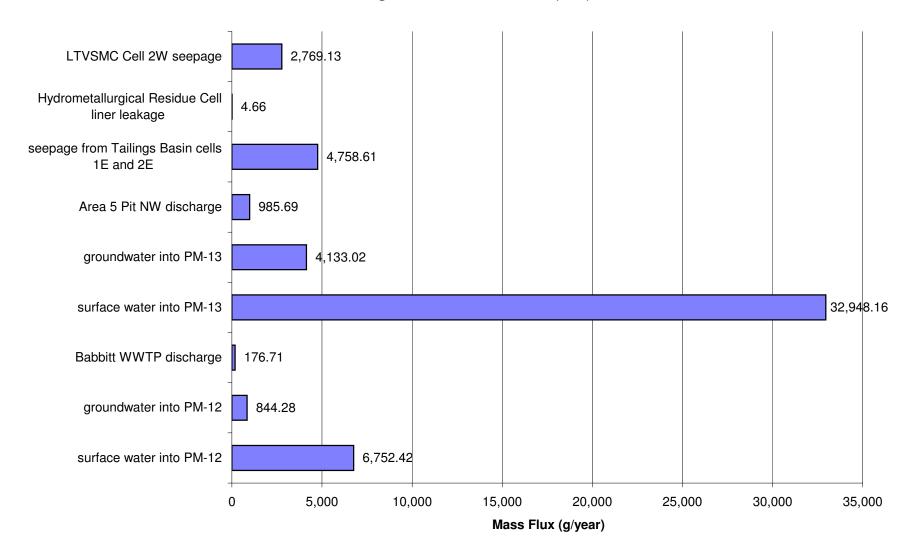
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Low Flow for Cobalt (Co)



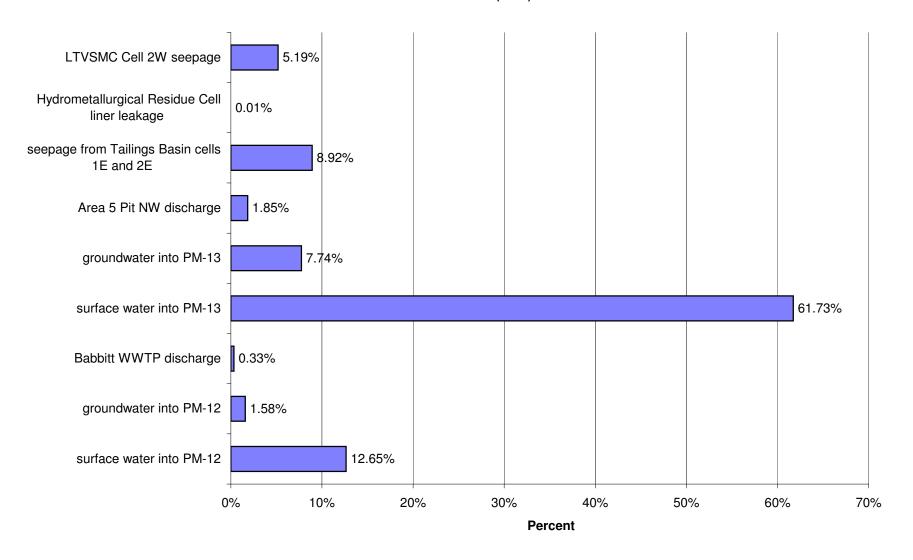
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for Low Flow for Cobalt (Co)



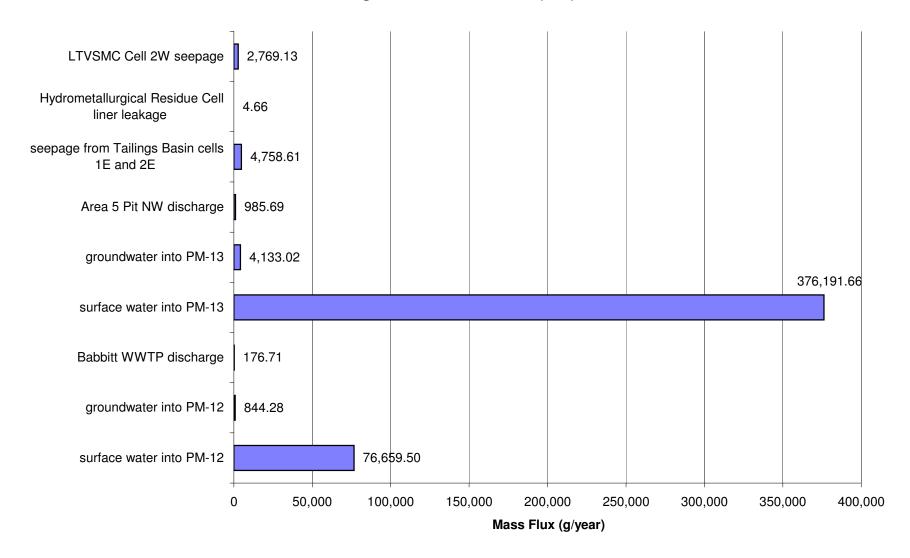
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Average Flow for Cobalt (Co)



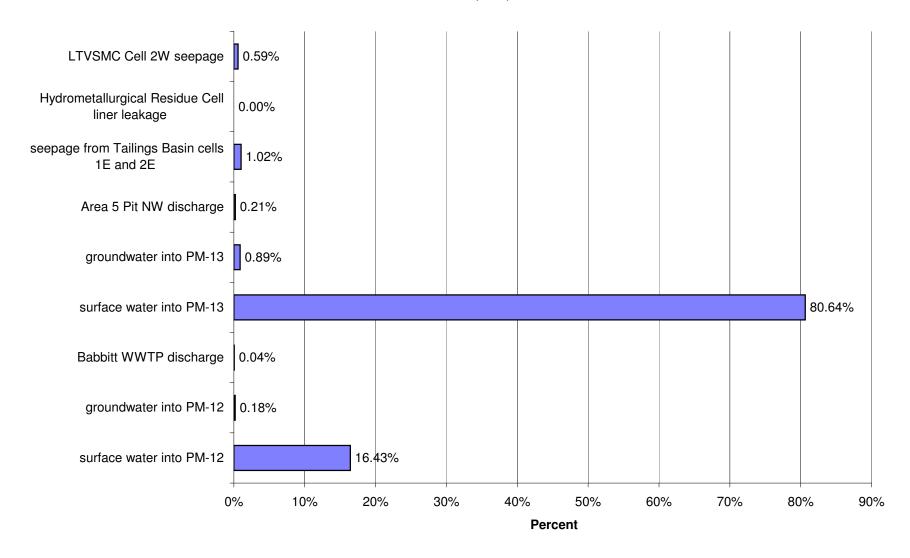
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for Average Flow for Cobalt (Co)



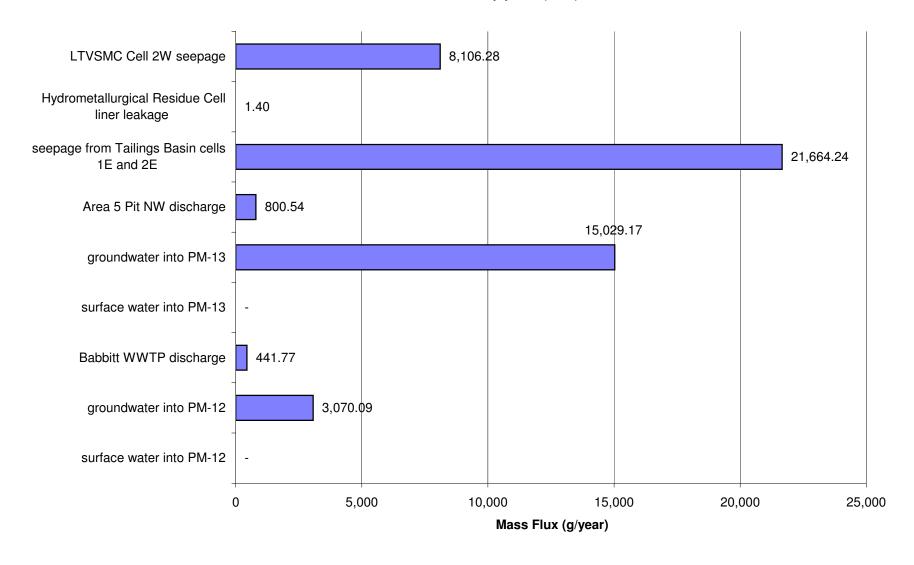
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for High Flow for Cobalt (Co)



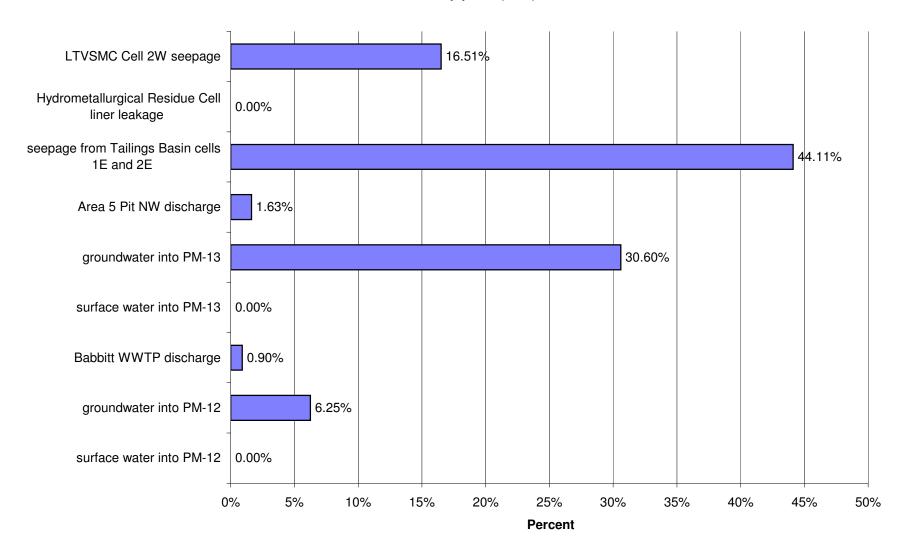
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for High Flow for Cobalt (Co)



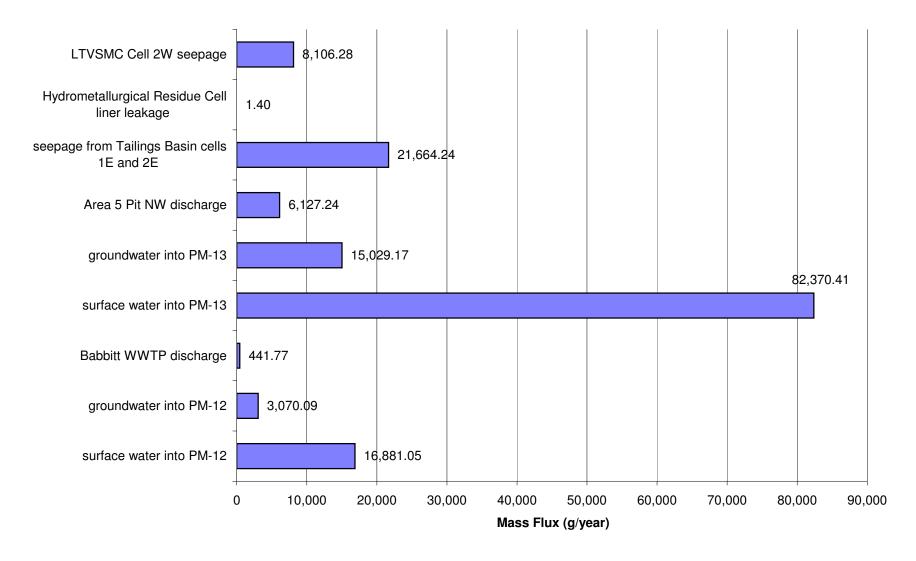
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Low Flow for Copper (Cu)



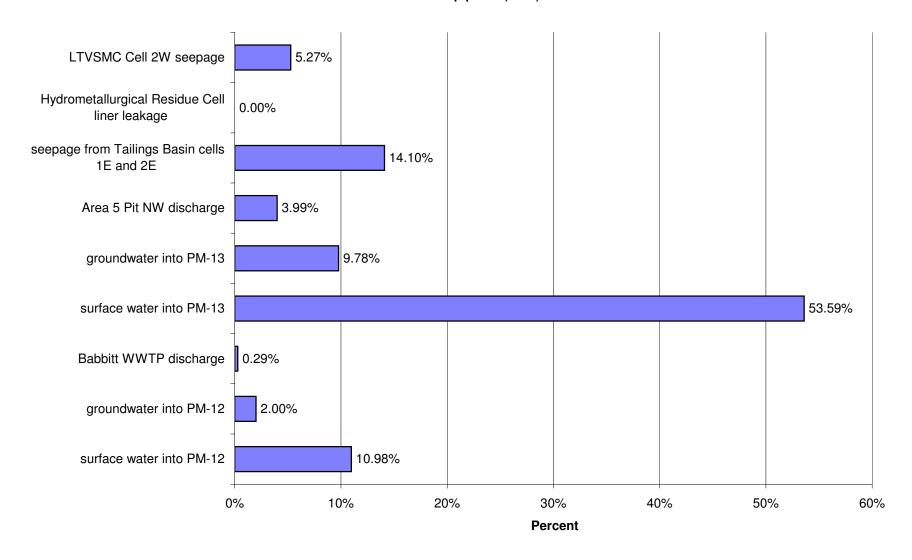
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for Low Flow for Copper (Cu)



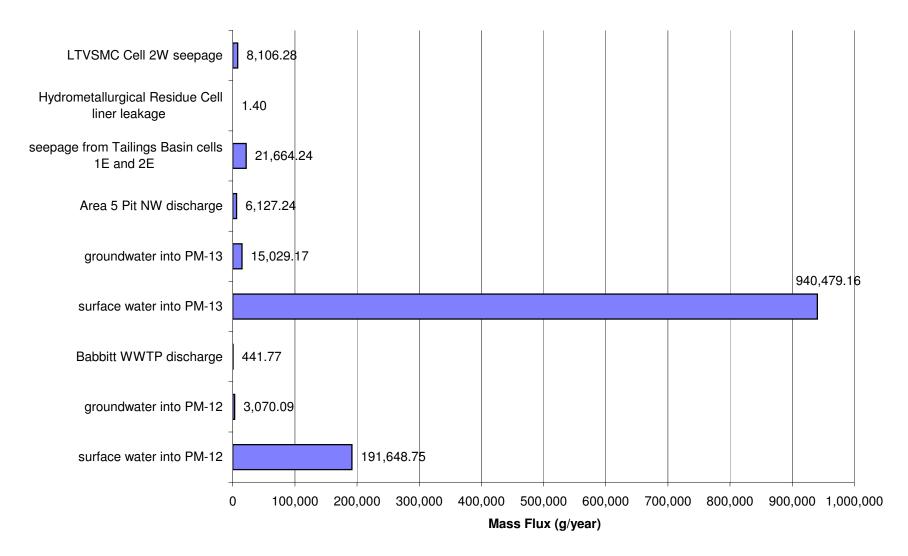
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Average Flow for Copper (Cu)



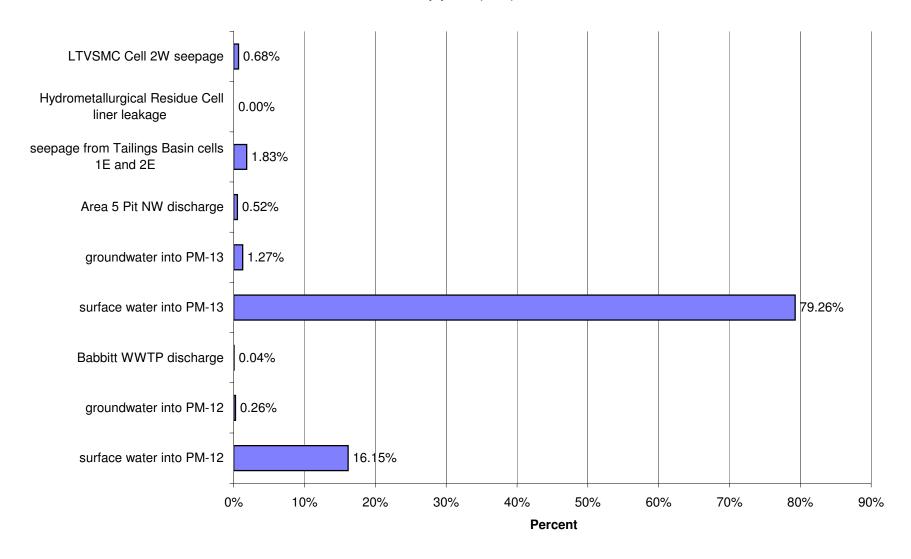
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for Average Flow for Copper (Cu)



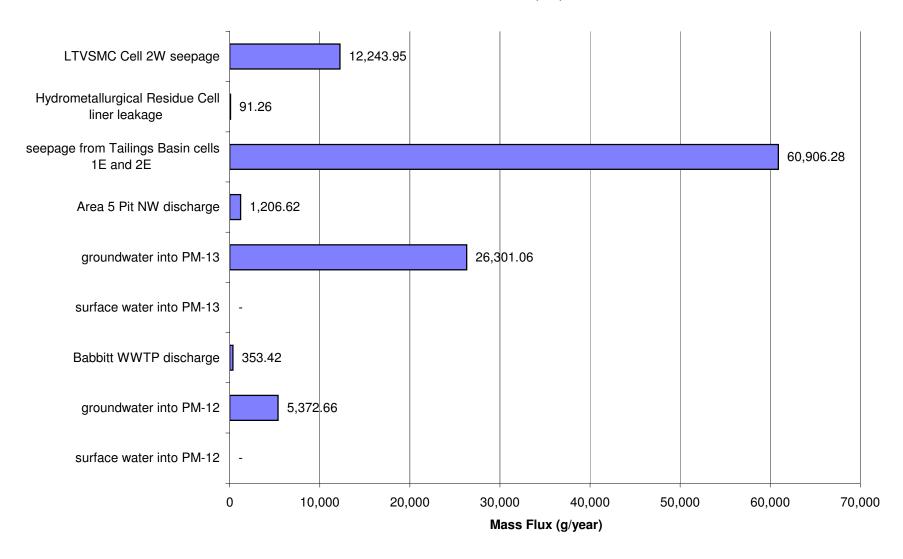
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for High Flow for Copper (Cu)



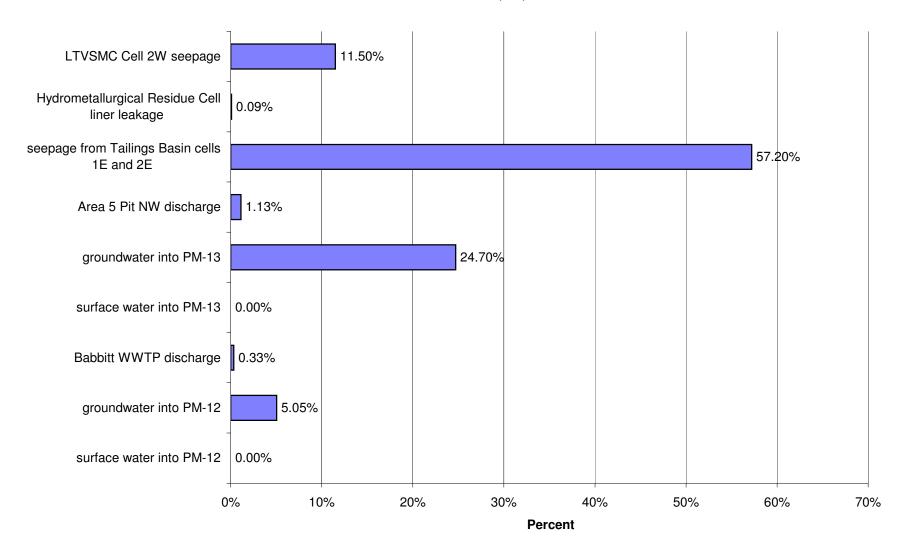
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for High Flow for Copper (Cu)



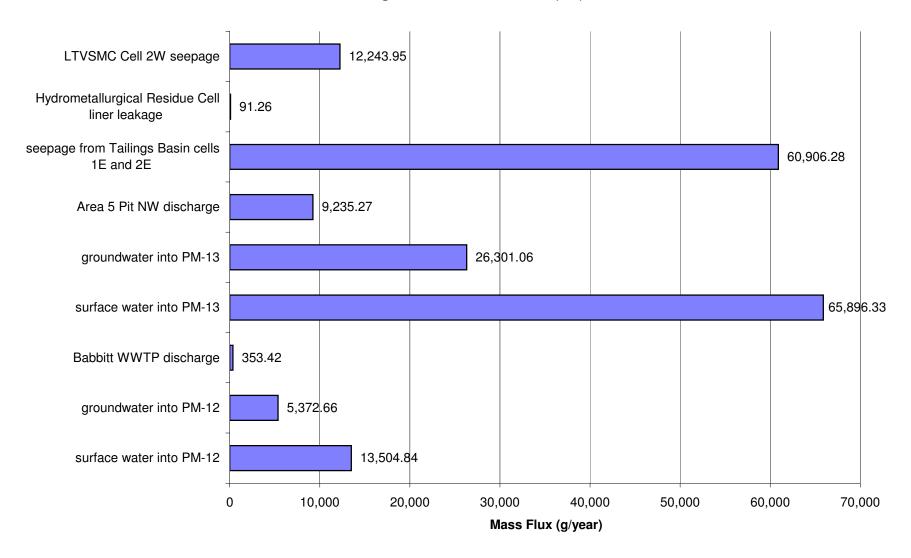
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Low Flow for Nickel (Ni)



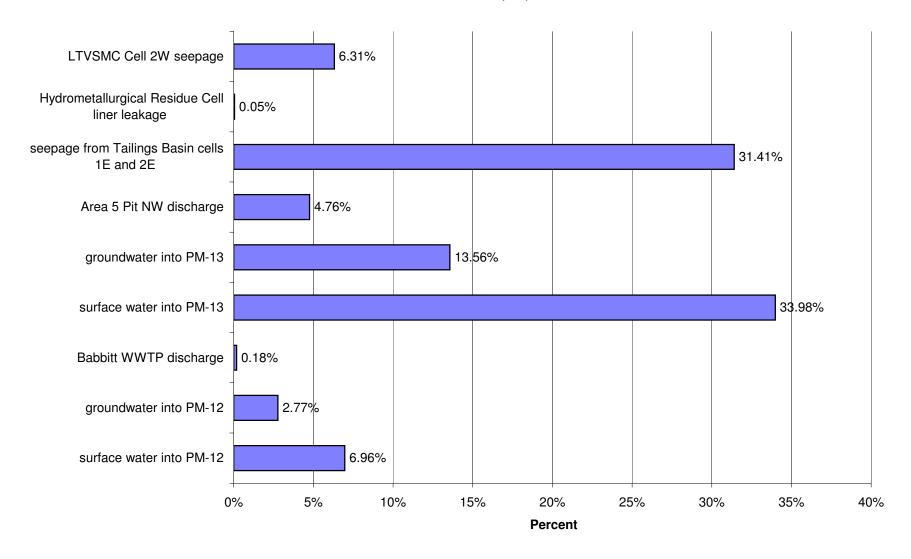
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for Low Flow for Nickel (Ni)



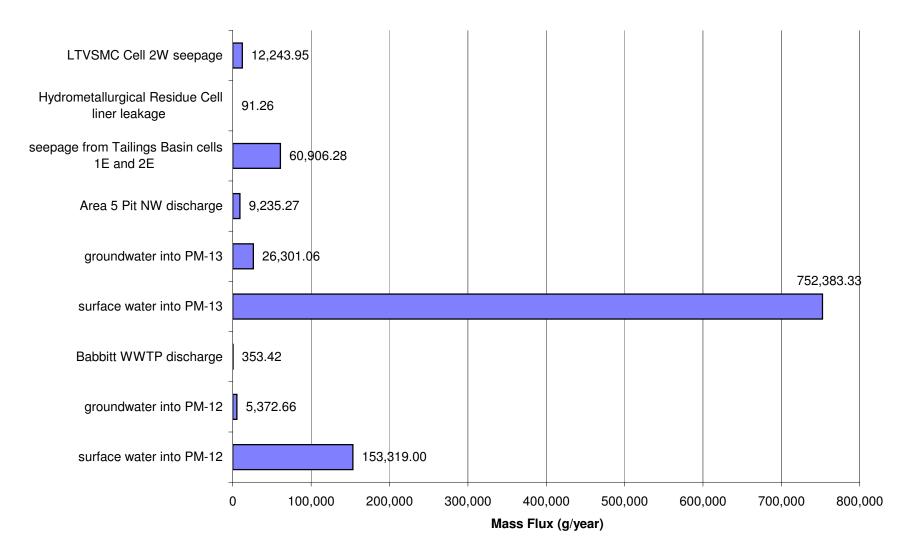
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Average Flow for Nickel (Ni)



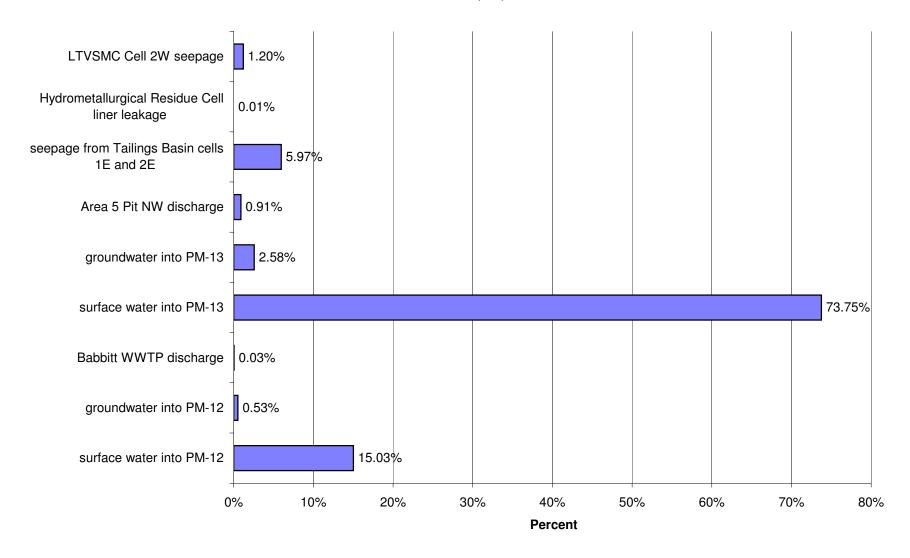
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for Average Flow for Nickel (Ni)



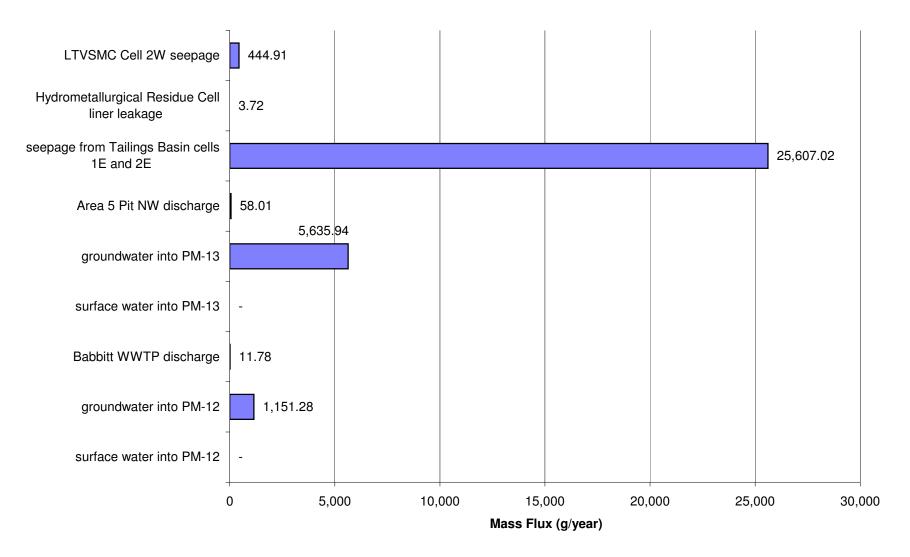
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for High Flow for Nickel (Ni)



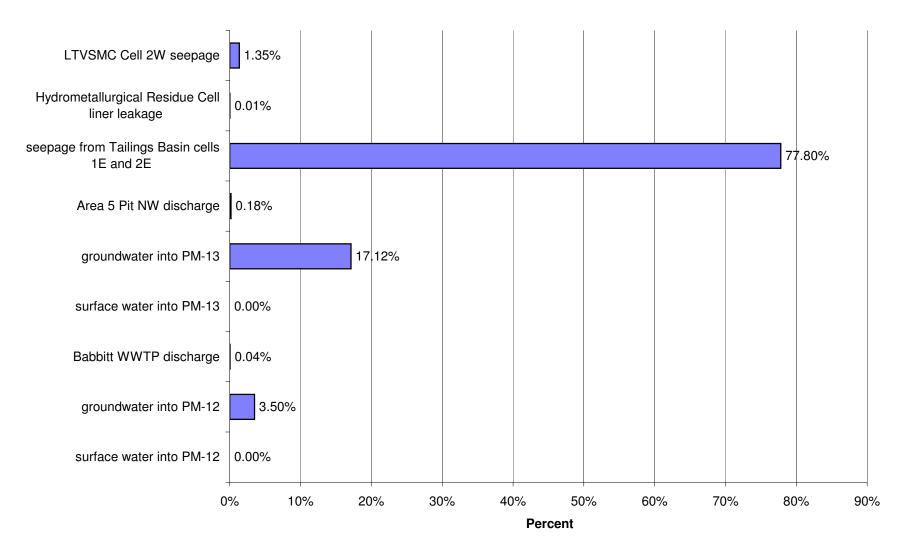
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for High Flow for Nickel (Ni)



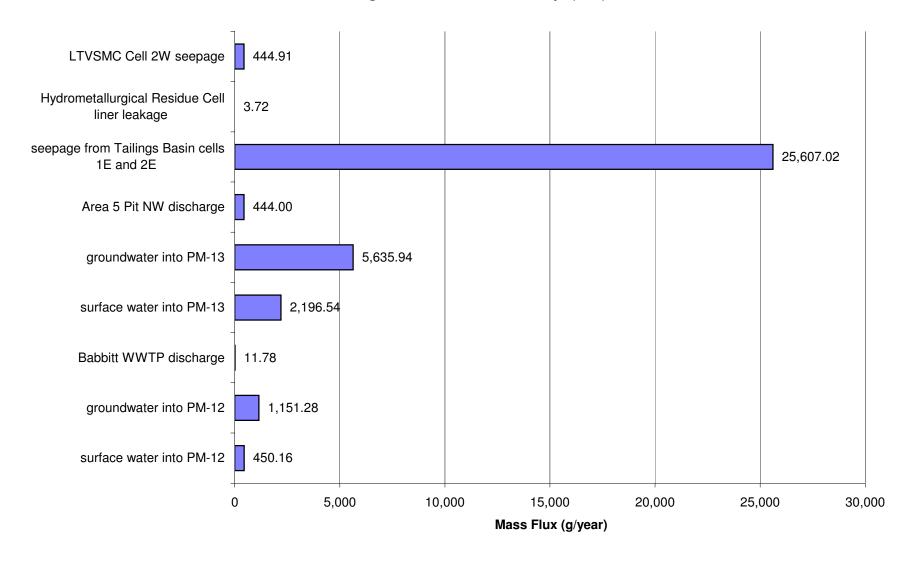
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Low Flow for Antimony (Sb)



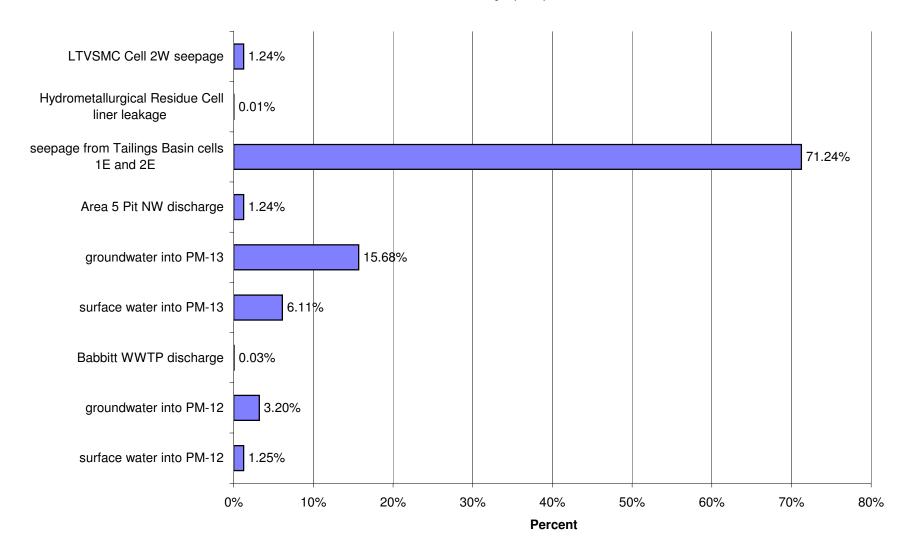
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for Low Flow for Antimony (Sb)



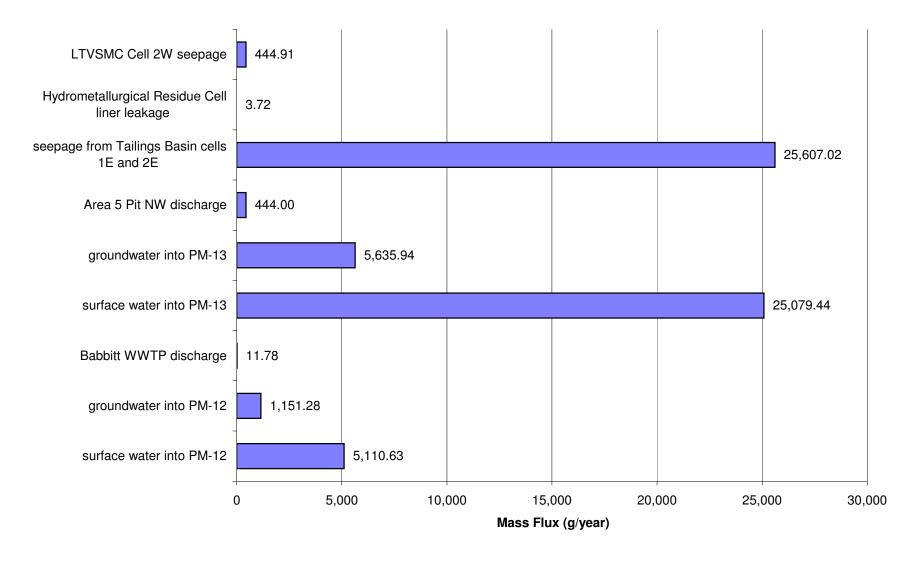
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for Average Flow for Antimony (Sb)



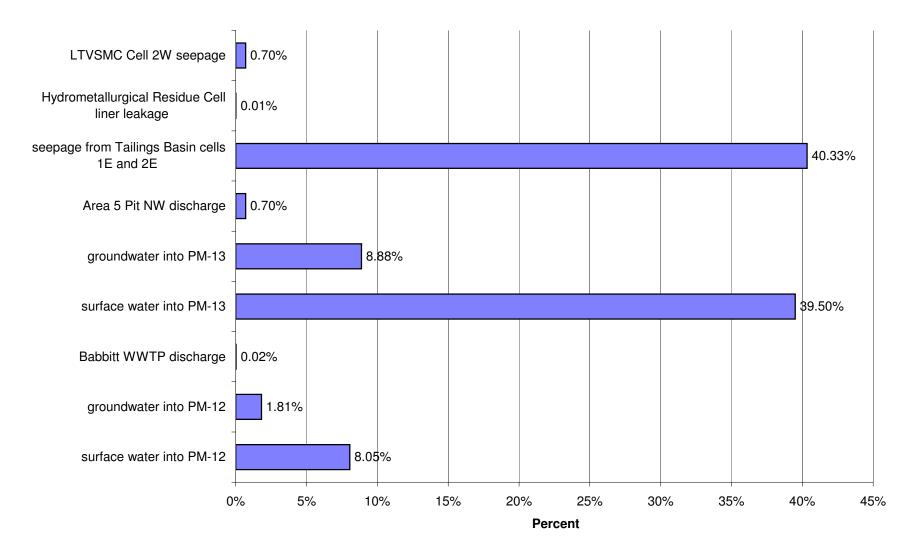
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for Average Flow for Antimony (Sb)



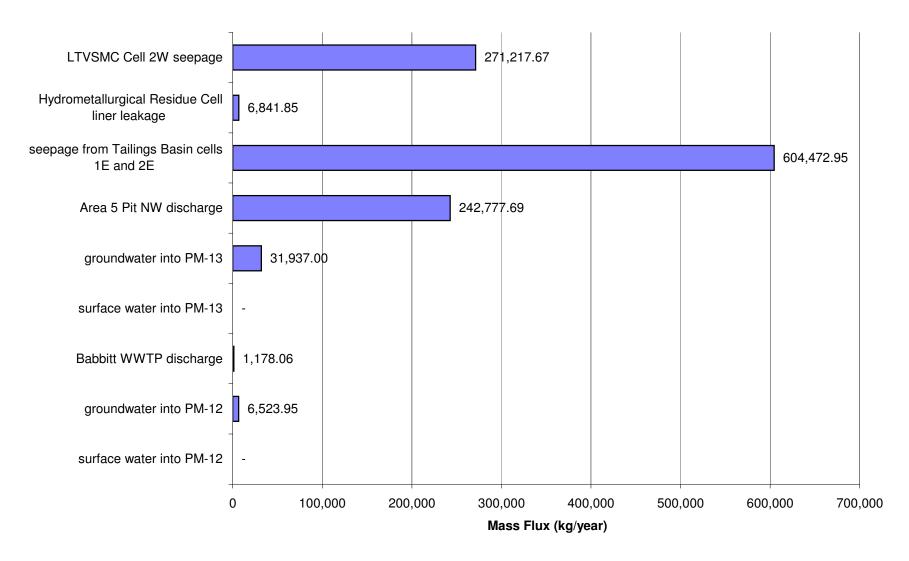
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 1 for High Flow for Antimony (Sb)



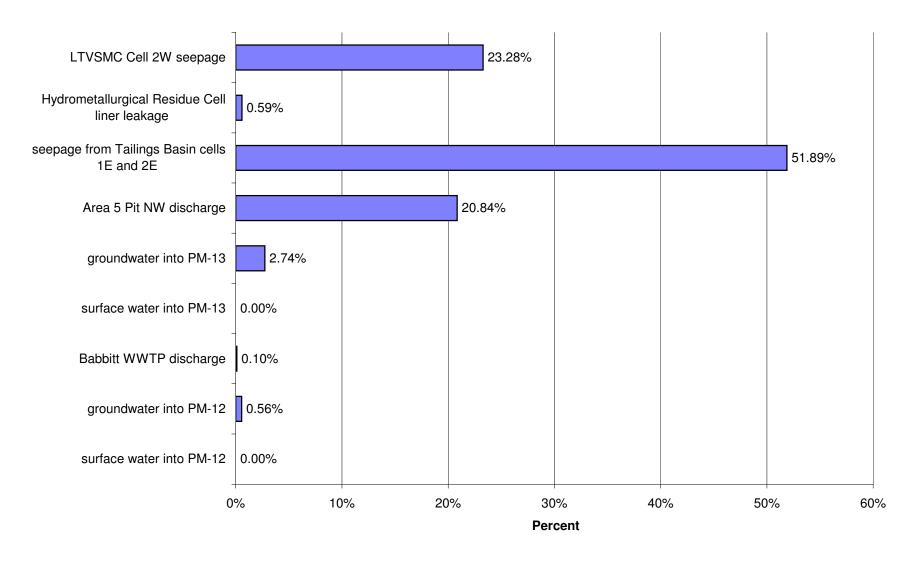
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for High Flow for Antimony (Sb)



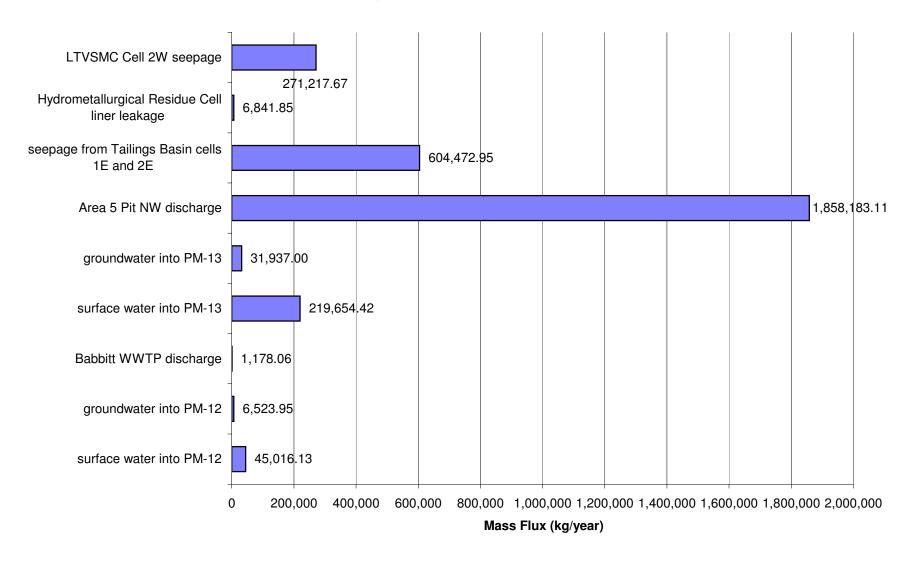
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Year 1 for Low Flow for Sulfate (SO₄)



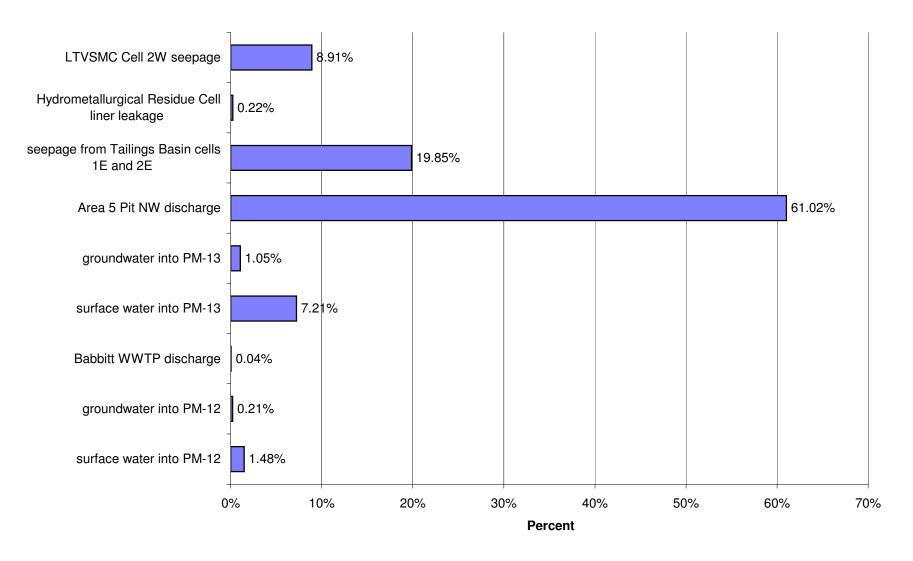
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for Low Flow for Sulfate (SO₄)



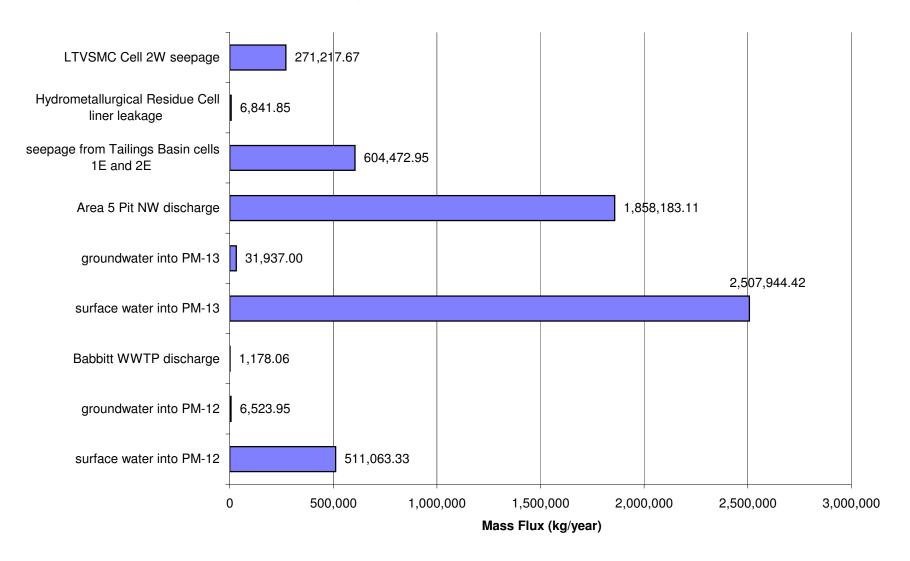
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Year 1 for Average Flow for Sulfate (SO₄)



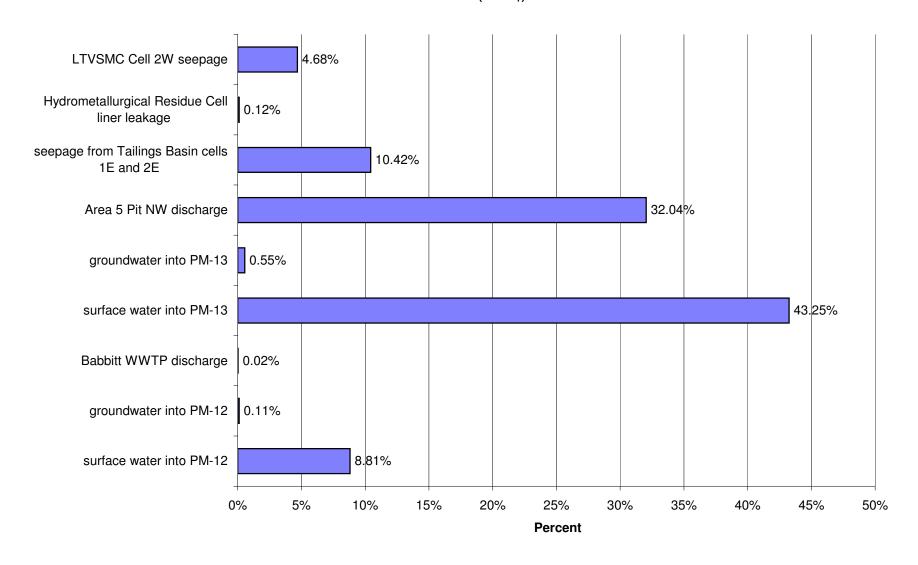
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for Average Flow for Sulfate (SO₄)



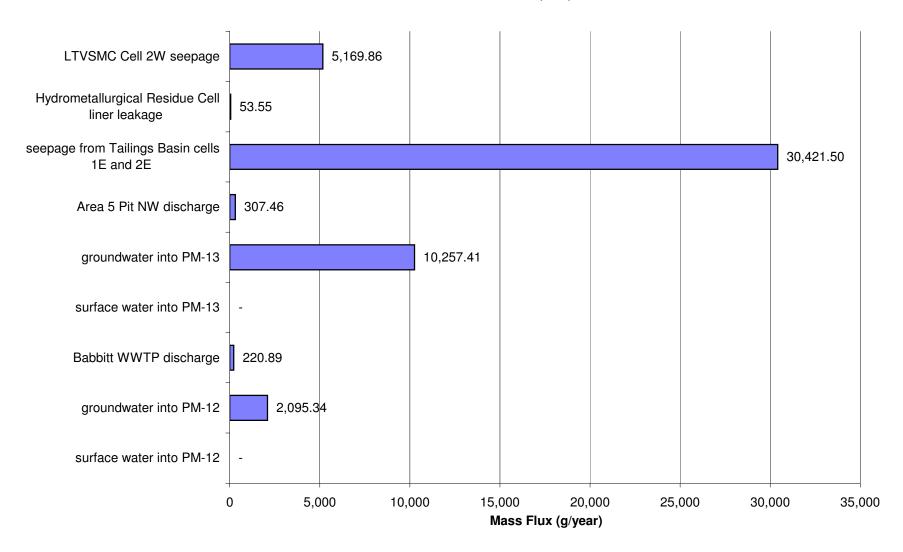
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Year 1 for High Flow for Sulfate (SO₄)



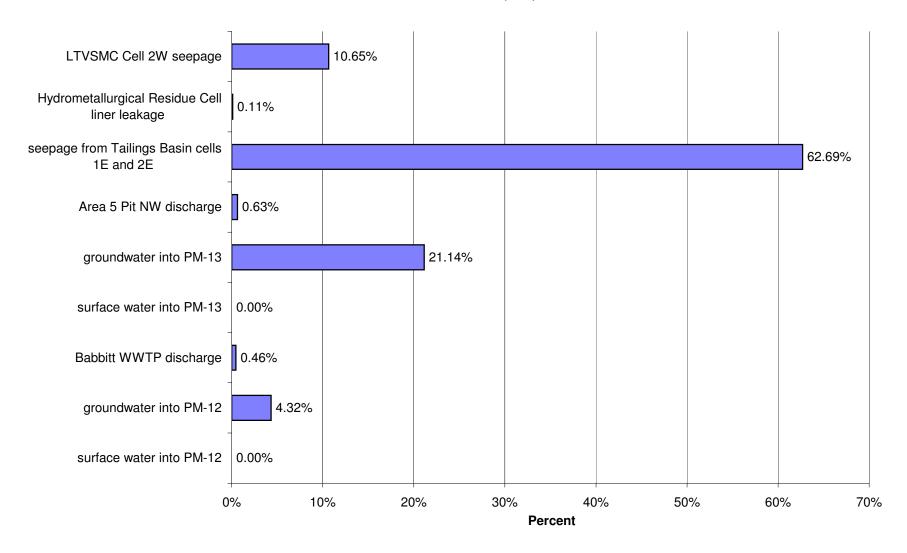
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 1 for High Flow for Sulfate (SO₄)



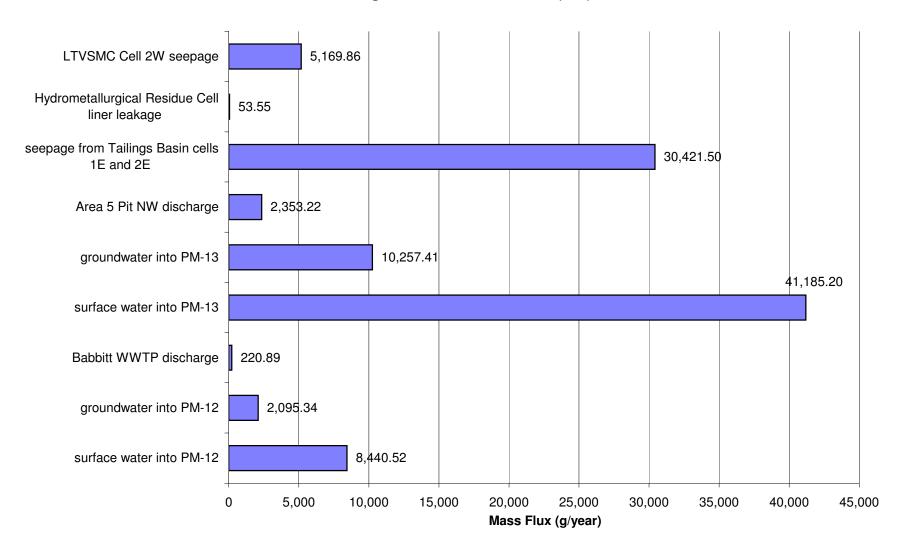
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Low Flow for Arsenic (As)



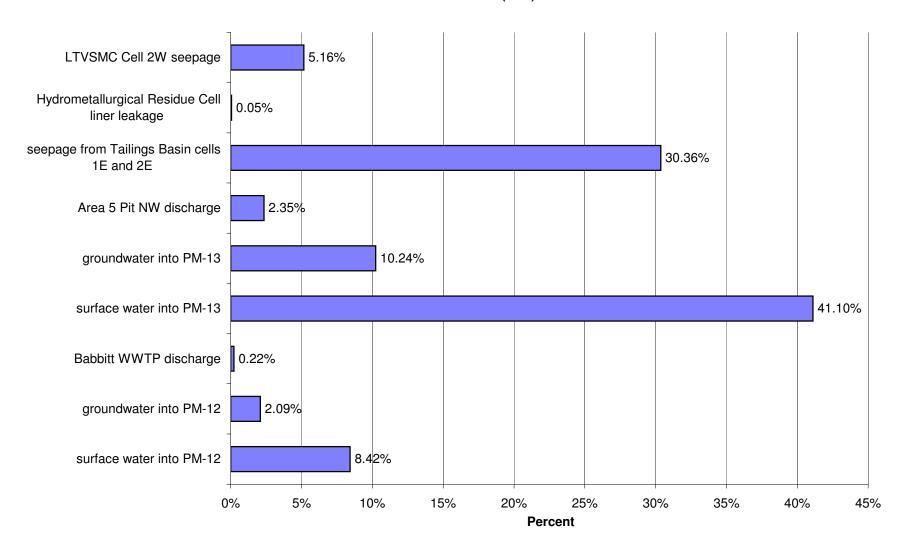
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for Low Flow for Arsenic (As)



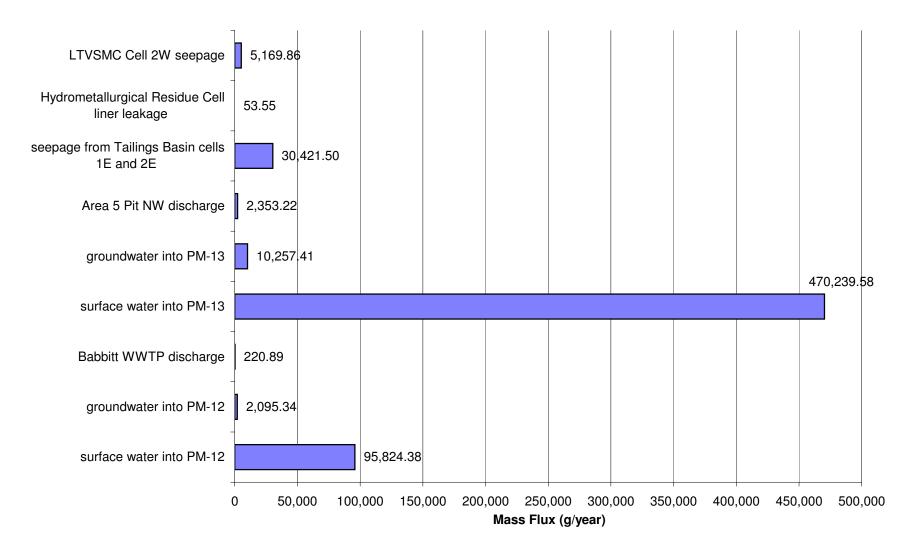
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Average Flow for Arsenic (As)



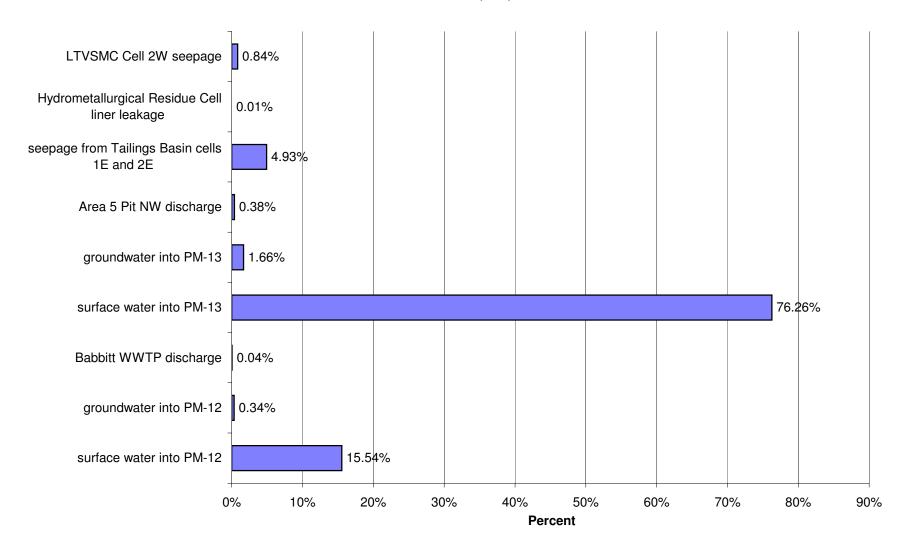
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for Average Flow for Arsenic (As)



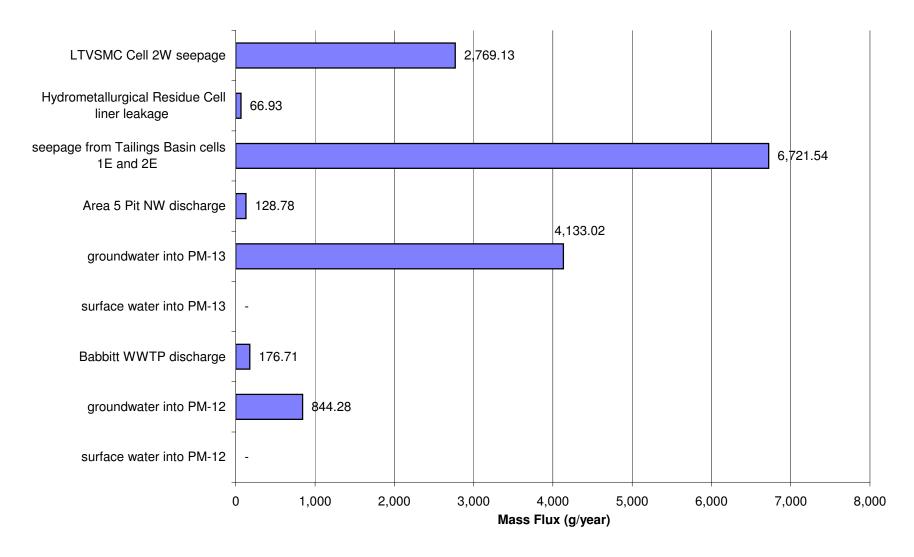
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for High Flow for Arsenic (As)



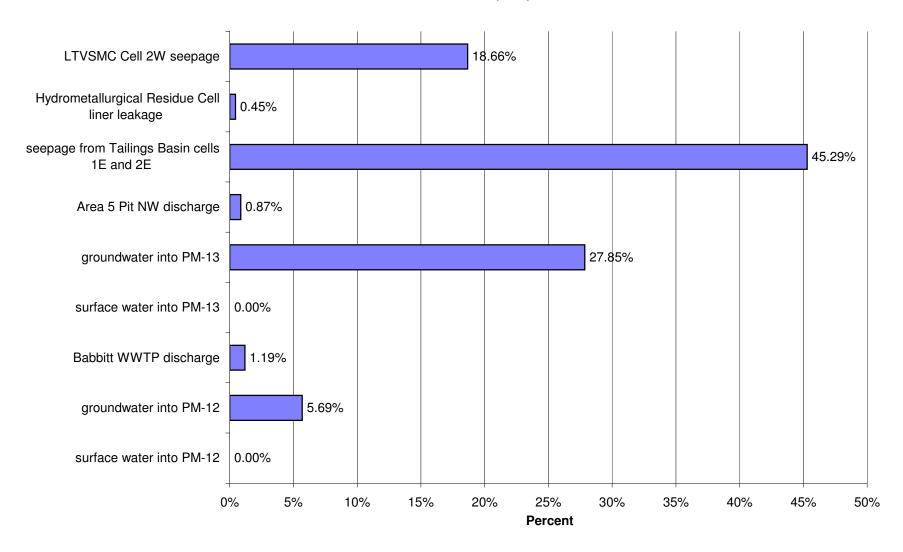
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for High Flow for Arsenic (As)



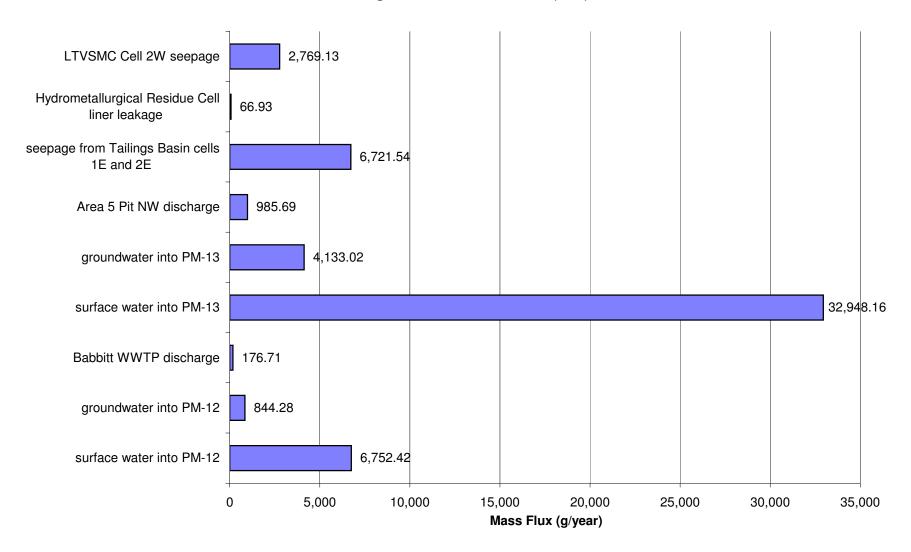
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Low Flow for Cobalt (Co)



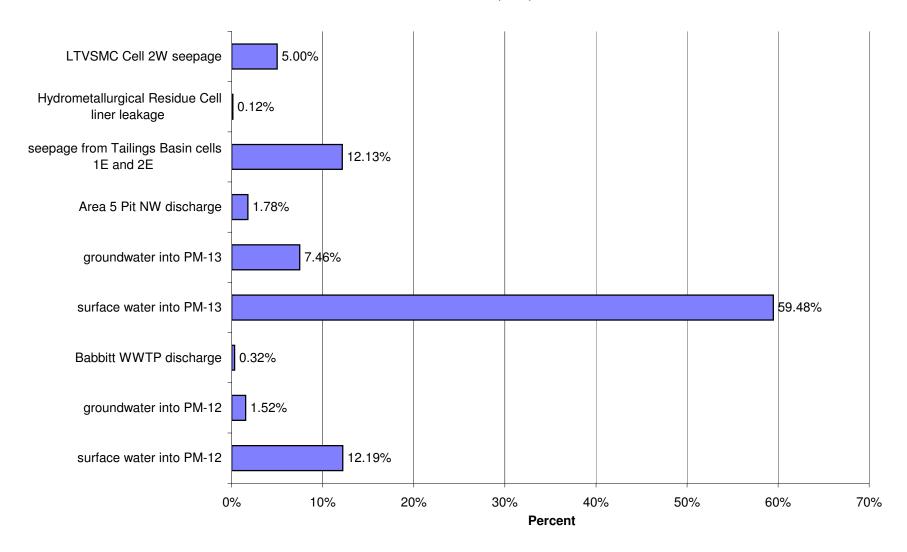
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for Low Flow for Cobalt (Co)



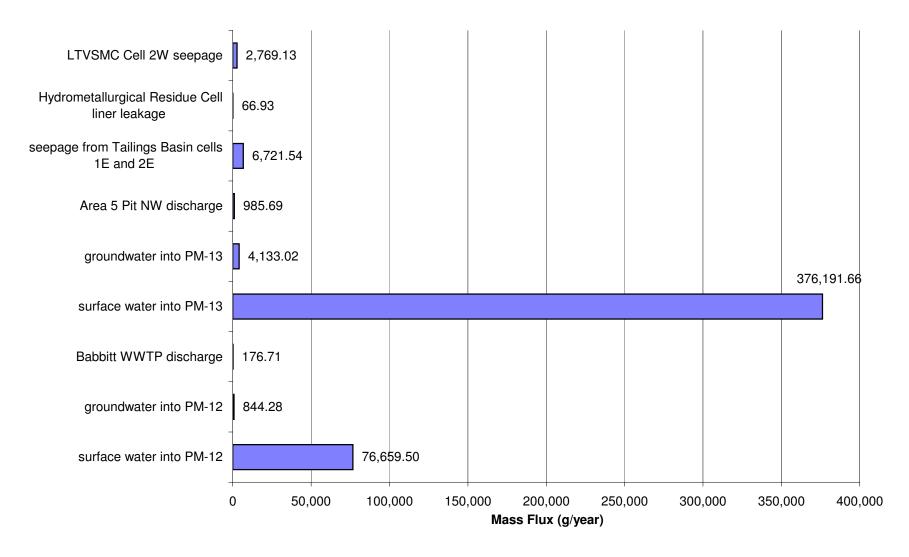
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Average Flow for Cobalt (Co)



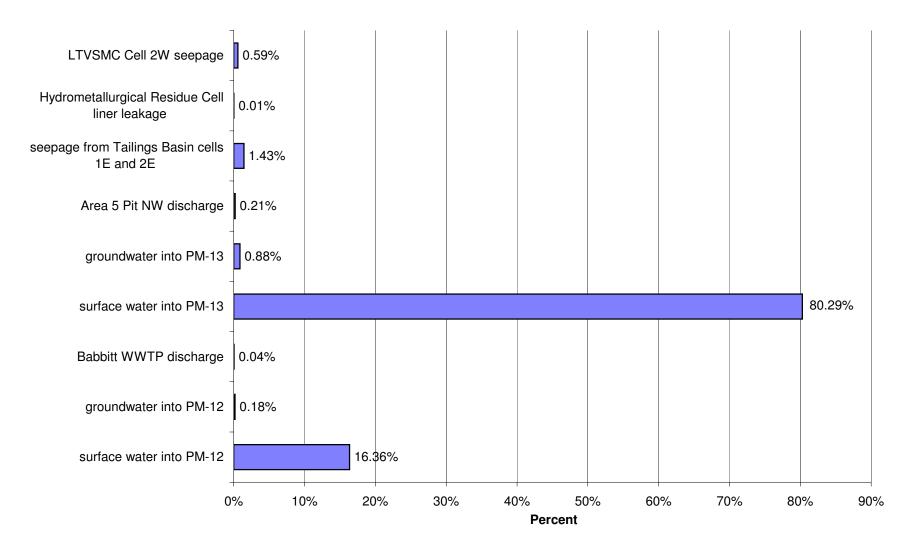
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for Average Flow for Cobalt (Co)



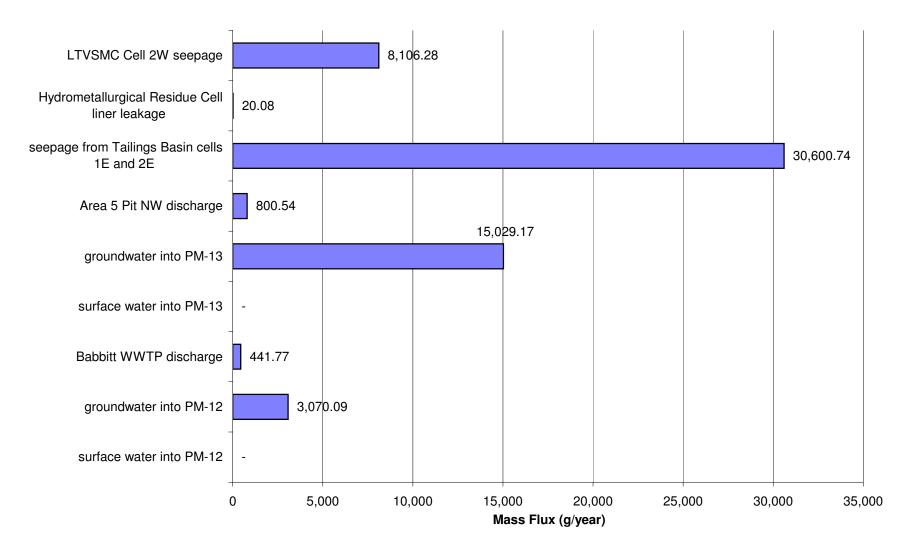
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for High Flow for Cobalt (Co)



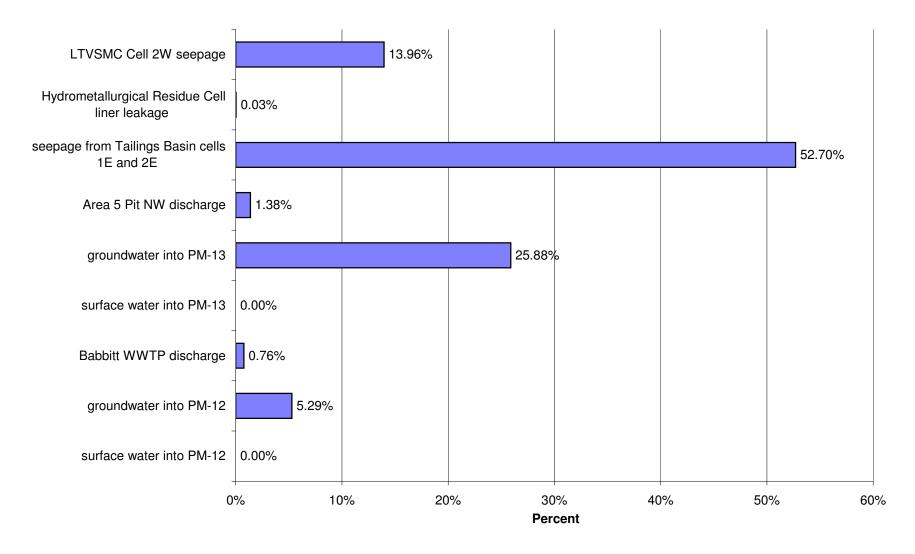
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for High Flow for Cobalt (Co)



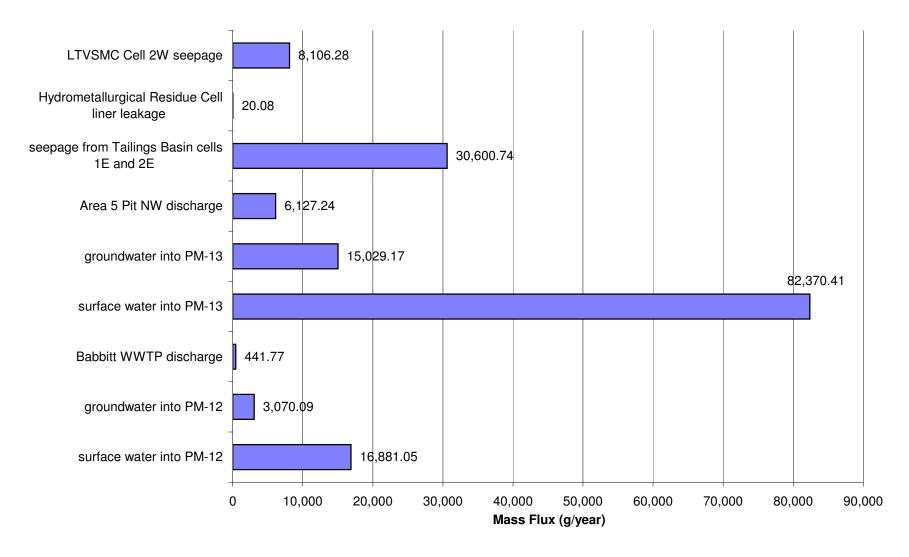
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Low Flow for Copper (Cu)



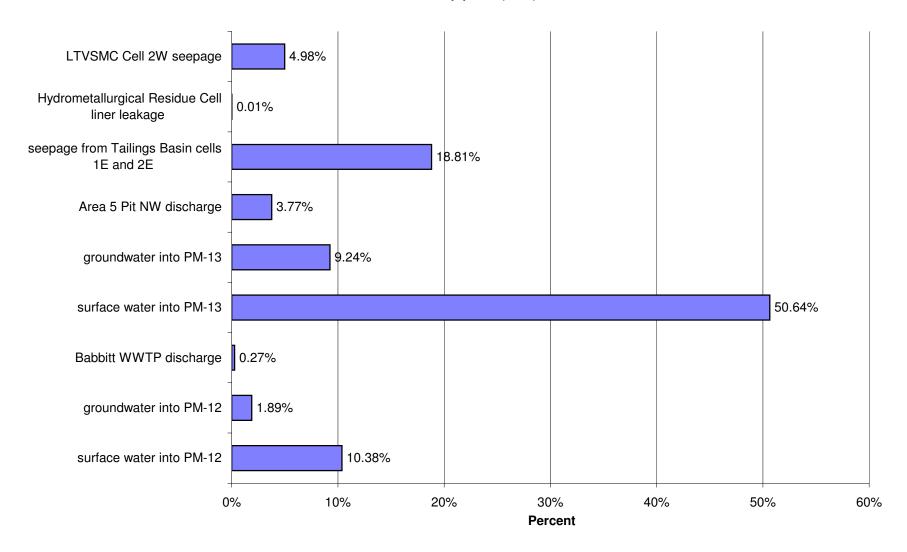
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for Low Flow for Copper (Cu)



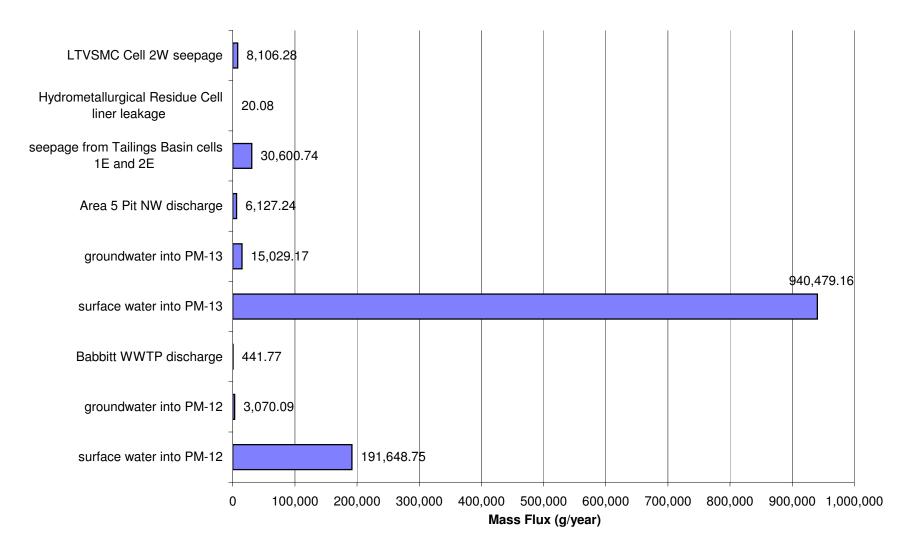
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Average Flow for Copper (Cu)



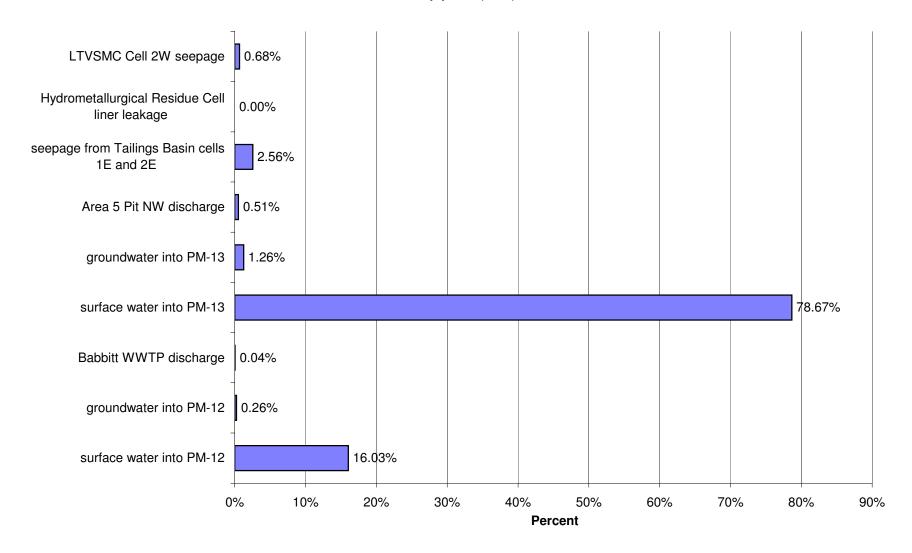
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for Average Flow for Copper (Cu)



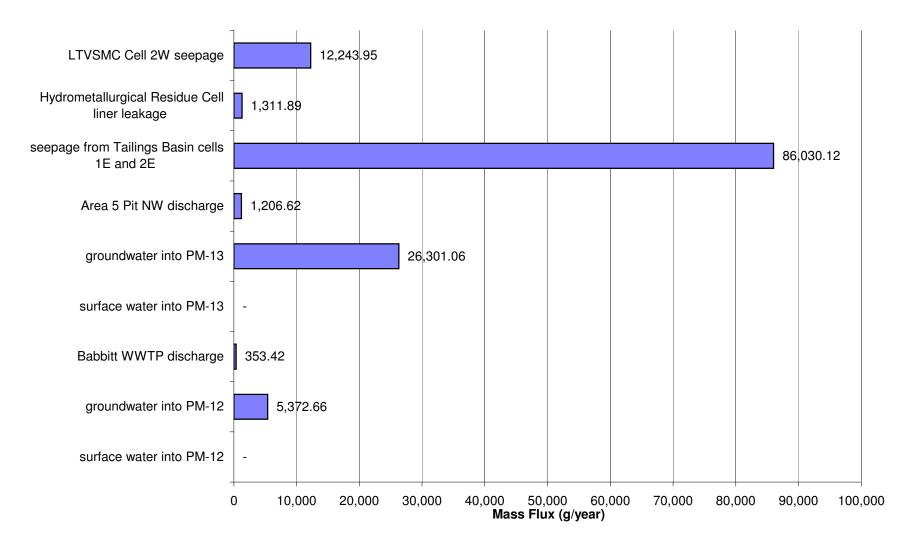
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for High Flow for Copper (Cu)



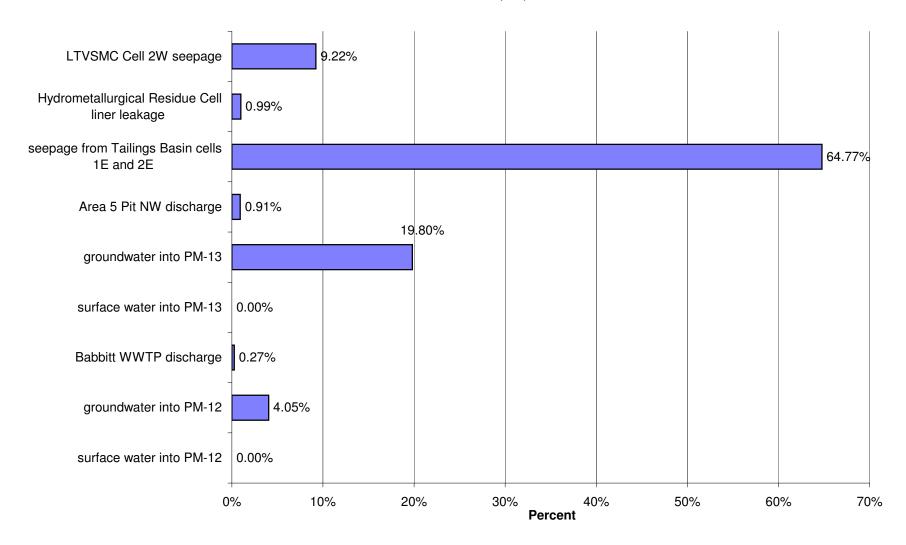
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for High Flow for Copper (Cu)



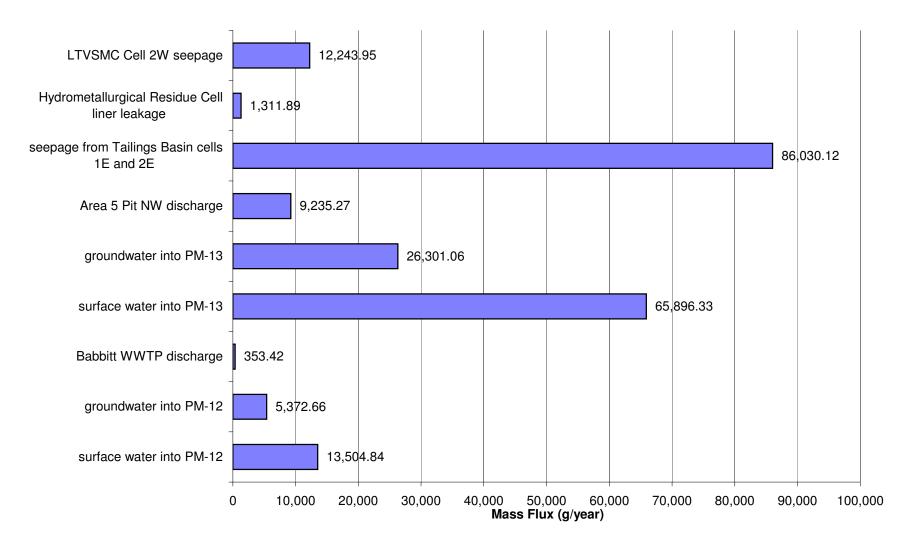
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Low Flow for Nickel (Ni)



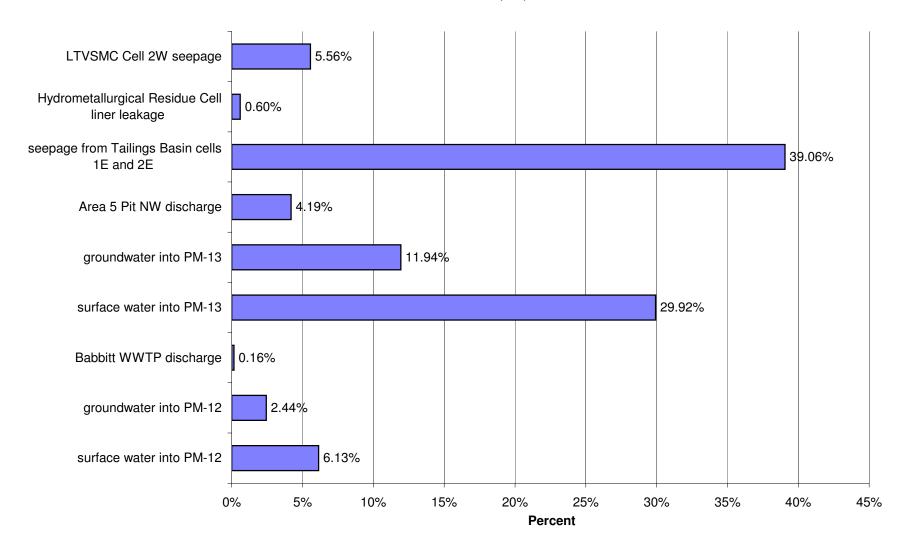
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for Low Flow for Nickel (Ni)



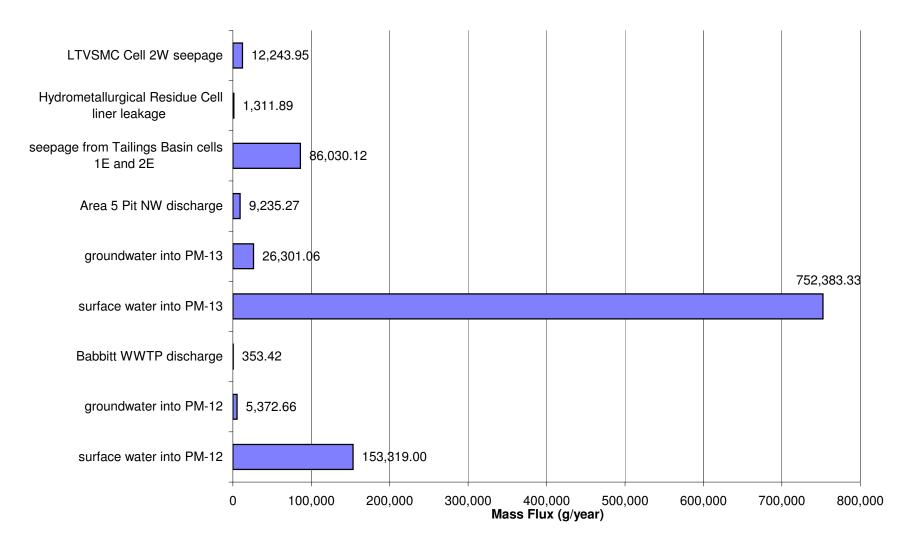
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Average Flow for Nickel (Ni)



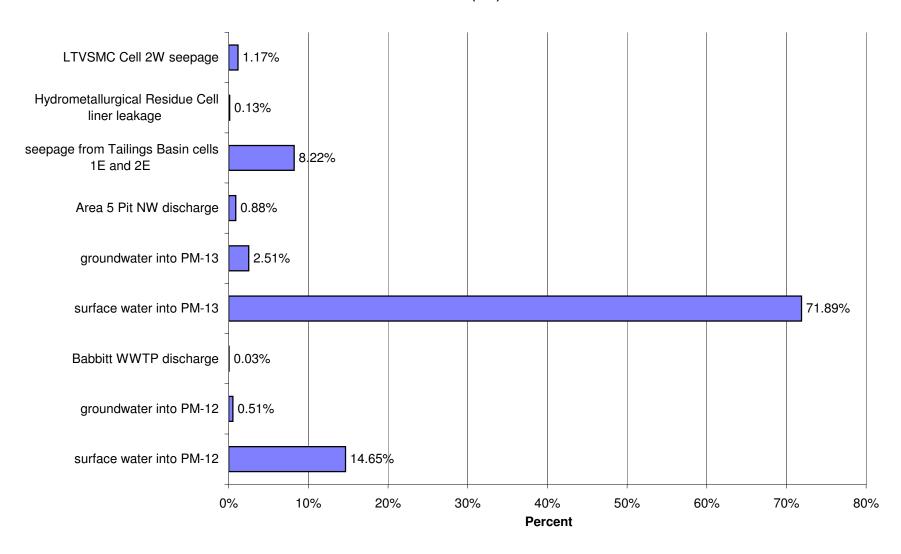
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for Average Flow for Nickel (Ni)



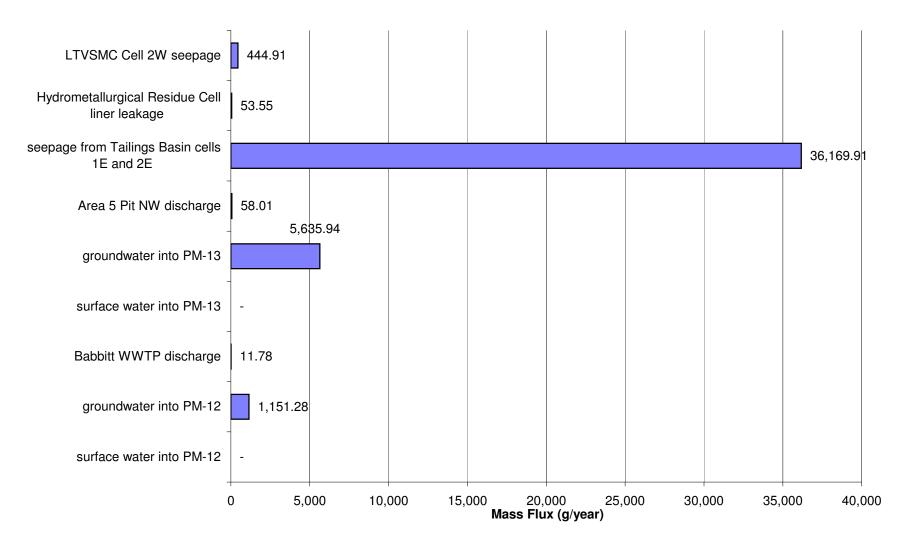
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for High Flow for Nickel (Ni)



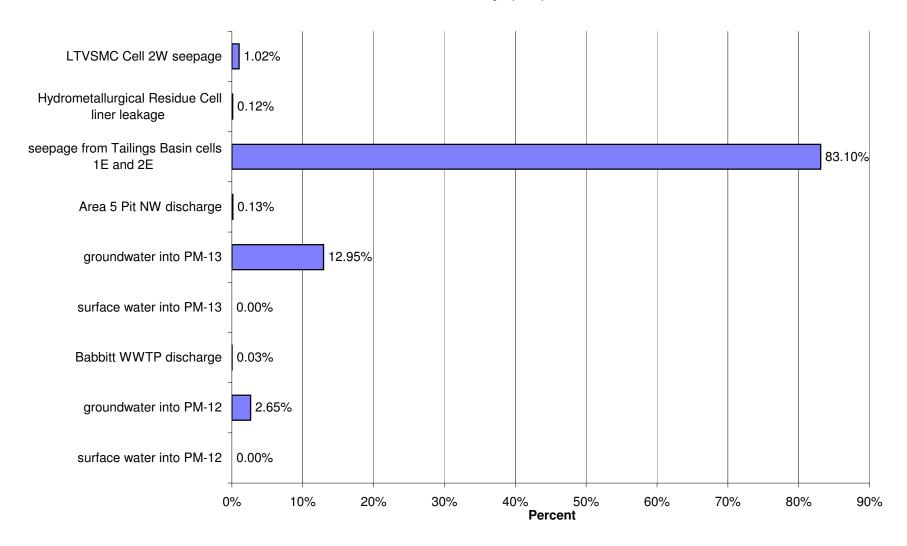
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for High Flow for Nickel (Ni)



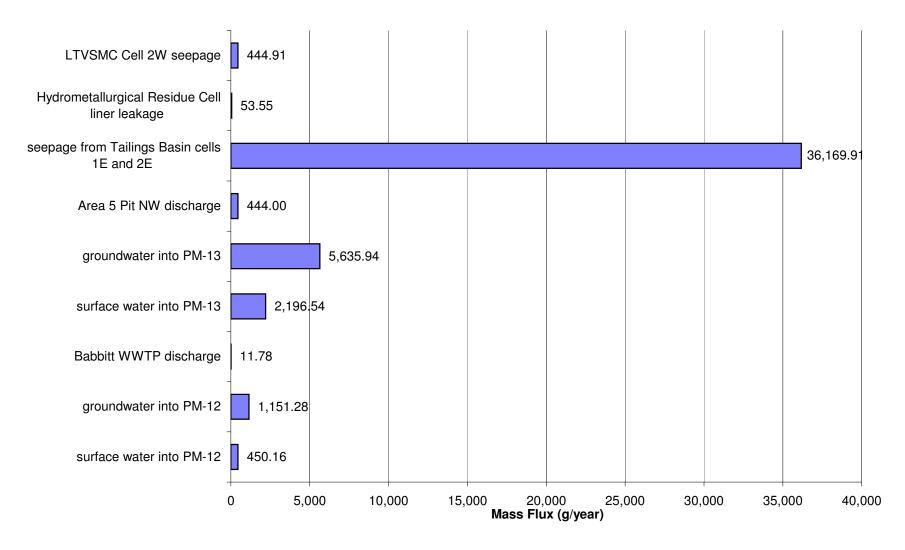
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Low Flow for Antimony (Sb)



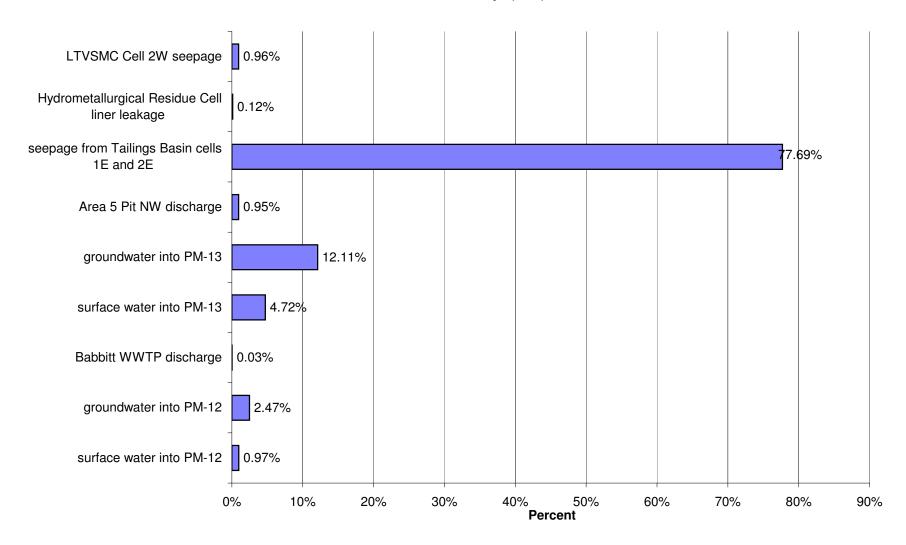
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for Low Flow for Antimony (Sb)



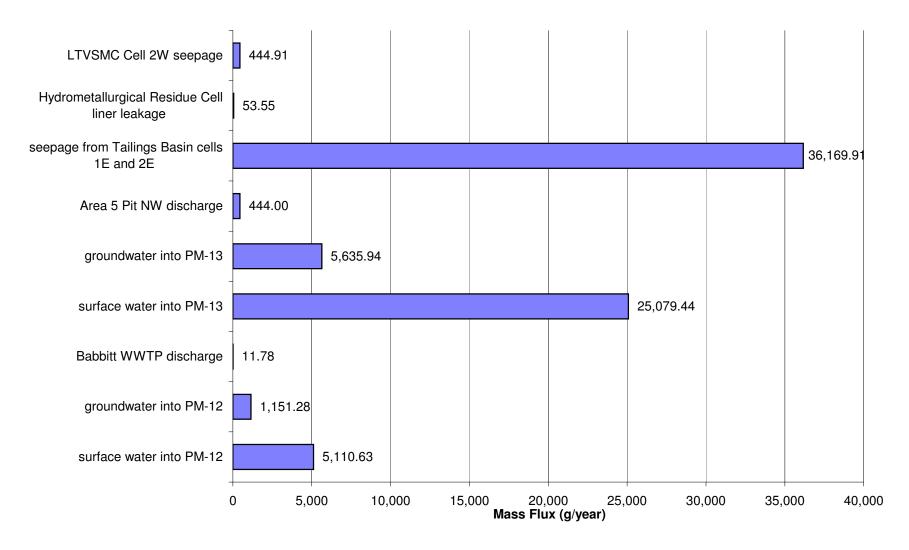
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for Average Flow for Antimony (Sb)



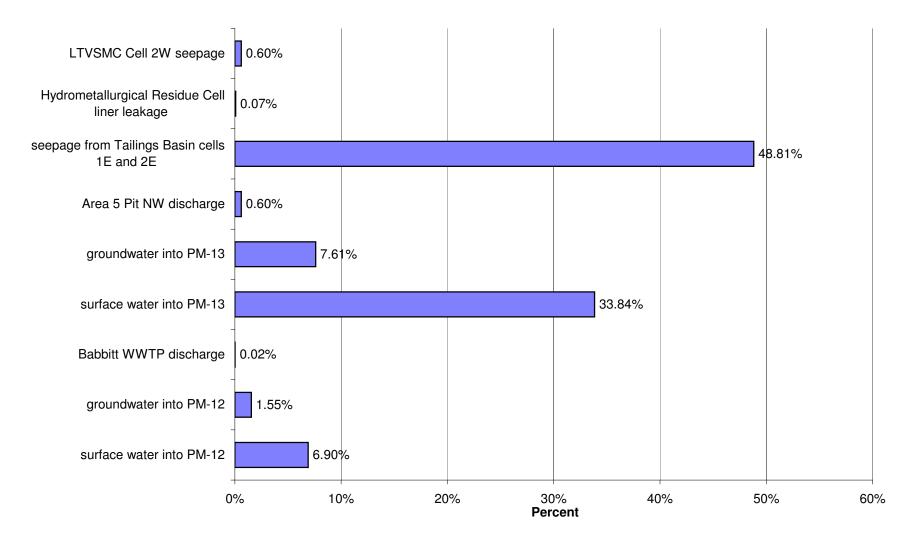
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for Average Flow for Antimony (Sb)



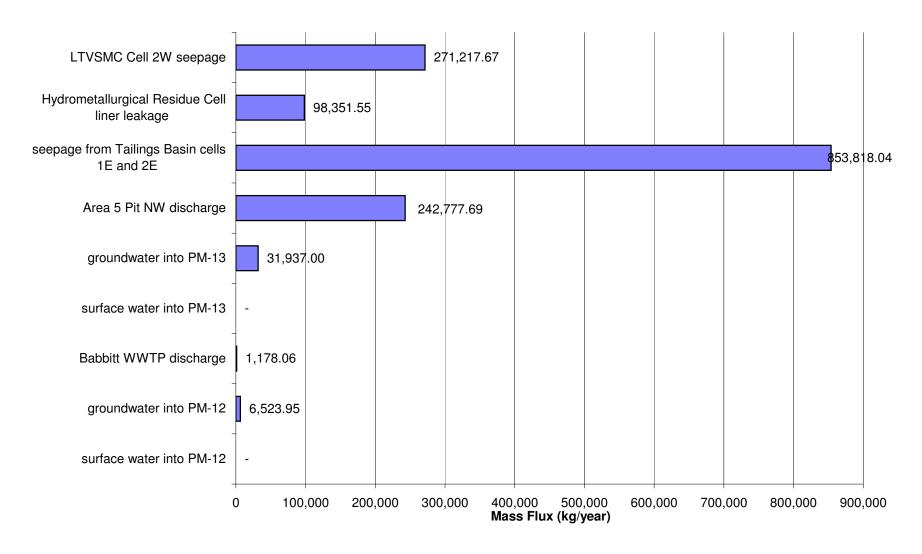
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 5 for High Flow for Antimony (Sb)



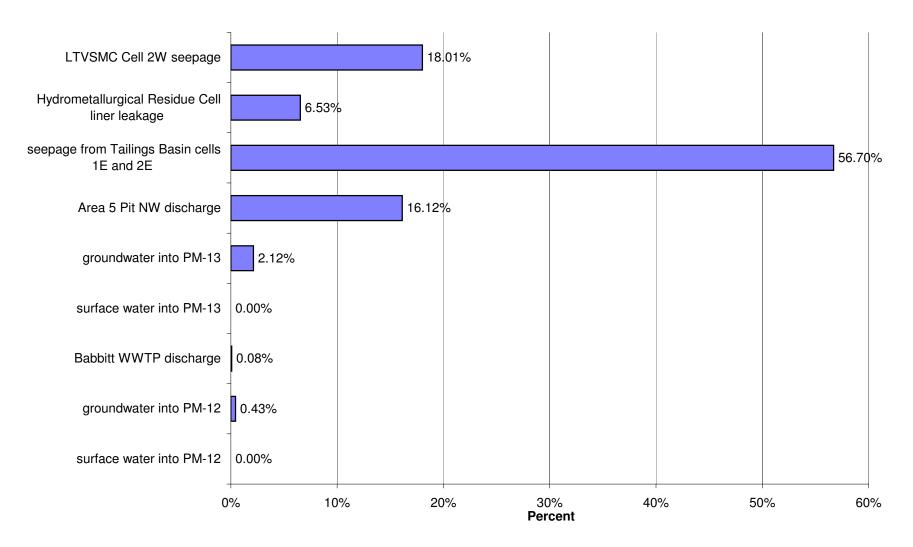
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for High Flow for Antimony (Sb)



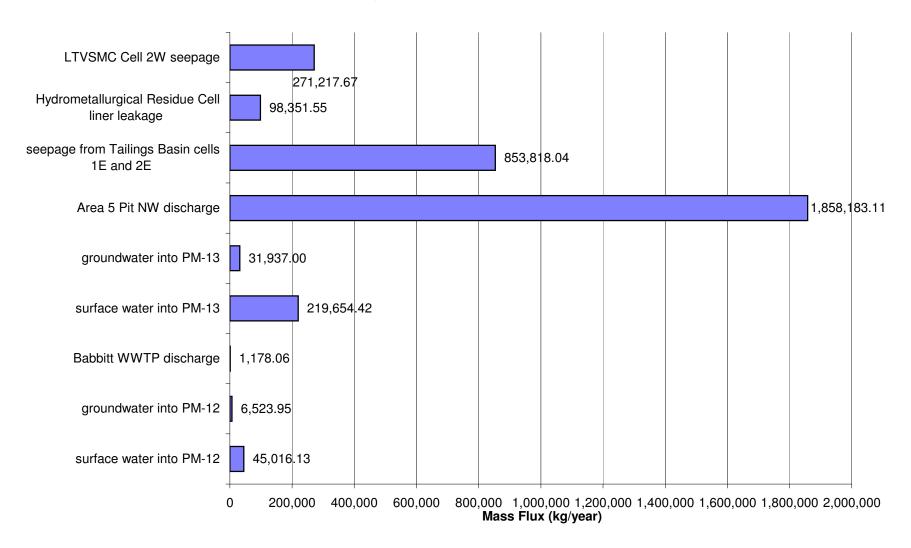
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Year 5 for Low Flow for Sulfate (SO₄)



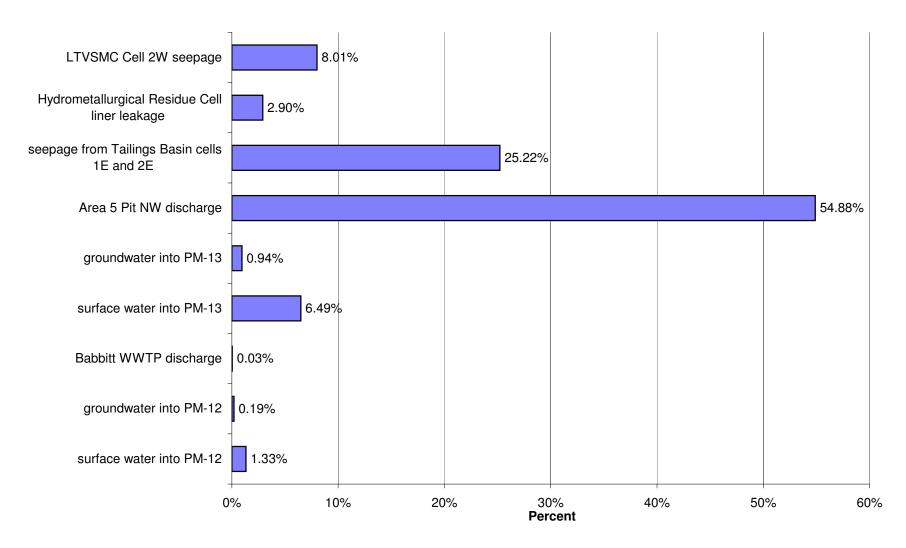
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for Low Flow for Sulfate (SO₄)



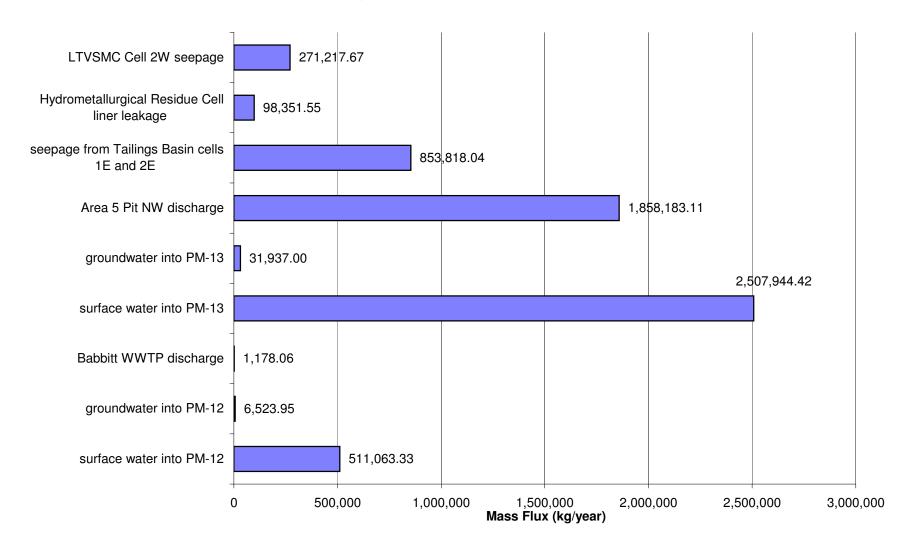
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Year 5 for Average Flow for Sulfate (SO₄)



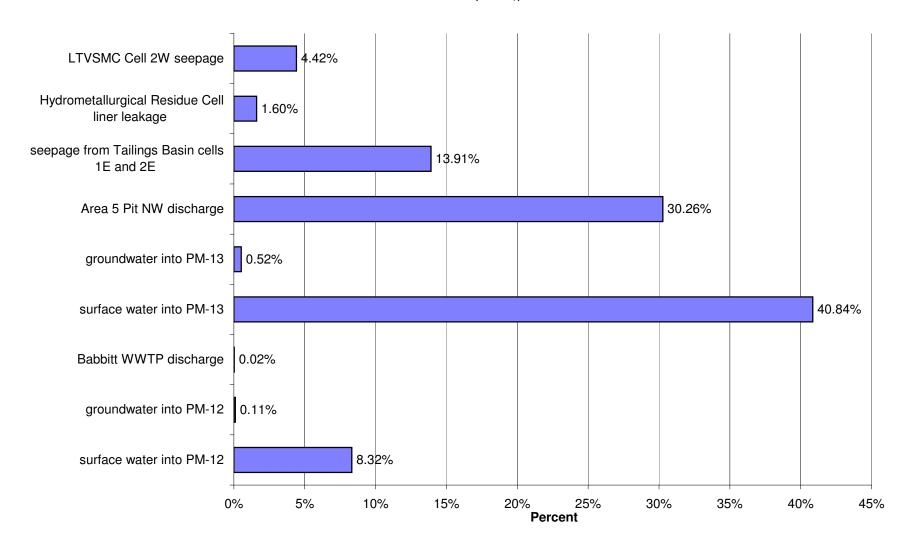
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for Average Flow for Sulfate (SO₄)



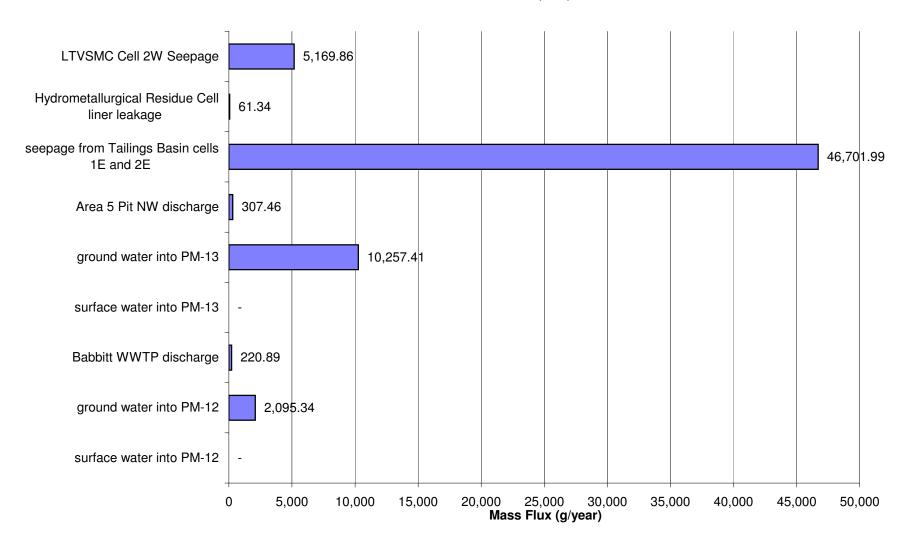
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Year 5 for High Flow for Sulfate (SO₄)



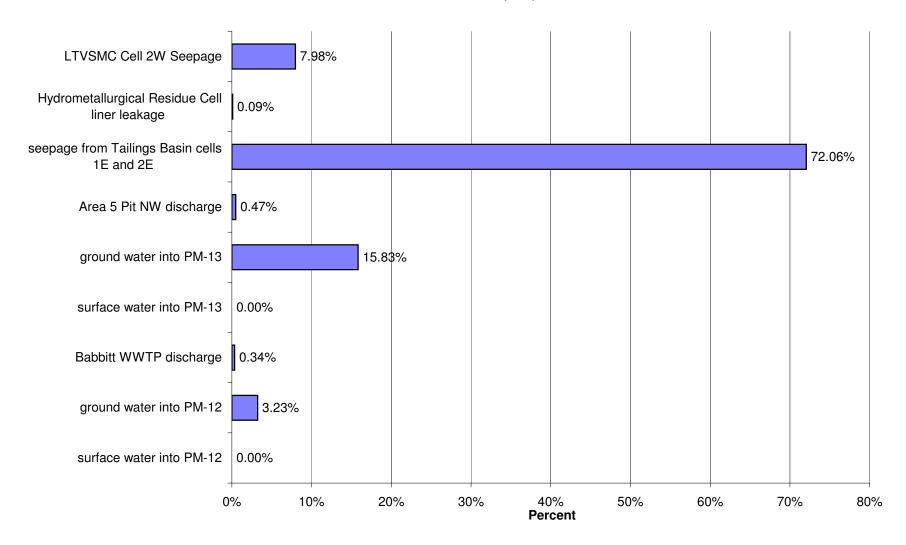
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 5 for High Flow for Sulfate (SO₄)



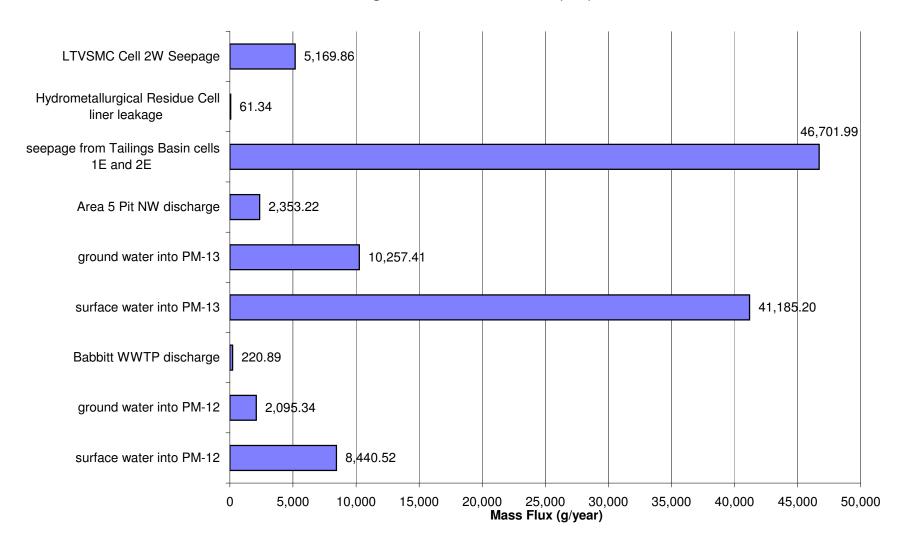
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 10 for Low Flow for Arsenic (As)



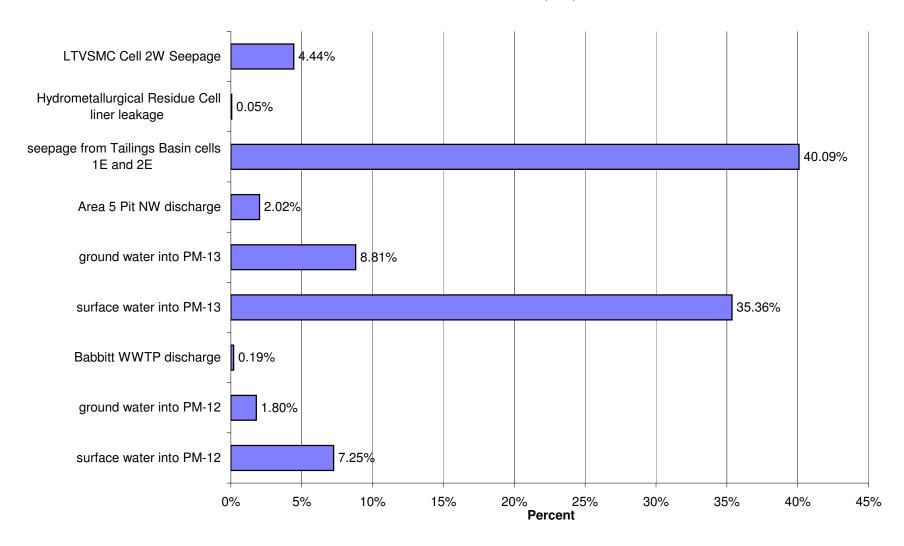
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for Low Flow for Arsenic (As)



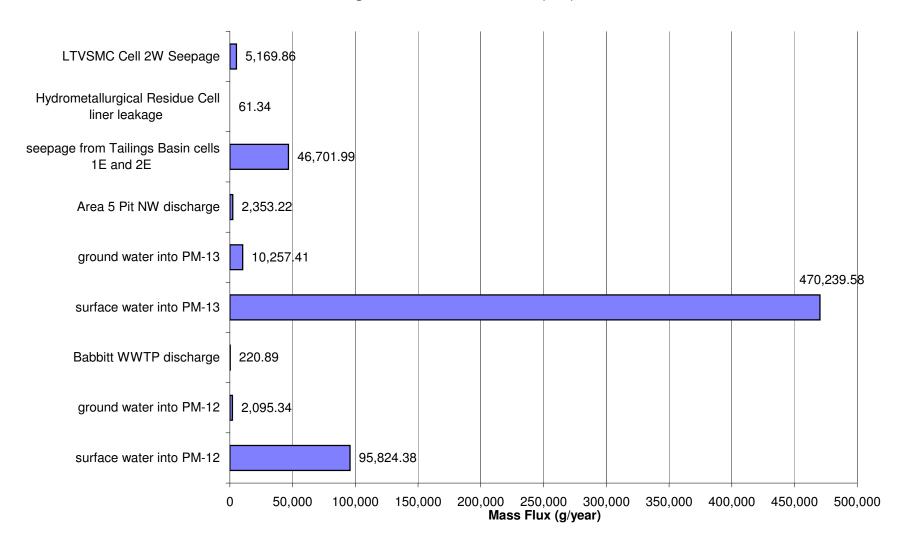
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 10 for Average Flow for Arsenic (As)



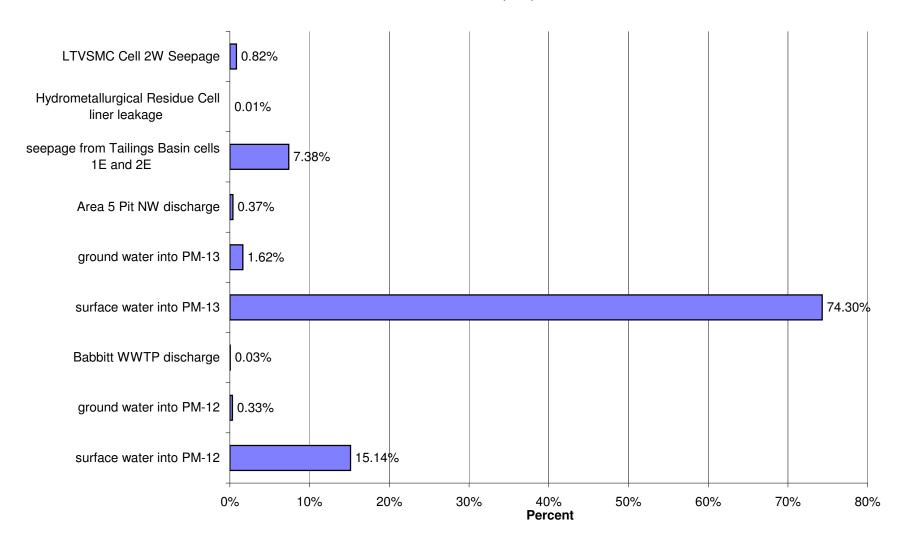
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for Average Flow for Arsenic (As)



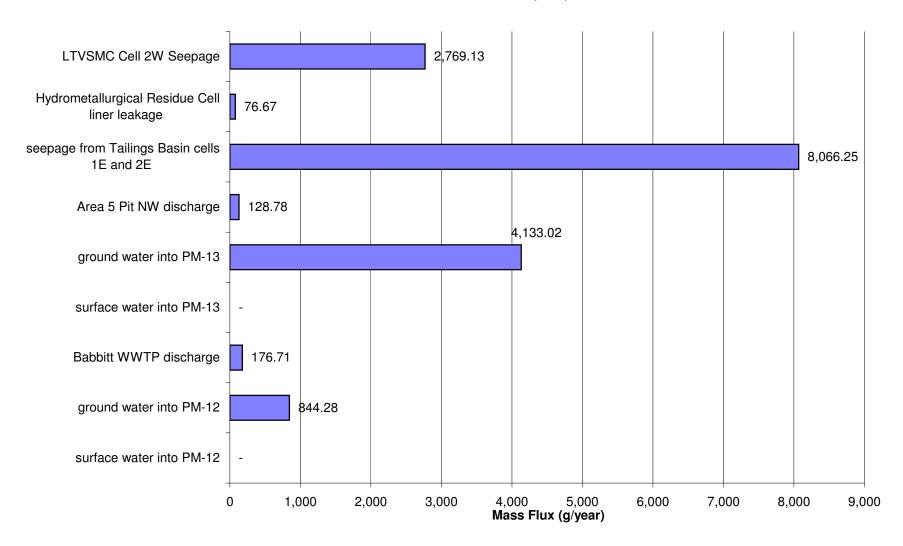
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 10 for High Flow for Arsenic (As)



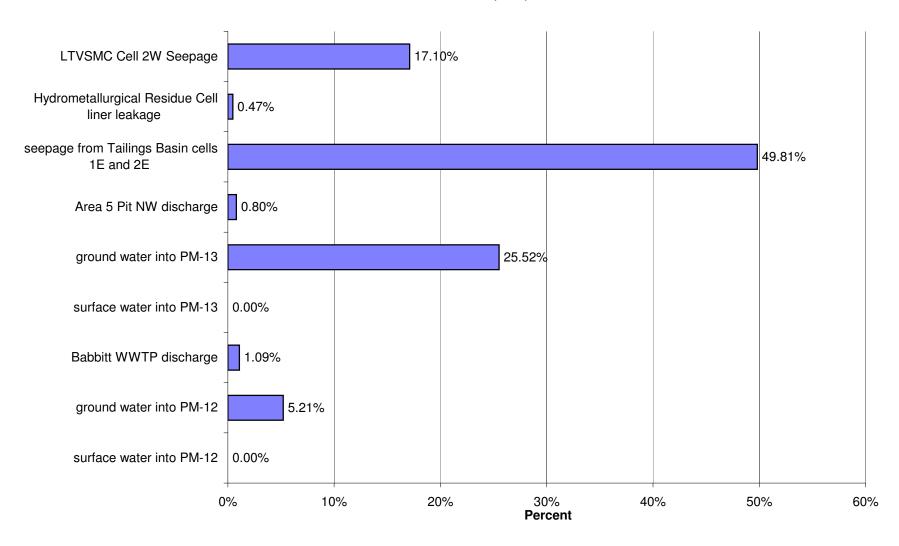
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for High Flow for Arsenic (As)



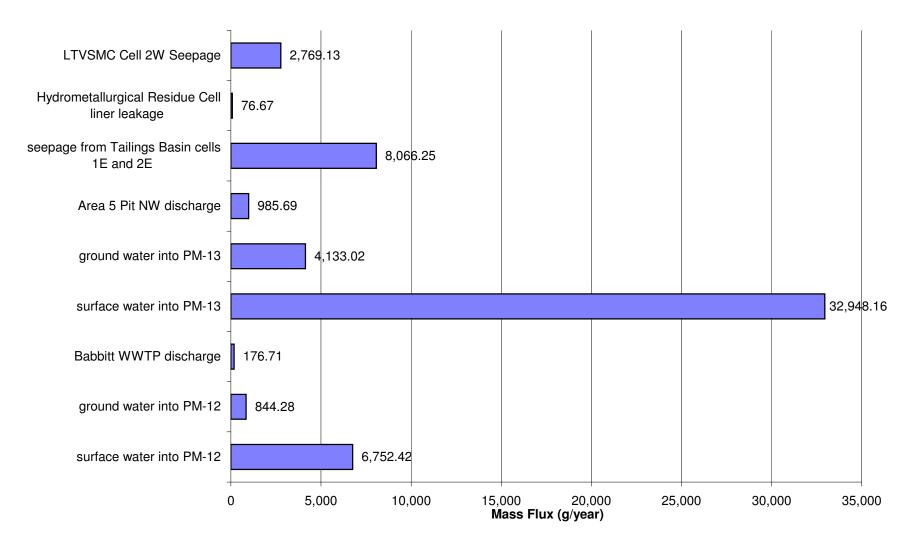
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 10 for Low Flow for Cobalt (Co)



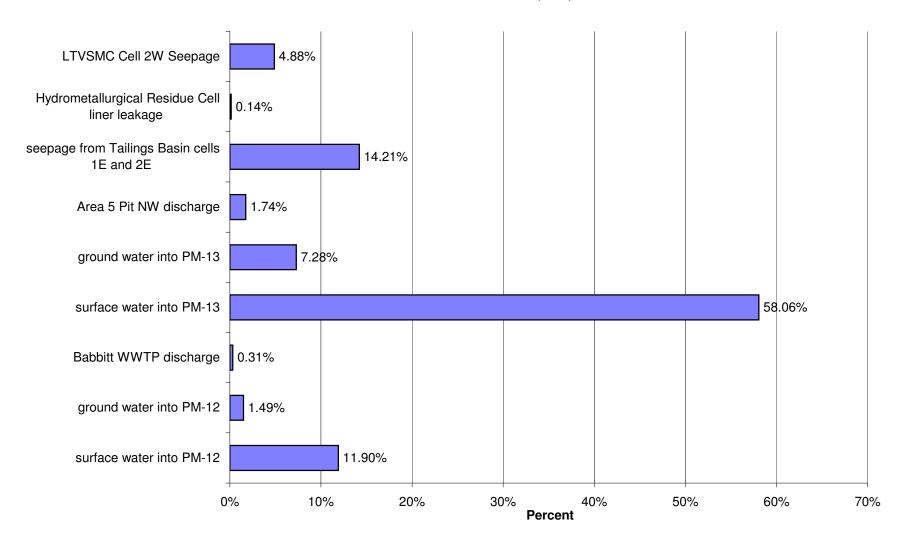
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for Low Flow for Cobalt (Co)



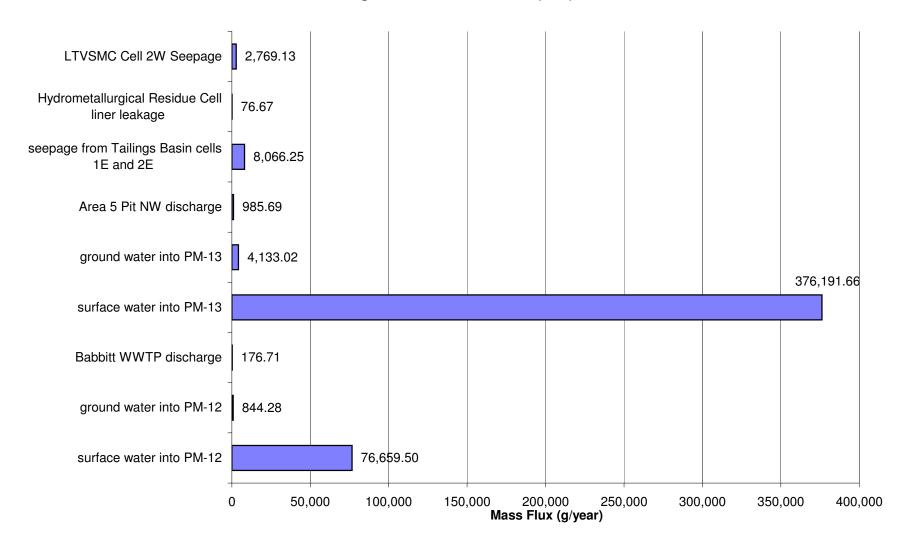
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 10 for Average Flow for Cobalt (Co)



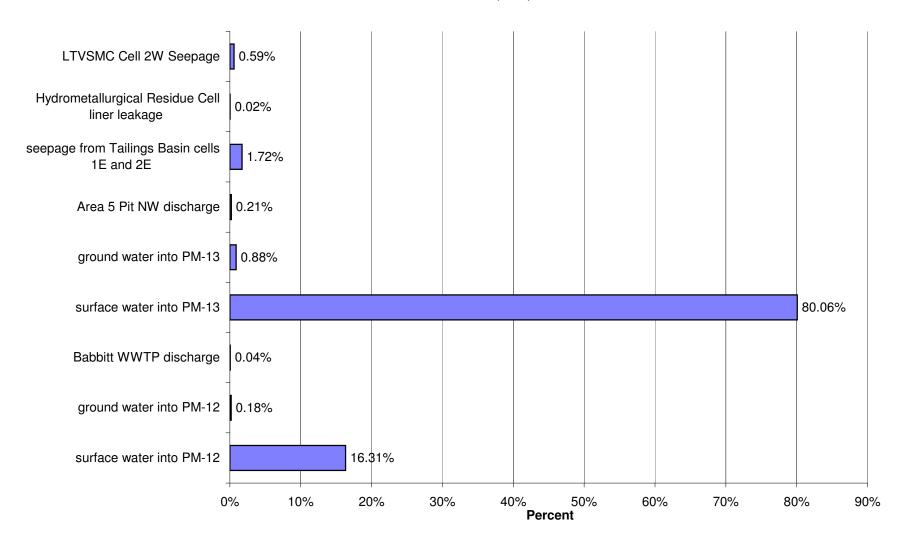
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for Average Flow for Cobalt (Co)



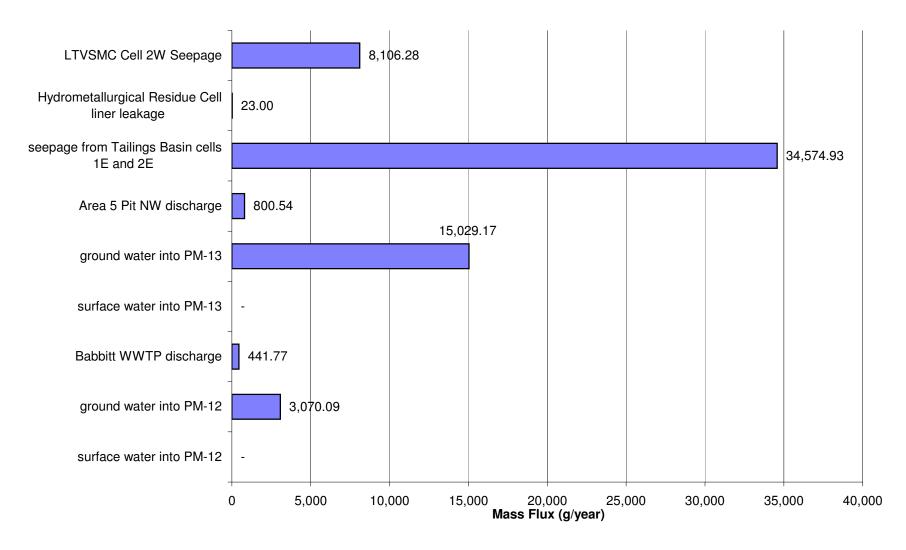
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 10 for High Flow for Cobalt (Co)



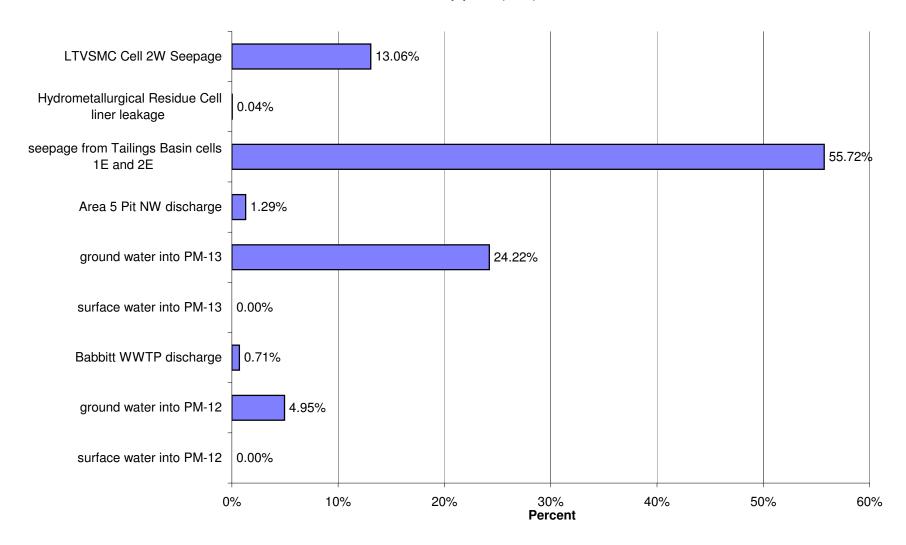
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for High Flow for Cobalt (Co)



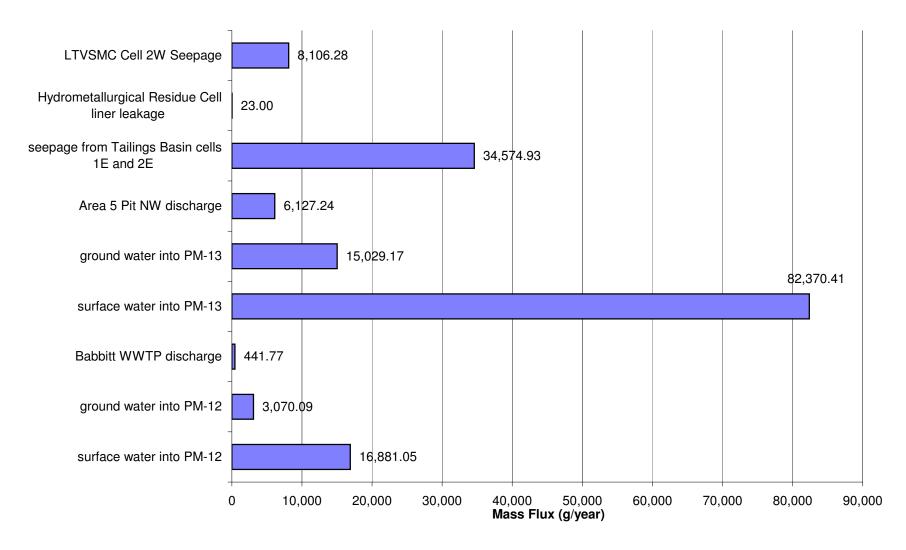
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 10 for Low Flow for Copper (Cu)



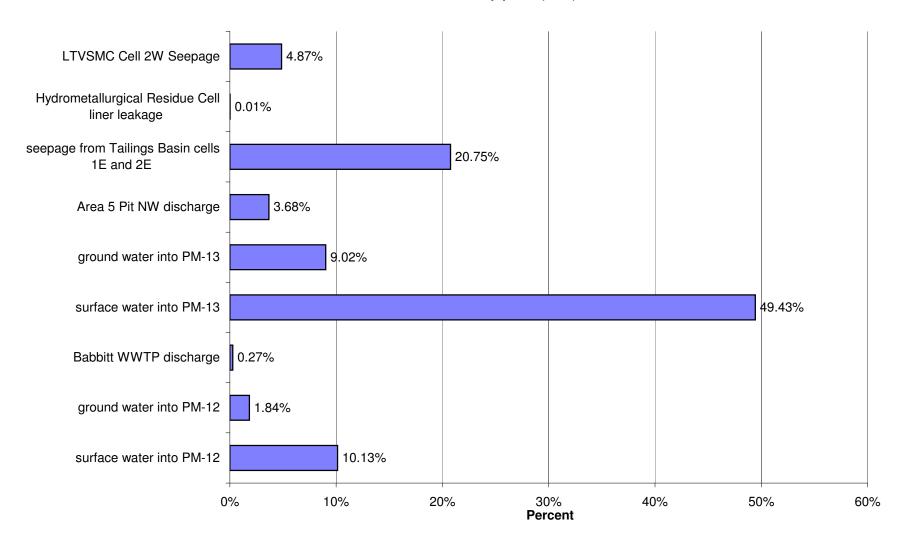
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for Low Flow for Copper (Cu)



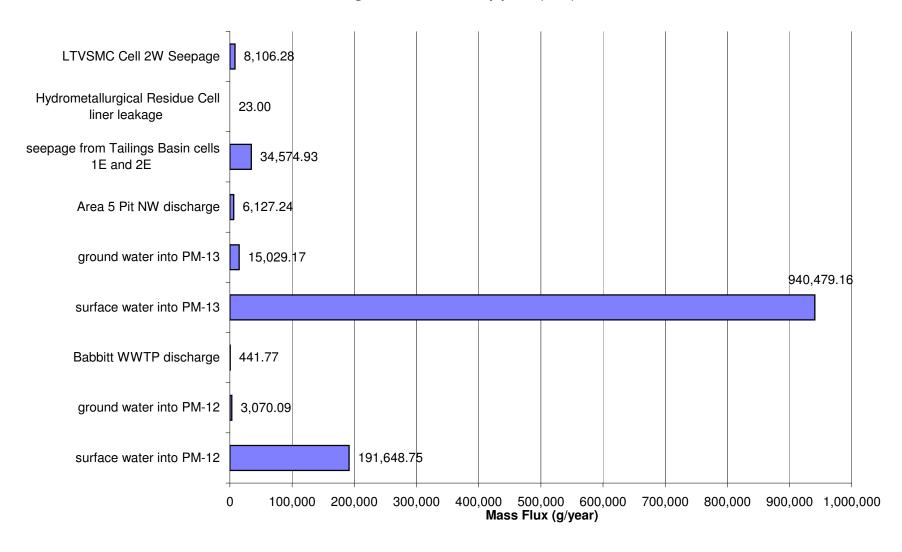
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 10 for Average Flow for Copper (Cu)



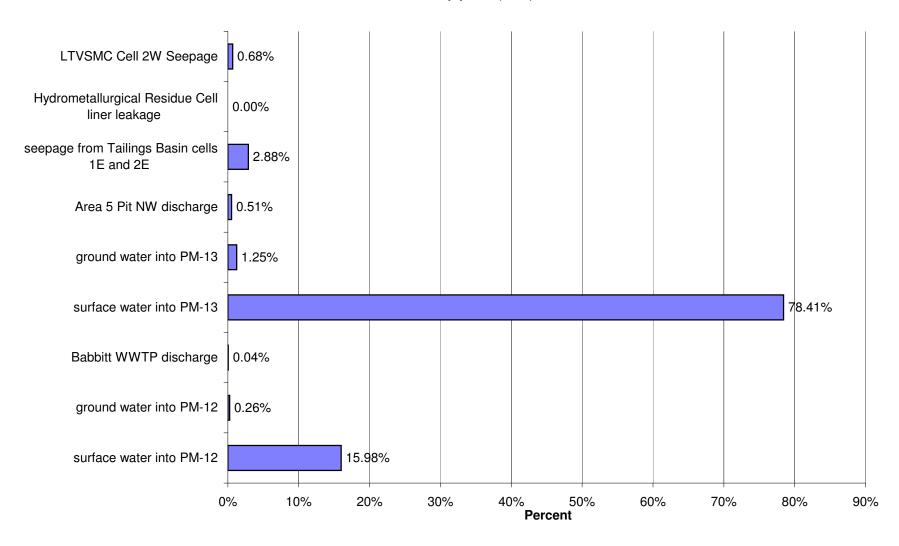
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for Average Flow for Copper (Cu)



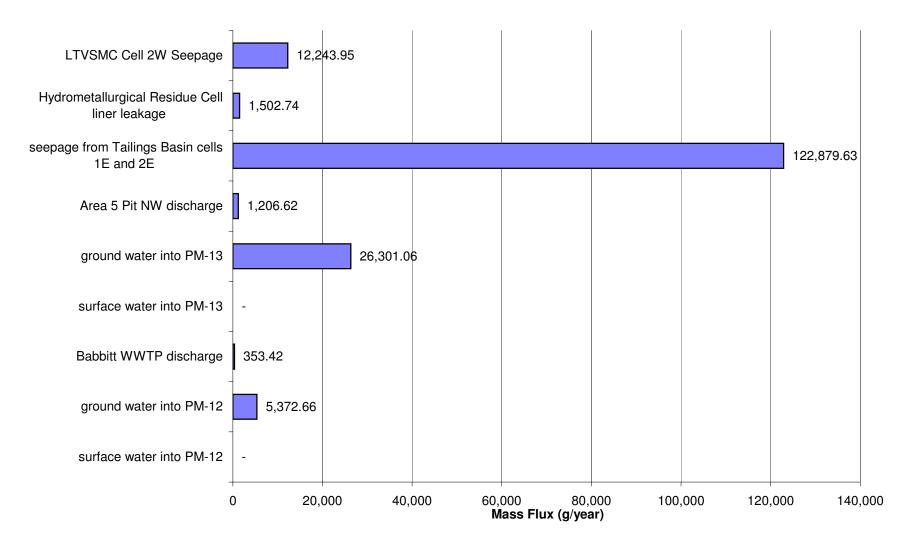
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 10 for High Flow for Copper (Cu)



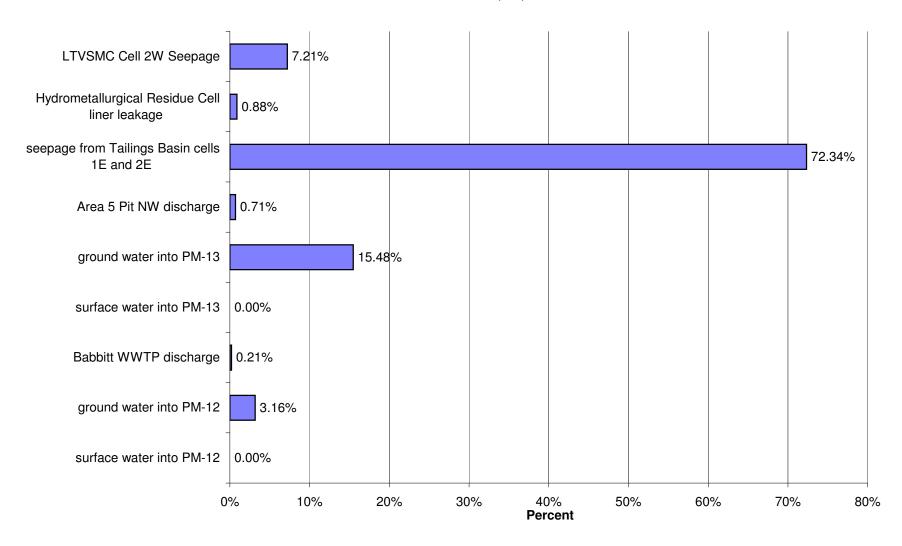
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for High Flow for Copper (Cu)



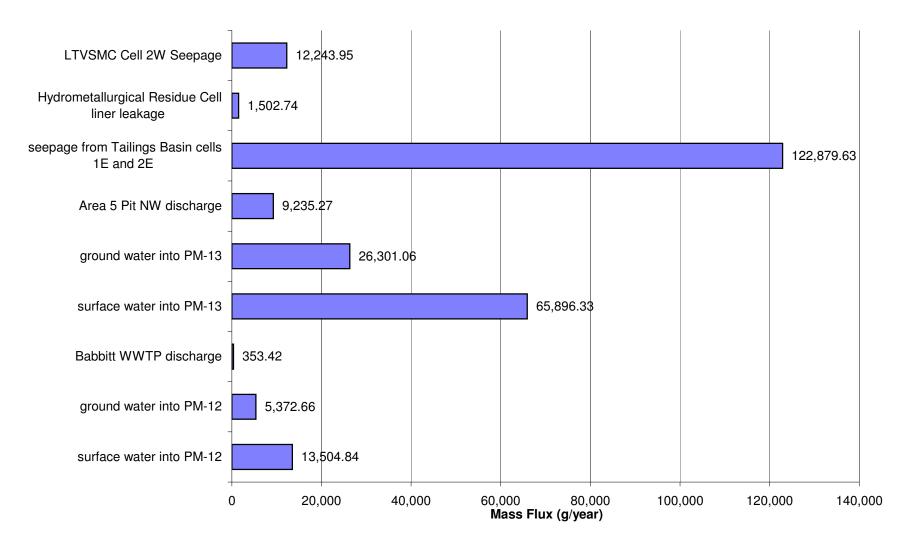
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 10 for Low Flow for Nickel (Ni)



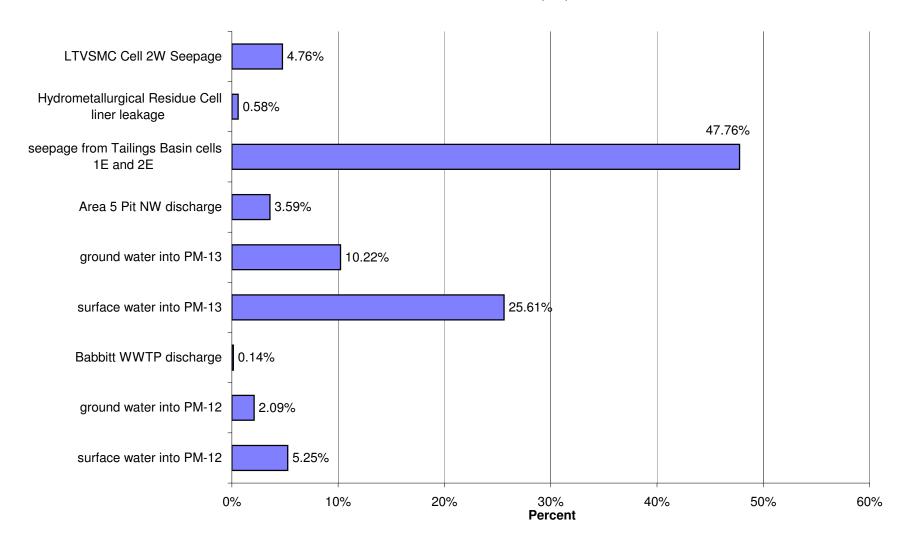
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for Low Flow for Nickel (Ni)



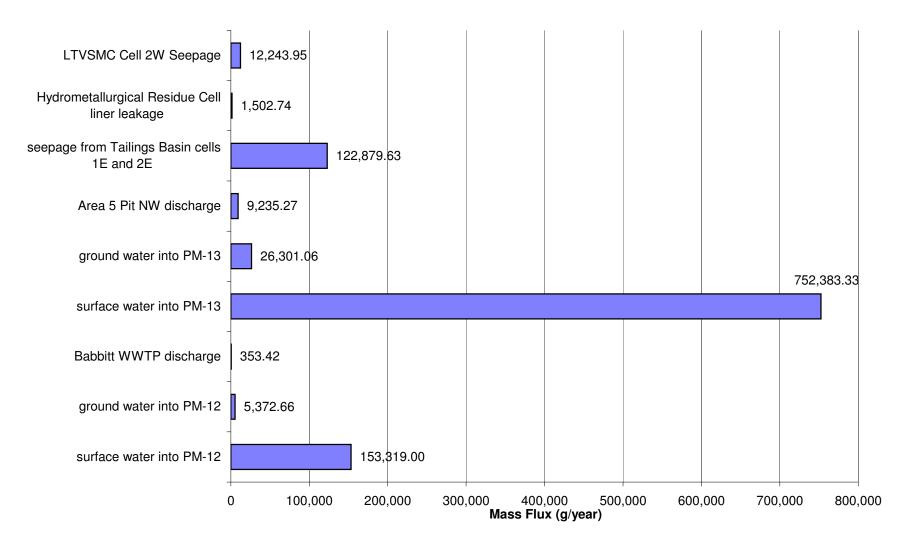
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 10 for Average Flow for Nickel (Ni)



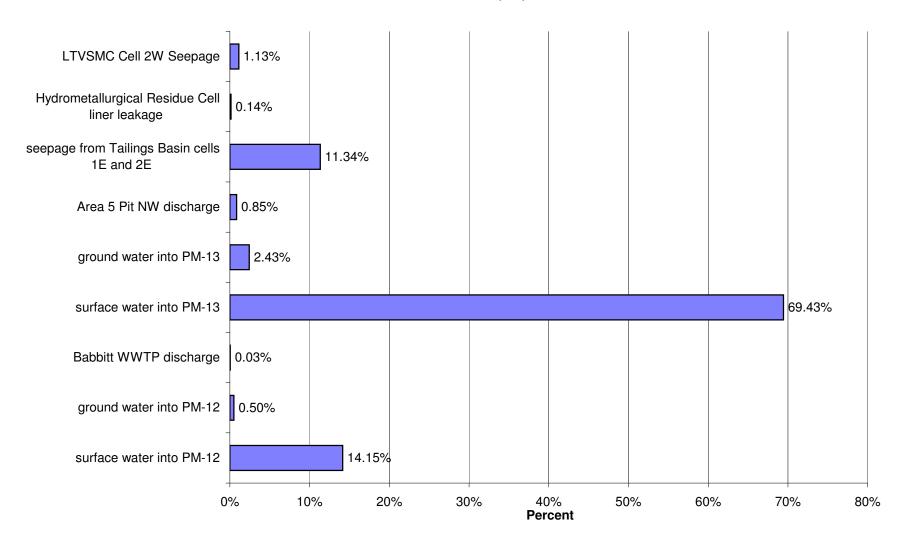
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for Average Flow for Nickel (Ni)



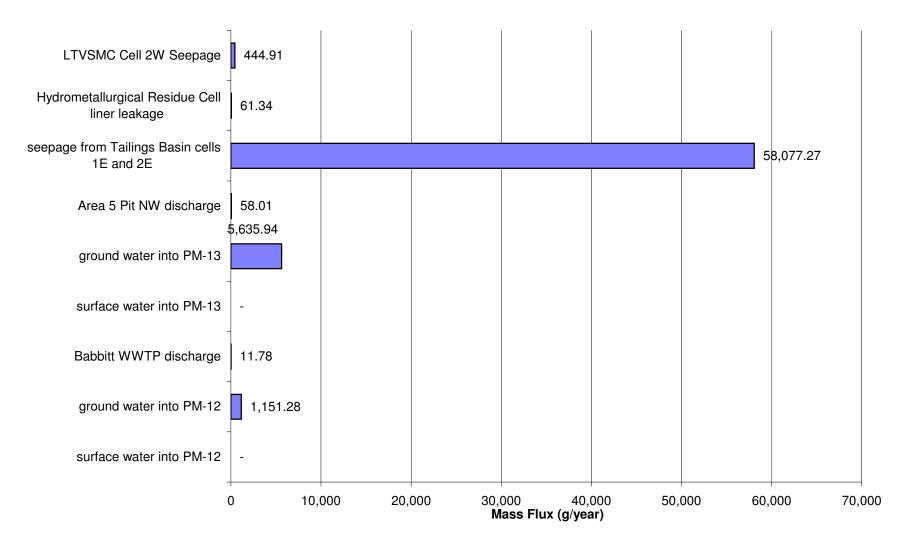
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 10 for High Flow for Nickel (Ni)



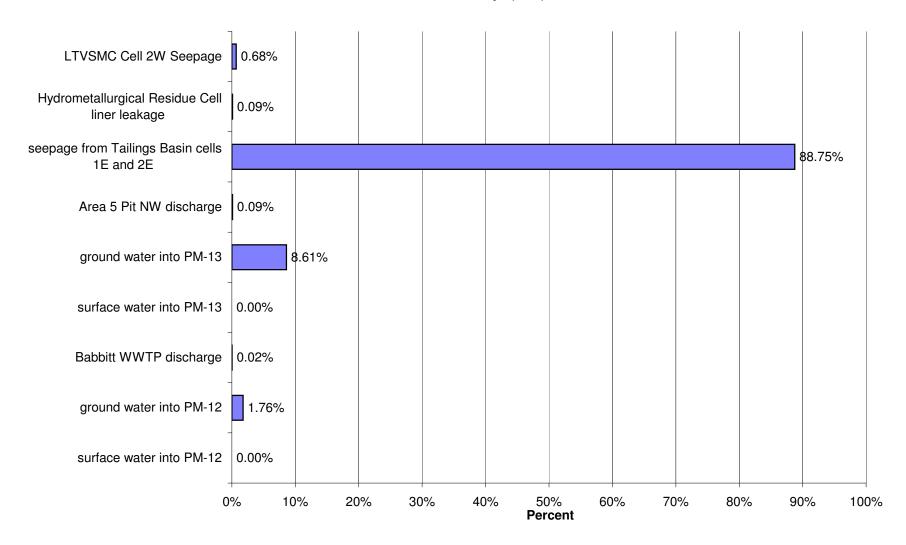
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for High Flow for Nickel (Ni)



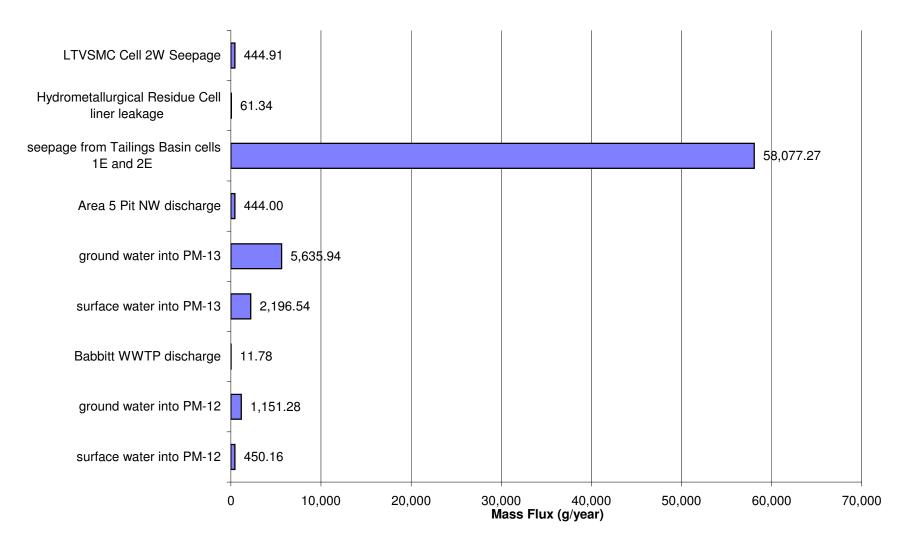
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 10 for Low Flow for Antimony (Sb)



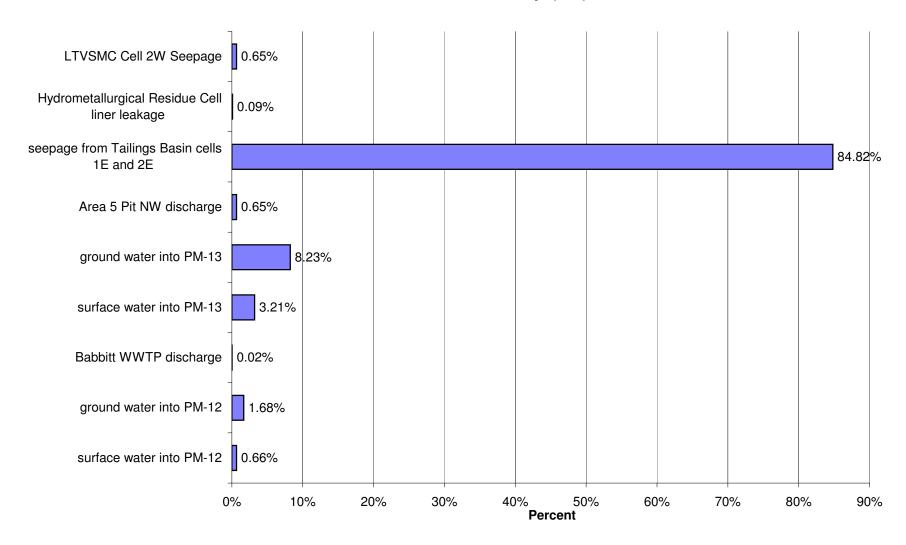
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for Low Flow for Antimony (Sb)



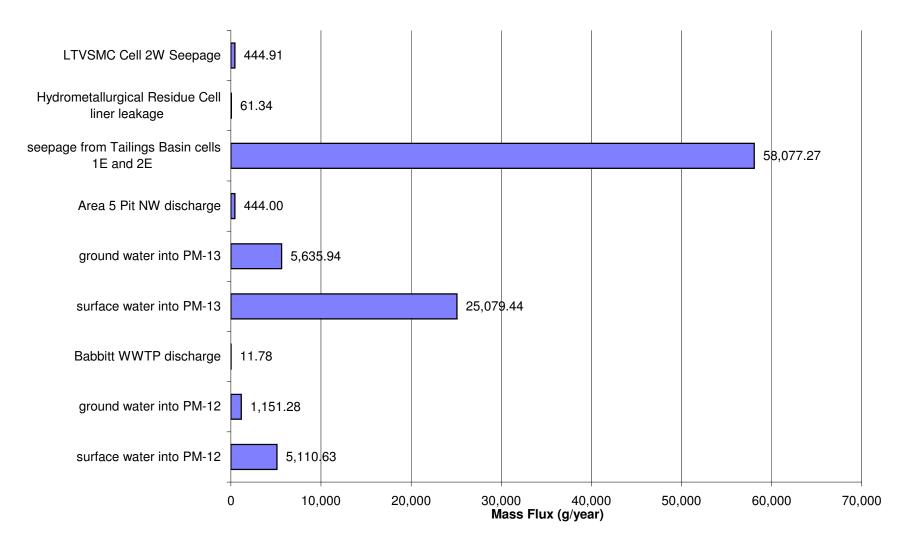
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 10 for Average Flow for Antimony (Sb)



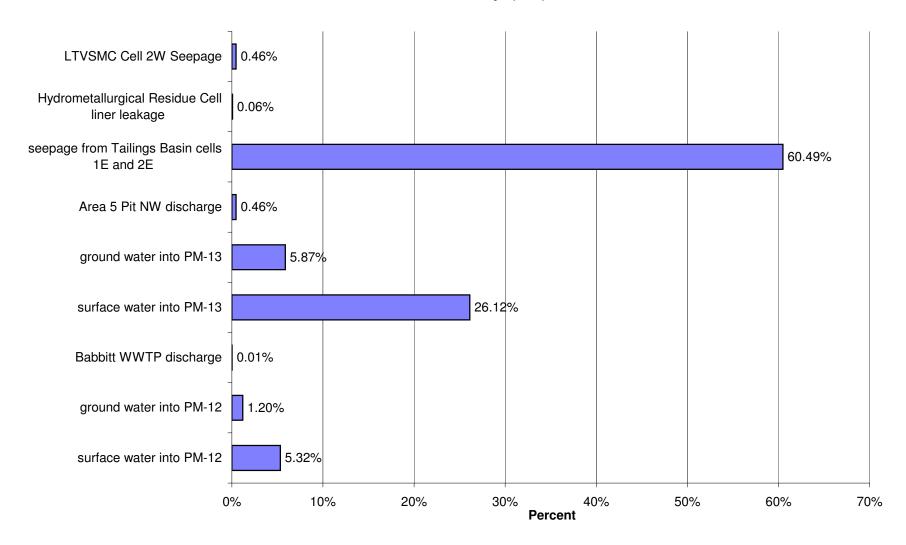
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for Average Flow for Antimony (Sb)



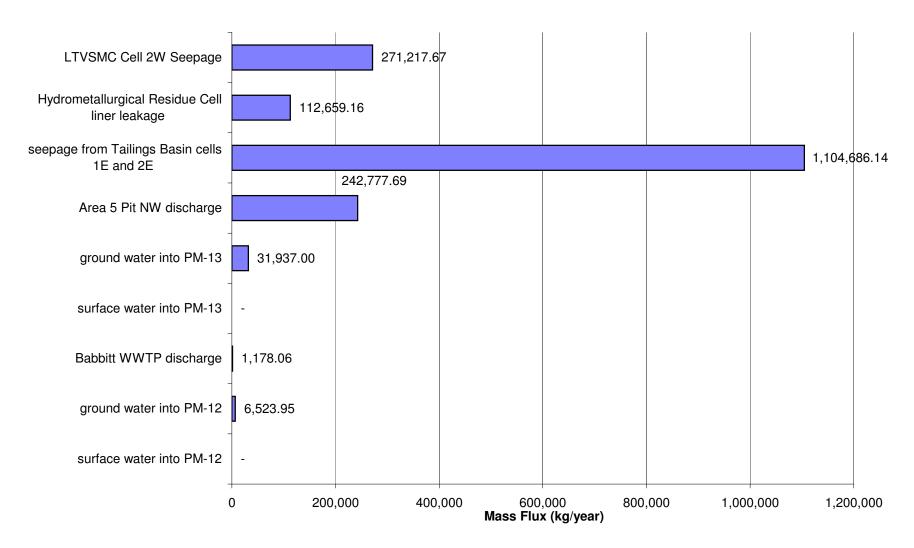
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 10 for High Flow for Antimony (Sb)



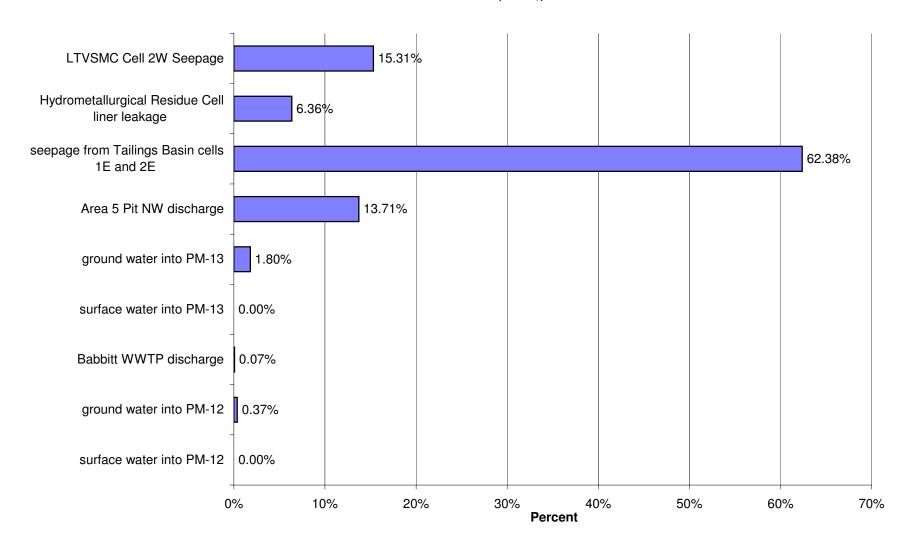
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for High Flow for Antimony (Sb)



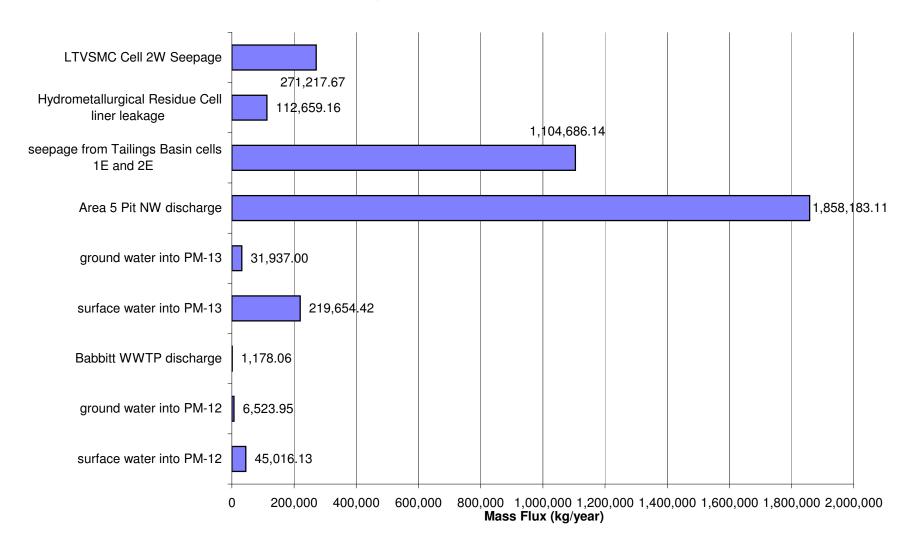
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Year 10 for Low Flow for Sulfate (SO₄)



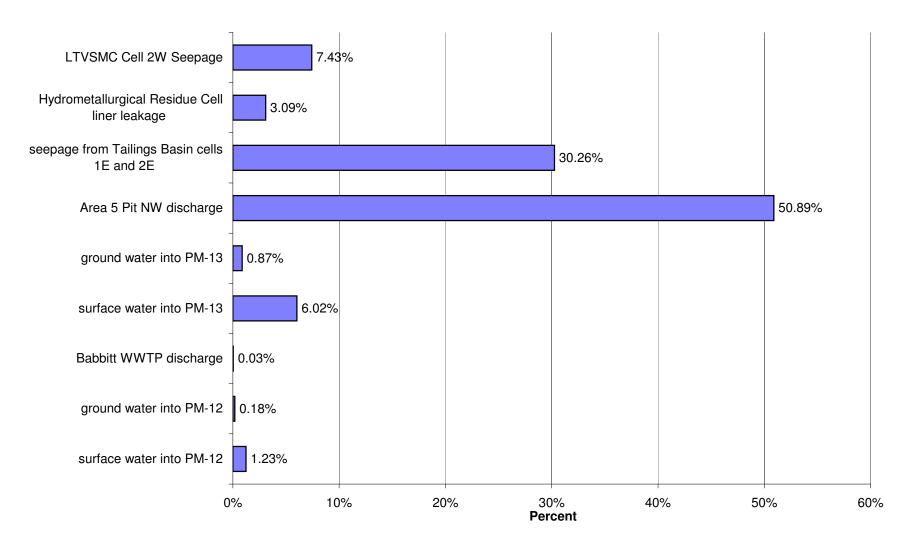
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for Low Flow for Sulfate (SO₄)



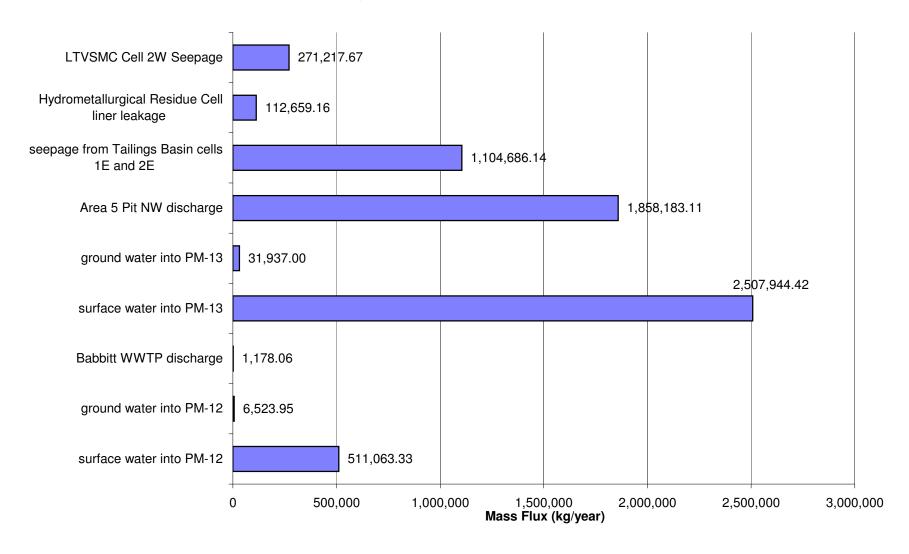
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Year 10 for Average Flow for Sulfate (SO₄)



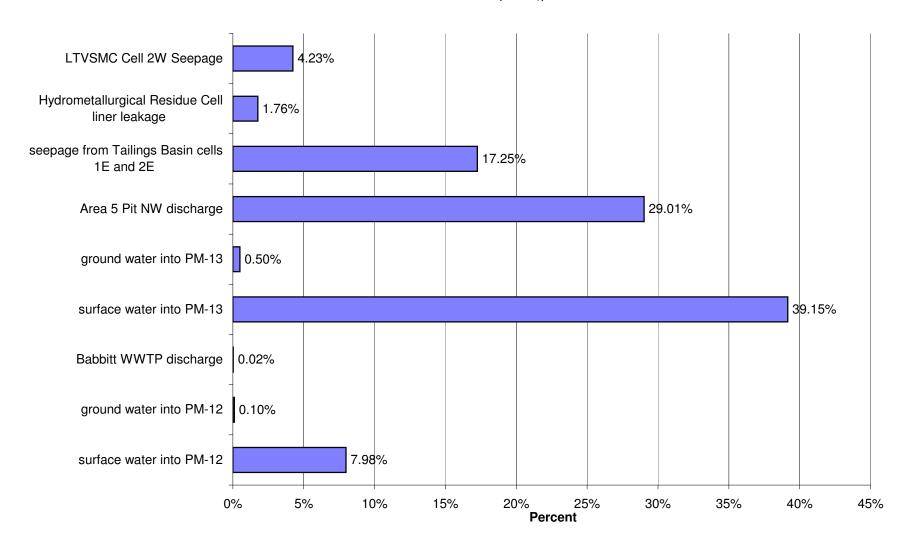
GeotechnicalMitigation: Percent of Impacts at PM-13 in Year 10 for Average Flow for Sulfate (SO₄)



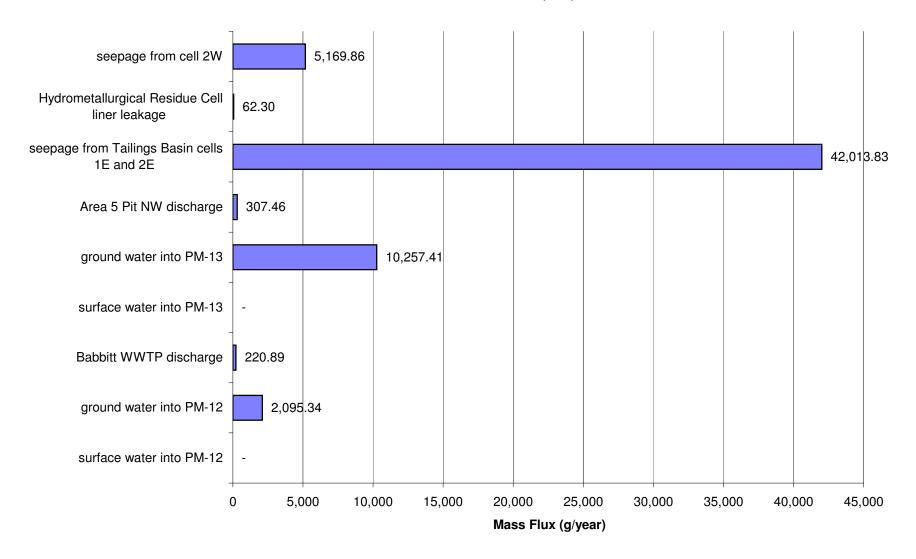
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Year 10 for High Flow for Sulfate (SO₄)



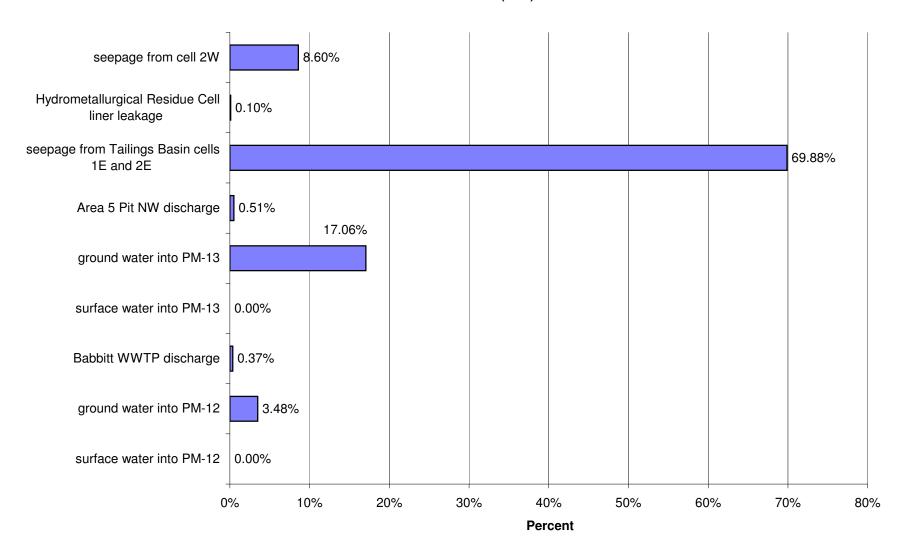
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 10 for High Flow for Sulfate (SO₄)



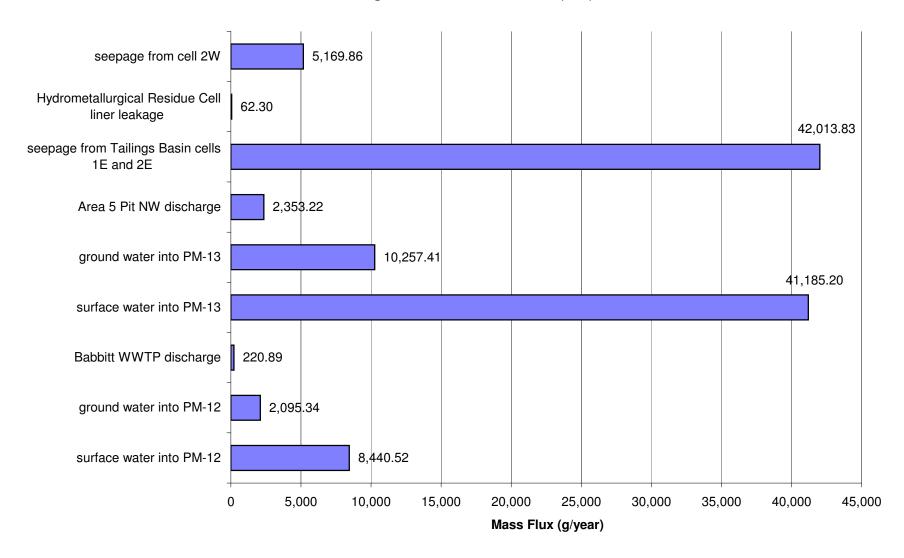
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Low Flow for Arsenic (As)



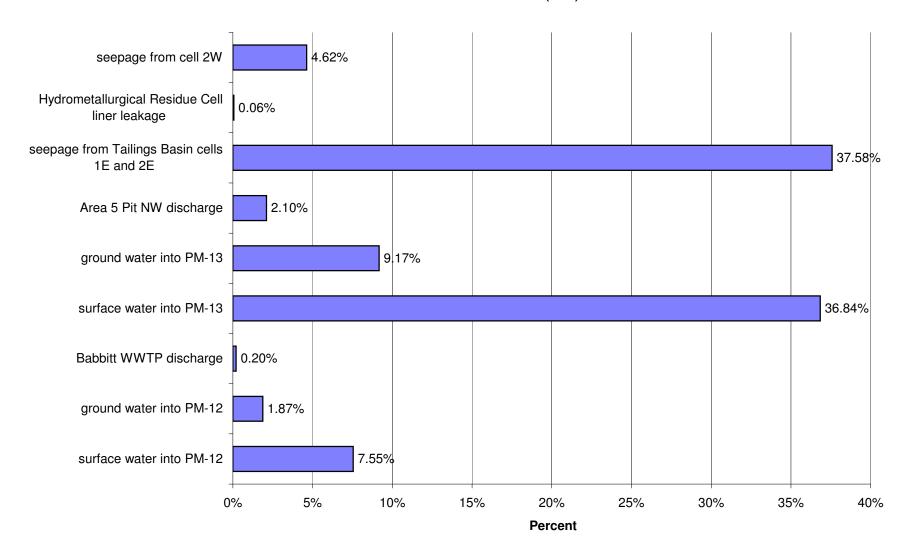
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for Low Flow for Arsenic (As)



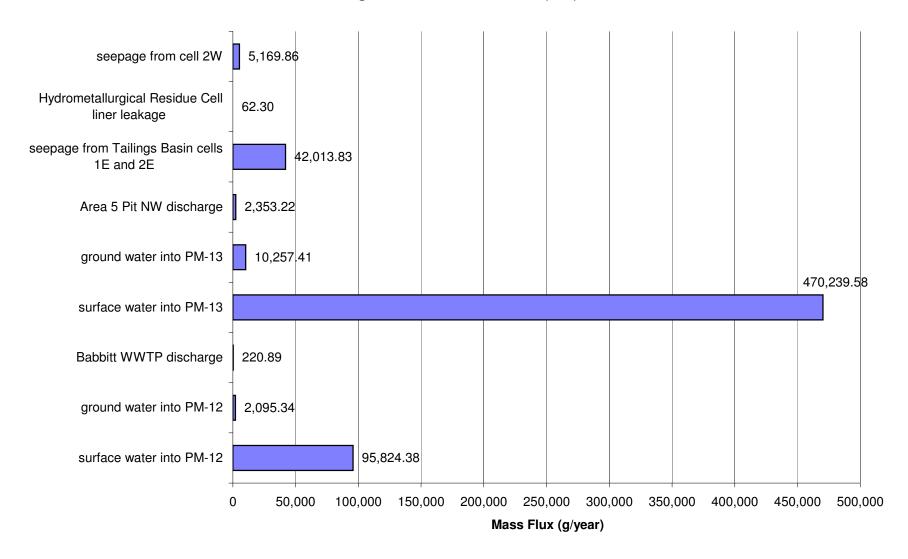
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Average Flow for Arsenic (As)



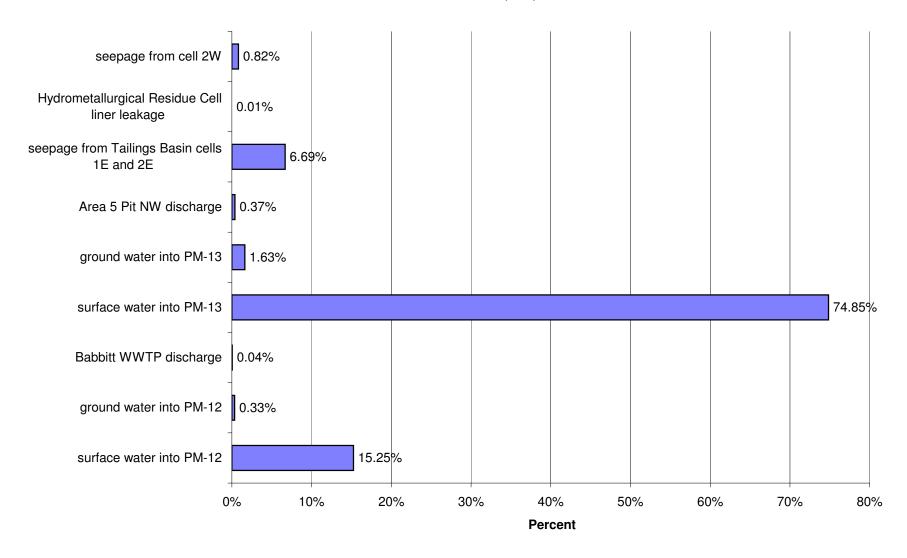
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for Average Flow for Arsenic (As)



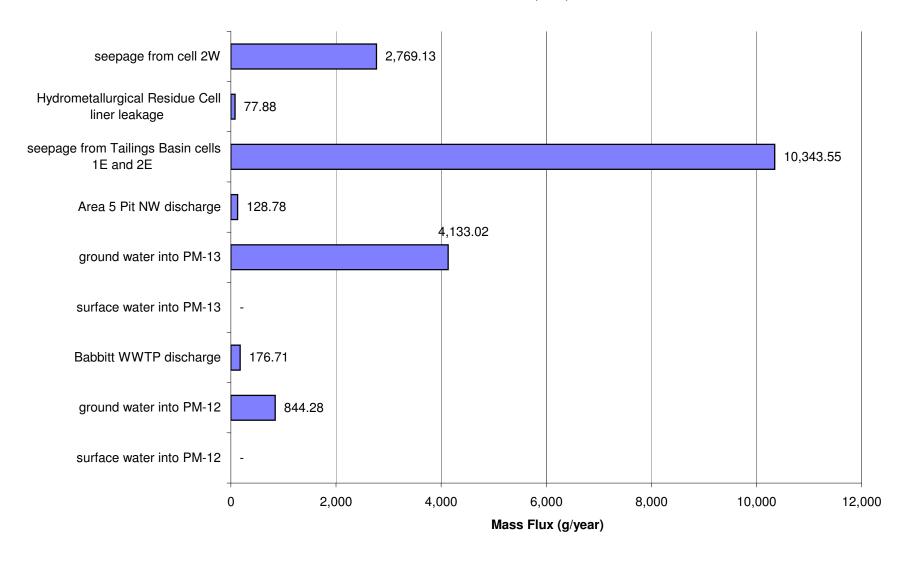
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for High Flow for Arsenic (As)



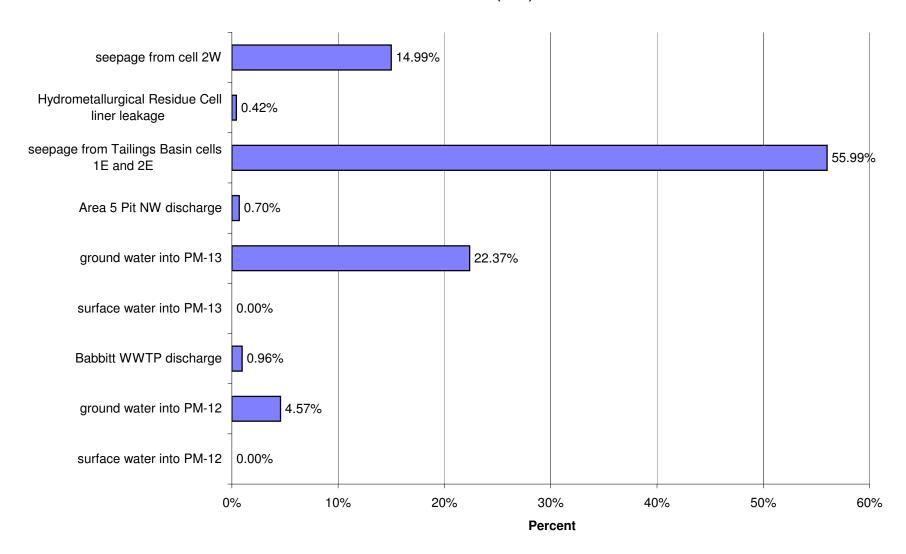
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for High Flow for Arsenic (As)



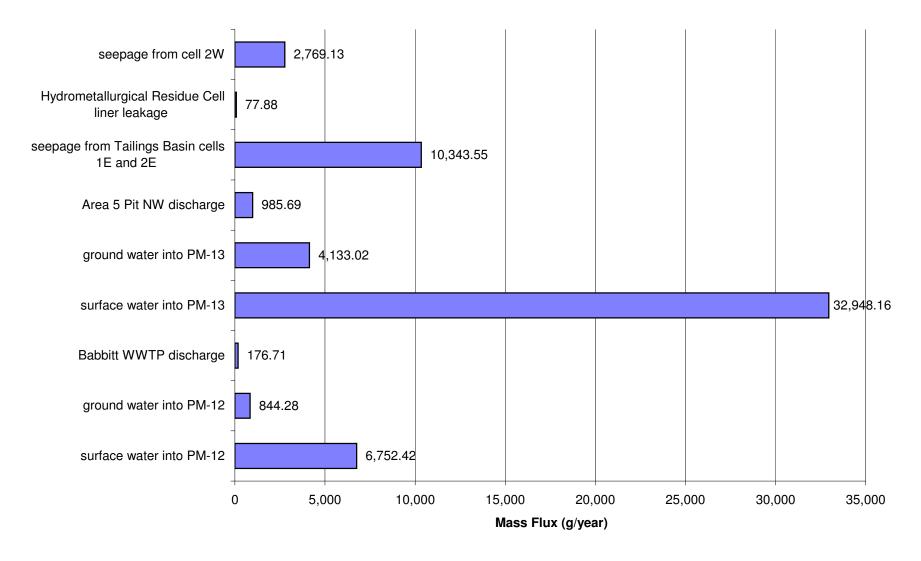
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Low Flow for Cobalt (Co)



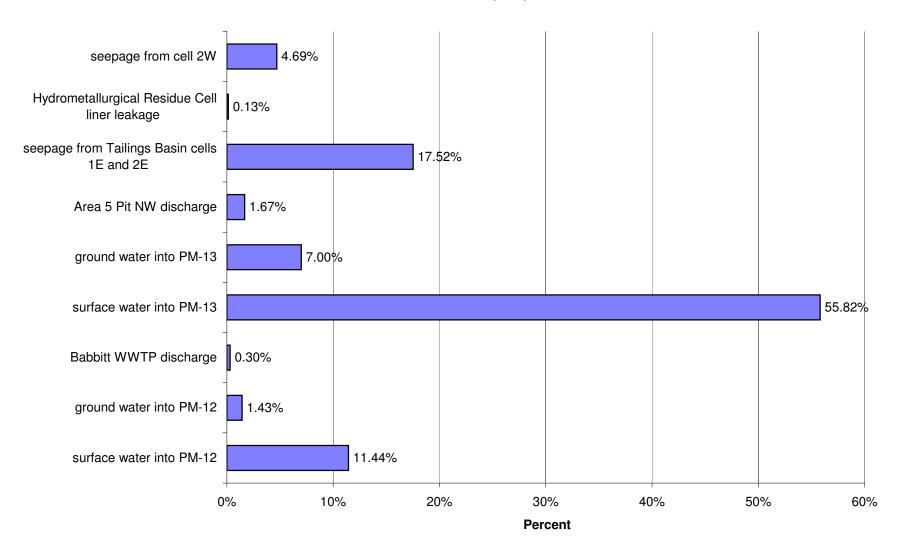
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for Low Flow for Cobalt (Co)



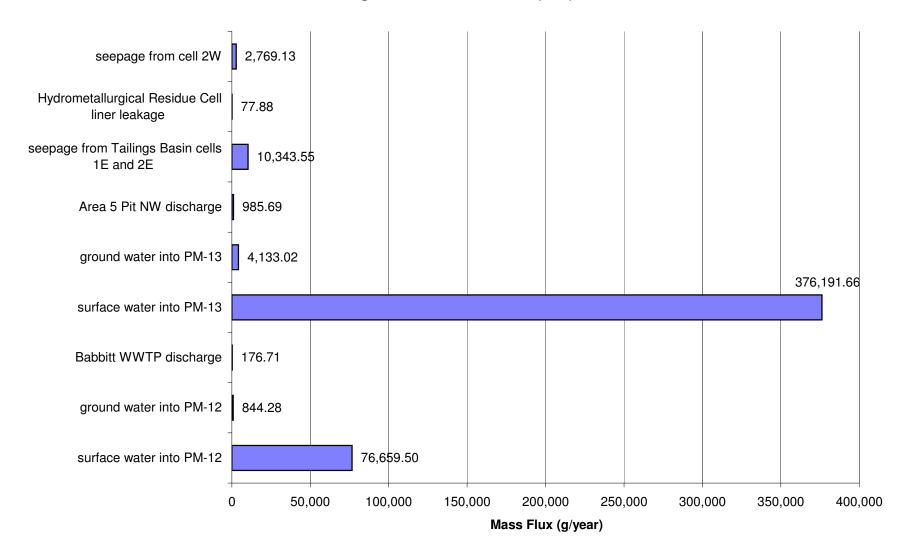
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Average Flow for Cobalt (Co)



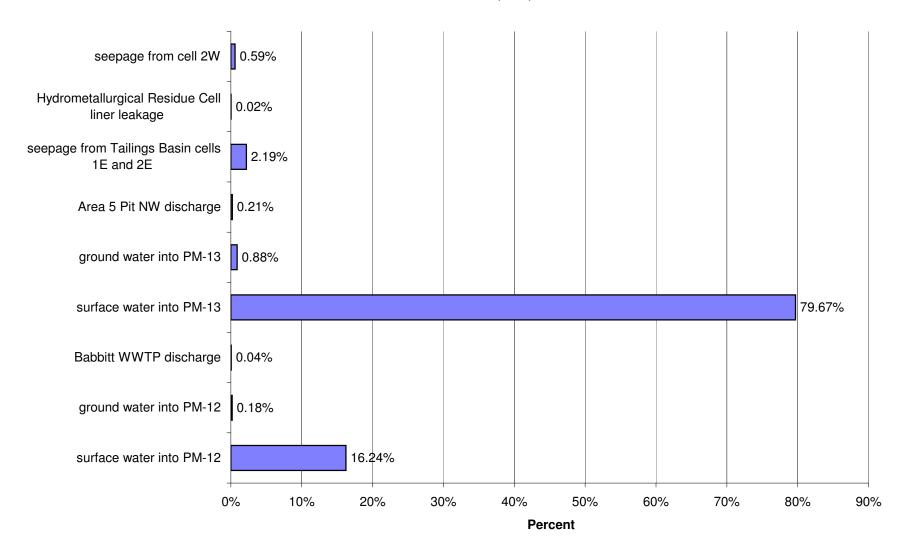
GeotechnicalMitigation: Percent of Impacts at PM-13 in Year 15 for Average Flow for Cobalt (Co)



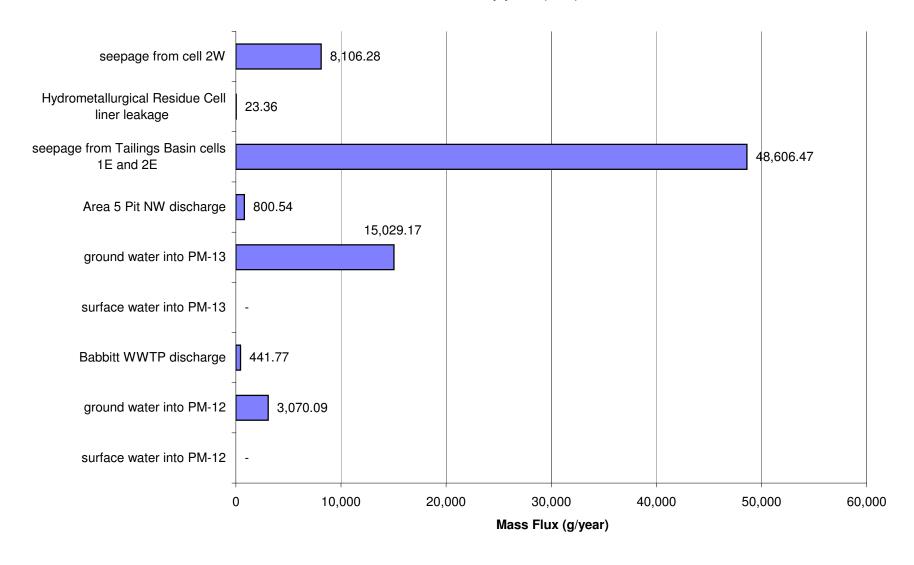
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for High Flow for Cobalt (Co)



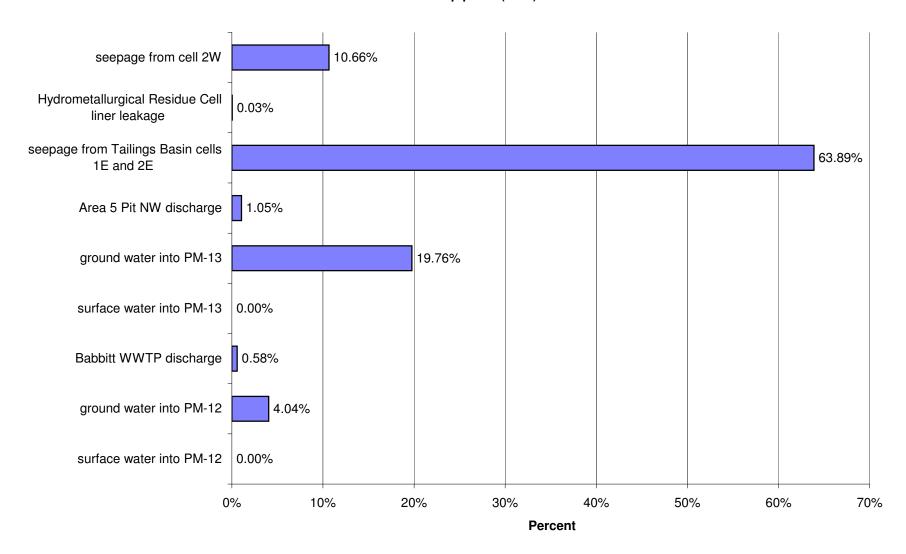
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for High Flow for Cobalt (Co)



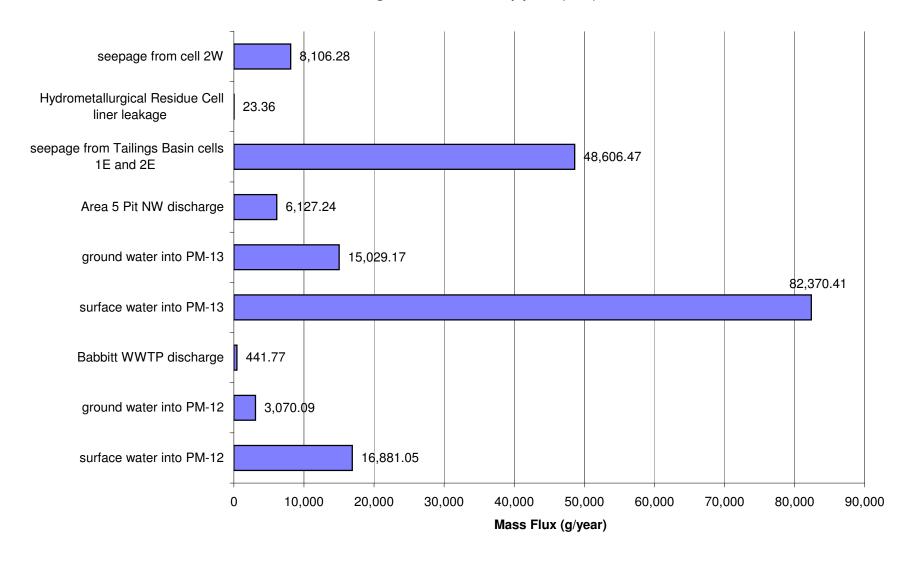
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Low Flow for Copper (Cu)



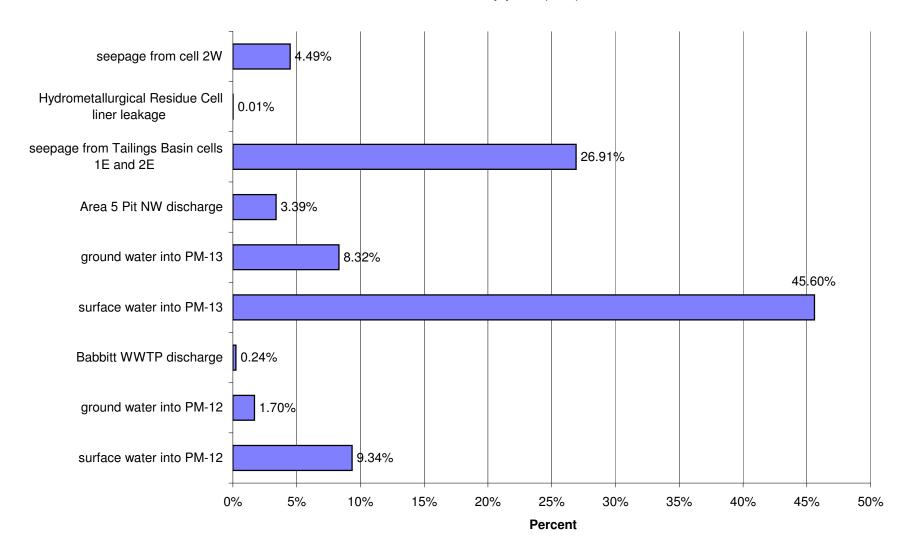
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for Low Flow for Copper (Cu)



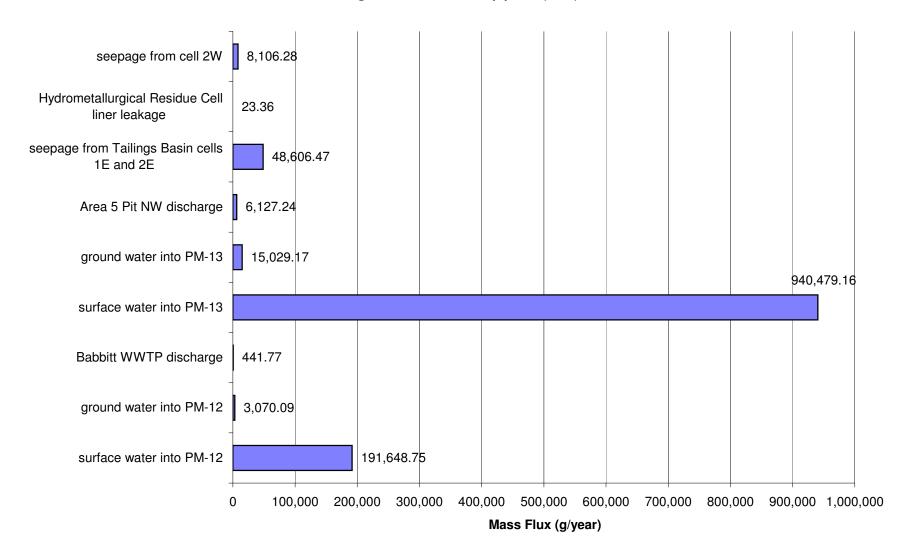
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Average Flow for Copper (Cu)



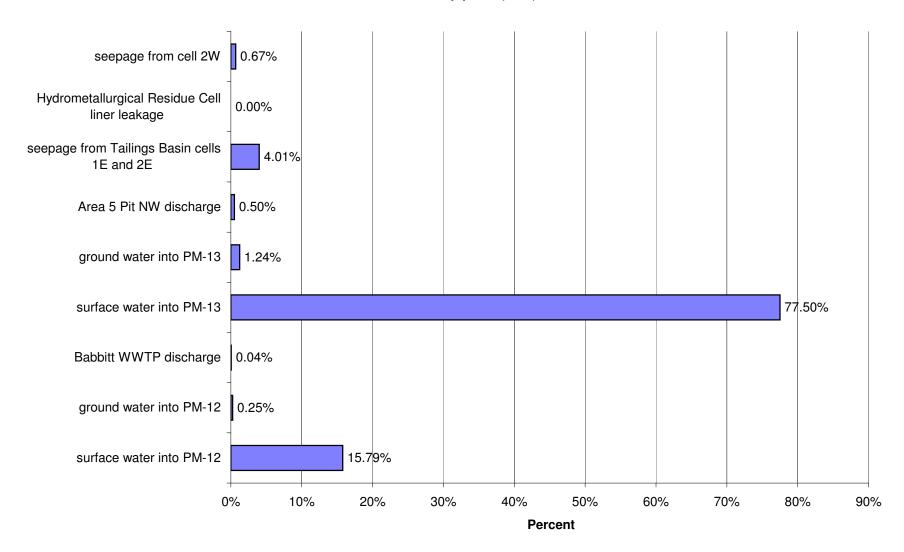
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for Average Flow for Copper (Cu)



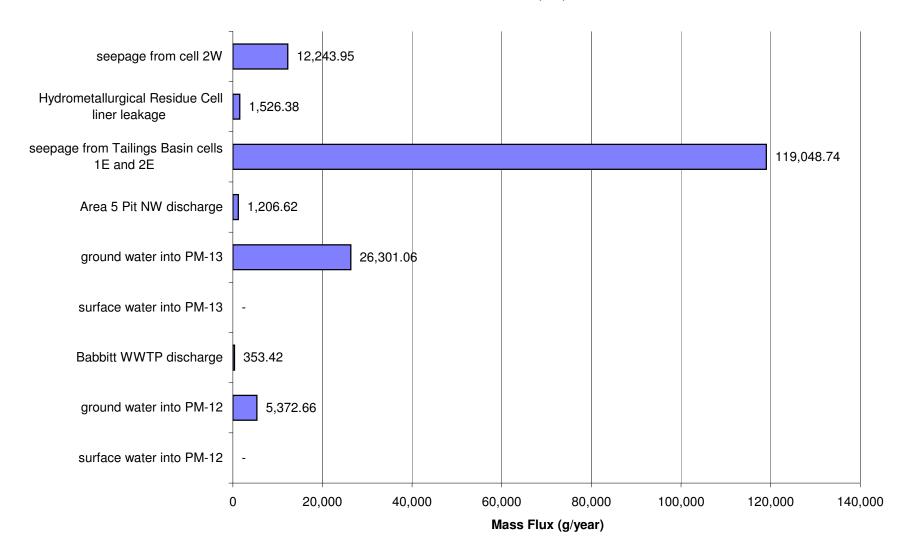
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for High Flow for Copper (Cu)



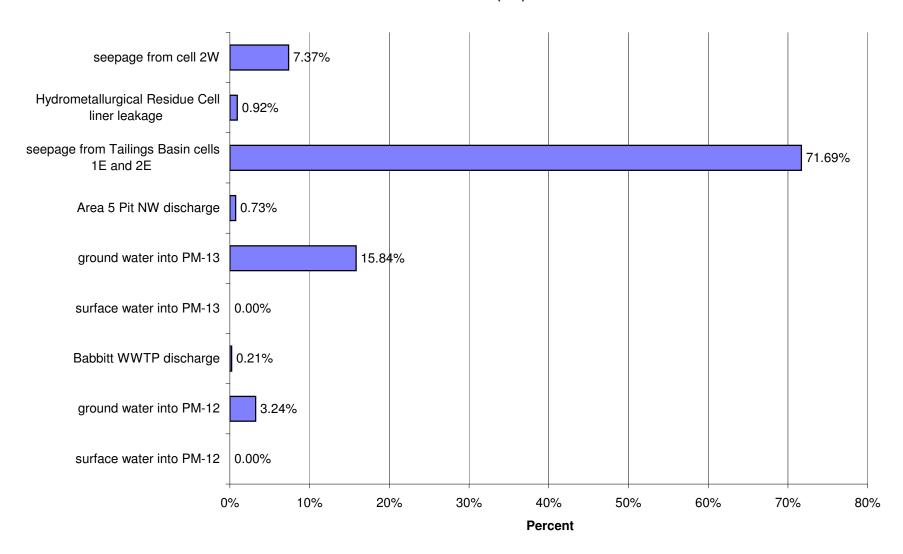
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for High Flow for Copper (Cu)



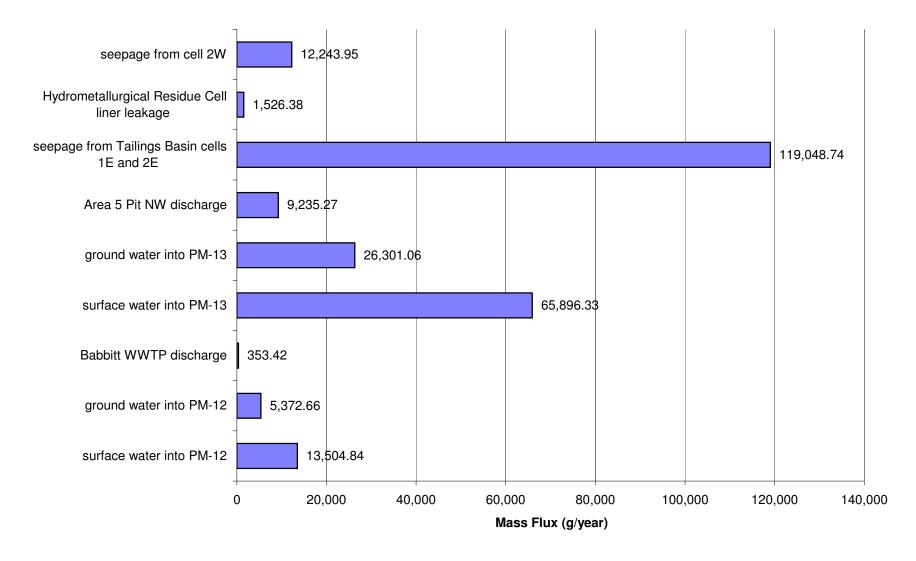
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Low Flow for Nickel (Ni)



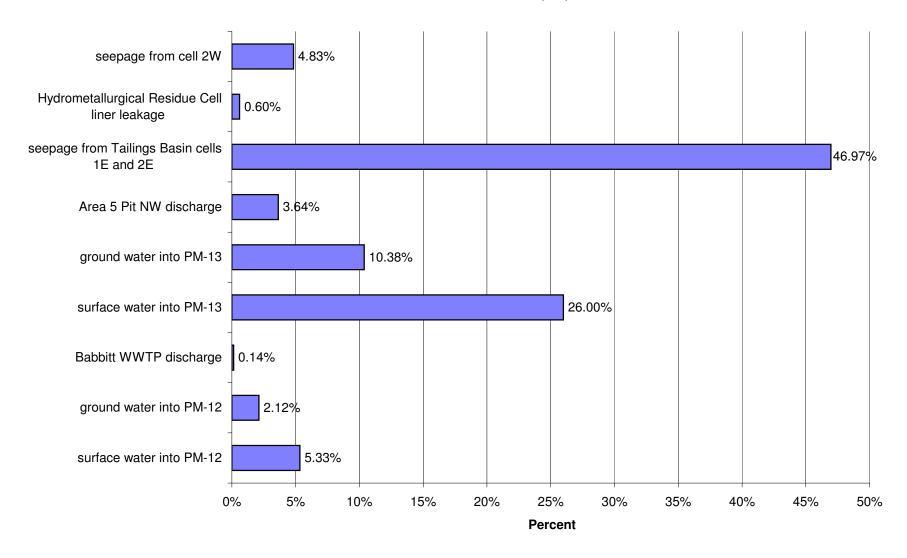
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for Low Flow for Nickel (Ni)



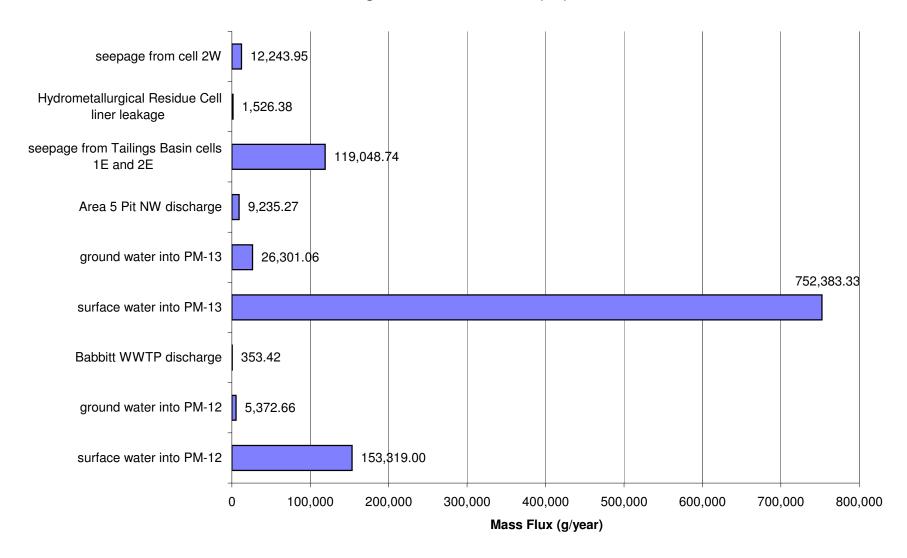
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Average Flow for Nickel (Ni)



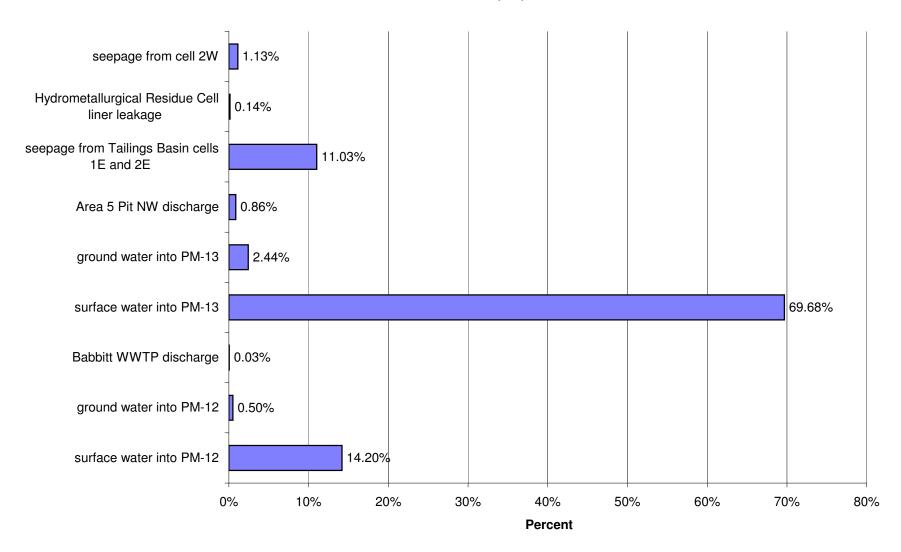
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for Average Flow for Nickel (Ni)



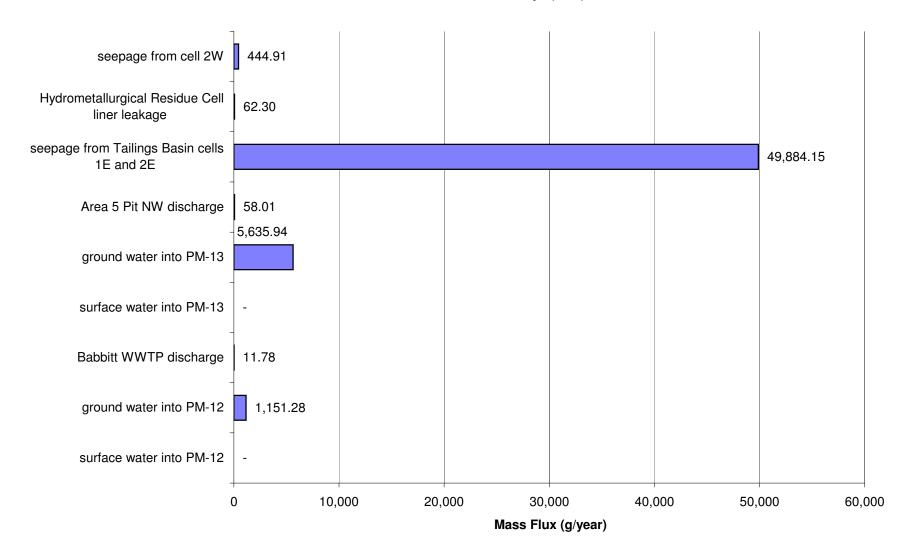
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for High Flow for Nickel (Ni)



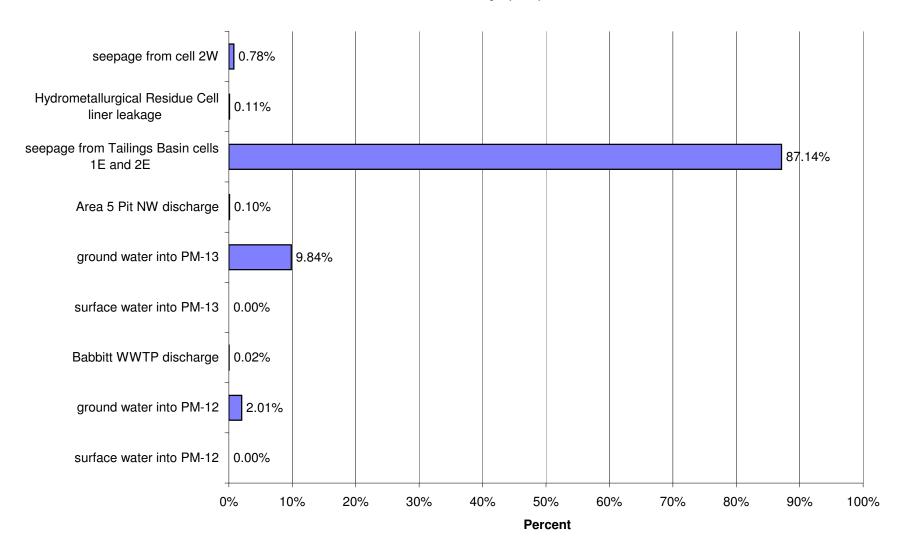
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for High Flow for Nickel (Ni)



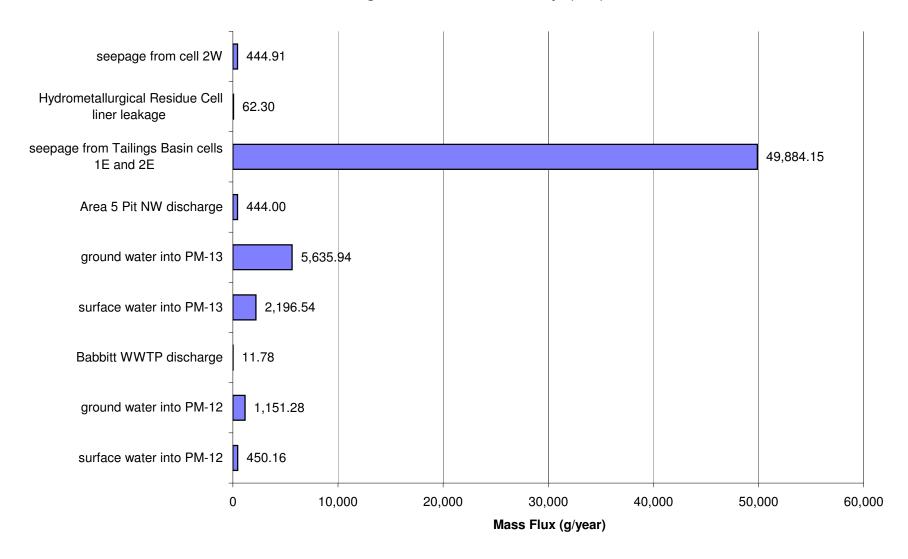
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Low Flow for Antimony (Sb)



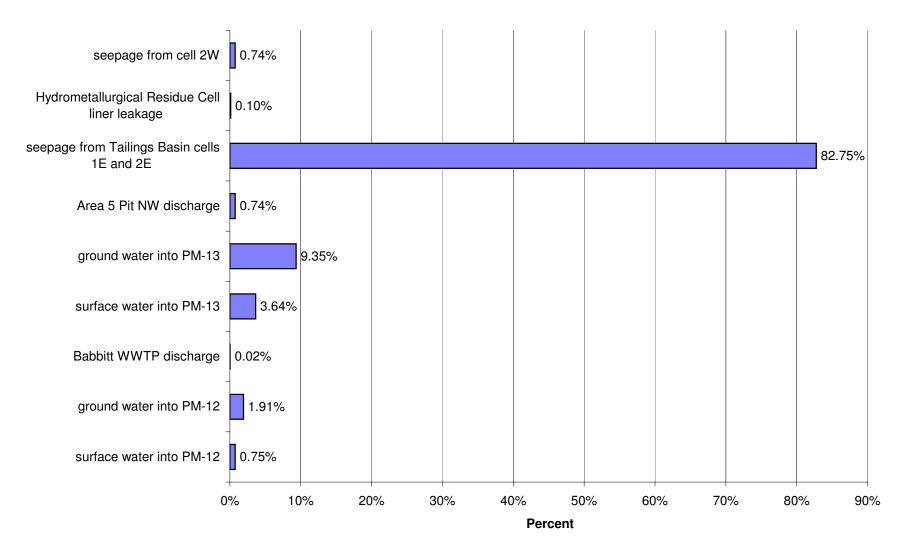
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for Low Flow for Antimony (Sb)



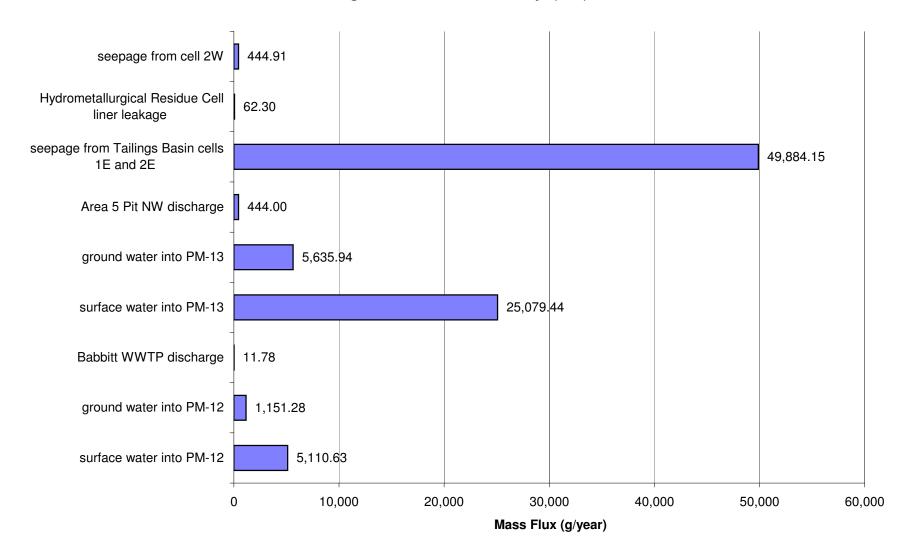
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for Average Flow for Antimony (Sb)



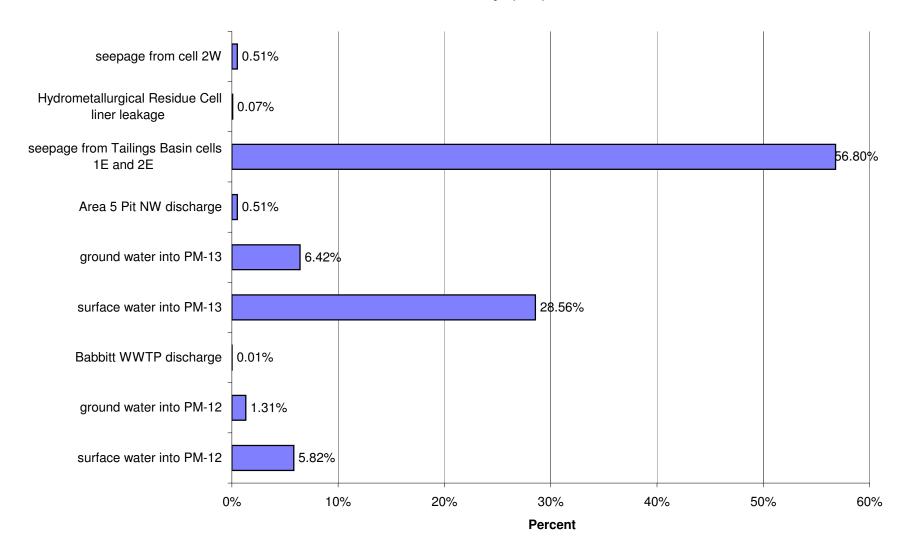
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for Average Flow for Antimony (Sb)



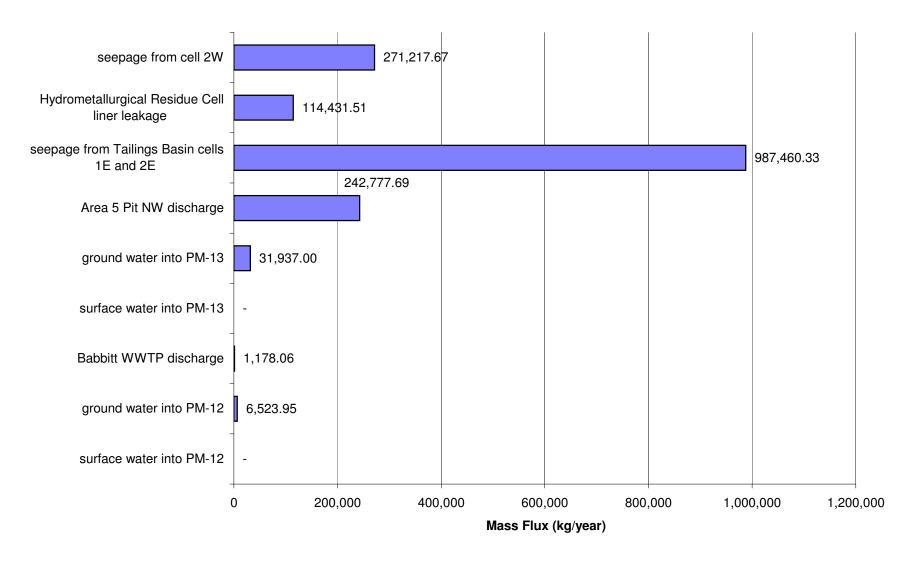
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 15 for High Flow for Antimony (Sb)



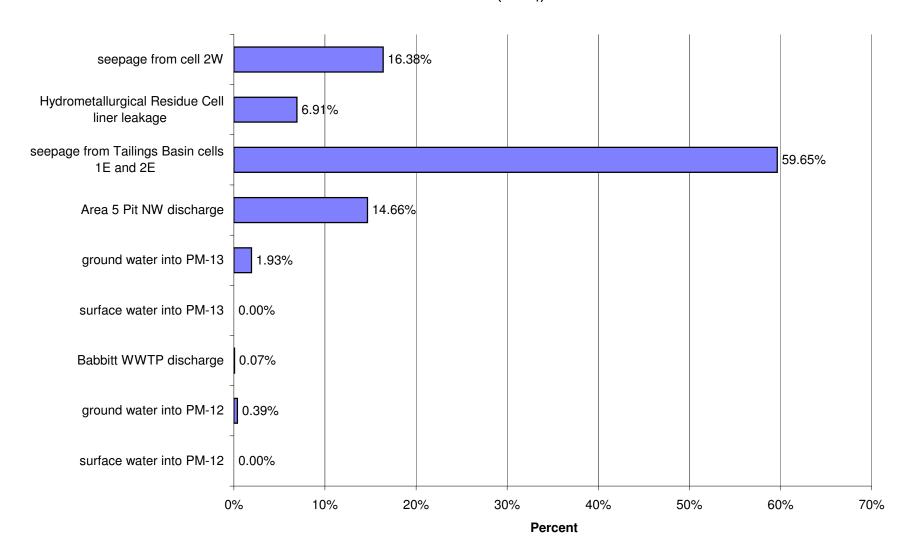
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for High Flow for Antimony (Sb)



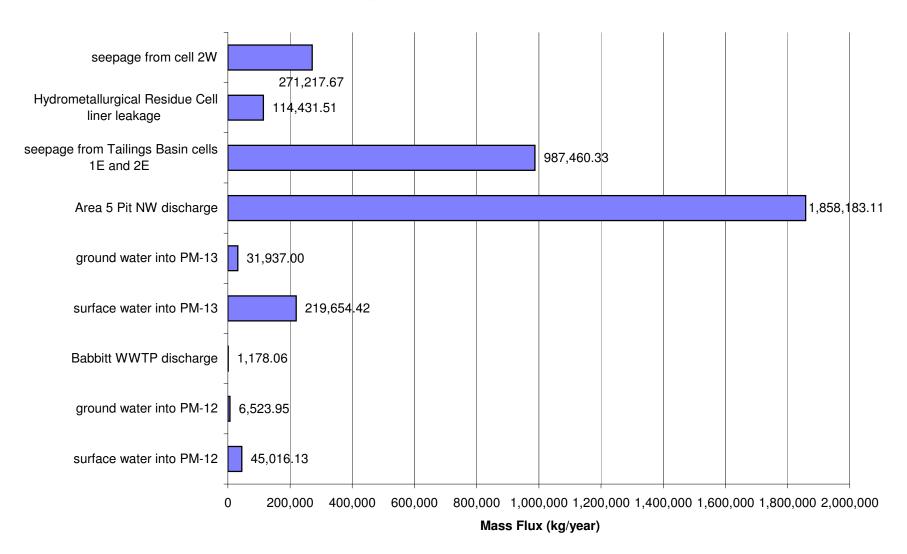
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Year 15 for Low Flow for Sulfate (SO₄)



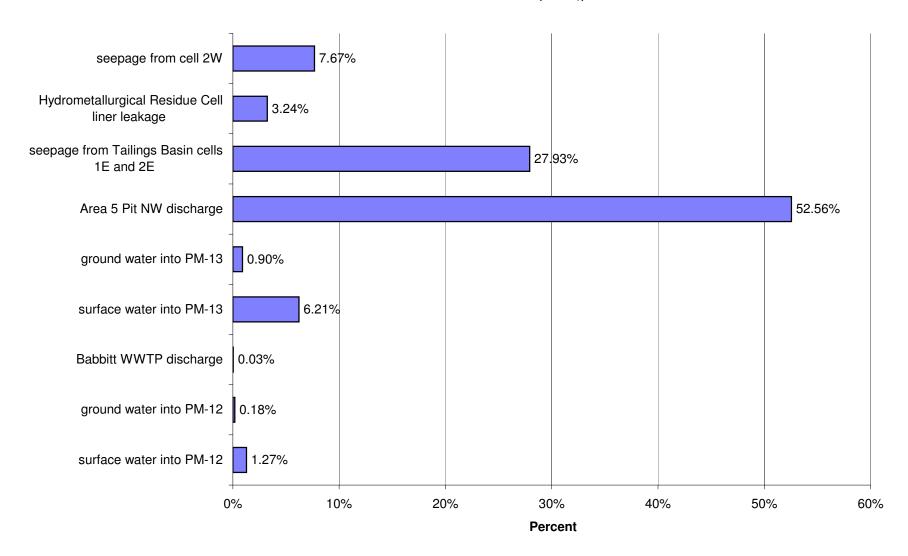
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for Low Flow for Sulfate (SO₄)



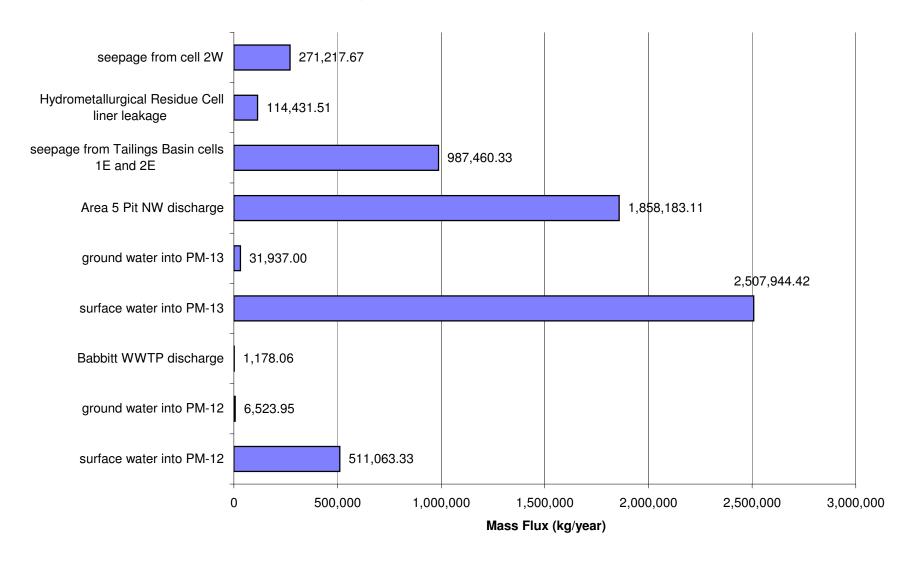
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Year 15 for Average Flow for Sulfate (SO₄)



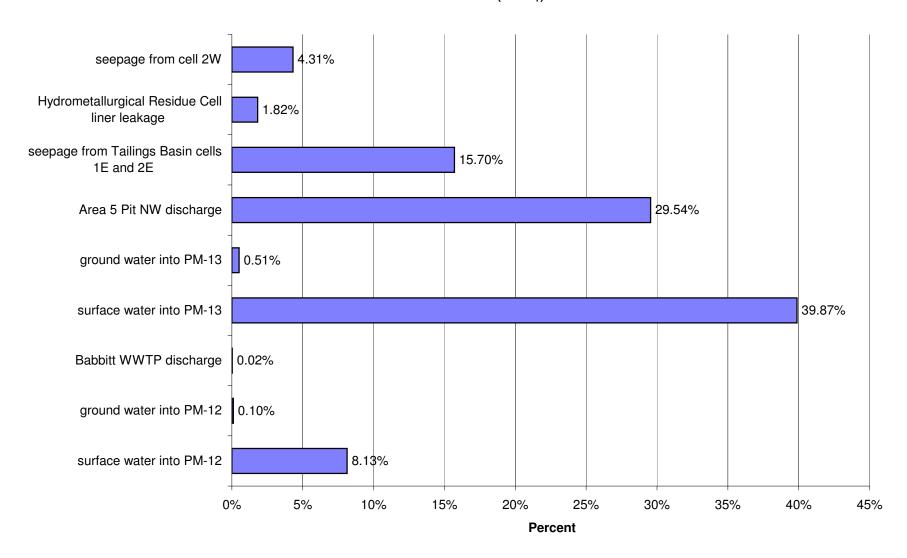
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for Average Flow for Sulfate (SO₄)



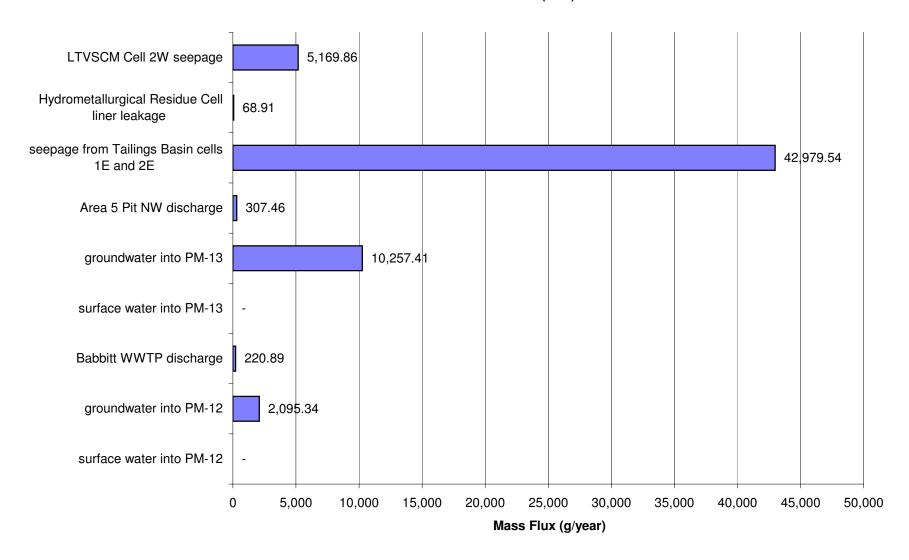
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Year 15 for High Flow for Sulfate (SO₄)



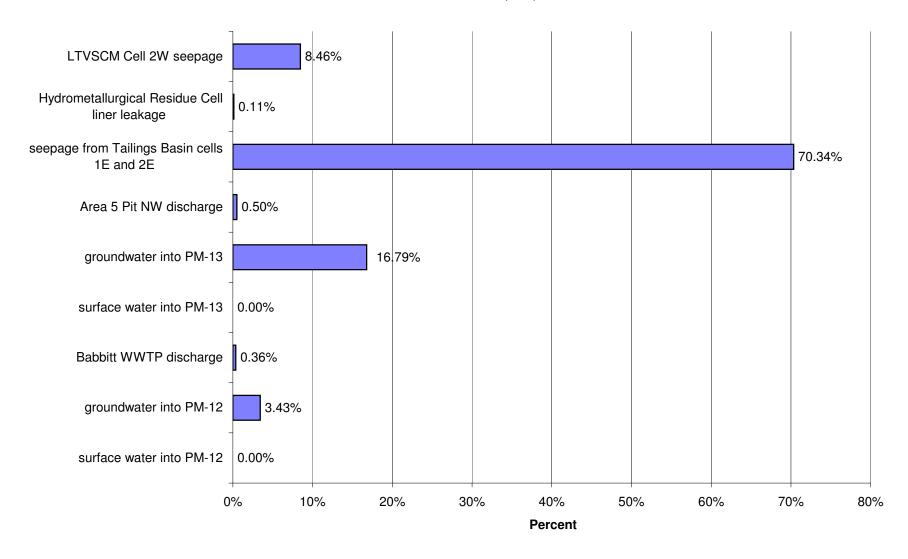
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 15 for High Flow for Sulfate (SO₄)



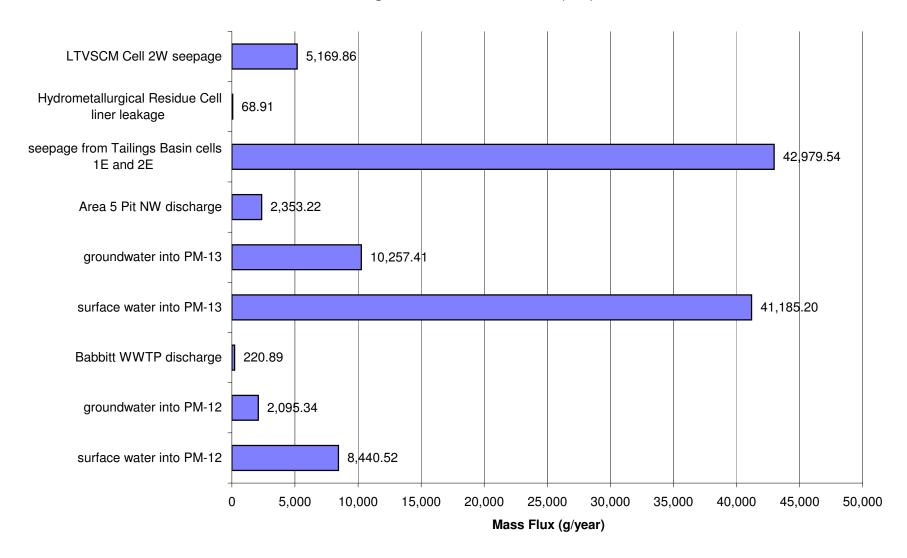
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Low Flow for Arsenic (As)



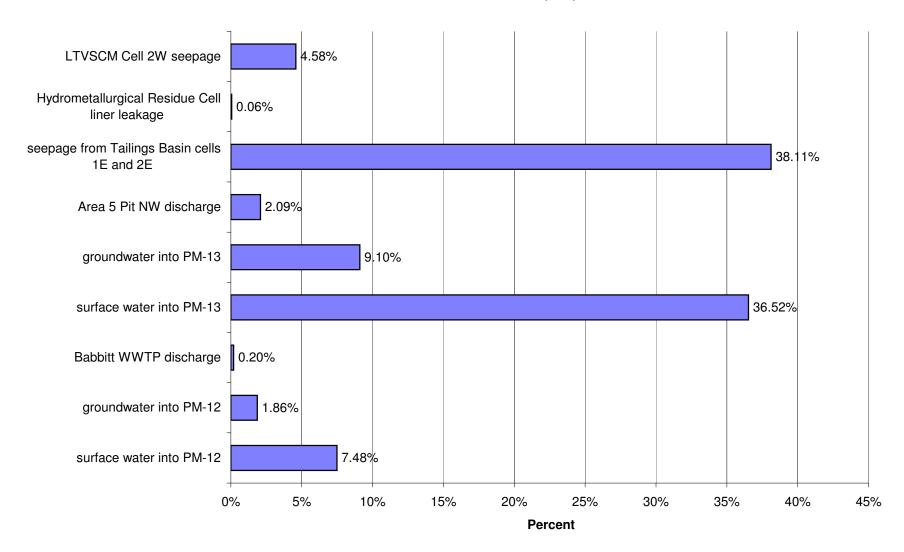
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for Low Flow for Arsenic (As)



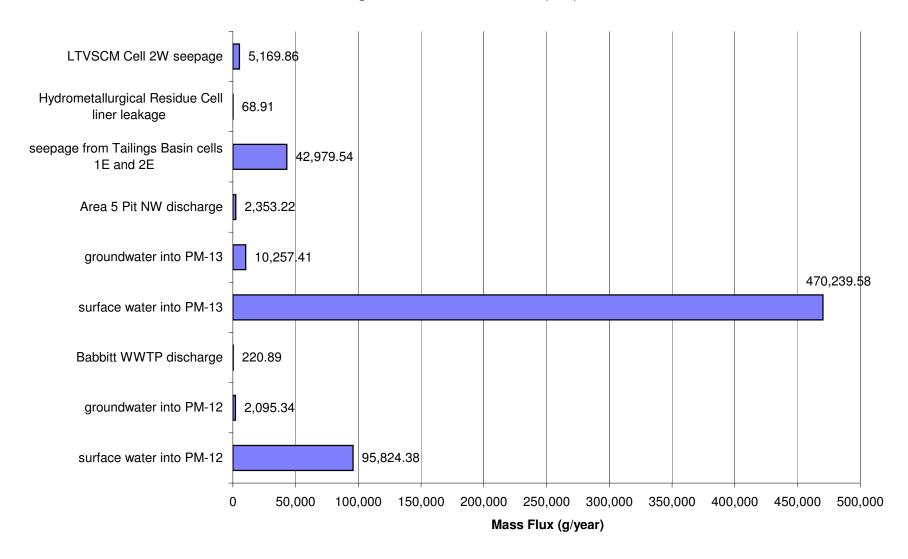
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Average Flow for Arsenic (As)



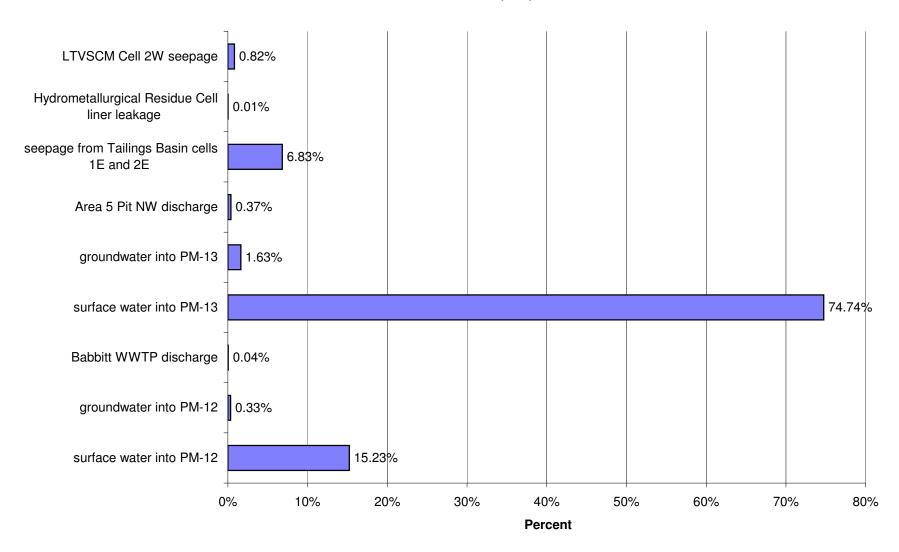
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for Average Flow for Arsenic (As)



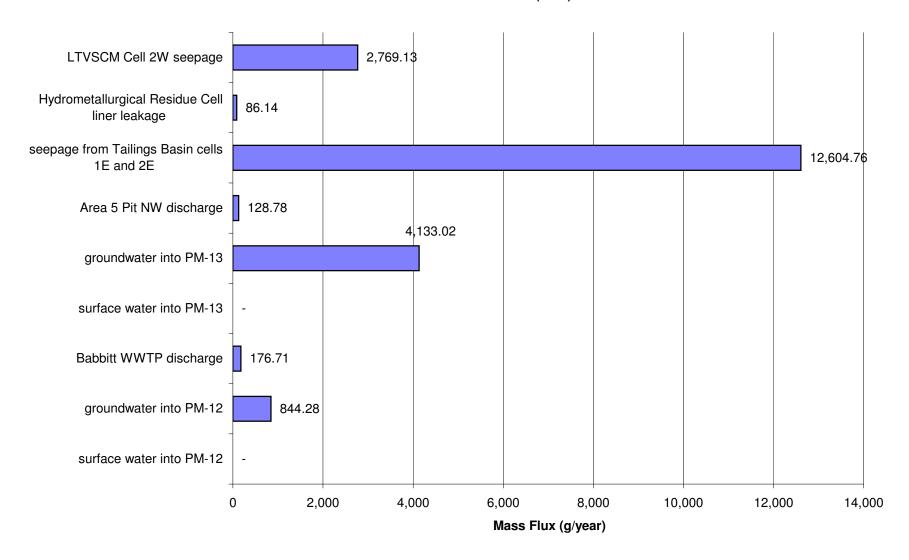
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for High Flow for Arsenic (As)



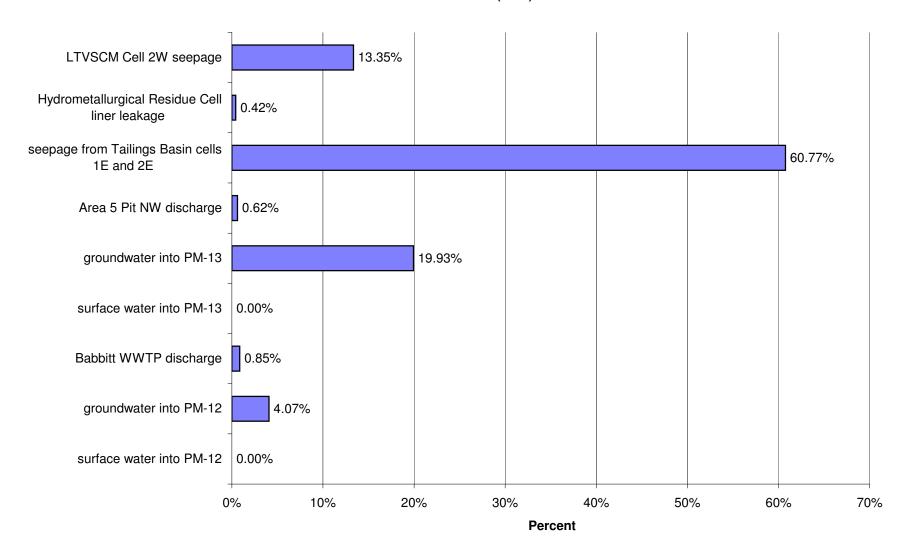
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for High Flow for Arsenic (As)



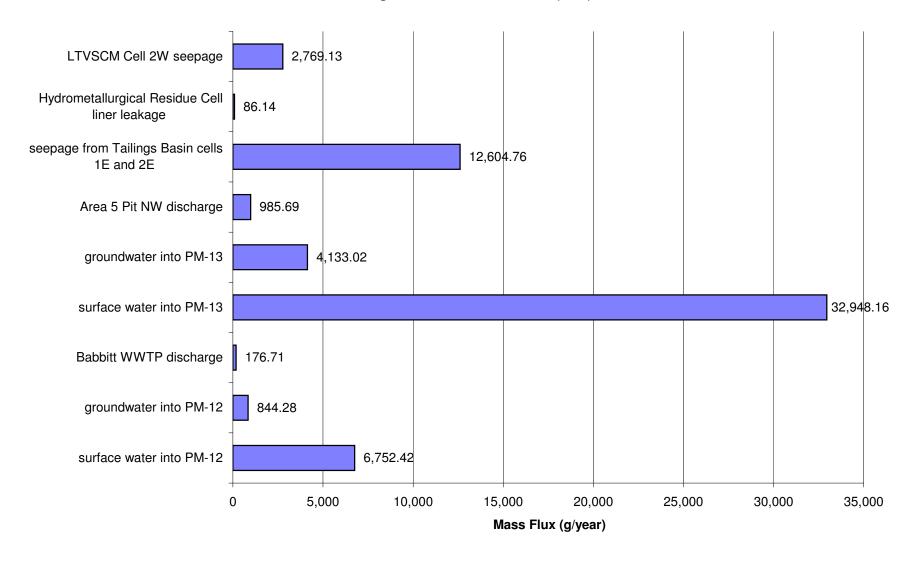
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Low Flow for Cobalt (Co)



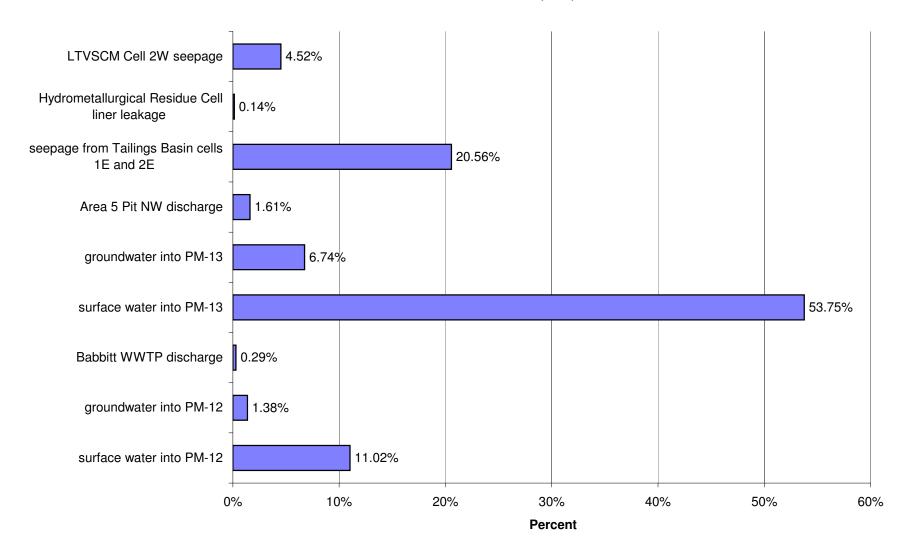
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for Low Flow for Cobalt (Co)



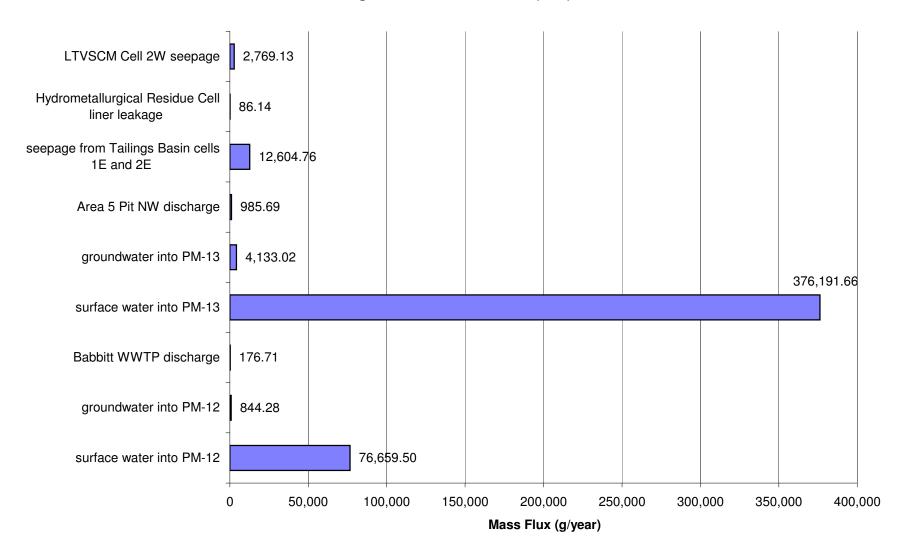
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Average Flow for Cobalt (Co)



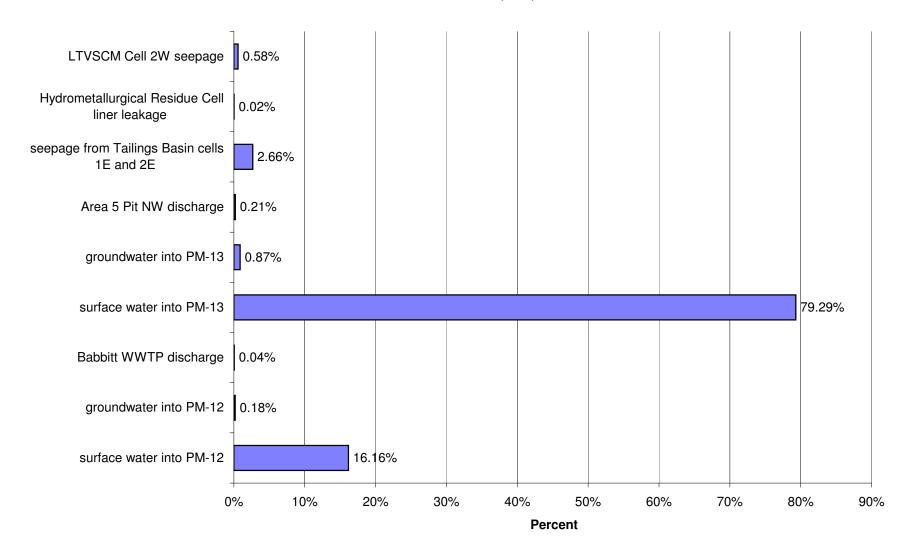
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for Average Flow for Cobalt (Co)



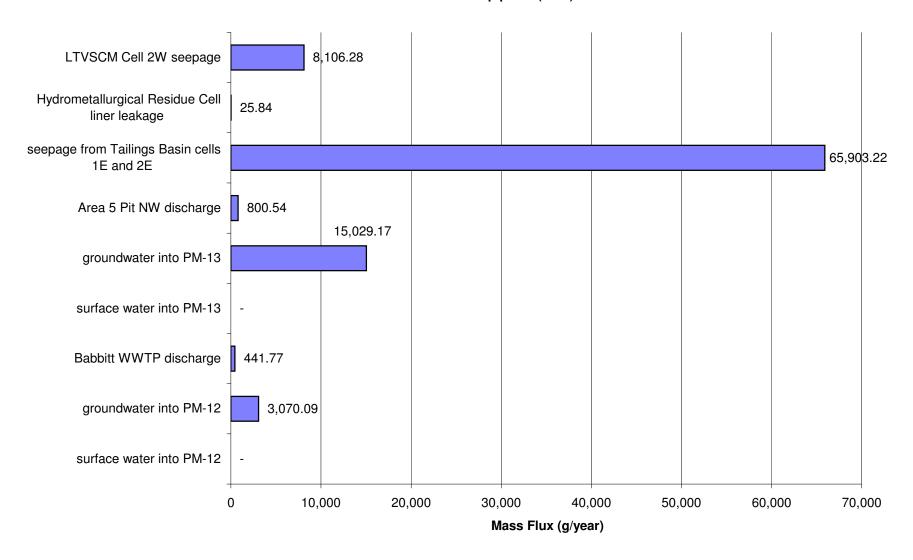
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for High Flow for Cobalt (Co)



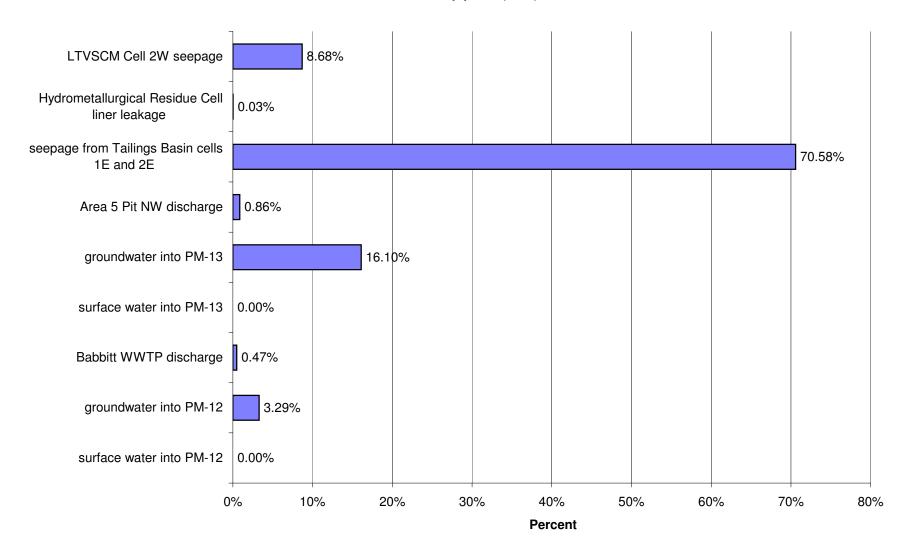
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for High Flow for Cobalt (Co)



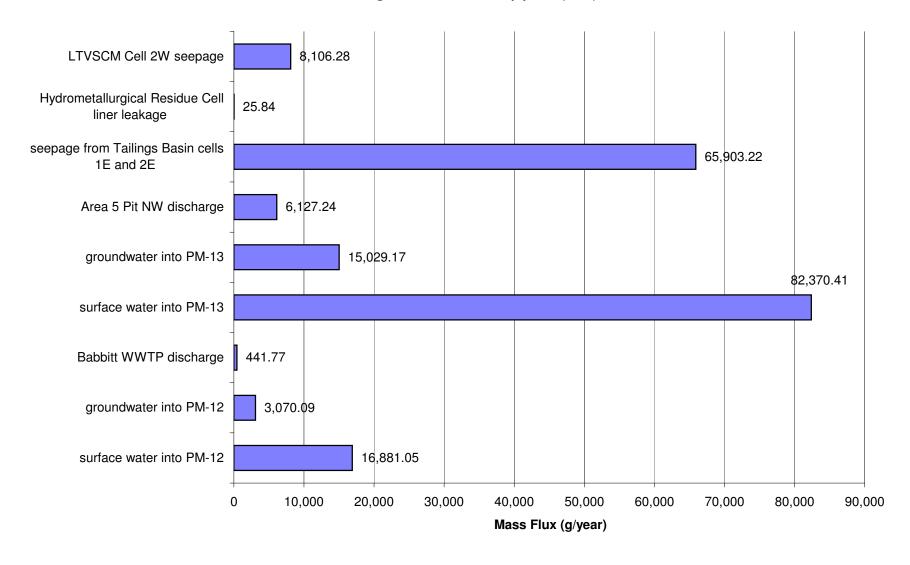
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Low Flow for Copper (Cu)



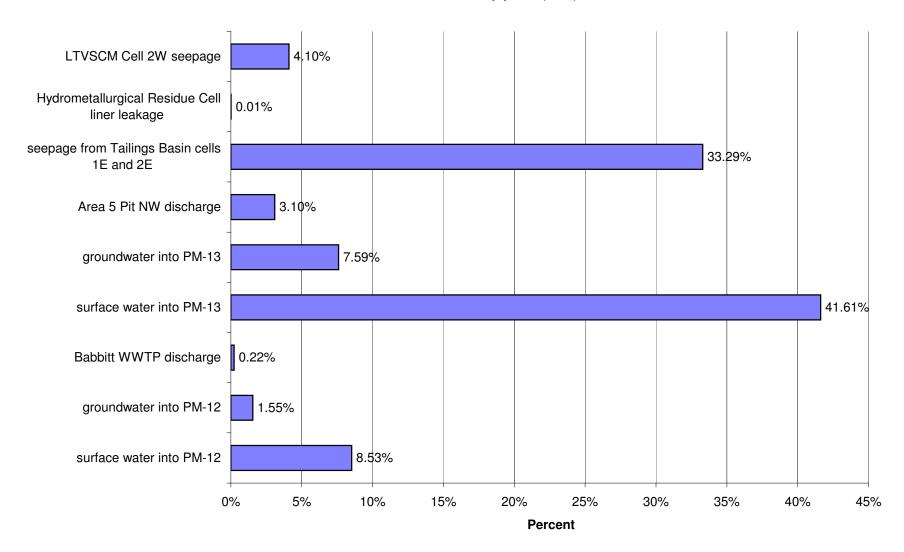
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for Low Flow for Copper (Cu)



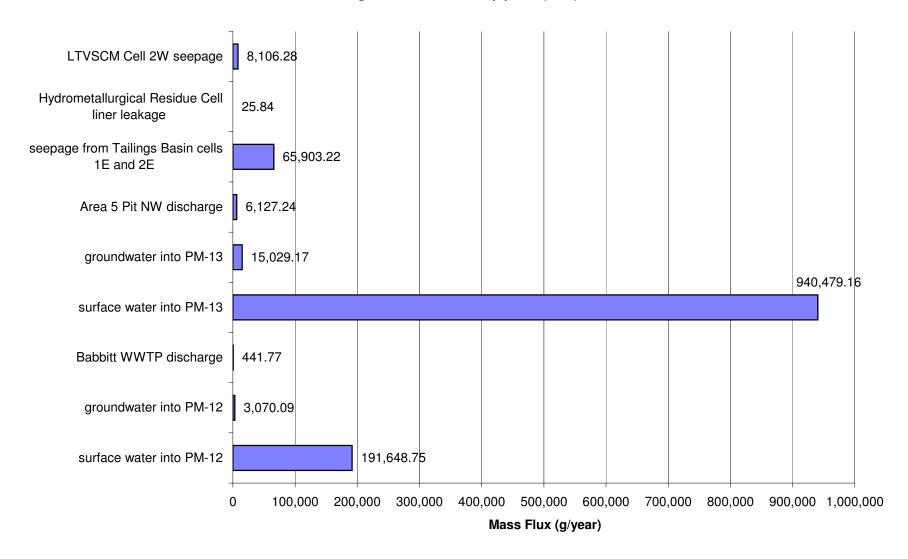
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Average Flow for Copper (Cu)



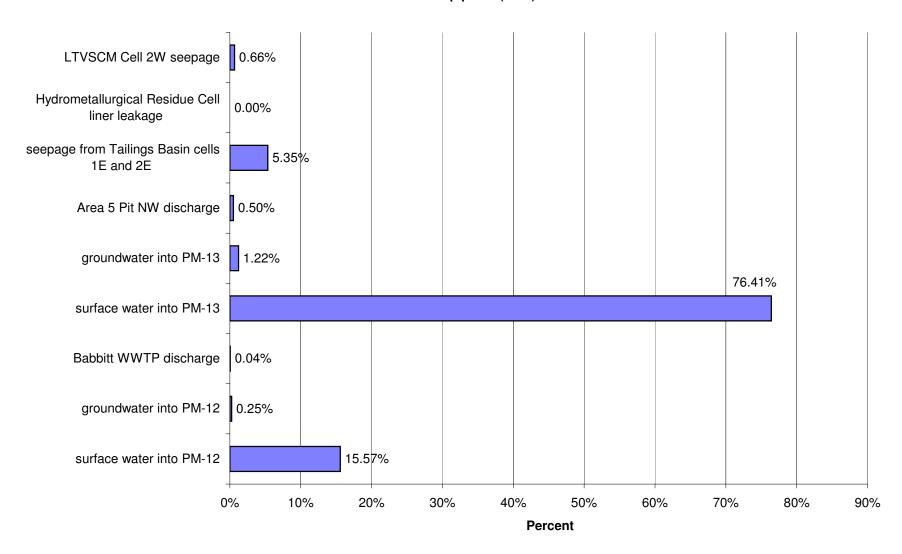
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for Average Flow for Copper (Cu)



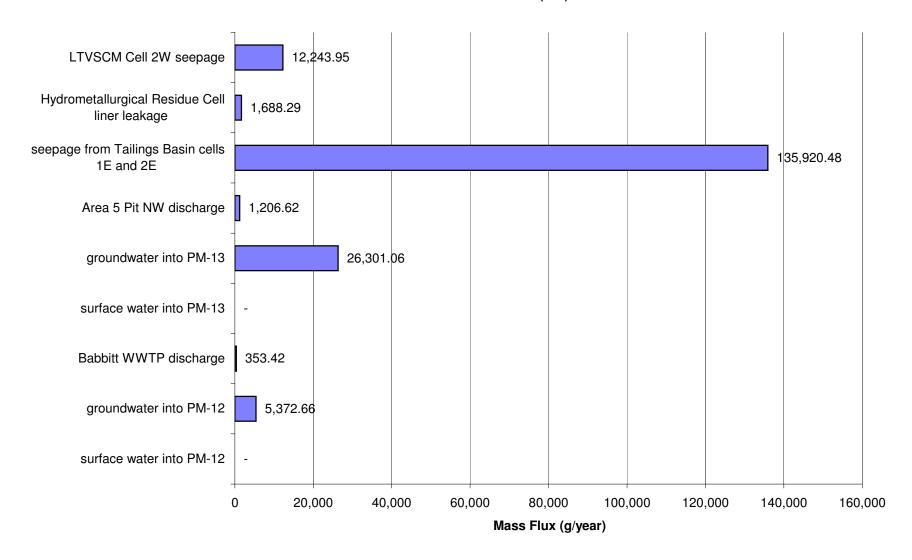
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for High Flow for Copper (Cu)



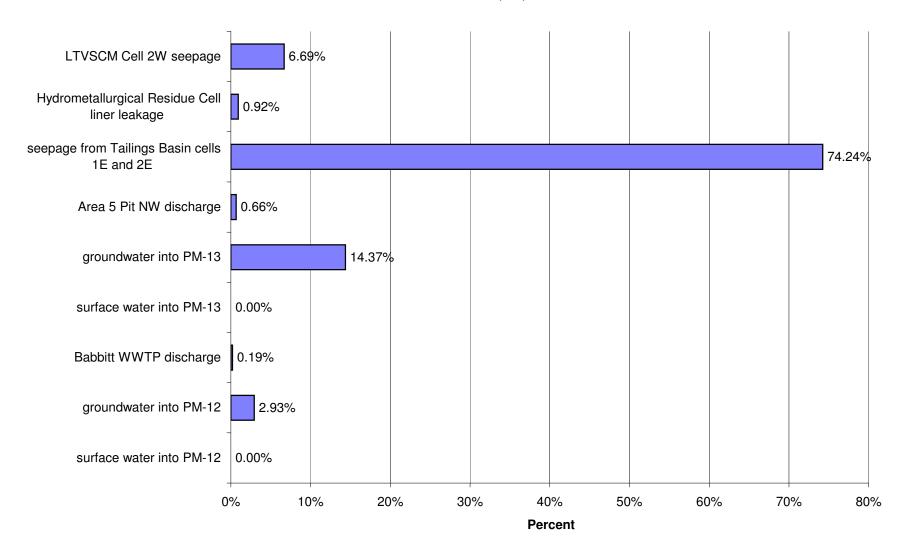
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for High Flow for Copper (Cu)



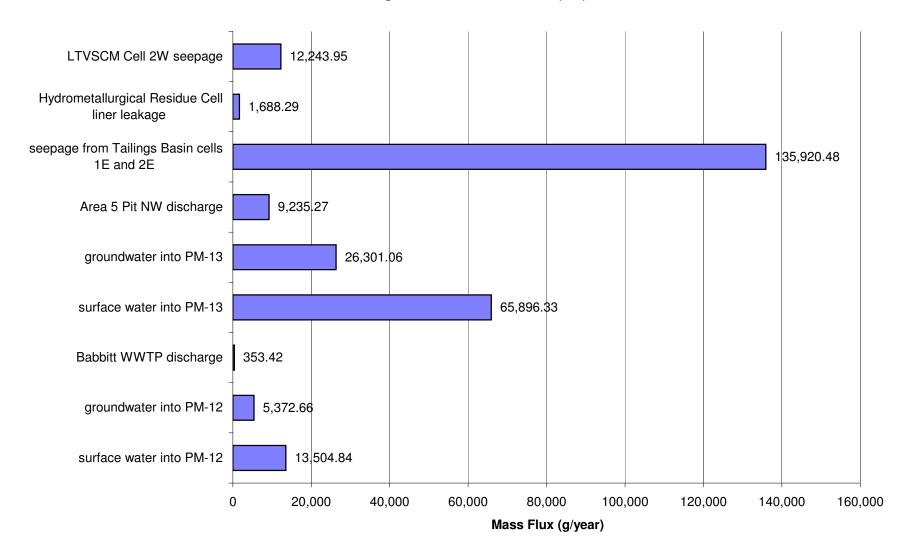
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Low Flow for Nickel (Ni)



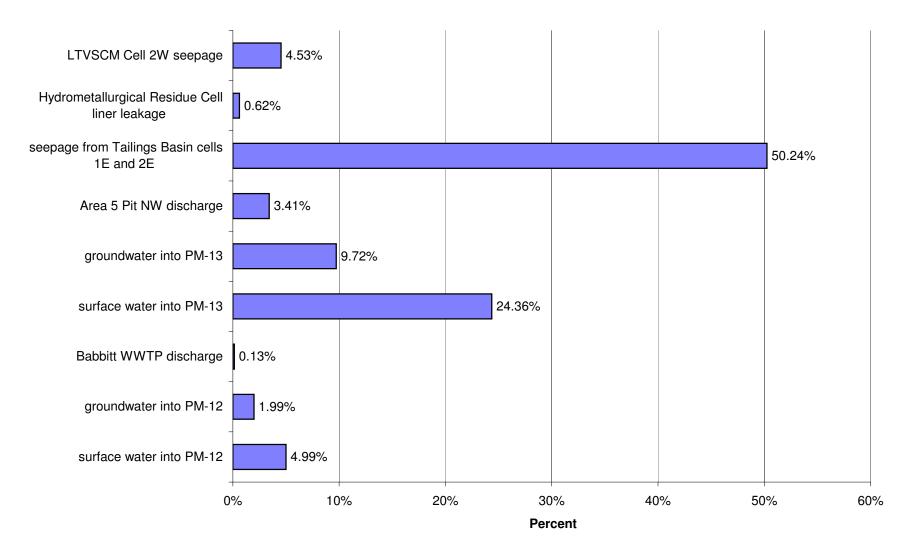
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for Low Flow for Nickel (Ni)



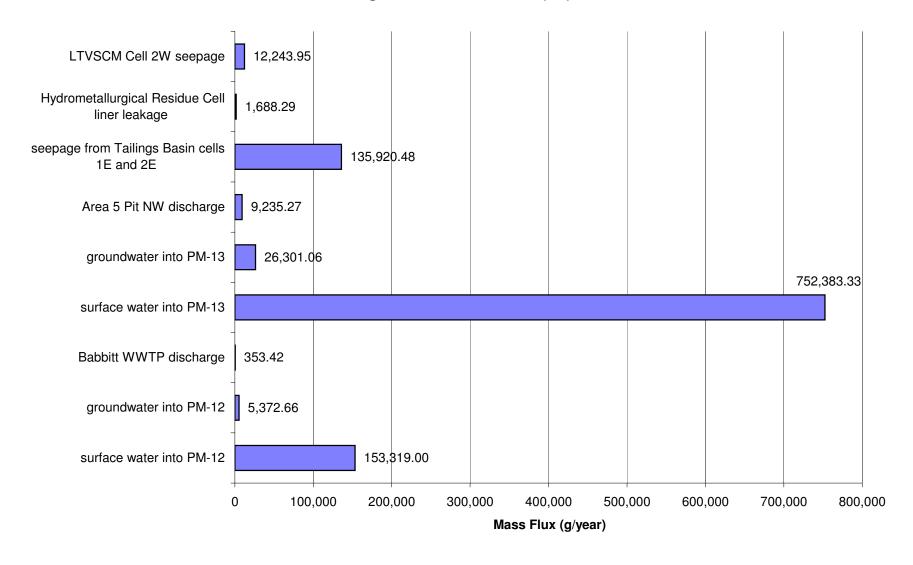
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Average Flow for Nickel (Ni)



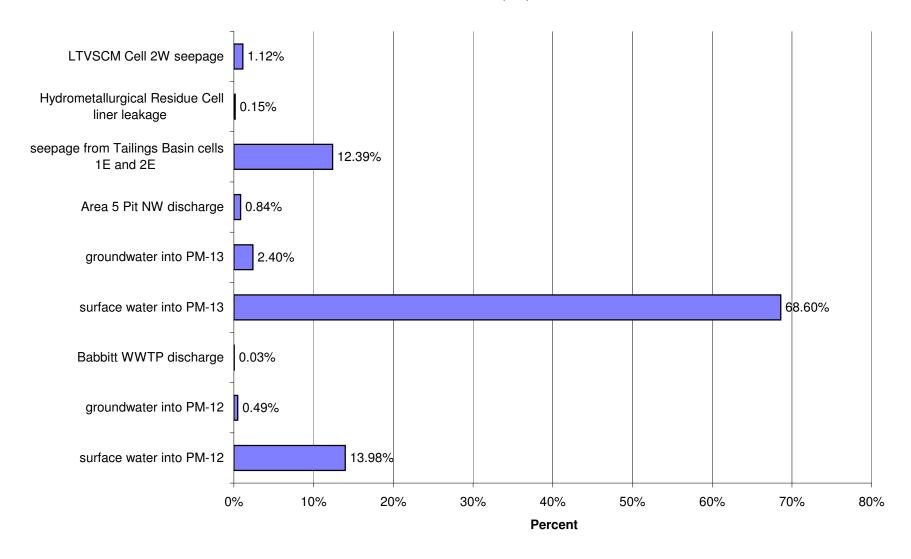
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for Average Flow for Nickel (Ni)



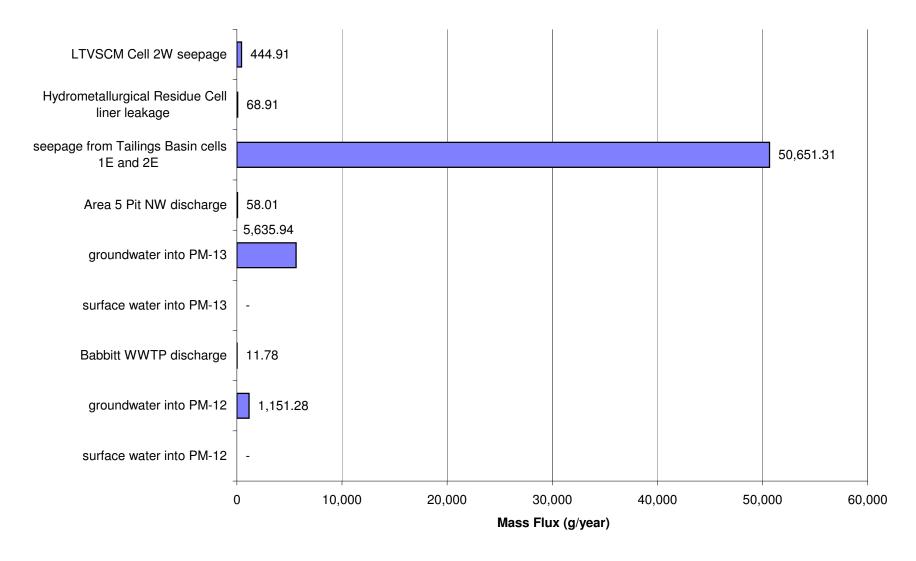
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for High Flow for Nickel (Ni)



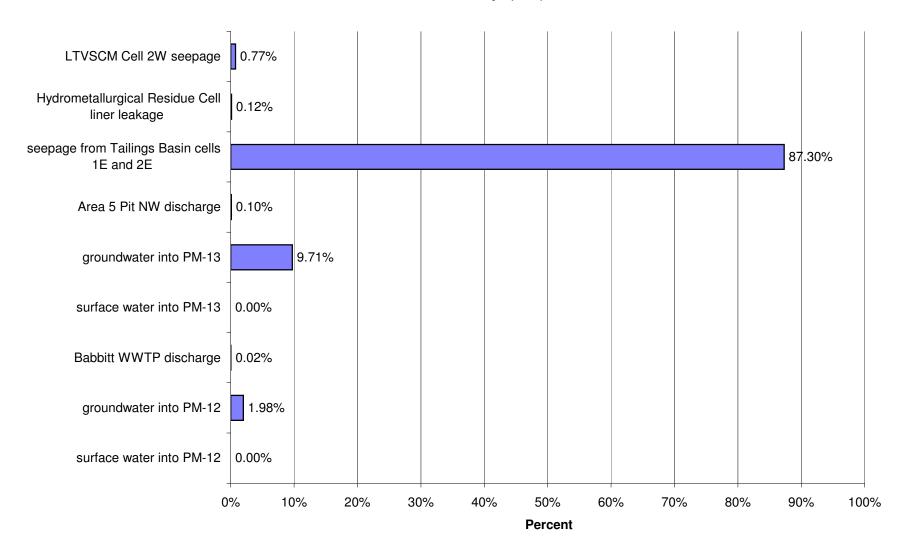
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for High Flow for Nickel (Ni)



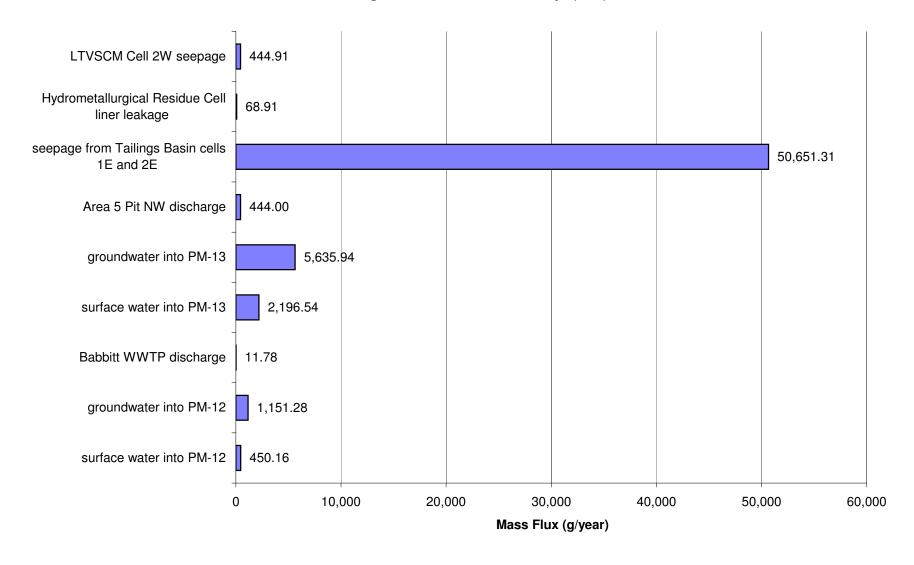
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Low Flow for Antimony (Sb)



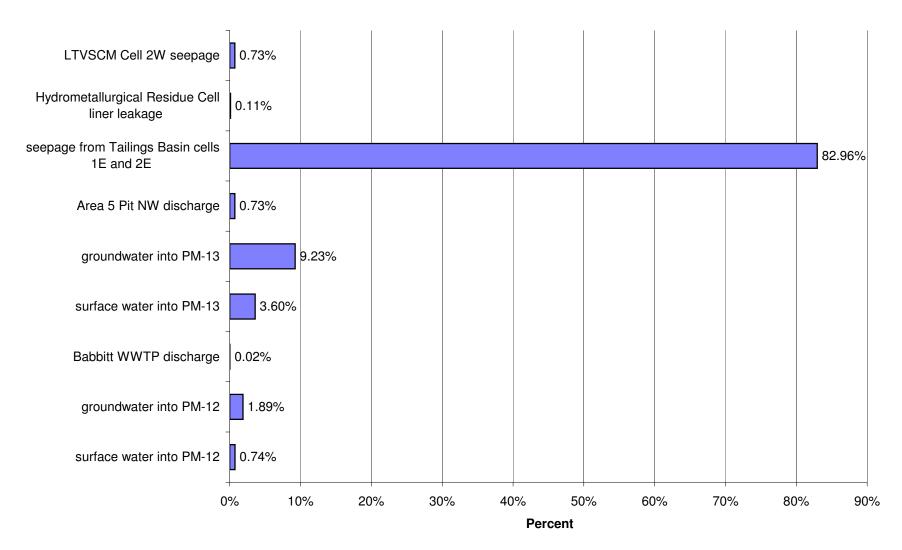
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for Low Flow for Antimony (Sb)



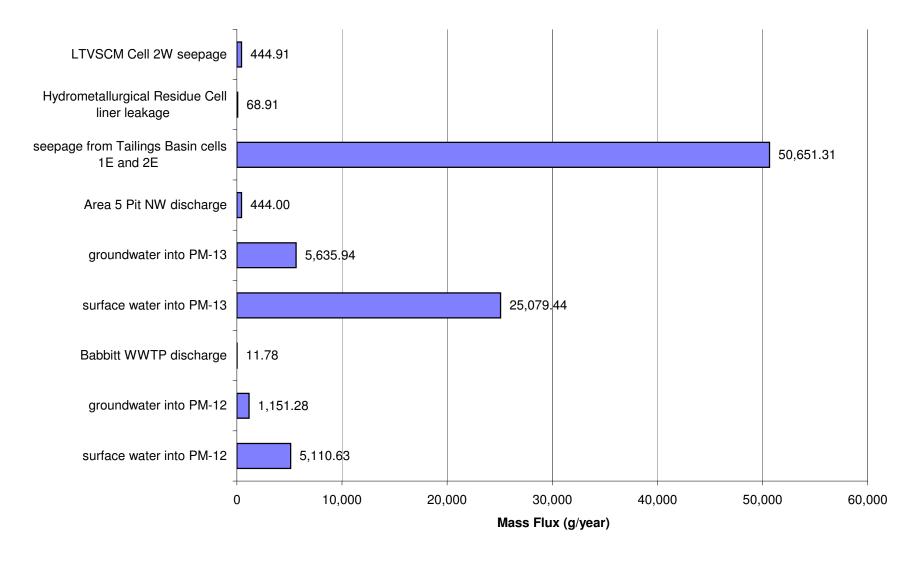
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for Average Flow for Antimony (Sb)



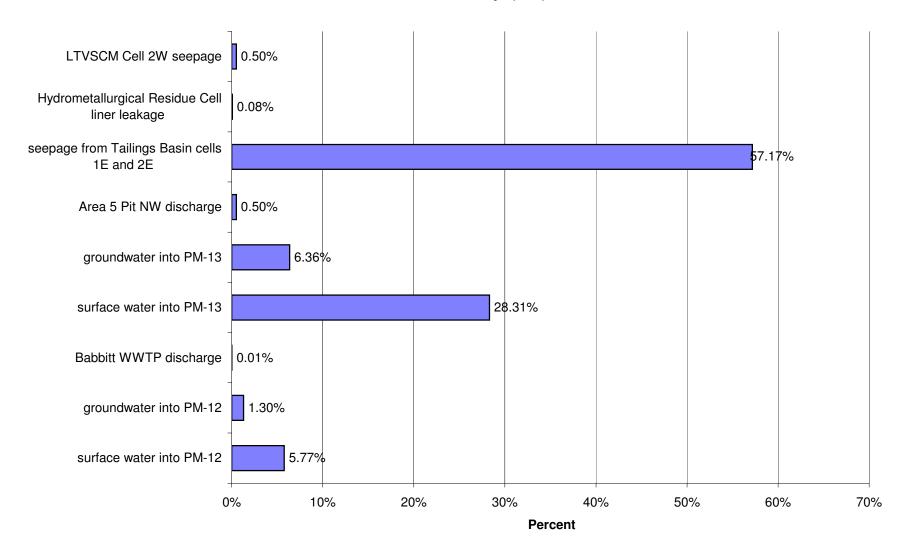
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for Average Flow for Antimony (Sb)



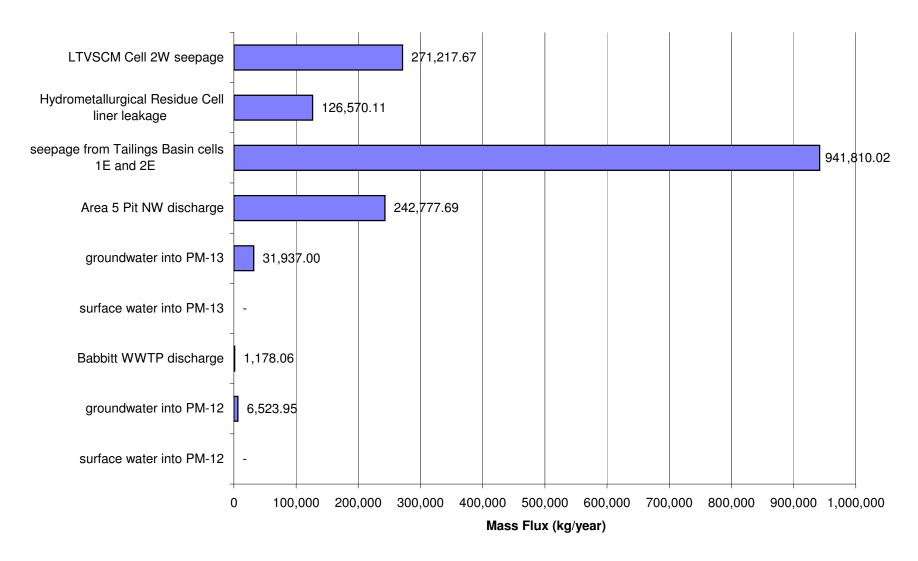
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Year 20 for High Flow for Antimony (Sb)



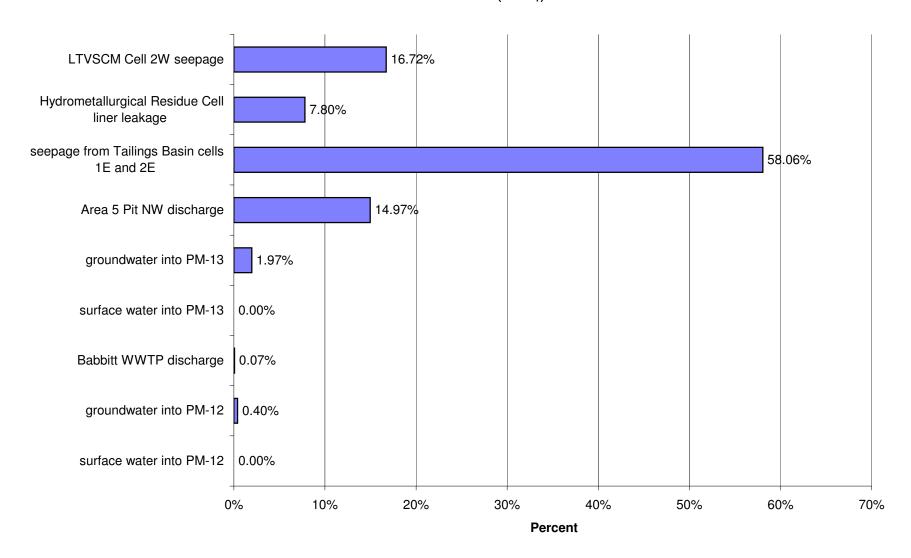
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for High Flow for Antimony (Sb)



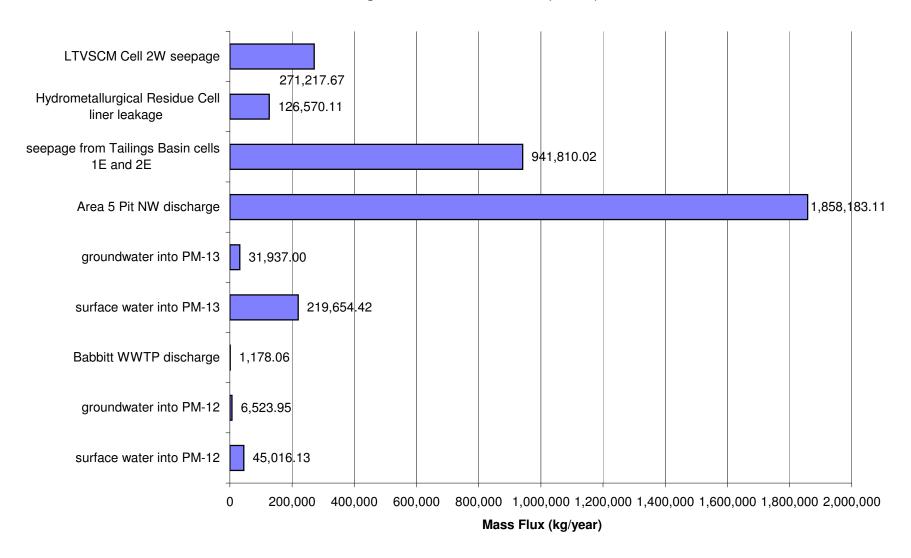
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Year 20 for Low Flow for Sulfate (SO₄)



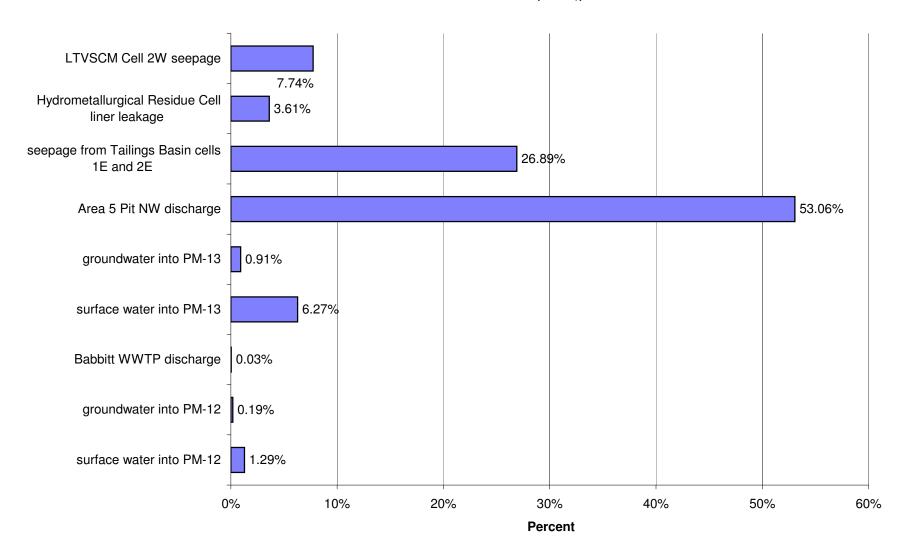
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for Low Flow for Sulfate (SO₄)



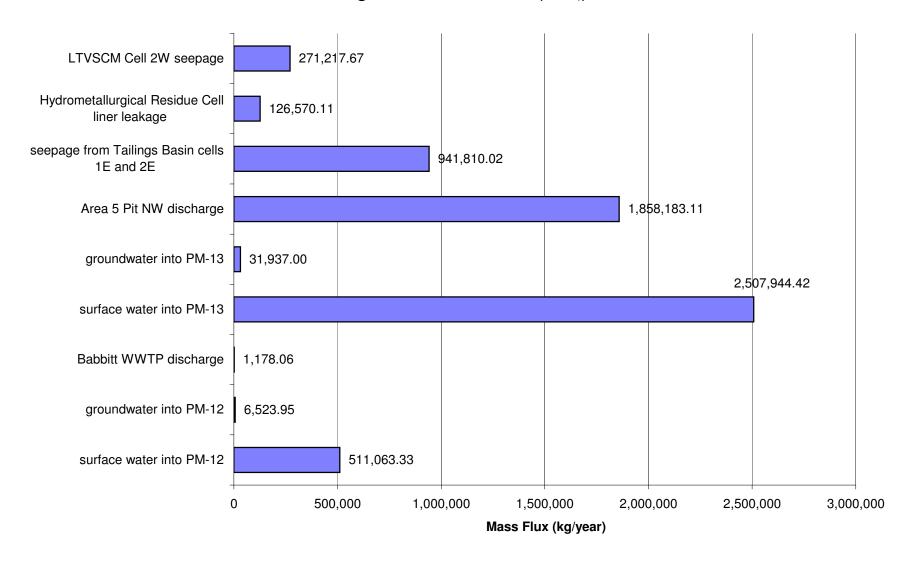
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Year 20 for Average Flow for Sulfate (SO4)



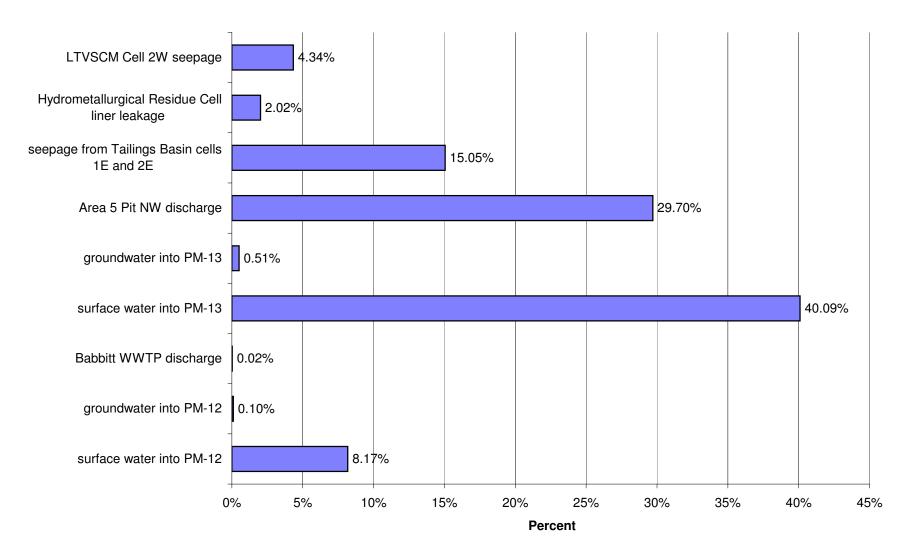
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for Average Flow for Sulfate (SO₄)



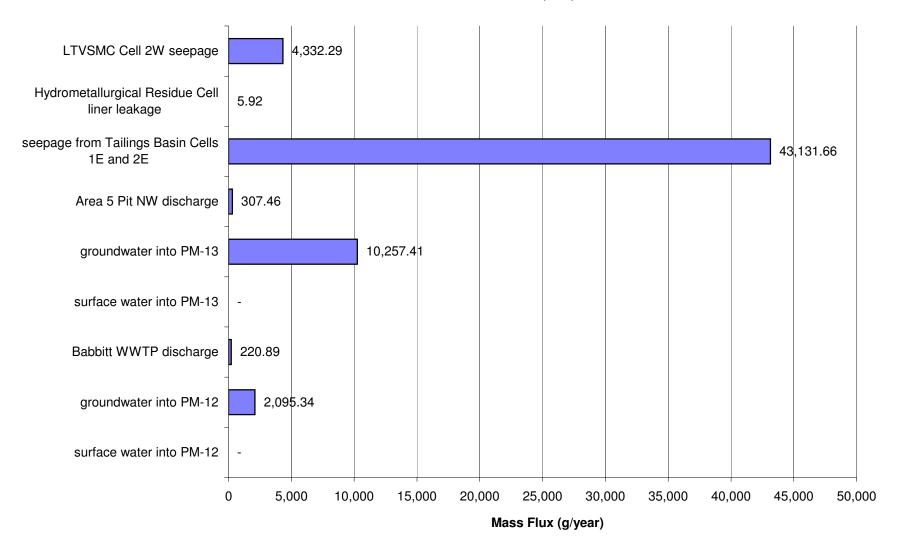
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Year 20 for High Flow for Sulfate (SO₄)



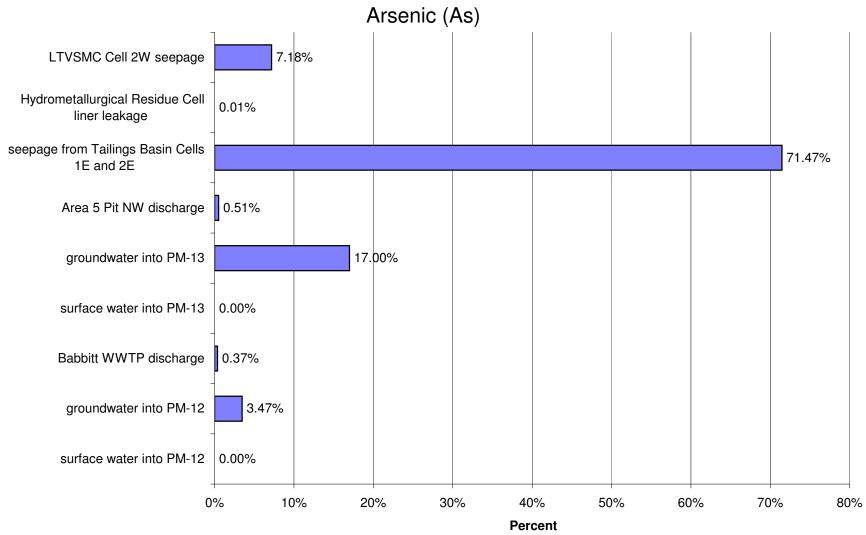
Geotechnical Mitigation: Percent of Impacts at PM-13 in Year 20 for High Flow for Sulfate (SO₄)



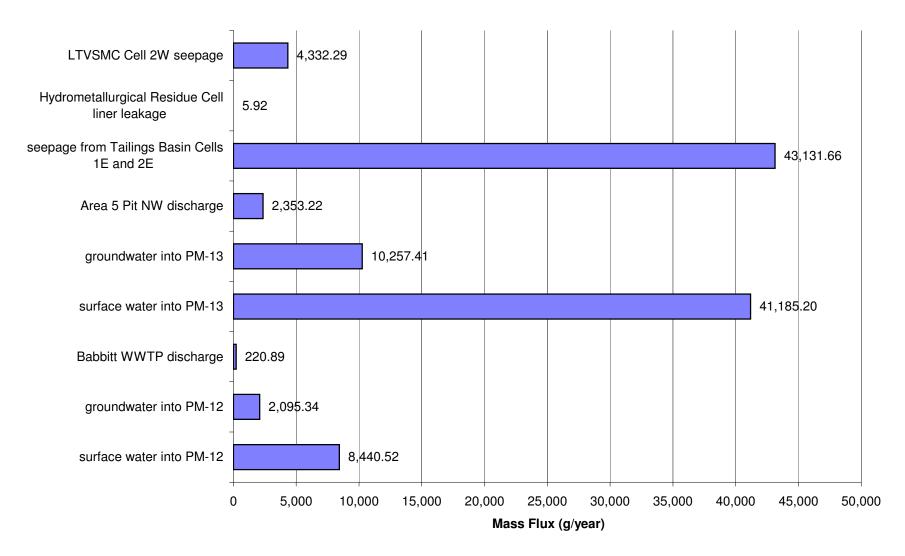
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Closure for Low Flow for Arsenic (As)



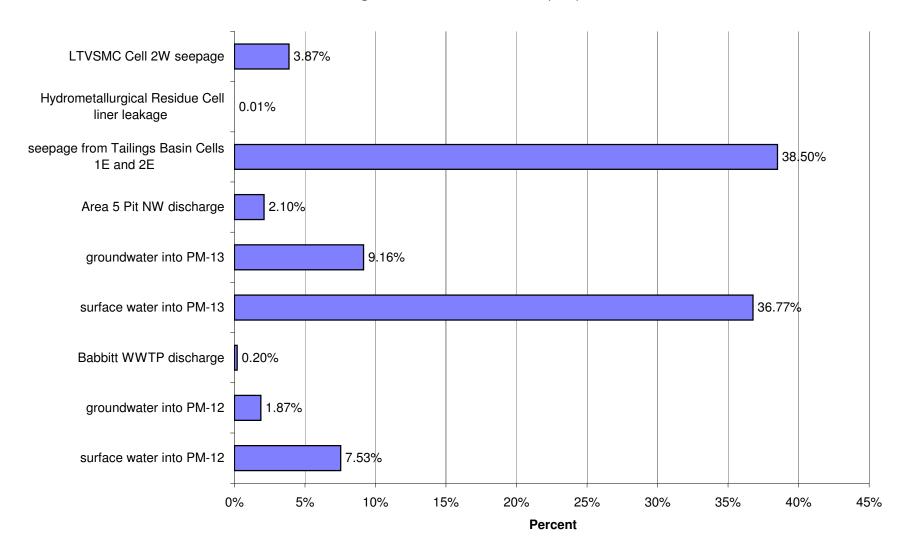
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for Low Flow for



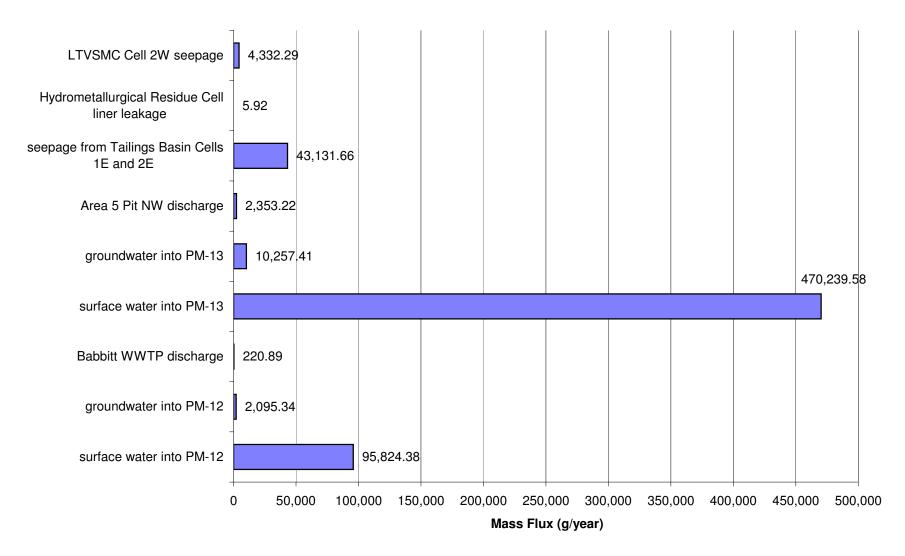
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Closure for Average Flow for Arsenic (As)



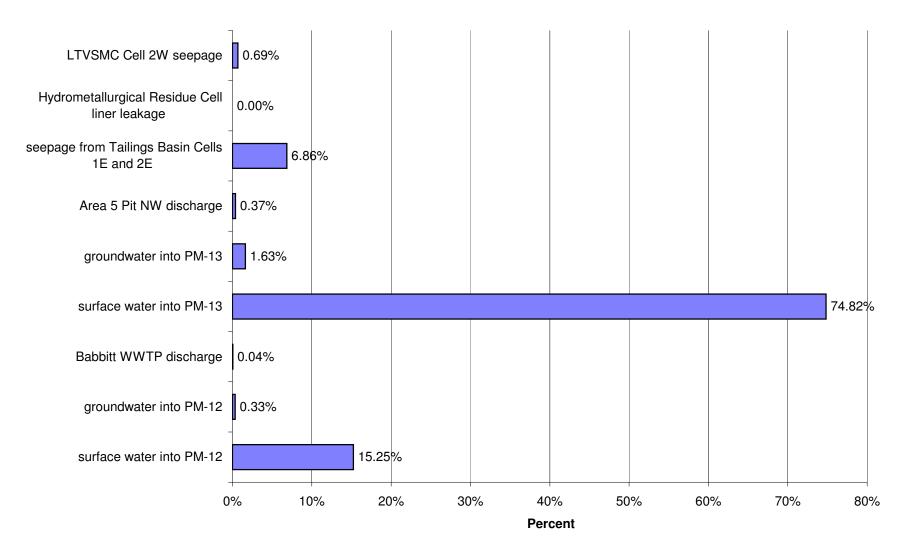
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for Average Flow for Arsenic (As)



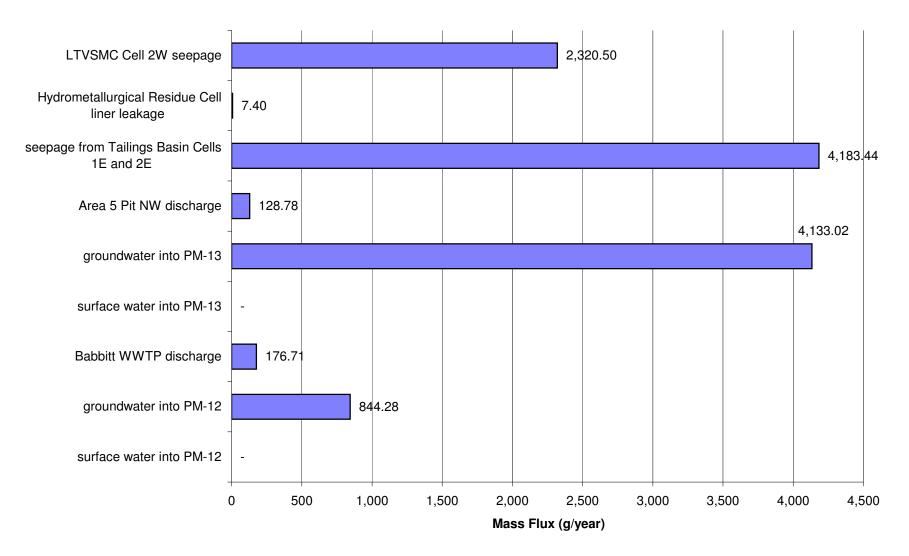
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Closure for High Flow for Arsenic (As)



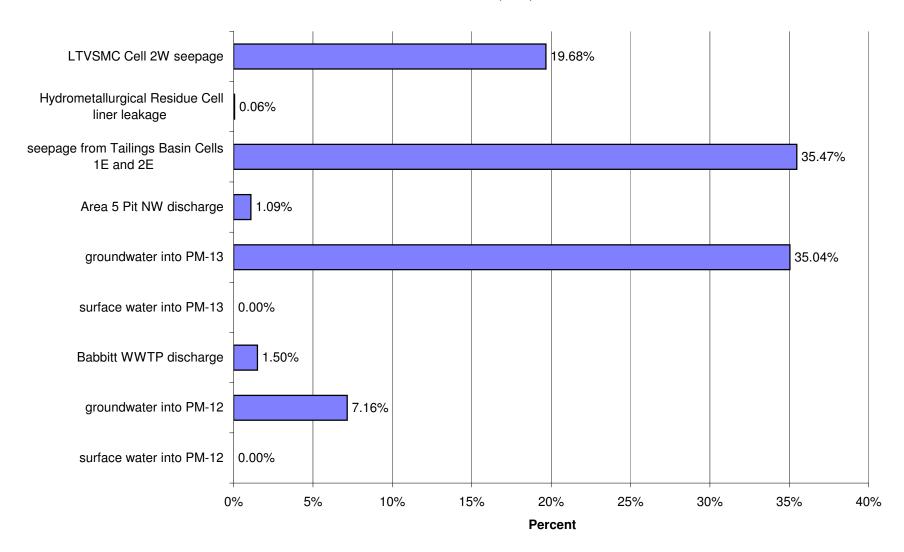
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for High Flow for Arsenic (As)



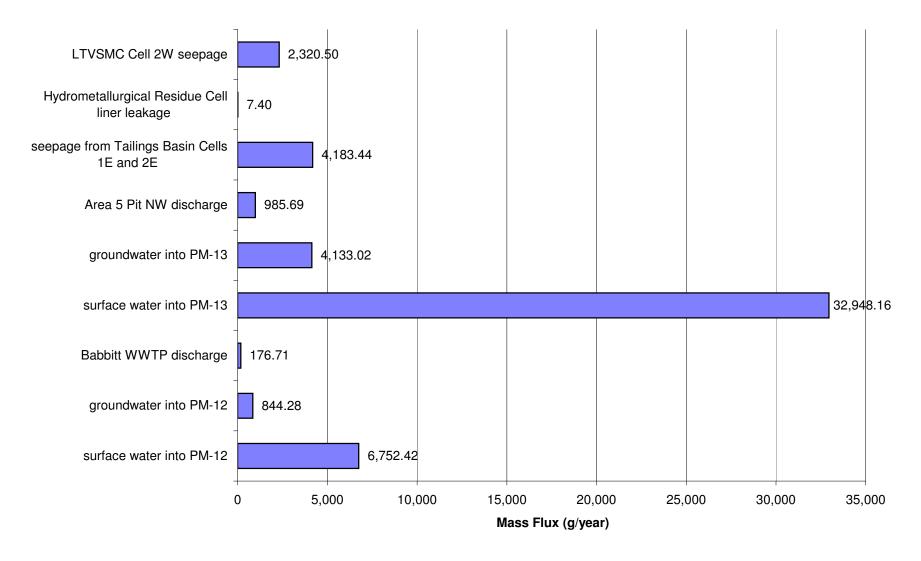
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Closure for Low Flow for Cobalt (Co)



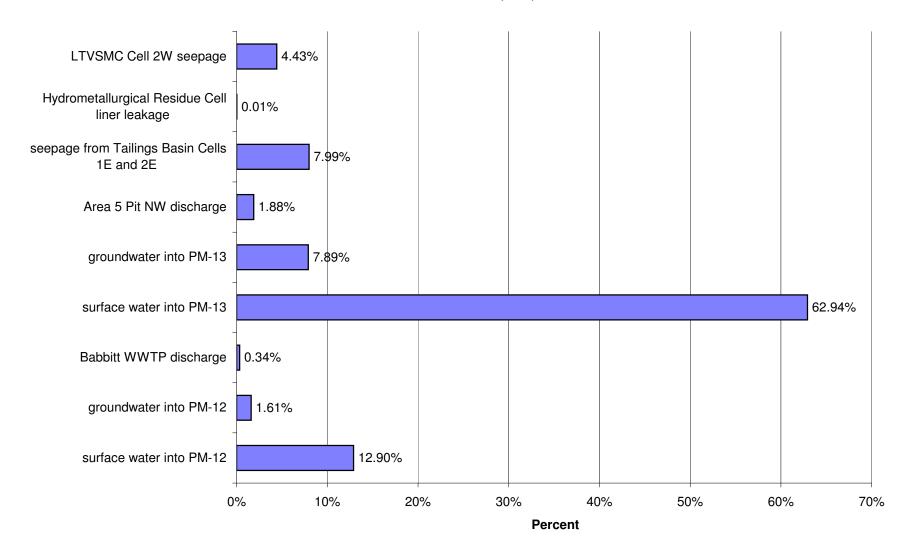
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for Low Flow for Cobalt (Co)



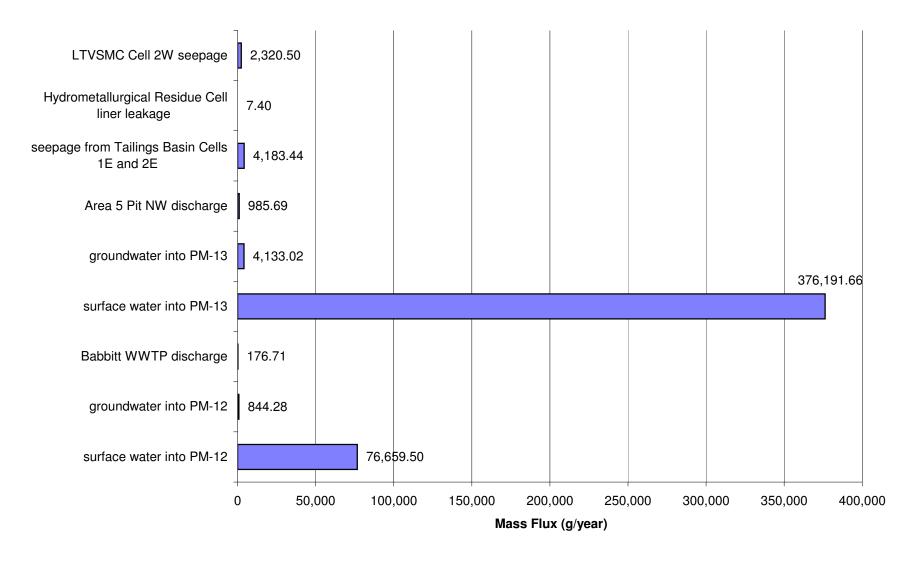
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Closure for Average Flow for Cobalt (Co)



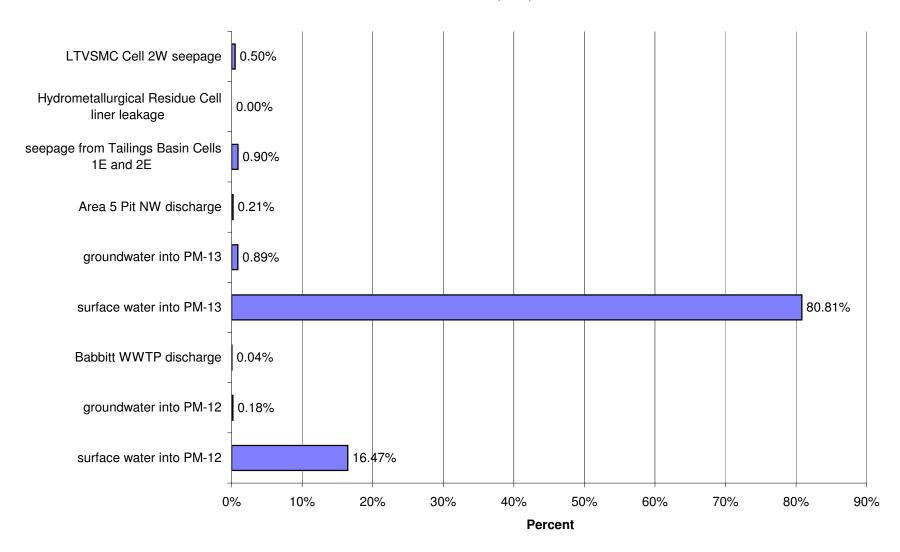
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for Average Flow for Cobalt (Co)



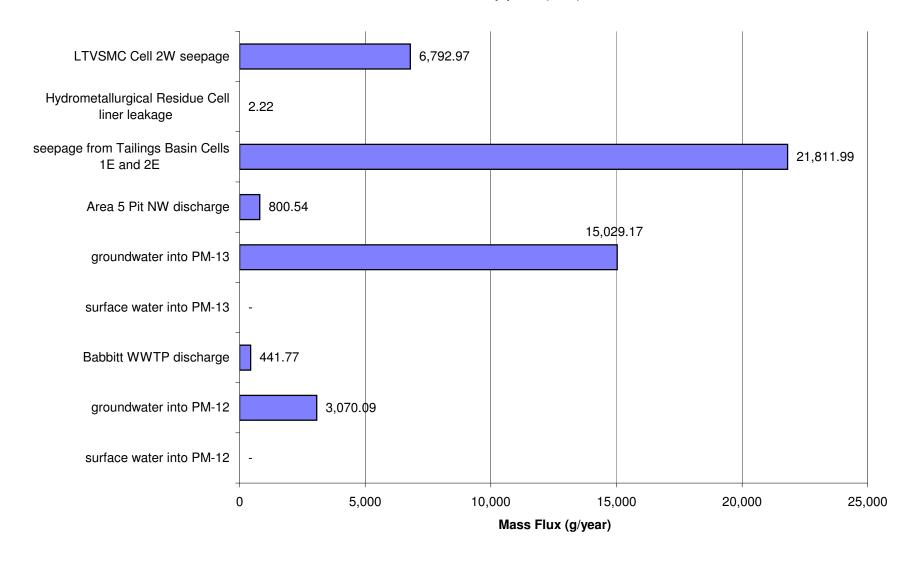
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Closure for High Flow for Cobalt (Co)



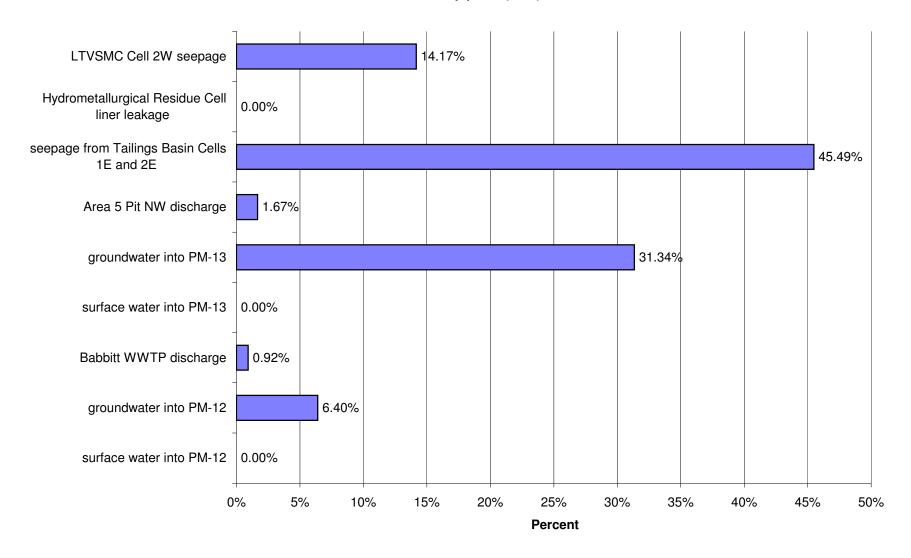
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for High Flow for Cobalt (Co)



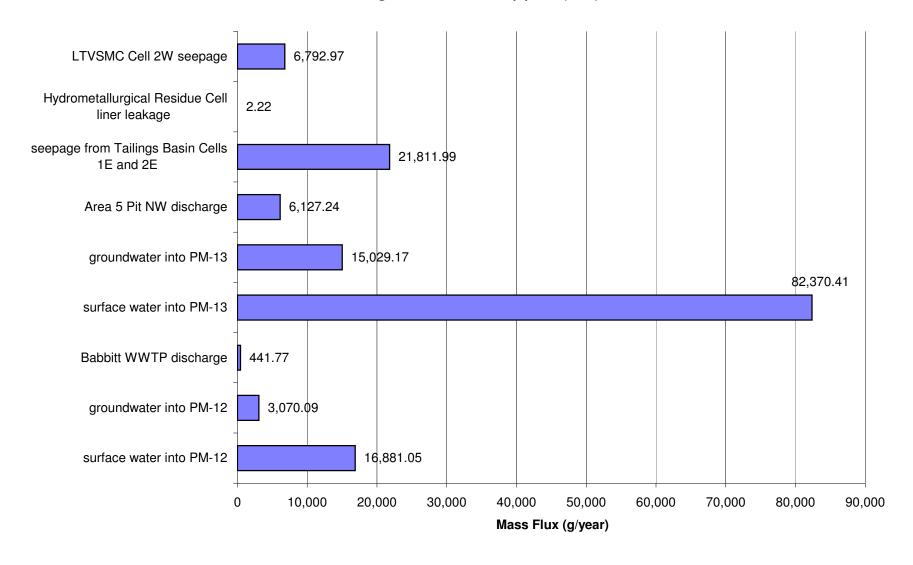
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Closure for Low Flow for Copper (Cu)



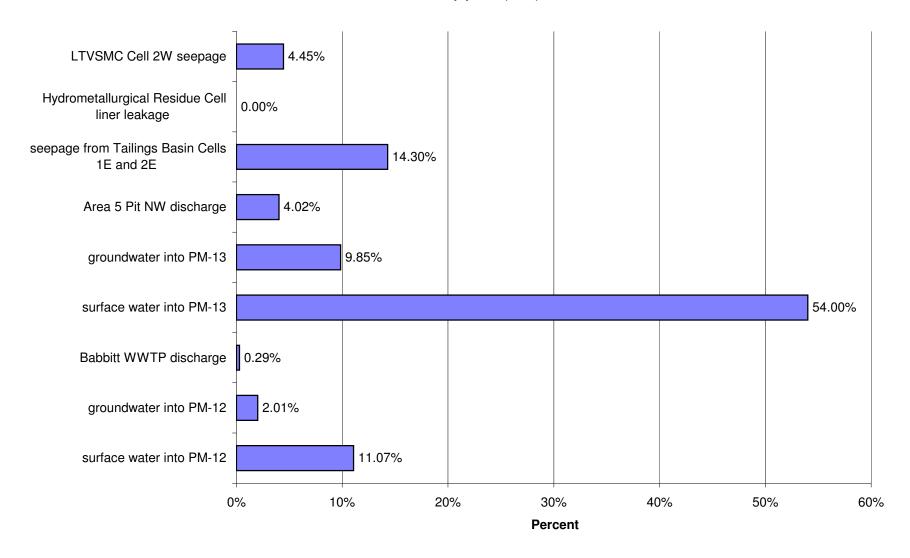
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for Low Flow for Copper (Cu)



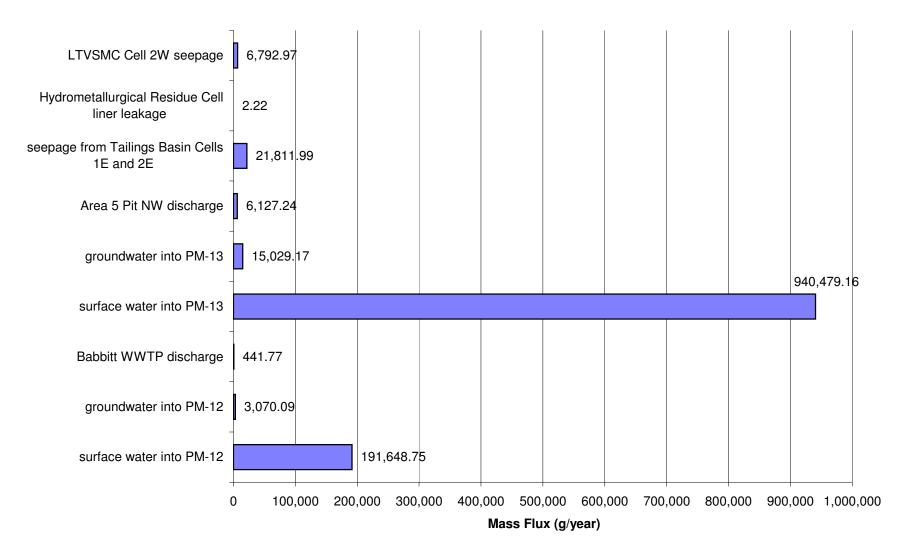
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Closure for Average Flow for Copper (Cu)



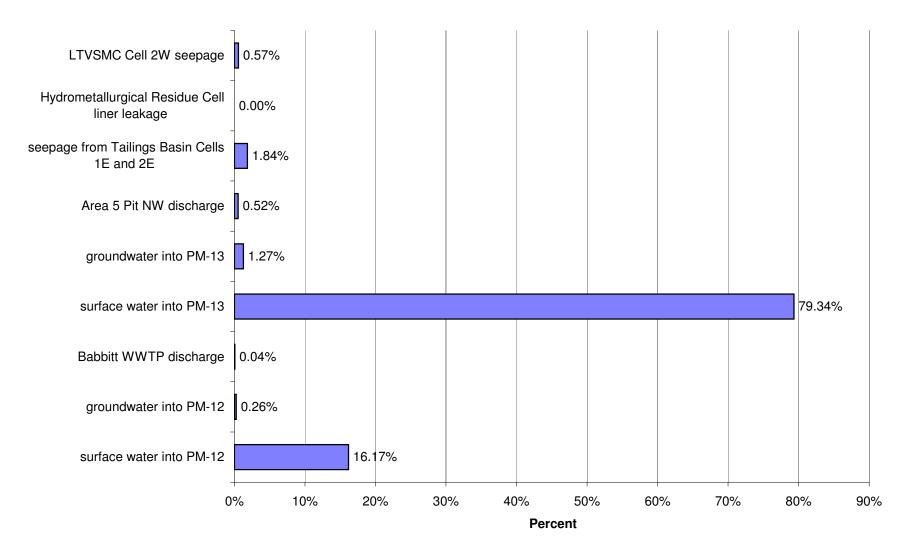
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for Average Flow for Copper (Cu)



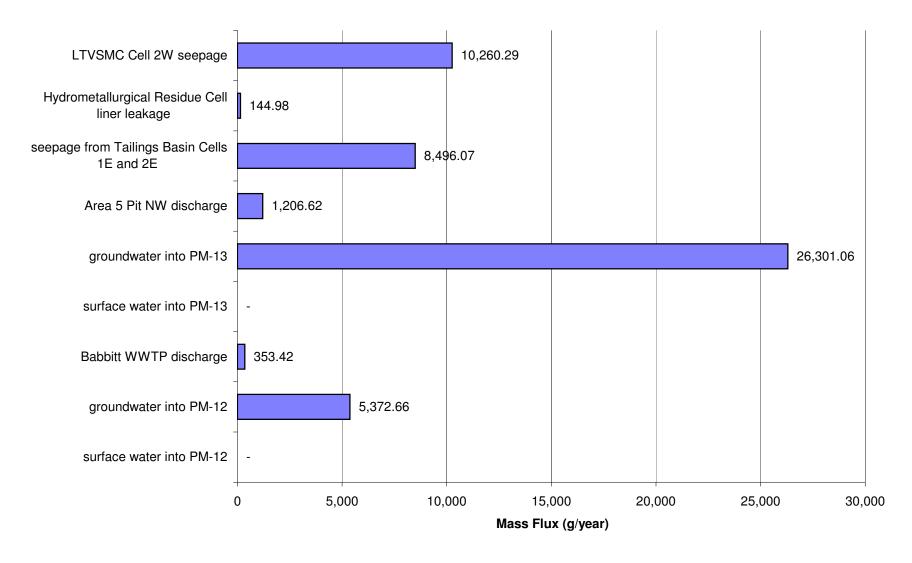
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Closure for High Flow for Copper (Cu)



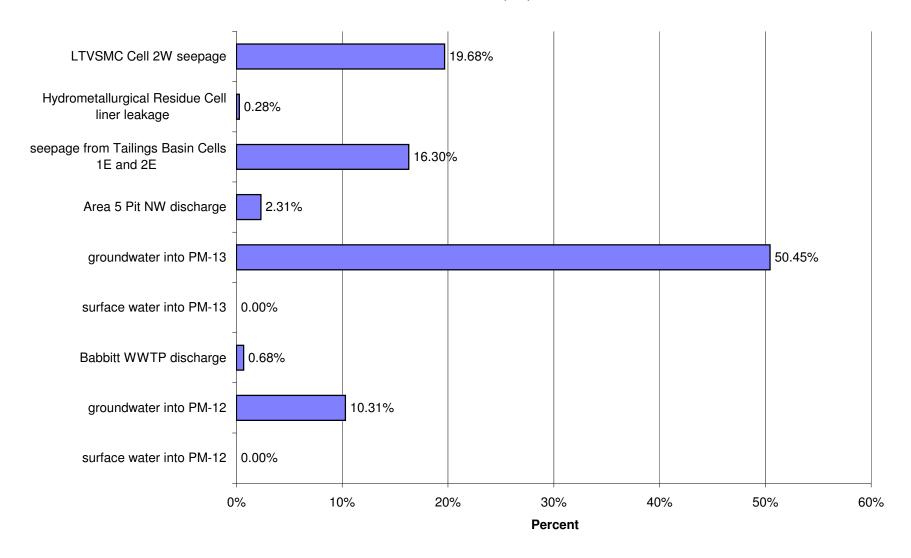
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for High Flow for Copper (Cu)



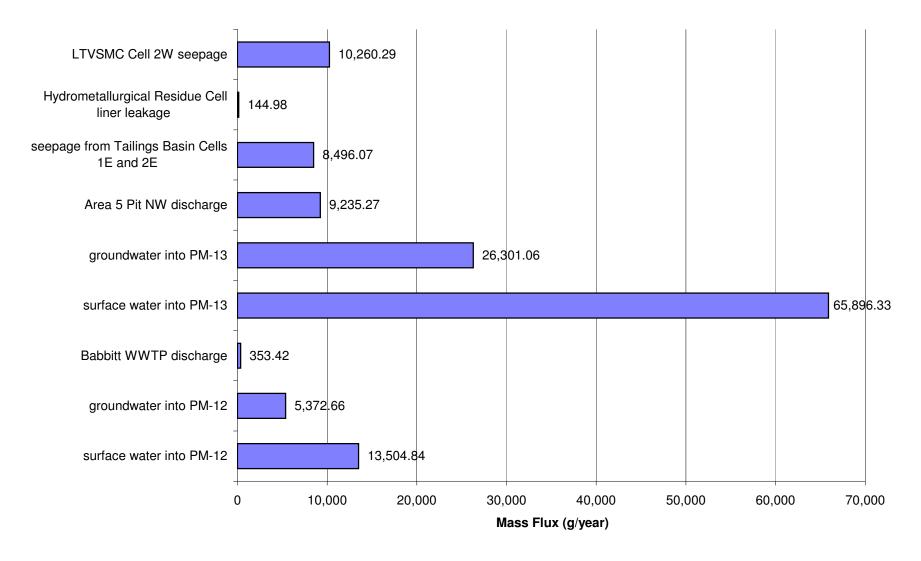
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Closure for Low Flow for Nickel (Ni)



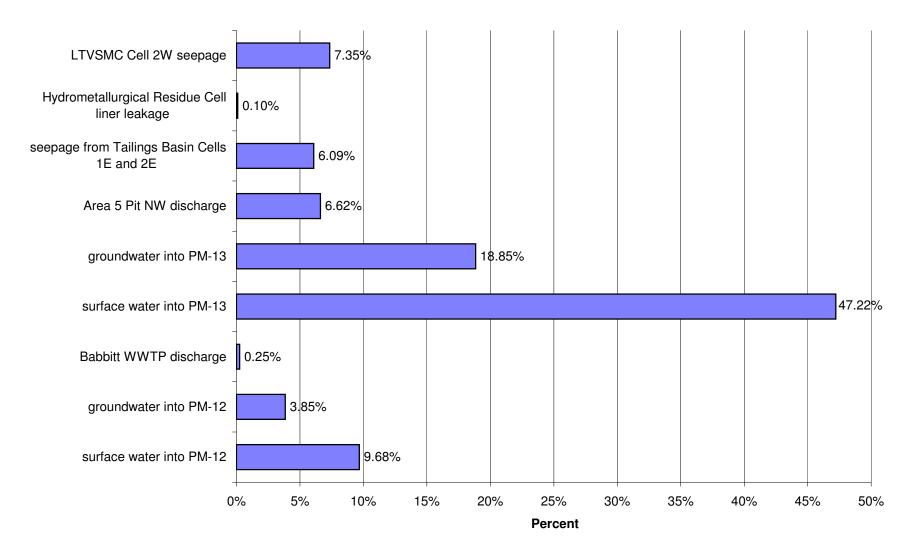
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for Low Flow for Nickel (Ni)



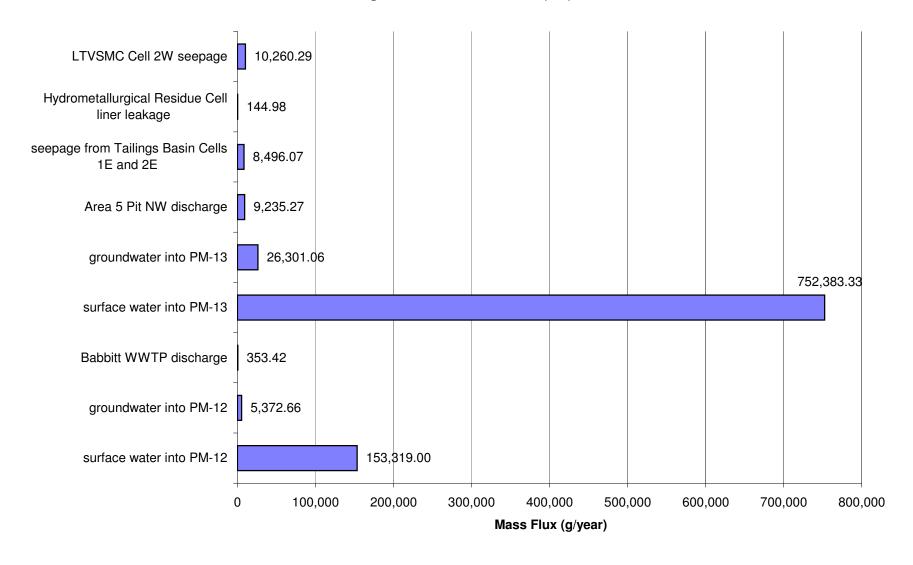
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Closure for Average Flow for Nickel (Ni)



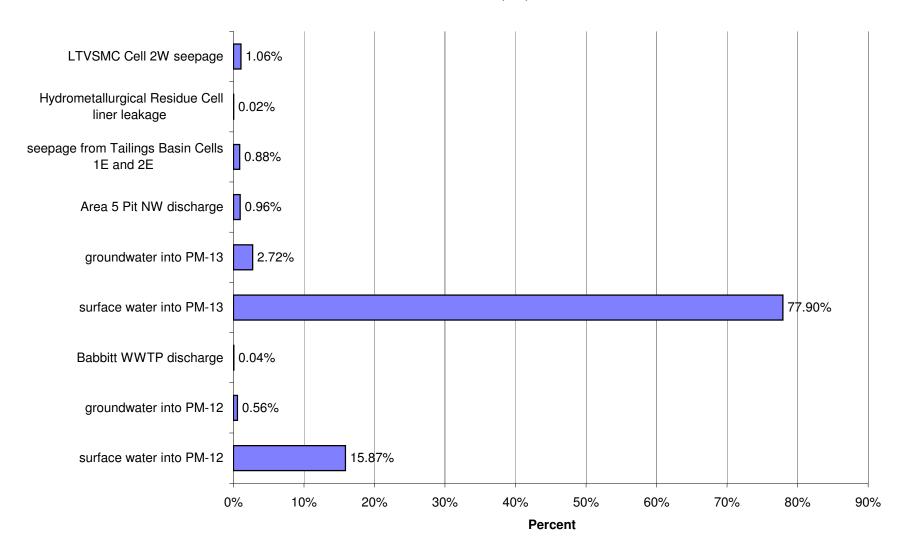
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for Average Flow for Nickel (Ni)



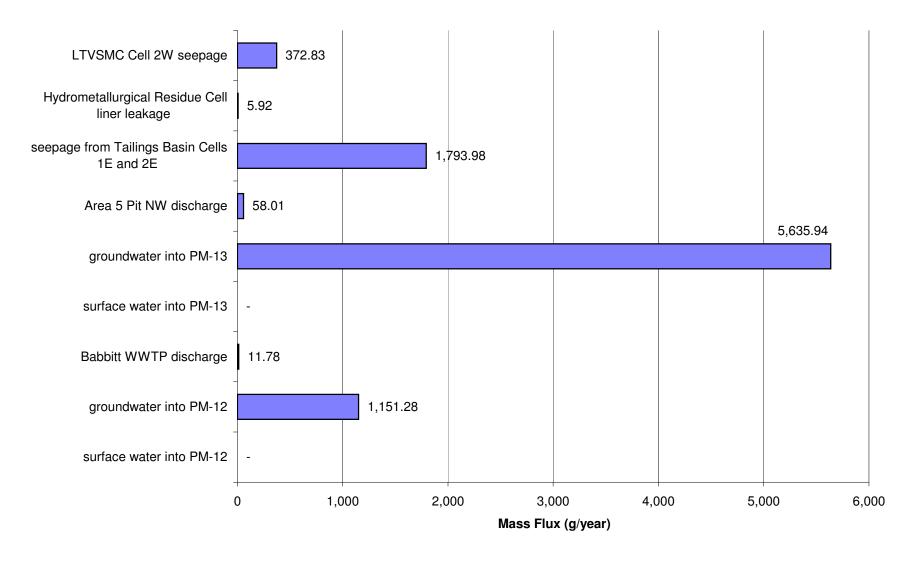
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Closure for High Flow for Nickel (Ni)



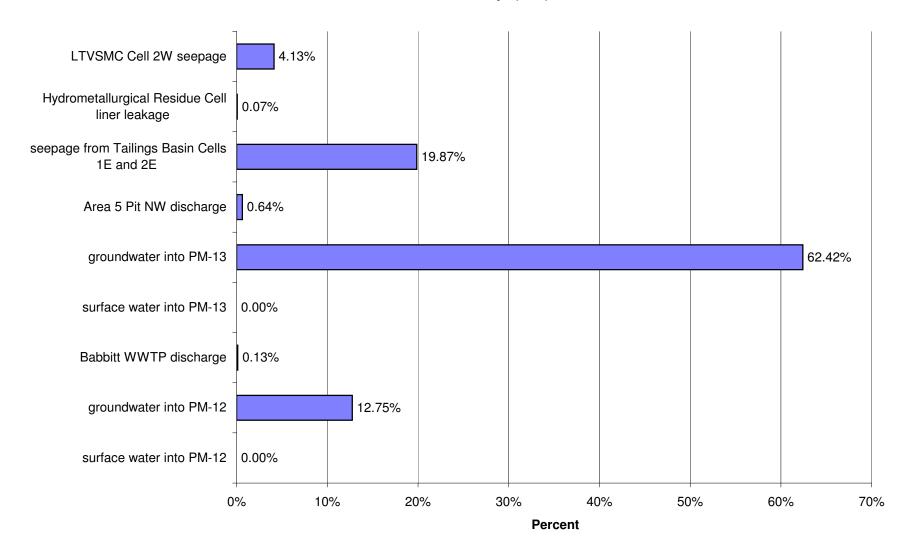
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for High Flow for Nickel (Ni)



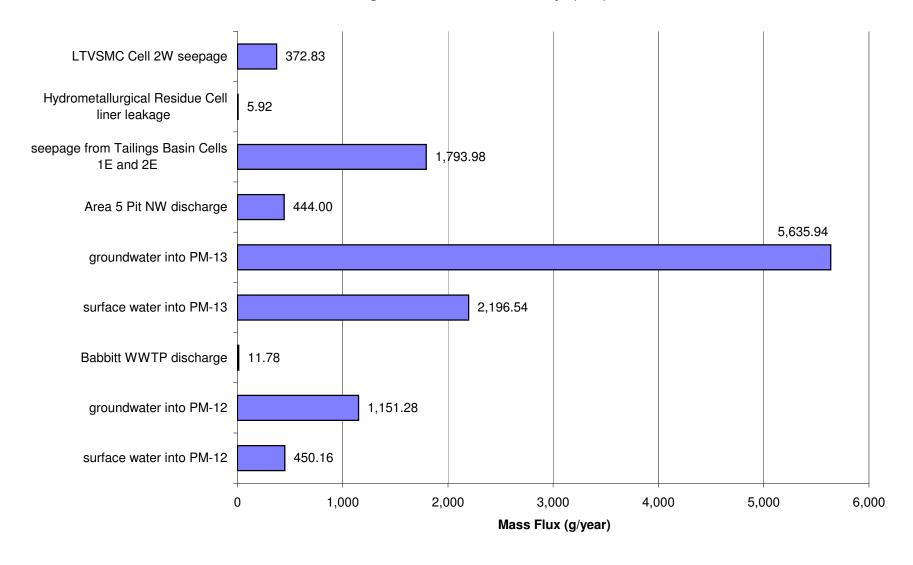
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Closure for Low Flow for Antimony (Sb)



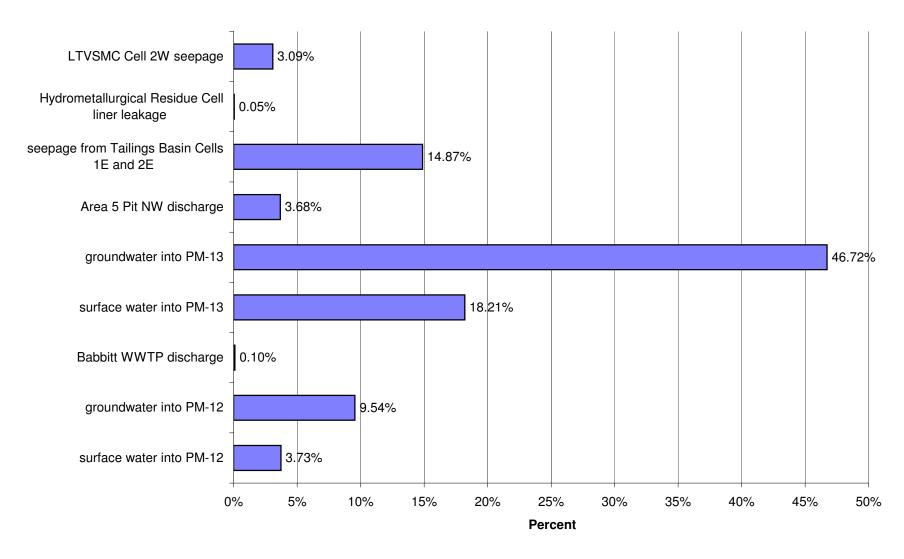
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for Low Flow for Antimony (Sb)



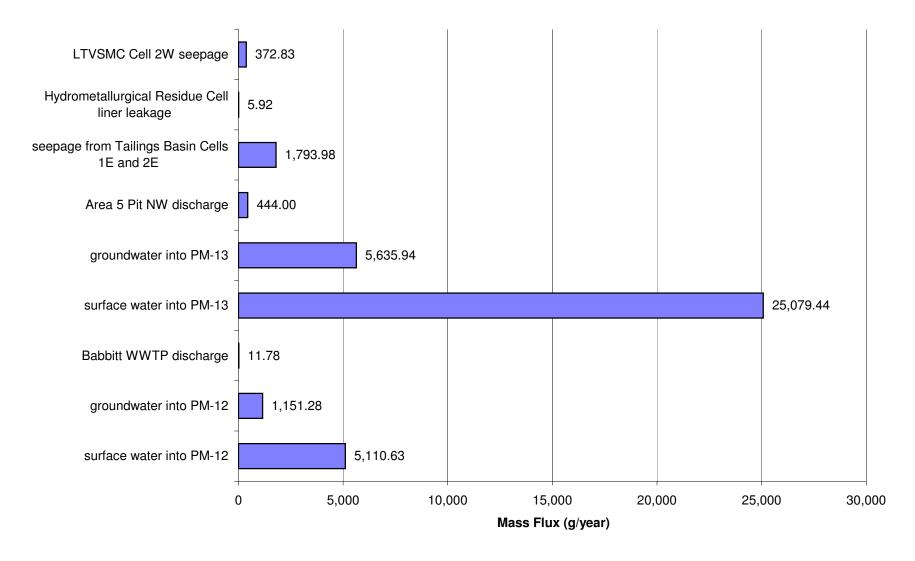
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Closure for Average Flow for Antimony (Sb)



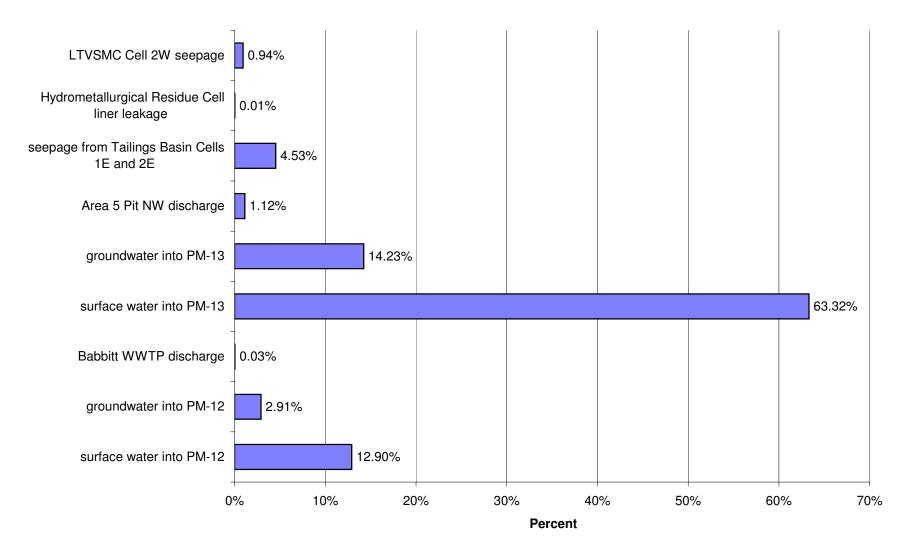
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for Average Flow for Antimony (Sb)



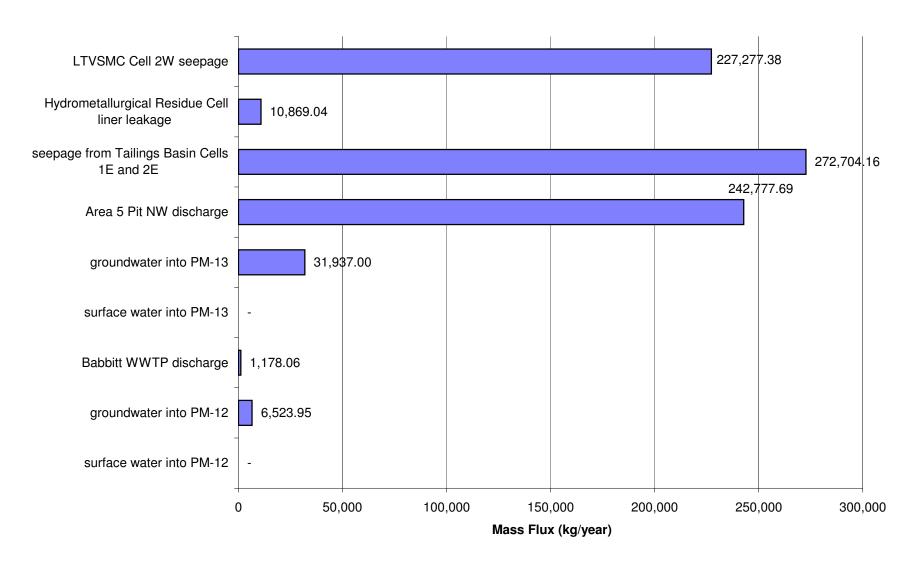
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Closure for High Flow for Antimony (Sb)



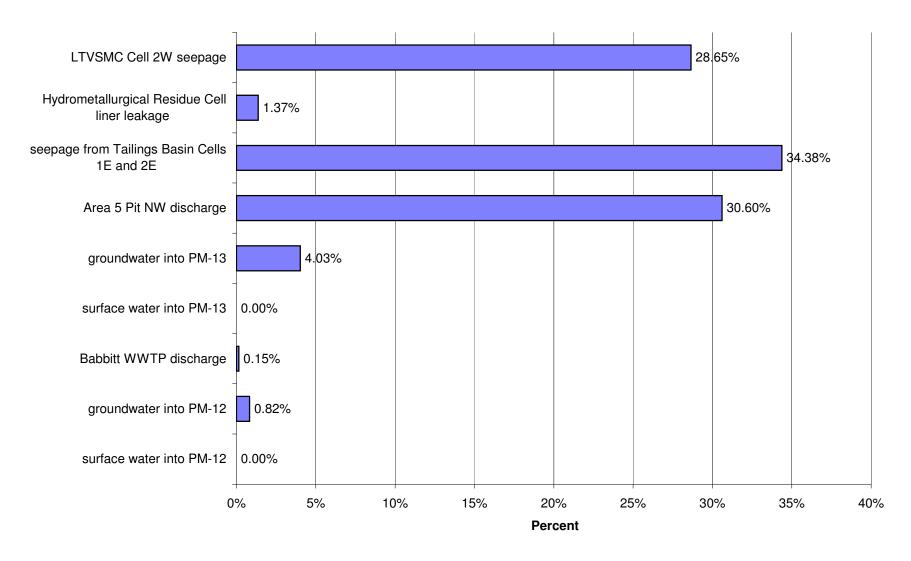
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for High Flow for Antimony (Sb)



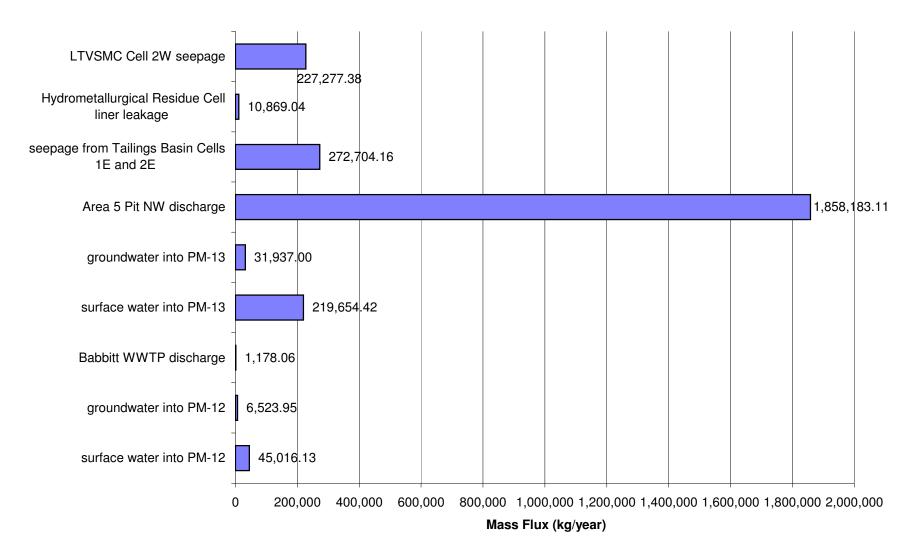
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Closure for Low Flow for Sulfate (SO₄)



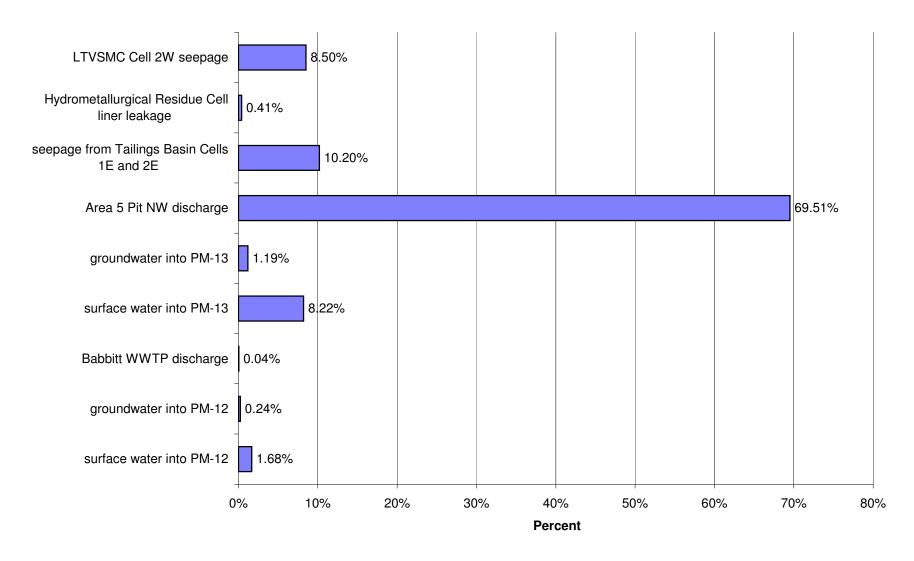
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for Low Flow for Sulfate (SO₄)



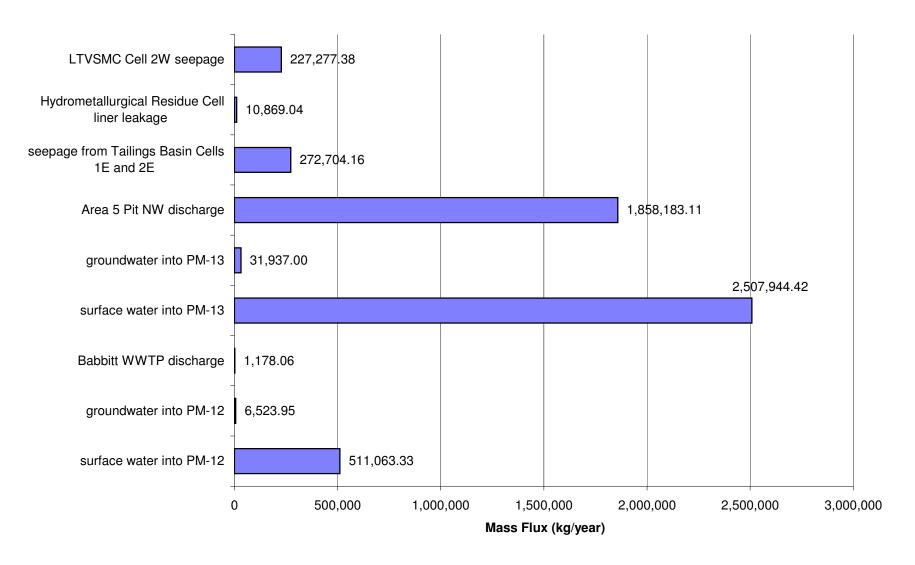
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Closure for Average Flow for Sulfate (SO₄)



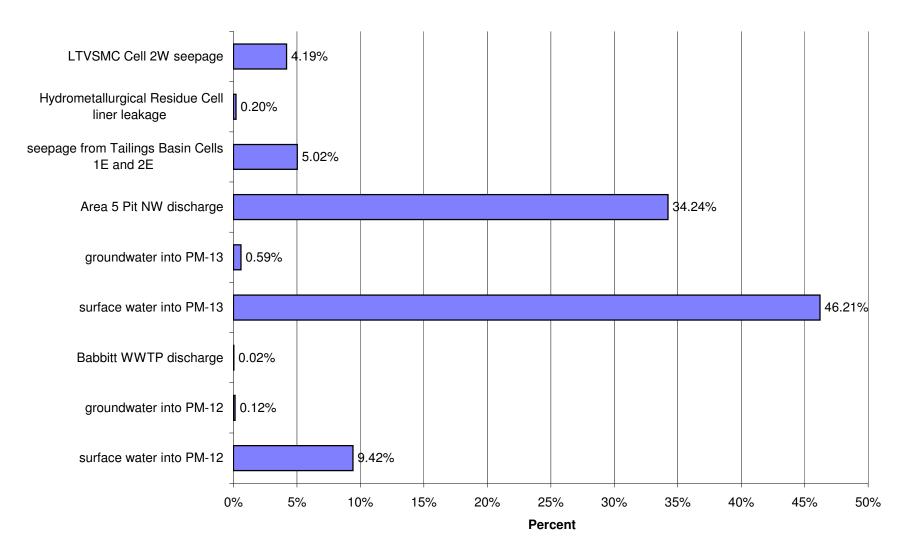
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for Average Flow for Sulfate (SO₄)



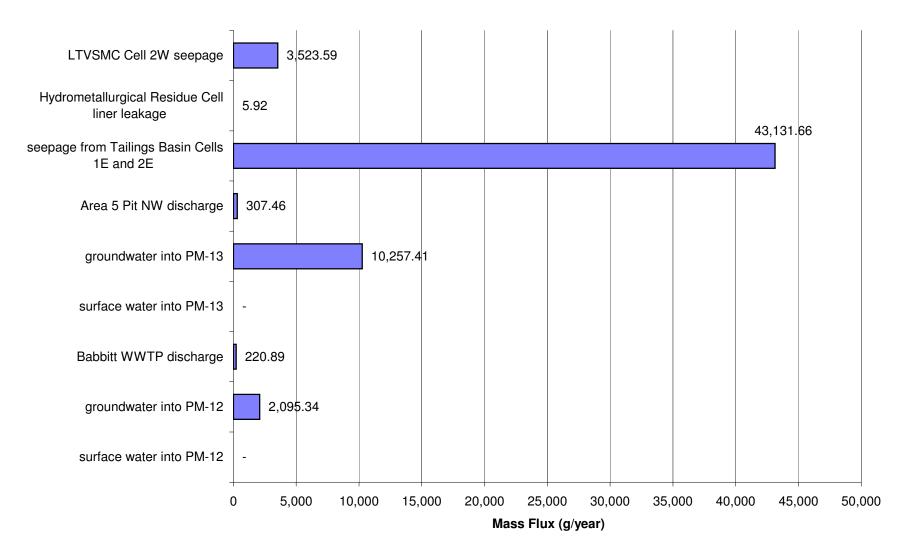
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Closure for High Flow for Sulfate (SO₄)



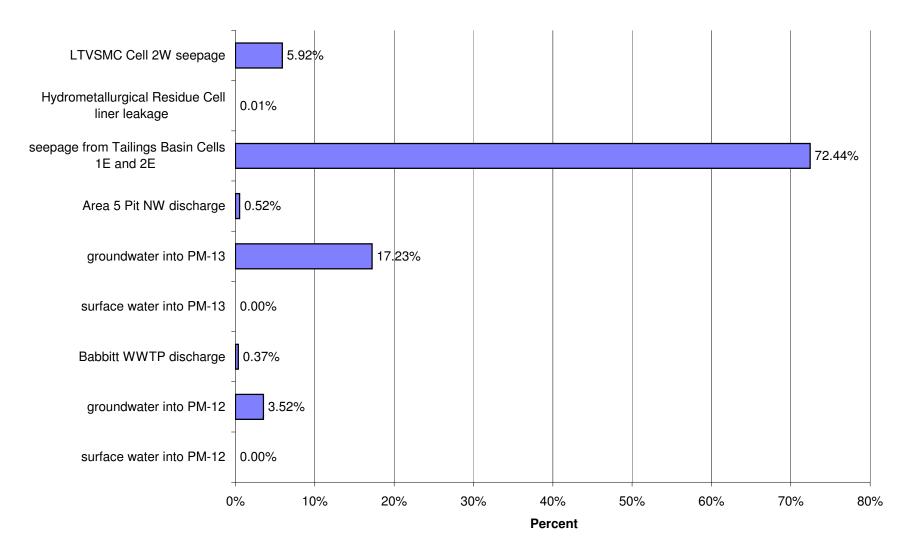
Geotechnical Mitigation: Percent of Impacts at PM-13 in Closure for High Flow for Sulfate (SO₄)



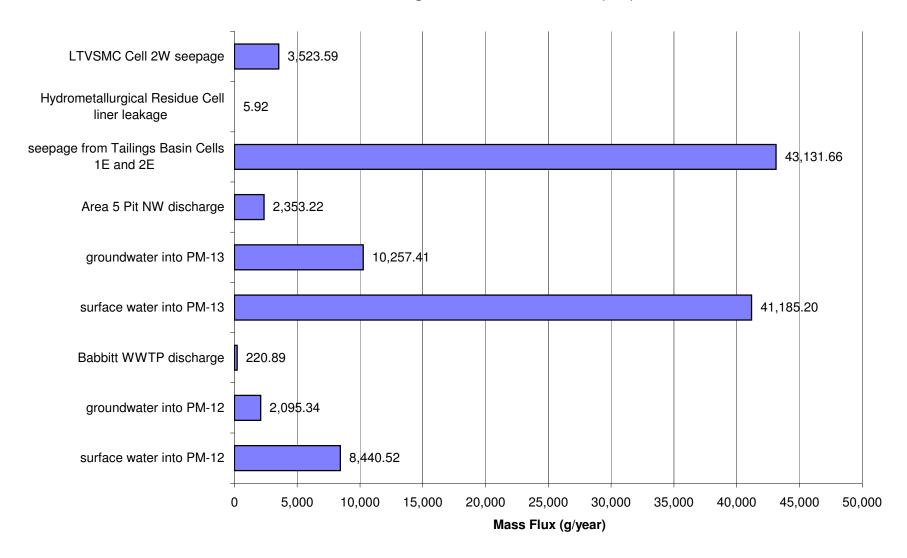
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Low Flow for Arsenic (As)



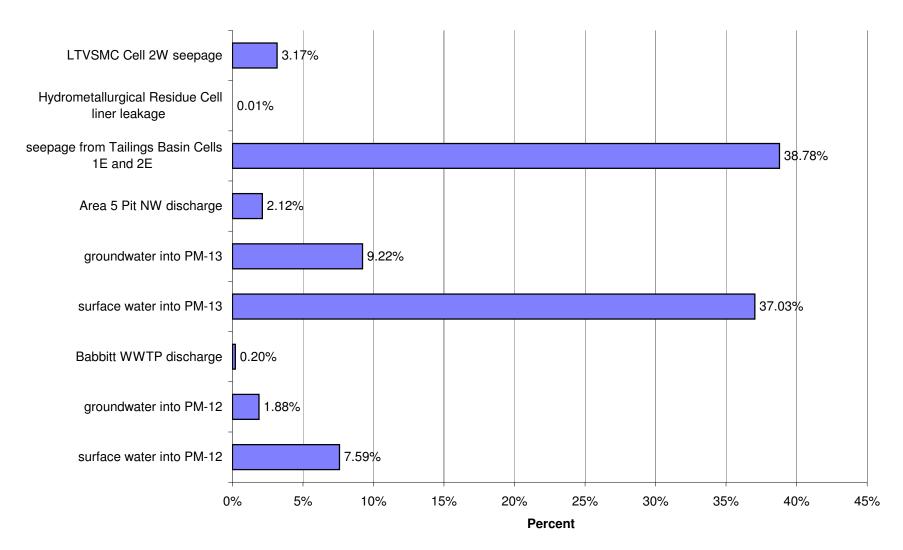
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for Low Flow for Arsenic (As)



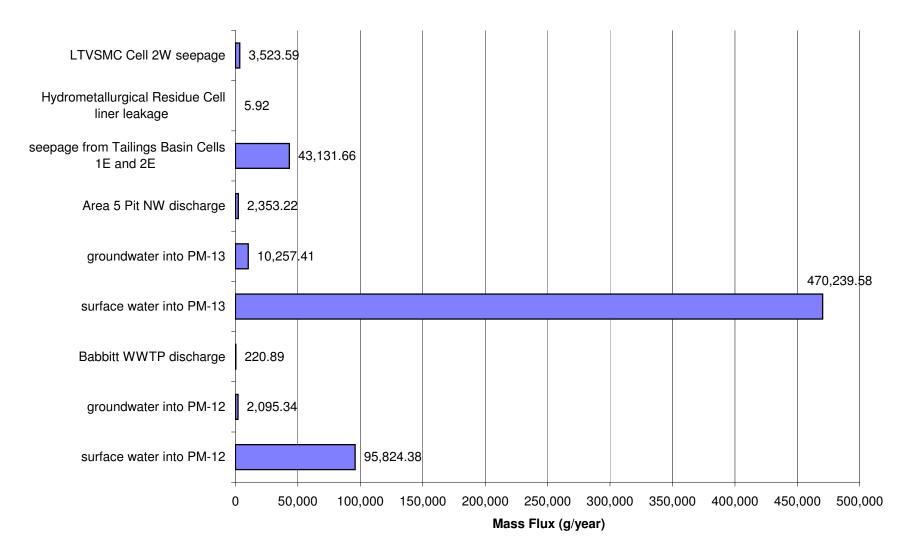
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Average Flow for Arsenic (As)



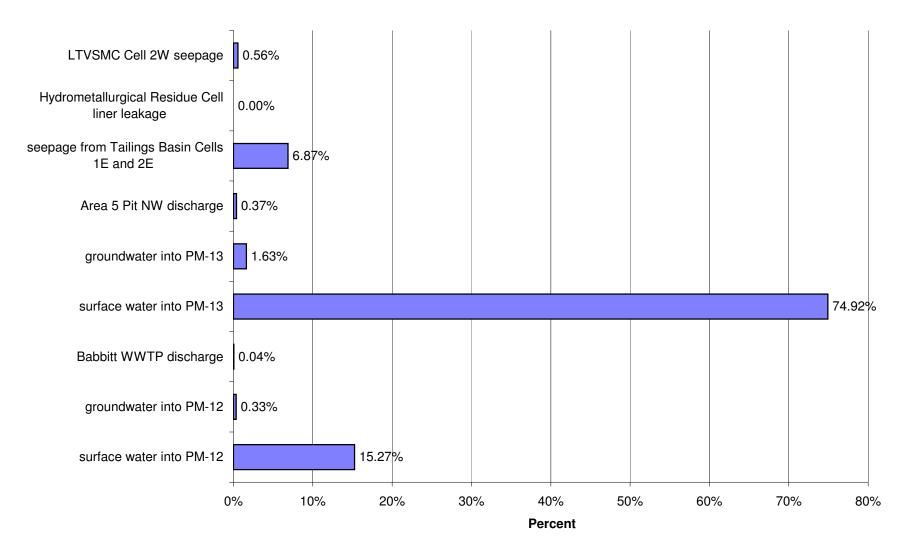
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for Average Flow for Arsenic (As)



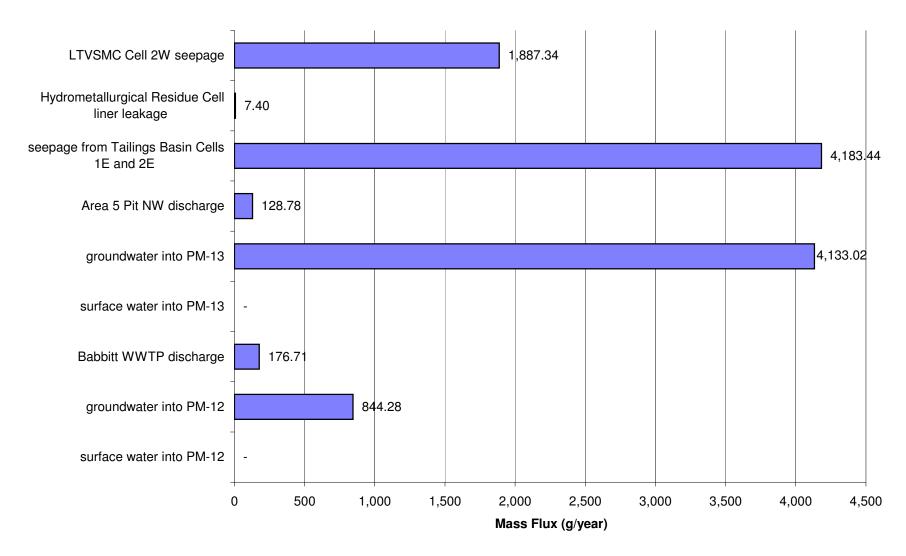
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for High Flow for Arsenic (As)



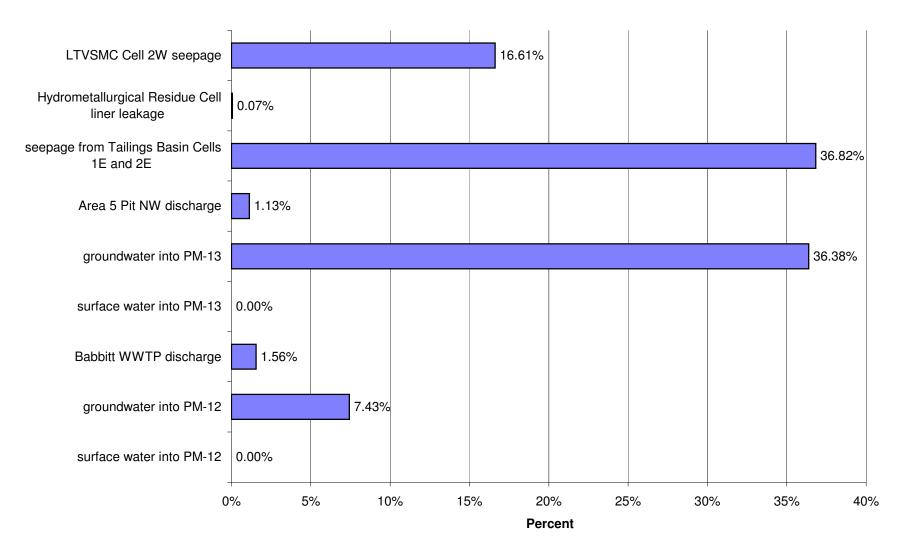
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for High Flow for Arsenic (As)



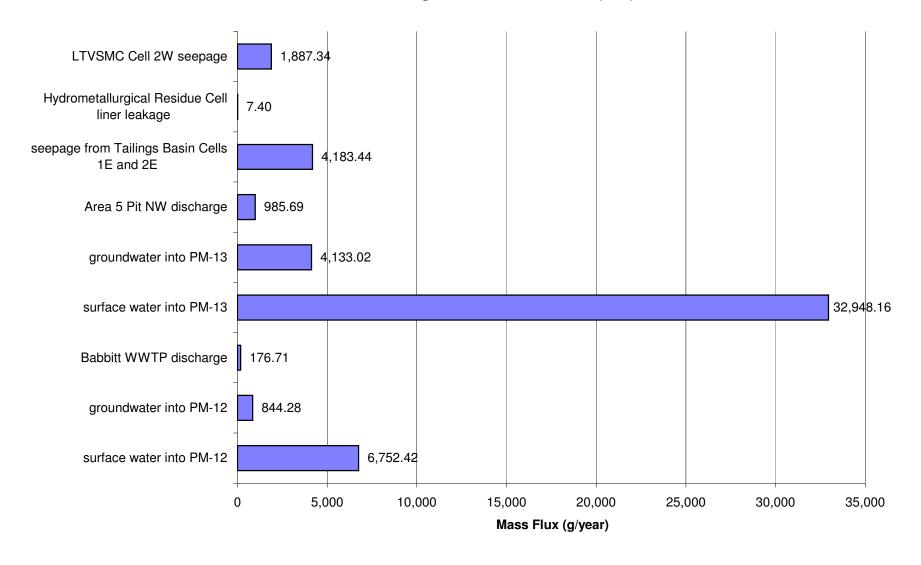
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Low Flow for Cobalt (Co)



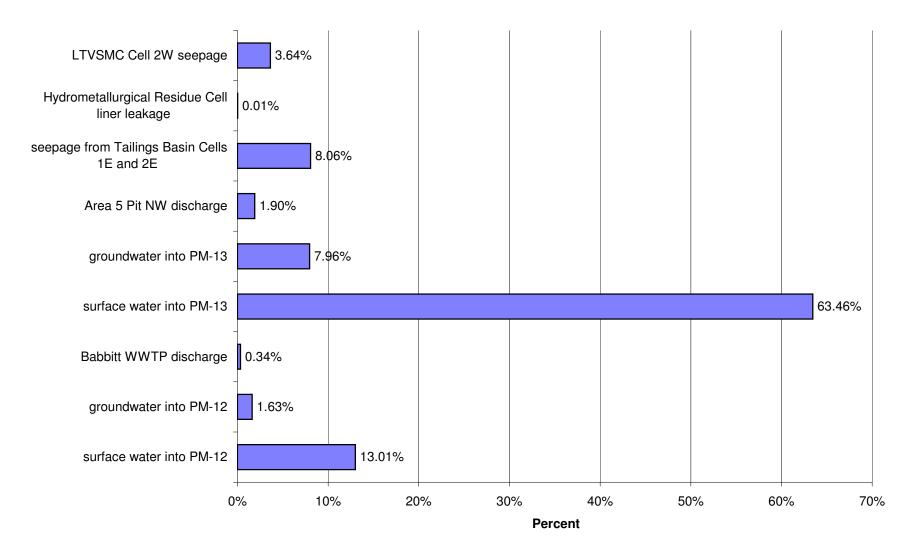
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for Low Flow for Cobalt (Co)



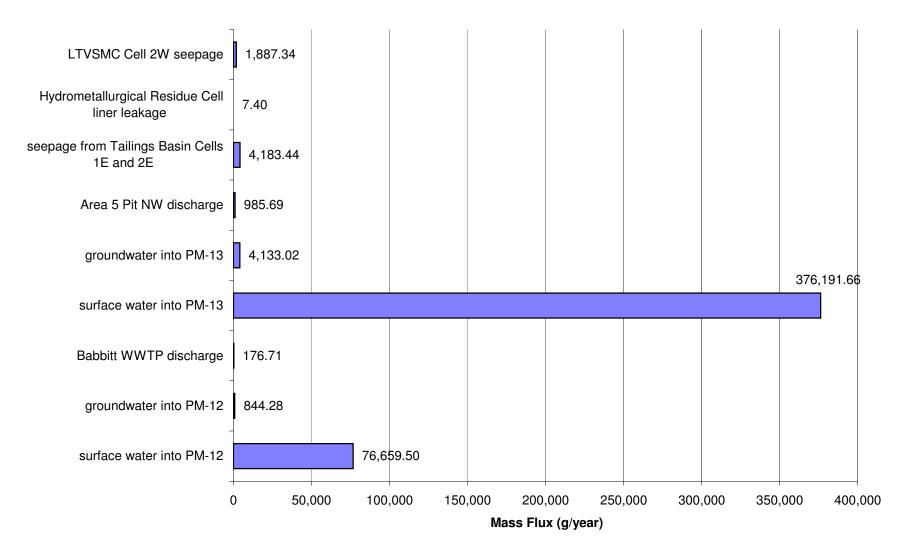
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Average Flow for Cobalt (Co)



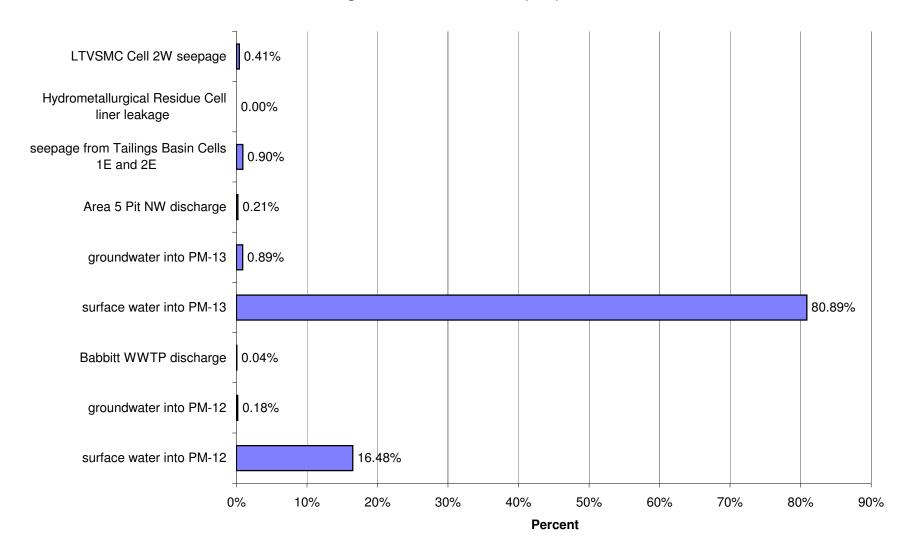
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for Average Flow for Cobalt (Co)



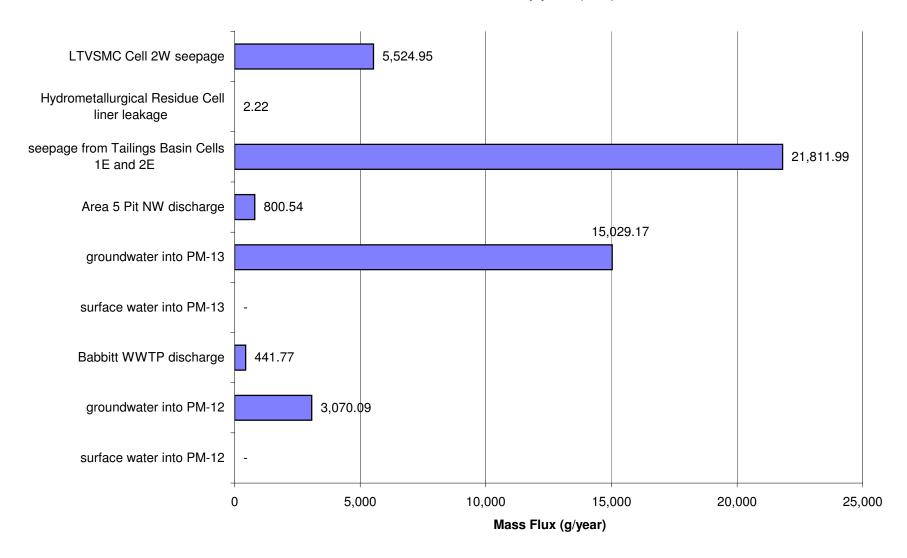
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for High Flow for Cobalt (Co)



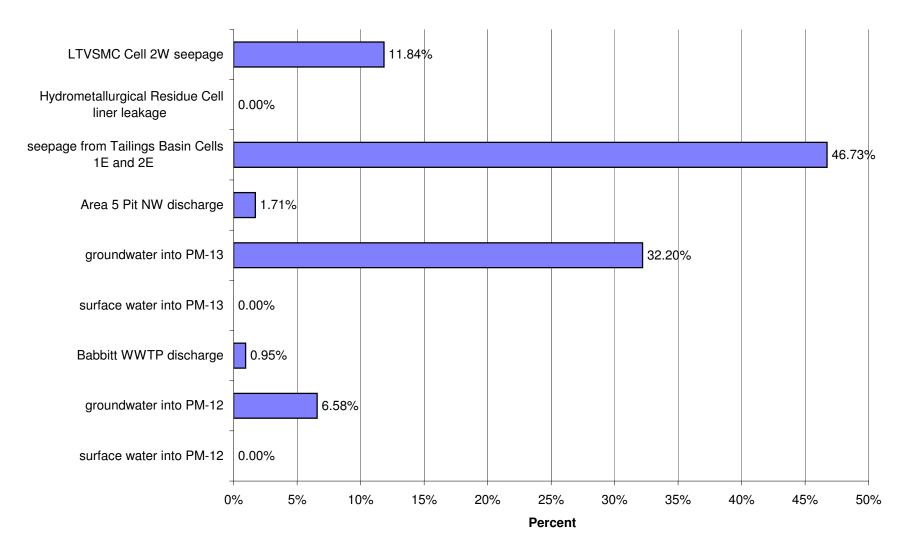
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for High Flow for Cobalt (Co)



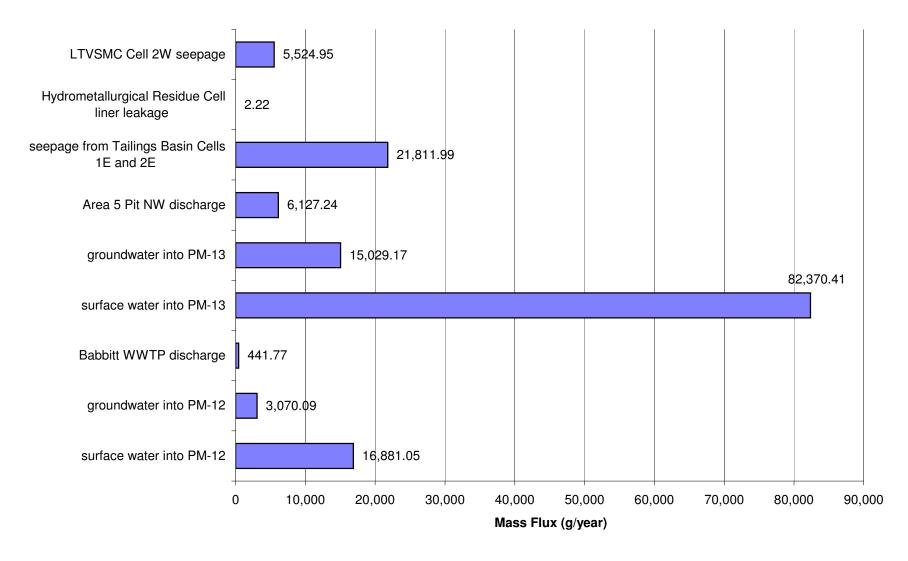
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Low Flow for Copper (Cu)



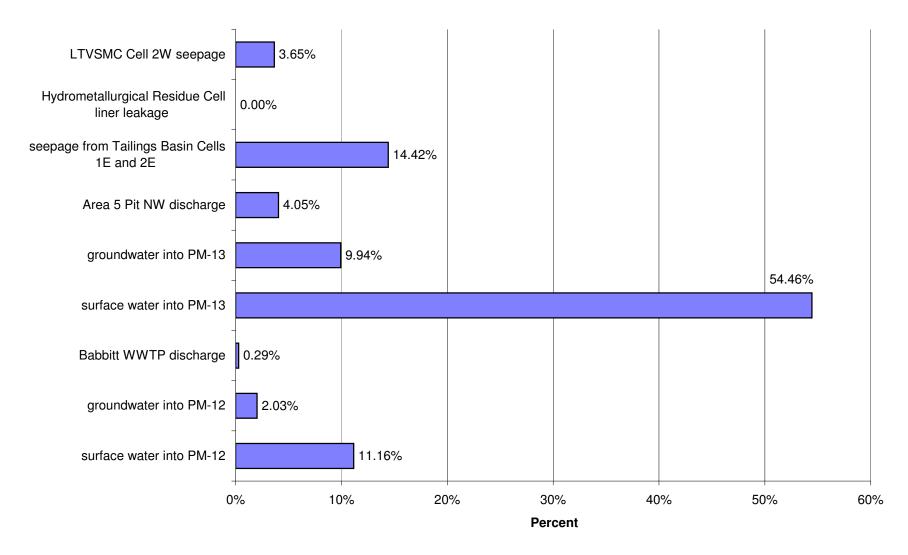
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for Low Flow for Copper (Cu)



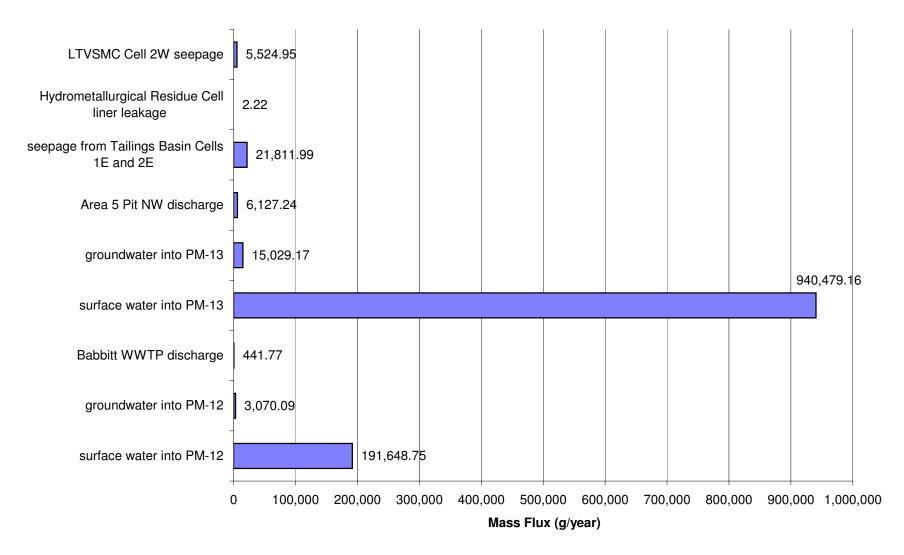
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Average Flow for Copper (Cu)



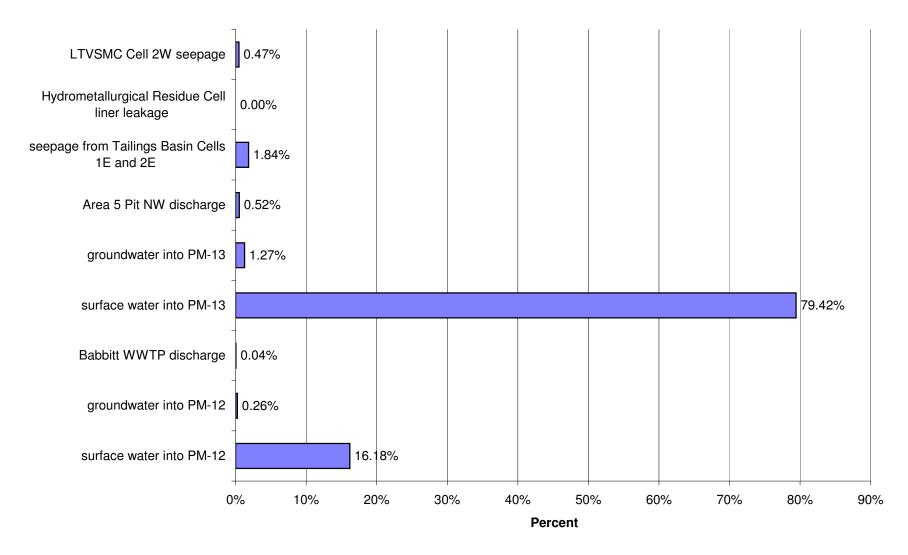
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for Average Flow for Copper (Cu)



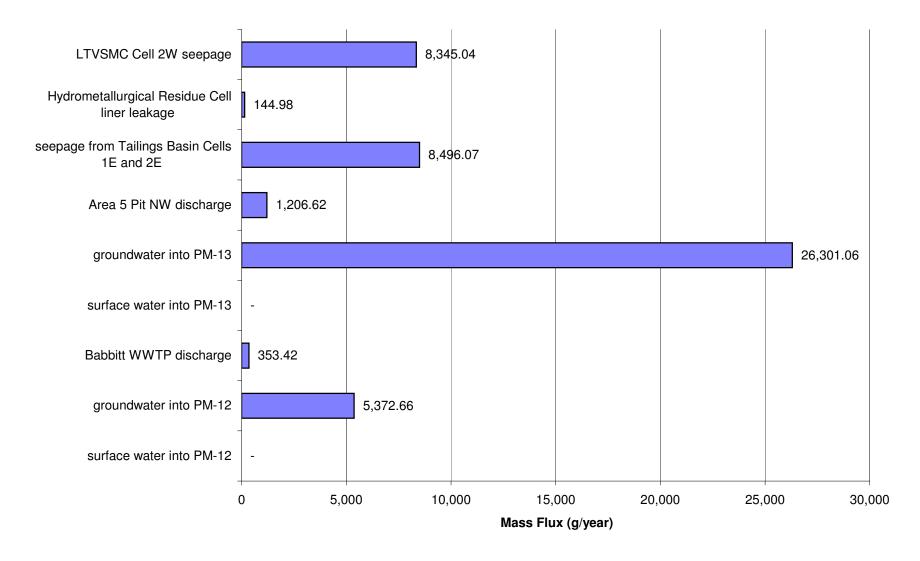
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for High Flow for Copper (Cu)



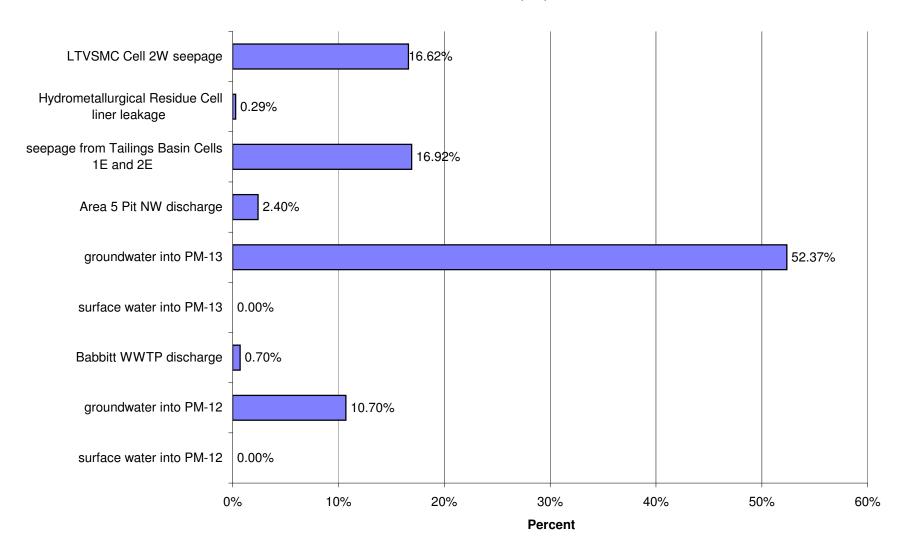
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for High Flow for Copper (Cu)



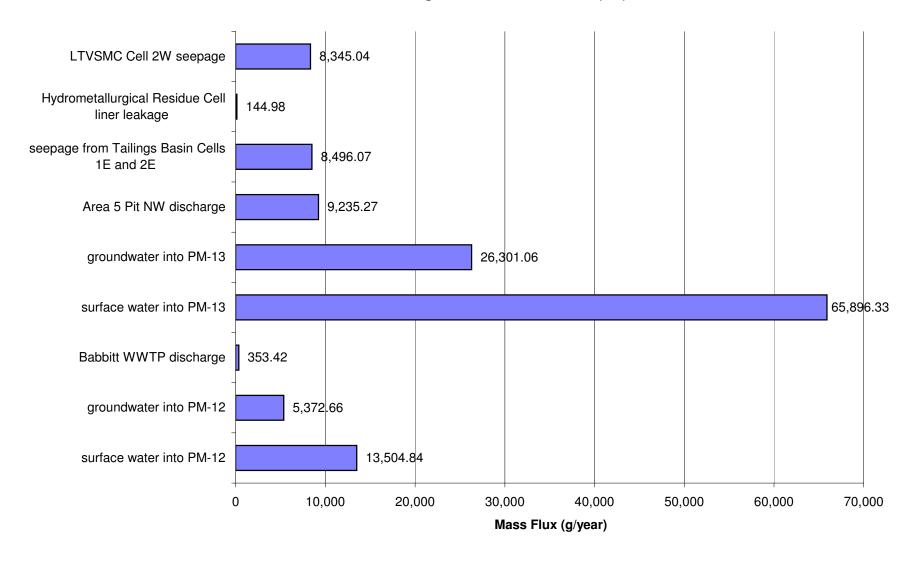
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Low Flow for Nickel (Ni)



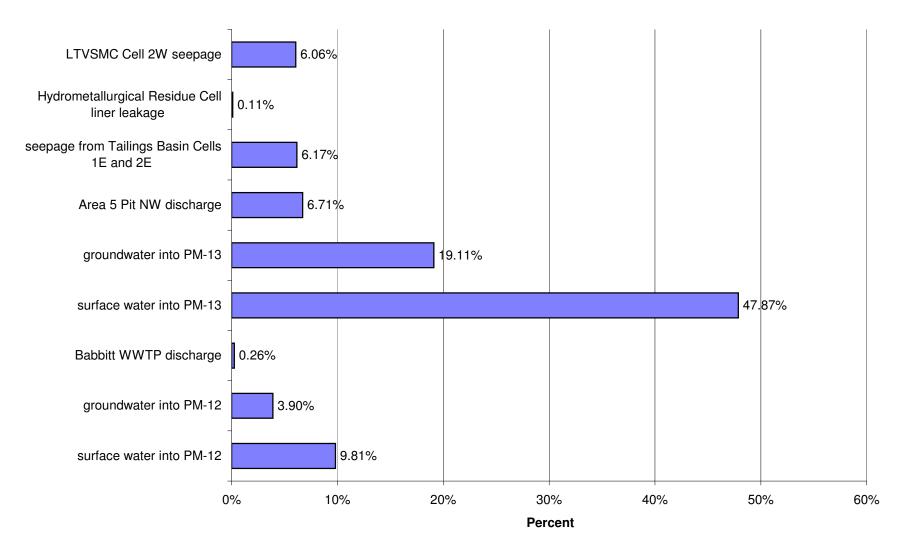
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for Low Flow for Nickel (Ni)



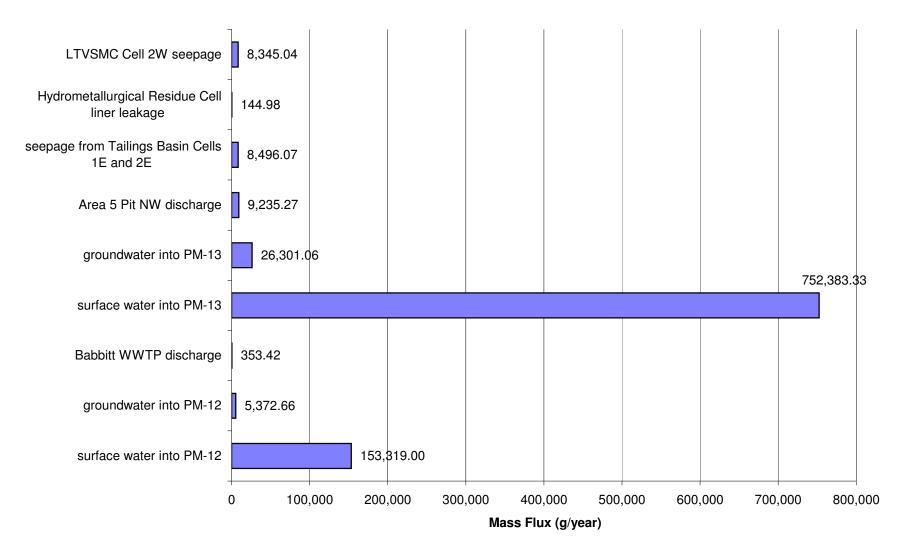
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Average Flow for Nickel (Ni)



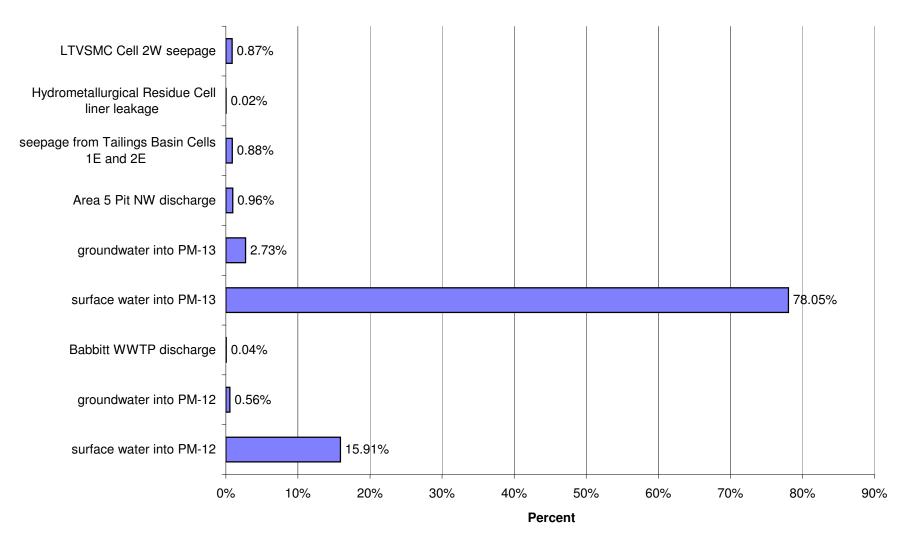
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for Average Flow for Nickel (Ni)



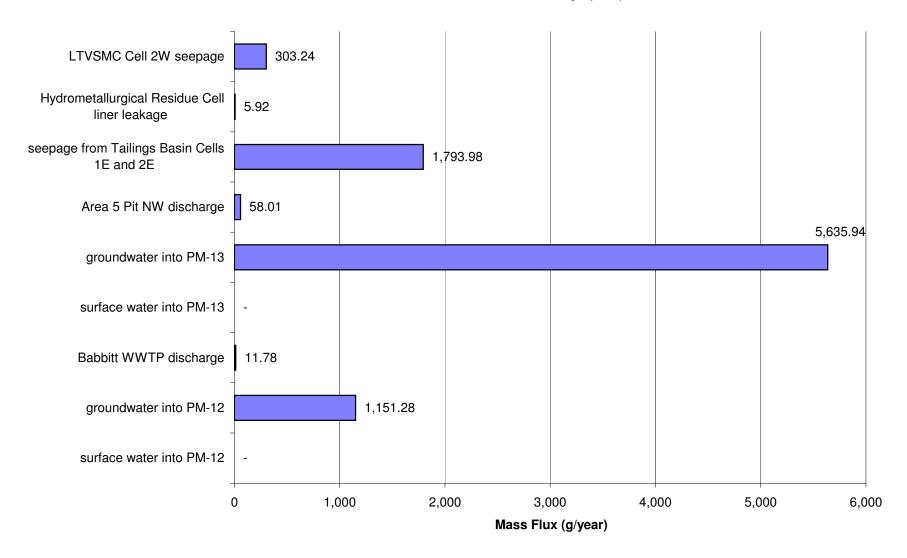
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for High Flow for Nickel (Ni)



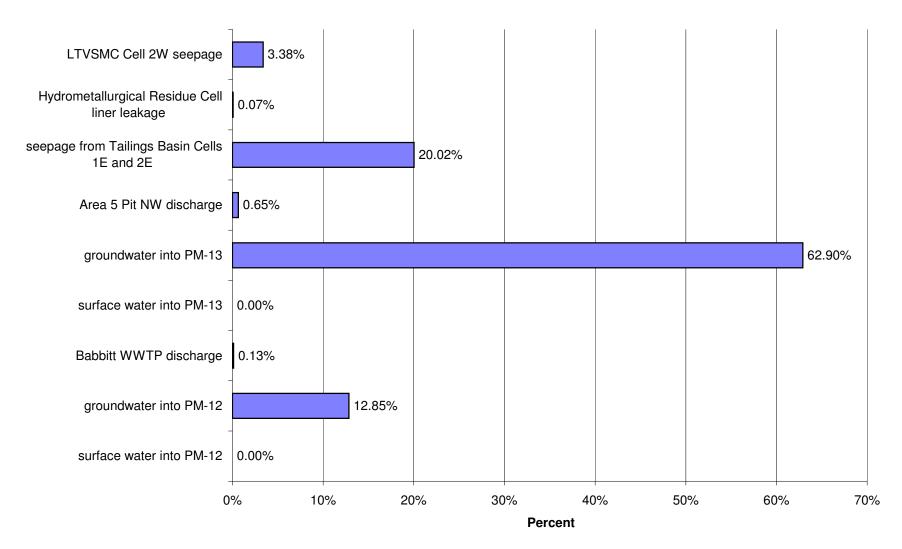
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for High Flow for Nickel (Ni)



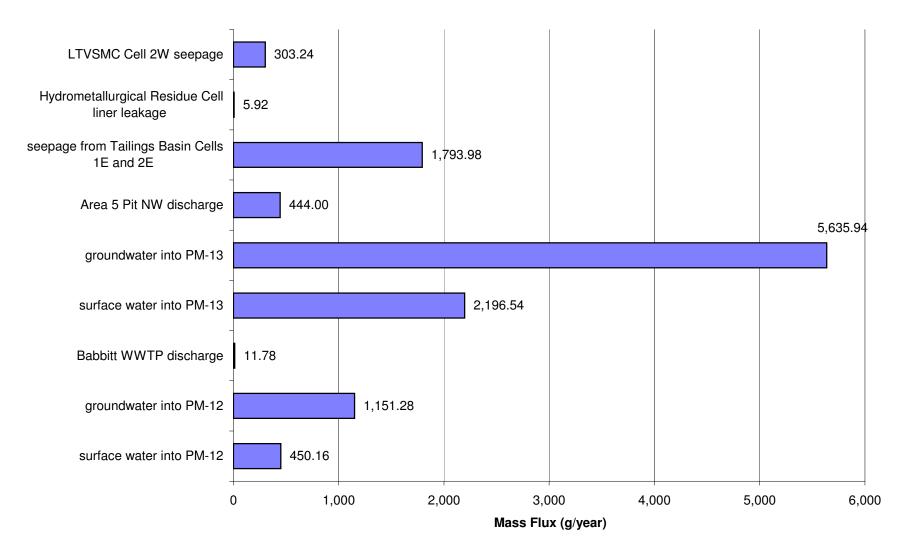
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Low Flow for Antimony (Sb)



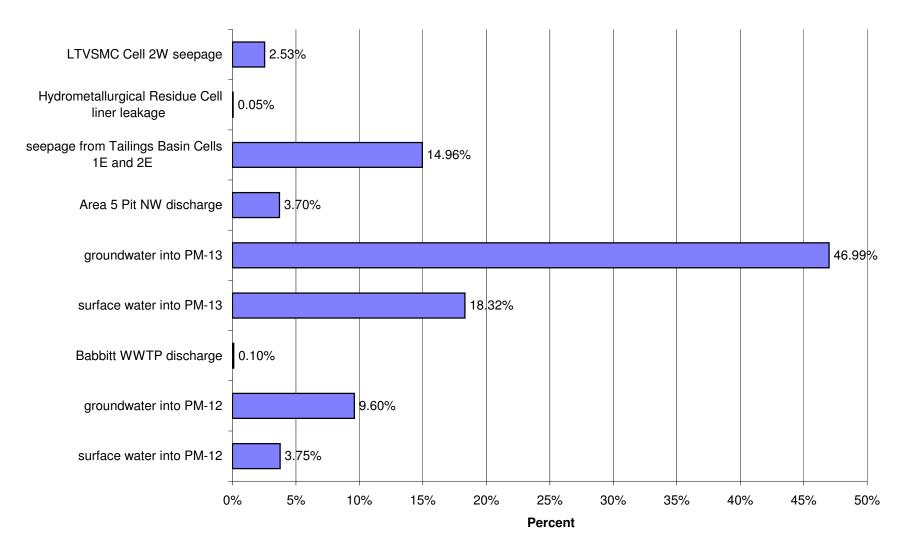
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for Low Flow for Antimony (Sb)



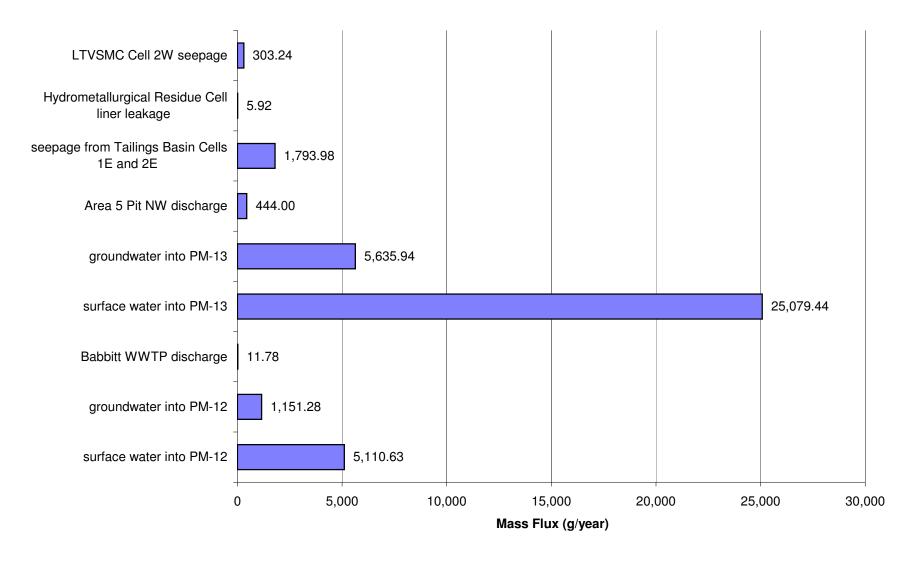
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for Average Flow for Antimony (Sb)



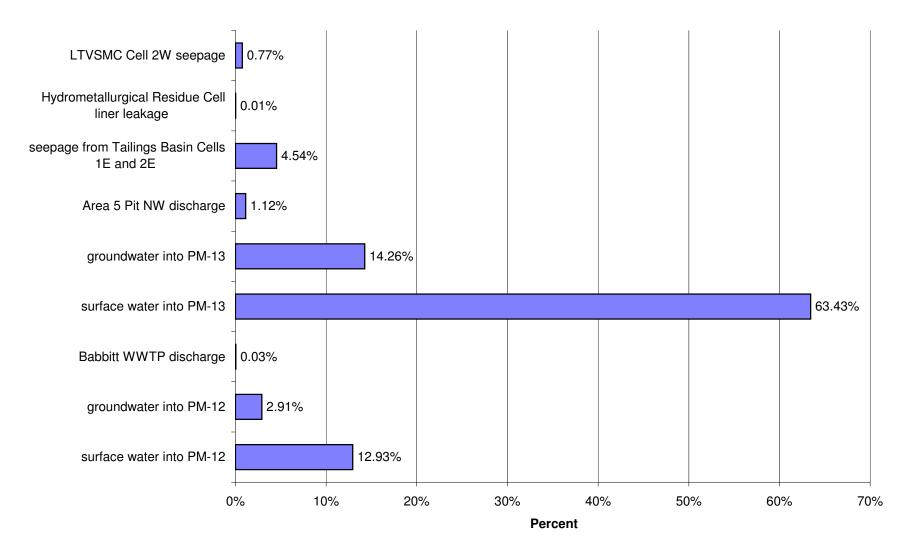
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for Average Flow for Antimony (Sb)



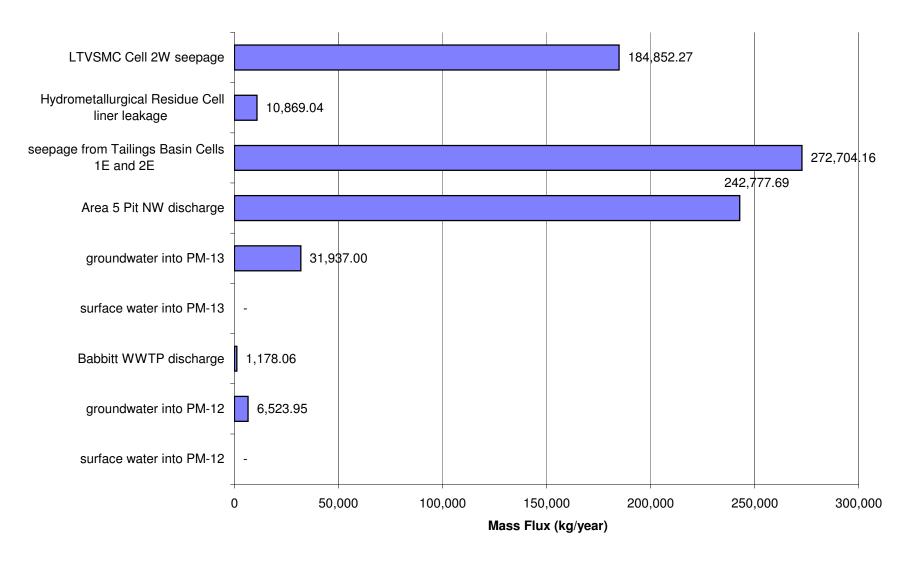
Geotechnical Mitigation: Mass Flux (g/year) of Impacts at PM-13 in Post - Closure for High Flow for Antimony (Sb)



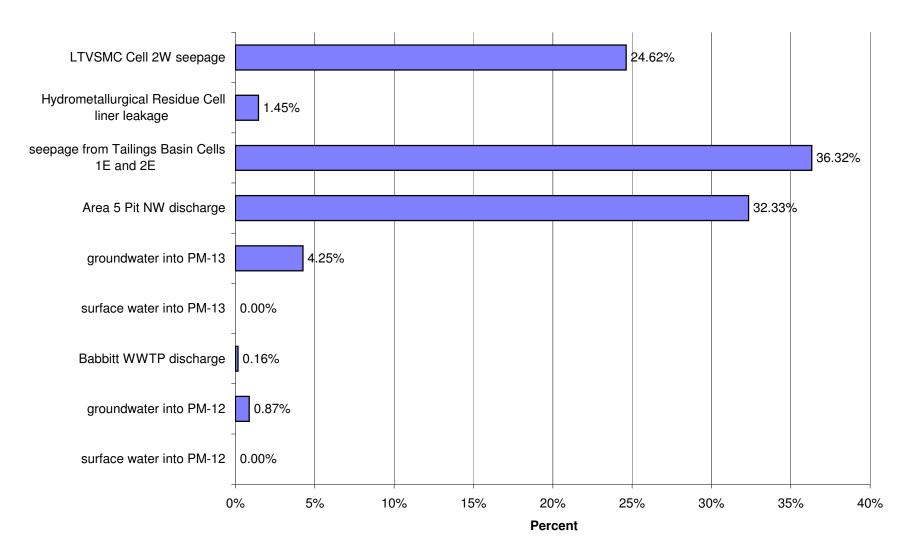
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for High Flow for Antimony (Sb)



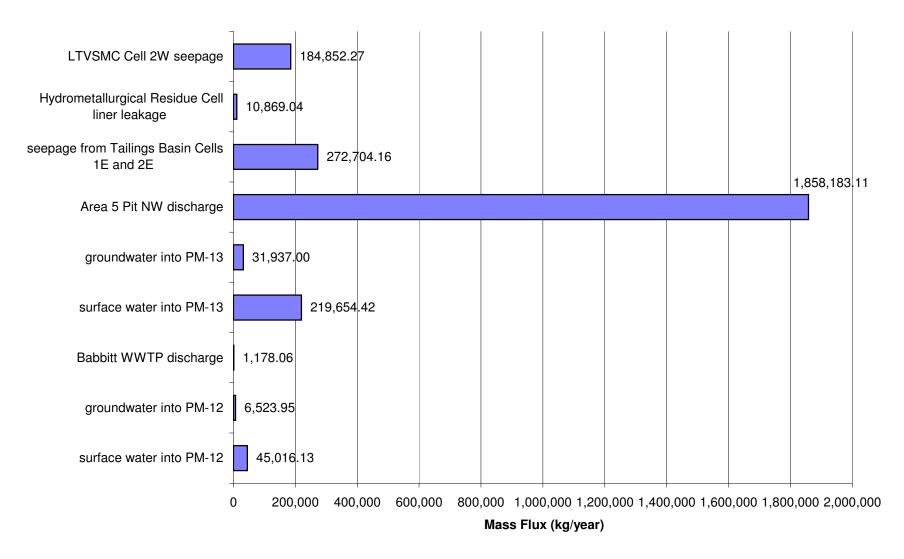
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Post - Closure for Low Flow for Sulfate (SO₄)



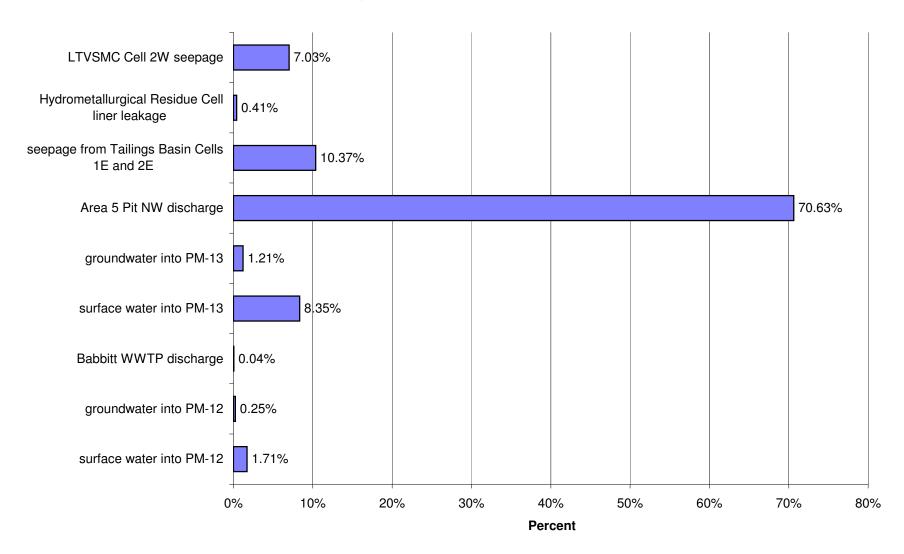
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for Low Flow for Sulfate (SO₄)



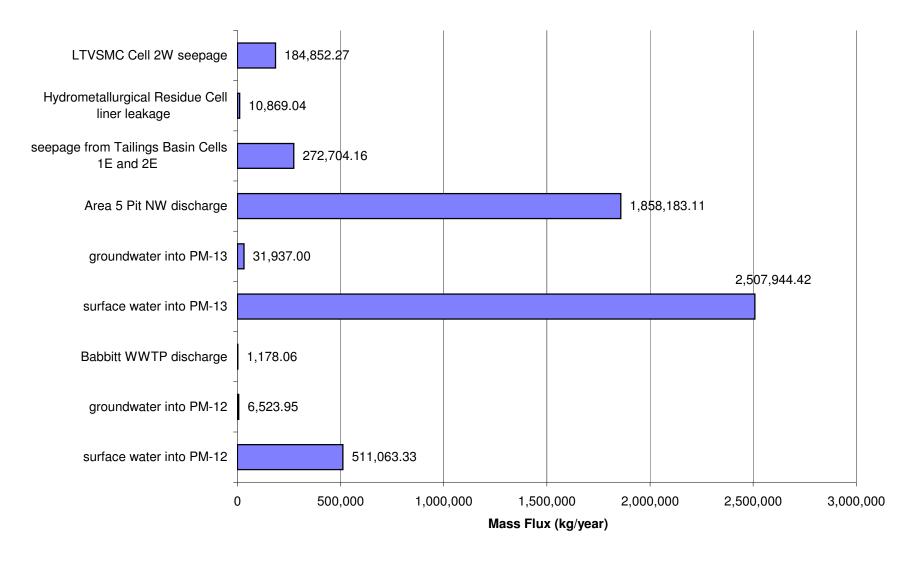
Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Post - Closure for Average Flow for Sulfate (SO₄)



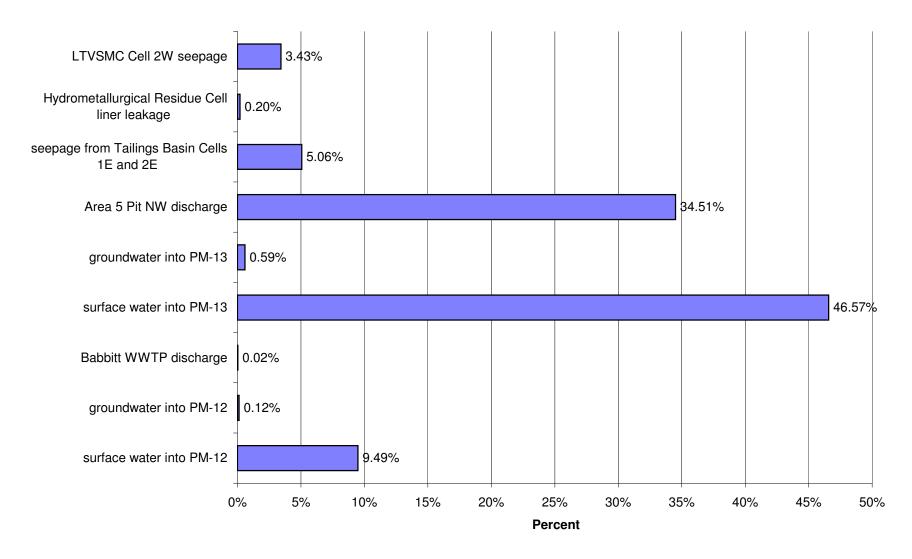
Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for Average Flow for Sulfate (SO₄)



Geotechnical Mitigation: Mass Flux (kg/year) of Impacts at PM-13 in Post - Closure for High Flow for Sulfate (SO₄)



Geotechnical Mitigation: Percent of Impacts at PM-13 in Post - Closure for High Flow for Sulfate (SO₄)



Appendix I

Calibration of Mass-Balance Model for Existing LTVSMC Tailings Basin Seepage Rate in the Embarrass River Watershed

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Calcium: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0 cfs surface water flow into PM-12 Q s12 = 0.00 (cfs) surface water flow into PM-13 Q s13 =0.00 (cfs) Q_sBab = 0.33 (cfs) Babbitt WWTP discharge Area 5 Pit NW discharge 0.00 (cfs) Q spit = LTVSMC Tailings Basin seepage Q fs =1.90 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 13 (mg/l) concentration of surface water into PM-13 $C_s13 =$ 13 (mg/l) Concentration concentration of WWTP discharge C sBab = 13 (mg/l) concentration of Area 5 Pit NW discharge C_spit = 95.4 (mg/l) concentration of LTVSMC Tailings Basin seepage $C_fs =$ 59.78 (mg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 0 19 (mg/l) concentration of ground water flow into PM-12 $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 19 (mg/l) Balance 1.51 (cfs) flow in river at PM-12 Q_r12 = flow in river at PM-13 Q r13 = 7.30 (cfs) flow check 7.30 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =0 (mg/s) mass flux of surface water into PM-13 M s13 =0 (mg/s) 121 (mg/s) mass flux of Babbitt WWTP M sBab = Calculation concentration of Area 5 Pit NW discharge M_spit = 0 (mg/s) concentration of LTVSMC Tailings Basin seepage 3214 (mg/s) M fs =concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) mass flux of ground water into PM-12 $M_{g12} =$ 462 (mg/s) mass flux of ground water into PM-13 M g13 =2264 (mg/s) Balance mass flux in river at PM-12 M r12 =584 (mg/s) mass flux in river at PM-13 $M_r13 =$ 6062 (mg/s) Concentration Calculated concentration in river at PM-12 C r12 = 13.68 (mg/l) concentration in river at PM-13 29.34 (mg/l) $C_r13 =$ Concentration

Observed concentration in river at PM-12 for flows at PM-13 of < 10 cfs

Observed concentration in river at PM-13 for flows < 10 cfs

18.80

(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Calcium: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0.26 cfs surface water flow into PM-12 Q s12 = 0.00 (cfs) surface water flow into PM-13 Q s13 =0.00 (cfs) Q_sBab = 0.33 (cfs) Babbitt WWTP discharge Area 5 Pit NW discharge Q spit = 0.26 (cfs) LTVSMC Tailings Basin seepage Q fs =1.40 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 13 (mg/l) $C_s13 =$ 13 (mg/l) concentration of surface water into PM-13 Concentration concentration of WWTP discharge C sBab = 13 (mg/l) concentration of Area 5 Pit NW discharge C_spit = 95.4 (mg/l) concentration of LTVSMC Tailings Basin seepage $C_fs =$ 59.78 (mg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 0 19 (mg/l) concentration of ground water flow into PM-12 $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 19 (mg/l) Balance 1.47 (cfs) flow in river at PM-12 Q_r12 = flow in river at PM-13 Q r13 = 7.06 (cfs) flow check 7.06 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =0 (mg/s) mass flux of surface water into PM-13 M s13 =0 (mg/s) mass flux of Babbitt WWTP M sBab = 121 (mg/s) Calculation concentration of Area 5 Pit NW discharge M_spit = 702 (mg/s) concentration of LTVSMC Tailings Basin seepage M fs =2368 (mg/s) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) $M_g12 =$ mass flux of ground water into PM-12 462 (mg/s) mass flux of ground water into PM-13 M g13 =2264 (mg/s) Balance mass flux in river at PM-12 M r12 =584 (mg/s) mass flux in river at PM-13 $M_r13 =$ 5918 (mg/s) Concentration Calculated concentration in river at PM-12 C r12 = 14.06 (mg/l) concentration in river at PM-13 29.62 (mg/l) $C_r13 =$ Concentration

Observed concentration in river at PM-12 for flows at PM-13 of < 10 cfs

Observed concentration in river at PM-13 for flows < 10 cfs

18.80

(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Calcium: Flows at PM-13 = 10 - 20 cfs, Pit 5NW Q = 0 cfs surface water flow into PM-12 Q s12 = 1.22 (cfs) surface water flow into PM-13 Q s13 =5.98 (cfs) Q_sBab = 0.33 (cfs) Babbitt WWTP discharge Area 5 Pit NW discharge 0.00 (cfs) Q spit = LTVSMC Tailings Basin seepage Q fs =3.90 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 13 (mg/l) $C_s13 =$ 13 (mg/l) concentration of surface water into PM-13 Concentration concentration of WWTP discharge C sBab = 13 (mg/l) concentration of Area 5 Pit NW discharge C_spit = 95.4 (mg/l) concentration of LTVSMC Tailings Basin seepage $C_fs =$ 59.78 (mg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 0 19 (mg/l) concentration of ground water flow into PM-12 $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 19 (mg/l) Balance flow in river at PM-12 Q_r12 = 3.06 (cfs) flow in river at PM-13 Q r13 = 16.50 (cfs) flow check 16.50 (cfs) Q_ck = mass flux of surface water into PM-12 450 (mg/s) M s12 =mass flux of surface water into PM-13 M s13 =2199 (mg/s) mass flux of Babbitt WWTP M sBab = 121 (mg/s) Calculation concentration of Area 5 Pit NW discharge M_spit = 0 (mg/s) concentration of LTVSMC Tailings Basin seepage M fs =6598 (mg/s) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) $M_g12 =$ 462 (mg/s) mass flux of ground water into PM-12 mass flux of ground water into PM-13 M g13 =2264 (mg/s) Balance mass flux in river at PM-12 M r12 =1034 (mg/s) mass flux in river at PM-13 $M_r13 =$ 12094 (mg/s) Concentration Calculated concentration in river at PM-12 C r12 = 11.93 (mg/l) concentration in river at PM-13 25.90 (mg/l) $C_r13 =$ Concentration

Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs

Observed concentration in river at PM-13 for flows of 10-20 cfs

15.65

24.03

(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Calcium: Flows at PM-13 = 10 - 20 cfs, Pit 5NW Q = 0.26 cfs

Parameter.	Odicium. 1 10w3 at 1 101-10 = 10 - 20 ci3, 1 it 5144	<u> </u>		
	lauriface wester flow into DM 10	IO -10	1.00	(afa)
æ	surface water flow into PM-12 surface water flow into PM-13	Q_s12 = Q s13 =	1.26 6.18	
Data	Babbitt WWTP discharge	Q_s13 = Q_sBab =	0.18	
	Area 5 Pit NW discharge	Q_spit =	0.33	
<u>8</u>	LTVSMC Tailings Basin seepage	Q_fs =	3.40	
Щ	Hydrometallurgical Residue Cells Liner Leakage	Q rrs =	0.00	
nput Flow	ground water flow into PM-12	Q g12 =	0.86	
드	ground water flow into PM-13	Q_g13 =	4.21	(cfs)
ď	concentration of surface water into PM-12	C_s12 =	13	(mg/l)
Data	concentration of surface water into PM-13	C_s13 =		(mg/l)
lon	concentration of WWTP discharge	C_sBab =	13	(mg/l)
trati	concentration of Area 5 Pit NW discharge	C_spit =	95.4	(mg/l)
ë	concentration of LTVSMC Tailings Basin seepage	C_fs =	59.78	(mg/l)
ono	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	19	(mg/l)
ld u	concentration of ground water flow into PM-13	C_g13 =	19	(mg/l)
	· · · · · · · · · · · · · · · · · · ·			. 5 /
Ø	flow in river at PM-12	Q_r12 =	3.06	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	16.50	
8al	flow check	Q_ck =	16.50	
	IIIOW CHECK	Q_CK =	10.50	(015)
	mass flux of surface water into PM-12	M s12 =	165	(mg/s)
	mass flux of surface water into PM-12	M_s13 =		(mg/s)
	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
Ę	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
Calculation of Mass Flux	concentration of LTVSMC Tailings Basin seepage	M fs =		(mg/s)
elu S F	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(mg/s)
Calcul Mass	mass flux of ground water into PM-12	M_g12 =		(mg/s)
ΰ∑	mass flux of ground water into PM-13	M_g13 =	2264	(mg/s)
e O	mass flux in river at PM-12	M r12 =	1049	(mg/s)
ss and	THE STATE OF THE S	1 12 -	1043	,g, 3)
Mass Balance	mass flux in river at PM-13	M_r13 =	12039	(mg/s)
		. –		,
n				
d d Stic				
te.	concentration in river at PM-12	C_r12 =	12.10	(mg/l)
uls				
Calculated Concentration		<u></u>		,
00	concentration in river at PM-13	C_r13 =	25.78	(mg/l)
tion				
ed tra	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	15.65	(mg/l)
en:				· 5 /
Observed Concentration				
ŌŎ	Observed concentration in river at PM-13 for flows of 10-20 cfs		24.03	(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Chloride: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0 cfs surface water flow into PM-12 Q s12 = 0.00 (cfs) surface water flow into PM-13 Q s13 =0.00 (cfs) Q_sBab = 0.33 (cfs) Babbitt WWTP discharge Area 5 Pit NW discharge 0.00 (cfs) Q spit = LTVSMC Tailings Basin seepage Q fs =4.00 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 10 (mg/l) concentration of surface water into PM-13 $C_s13 =$ 10 (mg/l) Concentration 10 (mg/l) concentration of WWTP discharge C sBab = concentration of Area 5 Pit NW discharge C_spit = 5.95 (mg/l) concentration of LTVSMC Tailings Basin seepage $C_fs =$ 21.54 (mg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 0 1.8 (mg/l) concentration of ground water flow into PM-12 $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 1.8 (mg/l) Balance 1.86 (cfs) flow in river at PM-12 Q_r12 = flow in river at PM-13 Q r13 = 9.40 (cfs) flow check 9.40 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =0 (mg/s) mass flux of surface water into PM-13 M s13 =0 (mg/s) 93 (mg/s) mass flux of Babbitt WWTP M sBab = Calculation concentration of Area 5 Pit NW discharge M_spit = 0 (mg/s) concentration of LTVSMC Tailings Basin seepage M fs =2438 (mg/s) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) 44 (mg/s) mass flux of ground water into PM-12 $M_{g12} =$ mass flux of ground water into PM-13 M g13 =214 (mg/s) Balance mass flux in river at PM-12 M r12 =137 (mg/s) 2790 (mg/s) mass flux in river at PM-13 $M_r13 =$ Concentration Calculated concentration in river at PM-12 C r12 = 2.60 (mg/l) concentration in river at PM-13 10.49 (mg/l) $C_r13 =$

Observed concentration in river at PM-12 for flows at PM-13 of < 10 cfs

Observed concentration in river at PM-13 for flows < 10 cfs

5.33

(mg/l)

(mg/l)

Concentration

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Chloride: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0.26 cfs surface water flow into PM-12 Q s12 =0.00 (cfs) surface water flow into PM-13 Q s13 =0.00 (cfs) 0.33 (cfs) Babbitt WWTP discharge Q sBab = 0.26 (cfs) Area 5 Pit NW discharge Q spit = LTVSMC Tailings Basin seepage Q fs =3.90 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q_g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 10 (mg/l) Input Concentration Data concentration of surface water into PM-13 $C_s13 =$ 10 (mg/l) concentration of WWTP discharge 10 (mg/l) C sBab = concentration of Area 5 Pit NW discharge C_spit = 5.95 (mg/l) concentration of LTVSMC Tailings Basin seepage $C_fs =$ 21.54 (mg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage C_<u>rrs =</u> 0 1.8 (mg/l) concentration of ground water flow into PM-12 $C_g12 =$

	flow in river at PM-12	Q_r12 =	1.89	(cfs)
⋋⋵	flow in river at PM-13	Q_r13 =	9.56	(cfs)
	flow check	Q ck =	9.56	(cfs)

 $C_g13 =$

1.8 (mg/l)

concentration of ground water flow into PM-13

		mass flux of surface water into PM-12	M_s12 =	0 (mg/s)
	Jo	mass flux of surface water into PM-13	M_s13 =	0 (mg/s)
		mass flux of Babbitt WWTP	M_sBab =	93 (mg/s)
	E ×	concentration of Area 5 Pit NW discharge	M_spit =	44 (mg/s)
	<u></u> <u></u>	concentration of LTVSMC Tailings Basin seepage	M_fs =	2377 (mg/s)
		concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =	0 (mg/s)
		mass flux of ground water into PM-12 mass flux of ground water into PM-13	M_g12 =	44 (mg/s)
	ΰ≥	mass flux of ground water into PM-13	$M_g13 =$	214 (mg/s)

	mass flux in river at PM-12	M_r12 =	137 (mg/s)
Mass Balan	mass flux in river at PM-13	M_r13 =	2773 (mg/s)

d ation				
ated	concentration in river at PM-12	C_r12 =	2.57	(mg/l)
e e				
필일				
S S	concentration in river at PM-13	C_r13 =	10.25	(mg/l)

ed tration	Observed concentration in river at PM-12 for flows at PM-13 of < 10 cfs	5.33	(mg/l)
Observ	Observed concentration in river at PM-13 for flows < 10 cfs	10.30	(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Chloride: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0 cfs surface water flow into PM-12 Q s12 = 1.63 (cfs) surface water flow into PM-13 Q s13 =7.97 (cfs) Q_sBab = 0.33 (cfs) Babbitt WWTP discharge Area 5 Pit NW discharge 0.00 (cfs) Q spit = LTVSMC Tailings Basin seepage Q fs =1.00 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 10 (mg/l) $C_s13 =$ 10 (mg/l) concentration of surface water into PM-13 Concentration 10 (mg/l) concentration of WWTP discharge C sBab = concentration of Area 5 Pit NW discharge C_spit = 5.95 (mg/l) concentration of LTVSMC Tailings Basin seepage $C_fs =$ 21.54 (mg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 0 1.8 (mg/l) concentration of ground water flow into PM-12 $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 1.8 (mg/l) Balance flow in river at PM-12 Q_r12 = 2.98 (cfs) flow in river at PM-13 Q r13 = 16.00 (cfs) flow check 16.00 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =462 (mg/s) mass flux of surface water into PM-13 M s13 =2255 (mg/s) mass flux of Babbitt WWTP M sBab = 93 (mg/s) Calculation concentration of Area 5 Pit NW discharge M_spit = 0 (mg/s) concentration of LTVSMC Tailings Basin seepage M fs =610 (mg/s) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) 44 (mg/s) mass flux of ground water into PM-12 $M_{g12} =$ mass flux of ground water into PM-13 M g13 =214 (mg/s) Balance mass flux in river at PM-12 M r12 =599 (mg/s) mass flux in river at PM-13 $M_r13 =$ 3678 (mg/s) Concentration Calculated concentration in river at PM-12 C r12 = 7.11 (mg/l) concentration in river at PM-13 8.12 (mg/l) $C_r13 =$ Concentration

Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs

Observed concentration in river at PM-13 for flows of 10-20 cfs

5.23

5.27

(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Chloride: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0.26 cfs

Parameter:	Chiloride. Flows at Fivi-13 of 10-20 cfs, Fit Siviv	Q = 0.200	112	
	Learning and the state DNA 40	0 -10	4.50	(-f-)
ď	surface water flow into PM-12 surface water flow into PM-13	Q_s12 = Q_s13 =	1.59 7.75	
Data	Babbitt WWTP discharge	Q_s13 = Q_sBab =	0.33	
0	Area 5 Pit NW discharge	Q_sbab = Q spit =	0.33	
Flow	LTVSMC Tailings Basin seepage	Q_fs =	1.00	
正	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
Input F	ground water flow into PM-12	Q_g12 =	0.86	
Ξ	ground water flow into PM-13	Q_g13 =	4.21	
æ	concentration of surface water into PM-12	C_s12 =	10	(mg/l)
Data	concentration of surface water into PM-13	C_s13 =	10	(mg/l)
on	concentration of WWTP discharge	C_sBab =	10	(mg/l)
trati	concentration of Area 5 Pit NW discharge	C_spit =	5.95	(mg/l)
ënt	concentration of LTVSMC Tailings Basin seepage	C_fs =	21.54	(mg/l)
Concentration	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
S t	concentration of ground water flow into PM-12	C_g12 =	1.8	(mg/l)
Input	concentration of ground water flow into PM-13	C_g13 =	1.8	(mg/l)
9	flow in river at PM-12	Q_r12 =	2.98	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	16.00	(cfs)
W. Ba	flow check	Q_ck =	16.00	(cfs)
	mass flux of surface water into PM-12	M_s12 =		(mg/s)
<u>_</u>	mass flux of surface water into PM-13	M_s13 =		(mg/s)
0 [mass flux of Babbitt WWTP	M_sBab =		(mg/s)
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage	M_spit = M_fs =		(mg/s)
교필	concentration of Hydrometallurgical Residue Cells Liner Leakage	M rrs =		(mg/s) (mg/s)
lor Iss	mass flux of ground water into PM-12	M_g12 =		(mg/s)
Calcul Mass	mass flux of ground water into PM-13	M_g13 =		(mg/s)
	· · ·		<u> </u>	· • · · ·
(h)				
lass alance	mass flux in river at PM-12	M_r12 =	587	(mg/s)
Mass Balan	mass flux in river at PM-13	M r12	2640	(mg/s)
Z Ш	ווומסס וועג ווו וועפו מו דועורוס	M_r13 =	3048	(111g/S)
Calculated Concentration				
tra	concentration in river at PM-12	C r12 =	6.96	(mg/l)
Calculated Concentral		_		. 5 /
alc.				
ပိပိ	concentration in river at PM-13	C_r13 =	8.06	(mg/l)
on				
ا atji	Observed season testing in the season DM 40 (settle	00 -1-	F 00	(/l)
vec	Observed concentration in river at PM-12 for flows at PM-13 of 10-	ZU CIS	5.23	(mg/l)
Observed Concentration				
9 0 0	Observed concentration in river at PM-13 for flows of 10-20 cfs		5.27	(mg/l)
				, J /

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Copper: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0 cfs surface water flow into PM-12 Q s12 = 0.00 (cfs) surface water flow into PM-13 Q s13 =0.00 (cfs) 0.33 (cfs) Babbitt WWTP discharge Q sBab = Area 5 Pit NW discharge 0.00 (cfs) Q spit = LTVSMC Tailings Basin seepage Q fs =0.00 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q_g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 1.5 (µg/l) Input Concentration Data concentration of surface water into PM-13 $C_s13 =$ 1.5 (µg/l) concentration of WWTP discharge C_sBab = 1.5 (µg/l) concentration of Area 5 Pit NW discharge 3.5 (µg/l) C_spit = concentration of LTVSMC Tailings Basin seepage $C_fs =$ 4.55 (µg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 0 concentration of ground water flow into PM-12 $C_g12 =$ 4 (µg/l) concentration of ground water flow into PM-13 $C_g13 =$ 4 (µg/l) Balance 1.19 (cfs) flow in river at PM-12 Q_r12 = flow in river at PM-13 Q r13 = 5.40 (cfs) flow check 5.40 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =0 (µg/s) mass flux of surface water into PM-13 M s13 = $0 (\mu g/s)$ mass flux of Babbitt WWTP M sBab = 14 (µg/s) Calculation concentration of Area 5 Pit NW discharge M_spit = $0 (\mu g/s)$ concentration of LTVSMC Tailings Basin seepage M fs = $0 (\mu g/s)$ concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = $0 (\mu g/s)$ $M_g12 =$ mass flux of ground water into PM-12 97 (μg/s) mass flux of ground water into PM-13 M g13 =477 (µg/s) Balance mass flux in river at PM-12 M r12 =111 (µg/s) mass flux in river at PM-13 $M_r13 =$ 588 (µg/s) Concentration Calculated concentration in river at PM-12 C r12 = 3.32 (µg/l) concentration in river at PM-13 3.85 (µg/l) $C_r13 =$

ed ıtration	Observed concentration in river at PM-12 for flows at PM-13 of < 10 cfs	1.19	(µg/l)
Observe	Observed concentration in river at PM-13 for flows < 10 cfs	1.30	(µg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Copper: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0.26 cfs

	2 7 7 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3			
	L. formation the PM 40	10 .40	0.00	(- (-)
	surface water flow into PM-12	Q_s12 =	0.00	
Data	surface water flow into PM-13	Q_s13 =	0.00	
ă	Babbitt WWTP discharge	Q_sBab =	0.33	
nput Flow	Area 5 Pit NW discharge	Q_spit =	0.26	
l 유	LTVSMC Tailings Basin seepage	Q_fs =	0.00	(cts)
=	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
፬	ground water flow into PM-12	Q_g12 =	0.86	
	ground water flow into PM-13	Q_g13 =	4.21	(cfs)
	concentration of surface water into PM-12	C_s12 =	1.5	(µg/l)
Data	concentration of surface water into PM-13	C_s13 =		(µg/l)
	concentration of WWTP discharge	C_sBab =		(µg/l)
ratic	concentration of Area 5 Pit NW discharge	C_spit =		(µg/l)
ent	concentration of LTVSMC Tailings Basin seepage	C_fs =		(µg/l)
ouc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	`` _ ′
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	4	(µg/l)
ndu	concentration of ground water flow into PM-13	C_g13 =		(µg/l)
	position and ground water now little 1 101-10	<u> </u>	4	(P9")
		1		
. 8	flow in river at PM-12	Q_r12 =	1.23	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	5.66	(cfs)
Ba ≪	flow check	Q ck =	5.66	(cfs)
		~	0.00	(0.0)
	Image flux of curfoce water into DM 10	IM a10	0	(110/0)
	mass flux of surface water into PM-12	M_s12 =		(µg/s)
<u>~</u>	mass flux of surface water into PM-13	M_s13 =		(µg/s)
٥	mass flux of Babbitt WWTP	M_sBab =		(µg/s)
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge	M_spit =		(µg/s)
<u> </u>	concentration of LTVSMC Tailings Basin seepage	M_fs =		(µg/s)
no Ss	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(µg/s)
Calcul Mass	mass flux of ground water into PM-12	M_g12 =		(µg/s)
0 2	mass flux of ground water into PM-13	$M_g13 =$	4//	(µg/s)
d)				
Mass Balance	mass flux in river at PM-12	M_r12 =	111	(µg/s)
Mass Balan				
Me Ba	mass flux in river at PM-13	M r13 =	614	(µg/s)
	•	_		5 /
5				
Calculated Concentration				
ed	concentration in river at PM-12	C r12 =	3 20	(µg/l)
Calculated Concentrat	CONCONTRATION IN TIVE AT LIVE 12	J_112 =	3.20	(µg/1)
<u> </u>				,
00	concentration in river at PM-13	C_r13 =	3.83	(µg/l)
nc				
± i				
ed	Observed concentration in river at PM-12 for flows at PM-13 of < 1	0 cfs	1.19	(µg/l)
je je				
Observed Concentration				
20	Observed concentration in river at PM-13 for flows < 10 cfs		1.30	(µg/l)
0.0	IObserved concentration in river at Pivi-13 for flows < 10 cts		1.00	(µu/ii

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Copper: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0 cfs

	,			
	T () () () () () ()	10 40	4.00	(()
_	surface water flow into PM-12	Q_s12 =	1.89	
ata	surface water flow into PM-13	Q_s13 =	9.21	
ı	Babbitt WWTP discharge	Q_sBab =	0.33	
≥	Area 5 Pit NW discharge	Q_spit =	0.00	
유	LTVSMC Tailings Basin seepage	Q_fs =	0.00	
<u></u>	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
nput Flow Data	ground water flow into PM-12	Q_g12 =	0.86	
<u> </u>	ground water flow into PM-13	Q_g13 =	4.21	(cfs)
_	concentration of surface water into PM-12	C_s12 =	1.5	(µg/l)
Data	concentration of surface water into PM-13	 C_s13 =		(µg/l)
	concentration of WWTP discharge	C_sBab =		(µg/l)
atio	concentration of Area 5 Pit NW discharge	C_spit =		(μg/l)
antr	concentration of Area 3 h NW discharge	C_spit =	1	(μg/l)
nce				
Ö	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	4	(µg/l)
n Zu	concentration of ground water flow into PM-13	C_g13 =	4	(µg/l)
. 8	flow in river at PM-12	Q_r12 =	3.06	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	16.50	(cfs)
Wa Ba	flow check	Q ck =	16.50	(cfs)
		<u> </u>		,
	mass flux of surface water into PM-12	M_s12 =	80	(µg/s)
	mass flux of surface water into PM-13	M_s13 =		(μg/s) (μg/s)
₩	mass flux of Babbitt WWTP	M_sBab =		(μg/s)
<u> </u>	concentration of Area 5 Pit NW discharge	M_spit =		(μg/s)
atior	concentration of LTVSMC Tailings Basin seepage	M_fs =		(μg/s)
屋 正	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(μg/s)
10 SS:	mass flux of ground water into PM-12	M_g12 =		
Calculation of Mass Flux	mass flux of ground water into PM-13	M_g13 =		(μg/s) (μg/s)
0 2	Iniass hax of ground water into I W-15	W_915 =	477	(µg/3)
		1		
O O	mass flux in river at PM-12 mass flux in river at PM-13	M r12 =	191	(µg/s)
Mass Balan		_		\(\frac{1}{2}\)
Ma Ba	Imass flux in river at PM-13	M r13 =	1059	(µg/s)
		1 • -	.000	(FB, C)
		1		
i.i.				
ed	concentration in river at PM-12	C r12 =	2 21	(µg/l)
Calculated Concentration	CONCONTRACION IN TIVEL ALT IVI-12	<u> </u>	۲.۲۱	(μg/1)
3 %				
la S	concentration in river at PM-13	C_r13 =	0.07	(ua/l)
	Concentration in river at Fivi-13	0_113 =	2.21	(µg/l)
_	T			
io				
		20 ofe	2.06	(µg/l)
<u> </u>	Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs			11111111
ved	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 013	2.00	(49/1)
served	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 013	2.00	(µg/1)
Observed Concentration	Observed concentration in river at PM-12 for flows at PM-13 of 10- Observed concentration in river at PM-13 for flows of 10-20 cfs	20 013		(μg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Copper: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0.26 cfs

Parameter:	Copper: Flows at PM-13 of 10-20 cfs, Pit 5NVV	Q = 0.26 CI	S	
	surface water flow into PM-12	Q_s12 =	1.84	
Data	surface water flow into PM-13	Q_s13 =	9.00	
	Babbitt WWTP discharge	Q_sBab =	0.33	
≥	Area 5 Pit NW discharge	Q_spit =	0.26	
은	LTVSMC Tailings Basin seepage	Q_fs =	0.00	
1	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
nput Flow	ground water flow into PM-12	Q_g12 =	0.86	
	ground water flow into PM-13	Q_g13 =	4.21	(cfs)
м	concentration of surface water into PM-12	C_s12 =	1.5	(µg/l)
Data	concentration of surface water into PM-13	C_s13 =	1.5	(µg/l)
	concentration of WWTP discharge	C_sBab =	1.5	(µg/l)
rati	concentration of Area 5 Pit NW discharge	C_spit =	3.5	(µg/l)
ent	concentration of LTVSMC Tailings Basin seepage	C_fs =		(µg/l)
onc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration	concentration of ground water flow into PM-12	 C_g12 =		(µg/l)
ndu	concentration of ground water flow into PM-13	C_g13 =		(µg/l)
_	Position and Around Marier flow little 1 181-13	JO_910 =	4	(P9/1)
0	We the transport DM 40	0.40	0.00	(-f-)
Water Balance	flow in river at PM-12	Q_r12 =	3.06	
Water Baland	flow in river at PM-13	Q_r13 =	16.50	(cfs)
§ ≪	flow check	Q_ck =	16.50	(cfs)
	mass flux of surface water into PM-12	M_s12 =	78	(µg/s)
	mass flux of surface water into PM-13	M_s13 =		(µg/s)
of	mass flux of Babbitt WWTP	M_sBab =		(µg/s)
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge	M_spit =		(µg/s)
atior Flux	concentration of LTVSMC Tailings Basin seepage	M fs =		(µg/s)
음	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(µg/s)
388	mass flux of ground water into PM-12	M_g12 =	97	(µg/s)
Calcul Mass	mass flux of ground water into PM-13	M_g13 =	477	(µg/s)
	·	<u> </u>		/
fass alance	mass flux in river at PM-12	M_r12 =	190	(µg/s)
lass alan				
B K	mass flux in river at PM-13	M_r13 =	1074	(µg/s)
'n				
는 Figure 1				
tec	concentration in river at PM-12	C_r12 =	2.19	(µg/l)
Jla en				
Calculated Concentration				
ပိပိ	concentration in river at PM-13	C_r13 =	2.30	(µg/l)
nc				
a a a a a a a a a a a a a a a a a a a				
ntr.	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	2.06	(µg/l)
en				
Observed Concentration			4.00	, ,,,
00	Observed concentration in river at PM-13 for flows of 10-20 cfs		1.88	(µg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Fluoride: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0 cfs surface water flow into PM-12 Q s12 = 0.00 (cfs) surface water flow into PM-13 Q s13 =0.00 (cfs) 0.33 (cfs) Babbitt WWTP discharge Q sBab = Area 5 Pit NW discharge 0.00 (cfs) Q spit = LTVSMC Tailings Basin seepage Q fs =1.70 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 0.2 (mg/l) concentration of surface water into PM-13 $C_s13 =$ 0.2 (mg/l) Concentration concentration of WWTP discharge C_sBab = 0.2 (mg/l) concentration of Area 5 Pit NW discharge 0.125 (mg/l) C_spit = concentration of LTVSMC Tailings Basin seepage $C_fs =$ 1.55 (mg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 0 concentration of ground water flow into PM-12 0.385 (mg/l) $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 0.385 (mg/l) Balance 1.47 (cfs) flow in river at PM-12 Q_r12 = flow in river at PM-13 Q r13 = 7.10 (cfs) flow check 7.10 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =0 (mg/s) mass flux of surface water into PM-13 M s13 =0 (mg/s) mass flux of Babbitt WWTP M sBab = 2 (mg/s) Calculation concentration of Area 5 Pit NW discharge M_spit = 0 (mg/s) concentration of LTVSMC Tailings Basin seepage M fs =75 (mg/s) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) mass flux of ground water into PM-12 $M_{g12} =$ 9 (mg/s) mass flux of ground water into PM-13 M g13 =46 (mg/s) Balance mass flux in river at PM-12 M r12 =11 (mg/s) mass flux in river at PM-13 $M_r13 =$ 132 (mg/s) Concentration Calculated concentration in river at PM-12 C r12 = 0.27 (mg/l) concentration in river at PM-13 0.66 (mg/l) $C_r13 =$ Concentration Observed concentration in river at PM-12 for flows at PM-13 of < 10 cfs 0.17 (mg/l)

Observed concentration in river at PM-13 for flows < 10 cfs

0.63

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Fluoride: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0.26 cfs surface water flow into PM-12 Q s12 = 0.00 (cfs) surface water flow into PM-13 Q s13 =0.00 (cfs) Q_sBab = 0.33 (cfs) Babbitt WWTP discharge Area 5 Pit NW discharge Q spit = 0.26 (cfs) LTVSMC Tailings Basin seepage Q fs =1.70 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 0.2 (mg/l) concentration of surface water into PM-13 $C_s13 =$ 0.2 (mg/l) Concentration concentration of WWTP discharge C_sBab = 0.2 (mg/l) concentration of Area 5 Pit NW discharge 0.125 (mg/l) C_spit = concentration of LTVSMC Tailings Basin seepage $C_fs =$ 1.55 (mg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 0 concentration of ground water flow into PM-12 0.385 (mg/l) $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 0.385 (mg/l) Balance 1.52 (cfs) flow in river at PM-12 Q_r12 = flow in river at PM-13 Q r13 = 7.36 (cfs) flow check 7.36 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =0 (mg/s) mass flux of surface water into PM-13 M s13 =0 (mg/s) 2 (mg/s) mass flux of Babbitt WWTP M sBab = Calculation concentration of Area 5 Pit NW discharge M_spit = (mg/s) concentration of LTVSMC Tailings Basin seepage M fs =(mg/s) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) mass flux of ground water into PM-12 $M_{g12} =$ 9 (mg/s) mass flux of ground water into PM-13 M g13 =46 (mg/s) Balance mass flux in river at PM-12 M r12 =11 (mg/s) mass flux in river at PM-13 $M_r13 =$ 133 (mg/s) Concentration Calculated concentration in river at PM-12 C r12 = 0.26 (mg/l) concentration in river at PM-13 0.64 (mg/l) $C_r13 =$ Concentration Observed concentration in river at PM-12 for flows at PM-13 of < 10 cfs 0.17 (mg/l)

Observed concentration in river at PM-13 for flows < 10 cfs

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Fluoride: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0 cfs surface water flow into PM-12 Q s12 = 0.87 (cfs) surface water flow into PM-13 Q s13 =4.23 (cfs) Q_sBab = 0.33 (cfs) Babbitt WWTP discharge Area 5 Pit NW discharge 0.00 (cfs) Q spit = LTVSMC Tailings Basin seepage Q fs =6.00 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 0.2 (mg/l) $C_s13 =$ 0.2 (mg/l) concentration of surface water into PM-13 Concentration concentration of WWTP discharge C sBab = 0.2 (mg/l) concentration of Area 5 Pit NW discharge 0.125 (mg/l) C_spit = concentration of LTVSMC Tailings Basin seepage $C_fs =$ 1.55 (mg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 0 concentration of ground water flow into PM-12 0.385 (mg/l) $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 0.385 (mg/l) Balance flow in river at PM-12 Q_r12 = 3.06 (cfs) flow in river at PM-13 Q r13 = 16.50 (cfs) flow check 16.50 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =5 (mg/s) mass flux of surface water into PM-13 M s13 =24 (mg/s) mass flux of Babbitt WWTP M sBab = 2 (mg/s) Calculation concentration of Area 5 Pit NW discharge M_spit = 0 (mg/s) concentration of LTVSMC Tailings Basin seepage M fs =263 (mg/s) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) mass flux of ground water into PM-12 $M_{g12} =$ 9 (mg/s) mass flux of ground water into PM-13 M g13 =46 (mg/s) Balance mass flux in river at PM-12 M r12 =16 (mg/s) mass flux in river at PM-13 $M_r13 =$ 349 (mg/s) Concentration Calculated concentration in river at PM-12 C r12 = 0.19 (mg/l) concentration in river at PM-13 0.75 (mg/l) $C_r13 =$ Concentration Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 0.11 (mg/l)

Observed concentration in river at PM-13 for flows of 10-20 cfs

0.76

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Fluoride: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0.26 cfs surface water flow into PM-12 Q s12 = 0.82 (cfs) surface water flow into PM-13 Q s13 =4.02 (cfs) Q_sBab = 0.33 (cfs) Babbitt WWTP discharge Area 5 Pit NW discharge Q spit = 0.26 (cfs) LTVSMC Tailings Basin seepage Q fs =6.00 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 0.2 (mg/l) $C_s13 =$ 0.2 (mg/l) concentration of surface water into PM-13 Concentration concentration of WWTP discharge C sBab = 0.2 (mg/l) concentration of Area 5 Pit NW discharge 0.125 (mg/l) C_spit = concentration of LTVSMC Tailings Basin seepage $C_fs =$ 1.55 (mg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 0 0.385 (mg/l) concentration of ground water flow into PM-12 $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 0.385 (mg/l) Balance flow in river at PM-12 Q_r12 = 3.06 (cfs) flow in river at PM-13 Q r13 = 16.50 (cfs) flow check 16.50 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =5 (mg/s) mass flux of surface water into PM-13 M s13 =23 (mg/s) mass flux of Babbitt WWTP M sBab = 2 (mg/s) Calculation concentration of Area 5 Pit NW discharge M_spit = (mg/s) concentration of LTVSMC Tailings Basin seepage M fs =263 (mg/s) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) mass flux of ground water into PM-12 $M_{g12} =$ 9 (mg/s) mass flux of ground water into PM-13 M g13 =46 (mg/s) Balance mass flux in river at PM-12 M r12 =16 (mg/s) mass flux in river at PM-13 $M_r13 =$ 349 (mg/s) Concentration Calculated concentration in river at PM-12 C r12 = 0.18 (mg/l) concentration in river at PM-13 0.75 (mg/l) $C_r13 =$ Concentration Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 0.11 (mg/l)

Observed concentration in river at PM-13 for flows of 10-20 cfs

0.76

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Iron: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0 cfs

	,			
	surface water flow into PM-12	Q s12 =	0.00	(ofc)
ď	surface water flow into PM-13	Q_s12 = Q_s13 =	0.00	
Data	Babbitt WWTP discharge	Q_s13 = Q_sBab =	0.00	
	Area 5 Pit NW discharge	Q_spit =	0.00	
á	LTVSMC Tailings Basin seepage	Q_fs =	2.80	
正	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	(cfs)
nput Flow	ground water flow into PM-12	Q_g12 =	0.86	
<u> </u>	ground water flow into PM-13	Q g13 =	4.21	
	10			,
	concentration of surface water into PM-12	C_s12 =	2.0	(mg/l)
Data				
	concentration of surface water into PM-13	C_s13 =		(mg/l)
tior	concentration of WWTP discharge	C_sBab =		(mg/l)
ıtra	concentration of Area 5 Pit NW discharge	C_spit =	0.038	
cer	concentration of LTVSMC Tailings Basin seepage	C_fs =	4.594	(mg/l)
no	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	0.035	(mg/l)
<u>d</u>	concentration of ground water flow into PM-13	C_g13 =	0.035	(mg/l)
ø	flow in river at PM-12	Q r12 =	1.66	(cfs)
Water Balance	flow in river at PM-13	 Q_r13 =	8.20	
Na 3al	flow check	Q ck =	8.20	
	now check	Q_CIV =	0.20	(013)
	Image flux of ourface water into DM 10	IM a10	0	(ma/a)
	mass flux of surface water into PM-12 mass flux of surface water into PM-13	M_s12 = M s13 =		(mg/s) (mg/s)
/	mass flux of Surface water into PM-13	M sBab =		(mg/s)
	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
Calculation of Mass Flux	concentration of Area of it it was discharge	M_fs =		(mg/s)
를 또	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(mg/s)
llci ass	mass flux of ground water into PM-12	M_g12 =		(mg/s)
Calcul Mass	mass flux of ground water into PM-13	M g13 =		(mg/s)
		<u>. —-</u>		,
Mass Balance	mass flux in river at PM-12	M_r12 =	28	(mg/s)
Mass Balan				
∑ ä	mass flux in river at PM-13	M_r13 =	396	(mg/s)
nc				
atic d				
ate.	concentration in river at PM-12	C_r12 =	0.59	(mg/l)
ule Ser				
Calculated Concentration				
ΟÖ	concentration in river at PM-13	C_r13 =	1.71	(mg/l)
no				
ا ati	Observed concentration in the state of DM 40 (c. (i) and DM 40 (c. 4)	O ofo	0.44	(ma = /I)
ver ver	Observed concentration in river at PM-12 for flows at PM-13 of < 1	U CIS	2.41	(mg/l)
er ce				
· · · · · ·	•			
Observed Concentration	Observed concentration in river at PM-13 for flows < 10 cfs		1.52	(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Iron: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0.26 cfs

Parameter:	Iron: Flows at PM-13 < 10 cfs, Pft 5NW $Q = 0.2$	6 CIS		
	surface water flow into PM-12	Q_s12 =	0.00	
Data	surface water flow into PM-13	Q_s13 =	0.00	
	Babbitt WWTP discharge	Q_sBab =	0.33	
≥	Area 5 Pit NW discharge	Q_spit =	0.26	
nput Flow	LTVSMC Tailings Basin seepage	Q_fs =	2.90	
1	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
ਰੂ	ground water flow into PM-12	Q_g12 =	0.86	
	ground water flow into PM-13	Q_g13 =	4.21	(cfs)
ď	concentration of surface water into PM-12	C_s12 =	2.9	(mg/l)
Data	concentration of surface water into PM-13	C_s13 =	2.9	(mg/l)
	concentration of WWTP discharge	C_sBab =	2.9	(mg/l)
rati	concentration of Area 5 Pit NW discharge	C_spit =	0.038	(mg/l)
ent	concentration of LTVSMC Tailings Basin seepage	C_fs =	4.594	
nce	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
ပိ				
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	0.035	(mg/l)
<u> </u>	concentration of ground water flow into PM-13	C_g13 =	0.035	(mg/l)
9	flow in river at PM-12	Q_r12 =	1.72	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	8.56	(cfs)
Na 3al	flow check	Q ck =	8.56	
	now check	Q_CK =	0.50	(013)
	(IV 40		(()
	mass flux of surface water into PM-12	M_s12 =		(mg/s)
4—	mass flux of surface water into PM-13	M_s13 =		(mg/s)
٥	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
atior Flux	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
<u> </u>	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
ss Ss	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(mg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12	M_g12 = M_g13 =		(mg/s) (mg/s)
02	mass flux of ground water into PM-13	M_g13 =	4	(mg/s)
	T			
e O	mass flux in river at PM-12	M r12 =	28	(mg/s)
lass alance	THE OTHER PROPERTY OF THE PERSON OF THE PERS		20	\g/3)
Mag Bal	mass flux in river at PM-13	M_r13 =	400	(mg/s)
2 11	Jungoo nan iii iivor act ivi 10	IVI_I 10 -	403	(111g/3)
_				
io				
ed rat	concentration in river at PM-12	C r12 =	0.57	(mg/l)
late intl	CONCENTIATION III NIVEL AT LINE 12	0_112 =	0.57	(1119/1)
ى 20 ك				
Calculated Concentration	concentration in river at PM-13	C_r13 =	1 60	(mg/l)
	Journalion in river at 1 ivi-13	0_110 =	1.09	(1119/1)
_	T			
ii				
ra d	Observed concentration in river at PM-12 for flows at PM-13 of < 1	0 cfs	2.41	(mg/l)
rve	COSCINGE CONCENTRATION IN TWO ALT WITE IO HOWS ALT WITE OF A	0 013	۲.٦١	\'''9/' <i>)</i>
Observed Concentration				
	•			
පි රි	Observed concentration in river at PM-13 for flows < 10 cfs		1.52	(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Iron: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0 cfs

Surface water flow into PM-12 0, s12 = 1.89 (cfs)	Parameter:	iron: Flows at PM-13 of 10-20 cfs, Pit 5NVV $Q =$	U CIS		
### Surface water flow into PM-13 ### Surface wate					
Babbit WWTP discharge					
Area 5 Pit NW discharge	ata				
CTVSMC Tailings Basin seepage Q. fs = 0.00 (cfs)	ı				
C ST2 = C. ST2 = C. ST2 C. ST3 C. ST	<u> </u>	Area 5 Pit NW discharge			
C ST2 = C. ST2 = C. ST2 C. ST3 C. ST	문				
C ST2 = C. ST2 = C. ST2 C. ST3 C. ST	=				
C ST2 = 2.9 (mg/l)	은				
C S13 = 2.9 (mg/l)	_	Iground water now into PM-13	Q_g13 =	4.21	(CIS)
C S13 = 2.9 (mg/l)			1_		
Concentration of WWTP discharge	id.	concentration of surface water into PM-12	C_s12 =	2.9	(mg/l)
Concentration of WWTP discharge	Dat	concentration of surface water into PM-13	C_s13 =	2.9	(mg/l)
Second S	0. 0.	concentration of WWTP discharge	C_sBab =	2.9	(mg/l)
Second S	trat	concentration of Area 5 Pit NW discharge	C_spit =	0.038	(mg/l)
Second S	Sen	concentration of LTVSMC Tailings Basin seepage	C_fs =	4.594	(mg/l)
Second S	onc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
Second S	S +	concentration of ground water flow into PM-12	C_g12 =	0.035	(mg/l)
State Post	<u>ld</u>	concentration of ground water flow into PM-13	C a13 =	0.035	(ma/l)
The last state of surface water into PM-12 The last state of surface water into PM-12 The last state of surface water into PM-13 The last state of s	_	10000000000000000000000000000000000000	9.0	0.000	(***9,**)
The part	Φ	flow in river at PM-12	O r12 =	3.06	(cfs)
mass flux of surface water into PM-12 M_s12 = 155 (mg/s)	ter				
M_s12 = 155 (mg/s)	Vat Sale		1 _		
Mass flux of Surface water into PM-13 M_sBab = 27 (mg/s)	<u></u> > ш	TIOW Check	Q_ck =	16.50	(CIS)
Mass flux of Surface water into PM-13 M_sBab = 27 (mg/s)					
M_sBab = 27 (mg/s)					
concentration of Area 5 Pit NW discharge	-				
mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12 concentration in river at PM-13 C_r12 = 2.11 (mg/l) concentration in river at PM-13 C_r13 = 2.02 (mg/l) Description Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 3.43 (mg/l)	Ö				
mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12 concentration in river at PM-13 C_r12 = 2.11 (mg/l) concentration in river at PM-13 C_r13 = 2.02 (mg/l) Description Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 3.43 (mg/l)	io X				
mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12 concentration in river at PM-13 C_r12 = 2.11 (mg/l) concentration in river at PM-13 C_r13 = 2.02 (mg/l) Description Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 3.43 (mg/l)	<u> </u>				
mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12 concentration in river at PM-13 C_r12 = 2.11 (mg/l) concentration in river at PM-13 C_r13 = 2.02 (mg/l) Description Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 3.43 (mg/l)	ss				
mass flux in river at PM-12 mass flux in river at PM-13 concentration in river at PM-12 concentration in river at PM-13 C_r12 = 2.11 (mg/l) concentration in river at PM-13 C_r13 = 2.02 (mg/l) Description Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 3.43 (mg/l)	la Sal				
M_r13 = 943 (mg/s) M_r13 = 943 (mg/s) C_r12 = 2.11 (mg/l) C_r13 = 2.02 (mg/l) Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 3.43 (mg/l)	02	Imass hux of ground water into PW-13	M_g13 =	4	(IIIg/S)
M_r13 = 943 (mg/s) M_r13 = 943 (mg/s) C_r12 = 2.11 (mg/l) C_r13 = 2.02 (mg/l) Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 3.43 (mg/l)			Ī		
M_r13 = 943 (mg/s)	Se	mass flux in river at PM-12	M r12 =	183	(mg/s)
M_r13 = 943 (mg/s) M_r13 = 943 (mg/s) C_r12 = 2.11 (mg/l) C_r13 = 2.02 (mg/l) Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 3.43 (mg/l)	ass Ilan		_		, ,
C_r12 = 2.11 (mg/l) Concentration in river at PM-12 C_r13 = 2.02 (mg/l) Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 3.43 (mg/l)	Ma Ba	mass flux in river at PM-13	M_r13 =	943	(mg/s)
Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 3.43 (mg/l)					
Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 3.43 (mg/l)	Ę				
Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 3.43 (mg/l)	t io				
Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 3.43 (mg/l)	tec	concentration in river at PM-12	C_r12 =	2.11	(mg/l)
Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 3.43 (mg/l)	ula				
Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs 3.43 (mg/l)					
Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs Observed concentration in river at PM-13 for flows of 10-20 cfs 1.75 (mg/l)	ΰŏ	concentration in river at PM-13	C_r13 =	2.02	(mg/l)
Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs Observed concentration in river at PM-13 for flows of 10-20 cfs 1.75 (mg/l)					
Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs Observed concentration in river at PM-13 for flows of 10-20 cfs 1.75 (mg/l)	nc				
Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs Observed concentration in river at PM-13 for flows of 10-20 cfs 1.75 (mg/l)					
Observed concentration in river at PM-13 for flows of 10-20 cfs 1.75 (mg/l)	ed	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	3.43	(mg/l)
Observed concentration in river at PM-13 for flows of 10-20 cfs 1.75 (mg/l)	erv				
O O Observed concentration in river at PM-13 for flows of 10-20 cfs 1.75 (mg/l)	bsq ouc				
	00	Observed concentration in river at PM-13 for flows of 10-20 cfs		1.75	(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Iron: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0.26 cfs

raiailletei.	11011. Flows at FIVI-13 OF 10-20 CIS, FIL SINVV Q =	0.20 013		
		To		(()
	surface water flow into PM-12	Q_s12 =	1.84	
Data	surface water flow into PM-13	Q_s13 =	9.00	
ă	Babbitt WWTP discharge	Q_sBab =	0.33	
Flow	Area 5 Pit NW discharge	Q_spit =	0.26	
芷	LTVSMC Tailings Basin seepage	Q_fs =	0.00	
Ħ	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs = Q_g12 =	0.00 0.86	
Input F	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	4.21	
_	Iground water now into 1 M-13	Q_g15 =	4.21	(015)
		0 -10	0.0	(/I)
<u>t</u> a	concentration of surface water into PM-12	C_s12 =	2.9	(mg/l)
Data	concentration of surface water into PM-13	C_s13 =	2.9	(mg/l)
ion	concentration of WWTP discharge	C_sBab =	2.9	(mg/l)
trat	concentration of Area 5 Pit NW discharge	C_spit =	0.038	(mg/l)
cen	concentration of LTVSMC Tailings Basin seepage	C_fs =	4.594	(mg/l)
Concentration	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
rt C	concentration of ground water flow into PM-12	C_g12 =	0.035	(mg/l)
Input	concentration of ground water flow into PM-13	C_g13 =	0.035	(mg/l)
e	flow in river at PM-12	Q_r12 =	3.06	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	16.50	
Wa Bal	flow check	Q ck =	16.50	
	non ones.	<u>a_</u> 0 –	10.00	(0.0)
	mass flux of surface water into PM-12	M_s12 =	151	(ma/c)
	mass flux of surface water into PM-12	M_s13 =		(mg/s) (mg/s)
'-	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
atior Flux	concentration of Area of In TWV disentage	M_fs =		(mg/s)
를 L	concentration of Hydrometallurgical Residue Cells Liner Leakage	M rrs =		(mg/s)
llct ass	mass flux of ground water into PM-12	M_g12 =		(mg/s)
Calcul Mass	mass flux of ground water into PM-13	M_g13 =		(mg/s)
		_9 -		(3 - 7
lass alance	mass flux in river at PM-12	M_r12 =	179	(mg/s)
Mass Balan				
≥ä	mass flux in river at PM-13	M_r13 =	922	(mg/s)
				-
on				
d atic				
ate otra	concentration in river at PM-12	C_r12 =	2.07	(mg/l)
iuls cer				
Calculated Concentration				
00	concentration in river at PM-13	C_r13 =	1.97	(mg/l)
o				
d ati	Observed concentration in vivor at DM 40 for flavor at DM 40 (f.40)	00 ofo	0.40	(ma m /l)
Ve	Observed concentration in river at PM-12 for flows at PM-13 of 10-	ZU CIS	3.43	(mg/l)
ser				
Observed Concentration	Observed concentration in river at PM-13 for flows of 10-20 cfs		1.75	(ma/l)
	Observed Concentration in fiver at Fivi-13 for flows of 10-20 CIS		1.75	(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Magnesium: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0 cfs surface water flow into PM-12 Q s12 = 0.00 (cfs) surface water flow into PM-13 Q s13 =0.00 (cfs) Q_sBab = 0.33 (cfs) Babbitt WWTP discharge Area 5 Pit NW discharge 0.00 (cfs) Q spit = LTVSMC Tailings Basin seepage Q fs =1.80 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 6 (mg/l) concentration of surface water into PM-13 $C_s13 =$ 6 (mg/l) Concentration concentration of WWTP discharge C sBab = 6 (mg/l) concentration of Area 5 Pit NW discharge C_spit = 271 (mg/l) 69.97 (mg/l) concentration of LTVSMC Tailings Basin seepage $C_fs =$ concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 0 concentration of ground water flow into PM-12 10.65 (mg/l) $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 10.65 (mg/l) Balance 1.49 (cfs) flow in river at PM-12 Q_r12 = flow in river at PM-13 Q r13 = 7.20 (cfs) flow check 7.20 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =0 (mg/s) mass flux of surface water into PM-13 M s13 =0 (mg/s) mass flux of Babbitt WWTP M sBab = 56 (mg/s) Calculation concentration of Area 5 Pit NW discharge M_spit = 0 (mg/s) concentration of LTVSMC Tailings Basin seepage M fs =3564 (mg/s) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) mass flux of ground water into PM-12 $M_{g12} =$ 259 (mg/s) mass flux of ground water into PM-13 M g13 =1269 (mg/s) Balance mass flux in river at PM-12 M r12 =315 (mg/s) mass flux in river at PM-13 $M_r13 =$ 5148 (mg/s) Concentration Calculated 7.47 (mg/l) concentration in river at PM-12 C r12 = concentration in river at PM-13 25.27 (mg/l) $C_r13 =$ Concentration Observed concentration in river at PM-12 for flows at PM-13 of < 10 cfs 6.90 (mg/l)

Observed concentration in river at PM-13 for flows < 10 cfs

24.53

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Magnesium: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0.26 cfs surface water flow into PM-12 Q s12 = 0.00 (cfs) surface water flow into PM-13 Q s13 =0.00 (cfs) Q_sBab = 0.33 (cfs) Babbitt WWTP discharge Area 5 Pit NW discharge Q spit = 0.26 (cfs) LTVSMC Tailings Basin seepage Q fs =0.30 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 6 (mg/l) concentration of surface water into PM-13 $C_s13 =$ 6 (mg/l) Concentration concentration of WWTP discharge C sBab = 6 (mg/l) concentration of Area 5 Pit NW discharge C_spit = 271 (mg/l) 69.97 (mg/l) concentration of LTVSMC Tailings Basin seepage $C_fs =$ concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 0 10.65 (mg/l) concentration of ground water flow into PM-12 $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 10.65 (mg/l) Balance flow in river at PM-12 Q_r12 = 1.28 (cfs) flow in river at PM-13 Q r13 = 5.96 (cfs) flow check 5.96 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =0 (mg/s) mass flux of surface water into PM-13 M s13 =0 (mg/s) mass flux of Babbitt WWTP M sBab = 56 (mg/s) Calculation concentration of Area 5 Pit NW discharge M_spit = 1994 (mg/s) concentration of LTVSMC Tailings Basin seepage M fs =594 (mg/s) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) mass flux of ground water into PM-12 $M_{g12} =$ 259 (mg/s) mass flux of ground water into PM-13 M g13 =1269 (mg/s) Balance mass flux in river at PM-12 M r12 =315 (mg/s) mass flux in river at PM-13 $M_r13 =$ 4172 (mg/s) Concentration Calculated concentration in river at PM-12 C r12 = 8.69 (mg/l) concentration in river at PM-13 24.74 (mg/l) $C_r13 =$ Concentration

Observed concentration in river at PM-12 for flows at PM-13 of < 10 cfs

Observed concentration in river at PM-13 for flows < 10 cfs

6.90

24.53

(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Magnesium: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0 cfs surface water flow into PM-12 Q s12 = 1.33 (cfs) surface water flow into PM-13 Q s13 =6.47 (cfs) Q_sBab = 0.33 (cfs) Babbitt WWTP discharge Area 5 Pit NW discharge 0.00 (cfs) Q spit = LTVSMC Tailings Basin seepage Q fs =3.30 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 6 (mg/l) concentration of surface water into PM-13 $C_s13 =$ 6 (mg/l) Concentration concentration of WWTP discharge C sBab = 6 (mg/l) concentration of Area 5 Pit NW discharge C_spit = 271 (mg/l) 69.97 (mg/l) concentration of LTVSMC Tailings Basin seepage $C_fs =$ concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 10.65 (mg/l) concentration of ground water flow into PM-12 $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 10.65 (mg/l) Balance flow in river at PM-12 Q_r12 = 3.06 (cfs) flow in river at PM-13 Q r13 = 16.50 (cfs) flow check 16.50 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =225 (mg/s) mass flux of surface water into PM-13 M s13 =1099 (mg/s) mass flux of Babbitt WWTP M sBab = 56 (mg/s) Calculation concentration of Area 5 Pit NW discharge M_spit = 0 (mg/s) concentration of LTVSMC Tailings Basin seepage M fs =6534 (mg/s) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) mass flux of ground water into PM-12 $M_{g12} =$ 259 (mg/s) mass flux of ground water into PM-13 M g13 =1269 (mg/s) Balance mass flux in river at PM-12 M r12 =540 (mg/s) mass flux in river at PM-13 $M_r13 =$ 9443 (mg/s) Concentration Calculated concentration in river at PM-12 C r12 = 6.23 (mg/l) concentration in river at PM-13 20.22 (mg/l) $C_r13 =$ Concentration

Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs

Observed concentration in river at PM-13 for flows of 10-20 cfs

6.06

(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Magnesium: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0.26 cfs surface water flow into PM-12 Q s12 = 1.47 (cfs) surface water flow into PM-13 Q s13 =7.17 (cfs) 0.33 (cfs) Babbitt WWTP discharge Q sBab = Area 5 Pit NW discharge Q spit = 0.26 (cfs) LTVSMC Tailings Basin seepage Q fs =2.20 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q_g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 6 (mg/l) Concentration Data concentration of surface water into PM-13 $C_s13 =$ 6 (mg/l) concentration of WWTP discharge C sBab = 6 (mg/l) concentration of Area 5 Pit NW discharge C_spit = 271 (mg/l) 69.97 (mg/l) concentration of LTVSMC Tailings Basin seepage $C_fs =$ C rrs = concentration of Hydrometallurgical Residue Cells Liner Leakage 10.65 (mg/l) concentration of ground water flow into PM-12 $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 10.65 (mg/l) Balance flow in river at PM-12 Q_r12 = 3.06 (cfs) flow in river at PM-13 Q r13 = 16.50 (cfs) flow check 16.50 (cfs) Q_ck = 249 (mg/s) mass flux of surface water into PM-12 M s12 =mass flux of surface water into PM-13 M s13 =1218 (mg/s) mass flux of Babbitt WWTP M sBab = 56 (mg/s) Calculation concentration of Area 5 Pit NW discharge M_spit = 1994 (mg/s) concentration of LTVSMC Tailings Basin seepage M fs =4356 (mg/s) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) mass flux of ground water into PM-12 $M_{g12} =$ 259 (mg/s) mass flux of ground water into PM-13 $M_g13 =$ 1269 (mg/s)

Mass Balance	mass flux in river at PM-12	M_r12 =	565	(mg/s)
Ma Ba	mass flux in river at PM-13	M_r13 =	9402	(mg/s)
alculated oncentration	concentration in river at PM-12	C_r12 =	6.51	(mg/l)
Calculated Concentral	concentration in river at PM-13	C_r13 =	20.13	(mg/l)
ation				
Observed Concentration	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	6.06	(mg/l)
Obse	Observed concentration in river at PM-13 for flows of 10-20 cfs		20.33	(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Sodium: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0 cfs surface water flow into PM-12 Q s12 = 0.00 (cfs) surface water flow into PM-13 Q s13 =0.00 (cfs) 0.33 (cfs) Babbitt WWTP discharge Q sBab = Area 5 Pit NW discharge 0.00 (cfs) Q spit = LTVSMC Tailings Basin seepage Q fs =4.20 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 3.5 (mg/l) $C_s13 =$ 3.5 (mg/l) concentration of surface water into PM-13 Concentration concentration of WWTP discharge C sBab = 3.5 (mg/l) concentration of Area 5 Pit NW discharge C_spit = 120 (mg/l) concentration of LTVSMC Tailings Basin seepage $C_fs =$ 44.31 (mg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 0 4.9 (mg/l) concentration of ground water flow into PM-12 $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 4.9 (mg/l) Balance 1.90 (cfs) flow in river at PM-12 Q_r12 = flow in river at PM-13 Q r13 = 9.60 (cfs) flow check 9.60 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =0 (mg/s) mass flux of surface water into PM-13 M s13 =0 (mg/s) 33 (mg/s) mass flux of Babbitt WWTP M sBab = Calculation concentration of Area 5 Pit NW discharge M_spit = 0 (mg/s) concentration of LTVSMC Tailings Basin seepage M fs =5267 (mg/s) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) mass flux of ground water into PM-12 $M_{g12} =$ 119 (mg/s) mass flux of ground water into PM-13 M g13 =584 (mg/s) Balance mass flux in river at PM-12 M r12 =152 (mg/s) mass flux in river at PM-13 $M_r13 =$ 6002 (mg/s) Concentration Calculated concentration in river at PM-12 C r12 = 2.83 (mg/l) concentration in river at PM-13 22.09 (mg/l) $C_r13 =$ Concentration

Observed concentration in river at PM-12 for flows at PM-13 of < 10 cfs

Observed concentration in river at PM-13 for flows < 10 cfs

3.20

22.20

(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Sodium: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0.26 cfs surface water flow into PM-12 Q s12 = 0.00 (cfs) surface water flow into PM-13 Q s13 =0.00 (cfs) 0.33 (cfs) Babbitt WWTP discharge Q sBab = Area 5 Pit NW discharge Q spit = 0.26 (cfs) LTVSMC Tailings Basin seepage Q fs =3.10 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q_g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 3.5 (mg/l) $C_s13 =$ 3.5 (mg/l) concentration of surface water into PM-13 Concentration concentration of WWTP discharge C sBab = 3.5 (mg/l) concentration of Area 5 Pit NW discharge C_spit = 120 (mg/l) concentration of LTVSMC Tailings Basin seepage $C_fs =$ 44.31 (mg/l) C rrs = 0 concentration of Hydrometallurgical Residue Cells Liner Leakage 4.9 (mg/l) concentration of ground water flow into PM-12 $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 4.9 (mg/l) Balance 1.75 (cfs) flow in river at PM-12 Q_r12 = flow in river at PM-13 Q r13 = 8.76 (cfs) flow check 8.76 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =0 (mg/s) mass flux of surface water into PM-13 M s13 =0 (mg/s) mass flux of Babbitt WWTP M sBab = 33 (mg/s) Calculation concentration of Area 5 Pit NW discharge M_spit = 883 (mg/s) concentration of LTVSMC Tailings Basin seepage M fs =3887 (mg/s) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) mass flux of ground water into PM-12 $M_{g12} =$ 119 (mg/s) mass flux of ground water into PM-13 M g13 =584 (mg/s) Balance mass flux in river at PM-12 M r12 =152 (mg/s) mass flux in river at PM-13 $M_r13 =$ 5506 (mg/s) ntration

Calcula	concentration in river at PM-13	C_r13 =	22.21	(mg/l)
ved entration	Observed concentration in river at PM-12 for flows at PM-13 of < 10) cfs	3.20	(mg/l)
Observ	Observed concentration in river at PM-13 for flows < 10 cfs		22.20	(mg/l)

C_r12 =

3.06 (mg/l)

concentration in river at PM-12

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Sodium: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0 cfs surface water flow into PM-12 Q s12 = 1.46 (cfs) surface water flow into PM-13 Q s13 =7.14 (cfs) Q_sBab = 0.33 (cfs) Babbitt WWTP discharge Area 5 Pit NW discharge 0.00 (cfs) Q spit = LTVSMC Tailings Basin seepage Q fs =2.50 (cfs) Hydrometallurgical Residue Cells Liner Leakage Q rrs = 0.00 (cfs) ground water flow into PM-12 Q_g12 = 0.86 (cfs) ground water flow into PM-13 $Q_g13 =$ 4.21 (cfs) concentration of surface water into PM-12 $C_s12 =$ 3.5 (mg/l) concentration of surface water into PM-13 $C_s13 =$ 3.5 (mg/l) Concentration concentration of WWTP discharge C_sBab = 3.5 (mg/l) concentration of Area 5 Pit NW discharge C_spit = 120 (mg/l) concentration of LTVSMC Tailings Basin seepage $C_fs =$ 44.31 (mg/l) concentration of Hydrometallurgical Residue Cells Liner Leakage C rrs = 0 4.9 (mg/l) concentration of ground water flow into PM-12 $C_g12 =$ concentration of ground water flow into PM-13 $C_g13 =$ 4.9 (mg/l) Balance flow in river at PM-12 Q_r12 = 3.06 (cfs) flow in river at PM-13 Q r13 = 16.50 (cfs) flow check 16.50 (cfs) Q_ck = mass flux of surface water into PM-12 M s12 =145 (mg/s) mass flux of surface water into PM-13 M s13 =707 (mg/s) mass flux of Babbitt WWTP M sBab = 33 (mg/s) Calculation concentration of Area 5 Pit NW discharge M_spit = 0 (mg/s) concentration of LTVSMC Tailings Basin seepage M fs =3135 (mg/s) concentration of Hydrometallurgical Residue Cells Liner Leakage M rrs = 0 (mg/s) mass flux of ground water into PM-12 $M_{g12} =$ 119 (mg/s) 584 (mg/s) mass flux of ground water into PM-13 M g13 =Balance mass flux in river at PM-12 M r12 =297 (mg/s) mass flux in river at PM-13 $M_r13 =$ 4723 (mg/s) on

concentration in river at PM-12	C_r12 =	3.42	(mg/l)
once	C_r13 =	10.11	(mg/l)
Observed concentration in river at PM-12 for flows at PM-13 of 10-2	0 cfs	2.70	(mg/l)
Observed concentration in river at PM-12 for flows at PM-13 of 10-2 Observed concentration in river at PM-13 for flows of 10-20 cfs		9.90	(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Sodium: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0.26 cfs

Parameter:	Sodium: Flows at PM-13 of 10-20 cfs, Pit 5NW	Q = 0.26 ct	S	
	surface water flow into PM-12	Q_s12 =	1.54	
Data	surface water flow into PM-13	Q_s13 =	7.50	
ă	Babbitt WWTP discharge	Q_sBab =	0.33	
Š	Area 5 Pit NW discharge	Q_spit =	0.26	
置	LTVSMC Tailings Basin seepage Hydrometallurgical Residue Cells Liner Leakage	Q_fs = Q_rrs =	1.80 0.00	
nput Flow	ground water flow into PM-12	Q_f15 = Q_g12 =	0.86	
gu	ground water flow into PM-13	Q_g12 = Q_g13 =		(cfs)
_	ground water new into t wi to	<u> </u>	7.21	(010)
	concentration of surface water into PM-12	C_s12 =	3.5	(mg/l)
Data	concentration of surface water into PM-13	C_s13 =		(mg/l)
u L	concentration of WWTP discharge	C sBab =		(mg/l)
atic	concentration of Area 5 Pit NW discharge	C_spit =		(mg/l)
entr	concentration of LTVSMC Tailings Basin seepage	C_fs =	44.31	
Duce.	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	(1119/1)
nput Concentration	concentration of ground water flow into PM-12	C_g12 =		(mg/l)
Indi				
	concentration of ground water flow into PM-13	C_g13 =	4.9	(mg/l)
Φ	flow in river at PM-12	Q_r12 =	3.06	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	16.50	
Water Baland	flow check	Q ck =	16.50	` '
·		<u> </u>		,
	mass flux of surface water into PM-12	M s12 =	152	(mg/s)
	mass flux of surface water into PM-13	M_s13 =		(mg/s)
of	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
atior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
Calcul Mass I	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(mg/s)
las ja	mass flux of ground water into PM-12	M_g12 =		(mg/s)
0 2	mass flux of ground water into PM-13	M_g13 =	584	(mg/s)
	T		1	
Se	mass flux in river at PM-12	M_r12 =	304	(mg/s)
lass alance		_		, ,
Ma Ba	mass flux in river at PM-13	M_r13 =	4771	(mg/s)
no				
Calculated Concentration				
ate ntr	concentration in river at PM-12	C_r12 =	3.51	(mg/l)
8 8				
Calculated Concentrat				
00	concentration in river at PM-13	C_r13 =	10.22	(mg/l)
-	Т	-		-
Observed Concentration				
rat E	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	2.70	(mg/l)
Observed	Observed concentration in fiver at 1 W-12 IOI flows at 1 W-13 Of 10-		2.10	\'''9/'I)
sei				
පි ගි	Observed concentration in river at PM-13 for flows of 10-20 cfs		9.90	(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Sulfate: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0 cfs

	,			
	L. formation the PM 40	10 .40	0.00	(- (-)
	surface water flow into PM-12	Q_s12 =	0.00	
ats	surface water flow into PM-13	Q_s13 =	0.00	
	Babbitt WWTP discharge	Q_sBab =	0.33	
_ ≥	Area 5 Pit NW discharge	Q_spit =	0.00	
Ⅰ 문	LTVSMC Tailings Basin seepage	Q_fs =	1.60	
Ħ	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	,
nput Flow Data	ground water flow into PM-12	Q_g12 =	0.86	
_	ground water flow into PM-13	Q_g13 =	4.21	(cfs)
	T	1		
ಹ	concentration of surface water into PM-12	C_s12 =	4	(mg/l)
Data	concentration of surface water into PM-13	C_s13 =	4	(mg/l)
o	concentration of WWTP discharge	C_sBab =	4	(mg/l)
Irati	concentration of Area 5 Pit NW discharge	C_spit =	1046	(mg/l)
ent	concentration of LTVSMC Tailings Basin seepage	C_fs =	152.4	(mg/l)
ouc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	8.5	(mg/l)
ndu	•			
	concentration of ground water flow into PM-13	C_g13 =	8.5	(mg/l)
	Г	1		
Water Balance	flow in river at PM-12	Q_r12 =	1.46	
Water Balan	flow in river at PM-13	Q_r13 =	7.00	(cfs)
ß ≪	flow check	Q_ck =	7.00	(cfs)
	mass flux of surface water into PM-12	M_s12 =	0	(mg/s)
	mass flux of surface water into PM-13	M s13 =		(mg/s)
ð	mass flux of Babbitt WWTP	M sBab =		(mg/s)
5 ×	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
Calculation of Mass Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
l ling	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(mg/s)
Calcul Mass	mass flux of ground water into PM-12	M_g12 =		(mg/s)
ΰΞ	mass flux of ground water into PM-13	$M_g13 =$	1013	(mg/s)
Sce	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 =	244	(mg/s)
Mass Balan				
Ma Ba	mass flux in river at PM-13	M_r13 =	8158	(mg/s)
		-		
_				
_ i≘				
tra	concentration in river at PM-12	C r12 =	5.92	(mg/l)
Calculated Concentration		-		, ,
힐일				
ပို ပိ	concentration in river at PM-13	C_r13 =	41.18	(ma/l)
		1	0	· · · · ' /
i l				
bd tra	Observed concentration in river at PM-12 for flows at PM-13 of < 1	0 cfs	3.06	(mg/l)
Observed Concentration				, <i>J</i> - /
se				
පි පි	Observed concentration in river at PM-13 for flows < 10 cfs		41.30	(mg/l)
	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -			\ "J"/

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Sulfate: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0.26 cfs

raiailletei.	Suitate. Flows at PW-13 < 10 dis, Pit SiNW Q =	0.20 013		
		1		
	surface water flow into PM-12	Q_s12 =	0.00	
Data	surface water flow into PM-13	Q_s13 =	0.00	
ă	Babbitt WWTP discharge	Q_sBab =	0.33	
Flow	Area 5 Pit NW discharge	Q_spit =	0.26	
芷	LTVSMC Tailings Basin seepage	Q_fs =	0.00	
Ħ	Hydrometallurgical Residue Cells Liner Leakage ground water flow into PM-12	Q_rrs = Q_g12 =	0.00 0.86	
Input F	ground water flow into PM-13	Q_g12 = Q_g13 =	4.21	
_	ground water now into 1 M-13	Q_g10 =	7.21	(013)
	concentration of aurface water into DM 12	C 010	4	(ma/l)
ta	concentration of surface water into PM-12	C_s12 =		(mg/l)
Data	concentration of surface water into PM-13	C_s13 =	4	(mg/l)
ion	concentration of WWTP discharge	C_sBab =	4	(mg/l)
tral	concentration of Area 5 Pit NW discharge	C_spit =	1046	(mg/l)
Sen	concentration of LTVSMC Tailings Basin seepage	C_fs =	152.4	(mg/l)
Concentration	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
t C	concentration of ground water flow into PM-12	C_g12 =	8.5	(mg/l)
Input	concentration of ground water flow into PM-13	C_g13 =	8.5	(mg/l)
	-			
e O	flow in river at PM-12	Q_r12 =	1.23	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	5.66	(cfs)
Wa Bal	flow check	Q ck =	5.66	
	Justin Gridgin	<u> </u>	0.00	(0.0)
	mass flux of surface water into PM-12	M_s12 =	O.	(mg/s)
	mass flux of surface water into PM-13	M_s13 =		(mg/s)
of of	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
atior Flux	concentration of LTVSMC Tailings Basin seepage	M fs =		(mg/s)
l en s	concentration of Hydrometallurgical Residue Cells Liner Leakage	M rrs =		(mg/s)
Calcul Mass	mass flux of ground water into PM-12	M_g12 =		(mg/s)
ပိ ≌ိ	mass flux of ground water into PM-13	M_g13 =		(mg/s)
(1)				
lass alance	mass flux in river at PM-12	M_r12 =	244	(mg/s)
Mass Balan				, , ,
≥ ₪	mass flux in river at PM-13	M_r13 =	8953	(mg/s)
_	T			
. <u>o</u>				
ed rat	concentration in river at PM-12	C_r12 =	7.01	(mg/l)
ılatı ent	Concentration in river at 1 W-12	0_112 =	7.01	(1119/1)
Calculated Concentration				
ပိ ပိ	concentration in river at PM-13	C r13 =	55.90	(mg/l)
		-		
nc				
ا عtic		0. 1	0.00	, "
vec	Observed concentration in river at PM-12 for flows at PM-13 of < 1	U cts	3.06	(mg/l)
ser				
Observed Concentration	Observed concentration in river at PM-13 for flows < 10 cfs		41.30	(mg/l)
	100001700 00110011111111111111111111111		11.00	\'''9'')

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Sulfate: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0 cfs

i didilictor.	Suitate. Flows at FIVI-13 of 10-20 cis, Fit SINVIV	3 – 0 013		
		To		(()
	surface water flow into PM-12	Q_s12 =	1.12	
Data	surface water flow into PM-13	Q_s13 =	5.49	
ă	Babbitt WWTP discharge	Q_sBab =	0.33	
Flow	Area 5 Pit NW discharge	Q_spit =	0.00	
芷	LTVSMC Tailings Basin seepage	Q_fs =	4.00	
Ħ	Hydrometallurgical Residue Cells Liner Leakage ground water flow into PM-12	Q_rrs = Q_g12 =	0.00 0.86	
Input F	ground water flow into PM-13	Q_g12 = Q_g13 =	4.21	
_	ground water now into i M-13	Q_g10 =	7.21	(013)
		0 -10		(/I)
<u>t</u> a	concentration of surface water into PM-12	C_s12 =	4	(mg/l)
Data	concentration of surface water into PM-13	C_s13 =	4	(mg/l)
ion	concentration of WWTP discharge	C_sBab =	4	(mg/l)
trat	concentration of Area 5 Pit NW discharge	C_spit =	1046	(mg/l)
cen	concentration of LTVSMC Tailings Basin seepage	C_fs =	152.4	(mg/l)
Concentration	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
rt C	concentration of ground water flow into PM-12	C_g12 =	8.5	(mg/l)
Input	concentration of ground water flow into PM-13	C_g13 =	8.5	(mg/l)
ø	flow in river at PM-12	Q_r12 =	2.98	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	16.01	
Vai Sala	flow check		16.01	
> Ш	lliow check	Q_ck =	10.01	(CIS)
		T		
	mass flux of surface water into PM-12	M_s12 =		(mg/s)
-	mass flux of surface water into PM-13	M_s13 =		(mg/s)
Calculation of Mass Flux	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
atior Flux	concentration of Area 5 Pit NW discharge	M_spit =	17050	(mg/s)
<u> </u>	concentration of LTVSMC Tailings Basin seepage	M_fs =	17252	
cn	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(mg/s)
Calcul Mass	mass flux of ground water into PM-12 mass flux of ground water into PM-13	M_g12 = M_g13 =		(mg/s)
02	Imass hux of ground water into PW-13	M_g13 =	1013	(mg/s)
				ı
CG	mass flux in river at PM-12	M_r12 =	371	(mg/s)
Mass Balance				, ,
Ma Ba	mass flux in river at PM-13	M_r13 =	19257	(mg/s)
		• =		
Ē				
L igi				
tec	concentration in river at PM-12	C_r12 =	4.40	(mg/l)
Calculated Concentration				
alc onc				
ΰŏ	concentration in river at PM-13	C_r13 =	42.50	(mg/l)
nc				
atic				
ntr.	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	5.03	(mg/l)
Ser				
Observed Concentration	Observed concentration in river at PM-13 for flows of 10-20 cfs		45.33	(ma/l)
	Observed concentration in fiver at PW-13 for flows of 10-20 CTS		40.33	(mg/l)

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Sulfate: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0.26 cfs

Parameter:	Suitate: Flows at PM-13 of 10-20 cts, Pit 5NW	Q = 0.26 CT	<u>S</u>	
				-
_	surface water flow into PM-12	Q_s12 =	1.35 (
Data	surface water flow into PM-13	Q_s13 =	6.60 (
ă	Babbitt WWTP discharge	Q_sBab =	0.33 (
×	Area 5 Pit NW discharge LTVSMC Tailings Basin seepage	Q_spit = Q fs =	0.26 (
芷	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	2.40 (0.00 (
nput Flow	ground water flow into PM-12	Q_f13 = Q_g12 =	0.86 (
g	ground water flow into PM-13	Q_g12 = Q_g13 =	4.21 (
_	ground water new inter in 10	<u> </u>	7.21	010)
	concentration of surface water into PM-12	C_s12 =	4 (mg/l)
Data	concentration of surface water into PM-13	C_s13 =		mg/l)
] uc	concentration of WWTP discharge	C sBab =		mg/l)
atic	concentration of Area 5 Pit NW discharge	C_spit =	1046 (
enti	concentration of LTVSMC Tailings Basin seepage	C_fs =	152.4 (
Suc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration	concentration of ground water flow into PM-12	C_g12 =		mg/l)
ndu				
	concentration of ground water flow into PM-13	C_g13 =	8.5 (mg/i)
ø	flow in river at PM-12	Q_r12 =	2.98 (cfs)
Water Balance	flow in river at PM-13	Q_r13 =	16.01 (
8 Ba	flow check	Q_ck =	16.01 (cfs)
	mass flux of surface water into PM-12	M_s12 =	153 (mg/s)
	mass flux of surface water into PM-13	M_s13 =		mg/s)
ð	mass flux of Babbitt WWTP	M_sBab =		mg/s)
Б×	concentration of Area 5 Pit NW discharge	M_spit =	7696 (
atior	concentration of LTVSMC Tailings Basin seepage	M_fs =	10351 (
cul	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		mg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12	M_g12 =		mg/s)
02	mass flux of ground water into PM-13	$M_g13 =$	1013 (mg/s)
	Г	1	Г	
lass alance	mass flux in river at PM-12	M_r12 =	397 (mg/s)
lass alan				
Ä Š	mass flux in river at PM-13	M_r13 =	20204 (mg/s)
	Т	1		
_ tio				
trai	concentration in river at PM-12	C_r12 =	4.71 (ma/l)
Jaj en		_		<u> </u>
ಕ ಜ				
= = =				
Calculated Concentration	concentration in river at PM-13	C_r13 =	44.59 (mg/l)
Cal	concentration in river at PM-13	C_r13 =	44.59 (mg/l)
	concentration in river at PM-13	C_r13 =	44.59 (mg/l)
	Observed concentration in river at PM-13 for flows at PM-13 of 10-			mg/l)
Observed Cal			5.03 (