Appendix I

Calibration of Mass-Balance Model for Existing LTVSMC Tailings Basin Seepage Rate in the Embarrass River Watershed P:\Mpls\23 MN\69\2369862_MovedFromMpls_P\WO 015 EIS Rpts Studies\RS74 Water Quality Modeling\Model Predictions\Embarrass_Calibertian and the second Embarrass_River_Calibration_TBSeepage_Summary_v2.xls

Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Calcium: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0 cfs

-		1 -		
_	surface water flow into PM-12	Q_s12 =	0.00	
ata	surface water flow into PM-13	Q_s13 =	0.00	
	Babbitt WWTP discharge	Q_sBab =	0.33	
Ň	Area 5 Pit NW discharge	Q_spit =	0.00	
밀	LTVSMC Tailings Basin seepage	Q_fs =	1.90	
-t	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
Idr	ground water flow into PM-12	Q_g12 =	0.86	
-	ground water flow into PM-13	Q_g13 =	4.21	(CIS)
				<i>(</i>
, B	concentration of surface water into PM-12	C_s12 =	13	(mg/l)
Dat	concentration of surface water into PM-13	C_s13 =	13	(mg/l)
u	concentration of WWTP discharge	C_sBab =	13	(mg/l)
trati	concentration of Area 5 Pit NW discharge	C_spit =	95.4	(mg/l)
tent	concentration of LTVSMC Tailings Basin seepage	C_fs =	59.78	(mg/l)
onc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration Data	concentration of ground water flow into PM-12	C_g12 =	19	(mg/l)
ndr	concentration of ground water flow into PM-13	C_g13 =		(mg/l)
		- <u>9</u> -0 -	13	(····9/··/
Φ	flow in river at PM-12	Q r12 =	1.51	(cfs)
	flow in river at PM-13	Q_112 =	7.30	· /
Water Balan	flow check	Q_ck =	7.30	
				(0.0)
	mass flux of surface water into PM-12	M_s12 =	0	(mg/s)
	mass flux of surface water into PM-13	M_ <u>312</u> =		(mg/s) (mg/s)
đ	mass flux of Babbitt WWTP	$M_srs =$ M sBab =		(mg/s) (mg/s)
u u	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s) (mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	$M_spit =$ M_fs =		(mg/s) (mg/s)
. ⊟ IIa	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_ <u>I</u> 3 = M_rrs =		(mg/s) (mg/s)
lct Iss	mass flux of ground water into PM-12	M_g12 =		(mg/s) (mg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12 mass flux of ground water into PM-13	M_g13 =		(mg/s) (mg/s)
02		W_g10 =	2204	(mg/s)
Ce Ce	mass flux in river at PM-12	M r12 =	584	(mg/s)
ss an				、 3/
Mass Balance	mass flux in river at PM-13	M_r13 =	6062	(mg/s)
				\ 3 -/
_ ۲				
tio				
tra	concentration in river at PM-12	C_r12 =	13.68	(ma/l)
Calculated Concentration				·
lcu				
ပ် ပ	concentration in river at PM-13	C_r13 =	29.34	(ma/l)
			_0.01	·····ˈə/ '/
Ę				
Observed Concentration				
red hträ	Observed concentration in river at PM-12 for flows at PM-13 of < 1	0 cfs	18.80	(mg/l)
erv				
Observed Concentra				
ΟŬ	Observed concentration in river at PM-13 for flows < 10 cfs		29.60	(mg/l)

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Calcium: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0.26 cfs

	european en flaurinte DM 10	0 -10	0.00	(-f-)
m m	surface water flow into PM-12 surface water flow into PM-13	Q_s12 = Q_s13 =	0.00	
ati	Babbitt WWTP discharge	$Q_sis =$ Q sBab =	0.00	
nput Flow Data	Area 5 Pit NW discharge	Q_spit =	0.33	
N N	LTVSMC Tailings Basin seepage	$Q_{spit} =$	1.40	<u> </u>
Ξ	Hydrometallurgical Residue Cells Liner Leakage	$Q_{rrs} =$	0.00	
ort	ground water flow into PM-12	Q_g12 =	0.86	
d L	ground water flow into PM-13	Q_g13 =	4.21	
		<u>a_910</u> =		(0.0)
m	concentration of surface water into PM-12	C_s12 =	13	(mg/l)
Data	concentration of surface water into PM-13	C_s13 =	13	(mg/l)
– uo	concentration of WWTP discharge	C_sBab =	13	(mg/l)
trati	concentration of Area 5 Pit NW discharge	C_spit =	95.4	(mg/l)
cent	concentration of LTVSMC Tailings Basin seepage	C_fs =	59.78	(mg/l)
ouc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration Data	concentration of ground water flow into PM-12	C_g12 =	19	(mg/l)
Idul	concentration of ground water flow into PM-13	C_g13 =	19	(mg/l)
, e	flow in river at PM-12	Q_r12 =	1.47	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	7.06	(cfs)
Ba K	flow check	Q_ck =	7.06	(cfs)
	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)
of	mass flux of Babbitt WWTP	M_sBab =	121	(mg/s)
– E ×	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
s P s	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)
ΰΣ	mass flux of ground water into PM-13	M_g13 =	2264	(mg/s)
ě	mass flux in river at PM-12	M r12 =	501	(ma/s)
Mass Balance	mass flux in river at PM-12	101_112 =	504	(mg/s)
Mass Balan	mass flux in river at PM-13	M r12	5010	(ma/a)
∠ Ш	IIIdoo IIUX III IIVEI al FIVI-10	M_r13 =	2918	(mg/s)
C				
tio				
ed	concentration in river at PM-12	C_r12 =	14.06	(ma/l)
Calculated Concentration		<u>~_'''2 -</u>	14.00	('''9'')
lcu Do				
Cal	concentration in river at PM-13	C_r13 =	29.62	(ma/l)
		0_10-	20.02	\'''9''/
L L				
Observed Concentration		.		<i>,</i>
ntr	Observed concentration in river at PM-12 for flows at PM-13 of < 1	U CIS	18.80	(mg/l)
ser Ice				
Observed Concentra	Observed concentration in river at PM-13 for flows < 10 cfs		29.60	(mg/l)
00	Observed Concentration in fiver at FIVE 13 101 10WS < 10 CIS		29.00	(mg/l)

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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 $Q_s12 =$ 1.22surface water flow into PM-13 $Q_s13 =$ 5.98Babbitt WWTP discharge $Q_sBab =$ 0.33Area 5 Pit NW discharge $Q_spit =$ 0.00LTVSMC Tailings Basin seepage $Q_fs =$ 3.90Hydrometallurgical Residue Cells Liner Leakage $Q_rrs =$ 0.00ground water flow into PM-12 $Q_g12 =$ 0.86ground water flow into PM-13 $Q_g13 =$ 4.21	(cfs) (cfs) (cfs) (cfs) (cfs)
Image: Babbitt WWTP dischargeQ_sBab =0.33Area 5 Pit NW dischargeQ_spit =0.00LTVSMC Tailings Basin seepageQ_fs =3.90Hydrometallurgical Residue Cells Liner LeakageQ_rrs =0.00ground water flow into PM-12Q_g12 =0.86	(cfs) (cfs) (cfs) (cfs) (cfs)
Area 5 Pit NW dischargeQ_spit =0.00UTVSMC Tailings Basin seepageQ_fs =3.90Hydrometallurgical Residue Cells Liner LeakageQ_rrs =0.00ground water flow into PM-12Q_g12 =0.86	(cfs) (cfs) (cfs)
Area 5 Pit NW dischargeQ_spit =0.00UTVSMC Tailings Basin seepageQ_fs =3.90Hydrometallurgical Residue Cells Liner LeakageQ_rrs =0.00ground water flow into PM-12Q_g12 =0.86	(cfs) (cfs)
OLTVSMC Tailings Basin seepageQ_fs =3.90Hydrometallurgical Residue Cells Liner LeakageQ_rrs =0.00ground water flow into PM-12Q_g12 =0.86ground water flow into PM-13Q_g13 =4.21	(cfs)
Hydrometallurgical Residue Cells Liner LeakageQ_rrs =0.00ground water flow into PM-12Q_g12 =0.86ground water flow into PM-13Q_g13 =4.21	
ground water flow into PM-12Q_g12 =0.86ground water flow into PM-13Q_g13 =4.21	
☐ ground water flow into PM-13 Q_g13 = 4.21	
	(cts)
concentration of ourfees water into DM 10	(ma m/l)
concentration of surface water into PM-12 C_s12 = 13	(mg/l)
$C_s13 = 13$	(mg/l)
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	
	(mg/l)
□ C_g13 = 19	(mg/l)
Image: Second state Image: Second state Q_r12 = 3.06 Image: Second state Image: Second state Q_r13 = 16.50 Image: Second state Image: Q_r13 = 16.50 Image: Second state Image: Q_r13 = 16.50	· · · ·
Image: Second stateImage: S	(cfs)
> 00 flow check Q_ck = 16.50	(cfs)
	(mg/s)
	(mg/s)
mass flux of Babbitt WWTP M_sBab = 121	(mg/s)
5 concentration of Area 5 Pit NW discharge M_spit = 0	(mg/s)
Concentration of Area 5 Pit NW discharge M_spit = 0 Image: Concentration of LTVSMC Tailings Basin seepage M_fs = 6598	(mg/s)
concentration of Hydrometallurgical Residue Cells Liner Leakage M_rrs = 0	(mg/s)
	(mg/s)
$O \ge$ mass flux of ground water into PM-13 $M_g13 = 2264$	(mg/s)
mass flux in river at PM-12 M_r12 = 1034	(mg/s)
$M_r 12 = 1034$ $M_r 12 = 1034$ $M_r 13 = 12094$	
mass flux in river at PM-13 M_r13 = 12094	(mg/s)
	(m c /l)
concentration in river at PM-12 C_r12 = 11.93	(mg/i)
C_r12 = 11.93	<u>(mg/i)</u>
concentration in river at PM-12 C_r12 = 11.93 C_r13 = 25.90	
concentration in river at PM-12 C_r12 = 11.93 concentration in river at PM-13 C_r13 = 25.90	
	(mg/l)

Observed concentration in river at PM-13 for flows of 10-20 cfs

24.03 (mg/l)

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Embarrass River Model - Calibration of Tailings Basin Seepage
Parameter: Calcium: Flows at PM-13 = 10 - 20 cfs, Pit 5NW Q = 0.26 cfs

	surface water flow into PM-12	Q_s12 =	1.26	(cfs)
lta	surface water flow into PM-13	Q_s13 =	6.18	(cfs)
Da	Babbitt WWTP discharge	Q_sBab =	0.33	
ş	Area 5 Pit NW discharge	Q_spit =	0.26	
음	LTVSMC Tailings Basin seepage	Q_fs =	3.40	
ut l	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)
	concentration of ourface water into DM 10	C_s12 =	10	(mg/l)
ata	concentration of surface water into PM-12			
õ	concentration of surface water into PM-13	C_s13 =		(mg/l)
ion	concentration of WWTP discharge	C_sBab =	13	(mg/l)
trat	concentration of Area 5 Pit NW discharge	C_spit =	95.4	(mg/l)
en.	concentration of LTVSMC Tailings Basin seepage	C_fs =	59.78	(mg/l)
onc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration Data	concentration of ground water flow into PM-12	 C_g12 =	19	(mg/l)
ndı				
<u> </u>	concentration of ground water flow into PM-13	C_g13 =	19	(mg/l)
0	flow in river at DM 10	0 +12	3.06	(ofo)
Water Balance	flow in river at PM-12	Q_r12 =		
Water Balanc	flow in river at PM-13	Q_r13 =	16.50	· · ·
5 0	flow check	Q_ck =	16.50	(cfs)
	mass flux of surface water into PM-12	M_s12 =	165	(mg/s)
		M c12	0070	(ma/c)
đ	mass flux of surface water into PM-13	M_s13 = M_sBab =	2272 121	
n of	mass flux of Babbitt WWTP	M_sBab =	121	(mg/s)
tion of ux	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge	M_sBab = M_spit =	121 702	(mg/s) (mg/s)
llation of Flux	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage	M_sBab = M_spit = M_fs =	121 702 5752	(mg/s) (mg/s) (mg/s)
culation of ss Flux	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage concentration of Hydrometallurgical Residue Cells Liner Leakage	M_sBab = M_spit = M_fs = M_rrs =	121 702 5752 0	(mg/s) (mg/s) (mg/s) (mg/s)
Calculation of Aass Flux	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12	M_sBab = M_spit = M_fs = M_rrs = M_g12 =	121 702 5752 0 462	(mg/s) (mg/s) (mg/s) (mg/s)
Calculation of Mass Flux	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage concentration of Hydrometallurgical Residue Cells Liner Leakage	M_sBab = M_spit = M_fs = M_rrs =	121 702 5752 0 462	(mg/s) (mg/s) (mg/s) (mg/s)
	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12	M_sBab = M_spit = M_fs = M_rrs = M_g12 =	121 702 5752 0 462	(mg/s) (mg/s) (mg/s) (mg/s)
	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12	M_sBab = M_spit = M_fs = M_rrs = M_g12 =	121 702 5752 0 462 2264	(mg/s) (mg/s) (mg/s) (mg/s)
	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13	M_sBab = M_spit = M_fs = M_rrs = M_g12 = M_g13 =	121 702 5752 0 462 2264	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s)
Mass Calculation of Balance Mass Flux	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12 mass flux of ground water into PM-13	M_sBab = M_spit = M_fs = M_rrs = M_g12 = M_g13 =	121 702 5752 0 462 2264	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s)
Mass Balance	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage 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_sBab = M_spit = M_fs = M_rrs = M_g12 = M_g13 = M_r12 =	121 702 5752 0 462 2264 1049	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s)
Mass Balance	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage 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_sBab = M_spit = M_fs = M_rrs = M_g12 = M_g13 = M_r12 =	121 702 5752 0 462 2264 1049	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s)
Mass Balance	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage 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_sBab = M_spit = M_fs = M_rrs = M_g12 = M_g13 = M_r12 = M_r13 =	121 702 5752 0 462 2264 1049 12039	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s)
Mass Balance	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage 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_sBab = M_spit = M_fs = M_rrs = M_g12 = M_g13 = M_r12 =	121 702 5752 0 462 2264 1049	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s)
Mass Balance	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage 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_sBab = M_spit = M_fs = M_rrs = M_g12 = M_g13 = M_r12 = M_r13 =	121 702 5752 0 462 2264 1049 12039	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s)
	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage 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-12 concentration in river at PM-12	M_sBab = M_spit = M_fs = M_g12 = M_g13 = M_r12 = M_r13 = C_r12 =	121 702 5752 0 462 2264 1049 12039	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/l)
Mass Balance	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage 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_sBab = M_spit = M_fs = M_rrs = M_g12 = M_g13 = M_r12 = M_r13 =	121 702 5752 0 462 2264 1049 12039	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s)
Calculated Mass Concentration Balance	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage 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-12 concentration in river at PM-12	M_sBab = M_spit = M_fs = M_g12 = M_g13 = M_r12 = M_r13 = C_r12 =	121 702 5752 0 462 2264 1049 12039	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s)
tion Concentration Balance	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage 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_sBab = M_spit = M_fs = M_rrs = M_g12 = M_g13 = M_r12 = M_r13 = C_r12 = C_r13 =	121 702 5752 0 462 2264 1049 12039 12039 12.10 25.78	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/l)
tion Concentration Balance	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage 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-12 concentration in river at PM-12	M_sBab = M_spit = M_fs = M_rrs = M_g12 = M_g13 = M_r12 = M_r13 = C_r12 = C_r13 =	121 702 5752 0 462 2264 1049 12039	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s)
Mass Balance	mass flux of Babbitt WWTP concentration of Area 5 Pit NW discharge concentration of LTVSMC Tailings Basin seepage 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_sBab = M_spit = M_fs = M_rrs = M_g12 = M_g13 = M_r12 = M_r13 = C_r12 = C_r13 =	121 702 5752 0 462 2264 1049 12039 12039 12.10 25.78	(mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/s) (mg/l) (mg/l)

O O Observed concentration in river at PM-13 for flows of 10-20 cfs

24.03

(mg/l)

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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	
ate	surface water flow into PM-13	Q_s13 =	0.00	
nput Flow Data	Babbitt WWTP discharge	Q_sBab =	0.33	
Ň	Area 5 Pit NW discharge	Q_spit =	0.00	
Ĕ	LTVSMC Tailings Basin seepage	Q_fs =	4.00	
t	Hydrometallurgical Residue Cells Liner Leakage ground water flow into PM-12	$Q_{rrs} =$	0.00	
du	ground water flow into PM-12 ground water flow into PM-13	Q_g12 =	0.86 4.21	
_	ground water now into PM-13	Q_g13 =	4.21	(CIS)
	concentration of surface water into PM-12	C_s12 =	10	(mg/l)
ata	concentration of surface water into PM-13	C_s13 =		(mg/l)
	concentration of WWTP discharge	C_sBab =		(mg/l)
atio		_		
entra	concentration of Area 5 Pit NW discharge	C_spit =		(mg/l)
nce	concentration of LTVSMC Tailings Basin seepage	C_fs =	21.54	(mg/l)
Co	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration Data	concentration of ground water flow into PM-12	C_g12 =	1.8	(mg/l)
Ing	concentration of ground water flow into PM-13	C_g13 =	1.8	(mg/l)
		1		-
Water Balance	flow in river at PM-12	Q_r12 =	1.86	(cfs)
Water Balanc	flow in river at PM-13	Q_r13 =	9.40	(cfs)
NS	flow check	Q_ck =	9.40	(cfs)
	mass flux of surface water into PM-12	M_s12 =		(mg/s)
	mass flux of surface water into PM-13	M_s13 =	0	(mg/s)
of	mass flux of Babbitt WWTP	M_sBab =	93	(mg/s)
ы	concentration of Area 5 Pit NW discharge	M_spit =	0	(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	2438	(mg/s)
s F	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 =	44	(mg/s)
ŰΣ	mass flux of ground water into PM-13	M_g13 =	214	(mg/s)
e	mass flux in river at PM-12	M r12 =	137	(mg/s)
Mass Balance				(
Ba Ba	mass flux in river at PM-13	M_r13 =	2790	(mg/s)
uo				
ed	concentration in river at PM-12	0 110	0.00	(mc/l)
late	concentration in river at PM-12	C_r12 =	2.60	(mg/l)
Calculated Concentration				
ပိုင်	concentration in river at PM-13	C_r13 =	10.49	(mg/l)
		•		- /
uo				
Observed Concentration	Observed concentration in river at PM-12 for flows at PM-13 of < 1	0 cfs	5.33	(mg/l)
Observed Concentra		0.010	5.55	(119/1)
es of				
S N				

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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	
ate	surface water flow into PM-13	Q_s13 =	0.00	
nput Flow Data	Babbitt WWTP discharge	Q_sBab =	0.33	
Ň	Area 5 Pit NW discharge	Q_spit =	0.26	
르	LTVSMC Tailings Basin seepage	Q_fs =	3.90	
E	Hydrometallurgical Residue Cells Liner Leakage ground water flow into PM-12	Q_rrs =	0.00	
얻	ground water flow into PM-12 ground water flow into PM-13	Q_g12 =	0.86 4.21	
_	Iground water now into PM-13	Q_g13 =	4.21	(CIS)
	concentration of surface water into PM-12	C_s12 =	10	(mg/l)
ata	concentration of surface water into PM-13	C_s13 =		(mg/l)
	concentration of WWTP discharge	C_sBab =		(mg/l)
atio	concentration of Area 5 Pit NW discharge	C_spit =		(mg/l)
entr	concentration of LTVSMC Tailings Basin seepage	$C_spit =$ $C_fs =$	21.54	
nce	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	(iiig/i)
ပိ				(
nput Concentration Data	concentration of ground water flow into PM-12	C_g12 =		(mg/l)
<u> </u>	concentration of ground water flow into PM-13	C_g13 =	1.8	(mg/l)
		.		
Water Balance	flow in river at PM-12	Q_r12 =	1.89	
Water Balanc	flow in river at PM-13	Q_r13 =	9.56	
<u>م ></u>	flow check	Q_ck =	9.56	(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)
Ö	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
uo Xr	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
ss sul	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 =	44	(mg/s)
0≥	mass flux of ground water into PM-13	M_g13 =	214	(mg/s)
		1		
ce	mass flux in river at PM-12	M_r12 =	137	(mg/s)
Mass Balance				
ÄЯ	mass flux in river at PM-13	M_r13 =	2773	(mg/s)
ion				
ed trat	concentration in river at PM-12	C r12 =	2.57	(mg/l)
Calculated Concentration			2.07	\···ˈʒ/ '/
alcu				
ΰŭ	concentration in river at PM-13	C_r13 =	10.25	(mg/l)
ttior				
tra d	Observed concentration in river at PM-12 for flows at PM-13 of < 1	0 cfs	5.33	(mg/l)
9 F				
erve cent				
Observed Concentration	Observed concentration in river at PM-13 for flows < 10 cfs		10.30	(mg/l)

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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	
ata	surface water flow into PM-13	Q_s13 =	7.97	
Õ	Babbitt WWTP discharge	Q_sBab =	0.33	
M	Area 5 Pit NW discharge	Q_spit =	0.00	
님	LTVSMC Tailings Basin seepage	Q_fs =	1.00	
nt	Hydrometallurgical Residue Cells Liner Leakage	$Q_{rrs} =$	0.00	
nput Flow Data	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	0.86 4.21	(cfs) (cfs)
—		Q_915 =	4.21	(015)
	concentration of surface water into PM-12	C_s12 =	10	(mg/l)
Data	concentration of surface water into PM-12	C Cs13 =		(mg/l)
D u				
atio	concentration of WWTP discharge	C_sBab =		(mg/l)
ntre	concentration of Area 5 Pit NW discharge	C_spit =		(mg/l)
Icel	concentration of LTVSMC Tailings Basin seepage	C_fs =	21.54	(mg/l)
Cor	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	1.8	(mg/l)
lnp	concentration of ground water flow into PM-13	C_g13 =	1.8	(mg/l)
. ee	flow in river at PM-12	Q_r12 =	2.98	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	16.00	(cfs)
Ba Ba	flow check	Q_ck =	16.00	(cfs)
	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)
Calculation of Mass Flux	mass flux of Babbitt WWTP	M_sBab =	93	(mg/s)
uo xr	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
Calcul Mass	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(mg/s)
alc las	mass flux of ground water into PM-12	M_g12 =		(mg/s)
O≥	mass flux of ground water into PM-13	M_g13 =	214	(mg/s)
e	mass flux in river at PM-12	M r12 =	599	(mg/s)
Mass Balance				(
Ma Ba	mass flux in river at PM-13	M r13 =	3678	(mg/s)
		• =		/
uc				
d atic				
ate	concentration in river at PM-12	C_r12 =	7.11	(mg/l)
sula cer				
Calculated Concentration				,
00	concentration in river at PM-13	C_r13 =	8.12	(mg/l)
C C				
Observed Concentration				
ed tra	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	5.23	(mg/l)
en en				
Observed Concentra				
	Observed concentration in river at PM-13 for flows of 10-20 cfs		5.27	(mg/l)

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Chloride: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0.26 cfs

	surface water flow into PM-12	Q_s12 =	1.59	
Data	surface water flow into PM-13	Q_s13 =	7.75	
õ	Babbitt WWTP discharge	Q_sBab =	0.33	
nput Flow	Area 5 Pit NW discharge	Q_spit =	0.26	
	LTVSMC Tailings Basin seepage	Q_fs =	1.00	
Ŧ	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
ਰੁ	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 =	10	(mg/l)
ata	concentration of surface water into PM-13	C_s13 =		(mg/l)
L L	concentration of WWTP discharge	C_sBab =		(mg/l)
atio				(mg/l)
utu	concentration of Area 5 Pit NW discharge	C_spit =	21.54	
nce	concentration of LTVSMC Tailings Basin seepage	C_fs =		(mg/i)
Col	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration Data	concentration of ground water flow into PM-12	C_g12 =	1.8	(mg/l)
Ľ	concentration of ground water flow into PM-13	C_g13 =	1.8	(mg/l)
				
ت وح	flow in river at PM-12	Q_r12 =	2.98	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	16.00	(cfs)
≥ ∞	flow check	Q_ck =	16.00	(cfs)
	mass flux of surface water into PM-12	M_s12 =		(mg/s)
ب	mass flux of surface water into PM-13	M_s13 =		(mg/s)
0	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
latior Flux	concentration of Area 5 Pit NW discharge	M_spit = M_fs =		(mg/s)
핀 <mark>[</mark> 4	concentration of LTVSMC Tailings Basin seepage	M_rrs =		(mg/s)
ss Icn	concentration of Hydrometallurgical Residue Cells Liner Leakage mass flux of ground water into PM-12	$M_g12 =$		(mg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12 mass flux of ground water into PM-13	M_g12 =		(mg/s) (mg/s)
02		W_g10 =	214	(119/3)
Ø				
s NC	mass flux in river at PM-12	M_r12 =	587	(mg/s)
Mass Balance		M		1
2 0	mass flux in river at PM-13	M_r13 =	3648	(mg/s)
Ę				
Calculated Concentration				
Calculated Concentral	concentration in river at PM-12	C_r12 =	6.96	(mg/l)
lub				
C al	concentration in river at PM-13	C_r13 =	8.06	(mg/l)
			0.00	\`` <i>`3'`'</i>
uo				
bserved oncentration	Observed concentration in viver at DM 10 for flows at DM 10 -5 10	20 of a	E 00	(mc/l)
vec	Observed concentration in river at PM-12 for flows at PM-13 of 10-	ZU CIS	5.23	(mg/l)
bserved oncentra				
ğ				<i>/ /</i>

Observed concentration in river at PM-13 for flows of 10-20 cfs

5.27 (mg/l)

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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	
Data	surface water flow into PM-13	Q_s13 =	0.00	
õ	Babbitt WWTP discharge	Q_sBab =	0.33	
nput Flow	Area 5 Pit NW discharge	Q_spit =	0.00	
문	LTVSMC Tailings Basin seepage	Q_fs =	0.00	· /
- T	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
d d	ground water flow into PM-12	Q_g12 =	0.86	· /
-	ground water flow into PM-13	Q_g13 =	4.21	(CIS)
		0 10		((1)
ta	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)
ion	concentration of WWTP discharge	C_sBab =	1.5	(µg/l)
trat	concentration of Area 5 Pit NW discharge	C_spit =	3.5	(µg/l)
.ueu	concentration of LTVSMC Tailings Basin seepage	C_fs =	4.55	(µg/l)
ouo	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)
Inpu	concentration of ground water flow into PM-13	C_g13 =	4	(µg/l)
		_9 -		
ø	flow in river at PM-12	Q_r12 =	1.19	(cfs)
Water Balance	flow in river at PM-13	 Q_r13 =	5.40	
Wa Bal	flow check	 Q_ck =	5.40	
	mass flux of surface water into PM-12	M_s12 =	0	(µg/s)
	mass flux of surface water into PM-13	M_s13 =		(µg/s)
of	mass flux of Babbitt WWTP	M_sBab =		(µg/s)
E ×	concentration of Area 5 Pit NW discharge	M_spit =		(µg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(µg/s)
с Н П С П С С	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(µg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12	 M_g12 =		(µg/s)
ΰÄ	mass flux of ground water into PM-13	M_g13 =	477	(µg/s)
()				
Mass Balance	mass flux in river at PM-12	M_r12 =	111	(µg/s)
las Jale			500	<i>((</i>)
20	mass flux in river at PM-13	M_r13 =	588	(µg/s)
— –				
ed at	concentration in river at DM 10	0 110	0.00	(µg/l)
ate	concentration in river at PM-12	C_r12 =	3.32	(µg/I)
cul				
Calculated Concentration	encoderation in view of DM 40	0 - 10	0.05	(
00	concentration in river at PM-13	C_r13 =	3.85	(µg/l)
C C				
Observed Concentration				
irai B	Observed concentration in river at PM-12 for flows at PM-13 of < 1	0 cfs	1.19	(µg/l)
Observed Concentra				\r"9''/
se				
පිරි	Observed concentration in river at PM-13 for flows < 10 cfs		1.30	(µg/l)
				\r"J''/

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Copper: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0.26 cfs

				<i>(</i> ,)
	surface water flow into PM-12	Q_s12 =	0.00	
Data	surface water flow into PM-13	Q_s13 =	0.00	
Ő	Babbitt WWTP discharge	Q_sBab =	0.33	
Ň	Area 5 Pit NW discharge	Q_spit =	0.26	<u>`</u>
nput Flow	LTVSMC Tailings Basin seepage	Q_fs =	0.00	
Et .	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
du	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	0.86 4.21	
_	ground water now into PM-13	Q_913 =	4.21	(CIS)
	concentration of surface water into PM-12	C_s12 =	1.5	(µg/l)
ata	concentration of surface water into PM-13	C_s13 =		(µg/l)
	concentration of WWTP discharge	C_sBab =		(µg/l)
atio				
ntra	concentration of Area 5 Pit NW discharge	C_spit =		(µg/l)
JCe	concentration of LTVSMC Tailings Basin seepage	C_fs =		(µg/l)
Cor	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration Data	concentration of ground water flow into PM-12	C_g12 =	4	(µg/l)
Ln dr	concentration of ground water flow into PM-13	C_g13 =	4	(µg/l)
	[I 1		
Water Balance	flow in river at PM-12	Q_r12 =	1.23	(cfs)
Water Balanc	flow in river at PM-13	Q_r13 =	5.66	(cfs)
≥ ä	flow check	Q_ck =	5.66	(cfs)
	mass flux of surface water into PM-12	M_s12 =		(µg/s)
	mass flux of surface water into PM-13	M_s13 =		(µg/s)
of	mass flux of Babbitt WWTP	M_sBab =		(µg/s)
– E ×	concentration of Area 5 Pit NW discharge	M_spit =		(µg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(µg/s)
s l s	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(µg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12	M_g12 =		(µg/s)
ŰΣ	mass flux of ground water into PM-13	M_g13 =	477	(µg/s)
e	mass flux in river at PM-12	M r12 =	111	(µg/s)
Mass Balance				(µg, c)
Ba Ba	mass flux in river at PM-13	M_r13 =	614	(µg/s)
uo				
ati	concentration in view at DM 10	0	0.00	(
late intr	concentration in river at PM-12	C_r12 =	3.20	(µg/l)
Calculated Concentration				
Cal	concentration in river at PM-13	C_r13 =	3.83	(µg/l)
				τr σr 7
uo				
Observed Concentration	Observed concentration in river at PM-12 for flows at PM-13 of < 1	0 ofo	1.10	(u.a./l)
Observed Concentra	Observed concentration in river at PM-12 for nows at PM-13 of < 1		1.19	(µg/l)
sel				
ဝိ ပိ	Observed concentration in river at PM-13 for flows < 10 cfs		1.30	(µg/l)

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Copper: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0 cfs

	surface water flow into PM-12	Q_s12 =	1.89	```
Data	surface water flow into PM-13	Q_s13 =	9.21	
ő	Babbitt WWTP discharge	Q_sBab =	0.33	
≥ S	Area 5 Pit NW discharge	Q_spit =	0.00	
문	LTVSMC Tailings Basin seepage	Q_fs =	0.00	
Ŧ	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
nput Flow I	ground water flow into PM-12	Q_g12 =	0.86	
=	ground water flow into PM-13	Q_g13 =	4.21	(CIS)
ъ	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)
Б	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 =	4	(µg/l)
ndu	-			(µg/l)
	concentration of ground water flow into PM-13	C_g13 =	4	(µg/I)
r r ce	flow in river at PM-12	Q_r12 =	3.06	· · ·
Water Balance	flow in river at PM-13	Q_r13 =	16.50	
≤ ä	flow check	Q_ck =	16.50	(cfs)
	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)
of	mass flux of Babbitt WWTP	M_sBab =	14	(µg/s)
Б ×	concentration of Area 5 Pit NW discharge	M_spit =	0	(µg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(µg/s)
s Ing	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(µg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12	M_g12 =		(µg/s)
ΰΣ	mass flux of ground water into PM-13	M_g13 =	477	(µg/s)
Ð				
Mass Balance	mass flux in river at PM-12	M_r12 =	191	(µg/s)
Mass Balan			1050	
20	mass flux in river at PM-13	M_r13 =	1059	(µg/s)
ion ion				
ati	and the strength of the streng	010	0.01	(
ate	concentration in river at PM-12	C_r12 =	2.21	(µg/l)
ce luc				
Calculated Concentration	concentration is vive at DM 10	0	0.07	(
00	concentration in river at PM-13	C_r13 =	2.27	(µg/l)
Observed Concentration				
irat	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	2.06	(µg/l)
Observed Concentra		20 010	2.00	(MA), (MA)
sel				
88	Observed concentration in river at PM-13 for flows of 10-20 cfs		1.88	(µg/l)
				\r" 3' '/

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Copper: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0.26 cfs

		0 10	1.0.1	(()
-	surface water flow into PM-12	Q_s12 =	1.84	
Data	surface water flow into PM-13	Q_s13 =	9.00	
Ő	Babbitt WWTP discharge	Q_sBab =	0.33	
nput Flow	Area 5 Pit NW discharge	Q_spit =	0.26	
드	LTVSMC Tailings Basin seepage	Q_fs =	0.00	
t	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
ē	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)
u L	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	$C_fs =$		(µg/l)
once	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	(- 9, -)
nput Concentration Data	concentration of ground water flow into PM-12	C_g12 =		(µg/l)
Ind				
<u> </u>	concentration of ground water flow into PM-13	C_g13 =	4	(µg/l)
۵. D	flow in river at PM-12	Q r12 =	3.06	(ofc)
Water Balance	flow in river at PM-12	Q_r12 = Q_r13 =	16.50	
Water Balanc	flow check	Q_r13 = Q_ck =	16.50	
<u> </u>			10.00	(013)
	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)
đ	mass flux of Babbitt WWTP	M_sBab =		(µg/s)
Ę ,	concentration of Area 5 Pit NW discharge	M_spit =		(µg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	$M_{s} = M_{s}$		(µg/s)
Га	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(µg/s)
Calculation of Mass Flux	mass flux of ground water into PM-12	M_g12 =		(µg/s)
Calcul Mass	mass flux of ground water into PM-13	M_g13 =		(µg/s)
		<u> </u>	-177	(µg/0)
D				
Mass Balance	mass flux in river at PM-12	M_r12 =	190	(µg/s)
Mass Balan	mass flux in river at PM-13	M r13 =	1074	(µg/s)
		<u>_</u>	1074	(MB, C)
uo				
ed atio	concentration in river at DM 10	0 110	0.40	(110/1)
Calculated Concentration	concentration in river at PM-12	C_r12 =	2.19	(µg/l)
ပိပိ	concentration in river at PM-13	C_r13 =	2.30	(µg/l)
Observed Concentration				
ed tra	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	2.06	(µg/l)
erv cer				
Observed Concentre	Observed sensentiation in vives at DM 40 for flows of 40,00 of		1.88	(
00	O O Observed concentration in river at PM-13 for flows of 10-20 cfs			(µg/l)

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Fluoride: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0 cfs

			0.00	(()
	surface water flow into PM-12	Q_s12 =	0.00	
Data	surface water flow into PM-13	Q_s13 =	0.00	
Ő	Babbitt WWTP discharge	Q_sBab =	0.33	
Ň	Area 5 Pit NW discharge	Q_spit =	0.00	
nput Flow	LTVSMC Tailings Basin seepage	Q_fs =	1.70	
rt	Hydrometallurgical Residue Cells Liner Leakage ground water flow into PM-12	Q_rrs = Q_g12 =	0.00 0.86	
du	ground water flow into PM-12 ground water flow into PM-13	$Q_{g12} = Q_{g13} =$	4.21	
	ground water now into 1 M-13	Q_915 =	4.21	(015)
ď	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)
uo	concentration of WWTP discharge	C_sBab =	0.2	(mg/l)
trati	concentration of Area 5 Pit NW discharge	C_spit =	0.125	(mg/l)
cent	concentration of LTVSMC Tailings Basin seepage	C_fs =	1.55	(mg/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 =	0.385	(mg/l)
dul	concentration of ground water flow into PM-13	C_g13 =	0.385	(mg/l)
ے م	flow in river at PM-12	Q_r12 =	1.47	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	7.10	(cfs)
M M	flow check	Q_ck =	7.10	(cfs)
	mass flux of surface water into PM-12	M_s12 =		(mg/s)
	mass flux of surface water into PM-13	M_s13 =	0	(mg/s)
of	mass flux of Babbitt WWTP	M_sBab =	2	(mg/s)
u na ka	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
l s	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 =	9	(mg/s)
ŰΣ	mass flux of ground water into PM-13	M_g13 =	46	(mg/s)
C C	mass flux in river at PM-12	M r12 =	11	(mg/s)
Mass Balance				(3 ⁻ /
Ma Ba	mass flux in river at PM-13	M_r13 =	132	(mg/s)
uo				
ati				,
Calculated Concentration	concentration in river at PM-12	C_r12 =	0.27	(mg/l)
ce Suls				
alc				,
00	concentration in river at PM-13	C_r13 =	0.66	(mg/l)
Observed Concentration				
ed itra	Observed concentration in river at PM-12 for flows at PM-13 of < 1	0 cfs	0.17	(mg/l)
Observed Concentra				
) Se				
ŏŏ	Observed concentration in river at PM-13 for flows < 10 cfs		0.63	(mg/l)

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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	` <i>'</i>
nput Flow Data	surface water flow into PM-13	Q_s13 =	0.00	
Ő	Babbitt WWTP discharge	Q_sBab =	0.33	
Ň	Area 5 Pit NW discharge LTVSMC Tailings Basin seepage	Q_spit = Q_fs =	0.26	
Ē	Hydrometallurgical Residue Cells Liner Leakage	$Q_{1S} =$ Q rrs =	0.00	
pt	ground water flow into PM-12	Q_g12 =	0.86	
브	ground water flow into PM-13	Q_g12 =	4.21	
		g. c		(0.0)
	concentration of surface water into PM-12	C s12 =	0.2	(mg/l)
Data				
0	concentration of surface water into PM-13	C_s13 =		(mg/l)
tion	concentration of WWTP discharge	C_sBab =	0.2	(mg/l)
trat	concentration of Area 5 Pit NW discharge	C_spit =	0.125	(mg/l)
eu	concentration of LTVSMC Tailings Basin seepage	C_fs =	1.55	(mg/l)
ouo	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	0.385	(mg/l)
Inpu	concentration of ground water flow into PM-13	C_g13 =	0.385	(mg/l)
				,
ø	flow in river at PM-12	Q_r12 =	1.52	(cfs)
ے ج	flow in river at PM-13	 Q_r13 =	7.36	· · · ·
Wa Bal	flow check	Q ck =	7.36	
	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)
of	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
ы Б х	concentration of Area 5 Pit NW discharge	M_spit =	1	(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
l si l	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)
0≥	mass flux of ground water into PM-13	M_g13 =	46	(mg/s)
		1		
é	mass flux in river at PM 12	M r12 =	44	(ma/a)
ss	mass flux in river at PM-12	1112 =	11	(mg/s)
Mass Balance	mass flux in river at PM-13	M r12	100	(ma/a)
∠ Ш	IIIass nux III nvei al Fivi-13	M_r13 =	133	(mg/s)
tion				
trat	concentration in river at PM-12	C r12 =	0.26	(mg/l)
Calculated Concentration		<u> </u>	0.20	\'''9'''/
llcu				
ပိပိ	concentration in river at PM-13	C_r13 =	0.64	(mg/l)
		• — —		、 し /
L C				
atic				
/ed	Observed concentration in river at PM-12 for flows at PM-13 of < 1	0 cfs	0.17	(mg/l)
erv				
Observed Concentration			0.00	, m
00	Observed concentration in river at PM-13 for flows < 10 cfs		0.63	(mg/l)

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Fluoride: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0 cfs

		ā		
	surface water flow into PM-12	Q_s12 =	0.87	
nput Flow Data	surface water flow into PM-13	Q_s13 =	4.23	
Õ	Babbitt WWTP discharge	Q_sBab =	0.33	
Ň	Area 5 Pit NW discharge	Q_spit =	0.00	
FIC	LTVSMC Tailings Basin seepage	Q_fs =	6.00	
rt	Hydrometallurgical Residue Cells Liner Leakage ground water flow into PM-12	Q_rrs = Q_g12 =	0.00 0.86	
du	ground water flow into PM-12 ground water flow into PM-13	$Q_{g12} = Q_{g13} =$	4.21	
	ground water now into this 13	Q_910 =	4.21	(013)
	concentration of surface water into PM-12	C_s12 =	0.2	(mg/l)
Data				
Da	concentration of surface water into PM-13	C_s13 =	0.2	(mg/l)
ion	concentration of WWTP discharge	C_sBab =	0.2	(mg/l)
trat	concentration of Area 5 Pit NW discharge	C_spit =	0.125	(mg/l)
Sen	concentration of LTVSMC Tailings Basin seepage	C_fs =	1.55	(mg/l)
onc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	0.385	(mg/l)
Inpu	concentration of ground water flow into PM-13	C_g13 =	0.385	(mg/l)
				、 U /
ð	flow in river at PM-12	Q r12 =	3.06	(cfs)
	flow in river at PM-13	Q_112 =	16.50	, <i>,</i> ,
Water Baland	flow check	Q_rio_ Q_ck =	16.50	
7 U	now check	Q_0K =	10.50	(015)
	mass flux of surface water into PM-12	M_s12 =	5	(mg/s)
	mass flux of surface water into PM-12 mass flux of surface water into PM-13	$M_{s12} =$		(mg/s) (mg/s)
of	mass flux of Babbitt WWTP	$M_sBab =$		(mg/s) (mg/s)
Calculation of Mass Flux	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	$M_{s} = M_{s}$		(mg/s)
ula F E	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)
ΰĔ	mass flux of ground water into PM-13	M_g13 =		(mg/s)
		-		
۵.				
Mass Balance	mass flux in river at PM-12	M_r12 =	16	(mg/s)
Mass Balan				
Σã	mass flux in river at PM-13	M_r13 =	349	(mg/s)
u				
ati	concentration in vivos et DM 40	0	0.40	(
ate	concentration in river at PM-12	C_r12 =	0.19	(mg/l)
Calculated Concentration				
Cor Cor	concentration in river at PM-13	C_r13 =	0.75	(mg/l)
		0_110 =	0.75	(119/1)
Observed Concentration				
ed itra	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	0.11	(mg/l)
er.				
Observed Concentra				
ΟŬ	Observed concentration in river at PM-13 for flows of 10-20 cfs		0.76	(mg/l)

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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	<u>\</u>
nput Flow Data	surface water flow into PM-13	Q_s13 =	4.02	
Ď	Babbitt WWTP discharge	Q_sBab =	0.33	
2	Area 5 Pit NW discharge	Q_spit =	0.26	
문	LTVSMC Tailings Basin seepage	Q_fs =	6.00	. /
- T	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
ਰਿ	ground water flow into PM-12	Q_g12 =	0.86	. /
=	ground water flow into PM-13	Q_g13 =	4.21	(cfs)
	concentration of ourface water into DM 10	0	0.0	(ma m/l)
Ita	concentration of surface water into PM-12	C_s12 =		(mg/l)
Da	concentration of surface water into PM-13	C_s13 =	0.2	(mg/l)
uo	concentration of WWTP discharge	C_sBab =	0.2	(mg/l)
rati	concentration of Area 5 Pit NW discharge	C_spit =	0.125	(mg/l)
ent	concentration of LTVSMC Tailings Basin seepage	C fs =		(mg/l)
nc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
Input Concentration Data				(ma/l)
put	concentration of ground water flow into PM-12	C_g12 =	0.385	
L L	concentration of ground water flow into PM-13	C_g13 =	0.385	(mg/l)
		1		
Water Balance	flow in river at PM-12	Q_r12 =	3.06	(cfs)
Water Balanc	flow in river at PM-13	Q_r13 =	16.50	(cfs)
Ba	flow check	Q_ck =	16.50	(cfs)
	mass flux of surface water into PM-12	M_s12 =	5	(mg/s)
	mass flux of surface water into PM-13	M_s13 =		(mg/s)
of	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
Ξ×	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
el e	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 =	9	(mg/s)
ΰË	mass flux of ground water into PM-13	M_g13 =		(mg/s)
Φ	mana flux in river at DM 10	M #10	10	(me/c)
Mass Balance	mass flux in river at PM-12	M_r12 =	16	(mg/s)
Mass Balan	mana flux in viver at DM 10	M =10	040	(22 2 /2)
	mass flux in river at PM-13	M_r13 =	349	(mg/s)
Calculated Concentration				
tec tra	concentration in river at PM-12	C_r12 =	0.18	(mg/l)
ulai				
Calculated Concentrat				
ΰŭ	concentration in river at PM-13	C_r13 =	0.75	(mg/l)
Observed Concentration				
d rati	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	0.11	(ma/l)
Observed Concentra	Observed concentration in river at FIVE12 for hows at FIVE13 OF 10-	20 613	0.11	(mg/l)
sei				
O O O O	Observed concentration in river at PM-13 for flows of 10-20 cfs		0.76	(mg/l)
			0.70	\''' ' '''

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Iron: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0 cfs

		0	0.00	(.(.)
	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	
Ň	Area 5 Pit NW discharge LTVSMC Tailings Basin seepage	Q_spit = Q_fs =	2.80	
nput Flow I	Hydrometallurgical Residue Cells Liner Leakage	$Q_{1s} = Q_{rrs} =$	0.00	
t	ground water flow into PM-12	$Q_{g12} =$	0.00	
du	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	4.21	
—	ground water now into r in-15	Q_910 =	7.21	(013)
ď	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)
on I	concentration of WWTP discharge	C_sBab =	2.9	(mg/l)
rati	concentration of Area 5 Pit NW discharge	C_spit =	0.038	(mg/l)
cent	concentration of LTVSMC Tailings Basin seepage	C_fs =	4.594	(mg/l)
ouc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration Data	concentration of ground water flow into PM-12	C_g12 =	0.035	(mg/l)
Inpi	concentration of ground water flow into PM-13	C_g13 =	0.035	(mg/l)
Water Balance	flow in river at PM-12	Q_r12 =	1.66	· · ·
Water Balan	flow in river at PM-13	Q_r13 =	8.20	
≤ ä	flow check	Q_ck =	8.20	(cfs)
	mass flux of surface water into PM-12	M_s12 =		(mg/s)
т	mass flux of surface water into PM-13	M_s13 =		(mg/s)
0	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
latior Flux	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
<u> </u>	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
cuss	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 =	4	(mg/s)
Mass Balance	mass flux in river at PM-12	M_r12 =	28	(mg/s)
Mass Balan				
Σú	mass flux in river at PM-13	M_r13 =	396	(mg/s)
tio				
tec	concentration in river at PM-12	C_r12 =	0.59	(mg/l)
ula cen				- /
Calculated Concentration	essentiation in view of DM 40	0		(m c /l)
00	concentration in river at PM-13	C_r13 =	1.71	(mg/l)
Ę				
Observed Concentration				
Observed Concentra	Observed concentration in river at PM-12 for flows at PM-13 of < 1	0 cfs	2.41	(mg/l)
ser Jce				
C O	Observed concentration in river at PM-13 for flows < 10 cfs		1.52	(mg/l)
	•			- /

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Iron: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0.26 cfs

surface water flow into PM-12 Q s12		
		· /
surface water flow into PM-13 Q_s13 Babbitt WWTP discharge Q_sBat Area 5 Pit NW discharge Q_spit LTVSMC Tailings Basin seepage Q_fs = Hydrometallurgical Residue Cells Liner Leakage Q_g12 ground water flow into PM-12 Q_g12 ground water flow into PM-12 Q_g12		
Babbitt WWTP discharge Q_sBat		· /
Area 5 Pit NW discharge Q_spit		
Q_fs = Hydrometallurgical Residue Cells Liner Leakage Q_rrs =	2.90 0.00	· /
ground water flow into PM-12 Q_g12		\ /
ground water flow into PM-12 Q_g13		(cfs)
		(010)
concentration of surface water into PM-12 C s12	= 2.9	(mg/l)
concentration of surface water into PM-12 C_s13		(mg/l)
5 concentration of WWTP discharge C_sBat		(mg/l)
concentration of Area 5 Pit NW discharge C_spit		(mg/l)
concentration of LTVSMC Tailings Basin seepage C_fs =		(mg/l)
concentration of Hydrometallurgical Residue Cells Liner Leakage C_rrs =		\`` ə ''/
concentration of WWTP discharge C_sBat concentration of Area 5 Pit NW discharge C_spit = concentration of LTVSMC Tailings Basin seepage C_fs = concentration of Hydrometallurgical Residue Cells Liner Leakage C_rrs = concentration of ground water flow into PM-12 C_g12 concentration of ground water flow into PM-13 C_g13		(mg/l)
C concentration of ground water flow into TM 12		
C_g13	= 0.035	(mg/l)
	1 70	(= { = }
flow in river at PM-12 Q_r12 = flow in river at PM-13 Q_r13 = flow check Q_ck =		· · ·
flow in river at PM-13 Q_r13 =		
S m flow check Q_ck =	8.56	(cfs)
mass flux of surface water into PM-12 M_s12		(mg/s)
mass flux of surface water into PM-13 M_s13		(mg/s)
mass flux of Babbitt WWTP M_sBal		(mg/s)
concentration of Area 5 Pit NW discharge M_spit concentration of LTVSMC Tailings Basin seepage M_fs =		(mg/s)
concentration of LTVSMC Tailings Basin seepage M_fs =		(mg/s)
concentration of Hydrometallurgical Residue Cells Liner Leakage M_rrs = mass flux of ground water into PM-12 M_g12		(mg/s) (mg/s)
mass flux of Babbitt WWTP M_sBal concentration of Area 5 Pit NW discharge M_spit concentration of LTVSMC Tailings Basin seepage M_fs = concentration of Hydrometallurgical Residue Cells Liner Leakage M_rrs = mass flux of ground water into PM-12 M_g12 mass flux of ground water into PM-13 M_g13		(mg/s) (mg/s)
		(119/3)
mass flux in river at PM-12 M_r12 mass flux in river at PM-13 M_r13 =	= 28	(mg/s)
M_12	/	, , , ,
∑ mass flux in river at PM-13 M_r13 =	= 409	(mg/s)
	- 0.57	(mg/l)
C r12		\``` ` ''/
concentration in river at PM-12 C_r12 =	- 0.07	
C_r12 =		
concentration in river at PM-12 C_r12 =		(mg/l)
		(mg/l)
		(mg/l)
	= 1.69	
		(mg/l) (mg/l)
	= 1.69	

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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	Q_s12 =	1.89	
nput Flow Data	surface water flow into PM-13	Q_s13 =	9.21	
õ	Babbitt WWTP discharge	Q_sBab =	0.33	
Ň	Area 5 Pit NW discharge	Q_spit =	0.00	
문	LTVSMC Tailings Basin seepage	Q_fs =	0.00	
t	Hydrometallurgical Residue Cells Liner Leakage	$Q_rrs =$	0.00	
du	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	0.86 4.21	
_		Q_915 =	4.21	(015)
	concentration of surface water into PM-12	C_s12 =	20	(mg/l)
Data		C_312 =		(mg/l)
	concentration of surface water into PM-13			
tior	concentration of WWTP discharge	C_sBab =		(mg/l)
ntra	concentration of Area 5 Pit NW discharge	C_spit =	0.038	
cer	concentration of LTVSMC Tailings Basin seepage	C_fs =	4.594	(mg/l)
lon	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)
lnp	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	<u>,</u> ,
Wa Bal	flow check	Q ck =	16.50	· · ·
				. ,
	mass flux of surface water into PM-12	M_s12 =	155	(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 =	0	(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	0	(mg/s)
s F 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 =		(mg/s)
ŰΣ	mass flux of ground water into PM-13	M_g13 =	4	(mg/s)
		1		
e	mass flux in river at PM-12	M r12 =	183	(mg/s)
Mass Balance			100	(iiig/3)
Mass Balan	mass flux in river at PM-13	M_r13 =	943	(mg/s)
	1			\ <u>3</u> -7/
L L				
atic				
ate ntr	concentration in river at PM-12	C_r12 =	2.11	(mg/l)
Calculated Concentration				
Col	concentration in river at PM-13	C_r13 =	2.02	(mg/l)
00		0_115 =	2.02	(mg/l)
Ę				
Observed Concentration				
/ed nträ	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	3.43	(mg/l)
cei				
Observed Concentra	Observed concentration in river at DM 10 for flows of 10,00 of		1 75	(ma/l)
00	Observed concentration in river at PM-13 for flows of 10-20 cfs		1.75	(mg/l)

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Iron: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0.26 cfs

		0	1.04	(
	surface water flow into PM-12	Q_s12 =	1.84	
Data	surface water flow into PM-13	Q_s13 =	9.00	
<u> </u>	Babbitt WWTP discharge	Q_sBab =	0.33	
nput Flow	Area 5 Pit NW discharge	Q_spit =	0.26	
드	LTVSMC Tailings Basin seepage	Q_fs =	0.00	
t	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
ā	ground water flow into PM-12	Q_g12 =	0.86	
	ground water flow into PM-13	Q_g13 =	4.21	(CIS)
_	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)
u I	concentration of WWTP discharge	 C_sBab =		(mg/l)
ratic	concentration of Area 5 Pit NW discharge	 C_spit =	0.038	
enti	concentration of LTVSMC Tailings Basin seepage	C_fs =	4.594	
DUC	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration Data	concentration of ground water flow into PM-12	C_g12 =	0.035	(ma/l)
ndu	concentration of ground water flow into PM-13	C_g13 =	0.035	
_	Concentration of ground water now into the 13	0_910 =	0.000	(mg/1)
ø	flow in river at PM-12	Q_r12 =	3.06	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	16.50	
Wa Ba	flow check	 Q_ck =	16.50	
	mass flux of surface water into PM-12	M_s12 =	151	(mg/s)
	mass flux of surface water into PM-13	M_s13 =		(mg/s)
of	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
Б×	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
с n В П	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)
ΰຶຶ	mass flux of ground water into PM-13	M_g13 =		(mg/s)
e C	mass flux in river at PM-12	M_r12 =	179	(mg/s)
Mass Balance				
Ba Ba	mass flux in river at PM-13	M_r13 =	922	(mg/s)
-ioi				
ed rat	concentration in river at PM-12	C r12 =	2.07	(mg/l)
ulat ent		0_112 =	2.07	(119/1)
Calculated Concentration				
ŰŬ	concentration in river at PM-13	C_r13 =	1.97	(mg/l)
C				
atio				
/ed ntra	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	3.43	(mg/l)
en cei				
Observed Concentration	Observed concentration in river at PM-13 for flows of 10-20 cfs		1.75	(mg/l)
	O Deserved concentration in river at Fivi-13 for nows of 10-20 cfs			\'''9'''/

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Magnesium: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0 cfs

			0.00	(()
	surface water flow into PM-12	Q_s12 =	0.00	
Data	surface water flow into PM-13	Q_s13 =	0.00	
Ő	Babbitt WWTP discharge	Q_sBab =	0.33	
Ň	Area 5 Pit NW discharge	Q_spit =	0.00	<u>`</u>
Ĕ	LTVSMC Tailings Basin seepage	Q_fs =	1.80	
t	Hydrometallurgical Residue Cells Liner Leakage	$Q_{rrs} =$	0.00	
nput Flow	ground water flow into PM-12 ground water flow into PM-13	Q_g12 = Q_g13 =	0.86 4.21	
_	ground water now into FM-13	Q_913 =	4.21	(015)
	concentration of surface water into PM-12	C_s12 =	6	(mg/l)
)ata	concentration of surface water into PM-13	C_s13 =		(mg/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 =	69.97	
nce	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	00.07	\''' '
nput Concentration Data	concentration of ground water flow into PM-12	C_g12 =	10.65	(ma/l)
Iput	-			
<u> </u>	concentration of ground water flow into PM-13	C_g13 =	10.65	(mg/l)
	flow in vivor of DM 10	0 - 10	1 40	(ofo)
Water Balance	flow in river at PM-12	Q_r12 =	1.49	
Water Balanc	flow in river at PM-13	Q_r13 =	7.20	
<u>>ш</u>	flow check	Q_ck =	7.20	(CIS)
	Image flux of ourfood water into DM 10	M_s12 =	0	(ma/a)
	mass flux of surface water into PM-12 mass flux of surface water into PM-13	$M_{s12} =$		(mg/s)
et.	mass flux of Babbitt WWTP	$M_s Bab =$		(mg/s) (mg/s)
U U	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s) (mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M fs =		(mg/s) (mg/s)
Ξla	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(mg/s) (mg/s)
lct Iss	mass flux of ground water into PM-12	M_g12 =	259	(mg/s) (mg/s)
Calculation of Mass Flux	mass flux of ground water into PM-13	M_g12 =	1269	(mg/s)
02		W_g15 =	1209	(ing/s)
0				
Mass Balance	mass flux in river at PM-12	M_r12 =	315	(mg/s)
Mass Balan				
2 0	mass flux in river at PM-13	M_r13 =	5148	(mg/s)
F				
tio T				
ttec	concentration in river at PM-12	C_r12 =	7.47	(mg/l)
Calculated Concentration				
alc				, m
00	concentration in river at PM-13	C_r13 =	25.27	(mg/l)
_ ۲				
Observed Concentration				
Observed Concentra	Observed concentration in river at PM-12 for flows at PM-13 of < 1	0 cfs	6.90	(mg/l)
ser				
o p O O	Observed concentration in river at PM-13 for flows < 10 cfs		24.53	(mg/l)
				\

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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)
uta	surface water flow into PM-13	Q_s13 =	0.00	
nput Flow Data	Babbitt WWTP discharge	Q_sBab =	0.33	
≥	Area 5 Pit NW discharge	Q_spit =	0.26	
음	LTVSMC Tailings Basin seepage	Q_fs =	0.30	<u>`</u>
E E	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
d d	ground water flow into PM-12	Q_g12 =	0.86	
<u> </u>	ground water flow into PM-13	Q_g13 =	4.21	(cfs)
ប	concentration of surface water into PM-12	C_s12 =	6	(mg/l)
Data	concentration of surface water into PM-13	C_s13 =	6	(mg/l)
	concentration of WWTP discharge	C_sBab =	6	(mg/l)
ratio	concentration of Area 5 Pit NW discharge	C_spit =		(mg/l)
entr	concentration of LTVSMC Tailings Basin seepage	C fs =	69.97	
nce	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	00.07	\`` <i>`</i> '''/
ပိ				,
nput Concentration	concentration of ground water flow into PM-12	C_g12 =	10.65	(mg/l)
Ing	concentration of ground water flow into PM-13	C_g13 =	10.65	(mg/l)
e e	flow in river at PM-12	Q_r12 =	1.28	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	5.96	(cfs)
Ba Ba	flow check	Q_ck =	5.96	(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)
of	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
Ξ×	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
	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)
ΰĔ	mass flux of ground water into PM-13	M_g13 =	1269	
			1200	(1119/5)
			1200	(mg/s)
) JCe	mass flux in river at PM-12	M_r12 =		(mg/s)
ass llance	mass flux in river at PM-12	M_r12 =		
Mass Balance	mass flux in river at PM-12 mass flux in river at PM-13	M_r12 = M_r13 =	315	
Mass Balance			315	(mg/s)
			315	(mg/s)
	mass flux in river at PM-13	 M_r13 =	<u>315</u> 4172	(mg/s) (mg/s)
			<u>315</u> 4172	(mg/s)
	mass flux in river at PM-13	 M_r13 =	<u>315</u> 4172	(mg/s) (mg/s)
	mass flux in river at PM-13	 M_r13 =	<u>315</u> 4172	(mg/s) (mg/s)
Calculated Mass Concentration Balance	mass flux in river at PM-13	 M_r13 =	<u>315</u> 4172	(mg/s) (mg/s) (mg/l)
Calculated Concentration	mass flux in river at PM-13 concentration in river at PM-12	M_r13 = C_r12 =	315 4172 8.69	(mg/s) (mg/s) (mg/l)
Calculated Concentration	mass flux in river at PM-13 concentration in river at PM-12	M_r13 = C_r12 =	315 4172 8.69	(mg/s) (mg/s) (mg/l)
Calculated Concentration	mass flux in river at PM-13 concentration in river at PM-12 concentration in river at PM-13	M_r13 = C_r12 = C_r13 =	315 4172 8.69 24.74	(mg/s) (mg/s) (mg/l)
Calculated Concentration	mass flux in river at PM-13 concentration in river at PM-12	M_r13 = C_r12 = C_r13 =	315 4172 8.69	(mg/s) (mg/s) (mg/l)
	mass flux in river at PM-13 concentration in river at PM-12 concentration in river at PM-13	M_r13 = C_r12 = C_r13 =	315 4172 8.69 24.74	(mg/s) (mg/s) (mg/l)

24.53 (mg/l)

Observed concentration in river at PM-13 for flows < 10 cfs

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Magnesium: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0 cfs

_	surface water flow into PM-12	Q_s12 =	1.33	
Data	surface water flow into PM-13	Q_s13 =		(cfs)
ä	Babbitt WWTP discharge	Q_sBab =	0.33	
nput Flow	Area 5 Pit NW discharge	Q_spit =	0.00	
문	LTVSMC Tailings Basin seepage	Q_fs =	3.30	· /
t t	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
đ	ground water flow into PM-12	Q_g12 =	0.86	` <i>'</i>
	ground water flow into PM-13	Q_g13 =	4.21	(cfs)
	anneathation of conference into DM 40	0 - 10	0	(
ta	concentration of surface water into PM-12	C_s12 =	6	(mg/l)
Da	concentration of surface water into PM-13	C_s13 =	6	(mg/l)
ion	concentration of WWTP discharge	C_sBab =	6	(mg/l)
trat	concentration of Area 5 Pit NW discharge	C_spit =	271	(mg/l)
cent	concentration of LTVSMC Tailings Basin seepage	C_fs =	69.97	(mg/l)
ouo	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration Data	concentration of ground water flow into PM-12	C_g12 =	10.65	(mg/l)
Inpi	concentration of ground water flow into PM-13	C_g13 =	10.65	(mg/l)
e	flow in river at PM-12	Q_r12 =	3.06	(cfs)
ے ج	flow in river at PM-13	 Q_r13 =	16.50	
Ba	flow check	 Q_ck =	16.50	
		-		
	mass flux of surface water into PM-12	M_s12 =	225	(mg/s)
	mass flux of surface water into PM-13	M_s13 =		(mg/s)
of	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
Ξ×	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
	concentration of Hydrometallurgical Residue Cells Liner Leakage	M rrs =		(mg/s)
	mass flux of ground water into PM-12	 M_g12 =		(mg/s)
ΰĔ	mass flux of ground water into PM-13	M_g13 =		(mg/s)
		-		
۵. س				
Mass Balance	mass flux in river at PM-12	M_r12 =	540	(mg/s)
Mass Balan				
Ва Ва	mass flux in river at PM-13	M_r13 =	9443	(mg/s)
uc				
d				
ate	concentration in river at PM-12	C_r12 =	6.23	(mg/l)
ula Ser				
Calculated Concentration				
ΰŭ	concentration in river at PM-13	C_r13 =	20.22	(mg/l)
on				
d ati	Observed serverstation in view of DM 40 (selfler set) DM 40. (40	00 -1-	0.00	(
vec	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 CIS	6.06	(mg/l)
ser Ice				
Observed Concentration	Observed servestion in viver at DM 40 for flows of 40,00 of		00.00	(m m/l)
00	Observed concentration in river at PM-13 for flows of 10-20 cfs		20.33	(mg/l)

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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	· /
nput Flow Data	surface water flow into PM-13	Q_s13 =	7.17	
	Babbitt WWTP discharge	Q_sBab =	0.33	· /
≥ S	Area 5 Pit NW discharge	Q_spit =	0.26	
	LTVSMC Tailings Basin seepage	Q_fs =	2.20	· /
T T	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
ਹਿ	ground water flow into PM-12	Q_g12 =	0.86	
-	ground water flow into PM-13	Q_g13 =	4.21	(cfs)
	concentration of ourfees water into DM 10	C s12 =	C	(m m/l)
Data	concentration of surface water into PM-12	_		(mg/l)
õ	concentration of surface water into PM-13	C_s13 =	6	(mg/l)
ion	concentration of WWTP discharge	C_sBab =	6	(mg/l)
trat	concentration of Area 5 Pit NW discharge	C_spit =	271	(mg/l)
.ueu	concentration of LTVSMC Tailings Basin seepage	C_fs =	69.97	(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 =	10.65	(ma/l)
ndr				
<u> </u>	concentration of ground water flow into PM-13	C_g13 =	10.65	(mg/I)
0	flow in vivor of DM 10	0 -10	0.00	(afc)
Water Balance	flow in river at PM-12	Q_r12 =	3.06	`
Water Balanc	flow in river at PM-13	Q_r13 =	16.50	
5 0	flow check	Q_ck =	16.50	(cfs)
	mass flux of surface water into PM-12	M_s12 =		(mg/s)
	mass flux of surface water into PM-13	M_s13 =		(mg/s)
ō	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
Lo X	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
luc si	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)
0≥	mass flux of ground water into PM-13	M_g13 =	1269	(mg/s)
C e	mass flux in river at PM-12	M r12 =	565	(mg/s)
ss an				(
Mass Balance	mass flux in river at PM-13	M r13 =	9402	(mg/s)
		<u> </u>	0.02	(····;) ···/
u U				
Calculated Concentration				
ate	concentration in river at PM-12	C_r12 =	6.51	(mg/l)
cei				
Calculated Concentrat				
00	concentration in river at PM-13	C_r13 =	20.13	(mg/l)
Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs				
		20 cfs	6.06	(mg/l)
Observed Concentra				
) See				
ŏŏ	Observed concentration in river at PM-13 for flows of 10-20 cfs		20.33	(mg/l)

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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	· /
nput Flow Data	surface water flow into PM-13	Q_s13 =	0.00	
	Babbitt WWTP discharge	Q_sBab =	0.33	<u>`</u>
	Area 5 Pit NW discharge	Q_spit =	0.00	<u>`</u>
음	LTVSMC Tailings Basin seepage	Q_fs =	4.20	<u>`</u>
rt I	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
ਹੁ	ground water flow into PM-12	Q_g12 =	0.86	
-	ground water flow into PM-13	Q_g13 =	4.21	(cfs)
ອ	concentration of surface water into PM-12	C_s12 =	3.5	(mg/l)
Data	concentration of surface water into PM-13	C_s13 =	3.5	(mg/l)
Lo	concentration of WWTP discharge	C_sBab =	3.5	(mg/l)
ratio	concentration of Area 5 Pit NW discharge	C_spit =		(mg/l)
enti	concentration of LTVSMC Tailings Basin seepage	C fs =	44.31	
uc uc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	(
ပိ				(ma/l)
nput Concentration	concentration of ground water flow into PM-12	C_g12 =		(mg/l)
<u>_</u>	concentration of ground water flow into PM-13	C_g13 =	4.9	(mg/l)
	I			
Water Balance	flow in river at PM-12	Q_r12 =	1.90	(cfs)
Water Balanc	flow in river at PM-13	Q_r13 =	9.60	(cfs)
Ba W	flow check	Q_ck =	9.60	(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)
of	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
Б×	concentration of Area 5 Pit NW discharge	M_spit =	0	(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	5267	(mg/s)
s F	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)
ΰΣ	mass flux of ground water into PM-13	M_g13 =	584	(mg/s)
Ð		N		
Mass Balance	mass flux in river at PM-12	M_r12 =	152	(mg/s)
Mass Balan	mass flux in river at DM 12	M r12	6000	(ma/c)
<u> 2 Ш</u>	mass flux in river at PM-13	M_r13 =	6002	(mg/s)
-				
tion				
ed rat	concentration in river at PM-12	C_r12 =	2.82	(mg/l)
lat ent		0_112 =	2.03	(119/1)
noe				
Calculated Concentration	concentration in river at PM-13	C_r13 =	22.09	(ma/l)
		<u> </u>	22.03	(יישייי)
uc				
Observed concentration in river at PM-12 for flows at PM-13 of < 10 cfs			, m	
Observed Concentra	Observed concentration in river at PM-12 for flows at PM-13 of < 1	UCIS	3.20	(mg/l)
ser				
ğ b	Observed concentration is given at DM 10 for flavor 10 of		22.20	(mg/l)
	O O Observed concentration in river at PM-13 for flows < 10 cfs			

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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	<u>,</u>
nput Flow 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	
음	LTVSMC Tailings Basin seepage	Q_fs =	3.10	<u> </u>
μ. μ	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
ndr	ground water flow into PM-12	Q_g12 =	0.86	
-	ground water flow into PM-13	Q_g13 =	4.21	(cfs)
			,	
ອ	concentration of surface water into PM-12	C_s12 =	3.5	(mg/l)
Data	concentration of surface water into PM-13	C_s13 =	3.5	(mg/l)
u U	concentration of WWTP discharge	C sBab =	3.5	(mg/l)
ratio	concentration of Area 5 Pit NW discharge	C_spit =		(mg/l)
enti	concentration of LTVSMC Tailings Basin seepage	C fs =	44.31	
uče uč	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	(9,.)
ပိ		_		(ma/l)
nput Concentration	concentration of ground water flow into PM-12	C_g12 =		(mg/l)
<u>_</u>	concentration of ground water flow into PM-13	C_g13 =	4.9	(mg/l)
		1	,	
_ e	flow in river at PM-12	Q_r12 =	1.75	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	8.76	(cfs)
Ba Ba	flow check	Q_ck =	8.76	(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)
of	mass flux of Babbitt WWTP	M_sBab =	33	(mg/s)
ысх	concentration of Area 5 Pit NW discharge	M_spit =	883	(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	3887	(mg/s)
s P s	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)
ΰΣ	mass flux of ground water into PM-13	M_g13 =	584	(mg/s)
Ð	and the first DM do	N		(
Mass Balance	mass flux in river at PM-12	M_r12 =	152	(mg/s)
Mass Balan	mass flux in river at PM 12	M r12	FEOC	(ma/c)
∠ Ш	mass flux in river at PM-13	M_r13 =	3006	(mg/s)
-				
tion				
ed rat	concentration in river at PM-12	C_r12 =	3.06	(mg/l)
lat [.] Эnt		0_112 =	5.00	(mg/1)
nce Licu				
Calculated Concentration	concentration in river at PM-13	C_r13 =	22.21	(ma/l)
		0_110 =	22.21	(119/1)
Ę				
Observed concentration in river at PM-12 for flows at PM-13 of < 10 cfs				
		3.20	(mg/l)	
utr je	er cer			
ervec				
Observed Concentration	Observed concentration in river at PM-13 for flows < 10 cfs		22.20	(mg/l)

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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	· · ·
nput Flow Data	surface water flow into PM-13	Q_s13 =	7.14	
ő	Babbitt WWTP discharge	Q_sBab =	0.33	· /
≥ /	Area 5 Pit NW discharge	Q_spit =	0.00	
음	LTVSMC Tailings Basin seepage	Q_fs =	2.50	· /
<u> </u>	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
d d	ground water flow into PM-12	Q_g12 =	0.86	
	ground water flow into PM-13	Q_g13 =	4.21	(cfs)
	en en el el transforma de la compañía de DM 40	010	0.5	(
to to	concentration of surface water into PM-12	C_s12 =		(mg/l)
Da	concentration of surface water into PM-13	C_s13 =	3.5	(mg/l)
uo uo	concentration of WWTP discharge	C_sBab =	3.5	(mg/l)
rati	concentration of Area 5 Pit NW discharge	C_spit =	120	(mg/l)
ent	concentration of LTVSMC Tailings Basin seepage	C_fs =	44.31	(mg/l)
onc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
Ŭ	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)
	flow in vivor et DM 10	0 - +10	0.00	(of c)
Water Balance	flow in river at PM-12	Q_r12 =	3.06	<u> </u>
Water Balanc	flow in river at PM-13	Q_r13 =	16.50	· · ·
<u>ا</u> ۵ ک	flow check	Q_ck =	16.50	(cfs)
		-		
	mass flux of surface water into PM-12	M_s12 =		(mg/s)
	mass flux of surface water into PM-13	M_s13 =		(mg/s)
io I	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
ss sul	concentration of Hydrometallurgical Residue Cells Liner Leakage	M_rrs =		(mg/s)
	mass flux of ground water into PM-12	M_g12 =		(mg/s)
O ≥ 1	mass flux of ground water into PM-13	M_g13 =	584	(mg/s)
e C	mass flux in river at PM-12	M r12 =	297	(mg/s)
Mass Balance				\ J ⁻ /
Ba	mass flux in river at PM-13	M r13 =	4723	(mg/s)
				、 ∪ -/
u				
atic				
ate	concentration in river at PM-12	C_r12 =	3.42	(mg/l)
Calculated				
Son	encoded in the et DM 10	0	10.11	(
	concentration in river at PM-13	C_r13 =	10.11	(mg/I)
C				
Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs				
ed htra	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	2.70	(mg/l)
erv				
Observed				
	Observed concentration in river at PM-13 for flows of 10-20 cfs		9.90	(mg/l)

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Sodium: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0.26 cfs

	· · · · · · · · · · · · · · · · · · ·		. – .	
_	surface water flow into PM-12	Q_s12 =	1.54	
Data	surface water flow into PM-13	Q_s13 =	7.50	
ä	Babbitt WWTP discharge	Q_sBab =	0.33	
Ň	Area 5 Pit NW discharge	Q_spit =	0.26	
nput Flow I	LTVSMC Tailings Basin seepage	Q_fs =	1.80	
т т	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
Idr	ground water flow into PM-12	Q_g12 =	0.86	
=	ground water flow into PM-13	Q_g13 =	4.21	(CIS)
	concentration of ourface water into DM 10	C_s12 =	2.5	(mg/l)
Data	concentration of surface water into PM-12			
Ď	concentration of surface water into PM-13	C_s13 =		(mg/l)
ion	concentration of WWTP discharge	C_sBab =	3.5	(mg/l)
trat	concentration of Area 5 Pit NW discharge	C_spit =	120	(mg/l)
Sen	concentration of LTVSMC Tailings Basin seepage	C_fs =	44.31	(mg/l)
onc	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	 Cg13 =		(mg/l)
	concentration of ground water now into t M-15	0_910 =	4.9	(mg/1)
()	flow in river at PM-12	Q_r12 =	3.06	(cfs)
	flow in river at PM-12	Q_112 = Q r13 =	16.50	`
Water Balan	flow check			
<u> </u>	now check	Q_ck =	16.50	(CIS)
	man flux of our for a surface lists DM 10	M = 10	150	(
	mass flux of surface water into PM-12	M_s12 =		(mg/s)
-t	mass flux of surface water into PM-13	M_s13 = M_sBab =		(mg/s)
οι	mass flux of Babbitt WWTP			(mg/s)
latior Flux	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
FI at	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
cu	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 =	584	(mg/s)
Mass Balance	mass flux in river at PM-12	M_r12 =	304	(mg/s)
Mass Balan				
Ba Ba	mass flux in river at PM-13	M_r13 =	4771	(mg/s)
uo				
d atic				
ate	concentration in river at PM-12	C_r12 =	3.51	(mg/l)
Calculated Concentration				
alc				
00	concentration in river at PM-13	C_r13 =	10.22	(mg/l)
C.				
Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs				
		20 cfs	2.70	(mg/l)
erv.				
Observed Concentra				
	Observed concentration in river at PM-13 for flows of 10-20 cfs		9.90	(mg/l)

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Sulfate: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0 cfs

			0.00	(()
	surface water flow into PM-12	Q_s12 =	0.00	
Data	surface water flow into PM-13	Q_s13 =	0.00	
Ő	Babbitt WWTP discharge	Q_sBab =	0.33	
Ň	Area 5 Pit NW discharge LTVSMC Tailings Basin seepage	Q_spit =		· /
nput Flow	Hydrometallurgical Residue Cells Liner Leakage	Q_fs = Q_rrs =	1.60 0.00	
rt	ground water flow into PM-12	$Q_{g12} =$	0.86	
du	ground water flow into PM-13	$Q_{g12} = Q_{g13} =$	4.21	
_		&_g10 =	7.21	(013)
ď	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)
u	concentration of WWTP discharge	C_sBab =	4	(mg/l)
trati	concentration of Area 5 Pit NW discharge	C_spit =	1046	(mg/l)
cent	concentration of LTVSMC Tailings Basin seepage	C_fs =	152.4	(mg/l)
ouo	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration Data	concentration of ground water flow into PM-12	C_g12 =	8.5	(mg/l)
Inpi	concentration of ground water flow into PM-13	C_g13 =	8.5	(mg/l)
e J	flow in river at PM-12	Q_r12 =	1.46	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	7.00	(cfs)
Ba K	flow check	Q_ck =	7.00	(cfs)
	mass flux of surface water into PM-12	M_s12 =		(mg/s)
	mass flux of surface water into PM-13	M_s13 =		(mg/s)
of	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
Lo X	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =		(mg/s)
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 =	207	(mg/s)
SΟ	mass flux of ground water into PM-13	M_g13 =	1013	(mg/s)
		T		
e	mass flux in river at PM-12	M r12 =	244	(mg/s)
ss an		<u></u>	211	(119/0)
Mass Balance	mass flux in river at PM-13	M r13 =	8158	(mg/s)
		1	0100	(119/3)
L L				
d atic				
ntre	concentration in river at PM-12	C_r12 =	5.92	(mg/l)
Calculated Concentration				
alc				
ΟŪ	concentration in river at PM-13	C_r13 =	41.18	(mg/l)
~				
Observed concentration in river at PM-12 for flows at PM-13 of < 10 cfs				
		0 cfs	3.06	(mg/l)
Observed Concentra				
se				
č č	Observed concentration in river at PM-13 for flows < 10 cfs		41.30	(mg/l)

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Sulfate: Flows at PM-13 < 10 cfs, Pit 5NW Q = 0.26 cfs

	A for a star flat to the DM 40	0	0.00	(.(.)
	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	
nput Flow	Area 5 Pit NW discharge	Q_spit =	0.26	
臣	LTVSMC Tailings Basin seepage	Q_fs =	0.00	
t	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
<u>ā</u>	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 =	4	(mg/l)
Data	concentration of surface water into PM-13	 C_s13 =		(mg/l)
u [concentration of WWTP discharge	C_sBab =		(mg/l)
ratic	concentration of Area 5 Pit NW discharge	C_spit =		(mg/l)
enti	concentration of LTVSMC Tailings Basin seepage	C_fs =	152.4	
DUC	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration Data	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/l)
Ð	flow in river at PM-12	Q_r12 =	1.23	(cfs)
Water Balance	flow in river at PM-13	Q_112 =	5.66	
Water Balanc	flow check	Q_ck =	5.66	
				(0.0)
	mass flux of surface water into PM-12	M_s12 =	0	(mg/s)
	mass flux of surface water into PM-13	M_ <u>512</u> =		(mg/s)
đ	mass flux of Babbitt WWTP	M_sBab =		(mg/s) (mg/s)
L L	concentration of Area 5 Pit NW discharge	M_spit =		(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	$M_{s} = M_{s}$		(mg/s)
л Па	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)
Calcul Mass	mass flux of ground water into PM-13	M_g13 =		(mg/s)
02		W_g10 =	1010	(119/3)
رب س				
Mass Balance	mass flux in river at PM-12	M_r12 =	244	(mg/s)
Mass Balan	and the first DM do	M . 10	0050	((-)
□ 2 山	mass flux in river at PM-13	M_r13 =	8953	(mg/s)
C				
tio				
ed	concentration in river at PM-12	C r12 =	7.01	(mg/l)
Calculated Concentration		0_112 -	7.01	(119/1)
alct				
ပိပိ	concentration in river at PM-13	C_r13 =	55.90	(mg/l)
_				
Observed concentration in river at PM-12 for flows at PM-13 of < 10 cfs				
		0 cfs	3.06	(mg/l)
en en				
Observed Concentra				
ÖÖ	Observed concentration in river at PM-13 for flows < 10 cfs		41.30	(mg/l)

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Sulfate: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0 cfs

_	surface water flow into PM-12	Q_s12 =	1.12	\ /
nput Flow Data	surface water flow into PM-13	Q_s13 =	5.49	
ä	Babbitt WWTP discharge	Q_sBab =	0.33	
No.	Area 5 Pit NW discharge	Q_spit =	0.00	
문	LTVSMC Tailings Basin seepage	Q_fs =	4.00	
- T	Hydrometallurgical Residue Cells Liner Leakage	Q_rrs =	0.00	
nd d	ground water flow into PM-12	Q_g12 =	0.86	
-	ground water flow into PM-13	Q_g13 =	4.21	(CfS)
		0		((I)
ផ្	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)
ч	concentration of WWTP discharge	C_sBab =	4	(mg/l)
rati	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)
onc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
Input Concentration	concentration of ground water flow into PM-12	 C_g12 =		(mg/l)
Indu				
<u> </u>	concentration of ground water flow into PM-13	C_g13 =	8.5	(mg/l)
				1
- Le	flow in river at PM-12	Q_r12 =	2.98	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	16.01	(cfs)
N A	flow check	Q_ck =	16.01	(cfs)
	mass flux of surface water into PM-12	M_s12 =	127	(mg/s)
	mass flux of surface water into PM-13	M_s13 =	621	(mg/s)
of	mass flux of Babbitt WWTP	M_sBab =	37	(mg/s)
ы Б	concentration of Area 5 Pit NW discharge	M_spit =	0	(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	17252	(mg/s)
s F	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)
ŰΣ	mass flux of ground water into PM-13	M_g13 =	1013	(mg/s)
		1		
e	mass flux in river at PM-12	M r12 =	271	(mg/s)
Mass Balance		<u> </u>	571	(119/3)
Mass Balan	mass flux in river at PM-13	M r13	10057	(ma/c)
	inass nux in nver al fivi-13	M_r13 =	19237	(mg/s)
E				
tion				
ed	concentration in river at PM-12	C r12 =	4 40	(mg/l)
Calculated Concentration		<u> </u>	т. т 0	('''9'')
uci Licu				
ပ် ပ	concentration in river at PM-13	C r13 =	42.50	(ma/l)
			12.00	('''9''')
Observed concentration in river at PM-12 for flows at PM-13 of 10-20 cfs				
		20 cfs	5.03	(mg/l)
erv				
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		45.33	(mg/l)

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Embarrass River Model - Calibration of Tailings Basin Seepage Parameter: Sulfate: Flows at PM-13 of 10-20 cfs, Pit 5NW Q = 0.26 cfs

			1.05	(()
	surface water flow into PM-12	Q_s12 =	1.35	
nput Flow Data	surface water flow into PM-13	Q_s13 =	6.60	
	Babbitt WWTP discharge	Q_sBab =	0.33	
Ň	Area 5 Pit NW discharge LTVSMC Tailings Basin seepage	Q_spit = Q_fs =	0.26	
Ē	Hydrometallurgical Residue Cells Liner Leakage	$Q_{rrs} =$	0.00	
t	ground water flow into PM-12	$Q_{g12} =$	0.00	
du	ground water flow into PM-12	Q_g12 = Q_g13 =	4.21	
	ground water now into 1 M-13	Q_910 =	4.21	(013)
-	concentration of surface water into PM-12	C_s12 =	4	(mg/l)
Data	concentration of surface water into PM-13	 C_s13 =		(mg/l)
on [concentration of WWTP discharge	C_sBab =		(mg/l)
ratic	concentration of Area 5 Pit NW discharge	 C_spit =		(mg/l)
ent	concentration of LTVSMC Tailings Basin seepage	C_fs =	152.4	
onc	concentration of Hydrometallurgical Residue Cells Liner Leakage	C_rrs =	0	
nput Concentration Data	concentration of ground water flow into PM-12	C_g12 =	8.5	(mg/l)
ndu	concentration of ground water flow into PM-13	 Cg13 =		(mg/l)
		9.0-	0.0	('''9''')
ø	flow in river at PM-12	Q_r12 =	2.98	(cfs)
Water Balance	flow in river at PM-13	Q_r13 =	16.01	
Ba	flow check	Q_ck =	16.01	(cfs)
			<u></u>	
	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)
of	mass flux of Babbitt WWTP	M_sBab =		(mg/s)
Б×	concentration of Area 5 Pit NW discharge	M_spit =	7696	(mg/s)
latior Flux	concentration of LTVSMC Tailings Basin seepage	M_fs =	10351	(mg/s)
s F	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 =		(mg/s)
ŰΣ	mass flux of ground water into PM-13	M_g13 =	1013	(mg/s)
		1	1	
e	mass flux in river at PM-12	M r12 =	397	(mg/s)
Mass Balance				(
Ma Ba	mass flux in river at PM-13	M_r13 =	20204	(mg/s)
Calculated Concentration				
∋d rati	concentration in river at PM-12	C r12	4 74	(ma/l)
late ent		C_r12 =	4.71	(mg/l)
Calculated Concentrat				
ပိုင်	concentration in river at PM-13	C_r13 =	44.59	(mg/l)
tion				
ed tration	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	5.03	(mg/l)
entration	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	5.03	(mg/l)
Observed Concentration	Observed concentration in river at PM-12 for flows at PM-13 of 10-	20 cfs	5.03 45.33	(mg/l) (mg/l)